

Auditee:	Forestry Corporation New South Wales (FCNSW)
Audit scope:	Kerewong State Forest (SF), compartment(s) 127, 128 & 129 (see Error! Reference source not found. , below).
Region:	Lower North East
Date/Audit timing:	12 & 19 May 2016
Lead EPA auditor:	N. Ly
Assisting EPA auditors:	J. Forcier, S. Viney & J. Kennedy
Justification of audit:	Initial audit in Lower North East (LNE) Integrated Forestry Operations Approval (IFOA) focussing on EPA compliance priority area
Audit objectives:	To assess FCNSW and their level of compliance with conditions and environmental performance in line EPA compliance priorities.
Audit criteria:	Determine compliance with relevant compliance priority conditions in the LNE IFOA region (TSL/EPL) and the POEO Act.
Audit scope	<p>Physical scope: Kerewong SF</p> <p>Temporal scope: The audit period adopted for assessment of compliance with operational conditions is on the days of the audit inspection (12 and 19 May 2016). The audit period for assessment of reporting conditions is 12 months prior to the audit inspection.</p> <p>Activities examined:</p> <p>Hollow bearing and Recruitment tree prescriptions</p> <ul style="list-style-type: none"> • <i>Conditions 5.6 (d)(e)(h) Regrowth retention, selection, protection & mark-up</i> <p>Water pollution - Crossings</p> <ul style="list-style-type: none"> • Schedule 5 clause 37 (5-30m drainage) <p>Exclusion zone mark-up for EZ and buffer zones within scope of audit</p> <ul style="list-style-type: none"> • <i>5.1 f Operational requirements</i> <p>Forest Structure</p> <ul style="list-style-type: none"> • <i>Basal area retention (as defined within 'Single Tree Selection definition TSL')</i>
Summary of Operations	<p>Operation approved date: 18 December 2015</p> <p>Stand age: Regrowth Zone</p> <p>Silvicultural practice: Regeneration Single Tree Selection</p>

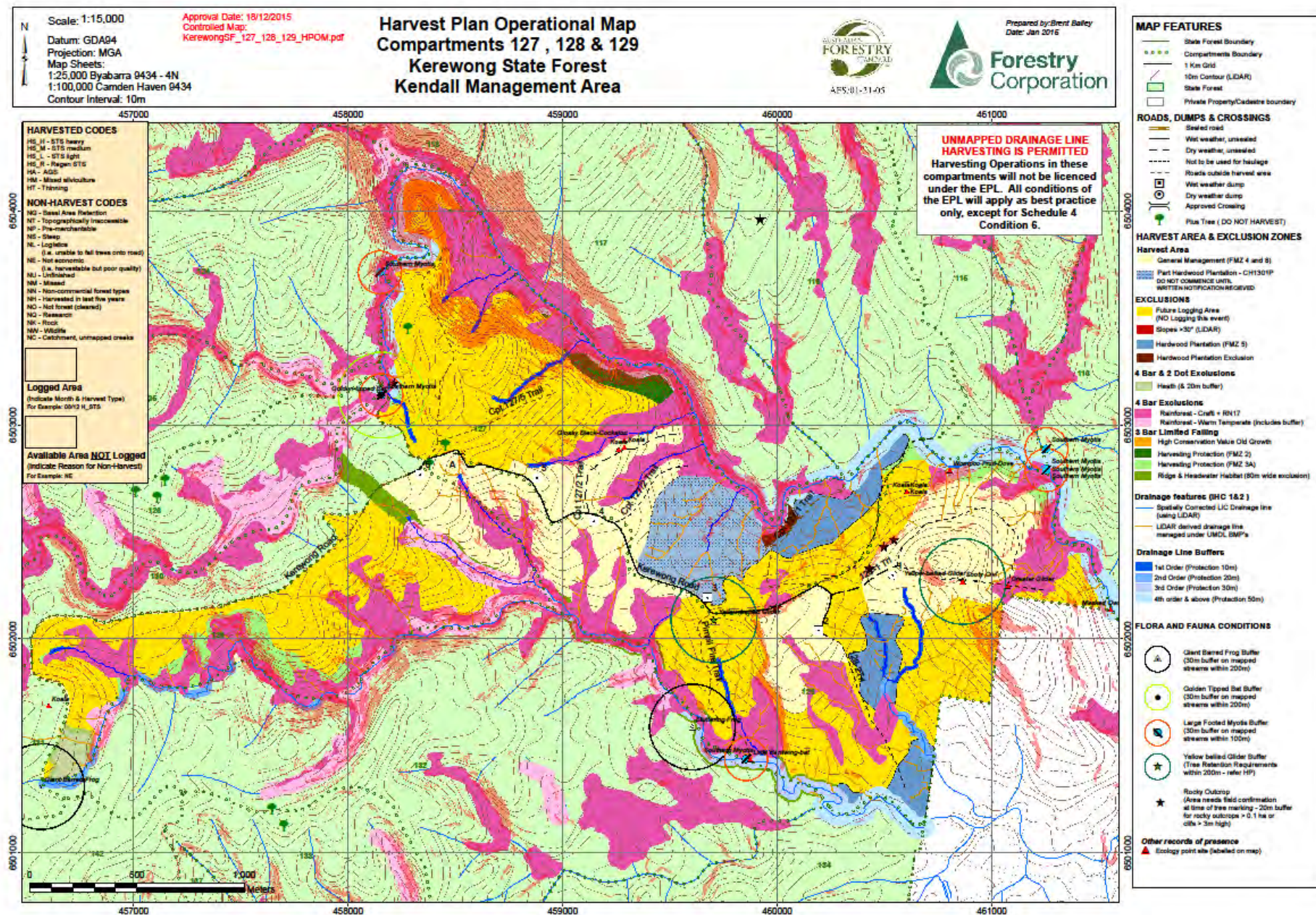


Figure 1: Harvest Plan Operational Map – Kerewong SF Compartments 127, 128 & 129

1. Audit Findings - Overview

A summary of EPAs findings are shown in the table below.

Condition	Audit scope	Compliant	Non-compliant	Not Determined	Not Applicable
Hollow Bearing (H) and Recruitment (R) Trees	H Retention	1	0	0	0
	H Selection	1	1	0	0
	R Retention	1	0	0	0
	R Selection	2	0	0	0
	H & R Tree Protection	3	5	0	0
Forest Structure	Basal Area Retention	0	0	1	0
Exclusion Zones	Rainforest Protection	2	0	0	0
	Rainforest Mark-up	2	0	0	0
Road Crossings And Drainage		1	0	0	0
	TOTAL	13	6	1	0

2. Audit Recommendations

Condition No.	Number of non-compliances	Action Details	Non-compliance Code*	Target/Action Date
5.6 (d)	1/2	An action plan must be developed and implemented to ensure that all H trees are selected and marked.	Yellow	12 September 2016
5.6 (h) i	2/4	An action plan must be developed and implemented to ensure that H&R trees are protected from logging debris accumulation and operational caused damage.	Red	Immediate
5.6 (h) ii	3/4			

ATTACHMENT 1: AUDIT FINDINGS TABLE – KEREWONG STATE FOREST, COMPARTMENT(S) 127, 128 & 129

CONDITION RELATED TO HOLLOW-BEARING TREES – REGROWTH ZONE - RETENTION																											
Condition No. and detail	Compliant? Yes/No/ Not determined/Not Applicable	Number of non- compliances (sample size & unit)	Action required by licensee																								
5.6(d) Tree Retention – Regrowth Zone Threatened Species Licence, Lower North East Region Within the Regrowth Zone the following requirements for retention of Hollow-bearing trees apply: <div><div>i.</div><div>A minimum of five hollow-bearing trees must be retained per hectare of net logging area. Where this density of hollow-bearing trees is not available all hollow-bearing trees within the net logging area must be retained.</div></div>	Yes	0/1																									
Comment and Evidence																											
<p>The Environment Protection Authority (EPA) determined FCNSW have complied with this condition in the area assessed.</p> <p>EPA Officers assessed two transects inside harvested areas (Error! Reference source not found.). The total area assessed was 2 hectares (ha). Each transect was comprised of five 0.2 ha circular plots. Plot centres were randomly selected on GPS before approaching the location. EPA count marked and unmarked live standing candidate H trees towards retention up to the regrowth H tree retention rate threshold.</p> <p>All plots were in the net harvested areas and did not overlap each other or protected features. Across the two transects, EPA officers observed one marked H tree and zero candidate unmarked H trees, totalling one H trees across 2 ha. FCNSW achieved a retention rate of 0.5 H trees/ha. The marked H tree had no crown.</p> <p>Though this is a low retention rate, during pre-harvest mark-up assessment the EPA did not observe any H trees.</p> <p>Table 1: H & R tree transects within harvested area – H tree results</p> <table><tr><th>Location</th><th>Assessment Method</th><th>Area assessed</th><th>H trees marked</th><th>Unmarked candidate H trees</th><th>Retention rate H/ha</th></tr><tr><td>Transect One</td><td>Plot transects (5 plots per transect)</td><td>1.0 ha</td><td>0</td><td>0</td><td>0 H/ha includes marked and unmarked</td></tr><tr><td>Transect Two</td><td>Plot transects (5 plots per transect)</td><td>1.0 ha</td><td>1</td><td>0</td><td>1 H/ha includes marked and unmarked</td></tr><tr><td>Total (comprises marked H and unmarked candidate H)</td><td></td><td>2 ha</td><td>1</td><td>0</td><td>0.5 H/ha marked and unmarked</td></tr></table> <p><i>NOTE: EPA officers considered trees retained to be candidate H trees only where they met the TSL criteria (despite not being marked)</i></p>				Location	Assessment Method	Area assessed	H trees marked	Unmarked candidate H trees	Retention rate H/ha	Transect One	Plot transects (5 plots per transect)	1.0 ha	0	0	0 H/ha includes marked and unmarked	Transect Two	Plot transects (5 plots per transect)	1.0 ha	1	0	1 H/ha includes marked and unmarked	Total (comprises marked H and unmarked candidate H)		2 ha	1	0	0.5 H/ha marked and unmarked
Location	Assessment Method	Area assessed	H trees marked	Unmarked candidate H trees	Retention rate H/ha																						
Transect One	Plot transects (5 plots per transect)	1.0 ha	0	0	0 H/ha includes marked and unmarked																						
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Total (comprises marked H and unmarked candidate H)		2 ha	1	0	0.5 H/ha marked and unmarked																						

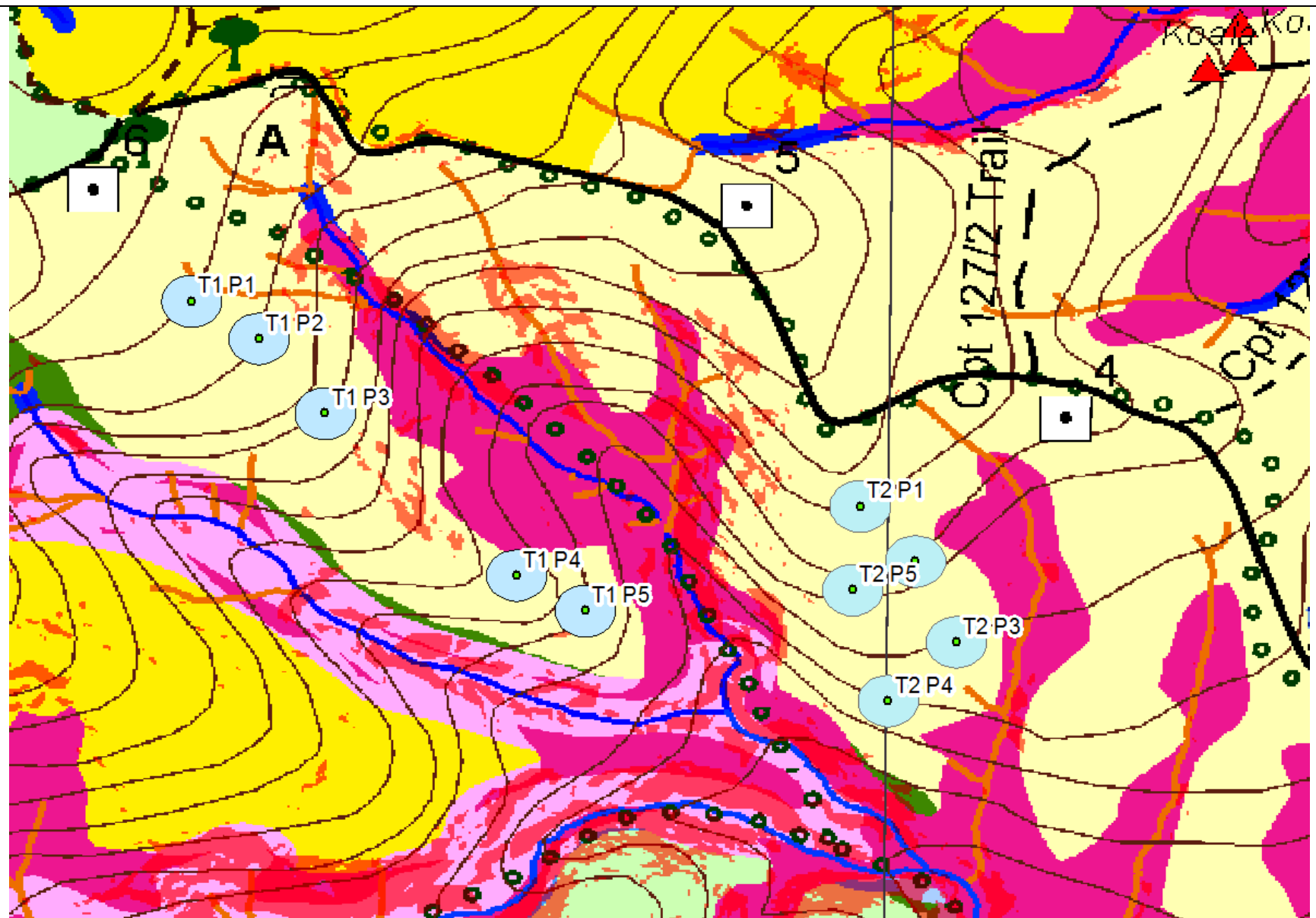


Figure 2: Transect 1 and Transect 2 plots undertaken in Kerewong State Forest, compartment 127, 128 & 129 during the EPA audit on 12 and 19 May 2016. Each plot has a radius of 25m. At each of the plot locations, EPA officers assessed basal area, tree retention and tree mark-up requirements.



Figure 3: Marked H tree, the only marked H tree in the area assessed – 2 ha

WHY IS COMPLIANCE WITH THIS TSL CONDITION IMPORTANT?

Largest Size Cohort:

The presence, abundance and size of hollows are positively correlated with tree basal diameter, which is an index of age (Lindenmayer *et al.* 1991a, Bennett *et al.* 1994, Ross 1999, Soderquist 1999, Gibbons *et al.* 2000, Shelly 2005). Tree diameter at breast height (DBH) is, in turn, a strong predictor of occupancy by vertebrate fauna (Mackowski 1984, Saunders *et al.* 1982, Smith and Lindenmayer 1988, Gibbons *et al.* 2002, Kalcounis-Rüppell *et al.* 2006). The minimum size-class at which trees consistently (>50% of trees) contain hollows varies depending on the species and environmental conditions, yet is always skewed toward the larger, more mature trees. (Reference: *Loss of Hollow-bearing Trees – key threatening process determination - NSW Scientific Committee - final determination (2007)*)

CONDITION RELATED TO HOLLOW-BEARING TREES – REGROWTH ZONE – SELECTION

Condition No. and detail	Compliant? Yes/No/ Not determined/Not Applicable	Number of non- compliance (sample size & unit)	Action required by licensee
<p>5.6 (d) Tree Selection Threatened Species Licence, Lower North East Region Within the Regrowth Zone the following requirements for retention of Hollow-bearing trees apply:</p> <p>(ii). In selecting hollow-bearing trees for retention, priority must be given to any hollow-bearing trees which exhibit evidence of occupancy by hollow dependent fauna and trees which contain multiple hollows or hollows of various sizes.</p> <p>(iii). Hollow-bearing trees must be selected with the objective of retaining trees having as many of the following characteristics as possible:</p> <ul style="list-style-type: none"> • belonging to a cohort of trees with the largest dbhob, • good crown development, <i>Note: this does not restrict the selection of trees with broken limbs consistent with the hollow-bearing tree definition.</i> • minimal butt damage, • represent the range of hollow-bearing species that occur in the area, • located such that they result in retained trees being evenly scattered throughout the net logging area. 	No	1/2	An action plan must be developed and implemented to ensure that all H trees are selected.
Comment and Evidence			
<p>The EPA found that FCNSW did not comply with the conditions in the area assessed. EPA uses the presence or absence of marking (paint) on trees to indicate whether a tree has been selected or not. Assessments were done in post-harvesting areas only (see Error! Reference source not found.). The results are shown in Error! Reference source not found..</p> <p>This is a low risk non-compliance (yellow code). It is a low risk as the likelihood of environmental harm occurring due to marking an H tree as an E tree is low, and the consequence from the level of environmental impact low to moderate. EPA officers recorded a H tree that had been incorrectly marked as an E tree. According to condition 5.6 (g) iii, 'Where a retained eucalypt feed tree also meets the requirements of a hollow-bearing or recruitment tree, the eucalypt feed tree can be counted as a hollow-bearing or recruitment tree', which is the case in this instance, see Error! Reference source not found... However, this condition focuses on selection which FCNSW incorrectly selected.</p>			

There were no marked H trees in Transect 1 and one marked H tree in Transect 2. This was the largest tree measured in the audit, DBHOB 106 cm. The EPA also observed one marked E tree which contained observable hollows, which could have also been marked as an H tree.

Within the harvested area, EPA officers conducted two transects, each comprising of 5 circular plots (Figure 1). Within each plot, EPA officers measured the retained trees (both marked and unmarked) and the diameters of fresh stumps. **Error! Reference source not found.** and **Error! Reference source not found.** contain the detailed results of these transects.

EPA officers recorded zero marked H trees, zero marked R trees and three marked E trees in Transect 1. One marked H tree, two marked R trees and three marked E trees were recorded in Transect 2.

The average DBHOB of retained trees – including unmarked trees – was 63.97 cm. The average DBHOB of marked trees was 69.89 cm. The average DBHOB (with a conservative taper of -5cm) of cut trees was 48.24 cm.

Table 2: EPA Post-Harvest Assessments – Retained tree characteristics across assessed areas

Plot No.	Tree no.	Species	DBHOB (cm)	Marked H tree / E tree / candidate H tree/ Unmarked	Crown Damage (Y / N)	Logging Debris within 5m	Tree used as Bumper	Ground Disturbance within 5m	Hollows, Burls, Protuberances	Crown Development	Tree Growth Stage
Transect 1											
T1P2	T1	WHITE MAHOGANY	75.4	Unmarked	N	N	Y	N	N	Sub-Dominant	Mature
	T2	TALLOWWOOD	42.5	Unmarked	Y-Natural	N	Y	N	N	Sub-Dominant	Early Mature
	T3	TALLOWWOOD	40.7	E Tree	Y-Operational	N	Y	N	N	Co-Dominant	Early Mature
	T3	TALLOWWOOD	45	E Tree	N	N	N	N	N	Dominant	Early Mature
	T4	WHITE MAHOGANY	76.5	Unmarked	N	Y	N	N	N	Dominant	Mature
T1P4	T1	WHITE MAHOGANY	72	Unmarked	N	N	Y	Y	N	Dominant	Mature
	T2	WHITE MAHOGANY	53	Unmarked	N	N	N	N	N	Suppressed	Mature
	T3	WHITE MAHOGANY	70	Unmarked	N	N	N	N	N	Dominant	Mature
T1P5	T1	TALLOWWOOD	50	Unmarked	N	Y	N	N	N	Sub-Dominant	Early Mature
	T2	WHITE MAHOGANY	50.8	Unmarked	N	N	N	N	N	Sub-Dominant	Early Mature
Transect 2											
T2P1	T1	BLACKBUTT	70	Unmarked	N	N	N	Y	N	Dominant	Early Mature
	T2	TALLOWWOOD	43	Unmarked	N	N	N	N	N	Sub-Dominant	Early Mature
	T3	TALLOWWOOD	40	E Tree	N	N	N	N	N	Suppressed	Early Mature
T2P3	T1	BLOODWOOD	82	Unmarked	Y-Operational	N	N	N	N	Suppressed	Early Mature
	T2	TALLOWWOOD	106.3	Marked H Tree	Y-Natural	Y	N	N	Limbs	Suppressed	Early Mature
	T3	BLACKBUTT	80	Marked R tree	N	Y	N	N	N	Suppressed	Early Mature
	T4	BLOODWOOD	91	E tree	N	N	N	N	Burls & Protuberances	Sub-Dominant	Mature

	T5	BLOODWOOD	70	Unmarked	N	Y	N	N	N	Suppressed	Early Mature
T2P4	T1	BLOODWOOD	91	E tree	N	Y	N	Y	Hollows & Protuberances	Sub-Dominant	Mature
	T2	BLACKBUTT	97	Marked R tree	Y-Operational	N	N	Y	N	Co-Dominant	mature
T2P5	T1	BLACKBUTT	73	Unmarked	N	N	N	N	N	Dominant	Early Mature
	T2	BLACKBUTT	45	Unmarked	N	N	N	N	N	Suppressed	Early Mature

Table 3: Stump diameters recorded inside the H & R plots within the two transects.

Plot No.	Tree/Stump no.	Basal Area (m ² /ha)	Species	SDOB (cm)	Stump Height (cm)	DBHOB using taper
Transect 1						
T1P1	S1	0	TALLOWWOOD	85	55	80
	S2		TALLOWWOOD	95	60	90
	S3		TALLOWWOOD	55	25	50
	S4		TALLOWWOOD	85	80	80
	S5		TALLOWWOOD	95	70	90
T1P2	S1	2	TALLOWWOOD	30	50	25
	S10		TALLOWWOOD	45	20	40
	S11		TALLOWWOOD	45	80	40
	S12		WHITE MAHOGANY	58		53
	S2		TALLOWWOOD	50	50	45
	S3		TALLOWWOOD	50	40	45
	S4		WHITE MAHOGANY	63	90	58
	S5		TALLOWWOOD	37	27	32
	S6		TALLOWWOOD	70	40	65
	S7		TALLOWWOOD	40	35	35
	S8		TALLOWWOOD	55	40	50
	S9		TALLOWWOOD	55	20	50
T1P3	S1	4	TALLOWWOOD	45	30	40
	S2		TALLOWWOOD	37	20	32
	S3		TALLOWWOOD	47	40	42
	S4		TALLOWWOOD	38	30	33

	S5		TALLOWWOOD	67	25	62
	S6		WHITE MAHOGANY	47	30	42
	S7		TALLOWWOOD	65	21	60
	S8		TALLOWWOOD	47	45	42
T1P4	S1	6	WHITE MAHOGANY	43	103	38
	S10		WHITE MAHOGANY	45	50	40
	S11		WHITE MAHOGANY	55	120	50
	S2		WHITE MAHOGANY	45	50	40
	S3		WHITE MAHOGANY	50	50	45
	S4		WHITE MAHOGANY	45	30	40
	S5		WHITE MAHOGANY	50	50	45
	S6		TALLOWWOOD	47	45	42
	S7		WHITE MAHOGANY	45	37	40
	S8		TALLOWWOOD	60	50	55
	S9		TALLOWWOOD	35	45	30
T1P5	S1	4	TALLOWWOOD	67.5	33	62.5
	S10		TALLOWWOOD	51.5	40	46.5
	S11		TALLOWWOOD	41.5	55	36.5
	S2		TALLOWWOOD	41	31	36
	S3		TALLOWWOOD	43	32	38
	S4		TALLOWWOOD	66	45	61
	S5		WHITE MAHOGANY	33	46	28
	S6		TALLOWWOOD	58	20	53
	S7		WHITE MAHOGANY	48	110	43
	S8		TALLOWWOOD	57	23	52
	S9		TALLOWWOOD	58	140	53
Transect 2						
T2P1	S1	10	TALLOWWOOD	70	37	65
	S10		WHITE MAHOGANY	70	90	65
	S11		WHITE MAHOGANY	72	85	67
	S12		WHITE MAHOGANY	45	50	40
	S13		TALLOWWOOD	39	32	34

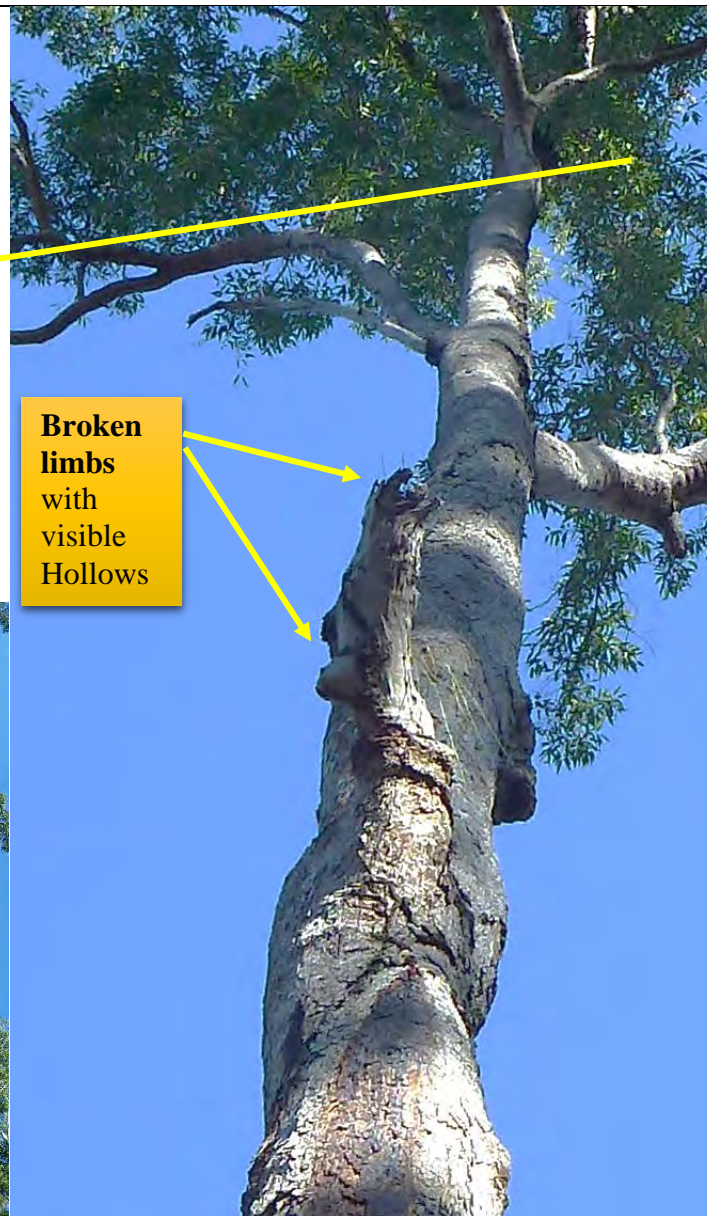
	S14		TALLOWWOOD	42	28	37
	S15		TALLOWWOOD	48	36	43
	S16		BLACKBUTT	58	50	53
	S17		TALLOWWOOD	40	30	35
	S18		BLACKBUTT	65	70	60
	S19		BLACKBUTT	60	30	55
	S2		TALLOWWOOD	43	75	38
	S20		WHITE MAHOGANY	50	60	45
	S21		TALLOWWOOD	75	40	70
	S3		TALLOWWOOD	42	23	37
	S4		TALLOWWOOD	45	28	40
	S5		TALLOWWOOD	30	20	25
	S6		WHITE MAHOGANY	59	42	54
	S7		TALLOWWOOD	43	40	38
	S8		WHITE MAHOGANY	32	46	27
	S9		TALLOWWOOD	47	53	42
T2P2	S1	5	TALLOWWOOD	40	60	35
	S2		BLACKBUTT	36	38	31
	S3		TALLOWWOOD	50	34	45
	S4		TALLOWWOOD	70	57	65
	S5		TALLOWWOOD	74	78	69
	S6		TALLOWWOOD	80	52	75
	S7		WHITE MAHOGANY	57	37	52
	S8		BLACKBUTT	73	75	68
T2P3	S1	11	TALLOWWOOD	40	15	35
	S10		TALLOWWOOD	85	60	80
	S11		TALLOWWOOD	32	20	27
	S12		TALLOWWOOD	60	50	55
	S13		TALLOWWOOD	30	20	25
	S14		WHITE MAHOGANY	34	18	29
	S15		TALLOWWOOD	60	30	55
	S16		TALLOWWOOD	70	25	65

	S17		TALLOWWOOD	90	50	85
	S18		TALLOWWOOD	80	60	75
	S19		TALLOWWOOD	22	15	17
	S2		BLACKBOX	66	55	61
	S3		BLACKBOX	70	65	65
	S4		TALLOWWOOD	45	40	40
	S5		TALLOWWOOD	85	80	80
	S6		TALLOWWOOD	64	45	59
	S7		TALLOWWOOD	42	36	37
	S8		TALLOWWOOD	43	40	38
	S9		TALLOWWOOD	40	35	35
T2P4	S1	5	TALLOWWOOD	45	21	40
	S10		TALLOWWOOD	82	55	77
	S2		BLACKBUTT	83	70	78
	S3		WHITE MAHOGANY	65	40	60
	S4		TALLOWWOOD	54	36	49
	S5		TALLOWWOOD	42	34	37
	S6		TALLOWWOOD	55	50	50
	S7		BLACKBUTT	65	76	60
	S8		TALLOWWOOD	30	40	25
	S9		TALLOWWOOD	55	25	50
T2P5	S1	9	TALLOWWOOD	72	50	67
	S10		TALLOWWOOD	40	60	35
	S2		TALLOWWOOD	36	50	31
	S3		TALLOWWOOD	40	30	35
	S4		BLACKBUTT	35	60	30
	S5		TALLOWWOOD	50	45	45
	S7		WHITE MAHOGANY	30	100	25
	S8		TALLOWWOOD	45	55	40
	S9		BLACKBUTT	42	66	37



This clearly **marked and selected H tree** had a missing crown (see **Error!**)

Figure 4: Clearly selected and marked H Tree, DBHOB 106 cm – the only selection made in the 2 ha of area assessed



This **hollow bearing tree** was not selected as an H tree.

Broken limbs with visible Hollows

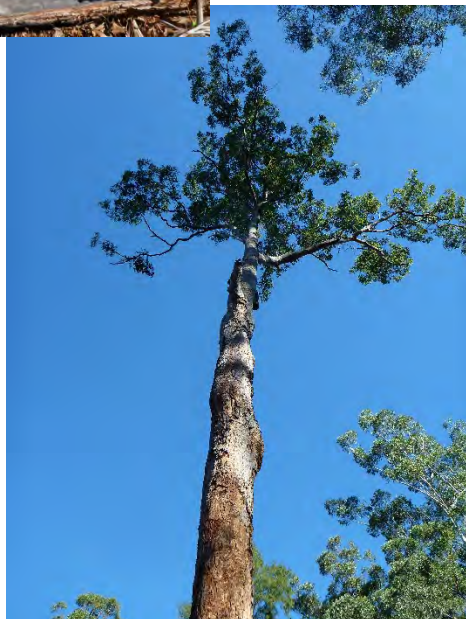


Figure 5: Marked E tree, DBHOB of 91 cm, showing good crown development and visible hollows – not selected as an H tree.

CONDITION RELATED TO RECRUITMENT TREES – REGROWTH ZONE - RETENTION

Condition No. and detail	Compliant? Yes/No/ Not determined/N ot Applicable	Number of non- compliance (sample size & unit)	Action required by licensee
5.6(e) Tree Retention Threatened Species Licence, Lower North East Region The following condition must be applied within the regrowth zone: e) Within the Regrowth Zone, for each hollow-bearing tree retained in (d) above a recruitment tree must be retained.	Yes	0/1	

Comment and Evidence

EPA found that the area assessed was compliant with this condition. One H tree was retained and thus one R tree is required to be retained across 2 ha in this regrowth zone. EPA counts and contributes marked and unmarked live standing candidate R trees for retention up to the TSL retention rate threshold.

Within the logged area, EPA officers undertook two transects comprising of five circular plots each (see **Error! Reference source not found.**). Within each plot, EPA officers measured the retained trees (both marked and unmarked) and the diameters of fresh stumps. **Error! Reference source not found.** and **Error! Reference source not found.** above contain the detailed results of these transects. In Transect 1 EPA officers recorded zero marked R trees and five unmarked, unselected R trees. In Transect 2 two marked R trees were recorded (see **Error! Reference source not found.** below). FCNSW achieved a marked retention rate of one R tree per hectare.

Table 4: H & R tree transect within harvest area - R tree results

Location	Assessment Method	Area assessed	R trees marked	Unmarked candidate R trees	Retention rate/ha
Transect One (T1)	Plot transects (5 plots per transect)	1.0 ha	0	6	6 R/ha includes marked and unmarked
Transect Two (T2)	Plot transects (5 plots per transect)	1.0 ha	2	0	2 R/ha includes marked and unmarked
Total (comprises marked R and unmarked candidate R)		2 ha	2	6	4 R/ha marked and unmarked

NOTE: EPA officers considered trees retained to be candidate R trees only where they met the TSL criteria (despite not being marked)

Table 5: EPA Unmarked Tree Assessments - Candidate R trees

Plot No.	Tree No.	Photo reference	Species	DBHOB (cm)
T1 P2	T1	56-57	WHITE MAHOGANY	75.4
T1 P3	T4	76-79	WHITE MAHOGANY	76.5
T1 P4	T1	84-85	WHITE MAHOGANY	72
T1 P4	T3	42-43	WHITE MAHOGANY	70
T1 P5	T1	97-99	TALLOWWOOD	50
T1 P5	T2	100-101	WHITE MAHOGANY	50.8

CONDITION RELATED TO RECRUITMENT TREES – REGROWTH ZONE – SELECTION

Condition No. and detail	Compliant? Yes/No/ Not determined/Not Applicable	Number of non- compliances (sample size & unit)	Action required by licensee
5.6(e) Tree Selection Threatened Species Licence, Lower North East Region Recruitment trees must be selected with the objective of retaining trees having as many of the following characteristics as possible: <ul style="list-style-type: none"> i. belong to a cohort of trees with the largest dbhob, ii. located such that they result in retained trees being evenly scattered throughout the net logging area iii. good crown development, iv. minimal butt damage, v. represent the range of hollow-bearing species that occur in the area. 	Yes	0/2	
Comment and Evidence			
<p>EPA found that FCNSW complied with this condition in the area assessed. EPA uses the presence or absence of marking (paint) on trees to indicate whether a tree has been selected or not. Assessments were done in post-harvesting areas only.</p> <p>Only one R tree was required to be selected. Two R trees were selected. The largest selected R tree had a DBH of 97 cm, seven centimetres larger than the largest stump measured. The other selected R tree measured 80 cm, with three stumps measuring larger than it.</p> <p>Within the logged area, EPA officers undertook two transects comprising of five circular plots each (see Error! Reference source not found.). EPA officers observed two marked R trees and six unmarked candidate R tree.</p> <p>Error! Reference source not found. and Error! Reference source not found. plot tree diameters with stump diameters, sorted by size, for each respective transect. In Transect 1 only unmarked candidate R trees were observed.</p> <p>The audit findings show compliance, with selected R trees belonging to the largest size cohort of trees.</p>			

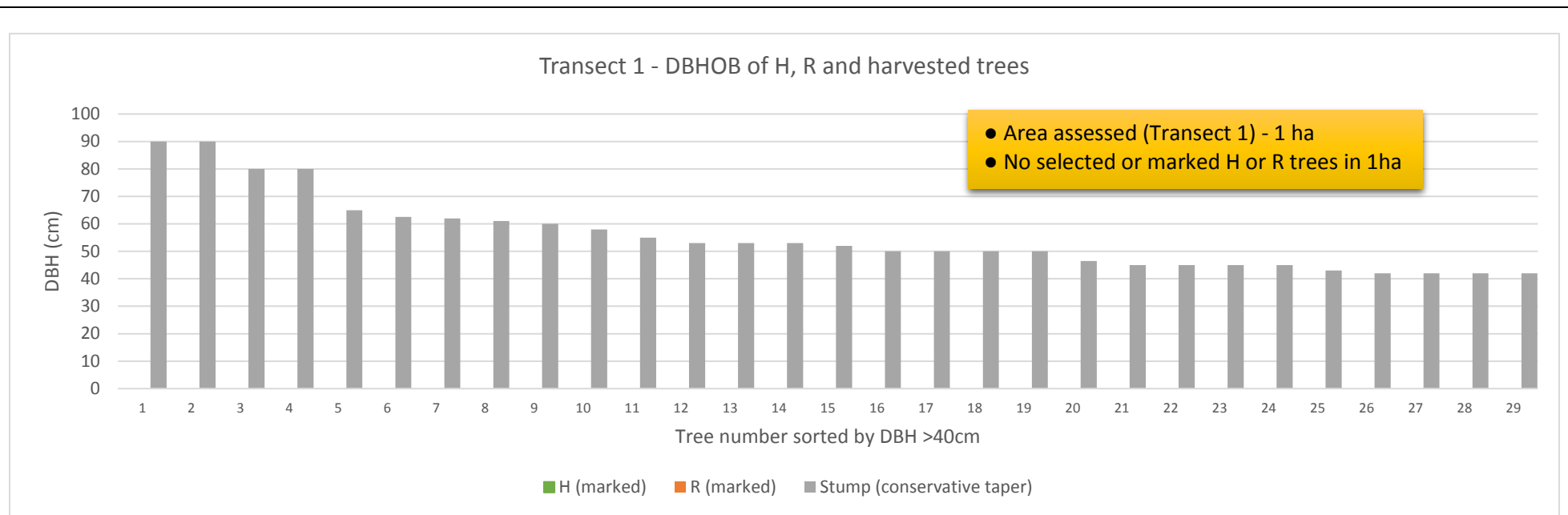


Figure 6: Graphed DBHOB of retained and harvested trees - Transect 1

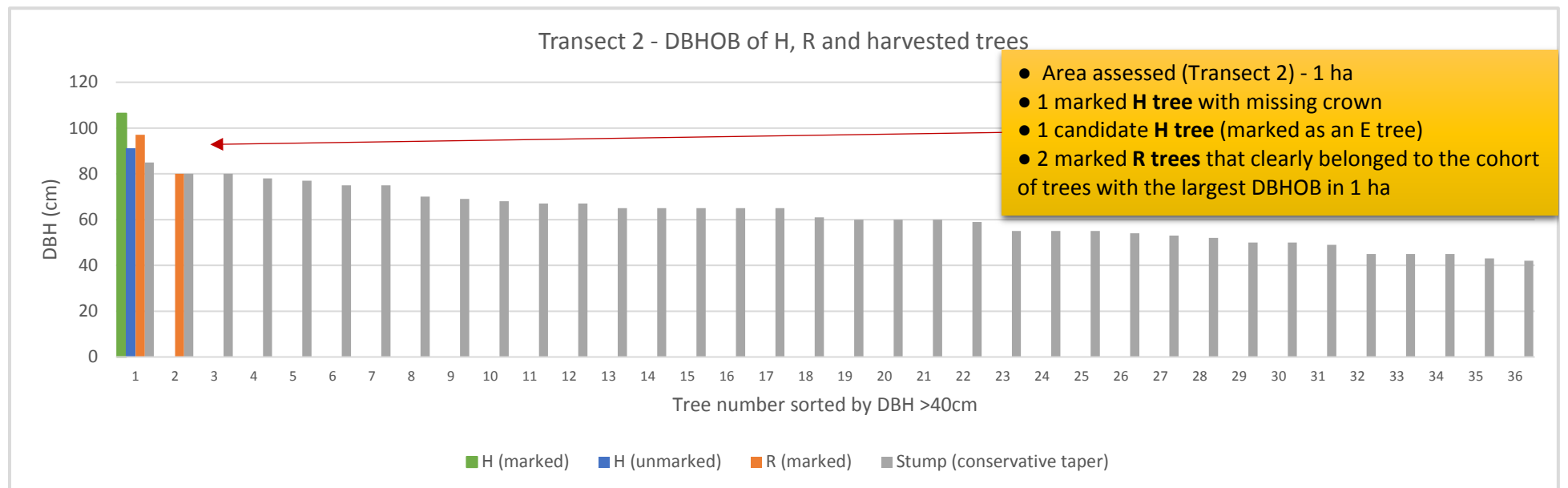


Figure 7: DBH of retained and harvested trees - Transect 2



**Good crown
development in
selected R tree**

Figure 8: Clearly selected and marked R tree, DBHOB of 80 cm, which clearly belong to the cohort of trees with the largest DBHOB.



Figure 9: Clearly selected and marked R tree, DBHOB of 97 cm, belonging to the largest cohort of trees

WHY IS COMPLIANCE WITH THIS TSL CONDITION IMPORTANT?

Largest Size Cohort:

The presence, abundance and size of hollows are positively correlated with tree basal diameter, which is an index of age (Lindenmayer *et al.* 1991a, Bennett *et al.* 1994, Ross 1999, Soderquist 1999, Gibbons *et al.* 2000, Shelly 2005). Tree diameter at breast height (DBH) is, in turn, a strong predictor of occupancy by vertebrate fauna (Mackowski 1984, Saunders *et al.* 1982, Smith and Lindenmayer 1988, Gibbons *et al.* 2002, Kalcounis-Rüppell *et al.* 2006). The minimum size-class at which trees consistently (>50% of trees) contain hollows varies depending on the species and environmental conditions, yet is always skewed toward the larger, more mature trees. (Reference: *Loss of Hollow-bearing Trees – key threatening process determination - NSW Scientific Committee - final determination (2007)*)

CONDITION RELATED TO HOLLOW-BEARING AND RECRUITMENT TREES – PROTECTION

Condition No. and detail	Compliant? Yes/No/ Not determined/Not Applicable	Number of non- compliance (sample size & unit)	Action required by licensee
<p>5.6(h) Protection of retained trees Threatened Species Licence, Lower North East Region</p> <p>i. When conducting specified forestry activities and post-logging burning, damage to trees retained under conditions 5.6 a), 5.6 b), 5.6 c), 5.6 d), 5.6 e) and 5.6 f) of this licence must be minimised to the greatest extent practicable. During harvesting operations, the potential for damage to these trees must be minimised by utilising techniques of directional felling.</p> <p>ii. In the course of conducting specified forestry activities, logging debris must not, to the greatest extent practicable, be allowed to accumulate within five metres of a retained hollow-bearing tree, recruitment tree, stag, <i>Allocasuarina</i> with more than 30 crushed cones beneath, eucalypt feed tree, or Yellow-bellied Glider or Squirrel Glider sap feed tree. Logging debris within a five metre radius of retained trees must be removed or flattened to a height of less than one metre. Mechanical disturbance to ground and understorey must be minimised to the greatest extent practicable within this five metre radius. Habitat and recruitment trees must not be used as bumper trees during harvesting operations.</p>	No	2/4	An action plan must be developed and implemented to ensure that H&R trees are protected from logging debris accumulation and operational caused damage.
<p style="text-align: center;">Comment and Evidence</p> <p>EPA officers determined that FCNSW did not comply with this condition in the assessed area. This is a high risk non-compliance (red code). It is high risk as the likelihood of environmental harm is likely to certain as partial crowns were removed for 1 of the 4 retained habitat trees, and debris (fire risk) accumulated above the licence threshold to 3 of the 4 retained habitat trees in the area assessed. The consequence of harm is high due to the scarcity of H and R resources and rate of non-compliance ie what was retained was damaged or open to a future fire risk.</p> <p>Operational crown damage were observed on a marked R tree and crown damage to a marked H tree (see Error! Reference source not found. and Error! Reference source not found.). Debris higher than one metre was found around the same marked H tree. Debris was also found around a marked R tree and an H tree, incorrectly marked as an E tree. The crown damage to the H tree was initially determined as from forestry operations. However following FCNSW's review (determination that the damaged crown was caused by natural events) and request to withdraw this non-compliance, it is determined that the crown is compliant.</p> <p>Because of the high intensity of logging, it is essential that all H & R trees are adequately protected (no debris within 5 metres higher than 1 metre) to minimise the potential damage which may occur to a tree during a bushfire.</p>			

The EPA also notes, that two instances of trunk damage were observed where the sapwood was exposed. However, these were of unmarked trees which are beyond the scope of this criteria and is hence only noted.



Figure 10: Operational crown damage to one of the two marked R trees in 2ha

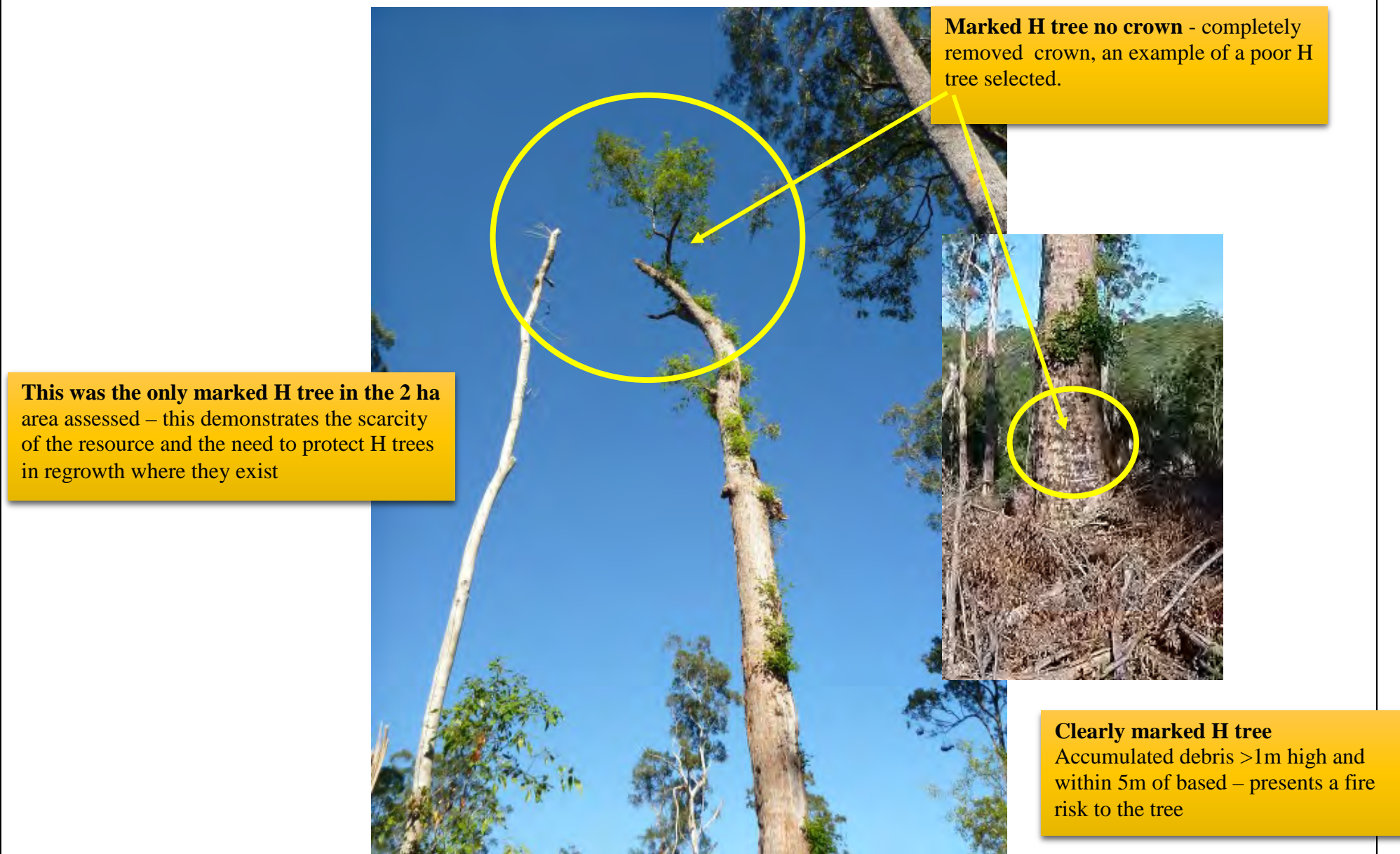


Figure 11: Crown damage and accumulated debris to the one marked H tree, DBHOB 106 cm, in 2ha



Figure 12: Accumulated debris of clearly marked R tree, DBHOB 80 cm, and marked E tree, DBHOB 91 cm

CONDITION RELATED TO FOREST STRUCTURE – BASAL AREA RETENTION

Condition No. and detail	Compliant? Yes/No/ Not determined/Not Applicable	Number of non- compliance (sample size & unit)	Action required by licensee
<p>Lower North East IFOA Condition 5 – “Single Tree Selection”</p> <p>“Single Tree Selection” refers to a silvicultural practice, which in relation to a tract of forested land has the following elements:</p> <p>(a) trees selected for logging have trunks, that in cross-section, measured 1.3 metres above ground level, have a diameter (including bark) of 20cm or more (that is, a diameter at breast height over bark of 20 cm or more); and</p> <p>(b) trees are selected for logging with the objective of ensuring that the sum of the basal areas of trees removed comprises no more than 40% of the sum of the basal areas of all trees existing immediately prior to logging within the net harvestable area of the tract.</p>	Not Determined	0/1	
Comment and Evidence			
<p><u>Preliminary observations:</u></p> <p>In considering compliance with part (b) of this condition, the EPA carried out 10 basal area sweeps within the harvested areas. The results are shown in Table 6. The lowest basal area recorded was 0 m²/ha, with the highest at 11 m²/ha. The average across all plots was 5.6 m²/ha.</p> <p>The EPA could not determine compliance with part (b) of this condition, due to lack of pre-harvesting data.</p>			

Table 6: Basal area sweeps carried out in harvested areas

Transect/Plot No.	Basal Area (m2/ha)	Latitude	Longitude
T1P1	0	-31.610452	152.561616
T1P2	2	-31.610779	152.562205
T1P3	4	-31.611431	152.562782
T1P4	6	-31.612844	152.564451
T1P5	4	-31.613153	152.565051
T2P1	10	-31.612241	152.567448
T2P2	5	-31.612721	152.567931
T2P3	11	-31.613426	152.568286
T2P4	5	-31.613938	152.567693
T2P5	9	-31.612971	152.567382

CONDITIONS RELATED TO RAINFOREST AND RAINFOREST EXCLUSION ZONES – PROTECTION

Condition No. and Detail	Compliant? Yes/No/Not determined/N ot applicable	Number of non- compliance and (sample size)	Action required by licensee
<p>5.4 Rainforest</p> <p>a) Specified forestry activities, except road and snig track construction in accordance with condition 5.4 (e), and road re-opening, are prohibited within all areas of Rainforest and exclusion zones around warm temperate Rainforest.</p>	Compliant	0/2 (400m of rainforest boundary were tracked)	

Comment and Evidence

EPA officers found that FCNSW complied with this condition.

EPA officers walked two sections of rainforest boundary, each 200 m in length.

The first location, RF1, there no intrusions were observed. At RF1 EZ4 and RF1 EZ5 debris was observed a few metres from the boundary.

The second location, RF2, officers observed that forestry operations maintained a considerable buffer from the boundary. The buffer was to the extent that no signs of operations were observed anywhere near the boundary, besides marked H and R trees.

Table 7: Rainforest exclusion zone survey results

GPS Point	Latitude	Longitude	GPS accuracy (m)	Point feature	Photo No.	Field Observations
RF1 EZ1	-31.6137	152.5654	3		102-103	No intrusions
RF1 EZ2	-31.6137	152.5656	3		104-105	On the boundary no intrusions.
RF1 EZ3	-31.6133	152.5655	3		106-107	No intrusions
RF1 EZ4	-31.6130	152.5654	3		108-109	No intrusion. Photo 109, looking away from exclusion zone observe debris, but not in exclusion zone.
RF1 EZ5	-31.6127	152.5651	3		110-111	No intrusion. Photo 110, looking away from exclusion zone observe debris, but not in exclusion zone.
RF2 EZ1	-31.6127	152.5667	3		220	Boundary of operations are well away from boundary of exclusion zone
RF2 EZ2	-31.6124	152.5666	3	Tree marking	221-223	Tree marked is at least 15 m from exclusion zone boundary. Photo 223 facing away from exclusion zone boundary
RF2 EZ3	-31.6121	152.5666	3	Felled tree	224-225	Tree felled towards exclusion zone, though still 30 m away from exclusion zone boundary.
RF2 EZ4	-31.6118	152.5664	3		226, 228-229	Mark up of exclusion zone 10 m away from exclusion boundary
RF2 EZ5	-31.6115	152.5665	3		230, 231-232	Unmarked drainage line
RF2 EZ6	-31.6114	152.5664	3	Marked H and R tree	233-236	H tree contains burls. Both are marked and within harvestable area but in unofficial buffer.
RF2 EZ7	-31.6110	152.5664	3	Marked H and R tree	237-241	H and R tree marked and within harvestable area, but in unofficial buffer.

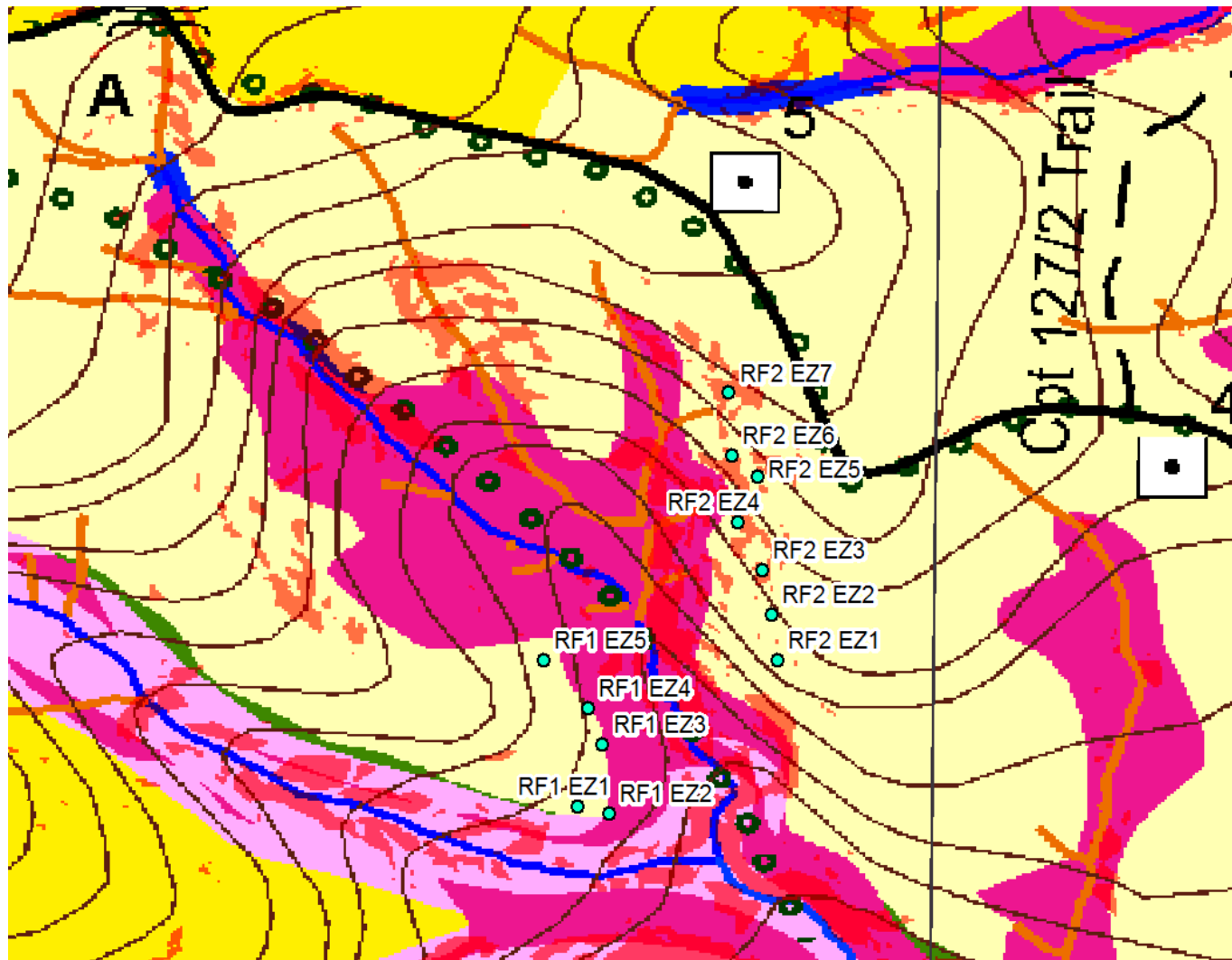


Figure 13: Rainforest exclusion zone survey locations



Figure 14: Photo 109 taken at RF1 EZ4 (the exclusion zone boundary) looking out, and Photo 108 looking in



Figure 15: Photo 237 of marked H tree, at RF2 EZ7, approximately 30 metres away from exclusion zone boundary

CONDITIONS RELATED TO RAINFOREST AND RAINFOREST EXCLUSION ZONES – MARKING

Condition No. and Detail	Compliant? Yes/No/Not determined/Not applicable	Number of non- compliance (sample size)	Action required by licensee
<p>5.1 Operational requirements (Threatened Species Licence, Lower North East Region)</p> <p>5.1(f) All exclusion zone and buffer zone boundaries must be marked in the field, except where specified forestry activities will not come within 50 metres of such boundaries. The outer edge of lines shown on the map is considered to represent the boundary of the mapped feature when marking the feature in the field.</p>	Compliant	<p>0/2</p> <p>(400m of rainforest boundary were tracked)</p>	
Comment and Evidence			
<p>EPA found that the areas assessed were compliant with this condition.</p> <p>There was adequate boundary exclusion markings observed, with two types of markings observed: three lines with “R F” and a circle with a horizontal line through it (see Error! Reference source not found.).</p> <p>The adequate markings may explain why no incursion occurred into the exclusion zone.</p>			

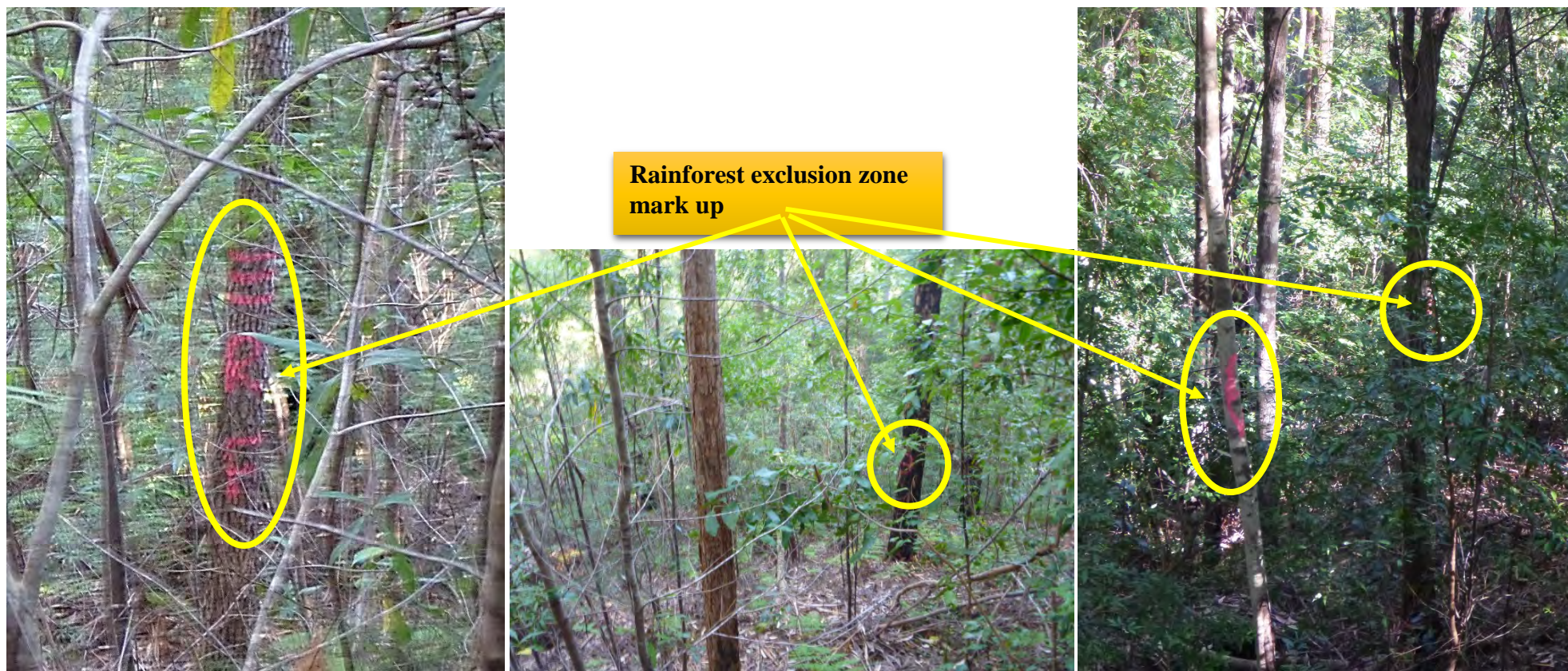


Figure 16: Two different types of rainforest exclusion zone markings

CONDITIONS RELATED TO ROAD CROSSINGS AND DRAINAGE FEATURES – 5 & 30 DRAINAGE

Condition No. and Detail	Compliant? Yes/No/Not determined/Not applicable	Number of non- compliance and (sample size)	Action required by licensee
Schedule 5 – Environment Protection Licence I. ROAD CROSSINGS WITHIN 30 METRES OF DRAINAGE FEATURES 37. Roads must be drained using a crossbank, relief pipe, spoon drain or mitre drain between 5 metres and 30 metres from a watercourse, drainage line, wetland or swamp crossing. This distance must be measured from the top of the bank of the incised channel, or where there is no defined bank, from the edge of the channel.	Yes	0/1	

Comment and Evidence

EPA officers inspected Crossing A as part of this audit, as shown in **Error! Reference source not found..**

Crossing A uses a cross drain. The inlet and outlet were observed to be clean and unobstructed. Sediment controls observed around Crossing A include a cross drain, mitres and silt trap. A mitre drain was observed which led to a silt trap. The mitre drain seemed to be functioning effectively as was the silt trap, witnessed by the sediment build up (**Error! Reference source not found.**). The mitre and silt trap may require maintenance very soon. The observed cross drain had significant sediment build up (see **Error! Reference source not found.**).

Crossing A is situated along a ridge top and hence there was no rollover or feature observed.

In all drainage seemed to be effective as deduced by the good condition of the road. However, maintenance of drainage features will need to be undertaken to ensure on-going effectiveness.



Figure 17: Crossing A - a) upstream, b) downstream, c) bank left, d) bank right



Figure 18: Mitre drain leading to silt trap, with silt build up



Figure 19: Cross drain entrance inlet, and outlet showing considerable sediment build up.

FURTHER OBSERVATIONS TABLE – KEREWONG STATE FOREST, COMPARTMENT 1, 2 AND 82

These are matters that were recorded during the field investigation but relate to conditions outside the audit scope

Number of Non-compliances and sample	Risk Code	Details of matter	Recommendation
4	Orange	<p>Pushed over casuarina across multiple locations. This non-compliance is an orange risk code as the likelihood of environmental harm occurring is likely to certain and the level of environmental impact is moderate.</p> <p>NSWFC said this was attributable to Regeneration STS harvesting, which is the heaviest harvesting technique, and as a result damage to casuarinas is inevitable.</p>	NSWFC to undertake a casuarina protection management plan.



Figure 20: Observed casuarina debris at different locations



Figure 21: Damaged casuarina tree and what is believed to be a casuarina stump

ACTION PLAN – KEREWONG STATE FOREST, COMPARTMENTS 127, 128 & 129

Compliance Priority	Number of non-compliances	Action Details	Non-compliance Code*	Target/Action Date
H Selection	1/2	An action plan must be developed and implemented to ensure that all H trees are selected and marked.	Yellow	12 Sept 2016
H & R Protection	5/8	An action plan must be developed and implemented to ensure that H&R trees are protected from logging debris accumulation and operational caused damage.	Red	Immediate
Total	6/10			

ATTACHMENT 2: Risk Assessment of Non-compliance

The significance of any non-compliances identified during the audit process are categorised according to the Risk Matrix below. The risk assessment for any non-compliance involves assessment against two criteria: the likelihood of environmental harm occurring and the level of environmental impact.

	Likelihood of Environmental Harm Occurring			
		Certain	Likely	Less Likely
Level of Environmental Impact	High	Code Red	Code Red	Code Orange
	Moderate	Code Red	Code Orange	Code Yellow
	Low	Code Orange	Code Yellow	Code Yellow

Risk matrix for determining the risk assessment code.

- a code red risk assessment denotes that the non-compliance is of considerable environmental significance and therefore must be dealt with as a matter of priority.
- a code orange risk assessment denotes a significant risk of harm to the environment however can be given a lower priority than a red risk assessment.
- a code yellow risk assessment indicates that the non-compliance could receive a lower priority but must be addressed.

There are also a number of licence conditions that do not have a direct environmental significance, but are still important to the integrity of the regulatory system. These conditions relate to administrative, monitoring and reporting requirements. Non-compliance of these conditions is given a blue colour code.

The colour code is used as the basis for deciding on the priority of remedial action required by the licensee and the timeframe within which the non-compliance needs to be addressed. This information is presented in the action program alongside the target/action date for the noncompliance to be addressed.

While the risk assessment of non-compliances is used to prioritise actions to be taken, the EPA considers all non-

ATTACHMENT 3: AUDITEE SUBMISSION AND NSW EPA RESPONSE

Condition / Audit finding reference / page No.	EPA draft finding / risk categorisation	Location – description, GPS	FCNSW evidence submission	EPA final finding / risk categorisation	EPA response to FCNSW submission
Not referenced Suggest 5.6 f) ii	Not Compliant / Code orange		Protection of Casuarina stands FCNSW acknowledges the importance of feed trees such as Casuarina, FCNSW have instructed contractor harvesting staff as well as FCNSW staff to be mindful and where possible protect not only Casuarina stands but also any other significant feed source they may come across. Ongoing training will also be provided as it becomes available.	Not Compliant/ Code Orange	NSW EPA advises that FCNSW's actions reflect the risk code (moderate). NSW EPA requires an action plan to be implemented. This action plan is to be a systemic process rather than just informal communication to contractors to be more mindful.
5.6 d) (TSL)	Not Compliant / Code yellow	Various	The tree identified by the EPA as a Habitat tree was viewed by the FCNSW Forest Technician as not meeting the requirements of a Habitat tree, however protected it as a Eucalypt feed tree. FCNSW agree with the EPA that this alleged breach is environmentally insignificant, as the tree has been retained and many additional seed trees (which also meet the definition as Recruitment trees) have been retained (well in excess of the recruitment tree retention requirement. FCNSW request that this alleged non-compliance be withdrawn.	Not Compliant/ Code Yellow	This E tree was not considered or selected by FCNSW staff as an H tree. The tree clearly had visible hollows from the ground. In regrowth zone particularly where H resources are scarce like at Kerewong, it is important to select trees with hollows as hollow bearing trees

					and then to select an accompanying recruitment tree for that hollow bearing tree. This tree should have been selected as an H tree but it wasn't and therefore is a non-compliance for H selection. These hollows are clearly visible in Error! Reference source not found. of the audit report.
5.6 h i) and ii)	Not Compliant / Code Red		<p>FCNSW undertakes quarterly audit inspections on harvesting operations. Since this audit the intensity on this issue of protection of retained has increased.</p> <p>FCNSW audit minimum standard is 10 X 1ha plots per quarter. The performance standards for H, R, E are:</p> <ul style="list-style-type: none"> <u>% Retained trees with debris</u> <p><10% = Acceptable 10-20% = Poor >20% = Very poor</p> <p>These results have bearing on the harvesting crews KPI's. Some notes for Kerewong include. A check of the HPOM tile revealed 37 H Trees 45 R trees have been marked by the forest technicians in the area harvested in the past 6 months. FNSW HC has established 16 1ha plots</p> <p>A total of 5H trees 8 R trees and 16 E trees were captured of the 29 H,R& E trees measured none were recorded as having as having significant debris around trees. The low number of H trees present can be attributed to the history of the Kendall MA it has been historically heavily logged and TSI 'd to remove non merchantable trees.</p>	Not Compliant/ Code Red	<p>These performance standards are set by FCNSW. Percentiles are not an appropriate measure or element of the TSL condition. Percentiles are not part of the TSL condition, they don't exist in the TSL, and shouldn't be used to assess compliance with this condition.</p> <p>This is a compliance audit and only licence conditions are used for</p>

			<p>FCNSW feels the damage caused to the R tree in Figure 10 is very minor and request for this to be removed from the audit. The H tree with the alleged crown damage has been inspected by FCNSW. This investigation found that it was most likely that the crown damage evident has not been caused by the recent harvesting event and likely to have been caused by historic or recent wind throw. FCNSW request that this alleged breach be removed from audit finding.</p> <p>FCNSW does not dispute your other findings but believes 2x 1ha plots does give a true reflection on the whole area harvested.</p> <p>FCNSW will continue to work with its contractors and harvesting staff to work towards achieving full compliance. FCNSW would welcome an opportunity to discuss the management of debris around retained trees in the field as 100% compliance is operationally difficult to achieve.</p>		<p>audit criteria. Only the elements of the TSL is used to determine compliance.</p> <p>It is concerning that there appears to be an acceptance of non-compliances with this TSL condition. It is concerning that there is an acceptance that up to 10% of marked and retained H & R resources is afforded not to be protected. It is particularly concerning that this acceptance is in regrowth forests like Kerewong SF where the resource as in this forest is very scarce. Therefore if percentiles are accepted, scarce H & R resources are likely to have their longevity cut short.</p> <p>In this case, it means that the spread of</p>
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Kerewong SF Cpts 127, 128 & 129– Auditee Response

					<p>habitat resource across the forest landscape is even more few and far between. With the retention of smaller R trees, the time gap between obtaining suitable replacement hollow bearing trees widens. Combined with the acceptance of inadequate tree protection, it will reduce the biodiversity values of a forest and not uphold the values of ESFM.</p> <p>This is an emerging issue in this IFOA region. The level of non-compliance and the extent of non-compliance and environmental risk appears to be aggravated by the intensity of 'regenerative harvesting', basal area reductions, the</p>
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Kerewong SF Cpts 127, 128 & 129– Auditee Response

					<p>harvesting of trees belonging to the largest size cohort and harvesting from boundary to boundary. These factors combine to significantly increase logging debris on the forest floor and increase the risk of harm to retained hollow bearing and recruitment trees from fire.</p> <p>The NSW EPA believes that a discussion on debris management around retained trees would be beneficial and welcomes such a proposal.</p> <p>The H tree with crown damage as shown in figure 5 of the audit report is considered a non-compliance. It is noted that this tree was selected as a H tree by FCNSW staff so if the</p>
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Kerewong SF Cpts 127, 128 & 129– Auditee Response

					<p>damage was caused after the FCNSW selection, it was most likely caused by the operation. EPA also base this finding on the audit evidence it collected during the field inspection, noting FCNSW did not provide evidence as part of their submission to counter the draft finding.</p> <p>EPA retains draft audit finding.</p>
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