NOTE: Names and location details have been removed for confidentiality.

Forest inventory and assessment : "Cxxxxxx"

Lots xxxxxxx on DPs xxxxxxxxxxxxx

Axxxxxxx NSW. Approved forestry plan PNF-PVP-xxxxx

Inventory and report by

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Myocum NSW

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September 201x

Forest inventory and assessment : "Cxxxxxx"

1. Introduction

This report is provided in response to a brief from xxxxxxxxxxxxxxxxxxxxxx
to investigate the above property and report on

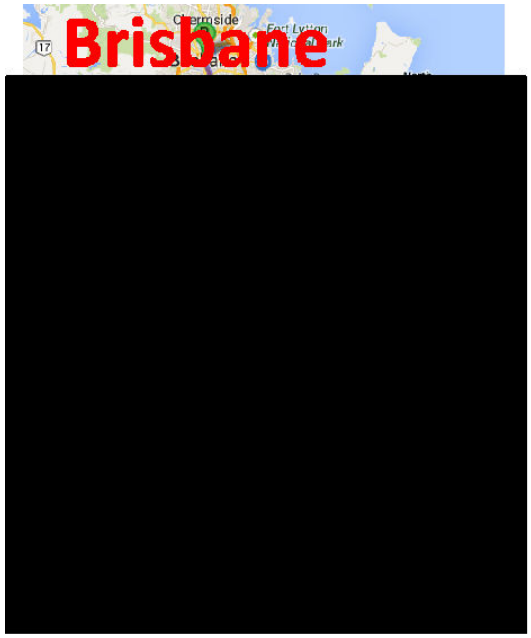
i. mapping of land quality, forest types, and harvestable area.
ii. assess total standing timber volumes, with plot summaries and breakdown by log grade, volume and main species.
iii. brief notes on silvicultural options and strategies to comply with NSW PNF Code (Code of Practices for Private Native Forestry; Northern NSW as at Sept 201x)
iv. estimate immediately available commercial harvest volume allowable under NSW PNF Code
v. project future volumes in response to harvest and silviculture strategy

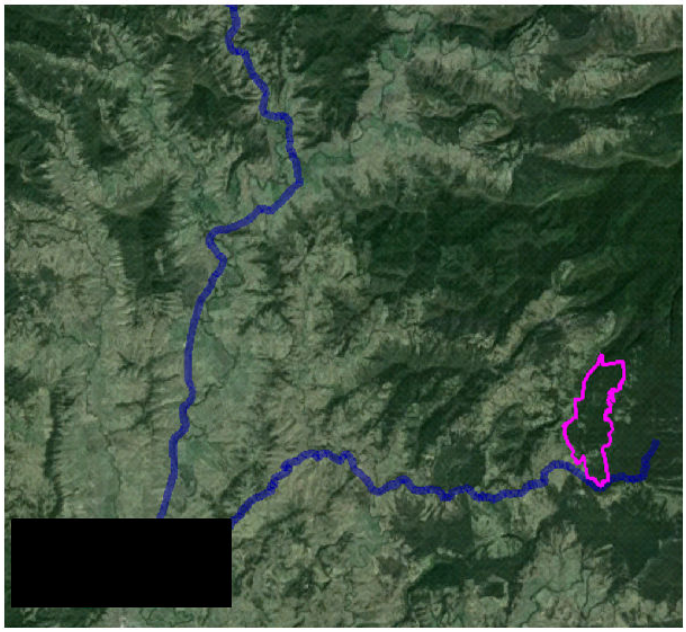
My report is based on mapping assessments and an inventory of standing timber in the above property, undertaken on 27- 31 August 2013.

The author is a qualified forestry and resource economics consultant with over 25 years experience in making forest assessments in northern NSW.

2. Description of the land area and forest

The property is located about xxkm by road xxxxx from Xxxxxx NSW, and about xxxkm from Brisbane. It consists of four adjoining largely forested lots bounded on the west west by xxxxxxxx Creek and to the east by open grazing land. Internal access is via ridge roads and minor spur or fenceline tracks. Access to the public road to the south uses a private concrete bridge over xxxxxxxx Ck, currently used by log trucks. Access to the northern parts of the property may require neighbour's consent for transit.

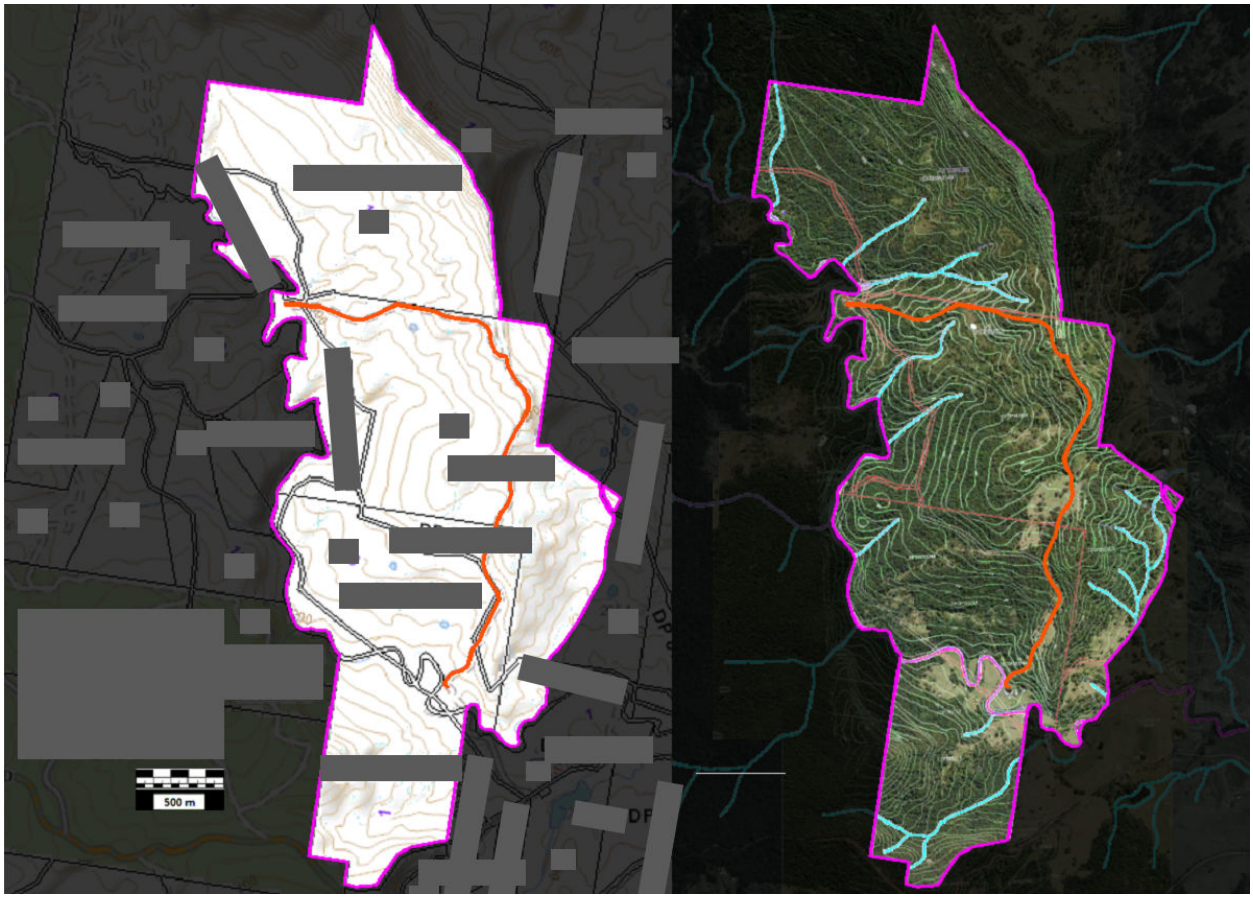




The topography is mostly hilly, with a high and steep basaltic ridge running N-S and spurs of moderate to very steep slopes. The main ridge is on the east, so most of the property falls westward to xxxxxxxx Ck. There are some sandstone cliffs and ledges in the southern part, and small areas of cleared flat land adjoining xxxxxxxx Ck near the

house. The sandstone cliff areas, steep land and areas with wet springs will constrain logging access.

Topographic map with main internal roads and boundaries



Forest Cover and Landforms; perspective view from xxxxxxxxxxx :-

Net forest production area

The net forest area available for harvesting is about 73% of the property at 364 ha, which is calculated as follows.

Hectares	
593	TOTAL
62	cleared
532	Forest
133	exlcusions
23	stream buffers
12	internal roads and fencelines
364	Net harvestable forest area

streams	Length	Ha buffer
1	3903	3.90
2	1913	1.91
3	3392	6.78
4	2960	5.92
unmapped	4000	4.00
	hectares	**22.5**

Constraint	Ha
cleared	45.6
lantana	39.1
steep	15.8
understocked	19.6
old growth	16.4
	136.5

ıb small amounts of overlap)

The extent of cleared land and logging exclusions was determined by inspection of the site, measurement from aerial photos, GIS layer intersections, and reference to the approved Private Native Forestry Property Vegetation Plan (number PNF-PVP-xxxxx). Area of Forest Type x Site Quality was determined by GIS layer intersections.

Mapped constraints included old growth identified on PVP, steep slopes, cleared land, understocked forest and areas with extensive lantana and little forest cover. Calculated land constraints included buffer zones on mapped drainage lines. An estimate was added for unmapped drainage which appeared to be quite extensive in the north, and the internal roads and fences. Unmapped constraints include small areas of rocky outcrops and springs.

The PNF plan permits harvesting and other forestry operations in accordance with the NSW Private Native Forestry Code of Practice (PNF Code). The estimate of available area has considered the provisions of the Code.

Note that an additional area of stream buffer, ie 10-20m zones around the no-entry reserves of 10m as already shown, is subject to some additional trafficability and harvest constraints under the NSW PNF Code.

Mapping of constraint areas is shown at the end of this section. The costs or feasibility of roading and drainage crossings has not been determined by this inventory. Internal roads are generally well-constructed, but would need some upgrade and extension for logging activity.

The gross property area is ~593 ha, of which around 532 ha (90%) is forested. Most of the forest has a long and continuous history of logging activity. There are four broad forest types present. (Note; species names and Codes can be found in Appendix 1).

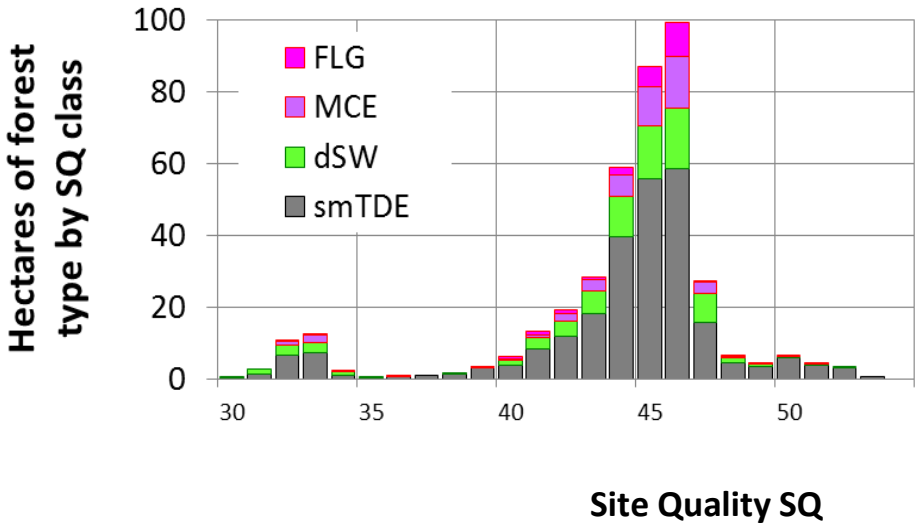
1. FLG Flooded Gum (n=2 samples)
Flooded Gum FLG dominated forest with Brushbox BBX co-dominant. There were few small trees in the sampled areas. Pink Bloodwood PBD, Grey Ironbark IBK and Hoop Pine HPP are secondary species. Wet sclerophyll understorey includes wattles and rainforest pioneers. As a mapped forest type, FLG is confined to a small strip adjoining the northwest although the species FLG is common on the property near watercourses.

2. MCE Moist Coastal Eucalypt (n=2)
Found on mid and lower slopes and elevated flatter areas with springs . Sampled areas were dominated by BBX and Grey Gum (GYG) in larger size classes with little regrowth. Tallowwood TWD, IBK and FLG are secondary species. Includes areas with bell miner associated dieback (BMAD) which were formerly dominated by Sydney Blue Gum SBG. Most of the SBG areas have little live forest cover remaining and are dominated by lantana and crofton weed.

3. smTDE semi-moist and Tall Dry Eucalypts (n=30)
The main forest type on the property. Includes the northern steep ridge, westerly slopes of the central part of the property, and the sandstone hills in the south. This mapping also covers some areas of BMAD dieback, formerly carrying SBG and FLG/IBK forest. The northern ridges have White Mahogany WMY IBK and PBD with moist understory and lantana. Southern ridges also have these species with the addition of Spotted Gum SPG. The slopes contain Turpentine TRP and PBD, TWD, GYG, SBG, FLG and BBX.
The main species in regrowth sizes (<40cm DBH) are PBD, TRP, BBX and WMY.

4. dSW dry Sclerophyll and Woodland (n=8)
A more open forest type found on the ridge of the central eastern part of the property, and on the spur running south. SPG and PBD are predominant on the ridge tops with occasional IBK, TWD and Forest Oak FOK as secondary species. Mid- and lower slopes contain more of the secondary species, and also apparent areas of BMAD dieback. The lower eastern parts of the property with this forest type could not be accessed. TRP, IBK, TWD and FOK are common in regrowth.

The forest types are distributed in the available logging area of 364 ha as shown in the following chart and then table. SQ is a site quality (potential productivity) rating discussed further below.



Distribution of 42 samples and Forest Types and Site Quality in available logging area

Harvestable Land Area

hectares by Forest Type and Site Quality

SQ	FLG	MCE	smTDE	dSW	Total HA
30-34	0.5	3.2	14.9	7.3	26
35-39	0.2	0.1	5.4	0.4	6
40-44	4.8	11.5	74.3	24.1	115
45-49	14.8	26.2	125.6	38.0	205
50-54	0.2	-	12.2	0.6	13
	20	41	232	70	364

The 42 sampling points were distributed to match the pattern of forest type occurrence, to the best extent possible considering access constraints.

Distribution of 42 field sample points

SQ	FLG	MCE	smTDE	dSW
30-34	-	-	2	-
35-39	1	-	2	-
40-44	-	-	10	6
45-49	1	2	16	2
50-54	-	-	-	-

Forest growth and productivity potential is referred to as site quality (SQ) and will vary according to climate, soil and topographic position. The SQ can be assessed by both the potential top height of trees, and by the maximum basal area (BA= cross-sectional area of tree trunks at breast height 1.3m) of mature trees in a healthy well-stocked native stand on the site. The SQ can be predicted from climate, soil and topography.

Using the BA descriptor, the mean SQ these forests in the Xxxxxx LGA north-east NSW region is about dSW 40, smTDE 43, MCE 45, FLG 47 (ie mature forest with 47 m2/ha "carrying capacity"). SQ on this property ranges from 30 on the higher exposed dry ridges and steep northern and western slopes, to some very small patches of over 50 on a fertile sheltered steep face and spring fed flats in the north. More than 2/3rds of the total forest is on SQ 44-47.

On the maps on the next page,

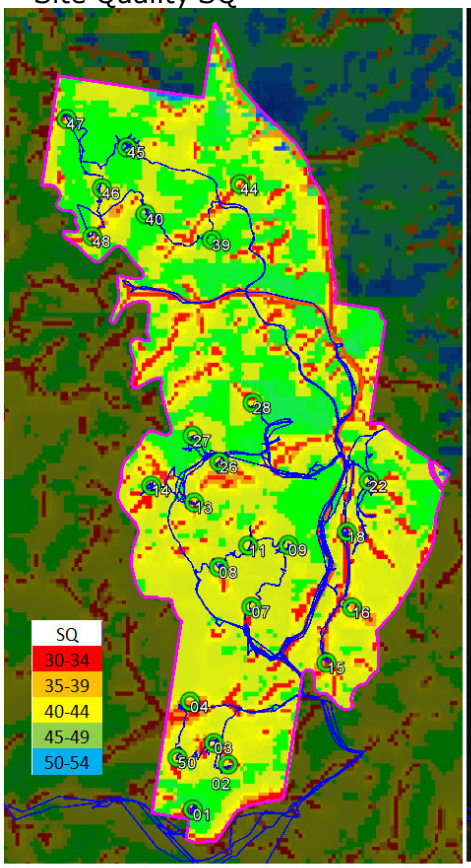
- Blue lines indicate GPS tracks made during field surveys.
- SQ represents potential mature healthy forest basal area, m^2/ha.
- Forest Type and Site Quality colours are as shown in tables above.
- Land constraints key is shown on the map.

Inventory sampling locations are numbered irregularly between 1 and 50

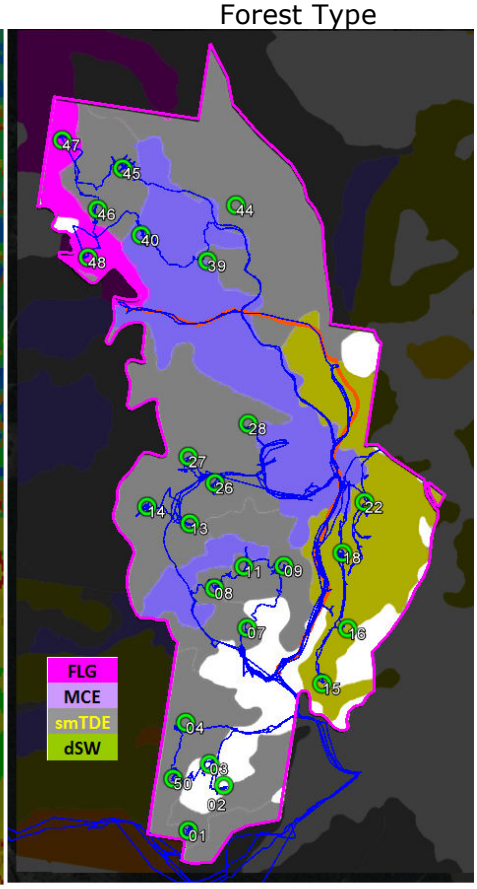
Detailed overlay mapping including SQ, forest type, location of the internal roads, contour levels and defined watercourses, can be viewed on Google Earth using the *.kmz files provided with the final report.

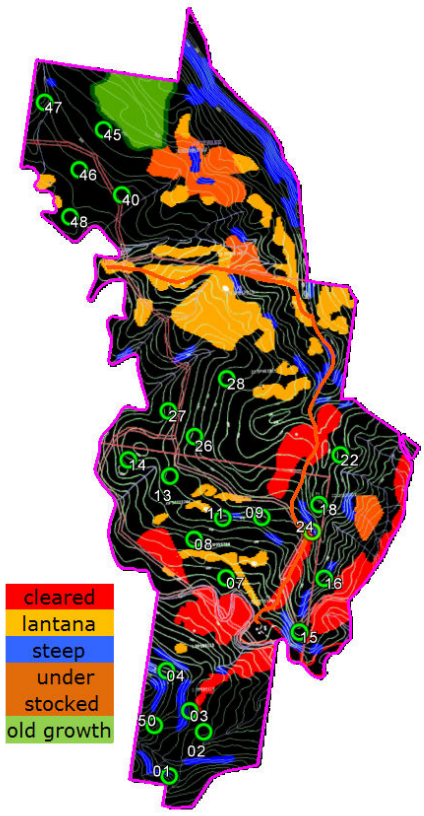
Property attribute mapping and inventory sample locations.

Site Quality SQ

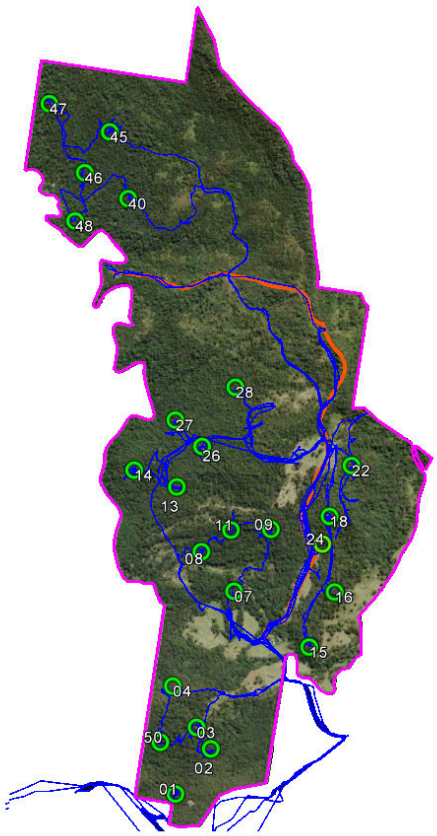


Forest Type





Land Constraints and Topography



Forest Cover

3. Inventory methods

3.1 Sampling procedures and data

Fifty (50) basal area sweep sampling locations[1] were identified and given Lat/Long co-ordinates using Google Earth. Sampling points were allocated proportionally over the property taking into consideration the forest type and SQ distributions. They are scattered across the property as shown in the preceding figures on page 7. In my opinion, formed after walking the area extensively, they are a reasonable representation of the forest conditions found on the properties. However many of the original identified 50 points could not be accessed due to the heavy lantana, or were visible from tracks and determined to be understocked or lantana-dominated.

At most sampling points visited, two basal area sweeps were made at points separated by 30-50m. A total of 42 point sweeps were measured. Attributes were recorded for all trees which were "in" using a basal area prism of factor 2. Small trees less than ten centimetres in diameter at Breast Height (1.3m above ground) were not measured. The Lat/Long of the point was recorded using a handheld GPS (accuracy ±8m or better), and a photo taken at each site.

The attributes recorded for each tree "in" the sample were

Species
DBH (Diameter at breast height over bark, for all trees >10cm)
Crown Vigour (4 classes),
Log length (nearest metre), and
Log grade (6 grades) for the main length.
Habitat features, presence of hollows etc

The aim was to include at least 16 trees per sample location; a few points with low stocking included a second sub-plot. 668 trees were measured in total.

From this information, a range of useful information about stocking density, log grade, volumes and silvicultural condition can be calculated.

On 364 net hectares, each of the 42 sample points could thus be taken to represent ~8.67 ha. I am satisfied that a full range of stand structures was sampled, and that it is very unlikely that the unsampled areas presently have very much better stand conditions or greater standing volumes. However some visited plot sites, including recent logging areas, contained little or no commercial volume, and to avoid wasting time were not measured. To account for these a discount of ~20% has been applied to arrive at **300 ha net productive forest area** when expanding measured plot volumes to whole of available area for forest harvesting. The actual recent logging area has not been measured, but appears to be around one-third to one half of the 70ha dsW mapped area.

Since sampling areas appear to be reasonably representative of forest structures, equal weightings have been applied to each expand plot. Future volume projections have taken into account current stand structure and SQ using the EUCAMIX model. Understocked areas (including BMAD affected forest) may also presently be unavailable for harvest under the PNF Code until Basal Area exceeds 18 m2/ha.

1. *The basal area sweep inventory method is relatively simple to employ in practice, but a sound understanding of the method is required in order to interpret the data and extract useful information. Circular plots (eg 0.1 ha, 17.84m radius) are easier to understand when it comes to tallying data, but they are more time consuming when trees <30cm DBH need to be included, and they have less statistical accuracy for large trees >50cm DBH. Hence the basal area sweep method is preferred since it is more efficient in the field and more accurate with regard to the largest trees. The latter tend to be of greater importance for both commercial and biological assessments.*

3.2 Data class definitions

Crown classes: Dominant, Codominant, Intermediate and Suppressed, D,C,I,S based on canopy height (stratum) and vigour (leafiness and health, leaf area index)

DBH classes: Diameter at Breast Height (1.3m) Over Bark DBHOB in 15cm intervals, starting from 10cm. Hence 7 classes; 10_25, 25_40, 40_55, 55_70, 70_85, 85_100, 100+

Log grades: Q = higher grade sawlogs, in large(Q) and small (TT) sub-classes (Q refers to "quota" , TT is thinnings)

Z = lower grade sawlogs, in large(Z) and small (zz) sub-classes (also described as Salvage grade)

R = Commercial quality logs which are smaller than minimum millable size are designated as pre-commercial grade or Recruits

W = not sawlog quality or species, but a harvestable bole for biomass products, for example woodchip, fencing, firewood where markets are available.

U= unusable

P= large pole logs, pp= small poles. Poles have been grouped with Q logs for some of the graphs in this report.

V = Veneer grade, allocated when the diameter or length of high grade log is not suitable for a Pole

Minimum log length is 3.0m for Q & T grades, and 2.5m for Z grade and lower.

All species and sizes are recorded in the field according to their "potential". The inventory software (EUCAMIX) tests each tree to find its highest potential grade according to specifications, and reports current volumes on that basis. The plot data can thus be used to investigate the effect of changes in grade specification (eg minimum size and length) if required.

Log grading in the field:

Bole length and log grade is recorded for one log per tree, being the most valuable log. This is invariably the main part of the trunk from stump height to first fault, ie bend, major branch, defect, or crown break. Many trees may have smaller secondary logs of lesser grades and value above the main log, and so the biomass and residues estimates, and to a lesser extent lower grade sawlogs, may actually be higher than reported here. Conversely, the assessment of sawlog quality in the field is based on log straightness and visible defect, but some logs assessed as sawlogs may have reduced volume or be downgraded because of hidden internal defect. These two factors, second log vs hidden defect, will be self-cancelling to some degree in regard to total volume estimates.

Log size:

DBHOB : Diameter at Breast Height (1.3m above ground) Over Bark
In this report, two important log size definitions are used. These are

Large Log DBHOB >=45cm ; minimum millable log = 30cm DBHOB

Alternative size definitions can be entered into the assessment model.

Poles : For this inventory, minimum pole size classes and acceptable species are as defined by "TECHNICAL SPECIFICATION FOR VACUUM PRESSURE IMPREGNATED HARDWOOD POLES" ETS 07-01-01 (Revised 21 July 2006) [pers. Comm. Ergon Energy Ltd July 2012]

4. Inventory Results

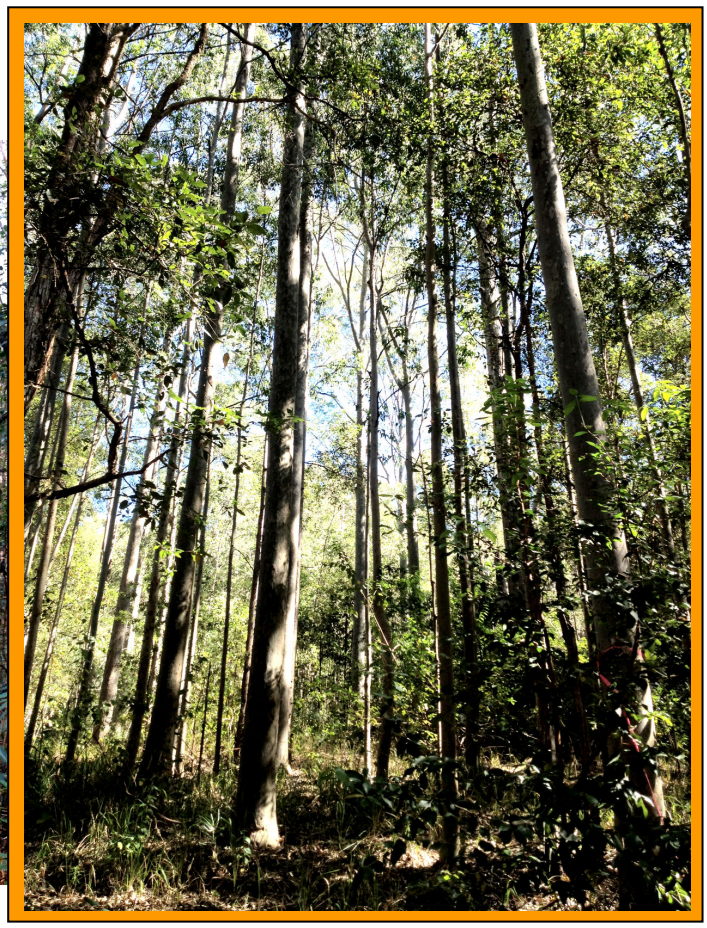
This section of the report summarizes the results for the forest as a whole.

A detailed breakdown of log volumes on each plot is on page 17 .

4.1 Forest condition and structure

Logging is currently taking place on the central elevated part of the property and on the eastern fall in the dSW forest type. Products include SPG, TWD and IBK logs in all grades including poles. Stumps of large trees (eg 70cm DBH) appear to be sound with little pipe or internal defect. However internal quality is variable and difficult to predict by purely visual assessment.

Typical forest stand structure
(below) northern section
(right) southern section



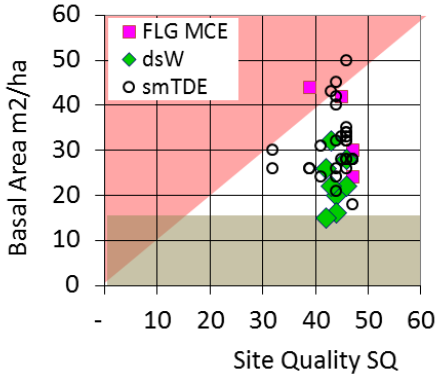
The landowner stated that, other than the present activity and cutting of fence posts for on-farm use, there has been no logging in the last 25+ years. Fires have been excluded for over 15 years.

The forest overstorey is very variable in structure, ranging from scattered large trees with little regrowth (see prev photo "north"), to patches of densely stocked mid-size regrowth in areas which have been logged or cleared in the past (photo "south").

As is typical for private forests of the region, the most common stand structure has a range of sizes of non-commercial trees retained from previous loggings, ± irregular regrowth, ± occasional large veterans. In the accessible parts of the property, there are some stands with good quality retained trees and regrowth. Other areas have significant dieback and lantana, of stands with a low or minimal stocking of high quality sawlog and pole grade trees.

To describe the forest more accurately from the plot data, it is convenient to use Stand Basal Area (BA, measured as m2/ha) as a measure for discussion, since BA is both a close proxy for total standing biomass and total volume and is used a regulatory tool in the PNF Code . Note also that mature forest BA is used here as an indicator of SQ.

The median (midpoint) BA of sampled plots was 28 m2/ha. 80% of plots had BA between about 21 and 42 m2/ha. The red shaded area in diagram at right shows plots which are fully stocked in relation to SQ. The grey area is the 16m2/ha BA retention requirement under the PNF Code. Most of the stands in this forest are therefore not overstocked relative to their potential full SQ stocking, and have trees legally available for harvest.

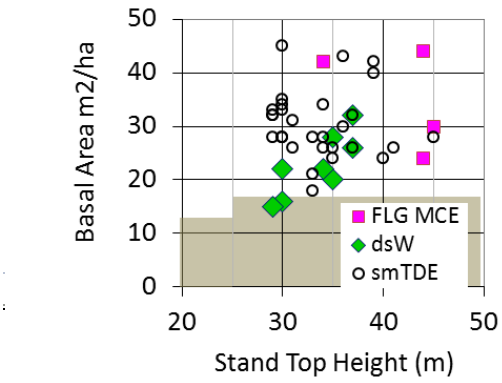


The minimum stand basal area to be retained for single tree selection and thinning operations according to Forest Type and Stand Height is as follows (Table A in PNF Code)

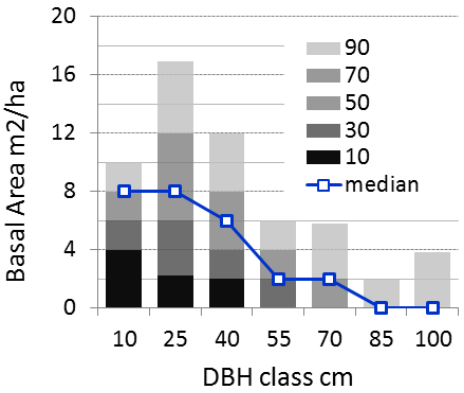
Stand Top Height	<25 metres	>=25 metres
FLG Flooded Gum	14 m2/ha	18 m2/ha
MCE Moist Coastal Eucalypt and smTDE, dSW, SPG etc	12 m2/ha	16 m2/ha

All stands on this property are over 25m site height. The left hand figure below show that 2/8 of dSW points could not currently be thinned or harvested except by Group Selection (AGSS) under the Code rules.

Sample point basal area and stand height



Basal Area distribution by size class



The right hand figure shows the distribution of basal area by size class on all plots (Stand tables of each plot, basal area x size class, are in the Appendix). The columns are broken down to show the percentile of plots with basal area less than the amount shown. For example 70% of plots had less than 8m2/ha basal area in the 40-55cm DBH class ("40"). The blue line is the median (ie 50th percentile; half of plots have more and half less). As can be seen, the most abundant biomass is in the <40cm diameter size classes, split on average equally into 25-40 cm and 10-25cm DBH sizes. Only a few plots had more biomass in the next larger commercial class than in regrowth saplings, although at least half the plots had some veteran trees in the larger size classes.

The distribution of basal area for all trees in all plots by size class (DBH cm) is

DBH size class	10_25	25_40	40_55	55_70	70_85	85_100	100+
BA by size class	25%	33%	21%	9%	6%	3%	3%

The above table shows that in total more than half of the combined biomass of all plots is in trees sizes <40cm DBH, and about 80% in sizes <55cm DBH.

In terms of tree numbers the whole-of-property average stocking is estimated to be 542 trees per ha, distributed by size as follows:-

DBH size class	10-25cm	25-40cm	40-70cm	>70cm	Total
Trees/ha	371	113	52	6	542
	68%	21%	10%	1.1%	

Note that ~90% of the standing trees are less than 40cm DBH.

The larger trees (up to 10 per ha) will be required to be retained under the Habitat Tree provisions of the PNF Code. (10 hollow bearing trees per hectare, including recruits from next largest cohort if hollows are not present)

The next series of tables show summaries of Basal Area for the whole forest, breaking the total down into subcategories of species, crown vigour and log grade. Stand tables of each plot, basal area x size class, are in the Appendix.

1. Species composition

Most of the tree biomass is comprised of commercial species. Some 70% of the standing tree basal area is in commercial species above 25cm DBH.

	10_25	25_40	40_55	55_70	70_85	85_100	100+	TOTAL
Commercial	17.1%	28.0%	21.6%	9.7%	6.2%	2.4%	2.9%	88%
Non-comm	6.9%	3.8%	1.1%	0.0%	0.2%	0.2%	0.0%	12%

PBD*, BBX and TRP are the most common commercial species on the property with collectively over 45% of total biomass in the sampled plots. The next most common species in the sampling were SPG and WMY in the drier ridge locations, and FLG, IBK, TWD and GYG on mid-slope and moist forests. FOK and small rainforest trees were the most common non-commercial species.

*PBD is classed here as commercial but is of relatively inferior quality.

Table shows % of basal area by species for all sampled plots. Species are shown grouped as commercial and non-commercial.

Size DBH class cm

Species	10_25	25_40	40_55	55_70	70_85	85_100	100+	TOTAL
FLG	0.2%	0.2%	1.4%	1.5%	0.8%	0.5%	0.5%	5.0%
BBX	3.8%	3.8%	2.9%	1.3%	1.3%	0.8%	1.0%	**14.9%**
GYG	0.2%	2.3%	1.0%	0.0%	0.2%	0.3%	0.2%	4.1%
IBK	1.4%	2.0%	1.0%	0.0%	0.3%	0.0%	0.0%	4.6%
PBD	3.6%	7.1%	5.0%	0.8%	0.8%	0.5%	0.2%	**17.9%**
SBG	0.0%	0.5%	1.8%	0.6%	0.2%	0.0%	0.2%	3.2%
SPG	0.2%	1.6%	2.9%	2.2%	1.3%	0.2%	0.0%	8.3%
TRP	5.4%	5.1%	1.8%	1.0%	0.6%	0.0%	0.3%	**14.2%**
TWD	0.8%	1.3%	2.4%	0.6%	0.4%	0.0%	0.5%	6.0%
WMY	1.6%	4.0%	1.8%	1.4%	0.2%	0.2%	0.2%	9.3%
HPP	0.0%	0.2%	0.0%	0.2%	0.2%	0.0%	0.0%	0.5%
FOK	2.9%	3.0%	0.8%	0.0%	0.0%	0.0%	0.0%	6.7%
WAT	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
Rf	3.6%	0.6%	0.2%	0.0%	0.0%	0.0%	0.0%	4.4%
RAP	0.0%	0.2%	0.2%	0.0%	0.2%	0.2%	0.0%	0.6%

2. Crown Vigour

Trees with relatively vigorous dominant crowns comprise slightly more than half of the stand basal area and are prevalent in the stem sizes above 40cm.

(see Table below)

3. Log Grade

In the log grade table, field codes have been screened against bole length, DBH size and species to ensure that for example, P or Q grade logs meet the standard.

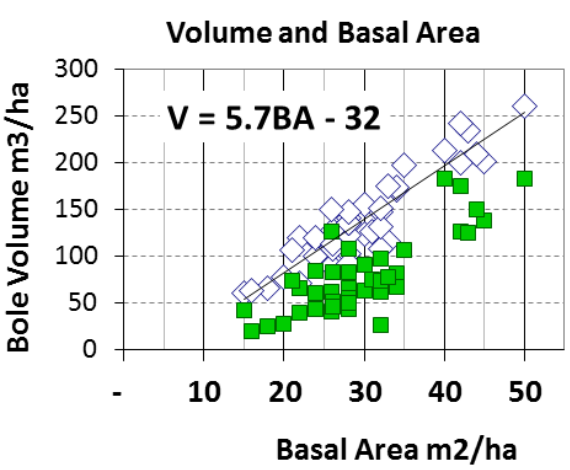
About 40% of the basal area is in commercial trees with relatively straight clean boles and more than 25cm DBH. A bit under half of this (18%) is in trees in the 40-70cm size classes which have been assessed as good quality sawlogs or poles . Pole and Veneer trees meeting spec constitute about 10% of the forest biomass.

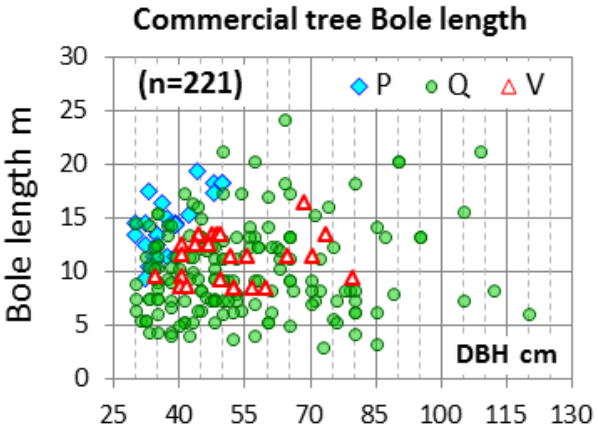
		10_25	25_40	40_55	55_70	70_85	85_100	100+	TOTAL
Crown	D	0.2%	3.6%	9.7%	7.3%	4.8%	2.2%	2.1%	30%
	C	0.8%	9.7%	9.4%	2.1%	1.3%	0.0%	0.3%	24%
	I	11.0%	15.4%	3.0%	0.3%	0.3%	0.3%	0.0%	30%
	S	12.0%	3.2%	0.6%	0.0%	0.0%	0.0%	0.5%	16%
ProdQ	P,V	0.5%	5.0%	3.3%	0.8%	0.5%	0.0%	0.0%	10%
	Q	5.5%	9.1%	9.3%	5.4%	3.4%	1.4%	1.0%	35%
	Z	4.0%	7.4%	5.9%	1.9%	1.0%	0.3%	0.2%	21%
	W	4.3%	4.6%	1.6%	1.3%	0.8%	0.5%	1.3%	14%
	U	9.7%	5.7%	2.6%	0.3%	0.8%	0.3%	0.5%	20%

5. Forest Volume estimations

Forest log volume estimates are made by nominating commercial and non-commercial species, and applying a standard NSW hardwood log volume formula (based on taper and length) to each tree in the sample data. The formula uses over-bark DBH, bole length minus stump height and docking, and trunk taper. Trees which do not meet the minimum length and diameter specifications are down-graded to next grade.

"Commercial" is taken here to mean only millable or pole logs; grades W & U are "non-commercial", although some of this volume may be saleable as fence posts or firewood.





In the left hand chart, total bole volume per ha is shown by open blue diamonds, commercial volume is green squares. Note that total volume is reasonably predictable from BA using the formula shown on the chart, but commercial volume is more variable.

The right hand chart shows the bole length of trees graded in the field and passing spec to have Q, P, or V quality boles (total 221 samples >30cm DBH), plotted against the tree DBH. (nb chart includes "smalls" in these grades, ie TT, pp, vv).

Note that the largest trees >70cm DBH, although assessed visually as having clean straight trunks, may harbor internal defect. Most commonly, commercial log lengths in the sampled trees were between 5 and 15 metres.

Per hectare volumes were derived for each product and size class from the plot data. Given the spread of 42 plots on the land, and that they covered a full range of forest types, stand condition and landform elements, the per hectare volumes were applied with even weightings to the 300 ha area of accessible forest with commercial volume, as derived earlier.

Hence the estimates below are for the forest as a whole. Two sets of volume information are given (i) standing forest volume , and (ii) harvestable volume, being the primary bole volume that could be obtained if all the commercial timber were to be harvested using Single Tree Selection methods complying with the NSW PNF Code conditions*. For the latter case, two harvest timings are indicated, during the next 12 months (year 1), and delaying harvest for 10 years (year 11).

** see definition see section 2 below later*

5.1 Standing Forest Volume

The total volume of standing timber on 300 hectares is distributed in grade classes as follows. Poles and Veneer are included in Q and TT grades in this initial table, and are itemized separately later and in the individual plot summaries.

Log specifications for this Table are based on
Large =>45cm DBHOB
Small = 30-45cm DBHOB
Recruits =10-30cm DBHOB

[redacted] Volume x Log Grade per 300 harvestable hectares			Standing Volume	
			VOLUME >45cm, 30cm	*90% confidence*
Grade	**Type**	**Description**	m3 total	*interval*
Q	Large Q	Sawlogs, P,V	10,593	*±19%*
Z	Large Z	Salvage	3,058	*±29%*
TT	Small Q	Thinnings	7,281	*±24%*
zz	Small Z	Small Salvage	2,957	*±32%*
M.Vol	*sub total Merchantable grades*		***23,889***	*m3*
R	pre-comm	Recruits	7,626	*±22%*
W +U	biomass	posts, chip & firewood	10,116	*±14%*
G.Vol	TOTAL all trees	gross standing bole volume	41,631 *m3*	*±9%*

Note the 90% confidence interval. This is a statistical calculation derived from the variability in the samples, and it means there is a 90% certainty that the true mean (ie if every tree in the forest was measured) lies in the range of sample mean± confidence interval.

Hence (in rounded terms) there is 90% certainty that total standing volume of all trees on 300 ha, is 41,600 m3 ± 3,750 m3 (±9%). This is comprised of

Merchantable bole volume + non-merchantable bole volume
= 23,900 m3 + 17,700 = ~41,600 m3 total

Note that confidence intervals for subcategories (such as large sawlogs only) are broader than for the total, since there are fewer numbers of trees in the subsample.

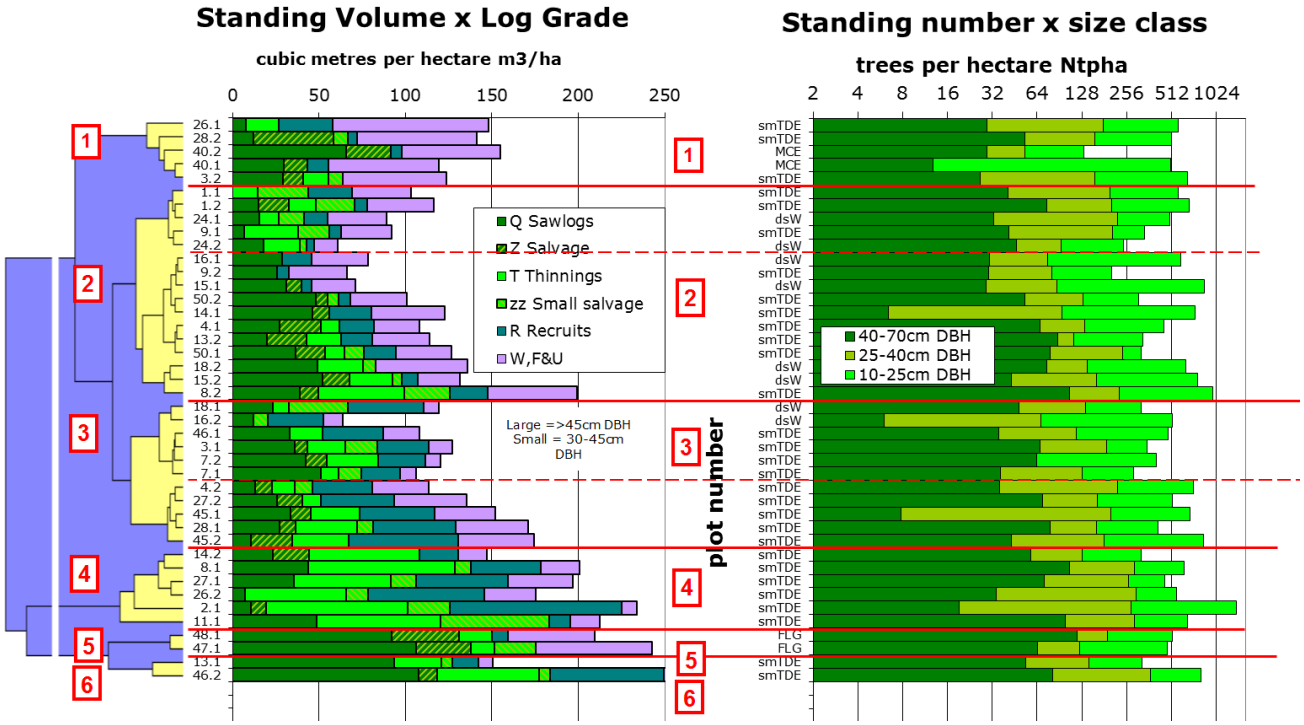
Individual plot volume results :

Commercial volumes by grade were calculated for each plot using the EUCAMIX inventory program. The plots were then analysed for similarity of volume distribution between grades, and grouped into 6 classes on this similarity basis as shown below. The similarity diagram is at left, and individual plot volumes are in the central bar graph. The graph on the right shows tree numbers by size class (nb logarithmic scale).

Group 1 contains relatively high volumes of biomass (waste) trees.
Group 2 has two discernible subgroups based on volumes of Q logs and recruits.
Group 3 has higher volume of recruits and little volume of Z logs volume. There are also two subgroups here, one of which has higher biomass (waste) volume.
Group 4 has higher volumes of recruits and small high quality sawlogs (T grade).
Groups 5 & 6 contain highest total volume and highest Q volume, and are differentiated by group 5 having high biomass (waste) volume. Only two plots are in each of these groups.

For this diagram like the previous table, Pole grade trees are included in Q and T grades but are itemized separately in the next section and in the individual plot summaries.

Groups 4,5,6 contain most of the pole trees, as is seen in the table on next page.



Volume summary for each plot

Plot No	VOLUME m3/ha							Ntpha				POLES				POLES							
		small sawlogs & Poles		large sawlogs & Poles				number of Trees per ha by DBH class cm				Pole Trees; number per ha by DBH class cm				Pole Trees Volume m3/ha by DBH class cm				Forest	Stand Basal Area		Site Height
plot	pre-comm	zz	TT	Z	QQ	biomass	TOTAL	10-25	25-40	40-70	TOTAL	10-25	25-40	40-70	TOTAL	10-25	25-40	40-70	TOTAL	Forest Type	m2/ha SQ	m2/ha SBA	m Height
26.1	31.1	0.0	19.0	0.0	7.9	90.2	**148**	387	149	29	**573**	53	-	-	**53**	13	-	-	**13**	smTDE	46	32	37
28.2	5.5	8.1	0.0	46.5	12.1	69.1	**141**	353	102	53	**519**	-	-	-	**-**	-	-	-	**-**	smTDE	46	28	30
40.2	6.2	0.0	0.0	25.6	65.9	57.2	**155**	79	23	29	**160**	-	-	-	**-**	-	-	-	**-**	MCE	47	30	45
40.1	12.0	0.0	0.0	13.6	29.8	63.7	**119**	489	-	13	**522**	-	-	-	**-**	-	-	-	**-**	MCE	47	24	44
3.2	0.0	8.4	14.9	11.3	29.4	59.6	**124**	497	129	27	**657**	-	18	-	**18**	-	15	-	**15**	smTDE	32	30	36
1.1	25.3	29.5	14.5	0.0	0.0	34.2	**103**	370	157	41	**568**	-	49	-	**49**	-	29	-	**29**	smTDE	45	28	29
1.2	7.0	22.4	15.6	17.7	15.0	38.8	**117**	468	130	75	**672**	-	-	-	**-**	-	-	-	**-**	smTDE	45	33	29
24.1	13.7	14.7	11.0	0.0	15.6	34.3	**89**	276	189	33	**502**	-	-	-	**-**	-	-	-	**-**	dsW	42	26	37
9.1	6.6	17.9	31.2	0.0	7.0	29.5	**92**	132	163	41	**337**	-	-	-	**-**	-	-	-	**-**	smTDE	47	28	33
24.2	4.3	4.1	20.8	0.0	18.0	13.6	**61**	149	47	47	**243**	-	-	-	**-**	-	-	-	**-**	dsW	42	15	29
16.1	17.2	0.0	0.0	0.0	28.6	32.8	**79**	514	44	31	**600**	-	-	-	**-**	-	-	-	**-**	dsW	44	20	35
9.2	6.6	0.0	0.0	0.0	25.9	34.0	**67**	123	50	30	**210**	-	-	-	**-**	-	-	-	**-**	smTDE	47	18	33
15.1	5.6	0.0	0.0	8.8	31.2	25.7	**71**	761	57	29	**856**	-	-	-	**-**	-	-	-	**-**	dsW	43	22	30
50.2	6.5	6.7	0.0	6.7	48.1	32.8	**101**	178	77	53	**318**	-	-	-	**-**	-	-	-	**-**	smTDE	41	24	35
14.1	24.6	0.0	0.0	9.7	46.3	42.3	**123**	643	88	6	**757**	-	-	-	**-**	-	-	-	**-**	smTDE	47	28	45
4.1	19.7	0.0	10.7	23.8	27.5	26.5	**108**	322	66	67	**465**	-	-	-	**-**	-	-	-	**-**	smTDE	44	32	29
13.2	18.2	0.0	20.1	22.6	20.2	33.2	**114**	215	25	89	**332**	-	-	-	**-**	-	-	-	**-**	smTDE	39	26	37
50.1	18.7	11.0	11.4	17.1	36.4	32.3	**127**	79	162	79	**319**	-	-	-	**-**	-	-	-	**-**	smTDE	41	31	31
18.2	0.0	7.4	26.5	0.0	49.1	53.0	**136**	496	64	75	**635**	-	-	-	**-**	-	-	-	**-**	dsW	46	28	35
15.2	9.3	5.3	24.9	16.0	51.9	24.1	**131**	609	117	43	**777**	-	25	11	**36**	-	15	19	**34**	dsW	43	32	37
8.2	21.7	26.3	49.9	10.7	39.1	51.7	**199**	739	121	106	**966**	-	-	53	**53**	-	-	65	**65**	smTDE	44	42	39
18.1	44.1	34.1	9.1	0.0	23.4	8.9	**120**	185	88	48	**321**	44	-	-	**44**	15	-	-	**15**	dsW	46	22	34
16.2	32.3	8.2	0.0	0.0	12.1	11.1	**64**	453	62	6	**520**	-	-	-	**-**	-	-	-	**-**	dsW	44	16	30
46.1	34.8	0.0	19.5	0.0	32.9	21.1	**108**	371	82	35	**499**	-	17	-	**21**	-	13	-	**24**	smTDE	46	26	41
3.1	29.7	18.2	22.2	7.1	36.1	13.9	**127**	166	119	67	**352**	-	84	11	**95**	-	35	18	**53**	smTDE	32	26	35
7.2	27.5	0.0	29.7	12.1	42.4	8.8	**121**	340	-	64	**412**	48	-	43	**96**	16	-	57	**86**	smTDE	44	24	40
7.1	22.5	13.0	10.5	0.0	51.1	9.2	**106**	157	92	36	**288**	-	16	29	**45**	-	11	45	**56**	smTDE	44	21	33
4.2	34.9	9.9	13.4	9.8	13.1	32.7	**114**	493	186	36	**715**	-	-	-	**-**	-	-	-	**-**	smTDE	44	26	31
27.2	42.4	0.0	10.6	14.5	25.9	41.9	**135**	352	93	69	**515**	-	-	-	**-**	-	-	-	**-**	smTDE	46	28	30
45.1	43.4	0.0	28.3	11.3	33.8	35.1	**152**	483	193	8	**695**	-	72	-	**72**	-	27	-	**27**	smTDE	46	32	29
28.1	47.7	9.1	36.0	8.8	27.5	41.9	**171**	254	83	78	**426**	44	60	17	**121**	11	28	16	**55**	smTDE	46	34	30
45.2	63.2	0.0	33.0	23.8	10.5	43.6	**174**	655	138	43	**845**	-	52	-	**52**	-	24	-	**24**	smTDE	46	34	34
14.2	22.2	0.0	64.1	20.9	23.3	16.8	**147**	192	71	58	**339**	-	21	-	**21**	-	13	-	**13**	smTDE	47	28	34
8.1	40.3	9.2	85.1	0.0	43.7	22.5	**201**	330	184	105	**619**	-	23	9	**32**	-	17	13	**30**	smTDE	44	45	30
27.1	53.0	14.8	56.1	0.0	35.5	37.6	**197**	196	193	71	**460**	-	82	17	**98**	-	35	16	**51**	smTDE	46	35	30
26.2	67.4	12.6	58.4	0.0	7.2	29.9	**175**	260	260	34	**555**	-	177	17	**194**	-	85	14	**99**	smTDE	46	33	30
2.1	99.7	24.0	82.3	8.6	10.7	8.6	**234**	##	255	19	**###**	-	20	-	**20**	-	17	-	**17**	smTDE	43	43	36
11.1	12.0	62.9	71.8	0.0	48.7	17.2	**213**	364	191	99	**654**	-	44	17	**61**	-	30	14	**44**	smTDE	44	40	39
48.1	9.6	0.0	18.7	39.0	92.3	49.9	**209**	329	71	120	**537**	-	16	10	**39**	-	12	18	**74**	FLG	39	44	44
47.1	0.0	23.7	13.8	31.4	###	67.4	**243**	355	59	65	**496**	-	-	16	**21**	-	-	36	**76**	FLG	45	42	34
13.1	15.0	6.2	27.2	0.0	93.8	8.4	**151**	182	89	54	**329**	-	-	25	**25**	-	-	52	**52**	smTDE	39	26	34
46.2	65.8	6.3	59.0	10.5	###	11.3	**261**	443	285	82	**810**	-	79	43	**122**	-	37	80	**117**	smTDE	46	50	44

The plots are listed in this table in same order as the previous diagram, with colour-coded plot numbers corresponding to the stand volume x log grade Groups 1-6. Note that neither Forest Type nor SQ are correlated with current stand condition.

POLE grade; individual tree sizes and species

This table shows individual sample tree details; per hectare counts and volumes are in the previous table

In total, 40 Pole grade trees which passed spec were recorded on 23/42 plots. (~1 in 16 trees of the total number sampled)

The complete list of these poles is shown at left. The list is sorted in species order, then by descending DBH. Species codes are in the Appendix.

Nearly all of the Pole trees were found in the plots located in the smTDE forest type.

Plot	Spp	DBH	Bole	VolTree	ForType
11.1	Gyg	35	14	0.671	smTDE
45.2	Gyg	34	11	0.529	smTDE
46.2	Gyg	33	11	0.499	smTDE
45.1	Gyg	25.5	14	0.362	smTDE
47.1	Ibk	50	19	1.682	FLG
1.1	Ibk	37	16	0.780	smTDE
2.1	Ibk	36	17	0.820	smTDE
7.1	Ibk	35	14	0.671	smTDE
8.1	Ibk	33	18	0.722	smTDE
28.1	Ibk	26	14	0.376	smTDE
18.1	Ibk	24	14	0.321	dsW
28.1	Ibk	24	9	0.230	smTDE
48.1	Pbd	50	19	1.682	FLG
26.2	Pbd	39	12	0.737	smTDE
28.1	Pbd	39	15	0.872	smTDE
11.1	Pbd	39	16	0.803	smTDE
14.2	Pbd	35	12	0.598	smTDE
28.1	Pbd	34	12	0.565	smTDE
26.2	Pbd	30	14	0.497	smTDE
1.1	Pbd	29	12	0.415	smTDE
27.1	Pbd	28	11	0.362	smTDE
3.1	Spg	48	18	1.494	smTDE
15.2	Spg	48	19	1.555	dsW
3.1	Spg	37	12	0.666	smTDE
15.2	Spg	32	13	0.533	dsW
3.1	Spg	29	10	0.361	smTDE
3.1	Spg	27	9	0.290	smTDE
3.2	Trp	38	15	0.829	smTDE
46.2	Trp	32	15	0.594	smTDE
46.2	Trp	29	9	0.333	smTDE
8.2	Twd	44	20	1.365	smTDE
8.2	Twd	42	16	1.057	smTDE
27.1	Wmy	39	15	0.872	smTDE
26.2	Wmy	35	13	0.635	smTDE
26.2	Wmy	32	10	0.435	smTDE
27.1	Wmy	30	15	0.523	smTDE
26.2	Wmy	29	12	0.415	smTDE
26.2	Wmy	27	12	0.361	smTDE
26.2	Wmy	26	14	0.376	smTDE
26.1	Wmy	22	11	0.226	smTDE

5.2 Harvestable Bole Volume

The following tables and figures show the primary bole volume that could be obtained if all the commercial timber were to be harvested using Single Tree Selection methods complying with the NSW PNF Code conditions. The projections are based on assumptions of land area and volume calculation methods as described earlier. Caveats regarding potential for unseen defect in large trees, and representativeness of plots for total landscape should be considered when necessary.

"Complying with the NSW PNF Code conditions" means that the modeling includes the previously described constraints which reduce Net Area to 300 ha, retention of 16m2/ha basal area (18 m2/ha in FLG forest type), and the retention of 20 habitat trees (HBT) per two hectares, including recruit trees taken from largest size cohort if hollow bearing trees are not present. In practice, slightly higher volumes than those predicted here may be obtained if some of the area (up to the maximum allowable 20%) is harvested in small patches, ie openings up to 2x tree height. Note that the PNF Code requires that satisfactory regeneration is obtained after harvest, and Group Selection operations should therefore ensure that a suitable seed bed and seed trees are available. An inspection was made of the NSW BioNet maps for rare and threatened species listed in Schedule 1 of the PNF Code and none were found listed for the subject property. Also, drainage and other landscape constraints are estimates and may change in actual practice. The projections are based on an unweighted area of 42 samples, and the data use in models and other calculations has been checked diligently. However the consultant cannot guarantee that application of the Code will be as assumed to permit the volume projections and estimates.

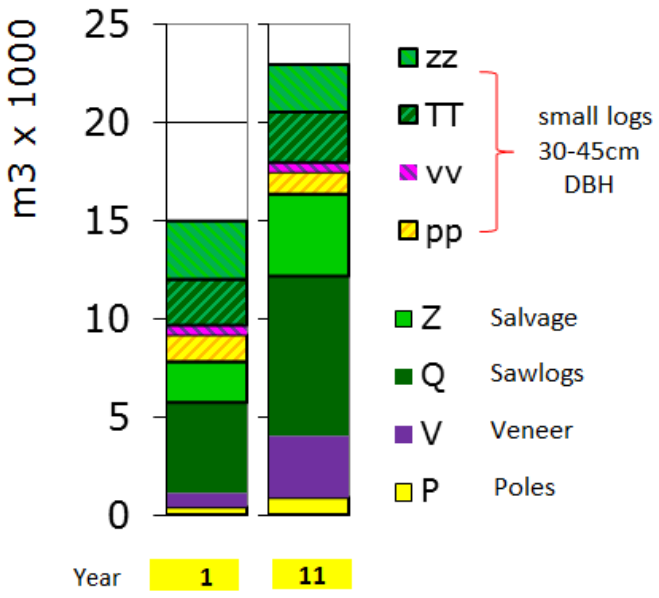
Two harvest timings are illustrated. These are (i) harvest during the next 12 months (year 1), and (ii) delaying harvest for 10 years (year 11).

The harvest was modeled as a Complete Commercial take, viz removal of all allowable trees with commercial product value >0, sawlogs larger than the designated minimum millable 30cm DBHOB, and small poles which passed spec down to 22cm DBHOB. No culling or thinning of unmerchantable trees was modeled to accompany harvest.

The Figures and Tables below are arranged in pairs. They show outcomes from harvest in EITHER Year 1 OR Year 11 . (ie they are alternative options, NOT sequential harvests).

(i) FIGURE total harvest volume estimates in year 1 or year 11 per 300 hectares.

See also further details in Table on next page.



(ii) TABLE total harvest volume estimates in year 1 or year 11,
per 300 hectares.

[redacted]
Volume x Log Grade
per 300 logged hectares

Grade	Type	Description	m3/ha	PNF Code complying Harvest Volume VOL m3	90% confidence interval	Tree N	per ha average harvest
P	Large P	Poles	1.4	420	± 86%	246	0.8
V	Large V	Veneer	2.4	734	± 52%	594	2.0
Q	Large Q	Sawlogs	15.1	4,545	± 29%	3,492	11.6
Z	Large Z	Salvage	6.9	2,084	± 37%	2,032	6.8
pp	small P	small Poles	4.8	1,434	± 58%	2,313	7.7
vv	small V	small Veneer	1.4	415	± 70%	524	1.7
TT	Small Q	Thinnings	7.9	2,381	± 28%	4,514	15.0
zz	Small Z	Small Salvage	10.0	2,991	± 31%	7,625	25.4
Merch.Vol	*total Merchantable grades*		50.0	***15,003***	± 16%	21,340	71.1

Year 1

average tree volume

Large =>45cm DBH 0.70 m3/tree
Small = 30-45cm DBH

[redacted]
Volume x Log Grade
per 300 logged hectares

Grade	Type	Description	m3/ha	PNF Code complying Harvest Volume VOL m3	90% confidence interval	Tree N	per ha average harvest
P	Large P	Poles	3.0	909	± 75%	614	2.0
V	Large V	Veneer	10.3	3,088	± 32%	2,104	7.0
Q	Large Q	Sawlogs	27.4	8,208	± 19%	5,786	19.3
Z	Large Z	Salvage	13.9	4,172	± 25%	3,708	12.4
pp	small P	small Poles	3.7	1,122	± 50%	1,757	5.9
vv	small V	small Veneer	1.7	514	± 95%	617	2.1
TT	Small Q	Thinnings	8.6	2,579	± 36%	4,050	13.5
zz	Small Z	Small Salvage	7.9	2,365	± 30%	6,085	20.3
Merch.Vol	*total Merchantable grades*		76.5	***22,957***	± 12%	24,721	82.4

Year 11

average tree volume

Large =>45cm DBH 0.93 m3/tree
Small = 30-45cm DBH

The average commercial volume increase , or merchantable Mean Annual Increment MAI projected by the EUCAMIX model for stands in their current condition, is therefore

(76.5-50.0)/10 = 2.65 m3/ha/yr merch MAI.

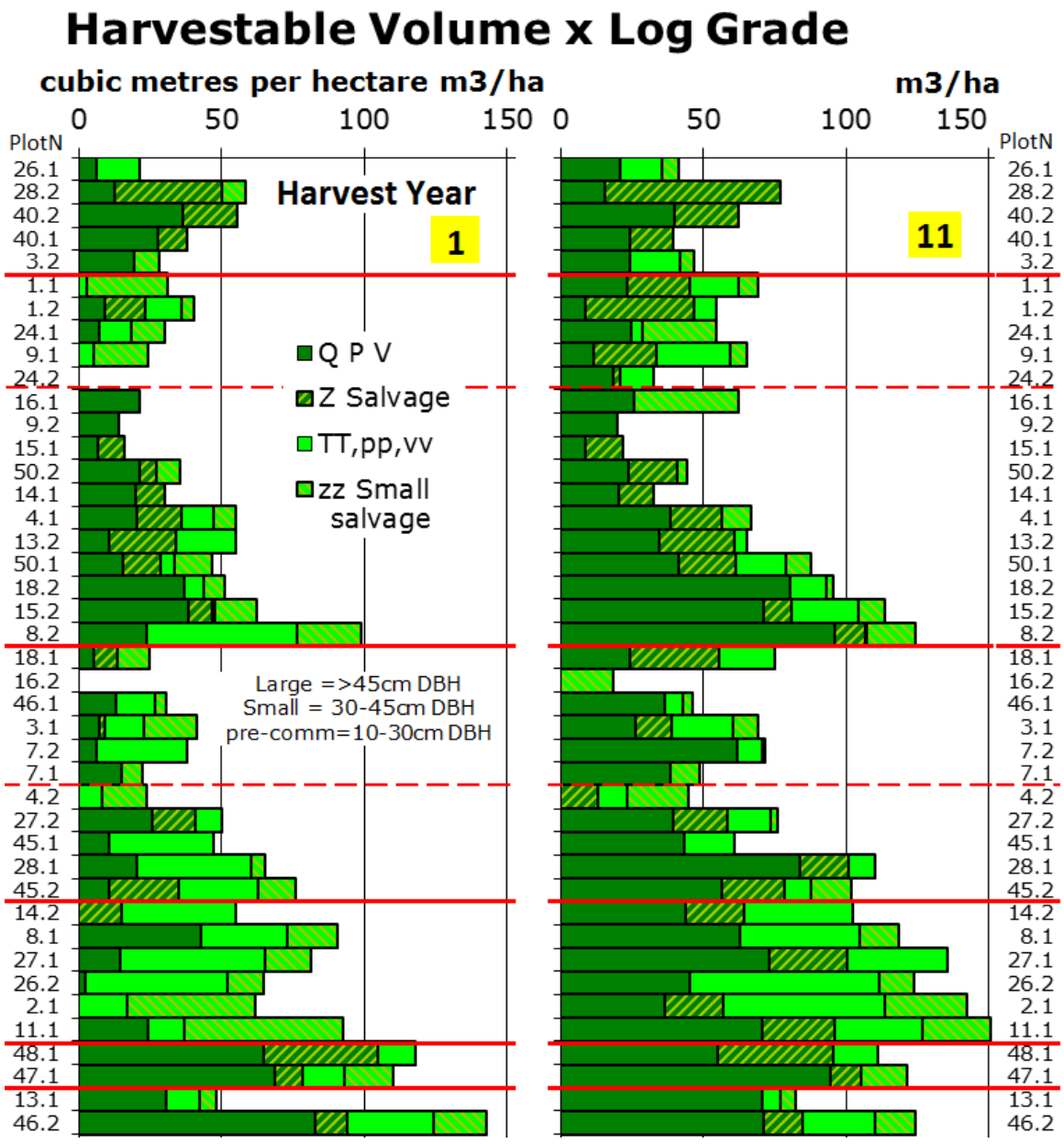
(iii) TABLE volume breakdown by plot and product type

Note the following tables are intended for on-screen viewing with enlargement of small print.

						Harvestable	VOLUMES per ha available for harvest								Tree Numbers per ha available for harvest							
				1		Plot	Year 1 available harvest :PNF Code compliance															
	Forest		POST HARVEST		Site	Volume	small sawlogs & Poles				large sawlogs & Poles				small sawlogs & Poles				large sawlogs & Poles			
plot	Type	SQ	SBAyr0	SBAyr1	Height	m3/ha	zz	TT	pp	vv	Z	Q	P	V	zz	TT	pp	vv	Z	Q	P	V
26.1	smTDE	46	32.0	27.8	37	22	-	5	-	10	-	6	-	-	-	12	-	16	-	5	-	-
28.2	smTDE	46	28.0	18.9	30	59	8	-	-	-	38	-	-	13	14	-	-	-	31	-	-	8
40.2	MCE	47	30.0	20.1	45	56	-	-	-	-	19	37	-	-	-	-	-	-	19	13	-	-
40.1	MCE	47	24.0	19.0	44	38	-	-	-	-	10	28	-	-	-	-	-	-	3	13	-	-
3.2	smTDE	32	30.0	23.7	36	28	9	-	0	-	-	9	-	10	25	-	0	-	-	11	-	9
1.1	smTDE	45	28.0	22.6	29	31	29	-	3	-	-	-	-	-	59	-	6	-	-	-	-	-
1.2	smTDE	45	33.0	22.2	29	40	5	12	-	-	15	9	-	-	14	42	-	-	26	11	-	-
24.1	dsW	42	26.0	21.1	37	30	12	11	-	-	-	7	-	-	49	16	-	-	-	7	-	-
9.1	smTDE	47	28.0	23.5	33	24	19	5	-	-	-	-	-	-	42	11	-	-	-	-	-	-
24.2	dsW	42	15.0	16.0	29	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16.1	dsW	44	20.0	18.6	35	22	-	-	-	-	-	22	-	-	-	-	-	-	-	17	-	-
9.2	smTDE	47	18.0	18.0	33	14	-	-	-	-	-	14	-	-	-	-	-	-	-	13	-	-
15.1	dsW	43	22.0	18.8	30	16	-	-	-	-	9	7	-	-	-	-	-	-	8	4	-	-
50.2	smTDE	41	24.0	18.7	35	36	8	-	-	-	6	6	-	15	26	-	-	-	10	4	-	11
14.1	smTDE	47	28.0	22.2	45	30	-	-	-	-	10	20	-	-	-	-	-	-	6	10	-	-
4.1	smTDE	44	32.0	18.8	29	55	7	-	-	11	15	21	-	-	16	-	-	15	21	25	-	-
13.2	smTDE	39	26.0	18.0	37	55	-	7	-	13	23	11	-	-	-	15	-	13	19	10	-	-
50.1	smTDE	41	31.0	21.0	31	47	13	5	-	-	13	16	-	-	54	14	-	-	15	19	-	-
18.2	dsW	46	28.0	19.5	35	51	7	7	-	-	-	22	-	15	23	10	-	-	-	21	-	11
15.2	dsW	43	32.0	21.8	37	63	15	0	0	-	8	20	18	-	50	1	1	-	9	17	11	-
8.2	smTDE	44	42.0	26.7	39	99	22	17	35	-	-	24	-	-	46	15	28	-	-	21	-	-
18.1	dsW	46	22.0	19.8	34	25	11	-	-	-	8	6	-	-	19	-	-	-	7	7	-	-
16.2	dsW	44	16.0	17.0	30	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
46.1	smTDE	46	26.0	20.5	41	31	4	13	-	-	-	-	-	13	32	27	-	-	-	-	-	12
3.1	smTDE	32	26.0	20.0	35	42	19	-	3	10	2	3	5	-	30	-	8	14	3	2	3	-
7.2	smTDE	44	24.0	18.6	40	38	-	32	-	-	-	6	-	-	-	28	-	-	-	10	-	-
7.1	smTDE	44	21.0	19.1	33	22	7	-	-	-	-	13	-	3	20	-	-	-	-	12	-	2
4.2	smTDE	44	26.0	21.7	31	24	16	8	-	-	-	-	-	-	54	44	-	-	-	-	-	-
27.2	smTDE	46	28.0	19.4	30	50	-	9	-	-	15	11	-	15	-	16	-	-	20	13	-	13
45.1	smTDE	46	32.0	24.3	29	47	-	25	11	-	-	11	-	-	-	73	30	-	-	8	-	-
28.1	smTDE	46	34.0	23.2	30	65	5	10	30	-	-	11	-	9	12	15	54	-	-	10	-	10
45.2	smTDE	46	34.0	22.7	34	76	13	15	-	13	24	11	-	-	32	46	-	15	15	6	-	-
14.2	smTDE	47	28.0	20.4	34	55	-	21	19	-	15	-	-	-	-	31	25	-	14	-	-	-
8.1	smTDE	44	45.0	25.4	30	91	18	25	5	-	-	43	-	-	76	43	7	-	-	44	-	-
27.1	smTDE	46	35.0	23.3	30	81	16	24	26	-	-	4	-	10	25	39	40	-	-	2	-	8
26.2	smTDE	46	33.0	25.4	30	65	13	3	46	-	-	2	-	-	20	7	87	-	-	3	-	-
2.1	smTDE	43	43.0	32.7	36	62	45	12	5	-	-	-	-	-	116	23	6	-	-	-	-	-
11.1	smTDE	44	40.0	24.4	39	93	55	13	-	-	-	24	-	-	99	14	-	-	-	20	-	-
48.1	FLG	39	44.0	18.9	44	118	-	13	-	-	40	47	18	-	-	23	-	-	47	27	10	-
47.1	FLG	45	42.0	24.9	34	110	17	14	-	-	10	51	18	-	23	13	-	-	3	24	10	-
13.1	smTDE	39	26.0	19.6	34	48	6	11	-	-	-	31	-	-	24	14	-	-	-	18	-	-
46.2	smTDE	46	50.0	26.2	44	143	18	14	17	-	11	83	-	-	66	39	32	-	10	61	-	-

						Harvestable	VOLUMES per ha available for harvest								Tree Numbers per ha available for harvest							
				2		Plot	Year 11 available harvest :PNF Code compliance															
	Forest		POST HARVEST		Site	Volume	small sawlogs & Poles				large sawlogs & Poles				small sawlogs & Poles				large sawlogs & Poles			
plot	Type	SQ	SBAyr0	SBAyr11	Height	m3/ha	zz	TT	pp	vv	Z	Q	P	V	zz	TT	pp	vv	Z	Q	P	V
26.1	smTDE	46	32.0	27.8	37	42	6	14	1	-	-	8	-	13	33	21	2	-	-	5	-	14
28.2	smTDE	46	28.0	18.9	30	77	-	-	-	-	61	-	-	16	-	-	-	-	41	-	-	7
40.2	MCE	47	30.0	20.1	45	63	-	-	-	-	22	40	-	-	-	-	-	-	19	12	-	-
40.1	MCE	47	24.0	19.0	44	39	-	-	-	-	15	24	-	-	-	-	-	-	4	11	-	-
3.2	smTDE	32	30.0	23.7	36	47	5	-	18	-	-	11	-	13	11	-	16	-	-	10	-	8
1.1	smTDE	45	28.0	22.6	29	69	7	6	10	-	22	-	24	-	15	14	18	-	27	-	17	-
1.2	smTDE	45	33.0	22.2	29	55	-	8	-	-	38	9	-	-	-	21	-	-	51	9	-	-
24.1	dsW	42	26.0	21.1	37	55	26	4	-	-	-	25	-	-	59	8	-	-	-	22	-	-
9.1	smTDE	47	28.0	23.5	33	65	6	26	-	-	22	12	-	-	20	33	-	-	17	19	-	-
24.2	dsW	42	15.0	16.0	29	33	-	12	-	-	3	18	-	-	-	18	-	-	8	16	-	-
16.1	dsW	44	20.0	18.6	35	62	37	-	-	-	-	26	-	-	112	-	-	-	-	14	-	-
9.2	smTDE	47	18.0	18.0	33	20	-	-	-	-	-	20	-	-	-	-	-	-	-	12	-	-
15.1	dsW	43	22.0	18.8	30	22	-	-	-	-	13	9	-	-	-	-	-	-	8	4	-	-
50.2	smTDE	41	24.0	18.7	35	44	4	-	-	-	17	6	-	18	15	-	-	-	22	3	-	9
14.1	smTDE	47	28.0	22.2	45	33	-	-	-	-	12	21	-	-	-	-	-	-	6	9	-	-
4.1	smTDE	44	32.0	18.8	29	67	10	-	-	-	18	25	-	14	14	-	-	-	18	23	-	13
13.2	smTDE	39	26.0	18.0	37	65	-	4	-	-	26	19	-	15	-	17	-	-	15	20	-	11
50.1	smTDE	41	31.0	21.0	31	88	9	17	-	-	20	41	-	-	30	20	-	-	19	37	-	-
18.2	dsW	46	28.0	19.5	35	96	2	13	-	-	-	62	-	18	7	14	-	-	-	37	-	8
15.2	dsW	43	32.0	21.8	37	113	9	-	-	23	10	44	-	26	26	-	-	21	8	33	-	10
8.2	smTDE	44	42.0	26.7	39	124	17	0	-	-	11	53	43	-	31	2	-	-	13	39	24	-
18.1	dsW	46	22.0	19.8	34	75	-	7	13	-	31	24	-	0	-	9	27	-	32	23	-	0
16.2	dsW	44	16.0	17.0	30	18	18	-	-	-	-	-	-	-	61	-	-	-	-	-	-	-
46.1	smTDE	46	26.0	20.5	41	46	3	6	-	-	-	21	-	15	24	26	-	-	-	24	-	10
3.1	smTDE	32	26.0	20.0	35	69	9	-	4	18	12	3	-	23	11	-	10	25	15	2	-	16
7.2	smTDE	44	24.0	18.6	40	72	1	9	-	-	-	62	-	-	6	16	-	-	-	39	-	-
7.1	smTDE	44	21.0	19.1	33	48	10	-	-	-	-	23	-	16	27	-	-	-	-	12	-	12
4.2	smTDE	44	26.0	21.7	31	45	22	10	-	-	13	-	-	-	57	16	-	-	13	-	-	-
27.2	smTDE	46	28.0	19.4	30	76	2	0	15	-	19	17	-	22	12	1	15	-	19	12	-	12
45.1	smTDE	46	32.0	24.3	29	61	-	11	6	-	-	43	-	-	-	27	13	-	-	38	-	-
28.1	smTDE	46	34.0	23.2	30	110	-	1	8	-	17	31	25	28	-	6	19	-	21	23	15	28
45.2	smTDE	46	34.0	22.7	34	102	14	6	4	-	22	25	-	31	25	17	9	-	11	23	-	29
14.2	smTDE	47	28.0	20.4	34	102	-	24	14	-	20	23	-	20	-	28	17	-	16	17	-	13
8.1	smTDE	44	45.0	25.4	30	119	14	40	2	-	-	63	-	-	52	42	2	-	-	61	-	-
27.1	smTDE	46	35.0	23.3	30	135	-	14	21	-	28	17	-	56	-	21	28	-	22	13	-	40
26.2	smTDE	46	33.0	25.4	30	124	12	-	35	31	-	11	-	34	15	-	56	40	-	16	-	28
2.1	smTDE	43	43.0	32.7	36	142	29	56	-	-	20	17	20	-	65	74	-	-	17	16	16	-
11.1	smTDE	44	40.0	24.4	39	150	24	31	-	-	25	44	16	11	44	38	-	-	21	28	13	9
48.1	FLG	39	44.0	18.9	44	111	-	16	-	-	40	34	-	21	-	24	-	-	38	18	-	8
47.1	FLG	45	42.0	24.9	34	122	16	-	-	-	11	73	-	21	14	-	-	-	12	33	-	9
13.1	smTDE	39	26.0	19.6	34	83	6	6	-	-	-	71	-	-	17	12	-	-	-	34	-	-
46.2	smTDE	46	50.0	26.2	44	124	14	18	8	-	13	71	-	-	48	44	13	-	8	42	-	-

(iv) FIGURE volume breakdown by plot and product type



(v) species composition of projected harvests

species proportions in Harvest Volumes

Year 1	LARGE		small	
Spp	QPV	Z	TT,pp,vv	zz
BBX	13%	19%	15%	7%
FLG	21%	4%	5%	2%
GYG	4%	0%	10%	15%
HPP	3%	0%	0%	0%
IBK	3%	4%	7%	7%
PBD	13%	33%	23%	12%
SBG	9%	6%	8%	0%
SPG	21%	10%	4%	2%
TRP	3%	7%	3%	27%
TWD	3%	4%	9%	17%
WMY	7%	14%	16%	12%

species proportions in Harvest Volumes

Year 11	LARGE		small	
Spp	QPV	Z	TT,pp,vv	zz
BBX	10%	11%	22%	9%
FLG	12%	2%	1%	5%
GYG	5%	7%	9%	8%
HPP	2%	0%	0%	0%
IBK	7%	6%	4%	4%
PBD	20%	29%	27%	15%
SBG	10%	2%	3%	0%
SPG	17%	7%	11%	3%
TRP	2%	8%	7%	26%
TWD	6%	15%	0%	19%
WMY	9%	14%	15%	12%

species volumes

Year 1	LARGE		small	
Spp	QPV	Z	TT,pp,vv	zz
BBX	726	387	645	200
FLG	1,194	78	226	52
GYG	202	-	422	451
HPP	161	-	-	-
IBK	180	73	309	204
PBD	721	684	966	355
SBG	531	129	321	-
SPG	1,185	202	150	75
TRP	181	151	119	799
TWD	199	91	381	504
WMY	418	288	689	352

TOTAL m3	QPV	Z	TT,pp,vv	zz
15,003	5,698	2,084	4,229	2,991

species volumes

Year 11	LARGE		small	
Spp	QPV	Z	TT,pp,vv	zz
BBX	1,224	446	941	202
FLG	1,490	95	62	117
GYG	588	274	393	191
HPP	276	-	-	-
IBK	815	257	182	90
PBD	2,483	1,226	1,122	353
SBG	1,172	97	137	-
SPG	2,079	284	450	61
TRP	183	315	285	617
TWD	761	608	4	448
WMY	1,132	572	639	286

TOTAL m3	QPV	Z	TT,pp,vv	zz
22,957	12,205	4,172	4,215	2,365

The broad species composition in harvest is changed only slightly with time. Most of the volume change occurs with DBH growth rather than recruitment from smaller sizes.

Notable changes include

- Transition in size class TWD Z grade from small to large categories
- Transition in size class and growth in size of large PBD Q grades
- Relatively slow increase in volume of large FLG Q grade
- SPG recruits transition into small commercial logs

6. Conclusions

In relation to the brief provided, it is my opinion that:-

i. mapping of land quality, forest types, and harvestable area.

The property contains commercial forest types on moderate to high site quality, Around 300 ha appears to be available now for harvest, after considering area constraints effected by the NSW PNF Code. Some areas of the property will have low standing volumes due to dieback, lantana dominance, and past logging history.

ii. assess total standing timber volumes, with plot summaries and breakdown by log grade, volume and main species.

Average standing bole volumes are around 140m3 per hectare (90% confidence limits ±9% of mean).

iii. brief notes on silvicultural options and strategies to comply with NSW PNF Code (Code of Practices for Private Native Forestry; Northern NSW as at Sept 2013)

(see Appendix 2 below)

iv. estimate immediately available commercial harvest volume allowable under NSW PNF Code

About 50 m3/ha ±16% of this is likely to be available for harvest under the NSW PNF Code rules in the next 12 months.

v. project future volumes in response to harvest and silviculture strategy

If no harvest was undertaken now, the property may continue growing new commercial timber bole volume at the rate of around 2.65 m^3/ha/yr, and the average harvest yield in 10 years time could be 76 m3/ha ±12%.

Yours sincerely,

Alex Jay

(B.Sc[For] Dip.Ag.Econ)

BlueChip forest services

Disclaimer and cautions: The consultant has used its best endeavors to survey the forest in the subject property in accordance with recognized sampling methods. However not all areas of the forest could be accessed, and outcomes may vary if the unseen parts of the forest are different to the sampled parts . The results of survey, analysis and projection of complex biological systems such as forests will contain errors and uncertainties arising from factors such as statistical variation in forest structure and hidden defect in log grade, and these uncertainties may cause present and future outcomes to be different from those reported here. Future volume projections are estimates based on assumptions about climate and tree growth contained within the EUCAMIX model, and other methods and assumptions stated in the report. Private Native Forestry and environmental regulations have been considered to the extent indicated in this report, however a full environmental investigation was beyond the scope of the report.

Appendix 1

1. Plot details

STAND TABLE

Basal Area m2/ha by Size DBH class cm

plotN	Type	SQ	m2/ha SBA	m Height	Lat	Long	Altitude	Volume GROUP	10_25	25_40	40_55	55_70	70_85	85_100	100+
24.1	dsW	42	26	37	[redacted]		297	2	4	14	4	2	0	2	0
15.2	dsW	43	32	37				2	8	10	6	4	4	0	0
16.1	dsW	44	20	35			296	2	8	0	4	2	6	0	0
18.2	dsW	46	28	35				2	10	8	8	2	0	0	0
18.1	dsW	46	22	34			353	3	6	8	8	0	0	0	0
15.1	dsW	43	22	30			239	2	8	4	2	4	2	2	0
16.2	dsW	44	16	30				3	10	4	0	2	0	0	0
24.2	dsW	42	15	29				2	3	4	6	2	0	0	0
48.1	FLG	39	44	44	[redacted]		324	5	6	8	16	6	6	2	0
47.1	FLG	45	42	34			359	5	10	6	8	6	4	4	4
40.2	MCE	47	30	45				1	2	2	2	6	4	8	6
40.1	MCE	47	24	44	[redacted]		306	1	8	0	0	4	8	2	2
14.1	smTDE	47	28	45	[redacted]		261	2	8	6	0	2	6	2	4
46.2	smTDE	46	50	44				6	10	22	10	8	0	0	0
46.1	smTDE	46	26	41			327	3	6	6	6	0	2	0	6
7.2	smTDE	44	24	40				3	8	0	8	4	2	2	0
8.2	smTDE	44	42	39				2	14	10	18	0	0	0	0
11.1	smTDE	44	40	39	[redacted]		305	4	6	22	10	2	0	0	0
26.1	smTDE	46	32	37			329	1	8	12	2	4	2	2	2
13.2	smTDE	39	26	37				2	6	2	14	2	2	0	0
3.2	smTDE	32	30	36				1	10	12	4	2	2	0	0
2.1	smTDE	43	43	36	[redacted]		245	4	18	21	4	0	0	0	0
50.2	smTDE	41	24	35				2	4	6	8	4	2	0	0
3.1	smTDE	32	26	35			321	3	4	10	12	0	0	0	0
45.2	smTDE	46	34	34				3	10	10	6	2	2	2	2
14.2	smTDE	47	28	34				4	4	8	6	2	6	2	0
13.1	smTDE	39	26	34	[redacted]		267	6	4	8	6	6	2	0	0
9.1	smTDE	47	28	33			276	2	4	16	6	2	0	0	0
9.2	smTDE	47	18	33				2	4	4	4	2	2	0	2
7.1	smTDE	44	21	33	[redacted]		219	3	5	8	5	3	2	0	0
50.1	smTDE	41	31	31			311	2	2	13	12	4	0	0	0
4.2	smTDE	44	26	31				3	8	12	4	2	0	0	0
28.2	smTDE	46	28	30				1	4	8	8	2	4	0	2
27.2	smTDE	46	28	30				3	6	8	10	4	0	0	0
28.1	smTDE	46	34	30	[redacted]		351	3	8	8	8	4	4	0	2
8.1	smTDE	44	45	30			243	4	12	15	16	2	0	0	0
27.1	smTDE	46	35	30			267	4	6	17	6	6	0	0	0
26.2	smTDE	46	33	30				4	7	22	4	0	0	0	0
1.1	smTDE	45	28	29	[redacted]		312	2	8	14	6	0	0	0	0
1.2	smTDE	45	33	29				2	8	11	10	4	0	0	0
4.1	smTDE	44	32	29	[redacted]		347	2	8	6	8	6	4	0	0
45.1	smTDE	46	32	29			359	3	8	14	0	2	2	2	4

2. Species names and abbreviations

Spp Code	Quality*	Pole S.D*	Common name	Latin name
BBX	2		Brush Box	Lophostemon confertus
FLG	1		Flooded Gum	Eucalyptus grandis
IBK	2	1.1	Grey Ironbark	Eucalyptus siderophloia /E.paniculata
GYG	2	1.1	Grey Gum	Eucalyptus propinqua /E.punctata
HPP	1		Hoop Pine	Araucaria cunninghamii
PBD	2	3.1	Pink Bloodwood	Corymbia intermedia
SBG	1		Sydney Blue Gum	Eucalyptus saligna
SPG	1	2.2	Spotted Gum	Eucalyptus maculata
TRP	2	3.1	Turpentine	Syncarpia glomulifera
TWD	1	2.1	Tallowwood	Eucalyptus microcorys
WMY/NMY	2	2.1	White Mahogany	Eucalyptus acmenioides / E. umbra
FOK	5		Forest Oak	Allocasuarina torulosa
RAP	3		Roughbarked Apple	Angophora floribunda
RF	5		Rainforest sp group	(Various)
WAT	5		Wattle group	Acacia spp.

* Quality= 1(Hi) -5(Lo); species 1 & 2 are grouped as "Commercial" for this report.

Pole S.D = Strength.Durability rating; 1= high

DED = dead trees, which are recorded but excluded from volume and other figures

Appendix 2

(iii) Silvicultural options and strategies

The harvest analyses here have assumed complete commercial harvest and no culling or stand reset activities. Whilst this minimises operating costs in the short term, it is likely that long-term forest productivity will decline without silviculture aimed to promote regeneration and release regrowth.

Future forest harvesting may be a mix of Single Tree Selection STS and Group selection AGS which results in a stand reset.

Retained trees following an STS operation will include some with commercial potential in sizes too small for sale at time of the initial logging. Some of these can be harvested in the next logging (15-20 years later), by both STS and AGS. The PNF Code would allow another ~20% of land area to be harvested by AGS at that time. Assuming that both the first and second logging included AGS as 20% of land area, then after the second logging, some 64% of land area will have been logged twice by STS . (ie 80% x 80%). Given (a) the current state of the forest and (b) the PNF Code requirements for basal area and habitat tree retention, it is likely (and has been confirmed by inspection of EUCAMIX growth model outputs) that areas which receive two consecutive STS loggings will have almost no remaining trees (or regrowth) with commercial potential. Stands in this condition will only become commercially productive again some 25-30 years after a full "stand reset" (AGS plus cull) operation.

In order to maximize pole output, most of the forest would need to be harvested and intensively culled of defective, non-commercial or non-vigorous stems in order to promote fresh regeneration. The pole-maximising regime would be a mainly even-aged stand of commercial species, with any retained, non-commercial seed trees culled by poisoning once the new saplings reach around 2-3 metres in height and are clear of weeds, and the developing pole stand thinned regularly through to maturity. Such a regime could only be implemented in accordance with the PNF Code prescriptions, (ie under Group Selection and gap creation criteria and constraints for 20% of land area, maximum openings around 0.2ha with 20 habitat trees per two hectares retained in untreated areas). An exemption may be sought by application.

To maximize seedling regeneration opportunity, there are two possibilities for seedbed preparation. A low intensity controlled burn can be carried out in late Winter, or as late in the year as seasonal conditions allow before the main local Fire Danger period of October/November. The fire will make the ground receptive for seed shed in Spring to early summer (local phenology and status of seed crops to be confirmed, but in general terms seed is shed during extended dry periods as the capsules become fully opened. Blackbutt usually has some viable seed in the canopy around the year, but peak seedfall is commonly late Spring with hot dry weather). Note: A Hazard Reduction Certificate for prescribed burning must be obtained from the Rural Fire Service prior to burning. The alternative to burning may be to use mechanical disturbance (eg tracked crawler and root rake). Mechanical disturbance has some advantages including avoiding risk of fire escape, more timing flexibility, and less stimulation of wattle germination. Containing fire within the property boundaries may prove difficult in some areas.

Ensuring that silvicultural treatments are timed to coincide with seed set is very important. Eucalyptus (and the closely related Corymbia) regeneration depends on processes that need to operate synchronously or at particular times. It can fail if any one of these processes fails. Trees have to flower, flowers have to be pollinated, and then set viable seed. Once the seed matures, the capsules need to dry out enough to open for seed dispersal, and once shed, the seed must escape predation (mainly by ants) and fungal attack, fall on a receptive bed (mineral soil or ash), and then experience favourable conditions (temperature, rain, sunlight, absence of grazing) for germination and early growth through to seedling stage. Once established however, the lignotuberous species are extremely resilient.

The presence of seed is not certain in any given year. Eucalypt (and Corymbia) seed production cycles are irregular, with trees producing heavy crops only once every two to four years. There may also be more than one year between flowering and seed maturity, and in some cases (seasonal conditions) early-mature capsules with viable seed may be retained on trees for more than one year before opening to release the seed. Timing of a silvicultural re-set operation will therefore need some advance planning to ensure full regeneration, especially of the non-lignotuberous Flooded Gum.

Further silvicultural prescription will depend on the nature and status of the regrowth, but in general terms is likely to involve

- non-commercial thinning to around 4 to 5 m spacing when saplings in AGSS spaces reach canopy closure (eg at heights of 2 to 5m depending on density).
- further thinning of the weakest 25-40% of basal area when stand basal areas reach about 10m2/ha (mean DBH 15-18cm). Depending on density this may be 6 -10 years later. This should bring the average spacing down to about 7 m average between trees, or 200 crop trees per hectare.
- Subsequent thinning on commercial basis.
- Understorey control (which can include grazing and fire) may be desirable after the final non-commercial thinning. The success of regeneration activity will depend on lantana and weed control.