PROPOSED HARVEY - KWINANA 330kV TRANSMISSION LINE

State Energy Commission of Western Australia

Report and Recommendations of the Environmental Protection Authority

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SUMMARY AND RECOMMENDATIONS

The State Energy Commission of Western Australia (SECWA) has proposed the construction and operation of a 330kV transmission line from Harvey to Kwinana. The Environmental Protection Authority (EPA) has assessed the proposal following the preparation and public review of a Public Environmental Report (PER) by the SECWA.

The PER was released for public comment for a period of eight weeks, concluding on 8 April 1988. A total of 22 submissions were received by the EPA.

The PER provided a sound basis for assessing the environmental impacts of the proposed transmission line. The document outlined the environment to be affected, including land use, natural and social environment and Aboriginal sites. The potential environmental impacts of the proposed route were then identified. The SECWA have made a number of commitments to minimise the environmental impacts of the line (Appendix 1).

Recommendation 1

The Environmental Protection Authority concludes that the proposed transmission line is environmentally acceptable subject to the commitments made by the proponent and the Authority's recommendations in the Assessment Report and recommends that it could proceed accordingly.

Recommendation 2

The Environmental Protection Authority recommends that to avoid erosion and resultant sedimentation and turbidity of water courses the SECWA should:

- **not locate transmission towers on or adjacent to stream and river banks. The SECWA has made a commitment to locate towers at least 100 metres from the Murray River;**
- **rehabilitate stream and river banks disturbed during construction and maintenance of the line;**
- **in steep areas ensure that the erosion potential is minimised by, for example, either deviating the access track so it is in sympathy with the contours of the area, or flattening vegetation rather than removing it completely.**

Recommendation 3

The Environmental Protection Authority recommends that the SECWA undertake a monitoring programme designed and implemented to check the success of rehabilitation following construction. Reporting on the findings of the monitoring programme to be referred to the Authority, initially after the first year of operation and then every three years until the rehabilitation is determined by the EPA to be successful. Rehabilitation should reflect the results of monitoring.

Recommendation 4

The Environmental Protection Authority recommends that clearing requirements for the transmission line should not be uniform for the entire length of the line, but should depend on the type of environment to be traversed. Clearing requirements for significant areas of native vegetation should be established in consultation with the Authority.

Recommendation 5

The Environmental Protection Authority recommends that the proposed transmission line should follow the deviation around the native vegetation at Murray Locations 323 and 688, between Buller and Coronation Roads, Shire of Waroona.

1. BACKGROUND

The State Energy Commission of Western Australia (SECWA) proposes to construct a 330 kV transmission line from Muja to Kwinana. The portion of the proposed route from Muja to Harvey was detailed in a Public Environmental Report (PER) and assessed by the EPA in June 1985. The proposed route was found to be environmentally acceptable by the Authority.

In November 1986 the SECWA submitted a Notice of Intent to the EPA outlining the proposed route for the Harvey to Kwinana section of the 330 kV transmission line. The EPA called for the preparation of a Public Environmental Report.

In February 1988 the SECWA submitted the Public Environmental Report for the proposed 330 kV transmission line from Harvey to Kwinana to the EPA. The PER was prepared under guidelines from the EPA and released for public comment for a period of eight weeks, ending on April 8, 1988.

2. THE PROPOSAL

The proposal is for a 330 kV transmission line from Harvey to Kwinana, a distance of approximately 102 km. The proponent for the proposal is the State Energy Commission of Western Australia (SECWA).

The proposed route for the transmission line is outlined in Figure 1.

The first 51 km of the route parallels the existing Bunbury - Cannington 132 kV line from the Harvey Substation site almost to Pinjarra. There are a number of deviations to avoid major road intersections, dwellings and their environs and Pinjarra townsite. Following this , the route joins the existing Muja - Southern Terminal 330 kV line and follows it for most of the next 44 km. There is a deviation around existing domestic dwellings and small holdings at Anketell and the line then remains in a separate easement for the remaining 4 km to Mandogalup. The final 7 km of the line will be strung on the spare side of the double circuit structures presently carrying the Kwinana - Southern Terminal 330 kV line.

The SECWA indicate that the timing of the project is dependent upon the growth of power demand, although the Commission believes that present load projections show the line will be required by mid-1994.

3. EXISTING ENVIRONMENT

3.1 Natural Environment

The proposed transmission line passes over the Swan Coastal Plain, a narrow strip of Quaternary alluvial and aeolian sediments, generally of low relief. The line crosses three major natural drainage lines, the Harvey, Murray and Serpentine Rivers, and several minor channels.

While the proposed transmission line route would cross primarily cleared agricultural land, it would cross some native vegetation comprising a few stands of woodland, low forest, heaths, shrublands and swamps and remnant trees in pasture. Most of the relatively intact woodlands are dominated by jarrah and, to a lesser extent, marri, with banksias, peppermint and sheoak as understorey trees. Paperbark is dominant in most swamp woodlands, and various species of shrubby *Melaleucas*, Tea-trees and other shrubs and sedges make up thickets in other seasonally wet areas.

There are five significant areas of relatively natural vegetation traversed by the proposed route. All of these support native vegetation which provides valuable native flora and fauna habits; four of the five are on private property.

There are 19 flora species recorded from the broad vicinity of the route which are rare or geographically restricted, or are poorly known but may be rare or restricted (listed in Table 1). No gazetted rare species was found along the route or was believed to occur there. Three species variously regarded as rare, restricted or poorly known, *Acacia flagelliformis, Acacia semitrullata* and *Evandra pauciflora,* were found at the southern end of the route, in the Riverdale Road area, and two others, *Jacksonia sericea* and *Restia stenostachyus,* were found in the Hymus Swamp area. *Villarsia violifolia* occurs in the cossidor, in paperbark low forest west of the route to the north of Thomas Street.

The five significant areas of relatively natural native vegetation and other smaller and more disturbed areas of native vegetation along the route provide habitats for native fauna. Most native species of vertebrates expected along the route are wide-ranging and reasonably common, but three which may occur along the route or in the vicinity are gazetted as "rare or otherwise in need of special protection". These species are Freckled Duck *(Stictonetta naevosa)*, Red-eared Firetail *(Emblema oculatum)* and Carpet Python *(Morelia spilota imbricata)*.

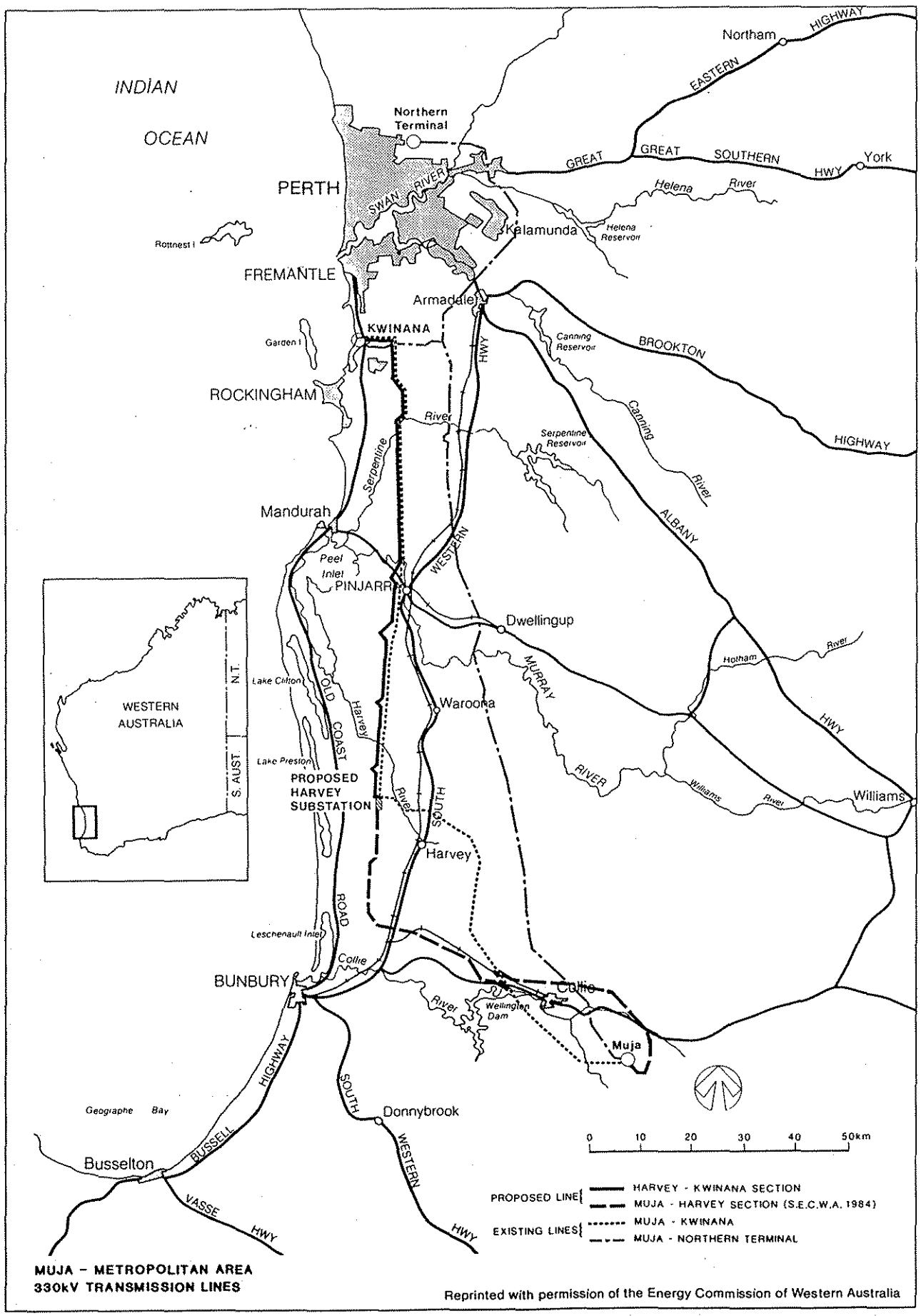

Figure 1 Proposed and existing 330kV transmission line

Table 1. Rare, Restricted and Poorly Collected Plant Species Possibly in Project Area.

SCIENTIFIC NAME	FLOWERS	HABITAT
Acacia flagelliformis	May-Aug	Seasonal semi-swamps Drummond Subdistrict
Acacia semitrullata	May-Sep	Lower, sandy slopes under Jarrah-Marri
Kunzea ericifolia		Drummond and Warren Subdistricts
Aponogeton hexatepalus	Aug-Sept	Seasonal swamps, in water or at water's edge; Drummond and Warren Subdistricts
Boronia capitata ssp. gracilis	Jun-Oct	In or near seasonal swamps; Drummond Subdistrict
Caladenia sp. A? (SDH 3400)	Sep-Oct	Lush undergrowth under Banksias; Drummond Subdistrict
Cartonema philydroides	Oct-Nov	Low-lying sandy soils in Jarrah-Marri woodland on coastal plain. Ludlow to Gingin (and Kalbarri)
Diuris purdiei	Sept-Oct	Swampy areas on sandy clay between Cannington and Pinjarra
Drakaea jeanensis	Sept-Oct	Sandy soils near swamps; Swan Coastal Plain
Evandra pauciflora	Sept-Oct	Seasonal swamps; Drummond Subdistrict
Helipterum pyrethrum	Oct-Nov	Seasonal swamps, in water or at water's edge; Drummond Subdistrict
Hemigenia microphylla	Sept-Nov	Seasonal swamps; Drummond Subdistrict
Jacksonia sericea	Dec-Feb	Sandy soils in Banksia woodland; Perth to Pinjarra
Lasiopetalum membranaceum	Sept-Nov	Tuart woodland; Drummond Subdistrict
Parsonsia diaphanophleba	Jan-Jun	River banks from the Harvey River to Murray River
Pultenaea skinneri	Jul-Sep	Ecotonebetween swamps and Jarrah-Marri-Banksia forest; Dale, Drummond and Menzies Subdistricts
Restio stenostachyus	Feb-May	Sandy, winter-wet depressions and along water-courses. Gingin to Hymus Swamp
Stylidium utricularioides	Oct-Nov	Flat, swampy areas; Bunbury to Gnangara
Villarsia violifolia	Nov-Feb	Seasonal freshwater swamps and streams; Drummond and Warren Subdistricts
Xyris lacera	Dec-Mar	Freshwater swamps; Drummond, Warren and Eyre Subdistricts, but rarely recorded in Perth Region

Listed in Government Gazette, W.A., 25 September 1987, as rare species.

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3.2 Social Environment

The existing social environment along the proposed transmission line is largely rural. Pinjarra township is located 2 kms from the line, and the line extends into Kwinana. Karnup, Baldivis, Wellard, Anketell and Mandogalup are all smaller rural areas which will be in the vicinity of the line. The proposed route avoids all of these more populated areas.

4. ENVIRONMENTAL ASSESSMENT AND MANAGEMENT

4.1 Water Resources

The proposed transmission line may affect surface water resources. The clearing of vegetation for the line and access track has the potential to result in increased runoff and erosion, and consequently in increased sedimentation and turbidity of water courses crossed by the transmission line. It is acknowledged that clearing for the line and access track is required. However, it is important that any potential impacts are minimised.

In regard to minimising impacts,the proponent has made a commitment (Appendix A) to take precautions to divert runoff into vegetated, more stable areas where the access track must be orientated down steep gradients.

However, the Authority believes that to limit erosion and stream turbidity, the SECWA should in addition to the above commitment, rehabilitate stream and river banks disturbed during construction and maintenance of the line, and not locate transmission towers on or near the banks of water courses. Furthermore, serious consideration should be given to rolling and flattening ground level vegetation on access tracks in steep areas, rather than scraping away all vegetation, as this will minimise the potential of erosion occurring. Alternatively, deviation of the access track in areas of steep gradient should occur.

Recommendation 2

The Environmental Protection Authority recommends that to avoid erosion and resultant sedimentation and turbidity of water courses the SECWA should:

- **not locate transmission towers on or adjacent to stream and river banks. The SECWA has made a commitment to locate towers at least 100 metres from the Murray River;**
- **rehabilitate stream and river banks disturbed during construction and maintenance of the line;**
- **in steep areas ensure that erosion potential is minimised by, for example, either deviating the access track so it is in sympathy with the contours of the area, or flattening vegetation rather than removing it completely.**

The Water Authority of Western Australia (WAWA) has indicated that the proposed transmission line route passes through areas identified for future extraction of groundwater for the Perth Metropolitan scheme. The SECWA have indicated that they have no objection to water pipelines passing beneath the proposed transmission line and they have also made a commitment that contamination of underground water resources will not occur as a result of the construction and operation activities associated with the proposed transmission line. Liaison between the WAWA and SECWA will be necessary regarding these matters.

4.2 Land Use

The proposed transmission line will result in some inconvenience to landholders both during construction, and as a result of limitations caused by the easement. The SECWA has made a commitment (Appendix A) to negotiate compensation to landholders for damage or loss of productivity brought about by an establishment of an easement.

Further to this commitment, the Authority recommends that every effort be made to minimise disturbance during construction and ensure adequate rehabilitation and cleaning-up after construction occurs. Monitoring following completion of construction should be undertaken to ensure that satisfactory rehabilitation of all disturbance occurs.

Recommendation 3

The Environmental Protection Authority recommends that the SECWA undertake a monitoring programme designed and implemented to check the success of rehabilitation following construction. Reporting on the findings of the monitoring programme to be referred to the Authority, initially after the first year of operation and then every three years until the rehabilitation is determined by the EPA to be successful. Rehabilitation should reflect the results of monitoring.

4.3 Biological Effects

4.3.1 Clearing of vegetation

The SECWA indicate that construction of the proposed transmission line will require clearing of native vegetation that intrudes into the "clearing profile" within a strip of 60m wide and complete clearing to ground level of a 4m wide strip of vegetation for access.

The SECWA has made a commitment to minimise clearing in areas of dense shrub vegetation and wetland communities (Appendix A).

The remnant native vegetation on the Swan Coastal Plain is very important, and its value is continually increasing in significance as further clearing and degradation of vegetation takes place. Minimisation of clearing required for the transmission line is therefore important. The Authority believes that placement of towers should as much as possible avoid existing vegetation. Varying span lengths should be used to advantage during placement of towers. The Authority also considers that the clearing specifications should not be uniform for the entire length of the transmission line, but should depend on the type of environment being crossed. The clearing required in areas of valuable vegetation, wetlands and fragile environments should be minimal.

For most of its length the proposed transmission line crosses cleared agricultural land. There are only five significant areas of native vegetation. These are:

(a) Location 3071 at the south side of Riverdale Road in the Shire of Harvey.

(b) Parts of Murray Location 323 and 688, between Buller and Coronation Roads in the Shire of Waroona - the EPA recommends that the line deviate around this area (Recommendation 4).

(c) Recreation Reserve 6038 and Murray Pistol Club Grounds, Brownes Road and Old Bunbury Road in the Shire of Murray.

(d) Hymus Swamp, north of Karnup Road in the Shires of Serpentine and Rockingham.

(e) Nine of ten unseparated Locations, 1191 - 1199, east of "The Spectacles" wetlands between Thomas Street and Hope Valley Road, in the Shire of Kwinana.

As the vegetated areas account for only a small proportion of the land crossed by the line, the Authority suggests that detailed consideration be given to the clearing required in these areas. Clearing requirements should be established in consultation with the EPA.

The transmission line corridor should follow the deviation around the native vegetation at Murray Locations 323 and 688, between Buller and Coronation Roads, Shire of Waroona. The subject area is within the Peel- Harvey Catchment Area and any clearing of vegetation in this area could contribute to the problems already existing in the Peel-Harvey Estuary. Further clearing in this area is therefore discouraged by the Authority. The proposed deviation in this area would therefore be preferred as it does not lead to clearing.

The SECWA have indicated that they will be offering free seedlings to landowners affected by the transmission line, to contribute to the community effort to overcome erosion and salinity problems. The SECWA should be contacted direct regarding this matter.

Recommendation 4

The Environmental Protection Authority recommends that clearing requirements for the transmission line should not be uniform for the entire length of the line, but should depend on the type of environment to be traversed. Clearing requirements for significant areas of native vegetation should be established in consultation with the Authority.

Recommendation 5

The Environmental Protection Authority recommends that the proposed transmission line should follow the deviation around the native vegetation at Murray Locations 323 and 688, between Buller and Coronation Roads, Shire of Waroona.

4.3.2 Dieback Disease (*Phytophthora Cinnamomi*)

The SECWA have, in consultation with the Department of Conservation and Land Management, established safeguards to prevent the spread of *Phytophthora cinnamomi.* These are outlined in the SECWA Environmental Specifications for Transmission Lines (Appendix B). Provided these safeguards are followed, the Authority is satisfied that the SECWA is doing all it can to prevent further spread of the disease.

4.3.3 Spread of weeds

The introduction of weeds to uninfected areas along the route is of concern to the Authority. The SECWA have made a commitment (Appendix A) to liaise with the Department of Agriculture, Local Government Authorities and affected landowners in the formulation and execution of noxious weed control procedures prior to and during the construction phase of the transmission line. The SECWA state that these procedures normally come in the form of an induction for all Commission personnel and contractors associated with the construction of the line and the establishment of washdown and brushdown stations at relevant locations.

4.4 Archaeological and Ethnographic effects

The SECWA have had a detailed archaeological and ethnographic survey undertaken for the area which may be affected by the proposed transmission line. This survey indicated that there is one site which could be affected by the proposed transmission line. The SECWA have made a commitment (Appendix A) that if they need to disturb the site they will formally apply to the Department of Aboriginal Site to do so. A commitment has also been made by the SECWA that they will take adequate measures to inform project personnel that it is an offence to interfere with Aboriginal sites unless authorised under the Aboriginal Heritage Act (1972 - 1980).

The Western Australian Museum's Department of Aboriginal Sites have indicated that the SECWA have adequately considered Aboriginal site matters within their study for the proposed transmission line.

4.5 Visual Impact

The visual impact of the proposed transmission line is largely unavoidable. The SECWA has made a commitment (Appendix A) to minimise the effects by distancing the line from roads and dwellings as much as possible, and using vegetation where possible to screen the transmission line. The SECWA also intends to use spacing and level of towers to minimise visual intrusion of the line on the landscape.

4.6 Electric and Magnetic Fields

An energised transmission line creates electric and magnetic fields surrounding the line conductors. The possible health effects associated with the electric and magnetic fields is an issue of concern. A recently prepared report entitled "Review of High Voltage ELF Transmission Line Field and Human Health Effects" (Scott and Furphy, 1987) states that a link between ELF (extra low frequency) electric and magnetic fields and human health is neither proven nor disproven at this time. Whilst no link has been established, various international bodies have established recommended maximum levels for electric and magnetic field strengths.

The SECWA have presented data on the fields that are expected to be generated by existing lines and the proposed line. This data indicates that the highest magnetic and electric fields that could occur within the easement are under the maximum levels recommended by the World Health Organization. The Health Department of Western Australia has indicated that the projected field intensities are consistent with existing data, and the evaluation of these fields with respect to human occupancy in the near vicinity is in line with current thinking on the subject. The Health Department is satisfied therefore, that in the light of current knowledge, the proposed transmission line is acceptable regarding the effects of the electric and magnetic fields generated.

When presenting the data on electric and magnetic fields the SECWA indicated that the results were evaluated taking into consideration the following:

- no dwellings will be permitted within the easement for the proposed line; and
- activities within the easement that would involve prolonged presence within the easement will not be permitted.

The EPA suggests that the SECWA gives consideration to ways of ensuring that activities involving a prolonged presence within the easement do not occur. This may involve an education programme for affected landowners, ensuring the transmission line is not located adjacent to fencelines or fencing the easement in some areas.

5. SUMMARY OF PUBLIC SUBMISSIONS

The Environmental Protection Authority received 22 submissions on the proposal. The following list is a summary of issues raised in the submissions:

- concern regarding the number of transmission lines already in the area;
- visual impact of the transmission line;
- effects of Electric and Magnetic fields;
- erosion and salinity problems caused by vegetation clearing;
- insufficient 'cleaning up' and rehabilitation after construction;
- spread of weeds;
- impact on foreshore areas;
- use of pesticides;
- effect on water resources; and
- clearing of vegetation.

The frequency of response to the above issues is summarized in Table 2.

Some of the issues raised in the public submissions fall outside the scope of the Environmental Protection Authority's assessment process. The issues raised which do fall within the scope of the EPA have been taken into account by the Authority during its environmental assessment of the proposal, and in its Recommendations.

6. CONCLUSIONS

The Environmental Protection Authority has assessed the State Energy Commission of Western Australia's proposal to construct a 330kV transmission line from Harvey to Kwinana. The Authority concludes that the proposal is environmentally acceptable subject to the Commission's environmental commitments and the EPA's recommendations in this report.

7. REFERENCES

Scott and Furphy Engineers Pty Ltd (1987) Review of High Voltage ELF Transmission Line Field and Human Health Effects.

Table 2. Summary of Public Submissions

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Concern regarding the number of transmission lines already in the area		*			*					*	*		*		*	*			*			*
Visual impact		*		*			*	*	*							*						
Effects of electric and magnetic fields		*					*					*				*					*	
Effects on farmland and/or farmers					*		*		*	*	*	*	*	*		*			*			*
Erosion and salinity problems caused by vegetation clearing										*	*											*
Insufficient "cleaning up" and rehabilitation after construction													*			*						
Spread of weeds																*			*			
Impact on foreshore areas																				*		
Pesticides													*							*		
Water resources	*																					
Clearing of vegetation				*						*	*	*				*		*	*	*	*	*
No objections			*			*											*					

Appendix A

List of Environmental Commitments

APPENDIX A

LIST OF ENVIRONMENTAL COMMITMENTS

(i) Various arrangements of tower heights and spans will be used to provide appropriate towersittings consistent with minimum environmental disturbance and minimal visual intrusion on the landscape.

(ii) The SECWA's Properties Officers have established and will maintain contact with property owners and occupiers in order to ascertain individual requirements affecting the project.

(iii) Timing of construction activities will, where possible, take into account landholders' farming practices, so as to minimise disturbance to the farmers' use of land.

(iv) Compensation will be negotiated where farmers suffer loss of production brought about by establishment of an easement.

(v) Periodic line inspections will be undertaken in order to maintain the desired window-type "clearing profile" of the easement. (This is depicted on Figure B1 in Appendix B)

(vi) On average, every two years some vegetation maintenance work will be required along the transmission line. In these instances, the vegetation will be cut back to the minimum permissible height as defined in Appendix B.

(vii) Special attention will be given to minimal clearing through the System 6 recommended area to ensure revegetation of the easement and maintenance of vegetation within it.

(viii) Clearing activities will be restricted to tower positions, track access and vegetation which extends into the clearing profile.

(ix) Where the access track is orientated down steep gradients, precautions will be taken to divert runoff into vegetated, more stable areas while maintaining vehicle access.

(x) Steps will be taken to minimise clearing in areas of dense scrub vegetation and wetland communities.

(xi) Design studies will be aimed, where practicable, at maximising the height of the conductors in the dense scrub and wetland areas, so span lengths can be increased.

(xii) Permanent access tracks will be detoured to use existing wetland crossings, whenever practicable, enabling retention of scrub layers and other vegetation.

(xiii) The procedures to be adopted for easement clearing will result in the maximum retention of rootstock and seedstock of understorey species.

(xiv) Easement maintenance will be aimed at restricting/preventing vegetation growing into the required clearing profile.

(xv) Groundcover and a shrub layer under the transmission line will be permitted to a maximum height of 1.5 m.

(xvi) Safeguards to control P.c. dieback disease will be consistent with Appendix B.

(xvii) Staff of the SECWA will be adequately informed of their obligations under the Aboriginal Heritage Act (1972-1980) regarding disturbance of sites.

(xviii) Towers will, where possible, be located close to the edges of wooded areas and rows of trees in order to minimise the visual intrusion of structures located on cleared land.

(xix) Where road crossings occur, the following guidelines will be applied, where possible, to minimise visual impacts:

- Ideally, the crossing will be effected at right angles, but where this is impracticable, the closest possible alignment to this will be achieved.
- Towers will be located as far as practicable from the road.
- Astrip of understorey shrubs up to three metres high will, where possible and practicable, be maintained for at least 10 m on either side of the road. This will depend to a large extent on the nature of the vegetation at the precise crossing location selected, and
- if little or no vegetation occurs at the crossing then appropriate roadside verge planting of local vegetation willassist in reducing the impact.

(xx) Gates will be established where transmission lines cross existing fences. Under normal circumstances, these will be kept locked.

(xxi) The construction and maintenance of access tracks will be to the minimum standard that is consistent with convenient four wheel drive access by the SECWA vehicles.

(xxii) The SECWA will liaise with the Department of Agriculture, Local Government Authorities and affected landowners in the formulation and execution of noxious weed control procedures prior to and during the construction phase of the transmission line.

(xxiii) Transmission towers will be located at least 100 metres from the Murray River.

Appendix B

SECWA Environmental Specifications for Transmission Lines

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APPENDIX B

SECWA ENVIRONMENTAL SPECIFICATIONS FOR TRANSMISSION LINES

1.0 ENVIRONMENTAL SPECIFICATIONS

1.1 CLEARING WITHIN STATE AND PRIVATE WOODLAND AREAS

Clearing is the first phase of a single contract for the entire transmission works programme. Clearing for 330kV, 132kV and 66kV transmission lines is carried out according to a predetermined "clearing profile". This "clearing profile" outlines the easement width and clearance limit for the route. The limits indicate the maximum allowable height of trees, undergrowth and scrub that may, in certain cases, remain within the cleared width (Figure B1). Within State and private forests, the following criteria area followed:

- The complete removal of all trees for a distance of 30m (330kV line) or 20m (132kV/66kV) either side of the centreline of the easement.
- The removal of all undergrowth, scrub and stumps, large rocks and other obstructions up to a maximum width of 5m. This area shall be levelled and graded to form an access track suitable for four wheel drive construction vehicles to travel along the route.
- The windrowing of all timber, undergrowth, scrub and stumps which have been cleared and the preparation of this windrowed timber for flash burning. This includes the construction of all necessary firebreaks.

1.2 CLEARING ON PRIVATE AND NON-FORESTED PROPERTY

- The removal of all trees, undergrowth, scrub and stumps for the total easement width. However, where the property owner wishes to retain certain vegetation, lopping and trimming is to be carried out in accordance with the clearance limits.
- Clearing of the track, windrowing and burning/removal is the same as for State or Private forests, and conforms to the "clearing profile".

All holes caused during felling of trees and stump removal are to be bladed in.

Where the transmission line angles or deviates, the area around these locations shall be cleared completely for a minimum of 30m (330kV lines) or 20m (132kV/66kV lines). No windrow timber shall be stacked within this area and the access track shall clear the angle peg by a minimum of 20m in 330kV lines and 20m in 132kV/66kV lines. In wet areas, the cleared area shall be graded to prevent wash or erosion occurring.

* NB Clearing specifications for 132kV and 66kV are generally the same.

1.3 SPECIAL REQUIREMENTS FOR THE CONTROL OF PHYTOPHTHORA sp. (DIEBACK)

To minimise the risk of spreading dieback disease, the CALM Department requires the following precautions to be taken:

- All clearing operations shall be completed in the dry months, generally considered to be December–March, unless otherwise authorised by the Principal and the CALM Department.

- The CALM Department has classified some of the land under its control into Disease Risk Areas. A permit is required for entry into Disease Risk Areas. Tenderer shall determine from the CALM Department, how the route is classified.

The following hygiene requirements have been specified by the CALM Department. These requirements shall be met by the Contractor.

When working in areas not infected by dieback, the Contractor may be required to cease operations temporarily in the event of rainfall. Recommencement of operations will be subject to the approval of a Forest Officer.

All Contractor's personnel, including staff not fully employed on the contract, sub-contractor and others, shall be instructed on hygiene requirements by the CALM Department before they commence clearing the route.

The Contractor's supervisor shall liaise with the CALM Department's Office-in-Charge for the section in which he is working, so that the following items can be defined:

- Roads and tracks which crews may be permitted to use and to gain access to the line route.
- The location of dieback along the proposed route.
- The locations along the proposed where all vehicles, plant and equipment must be cleaned before entering dieback free areas.
- The necessity for a cleaning down unit to be stationed at the boundary between dieback infected areas and areas not infected by dieback, to clean vehicles and equipment as they enter the uninfected areas. Vehicles shall be raised on a platform, e.g. rubber-belting or wood ramp during the clean-down procedure.

Signs defining the boundaries between dieback free, dieback infected and uninterpretable areas will be erected by the CALM Department.

Before clearing commences on land vested in CALM, all vehicles, plant and equipment shall be cleaned to the satisfaction of the CALM Department's Officer-in-Charge of the relevant District, or such other officer as he may delegate.

The Contractor shall provide all equipment for cleaning vehicles. This may be in the form of:

- Mobile washing unit shall consist of a tank of suitable capacity, coupled to a high pressure pump and hose with jet nozzle, all mounted on a suitable vehicle, and, compressor unit fitted with air hose and jet nozzle mounted on or part of a suitable vehicle.
- All washing down water shall be dosed with sodium hypochlorite. The required minimum dosage shall be 250ml of chemical for 500L of water. Renew sodium hypochlorite dosage every 24 hours.

The Contractor shall submit a list of all persons who will be directly engaged in the clearing. This shall include part-time personnel, such as relief drivers, pay officers and plant maintenance personnel and any other persons who may be associated with the work. Only those persons who have been instructed in the control of dieback shall be permitted in the area of operation.

It may be in the Contractor's interest to work all the dieback infected areas and the uninfected areas separately, so as to minimise the washing of plant and vehicles. Any such proposal will be acceptable to the Superintendent, provided a consistent policy is adopted.

1.4 WINDROWS

All trees, undergrowth, scrub and stumps shall be stacked in windrows using a rubber tyred machine fitted with a rake blade. Windrows to be no closer than 16m (for 330kV) and 10m (for 132kV/66kV) to the centreline of the route. A clear distance of no less than four metres shall be maintained between the edge of the windrow and the edge of the clearing. Where possible, only one windrow shall be used, and it shall be placed on the side opposite to the access track. The windrows shall be tightly packed, so as to allow flash burning to be undertaken when required. No windrows shall be stacked within 35m (330kV) or 25m (132kV/66kV) of an angle peg.

Any one section of windrow shall have a maximum length of 100m. A cleared distance of 20m shall be maintained between any two sections of windrow.

The maximum allowable windrow height shall be 3m.

Burning of windrows will be done given approval from the local CALM District Office. Material in the burning windrows will be reheaped until it has been completely burnt away.

1.5 ACCESS TO LINE ROUTE

Entry to forest areas shall be restricted to existing access tracks that have been nominated by CALM. Any deviation from these access tracks shall require the Superintendent's approval.

The Principal will supply the Contractor with drawings which will indicate access to the line route where the line route passes through private property. The Contractor shall not use any alternative means of access to the line route without the approval of the property owner and the Superintendent.

The Contractor shall be held responsible for all damage to access routes during the clearing operation and shall make good to the satisfaction of the property owner and the Superintendent, any damage caused.

1.6 ACCESS ROAD

The Contractor shall construct a two-wheel drive track along the centreline of the easement. The access track shall conform to the following:

- The track shall be suitable for access by vehicles under all weather conditions.
- The track shall have a maximum width of 5 metres on straight sections and 6 metres at bends. Fill, when required, shall consist of excavated hard material obtained from pits approved by CALM.
- Water courses shall be traversed by crossings which will have pipes installed and be gravelled in such a way as to minimise disturbance of banks.

Where the route traverses cleared farmland, no further grading for an access track will be required.

1.7 EROSION CONTROL AND ROUTE MAINTENANCE

Work is to be carried out in such a manner that disturbance to actual ground cover and land-form is minimised. Directions as to the methods to be adopted in the execution of the work to ensure this requirement is met will be issued by the Superintendent as the work proceeds.

The Contractor will, however, be required to instruct his staff, particularly plant operators, of the need for the utmost care to be exercised in carrying out all operations in order to avoid unnecessary damage. If such damage should occur and in the opinion of the Superintendent it could have been avoided, the Contractor is responsible for all costs involved in restoration of the damage.

1.8 PRESERVATION OF ROOT STOCK

Clearing of the easement through bushland shall be carried out in a manner that retains in situ, the maximum amount of root stock, by setting the bulldozer blade just above soil level. Retention of root stock is an essential element of the subsequent restoration programme. It is also important to minimise the risk of damage resulting from erosion to the transmission tower footings.

1.9 DUST SUPPRESSION

Special measures for dust control shall not be required unless dust becomes a nuisance. To alleviate the problem measures include:

- speed controls
- elimination of unnecessary vehicle movements
- water spraying (Treated water only)
- spreading of cut vegetation or woodchips.

1.10 CONTROL OF PLANTS ANIMALS AS REQUIRED BY THE AGRICULTURAL PROTECTION BOARD

The Contractor and his sub-contractors shall comply with regulations and requirements of the Agricultural Protection Board (APB) at all times during the performance of the work under the Contract, in order to maintain control of plants and animals that are declared under the provisions of the Agricultural and Related Resources Protection Act (1976 and amendments).

The minimum requirements with which the Contractor is to comply, are as follows:

- In order to control the spreading of infestations of declared plants and soil-borne diseases, maps showing the known areas of infestations will be provided to the Contractor by the Superintendent. The Contractor shall establish washing-down facilities along the route at the direction of the APB and these facilities shall enable the washing-down of vehicles and machinery with a high pressure water jet with water running into an open excavated pit which does not drain into a water system.

- Where there is a need to import construction plant, material, camp facilities and other such items from overseas or interstate, the Contractor shall notify the relevant APB officers 3 weeks in advance of the expected arrival of such goods. When interstate imports are concerned, the APB shall make arrangements at the appropriate checkpoint for a thorough inspection of all such constructional plant, material, camp facilities and other relevant items.

1.11 PROTECTION OF FLORA AND FAUNA

Flora: No flora shall be removed from the site except that necessary to undertake the works. The area trafficked to undertake the works shall be kept to a minimum. Exotic flora species shall not be introduced onto the site.

Fauna: No existing native species shall be trapped, killed or injured on the site or otherwise removed without prior to CALM. Firearms or other weapons shall not be brought onto the site. Exotic fauna species shall not be introduced onto the site.

Pets will not be permitted with contractors, or the workforce.

1.12 DISPOSAL OF WASTE MATERIALS

Waste fuels and lubricants shall be removed from the site by the Contractor to an approved disposal area.

Arrangements shall be made with the relevant Local Government Authority or a specialist contractor for the disposal of all garbage, refuse and waste fuels and lubricants.

1.13 STORAGE AND USE OF CONTAMINANTS

Storage of oil and other materials which would contaminate the soil if spilled, shall be confined to specially designed areas within the construction camp sites. The storage facility shall be designed to localise the effect of the spillage and prevent leakage into water courses and aquifers. Adequate quantities of suitable material shall be kept on hand to counteract spillages.

Maintenance of equipment involving the transfer of contaminants shall be conducted at specially designed facilities at the construction camp site. The maintenance facilities shall be such as to localise the effect of spillages as described above.

Maintenance of a minor nature may be carried out away from the facilities described above, provided that transfer of contaminants is not involved.

1.14 USE OF EXPLOSIVES

In addition to compliance with regulations regarding the use of explosives, the Contractor shall give due notice to adjacent landholders and users concerning his proposed use of explosives. The Contractor shall not unreasonably use explosives that will adversely affect the normal activities of the landholders or users.

Explosives shall not be used during declared fire bans.

1.15 CULVERT PREPARATION

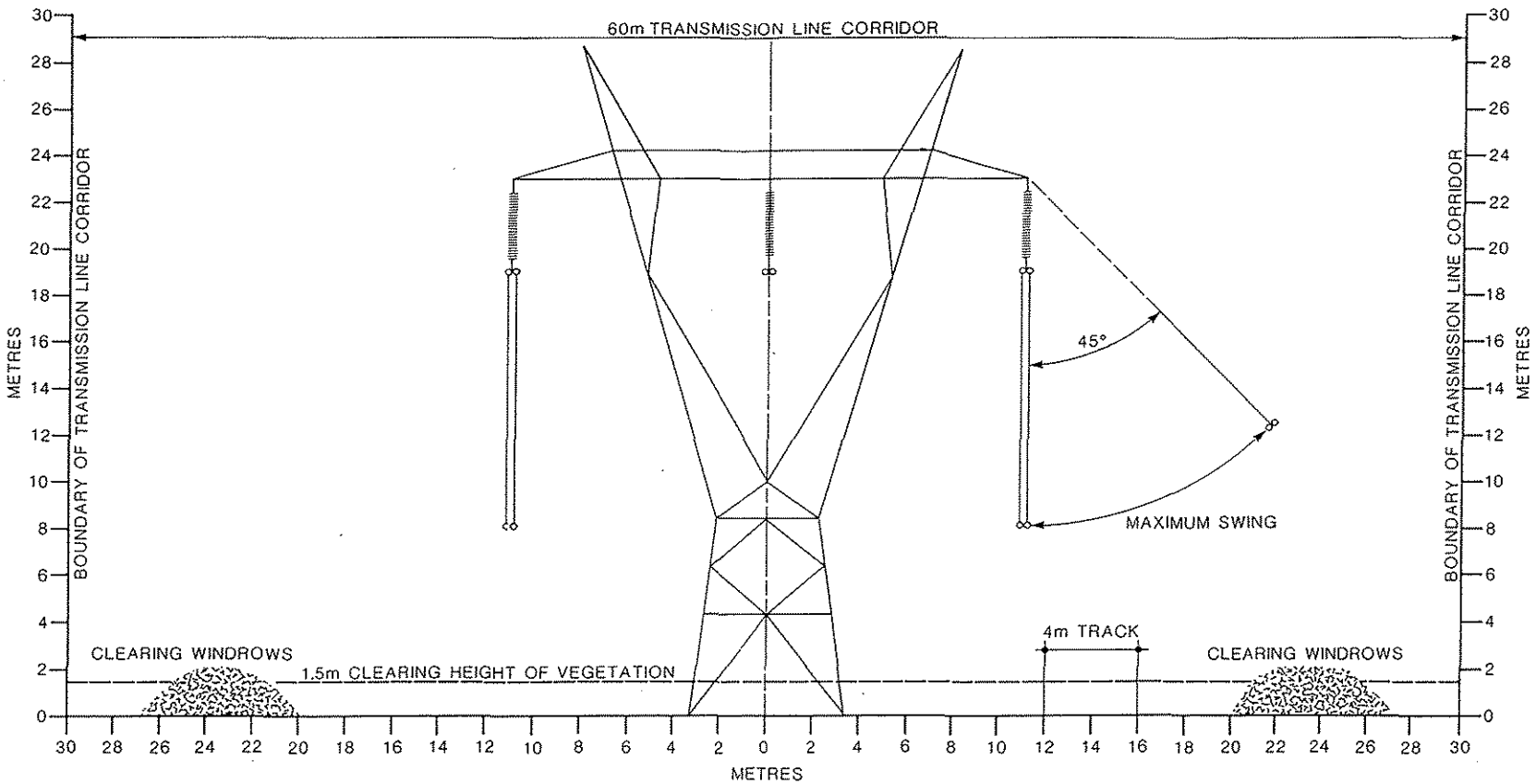
Pipes, concrete culverts or rock crossings may be installed at creeks and drainage channels.

The Contractor shall, however, clear across the creek or drainage channel removing all trees, undergrowth, and stumps, grading as close to the channel as possible to facilitate the later installation of pipes and culverts.

The creek or channel shall be left clear and tidy without obstruction to the natural flow of water.

2.0 BIBLIOGRAPHY

STATE ENERGY COMMISSION (1982). Specifications and General Conditions of Contract. Eastern Goldfields Project: Clearing for Transmission Line Route-Muja to Kalgoorlie, Specification CA162.



NOTE:

1.0 IN STATE FORESTS

1.1 ALL TREES WITHIN THE EASEMENT ARE TO BE MACHINE CLEARED OR, WHERE APPROPRIATE, FELLED.

1.2 REGROWTH AND SUCKERS WITHIN THE EASEMENT:
- (a) 1.5m AND ABOVE - CUT AT GROUND LEVEL AND POISON STUMP.
- (b) BELOW 1.5m - FOLIAGE SPRAY FOR SELECTED SPECIES WHICH ARE LIKELY TO CAUSE CLEARANCE PROBLEMS IF LEFT.

1.3 WHERE REGROWTH IS HEAVY, MACHINE CLEARANCE MAY BE USED:
- (a) THE MARDEN ROLLER (GENERALLY).
- (b) BULLDOZERS FOR STUMPS, ROCKS OR WHERE REGROWTH IS TOO HEAVY FOR THE MARDEN ROLLER.
- (c) SPECIAL HEAVY GROWTH AREAS (NOTABLY TEA TREE, MELALEUCA SPP., KUNZEA SPP.) A HYDROAX (LARGE SLASHER MACHINE).

1.4 ALL TREES OUTSIDE THE EASEMENT WHICH COULD FALL ONTO THE LINE ARE TO BE TAKEN DOWN IN CONSULTATION WITH THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

2.0 IN PRIVATE AREAS

2.1 SOME SELECTIVITY APPLIES AND STRAIGHT WINDOW CLEARING AS PER 1.0 TO BE CARRIED OUT WITH DISCRETION AFTER CONSULTATION WITH LAND OWNERS.

TYPICAL CLEARING PROFILE FOR 60m EASEMENT FOR 330kV SINGLE CIRCUIT LINE

Appendix C

SECWA's Response to Issues Raised in the Submissions

10
6

STATE ENERGY COMMISSION
WESTERN AUSTRALIA

Your Ref: 1/32/96
Our Ref: Mr C Morris
Enquiries: 326 4961
Telephone:

17 May 1988

Chairman
Environmental Protection Authority
1 Mount Street
PERTH WA 6000

ATT: MS G HANRAN-SMITH

Dear Sir

REPLY TO SUBMISSION - PER PROPOSED HARVEY TO KWINANA 330kV TRANSMISSION LINE

The Commission has reviewed the submission items that were summarised for the above report and wishes to provide the following comments:

Item 1:

We have no objection whatsoever to having water pipelines passing or crossing beneath the proposed transmission line provided the pipeline is buried at the crossing and over the entire width of the line easement. This requirement is essential to provide SECWA personnel continuous access along the line for maintenance purposes.

It will be WAWA's responsibility to ensure that the pipeline is properly and adequately earthed at and near the line crossing as part of the safety requirements against induction problems. The Water Authority of Western Australia is to bear the full cost for any works required to mitigate any affects arising from the induction problems.

We can categorically assure WAWA that the construction and operation activities associated with the proposed transmission line will not cause any contamination of the underground water resources of the region.

018373√

363-365 Wellington St., Perth, Box L921, G.P.O. Perth, W.A. 6001. T/grams: STATENECOM, Telex: AA92674 FAX: 326 4595 Phone: 326 4911

Item 2:

We have considered all possible alternatives to the proposed transmission line based on economic, technical and environmental constraints.

It is impossible and impractical to string the proposed transmission line on existing structures as is intended over the last 7km of the line for the following reasons;

1. The existing structures do not have the capability and facility to accommodate the proposed line,

2. Foundation design constraints on the existing structures makes it impossible to modify the structures to accommodate an additional line,

3. To replace existing structures with those which can carry multiple circuits would be expensive and unviable. Notwithstanding the cost factor, the replacement of these structures would require circuits to be taken out of service over a lengthy period of time which would undermine the security of the Commission's transmission system to an intolerable and unacceptable extent.

The last 7km of the proposed line will be strung on existing double circuit towers which had been designed and constructed to accommodate an additional circuit.

Item 3:

With regard to the issue relating to the electric and magnetic field effects in the close vicinity of the proposed transmission line, we do not agree that it has not been adequately resolved in the PER.

We feel that the issue has been resolved as far as it possibly can be in the light of present knowledge.

Item 4:

With regard to PIMA's concern about the proposed transmission line crossing of the Murray River we wish to comment as follows;

1. The transmission line structures at the river crossing will be located at least 100 metres from the banks of the river. The line construction activities will, therefore, not cause any instability to the banks or erosion.

2. Clearing of the foreshore vegetation will be carried out selectively and with discretion.

3. The proposed line crosses the Murray River through private properties. Hence, all maintenance tracks to the line at the crossing will be located on private properties. Consequently, these tracks will only be accessible to the landowners and Commission personnel because it is Commission policy that all maintenance tracks through private properties are controlled by locked gates. We, therefore, do not agree that the presence of the proposed line will result in easier access to the foreshore areas.

4. Commission personnel and its contractors will be made aware of the sensitivity of the foreshore areas and as such the need for its protection is paramount at all times.

5. Only herbicide is used on selected tree stumps which have the potential to grow into transmission lines.

Item 5

The descriptions of vegetation and flora given in the PER are, as stated in Section 5.2.2 based upon spring field surveys of the route as well as upon interpretation of aerial photographs. The field survey of the five significant areas of relatively natural native vegetation referred to in CALM's letter and described in Section 5.2.2.1 of the PER was mostly carried out in early spring. This is within the normal flowering time of 11 or more of the 19 species listed in the PER (Table 2) and all three of the gazetted species through which the route lies. Some of the other species are easily identifiable even when not in flower. Most of the survey work through the five areas of significant vegetation was done on foot, and all 19 of the Table 2 species were sought during this work. These were intensive, reasonably comprehensive rare flora surveys, with one exception, Hymus Swamp.

Hymus Swamp

The environmentally preferred route in the Hymus Swamp area (shown in Figure 2 as the western alternative) was subsequently rejected in favour of the more direct route because:

- it would cost approximately $300,000 more to construct, and
- its visual impacts would be much greater.

Furthermore, with regard to the preferred route as indicated in the PER:

- much of Hymus Swamp area in the neighbourhood of the route has been degraded by grazing;
- a total of only 5ha, less than 0.05% of the System 6 Recommended Reserve M105, Hymus Swamp, would need to be cleared;
- because the cleared strip would be a relatively narrow, incremental addition to an existing easement, it would have a relatively minor impact;
- the strip clearing is outside the Banksia woodland and along the woodland's western boundary, and
- the incremental strip is on the opposite side of the existing easement from Hymus Swamp and well away from the swamp itself.

The necessary clearing width required for paralleling the existing transmission line through Hymus Swamp area would be 50m; the clearing would be done in such a way as to have minimal effects on rare species, gazetted or otherwise.

A foot survey of the Hymus Swamp section of the final preferred route was carried out in late spring, after the end of the flowering period for the three gazetted species and many of the others listed in the PER (Table 2). Consequently, the SEC will carry out a survey in early spring after the precise location of the route within the corridor has been determined.

If there is any deviation in the route location or width through any areas of native vegetation mentioned above, rare species surveys will also be undertaken in these areas.

The only significant wetlands, either ephemeral or permanent, that will be affected by the project are in Area 4, "The Spectacles" area. Rare species were found in this area, though not in the preferred alignment.

The 300ha Buller Reserve referred to by CALM is noted on the Commission's survey maps and will be acknowledged during detail design work.

Item 6:

General site clean up requirements both during and after the line construction are and will be stipulated in the transmission line construction contract specification. Legally and contractually, it will be the contractor's responsibility to ensure that all these requirements are fully complied with.

In the past the Commission has always ensured that all rehabilitation works and general clean up of work sites are satisfactorily carried out. Any complaints from landowners are always acted upon and resolved speedily.

Item 7:

It is Commission policy to liaise with the Department of Agriculture, Local Government Authorities and affected landowners in the formulation and execution of noxious weed control procedures prior to and during the construction phase of a transmission line of this nature.

These procedures normally come in the form of an induction for all Commission personnel and contractors associated with the construction of the line and the establishment of washdown and brushdown stations at relevant locations.

Item 8:

The line deviation to the west side of Recreation Reserve 6038 is necessary to avoid the Reserve and existing buildings.

The alignment of the deviation will be fine tuned and finalised during the centreline survey of the line route within the proposed line corridor. As always, every effort will be made to minimise any vegetation clearing.

Item 9:

One of the principal concerns of transmission line route selection and centre line survey work is to ensure that the line route has minimal impact on existing vegetation, particularly in cleared agricultural areas. Hence, all existing vegetation will be retained wherever possible.

To contribute to the community effort to overcome erosion and salinity problems, the Commission will be offering free seedlings to all landowners affected by the proposed transmission line. Compatibility of seedlings to particular areas will be ensured by obtaining seedlings from CALM or the Department of Agriculture.

Please contact the Commission should you require any further clarification on the items.

Yours faithfully

K G ALLEN
MANAGER SYSTEM DEVELOPMENT

SD7046

L3/22dcm

Table 2. Summary of Public Submissions

Table 2. Summary of Public Submissions

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Concern regarding the number of transmission lines already in the area		*			*					*	*		*		*	*			*			*
Visual impact		*		*			*	*	*							*						
Effects of electric and magnetic fields		*					*					*				*					*	
Effects on farmland and/or farmers					*		*		*	*	*	*	*	*		*			*			*
Erosion and salinity problems caused by vegetation clearing										*	*											*
Insufficient "cleaning up" and rehabilitation after construction													*			*						
Spread of weeds																*			*			
Impact on foreshore areas																				*		
Pesticides													*							*		
Water resources	*																					
Clearing of vegetation				*						*	*	*				*		*	*	*	*	*
No objections			*			*											*					