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THE HON. MINISTER FOR FORESTS:

TECHNICAL ARGUMENTS AGAINST EXPANSION OF BAUXITE MINING AS PROPOSED BY ALCOA

General Points

The damage to forest by bauxite mining and the degree to which it can be repaired, cannot be fully quantified in technical terms, as value judgements are also involved.

Whilst it can be claimed that theoretically the environmental damage caused by bauxite mining can be repaired given sufficient time and money, such an engineering approach is not acceptable for the following reasons.

(a) No guarantee can be given that biological as distinct from engineering problems can be solved. There are numerous examples of this throughout the world.

(b) If the problems resulting from bauxite mining can be solved, they can only be solved if there is sufficient TIME available. Resolution of biological problems requires long time periods because (particularly in forest ecosystems) measurement of a response to a treatment can only be confidently made over long time periods.

(c) No scientist can accurately predict the effects of bauxite mining and hence similarly there is no way that we can guarantee that any rehabilitation system will work in the long term. This is not an unusual situation. Virtually no development project would proceed if it was first necessary to resolve all unknowns. What makes the bauxite mining situation different is firstly, the large number of unknowns involved and secondly, the potentially disastrous and irreversible damage to water supplies that would result if the gamble that as yet undeveloped technology will resolve the problem - does not come off. In other words, the degree to which you can gamble on technology should be strongly influenced by how high the stakes are.

Effects of bauxite mining

1. The size and location of bauxite mining will obviously determine its effects. Mining in areas adjacent to the Western Scarp which are already devastated by dieback will have minimal deleterious effects. However, if mining operations expanded to 700 hectares per year, the time available to develop rehabilitation strategies for healthy forest areas and potentially saline areas will be radically shortened.

2. The area of forest directly mined or cleared for mining, considered insignificant at 25 or 50 hectares per year, becomes very significant at 700 hectares a year. The correlation between bauxite deposits and high quality dieback free jarrah stands adds further significance to the direct loss of forest by mining.

3. The area of forest affected by mining will be far greater than the area mined as mining will increase the spread and intensification of jarrah dieback because:

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- it involves major soil movement;
- it is located high in the landscape thus permitting rapid spore spread downslope;
- it disrupts drainage and creates saturated soil conditions on previously freely-drained sites;
- the extra groundwater discharge will eventually increase the area of highly susceptible forest in the lower topographical situation;
- practices such as watering roads and the discharge of water from roads provides ideal conditions for spread of the fungus.

The Jarrahdale No. 2 site provides a good example of the effect of bauxite mining on spread and intensification of jarrah dieback.

4. Whilst it is not possible to predict accurately the additional area that will be affected by the jarrah dieback disease as a consequence of bauxite mining, one actual example of this already exists. A catchment near Jarrahdale (Seldom Seen) already fully mined, retains only 12% of the original forest in a protectable, healthy condition. Whilst in this case dieback was extensively developed in the valleys prior to mining, the net result would be ultimately the same even if the infections had been relatively minor.

5. The presence of dieback in the jarrah forest is not an argument in favour of mining. Mining generally operates on dieback-free uplands and its impact is additional. In the most critical, salt prone areas, dieback occurrence is at very low levels at present and there is a considerable hope of containing it as localised infections in the valleys. After mining of the uplands, this opportunity will no longer exist.

6. Mining does not merely affect timber production or catchment protection, it also affects a number of other uses such as recreation and conservation of flora and fauna. The existing forest, even after the impact of dieback, provides for this multiplicity of uses more safely and efficiently than any alternative cover that could be created to replace it after mining.

7. Mining and associated dieback will drastically alter the ecosystem and, as a consequence, many of its components will be lost. The losses of fauna and flora such as invertebrates (e.g. ants), and wildflowers, may or may not be rated as significant as they have no tangible economic value but they will occur.

8. Catchment Protection:

   (a) In the non-saline areas of the forest the effects of mining on catchments are positive provided that the problems of erosion and turbidity can be solved. This seems likely, but again time is required.

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(b) Expansion of bauxite mining into salt-prone areas has the potential to result in significant increase in salinity. The following technical facts are relevant to the salinity question :-

(i) Even small increases in salinity are significant because in W.A. higher quality water is needed to make more salty water usable by shandying. Many of the potentially usable streams, such as the Murray, could not be utilised without shandying because agricultural activities have already raised the salinity beyond acceptable levels.

(ii) We cannot map the precise location of salt in the forest. There is a broad west-east gradient of increasing salinity but in the intermediate zone adjacent micro-catchments can have grossly different salinities.

(iii) Although it is certain that stream salinity will increase if vegetation is removed in salt-prone areas we, as yet, cannot accurately predict the relationship between area of vegetation disturbed and stream salinity. Peck (C.S.I.R.O.) has developed a model in an attempt to predict the effect of mining and dieback on salinity of the South Dandalup reservoir. Early use of the model predicted that if the rehabilitation of the area affected by both mining and dieback were not successful, the salinity of the South Dandalup reservoir could rise to 612 p.p.m. Subsequent recalculation using additional Forests Department data indicated that the salinity could rise as high as 1000 p.p.m. Although the model is crude, its findings are the best available and, as such, are accepted by senior government officers (e.g. in Environmental Protection Authority). It demonstrates objectively the potential of mining and associated dieback to raise salinity in reservoirs significantly.

Rehabilitation

1. Non-Saline Areas

(a) It is possible to develop rehabilitation procedures in non-saline areas to provide a form of vegetative cover which will ensure catchment protection.

(b) Current tree growth on bauxite rehabilitated sites is rapid but it is not possible to assume any single tree species will grow to maturity on bauxite sites.

(c) Although tree growth has been rapid, the trees which have been planted are still in the first stage of development and some species may fail at later stages of development. For example, E. microcorys is one species which exhibited rapid early growth rates and then collapsed.

(d) Root growth on bauxite sites has been improved by deep ripping but is generally poor in relation to the root system of the native forest. It is possible that

root exploration of the soil profile will improve with time but it is also possible that the relatively poor root growth will result in drought deaths and instability at later stages of development.

(e) In summary, it is possible that a form of forest could be regrown on bauxite mined sites in non-saline areas but 20 - 30 years' observation of the trees which had been planted is required before the success of forest establishment can be guaranteed.

2. Saline Areas

(a) If the discharge of saline water is to be prevented on salt-prone catchments, it will be necessary to ensure that the new plant cover on mined and diseased areas uses water at the same rate as the original forest. This cannot be guaranteed on basis of present knowledge.

(b) The major technical problems are as follows -

(i) Soil conditions are even more extreme than those in western areas. The clay zone is acid and saline.

(ii) There are no long term trial plots which have been established on these sites. It is only possible to make an intelligent guess as to the species which will be successful. The species required must, in addition to being able to cope with the adverse soil conditions, be resistant to P. cinnamomi and fire and maintain a high rate of water use throughout the summer.

(iii) The long term survival of species on these sites is essential. A minimum period of 20 to 30 years of growth is required before it can be guaranteed that the species will survive on these sites. Trees may change their ability to respond to environmental stress at different stages of development. Failure of a species after a period of growth would, in addition to causing economic loss, also result in resumption of groundwater discharge and hence increase in stream salinity.

(iv) It is essential that water use by vegetation is maintained continually on these sites since even a short term increase in groundwater discharge could cause salinity to increase.

(c) It is important to re-emphasise that these problems are theoretically potentially solvable but not within the time constraints which would be imposed by bauxite mining at the expanded rate of 700 hectares per year proposed by Alcoa.

Positive Research Approaches Being Undertaken by the Department

The preceding discussion may have created the impression that the Forests Department has a negative approach to bauxite mining. This would be incorrect. A number of major research projects have been initiated which have been directed explicitly at resolving the salinity problem. Almost all of the major changes in rehabilitation of bauxite mined sites followed from research by Forests Department officers.

The following examples are cited:

(1) Use of native legumes to maintain healthy native forest in the presence of P. cinnamomi. If this research is successful then the effect of mining on spread of dieback will be markedly reduced.

(2) Studies to determine if jarrah can be regrown on bauxite mined sites with a native legume understory. Currently jarrah is not used because of the threat from jarrah dieback. This research may permit use of jarrah and thereby resolve many of the rehabilitation problems.

(3) The initiation of direct seeding of native species on bauxite mine sites to increase diversity and stabilise soil. This has been adopted as standard operational procedure.

(4) The establishment of less rapid growing species such as spotted gum and wandoo which have better root systems. This was based on Forests Department root studies.

(5) The concept of total catchment rehabilitation originated from the Forests Department.

(6) The establishment this year of an arboretum of over 50 species of trees on a harsh upland site. Information of the growth performance of these species will assist development of a rehabilitation strategy on salt-prone sites.

(7) Broadscale monitoring of the hydrologic characteristic of 50 species in existing arboreta in an effort to expedite the selection of tree species which could be used to rehabilitate salt-prone sites.

This statement illustrates:

1. recognition of bauxite mining as an acceptable and important land use but that its location, scale and timing must be planned in relation to other land uses;

2. there are considerable risks involved in accepting commitments for the expansion of bauxite mining in some sections of the forest where the impact is not fully understood and satisfactory rehabilitation techniques cannot be guaranteed.

CONSERVATOR OF FORESTS

BJB/PC
8th February, 1978