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Executive Summary

Guidelines for salvage harvest, storage and processing of plantation-grown logs affected by fire

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Foreword

This document has been developed to present a summary of the collective knowledge of many Australian forest industry members with previous experience in the salvage, storage and processing of fire damaged timber. The document fills a gap which was identified during the 2019/2020 fire season where extensive areas of Australian plantation and native forest were burnt. The authors, together with the Technical Expert Working Group, worked to assemble all of the relevant published references and a significant body of grey literature that contains the collective knowledge available for the salvage, storage and processing of fire damaged timber.

The document makes observations, best practice recommendations and identifies knowledge gaps however it is not a definitive document as such, because the variability of the fire events means that there are many possible combinations of inputs and outputs that can be achieved under different circumstances. It is envisaged that the document will be reviewed in advance of the 2021/2022 fire season to capture any additional knowledge arising from the most recent salvage storage and processing of fire damaged timber. As such the knowledge within the document represents the best available at the time of its preparation.

I wish to thank the members of the Technical Expert Working Group and the many other people who have contributed to the information presented in the document. It is hoped that the document will provide a basis for the most effective salvage, storage and processing of fire damaged timber and will provide the basis for an ongoing repository of the knowledge obtained in doing so. The foremost learning from the preparation of this document has been that fire incidents are not unforeseeable occurrences in Australia. Rather fires will continue to occur, maybe even more frequently and intensely, and the impacts need to be planned for strategically at an organisational and collective level to anticipate the likely responses required and minimise the adverse effects. I am confident that this document will contribute greatly to these successful outcomes from future fire events.

Chris Lafferty

RD&E Manager - FWPA

Making the most of log salvage, storage and processing after a fire

Integrated fire management planning is an imperative for forest growers and processors. Pre-planning needs to take into account what a major fire could potentially do to both regional and national supply chains, how individual stakeholders should respond and what steps need to be agreed with external agencies (including governments) as part of the planning process.

Fires regularly affect plantation forest areas in Australia and every year various locations need to deal with the aftermath. Salvage of usable log products from burnt forest will always be a prime objective for the forest grower. In the case of fires that have a significant impact on future resource availability, effective salvage will also be a strong objective for processors.

The full report, 'Guidelines for salvage harvest, storage and processing of plantation-grown logs affected by fire', brings together a large amount of relevant Australian and international information and knowledge contributed by a number of foresters and mill personnel associated with previous major fire activities. It includes an analysis of available data, identification of areas of future research requirements and recommendations for the development of an integrated fire management and response plan to inform both growers and processors.

The information has been collated, analysed and summarised into a single document to act as a set of guidelines for both growers and processors to reference when dealing with future significant fire events.

While the major focus in the report is on plantation timber, many of the findings are also applicable to management and salvage associated with native forests.

There are a number of priority issues that need to be assessed in regard to how the industry responds to fire events within current forest estates. These can be summarised into four key areas:

1. Industry impacts associated with scale and probability of future fires.
2. Salvage planning processes.
3. Salvage operational processes including storage/stockpiling efficacy.
4. Management of production processes associated with the variable fibre quality issues (physical and biological) relating to salvaged and stockpiled log products.

Log products that can be salvaged from forests after fire events are determined by a number of factors, including:

- species
- age of the plantation
- intensity of the fire
- magnitude of the area burnt
- time lapse between fire and salvage
- proximity of processing and export facilities
- establishment of suitable log storage facilities
- management of charcoal and charcoal dust contamination

- management of market perceptions
- net grower value of salvaged log products
- regulatory requirements.

Importance of integrated planning

The report's key message is the importance of developing sound, integrated fire management plans for all forest regions, which must include cooperative input from industry, government and community groups. The need for this level of integration arises because the majority of large fires that have affected plantation forests in Australia have originated outside the plantation areas, have burnt huge areas of cross-tenured land and have often been associated with fatalities within adjoining communities.

The frequency of fires within plantations over the past 100 years has meant that the processing industry has constantly been required to evaluate how it can best utilise any usable product within the burnt areas. In the case of smaller fires, the salvage is often quickly absorbed into the local processing infrastructure. With the few larger fires over the past century, a more integrated solution has been needed because of the potential impact for these fires to influence future resource availability well beyond the scope of salvage operations.

Salvage and recovery operations

Some plantation softwood species are more fire tolerant than others, as are some hardwood plantation species. The level of tolerance has a direct impact on the urgency associated with salvage operations.

Radiata pine plantations, which make up a significant proportion of the softwood plantations in Australia, are highly intolerant of fire. Once killed by fire there is a variable window of opportunity to salvage log products from suitably aged plantations. The period of time varies with fire intensity and post fire weather/climate conditions. Past experiences have ranged from 12 to 24 months in Radiata pine and longer in the more fire-tolerant southern pine plantations.

The period available to successfully salvage log products from burnt forests often relates to two key influences.

The first is the onset of insect attack and the establishment of microbiological activity that will ultimately render the log unsuitable to produce the timber products required. The incidence of attack of these various agents is often climate dependent, with the combination of higher moisture and higher temperature often promoting greater agent activity.

The second relates to the stem of the standing dead tree drying from the top down, with the drier sections becoming more brittle with age. The net result is that stems are likely to either break at time of harvest or be affected by internal defects that will present as low density timber within the subsequent mechanical grading process. Modern mechanical harvesters are less likely to produce these stem failures in the salvage process; however, there is also a greater chance of drier logs breaking in the de-barker, causing potential production losses.

In most circumstances, the onset of insect attack on dead standing trees along with airborne spore dissemination will initially result in the colonisation of the sapwood of the stem by various types of fungi that are categorised as blue stain fungi. These fungi are usually sustained by the fluid within the cell and have no significant impact on the cellulose structure of the cell walls (which relate to the timber strength parameters). The presence of the fungi within cells also increases the permeability

of the fibres, which enhances the access to cells by treatment chemicals and reduces the time required for the removal of moisture from the cells in kiln drying.

Both of these consequences are manageable and have little to no effect on the overall strength of structural products. However, they require specialised drying and treatment schedules developed on site for the processing of burnt timber.

Structural grading of burnt timber

While there will eventually be a reduction in strength as a result of biological and physical agents acting on the wood fibres, there is no risk of machine-graded structural products entering the market as a result of the deterioration in log quality resulting from either any increased presence of timber decay agents or dry wood fractures from harvesting operations. This is because the grading process is designed to only accept products that meet the machine-grading requirements. The same cannot be said for any products that are visually graded for strength properties (as can be the case for the F grades assigned under AS 2858).

The reduction in grade yield in the sawmill will ultimately determine the value of the salvaged logs and hence the time at which salvage operations for that product type should cease. Salvage for that same log into other products (such as biomass production) would extend the period if the log price delivered a feasible net financial solution.

Plantation age and species

Softwood plantations that are less than 10 years old notionally have too low a standing volume to be considered for a financially viable salvage operation. This usually requires these areas to be pushed over, incorporated into the soil (if possible) or windrowed and burnt, and then replanted. The high cost of this land preparation offset against the net return from harvest and removal of stem wood for panel and paper operations forms the basis for determining the minimum age at which salvage of wood products will occur. In some cases, this could result in plantations less than 10 years old being commercially salvaged.

Hardwood plantations of species that have a high propensity to coppice (especially higher up the stem) can remain salvageable for a longer period of time, especially if they are designated as pulpwood crops.

Impacts of burnt log on processing

The impact of burnt bark on the harvesting and utilisation of salvaged log products from burnt forests is discussed at length in the full report. The incidence of burnt bark on logs entering structural sawmill operations has limited to no impact on the processing of the sawlog once it has been effectively de-barked. The minimal amounts of charcoal dust and burnt wood fibre on the sawlogs after de-barking has negligible impact on saw integrity and could easily be removed by log spray operations (using recycled water) if considered an issue.

The greatest impact in sawmills of burnt sawlogs is the impact of charcoal-like material on the de-barker knives and the heat glazing of resin between the bark and wood, which can limit the ability of the knives to remove the bark cleanly.

Charcoal dust's greater impact is on the appearance of reconstituted products such as wood panels and paper products. The removal/minimisation of burnt fibres in these products is again mainly linked to the effectiveness of de-barking operations. Installation of log wash options after de-barking are an option, however, there has been limited independent research on the tolerable level of charcoal dust entering these production facilities.

Historically, residue from burnt sawlogs and pulplog has occasionally entered both domestic and international timber panel factories, and pulp and paper fibre streams, often with no detected effect on the manufactured product. This suggests that there is a need to better understand and review the current restriction on fibre from burnt resources to enable them to be more effectively salvaged and utilised in these production facilities.

Burnt log and woodchip storage

The report looks at the use of salvaged log storage facilities. Water-based storage of log products has been successfully utilised for up to 10 years after fire events. Storage both in and under water has been practised overseas (e.g. in Canada) for many years. Lake storage was utilised successfully after the 1983 fires in South Australia, however, the environmental conditions that existed in this circumstance (an already polluted shallow lake with easy foreshore access) are unlikely to be available in other Australian locations.

Above-ground sprinkler-based log storage has also been proven in Australia to be highly effective. This type of storage for sawlogs is constantly utilised within the hardwood sawmilling industry in its normal operations. It was also used in the 1983 South Australian salvage operations to successfully store about 0.5 million cubic metres of sawlog for up to 10 years.

The establishment and long-term operation of future above-ground facilities needs to be considered as part of future fire planning processes for all significant regional forestry resources. Prior agreement with approval authorities needs to be sought so that the facility can be established at the pace needed to meet the limited access time available before the burnt forests become unsalvageable.

Future above-ground storage areas need to be designed to recycle as much of the available water as possible. The 1995 Beerburrum fire in Queensland also used brackish water from an estuarine source. With the development of high-density plastics for water pumps, there does not appear to be any physical or biological restriction to using seawater as a water resource if required, other than the potential increase in salinity in the soils directly underneath the log storage area. The potential use of salt water is likely to be a strong consideration when faced with salvage operations from larger fires that often occur when severe drought conditions exist and/or limited water is available.

The report also looks at the storage of woodchip generated from burnt forest areas and the management issues associated with these stockpiles. Once de-barked and chipped, the process adopted is similar to that currently adopted for the stockpile management of fresh woodchip. The significant issues associated with the management of burnt fibre as woodchip relate mainly to the removal of burnt bark and any potential contaminating levels of charcoal dust in the woodchip.

The report highlights the areas where there is still significant scope for research to validate past observations and current perceptions while identifying potential viable salvage and processing options that could be employed after future significant fires.

Impacts of future trends

The recent push by the Australian Forest Products Association (AFPA) to increase the softwood estate by 400,000 hectares and the potential impacts of climate change on the extremes in weather will increase the exposure of future plantations to fire impacts.

While this report does not deal directly with the management of fire within the environment, it is important to ensure that fire control mechanisms form a significant part of integrated fire management and response plans. This includes the application of management processes that are capable of reducing fuel loads both within forest areas and on forest boundaries.

There are numerous examples of where prescribed burning practices that reduce fuel have either reduced or prevented the severe impact of fires. Most forest managers understand that strategic fuel reduction burns in native forest (and southern pine plantations) within Australia will either reduce intensity or increase suppression of wildfires. The Royal Commission into the 2019/20 bushfires will assess this as one of its primary objectives.

Source: Forestry Corporation of NSW, 2020