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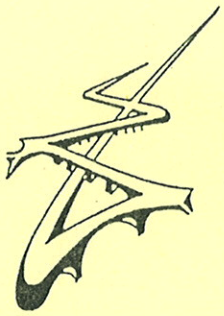

MAIN ROADS
Western Australia

PERTH - BUNBURY HIGHWAY
PEEL DEVIATION

ROAD ALIGNMENT DEFINITION REPORT

MARCH 1996

ecologia
ENVIRONMENTAL CONSULTANTS
GB HILL Consulting Engineers
in association with
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MAIN ROADS WESTERN AUSTRALIA

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ecologia Environmental Consultants
165 Walcott St.,
Mount Lawley W.A. 6050

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1.0 INTRODUCTION

For the purpose of implementing Main Roads Western Australia (MRWA) overall strategic planning program, Western Australia has been divided into nine regions. The South West is one such region, encompassing fifteen Local Government Councils which extend from the City of Mandurah and Shire of Murray (which adjoin the southern boundary of the Perth metropolitan area) to the Shire of Manjimup.

The South West Region centres on the City of Bunbury, Western Australia's second largest urban area. The Region contributes significantly to the State's economic and social development and is growing strongly. At present the Region accommodates about a third of the State's non-metropolitan population and contributes significantly towards its mineral and primary production and power generation. The South West Region is also an increasingly popular tourism and recreation destination.

An effective inter-regional road link between Perth and Bunbury is essential to the continued development of the South West Region. Since the early 1980s, successive State Governments have been committed to this objective through a multi-million dollar programme to upgrade the Perth - Bunbury Highway to a dual carriageway standard. The ultimate highway is intended to be a safe and efficient route that will provide a fast, free-flowing link between Perth and the South West. These objectives are set out in "Perth to Busselton: Coastal Corridor To The South West" (MRWA, 1993; see Appendix A).

The existing Highway, through and immediately south of Mandurah, is constrained by topography, urban development and sensitive environmental conditions such as the Yalgorup National Park. To overcome these difficulties, the concept of an inter-regional route bypassing Mandurah and located on the eastern side of the Peel - Harvey Estuary has been shown in regional and local plans and strategies since the 1980s. This route has become known as the Peel Deviation. It extends from the future Kwinana Freeway Extension north of Mandurah, across the Serpentine and Murray Rivers, east of the Peel - Harvey Estuary to merge with the existing Old Coast Road near Lake Clifton (see Figure 1).

The area east of the Peel - Harvey Estuary contains areas affected by System 6 conservation recommendations and wetlands subject to the Environmental Protection (Swan Coastal Plain Wetlands) Policy, 1992. It also forms part of the Peel - Harvey Estuary coastal plain catchment which is important in terms of nutrient enrichment of the estuarine system.

As a consequence of the environmental significance of the area and potential environmental impacts, the Environmental Protection Authority (EPA) has set the level of assessment for the proposed Peel Deviation at Public Environmental Review (PER). This report is part of the process of preparing the PER for the Peel Deviation. Its purpose is to document the review of route options for the Peel Deviation, and identify the "preferred option" upon which the detailed studies in the PER will focus.

The route alignment options illustrated within this report are representative only. The preferred alignment location will be subject to refinement as the planning and design process continues.

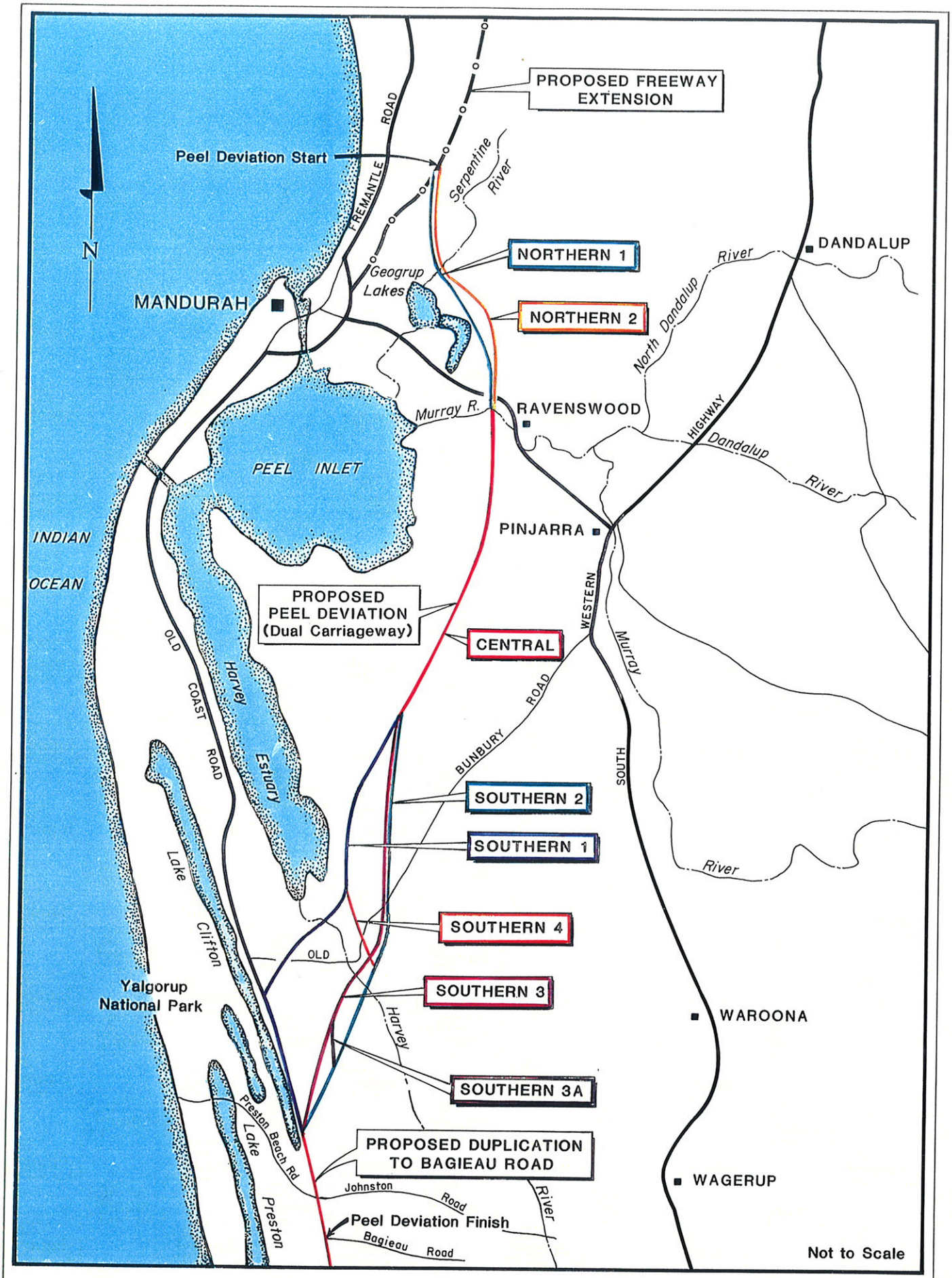


Figure 1: **Perth – Bunbury Highway Peel Deviation Location Map & Preliminary Route Options**

2.0 PROJECT DESCRIPTION

2.1 SCOPE

The study involves the selection, assessment and detailing of a route for the Peel Deviation which extends from the future Kwinana Freeway Extension north of Mandurah, across the Serpentine and Murray Rivers, east of the Peel - Harvey Estuary, joining the existing Perth Bunbury Highway (Old Coast Road) near Lake Clifton. However, for the purpose of this study the "Peel Deviation" shall also include that part of the duplication of the Old Coast Road which extends south to Bagieau Road, which is effectively the southern extremity of the Yalgorup National Park.

The Deviation will ultimately be developed to freeway/expressway standard (*i.e.* dual carriageway, grade separated interchanges and controlled access), however the first stage implementation would be built to a lesser standard.

The length of the Deviation is between 46 to 50 kilometres depending on the route adopted, with a further 6 to 12 kilometres of the existing Old Coast Road also affected. Most of the Deviation is within the Shires of Murray and Waroona, with the northern and southern ends within the City of Mandurah and Shire of Harvey respectively.

2.2 BACKGROUND

Some years ago the long term requirement for an alternative route to serve the needs of through traffic was investigated by MRWA. North of Mandurah this alternative can readily be provided by an extension of Kwinana Freeway linking it to the Mandurah Bypass. South of Mandurah the option of a parallel road is not possible due to the location of the existing road within a narrow peninsula between the Indian Ocean and the Peel Inlet - Harvey Estuary System. A concept for a new route east of the Peel Inlet was developed by Main Roads in the early 1980s. Initially the section between the Kwinana Freeway Extension and the Mandurah - Pinjarra Road at Ravenswood was developed in some detail because of development pressure particularly around the Serpentine River and just south of the Murray River. This section was included in the Murray Shire Town Planning Scheme.

South of Ravenswood, a preliminary route was developed but this was seen as very long term and no action was taken to confirm the route with Local Authorities and the general public. However, the route has been depicted on the Land Use Plan of the Peel Regional Plan, prepared by the Department of Planning and Urban Development (DPUD) and released in September 1994.

There are proposals for the residential development of land south of the Harvey Estuary in the path of the current route. These proposals have increased the requirement to better define the whole route of the Peel Deviation and its interconnection with the local road network to ensure that future road requirements are integrated into the land use planning and development of the area.

2.3 JUSTIFICATION FOR PEEL DEVIATION

There are two major road routes between Perth and the South West of the State, the Perth - Bunbury Highway which provides the coastal route and the South Western Highway which is located on the base of the Darling Scarp and provides the inland route. The Perth - Bunbury Highway is much more direct and is now firmly established as the primary route. The planning and development of the main road system servicing the South West is proceeding on this basis and is now well advanced, as indicated in the MRWA Perth - Busselton Strategy (see Appendix A).

The ultimate aim is to link the Perth - Bunbury Highway to the Kwinana Freeway Extension north of Mandurah and provide a fast, free flowing facility between Perth and Busselton. This implies a freeway or expressway facility with interchanges at major intersections to avoid traffic signals or roundabouts which impede the flow of through traffic and reduce efficiency.

Planning and development of this route in accordance with this ultimate objective includes the following:

- The Australind Bypass, which provides a high standard road around the residential areas of Australind and Eaton. The Bypass has been planned as a future freeway and is currently being upgraded to a dual carriageway.

- Duplication of sections of Old Coast Road north of Bunbury which has been accelerated with the injection of additional funds from the recently introduced State Fuel Levy. It is anticipated that the section between Bunbury and the southern end of the Peel Deviation will be completed by 1998. This represents about two thirds of the distance between Mandurah and Bunbury.

- Definition of the route for the Bunbury Outer Ring Road is nearing completion. This road is being planned as an expressway which when combined with the Australind Bypass, will provide a complete high speed bypass of the greater Bunbury area for through traffic.

- Duplication of the Bussell Highway between Bunbury and Capel is complete.

- A deviation has been constructed around the Ludlow Tuart forest with land set aside for a future second carriageway.

The requirement for the Peel Deviation essentially arose from the need to provide for a total bypass of Mandurah away from the existing coastal route. With the dual carriageway works extending up from Bunbury, and the Kwinana Freeway moving south toward Mandurah, there is an obvious bottleneck formed by development along the Mandurah Peninsula which can be overcome by the creation of a link on the east side of the Peel Inlet.

A study carried out by Uloth and Associates in 1992 for the City of Mandurah made recommendations on the future road network which would be required as a consequence of development in accordance with Mandurah Town Planning Scheme No.3. The study only considered the traffic generated by the development of the Mandurah area and assumed that through traffic would travel via an alternative road east of Peel Inlet/Harvey Estuary. Through traffic was not included in the traffic forecasts. The following conclusions from the study indicate the impact that the growth of Mandurah will have on the existing main road system.

- A new six lane freeway will be required north of Mandurah.

- The Mandurah Bypass will require six lanes north of Pinjarra Road.

- A six lane road will be required over the northern section of Old Coast Road. However, this may not be sufficient to carry the high traffic flows anticipated to use Old Coast Road between Casuarina Drive and Mandurah Bypass.

- Traffic lights will be required at between 8 and 18 intersections on Old Coast Road and at intersections on Mandurah Bypass leading to the Freeway.

The report commented that: "As long as Old Coast Road provides the only northern and southern access for the Peninsula south of Peelwood Parade there will be traffic congestion at the northern end of the Old Coast Road". This further highlights the problems expected on the existing route.

Delays to through traffic by traffic lights and congestion will become a major problem and it is expected that there will be a demand for an alternative route well before Mandurah becomes developed to the ultimate

stage assumed in the study. The existing development of Mandurah, particularly along the Peninsula, essentially precludes the upgrading of the existing road or development of an alternative route which satisfies the ultimate objective of providing a fast, free flowing road link between Perth and Bunbury.

It has been suggested during the public consultation phase of this study that the upgrading of the South Western Highway should be considered as an alternative to the Peel Deviation. This is clearly not a realistic alternative in this case as the Perth - Bunbury Highway is now firmly established as the primary route. The following should also be considered in relation to the South Western Highway route.

- The Perth-Bunbury Highway route is significantly shorter and provides the most economical route particularly for the cartage of heavy freight.
- The primary function of the South Western Highway is to provide access to the towns and other developments along the base of the Darling Scarp.
- The South Western Highway does not fit in with the proposed freeway system for Bunbury, which is already planned and substantially developed in the form of the Australind Bypass.
- The development of this route to a high standard freeway / expressway type facility would be very costly from an economic and social perspective, as land adjacent to this route is much more heavily developed and is considered more valuable as agricultural land.

The proposed Peel Deviation is the most practical and economical means of achieving a bypass of Mandurah for the Perth - Bunbury Highway and of satisfying the ultimate State objective of providing a high standard free flowing road link between Perth and Bunbury to service the future development of the South West.

2.4 DESIGN STANDARDS

The geometric design of the Peel Deviation is required to conform with the relevant AUSTROADS guidelines for a four lane divided rural freeway. The major design parameters for the new route will conform to the following:

Design Speed:	Main Alignment	130 km/hr
	Interchange Ramps	100 km/hr at noses to 60 km/hr at intersections
	Turning Roadways	80 km/hr
Minimum Radii:	5000 m	standard cross fall
	1500 m	3% super elevation
	900 m	5% super elevation (maximum)
Carriageways	2 x 3.5 m	traffic lanes and ramps
	4.2 m	single lane ramps
	2.5 m	left shoulder (1.5 m sealed)
	1.5 m	right shoulder (1.0 m sealed)
Median:	15.0 m minimum to 40 m desirable maximum	
Road Reserve:	General minimum 80 m, 100 m desirable.	
First Stage:	As above, without interchanges	
Vertical Clearance for Bridges over Roads:		5.8 m

2.5 ROUTE ALIGNMENT OPTIONS

As part of the Peel Deviation planning study various alternative routes have been examined to determine the route which best fulfils the desired objectives while minimising impact to both the biophysical and human environments (see Figure 1). A brief description of the potential route alignment options follows. The environmental, social, engineering and economic factors affecting route selection have been described in detail in Sections 5 and 6 of this report, with the selection of the preferred alignment being based on the comparative assessment of those factors in Section 7.

2.5.1 Northern 1 Option

The Northern 1 option is the route previously selected by earlier studies (MRWA Drawing No's 8622-80, 8622-81, 8922-62, 9122-14, 9122-15 & 9122-16) and is shown on the Peel Regional Strategy Land Use Plan (DPUD, 1994), and included within the Shire of Murray Town Planning Scheme, as the extension of the Kwinana Freeway from the Interchange at Lakelands near Lymon and Stock Roads to Pinjarra Road. Running parallel to Stock Road, the route swings east to cross the Serpentine River 500 m upstream from Stake Hill Bridge on Lakes Rd (see Figure 2A). The route then swings south-east to cross Nambeelup Brook at Nambeelup Pool and runs approximately parallel with Figirts Road south to Pinjarra Road.

New subdivisions in the vicinity of Woodland Parade and Paterson Road have been based on this alignment and MRWA has purchased land for the Peel Deviation as subdivisions have been developed. The areas of existing road reserve are illustrated in Figure 2A.

2.5.2 Northern 2 Option

The Northern 2 option has been nominated as an alternative alignment to the Northern 1 option due to impact of Northern 1 on the wetland adjacent to Goegrup Lake; Nambeelup Pool. Nambeelup Pool forms part of Nambeelup Brook and is an Environmental Protection Policy (EPP) classified wetland (EPA, 1992). The Northern 2 option crosses the Serpentine River at much the same location as Northern 1, but extends further east before swinging south in an effort to minimise impacts on Nambeelup Brook (see Figure 2A). It does however, require additional works to accommodate connection to Lakes Road.

2.5.3 Central Section

The Central Section of the route extends from Pinjarra Road to Birchmont Road and is the same route previously selected by MRWA for the Peel Deviation (MRWA Drawing No's 8622-82, 8622-83, 8622-84, 8922-62 & 9122-17). From Pinjarra Road the alignment continues due south across the Murray River to a point 800 m south of Grey Road, then turns south-west following a major cadastral boundary line (see Figure 2B). The nominated route minimises the effect on existing properties, by following the cadastral boundary, and avoids EPP wetlands. The Murray River crossing location has been determined by the approved development on either side of the alignment, restricting potential of alternative positions.

Other routes for the central section were initially examined including:

- a parallel alignment slightly to the west following the Thompson Road alignment;
- a parallel alignment slightly to the east following the Marsh Road alignment; and
- an eastern alignment incorporating a significant length of the Old Bunbury Road. This alignment ran directly south from the Murray River until intersecting with the Old Bunbury Road. The route then continued along the Old Bunbury Road alignment to the vicinity of the Harvey River.

However, none of the alternative routes were found to have advantages over the nominated route and hence were not pursued. All three routes were eliminated in initial assessments. The Thompson Road alignment offers no advantages and yields significantly more private land severance and disruption to local

traffic patterns through interruption of Thompson Road. Similarly the Marsh Road alignment results in increased severance, local access impacts and impact to remnant vegetation stands and EPP wetlands in the vicinity of Mills and Birchmont Roads (Figure 2B).

The Old Bunbury Road route would result in a high degree of private property severance with the alignment diagonally crossing all affected landholders between Greenlands Road and Old Bunbury Road. The Old Bunbury Road is a major local link road and would require duplication to maintain the local road network. To upgrade Old Bunbury Road to the specified design standard (refer to Section 2.4) would create significant property severance and consequent social impact to existing residents. In addition, the route would involve significant impact to the remnant vegetation corridors along Old Bunbury Road and in the vicinity of the Nine Mile Lake Nature Reserve. These factors along with increased route length and subsequent construction costs eliminate this route from the selection process.

2.5.4 Southern 1 Option

Southern 1 option is the route previously identified by MRWA (MRWA Drawing No's 8622-84 to 8622-88 inclusive) and is shown on the Peel Regional Strategy Land Use Plans (DPUD, 1994). The alignment continues south-west from Birchmont Road until the eastern boundary of Kooljerrenup Nature Reserve (See Figure 2B). It then follows the boundary south, traversing part of the reserve in the vicinity of the South Coolup Drain. Bordering the nature reserve, the alignment swings south-west to cross Clifton Road near the existing Telstra Microwave Repeater Station and connect to the Old Coast Road near the Clifton Roadhouse (see Figure 2C). From the junction with the Old Coast Road it is proposed that the existing Highway will be duplicated south to Bagieau Road on the east side of the existing road.

Alternatives to the Southern 1 route option were developed to minimise impact to Kooljerrenup Nature Reserve and State Forest Treasure Block, just south of Clifton Road, which is proposed for addition to Yalgorup National Park (Figure 2C). These areas also form part of the Harvey Estuary and Clifton Management Priority System 6 areas. In addition alternatives were sought to avoid steep grades and a major cutting inherent with Southern 1 in the vicinity of a proposed subdivision by Clifton Road.

2.5.5 Southern 2 Option

The Southern 2 option diverges from Southern 1 at Birchmont Road running due south approximately 1 km east of Southern 1 to Old Bunbury Road (see Figure 2B). From the point where the alignment crosses the Old Bunbury Road, the alignment runs south-south-west almost directly to Old Coast Road in the vicinity of Peppermint Grove Road (see Figure 2C). Crossing the Harvey River, the alignment traverses the low lying open farmland to the east of Doman Road, crossing Coronation Road near the Doman Road junction. The alignment then traverses 1.8 km of State Forest pine plantation and a similar amount of native vegetation which is proposed for addition to Yalgorup National Park.

2.5.6 Southern 3 & 3A Options

These two options are similar to Southern 2 except that from the Old Bunbury Road they diverge to the south-west and follow Doman Road, on the west and east side respectively, before/connecting to the Old Coast Road south of Peppermint Grove Road (see Figure 2C). Both of the Southern 3 options reduce the degree of private property severance and place the route on higher ground than Southern 2.

Southern 3 crosses Williamson Road near the junction with Old Bunbury Road then borders the eastern side of Doman Road until the State Forest. At this point the alignment crosses Doman Road and enters the State Forest to follow the eastern boundary of the pine plantation. To minimise impact to native forest vegetation the alignment would be constructed partially within the pine plantation. In addition Southern 3 crosses an isolated hill just south of Coronation Road which could be used for part of the fill required for the roadworks.

The Southern 3A option reduces impact to State Forest areas by following the eastern side of Doman Road and diverging east to rejoin Southern 2. This alignment produces greater private land severance than Southern 3 and occupies the higher ground within the Doman property. Additionally, the alignment provides less scope for sufficient fill material to be generated directly from the roadworks.

2.5.7 Southern 4 Option

The route option Southern 4 provides an alternative which combines elements of Southern 1 and Southern 2, 3 or 3A. The option incorporates the northern section of Southern 1 adjacent to Kooljerrenup Nature Reserve, follows the eastern boundary of the reserve, then deviates south-east from a point 1.3 km south of the South Coolup Drain to join Southern 2 or 3 just north of the Mayfield Drain. This option avoids the high conservation value areas to the south of the Harvey Estuary and in the State Forest Treasure Block around Clifton Road and reduces impact to the agricultural areas to the east. However, the option still impacts the eastern portion of Kooljerrenup Nature Reserve.

EPP WETLANDS

DRAINS

RESERVES

PLANTATIONS

NORTHERN 2

NORTHERN 1

CENTRAL

STOCK ROAD

LAKES ROAD

PEEL INLET

Nambeelup Pool

GOEGRUP LAKE

STAKE HILL BRIDGE

PATERSON ROAD

NAMBEELUP BROOK

ROGERS ROAD

OLD MANDURAH ROAD

PINJARRA ROAD

FIGTIS ROAD

SERPENTINE ROAD

SERPENTINE RIVER

LAKES ROAD

GREY ROAD

MURRAY RIVER

126351

14990

128087 AUSTIN B. NATURE RESERVE

FIGURE 2A : PERTH BUNBURY HIGHWAY PEEL DEVIATION - ALTERNATIVE ALIGNMENT OPTIONS

SCALE 1:50000

EPP WETLANDS

DRAINS

RESERVES

PLANTATIONS

CENTRAL

SOUTHERN 1

SOUTHERN 2

SOUTHERN 4

NINE MILE LAKE NATURE RESERVE

KOOLJERRENUP NATURE RESERVE A127756

CONSERVATION OF FLORA & FAUNA A123756

128087 AUSTIN BAY NATURE RESERVE

124036

12707

PEEL INLET

HARVEY ESTUARY

LAKE McLARTY A119404

LAKE MEALUP A16627

A124739

GREENLANDS ROAD

PAULL ROAD

MARSH ROAD

THOMPSON ROAD

DALEY ROAD

LAKE MEALUP ROAD

MILLS ROAD

BIRCHMONT ROAD

HERRON POINT ROAD

SOUTH WESTERN HIGHWAY

COOLUP DRAIN

HILL ROAD

OLD BUNBURY ROAD

FIGURE 2B : PERTH BUNBURY HIGHWAY PEEL DEVIATION - ALTERNATIVE ALIGNMENT OPTIONS

SCALE 1:50000

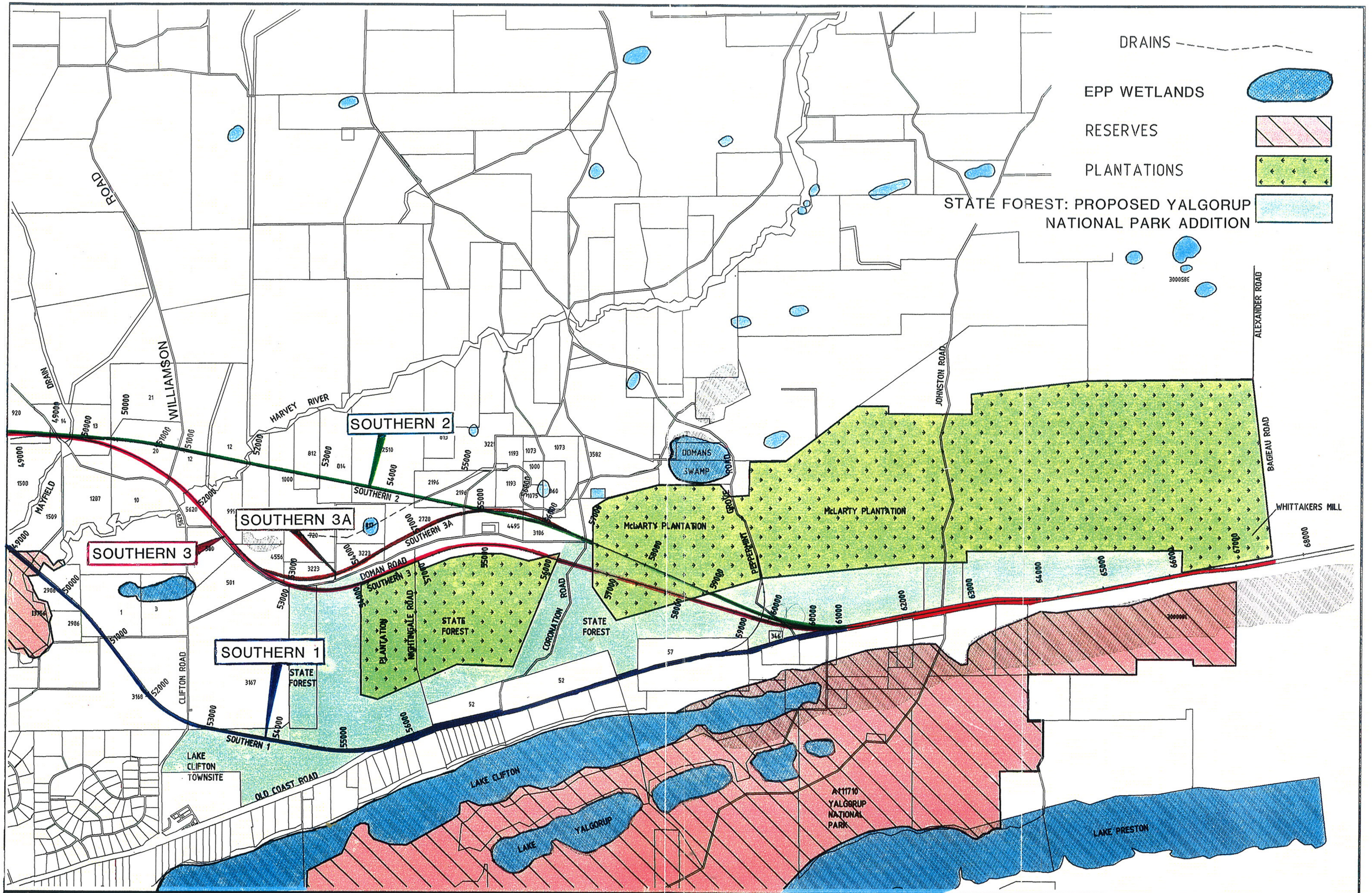

DRAINS
EPP WETLANDS
RESERVES
PLANTATIONS
STATE FOREST: PROPOSED YALGORUP NATIONAL PARK ADDITION
SOUTHERN 1
SOUTHERN 2
SOUTHERN 3
SOUTHERN 3A
HARVEY RIVER
WILLIAMSON ROAD
DRAIN
MAYFIELD
DOMANS SWAMP
DOMAN ROAD
McLARTY PLANTATION
JOHNSTON ROAD
ALEXANDER ROAD
BAGIEAU ROAD
WHITTAKERS MILL
PEPPERMINT GROVE ROAD
CORONATION ROAD
NIGHTINGALE ROAD
STATE FOREST
PLANTATION
CLIFTON ROAD
LAKE CLIFTON TOWNSITE
OLD COAST ROAD
LAKE CLIFTON
LAKE YALGORUP
A11710 YALGORUP NATIONAL PARK
LAKE PRESTON
SCALE 1:50000

FIGURE 2C : PERTH BUNBURY HIGHWAY PEEL DEVIATION - ALTERNATIVE ALIGNMENT OPTIONS

3.0 EXISTING ENVIRONMENT

3.1 LANDFORMS

The Peel Deviation corridor traverses two major landform units: Bassendean Dunes and Pinjarra Plain. A small region in the northern part of the study area, surrounding Goegrup Lake and much of the southern part of the area falls within the Bassendean Dune Division (McArthur & Bettenay, 1960).

The central part of the study area is within the Pinjarra Plain. The Pinjarra Plain ranges from 6 to 50 m in elevation. Most of this system within the project area is subject to seasonal flooding and is interspersed with swamps and lakes. Much of this area has already been cleared for agriculture.

3.2 HYDROLOGY

The Peel Deviation project area contains extensive systems of constructed drains, linking agricultural land with natural drainage channels and wetlands. The area is dissected by three major river systems. The Serpentine River flows into the northern end of Goegrup Lake before entering the Peel Inlet. The Murray River enters the Peel Inlet via a number of branches in the Yunderup area. The Harvey River flows into the southern end of the Harvey Estuary. All systems have dams upstream and are heavily used for both rural and urban water supplies.

Hydrogeologically, the Pinjarra Plain has limited aquifers in beds of gravel, sand and loam. The end of the dry season sees an increase in salinity. A shallow, good quality water table which often reaches the surface is typical of the Bassendean Dune System, hence the multitude of swamps and winter wet depressions in this system. The major aquifer systems drain into the Peel Harvey Estuary.

3.3 BIOLOGICAL ENVIRONMENT

Relevant literature was searched to compile lists of vegetation communities and fauna species potentially found within the Peel Deviation study area. Possible vegetation community types were determined by reference to Gibson *et al.* (1994), which mapped community types for the southern Swan Coastal Plain. Each community type which fell within the region of the proposed Peel Deviation route was considered as a possibility for the area. The flora expected within each of these possible community types was derived from Gibson *et al.* (1994), Dames & Moore (1991) and Beard (1979). Flora species potentially occurring were then compared to the Declared Rare Flora list of the Department of Conservation and Land Management (CALM) to determine the likelihood of the project impacting protected plant species.

The assessment of likely fauna habitats in the study area was based upon the vegetation community types identified as potentially occurring in the project area. Vertebrates which are found in one or more of these habitat types were considered to possibly occur in the study area. The Wildlife Conservation (Specially Protected Fauna) Notice 1994 was then consulted to determine if any of the potential fauna species occur on the Schedules of the rare fauna notice.

The scope of this report has not included site specific verification of the flora or fauna present. However, a comprehensive biological assessment has been undertaken for the project, the results of which will be included within the PER report. The PER will further refine the environmental impact assessment process and develop appropriate management strategies for the Peel Deviation Proposal.

3.3.1 Vegetation and Flora

The major vegetation systems of the Pinjarra area have been summarised by Beard (1979). The Bassendean System appears to be a mosaic of vegetation largely controlled by drainage. Near the Peel Deviation project area there is limited *Banksia* low woodland, merging into Jarrah - Marri woodland (*Eucalyptus marginata - E. calophylla*) on moister soils. This varies from an open canopy with a thick *Banksia* understorey to a well developed woodland with scattered *Banksia* and *Casuarina*. Wetland communities are dominated by paperbark *Melaleuca* species with sedges extending into the water.

Beard (1979) claims that there is no virgin vegetation left on the Pinjarra Plain System. It appears to have been dominated by *Melaleuca* swamps with fringing woodlands of *Eucalyptus* or *Banksia*. The area is now dominated by pasture plants.

In a detailed survey of the vegetation of the southern Swan Coastal Plain, Gibson *et al.* (1994) recognised 43 'community types'. Based on the mapped locations of their survey sites, at least seven community types occur within the Peel Deviation project area. This does not include the cleared farmland which was not surveyed in that report. A summary of their findings is detailed below.

Eucalyptus calophylla - E. marginata woodlands on sandy clay soils (Community Type 3b) occurs on heavy alluvial Pinjarra Plain soils near the Peel - Harvey Estuary. Heavily affected by clearing. Dominated by Eucalypts, *Bossiaea* and *Conostylis*.

Melaleuca preissiana damplands (Community Type 4) occurs on the Bassendean System in soils that are saturated for short periods in winter. This shrub rich community is dominated by *Melaleuca* (overstorey), *Pericalymma* and *Hypolaena*.

Mixed Shrub damplands (Community Type 5) lies on both Bassendean and Pinjarra Systems. It is similar to Type 4, but lacks a consistent dominant overstorey. With generally a more open ground cover and less dense shrub layer dominated by genera such as *Banksia*, *Melaleuca* and *Kunzea*.

Herb rich saline shrublands in clay pans (Community Type 7) occurs on typical heavy claypan Pinjarra Plain soils near the Peel - Harvey Estuary. These areas are inundated from winter into mid summer, with possible saline influences. Species composition varies with the degree of inundation.

Shrublands on dry clay flats (Community Type 10a) occurs on shallow, fast drying soils of the Pinjarra Plain. This community is species rich with many geophytes and annuals. Dominated by *Schoenus*, *Crassula* and *Eryngium*, it lacks many low frequency species.

Wet forests and woodlands (Community Type 11) occurs on both Bassendean and Pinjarra Systems in heavy soils of the deeper wetlands. This community is dominated by *Eucalyptus*, *Astartea*, *Lepidosperma* and *Pericalymma*.

Central *Banksia attenuata - Eucalyptus marginata* woodlands (Community Type 21a) occurs widely and commonly on the Bassendean System on the generally sandier soils. Dominated by *Eucalyptus* and *Banksia*, other common genera include *Sowerbaea*, *Drosera*, *Leucopogon* and *Allocasuarina*.

Much of the Peel Deviation project area is open farmland and cleared or heavily grazed. A limited number of flora surveys have taken place in the vicinity of the study area. A survey of similar, nearby habitats (Dames & Moore, 1991) recorded 107 native and 21 introduced species. This included 50 families of which the most dominant were the Myrtaceae (16 taxa), Proteaceae (16 taxa), Papilionaceae (13 taxa) and Mimosaceae (seven taxa). In terms of genera, *Acacia*, *Banksia Eucalyptus* and *Hibbertia* dominated with 21 taxa between them. Although only one priority species (*Conostylis pauciflora*) was recorded, Dames and Moore (1991) predicted that 31 species with Priority Status could potentially occur.

The present study has generated a list of 43 Priority Species from the area bounded by Rockingham in the north, Harvey to the south and eastwards to the base of the Darling Scarp, which may be present in the study area. This includes 11 Declared Rare, eight Priority One, 10 Priority Two, seven Priority Three and seven Priority Four species.

3.3.2 Fauna

Few fauna surveys have taken place in areas surrounding the study area. In a survey of the Lake Clifton to Australind Bypass section of the Perth - Bunbury Highway, Dames and Moore (1991) recorded two frog, one reptile, 24 bird, two native mammal and two introduced mammal species. They generated a list of fauna that potentially may occur, which detailed 64 bird (excluding waterbirds), 10 frog, 44 reptile, 24 native and eight introduced mammal species.

Five fauna habitats may occur within the Peel Deviation project area. These fauna habitats, and their associated vegetation community types (VCT) as described above, are:

Open Farmland (OF)	----
Samphire Flats (SF)	VCT 7
Wetlands (WL)	VCT 4, 5, 10a
Riverine (RV)	VCT 11
Mixed Woodland (MW)	VCT 3b, 21a

The present study has generated potential species lists of 21 native and six introduced mammal, 172 bird, 15 frog, 55 reptile, and six fish species.

Fauna species which have been formally recognised as rare, threatened with extinction or as having high conservation value are protected by law under the Western Australian Wildlife Conservation Act 1950. Species of significance which may occur in the project area include the Southern Brown Bandicoot *Isoodon obesulus*, Western Long-billed Corella *Cacatua pastinator*, Peregrine Falcon *Falco peregrinus*, Carnaby's Black-Cockatoo *Calyptorhynchus funereus latirostris*, Baudin's Black-Cockatoo *Calyptorhynchus baudinii* and the Carpet Python *Morelia spilota imbricata*.

A range of migratory species are protected under various international agreements, including the Japan and Australia Migratory Bird Agreement (JAMBA), the China and Australia Migratory Bird Agreement (CAMBA), and the Australian New Zealand Environment and Conservation Council (ANZECC) List of Endangered Vertebrate Fauna. These include Cattle Egret *Ardeola ibis*, Great Egret *Ardea alba*, Glossy Ibis *Plegadis falcinellus*, Grey Plover *Pluvialis squatarola*, Hooded Plover *Charadrius rubricollis*, Wood Sandpiper *Tringa glareola*, Common Sandpiper *Actitis hypoleucos*, Greenshank *Tringa nebularia*, Marsh Sandpiper *Tringa stagnatilis*, Sharp-tailed Sandpiper *Calidris acuminata*, Red-necked Stint *Calidris ruficollis*, Long-toed Stint *Calidris subminuta*, Curlew Sandpiper *Calidris ferruginea*, Oriental Pratincole *Glareola maldivarum*, Fork-tailed Swift *Apus pacificus*, Rainbow Bee-eater *Merops ornatus*. Most of these species are waders which use the nearby Lake McLarty, and may stop briefly in the swampy areas. These and other possible (unlisted) species are visitors which would not be greatly affected by the proposed deviation.

3.3.3 Wetlands

Wetlands on the Swan Coastal Plain can be classified under the Environmental Protection (Swan Coastal Plain Lakes) Policy to afford protection of the environment as a habitat. The purpose of the policy (EPA, 1992) is to protect the environmental value of lakes on the Swan Coastal Plain. The policy designates beneficial uses, and prohibits activities which may cause adverse environmental impact to these areas without the approval of the EPA. There is in excess of 150 EPP listed wetlands in a 10 km wide belt surrounding the proposed alignment of the Peel Deviation.

Additional recognition of the environmental value of wetland areas can occur through listing under the Ramsar Convention, which is a convention on wetlands of international importance. The objective of the Ramsar Convention is to promote wetland conservation, monitoring, management and use. The Peel - Yalgorup system has been classified as a Ramsar wetland, and is therefore of international significance.

3.4 HUMAN ENVIRONMENT

3.4.1 Aboriginal Habitation

Studies into the location of Aboriginal heritage sites by archaeological and ethnographic survey were commissioned for the Peel Deviation project. A brief summary of Aboriginal occupation in the area, and the nature and location of heritage sites follows.

Prior to European settlement, the broader region of which the study area is a part was inhabited by Aborigines of the Pindjarup dialect group of the Bibbulmun people (DPUD, 1990). Aboriginal occupation was concentrated on the coastal plain, particularly along the Murray River. Hunting and gathering activities extended into the Jarrah forests of the Darling Plateau (DPUD, 1990), while the Serpentine and Murray Rivers were important sources of fish.

As European settlement occurred, the Aboriginal population was increasingly displaced from areas of traditional habitation and mythological significance, resulting in conflict which culminated in 1834 in the Battle of Pinjarra (DPUD, 1990).

The traditional Pindjarup community effectively collapsed following the Battle of Pinjarra, with the remaining population becoming increasingly dependent upon the settlers. The remaining Aborigines became an important source of labour and contributed significantly to agricultural and pastoral development within the broader region (DPUD, 1990). Aboriginal involvement in regional development has, however, diminished over time, essentially leaving the original inhabitants on the fringe of the wider community.

An archival search was conducted to establish the location and description of previously recorded Aboriginal sites within the vicinity of the survey corridor. This involved a search of the Culture and Heritage Division of the Aboriginal Affairs Department's Aboriginal Site Register and a study of relevant files and survey reports. The result of the archival search is contained in Table 1.

From the existing information, it is possible to make the following conclusions:

(1) Small, low density surface artefact scatters represent the most numerous archeological sites;

(2) Quartz is the dominant lithic material used for the manufacture of artefacts;

(3) Flakes and chips form the major class of artefact types in the artefact assemblage;

(4) River margins, swamp margins and areas of de-vegetated sand are the main site locations; and

(5) There is some possibility that Aboriginal skeletal material may be present in coastal dunes.

Aboriginal burials have been recorded in the coastal dune systems along the Western Australian coast at various locations. The closest registered burials to the survey area are at Mandurah (S0177, S2746, S2748), Halls Head (S1387) and Pinjarra (S1845). These burials are usually discovered as a result of development.

On the Swan Coastal Plain, recorded sites are mostly located in areas disturbed either from natural processes or by human activities. Owing to the nature of the Swan Coastal Plain, it is postulated that Aboriginal sites may be present but covered by sand and vegetation, and will only be discovered when they become exposed.

The majority of the registered Aboriginal sites of the Peel Region are located around the Harvey Estuary. Of these, most comprise stone artefact scatters (O'Connor *et al.*, 1985; O'Connor *et al.*, 1988).

Table 1: Previously Recorded Aboriginal Sites Within the Vicinity of the Proposed Peel Deviation Route. (Abbreviations: Eth Ethnographic; Arc Archaeological; A Artefacts; B Burial; O Open Site Access).

WAM SITE #	GRID REFERENCE	SITE TYPE	SITE NAME
S0177	380 400	Arc B	Mandurah Burial
S0184	383 398	Arc A O	Barragup, Mandurah
S0185	385 402	Arc	Stake Hill Bridge
S2842	386 399	Arc A	Barragup Lake 04
S2844	386 400	Eth Arc A	Barragup Lake 06
S2226	386 400	Eth Arc A O	Goegrup Lake 2
S2845	386 400	Arc A	Barragup Lake 07
S0258	387 395	Arc	Yunderup North
S2843	387 399	Arc A	Barragup Lake 05
S2839	387 400	Arc A	Barragup Lake 01
S2840	387 400	Arc A	Barragup Lake 02
S2841	387 400	Arc A	Barragup Lake 03
S2445	388 411	Arc A	Lake Amarillo
S0256	389 383	Arc	Pinjarra
S0257	389 394	Arc A	Yunderup South
S2444	389 415	Arc A	Karnup
S1845	39- 38-	Arc B	Pinjarra Burial
S0187	39- 38-	Arc	Pinjarra
S2439	391 393	Arc A O	Murray River Artefact
S2440	392 393	Arc A	Murray River Artefact
S0323	377 372	Arc	Harvey Estuary 24:SWA
S0322	377 373	Arc	Harvey Estuary 23:FAR
S0330	378 358	Arc	Yalgorup Nat. Park 23
S0331	378 358	Arc	Yalgorup Nat. Park 33
S0329	379 358	Arc	Yalgorup Nat. Park 13
S0327	379 370	Arc	Harvey Estuary 28:PINE
S0328	380 360	Arc A	Lake Clifton 4:PRESTON
S0333	380 367	Arc	Harvey Estuary 34:LOS
S0334	380 368	Arc	Harvey Estuary 35:COR
S0332	381 356	Arc	Lake Preston : SANDPIT
S0339	381 360	Arc A	Pine Plantation Swamp
S0337	384 361	Arc	Harvey River 38:PLANT
S0338	384 361	Arc	Harvey River 39:BLACKB
S0336	384 362	Arc	Harvey River 37:HARVEY
S0335	384 362	Arc	Harvey River 36:BUSHFI

The closest sites to the survey area are S0185 Stake Hill Bridge artefact scatter and S0328 Lake Clifton artefact scatter located along the Old Coast Road. These sites were recorded in the mid 1970s and have probably either been collected or disturbed by development. No newly recorded archaeological sites were located during the field survey of the proposed alignment.

In terms of ethnographic significance, only two sites were located within the vicinity of the Peel Deviation; Sites S2844 and S2226 (Table 1) are near Barragup and Goegrup Lakes respectively.

Consultation with Aboriginal elders has highlighted three other sites with ethnographic significance.

(1) Figirts Road: Figirts Road Camp and Water-source occurs approximately 200 metres east of the proposed route and is an area which was used by the Pinjarra people as a camping ground and water reserve. The alignment should not disturb this site.

(2) Murray River: Crossing: the Yunderup Aboriginal Site occurs near where the proposed alignment crosses the Murray River and a swampy region is separated from the 'mainland' by a small creek. This area was a favoured Black Bream fishing hole of the Ravenswood people. The alignment should not disturb this site, however it is recommended that it be checked when the precise alignment is finally surveyed.

(3) Doman Road: The Doman Road Camp and Water-source occurs 1.5 km north of the intersection with Coronation Road between the Southern 2/3A and Southern 3 alignments. The site was a water reserve and camping area. All three of the potential route options border this area. Depending on the precise road alignment, some slight realignment may be necessary to minimise impact to this site.

3.4.2 European Settlement

The broader region of which the study area is a part was first settled in 1830 with the establishment of Peeltown, now Mandurah, from whence settlers moved up the Murray River in search of fertile land for agriculture (DPUD, 1990). As outlined above, the process led to conflict with the traditional Pindjarup population and the ultimate collapse of the Aboriginal community.

Regional development was premised on primary production, Peeltown (Mandurah) being the focus of fishing activity, while farming activity was concentrated on the more fertile and better drained alluvial soils along the Murray River (including around Pinjarra). Agriculture and other forms of primary production (including forestry and mining) have progressively developed throughout the broader region, while Mandurah has developed from its original fishing base to a tourist and retirement settlement in the 1950s and 1960s to its present role as a regional service centre (DPUD, 1990).

Agriculture, forestry and mining (including mineral processing) underpin the regional economy, although the tourism, recreation and service sectors are becoming increasingly important.

There are two sites and a bridle trail which may be considered of European heritage value. The Heritage Council of Western Australia is aware of Four Acres Cottage (a.k.a. Peppermint Grove Cottage) and has the structure listed as "ruins". The site is not included on the Council's formal register of heritage sites, nor is it listed by any other heritage organisation. The second site is Whittakers Mill, which is currently a recreation site on the eastern side of Old Coast Road immediately before the intersection with Bagieau Road where the study area ends.

A bridle trail of heritage value exists which was utilised historically by the Australian 10th Light Horse Brigade during training exercises. The trail runs parallel to the Old Coast Road south from the south-western corner of the Harvey Estuary along Southern Estuary, Doman, Centre Break and Runnymeade Roads ending at Wellesley Road. The 60 km trail is currently in use by members of the Yalgorup Recreational Horse Riders Association, and Peel Horseback Adventures; an ecotourism venture.

3.4.3 Existing and Future Landuse

Land use planning for the area has been undertaken through the Peel Regional Strategy (DPUD, 1994) and is shown in Figure 4. As can be seen, rural land uses predominate. Areas of existing and / or proposed more intense human settlement (*i.e.* residential, special rural and tourist/recreational development) focus upon the following areas;

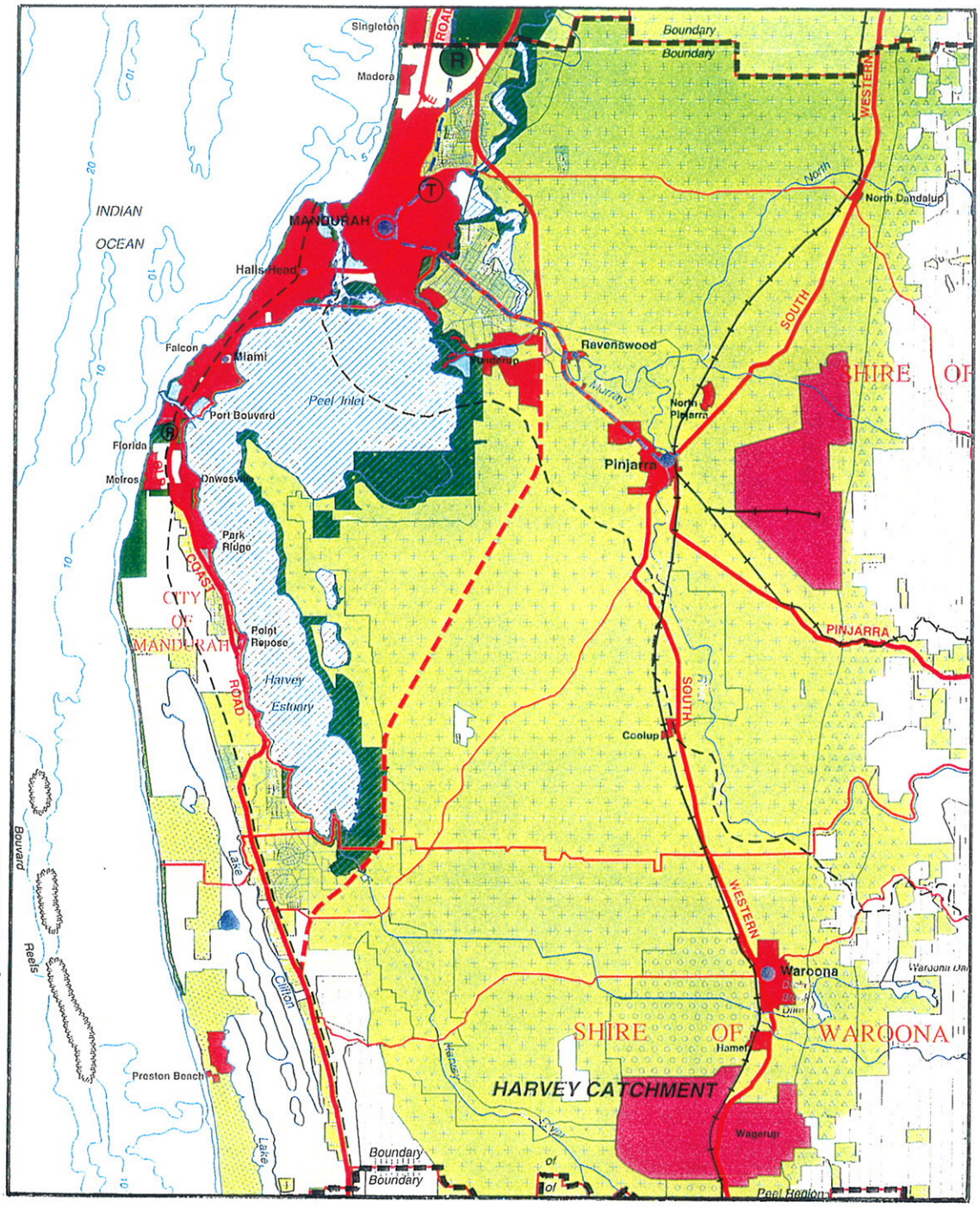
- effectively all of the City of Mandurah north of the Florida-Melros localities;
- localities extending from Dawesville to Point Repose along the western shore of the Harvey Estuary;
- the north-western extremity of the Shire of Murray (encompassing the localities of Parklands, Barragup, Furnissdale, North and South Yunderup and Ravenswood);
- Pinjarra;
- Point Grey; and
- lands at the southern extremity of Harvey Estuary within the Shire of Waroona.

Conservation is also a significant land use within the study area, the principal features in this context being:

- the proposed Peel Regional Park encompassing the lower reaches of the Serpentine River, much of Goegrup Lake, all of Black Lake, Lakes Mealup and McLarty and the Peel - Harvey Estuary;
- proposed Regional Open Space encompassing the lower reaches of the Serpentine River;
- proposed Regional Open Space and various Land Act Reserves along the eastern shores of the Peel - Harvey Estuary;
- the Nine Mile Lake Nature Reserve; and
- Yalgorup National Park (and the proposed additions thereto).

Many of these areas are affected by System 6 Red Book recommendations (Department of Conservation & Environment, 1983). The System 6 areas in the region include the Goegrup Lakes (M108), the Peel Inlet (C50), the Harvey Estuary (C51), Lakes McLarty and Mealup (C52), Yalgorup National Park (C54), Clifton Management Priority Area (C55), McLarty Management Priority Area (C56), Myalup Management Priority Area (C57), Reserve A↑23172, Harvey River (C58), Reserve C↑22199, and Wagerup (C59).

The implementation status of these recommendations varies, however the Peel Regional Strategy represents the mechanism by which the majority will now be realised. Many of the recommendations are partially implemented or remain unresolved EPA (1993).



Source: Dept of Planning & Urban Devt

LAND USE CATEGORIES

- Urban
- Future Urban
- Areas Under Consideration for Future Urban
- Regional Open Space
- Major Industry
- Canal Development
- Peel Regional Park
- Regional Sporting Facility
- Tertiary Education

Rural:

- Irrigation
- Scarp Amenity
- Coastal Amenity
- Waterways Amenity
- Predominantly Grazing & Cropping (Swan coastal plain)
- Predominantly Grazing & Cropping (Darling plateau)

Commercial / Administrative Centres:

- Regional Centre
- District Centre
- Other Major Centre

Transport:

- Railways
- Public Transport Corridor
- Inter Regional Road
- Intra Regional Road
- Proposed Extension of Perth-Bunbury Highway

Administrative Areas:

- Local Authority Boundary
- River Catchment Boundary
- Peel Region Planning Boundary

Calm Estate:

- State Forest
- Conservation Park
- National Park
- Nature Reserve
- Marine Park
- Calm Act Reserve Section 5(g)

0 5 10 20km

Scale 1:300,000

Figure 4: Peel Regional Strategy – Land Use Plan

4.0 PUBLIC CONSULTATION

4.1 AIMS

In accordance with Main Roads' study brief, the initial phase of the consultation process was directed towards:

- close liaison with State and Local Government agencies potentially affected by the Peel Deviation;
- close contact with affected landowners;
- provision of information to the community regarding progress of the Peel Deviation study; and
- identification of the impacts of the proposed route.

4.2 METHOD

The initial phase of the consultation process comprised:

- establishment of a Consultative Group comprising State and Local Government agencies, and representatives of community groups, to facilitate the transfer of information;
- distribution of an information brochure to affected landowners and other relevant individuals and community based groups;
- personal contact with affected landholders to obtain local knowledge on opportunities and constraints;
- utilisation of the local press to disseminate information about the study; and
- presentation of a public information display at an appropriate venue within the study area.

The initial meeting of the Consultative Group was held in Pinjarra on Thursday 10 August 1995. Among other matters, the envisaged consultation programme for the Peel Deviation Study was discussed, the consensus being that additional public information displays were desirable. MRWA subsequently agreed to modify the information display programme to encompass unstaffed displays of a week's duration in Waroona and Pinjarra, followed by a staffed display of one day's duration in Mandurah. As a result of lobbying by the Shire of Murray, part of the final day of the display in Pinjarra was staffed.

Other elements of the initial phase of the consultation process have been as outlined above. A copy of the information brochure and accompanying reply-paid response proforma mailed to landowners in the vicinity of the proposed alignments and available to the broader community through the respective Local Government Authorities is included in Appendix B.

4.3 RESULTS

The initial phase of the consultation programme has prompted some 15 verbal and 64 written responses. A summary of the public consultation programme is given in Table 2. Issues raised in the responses received and the number of respondents raising these issues are documented in Appendix C, which also includes issues raised in discussions with consulting personnel during the two staffed information displays.

As can be seen, the responses received demonstrate a degree of support for the Peel Deviation route. However comment questioning the proposed route alignments is predominant. The main issues raised by members of the public are:

- a preference for upgrading of the South Western Highway and Old Coast Road route rather than the development of a new road corridor;
- desire for a modified alignment to be located east of the Serpentine River, to run through Amarillo;
- concern over the impact of the Peel Deviation on wetlands listed either under the Ramsar convention, or classified as EPP wetlands;
- concern over potential impact on species of flora and fauna within the road alignment;
- severance and disruption of existing farming activities, and intrusion upon farm buildings; and
- traffic noise generated and resultant impact on nearby residents.

The local environmental groups are among those expressing opposition to the Peel Deviation route (essentially for the reasons outlined above) and have indicated their intention to lobby the broader environmental community to also oppose the proposed route.

The use of the South Western Highway as an option has been discussed in Section 2.3 of this report. The realignment of the Kwinana Freeway Extension east of Serpentine River is however dependent on many other planning issues and is outside the scope of this report. MRWA has agreed to review the alignment of the Peel Deviation between the existing connection to the proposed Freeway and Pinjarra Road should a change in the alignment of the Freeway occur in the future.

As previously indicated, concerns about the proposed route have been raised by residents in the Parklands and Murray Lakes areas (wherein the reserve for the proposed route has been created through surrounding subdivisions) in relation to noise impact. Comments in this regard include claims that prospective purchasers were not made aware of the proposed route's existence. However, other comment received during the consultation process does indicate that landowners are made aware of the route at the time of seeking a licence to construct a building on their property.

4.4 PHASE 2 CONSULTATION

During December 1995 Phase 2 of the Public Consultation Programme was commenced. This phase will encompass further ongoing liaison and community contact, newsletters, public displays and landowner contact. Landowners within the project area whose properties would be directly affected by the proposed deviation are currently being directly contacted to seek specific feedback regarding the route options outlined in this report.

Public displays and press releases will be used to inform the general community about project progress, while more specific (verbal and/or written) contact would be maintained with people/organisations that responded to the initial dissemination of information. It is envisaged that this contact would provide more detail than the initial general distribution newsletter and invite follow-up contact if desired.

The objective of the Phase 2 programme is to focus on the preferred alignment. The aim is to elicit comment which will assist the development of design and management strategies which will ameliorate impact and best satisfy both the local and broader community *i.e.* the users of the Peel Deviation.

Table 2: Summary of Public Submissions for Phase 1 of Public Consultation Programme.

Preferred Route Option	
N1	0
N2	1
C	1
S1	2
S2	3
S3	2
S3A	0
S4	0
Upgrade SW Highway/Old Coast Rd	28
Suggested modified alignment	25
Endorse but no option specified	4
Opposed but no option specified	3
No preference specified	7
	76
Social Issues	45
Problem of increased traffic through Pinjarra	4
Effect on private property	14
Reduction in farming land	6
Effect on existing community	8
Devaluation of land/businesses	5
Other land resumption issues	5
Disruption to current planning	3
Environmental Issues	107
Impact on wetlands/international significance	32
Further attrition of System 6 Estate	1
Impact on wildlife and flora	19
Effect of consequent development	10
Effect on past/current revegetation	11
Additional pollution	7
Risk from haulage of toxic chemicals	4
Possible damage to stromatolites	3
Other environmental damage	14
Hydrocarbon runoff and drainage problems	5
Swampland can encourage vermin/disease	1
Other	
Upgrade will be more cost/resource efficient	7
Additional bridge unnecessary	5
Additional road unnecessary	13
Concern over limited response time/consultation	3
Concern over 2 stage development	2
No guarantee of freeway construction in 50 yrs	1
Greater tourism appeal if wetlands protected	1
Importance of more efficient highways	1
Requests for further information only	5
Request to be added to mailing list only	4
	32

5.0 POTENTIAL ENVIRONMENTAL IMPACTS

5.1 BIOPHYSICAL ENVIRONMENT

Potential impacts from development of the proposed Peel Deviation on the biophysical environment include:

(i) During construction

Direct impacts	flora	- clearing of vegetation
		- dust generation / pollution affecting vegetation
		- introduction of dieback plant pathogens
	fauna	- loss of slow-moving, fossorial and localised territorial fauna species
	wetlands	- infilling or alteration from road construction
Indirect impacts	flora	- spread of dieback infection
	fauna	- clearing of vegetation resulting in loss of shelter and feeding grounds.
		- noise / dust causing dispersal away from area
	wetlands	- alteration of hydrological regime
		- alteration in habitat value through changes to water quality and vegetation

(ii) Following construction

Direct impacts	fauna	- road kills
Indirect impacts	flora	- pollution affecting vegetation growth
		- spread of dieback infection
		- people pressures, such as wildfires
	fauna	- traffic noise causing dispersal away from area
	wetlands	- altered water quality from road runoff

A general discussion of these factors and how they affect the Peel Deviation route selection process follows.

5.1.1 Flora and Fauna

Options Northern 1 and Northern 2 differ in the placement of the alignment with respect to Nambeelup Brook. Since the alignments are only approximately 0.3 km different in length, the two options will directly impact similar amounts of absolute area during construction. Northern 2, which involves swinging the alignment to the east of Figirts Rd, will have less impact on remnant vegetation by crossing Nambeelup Brook at a narrow point. Nambeelup Brook has moderate conservation value, forms part of the Goegrup Lakes system and is nominated under the EPP wetlands policy. Within the project corridor Nambeelup Brook, along with the Serpentine River, represents the largest remnant of riverine habitat.

Both Northern alignment options will impact the Serpentine River to a similar degree. Depending upon the method of construction and environmental management strategies utilised, impacts may occur to high conservation value samphire wetlands, riparian vegetation and fringing eucalypt woodland. The construction of a barrier to longitudinal fauna movement patterns along the river would present a significant impact to local fauna populations, including possible populations of the Schedule 1 rare species the Southern Brown Bandicoot *Isoodon obesulus*.

The central component of the Peel Deviation is predominantly located in cleared agricultural land and consequently will have minimal impact on vegetation and on fauna habitat.

The Southern 1 alignment presents the highest degree of impact to the biophysical environment. Impacts to flora and fauna from the development of Southern 1 encompass clearing over a portion of approximately

1 km where the alignment traverses an area proposed for addition to Yalgorup National Park (CALM, 1995). This land surrounds the Lake Clifton Townsite and is currently part of the State Forest Treasure Block. The area has been nominated for inclusion to Yalgorup National Park on account of its high conservation and recreation value. The Southern 1 alignment also impacts on Kooljerrenup Nature Reserve ↑23756. The Southern 1 alignment area may also contain vegetation types susceptible to dieback disease. For these reasons CALM has expressed strong opposition to the utilisation of this route option.

In addition Southern 1 borders the upper reaches of the Harvey River Delta. The delta forms part of the Ramsar listed wetlands in the Peel Inlet - Harvey Estuary system. The sensitivity of wetland complexes to disturbance is well-documented.

Southern 3 would be constructed partially in an existing disturbed corridor and would involve minimal clearing. The route borders an area of high conservation value. This option is less desirable than Southern 2 with regard to impact on flora and fauna due to the presence of the native vegetation along Doman Road and at the junction with Williamson Road. However the alignment would predominantly be constructed within the exotic pine plantation. The alignment also has the potential to encourage the spread of dieback through any areas of native vegetation it traverses.

In terms of impact to flora and fauna Southern 3A is very similar to Southern 3 in that it also traverses similar amounts of native vegetation and disturbed agricultural and pine plantation land.

The unique portion of the Southern 4 option presents minimal impact to the biophysical environment. The alignment traverses agricultural areas with only minimal remnant vegetation occurring in the vicinity of Mayfield Drain. The utilisation of the Southern 4 option incorporates the advantages of the Southern 2 or 3 in the lower sector of the route while avoiding the adverse impacts arising from Southern 1 in the area proposed for addition to Yalgorup National Park. However this option also utilises the northern section of Southern 1 and therefore shares the disadvantages of impact to Kooljerrenup Nature Reserve.

5.1.2 Declared Rare Species

A total of 43 Priority Species of flora may occur in the areas to be impacted by the Peel Deviation, however without detailed flora surveys (to be undertaken in Stage 2) it is not possible to make any statement on the extent to which individual species may be affected. However a greater proportion of these species is expected to occur in the Jarrah - Banksia woodlands, which means that Southern 1 would be expected to have the greatest impact on the high conservation value flora, followed by Southern 3, Southern 3A and finally Southern 2 which would have the least impact (routes arranged in order of decreasing amount of area of native vegetation which would be impacted during construction).

A number of gazetted Schedule fauna species potentially occur in the Peel Deviation project area. None of the proposed alignment options represent a significant impact to these species, other than the Southern Brown Bandicoot *Isoodon obesulus*, due to either nil or limited impact to preferred habitats.

The Northern 1 route option is likely to impact a population of the Schedule 1 Southern Brown Bandicoot *Isoodon obesulus*. A small population is known to be occur in the Nambeelup Pool area. Impact could be minimised, though not negated, through management strategies such as wildlife underpasses and habitat enhancement.

A range of migratory bird species are protected under various international agreements (JAMBA, CAMBA, ANZECC). Most of these species are waders which use the nearby Lake McLarty, and may stop briefly in swampy areas. These and other possible (unlisted) species are migratory visitors which would not be greatly affected by the proposed route.

5.1.3 Dieback

Phytophthora cinnamomi and other *Phytophthora* species are responsible for dramatic changes in native vegetation and associated faunal assemblages in southern Australia, with species of Proteaceae, Epacridaceae, Myrtaceae, Dilleniaceae, Papilionaceae and Xanthorrhoeaceae being particularly susceptible (Hill, 1989). It has been shown that introduction and intensification of *Phytophthora cinnamomi* disease in four National Parks is directly attributable to disturbance of the area caused by road and firebreak construction and their subsequent use (Hill, 1989).

Preliminary examination of the vegetation remnants of the Peel deviation project area revealed that the vegetation communities present were currently subjected to a low physiological stress level. Some *Eucalyptus calophylla* appear to be affected by *Armillaria* infection. Clearing, intensive grazing and fires over a protracted period have eliminated the majority of good understorey "dieback" indicator species from disturbed areas. However, dieback infections would be quite old and spread extensively, particularly in the cleared agricultural areas. Although no active dieback fronts were noted in the vegetation remnants the disease is almost certain to be present, if only at very low levels, due to the extreme degree of historical disturbance and proximity of transport vectors.

The entire Peel Deviation project area should be treated as potentially dieback infected. The area can be classified as "Not Effectively Quarantined". Aside from an overall containment policy, the construction phase should aim to prevent the introduction of dieback infection to the remnant vegetation present.

Considering the high number of flora species of conservation significance potentially occurring in the region, it is thus important to minimise the spread of any potential dieback infections. Construction of the Peel Deviation will need to incorporate the development and implementation of a comprehensive dieback hygiene management plan. The hygiene management plan will need to be developed from the Main Roads Dieback Management Procedure Manual (MRWA, 1992a) and CALM Dieback Disease Hygiene Manual (CALM, 1992).

Areas of greatest sensitivity to dieback are expected to be the Jarrah - Banksia woodlands in the vicinity of Southern 1 and Southern 2 & 3 on the crown land in the State Forest Treasure Block and the common Northern 1 and 2 area on the western bank of the Serpentine River. The assessment of the potential for dieback impact is based upon the sensitivity of the vegetation community type. The presence of dieback infections within the project area will be determined during the detailed surveys of the next phase of the project.

5.1.4 Construction Impacts

A number of additional impacts may result from the construction phase additional to requirements for vegetation clearing and effects on wetlands and drainage systems. These impacts will generally be consistent regardless of the alignment chosen.

- Various forms of waste would be generated during the construction process and unless effectively managed, could have the potential to produce various impacts ranging from soil and water contamination to visual degradation. These wastes include;

  - excess spoil / debris from earthworks not used in rehabilitation programmes
  - used engine oil and unserviceable parts from vehicle and machinery maintenance
  - packaging and other construction debris.

- Intrusion by construction workforce into areas of environmental / conservation value, and / or sites of particular significance (*i.e.* people pressures).

These impacts are unavoidable in road construction projects, however common management techniques are available to minimise these impacts.

5.1.5 People Pressures

By enhancing the level of access through the project area, the proposed road has the potential to increase human activity therein and as a consequence human pressures upon the environmental resources of the area. Considerations in this context include:

- physical intrusion to gain informal or legitimate access to conservation areas, resulting in the disturbance/loss of vegetation and displacement of wildlife;
- direct disturbance resulting from, for example, pilfering of vegetation and other environmental resources;
- consequential effects such as an increased risk of fire, erosion, and harassment of wildlife by domestic animals that can produce change within prevailing environmental conditions.

The physical manifestations and significance of such human-related pressures will vary depending on the characteristics of the area affected. In general, however, the overall effect is a progressive degradation of the intrinsic environmental qualities of the area.

In this instance, because of the high conservation values within parts of the project area and the general sensitivity to disturbance of the prevailing environmental conditions, human-related pressures have the potential to produce significant environmental impacts. However, it should be noted that many of these areas have already suffered from uncontrolled access. CALM have indicated that management strategies will need to be developed to minimise these impacts to the CALM estate. Suitable management strategies will be developed fully in the PER for the Peel Deviation project.

5.1.6 Wetlands & Hydrology

Impacts to wetlands could result from infilling or alteration due to road construction; alteration in habitat value through changes to water quality and vegetation; and alteration of the hydrological regime. Aside from the three major river crossings, the Serpentine, Murray and Harvey Rivers, the only wetland of significance which may be impacted is Nambeelup Pool. This EPP wetland is traversed by the Northern 1 alignment. Impact due to the major river crossings may be effectively managed with appropriate bridge and local drainage system design. Nambeelup Pool would be directly impacted through clearing and infilling, though the area impacted may be minimised through appropriate sensitive design.

The proposed new Peel Deviation is to function essentially as an inter-regional link between Perth and the South West. As such there is a risk of spillage of potentially hazardous or polluting materials from traffic using the proposed road. The road is likely to have vehicles transporting hazardous materials between the two regions. In areas where the route is in close proximity to wetlands, or 'upstream' of aquifers feeding wetlands, the potential exists for contamination.

5.2 HUMAN ENVIRONMENT

Potential impacts upon the human environment associated with the proposed Peel Deviation route focus on the physical severance and / or direct disturbance of, or otherwise intrusion upon;

- established activity patterns;
- land use and development;
- sites, features or other intrinsic qualities of particular significance; and
- services and infrastructure.

Specific considerations in this context include:

- Severance of privately owned land could pose logistical difficulties for the landowner (*e.g.* as a result of the site being physically partitioned by the road) and operational difficulties (*e.g.* additional management requirements resulting from increased human pressures attributable to the road). Land resumption to create the road reserve would also be necessary;

- Severance of Crown Land by the proposed road could impose similar difficulties upon the Agencies managing the land;

- Severance of current access routes by the proposed road would disrupt existing movement patterns and potentially, therefore, social interactions and other functional processes;

- Should the proposed route traverse the alignment of existing services, remedial measures may be necessary to avoid severance or other disturbance of the services;

- Should the alignment of the proposed road intrude upon or closely adjoin sites of particular significance, direct physical disruption of the sites may result and indirect (human) pressures could contribute to their progressive degradation if the sites became excessively accessible;

- Insufficient separation between the proposed road and dwellings would reduce residential amenity, for example as a result of traffic noise and other emissions, and possibly dust and light spill; and

- If the route was visually prominent it could be an obtrusive, unnatural feature within the landscape and therefore detract from visual amenity (illumination of the road must be considered in this context).

Discussion of these potential impacts follows.

5.2.1 Sites of Aboriginal significance

Although the overall area traversed by the Peel Deviation contains a number of sites of both archaeological and ethnographic significance to the Aboriginal community, the specialist investigations have not identified any specific site/s that would be directly affected by any of the route options that have been considered.

The Northern route options do, however, cross the Serpentine River upstream of Goegrup Lake and it is recognised that for its entire length between this lake and the Darling Scarp the Serpentine is of significance to the Aboriginal community. An additional site is located in close proximity to where the central portion of the alignment will cross the Murray River, and final design will need to ensure that this will not be affected by the proposal.

5.2.2 European Heritage Sites

DPUD (1994) identifies several known historic sites within the broad area traversed by the proposed Peel Deviation. These are concentrated around Mandurah, the Peel - Harvey Estuary and Pinjarra and will not be affected by the proposed route. There are however two recognised sites occurring at the southern end of Old Coast Road in the proposed area for duplication under the Peel Deviation project.

Four Acres Cottage or Peppermint Grove Cottage is located on the western side of Old Coast Road approximately six kilometres north of the boundary between the Shires of Waroona and Harvey. The cottage is reported as being constructed in 1868 as a wayside inn and change area for coach horses (Dames & Moore, 1992). The building is in poor condition and requires reinforcement. Upgrading of the Old Coast Road to a four lane divided carriageway standard may affect this site, due to its proximity to the existing roadway.

The second site known as Whittaker's Sawmill is located 8 km south of Peppermint Grove Cottage, 45 m east of Old Coast Road in a public picnic area. The mill was built in 1953 and only operated until 1964. The site's heritage value lies in it being representative of sawmill operations. The alignment of the duplication will need to account for this site.

The Australian 10th Light Horse Brigade bridle trail will be crossed in the vicinity of Doman Road. The trail runs parallel to the Old Coast Road south from the south-western corner of the Harvey Estuary along Southern Estuary, Doman, Centre Break and Runnymeade Roads ending at Wellesley Road. The 60 km trail is currently in use by members of the Yalgorup Recreational Horse Riders Association, and Peel Horseback Adventures; an ecotourism venture. Management strategies will need to cater for the trail and the trail users.

5.2.3 Access / Property Severance

With the following exceptions, the proposed Peel Deviation traverses privately owned and developed land;

- parts of the Northern 1 and 2 route options are within existing road reserves that have been created through subdivision of the surrounding land;
- the northern extremity of the Central portion of the route alignment is within similarly established road reserve;
- the southern extremity of the southern route options traverse State Forest.

Where feasible, the alignment of route options follows cadastral boundaries. Nevertheless the route options do intrude (to varying degrees) upon many privately owned properties that have been developed for agriculture, and will result in disruption of farming activities.

The Southern 1 route option traverses a substantial wedge of native bushland State Forest proposed for addition to Yalgorup National Park. A narrow portion of the State Forest area traversed by the Southern 2/3 route options is also proposed for addition to the National Park. The majority of the State Forest area traversed by the Southern 2/3 route options has, however, been developed as pine plantation.

5.2.4 Infrastructure Severance

As the proposed new route would be superimposed upon an area serviced by an existing road network, the potential for disruption of established local access and movement patterns is clear. However, MRWA is compelled to maintain legal access to all properties affected by its projects and accordingly, while the local road network may well be modified by the proposed Peel Deviation route, all pre-existing access will be maintained (albeit, in some instances, in modified form).

Other forms of infrastructure (particularly the surface drainage system and overhead power transmission lines) could be similarly affected by the proposed route. Again, however, Main Roads is compelled to maintain the continuity of these facilities to their current standard.

5.2.5 Noise

As rural land uses predominate throughout much of the area traversed by the proposed Peel Deviation route, current background environmental noise levels are low. Establishing an inter-regional route that will carry heavy truck traffic will inevitably change the noise environment in nearby areas.

Typically, noise levels of 70 dB (A) can occur in the vicinity of a major roadway and accordingly, where dwellings are affected, the changed noise environment could be regarded as an undesirable (social) consequence of the proposed route, regardless of the actual decibel level of traffic noise. MRWA policy

(MRWA,1992b) requires investigations for noise reduction options should L10 (18 hour) traffic noise at dwellings be measured in excess of 63 dB(A).

The consequences of noise as an impact in the route selection process relate to the proximity of the alternative route options to residences and the degree of noise reduction management strategies required in those areas. In general the greater the number of residences in close proximity to a potential alignment the lower the preferability of the route.

5.2.6 Visual Amenity

Recent planning documents have begun to treat the visual landscape as a resource to be managed, with the objective of minimising the impact of development on natural landscapes. The difficulty in performing visual analysis lies in the subjectivity in assessing the quality of a view. However, attempts have been made to develop systems which minimise this subjectivity by categorisation of landscape, and landscape characteristics.

The area which the Peel Deviation traverses has been allocated into a high, moderate or low quality category according to landform, vegetation and waterform criteria developed by DPUD (1993). As scenic quality is relative, the criteria are based on scenic quality increasing:

- with ruggedness and relative landscape relief;
- with the presence of water forms, water edges and water areas;
- as vegetative patterns become more diverse;
- as natural and agricultural landscapes increase; and
- as human-made landscapes decrease.

Although the alignments can be categorised on the basic criteria, scenic quality also varies according to the distance from which the affected site is viewed, public perception of alteration to the landscape, and the nature of the proposed alteration to the landscape.

Because of its predominantly rural character, the low-lying nature of the topography, and the relatively small area of impact, the area traversed by the proposed Peel Deviation route can be regarded as having low to medium landscape value. Areas of medium landscape value are those where the alignments cross or run adjacent to water bodies or significant stands of native vegetation.

The landscape amenity of the preferred alignment will be more comprehensively discussed in the PER for the Peel Deviation project. The low-medium landscape value will allow for categorisation into landscape management zones, resulting in determination of strategies to minimise the apparent landscape alteration possible from the road construction.

Other means by which the proposed route could detract from amenity within surrounding areas include;

- light spill from illumination of the route and from traffic using the route; and
- dust and exhaust emissions produced by vehicles using the route.

Potential impacts on amenity associated with the proposed route will apply within both the rural areas through which it would pass and the more developed areas wherein the road reserve has already been created.

6.0 ENGINEERING AND ECONOMIC FACTORS

A number of engineering and economic factors affect the relative merit of the various route options for the proposed Peel Deviation. The terrain traversed by each of the route options imposes specific engineering constraints and requirements for the construction of the route which in turn leads to varying construction, maintenance and operation costs. In addition, there is the potential for each of the routes to vary in terms of time and cost to the user. The engineering and economic factors affecting the route selection process include:

- Safety: the inherent safety of the route given the route's design constraints;
- Route length and travel time: route length and subsequent travel time impose a cost to both the user and also maintenance;
- Foundation and earthworks: the route foundation and topography determines the requirement for earthworks and fill materials, thus affecting construction costs;
- Drainage: drainage requirements are specific to the landscape a route traverses and impose specific cost implications to satisfy design and environmental requirements;
- Special construction requirements: the landscape, topography and existing features (including infrastructure) determine any specific requirements for a route;
- Public utilities: any public utilities disturbed by a route will need to be reinstated leading to route specific costs and design constraints; and
- General cost: the individual characteristics of a route will determine the ultimate construction, maintenance and operation costs.

A general discussion of these factors and how they affect the Peel Deviation route selection process follows.

6.1 SAFETY

Application of the design standards is possible for all options and hence adequate safety will be provided. The grade through the cutting of Southern 1 option, however, is likely to require the additional expense of a passing lane to provide adequate safety.

Road safety can be improved by designing a road with limited access to reduce potential conflict points and allow the free flow of through traffic. Freeways have no direct access, all access is at grade-separated interchanges and these roads have the lowest accident rates for a given traffic volume. Dual carriageways with strictly limited access also known as Expressways, have the next lowest accident rate.

The Peel Deviation will ultimately be developed as a Freeway with grade separated interchanges, however the initial stages will be constructed to Expressway type conditions. Property access will be provided from the local road system wherever possible. It is possible to develop a road with the potential for development as a Freeway on all the route options.

6.2 ROUTE LENGTH AND TRAVEL TIME

To enable comparison of the various options, the route length, travel time and traffic volumes anticipated by the year 2021 have been summarised in Table 3. To calculate travel times, it has been assumed that the northern section to the Pinjarra Road Interchange will have a speed limit of 100km/hr while a limit of 110 km/hr will apply on the remainder of the route.

Table 3: Route Lengths and Travel Times.

Option	Length Km	Speed Km/Hr	Average Daily Traffic 2021	Total Travel Times (Hrs)
Northern 1	11.4	100	25,000	2,850
Northern 2	12.1	100	25,000	3,025
Central	17.3	110	18,400	2,895
Southern 1	29.5	110	19,100	5,120
Southern 2	28.2	110	19,100	4,895
Southern 3	29.0	110	19,100	5,035
Southern 3A	29.1	110	19,100	5,050

6.3 FOUNDATION AND EARTHWORKS

The foundation conditions of the alignment have been obtained from the Environmental and Geology Series of maps prepared by the Department of Minerals and Energy.

The proposed alternative routes are all predominantly founded on the Guildford Formation. This formation comprises sandy/silty clay with some nodules of calcareous material and some lateritization. It is relatively stable but weak when wet with a low permeability. A 1 to 1.5 m cover of sand is therefore required to spread traffic loads and to provide a sub-grade which is of sufficient height above the winter water level. Much of the Guildford Formation in this area has a natural cover of 0.5 to 2 m of Bassendean Sand.

In comparing alternatives in the flat areas, earthworks have been estimated using the following criteria for importation of fill for sub-grade improvement:

- fill to extend over each carriageway but not across the median;
- sections over Bassendean Sand to be raised 0.5 m above existing ground to allow effective drainage control (15,000 m^3/km required);
- sections with thin layers of existing sand over Guildford Formation to be raised 1.0 m above existing ground to spread traffic loads and given that sheet flooding can occur in these areas (36,000 m^3/km required);
- sections directly founded on the low permeability Guildford Formation to be raised 1.5 m to provide approximately 1 m from the bottom of the pavement to the top of accumulated surface water (64,000 m^3/km required).

Closer to the existing Perth - Bunbury Highway, a 3 km wide parallel band of undulating country provides good construction sand and some limestone. Road profiles through the undulating sections will be kept as low as possible to provide excess cut material to use as fill in the flat areas.

For sections involving duplication of existing sections of the Perth - Bunbury Highway, an allowance of 10,000 m^3/km cut to fill has been determined.

6.4 DRAINAGE

It is proposed to provide a drainage system which maintains the existing drainage pattern of the area through subsurface drainage, and which incorporates collection of road run-off in open drains or swales. The open drains or swales will feed into retention basins to provide control of the road run-off before discharging into the existing drainage system of the area. The retention basins provide scope for collection of toxic spills and also help to strip other undesirable materials from the road run-off.

6.5 SPECIAL CONSTRUCTION REQUIREMENTS

In addition to the construction requirements associated with the various foundation and earthwork particulars described in Section 6.3, the following requirements need to be considered.

6.5.1 Northern Route Options

In determining the length of bridging over the Serpentine River, apart from the requirements to accommodate river flows, the impact of approach embankments on the riverbank wetlands needs to be considered. Similar environmental considerations will be required in assessing culvert or bridge options over the Nambeelup Brook. These aspects will be considered during the preliminary design phase.

In addition, the Northern 2 option will require realignment of about 1.5 km of Lakes Road to accommodate the proposed ultimate interchange.

6.5.2 Central

Because of the short horizontal distance between the Murray River and Pinjarra Road, it is unlikely that an at-grade intersection at Pinjarra Road will be possible due to the height difference between the Murray River bridge and Pinjarra Road. The river bridge will need to provide adequate clearance for river craft and for flood conditions. It is therefore envisaged that the interchange at Pinjarra Road will be constructed at the same time as the Murray River bridge crossing.

Structures will also be required in this section for three main drain crossings and possibly an underpass for Yunderup South Road. These will be assessed further during the concept design phase.

There is also a main drain running parallel and adjacent to the alignment for 2 km near Grey Road which may need adjustment, or alternatively the position of the highway may need minor adjustment, to maintain drainage requirements.

6.5.3 Southern Options

All the Southern options cross the Harvey River but at this stage the crossing does not appear to pose any great problems. However, the geological maps do indicate possible foundation benefits for the crossing along Southern 3 (and 3A).

Two to three drain crossings are required for these options but do not influence the route preferences significantly.

6.6 PUBLIC UTILITIES

Investigations show that existing services which affect all route options, are as follows:

- 391 mm and 489 mm water mains on the north side of Pinjarra Road. These are likely to be unaffected as they should pass under the new highway bridge.
- A 150 mm water main crossing the alignment approximately 500 m south of the Murray River. This may require sleeving prior to construction of the road embankment.
- Five single phase HV overhead power lines crossing the alignment at Grey Road, near Greenlands Road, at Paul Road, Dailey Road and near Clifton Road (Southern 1 only).
- One three phase overhead HV power line crossing the alignment at Clifton Road.
- Drain crossings as shown in the plans need to maintain the hydraulic requirements.

6.7 GENERAL COST

At this stage of the study cost estimates can only be approximate. However, whilst in total they may not be accurate, they do provide reasonable comparisons between options.

Estimates of construction costs have provided the following comparisons:

- Northern 1 is $300,000 cheaper to construct than Northern 2 and will also be cheaper to maintain.
- Utilisation of Southern 4 with options 2, 3, or 3A can save $120,000.
- Construction costs of Southern options 2, 3 and 3A are within 1% of one another.
- Southern 1 is cheaper than the other options by approximately $2 M, but this reduces to $800,000 if the existing carriageway of the Perth - Bunbury Highway over this route requires reconstruction.

7.0 ROUTE SELECTION

7.1 COMPARATIVE ASSESSMENT

In assessing the relative merit of the respective route options, the implications of the alternative routes in terms of the potential impacts previously outlined have been considered. In some instances, these potential impacts have been considered collectively to provide a composite evaluation of the anticipated effect of the respective options upon particular environmental qualities / features.

This assessment compares the options on the basis of environmental (biophysical and social) impacts in determining the optimal alignment for these factors. The outcome of this assessment must then be considered in relation to engineering and economic factors before a preferred alignment for the Peel Deviation can be recommended. Through this process, the northern and southern options have been assessed in terms of the following factors:

Habitat disturbance:
- extent of direct loss of vegetation (which equates to extent of fauna habitat loss); and
- the diversity and conservation of habitat likely to be disturbed.

Declared Rare Flora and Fauna (DRF):
- likely occurrence (and therefore disturbance) of such species.

Dieback:
- likely occurrence of infection; and
- susceptibility of endemic vegetation to infection.

Conservation Estate & EPP Wetlands:
- impact on areas classified for conservation purposes; and
- direct and indirect impact on classified wetlands.

Pollution of water resources from accidental spills:
- proximity of route to feature / area of water resource significance.

People pressure:
- consequences of introducing people into the area traversed by the route; and
- conservation value and status of the area traversed.

Aboriginal Heritage:
- intrusion upon known sites.

European Heritage:
- intrusion upon presently known sites.

Land Severance:
- number of private landholdings (& titles) which the route would partition and adjoin; and
- length of route encroaching upon Crown Land and the status of that land.

Infrastructure Severance:
- degree to which existing infrastructure would be permanently modified; and
- cost considerations.

Noise, Dust and Vibration:
- number of dwellings and their proximity to the proposed route; and
- noise, dust and vibration from both construction and operational phases.

Amenity:
- degree of impact to the broad character of the area the proposed route would traverse.

Engineering and Economic Factors:
- requirements for construction materials, construction costs, length of alternate routes, and subsequent travel costs.

Each route option has been ranked in terms of each of these factors from Low to High. The assessment is made on a comparative basis with the ranking of the factors assessed relatively. A Low rank being the lowest level of overall effect and High being the highest for the specific route comparison being made. If a factor does not occur, or no effect is anticipated within the sector being discussed, it is indicated as being Not Applicable (NA). Although such an approach assumes that each of the factors is considered to be of equal importance, it does represent consistent evaluation of the route options and should, therefore, be regarded as an acceptable methodology for selection of the preferred alignment.

This assessment has not been carried out for the Central section of the route due to no alternative alignments with perceived benefits over the original proposal being identified.

The outcome of the comparative assessment process is summarised in Tables 4 and 5.

7.2 NORTHERN SECTION ASSESSMENT

7.2.1 Habitat Disturbance

The Northern 1 alignment would produce the highest degree of environmental impact in the northern section of the project. The alignment bisects the Nambeelup Pool wetland which is of conservation value and is classified as an EPP wetland. However, the vegetation has been heavily disturbed historically and consists of remnant overstorey species with a heavily weed invaded exotic understorey.

The Northern 2 alignment would traverse Nambeelup Brook almost 1 km to the east of Northern 1, crossing the brook at a narrow point thus only impacting on fringing vegetation. Some remnant vegetation and a degraded wetland between Lakes Road and Pinjarra Road will be traversed by the alignment.

Both Northern 1 and Northern 2 will have a significant impact on the riverine vegetation of the Serpentine River where the proposed crossing point consists of high conservation value samphire wetland and fringing riverine eucalypt woodland. The area is listed under System 6 and EPP wetlands policies. There is a high potential for both rare flora and fauna to be impacted as well as general ecosystem processes being affected.

In reference to habitat clearance the Northern 1 option has a higher level of impact due to its alignment through the Nambeelup Pool wetland. Therefore, based only on this factor, Northern 2 is the preferred alignment.

7.2.2 Declared Rare Flora & Fauna

Northern 1 will impact a small population of Schedule 1 fauna; the Southern Brown Bandicoot *Isoodon obesulus* at Nambeelup Pool. This species was recorded during site inspections of the area and is also known to local residents. Both alignments may also impact bandicoot habitat at the Serpentine River crossing. The species is known to utilise the narrow riverine corridor along the Serpentine River (*ecologia*, 1990).

The degraded nature of the understorey along Nambeelup Brook reduces the probability of rare flora. However, the Jarrah - Banksia woodland vegetation complex on the western bank of the Serpentine River may contain rare or priority flora species. Both alignments have similar potential to impact this area.

Northern 2 is the preferred alignment for this factor due to the impact of Northern 1 on the Southern Brown Bandicoot population at Nambeelup Pool.

7.2.3 Dieback

The riverine vegetation complexes are less susceptible to dieback infection, although some level of risk still exists because of the presence of dieback within the broader region and the movement of vehicles, machines and construction materials associated with the project. Both alignments are equal with respect to this factor.

7.2.4 Conservation Estate and EPP Wetlands

Both route options will impact the Serpentine River which is listed under System 6 (M108), while Nambeelup Brook is an EPP protected wetland area. Both options will have an impact on the EPP classified samphire flats around the Serpentine River, and must cross Nambeelup Brook. However Northern 1 passes directly through the area classified as an EPP wetland, and referred to as the Nambeelup Pool wetland. Northern 1 also passes in close proximity to a second smaller EPP lake.

Northern 2 will traverse a wetland to the north of Nambeelup Brook (see Figure 2A) which is heavily modified and does not have EPP status. Northern 2 is the preferred option for this factor as it represents the least impact to the conservation estate and EPP wetlands.

7.2.5 Pollution Risk from Accidents

Both Northern 1 and Northern 2 traverse the Serpentine River and Nambeelup Brook and therefore the risk of contamination at the points of crossing is rated as moderate (a relatively high risk but at a single point only). As Northern 2 crosses Nambeelup Brook further upstream than Northern 1, it is slightly preferable in assessment of pollution risk due to the greater potential for containment of spills away from EPP wetlands.

7.2.6 People Pressure

The status of the two northern options is similar in this respect. It is expected that access patterns would not significantly alter or produce any additional adverse impacts.

7.2.7 Aboriginal Heritage Sites

Both Northern route options cross the Serpentine River, known to be of broad significance to the Aboriginal community. Consultation with Aboriginal elders has highlighted one site on Figirts Road within the proposed road corridor (Section 3.4.1) which is common to both route options. However, the site is outside the proposed road reserve and therefore not within a direct impact area.

7.2.8 European Heritage Sites

Neither of the Northern route options for the proposed Peel Deviation impinge upon any known European heritage sites.

7.2.9 Land Severance

Assessment - Private Land

- Northern 1 route option partitions five landholdings, affecting a total of 10 separate titles;
- Northern 2 route option partitions six landholdings, affecting a total of 13 separate titles;

Both alignments have been assessed as causing a high level of impact for this factor. However, in a comparative assessment, the Northern 2 option affects an additional landholding (and three titles) in comparison to Northern 1, and will therefore have greater impact. Additionally, the Northern 1 route has been incorporated in the City of Mandurah Town Planning Scheme 1A since December 1983, and the Shire of Murray Town Planning Scheme 4 gazetted in 1989. Development adjacent to Northern 1 has occurred subsequent to the gazettal of the town planning schemes, therefore the impact to residents in this area is lower than Northern 2 which has not been previously indicated as a potential route.

Assessment - Crown land

- The Northern options do not affect Crown land and so neither is preferable in relation to this factor.

7.2.10 Infrastructure Severance

With the exception of some existing local road links which would be permanently severed by the ultimate route, all infrastructure and services affected by the proposal would be maintained. Furthermore, even where local roads would be permanently severed, alternative routes accommodating local movement would be established. The implications of the respective route options in terms of infrastructure / service modification are, therefore, similar.

The cost of maintaining infrastructure and services could also be regarded as similar except in terms of the local road network. Where the proposed route severs private land, local access roads would ultimately be required on both sides (to maintain legal property access). On this basis, the implication of the Northern route options are similar, except for the slightly greater impact by Northern 2 on Lakes Road.

7.2.11 Noise, Dust and Vibration

Five rural and 38 special rural dwellings occur within close proximity of the Northern 1 alignment and may be affected by these impacts. Five rural dwellings and 25 special rural dwellings may be affected by the Northern 2 alignment.

The Northern 1 alignment is likely to cause more impact to existing residents due to the higher number of special rural dwellings on Paterson Road north of Nambeelup Brook. However, this development was established around the road reserve and details of the route were publicly available through the respective Town Planning Schemes.

Relocating the alignment to Northern 2 to minimise the social impact on the existing Special Rural lots is therefore not considered justified, as there is potential for further subdivision to take place around the relocated alignment before it is constructed, thereby replicating the existing situation.

7.2.12 Amenity

The Northern 1 route option is likely to be visually prominent at Serpentine River from nearby areas because of elevated structures and also at Nambeelup Brook crossing points. The remainder of the alignment is relatively low in the landscape and adjoins existing roadways. The Northern 2 route option is also visually prominent at Serpentine River and, to a lesser degree than Northern 1, at the Nambeelup Brook crossing points.

The remainder of the alignment is relatively low in the landscape but traverses open, fully developed farmland well away from existing roadways.

The Northern 2 option is rated as having marginally less impact than Northern 1 due to being less intrusive at the Nambeelup Brook crossing.

7.2.13 Engineering and Economic Factors

Northern 2 option is 0.7 km longer than Northern 1 and will therefore involve the public and business in more travel time and expense . The greater distance will also result in greater maintenance costs.

From the design and construction point of view the alignment of Northern 2 is slightly inferior and requires more reconstruction of Lakes Road to accommodate the required interchange with this road. Northern 2 is also slightly more expensive to construct and may require more expenditure in land acquisition.

Both options will require importation of considerable fill material during the construction phase to traverse low lying, periodically flooded areas and accordingly, sourcing of the material also represents potential impact.

7.2.14 Northern Route Selection

Impact to the biophysical environment is greater for Northern 1 than Northern 2. Development of the Northern 1 option results in greater impact to Nambeelup Brook which is an EPP protected wetland, contains a Schedule 1 fauna species and represents a moderate stand of remnant vegetation. However despite the presence of Schedule 1 fauna and EPP protection, the conservation values of the area are only moderate due to the significantly degraded nature of the understorey habitat. The brook is heavily weed invaded with little or no native understorey species and is comprised almost entirely of exotic weed flora.

Overall, social impacts are fairly evenly balanced, although comment from the local community tends to favour Northern 2. The social impacts arising from the development of either of the two northern route options are primarily private land severance, disturbance during construction in the form of increased noise, dust and vibration and the ongoing impact of reduced amenity.

The engineering aspects of both options are only marginally different but in reverse, *i.e.* favouring Northern 1. This is due to Northern 1 providing a shorter route (it is 0.5 km shorter) with better connection with the future interchange to Lakes Road. In addition, Northern 1 is located on slightly higher and more stable ground (although it crosses a greater length of alluvium). Northern 1 will however require construction of approximately 1.3 km of road to provide access to the bisected pocket of residential zoned land on the north side of Nambeelup Brook. Northern 1 is also estimated to be $300,000 cheaper than Northern 2 without any allowance for possible differences in land acquisition.

Referring to the Comparative Assessment Table (Table 4), it can be seen that both alignments have similar numbers of high, medium and low impacts. Northern 1 has medium to high impact on the biophysical elements and low to medium social impacts. Northern 2 has low to high biophysical impacts and as for Northern 1, low to medium human impacts but leads to slightly more severance of private land.

The major engineering and economic factors favouring Northern 1 are:

- savings in further land acquisition (part acquisition has already been carried out for Northern 1);
- savings of an estimated $300,000 in construction costs; and
- results in a shorter route with cheaper operating costs.

The two Northern route options therefore have opposing differences in biophysical impacts and engineering / economic aspects, with comparable social impacts. In view of this, Northern 1 has been selected as the preferred route for the northern section for the following reasons:

- details of the Northern 1 route have been publicly available through the respective Town Planning Schemes;
- subdivisions have already occurred on Northern 1 with the road reserve in place and land acquisition has occurred;

- the route is shorter, giving a saving in construction and operating costs; and
- the biophysical impacts appear to be manageable.

With reference to the last point, better definition of the environmental impacts and the management of these will be made as part of the detailed studies to be undertaken during the second stage of the planning study and the PER process. Should these impacts prove to be greater than anticipated or the management measures unacceptable, it may be necessary to review the preferred route and determine if the impacts could be reduced by selecting the alternative Northern 2 alignment.

Table 4: Comparative Assessment of Northern Route Options.

COMPARATIVE ASSESSMENT OF NORTHERN SECTION ALIGNMENT OPTIONS

Factor	Northern 1	Northern 2
Biophysical		
- Clearing:		
Habitat loss	High	Medium
Declared Rare Flora/Fauna	High	Low
- Dieback	Low	Low
- Hydrology	Medium	Medium
- Conservation estate	High	Medium
- EPP lakes	High	Medium
- Pollution risk from accidents	High	High
- People pressures	Low	Low
Human		
-Significant Sites		
Aboriginal Heritage sites	Medium	Medium
European Heritage sites	NA	NA
- Noise, Dust & Vibration	Medium	Medium
- Amenity	Medium	Medium
- Severance:		
Private land	Medium	High
Crown land	Low	Low
Infrastructure	Low	Medium
Engineering & Economic		
- Safety	NA	NA
- Length & travel time	Low	Medium
- Foundation & earthworks	Low	Medium
- Drainage	Low	Medium
- Special construction requirements	Low	Medium
- Public utilities	NA	NA
- Construction cost	Low	Medium

7.3 SOUTHERN SECTION ASSESSMENT

7.3.1 Habitat Disturbance

Clearing which would be required for options Southern 1 and 4 is rated as having a high environmental impact, while option Southern 2, 3 and 3A have medium impact. Southern 1 will impact on Kooljerrenup Nature Reserve and State Forest Treasure Block, the proposed addition to Yalgorup National Park. This option has the greatest impact in respect to clearing of vegetation. Southern 4 has a high impact due to its proximity to the Kooljerrenup Nature Reserve as it is consistent with Southern 1 in this area before linking into the Southern 2 or 3 options.

Southern 3 and 3A have the next greatest impact due to the alignment bordering additions to the Yalgorup National Park along Doman Road. However the extent of impact is reduced with Southern 3 by the alignment being constructed within the pine plantation.

The Southern 2 alignment has the least impact due to the majority of the alignment passing through cleared agricultural land. All of the Southern 2, 3 and 3A variations must pass through an area proposed for addition to the Yalgorup National Park in the vicinity of Peppermint Grove Road before joining Old Coast Road.

Southern 1 is the least preferred alignment, followed by 4, 3A, and 3. The Southern 2 alignment is rated as having the least impact on clearing of remnant vegetation and habitat.

7.3.2 Declared Rare Flora and Fauna

Southern 1 has a high probability of Declared Rare Flora (DRF) flora species within the Jarrah - Banksia woodland vegetation complex and a high likelihood of disturbance (due to the extent of clearing required). Potential impact is therefore rated as severe.

Although DRF may potentially occur along the Southern 2 alignment, the likelihood of disturbance is comparatively low because of the limited additional clearing required.

The likelihood of DRF is less for Southern 3 and 3A than for Southern 1 but greater than for Southern 2 due to the greater amount of native vegetation traversed. The potential impact is therefore rated as moderate.

The unique component of Southern 4 is unlikely to contain DRF flora, although the section common with Southern 1 has a high probability of rare flora in the vicinity of Kooljerrenup Nature Reserve.

On the basis of potential disturbance of DRF the preferred alignment would be Southern 2, followed by Southern 3, 3A, and 4 with Southern 1 forming the alignment with greatest potential impact.

7.3.3 Dieback

Remnant native vegetation within the area traversed by these routes is sensitive to infection. While the potential for the spread of dieback infected material during route construction is relatively constant irrespective of the option pursued, the consequences of infection are greatest for Southern 1 and to a lesser degree Southern 3 followed by Southern 3A and 2.

With respect to dieback risk Southern 2 is the preferred option.

7.3.4 Conservation Estate and EPP Wetlands

The Southern 1 route option is the least preferable because it skirts some 5 km of Kooljerrenup Nature Reserve, and traverses Treasure Block State Forest, the McLarty Management Priority area (System 6; C56), which is nominated for inclusion into Yalgorup National Park.

Southern 2, 3, and 3A must all traverse State Forest sections nominated for inclusion into Yalgorup National Park, however the area affected is less than that for Southern 1, and these three options will have a similar level of impact for this factor.

All four options would traverse a similar number of drains that discharge to Harvey Estuary. None of the Southern options impact EPP wetlands.

Southern 2 presents the least impact to conservation estate and EPP wetlands though only marginally less than Southern 3 or 3A.

7.3.5 Pollution Risk from Accidents

As part of Southern 1 passes immediately up-stream of the Harvey River Delta, the risk (and consequences) of surface or groundwater pollution are rated as moderate. In addition, Southern 1 passes just to the east of the Harvey Estuary for some 6 km heightening the risk of water resource pollution. Overall risk in this regard from the Southern 1 alignment is therefore rated as moderate.

Because a greater proportion of the Southern 2 alignment would traverse low lying, seasonally flooded areas, the Southern 2 route option would be regarded as less desirable than the Southern 3 option.

The Southern 4 option will have the same risk as Southern 1 adjacent to the Estuary in addition to the constraints of the Southern 2 route alignment. The Southern 3 options provide the least potential for contamination from accident events.

7.3.6 People Pressure

The potential exists for a significant increase in access from the Southern 1 alignment to Kooljerrenup Nature Reserve A↑23756, the proposed Yalgorup National Park inclusion area and the upper reaches of the Harvey River Delta. Therefore people pressures are likely to be placed on these areas of remnant vegetation. Improved road access provides opportunities for entry into bushland areas and can result in activities which are detrimental to the natural environment. This may include off-road vehicle use, fires, litter and increased introduction of weed species.

The Southern 1 route option is the least preferable because it skirts some 5 km of Conservation Reserve, and traverses bushland State Forest to be included in Yalgorup National Park.

Southern 2, 3 and 3A are equal with respect to people pressures because of the existing access patterns with Doman and Coronation Roads and the State Forest management tracks.

7.3.7 Aboriginal Heritage Sites

Southern 2 and 3 are in equal proximity to a site on Doman Road and have similar potential impact on Aboriginal sites. There are no specified sites nominated on the Southern 1 alignment, and therefore this alignment has less impact in terms of disturbance to Aboriginal sites.

7.3.8 European Heritage Sites

The upgrading of the Old Coast Road to four lane divided carriageway standard, required if the Southern 1 option is adopted, may impinge on the Four Acre Cottage site on the Old Coast Road about 6 km north of the Shire of Waroona / Harvey boundary.

All four Southern route options will cross the Australian 10th Light Horse Brigade bridle trail. Southern 1 will cross the trail in the vicinity of Southern Estuary Road and Southern 2 at Coronation Road. Southern 3 and 3A will have the greatest impact on the trail by affecting Doman Road. However, continuity of the trail would be maintained and impacts managed appropriately in consultation with the trail users.

7.3.9 Land Severance

Assessment - Private Land

- Southern 1 route option partitions eight landholdings, affecting a total of 11 titles;
- Southern 2 route option partitions 10 landholdings, affecting a total of 19 separate titles;
- Southern 3 route option partitions 10 landholdings, affecting a total of 21 separate titles.
- Southern 3A and Southern 4 are variations of Southern 1, 2, and 3 and will thus affect a varying number of private properties depending upon the combination of routes used.

The Southern 1 alignment affects less landholdings and titles than either of the Southern 2, 3, 3A or 4 options, and would therefore have less impact in terms of severance of private land.

Assessment - Crown land

- Southern 1 route option traverses approximately 1 km of Conservation Reserve, Kooljerrenup Nature Reserve A↑23756, and adjoins approximately 5 km of such reserve. Southern 1 also traverses approximately 3 km of State Forest proposed for addition to Yalgorup National Park;
- Southern 2 route option traverses approximately 2 km of State Forest retaining natural vegetation and a similar distance of State Forest pine plantation;
- Southern 3 route option traverses approximately 3 km of State Forest retaining natural vegetation and 3 km of State Forest pine plantation.

7.3.10 Infrastructure Severance

As stated in Section 7.2.10 all severance of infrastructure will be catered for. Southern 1 alignment would impact Southern Estuary and Clifton Roads. Southern 2, 3 and 3A will cross Old Bunbury, Williamson and Coronation Roads. The greatest disruption would arise from Southern 3 and 3A impacting Doman Road. This road would form a cul-de-sac thus prohibiting through traffic.

Southern 1 and 2 route options would have slightly less impact than Southern 3 and 3A options due to the interruption to Doman Road.

7.3.11 Noise, Dust and Vibration

Four rural dwellings will be affected by the Southern 1 alignment (13, if dwellings on the Old Coast Road are included), nine rural dwellings would be affected by the Southern 2, 3 and 3A route options. Southern 4 option is a variation of Southern 1, 2, and 3 and will thus affect a varying number of dwellings depending upon the combination of routes used. However the unique component of Southern 4 will affect an additional two rural dwellings. The proposed special rural subdivision at Lots 3168 and 3167 will result in a significantly greater impact arising from Southern 1 in the future.

The Southern 1 alignment will therefore have the greatest impact on dwellings in proximity to the Peel Deviation. Southern 2, 3 and 3A are equal with respect to this factor.

7.3.12 Amenity

The Southern 1 route option traverses a limited area of fully developed farmland that is relatively low in the landscape but has a substantial interface with (undeveloped) Conservation Reserve and traverses a very prominent ridgeline and area of bushland. It also passes through State Forest that is proposed for addition to Yalgorup National Park.

Southern 2 route option traverses extensive areas of fully developed farmland, significant portions of which are exposed to view from local roads. It also traverses the ridgeline (further to the south where it is less prominent) and a combination of pine plantation and bushland State Forest.

Southern 3 and 3A route options also traverse substantial areas of exposed farmland, but are more closely aligned with existing local roads and would therefore be less visually obtrusive. They encroach upon the ridgeline and State Forest areas (both pine plantation and bushland) areas to a greater degree than does the Southern 2 route option. However Southern 3 presents a more aesthetically pleasing route for the traveller by traversing the native and exotic forest areas.

Southern 4 traverses almost wholly areas of exposed farmland.

Southern 3 is the preferred alignment due to the aesthetic value of the route and the moderate impact to amenity.

7.3.13 Engineering and Economic Factors

Southern 2 is the shortest of the southern options with Southern 3 and 3A only 0.8 km and 0.9 km longer respectively. Southern 1 is 1.3 km longer than Southern 2. Hence from a travel time and cost point of view, the order of preference are options 2, 3, 3A and 1.

Design standards can be met on all southern options but the steep grades through a very large cutting on Southern 1 alignment will slow heavy traffic and require a passing lane. Despite this large cutting, Southern 1 requires less overall earthworks and is cheaper to construct.

Construction risk is another aspect to consider and the poorer foundation at the Harvey River crossing and across the flat country in Doman's property for Southern 2 is worthy of note. To a lesser extent, the cutting of Southern 1 poses some additional construction risk.

All options will require importation of considerable fill material for construction purposes to traverse low lying, periodically flooded areas and accordingly, sourcing of the material represents potential impact. Southern 2 traverses more low lying areas than the other options, and so material sourcing needs are greatest for this option.

7.3.14 Southern Route Selection

Southern 1 rates as highly undesirable due to its impact on areas of high conservation significance at Kooljerrenup Nature Reserve A↑23756 adjacent to the south-eastern shore of the Harvey Estuary, and within the proposed extension of Yalgorup National Park in the Treasure Block of State Forest further south. This alignment is also strongly opposed by CALM due to the impact on the above conservation areas. It also traverses prime land mooted for future subdivision by the Shire of Waroona. There are no significant engineering advantages for this route, however there is potential to save $800,000 (after allowing for the reconstruction of the Perth - Bunbury Highway forming part of this alignment). In view of the strong

disadvantages of this alignment, the potential saving of $800,000 is not considered significant. Therefore Southern 1 is not recommended.

The Southern 4 route option is a part alignment which can modify options 1, 2, 3 and 3A. The development of this option results in a high level of biophysical (due to impacts to Kooljerrenup Nature Reserve A↑23756) and social impact (significant private land severance and disruption to agricultural operations) with no significant engineering or economic benefits or advantages. The Southern 4 option is therefore not a favoured option.

The Southern 2, 3 and 3A route options are more difficult to separate. The Comparative Assessment (Table 5) shows that they have similar numbers of high, medium and low ratings. Environmental impacts are confined to impact to remnant native vegetation in the Treasure Block of State Forest for Southern 3 and to a lesser degree Southern 2 and 3A. Social impacts arising from these alignments are restricted to private land severance and disturbance to rural residences. Land severance is greatest for Southern 2 due to impact to Doman's property. Southern 3 and 3A options are closer to some residences in the vicinity of the Harvey River.

In terms of visual amenity, Southern 3 provides a more attractive route adjacent to existing trees, both native and exotic plantations, but would cause greater disruption to local access, particularly on the through route of Doman and Coronation Roads.

From an engineering perspective, Southern 2 passes through the most unsuitable land due to the low lying nature requiring a significantly greater amount of fill material. However there are no significant engineering problems with any of the Southern 2, 3, and 3A options.

Construction cost estimates show that options 2, 3 and 3A are within 1% of one another. The cost differences are not considered to be significant enough to be a deciding factor on route selection. Also, they could change if land acquisition costs are also taken into account.

In weighing up all these aspects, Southern 1 is rejected due to its significantly greater environmental impacts. Southern 3 is selected as the preferred route even though it is 0.5 km longer, because it has the advantage of providing a more interesting alignment in an aesthetic environment and reduces severance and acquisition of farming properties. A significant part of the Peel Deviation route is across farmland and this section of Southern 3 which cuts along the eastern boundary of a pine plantation with natural forest to the west, will provide variation and relief to the motorists. Being in higher ground there will also be less risk in the drainage and foundation design.

Southern 3 is recommended as the Preferred Alignment as it is considered to have the following advantages:

- Least effect on private property;
- Better sited for future land development;
- Aesthetic route travelling along the natural forest and pine plantation boundary and through another section of plantation providing a break from the monotonous flat terrain, thus maintaining driver awareness;
- Least impact on the pine plantations;
- Curvilinear alignment maintains driver awareness;
- Less construction risk in regard to drainage and foundation with greater length on higher ground;
- Provides the opportunity to source shortfall in earth fill requirements from a hill situated on the alignment.

Table 5: Comparative Assessment of Southern Route Options.

COMPARATIVE ASSESSMENT OF SOUTHERN SECTION ALIGNMENT OPTIONS

Factor	Southern 1	Southern 2	Southern 3	Southern 3 A	Southern 4
Biophysical					
- clearing:					
habitat loss	High	Low	Medium	Medium	High
Declared Rare Flora/Fauna	High	Medium	Medium	Medium	Medium
- dieback	High	Low	Medium	Medium	Medium
- hydrology	Medium	Medium	Low	Medium	High
- conservation estate	High	Low	Low	Low	High
- EPP lakes	Medium	Low	Low	Low	Low
- pollution risk from accidents	Medium	Medium	Medium	Medium	Medium
- people pressures	High	Low	Medium	Medium	High
Human					
-Significant Sites					
Aboriginal heritage sites	Low	Medium	Medium	Medium	Medium
European heritage sites	Medium	NA	NA	NA	NA
- Noise, dust & vibration	High	High	High	High	High
- Amenity	Medium	Low	Medium	Medium	Low/Medium
- Severance:					
private land	High	High	Medium	High	High
Crown land	High	Low	Medium	Medium	High
infrastructure	Low	Medium	Medium	Medium	Medium
Engineering & Economic					
- Safety	Medium	Low	Low	Low	Low
- Length & travel time	Medium	Low	Medium	Medium	Medium
- Foundation & earthworks	High	Medium	Low	Low	Low/Medium
- Drainage	Medium	High	Low	Low	Low/High
- Special construction requirements	High	Medium	Low	Low	Low/Medium
- Public utilities	Medium	medium	Medium	Medium	Medium
- Constructionl cost	Low	Medium	Medium	Medium	Medium

8.0 CONCLUSIONS

8.1 THE PREFERRED ALIGNMENT

This Road Alignment Definition Report has studied alignment options for the proposed Peel Deviation taking into account environmental, social, engineering and broad economic considerations. Points raised during special Consultative Group Meetings and by public response to information disseminated locally, have also been considered.

The comparative assessment of biophysical environmental factors associated with the various Peel Deviation route options indicates the following:

- Northern 2 is preferable to Northern 1, as it will have less impact on DRF and EPP wetlands;
- Southern 2 route option is preferable to the other Southern route options which have increasing degrees of biophysical impact with Southern 1 being the least preferable. However the difference between Southern 2 and Southern 3 and 3A is not great.

The comparative assessment of human environmental factors associated with the various Peel Deviation route options indicates the following:

- There is little difference between the two Northern options, although Northern 2 will have a slightly higher degree of severance of private land, though slightly less impact on residences;
- The Southern 3 route option is preferable to the other Southern options due to the reduced property severance and impact to agricultural operations. The other options are similar in terms of their overall social impact with Southern 1 being the least preferred.

The comparative assessment of the engineering and economic factors associated with the various Peel Deviation route options indicates the following:

- Northern 1 is preferable to Northern 2 due to reduced land requirements, construction costs and engineering constraints;
- Southern 3 is the preferred option due to less construction risk in regard to drainage and foundation with greater length on higher ground and the opportunity to source shortfall in earth fill requirements from a hill situated on the alignment.

Recognising that there are opposing differences for the two Northern route options, Northern 1 has been recommended as the preferred route with the proviso that review of this decision may be necessary during the more detailed studies in Stage 2 of the study and PER process.

The existence of Northern 1 route in the Town Planning Schemes of the Local Government Authorities weighs heavily in favour of its recommendation, as there was no clear advantage between the options based upon the assessment of factors outlined in Section 7.

In summary, the preferred route alignment for the Peel Deviation is Northern 1, Central and Southern 3.

8.2 STAGE 2 PLANNING AND PER

The route selected as the Preferred Alignment incorporates the Northern 1, Central and Southern 3 options as described in this report. Subsequent stages of the Peel Deviation study will now focus on this alignment and will involve:

- Development of concept design for the preferred alignment premised on proactive consultation with the local communities and further evaluation of environmental conditions within the proposed route corridor;
- Preparation of the PER for submission to the EPA, taking into account feedback received during the second phase of consultation and from agency liaison;
- Evaluation and response to public submissions on the PER;
- Finalisation of concept plans and report.

STUDY TEAM

The Road Alignment Definition Report was planned, coordinated and executed as part of the Peel Deviation Engineering and Environmental Study by;

ecologia Environmental Consultants
165 Walcott St.,
Mt. Lawley W.A. 6050

G. B. Hill Consulting Engineers
62 Colin St
West Perth W.A. 6005

In association with

Paul Holmes & Associates

Project staff

ecologia **Environmental Consultants**

G. W. Connell	BSc. (Hons.) (Zool)	Senior Environmental Scientist
C.J. Macpherson	BSc. (Biol)	Senior Botanist
G. I. Moore	BSc. (Zool/Bot) (Hons.) (Zool)	Biologist
T.M. Gepp	BA. (Hons.) (Geog)	Environmental Planner, Project Quality Manager
M. T. Ladyman		Research Assistant
M. A. Wells	Dip. Draft.	Drafting

Paul Holmes & Associates

Paul Holmes	BA (Urban & Regional Planning)	Urban and Regional Planner

G. B. Hill Consulting Engineers

Geoff Smith	BE.(Hons), MSc., D.I.C.	Team Leader
Henk de Jong	Tech College (Holland)	Senior Engineer

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APPENDIX A

MAIN ROADS "PERTH TO BUSSELTON: COASTAL CORRIDOR TO THE SOUTH WEST: BROCHURE

PERTH TO BUSSELTON

COASTAL CORRIDOR TO THE SOUTH WEST

The South West of Western Australia is growing strongly with increased activity in tourism and mineral development as well as in the traditional areas of forestry, beef and dairy farming.

A key strategy to serve this region's growing needs is a multi-million dollar upgrading program for the Perth-Bunbury-Busselton route to a four-lane dual carriageway standard.

The road will provide a safe and efficient scenic route while diverting through traffic and heavy road freight away from the urban centres with bypasses of Mandurah, Australind, Bunbury, Capel and Busselton.

This brochure outlines the history and proposed developments along this route.

MAIN ROADS
Western Australia

Much has been achieved

SINCE 1982, Main Roads has been progressing with a multi-million dollar program to upgrade to a four-lane dual carriageway standard the coastal corridor linking the State capital of Perth with the commercial and tourism centres of the South West.

Main Roads established a project team in Bunbury in 1991 to manage what has become known as the Perth-Busselton project in conjunction with the development of the mineral sands heavy haulage route through the South West to the port of Bunbury.

The Perth-Busselton Project raises planning issues that are more complex than simply providing a second carriageway on the existing alignment. For some sections of the route, duplicating the road on the existing alignment is undesirable from an engineering aspect or because of environmental considerations or both.

Projects totalling $61 million have been completed since 1982. They include:

Kwinana Freeway: A 7 km southern extension of the Kwinana Freeway from South Street to Thomas Road was completed in 1991.

Ennis Avenue: Completion of 13 km of dual carriageway through Rockingham in 1984 provided an effective means of moving high volumes of traffic around the urban area.

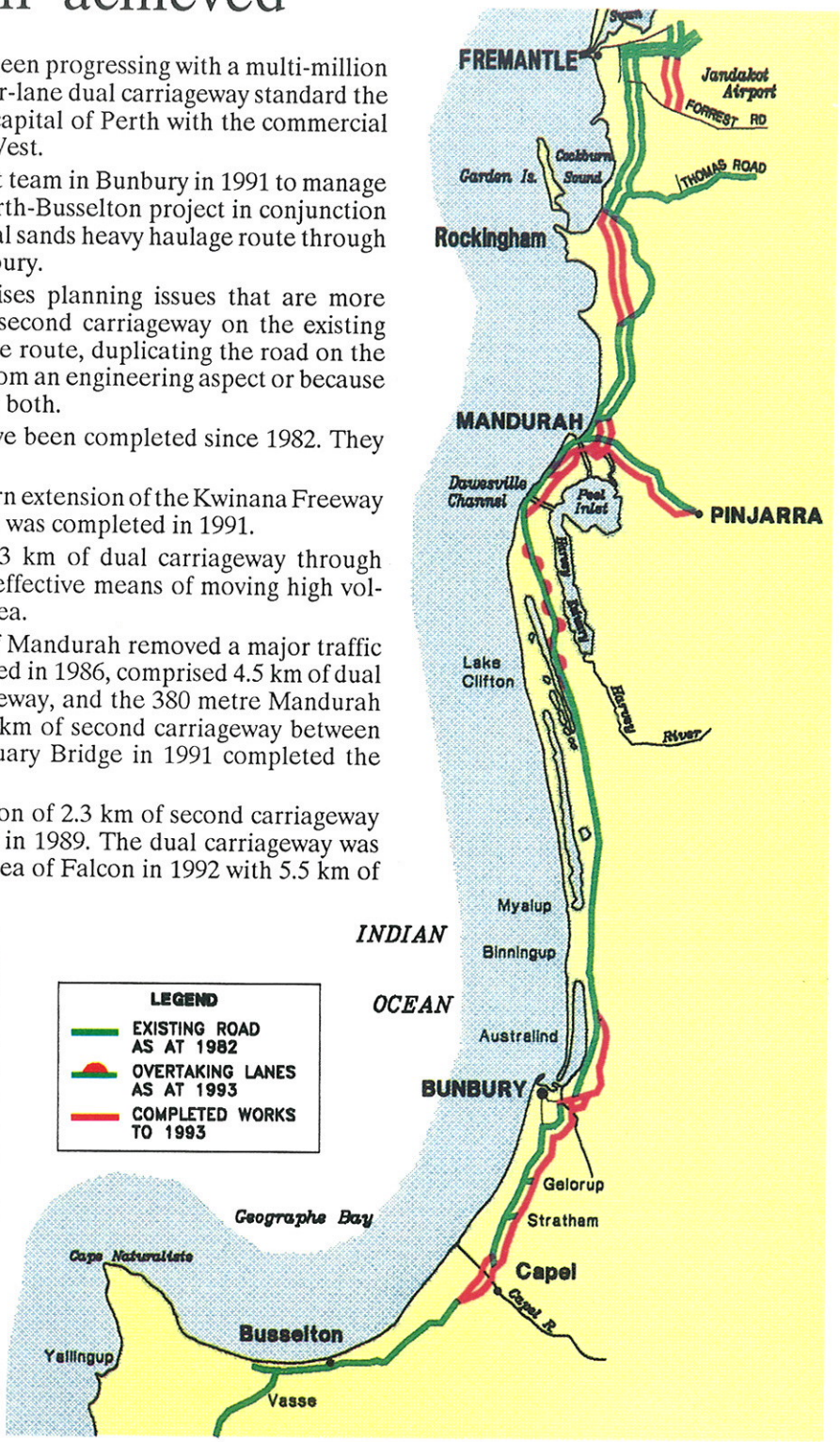
Mandurah Bypass: The bypass of Mandurah removed a major traffic bottleneck. The first stage, completed in 1986, comprised 4.5 km of dual carriageway, 4 km of single carriageway, and the 380 metre Mandurah Estuary Bridge. Construction of 2 km of second carriageway between Pinjarra Road and Mandurah Estuary Bridge in 1991 completed the second stage of the Bypass.

Halls Head to Falcon: Construction of 2.3 km of second carriageway south of Mandurah was completed in 1989. The dual carriageway was extended through the residential area of Falcon in 1992 with 5.5 km of second carriageway.

Dawesville Channel: Construction of a four-lane bridge over the Dawesville Channel and 2 km of dual carriageway approach roads was completed in 1993. This extended the dual carriageway from Falcon to the locality of Dawesville.

Dawesville to Myalup: Five overtaking lanes were completed in 1986 between Dawesville and Mt John. Since then, a further 3 overtaking lanes have been completed between Mt John and Lake Clifton, together with 20 km of shoulder widening and 9 km of reconstruction between Mt John and Myalup.

Australind Bypass: Completion in 1988 of the first stage of the bypass, 17.6 km of single carriageway and six bridges, provided an alternative route for through traffic at Australind.



PERTH TO BUSSELTON PROJECT 1982 - 1993

Glen Iris: Completion in 1991 of a second carriageway over 3 km of the Australind Bypass, including duplicate bridges over the railway and Preston River, improved the connection between Bunbury and Australind.

Bunbury Ring Road: Work was completed in 1992 on duplication of the existing Bunbury Ring Road single carriageway. Features of the design included intersection improvements to cater for large volumes of traffic as well as oversize vehicles transporting minerals to the port of Bunbury.

Bunbury to Gelorup: Construction of the second carriageway of this 3 km section was completed in 1985.

Gelorup to Stratham: This 10 km section of second carriageway was opened early in 1991.

Stratham to Capel: Duplication in 1993 of 9 km of existing single carriageway and of two bridges between Stratham and Capel completed the dual carriageway link from Bunbury to Capel.

Capel Bypass: Completed in 1993, the bypass comprises 3.3 km of dual carriageway, including dual bridges over the Capel River, and 1.5 km of single carriageway. The bypass takes tourism traffic and heavy haulage away from residential areas.

Public Participation

MAIN Roads encourages the public to be fully informed and involved in road planning to ensure that maximum benefits will be derived from all improvements. Close consultation is also maintained throughout the planning and design process with Local Government and other Government departments.

Particular consideration is given to environmental factors. The alignment for the deviation of the road around the Ludlow Tuart Forest, for instance, was chosen only after an exhaustive study on alternatives and a high degree of community input.

The next three years: 1994 to 1997

THE strategy for the next three years is:

Kwinana Freeway extension: Extend the Kwinana Freeway with construction of a dual carriageway from Forrest Road to Thomas Road. This is due for completion in mid-1994.

Peel Deviation: Carry out planning and environmental studies to establish a road reserve that can be incorporated into statutory plans.

Mandurah to Bunbury: Extend the four-lane dual carriageway from the Brunswick River on the Australind Bypass 16 km northwards to the vicinity of Myalup, providing for improved access for the settlement at Binningup and proposed new subdivisions north of Australind.

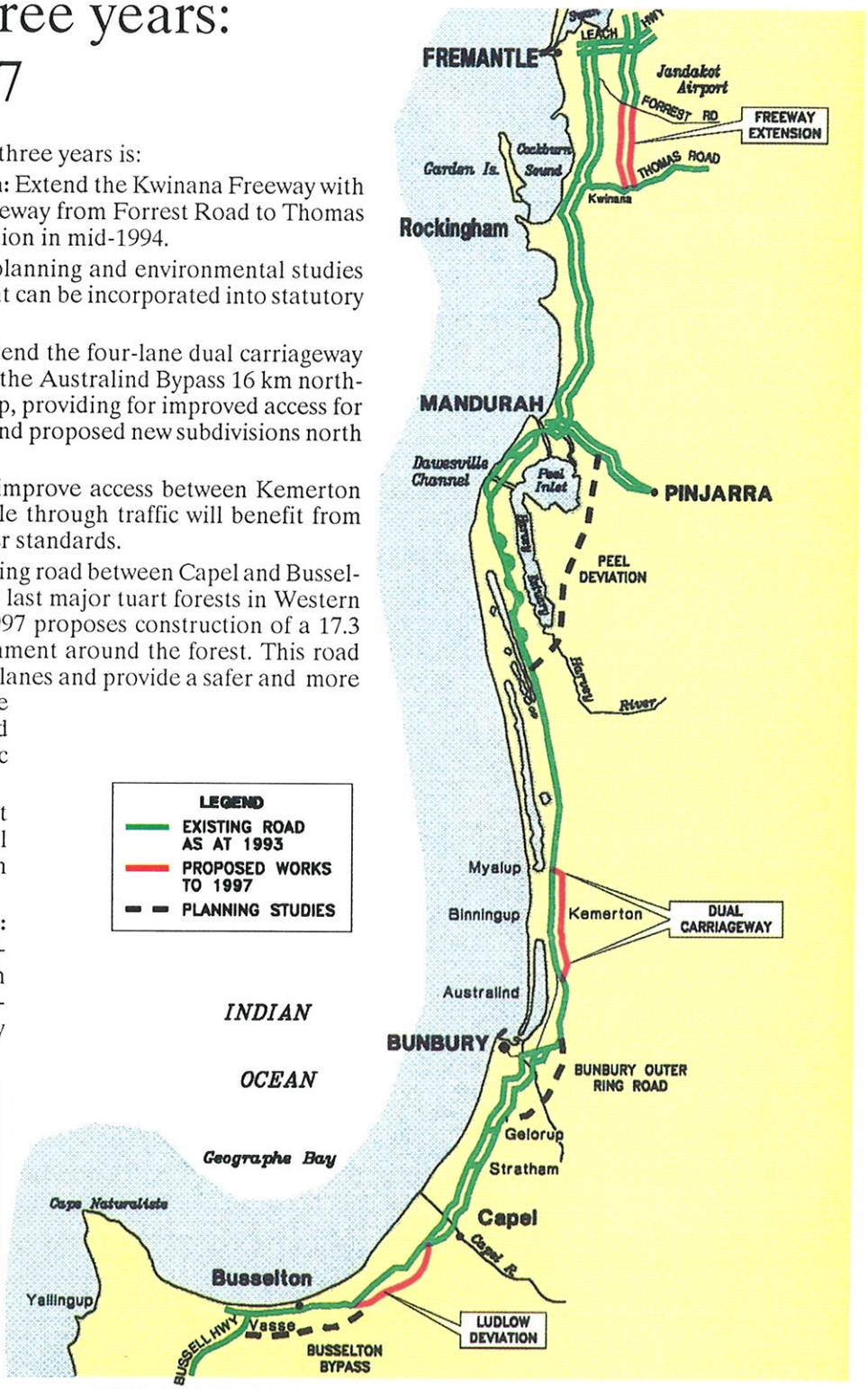
The dual carriageway will improve access between Kemerton and the port of Bunbury while through traffic will benefit from improved safety and road user standards.

Ludlow Deviation: The existing road between Capel and Busselton passes through one of the last major tuart forests in Western Australia. The strategy to 1997 proposes construction of a 17.3 km single carriageway realignment around the forest. This road would include five overtaking lanes and provide a safer and more effective through route while leaving the original road through the forest as a scenic route.

Busselton Bypass: Carry out planning and environmental studies to establish design parameters for the bypass.

Bunbury Outer Ring Road: Carry out planning and environmental studies to establish a road reserve that can be incorporated into statutory plans.

- *Dual carriageway near Gelorup*



PERTH TO BUSSELTON PROJECT 1993 - 1997

Preserving the environment

The natural vegetation along the Perth-Busselton highway route is typically tuart forest interspersed with jarrah and marri. Remnants of this forest are represented in the Yalgorup and Ludlow National Parks through which the existing route passes.

Roadside stops within the parks provide an opportunity for the traveller to break the journey and appreciate the unique features of the forest.

Much of the land adjoining the route has been substantially cleared for agriculture. Most of the land is used for grazing, however horticulture is becoming an increasingly important land use. Through the cleared farming areas, significant stands of natural vegetation are still contained within the road reserve.

The highway crosses or passes close to a number of estuaries and rivers. These and the lesser recognised wetlands, such as the Vasse-Wonnerup and Clifton-Preston-Myalup chain, are particularly important as bird habitats and filters for surface runoff entering the local groundwater basins.

Environmental factors are a major consideration in the planning, design and construction activities for this project. Main Roads is committed to minimising clearing and has developed very effective regeneration and rehabilitation techniques.

The Bunbury Division of Main Roads was awarded the 1991 John Tonkin Greening Australia Award for the rehabilitation of roadside verges on the Australind Bypass. Some 8 500 seedlings were planted and a further five hectares vegetated by direct seeding alongside the recently completed dual carriageway section between Gelorup and Stratham on the Bussell Highway. Similar plantings of native vegetation are proposed on future works.

On sections to be upgraded to a dual carriageway, the location of the second carriageway has been heavily influenced by environmental factors. In many cases, the second carriageway will be located inside cleared farmland in order to preserve existing road reserve vegetation for what would become the median strip of the dual carriageway.

The Bussel Highway will be deviated around the Ludlow Forest National Park as it is not possible to upgrade the existing road without seriously affecting large veteran tuart trees whose canopies create a cathedral effect over the road.

The new road will remove most of the through traffic from the national park and thus enhance its tourism and recreational value.

• *School children planting trees along Mandurah Bypass on Arbor Day.*

Message from the Minister for Transport, The Hon. Eric Charlton, MLC.

As well as its value to the tourism industry, the Perth-Busselton highway now taking shape is an important freight route which plays a vital role in the transport infrastructure needed to meet the rapidly growing economic diversification of the South West Region.

The resultant mixture of private and commercial traffic makes it essential that our road engineers design and construct upgrading projects to make this road efficient and safe for the wide variety of road users. I am pleased to say that we are doing just that.

The Perth-Busselton highway is a concept in which road user safety and environmental considerations are paramount. The concept is progressively becoming reality over a number of years. When the funds are available to meet the ultimate objective, as detailed in this brochure, it will be a road of enormous value to Western Australians generally and to the people of the South West in particular.

Mandurah Bridge will be duplicated in the ultimate plan.

The Ultimate Objective

THE ultimate objective will bring an extension of the Kwinana Freeway to Mandurah and a four-lane dual carriageway with control of access from Mandurah to Busselton with bypasses of Mandurah, Australind, Bunbury, Capel and Busselton.

To bring the Perth-Busselton route to this standard would require construction projects beyond 1997 to include:

☐ Extension of the Kwinana Freeway to Mandurah, initially constructed as a dual carriageway.

☐ Duplication of the Mandurah Estuary Bridge.

☐ 18 km of dual carriageway on the Serpentine Section between the Freeway extension in Mandurah and Ravenswood on the Pinjarra Road. Initially, this would be constructed as a single carriageway.

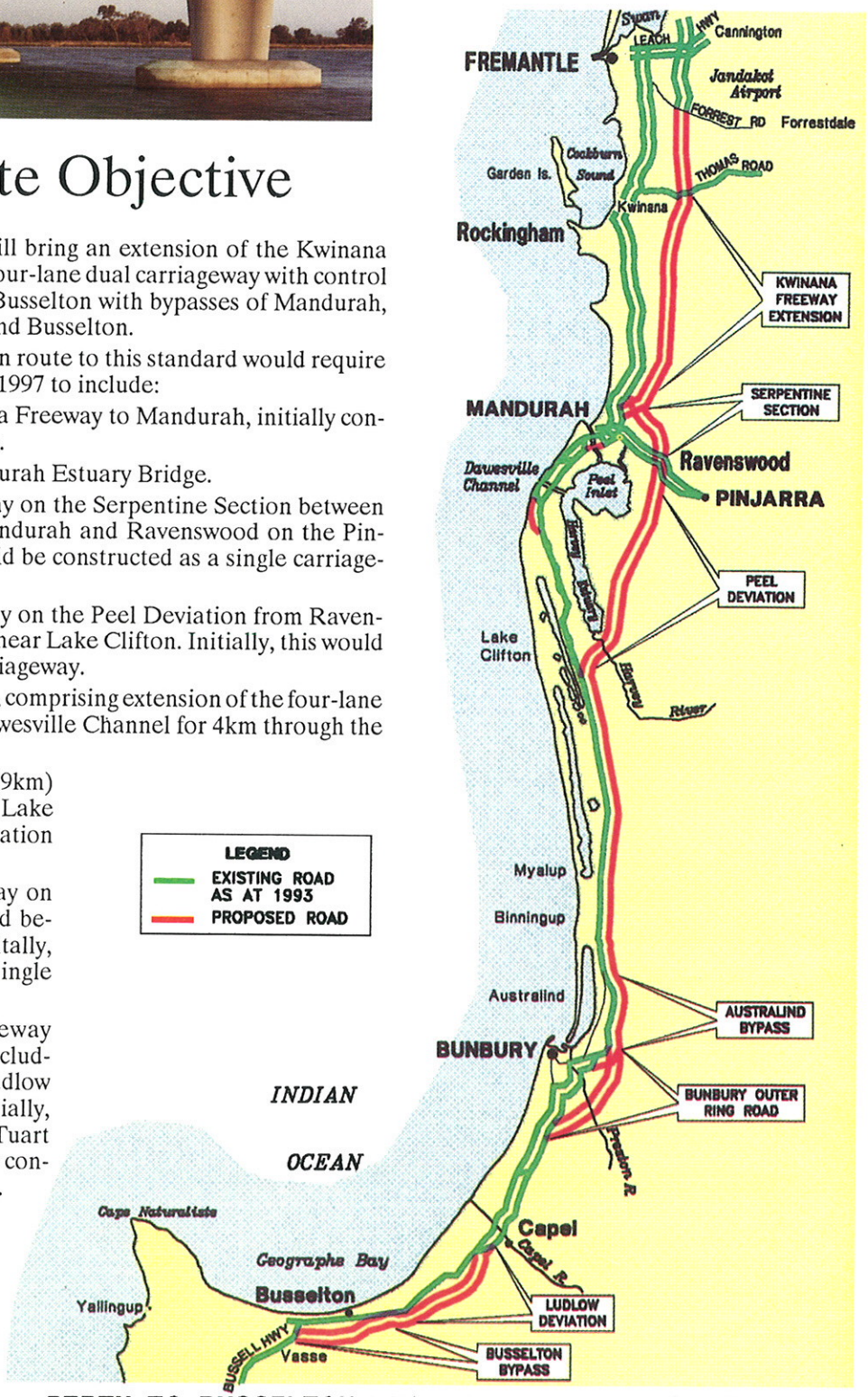
☐ 35 km of dual carriageway on the Peel Deviation from Ravenswood to the Old Coast Road near Lake Clifton. Initially, this would be constructed as a single carriageway.

☐ the Dawesville Deviation, comprising extension of the four-lane dual carriageway from the Dawesville Channel for 4km through the locality of Dawesville.

☐ a second carriageway (59km) on the Old Coast Road from Lake Clifton to incorporate duplication of Australind Bypass.

☐ 18 km of dual carriageway on the Bunbury Outer Ring Road between Eaton and Gelorup. Initally, this would be constructed as a single carriageway.

☐ 52 km of dual carriageway from Bunbury to Busselton including bypasses of Capel, the Ludlow Tuart forest and Busselton. Initially, the bypasses of the Ludlow Tuart forest and Busselton would be constructed as single carriageways.



PERTH TO BUSSELTON PROJECT ULTIMATE OBJECTIVE

Rebirth of the Old Coast Road

EUROPEAN settlement in Western Australia was based first at Albany on the southern coast and quickly followed by the Swan River coloney which spread from Fremantle to Perth and Guildford-Midland. Looking for new pastures, the later settlers explored the South West coast and established settlements - not always successfully - at Augusta, Busselton, Bunbury and Australind. Other towns grew up at river crossings such as Pinjarra and Mandurah and at settlers homesteads between these towns.

Communication between these isolated settlements initially depended on sea travel, but the need for an overland route was quickly evident.

The Inquirer newspaper of May 11th 1842 noted that "there has been talk lately of making a new line of road from Fremantle to Leschenault along the coast line crossing the inlet of the Murray Estuary by means of a ferry boat." The writer cast some doubt on the practicalities of a ferry crossing, but the route which became known as the Old Coast Road was soon established.

By the turn of the century, however, the establishment of the inland road and of the railway to Bunbury led to the demise of the settlements which had grown up alongside the Old Coast Road. The coastal route remained out of favour for more than half a century until Main Roads turned it into a modern highway linking Bunbury and Mandurah. The work was completed over a six-year period and the new highway was officially opened in September 1969. Appropriately, the then Minister of Works arrived for the opening ceremony in a 1909 Wolseley car.

By this time, the planners were visualising the long term benefits of a safe, dual carriageway highway linking Perth to the tourism and commercial centres of the South West. The modern highway now taking shape between Perth and Busselton follows closely the route of the old Bunbury Road and the Old Coast Road between Mandurah and Bunbury.

The coastal route dream of our early settlers was destined to be reborn.

- *Above: The Australind - Bunbury Road around 1930*

- *Below: Collie Bridge in flood around 1914*

APPENDIX B

INFORMATION BROCHURE AND RESPONSE PROFORMA MADE AVAILABLE TO RESIDENTS AND AT DISPLAYS AT PINJARRA AND MANDURAH.

TO THE RESIDENT

MAIN ROADS WESTERN AUSTRALIA

PEEL DEVIATION

BACKGROUND

The State's south - west has been growing strongly over a number of years. Much of this growth is in the coastal area between Perth and Bunbury. This has considerably increased regional traffic on the Perth - Bunbury Highway (see Figure 1)

Growth in the State's south - west will continue. An effective regional road link between Perth and Bunbury is essential to this growth. Regional strategies for the south - west have, therefore, provided for progressive upgrading of the Perth - Bunbury Highway.

However, due to development of Mandurah, local traffic in the Mandurah area has grown considerably. Increasingly, the Mandurah section of the highway is functioning as an urban arterial road.

This lessens the highway's effectiveness as a regional route.

South of Mandurah, the opportunity to significantly upgrade the Perth - Bunbury Highway is limited by:

- existing development;
- environmental conditions - the area is a narrow peninsula separating the Peel - Harvey Estuary and the coast, and includes part of the Yalgorup National Park.

Establishment of a new regional route passing to the east of the Peel - Harvey Estuary is, therefore, being considered.

This route is referred to as the Peel Deviation.

PEEL DEVIATION PROJECT

The project involves a dual carriageway route extending from the future Kwinana Freeway north of Mandurah, across the Serpentine and Murray Rivers, east of the Peel - Harvey Estuary, to join the existing Old Coast Road near Lake Clifton (see Figure 2).

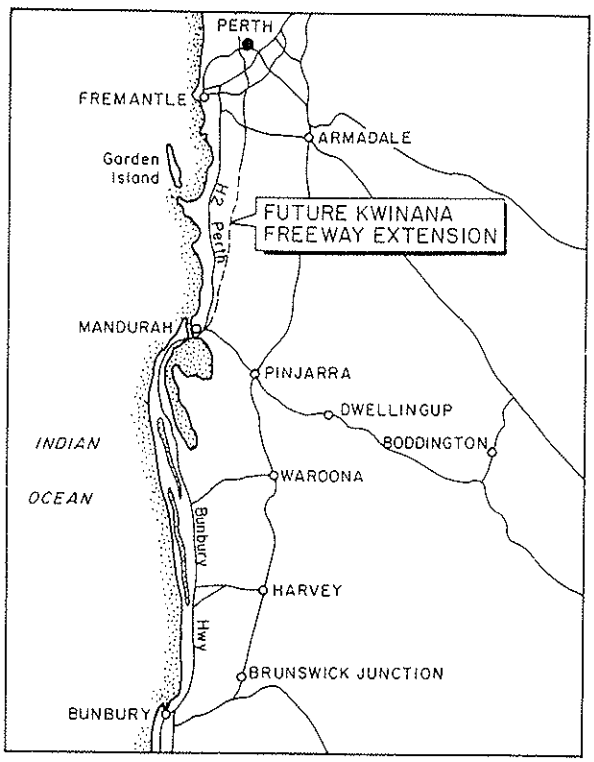


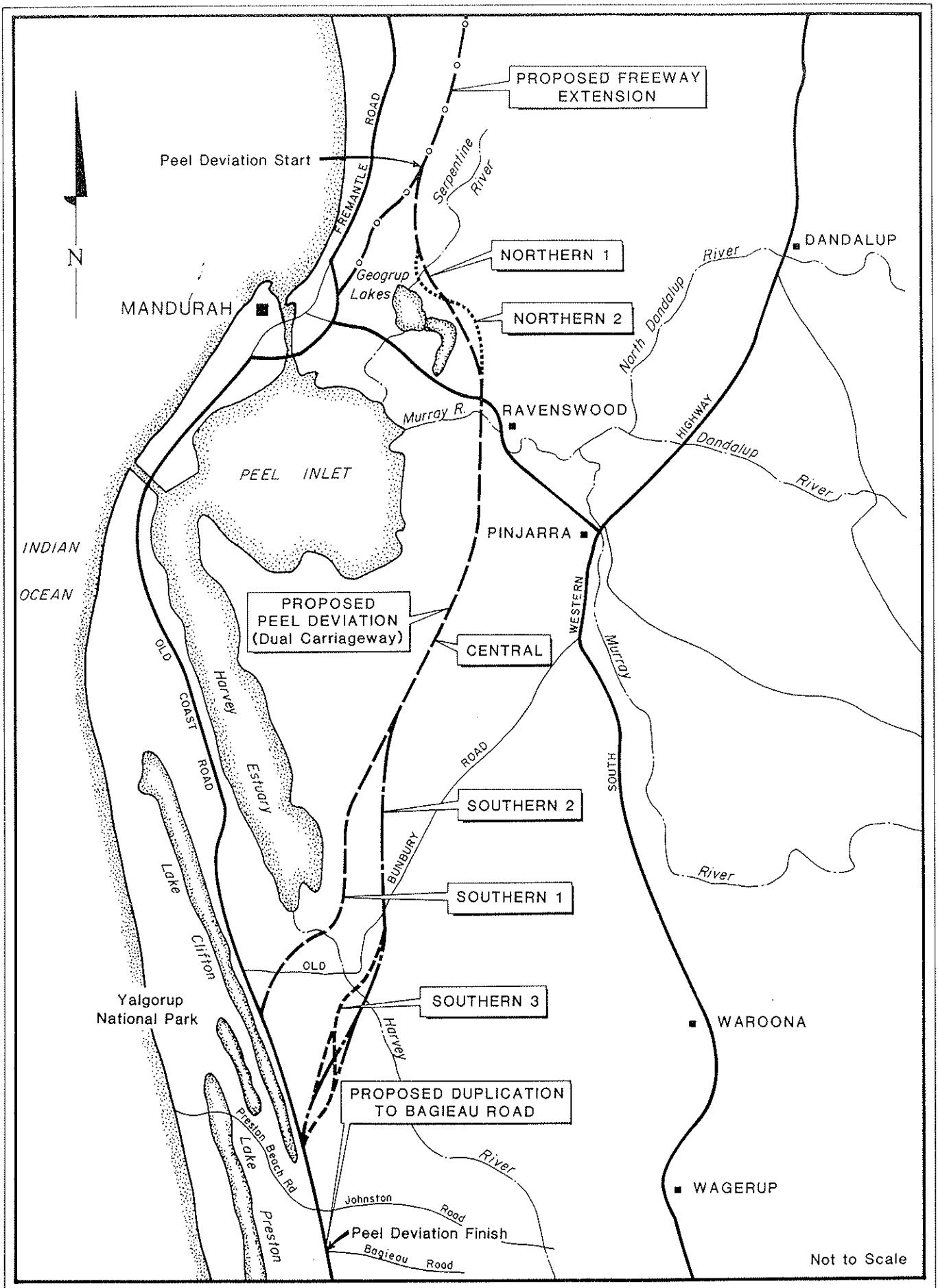
Figure 1: Perth - Bunbury Highway.

The concept of a regional route by - passing the Peel - Harvey Estuary and forming part of the Perth - Bunbury Highway has been shown in regional and local plans and strategies since the 1980's.

This by - pass route would ultimately be built to freeway standard (i.e. dual carriageway and controlled access). Initially, however, it would be built to a lesser standard.

The length of the by - pass route is about 46 kilometres. About 12 kilometres of the Old Coast Road is also affected. Most of the project is within the Shires of Murray and Waroona.

Main Roads has engaged GB Hill Consulting Engineers in association with *ecologia* Environmental Consultants to undertake a planning study to provide an accurate definition of the route and its interconnections with the total road network.



PEEL DEVIATION

Locality Plan

Figure 2

PEEL DEVIATION

The planning study also includes the duplication of the Old Coast Road from its junction with the proposed by - pass route south to Bagieau Road (see Figure 2).

ENVIRONMENTAL APPROVAL

The area affected by the Peel Deviation project is environmentally significant. It contains areas affected by System 6 conservation recommendations and is part of the Peel - Harvey Estuary coastal plain catchment.

As a consequence of the significance of the area the Environmental Protection Authority (EPA) will formally assess the project. Figure 3 details the EPA assessment process.

PUBLIC CONSULTATION

The Peel Deviation project will be undertaken in two stages as follows:

- Stage 1 - review of alignment options and recommendations of preferred option;
- Stage 2 - preparation of plans and the public and environmental assessment for the preferred option.

Wide community consultation is sought to help in both stages of the project.

This brochure is part of the consultation process for Stage 1 of the project. It provides background information about the project and also gives people an opportunity to tell the consultants about issues that will need to be considered during the project.

Please use the enclosed reply paid form if you wish to raise any issues concerning the Peel Deviation project and please return the form by Friday 29 September, 1995 .

There will also be Public Information Displays held during Stage 1 of the project. The displays will provide information about the route options being considered and the display at Mandurah will be attended by representatives of Main Roads and the consultants to answer questions. People attending will be able to provide comments either at the display or during the following week. The Public Information Displays will be held at Pinjarra, Waroona, and Mandurah.

Further community consultation will occur in Stage 2 of the project. Information about the next phase of consultation will be circulated to the community.

The second consultation period is scheduled for February / March 1996 and it is anticipated that the study will be completed by May 1996.

Your comments on the Peel Deviation project are welcomed. Please remember the following dates:

- **Public Information Displays**
- Waroona Library, Waroona
  8 - 14 September 1995, (unmanned)
- Murray Alcoa Library, Pinjarra
  15 - 22 September 1995, (unmanned)
- Mandurah Forum, Mandurah
  23 September 1995. Manned by representatives of MRWA and consultants.

- **Closing date for initial comments**

  - Friday 29 September 1995

Further details of the study may be obtained by contacting Mr Paul Holmes on (09) 328 7873 or writing to *ecologia* Environmental Consultants.

THE STUDY IN PERSPECTIVE

Following completion of the planning study and assuming an acceptable route can be determined the route will be protected by formal incorporation in relevant Town Planning Schemes. Land acquisition will not be initiated by Main Roads until the land is required for construction of the road unless subdivision of land occurs in the meantime.

No timetable has been set at this stage for construction of the road.

Thank you.

Main Roads
South West Region
Bunbury WA

GB Hill Consulting Engineers
62 Colin St
West Perth WA 6005

ecologia
Environmental Consultants
165 Walcott Street
Mt Lawley W.A. 6050

PEEL DEVIATION

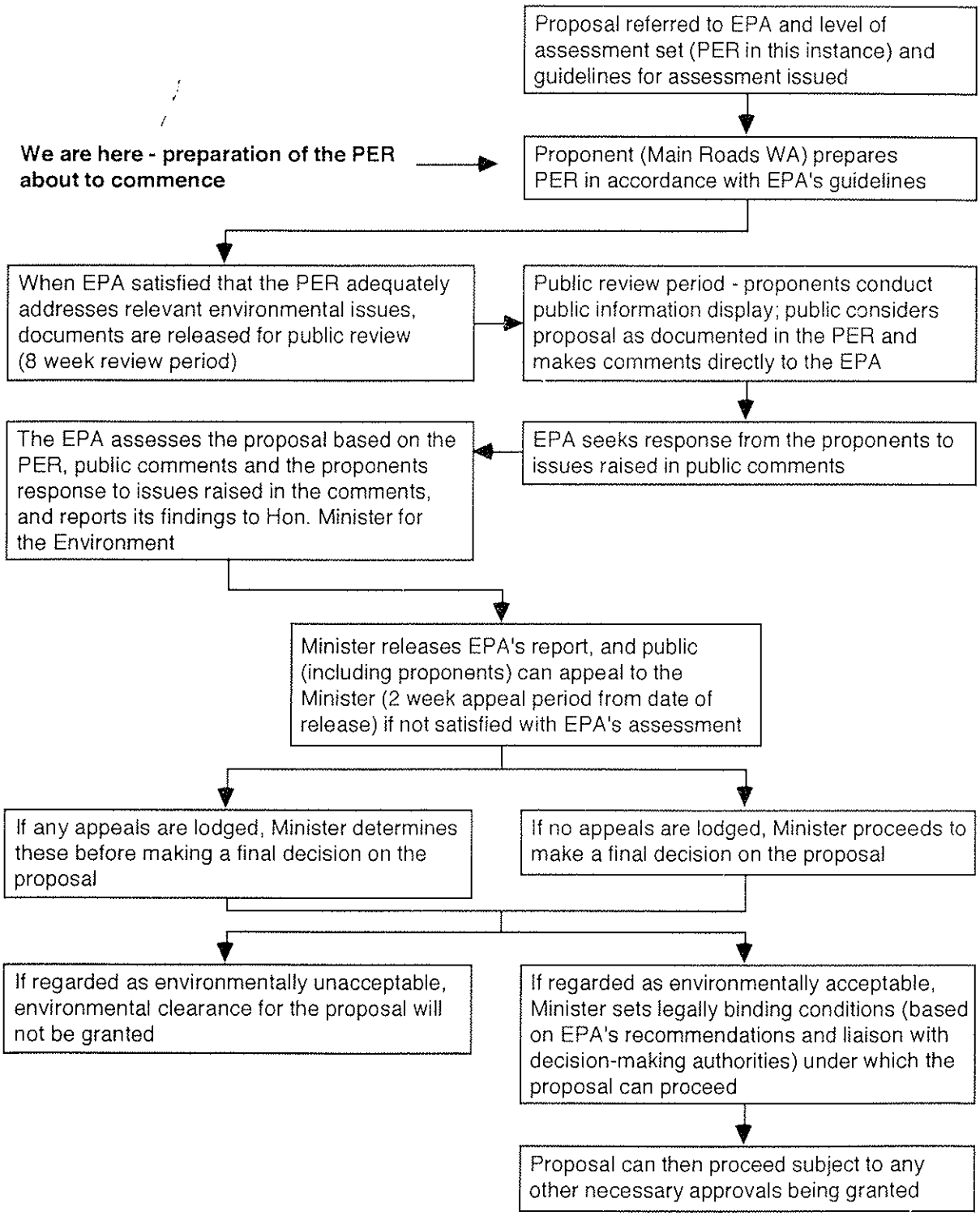


Figure 3: The Environmental Protection Authority's Assessment Process.

PEEL DEVIATION

NAME AND ADDRESS:

(for further consultation)

W.A. Phone No.

INTEREST IN PROJECT AREA:

(e.g. resident, landowner, regular visitor, etc.)

COMMENT:

(if insufficient space, please include additional sheet)

Thank you for your comment. Should you require a reply to your comments please tick the box ☐

Please fold sheet as indicated and seal with staple or adhesive tape.

APPENDIX C

ISSUES RAISED DURING STAFFED INFORMATION DISPLAYS AT PINJARRA AND MANDURAH.

APPENDIX C: ISSUES RAISED DURING THE STAFFED INFORMATION DISPLAYS AT PINJARRA & MANDURAH.

*Indicates that issue was raised at Pinjarra or at both Pinjarra and Mandurah

1. Notional support for a route bypassing Mandurah to enhance inter-regional access (6) *

2. Local landowner support for a westerly realignment of Southern 1 route option to place it within ↑23756 (3). *

3. Support from residents within the Parklands and Lakelands Special Rural Zones for realigning Northern 1 route option east of the Serpentine River (through cleared farmland) to merge with the Kwinana Freeway (5).

4. Realign Southern 2 route option (an unspecified distance) further to the east to coincide with more elevated landform (1).

5. Realign Southern 3 route option further to the east and extend it further to the south to merge with Merredith and Richardson Roads and enhance access to the Kemerton Industrial Park (1).

6. Deviate the Central route option to the east where it crosses the Murray River to increase separation from Murray Lakes Development (1).

7. Justification for a new deviation route is lacking - proposal is not traffic related but is intended to stimulate land development (5). *

   Why is a third north-south route needed through the Peel region (*i.e.* the proposed route plus Old Coast Road and South Western Highway) (7). *

   Upgrade the existing routes rather than construct a new one (8). *

   Promote inter-regional rail link rather than construct a new road (3). *

   In the 15 to 20 years until the proposed route would be constructed the cost of fossil fuels is likely to increase so much that road traffic will decrease, undermining any justification for the proposed route (2). *

8. Because it will enhance access within the areas it traverses, the proposed route will increase development pressures and resultant adverse environmental impacts (8). *

9. Limit local access to the proposed route to safeguard against development pressures (1).

10. Irrespective of its alignment, a new route passing east of the Peel Harvey estuary will cause considerable property severance and will disrupt existing farming operations (7). *

11. If the new route is to be constructed, its ultimate (localised) alignment must seek to minimise disruption of existing productive farming activities (4). *

12. Much of the area traversed by the proposed route is seasonally flooded and it will adversely affect surface drainage and wetlands (4). *

13. The proposed route will adversely affect important wetland areas (?YNP wetlands and others) and wildlife (including bandicoots and waterfowl) areas subject to international conservation agreements (8). *

14. The Northern 1 route option will have an adverse effect on the existing Parklands / Lakelands Special Rural developments (5).

15 Residents in the Parklands / Lakelands Special Rural developments were not made aware of the possible route at the time of purchasing their properties (3).

APPENDIX D

SUMMARY OF PUBLIC SUBMISSIONS

Sub No	Name	Address	Issues	Pref. Opt.	Recommendations	Type	Interest	Reply
1	TELFORD, Mr S and Mrs M	11 Townsend St Armadale 6112	- adverse impact on wetland areas - adverse effect on past/current revegetation efforts	U	Bypass around Pinjarra and Waroona.	I	Visitors/shareholders in Lake Mealup Preservation Society (land owners)	Y
2	JAMES, David F	284 Commercial Rd Forrestdale WA 6112 397 0276/397 0059	- adverse impact on wetland areas - Increased pollution	U	Bypass around Pinjarra and Waroona.	I	Member of Lake Mealup Preservation Society, Wetlands Conservation Society	Y
3	ELLAM, Brian C/- Mott	PO Box 5091 Rockingham Beach 593 1196	- adverse effect on current revegetation/restoration efforts - important wetland area	U		I	Member of Mott (provided flora for revegetation)	Y
4	WA Naturalists' Club Inc. (Kwinana/Rockingham/ Mandurah Branch)	PO Box 479 Rockingham 6168	- international significance as waterbird site - adverse impact on wetlands - vast community commitment to revegetate the area	U	Bypass north east of Pinjarra and around Waroona.	O	Regular studies and data collection	Y
5	HITCHIN, Diana	258 Safety Bay Rd Safety Bay 6169 527 1961	- MRD claim that upgrade was preferred/acceptable option - drainage required would destroy wetlands	U	Upgrade Old Bunbury Rd also.	I	Regular visitor	Y
6	SHEPHERD, Don & Margaret	8 Mimbalup Cl Hillman 6168 592 1821	- Deviation does not address problem of heavy through traffic and Alcoa traffic through Pinjarra - upgrade would re-vitalise towns on existing route - adverse impact on wetlands - upgrade has easier access to building materials (more convenient/ lower cost) - increased development would follow the Deviation, destroying more wetland area - significant efforts have been put into revegetation of the area - no guarantee that the freeway will reach Mandurah in the next 50 years	U	Bypass around Pinjarra and Waroona.	I I	Regular visitors Regular visitors	N
7	CURTIS, Richard Bruce	24 Neville St Bayswater 6053 271 6638	- adverse effect on wetlands and subsequent impact on Peel-Harvey Inlet ecosystem - international importance of the wetlands system - unique flora and fauna - decline in quality of wetlands has resulted from previous disturbances - upgrade will be cheaper, quicker, easier and build on existing infrastructure - upgrade will avoid problems associated with building a road in an area with a high water table	U	Bypass Waroona and Pinjarra. Link the freeway extension to Pinjarra and Bunbury via a Pinjarra bypass and the SW Highway.	I	Regular visitor	N
8	SCARROTT, Lela	70 Saw Ave Rockingham 6168 527 8141	- adverse impact on wetlands - area will have greater tourism appeal if maintained as wetlands area	U		I	Regular visitor	Y

Sub No	Name	Address	Issues	Pref. Opt.	Recommendations	Type	Interest	Reply
9	DILLEY, K.J. President WA Farmers Federation (Coolup/Pinjarra Branch)	C/- Post Office Coolup 6214 530 3307	- supposed limitations of "existing development and environmental conditions" apply equally to the upgrade and the bypass - deviation would further disrupt farming land, increase land charges and stock risk, diminish water supply and hinder long-term planning - considerable time, effort and money has been put into enhancing and conserving vegetation and changing farming practices	U		O	Farm organisation of local land holders	Y
10	Peel Preservation Group	PO Box 171 Mandurah 6201 535 4824	- current road reserves are already acquired and accepted by residents, Govt and developers - planned two stage development is unacceptable - construction of deviation would open up the area to tourism and residential development - further development would cause clearance of vegetation, nutrient run-off and re-pollution of the estuary - N2 and S2 and 3 routes cross Serpentine river which is rich in flora and fauna - construction would disrupt flood plain (on route to Murray River) - significant disturbance to important wetland areas	U		O		N
11	GOODALE, Mr & Mrs R Directors Goodale Sanctuary Pty Ltd	218 Arcadia Dr Safety Bay 6169 527 4289	- area has world recognition as wetland area - cost of upgrade would be less than Deviation - suburban development in the area would pollute and reduce water supplies from the natural water table	U	Kwinana freeway extensions should not be carried through to Bunbury.	O		N
12	WILMOT, Peter	6/53 Ramsdale St Doubleview 6018 244 3015	- adverse effect on wetlands - creates pressure for development of surrounding areas which should be subject to less intensive land use - proposal is further attrition of the System 6 Estate - significant effort has been put into rehabilitating the area	U		I	Land owner	Y
13	SHERLOCK, KP & LJ	10 Victor St Hilton 6163 337 5054	- proposed freeway route cuts through their property	M	Move freeway 32 metres west over Woodland Parade.	I	Land owner	Y
14	CAMPBELL, Mr Ross & Mrs Maureen E	14 Princeton Ct Thornlie 6108 459 4672	- bypass would be more environmentally friendly and cheaper - adverse effect on wetlands and nature reserves - additional bridge over Murray would be waste of money and environmentally destructive - measures can be taken (eg zoning) to reduce population growth in such ecologically significant areas - encourage growth in less significant areas such as Pinjarra, Waroona and Byford	U	Include town bypasses.	I	Land owner	Y
15	BURNS, Mr M & Mrs A	13 James St Gosnells 6110 398 1561	- adverse effect on wetlands and birdlife - signficant noise pollution from the elevated road through the wetlands	M	Re-route away from swamp lands on land closer to Ravenswood.	I	Land owner	N
16	WARREN, Greg	27 Dunbiane Road Floreat 6014 387 3586	- new bridge over Murray is unnecessary - current route will cause disruption to the environment and to a quiet, secluded area	M	Re-route over recently upgraded bridge at Ravenswood.	I	Land/holiday home owner	Y

Sub No	Name	Address	Issues	Pref. Opt.	Recommendations	Type Interest	Reply
17	KELLIHER, James W Kelliher Bros	RMB 238 West Pingelly 6308 098 841 012	- land has been cleared carefully, ensuring that pockets remain for wildlife - will cut through their property and cause disruption to wildlife	U	Join freeway to Old Coast Road (as in Fig 2) and add two more lanes to widen the road south.	I/O Land owner	Y
18	KING, T.S.	49 Kersey Way Carine 6020 491 6961	Nothern end of proposal will: - cut the existing community in half and cause significant noise pollution - eastern part of the split will be locked between the deviation and the Serpentine river, stifling development - distruption to flora and wildlife and truncation of the wildlife reserve - loss of tall trees will allow high velocity winds to traverse across the lake system - interference with the drainage system can cause serious local flooding and drainage failure - construction of the deviation through the reserve will destroy all hope of upgrading Frigirts road through to Paterson road which has been considered desirable by people to provide quicker access to Pinjarra road - will restrict development in the Murray and Mandurah districts - N2 slightly better than N1 but with proposed changes Southern end will be detrimental to the local flora and wildlife. S2 preferable to S1 but see proposed changes.	M	Move northern end inland to broad acre farming areas. Swing the deviation over the Murray river and link up with SW Highway south of Pinjarra. Upgrade and deviate SW Highway where necessary. See maps.	I Land owner and part-time resident	Y
19	KELLIHER, R Kelliher Bros	RMB 238 West Pingelly 6308 098 841 012	- cuts through their farm land Deviation would: - restrict the paddock management practices currently employed and reduce commercial viability of the land - quite probably drain areas of the land and possibly destroy summer pastures - remove access to cattle handling facilities on the eastern side of the proposed route necessitating additional construction at great expense - destroy remaining pockets of flora and wildlife		Link freeway extension to existing Mandurah bypass road and upgrade SW Highway to dual carriageway.	I/O Land owner	Y
20	HULBERT, KJ & JG	16 Ainslie Crt Kardinya 6163 331 2741	- proposed freeway alignment cuts through their land	M	Favour an option on the eastern side of Serpentine River.	I Land owner	Y
21	LAING, Jean	189 Nicholson Rd Shenton Park 6008 382 4332 (silent)	- adverse effect on delicate wetlands - intense investment in recent years by Govt and local groups in rehabilitating the area and restoring the health of the Harvey Estuary - suggest consultation with the various groups involved (see Community Catchment Centre in Pinjarra) - traffic problems in central Pinjarra and Waroona have not been addressed by this proposal - creation of a Peel Regional Park or Reserve has featured heavily in the local agenda	U		I Shareholder in Lake Mealup Preservation Society (land owner)	Y

Sub No	Name	Address	Issues	Pref. Opt.	Recommendations	Type Interest	Reply
22	HOUGHTON, Elisabeth A	PO Box 59 Mt Helena 6082 572 1084	- would open up access to (often) damaging 4WD vehicles - unfavourable impact on wetlands - will encourage intense development of the area and subsequent damage to the environment	U		I Land owner	Y
23	BOMBARA, Mark & Rowena	PO Box 799 Bunbury 6231 0418 903 275	- enhancements to drainage systems in the area would be beneficial (can the drainage works be used to provide a benefit to the existing drainage?) - strongly oppose any damage to EPP wetlands - discourage further clearing therefore already cleared land is more acceptable - suggest planting vegetative buffers along the freeway reserve - traffic corridors should be situated centrally where access can be obtained from both sides - S1,2 & 3 routes are not ideally situated due to very long term traffic needs ie a significant increase in traffic demand for a Mandurah to Bunbury route	M	Suggest a route through cleared farmland, avoiding EPP wetlands and where possible avoiding natural and plantation forest, some 5km east of the existing Old Coast Rd alignment.	I Land owner	N
24	WRIGHT, P & P	6 Correas St North Yunderup 6208 537 7185	- current alignment is wasteful of natural and material resources - alignment would open the area up to development causing environmental degradation	M	Realign eastwards to form a bypass of Pinjarra and upgrade the existing SW Highway. Utilise railway reserve where necessary.	I Resident approximately 700m from proposal	N
25	SOMERVILLE, David	30 Estuary Heights Pl Bouvard 582 1637	- fully endorse the Peel Deviation (no preferred alignment specified)	?		I Resident land owner	N
26	CAMPBELL, R.L.	Box 356 Pinjarra 6208 534 1235	- support the Deviation, sooner rather than later - there is increasing pressure on the existing highways - a more 'efficient' highway (ie less obstacles) is important in reducing freight costs (no preferred alignment specified)	?		I Resident land owner at West Pinjarra; carting contractor thus regular user of the highways	Y
27	DILLEY, Marie	Fishermans Rd Coolup 6214 019 111 304	- upgrade would be more cost-efficient - Deviation would affect the viability of her business - continued urban development in the agricultural areas of the Swan Coastal Plain is forcing (milk) prices up - "ridiculous" prices paid for resumed land - effort has been put into care of wetlands and revegetation - has the Coolup Land Conservation District been consulted (statutory body)	U		I Land holder (dairy farmer)	Y

Sub No	Name	Address	Issues	Pref. Opt.	Recommendations	Type	Interest	Reply
28	Merrick Tyler Pty Ltd	RMB 711 Waroona 6215	- support the Deviation but with modifications - S1 not supported as it would cut through a large sandhilll and would allow heavy trucks (with toxic substances) to travel through sensitive areas of Lake Clifton - potential risk to stromatolites - S2 & S3 not supported as native fauna hatch young in the forests east of the Old Coast Rd and guide offspring to Lake Clifton - cuts through their property and would hinder stock movements - suggest new alignment (see map)	M	Access to the Old Coast Rd would be better positioned further to the south (to enter using Johnston Rd as the access spur). Propose alternative alignments (see text and map).	I	Land holders (farmers)	N
29	PALING, F.G.	Lot 308 Stock Rd Mandurah 581 7263	- insufficient area allowed for freeway in N1 section in the Stock Rd area (will not allow adequate buffer zone for residents) - adverse effect on flora and fauna in the wetlands - have requested more information - where is it??	?		I	Resident land owner	Y
30	LITTLE, Mr Mark	Lot 14a Ibis Retreat Stakehill 6210 581 8490	- concerned about the use of Stock Rd due to difficulties associated with current and future semi-rural/urban development in the area	M	Align Deviation (approx 4km) east of the current proposed location with a feeder spur joining the Mandurah/ Fremantle Rd between (or at) Pagononi Rd or "Gravel Pit" Rd opposite Madora.	I	Resident	Y
31	MOUNSEY, R.H & D.J.	RMB 708 Waroona 6215	- suggest modifications to the southern end of Lake Clifton	M	Suggest that road go behind all private property fronting Old Coast Rd along Doman Rd to Johnson Rd or Bagieau Rd to meet Old Coast Rd.	I	Resident landowner	Y
32	DOUGHTY, Russell & Averil	11 Adaluma Way North Yunderup 6208 537 8101	- support N2 to Pinjarra Rd - from Pinjarra Rd support C-S2 or a modified alignment	N2 C-S2 or M	From Pijarra Rd carry in a south- easterly direction from the point in the C section due east of the Peel Inlet and join the SW Highway. Upgrade SW Highway from this point with bypasses to Waroona, Harvey and Brunswick.	I	Residents	N
33	WALSH, Paul	307 Stock Rd Mandurah 6210 581 7077 430 3620	- main Perth-Mandurah access could be serviced by the Fremantle Rd link - alignment on the eastern side of Serpentine River would be more convenient in providing access to the Paganoni area (once developed) and would cut through farmland rather than bush/urban	M	Run the alignment on the eastern side of the Serpentine River.	I	Resident land owner	N
34	THORSTENSEN, Claire	6 Ravenswood Dr Ravenswood 6208 537 6631	- upgrade makes far more economic and environmental sense	U		I	Resident land owner	N

Sub No				Pref. Opt.		Ty	erest	ly
35	CROOKES, Brian Shane	3 Foreshore Cove South Yunderup 6208 537 6515	- additional bridge over Murray is unnecessary (use Ravenswood) - disturbance to residential, farmlet areas, bushland, fauna - devaluation of surrounding land and existing businesses - make use of existing roadways including an upgrade of Old Bunbury Rd (see map)	M	Make use of existing roadways including an upgrade of Old Bunbury Rd (see map).	I	Resident and business owner	Y
36	DUNCAN, Philip J & Gavin J	"Double Creek Farm" Lot 13 Old Bunbury Rd West Coolup 6214 097 391 220	- strongly object to S2 & 3 which cut through their property and necessitate destruction of one of their houses, eliminate road access to the property - swampland on northern side of Old Bunbury Rd has historically enabled introduction and cultivation of vermin weed and dieback - run deviation through this area	S1		I	Resident land owners	Y
37	CLUNE, Ivan & Ann	PO Box 100 Pinjarra 6208 ?534 204	- adverse effect on the environmentally sensitive area in the Central Section	M	Suggest realignment of section between Pinjarra Rd south to Old Coast Rd (see map).	I	Resident land owners	N
38	TRICKETT, R & E	"Avondale" Coolup 6214 530 3295	- current proposed alignment would fragment their property and damage valuable farmland	U/M	Suggest follow the boundary of Reserve 23756 or upgrade of SW Highway.	I	Land owners	Y
39	DALEY, P.J.	PO Box 60 Pinjarra 6208	- third highway unnecessary; should be cutting down on speed and road deaths - adverse effect on flora, fauna, waterbird life etc	U		I	Land owner	Y
40	LUCA(?), Ken	2 Warri Rd City Beach 6015 245 1312 and Lot 1018 Birchmont Rd Coolup 6214 530 3382	- time allowed for responses is (deliberately?) too short - opposed to the project - adverse effect on wetlands, birds and rare fauna (many of which travel between Nine Mile Lake sanctuary and the Estuary) - problem of large, fast freight vehicles, some of which carry toxic materials - would open up the site for development - possible effect of "hydro carbie runoff"	U/M	Possible alternative closer to Pinjarra which follows the SW Highway south and runs alongside, cutting over to Old Coast Rd at a later point (giving Nine Nile Lake a wide berth).	I	Resident land owner	Y
41	WALKER, Mrs P.M.	27 Foreshore Cove South Yunderup 6208 537 6813	- possible that the entire extension would remain at the initial "lesser standard" - adverse effect on wetlands of Deviation and subsequent development - considerable time and effort has been put into protecting many of the wilderness areas - what measures to reduce the noise pollution?	U	Provide bypasses around Pinjarra, Waroona and Harvey.	I	Resident	Y
42	SELLS, John Eric	Lot 22 Paterson Rd Lakeland Park 6210 581 6711	- adverse effect on wetlands - an alignment further east would cause less inconvenience, disruption and noise/smoke pollution to existing landowners/residents - using Ravenswood bridge would cut costs	M	Move alignment east to avoid wetlands and utilise Ravenswood bridge.	I	Resident	Y
43	NOBLE, Elizabeth L	Lot 22 Paterson Rd Lakeland Park 6210 581 6711	- adverse effect on the wetlands, flora and fauna	M	Align road nearer to SW Highway, avoiding the lakes and Serpentine River.	I	Resident	Y

Sub No	Name	Address	Issues	Pref. Opt.	Recommendations	Type	Interest	Reply
44	DROPPERT, Gerard & Trish	21 France St Mandurah 535 3433	- adverse effect on environment - costs of upgrade/deviation are the same so why not upgrade? - more information should be provided to the public on comparative costs	U		I	Residents	Y
45	BIRCH, Mr Shane & Mrs Jenny	RMB 623 Waroona 6215 097 331 598	- opposed to S2 & 3 as will cut through their land	S1		I	Land owners	N
46	CHRISTY, Mrs E	29 Silversmith St Leda 6107 439 1813	- Deviation does not solve the problem of traffic through Pinjarra - adverse effect on wetlands and past/current revegetation efforts	U		I	Resident	N
47	MARSH, Alison	Lot 54 Woodland Pde Mandurah 6210 581 6544	- will the Deviation cut off the Riverlands Estate from Mandurah? - potential access problems	?		I	Resident	Y
48	BERG, Rhonda	20 Fiegerts Rd Mandurah 6210 581 7694	- adverse effect on wetlands, birds, fish, endangered mammals - loss of prime agricultural land resulting from development and subdivision	?		I	Resident & member of Goegrup Lakes & Serpentine Society	Y
49	STYLES, Graeme	PO Box 120 Waroona 6215 530 3366	- S3 less disruption to land owners and divides the State forest from farming lands - concerned about running through private property at the Peppermint Grove Rd/Old Coast Rd junction (re-route through forest?) - relocate owner of Lot 20 Murray Loc 880	S3		I	Resident land owner	N
50a	TYLER, Elaine J	RMB 694 Waroona 6215 097 391 062	Suggested alternative route which would: - disturb pine forest instead of native bush - plan for future residential development - remove need for resumptions - protect the fauna moving between the natural bushland and Lake Clifton - protect the living stromatolites from possible toxic spills	M	When coming from north to south along the east side of the estuary and crossing the Old Bunbury Rd the route to follow Doman Rd south through the State Forest No. 16 (McLarty) along the high country entering the Old Coast Rd at approximately Johnston Rd and Preston Beach Rd.	I I	Resident Resident	N
50b		As above	- proposes further alternative (too complex to summarise)	M	Alternative proposed - see text.			Y
51	BRIDLE, Don, Barbara, Alan & Paul	Lot 26 Shenton Rd Mandurah 6210 581 7129	- opposed to N1 due to effect on wildlife feeding at the reserve and Nambeelup Brook - is it possible that the two Patterson Roads could have been confused? Patterson Rd running through to Ravenswood would be better	M	Align to the "other" Patterson Rd (through flat open country to Ravenswood).	I	Residents	Y
52	CHAPMAN, B.W.	51 Cooper St Mandurah 6210 535 2088	- opposed to destruction of native bushland on northern side of Lakes Rd (contains large numbers of native orchids)	M	Move alignment approx 0.5km to the east to bypass the bushland.	I	Land owner	Y

Sub No	Name	Address	Issues	Pref. Opt.	Recommendations	Type Interest	Reply
53	FARDIN, Galliano & Nancy	77A Hardy Rd Ashfield 6054	- potential damage to Lake Clifton stromatolites - advantages of alternative as with 50a	M	As with 50a including access road/underpass to accommodate horseriders.	I Residents?	N
54	SUMMERS, E.B.	Lot 35 Matthie Rd Barragup 6210	- no need for another road; if one dual carriageway south of the Estuary can cope with the volume of traffic, then so can one dual carriageway north of that point - appear to be no impediments to upgrading the single carriageway sections to dual carriageway If absolutely necessary, the Deviation should: - avoid wetlands/conservation areas - avoid encouraging the subdivision of farming land for other uses - achieve the stated aims of the MRD - follow existing 2 chain road reserve easements - create a Pinjarra by-pass	U/M	Include Pinjarra bypass and re-route around sensitive conservation areas.	I Resident? Representative of GLASS	N
55	MCGUIGAN, Mr T.R.	43 Nolan Way Bateman 6150 332 3150 530 3340	Opposed to S1 as it runs through (?) his property: - daily movements of native animals between the adjacent reserve and the property - property is subject to flooding therefore substantial drainage would be required - property is used as a haven by native animals during regular bushfires - S1 would affect wildlife movements to and from the property	S2		I Landowner	N
56	Waterbird Conservation Group C/- T Payne (President)	10 Walcott St Mt Lawley 6050 371 1670	- in threatening wetlands is inconsistent with the Government's stated policy of wetland conservation - would open up seasonally inundated areas which serve as important breeding grounds for waterbirds - other adverse environmental effects	U		O Group involved in wetland protection and management	Y
57	MCMAHON, Gary & Leigh	Lot 302 Stock Rd Mandurah 6210 581 7550	- concerned about health hazards and noise and dust levels	M	Realign to the eastern side of the lakes system.	I Resident	Y
58	CLUNE, Timothy Ross	PO Box 100 Pinjarra 6208 534 1204	- lack of notification and consultation - adverse effect on existing development, environment and vegetation - can be highly productive farming land which, if damaged/ developed will force up prices, rates and risks and limit long term planning - much effort has been put into developing environmentally friendly farming practices/remnant vegetation - environmental/economic impacts are too high compared to upgrade	U		I Resident	Y
59	BROOKS, N.M. & G.W.R	PO Box 48 Pinjarra 6208 531 1670	- Deviation would resume important high land on their farm - high ground is essential to livestock welfare and safety - full value of the damage to the land would need to be provided if it was deemed absolutely necessary	?		I Land owner	Y

Sub No	Name	Address	Issues	Pref. Opt.	Recommendations	Type	Interest	Reply
60	JONES, Mr GF & Mrs EM	3 Norton Ridge Winthrop 6150 310 3422	- fully support the proposed route (no alignment specified)	?		I	Land owners	N
61	Shire of Waroona	PO Box 20 Waroona 6215 097 331 277 097 331 236	- strongly support S3, second preference S2, object to S1 - possible rezoning problems may reverse order of S3 and S2	S3 S2		G	Local government	N
62	Royal Australian Ornithologists Union	71 Oceanic Dr Floreat 6014 383 7749	- adverse effect on wetlands of local, regional and national significance - high conservation value of the area	U		O	Visitors for birdwatching and research	N
63	Waterways Commission	PO Box 332 Mandurah 6210 535 3411	- no opposition to construction but raise some concerns - need to minimise the impact on flora and fauna and on the hydrology of the area - erosion and riverbank disturbance, pollution, nutrient-sewage disposal, remediation plans for riverbanks and flora, revegetation during/post construction - measures to ensure that river flows are not altered to the detriment of the river - pollution traps for heavy metals and hydrocarbons, and infiltration basins and swales	?		G		N
	TELEPHONE RESPONSES							
*	LAING, Jean		- long term implications of vehicle use in society - acknowledges that upgrade of Old Coast Rd does have some environmental constraints - high cost of new road due to drainage, land resumption, land fill...	U	Bypass around Pinjarra and Waroona.	I		
	MCCAULY, John	Lot 1307 Mills Rd Coolup	- impact to land holders	?		I		
*	FOGARTY, Debbie	Lot 66 Woodlands Pde 581 8440	- adverse effect on reserve - impact to land holders	M	Move to east side of Woodland Pde.	I		
*	MCGUIGAN, Mr	Lot 1504 Murray Loc.	- pro-construction but opposed to S1 - potential effect on flora and fauna reserve - western boundary of property near reserve	?		I		
*	SHERLOCK, Kenneth	Lot 44 Stock Rd 337 5054	- pro-construction with modifications - concerned over loss of frontage of his property	M	Crossing further north preferred.	I		
	BAIN, Simone		- impact to land holders	?		I	SJB Town Planners	
*	BOMBARA, Mark		- impact to land holders	?		I	Member Meredith LCDC, land owner	
	FOALE, GT & SM	Lot 3167 Old Bunbury Rd	- concerned about alignment of S1 impact to landholders - planning for subdivision	?		I		

Sub No	Name	Address	Issues	Pref. Opt.	Type	Interest
	MANION, Mrs RH		- alignment, subidivision, compensation (impact to landholders)	?	I	
*	GOODALE, Bob	527 4289	- inadequate diagrams in mailout - concerns over process and time frames	?	I	
	NANCARROW, Noel	President, Murray SC Murray Loc 1429	- contains clay resources being excavated for brick production; valued at $15,000/acre - will seek comparable compensation	?	I	
*	Wildflower Society		- feel the issue is regional rather than local - concern over consultation process	?	O	
*	PALING, FG & JV	Lot 308 Stock Rd Parklands 6210	- impact to land holders - request for detailed plans	?	I	Land owner
	HOUGHTON, Mr Graham	4 Sutton Crt Clifton Park 6230	- request for further information - impact to landholders	?	G	Town Planner
	ALLERDING, Steve	221 1377	- impact on landholders	?	G	MoP

KEY

Preferred Option

M	Modified route
N1	Northern 1
N2	Northern 2
C	Central
S1	Southern 1
S2	Southern 2
S3	Southern 3
U	Upgrade Old Coast Road/SW Highway

Submission Type

I	Individual
O	Community organisation
G	Government authority

P
Jan 97

MAIN ROADS
Western Australia

PERTH - BUNBURY HIGHWAY
PEEL DEVIATION

PUBLIC ENVIRONMENTAL REVIEW

ecologia
ENVIRONMENTAL CONSULTANTS