Clearing of Native Vegetation on Victoria Location 10322, Watheroo West Road, Shire of Dandaragan

---

Mr D and Mrs W Johnston

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 980
June 2000

ISBN. 0 7309 8196 7
ISSN. 1030 - 0120

Summary and recommendations

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment on the proposal by Mr D and Mrs W Johnston (the proponents and landowners) to clear approximately 600 hectares of native vegetation on Victoria Location 10322 within the Shire of Dandaragan for agriculture. Specifically the stated purpose of the proposed clearing is to enable an expansion of an existing grazing enterprise

Following consideration by the Inter Agency Working Group under the *'Memorandum of Understanding (MOU) for the protection of remnant vegetation on private land in the agricultural region of Western Australia,'* the proposal was referred to the EPA by the Commissioner of Soil and Land Conservation in view of the likely impacts of the proposal on nature conservation and biological diversity values.

As the proposal appeared unlikely to meet the EPA's environmental objectives, the Authority set the level of assessment for the proposal at Proposal Unlikely to be Environmentally Acceptable (PUEA) in March 2000. At that time a brief statement of the reasons for the PUEA level of assessment was made publicly available as set out in the EPA's Administrative Procedures for Environmental Impact Assessment.

This report is the EPA's report to the Minister for the Environment on the proposal pursuant to Section 44 of the Environmental Protection Act.

Environmental Factors

It is the EPA's opinion that the environmental factors relevant to this proposal are:

- Nature conservation and biological diversity - impacts due to loss of native vegetation,
- Land degradation – potential for adverse on-site and off-site impacts on land productivity and ecological processes; and
- Greenhouse gas emissions – carbon loss from vegetation clearing and soil.

Conclusions

The EPA has considered the proposal by Mr and Mrs Johnston to clear approximately 600 hectares of native vegetation on Victoria Location 10322 for agriculture with reference to the relevant environmental factors.

The EPA considers the proposal is environmentally unacceptable for the reasons set out in Section 3 of this report.

As indicated in the EPA's preliminary position statement on the protection of native vegetation, the Environmental Protection Authority has been concerned about the environmental consequences of clearing in the agricultural region for some time and, whilst it appreciates that there are matters of equity to be considered, it holds strongly to the view that from an environmental perspective it is unreasonable to allow further clearing to be undertaken for agricultural purposes.

Furthermore, the EPA advises that while it will continue to consider and provide advice to the Minister on the environmental factors relevant to proposals for clearing of native vegetation in accordance with the requirements of Part IV of the of the Environmental Protection Act, any future proposals for agricultural clearing of native vegetation located with the agricultural region referred under Section 38 are likely to receive the 'Proposal Unlikely to be Environmentally Acceptable' level of assessment.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister considers the report on the relevant environmental factors of:

   (a) Nature conservation and biological diversity;
   (b) Land degradation; and
   (c) Greenhouse gas emissions,

   as set out in Section 3 of this report.

2. That the Minister notes that the EPA has concluded that the vegetation proposed to be cleared should be retained because clearing is likely to lead to the continued loss of nature conservation and biological diversity values of vegetation in the region, and may contribute to land degradation problems.

3. That the Minister not issue a statement that the proposal may be implemented.

4. That the Minister notes the advice provided in Section 4 of this report.

Contents

1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment on the proposal by Mr D and Mrs W Johnston (the proponents and landowners) to clear approximately 600 hectares of native vegetation on Victoria Location 10322 for agriculture. Location 10322 is located 25 km north east of Badgingarra on Watheroo West Road within the Shire of Dandaragan (Figure 1). Specifically the stated purpose of the proposed clearing is to enable an expansion of an existing grazing enterprise.

Under the Soil and Land Conservation Act, any landholder wishing to clear native vegetation greater than 1 hectare in area is required to notify the Commissioner of Soil and Land Conservation (the Commissioner). The Commissioner then decides whether or not to object to the clearing depending on whether or not land degradation is likely to occur and may issue a Soil Conservation Notice to prevent that clearing taking place.

The proponents notified the Commissioner of their intention to clear the subject land on 27 August 1998. As the Commissioner formed the opinion that a proportion of the proposed clearing within this proposal would not cause land degradation, the proposal was forwarded to the Inter Agency Working Group (IAWG) for consideration in February 1999. This was done in accordance with the requirements of *'Memorandum of Understanding (MOU) for the protection of remnant vegetation on private land in the agricultural region of Western Australia'* (MoU, 1997).

Following consideration by the Inter Agency Working Group, the proposal was referred to the EPA by the Commissioner in view of the likely impacts of the proposal on nature conservation and biological diversity values.

As the proposal appeared unlikely to meet the EPA's environmental objectives, the Authority set the level of assessment for the proposal at Proposal Unlikely to be Environmentally Acceptable (PUEA) in March 2000. At that time a brief statement of the reasons for the PUEA level of assessment was made publicly available, as set out in EPA's the Administrative Procedures for Environmental Impact Assessment. A copy of the EPA's statement of reasons is provided as Appendix 2 of this report.

This report is the EPA's report to the Minister for the Environment on the proposal pursuant to Section 44 of the Environmental Protection Act.

2. The proposal

A state and regional locality plan is provided as Figure 1 and a site plan is provided as Figure 2. The main characteristics of the proposal are summarised in Table 1 below.

Table 1. Summary of key proposal characteristics

Element	Description
Total area of property	1549.2 hectares
Area of Property Uncleared	901 hectares (58.2%)
Area to be cleared (area estimated by AgWA)	591 hectares (38.2 %)
Area of native vegetation remaining after proposed clearing	approximately 310 Hectares (20%)
Area of native vegetation to be protected under an Agreement To Reserve (ATR)	0 hectares
Purpose of clearing	Establishment of pasture for grazing
Method of disposal of vegetation cleared	burning
Condition of Vegetation	'Very good' using condition scale used in Connell (1995)
Mapped description of the type/s of vegetation to be cleared according to Beard (1980)	*Mosaic Shrublands; dryandra heath / Shrublands; hakea scrub heath* (100%) (from CALM GIS data)
Total Representation in (IUCN Category I to IV) reserves of vegetation type/s to be cleared.	Approximately 14%
Total mapped extent of Beard Vegetation type remaining (any condition)	Approximately 34% (DEP, CALM, AgWA GIS data)

3. Environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

It is the EPA's opinion that the environmental factors relevant to this proposal are:

- Nature conservation and biological diversity - impacts due to loss of native vegetation;
- Land degradation – potential for adverse on site and off site impacts on land productivity and ecological processes; and
- Greenhouse gas emissions – carbon loss from vegetation clearing and soil.

These relevant environmental factors are discussed in Sections 3.1 to 3.3 of this report.

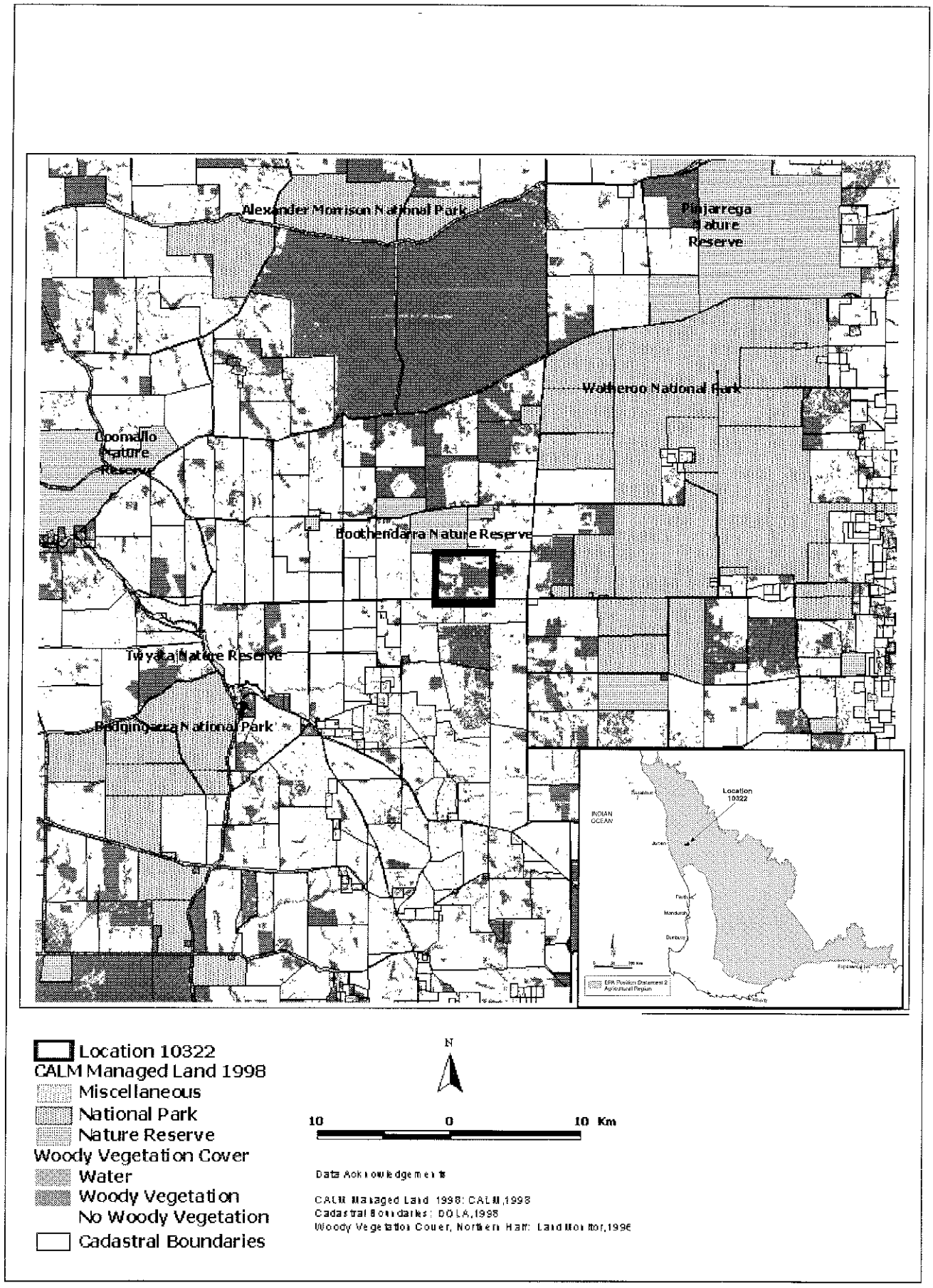

Figure 1. Location of the proposal.

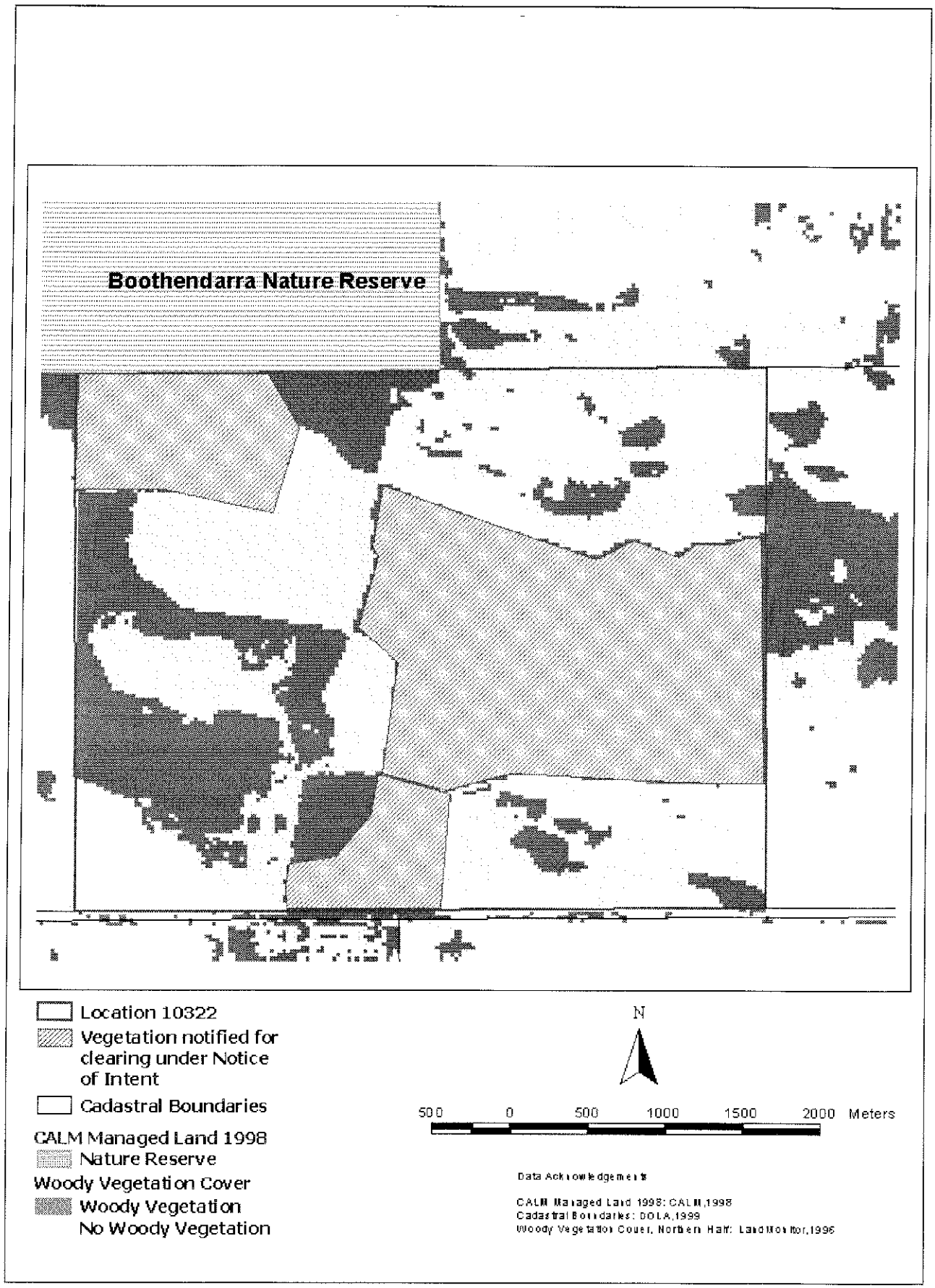

Figure 2. Site plan of the property showing proposed clearing.

3.1 Nature conservation and biological diversity

3.1.1 Strategic context

It is now well recognised that broad-scale land clearing and consequential salinity have had a dramatic effect on biodiversity in the agricultural area through the direct loss of vegetation communities and plant species, and the associated loss of mammals, birds, and other animals which depend upon large enough areas of healthy bush for food and shelter. These impacts have been reported in both the State and Commonwealth State of the Environment reporting (Western Australian Government, 1998b, and Commonwealth of Australia, 1996).

In response to impacts on biological diversity and nature conservation, as well as land and water degradation, the State and Commonwealth Governments have over recent years developed and implemented various policy positions and programs to provide a strategic context for the protection of remnant vegetation.

a) *State Government position, 1995*

The State Government position of 1995 agreed to apply restrictions on clearing and to augment the Commissioner's assessment of clearing applications to ensure that other natural resource management issues as well as land degradation issues were considered before any further clearing occurred on privately owned land. The position included the following elements:

- restrict any clearing that would reduce the amount of remnant vegetation or deep rooted perennial vegetation on any property (contiguous landholding) to below 20% of the original;
- discourage clearing in any Shire where the total amount of remnant vegetation is less than 20% of the Shire area; and
- put the onus onto the proponent to demonstrate clearly that clearing would not cause land degradation or threaten nature conservation values.

The target criteria of ensuring that there is minimum of 20% vegetation retention on individual properties and 20% vegetation retention within the Shire were derived primarily from consideration of land degradation impacts, and did not specifically provide for nature conservation values.

In this regard, for Shires with greater than 20% remnant vegetation, the position provided that the Commissioner for Soil and Land Conservation would decide on the need to refer any proposal to the EPA for consideration of nature conservation values in accordance with an agreed Memorandum of Understanding.

b) *State Memorandum of Understanding*

The State Government position has been implemented via a Memorandum of Understanding (MoU) signed by the Commissioner for Soil and Land Conservation, the Chairman of the EPA, and the Chief Executive Officers of the Department of Environmental Protection (DEP), Department of Conservation and Land Management (CALM), Water and Rivers Commission (WRC), and Agriculture Western Australia (AgWA). The MoU, which links the Commissioner's Notice of Intent (NOI) to Clear process with the environmental impact assessment process under the Environmental Protection Act 1986 was signed in March 1997. A summary document containing the main elements of the MoU has been published by Agriculture Western Australia (Agriculture WA, 1997).

The MoU provides for a process of coordinating the signatory government agencies in an attempt to ensure that bio-diversity and land and water degradation impacts are considered and to streamline the process. The MoU describes four levels of consideration once a Notice of Intent to clear has been submitted to the Commissioner for Soil and Land Conservation:

Level One - Desktop review. The Commissioner may object on various grounds or may refer the application to Level Two for more detailed investigations.

Level Two - Property investigation and report. The Commissioner may object because of the potential for land degradation or refer to Level Three for detailed review of bio-diversity and other issues.

Level Three - Inter Agency Working Group (IAWG) Review. This level involves a formal meeting of senior agency representatives to advise the Commissioner. Several actions are possible including referring the clearing proposal to the EPA for Level Four assessment.

Level Four - Formal assessment by the Environmental Protection Authority. It is the proponent's responsibility to provide any additional information required by the EPA.

c) *Other State and Commonwealth strategic initiatives*

Since 1995 when the State Government released its position on protection and management of remnant vegetation on private land in the agricultural region, there have been a number of significant policy and program initiatives at both a State and Commonwealth level, which have a bearing on the issue. These include:

- The National Strategy for the Conservation of Australia's Biological Diversity, specifically, Objective 7.1 of the National Strategy which commits all State, Territory and Commonwealth Governments by the year 2000 to, among other things;

  "(l) arresting and reversing the decline of remnant vegetation; and

  (k) avoiding or limiting any further broad-scale clearance of native vegetation, consistent with ecologically sustainable management and bio-regional planning, to those instances in which regional biological diversity objectives are not compromised" (Commonwealth of Australia, 1996, p.42).

- the establishment of the National Heritage Trust by the Commonwealth Government and its changes of focus from the National Landcare Program which funded work on private land for private benefit to an emphasis on funding work on private land for public benefit, in a more regional context, in particular through the Bushcare initiatives;

- the Commonwealth and WA State of the Environment reports which identified biodiversity, and clearing and salinity as critical issues;

- the development of the WA Salinity Strategy and formation of a WA State Salinity Council;

- the National Greenhouse Strategy from the Kyoto conference, which encourages the retention of native vegetation as a carbon sink; and

- The final report of the Native Vegetation Working Group (See Section 4).

d) *EPA position*

Within the strategic framework provided by the above government policy positions and programs, the EPA has assessed a number of land clearing proposals over recent years.

Based on these assessments, and a workshop with key personnel from agencies which are signatories to the MoU for protection of native vegetation, in December 1999 the EPA released a preliminary Position Statement regarding 'Environmental Protection of Native Vegetation in Western Australian' (EPA, 1999b).

Specifically in relation to the agricultural region, the EPA's current position on clearing includes the following:

1. Significant clearing of native vegetation has already occurred on agricultural land, and this has led to a reduction in biodiversity and increase in land salinisation. Accordingly, from an environmental perspective any further reduction in native vegetation through clearing for agriculture cannot be supported.
2. All existing remnant native vegetation should be protected from passive clearing (e.g. through grazing by stock) or clearing by other means, such as use of chemicals including fertilisers.
3. All existing remnant native vegetation should be actively managed by landholders and managers so as to maintain environmental values.

The EPA recognises that its position extends beyond the State Government position of 1995 which removed the presumed right to clear native vegetation in landscapes containing less than 20% of the original vegetation. The criterion of 20% vegetation related primarily to land degradation impacts and does not adequately provide for nature conservation and biological diversity considerations. Understanding of the need to protect remnant vegetation for nature conservation and biological diversity values has advanced since the 1995 State Government position as reflected in the policy and strategy initiatives listed in (c) above.

The EPA recognises that the Johnston's clearing proposal is located in the Shire of Dandaragan where there is approximately 45% of the original vegetation cover remaining, and that 20% of vegetation would remain on the property after the proposed clearing.

However, the Shire of Dandaragan is located within an area known as the Northern Sandplain or 'Kwongan' region which has long been recognised as having high nature conservation and biological diversity values. EPA Bulletin 424, entitled 'Nature Conservation, Landscape and Recreation Values of the Lesueur Area' (Burbidge et al., 1990) describes the significance of the region which has been identified as an area of world, national, State and regional conservation significance.

Importantly, the report states that the major characteristics of the region include:- its uniqueness in terms of high number of endemic plants; biodiversity as it includes high numbers of vascular plants and vertebrate animals; and its high nature conservation values due to its diverse vegetation associations and communities.

For this reason the Northern Sandplains region has been included in the agricultural region defined in the EPA's preliminary Position Statement on protection of native vegetation (EPA, 1999) where it does not support further agricultural clearing.

In accordance with this position, the EPA considers that the clearing proposed in this NOI to clear should not be permitted. The challenge is to establish a response to the equity issue rather than to continue to allow clearing (see also section 4.1).

3.1.2 Property specific considerations

The proposed clearing was evaluated by officers from AgWA, DEP, CALM and WRC in accordance with the principles and criteria set out in the MoU for protection of native vegetation, through the Levels 1 to 3 processes. A summary of these findings is presented in Appendices 3 and 4 as provided to the EPA.

The EPA notes that no specific surveys have been carried out for Declared Rare or Priority flora species within the vegetation proposed to be cleared. However, advice provided by CALM indicates that a large number of declared rare and priority flora occur in the area, with 5 populations of Declared Rare Flora (DRF) and 14 populations of priority flora occurring within close proximity of the property. Rare flora may therefore occur within the vegetation proposed to be cleared.

No specific survey of the vegetation has been carried out. However, based on regional mapping, the vegetation in the property falls within the 'Mosaic Shrublands; dryandra heath/Shrublands; hakea scrub heath Vegetation Type' (Beard, 1979). Analysis of the extent of

this vegetation type by the DEP using computerised Geographic Information Systems (GIS) data derived from CALM databases and satellite imagery indicates that less than 10% of the original extent of this vegetation type remains within a 15km radius of the property, and 34% of the original extent remains overall. This analysis also indicates that only approximately 14% of the original extent of this vegetation type is now located within secure conservation reserves. The EPA notes that the Beard mapping is of a broad nature and that little information is known, at a plant community level, regarding the type and condition of the vegetation proposed to be cleared, or vegetation in the general region,. It is therefore not possible to conclude that the vegetation proposed to be cleared is adequately represented in the region.

The EPA also notes that much of the native vegetation currently remaining on the property is of an area and shape which should maintain its viability in providing fauna corridor values as 'stepping stones' linking the Boothendarra Nature Reserve which adjoins the property to the North. The proposed clearing would effectively remove the majority of the vegetation on the property and significantly decrease the size, and increase the boundary, of any remaining vegetation blocks on the property, severely reducing their potential to act as stepping stones or, in combination with revegetated areas, as a corridor.

In its recent advice to the Minister for the Environment on issues arising from use of Section 38 to assess clearing proposals (EPA, 1999a), the EPA drew attention the difficulties presented to the Authority as a result of the limited detailed information which was generally available to it to assess individual proposals. In the case of the present proposal there is also limited specific information regarding the vegetation proposed to be cleared or other vegetation in the region.

However, based on the information which is available, and adopting a precautionary approach, the EPA considers that the further clearing proposed on Location 10322 would be likely to continue the loss of nature conservation and biological diversity values of vegetation in the region, and should not be permitted.

3.2 Land degradation

3.2.1 Strategic context

Land degradation caused by erosion, salinisation, waterlogging and acidification were key issues identified for action by the Government in Western Australia's State of the Environment Report (Western Australian Government, 1998b) and the Salinity Strategy (Western Australian Government, 2000a). Native vegetation management has been identified in the Salinity Strategy as an important tool to assist in the management of these threats.

Additionally the EPA has expressed the view in its Position Statement on the protection of native vegetation (EPA, 1999b) that:

"Clearing and consequential salinity are having a devastating effect on biodiversity through the direct loss of plant species, and the associated loss of mammals, birds and other animals which depend upon large enough areas of healthy rush for food and shelter. Many of the remaining areas of native vegetation in the wheatbelt are small islands surrounded by farmed land, and the fauna are unable to move to other areas when they are too far apart and not linked by 'stepping stones' or corridors.

The Environmental Protection Authority has been concerned about the environmental consequences of clearing in the Agricultural Region for some time and, whilst it appreciates that there are matters of equity to be considered, it holds strongly to the view that from an environmental perspective, it is unreasonable to allow further clearing to be undertaken for agricultural purposes."

3.2.2 Property specific considerations

Information provided to the EPA by the Commissioner of Soil and Land Conservation at the time of his referral of the clearing proposal (refer Appendix 4) indicates that:

- the sandy soils on the property have limited productive potential and are mostly classified as occurring within land capability classes III (fair) and IV (poor);
- there is a risk of wind erosion if areas of sandy soils were cleared;
- Class IV land (which occupies a significant proportion of the area proposed for clearing) may only be considered suitable for clearing where the proposed development incorporates strategies to prevent wind erosion;
- there is some risk of waterlogging and seepages developing in the broad valley system on the property; and
- the main valley running across the northern part of the property also crosses the south western corner of the location. Clearing could lead to waterlogging or seepages occurring offsite within the reserve and further down the catchment.

The Commissioner indicated that he was likely to object to clearing on Class IV land due to wind erosion hazards, until appropriate management strategies were developed.

3.2.3 EPA Assessment

The EPA recognises that the area of vegetation proposed to be cleared is relatively small in terms of the total area cleared within the locality and that the local area has been assessed as generally having a minimal salinity hazard rating.

Furthermore, the EPA recognises that the threat of wind and water erosion has significant potential to be managed through the application of suitable and precautionary agricultural land management practices .

However, the EPA is concerned that there appears to be some risk of on and off-site impacts of land degradation caused by waterlogging which could affect the viability and habitat value of the native vegetation in the Boothendarra Nature Reserve and the productivity of nearby agricultural land.

The EPA is also aware that substantial funding from the Natural Heritage Trust has been obtained by landholders within the Boothendarra sub-catchment for revegetation initiatives and is concerned that clearing of further native vegetation may obviate or lessen the effectiveness of the expenditure of these funds. Furthermore, the EPA is aware that all Australian Governments, have committed themselves through the Bush Heritage Trust, to achieving the national goal of reversing the long term decline in the quality and extent of Australia's native vegetation cover by the year 2001. The EPA considers that allowing clearing within a sub-catchment in which funds are being expended to establish native vegetation would conflict with the aims of this commitment.

Overall the EPA considers that it has not been confidently determined that the subject clearing proposal would not lead to land degradation through wind erosion or waterlogging and may undermine the effect of other revegetation efforts within the catchment. The EPA therefore considers that the proposed clearing should not be permitted.

3.3 Greenhouse emissions

3.3.1 Discussion

The clearing and burning of approximately 600 hectares of native vegetation will lead to the emission of greenhouses including carbon dioxide.

The prediction of the precise amount of greenhouse emissions attributable to a specific proposal for a land use change from native vegetation to agriculture is complex and involves the estimation of emissions from the aboveground biomass to be removed, decay of surface and subterranean material such as tree roots, emissions from the soil profile, the long term carbon sink effect of vegetation retention and carbon fluxes generated by agricultural activities such as grazing.

Detailed estimation of the long term carbon sink effect of not clearing the vegetation (ie carbon sequestration by the vegetation over the long term, if it were retained) and carbon fluxes generated by agricultural activities including grazing and cropping is beyond the scope of this assessment.

However, the Commonwealth body, the National Greenhouse Gas Inventory Committee (NGGIC) has developed a simplified methodology for calculating greenhouse emissions from clearing in order to assist land managers and decision-makers in broadly assessing the effects of land management and development. These are discussed in the booklet "Land Use Change and Forestry: Workbook for Carbon Dioxide from the Biosphere" (Commonwealth of Australia 1997).

By adapting the methodology outlined in the NGGIC workbook, and making the assumption that essentially all of the above ground biomass from clearing will be burnt or otherwise converted into greenhouse gases within a ten year period following clearing, the DEP has estimated that approximately 15 600 tonnes of carbon would be emitted from the initial clearing of the native vegetation on location 10322 over a ten year period, with a further 6000 tonnes lost from the soil over a 20 year period. An approximation of the potential carbon emissions from clearing (which excludes the effect of change in land use) was therefore given as 21600 tonnes.

3.3.2 Assessment

The EPA is aware of the commitment that Australia has made under the Kyoto protocol to ensuring that Australia's greenhouse emissions do not increase by more than 8% over 1990 levels for the first reporting period from 2008 to 2012. The EPA is also aware that Australia will be reporting in 2005 on progress toward meeting the target. The National Greenhouse Strategy also encourages the retention of native vegetation as a carbon sink.

While the EPA does not have a specific objective for the assessment of land clearing proposals in terms of levels of greenhouse emissions which are acceptable, the clearing of vegetation under the present proposal will not assist in meeting Australia's greenhouse targets. As referred to in Section 3.1 of this report, the EPA has also taken the impact of land clearing on greenhouse emissions into account in formulating its position statement on the protection of native vegetation.

4. Other advice

4.1 Final report of the Native Vegetation Working Group

The Working Group was established by the Minister for Primary Industry to 'develop mechanisms that minimise the economic burden carried by individual landholders in the protection and retention of privately owned bushland in agricultural areas'. The Working Group reported in January 2000 (Western Australian Government, 2000b).

In the Report Introduction, the Working Group set out that:

"Most of Western Australia's farmland has been cleared and developed in the past 100 years. We have now reached the limit of expansion, and there is now a high level of agreement across the community, rural and urban, that the time of broadacre clearing has passed. Amongst the challenges facing us is to determine a useful and well supported future of bushland in our

farming areas. Indeed, unless there is a substantial increase in tree and bush cover many of the farms established in the last hundred years may fall victim to increasing salinity."

The Report discusses a range of mechanisms aimed at both assisting in the protection and management of bushland, and ensuring that the costs are spread more equitably across the whole community. The Working Group put forward fifteen recommendations.

The EPA commends the Working Group on its report on mechanisms and encourages government to give active consideration to the recommendations (Western Australian Government, 2000b).

As noted in the EPA's recent advice to the Minister for the Environment on environmental issues arising from the assessment of individual land clearing proposals (EPA, 1999a), "the challenge now is to establish a response to these applications in terms of addressing the equity issue rather than continuing to allow clearing". The EPA sees the Working Group's report and recommendations as clearly progressing this issue.

5. Conclusions

The EPA has considered the proposal by Mr and Mrs Johnston to clear approximately 600 hectares of native vegetation on Victoria Location 10322 for agriculture with reference to the relevant environmental factors.

The EPA considers the proposal is environmentally unacceptable for the reasons set out in Section 3 of this report.

As indicated in the EPA's preliminary position statement on the protection of native vegetation, the Environmental Protection Authority has been concerned about the environmental consequences of clearing in the agricultural region for some time and, whilst it appreciates that there are matters of equity to be considered, it holds strongly to the view that from an environmental perspective it is unreasonable to allow further clearing to be undertaken for agricultural purposes.

Furthermore, the EPA advises that while it will continue to consider and provide advice to the Minister on the environmental factors relevant to proposals for clearing of native vegetation in accordance with the requirements of Part IV of the of the Environmental Protection Act, any future proposals for agricultural clearing of native vegetation located with the agricultural region referred under Section 38 are likely to receive the 'Proposal Unlikely to be Environmentally Acceptable' level of assessment.

6. Recommendations

Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister considers the report on the relevant environmental factors of:
   (a) Nature conservation and biological diversity;
   (b) Land degradation; and
   (c) Greenhouse gas emissions,
   as set out in Section 3 of this report.
2. That the Minister notes that the EPA has concluded that the vegetation proposed to be cleared should be retained because clearing is likely to lead to the continued loss of nature conservation and biological diversity values of vegetation in the region, and may contribute to land degradation problems.
3. That the Minister not issue a statement that the proposal may be implemented.
4. That the Minister notes the advice provided in Section 4 of this report.

Appendix 1

References

Agriculture WA (1997) The Protection of Remnant Vegetation on Private Land in the Agricultural Region of Western Australia, Agriculture Western Australia: Albany, WA.

Beard, J.S (1979). *Vegetation Survey of Western Australia 1:250 000 series. The Vegetation of the Hill River and Moora Area. Map and Explanatory Memoir.* Vegmap Publications Applecross WA.

Burbidge, AA., Hopper S.D. and Van Leeuwin, S (eds) (1990). *Nature Conservation Landscape and Recreational values of the Mt Lesueur area. A Report to the Environmental Protection Authority from the Department of Conservation and Land Management.*, Environmental Protection Authority , Bulletin 424, Perth.

Commonwealth of Australia (1996) *National Strategy for the Conservation of Australia's Biological Diversity'*, AGPS: Canberra, ACT.

Commonwealth of Australia (1998). *National Greenhouse Strategy - Strategic Framework for Advancing Australia's Greenhouse Response*, Australian Greenhouse Office: Canberra, ACT.

Commonwealth of Australia(1997) *Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks, Land Use Change and Forestry, "Workbook for Carbon Dioxide from the Biosphere", Workbook 4.2 Revision 2.* National Greenhouse Gas Inventory Committee.

Commonwealth of Australia and State of Western Australia (1997). *Partnership Agreement between the Commonwealth of Australia and the Sate of Western Australia addressing jointly agreed natural heritage objectives and the provision of financial assistance under the Natural Heritage Trust of Australia Reserve and related programs*, Environment Australia: Canberra, ACT.

Connell, S (1995). *Perth Environment Project-Remnant Vegetation Inventory and Assessment.* Unpublished report to the Australian Heritage Commission (National Estate Grants Programme) and the Ministry for Planning, Perth, Western Australia.

Environmental Protection Authority (*EPA*) (1994). *Clearing of Native Vegetation on Victoria Location 10598 Cockleshell Gully Road, Shire of Dandaragan – Reassessment under Section 43 of the Environmental Protection Act Report and Recommendations of the Environmental Protection Authority.* EPA Bulletin 894, Perth WA.

Environmental Protection Authority (EPA) (1999). *Environmental Protection of Native Vegetation in Western Australia. Preliminary Position Statement No 2.*

Hopkins, A.J.M, Coker, J, Beeston, G.R, Bowen, P, and Harvey, J.M, (1996). *Conservation Status of Vegetation Types Throughout Western Australia (Final Report).* Department of Conservation and Land Management, Department of Agriculture Western Australia and Australian Nature Conservation Agency, May 1996.

Memorandum of Understanding (MoU) (1997*) between the Commissioner for Soil and Land Conservation, Environmental Protection Authority, Department of Environmental Protection, Agriculture Western Australia, Department of Conservation and Land Management and the Water and Rivers Commission for the protection of remnant vegetation on private land in the agricultural region of Western Australia.* Agriculture Western Australia: Perth, WA.

Western Australian Government (1998a) *Western Australian Salinity Action Plan,.* Western Australian Government: Perth, WA.

Western Australian Government (1998b) State of Environment Report, Western Australian Government: Perth, WA.

Western Australian Government (2000a) *Natural Resource Management - The Salinity Strategy.* Prepared by the State Salinity Council in association with community groups and government agencies, Western Australian Government: Perth, WA.

Western Australian Government (2000b) *Final Report of the Native Vegetation Working Group.* Perth, WA.

Appendix 2

Public statement of reasons for the PUEA level of assessment

Environmental Protection Authority

Statement of reasons for level of assessment set at 'Proposal Unlikely to be Environmentally Acceptable (PUEA)'

Proposal: Clearing of 602 ha of land for grazing.

Location: Victoria Location 10322 Watheroo West and Coalara Roads Badgingarra.

Proponent: Landowners, Mr D & Mrs W Johnston.

Description of proposal and location :

The proponents and landowners, Mr D S Johnston and Mrs W Johnston, propose to clear approximately 591 hectares of native vegetation on their farming property, Victoria Location 10322, which has a total area of 1549.2 hectares. The property is located approximately 25 Km north east of the town of the Mid West town of Badgingarra and adjoins the Boothendarra Nature Reserve to the north of the property.

The proposed clearing, which is for expansion of the owners' grazing enterprise, would leave a total of 310 hectares (19% of the property) uncleared from an existing total of 901 hectares (59% of the property).

It is proposed that the vegetation material resulting from clearance would be disposed of by burning.

Soil description land capability and land degradation risk.

The soils on the property have been described as predominantly sandy gravel with lateritic gravel on the surface and with deeper white and yellow sands in 'hollows'. The sandy soils on the property are considered to be poorer soil types with a low water holding capacity and low nutrient retention ability. All areas proposed for clearing are in land capability Class III or Class IV (fair to low capability) for grazing because of the risk of wind and or water erosion.

The Commissioner for Soil and Land Conservation, on advice from the Water and Rivers Commission, has determined that due to the depth, quality and flow direction of the groundwater in the area, the proposal will not have an adverse impact on groundwater level or quality.

Vegetation description and biodiversity significance

The Dandaragan area, which occurs within the floristically rich Geraldton Sandplains bioregion, within the agricultural south west, contains flora communities of unusually high levels of species richness and endemism (EPA, 1998).

The vegetation on the property has been mapped by Beard (1979) as *'Mosaic: Shrublands; dryandra heath / Shrublands; hakea scrub-heath.'* Vegetation mapping using computerised Geographic Information Systems has estimated that these vegetation types have very low (approx 10% of pre-european extent) representation in conservation reserves within a 15km

radius) and low representation (13.9% of pre-european extent,) on CALM managed lands overall (Hopkins et al, 1996). Based on analysis of satellite imagery undertaken by the Department of Environmental Protection (DEP), 34% of the area originally occupied by this Beard vegetation type currently retains native vegetation. However it is unclear how much of the vegetation type remains in good condition.

The condition of the majority of the vegetation proposed for clearing under the present proposal, using the classification system of Connel (1995), has been described by Agriculture WA as 'very good.'

A large number of declared rare and priority flora occur in the general area, with 5 DRF and priority flora occurring within a relatively close proximity to the property.
The vegetation forms a stepping stone of native vegetation potentially connecting the Boothendarra Nature Reserve to other native vegetation on private property to the south of Watheroo Road which would otherwise be isolated to a large degree, from other remnant vegetation.

General

This proposal involves clearing for agricultural purposes within the agricultural region of WA, as defined by the map presented as Figure 1 of the EPA's Position Statement Number 2 (Preliminary). Copies of this Position Statement are available from the EPA's Perth office. The EPA's position with respect to clearing in this region is that any further reduction in native vegetation through clearing for agriculture cannot be supported.

Furthermore, under the joint Commonwealth-Western Australian Government Natural Heritage Trust (NHT) Partnership Agreement and the National Strategy for the Conservation of Australia's Biodiversity, all Australian jurisdictions, including the Government of Western Australia have agreed to contribute to addressing and reverse the decline of native vegetation in Australia by limiting further broadscale clearing to those instances which do not compromise regional biodiversity conservation objectives.

Brief Statement of Reasons for PUEA level of assessment

1. The proposal does not conform with the EPA's stated position as set out Position Statement Number 2 (preliminary) on the *Protection of Native Vegetation in Western Australia*, in that the proposal is for clearing of native vegetation within the agricultural zone, as defined in Figure 1 of the Position Statement.
2. The proposal occurs within the Geraldton Sandplains bioregion which contains vegetation communities with a high level of species diversity and endemism, resulting in them being considered to have a high level of significance for the conservation of biodiversity.
3. The property contains vegetation communities which are poorly represented (less than 30% of pre-European extent) in secure nature conservation reserves such that any further clearing may have irreversible consequences for the conservation of biodiversity.
4. The clearing has significant potential to impact on rare, threatened or poorly known flora species, in that a number of populations of Declared Rare Flora or Priority listed species occur within close proximity of the proposed clearing.
5. The proposal has the potential to affect the viability of the adjacent Boothendarra Nature Reserve for its stated purpose of Conservation of Flora and Fauna, and to further fragment and isolate other vegetation remnants on nearby private land, decreasing their viability for the protection of biodiversity.
6. The proposal would lead to the retention of less than 20% of the original (pre-European) extent of native vegetation on the property. This would have potential to significantly lower the present contribution of vegetation communities in the area, to mitigating or

buffering the longer term impacts of agricultural use on land productivity and ecological functions within the landscape.

7. The proposal would lead to the generation of additional carbon emissions via clearing and the subsequent land use change.

References

Beard, J.S, (1979). *Vegetation Survey of Western Australia 1:250 000 series. The Vegetation of the Hill River and Moora Area. Map and Explanatory Memoir.* Vegmap Publications Applecross WA.

EPA (1994). *Clearing of Native Vegetation on Victoria Location 10598 Cockleshell Gully Road, Shire of Dandaragan – Reassessment under Section 43 of the Environmental Protection Act Report and Recommendations of the Environmental Protection Authority.* EPA Bulletin 894,. Perth WA.

Connell, S (1995). *Perth Environment Project-Remnant Vegetation Inventory and Assessment.* Unpublished report to the Australian Heritage Commission (National Estate Grants Programme) and the Ministry for Planning, Perth, Western Australia.

Hopkins, A.J.M, Coker, J, Beeston, G.R, Bowen, P, and Harvey, J.M, (1996). *Conservation Status of Vegetation Types Throughout Western Australia (Final Report).* Department of Conservation and Land Management, Department of Agriculture Western Australia and Australian Nature Conservation Agency, May 1996.

Appendix 3

Summary Advice provided by involved agencies within the Level 3 MoU Process

OUTCOME OF LEVEL 3 SUMMARY SHEET - NOTICE OF INTENT TO CLEAR LAND

L 3 Assessment Date: 11 November 1998

Proponent: JOHNSTON, Donald and Wilhelmina

Location: VICTORIA Location 10322
25 km northeast of Badgingarra, west of the junction of Watheroo West Road and Coalara Road (Shire of Dandaragan)

NOI Date: 28 August 1998

Area Notified: Applied to clear 602 ha, later identified to be 591 ha

Intended use: Growing of crops, grazing of livestock

Issues:

1. Land degradation

On-site wind erosion is likely to occur on sandy soils. There is likelihood of an increased risk of waterlogging and seepages in the valley system off-site.

2. Nature Conservation

Directly to the northwest is the Boothendarra Nature Reserve and approximately 1.3 km further to the west is Boothendarra Creek.

There is a possibility that threatened flora or flora of special interest may occur within this area.

3. Wetlands/drainage

There are no wetlands of significance in the area. Surface drainage would be in a northerly direction.

Commissioner's (Regulatory) Opinion:

Sandy gravel soils over Parmelia formation. Commissioner has not objected to clearing class III land under MOU. Potential for some clearing under land clearing guidelines. Object to class IV land due to wind erosion hazards (until management strategies developed).

IAWG Advice to the Commissioner:

WRC:	Proposal will not have an adverse impact on groundwater level and quality. No objections. (see notes attached).
CALM:	Large number of DRF and priority species occur in the area. Survey required prior to clearing. Corridor and linkage issues identified. (see notes attached).
DEP:	Likely to contain rare and endangered species therefore survey required. Possible for survey to be carried out now. Site contains poorly conserved community types and likely to have high floristic value. Vegetation has corridor and stepping stone values. (see notes attached).
IAWG:	**Need to carry out flora survey and have other nature conservation values assessed. Refer to EPA.**

LEVEL 3 SUMMARY SHEET - NOTICE OF INTENT TO CLEAR LAND

Department of Environmental Protection Comments

IAWG Meeting Date: 11 November 1998 (20th Meeting)

Proponent: JOHNSTON, Donald Steven and Wilhelmina G

Location: VICTORIA Location 10322
25 km north east of Badgingarra, west of the junction of Watheroo West Road and Coalara Road (Shire of Dandaragan)

NOI Date: 28 August 1998

Area Notified: Applied to clear 602 ha, later identified to be 591 ha

Intended use: Growing of crops, grazing of livestock

DEP's Interim Advice to the Commissioner:

1. The vegetation is likely to have high floristic diversity.

2. The vegetation has the potential to have significant fauna and fauna habitat values.

3. The area is likely to contain rare and endangered flora species. There are records of four DRF and two priority 4 species within a 15 km radius on the same Beard veg type as that proposed to be cleared.

4. The site contains vegetation community types which are poorly conserved within the area. ie :- The vegetation type proposed to be cleared has only 10% representation in secure conservation reserves in a 15 km radius.

5. The vegetation has corridor and stepping stone values.

6. The area acts as a buffer for the abutting Boothendarra NR (C27872)

7. The current condition of the vegetation has been assessed as very good.

8. A survey to identify any DRF, Priority or Significant taxa should be carried out prior to any clearing approval.

9. A survey to identify any Declared threatened fauna, Other specially protected fauna or Priority listed fauna or the presence of suitable habitats of these species should be carried out prior to any clearing approval.

LEVEL 3 SUMMARY SHEET - NOTICE OF INTENT TO CLEAR LAND

Department Of Conservation And Land Management Comments

IAWG Meeting Date: 11th November 1998

Proponent:	JOHNSTON, Donald Steven and Wilhelmina G
Location:	VICTORIA Location 10322 25 km northeast of Badgingarra, west of the junction of Watheroo West Road and Coalara Road (Shire of Dandaragan)
NOI Date:	28 August 1998
Area Notified:	Applied to clear 602 ha, later identified to be 591 ha
Intended use:	Growing of crops, grazing of livestock

CALM's Interim Advice to the Commissioner:

A large number of declared rare and priority flora occur in the area, with of these 5 DRF and 14 priority flora occurring being relatively close.

The northern block adjoins Boothendarra Nature Reserve, and the other blocks have linkage to this reserve, and more tenuous link via a narrow road reserve to Watheroo NP.

It is noted that the areas that are currently fenced off are isolated. There should be a vegetation management strategy for the location to retain a vegetation corridor up the west side to act as a windbreak and wildlife corridor. Other strategic vegetation retention is also required over the rest of the location.

A flora survey should be undertaken to determine the conservation significance of the vegetation, and to define those areas that are of greater value for strategic retention if any clearing is permitted.

LEVEL 3 SUMMARY SHEET - NOTICE OF INTENT TO CLEAR LAND

Water and River Commission Comments

IAWG Meeting Date:	**11th November 1998 (20th Meeting)**
Proponent:	JOHNSTON, Donald Steven and Wilhelmina G
Location:	VICTORIA Location 10322 25 km northeast of Badgingarra, west of the junction of Watheroo West Road and Coalara Road (Shire of Dandaragan)
NOI Date:	28 August 1998
Area Notified:	Applied to clear 602 ha, later identified to be 591 ha
Intended use:	Growing of crops, grazing of livestock

WRC's Interim Advice to the Commissioner:

Groundwater risk assessment:

The proposed clearance will not have an adverse impact on groundwater level and quality.

This assessment is based upon:

- **A deep groundwater table;**
- **Vertical drainage of recharge;**
- **Marginally fresh groundwater; and**
- **Regional groundwater flows west – southwest.**

With respect to water resources the Commission has no objection to the proposed clearing.

Appendix 4

Evaluation of proposed clearing on Victoria Location 10322 under principles and criteria set in the MoU for protection of native vegetation as presented in the Level 2 process

COMMISSIONER OF SOIL & LAND CONSERVATION
AGRICULTURE WESTERN AUSTRALIA
SOUTH PERTH WA 6151

SOIL AND LAND CONSERVATION ACT: REGULATION 4

NOI TO CLEAR LAND VICTORIA LOCATION 10322

NOTIFIED BY: DONALD STEVEN JOHNSTON & WILHELMINA JOHNSTON

FILE: 980881V01P0G

SECTION A: BACKGROUND

1. Introduction and Summary

The landholder, Steven Johnston, proposes to clear approximately 600 ha of mainly low scrub-heath type vegetation to increase his cropping programme and for pasture production for grazing of livestock. It is suggested that some clearing could occur but there are areas where there would be a high risk of wind erosion associated with clearing.

Directly to the north west of the property is the Boothendarra Nature Reserve and about 13 kms further to the west is Boothendarra Creek.

There is greater than 25% native vegetation remaining on the location and the proposed clearing would mean that 19.4% vegetation would be retained.

2. Notification Dates

The Notice of Intent to Clear was received at the Moora District Office on 28 August 1998 by and forwarded to the Office of the Commissioner of Soil and Land Conservation on the same day.

3. Property Inspection

An inspection was carried out on 16 September 1998 by in conjunction with the landholder

4. Property Location

The property is located just to the west of the junction of Watheroo West Road and Coalara Road and about 25 kms north east of Badgingarra.

4.1 Geographic Position

Nearest Town: 25 kms north east of Badgingarra
Nearest Road: near the junction of Watheroo West Road and Coalara Road.
Map Reference: Lat 30° 18′ S and Long 115° 40′ E
AMG Reference: Zone 50, 372 000 mE and 6 647 000 mN

5. Local Government Area

The property is located in the Dandaragan Shire, which has been identified as containing greater than 20% native vegetation.

6. Contiguous Locations

There is one location, Victoria location 10322, with a total area of 1549.2 ha.

Property Areas

		Area (ha)		Percentage
1.	Total area of location	1549.2		100
2.	Currently cleared	648.2		41.8
3.	Current uncleared area	901		58.2
		Farmer estimate	AgWa estimate	
4.	Area notified to clear	602	591	38.2
5.	Final uncleared area		310	20
6.	Final cleared area		1239.2	80

From the above, there will be 20% native vegetation left after clearing.

7. Clearing Proposal

The landholders' proposal is to clear 591 ha (AgWa estimate) of mostly low scrub-heath type vegetation in the north west and central parts of the location and in the southern portion near Watheroo West Road. This is to increase the cropping area and expand areas for grazing of livestock.

8. Property Description

8.1 Landform

The landscape is undulating to hilly and is predominantly a dissected lateritic upland with sandy valleys between the uplands. Any surface drainage would be in a northerly direction to a defined valley on the property in the north. This valley is aligned south east to north west. There are no defined creeklines into or out of the property..

Although there are defined valleys on the property, there would be little surface drainage on the sands and sandy gravels, except from water repellent soils.

8.2 Position in Landscape

Clearing is proposed on the upper and mid parts of the landscape where there are mainly lateritic gravels and some sandy areas, and also in the smaller sandy valleys between these.

8.3 Geology

The geology is described as laterite, and associated sand and colluvium - quartz sand and soil - in the depressions.

The area lies between the Gingin and Dandaragan Scarps.

8.4 Soils

The majority of the soil types which are represented on the areas to be cleared, are sandy gravels with lateritic gravel to the surface. These are present on the hills and slopes, and have proportions of 50% gravel/50% sand or 60% gravel/40% sand. They are to be found at all sites A, B & C (see plan) but mainly on A & B. Massive laterite is sometimes exposed.
There are some areas on upper slopes with sands over gravel at 15 cms to 25cms.

The sandy valleys and lightly undulating sandy sites (site C) are comprised of grey sands over yellow sands or pale yellow sands. In some spots there are deeper white sands (sandy hollows).

The sands on the property are poorer soil types with a low water holding capacity and low nutrient retention ability.

8.5 Vegetation

The area falls within the Warro System which is part of the Darling Botanical District, Drummond Sub-District.
The vegetation is Dryandra heath on the extensive areas of laterite with a mix of low scrub-heath. On the sandy soils, as examples, are Blackbutt (Eucalyptus todtiana), Banksia, some Woollybush, Hakea, low scrub-heath and Xmas tree. There is evidence from the aerial photos that some clearing may have occurred in the past in the larger area proposed to be cleared, notably in the valleys.

The condition of the vegetation would be considered to be very good (vg) as determined by the condition scale used in PEP MAPPING after Connell (1995).

8.6 Climate

The region has hot,dry summers and warm, wet winters. The average annual rainfall is 550 mm.

SECTION B: ASSESSMENT

9. On site Degradation Hazards

There were no on site degradation hazards to be seen at the time of the inspection. There is 58% vegetation remaining.
The major degradation threat associated with the proposed clearing, is wind erosion of the sandy soils. This would be true on the exposed sandy uplands and to some extent in the valleys. Sandy gravels with lateritic gravels to the surface would be more stable than the sandy surfaced soils due to an increased resistance to wind erosion. Wind erosion would still occur on the gravelly soils, due to the sand component but would be somewhat less of a problem than the pure sands.

Where there are sections of exposed lateritic caprock, and reduction in plant cover, vegetation needs to be retained on these. After discussion, it is apparent that the landholder does not intend to clear these areas.

The property is well drained due to the elevation and soil type.

10. Off site Degradation Hazards

From the inspection, and after viewing the aerial photos, there does not appear to be any visual off site degradation. With clearing of the sandy soils, off site degradation would result from soil particles blown onto adjacent properties.

Clearing of up to 590 ha of native bush and reduced evapotranspiration will result in increased recharge to groundwater systems. The main valley running across the northern part of the property also crosses the south western corner of the Boothendarra Nature Reserve which adjoins the north western corner of the location. Clearing could lead to waterlogging or seepages occurring offsite within the Reserve and further down the catchment where the land flattens out somewhat just west of Dewar Road.

11. Clearing Effect on Degradation Hazards

The clearing of vegetation on the sandy soils will leave areas open to wind erosion. Windbreaks of native vegetation would be inadequate since there would be a reduced windbreak effect with the low scrub-heath vegetation. Taller trees are scattered and their effect would be negligible.

There could be an increased risk of waterlogging and seepages in the valley system off site.

12. Application of Guidelines

12.1 Land Degradation Hazards

In regard to the wind erosion threat on susceptible areas, (exposed loose sands), the land capability class for the wind erosion hazard is Class IV, which means there must be planned wind protection with clearing. This is derived from the hazard rating score of 16, ie. 6 for loose strength, 6 for small particle size and 4 for undulating landform. In the smaller valleys, the capability class for the wind erosion hazard would be Class III, with a hazard rating score of 14, ie. 6 for loose strength, 6 for small particle size and 2 as part of a hilly terrain. There is therefore less of a wind erosion risk in these valleys. However, there are poorer deep pale sands which are considered to be quite unproductive. These are found in conjunction with the grey sands over yellow sands.

The very poor pale/white sands have a low agricultural production potential and a reduced ability to maintain an adequate ground cover. Vegetation should be retained on these.

Steeper slopes are 7% - 8%. This would mean that the land capability class for the water erosion hazard is Class III with a fair capability. Conservation measures could be required on water repellant soils.

12.2 Subcatchment

A subcatchment has been defined. However, there would be little runoff because of the high water infiltration rate on the sandy soils. Runoff could occur in high rainfall events and would occur on water repellent soils.

Subcatchment details

	Area (ha)	Percentage
Size	3396	100
Total remnant bush	1694	49.9
Notified to clear	591	17.4
Remnant bush after clearing	1103	32.5

Therefore, there would be greater than 25% native vegetation remaining after clearing. As per the guidelines, with an average annual rainfall of 550 mm, 25% native bush would need to be retained on the property.

13. Suitability of Land for Proposed Use

The sandy gravels with gravel to the surface could be classified as Class III. With the soils within the gravel being poorer pale sands or pale loamy sands, wind erosion could be a risk with the low clay component and the lack of planned windbreaks. Crops growing on adjacent similar cleared land appear healthy.

On the sandy soils with a high wind erosion risk (Class IV land capability), provision would need to be made for windbreaks. As stated, the low scrub-heath type vegetation would provide for minimal wind protection.

The poorer soil types (pale sands) should be retained since they would have a low agricultural production potential and wind erosion would be an issue.

14. Evaluation of Native Vegetation

1.	**Regional Processes**	
Item	**Principle - native vegetation should be retained if:**	**Yes/No/Partly**
1.1 Water	the clearance of native vegetation is likely to cause deterioration in surface and groundwater catchments which result in increases in salinity and eutrophication. **See Sections 10 & 11**	**Possibly**
1.2 Soil	the clearance of vegetation is likely to contribute to soil erosion, waterlogging or flooding. **See Sections 9, 10 & 11**	**Yes**
1.3 Corridors and Buffers	the land provides a corridor or steeping stone between areas of conservation land or the land provides a buffer or is an inlier to areas reserved for conservation. **The land to the north west on the property is a buffer to the Boothendarra Nature Reserve. The remnants provide a stepping stone between the Watheroo National Park and the Boothendarra Nature Reserve.**	**Yes**

1.4 Aesthetics and Cultural	the land provides high landscape values, has special physiographic features, aboriginal sites or heritage value. **The lateritic upper slopes and ridges with associated vegetation may have high landscape values and special physiographic features.** **Aboriginal Affairs Dept. in Midland to provide advice on Aboriginal sites.**	**Possibly** **Unknown**

2.	**Representation**	
Item	**Principle - native vegetation should be retained if:**	**Yes/No/Partly**
2.1.1 Flora	it contains or is likely to contain threatened flora or flora of special interest. **There is a possibility that there could be threatened flora or flora of special interest.**	**Possibly**
2.1.2 Plant communities	it contains or is likely to contain threatened plant communities. **Threatened plant communities could exist.**	**Possibly**
2.1.3 Diversity	it contains areas of very high species richness. **There is a likelihood that there are areas of high species richness given the large size of the bush and the plant diversity.**	**Likely**
2.1.4 Wetlands	it contains wetlands of significance. **There are no wetlands of significance in the area.**	**No**
2.1.5 Local representation	within a 15 kilometre radius of the remnant there is less than 20% of the original cover of any plant community on the land represented by: (i) viable occurrences in NPNCA National Parks or Nature Reserves. (ii) Viable occurrences in the Crown Land or Remnant Vegetation Protection Scheme Covenants. **There is about 18% of NPNCA land within a 15 km radius.** **There is about 7% Crown Land within a 15 km radius.**	 **No** **Yes**
2.1.6 Regional representation	it includes vegetation communities not well conserved in the region compared with the original cover as represented in the Interim Biographical Representation in Australia (IBRA). **Liaison with CALM, Moora.**	**Possibly**
2.2.1 Wildlife	it contains or is likely to contain rare fauna. **Liaison with CALM. Moora.**	**Possibly**

2.2.2 Habitats	it has significance as habitat for wildlife or if a loss of diversity by clearing part of the land will adversely impact on fauna dependant on a mosaic of vegetation types. **The bush could have significance for wildlife since there are large areas of native vegetation remaining and there are a number of vegetation types.**	**Possibly**

3.	**Viability**	
Item	**Principle - survival of natural values over the next 50 years**	**Yes/No/Partly**
3.1 Area	Large areas have higher conservation values, the maximum possible area of a remnant should be retained. Groups of small remnant can support fauna able to move between remnants and threatened species. **Clearing will reduce the large size of the remnants so that only small areas will remain for fauna habitat and plant species.**	**Yes**
3.2 Shape	Very narrow areas of retained vegetation are less likely to be viable and of reduced value as corridors. **Retained areas will be relatively small compared to the large areas to be cleared. Currently, there are large remnants of a rectangular shape.**	**Yes**
3.3 Intactness	Remnants with little or no intact vegetation are unlikely to be viable. **The remnants are intact.**	**See comment**
3.4 Diseases and Pests	The vegetation should be free of major diseases and pests such as Dieback. Disease free vegetation is more important for retention if similar vegetation communities in nearby reserves are diseased. **Dieback has not been recorded in the area. It is in a low risk area.**	**See comments**
3.5 Invasive plants	Presence of invasive plants capable of, or with potential to, disrupt ecosystem processes. **At present, there are no problems from invasive plants in the remnants. However, with clearing, there will be increased contact between agriculture and the remaining bush. This could lead to invasive plants becoming a problem.**	**See comments**

3.6 Adjacent uses	Adjacent land uses impacting on the viability of the land must be considered. **With clearing, there is a likelihood of any increased agricultural practices having an adverse effect on the bush remaining. At present, the bush is in good condition.**	**See comments**

SECTION C: CONCLUSION

15. Vegetation to be Retained

As per the guidelines, the poorer sandy soils should be retained, since there is a high wind erosion risk and an adequate ground cover would not be maintained throughout the year. This would also mean that closer to 25% of the holding would be retained as perennial vegetation and would satisfy the guidelines in regard to the percentages of vegetation to be left on a property.

16. Discussion with Landholder

The landholder/s have pointed out that areas of bush have already been fenced off mainly because of poison bush adversely affecting stock.

17. Recommendation

It is suggested that there are sections which could be cleared (mainly the gravelly soils) notably on A & B & part C . However, there are areas where land degradation is identified, and native vegetation needs to be retained on those susceptible areas.

Wind erosion of the sandy soils has not been addressed by the plan that has been provided by the landholder/s.

18. References

1. Aerial photos - Badgingarra, 25 October 1996, Run 9, 5419 - 5421. Run 8, 5258 - 5260.
2. Vegetation Survey of W.A. - The Vegetation of the Moora & Hill River Areas by J.S.Beard.
3. Trees & Shrubs for the Midlands and Northern Wheatbelt. Agriculture W.A. Bulletin 4324.
4. Liaison with Ted Griffin, Soils Research Officer based in South Perth, regarding soil types in the region.
5. Liaison with Mayavan Pillai, hydrologist based at Moora District Office.
6. Topographic Survey, Badgingarra, Sheet 2037, Series R611.
7. Memorandum of Understanding - Procedures for the Administration and Assessment of Clearing and Protection of Native Vegetation in W.A. - Agriculture W.A.
8. Moora Geological Survey of W.A., Sheet SH 50 - 10
9. Liaison with Scott Godley from CALM, Moora.
10. Correspondence from E. Lazarus Leonhard, hydrologist, Water & Rivers Commission.

19. Attachments

1. Scanned Aerial Photos, Badgingarra, 25 October 1996, Run 8, 5259 & Run 9, 5420.
2. Scanned photo of Satellite Imagery, Badgingarra, Sheet 2037, 1 February 1996.
3. Topographic map - Badgingarra, Sheet 2037, Series R611.
4. Information on soils of the area from Ted Griffin, Research Officer with NRAG, South Perth (Draft only).
5. Contour map of the area from G.I.S.
6. Photocopied section from Moora District, CALM Managed Lands showing 15 km radius taken from centre of property.
7. Correspondence from E. Lazarus Leonhard, hydrologist, Water & Rivers Commission.

Appendix 5

Calculation of greenhouse emissions from proposal to clear native vegetation: Victoria Location 10322

Calculation of greenhouse (carbon) emissions: Proposal to clear native vegetation: Victoria Location 10322 using methodology and data from the CNGGIC workbook

Calculation of emissions from proposals to clear native vegetation require several assumptions:

5. It is assumed that where forests are cleared for agricultural purposes, all burning occurs in the year of clearing;
6. The net result from CO_2 uptake during subsequent regrowth is zero.

- If the area was cleared, there is no indication of the portion of the cleared biomass which will be burnt. Some might be burnt in the field to facilitate clearing (on-site burning) and some may be removed and used as fuel (off-site burning).
- A fraction of any material burned on-site is assumed not to be completely oxidised and builds up in the soil as charcoal, undergoing no further CO_2 release;
- Any aboveground biomass which remains on site but is not burned, will oxidise in approximately a decade.

Estimating Aboveground Biomass:

- Biomass estimates for each forest class vary widely partly because of variation in growth with climatic and soil conditions and also because of the range of species within forest classes;
- Actual values vary even within a State. For example, in the Northern Territory, 'woodland and scrub' biomass changes from about 25t dm (dry matter) / ha near the coast to a lower value in the dryer inland, with an average that might be as low as 17.5t dm/ ha[1];
- IPCC default methodology assumes that original aboveground biomass is destroyed after conversion from forest-s to agricultural lands, 90% occurring immediately and 10% over 10 years. New aboveground biomass is given the default value of 10t dm/ha[2];
- Average estimated before-clearing above ground biomass for 'woodland and scrub' is 21tC/ha [1].

Estimating Below-ground (including roots) Carbon Release:

- Even within one area, the magnitude and rate of loss of soil carbon after the conversion of forested land to agricultural land is highly variable due to a strong dependence on regional rainfall, soil water and isolated soil physio – chemical characteristics;
- From the limited data available, it is estimated that 30% of soil carbon is lost upon conversion of forested land to agriculture [1];
- The assumed time span for loss of soil carbon following clearing is 20 years[3] – it is assumed that soil carbon release is linear over the 20 year period (however, the rate of decay will be much faster in (say) the Northern Territory);
- The assumed time span for CO_2 release from decaying roots is 10 years;
- For crops and pastures, the root biomass is assumed to be half of the above ground biomass (default value of 10t C/ha);
- The soil carbon content of unimproved pasture is 50 t C/ha and improved pasture 62.5 t C/ha;
- The soil carbon of 'woodland and scrub' is estimated at 70t C/ha[1];

---

[1] Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks, Land Use Change and Forestry, "Workbook for Carbon Dioxide from the Biosphere", Workbook 4.2 Revision 2. National Greenhouse Gas Inventory Committee. Commonwealth of Australia.1997

[2] IPCC 1995 Vol 2

[3] IPCC 1995 Vol 3

For calculating the annual CO_2 flux associated with the loss of soil carbon following forest clearing, it is assumed that soil carbon release is linear over a 20 year period. The rate of carbon released from below-ground (including roots) after land clearing, the area of land clearing is multiplied by the change in soil carbon between a forest system and a 20 year old regrowth system, in this case to pasture (The Algorithm for this is located at Section 3.4, page 28, of NGGIC workbook 4.2).

Therefore:

Above-ground biomass carbon is then estimated as 21 tC/ha
Assume that new pasture aboveground biomass is about 5t C/ha
Assume 600 ha

Then 16 x 600 + 9600 t C would be emitted by clearing
90% (8640 t C) would be released immediately and 10% (960 t C) over 10 years

The below ground biomass soil carbon of 'woodland and scrub' is estimated at 70t C/ha[1]
Assume 600 ha
Assume that new pasture below-ground regrowth is 10t C/ha
Assume 30% of soil carbon is lost upon clearing (in actual fact, the change in soil carbon is a complicated calculation of the difference between a forest system and a 20 year old regrowth system, in this case to pasture)

Then 30% x (70 – 10) x 600 = 12 000 t C would be lost from below-ground biomass, in a linear fashion over 20 years after clearing (ie 600 t C/yr).

Therefore, total carbon emissions occurring as a result of clearing and conversion to pasture is estimated to be

8640 t C released immediately, a further 6960 (6000 + 960) released over 10 years and a further 6000 (600 x 10) released over the next 10 years ie a total of approx 21600 t C over 20 years.