

SHIRE OF QUAIRADING

TOWN PLANNING SCHEME NO. 2

NOTICE OF PUBLIC ADVERTISEMENT OF DEVELOPMENT PROPOSAL

The Shire of Quairading has received an application to use and/or develop land for the following purpose and public comments are invited.

LOT NO: 2 on D41385

HNO: 1642

STREET: Dulbelling South Road

SUBURB: South Quairading

PROPOSAL: To establish a Sandalwood plantation.

Details of the proposal are available for inspection at the Shire office and on Council's website at www.quairading.wa.gov.au

Comments on the proposal may be submitted to the Shire of Quairading in writing on or before the 24th day of March 2016.

GRAEME FARDON
CHIEF EXECUTIVE OFFICER



Sandalwood Establishment Plan

Overview

WA Sandalwood Plantations successfully became certified under the Australian Forestry Standard in 2010 and manage the plantations in line with AFS guidelines. Certification was renewed in September 2013 and WASP continue to undergo annual auditing.

The sandalwood plantations managed by WA Sandalwood Plantations (WASP) are established on agricultural land, typically used for the production of cereal crops. Sandalwood requires well drained sites in areas with an average annual rainfall of 350mm – 600 mm. The preferred soil type is deep sand. Soil depth should be at least 1.5 metres. Soils comprising of, heavy clay soils heavy loam soils and sites prone to water logging or salinity are to be avoided.

Active weed control is considered by WASP to be the most important factor in determining success of establishment with Australian sandalwood (*Santalum spicatum*) and the host tree. (*Acacia Acuminata*) The agronomic considerations relevant to this issue are discussed further below. The justification for this belief is that effective weed control conserves winter received rainfall for the usual and inevitable summer drought that follows. Trees are also likely to benefit from receiving full sun as opposed to shading, which can result from light competition from weed canopies.

Site preparation for tree establishment

WASP uses several techniques to improve and enhance the quality of a site on which to establish its sandalwood plantations. The impact of site modification on growth can be dramatic where treatments are able to address the factors most limiting to growth. Two examples that clearly demonstrate this are the effect of controlling weed competition in young plantations and the effect of deep ripping on soils with pronounced shallow hardpans. However, as plantations develop, the factors that limit growth will change.

Intensive site preparation and weed control used to promote early growth provides the advantage of increased growth rates in formative years and increased nut yields at an earlier age. These strategies can also mean the plantation reaches the growth limits set by other resources more quickly.

Sandalwood is unique in that it is a hemi-parasitic tree requiring the company of a suitable host tree. WASP's establishment phase of sandalwood is as a general rule a two year strategy typified by the planting of hosts and sandalwood in year one, followed by more sandalwood in year two to ensure the optimum planting density is achieved.

The stocking density WASP employs is based on trial plantations in the early years of the Company's establishment, to determine the optimum stocking rates for the environment and

soil type in our defined forest area. Following the initial planting in year one, the plantations are monitored and where necessary, culled or infilled in year two, depending on seasonal outcomes, to achieve the planned stocking rates per hectare.

This strategy has been proven to be the most cost effective way of achieving the desired stocking rates of both sandalwood and host trees.

As we continue to measure and review plantation growth and performance, we assess our planting strategies and modify the density / stocking rates as appropriate.

Soil cultivation

Land in the WA Wheatbelt is historically used for grain and/or livestock production, both enterprises which commonly create soil compaction issues at depth. Intensive soil preparation is also often used to identify planting lines and reduce the cost of contract tree planting. Planting crews can work faster when planting either host seedlings or sandalwood seeds into well-worked soil.

Soil preparation is essential to ensure tree root growth to an adequate depth of 500mm is possible. WASP protocol involves the ripping of tree lines to 500mm prior to tree seedling planting. Deep ripping improves the speed with which trees can be physically planted by tilling and softening the soil. It also improves the efficiency with which rainfall can infiltrate the soil profile immediately in the planting lines.

WASP now employ a new ripping design called the triple tram line design. Rows are ripped in threes, being three rows at 4.5m apart, followed by a 9m break and then another three rows and so on. This essentially provides an edge effect on all sandalwood rows. Sandalwood trees will only be established on the two outside rows of the three, with the centre row acting as a long term host row.

The improved access to the plantation in the 9m breaks provides a benefit for future nut harvesting, tree harvesting and sheep grazing. The 9m breaks also provide increased sunlight and water resource to the sandalwood trees.

Another advantage of WASP intensive site preparation is that it appears to improve uniformity of growth across sandalwood plantations.

Planting Techniques

A tree that is properly planted will be more tolerant of unfavourable conditions and will require less water and pest management. Seedlings may die if the roots are damaged, not covered with enough soil or if they are planted in waterlogged soils. Smaller plants are less likely to suffer transplant shock. WASP sources *Acacia* seedlings from nurseries that are of a suitable size to achieve the desired stocking rates. Typically, this would be a seedling greater than 150mm and less than 300mm.

Handling

Seedlings are protected from root, stem and foliage damage when transported to the WASP planting site and watered well the morning before planting. It is desirable to plant seedlings on overcast days or in light rain and the soil needs to be damp. The seedlings are protected from wind, excessive heat and moisture loss and are watered daily.

Planting

The planting method implemented by WASP involves the use of hand planters. Seedlings are planted from June to July to a depth of 100mm in the pre ripped lines to ensure moist soil surrounds the root bowl. *Acacia* host trees are planted to give a planting density of 1,000 trees per hectare.

Following the host tree planting period, sandalwood nuts are also planted in the rip lines at a density of 6 kilograms per hectare. This involves a proprietary seed treatment method, followed by planting of the nuts directly into the soil to a depth of 20 – 80 mm. (Soil type dependent). The aim of this planting is to look to opportunistically establish sandalwood in the same year as the host trees. This will generally depend on the rainfall that follows during the summer drought.

Sandalwood seeds are infilled between host trees in March of the second establishment year to bring sandalwood numbers up to the desired stocking rate of 500 stems per hectare.

Fertilisation

It is common practice in many forestry operations to add fertilisers when trees are planted or soon after. Achieving a growth response to fertilisation depends on two factors:

- whether nutrients were limiting growth before fertilisation; and
- whether or not there is sufficient moisture to make the nutrients available to the plant.

There is no need to apply nitrogen fertiliser in sandalwood plantations. Nitrogen needs are serviced by the leguminous nature of the *Acacia* host tree, which biologically fixes this nutrient and both trees can use. Phosphorous (P), sulphur (S) and potassium (K) are all important nutrients for tree growth and development. Soil P, S and K levels are generally elevated above indigenous levels where conventional farming has been practised. There is also commonly a leached nutrient bank at depth where annual roots have been unable to utilise. These can be exploited by the deeper perennial root systems of trees.

WASP currently does not provide any macro or micro nutrient fertilisation to its sandalwood plantations. Nutritional needs may arise after a number of successive nut harvests where nutrient export begins. Foliar sampling is becoming standard practice in industrial forestry. Soil sampling to detect deficiencies is thought to be less effective for trees than for pasture and crops. Trees are able to access nutrients from deeper in the soil and may be able to access nutrients unavailable to annual crops. At this time WASP does not practice foliar sampling of either sandalwood or host trees. WASP is not aware of any research into this practice in regards to plantations of Australian sandalwood, although we will continue to investigate further.

Maintenance Plan

Weed Control

Weed competition is the most important factor affecting tree survival and early growth. In a plantation context, a weed is anything that competes with a young tree for moisture or light. Removing competition—using chemicals, mulch or cultivation— encourages rapid and early growth of trees.

The most common methods of weed control involve applying a combination of pre- and post-emergent herbicides prior to planting. WASP's weed control strategies are strictly herbicidal and vary according to the year in the life of the sandalwood plantation, with each year having a carefully constructed herbicidal regime.

The very first herbicidal application (pre-planting tank mix) in year one is applied through a typical broad acre boom spray. All subsequent herbicide applications are sprayed up individual tree rows through a unit which is tailored to the five metre row widths. The spray jets are enclosed by a wind shield which effectively eliminates the risk of spray drift onto trees.

Grazing

Once sandalwood plantations are successfully established (after year four) herbicidal dependency can be significantly reduced through the implementation of selective grazing with sheep. Grazing is also highly beneficial for fire control by reducing under canopy fine fuel build up.

WASP currently have over 8000 sheep grazing across its managed estate in 2015. This will increase to approximately 12000 sheep in 2016.

The sheep grazing strategy also encompasses an evaluation of internal fencing infrastructure to prevent livestock from being able to access remnant bush within the defined forest area boundaries.

Herbicides

Sandalwood and their *Acacia* hosts are susceptible to plantation damage from a number of factors. The nature of these damaging agents can be biological or non biological, with some arising on farm and others from off farm. Some of these damaging agents such as foraging mammals can be managed effectively and some are to a degree unmanageable and rely on the biological resilience that is usually inherited by a bio diverse, native plant based system. It is common for biological imbalances emanating from surrounding broad acre agricultural systems to affect perennial plantations. Pest pressure moves from annual production systems, in this case grain crops and annual pastures, to the 'next' green bridge of food resources, in this case perennial sandalwood plantations.

Herbicides and pesticides are used by WASP to control weeds within plantations and around plantation margins. The Australian Pesticides and Veterinary Medicines Authority (APVMA) register all agricultural and veterinary chemical products for sale in Australia. The product label is the most important source of information about the use of agricultural and pest

control chemicals. The label is the key to using the product properly and safely. WASP requires all spraying contractors adhere to label recommendations when applying spray controls. The *Pesticides Act 1999* requires that a person using a registered pesticide must read the label or have it read to them.

Herbicide damage is a risk posed to the health of sandalwood trees with Acacias generally exhibiting a far greater tolerance to a wider range of herbicides and herbicide rates. Herbicides from the phenoxy group are commonly used by farmers to control broadleaf weeds in cereal crops such as wheat and barley, but also in tank mixes to control 'hard to kill' summer weeds. This particular chemical group is characterised by compounds, known as esters, which commonly volatilize and move with prevailing winds to non target areas. Sandalwood is particularly sensitive to the ester forms of phenoxy herbicides used on grain farms in close proximity to plantations. New growth is distorted very quickly after non target contact is experienced and in extreme cases tree growth is retarded and nut fruit set is detrimentally affected. WASP uses no herbicides from the phenoxy herbicide group. Agreements are also in place with neighbouring grain farmers to ensure if phenoxy herbicides are used, prevailing winds are away from WASP's properties.

Glyphosate is a herbicide commonly used within WASP's managed forest area. Being a non selective herbicide, care needs to be taken to avoid spray drift onto sandalwood and host trees. This risk is managed through the use of hooded spray shields surrounding the spray jets which effectively provide a physical barrier to herbicide drifting onto trees at the time of application.

Fluctuations in herbicide prices occur every year due to local and global demand. The most price volatile product is Glyphosate (Roundup) which can fluctuate by up to 40% either way. WASP's main contractor New Forest WA continues to monitor prices of all herbicides throughout the year. New Forest WA has a long standing relationship with a number of WA chemical suppliers and is on a schedule 1 wholesale price structure with both Landmark and Elders Rural suppliers. Should WASP and New Forest see an opportunity to bulk buy any products at a time when prices seem lower than normal, WASP will consider a forward ordering and buying strategy at that time.

Pests

Pest damage is generally less of an issue for perennial tree crops; however there are some insects which can affect the health of plantations at the margins and particularly with younger establishing trees. The most common insect pests for younger perennial plants are Rutherglen bugs which are a sap sucking insect. They are particularly active as annual crops and pastures die off and another green food source is required. WASP monitors plantations up to two years of age for evidence of Rutherglen infestation, generally in the months of November through to December. Rutherglen bugs are likely to be a problem where canola crops or radish dominant pastures are in close proximity to plantations.

WASP's management team monitor for such pests and liaise with their neighbours to limit damage to plantations.

Fire and Disturbance Regimes

The use of fire in native forest is a common management tool to maintain and enhance forest ecosystem health. However for native forests within WASP's defined forest area the use of fire is avoided. Fire in such fragmented ecosystems is deemed to do much more harm than good. There exists no ground based cover within sandalwood plantations for native wildlife to migrate to in the instance of removal via burning of dead timber at ground level within native bush land confines.

Fire administration

WASP adheres to the strict fire prevention requirements of the Shires of Beverley and Quairading who enforce a Fire Break Order under the *Bush Fire Act 1954*. This stipulates that all owners and occupiers of property within these Shires are hereby required, on or before 31 October of each year, to plough, cultivate, scarify, chemically spray or otherwise clear and thereafter maintain free of all flammable material until 31 March the following year. Firebreaks are maintained around all WASP's properties. These firebreaks are generally 15 metres wide. This is five times greater than the three metre firebreak recommendation enforced on landholders by the Beverley and Quairading Shires.

Set back distances –WASP's plantations are established on previously cleared land. There are no towns / settlements in the immediate vicinity.

Distances to habitable buildings are to be a minimum of 50 metres from the plantation, sheds and outbuildings to be a minimum of 50 metres from the plantation.

Remnant vegetation is protected by firebreaks of a minimum of 15 metres. All natural water courses, wetlands and significant features have set-backs of at least 20 metres.

During the period when sandalwood nut harvesting operations are being conducted, it is a Shire requirement that there is to be provided in the same paddock or within 400 metres of that paddock an operational independent mobile fire-fighting unit having a water capacity of not less than 650 litres. The tank of the unit is to be kept full of water at all times during the nut harvest operations. This requirement is followed by WASP.

During the restricted and prohibited burning times, it is also a Shire requirement that all machinery shall not be operated on rural land unless fitted with a fire extinguisher. On days of harvest bans there shall be no movement of any vehicles within paddocks. This requirement is followed by WASP.

Refer to the separate Fire Management Plan

Feral Animal Control

Plantation damage from foraging mammals is a significant risk where native bushland adjoins plantations. Rabbits are particularly fond of young *Acacia* host trees and will decimate young plantings, if not effectively controlled or managed. Sandalwood treelings themselves exhibit strong resilience to grazing mammals and are the species of last resort as a food source. The

most common management strategy for rabbits is the use of poison bait in the form of 1080 laced oats. This poison is preferred by WASP over pindone based baits as there is no risk of secondary poisoning of native predators. The 1080 poison oat trails and baiting stations are positioned between the rabbit warrens and close proximity *Acacia* plantings. This strategy is highly effective in reducing numbers and damage to young trees. Once trees are over two years old then they are able to physically resist grazing damage from rabbits.

Kangaroos are typically not a problem for *Acacia acuminata* and sandalwood based plantations. Neither species are attractive for kangaroo grazing, unless extreme drought conditions are prevalent in the landscape.

Native parrots, such as the Port Lincoln Parrot, are likely to pose a small risk to orchard health once again where plantings are next to remnant vegetation. Parrots typically strip bark from one year old branches to access moisture as summer drought emerges in the landscape. Parrots prefer Acacias but will also damage sandalwood branches or trunks. There is no real effective means of cost effectively deterring these parrots from damaging orchards other than to ensure plantation size is sufficient enough to dilute damage across more trees than fewer. Acacias and sandalwood are able to recover very well from parrot bark stripping and ring barking if it is not too concentrated.

Grasshoppers can be problematic with newly established seedlings particularly in year one of a plantation. Grasshoppers in plague numbers will eat green leaves that are close to the ground and ring bark young seedlings. When evident these can be controlled with insecticide applied by plane or a vehicle equipped with a fogging unit.

Field mice in large numbers have shown to wipe out young plantations of eucalypt species in Western Australia. WASP are yet to encounter such a problem with sandalwood or acacia host trees. WASP has noticed large numbers of mouse holes throughout the STA properties. To date there is no evidence of the mice causing any problems within the STA plantations. Identified areas are monitored weekly. Should the mice become destructive to either the young sandalwood or host trees they will be treated with an aerial application broad acre baiting program.

Monitoring Forest Health

Maintaining forest health it is a key function of the plantation manager through continual surveillance of the plantations. This is achieved through a number of methods including taking inventory, spraying, aerial photography, and the infill process in the early years and monitoring of each properties fencing, waterways and roads within the defined forest area.

Access & Roding

Conservation and maintenance of soil and water resources has been identified as one of the key criteria for sustainable forest and plantation management in Australia. Such tree resources cannot be sustained without water, soil and nutrients. It is imperative that soil and water values are protected in order to also enhance productive capacity. WASP manages its

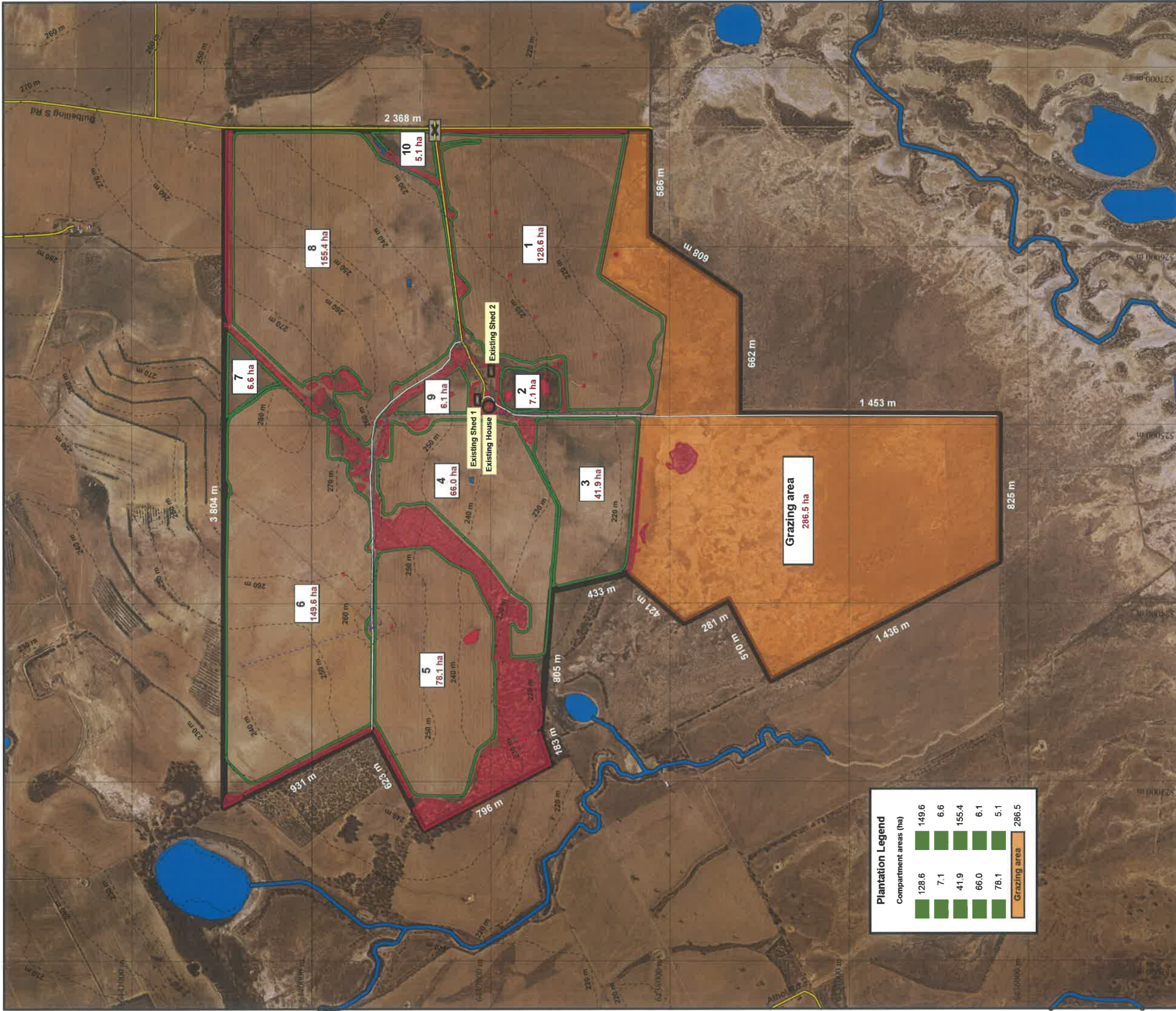
plantations in line with the *Soil and Land Conservation Act 1945* and the *Land Drainage Act 1925*, as discussed below;

WASP understands that the long term productivity of a sandalwood plantation includes maintaining an appropriate level of soil nutrients, and organic matter both on the soil surface and in the soil profile. Sufficient surface organic matter levels will facilitate a greater percentage of total rainfall being absorbed by soil profiles rather than simply running off. Adequate soil nutrition then allows for the efficient use of this infiltrated soil moisture to fuel plantation growth.

The construction of access roads for sandalwood timber production and nut harvesting activities can all negatively impact soil and water values. WASP understands the need to effectively plan for traffic ability within plantations in a manner that does not detrimentally affect these values. All roads have spurs which divert water flows into plantations, where possible, at suitably assessed intervals, determined by landscape slope and soil type. Similarly for firebreak catchments, earthworks are installed where water erosion risks become evident. The courser the soil type the greater the intervals between spurs and similarly the less the slope the greater the intervals. This ensures water volumes flowing down roads and on firebreaks is kept to a minimum and harvested water is diverted to fuel a productive response. Damage is more likely to be done when harvested water volumes are allowed to accumulate too much.

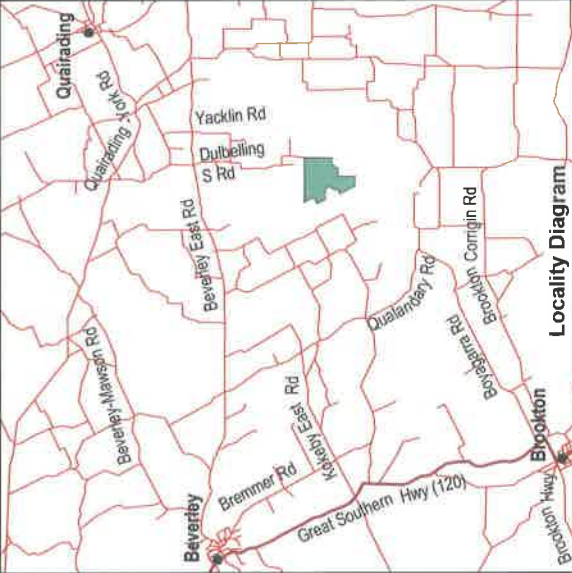
Fortunately for WASP, the machinery requirement for the year to year management of weeds and collection of nuts at harvest employs the use of light weight equipment. This greatly reduces the amount of soil compaction exerted on tree inter-rows within plantation bounds, a factor which usually encourages sheet erosion during medium to heavy rainfall events, and particularly in younger plantations. Nut harvest is largely a human labour intensive activity.

WASP is currently trialling wood harvesting techniques. WASP examines access routes and road infrastructure at each plantation when it is approaching harvest, in order to ensure the protection of soil & water flows.



Plantation Legend

Compartment areas (ha)	Area (ha)
128.6	149.6
7.1	6.6
41.9	155.4
66.0	6.1
78.1	5.1
Grazing area	286.5



Plantation Legend

- Lot Title and Property Boundary Border
- Proposed Sandalwood Growing Areas (644.3 ha)
- Grazing Area (286.5 ha)
- Native Existing Tree Vegetation Left on Property
- Roads
- 10 m Contours
- Dams and Water Features
- Gate
- Internal Access Roads
- Water Infrastructure

SITE PLAN MAP
SALTUS-KOOLINA PROPERTY

Author: L. Saukko Date: February 2016 Scale: 1:20,000 A3

Notes: Aerial Photography
 Datum & Projection: MGA 94, Zone 50
 Capture Date: 05/05/2010
 Location: Quairading, Shire: Quairading, State: WA
 Source of Photo: Landgate
 Source of Lot Titles: Landgate - Map Viewer
 (www.landgate.wa.gov.au)
 Lot Area: 1069.7 ha, Lot Perimeter: 16 725 m
 Lot Information: Lot 2, DP41385, Vol/Folio 515/50A
 Source of Cropped Areas: World Imagery & Google
 Source of Topographic Data: NRM
 (Natural Resource Management) INFO
 Mapping Portal (<http://maps.agric.wa.gov.au/nrminfo>)
 Accuracy of property boundary, gross area and cropped areas not confirmed by ground survey

0 m 200 m 400 m
 Scale 1:20,000
 MGA 94 (Zone 50)

Map Ref:
SALTUS-K-X