PROPOSED DEVELOPMENT AT McCABE STREET MOSMAN PARK

LANDBANK

Report and Recommendations of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 324 April 1988

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i SUMMARY AND RECOMMENDATIONS

Landbank (formerly the Western Australian Urban Land Council), the proponent, is a Government agency established to acquire, develop and market residential land in the Perth Metropolitan Area and to ensure the availability of supply at a reasonable price in a range of locations.

Landbank proposes to develop a former industrial site between McCabe Street, Mosman Park and the Swan River for residential and parkland purposes (Figure 1). There is a need to clean up and manage the site such that it is safe for public use whilst at the same time realise the site's residential and recreational amenity. Landbank's proposal seeks to achieve this by various site treatments, by appropriate planning and by continued management and monitoring.

This site was first used for commercial purposes in 1895 as a limestone quarry. Between 1910 and 1969 sulphuric acid was produced in lead lined containers using a variety of sulphur compounds, for the manufacture of fertilizers. Many of the compounds, including pyrites from the Goldfields, contained heavy metals which, in addition to lead, now contaminate the site. Later, improved gold cyanide extraction techniques allowed further gold extraction from pyrites on site, hence the presence of cyanide.

A Public Environmental Report (PER) was submitted by the proponent in November 1987 to the Environmental Protection Authority (EPA) and released for a 10 week public review period commencing on the 23 November 1987 and concluding 29 January 1988. The Authority received 16 submissions.

The Authority's assessment and issues identified in public and government submissions raised concerns in the following general areas and are summarized below:

Rehabilitation:

The method and adequacy of rehabilitation of the site and foreshore was highlighted. Particular issues such as the nature of sealant to be used, stability and landscaping of proposed dumps, cleaning up the foreshore and removal of highly contaminated material off site were some issues raised. Others include dust and noise control, qualified supervision during rehabilitation, erection of warning signs of contaminants, installation of domestic services and provision for barbeques.

Groundwater and monitoring:

Groundwater issues were mainly concerned with establishing a proper data base before rehabilitation, contamination, monitoring, use of bores, increased salinity and consideration of other users in the area.

Swan River:

The major issues regarding the Swan River were rates of leaching of heavy metals to the foreshore, nature of cleanup along foreshore and the issue of the erection of signs warning against eating contaminated mussels. In addition, clarification was required concerning the nature of stormwater discharge to the Swan River and use of mussels for monitoring pollutants.

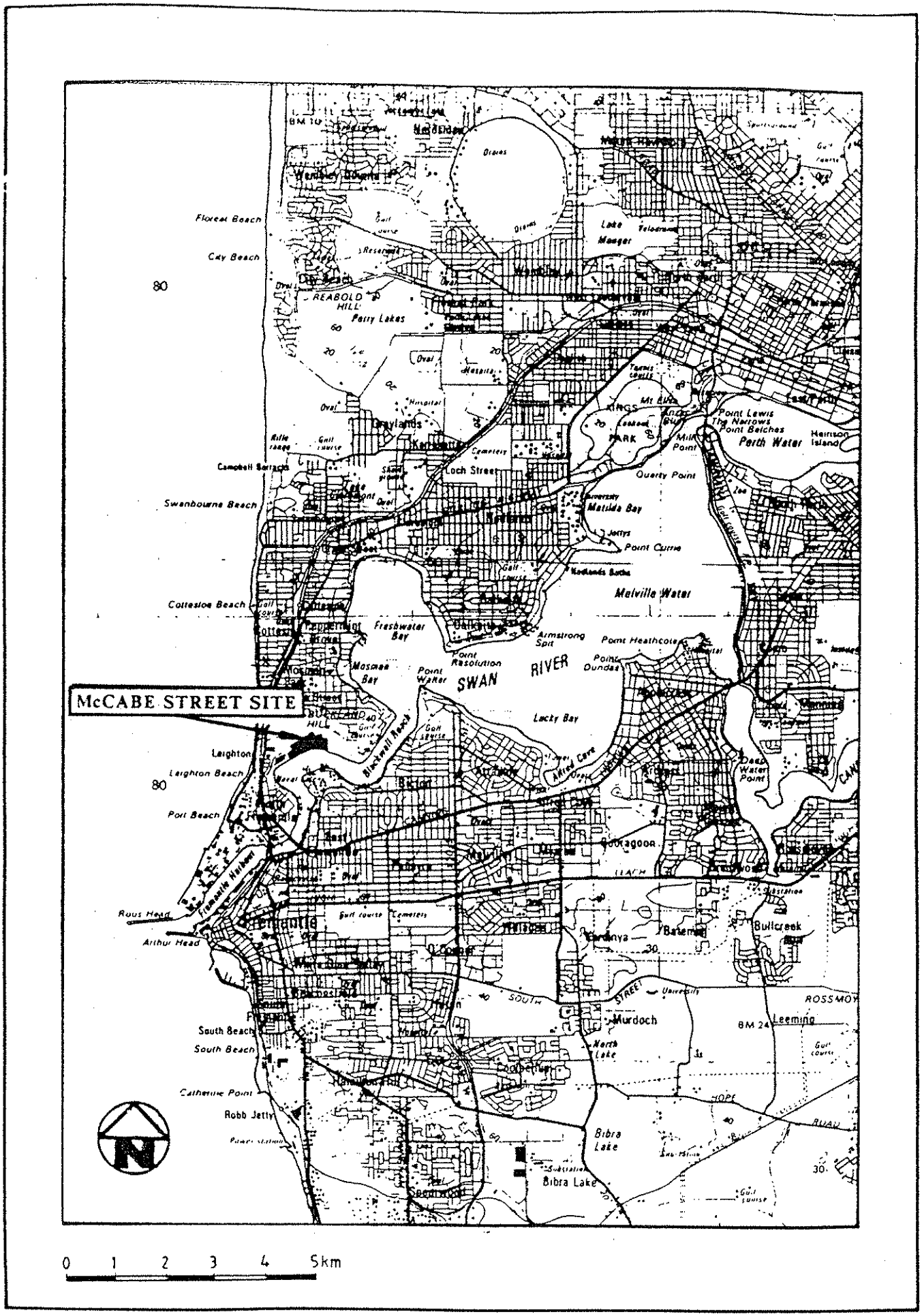

Fig. 1 Location of development site (Source of Fig.:PER)

On Site Worker Safety:

Due to the nature of the proposed site works, concern was expressed about protection for workers against inhaling and touching contaminated material. In addition, noise and dust levels should be controlled.

Housing Development and Open Space:

Several contrasting suggestions concerning the type of residential development for the area were submitted ranging from high rise to single residential on large blocks. In addition, assurance was sought that the proposed open space would not be developed at a later stage.

The Authority has assessed the environmental impacts of the proposal utilising the PER, additional information supplied by the proponent, other government agencies and the public. It specifically notes the comprehensive list of commitments the proponent has made in the PER and the additional commitments after analysis of submissions to assure the environmental acceptability of rehabilitation.

The Authority considers the project to be environmentally acceptable and that it could proceed subject to the commitments given by the proponent in the PER and in response to subsequent questions, and to the Authority's recommendations in this Report.

RECOMMENDATION 1

The Environmental Protection Authority concludes that the proposal is environmentally acceptable and recommends that it could proceed subject to the Authority's recommendations in this Report and the commitments made by the proponent for rehabilitation and environmental management. These commitments include:

provisions to ensure that the health of workers and residents is not jeopardised;

specific details to remove hazardous material and other contaminated material;

ensuring that the surrounding environment including the Swan River is not degraded; and

the putting in place of a monitoring programme.

Landbank will be responsible for all monitoring programmes and will make results available to Government agencies as required by the Environmental Protection Authority; and

Landbank is committed to carrying out monitoring programmes until the Environmental Protection Authority gives approval for their cessation.

RECOMMENDATION 2

The Environmental Protection Authority recommends that groundwater monitoring bores be established systematically around the site and

groundwater movement be fully established before site rehabilitation. This work should be carried out by qualified groundwater consultants to the satisfaction of the Environmental Protection Authority, the Water Authority of Western Australia and Geological Survey of Western Australia. The proponent is to report the groundwater movement results to the Environmental Protection Authority for approval before rehabilitation commences.

RECOMMENDATION 3

The Environmental Protection Authority recommends that the Proponent has the monitoring programme approved by the Environmental Protection Authority before monitoring begins and that rehabilitation not commence until approval is given.

RECOMMENDATION 4

The Environmental Protection Authority recommends that groundwater from beneath the site not be used for dust control, clean down, potable or irrigation purposes during rehabilitation. If groundwater is proposed for any use at a later date, it should be monitored regularly by the proponent and conform to standards laid down for the proposed use by the appropriate Government Agency. Such a monitoring programme and reporting of results should comply with Recommendation 3 (above). In addition, if groundwater is used for any purpose, the proposed monitoring programme should ensure that no saltwater intrusion migrates toward the area of extraction and that water use meets the requirements of the Water Authority of Western Australia.

RECOMMENDATION 5

The Environmental Protection Authority recommends, the proponent redirect stormwater discharge from the proposed drainage system into the Mosman Park drainage system. This should be carried out during rehabilitation and to the satisfacation of the Environmental Protection Authority. The Environmental Protection Authority recommends that the proposed drainage system discharge be monitored by the proponent as part of the monitoring programme to be approved by the Environmental Protection Authority in Recommendation 3.

RECOMMENDATION 6

The Environmental Protection Authority recommends that the clean fill comprise a minimum average of 50% limestone and limesands as far as possible so alkaline conditions prevail. This should be carried out by the proponent during rehabilitation and to the satisfaction of the Environmental Protection Authority. In order to avoid water logging, sheet discharge, erosion and instability of dump mounds, the Environmental Protection Authority recommends that the proponent consider the use of alkaline red muds to cover both rehabilitated cinder dumps inconjunction with PVC liners. The final plan to protect dump mounds from further leaching should be approved by Environmental Protection Authority before rehabilitation commences. In addition, plans to ensure dump stability should meet with the Town of Mosman Park and the Environmental Protection Authority approval before and during rehabilitation, revegetation and landscaping.

RECOMMENDATION 7

The Environmental Protection Authority recommends that dust and noise level s be controlled at all times to avoid annoyance to site workers and local residents and this should be to the satisfaction of the Environmental Protection Authority, the Health Department of Western Australia, the

Department of Occupational Health, Safety and Welfare of Western Australia and the Town of Mosman Park. In addition, groundwater below the site should not be used for dust control and water used by the proponent for dust control should not enter the Swan River.

RECOMMENDATION 8

The Environmental Protection Authority recommends that details of disposal of contaminated solids should be forwarded to the Environmental Protection Authority and the Health Department of Western Australia for approval prior to commencement of rehabilitation and that rehabilitation work be carried out under qualified supervision and to the satisfaction of the Environmental Protection Authority.

RECOMMENDATION 9

The Environmental Protection Authority recommends that the proponent ensure that any underground or partially underground service be installed during rehabilitation where possible. In addition, the Environmental Protection Authority recommends that the proponent not place service lines across either of the rehabilitated cinder dumps and that service lines be surrounded by 1m of limestone cleanfill. Excavation of any service line at a later date must ensure that the cleanfill barrier is protected or re-established to the satisfaction of the Environmental Protection Authority.

RECOMMENDATION 10

The Environmental Protection Authority recommends that strict noise control be implemented by the proponent during rehabilitation and be to the satisfaction of the Environmental Protection Authority as in Recommendation 7.

RECOMMENDATION 11

The Environmental Protection Authority recommends Landbank consult with local interest parties, the Town of Mosman Park and the Swan River Management Authority and the State Planning Commission regarding all issues concerning regional plans, open space, cycleways, access and amenities before rehabilitation.

1. INTRODUCTION

Landbank (formerly the Western Australian Urban Land Council), the proponent, is a Government agency established to acquire develop and market residential land in the Perth Metropolitan Area and to ensure the availability of supply at a reasonable price in a range of locations. Landbank proposes to rehabilitate and develop contaminated land adjacent to McCabe Street, Mosman Park for residential and parkland purposes. The latter will be accessible to the public and will include the important section along the banks of the Swan River.

This McCabe Street site was first used for commercial purposes in 1895 as a limestone quarry. Between 1910 and 1969 the site was used for the production of superphosphate. In the process, sulphuric acid was produced in lead lined containers by roasting a variety of sulphur compounds including heavy metal contaminated pyrites from the goldfields and sulphur. Consequently, the site is contaminated with lead, other heavy metals and chemical by-products. With improved gold cyanide extraction techniques, dumped pyrite cinders were further extracted for gold on site, hence the presence of cyanide. The presence of asbestos as amosite at one location on site is not explainable.

A Public Environmental Report (PER) was submitted by the proponent in November 1987 to the Environmental Protection Authority (EPA) and released for a 10 week public review period commencing on the 23 November 1987 and concluding 29 January 1988. The Authority received 16 submissions.

2. SUMMARY OF PROPOSAL

Landbank proposes to rehabilitate and develop the McCabe Street site in Mosman Park for parkland and residential purposes (Fig.1) in the ratio of approximately seventy percent parkland and thirty percent residential. The parkland will occupy the area closest to the river. To achieve this, site clean up is required to render it safe for such development. Site clean up will be by way of removing all highly contaminated material from site to an approved dump, stockpiling low level contaminants into sealed dumps on site (Fig.2), covering the whole site with limestone clean fill and landscaping and revegetating it. In addition, the foreshore of the Swan River will be cleared of contaminated sediments and landscaped. Only the northern segment of the site, which is relatively uncontaminated, is proposed for residential development.

Specifically, Landbank's proposal includes:

Rehabilitation (see Figure 2b)

- Removal of topsoil from the northern part of the site to the western cinder dump and the slurry dump.
- Removal of the embankment cinder dump to the western cinder dump.
- Removal of the old site drainage system which is causing surface leaching of heavy metals to the Swan River.
- Covering the slurry dump with PVC membrane to prevent leaching.
- Covering the entire site with 1m of clean soil fill.

Human Health Considerations

. Scheduling site works when soil moisture levels are high and use of spray tankers to ensure no hazardous dust is generated.

. Removal of the lead contaminated soils to an approved landfill site.

Nature of Development: Residential Development

. Development of a residential subdivision on the northern part of the site (about 30% of the site).

. Development of the remainder of the site (about 70% of the total area), including land adjacent to the Swan River, as parkland.

Monitoring

. Followup monitoring to ensure the effectiveness of the site treatment

3. POTENTIAL ENVIRONMENTAL IMPACTS IDENTIFIED IN PER

The PER identified the following potential impacts from the project which are summarised below:

Rehabilitation

. Future leakage of metals to the beach area and Swan River from proposed dump areas.

. Control of drainage from residential site unto rehabilitated parkland.

. Control of subsurface water entering dump from the sides.

. Disturbance of rehabilitated site by domestic services.

Groundwater and Stormwater

. Contamination of groundwater and subsequent leakage to the Swan River.

. Contamination of clean fill from use of groundwater for irrigation.

. Uses of extracted groundwater and its impact on salinity migration in the North Fremantle area.

. Mobilization of contaminations due to poor control of stormwater on parkland and from the proposed residential development.

. Stormwater entering sides of dumps under seal.

Human Health, Dust Control and Noise

. Control of contaminated dust.

. Disposal of highly contaminated surface material.

. Occupational health and safety of workers during rehabilitation and removal of contaminated material.

. Noise to workers and locals.

. Accessibility of contaminated material to the public.

Warning Signs: Contamination

. Contaminated mussels on river foreshore.

. Contamination problems if contaminated material is exposed at a later date.

Swan River and Foreshore

. Further leakage of contaminants to Swan River.

. Contaminated stormwater entering Swan River.

Cycleways and Pedestrians

. Destruction of lower cycleway.

. Design of upper cycleway to facilitate public access to edge of proposed escarpment and barbeque area.

Assurance for Open Space and Future Use of Land

. Further development on parkland in future .

. The proportion (30%) of the site for residential development is not to increase when final residential plan is drawn up.

Aestethics

. Blending of development with parkland area.

Flora and Fauna

. Destruction of fauna habitat.

. Destruction of native flora and reduction in its diversity.

4. SITE EVALUATION

4.1 INTRODUCTION

Since 1910 CSBP and its predecessors leased this site from the Crown. In 1973 the lease on the site was terminated by CSBP and the Government of the day was satisfied that the conditions of the lease with respect to cleanup of the site was satisfactory. The University of Western Australia, which presently owns the majority of the site, exchanged the land now used by the Rocky Bay Village for Lot 416 (Fig.2a). Upon recognising the polluted state of the site, the University employed consultants to establish the pollution status of soil and groundwater on and under the site. Result indicated follow up work was required to determine the full extent of pollution. In all, four reports have been prepared summarizing the pollution status of the site, the latter being prepared also for the former Department of Lands and Surveys, now the Department of Lands Administration. In 1986 Landbank became responsible for the management and development of the site.

4.2 CONSULTANTS' REPORTS

Four consecutive studies have investigated the extent of industrial contamination at the McCabe Street with particular emphasis on the areas occupied by former buildings and waste dumps. These have been:

- a groundwater assessment by Rockwater Pty. Ltd. in 1980;
- a study of surface soils by Analabs Pty. Ltd. in 1981;
- air and soil sampling by a Technical Assessment Group in 1984, and
- additional soil sampling and development of a zoning plan by Maunsell & Partners Pty. Ltd. in 1986.

4.3 GENERAL SUMMARY OF CONSULTANTS' REPORTS

In summary, these reports have indicated that for all practical purposes the entire site must be considered to be in need of remedial treatment to remove the potential health risk posed by heavy metal contamination. The principal areas of contamination are three large pyrite dumps (the western cinders dump, the pyrite slurry dump and the embankment cinders dump) and the area around the former building which contained the lead chambers (Fig.2b). Discrete pockets of topsoil contamination, however, occur also on various parts of the site and particularly around former buildings. There is evidence of heavy metal leachate beach contamination, and possibly contaminant transfer to the food chain along the foreshore. More work is required to establish the status of groundwater contamination and likely impacts upon extraction.

4.4 SPECIFIC COMMENTS IN CONSULTANT'S REPORTS

It is pointed out that many comments are quoted directly from the report concerned.

The Rockwater report identified a slight groundwater gradient towards the Swan River with potential contamination of groundwater on the southern and south eastern edge of the site. In particular nitrate, phosphate and mercury levels were found to exceed levels recommended for potable water. Groundwater to the north of the site was found to be uncontaminated and of potable quality.

The Analabs study established various degrees of surface soil contamination within lot 416 (Fig.2a) while the Technical Assessment Group concluded that:

- the "majority of the site is contaminated to various degrees by various substances",

- the most significant contaminant in the surface soil was lead but high levels of cadmium, copper, and zinc were also found particularly in areas close to former building sites, and .

- groundwater beneath the site was not contaminated and there was no significant contamination of the atmosphere due to windblown dust.

The latter report was reviewed by the Health Department of Western Australia in 1984 which concluded that the site could be used for residential development subject to site coverage with suitable clean fill and that use of groundwater from beneath the site be prohibited.

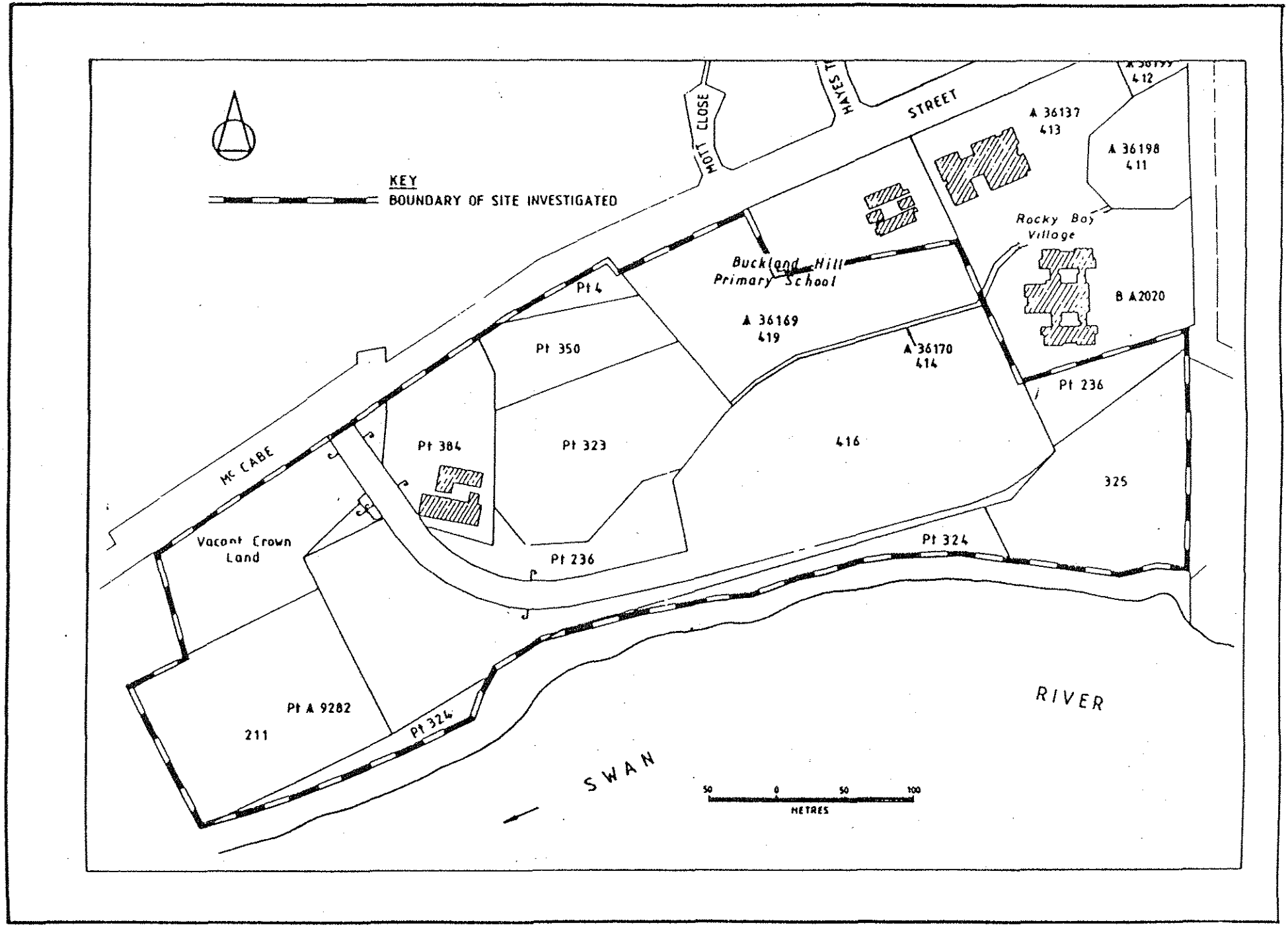

Fig. 2a Boundaries of development site (Source of Fig.: PER)

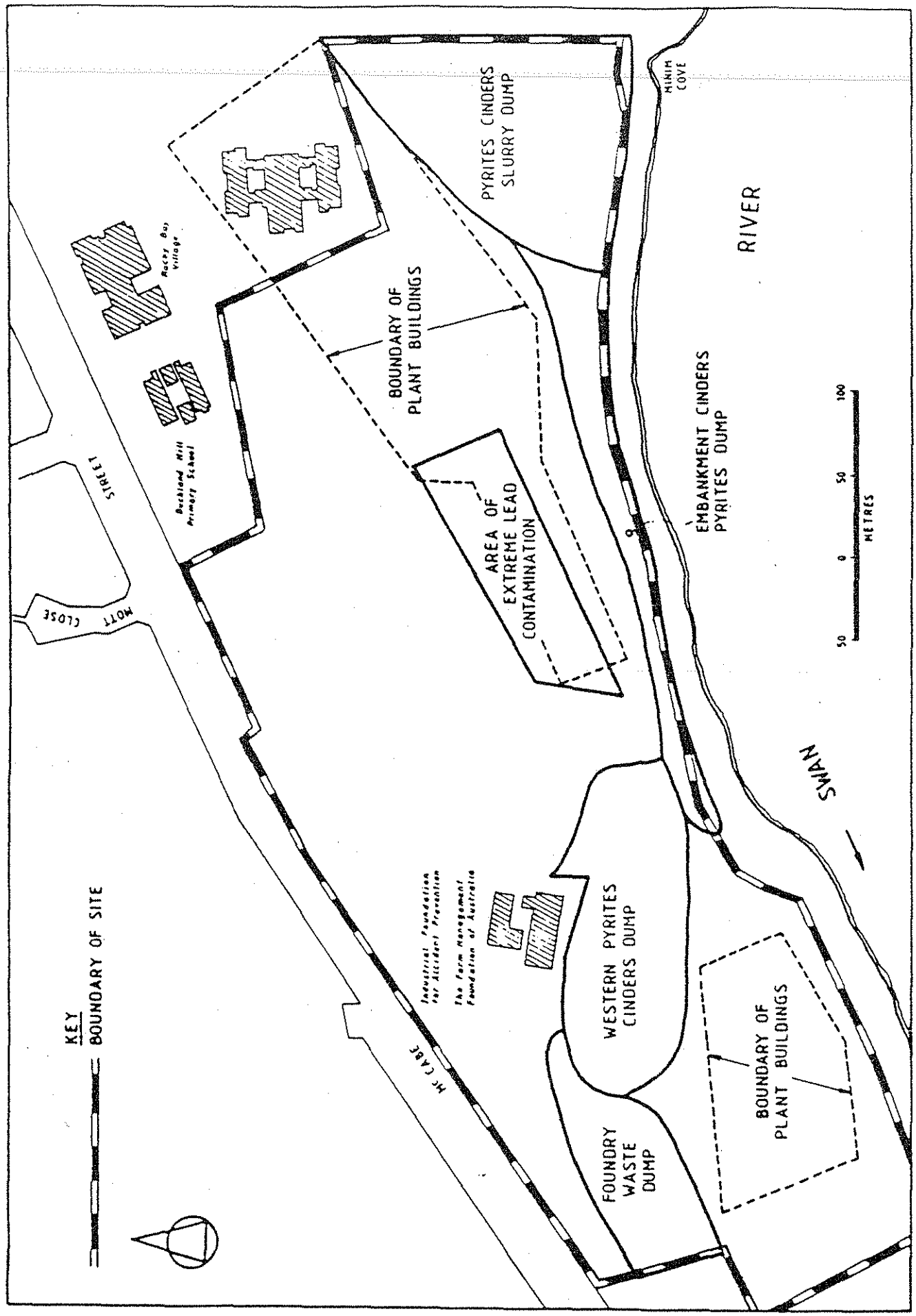

Fig.2b Former industrial plant and waste disposal areas.
(Source of Fig.:PER).

The Maunsell report concluded:

- heavy metal contamination of the river foreshore is evident as is contamination of molluscs in the section of the river adjacent to the embankment pyrite cinders dump;

- mineralogical investigations and site observations have confirmed the presence of oxidation of the pyrite cinder giving rise to the production of sulphuric acid and the associated release of soluble heavy metal compounds;

- these investigations and observations indicate that leaching has occurred from this dump and there is potential for continued leaching associated with the present active oxidation of the materials;

- toxicological opinion confirms that the levels of contamination identified on the river foreshore can be considered high for a beach frequented by children and that the heavy metal levels contained in the pyrite cinders warrants burial to avoid human contact with this material;

- the previously uninvestigated northern areas of the site along McCabe Street and west of the Primary School, defined as being suitable for development, are relatively free of contamination;

- the discovery of a deposit of amosite (asbestos fibre) in a trench excavated in this northern area supports the generally acknowledged characteristic of industrial sites that contamination is unpredictable both in type and distribution;

- whilst evidence of pollution has been identified, little is yet known about the possible transport mechanisms that have lead to and may still be actively causing such pollution, and further investigation is required before firm conclusions can be drawn in respect of the potential for and extent of further pollution levels;

- the evidence obtained regarding active weathering (oxidation) of the pyrite cinders and leaching, particularly from the embankment dump, raise concerns regarding contamination of groundwater beneath the site; and

- it has been considered unacceptable to suggest establishment of residential properties on any part of the site where a substantially risk-free environment for future landowners cannot be achieved.

5. SUMMARY OF PUBLIC AND GOVERNMENT AGENCIES SUBMISSIONS

5.1 INTRODUCTION

A total of 16 public and Government submissions on this proposal have been received by the Environmental Protection Authority. Names of contributors are given in Appendix 10.3. Submissions indicated either no further input was required or conditions and alterations to cleanup were required. No submission indicated cleanup to be undesirable whilst two were against any residential development.

The Environmental Protection Authority considered that some of the submissions were particularly well researched and documented and commends those who made such submissions.

5.2 SPECIFIC ISSUES RAISED IN THE SUBMISSIONS BY THE PUBLIC AND GOVERNMENT AGENCIES

Comments from submissions are broadly classified as follows:

Rehabilitation

There is overall support for the cleanup of this site. There is concern, however, about adequacy and method of cleanup of the western pyrite dump. It was suggested that a grout curtain and a surface diversion drain be placed upgradient of the western pyrite dump, and the dump be covered by an impermeable liner to stop further leaching to the foreshore.

Enquiries were made about the present status of contaminants, adequacy of rehabilitation of and access to foreshore. Other issues raised included timing of installation of domestic service lines, qualified supervision during rehabilitation, landscaping proposed dump mounds, stabilisation of dumps, failure of PVC lining, removal of highly contaminated material to an approved dump and stock piling low level contaminated soil on site.

Groundwater and Stormwater

The major groundwater issues raised covered the establishment of a proper set of data prior to rehabilitation and continued monitoring during and after rehabilitation. It was noted that groundwater work should be carried out under professional guidance and supervision and that monitoring be approved by EPA and relevant Government authorities. Such monitoring should consider, water quality, use of groundwater for bores, and salinity. Management issues raised included freshwater supply for the area as a whole, licensing of bores, restriction on borewater use and water use as a function of residential type development.

Concern was also raised about drainage, monitoring and disposal of stormwater off site,in addition to seasonal and residential developmental effects on stormwater control and effects on runoff.

Human Health, Dust Control and Noise

Major issues raised were, possible access of contaminated stockpiled dump material after rehabilitation, details of removal of contaminated material from site, potential impacts of contaminated groundwater on human health, noise and dust control and safety of workers.

Nature of Development: Residential Development

Submissions on type of residential development varied from support for high rise, large block, medium density to retaining the area wholly as a nature reserve. Other submissions addressed issues such as sewering of residential development, recreational activities that the open space will support and consideration of the regional plan for the North Fremantle area.

Warning Signs: Contamination

As some edible mussels are contaminated with heavy metals on the foreshore, it was suggested that warning signs be erected along the foreshore indicating mussel contamination, and on proposed dumps indicating their contaminated nature.

Monitoring

Concern was expressed as to the lack of detail about proposed monitoring programmes and the usefulness of using mussels to monitor pollutants on the foreshore. Specifically, interest was in timing, who carries out the work, who is responsible to whom for acceptance of the programmes and who reports to whom, and when.

Swan River and Foreshore

Information was sought as to the present rate of leaching of metals to the Swan River. Destruction of contaminated mussels on the foreshore to eliminate the problem of contaminated mussels is queried since new spatfalls are likely.

It was pointed out that cleanup would ensure sediments in the Swan River remained relatively uncontaminated and hence would not present dredge spoil disposal problems later.

Cycleways and Pedestrians

It was suggested that the location and nature of the proposed upper cycleway be such that access to viewing vantage points not be hindered and that barbeque areas can be established. Development and rehabilitation should also consider retention of the lower cycleway presently existing. In addition, consideration be given to the access point to proposed parkland for pedestrians and cyclists.

Accuracy of PER

It was pointed out that the PER was a conglomeration of disparate reports of different origins and intents and the considerable inconsistencies between reports implied that knowledge of the site was dangerously incomplete.

Assurance for Open Space and Future Use of Land

Concern was expressed at the lack of long term assurance given to the proposed public open space. It was pointed out that this area had considerable value due to its heath vegetation, its recreational potential and as a viewpoint over the Swan River.

Aesthetics

It was suggested that residential development consider colour and type of roadways so they blend into their surroundings.

Flora and Fauna

It was pointed out that the proposed development would pose a threat to biological community type and diversity in the area.

5.3 PROPONENT'S RESPONSE TO ISSUES RAISED

Landbank notes the proposed method of cleanup including removal of highly contaminated material to an approved dump, the isolation, on site, of low level contaminated wastes and site coverage with 1m thick clean fill is a relatively common rehabilitation practice. Hence satisfactory results are anticipated. Consequently, the proponent has responded to the Government and Public submissions in the form of an additional set of commitments to ensure success (Section 10.2) over and above the list given in the PER:

- Rehabilitation:

Western Pyrites Dump: Landbank considers that placing of limestone rubble and cleanfill over the western pyrites dump will limit down-slope movement of heavy metals in surface waters. In response to concerns that large volumes of stormwater could percolate through the western pyrites dump it is now planned to install a diversion drain up-slope from the dump. Further action such as grout curtains and PVC membranes are considered either not technically feasible at this location, or unnecessary.

Action will be taken to ensure dumps on site will be stable. This will include dump landscaping to complement existing contours, and the stabilising of the embankment with mulching or seeding techniques.

As a result of concerns regarding the installation of PVC barriers and other remedial works, Landbank will ensure works on site are professionally supervised. Landbank considers that removal of all contaminated soil from the site is unjustified given the low level of risk to the public and the environment. It would involve such a large financial outlay that the viability of the project could be threatened, possibly resulting in the site being left in its current state. Landbank will liaise with the relevant authorities when contaminated soils are to be removed. This will include notification of the volume and level of contamination of soils and conforming to the Department of Occupational Health, Safety and Welfare of W.A.'s special requirements for the removal of amosite.

Landbank notes that the drainage systems cannot be installed before fill is applied because of engineering constraints placed on such work by the Water Authority of Western Australia. However, all efforts will be made to minimise soil disturbance during sewerage line installation. Any drains will be fed from clean fill and hard surfaces and will be connected to the existing stormwater drainage system of Mosman Park. As a result stormwater runoff will not be channelled onto the river foreshore.

Landbank commits itself to apply for a works approval and licence under Sections 54 and 57 of the Environmental Protection Act 1986 to carry out rehabilitation even though the site is not a scheduled premises.

- Groundwater, Stormwater and Monitoring Programmes:

Landbank commits its itself to a monitoring programme including groundwater studies to will commence immediately Government approvals for the development are given and prior to the use of any groundwater. Groundwater investigations will be carried out by qualified groundwater consultants in liaison with the Water Authority and Geological Survey of W.A. Data obtained before remedial work begins will be used to establish baseline conditions for the site. Continued monitoring during and after development will provide data to assess effectiveness of remedial action, to decide on suitable uses for bore waters, and to ensure health standards continue to be met. The Water Authority and Geological Survey of W.A. will also be consulted during the monitoring programme.

Landbank commits itself to being responsible for all monitoring programmes and will make results available to Government authorities as

instructed by EPA. It is anticipated that some of these authorities will play an inspectorate role during remedial action.

Mussels: The availability of mussels for a monitoring programme will be assessed prior to commencement. If numbers are lacking then emphasis will be placed on sediment sampling by Landbank.

Landbank is committed to carrying out monitoring programmes until the EPA gives approval for their cessation.

. Human Health, Dust and Noise

Landbank will consult fully with the Department of Occupational Health, Safety and Welfare of Western Australia to ensure workers will be protected while working on site.

Landbank will take every precaution to minimise dust dispersion on-site. This will include the extensive use of water sprays and the confinement of work to winter months. Where deemed necessary, Landbank will consider using paper mulch and growing rye grass over and above its commitment already given.

Every action will be taken by Landbank to minimise noise generation during remedial works. Landbank believes this will be minimal. However, the site manager will liaise with Rocky Bay Village and the local school Principal to ensure disturbance at both centres is kept to a minimum.

. Nature of Development: Residential Development

Landbank considers that housing density within the specified subdivision is a planning rather than environmental issue. Landbank will liaise with the State Planning Commission, the Town of Mosman Park and any other relevant Government agency on planning matters. Controls to be put in place will allow any level of housing development specified by the appropriate planning authorities.

Given that over 70% of the site will be turned to public open space, Landbank considers the amount of parkland to be adequate. It should be noted that public open space will include all of the foreshore area which has good views over the river and will contain more native vegetation than is currently on site.

Landbank commits itself to liaise with local government authorities to ensure the needs of local people who use the cycleways are met. This may include such features as access and recreational facilities.

Landbank regards the planning aspects of its proposal in relationship to an overall plan for the North Fremantle area as a planning issue. Landbank commits itself, however, to liaise closely with local Government authorities, the State Planning Commission and any other relevant Government Agency.

. Warning Signs:

Warning signs will be placed on foreshore areas by Landbank to bring to the attention of the public that any mussels in the area may exceed recommended health limits for heavy metals.

Landbank notes the environmental impacts of leachate on the Swan River is limited to high concentrations of heavy metal in discrete groups of mussels. These mussels will be removed and warning signs put up to warn the public of potential health dangers. (The Environmental Protection Authority points out that the erection of such signs is a Health Department of Western Australia issue).

Warning signs will be placed by Landbank on spoil dumps containing contaminated soils up until remedial treatment begins on site.

. Swan River and Foreshore

Contaminated sands on the Swan River frontage of the McCabe Street site will be removed by Landbank either by a hydraulic excavator or a sludge pump depending on the depth of sand and will be replaced by clean sand. Access to this beach will not be encouraged since a priority will be to maintain steep slopes above the beach and also to use the beach as a monitoring station for pollution.

Landbank notes remedial action is planned to stop leachate reaching the Swan River. Given the extensive rehabilitation proposed, it is highly unlikely that identifiable impacts will occur on the foreshore due to leaching of heavy metals. The Environmental Protection Authority also notes after reviewing the history of the site, consultant reports and making several inspections, that it is likely that most of the heavy metal on the foreshore are due to physical washdown from the cinder dumps rather than chemical leaching.

. Further Studies Before Development

The proponent considers that appropriate studies have been performed to adequately plan remedial action for the site. Given this remedial action the site will be suitable for residential development. The EPA concurs with this view.

. Cycleways and Pedestrians

Although cycleways are considered to be a planning rather than an environmental issue, Landbank will make every effort to re-establish cycleways removed through the course of the works. During planning Landbank will liaise with local Government authorities to ensure the needs of local people who use the cycleway are met. This may include features such as entry/exit points for local users and additional recreational facilities.

. Accuracy of PER

Doubts have been cast on the detailed accuracy of the PER and its associated reports. Landbank considers that although these doubts are interesting academically they are not relevant to the major aim of the PER which is to minimise the environmental impact of the site and its development.

. Assurance of Open Space and Future Use of Land

With regard to the management of the site, parkland is to be vested as public open space after landscaping and remedial action taken place. Up until then Landbank is committed to managing the McCabe Street site.

. Aesthetics

Landbank believes road surfaces used in the residential development are a planning rather than environmental issue and thus are outside the scope of this document. (The Environmental Protection Authority concurs with Landbank but suggests that Landbank discuss these issues with the Town of Mosman Park and local interested parties).

. Flora and Fauna

Planned parkland will result in an increase in both the density and diversity of plant life at McCabe Street. The proponent will make every effort to include heathland species in the parkland.

6. POTENTIAL BENEFITS OF SITE REHABILITATION

The McCabe Street site is of little environmental or recreational value at present and cleanup would be very expensive and highly desirable. Apart from the cycleway presently crossing the site, access is poor and open space is very irregular. The proposed development provides means for rehabilitation of 70% of the site for public parkland and recreational purposes along the Swan river. It will also have visual appeal to river users. The environmental value of the site will be increased by revegetation with native plants where possible and by sustaining a reasonable diversity of flora. Presently there are no identifiable endangered species of flora or fauna that require special protection. It will also add to the amenity available to the Rocky Bay Village and the Buckland Primary School as well as local residents.

Development will also provide an opportunity to remove all of the highly contaminated material from site and the consolidation of low level contaminated material on site into safe stable mounds which the Health Department consider acceptable.

The inclusion of residential development on largely uncontaminated north segment of the site provides means for funding the intensive treatment required to make the rest of the site suitable for public use.

7. ENVIRONMENTAL IMPACTS AND MANAGEMENT

Potential environmental impacts are identified and discussed below:

7.1 GROUNDWATER CONTAMINATION

Groundwater sampling has been carried out on only a limited scale. The Rockwater report concluded that only two of the four boreholes analysed showed contamination and these were adjacent to the river where no residential development is proposed. Water from one of the contaminated boreholes contained up to 132 mg/L nitrate (recommended limit for nitrate in drinking water by the U.S. Public Health Service is 45 mg/L or 10 mg/L N-nitrate). Water from the remaining contaminated borehole contained phosphorus (1.2 mg/L) and mercury (0.07 mg/L) (recommended limits for potable water are 0.2 and 0.02 mg/L respectively). Whilst this exceedance seems significant, it is pointed out this water is not used for potable purposes and no evidence of associated eutrophication of the river has been detected. Mercury levels in mussels, exceed recommended health standards for human consumption at one site in the River. The Technical Assessment Group Study noted from analysis of 12 boreholes that 'apart from the occasional high iron levels all other metal levels were

well below the maximum allowable for potable water'. The Group also noted that from generalised hydraulic gradient and water table contours that groundwater flow was towards the river. Given the proximity of porous limestone bedrock to the surface, the porosity of associated soil and the steep surface gradient to the Swan River, it is highly unlikely that contaminants could migrate to the clean fill and hence pollute.

Maunsell & Partners noted that contamination of the sediments on the river foreshore was a function of surface drainage through one old drain. As this has not been established properly, consideration has to be given also to slight groundwater pollution of the foreshore.

RECOMMENDATION

The Environmental Protection Authority recommends that groundwater monitoring bores be established systematically around the site and groundwater movement be fully established before site rehabilitation. This work should be carried out by qualified groundwater consultants to the satisfaction of the Environmental Protection Authority, the Water Authority of Western Australia and Geological Survey of Western Australia. The proponent is to report the groundwater movement results to the Environmental Protection Authority for approval before rehabilitation commences.

RECOMMENDATION

The Environmental Protection Authority recommends that the Proponent has the monitoring programme approved by the Environmental Protection Authority before monitoring begins and that rehabilitation not commence until approval is given.

The monitoring programme, to be carried out by the Proponent, should include:

- the parameters to be measured;
- the initial sampling period to determine background contaminant levels prior to site rehabilitation;
- sampling sites and times;
- reporting times to the Environmental Protection Authority; and
- commitment to modify the environmental management programme in line with results and approval by the Environmental Protection Authority.

RECOMMENDATION

The Environmental Protection Authority recommends that groundwater from beneath the site not be used for dust control, clean down, potable or irrigation purposes during rehabilitation. If groundwater is proposed for any use at a later date, it should be monitored regularly by the proponent and conform to standards laid down for the proposed use by the appropriate Government Agency. Such a monitoring programme and reporting of results should comply with Recommendation 3 (above). In addition, if groundwater is used for any purpose, the proposed monitoring programme should ensure that no saltwater intrusion migrates toward the area of extraction and that water use meets the requirements of the Water Authority of Western Australia.

7.2 LEACHING OF HEAVY METALS FROM NEW PROPOSED DUMP AREAS

The Technical Advisory Group noted that the cinder dumps are considered stable. Although there is no clear evidence to suggest that there is major leakage of hazardous material from the main pyrite dumps, it is likely that the build up of metal in the sediment along foreshore is related to some leaching, albeit, slowly. It is pointed out that much of the iron-rich material on the foreshore is likely to be washdown material from the cinders dumps rather than chemically leached and precipitated material. Whilst alkalinity and limestone conditions existing at the site favour precipitation and stabilization of many metals, all reasonable care should be taken to minimise stormwater entering dumps.

It is pointed out that whilst the existing contaminated dumps are called "pyrite cinder dumps", they are actually iron oxide dumps. Consequently, their ability to produce very acidic conditions is somewhat limited. Considering that the proposal is to completely enclose them in limestone fill (alkaline material), and in the case of the western dump install stormwater diversion drains, it is unlikely that leaching will be a major problem in the future.

Potential problems regarding the sealing of dumps with PVC lining are drainage and dump stability. As most metals become much less mobile under alkaline conditions, the use of alkaline rich red mud to cover the dumps is more acceptable than PVC lining. The use of such mud has the following advantages, it will immobilize the heavy metals, keep the dumps alkaline, give greater flexibility during landscaping, will not have leakage or breakage problems, should be more stable and should not cause drainage problems.

RECOMMENDATION

The Environmental Protection Authority recommends, the proponent redirect stormwater discharge from the proposed drainage system into the Mosman Park drainage system. This should be carried out during rehabilitation and to the satisfaction of the Environmental Protection Authority. The Environmental Protection Authority recommends that the proposed drainage system discharge be monitored by the proponent as part of the monitoring programme to be approved by the Environmental Protection Authority in Recommendation 3.

RECOMMENDATION

The Environmental Protection Authority recommends that the clean fill comprise a minimum average of 50% limestone and limesands as far as possible so alkaline conditions prevail. This should be carried out by the proponent during rehabilitation and to the satisfaction of the Environmental Protection Authority. In order to avoid water logging, sheet discharge, erosion and instability of dump mounds, the Environmental Protection Authority recommends that the proponent consider the use of alkaline red muds to cover both rehabilitated cinder dumps inconjunction with PVC liners. The final plan to protect dump mounds from further leaching should be approved by Environmental Protection Authority before rehabilitation commences. In addition, plans to ensure dump stability should meet with the Town of Mosan Park and the Environmental Protection Authority approval before and during rehabilitation, revegetation and landscaping.

7.3 DUST

Dust annoyance during dry weather could be a problem during construction. After rehabilitation and revegetation soil will not be exposed and hence should not cause a dust problem. The proponent has commited to schedule rehabilitation to the winter months when dust should be less of a problem. The Proponent has also made a commitment to control dust to the satisfaction of the EPA.

RECOMMENDATION

The Environmental Protection Authority recommends that dust and noise level s be controlled at all times to avoid annoyance to site workers and local residents and this should be to the satisfaction of the Environmental Protection Authority, the Health Department of Western Australia, the Department of Occupational Health, Safety and Welfare of Western Australia and the Town of Mosman Park. In addition, groundwater below the site should not be used for dust control and water used by the proponent for dust control should not enter the Swan River.

7.4 DISPOSAL OF HIGHLY CONTAMINATED SURFACE MATERIAL

The Proponent intends to remove highly contaminated surface material from the site and place it in an approved landfill site.

RECOMMENDATION

The Environmental Protection Authority recommends that details of disposal of contaminated solids should be forwarded to the Environmental Protection Authority and the Health Department of Western Australia for approval prior to commencement of rehabilitation and that rehabilitation work be carried out under qualified supervision and to the satisfaction of the Environmental Protection Authority.

7.5 DISTURBANCE OF REHABILITATED SITE BY DOMESTIC SERVICES

As the rehabilitated site is proposed for residential and recreational uses, rehabilitation should not proceed until all associated underground domestic and public services are considered.

RECOMMENDATION

The Environmental Protection Authority recommends that the proponent ensure that any underground or partially underground service be installed during rehabilitation where possible. In addition, the Environmental Protection Authority recommends that the proponent not place service lines across either of the rehabilitated cinder dumps and that service lines be surrounded by 1m of limestone cleanfill. Excavation of any service line at a later date must ensure that the cleanfill barrier is protected or re-established to the satisfaction of the Environmental Protection Authority.

7.6 HUMAN HEALTH

The Health Department of Western Australia has no objection to this proposal proceeding subject to the recommendations concerning:

. disposal of highly contaminated surface material.

. potable and irrigation water.

. public and domestic service lines.

Concern has been expressed that children may play on or dig into the proposed waste dump mounds. It is pointed out that these mounds will be covered with PVC liners and covered with 1m of clean fill. In addition parts of the mounds will not be accessible to the public.

7.7 OCCUPATIONAL HEALTH AND SAFETY OF WORKERS

Concern exists over the potential health risk to workers carrying rehabilitation. This matter can be dealt with by the Occupational Health, Safety and Welfare Act 1986.

7.8 NOISE

Traffic and on-site machinery noise is likely to cause come concern to local residents during the rehabilitation period.

RECOMMENDATION

The Environmental Protection Authority recommends that strict noise control be implemented by the proponent during rehabilitation and be to the satisfaction of the Environmental Protection Authority as in Recommendation 7.

7.9 OPEN SPACES, CYCLEWAYS, AMENITIES AND ACCESS POINTS

The proposal does not address the issue of how Landbank's proposal integrates with the broader plan for the Mosman Park/North Fremantle Area and how the linkages to the regional open space areas would be effected. Also, it is highly desirable that local opinion and expertise is considered before and during rehabilitation and revegetation.

The EPA is aware that a concept plan has been prepared by a working party comprising of officers from Local and State government which addresses, amongst other things, open space linkages and the visual amenity of the area. The Authority considers that the detailed planning for the Landbank area should have regard to this concept plan.

Concern has been expressed also about the loss of the lower cycleway and location of the proposed upper cycleway. In addition, the issues of amenities, access to parkland and recreational facilities were raised.

RECOMMENDATION

The Environmental Protection Authority recommends Landbank consult with local interest parties, the Town of Mosman Park and the Swan River Management Authority and the State Planning Commission regarding all issues concerning regional plans, open space, cycleways, access and amenities before rehabilitation.

7.10 DISAPPEARANCE OF WILDLIFE

Concerns were raised about the assurance of the amount of open space designated for parkland and nature purposes. It is pointed out that this area has no special examples of flora or fauna and that the amount of open space has been committed by Landbank.

7.11 ERECTION OF SIGNS

There is concern that the public is not being made sufficiently aware of the environmental impacts both present and future concerning this site. This matter is a Health Department issue. It is pointed out also, that mussels are scarce along this section of the river and it would be difficult to collect mussels in sufficient quantity as to cause human health problems.

7.12 DUMP STABILITY

There is concern about the stability of the proposed dump especially during periods of heavy rain. This has been addressed in Recommendation 6.

8. CONCLUSIONS AND RECOMMENDATIONS

Based on the information supplied in the PER and the additional information supplied by the proponent, Government and Public submissions, the Environmental Protection Authority has concluded that the project is environmentally acceptable and recommends that it could proceed subject to the commitments given in the PER and in the proponents' response to issues raised, and the EPA's recommendations.

One of the major concerns is that for human health. The Health Department of Western Australia has given support for the project on conditional approval. Most aspects of the proposed rehabilitation and disposal of highly contaminated surface material can be managed. The proposal to seal the slurry dump only is not regarded as satisfactory. In addition, the use of a PVC liner alone may cause drainage, erosion and stability problems. Hence, this Authority requires the proponent to consider the use of a combination of alkaline rich red muds and PVC liners to prevent such problems and at the same time immobilise the heavy metals. In addition, stormwater should be directed away from the dumps and be discharged to the local drainage system. Such drainage water should be monitored to measure success.

Given the conditions put on groundwater use, it is highly unlikely that any related environmental impact will occur.

Considering the present state of the site and the lack of any evidence of impact on flora, fauna, or humans, it is highly unlikely that rehabilitation will do anything other than greatly improve the site and area in general.

Whilst heavy metal values in foreshore sediments are very high, no environmental impact has been determined to date with the exception of contaminated mussels. It is pointed out that contaminated sediments will be removed and edible mussels are hard to find in quantity. Rehabilitation will also be such that the landscape will discourages access to this area. In addition, signs will be erected warning the public against the taking of mussels for human consumption.

RECOMMENDATION

The Environmental Protection Authority concludes that the proposal is environmentally acceptable and recommends that it could proceed subject to the Authority's recommendations in this Report and the commitments made by the proponent for rehabilitation and environmental management. These commitments include:

provisions to ensure that the health of workers and residents is not jeopardised;

specific details to remove hazardous material and other contaminated material;

ensuring that the surrounding environment including the Swan River is not degraded; and

the putting in place of a monitoring programme.

Landbank will be responsible for all monitoring programmes and will make results available to Government agencies as required by the Environmental Protection Authority; and

Landbank is committed to carrying out monitoring programmes until the Environmental Protection Authority gives approval for their cessation.

9. REFERENCES

- Analabs, 1981. University of Western Australia Mosman Park Land: Results of Testing Soil for Heavy Metals at North Fremantle Lot 416, (unpublished).

- Maunsell & Partners Pty. Ltd., 1986. McCabe Street Development Study: Final Report. University of Western Australia and Lands & Survey Department (unpublished).

- Report of the Technical Assessment Group, 1984. CSBP Fertilizer Works Site Mosman Park, (unpublished).

- Rockwater Pty. Ltd., 1980. University of Western Australia Mosman Park Land: Results of Testing Groundwater Quality North Fremantle Lot 416, (unpublished).

APPENDIX 1

COMMITMENTS GIVEN IN PER

The proponent makes the following commitments:

Any activity undertaken on the McCabe Street site shall:

- in no way jeopardise the health of either workers or residents.
- not compromise the present residential or recreational amenity of the site or its environs.
- not incur on behalf of the people of Western Australia any financial or environmental burden in the long term.
- not cause any degradation to the terrestrial or aquatic environment of the surrounding area or the Swan River.

To implement the general commitments above the proponent shall develop the site in the following way:

- Prior to development most of the site will be treated with remedial work to effectively remove any hazard to the public and residents. The bitumen and concrete surface remaining from the fertilizer work's building will remain and have fill placed over them.
- In the residential zone soil to a depth of not less than 300mm will be removed, unless solid bedrock is found at lesser depth. This stripped top-soil material will be placed on top of the cinder and slurry dumps. The work will be supervised and programmed for winter with strict requirements related to watering for dust control purposes. Inspection by a qualified chemist and supplementary soils testing will be employed to ensure removal of all contaminated ground. The area for development will then be covered with a minimum of one metre of clean fill.
- Pyrite cinders from the river embankment area will also be added to the western pyrite cinder dump. Deposits of foreign material will be identified, from previous site work, and either treated similarly to the pyrite cinders of, if judged to be inappropriate for this type of disposal, removed from the site to an approved landfill site.

In the parkland zone the following treatment will be applied to each of the distinct and unique features associated with the site:

Pyrite Slurry Dump The surface will be covered with an impermeable PVC membrane (Canvacon 16SS or similar) on a 150mm thick layer of clean sand. The dump will then be topped with some of the top-soil from the proposed residential area of the site as well as one metre of clean fill. All possible care and supervision will be undertaken during placement of the membrane to ensure that tears do not occur.

The face of the slurry dump will be treated in the following way:

- A low (800-1,000mm) limestone wall will be built along the top edge of the face of the dump.
- The bottom of the bund wall slope will be security fenced and returned as necessary to meet the limestone wall to isolate the slope area. The slopes will then be intensively landscaped.

. A leach drain will be installed immediately behind the limestone wall to intercept and remove groundwater seepage above the membrane and to carry it to a suitable sump.

Riverbank Beaches

Action in this area of the site will include the following:

. Excavation and removal of beach sand together with loose rock and soil from the lower embankment. The initial extent of such excavation will be guided by visual inspection but will be finally determined by further sampling and testing.

. Re-establishment of the bank profile and beachline with crushed limestone filling, including replanting on the lower embankment slopes and placement of limestone rip-rap to prevent scour of the rebuilt slopes.

. Placement of contaminated material removed from the beach in a discrete stockpile not exceeding 1.5m in height adjacent to the toe of the western pyrite cinders dump and covering of this stockpile with crushed limestone to a depth of not less than 0.5m.

Cycleway

Removal of the existing cycleway at least in the area adjacent to the embankment pyrite cinders dump. The cycleway will be relocated to the top of the treatment embankment.

Embankment Pyrite Cinders Dump

Removal of the pyrites cinders material from the river embankment. Partial treatment with a covering of crushed limestone and sand.

Dust control will be of paramount importance so the work will be programmed for the winter months and water sprays will be used if necessary. The excavated material will be relocated on-site to form either an extension of the western pyrite cinders dump or the eastern slurry dump.

Following removal of all the pyrite cinders and any other foreign materials encountered, the embankment slope above the existing berm will be flattened to a slope not exceeding 26 degrees (approximately 1:2). The slope will then be covered with one metre of clean fill and intensively landscaped with discrete paths provided at selected locations to facilitate public access to the river.

Former Lead Melting Site

All soil within this heavily contaminated area will be excavated, removed and buried in an approved toxic waste landfill site.

Western Pyrite Cinders Dump

This dump will be left undisturbed except for covering with 300mm of crushed limestone topped with 700mm of clean fill. This treatment will also apply to the stockpiled pyrite cinders from the embankment dump.

Passive Recreation Area

All other areas of the site identified as being suitable for passive open space recreation will be covered with a minimum of one metre of clean fill and vegetated.

Stormwater Collection Systems and Outfalls

All existing stormwater collection systems and outfalls on the site will be excavated and removed. Rubble and other debris will be disposed of in an approved toxic waste landfill site. All trench excavations required for removal of the outfalls in the embankment will be backfilled with at least two impermeable barriers across each trenchline to prevent continued drainage.

Groundwater

The present level of investigation of groundwater in the northern area of the site indicates that there need to be a restriction on the use of groundwater. However, a further study will be undertaken of the quality of groundwater under the northern area of the site to absolutely determine whether there is any need to limit usage.

Monitoring

After site development, the following monitoring programme will apply:

- The restored river beachline and adjacent embankment will be inspected for scour and erosion.
- Inspection will be carried out to identify and analyse any leaching.
- The gross pollutant trap installed on the surface drainage outlet to the river will be maintained and cleaned out on a regular basis. Each time the trap is cleaned a sample of sediment will be taken and processed to determine if it contains any contaminant.
- Slotted PVC groundwater monitoring bores, along the upper beachline or on the embankment berm, will monitor the quality of the shallow groundwater.
- Permanent bores on the site and particularly those close to or along the river embankment will be sampled and analysed.
- Soil samples will be taken and analysed at pre-selected locations along the foreshore adjacent to the entire site, and
- Samples of mussels from locations adjacent to the site where heavy metal concentrations have been identified and from a control area nearby will be collected and analysed.

ADDITIONAL COMMITMENTS MADE BY PROPONENT IN RESPONSE TO GOVERNMENT AND PUBLIC SUBMISSIONS

Monitoring Programmes:

Monitoring programmes including groundwater studies will commence immediately Government approvals for the development are given and prior to the use of any groundwaters. Groundwater investigations will be carried out by qualified groundwater consultants in liaison with the Water Authority and Geological Survey of W.A. Data obtained before remedial work has begun will be used to establish baseline conditions for the site. Continued monitoring during and after development will provide data to assess effectiveness of remedial action, decide on suitable uses for bore waters, and ensure health standards continue to be met. The Water Authority and Geological Survey of W.A. will also be consulted during the monitoring programme.

Landbank will be responsible for all monitoring programmes and will make results available to government authorities as instructed by EPA. It is anticipated that some of these authorities will play an inspectorate role during remedial action.

Landbank is committed to carrying out monitoring programmes until the EPA gives approval for their cessation.

Remedial Action:

- Western Pyrites Dump: It is planned to install a diversion stormwater drain up-slope from the dump.

- Action will be taken to ensure dumps on site will be stable. This will include dump landscaping to compliment existing contours, and the stabilising of the embankment dump with mulching or seeding techniques.

- Beach Frontage: Contaminated sands on the Swan River frontage of the McCabe Street site will be removed either by a hydraulic excavator or a sludge pump depending on the depth of sand and will be replaced by clean sand. Access to this beach will not be encouraged since a priority will be to maintain steep slopes above the beach and also to use the beach as a monitoring station for pollution.

- Soil Removal: Landbank will liaise with the relevant authorities when contaminated soils are to be removed. This will include notification of the volume and level of contamination of soils and conforming to the Department of Occupational Health, Safety and Welfare of W.A.'s special requirements for the removal of amosite.

- Development Site Licence: Landbank will apply for a licence as a development site under Section 57 of the Environmental Act.

- Dust: Every precaution will be taken to minimise dust dispersion on site. This will include the extensive use of water sprays and the confinement of work to winter months.

- Warning signs: Warning signs will be placed on foreshore areas to bring to the attention of the public that any mussels in the area may exceed recommended health limits for heavy metals.

- Mussels will be removed from foreshore.

- Warning signs will be placed on spoil dumps containing contaminated soils up until remedial treatment begins on site.

- Landbank will ensure works on site are professionally supervised.

Noise

Every action will be taken to minimise noise generation during remedial works. Landbank believes this will be minimal, however, the site manager will liaise with Rocky Bay Village and the local school principal to ensure disturbance at both centres is kept to a minimum.

Drainage

Drainage systems cannot be installed before fill is applied because of engineering constraints, however, all efforts will be made to minimise soil disturbance during sewerage line installation. Any drains will be fed from clean fill and hard surfaces and will be connected to the existing stormwater drainage system of Mosman Park. As a result stormwater runoff will not be channelled onto the river foreshore in quantity.

Worker Safeguards

Landbank will fully consult with the Department of Occupational Health, Safety and Welfare of Western Australia to ensure workers will be protected while working on site.

Mussel Monitoring Programme

The availability of mussels for a monitoring programme will be assessed prior to commencement. If numbers are lacking then emphasis will be placed on sediment sampling.

Land Use and Planning

It should be noted that public open space will contain more native vegetation than is currently on site. Planned parkland will result in an increase in both the density and diversity of plant life at McCabe Street. The proponent will make every effort to include heathland species in the parkland.

Parkland is to be vested as public open space after landscaping and remedial action has taken place. Up until then Landbank is committed to managing the McCabe Street site.

Landbank regards the planning aspects of its proposal in relationship to an overall plan for the North Fremantle area, as a planning issue. Landbank commits itself, however, to liaise closely with local government authorities, the State Planning Commission and any other relavent Government Agency.

Cycleways

Whilst Landbank regards this issue as a planning issue, the proponent will make every effort to re-establish cycleways removed through the course of

the works. During planning Landbank will liaise with local government authorities to ensure the needs of local people who use the cycleway are considered. This may include features such as entry/exit points for local users and recreational facilities.

APPENDIX 3

LIST OF ORGANISATIONS AND INDIVIDUALS WHO MADE WRITTEN SUBMISSIONS

- T R Bridle Perth
- Dr N M S Rock and D Kaesehagen
- M Hipkins East Perth
- Mrs M P Hudson-Ansell
- Health Department of Western Australia
- State Energy Commission of Western Australia
- Education Department of Western Australia
- Department of Local Government
- Department of Marine and Harbours
- Department of Occupational Health, Safety and Welfare of Western Australia
- Fremantle Port Authority
- Water Authority of Western Australian
- Main Roads Department
- State Planning Commission
- Swan River Management Authority
- Town of Mosman Park