Regional Forest Agreement in Western Australia

Review of Old Growth Areas

raised by Stakeholders

Report Prepared by: Mattiske Consulting Pty Ltd

Report Prepared for: Environment Australia

August 1998

ADDENDUM

Subsequent to Mattiske Consulting Pty Ltd reviewing a series of areas identified as old-growth forest by stakeholders through the RFA public consultation process, a range of issues have been resolved by further field studies. The following text is an addendum to the report prepared by Mattiske Consulting Pty Ltd entitled *Regional Forest Agreement in Western Australia. Review of Old Growth Areas raised by Stakeholders* (prepared for Environment Australia, August 1998).

Blackwood Plateau Areas

As a result of further detailed field studies (which were not feasible through the previous study in August) the following changes apply to the summary:

Boronia

Further field studies have verified that one of the pre-1940 logged areas was not logged intensively and therefore may be considered to be old-growth (the eastern block of the two blocks highlighted previously). The old-growth areas in the western area of the Boronia block are considered to be too patchy and restricted to warrant consideration.

St John's

Further field inspections have verified that there are some scattered small pockets of areas which were not logged intensively within the pre-1940 logged areas. Although some small old-growth areas exist, these areas are considered to be too patchy and restricted to warrant further consideration as designated old-growth areas.

Mowen

Further field inspections have verified that there are some scattered small pockets of areas which were not logged intensively within the pre-1940 logged areas. Although some small old-growth areas exist, these areas are considered to be too patchy and restricted to warrant further consideration as designated old-growth areas.

Mattiske Consulting Pty Ltd (October 1998)

TABLE OF CONTENTS

1. SUMMARY

Mattiske Consulting Pty Ltd was commissioned by Environment Australia to review a series of areas identified as old growth forest by stakeholders through the RFA public consultation process. This project is related to the projects for the WA Comprehensive Regional Assessment (CRA) identification and mapping of old growth forest projects: the old growth data review project: the mapping of development stages in karri forests: and the assessment of disturbance.

The specific objective of this work was to independently review the old growth status of areas not mapped as old growth by the CRA, but suggested as old growth by stakeholders through the RFA public consultation process.

The key issues raised include the following:

. there appears to be some confusion about the definition of old growth in the stakeholder groups and community.

. the vast majority of the areas as documented by CALM on the FMIS system were confirmed:

- The Leeuwin Conservation Group questioned approximately 37,320ha. Some 1,270 hectares of this area were private land which the CRA old growth rule set excluded. Potentially less than 1.5% of the area in question could be considered to be potential old growth in the Leeuwin Conservation Group's queries; although some of these areas may have been questioned, during the CRA process, on the basis of the degree of disturbance from dieback infections (Chester) or age of logging (pre 1940's - Boronia).

- Frith questioned approximately 600ha. This was all on public land in two areas – Hester and Dalgarup. There is approximately 150ha of potential old growth in 1930 logged areas within the Hester block and some restricted old growth areas along the creeklines in the proposed forest reserve at Dalgarup.

- Initially there appeared to be no records of logging for the areas at Winnejup (on Crown Reserves 1811 and 10228). Since checking, CALM and EA have acknowledged in a public meeting that these areas were logged in the 1970's and are therefore not old growth. This area was not inspected in August 1998, following clarification that CALM and EA acknowledged the changed dataset.

- There appeared to be some confusion over the different maps presented. For example, queries associated with the Carey block were withdrawn when the stakeholder (Cheeseman) acknowledged that the query related to the National Estate map rather than the CRA old growth map. Hence, this area was not inspected.

Specific issues raised include the following:

- a few areas within the 1940 logged areas are old growth areas and need boundary verification in the field (Mowen - Appendix A8 - 150ha).

- some of the pre 1940 logged areas were not logged intensively and therefore may be considered to be old growth areas (Boronia - Appendices A5 - 50 hectares over two areas and A6; Hester - Appendix A17 - 150 hectares over three areas).

- some suggested old growth areas were either very localized and or may be infected by *Phytophthora cinnámomi*, and particularly along gullies and riverine areas (Whicher - Appendix A1; Rapids - Appendix A3; Kingia - Appendix A4, St Johns - Appendix A7, Chester - Appendix A9, West Chapman - Appendix A10, Margaret River - Appendix A13). Most of these areas were only a few hectares in size and do not warrant further field inspection. An exception to the latter is the Chester block on the western side.

- there appeared to be some confusion over the role of private land in the RFA (e.g. Boranup issues - Appendix A16 - occurred on private land).

Recommendations:

- There appears to be a need to re-address some of the pre-1940 areas for old growth values, as it appears that the intensity of logging is not always as predicted. This will require a summary being extracted from the FMIS database and then field verification.

- There appears to be a need to update the status of pole/sapling stands in the western part of the Blackwood area; although this does not appear to be an immediate need for the RFA process.

2. INTRODUCTION

2.1 Objectives

The specific objective of this work was to independently review the old growth status of areas not mapped as old growth by the CRA, but suggested as old growth by stakeholders through the RFA public consultation process.

The definitions of old growth as defined by the RFA process were not revisited as this was not part of this review process. Although this matter was raised in discussions with one of the Stakeholders, it was emphasized that Mattiske Consulting Pty Ltd was commissioned to "independently review the old growth status of areas not mapped as old growth by the CRA, but suggested as old growth by stakeholders through the RFA public consultation process".

2.2 Old Growth Definitions

The following definitions are extracted from Chapter 13 – Comprehensive Regional Assessment report (1998), pages 163 to 166.

"13.1 INTRODUCTION

The 1992 National Forest Policy Statement (NFPS) provides a strategy to reserve old growth as part of a comprehensive, adequate and representative forest reserve system. The nationally agreed criteria for old growth (see Table 13.1) which were subsequently developed for the Joint Implementation sub-committee (JANIS 1997) are the basis for mapping and selecting old growth for reservation in the CRA for Western Australia.

The NFPS defines old growth as:

> *"Forest that is ecologically mature and has been subjected to negligible unnatural disturbance such as logging, roading and clearing. The definition of focuses on forest in which the upper stratum or overstorey is in the late mature to over mature growth phases"*

The national operational definition of old growth developed by JANIS is:

> *"Old growth forest is ecologically mature forest where the effects of disturbance are now negligible".*

The JANIS criteria acknowledge the differences which occur in the interpretation of old growth for forest of different ecological characteristics such as exist, for example, between rain forest and dry sclerophyll forest.

Since there have been no comprehensive studies in Western Australia on the functionality of old growth forest relative to other stages of forest development, identification and mapping of old growth is based on structure (or development stage) and disturbance history. Because of their ecological differences, the methodologies used in Western Australia for wet sclerophyll forests (karri and its mixtures) differs from that used for dry forests (jarrah and wandoo).

Table 13.1 Summary of old-growth criteria

Noting that it is necessary to approach old growth in a flexible manner according to regional circumstances:

1. Where old growth forest is rare or depleted (generally less than 10% of the extant distribution) within a forest ecosystem, all viable examples should be protected, wherever possible.
2. For other forest ecosystems, 60% of the old growth forest identified at the time of assessment would be protected, consistent with a flexible approach where appropriate, increasing to the levels of protection necessary to achieve: representation across the geographic range of the ecosystem; the protection of high quality habitat for JANIS target species; appropriate reserve design; protection of the largest and least fragmented areas of old growth; and community needs for recreation and tourism.

13.2 METHODS

Development Stage

Wet Sclerophyll forest

Following germination, even-staged stands of karri forest develop through several distinct stages - establishment (nominally 0 to 8 years old), juvenile (9 to 25), immature (26 to 120), mature (121 to 250), senescent (250 plus). In terms of development stage mapping for old growth purposes, recognition and mapping of the mature and senescent stages are of most interest. Fire disturbance plays several roles in stand development and condition. It provides conditions for germination of karri, it burns and regenerates the understorey and, if severe enough, may kill the overstorey trees. If large patches of trees are killed, an even-aged stand of karri is initiated, while less severe fire may result in a new patch of regeneration developing in the context of an uneven-aged stand.

The methodology for development stage mapping was developed to take account of this variable structure and mapping was already in progress for the karri dominant forest in the main karri belt (Bradshaw and Rayner 1997). The same techniques were used to extend this mapping to other forest containing karri in the remaining public and private forest. The dynamics of the marri/karri and the karri/tingle forest were considered to be sufficiently similar to extend the technique to these forests for the purpose of old growth mapping. The process is described below:

- Even-aged stands of known age (Armstrong 1984) were obtained from the most recent updated records in CALM's GIS database.
- Remaining areas were interpreted using to 1:25,000 colour aerial photography to categorize stands as immature, mature and senescent development stage. For uneven-aged stands, the stage attributed to the stands, was that of the dominant cohort, i.e. the oldest cohort with a crown cover exceeding 25%, a level which had previously been established as being critical to the development of younger cohorts (Rotheram 1983). Immature stands were distinguished from mature on the basis of crown size and character. Mature forest was distinguished from senescent on the basis of stand structure rather individual tree characteristics, which had proved to be unreliable. Photo interpretation was unable to separate late from early mature.
- Age was estimated at 121 sites within these categories using a sample of dominant tree diameters and a previously-derived regressions of age versus diameter of large dominant trees. These age data were within the expected range for the development stage. 50% of the mature forest is estimated to be "late mature".
- Continuous field checking of the interpreted area was carried our on public land but private land was not field checked.

These data provide for the mapping of development stage which is dependent of disturbance data.

Dry sclerophyll forest

Jarrah forest dynamics differ substantially from those of karri forest. Jarrah seedlings may become established under a canopy following even mild disturbance. Seedlings which survive the initial establishment period develop into lignotubers. This process is repeated to some extent every time the area is burnt. As a consequence the majority of jarrah forest contains a substantial lignotuber pool. The lignotuber develops over a period of time (perhaps 20 years) to the stage where it is capable of rapid development into a sapling if overstorey competition is removed.

Jarrah has other characteristics that affect its dynamics. It is relatively resistant to fire, it has a very strong capacity to recover from defoliation, and it is persistent, i.e. it can survive under extreme competition.

Disturbance (typically fire in natural forests) which removes the overstorey competition will allow for the release and rapid development of the established lignotubers. If the overstorey removal is temporary (say defoliation) the development of the saplings will be arrested when the overstorey crowns recover. The released regeneration will then be subjected to varying degrees of suppression. Development will proceed again at the next temporary setback of the overstorey crowns. If the reduced competition is permanent (as a result of mortality of the overstorey) then the saplings will continue to develop if the gap in the overstorey is large enough. Release under these circumstances is not necessarily associated with fire. Mortality may be due, for example, to old age or wind-throw.

This pattern of more or less continuous recruitment is reflected in the multi-aged structure of much of the jarrah forest. Cohorts occur at a fine scale and are generally difficult to differentiate because of the overlap between dominant individuals of one cohort and suppressed individuals of another. This is exacerbated over the long term due to the impact of fire damage in the crowns. All of the jarrah forest shows indications of previous fire disturbance of varying intensity.

More or less single storey stands do occur where mature trees dominate the site and inhibit lignotuber establishment or development. Such stands also occur as woodlands where understorey competition inhibits lignotuber development.

While these differences in the mature and immature strata are often readily apparent in cutover forests when examined on aerial photos, no such distinction is evident for virgin forests at a degree of reliability or significance. For these reasons the jarrah forest could not be interpreted for development stage in the same way as karri and the qualification for old growth is based on disturbance.

Disturbance History

Because of the fundamental role that fire plays in the normal stand dynamics of both karri and jarrah forest and the fact that all mature forests have been subject to many fires in the past, fire has not been included as a form of disturbance in the mapping of old growth. Consequently understorey age or development is not considered as a factor in the determination of old growth in these forests.

Disturbances which have been considered are past clearing for agriculture, logging, symptoms of *Phytophthora cinnamomi* infection, clearing for mining and grazing.

Records of past agricultural clearing in what is now forest are generally good. However, settlement of forest areas is too recent to have resulted in regeneration of forest which could be old enough to qualify as mature forest. The same comments apply to open cut mining areas. Areas subjected to these forms of disturbance have been excluded from old growth.

Logging records are maintained in the CALM Forest Management Information System (FMIS) system, recording logging activities which began in the forest area in about the 1870's. They are generally reliable, but these records underwent substantial field checking as part of the RFA process.

Particular emphasis was given to confirming that areas recorded as uncut were indeed unlogged and to checking areas recorded as logged where there was a possibility that they may have been unlogged (e.g. steep areas). These new data have been incorporated.

To address the question of negligible disturbance, the intensity of past harvesting, the time since harvest and the number of times harvested have been considered.

The earliest harvesting of karri forest on the west past resulted in even-aged regeneration which is only now approaching the mature stage and is therefore too young to qualify as old growth. Group selection harvesting practices from 1940 to 1967 resulted in patches of regeneration throughout the harvested areas. The resultant structural changes in the forest canopy in these areas are still evident, and the disturbance therefore cannot be considered as negligible in the context of identifying old growth. On this basis, all karri areas that are recorded as having been subjected to the practices described above area excluded from old growth.

CALM records show that intensive harvesting was characteristic of jarrah forest harvesting up until about 1940 (Stoneman *et al.* 1989). A high component of regrowth in the canopy which resulted from that logging remains an obvious structural change in these forests. Harvesting after 1970 was also relatively intense and the evidence of harvesting is both too recent and too intensive for the disturbance to qualify as negligible. Many of these areas have also been cut more than once. All of the above areas identified as being subjected to these practices have therefore been excluded from old growth.

On the basis of CALM records and the prescriptions known to have been applied, harvesting of jarrah forest between 1940 and 1960 was more variable in intensity (Stoneman *et al.* 1989). The intensity of logging was not recorded for this period and because of this there was a possibility that some areas would qualify as having negligible disturbance in the context of identifying old growth. Areas of forest which have been harvested only once between 1940 and 1960 were identified from FMIS and as far as was possible each area was jointly inspected in the field by Commonwealth and State officers. Using the operational old growth definition and experience from other old growth assessments, areas were excluded from old growth if they showed evidence of harvesting that was sufficiently intense to have resulted in persistent regrowth in the canopy 30 to 40 years on. In most cases, the structural changes were easily determined and the decision to include or exclude was obvious. Three thousand and seventy hectares of additional old growth were included as a result of this inspection.

All areas of uncut jarrah were included as old growth.

Although not strictly included in the CRA old growth assessment because they do not qualify as forest, jarrah woodland was assumed to have had minimal disturbance and was included as old growth (see below).

In the absence of any detailed study, all uncut wandoo forest and woodland was included as Old growth.

Areas known to be affected by Phytophthora cinnamomi are considered disturbed and are excluded from old growth, regardless of the status established to this point, The source of this information was the existing maps of known infection, the data originating from the 1970's to the present.

While specific areas of the forest have been grazed in the past, most leases in the forest areas were cancelled by the 1960's. There were no areas in the RFA area where it is considered that grazing impact would be sufficient to exclude candidate areas of old growth.

All areas known to have been subjected to intensive mining were excluded as old growth.

Private forest land was not subjected to analysis and was generally regarded as significantly disturbed and therefore excluded from old growth.. The exception to this was one small areas identified opportunistically as part of the joint field inspection of once cut jarrah described above."

2.3 Areas Nominated by Stakeholders

The areas nominated by Stakeholders were:

- forest within the Jarrah Leeuwin Ridge and Jarrah Blackwood Plateau forest ecosystems (including Bramley).

- areas (to be more precisely defined if further information available from stakeholders) within the Dalgarup, Winnejup, the Greenbushes/Hester and the Charnwood area in Carey block.

2.4 Involvement of CALM and EA

During this process the staff of the Department of Conservation and Land Management (CALM) and Environment Australia (EA) were involved in discussions on the definitions of old growth as agreed to in the CRA report adopted by the State and the Commonwealth and in providing the data from FMIS on the specific areas as used in the CRA. More specifically the staff of the Department of Conservation and Land Management and Environment Australia were involved in the following tasks:

- delineating the land tenure of areas under investigation (State Forest, National Parks, Nature Reserves and Private Land).

- extracting the relevant FMIS data as used in the CRA old growth map.

- providing field assistance to rapidly locate the respective areas in the period from 5 August to 7 August. Additional fieldwork was also undertaken on 10, 11 and 24 August by Mattiske Consulting Pty Ltd staff.

- develop a sampling strategy consistent with the old growth definitions as adopted in consultation with CALM and EA staff for field checking for old growth of areas under investigation. The minimum patch size for old growth to be considered was 2 hectares, to ensure consistency with the resolution of mapped data used in the CRA old growth assessment.

2.5 Involvement of Mattiske Consulting Pty Ltd

During this process the staff of Mattiske Consulting Pty Ltd were involved in discussions on the definitions of old growth as agreed to in the CRA report adopted by the State and the Commonwealth and in reviewing the data extracted from FMIS by CALM through field inspections on the specific areas as used in the CRA. If the specific areas were not clear then further contact was also made by Ministerial staff or staff of Mattiske Consulting Pty Ltd direct to the stakeholders. The specific tasks in the work involved:

- attending a briefing by CALM and EA staff on the definitions of old growth as agreed to in the CRA report and as adopted by the State and the Commonwealth;
- field inspections on specific areas over the period from 5 to 24 August 1998, to determine old growth status of the specific areas under investigation;
- provide relevant maps to CALM and EA on the field inspections as required in specific areas illustrating the extent or otherwise of old growth areas (submitted in the form of facsimiles direct to CALM and EA);
- provide a statistical estimate of error rates in CRA old growth map;
- submit a report on the field checking of areas, including advice on the extent of any further work required to complete the assessment of identified areas.

3. RESULTS

The report content was prepared by Mattiske Consulting Pty Ltd; although the maps included in Appendix A were extracted from FMIS information supplied by the Department of Conservation and Land.

The results for the specific areas are summarized in Appendix A, with the exception of Winnejup and Carey (see Sections 3.4 and 3.5).

3.1 Leeuwin Ridge and Blackwood Plateau

The Leeuwin Conservation Group questioned approximately 37,320ha. Some 1,270 hectares of this area were private land which the CRA old growth rule set excluded. Potentially less than 1.5% of the area in question could be considered to be potential old growth in the Leeuwin Conservation Group's queries; although some of these areas may have been questioned, during the CRA process, on the basis of the degree of disturbance from dieback infections (Chester) or age of logging (pre 1940's - Boronia). Consequently, the estimate of 1.5% may also be too high as some areas were affected by dieback or the age of logging and therefore would not have met the threshold as defined in the CRA.

Specific issues raised include the following:

- a few areas within the 1940 logged areas are old growth areas and need boundary verification in the field (Mowen - Appendix A8 - 150ha).

- some of the pre 1940 logged areas were not logged intensively and therefore may be considered to be old growth areas (Boronia - Appendices A5 - 50 hectares over two areas).

- some suggested old growth areas were either very localized and or may be infected by *Phytophthora cinnamomi*, and particularly along gullies and riverine areas (Whicher - Appendix A1; Rapids - Appendix A3; Kingia - Appendix A4, St Johns - Appendix A7, Chester - Appendix A9, West Chapman - Appendix A10, Margaret River - Appendix A13). Most of these areas were only a few hectares in size and do not warrant further field inspection. An exception to the latter is the Chester block on the western side.

- there appeared to be some confusion over the role of private land in the RFA (e.g. Boranup issues - Appendix A16 - occurred on private land).

3.2 Hester

Frith questioned approximately 600ha. This was all on public land in two areas - Hester and Dalgarup. There is approximately 150ha of potential old growth in 1930 logged areas within the Hester block. The potential area of old growth in the 1930 logging areas at Hester (located in three areas) requires further field checking for the date of logging and subsequent updating of the FMIS data set. Both CALM and EA personnel were present on the recent site inspection and the question of potential areas in pre-1940 areas of Jarrah was raised as an issue in the definition of old growth stands.

3.3 Dalgarup

Frith questioned approximately 600ha. This was all on public land in two areas - Hester and Dalgarup. There is some old growth areas along the creeklines within the Dalgarup forest block.

The area at Dalgarup was logged in the 1950's and is mostly a regrowth pole stand, except for a few streamline areas that have not been logged. As this area is within the proposed Bridgetown Forest Park, it is considered that further fieldwork is not required.

3.4 Winnejup

Initially there appeared to be no records of logging for the areas at Winnejup are on Crown Reserves (Reserve 1811 and 10228). Since checking, CALM and EA have acknowledged in a public meeting that these areas were logged in the 1970's and are therefore not old growth. This area was not inspected in August 1998, following clarification that CALM and EA acknowledged the changed dataset.

The area at Winnejup of 1970's logging requires updating on the FMIS data set.

3.5 Carey

There appeared to be some confusion over the different maps presented. For example, queries associated with the Carey block were withdrawn when the stakeholder (Cheeseman) acknowledged that the query related to the National Estate map rather than the old growth maps produced by CALM. Hence, this area was not inspected in August 1998.

No further action is required on this area.

4. LIST OF PARTICIPANTS

Principal Ecologist & Project Coordinator
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5. CONSULTATIONS

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Mr J Bradshaw
Ms P Collins
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Environment Australia staff and in particular:

Mr B Prince
Mr P Lyons

Individual Stakeholders

Mr J Frith
Mr R Cheeseman
Mr R Whittle

6. REFERENCES

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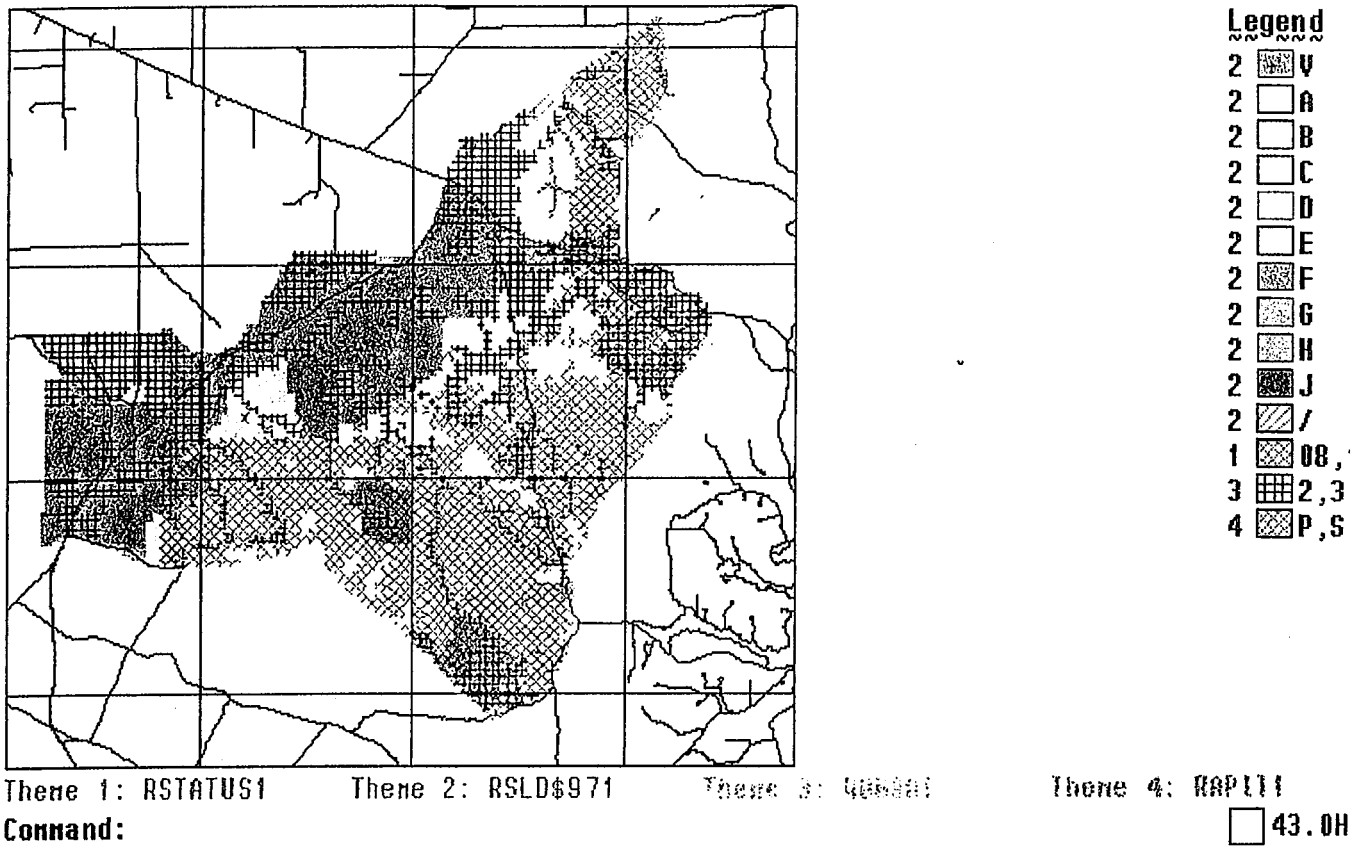
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders

Legend Code on Following Pages:

01-07	National Park and Nature Reserve
17	Private Land
2,3	Dieback Infections (largely Phytophthora cinnamomi)
p,s	Pole and Sapling Stands
V	Virgin
A	Logged pre-1920's
B	Logged 1920's
C	Logged 1930's
A-C	Logged pre 1940's
D	Logged 1940's
E	Logged 1950's
F	Logged 1960's
G	Logged 1970's
H	Logged 1980's
J	Logged 1990's

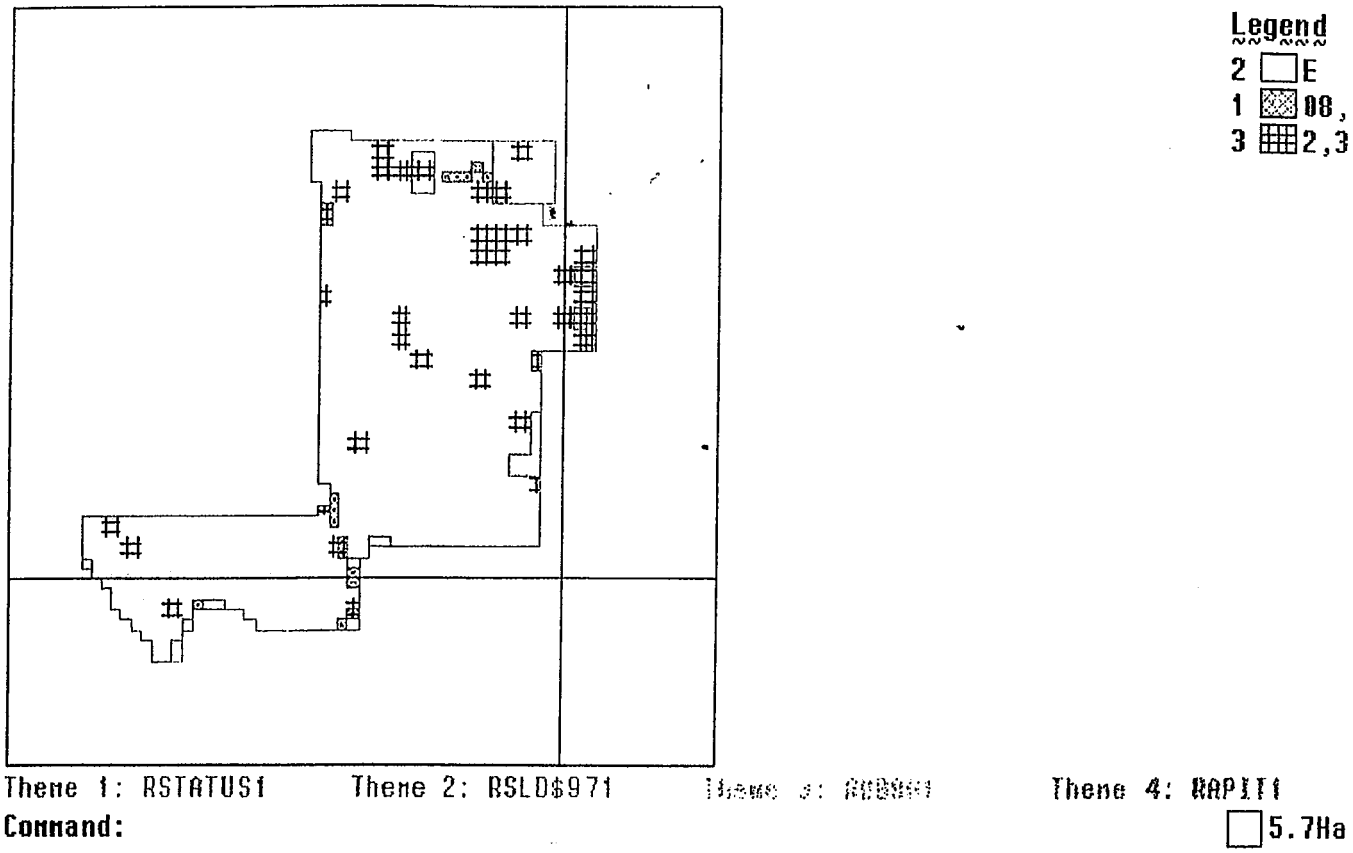
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : Whicher Area – Northern Blackwood Plateau

	CALM Data	MCPL Inspection
Virgin Area	Minor area is virgin in western section, already recognized as old growth in CRA.	Majority logged and regrowth, western border severely infected with *Phytophthora cinnamomi*.
1940's Logged Areas	Several areas within Whicher Range, regrowth (pole/sapling stands) and *Phytophthora cinnamomi* present in gullies mainly.	Confirmed 1940's logging, scattered light selective logging so some potential old growth, however *Phytophthora cinnamomi* more extensive than noted on maps.
1950's Logged Areas	Most of Whicher block was logged in the 1950's, regrowth (pole/sapling stands over vast majority) and *Phytophthora cinnamomi* present in gullies mainly.	Confirmed 1950's logging, scattered light selective logging so some potential old growth, however *Phytophthora cinnamomi* present in gullies and on flats.
1960's Logged Areas	Large sections of Whicher block were logged in the 1960's, regrowth (pole/sapling stands over large sections) and *Phytophthora cinnamomi* present in gullies mainly.	Confirmed as 1960's logging, however *Phytophthora cinnamomi* more extensive than noted on maps.
General	Vast majority of area logged in period 1940's to 1960's and pole/sapling stands over most of area. Significant infections of *Phytophthora cinnamomi*.	Although potential old growth values present in localized pockets (1940's, 1950's) the areas have been affected by *Phytophthora cinnamomi*.

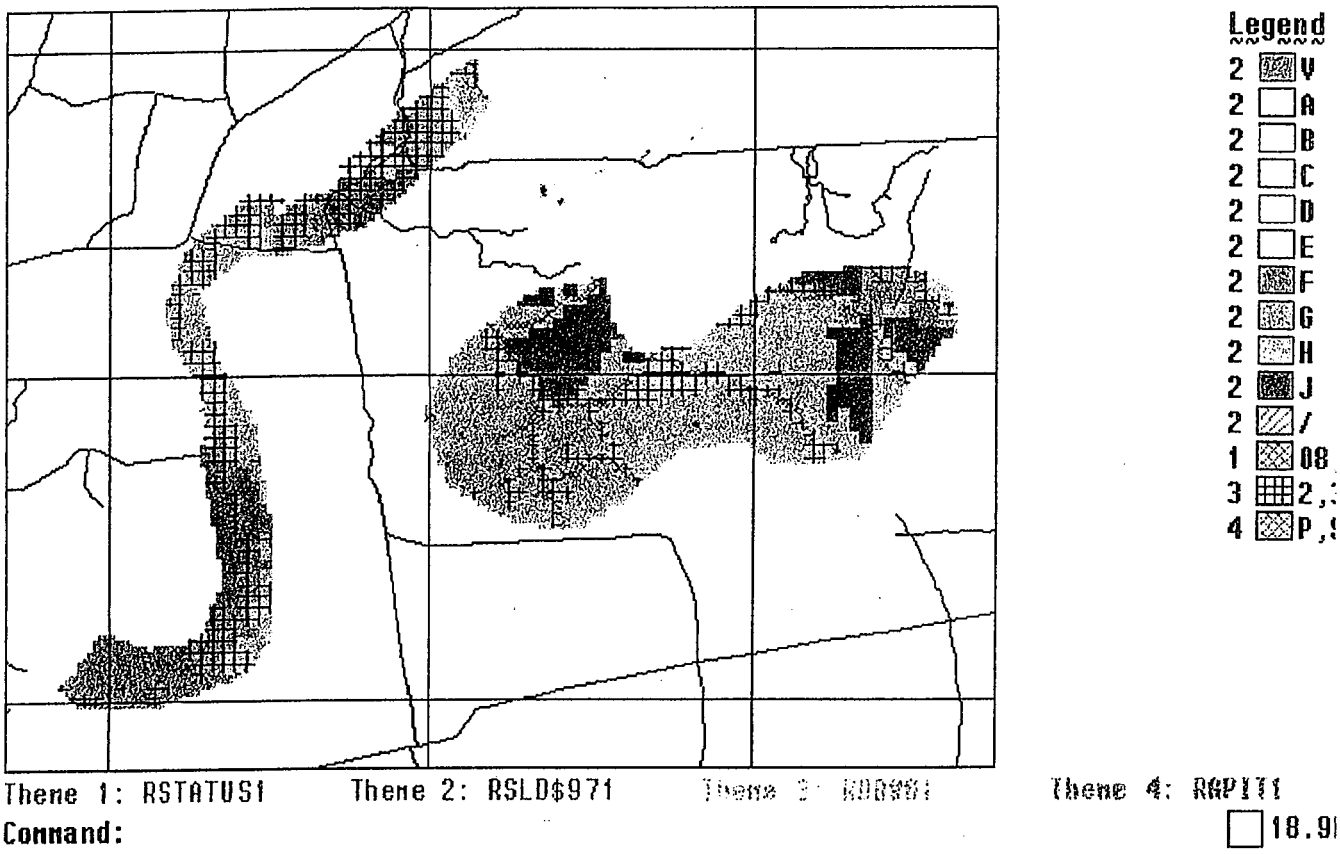
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : Yelverton Area - Northern Blackwood Plateau

	CALM Data	MCPL Inspection
1950's Logged Areas	Most of Yelverton area was logged once in 1950's, although no pole and sapling data available on the FMIS system as west of the data set currently, this area was inspected previously by CALM and EA and the pole/sapling status was confirmed. *Phytophthora cinnamomi* in gullies.	Confirmed as 1950's logging and pole/sapling present.
1960's Logged Areas	Sections of Yelverton area was logged over once in 1960's, although no pole and sapling data available on the FMIS system as west of the data set currently, this area was inspected previously by CALM and EA and the pole/sapling status was confirmed. *Phytophthora cinnamomi* in gullies.	Confirmed as 1960's logging and pole/sapling present.
General	Vast majority of area logged in period 1950's to 1960's and pole/sapling stands over most of area. Some infections of *Phytophthora cinnamomi*. Site of first SawMill in Western Australia.	No old growth present in the area.

Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : Rapids Area – Blackwood Plateau

	CALM Data	MCPL Inspection
1950's Logged Areas	The northern section of the Rapids Area was logged in the 1950's, although no pole and sapling data available on the FMIS system as west of the data set currently, *Phytophthora cinnamomi* in gullies.	Confirmed as 1950's logging and pole/sapling stands present, *Phytophthora cinnamomi* in gullies and on lower slopes. Area in question on northern end of map does not have old growth values.
1960 – 1990's Logged Areas	The eastern Rapids Area has been logged in the period from 1960 to 1990 and all these areas have been mostly logged multiple times in this period.	Area has been logged.
Riverine Areas	There are small pockets that have not been cut within the riverine areas (code 08,02).	Confirmed that localized areas not cut in the riverine area, but gully vegetation affected by *Phytophthora cinnamomi*.
General	Vast majority of area logged in period 1950's or is private land (code 17). Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.	No old growth present in the area, beyond the riverine area which have been affected by *Phytophthora cinnamomi*.

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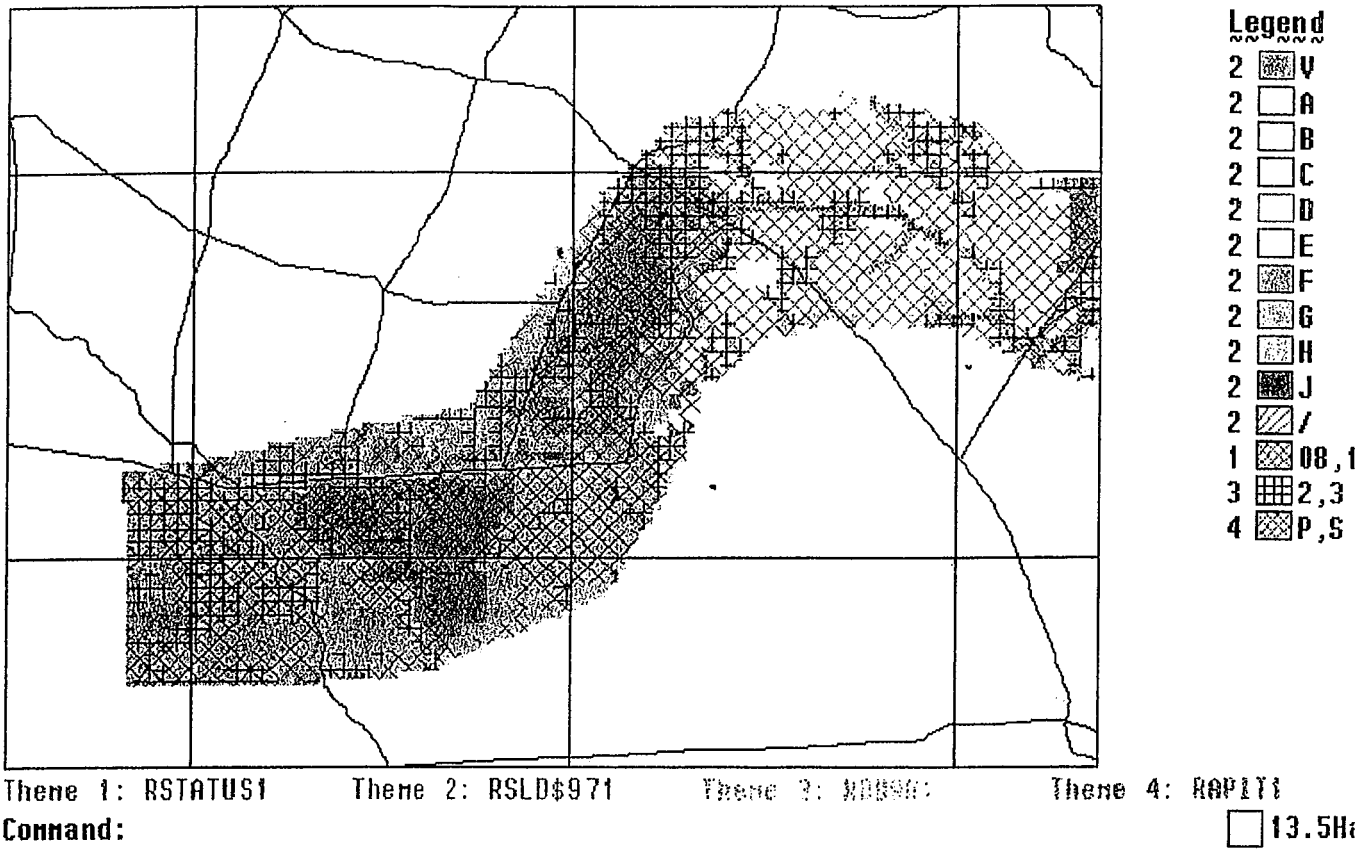
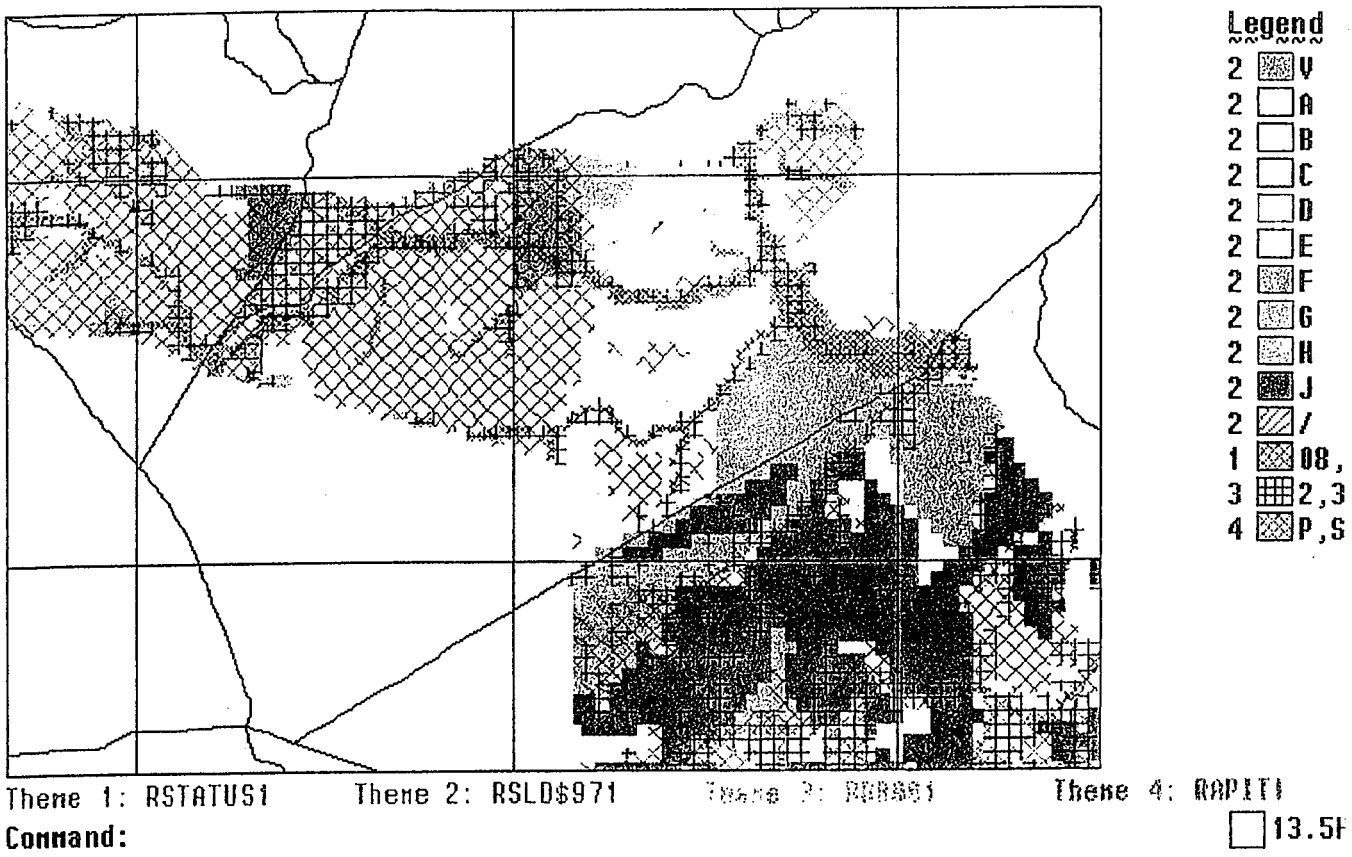


Location : Kingia Area – Blackwood Plateau

	CALM Data	MCPL Inspection
1940 and 1950's Logged Areas	Sections of the Kingia Area have been logged in the 1940's and 1950's. The vast majority of the area consists of pole/sapling stands and there is some *Phytophthora cinnamomi* in the gullies.	The areas logged in 1940's and 1950's within the Kingia Area have been logged and are mostly pole/sapling stands. The area of potential old growth in the 1940's and 1950's is less than a few hectares. The gully vegetation and lower slopes is affected by *Phytophthora cinnamomi*
1960's Logged Areas	Sections of the Kingia Area have been logged in the 1960's. The majority of the area consists of pole/sapling stands and there is some *Phytophthora cinnamomi* in the gullies.	The areas within the Kingia Area have been logged in the 1960's and the stands that were not indicated as pole/sapling stands are regrowth areas and therefore are not old growth areas. The gully vegetation is affected by *Phytophthora cinnamomi.*
1970 and 1980's Logged Areas	Large sections of the Kingia Area have been logged in the 1970's and 1980's. The majority of the area also consists of pole/sapling stands and there is some *Phytophthora cinnamomi* in the gullies.	The areas within the Kingia Area have been logged in the 1970's and 1980's and therefore are not old growth areas. The gully vegetation is affected by *Phytophthora cinnamomi.*
General	Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.	The old growth was restricted to very small pockets only in occurrence within the area, and in view of the extent of *Phytophthora cinnamomi* in gullies additional field checking is not warranted.

Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : Boronia Area - Blackwood Plateau (note: Table continued over page)

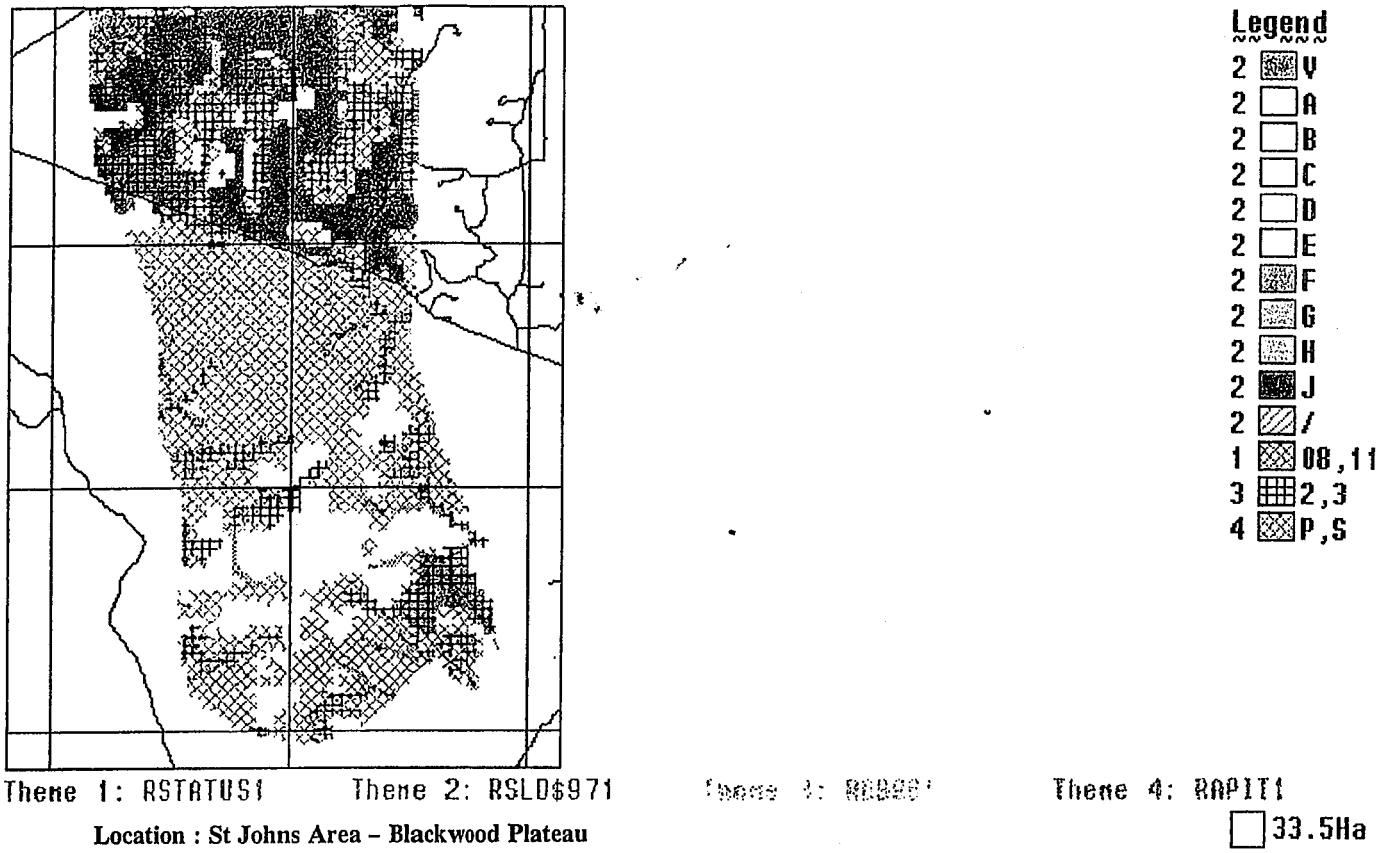
	CALM Data	MCPL Inspection
Pre 1920's Logged Areas	Sections of the Boronia Area have been logged before 1920. There is some *Phytophthora cinnamomi* in the fringing gullies of this area.	Although most of this pre 1920's area was regrowth pole/sapling stands, there was a small pocket in the south-west corner that was considered to be old growth (approximately 20 hectares). There is some *Phytophthora cinnamomi* in the fringing gullies of this area.
1920's Logged Areas	Sections of the Boronia Area have been logged in the 1920's. There is some *Phytophthora cinnamomi* in the fringing gullies of these areas.	Although most of this 1920's area was regrowth pole/sapling stands, there was a small pocket in the north-east corner of the map (south-east of pre 1920 area and near stream zone) that was considered to be old growth (approximately 30 hectares). There is some *Phytophthora cinnamomi* in the fringing gullies of this area. The other three areas in the 1920's were not old growth as they were all pole/sapling regrowth areas.
1930's Logged Areas	Sections of the Boronia Area have been logged in the 1930's. There is some *Phytophthora cinnamomi* in the fringing gullies of these areas.	The area in the 1930's was not old growth as it was a regrowth area. There is some *Phytophthora cinnamomi* in the fringing gullies of this area.

Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders

Location : Boronia Area - Blackwood Plateau (continued)

	CALM Data	MCPL Inspection
1940's, 1950's Logged Areas	Some areas were logged in the 1940's and 1950's. The vast majority of these were pole/sapling stands and there is some *Phytophthora cinnamomi* in the gullies.	The areas logged in 1940's and 1950's within the Boronia have been mostly logged and are mostly pole/sapling stands. The areas, which have not been logged, are below 10 hectares and abut infected gullies. The gully vegetation and lower slopes is affected by *Phytophthora cinnamomi.*
1960's to 1990's Logged Areas	Large sections of the Boronia Area have been logged in the 1960's to 1990's. The majority of the area also consists of pole/sapling stands and there is some *Phytophthora cinnamomi* in the gullies.	The remaining areas within the Boronia Area have been logged in the 1960's to 1990's and therefore are not old growth areas under current definitions. The gully vegetation is affected by *Phytophthora cinnamomi.*
General	Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.	There are several potential old growth areas within the pre 1920's and the 1920 areas. Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.

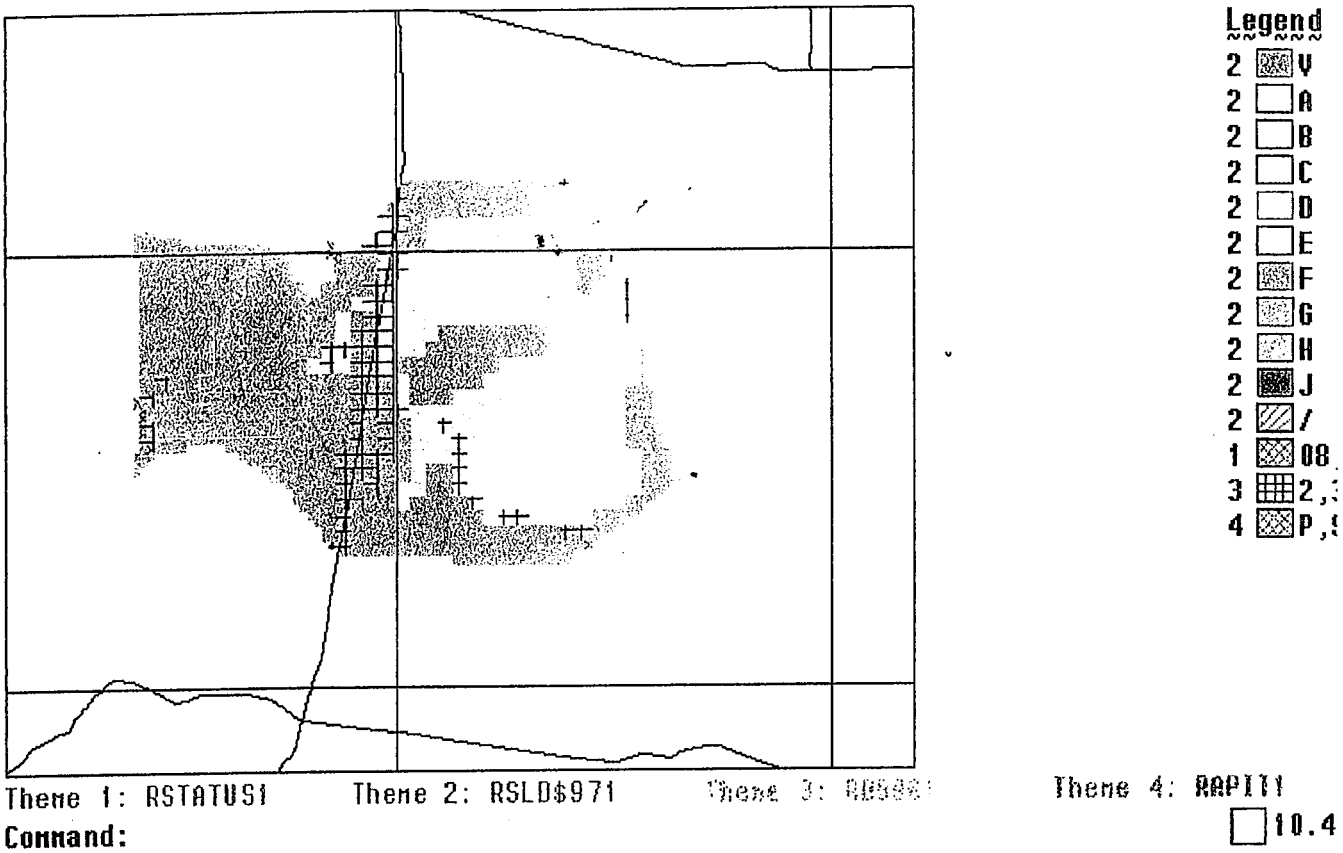
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : St Johns Area – Blackwood Plateau

	CALM Data	MCPL Inspection
Pre 1940's Logged Areas	Sections of the St Johns Area have been logged before 1940. Many of these areas are now pole/sapling stands, however there is a central area on the map that is not pole/sapling stands. There is some *Phytophthora cinnamomi* in the gullies of this area.	There were substantial pre 1940's areas, which did not support pole/sapling stands in the CALM data base. Following inspections, only one small area was located that could be considered to be old growth (less than 40 hectares). There is some *Phytophthora cinnamomi* in the fringing gullies of this area.
1940's and 1950's Logged Areas	There were some localized 1940's areas, in the southern end of the area without pole/sapiling stands.	There were some localized 1940's areas, in the southern end of the area without pole/sapiling stands; however all these areas had been logged more recently and are not old growth areas.
1960's to 1990's Logged Areas	Large sections of the St Johns Area have been logged in the 1960's to 1990's. There has been substantial logging in the area in the 1990's The majority of the area also consists of pole/sapling stands and there is some *Phytophthora cinnamomi* in the gullies.	The remaining areas within the St Johns Area have been logged in the 1960's to 1990's and therefore are not old growth areas under current definitions. The gully vegetation is affected by *Phytophthora cinnamomi*.
General	The majority of the area was either logged before 1940's or more recently in the 1990's. Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.	There was a small area of old growth in the pre-1940's.

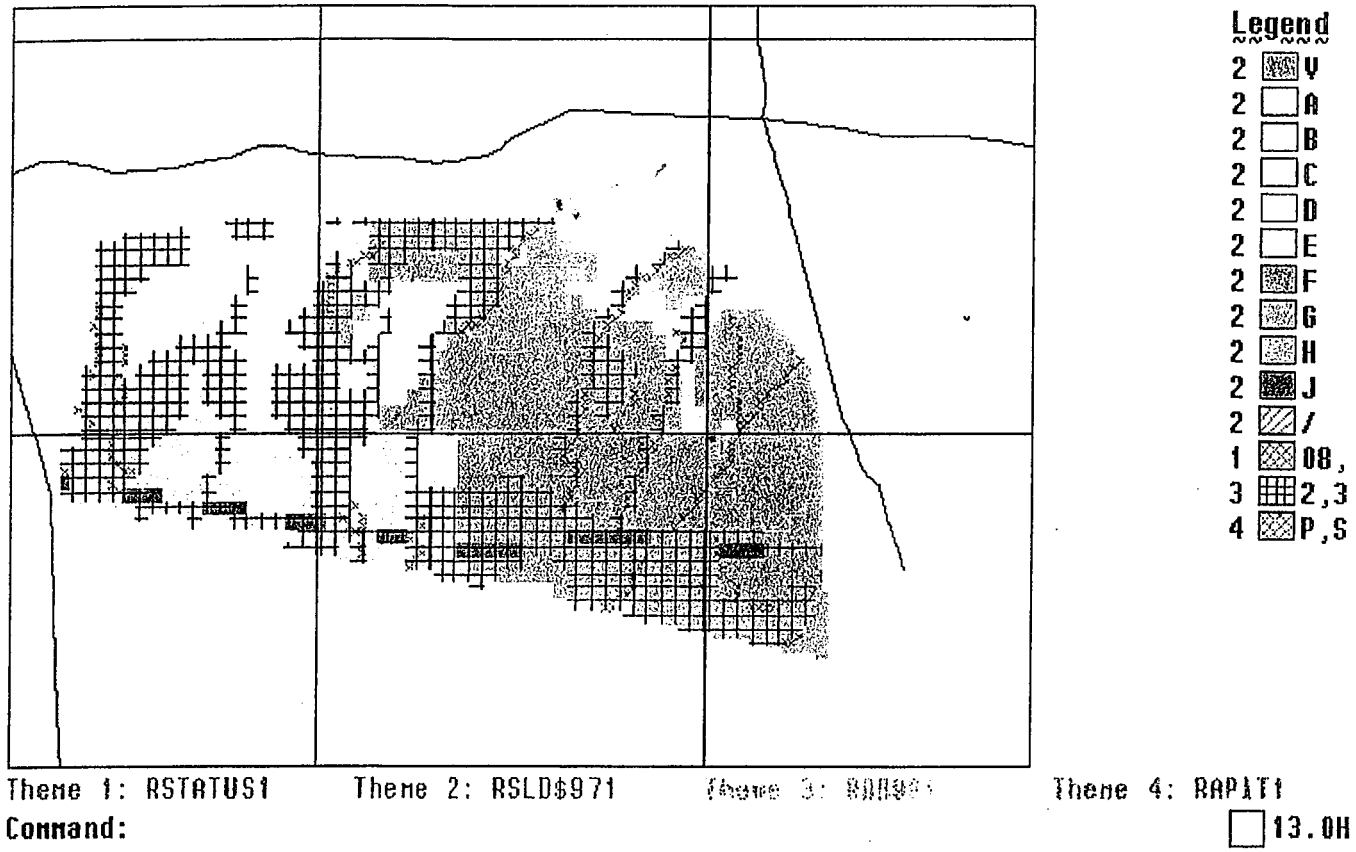
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : Mowen Area – Blackwood Plateau

	CALM Data	MCPL Inspection
1940's Logged Areas	Sections of the Mowen Area have been logged in the 1940's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies of this area.	There is some old growth in the eastern section (some 150ha) of the 1940's logged area. The remaining areas in the 1940 area have been logged and therefore the remaining areas are regrowth pole/sapling areas. There is also dieback in the gullies and associated lower slopes.
1950's Logged Areas	Sections of the Mowen Area have been logged in the 1950's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies of this area.	The 1950's logged are regrowth pole/sapling areas. There is also dieback in the gullies and associated lower slopes.
1970's Logged Areas	The majority of the remaining area of Mowen has been logged in the 1970's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies of this area.	The majority of the remaining area of Mowen has been logged in the 1970's. The area is dominated by regrowth. There is some *Phytophthora cinnamomi* in the gullies of this area.
General	The majority of the area was either logged before 1960 or more recently in the 1970's. Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.	There are some old growth areas within the 1940 areas, which were not included in the CRA.

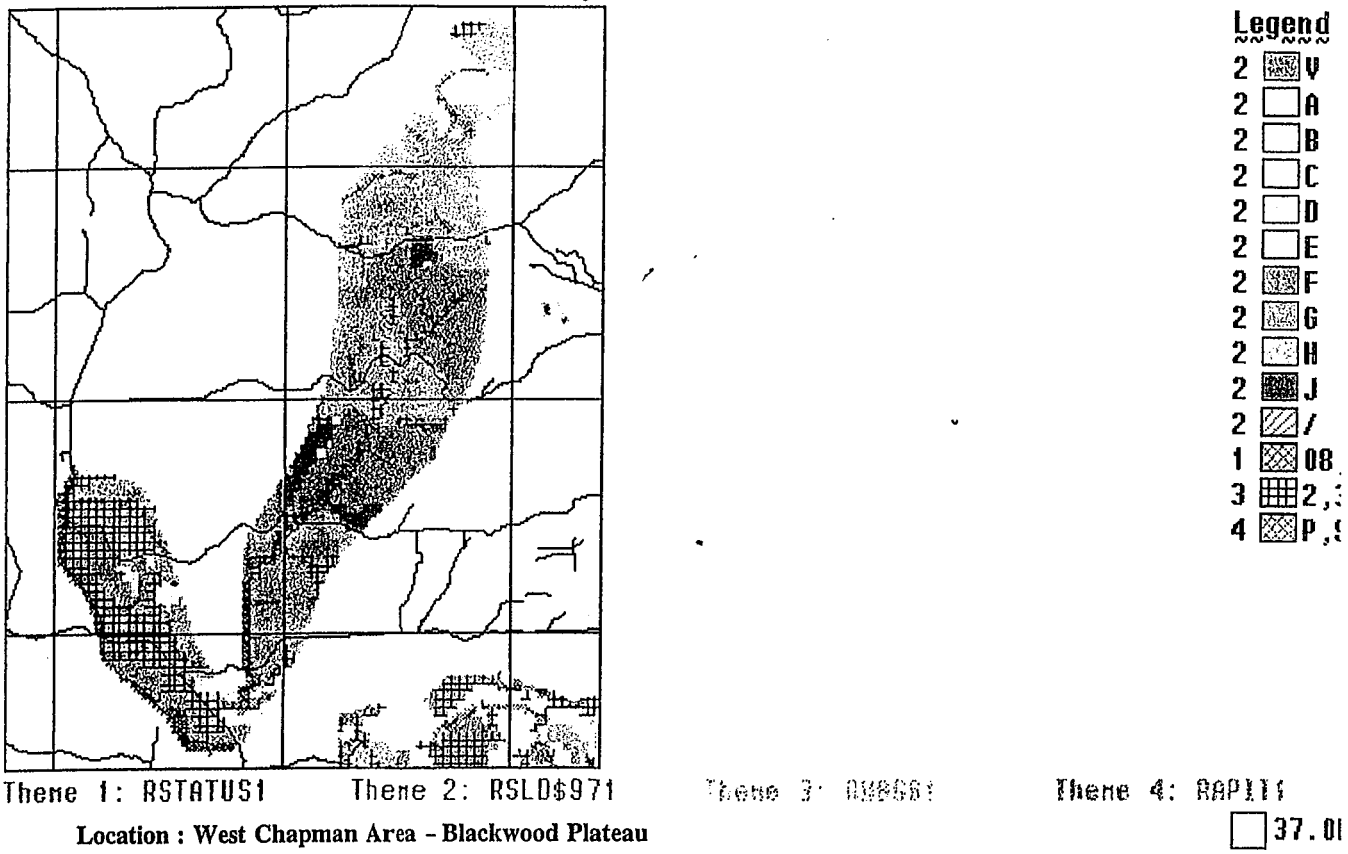
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : Chester Area - Blackwood Plateau

	CALM Data	MCPL Inspection
1950's Logged Areas	Sections of the Chester Area have been logged in the 1950's. No pole/sapling data available. There is extensive *Phytophthora cinnamomi* in the gullies and on the flats within this area.	There is some potential old growth in the western section (some 300ha) of the 1950's logged area. Large sections of the two areas on the map are forests on sandy soils and low lying sedge and swamp communities. There is also dieback in the gullies and associated flats.
1970's Logged Areas	The majority of the remaining areas of Chester have been logged in the 1970's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies of this area.	The majority of the remaining area of Chester has been logged in the 1970's. There is *Phytophthora cinnamomi* in the gullies and associated flats of this area.
General	The majority of the area was either logged in the 1950's or in the 1970's. Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.	There are some potential old growth areas within the 1950 areas, which were not included in the CRA, possibly due to the extent of *Phytophthora cinnamomi* in the area.

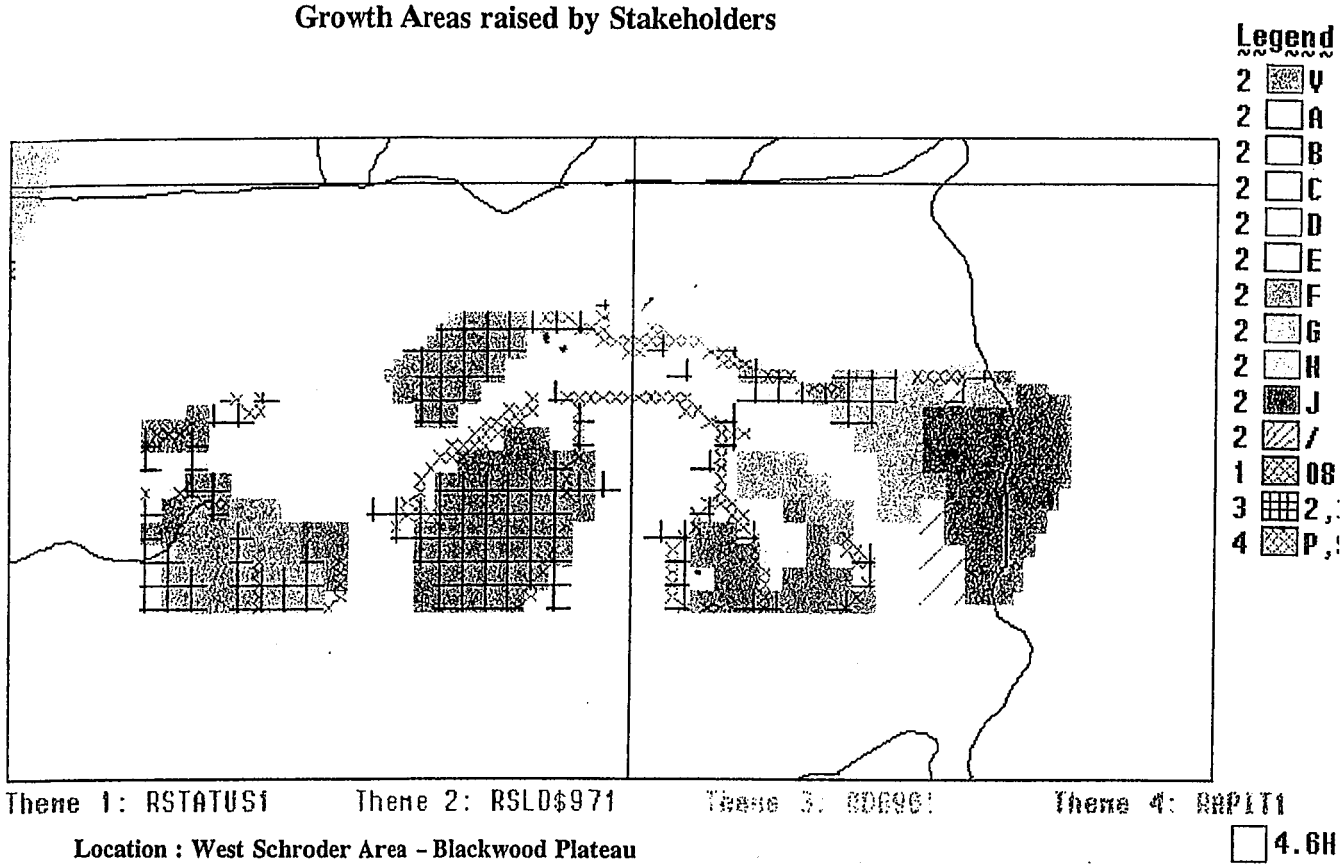
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : West Chapman Area - Blackwood Plateau

	CALM Data	MCPL Inspection
1940's Logged Areas	Sections of the West Chapman Area have been logged once in the 1940's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.	The main 1940's area on West Chapman is regrowth, pole/sapling stands. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.
1950's Logged Areas	Sections of the West Chapman Area have been logged once in the 1950's. No pole/sapling data available. There is extensive *Phytophthora cinnamomi* in the gullies and on the flats within this area.	There is some potential old growth along a 100m wide strip near the river, roughly aligned with the northern boundary of the National Park. There is a potential old growth area approximately 600m along Denny Road, near intersection of Warren Glen Road (some 10ha), plus some scattered 2ha areas along Denny Road. Remainder of area is mostly pole/sapling stands. There is *Phytophthora cinnamomi* in the gullies and on the flats within this area.
1960's and 1970's Logged Areas	The majority of the remaining areas of West Chapman have been logged in the 1960's and 1970's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies of this area.	The majority of the remaining area of West Chapman has been logged in the 1960's and 1970's, and is mostly regrowth pole/sapling stands. There is *Phytophthora cinnamomi* in the gullies and associated flats of this area.
General	The majority of the area was either logged in the 1950's or in the period 1960's to 1970's. Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.	There may be some potential old growth areas within the 1950 areas which were not included in the CRA, possibly due to the extent of *Phytophthora cinnamomi* in the area.

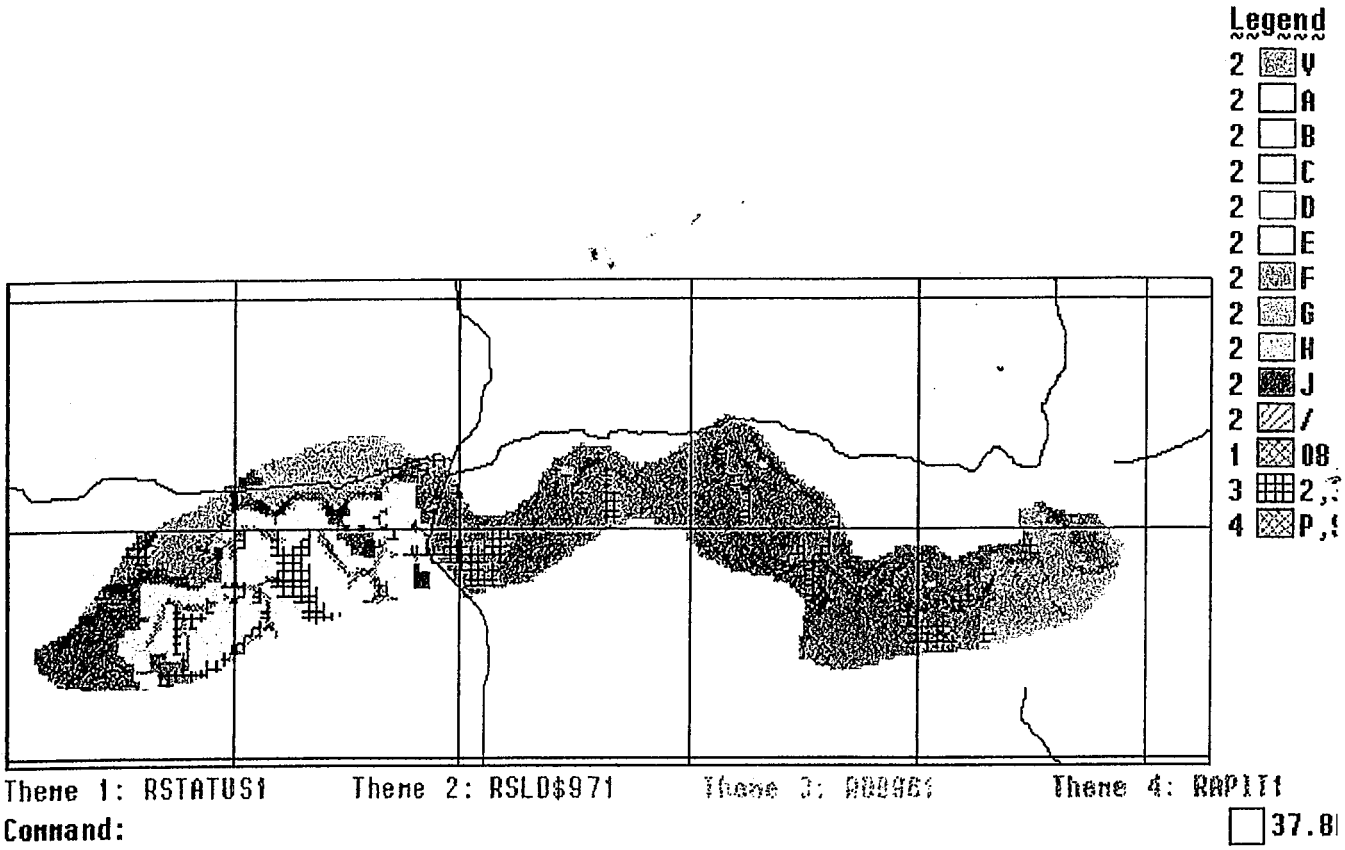
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : West Schroder Area - Blackwood Plateau

	CALM Data	MCPL Inspection
Virgin Areas	In the eastern section of West Schroder there is a small pocket of virgin and old growth area.	Confirmed virgin area.
1940's Logged Areas	Sections of the West Schroder Area have been logged once in the 1940's. No pole/sapling data available. There is extensive *Phytophthora cinnamomi* in the gullies and on the flats within this area.	Confirmed 1940 logging. Mainly regrowth pole/sapling stands. There is *Phytophthora cinnamomi* in the gullies and on the flats within this area.
1950's Logged Areas	Sections of the West Schroder Area have been logged once in the 1950's. No pole/sapling data available. There is extensive *Phytophthora cinnamomi* in the gullies and on the flats within this area.	Confirmed 1950 logging. Mainly regrowth pole/sapling stands. There is *Phytophthora cinnamomi* in the gullies and on the flats within this area.
1960's to 1970's Logged Areas	The majority of the remaining area of West Schroder has been logged in the period 1960's to 1970's. No pole/sapling data available. There is extensive *Phytophthora cinnamomi* in the gullies of this area.	The majority of the remaining area has been logged in the 1960's and 1970's. Some riverine areas old growth, but within existing National Park.
General	The majority of the area was either logged in the 1940's and 1950's or in the period 1960's to 1970s. Some extensive infections of *Phytophthora cinnamomi* in gullies and on lower slopes.	The majority of the area has been logged in the 1940-1970 period and regrowth stands dominate the area, with the exception of some riverine areas, which are within the National Park. *Phytophthora cinnamomi* in gullies and on lower slopes.

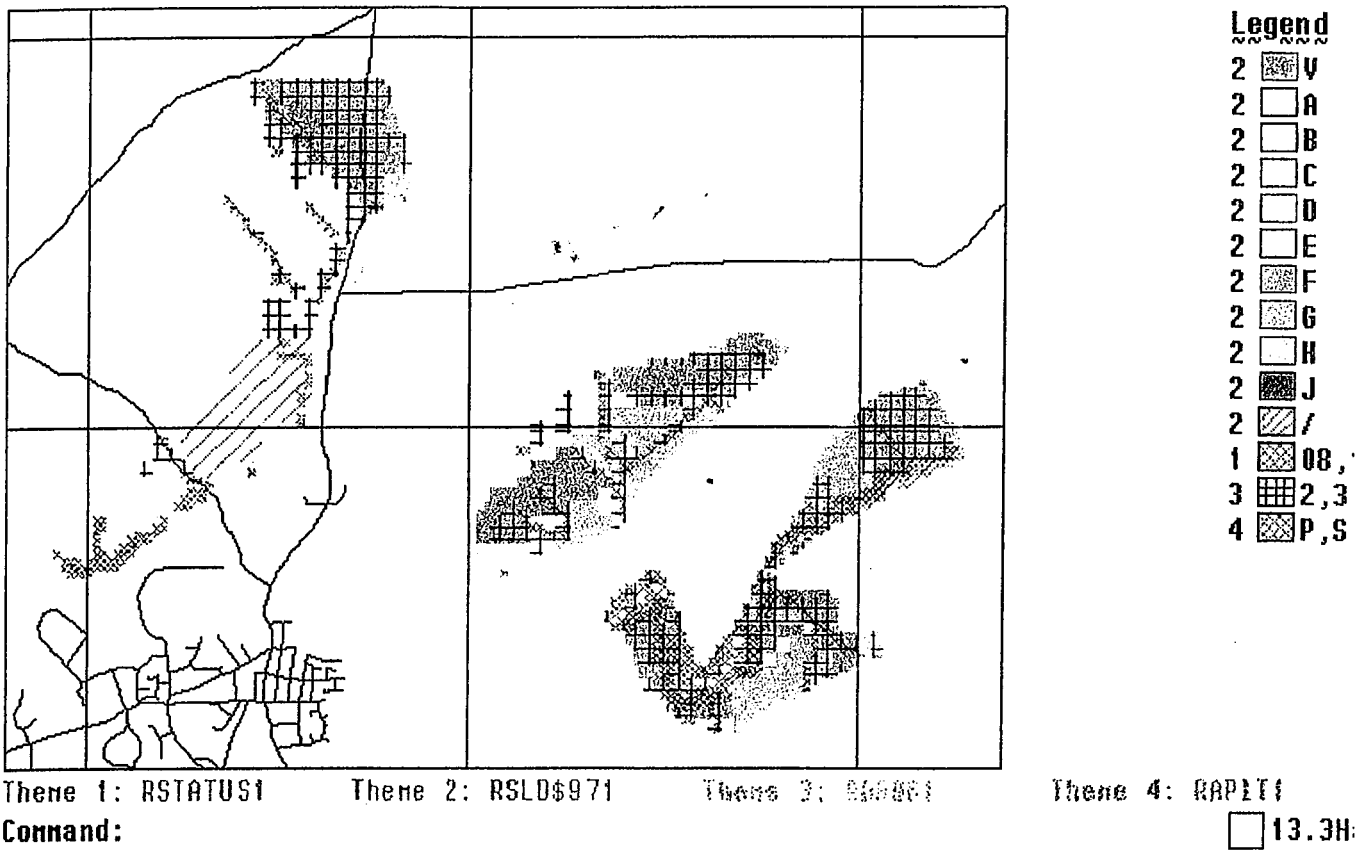
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : East Schroder Area - Blackwood Plateau

	CALM Data	MCPL Inspection
Virgin Areas	Sections of the East Schroder Area are virgin forest and are confirmed as old growth. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.	Confirmed old growth in virgin areas. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.
1950's Logged Areas	Sections of the East Schroder Area have been logged in the 1950's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.	There is some old growth in a 150m buffer along the Blackwood River (however this is already in the National Park). Confirmed that no old growth in the 1950's area, as regrowth pole/sapling stands.
1960's to 1980's Logged Areas	The majority of the remaining areas of East Schroder have been logged in the period 1960's to 1980's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies of this area.	The majority of the remaining areas of East Schroder have been logged in the period 1960's to 1980's. There is some *Phytophthora cinnamomi* in the gullies of this area.
General	The majority of the area was either virgin (and recognized as old growth), logged in the 1950's or in the period 1960's to 1980's. Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.	Old growth restricted to the area already recognized in CRA and within the National Park area along Blackwood River.

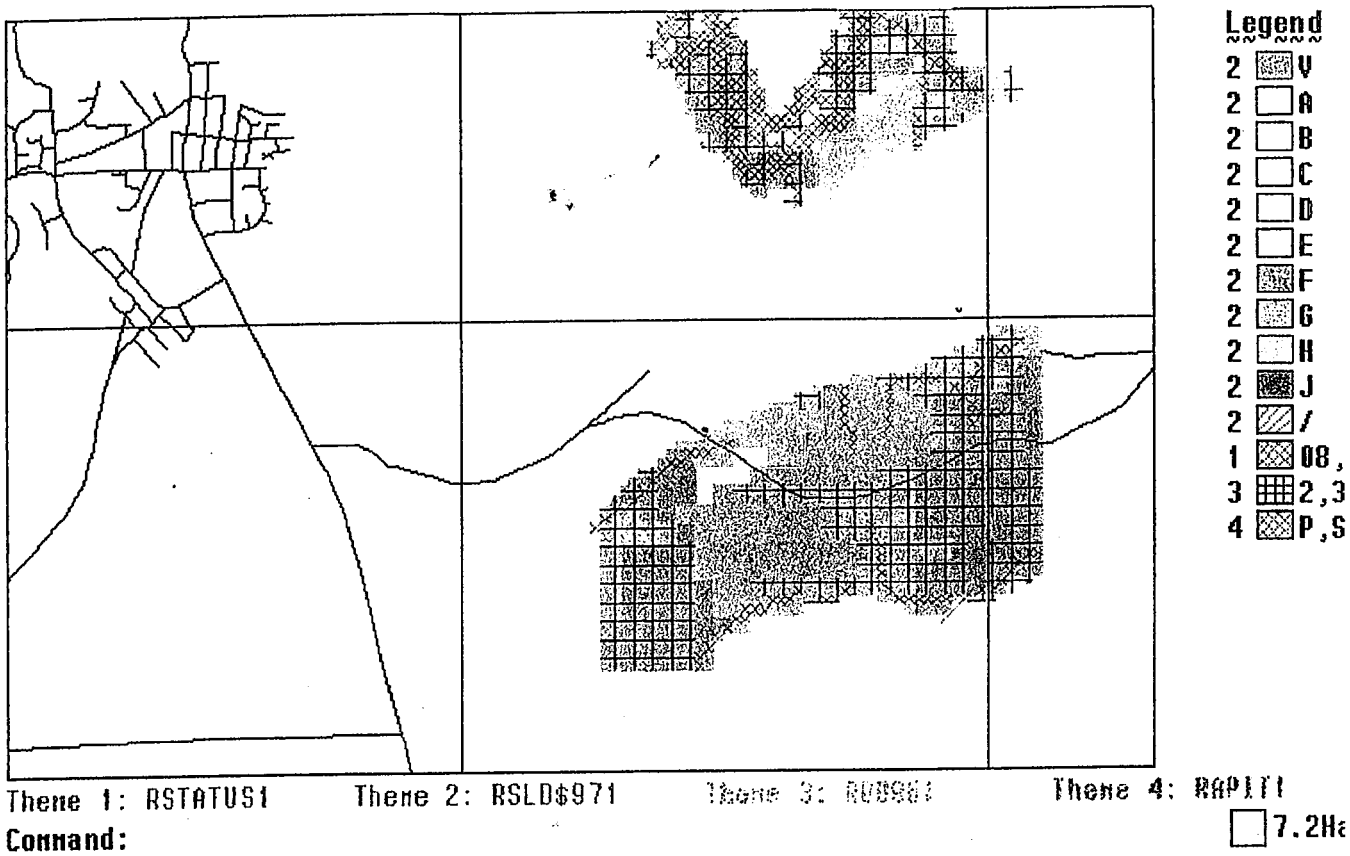
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : Margaret River Area – Blackwood Plateau

	CALM Data	MCPL Inspection
1940's Logged Areas	Sections of the Margaret River area has been logged in 1940's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.	Confirmed no old growth in 1940's areas, all regrowth stands. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.
1950's Logged Areas	Sections of the Margaret River Area have been logged in the 1950's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.	Confirmed no old growth in 1950's areas, all regrowth stands. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.
1960's to 1980's Logged Areas	The majority of the remaining areas of Margaret River have been logged in the period 1960's to 1980's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies of this area.	The majority of the remaining areas of Margaret River have been logged in the period 1960's to 1980's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies of this area.
General	The majority of the area was either logged in the 1940's, logged in the 1950's or in the period 1960's to 1980's. Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.	Old growth restricted to an area of 1 to 2 hectares, near powerline on a creekline north-east of Margaret River. Remainder regrowth stands. Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.

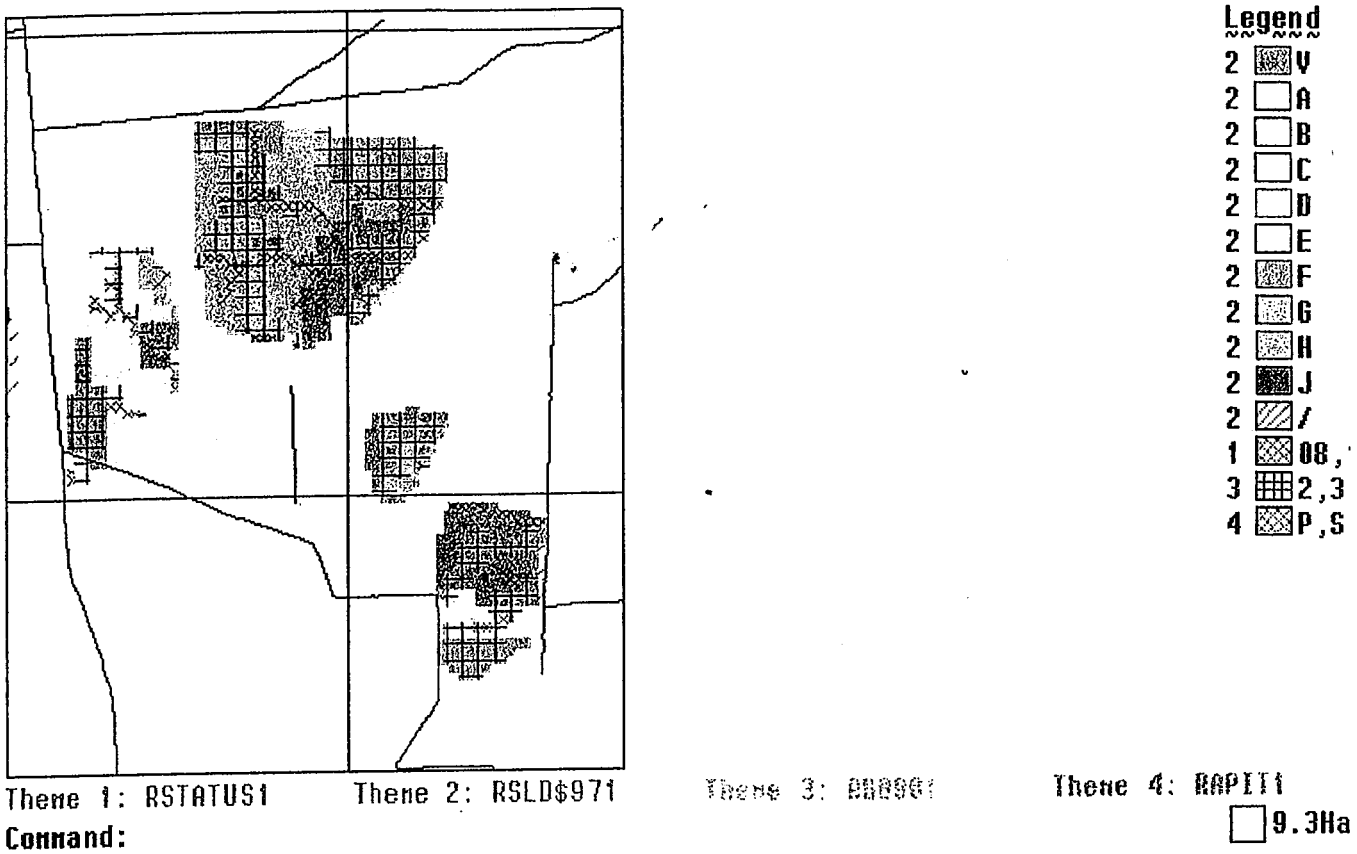
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : Southern Margaret River (Bramley) Area – Blackwood Plateau

	CALM Data	MCPL Inspection
1950's Logged Areas	Small sections of the Southern Margaret River (Bramley) Area have been logged in the 1950's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.	Confirmed no old growth in 1950's areas, all regrowth stands. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.
1960's to 1980's Logged Areas	The majority of the remaining areas of Southern Margaret River have been logged in the period 1960's to 1980's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies of this area.	The majority of the remaining areas of Southern Margaret River have been logged in the period 1960's to 1980's. Regrowth stands. There is some *Phytophthora cinnamomi* in the gullies of this area.
General	The majority of the area was either logged in the 1950's or in the period 1960's to 1980's. Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.	Areas were either regrowth or logged recently. Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.

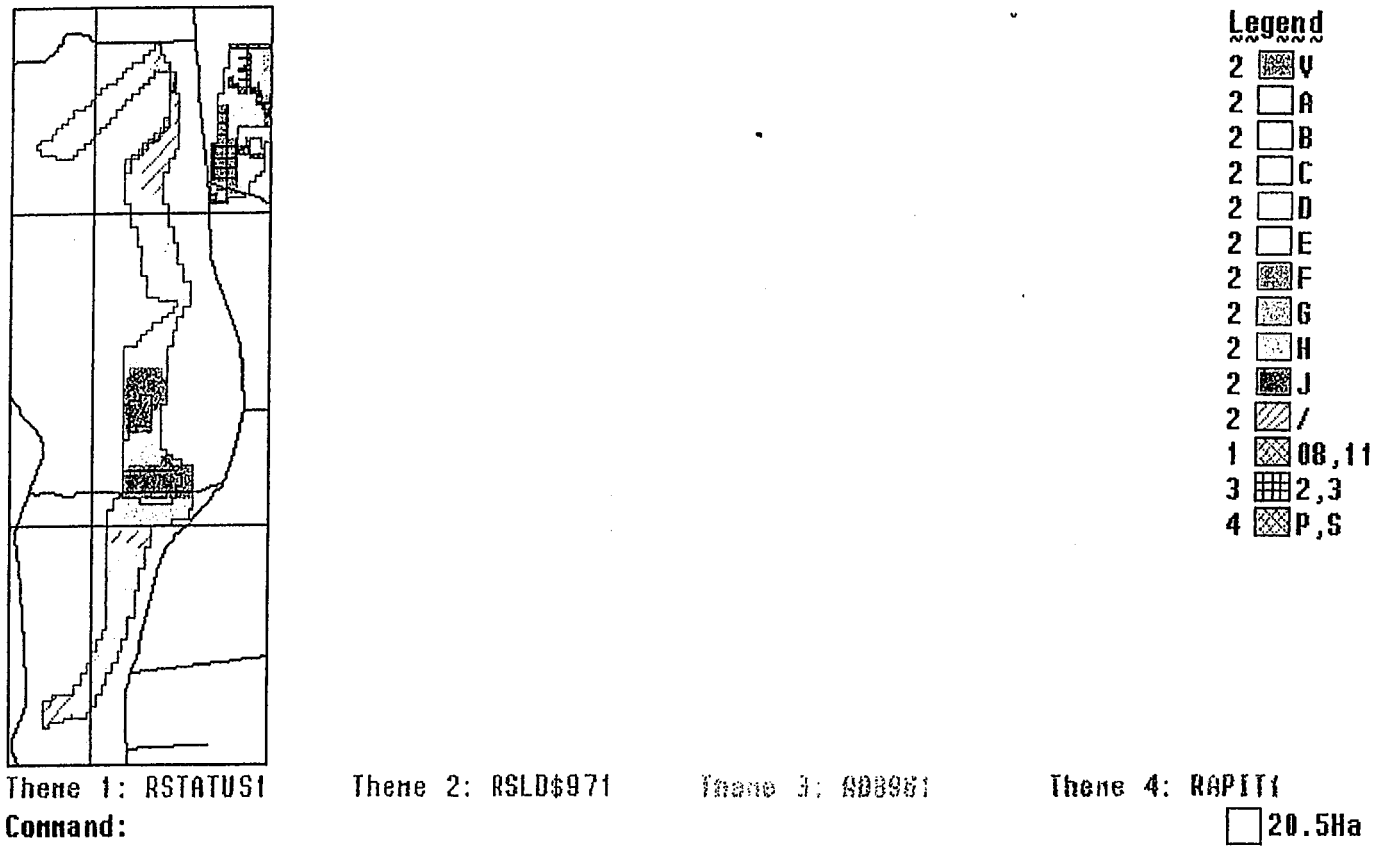
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : Forest Grove Area - Blackwood Plateau

	CALM Data	MCPL Inspection
Virgin Areas	Substantial sections of the Forest Grove are recognized as virgin and old growth. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.	Confirmed old growth. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.
1950's Logged Areas	Small sections of the Forest Grove have been logged in the 1950's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.	Small sections of the Forest Grove have been logged in the 1950's. There is some *Phytophthora cinnamomi* in the gullies and on the flats within this area.
1960's to 1970's Logged Areas	The majority of the remaining areas of Forest Grove have been logged in the period 1960's to 1970's. No pole/sapling data available. There is some *Phytophthora cinnamomi* in the gullies of this area.	The majority of the remaining areas of Forest Grove have been logged in the period 1960's to 1970's. There is some *Phytophthora cinnamomi* in the gullies of this area.
General	The area is largely virgin or logged in the 1950's or in the period 1960's to 1970's. Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes.	The area is largely virgin or logged in the 1950's or in the period 1960's to 1970's. Some infections of *Phytophthora cinnamomi* in gullies and on lower slopes. Confirmed CRA's recognized old growth areas.

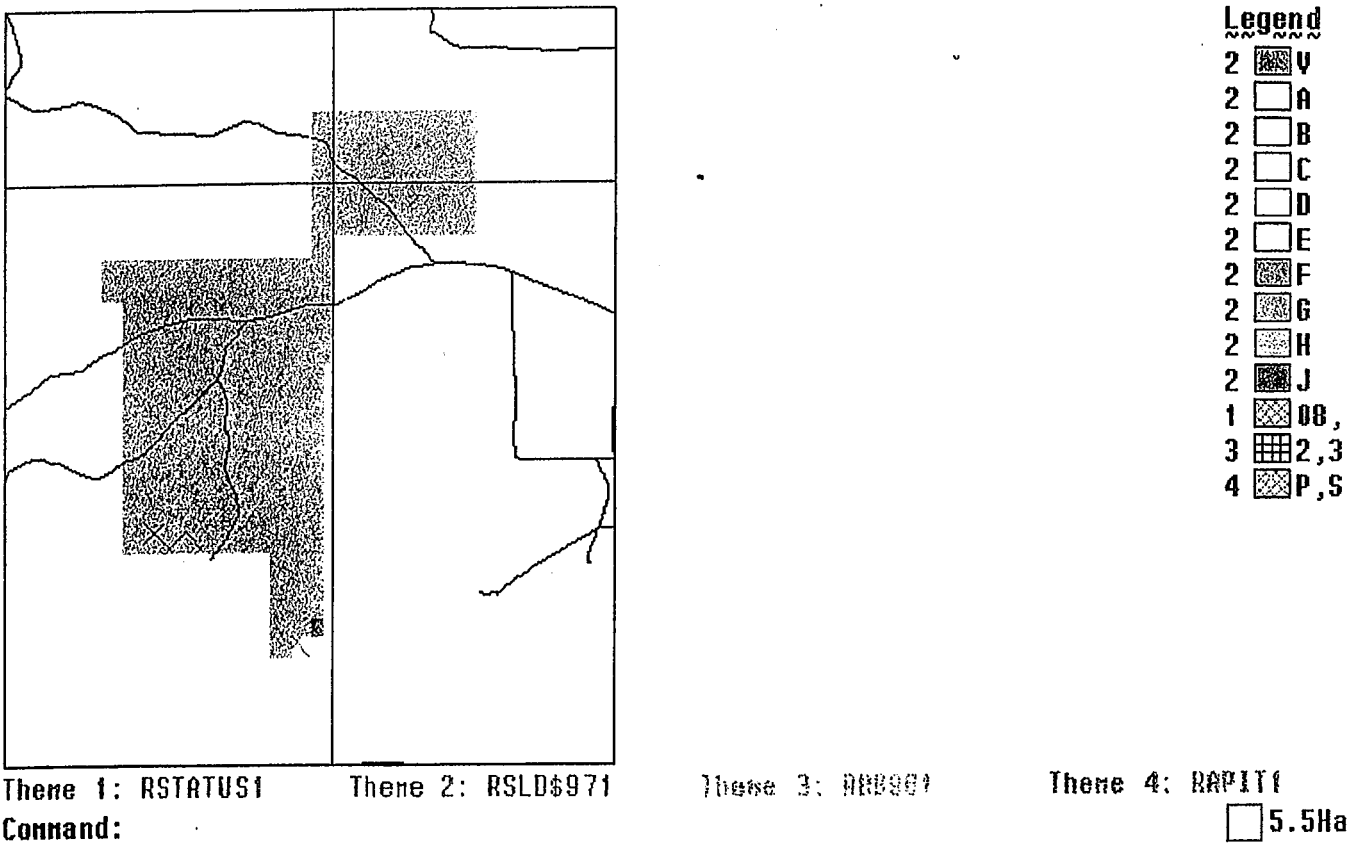
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : Boranup Area – Blackwood Plateau

	CALM Data	MCPL Inspection
National Park Area	The Boranup area is east of National Park within Private Land and therefore has not been considered as part of CRA. No pole/sapling data available.	The Boranup area is east of the National Park within Private Land and therefore has not been considered as part of CRA.

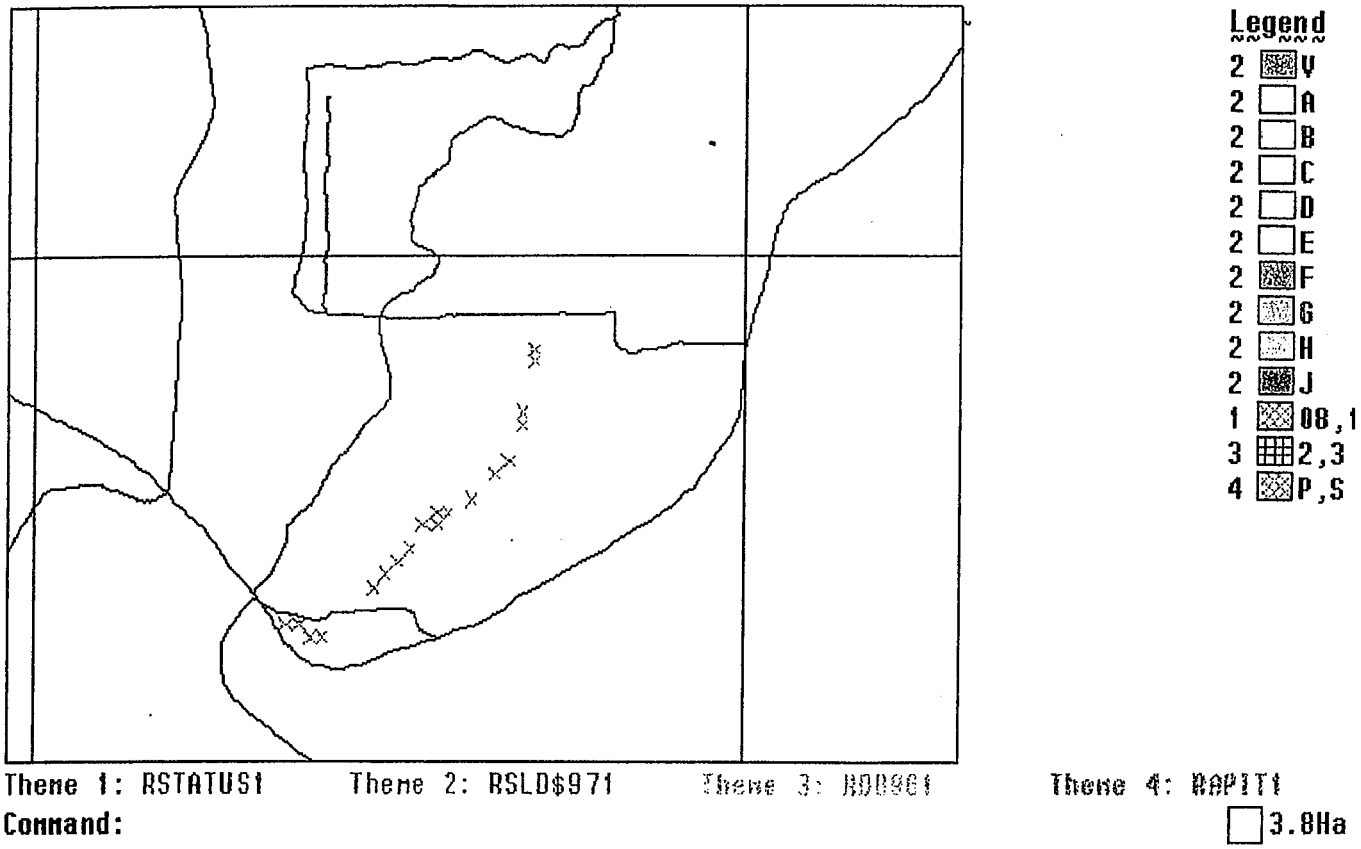
Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : Hester Area - Darling Plateau

	CALM Data	MCPL Inspection
1970's	The majority of the Hester block on the CALM database was designated as 1970's logging, with some pole/sapling stands in restricted areas. Recent notation by CALM officers has recorded the area as logged in the 1930's and that only a few localized areas are pole stands.	The majority of the area was logged in the 1930's, and substantial areas are potential old growth areas (150ha in three locations - south-west corner south of Wheatley Road, straddling Walter Willis Road and north-east corner) . The extent of the regrowth areas differs also from the CALM records. These will need field verification to check the exact boundaries.

Appendix A: Regional Forest Agreement in Western Australia - Review of Old Growth Areas raised by Stakeholders



Location : Dalgarup Area – Darling Plateau

	CALM Data	MCPL Inspection
1950's	The majority of the Dalgarup block on the CALM database was designated as 1950's.	The majority of the Dalgarup block was logged in the 1950's and is regrowth pole/sapling stands on the slopes and uplands. Some old growth areas occur along streamzone. There is *Phytopththora cinnamomi* along sections of creeklines and tracks. Area occurs in proposed Bridgetown forest park.