

Collection of Waste Timber from Melbourne Businesses

Part 2: Infrastructure Requirements

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Prepared by:
Nolan ITU Pty Ltd

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FOREWORD

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This Report, *The Collection of Waste Timber from Melbourne Businesses Report - Part 2*, has been prepared by Meinhardt (Vic) Pty Ltd for EcoRecycle Victoria. This report details research aimed at identifying and assessing infrastructure requirements for the greater diversion of timber waste from landfills metropolitan Melbourne.

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On behalf of
MEINHARDT (VIC) PTY LTD

EXECUTIVE SUMMARY

INTRODUCTION

This report presents the research undertaken to identify and assess the constraints and infrastructure requirements for maximising the diversion from landfill of timber waste generated by businesses.

This report:

- Identifies existing and proposed facilities and collection systems in the metropolitan Melbourne region that divert timber waste, and details the operations undertaken at these facilities
- Identifies and assesses the viability of options for greater diversion of timber waste from C&I and C&D sources for reuse, recycling and mulching
- Identifies and assesses the infrastructure requirements across metropolitan Melbourne for maximising diversion of timber waste from landfill
- Provides cost estimates and recommendations for systems and infrastructure that will facilitate the diversion of timber from landfill

Although this study primarily aims to develop systems for diverting more timber from landfill, it places an emphasis on the development of systems to divert waste timber to “higher-end” uses such as reuse and recycling.

CURRENT PRACTICES

Research was undertaken to determine how timber wastes are currently being managed in the metropolitan area. Meinhardt also contacted businesses that had previously expressed interest in timber waste recycling and had been provided contact details for timber collection and recycling services during a previous study to determine whether many of these businesses had changed practices.

The following situations were identified:

- Most of Melbourne has access to timber drop off facilities for small vehicle traffic at transfer stations. These facilities generally divert timber waste (predominantly domestic hardwood fencing) to green organics processing operations or to areas where timber can be scavenged/ picked over on an ad hoc basis, with the residue being landfilled.
- Vehicles with a Tare weight of less than 1.6 tonne must use a transfer station as they are excluded from the face of landfills). This means that most self-haul domestic timber waste is handled through transfer stations, creating an opportunity to divert this timber.
- Large vehicle loads of C&I and B&D waste typically by-pass transfer stations (and therefore drop-off facilities) taking material directly to landfill. Some companies separate timber waste for recycling.
- Most larger dimensional timber, and in particular timber fittings, from building sites has traditionally been diverted for reuse.
- Operations in the Northern (Moss Rock at Epping) and South Eastern (WM Waste Management at Dandenong) Regions are targeting C&I timber, diverting material to both mulch production and recycled-content particleboard manufacturing. A smaller facility in the Lilydale area (also operated by WM Waste Management) diverts and processes some waste timber. Facilities in the Western (Twiggs and Calleja in the Brooklyn area) and South Eastern (John Benedict on Grange Road) Regions are stockpiling timber, but only a small amount of this material is currently being processed. Organic Recyclers at Brooklyn also receive some timber waste for inclusion in composting.
- A number of waste collection and transport companies are diverting clean loads of C&I timber waste to mulching operations, including those that serve the particleboard manufacturing market
- Only two out of 50 sources of C&I waste that had previously expressed interest in timber waste recycling had altered practices in favour of recycling. The main reasons given for not

recycling were that it was not economically viable or that they had not had time to make the change.

- The incidence of treated pine, laminated and particleboard timber waste is increasing. At present there are no management pathways for these wastes other than landfill.

REGIONAL DEVELOPMENTS

Interviews were conducted with Regional Waste Management Group Executive officers or their representatives to determine Regional directions for timber waste diversion. These interviews revealed the following.

The Northern Regional Waste Management Group is committed to diverting more timber waste from landfill, with materials being separated for reuse, recycled content particle board manufacture, and mulching. The current Mossrock facility in Epping and neighbouring sites are seen as the logical location to expand timber waste diversion in the Region. Transfer station upgrades in the Region will include expanded areas to receive separated timber waste. It is anticipated that sorting and processing will occur at the Epping site.

The Western Regional Waste Management Group is also committed to diversion of timber waste for reuse, recycling and mulching. The Region has two operating facilities at Altona North and Brooklyn that are currently mainly stockpiling timber with some mulching being conducted. A portion of the stockpiled material is suited to processing for the Laminex Industries market. A facility being developed by Alex Fraser Pty Ltd in the Laverton area will process (mill) unsorted B&D (and possibly C&I) waste and use air sifting technology to separate fractions for reuse in recycled building products. The timber component of this stream may be able to be used in mulches/composts or diverted to gasification (or other energy recovery) if such a facility is established.

The South Eastern Regional Waste Management Group facilities divert some timber waste for either mulching or landfilling after *ad hoc* scavenging. A private operator, WM Waste Management, is operating a Dandenong facility that captures significant amounts of C&I and C&D timber, some of which is sold to the particleboard manufacture market, but is mostly sold for landscaping mulches and compost. According to earlier studies, the South Eastern Region is apparently the most significant source of waste timber, and in particular clean softwood, in the metropolitan area. Also, facilities in the South Eastern Region receive much of the C&I and C&D waste from the Eastern Region. There is apparently great potential for increasing timber waste diversion through the provision of more adequate collection, separation and processing facilities within the South Eastern Region. According to the draft South Eastern Regional Waste Management Plan, the South Eastern Region proposes to establish a Regional transfer station in ten to fifteen years time once landfill airspace in the Clayton South area is exhausted. An upgrade of the transfer station at the Clayton South "Camberwell/Boroondara" has been undertaken and this diverts some waste timber for scavenging and mulching.

The Eastern Regional Waste Management Group (Least Waste) is committed to diverting timber waste from landfill, but sees limited potential for recycling, and anticipates that most diverted timber will be mulched as with the green waste stream. The Regional Group has previously investigated diverting suitable softwoods for particleboard manufacture, but concluded that there are insufficient volumes to warrant separate processing streams. This conclusion contradicts the conclusions of previous studies by Meinhardt that estimated significant softwood waste generation in the Eastern Region. However, it is possible that Least Waste's position is influenced by a focus on municipal facilities in the Region that receive mainly domestic and small business self-haul and receive little C&I and C&D waste transported by commercial waste disposal contractors. The Eastern Region has few operating landfills and much of the C&I and C&D waste is transported by commercial waste haulage companies directly to landfills outside of the Region (mainly in the South Eastern Region). WM waste management also operate a facility in Lilydale that captures some C&I and C&D waste from the Region. Least waste (the Eastern Regional Waste Management Group) is in the process of identifying and contracting out a site for a Regional transfer station. At the time of writing, least waste anticipates that waste timber will

be diverted to processing as part of the green waste stream. Whether the Regional transfer station diverts material for recycling will apparently depend on the successful tender for supplying and operating the facility.

MAXIMISING TIMBER WASTE RECOVERY

Figure E1 shows possible management pathways for timber. This model was used to identify the most significant opportunities for, and constraints to, diverting timber from landfills, and to develop and assess possible systems for maximising timber waste diversion.

Opportunities and Constraints

The main constraints for all types of timber waste recycling and reuse operations are:

- Contamination of timber received from source and at drop-off,
- Lack of awareness by the sources of timber of the availability and potential financial benefits of timber diversion services/systems,
- Lack of sufficient financial incentives for sources to separate timber because landfill waste disposal charges are not high enough for many to separate timber.

The main constraints to “high end” recycling of suitable timber for particleboard manufacture are the:

- Lack of drop-off facilities that allow separation of clean softwood from other timber waste streams in most parts of Melbourne, but particularly the Eastern and South Eastern Region.
- Distance to market (Ballarat) and corresponding transport costs. A financial assessment conducted suggests that it is only likely to be economic viable for loads of chipped material of 25 tonnes or greater (ie. 100 cubic metres) to be transported from Melbourne to Ballarat. The assessment also suggests that processing facilities in the Northern and Western Regions could profitably serve the Laminex Industries market, while to the East of Melbourne are likely to need to charge gate fees for received timber to cover the additional transport costs.
- Lack of suitable site infrastructure to process, store and load material so that processed material meets market specifications.

The main constraints to mulching and composting operations are the:

- Markets for products (particularly compost products – processors report a strong demand for clean timber mulches)

The main barrier to other options for timber waste management such as gasification, fuel manufacture and production of activated carbon is that there are no such operating facilities established to receive Melbourne’s timber waste.

Opportunities for EcoRecycle Victoria to work to overcome these constraints include the:

- Facilitation of the establishment and improvement of timber waste processing operations by:
 - Promoting and assisting Regional Waste Management Groups and private operators to establish and upgrade of Regional timber processing facilities.
 - Providing operators with assistance in promoting awareness of the existence of such facilities.
 - Facilitating the development of markets for waste timber.
 - Making operators aware of potential markets for diverted timber waste.
- Promotion of the improvement and establishment of timber waste drop-off facilities by:
 - Encouraging Regional Waste management Groups and their member councils to upgrade transfer stations to include timber waste drop-off areas, so that all of Melbourne has access to timber drop-off facilities within 10km.
 - Encouraging all landfill operators to provide timber drop-off facilities for large vehicle loads of C&I and B&D waste.

- Encouraging timber waste drop-off facilities to allow hauler/source separation of timber into separate “clean softwood” and “clean other/mixed” skips, with service users being educated to use the systems and to dispose of contaminated and unsuitable timber as general waste. This should reduce sorting and transport costs for the recycled-content particleboard stream.
 - Assisting the operators of municipal and private timber waste drop-off facilities to educate service users about correct use of services.
 - Promoting the adoption by drop-off facilities of financial incentives for service users to separate timber and deliver uncontaminated loads.
- Promotion of source separation of timber at C&I and B&D premises with direct haul to processing facilities through:
 - Assistance to premises and waste collection contractors wanting to install dedicated skips or other systems for the diversion of timber waste to processing facilities.
 - Assistance to collection companies providing dedicated timber waste collection services to promote their services to C&I and B&D sources.

The viability of transporting material to Ballarat could be improved if vehicles are able to backload materials to Melbourne. EcoRecycle Victoria may be able to facilitate links between Melbourne companies hauling timber to Ballarat and Ballarat recyclers needing materials delivered to Melbourne.

Infrastructure Needs

Collection Systems

Transfer stations and other drop-off sites that receive separated timber waste were identified and are shown in Figure B1 (Appendix B). This suggests that most of Melbourne has access to timber waste drop-off facilities. However, transfer stations typically service smaller vehicles that are not permitted into landfill faces and large vehicle loads of C&I and B&D waste will typically by-pass these facilities and be delivered direct to landfills. The majority of the transfer station facilities do not separate timber for “higher end” recycling and mainly capture self-haul domestic timber waste. Many of these facilities stockpile timber wastes and allow ad hoc scavenging, with the residue being periodically landfilled or mulched. Other facilities process timber waste as a part of their green organics mulching operations.

A range of options for diverting waste timber from landfill were considered, and the model shown in Figure E2 was developed to describe the preferred system. There are three components to this system, which are shown in Figure E2 as Components A, B and C. This shows two options for small vehicle traffic. The first (Component A) where clean softwood/pine is separated from other timber for transport to a central timber processing facility, with the “other timber” stream being processed as part of the drop-off facility or Regions green organics processing facility. It is suggested that this system be adopted at drop-off facilities with sufficient room for separate drop-off areas for two streams of timber waste and/or access to an existing green organics processing operation. The second option for small vehicle timber waste (Component B) involves all clean timber being dropped-off in one area/skip and transported to a central timber waste processing facility for sorting and processing. This is recommended for transfer stations that do not have adequate room for storing two streams of timber and/or do not have access to a green organics processing facility. The third component of the system (Component C) is for larger loads of C&I and B&D timber waste. This system would involve source separation of timber with delivery by the generator or their waste collection contractor direct to the central timber processing facility. Loads of C&I and C&D with high timber content (ie. not source separated) might also be received at central processing facilities with gate fees being charged to cover the costs of sorting.

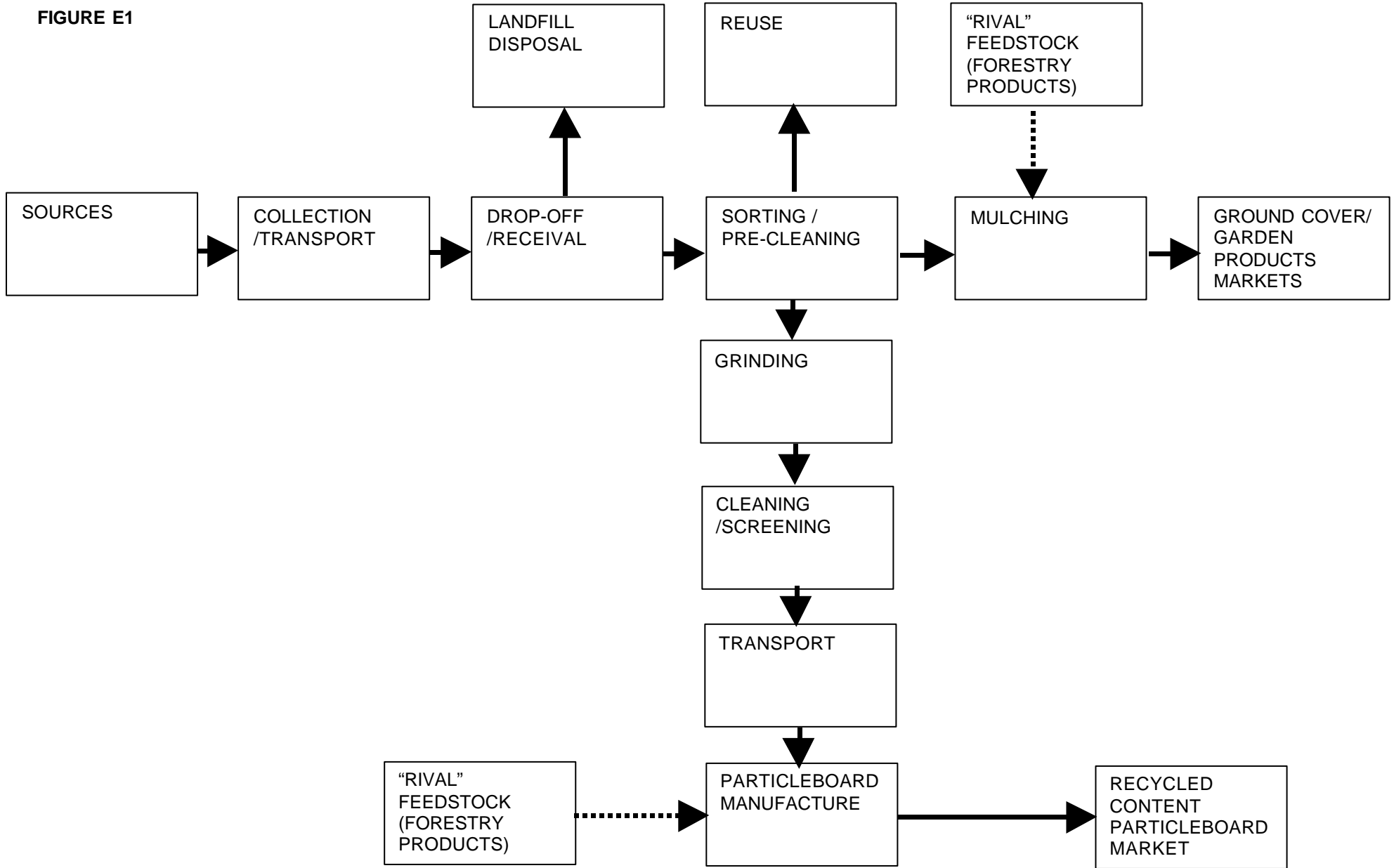
Processing Systems and Facilities' Locations

Investigations and financial assessment suggests that large scale central processing facilities will be more efficient than small scale processing at individual transfer stations. This is because of

the limited storage space at many transfer stations and the economies of scale of large grinders (with capacities of 100 cubic metres per hour and capable of processing large pieces of hardwood) versus smaller grinders. Large grinders are more efficient provided a large volume of timber is supplied for processing. Where smaller grinders are already in operation for green organics processing it is recommended that lighter pieces of hardwood timbers (such as fence palings) should be processed as part of this stream.

Another infrastructure requirement for processing clean softwood for particleboard manufacture includes hardstand or sealed areas for stored unprocessed and processed material. This is to keep material free of soil and gravel contamination picked up during loading. The sealed area could possibly be a container or skip, although it is not likely to be practical to load material out of containers directly to processing equipment and then constantly supply fresh containers for processed material.

FIGURE E1



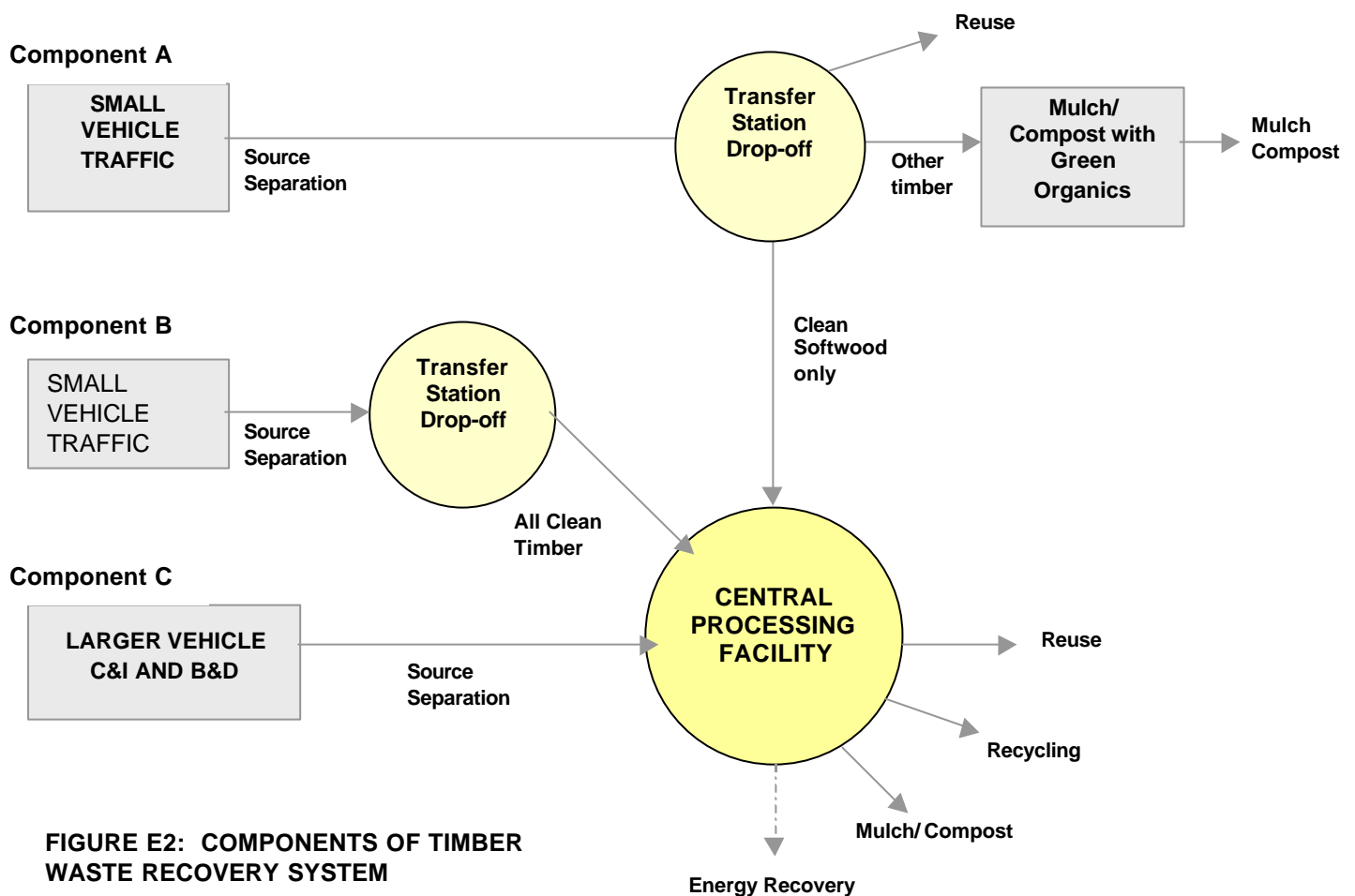


FIGURE E2: COMPONENTS OF TIMBER WASTE RECOVERY SYSTEM

It has been suggested that storage areas for processed material should also be rooved and possibly walled to protect material from the elements. However, the cost of such infrastructure may be prohibitive, and it is recommended that such infrastructure only be provided if it shown to be viable and necessary. Reduced holding times for stored materials should largely eliminate the need for housing of processed materials.

It is recommended that to divert vehicles carrying C&I and B&D timber waste from landfills central drop-off and processing facilities should be located near landfills receiving these wastestreams. Figure B2 in Appendix B shows actual, proposed and suggested sites for such facilities.

It is recommended that the following locations and existing facilities are used as processing facilities, with transfer stations feeding them:

- Northern Region – The Mossrock processing facility at Epping is an obvious candidate for the location of a regional facility, with the Darebin and other transfer stations serving as drop-off points for smaller C&I, B&D and domestic loads.
- Western Region – A site such as the Twigg Group regional transfer station and landfill, or Calleja Transport recycling and reprocessing facilities located at Altona North could be developed as regional facilities.
- South Eastern Region – a regional facility is needed in the Greater Dandenong Area. The WM Waste Management’s Dandenong facility is potentially a site. Alternatively, the Bayside transfer station could be developed, although it may not be central enough.

- Eastern Region – There are number of processing facilities that could serve this area including, WM Waste Management’s Lilydale or Dandenong facilities, the proposed Regional Transfer Station in the Kilsyth area, or the MossRock Epping Facility. It is recommended that drop-off facilities for larger vehicles be established in the Knox or Whitehorse areas because there is an apparent concentration of C&I sources of clean pine timber in the area. Source separated clean pine could then be transported to a processing facility.

It is recommended that all transfer stations provide facilities for the drop-off of timber. It is also recommended that facilities where it is observed that significant volumes of pine are received should trial providing separate collection bins for clean pine. If sufficient volumes are collected this could be transported to processing facilities.

It is recommended that existing collection, transportation and reprocessing systems are promoted and given assistance. Identified specific needs and opportunities for each Region include:

Northern Region:

- Mossrock Epping - Supply of sealed storage areas for chipped material and assistance with net-working and marketing, particularly the drop-off and collection services
- Darebin transfer station – Two 40m³ Bins for source separated clean pine and clean other/mixed timber with retaining walling for the drop area
- Banyule transfer station – Two 40m³ Bins for source separated clean pine and clean other/mixed timber with retaining walling for the drop area

Western Region

- Twigg Group- Assistance in promoting awareness of the facility’s existence to C&I and B&D sources of timber waste. Laminex Industries may be interested in having material stockpiled at the site sorted.
- Calleja Transport - Assistance with network and market development for collection and drop-off. Allocation of funds for sealed storage facilities. Funding to further develop timber-processing equipment is already available and being used.

South Eastern Region

- WM Waste Management – Assistance in promoting service to sources of waste timber.
- Possible establishment of drop-off facilities for large vehicle loads of C&I and B&D timber waste at Bayside transfer station.

Eastern Region

- Support for the establishment drop-off facilities for large vehicle loads of C&I and B&D timber at the proposed Regional transfer station (to be established in the Kilsyth area), with processing at this or another Regional site (possibly the WM Waste Management Lilydale operation) or the Northern or South Eastern Facilities.
- Possible upgrade of Whitehorse or Knox transfer station as a drop-off point for large vehicle loads of C&I and B&D timber, with material being diverted to processing facilities at Dandenong or Epping.

It is recommended that greatest priority be given to developments in the Northern Region, with timber from the Northern, Eastern and possibly South Eastern Regions being diverted to this facility. Up-grades of drop-off facilities are recommended for all regions to promote source separation of timber waste. Where there are sufficient volumes of clean softwood, provision for separation of timber into “clean softwood” and “clean other” streams should be considered.

Priority should also be given to the establishment of a Regional processing facility in the Western Region which has a number of sites successfully diverting, but not processing and marketing, C&I and B&D timber.

Establishment of Northern and Western processing sites are favoured because of existing operations and their relative proximity to timber recycling markets in Ballarat. Establishment of facilities in these Regions will allow determination of whether additional processing sites are required in the Eastern and South Eastern Regions.

EDUCATION NEEDS

Waste Management Operators

The study identified an opportunity for EcoRecycle Victoria to educate the operators of waste management collection and drop-off services about market opportunities and product specifications for waste timber.

C&I Sources

There appears to be a strong need for the promotion of the availability and benefit of C&I timber waste recycling services. It is possible that individual firms that do not feel that they generate enough timber to warrant source separation might be invited to share collection services with neighbouring businesses. Areas with high concentrations of light industries that collectively generate large quantities of timber could be encouraged by collection companies to form part of collection rounds.

It is recommended that waste generators are educated, with a focus on particular industry groups and associations, such as carpenters and joiners, furniture manufacturers builders and elements of the construction industry. Key messages to be communicated include:

- The availability and locations of markets for timber.
- The availability and location of transfer stations and processing facilities accepting timber waste for processing
- The availability of collection services for source separated timber waste for processing
- Potential cost savings through source separating timber of collection or delivery to timber drop-off and processing facilities.

It is recommended that EcoRecycle Victoria provide assistance to waste collection firms involved in diverting timber waste to processing facilities to promote their services. This assistance may include provision of information to major sources of timber and possibly providing assistance to collection companies that express interest for infrastructure such as dedicated skips for waste C&I timber source separation and collection.

General Community

Those consulted indicated that most of the small vehicle traffic timber waste received and diverted at transfer station drop-off facilities is hardwood fencing from domestic sources. Some smaller amounts of clean and treated pine is received from smaller C&I and B&D operations. Diverted untreated timber is typically mulched as part of green organics processing operations or made available for scavenging on an ad hoc basis. However, it may be possible to divert timber suitable for recycled content particleboard manufacture at some facilities. It is recommended that EcoRecycle Victoria support the trial of drop-off facilities where hauler separation of diverted timber is encouraged through the provision of two separate labelled areas; one for "Clean untreated pine" and the other for "Other clean untreated timber". It is recommended that the clean pine drop-off is a skip that will allow collection and transport to processing facilities. The "Other timber" drop-off area could be a skip or simply a stockpile area, depending on where and how the green organics processing operation took place. This system would allow pine waste to be diverted to recycling markets and the other material to be processed as part of green organics processing programs. It is recommended that this trial be conducted at a transfer station in the Eastern or South Eastern Regions in areas where there are a concentration of smaller C&I premises likely to generate suitable clean pine waste. It is suggested that Knox or Whitehorse transfer stations may be suitable sites for such a trial.

In the event that the trial successfully diverts economic loads of pine waste, it is recommended that other transfer station operators are encouraged to assess the quantities of pine timber in their timber waste stream, and if there is a significant portion, introduce similar systems for diverting pine timber. EcoRecycle Victoria could provide assistance for the upgrade of facilities that would require additional bins and, in most cases, additional drop-off area with a retaining wall for the “drop”. It is recommended that timber is dropped into bins rather than onto the ground as this will reduce handling costs prior to transport to processing operations. In the event that such “two-bin” systems are widely introduced, EcoRecycle Victoria could assist by creating and promoting standardised recycling signs for the two streams of timber for display at transfer stations and landfills.

MARKET DEVELOPMENT

A major constraint to greater levels of timber waste recycling appears to be limited viable markets for recovered timber products. The market demand for timber mulches is apparently strong. However, while there is potentially a high value use in recycled content particleboard (currently paying \$50 per tonne delivered) the distance to this market from Melbourne makes this marginal or non-viable in many areas unless a gate fee is charged for receiving waste timber. Composting operations report periodic difficulties in selling products at prices that cover production costs.

It is recommended that EcoRecycle Victoria encourages and assists the investigation and establishment of alternative markets such as:

- Promotion of clean timber mulch and compost products
- energy recovery
- more local (Melbourne based) recycled-content timber product manufacturers.

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APPENDIX A Businesses consulted who previously indicated an interest in waster timber recycling

APPENDIX.B Figure B1 Existing Facilities.
Figure B2 Recommended Locations of Processing Facilities and Transfer Stations

APPENDIX C Site and Facility Inspections

APPENDIX D Business and Municipal Councils Surveyed for Recycling Practices

1. INTRODUCTION

This report presents the research undertaken to identify and assess the constraints and infrastructure requirements for maximising the diversion from landfills of timber waste generated by businesses.

This study:

- Identifies existing and proposed facilities and collection systems in the metropolitan Melbourne region that divert timber waste;
- Details the operations undertaken at these facilities
- Identifies and assesses the viability of options for greater diversion of timber waste from C&I and C&D sources for reuse, recycling and mulching/composting
- Identifies and assesses the infrastructure requirements across metropolitan Melbourne for maximising diversion of timber waste from landfill
- Provides cost estimates and recommendations for systems and infrastructure that will facilitate the diversion of timber from landfill

Although this study primarily aims to develop systems for diverting more timber from landfill, it places an emphasis on the development of systems to divert waste timber to “higher-end” uses such as reuse and recycling.

The primary local market for waste timber for particleboard manufacture, Laminex Industries, is based in Ballarat and requires predominantly clean softwood for reprocessing. Current usage is in the order of 15,000 tonnes per annum, and Laminex Industries could, and would like to, increase usage to 25,000 tonnes per annum, but is having difficulty in obtaining sufficient supply. This report includes discussion of the constraints to better servicing this and other markets. It also discusses opportunities for overcoming these constraints.

2. CURRENT PRACTICES

2.1 SOURCES, CONCENTRATIONS AND TYPES OF TIMBER WASTE

Research was undertaken to identify the source and concentration of different types of timber waste, with particular emphasis on timber suited for recycling by particleboard manufacturers.

Major sources of timber waste from the Commercial and Industrial (C&I) sector are:

- Furniture manufacturers
- Housing framing pre-fab. manufacturers
- Sawmill operators
- Timber and hardware wholesalers and large retailers
- Vehicle manufacturing industries that import components

These sources generate large quantities of untreated softwood off-cuts and pallet and crates that are suited to repair/reuse, mulching, or recycled-content particle board manufacture.

The Construction and Demolition (C&D) sector is also a significant contributor to the timber waste stream. Much of the timber from demolition sites is hardwood or treated and painted timbers unsuited to recycling for particle board manufacture. Construction sites can be a source of untreated softwood.

A previous study by Meinhardt in 1997 of pine waste timber generation across Melbourne found that:

- Within the South Eastern Region the municipalities of Greater Dandenong, Kingston and Monash produced 23,300 cubic metres a year, making up approximately two thirds of the total 36,400 cubic metres of pine waste off-cuts produced within the South East Regional Waste Group's catchment.
- Within the Northern Region Waste Management Group area the municipalities of Darebin, Whittlesea, Hume and Moreland produce 26,200 cubic metres of an annual total of 30,000 cubic metres of pine for the catchment.
- The City of Knox was the largest waste timber producer within the Eastern Region, contributing 13,100 cubic metres to the total of 26,500 cubic metres.
- The Cities of Brimbank, Moonee Valley and Yarra produced 12,900 cubic metres of an annual total of 19,100 cubic metres of pine generated within the Western Region Waste Management Group's catchment.

These figures suggest that the South Eastern and Northern Regions have the greatest opportunity for timber waste collection systems and facilities for the diversion of softwood timber suited to particleboard manufacture. The South Eastern Region also contains the Cranbourne Growth corridor, and is therefore likely to generate significant quantities of timber from construction sites. Growth corridors also exist in the Northern and Western Regions, suggesting significant quantities of construction waste timber in these areas also. The Northern, South Eastern and Western Regions are also likely to generate significant quantities of waste timber from transport pallets and crates.

2.2 EXISTING MARKETS

There are a number of potential markets for timber waste from C&I and C&D businesses. Applying the waste minimisation hierarchy, these options can be ranked as:

- **Reuse.** Reuse is the preferred option for diverted timber. At the “high” end of the market, this involves the diversion and sale of high quality timber, typically larger structural timber. Research has revealed that most of this timber is already diverted before it enters the wastestream. A potential reuse for lower grade pallet timbers identified by this study is the diversion and repair of non-returnable pallets (particularly hardwood pallets) for reuse. Several timber drop-off facility operators indicated that timber was stockpiled for people to salvage on an *ad hoc* basis, with the residue being mulched or landfilled.
- **Recycling.** The main focus of this project is the diversion of waste timber for recycling for higher end uses such as MDF manufacture. Timber truss and pine furniture manufacturers, construction sites, and softwood timber pallets and packing crates from large importers (such as automotive manufacturers) and small and medium size businesses are the primary targets for softwood suited to MDF manufacture.
- **Mulching** for groundcover mulch or compost feedstock. Increasingly, timber waste from domestic sources is diverted to green waste mulching operations. Some clean softwood and hardwood from industrial sources is also chipped by specialist firms to produce groundcover mulches.
- **Use for fuel.** Many timber waste generating businesses and drop-off facility operators consulted reported that stockpiles of timber are left to be “picked over” on an *ad hoc* basis by people seeking firewood for domestic heating. This is considered a low grade use for waste timber, and may have potential health risks if people use chemically treated or painted timbers. The burning of seasoned, aged wood is likely to be preferable to the use of unseasoned or green timber from an air quality perspective. A potential market for recycled timber is manufacture into fuel pellets, with timber being chipped and compressed into pellets. A Melbourne door manufacturer has imported off-the-shelf pressing technology that converts waste sanding dust and fine sawdust into fuel pellets. These are sold back to a timber supplier to fuel drying kilns. Some of the pallets are also sold for domestic heating.
- **Other opportunities** requiring further investigation include:
 - the potential for timber waste to be converted into activated carbon for use in filter systems;
 - Gasification, which involves the thermal decomposition of organic wastes in an anaerobic environment with gas capture to power generators. EDL Pty Ltd are constructing a pilot gasification facility in Woolongong NSW and have expressed interest in investigating the viability of similar facilities in Victoria.
 - the use of used particleboard and laminates to stabilise the calorific value of liquid wastes destined for energy recovery in cement or other EPA approved industrial uses. This is an untried application that would require research and development if it were to be considered.

2.3 CURRENT PRACTICES BY GENERATORS

Telephone interviews were conducted with business that had indicated an interest in timber recycling during the first stage of the project. The companies contacted are listed in Appendix A. These interviews revealed that for most businesses, there has been little change in recycling practices and activities. Three of the forty-eight businesses contacted were no longer available on their listed telephone number, suggesting a cessation of operations.

In the majority of cases the reason interviewees' practices had not changed was due to the scale and nature of the business activities. Many of the businesses are small to medium size specialist industries that produce small amounts of waste timber and therefore do not consider it economically viable to make separate arrangements for recycling timber. Examples of such businesses are picket, pallet and crate producers and repairers and small joinery and furniture enterprises. The small volumes of waste timber produced are either included as co-mingled hard waste or, more typically, left for staff and locals that have a need for firewood.

Several of the businesses contacted that produce significant volumes of uncontaminated waste timber were diverting this material to mulching operators. For many this was the preferred option because it cost them little, if anything, for sorting, transportation or collection.

In the case of demolition and salvage operators, recycling activities were constrained by storage, sorting and transportation problems. These businesses were typically only removing re-saleable products, such as windows, doors, large beams, and other structural timbers and items. In two cases, salvage and demolition operations were undertaking activities catering for the upper end of the recycling/ reuse market. These businesses are sourcing timber such as large posts and beams from warehouses, wharfs and jetties, obtaining high quality timber that has high market value for reuse. These businesses both had a supply problem, although this can be attributed to scarcity of such timber relative to demand rather than a failure of timber diversion systems. These types of timber are typically salvaged before they enter the waste stream and are therefore beyond the scope of this study.

Two of the interviewees reported altering their disposal practices by contacting relevant operators from the list provided to them.

The first, a construction company (Glennross Builders) had attempted on-site sorting and the allocation of site bins, which were removed by an independent waste contractor. Previously, the company, like many others, was simply allowing waste timber from their operations to be collected by private individuals or disposing of it as general waste to landfill.

The second company, General Motors, was planning a strategy that would effectively sort and recycle 90% of their waste timber material within a six-month period. Significantly, in this instance much of the material being diverted for recycling is of a high quality in that it is largely free of contaminants and consists of material derived from pallet and crate waste. In this case, the pallet and crate materials are being collected by businesses that either repair or reuse components, or divert timber wastes to the green waste mulching industry. The pallet repair operators interviewed also diverted timber waste to timber mulching operations.

In summary, it appears that there has been little change in the recycling activities of most significant sources of timber waste identified in the first stage of this

project. Most have failed to change their activities because they do not see a financial advantage in doing so. This indicates a need for timber waste diversion systems that are convenient and well promoted, and that provide clear financial advantages over landfill disposal.

There appears to be an opportunity for EcoRecycle Victoria to promote source separation of timber waste by C&I and B&D operators for collection by or delivery to timber reprocessors. However, there are currently not adequate systems in place to neither service all of Melbourne nor make source of timber aware of existing opportunities to divert timber waste.

2.4 CURRENT PRACTICES AT TIMBER DROP-OFF AND PROCESSING FACILITIES

2.4.1 Locations of drop-off facilities

During the first stage of this project, Meinhardt identified and mapped facilities for the drop-off of waste timber for recycling. This map has been modified to show additional, existing and proposed sites identified. Distinction has also been made between facilities that are receiving timber and processing it to produce ground cover mulches and/or chipping it as an adjunct to green waste processing operations. The modified map is shown in Figure B.1 in Appendix B.

Figure B.1 suggests that although most of Melbourne has access to drop-off facilities for timber waste, few of these facilities direct material to recycling to “higher end” uses such as particleboard manufacture. Waste timber collected at these facilities is mainly scavenged for reuse on an *ad hoc* basis, mulched, or eventually landfilled (several operators indicated that residue timber left after scavenging was landfilled).

The Northern and Western Regions have existing and proposed facilities for the diversion of timber for recycling. Current operations are mainly stockpiling material for mulching and are having difficulties in supplying particleboard manufacturers’ (ie. Laminex Industries) demand for clean untreated pine. Proposed drop-off facilities in the Northern and Western Regional facilities are in the planning phase. If these are developed, these areas will be well placed to divert and process waste timber from these, and possibly other Regions.

In the Northern Region, Moss Rock operate a timber drop-off and processing facility at Epping. This facility receives timber waste from many private contractors who deliver sorted timber for free. A gate fee to cover sorting costs may be charged for contaminated loads. Material is sourced predominantly from the Northern Region and Eastern Regions, with smaller amounts coming from the South Eastern and Western Regions. The facility will also receive timber waste from up-graded transfer stations at Darebin and Banyule. The Moss Rock site had an EPA Works Approval for the establishment of a Regional composting facility, but the development of this has been delayed. Moss Rock do not consider composting viable compared to simple mulch production from timber waste. This is because of a perceived lack of markets for compost products, whilst the demand for timber mulches is apparently strong.

In the Western Region sites operated by Twiggs and Callega have stockpiled timber with limited chipping of timber. In addition the Regional composting facility at Brooklyn received a small quantity of timber for use as compost feedstock.

A private waste timber mulching and recycling operation, W.M.Waste Management, has sites located in both the Eastern and South Eastern Regions. These operations mainly produce timber chips for mulches, but also divert

softwood timber from a number of premises in the South Eastern and Eastern Region for processing to supply particleboard manufacturers. They supplement the post-consumer timber recycling stream with clean kiln-dried material sourced from timber mills, allowing them to maintain a high quality of product that meets particleboard manufacturers' specifications (ie. Clean softwood with very low levels of soil, grit and other contaminants and less than 10% hardwood content). The WM Waste Management site received large loads of timber waste from C&I sites hauled by their own and other waste collection contractors' vehicles.

A private facility operator identified in the South Eastern Region (John Benedict on Grange Road) has large quantities of timber stockpiled, from which relatively small volumes of timber are being progressively processed to produce mulch.

2.4.2 Current Facility Operations

Private and municipal transfer stations and recycling drop-off facilities that are currently involved in the diversion of timber waste from landfill are largely interested in receiving and/or processing green waste products to produce mulches and compost. Much of the waste timber received at municipal facilities is of domestic origin, and is predominantly hardwood fencing that is well suited to mulching, but unsuitable for the recycled particleboard market.

Some businesses process waste timber as a separate stream to produce groundcover mulches. These firms source materials from both dedicated collection from large generators of softwoods and from timber selected from drop-off facilities.

At least two private contractors have established on-going collection services using collection bins. Glennross Builders has attempted separation at source on their work sites. The commercial waste transport organisation Cleanaway has twenty 30 and 40M³ bins in circulation dedicated to timber waste collection from commercial and industrial premises. This commercial collection service is provided for a variety of industry groups. These range from small framing and joinery shops through to large manufacturing and importing firms. The material collected is largely suitable for chipboard manufacturing which include large volumes of clean pallet and packing case waste. The remainder of this potential mulch material is stockpiled at private facilities such as salvage yards and transfer stations and either mulched on site or collected for firms that run mulching facilities. The Brooklyn facility run by Twiggs is one such stockpiling facility.

At this stage all privately run collection and waste transfer facility operators are sorting waste timber by hand. Although waste timber is easy to see and in some cases relatively simple to sort, the occupational health and safety issues and associated cost of sorting is the most prohibitive reason preventing further diversion. The development of more mechanised and improved timber sorting and storage facilities are apparently still very much in the planning and development stages. Alex Frasers Pty Ltd, have received EcoRecycle Victoria funding for the establishment of a mixed Building and Demolition (and potentially Commercial and Industrial) waste processing facility at Laverton. This facility will mill waste and use an air sifter to blow lighter fractions from concrete and rubble waste. The lighter fraction will contain timber waste and soil, sand and dust as well as other contaminants such as glass fines. This material may be able to be composted, but will not be suited to particleboard manufacturer.

A regional firm, Midland Recyclers, perceives a demand for second-hand construction timber from metropolitan Melbourne to meet regional Victoria's concreting and form-work needs, and is developing a relatively new recycling or reuse program. This program is being is still in the feasibility stage and its viability

will depend on demand and the ability of Midlands to source material in Melbourne. It is unlikely that this initiative will divert large volumes of waste timber from Melbourne.

Numerous transfer station operators (including private and municipal) have indicated that even when designated areas are set aside for waste timber of all sorts, people are still willing to pay the full price for disposal of co-mingled loads rather than reducing the cost through self separation. For many operators this is a valid reason for not providing space, facilities or labour for separating waste timber. This suggests that education of facility users, and possibly greater price incentives are required to promote source separation of timber.

With little exception, transfer station and drop-off facility operators suggested similar requirements to assist the separation of waste timber from mixed loads. These include:

- Pre-sorting by those that dispose and deliver waste timber;
- Sufficient space for drop-off, sorting and storage of timber; and
- At smaller facilities, drop-off bins for timber could be used to consolidate small loads for bulk transport to larger processing facilities.

Operators have remarked that sorting by hand remained the only realistic option to ensure low contamination, particularly for the removal of treated timber. Raised conveyors are employed in the USA to increase the managability of timber and to reduce bending and lifting by staff. No operators interviewed expressed interest in obtaining such systems. Typically source separation followed by sorting using a front-end loader and manual handling to remove contaminants is the preferred method of sorting.

The proposed Alex Frasers Pty Ltd B&D waste processing facility to be established at Laverton will use air sifters to separate milled material into fractions for use in building products. The timber fraction may be able to be used as a mulch or compost, although the effects of contamination due to paint and/or chemical treatments on these products is unknown.

In general it was suggested that gate fees would be needed to off-set the transportation and/or the pre-sorting costs. A financial incentive in the form of no or lower gate fees for source separated timber is recommended. Facilities such as shelters and raised surface areas are required for proper and safe handling and storage where the waste timber is prevented from further contamination or excessive deterioration. Limitations with respect to physical space, location and traffic management were also identified as significant factors.

Contamination is also a limitation to reuse, recycling and mulching. Treated and painted timbers cannot be mulched or recycled. This is particularly an issue for pallet and construction wastes where a mixture of untreated and treated waste timbers are generated. Paint may be able to be removed using air knives.

Grit and soil contamination is a constraint to recycling timber as particle board. Laminex Industries reports that much of the material that they are receiving has unacceptable soil and grit contamination. Processing facilities need to have sealed and clean tipping, sorting and processing areas to minimise soil and grit contamination.

Other significant contaminants include ferrous metals, which can be separated magnetically after grinding, and non-ferrous metals, which can be separated by using air blowers to blow the lighter ground material from the metals.

In summary, most of the existing timber diversion facilities are processing timber as part of the green waste mulching stream. Little effort is made to separate

timbers with potentially higher reuse or recycling value. The facilities at Epping (Mossrock) and Brooklyn (Twiggs) are receiving timber waste from C&I and C&D businesses as well as from municipal sources. They are receiving this material free of charge, but are still having difficulties in supplying Laminex Industries demand for clean untreated softwood, with most of the received material being mulched for groundcover.

Significantly, Laminex Industries have recently created and filled a position for an operator dedicated to sourcing suitable timber direct from large generators of clean pine waste timber. Laminex Industries are interested in developing direct contractual arrangements with such waste generators for the collection of their waste timber. The operator is currently seeking to source material from Ballarat, Geelong and the Melbourne areas. There is potential for EcoRecycle Victoria to work with Laminex Industries and other markets for timber to raise awareness amongst C&I and B&D sources of timber that these markets exist.

2.5 REGIONAL WASTE MANAGEMENT GROUP APPROACHES AND DEVELOPMENTS

Interviews were conducted with Regional Waste Management Group Executive officers or their representatives to determine Regional directions for timber waste diversion. These interviews revealed the following.

The Northern Regional Waste Management Group is committed to diverting more timber waste from landfill, with materials being separated for reuse, recycled content particle board manufacture, and mulching. The current Mossrock facility in Epping and neighbouring sites are seen as the logical location to expand timber waste diversion in the Region. Transfer station upgrades in the Region will include expanded areas to receive separated timber waste. It is anticipated that sorting and processing will occur at the Epping site.

The Western Regional Waste Management Group is also committed to diversion of timber waste for reuse, recycling and mulching. The Region has two operating facilities at Altona North and Brooklyn that are currently mainly stockpiling timber with some mulching being conducted. A portion of the stockpiled material is suited to processing for the Laminex Industries market.

The South Eastern Regional Waste Management group diverts waste timber at facilities for either mulching or landfilling after *ad hoc* scavenging. A private operator, WM Waste Management, is operating a Dandenong facility that captures significant amounts of C&I and C&D timber. According to earlier studies, the South Eastern Region is apparently the most significant source of waste timber, and in particular clean softwood, in the metropolitan area. Also, facilities in the South Eastern Region receive much of the C&I and C&D waste from the Eastern Region. There is apparently great potential for increasing timber waste diversion through the provision of more adequate collection, separation and processing facilities within the South Eastern Region. According to the draft South Eastern Regional Waste Management Plan, the South Eastern Region proposes to establish a Regional transfer station in ten to fifteen years time once landfill airspace in the Clayton South area is exhausted. An upgrade of the transfer station at the Clayton South "Camberwell/Boroondara" has been undertaken and this diverts some waste timber for scavenging and mulching.

The Eastern Regional Waste Management Group (Least Waste) is committed to diverting timber waste from landfill, but sees limited potential for recycling, and anticipates that most diverted timber will be mulched as with the green waste stream. The Regional Group has previously investigated diverting suitable softwoods for particleboard manufacture, but concluded that there are insufficient volumes to warrant separate processing streams. This conclusion contradicts the

conclusions of previous studies by Meinhardt that estimated significant softwood generation in the Eastern Region. However, it is possible that Least Waste's position is influenced by a focus on municipal facilities in the Region that receive mainly domestic and small business self-haul and receive little C&I and C&D waste transported by commercial waste disposal contractors. The Eastern Region has few operating landfills and much of the C&I and C&D waste is transported by commercial waste haulage companies directly to landfills outside of the Region (mainly in the South Eastern Region). WM waste management also operate a facility in Lilydale that captures some C&I and C&D waste from the Region. Least waste (the Eastern Regional Waste Management Group) is in the process of identifying and contracting out a site for a Regional transfer station. At the time of writing, least waste anticipates that waste timber will be diverted to processing as part of the green waste stream. Whether the Regional transfer station diverts material for recycling will apparently depend on the successful tender for supplying and operating the facility.

3. TIMBER WASTE RECOVERY SYSTEMS

3.1 THE TIMBER WASTE MANAGEMENT SYSTEM

In order to develop a strategy for better timber waste recovery, it is important to have an understanding of the factors influencing the ways in which timber waste is managed. The following model (Figure 3.1) was developed to describe the different management pathways for waste timber. This allows discussion of the relative influence of different factors on the ways in which timber is currently managed. It also allows consideration of where efforts (by EcoRecycle Victoria and other players) can be most effectively applied to facilitate greater diversion of timber waste to “higher-end” markets such as reuse and recycling in particleboard manufacture.

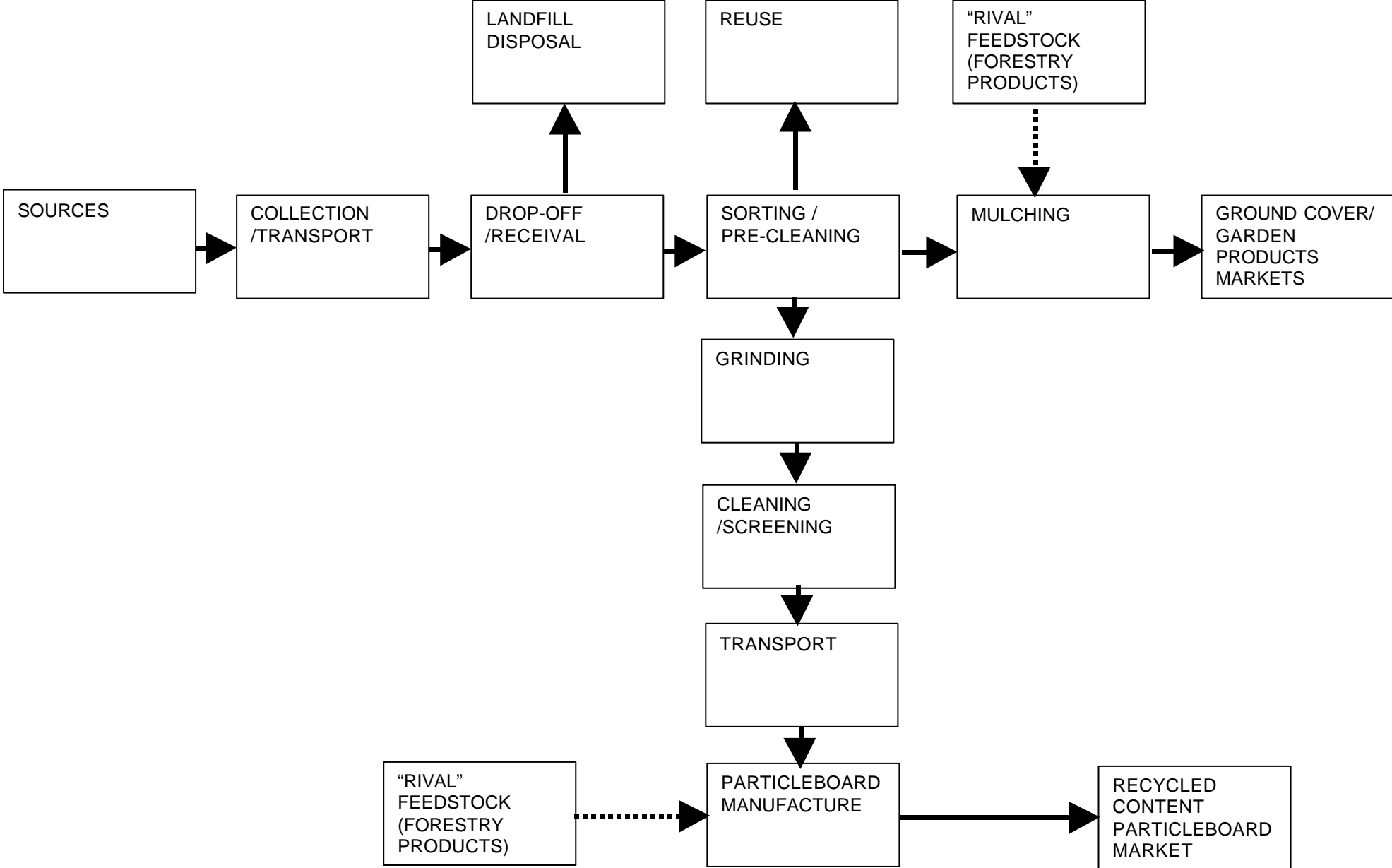
Figure 3.1 shows the management options for waste timber, with dark arrows showing the preferred management pathways for better quality waste timber. This shows that waste timber generated by different sources needs to be:

- **Collected and transported** to a receival facility. Collected material can either be source separated, into a discrete type of timber waste or commingled with other types of timber and other wastes.
- **Received at a drop-off facility**, where it can be either sent to landfill or diverted for reuse, recycling or mulching.
- **Sorted (and potentially pre-cleaned)**. If the material is to go to reuse, recycling or mulching, it needs to be visually assessed and physically sorted to remove potential contaminants, including treated and painted timber. The timber will also be sorted according to grades of timber. For example, higher value structural timber may be diverted for reuse, and clean softwoods might be diverted for MDF manufacture. Timber diverted for reuse or particleboard/MDF manufacture may require pre-cleaning to remove contaminants such as soil, grit, and paint prior to re-sale or grinding. Laminex Industries have reported that soil and grit contaminants are creating problems for reprocessing.
- **Mulched or ground/chipped**. At present, most timber waste diverted by waste management facilities is ground for mulch. Timber waste destined for particleboard manufacture is also typically ground/chipped at the receival point prior to transport to markets.
- **Cleaned/Screened**. Chipped timber typically needs to be screened for the removal of metallic contaminants such as staples, nails and strapping. Ferrous metals can be extracted using an electromagnetic separator. Non-ferrous contaminants, which are creating processing problems for Laminex Industries, are more difficult to remove. Larger items might be removed through screens. Air separators can also be used to blow chipped timber from heavier metallic contaminants. Mulched for garden products may also need to be screened for metallic contaminants.
- **Transported**. Timber processed for particleboard manufacture must be transported to markets. The current most readily available market is in Ballarat, so the transport distances for a return trip from the centre of Melbourne is in the order of 200 km. Methods for improving the efficiency of bulk transport operations need to be considered. Alternatively, the establishment of recycling markets located in Melbourne could be promoted.

The main limitations to timber waste diversion are similar to those for green organics and include:

- The relative ease and low cost of landfill disposal.
- Contamination of feedstock materials and subsequent sorting costs.
- Transport costs to markets.
- The availability of markets and the potential for oversupply.
- The availability and cost of rival products that can substitute for post-processing and post-consumer timber.

FIGURE 3.1: TIMBER WASTE MANAGEMENT PATHWAYS



- Laminex Industries is currently paying in the order of \$50 per tonne for delivered chipped and cleaned recycled timber. They pay in the order of \$1 per tonne for unseasoned timber (which needs to be kiln dried; an energy intensive and costly process) and \$70 per tonne for kiln-dried and chipped first use timber. The recycled timber therefore has a price advantage over the first use material. At current prices, first use material is not necessarily a “rival” product and because particleboard cannot be manufactured entirely by recycled timber, the use of first use material in the production of recycled content particleboard is essential. At present, recycled content particleboard contains up to 10% recycled timber. This could be increased as long as the chipped recycled material is predominantly (greater than 90%) softwood and is consistently clean of contaminants.

Strategies for achieving greater diversion of timber waste for reuse and recycling will need to consider how timber waste diversion can be made cost-competitive with other management options.

4. IDENTIFICATION AND ASSESSMENT OF MANAGEMENT OPTIONS

Research was undertaken to identify examples of best practice timber waste diversion and processing systems. This involved a literature search of relevant waste management publications and consultation with those interviewed about what would be required to best divert and process waste timber reuse, particleboard manufacturing and mulching.

The components of a timber waste management system include:

- Collection and sorting
- Transport to processing facilities
- Processing
- Transport to markets

4.1 COLLECTION AND SORTING

Contamination and associated sorting costs are a major limitation to successful timber waste diversion.

Contamination types generally fall into the following four categories:

- Treated timbers such as pine framing and structural laminates
- Painted and surface sealing compounds, such as lead and oil paints, stains, resins, laminates and glues.
- Ferrous material, such as staples, nails and wire.
- Non ferrous materials regardless of its size type and characteristics, such as soil, rocks, plastics, glass, etc. Soil and rock contamination are known to cause reprocessing constraints when attempting to produce chip board from chipped waste timber. Much of this contamination can be attributed to inappropriate storage and handling of material.

Chipped material needs to be free from contaminants that are derived from sorting, storage and transportation facilities and processing.

Sorting can occur either at source, point of receipt, or at the processing facility.

To reduce costs, source separation should be promoted. Where source separation and collection from premises is practiced, a high rate of clean material will be diverted to processing plants and sorting costs to processors will be low. Education of service users is required to increase source separation and delivery of separated load to transfer stations.

Source separated material will still need to be screened prior to processing. It is considered likely that it will be more cost effective for screening and sorting to occur at the processing facility rather than other points of receipt. If users of drop-off facilities are encouraged to sort timber into categories, including a discrete "Clean Pine/softwood" category, then screening and further sorting costs should be reduced.

At present, manual sorting appears to be the only way to divert timber for reuse and recycling. In the USA, raised conveyor systems are used to reduce bending and lifting by staff. Such systems were not favoured by operators consulted as part of this project, who saw them as expensive and unnecessary, preferring the use of a combination of front-end loaders and manual handling of timber after source separation.

Occupational Health and Safety (OH&S) issues are significant concerns where manual sorting is required for co-mingled waste. Staff training will be required to manage this risk.

The proposed air sifting technology to be employed at the Alex Frasers Pty Ltd facility at Laverton will reduce manual sorting but is likely to produce a "dirty" grade of mulched

timber that will not be suitable for recycling. This fraction may, however, be able to be composted.

4.2 TRANSPORT TO PROCESSING FACILITIES

It is estimated that a 40 cubic metre skip of timber could be collected and delivered to a processing facility within 10km for approximately \$100 to 120 per pick up. Such material could be compacted using heavy vehicles to achieve densities of around 300 to 350 kg per cubic metre. Transport costs would therefore be in the order of between \$2.50 and 3.00 per cubic metre or \$7.20 to \$9.00 per tonne. This represents a significant portion of the potential (up to \$50 per tonne) value of the final product, highlighting the need to:

- encourage waste generators to haul directly to facilities;
- charge gate fees to cover costs of storage and transport; and/or
- consider feeding the collected timber into green organics processing streams.

4.3 STORAGE

Large areas are required for the storage of separated waste timber. Lack of space was the principle constraint and limitation to existing drop-off and processing operations. On average, loose dimensional timber has low density and a tonne of material occupies between 4.5 and 6.5 cubic metres. Assuming that timber can be safely piled 2 to 3 metres high in a pile twice as wide as it is high, then 10 tonnes of loose timber will occupy an area of between 36 and almost 70 square metres. When chipped, a tonne of timber will reduce down to 3 to 4 cubic metres. Assuming that this forms a pile that is twice as wide as it is high, then 10 tonnes will require 30 to 40 square metres. Storage of material in containers will reduce floor area required, but will increase capital costs.

Contamination of chipped material by soil is a major cause of poor quality product. Solid, sealed and graded, drained surfaces are required. Concreted areas are preferred as they will reduce soil and grit contamination. These areas would require effective run-off and stormwater management considerations with respect to the location of the site and its design, so as to avoid off site environmental impacts.

Stored unchipped material needs to be protected from further contamination and deterioration. Discolouration of timber reduces its attractiveness for particleboard manufacture. Ideally this material will be stored under cover, although this may be impractical. It has been suggested that chipped material should be immediately taken off-site or stored in a roofed area on a sealed surface, with wall on at least three sides. This is to protect it from weathering and contamination, and to control dust. The covered work area would also provide employee comfort and safety as well as protection of the stored material. The cost of such housing is likely to be prohibitive and it is recommended that holding times in exposed areas should be minimised by processing material according to market demand and shipping processed material directly to markets. It is recommended that such housing of storage areas is only considered if it is found to be required by operating facilities that have sealed work surfaces.

4.4 PROCESSING

Processing of sorted materials involves mechanical grinding to produce chips suited to particle board manufacture or mulched timber for groundcover mulches or compost feedstock.

The main issue is the cost of installing and operating these systems and their optimal processing capacity. Larger and more expensive equipment should be able to process larger volumes of materials and handle and remove contaminants such as metals.

It may be viable for existing grinding equipment employed at some facilities for processing green waste to be used to process timber waste from recycling. This would involve cleaning equipment (using an air gun) and possibly running some timber through

the system to produce garden mulches prior to processing clean pine material for recycling. Use of tree waste and/or processing equipment used for processing green waste is likely to increase the risk of contamination of the recycled softwood timber stream. However, some of those consulted successfully use machines for both green waste and clean pine. Such dual use should ensure that equipment is used at optimal economies of scale.

Options for timber processing considered were:

- Use of smaller chippers and grinders at transfer stations
- Use of stationary large scale grinders
- Use of mobile chippers or grinders

The assessment of option suggests that large scale grinders achieve better economies of scale than smaller chippers as long as sufficient volumes of material are available for processing.

The cost of purchasing a heavy-duty grinder capable of processing 100 cubic metres of chipped material per hour is in the order of \$62,000. Such machines need to be fed with a front-end loader. The running cost of operating a large tub grinder capable of processing up to 100 cubic metres of finished product per hour is up to \$400 an hour. This includes the tub grinder's depreciation and operating costs and the cost of an operator with a large front-end loader.

Chipping machines can be mobile, creating the option for roving crews to process and load material at different transfer stations for transport direct to markets. However, to ensure optimal economies of scale, it is recommended that timber is stockpiled until there are sufficient quantities to occupy an operator for at least a day. This would require storage space at transfer stations capable of holding at least 1000 cubic metres of unchipped material, requiring in the order of 500 to 1000 square metres. Few facilities have such room. Therefore, load consolidation of loose timber for delivery to a processing facility with adequate room is recommended

Financial assessment suggests that the greatest economy of scale is achieved by large capacity grinders as long as they have adequate feedstock. For this reason large scale regional processing facilities are favoured. These facilities could also process green organics to ensure that grinders are utilised at full capacity.

4.5 TRANSPORT TO MARKETS

Loose dimensional timber is a relatively medium to low density material that is not well suited to mechanical compaction. Grinding of dimensional timber will produce higher density chips. Research suggests that loose dimensional waste timber has a density of 145 to 220 kg per cubic metre, depending on the density of the wood and lengths of timber (the longer they are, the less well they "stack", resulting in more air pockets and lower density). An assessment of options for transporting chipped material to markets suggests that it is more viable to transport large uncompacted loads that approach weight limits rather than smaller compacted loads.

According to the timber waste processors consulted, chipped material can achieve non-compacted densities in the order of 200 to 250 kg per cubic metres. Those consulted also suggested that there is little benefit in mechanically compacting chipped materials because it is more economical to use large volume (eg. 100 cubic metres) non-compactor vehicles rather than smaller volume compactor trucks. An uncompacted 100 cubic metre load will have a load weight of 20 to 25 tonne. A review of literature supported this view, with no examples of wood chips being compacted for transport being identified. However, transport modelling suggests that increasing compaction densities above 250 kg/cub m to even 300kg/cub m may make the difference between the Eastern and South Eastern Regions of Melbourne profitably marketing clean pine to Laminex Industries.

4.6 TIMBER WASTE RECYCLING

There are a number of key variables that greatly influence the profitability, including the price received for processed timber, sorting costs and capital depreciation. However, the most significant variables in relation to servicing Laminex Industries' demand for clean pine are the:

- costs of processing (estimated at about \$10 to 15 per tonne);
- transport costs and distances to Ballarat (estimated at \$0.10 to \$0.15 per tonne per kilometre for a 200 to 300km return trip); and
- tonnage of material transported in each load (which determines income per load).

The modelling found that it is only likely to be profitable for large vehicles carrying in excess of 25 tonnes per load to Ballarat. The modelling also suggests that servicing the Laminex Industries market is likely to be marginally profitable for locations in the Northern and Western Regions of Melbourne, where return transport distances are likely to be less than 200km. The profitability of operations could be markedly improved through:

- Increased density of loads. Research suggests that compacted chipped timber could achieve higher densities. However, consultation with those involved in transporting chipped timber and modelling revealed that it is more cost effective to haul large uncompacted loads that approach transport weight limits, rather than transport smaller loads in compactor vehicles. Non-compactor vehicles could only achieve higher compaction rates through compaction by loading vehicles and would only achieve sustained higher densities if the material was wetted. Laminex Industries require dry material. Achievement of densities greater than 250kg per cubic metre for dry chipped timber should be an aim because the value of the load is very sensitive to density. The use of packer trucks such as those used by Boroondara transfer station for putrescible waste may allow higher densities to be achieved. Capital depreciation costs on packing equipment are likely to be considerably less than the benefit of increased densities.
- Backloading vehicles for return trips to Melbourne, effectively halving the transport costs.
- Service and gate fees for those using timber waste collection and drop-off services. These may also be used to recoup some of the costs of processing and transporting timber. Avoided landfill disposal costs for timber in the metropolitan area (excluding transport costs which would have to be borne in transporting timber to drop-off facilities) are likely to be in the order of \$20 to \$40 per tonne, depending on whether disposal charges are based on weight or volume. It can be assumed that for the disposal of timber, waste disposal contractors will choose sites where disposal is weight based, or alternatively where price incentives are offered for delivery of separated loads for processing. It is estimated that the incentive of avoided waste disposal costs for those disposing of loose timber should only be enough to encourage them to travel an additional 5 to 10 kilometres to a processing or drop-off facility more than they would to landfill. This assumes that no gate fees are charged for the recieval of sorted timber. Although any gate fees could be expected to reduce capture rates, a gate fee of \$5.00 per tonne could make the difference between a marginal and healthy return on investment in a processing facility located within 125km of the Laminex Industries recycling plant. Figure 4.1 shows the locations of existing and proposed facilities for major timber waste drop-off and processing facilities, with 5 and 10 kilometre radii.

Modelling suggests that servicing the Laminex Industries market in Ballarat will be very marginal to non-viable for most locations in Eastern and South Eastern metropolitan Melbourne, where return trip transport distances will exceed 250km.

Once again, backloading, higher compaction densities and service/gate fees will improve viability. If only gate fees are employed, a gate fee of \$8 to 9 per tonne would be required to break even, and a fee of \$14 to 15 per tonne required to deliver a 10% return on investment.

Backloading and increased compaction rates are recommended strategies for improving viability. It is recommended that EcoRecycle Victoria facilitate links between those hauling timber waste to Ballarat and Ballarat recyclers wanting to transport materials to Melbourne.

Potential market oversupply is particularly an issue in relation to potentially large capital investments in facilities to divert, store and process clean pine waste for the particle board market. Because there is currently a single local market for this material, the buyer is in a position where they could lower the market price for timber once investment had been made in diversion and processing systems. Operators may be obliged to accept the lower price if they have investment reliant on the sale of product to Laminex Industries. Balancing this are the facts that:

- Laminex Industries have a stated demand almost double the amount of material currently received;
- there are alternative markets for wood chips; and
- the transport distances to Laminex Industries make timber waste recycling marginal and a small decrease in price would most probably result in processors selling materials to different markets.

4.7 MULCHING AND COMPOSTING OPERATIONS

Mulching operations have similar collection and processing costs and requirements to processing for the recycled content particleboard market. However, they appear to be more viable because, although the price received per tonne of mulch material is less than that paid by the particleboard manufacturer, markets are strong and located nearer to processing facilities. The marginal viability of transporting chipped clean softwood to Ballarat and the limited available volumes of this material means that grinders will need to be used to process green organics to achieve adequate economies of scale.

Composting has additional costs to mulching, with turning or other aeration and heat and moisture management being required. Composting operations in Melbourne have historically had periodic problems in selling products at a price that covers the cost of production. Diverting additional timber waste to this market will only be viable if markets for compost products can be further developed.

4.8 SYSTEMS' INTEGRATION

Following the assessment of options, the model shown in figure 4.1 has been developed to describe the preferred system. There are three components to this integrated system, which are shown in Figure 4.1 as Components A, B and C. This shows two options for small vehicle traffic, one (Component A) where clean softwood/pine is separated from other timber for transport to a central timber processing facility, with the "other timber" stream being processed as part of the drop-off facility or Regions green organics processing facility. It is suggested that this system be adopted at drop-off facilities with sufficient room for separate drop-off areas for two streams of timber waste and/or access to an existing green organics processing operation. The second option for small vehicle timber waste (Component B) involves all clean timber being dropped-off in one area/skip and transported to a central timber waste processing facility for sorting and processing. This is recommended for transfer stations that do not have adequate room for storing two streams of timber and/or do not have access to a green organics processing facility. The third component of the system (Component C) is

for larger loads of C&I and B&D timber waste. This system would involve source separation of timber with delivery by the generator or their waste collection contractor direct to the central timber processing facility. Loads of C&I and C&D with high timber content (ie. not source separated) might also be received at central processing facilities with gate fees being charged to cover the costs of sorting.

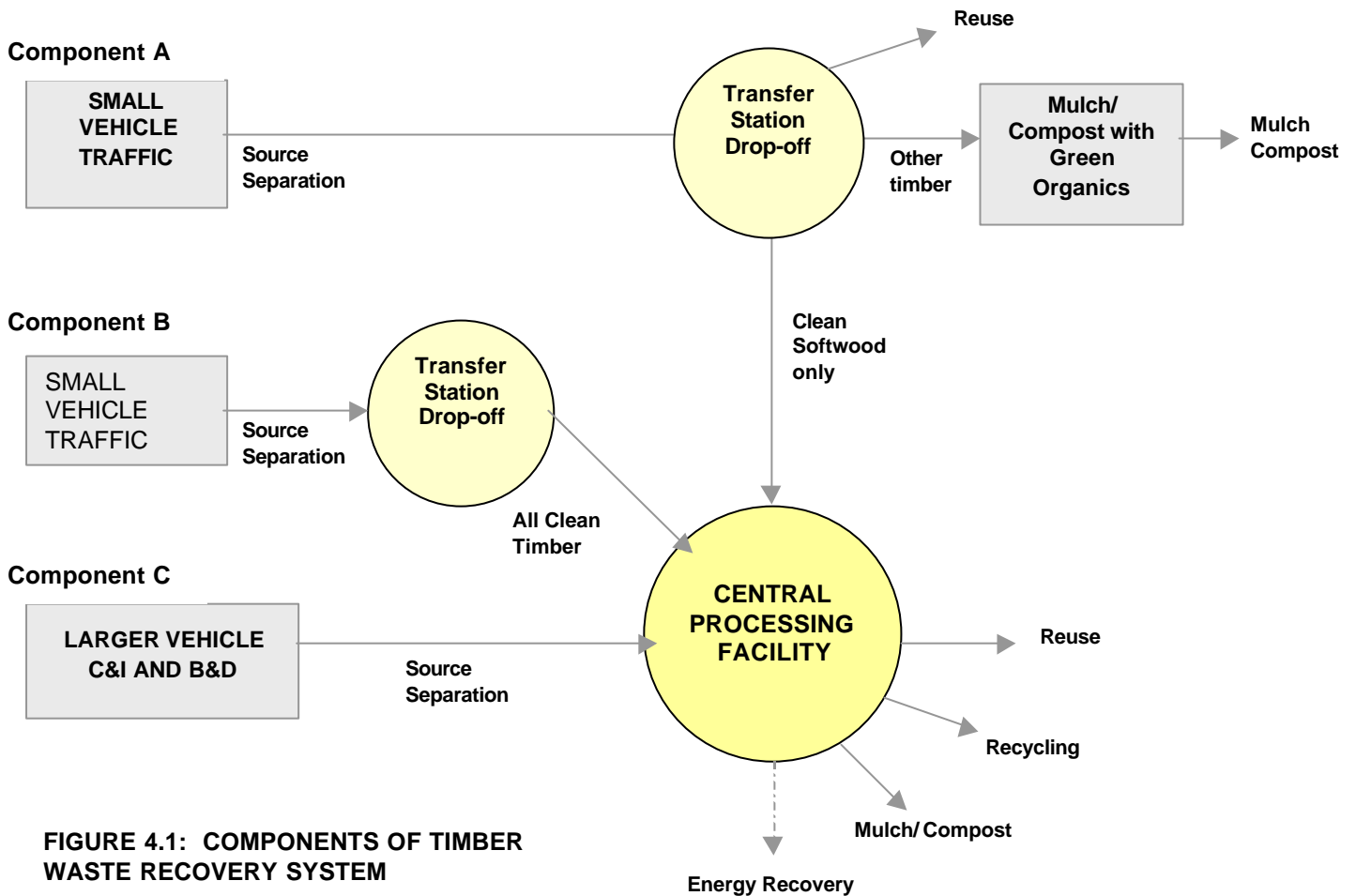


FIGURE 4.1: COMPONENTS OF TIMBER WASTE RECOVERY SYSTEM

4.9 LOCATION OF FACILITIES

When assessing the potential locations of local and regional transfer stations and reprocessing facilities certain factors were considered. These included the:

- Location of existing local and regional transfer station in relation to the location of existing reprocessing facilities that have the capacity to store and reprocess delivered waste timber.
- Cost of transportation from transfer station to regional reprocessing facilities.
- Location of both transfer stations and reprocessing facility in relation to the volume of waste generation.

Figure B2 in Appendix B shows the location of actual and proposed timber processing facilities and transfer stations for large vehicle C&I and B&D timber waste.

Previous research suggests that the South Eastern and Northern Regions are the two regions that produce the largest volume of waste timber. The South Eastern Region does not appear to have adequate transfer stations for the diversion of timber waste at present, particularly for the diversion of large vehicle loads of C&I and B&D waste. However, the existing Bayside transfer station, although small, has enough of the necessary infrastructure requirements to accept waste timber for transfer to a timber processing facility. Bayside's infrastructure includes, flow through roads, signage and sufficient bays and space. Additionally the existing transfer station once sorted and stored waste timber. It is also located close to the suburb of Moorabbin, which has been identified as one of the larger producers of waste timber. Further, the transfer station is located reasonably close to the Mulchmaster chipping facility in Ordish Rd Dandenong. Minimal upgrading or enhancement of the existing station would be required. In fact, given it once sorted waste timber, the addition of two 30-40 cubic metre bins at a cost of between \$5000 - \$6000 each would be the base requirement for the facility to divert waste timber.

The Northern Region, identified as the second largest producer of waste timber, will more than adequately be serviced by the new City of Darebin transfer station. The transfer station has recently been upgraded as a regional facility, and is of sufficient size and capacity to handle a large volume of waste timber. Further, it is conveniently located to the Mossrock facility in Epping, which is more than capable of handling large volumes of bulk timber waste. MossRock have developed markets and networks, and are already collecting from the Northern and Eastern suburbs and some selective collection within the South eastern suburbs. The Darebin transfer station also has the advantage of being capable of receiving some waste timber from the western and north-western suburbs.

The City of Knox has been identified as a significant producer of waste timber within the Eastern Region. It is located between both the northern facility of Mossrock and southern and eastern facilities of W.M. Waste Management, which are to a limited extent servicing the region. It is recommended that consideration be given to the establishment of clean pine timber drop-off facilities in the Knox or Whitehorse areas. Alternatively, clean pine timber collection services such as those offered by Mossrock or WM Waste management could be promoted to businesses in the area. Notifying these firms about the existence of these services has not been very effective in the past. EcoRecycle Victoria may consider funding a trial collection for companies so that companies can see the convenience and benefit of the services.

It is recommended that EcoRecycle Victoria promote the establishment of at least one timber waste processing facility to divert material for recycling in the South Eastern and Eastern Regions. In this case, the Lilydale and Dandenong facilities

operated by W.M Waste Management are the most appropriate in the short term. The Eastern Region Waste Management Group are proposing to contract out the provision of a regional transfer station in the Kilsyth area. It is recommended that EcoRecycle Victoria liaise with Least waste and the successful contractor to promote the establishment of clean pine timber drop-off at the facility. Depending on who the successful contractor is and the suitability of their site, the Regional transfer station may be a suitable location for a Regional processing facility. Alternatively, material from the transfer station could be processed at the Epping site.

Two operations within the Western Region are capable of taking on the collection, storage and reprocessing of waste timber. These are Calleja Transport located in Altona and the Twigg landfill regional transfer station located at Brooklyn. Calleja Transport is already in the process of stockpiling waste timber, and intends establishing a transfer station at Bacchus Marsh. They are in the transport business and have a profitable collection and marketing network. They are also a private organisation specifically in the business of recycling, waste transportation and disposal. Calleja is developing their own heavy-duty chipper for wood and green organics processing. However, their principle need is the construction of a storage facility for the protection of chipped material. This would require investment in a sealed and possibly roofed area.

The Twigg operation, although a functional transfer station of suitable size, is not presently diverting much timber waste. However, they contract out the chipping of their municipal and commercial derived green organics. Further, they have a substantial stockpile of waste timber. If this group was to process waste timber on site, they may require a storage facility for clean and dry chip material if they intend to supply Laminex Industries.

Both of the commercial operations are well situated in terms of space, operation needs to service the western suburbs and are conveniently located for major road access for both waste disposers and processed material delivery. Both these operations should be encouraged to further divert and process waste timber. Calleja Transport has a well-developed collection system, however has little storage space and is yet to develop their chipping equipment. The Twigg Group has the space and a well developed site capable of handling large volumes of timber.

Processing facilities need to provide financial incentives to timber waste generators and waste haulage firms to use the facilities rather than landfills. The location of such facilities at or near existing landfill sites is favoured, as they will then fall on established waste management routes. Facilities are likely to be able to offer financial incentives to users by offering convenience and cost advantage relative to landfill disposal.

Staged Development is favoured as it will require incremental funding over several years and has less risk of either not meeting processing capacity or oversupplying market demand. Technologies for processing timber waste are suited to Staged Development as additional grinding equipment and sorting staff can be employed as the volumes of timber waste diverted increase.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 CONSTRAINTS

The main constraints for all types of timber waste recycling and reuse operations are:

- Contamination of timber received from source and at drop-off.
- Lack of awareness by the sources of timber of the availability and potential financial benefits of timber diversion services/systems
- Lack of sufficient financial incentives for sources to separate timber because landfill waste disposal charges are not high enough for many to separate timber.

The main constraints to “high end” recycling of suitable timber for particleboard manufacture are the:

- Lack of drop-off facilities that allow separation of clean softwood from other timber waste streams in most parts of Melbourne, but particularly the Eastern and South Eastern Region.
- Distance to market (Ballarat) and corresponding transport costs. A financial assessment conducted suggests that it is only likely to be economic viable for loads of chipped material of 25 tonnes or greater (ie. 100 cubic metres) to be transported from Melbourne to Ballarat. The assessment also suggests that processing facilities in the Northern and Western Regions could profitably serve the Laminex Industries market, while to the East of Melbourne are likely to need to charge gate fees for received timber to cover the additional transport costs.
- Lack of suitable site infrastructure to process, store and load material so that processed material meets market specifications

The main constraints to mulching and composting operations are the:

- Markets for products (particularly compost products – processors report a strong demand for clean timber mulches)

The main barrier to other options for timber waste management such as gasification, fuel manufacture and production of activated carbon is that there are no such operating facilities established to receive Melbourne’s timber waste.

5.2 OPPORTUNITIES

Opportunities for EcoRecycle Victoria to work to overcome these constraints include the:

- Facilitation of the establishment and improvement of timber waste processing operations by:
 - Promoting and assisting Regional Waste Management Groups and private operators to establish and upgrade of Regional timber processing facilities.
 - Providing operators with assistance in promoting awareness of the existence of such facilities.
 - Facilitating the development of markets for waste timber.
 - Making operators aware of potential markets for diverted timber waste.
- Promotion of the improvement and establishment of timber waste drop-off facilities by:
 - Encouraging Regional Waste management Groups and their member councils to up-grade transfer stations to include timber waste drop-off areas, so that all of Melbourne has access to timber drop-off facilities no more than 10km.
 - Encouraging timber waste drop-off facilities to allow hauler/source separation of timber into separate “clean softwood” and “clean other/mixed” skips, with service users being educated to use the systems and to dispose of contaminated and unsuitable timber as general waste. This should reduce sorting and transport costs for the recycled particleboard stream.

- Assisting the operators of municipal and private timber waste drop-off facilities to educate service users about correct use of services
- Promoting the adoption by drop-off facilities of financial incentives for service users to separate timber and deliver uncontaminated loads.

- Promotion of source separation of timber at C&I and B&D premises with direct haul to processing facilities through:
 - Assistance to premises and waste collection contractors wanting to install dedicated skips or other systems for the diversion of timber waste to processing facilities.
 - Assistance to collection companies providing dedicated timber waste collection services to promote their services to C&I and B&D sources.

5.3 INFRASTRUCTURE NEEDS

5.3.1 Collection Systems

It is recommended that to divert vehicles carrying C&I and B&D timber waste from landfills central drop-off and processing facilities should be located near landfills receiving these wastestreams.

It is recommended that the following locations and existing facilities are used as processing facilities, with transfer stations feeding them:

- Northern Region – The Mossrock processing facility at Epping is an obvious candidate for the location of a regional facility, with the Darebin and other transfer stations serving as drop-off points for smaller C&I, B&D and domestic loads.
- Western Region – A site such as the Twigg Group regional transfer station and landfill, or Calleja Transport recycling and reprocessing facilities located at Altona North could be developed as regional facilities.
- South Eastern Region – a regional facility is needed in the Greater Dandenong Area. The WM Waste Management's Dandenong facility is potentially a site. Alternatively, the Bayside transfer station could be developed, although it may not be central enough.
- Eastern Region – There are number of processing facilities that could serve this area including, WM Waste Management's Lilydale or Dandenong facilities, the proposed Regional Transfer Station in the Kilsyth area, or the MossRock Epping Facility. It is recommended that drop-off facilities for larger vehicles be established in the Knox or Whitehorse areas because there is an apparent concentration of C&I sources of clean pine timber in the area. Source separated clean pine could then be transported to a processing facility.

It is recommended that all transfer stations provide facilities for the drop-off of timber. It is also recommended that facilities where it is observed that significant volumes of pine are received should trial providing separate collection bins for clean pine. If sufficient volumes are collected this could be transported to processing facilities.

5.3.2 Processing Facility requirements

Facilities need to be designed and operated to aid vehicle access and convenience, and to operate at maximum efficiency so that the cost per tonne of received and processed timber is minimised.

Facilities require:

- Adequate storage space for unprocessed and processed timber. These areas, particular the area for processed material, need to be sealed and kept clean, so as to reduce soil and grit contamination in the recycled timber waste

stream. Storage areas should ideally be roofed to protect materials. Processed material will ideally be loaded directly to bulk transport containers for immediate delivery to markets. This will reduce required storage space.

- Adequate space and equipment for sorting. Again, these areas should be sealed, however existing operations are able to dispense with such facilities, due to the rate at which they process the timber.
- Front-end loaders are also likely to be required for moving loads of timber and separating large pieces of timber from loads, as is the case with existing operations.
- Adequate staff to sort material is possibly only necessary at the transfer station
- Grinding equipment to chip timber for delivery to markets, need to process the material at a high volume to make it economically viable.
- Magnetic separation and/or air blowing equipment to separate ferrous and non-ferrous metals from chipped materials may be necessary at a pre-storage and pre-transportation stage depending on the effectiveness of pre-sorting.

The experience of the Epping and Brooklyn facilities suggests that provision of a facility is not, in itself, sufficient to divert waste timber. Collection systems need to be provided and promoted to large sources of timber. A number of private waste haulage operators are providing such services and are more successfully separating timber

It is recommended that existing collection, transportation and reprocessing systems are promoted and given assistance. Identified specific needs and opportunities for each Region include:

Northern Region:

- Mossrock Epping - Supply of sealed storage areas for chipped material and assistance with net-working and marketing, particularly the drop-off and collection services
- Darebin transfer station – Two 40m³ Bins for source separated clean pine and clean other/mixed timber with retaining walling for the drop area
- Banyule transfer station – Two 40m³ Bins for source separated clean pine and clean other/mixed timber with retaining walling for the drop area

Western Region

- Twigg Group- Assistance in promoting awareness of the facility's existence to C&I and B&D sources of timber waste. Laminex Industries may be interested in having material stockpiled at the site sorted.
- Calleja Transport - Assistance with network and market development for collection and drop-off. Allocation of funds for sealed storage facilities. Funding to further develop timber-processing equipment is already available and being used.

South Eastern Region

- WM Waste Management – Assistance in promoting service to sources of waste timber.
- Possible establishment of drop-off facilities for large vehicle loads of C&I and B&D timber waste at Bayside transfer station.

Eastern Region

- Support for the establishment drop-off facilities for large vehicle loads of C&I and B&D timber at the proposed Regional transfer station (to be established in the Kilsyth area), with processing at this or another Regional site (possibly the WM Waste Management Lilydale operation) or the Northern or South Eastern Facilities.

- Possible upgrade of Whitehorse or Knox transfer station as a drop-off point for large vehicle loads of C&I and B&D timber, with material being diverted to processing facilities at Dandenong or Epping.

It is recommended that greatest priority be given to developments in the Northern Region, with timber from the Northern, Eastern and possibly South Eastern Regions being diverted to this facility. Up-grades of drop-off facilities are recommended for all regions to promote source separation of timber waste. Where there are sufficient volumes of clean softwood, provision for separation of timber into “clean softwood” and “clean other” streams should be considered.

Priority should also be given to the establishment of a Regional processing facility in the Western Region which has a number of sites successfully diverting, but not processing and marketing, C&I and B&D timber.

Establishment of Northern and Western processing sites are favoured because of existing operations and their relative proximity to timber recycling markets in Ballarat. Establishment of facilities in these Regions will allow determination of whether additional processing sites are required in the Eastern and South Eastern Regions.

5.4 EDUCATION NEEDS

5.4.1 Waste Management Operators

The study identified an opportunity for EcoRecycle Victoria to educate the operators of waste management collection and drop-off services about market opportunities and product specifications for waste timber.

5.4.2 C&I Sources

There appears to be a strong need for the promotion of the availability and benefit of C&I timber waste recycling services. It is possible that individual firms that do not feel that they generate enough timber to warrant source separation might be invited to share collection services with neighbouring businesses. Areas with high concentrations of light industries that collectively generate large quantities of timber could be encouraged by collection companies to form part of collection rounds.

It is recommended that waste generators are educated, with a focus on particular industry groups and associations, such as carpenters and joiners, furniture manufactures builders and elements of the construction industry. Key messages to be communicated include:

- The availability and locations of markets for timber.
- The availability and location of transfer stations and processing facilities accepting timber waste for processing
- The availability of collection services for source separated timber waste for processing
- Potential cost savings though source separating timber of collection or delivery to timber drop-off and processing facilities.

It is recommended that EcoRecycle Victoria provide assistance to waste collection firms involved in diverting timber waste to processing facilities to promote their services. This assistance may include provision of information to major sources of timber and possibly providing assistance to collection companies that express interest for infrastructure such as dedicated C&I skips for waste timber source separation and collection.

5.4.3 General Community

Those consulted indicated that most of the small vehicle traffic timber waste received and diverted at transfer station drop-off facilities is hardwood fencing from domestic sources. Some smaller amounts of clean and treated pine is received from smaller C&I and B&D operations. Diverted untreated timber is typically mulched as part of green organics processing operations or made available for scavenging on an ad hoc basis. However, it may be possible to divert timber suitable for recycled content particleboard manufacture at some facilities. It is recommended that EcoRecycle Victoria support the trial of a drop-off facilities where hauler separation of diverted timber is encouraged through the provision of two separate labelled areas; one for “Clean untreated pine” and the other for “Other clean untreated timber”. It is recommended that the clean pine drop-off is a skip that will allow collection and transport to processing facilities. The “Other timber” drop-off area could be a skip or simply a stockpile area, depending on where and how the green organics processing operation took place. This system would allow pine waste to be diverted to recycling markets and the other material to be processed as part of green organics processing programs. It is recommended that this trial be conducted at a transfer station in the Eastern or South Eastern Regions in areas where there are a concentration of smaller C&I premises likely to generate suitable clean pine waste. It is suggested that Knox or Whitehorse transfer stations may be suitable sites for such a trial.

In the event that the trial successfully diverts economic loads of pine waste, it is recommended that other transfer station operators are encouraged to assess the quantities of pine timber in their timber waste stream, and if there is a significant portion, introduce similar systems for diverting pine timber. EcoRecycle Victoria could provide assistance for the upgrade of facilities that would require additional bins and, in most cases, additional drop-off area with a retaining wall for the “drop”. It is recommended that timber is dropped into bins rather than onto the ground as this will reduce handling costs prior to transport to processing operations. In the event that such “two-bin” systems are widely introduced, EcoRecycle Victoria could assist by creating and promoting standardised recycling signs for the two streams of timber for display at transfer stations and landfills.

5.5 MARKET DEVELOPMENT

A major constraint to greater levels of timber waste recycling appears to be limited viable markets for recovered timber products. The market demand for timber mulches is apparently strong. However, while there is potentially a high value use in recycled content particleboard (currently paying \$50 per tonne delivered) the distance to this market from Melbourne makes this marginal or non-viable in many areas unless agate fee is charged for receiving waste timber. Composting operations report periodic difficulties in selling products at prices that cover production costs.

It is recommended that EcoRecycle Victoria encourage and assist the investigation and establishment of alternative markets such as:

- Promotion of clean timber mulch and compost products
- energy recovery
- more local (Melbourne based) recycled-content timber product manufacturers.

6 REFERENCES

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APPENDIX D

BUSINESSES AND MUNICIPAL COUNCILS SURVEYED FOR RECYCLING PRACTICES

Company Name	Contact	Chance/Practices		Phone
		Yes	No	
AA All Shape Pallets	Chris Randle	Yes		(03) 9315 1766 018 3123 737
Australian Recycled Timbers	John Monument	No		(03) 9478 2444
Australian Rescued Timber	Jim Kelly	No		5977 1444
Brennan's Timber Yard	Colin Diver	No		(03) 9807 9731 5441 1146
Burdett's Sand, Soil & Stone Supplies	Andrew Burdett	No longer chipping		(03) 9789 8266
Calleja	Peter Duddley	No		(03) 9369 6222
Cleanaway – Total Waste Management	Leon Howden	No		(03) 9729 1500
Enviro-Mulch Pty Ltd	Bob Green	No		5982 2869 0418 100 427
Environbark	Malcolm McDougall	No		5261 3276
Homestead Collections Classic Aged	Michael Kennedy	No		0417 817 597
Just Old Flooring	Rick Venn	No		(03) 9439 9293
Kenney Pierce Timber	Mark Kenney	No		5962 2181
Midland Recycling – Visy Agent	Jeff Murray	Yes		5427 4268
Mossrock	Chris Wearne	No		9408 7900
Mulchmaster	Bill Jeffs	No		(03) 9723 9733
Natural Image Products	Marcus Lyon	No		(03) 8545 6667
Nullabor Forest Timber Industries	Barry Donchi	No		5480 0044 018 505 474
Overboard	Bill McNamara	No		(03) 5984 2055
Organic Recycles Pty Ltd	Kevin Banner	No		(03) 5561 3326 018 312 737
Rare Woods	Ros Poole	No		9427 0570
SEARCH – AJG Recycling	John Evans	No		(03) 9551 8690
Twigs	Ross Curry	No		(03) 03 9314 4731
Waste Converters/ Commercial Sands Pty Ltd	Ward Petherbridge	No		(03) 9799 1935
Western Community Repairs and Reuse Centre		Yes		(03) 9369 8367
Whelan Kartaway	Mark Whelan	No		9387 9999
WM Waste Management Services Pty Ltd	Mark Jeffs	No		(03)9720 4644

Municipality	Timber/recycling	Contact Numbers
Bayside City Council	Y	9583 4474
Boroondora City Council	Y	9278 4560
Brimbank City Council	N	9249 4961
Casey City Council	Y	5991 1651
Darebin City Council	Y	9479 4796
Frankston City Council	N	9784 1888
Glen Eira City Council	N	9524 3443
Hobson Bay City Council	N	9932 1107
Hume City Council	N	9109 0109
Kingston City Council	N	9556 4304
Knox City Council	Y	9299 8128
Maribyrnong City Council	N	9688 0308
Maroondah City Council	N	9724 3364
Melton Shire Council	Y	9747 7263
Monash City Council	Y	9518 3416
Moonee Valley City Council	Y	9243 8899
Moreland City Council	N	9240 1282
Nillumbik Shire Council	N	9433 3219
Port Phillip City Council	Y	9209 6533
Stonnington City Council	N	9823 1198
Whitehorse City Council	Y	9262 6377
Whittlesea City Council	Y	9401 0521
Wyndham City Council	N	9742 0744

