Audit of timber harvesting operations in Victoria's State forests

Department of Environment, Land, Water and Planning

Report on the 2017-18 Forest Audit Program

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Contents

Executive summary

Audit scope and objectives

This report documents the methods, results and key findings of an environmental audit of timber harvesting operations in Victoria's State forests. Jacobs Group (Australia) Pty Ltd (Jacobs) was commissioned by the Department of Environment, Land, Water and Planning (DELWP) to deliver the 2017-18 audit, as part of its Forest Audit Program (FAP). The audit addresses mandatory compliance elements, based on the *Code of Practice for Timber Production* (the Code) and the *Management Standards and Procedures for Timber Harvesting Operations in Victoria's State forests* 2014 (the MSPs).

The FAP has been in operation since 2002 and has been managed by DELWP since 2010. It assesses compliance with the regulatory framework for timber harvesting operations in State forests and identifies and assesses any risk of harm they pose to the environment.

The specific regulatory compliance criteria that were considered in this years' audit were selected by DELWP's Timber Harvesting Compliance Unit (THCU) and related to two themes:

- Protection of soil, water and biodiversity values from adverse impacts associated with harvesting and in-coupe roading
- Design, construction, maintenance and closure of in-coupe roads.

Compliance was assessed for timber harvesting operations conducted in 30 coupes located in State forests within the Benalla-Mansfield, Central, Central Gippsland, Dandenong, East Gippsland, North-East and Tambo FMAs (Figure ES.1). Two of the coupes were located in Melbourne Water catchment areas.

Audit approach

Prospective coupes for the audit were selected from a list of coupes included in VicForests' current *Timber Release Plan*. Selection was randomised, but weighted towards coupes with higher risk features, including: waterway crossings, long lengths of in-coupe road, steep slopes and more erosive soils.

As coupe selection was risk-based, rather than fully randomised, the findings of this audit cannot be taken as being statistically representative of VicForests' operations overall.

Source: Department of Environment, Land Water and Planning.

Figure ES.1 Victorian Forest Management Areas

Compliance criteria considered in the audit drew on mandatory requirements of Code, mostly as expressed in related clauses from the MSPs and associated Planning Standards (PS). Compliance criteria were grouped into two main themes, with several sub-themes, as follows:

- *Environment:* compliance criteria developed for the audit drew on Section 2.2 of the Code (*Environmental values in State forests*) and related compliance elements from the MSPs and PS. There were three environmental sub-themes: soil, water (incorporating flows, water quality and river health) and biodiversity. Some audit criteria related to more than one of these sub-themes.

- *Roading:* compliance criteria developed for the audit drew on Section 2.4 of the Code (*Roading for timber harvesting operations*) and related compliance elements from the MSPs. There were three roading sub-themes: design, construction and maintenance-closure. Some of these compliance elements are also relevant to the water and biodiversity sub-themes.

Audits considered up to 105 compliance criteria[1] across environmental and roading themes in each of the 30 selected coupes. An audit workbook was completed for each coupe, based on observations by the audit team of harvesting and roading activities and a review of VicForests' respective Forest Coupe Plan (FCP). Where instances of non-compliance with the regulatory framework were detected, their potential environmental impact was assessed using the FAP's environmental impact assessment (EIA) tool. Field assessments for the audit were undertaken in May and June 2018.

VicForests personnel accompanied the audit team on all coupe assessments. This enabled useful discussions about planning and management practices, applicable elements of the regulatory framework and of any non-compliances that were observed.

Audit findings

Compliance with environmental and roading criteria for harvesting coupes

On average, the audited coupes fully complied with 91% of applicable environmental and roading criteria, with the level of full compliance for individual coupes ranging between 63% and 100%. The average level of compliance[2] varied across audit themes, as follows:

Environmental compliance elements:

- Protection of forest soils: 87% (44-100%)
- Protection of water flows, water quality and river health: 90% (55-100%)
- Protection of biodiversity values: 92% (71-100%)

Roading compliance elements:

- Road design: 81% (25-100%)
- Road construction: 92% (53-100%)
- Road maintenance and closure: 71% (0-100%)

Instances of non-compliance with the regulatory framework were recorded in two categories: those directly resulting in environmental impact and those that posed no direct risk of environmental harm. Often, the activity with direct environmental harm (e.g. an inappropriately constructed waterway crossing) was associated with multiple instances of non-compliance.

The severity of potential environmental impacts associated with the former were assessed using the FAP's EIA tool. EIA ratings ranged between negligible and major. The activities with major potential environmental impact assessments both related to harvest in what were intended to be unharvested riparian buffers. In both cases, the EIA rating given reflects the sensitivity of locations at which they occurred rather than the actual level of environmental harm (at the time of the audit).

Other kinds of issues contributing non-compliances with environmental impact were:

- In-coupe roads not being constructed with effective drainage at intervals consistent with MSP requirements, including approaches to waterway crossings
- Non-compliant waterway crossing design, construction and/or removal, including culvert outlets dropping water onto poorly protected stream channels
- Culvert outlets draining onto in-coupe road embankments and/or dropping water onto other areas that are prone to erosion
- Inadequate maintenance of in-coupe roads, leading to failure of drainage and/or sediment control structures

[1] Of the 105 potentially applicable audit criteria, only 77 were found to be applicable to one or more of the audited coupes.
[2] The lists below show the average level of full compliance across all coupes, plus (in parentheses) the range in compliance levels for the group of audit criteria. Note that, as previously stated, the level of compliance is for the audited coupes (only) and cannot be considered to be representative of VicForests operations overall.

- Damage to retained trees and understorey vegetation from regeneration activities, including regeneration burning and construction of boundary tracks for burning
- Road embankment materials covering the base of live trees that will be/have been retained post-harvest
- Harvesting in a small area mapped as having slope exceeding 30° within a declared water supply catchment
- Machinery disturbing and pushing soil into a riparian filter area.

Most of these issues have been observed in at least one of the two most recent FAP audits (in 2015-16 and/or 2016-17). They typically have potential to result in soil erosion and sediment generation. Depending on where they occurred within the coupe, they could lead to sediment deposition in waterways and water quality impairment. Others of the incidents affect the value of retained habitat.

Recommendations

Findings of this audit have led to a series of recommendations from the auditor to VicForests and DELWP (Table ES.1). Recommendations to VicForests address potential improvements in the management of timber harvesting and related roading activities and those to DELWP address potential improvements to the regulatory framework, including the FAP.

The priority given to recommendations reflects either the potential environmental impact associated with the aspect of harvesting practice or the importance of the recommendation to the effectiveness of the regulatory framework.

Table ES.1 Recommendations of the 2017-18 Forest Audit Program

Recommendations for VicForests	Recommendations for DELWP
High priority:	
V1: VicForests should thoroughly review its approach to the design, construction and rehabilitation of waterway crossings to significantly improve their compliance with regulatory requirements. This review should consider the recommendations included in Section 5.3.1 and discussed in the 2016-17 FAP audit report (Jacobs, 2018a).	D2: DELWP should develop a process for reviewing and acting on key findings and recommendations from each years' Forest Audit Program. D3: DELWP and VicForests should gather information on actual coupe attributes to support audit coupe selection rather than only information from the coupe planning stage.
Moderate priority:	
V2: As part of its review of the construction of waterway crossings and in-coupe roads and during coupe monitoring, VicForests should ensure culvert outlets comply with regulatory requirements and do not discharge onto unprotected embankments or from above the downstream surface elevation. V3: VicForests should continue to review its approach to regeneration burns to identify and implement opportunities to reduce unintended impacts in unharvested buffer areas. V4: VicForests should construct drainage on all in-coupe roads prior to any temporary or longer-term suspension of harvesting. Completion of construction and compliance with MSP drainage requirements should be confirmed in coupe monitoring records at suspension or closure.	D1: DELWP should review the methodology for assessing water quality risk of soils in the MSPs to more reliably classify erodible soils with high permeability. D4: DELWP should establish and maintain a register of coupes included in the FAP.

Glossary

Audit criteria	Criteria used to assess whether timber harvesting and related activities are consistent with mandatory requirements of the Code and MSP.
Code	The *Code of Practice for Timber Production* 2014, which lists mandatory actions for timber harvesting activities in native forests and plantations in Victoria.
Compliance	Compliance with audit criteria. Activities were assessed to comply (or fully comply), not comply or partly comply with audit criteria. Part compliance was determined where the actions did not fully comply with the compliance element, but no environmental impact assessment was required or applicable. Environmental Impact Assessment (EIA) ratings were applicable to instances of non-compliance.
Coupe	An individual management unit within forests and plantations where timber harvesting or thinning activities are planned and conducted. Under the *Sustainable Forests (Timber) Act* 2004, a coupe is a specific area of State forest identified for the purposes of timber harvesting and regeneration in a Timber Release Plan.
DELWP	Department of Environment, Land, Water and Planning: DELWP has responsibility for environmental regulation of timber production activities in State forests. DELWP were formerly known as the Department of Environment and Primary Industries (DEPI) and the Department of Sustainability and Environment (DSE).
EIA rating tool	A tool developed for the FAP to provide a consistent basis for assessing the potential environmental implications of non-compliance with audit criteria.
FAP	Forest Audit Program – an annual program of environmental audits coordinated by DELWP to ensure that timber production operations in State forests provide for sustainable forest management.
Filter strip	A protective boundary around a drainage line, temporary stream or buffer strip. Trees may be harvested from within the filter strip, although they may not generally be entered by harvesting machines.
Forest coupe plan (FCP)	A plan that is prepared for each coupe that describes the biophysical character of the coupe and the nature of planned harvesting operations. The minimum content requirements of an FCP are specified in the Code. The FCP is contained within a coupe file that includes other information, including coupe monitoring records, traffic management provisions and silvicultural operations. The coupe file may also refer to information about the coupe and its operations that is held within a VicForests or DSE information management system.
Forest Management Area (FMA)	The basic regional unit for forest planning used for public land in Victoria. These forest planning units are not administrative units.
Full compliance	The assessment for individual audit criteria and criteria overall that the relevant aspect of coupe planning or operations is fully consistent with the regulatory requirement and audit criterion, as per Table 3.3.
Incident	An event, action or lack of action on a coupe that gives rise to an assessment of non-compliance with an audit criterion that has environmental impact. The nature of the audit criteria and various prescriptions mean that a single incident may result in multiple non-compliances.
In-coupe road	A temporary road constructed to provide access to landings and/or allow haulage of timber from the coupe.
Landing	An area within the coupe that is specifically developed to sort, process and/or load trees or parts of trees for transport from the forest. Top soil is removed before landings are developed. Landings must be rehabilitated at coupe closure (including by re-spreading top soil) unless they are to be used for an adjacent coupe.
MSP	*Management standards and procedures for timber harvesting operations in Victoria's State forests 2014.* They are designed to help interpret the Code for timber harvesting and related activities in State forests. They are a secondary source of mandatory prescriptions for forest management.
PS	*Planning standards for timber harvesting operations in Victoria's State forests 2014.* Appendix 5 to the MSPs.
Rough heaping	A method of preparing coupes for regeneration, generally following failure of initial attempts. Remaining woody material is pushed into heaps and burnt. Soils, understorey and coupe infrastructure are disturbed by machinery to create a receptive seed bed.

Snig track	A track through a harvested coupe along which harvested logs are towed or winched, normally towards a landing.
Soil erosion hazard	Soil erosion hazard (or SEH) is a composite index of the potential for soil erosion to occur within a forest coupe. SEH is based on field assessments of soil texture, aggregate stability, structure, colour, organic content, mottling and stoniness. It also takes account of the erosivity of rainfall at the location, average slope, slope length, tree size and revegetation capacity. The method of calculation is described in the MSP (DEPI, 2014b). SEH is assessed for each coupe during harvest planning.
State forest	Publicly-owned and managed forest estate. Victoria has 3.4 million ha of State forest. State forest is managed for multiple beneficial uses, including conserving flora and fauna, protecting water catchments and water supply, providing timber for sustainable forestry, protecting landscape, archaeological and historic values, and providing recreational and educational opportunities.
Timber Release Plan (TRP)	Timber resources in State forests in eastern Victoria are allocated to VicForests for the purposes of harvesting and/or selling through the Allocation to VicForests Order 2004 (as amended). The Allocation Order specifies the extent and location of the forest stands to which VicForests has access under this Order. VicForests must prepare a Timber Release Plan for allocated areas. Timber Release Plans (TRPs) are publicly available documents that must include: a schedule of coupes selected for timber harvesting and associated access road requirements; details of the location and approximate timing of timber harvesting in the proposed coupes; and details of the location of any associated access roads. They are prepared by VicForests in accordance with Part 5 of the *Sustainable Forests (Timber) Act* 2004 and may be reviewed and changed in accordance with section 43.

1. Introduction

1.1 Sustainable Forest Management in Victoria

The legislative framework for the harvesting and management of timber resources in Victoria's State forests is provided by the *Forests Act 1958,* the *Conservation, Forests and Lands Act 1987* (the CFL Act) and the *Sustainable Forests (Timber) Act 2004* (the SFT Act). The latter establishes the current regulatory framework for the sustainable management of Victoria's State forests.

Under the SFT Act, harvesting of timber from public land by VicForests is to be conducted in a manner which has regard to the principles of ecologically sustainable development. The Act provides for the development of a Sustainability Charter, which sets out the State's objectives for sustainable forest management. These objectives (DSE, 2006) are to:

- Maintain and conserve biodiversity in State forests
- Maintain and improve the capacity of forest ecosystems to produce wood and non-wood products
- Promote healthy forests by actively managing disturbance
- Maintain and conserve the soil and water resources of State forests
- Maintain and better understand the role of Victoria's State forests in global carbon cycles
- Maintain and enhance the socio-economic benefits of State forests to Victorian communities
- Ensure Victoria's legal, institutional and economic frameworks effectively support the sustainable management of State forests.

The SFT Act requires VicForests and its contractors to comply with relevant Codes of Practice. Under the CFL Act, the Minister may make such Codes of Practice, including for sustainable forest management, to specify management standards and procedures.

The regulatory framework for sustainable forest management requires organisations and individuals undertaking commercial timber harvesting on public land to comply with two Codes of Practice, the *Code of Practice for Timber Production 2014* (the Code; DEPI, 2014a) and the *Code of Practice for Bushfire Management on Public Land 2012*, as well as various management prescriptions and guidelines. These Codes of Practice are administered by the Department of Environment, Land, Water and Planning (DELWP) on behalf of the Minister for Energy, Environment and Climate Change.

The SFT Act provides for the Minister to seek an audit of VicForests' compliance with relevant Codes of Practice. If such an audit includes any adverse findings against VicForests, the Minister must make those adverse findings available to VicForests and VicForests must prepare a written response to those findings, including details of measures VicForests intends to undertake or has undertaken to improve compliance with the relevant Code of Practice. Any adverse findings of an audit and VicForests response(s) to these are to be made available to the public.

In reviewing VicForests' Allocation Order, the SFT Act requires that the Minister will also have regard to VicForests' compliance with such Codes of Practice.

1.2 Forest Audit Program

Since 2002, environmental auditors appointed under the *Environment Protection Act 1970* have been engaged to undertake audits of timber harvesting operations in Victoria's State forests. These audits have assessed compliance with the Code and related standards and management procedures. This program of audits was initially administered by the Environment Protection Authority (EPA), but has been delivered by DELWP[3] since 2010.

[3] The audits have been delivered by DELWP and its predecessor agencies, the Departments of Sustainability and Environment (DSE) and Environment and Primary Industries (DEPI).

The Forest Audit Program (FAP) has undergone several major changes since it was first delivered by DELWP. This has reflected changes to the regulatory framework (including the revision of the Code and Management Standards and Procedures in 2014), as well as the adoption of a risk-based approach to the selection of audit compliance priorities. Since 2015-16, FAP audits have largely focussed on Code compliance priorities relating to:

- Environmental values in State forests, particularly those relating to soils, water, waterways and biodiversity
- Design, construction, maintenance and closure of in-coupe roads.

2. Audit scope

2.1 Audit objectives

The FAP enables DELWP to commission external third-party environmental auditors to provide an objective and independent assessment of:

- Compliance by VicForests and their contractors with specified rules outlined in the regulatory framework
- Environmental performance of timber harvesting operations in Victoria's State forests, and any associated risks of harm to the environment.

The FAP is a key contributor to continual improvement to systems of sustainable management for Victoria's State forests.

2.2 Audit scope

The audit addresses mandatory compliance elements drawn from both the Code and *Management Standards and Procedures for Timber Harvesting Operations in Victoria's State forests 2014* (MSPs[4]; DEPI, 2014b). Code compliance elements for this audit were selected by DELWP prior to commissioning of the audit. These address:

- Environmental values in State forests (Code, Section 2.2): namely water quality, river health and soil protection and the conservation of biodiversity
- Roading for timber harvesting operations (Code, Section 2.4): specifically, road design, construction, maintenance and closure.

Compliance elements for the audit (see Appendix B) also included mandatory requirements of the MSPs and their Planning Standards (PS; *Planning Standards for timber harvesting operations in Victoria's State forests 2014*; DEPI, 2014c). These were selected by the auditors following commissioning.

Collectively, the compliance elements seek to ensure that harvesting and associated forest roading activities are conducted so that the range, quantity and quality of environmental goods and services provided by State forests are maintained.

Compliance by VicForests and their contractors with the selected regulatory requirements was assessed in 30 coupes located in State forests in the Benalla-Mansfield, Central, Central Gippsland, Dandenong, East Gippsland, North East and Tambo Forest Management Areas (FMAs; Figure 2.1). Timber harvesting activities took place in each of these coupes during at least the 2016-17 financial year.

[4] This also includes the *Planning Standards for timber harvesting operations in Victoria's State forests* (DEPI, 2014c), which is published separately, but is Appendix 5 of the MSPs.

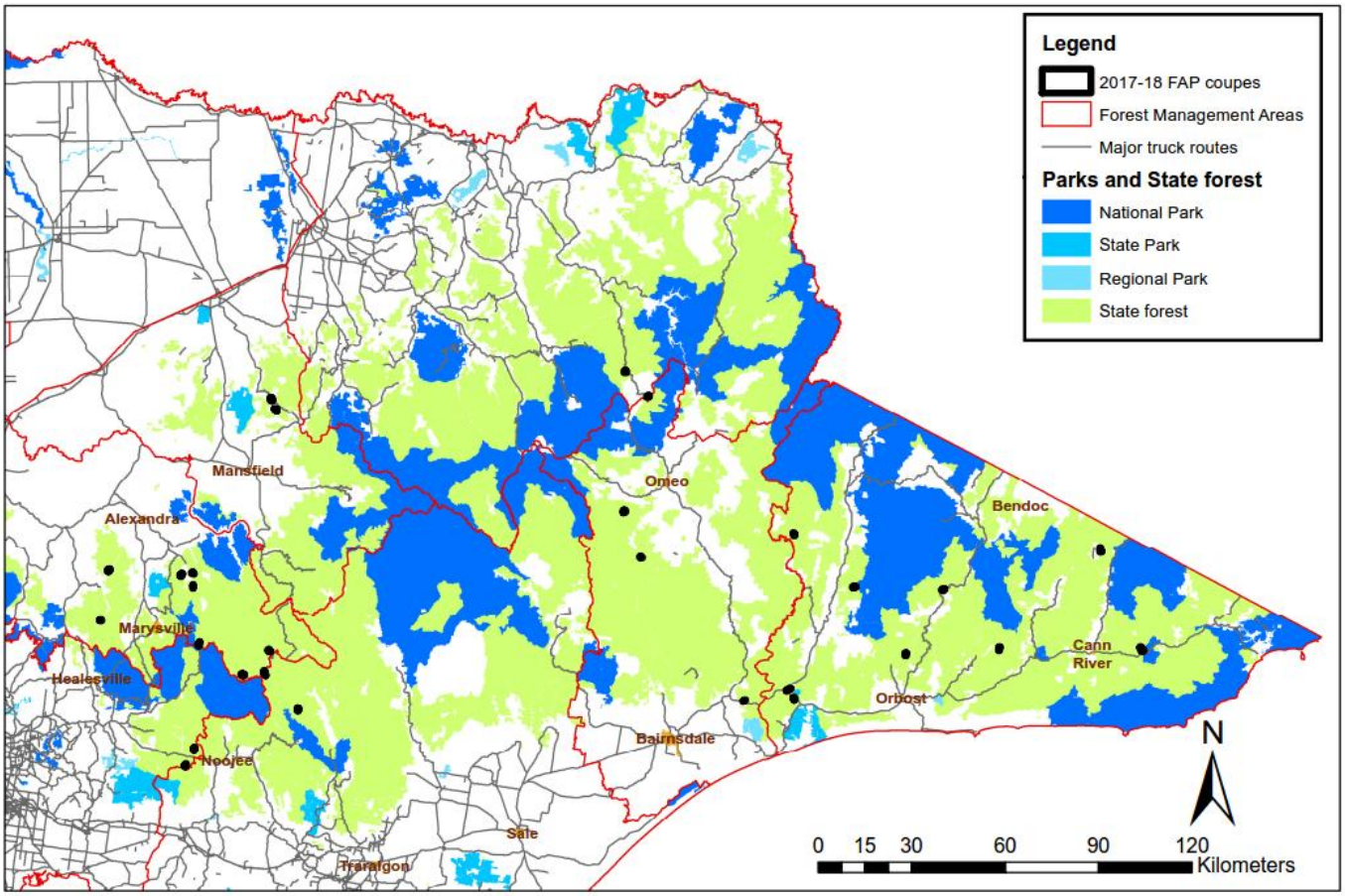


Figure 2.1 Locations of coupes included in 2017-18 Forest Audit Program

2.3 Audit timing

Field assessments of the coupes included in this audit were undertaken during May and June 2018. Audit reporting was carried out in two stages, with an initial summary report on the results of the audit submitted to DELWP in June 2018 and a draft version of this audit report being submitted to DELWP in October 2018. The summary report (Jacobs, 2018b) provided preliminary information on compliance assessments and the potential environmental impact of any non-compliances, but did not draw out any overall findings or conclusions.

2.4 Audit team

The audit team were all employed by Jacobs Group (Australia) Pty Ltd (Jacobs). They included the following team members:

- *Craig Clifton (Project Manager and lead auditor*): Craig is an EPA-appointed natural resources environmental auditor. He developed the audit methodology, led the field assessments and their analysis and is lead author of this audit report. Craig is an experienced environmental auditor and has led audit teams undertaking five previous audit projects as part of the FAP.
- *David Endersby (Project Director):* David is a principal consultant with extensive experience in ecological survey. He has participated in several previous FAP audits as a field team member, project director and technical reviewer. David is the internal technical reviewer for this report and Jacobs' project director.
- *Dr Drew King (Audit team member):* Drew is a senior ecologist with extensive ecological survey experience and has been involved in previous timber harvesting compliance investigations and FAP audits for DELWP. Drew assisted with field assessments of 15 of the audit coupes.
- *Sally Waller (Audit team member):* Sally is a senior consultant with extensive ecological survey and landscape ecology experience. She participated in field assessments of 15 of the audit coupes.

3. Audit approach

3.1 Coupe selection

DELWP specified that evidence for this audit would be gathered from assessments of 30 coupes, distributed between East Gippsland FMA and the Central Highlands, Gippsland and North East groups of FMAs[5]. At least two of the 30 coupes were required to be located within Melbourne Water's water supply catchment areas.

Target coupes were selected by the auditors from the set of 231 VicForests' Timber Release Plan (TRP) coupes that were operational during the 2016-17 financial year. The spreadsheet containing the list of coupes included data from VicForests' coupe planning processes, including:

- *Inherent characteristics of the coupe:* including slope, soil erosion hazard, forest type and (gross) coupe area
- *Protected environmental values located within or near the coupe:* including the presence of (modelled) rainforest vegetation and whether the coupes were located in a designated water supply catchment
- *Forest management zoning characteristics:* including the presence and characteristics of any Special Protection Zones or Special Management Zones (SPZ and SMZ, respectively)
- *Planned coupe development activities:* including the planned length of in-coupe road, likely construction of waterway crossings, silvicultural system and marked harvest area (in 2016-17).

A risk-based selection process was used by the auditors to identify the target coupes, based on some of this information. Coupes were short-listed for selection where they were identified in coupe planning as having one or more of these characteristics:

- A waterway crossing was to be constructed to access the coupe
- Modelled rainforest vegetation was identified as being present within the gross coupe area
- At least 400 m of in-coupe road was to be constructed to provide access to landing(s) or through the coupe
- Soil erosion hazard in the A or B horizon was high
- Average coupe slope was 15° or greater.

Coupe selection was therefore weighted towards coupes with high potential for risk to soil, water quality and/or biodiversity values. *This intentional bias in coupe selection means that the audit findings are not necessarily statistically representative of VicForests' harvesting operations as a whole.* However, the approach does allow a robust assessment of VicForests' management of timber harvesting in the more sensitive of the landscapes in which it operates.

Coupes were preferentially selected for audit where multiple risk factors (as above) were present. The distribution between FMA was as specified by DELWP in its terms of reference for the audit (see Table 3.1). None of the coupes had previously been included in FAP audits. Some coupes were still active at the start of the 2017-2018 financial year, however harvesting and (often) regeneration had been completed in most coupes. Two of the selected coupes (457-501-0020 Andy; 480-501-0003 Whitelaws Ramble) were located in Melbourne Water catchment areas. The list of target coupes is given in Appendix A and their locations shown in Figures A.1 and A.2.

[5] As defined in the MSPs: Central Highlands FMAs refers to Central and Dandenong FMAs and parts of the Central Gippsland FMA referred to in the *Central Highlands Forest Management Plan.* Gippsland FMAs refers to parts of the Central Gippsland and North East FMAs referred to in the *Gippsland Forest Management Plan* and Tambo FMA. North East FMAs include Benalla-Mansfield FMA and parts of the Central and North East FMA referred to in the *North East Forest Management Plan.*

Table 3.1 Summary of audit targets by Forest Management Area region

FMA region	# Coupes	Reserve coupes
Gippsland FMAs – Central Gippsland, Tambo	5	6
East Gippsland	10	6
Central Highlands FMAs – Central, Dandenong	10	5
North-East FMAs – Benalla-Mansfield, North-East	5	1

The harvested area for the target coupes (Table 3.2) ranged between 4.9 ha and 42.3[6] ha, with the average being 20.2 ha. On average across the 30 coupes, only about 50% of the gross coupe area was actually harvested.

All but two of the coupes were planned to have in-coupe roads, with the average planned length approximately 490 m. However, no new in-coupe roads were actually constructed, or existing tracks upgraded on another four coupes. In-coupe roads less than 100 m were constructed on a further three coupes. The average length of in-coupe road constructed was approximately 470 m.

The actual length of in-coupe road exceeded the planned length by more than 100 m on eight of the target coupes.

Waterway crossings were planned for 12 of the coupes but were only actually constructed on seven coupes. Cool and/or warm temperate rainforest vegetation communities were detected (based on ecological vegetation community [EVC] modelling undertaken by DELWP[7]) in coupe planning for 13 of the 30 coupes. Rainforest stands, as defined by the Code, were only detected near the harvest areas in two of the coupes. Sixteen of the coupes were located in designated water supply catchments.

Soils in the harvest audit coupes were generally relatively stable, with only eight of the 30 coupes recording soil erosion hazard (SEH) values of high or greater. Coupes were generally located in relatively steep landscapes, with the average slope estimated to be 15° or more in 16 of the 30 coupes.

Table 3.2 Location and characteristics of audit coupes

#	Coupe ID	FMA[1]	Name	Area[2]	ICR[3]	WWX[4]	RF[5]	Slope[6]	SEH[7]	WSC[8]
1	281-514-0005	CT	Bear Grylls	37.9	420	3	No	S>15	M	N
2	286-505-0026	CT	High Voltage	4.9	410	0	Yes		M	N
3	287-508-0004	CT	Rocksteady	15.3	1050	1	No	S>15	M	N
4	287-513-0004	CT	Royston Slim	9.6	0	0	Yes	S>15	H	N
5	298-513-0005	CT	French Island	16.8	0	0	Yes	S>15	L	N
6	312-512-0004	CT	Liverpool	33.7	375	0	Yes	S>15	M	Y
7	317-508-0003	CT	Machikichori	11.6	538	0	No	S>15	M	Y
8	318-512-0007	CT	Eddy Grant	22.6	780	0	No	S>15	H	Y
9	348-517-0005	DD	Tarzan	17.0	75	1	No	S>15	H	N
10	349-514-0006	DD	You Just Know	25.1	1035	1	No	S>15	M	N
11	457-501-0020	CG	Andy	33.4	1010	0	Yes	S>15	M	Y
12	480-501-0003	CG	Whitelaws Ramble	11.3	605	0	No	S>15	L	Y
13	742-513-0012	TB	Pharlap	18.9	40	0	No		H	N
14	771-507-0027	TB	Tom Tom Drums	30.2	140	0	Yes		M	Y

[6] 18 Stringybark Creek coupe is a single tree selection coupe and is not subject to an area limit (as per MSP 2.4.4.1). Note that coupe size and configuration MSP elements were not within the scope of this audit.
[7] Source of data: https://www.data.vic.gov.au/data/dataset/native-vegetation-modelled-2005-ecological-vegetation-classes-with-bioregional-conservation-status

#	Coupe ID	FMA[1]	Name	Area[2]	ICR[3]	WWX[4]	RF[5]	Slope[6]	SEH[7]	WSC[8]
15	760-506-0011	TB	Johnnie and Jack	22.4	895	3	No		M	Y
16	394-501-0002	BM	Tatong Heights	10.1	0	0	No	S>15	L	N
17	394-501-0005	BM	Tatong Wedge	14.9	200	0	No		L	N
18	395-502-0003	BM	Stringybark Creek	42.3	100	0	No		L	Y
19	684-514-0003	NE	Swivel	14.4	610	1	No	S>15	L	Y
20	686-510-0004	NE	Lyons	13.5	481	0	No	S>15	M	Y
21	801-504-0018	EG	Lambpoon	33.4	300	0	Yes		M	N
22	803-506-0004	EG	Lyles	16.4	410	0	No		M	Y
23	810-501-0009	EG	Boxed Chook	14.8	0	0	Yes		H	N
24	810-501-0020	EG	Running Creek	15.5	0	0	Yes		H	N
25	814-504-0002	EG	Titanium	19.3	300	0	Yes		M	Y
26	827-501-0024	EG	Wayfarer	29.6	800	0	Yes		M	Y
27	833-512-0025	EG	Panglossian	23.8	340	0	Yes	S>15	L	Y
28	836-524-0021	EG	Buckskin	11.8	310	1	No		H	Y
29	874-501-0012	EG	Donkeyshoe	19.1	0	0	Yes		L	N
30	888-510-0010	EG	Cabbage Patch	16.4	60	0	No	S>15	H	Y

Key:

1. FMA – Forest Management Area: BM–Benalla-Mansfield; CG-Central Gippsland; CT–Central; DD-Dandenong; EG-East Gippsland; NE-North East; TB-Tambo.
2. Area – actual harvest area (ha). Note that for some coupes there are discrepancies in harvest area between operations maps, final harvest map and/or the FCP.
3. ICR – planned length of in-coupe road (m). Shading code: green – ICR >100 m shorter than planned; orange – ICR>100 m longer than planned. Note 29 Donkeyshoe: forwarding tracks were used rather than in-coupe roads to haul logs to the landing.
4. WWX – number of waterway crossings within the coupe. Green shade indicates coupes where a WWX was planned but not actually constructed. Orange shading indicates that a waterway crossing was constructed, although one was not originally planned. For some coupes, ICR or snig track WWX on adjacent coupes were assessed, as these were used during harvesting of the target coupe.
5. RF – (modelled) cool or warm rainforest vegetation was identified within the gross coupe area during planning. Blue shaded cells are those in which a rainforest stand (as defined by the Code) was detected.
6. Slope – S>15 indicates coupes in which the average slope was estimated to be 15° or more.
7. SEH – highest soil erosion hazard (from FCP) of A or B horizon: low (L), medium (M) or high (H).
8. WSC – coupe located in a designated water supply catchment. Blue shaded coupes located in Melbourne Water catchment area. Green shaded coupes – flagged by VicForests as located in a water supply catchment, but not actually located in one. These coupes were located within 500 m of a designated water supply catchment

3.2 Audit criteria and workbook

Audit criteria were based on mandatory requirements of the Code selected by DELWP's Timber Harvesting Compliance Unit (THCU). Most commonly, these referenced compliance elements from the MSPs and its PS, as these provide more detailed interpretations of Code requirements. Compliance criteria were grouped into two themes, with several sub-themes, as follows:

- *Environment theme:* relating to compliance criteria drawing on Section 2.2 of the Code (*Environmental values in State forests*) and related compliance elements from the MSPs and PS. There were three environmental sub-themes: soil; water (incorporating flows, water quality and river health); and biodiversity. Some audit criteria related to more than one of the environmental sub-themes.
- *Roading theme:* relating to compliance criteria drawing on Section 2.4 of the Code (*Roading for timber harvesting operations*) and related compliance elements from the MSPs. Three roading sub-themes were identified: design; construction; maintenance and closure. Maintenance and closure were combined into a

single sub-theme as there was only one applicable maintenance criterion. Some roading compliance elements are also relevant to water and biodiversity sub-themes.

The set of compliance criteria considered in the audit are given in Table B.1 in Appendix B. These were assessed, as applicable, for the target coupes. An audit workbook was developed to capture assessments against all applicable criteria for each individual coupe during the field assessment (see Section 3.3).

During the field assessment, the applicability of each compliance criterion to the specific coupe was determined, based on site conditions and/or documentary evidence in VicForests' coupe files or related records. If a criterion was applicable to the coupe, an assessment was then made as to whether or not the coupe operations fully complied, as per Table 3.3. Where the operations were not fully compliant with the criterion, an assessment was made of the potential environmental impact, using the method described in Appendix C.

Table 3.3 Descriptors used to assess compliance against audit criteria

Level of compliance	Fully complies	Non-compliant with no environmental impact (Non-No EI)	Not compliant with environmental impact (Non-EI)
Description	All requirements of the compliance element are fully satisfied.	Not all requirements of the compliance criterion are fully satisfied, however there is no pathway, evidence and/or or suggestion of risk of harm to the environment as a result.	The non-compliance results in a direct impact on or risk of harm to the environment. An assessment is conducted using the FAP's Environmental Impact Assessment [EIA] tool, Appendix C.

3.3 Field assessments

Field assessments were carried out for all 30 target coupes during May and June 2018, using the procedures summarised in Table 3.4. Results of assessments were captured on data sheets and reported, as applicable, in the audit workbook for the respective coupe.

Table 3.4 Field assessment methods

Attribute being assessed	Method
1. Waterway classification and correct provision of riparian filters and/or buffers.	Assessment of waterway(s) as drainage line, temporary stream or permanent stream, based on Code definitions. Streams and widths of filters/buffers assessed along up to ~600 m of waterway per coupe, if present. Adequacy of filter and buffer widths typically assessed with a range finder, supported by ground traverses to locate the centreline of the stream where necessary. Assessments are not necessarily formally undertaken where a waterway buffer clearly exceeds MSP specifications (i.e. by tens of metres).
2. Extent to which harvesting was conducted on slopes >30° (or >25° in coupes with granite soils in East Gippsland FMA).	Visual observation, using a clinometer, if required.
3. Adequacy of protection provided to soils, waterways and river health.	Visual observations and auditors' interpretations, based on the presence/extent/ absence of excessive disturbance and/or activities which are not compliant with elements of the regulatory framework.
4. Soil erosion hazard/water quality risk	Comparison of VicForests assessment of soil erosion hazard with observations of erosion within the coupe. Soil erosion hazard was assessed using MSP methods where evidence of soil erosion suggested to the auditor that the initial assessment many have understated the actual erosion hazard.[8].
5. Presence of in-coupe roads or snig tracks in riparian habitats.	Visual observations and auditors' interpretations of the reasonable practicability of alternative placements which avoided riparian areas.

[8] Soil erosion hazard was only assessed from soil samples for one coupe (814-504-0002 Titanium). Erosion on the in-coupe road suggested to the auditor that the soil erosion hazard assessment may have been incorrect. However, the auditor's soil assessment confirmed VicForests' assessment for the coupe.

Attribute being assessed	Method
6. Waterway crossings and culverts.	Assessment of culverts, embankments and road drainage against MSP requirements. Observations and auditors' interpretation of crossings from which the culvert had been removed. Observations of sediment entry into the waterway from crossing embankments and/or road drainage in the near-stream environment. Some of the waterway crossings included in the audit were located on sections of the in-coupe road or snig tracks located outside of the target coupe. These were, however, used to support harvesting of the target coupe.
7. Habitat trees.	Assessment of the density and distribution of habitat trees, their location in relation to other habitat and the presence of or their potential to develop hollows.
8. If listed threatened fauna or flora are recorded as being present, whether prescribed management actions been followed.	Comparison of Victorian Biodiversity Atlas (VBA) search results with reported presence of threatened species in the FCP. Observation of coupe conditions and comparison with relevant management actions (e.g. specified in the PS).
9. Road construction in or near heathland or montane riparian thicket (MRT).	Confirmation of the presence of the vegetation community and observation of its proximity to in-coupe roads. Auditors' assessment as to the reasonable practicability of alternative road location if the road entered the protected vegetation community. This assessment only considered MRT vegetation; no heathlands were observed in the target coupes for this audit.
10. Rainforest buffers.	Identification of rainforest stands, as per MSP definitions. Assessment of provision of any required buffers as per MSP compliance requirements for up to 600 m length of buffer in each coupe.
11. Myrtle Wilt risk.	Observation of harvesting related damage to or wounding of Myrtle Beech trees, in applicable coupes.
12. In-coupe road clearing width.	For in-coupe roads through retained vegetation, assessment of whether clearing width was consistent with MSP requirements.
13. In-coupe road.	Compliance with MSP drain spacing requirements, based on soil erosion hazard and gradient, for full length of in-coupe road (up to ~1 km). Assessment of effectiveness of drainage and appropriateness of drainage disposal, considering Code and MSP requirements. Observation of any instances where road embankments covered the base of retained trees. Observation of the stability of road, waterway crossing and landing embankments. Observation and auditors' interpretation of the adequacy of road maintenance and any road closure works. Assessments of in-coupe roads sometimes extended beyond the boundary of the target coupe. Sections of the permanent, DELWP-managed, road network were assessed for coupes where these roads were upgraded to support harvesting.

3.4 Environmental impact assessment

The risk of harm to the environment resulting from all observed non-compliances (as per Table 3.3) was assessed using the environmental impact assessment (EIA) tool that was amended in the 2016-17 FAP audit program (Jacobs, 2018b; Appendix C), as requested by DELWP's THCU. The tool assesses environmental risk based on:

- *Extent and location of impact:* an auditor's assessment based on one or more of several factors, namely
  - Proportion of the harvestable coupe area affected by the non-compliance
  - Length of in-coupe road without compliant drainage
  - The number and/or extent of incidences of unauthorised disturbance (i.e. disturbances which are not permitted by the regulatory framework for timber harvesting operations) to waterways and riparian buffers or filters
  - The extent of disturbances to other exclusion areas within the gross coupe area or on adjacent land.
- *Duration of impact/recovery time:* an assessment by the auditor of the time required for the coupe and any associated values to recover from any impact or disturbance associated with the non-compliance incident.
- *Values affected:* an assessment based on the value or environmental aspect experiencing or potentially experiencing an impact stemming from the non-compliance. General forest areas are valued less than riparian or rainforest buffers and SPZ, for example.

The EIA tool is described in Appendix C. Scores for each aspect are added and the total score compared against an overall five-point rating scale. Overall EIA ratings potentially range between negligible and severe. EIA ratings were made where there was a direct pathway to or evidence of environmental harm associated with the absence of full compliance with the regulatory framework, as per Table 3.3.

4. Audit results

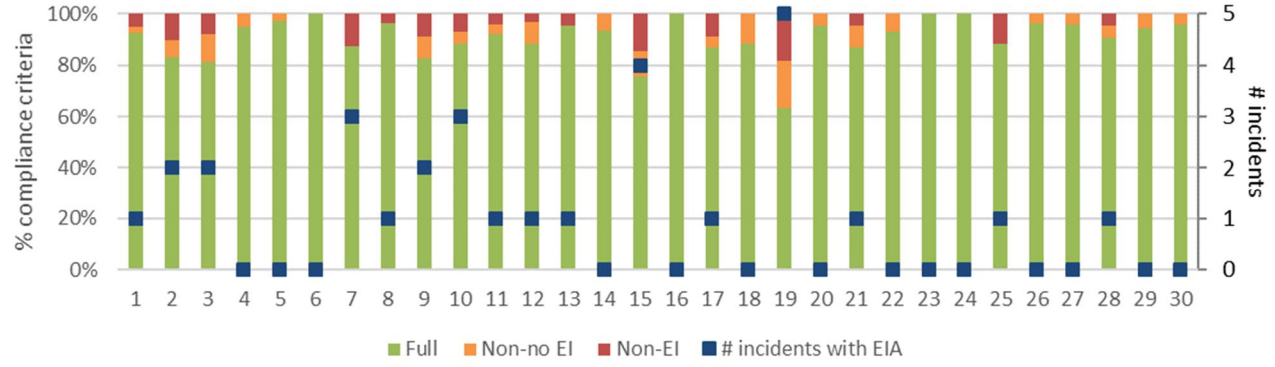
The following discussion summarises the results of the assessments of compliance with mandatory elements of the regulatory framework for timber harvesting in State forests, as listed in Appendix B. Overall results are presented first, with those for each compliance theme and sub-theme following.

Due to space constraints, coupes are represented in the figures in the following sections by the number assigned in Table 3.2 and Appendix A and in the accompanying text by that number (rather than the TRP coupe number) and the coupe name.

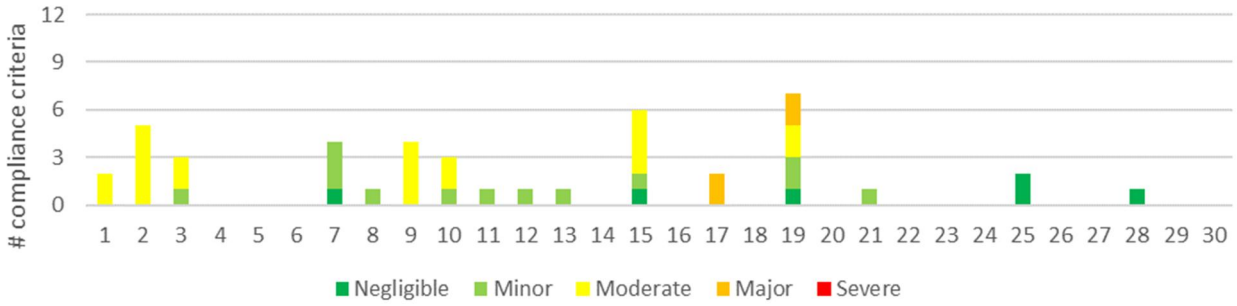
4.1 Overall compliance findings

A total of 105 compliance criteria were identified from the Code compliance elements specified by DELWP in their audit scope (Appendix B). Of these, 28 were not applicable to any of the coupes included in the audit. Full compliance was recorded on all applicable coupes for 63 criteria. Non-compliances with potential for environmental impact were recorded against 15 individual criteria (Table B.1, Appendix B).

The overall level of full compliance with applicable audit criteria[9] ranged between 63% (19 Swivel) and 100% (6 Liverpool, 16 Tatong Heights, 23 Boxed Chook, 24 Running Creek; Figure 4.1). The average level of full compliance with applicable criteria across the 30 audited coupes was 91%. Non-compliances with environmental impact were recorded on 16 of the 30 audited coupes (Figure 4.1).



a) Level of compliance with audit criteria and number of non-compliance incidents with assessable environmental impact. Compliance definitions (Full, Non-no EI, Non-EI) as per Table 3.3.



b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.1 Overall compliance results and assessed potential environmental impact for instances of non-compliance. The horizontal axis in both graphs refers to the coupe numbers, as per Table 3.2.

Figure 4.1 also records the number of 'incidents' (events, actions or lack of preventative action on a coupe that gives rise to single or multiple assessments of non-compliance with audit criteria and result in environmental

[9] Full compliance means that coupes were assessed to comply with an applicable audit criterion, as per Table 3.3.

impact) observed in each coupe[10]. Between zero (14 coupes, as above) and five (19 Swivel) incidents were recorded for each of the coupes, with an average of 1 incident per coupe. A listing of the identified incidents leading to assessments of non-compliance with audit criteria and the regulatory framework for timber harvesting is given in Appendix D.

The EIA tool (Appendix C) was used to assess the potential environmental impact associated with each non-compliance incident[11]. These assessments ranged between negligible and major (Figure 4.1). Non-compliances that were assessed to have major environmental impact were detected in two of the 30 audit coupes. These were associated with harvesting in what were intended to be riparian buffers.

4.2 Environmental compliance theme

The environmental theme included three main groups of compliance element and audit criteria, those relating to soil, water and biodiversity values. Several roading compliance elements and criteria were also applicable to this theme.

4.2.1 Compliance elements related to the protection of forest soils

Compliance elements related to the protection of forest soils (Appendix B) primarily relate to the avoidance of erosion or mass movement of soils, as well as to mitigating the risk of entry of sediments into waterways, should they be mobilised. The entry of mobilised sediments into waterways is primarily dealt with under the water sub-theme (Section 4.2.2). The avoidance of erosion and mass movement of soils is achieved by:

- Assessing and understanding soil erosion hazard within the coupe
- Not harvesting in excessively steep areas[12]
- Application of seasonal closures to reduce the risk of sediment mobilisation during wet weather in water supply catchments
- Appropriate construction, maintenance, closure and/or removal of in-coupe roads, road drainage and road or snig track waterway crossings.

A total of 19 audit criteria were relevant to the protection of forest soils, of which three were not applicable to any of the target coupes. The average level of full compliance with applicable criteria was found to be 87%, with the level of compliance ranging between 44% (15 Jonnie and Jackie, 19 Swivel) and 100% (12 coupes; Figure 4.3). The assessed environmental impact associated with non-compliances ranged between negligible and major (Figure 4.3).

Non-compliance incidents resulting in environmental impacts on forest soils were identified in 14 coupes. These were mostly connected with in-coupe roads and included:

- Excessive distances between effective drainage structures on in-coupe roads (relative to MSP specifications)
- Inadequate maintenance, which sometimes led to failure of in-coupe road drainage structures (Figure 4.2)
- Erosion at the outlet of road drainage or waterway crossing culverts
- Excessive soil disturbance associated with the removal of snig track waterway crossings (Figure 4.2).

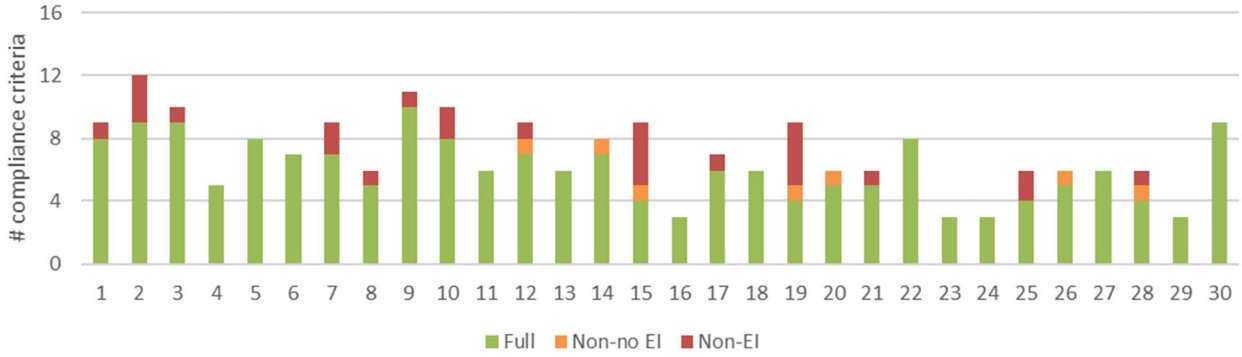
The assessed environmental impact associated with these non-compliances was moderate or lower. The assessed levels of environmental impact are considered by the auditor to appropriately reflect the risk to soils.

[10] In-coupe roads with multiple incidences of trees covered by embankment materials and/or multiple incidences of non-conforming drainage structure spacings were counted as single incidences of non-compliances (in each case).
[11] These are recorded for each instance of non-compliance with audit criteria: which may mean multiple records of environmental impact for the same incident.
[12] Excessive slope is defined in the MSPs and is 25° (for granite derived soils in East Gippsland), 30° (elsewhere) or as specified in Table 11, Appendix 3 for water supply catchment areas.

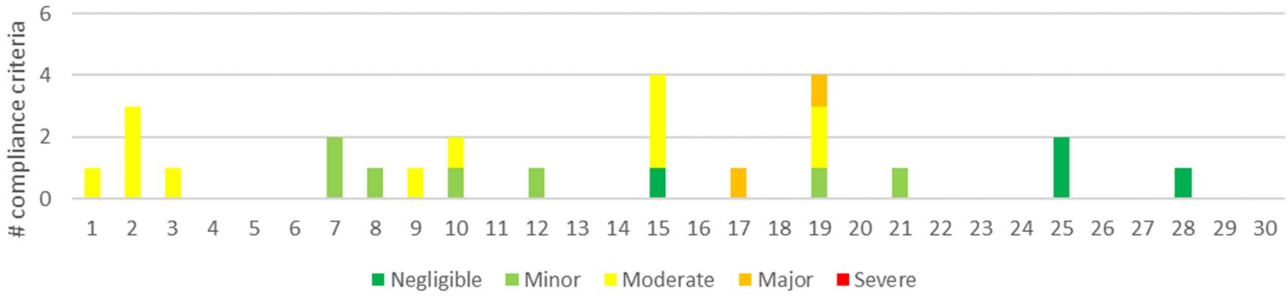
Inadequate maintenance of the in-coupe road from 25 Titanium through adjacent Platinum and Tungsten coupes means that the bypass of cross-drainage structures (on left side of road) by road drainage has not been corrected. Long drainage lengths have allowed the left-hand side of the road to erode. EIA rating: negligible.

Some logs from High Voltage coupe were snigged across this temporary stream to the adjacent Zap coupe. The snig track waterway crossing was constructed as a log-fill crossing. Removal of the crossing resulted in an unaddressed disturbance to the waterway. EIA rating: moderate.

Figure 4.2: Examples of non-compliance incidents associated with in-coupe roads and waterway crossings with potential to affect the condition of forest soils.



a) Level of compliance with audit criteria. Compliance definitions (Full, Non-no EI, Non-EI) as per Table 3.3.



b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.3 Compliance findings and assessed environmental impact for instances of non-compliance for criteria applicable to the protection of forest soils. The x-axis refers to the coupe numbers, as per Table 3.2.

The incidents relevant to the protection of forest soils with the greatest assessed environmental impact were two incidents involving harvesting in what were intended to be riparian buffers (17 Tatong Wedge and 19

Swivel). The assessed environmental impact was major, which reflects the sensitivity of the affected areas rather than the level of actual impact on forest soil values[13].

Risks associated with harvesting in steep areas and soils with higher erosion hazard were generally well-managed, with steep areas (20-30° and >30° slope) typically marked on the coupe operations map and/or noted in the forest coupe plan (FCP). Where required by the MSPs and/or dictated by practical constraints, steep areas were generally found to have been excluded from harvesting.

Coupe marking included a small area of land mapped as having slope exceeding 30° in 7 Machikichori. The post-harvest map for the coupe shows that some of this area was harvested. Ordinarily, up to 10% of the net harvest area may be harvested in areas with over 30° slope[14]. However, the coupe is located in the Upper Goulburn designated water supply catchment and according to Table 11 of the MSPs, the slope limit for harvesting is 30° and there is no minimum area qualification. Harvesting in the small area that was mapped as having over 30° slope in the coupe was therefore assessed as a non-compliance, with minor potential environmental impact.

Waterway crossings were typically considered to have been constructed without unnecessary disturbance to the waterway.

4.2.2 Compliance elements related to the protection of water flows, water quality and river health

Compliance elements relevant to this theme (Appendix B) seek to protect water flows, water quality and river health by:

- Classifying waterways present in the coupe and applying at least the minimum width of filters and/or buffers required
- Application of seasonal closures to reduce the risk of sediment mobilisation during wet weather in water supply catchments
- Appropriate design, construction and maintenance of in-coupe roads, road drainage and waterway crossings.

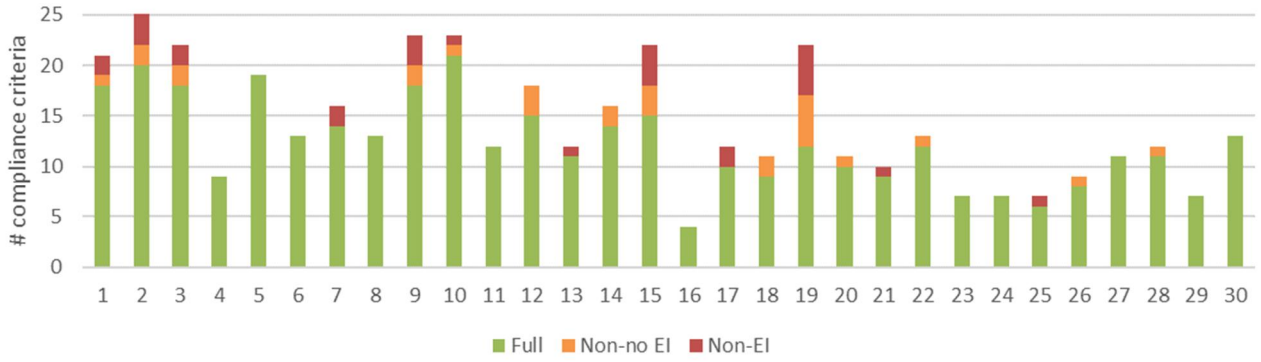
Many of the compliance requirements (and criteria) were also applicable to the protection of forest soils. A total of 40 audit criteria were relevant to this theme, of which seven were not applicable to any of the target coupes.

The average level of full compliance with applicable criteria was found to be 90%, with the level of compliance ranging between 55% (19 Swivel) and 100% (11 coupes; Figure 4.4). The assessed environmental impact associated with non-compliances ranged between negligible and major (Figure 4.4). Non-compliances which were assessed to have major environmental impact were identified in two coupes. Both cases (17 Tatong Wedge, 19 Swivel) related to incidents where harvesting took place in areas that were intended to be unharvested riparian buffers.

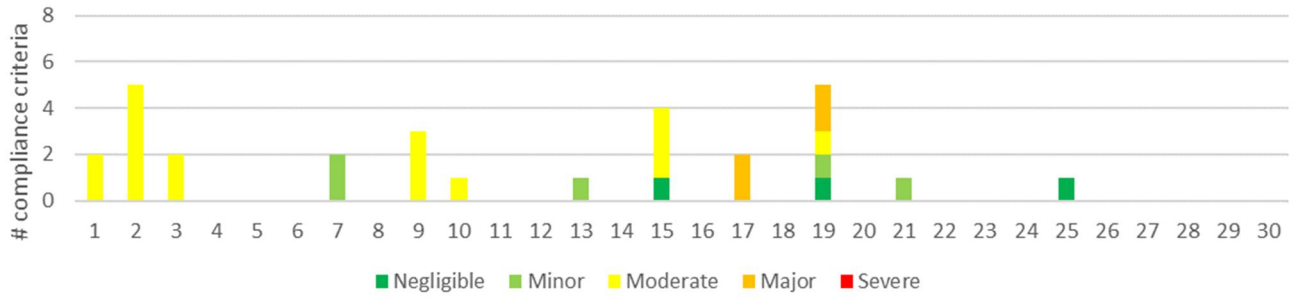
As with soils, there was no evidence at the time of the audit of adverse impacts of this non-compliance on water flows, water quality or river health. While soil could be mobilised from these areas while the stand is regenerating, the size of the intended buffer areas that were harvested mean that the actual level of impact is likely to be small. The assessment of potential environmental impact in both cases highlight the sensitivity of the locations, rather than the risk posed to the environment.

[13] At the time of the audit, there was no evidence of soil being mobilised into the waterway as a result of harvesting in the buffers on both Tatong Wedge and Swivel coupes.

[14] According to MSP 3.4.1.2, up to 10% of the net harvest area of any coupe can contain areas greater than 30°, where the risk of mass soil movement has been managed accordingly.



a) Level of compliance with audit criteria. Compliance definitions (Full, Non-no EI, Non-EI) as per Table 3.3.



b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.4 Compliance findings and assessed environmental impact for instances of non-compliance for criteria applicable to the protection of water quality, flows and river health. The x-axis refers to the coupe numbers, as per Table 3.2.

Other non-compliance incidents causing environmental impact relating to water quality, flows and river health were mostly connected with in-coupe roads. They included:

- Lack of post-harvesting maintenance potentially resulting in sediment mobilisation (Figure 4.2); and
- Inappropriate design and construction, such that culverts at waterway crossings and along roads discharged water onto embankments and created point sources of sediment generation (Figure 4.5);

The assessed environmental impact associated with these non-compliances was moderate or lower.

Inappropriately located culvert outlet, 2 High Voltage. The culvert discharges onto unconsolidated sediments on a log-fill crossing and created a point source of erosion. EIA rating: moderate.

Culvert on 19 Swivel discharges onto the embankment sediments, causing a small amount of erosion. EIA rating: moderate.

Figure 4.5 Examples of inappropriate design and construction of culverts, leading to erosion of embankment sediments.

Non-compliance incidents with waterway crossings was identified as a significant issue in the 2016-17 FAP (Jacobs, 2018a), with eight of 17 coupes with crossings having non-compliances with EIA ratings of major. Fewer coupes targeted in this audit had waterway crossings (seven; Table 3.2). While non-compliances were identified in five of these coupes, the assessed environmental impact did not exceed moderate and hence was generally lower than in the 2016-17 FAP.

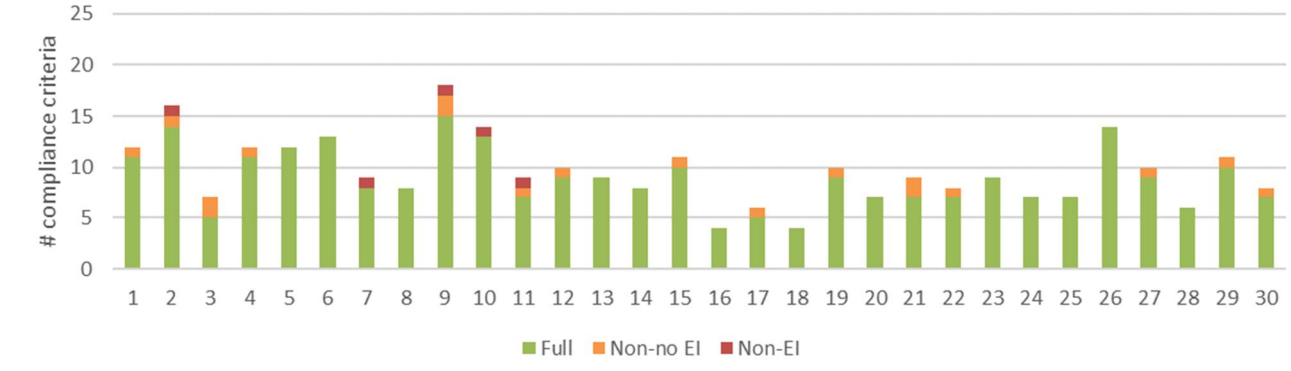
4.2.3 Compliance elements related to the protection of biodiversity values

Compliance elements relevant to this theme (Appendix B) seek to protect biodiversity values by:

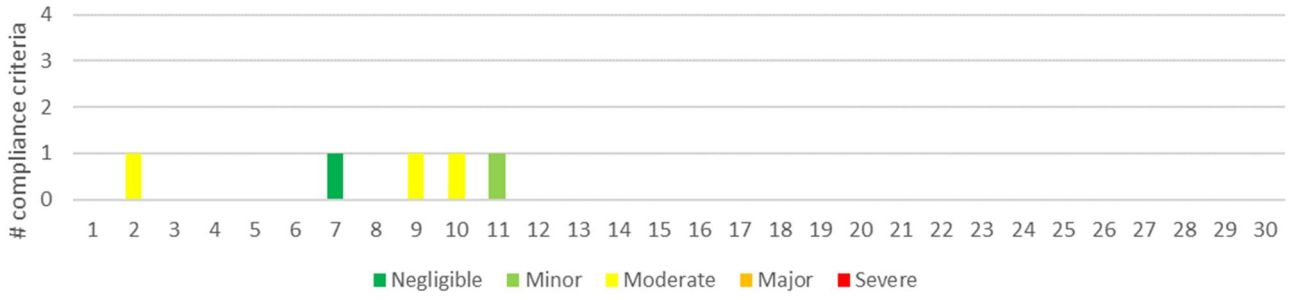
- Retaining trees and other habitat within the gross coupe and/or harvested area, including old growth elements and trees with or with potential to form hollows
- Preventing harvesting activities or roading taking place within or adjacent to sensitive vegetation communities (e.g. heathlands, montane riparian thickets, rainforest stands);
- Identifying listed, threatened species of native flora and fauna which have been recorded within or adjacent to the coupe and applying the management measures prescribed by the MSPs and PS
- Not harvesting in Special Protection Zones (SPZ) established to protect important native fauna habitats (e.g. for Leadbeater's Possum, Long-footed Potoroos, Owls)
- Maintaining passage for fish or other aquatic fauna along permanent streams
- Managing the risk of entry or spread of weeds and soil-borne or other plant diseases.

A total of 53 audit criteria are relevant to the protection of biodiversity values, of which 19 were not applicable to any of the selected coupes.

The average level of full compliance with applicable criteria was found to be 92%, with the level of full compliance ranging between 71% (3 Rocksteady) and 100% (13 coupes; Figure 4.6).



a) Level of compliance with audit criteria. Compliance definitions (Full, Non-no EI, Non-EI) as per Table 3.3.



b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.6 Compliance findings and assessed environmental impact for instances of non-compliance for criteria applicable to the protection of biodiversity values. The x-axis refers to the coupe numbers, as per Table 3.2.

Non-compliances with environmental impact were observed on five of the 30 coupes. The assessed environmental impact ranged between negligible and moderate (Figure 4.6), with the latter identified on three coupes (2 High Voltage; 9 Tarzan, 10 You just know). These were associated with disturbance to riparian habitats when an alternative existed (High Voltage[15]) and damage to unharvested vegetation during regeneration burning (Tarzan, You just know[16]; Figure 4.7). Damage to unharvested vegetation was sustained during regeneration burning on one other coupe (7 Machikichori), but the EIA rating was assessed as negligible in this case.

No non-compliances with potential for environmental impact were identified for 31 of the 34 biodiversity-related criteria that were applicable to the target coupes. These criteria addressed:

- Habitat and habitat tree retention requirements;
- Avoidance of harvesting in rainforest stands and stands of Montane Riparian Thicket vegetation;
- Protection of identified habitat areas for listed threatened species; and
- Hygiene for weeds and diseases.

The regeneration burn in 9 Tarzan crossed containment lines more than 100 m (in places) into this area that was planned to remain unharvested. EIA rating: moderate.

The regeneration burn in 10 You just know crossed containment lines into this riparian buffer area, which was planned to remain unharvested. EIA rating: moderate.

Figure 4.7 Examples of damage sustained by retained vegetation during regeneration burning.

4.3 Roading compliance elements

The roading theme includes three main groups of compliance elements and audit criteria, those relating to; design; construction; and maintenance and closure. Several roading compliance elements and criteria were also considered under the environmental theme.

4.3.1 Road design

The six compliance elements relevant to this theme (Appendix B) seek to ensure that appropriate in-coupe road design protects soil and water values from risks associated with the construction of road embankments and waterway crossings. Design is intended to ensure the stability of roads and road embankments, safe passage of high flow events through crossings and culverts and to prevent erosion of roads and crossings and associated sediment generation. Four of the six criteria were applicable to the audited coupes.

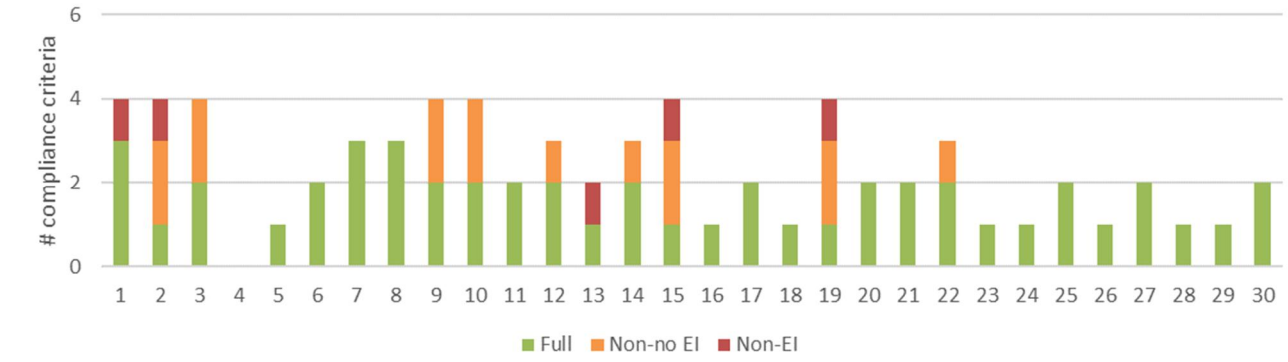
The average level of full compliance with applicable criteria was found to be 81%, with the level of compliance ranging between 25% (2 High Voltage, 15 Johnnie and Jack, 19 Swivel) and 100% (18 coupes; Figure 4.8).

[15] A snig track was constructed across a temporary stream between 2 High Voltage and another nearby coupe (Zap). The snig track enabled logs to be hauled to the landing on High Voltage coupe, rather than construct a new landing on part of Zap coupe. This was considered not to comply with the requirement to exclude roads and snig tracks from aquatic and riparian areas, where it is reasonably practicable to do so (Code 2.2.1.5).

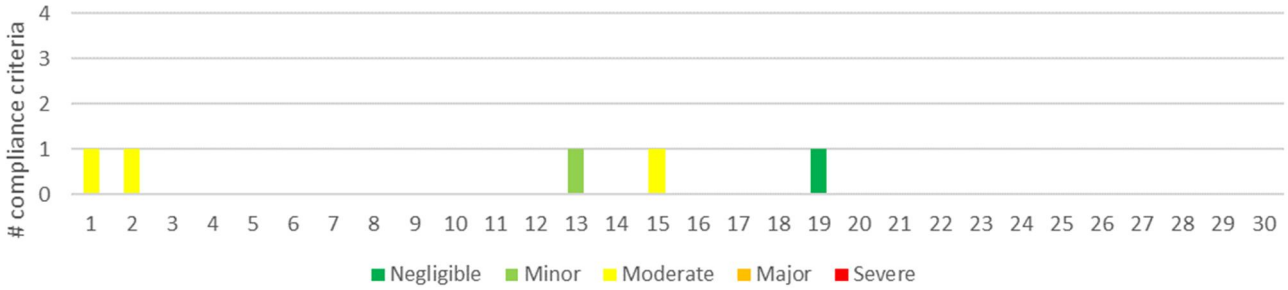
[16] As retained vegetation was damaged during regeneration burning, this was assessed to not comply with the MSP requirement (4.1.4.5), applicable to the Central Highlands FMAs) to retain habitat trees where they can be most easily protected from damage during harvesting and site preparation treatment.

Non-compliances without environmental impact were relatively common for this compliance element, reflecting the general absence of formal design and the lack of direct connection between some design non-compliances and environmental impact. Common design-related non-compliance issues were:

- Having no recorded engineering basis for design for larger embankments or waterway crossings (e.g. MSPs 6.2.2.3, 6.2.5.4; Code 2.4.2.4)
- Having no specific evidence that the culvert size is consistent with flow requirements in a 10% annual exceedance probability (AEP) rainfall event (MSP 6.2.5.3).



a) Level of compliance with audit criteria. Compliance definitions (Full, Non-no EI, Non-EI) as per Table 3.3.



b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

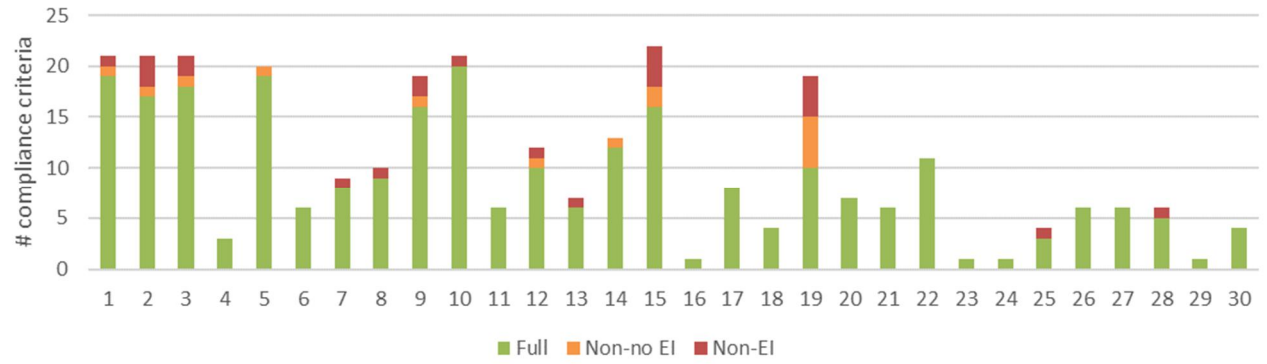
Figure 4.8 Compliance findings and assessed environmental impact for instances of non-compliance for criteria applicable to the road design. The x-axis refers to the coupe numbers, as per Table 3.2.

Non-compliances with environmental impact were recorded for one criterion (10.1; Appendix B[17]). The assessed environmental impact associated with these ranged between negligible and moderate (Figure 4.8). Each instance assessed to have moderate environmental impact (1 Bear Grylls, 2 High Voltage, 15 Johnnie and Jack) was associated with a culvert design (and subsequent construction) that resulted in water discharging directly onto embankment materials without any erosion control measures (see Figure 4.5).

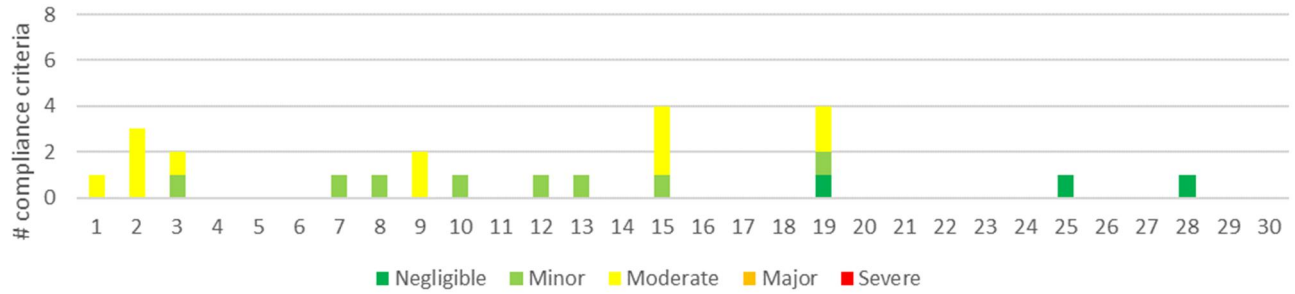
4.3.2 Road construction

The 33 compliance elements relevant to this theme[18] (Appendix B), like those for road design, largely seek to protect soil and water values from risks associated with the construction of road embankments and waterway crossings. The average level of full compliance with applicable criteria was found to be 92%, with the level of compliance ranging between 53% (19 Swivel) and 100% (15 coupes; Figure 4.8). The level of assessed environmental impact associated with non-compliances ranged between negligible and moderate.

[17] This criterion reflects on the design, construction and maintenance of roads, crossings and other relevant coupe infrastructure.
[18] Eight of the 33 criteria were not applicable to any of the target coupes.



a) Level of compliance with audit criteria. Compliance definitions (Full, Non-no EI, Non-EI) as per Table 3.3.



b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.9 Compliance findings and assessed environmental impact for instances of non-compliance for criteria applicable to the road construction. The x-axis refers to the coupe numbers, as per Table 3.2.

Non-compliances with potential environmental impact were associated with seven of the 25 applicable road construction criteria. These relate to the following issues:

- *Construction of roads and snig tracks within or through aquatic and riparian habitats*: this applied to a single coupe (2 High Voltage) and to a snig track rather than an in-coupe road. While several in-coupe roads crossed riparian habitat, in the auditor's opinion there was no reasonably practicable alternative to this and so they were assessed as complying with regulatory requirements.
- *Culverts being constructed so that water is discharged onto unprotected embankment materials:* this occurred on several coupes (1 Bear Grylls, 2 High Voltage, 15 Johnnie and Jack) with moderate potential impact, as discussed in Section 4.3.1 (see Figure 4.5).
- *Distances between drainage features on in-coupe roads exceeding MSP (Appendix 4, Table 20) specifications for the slope and soil erosion hazard class:* this was identified as an issue on eight of the 30 coupes, with potential environmental impact ranging between negligible and moderate. The latter was assessed for 19 Swivel, which was left over winter with over 400 m of undrained in-coupe road.
- *In-coupe road embankment materials covering the base of live trees:* MSP 6.2.2.1 specifies that fill batters should not cover the base of live trees[19]. This requirement was not satisfied in three of the five coupes with significant fill batters (3 Rocksteady, 15 Johnnie and Jack, 19 Swivel; Figure 4.10). In each of these cases, embankment materials only covered parts of the base of the affected trees and there was no evidence, at the time of the audit, of any deterioration in health of the affected trees.
- *Management of road drainage in the vicinity of waterway crossings:* the MSP (6.2.4.5 and 6.2.4.6) require that steps are taken to manage sediment carried by road drainage in the vicinity of a waterway crossing on permanent or temporary streams. Such measures were observed on several coupes but were absent or ineffective on waterway crossings in 3 Rocksteady and 9 Tarzan (Figure 4.10).

[19] This prescription is taken to apply only to trees which will be retained post-harvest.

Several instances (seven coupes) where culvert outlets projected above the bed of the downstream (temporary) waterway (contrary to MSP 6.2.5.11) were observed in the audit. These were all assessed as non-compliances without potential environmental impact, as at the respective locations within the landscape, the passage of aquatic fauna was determined by the auditor not to be a relevant consideration.

The bases of several live trees were covered by the road embankment for the in-coupe road constructed to access 3 Rocksteady. EIA Rating: minor

A silt trap was constructed to capture sediment carried by road drainage approaching a waterway crossing on 3 Rocksteady coupe. The silt trap has subsequently been damaged and is no longer effective allowing an extended section of the road to drain directly into the waterway.

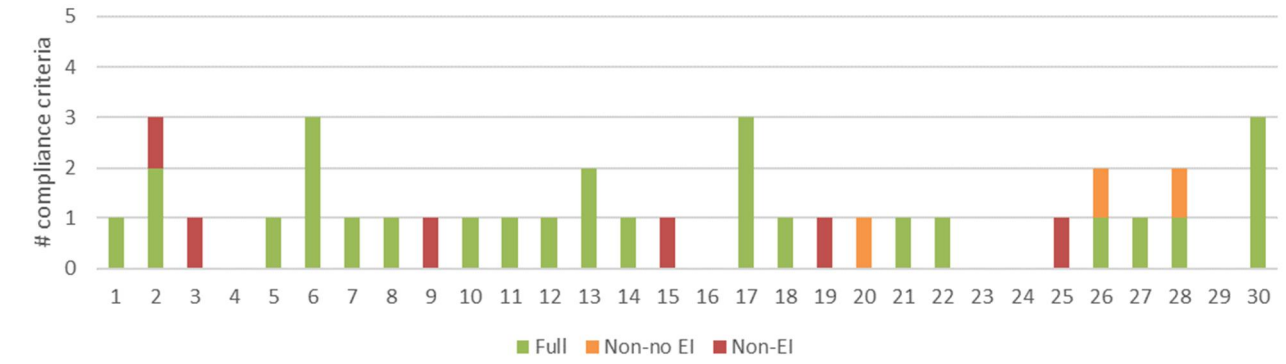
Figure 4.10 Examples of non-compliance issues associated with the road construction sub-theme.

4.3.3 Road maintenance and closure

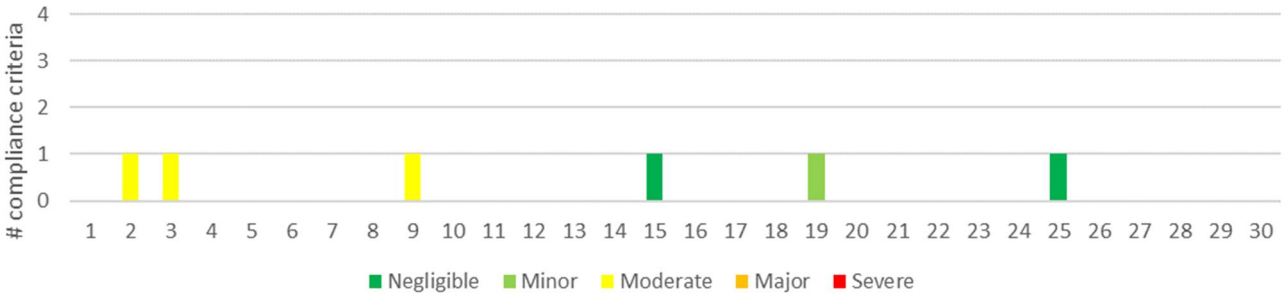
Only five compliance criteria relevant to road maintenance or closure were considered in this audit (Appendix B), all of which were applicable to at least some coupes. Like compliance elements for road design and construction, they are largely concerned with protecting soil and water values from risks associated with the use of in-coupe roads and their closure following the completion of harvesting operations. The average level of full compliance with applicable criteria was found to be 71%, with the level of compliance ranging between 0% and 100% (Figure 4.11).

The level of assessed environmental impact associated with non-compliances ranged between negligible and moderate (2 High Voltage, 3 Rocksteady, 9 Tarzan). Non-compliance incidents related to the Code requirements to:

- *Remove crossings using techniques that minimise soil and habitat disturbance (Code 2.2.1.7):* removal of a snig track crossing in 2 High Voltage resulted in what the auditor considered to be excessive disturbance (Figure 4.2), with potential to exacerbate the movement of sediment into a temporary stream.
- *Maintain roads in a manner that minimises erosion and protects water quality (Code 2.4.4.2):* two incidents were observed where important road drainage features had not been maintained, increasing opportunities for road sediments to enter waterways. In 3 Rocksteady (Figure 4.10), a silt trap on a drain entering a temporary stream had been left in a damaged state and operating ineffectively. In 9 Tarzan, a roadside sump, which was used to capture sediment in road drainage had been bypassed as a result of traffic damage to the road surface, with the result that road sediment could directly drain into a waterway. Both deficiencies should have been identified and rectified as part of road maintenance.



a) Level of compliance with audit criteria. Compliance definitions (Full, Non-no EI, Non-EI) as per Table 3.3.



b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.11 Compliance findings and assessed environmental impact for instances of non-compliance for criteria applicable to the road maintenance and closure. The x-axis refers to the coupe numbers, as per Table 3.2.

5. Discussion

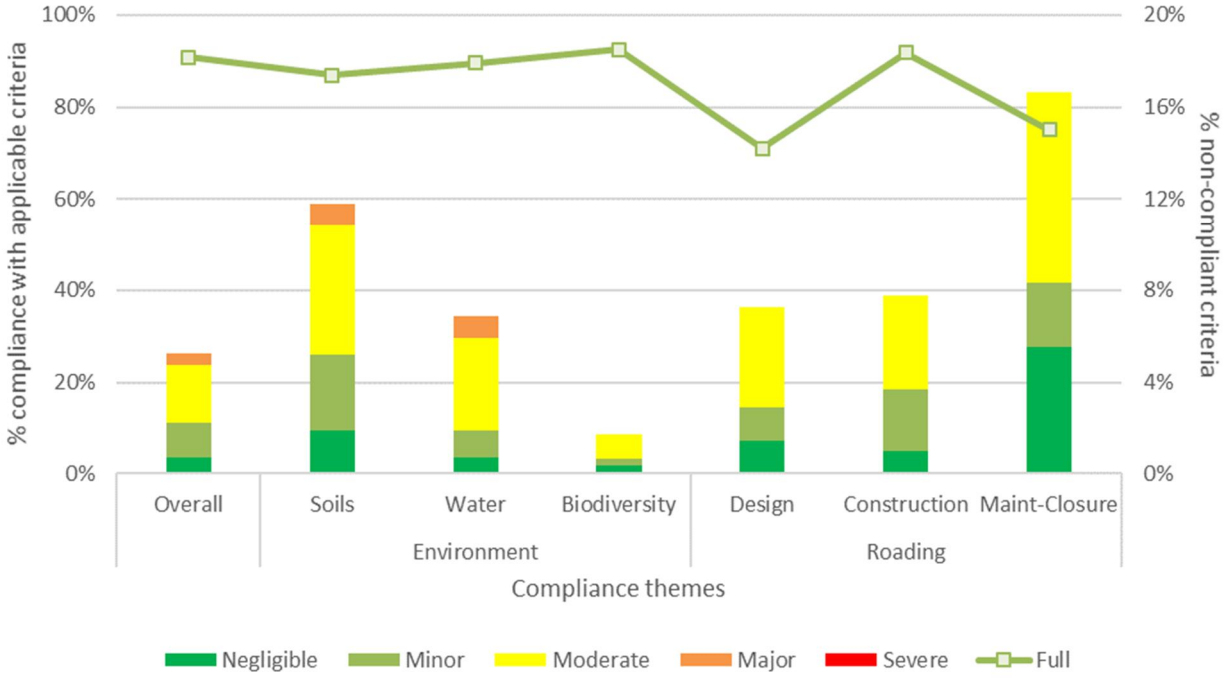
5.1 Overall audit findings

The audit's objectives were to assess VicForests' compliance with selected elements of the regulatory framework for timber harvesting activities in State forests, as well as any environmental risks posed by non-compliances with the regulatory framework. This section provides a summary of the audit's overall findings in relation to these objectives.

5.1.1 Findings in relation to regulatory compliance

The audit of timber harvesting and roading compliance elements included 30 coupes, distributed between the Benalla-Mansfield, Central, Central Gippsland, Dandenong, East Gippsland, North East and Tambo FMAs. The coupes were selected because they included higher risk constructed or natural features, such as waterway crossings, longer lengths of in-coupe roads, rainforest vegetation, steeper slopes and/or more erodible soils. *This means that the audit findings are not necessarily statistically representative of VicForests' operations overall*.

The overall level of full compliance with audit criteria which were applicable to the respective coupes (Figure 5.1) was assessed to be 91%, with average compliance for the various themes varying between 71% (road design) and 92% (biodiversity, road construction). Non-compliances with direct environmental impact were associated with 30 individual incidents on 16 coupes. One of these was associated with a section of the permanent forest road network used in timber haulage (12 Whitelaws Ramble).



Full – % applicable criteria for which full compliance was recorded; Compliance is referenced in the left vertical axis and EIA ratings are referenced on the right vertical axis.

Figure 5.1 Summary of overall audit findings for regulatory compliance and risk of environmental impact from non-compliance with the regulatory framework.

A total of 105 criteria were included in the audit framework (Appendix B), of which 28 were not applicable to any of the 30 coupes assessed. For 51 of the criteria, all coupes to which the compliance element applied were assessed to be fully compliant. The full compliance score was 90% or more for a further four criteria (Table B.1, Appendix B).

Instances of non-compliance were identified from across various environmental and roading sub-themes. The kinds of incidents causing non-compliances with environmental impact are summarised in Table 5.1. The impacts are primarily associated with risks to soil, water and river health-related values. Potential environmental impact, as assessed using the FAP's EIA rating tool, ranged up to major. Only two incidents with the highest level of potential severity were identified, both of which related to harvesting in a planned riparian buffer. No incidents with severe EIA rating were identified.

Table 5.1 Issues resulting in incidences of non-compliance with the regulatory framework for timber harvesting that have environmental impact.

Issue giving risk to non-compliance	# incidents	Maximum EIA rating	Code (C) or MSP (M) references
1. Road not constructed with drainage at intervals consistent with MSP requirements, including approaches to waterway crossings. *Potential consequences:* erosion of the road surface, sediment mobilisation, sediment deposition in waterways, impairment of aquatic habitat, reduced water quality.	8	Moderate	C2.2.1.2, C2.2.1.12
2. Non-compliant waterway crossing design, construction and/or removal, including culvert outlets dropping water onto poorly protected stream channels. *Potential consequences:* erosion of stream bed, sediment mobilisation and deposition in waterways, impairment of aquatic habitat, reduced water quality.	5	Moderate	C2.2.1.7, M6.2.5.5
3. Culvert outlets draining onto in-coupe road embankments and/or dropping water onto other areas that are prone to erosion. *Potential consequences:* erosion of crossing embankment and other areas of exposed soil, sediment mobilisation and deposition in waterways, impairment of aquatic habitat, reduced water quality.	5	Moderate	M6.2.5.5
4. Inadequate maintenance of in-coupe roads, leading to failure of drainage and/or sediment control structures. *Potential consequences:* erosion of the road surface sediment, mobilisation and deposition of sediment in waterways, impairment of aquatic habitat, reduced water quality.	4	Moderate	C2.4.4.2
5. Damage to retained trees and understorey vegetation from regeneration activities, including regeneration burning and construction of boundary tracks for burning. *Potential consequences:* loss of overstorey and understorey vegetation that was planned to be retained without disturbance, soil erosion in burnt areas, leading to sediment mobilisation, impairment of aquatic habitat and water quality reduction, reduction in terrestrial biodiversity values, damage to Myrtle Beech trees (11 Andy only), with potential entry of Myrtle Wilt.	4	Moderate	M4.1.4.5 (Central Highlands FMAs only)
6. Road embankment materials covering the base of live trees that will be/have been retained post-harvest. *Potential consequences:* decline or death of trees intended to be retained within coupe, reduction in fauna habitat.	3	Minor	M6.2.2.1

Issue giving risk to non-compliance	# incidents	Maximum EIA rating	Code (C) or MSP (M) references
7. Harvesting in areas intended to be unharvested riparian buffer areas. *Potential consequences:* loss of overstorey and understorey vegetation that was planned to be retained without disturbance, soil erosion, leading to sediment mobilisation, impairment of aquatic habitat and water quality reduction, reduction in terrestrial biodiversity values.	2	Major	M3.3.1.1 C2.2.1.2
8. Harvesting in an area with slope exceeding 30° within a declared water supply catchment. *Potential consequences:* soil erosion, leading to sediment mobilisation, impairment of aquatic habitat and water quality reduction.	1	Minor	MSP3.4.1.1
9. Machinery disturbing and pushing soil into a riparian filter area. *Potential consequences:* mobilisation of sediment during an extreme rain event, leading to impairment of water quality.	1	Minor	C2.2.1.2

All of the six most common kinds of non-compliance incident listed in Table 5.1 have been observed in at least one of the two most recent FAP audits (2015-16, 2016-17; Jacobs, 2016; 2018a), with five of these associated with in-coupe roading and/or waterway crossings. The most severe kind of incident *(#7 Harvesting in a riparian buffer*) is uncommon and has not been reported in FAP audits since 2012-2013 (SKM, 2013).

5.1.2 Findings in relation to environmental impact

Overall, environmental impacts were assessed for 15 of the 105 audit criteria, with almost all of these rated as moderate or lower (Figure 5.1). As noted in Section 5.1.1, non-compliant road drainage, including on the approaches to waterway crossings, was the main source of non-compliance incident with environmental impact (Table 5.1). These were all rated as moderate or lower.

Harvesting in what was intended to be an unharvested riparian buffer was identified for two coupes (17 Tatong Wedge, 19 Swivel) and was the only kind of non-compliance incident with major potential environmental impact. No severe non-compliance incidents were identified in this audit.

The occurrence of non-compliances with environmental impact varied between audit themes and sub-themes. About 2% of criteria applicable to the biodiversity theme recorded non-compliances with environmental impact. This increased to 17% of criteria applicable to road maintenance and closure, although there were significantly fewer criteria included in the latter theme (five criteria, compared with 53 for biodiversity).

5.2 Comparison with previous audits

Coupe selection for the FAP is risk-based, which means that audit results cannot be considered to be representative of VicForests' operations overall. While the approach to coupe selection limits the validity of comparisons between successive audits, as the 2016-17 audit and this one used the same criteria and field methodology and were conducted by the same lead auditor, there is a reasonable basis for comparing audit results (Table 5.2).

The comparison of audit results shows a small improvement in the overall level of full compliance, with those improvements evident in both main themes and all but one of the sub-themes (Table 5.2). The most significant difference in audit results was the big reduction in the number of non-compliances with major or greater potential environmental impact. The 2016-17 audit identified 37 non-compliances with this level of potential environmental impact (from 13 individual incidents), whereas this audit identified four such non-compliances, resulting from two incidents.

Most of the non-compliances with major potential environmental impact identified in the 2016-17 audit were associated with the construction and/or removal of waterway crossings. While some issues were identified with these in the current audit (Section 4.2.2), none were assessed to have more than moderate potential environmental impact. Even allowing for fewer coupes with waterway crossings being included in this audit (7

coupes, compared with 17 in 2016-17), there was still a large reduction in the incidence and (especially) severity of non-compliance issues with the crossings.

Table 5.2 Comparison of audit results for 2016-17 (Jacobs, 2018a) and 2017-18 FAP audits.

	% Full compliance with applicable audit criteria		# Non-compliances with major or greater potential environmental impact[1]	
FAP compliance theme and sub-theme	**2015-16**	**2016-17**	**2015-16**	**2016-17**
Overall	86%	91%	37	4
Environment				
· Soils	83%	87%	13	2
· Water	85%	90%	29	4
· Biodiversity	90%	92%	13	0
Roading				
· Design	57%	81%	7	0
· Construction	79%	92%	30	0
· Maintenance and closure	73%	71%	5	0

1. Note that individual incidents may give rise to non-compliances against more than one audit criterion.

As noted above, the six most common kinds of non-compliance incidents with potential environmental impact (Table 5.1) were all observed in previous audits. Thus, while compliance performance has improved overall, many of the same kinds of non-compliance issues have remained. These mostly concern the design, construction and/or removal of in-coupe roads and waterway crossings.

5.3 Potential improvements to timber harvesting practices

The findings of this and the previous audit highlight several potential areas for improvement in timber harvesting and related in-coupe roading activities. Some of these opportunities were identified in our previous report (Jacobs, 2018a) and are reiterated here because it is not clear, on the basis of this audit, that they have yet been fully addressed in VicForests' coupe planning and/or operational practice.

5.3.1 Harvesting in riparian buffers

The two incidents giving rise to non-compliances with the most severe EIA ratings assessed in this audit both involved harvesting in what were intended to be riparian buffers. Details of these incidents are as follows:

- *17 Tatong Wedge:* a marking error resulted in a small section of permanent stream not having the 20 m buffer that was proposed in the Forest Coupe Plan (FCP) and required by the MSPs. Harvesting took place and a boundary track was constructed to within about 18 m of approximately 20 m length of the waterway.
- *19 Swivel:* temporary streams within the coupe were marked as having an unharvested buffer, which was to be 20 m in width (which exceeds the minimum requirement of a 10 m filter specified in the MSPs). Some sections of the buffer were marked to slightly less than the 20 m specified in the FCP. The main incident resulted from the contractor harvesting into the marked riparian buffer. This was noted in the coupe diary and post-harvest map.

The two incidents are independent of each other and, while they are of concern[20], in the auditor's experience, they are isolated events that are inconsistent with routine VicForests' practice. Based on experiences in this and previous audits, waterways are typically conservatively marked, with wider buffers than the minimum required by the regulatory framework and unharvested buffers marked where only filters were required. This practice

[20] As noted previously, while the EIA rating of major for these incidents overstates the level of actual environmental impact (at the time of the audit), the EIA rating is considered to appropriately reflect the risk to water-related values.

often reflects the logistical challenges in marking riparian buffers in some coupes and in harvesting steeply sloping areas near some waterways, as well as the potential disturbance that could be caused if harvesting machinery operated in areas with wet soils.

While no recommendation is made on practice improvements, the incidents reinforce the need for careful attention to be paid during coupe marking and for contractors to take care when harvesting near marked buffer areas.

5.3.2 Waterway crossings

Waterway crossings were the main source of non-compliances with high potential for environmental impact identified in the 2016-17 FAP audit (Jacobs, 2018a). While many similar kinds of issue were identified in the current audit, the potential severity of environmental impact was less than identified in the previous FAP audit. The recommendations on practice improvements with waterway crossings made in the previous audit report (summarised below) remain applicable.

- *Establish a standardised engineering basis for design and construction:* the regulatory framework (Code 2.4.2.4) requires that stream crossings are "designed" to account for traffic, water flows and the characteristics of the stream and that crossings are to be constructed in a manner consistent with designs and plans (Code 2.4.3.2). Despite this, no evidence was provided during this audit of a clear basis for design for any of the crossings within or adjacent to the selected coupes. This is not to say that there is no evidence of considerable thought having been put into the configuration and construction of at least some crossings, just that there is generally no clear and documented engineering design or basis for the construction methods employed. Evidence from the 2016-17 FAP audit, particularly, suggests that even informal "design" is lacking in some instances, with the result that crossings are non-compliant and detrimentally affecting water quality.

  The report on the 2016-17 FAP recommended that VicForests develop a set of standardised engineering designs for crossings in various representative situations and that these be used as the starting point for the design of each individual crossing. The basis of design would consider various features of the site and the crossing's operation, including: constructability, traffic, operational life, topography, geotechnical stability, pre and post-harvest flows, and requirements for fish passage, water quality protection and successful rehabilitation. A specific design would then be developed and documented for each crossing and retained with the coupe file.

- *Design and construction review:* unknown site features are likely, in many instances, to require that modifications are made to the initial design. The report on the 2016-17 FAP audit also recommended that all material changes in design should be recorded (and copies retained with the coupe file), a clear rationale provided and a statement of how risks to the environment (and user safety) are managed included with the FCP. Once completed, the constructed waterway crossing would be reviewed to ensure compliance with the agreed design and regulatory requirements. Any material defects would be identified and remediated.

- *Use of sediment traps:* sediment carried in table drains on the "inside" of the approach to the crossing (i.e. the embankment side) can be challenging to manage. Opportunities to filter drainage water through undisturbed vegetation may be limited or non-existent. Where this is the case, sediment or "silt" traps, sumps or similar features should be used (as required by the Code 2.4.2.6) to reduce the quantity of sediment reaching the waterway.

  Silt traps or sumps were used to good effect on the approaches to waterway crossings inspected during the current audit. However, instances were also seen where road traffic and/or poor maintenance had resulted in these being damaged, bypassed or otherwise made ineffective (e.g. Figure 4.10).

- *Rehabilitation plan:* the report on the 2016-17 FAP audit recommended that planning for rehabilitation of temporary crossings should be incorporated into their design so that construction facilitates an appropriate environmental outcome. It was proposed that the plan should specify how embankment materials are to be managed so that they do not become a significant source of sediment and how drainage from the approach of the closed in-coupe road will be managed to prevent or minimise sediment delivery into the waterway. Records from planning and review of construction were proposed to be retained with the coupe file.

- *Rehabilitation review:* the report on the 2015-16 FAP audit also recommended that rehabilitation of the crossing should be reviewed to ensure that works (including road drainage on the approaches to the crossing) are completed as planned, operating effectively and that any defects are rectified. It was proposed that a second review be conducted following the winter after closure to ensure that rehabilitation has been successful and that road drainage interception continues to work effectively.

It was recommended in the report on the 2016-17 FAP audit that this process be scaled to the level of risk, with a more rigorous approach to design, construction and rehabilitation taken for crossings over permanent streams, those upstream of protected aquatic species or potable water diversion points and those located on unstable soils.

As appears to be common practice with VicForests and their contractors, it was proposed that planning for in-coupe roads should be used to avoid, where reasonably practicable, the need for waterway crossings. Avoidance of crossings, where reasonably practicable, should generally lead to a better environmental outcome than would be the case for a crossing that is well planned, designed, constructed and rehabilitated.

Recommendation to VicForests	Priority: high
V1: VicForests should thoroughly review its approach to the design, construction and rehabilitation of waterway crossings to significantly improve their compliance with regulatory requirements. This review should consider the recommendations included in Section 5.3.1 and discussed in the 2016-17 FAP audit report (Jacobs, 2018a).	

5.3.3 Culvert outlets

Numerous instances were observed in this and the previous audit of culverts inappropriately discharging road drainage water or flows through waterway crossings. The two main issues (e.g. Figure 5.2) are:

- Culverts discharging water onto road or waterway crossing embankments
- Culvert outlets being elevated above the downstream bed of the waterway.

Both issues are not compliant with the regulatory framework for timber harvesting (Code 2.2.1.6, 2.2.1.12; MSP 6.2.5.11) and have potential to cause erosion, mobilise sediments and impair water quality. The second of the issues is also likely to prevent the upstream passage of aquatic fauna, if that is a relevant consideration.

It is recognised that in many instances, it is not reasonably practicable to lay a culvert so that its outlet sits at the downstream land or watercourse elevation. In such instances (where provision of passage for aquatic fauna is not a relevant consideration), there are several techniques that may be used to safely discharge the drainage water. These include the use of rock armouring or fitting a sleeve over the culvert outlet (as per Figure 5.2).

Recommendation to VicForests	Priority: moderate
V2: As part of its review of the construction of waterway crossings and in-coupe roads and during coupe monitoring, VicForests should ensure culvert outlets comply with regulatory requirements and do not discharge onto unprotected embankments or from above the downstream surface elevation.	

a) Culvert outlet located above the downstream bed of the waterway (1 Bear Grylls)

b) Road drainage culvert inappropriately discharging onto embankment materials (Zebra coupe, 2016-17 FAP audit)

c) Road drainage culvert discharges onto drain across road embankment that has been protected using rock armouring (10 You just know)

d) Outlet of waterway crossing discharged via a “sleeve” to the waterway. Aquatic fauna passage was not a relevant consideration at this location within the catchment (Hairy Hide coupe, 2016-17 FAP audit)

Figure 5.2 Examples of inappropriately constructed culvert outlets (a and b) and options that are regularly used by VicForests contractor safely manage culvert water discharges (c and d).

5.3.4 Regeneration burning

Several instances were observed in this and the previous audit where regeneration burns crossed marked coupe boundaries into unharvested riparian buffers[21] (Figure 4.7). The impact observed ranged from damage to understorey vegetation to canopy scorch and death of fire sensitive overstorey species (i.e. ash eucalypts, Myrtle Beech). In most cases, environmental impacts are likely to persist for several years, although this will be much longer where, for example, overstorey vegetation is killed.

As in the previous audit report, the auditors acknowledge the practical difficulties in managing regeneration burns, particularly in wetter and higher elevation areas where safe and effective burning opportunities are limited. However, we again recommend that VicForests continue to review its burning practices and incidents

[21] These were not necessarily assessed to be non-compliances with the regulatory framework, particularly outside of the Central Highlands FMAs and in less fire-sensitive forest types (i.e. other than ash-type forests), where the MSPs do not refer to coupe impacts associated with regeneration.

where regeneration burns cross into riparian or habitat buffers to identify opportunities to burn safely, accomplish regeneration objectives and reduce unintended impacts in unharvested areas.

Recommendation to VicForests	Priority: moderate
V3: VicForests should continue to review its approach to regeneration burns to identify and implement opportunities to reduce unintended impacts in unharvested buffer areas.	

5.3.5 Road drainage spacing

This audit and the two previous audits that have considered in-coupe road drainage (Jacobs, 2016; 2018a) have consistently identified incidents where spacings between effective road drainage structures have exceeded specifications in MSP Table 21. While most of these involve small excess lengths of road and have negligible or minor potential environmental impact, some non-compliance incidents are more material. The main causes of non-compliance incidents appear to be:

- *Failure to construct appropriate in-coupe road drainage:* our experience is that many temporary in-coupe roads have no formal drainage structures during their operating lives. Drains are only constructed (typically using the “bar and breach” method) following the completion of harvesting, as harvesting machinery is withdrawn from the coupe. Several instances have been identified (including 15 Johnnie and Jack in this audit) where harvesting has been suspended (e.g. for seasonal closure) or competed and no compliant drainage has been provided. This is inconsistent with the regulatory requirements, exposes the road to erosion and other forms of damage and may lead to sediment entering waterways.

  In the auditor’s opinion, it is arguable that VicForests’ practices in not constructing drainage until harvesting completion is always non-compliant with Code requirements (2.4.2.5) to provide “appropriate drainage”. It may not be an unreasonable practice where a coupe is active for a short period and there is no forecast rain. However, it is not considered by the auditors to be consistent with the regulatory framework to even temporarily suspend harvesting and not provide appropriate drainage.

  It is suggested that VicForests coupe monitoring sheets are amended to ensure that it is confirmed that adequate drainage on in-coupe roads is provided at all points at which the coupe is temporarily or permanently closed.

- *Post-harvest vehicle traffic:* repeated instances have been observed in this and previous audits where in-coupe road drainage structures (typically “bar and breach” formats) have been damaged and, in some cases, rendered ineffective by post-harvest vehicle traffic. Observations by the audit team suggest that some of this traffic is associated with coupe regeneration, in which case the damage should have been remediated as part of the finalisation of regeneration activity. Experience with this audit suggests that remediation does not always occur.

  Other traffic is associated with authorised or unauthorised firewood collection and so cannot necessarily be practicably addressed by VicForests. While the Code (2.4.6.2) requires that roads that are *no longer required for timber harvesting operations or other forest management purposes* (are) *… permanently closed to vehicle traffic and effectively drained*, prevention of access is not always reasonably practicable given the prevalence and capability of 4WD vehicles.

- *Inadequate maintenance:* several instances were observed in this audit where road drainage features (e.g. “roll over” cross drains, roadside sumps, out-sloping) were damaged or made ineffective by road traffic, particularly log trucks. Where these defects were not corrected in the course of road maintenance (which is limited on temporary in-coupe roads), the spacing of effective drains did not comply with MSP specifications.

Recommendation to VicForests	Priority: moderate
V4: VicForests should construct drainage on all in-coupe roads prior to any temporary or longer-term suspension of harvesting. Completion of construction and compliance with MSP drainage requirements should be confirmed in coupe monitoring records at suspension or closure.	

5.4 Regulatory framework improvement opportunities

In commissioning this audit, DELWP asked for comments on opportunities to improve the regulatory framework for timber harvesting in State forests. These are discussed below in the context of the regulatory framework for timber harvesting and the FAP. Recommendations offered in our previous audit report (Jacobs, 2018a) are considered to remain relevant.

5.4.1 Improvement to the regulatory framework for timber harvesting

Observations made during this and previous audits suggests that the method of assessing soil erosion and water quality risk in the MSPs (MSP Appendix 2) warrants review and possible revision. Several coupes have been included in this and the previous audit (e.g. 25 Titanium; Epiphone, respectively) with apparently erodible soils (Figure 5.3) that are assessed to have low water quality risk using the method described in the MSPs. In both cases, the soils' high permeability seems to have dominated the water quality risk classification, despite evidence that they relatively easily eroded (Figure 5.3).

It is recommended that the soil assessment procedures be reviewed to more appropriately classify erodible, but highly permeable soils.

a) Relatively erodible soils on the in-coupe road to 25 Titanium coupe. Erosion has resulted in the cross-drainage structure being bypassed. Water quality risk was assessed by VicForests to be low, which was confirmed as accurate by the auditor.

b) Erosion on in-coupe road ~1 year after coupe closure. Coupe was assessed to have low water quality risk by VicForests, an assessment that was confirmed by the auditor (Epiphone coupe, 2016-17 FAP audit)

Figure 5.3 Examples of in-coupe roads on apparently erodible soils, rated as having low water quality risk.

Recommendation to DELWP	Priority: moderate
D1: DELWP should review the methodology for assessing water quality risk of soils in the MSPs (Appendix 2) to more reliably classify erodible soils with high permeability.	

In our report on the 2016 FAP audit of in-coupe roading (Jacobs, 2016) we provided recommendations on how the regulatory framework could be modified to eliminate ambiguous language and improve the effectiveness of auditing. These have been reproduced in Appendix E along with additional commentary on strengthening the way in which the regulatory framework addresses risks to the environment from pests, weeds and diseases.

5.4.2 Improvements to audit program management

DELWP's forest audit program forms an important component of the accountability and adaptive management process which is required to deliver and demonstrate sound and improving environmental performance during

timber harvesting activities. The 2016-17 audit identified three important opportunities to improve the management and effectiveness of the program, as follows. These have not yet been fully implemented and are reiterated here.

- *Clear process for responding to audit recommendations:* although the FAP potentially forms part of a continuous improvement process for timber harvesting activities, there is no clearly established process to ensure agreed responses to audit findings and recommendations are implemented. It was recommended in the 2016-17 FAP audit report that DELWP, as the regulator of timber harvesting compliance, develop a process for reviewing and acting on audit findings and recommendations. That process could involve meeting with VicForests (and [potentially] the auditors) to discuss findings and recommendations and agree on how these will be responded to. This would be documented in an implementation plan to which DELWP and VicForests would commit and whose progress would be tracked at regular intervals.
- *Coupe selection:* the data VicForests provides to DELWP to support the selection of audit targets is based on coupe planning information. It indicates the intended length of in-coupe road, any proposals for waterway crossings and the presence of modelled rainforest within the gross coupe area. As demonstrated by Table 3.2, the actual characteristics of the coupe are often quite different from those understood at the time of coupe planning. This has resulted in some coupes being selected for audit (in both 2016-17 and 2017-18 FAP audits) on the basis of risk to sensitive values that are not actually present in the coupe. While this may improve the representativeness of the audit, it potentially dilutes the focus on key risk issues.
- *Audit coupe register:* since harvest coupes remain on the Timber Release Plan (TRP) for several years and may be harvested over more than one season, it is possible that a coupe with higher risk attributes may be selected for audits in successive years[22]. DELWP should maintain a register of coupes included in the audit program to ensure auditors do not inadvertently audit coupes which have previously audited under the FAP.

  Maintaining a register of audited coupes could facilitate longitudinal assessments of environmental impacts associated with instances of non-compliance with the regulatory framework for timber harvesting. This would help to strengthen the evidence base for the regulatory framework.

Recommendations to DELWP
D2: DELWP should develop a process for reviewing and acting on key findings and recommendations from each years' forest audit program. **High priority**
D3: DELWP **and VicForests** should gather information on actual coupe attributes to support audit coupe selection rather than just information from the coupe planning stage. **High priority**
D4: DELWP should establish and maintain a register of coupes included in the FAP. **Moderate priority**

5.5 Auditee comments

A draft of this report was provided to VicForests, as auditees, for review and comment. A summary of their substantive comments and the auditors' responses are provided in Appendix F. Several recommendations (for VicForests and DELWP) have been formulated following the auditors' reflections on VicForests' comments.

[22] This occurred during the 2016-17 FAP audit. Several coupes included in the Indufor (2015) audit of waterway crossings (#6 Zebra, #9 Mosquito, #15 Makybe Diva, #19 Turkey Neck) were selected for that audit – in part because they had waterway crossings. This was known in advance of the field assessments of most of these coupes. Audits proceeded because of the wider scope of the 2016-17 audit program than the Indufor audits in 2015.

6. Conclusions and recommendations

6.1 Conclusions

The objectives of DELWP's FAP are to assess VicForests' compliance with the regulatory framework for timber harvesting activities in State forests and any risks non-compliances pose to the State's sustainable forest management objectives. The 2017-18 FAP addressed mandatory compliance elements selected by DELWP's THCU that draw on both the Code and MSPs and follow two main themes:

- Protection of soil, water and biodiversity values from adverse impacts associated with harvesting and in-coupe roading;
- Design, construction, maintenance and closure of in-coupe roads.

Compliance of harvesting and roading activities with the regulatory framework was assessed for 30 coupes located in State forests within the Benalla-Mansfield, Central, Central Gippsland, Dandenong, East Gippsland, North-East and Tambo FMAs. Coupe selection was risk-based, meaning that audit findings cannot be taken as being statistically representative of VicForests' operations overall.

Overall compliance findings for harvesting coupes

A total of 105 compliance criteria were identified from the various Code and MSP compliance elements within the scope developed by DELWP. Of these, 28 criteria were not applicable to any of the 30 selected coupes.

The overall average level of full compliance with applicable audit criteria was 91%. The level of full compliance for individual coupes ranged between 63% and 100% of applicable criteria. Of the 30 coupes included in this audit, four were found to fully comply with applicable audit criteria.

Non-compliances with potential for environmental impact resulted from 30 individual incidents in 16 coupes. The assessed level of potential environmental impact associated with these incidents ranged between negligible and major. Two of the incidents resulted in non-compliances with major potential environmental impact. This reflected the relative sensitivity of the locations at which the incidents occurred, namely planned riparian buffers.

Compliance with environmental audit criteria

Environment-themed audit criteria were grouped into three sub-themes, with some cross-over between criteria. The main findings for each sub-theme were:

- *Protection of forest soils:* 19 audit criteria were relevant to the protection of forest soils, of which three were not applicable to any of the selected coupes. The level of full compliance with applicable criteria ranged between 44% and 100%, with an average of 87% compliance. Non-compliances assessed to have major potential environmental impact resulted from harvesting in two coupes in small areas of what were intended to be riparian buffers.
- *Protection of water flows, water quality and river health:* 40 audit criteria were relevant to this theme, of which seven were not applicable to any of the selected coupes. The average level of full compliance with applicable criteria was 90%, with compliance ranging between 55% and 100%. Non-compliances which were assessed to have major potential environmental impact were identified on two coupes, with this (as previously) resulting from harvesting in small areas of what were intended to be riparian buffers.
- *Protection of biodiversity values:* 53 audit criteria were relevant to the protection of biodiversity values, of which 19 were not applicable to any of the selected coupes. Average compliance with applicable criteria was 92%, with the range being 71-100%. No non-compliances with major potential environmental impact were observed in relation to this sub-theme. The highest level of potential environmental impact (moderate) was associated with non-compliances in relation to disturbance to retained vegetation during construction of boundary tracks for regeneration burning and during the burning itself.

Compliance with roading audit criteria

Roading criteria were grouped for the audit into three sub-themes. Some criteria were applicable to more than one roading sub-theme and in some cases were also relevant to environmental sub-themes. The main findings were:

- *Road design:* the average level of full compliance with the six criteria relevant to this theme was 81%, with compliance ranging between 25% (for a single applicable criterion for four coupes) and 100%. Non-compliances with no environmental impact were relatively common for this compliance element; these resulted from having no recorded engineering basis for design for larger embankments or waterway crossings and having no specific evidence that the culvert size is consistent with flow requirements in a 10% AEP rainfall event.
- *Road construction:* 33 compliance elements were relevant to this theme. The average level of full compliance with applicable criteria was 92%, with the level of compliance ranging between 53% and 100%. A variety of issues resulted in incidents with environmental impact, although none of these were assessed to have more than moderate potential environmental impact.
- *Road maintenance and closure:* there were only five compliance criteria which were relevant to road maintenance or closure. The average level of compliance with applicable criteria was 71%, with the level of full compliance ranging between 0% (non-compliance for one or two applicable criteria) and 100%. Non-compliance incidents were assessed as having up to moderate potential environmental impact.

Key non-compliance issues with environmental impact

This audit identified nine kinds of incident that gave rise to non-compliances with environmental impact. In order of frequency of occurrence, these were:

- In-coupe roads not being constructed with effective drainage at intervals consistent with MSP requirements, including approaches to waterway crossings
- Non-compliant waterway crossing design, construction and/or removal, including culvert outlets dropping water onto poorly protected stream channels
- Culvert outlets draining onto in-coupe road embankments and/or dropping water onto other areas that are prone to erosion
- Inadequate maintenance of in-coupe roads, leading to failure of drainage and/or sediment control structures
- Damage to retained trees and understorey vegetation from regeneration activities, including regeneration burning and construction of boundary tracks for burning
- Road embankment materials covering the base of live trees that will be/have been retained post-harvest
- Harvesting in riparian buffer areas
- Harvesting in a small area with slope exceeding 30°[23] within a declared water supply catchment
- Machinery disturbing and pushing soil into a riparian filter area.

The first six of these have been observed in at least one of the two most recent FAP audits (in 2015-16 and/or 2016-17). Most of the issues have potential to result in soil erosion and sediment generation. Depending on where the incidents are located, they could also lead to sediment deposition in waterways and water quality impairment. Others of the incidents affect the value of retained habitat in the coupes.

The incidents posing the greatest environmental risk (major EIA rating) were the two that involved harvesting in planned (and in one case marked) riparian buffers (17 Tatong Wedge, 19 Swivel). In 17 Tatong Wedge coupe, the boundary track was also constructed within what was intended to be a riparian buffer.

[23] Note that slope was as mapped in VicForests' coupe operations map.

Comparison with previous audits

Coupe selection for the FAP is risk-based, which limits the validity of comparisons between successive audits. However, as the 2016-17 audit and this one used the same criteria and field methodology and were conducted by the same lead auditor, there is a reasonable basis for comparing results.

That comparison shows a small improvement in the overall level of full compliance, with those improvements evident in both main themes and all but one of the sub-themes (i.e. road maintenance and closure). The most significant difference in audit results was the reduced number of non-compliances with major potential environmental impact (37 non-compliances resulting from 13 incidents in 2016-17, compared with 4 non-compliances resulting from 2 incidents in 2017-18).

Most of the non-compliances with major potential environmental impact identified in the 2015-16 audit were associated with the construction and/or removal of waterway crossings. While some issues were identified with waterway crossings in the current audit, none were assessed to have more than moderate potential environmental impact.

The six most common kinds of non-compliance incidents with potential environmental impact have been observed in previous audits. Thus, while compliance performance has improved overall, many of the same kinds of non-compliance issues have remained. These mostly concern the design, construction and/or removal of in-coupe roads and waterway crossings.

6.2 Recommendations

Findings of this audit have led to a series of recommendations for VicForests, as auditees, and DELWP, as the environmental regulator of timber harvesting activities and audit client. Recommendations address potential improvements to the management of timber harvesting and related roading activities, as well as potential improvements to the regulatory framework.

The priority given to recommendations reflects either the potential environmental impact associated with the aspect of harvesting practice or the auditor's perception of the importance of the recommendation to the effectiveness of the regulatory framework.

Recommendations for VicForests

Recommendation	Rationale
V1: High priority VicForests should thoroughly review its approach to the design, construction and rehabilitation of waterway crossings to significantly improve their compliance with regulatory requirements. This review should consider the suggestions included in Section 5.3.1 and discussed in the 2016-17 FAP audit report (Jacobs, 2018a).	Waterway crossing non-compliance issues observed in this audit were generally not as severe as those identified in the 2016-17 audit program. However, deficiencies in their design, construction and/or removal were commonplace among the coupes with in-coupe road or snig track crossings. The practice improvements recommended in the 2016-17 audit are reiterated here and remain relevant.
V2: Moderate priority As part of its review of the construction of waterway crossings and in-coupe roads and during coupe monitoring, VicForests should ensure culvert outlets comply with regulatory requirements and do not discharge onto unprotected embankments or from above the downstream surface elevation.	This and previous audits considering waterway crossings and in-coupe road drainage have found multiple instances of culvert outlets that are non-compliant in these ways. VicForests construction practices should be revised to ensure these issues are addressed before the culverts become operational.,

Recommendation	Rationale
V3: Moderate priority VicForests should continue to review its approach to regeneration burns to identify and implement opportunities to reduce unintended impacts in unharvested buffer areas.	Regeneration burns may be challenging to contain within a coupe's harvest area. However, fire incursions into planned buffer areas may have significant mid to long term impacts on sediment generation and biodiversity values. Continued work to improve management of regeneration burns is required to reduce the incidence of these effects.
V4: Moderate priority VicForests should construct drainage on all in-coupe roads prior to any temporary or longer-term suspension of harvesting. Completion of construction and compliance with MSP drainage requirements should be confirmed in coupe monitoring records at suspension or closure.	This and previous audits have identified repeated incidences of cross drains not being constructed on in-coupe roads prior to the suspension or cessation of harvesting. This leaves the roads vulnerable to erosion and may result in sediment deposition into waterways.
V5: Moderate priority As part of their briefing of contractors prior to the commencement of operations on a coupe, VicForests should note the mandatory requirement to avoid spreading road embankment materials across the bases of trees that will be retained through harvesting and regeneration.	This and previous audits have identified repeated incidences where embankment materials from in-coupe roads and waterway crossings have been deposited over the base of trees that were to be retained through harvesting and regeneration. While this may be unavoidable (apart from removing the tree) in some instances, it does not comply with MSP 6.2.2.1).

Recommendations for the Department of Environment, Land, Water and Environment

Recommendation	Rationale
D1: Moderate priority DELWP should review the methodology for assessing water quality risk of soils in the MSPs to more reliably classify erodible soils with high permeability.	The current method for estimating water quality risk for soils appears to understate the risk posed by moderately dispersive, but highly permeable soils. The methodology should be reviewed to ensure that harvesting and roading activities appropriately manage the risks of erosion and sediment generation.
D2: High priority DELWP should develop a process for reviewing and acting on key findings and recommendations from each years' forest audit program.	The FAP is a potentially important process in achieving continuous improvement in timber harvesting activities in State forests. The historical lack of a formal process for responding and acting upon findings and recommendations of the audits diminishes their value. This restates a recommendation from the 2016-17 audit report. It is understood that a process is being developed to support consider and, as appropriate, act on audit findings and recommendations.
D3: High priority DELWP and VicForests should gather information on actual coupe attributes to support audit coupe selection rather than information only from the coupe planning stage.	Use of planning stage information means that audit targets may not have the values or risk factors for which they were selected. This potentially dilutes the value of the audit. This issue has been a feature of the audit coupe selection process for some time and has not been adequately addressed.
D4: Moderate priority DELWP should establish and maintain a register of coupes included in the FAP.	A register will help to avoid inadvertent re-auditing of coupes and also provide a basis for longitudinal studies assessing the environmental impacts of non-compliances with the regulatory framework. This restates a recommendation of the 2016-17 audit.

Recommendation	Rationale
D5 Moderate priority DELWP should review MSP 6.2.2.1 and consider rewording to constrain its application to trees that will be retained post-harvest and regeneration rather than all "live" trees and allow for modest levels of "unavoidable" spillage of materials across the base of such trees.	The prescription is presumably meant to apply only to trees that are to be retained long-term, following road construction and not to trees beside in-coupe roads that would be felled during harvesting or killed by regeneration burns. As written, the prescription does not provide for such circumstances. In some settings contractors constructing in-coupe roads may be faced with the choice of either removing a tree or placing embankment materials over at least part of its base, the latter (only) in contravention to the MSPs. While placement of excessive levels of embankment material over the base of trees may lead to their decline and subsequent death (hence the prescription), smaller amounts over part of the tree base may have minimal detrimental effect. MSP 6.2.2.1 is unnuanced and this recommendation also seeks a modification that avoids unnecessary removal of a tree that would otherwise survive in the coupe merely to comply with this requirement. The wording of the prescription would also need to limit the circumstances under which embankment materials would be permitted to be deposited over the base of a retained tree.
D6 Moderate priority DELWP should review MSP 3.4. Slope, to clarify if the exception for harvesting in slopes >30° in 3.4.1.2 also applies to slopes >25° on granite soils in East Gippsland FMA (3.4.1.3) and/or to the slope limits in Appendix 3 Table 11.	MSP 3.4.1.2 provides an exemption to the general requirement not to harvest areas greater than 30° slope, where only 10% or less of the net harvestable area is affected and harvesting is managed to minimise the risk of soil mass movement. However, the MSPs include specific slope limits: those applying to designated water supply catchment areas (MSP Table 11) and to areas of granite-derived soils in East Gippsland. It is unclear if the general exemption applies where in these situations; the recommendation seeks clarification on this matter.

7. References

Department of Environment and Primary Industries [DEPI] 2014a. *Code of practice for timber production 2014*. DEPI.

DEPI 2014b. *Management standards and procedures for timber harvesting operations in Victoria's State forests 2014.* DEPI.

DEPI 2014c. *Planning standards and procedures for timber harvesting operations in Victoria's State forests 2014.* Appendix 5 to the *Management standards and procedures for timber harvesting operations in Victoria's State forests 2014.* DEPI.

Department of Sustainability and Environment [DSE] 2006. *Sustainability charter for Victoria's State forests*. DSE.

DSE 2009. Management procedures for timber harvesting, roading and regeneration in Victoria's State forests 2009. DSE.

Indufor 2016. Forest Audit Program 2015. Environmental audit of the construction & rehabilitation of waterway crossings. Final Report to DELWP. February 2016.

Jacobs 2016. Forest Audit Program 2015: Audit of in-coupe roads. Environmental audit of the construction and maintenance of in-coupe roads. V2.3 Report to DELWP. March 2016.

Jacobs 2018a. Audit of timber harvesting and forest regeneration in State forests in eastern Victoria. Report on the 2016-17 Forest Audit Program. IS206000-P2-001. Report to DELWP. April 2018.

Jacobs 2018b. Forest Audit Program 2017-18. 2017-18 Audit Summary Report. IS247800-RP-001. Report to DELWP. June 2018.

SKM 2013. Forest Audit Program. 2012-13 audit of coupe regeneration and finalisation. Report to DELWP. July 2013.

URS (2015) Environmental audit. Forest Audit Program 2014. Report on Module 1: Harvesting and closure and Module 3: Regeneration and finalisation. Report for Department of Environment and Primary Industries. URS Australia Pty Ltd.

Spatial data sources:

- Victorian government: www.data.vic.gov.au
- ESRI

Limitation statement

The purpose of this report and the associated services performed by Jacobs was to conduct an environmental audit of timber harvesting operations in Victorian State forests. The work has been undertaken in accordance with the scope of services set out in the contract between Jacobs and the Department of Environment, Land, Water and Planning (DELWP).

Jacobs derived the data in this report from field observations and information sourced from DELWP, VicForests and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report.

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Appendix A. Target coupes

The following coupes were selected as the audit target coupes using the procedure described in Section 3.1. Ticks represent features indicated in information provided by VicForests and are based on coupe planning. They do not necessarily reflect the actual circumstances of the coupe. The location of the coupes is shown in Figure A.1 or A.2, as per the “map” column.

Audit #	Coupe address	Coupe Name	FMA	Map	Silviculture	Coupe statues	Coupe Size (ha)	Waterway crossing	Rainforest	ICR ≥ 400 m	Soil erosion hazard - high	Ave slope ≥ 15°	SMZ or SPZ
Central Highlands FMAs													
1	281-514-0005	Bear Grylls	CT	A.1	STR	Regenerating	49.78	ü		ü		ü	
2	286-505-0026	High Voltage	CT	A.1	CFE	Active Harvest	54.25		ü	ü			ü
3	287-508-0004	Rocksteady	CT	A.1	RRH	Active Harvest	37.98	ü		ü		ü	
4	287-513-0004	Royston Slim	CT	A.1	RRH	Regenerating	20.4		ü	ü	ü	ü	ü
5	298-513-0005	French Island	CT	A.1	CFE	Regenerating	23.26		ü	ü		ü	ü
6	312-512-0004	Liverpool	CT	A.1	STR	Regenerating	51.92	ü	ü	ü		ü	ü
7	317-508-0003	Machikichori	CT	A.1	CFE	Regenerating	54.62	ü		ü		ü	ü
8	318-512-0007	Eddy Grant	CT	A.1	RRH	Regenerating	38.96			ü	ü	ü	ü
9	348-517-0005	Tarzan	DD	A.1	CFE	Regenerating	30.51	ü			ü	ü	ü
10	349-514-0006	You Just Know	DD	A.1	CFE	Regenerating	37.85	ü		ü		ü	ü
Gippsland FMAs													
11	457-501-0020	Andy	CG	A.1	CFE	Regenerating	55.21		ü	ü		ü	ü
12	480-501-0003	Whitelaws Ramble	CG	A.1	CFE	Active Harvest	41.41	ü				ü	ü
13	742-513-0012	Pharlap	TB	A.2	STR	Regenerating	22.88				ü		ü
14	771-507-0027	Tom Tom Drums	TB	A.2	CFE	Regenerating	34.13		ü	ü			
15	760-506-0011	Johnnie and Jack	TB	A.2	CFE	Active Harvest	48.28	ü		ü			ü
North-East FMAs													
16	394-501-0002	Tatong Heights	BM	A.1	STS	Regenerating	40.91					ü	ü

Audit #	Coupe address	Coupe Name	FMA	Map	Silviculture	Coupe statues	Coupe Size (ha)	Waterway crossing	Rainforest	ICR ≥ 400 m	Soil erosion hazard - high	Ave slope ≥ 15°	SMZ or SPZ
17	394-501-0005	Tatong Wedge	BM	A.1	STR	Regenerating	22.76						ü
18	395-502-0003	Stringybark Creek	BM	A.1	STS	Regenerating	48.23						ü
19	684-514-0003	Swivel	NE	A.2	CFE	Regenerating	42.79			ü		ü	
20	686-510-0004	Lyons	NE	A.2	CFE	Regenerating	51.4					ü	
East Gippsland FMA													
21	801-504-0018	Lambpoon	EG	A.2	STR	Regenerating	39.13	ü	ü	ü			ü
22	803-506-0004	Lyles	EG	A.2	STR	Regenerating	37.27	ü					ü
23	810-501-0009	Boxed Chook	EG	A.2	STR	Regenerating	29.71		ü		ü		
24	810-501-0020	Running Creek	EG	A.2	STR	Regenerating	24.36		ü		ü		
25	814-504-0002	Titanium	EG	A.2	STR	Regenerating	36.14		ü	ü			ü
26	827-501-0024	Wayfarer	EG	A.2	STR	Regenerating	40.89		ü	ü			ü
27	833-512-0025	Panglossian	EG	A.2	STR	Regenerating	46.39		ü	ü		ü	ü
28	836-524-0021	Buckskin	EG	A.2	STR	Regenerating	35.88	ü		ü	ü		ü
29	874-501-0012	Donkeyshoe	EG	A.2	THB	Regenerating	92.06	ü	ü	ü			ü
30	888-510-0010	Cabbage Patch	EG	A.2	STR	Regenerating	47.95			ü	ü	ü	

Notes:

ICR – In-coupe road, SMZ – Special management zone, SPZ – Special protection zone (within or within 500 m of the coupe)

FMA – Forest Management Area: BM – Benalla Mansfield, CG – Central Gippsland, CT- Central, DD – Dandenong, EG – East Gippsland, NE – North East, TB - Tambo

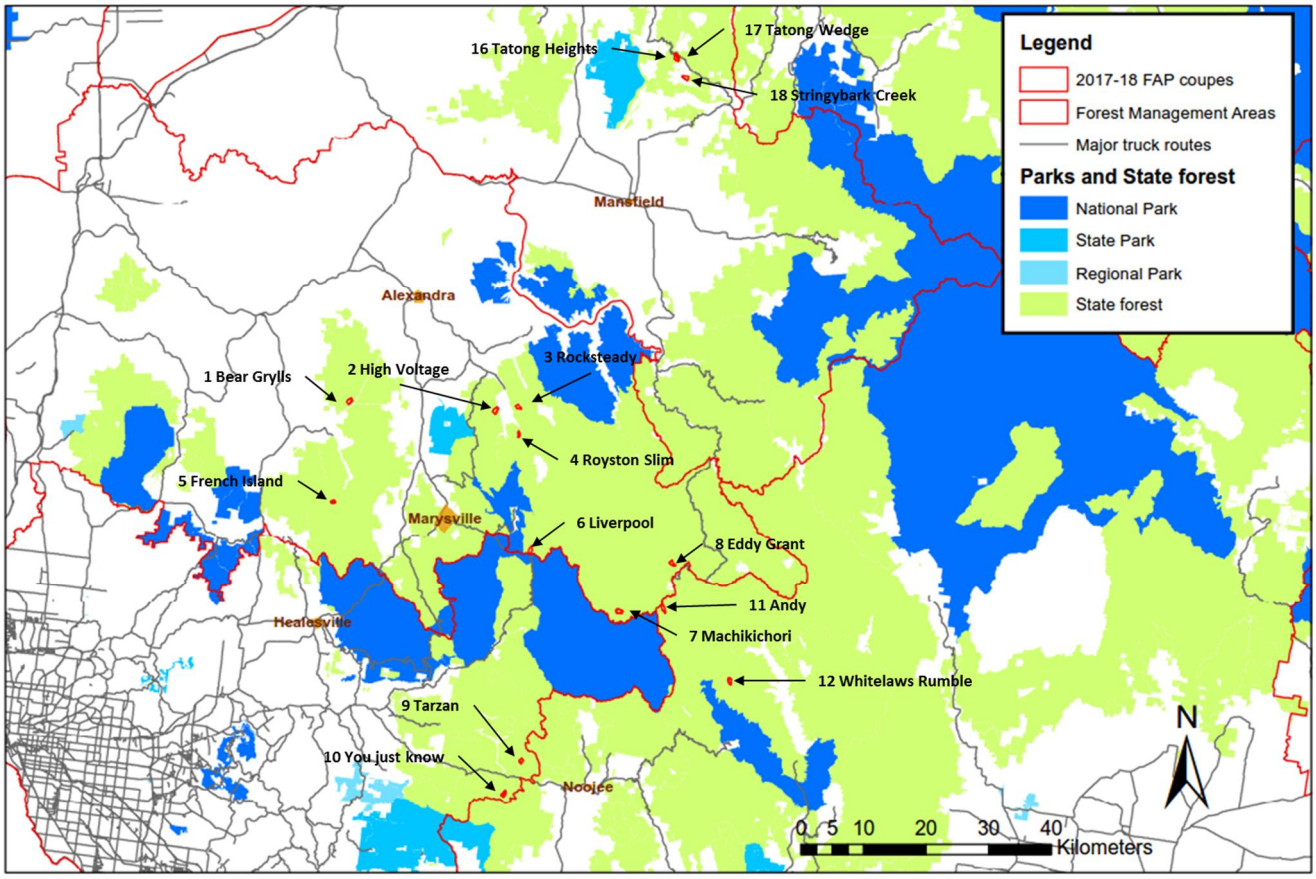

Figure A.1 : Audit target coupes in Benalla-Mansfield, Central and Central Gippsland FMAs

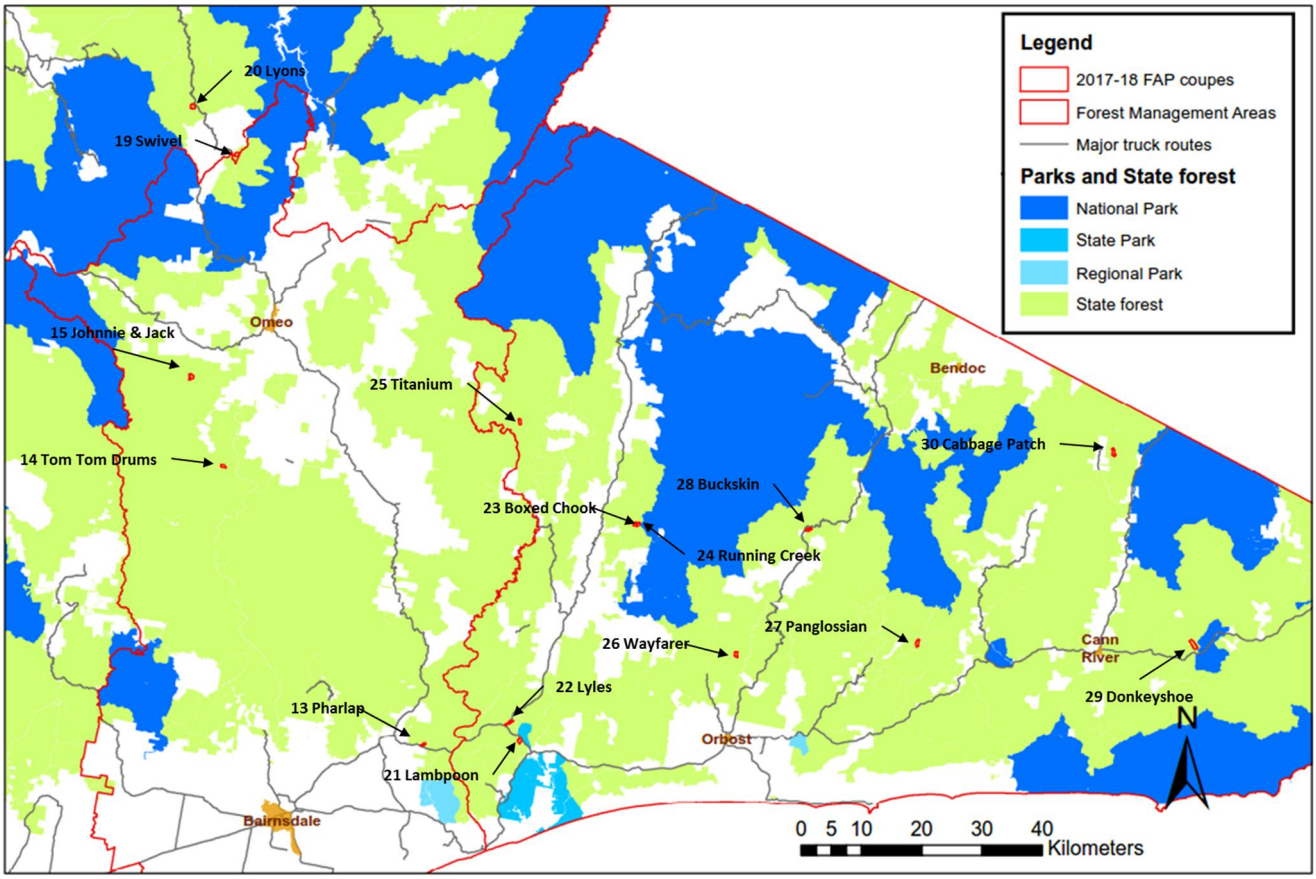

Figure A.2 : Audit target coupes in East Gippsland, North East and Tambo FMAs

Appendix B. Audit compliance elements

Regulatory compliance elements considered in the audit are included in Table B.1. They were drawn from the *Code of Practice for Timber Production* (Code; DEPI, 2014a), the associated *Management Standards and Procedures for Timber Harvesting Operations in Victoria's State forests* (MSPs; DEPI, 2104b) and the *Planning Standards* (PS) which form Appendix 5 to the MSPs (DEPI, 2014c). Code compliance elements were selected by DELWP's Timber Harvesting Compliance Unit (THCU). Supporting compliance elements from the MSPs and PS were selected by the audit team.

Compliance criteria (stated as a question) were developed by the audit team to enable assessments of compliance with each element of the regulatory framework. Criteria typically (although not always) refer to individual MSP or PS compliance elements, rather than a more overarching Code requirement. In some cases, criteria refer to individual Code compliance elements. Compliance elements have been incorporated with criteria in Table B.1. The compliance theme(s) to which each criterion relates is also given in the table.

Table B.1 provides a summary of the number of coupes recording non-compliances with potential environmental impact, compared with the total number of coupes for which the criterion was applicable.

Table B.1 Selected regulatory compliance elements for 2017-18 FAP audits and associated audit compliance criteria. A summary of the level of compliance with each criterion and the compliance theme or sub-theme to which each criterion relates is also shown.

Source	Compliance elements and criteria[1]	%full compliance[2]	Compliance themes[3]
Environmental values in State forests – Code section 2.2			
2.2.1 Water quality, river health and soil protection			
Code	2.2.1.1 Planning and management of timber harvesting operations must comply with relevant water quality, river health and soil protection measures specified within the Management Standards and Procedures.		
MSP	3.1.1.1 Use the following categories when determining buffer (B) and filter (F) widths for waterways within and immediately adjacent to each coupe. Aids to the identification of each class of waterway are provided in the Code Glossary. (a) Permanent streams, pools and wetlands. (b) Temporary streams. c) Drainage lines.		
	1.1 Have the categories prescribed in the MSPs been used in classifying waterways present on the coupe?	100%	W
	1.2. Are the classification assessed to have been applied correctly?	100%	
MSP	3.2.1.1 Conduct field assessments to determine the soil erosion hazard and soil permeability classifications for an area proposed for any soil disturbing timber harvesting operations as follows (3.2.1.2-3.2.1.11, Table 8).		
	2.1 Has soil erosion hazard and soil permeability been assessed using the method prescribed in the MSPs?	100%	S,W
	2.2 Has the methodology been followed correctly?	100%	
MSP	3.3.1.1 Apply appropriate protection to class of waterway as outlined in table 9.		
	3.1 If applicable, have the buffer and filter strip widths prescribed in MSP Table 9 been applied to the coupe?	92%	W
MSP	3.3.1.2 Apply appropriate protection to class of waterway as outlined in table 10 below for coupes in catchments up to 1 km upstream of verified and potential Spotted Tree Frog sites or coupes in Barred Galaxias and Mountain Galaxias SMZs where specified in section 4.2.		
	3.2 If applicable, have the buffer and filter strip widths prescribed in MSP Table 10 been applied to the coupe?	100%	W,B
MSP	3.4.1.1 Exclude timber harvesting operations from slopes over 30 degrees.		
	4.1 Does the forest coupe plan (FCP) show areas of the coupe with slope >30°?	100%	S,W
	4.2 Has timber harvesting been excluded from areas with slopes >30°?	80%	S,W

Source	Compliance elements and criteria[1]	%full compliance[2]	Compliance themes[3]
MSP	3.4.1.2 Up to 10% of the net harvest area of any coupe can contain areas greater than 30 degrees, where the risk of mass soil movement has been managed accordingly.		
	4.3 If timber harvesting is undertaken in areas with slope >30°, does the area harvested exceed 10% of net harvest area and has the risk of soil mass movement been managed accordingly?	100%	S,W
MSP	3.4.1.3 Exclude timber harvesting operations from slopes over 25 degrees in the East Gippsland FMA in areas with granite-based soils.		
	4.4 For applicable couples, does the FCP show areas of the coupe with slope >25°?	100%	S,W
	4.5 For applicable coupes, has timber harvesting been excluded from areas with slopes >25°?	100%	
MSP	3.5.1.1 Apply the slope limits, seasonal closures, buffer and filter strip widths and other relevant management actions specified in Appendix 3 Table 11 (Water supply protection areas) for timber harvesting operations and associated roading and regeneration in water supply protection areas.		
	5.1 For applicable coupes, does the FCP correctly note that the coupe is located in a WSPA?	100%	W
	5.2 For relevant couples, have the applicable slope limits, seasonal closures, buffer and filter strip widths and other relevant management actions specified in Appendix 3 Table 11 been correctly applied on the coupe?	91%	W
MSP	3.5.1.2 Refer to table 2 in Appendix 5 the Planning Standards for management actions that apply to water supply protection area SMZs in the … East Gippsland FMA ...		
	5.3 For coupes in these catchments, are the applicable stream buffers and maximum annual areas harvested correctly applied on the coupe?	n/a	W
MSP	3.5.1.3 Obtain approval from the Minister or delegate in accordance with section 1.4 for any timber harvesting operations that are not conducted in accordance with clauses 3.5.1.1 or 3.5.1.2.		
	5.4 For relevant coupes, if timber harvesting operations are not conducted in accordance with the relevant MSP prescriptions, has Ministerial approval been obtained in accordance with MSP section 1.5 and Appendix 1 prior to harvesting commencing?	n/a	W
Code	2.2.1.2 Management actions to protect waterways, river health and soil must be appropriate to the waterway class, soil category, and potential water quality risk posed by timber harvesting operations at each site.		
	6.1 In the auditor's opinion (ITAO), is there evidence from the coupe which suggests that management actions to protect waterways, river health and soil have not been appropriate to protect waterways, river health and soil?	77%	S,W
Code	2.2.1.5 Where practical exclude roads and snig tracks from aquatic and riparian habitats.		
	7.1 If roads and snig tracks have not been excluded from aquatic and riparian habitats, ITAO was it reasonably practicable to have done so?	91%	W,B,C
Code	2.2.1.6 Where crossings are required, minimise the extent of habitat damage, constriction to stream flow and barriers to fish and other aquatic fauna.		
	8.1 ITAO were there reasonably practicable alternatives to construction of the creek crossing?	100%	W,C
	8.2 ITAO did the crossing minimise the extent of habitat damage, constriction to stream flow and barriers to fish and other aquatic fauna?	100%	W,B,C
Code	2.2.1.7 Remove temporary crossings immediately after harvesting or any subsequent regeneration work is complete using a technique that minimises soil and habitat disturbance.		
	9.1 ITAO has the crossing been removed as soon as reasonably practicable following harvesting or regeneration work?	100%	W,CL
	9.2 ITAO has removal of the crossing been undertaken in a manner that has minimised soil and habitat disturbance?	0%	S,W,CL

Source	Compliance elements and criteria[1]	%full compliance[2]	Compliance themes[3]
Code	2.2.1.12 Design, construct and maintain roads, crossings, coupe infrastructure and drainage structures to withstand foreseeable rainfall events and traffic conditions, and protect water quality.		
	10.1 ITAO is there evidence from the coupe which suggests that the design, construction and maintenance of roads, crossings, coupe infrastructure and drainage structures has been insufficient to protect water quality?	82%	W,D,C
2.2.2 Conservation of biodiversity			
Code	2.2.2.1 Planning and management of timber harvesting operations must comply with relevant biodiversity conservation measures specified within the Management Standards and Procedures.		
Code	2.2.2.4 During planning identify biodiversity values listed in the Management Standards and Procedures prior to roading, harvesting, tending and regeneration. Address risks to these values through management actions consistent with the Management Standards and Procedures such as appropriate location of coupe infrastructure, buffers, exclusion areas, modified harvest timing, modified silvicultural techniques or retention of specific structural attributes.		
Code	2.2.2.5 Protect areas excluded from harvesting from the impacts of timber harvesting operations.		
MSP	*MSP4.1.1 Statewide* 4.1.1.1 Retain habitat trees in accordance with the FMA summary provided in Appendix 3 Table 12 (Habitat tree prescriptions). 4.1.1.2 Trees in buffers or other exclusion areas that have been extended beyond minimum required widths can contribute to habitat tree retention requirements		
	11.1 Have the required number of habitat trees been retained on the coupe (as per MSP Appendix 3, Table 12) - including in areas where buffers and other exclusion areas extended beyond the minimum required widths?	100%	B
MSP	*4.1.4 Central Highlands FMAs* 4.1.4.1 When selecting habitat trees, prioritise hollow-bearing trees where they are present and trees most likely to develop hollows in the short term. 4.1.4.2 Scatter habitat trees across the timber harvesting coupe in mixed-species forest. 4.1.4.3 Where possible, retain potential hollow-bearing ash eucalypts in clumps to increase their protection from exposure, windthrow and fire. 4.1.4.4 No gap between retained vegetation is to be greater than 150 m. 4.1.4.5 Retain habitat trees where they can be most easily protected from damage during harvesting and site preparation treatment.		
	11.3 ITAO do any retained habitat trees appear to have been selected for hollow bearing or potential to become hollow bearing?	100%	B
	11.4 If there are retained habitat trees, have they been scattered evenly across the coupe?	100%	
	11.5 If present, have hollow bearing ash eucalypts been retained in clumps.	100%	
	11.6 Are gaps between retained vegetation ≤ 150 m?	100%	
	11.7 ITAO, are any retained habitat trees located where they can most easily be protected from damage during harvesting and site preparation treatment?	91%	
	11.8 Is there evidence of damage to retained vegetation from harvesting or regeneration?	73%	
MSP	*4.1.5 East Gippsland FMA and Gippsland FMAs* 4.1.5.1 When selecting habitat trees, prioritise old living trees with a range of hollow sizes. Where these are absent or not present in sufficient numbers, prioritise trees that are old enough to develop hollows during the next 50 years. 4.1.5.2 Stags and younger, smaller trees may be counted as habitat trees if trees of the type described in 4.1.5.1 are absent or not present in sufficient numbers. 4.1.5.3 Where possible, retain habitat trees in small clusters which include younger regrowth and understorey. 4.1.5.4 Distribute habitat tree clusters across the coupe with consideration of the proximity of other retained vegetation.		

Source	Compliance elements and criteria[1]	%full compliance[2]	Compliance themes[3]
	11.9 ITAO, does the selection of any retained habitat trees appear to have prioritised old living trees with hollows of various sizes or trees that are old enough to develop hollows in the next 50 years?	100%	B
	11.10 Have habitat trees been retained in small clusters with younger regrowth and understorey?	100%	
	11.11 ITAO, does the distribution of any habitat tree clusters appropriately consider the proximity of other retained vegetation?	100%	
MSP	4.2.1.1 Apply management actions for rare and threatened fauna identified within areas affected by timber harvesting operations as outlined in Appendix 3 Table 13 (Rare or threatened fauna prescriptions).		
	12.1 Does the FCP correctly note record(s) of rare or threatened fauna –based on the Victorian Biodiversity Atlas (VBA) - on the coupe?	100%	B
	12.2 Have the management actions for fauna (as per MSP Appendix 3, Table 13) been carried out?	100%	
PS	4.2.1.1 Plan management actions for rare and endangered fauna in accordance with Table 3 (Fixed forest management zone [FMZ] rules for fauna) below. 4.2.1.2 Maintain FMZ schemes for rare and endangered fauna in accordance with Table 3 (Fixed FMZ rules for fauna) below		
	12.3 Does the FCP correctly note the applicable fauna-related FMZ?	100%	B
	12.4 Have the management actions specified in PS Table 3 been implemented?	100%	
MSP	4.3.1.1 Apply management actions for rare and threatened flora identified within areas affected by timber harvesting operations as outlined in Appendix 3 Table 14 (Rare or threatened flora prescriptions).		
	12.5 Does the FCP correctly note the applicable fauna-related FMZ?	100%	B
	12.6 Have the management actions specified in PS Table 4 been implemented?	100%	
PS	4.3.1.1 Apply the management actions outlined in Table 4 (Detection based FMZ rules for fauna) below for zoned rare or threatened fauna. 4.3.1.2 Implement FMZ amendments and reviews in accordance with Table 4 (Detection based FMZ rules for fauna) below for new verified rare or threatened fauna records and FMZ amendment requirements outlined in section 2.		
	13.1 Does the FCP correctly note record(s) of rare or threatened flora –based on the VBA - on the coupe?	100%	B
	13.2 Have the management actions for flora (as per MSP Appendix 3, Table 14) been carried out?	n/a	
PS	4.5.1.1 Apply the management actions outlined in Table 5 (Detection based FMZ rules for flora) below for zoned rare or threatened flora values. 4.5.1.2 Implement FMZ amendments and reviews in accordance with Table 5 (Detection based FMZ rules for flora) below for new verified rare or threatened flora records and FMZ amendment requirements outlined in section 2.		
	13.3 Does the FCP correctly note the applicable fora-related FMZ?	100%	B
	13.4 Have the management actions specified in PS Table 5 been implemented?	n/a	
PS	4.5.2.4 Plan disturbances in SMZ in consultation with DEPI biologists to ensure the species is adequately protected.		
	13.5 If disturbance has been planned within the SMZ, have DELWP biologists been consulted on species protection?	n/a	B
	13.6 ITAO has the disturbance been carried out according to the agreed approach?	n/a	
MSP	4.4.1.1 In the Gippsland FMAs exclude selective harvesting from Box Ironbark forests typically containing Forest Red Gum (*Eucalyptus tereticornis*), Yellow Box (*Eucalyptus melliodora*), Coast Grey Box (*Eucalyptus bosistoana*) and Red Ironbark (*Eucalyptus tricarpa*). Silvicultural practices that promote regeneration of these species is permitted. 4.4.1.2 In the East Gippsland FMA exclude selective harvesting from Box Ironbark forests typically containing Red Ironbark (*Eucalyptus tricarpa*), Gippsland Grey Box (*Eucalyptus bosistoana*), Red Box (*Eucalyptus polyanthemos*), Blue Box (*Eucalyptus baueriana*) and Yellow Stringybark (*Eucalyptus muelleriana*). The use of seed-tree regeneration systems is		

Source	Compliance elements and criteria[1]	%full compliance[2]	Compliance themes[3]
	permitted to restore the original species mix when combined with: a) cutting stumps of desired species to a maximum height of 30 cm, to encourage coppice growth; b) supplementary planting and sowing where necessary; c) removing unproductive trees of the less-preferred species to remove overwood competition; and d) thinning of advanced regrowth.		
	14.1 Has selective harvesting been excluded from the coupe if its composition corresponds with 4.4.1.1 or 4.4.1.2?	n/a	B
	14.2 If seed tree regeneration is used, does it comply with the specifications in 4.4.1.2?	n/a	
MSP	4.4.2.1 Avoid road construction across areas of heathland or within 40 m of heathlands unless no reasonable alternative exists. 4.4.2.2 In the Gippsland FMAs, exclude Wet Heathland, Clay Heathland and Riparian Scrub Mosaic EVCs from harvesting. Protect these heathland EVCs with a 40 m buffer. 4.4.2.3 In the East Gippsland FMA and Otway FMA where evidence of heathland is found in the field and it isn't already classified as SPZ, application must be made to the Secretary or delegate prior to commencement of the timber harvesting operation to create an SPZ in accordance with table 7 in Appendix 5 the Planning Standards.		
	15.1 If a road was constructed through a heathland EVC, ITAO, was it reasonably practicable to construct the road in another location?	n/a	B
	15.2 If present, has harvesting been carried out in or within 40 m of one of these heathland EVCs?	n/a	
	15.3 If evidence of heathland was found in the coupe and it was not already classified as SPZ, has application been made to the Secretary to create an SPZ in accordance with table 7 in Appendix 5 the Planning Standards?	n/a	
	15.4 Have the SPZ conditions been followed in the management of harvesting?	n/a	
MSP	4.4.3.1 In the Tambo FMA protect small stands of Montane Riparian Thicket (MRT) between 0.01 ha and 0.5 ha and less than 10 m wide with a 10 m filter strip and stands of MRT wider than 10 m with a 20 m wide filter strip. 4.4.3.2 In all other FMAs apply the heathland prescriptions listed above in 3.4.2 (*sic* – actually 4.4.2).		
	16.1 If small Montane Riparian Thicket stands were/are present within the coupe, were the prescribed protections from harvesting noted in the FCP?	100%	B
	16.2 If small Montane Riparian Thicket stands were/are present within the coupe, were the prescribed protections from harvesting provided?	100%	B
	16.3 If MRT is present and a road was constructed through it, ITAO, was it reasonably practicable to construct the road in another location?	n/a	B,C
MSP	4.4.4.1 Within the Leadbeater's Possum range apply a 100 m buffer around all stands of modelled Ash old growth forest that are depicted in the DEPI old growth spatial layer (MOG2009.shp) and verified during field assessment by the Managing Authority or DEPI to be Ash type forest.		
	17.1 Have 100 m buffers been provided around all stands noted in MSP 4.4.4.1?	n/a	B
Code	2.2.2.7 Rainforest communities must not be harvested.		
MSP	4.4.9.1 Protect all rainforest from timber harvesting operations as follows: (a) Exclude non-linear stands that are 0.1 ha or more in size but less than 0.4 ha from timber harvesting operations. These stands do not require a buffer. (b) Exclude linear stands that are at least 0.1 ha but are less than 0.2 ha from timber harvesting operations. These stands do not require a buffer. (c) Exclude linear stands that are at least 0.2 ha but are less than 0.4 ha from timber harvesting operations. Protect these stands with a 20 m buffer. (d) Exclude all rainforest stands (including linear stands) equal to or exceeding 0.4 ha from timber harvesting operations. Protect these stands with a 40 m buffer except for rainforest stands in the Central Highlands FMAs and the Gippsland FMAs where 3.4.8.2 (*sic* -actually 4.4.9.2) below must be complied with. (e) Distribute slash away from retained rainforest stands or buffers. 4.4.9.2 In Central Highlands and Gippsland FMAs, areas categorised as being of National, State or Regional significance in the Sites of Significance for Rainforest spatial layer where evidence of rainforest is found in the field and it isn't already classified as SPZ, application must be made to the Secretary or delegate prior to commencement of the timber harvesting operation to create a SPZ in accordance with table 6 in Appendix 5 the Planning Standards.		

Source	Compliance elements and criteria[1]	%full compliance[2]	Compliance themes[3]
	18.1 Has the existence of mapped/modelled rainforest EVC and any status as a RFSOS been noted within the FCP?	100%	B
	18.2 Have the prescribed rainforest protection measures for the rainforest type (as per MSP 4.4.9.1 and 4.4.9.2) been provided?	100%	
PS	4.6.1.1 Include in the SPZ all rainforest stands over 0.4 ha in area (whether already mapped or newly detected) that fall within the area categorised as National Priority 1 in the Sites of Significance for Rainforest spatial layer. The SPZ should extend to the nearest watershed boundary.		
	18.3 Where a rainforest stand of this type is included or identified in the coupe, has an SPZ to the watershed boundary been formed?	100%	B
	18.4 Has harvesting been excluded from the SPZ?	n/a	
PS	4.6.3.1 Central Highlands FMAs - Include in the SPZ all rainforest stands over 0.4 hectares in area (whether already mapped or newly detected) that fall within the area categorised as State or Regional in the Sites of Significance for Rainforest spatial layer. Also include in the SPZ the relevant buffer as identified below in Table 6 (Buffer widths for Rainforest Sites of Significance by category and priority).		
	18.5 Has the rainforest stand and the required buffer (as per PS Table 6) been included in an SPZ?	n/a	B
	18.6 Has the rainforest and its buffer been excluded from harvesting?	n/a	
PS	4.6.4.1 East Gippsland FMA Where rainforest stands coincide with linear reserves, include in the SPZ the rainforest stand plus a 100m buffer. Exceptions may apply where an alternative logical boundary exists within the buffer, for example an existing road. Avoid road construction across linear reserves containing rainforest wherever practicable.		
	18.7 Does the SPZ extend 100 m from the rainforest stand or to what ITAO is another logical boundary?	100%	B
	18.8 If an ICR has been constructed through the linear reserve, was there ITAO any other reasonably practicable alternative.	n/a	B,C
PS	4.6.5.1 In the Gippsland FMAs, include in the SPZ all Cool Temperate Rainforest and Warm Temperate Rainforest stands over 0.4 hectares in area (whether already mapped or newly detected) that fall within the area categorised as State or Regional in the Sites of Significance for Rainforest spatial layer. Also include in the SPZ the relevant buffer as identified below in table 6.		
	18.9 Has the rainforest stand and the required buffer (as per PS Table 6) been included in an SPZ?	100%	B
	18.10 Has the rainforest and its buffer been excluded from harvesting?	100%	
Code	2.2.2.13 Implement appropriate vehicle and equipment hygiene precautions when moving from areas of known pest plant, pest animal and pathogen infestations. 2.2.2.14 Implement appropriate control actions where timber harvesting operations have introduced or exacerbated a pathogen or weed.		
MSP	4.5.1.1 Minimise the risk of introduction or movement of Cinnamon Fungus (*Phytophthora cinnamomi*) and Root Rot (*Armillaria*) from known infected areas, into uninfected areas by: (a) washing machinery before moving into uninfected areas; (b) restricting activities where the movement of soil or gravel is likely to cross from infected sites into healthy vegetation; (c) minimising the relocation or movement of infected gravel or soil during road and track construction or maintenance works, or logging operations; (d) restricting or controlling drainage water run-off from roads and tracks away from healthy vegetation; (e) testing gravel from infected areas and using only uncontaminated gravel in uninfected areas; and (f) cleaning and disinfecting vehicles, machinery, tools and equipment used in infected areas.		
	19.1 Does the FCP note or can VF personnel confirm if the coupe is or is not located in a known Phytophthora or Armillaria infection area?	100%	B
	19.2 If the coupe is located in a known infection area, ITAO are appropriate measures prescribed to prevent the movement of these pathogens to other coupes?	n/a	

Source	Compliance elements and criteria[1]	%full compliance[2]	Compliance themes[3]
	19.3 If the coupe is not located in a known infection area, ITAO have appropriate measures been taken to prevent the movement of these pathogens (as per MSP 4.5.1.1) to this coupe?	100%	
MSP	4.5.1.2 Minimise the spread of Myrtle Wilt (*Chalara australis*) when operating in areas where it is known to exist by: (a) protecting individual Myrtle Beech (*Nothofagus cunninghamii*) trees; (b) sterilising equipment with anti-fungal agent or warm water and soap prior to moving into a new area; (c) pruning Myrtle Beech (*Nothofagus cunninghamii*) that are subject to ongoing damage by vehicles; and (d) immediately treating wounds on Myrtle Beech (*Nothofagus cunninghamii*) (including those left by pruning) with a commercial, waterproof wound sealant.		
	20.1 Does the FCP note or can VF personnel confirm if the coupe is or is not located in a known area where MW is known to exist?	100%	B
	20.2 If the coupe is located in a known infection area, are the prescribed treatment measures to prevent the movement of MW to other coupes being implemented successfully?	n/a	
MSP	4.5.2.1 Conduct a pre-harvest assessment to determine the type and extent of weeds on the coupe and on associated access roads.		
	21.1 Does the FCP provide evidence that a pre-harvest assessment for weeds of the coupe and roads was undertaken?	100%	B
Roading for timber harvesting operations – Code section 2.4			
2.4.2 Road design			
Code	2.4.2.1 Planning and management of timber harvesting operations must comply with this Code and relevant road design measures specified within the MSPs unless the road is covered by a formal roading agreement with DEPI that would supersede this requirement.		
MSP	6.1.1.4 Identify the intended class of a new road or road upgrade in accordance with the appropriate service function description in Appendix 4 Table 18 (Road classification system).		
	22.1 Does the FCP specify the intended class of a new in coupe road or road upgrade in accordance with MSP Appendix 4 Table 18?	100%	D
MSP	6.1.2.4 Limit clearing widths to those specified in Appendix 4 Table 20 (Minimum clearing widths (m) required for typical road construction) plus any additional width required to construct batters.		
	22.2 Does the minimum clearing width for an in-coupe road not located within the harvest area conform to the specifications in MSP Appendix 4 Table 20?	100%	C
MSP	6.2.4.1 The maximum distance between drainage structures for road grade and soil erosion hazard is specified in Appendix 4 Table 21 (Maximum distance between drainage structures).		
	22.3 Does the maximum distance between drainage structures conform to the specifications in MSP Appendix 4 Table 21?	68%	C,S
Code	2.4.2.3 All fill disposal areas and embankments must be planned and designed to minimise soil erosion, mass soil movement, and potential water quality deterioration.		
Code	2.4.3.3: All fill disposal areas and embankments must be appropriately stabilised. Where revegetation is used to stabilise fills or embankments, the species must be suitable for the site and where possible indigenous to the area.		
	23.1 Does the FCP include evidence of planning and design for embankments (>2m) or fill disposal areas to account for soil erosion, mass movement and water quality risk?	n/a	S,W,D
	23.2 Is there evidence of soil erosion, mass movement and water quality impact due to fill disposal or embankment construction?	n/a	S,W,C
Code	2.4.2.4 Stream crossings must be designed according to traffic requirements and the nature, size and period of flow (both pre and anticipated post-harvest) and characteristics of the bed and banks of the stream.		
	24.1 Does the FCP include evidence of design for the stream crossing, considering the elements specified in Code 2.4.2.4?	100%	D

Source	Compliance elements and criteria[1]	%full compliance[2]	Compliance themes[3]
2.4.3 Road construction			
Code	2.4.3.1 Planning and management of timber harvesting operations must comply with this Code and relevant road construction measures specified within the MSPs unless the road is covered by a formal roading agreement with DEPI that would supersede this requirement.		
MSP	6.2.1.1 Undertake road construction when rainfall and soil conditions minimise the risk of erosion and impact on water quality, and when soil moisture is adequate to achieve compaction and stabilisation of the sub-grade. 6.2.1.3 For permanent roads, remove all stumps, logs and other debris from within the formed width of the road site. 6.2.1.5 Create table drains by extending the road when it is formed, and not by subsequent excavation. 6.2.1.6 Limit earthworks to the least possible to achieve the road design specification. 6.2.1.7 At the completion of permanent road construction operations, notify DEPI of the location of the road (so that the road may be included on the DEPI Road Register).		
	25.1 ITAO, is there evidence that the timing of road construction was inconsistent with the requirement to minimise the risk of erosion and impact on water quality?	100%	S,W,C
	25.3 Have all stumps, logs and other debris been removed from within the formed width of the road site (for permanent roads)?	100%	C
	25.4 Is there evidence that table drains have been formed by subsequent excavation?	100%	C
	25.5 ITAO are the earthworks for ICR a reasonable minimum to achieve the road design specification?	100%	C
	25.6 Does the FCP include documentation to indicate that DELWP have been notified of the location of the road – for inclusion in its road register?	100%	C
MSP	6.2.2.1 Prevent fill batters from covering the base of live trees. 6.2.2.3 Use engineer approved methods of mechanical consolidation of fill batters.		
	26.1 Do any fill batters cover the base of live, retained trees?	40%	C
	26.2 For large fill batters, does the FCP include evidence of engineer approval of mechanical consolidation methods?	n/a	C
	26.3 Is there evidence of failure of fill batters? (*Assessed at 23.2)*	n/a	S,W,C
MSP	6.2.4.2 Construct cross-drains at an angle sufficient to discharge any water from the surface of the road. 6.2.4.4 Appropriate discharge areas for drainage include: (a) a strip of undisturbed vegetation at least 20 m wide; (b) a rock spill; or (c) some other structure that dissipates the velocity of drainage flows. 6.2.4.3 On soils of high erosion hazard, use temporary sediment traps to prevent erosion during road construction 6.2.4.5 Place drainage structures approximately 20 m from permanent or temporary streams, to allow discharge onto undisturbed vegetation and to maximise the flow distance between the drainage outlet and the waterway. 6.2.4.6 Within 20 m of a permanent or temporary stream: (a) use crown or cross fall techniques to drain roads into undisturbed vegetation; or (b) pass drainage through an appropriate sediment control structure such as a sediment pond or silt trap before entering a permanent or temporary stream. 6.2.4.7 Construct table drains to: (a) allow water to flow, without ponding; (b) include run-offs of sufficient length to allow the table drain and run-offs to be cleaned; (c) be supported by rock or otherwise stabilised in soils of a high erosion hazard; and (d) have silt traps constructed at the end if discharging directly into a stream or wetland buffer.		
	27.1 Have cross drains been constructed at sufficient angle to discharge any water from the surface of the road?	100%	C
	27.2 Is there physical evidence or evidence in the FCP that temporary sediment traps were considered or used in road construction?	n/a	W,C
	27.3 Do drainage discharge areas comply with MSP 6.2.4.4 specifications?	100%	W,C
	27.4 Do drainage structures allow interception and discharge of road drainage prior to a stream crossing, as per MSP 6.2.4.5?	87%	W,C
	27.5 Does road construction appropriately manage road drainage in the final 20 m prior to a stream crossing, as per MSP 6.2.4.6?	75%	W,C
	27.6 Does construction of any table drain comply with the requirement of MSP 6.2.4.7?	100%	C

Source	Compliance elements and criteria[1]	%full compliance[2]	Compliance themes[3]
MSP	6.2.5.1 Culverts used in permanent roads are a minimum of 375 mm in diameter. 6.2.5.2 Culverts used in temporary roads are a minimum of 300 mm in diameter. 6.2.5.3 All culverts are designed to withstand a 1 in 10 year rainfall event. 6.2.5.4 Construct culverts in catchment areas exceeding 100 ha in accordance with engineering advice. 6.2.5.5 On drainage lines, stream and river crossings or soils of High Erosion Hazard place sandbags, timber, concrete or rock at the head of the culvert and at the point of discharge to hold the culvert in place and protect it from erosion. 6.2.5.7 If constructed of concrete, have a minimum cover of 600 mm as measured from the road surface to the top of the pipe and a maximum cover as specified in the Installation of Steel-Reinforced Concrete Drainage Pipelines, Concrete Pipe Association of Australasia. 6.2.5.8 If constructed of a material other than concrete, have a minimum cover over the pipe as recommended in the manufacturer's specifications. 6.2.5.9 On permanent streams, include a fish ladder if the diameter of the culvert is greater than 750 mm. 6.2.5.11 Ensure culverts do not project above the bed of a waterway in a way which may prevent the passage of aquatic fauna. 6.2.5.12 Where culvert construction diverts water from its natural course, return water to its natural course over a flume, rock spill, or other hard surface.		
	28.1 Is the size of the culvert consistent with the type of road, as per MSP 6.2.5.1 and 2?	100%	C
	28.2 Is there evidence in the FCP that the size of the culvert is consistent with flow requirements in a 10% AEP rainfall event?	100%	W,D
	28.3 Where the catchment area exceeds 100 ha, is there evidence in the FCP that engineering advice has been provided on culvert construction?	n/a	D
	28.4 Have the head and outlet of culvert(s) been constructed as specified in MSP 6.2.5.5 to hold them in place and protect from erosion?	100%	S,W,C
	28.5 Is there evidence of erosion at the head and/or outlet of the culvert?	75%	S,W,C
	28.6 Does the cover provided satisfy MSP 6.2.5.7 requirements for concrete culverts?	100%	C
	28.7 Does the minimum cover for the culvert(s) satisfy the manufacturer's specifications for non-concrete culverts?	100%	C
	28.8 If the culvert is >750 mm (on a permanent stream) does it include a fish ladder?	n/a	W,B,C
	28.9 Does the culvert protect above the bed of the downstream waterway and prevent the passage of aquatic fauna?	100%	W,B,C
	28.10 If the culvert diverts water from its natural course, does it return water to its natural course via a flume, rock spill, or other hard surface?	100%	W,C
Code	2.4.3.6: Road construction must ensure that: disturbance to stream beds and banks is kept to a minimum; soil and rock fill is not pushed into waterways, nor placed into a position where there is a risk that it can erode into a waterway; and cement, raw concrete, soil fill and other road making materials are not spilt or disposed of into waterways during road construction.		
	29.1 ITAO has the road been constructed in a way that the stream bed and/or banks are unnecessarily disturbed or there is an unnecessary risk of erosion into a waterway?	100%	S,W,C
	29.2 Have road construction materials been spilt or disposed of into a waterway?	100%	W,C
Code	2.4.4.2 Roads used for timber haulage must be maintained in a manner that minimises erosion and protects water quality and other environmental values. 2.4.6.2 Roads no longer required for timber harvesting operations or other forest management purposes, must be permanently closed to vehicle traffic and effectively drained following completion of the timber harvesting operation.		
	30.1 Is there evidence that suggests road maintenance is insufficient to minimise erosion and protect water quality and other environmental values influenced by the in-coupe road?	79%	S,W,M
	30.2 If the road is no longer required for harvesting or other forest management purposes, has it been permanently closed to traffic and effectively drained?	100%	CL
	30.3 Is there evidence that the closed road is contributing to on-going soil degradation or water quality impairment?	100%	S,W,CL

Notes:

1. Rows are shaded as follows: Code compliance elements (orange), MSP compliance elements (blue), PS compliance elements (green), compliance criteria (unshaded).
2. % full compliance – percentage of coupes with full compliance with criterion, compared with the number of coupes for which the criterion is applicable. n/a – these criteria were not applicable to any of the coupes included in the audit.
3. Compliance themes for audit criteria: Themes associated with environmental values in State forests (Code section 2.2): **S** environmental compliance criteria related to protection of soils; **W** environmental compliance criteria related to protection of water quality and river health; **B** environmental compliance criteria related to protection of biodiversity values. Themes associated with roading activities (Code section 2.4): **D** roading compliance criteria related to design; **C** roading compliance criteria related to construction; **M** roading compliance criteria related to maintenance; **CL** roading compliance criteria related to closure.

Appendix C. Environmental impact assessment tool

The assessment of risk of harm to the environment resulting from any instance of non-compliance with the regulatory framework for timber harvesting is assessed using an environmental impact assessment (EIA) tool. The tool (see below) was revised from one used in earlier FAP audits in the 2016-17 FAP (Jacobs, 2018b).

C.1 Extent and location of impact

The first of the EIA criteria addresses the extent and location of impact (Table C.1). Where the impact affects a larger area of the coupe, longer length of in-coupe road and/or more sensitive locations within the coupe, the score is higher.

Table C.1 Extent and location of impact assessment criteria and scoring

Score	Extent and location of impact (revised)
1	Impact affects 0-10% marked harvesting area. ≤100/80 m ICR not correctly drained (low-med/high soil erosion hazard)
2	Impact affects 11-25% marked harvesting area. 101-150/81-100 m ICR not correctly drained (low-med/high soil erosion hazard)
3	Impact affects 26-50% marked harvesting area. 151-200/101-130 m ICR not correctly drained (low-med/high soil erosion hazard). Single or localised incidence of unplanned or unauthorised disturbance within drainage line filter area (e.g. entry of harvesting machine) affecting <10% of filter area.
4	Impact affects >50% marked harvesting area. >200/130 m ICR not correctly drained (low-med/high soil erosion hazard). Multiple and/or widespread (>10% of filter area) unauthorised disturbance within drainage line filter area. Localised (<10% of filter or buffer area) unauthorised disturbance to temporary stream filter or buffer (e.g. single entry of harvesting machine, escape of regeneration burn). Non-compliant waterway crossing disturbs temporary stream within 10 m of the crossing.
5	Impact involves disturbance (including regeneration burn escape) or harvesting of small area (within gross coupe area) extending ≤10m into an area that should have been excluded from harvesting (e.g. threatened species habitat, rainforest, riparian buffer). Non-compliant waterway crossing disturbs permanent stream within 10 m of the crossing or a temporary stream >10 m from the crossing.
6	Impact involves disturbance (including regeneration burn escape) or harvesting 10-100 m into area (within gross coupe area) that should have been excluded from harvesting (e.g. threatened species habitat, rainforest, riparian buffer). Non-compliant waterway crossing disturbs permanent stream >10 m of the crossing.
7	Impact involves disturbance or harvesting (within gross coupe area) extending >100m into an area that should have been excluded from harvesting (e.g. threatened species habitat, rainforest, riparian buffer) or extends beyond the coupe into an area which should not have been harvested.

C.2 Extent and duration of recovery

The recovery duration and the likely level of recovery are combined into a single score, as per Table C.2.

Table C.2 Assessment of the duration and extent of recover

Score	Duration and recovery from impacts
1	Near full recovery from impact or disturbance within 1 year
2	Near full recovery from impact or disturbance within 1-3 years
3	Near full recovery from impact or disturbance within 3-10 years
4	Near full recovery unlikely within harvest cycle.

C.3 Asset

The asset score is unchanged from the original EIA tool, as per Table C.3. This assesses the consequence or significance of the environmental risk resulting from non-compliance with the regulatory framework.

Table C.3 Asset or value significance score

Asset or value	Score
General forest	1
Filters	2
Landscape buffers, representative Special Protection Zones (based on modelled values)	3
Riparian Buffers, Rainforest and Rainforest Buffers, Special Protection Zones; other protected forest values such as threatened species habitat; National Parks or other formally acknowledged reserves.	4

C.4 Overall potential environmental impact

Overall environmental potential environmental impact associated the non-compliance issue is taken as the sum scores for the criteria in Tables C.1-C.3. This is ranked in five classes as per Table C.4.

Table C.4 Ranking of EIA scores

EIA class	Overall score
Negligible	4-5
Minor	6-7
Moderate	8-10
Major	11-14
Severe	15-18

Appendix D. Incidents leading to assessments of non-compliance with audit criteria and the regulatory framework for timber harvesting

#	Name	Area[1]	Non-compliance incident[2]	Audit criteria[3]	EIA rating
1	Bear Grylls	37.9	WWX[4] culvert outlet drops water ~20 cm onto bed of temporary stream	6.1, 10.1	Moderate
2	High Voltage	4.9	WWX culvert outlet drops water onto unstable embankment sediment.	6.1, 7.1, 10.1, 28.5	Moderate
			Snig track log bridge removal left bare and disturbed soil.	9.2	Moderate
3	Rocksteady	15.3	Fill at WWX covers base of at least 3 trees	26.1	Minor
			Silt trap installed at culvert draining to temporary stream damaged and not operating effectively.	27.5, 30.1	Moderate
4	Royston Slim	9.6	None		
5	French Island	16.8	None		
6	Liverpool	33.7	None		
7	Machikichori	11.6	Operations map shows area of harvesting with >30° slope in Upper Goulburn catchment.	4.2, 5.2 MSP Table 11	Minor
			Some retained trees in unharvested area damaged by regeneration burn.	11.8	Negligible
			Two sections of ICR[5] with effective drain spacing exceeding MSP requirements for slope and erosion hazard	22.3	Minor
8	Eddy Grant	22.6	Section of ICR with effective drain spacing exceeding MSP requirements for slope and erosion hazard	22.3	Minor
9	Tarzan	17.0	Retained vegetation in unharvested area damaged by regeneration burn.	11.8	Moderate
			Drainage on approach to WWX does not comply with MSP requirements due to bypassing of sump constructed to capture road sediment.	27.4, 27.5, 30.1	Moderate
10	You Just Know	25.1	Road culvert outlet elevated ~20 cm above downstream drainage line stream bed, with some erosion.	6.1	Moderate
			Retained vegetation in unharvested area damaged by regeneration burn.	11.8	Moderate
			Section of ICR with effective drain spacing exceeding MSP requirements for slope and erosion hazard	22.3	Minor
11	Andy	33.4	Small patch of Myrtle Beech separated from larger patch by burning track. Was reasonably practicable to locate the track around this patch.	11.7	Minor
12	Whitelaws Ramble	11.3	Sections of permanent (DELWP) road with excessive length of fully functional drainage, as per MSP requirements for slope and soil erosion hazard.	22.3	Minor
13	Pharlap	18.9	Boundary/burning track constructed without proper diversion of road drainage prior to entry to temporary stream.	10.1	Minor
14	Tom Tom Drums	30.2	None		
15	Johnnie and Jack	22.4	Section of ICR with effective drain spacing exceeding MSP requirements for slope and erosion hazard	6.1, 22.3	Moderate

#	Name	Area[1]	Non-compliance incident[2]	Audit criteria[3]	EIA rating
			WWX culvert discharges water onto unprotected embankment, leading to sediment movement.	6.1, 10.1, 28.5	Moderate
			Bases of several retained trees covered by embankment soil.	26.1	Minor
			Large puddle at low point in ICR, which requires drainage to shed water from track.	30.1	Negligible
16	Tatong Heights	10.1	None		
17	Tatong Wedge	14.9	Small section of what was intended as a riparian buffer was harvested.	3.1, 6.1	Major
18	Stringybark Creek	42.3	None		
19	Swivel	14.4	Logging conducted in an area marked as riparian buffer.	3.1, 6.1	Major
			Section of ICR with effective drain spacing exceeding MSP requirements for slope and erosion hazard	22.3, 6.1, 10.1, 30.1	Moderate
			Tracks from rough heaping operation without drainage structures over winder and in locations adjacent to drainage line (in adjacent Rapala coupe)	10.1	Negligible
			Base of live tree covered by road embankment materials	26.1	Minor
			Culvert outlet sits above level of downstream waterway and drops water onto embankment in riparian buffer area	28.5	Moderate
20	Lyons	13.5	None		
21	Lambpoon	33.4	Soil pushed across harvest boundary into drainage line	6.1	Minor
22	Lyles	16.4	None		
23	Boxed Chook	14.8	None		
24	Running Creek	15.5	None		
25	Titanium	19.3	Post-harvest traffic has damaged “bar and breach” drainage structures, which appear undersized for soil type.	30.1	Negligible
26	Wayfarer	29.6	None		
27	Panglossian	23.8	None		
28	Buckskin	11.8	Section of ICR with effective drain spacing exceeding MSP requirements for slope and erosion hazard	22.3	Negligible
29	Donkeyshoe	19.1	None		
30	Cabbage Patch	16.4	None		

Note:

1. Area: actual harvest area
2. Incident: an event, action or lack of action on a coupe that gives rise to an assessment of non-compliance with an audit criterion that has environmental impact. The nature of the audit criteria and various prescriptions mean that a single incident may result in multiple non-compliances.
3. Audit criteria: as per Appendix B.
4. WWX: waterway crossing
5. ICR: in-coupe road

Appendix E. Potential modifications to the regulatory framework for timber harvesting in State forests.

E.1 Modifications to improve auditing against the regulatory framework

The Code states that its purpose is to *provide direction to timber harvesting managers, harvesting entities and operators to deliver sound environmental performance when planning for and conducting timber harvesting operations* (DEPI, 2014a). While it is not necessarily written with auditing in mind, audits are an important component of the accountability and adaptive management process which is required to deliver and demonstrate sound and improving environmental performance during timber harvesting activities.

This appendix (Table C.1) includes a series of comments and recommendations on potential changes in the Code to clarify intent, reduce ambiguity and provide a more objective basis for audit. These are reproduced from the report on the audit of the construction and maintenance of in-coupe roads (Jacobs, 2016).

Table C.1 Analysis of Code mandatory actions applicable to in-coupe roads for which objective assessment of compliance is impeded by ambiguous wording.

Code mandatory action	Comment
2.2.1.6 Where crossings are required, minimise the extent of habitat damage, constriction to stream flow and barriers to fish and other aquatic fauna.	The aim of this mandatory action is to prevent unnecessary habitat damage at waterway crossings and prevent avoidable restrictions to streamflows (particularly during low flows) and fish passage. It is impossible to determine if these have been "minimised", although it is possible to determine if the level of damage and flow and fish passage impairment is excessive. The wording of this action could be revised to, *Where crossings are necessary, ensure stream flow and fish passage are maintained during low flows and that habitat damage is confined to the crossing pathway and applicable clearing widths on either side.*
2.2.1.10 Minimise the extent and duration of soil disturbance adjacent to or within waterways.	Aside from the use of "minimise", the context for this action is unclear. It could be applicable to roading and/or harvesting operations and could apply to one or all three classes of waterway. The wording of this action should be modified to clarify its intent.
2.2.1.11 Use management practices such as modified harvesting techniques, scheduling, wet weather suspensions or progressive rehabilitation to minimise the potential for sediments and other pollutants to move into streams.	"Minimise" is used, but the action is concerned with implementing particular types of actions which reduce sediment supply and mobilisation. The wording of this action could be revised to, *Restrict the mobilisation of sediments or other pollutants into waterways through practices such as modified harvesting techniques, scheduling, wet weather suspensions or progressive rehabilitation.*
2.2.1.12 Design, construct and maintain roads, crossings, coupe infrastructure and drainage structures to withstand foreseeable rainfall events and traffic conditions and protect water quality.	All flows (and hence rainfall) up to the maximum possible flood are "foreseeable". The intent of the action is to ensure design handles relatively low frequency/high intensity rainfall and flow events. The wording could be revised to be consistent with the MSP requirement for culvert design to handle a 1 in 10 year (10% Annual Exceedance Probability) rainfall or flow event.
2.2.1.14 Minimise potential for soil erosion or mass movement by planning and using operational methods and restrictions appropriate to the assessed soil erosion risk and slope.	The point of this action is the use of planning and operational methods. The wording could be modified to, *Use planning and operational methods and restrictions which are proportional to the risk of erosion and mass movement.*
2.2.1.15 Locate coupe infrastructure and roads to minimise soil erosion and degradation.	The point of the action is to locate coupe infrastructure appropriately. The wording could be modified to, *Wherever possible, locate coupe infrastructure and roads away from areas with high risk of erosion and soil degradation.*

Code mandatory action	Comment
2.2.1.17 Limit the area of soil affected by coupe infrastructure and roads to the minimum required to safely complete timber harvesting operations to the required standard.	Objectively determining the "minimum possible" level of soil disturbance for safe harvesting is not possible, particularly given the diversity of slopes, soil conditions and harvesting methods likely to be encountered. In the absence of objective criteria on what an appropriate limit to soil disturbance might be, it is suggested the wording could be changed to, *Develop coupe infrastructure and roads to enable timber harvesting operations to be completed safely, to the required standard and without excessive soil disturbance.*
2.4.1.3 Road planning must: i. locate roads so as to minimise risks to safety and environmental values, particularly soil, water quality and river health, during both construction and ongoing road use; and ii. ensure that the timing of construction activities minimises risks associated with unsuitable weather conditions and provides for completion to the required standard in advance of timber harvesting operations.	Use of "minimise" is unnecessary in both components of this action and makes them impossible to audit objectively. The wording should be revised to focus on locating roads to avoid high risk areas for safety and soil disturbance and to undertake construction activities during periods when there is a low likelihood of unsuitable weather.
2.4.1.4 Existing roads must be used for access to a coupe or work site and to haul timber, except where it can be clearly demonstrated that a new or relocated road further minimises or removes existing threats to soil, water quality or biodiversity.	It is not possible to "further minimise" a threat. "Reduce" should be used in place of "minimise".
2.4.2.3 All fill disposal areas and embankments must be planned and designed to minimise soil erosion, mass soil movement, and potential water quality deterioration.	Planning and design of fill disposal areas and embankments are intended to reduce the risk of various forms of erosion and subsequent water quality impairment. The wording could be revised to, *Plan and design fill disposal areas to effectively manage risks to soils and water quality from soil erosion and mass movement.*
2.4.3.6 Road construction must ensure that: i. disturbance to stream beds and banks is kept to a minimum;	A "minimum" level of disturbance is difficult to quantify. This component of the action could be rephrased to, *confine disturbance to stream beds and banks to the pathway of any crossing.*
2.4.4.3 Road drainage systems must be maintained at sufficient frequency to minimise erosion and the discharge of sediment into waterways.	The point of road design and maintenance is to prevent discharge of sediment into waterways. The outcome rather than the frequency of maintenance is the point. This action could be reworded as follows, *Road drainage systems must be maintained to prevent the discharge of sediment into waterways*.

E.2 Modifications relating to pests, weeds and diseases

The 2014 FAP audit of harvesting and coupe closure (URS, 2015) found a systemic non-compliance in relation to the prevention of *P.cinnamomi* introduction via infected quarry materials. It found no evidence that VicForests had assessed the risk of disease transmission on coupes where gravel was used to surface roads. No similar finding was made in this audit or our audit of in-coupe roading (Jacobs, 2016).

While the auditors agree with the URS (2015) finding that the management of disease risk is not sufficiently rigorous, our view is that this reflects a systemic issue with the Code.

Code mandatory actions relating to pests, weeds and diseases which are applicable to roading are:

- 2.2.2.13 Implement appropriate vehicle and equipment hygiene precautions when moving from areas of known pest plant, pest animal and pathogen infestations.
- 2.4.3.5 Quarry materials known to be infected with any pest plant or pathogen must not be used.

Both of these require action on the basis of knowledge of a disease issue, rather than the risk or an assessment of risk. The auditor considers that to mitigate this risk more effectively, hygiene procedures should be adopted

as a matter of course and that all quarries should be subject to regular checks to assess their disease and pest status. Complementation mandatory actions in the MSP are more pro-active than those in the Code, but still only apply when infection is known. Suggested improvements are:

- *Wash down:* all harvesting and road construction machinery should be thoroughly cleaned and inspected before being brought onto a new coupe (unless it is adjacent to the one from which the machinery is being moved). This is routine practice for VicForests (VicForests, 2017) and many other land managers (e.g. Department of Defence).
- *Monitoring of disease status:* quarries from which materials are sourced for forest road construction should be checked annually by a competent, independent party to confirm disease and weed free status;
- *Treatment:* gravel obtained from quarries which are not confirmed as weed and disease free should be treated to mitigate any weed or disease threat prior to use within a harvest coupe.

Evidence of machinery inspections, disease and weed free status of quarries and/or treatment should be retained in the FCP for all applicable coupes.

Appendix F. VicForests' comments on draft audit report

The final draft version of this audit report was provided to VicForests, as auditees, for comment. A summary of the substantive comments VicForests provided and the auditors' responses are provided in Table E.1.

Table D.1 : Summary of substantive comments on draft audit report provide by VicForests and auditors' response

Document reference	VicForests' comment	Auditors' response
Executive summary	Identification of road embankment materials covering the base of live trees that have been or will be retained post-harvest as a non-compliance issue: *removing the trees would arguably cause a more significant environmental impact in many cases. By retaining more trees, we aim to lessen our footprint.*	MSP 6.2.2.1 requires that fill batters be prevented from covering the base of live trees. This is interpreted by the auditor to mean trees that would otherwise be retained or remain alive following harvesting and regeneration. The lead auditor has observed numerous instances of non-compliance with this mandatory requirement. In no cases (at the time of audit) were the trees showing signs of ill health, apart from one tree in 720-505-0018 Dapples Creek coupe that had also been damaged by machinery during road construction. As a consequence, the EIA ratings for these non-compliance issues are typically assessed to be negligible or minor. The auditor agrees that retention of the tree whose base is unavoidably covered by embankment materials is preferable to removal. However, it is not clear that all instances of embankment materials covering the bases of live trees could not be reasonably practicably avoided. The comment suggests two recommendations, as follows: **V5:** As part of their briefing of contractors prior to the commencement of operations on a coupe, VicForests should note the mandatory requirement to avoid spreading road embankment materials across the bases of trees that will be retained through harvesting and regeneration. Moderate priority. **D5:** DELWP should review MSP 6.2.2.1 and consider rewording to constrain its application to trees that will be retained post-harvest and regeneration rather than all "live" trees and allow for modest levels of "unavoidable" spillage of materials across the base of such trees. Moderate priority.
3.1 Coupe selection	*Note that coupe with planned harvest area of 42.3 ha is a single tree selection coupe.*	Noted. A footnote has been included in the audit report (Section 3.1) noting that the coupe is a single tree selection coupe and that under the MSPs there is no upper limit to coupe size for that silvicultural system. Checking coupe size compliance was not within scope for this audit.
3.3 Field assessment	Comment on field assessment of extent of harvesting in steep slope areas: *Still thinking our lidar assessments (where applicable) would be better than small samples via visual obs. What defines an "area" that is over 30 degrees and has been harvested? 1ha? 0.001ha? How many fixed visual pots do you need to accurately assess slope*	MSPs (3.4.1.2) allow for up to 10% of net harvest area to contain slopes >30° where the risk of mass soil movement has been managed accordingly. It is unclear if this exception also applies to slopes >25° on granite soils in East Gippsland FMA or to the slope limits in Appendix 3 Table 11; hence the following recommendation: **D6:** DELWP should review MSP 3.4. Slope, to clarify if the exception for harvesting in slopes >30° in 3.4.1.2 also applies to slopes >25° on granite soils in East Gippsland FMA (3.4.1.3) and/or to the slope limits in Appendix 3 Table 11. Moderate priority. The comment highlights an area for potential improvement in the audit method (where Lidar data are available). Prior to the field audit, the auditor would request Lidar data from VicForests, confirm the identification of areas of excess slope (compared with MSP restrictions), assess the extent of any harvesting and determine if the

Document reference	VicForests' comment	Auditors' response
		risk of mass soil movement has been managed appropriately (as per MSP 3.4.1.2).
4.1 Overall compliance findings	*It would be useful to have a summary table that identifies each of the incidents with each of the non-compliances identified at each coupe in the audit.*	A description of the incidents leading to non-compliance assessments is provided in Appendix D of this final version of the audit report.
4.2.1 Protection of forest soils	Comment on dot point that avoidance of mass movement of soils is achieved by not harvesting excessively steep areas: *metrics would be good here.*	Footnote included to reference MSP definitions of steep slopes
	Comments on non-compliance recorded for 7 Machikichori: *was this area of non-compliance based off the modelled layer on the operations map or measured in the field? Was this area <10% and where was it located in the landscape (e.g. close to watercourse)? Clarification on tolerance is required from Forest Regulation group in DELWP. This is an interpretation issue and should not be a non-conformance. The MSP (3.4.1) are general restrictions. Table 11 does not specify to ignore the general restrictions. 30 degrees is the upper slope limit in the MSPs anyway.*	The text has been clarified to indicate that coupe marking included the area mapped as having >30° slope area in the planned harvest area and that the post-harvest map showed that some of this was harvested. The area harvested in what was mapped as over 30° slope was <10% of the net harvest area, as noted in the text. The EIA rating for the non-compliance was minor, which is consistent with the small area and its location away from waterways. The non-compliance is based on the auditor's interpretation of the MSP. MSP 3.4.1 contains general slope restrictions, with the reference to specific restrictions for granite derived soils in East Gippsland in 3.4.1.3 and for water supply protection areas in Table 11 in MSP 3.5.1.1. These latter clauses do not reference the 10% of the net harvest area "exemptions" (subject to management of soil mass movement) of MSP 3.4.1.2. It is agreed that clarification on the meaning of the MSPs at this point is required, hence recommendation D6 (above).
4.2.3 Protection of biodiversity values	Comment on non-compliances assessed for instances of damage to unharvested vegetation during regeneration burning: *planned burns are conducted under DELWP management and are conducted in accordance with the parameters and conditions required and have multi-level approval prior to ignition*.	Non-compliance was assessed for instances of damage to unharvested vegetation during regeneration burning in relation to criterion 11.8 (Appendix B). This interprets MSP 4.1.4.5 *Retain habitat trees where they can be most easily be protected from damage during harvesting and site preparation treatment,* which applies only in Central Highlands FMA. In the three incidents referred to, retained trees were located in unharvested areas within the coupe. The retained trees (and understorey vegetation) were affected by regeneration burns that extended beyond their planned boundaries and hence, the auditors assessed that, in practice, the MSP requirement was not satisfied. It is acknowledged that regeneration burns are conducted under DELWP management and approval and that they are conducted with the aim of confining burning to the planned area. It is also recognised that there are practical limitations in some coupes on the effectiveness of control of regeneration burns at some boundaries. The FAP audits assess (as per Section 2.1): · Compliance by VicForests with rules outlined in the regulatory framework for timber harvesting; and · Environmental performance of timber harvesting operations in and any associated risks of harm to the environment. Thus, if regeneration burns sometimes escape beyond planned boundaries (against the intent of the MSPs) into environmentally sensitive, unharvested areas, it is important that FAP audits note and report on this. This is an important area of focus for continuous

Document reference	VicForests' comment	Auditors' response
		improvement in harvesting practice, as per recommendation V3, which reiterates a recommendation from the 2016-17 FAP audit.
4.3.1 Road design	Comment on non-compliance in relation to not recording the class of in-coupe road (as per MSP 6.1.1.4): *Utilisation Procedures form part of the coupe plan. Which state "construct a new road which is of Rural Class 5C or 5D in accordance with the guidelines in Schedule 6: Design Standard Guidelines For Roads" unless otherwise specified…*	Comment accepted. All instances of non-recording of the class of in-coupe road within the FCP have been revised to "complies". Overall compliance levels and those for road design have been adjusted accordingly.
5.3.1 Harvesting in riparian buffers	Comment on non-compliance in 17 Tatong Wedge: *Whilst a "major" EIA rating using the EIA tool is technically appropriate, this does not accurately reflect the severity of the incident… As there was still an 18m buffer in place before the permanent stream, then the impact on the stream (e.g. soil movement, sediment, compaction, flows, etc.) compared to the required 20m buffer (over a 20m section) would not be measurable.*	The auditor agrees that the assessment overstates the likely actual level of environmental impact. This is noted in the text relating to the incident in Sections 4.2.1 and 4.2.2. The EIA tool rating of potential environmental impact is considered by the auditor to be appropriate to the circumstances and highlights the sensitivity of the location at which the non-compliance issue occurred. Note that the boundary/burning track was constructed to within 18 m of the stream, which is also not compliant with MSP 7.2.3.1.
	Comment on non-compliance in 19 Swivel: *In this case VicForests applied protection measures greater than required by the Code and the contractor breached what VF had implemented but did not breach the mandatory requirement. The incident was addressed internally by VF. Therefore, in this context there is no environmental breach and no reportable incident regarding compliance with the Code. Therefore, this cannot register as an incident with an environmental impact against VicForests*.	The circumstances associated with this incident are considered by the auditor to have been clearly reported (see also Sections 4.2.1 and 4.2.2). VicForests defined the area in question as a riparian buffer in coupe planning and marking. As per MSP Table 9, only a 10 m filter was required for the temporary stream. However, having been defined by VicForests as a riparian buffer, the auditor has evaluated the contractor's actions as harvesting in a riparian buffer – which is not permitted (except where authorised for safety), as per MSP 7.1.3.1. This escalates the extent and location of impact scoring in the EIA tool and contributes to the overall major EIA assessment. This clearly overstates the actual level and risk of environmental impact. The non-compliance is assessed against coupe operations, regardless of who is directly responsible.