Submission to Productivity Commission Inquiry:

Impacts of Native Vegetation and Biodiversity Regulations

Some comments on the draft report dated December 2003

Submitted by

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Following are some comments on the draft Productivity Commission report (draft report). The comments are mainly in regard to Appendix K and the impacts of thickening in the Murweh Shire. These comments are based on information in the draft report and other published documents that are cited in the submission.

1. Overestimate of the amount of thickening that is prevented by Business as Usual Scenario

It is difficult for me to reconcile the size of the impacts of thickening (Table K4) with the fact that most of the loss of productivity due to thickening associated with the Policy Option scenario will also occur under the Business As Usual scenario (BAU). It is also not clear, to me, how the diminution of a current average annual return of $2.60/ha/annum (Table K1) on uncleared land due to thickening can result in a total cost of $55/ha (Table K4) while the prevention of clearing and the associated increase in current returns of $13/ha/annum (Table K1) results in a total cost of $51/ha/annum.

As there is not enough information for me to determine exactly how the impacts of thickening were calculated in the report, below I will explain how I think the costs due to thickening should manifest themselves.

Under BAU, thickening will occur on all remnant vegetation less the amount that has been cleared at a particular time. Thus, in the first year of BAU thickening will occur on 1.7 million – x1 ha, in the 2nd year 1.7 – x1 – x2 million ha 3rd year 1.7 – x1 – x2 – x3 million ha etc. (where x is the amount cleared in year 1, 2 3 etc). As most of the drop off in productivity associated with the thickening in the Draft PC report (Figure K1) occurs quickly, 90 % of productivity is lost well before most of the remnant vegetation is cleared under BAU. Thus if the projections in Table K4 are accurate, the productivity of the region is in imminent and drastic decline, with or without a ban on broadacre clearance.

The differences in impacts of thickening between the policy option and BAU only manifest themselves when land is cleared (unless all non cleared land was thinned every year to compensate for any thickening or the BAU rate of clearing was drastically increased). Therefore an appropriate way to allow for any impacts of thickening is by incorporating an increased differential in the returns between cleared and uncleared land (Table K.1) over time. This could be done by using the initial differential in returns (assuming they equate with the initial mean FPC) but then adjusting this each year to

allow for any thickening that is deemed to occur using information from Kelly and Beale (2003).

2. Error in FPC for Murweh shire which demonstrates the sensitivity of Carry Capacity estimates to input variables.

The highly asymptotic relationship between FPC and WI (Figure 1, in Kelly & Beale) means that the changes in carrying capacity are highly sensitive to the assumptions and accuracy of input variables.

Following is an example of where a small error made by Kelly & Beale (2003) in the initial FPC results in an erroneous estimate of the reduction in carrying capacity after 2003.

Kelly and Beale (2003) state that the SLATS FPC figure was for 2001 when it is actually for 1997[1]. Thus the 23.6% FPC figure should be extrapolated from 1997 rather than 2003. Using the 23.6% FPC in 1997 and the mean thickening rate of 1% per annum and data from table 1 in Kelly & Beale (2003), then;

- the mean FPC has already increased to 29.6% by 2003 and therefore;
- the carrying capacity (CC), would already have decreased from 0.328 DSE/ha to 0.212 DSE/ha (derived from Kelly & Beale 2003, Table 1) by this date;
- the mean FPC increase due to a 'ban on broad scale clearing' from 2003 – 2017 would be from 29.6% to 43.6% and;
- this would be associated with a decrease in carrying capacity from 0.126 (0.212 – 0.086) DSE/ha rather than the 0.216 (0.328 – 0.112) figure in Kelly and Beale (2003).
- This would be followed by a much smaller decrease in CC from 2017 – 2023 (calculation for this latter period requires extrapolation of Figure 1 and Table 1

[1] The SLATS project uses 1991 imagery as a baseline for woody vegetation cover and FPC calculations. The FPC calculations are calibrated against field data obtained in 1996 – 1998 (Kuhnell *et al.* 1998; SLATS, undated). Therefore the FPC figures are for about 1997, the average time of the field work used in their calibration. The SLATS project updates the extent (not FPC) of woody vegetation in subsequent years (i.e. '95, '97, '99, 2000, '01 - see SLATS 1999a and other reports listed in that series in the references below). If this were not the case, SLATS would be able to provide a comprehensive estimate of changes in FPC on uncleared lands between 1991 and 2001!

but the asymptotic relationship means annual changes would be less than 0.005 DSE per year).

The above discrepancy is not as important if a smaller rate of thickening is used (see below). However, it does show the sensitivity of some of the outputs to small variations in input variables. Thus the sensitivity analysis in the draft report (page 514) should be expanded to include to sensitivity to variations in these inputs where they have unknown accuracy.

3. Overestimate of the rate and extent of thickening

While the occurrence of thickening in the Murweh Shire is not questioned, the rate, extent and therefore any resulting calculation of discounted costs, appears to be exaggerated.

Average FPC in the shire is quoted as 25.6% in 2003. This, combined with the 1% increase in FPC implies that this vegetation has gone from grassland to dense woodland over the last 25 years. This implies that either thickening has only commenced in the last 25 years or that clearing rates have been a lot (2-3 times) higher than those recorded by SLATS over the 1991 – 2001 period (500, 000 ha for Murweh shire, see SLATS, 2003 and previous reports in that series).

The 1% figure used in the draft report has been derived from interpretation of 1960's – 1990's aerial photography at unknown locations and unspecified accuracy ('approximately 1%' Kelly and Beale 2003). The use of aerial photography has proven to be an accurate way to estimate rates of crown thickening (Fensham *et al.* 2002) but its interpretation needs to be calibrated against ground sites. This is because the relationship between photo and on-ground cover is not one to one, nor linear and other factors such as scale and land type must be accounted for (see Fensham *et al.* 2002).

Furthermore, although the description of the methodology used to estimate changes in vegetation cover in Kelly and Beale (2003) is vague, it is difficult to see how, in the absence of field calibration, it is not more closely related to an estimate of changes in Crown Cover as opposed to FPC (e.g. Fensham *et al.* 2002 measure changes in crown cover from aerial photos).[2] The relationship between foliage and crown cover varies with

[2] The difference between Crown Cover and FPC are well know to anyone familiar with the description and classification of vegetation cover in Australia. However, the draft Productivity Commission report refers to FPC as 'a measure of crown cover' (App. K). Figure 1 in Kenny and Beale (2003) labels the x axis as FPC while the identical figure in Property Rights Australia (2003, figure 3a, attributed to Beale, 1999) labels the x axis 'Tree Cover (%)' and refers to it in the text as 'canopy cover'. This variable use of these terms is

crown type. 'Foliage Cover' (*sensu* Walker and Hopkins 1990) is typically around 0.5 – 0.6 of Crown Cover (Walker & Hopkins, 1990, tables 14a and 17) while the FPC measure used by SLATS (which is equivalent to 'Projected Foliage Cover' defined in Walker and Hopkins, 1990) is lower.

The 1% annual increase used in the draft report is substantially larger than published studies to the east of the Murweh shire. Fensham *et al.* (2003, table 3) have shown the mean rate of crown cover increase in uncleared eucalypt woodlands over a 44 year period in central Queensland was 0.14 % (± SE 0.02) per annum (which equates to an FPC of about 0.08%). This was associated with a mean basal area increase of 0.51 m2/ha. Burrows *et al.* (2003) have estimated a mean rate of increase in basal area of eucalypt woodlands across a wider range of environments as 1.06m^2/annum (± SE 2.17) over a 14.4 year period. Burrows *et al.* (2003) did not measure changes in foliage or crown cover but their basal area figure would be expected to equate to an FPC change of about 0.2%/annum[3]. Although it is difficult to extrapolate from these studies to Murweh shire and there is a large discrepancy between the Fensham *et al.* (2003) and Burrows *et al.* (2003) figures, both are substantially lower than the 1% figure used in the draft PC report (In higher mean rainfall associated with the Burrows *et al.* (2003) and Fensham *et al.* (2003) studies might be expected to be associated with higher growth and thickening rates that occur in the Murweh shire.

Fensham *et al.* (2002) also show that the rate of thickening varies with the initial crown cover. This leads to the common sense conclusion that for a given land type, more open areas will increase more rapidly than denser areas (presumably due the effects of competition). This means a uniform rate of thickening cannot be assumed and certainly

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probably a case of 'user friendly' language but it does create some uncertainty about what is being measured.

[3] Details of conversion of changes in basal area @ 0.3 metres height from Burrows *at al* 2003 to FPC/yr.

	Time_1	Time_1 + 14.4yrs	Source and conversion formula
BA @ 0.3 m height	11.86 (SE 1.38)	12.92 (SE 1.67)	Burrows et al. 2003, table 1
BA@1.3 m height	9.54	10.42	Fensham *et al.* (2003), (BA@.3m-0.317)/1.21
FPC%	25.9	28.0	Kuhnell et al 1998, (1.896+(2.674*BA@1.3))-0.016*(BA@1.3^2)
Change in FPC/yr		0.18	(28.0-25.9/14.4)

This figure is only approximate but it is roughly twice Crown Cover figure (0.14%) obtained by Fensham *et al.* (2003) which would be consistent with a doubling of the Basal Area increase of the Burrows *et al.* (2003) figure compared to Fensham *et al.* 2003).

not extrapolated forward indefinitely, as thickening will tend to slow down and then plateau over time as vegetation becomes thicker. The projected mean (i.e. with variation around) FPC figure of 52.5% (i.e. Crown Cover > 80%?) for the mainly *Acacia* dominated communities in the semi-arid Murweh shire in 2040 (page 504 of the draft PC report) is likely to be physiologically impossible.

It would be useful to examine the sites used to estimate the 1% thickening rate from Kelly and Beale (2003) to compare with and calibrate against the SLATS FPC figures for the same areas. In addition the range of initial and final cover figures are required to verify that extrapolation of results are not applied outside the range of the original data e.g. it is not valid to apply a thickening rate derived from vegetation increasing from 10-40% to vegetation that has an FPC of 20% for a period of 20 years.

The methods used by Fensham *et al.* 2003 could readily to applied to the aerial photography in the Murweh shire to verify thickening rates.

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