Review of performance and management practices associated with conducting timely regeneration burns.

Sustainable Forest Management Series

Action report identified in the Mid Term Audit of the Forest Management Plan (2004-2013) in response to target shortfall of KPI 9 - time to regenerate harvested areas.

2009

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1. Summary

The Forest Management Plan 2004–2013 (FMP) includes a number of Key Performance Indicators (KPI). The Mid Term Audit of the FMP, included a report on KPI 9 - Time to regenerate harvested areas. The FMP performance targets for KPI 9 were partially met for karri, and not met for jarrah, for the reporting period (2004-2006). The Conservation Commission response to the KPI 9 target shortfall requested the Department of Environment and Conservation (DEC) to review performance in conducting timely regeneration burns, in consultation with the Conservation Commission.

DEC have undertaken initial liaison with staff from the Forest Products Commission (FPC) and DEC staff from Fire Management Services (FMS) and Sustainable Forest Management (SFM) in each of the three forest regions, to ensure that all views in relation to performance are recorded and may be considered in the review of management practices.

Factors identified that have contributed to the low level of performance in jarrah regeneration areas include:

- log stockpiles;
- integrated planning;
- seed crop monitoring;
- burn program flexibility;
- suitable burning days due to weather conditions;
- suitable burning days due to smoke management requirements.

The most significant factor identified was suitable weather conditions to complete burns under prescribed conditions.

Changes to management practices are recommended in two key areas:

- revised requirements for approval of log stockpile locations;
- improved integrated planning practices.

The recommended changes are likely to result in improvements in achieving KPI 9 performance targets, by reducing the time taken to regenerate harvested areas. However, even with these changes implemented it may not be possible to meet the performance target, as specified in the FMP.

Management practices that may also lead to performance improvements are:

- jarrah seed crop monitoring and;
- program flexibility.

These issues require more detailed investigations before changes to management practices can be recommended. Rudimentary seed crop monitoring is currently conducted; however current research may lead to recommendations that enable further management review. Program flexibility matters require further discussion and consultation through the DEC SFM Working Group.

2. Background

Completing regeneration treatments following harvesting operations is essential in maintaining the long term productive capacity, flora composition and structural attributes of native forests. Time delays between harvesting and regeneration reduce the ability to achieve prescribed burn outcomes and may lead to site degradation. Ensuring that areas are regenerated within target timeframes increases the likelihood of achieving effective regeneration and potentially reduces the time taken for biodiversity to return to pre-disturbance levels.

The time taken to harvest an individual coupe varies according to a number of factors including the volume of product to be harvested and seasonal access restrictions. The date that harvesting is considered to be completed is when all fellers' blocks within the coupe have been certified as complete. It should be noted that further transportation of timber products from landings to customers usually occurs after this date.

The regeneration of harvested areas involves the completion of a sequence of tasks involving harvesting, post-harvest treatments, burn preparation, burning and in some cases planting. The date of the last operation in the sequence of regeneration treatments in the last fellers' block to be completed is seen as the date regeneration treatments were completed.

Objective of Key performance indicator (KPI) 9
The objective of KPI 9 is to assess the success of the implementation of the Forest Management Plan in achieving its targets in regard to the time taken to regenerate harvested areas.

Performance targets
For karri and planted jarrah:

- achieve more than 75 per cent of areas treated to be completed within 18 months; and
- achieve 100 per cent of areas treated to be completed within 30 months.

For other jarrah:

- achieve 100 per cent of areas treated to be completed within 18 months.

Performance results (as reported in the mid term audit of FMP)

Table 1. Per cent of sampled jarrah harvest coupes in various categories of time between harvest and completion of regeneration treatments. The sample covers coupes in which harvesting was completed during the period 2004-2006, in which regeneration was not based on planting of seedlings and hence where the performance target is 100 per cent of areas treated to be completed within 18 months. Numbers in parentheses refer to the number of coupes contributing data for that year.

Year harvest completed	Less than 18 months	18 to 30 Months	Greater than 30 months	Regeneration not recorded at 30/6/08	Total
2004	13% (1)	38% (3)	38% (3)	13% (1)	100% (8)
2005	29% (2)	57% (4)	0% (0)	14% (1)	100% (7)
2006	50% (8)	6% (1)	6% (1)	38% (6)	100% (16)
Total	35% (11)	26% (8)	13 (4)	26% (8)	100% (31)
Target	100%				

The performance target was partially met in the available sample of karri coupes (Table 2).

Table 2. Per cent of sampled karri harvest coupes in various categories of time between harvest and completion of regeneration treatments. The sample covers coupes in which harvesting was completed during the period 2004 to 2006, in which regeneration was based on planting of seedlings and hence where the performance target is 75 per cent of areas treated to be completed within 18 months and 100 per cent of areas treated to be completed within 30 months. Numbers in parentheses refer to the number of coupes contributing data for that year.

Year harvest complete	Less than 18 months	18 to 30 months	Greater than 30 months	Regeneration not recorded at 30/6/	Total
2004	50% (2)	50% (2)	0% (0)	0% (0)	100% (4)
2005	70% (7)	30% (3)	0% (0)	0% (0)	100% (10)
2006	100% (7)	0% (0)	0% (0)	0% (0)	100% (7)
Total	76% (16)	24% (5)	0% (0)	0% (0)	100% (21)
Target	75%	100 %			

The target of 75 per cent was not met in the first two years of the FMP.

3. Review of performance

As per the Mid Term Audit of the FMP, the Conservation Commission requested DEC to determine the need for a revision of management practices. DEC has determined a revision of management practices is required.

The review involved meeting with managers involved with coupe and burn planning in the three forest regions to discuss the KPI shortfall as per table below. Managers described reasons for the shortfall, and discussed potential mitigation strategies.

Warren Region attendees *Manjimup 15/05/09*	South West Region attendees *Bunbury 25/05/09*	Swan Region attendees *Perth 03/06/09*	FPC attendees *Bunbury 03/07/09*
Steve Collings Warren Region SFM Coordinator Rod Simmonds Warren Region Fire Coordinator	Jason Foster South West Region SFM Coordinator John Tillman South West Region Fire Coordinator	Steve Raper Swan Region SFM Coordinator Greg Broomhall Acting Swan Region Fire Coordinator Mark Humble Perth Hills District SFM Coordinator Kevin Pollock Perth Hills District Fire Coordinator	Todd Brittain Senior Forester Planning and Silviculture Alan Seymour Manager Planning and Silviculture

3.1 Limitations of reporting data

The data used in this review (as shown in Appendix 2) is a sample of the total, and comprises approximately 50% of coupes harvested. However this is highly variable spatially and temporally. Development of a routine reporting system between FPC and DEC is required to improve future sample size.

Data provided to DEC regarding achieved silvicultural objectives is not always accurate, and is often modified upon more detailed investigation. This affects reporting as different objectives have different burning requirements. Silvicultural information reporting systems need further development.

Coupe and burn areas often contain multiple silvicultural objectives. In cases where the proportion of a coupe requiring post harvest burning is small, the burn may be postponed to allow completion of other burns of greater priority. This is a sensible management strategy, however this process is not captured in the data.

Recommendation 1: That FPC and DEC work together to develop a routine reporting system that provides more timely and accurate silvicultural information.

4. Discussion of issues identified

The following issues were identified through the meetings with relevant managers as the key ones involved in the delay in achievement of regeneration operations.

4.1 Log stockpiles

During harvesting operations, logs that either do not meet sawlog specifications, or do not have a current buyer are stockpiled on landings. Markets for residue products such as charcoal and firewood are seasonal and fresh logs are often not saleable until they are dried.

Where small stockpiles are located throughout the coupe and the FPC expects markets can be found for these logs, post harvest burns are delayed. Where stockpiles are considered protectable, or when markets for residue logs have not been identified, post harvest burns may proceed. Controlling the number and location of log stockpiles will increase the likelihood of completing burns within the performance target timeframe.

Recommendation 2: If the FPC requires active protection of residue logs during post harvest burns they will identify protectable storage sites prior to harvesting in consultation with DEC through the pre-operations checklist (DEC019).

4.2 Integrated planning

Coupe boundaries often do not match trafficable management boundaries for use in the post harvest burn, and a separate burn boundary needs to be established. When burn boundaries are not included as part of the disturbance area identified during the harvest planning process, a second disturbance checklist, and associated flora surveys and dieback mapping is required. This process may delay regeneration by several months to a year. Some changes have recently been made in this process, but further improvements are possible.

Recommendation 3: That Regional Services staff ensure burn boundaries are identified for all coupes during the harvest planning and approval process.

In most jarrah coupes where burn boundary upgrade is required, DEC roading machinery complete it after harvesting. This may add up to 8 months on to the delay between harvesting and regeneration burning, and may be more in wet southern coupes. It is common practice in karri coupes for the FPC harvesting contractor to perform the burn boundary upgrade at the completion of harvesting. This is more time efficient and cost effective than for DEC machinery to return to a coupe to complete this work.

FPC harvesting contractors' machinery may not always be appropriate for burn boundary upgrade. FPC also contract dedicated roading crews that perform pre harvest road construction and maintenance. If identified early in the planning phase, burn boundary upgrade could be performed prior to harvesting by these contract roading crews.

Recommendation 4: DEC and FPC to develop strategies that improve efficiencies in conducting burn boundary upgrade.

Jarrah coupes are often harvested over protracted periods up to several years, resulting in substantial regeneration establishment and growth prior to the post-harvest burn, which may compromise burn objectives. This is not captured in the KPI 9 reporting as the time to regenerate harvested areas criteria commences when whole of coupe harvesting is complete.

Recommendation 5: That DEC through the SFM Working Group develop a target harvest completion time period in consultation with FPC.

4.3 Seed crops

To achieve silvicultural objectives, jarrah forest harvested to a shelterwood regime should be burnt to coincide with a seed crop. The floral cycle may take up to 4 years. Presently in many shelterwood dominant coupes harvesting is completed and the burn is postponed until seed conditions are optimal, rather than timing the harvest to occur just prior to seed fall.

DEC is sponsoring a study examining the fate of jarrah seed from canopy-store to emergence. This study is expected to aid in refining procedures for improved seed crop monitoring. The feasibility of manipulating harvesting to coincide with seed crops can then be examined in more detail.

It is recognised that manipulating harvesting to coincide with seed crops will only lead to positive outcomes if post harvest burns are completed at the appropriate time. Potentially, great effort and expense monitoring seed crops and manipulating harvest plans could be wasted.

Recommendation 6: That DEC through the SFM Working Group develop management recommendations regarding seed crop monitoring and harvest timing in consultation with FPC, considering and incorporating new information as it becomes available.

4.4 Program flexibility

Under current funding arrangements the funds for conducting post-harvest burning are provided by an appropriation to DEC from the Department of Treasury and Finance (DTF) and this is matched by a payment from FPC to DTF. The appropriation amount is based on the planned burn program, irrespective of whether all burns programmed are completed. When they are not completed, DEC develop contingency works programs for the remaining funding, usually for water point and roading works associated with the post harvest burn.

As a result FPC sometimes show reluctance to schedule more burns than they believe DEC can complete. In particularly long and favourable burn seasons, this results in the completion of less post harvest burns than is otherwise possible.

Resource availability for post harvest burning by DEC can be limited due to competing priorities with other programs, other burns of higher priority, and bushfire requirements. Burns of higher priority are generally protection burns adjacent to town sites, or surrounding important biodiversity values. Competing bushfire requirements are generally limited to southern karri forest areas.

To complete post harvest burns under prescribed conditions that meet a range of values and objectives, two full burn seasons are required to be available within the KPI 9 time frames. Well defined time frames for completion of post-harvest treatments are necessary to allow two burn seasons within these time frames. Setting of interim time frame targets regarding post harvest treatments should occur as soon as practicable.

Issues pertaining to program flexibility require further investigation and discussion. This may best be achieved through the SFM Working Group.

Recommendation 7: That matters regarding program flexibility are further investigated by the DEC SFM Working Group, involving both FMS and FPC.

4.5 Weather conditions

Lack of suitable weather conditions to conduct post harvest burns under prescribed conditions is the greatest limiting factor in burn program completion. This factor applies to all prescribed burning activities and is not a new phenomenon. To improve utilisation of prevailing weather conditions requires a more accurate understanding of forecasted conditions, and greater resources to undertake more burns within favourable conditions.

During periods of favourable weather conditions, DEC can obtain resources from across the south west, and the number of burns undertaken within a given time frame is generally restricted by smoke management requirements, rather than resource availability. However, resource availability is a factor in achieving the requirements of KPI 9, and is discussed under *Program flexibility* above.

Recommendation 8: DEC to maintain a record of weather conditions and outcomes for each silviculture burn and conduct an annual review of the current guideline settings to ensure burning opportunities are not artificially limited by settings in the silviculture guidelines.

4.6 Smoke management

The number of days that burning can occur in a season is reducing through smoke related restrictions. Smoke from prescribed burning affects events, highways and traffic, cities and large towns, and industry such as vineyards. Smoke management guidelines manage these impacts by modifying burn programs and burn implementation.

Reducing the number of burns completed in a season increases those carried over to the following season, and results in an overall increase in the number of post harvest burns that will exceed the requirements of KPI 9.

Smoke management guidelines are developed by DEC to balance community expectations with prescribed burning requirements. Recommendations regarding their implementation are not relevant to this review.

5. Summary of recommendations with indicative timeframes for implementation

Recommendation 1

That FPC and DEC work together to develop a routine reporting system that provides more accurate silvicultural information – Dec 2010.

Recommendation 2

If the FPC requires active protection of residue logs during post harvest burns they will identify protectable storage sites prior to harvesting in consultation with DEC through the pre-operations checklist (DEC019) – June 2010.

Recommendation 3

That Regional Services staff ensure burn boundaries are identified for all coupes during the harvest planning and approval process – June 2010.

Recommendation 4

DEC and FPC to develop strategies that improve efficiencies in conducting burn boundary upgrade – December 2010.

Recommendation 5

That DEC through the SFM Working Group develop a target harvest completion time period in consultation with FPC – December 2010.

Recommendation 6

That DEC through the SFM Working Group develop management recommendations regarding seed crop monitoring and harvest timing in consultation with FPC, considering and incorporating new information as it becomes available – December 2010, and ongoing.

Recommendation 7

That matters regarding program flexibility are further investigated by the DEC SFM Working Group, involving both FMS and FPC – December 2010.

Recommendation 8

DEC to maintain a record of weather conditions and outcomes for each silviculture burn and conduct an annual review of the current guideline settings to ensure burning opportunities are not artificially limited by settings in the silviculture guidelines – December 2010.

Appendix 1 - Process Description

This is a general overview of the steps in the process that are relevant to KPI 9. These steps sometimes overlap and may occur concurrently.

Coupe level Planning
The coupe planning phase is the initial determination of actual coupe boundaries in the forest. The Forest Management Branch produce 3 year indicative harvest plans with proposed coupe boundaries. Proposed coupe boundaries are provided to the FPC and Regional Services for field assessment. Annual harvest plans are developed through this process. An interpretation for the presence of *Phytophthora cinnamomi* (Dieback) is conducted based on the final coupe boundary in this plan.

Pre Operations Planning
The pre operations planning phase involves dividing the coupe into fallers blocks, planning a roading network for timber extraction, assessing the impacts of disturbance on a range of environmental, social and cultural values, and planning operations to minimise impacts on these values. This may involve field surveys of flora and fauna and a range of other assessments.

The FPC complete a range of planning documents including the Pre Operations Checklist (FPC 109), and DEC approve these documents prior to commencement of operations.

Harvesting
Harvesting involves the felling and transportation of timber from a coupe. The time taken to regenerate harvested areas is considered to begin once all fellers blocks within a coupe are certified as complete.

Post harvest treatments
Different silvicultural treatments are conducted by the FPC after harvesting. Cull tree removal involves removal of defective, malformed and unhealthy trees from harvested areas, reducing competition with crop trees to maximise the productive capacity of a stand.

Cull trees are usually removed by either herbicide application or mechanical removal, depending on site characteristics. Post harvest treatments are generally used on productive sites where increased growth resulting from treatment justifies treatment cost.

Cull tree removal treatments usually take approximately 6 weeks per coupe. However, herbicide application can only be conducted during the growing periods of spring or autumn, so up to a 6 month period may elapse between harvest completion and post harvest treatment completion.

Shelterwood preparation involves scarification of the seed bed to promote regeneration. It is usually completed using a wheeled loader. It is often completed in conjunction with cull tree removal.

Clearfelled karri coupes usually require a post harvest treatment involving the rough heaping of tops and logging slash into heaps, in preparation of burning, to allow regeneration. Rough heaping is carried out by bulldozer. As a treatment rough heaping is not desirable from a cost or environmental perspective, and been forced into the regeneration process due to smoke management requirements. It allows burning to occur outside of the normal burn season when smoke may affect vineyards.

Burn prescription/ planning
The burn prescription preparation and burn planning phase involves determining actual burn boundaries and burn area, identifying the impacts of the burn on a range of environmental, social and cultural values, and planning operations to promote positive impacts on these values. This may involve field surveys of flora and fauna and a range of other assessments, often including dieback interpretation.

Flora and fauna surveys may take anywhere from several weeks to a year to complete, depending on a range of factors from availability of appropriate staff, through to plant flowering time (to enable identification). Dieback interpretation may take up to 6 months to complete, depending on availability of appropriate staff.

If the final proposed burn area is identical to the actual coupe boundary, most of these processes are completed in the coupe or pre operations planning phases, and do not require reassessment.

Depending on burn location, proximity to townsites and other burn objectives and values, stakeholder consultation may be extensive and take several months.

Burn boundary preparation
Often it is not possible to position burn boundaries on formed and gravelled roads. In these cases it is necessary to upgrade existing tracks that have overgrown and/or eroded and are no longer trafficable. This phase is weather and resource dependent, and may take up to 6 or 8 months in especially wet areas, although 1 – 3 months is common.

Burn implementation
Where planting is not necessary (most Jarrah coupes), regeneration is considered complete at the completion of the post harvest burn. The reasons burn implementation may be delayed are varied and complex.

Planting
In Karri coupes, planting is conducted in the next winter after the post harvest burn, and is the point at which regeneration is considered complete. Most coupes take approximately 1 month to plant, but due to the winter requirement, up to a 6 month period may elapse between burn completion and planting completion.

Appendix 2 - Jarrah Coupe details

2004

Region	Block	Coupe Code	Regeneration Type	Harvesting Completed	Burn Date	Months Delay	Months to 15/10/2008*
Swan	Curara	DCU0202	JW-RELEASE	12/03/2004			55
Warren	Graphite	MGP0302	JW-RELEASE	15/04/2004	15-Nov-04	7	
South West	Kingia	BKG0102	JW-RELEASE	21/05/2004	15-May-06	23	
Swan	Lang	JLA0303	JW-RELEASE	23/04/2004	15-Jun-06	25	
South West	Preston	KPR0502	JW-RELEASE	14/01/2004	15-Oct-07	45	
South West	Schroeder	BSC0401	JW-RELEASE	19/03/2004	15-Apr-08	48	
Warren	Thornton	MTR0302	JW-RELEASE	9/03/2004	15-Nov-05	20	
Swan	Yarragill	DYA0203	JW-RELEASE	4/05/2004	15-Apr-08	47	

2005

Region	Block	Coupe Code	Regeneration Type	Harvesting Completed	Burn Date	Months Delay	Months to 15/10/2008*
Warren	Collins	PCO0403	JW-RELEASE	19/04/2005	15-Jul-06	14	
Swan	Dale	UDA0603	JW-ESTABLISH	15/06/2005	15-Oct-07	28	
Warren	Diamond(2)	PDT1203	JW-RELEASE	19/04/2005	15-Dec-06	19	
South West	Fleays	CFL0302	JE-ESTABLISH	4/01/2005	15-Oct-06	21	
South West	Fleays	CFL0202	JE-RELEASE	4/01/2005	15-Oct-06	21	
South West	Fleays	CFL0202	JE-ESTABLISH	17/06/2005	15-Apr-07	21	
Warren	Iffley	MIF0505	JW-ESTABLISH	8/03/2005	15-Nov-05	8	
Warren	Iffley	MIF0602	JW-ESTABLISH	8/03/2005	15-Nov-05	8	
Swan	Taree	DTA0203	JW-RELEASE	21/04/2005			41

2006

Region	Block	Coupe Code	Regeneration Type	Harvesting Completed	Burn Date	Months Delay	Months to 15/10/2008*
South West	Blackwood	NBC0103	JW-RELEASE	27/07/2006			26
South West	Cambray	NCM0106	JW-RELEASE	30/11/2006			22
Warren	Gobblecannup	PGB0205	JW-RELEASE	12/12/2006			22
South West	Harrington	KHR0402	JW-RELEASE	17/05/2006	15-Oct-06	4	
South West	Helms	NHE0106	JW-RELEASE	29/11/2006	15-Apr-08	16	
South West	Hunt	KHU0305	JE-ESTABLISH	10/07/2006	15-Apr-07	9	
South West	Jolly	KJO0306	JE-ESTABLISH	20/10/2006			23
South West	Jolly	KJO0103	JE-ESTABLISH	9/02/2006	15-May-06	3	
Swan	Lang	JLA0403	JW-RELEASE	28/02/2006	15-Apr-07	13	
South West	Lowden	CLO0101	JW-RELEASE	11/05/2006			29
South West	Lowden	CLO0101	JE-ESTABLISH	11/05/2006			29
Swan	Morgan	HMO0403	JE-ESTABLISH	9/03/2006	15-Oct-08	31	
Warren	Murtin	PMU0302	JW-RELEASE	8/05/2006			29
South West	Palmer	CPA0105	JW-RELEASE	5/03/2006	15-Oct-07	19	
South West	Rapids	BRA0602	JW-ESTABLISH	24/10/2006	30-Oct-06		
South West	Sussex	NSU0305	JW-RELEASE	2/02/2006	15-Apr-05	0	
South West	Sussex	NSU0405	JW-RELEASE	2/02/2006	15-Apr-05	0	
South West	Wilga	KWI0305	JE-ESTABLISH	12/06/2006	15-Oct-07	16	
South West	Wilga	KWI0305	JW-RELEASE	12/06/2006	15-Oct-07	16	

Appendix 3 - Karri Coupe details

2004

Region	Block	Coupe Code	Regeneration Type	Harvesting Completed	Planting Date	Months Delay	Months to 15/10/2008*
Warren	Bigbrook	PBB0103	K-ESTABLISH	14/01/2004	15-Aug-05	19	
Warren	Mattaband	WMA0803	K-ESTABLISH	2/12/2004	15-Jul-06	19	
Warren	Mattaband	WMA0803	K-PART-ESTAB	2/12/2004	15-Jul-06	19	
Warren	Mattaband	WMA0803	KJ-ESTAB	2/12/2004	15-Jul-06	19	
Warren	Northcliffe	PNC0203	K-ESTABLISH	19/03/2004	15-Jul-05	15	
Warren	Treenbrook	PTB0703	K-ESTABLISH	5/05/2004	15-Jul-05	14	
Warren	Treenbrook	PTB0803	K-PART-ESTAB	5/05/2004	15-Jul-05	14	

2005

Region	Block	Coupe Code	Regeneration Type	Harvesting Completed	Planting Date	Months Delay	Months to 15/10/2008*
Warren	Bigbrook	PBB0804	K-ESTABLISH	29/11/2005	15-Jul-07	19	
Warren	Challar	WCL0904	K-ESTABLISH	06/04/2005	15-Jul-06	15	
Warren	Channybearup	MCH0204	K-ESTABLISH	19/04/2005	15-Jul-06	14	
Warren	Court	PCU0405	K-ESTABLISH	29/11/2005	15-Jul-07	19	
Warren	Collins	PCO0303	K-ESTABLISH	19/04/2005	15-Jul-06	14	
Warren	Collins	PCO0403	K-ESTABLISH	19/04/2005	15-Jul-06	14	
Warren	Collins	PCO0403	KJ-ESTAB	19/04/2005	15-Jul-06	14	
Warren	Dombakup	PDM0303	K-PART-ESTAB	1/02/2005	15-Jun-06	16	
Warren	Diamond(2)	PDT1303	K-ESTABLISH	21/02/2005	15-Jul-06	16	
Warren	Diamond(2)	PDT1203	KJ-ESTAB	19/04/2005	15-Jul-06	14	
Warren	Diamond(2)	PDT1203	K-ESTABLISH	19/04/2005	15-Jul-06	14	
Warren	Dombakup	PDM0303	K-ESTABLISH	1/02/2005	15-Jun-06	16	
Warren	Lindsay	MLI3102	K-ESTABLISH	27/01/2005	15-Jul-06	17	
Warren	Treenbrook	PTB0104	K-ESTABLISH	29/11/2005	15-Jul-07	19	

2006

Region	Block	Coupe Code	Regeneration Type	Harvesting Completed	Planting Date	Months Delay	Months to 15/10/2008*
Warren	Bigbrook	PBB0204	K-ESTABLISH	20/01/2006	15-Jul-07	17	
Warren	Bigbrook	PBB0505	K-ESTABLISH	04/12/2006	15-Jul-07	7	
Warren	Diamond(2)	PDT1305	K-ESTABLISH	25/02/2006	15-Jul-07	16	
Warren	Lindsay	MLI2503	K-ESTABLISH	02/03/2006	15-Jul-06	4	
Warren	Northcliffe	PNC0305	K-ESTABLISH	22/11/2006	15-Jul-07	7	
Warren	Solai	MSL0704	K-ESTABLISH	22/05/2006	15-Jul-07	13	
Warren	Sutton	PSU0203	K-ESTABLISH	03/04/2006	15-Jul-06	3	
Warren	Sutton	PSU0103	K-ESTABLISH	03/04/2006	15-Jul-06	3	

* date that was last used to assess KPI 9 data in the FMP mid-term audit.

Regeneration Type codes

JE-RELEASE = eastern jarrah with objective to release existing regeneration
JW-ESTABLISH = western jarrah with objective to establish regeneration
KJ-ESTAB = mixed karri and jarrah with objective to establish regeneration

Appendix 4 - Case studies

These case studies are coupes that were harvested during the existing FMP. The post harvest burns were delayed for a range of reasons, that are relevant to the recommendations of this report.

Cambray 0106

- harvesting complete June 07
- post harvest treatment not conducted
- now scheduled spring 09
- total time to regenerate – 29 months (if completed spring 09)
- main reason for delay – **inappropriate boundary identification**

The coupe boundaries did not align with manageable burn boundaries and was brought out to include a larger area. Assessment of environmental sensitivities and the burn planning process began for the new area after harvesting complete. Significant quokka and woylie habitat existed in this new area, which necessitated further survey work, hence the burn was delayed

Blackwood 0103

- harvesting complete December 06
- post harvest treatment conducted during harvesting
- burn completed May 09
- total time to regenerate – 30 months
- main reason for delay – **logs on landing**

The coupe boundaries did not align with manageable burn boundaries and was brought out to include a larger area. Assessment of environmental sensitivities and the burn planning process began for the new area after harvesting complete. However, the greatest delay was caused by logs remaining on landings.

Morgan 0403

- harvesting complete February 06
- post harvest treatment March 08
- burn completed October 08
- total time to regenerate – 32 months
- main reason for delay – **timing with seed crop**

The post harvest treatment was delayed but the burn was deferred for 2 years to coincide with seed crop.

Yarragil 0203

- harvesting complete May 05
- post harvest treatment October 05
- burn completed September 08
- total time to regenerate – 40 months
- main reason for delay – **burn was a lower priority**

The burn was a lower priority, and carried over several seasons