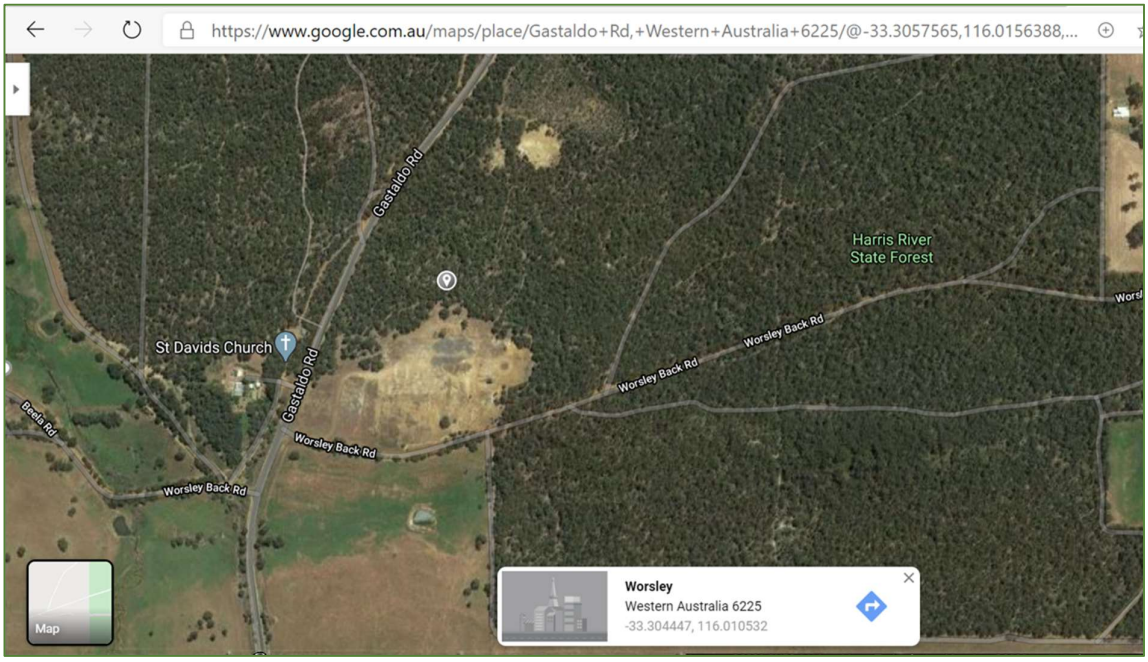
1. Introduction

Shire officers and representatives from DFES have agreed to trialling the possibility of using mechanical fuel reduction in Shire managed reserves to reduce fuel loads and mitigate risk. A proposed mechanical fuel reduction trial site within the Shire of Collie has been identified. Reserve 36801 has been identified as a site which could be used as a trial site for mechanical fuel reduction. Reserve 36801 is jointly vested between the Shire of Collie and Main Roads WA for the purpose of "Gravel"

The need for fuel reduction of Reserve 36801 was identified through the BRMP process being undertaken in the Shire of Collie. Reserve 36801 is approximately 67 hectares in area and estimated to be heavily vegetated for 90% as its area. Reserve 36801 is flanked on the north and east sides by State Forest, to the south by South32 and by privately owned land. Several roads traverse Reserve 36801, both unmade and made.

This thinning process has the effect of allowing larger mature trees to develop in a natural state, thereby growing taller with an increased canopy cover. The sapling stumps are poisoned to prevent the stumps from coppicing after harvest. The aim of this process is to return the forests to a natural state prior to European settlement resulting in reduced fuel litter loads, suspended fuels and scrub/ladder plants. Reduced fuel loads and absence of ladder fuels significantly reduces the intensity of a wildfire.

This Harvest Management Plan will set out the objectives of the owner and how they will be achieved as well as the measures in place to conserve the flora, fauna, and productive capacity of the site.



2. General

Reserve 36801 is approximately 67 hectares and the entire area is planned to be integrated into the trial (please see attached map). The land was burnt ~20 years ago, and since then, the undergrowth has become quite thick and assessed fuel loads are in excess of 25 T/ha. The area contains the historic St David's Catholic Church built in the early 1900's and is 16kms from the town of Collie.

The native vegetation is regrowth jarrah-marri dominated mix on gravelly soils. It is heavily stocked with few mature or habitat trees and many stumps – a result of very heavy harvesting in the past, with only trees that were non-commercial at the time having been left behind. The complex is quite thick and is showing signs of moisture stress due to this overstocking. Average tree size is very small. Basal areas have been measured and average approximately 30 m2 per hectare. The mechanical fuel reduction trial aims to reduce basal area to between 8-14 m2/ha, whilst retaining important habitat structures.

The final basal area target will be reached in consultation with an experienced tree marker. The site is in the Eastern Jarrah zone, but near to the boundary of the Western (using the 900mm isohyet as the guide). This has some bearing on the retained stand density. Typically, DBCA practice is to leave less retained basal area in the Eastern Zone, and more in the Western Zone (because of rainfall enabling a higher site carrying capacity).

The site meets several criteria for the successful implementation of a mechanical fuel reduction trial:

- Location that makes fuel reduction burning difficult (several critical State assets to protect)
- Adequate size to have replicates
- Good track record of collaboration with external and internal stakeholders
- Ability to commercially utilise products arising from thinning operations

3. Objectives

The specific objectives of the Collie Shire for this Reserve are:

1. Thin from below to reduce crown density and remove ladder fuels that allow fire to transition from ground fire to crown fire.
2. Reduce fuel loads to reduce bushfire risk to neighbouring historic church, electricity and water infrastructure and ultimately the Collie town site
3. Protect larger and dead habitat trees from wildfire and thinning operations
4. Conduct prescribed burning to reduce surface fuels
5. Protect larger and dead habitat trees from wildfire and thinning operations
6. Treat coppice to prevent re-sprouting and rapid diminution of fire mitigation.

4. Flora and Fauna

The area is not fenced and these has been no history of grazing on the site. The site was heavily logged in the past with nearly all large trees removed. There are few habitat trees remaining on the site (a few dead trees with hollows were sited). There is some evidence of activity at the site, consistent with recreational four wheel driving. The site is probably too close to settlements for illegal hunting to take place. There are no threatened ecological communities or threatened flora or fauna recorded at the site. From investigations carried out, some rare fauna were identified as being likely to inhabit the area, for example Baudin's cockatoo. However non were sited. The silvicultural plan will aim to retain large mature trees which are likely to have or the potential to form hollows suitable for Baudin's cockatoo.

5. Weeds and other exotic vegetation

The block is contained within a larger area surrounded by broadacre agriculture, state forest and mining land uses. An initial flora survey no weeds were recorded. It was noted there was very little edge effect of weeds into the bush along the Gestaldo Road easement.

6. Fire

The area has not been burnt for ~20 years when the local volunteer bushfire brigade and the DEFES last conducted a prescription burn at the site. The Department of Fire and Emergency Services and The Shire of Collie have performed an initial calculation of fuel loads and fire prediction at the site, with the following results:

- Overall fuel hazard: High
- Total fuel quantity: ~25t/ha

Based on the 99% weather conditions for Collie (2002-2011) the following fire behaviour can be expected:

- Forest Fire Danger Index (FFDI): 33.7, T: 3.4, RH 17%, Wind: 24km/hr, Wind Direction; NNW
- Fuel moisture content (FMC): 5%
- Fire rate of spread (FROS); 1300-1550m/hr
- Flame Height: 12.5-14.2m
- Max spotting: 2160-2625m
- Headfire intensity:>15000km/m

Assuming a fire developed under these conditions with a headfire greater than 100m in width there would be a crown fire (>10 000kw/m) with no ability to conduct a direct attack on either the headfire of flanks. Spotting from this fire would be experienced up to 2.6 km from the headfire which would provide ember ignition in the Harris State Forest and ultimately in therural subdivision in the north-east of the town of Collie in advance of the fire impact. Due to the high fire hazard there is significant risk to neighbouring state assets. These include S32 Worsely Refinery, the neighbouring St David's Catholic church and the town of Collie, especially the rural/urban interface. Fire breaks do exist and are maintained chemically or with earthmoving equipment seasonally, by the Shire of Collie as needed.

7. Dieback Management

There is no occurrence of dieback currently expressed in the vegetation as it is not vulnerable. Whether it is present in the soil is unknown. Notwithstanding consideration of the above, vehicle movements associated with any tree harvesting are preferred to be undertaken in drier soil conditions, and will be required to arrive at the harvest area clean of soil and plant material.

8. Silvicultural Treatment Management Plan

The overall management objective of this block is for bushfire risk mitigation.

Long term survival and vigour of native forest overstorey vegetation at the site requires disturbance events to promote regeneration. Natural disturbance events other than fire have not occurred for several decades. The objective of the proposed harvest is to thin with a focus on removing less vigorous and/or suppressed trees to release retained trees from competition and improve forest health. The thinning will:

1. Reduce ladder fuels (suppressed sub-dominant canopy species and understorey species) which will help to prevent a fire moving from the ground into the crown.
2. reduce crown cover which in conjunction with (1) will make it more difficult for a crown fire (should it occur) to be maintained

Some areas of the block will also be subject to a prescribed fire post-thinning, depending on the researchers trial layout and treatments. The thinning will greatly reduce the risk to state infrastructure that any sort of fire would normally pose.

The area appears to be on the immature part of the spectrum (figure 2 page 14 "Silviculture Guidelines for Jarrah Forest"[1]).

[1] Forest Management Series, Department of Parks and Wildlife FEM Guideline No. 1

The same silviculture plan will apply to the whole area, allowing for finer grain variation occurring as provided for by an experienced tree marker. The experienced tree marker to carry out this task will be sourced from the Forest Products Commission.

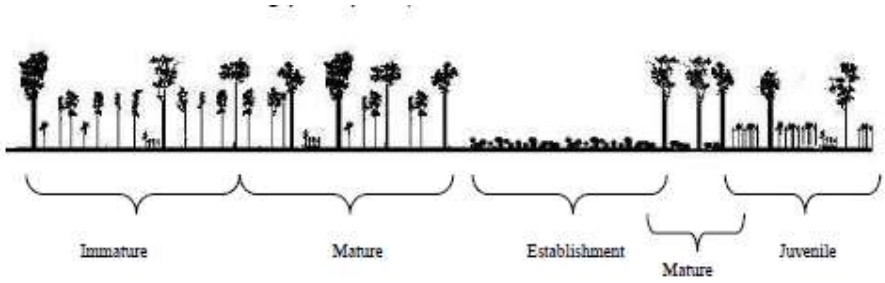


Figure 2. A diagrammatic representation of jarrah forest development stages. The developmental stage is the predominant age in that stand, for example there may be mature trees present, but if the predominant age of trees in the stand is juvenile, then the areas is classified as juvenile.

Figure 1 - Jarrah Development Stages (DPaW)

Tree height is approximately 13-20m. Average basal area is ~30m^2/ha . Ground cover is thick and healthy. Estimates from other trial areas suggest that harvest should be able to realise approximately 100 tonnes per hectare. There is evidence that the site has been previously heavily harvested. Based on tree size and stocking density, the site has likely been largely undisturbed for at least the last 40 years, except for some unauthorised fire wood gathering. There is little evidence of recent fire. Recruitment of new stems does exist., in the form of seedling and lignotubers, however it is very sparse and activity to stimulate further lignotuber development or augment the existing population of seedlings would be beneficial. There are only a few habitat trees, attributable to the heavy logging of the area in the past, however birds were apparent at the time of inspection.

i. Proposed Harvest Operation

The harvest will be a thinning operation. It will be in accordance with the "Silviculture Guidelines for Jarrah Forest" and the research objectives of the bushfire mitigation program. Therefore the harvest will vary across the site, where available timber exists, down to an average basal area of between 6 and 10 m^2 (crop trees) consistent with existing retention in native forest management (**Table 1**). All extracted trees will be chipped, so there are no bole specifications applicable and all stems on site are potentially harvestable. The target products are alternative renewable fuels to displace fossil fuel combustion (GP 14).

Table 1. Thinning guidelines for eastern jarrah forest recommended by the Department of Parks and Wildlife

Development stage	Mean dbhob of crop trees/ha (cm)	Target stocking (stems/ha)	Nominal stand density[a] (m^2/ha)	Spacing guide (m)
Juvenile	<15	350	5	4.5
Immature	16 – 25	200	6	6
	26 – 35	100	7	10
	36 – 45	100	13	10
Mature	>45	100	16	10

[a] Does not include habitat trees

There is also potential to harvest ground material not otherwise identified for habitat retention. All Coarse Woody Debris (CWD) within 20 metres of boundaries will be either removed for chipping or pulled into the interior. This is to reduce the amount of material that could harbour embers and contribute to flare ups in the event of a bush fire, as well as help protect afore mentioned state assets. Beyond the 20m boundary buffer, CWD will be retained as marked for retention. Legacy elements retained as marked, including senescing Marri where available (GP 3).

An average of between 6 and 10m^2/ha of stems will be retained over all sites. The aim will be to maintain, as best is practical, an even cover of trees to provide both seed for regeneration and a cover to maintain forest values.

As habitat trees are rare at the site, they will all be retained. Mature individuals of second storey species such as large Grasstrees, and Banksia *Spp*., will be retained to ensure diversity is maintained (GP 5).

Several landings will be created, both for operational but also for experimental method reasons (to ensure that removals from a specific treatment are not cross-mixed with removals from another treatment). Only minimal road works should be required within the harvest areas.

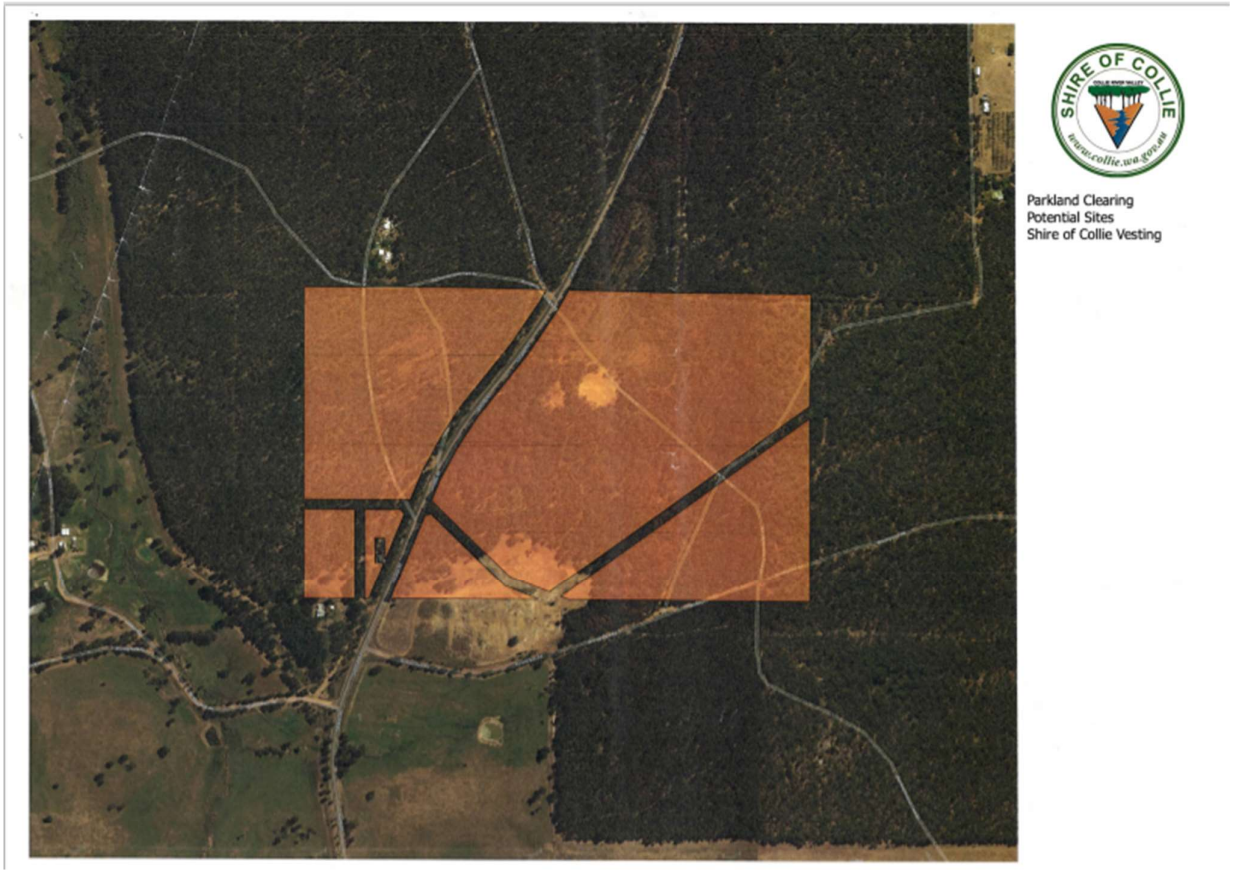
ii. Revegetation

Maintenance of healthy native vegetative cover is an important consideration, and recruitment of next generation is vital across the treated areas. Post-harvest burns may be conducted as part of the trial to assess the effectiveness of mechanical fuel reduction in reducing bushfire intensity. These burns will help stimulate germination of new seedlings.

9. Roading

It should be possible to manage all harvesting and transport from existing roads.

9. Site Map


SHIRE OF COLLIE
Parkland Clearing
Potential Sites
Shire of Collie Vesting