

Report to
Department of
Environment

Used Tyre Recycling Industry
Triple Bottom Line Analysis
RFQ: 0005/2005

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Sustainable Strategic Solutions
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Executive Summary

There is general agreement amongst stakeholders that waste tyres and other waste rubber should be better managed both to preserve valuable resources and to prevent environmental damage due to improper disposal. There has also been considerable research and development into the recycling of rubber and other tyre components. However resource security for potential investors in recycling facilities remains an issue, with a need for intervention to ensure end-of-life tyres are directed to the most beneficial end use.

A national tyre industry product stewardship scheme is currently being developed under the auspices of the Environment Protection and Heritage Council (EPHC) for the recovery of the resource value from end-of-life tyres. The aim of the scheme is to create a "market-pull" demand for used tyres thus making inappropriate disposal of used tyres unattractive. The scheme's objective is to divert all used tyres away from landfill and into uses where the maximum resource value can be recovered. It is anticipated that the national scheme will be launched in 2006.

The current market for used rubber is based on recyclers being paid to "dispose" of a waste product. Hopefully with the introduction of the national benefit scheme this dynamic will change and recyclers will begin to pay for the used rubber they need, thus creating much greater incentive for the collection and transport of used tyres and other used rubber products.

The Department of Environment commissioned this study to complete the business analysis of the used rubber recycling industry (derived from used tyres and rubber conveyor belt) in Western Australia. This study is a triple bottom line (economic, social and environmental) analysis of the used tyre recycling industry. A major aim of this work was the identification of critical points at which the government will need to intervene to support and encourage the development of the industry.

The study found that there is a need for the Western Australian government to be closely involved in the development of the national scheme, particularly to ensure that the State's needs relating to rural and remote tyre recycling are considered. The national scheme is likely to require considerable extra State resources for administration and enforcement.

A review of the capacity of the used rubber market in WA to support a local recycling industry found that demand for used rubber is likely to exceed supply in the near future, with one already well established recycler and others ready to enter the market. Assuming the majority of used tyres could be recovered, WA only has sufficient resources to support perhaps one or two recyclers. The establishment of a new business could drive the recovery of tyres from stockpiles and perhaps the use of tyres from South Australia. Up until recently shredded truck tyres have been brought by rail from SA to Perth for recycling.

There is already an unmet demand for off-the-road (OTR) tyres for retreading and excess demand for truck tyres for recycling and conveyor belt for reconditioning and recycling.

Most tyres are still disposed of to landfill with the Tyre Landfill Exclusion Zone being rendered ineffective through exemptions. However for tyres from the metropolitan area the landfills are now monofills, one for baled tyres, and the other for used rubber only. The Government should act to entrench this status quo by reviewing exemptions available under the current

TLEZ and allowing only monofilling of used tyres. Truck tyres of the sizes that can currently be recycled should be banned from landfill and, as capacity becomes available to recycle other types of tyres, bans on their landfilling should also be considered.

There is currently no capacity to recycle passenger tyres or OTR tyres in WA, though this may change in the near future with plans for capital investment. There is one mobile baler operating in WA currently but no operator has a mobile shredder, again this situation may be about to change.

There is a need for more stringent controls on the management of both used tyres and used conveyor belt on mine sites and this could be achieved in several ways, including the development of Codes of Practice in conjunction with the industry. Similar issues exist on farms for the management of earthmoving tyres and again a joint approach with the industry may be the best solution.

Inappropriate disposal of used tyres is a growing issue in rural and remote areas. The recent introduction of a tracking system for used tyres as a controlled waste may provide information regarding previously unaccounted for tyres. As the fee paid per truck load of tyres is an extra cost to recyclers and retreaders the Government could consider waiving the fee when tyres are to be reused.

As used tyres are often taken by rural landholders for diverse temporary purposes such as training horses, and as tree guards etc, the Government should work with retailers and the Farmer's Federation to develop a Code of Practice requiring retailers to obtain a signed release form and an undertaking that tyres will be returned when they are no longer required on the farm.

Demand is already driving the collection of truck tyres from rural areas around Perth and this is likely to increase as information regarding the location of stockpiles of tyres becomes available. It is very important that the industry has access to the stockpile survey data recently collected by the Department.

The study found that once demand for rubber for recycling increases it will be economically viable to transport used tyres by road or rail from as far north as Broome to Perth for recycling and from north of Broome to Darwin, perhaps for export. It is not however economically viable to transport tyres to Perth for storage as the costs of baling and landfill outweigh the benefits.

It will only be feasible to transport tyres for recycling when full loads are available, so coupled with the problem of inappropriate disposal and illegal stockpiles in rural and remote regions, a sensible option may be the development of centralised storage locations along major transport routes. Under the proposed national scheme it is likely that benefit payments will be available to those collecting and transporting tyres from remote regions and grants may also be available to establish storage facilities. The Government should begin now to work with stakeholders to identify the optimal storage locations and coordinate the establishment of facilities. This will require new licensing arrangements and decisions regarding appropriate storage methods. Options include storing tyres above or below ground, baled or loose.

The most important market development role for Government is in providing information. Only Government agencies have the necessary overview of the State. It is vital that the

Government's policies are clear, consistent and understood. Information such as this report and the stockpile survey data should be publicly available to allow businesses to make investment decisions. The Waste Management Board/ Department's web site should provide up-to-date information on tyre recycling in WA and contacts for disposal and recycling. Information about proper tyre maintenance to extend tyre life and the use of retreaded tyres by the Government fleet should be available to the general public to encourage better practices.

The provision of direct funding to companies for capital purchases will need to be carefully considered, however strategic funding for feasibility studies or trials, with the results available to all may be useful.

The other very important role for Government in stimulating the market is through procurement and reporting policies. Examples include encouraging the use of retreaded tyres on Government vehicles and recycled rubber products in road construction and maintenance.

Introduction

The Department of Environment and the Western Australian Waste Management Board have identified the need to find alternative uses for used tyres in Western Australia.

There is general agreement amongst stakeholders that waste tyres and other waste rubber should be better managed both to preserve valuable resources and to prevent environmental damage due to improper disposal. There has also been considerable research and development into the recycling of rubber and other tyre components. However resource security for potential investors in recycling facilities remains an issue, with a need for intervention to ensure end-of-life tyres are directed to the most beneficial end use.

Since 1994 the government has commissioned various reports examining options for the management of waste tyres, however to date no comprehensive strategy for used tyres has been developed.

An effective, whole-of-industry approach toward best practice recovery is required, including market development, industry support and banning of whole used tyres from burial in landfill. In moving towards a strategy, the Department has initiated the following actions:

- A survey of local governments and other authorities to determine the extent and location of used tyre storage/stockpiles.
- All commercial quantities (above 20 equivalent passenger units (EPU)) of tyre movements throughout the state are to be tracked/monitored. Tyre transporters will be licensed. This is to enable proper tracking/mapping of estimated 90% of tyres and to facilitate maximum recovery opportunities.

A national tyre industry product stewardship scheme is currently being developed under the auspices of the Environment Protection and Heritage Council (EPHC) for the recovery of the resource value from end-of-life tyres.

The aim of the scheme is to create a "market-pull" demand for used tyres thus making inappropriate disposal of used tyres unattractive. The scheme's objective is to divert all used tyres away from landfill and into uses where the maximum resource value can be recovered.

To support the scheme, the Federal Government will legislate via a National Environmental Protection Measure to manage "free riders" and to mandate those that are not part of the scheme or do not have an approved alternative scheme. It is anticipated that the national scheme will be launched 1 January 2006.

The Department of Environment commissioned this study to complete the business analysis of the used rubber recycling industry (derived from used tyres and rubber conveyor belt) in Western Australia. This study is a triple bottom line (economic, social and environmental) analysis of the used tyre recycling industry to determine the potential development of the industry. A major aim of this work was the identification of critical points at which the government will need to intervene to support and encourage its development.

Sustainable Strategic Solutions (S3) is pleased to submit this report to the Department.

The required tasks

The consultancy was required to undertake a number of tasks:

- Identify approximate quantities, location and types of used rubber in Western Australia that may be available for recycling;
- Interpret the impact of the proposed national scheme mechanisms and what additional support is needed to further encourage the establishment of a economic viable used rubber recycling industry in WA;
- Identify the capacity of the existing used rubber market in WA to support a local rubber recycling industry;
- Identify various transportation opportunities for the return of used rubber either to Perth or the Eastern States or alternative used rubber recycling markets including offshore to Asian markets or any other options;
- Develop an 'economic viability' model that identifies costs associated with transport (type and distances) of used rubber in its various forms (e.g. whole, baled, shredded; conveyor belt rubber; etc) from the major regions/locations of the state to viable markets or recycling facilities;
- Identify the need for key government intervention points that would stimulate resource recovery as distinct from disposal;
- Identify key intervention points and realistically assess the actions required that would stimulate existing and potential marketing and business opportunities for recycled rubber;
- Consider and detail potential environmental and social impacts from the various viable actions for recycling rubber identified in this consultancy;
- Identify and detail all relevant stakeholders that are contacted regarding this consultancy including federal, state, regional and local governments and their respective agencies, mining, tyre retailing, recycling and transport companies, etc.;
- Identify and realistically assess the priorities for potential innovative technologies in rubber recovery from used rubber products; and
- Make specific recommendations to address pertinent aspects that could detract from the development of an economically viable used rubber recycling industry.

For the purposes of this consultancy, 'used rubber' includes used tyres, conveyor belt rubber and other sources of rubber in quantities of greater than 200kg net (20 EPU).

Deliverables

Results of the business analysis in the form of a report and presentation that provides a:

- Documented account of the methodology used in the study;
- Documented account of the stakeholders contacted in the analysis, including federal, state, regional and local government and their respective agencies, mining, tyre retailing, recycling and transport companies etc.

- Documented findings of each assessment conducted against criteria listed in the scope of works;
- Reference and relation to the national tyre industry product stewardship scheme;
- Recommendations and conclusions drawn on the basis of the overall analysis.

Project approach

The project was approached in the following stages:

Project initiation

Stage 1 Review of the proposed National Scheme -covering the requirement to:

- Interpret the impact of the proposed national scheme mechanisms and what additional support is needed to further encourage the establishment of a economic viable used rubber recycling industry in WA;

Stage 2 Capacity of the used rubber market in WA to support a local recycling industry - covering the requirements to:

- Identify approximate quantities, locations and types of used rubber in Western Australia that may be available for recycling; and
- Identify the capacity of the existing used rubber market in WA to support a local rubber recycling industry;

Stage 3 The economic viability of transport -covering the requirements to:

- Identify various transportation opportunities for the return of used rubber either to Perth or the Eastern States or alternative used rubber recycling markets including offshore to Asian markets or any other options; and
- Develop an 'economic viability' model that identifies costs associated with transport (type and distances) of used rubber in its various forms (e.g. whole, baled, shredded; conveyor belt rubber; etc) from the major regions/locations of the state to viable markets or recycling facilities;

Stage 4 Identification of key government intervention points to stimulate resource recovery - covering the requirement to:

- Identify the need for key government intervention points that would stimulate resource recovery as distinct from disposal;

Stage 5 Identification of key intervention points to stimulate marketing and business opportunities for recycled rubber - covering the requirements to:

- Identify key intervention points and realistically assess the actions required that would stimulate existing and potential marketing and business opportunities for recycled rubber; and
- Identify and realistically assess the priorities for potential innovative technologies in rubber recovery from used rubber products;

Stage 6 Consideration of potential environmental and social impacts of the various actions identified - covering the requirement to:

- Consider and detail potential environmental and social impacts from the various viable actions for recycling rubber identified in this consultancy;

Stage 7 Preparation of the final report - covering the requirements to:

- Identify and detail all relevant stakeholders that are contacted regarding this consultancy including federal, state, regional and local governments and their respective agencies, mining, tyre retailing, recycling and transport companies, etc.; and
- Make specific recommendations to address pertinent aspects that could detract from the development of an economically viable used rubber recycling industry.

Project initiation

An inception meeting was held with the Department of Environment soon after beginning the project. The purpose of the inception meeting was to:

- Confirm the objectives and deliverables for the project
- Clarify project management and reporting arrangements, and
- Collect available information held by the Department to support the project.

1. The Proposed National Scheme

A thorough review of the proposed national scheme was conducted, with discussions to confirm the subsequent interpretations held with the Department of the Environment and Heritage, the Department of Environment WA and its counterparts in NSW and Victoria. Discussions were held with the Australian Tyre Recyclers Association as the driver for the Joint Working Group on Tyres (JWGT).

Western Australia has special needs and issues that could impede the effective implementation of the proposed national scheme, particularly relating to remoteness of mining sites and communities.

Background

In December 2000 a workshop of industry and government stakeholders agreed to a national approach to waste tyres that should encourage re-use and recycling of tyres¹.

In 2000/2001 Environment Australia funded a consultancy project *A National Approach to Waste Tyres* to investigate and analyse the scope and nature of the waste tyre problem in Australia and to assess policy options to address the problem.

Following stakeholder comments on the original consultancy report, the Department of the Environment and Heritage prepared a short paper *A National Approach to Waste Tyres: Analysis of Policy Options* to develop three product stewardship options for tyres:

(1) a take-back scheme (where tyre manufacturers and importers take back and manage used or exhausted tyres);

(2) a levy-benefit scheme (where a levy is imposed at the point of manufacture/import or at the point of sale); and

(3) a tradeable certificate scheme.

After the release of this paper, the Joint Working Group on Tyres (JWGT, comprising the Australian Tyre Manufacturers Association, Australia Tyre Importers Group, Cleanaway and Renewed Rubber) approached government with the desire to develop a voluntary industry Extended Producer Responsibility (EPR) scheme. This concept was put to the Environment Protection and Heritage Council (EPHC) in October 2003.

The EPHC asked industry to fully develop a proposal and present it to their April 2004 meeting. The Department of the Environment and Heritage has been facilitating the development of the proposal through a series of roundtable meetings. These meetings bring together representatives from JWGT, Australian Tyre Recycling Association (ATRA), Australian Tyre Dealers and Retreaders Association (ATDRA), Cement Industry Federation (CIF) and the Motor Trades Association of Australia (MTAA).

Structure and governance of the proposed scheme

The proposed scheme will be a temporary intervention, proposed for a period of ten years. A review of the scheme, including a review of the rates of the levy and benefit will commence at

¹ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

the end of the 2nd and 5th years. Any changes recommended will take effect the end of the 3rd and 6th years (1 July 2008 and 1 July 2011). At the end of the 8th year parties will initiate a review of the effectiveness and outcomes of the scheme. By unanimous agreement of the parties and with the consent of the EPHC, the scheme may be extended for an agreed period.²

The scheme will reward the end use of a tyre rather than a collector of tyres to ensure tyres are substantially transformed for beneficial uses, so only final end-uses of tyres will attract financial support such as benefit payments.

The levy

The proposed levy must be set at a level that will make the scheme viable but not push up consumer prices unreasonably; preliminary economic modelling³ indicates a levy of 1 to 2 % of the cost of a tyre.

It was estimated that a uniform levy-benefit of \$2 per EPU is sufficient to reduce the proportion of scrap tyres destined for landfill to about 10%. This estimate is probabilistic; there is a 90% probability that the proportion will lie between almost nothing and about 20%. Lower levels of levy-benefit will result in higher proportions of scrap tyres being sent to landfill. For instance, if there is no levy-benefit at all, the proportion would be about 42%. This is lower than the current level of 49% because technological change is expected to increase the attractiveness of recycling even without a real price reduction in the form of a levy-benefit subsidy.

Levels of levy-benefit higher than \$2 were not analysed as this amount is sufficient to cause about 90% of tyres to be recycled, that is, all tyres within, say, 100 km of the major urban centres, where recycling plants are likely to be sited.

It was also estimated that with total compliance, a levy-benefit of \$2 per EPU is estimated to collect up to about \$40 million per annum in revenue⁴.

This modelling is to be refined through a further study to be undertaken by consultants engaged by the JWGT from June 2005⁵.

Retailers currently charge customers a fee for the cost of collection and disposal of end-of-life tyres, which typically covers the cost paid by the retailer to the collection company, often described as a disposal fee, collection fee or environmental levy. This may be as high as \$4.00/tyre⁶.

² Draft End-of Life Tyres Issues Paper, Department of the Environment and Heritage, August 2004.

³ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

⁴ Ibid.

⁵ Julie Quinn, Department of the Environment and Heritage, Personal communication.

⁶ Marie Donato, Motor Trade Association (WA), Personal communication.

The benefit paid to recyclers and re-users of tyres is expected to reduce the fee that they charge collectors (and may become a payment over time). It is hoped this will in turn, reduce the rate at which retailers are charged by the collectors for the used tyres.⁷

The description of the disposal fee as an environmental levy may contravene trade practices and the ACCC or the relevant fair trading authority in each State should be requested to stop the term being used. Information material will be given to retailers relating the details of the industry scheme to encourage the correct description to be used. The MTAA will inform its members about appropriate descriptions of the disposal fee.

Governance

A Producer Responsibility Organisation (PRO) established by the tyre industry will be run as a not-for-profit company and will be responsible for the day-to-day management and operation of the scheme. The company constitution will stipulate the range of activities in which the company can be involved, and the requirement for any profits to be held in trust to be used solely for scheme approved purposes⁸.

The PRO will be bound by the Tyre Product Stewardship Agreement (made between the Tyre industry and the EPHC) and fully funded from the levy raised on the sale or import of new tyres. The Product Stewardship Agreement is expected to be finalised by the end of June 2005⁹.

A Board of Directors nominated and appointed by Industry Corporators will oversee the running of the PRO, appointing staff, receiving and making payments etc.

Industry Corporators are Industry Associations who choose to be a party to the Agreement and who may choose to enter an industry agreement to manage aspects of the PRO (not involving Government or stakeholders).

The PRO will report under the Agreement on the overall administration of the scheme. The scheme can be changed by amending the Agreement.

The Stakeholders Forum under the Product Stewardship Agreement will be open to key stakeholders in the tyre industry, the tyre manufactures and importers, recyclers, retreaders, tyre-derived-fuel users, mining and other specialty tyre users and governments at all levels. The Forum will resemble the currently established Tyre Roundtable.

The Stakeholders Forum will need to:

- monitor and provide direction to both the PRO and governments on the performance of the scheme and any policy issues arising from operations of the scheme;

⁷ Draft End-of Life Tyres Issues Paper, Department of the Environment and Heritage, August 2004.

⁸ Ibid.

⁹ Rod Clare, Department of Environment and Conservation (NSW), Personal communication.

- agree to changes on the levy rate, benefit rates, approved end-uses and other funding;
- also agree on any amendments required to the Agreement following reviews of the scheme.

Stakeholders such as the MTAA and consumer groups would be invited to a general consultation meeting no less than annually to provide input on scheme performance and any policy issues arising.

Scheme membership

Any tyre importer, manufacturer or reuser can elect to join the industry scheme by advising the PRO in writing. The country of origin should not be an issue in membership. The PRO may require the payment of a reasonable fee to cover the administrative costs of new companies registering for the scheme. Any scheme member may leave the scheme after giving 28 days notice in writing.

Tyre recyclers or waste to energy users will not formally become members of the PRO but will be bound by rules and conditions set by the Agreement and the PRO in order to receive benefits.

Levy collection

Scheme members who are importers or manufacturers agree to pay the voluntary levy to the PRO.

A levy will be collected on each tyre at the point of entry to the Australian market, i.e. manufacturers and importers will be required to pay the levy to the PRO prior to the entry of their tyres to the market. They may negotiate terms of payment (eg 60 days) with the PRO to allow for the storage of stock prior to sale. The levy will be payable on an EPU basis for passenger vehicle and light commercial tyres.

Imported tyres will be levied whether they are part of a consignment of tyres or on a new vehicle. A levy will not be payable on tyres retreaded in Australia, but imported retreaded tyres and used tyres imported for retreading will be levied as they will be entering the Australian market for the first time¹⁰.

Payment of benefits

A benefit will be payable no more than once per tyre, for all PRO approved commercial end uses which substantially transform a whole tyre casing and permanently remove the tyre from the waste stream. Acceptable end-uses will be periodically reviewed to allow technical innovations to become eligible¹¹.

¹⁰ Draft End-of Life Tyres Issues Paper, Department of the Environment and Heritage, August 2004.

¹¹ Ibid.

Levy payments will be “refunded” to recyclers who export substantially transformed tyres leaving the Australian tyre market for an approved end use internationally. The onus of proof that the tyres are being appropriately reused in their destination country will rest with the exporter, i.e. initial inspections of overseas facilities by the PRO will be at the expense of the proponent. Full benefit payments for exports are not possible under the subsidies and countervailing measures agreement under the WTO. Where the destination market has a similar product stewardship scheme in operation (eg Canada) the PRO may enter into a MoU with the equivalent body in the importing country to facilitate payment of benefits on exported tyres.

Where an end-user uses only a portion of a tyre above a certain threshold, payment will be made for the portion of the tyre (or EPU) being used.

Prior to the receipt of the first benefit payment, a tyre reuser must agree to submit to an inspection of their facility to prove that the ultimate end use for the tyre is in accordance with approved end-uses. The reuser must also agree to provide proof of legitimate reuse or submit to a further inspection when required by the PRO.

All users of tyres will need to demonstrate to the PRO that they are meeting State and Territory regulation requirements before a benefit payment can be made. This could be a demonstration of an appropriate regulatory licence.

Benefit payments would be made on a differentiated scale that reflects the cost of recycling or reuse of the tyre. Included in the calculation are costs such as the sorting, shredding and crumbing of tyres. The costs of collection would not be included.

The Joint Working Group on Tyres (that is the importers and manufacturers) are engaging a consultant to undertake the final economic modelling of the scheme, expected to be concluded by the end of June 2005¹².

Approved end uses:

- (i) Remanufacture: payments will be made for the transformation of a tyre into a new product available for sale. Payment may be made either to a direct end-user on proof of sale to the end-user, or to an intermediate processor (eg a crumber or shredder) upon proof of sale and delivery to a remanufacturer for an approved end use.
- (ii) Waste to Energy: payments will be made where tyres are combusted as direct fuel in an industrial plant or to generate electricity.
- (iii) Civil Engineering applications: Payment will be made for some civil engineering applications where the tyre has been substantially transformed for incorporation into a permanent structure approved by a development application or an environmental impact assessment.
- (iv) Payments for other purposes: Subject to sufficient funds being available after the distribution of all benefit entitlements and administrative costs, payments may be made for other pre-approved purposes consistent with scheme objectives, eg

¹² Rod Clare, Department of Environment and Conservation (NSW), Personal communication.

general market development, education and awareness, the benefits of which are available to all. Remote area tyres are another special category that is eligible for funding. No other payments would be permitted. Strict eligibility and conflict of interest guidelines would be developed for funding in this category. The process of selecting projects for funding would be open and transparent with reasons for decisions being publicly available. The PRO will report on discretionary payments and an allocation for this funding will be built into the levy rate.

Free rider regulation

Regulatory assistance has been requested by industry for the voluntary scheme to ensure fair competition. Manufacturers and importers who do not join the PRO would receive a price advantage in what they charge for new tyres. EPHC Ministers agreed to explore regulatory safety net options¹³.

The EPHC developed an Industry Discussion Paper on Co-Regulatory Frameworks for Product Stewardship that provides a generic framework for product stewardship which could be applied to many different products. Public consultation on this paper has now been concluded and the outcomes have been provided to the EPHC.

It is likely there will be a framework NEPM developed that will give the basis for a product to be considered as in the Co-Regulatory Discussion Paper. Schedules outlining the regulation and enforcement method will be attached to the NEPM for specific products, eg tyres. State governments may need to enact regulations for each schedule¹⁴.

Currently the Department of the Environment and Heritage is considering the regulation of tyre imports through prohibited goods legislation. Tyres would be declared a prohibited import under the Prohibited Goods legislation, which would empower Customs to require proof of membership of the PRO or proof of an alternative compliance scheme¹⁵. This is likely to be the most efficient way to achieve the necessary outcomes. There is still much assessment and consultation to be undertaken before a decision is reached¹⁶.

The schedule for tyres may not require State governments to enact legislation if Customs is used as the method for stopping free riders. However there may need to be a requirement in the Schedule for enforcement of any potential future Australian manufacturers. The two current manufacturers are part of the scheme but if a new company set up they may choose not to participate. There may also be a requirement in the Schedule for using State enforcement officers to check compliance of companies, for example to check that the company had taken back and recycled the required number of tyres. In this situation the WA Government would need to pass some regulation¹⁷.

¹³ Draft End-of Life Tyres Issues Paper, Department of the Environment and Heritage, August 2004.

¹⁴ Julie Quinn, Department of the Environment and Heritage, Personal communication.

¹⁵ Ibid.

¹⁶ Michael Bissell, Department of the Environment and Heritage, Personal communication.

¹⁷ Julie Quinn, Department of the Environment and Heritage, Personal communication.

Remote and rural areas

Remote and rural areas have challenges of distance and low numbers of end-of-life tyres, and these require special consideration.

Options to subsidise the transportation costs of tyres to central locations being considered include the possible use of a mobile shredding and collecting facility or projects identified by local governments such as road base or landfill applications. These options will require subsidies over the standard benefit payment and will be funded by a specific amount in the tyre levy (to be determined in the economic modelling¹⁸).

A phased roll-out of the collection or facilities to rural and remote areas will be built into the voluntary industry scheme¹⁹.

Although payments will not generally be made to intermediate parties such as collectors and transporters to prevent stockpiling and maintain a strong focus on developing approved end-uses, special arrangements may be developed for collectors in remote areas²⁰.

This issue will be discussed in more detail in Stage 3 of this Report.

Issues for WA arising from the review of the proposed national scheme

The proposed national scheme relies entirely on market pull-through, that is making benefit payments to the end-users of tyres so that end-of-life tyres become valued as a resource and may eventually be bought from collectors and retailers rather than being waste needing paid disposal. The national scheme will address the importation of used tyres but will not address export (other than providing a levy refund).

The national scheme will not require the banning of tyres to landfill disposal but will instead rely on creating value for used tyres.

The aim at this stage is to have the scheme in place by mid 2006. It will take some time for benefit payments to start flowing to end recyclers and a further period of time for this to begin changing market dynamics.

The Western Australian Government may wish to consider further bans on the disposal of tyres to landfill as part of market development, providing more security of resource to potential recyclers.

The minerals industry, with the manufacturers of OTR tyres, has made representations to the Department of the Environment and Heritage that tyres used by the industry should be outside the levy scheme²¹. The management of tyres on mine sites is of particular importance to WA.

¹⁸ Draft End-of Life Tyres Issues Paper, Department of the Environment and Heritage, August 2004.

¹⁹ Ibid.

²⁰ Ibid.

²¹ Melanie Stutsel, Minerals Council of Australia, Personal communication.

The proposed scheme will not provide funds to companies for research and development but will only fund R&D “of general benefit²²”. The WA Government may wish to consider its role in funding, for example feasibility studies or market development.

Retreaders will not be entitled to benefit payments under the scheme which may severely impact the number of tyres available for retreading if the scheme is successful in meeting its objectives. Retreading uses considerably less resources than the manufacture of new tyres and reuse is higher on the waste hierarchy than recycling of end-of-life tyres. The WA Government may wish to consider measures to encourage retreading in the future.

It seems likely that the national scheme as currently envisaged will require significant additional State legislation and Government resources. For example:

- Stockpiles are to be monitored by governments. Does the WA DoE have the resources and mechanisms to undertake this function?
- All uses of tyres will need to demonstrate to the PRO that they are meeting State and Territory regulation requirements before a benefit payment can be made. This could be a demonstration of an appropriate regulatory licence. What types of licences are currently issued and what types may be required?
- There may also be a requirement in the NEPM Schedule for using State enforcement officers to check compliance of companies, for example to check that the company had taken back and recycled the required number of tyres. How would this role be funded?

The policy settings for the national scheme are still being developed and there is still opportunity for input from State Ministers on the issues raised above.

Another issue worth consideration is the payment of differential benefit rates to particular uses. During consultations with the recycling industry²³, several stakeholders affirmed the belief that a differential ‘benefit level’ should be applied to reflect the end-use fate of tyres. Products that reflect “higher value” end uses such as manufactured products, should be treated differently from those that reflect “low value” end uses, such as Tyre Derived Fuel (TDF). Recyclers contend that a differential rate would encourage and reward resource recovery (assuming that TDF is not a resource recovery method since the resource is destroyed/burnt in the process). By way of comparison, the Canadian tyre recycling scheme has a differential benefit rate. There are two levels of benefit: a TDF benefit and a higher benefit level for other segments/end-uses²⁴.

²² Julie Quinn, Department of the Environment and Heritage, Personal communication.

²³ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

²⁴ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

The current proposal is that benefit payments would be made on a differentiated scale that reflects the cost of recycling or reuse of the tyre. Included in the calculation are costs such as the sorting, shredding and crumbing of tyres. The industry is proposing that benefit payment levels would be determined by crumb size, reflecting the costs of processing²⁵. This would result in higher payments for recycling than for Waste to Energy which would be in agreement with the Waste Management Hierarchy.

However it may be better to apply the differential payment rate on the basis of greatest environmental benefit.

One stakeholder²⁶ mentioned that used tyres are often used as packing material, for example when engine reconditioners import cases. These are imported by jobbing shops of which there are only a few in Australia (GEM NSW incorporating HM engines in Victoria, RPM engines in Victoria and Redlands, Queensland). It may be of value to ensure the Department of the Environment and Heritage is aware of this fact and can alert customs agents to the issue when classifying tyres as prohibited goods.

Another policy issue identified by the review of the proposed national scheme which is of more immediate concern to Western Australia is that of remote and rural tyre recycling. The possibility of payments being available to collectors of tyres from remote and rural regions under special arrangements should be pursued.

All of the issues raised above will be addressed later in this report.

²⁵ Rod Clare, Department of Environment and Conservation (NSW), Personal communication.

²⁶ Marie Donato, Motor Trade Association (WA), Personal communication.

2. Capacity of the used rubber market in WA to support a local recycling industry

Consultations were undertaken to determine the approximate quantities, location and types of used rubber in Western Australia that may be available for recycling. Discussions were held with retailers and suppliers including the Motor Trade Association, large transport companies and mine operators.

This information was used together with information from the Department on the extent and location of stockpiles, in talks with recyclers in Western Australia and other States to determine what capacity there is to support a local recycling rubber industry and to identify the critical gaps in the current capacity of the industry.

Manufacture and import of new tyres

Passenger tyres

There are two large tyre manufacturers in Australia: South Pacific Tyres which manufactures tyres under the brand names of Dunlop, Goodyear and Olympic, and Bridgestone Australia Limited which sell tyres under the Bridgestone and Firestone brands. These companies comprise the membership of the Australian Tyre Manufacturers Association (ATMA)²⁷.

South Pacific Tyres are also a large tyre importer, and one of the largest retreaders in Australia²⁸. South Pacific Tyres owns approximately 400 retail stores across Australia (Beaurepaires and Goodyear Auto Service Centres) with affiliations with 500 other stores.

Imported passenger tyres come from New Zealand (South Pacific Tyres), Thailand, USA, Slovenia, Brazil, Japan, China, Germany, Korea and Turkey. Japan is the biggest tyre exporter. Truck tyre imports come from Slovenia and Turkey. South Pacific Tyres is the largest importer of tyres in Australia.

South Pacific Tyres have two manufacturing plants located at Somerton (in Victoria) and Upper Hutt (in NZ), manufacturing passenger, light truck and recreational vehicle tyres. Bridgestone has a tyre manufacturing facility in South Australia.

A range of raw material inputs are required in the manufacture of new tyres²⁹. These include synthetic rubber, natural rubber, tyre cord, butyl rubber, carbon black, steel cord, bead wire, zinc oxides, chemicals and acids. These material inputs are imported and sourced locally. The manufacturing process is expensive with high raw material costs. In rough terms, the major components of the material input costs include synthetic rubber (which accounts for around 23% of material cost), carbon black (accounting for around 20% of the material cost) and steel cord and bead wire (accounting for around 17% of the material cost).

²⁷ www.atma.org.au

²⁸ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

²⁹ Ibid.

At present, South Pacific Tyres use 5% recovered rubber in the raw material input mix, the amount being limited by technological constraints associated with the properties of vulcanised rubber derived from recycled waste tyres. Bridgestone do not use recycled rubber in their manufacturing process.

Passenger tyres account for 73% of the total volume of new tyre sales but there is considerable variation in the growth rates particularly in light commercial vehicle and tractor tyres. Significant growth is seen in truck tyre manufacture while passenger tyre manufacture has consistently grown at a level below that of truck tyres.

Earthmover tyres

Earthmover tyres (also called 'off-the-road' (OTR) tyres) are used for vehicles in the mining, construction, civil engineering, forestry, etc., industries. A typical example is a 240 tonne dump truck, which is used in the mining industry. The truck needs 6 tyres, each costing \$25,000, and the tyre stands 3.5m high and weighs 3.2 tonne³⁰.

The OTR segment of the tyre industry is dominated by three tyre companies (95% of the market): Bridgestone, Michelin and Goodyear. No OTR tyres are manufactured in Australia, they are imported from Japan, Indonesia, Thailand and the USA.

OTR tyres range in size from quite small up to 4.0 meters in diameter and 7.0 tonne in weight. Classification of OTR tyres is difficult because there is no industry standard so different distributors/producers have different tyre classifications, for example Bridgestone have 13 different OTR tyre classifications³¹.

Used tyre generation in Western Australia

Passenger and truck tyres

Reasonably recent market analysis indicates that the current quantity of waste tyres generated in Australia is around 14.9 million tyres (including passenger, light commercial vehicle, truck and machinery tyres) or 20.8 million EPU each year, representing a waste stream of approximately 197,000 tonnes per annum³². This is expected to increase to 24 million EPU in 2010.

Approximately 3.9 million EPU are generated in Western Australia per annum, with 2.8 million per annum in the Perth metropolitan area³³, a total mass of approximately 36,000 tonne. This report states that the estimates probably have an accuracy "of no more than 20 %".

As an input to a later study³⁴ the Department of Environment estimated that 1.7 million used tyres are generated in Western Australia per annum with approximately 1.25 million generated

³⁰ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

³¹ Ibid.

³² Ibid.

³³ Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003.

³⁴ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

within the Perth metropolitan area. In terms of EPU, this represents approximately 2.3 m EPU pa and 1.75 m EPU pa respectively.

Approximately 73% of the tyres are generated in the Perth Metropolitan area, 11% in regional areas (Bunbury, Busselton, Geraldton, Northam, Albany, Kalgoorlie-Boulder, Esperance, Port Hedland, Roebourne and Broome) and the remaining 16% generated in country areas. As a large proportion of tyres generated in the country areas are from the mining and agricultural industries the percentage of EPU would be greater than 16%.

Earthmover tyres

OTR tyres used by the minerals industry account for 25% of the total weight of tyres used in Australia per year³⁵. Due to the size of the product involved, quantity is not usually used as a measure of volume for this range of tyre. Historically, volumes are recorded imports on a tonnage basis. The 2002 OTR import WA figure is 17,043 tonnes, the largest of any State or territory³⁶.

Aircraft tyres

Aircraft tyres are manufactured overseas by Michelin and Bridgestone. Large aircraft tyres are retreaded up to six times per tyre, for example by Air Treads Australia (Victoria) who manage all QANTAS tyres. The whole wheel is assembled and checked then transported to holding warehouses on the carrier routes. Occasionally for charters to non-network destinations an aircraft would carry a whole assembled wheel as a spare³⁷. At the end of life the large aircraft tyres are sold by Air Treads Australia to a second-hand tyre dealer in Victoria and many are fitted to agricultural equipment as they are extremely puncture resistant. There is also demand for the used tyres as buffers for example on jetties and tugboats³⁸.

While all QANTAS tyres are returned to Victoria there may be large aircraft tyres generated by other airlines flying into Perth and by the RAAF. The large aircraft tyres are a very small proportion (no more than 20,000), of the total number of tyres used annually in Australia.

The small tyres used on large aircraft and on all light aircraft are not retreadable and are generally disposed of to landfill³⁹.

Reuse of tyres

Retreaders

Retreading has probably accounted for most of the reuse of materials from tyres in Western Australia. Strictly speaking reuse is not at end of life as the process extends the useful life of tyres. Since tyres are manufactured from non-renewable resources (a new tyre requires

³⁵ Melanie Stutsel, Minerals Council of Australia, Personal communication.

³⁶ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

³⁷ Paul Gluschenko, Purchasing, QANTAS, Personal communication.

³⁸ Peter Monahan, Air Treads Australia, Personal communication.

³⁹ Ibid.

around 13 litres of crude oil equivalent compared with 7 litres for a retread) and the waste hierarchy values reuse above recycling, this is an important sector.

About 19% (on a tonnage basis) of used tyres in metropolitan Perth are retreaded. While until recently approximately 37,000 passenger tyres (350 tonnes) were retreaded in Perth per year⁴⁰, this has now ceased⁴¹. Retreading of passenger tyres has diminished nationally due mainly to the reduction in the price of new passenger tyres due to competition from cheaper imported tyres.

Approximately 100,000 truck tyres (4,750 tonne; 5000,000 EPU) are retreaded in Western Australia each year. Truck tyres are on average retreaded twice with some retreaded up to four times⁴².

The average life of retreaded tyres depends on a range of factors including tyre maintenance and conditions of use. As an average, light commercial vehicle tyres deliver 40,000 kilometres of service, while truck tyre service life depends on the specific role of the tyre (as a drive tyre, steer tyre or trailer tyre). Typically a new drive tyre delivers 120,000 kms of service, with a retread providing a similar level of travel. A trailer tyre lifetime is longer typically around 260,000 km⁴³.

Danwest sends its buffings from retreading and scrap tyres to Reclaim Industries for use in the manufacture of secondary products and has been used in bitumen for road construction.

Earthmover tyres

Currently most OTR tyres are disposed of by burial on mine sites. Recently due to the current worldwide shortage of OTR tyres contractors have begun digging up old tyres for re-use⁴⁴.

There is significant demand for OTR tyres for retreading and repair, which is done by several private operators in Australia as well as overseas.

One company, Tyre Clean Australia, exports tyres for retreading to Malaysia, China and Korea, but cannot meet the current local demand.

Tyre Clean has developed a Tyre Audit Recycling System (TARS), which splits tyres into four categories ranging from suitable for reuse through to unsalvageable, with a category for warranty claim. This is basically an on-site system to promote better management of tyres. The information can then be sent to Tyre Clean for entering into a Global Tyre Information (GTI) website which allows clients to search for tyres. On the sites serviced by Tyre Clean

⁴⁰ Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003.

⁴¹ Paul Nicholls, Danwest, Personal communication.

⁴² Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003, J. Steffanelli, Danwest Rubber Co., Personal communication.

⁴³ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

⁴⁴ Vince Schepsis, Tyre Clean Australia, Personal communication.

Australia recovery of used tyres for retreading is reaching 40%. Tyre Clean Australia is also keen to promote better management of tyres through better maintenance of roads and tyres and slower travelling speeds.

The mining industry generally considers that the costs of transport of such tyres is prohibitive but given the value of individual tyres (for example over \$24,000 each) transport costs are minor. Tyre Clean uses back loading where possible but also freights tyres from sites to retreaders. Since January 2005 average monthly loads have been around 150 tonnes.

There are other players in the industry promoting the better tyre management practices, for example Adam Gosling, a consultant who provides a range of services to the industry including safety training. Adam sources tyres for repair by several companies including Tytec in Kewdale⁴⁵.

Not all mining companies bury used tyres on site. For example, BHP Billiton has a company policy prohibiting the practice. At one stage there were 4,000 haul pack tyres stockpiled at the Newman mine⁴⁶.

A recent entrant to the market is planning to export OTR tyres for processing overseas⁴⁷.

Fate of end-of-life tyres

In terms of current usage of waste tyres⁴⁸, nationally, around 49% of tyres are disposed to landfill, 33% are reprocessed into recovered rubber (for a range of end uses), 10% are illegally dumped and 5% are used for waste to energy. Around 3% are used for numerous other end-uses including civil construction.

For tyres generated in the Perth metropolitan area, it is estimated that, on a mass basis, approximately 34% are landfilled, approximately 28% are retreaded or used for material recovery, with 1% exported (nominal value) and the remaining 37% are used for acceptable or approved end uses or dumped illegally⁴⁹.

The number of tyres that are reused or recycled in regional and country areas is considerably less. There is no reliable data available on used tyre management in country areas. However, there have been approximately 200,000 passenger tyres used in subsoil drains for salinity control in the Kojonup area⁵⁰ (180km south east of Perth), which in relation to the quantity of tyres produced, is currently not very significant.

⁴⁵ Adam Gosling, Successful Tyre Management, Personal communication.

⁴⁶ Trevor Hale, BHP Billiton Iron Ore, Personal communication.

⁴⁷ Jonathan Youngs, Saypol, Personal communication.

⁴⁸ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004

⁴⁹ Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003.

⁵⁰ Ibid.

Collectors in WA

There are numerous small collectors of tyres but it seems the majority of tyres are currently handled by three main collectors:

- Tyre Waste WA
- Tyre Recyclers WA
- Reclaim Industries/Entyre Rubber

OTR Tyre Repairs and Sales is the largest collector of truck and earthmoving tyres.

Tyre Waste WA

Tyre Waste WA is now the former Western Tyre Recycling who bought the name when the former shredder (Tyre Waste WA) ceased operations⁵¹. Tyre Waste WA was a shredding plant with the capacity to process at least 550,000 light truck and passenger tyres per annum, i.e. half the passenger tyres produced in metropolitan Perth. A number of factors seem to have contributed to the company's closure including failure of the shredding plant which would have cost \$60,000 to repair⁵².

Tyre Waste WA has purchased the mobile baler imported by WAESCO (another failed business that aimed to bale tyres for use in civil construction) and stores the baled tyres at the S.T.E.G. monofill site at Brookton. They also handle tyres from car yards for Cleanaway and several major private tyre companies, and until recently had the Beaurepaire contract.

Tyre Waste WA is working to develop business with shires, travelling to their sites to bale tyres, however they have found it is uneconomical to return baled tyres to the S.T.E.G. monofill at current prices and would like to investigate the option of baling for burial at local Shire landfill sites, perhaps in a small monofill cell. Councils are willing to pay \$1-2/tyre which will cover the costs of taking the baler to regional centres such as Quairading and Albany and even Esperance and but will not cover the costs of transport back to the S.T.E.G. landfill at Brookton.

Baling, with travel and handling costs is about \$1.10/car tyre, \$2.50 for 4-wheel drive and small truck tyres and \$8.50 for larger truck tyres. The mobile baler can handle 2,500 tyres per day, ie producing 25 bales per day. The baler can not handle very large OTR tyres.

Tyre Recyclers WA

This company collects about one quarter of the passenger and light truck tyres generated in the wider metropolitan area⁵³, approximately 1,000-2,000 tyres per day. The tyres are sorted with truck tyres going to Reclaim Industries (approximately 250/week) and passenger tyres suitable for retreading going to Transearth and on to the Eastern states for recapping. An

⁵¹ Rod Rinaldi, Tyre Waste WA, Personal communication.

⁵² David Gooch, Tyre Waste WA, Personal communication.

⁵³ Willy Van Grootel, Tyre Recyclers WA, Personal communication.

increasing number of the tyres are exported to Brazil for second-hand use and recapping. Tyre Recyclers WA has an export order for 2 million tyres. Any remaining tyres are disposed at the RCG landfill at Quinns Road⁵⁴. Tyre Recyclers WA is currently taking 350,000 – 400,000 tyres per annum (8-10 bales per day) to this landfill. The landfill charges \$20/tonne.

There is an immediate problem for Tyre Recyclers WA as Colin Zampatti at RCG has decided not to renew his licence for tyres from July 2005, closing this option for disposal. The remaining landfills receiving tyres (S.T.E.G. and JW Cross & Sons) have considerably higher gate fees which will impact on the collection business. If Reclaim Industries is able to process all tyres within 6 to 12 months as forecast (see below), this will absorb all of the tyres collected but there is a problem until Reclaim has the capability to handle passenger tyres.

It may be necessary for the Department to assist Tyre Recyclers WA to find a short term solution, for example through negotiations with RCG regarding the continuation of the current licence conditions.

Reclaim Industries

Reclaim Industries has a system for processing truck and bus tyres to produce granulated rubber for the production of manufactured products including surfacing. Reclaim is also a manufacturer of recycled rubber products.

Reclaim Industries does not currently process passenger tyres but it has recently won the Beaufort contract and will collect all truck and passenger tyres from these outlets. The company is planning to use the assured stream of car tyres to justify investment in plant for their processing⁵⁵.

Reclaim Industries is examining the feasibility of purchasing a mobile shredder to use for collecting rubber from regional sites. This would be an alternative to baling and monofill storage on site. It is uncertain whether the mobile shredder would be able to handle the large OTR size tyres. Reclaim Industries is also in the final stages of designing and constructing a tyre cutting machine to handle earthmoving tyres and expect to have it built within the next two months⁵⁶.

Western Reclaim

Western Reclaim is at the business formation stage. The business model is the collection of all types of tyres: passenger, truck and haul Pac for the production of crumbed rubber for export and supply to local industries, for example for use in asphalt and bitumen⁵⁷.

⁵⁴ David Gooch, Tyre Waste WA, Personal communication.

⁵⁵ Chris Battel, Reclaim Industries, Personal communication.

⁵⁶ Tim Francis, Reclaim Industries, Personal communication.

⁵⁷ Carlo Mangione, Western Reclaim, Personal communication.

There is also another possible entrant interested in establishing plant to process car and truck tyres in the near future.

OTR Tyre Repairs and Sales

OTR Tyre Repair and Sales handle mostly larger tyres. They dispose of a 7 tonne truckload of tyres daily to the JW Cross and Sons landfill in Australind⁵⁸.

Landfill disposal/storage

Landfill	Tonnes 2003	Tonnes 2004	Comments
City of Armadale Hopkinson Road, Forrestdale	1	1	Tyres collected, baled and transported to STEG by Tyre Waste WA ⁵⁹
RCG, Quinns Road Neerabup	779	3,921	Currently takes tyres but ceasing from 1 July 2005 ⁶⁰
Eclipse Resources, Flynn Drive, Neerabup	-	9	No longer taking tyre waste ⁶¹
Red Hill, EMRC, Toodyay Road, Gidgegannup	1	-	Only accepts shredded tyres ⁶²
Waste Stream Management, Ratcliffe Road, Medina	4,854	1,177	Was previously taking shredded passenger tyres from Reclaim Industries, no longer accepting; Reclaim Passenger tyres now being baled by Tyre Waste WA for STEG
JW Cross & Sons, Stanley Road Australind	321	4,002	This landfill also receives at least an equivalent volume of tyres from outside the metropolitan area ⁶³ .
Meekatharra Cashmans Tyre Disposal Site		216	No longer accepting tyres due to expense of fire fighting equipment; were providing a service for mining companies & shire & taking some tyres for OTR Tyre Repair & Sales. OTR tyres are now going to JW Cross, Bunbury ⁶⁴

⁵⁸ Vic Cross, JW Cross & Sons, Personal communication.

⁵⁹ David Gooch, Tyre Waste WA, Personal communication.

⁶⁰ Ibid.

⁶¹ Ibid.

⁶² Ranka Kotur, Department of Environment, Personal communication.

⁶³ Vic Cross, JW Cross & Sons, Personal communication.

⁶⁴ Mark Horswill, Meekatharra Cashmans Tyre Disposal Site, Personal communication.

Mindarie Regional Council, Tamala Park, Marmion Ave, Mindarie	10	-	
STEG , Canns Road, Bedforddale Brookton	1,401	1,454	Monofill
Totals	7,367	10,780	

Table 1. The volumes of tyres from the metropolitan area disposed of to landfills in 2003 and 2004⁶⁵.

The J.W. Cross and Sons site at Stanley Road Australind receives very large quantities of tyres and in fact would seem to be the largest tyre landfill site in WA. In addition to receiving approximately 7 tonnes per day from Perth (collected by OTR Tyre Repair and Sales); they operate their own bin pick up service in the South West, providing approximately another 4,000 tonnes per annum⁶⁶. Most of the tyres in the landfill are truck and passenger tyres but there is an occasional large earthmoving tyre. The landfill is dedicated to rubber and they also receive some small quantities of conveyor belt from Perth, mostly from crushing plants and factories. They do not receive any of the large mining conveyor belts. The landfill usually keeps the conveyor belt to one side and reuses it at the landfill as road surfacing. Small quantities of plastic/rubber pipe are also taken. Tyres could be recovered from the site for future recycling. The gate price is \$10/cubic metre which equates to about \$300 for a 7 tonne truck or \$42-43/tonne⁶⁷ though this has recently increased to \$50/tonne⁶⁸.

The Save The Earth Group (S.T.E.G.) landfill is a monofill designed for the storage of baled tyres. Tyres are pressed into bales of 1 tonne at the depot or using a mobile press. The bales are then arranged in landfill cells each containing 1015 bales with a weight of 1015 tonnes⁶⁹.

The cells are buried up to 4 layers deep with a 0.5m minimum clean fill fire blanket between each set of layers. The top layer is dressed with at least 0.8m top soil to encourage plant growth. The very tight baling means significant exclusion of air to reduce fire risk. As there is clay beneath the monofill water is retained, further reducing the fire risk and minimising any prospect of leaching⁷⁰.

Tyre cells are plotted and logged by GPS before burial to facilitate future recovery.

The monofill is currently receiving approximately 350 tonnes per month⁷¹, about 10% of the volume of used tyres generated in WA per annum.

⁶⁵ Ranka Kotur, Department of Environment, Personal communication.

⁶⁶ Vic Cross, JW Cross & Sons, Personal communication.

⁶⁷ Ibid.

⁶⁸ David Gooch, Tyre Waste WA, Personal communication.

⁶⁹ Peter Bertei, S.T.E.G., Personal communication.

⁷⁰ www.steg.net.au

⁷¹ Peter Bertei, S.T.E.G., Personal communication.

The available storage area is about 100 acres, providing potential storage for 2.5 million tonnes of tyres. The current gate price is \$55/tonne.

The monofill pays a landfill levy of \$1/tonne as do all the inert landfills which accept tyres from the metropolitan region⁷². None of the Class 2 or 3 landfills licensed to accept tyres, which pay a higher levy (EMRC, Red Hill, Wastestream Management, or West Australian Landfill Services, Cardup) are receiving tyre waste.

S.T.E.G. has had difficulty competing with landfills such as RCG at Quinns Road who were charging \$20/tonne⁷³⁷⁴ to bury whole/baled tyres with other inert waste, but these players are now leaving the market.

Similarly the Meekatharra Cashmans Tyre Disposal Site (a gold mine operation operated by Lightrange Pty Ltd) has ceased its tyre operation due to difficulties in meeting the requirements for fire fighting equipment. This site was taking tyres for mining companies and shires as a service, i.e. without charging. The site also received some tyres from the metropolitan region from OTR Truck Repairs and Sales⁷⁵. Some charge must have applied in this instance as the disposal of metropolitan waste incurs a landfill levy.

Rod Howe (Circle Track Productions) at the Northam Speedway is licensed as an inert landfill to receive tyres. Some of the tyres are used to build embankments for the Speedway but most are buried. The site receives 50 -60 of the very large haul pack tyres per month from mine sites. The companies pay \$200-400/tyre for disposal at the site⁷⁶.

There is currently no shredding or recycling of rubber from earthmoving tyres in Australia. The large percentage of steel in these tyres (up to 50%) and the large size makes shredding difficult⁷⁷. At least two participants in the WA market are considering the purchase of mobile equipment to handle these tyres.

While some companies have developed Environmental Guidelines to manage the disposal of used tyres⁷⁸, for example requiring the surveying and recording of the site of burial of tyres, this is not required by regulation. Under the Environmental Protection Regulations 1987 "tyres may be disposed of by burial under a 500 mm layer of soil in batches separated by 100mm of soil". Mine sites in WA have no license conditions relating to tyre disposal and there is no requirement to bury tyre separately from other inert waste. Most tyres are buried on site.

In general country landfills are allowed to bury tyres whole only if they receive sufficient fill to allow them to meet their licence conditions⁷⁹. Tyres therefore must be shredded and a number

⁷² Ranka Kotur, Department of Environment, Personal communication.

⁷³ Peter Bertei, S.T.E.G., Personal communication.

⁷⁴ Willy Van Grootel, Tyre Recyclers WA, Personal communication.

⁷⁵ Mark Horswill, Meekatharra Cashmans Tyre Disposal Site, Personal communication.

⁷⁶ Mike Allen, Department of Environment, Personal communication.

⁷⁷ Vince Schepsis, Tyre Clean Australia, Personal communication.

⁷⁸ Mark Edebone, Iluka Resources, Personal communication.

⁷⁹ Wayne Ennor, Department of Environment, Personal communication.

of Councils are now refusing to accept tyres to landfill as a consequence. This may be leading to significant inappropriate disposal⁸⁰. Kalgoorlie was until recently shredding tyres prior to landfilling but is now burying tyres whole⁸¹.

Most landfills outside the metropolitan region do not report the quantities of tyres they receive. Bunbury and Geraldton are exceptions as they have the software package to provide the information to the Department of Environment⁸².

Landfill	Tyres (tonnes) 2003	Tyres (tonnes) 2004
City of Bunbury, Stanley Road	32	35
Meru Road Landfill Geraldton	45	42

Table 2: Tyres disposed to landfill outside the metropolitan region.

In the mid west region the Department has been working with the shires and with tyre retailers to develop alternative solutions⁸³. As a result retailers are now sending tyres to the Humpty Doo facility which is the only licensed facility currently operating in the area. For 2004 this landfill received approximately 1300 tyres per month. Humpty Doo is basically a tyre monofill but there is no baling of tyres prior to burial.

Two sites in the area also have licences to receive tyres for quarry rehabilitation: Sangarra Plains and Constantine. Although they are licensed to receive tyres neither site has been.

The Meekatharra Shire accepts tyres at its landfill but does not want to continue as the cap-rock base of the landfill makes landfill space expensive⁸⁴. Meekatharra might be an excellent location for a collection point or depot for used tyres from the region.

A large proportion of the tyres sold in WA are unaccounted for. The TJ Waters report⁸⁵ estimated that 38% of used tyres in the metropolitan Perth area (on a mass basis) or

⁸⁰ David Gooch, Tyre Waste WA, Personal communication.

⁸¹ Ibid.

⁸² Ranka Kotur, Department of Environment, Personal communication.

⁸³ Nanette Schapel, Department of Environment, Personal communication.

⁸⁴ Ibid.

⁸⁵ Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003.

approximately 10,000 tonne are unaccounted for each year. Only 10,000 of the 40,000 tyres sent to Albany each year are returned to Perth⁸⁶.

These tyres are probably being stored in accordance with the Tyre Regulations that allow storage of up to 100 tyres without a licence, but they may be being stored or disposed of illegally.

The recent introduction of tracking of used tyres as a controlled waste under the *Environmental Protection (Controlled Waste) Regulations 2004* may provide information regarding previously unaccounted for tyres as may the recent survey of local governments and other authorities to determine the extent and location of stockpiles.

Inappropriate disposal (that is, legal and illegal dumping) is an attractive option wherever the benefits exceed the perceived expected cost of apprehension (that is, the perceived probability of being caught, times the cost of the penalty). These certainly differ greatly by person and place, which explains why only some people do it. For instance, dumping is probably more common in rural and remote locations. This is because the benefit is high, as legal disposal requires a costly trip to the nearest legal tip (recycling is typically unavailable); and the expected cost of apprehension is low, as enforcement is sparse⁸⁷.

Currently, about 10% of scrap tyres are dumped. Theory suggests this will fall as recycling becomes more lucrative. But any change is likely to be small, since recycling is rarely an option in rural areas; there, dumping competes mainly with landfill, whose costs are not expected to change.

It is worth noting that in some places so-called 'inappropriate disposal' may in fact not be inappropriate at all. In some remote locations landfill may be simply unavailable; the social cost of disposing to landfill (let alone recycling) may exceed the social cost of dumping. In that case, the efficient solution is to dump. This implies some dumping is desirable; and to eliminate dumping altogether would cost more than it is worth.

Use of End-of-Life Tyres

The ARRB Report⁸⁸ identified three broad target segments for used tyres:

1. Waste tyre reprocessing into recovered rubber. This segment includes a number of target applications that use recovered rubber as an input including:

- road pavements as rubber modified binders;
- other applications for recovered rubber including manufacture of new tyres, moulded products that typically are high volume and low technology, such as mats, domestic products (flooring, carpet underlay, etc), and manufactured products such as athletic surfaces, acoustic floors, and playground surfaces.
- use of crumbed rubber as a stemming agent for explosives

⁸⁶ Lillias Bovell, Department of Environment, Personal communication.

⁸⁷ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

⁸⁸ Ibid.

2. Waste to energy as tyre derived fuel. This segment includes the cement industry where waste tyres are used as an alternative kiln fuel. There is considerable interest in a range of alternative fuels.

3. Civil engineering applications. This segment includes a broad range of end uses such as retaining walls, embankments, fills and geotechnical uses such as drainage and pipes.

The market analysis suggested growth in the use of waste tyres for civil construction, recovered rubber, tyre derived fuel and new technologies that could open up new end-uses.

Waste tyre reprocessing

Shredding is typically the first step in the recovery of materials from tyres. Tyre reprocessors receive a fee to accept waste tyres from independent collectors who collect tyres from retailers and reprocess them towards different end uses⁸⁹.

There are several companies in Australia recycling rubber from tyres including⁹⁰:

- Sims Tyrecycle Victoria
- Chip Tyre, Queensland, now incorporating Steve Shakespeare's former company Rubber Recyclers Australia
- Reclaim Industries, WA

All of these companies are members of the Australian Tyre Recyclers Association, formed to participate in the development of the national Tyre Product Stewardship Scheme⁹¹.

Processing of recovered rubber produces a range of granule sizes depending on the target application. For example, fine rubber crumb is used in a 5% crumb mix in the manufacture of new tyres. This additive improves the air entrapment problem which arises during manufacturing. Increased use in this end market is constrained by two key factors – the constraint of the proportion of (vulcanised) crumb rubber and the tyre manufacturing capacity in Australia⁹².

Some countries including USA and Europe have been supplying Australia with granules at a price of around \$250 / tonne⁹³. The price depends on granule size. South Africa exports the most granulated rubber into Australia. Companies in WA import 50–90 tonnes of fine 30 mesh granules for grout, asphalt and render manufacture per month from overseas and interstate⁹⁴.

In Australia, the finished product (recovered rubber) sells for \$500/ tonne - \$700/tonne depending on granule size. Depending on the destination, the transport costs may be an additional \$80 / tonne.

⁸⁹ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

⁹⁰ Chris Battel, Reclaim Industries, Personal communication.

⁹¹ Peter Kreital, Australian Tyre Recyclers Association, Personal communication.

⁹² Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

⁹³ Ibid.

⁹⁴ Chris Battel, Reclaim Industries, Personal communication.

Currently the revenue received for steel from waste tyres is around \$130 per tonne⁹⁵ though the waste steel produced by Reclaim Industries is not generating revenue⁹⁶.

Manufactured products

Waste tyres are used to manufacture a wide range of surfacing and roadside products⁹⁷ including footpaths, playground surfacing, safety mats (for swings, slides, etc), livestock mats used to prevent injury and stop slipping (used in dairies, processing plants, etc), pavers, wheelchair ramps, anti-fatigue matting for high traffic areas in factories, speed humps, speed cushions, rubber curbing, crash barriers, guideposts, bollard bases, regulatory signage, etc. Guideposts are made from whole tyres – the sidewalls are removed and the tyre is flattened out, however the remainder of the products are made from recovered rubber. Tyre casing and tread produce different quality of recovered rubber which is used in different products.

Recovered rubber can also be used as ‘filler’ in industrial products. For example recovered rubber is used in the manufacture of carpet underlay. The rubber is used as cheap filler that provides bulk and weight. Recovered rubber can also be used to produce industrial adhesives.

Surfacing is a major business stream for recovered rubber. Surfacing includes playgrounds, footpaths, flooring for stables, etc. An estimated 35 surfacing companies operate Australia-wide (6 in Victoria, 15 in NSW, 7 in Queensland, 1 in Tasmania, 2 in South Australia and 4 in Western Australia). Capital investment to set up a site pouring operation for surfacing is low requiring minor equipment, a truck and mixer.

Moulded products is another important business stream manufacturing mats, pavers, speed humps and cushions, crash barriers, etc. These manufactured products are made from more than 90% recovered rubber, with added binder and colour pigment if required (see Table below).

Product	Tyre usage
1 traffic cone base	3 tyres
1 safety (fall) mat	15-20 tyres
1 speed cushion	120 tyres
1m kerbing or speed hump (approx 15cm wide)	6 tyres
1m ² playground surfacing	15 tyres ⁹⁸

Table 3. Tyre usage in manufactured products⁹⁹

Reclaim Industries

⁹⁵ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

⁹⁶ Chris Battel, Reclaim Industries, Personal communication.

⁹⁷ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

⁹⁸ Reclaim Industries provides a figure of 1-8 truck tyres per square metre

⁹⁹ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

Reclaim Industries is a WA based publicly listed company recovering rubber, steel and other by-products from truck and bus tyres. Reclaim Industries is currently processing approximately 48,000 truck tyres per annum¹⁰⁰. The rubber crumb produced in Perth is sent to their manufacturing facilities in Adelaide, Melbourne, Sydney, Brisbane and MacKay as well as being used here. Reclaim Industries also supplies raw product to other manufacturers of rubber products. Each year the WA plant is sending approximately 2,500 tonnes of product interstate. They use back loading rates for both road and rail.

This rubber is primarily used for playground and sports pavements and for traffic calming products such as flexible guide posts, speed bumps and car stoppers^{101,102}. This market is worth \$80 - 100 million per year, and is growing at a rate of 30% per year¹⁰³. Each playground uses 10-13 tonnes of rubber for an average size of 200 m².

There is also a very big market for finer grades of crumb for adhesives, grout and render manufacture. Reclaim Industries sells 10-15 tonnes of 30 mesh grade for grout per month. One Victorian manufacturer of asphalt and bitumen surfacing products requires 50 tonnes/month¹⁰⁴. Car tyres are more easily ground to the smaller granule sizes.

Demand from overseas markets for crumbed rubber is also high as there is a global shortage of rubber and the crumb manufactured overseas is not always of the required quality specification. One of Reclaim's competitors, Sims Tyrecycle has large orders for overseas¹⁰⁵.

Demand is far greater than supply. The growth of Reclaim Industries and its expansion into processing car tyres has been delayed by the difficulty of securing assured supplies of tyres in competition with cheap landfill. Reclaim Industries has been bringing cut up truck tyres from South Australia at a cost of \$140/tonne by rail¹⁰⁶.

The rated capacity of the Reclaim Industries plant in Perth is approx 7,000 tonnes per annum of truck tyres processed, equivalent to approx 740,000 EPUs or 148,000 truck tyres per annum, equivalent to the total estimated quantity of the truck & bus tyres generated in metropolitan Perth¹⁰⁷. The company is considering the purchase of a mobile shredder to visit regional centres¹⁰⁸.

The company has recently secured the contract from South Pacific to collect all used tyres from Beaufort outlets: 20,000 car and truck tyres per month. This contract will begin mid 2005. The company is now seriously considering the purchase of plant to enable the

¹⁰⁰ Chris Battel, Reclaim Industries, Personal communication.

¹⁰¹ Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003.

¹⁰² www.reclaim.com.au

¹⁰³ Tim Francis, Reclaim Industries, Personal communication.

¹⁰⁴ Chris Battel, Reclaim Industries, Personal communication.

¹⁰⁵ Ibid.

¹⁰⁶ Tim Francis, Reclaim Industries, Personal communication.

¹⁰⁷ Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003.

¹⁰⁸ Chris Battel, Reclaim Industries, Personal communication.

processing of car tyres. This requires an investment of US\$350,000 for a cracker mill. If this proceeds, by the end of 2005 the company would be able to process every available used tyre generated in WA¹⁰⁹.

Road surfacing

Recovered rubber is used in a pavement surface treatment consisting of a sprayed film of bituminous binder covered with aggregates. The use of recovered rubber is now a standard practice that delivers reliable performance in terms of addressing the characteristics of pavement fatigue including the loss of stone and the onset of cracking. In general the use of Crumb Rubber Modified binder (CRM) is targeted at pavements under distress (i.e. cracked and near end of life). The CRM maintenance technique can give added surface life¹¹⁰.

Scrap Rubber Modified Binder (or CRM) is formed by dispersing scrap rubber particles in bitumen. The particles are partially digested and partially swollen by the adsorption of bitumen oils. CRM is a competitor to Styrene Butadiene Styrene (SBS) which is used in Polymer Modified Binder. SBS is not particularly stable and can degrade if there are large haulage distances and time delays involved. CRM binder does not suffer from this disadvantage. Polymers are also much more expensive than crumbed rubber¹¹¹.

A CRM specification requires a minimum metal content (since this can be detrimental to the spraying operation), and a specific particle size.

CRM can be premanufactured for transport to the paving location or prepared at the site.

Around 1.6 tonne of recovered rubber are required for each lane-km constructed using a spray seal, so the usage of 300 tonnes of crumb rubber per annum (Table below) is equivalent to around 90 km (or 45 lane-km) of spray sealed road.

VicRoads	250 - 300 tonnes pa	VicRoads use 30 mesh
RTA	450 – 500 tonnes pa	RTA use 16 mesh (larger than 30 mesh)

Table 4. Usage of recovered rubber in pavements in Victoria¹¹²

Around 300 car tyres are required to produce a tonne of crumbed rubber. A typical truck tyre has a weight of around 45kg and a higher rubber content of around 70%. A used truck tyre therefore is able to source around 24 kg of rubber (equivalent to around 6kg per EPU). Therefore, around 180 EPU will be required to produce 1 tonne of crumb rubber. In practice crumbed rubber is usually made from a mixture of truck and passenger tyres giving an average estimate of 240 EPU per tonne of crumbed rubber.

¹⁰⁹ Tim Francis, Reclaim Industries, Personal communication.

¹¹⁰ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

¹¹¹ Meda Sicoe, Pioneer Road Services, Personal communication.

¹¹² Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

Using the estimate of 240 EPUs per tonne of crumb rubber, the VicRoads usage of 300 tonnes is equivalent to 72,000 EPU. Using a similar factor, the RTA usage is equivalent to around 120,000 EPU per annum. Assuming the total usage in other states is around 50,000 EPUs per annum, the total market size is estimated at 240,000 EPU per annum.

In NSW the RTA and Resource NSW have prepared a business plan to commercialise scrap rubber asphalt. Scrap rubber asphalt is a technically proven technology that is particularly suitable for use in overlaying fatigue/cracked pavements. Rubberised asphalt is widely used overseas as a traffic noise mitigation measure¹¹³. The Business Plan includes the development of an industry standard Code of Practice including best practice guidelines for the manufacture, handling and use of scrap rubber asphalt. Following on from this, modifications to the RTA asphalt specifications will be undertaken to allow for the use of scrap rubber asphalt.

There are additional costs relating to the use of scrap rubber in asphalt mixes. These have been estimated at around \$25 per tonne of asphalt mix. This is equivalent to around \$25 per 50 kg scrap rubber (calculated at a 5% mix), or around \$5 per EPU.

A key outcome of the Plan is the diversion of scrap rubber tyres from landfill. The Plan proposes a set of RTA targets for the annual use of scrap rubber in asphalt and sprayed seals. The potential market is about 10,000 tonnes crumbed rubber/year which would equate to 2.4 million EPU¹¹⁴.

This volume would use approximately half of all used tyre rubber generated in WA per annum. Main Roads WA uses only about 15 tonnes per annum of crumbed rubber (approx one-tenth of that used previously). The use has diminished mainly because crumbed rubber in bitumen has been largely replaced over the past ten years by polymers¹¹⁵.

Other issues cited by Main Roads include:

- Problems with consistency of supply;
- Noxious fumes during the blending with bitumen at 170-180C; and
- The need to clean trucks immediately after spraying to prevent blockages¹¹⁶.

Main Roads contracts are now "performance based" rather than "technical specification" contracts and they have been in place for 5 to 7 years of their 10 year terms. Interestingly the editorial for the Proceedings of a Conference held in the USA in 2000 nominated the move to performance based specifications for binders and mixes for roads as making it easier for highway agencies to adopt asphalt rubber¹¹⁷.

¹¹³ Report on the Status of Rubberized Asphalt: Traffic Noise Reduction in Sacramento County, Theron Roschen, pp517-539, Proceedings of the Asphalt Rubber 2000 Conference, November, 2000.

¹¹⁴ Rod Clare, Department of Environment and Conservation (NSW), Personal communication.

¹¹⁵ Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003, (R. Kealy, Main Roads WA, Pers. Comm.)

¹¹⁶ Garnet Gregory, Main Roads WA, Personal communication.

¹¹⁷ Proceedings of the Asphalt Rubber 2000 Conference, November, 2000.

It is likely that the existing contracts will be renewed at the end of their current term, perhaps with some tightening of specifications¹¹⁸.

Within the next month Pioneer Road Services will begin a trial with the City of Canning using 3% crumbed rubber in asphalt¹¹⁹. The trial will use approximately 150 tonnes of rubber on half of a street, the other half to be the control. A new machine designed to absorb fumes during the on-site production process will be used to protect workers.

The aim of the trial is to demonstrate the superior performance of crumbed rubber in preventing cracking and rutting and its safe use to encourage promotion by the Department of Environment and use by other Councils in Perth.

Use of chipped tyre as an explosives stemming agent¹²⁰

Brambles Industrial Services has been working with Orica and a major mining company in the Hunter Valley NSW over the last few years to develop the use of chipped rubber as a replacement for crushed aggregate as a stemming agent. The chipped rubber has been found to be better than crushed aggregate as it is less than one third the weight, creates less greenhouse gas compared with the emissions from quarrying and transporting aggregate and is much cheaper. The aggregate used must be of high quality and typically costs \$20/tonne. One project in the Hunter consumes 90,000 tonnes aggregate per year, this would be replaced by 30,000 tonnes /year of rubber chips 20-50mm in size.

This market has the potential to take all of the used tyres available in Australia and may be a promising option for WA with its large mining industry. However the use of rubber chip in this application is a "low-end use" in terms of the waste hierarchy and under the national Scheme it would attract a lower benefit payment than the use of recycled rubber in manufactured products.

Waste to energy as tyre derived fuel

Tyre derived fuel (TDF) refers to the use of tyres as a fuel substitute for fossil fuels within purpose built furnaces for cement kilns, power stations, smelters or paper mills. In Australia cement kilns are the only TDF facilities in operation. Used whole or shredded/chipped tyres are fed directly into the kiln where the cement clinker is produced. Tyres are burnt at very high temperatures so there is very little residue. The viability of TDF depends on tyre availability and energy price structures in each state, which are highly variable¹²¹.

TDF is not the 'best' solution to the waste tyre problem from a waste management hierarchy perspective, but while other emerging markets develop, it is a viable alternative that has benefits over alternative options including landfill and waste incineration.

¹¹⁸ Garnet Gregory, Main Roads WA, Personal communication.

¹¹⁹ Meda Sicoe, Pioneer Road Services, Personal communication.

¹²⁰ Rod Clare, Department of Environment and Conservation (NSW), Personal communication.

¹²¹ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

The use of TDF by the Cockburn Cement kilns would not be considered an option unless the Government strongly supported such a policy¹²². Given that waste to energy is lower in the waste hierarchy than reuse or recycling and there is likely to be considerable public opposition to such a proposal, this option was not further investigated.

Civil engineering applications

Used tyres are being utilised in a range of segments of the construction industry for applications such as retaining walls, wall building blocks, rapid formwork or void filler, pavements and access roads and erosion control.

A company known as WAESCO Pty Ltd was established in Western Australia in 2003 with the aim of using baled used tyres encased in concrete for the construction of houses and retaining walls and as a floor base for piggeries¹²³ etc. The company imported a mobile baler and collected a large quantity of tyres before becoming insolvent. The tyres were mostly disposed of to the RCG landfill¹²⁴.

Ecoflex Australia¹²⁵ provides a range of engineered systems involving the removal of the sidewall of used tyres to create a structural unit or container. The container void can be filled with crushed rock, gravel, sand or soil, to form a structural building block or unit. These units can be combined in various cellular arrangements and designed to perform basic engineering functions in accordance with certifiable engineering standards and building codes. Ecoflex units can be combined to create retaining walls, dam and pond embankments, sea walls and drainage channels.

Ecoflex applications are certified engineering systems that meet the relevant Australian Standards and have been used in the construction of over 400 projects. The largest of these, currently under construction on behalf of Energy Australia, will consume over 450,000 EPU in the construction of a 20 km access road¹²⁶. (This project represents 2% of the national annual waste tyre stream).

Ecoflex Australia indicates that their systems are able to deliver a cost advantage compared with conventional construction methods. The Ecoflex technology involves a lower level of technology investment compared to other levels of investment for tyre reprocessing, which could assist the development of solutions to waste tyres in regional areas, and encourage local civil construction activity.

Ecoflex is interested in establishing its business in Western Australia¹²⁷.

¹²² Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003.

¹²³ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

¹²⁴ Peter Bertei, S.T.E.G., Personal communication.

¹²⁵ www.ecoflex.com.au

¹²⁶ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004

¹²⁷ Vic Andrich, Department of Environment, Personal communication.

All the above uses are likely to be approved for benefit payments under the proposed National Scheme though tyre-derived-fuel is likely to attract a lower benefit payment than remanufacture or civil engineering applications.

Fate of tyre	Organisation*	Description
Retreading	Danwest Rubber	Danwest Rubber is WA's largest retreader of car tyres.
	OTR Tyre Repair and Sales	OTR (Off The Road) refurbish haulpac tyres for the mining industry.
	Tyre Clean Australia	Sources OTR tyres from the mining industry for retreading.
Collecting & baling	Tyre Waste WA	Bales for monofil.
	Tyre Recyclers WA	Collects for landfill, some sales to retreaders, export.
Shredding	Reclaim Industries	Collects and shreds for recycling.
	Western Reclaim intending to establish	Collect and shred/crumb for recycling
Recovered Rubber	Reclaim Industries	Reclaim Industries recycles (grind and refine) a range of truck tyres into doormats, cricket pitches, playground mats, hockey pitches, dressage arenas, bollards, speed humps, parking bay buffers. They also supply crumb to other manufacturers.
Civil Engineering	EcoFlex considering establishment in WA	Uses tyres to create structural building blocks for civil engineering applications
Pyrolysis	Tox Free	A new and emerging technology subject to R&D. recovering Jet fuel, Diesel, Carbon black, Activated carbon. Tox Free is not pursuing this technology as the purity of end products is not sufficient for sale ¹²⁸ .

Table 5. Fate of tyres in WA

* This table is not intended to be comprehensive but lists the major retreaders, collectors etc.

Volumes required for viability of tyre recycling industries

There are estimates that a supply of 1 million tyres for recycling or reuse is required in an area of 250 km around a tyre recycler before the operation becomes viable¹²⁹. On a typical population generation rate of 1 tyre per person per year this would require more dense populations than most of rural and remote Western Australia, however there is a high generation rate for large tyres used in the mining and agricultural industries. Some shredding and crushing plant requires a minimum of 800,000 tyres per year to be economically viable.

Some civil engineering applications can operate on a lower-density supply, with one company indicating a population of 20,000 within a 100 km radius is generally sufficient for a civil engineering project¹³⁰.

¹²⁸ Ralph Nielsen, Tox Free Solutions Ltd, Personal communication.

¹²⁹ Draft End-of-Life Tyres Issues Paper, 2004, Department of the Environment and Heritage.

¹³⁰ Used Tyre Remote Benefit Proposal, Department of the Environment and Heritage, 2005.

However it is clear that a viable recycling industry can only be established in areas with more dense populations than most of rural and remote Western Australia and that with the current supply of used tyres, WA only has sufficient resources to support perhaps one or two recyclers in Perth assuming the majority of used tyres can be recovered. Given the potential value of the resource efforts should be made to prevent its disposal in landfill and to recover it from remote and rural areas.

The potential demand for used rubber for Reclaim Industries alone (assuming they proceed with the capital investment required to process passenger tyres) will exceed the volumes available in WA. With the new entrant to the market in the near future there will be a shortage of tyres within 18 months and may even be a need to recover old stockpiles or consider the use of tyres from South Australia.

The number of waste tyres generated in South Australia is of the order of 1.4 million per annum¹³¹. Around 90% of these tyres are disposed to landfill. A small number of tyres are transported to Victoria for use as waste-to-energy. All waste tyres must be shredded before disposal in landfill – the only exception is large earthmoving tyres in remote areas where there is no shredding facility.

South Australia is developing a waste policy that emphasises Extended Producer Responsibility. South Australia operates a tracking system to prevent illegal dumping.

A key constraint to increasing the scope for tyre recycling in South Australia is the small number of tyres which critically hinders the economic viability of a waste tyre recycling plant. There are only two existing retreaders and rubber reprocessors in the state, and there are limited 'boutique' applications.

Reclaim Industries has been bringing truck tyres from South Australia by rail at a cost of \$140/tonne. Another manufacturer, Retech Rubber imports rubber from SA. Reclaim have also bought crumbed rubber from Encore in Victoria¹³²

The use of rubber in road surfacing should also be pursued to provide alternative markets. If WA used similar amounts to that forecast for NSW, half the State's used tyres would be needed for this application.

Industry capacity

The most critical gap in industry capacity identified through this consultation is the lack of plant in WA to shred passenger tyres. Reclaim Industries have indicated they are considering the purchase of a shredder to process passenger tyres. Reclaim may also be interested in the purchase of a mobile shredder to enable collection from more remote areas.

Another gap in capacity is the lack of storage facilities, particularly in remote and rural areas, where tyres could be safely stockpiled until quantities are large enough to justify the visit of a

¹³¹ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

¹³² Tim Francis, Reclaim Industries, Personal communication.

mobile baler to bale tyres for on-site monofill or transport to Perth or a mobile shredder to enable transport of the shredded material to Perth. Current licence conditions restricting storage to 100 tyres would need to be varied to allow the collection of larger numbers of tyres.

Conveyor belt

Conveyor belt will not be covered under the proposed National Scheme but was included in the brief for this study as it is a significant source of used rubber and steel in WA.

BHP Billiton and Rio Tinto together would use 80% of the conveyor belt in WA, in roughly equal quantities. BHP Billiton Iron Ore uses 10,000 linear metres per year¹³³.

It is very difficult to quantify the weight used due to varying specifications. For example, BHP Billiton Iron Ore uses 12 different specifications ranging from 10kg/linear metre to 120kg/linear metre. They vary in width from 600mm to 2400mm and are of two main types: fabric or steel carcass belt. The belt is purchased from Australian distributors or factories, supplied by six manufacturers, all overseas except for Apex Fenner and Goodyear, both in Victoria.

BHP Billiton Iron Ore has a waste disposal contract for conveyor belts with Nilos Australia, based in Jandakot¹³⁴. Nilos Australia, established five years ago to take advantage of the very large quantities of belt used in the Australian mining industry, is an offshoot of the German company. Nilos collects the used conveyor belt on site and transports it to Perth in loads of 20-22 tonnes at a time. Nilos keeps a register of the incoming belt as part of the contract.

Nilos sort the belt into three categories:

- Scrap – badly damaged belt, shredded or worn out: disposed to landfill
- Recyclable – belt that can be reused by on selling for mud flaps, lining truck trays, covering concrete on stable floors, lining water troughs etc
- Reconditioning – belt is reconditioned and reused only once, though in Germany belt is reconditioned up to five times. The worn section (usually in the middle) is cut out and new rubber laid in the tracks, and then revulcanised. The cost is approximately 80% of the cost of a new belt.

Some rubber buffings from the reconditioning process and some scrap are crumbed for sale in asphalt/bitumen; some is used for playground surfacing.

Not only is there an environmental cost in inappropriate disposal of conveyor belts in terms of wasted resources, disposing of damaged belts and normal worn belts equate to millions of wasted dollars in capital expenditure each year.

The steelcord carcass of every steelcord belt accounts for 50 - 60% of the belt value, depending on the tensile strength rating and rubber cover thickness of each individual belt.

Therefore on average \$200 - \$250 of each worn belt metre is dumped or discarded sometimes as early as 6 months after installation or 25% of its useful life. In many cases operational

¹³³ Trevor Hale, BHP Billiton Iron Ore, Personal communication.

¹³⁴ Ibid.

problems or accidents are the cause¹³⁵. Conveyor belt condition monitoring and dedicated maintenance create long belt life and are the basis for reconditioning.

BHP Billiton is saving \$300,000 year in belt costs, as well as reducing environmental impacts and cutting waste disposal costs. The previous cost of disposing of the belt was estimated by BHP at \$120/tonne (\$60,000/year for the Nelson Point site). BHP Billiton pays the cost of transport of belt that will be reconditioned, Nilos pays to transport belt that has already been reconditioned once and is at the end of its belt life. This belt is sold to the US for use on cattle lots.

Nilos estimates in excess of 15,000m of used steelcord belts are either stockpiled or land-filled annually in Western Australia alone. If each belt were re-conditioned once, this would be reduced by at least half. There are currently approximately 50 - 60,000m of used steelcord belt stocked in lay down areas at mine sites and port shiploading facilities¹³⁶.

Nilos has been attempting for some time to demonstrate the environmental and financial benefits of conveyor belt reconditioning and recycling to mining companies in WA with limited success as "they are driven by the resources boom and the focus is only on increasing production, not containing costs"¹³⁷.

There is also some localised recycling of conveyor belt. For example J&P Metals Bunbury buys used conveyor belt from Iluka Resources Capel mine. The conveyor belt is cleaned and cut at the site then sold for use on dirt access tracks by farmers¹³⁸.

The tyre landfill operated by JW Cross & Sons at Australind receives one to two truckloads of conveyor belt per year, mostly from light industrial premises in Perth. The conveyor belt is kept to one side and cut up for use at the landfill for surfacing etc¹³⁹.

Until recently Meekatharra Cashmans Tyres was accepting conveyor belt and rubber blocks from mill sites for disposal along with tyres¹⁴⁰.

Most conveyor belt is still disposed of by burial on site.

Issues arising from Stage 2:

The tyre recycling industry nationally and in WA in particular seems to be at a critical point where demand for the resource is about to begin to equal supply.

¹³⁵ www.nilosaustralia.com

¹³⁶ Ibid.

¹³⁷ Henning Volzke, Nilos Australia, Personal communication.

¹³⁸ Kim Sherry, Iluka Resources, Personal communication.

¹³⁹ Vic Cross, JW Cross & Sons, Personal communication.

¹⁴⁰ Mark Horswill, Meekatharra Cashmans Tyre Disposal Site, Personal communication.

There is already excess capacity for truck tyres in the plant operated by Reclaim Industries, while truck tyres are still being buried in landfill/monofill. Perhaps truck tyres of the size required by Reclaim Industries should be banned from landfill altogether.

Most used tyres generated in Western Australia are disposed of to landfill. This includes the tyres generated in the metropolitan region. The Tyre Landfill Exclusion Zone seems to have been totally ineffective in encouraging the diversion of tyres from landfill due to the number of exemptions granted to allow metropolitan landfills to receive tyres and the availability of landfill outside the TLEZ.

The WA Government might consider more stringent controls on landfill or a different approach altogether. Options include a requirement for shredding before landfilling, a ban on landfill with other wastes, or a total ban on tyres to landfill.

A reasonable proportion of the landfilled tyres have been monofilled (in bales at S.T.E.G. and loose at JW Cross and Sons) which may be regarded as storage from which the tyres can be recovered in the future. Considering the total estimated mass of tyres generated per annum in Western Australia is in the range 36,000 – 39,000 tonnes there is effectively unlimited storage available at the S.T.E.G. monofill.

Recognising that some storage /disposal option will be needed at least for the short to medium term, at least until investment in recycling plant has been completed, a requirement that tyres must only be stored in a monofill could be considered. This could possibly also be applied to country landfills. This situation seems to be developing for tyre waste from the metropolitan region in any case with several of the landfills that have been taking waste tyres for burial with other inert wastes withdrawing from the market.

The recent decision by RCG not to accept tyre waste from July 2005 will create a significant issue for Tyre Waste WA, one of the largest collectors. The only other landfill options available are much more expensive and could result in the closure of the business. This collector already takes truck tyres to Reclaim Industries and claims to recycle up to a third in total through this and other means. However there are still up to 2,000 tyres per day to be disposed/stored. Within 6 months if Reclaim Industries invests in the plant for processing car tyres or a new entrant establishes in the market these tyres will not need disposal.

The Department might wish to consider whether there is any short term solution to this issue.

In WA it seems inappropriate disposal may be increasing in remote and rural areas due to rural landfills refusing to take tyres as they are not able to meet the licence conditions for cover.

This could be prevented by encouraging Councils to receive tyres for free and licensing them to store sufficient quantities to make it viable for a mobile baler or shredder to visit. The costs of storage or baling might perhaps be subsidised, perhaps through the RRRS in the interim until the national scheme is developed. A mobile shredder would be collecting rubber for use in recycling and would bring the shredded rubber back to Perth.

It is currently uneconomical to transport baled tyres to Brookton (S.T.E.G.) for monofilling. Bales might be buried in a dedicated Council site, perhaps shared by several neighbouring Councils.

Most OTR tyres are buried on mine sites. Up to 40% of these tyres may be suitable for reuse via retreading. There is significant demand for the proportion of these tyres that may be suitable for retreading.

There is currently no process available in Australia for shredding and recycling of these oversized tyres, though this may change in the near future.

There is no license requirement for mine sites to manage their used tyres in a particular way. The Department could work with the industry and with the various specialist industry consultants to develop criteria for the development of tyre management plans as a requirement for used tyres at mine sites. There are different regulatory requirements for the management of tyres on mine sites around the country, which could be used as models for WA.

Similarly, there is demand for used conveyor belt and financial rewards for companies to reuse and recycle their belt. A requirement for a management system to ensure the correct management and disposal of conveyor belt on mine sites would prevent the wastage of this resource.

A large proportion of used tyres is unaccounted for in WA. These tyres are probably being stored in accordance with the Tyre Regulations that allow storage of up to 100 tyres without a licence, but they may be being stored or disposed of illegally.

The recent introduction of tracking of used tyres as a controlled waste under the *Environmental Protection (Controlled Waste) Regulations 2004* may provide information regarding previously unaccounted for tyres. When sufficient data is available, for example 12 months, the proportion of unaccounted for tyres should be estimated by checking the transport information against landfill data and sales data.

The lack of growth of used rubber for asphalt and pavement in WA compared with other States deserves attention. Some States have more explicit procurement policies for waste reduction, for example NSW has WRAPP (Waste Reduction and Procurement Policy). Agencies such as the RTA report on their use of recycled products for example the quantities of crumbed rubber used in bitumen and progress towards its use in asphalt¹⁴¹.

¹⁴¹ Rod Clare, Department of Environment and Conservation (NSW), Personal communication.

3. The economic viability of transport

The distances between populations in Western Australia and the relative remoteness of Perth from other Australian capital cities can be a significant barrier to the establishment of viable recycling industries in Western Australia due to the costs of transport.

It has been established that a large proportion (at least 1.75 million EPUs) of used tyres generated in WA are in remote and rural areas, where apart from low-end use such as stemming agent for explosives on mine sites, there is likely to be little capacity for recycling. On the other hand demand is rapidly developing for greater volumes of tyres than can be supplied from the metropolitan area and there is recognition that the disposal of tyres containing non-renewable resources is no longer a desirable option.

Initially, in very remote areas a goal of the used tyres national product stewardship scheme will be to ensure that tyres are collected so that they are not disposed of inappropriately, a particular problem in small uncontrolled landfills where illegal dumping is very difficult to police. For some locations a life cycle analysis (LCA) may show it is better to use tyres on site or landfill instead of transporting to another location or recycling¹⁴².

Transport options

The Transport Logistics study¹⁴³ undertaken for the National Packaging Covenant's WA Jurisdictional Recycling Group was reviewed as a starting point for determining the major transport routes and centres of population for used rubber.

WA accounts for a third of Australia's freight transport task of almost 320 million tonne-kilometres. Factors contributing to this high percentage are long trip distances and movements of heavy commodities such as ores. Road is the main mode of transport for all freight types in Australia except bulk commodities such as coal and ores. However, rail is the dominant transport mode between Perth and the eastern States (58% of annual tonnages), followed by road (24%) and sea (18%).

Regional road networks are well established and account for the bulk of transport movements. Major sealed highways include the Bussell, Eastern, Eyre, Great Northern, Great Southern, South Western and West Coastal Highways. There is also a proposal to upgrade the Meekatharra to Kalgoorlie - Boulder road to highway status. These highways are supported by an extensive network of local sealed roads to regional centres, as well as unsealed roads (especially across the WA – NT border).

Regional WA's freight rail network is limited. There are rail links within the south-western corner of the state; however these are generally for bulk freight or passenger services only. Very little non-bulk freight is transported by rail; some is moved from Kalgoorlie or Bunbury back to Perth. Privately owned rail networks in the Pilbara are limited to the bulk haulage of iron ore from mining sites to ports.

Major general rail links include¹⁴⁴:

¹⁴² Used Tyre Remote Benefit Proposal, Department of the Environment and Heritage, 2005.

¹⁴³ BSD Meinhardt, Kerbside Recycling – Exploring Regional Transport Economics, 2004.

¹⁴⁴ Ibid.

- Geraldton to Perth (bulk haulage only);
- Merredin to Kondinin;
- Northam to Mukinbudin;
- Wagin to Hyden;
- Albany to Northam;
- Northam to Kalgoorlie-Boulder and the eastern States;
- north - south Leonora to Esperance (through Kalgoorlie);
- Manjimup to Perth; and
- Tambellup to Gnowangerup.

One of the priority actions of the Freight Network Review (2002) was to identify options for operation and future location of regional freight nodes at, for example, Picton (near Bunbury) and Northam.

With the expected growth in freight outlined above, it may become more viable to establish or expand road - rail intermodal freight facilities in the Goldfields and South West. An intermodal freight facility has been proposed for Kalgoorlie - Boulder at the junction of the north-south Leonora to Esperance railway line and the Trans-Australian east-west artery. It has also been proposed that the Wiluna to Meekatharra Road be sealed, improving hub connections to the Pilbara region. This and other regional transport hubs would provide strategic locations for centralised bulk handling of recyclables, including tyres.

More interstate and international shipping freight leaves WA than any other State, but most of this is bulk commodities¹⁴⁵. Facilities for non-bulk container freight are limited. Fremantle is WA's only specialised container port for import and export of general cargo containers.

Air freight makes up a minor component of freight transported within WA and would not be economic for the transport of used rubber in any case.

Road transport

Recyclables transport is expected to become steadily more viable in regional WA and there is no reason to suppose this will not apply to used tyres.

Real freight rates declined by 70% for rail and 50% for road between 1965 and 2001, and this trend is expected to continue¹⁴⁶.

It is predicted that road transport will remain the most efficient and flexible transport method for non-bulk general freight in WA. This is due to the small, scattered population, the varied destinations, the flexibility of road delivery and its capacity for rapid turnaround. Demand in rural and regional areas will be supported by road improvements.

¹⁴⁵ BSD Meinhardt, *Kerbside Recycling – Exploring Regional Transport Economics*, 2004.

¹⁴⁶ *Ibid.*

The survey of West Australian Local Councils conducted for the Kerbside study found that most of those running a recycling program transport collected material to Perth by road; the only exception was the transport of glass via ship from Broome.

For tyres, as for other recyclables, for an 80 m³ trailer, the maximum weight is 24 tonnes and the optimum density would be 333 kg / m³. Due to differences in density, the cost is much higher for unbaled tyres than for baled tyres and the transport of shredded tyres would be probably a third of the cost of loose tyres.

Major differences in costs between the various types of used rubber relate to its weight, for example shredded rubber will be heavier than whole tyres but also more compact, so more economical to move. The ARRB study¹⁴⁷ used a single uniform rate of \$30 per tonne for transport of whole tyres (within an urban network) compared with a \$10/tonne cost for transporting reprocessed rubber so perhaps a ratio of 3:1 is likely.

A 24 foot semi-trailer can carry 10 tonnes of unbaled tyres or 20 tonnes of baled tyres¹⁴⁸. No one in WA currently has a mobile shredder, the only shredding plant being available at Reclaim Industries, though this situation may change in the near future.

The Kerbside Recycling study found that widely varying prices apply to non-bulk regional freight transport. Prices are higher for longer distances, but doubling the distance increases the fee by much less than double.

This was confirmed by Tyre Waste WA, which has a mobile baler and has investigated the possibility of baling tyres for return to Brookton.

Baled tyres have been moved between Kalgoorlie and Brookton for \$30/bale (tonne) and it is likely that a rate of \$20/tonne could be available through the right contract. A collector would need a full load (20 tonnes) to make this exercise viable. Costs for transport from the South West region are comparable¹⁴⁹. Transport costs from Geraldton to Brookton or Perth are likely to be slightly higher, but due to the number of back-loading opportunities transport from the far north, moving baled tyres from Broome or Port Hedland might be about same price as from Geraldton¹⁵⁰.

The rate for transport from Kalgoorlie to Perth quoted above is considerably cheaper than the prices quoted in the Kerbside Recycling Report¹⁵¹, for example \$52 - \$85/tonne for Kalgoorlie to Perth; but in rough agreement with the study on prices for the South West (\$27 - \$45/tonne), and for Geraldton to Perth (\$39 - \$49/tonne). Where road transport companies are engaged to deliver freight one-way, particularly in long-haul distances, they may reduce charges for return

¹⁴⁷ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

¹⁴⁸ David Gooch, Tyre Waste WA, Personal communication.

¹⁴⁹ Ibid.

¹⁵⁰ Ibid.

¹⁵¹ BSD Meinhardt, Kerbside Recycling – Exploring Regional Transport Economics, 2004.

deliveries. There are some opportunities for recyclables to be handled under these backloading arrangements. However, the distinction between back-loading and normal freight is moot as companies providing regular and reliable commercial deliveries generally seek to share the cost burden across journeys in both directions, rather than load the price in one particular direction¹⁵².

Nevertheless, the study found some back-loading opportunities are available, especially from regional centres such as Broome and Port Hedland.

Reclaim Industries transports large volumes of its rubber crumb to the Eastern states using back-loading rates for rail and road¹⁵³.

Back loading is one of the options used by Tyre Clean Australia to move large earthmoving tyres from mine sites¹⁵⁴. Tyre Clean Australia also pays to freight tyres from mine sites to interstate retreaders; however the value of these tyres makes this a feasible option.

Rail

Only the southern part of WA's rail network holds any prospect for transporting recyclables; the northern lines are restricted to the transport of bulk ores and similar.

Rail currently holds 70% - 80% of the share of interstate land-based container freight (60% of total interstate freight, including sea freight) and operators are attempting to increase this by using double stacking, trailer rail and stacking trailers on flat cars. The WA Government seeks to shift freight from road to rail where it is viable. To date, the focus has been on opportunities in and around Perth, especially the Manjimup - Bunbury - Perth corridor and the port of Fremantle.

WA's major freight operator is Australian Western Railroad. About 95% of its freight business is related to exports through the ports of Geraldton, Fremantle, Kwinana, Bunbury, Albany and Esperance, but it also transports about 60,000 containers each year. A typical current rate for container rail freight in regional WA would be 8¢ per net tonne km. Back-loading options are available but only in rail vans, as few containers return to Perth empty. However, rail vans run only between Kalgoorlie and Kewdale, do not stop between these two stations and are not available in other areas. Nevertheless there may be potential to expand the availability of rail vans beyond the Kalgoorlie route.

The cost for back-loading from Kalgoorlie would be much less than the standard rate, potentially less than 3¢ / tonne km. Additional costs would also be incurred in transfer to and from the rail network.

Container lifting facilities are not available at regional WA rail transport facilities. For the purposes of rough calculation, a loading cost of \$300 is assumed. For a 24 tonne load, the

¹⁵²BSD Meinhardt, *Kerbside Recycling – Exploring Regional Transport Economics*, 2004..

¹⁵³ Chris Battel, Reclaim Industries, Personal communication.

¹⁵⁴ Vince Schepsis, Tyre Clean Australia, Personal communication.

cost of rail transport is therefore generally estimated at \$500 + \$1.92 x distance for containers and \$500 + \$0.70 x distance for back-loading in rail vans¹⁵⁵.

Based on this formula, the cost of rail transport of a full 24 tonne container is \$68.50/tonne from Kalgoorlie to Perth, \$55 for Geraldton to Perth. The container prices are mostly higher than those available by road.

The rail van back-loading option, if available and logistically feasible, appears competitive with road transport at most locations, for example \$39/tonne from Kalgoorlie to Perth, \$33.50/tonne for Geraldton to Perth.

Sea

The interstate shipping freight rates to and from Fremantle Port have steadily declined from 2.54¢ to 2.08¢ / tonne km between 1989/90 and 2000/01¹⁵⁶. This has corresponded with a notable increase in shipping to and from Fremantle.

Container facilities in regional WA are very limited and rely on ships having onboard cranes to load and unload containers. The potential to upgrade the Bunbury port to cater for container shipping is under investigation. International ships do not currently use WA ports other than Fremantle due to the lack of infrastructure and lower profit margins related to low volumes and higher loading costs. Export through regional ports would therefore seem improbable. A container origin and destination survey conducted in 2000 indicated that only 13% of containers imported through Fremantle were destined for northern and eastern WA, and only 5% for the south-west. These volumes were considered too low to justify stops at regional ports, especially when all major distribution facilities are located in the metropolitan area¹⁵⁷.

The sole Australian-flagged ship suitable for general cargo that is licensed to service the Fremantle, WA coastal and Darwin route is *The Kimberley*. This is equipped with on-board cranes and calls at the northern ports of Dampier, Port Hedland, Broome and Wyndham on a seventeen day cycle. Some containers are reportedly being shipped back to Perth empty. Cost estimates were provided for delivering a 24 tonne, 80 m³ container of recyclables to Fremantle and Darwin from Broome and Kununurra¹⁵⁸.

Estimated costs per tonne were approximately \$53 for Kununurra to Darwin, \$96 for Kununurra to Fremantle, \$109 for Broome to Darwin and \$90 for Broome to Fremantle. It is obvious that shipping tyres from the East Kimberley (Wyndham/Kununurra) to either Darwin or Fremantle would be cheaper than road transport.

Based on typical timeframes and distances, the additional cost of transporting materials to and from the port might amount to about \$200 per container in Perth and \$100 in Broome. From

¹⁵⁵ BSD Meinhardt, Kerbside Recycling – Exploring Regional Transport Economics, 2004.

¹⁵⁶ Ibid.

¹⁵⁷ Ibid.

¹⁵⁸ Ibid.

Broome, shipping prices are towards the low end of the cost estimate range provided by road transport companies. From Broome, Port Hedland and Dampier it is possible, but unlikely, that shipping could be competitive. This would depend on negotiation of favourable rates and low cost transfer to and from port¹⁵⁹.

Northern Territory transport links

The Kimberley area is closer to Darwin than to Perth and has reasonable transport links through the sealed Victoria Highway, which passes through Kununurra to Darwin (a distance of 825 km). Transport through the port of Wyndham is also possible, but unlikely because the required infrastructure at the port does not currently exist. Transport costs from Kununurra are lower to Darwin than to Perth. From Broome, however, even though it is closer to Darwin (1,900 km), road transport to Perth (2,400 km) is still apparently cheaper. Quotes for transport within the tropical regions generally were found to be typically higher than in other regions¹⁶⁰. This may be due to a generally less competitive market and the common problem of wet season delays.

Darwin is establishing itself as a multimodal transport hub linking southern Australia with Asian markets. The recent completion of the Alice Springs to Adelaide rail link has supported the Territory's strong growth in transport and storage. Trade tonnages through Darwin's port increased by 18% in 2002/03.

The Northern Territory is unlikely to establish a viable tyre recycling industry and it is more likely tyres would be brought from Darwin into WA. There is the potential for used tyres from WA to be transported to Darwin for export, however most exporters require tyres sorted first for suitability or reuse and recapping/retreading. The export of whole used tyres for recycling may be feasible. It may become economic to ship materials to Darwin from the ports of Dampier, Port Hedland, Broome and Wyndham for amalgamation with tyres from the Northern Territory prior to export.

Currently there are no controls on the export of used tyres either whole or shredded. There is currently an interest in using the Basel Convention on the transport of Hazardous Wastes to regulate the export of used rubber from Australia¹⁶¹. This might be done using the provision for control of zinc compounds. It is highly unlikely that tyres could be exported for disposal. For other uses permits would be required and proponents would need to demonstrate that export was to a facility capable of meeting the environmental requirements for management. This might be difficult for non-OECD countries, including China.

At least one WA company is keen to export shredded rubber to Asia for remanufacture. There is already export of OTR tyres for resale/retreading and the possibility of export of OTR tyres for processing overseas.

¹⁵⁹ BSD Meinhardt, Kerbside Recycling – Exploring Regional Transport Economics, 2004.

¹⁶⁰ Ibid.

¹⁶¹ Greg Ripon, Department of the Environment and Heritage, Personal communication.

Feasibility of transport of used tyres to Perth

At the current time the only options are the transport of baled or loose tyres to Perth for landfill disposal/storage, given that there is no mobile shredder in WA. For all forms of tyres a full load is assumed to derive the costs given. The costs are for road transport though similar costs may apply to rail back-loading where this option is available. A 24 foot semi-trailer can carry 10 tonnes of unbaled tyres or 20 tonnes of baled tyres and perhaps 24 tonnes of shredded tyres.

Form of tyres	Loose	Baled	Shredded
Cost of process	Nil	\$48/tonne @ \$0.40/tyre x120 tyres	\$60/tonne@ 0.50/tyre x 120 tyres***
Transport	\$60/tonne	\$30/tonne*	\$25/tonne
Landfill disposal/storage	\$50/tonne	\$55/tonne**	\$20/tonne for blocks of chip ¹⁶²
Total	\$110 +	\$133/tonne +	\$105/tonne +

Table 6. Cost of transport of tyres to Perth for landfill storage

*Price for Kalgoorlie to Perth, South West to Perth¹⁶³

** Price of storage in S.T.E.G. monofill

*** as no-one in WA has a mobile shredder this value is a very rough estimate which may not take into account the maintenance and transport costs of a shredder

+ The costs given above do not include handling costs, for example loading and unloading or the costs of storage prior to loading (loose tyres), baling or shredding.

At the current collection fee of \$0.80 - \$1.50/passenger tyre, which is \$96 - \$180/tonne passenger tyres, it is not feasible to bring baled tyres to Perth for storage except for locations within a 2 hour radius, though it may be feasible if councils were willing to pay slightly more per tyre, say \$1.60 - \$2.00.

At \$1.50 per tyre it is feasible to bale tyres for storage on site.

It is feasible to bring loose tyres to Perth for storage in a monofill from locations reasonably close to Perth so long as a full load (10 tonnes) is available.

Of course when the tyres are required for recycling there is no landfill/storage cost and it is probably feasible already to transport loose tyres considerable distances. Reclaim Industries has recently begun collecting tyres from locations around Perth such as Beverley, Chittering, York and Northam.

¹⁶² Chris Battel, Reclaim Industries, Personal communication.

¹⁶³ David Gooch, Tyre Waste WA, Personal communication.

It is likely that the availability of stockpile information through the Department will hasten the collection of tyres from at least those rural areas within a certain radius of metropolitan Perth. It is not economically viable at present to transport loose tyres further than Geraldton or Kalgoorlie, however this is likely to change with the introduction of benefit payments for recycling.

The transport of tyres for recycling would probably become an even more attractive proposition with a mobile shredder. No one in WA currently has a mobile shredder but at least two recyclers are considering such an investment.

Shredding is likely to cost around 50c/tyre. The gains in transport costs for shredded tyres are offset somewhat by the cost of the equipment needed. A mobile shredder costs \$100,000 - \$150,000, while a mobile baler can be purchased for \$100,000. A trailer to carry the mobile shredder would cost \$140,000. Running costs for a baler are half the costs for a shredder, as there is much less maintenance due to fewer moving parts¹⁶⁴ and less wear and tear.

Until recently Reclaim Industries has been bringing truck tyres cut into pieces into WA by rail for \$140/tonne. In general tyres used by the mining and farming sectors are larger and constructed from a higher proportion of natural rubber than are passenger tyres. While such tyres may need to be transported longer distances than the majority of passenger tyres, their special characteristics may outweigh this disadvantage.

As the value of used tyres increases it is probable that transport to Perth even over large distances will become a feasible option, however it is unlikely that transport to Perth for disposal or storage will ever be economically viable or desirable. In the medium term financial assistance from the national scheme might assist in achieving this transition to collecting and transport for recycling.

If sufficient quantities of used tyres could be accumulated in central locations along major highways and railways the logistics of baling on site for storage or backloading for recycling would be simpler than the current situation where tyres are stockpiled or landfilled in many different locations.

It would take some time to collect a part-load for a truck, (eg a b-double sized truck takes the equivalent of 1500 passenger tyres and almost twice as many baled) or a rail freight container and there will be a need to store the tyre safely but inexpensively. The Oil Product Stewardship program has established used oil drop-off points in communities¹⁶⁵. For tyres the main issues are the cost of storage facilities, fire safety and the prevention of pests breeding in the tyres. Community education about disposal of used tyres at the facility would need to be part of the scheme.

Any solution for remote and rural areas will require some initial capital and organisation to establish.

¹⁶⁴ David Gooch, Tyre Waste WA, Personal communication.

¹⁶⁵ Used Tyre Remote Benefit Proposal, Department of the Environment and Heritage, 2005.

Used tyre remote benefit proposal

The draft Discussion paper for the proposed national scheme suggests that the costs of sorting, shredding and crumbing of tyres would be covered by the benefit payments from the levy¹⁶⁶. Collection costs would not be covered except for special arrangements which might be developed for collectors in remote areas.

Recognising the importance of this issue the Department of the Environment and Heritage has developed a paper¹⁶⁷ outlining options for additional assistance with used tyres generated in rural and remote Australia.

Two options are proposed:

1. Remote benefit system

A benefit would be paid in addition to the standard benefit received on sale of a used tyre or used tyre product to an approved end use. The rate could be based on the remoteness of the local government area from which the tyres are collected, based on the 'Local Governments – Accessibility/ Remoteness Index' (an Australian Bureau of Statistics endorsed measure), which scores areas between 0 and 12 (where 12 is the most remote). These values are derived from values for 11,340 populated localities according to their road distances from four different categories of service centres. Rather than having thirteen different rates of benefit for each of the scores of remoteness, scores could be combined so that there are fewer levels of remoteness on which benefit rates are paid (e.g. Scores 0 to 4 could be combined to one rate). Economic modelling will need to be undertaken to determine the number of rates required.

In a few special cases, two rates of remote benefit might be stipulated for one local government area. An example of a special case would be where the local government area is large with the majority of the population in one area and road access to the rest of the area is difficult (e.g. local government area of Cook, Far North Queensland, where Cooktown is relatively easy to access in comparison to the rest of the LGA). Where land is not in a local government area but has a form of governance at a local area such as an Aboriginal Council the boundaries for these may be used. In this situation, the same classification system will be used but will require the PRO to determine the remoteness classification in consultation with the Council or State Government. Typically, these would fall into the most remote rate.

Recipient of the remote benefit

The recipient of the remote benefit would be the company who collects the tyres from the remote location, which may not be the same company who is eligible for a standard benefit payment for recycling those tyres. Because the payment will only be for tyres collected from a rural or remote area, evidence will be required to check that the tyres are not from an urban area. The payment would not be to the end recycler claiming the standard benefit because, unless they collected the tyres, they would be unable to guarantee the location from which the tyres were sourced. The PRO may choose to put in place a tracking system to ensure the tyre collectors have collected tyres from these locations.

¹⁶⁶ Draft End-of-Life Tyres Issues Paper, 2004, Department of the Environment and Heritage.

¹⁶⁷ Used Tyre Remote Benefit Proposal, Department of the Environment and Heritage, 2005.

Proof of collection and deposit

To prevent collusion between collectors and used tyre suppliers (owners of collection facilities), the used tyre transporter would have to provide a receipt for the number of used tyres collected from the local government or used tyre supplier. The receipt would need to include a physical address of the original location of the tyres. The collector would also be required to collect a receipt from the location at which the tyres have been dropped for recycling or reuse.

The PRO might opt to freely register all used tyre suppliers, collectors and processors to ensure the companies are legitimate businesses in that particular location. The PRO could choose to issue Used Tyre Supplier identification numbers that could be put on receipts or provide a full tracking system.

2. Remote storage facilities

The remote storage facilities program would provide grants to local governments, Aboriginal Councils and other bodies to establish suitable facilities for the storage of used tyres. Storage facilities would allow local governments to collect the tyres until such time as there was a sufficient quantity to make it economic for a tyre collector to transport the tyres from that facility and possibly a number of facilities in the wider area.

By providing the incentive of a full truck load of tyres (or even tyre shred if a mobile shredder was used) and the knowledge of a benefit payment for the approved end use for reuse or recycling, a competitive tyre market should take up the challenge of getting tyres from rural and remote areas.

Safe storage of used tyres would also allow for local government to build up sufficient quantities of tyres for use in local projects (e.g. civil engineering projects).

A suitable storage facility would need to minimise risks of fire hazards and infestation by mosquitoes and other vermin. Correct storage will help keep the tyres cleaner and minimise wear and tear on shredding and crumbing machinery.

Providing fire-safe stacking and storage arrangements are followed, the storage facility may be as simple as a fenced area with a covering roof, or even a pre-arranged shipping container. Any arrangement would need to consider how the tyres will then be handled again at the time of pick-up. Being a remote location, the portion of off-road, agricultural and light truck tyres dropped off for disposal or recycling is likely to be higher than in an urban area.

Such a program would require a staggered rollout because of the initial high outlay of funds for grants. A similar program was undertaken with the Commonwealth's Product Stewardship for Oil program and this had a phased rollout of grants over several years. The cost of this program totalled about \$6.5 million for 270 grants with a further \$3.65 million allocated to States and Territories to complete the task in a locally co-ordinated manner.

Establishment of storage facilities

Given the current options, the storage of tyres in centralised locations for transport to Perth at a time in the (probably not too distant) future when recyclers have the demand appears to be the only option currently available for tyres in remote and rural areas of WA. Mobile shredding for the return of rubber to Perth is not yet available and the cost of transporting baled tyres for burial close to Perth appears to be prohibitive in the current circumstances.

As an interim measure the best strategy may be the establishment of storage nodes along the major transport routes where tyres can be stored until either the benefit scheme or unassisted market demand makes it economical for recyclers to transport the tyres to Perth.

The WA Government can assist in this process by identifying the optimal storage locations and working with local councils and tyre retailers to coordinate the establishment of storage facilities. In the immediate future, until such time as grants may become available through the national scheme for storage infrastructure, decisions must be made regarding the best way of storing quantities of tyres in centralised locations. The options appear to be burial or above ground storage, both being available for baled or non-baled tyres. Consultation with councils and tyre retailers in the different regions, together with input from mobile balers and recyclers should be undertaken for each proposed storage site to determine the best options for storage on that site.

Collection of tyres at centralised locations

Councils are currently able to store only 100 tyres without additional licence conditions; however obtaining approval to store up to 1000 tyres would be possible under the current Regulations with the addition of conditions to their licences¹⁶⁸.

Assuming tyres will be accumulated for storage above ground or burial in batches it will be necessary for the sites to have some form of managed storage such as cages or a fenced area covered with a roof. As suggested by the Remote Benefit proposal, containers may be a good option. It will be important to ensure there is minimal fire risk, for example by providing several smaller storage areas separated by the required distances and ensuring access to fire fighting vehicles etc. For both above ground storage and burial there needs to be measures to prevent leachate from the tyres contaminating the soil and groundwater¹⁶⁹.

Ongoing above ground storage is likely to be appropriate for sites where the number of tyres accumulated over a two year period is forecast to be less than 1,000, or where burial is not really an option due to the subsurface structure.

For example the Meekatharra Shire accepts tyres at its landfill but does not want to continue as the cap-rock base of the landfill makes landfill space expensive¹⁷⁰. Meekatharra might be an excellent location for a collection point or depot for used tyres from the region. It is located

¹⁶⁸ Wayne Ennor, Department of Environment, Personal communication.

¹⁶⁹ www.mfe.govt.nz/publications/waste/end-of-life-tyre-managemnet-jul04/end-of-life-tyre-managemnet.pdf

¹⁷⁰ Nanette Schapel, Department of Environment, Personal communication.

on the Great Northern Highway on the road from Newman and might be an ideal pilot for above ground storage. Tyres could be baled regularly for storage or stored loose.

The idea of creating a central monofill is already being tested in the mid west region, as the Geraldton city landfill no longer wishes to receive tyres. The Department of Environment has been working with the shires and with tyre retailers to develop alternative solutions¹⁷¹. The Department met with tyre retailers in Geraldton and asked them to institute a common fee of \$2 per car tyre (more for larger tyres) to pay for disposal. The retailers then send the tyres to the Humpty Doo facility which is the only licensed facility currently operating in the area. The disposal fee pays the cost of landfill at this facility. For 2004 this landfill received approximately 1300 tyres per month. Humpty Doo is basically a tyre monofill but there is no baling of tyres prior to burial.

Burial: baled vs unbaled

The landfill storage of tyres, if done correctly, is probably easier than ongoing above-ground storage. Tyres can be buried as loose tyres or baled first.

Burial of baled tyres has several advantages. The tyres are compact and can be stacked in an orderly manner into a monofill cell. Tyres can be baled at a cost of \$1-\$2 per passenger tyre. The additional cost of baling is offset somewhat by the saving in landfill space.

The most economical method would be to wait until a stockpile of approximately 1,000 tyres has accumulated at a Council site or at several neighbouring sites, and then have the tyres baled by a mobile baler. The mobile baler owned by the current operator can handle 2,500 tyres per day, i.e. producing 25 bales per day¹⁷². The baler can not handle very large OTR tyres.

When baled, 1,000 tyres can be stored in a landfill cell 2m deep x10m long x 5m wide, easily dug with a front end loader. There would be no difficulty either from a regulatory viewpoint with Councils establishing small tyre monofills¹⁷³. Alternatively tyre storage facilities could be privately managed.

The disadvantages of burial include the cost to retrieve the tyres and the possible extra cost involved in cleaning the tyres prior to recycling. While values are provided for the landfill space required and cost of shredding, it is not likely that shredded tyres could be recovered for recycling.

¹⁷¹ Nanette Schapel, Department of Environment, Personal communication.

¹⁷² David Gooch, Tyre Waste WA, Personal communication.

¹⁷³ Wayne Ennor, Department of Environment, Personal communication.

Tyres	No. tyres buried*	Cost of process	Recovery costs**
Loose	40	Nil	45c/tyre
Baled	120	40c/tyre	45c/tyre
Shredded	60	50c/tyre	NA

Table 7. Comparison of burial of loose, baled and shredded tyres

* burial is in a landfill cell 1.5 m³ and includes sand cover¹⁷⁴

**The only estimates for the cost of extracting tyres from landfills are derived for cleaning up illegal dumps of used tyres¹⁷⁵. The cost of extracting tyres from the ground was given at \$0.10 per tyre and cleaning for shredding \$0.15 per tyre. There would also be transport and handling costs of approximately \$0.20 per tyre. These costs were estimated for cleaning up large dump, (over 100,000 tyres) where there would be significant economies of scale. It may be cheaper to recover and clean baled tyres. There is no experience with the recovery of baled tyres to date.

While the current landfill fees for baled and unbaled tyres are almost identical it is obvious that baling reduces the amount of land needed considerably. This may or may not be a deciding factor when establishing rural and remote storage facilities. The extra cost of baling can be offset by both lower land costs and cheaper costs for eventual transport to Perth and perhaps by cheaper recovery costs.

Location of storage nodes

There are several possible approaches to determining the optimal sites for storage nodes. Important criteria will include:

- Sufficient generation of used tyres in a defined catchment area;
- Proximity to major transport routes; and
- Availability of appropriate sites and management.

Stockpiles

As part of the preparation for the introduction of the national Scheme, a survey of local governments and other authorities in WA has recently been undertaken to determine the extent and location of used tyre storage/stockpiles. Respondents were asked to identify the locations of quantities of tyres over 21 EPU (199.5 kg). The survey has revealed 122 sites for mapping¹⁷⁶.

¹⁷⁴ Peter Bertei, S.T.E.G., Personal communication.

¹⁷⁵ A National Approach to Waste Tyres, prepared for Environment Australia by Atech Group, 2001.

¹⁷⁶ Narah Stuart, Department of Environment, Personal communication.

This information reveals something about the historical generation of tyres around the State. It should be noted that for many of the sites reported tyres are being continually buried and the numbers reported may reflect only the tyres awaiting burial, not giving a true picture of how many tyres are being buried each year.

The largest single stockpiles (over 30 tonnes) were identified at Corrigin, Newman, Esperance, Geraldton, Lake Grace, Narembeen, and South Hedland. Of these larger stockpiles only the one at Lake Grace was identified as a dump and as posing a risk. However when the stockpiles in a given area are combined it is easier to see where large numbers of tyres are being generated.

While some of the stockpiles identified are of illegally dumped tyres, others are industry stockpiles and some are dedicated landfill cells for tyres that could potentially be extracted and used in secondary markets.

Although incomplete at this stage, as several surveys have not been returned and there is no data for areas north of Broome, the survey has provided information not previously available and which can be of great value to the recycling industry. The database should be made available to the industry so that collectors, balers and recyclers can make decisions about whether to access stockpiles. For example, truck tyres have been in great demand by Reclaim Industries, to the point where they have brought tyres in from South Australia. Reasonable quantities of truck tyres are available quite close to Perth, at Narembeen (16 tonnes), Kondinin/Hyden (12 tonnes) and Geraldton (42 tonnes).

The available data was analysed with the objective of consolidating tyres in central locations on major transport routes. The three known tyre monofills (at Brookton, Australind and Geraldton (Humpty Doo farm) are obvious nodes, however financial and other issues may make these sites problematic. Even if these privately owned sites are not chosen the same conclusions would apply regarding catchments for storage facilities. The owners of stockpiles and the councils in each of the regions will need to be consulted regarding the practicality of these proposals.

Area*	Tyres tonnes/ EPU	Potential storage site	Comments
Albany	1.33+/140++	Albany, managed by Vancouver Waste Services	Council does not receive tyres. Need to investigate whether site is monofill or mixed inert, baled or loose.
Denmark	13.006 ++/ 1,369 ++	Denmark/ Albany	Tyres at 11 sites, including Shire landfill. Council may be interested in establishing a storage facility.
Bridgetown	11.22/ 1,181	Australind, JW Cross & Sons monofill	Some of tyres reported for Bridgetown are used in marron ponds etc. 50% OTR tyres.
Busselton/ Dunsborough	8.92/939	Australind	Tyres are disposed at Council landfill. Tyre numbers are increasing. It may be of benefit to divert tyres from mixed landfill to monofill.

Dardanup	unknown	Australind	Dardanup site is a licensed landfill (South West Waste) with approval to store up to 2,000 tyres. When this level is reached tyres could be diverted to Australind.
Balingup	0.19/20	Australind	Tyres are buried daily at Shire landfill. 50% OTR Tyres.
Williams	5/526	Australind	Tyre Retailer.
Boddington	5.116/528	Brookton, S.T.E.G. baled monofill site	30-40% of tyres reported for Boddington are OTR tyres.
Brookton	2.28/240	Brookton	
Corrigin	40.897/431	Brookton	Tyres are stored at retailer's premises, 92 km to Brookton.
Dongara	unknown	Brookton	Currently going to Shire landfill.
Kondinin/ Hyden	40.052/4,216	Brookton	These tyres could be left in situ for now as the stockpiles are static or increasing very slowly. 60% of tyres at Hyden are OTR.
Kulin	9.956/1,048	Brookton	Kulin Tyre Service, 80% OTR tyres. Stockpile is static.
Nannup	unknown	Brookton	Tyres are buried in Shire landfill.
Narembeen	41.8/4400	Brookton	Narembeen tyre service site, 40% OTR tyres.
Pingelly	1.9/200	Brookton	Tyre retailer.
Wickepin	1.9/200	Brookton	Tyres collected by retailer for reuse?
York	18.62/1,960	Brookton	2 sites, both service stations, numbers increasing
Broome	8.283/991	Broome	Council site receives some tyres for landfill, need to investigate if monofill, may be interested in establishing storage facility.
Carnarvon	8.075/850	Carnarvon	Stockpile within fenced area, stable numbers. Council may be interested in establishing storage facility. Need to investigate where other tyres are going in region.
Muchea/Bindoon	0.38/40	Bindoon	Shire buries tyres as they arrive, may be interested in establishing a storage facility.
Moora	unknown	Bindoon	Tyres buried in Shire landfill, tyre numbers increasing.
Three Springs	0.475/50	Bindoon	Tyres in separate landfill. Shire operated. Small amounts, may be best arrangement.
Toodyay	12.825/1,350	Bindoon	Tyre retailer.
Trayning	0.418/44	Bindoon	Shire operates landfill, numbers slowly increasing.
Calingiri	3.03/319	Bindoon	Shire of Victoria Plains operates landfill.
Wyalkatchem	10/1052	Bindoon	Shire operates landfill, numbers increasing.

Cranbrook	7.671/808	Katanning	Mainly tyres from farmers, 30% OTR tyres
Katanning	2.85/300	Katanning	Shire of Katanning site. Tyre numbers are increasing. Shire may be interested in establishing a storage facility.
Kojanup	0.475/50	Katanning	Tyres are currently going to Kojanup Shire landfill. Tyre numbers are increasing.
Dundas	19.19/2,105	Norseman	Shire landfill site. Tyre numbers are increasing. Shire may be interested in establishing storage facility.
Newman	70.775 ++/ 7,450 ++	Newman	Tyres at 4 sites. One site 100% OTR tyres from closed mine. Shire of East Pilbara may be interested in establishing storage facility.
Esperance	115.066/12,113	Esperance	Tyres at 5 sites, all with very high percentages of OTR tyres. Shire of Esperance may be interested in establishing storage facilities.
Geraldton	155.8/16,400 +	Geraldton - Humpty Doo Farm Site at Greenough (tyre monofill) has already been identified to take used tyres from Geraldton	Tyres at 3 sites, one has 2,000 + OTR tyres stacked and heaped.
Mingenew	0.95/100	Geraldton	40% OTR tyres. Shire manages landfill.
Morawa	0.95/100	Geraldton	Tyres buried in Shire landfill, tyre numbers increasing.
Perenjori	0.475/50	Geraldton	100% OTR tyres. Tyres in pit at Shire landfill. Divert to Humpty Doo.
Gascoyne	3/316	Geraldton	70% OTR tyres. Shire operates landfill, numbers increasing.
Kalgoorlie-Boulder	37.05/3,900	Kalgoorlie	Tyres are mostly shredded or disposed of whole to Shire landfill. Council may be interested in establishing a storage facility.
Lake Grace	40.305 ++/ 4,242 ++	Katanning	4 sites, tyre numbers increasing. Sites are managed by Shire of Lake Grace.
Meekatharra		Leave in situ Meekatharra	Tyre stockpile is buried, has ceased taking tyres.
Merredin	41.585/4,377	Merredin	3 sites, one retailer has 40% OTR tyres. Shire manages landfill, may be interested in establishing a storage facility.
Mullewa	4.95/520	Leave in situ	These are quarries licensed to take tyres for rehabilitation.
Port Hedland	855.8/89,734	Port Hedland	2 sites, one with 50% OTR tyres. Shire operates landfill, other site illegal dump. Shire may be interested in establishing a storage facility.

Karratha	3.325/350	Karratha	40% OTR tyres. Shire operates landfill, may be interested in establishing a storage facility.
Denham	45.478/ 4,835	Denham	7 sites, average 40% OTR tyres. Shire operates landfill, may be interested in establishing a storage facility.
Laverton	4.778/ 503	?Leonora	The Laverton site is operated by the Shire. Tyres are buried in landfill each two months. Leonora is on the route to Kalgoorlie-Boulder, however there is insufficient information to decide whether Leonora would be a suitable central storage site.

Table 8. Summary of stockpile data with potential sites for central storage

* Each area in this table is the result of pooling data reported for sites from the same or neighbouring Local Government Area

In addition to the three existing monofills (all privately operated), thirteen Shire landfills have been identified as possible storage locations. There will also be a need to establish at least one or two facilities between Derby and Kununurra region and a site at Meekatharra or Mt Magnet. Where new facilities are required the provision of grants to establish infrastructure could be prioritised according to:

- the interest of the Shire in establishing a suitable storage facility;
- the ability of the facility to attract tyres (volume and regional catchment area); and
- the likelihood of collection for recycling within a given period.

Storage site	Road access	Rail access	Sea access
Esperance	junction of South Coast Highway and Great Eastern Highway	Esperance-Kalgoorlie	NA
Albany	junction of South Coast Highway and Albany/Great Southern Highway	Albany through Katanning, Brookton to Northam	NA
Australind	South Western Highway, currently receiving most metropolitan tyres	Perth to Manjimup	NA
Katanning	Great Southern Highway	On line from Albany to Northam through Brookton	NA
Brookton	Great Southern Highway, currently receiving large quantities of metropolitan	Line from Northam	NA

	tyres		
Merredin	Great Eastern Highway	Kondinin to Merredin, on line from Kalgoorlie	NA
Kalgoorlie	Great Eastern Highway	From South Australia/to Northam	NA
Leonora	possible point for Laverton/Leister catchment	north - south Leonora to Esperance (through Kalgoorlie)	NA
Norseman	junction of Great Eastern Highway and Eyre Highway	On line from Esperance to Kalgoorlie	NA
Bindoon	Great Northern Highway	NA	NA
Mt Magnet and/or Meekatharra	Great Northern Highway	NA	NA
Newman:	Great Northern Highway	NA	NA
Port Hedland	Great Northern Highway, North West Coastal Highway	NA	<i>The Kimberley</i> route to Fremantle
Broome	Great Northern Highway	NA	<i>The Kimberley</i> route to Fremantle
Derby	Great Northern Highway	NA	Via Broome <i>The Kimberley</i> route to Fremantle
Halls Creek	Great Northern Highway	NA	NA
Kununurra	Victoria Highway	NA	<i>The Kimberley</i> route to Darwin or Fremantle
Karratha	North West Coastal Highway	NA	Via Port Hedland <i>The Kimberley</i> route to Fremantle
Carnarvon	North West Coastal Highway	NA	NA
Denham	off North West Coastal Highway	NA	NA
Geraldton	junction Brand Highway and North West Coastal Highway	Geraldton to Perth (bulk haulage only)	NA

Table 9. Proposed storage sites

Issues arising from Stage 3:

Significantly increased market demand for used tyres for recycling in Perth is likely to occur in the near future (1 – 2 years) due to market demand, infrastructure investment and eventually the national benefit scheme.

Until this increased demand occurs it is not economic to transport tyres to Perth for landfill/storage.

When market demand does increase it will be feasible to transport tyres from most regions of WA via road or rail and sea from several ports, providing large enough quantities are available at central nodes to make the exercise economically viable.

Currently large volumes of tyres are being stockpiled and/or buried in non-recoverable landfills in a large number of sites across WA.

The identification and establishment of central storage facilities will take some time, particularly as funding for infrastructure will be required, so this exercise should begin now.

It is critical that the WA Government plays an active role in the development of the benefit proposal for remote and rural areas under the proposed national scheme.

4. Identification of key government intervention points to stimulate resource recovery

The aim of the proposed national scheme is to create demand for used tyres which will provide incentives for their recycling. In Western Australia, as in other States, the current governance and regulatory controls do not encourage industry investment in tyre recycling. It is simply cheaper and easier to dispose of used tyres at landfill than it is to provide them as a resource to a recycler.

At each of the preceding stages of the study issues of resource security and recovery arose which might be resolved by the correct government intervention.

Stage 1 issues

Landfill disposal

The proposed national scheme relies entirely on market pull-through, that is making benefit payments to the end-users of tyres so that end-of-life tyres become valued as a resource and may eventually be bought from collectors and retailers rather than being waste needing paid disposal. The national scheme will address the importation of used tyres but will not address export (other than providing a levy refund).

The national scheme will not require the banning of tyres to landfill disposal but will instead rely on creating value for used tyres.

The aim at this stage is to have the Scheme in place from July 2006. It will take some time for benefit payments to start flowing to end recyclers and a further period of time for this to begin changing market dynamics.

The Western Australian Government may wish to consider further bans on the disposal of tyres to landfill as part of market development, providing more security of resource to potential recyclers.

Recent restrictions on the landfilling of unshredded bus and truck tyres within the Tyre Landfill Exclusion Zone (TLEZ) and within the vicinity of Bunbury have not assisted tyre recycling as intended due to less expensive disposal and storage options being available outside the Zone and the provision of exemptions to several landfills within the Zone.

The Tyre Landfill Exclusion Zone (TLEZ) is defined in the Used Tyre Regulations. The zone covers the Perth metropolitan area and surrounding local government districts and includes the country towns of Beverley, Boddington, Brookton, Chittering, Gingin, Mandurah, Murray, Northam, Toodyay, Wandering and York¹⁷⁷.

Tyres may be disposed in the TLEZ only with the written permission of the CEO of the Department of Environment. Outside the TLEZ they may be disposed at a licensed landfill site or at other sites approved by the CEO of the Department.

¹⁷⁷ Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003.

It may be appropriate to consider a more stringent approach to tyre disposal. The European Council Directive 99/31/EC bans whole tyres to landfill by July 2003 and shredded tyres to landfill by 2006¹⁷⁸.

The 2003 Waters Report recommended that for landfills in the metropolitan area and surrounding districts as listed in Schedule 5 of the Used Tyre Regulations:

- disposal of whole tyres be banned immediately through administration of landfill licences as provided in the Used Tyre Regulations; and
- A schedule be developed in consultation with industry and local government authorities for the banning of shredded tyres with due consideration of the availability of reuse/recycling options.

For other landfills the report recommended that a schedule be developed in consultation with industry and local government authorities for the banning of whole and shredded tyres with due consideration of the availability of reuse/recycling options.

The landfilling of shredded tyres has effectively ceased as the Wastestream landfill at Kwinana no longer accepts the waste and the only shredder in operation in WA is that at the Reclaim Industries site.

OTR tyres and the minerals industry

The minerals industry, with the manufacturers of OTR tyres, has made representations to the Department of the Environment and Heritage that tyres used by the industry should be outside the levy scheme¹⁷⁹. The management of tyres on mine sites is of particular importance to WA, as the largest importer of these tyres.

As OTR tyres are 25% of the total weight of tyres used in Australia annually, their wastage represents a considerable loss of resources, including steel and high quality rubber.

The WA Government may wish to provide input to the proposed national scheme regarding this issue, and may also consider other approaches to the recovery of OTR tyres such as the development of a Code of Practice or the imposition of tighter license conditions regarding the on-site disposal of tyres.

Retreaders

As retreading uses considerably less resources than the manufacture of new tyres and reuse is higher on the waste hierarchy than recycling of end-of-life tyres, the WA Government may wish to consider measures to increase the use of retreaded tyres.

¹⁷⁸ Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003.

¹⁷⁹ Melanie Stutsel, Minerals Council of Australia, Personal communication.

Retreaders will not be entitled to benefit payments under the Scheme which could impact the number of tyres available for retreading if the Scheme is successful in meeting its objectives, however it is likely that the increase in price caused by the imposition of the levy on new tyres will make retreads more attractive. The major buyers of retreads are currently fleet owners and vehicle owners from lower socio-economic groups who might consider the savings sufficient to encourage them to purchase retreads over new tyres¹⁸⁰.

Need for additional State Government resources

It seems likely that the national Scheme as currently envisaged will require significant additional State legislation and Government resources. For example:

- Stockpiles are to be monitored by governments. A survey of local government authorities has just been conducted. The information is potentially very valuable but will need to be regularly updated through repeat of the survey. This exercise will require Department of Environment resources.
- All uses of tyres will need to demonstrate to the PRO that they are meeting State and Territory regulation requirements before a benefit payment can be made. This could be a demonstration of an appropriate regulatory licence.

Queensland requires registration for facilities that process and recycle tyres¹⁸¹. NSW licences premises that manufacture, retread, recycle or process rubber products or rubber tyres over 5,000 tonnes per year or treat, process or dispose of used, rejected or unwanted tyres (including tyres or shredded tyres or tyre pieces) over 5,000 tonnes per year or store over 50 tonnes at any one time¹⁸².

WA requires a licence for used tyre storage for 500 tyres or more on the premises of a tyre fitting business and 100 tyres or more on any other premises. There is no requirement for recycling premises to be licensed as such.

Queensland also requires financial assurances for new development approvals for the storage of scrap tyres (from 2004) to cover the costs of tyre disposal and site remediation if required¹⁸³. A reduction in the level of financial assurance required can be negotiated where the operator has a licence to provide tyres to an approved recycling or waste to energy facility.

- There may also be a requirement in the NEPM Schedule for using State enforcement officers to check compliance of companies, for example to check that the company had taken back and recycled the required number of tyres. It is unclear whether this role would be funded through the levy and could impose significant additional cost on WA.

¹⁸⁰ A National Approach to Waste Tyres, report for Environment Australia by Atech Group, 2001.

¹⁸¹ www.epa.qld.gov.au/ecoaccess/business_and_industry/waste_management

¹⁸² www.environment.nsw.gov.au/resources/guide_b1.pdf

¹⁸³ Operational Policy Conditioning new development approvals for storage of scrap tyres, EPA Queensland.

The policy settings for the national Scheme are still being developed and there is still opportunity for input from State Ministers on the issues raised above.

Policy development for the national scheme

It is generally accepted by the Department of the Environment and Heritage and the tyre manufacturers industry and recyclers that "higher value" end uses such as manufactured products, should receive a higher benefit payment than those that reflect "low value" end uses, such as Tyre Derived Fuel (TDF). Recyclers contend that a differential rate would encourage and reward resource recovery (assuming that TDF is not a resource recovery method since the resource is destroyed in the process).

The current proposal is that benefit payments would be made on a differentiated scale that reflects the cost of recycling or reuse of the tyre. Included in the calculation are costs such as the sorting, shredding and crumbing of tyres. The industry is proposing that benefit payment levels would be determined by crumb size, reflecting the costs of processing¹⁸⁴. This would result in higher payments for recycling than for Waste to Energy which would be in agreement with the Waste Management Hierarchy.

However it may be better to apply the differential payment rate on the basis of greatest environmental benefit. For example the chipping of rubber for use as a stemming agent in explosives would attract a higher benefit than waste to energy while the environmental benefit is probably not much greater.

One stakeholder¹⁸⁵ mentioned that used tyres are often used as packing material, for example when engine reconditioners import cases. These are imported by jobbing shops of which there are only a few in Australia (GEM NSW incorporating HM engines in Victoria, RPM engines in Victoria and Redlands, Queensland). It may be of value to ensure the Department of the Environment and Heritage is aware of this fact and can alert customs agents to the issue when classifying tyres as prohibited goods.

Another policy issue identified by the review of the proposed national scheme which is of more immediate concern to Western Australia is that of remote and rural tyre recycling. The possibility of payments being available to collectors of tyres from remote and rural regions under special arrangements should be pursued.

Timely and informed input to the development of the national scheme will ensure WA is able to maximise the recovery of the valuable resources in used tyres in the most cost efficient ways possible.

Stage 2 issues

The tyre recycling industry nationally and in WA in particular seems to be at a critical point where demand for the resource is about to begin to equal supply. There is already potential

¹⁸⁴ Rod Clare, Department of Environment and Conservation (NSW), Personal communication.

¹⁸⁵ Marie Donato, Motor Trade Association (WA), Personal communication.

unmet demand for used tyres both for retreading (re-use) and recycling. Issues regarding security of supply and cost of obtaining tyres continue to inhibit infrastructure investment in the reuse and recycling of rubber in WA.

Increased costs for retreaders

In addition to difficulties in sourcing truck and OTR tyres, retreaders are also facing increased transport costs as the requirement for paying a fee for a controlled waste tracking number for transporting tyres on public roads comes into effect for collectors under the *Environmental Protection (Controlled Waste) Regulations 2004*. This fee is \$22.50 per Tracking Form, and will be payable for tyres transported to a retreader or recycler as well as tyres transported to landfill. This will particularly discourage the collection and transport of passenger tyres for retreading as they are of lower value and currently must be moved interstate for retreading.

One way of encouraging reuse and recycling of used tyres would be to eliminate the fee associated with a controlled waste tracking number for waste tyres taken to approved locations for retreading or recycling¹⁸⁶. A tracking form would still be required as there is a need to understand where used tyres are being treated.

This will also be important in encouraging collectors to travel to rural and remote regions to collect accumulated tyres from storage sites established under the national Scheme and situated in locations, identified in Stage 3 of this project, as the most efficient places to provide this infrastructure.

Landfill

Most used tyres generated in the metropolitan region continue to be disposed of to landfill, in spite of the TLEZ, which has not been effective in encouraging the diversion of tyres from landfill.

Queensland has a policy limiting the disposal of whole tyres at new (from 2004) landfills to encourage the use of scrap tyres as a resource¹⁸⁷. The EPA has adopted the "national and international best practice policy position" of limiting the disposal of whole tyres to landfill. For new development applications the number of whole tyres disposed of annually at any one facility is limited to 10,000 EPU.

In Victoria and in the wider metropolitan area of NSW there is a requirement to shred tyres before landfilling to overcome problems at landfills caused by loose tyres. The requirement to shred tyres is an extra cost to the tyre collector¹⁸⁸.

One stakeholder consulted in this study proposed a requirement that tyres should be shredded before disposal to landfill. It was felt this would remove non-competitive collectors. However there is no evidence from Victoria or metropolitan NSW to suggest that the requirement for

¹⁸⁶ Lillias Bovell, Department of Environment, Personal Communication.

¹⁸⁷ Operational Policy Limitation on the disposal of whole tyres at new landfills, EPA Queensland.

¹⁸⁸ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

shredding has increased diversion from landfill or recycling. Further, there is no possibility of recovery of shredded tyres in the future.

It has been suggested previously that monofills as storage for future recovery are a good option¹⁸⁹.

A reasonable proportion of the landfilled tyres have been monofilled (S.T.E.G. and JW Cross and Sons) which may be regarded as storage from which the tyres can be recovered in the future. Considering the total estimated mass of tyres generated per annum in Western Australia is in the range 36,000 – 39,000 tonnes there is effectively unlimited storage available at the S.T.E.G. monofill.

As an interim measure until investment in recycling plant has been completed, a requirement that tyres must only be stored in a monofill could be considered. This could possibly also be applied to country landfills. This situation seems to be developing for tyre waste from the metropolitan region in any case with several of the landfills that have been taking waste tyres for burial with other inert wastes withdrawing from the market (see below).

There is already excess capacity for truck tyres in the plant operated by Reclaim Industries, while truck tyres are still being buried in landfill/monofill.

The WA Government could consider an immediate ban on the landfilling of truck tyres within the TLEZ and a ban on the transport of these tyres outside the TLEZ.

Short term intervention

The recent decision by the RCG landfill at Quinns Road not to accept tyre waste from July 2005 will create a significant issue for Tyre Waste WA, one of the largest collectors. The only other landfill options available are much more expensive and could result in the closure of the business. This collector already takes truck tyres to Reclaim Industries and claims to recycle up to a third in total through this and other means. However there are still up to 2,000 tyres per day to be disposed/stored. Within 6 months if Reclaim Industries invests in the plant for processing car tyres or a new entrant establishes in the market these tyres will not need disposal.

The Department might wish to consider whether there is any short term solution to this issue.

Inappropriate disposal

A significant proportion of used tyres seem unaccounted for in WA by landfill and recycling figures, though the lack of a requirement for country landfills to report their tyre numbers explains some of the discrepancy.

These tyres are probably being stored in accordance with the Tyre Regulations that allow storage of up to 100 tyres without a licence, but they may be being stored or disposed of illegally.

¹⁸⁹ Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003.

The recent introduction of tracking of used tyres as a controlled waste under the *Environmental Protection (Controlled Waste) Regulations 2004* may provide information regarding previously unaccounted for tyres. The system will track used tyre loads over 200kg, which is approximately 20 EPU.

When sufficient data is available, for example after 12 months, the proportion of unaccounted for tyres should be estimated by checking the transport information against landfill data and sales data.

Some tyre retailers are charging the public \$4.00/tyre to dispose of old tyres¹⁹⁰. There is a considerable profit being made by retailers from this disposal fee as collectors are currently receiving \$0.80 to \$1.50 per tyre.

At least one retailer informs customers that there is a levy for disposal and some in the industry believe this may discourage proper disposal and lead to dumping. This issue may be addressed through the national scheme.

In the meantime the WA Government could consider asking Councils to collect tyres from the public at no charge, perhaps using the RRRS rebate to cover council costs.

In remote and rural areas inappropriate disposal may be increasing due to rural landfills refusing to take tyres as they are not able to meet the licence conditions for cover.

One solution may be to offer assistance to Councils to receive tyres for free and license them to store sufficient quantities to make it viable for a mobile baler or shredder to visit. Issues to be considered include the costs of storage or baling. Some of these costs might be subsidised perhaps through the RRRS in the interim until the national scheme is developed.

As it is currently uneconomical to transport baled tyres to Brookton (S.T.E.G.) or Bunbury (JW Cross and Sons) for monofilling, bales might be buried in a dedicated Council site, perhaps shared by several neighbouring Councils.

OTR tyres

Most OTR tyres are buried on mine sites. Up to 40% of these tyres may be suitable or reuse via retreading. There is significant demand for the proportion of these tyres that may be suitable for retreading or reuse.

There is no license requirement for mine sites in WA to manage their used tyres in a particular way¹⁹¹. It is very likely that regulation will be needed to drive change on mining sites. There are different regulatory requirements for the management of tyres on mine sites around the country, which could be used as models for WA. One approach might be the development of a Code of Practice for mine sites.

¹⁹⁰ Marie Donato, Motor Trades Association, Personal communication.

¹⁹¹ Mike Allen, Department of Environment, Personal Communication.

The Queensland EPA has a policy statement relating to the disposal and storage of tyres at mine sites which limits the size of stockpiles and provides guidance as to acceptable disposal methods on site. Disposing of scrap tyres and other wastes on mine sites is a notifiable activity under schedule 2 of the Environment Protection Act 1994, and the locations of the disposal site(s) need to be recorded on the Environmental Management Register¹⁹².

WA could adopt a similar policy as an interim measure.

The mining industry is resistant to the national scheme proposal, insisting that the levy cannot benefit the recycling of large earthmoving tyres as no recycling for these tyres exists in Australia, and voicing concern regarding the cost to the industry of the levy. The Minerals Council of Australia is exploring options for the mining industry, including the development of an industry specific scheme. The industry is holding discussions with Cleanaway and Sims regarding the development of a recycling scheme¹⁹³.

There is currently no process available in Australia for shredding and recycling of these oversized tyres, though this may change in the near future. The levy as a proportion of the cost of a tyre is insignificant, for example at a rate of \$2 /EPU a 200kg tyre (costing thousands of dollars) would incur a levy of \$42.

The Department could work with the industry and with the various specialist industry consultants to develop criteria for the development of tyre management plans as a requirement for used tyres at mine sites.

On-site management plans should ensure maximum recovery of tyres suitable for retreading and disposal through monofilling with survey and GIS mapping of those tyres not suitable for retreading.

Similar issues apply to OTR tyres used on farming properties. The Department could consider working with the Farmers Federation to develop a Code of Practice for the management of agricultural earth moving tyres.

Given the amount and quality of rubber and steel available in OTR tyres, strong demand is likely to emerge for these tyres for recycling, with at least two companies currently proposing to purchase mobile shredders that can handle such tyres.

When this equipment is available and proven, the Government could consider a ban on landfilling of OTR tyres.

Conveyor belt

Similarly, there is demand for used conveyor belt and financial rewards for companies to reuse and recycle their belt. A requirement for a management system to ensure the correct

¹⁹² Operational Policy Disposal and storage of scrap tyres at mine sites, EPA Queensland.

¹⁹³ Melanie Stutsel, Minerals Council of Australia, Personal communication.

management and disposal of conveyor belt on mine sites would prevent the wastage of this resource.

Stage 3 issues

Significantly increased market demand for used tyres for recycling in Perth is likely to occur in the near future (1 – 2 years) due to market demand, infrastructure investment and eventually the national benefit scheme.

Until this increased demand occurs it is not economic to transport tyres to Perth for landfill/storage.

When market demand does increase it will be feasible to transport tyres from most regions of WA via road or rail and sea from several ports, providing large enough quantities are available at central nodes to make the exercise economically viable. These costs will most likely be covered by the recyclers, particularly given the possibility of benefit payments from the National Scheme for recovery of tyres from remote and rural areas.

Establishment of central storage facilities

Currently large volumes of tyres are being stockpiled and/or buried in non-recoverable landfills in a large number of sites across WA.

The identification and establishment of central storage facilities will take some time, particularly as funding for infrastructure will be required, so this exercise should begin now. There is a need for regional offices of the Department to work closely with local stakeholders including Shires, tyre retailers and mine sites to identify the best solution for that area. The stockpile information and transport options analysis are a starting point for this exercise.

Funding for remote and rural resource recovery

It is critical that the WA Government participates fully in the development of options under the national scheme for recycling of end-of-life tyres from remote and rural areas.

In particular there should be provision for the collection of tyres to receive some benefit payment. Exemptions for the landfilling of tyres in remote and unmanned landfills may be unnecessary if the benefit scheme can be used to cover the costs of transporting used tyres from remote areas and if there is sufficient demand for the used tyres.

Both of the options proposed (benefit payments for collection and to establish storage facilities) would be of benefit to WA as shown by the analysis in Stage 3 of this report. It is important that WA responds positively to this proposal and supports the Department of the Environment and Heritage in pursuing the inclusion of these benefit payments in the national scheme. The final economic modelling undertaken to derive the levy-benefit must include an amount for remote and rural collection and storage.

Ideally the WA Government would be able to nominate sites for the provision of infrastructure under the national scheme Grants program to ensure the most efficient network of facilities as identified in Stage 3. Given the large area from which tyres need to be recovered and the correspondingly large number of central collection points that will be needed, it is critical that the WA Government plays an active role in the development of the benefit proposal for remote and rural areas under the proposed national scheme.

As the WA government is not represented on the Tyre Roundtable WA should work closely with the Queensland and NSW State Government representatives. While Queensland will share some of the issues relating to remoteness, WA should ensure the particular needs of its remote and rural communities are met.

The survey of stockpiles has revealed the existence of reasonably large quantities of tyres on rural properties where they are being used for various purposes including covering silage, protecting trees, horse training and in marron dams. Some property owners are also faced with the task of cleaning up tyres that have been used for such purposes by previous owners of the property. It may be useful to develop a Code of Practice for retailers requiring them to ask anyone taking used tyres for such a purpose to sign a release form and undertake to return the tyres when they are no longer required.

5. Identification of key intervention points to stimulate marketing and business opportunities for recycled rubber

There may be a role for government intervention to stimulate the development of markets for products using recycled rubber. Any intervention points should clearly address market failure.

Several issues relating to market development were identified at previous stages of the report.

Stage 1 issues

Funding of research and development

The proposed national scheme will not provide funds to companies for research and development but will only fund R&D "of general benefit"¹⁹⁴. The WA Government may wish to consider its role in funding, for example feasibility studies or market development.

There does not seem to currently be a need to fund basic research and development in the industry. A review of emerging technologies (below) and other existing technologies (Stage 2) found that the basic R&D has been completed, and the requirement is for infrastructure investment, market development and commercialisation.

The Waste Management Board might consider strategic funding from the Waste Management and Recycling fund if tyres were identified as a priority by the Board for funding in the given period. There might be an opportunity for the Board to invite applications from particular parts of the industry.

New technologies/ applications

There are a number of new technologies or applications that offer promise in relation to waste tyres. They include:

- CSIRO surface modification technology
- Devulcanisation processes (including Pyrolysis)
- Bioreactor leachate management

Surface modification

CSIRO has developed an 'enabling technology' that enables recovered rubber to successfully combine with other materials such as plastics¹⁹⁵. For example, a composite mix can utilise 50% recovered rubber to replace plastic, offering an economic alternative to poly vinyl chloride (PVC) plastics.

Recovered rubber is chemically inert and cannot be linked into other materials, so it is typically only used in lower value applications. The CSIRO process provides a chemical modification of the surface without changing the bulk properties of the rubber. The process can be tailored depending on the end product market. Such surface treated rubber may be used in a broad

¹⁹⁴ Julie Quinn, Department of the Environment and Heritage, Personal communication.

¹⁹⁵ www.csiro.au

range of high-value applications such as shoe soles, automotive components, tyres, non-pneumatic tyres, wheels, building products (roofing materials, insulating materials, window gaskets) coatings/sealants, containers for hazardous waste, industrial products (enclosures, conveyor belts, etc.) At present, the process has not been commercialised and CSIRO is not pursuing its patents.

Rubber devulcanisation

Vulcanisation is a thermal process that produces a cured cross-linked chain that bonds rubber permanently using sulfur. Recovered rubber is chemically inert and cannot be used to form a product. Devulcanisation means reverting rubber from its thermoset, elastic state back into a plastic, mouldable state¹⁹⁶. A range of processes have been described including chemical, microwave, ultrasound and microbial devulcanisation approaches. Basically the process breaks the di-sulfide bonds in the molecular structure and enables waste rubber to be used as a rubber substitute. There are many advantages particularly enabling the use of a much higher percentage of devulcanised rubber in product manufacture than is possible using vulcanised rubber. As an example, the reuse of recovered rubber in new tyre manufacture could increase from the current limit of 5% to 10-15% (using devulcanised rubber).

Pyrolysis

Pyrolysis involves heating a shredded tyre in the absence of oxygen to decompose the tyre into constituent products including carbon black, oil, gas, steel and inorganic ash. Potential uses of the constituent products:

- Carbon black is used in a wide variety of applications including the rubber industry. Tyres contain approximately 20% carbon black and around 10,000 tonnes are used in tyre manufacturing each year. This material could be sourced from reprocessing around 25% (or 5 million tyres) of the waste tyre stream.
- Oil derived from pyrolysis is similar to diesel and can be used as a fuel.
- Steel derived from pyrolysis contains a range of residuals but would be consumed in a much larger recycled steel market¹⁹⁷.

Tox Free Solutions undertook feasibility trials in WA in 2003¹⁹⁸. The feasibility trials were successful in that the equipment did break down shredded tyres to constituents, and provide the correct mass balance at the end of the process. However there were several difficulties that resulted in the company not pursuing the market. Firstly tyres must be shredded to an appropriate size for the kiln. As tyres come in many different sizes this was a major issue, particularly for the larger OTR tyres. The biggest issue however was the lack of markets for the end products. The carbon black produced was contaminated with heavy metals and would need to undergo several purification steps before it could be resold to tyre manufacturers and the oil is of low flammability and limited use.

¹⁹⁶ A National Approach to Waste Tyres, report for Environment Australia by Atech Group, 2001.

¹⁹⁷ Ibid.

¹⁹⁸ Ralph Nielsen, Tox Free Solutions Ltd, Personal communication.

Molecetra

Molecetra is a small operation in Queensland recently featured on the ABC New Inventors program¹⁹⁹. The process uses several steps:

- Mechanical removal of the two steel beadwires intact from the rim of the tyre;
- Chemical treatment of the tyre segments to soften and clean the rubber;
- Mechanical separation of the reinforcing steel wires and fibre cords from the rubber;
- Granulation of the softened rubber; and
- Heating of the rubber on low heat to produce 100% pure rubber or on high heat (1300 deg C) to produce carbon and oil using an industrial microwave.

The low heat process produces 7.6 kg of pure crumb rubber from a 10kg tyre or 3.9 litres of oil and 3.8 kg of carbon black per tyre.

The recovered rubber can be used to manufacture a range of rubber products. The recovered carbon may be activated carbon, used for purifying industrial water, or carbon black, which has wide range of industrial applications including the generation of electricity.

The inventor estimates the process recovers around \$5.40 value from each tyre²⁰⁰.

Molecetra has built a pilot plant on the Gold Coast and is planning to build a commercial facility in Sydney that is expected to process 2 million tyres per year (3 tonnes per hour). Other commercial plants are planned for Melbourne, Brisbane and Adelaide. Molecetra recommends recycling plants should be built with a capacity of at least 3-tonnes per hour for a reasonable payback period²⁰¹.

One of these plants could process over 60% of the 40,000 tonnes of used tyres generated in WA each year.

There is also international interest in the technology.

Bioreactor landfill leachate management

Collex Waste Management have developed a process to use shredded waste tyres within their leachate and drainage systems within a bioreactor landfill ²⁰². The Ti Tree bioreactor system consists of a number of cells constructed within a disused quarry site. One of the critical design parameters for an anaerobic bioreactor landfill is management of the moisture content. The leachate management system consists of a matrix of trenches that are filled with compressed shredded waste tyre material. Piping within the trenches enables the distribution of the bioactive leachate throughout the cells and makes the waste decomposition occur quicker. This application does not seem likely to use large volumes of used tyres.

¹⁹⁹ www.abc.net.au/newinventors/txt/s1300273.htm

²⁰⁰ A Heap of Great Returns, Ecos, Jan-Mar, 2004.

²⁰¹ www.molecetra.com.au

²⁰² www.collex.com.au/innovations/bioreactor

Summary

Given the forecast market sizes for more established technologies such as the use of crumbed rubber in asphalt and in surfacing, adhesives and grout etc, investment in these emerging technologies does not seem necessary for market development at this time. It seems that Australia is following the same path to markets for recycled rubber as seen in other countries.

For example data over the period 1990 to 2001 from the Rubber Manufacturers Association in the US indicate that the total number of used tyres that are recycled, reused or recovered has increased from 24 million in 1990 to around 218 million in 2001. In percentage terms this corresponds to an increase in the total number of tyres captured for end-uses from 11% (in 1990) to over 77% in 2001.

Over the same period, there has been a change in the number of tyres used for specific end use markets. While all of the major end use market segments have grown in total size, the number of tyres used for TDF has fallen from 84% in 1992 to around 53% in 2001. This has primarily occurred due to the development of the two other major end use segments – recovered rubber (for use in tyre derived products) and civil engineering applications²⁰³.

Stage 2 issues

Government procurement policies

Government procurement policies can have an important influence on private companies as civil engineers and contractors can be wary of new technology²⁰⁴. Government can show leadership and play an important role in demonstrating the viability of new technologies. As one of the largest purchasers in the State, the Government is able to promote change through its procurement policies and guidelines and can be a critical source of scale for new technologies.

The lack of growth of used rubber in asphalt in WA compared with other States deserves attention. It seems that many of the barriers to its uptake cited by Main Roads have been overcome by other users. The forthcoming trial by Pioneer Road Services should be used as a case study to encourage Main Roads to consider the technology.

Detailed discussions should be held with Main Roads WA to further assess the prospects for the use of crumbed rubber. The performance based contracts are 10-year contracts that have been in place (2003) for 3 to 5 years²⁰⁵ (i.e. now 5-7 years).

It may be feasible to renegotiate these contracts to include technical specifications for the use of crumbed rubber. However this would need to be achieved through persuasion, not imposed upon the agency.

²⁰³Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

²⁰⁴Tim Edwards, EcoFlex, presentation to Australian Environmental Labelling Association Conference, www.aela.org.au.

²⁰⁵ Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003.

In 1991 the US Congress mandated the use of ground tyre rubber in a prescribed percentage of highways that were funded by the Federal Government. Several States began testing programs, however most States refused to comply with the mandate²⁰⁶.

There may also be an opportunity to influence local government procurement guidelines.

Some States have more explicit procurement policies for waste reduction. The NSW government has implemented a Waste Reduction and Purchasing Policy (WRAPP)^{207, 208}. The Policy has several target products and materials for purchasing, disposal or recycling. However tyres are not currently a "scheduled item" for agency reporting.

Under the Policy, all NSW government agencies and State-owned corporations are required to implement environmentally responsible waste reduction and purchasing policies and to work towards becoming model waste managers. Agencies are encouraged to look beyond the products targeted under the Policy to those additional products which present a significant waste problem for their agency, or where opportunities arise to purchase recycled content alternatives where they are price and performance competitive.

For example, major users of tyres such as the State Transit Authority (STA) will normally retread tyres three times before the tyre's "end of life", then as part of their tyre contract the tyres are collected for recycling into road base materials.

Government vehicles should have good programs for tyre use and maintenance, use a record system to monitor the program and provide the information for community awareness²⁰⁹.

As part of this program the use of retreaded tyres for government-owned trucks and buses could, with due consideration of safety standards, be assessed with a view to promote the sustainable use of retreaded tyres and ensure a consistent policy across government.

In WA tyres could be included in State Government Procurement Policies as a target product for purchasing and reporting. Such information could be incorporated into reporting against the State Sustainability Strategy. This would demonstrate Government leadership and reassure the public and industry of the safety and value of both retreaded tyres and products made from recycled rubber.

Information provision

There is an important role for government in the provision of information about the correct methods of use, disposal and recycling of tyres.

²⁰⁶ Economics of Tyre Recycling, ARRB Transport Research Ltd, June 2004.

²⁰⁷ Jenny Brown, Department of Environment and Conservation NSW, Personal communication.

²⁰⁸ www.wrapp.nsw.gov.au

²⁰⁹ Technical Report: Management of Used Tyres in Western Australia, TJ Waters Environmental 2003.

The Waste Wise website²¹⁰ has a page dedicated to Tyres, providing information about volumes used, environmental impacts and the regulatory requirements for storage. There is a list of businesses and companies that deal with unwanted tyres. Almost all of the contact names and addresses are out of date, as is the regulatory information. For information to be useful and used it must be regularly maintained.

The government also plays a vital role in promoting recycling. The Waste Wise website page has a short paragraph relating to some of the uses of crumbed rubber, but this section could also be updated and links created, for example to the Reclaim Industries website.

In the course of this study several stakeholders sought information regarding the availability of used tyres for the purposes of establishing various business ventures. This type of information is critical to encourage investment in the industry. One source of information is reports such as this and previous studies, which could be provided through the website. The recent stockpile survey contains very valuable information that might encourage recyclers to investigate options for recovery of tyres from rural and remote regions. The survey should be updated regularly and the data should be publicly available.

A community awareness program to inform the community of local, national and international issues relating to used tyres and management practices could be included in the waste education strategy being developed by the Waste Management Board.

The WA Government could work with the Motor Trade Association to ensure the information disseminated by tyre retailers regarding the levy and disposal fees also covers the extension of tyre life through care and maintenance.

²¹⁰ www.wastewise.wa.gov.au

6. Consideration of potential environmental and social impacts of the various actions identified

A range of possible Government intervention points have been identified in the preceding stages of this study. Each of these potential intervention points requires assessment regarding environmental and social impacts of the proposed actions.

Government intervention points to stimulate resource recovery

Retreading

Retreading of tyres allows reuse, contributing to the conservation of resources in the tyre and delaying the need for manufacture of a new tyre.

Retreading of passenger tyres has already ceased in WA due to competition from cheaper imports, however the price advantage may be lost with the imposition of the levy on new tyres. Truck and bus tyres are still retreaded due to their higher value. The WA Government has several options for supporting the retread industry including the purchase of retreaded tyres for Government vehicles and the provision of information to the public, addressed in the next section.

- The Government could waive the fee for a controlled waste tracking number for transporting tyres on public roads to a retreader's premises. This could also apply to tyres taken to recycling/reprocessing facilities.

The inclusion of tyres as a controlled waste under the *Environmental Protection (Controlled Waste) Regulations 2004* was introduced to provide better information to the Government and industry regarding the fate of used tyres in WA and to discourage illegal dumping. To achieve these aims it will still be necessary to issue a tracking form and number to collectors taking tyres to retreaders. This will impose a cost on the Government that will not be covered by the Scheme which is designed to be self-funding.

The alternatives include raising the fee for other loads to subsidise loads taken to retreaders and recyclers or to source the funds elsewhere, for example from the Waste Management and Recycling Fund (WMRF). Neither of these options would be preferred, as there is an equity issue in the subsidy of one part of an industry by another and the WMRF should not be used for recurrent funding but reserved for strategic priorities. This action would therefore only be recommended if a source of funding to cover the shortfall can be identified.

Landfill disposal

The WA Government could consider further bans on the disposal of tyres to landfill, providing more security of resource to potential recyclers.

Options for tyres from the metropolitan area include:

- A ban on the disposal of whole or shredded tyres to landfill in the TLEZ;
- A requirement to shred tyres before landfilling in the TLEZ;
- A ban on the disposal of particular classes of tyres to landfill in the TLEZ; or
- A requirement that tyres be landfilled only with other waste rubber (monofills).

The first option would require the removal of the current exemptions for landfills in the TLEZ. Decisions would need to be made on whether to ban the transport of tyres from the metropolitan area to landfills outside the TLEZ.

The environmental impacts are likely to be very significant in either case: if there is no landfill option in the metropolitan region, large volumes of tyres will accumulate at tyre retailer and council sites, creating difficulties for the enforcement of licence conditions. The recycling industry is not yet at the stage where the passenger tyres generated in Perth can be processed.

Without bans on the transport of tyres outside the TLEZ some collectors might attempt to establish alternatives. The extra costs to the environment of transporting tyres away from the metropolitan region and of landfilling or storing them in rural areas would not be justifiable.

The social impacts of a ban on disposal within the TLEZ, even if transport to other sites was allowed, are likely to be very significant with many collectors unable to continue in business without much greater investment in trucks etc. The costs of tyre disposal would also increase significantly, though there is a profit margin for retailers in the current disposal fee charge, which could be used to cover the increased cost.

A ban on the landfill of unshredded tyres within part 1 of the TLEZ, that is excluding Bunbury, is desired by some players in the market as a requirement to shred tyres prior to landfilling would make the price charged for recycling competitive with landfilling whole tyres outside of the TLEZ. This would drive more tyres into recycling rather than landfilling.

A requirement to shred tyres before landfilling would force collectors to pay the significant costs of purchasing and maintaining shredding equipment, travel much further to dispose of whole tyres outside the TLEZ, or accept whatever price the recycler charged for taking their tyres. In the current situation this may leave only one collector in the market. This requirement would certainly put monofills in the TLEZ such as S.T.E.G. out of business.

Perhaps the premise is correct and a requirement to shred tyres before landfilling in the TLEZ may drive more tyres into recycling. The requirement to shred prior to landfilling has not increased recycling in NSW or Victoria and has been implemented purely to ensure better management of landfills. The environmental benefits of shredding are doubtful: the benefit to the landfill operator in terms of easier management of the landfill is offset by increased energy usage for shredding and the irrevocable loss of the resources in the tyres.

The use of such an indirect policy tool to achieve the diversion of more tyres from landfill is likely to be fraught with unforeseen consequences. While it is understood that this suggestion has arisen from frustration with the difficulty in securing a supply of tyres in the past there are other, more direct ways of overcoming this issue.

The third option involves the banning of particular types of tyres from landfill within the TLEZ, and a ban on their transport outside the TLEZ for landfill disposal.

Reclaim Industries already has excess capacity for the processing of truck tyres and cannot meet the demand for rubber from these tyres.

- The WA Government could ban the landfilling of truck tyres of the type required by Reclaim Industries and phase in bans on the landfilling of other types of tyres as capacity to process them becomes available.

There would be environmental benefit from this action as significant volumes of truck tyres are currently being sent to landfill that could be diverted. The social costs would include the loss of business for landfill operators and the extra handling that would be required by collectors. One large collector is already sorting truck tyres for either retreading or transport to Reclaim Industries.

At this time Reclaim Industries is the only processor in WA, which could lead to price distortions and/or illegal dumping if collectors have only that option. However other processors are expected to enter the market in the near future (within 6 months to a year). This will provide competition and choice to collectors. The Government should ban the disposal of truck tyres to landfill, with an appropriate adjustment period and a review within two years to ensure the market is operating efficiently.

This recommendation does not immediately serve to divert more passenger tyres from landfill, however Reclaim Industries has now secured a contract for the collection of both truck and passenger tyres that will enable it to consider investment in the equipment needed to process passenger tyres. Industry assistance might also be considered (discussed later in this Chapter). When there is capacity to handle passenger tyres a ban on their landfilling within the TLEZ could be considered.

The last option reflects the evolving status quo. Landfills in the TLEZ that were receiving whole or shredded tyres for disposal with other inert wastes have withdrawn from the market, leaving only those landfills that specialise in tyres. One of these is a monofill for baled tyres, which involves an extra cost; the other is a more conventional landfill receiving loose tyres as well as other rubber waste.

While it may seem unlikely in the current circumstances that tyres would ever be recovered from landfill for recycling, the value of resources embodied in tyres and the continuing innovation in technologies, coupled with emerging world shortages of rubber and oil require application of the precautionary principle.

The only estimates for the cost of extracting tyres from landfills are derived for cleaning up illegal dumps of used tyres²¹¹. The cost of extracting tyres from the ground was given at \$0.10 per tyre and cleaning for shredding \$0.15 per tyre. There would also be transport and handling costs of approximately \$0.20 per tyre. These costs were estimated for cleaning up large dump, (over 100,000 tyres) where there would be significant economies of scale.

The social impact of this option is limited as many tyres are already being placed into these landfills. There is one collector who will be impacted by the change but the mixed inert landfill he has been using has already decided not to accept tyres in any case, without government

²¹¹ A National Approach to Waste Tyres, prepared for Environment Australia by Atech Group, 2001.

intervention. The Government might consider working with this collector to develop a transitional solution for the tyres he collects.

Most Government intervention requires a transition phase and adequate notice to stakeholders, however as the landfill market has already evolved to this stage it would be better to ban the disposal of tyres to mixed landfills immediately in case new entrants are considering that option.

OTR tyres on mine sites and farms

It seems probable that OTR tyres used by the mining industry will not be included in the national scheme. The volume of material in OTR tyres and the large number used in WA make this a particular issue for WA. The Government has several options for action to increase resource recovery from OTR tyres.

- The Government could make strong representations to the industry and to the Tyre Roundtable developing the Scheme that OTR tyres should be included.
- The Government could encourage reuse and retreading through a requirement for tyre management plans on mine sites and through working with the industry and retreaders/repairers to develop the criteria for such management plans, perhaps as a Code of Practice.
- The Government could ban the disposal of OTR tyres on mine sites or alternatively impose restrictions on the numbers that may be stockpiled and requirements for the recording of locations of buried tyres.

The costs involved in having more involvement in the development of the National Scheme would be spread across several issues discussed in this report. There will be a requirement for extra Departmental resources to ensure the needs of WA are addressed. However it is unlikely that the Scheme will be applied to OTR tyres at least initially due to several factors including the lack of current recycling options and the views of the mining industry.

Other States, notably Queensland and Victoria, require tyres to be managed on mine sites. The additional costs to the industry and government of developing criteria for the on-site management of tyres would be likely to be offset by the financial benefits to be obtained by companies from increased reuse and retreading and the environment benefits realised through these practices and better managed on-site disposal.

Similar issues apply to large tyres used by the agricultural industry. The Government should work with the Farmer's Federation to develop a Code of Practice for the management of these tyres on farms.

Currently there is no available means of recycling OTR tyres, but the inclusion of a requirement for survey and GIS mapping of disposal sites will facilitate future recovery if this becomes feasible as well as providing better environmental management now.

At a future time when there is capacity for recycling of OTR tyres the Government could consider bans on the on-site burial of OTR tyres.

Conveyor belt

Similar issues relating to the demand for conveyor belt for reuse and recycling apply except that there are established mechanisms for its end use.

- The Government could require the development of plans for the management of conveyor belts including consideration of reconditioning and consignment for reuse/recycling and requirements for the recording of disposal sites.
- The Government could ban the disposal of conveyor belt on mine sites.

The additional costs involved for industry in developing management plans will be more than offset by the potential savings in the purchase of new conveyor belts as demonstrated by the experience of BHP Billiton Iron Ore. The costs to the Government of overseeing the development of such plans will be compensated by the environmental benefit of reuse and recycling of large quantities of conveyor belt.

As there is only one provider of large belt reconditioning services in WA at the current time and this is the major provider of recycling/disposal services there is limited choice for mining companies. Forcing the use of the one company by the industry may cause price distortions. Therefore a ban on the disposal of belt on sites is not practicable but the management plans should include recording of GIS coordinates.

Inappropriate disposal

A significant proportion of used tyres in WA seems to be unaccounted for by landfill and recycling figures. This may be largely resolved by the introduction of the tracking system for used tyres. There are several actions the Government could undertake:

- After a period of 12 months the data from the tracking forms should be compared with the landfill, recycling and sales data to determine what volume of tyres is not being tracked.
- The Government could work with the Motor Trade Association to ensure that all retailers include the levy for disposal as part of the cost of replacing tyres, not as a separate cost that the consumer can choose not to pay.
- The Government could encourage both metropolitan and rural Councils to accept tyres from residents for no charge and assist them with arrangements for storage or collection.
- The Government could work with Shires in rural and remote regions to develop alternatives for the storage of tyres, for example burial in dedicated tyre landfills.

The cost of reviewing the data from the Tracking system will be negligible and should be done in any case to determine whether the system is achieving its objectives.

Working with the Motor Trade Association will require resources from both the Department and the industry and may not be justified in terms of the numbers of tyres that could be diverted from inappropriate disposal. In any case the National Scheme should address this issue.

There is a rebate to Councils from the Resource Recovery Rebate Scheme (RRRS) for diverting used tyres from landfill although it is rarely claimed by Councils. Councils could be encouraged to take advantage of it to cover some of the costs of accepting and storing small

numbers of tyres. Denmark received a rebate of \$4.47 in 2003 for the diversion of tyres at a drop off rebate rate of \$27.93/tonne, while the EMRC received \$52.31. In 2004 Armadale receive \$94.50 for 10.31 tonnes, the EMRC received \$34.28 for 3.82 tonnes. Some effort would be needed to ensure that Councils are aware of the opportunity and of their options for disposal to collectors and recyclers. With the proposed changes to the RRRS rebate the Waste Management Board might consider diverting some strategic funds for this purpose.

As more country landfills become unwilling to accept whole tyres due to management problems there will be increased social and environmental impacts from inappropriate disposal. These impacts could be largely alleviated through the provision of centralised storage locations accepting tyres from a catchment area. Considerable resources may be required to coordinate this exercise as there will need to be consultation for each area with key stakeholders and the funding of storage infrastructure.

The survey of stockpiles revealed the existence of reasonably large quantities of tyres on rural properties where they are being used for various purposes including covering silage, protecting trees, horse training and in marron dams. Some property owners are also faced with the task of cleaning up tyres that have been used for such purposes by previous owners of the property.

- The Government should work with retailers and the Farmer's Federation to develop a Code of Practice requiring retailers to obtain a signed release form and an undertaking that tyres will be returned when they are no longer required on the farm.

The costs to the Government, retailers and farmers in developing this Code of Practice will be offset by benefits to future property owners and the environment.

Recovery of used tyres from remote and regional areas

As a significant volume of used tyres in WA is generated outside the metropolitan area it is important to develop mechanisms for the recovery of this resource.

- The Government should work to ensure these tyres are included in the National Scheme with provision for benefit payments both for central storage facilities and for collection from remote areas. Ideally the Scheme should allow the State Government to have a role in nominating sites for funding of facilities.
- The Government could begin to work now with stakeholders in potential storage locations to determine the best site and the most appropriate form of storage as well as the most suitable manager for a particular site.

The costs to the Government in diverting Departmental resources to engaging with the National process will be more than offset by the potential environmental and social benefits of achieving benefits through the Scheme that facilitate resource recovery in WA.

The effort expended by Government and rural and remote stakeholders now in developing plans for centralised storage locations will have considerable social and environmental benefits, alleviating problems for disposal for country landfills, preventing illegal dumping and providing possible business or community development opportunities for small communities.

There are potential benefits for community groups who might collect tyres from the bush or roadsides in return for payment as part of fundraising efforts or oversee the management of a

tyre storage facility. The safety and liability issues involved would need to be closely examined as would the possible mechanisms for funding of such schemes. These issues should be examined as part of planning for centralised storage locations.

Potential social and environmental impacts, including impact on visual amenity, land use and possible pollution from leachate arising from the storage facilities will need to be considered for each site. Well planned, centralised facilities should avoid the detrimental impacts of illegal or unmanaged stockpiles.

Government intervention points to stimulate marketing and business opportunities for rubber

Funding of research and development

A review of emerging technologies and applications found that there is not really a need for new basic R&D in the field of rubber recycling. What is needed is commercialisation. There is also a critical gap in industry capacity in that WA has no capacity to recycle passenger tyres.

- The Government could consider providing strategic funds for feasibility studies or trials or for equipment to overcome lack of capacity.

Government funding for industry development is fraught with difficulties including accusations of unfairness, wastage of funds due to business failure and the lack of expertise to make funding decisions.

There is already a perception by some in the industry that the Waste Management Board should provide funds for plant and equipment because of previous grants that have been provided through the WMRF. Of course if the Board does fund the acquisition of plant there will be other companies who are competitively disadvantaged and will also expect similar funds.

There have been several ventures in the WA used tyre industry that have failed in recent years due to a multitude of factors including competition from outside WA.

If the Government does choose to invest in industry development it should be done very carefully, probably after a targeted call for expressions of interest from the industry.

Government procurement policies

The Government has an important leadership role in the adoption of new sustainable technologies.

- The Government could work with agencies likely to use products from the rubber recycling industry, including Main Roads WA, to overcome barriers to the adoption of the product.
- The Department could work with other Departments and agencies to increase the use of retreaded tyres on Government vehicles, perhaps by developing minimum specifications for contracts.
- Tyres and recycled rubber products could be included as a target product for purchasing and reporting in a State Government Procurement Policy.

As part of the development of reporting against the State Sustainability Strategy there is renewed focus on the impact of government activities on suppliers and the environment. This provides an opportunity to incorporate a preference for reuse and for the purchase of products with recycled content.

Providing information

One of the key roles of Government is information provision to address market failure. Often only a government agency is able to access the necessary information and to provide an overview of a whole industry.

- The Government should update and maintain the information on the Waste Wise website, including information about the volumes of used tyres in WA, their fate at end-of-life, regulatory requirements and a Directory of contacts for disposal and recycling.
- Information such as this report and previous reports should be available (after appropriate editing of commercial-in-confidence material) to the public.
- The survey of tyre stockpiles (regularly updated) should be available to the public so that potential investors can assess business opportunities.
- Information regarding proper tyre maintenance to extend the life of tyres (waste avoidance) and the use of retreaded tyres by the Government fleet including specifications should be available to the general public to encourage better practices.
- The Government's purchase and use of products with recycled rubber content should be promoted to demonstrate the viability of the technology.

Most of these actions do not require significant additional expenditure or resources. Implementation does however depend on individuals taking responsibility for ensuring updates and maintenance of information and the uploading of information onto websites. The benefits in terms of market development and industry growth as well as to the environment would make this effort very worthwhile.

7. Recommendations

The recommendations below have been grouped as in Chapter 6, with an indication of whether the recommendation should be implemented in the short, medium or longer term. These recommendations could be used as a staged action plan to deliver a used tyres strategy for Western Australia.

Government intervention points to stimulate resource recovery

Short term measures: 12 – 18 months

1. The fee for a controlled waste tracking number for transporting tyres on public roads for retreading/ or recycling should be waived but only if an alternative source of funding to cover administration of the tracking form can be established.
2. The WA Government should ban the landfilling of truck tyres of the type required by Reclaim Industries within the TLEZ. A review should be undertaken within two years to check that the policy is having the desired effect and not leading, for example, to tyres being transported outside the TLEZ.
3. The disposal of tyres to mixed landfills within the TLEZ should be banned immediately to entrench the emerging status quo. Landfills receiving only tyres and rubber waste should be able to continue to do so. Again the effect of this policy should be reviewed to ensure no unforeseen impacts.
4. After a period of 12 months the data from the Controlled Waste tracking forms should be compared with the landfill, recycling and sales data to determine what volume of tyres is not being tracked.
5. The Government should work to ensure tyres from remote and rural areas are included in the National Scheme with provision for benefit payments both for central storage facilities and for collection. Ideally the scheme should allow the State Government to have a role in nominating sites for funding of facilities.
6. The Government should begin to work now with stakeholders in potential storage locations to determine the best site and the most appropriate form of storage as well as the most suitable manager for a particular site.

Medium term measures: 18 months – 3 years

7. Bans on the landfilling of passenger tyres in the TLEZ should be considered as the capacity to process them becomes available.
8. The Government should encourage reuse and retreading of OTR tyres on mine sites through a requirement for tyre management plans and through working with the industry and retreaders/repairers to develop the criteria for such management plans perhaps as a Code of Practice.

9. The Government should impose restrictions on the numbers of tyres that may be stockpiled on mine sites and requirements for the recording of locations of buried tyres.
10. The Government should work with the Farmer's Federation to develop a Code of Practice for the management of OTR tyres on farms.
11. The Government should work with retailers and the Farmer's Federation to develop a Code of Practice requiring retailers to obtain a signed release form and an undertaking that tyres will be returned when they are no longer required on the farm.
12. The Government should require the development of plans for the management of conveyor belts including consideration of reconditioning and consignment for reuse/recycling and requirements for the recording of disposal sites.
13. The Government should encourage both metropolitan and rural Councils to accept tyres from residents for no charge and assist them with arrangements for storage or collection.
14. The Government should work with Shires in rural and remote regions to develop alternatives for the storage of tyres, for example burial in dedicated tyre landfills.

Long term measures: 3 - 5 years

15. In the future when there is capacity for recycling of OTR tyres the Government should consider bans on the on-site burial of OTR tyres.

Government intervention points to stimulate marketing and business opportunities for rubber

Short term measures: 12 – 18 months

16. The Government should update and maintain the information on the Waste Wise website, including information about the volumes of used tyres in WA, their fate at end-of-life, regulatory requirements and contacts for disposal and recycling.
17. Information such as this report and previous reports should be available (after appropriate editing of commercial-in-confidence material) to the public.
18. The survey of tyre stockpiles (regularly updated) should be available to the public so that potential investors can assess business opportunities.
19. The Government should work with agencies likely to use products from the rubber recycling industry, including Main Roads WA, to overcome barriers to the adoption of the product.

Medium term measures: 18 months – 3 years

20. The Government should consider providing strategic funds for feasibility studies or trials through the Waste Management Board. Care should be taken not to disadvantage particular market participants.
21. The Department should work with other Departments and agencies to increase the use of retreaded tyres on Government vehicles, perhaps by developing minimum specifications for contracts.
22. Tyres and recycled rubber products should be included as a target product for purchasing and reporting in a State Government Procurement Policy and as part of Sustainability reporting.
23. Information regarding proper tyre maintenance to extend the life of tyres (waste avoidance) and the use of retreaded tyres by the Government fleet including specifications should be available to the general public to encourage better practices.
24. The Government's purchase and use of products with recycled rubber content should be promoted to demonstrate the viability of the technology.

Implementation of the recommendations of this report

Implementation of the recommendations above will require resources and support from several agencies. The first step towards implementation should probably be to obtain endorsement for a used tyres strategy from the Ministers for:

- Environment
- Planning and Infrastructure; and
- Housing and Works.

Integration of reporting requirements into Government processes requires a whole of Government approach which may need the involvement of the Premier's Department.

Consultation with the Local Government Association would also be useful as a preliminary step before beginning to work with shires to establish storage facilities.

APPENDIX 1

Stakeholders contacted for this analysis

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