Review of Key Issues

1. Nature of the Fuelwood Harvest

Recovery of fuel wood material will increase the level of wood removal from harvested sites. This potentially has a number of site impacts, e.g. on residual habitat, soils, regeneration, depending on the extent of additional removals, the intensity and management of operations and the types of technology employed. These impacts are considered elsewhere in this report.

These operations have not yet started, and the technologies to be employed have not been definitively specified. It must also be noted that an important new low impact logging technology, based on the cording of snig tracks with small residual trees and debris has been developed in this region to overcome the difficulties associated with wet weather operations. Research indicates that where this system is applied, site impacts are considerably reduced.

State of Knowledge

The first requirements are to establish a classification of woody material types that might be removed. In Tasmania's wet eucalypt forests these categories include:

Category	Description
1	Material harvested as conventional stems, where either a part or the whole stem is not merchantable as sawlog or pulpwood, and is removed for fuelwood
2	Log material created as off cuts during the sawlog/pulpwood harvest, that is not suited to higher value use
3	Standing dead trees
4	Green residues on the harvest area, usually upper stem and large branch material
5	Stumps
6	Dead material from earlier harvest or fallen dead stags

Expected Approaches to Harvesting

Most of the fuelwood is expected to be skidded to roadside landings by equipment already on site, or conventional equipment used nearby. Some specialised equipment, such as residue bins might be required for transport.

- The Category 1 material would simply be part of the conventional harvest, and existing ground skidding and loading technologies would be employed. Fuelwood will be separated at the mill site.

- The largest volumes of Category 2 (residue log material) are usually created on the log landing in the harvesting of wet eucalypt forest in Tasmania. This material can be handled by conventional loading equipment. Some other log material can be created in the general harvest area, although volumes are usually small under the full stem logging method. If this material is to be recovered from the general harvest area, preference would be given to the larger pieces if conventional skidding equipment were to be used.

- Standing dead trees (Category 3) represent a potential fuelwood resource. Sound dead trees are sometimes included in conventional pulpwood or firewood harvest. It is expected that the conventional equipment already on site would be used for skidding and loading.

- Recovery of Category 4 material (upper stem and larger branches) could require some modification to the harvesting system. Cost considerations may limit recovery to larger and straighter material. Where possible upper stem material would be removed in the conventional phase of the harvest, by simply heading stems off at a higher point. Recovery of remaining material would likely require more specialised equipment and involve forwarding (carrying) rather than ground skidding.

- Separate recovery of Category 5 stump material presents a number of challenges. Stumps can be residuals from previous harvesting, or be part of the existing harvest. These could be harvested by conventional means, i.e. using a chainsaw to fall the upper stump material and then ground skidding. Volumes are expected to be low.

- Recovery of Category 6 (dead fallen material or larger residues from earlier harvest) biomass is expected to be restricted to larger material, and be harvested using similar methods to those for Category 2 and 3.

In all of these cases, the additional physical effects are most likely directly related to increases in traffic. For example, if there is an additional 20% of material recovered in categories 2 and above, this is likely to require a similar increase in skidding effort. Where these operations are carried out using the low impact cording technique, additional skidding impacts should be minimal.

2. Planning at Landscape and Harvest-Area Scales

Issues and relevance to ESFM

Management of a new activity such as the proposed fuelwood harvest requires an evaluation of the adequacy and effectiveness of processes for assessment, planning and then control of operations. The principles of Ecologically Sustainable Forest Management (ESFM) require these assessments to consider economic, social and biological aspects. While the proposed harvest is an extension of current operations and is substantially covered by existing processes, it does involve some additional considerations.

State of Knowledge

The management systems used in moist eucalypt forests are similar to those used for forestry activities in other temperate forestry regions. Larger public or private sector organisations in advanced western economies usually employ a multi-level planning process to ensure that operations have a sustainable basis, particularly in relation to harvesting rates (sustained yield). The three key components are typically a long-term strategic planning system, a medium-term cut scheduling procedure and a system based on detailed operational plans for individual cutting units (coupes). These systems are generally backed up by control systems to ensure maintenance of standards in both planning and operations, and recently this has extended in some cases to the implementation of formally documented and audited overarching management systems.

Strategic Planning Systems: There is a wide variation in management objectives for intensively managed temperate forests. However, there is usually a common structure in (i) an area-based description of existing forest types or strata supported by forest inventory, (ii) mechanisms for estimating forest growth and prediction of available yield at future times, and (iii) methods for establishing a sustainable harvesting rate. Currently, most forest description systems are computer based, building on GIS as a core technology underpinning all three levels of planning. Estimation of a sustainable harvesting rate usually involves long-term systematic inventory, supported by growth modelling and the development of yield simulations.

There are major differences between forestry management organisations in the complexity and scope of strategic planning systems. One key area of difference is the selection of the yield objective. Many systems are managed for a single objective (eg. sawlog yield) which has the advantage that they can often be supported by detailed quantitative modelling and optimisation systems similar to those used in plantation management. However, where management aims to produce a number of timber and non-timber products, plans require trade-off between competing objectives. Some values are only measured in qualitative or subjective terms, and although there are ongoing attempts to develop multi-objective planning systems, they have so far not been very effective. A trade off between yields is needed. This is currently a field of active research and development.

Medium Term Planning: This phase seeks to establish a specific cutting pattern (and related yield flows) for periods of between three and ten years that are consistent with the sustainability goals set in the long-term strategic plan, and generally relate these to specific coupes. Where management is for single or a restricted range of products that are supported by quantitative modelling systems, these plans are frequently computer generated. However, where there are multiple (and competing) yield types and flows, these plans are usually generated iteratively by expert planning teams supported by flexible computer information and forest simulation systems. The iterative process is required to adaptively refine plans that must satisfy competing objectives, in an arena where there is not a right or wrong answer.

The relationships between medium-term coupe level cutting sequence plans and the longer-term maintenance of landscape level processes is being increasingly recognised as a significant issue and is an active area of research and development.

Short-term (Operational) planning: These systems develop spatially explicit operations plans such as roading or coupe harvesting plans. These are commonly developed against a suite of established prescriptions or procedures, such as codes of operational practice.

Management Systems: There has been an increased recognition of the role of well defined and audited management systems. Where organisations are large and/or complex this has been shown to stabilise overall organisational performance and support continuous improvement. A management systems approach also helps meet increasing needs to assure external stakeholders of an organisation's ongoing capability to maintain the quality of its performance. The International Standards Organisation (ISO) has developed two important worldwide standards for management systems. These are the ISO9000 series for quality management and ISO 14000 series for environmental management. These set out required elements and provide a structure for internal or external audit.

Current Approach and its adequacy for ESFM

Forestry Tasmania employs a hierarchy of planning and assessment systems and processes to regulate forest uses including timber harvesting. These will also apply to the proposed fuelwood harvesting, and include:

1. Forest Management Plans
2. Wood Production Plans
3. Forest Practices Plans required under the Forest Practices Act
4. Inventory, growth projection and yield regulation systems
5. Management Decision Classification (MDC), a support system used to record forest classification and zoning decisions.
6. Environmental Management System (EMS)

These systems are comparable to those used in other Australian states and internationally in the management of temperate forests and in general, contain the elements required to develop and implement ESFM.

Strategic planning is currently addressed through a combination of the inventory and growth modelling systems, which have been operating from a basis of permanent inventory plots for some 40 years, and a set of district Forest Management Plans covering the production regions. The latter record the objectives, strategies and prescriptions to be used to guide forest management over the longer term (ten years). Tasmania adopted a long-term sawlog supply level from public land

(300,000 cubic metres) on the basis of technical and community consultations in the 1990's and this was subsequently confirmed as the agreed target in the Tasmanian RFA.

Medium-term planning is based on five yearly revision of sustainable yield and the related establishment of yield targets for individual regions, followed by the preparation of Wood Production Plans which assign individual coupes for harvesting. Similarly to other States, sawlogs are the primary focus of yield regulation. Wood Production Plans are drawn up each year with a three-year forward time horizon and these focus first on the production of the target quantity of sawlogs. This largely determines the area of forest to be cut and other products are considered by-products of the sawlog harvesting operation. Their harvestable quantity is limited to the physical production obtainable from the area designated for sawlog harvesting (or conversion to plantations).

Wood production planning and the development of coupe level harvesting schedules are core aspects of the Forestry Tasmania planning system. This activity employs a combination of expert judgement and computer-based support (GIS and modelling) and plans under development iterate between regional and head office experts until finalised as a specific set of coupes and a proposed harvesting sequence. Planning is supported by a GIS-based forest zoning system (MDC) which contains information on management intentions. At present there are no explicit systems for the planning of fuelwood harvesting, although these could readily be developed within the existing framework.

Operational planning is undertaken under the umbrella of the Forest Practices System essentially on a coupe-by-coupe basis. Forest Practices Plans must be prepared and approved under the forest practices system for all significant operations. Assurance on environmental performance (including biodiversity protection) is provided through the Forest Practices Code and the support systems of the Forest Practices Board.

It is also important to note that Forestry Tasmania has recently completed the development of an externally audited EMS accredited to the ISO14000 series. This EMS contains requirements for consideration of significant environmental impacts of operations.

Options for addressing perceived weaknesses

Effective management of the economic aspects of fuelwood harvest requires that the planning systems develop yield plans for the economically accessible component of this resource. Fuelwood harvest is not currently part of the planing system.

Analysis presented in Section 7 indicates that active management of Coarse Woody Debris (CWD) is required, and that decisions at the individual coupe level need to consider habitat requirements at a landscape level. The planning system needs to have the capacity to support the landscape level analysis of CWD stocks. There are also issues related to the role of the Forest Practices system. This currently operates primarily on the basis of approval of individual Forest Practices Plans, supplemented by three-year indicative wood utilisation plans and does not appear to have a clear role in landscape level analysis (See Section 7 for further discussion).

The Forestry Tasmania EMS includes procedures for the consideration of significant environmental factors, the development and implementation of measures to address them, and for monitoring their impacts. Where significant new impacts are expected, the EMS requires that these are addressed. A risk assessment, for example in relation to the proposed Southwood bio-energy plant, would normally be undertaken when the proposal receives formal go-ahead.

Summary and Recommendations

Sound estimates of fuelwood availability and its economic accessibility are required for planning. As the proposed activity is a new one, there are no established inventory and yield prediction systems for this new class of harvest material. Preliminary estimates of availability are based on averaging residue levels existing on recently harvested coupes, and data drawn from the permanent plot inventory system. These data highlight a high degree of variability and some uncertainty as to the intensity of harvest in specific locations. More accurate estimates of fuelwood availability on coupes nominated for harvest in the Wood Production Plan are needed to ensure continuity of economic supply. It will also be important to differentiate residue resources by size class and origin. Prescription management of CWD resources is likely to be important in some areas for maintenance of critical habitat and targeted inventory methods will be needed to manage CWD resources (See Section 7).

Existing planning procedures provide an adequate basis for broad assessment and for the initial years of a major new project such as the bioenergy plant. However, as experience with energy-wood harvesting is gained, further development of the inventory and planning system should be undertaken to provide support for (a) improved estimation of the expected nature, quantities and economic accessibility fuelwood on individual coupes, and (b) varying the scheduling and degree of fuelwood harvest from coupes within a landscape context to ensure the longer term recruitment and maintenance of CWD.

The decay and recruitment rates for large dimension CWD in regrowth forest, particularly those managed under Clearfall, Burn and Sow (CBS) silviculture are not yet well known. Proposed harvesting patterns need to be modelled at the landscape level for time periods beyond at least one rotation to establish that adequate stocks of CWD will be sustained. It is envisaged that patterns of coupe dispersal, sequencing of cutting, and the design of harvesting boundaries and reserved areas within the wood production forest landscape and at the coupe scale will be important.

Recommendation 1. *Procedures should be developed within 3 years of the commencement of energy-wood harvesting to provide adequate estimates of the availability and characteristics of energy-wood at the coupe level to support resource planning and management of CWD stocks.*

Recommendation 2. *Procedures should be developed within 3 years of the commencement of energy-wood harvesting for modelling the CWD resources in both harvested and reserved forests for time periods exceeding at least one rotation. These findings must be incorporated in assessments of harvest schedules to establish that required long-term CWD habitat is recruited and maintained. (See also Recommendations 11 and 14).*

.3. Protection of Soil Physical Properties and Water Values

Issues and relevance to ESFM

Wet eucalypt forests in Tasmania are harvested by ground-based machinery when slopes are <20° Rubber-tyred skidders are generally used and the resulting snig tracks (skid trails) can create soil physical conditions that can impede the recruitment and early growth of seedlings, as well as create and channel overland flow of water with the potential to increase erosion (sediment transport) with negative consequences for water quality. Removal of additional biomass (either boles or large branches) as fuelwood has the potential to increase levels of soil disturbance with adverse impacts on for environmental values.

State of knowledge

- On primary snig tracks (areas where there has been removal or displacement of topsoil by gouging, puddling and mixing of the soil profile with rutting into the B horizon) eucalypt stocking and early growth is reduced in Tasmania (Williamson 1990). In mountain ash forest in Victoria, growth of 3 year old regeneration was significantly reduced on primary snig tracks (King et al. 1993a, b).

- Unless harvesting operations are carefully planned, large areas of the harvested area can be subject to soil compaction (e.g. after clearfelling of Victorian mountain ash forest; Rab 1994, 1998).

- A relatively simple visual classification system based on the degree of soil disturbance can be used to assess the degree of soil compaction (increase in bulk density) in Tasmanian wet forest (Pennington and Laffan, 2001). Interpretation of visual assessments requires a good understanding of soil properties, silvicultural system, and the equipment used for harvesting. Cording (covering the soil with a mat of coarse slash and bark) of major snig tracts can reduce soil compaction.

- Soil type, soil water content at the time of harvest, harvesting system, and terrain all have important effects on the degree of soil physical change, and resultant threats to soil erosion and water values. Threats to soil physical properties, erosion and water values can be identified and are used to plan harvesting operations so as to minimise adverse impacts.

- The degree of additional soil disturbance resulting from harvesting of fuelwood will depend on how much extra biomass is removed (e.g. whether only larger defective logs are removed, or whether larger branches are also extracted), as well as the way it is collected. Both of these variables need to be better defined, to enable a better assessment of potential risk to soil and water values.

Current approach and its adequacy for ESFM

There are strategies for protecting soil and water resources across the whole Tasmanian forest estate, and the adequacy was assessed as part of development of the RFA (see p.62 – 69 in ESFM Assessment Report, 1997). The two most important elements that are relevant here are:

- Specification of goals and guidelines in the Forest Practices Code (2000) and supporting manuals.

- Application and local adaptation of these guidelines that are reflected in a timber harvesting plan, and associated management prescriptions.

Soil protection focuses on erosion and soil physical change. Protection of water quality focuses on control of sediment generation and movement within the harvested area, and the avoidance of entry of sediment, harvesting debris or chemicals into streams. In general, the Code provides comprehensive measures, based on best available information, for the protection of soil and water values. There are good links between the Code, a soil conservation manual developed by Forestry Tasmania, and development of timber harvesting plans. Importantly, mechanisms exist to modify management prescriptions to suit local soil and terrain, and the importance of water values for a range of uses.

Important recent improvements in the Code include limitations on the area of major snig tracks, cording or matting of all wet weather snig tracks prior to use, and limits to the area of damaged soil (A horizon removed, or A horizon mixed with B horizon or debris, or severely compacted, or contaminated with chemicals) due to landings and snig tracks.

The above limitations, if complied with, would constrain any potential for increased risk to soil and water values resulting from more intensive removal of biomass as fuelwood. A key question is how are these limits currently assessed – are they visually assessed by Forest Practices Officers, or are they quantified in a systematic manner?

Provided that fuelwood harvesting methods remain similar to those used for intensive pulpwood harvesting operations, and that the Code of Forest Practice is complied with, then there should be no increased threat to soil and water values.

Options for addressing perceived weaknesses

- A simple system for monitoring the effects of harvesting intensity on soil disturbance could be adopted as proposed by Pennington and Laffan (2001). Since this is based on visual assessment (but using a systematic sampling approach) it could be cost-effective. There is a need to ensure that visual ratings are well correlated with important soil physical change.

- The link between the level of soil disturbance and the adequacy of prescriptions for protecting water values (especially threats posed to ephemeral streams) may require some further evaluation if the methods used for harvest of fuelwood result in significantly more soil disturbance (sediment generation, or increased run-off). A limitation of the degree and nature of biomass removal would be a precautionary approach until R&D better defines these factors.

Summary and Recommendations

Removal of additional forest biomass as fuelwood using ground-based machinery has the potential to create increased soil disturbance, as well as to channel overland flow and increase sediment transport into the stream system. Extensive measures are proposed in the Forest Practices Code to mitigate adverse impacts, including limitations on the area of major snig tracks and the area of damaged soil. Whilst compliance with the Code will constrain the potential for increased risks to soil and water values, better quantitative methods of monitoring soil damage are needed.

Recommendation 3. *Further development of the visual assessment methods proposed by Pennington and Laffan (2001) for monitoring the effects of harvesting intensity on soil disturbance should be undertaken. The method requires calibration of visual ratings to important soil physical change for major soil types and harvesting systems.*

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