Final Report

The Forestry Industry Database Project

Project Methodology

8 OCTOBER 2010

Prepared for

Department of Agriculture, Fisheries and Forestry

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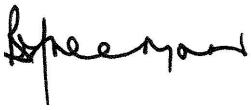

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Table of Contents

1 Introduction 1
2 Project scope 3
3 Data sources and industry consultation 5
3.1 Existing data 5
3.2 Industry occupations 6
3.3 Industry consultation 6
3.4 Collection of new data 7
3.5 Data compilation 9
4 Website and database development 13
4.1 Website 13
4.2 Database functionality 13
5 Modelling the industry outlook 15
5.1 Rationale 15
5.2 Model design 15
5.3 Key parameters 15
5.4 User inputs 18
5.5 Model outputs 18
6 References 21
7 Limitations 23

Tables

Table 2-1 Sector and sub-sector classification for this Project 3
Table 3-1 Summary of key data availability 5
Table 3-2 Additional project research requirements 8
Table 4-1 Overview of key database functions 14
Table 5-1 Key parameters for modelling employment and skills requirements 17

Figures

Figure 1-1 Overview of project methodology 1
Figure 3-1 Illustrative map of overlapping boundaries of forestry regions 10
Figure 3-2 Overview of methodology for aligning employment data with resource data 11

Figure 5-1 Outlook model - User interactions with data groupings.....18

Appendices

Appendix A Project data sets

Appendix B Scope of industry sectors

Appendix C ANZSCO occupation codes

Appendix D Project survey

Appendix E Project survey outcomes

Abbreviations

Abbreviation	Description
A3P	Australian Plantation Products and Paper Industry Council
ABARE	Australian Bureau of Agricultural Resource Economics
ABS	Australian Bureau of Statistics
ANZSCO	Australian and New Zealand Standard Classification for Occupations
BRS	Bureau of Rural Sciences
CRA	Comprehensive Regional Assessment
CRC Forestry	Cooperative Research Centre for Forestry
DAFF	Department of Agriculture, Fisheries and Forestry
DEEWR	Department of Education, Employment and Workplace Relations
FAFPESC	Forest and Forest Products Employment Skills Company
GIS	Geographic Information Systems
gmt	Green metric tonnes
ha	Hectares
LGA	Local Government Area
m^3	Cubic metres
NAFI	National Association of Forest Industries
NCVER	National Centre for Vocational Education Research
NFI	National Forest Inventory
NPI	National Plantation Inventory
RFA	Regional Forest Agreement
RTO	Registered Training Organisation
URS	URS Australia Pty Ltd, trading as URS Forestry
VET	Vocational education and training
WCAG	Web Content Accessibility Guidelines

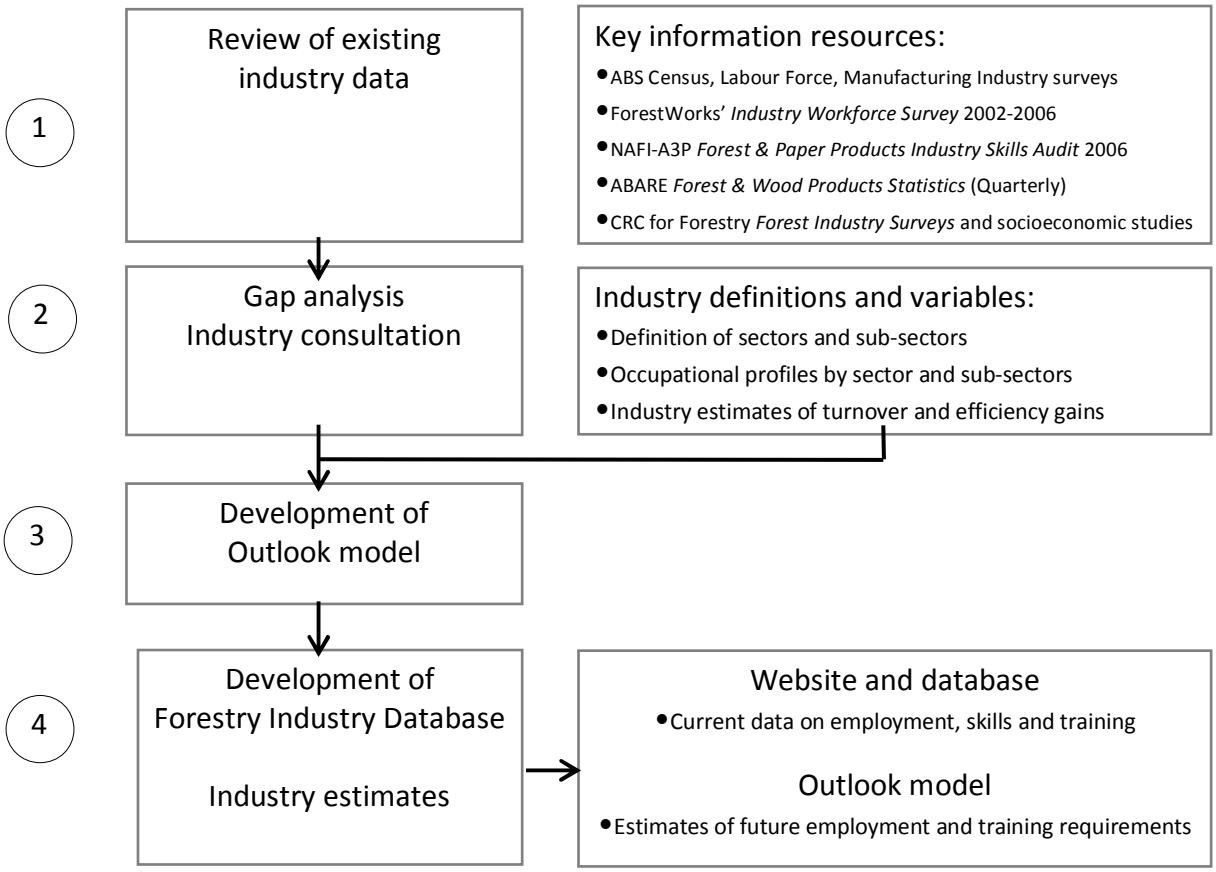
1

Introduction

This report presents the project methodology for the Forestry Industry Database Project ('the Project'). The Project was funded by the Commonwealth Government, through the Department of Agriculture, Fisheries and Forestry ('DAFF'), for and on behalf of Australia's forest and wood products industry.

Lack of industry specific data has been a significant factor limiting the forest sector's ability to identify areas of skills shortages, inform workforce planning and skills development, and understand the future demand and growth of the forest and wood products industry. The Australian Government has addressed this need through the development of a publicly available, comprehensive industry wide database. An overview of the methodology for this project is presented in Figure 1-1.

Figure 1-1 Overview of project methodology



The Forest and Forest Products Employment Skills Company (FAFPESC) *Forest and Wood Products Industry Workforce and Industry Data Collection Survey Report 2006*, compiled between 2002 and 2006, identified industry sectors and sub-sectors to enable data collection. This work provided a framework and workforce data for the development of the Forestry Industry Database.

The findings from this project are set out in a separate report. The *Summary of Findings* report (URS, 2010) presents an overview of the anticipated future trends and drivers impacting employment, skills and training in the forest and wood products industry.

2

Project scope

Reporting parameters formed the basis of data collection and model development for the Project. Table 2-1 shows the sector and sub-sector classification of the forest and wood products industry for the purpose of the Project. A previous study, culminating in the *Forest and Wood Products Industry Workforce and Industry Data Collection* (FAFPESC, 2006)[1], identified industry sectors. Within each sector, URS described particular sub-sectors to add clarity and provide for emerging areas of industry including carbon sink forestry and bioenergy production. In total, there are seven industry sectors and 27 sub-sectors. These groups have been developed based on logical delineations of key activities and labour productivity.

Table 2-1 Sector and sub-sector classification for this Project

Sector	Sub-sector
Forest growing and management	• Hardwood plantation management
	• Softwood plantation management
	• Native forest management
	• Carbon sink forestry
Harvesting and haulage	• Hardwood plantation harvesting
	• Softwood plantation harvesting
	• Native forest harvesting
	• Haulage contractors
Sawmilling and processing	• Hardwood sawmills
	• Softwood sawmills
	• Woodchip mills
	• Bioenergy facilities
Timber products manufacturing	• Framing and truss manufacturing
	• Window and door manufacturing
	• Wood kitchens and cabinetry
	• Wood furniture
	• Wood pallets, packaging and other wood products
Pulp and paper production	• Pulping and paper manufacturing enterprises
	• Fine paper manufacturing
	• Tissue manufacturing
	• Newsprint manufacturing
	• Board manufacturing
Panel and board production	• Veneer and plywood manufacturing
	• Particleboard manufacturing
	• MDF manufacturing
	• Other board and panel manufacturing
Timber merchandising	• Timber merchandising and wholesaling

Source: Forestry Industry Database 2010; based on sectoral classification in FAFPESC 2006

[1] FAFPESC was the Forest and Forest Products Employment Skills Company; FAFPESC was replaced by ForestWorks, however ForestWorks is a different organisation with a different constitution.

2 Project scope

Reporting of information within these sectors is based around four key themes:

- Employment
- Skills and training
- Recruitment and retention; and
- Future workforce requirements.

Employment

The Employment theme reports the current number of employees in the industry and relevant characteristics, by sector and sub-sector. The basis of employment information reported is all full time, part time and casual employees aged 15 years and over.

The information presented comprises the number of employees in the forest and wood products industry by gender, age group and the participation of indigenous employees in the industry. The age group and indigenous employee information compares the forest and wood products industry statistics against the characteristics of the general workforce. General employment and gender data is reported for National Plantation Inventory (NPI) and Regional Forest Agreement (RFA) regions, in addition to State and National coverage within these datasets.

Skills and training

The Skills and Training theme provides estimates of the main occupations of forest and wood products industry employees, by sector, and sub-sector for occupations data. It also provides web links to current forest and wood products industry training providers, including tertiary training and vocational education and training (VET) providers. General training statistics are provided, including information on the level of workplace based training; apprentices and trainees; the proportion of employees with post-school qualifications; commencements of training courses, and a national overview of skills shortages in the forest and wood products industry. Information within this theme is reported at State and National level.

Recruitment and retention

The Recruitment and Retention theme summarises available data on the rate of change in employment and total number of employees (seasonal or other variation) sourced from the FAFPESC survey (2002-06).

Future workforce requirements

The Future Workforce Requirements theme provides an outlook of the forest and wood products industry's employment, skills and training requirements to 2029. An Outlook model has been developed as a part of this Project to allow users to project estimates of future industry requirements by varying a range of resource and processing parameters. The findings from project modelling based on default assumptions are set out in the *Summary of Findings* report.

3

Data sources and industry consultation

Data presented within the Forestry Industry Database and the Outlook model are based predominantly on the Australian Bureau of Statistics (ABS) data, with additional data compiled from industry surveys undertaken as part of the Project. Sectoral and regional studies were also used, as well as data from education and training providers and researchers.

3.1 Existing data

The existing information about industry sectors and sub-sectors was analysed and consolidated in order to present clear and meaningful 'harmonised' data on the industry workforce. This approach was preferred over the presentation of multiple information sources for one sector or theme, on account of industry concerns this would lead to confusion or misunderstandings about the data or topic.

Table 3-1 summarises the key data referenced in the Project in terms of frequency and vintage (of latest survey data) for each publication. A complete reference list of these publications is included in Appendix A.

Table 3-1 Summary of key data availability

Publication	Frequency	Availability	Latest survey
ABS publications			
• Census	Five-yearly	• Online, publicly available	2006
• Labour Force	Quarterly	• Online, publicly available	2010
• Manufacturing Industry	Annual	• Online, publicly available	2006/07
Forest industry publications			
• FAFPESC Forest and Wood Products Industry Workforce and Industry Data Collection	Single survey	• Reports from survey data provided by ForestWorks	2002-06
• CRC for Forestry Forest Industry Survey	Bi-annual	• Reported data online, publicly available	2006-2008
• NAFI-A3P Skills Shortage Audit	Single survey	• Online, publicly available	2005-06
• ForestWorks Environmental Scan	Annual report	• Online, publicly available	2009-10
• Regional Forest Agreement sustainable yields by region	Periodic reviews	• Datasets provided by BRS	2009
• BRS National Plantation Inventory	Annual	• Datasets provided by BRS	2008
• BRS Plantation Log Supply	Every 4-5 years	• Datasets provided by BRS	2007
Other relevant publications			
• DEEWR Skills Shortages Report	Quarterly & Annual	• Online, publicly available	2009-10
• NCVER Apprentices & Trainees*	Quarterly & Annual	• Online, publicly available	2008
• NCVER Students and courses 2008*	Annual	• Online, publicly available	2008

* Customised data reports obtained for reporting of detailed industry information

3 Data sources and industry consultation

URS completed an extensive review of the available data in the context of the four data themes. Information gaps were identified through consideration of key criteria for reporting, including the availability of time-series data, geographical coverage and forest sector categories. At the conclusion this phase of the Project, URS prepared a milestone report (July 2009), providing a summary of existing data, a gap analysis across industry sectors and regions, options for addressing critical information gaps and a stakeholder engagement plan.

URS also prepared a consultation paper for industry, based on the milestone report (July 2009). The primary purpose of the consultation paper was to provide stakeholders with the opportunity to consider the Project and the database and provide for substantive discussion and feedback from interested industry parties and informed stakeholders through various forms of consultation.

3.2 Industry occupations

For this Project, URS obtained ABS data relating to occupations in each of the industry classes included in the core scope of the Project. Key industry occupations in industry classes initially considered outside the scope of the Project were also reviewed and this led to inclusion of additional employment counts, including:

- State and Central Government Administration;
- Building Wholesaling;
- Domestic Hardware and Houseware Retailing;
- Scientific Research Services; and
- Road Transport.

A complete list of industry classes from which additional employment was included, based on industry specific occupations, is provided in Appendix B. Industry specific occupations are presented in Appendix C.

3.3 Industry consultation

An Advisory Committee was established to provide guidance on the development of this Project. The Committee[2], chaired by DAFF, was established following industry consultation on the Project and met during the course of the Project to provide input on the Database design and functionality. Constructive engagement with a broad base of industry stakeholders was also undertaken as an important component of this Project. Key objectives in engaging with industry comprised:

- Raising awareness among industry stakeholders of the development of the Project;
- Identifying key change drivers that will impact on future industry workforce requirements; and
- Obtaining specific industry feedback on:
  - the functional requirements of the database to assist most effectively with workforce planning requirements across industry sectors;
  - the range of available data for the selected themes;
  - the information and data gaps across these themes;
  - the priorities for addressing the data gaps; and
  - appropriate and efficient approaches to collecting data to address gaps.

[2] The Advisory Committee comprised members representing DAFF, the National Association of Forest Industries, the Australian Plantation Products and Paper Industry Council, ForestWorks and the Australian National University – Fenner School.

3 Data sources and industry consultation

URS initially identified over 200 industry stakeholders to whom email invitations were sent for expressions of interest in attending industry workshops and reviewing the consultation paper. Notices regarding the industry workshops were also included in the industry wide *A3P Canopy* and *Friday Offcuts* email newsletters.

Industry consultation for the Project was undertaken primarily during September – October 2009. Based on responses from interested parties, workshop venues included Canberra (ACT), Melbourne (Victoria), Hobart (Tasmania), Mount Gambier (South Australia) and Albany (Western Australia). Individual meetings took place via face to face meetings and telephone discussions.

During this consultation, stakeholders were asked about their views on the extent to which additional data capture could address information gaps. A number of stakeholders emphasised that outputs of the database should include:

- An Outlook model for projecting future industry requirements and providing analysis that assists with understanding the demand and supply of employment, skills and training;
- Regional and, where possible, sub-regional level information on industry options and employment requirements;
- Resource availability scenarios for native forest, plantation forests and carbon sink forests; and
- Carbon sink forestry and bioenergy production to be recognised discretely as these sub-sectors are expected to grow over time.

In addition, a range of feedback from industry companies and representative associations highlighted that some industry sectors have a level of 'survey fatigue'. Most stakeholders clearly advised their preference for the Project to make the best use of information that industry has already contributed to through other recent surveys.

This feedback and requirements provided the basis for the design of the database and the Outlook model, and the approach to additional data collection to complement existing data.

3.4 Collection of new data

Recognising the limitations of the existing data, URS completed further research with industry to compile additional data. This additional data was collected through a targeted survey, which was focussed primarily on collection and validation of employment data relating to industry sub-sectors, where there was variable coverage by key data sources. Survey targets were identified with the objective of achieving a cross section of enterprise sizes and activities within each industry sector, as well as representation across regional and metropolitan based operations.

Survey questions were also included to validate information on industry skills and training requirements reported by ABS Census 2006 data, ForestWorks Environmental Scan reports (Forestworks 2009; 2010), the Department of Education, Employment and Workplace Relations (DEEWR) State and Territory Skill Shortage Lists (DEEWR 2010) and the Forest and Paper Industry Skills Shortages Audit conducted by NAFI and A3P in 2006 (NAFI 2006).

A summary of the key gaps in existing data, and new data collection activities undertaken by the project team are summarised in Table 3-2.

3 Data sources and industry consultation

Table 3-2 Additional project research requirements

Sector(s)	Gap analysis	New data collection and analysis
Forest growing and management	• There are differences in assumptions applied in various datasets, e.g., the Forest Industry Survey reports employment for plantation management separately to silvicultural contractors, whereas other case study information has combined all plantation management activities • There are differences in employment productivity estimates due to the age class profile of plantations • Existing data cannot be reported at a sub-sector level	• Analysis of ABS data in regions with unique resource characteristics to develop labour productivity estimates for key resource categories • Analysis of data from CRC Forestry to develop employment numbers associated with resource type • Refinement of existing data to ensure consistent basis for estimates at a sub-sector level • Project surveys conducted to validate labour productivity, occupational profiles and collect information on critical skills and skills shortages
Harvesting and haulage	• There is variable information in labour productivity estimates • The data collection limits opportunities to analyse data by sub-sectors, for example where some surveys and case studies combine employment numbers for harvest and haulage • Existing data cannot be reliably analysed at a sub-sector level	• Project surveys conducted to validate labour productivity, occupational profiles and collect information on critical skills and skills shortages • Modelling of harvesting crew size in each resource type and region and validation against actual totals from existing studies • Haulage requirements estimated based on direct data capture and modelling of regional average haulage distances and annual volume and validation against actual totals from existing studies
Sawmilling and processing, and Panels and board production	• Variable information for reporting at a sub-sector level • Existing data could be further analysed to align with facility types and scales	• Project surveys conducted to validate labour productivity, occupational profiles and collect information on critical skills and skills shortages • Employment requirements extracted from previous studies relating to employment levels for various facility type • Analysis of sawmill employment survey information from ABARE • Analysis of data from CRC Forestry to develop employment numbers associated with resource type
Timber products manufacturing and Timber merchandising	• Existing data cannot be reliably analysed at a sub-sector level	• Project surveys conducted to validate labour productivity, occupational profiles and collect information on critical skills and skills shortages • Data on sub-sectors incorporated from existing studies
Pulp and paper production	• Employment estimates are available from various sources, e.g. the ABS, Forest Industry Surveys, and the Pulp and Paper Industry Strategy Group, but there are differences in the numbers for each due to the extent to which downstream distribution and merchandising is included	• Project surveys conducted to validate labour productivity, occupational profiles and collect information on critical skills and skills shortages • Analysis of data from the Pulp and Paper Industry Strategy Group and CRC Forestry to confirm scope of industry and employment

The design principles and coverage of the Project surveys is described in Appendix D. Industry surveys were undertaken primarily through direct contact with individual enterprises. Representatives of the enterprises were provided with an outline of the Project and supporting letter of introduction from DAFF, and were asked whether they would be able to provide information for the purposes of the Project. Enterprises that agreed to participate were emailed questionnaires relevant to the sector, or sectors in which they operate. The survey questionnaires allowed enterprises to report data on more than one facility within each of the industry sectors.

A follow up meeting was arranged, either through a scheduled telephone discussion, or face-to-face meeting. This arrangement provided respondents with the opportunity to provide additional perspectives, and allowed URS to clarify aspects of the response if needed.

Survey forms went out to over 60 companies, incorporating approximately 100 separate 'facilities', representing distinct operational units or production facilities in various locations. In response, 46 companies, accounting for around 80 separate facilities, provided completed surveys within the timeframes of this project.

The responses received comprised a broad range of companies, including State owned forest management agencies; farm forestry managers; carbon sink managers; harvest and haulage contractors; large industry processors (including bioenergy producers); wood product manufacturers; pulp and paper manufacturers; furniture industry representatives; and timber merchandising companies. Responses from enterprises accounted for:

- Approximately 32% of Australia's plantation and native forest area managed for timber production;
- Approximately 10% of logs harvested in Australia; and
- Approximately 23% of primary wood processing in Australia.

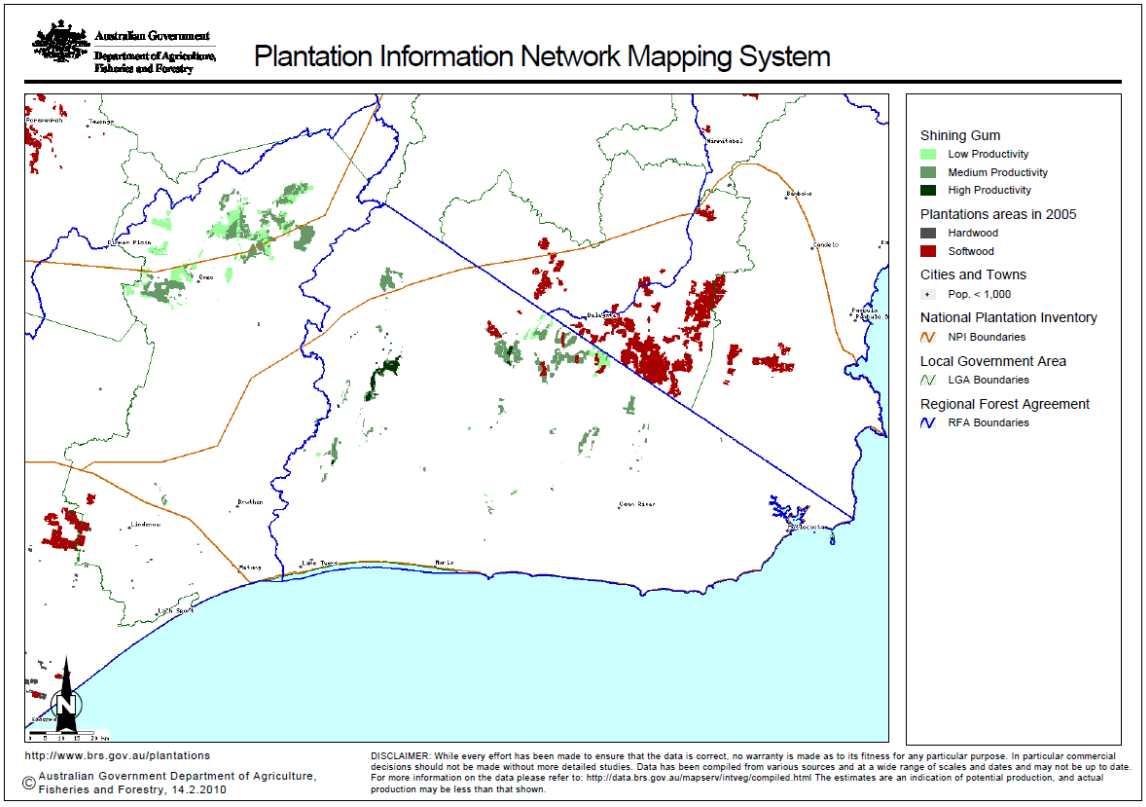
Coverage of downstream sectors from a production perspective was not quantified due to the range of production metrics used. A summary of data obtained through the Project surveys is set out in Appendix E.

3.5 Data compilation

To report information at a regional level, *ABS Industry of Employment (by Sex)* datasets were compiled for the Local Government Areas (LGA) comprising each NPI and RFA region. URS undertook spatial analysis of RFA and NPI regions through an overlay on LGA boundaries and reporting of LGAs within each region. The results of this analysis indicated considerable overlap of RFA and NPI regions within a number of LGAs. Figure 3-1 illustrates the complexity of overlapping boundaries, e.g. East Gippsland/Bombala NPI; Gippsland, East Gippsland, Eden and Southern NSW RFAs; and LGA boundaries.

3 Data sources and industry consultation

Figure 3-1 Illustrative map of overlapping boundaries of forestry regions



Source: BRS 2010b

Key issues addressed in completing this work included:

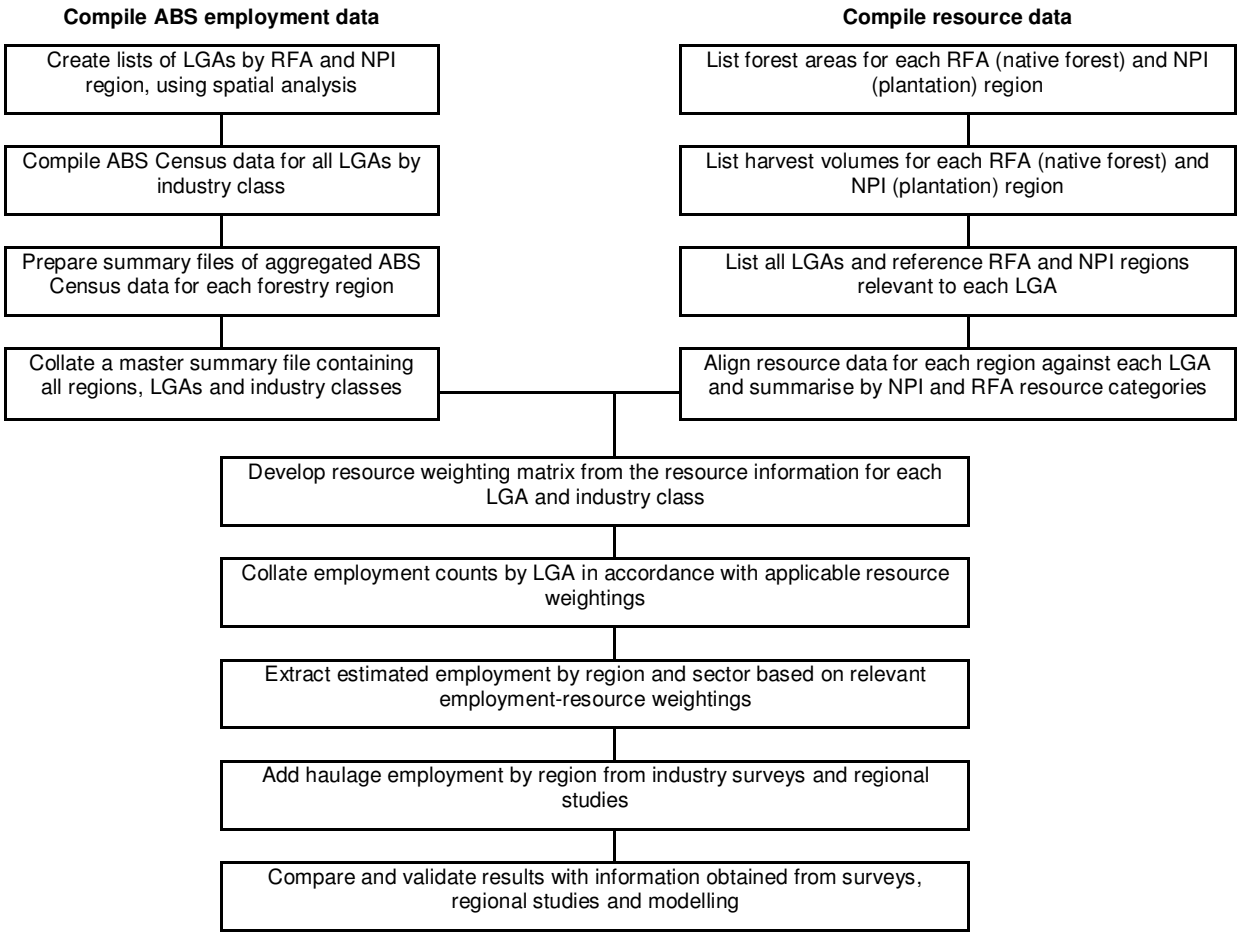
- Overlap of RFA and NPI regions and, in some areas, wood flows – the forestry regions defined by RFA and NPI boundaries comprise around 321 LGAs, and within this around 150 LGAs overlap across more than one RFA and/or NPI region. The areas of overlap were identified and resolved using Geographic Information Systems (GIS)[3] tools to overlay the boundaries of forestry regions with those of LGAs;
- Employment associated with facilities within each LGA – employment was reported within a NPI or RFA region depending on the nature of resource intake, and the location within the LGA if there was more than one region type (NPI or RFA) overlapping within the LGA; and
- Employment associated with facilities where there is a combined intake – employment was split and allocated under each resource category; for example, employment associated with a Pulp and paper production facility that utilises both native forest (RFA region) and plantation (NPI region) fibre was split on the basis of a volume-weighting of employment to each resource supply category.

Schirmer et al (2008) recommended an approach for reporting of direct employment in the forest and wood products industry based on ABS Census data, which includes compilation of the Census information and further investigation through available regional information, discussion with industry experts in the region, and direct data capture. The process implemented in the Forestry Industry Database Project is based on this methodology and is summarised in Figure 3-2 below.

[3] Geographic Information Systems – spatial data for forestry regions were supplied by BRS for this analysis.

3 Data sources and industry consultation

Figure 3-2 Overview of methodology for aligning employment data with resource data



4

Website and database development

The Forestry Industry Database comprises a website and database, which were developed to aggregate existing information and provide a centralised information portal. The website incorporates an Outlook model, to provide a basis for forecasting future industry employment and training requirements. The future workforce model is discussed in more detail in Section 5.

4.1 Website

The website has been developed as an internet application designed to operate on the following browsers:

- Internet Explorer 8.0;
- Internet Explorer 7.0;
- Internet Explorer 6.0;
- Firefox 3.5 (latest version); and
- Safari (Windows emulator).

Designed for ease of use and accessibility, particular emphasis was given to:

- Provision of features to select, organise and display data on a certain criteria in graphical and tabular form;
- Provision of appropriate error messages, where applicable; and
- The employment of simple and familiar terminology.

The website was designed to be compliant with Web Content Accessibility Guidelines (WCAG) 2.0, which covers a wide range of recommendations for making web content more accessible to people with disabilities, including blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photosensitivity and combinations of these.

The website was also designed to provide industry data and information in response to specific user queries without imposing any restriction by applying access rights. The Forestry Industry Database is referenced through the website and direct access is limited to this query-based interface. Through the web hosting arrangements[4], there are security measures and administrator controls in place to protect the integrity of the website.

In terms of maintenance and support requirements, the system is designed to accept new data with the same structure and format to be loaded into the database in subsequent years without any modification to the existing data structures and data load routines.

4.2 Database functionality

The database development process commenced following stakeholder workshops, to ensure feedback from industry could be incorporated as much as possible. The process included development of a requirements specification; functional and design specifications; and development of a prototype to capture additional feedback from the Advisory Committee and other industry stakeholders. These specifications provided a detailed description of the website, database

[4] It is intended that the Forestry Industry Database will be hosted by an industry organisation. Forest & Wood Products Australia (FWPA) has undertaken to provide hosting for the website for an initial 12 month period. Hosting arrangements beyond this period are yet to be determined.

4 Website and database development

functionality and business rules, and user acceptance criteria. An overview of the database functionality is provided in Table 4-1 below.

Table 4-1 Overview of key database functions

Theme	Requirement description
All themes	• Displays forest and wood products industry employment in a data table based on one or more query parameters i.e., by region, by sector and by sub-sector (where available) • Provides a feature to generate a graph for the data in the table • Displays meta-data for each data table
Employment	• Displays general employment (including full time, part time and casual employment) information by region by sector and by sub-sector • Displays employment by gender data (i.e. percentage of male and female employees), in a data table that can be queried by regions, by sector and by sub-sector • Displays employment by age group and indigenous status in data tables that can be queried by State • Displays the percentage of employees in the forest and wood products industry versus the percentage of indigenous employees in the general workforce, based on the query parameters
Skills and training	• Displays occupations data in a table that can be queried by State, by sector, by sub-sector and by occupation • Displays external training data in a table that can be queried by State and by training package • Provides website links for industry training providers including ForestWorks' '*Find an industry RTO'* search tool • Displays workplace based training data in a table that can be queried by defined input parameters • Displays industry skills shortages data in a static table
Recruitment and retention	• Displays recruitment and retention data in a table that can be queried by sector
Industry sectors	• Provides industry sector profiles for each of the industry sectors: — Forest growing and management — Harvesting and haulage — Sawmilling and processing — Timber products manufacturing — Panel and board production — Pulp and paper production — Timber merchandising
Forestry regions	• Provides a brief summary of each NPI and RFA region so that users less familiar with these regions have context about their location, forest resources and main processing industries. It also provided links to recent regional studies where available.
Future workforce	• Provides a downloadable model for ready access by users, to forecast employment and skills that will be required for a given modelled industry scenario, based on varying numbers of resources and on varying combinations of processing parameters, across time periods to 2029.

5

Modelling the industry outlook

The Outlook model provides a basis for forecasting employment and training requirements associated with a range of industry development scenarios.

5.1 Rationale

Stakeholder workshops confirmed that a key requirement for this project was to provide industry with a means of identifying future workforce requirements based on changes in future resource availability and processing infrastructure. Another clear message in relation to modelling future requirements was that outputs needed to be available at regional level, so that the demand for training providers could be quantified and communicated to Registered Training Organisations (RTOs) and government.

The modelling at a regional level was based on scenarios of resource availability, processing configurations and occupational profiles. This requires a substantive amount of data and generalised relationships between resources, labour productivity, occupational multipliers and training packages.

5.2 Model design

The Outlook model was designed as part of this Project to provide estimates of current and future employment and training requirements across industry sectors. Central to its design is the alignment of employment with occupational profiles for each sector, and the back-to-back alignment of occupations with training requirements. In this way, employment trends can be used to provide indicative estimates of training requirements by sector and region.

Through the Project development process, it was found that the delivery of a model to address these requirements was more suited to a downloadable product. This option was preferred on account of the extent to which user interaction was required for customised reports and potential performance issues associated with real-time transmission of data between the database server and client.

As a result, the Outlook model was embedded within the database as a downloadable tool. The model was developed using Microsoft® Office Excel, as this is a widely used software platform that provides database functions sufficient to support the requirements of the model, and a transparent architecture for updating data in the future. The model incorporates sheet protection features, to provide a robust tool for analysis and maintain the integrity of the underlying data derived from the Forestry Industry Database.

5.3 Key parameters

Key parameters of the Outlook model are outlined below.

Resource availability

The model is dependent on a base dataset that describes current and future resource availability. Base resource data is provided by BRS and data is delineated by the following parameters:

- Geographic areas including RFA and NPI forest regions;
- Resource type: native forest and plantation (softwood and hardwood), and carbon sink forestry;
- Log types (sawlog/pulpwood/biomass); and
- Wood flows reported in 5-year periods, presented as an average annual volume within each period.

5 Modelling the industry outlook

Industry stakeholders requested that the database incorporate the capacity to consider future industry workforce requirements at a regional level under various resource scenarios. A limited range of scenarios have been incorporated, based on the current BRS forecasts of plantation log supply and current levels of annual allowable cut within public native forests.

A limitation of these scenarios is that hardwood pulpwood production from native forests is generally not prescribed; it is ultimately determined by the actual harvest of sawlogs. This limitation contributes to a higher level of variability around production of native forest wood and associated levels of employment.

The expansion of carbon sink forests was identified by various industry representatives as a key platform for industry growth and has been incorporated in the database for modelling of future workforce requirements.

Employment data and occupational profiles

Employment and occupational profiles are correlated with key drivers of industry scale, such as volume processed or area under management. These relationships were used to model the current industry workforce profile based on the available resource and industry structure. Output from the Outlook model based on current data was verified against the original datasets at a sub-sector level to reality check the performance of the model. Table 5-1 presents key parameters for employment productivity and industry scale that are used in the model.

The relationships outlined in Table 5-1 reflect production measures that drive employment at a sub-sector level. Generalised relationships were developed between these variables. In particular:

- Increasing forest area can be assumed to directly increase employment requirements at the sub-sector level within the forest growing and management sector;
- Increasing volumes harvested can be assumed to directly increase employment and skills in the harvest and haulage sector; and
- In the processing sector, increasing throughput can be assumed to increase employment requirements at the sub-sector level, allowing for the impact of mill scale on labour productivity. For example, employment profiles have been developed for:
  - *Hardwood sawmills* – four scales of annual log intake, comprising: < 25,000 m^3; 25 – 50,000 m^3; 50 – 75,000 m^3; 75 – 100,000 m^3; and > 100,000 m^3
  - *Softwood sawmills* – five scales of annual log intake, comprising: < 25,000 m^3; 25 – 50,000 m^3; 50 – 100,000 m^3; 100 – 500,000 m^3; and > 500,000 m^3.

Modelling of employment data by occupation provides a basis for estimating the scale and nature of training that will be required to support future employment, across sectors and regions. Occupational profiles were referenced[5] to identify the range of skills requirements within each sector, with a particular focus on those occupations that require dedicated industry-specific training. These occupational profiles are listed in Appendix E. Training requirements were then derived through identifying the formal training qualifications that are aligned with the range of skills and competencies required for each occupation.

[5] Occupational profiles were derived, based on information compiled from the ABS and Project surveys. Further information on the derivation of these profiles is presented at Appendix E.

5 Modelling the industry outlook

Table 5-1 Key parameters for modelling employment and skills requirements

Sector	Sub-sector	Model parameters
Forest growing and management	Hardwood plantation management	Area (ha)
	Softwood plantation management	Area (ha)
	Native forest management	Timber production area (ha)
	Farm forestry enterprises	Area (ha)
	Carbon sink forestry	Area (ha)
Harvesting and haulage	Hardwood plantation harvesting	Log volume (m^3 or gmt) - harvest
	Softwood plantation harvesting	Log volume (m^3 or gmt) - harvest
	Native forest harvesting	Log volume (m^3 or gmt) - harvest
	Haulage contractors	Log volume (m^3 or gmt) - harvest
Sawmilling and processing	Hardwood sawmills	Log volume (m^3 or gmt) – throughput and scale
	Softwood sawmills	Log volume (m^3 or gmt) – throughput and scale
	Woodchip mills	Log volume (m^3 or gmt) – throughput and scale
	Bioenergy plants	Log volume (m^3 or gmt) – throughput and scale
Timber products manufacturing	Frame and truss operations	Percentage change over time
	Window and door manufacturers	Percentage change over time
	Joinery/cabinet making	Percentage change over time
	Timber furniture	Percentage change over time
	Wood packaging, pallets and other wood products	Percentage change over time
Panel and board production	MDF manufacturing	Log volume (m^3 or gmt) – throughput and scale
	Particleboard manufacturing	Log volume (m^3 or gmt) – throughput and scale
	Other board and panel manufacturing	Log volume (m^3 or gmt) - throughput and scale
	Veneer and plywood manufacturing	Log volume (m^3 or gmt) – throughput and scale
Pulp and paper production	Pulping and paper manufacturing	Log volume (m^3 or gmt) – throughput and nature of manufacturing process
	Fine paper manufacturing	Percentage change over time
	Tissue manufacturing	Percentage change over time
	Newsprint manufacturing	Percentage change over time
	Board manufacturing	Percentage change over time
Timber merchandising	Timber merchandising and wholesaling	Percentage change over time

Modelling of training requirements over an extensive time period of 20 years has some limitations. The existing skill sets of incoming employees are not taken into account, and there is no differentiation between informal, internal workplace based training and training that is provided externally under industry training packages and other tertiary programs.

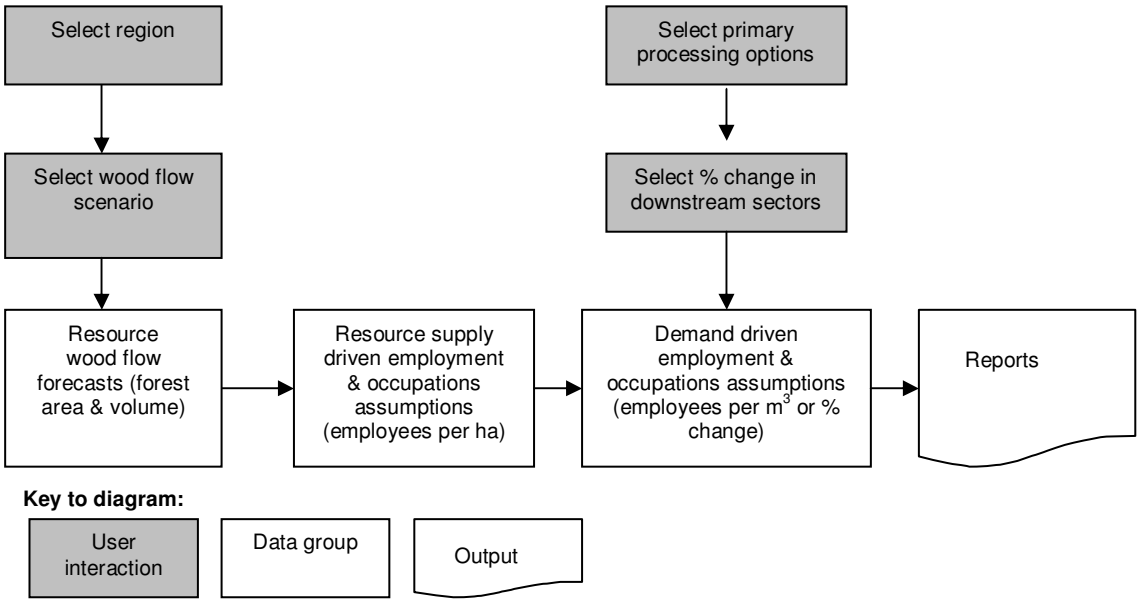
5 Modelling the industry outlook

The approach adopted for this Project relates predominantly to addressing training requirements as a result of employment turnover and the training of entrants for industry-specific roles, at all levels. It does not incorporate training requirements of the existing workforce, on the broad assumption that present incumbents are generally competent in fulfilling the requirements of their roles. Therefore modelling outputs should be considered as industry's minimum requirements for industry-specific roles over the next 20 years. For example, trends in the uptake of new processing technologies are expected to drive further training requirements ('upskilling' requirements) for existing workers within specific processing functions or technology applications.

5.4 User inputs

The Outlook model incorporates default settings for all regions. However, the model also allows users to change these defaults and select their own regional resource profile and developing an industry structure around this profile. Figure 5-1 shows the data flow of the Outlook model and the points within the data flow where users can make selections.

Figure 5-1 Outlook model - User interactions with data groupings



5.5 Model outputs

Data output is in the form of five key reports that provide industry workforce requirements across five year time periods through to 2029, based on the parameters selected by the user, as follows:

- Total employment requirements by sector;
- Total employment requirements by sub-sector;
- Occupation requirements by sector;
- Number of additional employees required by occupation by sector; and
- Training requirements based on occupations and key formal qualifications associated with each industry-specific occupation.

5 Modelling the industry outlook

The approach of modelling employment by sector and sub-sectors, and subsequently occupational profiles associated with sub-sectors, provides interested stakeholders with the following information:

- *Location of employment and training requirements at a regional level* – by comparison to presentation of requirements at a State level, this provides stakeholders with information to support workforce recruitment and development requirements that are specific to where the demand is based;
- *Quantification of employment and occupation requirements* - for example, output reports tell the users that the Green Triangle could require around 300 additional employees to harvest and transport the anticipated increase in hardwood plantation volumes available in 2010-2014;
- *Quantification of requirements at a sector level for key industry occupations* - to assist with the development of targeted strategies to attract employees and training providers; and
- *Linkages between occupations and training pathways* - providing estimates of the potential training demand for training providers.

While it is acknowledged that the uptake of formal training packages is less dominant than informal training processes at an enterprise level, this information may support initiatives for greater uptake through investigating the specific competencies desired by employers in the region and development of customised training options within the industry training package framework.

Based on this methodology, the *Summary of Findings* report presents an overview of the analysis of anticipated future trends and drivers impacting employment, skills and training in the forest and wood products industry.

6

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7

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of the Department of Agriculture, Fisheries and Forestry, and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 26 March 2009.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between 1 March 2010 and 7 July 2010 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

A

Appendix A Project data sets

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ABS Census of Population and Housing 2006 data compiled on the following topics for the purposes of this project includes:

- Industry of Employment – 2006 ANZSIC (Full Classification list) Sex
- Industry of Employment – 2006 ANZSIC (Full Classification list) Age Profile
- Industry of Employment – 2006 ANZSIC (Full Classification list) Qualifications - Level of highest educational attainment
- Industry of Employment – 2006 ANZSIC (Full Classification list) Employment type (Full time or part time)
- Industry of Employment – 2006 ANZSIC (Full Classification list) Labour Force Status
- Industry of Employment – 2006 ANZSIC (Full Classification list) Indigenous Status
- Industry of Employment – 2006 ANZSIC (Full Classification list) Occupations (Australia and New Zealand Standard Classification of Occupations) by Industry Class

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B

Appendix B Scope of industry sectors

Scope of sectors based on industry sectors and incorporation of selected classes from within the Australia and New Zealand Standard Industry Classification (ABS 2006d), and selected occupations across broader industry classes from the Australia and New Zealand Standard Classification of Occupations (ABS 2006e).

B.1 Forest growing & management

Division A AGRICULTURE, FORESTRY AND FISHING
Subdivision 03 FORESTRY AND LOGGING
Group 030 FORESTRY AND LOGGING
Class 0301 Forestry

This class consists of units mainly engaged in growing standing timber in native or plantation forests, or timber tracts, for commercial benefit. This class also includes the gathering of forest products such as mushrooms, kauri gum or resin from forest environments.

Primary activities

- Forest product gathering
- Forestry growing operation
- Kauri gum digging
- Native orchid gathering
- Pine cone collecting
- Resin gathering
- Sphagnum moss gathering

Exclusions/References
Units mainly engaged in:

- providing support services to forestry, including silvicultural services such as planting, pruning or thinning, or forest nursery operation are included in Class 0510 Forestry Support Services;
- logging forests are included in Class 0302 Logging;
- investing in any of the above activities are included in Class 6240 Financial Asset Investing; and
- distilling eucalyptus oil are included in Class 1899 Other Basic Chemical Product Manufacturing n.e.c.

Division A AGRICULTURE, FORESTRY AND FISHING
Subdivision 05 AGRICULTURE, FORESTRY AND FISHING SUPPORT SERVICES
Group 051 FORESTRY SUPPORT SERVICES
Class 0510 Forestry Support Services

This class consists of units mainly engaged in providing support services to forestry. Services include silvicultural services, such as planting, pruning and thinning trees, forest reafforestation, forest plantation conservation or maintenance. This class also includes units mainly engaged in operating forestry planting stock nurseries.

Primary activities

- Forest conservation service
- Forest nursery operation or service
- Forest pest control service (except aerial or wild animal control)
- Forest planting
- Reafforestation service
- Silvicultural service
- Timber plantation maintenance

- Timber tract maintenance
- Tree pruning (forest)
- Tree thinning (forest)

Exclusions/References
Units mainly engaged in

- planting or propagating non-forest nursery stock are included in either Class 0111 Nursery Production (Under Cover) or 0112 Nursery Production (Outdoors);
- wild animal pest control are included in Class 0420 Hunting and Trapping;
- aerial pest control services are included in Class 0529 Other Agriculture and Fishing Support Services; and
- forest fire fighting services are included in Class 7713 Fire Protection and Other Emergency Services.

Appendix B

B.2 Harvesting & haulage

Division A AGRICULTURE, FORESTRY AND FISHING
Subdivision 03 FORESTRY AND LOGGING
Group 030 FORESTRY AND LOGGING
Class 0302 Logging

This class consists of units mainly engaged in logging native or plantation forests, including felling, cutting and/or roughly hewing logs into products such as railway sleepers or posts. This class also includes units mainly engaged in cutting trees and scrubs for firewood.

Primary activities

- Firewood cutting (forest)
- Logging
- Mine timber hewing (forest)
- Pole hewing (forest)
- Post shaping (forest)
- Railway sleeper hewing
- Rough shaping of forest timber
- Timber hewing (forest)
- Tree cutting or felling

Exclusions/References
Units mainly engaged in

- gathering forest products are included in Class 0301 Forestry; and
- log sawmilling or woodchipping are included in Class 1411 Log Sawmilling.

B.3 Sawmilling & processing

Division C MANUFACTURING
Subdivision 14 WOOD PRODUCT MANUFACTURING
Group 141 LOG SAWMILLING AND TIMBER DRESSING
Class 1411 Log Sawmilling

This class consists of units mainly engaged in manufacturing rough sawn timber, and boards.
Primary activities

- Log sawmilling
- Rough sawn timber manufacturing
- Shook manufacturing (for containers)

Exclusions/References
Units mainly engaged in

- hewing or rough shaping timber or cutting firewood in forests are included in Class 0302 Logging;
- manufacturing softwood or hardwood wood chips are included in Class 1412 Wood Chipping; and
- kiln drying, seasoning or chemically preserving timber (except chemical preservation of logs sawn at the same unit) are included in Class 1413 Timber Resawing and Dressing.

Division C MANUFACTURING
Subdivision 14 WOOD PRODUCT MANUFACTURING
Group 141 LOG SAWMILLING AND TIMBER DRESSING
Class 1413 Timber Resawing and Dressing

This class consists of units mainly engaged in resawing or dressing timber, timber boards and mouldings. Dressing timber includes seasoning (kiln or air drying) or chemical preservation.

Primary activities

- Air-drying timber
- Building timber manufacturing
- Chemically preserving timber (except chemical preservation of logs sawn at the same unit)
- Dressed timber or moulding manufacturing
- Kiln drying timber
- Seasoning timber
- Wooden flooring manufacturing (solid timber only)

Exclusions/References
Units mainly engaged in

- manufacturing wooden structural fittings (including kitchen fittings) or components such as doors, windows and other wooden framing are included in Class 1492 Wooden Structural Fitting and Component Manufacturing;
- manufacturing veneers or plywood are included in Class 1493 Veneer and Plywood Manufacturing; and
- manufacturing reconstituted wood products are included in Class 1494 Reconstituted Wood Product Manufacturing.

Appendix B

Division C MANUFACTURING
Subdivision 14 WOOD PRODUCT MANUFACTURING
Group 141 LOG SAWMILLING AND TIMBER DRESSING
Class 1412 Wood Chipping

This class consists of units mainly engaged in manufacturing softwood or hardwood wood chips.

Primary activities

- Hardwood wood chip manufacturing
- Softwood wood chip manufacturing

B.4 Timber products manufacturing

Division C MANUFACTURING
Subdivision 14 WOOD PRODUCT MANUFACTURING
Group 149 OTHER WOOD PRODUCT MANUFACTURING
Class 1491 Prefabricated Wooden Building Manufacturing

This class consists of units mainly engaged in manufacturing wooden prefabricated buildings.

Primary activities

- Building, prefabricated wood, manufacturing
- Bus shelter, prefabricated wood, manufacturing
- Carport, prefabricated wood, manufacturing
- Conservatory, prefabricated wood, manufacturing
- Garage, prefabricated wood, manufacturing
- Gazebo, prefabricated wood, manufacturing
- Kit set home, prefabricated wood, manufacturing
- Shed, prefabricated wood, manufacturing

Division C MANUFACTURING
Subdivision 14 WOOD PRODUCT MANUFACTURING
Group 149 OTHER WOOD PRODUCT MANUFACTURING
Class 1492 Wooden Structural Fitting and Component Manufacturing

This class consists of units mainly engaged in manufacturing wooden structural fittings and components such as roof trusses, doors, wood-framed doors, wall and window frames, shop fronts and joinery (including kitchen fittings) for buildings.

Primary activities

- Finger-jointing manufacturing
- Roof truss, wooden, manufacturing
- Wood or wood-framed door manufacturing
- Wood-framed window manufacturing
- Wooden kitchen cabinet manufacturing
- Wooden structural component/fitting manufacturing

Exclusions/References
Units mainly engaged in

- manufacturing corestock are included in Class 1494 Reconstituted Wood Product Manufacturing;
- manufacturing dressed timber, mouldings or floorboards are included in Class 1413 Timber Resawing and Dressing;
- manufacturing wooden furniture (except custom-made built-in furniture) are included in Class 2511 Wooden Furniture and Upholstered Seat Manufacturing;
- assembling or installing wooden structural fittings manufactured by other units are included in Class 3242 Carpentry Services; and
- on-site fabrication of built-in furniture or other joinery are included in Class 3242 Carpentry Services.

Division C MANUFACTURING
Subdivision 14 WOOD PRODUCT MANUFACTURING

Appendix B

Group 149 OTHER WOOD PRODUCT MANUFACTURING
Class 1499 Other Wood Product Manufacturing n.e.c.

This class consists of units mainly engaged in manufacturing wood products not elsewhere classified, including wicker ware, cork, bamboo or cane products (excluding furniture).

Primary activities

- Container, wooden, manufacturing
- Ornamental woodwork manufacturing
- Pallet (wooden) manufacturing
- Picture or mirror frame, wooden, manufacturing
- Tool handle, wooden, manufacturing
- Trellis, wooden, manufacturing
- Wood product manufacturing n.e.c.
- Wood turning

Exclusions/References
Units mainly engaged in

- manufacturing shooks for containers are included in Class 1411 Log Sawmilling;
- manufacturing wooden, wicker, bamboo or cane furniture are included in the appropriate classes of Group 251 Furniture Manufacturing; and
- manufacturing wooden toys and sporting goods are included in Class 2592 Toy, Sporting and Recreational Product Manufacturing.

Division C MANUFACTURING
Subdivision 25 FURNITURE AND OTHER MANUFACTURING
Group 251 FURNITURE MANUFACTURING
Class 2511 Wooden Furniture and Upholstered Seat Manufacturing

This class consists of units mainly engaged in manufacturing furniture of wood or predominantly of wood (except custom-made built-in furniture), complete upholstered seating with wooden or metal frames (including seats convertible into beds) or in upholstering wooden furniture. This class also includes units mainly engaged in manufacturing upholstered seats with frames of any material for transport equipment.

Primary activities

- Bedroom suite, wooden, manufacturing
- Chair manufacturing (except dental chairs fitted with mechanical devices)
- Dining room furniture, wooden, manufacturing
- Disassembled furniture, wooden, manufacturing
- Disassembled kitchen furniture, wooden, manufacturing
- Furniture part, wooden, manufacturing
- Furniture reupholstering
- Lounge suite manufacturing
- Office furniture, wooden, manufacturing
- Outdoor furniture, wooden, manufacturing
- Seat, upholstered, manufacturing
- Table, wooden, manufacturing
- Upholstered furniture manufacturing

Exclusions/References

Units mainly engaged in:

- manufacturing custom made built-in furniture or shop fronts made of wood or joinery n.e.c. are included in Class 1492 Wooden Structural Fitting and Component Manufacturing;
- manufacturing furniture predominantly of metal, including sheet metal and tubular metal, are included in Class 2512 Metal Furniture Manufacturing;
- manufacturing dental chairs fitted with mechanical devices are included in Class 2412 Medical and Surgical Equipment Manufacturing;
- finishing or French polishing furniture are included in Class 9499 Other Repair and Maintenance n.e.c; and
- on-site fabrication of built-in furniture or other joinery are included in Class 3242 Carpentry Services.

Appendix B

B.5 Panel & board manufacturing

Division C MANUFACTURING
Subdivision 14 WOOD PRODUCT MANUFACTURING
Group 149 OTHER WOOD PRODUCT MANUFACTURING
Class 1493 Veneer and Plywood Manufacturing

This class consists of units mainly engaged in manufacturing veneers and plywood.

Primary activities

- Core, plywood or veneer, manufacturing
- Glue laminated lumber (Glulam) manufacturing
- Laminated veneer lumber (LVL) manufacturing
- Plywood manufacturing
- Veneer manufacturing

Division C MANUFACTURING
Subdivision 14 WOOD PRODUCT MANUFACTURING
Group 149 OTHER WOOD PRODUCT MANUFACTURING
Class 1494 Reconstituted Wood Product Manufacturing

This class consists of units mainly engaged in manufacturing wood boards and sheets from reconstituted wood fibres such as wood chips, sawdust, wood shavings, slabwood or off-cuts. Also included are units that manufacture laminations of timber and non-timber materials (including decorative plastic laminates on boards or other substrates).

Primary activities

- Chip board manufacturing
- Corestock manufacturing
- Fibreboard manufacturing
- Hardboard manufacturing
- Laminations of timber and non-timber materials manufacturing
- Medium density fibreboard (MDF) manufacturing
- Oriented strand board (OSB) manufacturing
- Particleboard manufacturing

B.6 Pulp and paper manufacturing

Division C MANUFACTURING
Subdivision 15 PULP, PAPER AND CONVERTED PAPER PRODUCT MANUFACTURING
Group 151 PULP, PAPER AND PAPERBOARD MANUFACTURING
Class 1510 Pulp, Paper and Paperboard Manufacturing

This class consists of units mainly engaged in manufacturing wood pulp (chemical or mechanical), paper or paperboard. It includes the manufacture of bulk paper from any fibre (including used paper) and the production of pulp from used paper.

Primary activities

- Newsprint manufacturing
- Paper manufacturing
- Paper pulp manufacturing
- Paperboard manufacturing
- Wood pulp manufacturing

Exclusions/References
Units mainly engaged in

- manufacturing corrugated paperboard sheeting or containers, or paperboard containers, are included in Class 1521 Corrugated Paperboard and Paperboard Container Manufacturing;
- manufacturing paper stationery are included in Class 1523 Paper Stationery Manufacturing;
- manufacturing bitumen or tar treated papers, felts or foils (including laminated or impregnated) in which the lamination or impregnation is the main ingredient are included in Class 1709 Other Petroleum and Coal Product Manufacturing;
- manufacturing non-bituminous and non-plastic laminations of paper or paperboard with other materials, non-bitumised building paper or paperboard, or abrasive coated papers, in which the lamination or coating is the main ingredient are included in Class 2090 Other Non-Metallic Mineral Product Manufacturing; and
- manufacturing chemically treated paper or sensitised photographic paper are included in Class 1891 Photographic Chemical Product Manufacturing.

Division C MANUFACTURING
Subdivision 15 PULP, PAPER AND CONVERTED PAPER PRODUCT MANUFACTURING
Group 152 CONVERTED PAPER PRODUCT MANUFACTURING
Class 1521 Corrugated Paperboard and Paperboard Container Manufacturing

This class consists of units mainly engaged in manufacturing corrugated paperboard containers, sheeting or solid paperboard containers.

Primary activities

- Corrugated paperboard container manufacturing
- Corrugated paperboard manufacturing
- Paperboard container manufacturing

Exclusions/References
Units mainly engaged in

- manufacturing paperboard are included in Class 1510 Pulp, Paper and Paperboard Manufacturing; and
- manufacturing paper bags and sacks are included in Class 1522 Paper Bag Manufacturing.

Appendix B

Division C MANUFACTURING
Subdivision 15 PULP, PAPER AND CONVERTED PAPER PRODUCT MANUFACTURING
Group 152 CONVERTED PAPER PRODUCT MANUFACTURING
Class 1522 Paper Bag Manufacturing

This class consists of units mainly engaged in manufacturing paper bags (including multiwall bags of paper).

Primary activities

- Paper bag manufacturing

Division C MANUFACTURING
Subdivision 15 PULP, PAPER AND CONVERTED PAPER PRODUCT MANUFACTURING
Group 152 CONVERTED PAPER PRODUCT MANUFACTURING
Class 1523 Paper Stationery Manufacturing

This class consists of units mainly engaged in manufacturing paper stationery products, including paper products used for writing, filing and similar applications.

Primary activities

- Paper label manufacturing (except adhesive)
- Paper stationery manufacturing
- Paperboard game manufacturing
- Paperboard toy manufacturing
- Playing cards manufacturing

Exclusions/References
Units mainly engaged in:

- manufacturing non-paper stationery products such as pens and pencils are included in Class 2599 Other Manufacturing n.e.c.;
- manufacturing adhesive paper labels are included in Class 1529 Other Converted Paper Product Manufacturing;
- printing paper stationery are included in Class 1611 Printing; and
- publishing greeting cards or calendars are included in Class 5419 Other Publishing (except Software, Music and Internet).

Division C MANUFACTURING
Subdivision 15 PULP, PAPER AND CONVERTED PAPER PRODUCT MANUFACTURING
Group 152 CONVERTED PAPER PRODUCT MANUFACTURING
Class 1524 Sanitary Paper Product Manufacturing

This class consists of units mainly engaged in manufacturing sanitary paper-based products from paper or cellulose wadding.
Primary activities

- Disposable paper nappy (cellulose-based) manufacturing
- Facial tissue manufacturing
- Paper napkin manufacturing
- Paper towel manufacturing
- Sanitary napkin (cellulose-based) manufacturing
- Sanitary paper product manufacturing n.e.c.
- Tampon (cellulose-based) manufacturing
- Toilet tissue manufacturing

B.7 Timber merchandising

Division F WHOLESALE TRADE
Subdivision 33 BASIC MATERIAL WHOLESALING
Group 333 TIMBER AND HARDWARE GOODS WHOLESALING
Class 3331 Timber Wholesaling

This class consists of units mainly engaged in wholesaling timber (except firewood).

Primary activities

- Plywood wholesaling
- Timber dealing, wholesaling, (except firewood)
- Veneer, wood, wholesaling

Exclusions/References
Units mainly engaged in firewood wholesaling are included in Class 3739 Other Goods Wholesaling n.e.c.

Appendix B

B.8 ANZSIC classes with partial counts for industry occupations

For this Project, URS obtained ABS employment data relating to occupations in each of the industry classes included in the core scope of the Project. Key industry occupations in ANZSIC classes initially considered outside the scope of the Project were also reviewed and this led to inclusion of additional, partial employment counts.

Employment for industry-specific occupations were identified within the following ANZSIC classes and included in the estimates of employment by sector at a state and national level. Industry-specific occupations are identified in Appendix C.

Division O PUBLIC ADMINISTRATION AND SAFETY
Subdivision 75 PUBLIC ADMINISTRATION
Group 751 CENTRAL GOVERNMENT ADMINISTRATION
Class 7510 Central Government Administration

This class consists of units engaged in the setting of central government policy; the oversight of central government programs (excluding military defence); collecting revenue to fund central government programs; creating statute laws and by-laws (excluding creating case law through the judicial processes of civil, criminal and other court operation); and distributing central government funds.

Primary activities

- Administration, except justice and defence (central government)
- Financial and economic management except banking (central government)
- Governor-General's unit operation
- Legislation enactment (central government)
- Parliament operation (central government)
- Policy formulation and administration (central government)

Exclusions/References
Units mainly engaged in

- the management of commercial and business activities or activities other than central government administration are included in the classes appropriate to these activities;
- the operation or administration of judicial authorities, and the operation of civil, criminal and other courts, are included in Class 7540 Justice; and
- exercising regulatory control over specified activities are included in Class 7720 Regulatory Services.

Division O PUBLIC ADMINISTRATION AND SAFETY
Subdivision 75 PUBLIC ADMINISTRATION
Group 752 STATE GOVERNMENT ADMINISTRATION
Class 7520 State Government Administration

This class consists of units engaged in the setting of state government policy; the oversight of state government programs (except military defence); collecting revenue to fund state government programs; creating statute law and by-laws (excluding creating case law through the judicial processes of civil, criminal and other court operation); and distributing state government funds.

Primary activities

- Financial and economic management except banking (state government)
- Legislation enactment and enforcement (state government)

- Parliament operation (state government)
- Policy formulation and administration (state government)
- State government administration (except justice)
- State governor's unit operation

Exclusions/References
Units mainly engaged in

- the management of commercial and business activities or activities other than state government administration are included in the classes appropriate to these activities;
- the operation or administration of judicial authorities or commissions are included in Class 7540 Justice; and
- exercising regulatory control over specified activities are included in Class 7720 Regulatory Services.

Division K FINANCIAL AND INSURANCE SERVICES
Subdivision 64 AUXILIARY FINANCE AND INSURANCE SERVICES
Group 641 AUXILIARY FINANCE AND INVESTMENT SERVICES
Class 6411 Financial Asset Broking Services

This class consists of units mainly engaged in trading in stocks, shares or other financial assets on behalf of others, or in underwriting financial asset issues. Also included in this class are units mainly engaged in buying, selling and trading in mortgage documents for others.

Primary activities

- Commodity futures broking or dealing (on a commission or transaction fee basis)
- Financial asset broking service (on a commission or transaction fee basis)
- Stock broking or trading (on a commission or transaction fee basis)
- Trading of mortgages operation (on a commission or transaction fee basis)

Exclusions/References
Units mainly engaged in:

- investing money in financial assets such as shares, bonds, bills, etc, on own account are included in Class 6240 Financial Asset Investing; and
- providing investment management or advisory services, or arranging home loans for others on a commission or fee basis, are included in Class 6419 Other Auxiliary Finance and Investment Services.

Division P EDUCATION AND TRAINING
Subdivision 81 TERTIARY EDUCATION
Group 810 TERTIARY EDUCATION
Class 8102 Higher Education

This class consists of units mainly engaged in providing undergraduate or postgraduate teaching.

Primary activities

- Colleges of education operation
- Postgraduate school, university operation
- Research school, university operation
- Specialist institute or college
- Teachers' college operation
- Undergraduate school, university operation
- University operation

Appendix B

Exclusions/References
Units mainly engaged in:

- operating student halls of residence are included in Class 4400 Accommodation; and
- undertaking research in the agricultural, biological, physical or social sciences are included in Class 6910 Scientific Research Services.

Division P EDUCATION AND TRAINING
Subdivision 81 TERTIARY EDUCATION
Group 810 TERTIARY EDUCATION
Class 8101 Technical and Vocational Education and Training

This class consists of units mainly engaged in providing technical and vocational education and training. These units offer a large variety of courses covering a range of subjects or specialise in a particular field of education such as computer and business management training.

Primary activities

- Apprenticeship training program operation
- Business college and school operation
- Information technology training centre operation
- Institute of technology operation
- Professional and management development training
- Secretarial training
- Technical and further education college operation
- Technical college operation
- Vocational computer training

Exclusions/References

Units mainly engaged in

- providing undergraduate or postgraduate teaching are included in Class 8102 Higher Education;
- providing sports and physical recreation coaching not predominantly leading to tertiary qualifications are included in Class 8211 Sports and Physical Recreation Instruction; and
- providing education in the arts not predominantly leading to tertiary qualifications are included in Class 8212 Arts Education.

Division M PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES
Subdivision 69 PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES (EXCEPT COMPUTER SYSTEM DESIGN AND RELATED SERVICES)
Group 691 SCIENTIFIC RESEARCH SERVICES
Class 6910 Scientific Research Services

This class consists of units mainly engaged in undertaking research in the agricultural, biological, physical or social sciences. Units may undertake the research for themselves or others.

Primary activities

- Aeronautical research service
- Agricultural research service
- Biological research service
- Biotechnology research service
- Economic research service
- Food research service

- Industrial research service
- Medical research service
- Observatory research service
- Research farm operation
- Scientific research service
- Social science research service
- Space tracking research station operation

Exclusions/references
Units mainly engaged in:

- providing technical or engineering consulting services are included in Class 6923 Engineering Design and Engineering Consulting Services;
- providing market research or statistical services are included in Class 6950 Market Research and Statistical Services; and
- providing pathological services for the medical profession are included in Class 8520 Pathology and Diagnostic Imaging Services.

Division F WHOLESALE TRADE
Subdivision 33 BASIC MATERIAL WHOLESALING
Group 333 TIMBER AND HARDWARE GOODS WHOLESALING
Class 3339 Other Hardware Goods Wholesaling

This class consists of units mainly engaged in wholesaling other hardware goods (except timber or plumbing goods), including construction or building materials.

Primary activities

- Abrasive wholesaling (except abrasive cleansers)
- Awning wholesaling (except textile)
- Brick wholesaling
- Builders' hardware dealing (wholesaling) n.e.c.
- Building material dealing (wholesaling) n.e.c.
- Building paper and paper board wholesaling
- Cement wholesaling
- Cloth hoist wholesaling
- Door or window wholesaling
- Earthenware construction good wholesaling
- Fence post wholesaling (except timber)
- Fencing wire wholesaling
- Galvanised iron product wholesaling
- Garden tool wholesaling
- Hand tool wholesaling (including power operated)
- Insulating material wholesaling
- Lock wholesaling
- Mineral turpentine wholesaling
- Paint wholesaling
- Plaster wholesaling
- Plastic decorative laminated sheet wholesaling

Appendix B

- Plastic wood wholesaling
- Reinforcing wire wholesaling
- Roller shutter wholesaling
- Roofing material wholesaling
- Sand wholesaling
- Screening wire wholesaling
- Screens, window, wholesaling
- Stain wholesaling
- Stonecutter's tool wholesaling
- Swimming pool, below ground fibreglass, wholesaling
- Tile, ceramic, wholesaling
- Wall or ceiling board wholesaling
- Wallpaper wholesaling
- Wire netting wholesaling
- Wire or cable wholesaling (except electric cable)
- Woodworking tool wholesaling

Exclusions/References

Units mainly engaged in

- installing insulation, tiles or most other building components are included in the appropriate classes of Division E Construction;
- wholesaling abrasive cleansers are included in Class 3323 Industrial and Agricultural Chemical Product Wholesaling;
- wholesaling textile awnings are included in Class 3711 Textile Product Wholesaling;
- wholesaling non-ceramic floor tiles are included in Class 3731 Furniture and Floor Covering Wholesaling;
- wholesaling electric cable are included in Class 3494 Other Electrical and Electronic Goods Wholesaling; and
- wholesaling plumbing goods are included in Class 3332 Plumbing Goods Wholesaling.

Division F WHOLESALE TRADE
Subdivision 34 MACHINERY AND EQUIPMENT WHOLESALING
Group 341 SPECIALISED INDUSTRIAL MACHINERY AND EQUIPMENT WHOLESALING
Class 3419 Other Specialised Industrial Machinery and Equipment Wholesaling

This class consists of units mainly engaged in wholesaling specialised industrial machinery, parts or equipment not elsewhere classified.

Primary activities

- Distilling equipment wholesaling
- Dry-cleaning machinery or equipment wholesaling
- Food processing machinery or equipment wholesaling
- Forging machinery or equipment wholesaling
- Foundry machinery or equipment wholesaling
- Leather working machinery or equipment wholesaling
- Machine attachment, part or accessory wholesaling
- Machine tool wholesaling
- Metalworking machinery wholesaling
- Milk processing machinery or equipment wholesaling

- Mining machinery or equipment wholesaling
- Paper making machinery or equipment wholesaling
- Printing machinery or equipment wholesaling
- Rubber making or working machinery or equipment wholesaling
- Tanning machinery or equipment wholesaling
- Textile working machinery or equipment wholesaling
- Welding machinery or equipment, non-electric, wholesaling
- Woodworking machinery or equipment wholesaling

Exclusions/References

Units mainly engaged in

- wholesaling electrical or electronic equipment are included in the appropriate classes of Group 349 Other Machinery and Equipment Wholesaling; and
- wholesaling industrial machinery and equipment used in a wide range of industries are included in Class 3499 Other Machinery and Equipment Wholesaling n.e.c.

Division G RETAIL TRADE
Subdivision 42 OTHER STORE-BASED RETAILING
Group 423 HARDWARE, BUILDING AND GARDEN SUPPLIES RETAILING
Class 4231 Hardware and Building Supplies Retailing

This class consists of units mainly engaged in retailing hardware or building supplies.

Primary activities

- Carpenters' tool retailing
- Cement retailing
- Ceramic floor tile retailing
- Garden tool retailing
- Hardware retailing
- Lacquer retailing
- Lawn mower retailing
- Lock retailing
- Mineral turpentine retailing
- Nail retailing
- Paint retailing
- Plumbers' fittings retailing
- Plumbers' tools retailing
- Timber retailing
- Tool retailing
- Wallpaper retailing
- Woodworking tool retailing

Exclusions/References

Units mainly engaged in

- wholesaling builders' hardware or supplies (except plumbing supplies) are included in Class 3339 Other Hardware Goods Wholesaling; and
- wholesaling timber are included in Class 3331 Timber Wholesaling.

Appendix B

Division I TRANSPORT, POSTAL AND WAREHOUSING
Subdivision 46 ROAD TRANSPORT
Group 461 ROAD FREIGHT TRANSPORT
Class 4610 Road Freight Transport

This class consists of units mainly engaged in the transportation of freight by road. It also includes units mainly engaged in renting trucks with drivers for road freight transport and road vehicle towing service.

Primary activities

- Furniture removal service
- Log haulage service (road)
- Road freight transport service
- Road vehicle towing
- Taxi truck service (with driver)
- Truck hire service (with driver)

Exclusions/References

Units mainly engaged in

- operating road freight terminals are included in Class 5299 Other Transport Support Services n.e.c.;
- providing road freight forwarding services are included in Class 5292 Freight Forwarding Services;
- providing crating or packing for road freight transport are included in Class 7320 Packaging Services; and
- leasing or hiring trucks without drivers are included in Class 6619 Other Motor Vehicle and Transport Equipment Rental and Hiring.

C

Appendix C ANZSCO occupation codes

Figure C-1 lists the ANZSCO codes and occupation titles or groupings, with alternative occupation titles identified in the classification definitions, and by industry participants during project surveys.

Figure C-1 ANZSCO codes for occupations within the forest and wood products industry

ANZSCO code	Occupation	Alternative titles	Skill Level	Qualification level*
133511	• Production Manager (Forestry)*	• Forester, Forest Operations Manager, Harvesting Supervisor, Forest Manager, Harvest Manager (Forestry), Operations Manager (Forestry)	1	Bachelors degree, Advanced diploma
133512	• Production Manager (Manufacturing)	• Operations Manager, Sawmill Manager	1	Bachelors degree, Advanced diploma
234113	• Forester*	• Forest Scientist, Plantation Forester, Roading Manager, Regional Forester, Silviculture Officer, Planning Forester, Operations Manager, Resource Manager, Logistics Manager, Forestry Adviser, Forestry Consultant, Resource Supply Manager	1	Bachelors degree, Advanced diploma
323315	• Saw Maker & Repairer*	• Saw Doctor	3	Certificate IV
331211	• Carpenter & Joiner	• Process Worker, Carpenter, Joiner	3	Certificate IV
331212	• Carpenter	• Process Worker, Carpenter, Joiner	3	Certificate IV
331213	• Joiner	• Process Worker, Carpenter, Joiner	3	Certificate IV
362212	• Arborist	• Tree Surgeon	3	Certificate IV
393311	• Upholsterer	• Furniture Maker	3	Certificate IV
394000	• Wood Trades Workers	• Cabinetmaker, Joiner, Carpenter, Wood Machinist	3	Certificate IV
394111	• Cabinetmaker	• Furniture Maker	3	Certificate IV
394211	• Furniture Finisher	• Furniture Maker	3	Certificate IV
394212	• Picture Framer	• -	3	Certificate IV
394213	• Wood Machinist*	• Timber Machinist, Automatic Profile Sander Operator, Copy Lathe Operator, Edge Bander Operator, Jigmaker (Wood), Panel Saw Operator, Woodworking Machine Setter	3	Certificate IV
394214	• Wood Turner*	• -	3	Certificate IV
394200	• Wood Machinists & Other Wood Trades Workers	• Stackers, Dockers, Stackers, Graders,	3	Certificate IV
712916	• Paper & Pulp Mill Operator*	• Bleach Plant Operator, Dryerman/woman (Paper Mill), Fourdrinier Machine Operator, Inverform Machine Operator, Paperboard Machine Operator, Paper Rewinder Operator, Supercalender	4	AQF Certificate II or III

Appendix C

ANZSCO code	Occupation	Alternative titles	Skill Level	Qualification level*
		Operator (Papermaking)		
721112	• Logging Plant Operator*	• Chipper Operator, Feller Buncher Operators, Skidder Operator, Harvester Operator, Forwarder Operator,	4	AQF Certificate II or III
733111	• Truck Driver	• Log Truck Driver	4	AQF Certificate II or III
711311	• Paper Products Machine Operator*	• Carton Making Machinist, Embosser, Paper Making Machinist	4	AQF Certificate II or III
711312	• Wood Processing Machine Operator*	• Sawmill Operator, Sawyer, Kiln Operator, Lathe Operator, Sawmiller , Head Rig Operator, Finger Jointer Operator, Band Saw Operator, Beam Saw Operator, Cant Gang Sawyer, Resawyer, Ripsaw Operator, Debarker Operator, Docking Saw Operator, Log Preparer, Plywood and Veneer Repairer, Sawmill Moulder Operator, Veneer Production Machine Operator, Truss Plant Operator	4	AQF Certificate II or III
832211	• Product Assembler	• -	4	AQF Certificate II or III
839411	• Paper & Pulp Mill Worker*	• Pulp, Paper Making and Paper Products Labourer	5	AQF Certificate I
839412	• Sawmill or Timber Yard Worker*	• Timber Mill Worker, Wood Processing Worker	5	AQF Certificate I
839413	• Wood & Wood Products Factory Worker*	• Wood and Wood Products Labourer, Hardboard Factory Worker, Joinery Factory Worker, Particleboard Factory Worker, Plywood Factory Worker, Sawmill Worker	5	AQF Certificate I
839413	• Forestry & Logging Workers*	• Logging Assistant, Logging Crew, Silviculture Worker, Forest Worker	4	AQF Certificate II or III
841311	• Forestry Worker*	• Silviculture Worker, Fire Lookout, Tree Planter	4	AQF Certificate II or III
841312	• Logging Assistant*	• Log Maker, Log Grader, Landing Crew, Breakers-out	4	AQF Certificate II or III
841313	• Tree Faller*	• Hardwood Faller, Softwood Faller, Forestry Contractor	4	AQF Certificate II or III
841913	• Pest or Weed Controller	• Silviculture Contractor	4	AQF Certificate II or III
839312	• Product Grader	• Timber Grader	4	AQF Certificate II or III
899511	• Printer's Assistant	• -	4	AQF Certificate II or III
800000	• Labourers	• Process Workers, Line Workers, Packing Staff, Tree Planters, Storepersons	5	AQF Certificate I

ANZSCO code	Occupation	Alternative titles	Skill Level	Qualification level*
700000	• Machinery Operators & Drivers	• Forklift Drivers, Loaders, Process Workers, Mobile Plant Operators	4	AQF Certificate II or III
100000	• Managers	• General Manager, Human Resources Manager, Commercial Manager, Business Manager, Business Development Manager, Services Manager	1	Bachelors degree, Advanced diploma
500000	• Clerical & Administrative workers	• Accounts Payable, Accounts Receivable, Administration Officer, Human Resources Coordinator, Accounts Clerk, Production Planner	4	AQF Certificate II or III
200000	• Professionals	• Accountants, Information Technology Managers, Human Resources Managers, Research Officers, GIS Specialists, Estimators, Designers	1	Bachelors degree, Advanced diploma
600000	• Sales Workers	• Sales Representatives, Sales Clerks, Sales Officers, Export Clerk	4	AQF Certificate II or III
300000	• Technicians & Trades Workers	• Fitter Turners, Electricians, Engineering Technicians, Maintenance Technicians	3	Certificate IV

* Industry specific occupations included in counts of employment taken from ANZSIC classes identified in Appendix B8.

D

Appendix D Project survey

URS undertook a limited survey of industry organisations to obtain additional, complementary data for this project. The scope of this survey is outlined below.

Survey design

The design of the survey for this project was intentionally selective and targeted, on the basis that:

- In response to the Terms of Reference for this project, URS proposed to undertake a survey that would provide complementary data to existing data sets. This approach recognised there were established datasets with substantial data as well as recent and ongoing industry surveys of employment. URS undertook to review the existing datasets and processes and identify any gaps that could be addressed through a targeted survey;
- Industry consultation in September-October 2009 identified a consistent message that the industry was suffering to varying extents from "survey fatigue", at a time of substantial industry upheaval, and the consensus of industry views requested that our focus should be on utilising existing data sets and recent survey analyses to develop the database with modelling capabilities;
- Through the gap analysis, identification of additional data during consultation and subsequent discussion with the Advisory Committee, URS concluded the key "gap" or limitation on data that it could address through an industry survey was occupational profiles across industry sectors and subsectors, such that ABS data on employment could be aligned with indicative occupational profiles for each of the sectors and subsectors. Aspects of skills shortages and the extent of formal qualifications held by employees were also addressed;
- URS developed survey forms and discussed samples of these with the Advisory Committee in early 2010. There are separate survey forms for each sector, designed to pick up on the different production metrics and key industry occupations within each of the industry sectors covered by the database. The Advisory Committee recommended a change to a question relating to skills shortages, to clarify the nature of the shortage (i.e. an occupation shortage or the skills sets of existing employees). This change was made to the template survey form and incorporated in survey work conducted between February and April 2010.

The survey forms were developed on the basis that the surveys would be conducted, where possible, through face-to-face meetings with company representatives.

Survey coverage

In total, survey forms were provided to approximately 60 companies across the industry, incorporating over 100 separate 'facilities', representing distinct operational units or production facilities in various locations. Responses were received from 46 companies, accounting for around 80 separate facilities.

The survey coverage of resource dependent sectors is outlined in Table D-1. Coverage of downstream sectors from a production perspective was not quantified due to the variability of production metrics used.

Appendix D

Table D-1 Survey coverage - resource dependent sectors

Sector	National activity level (2008/09)[1, 2]	Survey coverage % of activity level
• Forest growing & management	— 5.3 million hectares of plantations and native forest under management for timber production	32%
• Harvesting & haulage	— 25.2 million cubic metres of logs harvested	10%
• Sawmilling & processing	— 19.9 million cubic metres of sawn timber and woodchip production	23%
• Panel & board production	— 1.7 million cubic metres of panel and board production	59%
• Pulp & paper production[3]	— 3.3 million tonnes of newsprint, printing and writing, household and sanitary, packaging and industrial paper and paperboard production	5%*

Sources:

1. National activity level for Forest Growing & Management derived from resource data provided by BRS for this Project;
2. National activity level for all other primary production sectors derived from ABARE 2010; and
3. All major pulp and paper manufacturers were approached for the survey – the coverage represents responses at the conclusion of the project in May 2010. Information presented in the Pulp and Paper Industry Strategy Group Final Report (2010) was referred for this sector.

Sample survey form

A sample of the industry survey form used in the Forestry Industry Database Project to obtain specific data on occupational profiles across sectors is presented below.

URS Forestry

Australia's Forest Industry Database

Summary information

Survey for Sector: **Sawmilling and processing (includes woodchip production and export)**

Organisation:

Address:

Post code:

Contact person:

Email:

Phone:

No organisations or facilities will be identified in the results reported

Description of facility:

Date of survey:

Enter year in appropriate box

Response provide applies to production and employment in the year:

Year ending June

Year ending December

Other:

If more than one facility is included in the response, please list additional site locations below

1	Town:		Postcode:	
2	Town:		Postcode:	
3	Town:		Postcode:	
4	Town:		Postcode:	
5	Town:		Postcode:	
6	Town:		Postcode:	

URS

Appendix D

URS Forestry

Australia's Forest Industry Database

Industry information request

Question 1.
Operational profile

The purpose of the following question is to obtain contextual information such that we can relate employment profiles to operational scale and type of activity.
Questions 2 and 3 relate specifically to the employment profiles for the enterprise.
All enterprise level information obtained through this survey will be treated as strictly confidential.

Product / Facility	Indicative annual production	Unit of measure	Wood inputs to production (indicative quantity or %)			
			Sawlog or veneer logs	Pulp logs	Sawmill residues	Other:

Question 2.
Total employment requirement for processing

For sawmilling please indicate which activities are included

Product / Facility	Total employment requirement	Green mill	Kiln drying	Dry mill	Timber treatment	Other:
		Yes No	Yes No	Yes No	Yes No	Yes No
		Yes No	Yes No	Yes No	Yes No	Yes No
		Yes No	Yes No	Yes No	Yes No	Yes No
		Yes No	Yes No	Yes No	Yes No	Yes No
		Yes No	Yes No	Yes No	Yes No	Yes No
		Yes No	Yes No	Yes No	Yes No	Yes No

Note: If you would prefer to use generic terms for Product/Facility, please feel free to do so

URS

Appendix D

URS Forestry

Australia's Forest Industry Database

Industry information request

Question 3.
Occupation/skills profile
Please outline the general occupation/skills profile – either by number of employees in each occupation group, or proportion of total employees
The occupations listed in Table 1 are based on ABS Census employment statistics for "Log Sawmilling" and "Wood Chipping" using the Australian and New Zealand Standard Classification of Occup
A glossary of industry specific occupations is provided in Annex 1
If you would prefer to describe occupations based on your organisation's job titles, please feel free to do so using the space provided

Table 1a: Industry specific occupations

Occupations	Alternative occupation titles	No. or % employees	Key skills or competencies required	No. or % employees with external qualification
Forester				
Wood Processing Machine Operator				
Wood Machinist				
Saw Maker and Repairer				
Timber and Wood Process Worker				
Sawmill or Timber Yard Worker				
Wood Turner				
Cabinetmaker				
Carpenter				
Joiner				
Other:				

Appendix D

Table 1b: Non-industry specific occupations

Occupations	Alternative occupation titles	No. or % employees	Key skills or competencies required	No. or % employees with external qualification
Managers				
Professionals				
Technicians and Trades Workers				
Clerical and Administrative Workers				
Sales Workers				
Machinery Operators and Drivers				
Labourers				

Any other comments regarding key/future employment and skills requirements for processing activities:

We appreciate your input, thank you.

Forest Industry Database Project Team

E

Appendix E Project survey outcomes

Survey responses provided three primary sources of data, which was used to validate and complement existing data from available publications. These sources of data comprised:

- Employment ratios, or multipliers, for each occupation in each industry sector;
- Occupational profiles for each industry sector; and
- Key skills and competencies identified by respondents in relation to their respective industry sector.

These survey data are summarised below.

Employment ratios

Employment ratios are utilised in the Outlook model for resource dependent sectors where employment requirements are linked to areas of forest under management (Table E-2), volume of logs harvested (Table E-3) or volume of log or wood product processed (Table E-4).

It is important to note the employment ratios, which reflect labour productivity within particular forest and wood products industry activities, should not be used for benchmarking purposes. The ratios are broad indicators of labour productivity, within which there is considerable variation between individual operations and facilities. This is due to differences between operations such as the location of operations, technology and equipment configuration, silviculture and harvesting practices, log size and quality. Employment ratios have been based directly on survey data, information from industry and existing publications.

Table E-2 Employment ratios - Forest growing and management

Forest growing and management	Per '000 ha	Source
Carbon sink forestry*	18.1	Survey data
Hardwood plantation management	3.3	Industry averages
Native forest management	0.8	Industry averages
Softwood plantation management	2.0	Industry averages

* Employment ratio reflects the recent emergence of this sub-sector. Survey respondents from this sub-sector noted expansion plans in the immediate future.

Table E-3 Employment ratios – Harvesting and haulage

Harvest and haulage	Per '000 m^3	Source
Hardwood plantation harvesting	0.04	Industry averages
Haulage contractors	0.14	Industry averages
Native forest harvesting	0.41	Industry averages
Softwood plantation harvesting	0.14	Industry averages

Appendix E

Table E-4 Employment ratios – Wood processing activities

Resource type	Facility type	Scale group	Lower scale	Upper scale	Per '000 m^3	Data sources
Biomass	Bioenergy Plant	Scale 1	-	100,000	0.20	Survey data
		Scale 2	100,000		0.12	Industry data
Hardwood	Board and Panel Manufacturing	Scale 1	-	50,000	2.17	Industry data
		Scale 2	50,000		0.50	Industry data
	Pulp & Paper Mills	Scale 1	-		1.19	Industry data
		Scale 2	-		0.83	Industry data
		Scale 3	-		0.65	Industry data
	Sawmills	Scale 1	-	25,000	2.09	Industry data
		Scale 2	25,000	50,000	1.29	Industry data
		Scale 3	50,000	100,000	0.83	Industry data
		Scale 4	100,000		0.58	Industry data
	Veneer Mills (Plywood and LVL)	Scale 1	-	50,000	2.39	Industry data
		Scale 2	50,000		1.05	Industry data
	Wood Chip Export Port	Scale 1	-	500,000	0.08	Industry data
		Scale 2	500,000		0.06	Industry data
Softwood	Board and Panel Manufacturing	Scale 1	-	50,000	1.21	Industry data
		Scale 2	50,000		0.90	Industry data
	Pulp & Paper Mills	Scale 1	-		0.63	Industry data
		Scale 2	-		0.24	Industry data
		Scale 3	-		0.05	Industry data
	Sawmills	Scale 1	-	25,000	1.66	Industry data
		Scale 2	25,000	50,000	1.28	Industry data
		Scale 3	50,000	100,000	1.37	Industry data
		Scale 4	100,000	400,000	0.81	Industry data
		Scale 5	400,000		0.43	Industry data
	Veneer Mills (Plywood and LVL)	Scale 1	-	50,000	2.10	Industry data
		Scale 2	50,000		1.25	Industry data
	Wood Chip Export Port	Scale 1	-	500,000	0.05	Industry data
		Scale 2	500,000		0.01	Industry data

Occupational profiles

Forest growing & management

ABS data

Occupation	ABS %	Revised %
Clerical & Administrative Workers	17.1%	17.1%
Forestry Worker	16.8%	16.8%
Professionals	15.2%	15.2%
Forester	11.6%	11.6%
Forestry & Logging Workers	9.1%	9.1%
Technicians & Trades Workers	9.0%	9.0%
Labourers	5.2%	5.2%
Logging Plant Operator	4.6%	4.6%
Production Manager (Forestry)	2.9%	2.9%
Machinery Operators & Drivers	1.5%	1.5%
Tree Faller	1.4%	1.4%
Truck Driver	1.3%	1.3%
Managers	1.2%	1.2%
Arborist	1.1%	1.1%
Wood Processing Machine Operator	0.6%	0.6%
Logging Assistant	0.5%	0.5%
Pest or Weed Controller	0.5%	0.5%
Sawmill or Timber Yard Worker	0.5%	0.5%

Project survey data

Occupation	URS %
Forestry Worker	27.0%
Forester	15.8%
Clerical & Administrative Workers	13.4%
Professionals	13.1%
Managers	10.8%
Supervisor, Forestry & Logging Workers	10.3%
Technicians & Trades Workers	4.0%
Machinery Operators & Drivers	2.3%
Logging Plant Operator	1.3%
Heavy Truck Driver	0.8%
Environment, Parks, & Land Care Manager	0.7%
Pest & Weed Controller	0.4%

Comments:
No change to ABS employment multipliers based on Project survey.

Total sum of all Forestry Workers and Logging related workers is 35%, which is similar to Forestry Workers and Supervisors in the survey results; Total sum of ABS Forester and Production Manager (Forestry) is similar to Foresters result in survey.

Harvesting & haulage

ABS data

Occupation	ABS %	Revised %
Truck Driver	21.5%	21.5%
Logging Plant Operator	14.3%	18.4%
Clerical & Administrative Workers	14.2%	14.2%
Machinery Operators & Drivers	13.6%	13.6%
Tree Faller	8.5%	8.5%
Technicians & Trades Workers	6.8%	6.8%
Logging Assistant	6.5%	6.5%
Wood Processing Machine Operator	3.3%	0.0%
Forestry & Logging Workers	2.7%	2.7%
Production Manager (Forestry)	2.1%	2.1%
Forestry Worker	2.0%	2.0%
Forester	1.9%	1.9%
Sawmill or Timber Yard Worker	1.6%	1.6%
Arborist	0.9%	

Project survey data

Occupation	URS %
Truck Driver	19.2%
Logging Plant Operator	18.3%
Machinery Operators & Drivers	16.4%
Clerical & Administrative Workers	14.4%
Tree Faller	8.1%
Technicians & Trades Workers	5.7%
Logging Assistant	5.4%
Production Manager (Forestry)	2.8%
Forestry & Logging Workers	2.6%
Forestry Worker	2.5%
Forester	2.5%
Sawmill or Timber Yard Worker	2.1%

Comments:

Changes to ABS employment multipliers based on Project survey were:

- Remove Arborists and Wood Processing Machine Operators; and
- Add allocations to Logging Plant Operators.

Appendix E

Sawmilling & processing

ABS data		
Occupation	**ABS %**	**Revised %**
Sawmill or Timber Yard Worker	22.0%	22.0%
Machinery Operators & Drivers	19.2%	9.3%
Wood Processing Machine Operator	16.5%	26.5%
Technicians & Trades Workers	10.4%	10.4%
Managers	9.6%	9.6%
Clerical & Administrative Workers	8.4%	8.4%
Sales Workers	3.4%	3.4%
Wood Machinist	2.0%	2.0%
Production Manager (Manufacturing)	1.8%	1.8%
Truck Driver	1.6%	1.6%
Labourers	1.3%	1.3%
Saw Maker & Repairer	1.2%	1.2%
Forester	0.4%	0.5%
Wood & Wood Products Factory Worker	0.4%	0.4%
Forestry & Logging Workers	0.3%	0.3%
Carpenter	0.3%	0.3%
Tree Faller	0.2%	0.2%
Cabinetmaker	0.2%	0.2%
Joiner	0.2%	0.2%
Forestry Worker	0.2%	0.2%
Product Assembler	0.2%	0.2%
Product Grader	0.2%	0.2%
Logging Plant Operator	0.1%	
Production Manager (Forestry)	0.1%	

Project survey data	
Occupation	**URS %**
Wood Processing Machine Operator	25.9%
Sawmill or Timber Yard Worker	17.9%
Clerical & Administrative Workers	15.3%
Managers	10.2%
Technicians & Trades Workers	7.3%
Machinery Operators & Drivers	3.6%
Forester	3.4%
Timber & Wood Process Worker	3.3%
Labourers	3.0%
Wood Machinist	2.9%
Professionals	2.6%
Saw Maker & Repairer	1.6%
Carpenter	1.4%
Other:	0.6%
Sales Workers	0.6%
Wood Turner	0.3%
Cabinetmaker	0.2%

Comments:

Project survey results suggested a higher proportion of Wood Processing Machine Operators, therefore changes made to ABS employment multipliers were:

- Allocate 10% of total allocation from Machinery Operators and Drivers to Wood Processing Machine Operators;
- Combine Foresters and Production Manager (Forestry); and
- Add Logging Plant Operators to Machinery Operators.

Timber products manufacturing

ABS data

Occupation	ABS %	Revised %
Cabinetmaker	17.6%	12.6%
Clerical & Administrative Workers	16.8%	11.8%
Technicians & Trades Workers	9.4%	9.4%
Machinery Operators & Drivers	8.1%	3.1%
Managers	7.8%	7.8%
Professionals	4.6%	4.6%
Wood Trades Workers	4.4%	4.4%
Carpenter	4.3%	4.3%
Joiner	3.4%	3.4%
Upholsterer	3.4%	3.4%
Product Assembler	3.0%	3.0%
Sales Workers	3.0%	3.0%
Wood Processing Machine Operator	2.9%	7.9%
Carpenter & Joiner	2.3%	2.3%
Wood Machinist	2.1%	2.1%
Production Manager (Manufacturing)	2.0%	2.0%
Sawmill or Timber Yard Worker	1.6%	1.6%
Labourers	1.4%	1.4%
Furniture Finisher	1.0%	1.0%
Wood & Wood Products Factory Worker	0.7%	0.7%
Wood Turner	0.1%	0.1%
Truck Driver	0.1%	0.1%
Estimators		5.0%
Frame & Truss Manufacturer		5.0%

Project survey data

Occupation	URS %
Wood Processing Machine Operator	17.6%
Timber & Wood Process Worker	10.4%
Frame & Truss Manufacturer	10.2%
Technicians & Trades Workers	9.7%
Clerical & Administrative Workers	8.0%
Managers	5.9%
Carpenter	5.6%
Sales Workers	4.9%
Machinery Operators & Drivers	4.4%
Estimators / Detailers	4.3%
Professionals	4.1%
Other:	3.7%
Sawmill or Timber Yard Worker	3.1%
Labourers	2.5%
Wood Machinist	2.5%
Joiner	2.2%
Cabinetmaker	0.8%
Saw Maker & Repairer	0.1%

Comments:

Changes made to ABS employment multipliers based on Project survey were:

- Allocate 5% of total allocation to Machinery Operators to Wood Processing Machine Operators;
- Allocate 5% of total allocation to Clerical/Administrative Workers (which includes activities such as production planning and estimating) to Estimators; and
- As Frame & Truss Manufacturers are not currently listed as an ANZSCO occupation, include in profile for modelling of future requirements.

Appendix E

Panel & board production

ABS data

Occupation	ABS %	Revised %
Machinery Operators & Drivers	33.9%	6.4%
Technicians & Trades Workers	16.8%	16.6%
Sales Workers	8.9%	8.9%
Managers	8.3%	8.3%
Wood Processing Machine Operator	6.4%	33.9%
Clerical & Administrative Workers	5.0%	5.0%
Sawmill or Timber Yard Worker	3.6%	3.6%
Production Manager (Manufacturing)	3.6%	3.6%
Labourers	3.0%	3.0%
Wood & Wood Products Factory Worker	2.8%	2.8%
Truck Driver	2.7%	2.7%
Professionals	2.2%	2.2%
Wood Machinist	1.4%	1.4%
Cabinetmaker	1.3%	1.3%
Saw Maker & Repairer		0.2%

Project survey data

Occupation	URS %
Wood Processing Machine Operator	47.8%
Clerical & Administrative Workers	12.6%
Managers	9.4%
Labourers	5.9%
Technicians & Trades Workers	4.9%
Timber & Wood Process Worker	4.2%
Sales Workers	3.1%
Other:	2.9%
Wood Machinist	2.6%
Professionals	2.0%
Sawmill or Timber Yard Worker	1.7%
Machinery Operators & Drivers	1.4%
Joiner	0.6%
Cabinetmaker	0.4%
Carpenter	0.2%
Saw Maker & Repairer	0.2%

Comments:

The major difference between ABS data and Project survey data was in Wood Processing Machine Operators and Machinery Operators and Drivers. Changes made to ABS employment multipliers were:

- Allocations to Wood Processing Machine Operators and Machinery Operators and Drivers were reversed; and
- As ABS data did not identify Saw Makers and Repairers, which would be required, this occupation was added on the basis of survey results and the allocation to Technicians and Trades Workers was reduced accordingly.

Pulp & paper production

ABS data

Occupation	ABS %	Revised %
Technicians & Trades Workers	22.3%	12.3%
Machinery Operators & Drivers	21.8%	11.8%
Labourers	11.0%	11.0%
Paper Products Machine Operator	8.6%	8.6%
Sales Workers	7.4%	7.4%
Clerical & Administrative Workers	6.7%	6.7%
Managers	4.9%	4.9%
Paper & Pulp Mill Operator	4.8%	14.8%
Paper & Pulp Mill Worker	4.7%	14.7%
Professionals	4.0%	4.0%
Production Manager (Manufacturing)	3.1%	3.1%
Truck Driver	0.6%	0.6%

Project survey data

Occupation	URS %
Paper Products Machine Operators	37.7%
Machinery Operators & Drivers	14.8%
Paper & Pulp Mill Operators	14.1%
Paper & Pulp Mill Workers	11.3%
Technicians & Trades Workers	7.7%
Professionals	5.6%
Clerical & Administrative Workers	4.7%
Other:	1.7%
Managers	1.3%
Production Managers	1.0%

Comments:

The major difference between ABS data and Project survey data was in Paper Products Machine and Paper Operators, Pulp Mill Operators and Machinery Operators and Drivers. As the survey results suggested more Pulp & Paper Mill Operators, changes made to ABS employment multipliers were:

- Allocate additional 10% from Machine Operators & Drivers; and
- Allocate 10% of Technicians and Trades Workers to Pulp and Paper Workers.

Timber merchandising

ABS data

Occupation	ABS %	Revised %
Sales Workers	26.2%	26.2%
Clerical & Administrative Workers	19.1%	19.1%
Managers	18.8%	18.8%
Machinery Operators & Drivers	13.6%	13.6%
Sawmill or Timber Yard Worker	7.0%	7.0%
Wood Processing Machine Operator	4.9%	4.9%
Truck Driver	4.2%	4.2%
Labourers	3.2%	3.2%
Professionals	1.8%	1.8%
Wood Machinist	1.3%	

Project survey data

Occupation	URS %
Sales Workers	29.4%
Clerical & Administrative Workers	20.1%
Labourers	18.4%
Machinery Operators & Drivers	17.8%
Managers	5.5%
Sawmill or Timber Yard Worker	2.9%
Wood Processing Machine Operator	2.5%
Professionals	0.8%
Estimators / Detailers	0.6%
Frame & Truss Manufacturer	0.6%
Wood Machinist	0.6%
Other	0.4%
Technicians & Trades Workers	0.2%

Comments:

No changes to ABS data – Project survey results for occupations representing a large proportion of employment were reasonably similar.

Appendix E

Key skills and competencies

The survey sought to obtain current information on key skills and competencies relating to specific occupations. However, the results are not consistent across all sectors. The most informative survey feedback relates to more general perspectives, which incorporated some reference to specific occupations. Selected comments that provide current insights from across the industry are summarised below:

Forest growing & management – Survey insights

- "*The (recent) demise of the Managed Investment Scheme (MIS) Industry has led to a number of suitable and qualified people to become available for future employment. Therefore, there is no foreseeable shortage of good people in the market for a job within our industry*"
- "*There are specific examples of a lack of experienced and trained harvesting contractors to thin/clearfall plantation forests";*
- "*In respect to Forester occupations - it is difficult to find staff with more contemporary skills and a broader knowledge base. It is also difficult to find staff with operational/forest management exposure in the field*";
- *"In respect to Manager occupations – it is difficult to find an appropriate balance between technical expertise and management skills*"; and
- "*There is a shortage of people with road construction and maintenance skills and a shortage of people looking to work in roading*."

Harvesting & haulage - Survey insights

- The key requirements for employment within this sector incorporate:
  - leadership skills;
  - a willingness to work in remote locations;
  - capacity to maintain compliance with certification/code of practice requirements; and
  - capacity to maintain compliance with OH&S and licensing requirements.

Sawmilling & processing – Survey insights

- *"Skills shortages have been addressed to an extent through training existing employees – for example, in Victoria, through timber training centres at Creswick, Yallourn and the East Gippsland TAFE*."
- A case study relevant to skills shortages, training pathways and industry initiatives:
  - In 2009, approximately 25 employees within a sawmilling enterprise were signed up to Certificate II and Certificate Ill in Sawmilling and Processing, under the Forest and Forest Products Training package;
  - A constraint on this training delivery was the lack of a qualified trainer and assessor. This was addressed through a partnership arrangement with an RTO. A senior sawmill operator had expressed an intention to leave the business and study to improve his skills so that he could move away from heavy work;
  - Working with the RTO, the company took the operator out of the production process, provided Certificate IV in Training and Assessing and developed a training plan. Once the plan was implemented, Contracts of training were signed and a schedule established; the employee then ceased working for the company and commenced employment with the training company;

  - This region now has a full time trainer and assessor in the Forest Training Package. The trainer attends the sawmilling site two days a week to continue training and assessing. The sawmill enterprise will look at continuing this initiative, with the intention of keeping the next trainer/assessor within the business.
- In respect to other observations from this industry sector:
  - Skills shortages have been created due to competition within the mining industry for trained or highly capable personnel;
  - Difficult to attract apprentices; and
  - Industry needs more saw doctors.

Timber products manufacturing – Survey insights

- "*Very difficult to find good wood machinists; noted that the two-year certificate course for wood machining represents a time lag ahead before more wood machinists are available.*"
- "*Greater mechanisation of manufacturing equipment will change skill requirements from manual labour to more analytical skills.*"
- "*There should be a greater emphasis on fit-for-purpose timber knowledge.*"
- "*Efforts needed to focus on training unskilled workers to use wood machines to cut, drill and edge timber products.*"

Panels and board production - Survey insights

- "*There is a shortage of reliable people that can provide high quality outputs, currently wanting to work in the industry. The workforce is currently being maintained by migrants or others on temporary work visas (notably from Pacific Islands).*"
- "*While carpenter and cabinet makers are employed as operators due to their previous experience using and working with wood and wood working machines, their previous skills are not used directly in the production of industrial panels.*"

Pulp and paper production – Survey insights

- Key skills requirements within this sector include:
  - operating high speed packaging equipment plus support level maintenance skills; and
  - leadership skills plus high level technical understanding of processes and equipment
- *"Employees within this sector need to attain nationally recognised skills against the Pulp & Paper Industry Training Package.*"

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