Cost Benefit Analysis Report

This report has been prepared for the Tyrewise Working Group as part of a process to develop an industry led product stewardship programme for end of life tyres in New Zealand.

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This report provides recommendations from the Tyrewise Working group, based on the best information at the time of compiling the report. Its intention is to provide guidance to the Minister for the Environment and the future Product Stewardship Organisation (PSO) who would be responsible for an ELT scheme. ***Any fees, incentive payments, and funding provisions are recommendations only****. These will be subject to review and potentially changed by the PSO board once it is established.* ***We strongly recommend that significant business investment decisions are not made on the basis of this report alone.*** *The Tyrewise Working Group accept no responsibility whatsoever for any loss should individuals/groups/companies disregard this statement and proceed based on information contained in the report.*

Document Control

Date	Version	Document	Author
28/05/13	DRAFT	Tyrewise Cost Benefit Analysis	3R Group Ltd Tyrewise Project Managers
11/12/13	DRAFT V2	Tyrewise Cost Benefit Analysis – update following working group input on 30th May 2013	3R Group Ltd Tyrewise Project Managers
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6/08/13	V4	Tyrewise Cost Benefit Analysis – minor corrections	3R Group Ltd Tyrewise Project Managers

Terminology Explanation:

The Waste Minimisation Act 2008 has provision for "setting of fees for management of a product" (section 23(1)(d)). To be consistent with this provision and the intent of the proposed scheme to meet requirements for supporting regulation under the WMA, the term "fee" has been replaced with "Tyrewise Fee/Advance Disposal Fee" through-out this report and will be used in all future Tyrewise material.

Previously published Scoping Reports 1 to 3 will have used the terminology "levy".

Scoping Report 4 and 5 used the terminology "fee".

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Contents

1.0 Background Information

This cost benefit analysis is part of a series of guiding documents that collectively intend to provide the necessary information for developing a comprehensive and robust nationwide product stewardship scheme for ELTs.

The reports completed previously have investigated and presented:

1. The current situation for collection and disposal of ELTs in New Zealand and internationally.
2. Alternative uses for collected tyres internationally and in New Zealand, and then ranked these potential uses by cost efficiency and resource recovery effectiveness.
3. Feasible options for a product stewardship programme for ELTs in New Zealand investigated the likely costs and benefits of the options and reported on the nature of any regulatory framework that might be required.
4. A set of guiding principles, an outline of governance for the proposed scheme, scheme coverage, limits and regulatory framework required for viability, and indicative timelines
5. Feedback from the WasteMINZ public consultation workshops in October 2012.
6. Feedback from additional public consultation undertaken March 2013 following the release of scoping report four.

A working group comprising ten industry members have come together to take a leadership role in the development of this scheme, and have signed a mandate to represent their sector. It was recognised that from the broader industry sector, this was the group that had the most influence and opportunity within the ELT process to bring about effective change and to ensure that a structure for ELT development within New Zealand was robust. One of their key tasks is to ensure that the wider industry stakeholder groups (inclusive of ELT tyre collectors, processors and end users) know how to have their say throughout the process.

The working group participants are:

Organisation	Participant
Motor Trade Association (Inc.) (MTA)	Liezel Jahnke
Bridgestone NZ Ltd	Heath Barclay
Goodyear Dunlop Tyres (NZ) Ltd	Bill Prebble
Motor Industry Association Incorporated (MIA)	Perry Kerr
Imported Motor Vehicle Industry Association Incorporated (IMVIA)	David Vinsen
The NZ Automobile Association Incorporate (AA)	Stella Stocks
Local Government NZ	Brent Aitken
Value Tyres	Billie Watmuff
NZTRACA (NZ Tyre Recycler and Collector Association)	Jo Knight & Jim Laughton
Ministry for the Environment (MfE)	Dana Peterson (observer)

2.0 Analysis Approach

This report presents a range of assumptions and estimates that underpin a cost benefit analysis (CBA) of options relating to an industry led product stewardship scheme for end of life tyres in New Zealand.

The CBA is an economic assessment tool that enables comparison of the status quo "do nothing" scenario with the impacts of the proposed scheme which will address the environmental and resource waste issues currently observed relating to end of life tyres. Economic cost and benefits will be measured from the perspective of society as a whole, and for comparative purposes, where possible monetized and discounted to convert them to their net present value (NPV). To do this the following key estimates and assumptions have been made:

	Assumption Type	Base Case (ref page 7)	Preferred Scenario (ref page 8)	Alternative Scenario (ref page 9)
General	Base year for data collection	2011		
	Evaluation period	10 years	10 years	10 years
	Discount Rate	3.91%	3.91%	3.91%
Projections (Per annum)	Quantities of ELTs generated	62,000 tonnes, reducing by 1% annually	62,000 tonnes, reducing by 1% annually	62,000 tonnes, reducing by 1% annually
	Recycling Rates	18,000 tonnes/yr 29%	51,000 tonnes/yr 95% (Year 5)	29,000 tonnes/yr 58% (Year 5)
	Land filling/Export:	38,000 tonnes	3,000 tonnes	21,000 tonnes
	Illegal Dumping.	3,000 tonnes	0 tonnes	300 tonnes
	Tyre Fires	4 fires per year	3 fires per year	3 fires per year
	Tyrewise Fee/Advance disposal fee	$23 million	$43 million (Yr1) to $14 million (Yr10)	$32 million (Yr1) to $14 million (Yr10)
Cost Assumptions (over 10 years of CBA Analysis)	Government Costs	$0	$3.2 million	$4.8 million
	Business Cost (compliance + capital investment)	$0	$47 million	$69 million
	Illegal Dumping (orphan tyres)	$16 million	$0	$0
	Tyre Fires	$12 million	See benefit assumption	See benefit assumption
	Landfill stability leachate issues	Not quantified	Not quantified	Not quantified
	Public Health (mosquito borne disease)	Not quantified	Not quantified	Not quantified
	NZ 100% Pure Brand	$122 million (0.1% drop)	brand maintained	brand maintained

	Market value of resources	$40 million	$83 million	$55 million
	New industry and employment	$0	$207 million	$162 million
Benefit Assumptions (over 10 years of CBA Analysis)	Benefits of tyre derived fuel	$0 TDF not in use	$42 million	$42 million
	Benefits of rubber asphalt	$0 Rubber roads not in use	$3.2 million Further benefits tbc by new project	$3.2 million per yr Further benefits tbc by new project
	Avoided costs illegal dumping	n/a	$16 million	$14 million
	Avoided costs tyre fires	n/a	$3 million	$3 million
	Avoided landfills operating cost	n/a	$24 million	$5 million
	Avoided cost public health liability – legacy tyres	n/a	Not quantified	Not quantified
	Avoided cost to NZ's brand, tourism and export industries	n/a		
NET PRESENT VALUE		-$89 million	$36 million	-$18 million

2.1 Options Analysed

2.2 Base Case Scenario: Current Situation

The base case "do nothing" scenario was presented in *Scoping Report 1 – Investigation into the collection and disposal of ELTs in New Zealand and Internationally*[23].

The key points from this report were:

5.1 million tyres are imported into New Zealand annually. These include tyres for motorbike, passenger, light and medium commercials, truck, bus, off road, and aircraft.

In 2011 these were split between 74% new loose tyres, 6% used loose tyres and 20% tyres fitted to vehicles.

Collectively this amounts to 62,000 tonnes of end of life tyres of which:

- 52% originate from "passenger vehicles";
- 38% originate from "truck, bus and commercial" and
- 10% originate from "off road" (grader, forestry, tractors and earthmovers).

A network of collectors, processors and end users of ELTs has established over the years (supported by leading tyre companies) but they collectively address only a minority of the ELTs generated. It is estimated that 29% (18,000 tonnes) of ELTs are moving to material recovery – the rest go to some form of land filling or other unsound disposal.

The focus of the networks to date has been on passenger/truck tyres with off road "the elephant in the room" as disposal is currently highly problematic.

There is no history of tyre derived fuel (TDF) use in New Zealand although some of the tyres currently collected are being sent to Asia as TDF. There is also no history of rubberized roading, although New Zealand processors are exporting rubber powder to Australia and other markets for this end use.

Interviews with sector participants confirm that, for the majority in New Zealand, ELTs are seen as a waste issue, not a resource to be utilised. This contrasts with overseas experience where, provided there is supporting rule making which requires participation and registration, a wide range of end use and energy recovery options have developed.

A gap analysis using the World Business Council for Sustainable Development's Tire Working Group (TWG) framework shows only partial achievement of management, collection and recovery of ELTs and an absence of supporting legislation to "level the playing field" and support universal access to stewardship for tyres. In spite of this landscape the sector sees an opportunity to emulate other jurisdictions and achieve much higher recovery to beneficial use rates.

There is provision under the **Waste Minimisation Act 2008** for a regulatory framework, administered by the Ministry for the Environment for the establishment of product stewardship of end of life products, which could include end of life tyres.

2.3 Preferred Scenario: End of Life Tyre Stewardship Model

The Tyrewise Working Group's preferred scenario was presented in *Scoping Report 4 – What might a future programme look like*[1]*?* The key points from this report plus an outline of how the scheme might be operating after five years is below:

Tyrewise is the accredited stewardship programme for End of Life Tyres (ELTs) in New Zealand. It is an industry led and government supported via the priority product provisions of the Waste Minimisation Act 2008. Stakeholders include key industry participants, government and public/consumer groups.

A Tyrewise Fee/Advance Disposal Fee is collected on all new and used tyres entering the country either as loose imports or fitted to vehicles. The fee is collected by Customs on loose tyres and by the NZ Transport Agency via the initial vehicle registration process for tyres fitted to vehicles and paid to the Product Stewardship Organisation (PSO) with overall responsibilities for delivering the ELT stewardship programme.

The preferred scenario assumes that the regulatory powers under the Waste Minimisation Act, relating to "setting of fee" for management of a product and "class of person or persons" who must pay the fee will be sufficient to allow/require Customs and NZTA to collect the fee in the proposed manner.

The Tyrewise Product Stewardship Organisation (PSO) has completed a five year review and has a strategic plan which seeks to manage the long term environmental, economic and social impacts of ELTs whilst minimising the cost to stakeholders.

Achievements to date include

- In the year to March 2018 the recovery rate was 95% of assessed volume to market. The aim is to achieve an effective 100% recovery rate to beneficial use by 2020.
- The majority of processing occurs within New Zealand. A series of approved beneficial uses is in place; the collection and processing sector is self regulating with participant companies adhering to industry practice and which is in turn linked to Tyrewise standards for participant registration.
- The option to landfill tyres is being phased out as consents expire or as mandated in various plans of councils. This transition will be complete by 2020.
- Tyre Derived Fuel (TDF) has become an integral option for ELT use in New Zealand and there is no TDF export as the New Zealand market demand now meets or exceeds supply.
- Other bulk uses include as crumb into asphalt which has been led by public sector procurement practice in the first instance but is now an accepted offering in the market place.

- Regional solutions are in place such as operating pyrolysis plants and facilities to manage off-the-road tyres close to source
- Incentives, funded by fees, are still a feature but reducing as end use values for ELTs rise. Most of the incentive is at the demand end of the ELT cycle; the only exception is an equalising payment to ensure ELTs distant from processing capability are not marginalised from inclusion.
- There is a robust system in place which manages information on the flow of tyres into beneficial use.
- Research and development activity has continued and is incentivised with funding allocated via the Product Stewardship Organisation.
- The Tyrewise annual conference has targeted three primary objectives – communication, education and promotion of self funding activity.
- The incidence of stockpiles or non-compliant activity has virtually ceased as there is no incentive to be outside the scheme.

2.4 Alternative Scenario ELT Stewardship Model

The alternative scenario is also documented in *Scoping Report 4 – What might a future programme look like*[1]*?*

The key feature of the proposed alternative model would require first importers of loose tyres and vehicles to declare import or sales volumes to the PSO and remit the corresponding fee directly to the PSO, rather than being collected by Customs or NZTA. This alternative was described in *Scoping Report 3 – Feasible Product Stewardship Options for End of Life Tyres in New Zealand*[22] as part of Option 1 and is also described on page 50 of Scoping Report 4[1]. This alternative scenario is not supported by the Tyrewise working group.

A disadvantage of the alternative model is that it will require around 800 first importers of tyres plus a smaller number of vehicle importers to report to the PSO on a quarterly basis, and pay the required fees to the PSO. This will add significant administration overheads to the PSO, and tyre and vehicle importers. This additional administration will add cost to the overall stewardship programme, but this will be offset by the reduction in system and IT costs incurred at NZTA and Customs.

A second disadvantage with the alternative scenario is that it will provide opportunities for "free riders". If the PSO is dependent on the first importers to declare tyre volumes and pay the required fee, there will be more likelihood of importers ignoring requests for payment or not declaring their tyres. It is likely that to minimize administration costs the scheme would set lower activity thresholds, for example if an individual or company imported less than 10 vehicles per annum they would not need to comply with the schemes requirements. Tyres fitted to those vehicles will not have paid the Tyrewise Fee/Advance Disposal Fee, yet will still need disposal at the end of their life.

The Working Groups view is that unscrupulous organizations will organize their business activity to "fly under the radar" and avoid paying the Tyrewise Fee/Advance Disposal Fee. This would see these companies with a financial benefit and competitive advantage when compared to their competitors who are registered with the scheme, reporting tyres and paying the required Tyrewise Fee/Advance Disposal Fees. The scheme will incur substantial additional time and costs in compliance, auditing and enforcement to maximize the fee capture and try to ensure a level playing field for all. A level playing field for all was identified by the Working Group as a key factor for the success of an ELT stewardship programme.

Free riders undermine the success of the programme. The end result of free riders will be that the fee paid by those responsible importers will need to be higher on a per EPU basis to generate the required funds to operate the scheme. These increased costs will in turn be passed on to the consumer. Or alternatively if the fee per EPU is kept at the same level, then reduced revenue will be generated by the scheme. This would not be sufficient to fund the supply chain incentives and would result in lower recovery outcomes and some ELTs continuing to go to undesirable outcomes such as landfill, or stockpiles. The end result of this would be a scheme that is not meeting its recovery targets, and in turn would not meet the criteria for a Ministry for the Environment accredited product stewardship scheme.

However, one advantage of the alternative scenario is that it will not require the systems and process changes at both NZ Customs and NZ Transport Agency. These costs have been estimated at $700,000 for initial project implementation, plus additional annual fees of $240,000 to collect the Tyrewise Fee/Advance Disposal Fee on behalf of the PSO and remit this along with regular reporting. Customs have provided a ballpark estimate for the costs to Customs, however NZTA have not yet provided feedback or preliminary cost estimates for this project. Therefore the cost estimates for NZTA systems changes and ongoing fee collection have been based on the recent Synthetic Greenhouse Gas levy estimates. These were available in the regulatory impact statement and this was considered a similar project, however, it is not known whether this estimate is within the ball park range or not. That the NZTA cost estimate is unverified adds a level of uncertainty to this cost benefit analysis and decision making based on its results.

A second advantage of the alternative scenario is that it may be simpler to implement from a legislation perspective. Both NZTA and Customs require specific power to collect a new fee. Initial research has indicated that there are no precedents for a government agency to collect a fee and pay the monies directly to an external organization such as the proposed PSO. If monies go to an external organisation either the organisation is named in the legislation or the money goes through a departmental account and is allocated on set criteria.

Further work is underway to seek legal advice on whether the Waste Management Act provisions under setting fees and the "class of person or persons" who must pay the fee will be sufficient to allow Customs and NZTA to collect the fee in the proposed manner. If this advice confirms that the Waste Minimisation Act provisions are <u>not</u> sufficient, then new legislation may be required to enable the Working Groups preferred scenario. This will require an Act of Parliament, which would have to compete with other government priorities, could take three or more years and cost significantly more.

It is assumed that incremental costs will occur under the alternative scenario in the following areas:

- Additional enforcement costs for Ministry for the Environment
- Additional administration cost for the PSO and programme manager
- Additional business compliance costs for tyre and vehicle importers
- Reduced service fees from Customs and NZTA
- Reduced IT system change costs and Customs and NZTA
- Potentially a higher Tyrewise Fee/Advance Disposal Fee which will be passed on to consumers **OR**
- Reduced advance disposal fee revenue generated which will mean reduced incentive payments for the supply chain
- In turn this will likely result in reduced recycling outcomes for the alternative scheme.

3.0 General Assumptions

This report presents a range of assumptions and estimates that underpin the cost benefit analysis of the three options relating to the end of life management for tyres in New Zealand.

- **Incremental basis -** based on the New Zealand Treasury Cost Benefit Analysis Primer all option costs and benefits are measured incrementally relative to the base case. This enables assessment of the potential impact on society relative to the status quo scenario. This analysis considers the impacts of the proposed nationwide product stewardship scheme for ELTs across all sectors of the economy.

- **Evaluation period** – the total period of the evaluation should be long enough to capture all the potential costs and benefits of a proposal. The NZ Treasury Cost Benefit Analysis Primer suggests the period should be for the economic life of the underlying proposal or assets, subject to a maximum of twenty years. In this assessment a ten year period has been assumed from 2015 to 2024 as is expected that a positive benefit should be realized within this time frame.

- **Base year of appraisal** – 2011. This is a practical assumption that relates to the data collected for end of life tyre volumes, recycling rates and some costs.

- **Real discount rate** – 3.91%. In accordance with the guidance on the NZ Treasury website a discount rate of 3.91% was used for this analysis, which is the spot rate for 2024 as at 31st May 2013. The discount rate is effectively a desired return, or the return that an investor would expect to receive on some other typical proposal of equal risk.

4.0 Projections

Underlying projections in tonnes for the quantities of end of life tyres generated, recycling rates, landfill and illegal dumping are required for the base case and options. This is because a number of the costs and benefits will be dependent on the quantity of ELTs that will be managed in an environmentally sound way versus the quantity going to unsound disposal option such as landfill or to an unknown end use either in New Zealand or internationally.

- **Tonnes of End of Life Tyres -** In "Tyrewise Scoping Report 4 – What a scheme might look like" it was estimated that 7.7 million equivalent passenger unit (EPUs) enter New Zealand each year either as loose tyre imports or fitted to vehicles. These 7.7 million EPUs correspond to an estimated **62,000 tonnes** of end of life tyres generated annually.

- **Available ELTs** - data from New Zealand Transport Authority[3] shows that the New Zealand vehicle fleet numbers had remained almost constant since 2008, with 3.2 million licensed vehicles. Statistics New Zealand data also shows that the number of loose tyres imported (new plus used) has grown slowly since 2008 from 3.8 million to 4 million in 2012. Ministry

of Transport Annual Fleet statistics shows the kilometers driven per light vehicle per annum are decreasing by 1% per annum. Based on this data and the Working Group view that the New Zealand vehicle population has reached a plateau, the volume of end of life tyres available to enter a scheme has been estimated as decreasing by 1% per annum. By year five of the preferred scheme it is estimated there will be 54,000 tonnes of ELTs entering the recovery chain.

- **Recycling rates -** The base case scenario assumes that the current arrangements continue with approximately 18,000 tonnes (29%) of ELTs either processed in New Zealand for material recovery or civil engineering uses or exported for fuel or material recovery[23]. These values were extracted from an addendum to Scoping Report 1[24], which provided an updated estimate of 62,000 tonnes of ELTs available annually and have been confirmed where possible with export data from Statistics Infoshare database. It is assumed that in the absence of regulatory drivers that recycling rates for ELTs will not improve substantially.

- The preferred product stewardship option assumes recycling rates will increase initially from the base case of 29% recovery (18,000 tonnes) through to a 95% (51,000 tonnes) recovery rate after five years of scheme operation. These assumptions are in line with experience in British Columbia and Ontario when regulated tyre product stewardship schemes were established. In Ontario, a recovery rate of 96% of its passenger and light truck tyres was achieved by 2011, two and a half years after the scheme was established in 2009.

- **Land filling -** The base case scenario assumes that the current arrangements continue with an estimated 38,000 tonnes of ELTs going to legal landfill or unsound disposal per annum. The preferred scheme option assumes that landfill quantities will be the difference between total ELTs available, less those recycled. So by year five of the preferred scenario, with a recovery rate of 95%, it is assumed that the remaining 3,000 tonnes of ELTs are going to landfill disposal.

- **Illegal dumping –** The base case assumes that 3,000 tonnes of tyres are illegally dumped per annum nationally. This assumption was based on data provided by a tyre collector in the Auckland region and scaled up to a national estimate based on population. These ELTs are included in the tonnes that are assumed to go to legal landfill disposal after they are dumped.

  Additionally it is assumed that one large scale tyre stockpile or illegal dumping event occurs every three years. This assumption is based on the Napier stockpile of 2,000 tonnes of tyres which was cleaned up in 2010, and the discovery in 2011 of over a million tyres buried illegally on a Huntly property.

  The preferred solution assumes that illegal dumping of tyres is eradicated, as the collection points are easy for public and business to access and free of charge.

- **Tyre Fires –** the base case assumes four small tyre fires per year caused primarily by arson activity, plus one large scale tyre fire every 3 years. This is based on evidence of nine tyre related fires in the two year period from Apr-2011 to Mar-2013. The preferred scenario assumes the incidence of tyre fires will decrease but probably not significantly as arsonists

will still find targets for fires. A request has been made to the NZ Fire Service for costs and data on fires relating to tyres and we are still waiting for a response.

5.0 Cost Assumptions

There are assumed to be incremental costs to government, households and businesses under both the preferred scenario option and the alternative option.

5.1 Advance Disposal Fees/Tyrewise Fee

Under the base case scenario most tyre retailers include the cost to dispose of the end of life tyre in the transactional price of a new or replacement tyre. In some instances this is transparently displayed to the consumer as a disposal fee, but in many cases it is not. In either situation it is the consumer who is paying for the disposal of the ELT, even though they may be unaware that cost is included in the purchase price of their new tyres. The cost commonly ranges between $2.50 and $7.00 for a passenger tyre. Under the base case scenario the disposal fee is only collected at the end of the tyres useful life. It is estimated that the cost of disposal fees to consumers under the base case scenario is **$23 million per annum.**

Over the ten year period of this analysis it is estimated that the total costs borne by the households and businesses relating to disposal fees under the base case scenario are $237 million.

In the proposed product stewardship scheme the Tyrewise Fee/Advance Disposal Fee will be collected by Customs when a loose tyre enters the country and by the New Zealand Transport Authority when a vehicle is first registered in New Zealand. This captures a fee on **all** tyres entering New Zealand. This means the fee will be captured on a greater number of tyres than in the base case scenario, as it includes the 20% of tyres that enter the country fitted to vehicles as well as non-passenger tyres. The consumer will also bear the cost of the Tyrewise Fee/Advance Disposal Fee, as it will be passed on from the importer in the price of tyres and included in the vehicle registration costs for tyres fitted to vehicles.

It is estimated that the cost of the Tyrewise Fee/Advance Disposal Fee to the householder under the **preferred scenario is $43 million** in year one of a scheme. This is based on a $5.50 per EPU fee in years one to four of the preferred scheme, decreasing to $3.50 for years five and six, then reducing to $2.00. The fee includes provision for full subsidy of transport costs via the transport incentive which has been proposed for years 1-3. The Tyrewise Fee/Advance Disposal Fee is modeled to reduce over the ten year period as the markets for tyre derived products develop and the need for supply chain incentives decrease.

Over the ten year period of this analysis it is estimated that the total costs borne by the households and businesses under the preferred scenario for Tyrewise disposal fees is $278 million. Over the ten year period the Tyrewise Fee/Advance Disposal Fee costs ($278m) are

more than the current disposal costs ($237m), but $207 million from the Tyrewise Fee/Advance Disposal Fee directly translates into economic benefits for society including investment in a new ELT recycling industry, increased employment and export opportunities. In addition it will bring international environmental reputation and branding benefits that are not available under the base case scenario. The Tyrewise Fee/Advance Disposal Fee will apply across all vehicle users and type of pneumatic tyres so will be fairly applied to all consumers of tyres and will be transparent, unlike the current disposal costs.

It is assumed that all costs to administer and operate the Tyrewise scheme under the preferred scenario would be covered by the Tyrewise Fee/Advance Disposal Fee of $43 million per annum, which is based on a $5.50 fee per EPU. There would be no additional costs to the householder.

Scheme administration costs of an industry run product stewardship organization (PSO) to administer the Tyrewise programme initiatives are estimated at $168,000 per annum. The 2011 Australian Packaging Cost Benefit Analysis[6] estimated scheme administration costs of $750,000 per annum for an industry run PSO.

Under the alternative scenario where the Tyrewise Fee/Advance Disposal Fee is collected by the PSO based on first importer declarations of sales or import volumes there will be additional administration costs for compliance, auditing and enforcement plus a reduction in available fee income due to free rider activity. These costs would be offset by reduction in system change costs at Customs and NZTA.

Under the alternative scenario, it is expected that only 75% of importers will actually pay the required fee, and this will impact on the revenue the scheme will collect, down from $43 million to $32 million. The reduced revenue will have a number of possible implications:

- A higher fee per EPU will need to be set to cover the scheme costs and achieve the same recycling targets
- Or reduced financial incentives through the supply chain would be available, which would result in lower recovery rates and
- ELTs still going to landfill or illegal disposal.

5.2 Government Costs

New Regulation Design and Implementation

Under the base case scenario it is assumed there are no costs to Government.

Under the preferred scenario the Government will incur costs to design the new priority product regulations proposed under the Waste Minimisation Act, which is likely to include provision for a Tyrewise Fee/Advance Disposal Fee, controls on disposal and sale of tyres, quality standards for reuse, recycling and recovery, and the collection and provision of information. There will also be costs involved in obtaining advice from the Waste Advisory Board and for further public consultation. Potentially there may be a need for new legislation to require NZTA and Customs to collect the Tyrewise Fee/Advance Disposal Fee on behalf of the PSO.

Based on recent Ministry for the Environment in-house and consultation costs for new regulations, a range between $350,000 and $2.5 million could be expected, with contentiousness and complexity adding to costs. It is assumed that proposed new Tyrewise regulations would sit in the mid to upper cost range given the potential involvement of two other government agencies NZTA and NZ Customs, and as tyres are likely to be one of the first priority products to be declared under the Waste Minimisation Act. For the purpose of this analysis a cost of $1.5 million was assumed.

As a comparison, the 2011 Australian Packaging Cost Benefit Analysis[6] which looked at various regulatory support options to increase packaging recycling rates estimated regulatory costs for a mandatory advance disposal fee scheme at $1 million over two years. This included a separate levy bill and amendments to its Product Stewardship Act and direct costs in project team travel costs, consultation road show, consultancy fees for regulatory impact statement development and teleconferences.

Ongoing Costs to Administer Regulations

There will also be costs over the ten year analysis period to amend the Tyrewise Fee/Advance Disposal Fee set in regulations. As the markets for tyre derived products develop and the need for supply chain incentives reduce, so to will the Tyrewise Fee/Advance Disposal Fee. For the purpose of this analysis it is assumed the fee will be reviewed annually and if required changed by way of a gazette notice issued by the Minister. Annual costs for these changes are minimal and estimated at $3,150.

Additionally the Government will incur costs to review the product stewardship scheme accreditation application, which could be the first for a priority product. In Australia these costs are estimated at $15k per accreditation[12] for a full product life cycle stewardship programme. There will also be costs to audit the accredited scheme on an annual basis, which would not be incurred under the base case scenario. For the purpose of this analysis we have estimated this as $5k per annum.

Enforcement Costs

Enforcement activity in relation to the proposed new priority product regulations under the Waste Minimisation Act regulations have been estimated at $250,000 per annum for the first three years of a scheme, and at $150,000 annually thereafter. This estimate is based on current enforcement activity costs in relation to the Waste Minimisation Act and the TV Takeback scheme, and was provided by the Ministry for the Environment.

Under the alternative scenario it is expected that additional costs will be incurred to enforce importers to pay the mandatory fees required under the Waste Minimisation Act provisions. For this analysis it has been assumed that enforcement costs would be at least double, at $500,000 per annum for the first three years and $300,000 thereafter.

5.3 Illegal Dumping – Orphan Tyres

Illegal dumping is a regular occurrence under the base case scenario. With no supporting regulation requiring tyre generators to use the small number of responsible ELT recyclers, disposal of the ELTs is simply a cost to most businesses. There are instances of unscrupulous operators picking up ELTs from tyre retailers for a minimal fee, under cutting the responsible recyclers and then storing or dumping loads of tyres in gullies, under houses, or burying them on properties.

Two recent large scale examples illustrate the significant costs involved in clean up activity following illegal dumping or stockpiling.

A Napier man collected 250,000 ELTs and stored them on a leased site owned by Land Information New Zealand. His intention was to export the tyres but when that business venture failed and he left the country, LINZ and Napier City Council were left with a large tyre stockpile on low lying land in close proximity to major wetland areas and residential populations which posed a significant environmental risk. The removal and disposal of the tyres during 2010 took several months and cost approximately $2 million dollars of local ratepayer and central government money.

In 2012, Environment Waikato and the Franklin District Council discovered more than one million tyres buried illegally on a Huntly property. The tyres had been collected from tyre retailers in the Waikato area over a period of several years and buried at five different sites on the large rural property. The owner did not have resource consent to bury the tyres and had received several abatement notices over several years. A prosecution was brought against owner Ross (Des) Britten Limited, who was convicted and fined $77,600. However he has also left the country. So far the tyres have not been removed as it is estimated there would be further detrimental environmental impact in unearthing and removing the tyres. Additionally an environmentally responsible disposal solution for what would be very contaminated tyres would be hard to find. Costs borne by Environment Waikato in bringing the prosecution before the courts were estimated at $200,000.

Data on costs incurred for illegal tyre dumping collection and disposal for the financial years from 2008/09 though to 20012/13 was provided by a legitimate tyre collector for the Auckland City Council region. This tyre collector has the contract with the Auckland City Council to collect and dispose of illegally dumped tyres, and also provides a similar service to business or individuals who experience illegal tyre dumping problems. This data was used to estimate the total cost of illegal dumping at a nationwide level at $600,000 per annum. This estimate is believed to be conservative.

In the 2006 report Market Failure in End of Life Tyre Disposal[25] prepared for the Australian Department of the Environment and Heritage, it was estimated that illegal disposal costs were between $35 and $70 million over a 10 year period. Applying a conversion based on the relative population sizes of 20.404 million in Australia and 4.134 million in New Zealand[17], this estimates the costs incurred due to illegal dumping to be in the order of $6-7 million per annum.

In the base case scenario it is assumed that there will be no change in illegal dumping activity, and that it will continue to be a major cost that is borne by households through their rates payments to local councils, who arrange the cleanup activities. Annual costs of $600,000 per annum have been assumed, increasing by 10% annually due to increased waste disposal costs, plus $2.2 million for a large scale illegal dumping event every three years. Over the 10 year analysis period this equates to $15.8 million in costs associated with illegal dumping.

5.4 Tyre Fires

Tyre fires produce hazardous air emissions and toxic effluent run off which have both adverse health and environmental implications. With regards to health impacts tyre fires produce smoke and run off containing a range of toxic and carcinogenic compounds including dioxins, furans, mercury and lead. Typically nearby communities need to be evacuated in the event of a tyre fire.

Environmental impacts from tyre fire air emissions have the potential to contaminate water supplies and crops and the effluent run-off can contaminate nearby water sources and ground water. The land itself can also be contaminated by the effluent run off, limiting its further use.

Internet research showed there were nine fires related to storage of tyres in the two year period from February 2011 to March 2013. Most of these fires were at tyre retailers and were caused by arson. Costs to business were estimated at $250,000 per event based on data provided by Tony's Tyre Service in Porirua and Wanganui Tyres and Alloys. Both of these business suffered fires caused by arson and resulted in economic losses including clean-up costs, disposal of burnt materials, loss of equipment, loss of stock, loss of earnings, temporary relocation to new premises, insurance, and rebuild costs.

Under the base case scenario it is assumed that there will be no change in arson activity and the number of fires relating to tyres in storage will continue to occur at around four per annum, with business costs of $250,000 per event.

A further cost directly relevant to tyre fires is the cost of the NZ Fire Service to attend and extinguishing these fires. A request has been lodged with the NZ Fire Service to obtain data on their costs but at the time of compiling this report a response has not been received. A pc sum has been estimated at $45,000 per incident, based on historic cost data available in earlier reports[34]. This cost is funded by the householder who pays a Fire Service Levy on insurance premiums.

A survey of councils through the Working Groups local government representative did not provide any details of costs relating to environmental clean up as a consequence of tyre fires in recent years.

However historic data (circa 2004) was available for large scale fire of approximately 30,000 tyres in Hamilton. Costs included:

- Environment Waikato $31,000 to collect the 30,000 litres of oil discharged and prosecute the site operator for water and air discharges.
- Waikato District Council costs of $14,000 to deal with the effects on the local population including temporary accommodation for ten families.
- Department of Conservation acting as the rural fire authority $45,000 to extinguish the fire.

Therefore the costs of environmental impacts have been assumed conservatively at these rates in this analysis.

5.5 Landfill Operating Costs

According to the 2011 Australian Packaging Cost Benefit analysis[6] there are avoidable direct costs associated with operating landfills including the opportunity cost of land and other ongoing operating costs which vary with landfill volumes. The private costs of landfill include:

- Land purchase
- Resource consent approval process
- Equipment and buildings
- Construction costs such as excavation and lining of landfill bases to minimize leaching
- On site gas recovery
- Fencing
- Operational costs like fuels and materials
- Monitoring and reporting
- Capping landfills and landscaping
- Rehabilitation and after care
- Employee and
- Contractor costs

The report estimates the following dollar value operating costs of landfills per tonne.

Size of landfill	Best practice controls	Poor controls
Small	$100	$74
Medium	$80	$44
Large	$40	$30

Under the base case scenario it is assumed that there is no change to the current practice of disposal of ELTs in landfill at a rate of approximately 38,000 tonnes per annum. As there will be no change to the practice, there will be no change to landfill operating costs due to disposal of ELTs.

It is documented in previous reports[34] that disposal of ELTs in landfill can cause problems with leachate and stability issues caused by whole tyres floating to the surface. A survey of councils through the Working Groups local government representative did not provide any details of costs relating to landfill leachate or stability issues as a consequence of tyre disposal. Therefore no costs were quantified for inclusion in this analysis.

5.6 Business Costs

It is assumed there are no incremental costs to business under the base case scenario.

Under the preferred scenario with priority product regulations under the Waste Minimisation Act, it is assumed there will be reporting requirements on those involved in the import, sale, collection, transport and processing of tyres.

The registered scheme participants will incur compliance costs in preparing monthly or quarterly reports of ELT movements. This reporting will be necessary to understand the flow of tyres from generators and collection sites through to processors and eventual end use, so that recovery rates can be calculated, scheme performance assessed and supply chain incentives calculated. These compliance costs borne by businesses under the preferred scenario will be offset by the incentives that a registered scheme participant will receive.

Under the preferred scenario it has been assumed:

- 1400 importers (800 tyre and 600 vehicle) will have annual compliance costs of $480 per year
- 3,000 generators will have annual compliance costs of $400 per business
- 200 collection sites will have annual compliance costs of $4,800 per site
- 10 transporters will have annual compliance costs of $1,900 per year
- 25 processors and manufacturers will have annual compliance costs of $1,900 per business

In total business compliance costs incurred under the preferred scenario model are estimated at $2.7 million annually. Over the 10 years analysis period this equates to $27 million.

Under the alternative scenario, where first importers of vehicles and tyres will be required to report volumes to the PSO and pay the corresponding Tyrewise Fee/Advance Disposal Fee there will be additional compliance and administration costs. For the alternative scenario the following assumptions were made:

- 1400 importers (tyres and vehicles) will have annual compliance costs of $1,920 per year

In total business compliance costs incurred under the alternative model are estimated at $4.9 million annually, which equates to $49 million over the 10 years analysis period.

In both the preferred scheme and alternative scheme options it is assumed that there will be capital costs borne by businesses who invest in new processing technology. These costs are incremental to the current base case scenario, where it is assumed they would not be incurred without the establishment of a scheme.

For the purpose of this analysis it was assumed that new processing facility would be established in the South Island, at a cost of $5 million spread over the first two years. It was also assumed that a Hot Disc or similar facility would be implemented at one suitable cement kiln to allow whole tyres as tyre derived fuel to replace imported coal. The cost of the Hot Disc technology

was estimated at $15 million based on industry supplied information and spread across the first three years of the scheme. These capital cash flows were included based on the guidance in the Treasury CBA Primer[2] and as the benefits of tyre derived fuel are claimed in this analysis.

5.7 Public Health Risk

New Zealand has 12 native species of mosquito and four introduced species; these are at present harmless but have the potential to transmit disease if certain other disease-carrying species of mosquito slip into the country and become established[7]. There have been many interceptions of exotic mosquitoes at ports and discoveries of populations of a cool climate tolerant species capable of transmitting Ross River virus have been found in Hawke's Bay (1998, 2000), Gisborne (2000), Kaipara (2001), Auckland (2001, 2002, 2004) and Marlborough (2004) regions[11]. This highlights the very real risk that mosquitoes of public health significance may be introduced and establish here in New Zealand.

The most likely potential diseases to be transmitted are arborviral diseases such as Ross River virus and Dengue Fever. Dengue fever is the world's fastest spreading tropical disease, with a recent report[10] estimating 390 million people infected each year, more than triple the World Health Organisation previous estimate. The report based on several years of analysis highlights the growing worldwide burden of mosquito borne viral disease. As yet there is no approved vaccine or treatment for Dengue fever which is not normally fatal but lands many victims in hospital.

The risk of mosquitoes of public health significance becoming established in New Zealand is likely to increase greatly with the effects of climate change and warmer temperatures extending the possible habitats. Stockpiles of ELTs are a perfect breeding environment for mosquitoes, and the link between mosquitoes and tyre stockpiles is widely reported. So far establishment of successful populations has been controlled by New Zealand's strict biosecurity measures and the good fortune of a cool climate. When climate conditions are favourable, eradication and control would become exceptionally difficult given the extent of suitable habitiat[11].

A report on the economic cost of dengue fever epidemics in Australia[9] estimated annual costs of $2.7m, which included lost work days plus epidemic control costs. This cost did not include intangible costs to individuals or society which can greatly detract from quality of life and well being.

Under the base case scenario it was assumed that New Zealand's biosecurity and import controls will remain successful at keeping New Zealand free from mosquito borne disease. While the base case scenario will continue to have unregulated ELT stockpiles, which could be potential breeding grounds for mosquitoes, it was not reasonable to assume the tyre stock piles would directly link to increases in mosquito borne disease and associated public health costs. Therefore no incremental costs to society were assumed either under the base case or the preferred scenario.

5.8 New Zealand's 100% Pure Brand

New Zealand's "100% Pure" branding and clean green image has two critical areas of influence, international tourism and our primary product exports. The Pure Advantage report[5] published in 2012 estimated a 5% drop in reputation and consequent drop in demand for primary products and international tourism would cost the economy more than 22,000 jobs, and annual direct loss of NZ$455 million in primary product sales and $155 million loss in international tourism sales.

Similarly a 2001 report[4] from the Ministry for the Environment estimated the financial impact of a perceived sharp deterioration in New Zealand's environment on the dairy, international tourism and organic food sectors, would reduce expenditure by $780m (in 2001 dollars). By way of comparison total expenditure by international tourist in 2011 was $9.7 billion[21].

Under the base case scenario it is assumed the "do nothing" approach to end of life tyres is incurring a 0.1% drop in New Zealand's brand and international reputation. This corresponds to a cost of $12.2 million per annum. This could be considered a conservative estimate of the costs which are borne by New Zealand's economy under the base case scenario. Publicity from a large scale environmental issue caused by tyres, such as a large scale tyre fire or illegal dumping or export of waste tyres to developing countries for use as fuel source in uncontrolled burning could significantly affect New Zealand's brand and result in direct losses.

A recent environmental disaster that could be considered comparable is the grounding of the Rena container ship on the Astrolabe reef off Tauranga, which resulted in 350 tonnes of oil spilt into the marine environment. The cost for clean up and prosecution of this case has to date cost the New Zealand taxpayers $46 million, and the shipping company $235m for salvage and clean up costs[33]. Numerous businesses and local iwi were also affected by the pollution and environmental damage with claims totaling several million.[33] What is more significant to a discussion on New Zealand's brand and how it could be affected by a tyre stewardship scheme is the international media reporting of the incidence. The Rena grounding and environmental damage was reported internationally by CBC News (Canada), British Guardian newspaper, BBC, World Wildlife Fund, plus various You Tube clips, within days of the event.

Under the preferred scenario, it is assumed that New Zealand's brand integrity will be maintained. Potentially New Zealand's 100% Pure brand could be enhanced by the establishment of a nationwide industry stewardship programme for ELTs, but this has not been quantified.

6.0 Benefit Assumptions

There are assumed to be benefits and avoided costs to government, households, businesses and the recycling and tyre derived product industries.

6.1 Market Value of Resources

The disposal of tyres into landfill under the base case scenario means that the resource is not available for tyre collectors and processors to capture the economic market value of tyre derived products.

Under the base case most tyre derived products have a cost negative value, that is, the cost to transform them from ELTs to a tyre derived product is more than the market value of the product. This is influenced by the lack of demand for TDPs in New Zealand. For example there is a world market for tyre derived fuel as a replacement for fossil fuels, but often the cost of shipping from New Zealand makes this outcome uneconomic.

The table below estimates the current and future market value of various tyre derived products

Product	Current NZ Market Values	Future Market Value[26]
A: Whole Tyres	Generally have to pay someone to take them. There is a small export market for used tyres to Pacific Islands and Africa, receiving about $5/tyre	$55
B: Rubber Powder	$750 tonne	$750
C: Rubber Crumb	$450 tonne	$450
D: Rubber Chip	Cost negative	$130[26]
E: Cut tyres or portions	Cost negative	$55[26]
F: Whole Tyres (TDF or Pyrolysis)	No market	$55[26]
G: Shred Tyres (TDF or Pyrolysis)	No market	$55[26]

Under the base case scenario the total market value of tyre derived products is estimated at $4.0 million annually. This is based on current market prices provided by industry and the estimated recycling volumes described in *Scoping Report 1 – Investigation into the collection and disposal of used tyres in New Zealand and internationally*[23].

In the preferred scenario with a recovery rate of 95% at year five of the scheme, an estimated 51,000 tonnes of ELTs will be diverted from landfill to an environmentally sound end use. Assuming a split between tyre derived products such as 40% going to tyre derived fuel, 30% going to tyre derived aggregate and 30% going to more highly processed end uses such as rubber powder for roading, artificial turf or niche consumer products, a more attractive financial benefit of $7-10 million per annum could be realized.

The future market values are assumed to be the same as the current market values provided by industry sources, or where not available from the Financial and Economic Analysis of the Proposed National Used Tyre Product Stewardship Scheme[26] It is estimated in the preferred

scenario that $83 million of financial benefit would be gained from the market value of these products over the ten year analysis period.

Under the alternative scheme, one outcome will see lower recovery rates of ELTs, due to the reduction in available funding for supply chain incentives. Lower recovery rates will overall less financial benefit for market value of materials. It is assumed that under the alternative scheme with only 50% recovery, the market value for resources would be between $4 and $6 million per annum. Over the ten year analysis period this equates to $55 million.

6.2 New Industry and Employment

As a minimum the incentives paid by the Tyrewise scheme to the registered scheme participants would all be direct economic benefits to businesses and society as a whole.

Under the preferred scheme a significant proportion of the Tyrewise Fee/Advance Disposal Fee paid by consumers to the Tyrewise Product Stewardship Organisation (PSO) will directly fund new business in New Zealand, in turn creating employment opportunities. The proposed scheme has provision for the following economic benefits:

- Incentives paid throughout the ELT supply chain including ELT collection sites, transporters, ELT processors and recyclers and new product manufacturers.
- Research and development grants to allow for specific funding to develop new and innovative end uses for tyre derived products
- Community development grants to provide funding for New Zealand based non-profit organizations to use NZ made tyre derived products in public spaces or buildings.
- Funding for orphan and legacy tyre collections to remove them from the environment and ensure they are recycled in environmentally sounds manner.

In addition to the above funds there will be additional benefits to service providers involved in communication and marketing, promotion and education, programme management and scheme administration. All of these financial benefits from the Tyrewise scheme will go directly to New Zealand based businesses with flow on effects on employment.

Under the preferred scheme scenario it is estimated that these financial benefits will total between $11 million and $40 million per annum, and accumulate to $207 million over the 10 year analysis period.

Under the alternative scheme, one outcome would be the reduction in available funding for supply chain incentives, and therefore lower recovery rates. Less funding of supply chain incentives will result in less investment in new industry and employment. It is assumed the financial benefit of new industry and employment under the alternative scheme would be between $10 million and $27 million per annum. Over the ten year analysis period this equates to $162 million.

6.3 Benefits of Rubber in Roading

Under the base case scenario it is expected that the current situation will prevail, and the use of rubber in roading will not be common practice.

Under the preferred scheme scenario it is assumed that the use of rubber in roading surfaces will be an important end use for ELTs in New Zealand. Rubber can be used in both rubber modified asphalt for motorway surfaces as well as chip seal roads. Chip seal roads make up around 90% of New Zealand's road surfaces.

Rubber crumb can replace imported SBS polymers used in modified asphalt, which is approximately 10% of the roading surface laid in New Zealand. To achieve the same performance criteria five times the quantity of rubber must be used as a substitute for the SBS polymer. For this analysis it was assumed that a maximum of 2000 tonnes of rubber powder could be diverted to this end use annually. It was assumed that rubber powder was available at a cost of $750/tonne, which is in line with the industry supplied market values discussed in the previous section. Assuming five times the amount of rubber crumb is needed to achieve the same performance benefits as the SBS polymers this would represent a cost saving of $10 per tonne modified asphalt, compared to the imported SBS polymers which cost $4000 per tonne at today's prices. Over the ten years of this analysis the cost benefit from using rubber crumb in modified asphalt is estimated as $1 million.

While the use of rubber in roading as a substitute for SBS polymers in modified asphalt may only give a slight cost benefit, from an environmental point of view it is a preferred outcome. Also as the cost of imported SBS polymers increase and the cost of processing crumb rubber in New Zealand decreases due to the Tyrewise scheme incentives, the economic benefit will only increase.

A second use of rubber in roading is as an aggregate or drainage material replacement. Overseas literature shows that this has benefits including engineering performance such as compressibility, lightweight, better insulation and drainage as well as being cost effective. The financial benefits of using tyre derived aggregate have not yet been fully quantified for New Zealand. For the purpose of this analysis it is assumed tyre derived aggregate could be supplied for $10 per tonne cheaper than the replaced aggregate. This would equate to $2.25 million economic benefit over the 10 year analysis period.

To date the use of tyre derived products in this way has been limited by the technology in the hot mix plants as well as the costs to produce the crumb rubber. As new plants are built there will be more flexibility to allow for recycled materials to be added to the mix. It is estimated that costs to upgrade existing plants to allow for tyre derived aggregate to be substituted in a dry mix process would be around $60,000 per plant

The use of rubber in roading also takes advantage of the elasticity and the noise absorbing characteristics of rubber. The following benefits of rubber roading have been reported internationally:

- 50% increase in life span of the road surface and therefore reduced maintenance costs

- 50% increase in the safety of the road in wet conditions, resulting in less accidents
- 30% reduction in noise pollution
- Reduction in road marking costs as rubber asphalt holds colour longer
- Reduction in roading construction costs.

These claims have yet to be tested for New Zealand contexts. It is expected that in the initial years there are likely to be additional labour and equipment costs, until the technology is established and the benefits of longer wearing roads can accrue. It is likely there will be financial benefits associated with increased life span of road surfaces, but at this stage and for the purpose of this analysis they have not been quantified.

A new project has been proposed as a spin off from the Tyrewise project which will specifically identify and address the remaining barriers for rubberised roads in appropriate applications in New Zealand and seek to future proof this end use for recycled tyre rubber. It is expected this project will take up to three years to specifically evaluate the whole of life costs of rubber in roads and test the claimed improvements against reality.

To give an idea of scale of investment in roading projects, the National Land Transport Programme (NLTP) represents $12 billion investment over the three years from 2012-15[18]. From that, $4.3 billion is set aside for new and improved local and state highway infrastructure while a further $4.8 billion is designated for local and state highway renewals and maintenance. This shows the significant size of the roading industry and why it is considered an important end use pathway for ELTs.

6.4 Benefits of Tyre Derived Fuel

Internationally tyre derived fuel is a well established replacement for coal as a fuel source in controlled environments such as cement kilns and industrial boilers. Tyre derived fuel is used in many countries including Canada, USA, and Europe and is an accepted end use for large quantities of ELTs generated in those countries. In British Columbia approximately 13% of ELTs generated annually go to tyre derived fuel while in Europe and USA the proportion is higher at around 45%.

There are several economic and environmental benefits associated with the use of tyre derived fuel. Tyres have higher calorific value than coal on a per kilogram basis, so fewer tyres are consumed to generate the equivalent energy. Energy intensive industries such as cement kilns use ELTs to reduce their fuel expenses. A tonne of bitumous coal imported from Australia suitable for the Golden Bay cement kiln is estimated to cost $208 in 2015[16]. If ELTs were delivered to a cement kiln free of charge that would generate financial benefit of $208 per tonne of ELT.

A second advantage is that burning ELTs as a replacement for fossil fuels reduces the amount of greenhouse gas emissions. This is due to the significant proportion of biomass in tyres (20%-30%), which is exempt from greenhouse gas reporting under the Kyoto protocol. A life cycle

assessment[14] of tyre derived fuel used in cement kilns as a replacement for coal, shows a reduction in of 613 kg CO_2e per tonne of tyre derived fuel used. There is an obvious environmental benefit to society by reducing green house gas emissions as well as an economic benefit for companies that are part of New Zealand's Emission Trading scheme, and who are required to report their greenhouse gas emissions and surrender emissions units (NZU).

Thirdly, the life cycle assessment comparison[14] of ELTs in cement kilns versus a base case of bitumous coal also showed large reductions of common air pollutants (nitrogen oxide, sulfur oxides, carbon monoxide, and lead) as well as volatile organic compounds, dioxins and heavy metals. These reductions have positive environmental effects.

Under the base case scenario it is assumed that the status quo will prevail, with tyre derived fuel unutilized in New Zealand. Industry has advised that without security of supply and support from government by way of necessary resource consents it is unlikely to make the necessary investment in kiln upgrades required for tyre derived fuel.

Under the preferred scenario, tyre derived fuel is expected to be an important end use pathway for ELTs in New Zealand. The product stewardship scheme will increase the supply of ELTs available and eliminate the security of supply issue. Financial incentives from the scheme and government support of tyre derived fuel use from an environmental viewpoint will also encourage industry to use tyre derived fuel. It is assumed that 20,000 tonnes of whole passenger tyres could be diverted to a suitable cement kiln as a replacement for bitumous coal. This equates to annual economic benefit of $4.2 million.

Additionally if 20,000 tonnes of TDF replaced coal as a fuel source in suitable cement kiln this would reduce New Zealand's greenhouse gas emissions by 12 tonnes per annum. Based on current NZ Emission Units (NZU) costs of $2 per unit this would be a financial savings of $25,000 per annum.

6.5 Avoided costs of illegal dumping

In the preferred scenario, it is assumed that illegal dumping will cease, as there will be easily accessible free public collection points for the general public to access. Also tyre retailers and other generators of ELTs will have free collection of their tyres so the opportunity for unscrupulous operations to undercut reputable tyre collectors will disappear. Based on this assumption there will be avoided costs of illegal dumping of $16 million over the 10 year period of this analysis.

Under the alternative scenario with an outcome of reduced supply chain incentives, illegal dumping may still occur. If supply chain incentives are not sufficient to cover the cost of transporting ELTs from Generators to Processors, then a situation may arise where the Transporter will require additional payments from the Generator. This would encourage the current scenario to continue where some unscrupulous operators look for lowest cost disposal options, rather than the most environmentally sound end use.

It was assumed that 10% of ELTs not being recovered would end up being illegally dumped. Therefore the financial benefit of avoided illegal dumping costs would be less than under the preferred scenario. The total avoided costs of illegal dumping under the alternative scenario over the 10 year period of the analysis are estimated at $14 million.

6.6 Avoided costs resulting from tyre fires

Under the preferred option scenario it is assumed that tyres in storage will still be a target for arsonists. However, as the scheme will provide regular scheduled collection of ELTs from generators sites, who will need to comply with scheme guidelines for safe storage of ELTs awaiting collection, the incidence and risk of large scale tyre fires will decrease. A 25% reduction in fires related to tyres has been assumed under both the preferred and alternative scenarios. This equates to three tyre per year instead of four, with an avoided cost of $250,000.

6.7 Avoided operating costs of landfills

In the base case scenario it is estimated that 38,000 tonnes of ELTs are destined for landfill each year. Under the preferred scenario it is assumed that with ELTs being diverted to environmentally sound end use, there will be a reduction in the volume of ELTs going to landfill, and this amount will reduce in line with the recovery rate of ELTs. In year five of a scheme when there is a 95% recovery rate, only 3,000 tonnes are estimated to go to landfill disposal.

There will be avoided landfill operating costs associated with this reduced volume to landfill. For this analysis it was assumed that New Zealand landfills were split evenly between small and large size and 50% have best practice controls and 50% have poor controls. The total avoided costs of landfill operation over the 10 year period of this analysis are estimated at $24 million.

Under the alternative scenario with an outcome of reduced recovery rates, disposal of ELTs to landfill will still occur. It was assumed that approximately 50% of ELTs not being recycled or recovered would still be diverted to landfill, and the other 50% would be stockpiled or exported. Therefore the financial benefit of avoided landfill operating costs would be less than under the preferred scenario. The total avoided costs of landfill operation over the 10 year period of the analysis are estimated at $5 million.

6.8 Avoided public health risk

In the preferred scenario, it is assumed that the storage of ELTs will be controlled by guidelines and auditing of registered scheme participants. Improved storage, less incidence of stockpiles and illegal dumping of tyres and will provide fewer habitats for mosquito populations to become established. The risk of mosquito borne disease and associated public health costs will reduce, but for the purpose of this analysis this benefit has not been quantified.

7.0 Net Benefits

The base case scenario shows negative net benefits, or a cost to society as whole at a rate of -$10 to -$12 million per annum. Converted to a net present value (NPV) using the discount rate of 3.91% over the 10 year analysis period this equates to a negative **NPV of -$89 million.**

Under the preferred scenario with an industry led and government supported product stewardship scheme for ELTs, and the Tyrewise Fee/Advance Disposal Fee collected on loose tyres by Customs and by NZTA for tyres fitted to vehicles, the annual net benefit ranges from -$3 million in year 1 of the scheme, through to $13 million in year 10.

Converted to a net present value using the discount rate of 3.91% over the 10 year analysis period this equates to a positive **NPV of $36 million.**

Under the alternative scenario with an industry led and government supported product stewardship scheme for ELTs, and the Tyrewise Fee/Advance Disposal Fee collected by the Product Stewardship Organisation based on first importer declarations, the annual net benefit ranges from -$9 million in year 1 of the scheme, through to $5 million in year 10.

Converted to a net present value using the discount rate of 3.91% over the 10 year analysis period this equates to a negative **NPV of -$18 million.**

8.0 Conclusions

Based on the estimates and assumptions made, the 10 year cost benefit analysis shows that the preferred scenario with an industry led and government supported product stewardship scheme for ELTs, and the Tyrewise Fee/Advance Disposal Fee collected on loose tyres by Customs and by NZTA for tyres fitted to vehicles has the highest net preset value with a **NPV of $36 million.**

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33. http://www.maritimenz.govt.nz/Environmental/Responding-to-spills-and-pollution/Past-spill-responses/Rena-response.asp

34. Management of End of Life Tyres - Firecone Report (2004) prepared for MfE

35. http://en.wikipedia.org/wiki/Rena_oil_spill

10.0 Glossary

Advance Disposal Fee (ADF) means a fee that is charged to the originators of tyres imported to New Zealand market, either as loose tyres or as tyres fitted to vehicles.

Buffings means rubber removed from tyre casings to prepare them for retreading or during finishing of the tyres after the retreads are applied.

Collection Site A Collection Site is a location where ELTs are consolidated from either members of the public or from Generators. In areas where there is only one Collection Site the collection site **must** be able to accept tyres from the public. In the case of closed landfills only Commercial Operators/Contractors with a Waste Disposal License will be allowed access.

End of Life Tyre means a tyre that is no longer capable of performing the function for which it was originally made.

Environmentally sound use

a) Means the use of end of life tyres for:
   i) Recycling into tyre crumb, shred, chips, granules, steel or other tyre components
   ii) Use as a fuel (other than in direct incineration) or other means to generate energy;
   iii) Production of tyre derived products including tyre derived fuel
   iv) Civil engineering (including the civil engineering use of tyre derived products to improve the functioning of landfill sites)
b) But excludes
   v) Disposal through dumping, landfill, incineration or burning;
   vi) Stockpiling as an end point;
   vii) Export of whole baled tyres for operations listed under b (v) and (vi)

Evidence for the environmentally sound use of end of life tyres as defined in paragraphs a (ii)-(iv) may include a copy of a written contract between relevant parties, or other evidence. Where the export of whole baled tyres is for the purpose of energy recovery under a(i), evidence will be required that this would meet NZ equivalent environmental regulations.

Equivalent Passenger Unit (EPU) means a standardised measure for the quantity of tyres. One EPU contains as much rubber and other materials as a 'typical/' passenger tyre.

Generator A Generator is a business that as a result of their operations generates tyres; these businesses can then register as a generator. A Generator is **not** required to take ELTs from the public other than as a result of providing service to their customers (i.e. if a garage). Any arrangements put in place around the volume required for a pickup or the frequency of pickups will be made between the Generator and Transporter.

Landfill means waste disposal sites used for the authorised deposit of solid waste on to or into land.

Fee means the fee that is charged to the originators of tyres imported to the New Zealand market, either as loose tyres or as tyres fitted to vehicles. Same as Advance Disposal fee.

Legacy Tyre Stockpiled tyres that still have an owner / responsible person.

Manufacturer/End User A Manufacturer/End User is a business that receipts in a product derived from an ELT that has been produced by a Processor. The Manufacturer/End User then uses this product in the manufacture of further products or in an end use.

Orphan Tyre A tyre that has been abandoned and is deemed to no longer have an owner

Product Stewardship means a 'cradle to cradle' methodology that helps reduce the environmental impact of manufactured products, where producers or manufacturers, brand owners, importers, retailers, consumers and other parties accept responsibility for the environmental effects of their products – from the time they are produced until the end of their useful life and are recycled or disposed.

Product Stewardship Organisation (PSO) is usually a not for profit organisation or an industry association, and is the entity designated by a producer or producers to act on their behalf to administer a product stewardship programme. It can also be referred to as a producer responsibility organisation (PRO), industry funding organisation or delegated administrative organisation.

Processor A Processor is a business that receipts in ELTs (either whole or partially processed) from a Transporter. The processor then transforms the ELT into either a functional end use product or a product that is sold/supplied to a Manufacturer/End User.

Priority Products have legislation requiring that they have a product stewardship scheme. The schemes will be compulsory rather than voluntary. The Minister for the Environment has not declared any priority products at present.

Pull Model A model that pulls the tyre through the supply chain with incentives focused on creating demand which facilitates the "pull" effect.

Push/Pull Model A model that both "pushes" and "pulls" the tyre through the supply chain with incentives placed at all points within the chain to facilitate this.

Re-Use means to collect a tyre for the same or similar purpose as the original purpose without subjecting the tyre to a manufacturing process that would change its physical appearance.

Transporter A Transporter is a transporter of ELTs (either whole or part processed) that collects from both Collection Sites and Generators and delivers these ELTs to a Processor.

Tyre means a vulcanised rubber product designed to be fitted to a wheel for use on, or already fitted to, motorised vehicles and non motorised trailers towed behind motorised vehicles. For the purpose of this report a 'tyre' includes but is not limited to a tyre for motorcycles, passenger cars,

box trailers, caravans, light commercial vehicles, trucks and truck trailers, buses mining and earth moving vehicles, cranes, excavators, graders, farm machinery, forklifts and aircraft.

Tyre derived aggregate (TDA) means crumb rubber applied in rubber asphalt for roading applications or as an alternative to sand or gravel in civil engineering applications

Tyre Derived Fuel (TDF) is a fuel derived from end of life tyres and includes whole or shredded tyres used for this purpose

Tyre derived product (TDP) means any product produced from rubber, steel, textile or other material recovered from end of life tyres

Tyre Importer means a business or organisation that import loose tyres or import tyres that are fitted to vehicles

Tyre Recycler means a business or organisation recovering rubber, steel, textile and/or other materials and processing if into a form whereby it can be used as an intermediate product in the manufacture of tyre derived products.