WESTERN AUSTRALIAN PCB INCINERATION FACILITY NEAR KOOLYANOBBING

HEALTH DEPARTMENT OF WESTERN AUSTRALIA

Report and Recommendations
of the
Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 297 September 1987

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i SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The Environmental Protection Authority (EPA) has assessed the proposal by the Health Department of Western Australia (the proponent) presented in the Public Environmental Report (PER) and submitted to the EPA by the proponent. The Health Department proposes to incinerate approximately 1 000 tonnes of Polychlorinated Biphenyls (PCBs), over a 3-5 year period, at a waste disposal facility to be located in the proximity of Koolyanobbing, approximately 53 km north of Southern Cross in the Goldfields region of Western Australia.

The proposal consists of transporting the PCBs from storage and handling facilities in Perth and the Pilbara to the incinerator site at an abandoned hard rock quarry near Koolyanobbing, a former mining town currently inhabitated by two caretakers and their families.

PCBs belong to a family of chemicals called organochlorines. This family also includes the industrial by-product hexachlor-benzene (HCB) and pesticides such as DDT, 2,4D, 2,4,5 T, dieldrin as well as pentachloro-phenols (PCP). PCBs have been found to have excellent insulating properties and have been used as heat exchange fluids in electrical equipment, especially in transformers and capacitors. However, PCBs, if released to the environment, do not degrade but build-up in nature. Once they enter the food chain and concentrate (ie bioaccumulate), they can cause serious illness or death in marine life, birds and other animals. Ingestion of large quantities of PCBs by humans can cause skin rashes, liver damage and possibly death.

PCBs in WA have, up to now, been stored in depots where the inventories are building-up as PCBs are phased out in the State due to environmental concerns. Accidents can occur with unacceptable consequences. Recently, it was revealed that, in the past, capacitors containing PCBs were dumped near the power station at South Fremantle. The EPA's assessment of that incident resulted in the removal of part of the groyne at the power station, in order to locate buried capacitors, which are now in storage.

Given this situation, the EPA concurs with the decision to find a resolution to eliminate the storage of organochlorines, especially PCBs, in Western Australia.

The Health Department of Western Australia proposed the disposal of Western Australian PCBs by incineration, over a short-period of time (3-5 years). The Health Department forwarded the preliminary proposal to the EPA for its review. Subsequently, the EPA decided that a Public Environmental Report (PER) would be required, and issued guidelines for such a report.

The Health Department subsequently initiated a number of working groups, dealing with such issues as site selection, technical standards, engineering design and construction, transport, and occupational health. A steering committee, consisting of the convenors of the working groups, had oversight of the study. The Health Department engaged a consultant to provide a focus for the study, to do most of the investigations and to prepare the PER document.

The development of the PER commenced on 13 October 1986 and the document was finalised for public release on 22 December 1986. The PER went on public review for 10 weeks commencing on 12 January, 1987 and finishing on 20 March, 1987. The EPA received a total of 61 submissions on this proposal.

The Authority found that the PER, was a detailed document on most matters. However, as part of its environmental assessment process, the EPA prepared and forwarded to the proponent a list of questions summarising issues raised in the submissions. The Health Department of Western Australia subsequently provided to the EPA a comprehensive response to these issues.

After undertaking its assessment, the Environmental Protection Authority makes the following conclusions:

- Long-term storage of PCBs in Western Australia would be environmentally undesirable.

- High temperature incineration is technically and environmentally the most acceptable method of disposing of Western Australian PCBs.

- Given the geological and hydrogeological stability of the Yilgarn block, the Western Goldfields near Koolyanobbing is an appropriate region to locate a PCB incinerator.

- All bulk transportation of PCBs from the storage depots in Perth to the incinerator facility should be by rail.

- The safety aspects of the facility are manageable and the emissions and discharges from the facility will be so small as to have negligible effect on the environment.

Given the above, the Authority believes that the proposed incinerator facility for PCB disposal near Koolyanobbing is environmentally acceptable subject to the proponent's commitments and the EPA's recommendations.

There are a number of other issues which have been assessed and discussed in this Assessment Report including monitoring during operational phase and the management of the facility by an experienced operator. The general conclusion is that the proponent has developed a detailed proposal and has provided a most comprehensive set of commitments which takes into consideration a large number of issues and matters which can be resolved in an environmentally acceptable manner.

The Authority would require regular reporting from the proponent on the facility, a monitoring programme to be undertaken by government agencies, and the EPA would undertake periodic auditing of the environmental performance of the facility.

In this Assessment Report the EPA has made the following conclusions and recommendations:

1 RECOMMENDATION

The Environmental Protection Authority concludes that the proposal to incinerate Western Australian PCBs near Koolyanobbing is environmentally acceptable and recommends that it could proceed subject to:

- the commitments for environmental protection made by the proponent for the proposal as included in Appendix 2 of this Report; and

- the EPA's recommendations in this Assessment Report.

2 CONCLUSION

Long-term storage of PCBs in Western Australia would be environmentally undesirable.

3 CONCLUSION

High temperature incineration is technically and environmentally the most acceptable method of disposing of Western Australian PCBs.

4 CONCLUSION

Given the geological and hydrogeological stability of the Yilgarn block, Western Goldfields near Koolyanobbing is an appropriate region to locate a PCB incinerator.

5 CONCLUSION

Either of the two proposed sites near Koolyanobbing are environmentally acceptable.

6 RECOMMENDATION

The Environmental Protection Authority recommends the preparation in stages of a hazards and safety management strategy as outlined by the proponent to the satisfaction of the EPA and the appropriate Government agencies.

7 RECOMMENDATION

The Environmental Protection Authority recommends that all bulk transportation of PCBs from the storage depots in Perth to the incinerator facility should be by rail.

8 RECOMMENDATION

The Environmental Protection Authority recommends that the proponent undertakes the following for all stages of the transport operation to the satisfaction of the EPA and relevant Government agencies:

. establish detailed specifications for PCB loading, transfer and unloading areas;

. outline specific safeguards for rail containers containing PCBs;

. detail plant site storage and handling requirements, including fire safety;

. identify responsibility for the various aspects of transport and transfer operations; and

. prepare contingency plans for dealing with spillages should they occur.

9 RECOMMENDATION

The Environmental Protection Authority recommends that the incineration facility should be operated and managed by an experienced operator.

10 RECOMMENDATION

The Environmental Protection Authority recommends that the proponent prepare a monitoring programme to the satisfaction of the EPA before the commissioning of the incineration facility. This programme should include the following:

. the parameters contained in the proponent's commitments;

. the results to be forwarded to the EPA;

. the programme to be reviewed by the EPA after 2 years; and

. it should address baseline and post - PCB disposal monitoring requirements.

1. INTRODUCTION

The proponent, the Health Department of Western Australia proposes to incinerate approximately 1 000 tonnes of Western Australian stored Polychlorinated Biphenyls (PCBs), over a 3-5 year period, at a waste disposal facility to be located in the proximity of Koolyanobbing, approximately 53 km north of Southern Cross in the Goldfields region of Western Australia. Koolyanobbing is approximately 460 km east of Perth as shown in Figure 1.

The proposal consists of transporting the PCBs from storage and handling facilities in Perth and the Pilbara to the incinerator site at an abandoned hard rock quarry in the proximity of Koolyanobbing, a former mining town currently inhabited by two caretakers and their families.

The total cost of the proposal is estimated to be between $1.5 - $2.0 million.

PCB's belong to a family of chemicals called organochlorines. This family also includes the industrial by-product hexachlor-benzene (HCB) and pesticides such as DDT, 2, 4D, 2, 4, 5, T, dieldrin, as well as pentachlorophenols (PCP). PCBs had been found to have excellent insulating properties in that they are both non-flammable and non-corrosive as well as being very stable over time. The first two properties have led to PCBs being used as heat exchange fluids in electrical equipment, especially in transformers and capacitors. The last property (ie stability over long period) means that PCBs, if released to the environment, do not degrade but build-up in nature. Once they enter the food chain and concentrate (ie bioaccumulate), they can cause serious illness or death in marine life, birds and other animals. Ingestion of large quantities of PCBs by humans can cause skin rashes, liver damage and possibly death.

Currently, PCBs within WA are stored at depots awaiting further treatment and disposal. The consequences of their accidental discharge to the environment through a spillage or by fire would be unacceptable.

Given this situation, the EPA concurs with the decision to find a resolution to eliminate the storage of organochlorines, especially PCBs, in Western Australia through disposal by incineration.

In response to a Health Department initiative the EPA decided that a Public Environmental Report (PER) would be required, and issued guidelines.

The Health Department subsequently initiated a number of working groups, dealing with such issues as site selection, technical standards, engineering design and construction, transport, and occupational health. These groups were chaired by the Health Department, State Energy Commission, Department of Mines, and the Department of Occupational Health Safety and Welfare respectively. While membership of the groups consisted principally of government officers, the Chamber of Mines made an important contribution of locating PCBs; the Confederation of WA Industry was a member of the occupational health group; the Conservation Council of WA was a member of the site selection group; and the Trades and Labor Council was represented on the transport group and the occupational health group.

A steering committee, consisting of the convenors of the working groups, had the oversight of the study. The Health Department engaged a consultant to

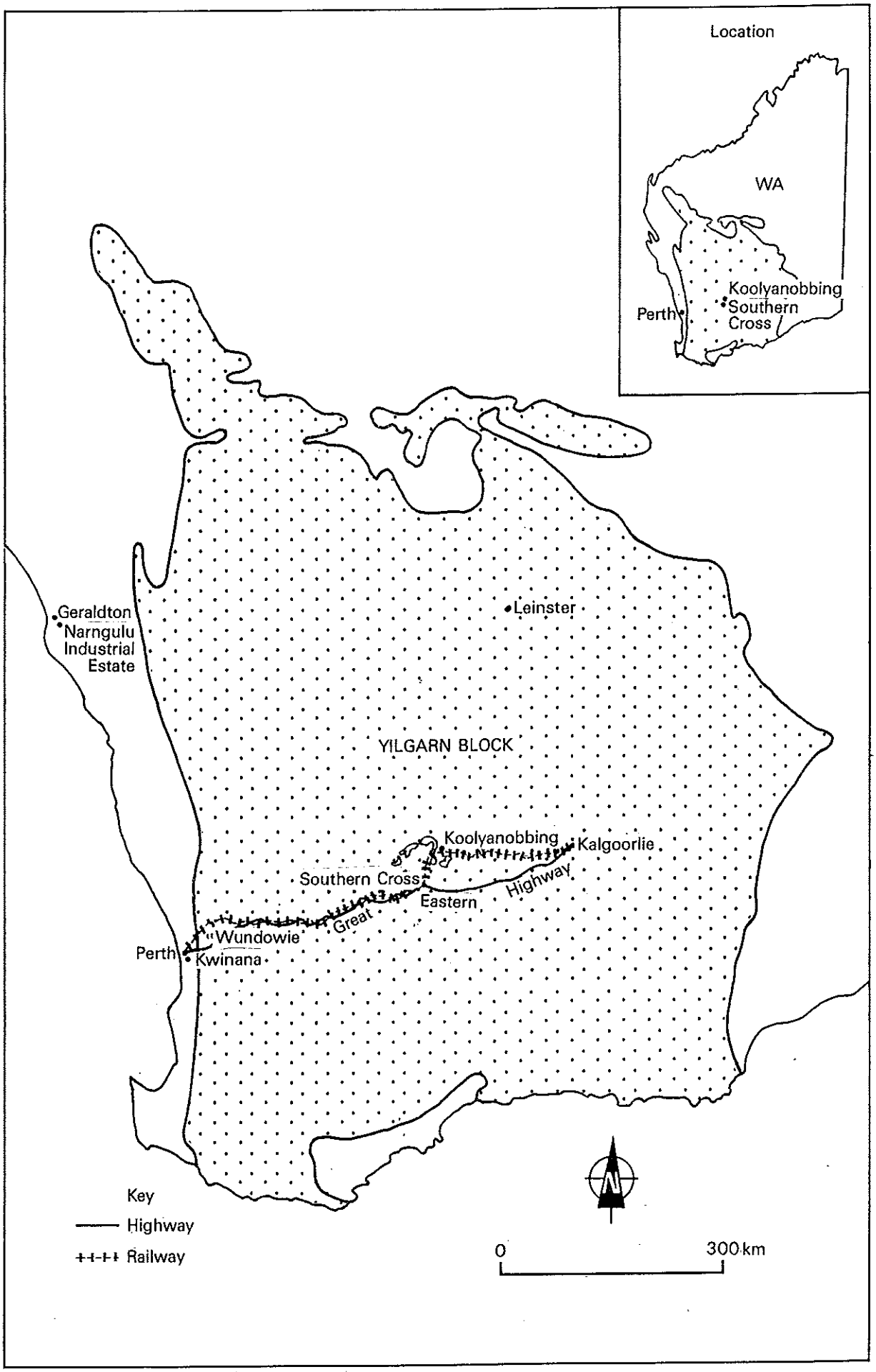

Figure 1. General Location and Alternative Regional Sites. (Source: PER)

provide a focus for the study, to do most of the investigations and to prepare the document.

The development of the PER commenced on 13 October 1986 and the document was finalised for public release on 22 December 1986. The PER went on public review for 10 weeks. The EPA received a total of 61 submissions on this proposal. A detailed list of comments arising from these submissions is included as Appendix 1 of this Assessment Report.

During the Authority's assessment of the proposal, it became apparent that the following issues required detailed evaluation:

. Does Western Australia need disposal of its organochlorines (PCBs) or could these wastes be stored over the medium to long-term period?

. If it is environmentally unacceptable to store these wastes over the long-term, then what other methods of disposal exist ie which is the most appropriate method of disposal for Western Australia?

. If an incinerator facility is required, then is the western goldfields region an appropriate region for such a facility in the State?

. If so, which of the two identified sites near Koolyanobbing is environmentally preferred?

. Are the proposed safety aspects of the facility adequate and acceptable?

. Would the environmental impacts arising from the construction and operation of such a facility be environmentally acceptable?

. Would there be adequate monitoring and management to ensure that the plant was operated in an environmentally acceptable manner?

. Should these wastes be transported to the proposed incinerator facility by rail or/and road.

As part of its environmental assessment process, the EPA summarised issues raised in the submissions to the Authority and forwarded these to the proponent for response. The Health Department of Western Australia subsequently provided detailed responses to the EPA on the issues raised in the submissions as well as to the EPA's questions.

The EPA has assessed the environmental aspects of the project discussed in this Assessment Report using information provided in the PER; public and government agencies submissions on the proposal as outlined in the PER; the proponent's responses to the issues raised in the submissions as well as to the EPA's questions; and the Authority's own investigations. The Authority also notes that the proponent has provided a most detailed set of commitments (approximately 150 commitments) to manage the facility (see Appendix 2).

The Authority concludes that the proposed incineration plant near Koolyanobbing is environmentally acceptable and makes the following recommendation:

1 RECOMMENDATION

The Environmental Protection Authority concludes that the proposal to incinerate Western Australian PCBs near Koolyanobbing is environmentally acceptable and recommends that it could proceed subject to:

. the commitments for environmental protection made by the proponent for the proposal as included in Appendix 2 of this Report; and

. the EPA's recommendations in this Assessment Report.

2. DESCRIPTION OF THE PROPOSAL

The full description of the proposed facility is provided in the PER (p 37-67). In summary, this consists of the following:

. unloading area for the receival of wastes including facilities for the receival and unloading of PCB packages and facilities for the preparation of PCBs for transfer to the incinerator;

. storage tanks and drum storage area. An area for the storage of capacitors awaiting disposal would also be provided;

. high temperature incinerator system including feed system, primary and secondary combustion chambers with associated controls;

. gas cleaning system; ie either a wet venturi scrubber system or a dry lime reactor for particulate removal and for gas scrubbing;

. evaporation ponds for the disposal of scrubber water;

. a residue treatment and disposal system;

. process control; and

. support services infrastructure, administration and amenity buildings.

The proposed development would occupy part of a former quarry lease. The actual incinerator site would be approximately 0.2 hectare, set in a stock security fenced area of 2 hectares. The total area of the lease is approximately 10 hectares.

The proposed incinerator's maximum capacity is 300 tonnes/year of wastes (both liquids and solids). The proposed operating feed rate for the wastes is approximately 1 tonne/day. Details of specialised equipment and of operating conditions are referred to in the PER and relevant aspects in this Assessment Report (see Section 7.3 and Appendices 2 and 3). The maximum proposed life-time of the incineration facility is 5 years.

A simplified process diagram of the facility is shown in Figure 2. An artist's impression of the incineration facility is shown in Figure 3.

Other relevant aspects of the proposal are:

. PCBs collected from different parts of the State would be transported by road to central interim storage facilities in Perth;

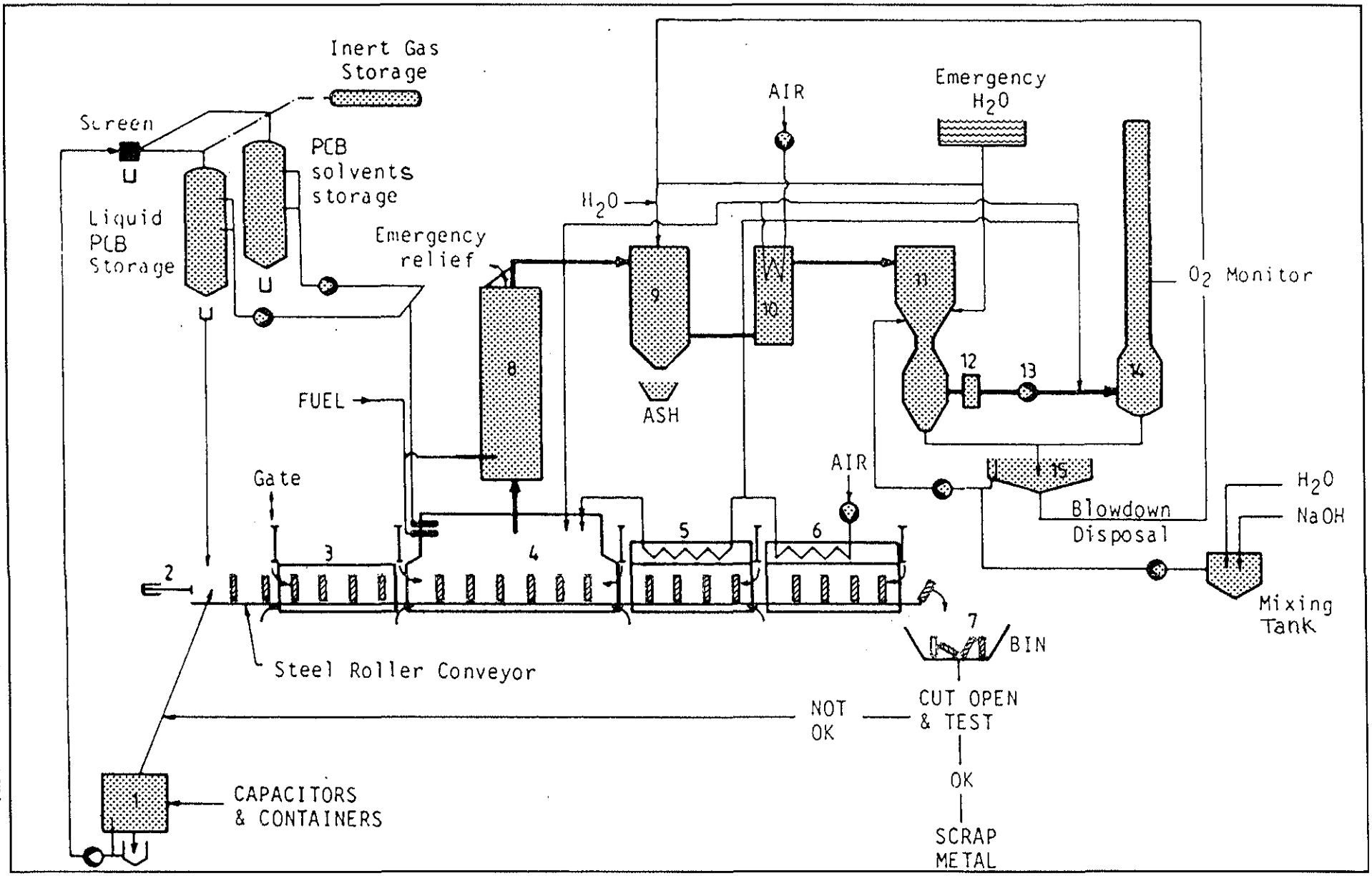

Figure 2. Simplified Process Diagram of the Incinerator. (Source: PER)

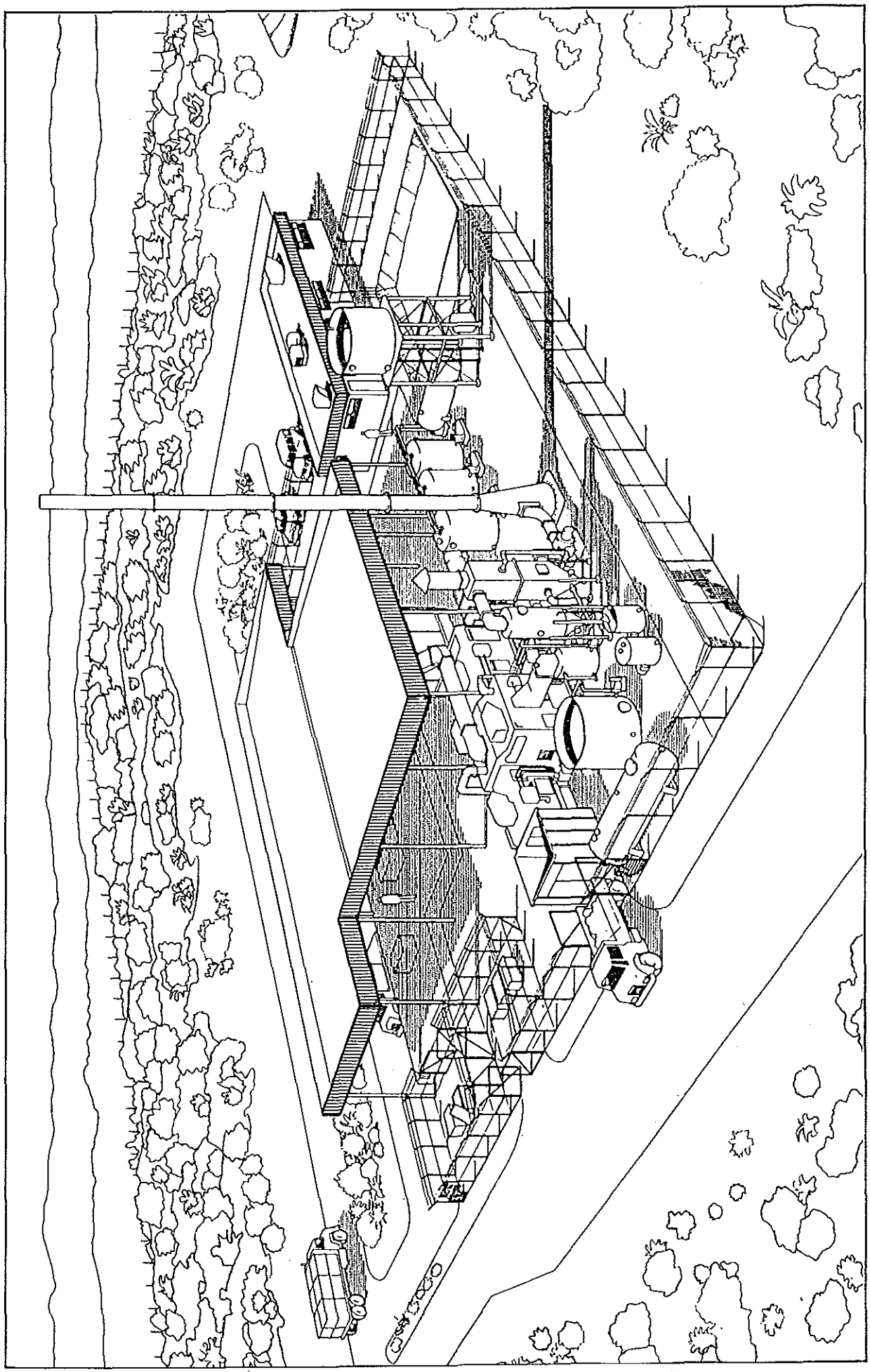

Figure 3. Artist's Impression of the Facility. (Source: PER)

- the proponent would make use of the central collection and interim storage facilities in the metropolitan area with subsequent bulk conveyance of PCBs to the disposal site so as to meet the long-term collection timetable and the need to avoid storage of PCBs on-site at the disposal facility;

- there would be a single storage, handling and transport agency throughout the disposal operation; and

- PCBs would be handled and transported in purpose-built steel containers which can be safety sealed.

The proposed incineration facility would take 3-4 months to design and 6-8 months to construct. The incinerator is proposed to be operated over one shift only. There would be 3-4 full time employees required to operate and maintain the facility.

3. DESCRIPTION OF THE EXISTING ENVIRONMENT

3.1 LOCATION

The PER states that the proposed incineration site is located in the Shire of Yilgarn, near Koolyanobbing, about 460 km east of Perth and 53 km north of Southern Cross, which is the nearest inhabited town (see Figure 1). The incinerator site is part of the Brontie pastoral lease and is located approximately 7 km south of Koolyanobbing and 0.5 km east of the road between Southern Cross and Koolyanobbing (see Figure 4).

3.2 LAND USES

The proponent's preferred site (Site 1) is part of a former quarry lease that lapsed in 1984. The central part of the lease area has been developed in the past as a ballast quarry. The site works include the quarry itself and nearby overburden and rock dumps together with surrounding disturbed land. The PER states that the proponent proposes to site the incinerator on disturbed land close to the quarry and to use the quarry itself for landfill of scrap metal. There are no current mineral tenements in the area.

The PER also states that the site itself is located within the Brontie pastoral lease which covers just over 78 900 ha and is owned by H A, R A & L P Dellabosca of Southern Cross. The document claims that apart from Koolyanobbing, the nearest residence is a farming property 20 km to the south.

Existing land uses near Koolyanobbing are shown in Figure 4. The area in the proximity of the proposed site has little native vegetation, apart from a few acacia shrubs, due to previous use as a quarry site.

The PER states that the surrounding environment comprises an extensive tract of low open mixed acacia woodland to 5 m in height. This type of vegetation is typical of a large part of the eastern goldfields.

As mentioned earlier, the nearest farming area is approximately 20 km away from the proposed plant site. Also located in the area are a number of apiaries and sandalwood extraction areas as shown in Figure 4.

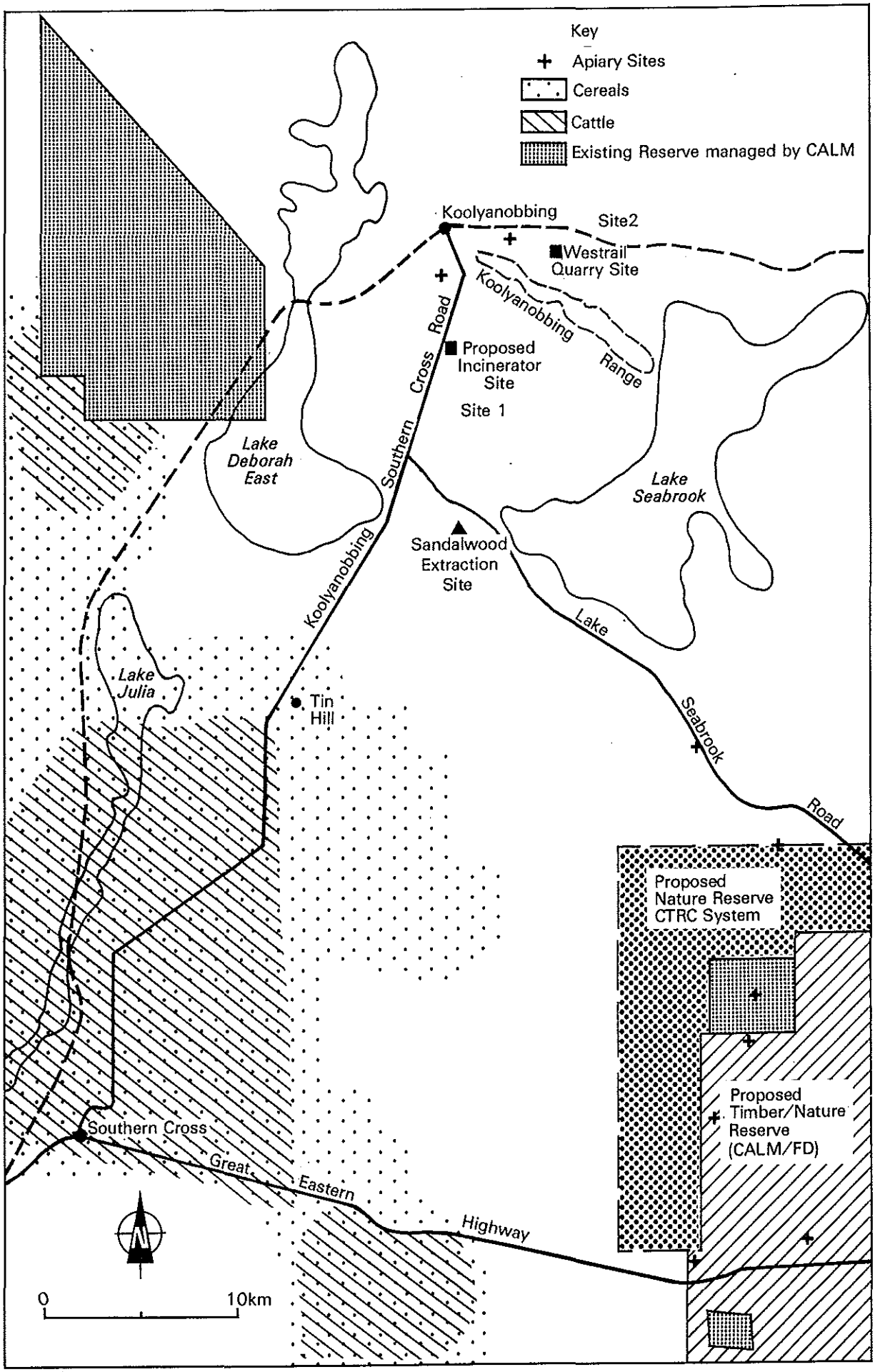

Figure 4. Alternative Sites and Land Uses.

3.3 GEOLOGY AND LANDFORM

The whole of Koolyanobbing district is located on the geological formation known as the Yilgarn Block which is the dominant feature of the Western Australian goldfields districts (see Figure 1). The PER notes that this Block is very suitable for waste disposal activities because it is geologically and hydrogeologically very stable, has no seismic activity and has a considerable thickness of impervious strata close to the surface which would prevent any wastewater leaking into the subsurface. The Yilgarn Block is a vast area of very ancient (Precambrian) granitic gneisses with areas of greenstones oriented in a north-north-west direction and intruded by massive granites. The greenstones are the oldest rocks and for the most part are basaltic lavas in places interbedded with jaspilites which in turn at Koolyanobbing contain significant iron ore deposits. These deposits have been developed in the past by BHP near Koolyanobbing but production has been discontinued and the town abandoned.

The landscape around the site is flat although the site itself is slightly elevated. The site is generally about 360 m ADH (Australian Datum Height), gently sloping to the south-west towards Lake Deborah East, 7 km away (Figure 4).

3.4 HYDROGEOLOGY AND SURFACE DRAINAGE

While there are no specific hydrogeological bore data for the site, the Geological Survey of WA has informed the EPA that the area is unlikely to have any useable groundwater. The PER points out that bores completed by Westrail along the railway line in the Koolyanobbing region indicate that groundwater is generally saline to hypersaline and is unusable for any purpose. It is also available only in limited quantitites. No bores for stock purposes are near the site.

The surface drainage is towards the south-west to Lake Deborah East. There is no prominent surface drainage system and run-off is probably very limited.

3.5 CLIMATE

Koolyanobbing is in the arid climatic zone which features hot to extreme temperatures and very dry conditions and very irregular rain in summer, and cool to mild but dry conditions with variable but mainly light rain in winter (average annual 281 mm).

3.6 DESCRIPTION OF KOOLYANOBBING

The PER provides the following description of the town of Koolyanobbing.

"The town of Koolyanobbing was built by Broken Hill Pty Ltd, in the early 1960s to provide accommodation and facilities for the workforce required for development of iron ore deposits. These are located in the Koolyanobbing Range. The ore was transported by train to Perth to supply blast furnaces at Kwinana.

The blast furnaces were closed in the 1970s and as a consequence production of iron ore from Koolyanobbing also ceased. Since that time the town has been placed on a care and maintenance basis and 2 caretakers and their families are in residence." (PER p 81)

4. REVIEW OF SUBMISSIONS

The PER was released to the public and Government departments on 12 January 1987 for a ten week review period, which ended on 20 March 1987.

A total of 61 submissions were received. Of these, 19 were from Government departments, four from Local Authorities, two from conservation oriented groups and the balance from private individuals, companies and tertiary institutions.

The main issues addressed in all submissions are indicated in Table 1. A detailed review of submissions is made in Appendix 1. This Appendix provides a more detailed analysis of the issues raised and comments made in the submissions received by the Environmental Protection Authority. Appendix 1 also includes the list of people and Government departments making submissions.

One particular point raised in submissions has that the PER was a comprehensive compilation of information on PCBs but that it was not well referred. The EPA considers that the compilation and publication of a reference list by the proponent would be useful and valuable.

The issues that received most frequent comment were:

4.1 EITHER OPPOSE OR SUPPORT PROPOSAL

4.2 ALTERNATIVE OPTIONS

. mobile plant
. burning at sea
. exported for disposal overseas
. national incinerator
. physico-chemical/biological system
. 'do nothing' option.

4.3 SITE SELECTION

. more remote site eg 20-50 km east (if dangerous)
. operation of facility - who? Must be experienced
. closer to stocks ie near Perth (if not any danger)
. Koolyanobbing not an appropriate site
. Koolyanobbing is a suitable site.

4.4 DETAILS OF THE PROPOSAL

. proposed life time of facility not clearly stated
. WA PCBs only should be incinerated/PCBs from other states should also be incinerated
. total cost of facility/financial proposition questioned
. storage, batch containment and handling aspects need more details.

4.5 PLANT DESIGN

. malfunctions and their management.

Table 1. Summary of Submissions.

ISSUES RAISED IN SUBMISSIONS	GOVERNMENT SUBMISSIONS																											PUBLIC SUBMISSIONS																																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
1. SUPPORT PROPOSAL	*																			*	*				*			*	*																							*									
2. OPPOSE PROPOSAL																							*	*		*	*					*			*	*	*	*		*			*	*	*						*						*				
3. ALTERNATIVE OPTIONS																						*																*		*						*													*		
3.1 Mobile Plant																						*		*		*			*							*		*									*						*								
3.2 Burning at Sea																						*															*	*		*					*																
3.3 Overseas Disposal																				*			*							*																*															
3.4 National Incinerator		*																				*			*	*	*											*																							
3.5 Physico-Chem/Biological Sys																																																								*					
3.6 'Do Nothing' Option																											*																																		
4. SITE SELECTION	*	*																		*		*	*			*	*		*	*		*	*	*			*	*		*	*	*	*	*	*		*	*	*		*				*	*	*	*			
5. DETAILS OF THE PROPOSAL																																																													
5.1 Proposed Life Time																				*		*	*						*	*		*	*	*						*			*		*			*	*												
5.2 WA PCBs Only																				*		*	*						*				*										*				*	*	*												
5.3 Total Cost of Facility															*				*				*				*	*	*	*			*					*								*	*					*	*	*		*					
5.4 Storage and Handling								*					*							*	*							*							*											*				*						*					
5.5 Operation of the Facility													*						*							*										*		*															*			*					
5.6 PCB Inventory																													*																							*									
6. PLANT DESIGN								*					*						*			*		*		*		*	*	*					*			*		*							*		*			*	*	*		*					
7. COLLECTION & TRANSPORTATION										*			*		*					*		*	*	*					*	*	*			*	*			*	*	*	*					*							*			*					
8. SAFETY ASPECTS & PROPOSED SAFEGUARDS								*							*				*	*				*		*	*	*	*	*			*	*					*	*		*	*							*						*					
9. ENVIRONMENTAL IMPACTS							*												*			*				*						*			*			*		*						*										*	*				
9.1 Contamination of Water Res							*												*			*		*		*					*	*	*	*	*					*								*	*												
9.2 Prevailing Winds							*																								*			*	*					*	*																				
9.3 Flora and Fauna						*	*															*													*																										
9.4 Earthquakes																																			*																										
10. MONITORING							*												*	*		*					*	*												*										*		*									
11. EMERGENCY & CONTINGENCY				*					*	*																									*					*																					
12. COMPENSATION																						*	*			*					*	*			*					*																					
13. DOWNGRADE YILGARN		*				*	*															*	*			*					*	*	*		*	*	*			*		*	*		*										*		*				
14. OCCUPATIONAL HEALTH								*										*		*	*	*					*	*	*	*	*				*			*		*		*				*			*	*					*	*	*				
15. ONUS ON OWNERS OF PCBs																				*							*																																		
16. NO COMMENTS			*		*						*	*		*		*		*																																											

4.6 COLLECTION AND TRANSPORTATION OF PCBs

. transportation major concern - provides greatest risk. Should be by rail
. risk of an accident over long transportation by road
. concern over transport through population centres by road
. no town along way equipped to handle spill.

4.7 SAFETY ASPECTS AND PROPOSED SAFEGUARDS

. believed no such thing as a perfectly safe plant
. privately owned - corners cut. Should be a Government controlled facility
. fire control.

4.8 ENVIRONMENTAL IMPACTS AND MANAGEMENT

. contamination of water resources
. prevailing winds
. flora and fauna
. earthquakes.

4.9 MONITORING

. regular monitoring should take place by EPA
. responsibility?
. what monitored?

4.10 EMERGENCY AND CONTINGENCIES

. local capability to manage emergencies
. proposed emergency planning.

4.11 COMPENSATION

. land value
. primary product.

4.12 PROPOSAL MAY DOWNGRADE YILGARN SHIRE AREA

. decrease value of the Shire area
. Shire will lose residents and not gain any.

4.13 OCCUPATIONAL HEALTH

. medical surveillance
. training.

4.14 SHOULD BE ONUS ON OWNERS OF PCBs TO UTILISE INCINERATOR

. details of proposal.

Information and comments provided in submissions have been used to assist in the evaluation and assessment of this proposal.

5. ASSESSMENT OF ALTERNATIVE DISPOSAL OPTIONS

Currently, there are approximately 1 000 tonnes of PCB waste stored in Western Australia. The EPA believes that the consequences of indefinite

storage of these wastes in the State (the 'do nothing' option) is environmentally undesirable.

Stored chemicals can be spilt and leakages can occur from containers. In addition low temperature fires can result in toxic products being formed (high temperature incineration ensures that PCBs are destroyed completely).

2 CONCLUSION

Long-term storage of PCBs in Western Australia would be environmentally undesirable.

The PER (p 35) states that waste PCBs cannot be recycled. That only disposal options available are destruction or indefinite secure storage. The document then lists the possible options for PCB disposal which are examined in detail in Appendix 5 of the PER. These include:

. landfill;
. biological treatment;
. physical/chemical treatment, including extraction, filtration, adsorption, fixation and encapsulation, chemical dechlorination, UV degradation and oxidation; and
. high temperature thermal treatment, of which there are two types of treatment - pyrolisis and high temperature incineration.

The proponent has used the following criteria to evaluate these options:

. proven status of the method;
. reliability;
. costs;
. availability and lead time of the technology;
. hazards including emissions and residues and the need for ongoing monitoring and remedial work;
. suitability of the process to Western Australia PCB wastes; and
. the selected system must minimise operator exposure.

The PER states that using this evaluation procedure, it can be concluded that high temperature incineration is the most suitable option for PCB disposal. The proponent concludes that other methods do not provide sufficient flexibility, reliability or safety, or that the technology is as yet not fully proven in relation to PCB disposal.

The proponent's preferred option of high temperature incineration consists of a stationary hearth incinerator.

The Authority has examined the information provided on alternative means of disposing of PCBs. The Authority's investigations show that while biological treatment of low level PCBs may be technically feasible, high temperature incineration, especially by stationary hearth incinerator, is the most appropriate means to dipose of high level PCBs in Western Australia.

3 CONCLUSION

High temperature incineration is technically and environmentally the most acceptable method of disposing of Western Australian PCBs.

6. ASSESSMENT OF THE PROPOSED SITE

The assessment of the site selection process for this proposal can be divided into two parts. These are:

. regional site selection process and the appropriateness of selecting the eastern goldfields rather than some other region in WA as the preferred region; and

. site selection process in the proximity of Koolyanobbing. The proponent has proposed two sites and prefers one site over the other.

6.1 REGIONAL SITE SELECTION PROCESS

The PER (p 70-72) examined the following locations, as shown in Figure 1, as potential sites for the proposed PCB's incinerator:

. Perth metropolitan area (Kwinana/Cockburn);

. Wundowie;

. Narngulu Industrial Estate south of Geraldton;

. Leinster area;

. Koolyanobbing area; and

. Reserve land and vacant Crown land in the Yilgarn Geological Block.

The PER document stated that:

"Although a significant proportion of the wastes are held by the mining industry in the Pilbara, no attempt was made to find a suitable site in this region as the transformers will have to be brought to Perth for proper cleaning and refilling." (PER p 70).

The advantages and disadvantages of the above regional locations is shown in Table 2.

The Authority has reviewed the regional site selection assessment presented by the proponent and summarised in Table 2 of this Assessment Report, and has found this process to be adequate and acceptable on the regional level. The proponent has argued that the area in the proximity of Koolyanobbing is remote from environmentally sensitive areas such as the Swan Coastal Plain; is remote from the nearest town (Southern Cross is 53 km away); is located on the Yilgarn block so as to prevent groundwater contamination of usable groundwater resources; has all of the appropriate infrastructure available; has an adequate (minimum 2 km) buffer zone; and the incinerator facility can be managed in an environmentally acceptable manner. The proponent has also argued that alternative regions or areas have certain disadvantages which makes it inappropriate to locate the incineration facilities at these regions (see Table 2). Given this information, and especially the geological and hydrogeological stability of the Yilgarn block, the Authority concludes that it is more appropriate to locate the proposed plant in the proximity of Koolyanobbing than the other regions investigated by the proponent.

Table 2. Regional Site Selection Assessment as outlined in the PER.

ALTERNATIVE REGIONAL SITES	AVAILABILITY OF ADEQUATE LAND	PROXIMITY TO PCB STORAGE (ACCESS TO RAIL/ROAD)	AVAILABILITY OF ADEQUATE BUFFER ZONE	VISUAL IMPACT	PROXIMITY TO INTRASTRUCTURE	LOCATION ON YILGARN BLOCK
Perth Kwinana/ Cockburn	Good	Good	Bad	Bad	Very good	No
Wundowie	Land available but in private ownership	Good	Bad	Bad	Good	Yes
Narngulu (Geraldton)	Good	Bad	Bad	-	Good	No
Leinster Area	Good	Very bad	Good			Yes
Koolyanobbing Area	Very good	Good	Very good	Good	Good	Yes
Reserve Land on Yilgarn block	Bad - Good	Very bad	Good	Good	Bad	

Source: PER

4 CONCLUSION

Given the geological and hydrogeological stability of the Yilgarn block, Western Goldfields near Koolyanobbing is an appropriate region to locate a PCB incinerator.

6.2 SELECTION OF THE APPROPRIATE SITE IN THE PROXIMITY OF KOOLYANOBBING

The two sites investigated by the proponent for the proposed incineration facility are shown in Figure 4. Both of these sites are abandoned hard rock quarries.

Site 1 is the proponents preferred site and consists of a 9.7 hectare lease. Site 2 is also an abandoned quarry, previously utilised by Westrail for its quarrying requirements. Site 2 is much larger (135.3 hectares) than Site 1.

The main difference between Site 1 and Site 2 appears to be the ready availability of utilities (power and water) at Site 1. Site 2 is closer to the railway line.

The Authority's investigations show that from an environmental viewpoint, both sites would be acceptable for the proposed incineration facility.

5 CONCLUSION

Either of the two proposed sites near Koolyanobbing are environmentally acceptable.

7. ASSESSMENT OF ENVIRONMENTAL IMPACTS

7.1 INTRODUCTION

In Section 6 of this Assessment Report, the Authority concluded that either of the two proposed sites in the proximity of the Koolyanobbing area would be an acceptable site to locate the proposed PCB incinerator.

The development of a PCB incinerator near Koolyanobbing will generate environmental issues requiring management. These include the following:

. construction stage impacts;
. impacts of safety aspects of the proposal;
. other environmental impacts due to the emissions of wastes;
. transport impacts; and
. occupational health issues.

The Health Department of Western Australia, being aware of the need to have in place the highest levels of management controls and safeguards, has made a large number of commitments to ensure that these objectives would be met. (See Appendix 2 of this report for a list of the proponent's management commitments). The EPA finds these commitments to be comprehensive and commends the Health Department for developing such a detailed proposal.

7.2 CONSTRUCTION STAGE IMPACTS

The construction of the incinerator over a 6-8 month period, would have the following impacts:

. the generation of dust; and
. discharge of contaminated stormwater (especially grease and oil from construction equipment).

The proponent has made the following commitments to environmentally manage the construction phase:

". Materials for construction will be selected using all necessary engineering skills and will incorporate experiences of other hazardous waste facilities around the world. Materials specification will be included in the detailed design; and

. There will be minimal environmental impact during the construction phase and all emissions and wastes will be handled by normal procedures as per EPA directions." (Source Appendix 2)

7.3 SAFETY ASPECTS OF THE PROPOSAL

As discussed earlier, the destruction of PCBs needs to be carried out in a manner so as to minimise the potential hazards and maximise the safety of the disposal facility. The major safety issue associated with the plant is the storage and destruction of PCBs and the possibility of the loss of containment of PCBs and associated compounds from the incineration facility.

The Authority notes that there are over 20 such high temperature incinerator facilities in at least eight countries (mostly in Europe) and that all of these facilities are significantly larger than the incinerator proposed for the Koolyanobbing area. Many of these overseas facilities are located in close proximity to residential area, and have been operating for more than 10 years. A number of these facilities are located within half a kilometre from residential areas.

The PER states that the Koolyanobbing site would have a minimum of a two kilometre buffer zone, and that the nearest inhabitants (3 people) reside at Koolyanobbing, approximately seven kilometres from the proposed site.

However, the Authority does not believe that only having an adequate buffer zone is enough. In its assessment, the EPA has examined in detail the proposed safeguards within the facility. In principle, the Authority believes that the safeguards for this facility should be appropriate and adequate to site such a facility within an industrial area in the metropolitan region.

In order to achieve this objective, the Health Department has provided the following safeguards to ensure that the highest standards of safety would be implemented at the proposed incineration facility:

". PCB wastes will be tested before delivery to the disposal facility to allow optimum incineration control for each type of waste;

. PCB liquids will be stored in a liquids tank farm that will provide full fire control, spillage containment and vapour control for all waste liquids stored. Further details will be developed during the design phase in consultation with relevant agencies;

. A comprehensive fire suppression system will be installed and safety procedures applicable to the handling of flammable liquids will be adopted;

. Provision for emergency services will include fire water supply, foam dousing (or similar) in flammable liquid storage areas, firebreaks, emergency washing facilities, visual and audible alarms and contingency planning;

. A fault tree analysis with meaningful figures is not possible to develop until detailed design of the plant is done. Naturally, such analysis (including a HAZOP) will be carried out at that stage. At present, a comprehensive fault identification has been undertaken with consequences and preventive measures outlined for each possible fault;

. Waste feed to the incinerator will be achieved by positive displacement metered pumping through an atomising lance for liquids, and by a ram feed into an air lock for solids;

. The primary and secondary combustion chambers will be operated at 15 mm negative pressure to control fugitive emissions with facility to vary solids retention times and to achieve specified minimum temperatures, gas retention times and excess oxygen content in the flue gas;

. Flame failure for any reason will cause a drop in temperature and the automatic instant liquid PCB feed cut-off will operate;

. The incinerator system will operate at a negative pressure to prevent fugitive emissions and allow venting of PCB feed areas;

. Leak prevention from the kiln will be managed by keeping negative draft throughout furnace and pressure indicators at strategic locations;

. Over pressure (within the incinerator) should not be possible: Flame failure will cut fuel supply, and liquid feed will be tested for calorific value before supply to furnace;

. The criteria for achieving 99.9999% Destruction and Removal Efficiency (DRE) are given by the USEPA as two seconds residence time in the secondary chamber at 1 200 ^{o}C and a minimum of 3% Excess Oxygen. Trial burns will confirm the DRE;

. The residence time of the system is a minimum of three seconds in the secondary chamber at maximum gas flow;

. In the event of a power failure, DRE is not applicable as the fuel, PCB feed and airflow stop immediately. Emergency power supply (generator) for lighting, controls, fire fighting, etc will be installed;

. Liquid PCBs are fed to the primary chamber via the centre of the burner. All feed lines are outside the furnace and vaporisation does not take place until the feed reaches the centre of the naked flame. High/low temperature, pressure loss, etc will cause instantaneous shut-off of feed;

. The quench unit and scrubber are conventional, well proven pieces of equipment. Their efficiency will guarantee hydrogen chloride emissions well within national and international standards; and

. Scheduled maintenance will be programmed during the design phase." (Source Appendix 2)

The Health Department of Western Australia's details on the safety aspects have demonstrated to the EPA that a safe and viable incineration facility can be built and maintained near Koolyanobbing, to the satisfaction of the EPA.

In response to an EPA question, the proponent has provided a fault indentification and management programme (see Appendix 3) which outlines the contingency and prevention measures to manage possible faults or accidents that have the potential to occur in the facility. In addition the proponent has outlined a detailed set of commitments (see Appendix 2) to manage the safety aspects of the incinerator facility.

The EPA also notes that the proponent, as part of a Safety Management Strategy, would be undertaking the following:

. a Hazard and Operability (HAZOP) study for the plant;

. a fire safety study for the site; and

. a study of emergency procedures before the commissioning of the plant.

The Authority believes that the above safety management strategy is appropriate. The details of this safety strategy would need to be reviewed for approval by the EPA and appropriate Government agencies.

6 RECOMMENDATION

The Environmental Protection Authority recommends the preparation in stages of a hazards and safety management strategy as outlined by the proponent to the satisfaction of the EPA and the appropriate Government agencies.

The EPA believes that with the implementation of the proponent's proposed safeguards (as outlined in Appendix 2) and with the plant being operated by an experienced operater, (see Recommendation 9) the likely safety issues associated with the plant would be managed to the satisfaction of the Environmental Protection Authority. In addition, the EPA would be undertaking periodic auditing of the facility to ensure that safety aspects are maintained.

7.4 OTHER ENVIRONMENTAL IMPACTS DUE TO THE EMISSIONS OF WASTES

The PER identified a number of waste products being generated from the plant which would require treatment and/or disposal. These include:

. atmospheric emissions;

. liquid wastes; and

. solid wastes.

7.4.1 ATMOSPHERIC EMISSIONS

The PER states that the discharged atmospheric emissions would be treated through an air pollution control device. The options proposed are:

. wet venturi scrubber; and

. dry lime reactor.

The proponent states that while no decision has been made on which of the above two devices would finally be utilised, both of these devices would provide high efficiency scrubbing of waste gases and non-conbustible contaminants. Some elementary modelling, presented by the proponent, (the results of which are presented as Appendix 8 of the PER) shows that atmospheric emissions from the stack would be low and the ground level concentrations in the proximity, significantly lower, and well within Western Australian standards.

A number of submissions, especially one from Fichtner Consulting Engineers has pointed out that:

> "today there exists flue gas cleaning systems that have considerably better efficiences (than pointed out in the PER) and work waste water free". (Source: Fichtner submission)

The Authority notes that the implementing of the proposal would require a Works Approval for a construction Licence under the Environmental Protection Act 1986 and that the matter of the appropriate air pollution control technology and its destruction efficiency could be resolved at the works approval licence stage.

7.4.2 LIQUID WASTES

Under the assumption that a wet venturi scrubber system would be employed (as it is in most other incinerators in Europe) the proponent states that liquid waste from the scrubbers would be stored in lined ponds. A subsequent commitment by the proponent entails the destruction of any contaminated wastewater, either from scrubber water, stormwater runoff or from in-plant spillages, through incineration within the facility. Other commitments made by the proponent, on this matter are as below:

". On-site liquid wastes will be fully contained and generally disposed of by evaporation unless they result from PCB spillage in which case they will be fed into the incinerator;

. There will be no uncontrolled runoff from the site;

. Process water will be retained within the plant area and evaporated or burnt if contaminated;

. Stormwater runoff will be retained and only released if un-contaminated;

. All potentially contaminated stormwater will be collected and stored in the ponding system. No release to the environment will occur without proof of no contamination;

. The evaporation pond size is approximately 1 000 cubic metres which will adequately cover the event of a very heavy thunderstorm. This pond will be lined;

. There will be no evolution of particulate fugitive emissions from the wastewater pond; and

. Only sodium chloride (common salt) will be in high concentration." (Source: Appendix 2)

The Authority notes that no contaminated wastewater would be discharged offsite under any circumstances.

7.4.3 SOLID WASTES

The PER states that "solid residues will consist of metal containers such as drums and the shells of capacitors after these have passed through the incinerator". The PER prefers landfill disposal at the old quarry adjacent to the plant site. The proponent has made a number of commitments on how this solid waste should be disposed of. These include the following:

". Solid residues including remnants of burnt PCB containers and residue from evaporation ponds will be disposed of as landfill in the quarry adjacent to the site. Monitoring of leachates will be carried out to ensure no pollution occurs from this waste. Other solid waste deposited in the quarry will be burnt out capacitors, ash, etc;

. PCB - containing capacitors can be burnt to a stage where PCBs are not detectable;

. US EPA standard for non-PCB material is defined as less than 50 ppm and incinerator ash as less than 2ppm. Solid waste from the facility will easily comply with these standards (note that the WA Environmental Protection Authority requires much better performance than these standards);

. During the trial burn period, PCB equipment which has passed through the incinerator will be tested to ensure that the scrap metal is decontaminated. The need for further random testing during the operational phase will be finally determined after consultation with the Environmental Protection Authority. The design for these tests will be determined by the Government Chemical Laboratories. The system has been designed to ensure that all metal surfaces that have been in contact with PCBs will be exposed to heat in the incinerator. As a result, effective destruction of PCBs is expected;

. Sludge from the base of the recirculation tank will consist of particulates captured in the scrubber water. The sludge will be periodically analysed for organic and heavy metal contents before being disposed of as landfill. High organic contents will mean the sludge will be re-incinerated. High heavy metal contents will require solidification and fixation treatment (binding with cement to form a concrete) prior to disposal. The sludge will be dewatered on site by natural evaporation prior to disposal; and

. Ash from the primary combustion chamber will be handled in the same manner as sludge from the recirculation tank." (Source: Appendix 2)

The proponent argues that groundwater beneath the proposed site is saline to hypersaline and that:

> "even if leachate from the landfill permeate to the aquifer, the groundwater will not be contaminated with other than very low traces of PCBs and is most unlikely to be extracted for use." (PER pp 120)

A submission from the Geological Survey of the Mines Department of Western Australia supports this view. This submission states that:

> "Groundwater, where it is present in the area, is certain to be brackish or saline and therefore unlikely to be degraded to any appreciable degree by leachate generated in the associated sanitory landfill." (Mines Department Submission)

The Authority accepts the view put forward by the Mines Department on this matter. However, the EPA believes that all measures should be undertaken by the proponent to minimise groundwater contamination of the landfill site.

7.5 STORAGE, HANDLING AND TRANSPORT IMPACTS

As mentioned in Chapter 2, the proposal consists of collecting PCBs from different parts of the State and transporting them by road to one or more central interim storage facilities in Perth. The proposal then calls for the transport of approximately 20 tonnes of PCBs per month from Perth to Koolyanobbing by road transport.

The Authority recently reviewed (EPA Bulletin 284, July 1987) the matter of transporting liquid sodium cyanide material, by road transportation, within the State and concluded that:

> "Transportation by road (of this liquid material) through the Authority's defined area of concern is environmentally unacceptable. The defined area of concern constitutes that part of the State within 50 km of the Perth GPO plus designated surface and groundwater catchment areas." (EPA Bulletin 274)

The Authority would have similar concerns regarding the transport of liquid PCBs through the EPA's defined area of concern. The Authority notes that transport of PCBs does not constitute the same level or type of environmental concern as that of liquid sodium cyanide. This is due to the factthat the quantityofPCBs transported on a monthly basis would be significantly lower (eg 20tonnes of PCBs as compared with approximately 3 500tonnes of liquid sodium cyanide). In addition, spillages of liquid sodium cyanide constitutes a short-term, accute environmental impact. PCBs on the other hand are very stable and once spilled cause negligible short-term impacts. However,their strong stability means that they remain in the ecosystem fora long period. This means that transportation of PCBs, as is rightlypointed out in the PER, constitute a risk and needs to be managed carefully.

The Authority previously undertook a detailed assessment of the safety aspects of transport modes (road vs rail) and made the following conclusion:

> "The EPA believes that rail transport of (liquid) sodium cyanide is safe because the likelihood of an accident leading to a major spill

is approximately 5 000 times lower than for a road accident of similar dimensions. The likelihood of a spill incident has been estimated as once in 16 million years for rail, and once in 3030 years by road. Moreover, the (rail) iso-tainer would likely remain intact in the event of an accident." (EPA Bulletin 284)

Given the above, the Authority concludes that all bulk transportation of PCB's from Perth to Koolyanobbing should be undertaken by rail.

7 RECOMMENDATION

The Environmental Protection Authority recommends that all bulk transportation of PCBs from the storage depots in Perth to the incinerator facility should be by rail.

Given that all bulk PCBs would need to be transported by rail, the Authority believes that transportation of PCBs needs to be undertaken in a manner so as to minimise any likelihood of spillages and to achieve this objective the proponent needs to prepare emergency plans for any contingencies.

8 RECOMMENDATION

The Environmental Protection Authority recommends that the proponent undertakes the following for all stages of the transport operation to the satisfaction of the EPA and relevant Government agencies:

- **establish detailed specifications for PCB loading, transfer and unloading areas;**
- **outline specific safeguards for rail containers containing PCBs;**
- **detail plant site storage and handling requirements, including fire safety;**
- **identify responsibility for the various aspects of transport and transfer operations; and**
- **prepare contingency plans for dealing with spillages should they occur.**

7.6 OCCUPATIONAL HEALTH ISSUES

The EPA acknowledges that the responsibility for reviewing occupational health issues within the plant rests with the Commissioner for Occupational Health Safety and Welfare and the Department (DOHSWA). The Authority notes that the proponent has made a number of commitments regarding the occupational health matters. Accordingly, the Authority believes that the proponent needs to liaise with DOHSWA.

8. ENVIRONMENTAL MANAGEMENT AND MONITORING

The environmental assessment process in Western Australia places a high priority on the management of environmental impacts and the monitoring of both the management programme and the impacts to ensure that appropriate steps are taken to ameliorate and minimise impacts.

REVIEW OF SUBMISSIONS

SUPPORT PROPOSAL

A small number of submissions indicated that the destruction of PCB wastes was desirable and supported the preferred options detailed in the PER. These submissions believed that the only current, proven, feasible and acceptably low risk technology for disposing of them is modern, high temperature incineration.

OPPOSE PROPOSAL

There was strong opposition to a high temperature incinerator being constructed at Koolyanobbing expressed in several submissions. Some held the view that it should not be built anywhere in Australia and others did not want 'somebody else's rubbish on their doorstep'. It was believed that the incinerator would prove to be a greater burden than a help and that they had a poor track record.

ALTERNATIVE OPTIONS

Whilst a number of people believed there was a necessity for the facility they did not feel that a stationary high temperature incinerator was the solution to the disposal problem and that alternative options should be further developed. A number of alternatives, as outlined below, were suggested:

. Mobile Plant

  This suggestion was for a similar type of plant but in a portable or mobile form as this would decrease the transport problem.

. Burning at Sea

  Some thought that existing methods such as a sea-going incinerator was a more viable alternative. That is, the PCB wastes should be shipped out to sea and burnt as there were ships already equipped for such tasks.

. Overseas Disposal

  A few submissions felt that there was no satisfactory reason why PCB could not be shipped overseas and the containers destroyed in incinerators already established as this is apparently cheaper. This would also eliminate the need for the construction, operation and decommissioning of a high temperature incinerator facility and minimise the road transportation risk. It would also eliminate the need to provide larger storage facilities on store.

. National Incinerator

  Concern and disappointment was expressed over the lack of effective inter-government cooperation to achieve a programme for establishing an acceptable national facility for disposing of Australia's intractable wastes. It was questioned why there was a "go-it-alone" approach to PCB disposal when WA's technology experience lags behind other states and only has 1% of Australia's PCBS.

REVIEW OF SUBMISSIONS (contd)

. Physico-chemical/biological System

This method of disposal was suggested as it would be less expensive, safer, it will not conflict with land uses, transportation is reduced to a minimum and has no tendency to leave undestroyed any component of the PCBs mixtures.

. 'Do Nothing' Option

Some believed that current PCB disposals do not pose a threat and therefore asked what would be the environmental consequences of the 'Do Nothing' option.

SITE SELECTION

Several submissions were from people who felt that Koolyanobbing was not an appropriate site for the location of the plant. The question was asked, if there is no danger from PCBs why is it necessary to locate in a remote area and if there is a risk why not locate it in a truly remote area, preferably 20-50 miles east of the proposed site. Questions as to the selection criteria were also asked, in particular, the cost/profit ratio. There were also those, however, who felt that Koolyanobbing was a suitable site for the location of a high temperature incinerator.

DETAILS OF THE PROPOSAL

A substantial number of submissions were concerned about certain details of the proposal as outlined below.

. Proposed Life Time of the Facility

Some submissions said that it seems unlikely that the Government will invest in such a plant and not take the opportunity to recover this investment at the conclusion of the destruction of PCBs. There was widespread concern that the PCB incinerator may become a permanent fixture used for disposal of other dangerous substances because the facility is already there. Also, with a change of government the incinerator may stay longer. It was stated that continued support for the proposal hinges on the Government's commitment to dismantle the facility promptly within 5 years of commissioning.

. WA PCBs Only

Continued support also hinges on the Government's commitment to utilise the facility for WA PCB wastes only. People felt that it could develop into a National Waste Disposal Centre accepting wastes from interstate and this was strongly opposed by many.

. Total Cost of the Facility

Several submissions mentioned the overall cost of the facility and that no empirical data was provided on this matter nor was any reference made to Environmental Impairment Insurance. Some felt that there is minimal guarantee the proposition will be financial and that the taxpayers will

bear the brunt of the costs. Others did not believe that so much money should be spent on such a short item project. One submission suggested that the owners and holders of PCBs should be charged for their removal.

. Storage and Handling

A number of comments were made on different aspects of the storage and handling matter. One submission thought that consideration should be given to construction of a storage facility large enough to take all PCBs stored in Perth pending the construction of a disposal facility. Another recommended the establishment of an on-site receiving and storage facility. Some believed there is a hazard relating to handling of PCBs within the facility while others supported the recommendations made in the report for storage, batch containment and handling.

. Operation of the Facility

Information was requested on confirmation as to who is responsible for the operation of the plant.

. PCB Inventory

A few submissions mentioned that an inventory of PCB wastes needs to be addressed. That is, a state and national inventory which is updated through to destruction of all PCBs.

PLANT DESIGN

A large number of issues were raised on the subject of plant design including standards for contamination due to the process, design area of the proposed runoff catchment sump, the subject of open ponds and natural evaporation, air locks incorporated in the design and number of persons required to run the facility. The submissions generally disagreed with what was being said on each of these matters. Another aspect was that of malfunctions due to electrical or mechanical failure and the potential hazard this posed for the environment and those in close proximity.

COLLECTION AND TRANSPORTATION OF PCBs

Transportation by road was thought to provide the greatest risk of contamination due to an accident on the long transport lines. People also did not find the matter of transport through populated areas acceptable. Transportation by rail is unacceptable due to derailments and the risk of spillage. Also, there is thought to be only one fire brigade operating with full time staff (Northam) equipped suitably in case of accident along the whole transport line. A suggestion was that the vehicles should be radio equipped and escorted at low speed. Generally though, the transport aspect was believed unacceptable.

SAFETY ASPECTS AND PROPOSED SAFEGUARDS

There was a general opinion that there is no such thing as a perfectly safe plant and the assumption that there is no risk is false. Some submissions

thought the report was a bit vogue as to whether the most stringent safety precautions will always apply. There is also believed to be a fire hazard concerning the kerosene solutions and the risk of explosion and fire. It was believed that there was a possibility of costs and corners being cut to increase the profit margin if privately operated.

ENVIRONMENTAL IMPACTS AND MANAGEMENT

There was concern expressed on a number of issues related to the environment in general outlined below.

. Contamination of Water Resources

It was felt that there is a danger to all WA residents as the catchment area near the plant if contaminated would also contaminate other drainage systems as it feeds into water systems throughout the entire wheatbelt and ultimately feeds into the Swan River through the Avon River System. Also the combination of PCB effluent with rain water may result in groundwater contamination. The contamination of Lake Deborah was also of concern.

. Prevailing Winds

The prevailing winds in the area are easterly and are capable of moving dust for miles, possibly causing environmental damage. It was thought that a closer examination of prevailing wind patterns .ought to be undertaken.

. Flora and Fauna

It is believed that the flora and fauna of the subject area are unique and should not be subjected to any contamination risk. Some said that the report provided little information or possible effects of PCB effluent emission and possible risks to vegetation in the areas adjacent to the site which are important for a large variety of vegetation types forming part of an important area for hardwood supplies. The area is an important one for a diverse range of fauna and avifaunal species.

. Earthquakes

The stability of both the plant structure and the rock formation at the quarry in the event of an earthquake was questioned.

MONITORING

It was asked what methods of monitoring are going to be used and also what is to be monitored. The following were considered necessary items to be monitored:

. the Lake Deborah system;

. primary product items in adjacent areas eg honey, cattle, sheep and crops;

. local ponds/farm dams; and

. within the plant.

On-line monitoring was recommended by most. It was considered that regular monitoring should take place and the responsible body identified.

EMERGENCY AND CONTINGENCIES

It was requested that the proponent should detail the proposed emergency planning and that after completion of the organisations emergency contingency plans for liaison to take place with existing emergency services at Southern Cross. Questions were also forwarded on the local capability to manage emergencies should they eventuate.

COMPENSATION

The question was raised as to whether there would be any compensation given to farmers should their land or primary produce be affected by PCB effluent. It was suggested that a large fund be set aside to cover the costs of any problems caused by transport and destruction of wastes.

DOWNGRADE YILGARN

The Yilgarn District was said to have a major contribution to Australia's economy by way of its exports and that the establishment of a PCB incinerator at Koolyanobbing presented a threat to the quality of these exports. As well as cattle, sheep and wheat products there is also honey production and Sandalwood harvesting in the forest adjacent to the site and salt harvesting on Lake Deborah. The quarry 7 km south of Koolyanobbing also is said to have great potential for the development of a top quality hard rock blue metal industry for future use and the proposal will retard the revival of the mining town. As well as this, contamination of perceived potential contamination may cause a drop in land value and the loss of residents. Residents were also concerned about the health risk as PCBs are said to be carcinogenic.

OCCUPATIONAL HEALTH

A number of aspects of occupational health were highlighted in a few submissions including such things as personnel training to eliminate human error, protective clothing for employees and an impermeable concrete pad in the main part of the facility so that it does not absorb spilled materials, as well as aspects of first aid were all discussed. The issue of medical surveillance was also addressed. It was recommended that all people in the Yilgarn area as well as employees need some surveillance and the workers should be followed for the rest of their lives. However, others felt that the PER was proposing a level of medical surveillance neither warranted nor available. It was also recommended that records of all workers should be held for 20 years.

SHOULD BE THE ONUS OF OWNERS OF PCBs TO UTILISE INCINERATOR

A small number of submissions considered there to be no forcible onus on owners to use the incinerator and that this should be done.

LIST OF COMMITMENTS

Environmental protection and other commitments made by the proponent in the PER; in the proponent's response to issues raised in submissions; and to issues raised by the EPA.

*Indicates commitments made in response by the Health Department of WA (23 April 1987) to the EPA.

APPENDIX 2

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1. GENERAL

1.1 *The State accepts responsibility for the disposal of Western Australia hazardous wastes.

1.2 *The proponents considered a wide range of studies during development of the present proposal. They believe that the data presented clearly indicate that the level of hazard posed by the Western Australian proposal is so low that for all practical purposes it must be regarded as non-existent.

1.3 *Attempts to establish a national facility have been made but have failed for a number of reasons. As Western Australia has a long-standing problem of PCB disposal it stands to reason that this problem alone be addressed.

1.4 Any disposal facility established in the State would be used exclusively for PCB treatment and would handle only PCB waste originating from within Western Australia.

1.5 The PCB disposal operation will be controlled by the Health Department of Western Australia.

1.6 The Environmental Protection Authority will form the independent safeguard authority and will have access to the specialist assistance of the Government Chemical Laboratories for monitoring analysis.

1.7 An experienced and competent contractor will be selected by tender to design, construct, commission and operate the disposal facility.

1.8 Financial arrangements covering the capital and operating costs associated with the disposal facility are subject to further investigation and evaluation.

1.9 The owners of PCB wastes will be responsible for disposing of PCBs within the proposed system, within the timescale proposed and at the charge rates specified for packaging and disposal.

1.10 *The incinerator will operate for from 4 to 6 years and not on a continuous basis.

1.11 *The best guarantee against accident lies in the use of proven technology, careful design, contractual specification of construction and operational detail, and monitoring.

1.12 *There will be a high security fence around the plant. No admission by unauthorised persons unless cleared by the manager, and there will be a security patrol during periods of non-operation.

1.13 *It is suggested that a Liaison Committee be established to monitor and be informed of the activities at the facility. The Committee

could consist of one or two elected members of the Yilgarn Shire Council, the local health surveyor and one or two local residents. These people would meet at regular intervals with the manager of the plant and representatives of the Health Department of WA, the Environmental Protection Authority and the Department of Occupational Health, Safety and Welfare.

1.14 *It is also proposed that the existing working groups overseeing the development of the PER be maintained throughout the design and construction period, and if necessary during the operation of the plant.

1.15 *The proposed programme for disposal of PCBs in Western Australia may provide opportunities for field evaluations of biological treatment, particularly for treatment of contaminated soils in situ.

2. CONSTRUCTION

2.1 *Design time will be 3-4 months and construction time 6-8 months.

2.2 *A tender for construction will be chosen by the Health Department of Western Australia.

2.3 *Materials for construction will be selected using all necessary engineering skills and will incorporate experiences of other hazardous waste facilities around the world. Materials specification will be included in the detailed design.

2.4 There will be minimal environmental impact during the construction phase and all emissions and wastes can be handled by normal procedures.

3. PCB INVENTORY (PER S10.2)

3.1 Further work on compilation of a full inventory is necessary to locate small and individual items of electrical equipment that contain PCBs and to identify any PCB wastes that may have been dumped in sanitary landfill sites.

3.2 *Transformer oils currently in use must be disposed of due to unacceptable levels of PCBs. Also soils are known to contain unacceptable levels at certain sites in Western Australia.

4. OPERATION (PER S10.3)

4.1 *It is proposed to have private industry operating the facility on contract to the Health Department of WA. The contractual basis for operation will provide a legal mechanism to ensure safe operating standards. It is considered that this structure will provide the greatest assurance that the facility will be strictly regulated and subject to independent monitoring. However, if this is unacceptable the Health Department is willing to consider operating the plant itself by employing suitable personnel for the task.

4.2 *If a private operator is chosen it will be only with continuous on-site presence of a government officer with relevant qualifications for the task.

4.3 *If the Health Department was to operate the facility it would hire suitably qualified personnel for operation, monitoring and bookkeeping.

4.4 The process will handle all forms of PCB waste identified in Western Australia.

4.5 The process operates at 99.9999% efficiency.

4.6 The process can be effectively monitored and controlled at all times.

4.7 Plant and operating costs are not excessive and a suitably sized incinerator can be assembled quickly on a relatively small site area.

4.8 High temperature incineration is a proven technology.

4.9 The process involves minimal operator exposure.

4.10 *Workers with experience in operation of plants such as refineries will operate the facility.

4.11 *At least one employee will be a tradesman.

4.12 *Scheduled maintenance will be programmed during the design phase.

4.13 *As plant is operated at one shift only, maintenance can take place during non-operation if required.

4.14 *Major unscheduled maintenance will be carried out as required. The PCB destruction programme need not be interrupted as extra shift can "catch up" with any backlog.

4.15 *Through put will be one tonne per day or 300 tonnes per year.

5. DESIGN CRITERIA (PER S10.4)

The selection of a stationary hearth high temperature incinerator will provide a highly efficient and cost effective means of disposing of PCB wastes. However, the incinerator unit itself forms only a small part of the overall disposal facility and there is a significant amount of associated operating, control and monitoring equipment that forms a necessary part of the overall disposal facility and contributes towards achieving a reliable, efficient and safe operation. In the following sections the essential design aspects of the disposal facility that will form the basis of the eventual detailed design are outlined.

5.1 PRIOR TO COMBUSTION

5.1.1 PCB wastes will be tested before delivery to the disposal facility to allow optimum incineration control for each type of waste.

5.1.2 Waste unloading and preparation for incineration will be automated as far as economically possible to minimise chances of worker exposure.

5.1.3 Equipment will be provided in the unloading area to contain PCB spills and to remove excessive levels of PCB vapours from sealed containers.

5.1.4 PCB liquids will be stored in a liquids tank farm that will provide full fire control, spillage containment and vapour control for all waste liquids stored.

5.1.5 PCB containers such as capacitors will be drained and prepared for treatment in the incinerator using automatic equipment.

5.1.6 Waste feed to the incinerator will be achieved by positive displacement metered pumping through an atomising lance for liquids, and by a ram feed into an air lock for solids.

5.1.7 *No milling will take place. See 7.1.10 and 7.1.11.

5.1.8 Liquids will be pumped into the primary combustion chamber through an atomising lance.

Drained capacitors will be transferred in leak proof trays by a monorail to the main feed conveyor and then pushed into the air lock with a ram. Insertion of a tray into the air lock will push the previous tray into the incinerator and push another tray from the incinerator into the exit air lock. The frequency of moving new trays into the inlet air lock will determine the retention time of the capacitors in the primary combustion chamber.

Liquids in drums will be drained to the liquid storage tanks under conditions which minimise fugitive emissions and the possibility of fires (if solvents are involved).

Solids in drums will be removed by hand-operated extension tongs or, for heavier items, by overhead monorail, and then placed in steel trays and sealed with a combustible membrane. The trays will then be stored in a covered well vented area prior to being fed to the incinerator via the ram feed/air lock system as described above. Emptied drums will then either be flushed with solvent for later re-use for transporting PCBs or crushed into a concertina form and fed through the incinerator before being disposed of as landfill.

5.1.9 *Liquid feed will be monitored continuously with alarm for high or low flow.

The frequency of loading of the steel trays will determine the solids retention time in the primary combustion chamber. The requirement will be determined during the trial burn procedure. Retention times are likely to be about half an hour for loose contaminated solids (gloves etc) and may be up to 4 hours for drained capacitors.

5.2 COMBUSTION

5.2.1 The primary and secondary combustion chambers will be operated at 15 mm negative pressure to control fugitive emissions with facility to vary solids retention times and to achieve specified minimum temperatures, gas retention times and excess oxygen content in the flue gas.

5.2.2 A combination of automatic and manual controls will be used to monitor and control the system.

5.2.3 *Equipment for automatic fuel control will be installed. Fuel/air ratio is set and fuel is burnt to maintain a set temperature in each chamber.

5.2.4 *Flame failure for any reason will cause a drop in temperature and the automatic instant liquid PCB feed cut-off will operate.

5.2.5 *The incinerator system will operate at a negative pressure to prevent fugitive emissions and allow venting of PCB feed areas.

5.2.6 *Based on previous experience in Perth it is doubtful if any refractory relining will be required. If relining is required, the disposal programme can be kept on schedule through overtime or extra shifts.

5.2.7 *Leak prevention from the kiln will be managed by keeping negative draft throughout furnace and pressure indicators at strategic locations.

5.2.8 *Over pressure should not be possible: Flame failure will cut fuel supply, and liquid feed will be tested for calorific value before supply to furnace.

5.2.9 *The criteria for achieving 99.9999% Destruction and Removal Efficiency (DRE) are given by the USEPA as two seconds residence time in the secondary chamber at 1200 ^{o}C and a minimum of 3% Excess Oxygen. Trial burns will confirm the DRE.

5.2.10 *The residence time of the system is a minimum of three seconds in the secondary chamber at maximum gas flow.

5.2.11 *In the event of a power failure, DRE is not applicable as the fuel, PCB feed and airflow stop immediately. Emergency power supply (generator) for lighting, controls, fire fighting, etc will be installed.

5.3 CONTROLS

5.3.1 *The type, location and reliability of process control instrumentation and the parameters they will measure are described in Section 5.2.7 PER.

5.3.2 *Liquid PCBs are fed to the primary chamber via the centre of the burner. All feed lines are outside the furnace and vapourisation

does not take place until the feed reaches the centre of the naked flame. High/low temperature, pressure loss, etc will cause instantaneous shut-off of feed.

See section 5.2.7 PER for details.

5.4 RESIDUES

5.4.1 *Automatic solids discharge to vented area for cooling, then transport to landfill (quarry) will take place.

5.4.2 *The quench unit and scrubber are conventional, well proven pieces of equipment. Their efficiency will guarantee hydrogen chloride emissions well within national and international standards. Loss of cooling water will shut off PCB feed.

5.4.3 *If burning pure PCBs at maximum rates, approximately 400 kilogram per day of sodium hydroxide would be required to neutralise flue gases. Actual requirements will be far less as a large proportion of the PCB wastes are solids (steel, contaminated clothing, etc) and solvents.

5.5 SAFETY

5.5.1 PCB liquids will be stored in a liquids tank farm that will provide full fire control, spillage containment and vapour control for all waste liquids stored.

*Further details will be developed during the design phase in consultation with relevant agencies.

5.5.2 *A fault tree analysis with meaningful figures is not possible to develop until detailed design of the plant is done. Naturally, such analysis (ie a HAZOP) will be carried out at that stage. At present, a comprehensive fault identification has been undertaken with consequences and preventive measures outlined for each possible fault.

5.5.3 *To maximise operational safety it will be necessary to have special equipment to prepare and introduce the waste into the incinerator.

5.5.4 *LPG tanks have a long record of safe use and can be sited at a safe distance so that even if a tank exploded there would be no hazard to the other components of the incinerator plant.

5.5.5 *A comprehensive fire suppression system will be installed and safety procedures applicable to the handling of flammable liquids will be adopted.

5.5.6 Provision for emergency services will include fire water supply, foam dousing (or similar) in flammable liquid storage areas, firebreaks, emergency washing facilities, visual and audible alarms and contingency planning.

5.6 GENERAL

5.6.1 Services required at the disposal facility include electrical power, auxiliary fuel, potable water and sodium hydroxide.

5.6.2 *A training programme will be developed at the design phase in consultation with the staff at existing overseas facilities and state authorities such as the Department of Occupational Health, Safety and Welfare. Relevant unions will be also be asked for advice. Overall management will be by a government officer with relevant qualifications and experience.

6. SITE SELECTION (PER S10.5)

6.1 *The proponents acknowledge that use of stringent criteria provides extra assurance that the site presents no hazard to the public, to human activities such as farming, or to the natural environment.

6.2 *The Koolyanobbing site is an ideal location for the disposal of PCBs as it offers an optimal combination of a high level of environmental security, public safety and reasonable construction and operation costs.

6.3 *Furthermore this site has by far the biggest buffer zone ever used.

6.4 *There will be no uncontrolled runoff from the site.

6.5 *Process water will be retained within the plant area and evaporated or burnt if contaminated.

6.6 *Stormwater runoff will be retained and only released if uncontaminated.

6.7 *Site selection has been based on giving the absolute maximum protection to the environment and the residents of the area in accordance with the EPA guidelines.

7. HANDLING, STORAGE AND TRANSPORT (PER S10.6)

7.1 HANDLING

7.1.1 Storage, handling and transport of PCBs will be carried out only by properly trained and fully qualified operators.

7.1.2 Purpose-built sealed steel containers will be used for the PCB disposal operation as this allows for the wide variation in the form of PCB waste and the variable nature and condition of present PCB waste containers. It also ensures that the most stringent Dangerous Goods (Road Transport). Regulations can be applied to transport of PCBs without modification.

7.1.3 The sealed, steel containers provide additional security against leakage or accidental rupture and ensure that large loads are separated into discrete packages of manageable size. They allow for semi-automated handling and provide a conveniently sized container for automated decontamination ready for re-use.

7.1.4 Collection and storage of PCBs is best achieved by the use of a local collection operation in Perth to a central bulk transfer location with subsequent bulk transport to Koolyanobbing.

7.1.5 The workforce involved in the storage, handling and transport of PCBs will be carefully selected and fully trained.

7.1.6 *Record keeping will be very tight. Apart from standard documentation required by the Transport of Dangerous Goods Regulations, the Health Department will have its own "Cradle-to-grave" system with forms being signed by PCB owner, transporter and disposal site operator. All relevant details of the waste will be demanded throughout the process. The information will be computerised.

7.1.7 Prior to entering into an agreement to treat the PCB wastes the incinerator operator, with a Government officer and a representative of the owner of the waste, will inspect the waste and take samples to determine:

(a) PCB content;

(b) heat content (related to the proportion and type of solvent present); and

(c) contamination with water, clothes, rags, grit etc.

The waste containers will be appropriately labelled.

7.1.8 Waste PCBs will arrive at the Material Receiving Dock in heavy duty steel containers. On arrival at the facility the containers will be removed from the truck by a hoist and placed on the receival dock. When required they will be moved to the preparation area and opened with hand tools. The contents will then be lifted out by hoist and moved into the processing system.

Some PCB wastes will arrive at the site in large shipping containers in which they are currently stored. In these cases the container will need to be vented to the incinerator (three air exchanges) to prevent the emission of any evaporated PCBs. The shipping containers will also be cleaned on-site and then disposed of as landfill.

7.1.9 Interim storage of waste PCBs at the incinerator site will be undertaken in the transport containers for solids and in the liquids tank farm for liquids. Features of the storage facilities include:

(a) 100% containment capacity for the liquids storage tanks. (This will be by way of a bunded area around the tanks, draining to a remote (greater than 10 m) subsurface sump. Any spilt material will be pumped from the sump into drums and moved to the waste feed into the incinerator.);

(b) inert gas blanket for flammable solvents contaminated with PCBs;

(c) fire prevention systems will be provided to all areas of flammable material storage to meet the requirements of the Flammable Liquids Regulations;

(d) venting of gases from liquids storage tanks to the incinerator;

(e) storage of drummed wastes and other PCB-contaminated solids under a roofed area to minimise surface run-off contamination;

(f) facility for removal of sludge from the base of liquids tanks;

(g) mixing tank to blend various liquids (solvents, PCB oils) to achieve a uniform heat loading on the incinerator; and

(h) contained and controlled drainage, and drainage water disposal system for the whole site.

7.1.10 The capacitors will be drained of liquid PCBs prior to being charged to the incinerator, as far as the viscosity of the fluid allows. Holes will be punctured in the casing by an automatic press and the liquid PCB allowed to drain into a sump before being pumped to the liquid PCB storage tank. The operation will be undertaken in an enclosed hood, with extracted fumes being vented to the incinerator. After draining has finished, the holed capacitor will move onto a steel tray in a well vented area ready to be charged to the incinerator. Remote handling operations will be assisted by an overhead monorail crane and/or a forklift.

7.1.11 Liquid PCBs in drums will be removed by pumping or by inverting each drum over a sump from where it will be automatically pumped to the main PCB storage tank. The drums will then be moved to the puncturing press and treated in the same way as capacitors (see 7.1.10).

7.1.12 PCB spills will be handled according to the following guidelines:

(a) any skin contact with PCBs is to be prevented;

(b) protective clothing including gloves, wet weather clothing, gum boots, must be worn;

(c) gloves, clothing or gumboots which have come into contact with PCBs are not to be retained for future use but are to be disposed of by incineration;

(d) eye protection must be worn;

(e) no smoking is to be permitted during the clean-up;

(f) if a large spill occurs, a bund is to be formed with absorbent material to prevent any escape of PCB material;

(g) under no circumstances are PCBs to be permitted to enter sewers or water courses;

(h) spilled fluid must be absorbed, using materials such as cloth, paper towel, sand or sawdust;

(i) soil or gravel which has been contaminated by the spill/leak is to be dug up;

(j) all absorbent waste materials including clothing, soil etc are to be placed in a strong polyethylene bag;

(k) the bag must be sealed and placed in a sound metal drum;

(l) the drum must be securely sealed with a ring lock;

(m) the drum must be labelled;

(n) where a significant spill (ie in excess of 500 mL) to the environment has occurred, the Environmental Protection Authority must be notified;

(o) equipment is to be cleaned down with a suitable solvent such as kerosene and contaminated solvent placed in a sound metal drum;

(p) further leakage is to be prevented either by containment or decanting into heavy duty metal drums in good condition;

(q) flammable PCB contaminated clean-up fluids must be stored in separate drums; and

(r) drums containing contaminated kerosene must be labelled.

7.1.13 *Further details of receival, handling and storage will be contained in the operations manual to be developed concurrently with detailed design of the plant.

7.2 STORAGE

7.2.1 *PCBs will be collected on rotation from the current storage points. Only existing sites will be used for storage until the PCBs are transported to the incinerator site. A possible exception may be a small Health Department controlled depot for collection of small PCB items.

*The same safeguards as at present will be maintained at the storage points.

7.2.2 *The quantity of PCBs stored on-site will be approximately three weeks' supply. It should be remembered that tonnes of PCB means PCBs and their containers. For example, a capacitor weighs approximately 40 kilograms, but only 10 kg is PCB.

7.3 TRANSPORT

7.3.1 The use of a single private transport operation selected by tender will provide the most consistent, safe and efficient means of collection and bulk conveyance of PCB wastes.

7.3.2 Main highways from the Pilbara to Perth and from Perth to Koolyanobbing provide the most suitable routes for bulk conveyance of PCBs.

7.3.3 *The need for contingency planning to cover any emergency situations is recognised.

The existing State Road Transport Emergency Assistance Scheme (WATEAS) provides the most effective and suitable means for handling emergency situations involving PCB transport.

*This well established emergency response arrangement involves the Police, Fire Brigade, Mines and Health Departments and other agencies are on stand-by for assistance. In the case of PCB handling and transport it is proposed to enlarge the scheme by providing specific training to all agencies which may be involved in such an emergency. It will include local fire brigades and police, local authorities, as well as hospitals and the Royal Flying Doctor Service. In addition, radio or telephone contact will be available between all parties which may be involved.

7.3.4 *Transport will comply with all relevant requirements of the Dangerous Goods (Road Transport) Regulations. In addition further safeguards will include:

(a) specific transport containers;

(b) definition of specific transport routes;

(c) specific documentation of PCB waste;

(d) regular stops during transport to check load;

(e) equipment on truck for emergencies and spills; and

(f) radio contact with relevant authorities.

7.3.5 *The PCB material will be transported in special containers, ie double sealing from the environment.

7.3.6 Action is required to develop an Emergency Procedures Guide card relating to PCBs before transport connected with the disposal operation is commenced.

8. ENVIRONMENTAL ISSUES (PER S10.7)

8.1 <u>ENVIRONMENTAL MANAGEMENT</u>

8.1.1 Gaseous residues will be disposed of by enhanced atmospheric dispersion.

8.1.2 Liquid residues will be contained and evaporated.

8.1.3 Solid residues will be disposed of as landfill.

8.1.4 *With the controls and safeguards employed no contamination should take place.

8.1.5 *All solid residues will be covered at regular intervals. The aim will be to rehabilitate the quarry to its original contours and return the site to its natural state.

8.1.6 Prior to examining the impact of emissions and wastes from the disposal plant, consideration was given to setting allowable limits of PCB contamination as follows:

(a) Levels of PCBs constituting hazardous wastes - a level of 50 ppm PCBs should be generally adopted as the lower limit for materials to be classified as PCB contaminated with the exception that a 2 ppm lower limit be used as the standard for effective decontamination as applied to solid residue from the incinerator;

(b) PCBs in atmospheric emissions - standards set by United States agencies for incinerator efficiency will be adopted for the proposed disposal facility, these being that the Destruction and Removal Efficiency of the incinerator will be not less than 99.9999% and that the combustion efficiency will be not less than 99.9%;

(c) Standards for other residues from PCB incineration - standards adopted will be as prescribed by the Australian National Health and Medical Research Council (1985);

(d) Occupational standards for PCBs - the standard for PCB levels set by the US National Institute for Occupational Safety and Health in the workplace will apply, this being that the average PCB levels over an 8 hour working day should not exceed 1 microgram per cubic metre of air;

(e) Environmental standards for PCBs - ground level concentration of PCBs shall not exceed 0.033 micrograms per cubic metre;

(f) Landfill disposal of PCBs - no standard is adopted for landfill but levels of PCB contamination in all solid waste from the incinerator will be less than 2 ppm which is well below allowable levels in the United States;

(g) PCB tolerances in food - maximum permissible levels will be as specified by the National Health and Medical Research Council of Australia (1986); and

(h) Standards relating to PCDFs and PCDDs - these standards have yet to be adopted but shall comply with those under consideration by New York authorities which set allowable daily intake of 2,3,7,8 TCDD at 2 picograms per kilogram of body weight per day.

8.1.7 There will be minimal environmental impact during the construction phase and all emissions and wastes can be handled by normal procedures.

8.1.8 Transport of PCBs represents the highest risk activity associated with the disposal operation. However, the use of sealed, steel containers will minimise the risk of spillage in a traffic accident and will also limit the quantity of PCBs that may be released in a serious accident. Training of transport crews and adequate contingency planning through the TEA Scheme will further limit impact associated with an emergency situation.

8.1.9 Adverse impact on the social environment from the proposal will be minimal and limited to some marginal increase in risk of contamination caused by the need to transport bulk PCBs through population centres. Beneficial effects are predicted from the safe disposal of hazardous materials presently in unreliable storage around the State and the ultimate destruction and thereby elimination of all PCBs in Western Australia.

8.1.10 Decommissioning and rehabilitation can be achieved without excessive cost and with minimal long term effects on the plant site or its surrounding environs.

8.1.11 *The amount of PCBs stored on the site will be approximately three weeks' supply. Note that tonnes of PCB means PCBs and their containers.

8.1.12 *Transport containers where necessary will be cleaned at the disposal site with solvents before re-use for PCBs transport and the solvent will be burnt in the incinerator. The Government Chemical Laboratories will be asked to design a trial cleaning exercise to determine the treatment necessary to ensure that the containers are free of PCBs before re-use. During the trial the amount of PCB surface contamination in the containers after various degrees of cleaning will be measured. Thereafter, the appropriate cleaning prescription will be strictly adhered to by the operator as a condition of the contract. At the end of the project the containers will be finally decontaminated and salvaged or disposed of at the quarry landfill.

8.1.13 *The need for contingency planning to cover any emergency situation is recognised. A well established emergency response arrangement already exists: ie The WA Transport Emergency Assistance Scheme (WATEAS) which involves the Police Fire Brigade, Mines and Health Departments with other agencies being on stand-by for assistance. In the case of PCB handling and transport it is proposed to enlarge the scheme by providing specific training to all agencies which may be involved in such an emergency. It will include local fire brigades and police, local authorities, as well as hospitals and the Royal Flying Doctor Service. In addition, radio or telephone contact will be available between all parties which may be involved.

8.2 GASEOUS EMISSIONS

8.2.1 *The efficiency for destruction of PCBs in the proposed unit has been proven conclusively.

8.2.2 Despite extremely low health risks, a decision has been made to site the incinerator at a remote location with effectively a 7 km radius "buffer zone" around the disposal site.

8.2.3 The high efficiency of the incinerator (DRE not less than 99.9999% and combustion efficiency not less than 99.9%) will limit stack emissions, but flue gas will be further treated in a scrubber system to remove hydrogen chloride.

8.2.4 An air pollution control system using either a wet or dry scrubber system will be installed to limit particulate and gaseous emissions to acceptable levels.

8.2.5 *Air dispersion modelling presented in the PER indicates that ground level concentrations of significant chemicals outside the plant will be well within national and international standards.

8.3 LIQUID WASTES

8.3.1 On-site liquid wastes will be fully contained and generally disposed of by evaporation unless they result from PCB spillage in which case they will be fed into the incinerator.

8.3.2 *THERE WILL BE NO UNCONTROLLED RUNOFF FROM THE SITE.

8.3.3 *Process water will be retained within the plant area and evaporated or burnt if contaminated.

8.3.4 *Stormwater runoff will be retained and only released if uncontaminated.

8.3.5 *All potentially contaminated stormwater will be collected and stored in the ponding system. No release to the environment without proof of no contamination will occur.

8.3.6 *The evaporation pond size is approximately 1 000 cubic metres which will adequately cover the event of a very heavy thunderstorm. This pond will be lined.

8.3.7 *There will be no evolution of particulate fugitive emissions from the wastewater pond. Only sodium chloride (common salt) will be in high concentration.

8.4 SOLID WASTES

8.4.1 Solid residues including remnants of burnt PCB containers and residue from evaporation ponds will be disposed of as landfill in the quarry adjacent to the site. Monitoring of leachates will be carried out to ensure no pollution occurs from this waste.

8.4.2 *Solid waste deposited in the quarry will be burnt out capacitors, ash, etc.

8.4.3 *PCB - containing capacitors can be burnt to a stage where PCBs are not detectable.

8.4.4 *US EPA standard for non-PCB material is defined as less than 50 ppm and incinerator ash as less than 2 ppm. Solid waste from the facility will easily comply with these standards.

8.4.5 *Automatic solids discharge to a vented area for cooling will take place prior to transport to landfill (quarry).

8.4.6 During the trial burn period, PCB equipment which has passed through the incinerator will be tested to ensure that the scrap metal is decontaminated. The need for further random testing during the operational phase will be finally determined after consultation with the Environmental Protection Authority. The design for these tests will be determined by the Government Chemical Laboratories. The system has been designed to ensure that all metal surfaces that have been in contact with PCBs will be exposed to heat in the incinerator. As a result, effective destruction of PCBs is expected. If this is the case, the proponents believe that no further checking of the scrap metal will be necessary as the required combustion efficiency will ensure that the necessary destruction level is maintained.

8.4.7 Sludge from the base of the recirculation tank will consist of particulates captured in the scrubber water. The sludge will be periodically analysed for organic and heavy metal contents before being disposed of as landfill. High organic contents will mean the sludge will be re-incinerated. High heavy metal contents will require solidification and fixation treatment (binding with cement to form a concrete) prior to disposal. The sludge will be dewatered on site by natural evaporation prior to disposal.

8.4.8 Ash from the primary combustion chamber will be handled in the same manner as sludge from the recirculation tank (see 8.4.7).

8.5 MONITORING

8.5.1 A monitoring programme involving continuous and intermittent sampling, testing and monitoring of plant operating conditions together with soil and leaf sampling and testing from around the incinerator site will be carried out.

8.5.2 *The monitoring programme will include the following:

(a) monitoring of the Lake Deborah system;

(b) monitoring of locally produced honey;

(c) monitoring of cattle, sheep and crops on the Guerini and Della Bosca family lands;

(d) monitoring of local ponds/farm dams; and

(e) regular monitoring within the plant including land disposal site and within a 2 km radius of the facility.

*Additional monitoring suggested by the Department of Agriculture, the Department of Conservation and Land Management and the Environmental Protection Authority will also be included.

8.5.3 *The monitoring programme will be developed during the design phase and background sampling carried out before start-up. A systematic air, soil and biological sampling study will be implemented prior to the start of operations to enable levels during operation to be compared with pre-existing conditions.

8.5.4 *The Department of Agriculture will be consulted on the monitoring programme for sandalwood and honey.

8.5.5 *Monitoring of PCB levels and for the presence of furans and dioxins in and around the plant will be the responsibility of a combination of Government agencies, especially the Health Department and the Government Chemical Laboratories. One of these agencies will maintain an officer on-site at all times to monitor operating parameters and general operational safety.

8.5.6 *The Health Department is prepared to finance independent low-frequency monitoring.

8.5.7 *The results of monitoring will be made available to workers at the facility and to residents of the Shire of Yilgarn through a proposed Community Liaison Committee (see 1.13).

8.5.8 *Intensive monitoring will ensure this to be a safe facility.

9. OCCUPATIONAL HEALTH (PER S10.8)

The protection of workers at the disposal site has been a major concern during the development of this proposal. Commitments to ensure adequate health protection for all employees involved in the plant operation are:

9.1 Initiation by the Occupational Health, Safety and Welfare Commission to develop comprehensive guidelines for safe handling of PCBs during storage, transport and destruction operations.

9.2 All personnel will be fully trained in the handling of PCBs using a course to be developed and administered by the Occupational Health, Safety and Welfare Commission or by the Trades and Labor Council.

9.3 *A training course will be provided for all personnel involved with PCB disposal in Western Australia. Such training may be coordinated by the Occupational Health, Safety and Welfare Commission in accordance with Section 14 of the Occupational Health, Safety and Welfare Act or by the Trades & Labor Council with support by Government agencies or by the operator/manager. The training programme will occur prior to the start of the project and refresher courses will be provided as necessary. All new employees will be trained.

9.4 A thorough medical surveillance programme will be provided to give baseline and progressive personal health data throughout and beyond the employment period for each worker.

9.5 First aid and hygiene measures will be provided at the disposal facility.

9.6 The need for full protective clothing during normal operations will be evaluated just prior to the time when the facility becomes operational. Sufficient protective clothing will be provided at the site to cover emergency situations.

9.7 Contingency planning will be developed as part of the handling guidelines (see also 7.3.3 and 7.1.12).

9.8 Noise levels in the disposal plant will comply with the Noise Abatement (Hearing Conservation in Workplaces) Regulations, 1983.

9.9 *The proponent gives an assurance that occupational health matters will receive close attention during the design stage, and consultation with relevant agencies, unions and overseas operating facilities will take place. See also 8.1.6, 8.5.5, 8.5.7 and 8.5.8.

10. INSURANCE AND COMPENSATION

10.1 *Insurance cover will be determined by Government policy. Basically two possibilities exist:

(a) Public and Third Party Indemnity with an appropriate liability (eg $5 million), or

(b) A Government guarantee.

*The former would involve a sizeable addition to the annual operating costs and therefore to the unit costs for destruction. Coverage by Government guarantee is a common approach to underwriting risks and avoids the annual outlay of a premium, but involves direct costs to Government in case of claims.

10.2 *The mechanism for assessing any claim would in either case probably be based on detailed assessment of the validity of the claim and the damages sought, employing competent assessors.

* Indicates commitments made in the response by the Health Department of WA (23 April 1987) to the EPA.

FAULT IDENTIFICATION AND MANAGEMENT PROGRAMME

Preliminary fault indentification and Management Programme outlined for the incineration facility.

FAULT IDENTIFICATION

COMPONENT	POSSIBLE FAULTS	CONSEQUENCES	CONTINGENCY/PREVENTION MEASURES
1. Waste Receival and Storage			
1.1 Capacitor Draining	(a) Breakdown of forklift and/or mono-rail crane	(a) Incoming waste cannot be unloaded from trucks or moved from storage to draining facility etc. (Inconvenience, no hazard)	(i) Provide sufficient storage for trailer and unprocessed waste. Provide sufficient storage of liquid wastes and packaged solid wastes to enable incinerator operation to continue while forklift etc. being repaired. Provide a range of spare parts on-site including a spare mono-rail crane.
	(b) Breakdown of hydraulic puncturing equipment pumps etc.	(i) Inconvenience, no hazard processing of capacitor draining and/or pumping of liquid wastes from drums stopped.	(i) Provide adequate storage to allow incoming wastes to be received and to allow operation of the incinerator to continue. Provide a range of spare parts on-site.
	(c) Breakdown of exhaust fan in hood above capacitor draining facility	(i) Hazard: concentration of PCBs in air in vicinity of operators may be elevated.	(i) Provide warning light and alarm to indicate fan failure (in control room) Provide interlock on hydraulic puncturing press, preventing its operation during fan failure.
		(ii) Inconvenience: contingency plan for (c)(i) leads to consequences per (b)(i) above (processing of capacitors stopped)	(ii) Provide adequate storage for incoming wastes and processed wastes to enable operation of incinerator to continue. Provide adequate spare parts on-site.
1.2 Emptying liquid PCBs from drums	(a) Breakdown of pump	per (b)(i) above	per (b)(i) above
	(b) Escape of volatile solvents and PCBs from drums	(i) Hazard: health risk worsened	
		(ii) Hazard: explosion/fire risk worsened	(ii) Prevent by adequate testing and labelling drums Prevent by removing bung in top of drum extract volatiles by exhaust fan/duct and dispose of in the incinerator. Prevent by minimizing potential for sparks in the area (special equipment, coatings, no smoking)

COMPONENT	POSSIBLE FAULTS	CONSEQUENCES	CONTINGENCY/PREVENTION MEASURES
1.3 Liquid PCB Storage	(a) Leak of volatiles from gas space above liquids	(i) Hazard: health risk	(ii) Prevention by provision of nitrogen blanket above liquid surface. Displaced gas (as tank filled with liquid PCBs) is vented to the incinerator.
	(b) Rupture of tank and spillage of contents	(i) Hazard: health risk (ii) Hazard: explosion/ fire risk	(ii) Provision of full containment bunds around tanks, drainage of spilled material to remote dump to minimize fire hazard, recycle spilled PCBs to storage tank following its repair. Prevention by routine inspection of integrity of tanks (unlikely to be a problem due to limited life of facility) Containment by fire fighting system
1.4 PCB Contaminated Solids Storage	(a) Fugitive emission of solvents/PCBs	(i) Hazard: health risk (ii) Hazard: explosion/fire risk	(i), (ii) Prevention by covering drums and trays with a combustible air tight sealing membrane Containment by fire fighting system. Control by regular monitoring of PCB concentration in air.
2. <u>Waste Feed System</u>			
2.1 Liquid Waste Feed	(a) Failure of pump	Inconvenience - liquid waste feed stopped until pump repaired.	(i) Provide spares on-site
	(b) Failure of feed line	(i) Hazard: health risk (also fire risk if solvents involved)	(i) Regular inspection of feed lines. Place feed lines within pipes or channels to collect leakage pump back to storage tanks Store replacement pipes and fittings on-site
2.2 Solid Waste Feed system	(a) Failure of hydraulic ram feed mechanism	(i) Inconvenience - solid waste feed stopped until ram repaired.	(i) Provide spares on-site and undertake routine maintenance.

COMPONENT	POSSIBLE FAULTS	CONSEQUENCES	CONTINGENCY/PREVENTION MEASURES
2.2	(b) Failure of isolating gates in air locks	(i) Inconvenience - solid waste feed stopped until gates repaired - may have to also shut down furnace.	(i) Provide spares on-site and undertake routine maintenance.
	(c) Failure of fan on preheated air system	(i) Inconvenience - increased fuel usage to maintain temperature in primary and secondary combustion chamber.	(i) Repair fan - no need for spares on-site.
		(ii) Hazard - environmental risk - reduced air supply leads to reduced combustion efficiency.	(ii) Monitoring of combusion efficiency (continuous O_2) in stack gas (p54)) and warning light and audial alarm indicates faulure of preheated air fan. Automatic compensation by increasing the speed of the I.D. fan to draw through more air.
3. Combustion Chambers			
3.1 Primary combustion Chamber	(a) Failure of waste injection nozzle	(i) Inconvenience - liquid waste injection stopped	(i) Provide spare nozzle on-site and replace.
	(b) Failure of fuel supply and/or nozzle	(ii) Hazard - environmental, temperature in primary and secondary kiln drops below 1000°C and 1200°C respectively.	(ii) Automatic control shuts off liquid and solid waste feed. Manual start-up to restart waste feed required after temperature normalised.
	(c) Incomplete combustion of PCBs in contaminated solids	(i) Hazard - environmental, if solids subsequently disposed of off-site.	(i) Routine analysis of residual PCB content of contaminated solids. Should elevated levels be detected (> 2ppm) then these solids would be incinerated for a second time and the retention time for these particular solids would be increased in future to avoid the need for double incineration.
	(d) Failure of refractory lining material	(i) Inconvenience - loss of heat from the system and increased fuel usage. Hazard - higher steel temperatures on outside lining pose a hazard to operators.	(i) Routine monitoring of outer steel shell temperature to warn of the occurrence of refractory lining failure. Routine inspection and repair of refractory lining (6-12 month intervals).

COMPONENT		POSSIBLE FAULTS	CONSEQUENCES	CONTINGENCY/PREVENTION MEASURES
3.2 Secondary Combustion chamber	(a)	Failure of fuel supply and/or nozzle	Refer 3.1.(b)	Refer 3.1.(b)
	(b)	Failure of refractory lining material	Refer 3.1.(d)	Refer 3.1.(d)
	(c)	Explosion of unignited gas in primary or secondary chamber.	(i) Hazard - damage to process equipment (ii) Hazard - poor combustion of wastes and emission of un-combusted PCBs and products of incomplete combustion.	(i), (ii) Pilot flame in both combustion chambers at all times - if extinguished then alarm initiated and waste feed stopped Wastes tested and fed in at controlled rate so possibility of shock loading of solvents minimised. Volume of primary and secondary chambers and operation under negative pressure ensures most transient pressure increased can be contained within the combustion chambers. Emergency relief valve on top of secondary combustion chamber releases excess pressure to prevent damage to process equipment. Analysis and rectification of problem to ensure short duration (seconds) release of poorly combusted wastes not repeated.
4. Air Pollution Control Devices				
4.1 Cooling Chamber	(a)	Failure of water supply to chamber	(i) Inconvenience - particulates in semi-molten condition stick to heat exchanger and reduce its effectiveness.	(i) Utilize emergency H_2O supply until fault rectified.
			(ii) Inconvenience - possibly heat damage to downstream equipment.	(ii) Increase supply of water to venturi to provide additional cooling to protect downstream equipment.
4.2 Heat Exchanger	(a)	Failure of fan	(i) Inconvenience - reduced preheated air to combustion chambers increases fuel consumption to maintain temperature.	(i) Provide spare parts on-site.

COMPONENT	POSSIBLE FAULTS	CONSEQUENCES	CONTINGENCY/PREVENTION MEASURES
4.2		(ii) Hazard - environmental - reduced air supply reduces combustion efficiency.	(ii) Increase fan speed for ID fan and other preheated air fans to compensate until fan repaired
		(iii) Inconvenience - visible plume as stack gases are not reheated.	(iii) No action required.
4.3 Venturi Scrubber	(a) Failure of water supply	(i) Hazard - damage to equipment and failure to remove acid gases from off-gas	(i) Provide emergency water supply, gravity feed to venturi if normal water supply fails. Shut down incinerator until fault rectified.
	(b) Failure of NaOH system.	(i) Inconvenience - acid gas removal efficiency decreased, pH decreases until efficiency very low.	(i) Shut down liquid PCB feed until pH control system rectified.
	(c) Blockage of venturi throat at water sprays	(i) Hazard - acid gas removal stopped, off-gas bypasses scrubber (venturi is more reliable than other wet scrubber in this regard).	(i) Shut down liquid PCB feed until venturi unblocked. Routine inspection and maintenance. Potential for blockage indicated by changes in pressure drop across throat of venturi.
4.4 Demister	(a) Corrosion of air blockage between plates	(i) Inconvenience - increased steam plume and possibly increased corrosion of ID fan.	(i) Routine inspection and maintenance.
4.5 I.D. Fan	(a) Fan failure	(i) Hazard - loss of negative pressure throughout system, potential for fugitive emissions of PICs at joints and seals.	(i) Automatic shut down of waste feed if negative pressure in primary combustion chamber is not maintained. Repair ID fan and restart. Provide spare parts on-site.
4.6 Stack	(a) Failure of continuous monitoring devices.	(i) Hazard - environmental - combustion efficiency of incineration system cannot be continuously monitored.	(i) Shut down of waste feed, replacement of monitors with spare held on-site, check on performance and restart waste feed.

COMPONENT	POSSIBLE FAULTS	CONSEQUENCES	CONTINGENCY/PREVENTION MEASURES
5. Power Supply	(a) Failure of electrical power supply	(i) Hazard - environmental - system shuts down.	(i) Automatic start-up of standby diesel generator to supply emergency power to lighting system and key controls, valves and pumps to avoid damage to system. Shut down of waste feed in incinerator.

8.1 ENVIRONMENTAL MANAGEMENT OUTLINED IN THE PER

The proponent has made a comprehensive set of commitments (see Appendix 2) to manage the potential impacts of the incineration facility and to ensure that these impacts would be minimised and ameliorated.

8.2 MANAGEMENT OF THE FACILITY

The PER discusses six management options in terms of who would be operating the facility. The proponent's preferred management option consists of Government financing the facility but that a private contractor designs, builds and operates the facility. After reviewing this matter, the Authority concludes that this is a matter for the Government to decide.

However, the EPA believes that irrespective of which management option is chosen by the Government, an experienced operator should be chosen to manage the proposed facility.

9 RECOMMENDATION

The Environmental Protection Authority recommends that the incineration facility should be operated and managed by an experienced operator.

8.3 MONITORING

The proponent has made the following major commitments regarding the monitoring of the proposal:

". A monitoring programme involving continuous and intermittent sampling, testing and monitoring of plant operating conditions together with soil and leaf sampling and testing from around the incinerator site will be carried out;

. The monitoring programme will be developed during the design phase and background sampling carried out before start-up. A systematic air, soil and biological sampling study will be implemented prior to the start of operations to enable levels during operation to be compared with pre-existing conditions;

. The Department of Agriculture will be consulted on the monitoring programme for sandalwood and honey;

. Monitoring of PCB and HCL levels and for the presence of other parameters in and around the plant will be the responsibility of a combination of Government agencies, especially the Health Department and the Government Chemical Laboratories. One of these agencies will maintain an officer on-site at all times to monitor operating parameters and general operational safety;

. The Health Department is prepared to finance independent low-frequency monitoring; and

. The results of monitoring will be made available to workers at the facility and to residents of the Shire of Yilgarn through a proposed Community Liaison Committee." (Source: Appendix 2)

The EPA notes the proponent's commitment regarding monitoring and believes that the proponent needs to prepare its monitoring programme in consultation with and to the satisfaction of the EPA.

10 RECOMMENDATION

The Environmental Protection Authority recommends that the proponent prepare a monitoring programme to the satisfaction of the EPA before the commissioning of the incineration facility. This programme should include the following:

- the parameters contained in the proponent's commitments;
- the results to be forwarded to the EPA;
- the programme to be reviewed by the EPA after 2 years; and
- it should address baseline and post - PCB disposal monitoring requirements.

As mentioned earlier, the Authority will undertake periodic environmental and safety auditing of the plant.

8.4 COMMUNITY LIAISON

The Shire of Yilgarn in its submission has raised the question of community liaison in managing the project.

In response to this issue, the proponent states that:

> "The proponent considers liaison with local residents very important. It is therefore suggested that a Liaison Committee be established to monitor and be informed of the activities at the facility. The Committee could consist of one or two elected members of the Yilgarn Shire Council, the local health surveyor and one or two local residents. These people would meet at regular intervals with the manager of the plant and representatives of the Health Department of WA, EPA and DOSHWA." (Source: Appendix 2)

9. CONCLUSION

This Assessment Report provides an environmental input to decision making on the proposed incineration facility for PCBs near Koolyanobbing. In preparing this report, the Authority has considered a range of documentation and technical information and has been assisted by contributions from the public and other Government agencies.

The Authority believes that it is environmentally acceptable to locate the proposed incineration facility near Koolynobbing. From its investigations on the proposal, the Authority has concluded that if an incinerator is designed, commissioned and operated properly, and given the 2-7 km buffer zone at each of the two proposed sites, then it would meet the EPA's expectations of environmental performance.

After undertaking its assessment, the Authority makes the following conclusions:

. Long-term storage of PCBs in Western Australia would be environmentally undesirable to the EPA.

. High temperature incineration is technically and environmentally the most acceptable method of disposing of Western Australian PCBs.

. The Western Goldfields near Koolyanobbing is an appropriate area to locate such an incinerator.

. Either of the two proposed sites near Koolyanobbing are environmentally acceptable to the EPA.

. All bulk transportation of PCBs from the storage depots in Perth to the incinerator facility should be by rail.

. The safety aspects of the facility as well as the emissions and discharges from the facility are manageable.

Given the above, the Authority believes that the proposed incinerator facility of PCB disposal near Koolyanobbing is environmentally acceptable subject to the proponent's commitments and the EPA's recommendations.

There are number of other issues which have been assessed and discussed in this Assessment Report, including monitoring during the operational phase and the issue of community liaison with the local shire. The general conclusion is that the proponent has developed a detailed proposal which takes into consideration these matters which can be resolved in an environmentally acceptable manner.

The Authority would require regular reporting from the proponent on the facility's management and monitoring programme and would undertake periodic auditing of the facility.

REVIEW OF SUBMISSIONS

This appendix contains the List of Government Departments and others (including individuals and groups) who have made submissions, to the EPA, on this proposal.

A total of 61 submissions were received. Of these, 19 were from Government departments, four were from Local Authorities, two from conservation orientated groups and the balance from private individuals, companies and tertiary institutions.

The main issues addressed in all submissions are indicated in Table 1 of the Assessment Report.