GRIMWADE PINE PLANTATION FIRE

(KIRUP 19)

2 MARCH 1984

REPORT BY PROTECTION BRANCH (FIRE) S.H.Q. -MAY 1984

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1. INTRODUCTION

On March 2nd 1984 a fire was detected by the Busselton Spotter and Stewart Tower at 1430 hours in Compartment C6 of Grimwade Plantation.

The fire is suspected to have been started around 1400 to 1420 hours in an area in which a Pine Hauliers Kockum loader had worked earlier in the day (1200 - 1300 hours). A Red Action was not called until 1435 hours when the Spotter confirmed its initial 'B' sighting with an 'A' smoke report. The 5 minute delay may have been critical to the success or failure of the initial attack as the fire size would have been about 0.2 ha only by the time the first gang unit would have arrived. As it was, the fire spread rapidly in the first half hour after detection, as it was burning up a 10° slope in heavy logging debris remaining after recent clearfalling. The heavy slash and residual pine stumps presented severe difficulties to the tracked D4, and crews. The average fire spread was not fast (85 m/hr) in the first 3 hours, whilst winds remained relatively light. However the 6-8 metre flames were difficult to control and mop-up by water.

The combination of extremely dry conditions (SDI = 1725, Max Temp 35°C, Min RH 20%, FDI (Pine) 470, and SMC (pine) = 4%) and the strong SW wind change of 25-30 kph at 1730 hours resulted in a very rapid escalation of fire behaviour. The fire rapidly jumped fire-lines established by hose-lays and a narrow D4 dozer break on the eastern flank. A high degree of instability was observed and spotting occurred up to 1 km into the adjoining compartments east and north-east of the initial fire.

Fire behaviour was severe with flames of more than 40 metres high in the 50-year-old stands, and some 150-200 metres deep. Mass spotting from scattered eucalypt regrowth in the clearfelled areas accelerated the fire spread which averaged 600-700 m/hr.

The firefighting crews were forced to hurriedly evacuate to safety and were not able to carry out effective suppression until the headfire had run into the recently-burnt jarrah hardwood buffer to the north and east of Compartment B. Here the fire behaviour decreased markedly after running 200 m into the buffer, allowing forces to carry out a direct attack. A complete firebreak was eventually established by 2130 hours, although complete mop-up to 100 metre depth was not achieved until 6 days and nights later on March 9th, 1984.

The fire burnt over 172.6 ha consisting of the following categories:

(i)	Standing mature pine (P33-49)	49.1 ha
(ii)	P73, 78	5.7 ha
(iii)	P83	3.7 ha
(iv)	Clearfelled and N.P.	61.0 ha
(v)	Jarrah buffer	18.1 ha
(vi)	Firebreaks and Airstrip	35.0 ha
		172.6 ha

Salvage of the mature standing pine commenced on March 7th, 1984 and is anticipated to yield approximately 10,000 m^3 of sawlogs and peelers.

Approximately $91,000 of direct costs (not including staff overheads) have been expended on the suppression operation. (Appendix 1).

The following report has been prepared to provide a basis for discussion and remedial action so that many of the incorrect decisions and procedures found to have occurred in this fire control operation may not be repeated in future.

2. ORIGIN AND CAUSE OF FIRE

The initial report of the fire was given by the Spotter at 1430 hrs as FL 6352 with an area of 0.2 ha. The field confirmation came 15 minutes later by the A/Forester who gave the position as FL 6353 with a 2.0 ha area. Following discussion with

the staff and employees who arrived early on the scene, the likely area at that time was closer to 0.2 ha.

On 3/3/84 a full and detailed investigation of the site was made and an origin area of 10 m x 5 m was determined. It was subsequently established that a Kockum loader worked in this area between 1200 and 1300 hrs when the driver claimed he knocked off and ate his lunch in the machine. Following which, he greased and cleaned the machine and returned to Grimwade between 1400 and 1420 hrs. The driver is a smoker but claims on the day in question he had a sore throat and did not even carry cigarettes with him. The only other person in the area that day was a faller who knocked off at 1000 hrs, and left the scene with a truck driver about 1130 hrs. There was no visible sign of fire or smoke then.

There are four possible causes of the fire which are listed in order of probability:

(1) An inspection of the Kockum on 3/3/84 revealed that although the engine compartment of the unit was oily and dirty, there was no sign of ash or charred needles or other signs of fire around the motor. The exhaust and manifold appeared sound and the gaskets tight. However a later inspection revealed a carbon build-up in the exhaust and a piece of glowing carbon could have been emitted, thus starting the fire. It should be noted that the engine is a self-aspired type and is not fitted with a spark arrester.

(2) The driver is a smoker and a butt could have started the fire. Although he claims not to have carried cigarettes that day, it has been established that his evidence on the movement of the Kockum on 2/3/84 was most unreliable.

(3) The chainsaw could have started duff smouldering prior to 1000 hrs. The faller is a non-smoker and remained on site until 1130 hours. Neither he nor the truck driver, also a non-smoker, saw any smoke or sign of fire.

(4) The fire could have been deliberately lit by persons unknown. The area is surrounded by quarantined forest and access is limited to the south, where the road passes through Grimwade settlement. No strangers were reported in the vicinity on that day.

The conclusion can only be drawn that the fire started some time around 1400 hours - 1420 hours in an area in which a Kockum loader had worked earlier in the day.

3. WEATHER DETAILS

The Kirup weather forecast at 1000 hrs (amendments) for Friday March 2nd, 1984 was very close to actual conditions:

	Forecast	Actual
Max Temp	35°C	35°C
Min RH	22%	20%
Dew Point	8°	9°
Winds		
10-1200 hrs	NE 12	NNE 14
12-1400	NNE 8	ENE 16
14-1600	NNE 8	NNW 15
16-1800	SSW 18	SW 25-30 (guessed
18-2100	SSW 8	SW 10 not recorded)
21-0800	S 4	
Soil Dryness Index	1725	
SMC (Jarrah)	4%	
FDI (J)	107 m/hr	
SMC (Pine)	4%	
FDI (Pine)	470 m/hr	

A spot forecast supplied by Oceanroutes at 1600 hrs indicated that NW winds would continue from 1600 to 2100 hrs and then veer to NE, and there was no indication of the SW winds as forecasted in the morning forecast. However this spot reading was not used by Kirup control and was not passed on to the Fire Boss.

Mild but dry conditions occurred on the subsequent days, allowing mop-up to proceed satisfactorily.

4. FIRE BEHAVIOUR

Fuel types ranged from P 83 planted areas containing negligible fuel, to areas clear felled in recent years estimated to be carrying 40-50 tonnes/ha of fuel comprised of pine debris and marri regrowth. In many of the N.P. areas dense natural pine regeneration up to 10 metres in height made access very difficult.

Details on the fire behaviour and progression of fire perimeter are extremely difficult to obtain. A plot of the initiating fire was kept at Kirup. However due to inconsistencies in maps, scales and plot co-ordinates, this plot was considered highly inaccurate and almost useless in control planning. Details of fire flame heights and rate of spread were not recorded. The incomplete records make it difficult to reconstruct the fire history.

The plot of the fire given in Map No. 1 is a reconstruction based on wash-up reports and observations of officers and crews around the fire. Again these were difficult to verify because very little cognisance was given to times in any of the reports.

Fire behaviour prior to 1730 hrs when the fire was burning in the clear felled areas (C6 and C7) ranged from 5 m high and 50 m/hr R.O.S. on the flank fires, to 8 m high and 100 m/hr R.O.S. on the headfire. Up to 1730 hrs the fire had covered approximately 15 ha at an average rate of spread of 85 m/hr.

The advent of the strong SW change brought about a great deal of instability, resulting in numerous fire whirlwinds and a very rapid increase in fire behaviour on the eastern sections. Fires broke through the eastern firelines in several places and flames of 20-30 metres were accompanied by massive spot fire development initiating from the scattered eucalypt regrowth in C6, C7 and B5.

Within 7 minutes of the SW wind change, spot fires had developed in Compartment B4 and 1000 metres east of the fireline. After the initial burst in the easterly direction, the fire headed in a NE direction. Fire behaviour in the mature stands of B6 and 7 averaged 600-700 m/hr with flames exceeding 40 metres in height. The fire raced into the jarrah buffer at about 1930 hrs and fire behaviour decreased dramatically in the next hour to 2-3 metre flames. By 2130 hrs a firebreak was established around the headfire in the jarrah buffer, and along the flank fires in Compartment C2 and internal boundary roads as shown on Map 2.

5. DETECTION

The Busselton spotter gave a 'B' sighting of the fire at 1430 hrs. A "Red Action" was not called even though the 4-figure reference given FL63 proved correct. The spotter was instructed to move closer to give an 'A' sighting. Grimwade office sounded the siren after Kirup radiod a Red Action at 1435 hrs.

It is important that in future Red Actions be called immediately following a 'B' or 'A' sighting if it is apparent that the smoke may plot within the Red Action Zone.

Neither the Busselton spotter nor the Blackwood spotter carried 1:12500 Plantation Maps. This hindered the ability to accurately plot the fire perimeter throughout the fire run - the plot of the fire perimeter given to Kirup office at 1520 hrs placed the fire mostly in C3 rather than C6. The plantation maps should be upgraded on a weekly basis to show all recent logging operations (clear falling, thinning etc.). The Divisional Duty Officer could make this part of his responsibility in compiling his handover statement.

6. USE OF THE SPOTTER

On 2/3/84 the spotter circuit was on Schedule 4 (i.e. continuous from 0930 to 1800 hrs). At the time of the outbreak the Busselton spotter was on the Blackwood circuit relieving the normal Blackwood spotter. The Busselton spotter was 27 km south

of Grimwade at the time of the first sighting and thus had to make a 'B' sighting. This sighting plotted correctly. The Busselton spotter was retained over the fire until 1520 hrs, before being ordered to complete the normal circuit. No arrangements were made to provide further surveillance until 1645 hrs when the Blackwood spotter arrived. There was a lack of spotter coverage from 1520 to 1645 hrs. Considering the severe difficulties experienced by Kirup office in obtaining accurate fire data from the field, more use could have been made of the spotter reports. The proximity of the Grimwade strip to the fire would have allowed the Fire Boss or a Reconnaissance Officer to utilize the aircraft as a platform to assess the situation and direct operations more effectively.

7. RED ACTION DESPATCH

The Red Action procedures as laid down in the Kirup Red Action orders were followed correctly. Appendix 2 lists the arrival times of the officers and crews at the fire on the 2/3/84. The outside forces were directed to head straight for the fire at reference FL6352, rather than to a centralized assembly area or Control Point. This resulted in much confusion at Grimwade as some crews and officers reported in at the office, whilst others headed straight for the fire. There was uncertainty as to the forces and officers present at the fire face. This uncertainty reached a peak at about 1735 hrs when it became extremely difficult to account for all personnel forced to evacuate during the major fire run that occurred at that time.

Future despatch orders must provide the location of a suitable assembly point (e.g. Grimwade Office), manned by trained officers whose function is to record the necessary details and redirect officers and men to the fire face, as required by the Fire Boss.

All Divisions should ensure that their men are made aware of the need to follow the Red Action instructions and report to the nominated assembly point.

8. DESPATCH AND BUILD-UP OF FORCES

The Kirup FDI for Pine on 2/3/84 was calculated from the weather forecast to be 450 m/hr. In response to the Red Action a total of 12 gangs, 15 HDs and 1 D4 dozer were despatched. This agrees with the preplanned response laid down in the Kirup F.C.W.P. The despatch table (9.1.3) in the Fire Behaviour Table requires that within 1 hour of detection and attack at least 3 bulldozers should be despatched. This shortfall was recognized, but the John Deere 850 from Pemberton was not called for until after 1700 hrs and did not commence work until midnight.

There appeared to be a lack of planning to ensure ready availability of outside machines during bad fire weather days. On the day of the fire Pine Hauliers' low-loader was in the Denmark area instead of its usual location near Grimwade. In addition, the Pine Hauliers' skidder, which normally works in Grimwade, had been shifted to Balingup without notification to the Kirup office.

No back-up arrangements to ensure the availability of alternative dozer transport was considered, even though the FDI for Pine was forecast to be in excess of 450 m/hr. A D7 dozer belonging to Carbone Bros. was parked within 3 km of the fire on the corner of Thane and Tower Roads, but as no prior arrangements had been made by Kirup, there was considerable delay before this machine was available at the fire.

None of the contract dozers and skidders were fitted with lights resulting in severe difficulties during the suppression and mop-up operations after dark. It is strongly recommended that all Divisions carry spare sets of lights for use by contract machines, as is the practice in the Southern Region Divisions.

The inexperience shown by contract machine operators severely restricted the usefullness of their dozer on direct fire attack. Training of contract machine operators in fire suppression by machines should be conducted each year to ensure that the contract machines can be used to best effect. Training should be extended to ensure that contract operators understand the

command structures and communication links within the L.F.O. field control, and the need to follow the instructions of the Fire Boss or Sector Boss. This will help avoid the recurrence of contractor machine operators "doing their own thing." An acceptable option would be to assign a skilled F.D. operator with the contractor operator.

9. FIRE REPORTS

Throughout the first 4 hours of the Grimwade fire, fire reports from the field were both infrequent and inadequate. The first PAFTAC report given at 1440 hrs, gave the fire size as 2.0 ha, when in fact it was more like 0.3 ha. PAFTAC information needs to be accurate to enable the Controller to set appropriate suppression objectives and strategies. Further training of all office staff on fire reporting and accuracy is called for. No estimate was given of the fire behaviour.

Serious delays in subsequent fire reports to Kirup office meant that this staff had little information on which to base Fire Appreciation and Strategy determination. According to the Kirup fire diary, the second report from the Fire Boss was not received until 1600 hrs, a delay of 1 hour and 30 minutes. According to the Kirup Duty Officer, the report was misleading and confusing owing to the fact that the Fire Boss did not have a Plantation Map and only a 1:50000 scale map.

The later report at about 1620 hours was again described as being "confusing to plot and adapt to". However, the field reports indicated that the fire seemed to be coming under control and that a further report would be given at 1745 hrs. This confidence prevailed right up to 1730 hours, when the fire behaviour increased dramatically.

The poor quality and infrequency of reports prevented adequate consideration by the office and field control officers on the preferred and alternative strategies and tactics required to suppress the fire.

10. STRATEGY AND TACTICS

On arrival at the fire at 1450, the Fire Boss established a Control Point at the intersection of Compartments C3, C6 and the western firebreak of B5. This site was a very poor selection as it ultimately lay in the path of the headfire run, under the predicted SW wind; its location within the plantation made it difficult to find and did not provide adequate space for incoming trucks and other plant. The need to move the Control Point to the more suitable site at Grimwade Office at about 1640 hrs, led to further confusion and uncertainty. The need to establish a suitable, stable Control Point, adequately manned with a Fire Control Point Officer/Recorder at the start of an L.F.O. operation, has long been recognized as being critical to the orderly running of a fire.

The initial forces found the fire in the north-east section of C6 burning in heavy, recent logging debris. It was travelling uphill in a northerly direction towards C3, and also in a southerly direction under the light NE winds prevailing at that time.

The Fire Boss's strategy was to contain the NE and N flanks with a D4 break, whilst holding the SE and western boundaries with retardant trails applied by hose lays. The concern was that the D4 may have had great difficulties in working in the heavy slash on the southern boundaries, and therefore preferred to attack these flanks with hose lays. Field Control failed to obtain the weather forecast and was unaware of the strong SW wind change forecast for 1600 to 1800 hrs. This omission put crews and equipment at risk when the change came at 1730 hrs.

The D4 fireline on the NE and NW flanks was completed at about 1600 hrs. However, instead of working back towards the SE flank as directed by the Fire Boss, the D4 was diverted by a Sector Boss to construct a break on the western flank some 50 m east of and parallel to Cuckoo Road. This was a complete waste of a vital tool at a time when it was critical to

establish the mineral earth break on the SE flank, which was under threat from the NW winds prevailing between about 1600 and 1730 hrs. The existence of 1983 plantings west of Robin Road meant that suppression efforts on the western flank should have been downgraded in preference to the southern and eastern flanks where there were insufficient forces available to contain the fire.

The improper allocation of resources was probably aggravated by the lack of senior, experienced fire officers at the fire face, to direct forces more effectively. This situation was highlighted just prior to the 1730 blow-up, when the forces on the SE sector had been unable to complete the last 10-15 metres with a retardant hose lay because the Heavy Duties had run out of water. At the same time, spare Heavy Duties were idle on the western flank and could have been profitably employed on the SE sector as water carriers and suppliers. By 1700 hrs 12 HD's and 11 Gang Trucks were available to supply water at the fire face. It is a well-known Cardinal rule in hose-lay fire suppression, that water must never be allowed to run out. To do so risks losing the fire and endangering men and equipment

Poor use was made of machines at the fire, including the D4 dozer and 2 of Pine Hauliers' rubber-tyred machines. At about 1600 hrs the Fire Boss directed one skidder onto Cuckoo Road (western flank) instead of the troubled SE flank. The second one was never sighted on the fire front. If both of these machines had been available to consolidate the SE and NE flanks prior to 1730 hrs, the fire may have been successfully contained to a relatively small size.

The D4 was found to be extremely unsuitable for fireline construction amongst the heavy logging debris and pine stumps in the Grimwade Plantations. On the other hand, the rubber-tyred loaders, e.g. Cat 930s etc. have been found to be most effective under these difficult conditions. It is recommended that serious consideration be given to supplementing the Kirup D4 with a Cat 930 as soon as practical. In the meantime, arrangements should be made to have an Industry rubber-tyred

machine and operator available at all times during the summer months at Grimwade.

Dense blackberries and stands of tall wildlings beneath mature pines exist throughout Grimwade. These present a most serious impediment and risk to both machines and fire forces. Action will need to be taken to improve the access in such stands, and preventative measures (e.g. burning or mechanical slashing) will need to be applied to minimize the development of such stands in future.

11. EVACUATION

The failure by both field and office control to account for the imminent strong SW wind change jeopardised both men and equipment.

The task of accounting for all personnel and equipment was hampered and delayed by the lack of precise records of the numbers of men, trucks and machines present at the fire face. Neither Kirup Office nor the Fire Boss at Grimwade Office were exactly sure of who was at the fire. This highlights the need for the Control Point Officer role to be filled as soon as a Red Action/LFO is called. This should be an experienced officer, with assistance of another officer to record all incoming men and equipment.

12. LARGE FIRE ORGANIZATION

12.1 Kirup Office

At the declaration of the Red Action order at 1435 hrs a Large Fire Organization should have been mounted immediately as there were more than 3 gangs involved in the fire and the FDI for pine far exceeded 140 m/hr.

A great degree of confusion existed at Kirup office and in the field as to which officer was carrying out the functions of Controller and Intelligence. It was not

until 1900 hrs, some 4½ hours later, when Regional Control officially nominated an SDFO from the Region as the Controller, that the L.F.O. was properly staffed and organized.

On the basis of the sketchy field reports, the office control section were confident that the fire was almost under control. As a result insufficient planning and forethought was given to the possibility of any sudden changes in weather conditions and fire behaviour.

There was no systematic attempt made to calculate the fire control task ahead and the anticipated need for additional resources if the fire situation was to deteriorate markedly. Insufficient use was made of the Controller Check List (in the back of the LFO booklet), which would have ensured that all the important steps in an LFO set-up were considered.

The Controller Fire Appreciation form (FD 613) was never completed and calculations of the fire growth and fireline construction task required to hold the fire were not carried out. The LFO disposition board was not set up until after 1600 hrs.

The Regional Controller at Bunbury sent a Regional DFO and Protection Officer to Kirup at 1520 to assist with the control functions of the LFO. However, through a combination of loose briefing instructions by the Region of their roles, and a lack of initiative shown by these officers, their contribution to the running of the initial phases of the fire were ineffective.

Despite the high FDI, the Kirup staff was severely undermanned, owing to the fact that 5 out of a complement of 14 officers and staff, were absent on "Leave in Lieu". As a result, many of the recognized LFO roles were inadequately serviced in the initial stages of the fire. The Regional Control was not informed of this situation.

The Intelligence duties of determining fire spread rates, updating weather forecasts, predicting manpower and machine requirements and investigating alternative control strategies were not properly carried out. As a result the Fire Boss worked in ignorance of the actual weather forecast and was not given any updates. No attempt was made to confirm the arrival and extent of the SW wind change, even though this could have been readily given by wind readings at Stewart Tower and Nannup, or from the Blackwood and Busselton spotters. A SW wind reading of 15 kmh at Stewart Tower at 1600 hrs was never passed on to Kirup office. These wind checks would have emphasised the need to concentrate on the eastern flanks and allowed ground forces to be given advance warning of the safety risks on these sectors.

The fire diary was not well recorded as a great deal of information was omitted and very few accurate times kept.

The field control and incoming officers and crews were poorly serviced with up-to-date maps on the fire perimeter and sector control. Maps finally provided, lacked information on such matters as fuel age and fuel types, accessible water points and quarantine boundaries. Such maps are vital to smooth and safe implementation of field control.

Once the main crisis had passed at 1900 hrs, the LFO began to function properly, with all LFO positions in the Division and Central Region filled.

Most other aspects of the LFO after 1900 hrs followed laid-down procedures. There were few problems associated with the crew changeover at 2200 hrs, even though the shift change occurred in the dark and new officers found some difficulties in familiarizing themselves with the fire situation.

Due consideration was given to the working hours and penalty rates, so that there were no known instances of unnecessary over-award payments (e.g. paid rest periods).

The catering arrangements went extremely well considering the difficulties associated with feeding large numbers of officers and crew at the fire on Friday night.

Communications systems were hard-pressed, especially prior to 1900 hrs. However these improved considerably on Friday night and on subsequent days of the mop-up.

The Blackwood spotter had difficulty passing information through to Kirup Office. This was due to the lack of office staff available to man the R.T. as well as the telephones and V.H.F. radio.

12.2 Field Control Point

The selection of the original Control Point at the intersection of compartments C3, B5 and B6 was most inappropriate in view of the predicted wind change and the problems associated with access and congestion. This problem was further aggravated by the lack of an experienced Control Point Officer to control, register and redirect incoming resources. This situation meant that the Fire Boss could not devote the required time and energy to the prime task of implementing any plan of action, as he had to contend with many outside interferences and queries.

The transfer of the Control Point to Grimwade Office improved the field organization somewhat, although the transfer of the Fire Boss away from the fire meant that there were insufficient experienced officers at the fire face to direct forces and Heavy Duties, in order to maximise their effectiveness.

Initially, no reconnaissance was done by an experienced local officer, leading to the great confusion that persisted for the first hour or so, on the actual location of the fire perimeter. An aerial reconnaissance by the Fire Boss or local officer should have been considered, given the proximity of the Grimwade airstrip. It was not until after 1730 hrs that the senior Grimwade officer was released from Kirup to act as Reconnaissance Officer.

His local knowledge of the area enabled him to accurately plot the fire within ½ an hour of arrival at the fire.

Reports from Sector Bosses indicated good performances on the fire front by all gangs. The effectiveness of the firefighting resources would have been much greater if these had been directed by experienced fire officers at the fire face.

It is apparent that further training is required in fire suppression techniques in heavy pine logging fuels. The use of hose lays and retardant trails also needs improvement.

13. RECOMMENDATIONS FOR REMEDIAL ACTION

It is recommended that:

13.1 Policy

(a) Fire Protection Branch endorses draft plantation management plans for first and second rotation areas before their final approval. Consideration be given to locating clearfelled and recently planted areas to provide strategic protection and minimum fire risk.

(b) The current practice of taking days off (e.g. Mondays or Fridays usually) to offset hours worked on 5 days a week above 37½ hours needs a complete review.

(c) Annual reappraisal of staff be made by senior Regional and Protection Branch staff prior to the designation of fire control roles in Divisional and Regional L.F.Os. Regional staff will need to consider the immediate despatch of a competent Controller or Fire Boss to those Divisions with

inexperienced control staff.

(d) To ensure uniformity of fire competence throughout Divisions and Regions, the Protection Branch to be consulted prior to any staff moves, so that alternatives can be considered, and fire control organisation can be modified immediately.

(e) Staff leave arrangements must be planned to enable adequate staffing of L.F.O.'s at all times during the fire season.

13.2 Planning and Operational Strategy

(a) Access within heavily logged or clearfelled areas must be improved, and a track to be left every 100 metres to provide access for a hose lay, if not vehicular traffic.

(b) The potential risk of high fuel loading in clear-felled areas to be reduced where necessary, either by mechanical means or by prescribed fire.

(c) Stricter controls be placed on the operation of logging equipment in all plantations in the summer period. It is suggested that the following restrictions apply. Figures relate to Northern Jarrah Forest FDI.

	Chain Saw	Logging Equipment	Load on Cleared Break
HILLS PLANTATIONS	0-60 m/hr No restrictions 60 m+ Cease ops.	0-60 m/hr No restrictions 60 m+ Cease ops.	0-140 m/hr No restrictions 140+ Cease ops.
COASTAL PLANTATIONS a) Prescribed burnt	0-140 m/hr No restrictions 140 m+ Cease ops.	0-140 m/hr No restrictions 140 m+ Cease ops.	"
b) Unburnt	0-60 m/hr No restrictions 60 m+ Cease ops.	0-60 m/hr No restrictions 60 m+ Cease ops.	"

(d) Machinery inspections by Divisional staff be made on a weekly basis, of all contractor logging equipment to check for adequacy of exhaust systems and fire suppression equipment, as well as for the presence of flash fuel accumulations on machinery parts.

(e) Arrangements to be made with logging contractors to maintain radio communications with F.D. on location of operations and machinery, and departure times from plantations.

(f) Settlement protection plans must be upgraded or reviewed biennially in June and December to ensure adequate protection to communities in close proximity to pine plantations.

(g) Hazard plans must be updated on a regular (weekly) basis in summer by Divisional Protection Officer. These must show current operations as well as fuel hazard status throughout plantations. These plans should form the basis for a handover statement for on-coming duty officers. Protection Branch to develop a standard pro-forma for next fire season.

(h) Area OICs and/or Duty Officers to monitor fire preparedness levels each morning to ensure these are appropriate to the forecast fire weather conditions.

(i) Greater emphasis be placed on prescribed burning of strategic buffers within *Pinus radiata* stands. This will help reduce the density of eucalypt regrowth and thickets of self-sown *P. radiata* regrowth.

(j) Mechanical control of *P. radiata* regrowth and dense understorey thickets be tested (e.g. Hydro-axe).

13.3 Training and Staff

(a) Red Action or L.F.O. despatch orders must nominate the location of a suitable assembly point, manned by trained officers, whose function is to record necessary details and redirect officers and men to those sectors as required by the Fire Boss.

(b) All Divisions to instruct their personnel of the need to follow Red Action instructions closely, and to report to the nominated assembly point.

(c) Regional and Divisional Red Action and L.F.O. training must be upgraded, especially in view of inexperienced staff being appointed to senior and responsible positions. Sector and Fire Boss training also requires upgrading for the same reasons.

(d) Training for officers and gangs should extend to the field exercises designed to test suppression tasks in heavy pine fuels, steep terrain and the like.

(e) Provision be made for pre-season training of contract dozer drivers and industry operators in fire suppression techniques by machines in pine and hardwood fires. Whenever contract machines are manned by unskilled or untrained operators, these are to be accompanied by skilled F.D. operators.

13.4 Detection

(a) Red Actions be called immediately upon receipt of the first "A" or "B" smoke sighting, if it is apparent the smoke may plot within the Red Action zone.

(b) Better use be made of spotters in future and that in plantation areas covered by spotter aircraft, continuous surveillance be provided until control is achieved. All spotters likely to be used in proximity to pine plantations must be supplied with updated 1:12500 Plantation Plans

(c) Better use be made of tower weather readings and smoke reports in inter-Divisional tasks, e.g. Stewart Tower wind readings to be automatically available to Kirup as well as Nannup.

13.5 Suppression Equipment

(a) Investigate feasibility of a D6 or D7 type bulldozer being purchased by the Department, based in the Kirup/Nannup area, with fire suppression in summer as one of its roles.

(b) Supplement the Kirup D4 with a rubber-tyred loader (Cat 930 or 966) as a prime suppression unit in the Grimwade Plantation.

(c) Divisions should maintain an accurate and updated record of the position and availability of heavy dozers and L/L transport equipment in their vicinity, and determine standby arrangements in the case of bad days of fire weather.

(d) Spare sets of lights for contract machines be kept at each headquarters for use in night-time emergencies.

APPENDIX 1.

SUPPRESSION COSTS K19 02-03-84

DIVISION	CONTRACT	WAGES	PLANT	SALARY	OTHER	O/HEADS	TOTAL
Harvey		3 990	1 298	1 000			6 288
Collie		4 821	987	767			6 575
Pemberton		1 351	1 631	537			3 519
Manjimup		2 467	800	350			3 617
Nannup		8 371	4 464	2 513			15 348
Busselton		4 751	1 591	1 008			7 350
Kirup		14 606	3 495	7 981			26 082
Kirup Serpa		326					326
Retardant					20 000		20 000
Rations					1 269		1 269
Carbone	540						540
Niewenhuyze	225						225
	765	40 683	14 266	14 156	21 269		$91 139

APPENDIX 2.

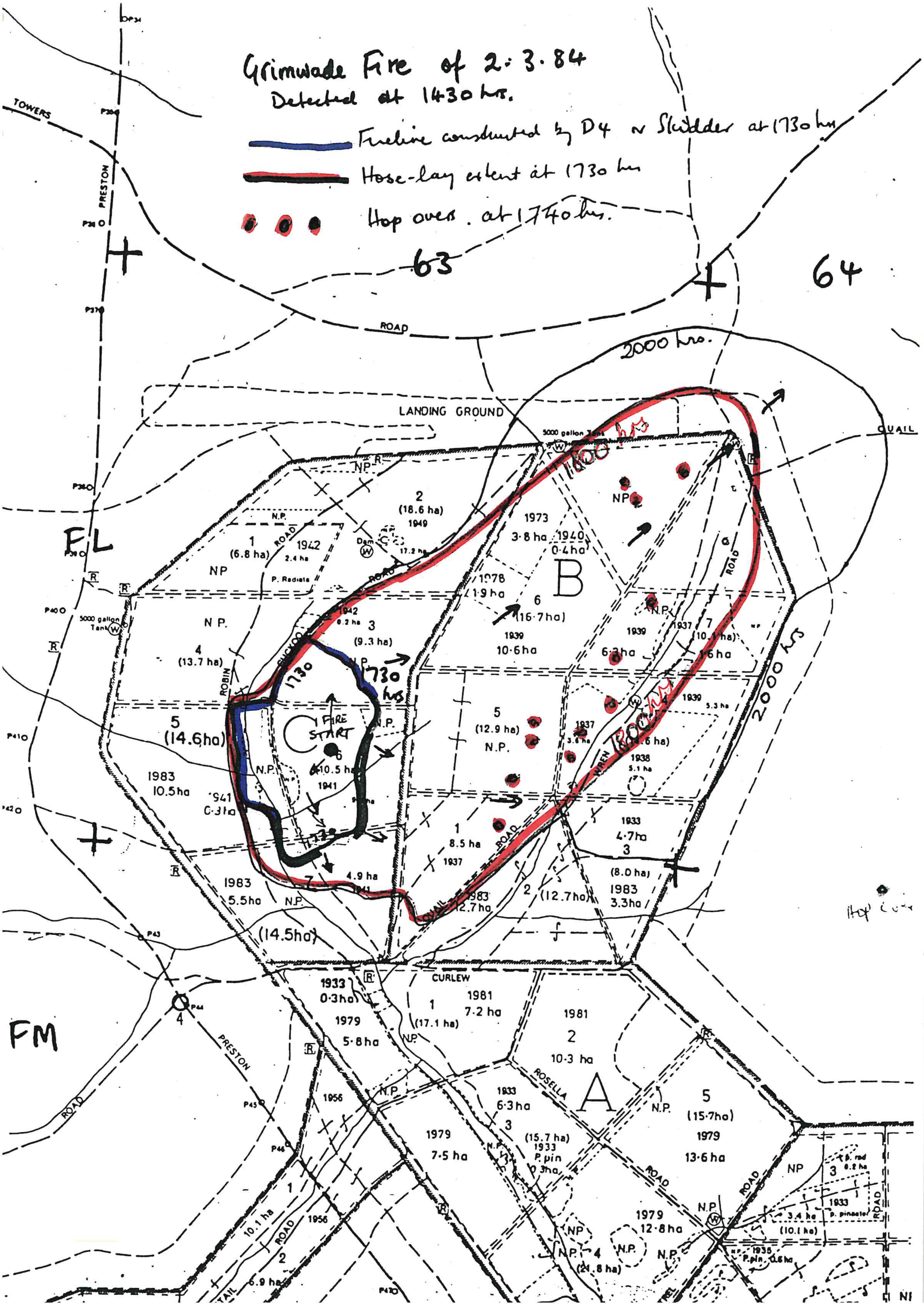
BUILD UP OF FORCES AND EQUIPMENT

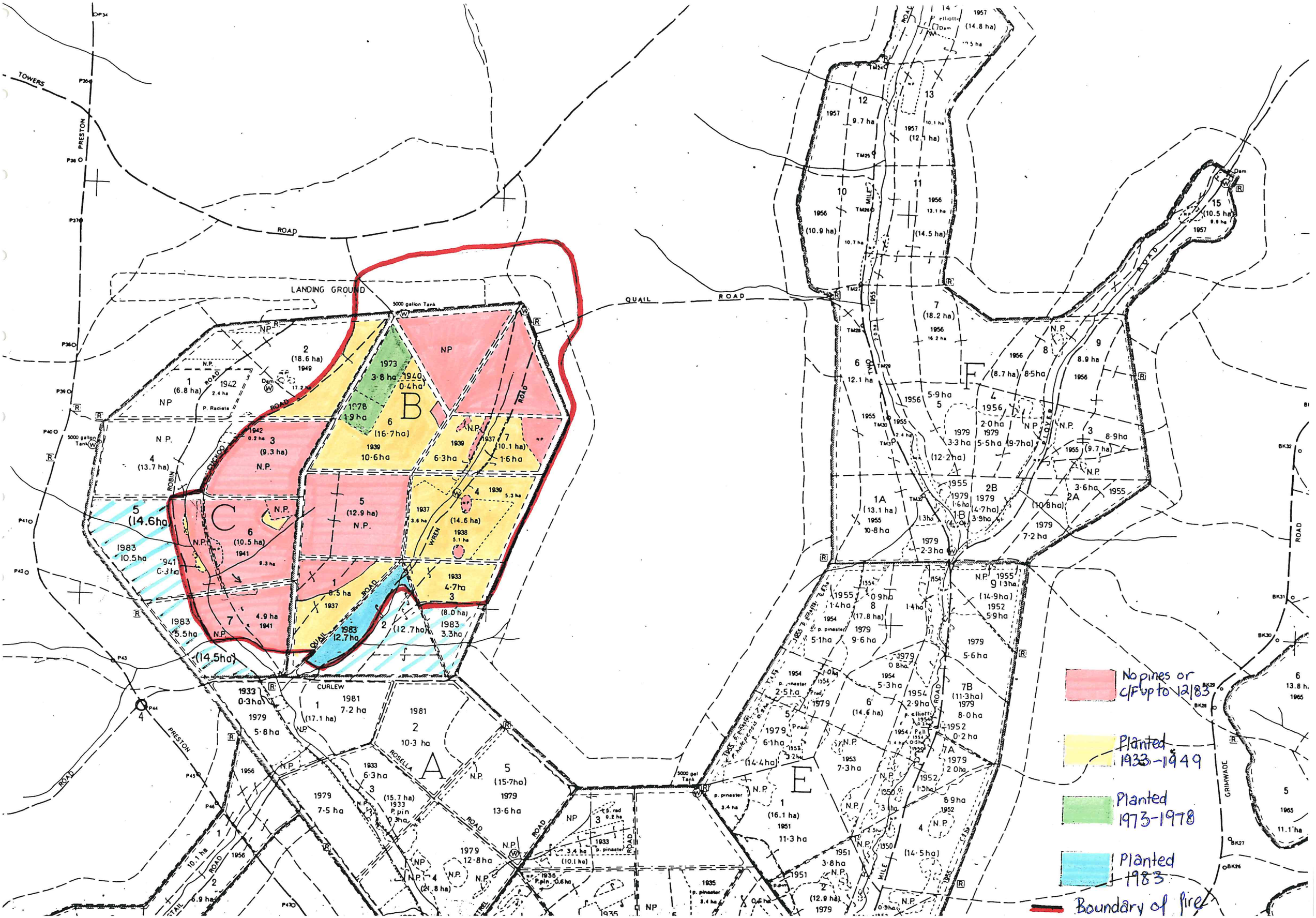
Forces requested and times of arrival were as follows:

Division	Gangs	Time of Arrival
KIRUP	1	1515 hrs
	2	1500
	3	1500
	H/D	
	1	1450
	2	1450
	3	1500
	4	1500
	5	1500
	D 4	1500
NANNUP	1	1520
	2	1600
	3	1600
	H/D	
	1	1520
	2	1520
	3	1600
	Cat 930	1600
COLLIE	1	1555
	H/D	
	1	1555
	2	1533
BUSSELTON	1	1705
	2	1625
	H/D	
	1	1705
	2	1625
MANJIMUP	1	1615
	2	1700
	H/D	
	1	1615
	2	1700
PEMBERTON	1	1715
	H/D	1715
	1	1715

Other equipment and time of arrivals were:

- 2 skidders ex Pine Hauliers 1545 hours
- Cat 930 Loader ex Palmers 1825 "
- D7E ex P. Carbone & Sons 2010 "
- D7 ex Nieuwenhyze, Donnybrook 1815 "
- John Deere 850 & L/L ex Mjp FD 2230 "


Grimwade Fire of 2.3.84
Detected at 1430 hrs.
Fireline constructed by D4 & Skidder at 1730 hrs
Hose-lay extent at 1730 hrs
Hop overs at 1740 hrs.
63
64
TOWERS
PRESTON
ROAD
LANDING GROUND
QUAIL
2000 hrs.
1800 hrs
1730 hrs
FIRE START
B
A
FL
FM
CURLEW
ROSELLA
ROBIN
5000 gallon Tank
NP
2
(18.6 ha)
1949
1973
3.8 ha
1940
0.4 ha
1
(6.8 ha)
1942
2.4 ha
P. Radiata
4
(13.7 ha)
3
(9.3 ha)
5
(14.6ha)
1983
10.5ha
6
(16.7ha)
1939
10.6ha
5
(12.9 ha)
1
8.5 ha
1937
1983
5.5ha
(14.5ha)
4.9 ha
1983
12.7ha
(12.7ha)
1933
4.7ha
3
(8.0 ha)
1983
3.3ha
1933
0.3ha
1979
5.8ha
1
(17.1 ha)
1981
7.2 ha
1981
2
10.3 ha
1933
6.3ha
3
(15.7 ha)
1979
7.5 ha
5
(15.7ha)
1979
13.6 ha
1979
12.8ha
4
(21.8 ha)
1956
10.1 ha
2
6.9 ha
Hop over



Legend:

🟥	No pines or c/F up to 12/83
🟨	Planted 1933–1949
🟩	Planted 1973–1978
🟦	Planted 1983
▬	Boundary of fire