

Trevor Butler Frame Group Limited

Impact on District Roads from
Forest Harvesting Traffic

Background

- “A Review of Issues Relating to the use of District Roads for the Transportation of Forest Harvest”
- Prepared by Frame Group Ltd for Forest Owners Assoc. Sept 2003.
 - Covers:
 - Technical Issues of road standards
 - Traffic Management Issues
 - Funding Issues

Traffic Generated from Different Land Use

Allocation of traffic on the basis of land production or vehicle trip generation

- Can be very subjective
- Lack of evidence that it is a fair basis for cost allocation
- Most traffic generation data is collected for different purposes

Rural Land Production Yield

Land Use	Tonne/ha/yr
Pip Fruit	40
Forestry	22
Kiwifruit	17
Dairy Farming	9

Truck Movements for Various Land Use

Land Use	Trucks/ha/yr
Dairy Farming	1.94
Beef	0.81
Forestry	0.80
Mixed Sheep / Beef	0.09
Sheep	0.02

Timing

- Pasture land can be converted from drystock to dairy production in one year.
- Most food crops take from one to five years before full production is reached.
- Harvesting of forests follows typically 25 to 30 yrs of no production (or possibly production thinning activity earlier)

Hence the real impact of providing for forestry is reduced because of the long lead time

Rural Land Production Yield

(Discounting for future yields at 10%)

Land Use	Tonne/ha/yr
Pip Fruit	40
Kiwifruit	17
Dairy Farming	9
Forestry	6

Truck Movements for Various Land Use

(Discounting for future yields at 10%)

Land Use	Trucks/ha/yr
Dairy Farming	1.94
Beef	0.81
Forestry	0.22
Mixed Sheep / Beef	0.09
Sheep	0.02

So Why is there a Problem?

- Future impact of forest harvesting has been underestimated
- The destination of wood from forests changes depending on new processing site and export facility development
- Actual forest harvesting timing is not fixed and may be varied due to market demand
- Forest companies often make rapid, significant changes in harvesting programme
- Forest ownership has changed frequently in recent decades (Intended transport routes for harvesting may have also changed with ownership)
- Modern truck types and configurations demand higher road standards

So Why is there a Problem?

- TLA's have been unable to accumulate funds for future demand
- Funding has been targeted at the current need (Sometimes at the detriment of future requirements)
- Public road upgrading has a long approval process
- The funding evaluation mechanism has not been well suited to the forest harvesting scenario
- The desire for high service standards results in increased costs

Other Factors

- The large amount of current infrastructure development has forced up costs for roading significantly
- There is an increasing shortage of plant, labour and supervision for construction
- Delayed projects are becoming the norm
- The forest industry is under price pressure in international markets

“Problems are opportunities
dressed in work clothes”

What are some options for dealing with the forest roading issue?

- Regional forecasting and coordination of arterial routes (network analysis of wood-flows)
- Timely planning of upgrading
- Establishment of appropriate road standards
- Consideration of alternative traffic management options
- Others

Forecasting and Coordination Options

- Establish a network model and keep it current
- Co-operation between forest owners
- Be prepared to make agreements and sacrifice flexibility for certainty
- Recognise each parties organisational constraints
- Consider creative funding options

Road Standard Options

- Identify the physical requirements vs the safety requirements
- Select appropriate geometric standards (width, curve radius, intersection geometry)
- Target funds to the features that provide most benefit (curve widening, sight benching, passing bays)
- Unsealed pavements have advantages
- Use appropriate design expertise and techniques

Traffic Management Options

- Manage the timing of trucking operations
- Use traffic control measures
- Develop community involvement and co-operation
- Control the truck configurations
- Consider use of CTI on all axles
- Make agreements on regulating harvesting operations
- Look for low capital solutions

Conclusion

- Taken over the forest cycle, forest harvesting places a similar demand on District resources as many other land uses.
- The problem has arisen because of the long term nature of the industry and the inability of funding mechanisms to cope with this
- Better forecasting, cooperation and planning is needed
- Opportunities exist in the use of appropriate standards and traffic control measures

Frank Porter, Transit New Zealand
Marlborough Roads

David Currie
OPUS International Consultants

The impact of forestry traffic on
the Marlborough Road network

Agenda...

- The benefits of the project to Transit New Zealand and the Marlborough District Council
 - Frank Porter
- Modelling the long term impact of forestry traffic
 - David Currie

An aerial photograph showing a winding road through a forested area. The road is light-colored and curves through the dark green trees. To the right of the road, there is a river or stream. The overall scene is a mix of natural forest and human infrastructure.

Introduction

- Marlborough is the 9th largest forestry producing region in New Zealand.
- Forecast extraction volumes are 2 million m³ p.a. for at least the next 10 years. Virtually all will be transported directly or indirectly on the State Highway system.
- 1 million m³ p.a. are forecast to be carted over MDC roads.
- A small balance will be barged in areas suitable for water transport or where no roads exist.



Mensuration of Forests

- MDC purchased Satellite Imagery, had forests of known ages and used these to assess the density/age for all forests.
- The method is quite coarse but did allow forests to be defined in 5 year bands between 0-25 years.
- Practitioners viewed representative forests and confirmed, or otherwise, the accuracy of the forecast age. There were some “glaring” errors.
- The forestry industry effected their own survey of private owners and large forestry corporations, of both area and yields and produced forecast volumes.
- These were produced for Nelson/Marlborough however the boundaries between the 2 definitions did not match TLA boundaries and the information needed adjustment.

An aerial photograph showing a winding road through a forested area. The road is light-colored and curves through the dark green trees. A stream or river is visible on the left side of the road. The background is a solid teal color.

Mensuration continued

- The forest industry work did not define areas ,whether extraction was to be barged, whether local roads and/or State Highways were to be affected by extraction and a number of other items.
- Nevertheless the combination of the satellite imagery work, industry information and other work allowed MDC to forecast in 5 yr. bands the extraction quantity on each road and the timing.
- This has been done for both networks and has reasonable confidence level.
- The following slide comments on the information:

An aerial photograph showing a winding road through a forested landscape. A stream or river flows alongside the road. The terrain is hilly and covered in dense green trees. The image is partially obscured by a teal header bar on the right side.

Mensuration comments

- NZ Radiata production is app. 500 tonnes/m³ Hectare. (more accurate evaluation at network level is probably unwarranted)
- Typical public road payloads are 28-30 tonnes on Truck/Jinker combinations with pavement loading 3.0 EDA (laden) 0.8 EDA (unladen).
- Most forests are harvested near 25-28 years, extraction is markedly affected by cash flow requirements, ruling log prices , exchange rate and other factors.
- This is the reason for suggesting 5 year bands and non-detailed quantities are all that is required at network level analysis.
- A simple calculation can now be made to forecast the timing and pavement loadings on individual roads and these forecasts are incorporated into MDC / Transit maintenance contracts.



Modelling outputs

- David will discuss the formatting to the model and financial requirements and work category definitions that adding this loading to each network delivers.
- The information can be of value; MDC for example is producing a Growth Strategy and this work can be of benefit in quantifying costs due to forestry extraction. The costs can be included in Transits' long term financial planning and Forward Work Programmes, and similarly for MDC.
- Contractors can make Resource and Financial forward commitments.
- Practitioners still need to apply judgement and 'logic checks' to the results and outputs before using.



Modelling outputs

Identified deficiencies and comments

- Detailed investigation of some outputs i.e. comparing FWP's for roads with AND without forestry loading applied display some anomalies / obvious errors in the modelling process.
- dTIMs does not address **capacity** of roads in respect of demand for Seal Widening. Simple analysis has shown that this is a major problem for Marlborough mainly occasioned by Viticultural development and is a significant programme cost.
- Current modelling does not address one factor, and that is, the accelerated deterioration that occurs when significant harvesting commences.



Modelling outputs

Identified deficiencies and comments

- Pavement design and associated models do not address sudden/intense loading on a pavement but simply consider the number of load repetitions. This is obviously a deficiency as discovered by both Transit and TLA's; these effects have not, to date, been quantified or been able to be factored in. Opus International Consultants are currently doing a research project on this subject and possibly these can be incorporated in future.
- The effects are particularly pronounced on low strength pavements and heavily influenced by pavement and subgrade moisture (as you would expect !) and can have significant cost and level of service adverse impacts.
- It would be correct to state the Contracting Industry still has some trepidation regarding these impacts and we allow some tolerance and accommodation in reactive response.
- MDC requires a higher investment in determining SN, especially for roads likely to be effected, to give an increased confidence in the modelling.

Previous Modelling

- MDC commissioned a model, using HDM 3, in 1996, from BECA.
- It was fairly coarse and relied on the Asset Manager assigning CBR values to each road in 3 bands (3-5, 5-10, >10), pavement depth in 3 bands (<100mm, 100-200, >200mm) and other factors including the forestry outputs above.
- Two models were run; to determine the investment to maintain the network, AND the added costs when the forestry was included.
- This additional cost was \$280,000 p.a.(a figure not dissimilar to the dTIMs output) although not as specific.
- There were 3 basic investment models run with outputs from 2 as follows:

Previous Modelling

- Model 1- Cheapest
- The total cost was \$67.0m
- (428km reverted from Sealed road to Gravel road)
- Therefore total including loss of asset was \$105.5 m

Year	Capital	Maintenance	Total Cost
1-4	5.8	7.6	13.4
5-8	5.8	7.6	13.4
9-12	5.8	7.6	13.4
13-16	5.8	7.6	13.4
17-20	5.8	7.6	13.4

Previous Modelling

- Model 2- Optimum
- The total cost was \$76.94m
- The model included Forestry
- Seems to have been reasonably accurate considering coarse inputs.

Year	Reseal	Rehab.	Maint.	Total
1-4	5.58	9.44	3.79	18.81
5-8	3.15	13.15	3.29	19.59
9-12	4.86	2.93	3.29	11.08
13-16	4.14	8.42	3.29	15.85
17-20	3.78	4.54	3.29	11.61



dTIMS output summary

- The outputs 04' Analysis for "Performance Analysis" average \$3.17m p.a.
- Over a 20 year analysis period this equates to \$63.4m
- This is considerably less than the earlier HDM model , however , the pavement investment required increases considerably beyond the 2017 year AND the model indicates deteriorating Roughness and Rutting over the 20 year analysis period.
 - This is only this because the budget is constrained to near historic levels
- Continued verification of existing pavement depth(Probably by GPR) , and CBR (by Scala) with refined SN's will add confidence and validity to long term financial and physical works programming and allow investment to optimise pavement management.



Modelling the long term impact of forestry traffic

- Some Background
- Some Theory
- Project Goal
- Methodology
- Analysis
- Results
- Conclusion



Some background

- dTIMS introduced to NZ Road Controlling Authorities by the RIMS Group
- Transit New Zealand modelling since 1999
- Sophisticated computer programme using vast amounts of road data and deterioration models to predict the future condition of the road
- Deterioration models based on international best practice
- More accurate multi-year programming of road works



Some background

“It must be recognised that environmental deterioration – as opposed to deterioration caused by traffic loading – will be significant over much of the New Zealand network, again because of the lower traffic volumes. This is reflected in the modelling approach embodied in dTIMS but may have an impact on investment prioritisation”



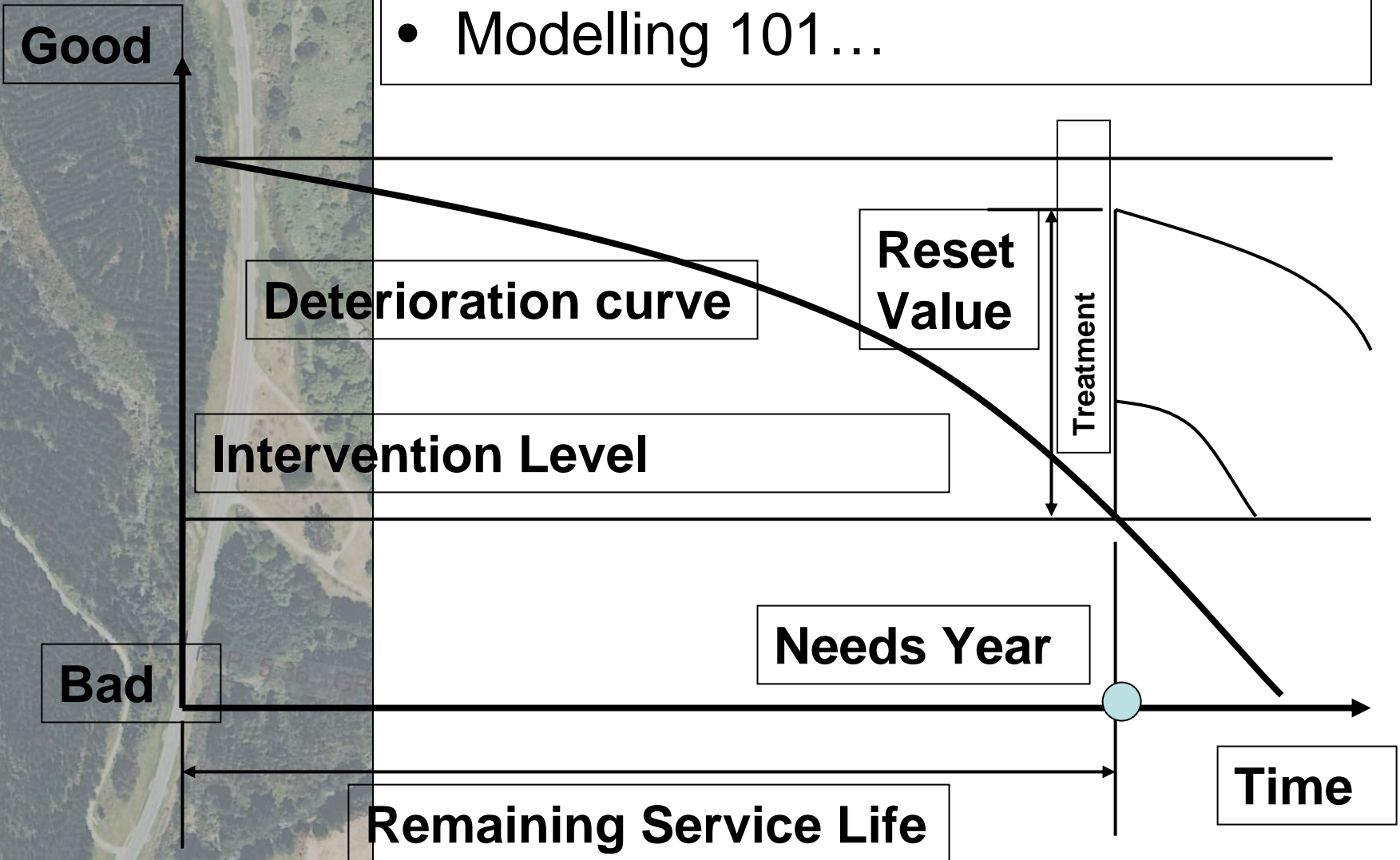
Some background

Why do we do what we do?

- Robust funding requests
- Reduction in future maintenance costs
- An increase in asset condition
- Impacts of various budget or condition scenarios
- Impacts of funding reduction
- Impacts of different traffic loadings
- Expectation of Transfund/Audit NZ

Some theory

- Modelling 101...



An aerial photograph showing a road network winding through a forested area. The roads are light-colored, and the surrounding land is covered in dense green trees. The image is partially obscured by a teal header bar on the right and a yellow vertical bar on the left.

The project goal

- To determine the long term financial impact of forestry traffic loading on the network

An aerial photograph showing a road network in a hilly, forested area. The roads are light-colored and wind through the green landscape. The image is partially obscured by a teal header bar on the right and a yellow vertical bar on the left.

Methodology

- First analysis to check the theory that...
 - ...increasing the load factor of the HCV's should increase the length of strengthening treatments predicted.
- 55% of total network affected by the additional traffic



Methodology

- Forestry data and load factors supplied by the client in spreadsheets
- New expressions and filters created in the model to apply the data to the correct roads
- Modifying the HCV's **DID** increase the length of pavement works – methodology proved valid

An aerial photograph showing a winding road through a forested area. The road is light-colored and curves through the dark green trees. A stream or river is visible on the left side of the road. The background is a solid teal color.

The Analysis

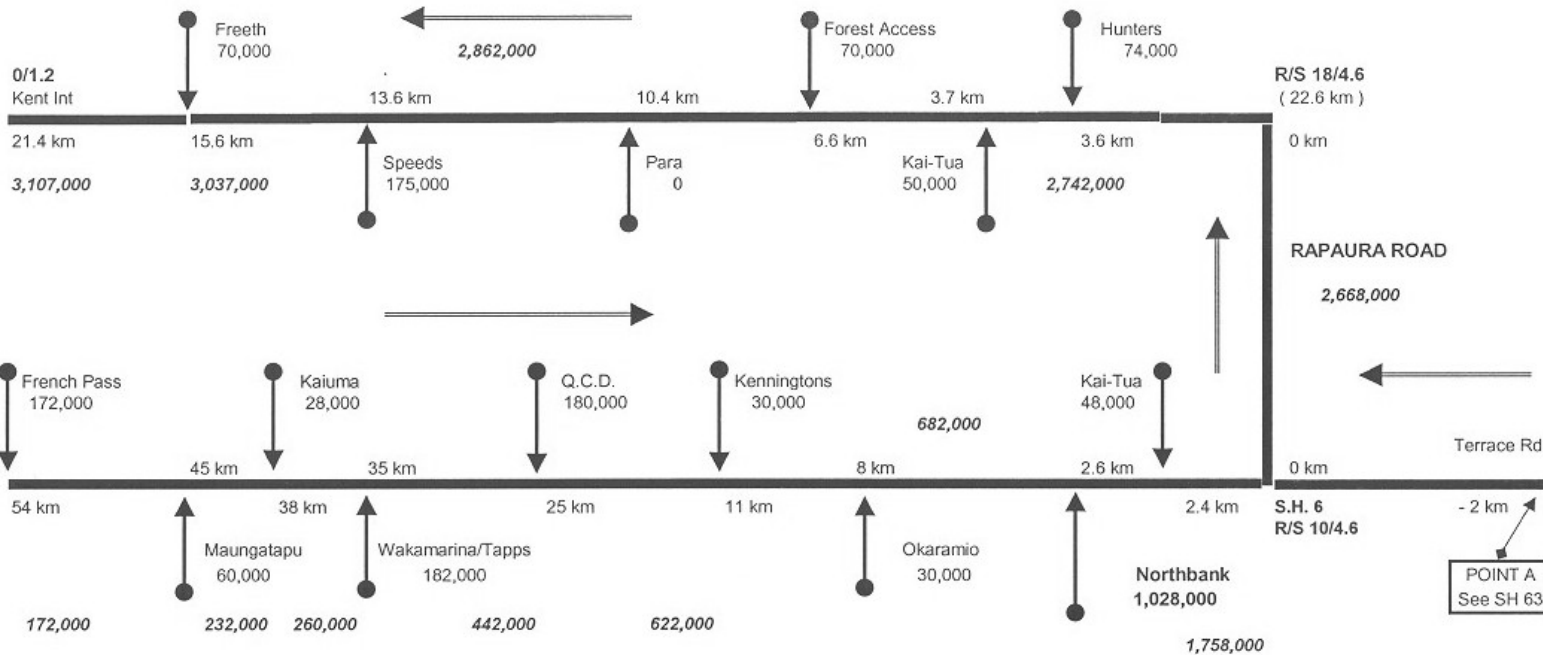
- Modelled two separate predictions of treatment need and compared the two outputs:
 - One model *without* additional forestry traffic
 - One model *with* additional forestry traffic
- Added client's calculated forestry traffic volume and loading data (next slide)
- Data was applied to each individual road in the database input file at treatment length level
- Done this way so as not to disturb total traffic volume which would impact on other condition predictions

" MARLBOROUGH ROADS " STATE HIGHWAYS 1 , 6, AND 63

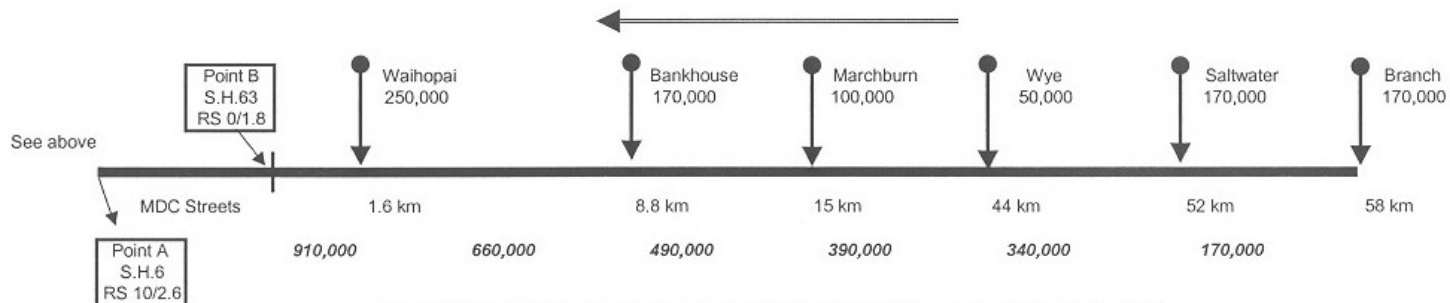
FORESTRY FORECAST EXTRACTION Industry Sources, D.Miller collation 2001

Period 2003-08 (5 yrs.)

STATE HIGHWAY No 1 (PICTON TO SPRING CREEK / RAPAURA ROAD) R/S 0/1.2 - R/S 18/4.6

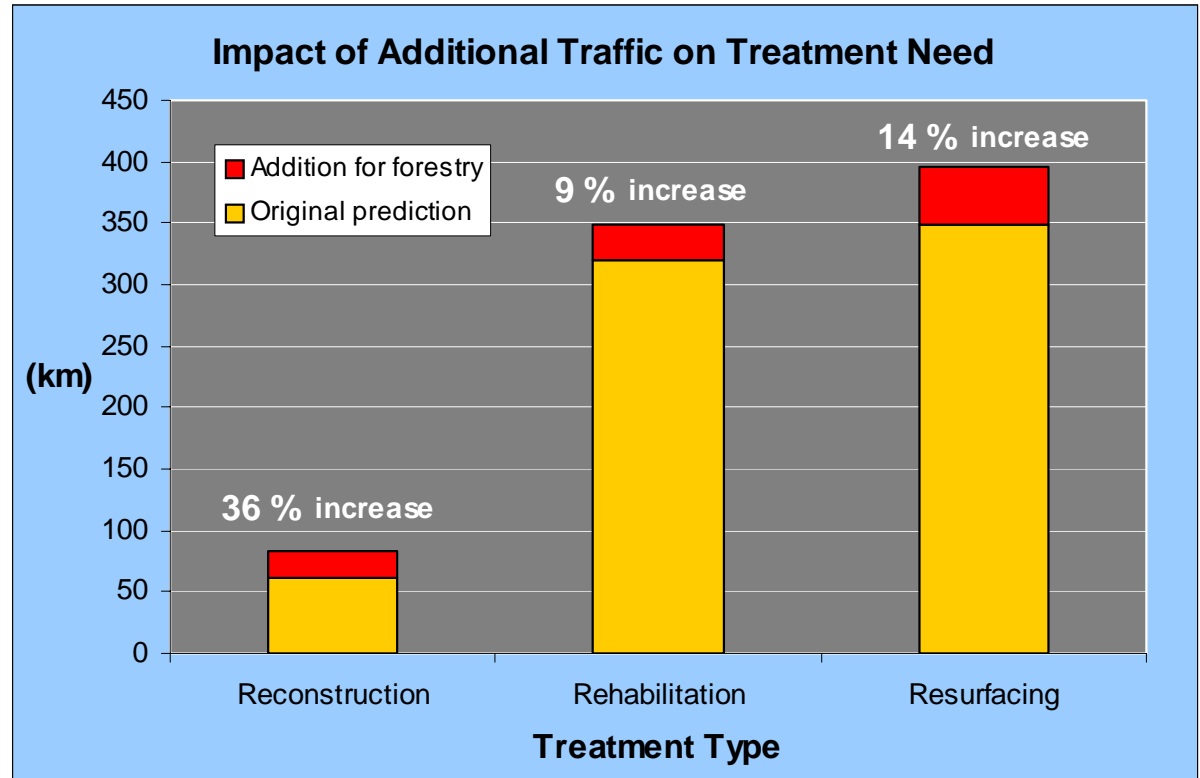


STATE HIGHWAY No 6 CROISELLES/FRENCH PASS (RONGA ROAD) INT. TO TERRACE ROAD (RENWICK) R/S 65 / 10.07 - R/S 10 / 2.4



STATE HIGHWAY No 63 ANGLESEA STREET TO BRANCH RP. 1 / 1.8 - RP. 59 / 1.0

The Results



- The net effect of the forestry traffic in terms of budget need is an **increase of \$280,000 p.a.**



Conclusion

- Predictive modelling allows us to identify the long term needs of our pavements
- Specific modelling of heavy vehicles ensures we apply adequate treatments in advance of use (proactive vs reactive)
- Provides a transparent mechanism for funding requests
- Identifies cashflow requirements
- Allows for resource planning for contractors

Bill Turner

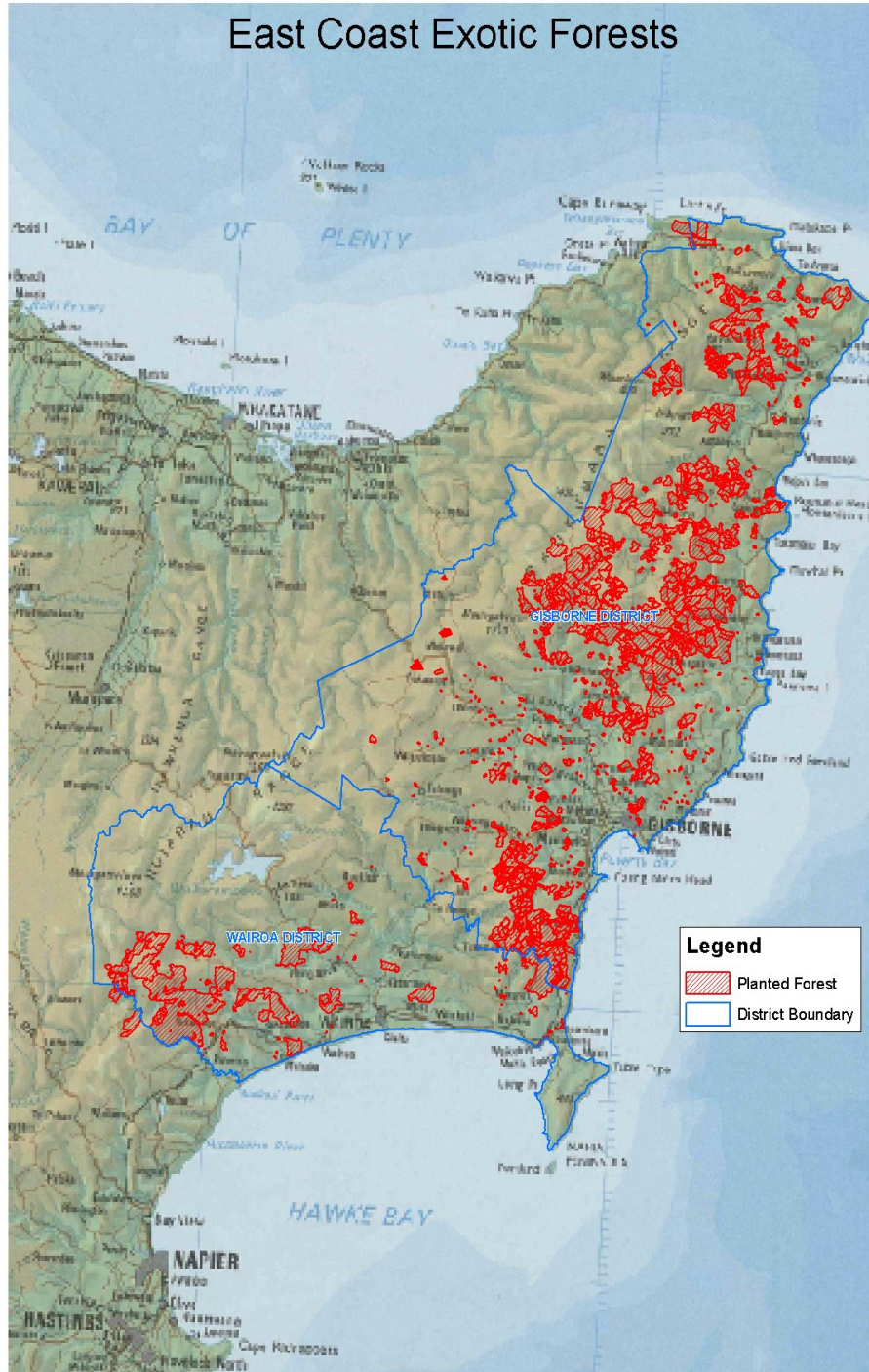
Gisborne District Council

The standards and costs of public roads to accommodate forestry traffic

INTRODUCTION

- **Legislation**
- **Activities**
- **Funding**
- **Procurement**
- **Local Roding Issues**
- **Examples**

East Coast Exotic Forests



LEGISLATION

- **Local Government Act 1974**

S353 – The Council shall take all sufficient precautions for the general safety of the public and traffic and workmen employed on or near any road and, in particular, shall –

- **Land Transport Management Act 2003**

S25 Procurement Procedures

ACTIVITIES

Capital

Renewal

- Reseals
- Surfacing
- Rehabilitation

Construction

- Bridges
- New Roads
- Improved Roads
- Seal Widening
- Seal Extension
- Safety Projects
- Flood Damage Repairs

Maintenance

Grading

Metalling

Pot-holes

Edgebreak

Vegetation Control

Traffic Signs

Road Marking

Watertables

Flooding Response

FUNDING

- **Capital work is funded by Depreciation Reserve Funds or loans and LTNZ 65%.**
- **Regional Development Roothing Projects are funded by LTNZ 100%.**
- **Maintenance work is funded from rates and LTNZ 60%.**
- **Rates levied must relate to the relevant year.**
- **Depreciation is also funded from rates.**
- **Roothing assets must be revalued regularly using current contract rates.**
- **Increased value → increased depreciation cost → increased rates cost.**

PROCUREMENT

- **Compliance with Land Transport Management Act essential.**
- **Non-compliance means no funding assistance.**
- **Regular audits take place.**
- **CPP process is prescriptive.**
- **Tenders must be based on outputs not inputs.**
- **Tender procedures also defined**
 - **Competition**
 - **Approved Method**
 - **Evaluation**
 - **Management Plans**

LOCAL ROADING ISSUES

- **Assess variables – usage, time etc.**
- **Generally maintain public access.**
- **Employ best practice design standards.**
- **Adopt strategic approach.**
- **Design criteria based on consumption, not time.**
- **Impact of axle weights and frequency of loading.**
- **Limited ability to control usage.**
- **Public money requires open processes.**
- **Sustainable contracting industry.**







Peter Farley

The standards and costs of public roads to accommodate forestry traffic

Forest Harvest Roding Workshop 2005 – Peter Farley’s Notes

The Regional Development Roding Programme

The programme is \$20 million per year exclusive of GST.

A formal review of the Programme is due after the 2006 which means that the funding will continue at least until the end of the 2007/08 financial year.

The programme is limited to the Northland and Tairāwhiti (Gisborne and Wairoa Districts) regions where the bulk of the critical work, priority (a) below, will be completed in the 2005/06 financial year.

The programme was introduced because of the following combination of factors that applied to those two regions at that time:

- High volumes of new forests nearing maturity;
- Relatively low level of current harvesting activity;
- Potential for new processing capacity that would be regionally significant in terms of economic and employment impact;
- Generally poor standard of existing district roads;
- Relatively high roding costs;
- Regions with generally low socio-economic status; and
- Small rating bases and no capacity to raise a local contribution for a significantly expanded roding programme;

The priority system for ranking projects is:

- (a) Harvesting new forests
 - (i) Supplying a new processing plant
 - (ii) Supplying an existing/expanded processing plant
 - (iii) Supplying log exports
- (b) Reducing forestry transport costs
- (c) Benefits to other road users on forestry transport routes

A fairly good process has been developed after an initial rushed start which created some problems. While the details are slightly different between Northland (a single regional council and three district councils) and Tairāwhiti (one district council in the Hawkes Bay region and a unitary authority – Gisborne) the basic structure is the same:

- A strong informal group representing forest owners in the region;
- Formal meetings between the forestry group, TLA representatives and LTNZ;
- A formal process for setting project standards with forestry input; and

- A mechanism for making appropriate adjustments as circumstances change.

It is important to understand and allow for the critical annual timetable milestones that must be met in order to have work completed to fit in with harvesting programmes.

Working backwards, the sequence is:

- Construction contracts generally let about August-September for completion March-June the following year (ie the same financial year);
- National Land Transport Programme for the coming financial year published by 30 June each year;
- Draft NLTP formally adopted by the LTNZ board in May and forwarded to the Minister of Transport for approval;
- Regional priority lists must be finalized and sent to LTNZ by March for the financial year beginning in the following July;
- LTNZ will consolidate the regional priority lists into a national priority list in April;
- Draft regional priority lists need to be finalized and sent to LTNZ by November, which is when the road controlling authorities have to submit their draft land transport programmes.
- Regional forestry groups need to meet and draw up an agreed draft regional priority list by October – note that this is for work that will be required to be completed in about 18 months time;
- Individual forest owners need to prepare relevant information on the roads that will need upgrading and submit to the regional forestry group by September.

The number one priority for this Workshop should be an agreement between industry and local government to work together to put a united and credible case to Government for the RDR programme to be continued and extended to other parts of New Zealand.

The Standards and Costs of Public Roads to Accommodate Forestry Traffic

There has been difficulty in many cases in getting roads of appropriate standard for the purpose under the RDR programme.

This has improved substantially over the last three years but further improvement is possible.

There are jobs undertaken as part of the RDR programme where the contracted prices and resulting standard of road are entirely consistent with forest industry costs for in-forest harvesting roads. There are also jobs where the contracted prices have been substantially (100-200%) higher than forest industry costs for in-forest harvesting roads.

This diversity of results should not be a matter for acrimony, but a set of useful data from which everyone can attempt to identify possible improvements in design and management that will benefit both forest owners and local authorities.

Possible sources of differences in costs between forest industry roading costs and public sector roading costs:

Area	Requirement	Onus
Design		
Design method	The design method should be appropriate to the situation and the final accuracy required. Motorway design software is inappropriate for a low-volume, low-speed environment where land boundaries are largely irrelevant.	Councils
Design qualifications	Where the design work is contracted to consultants, Councils should invite bids for the RDR programme work from a wider group than the traditional state highway and district road consultants. Experience at designing and supervising harvesting road construction and maintenance within forests should be accepted as qualifying a consultant to bid for this work.	LTNZ
Geometry	The prime variable here is pavement width. Where traffic volumes are low (or moderate but intermittent), reduce width to single lane with passing bays and adequate sight distance. Need to be aware of the difference between average and minimum widths. Also consider alternative traffic management measures.	LTNZ, Councils, consultants
Pavement	In areas where metal is expensive (eg on the East Coast, metal for the pavement can amount to 60-70% of total costs) and a non-sealed surface is being constructed, design for a high probability of some pavement failure. Localised pavement failure is relatively easy to fix and much cheaper than a fail-safe design. This will require a specific agreement required with LTNZ so that any “designed” pavement reinstatement attracts the same subsidy rate as the construction work. (precedents exist)	LTNZ, Councils, consultants
Drainage	No headwalls were it is cheaper to simply install another length of culvert.	Councils, consultants
Earthworks	Use side-casting of waste material where there is no significant risk of instability or excessive sedimentation, instead of end-hauling to dump sites.	Councils, consultants

Contract Process		
Tender eligibility	<p>LTNZ specifications currently allow only two standards of formal quality assurance: ISO 9002 plus TNZ Q/1: 1995 and TNZ TQS1 (1995) plus TNZ Q/1 1995. This is a level of quality assurance documentation that is excessive for smaller contracts and beyond the resources of many contractors that could effectively and efficiently carry out such contracts.</p> <p>There needs to be a third level that requires only a reasonable level of competence, not necessarily directly related to public roading (eg experience on forestry road construction and maintenance) that would be acceptable in situations where there is a relatively low level of technical complexity in the job, traffic management is not a huge issue and there are no exceptionally difficult or complex environmental issues. This would reduce the barriers to entry and significantly increase competition in the tender process.</p>	LTNZ
Contract size	Where appropriate, contracts need to be let in small parcels to encourage smaller contractors to enter the market, develop skills and expand. Failure to reduce this (and other) barriers to entry will increase all roading costs.	Councils
Documentation	The extent of contract documentation needs to reflect the size and circumstance of the job. Highly legalistic documents are appropriate for large jobs where the sums at stake are large in relation to the cost of litigation and arbitration. In many RDR jobs, much simpler documentation will suffice. This again reduces the barriers to entry for smaller contractors.	Councils, LTNZ
Specifications	Ditto. Examples of absurd specification provisions have been found in the RDR programme.	Councils
Planning	Inappropriately excessive planning requirements in the simpler jobs increase costs and act as a barrier to entry for new contractors. Does a job of less than \$1 million in a remote site with negligible traffic really require a quality plan, a traffic management plan, a safety plan, an environmental plan	LTNZ, Councils
Cut disposal	Too many instances of waste material being end hauled to prepared dump sites when there is no environmental or structural damage that would result from side-casting the material.	Councils

NZFOA, LTNZ and LGNZ should set up a small technical group to the standard requirements and determine set of provisions that would lower barriers to entry to contracting and also determine the conditions under which such low-barrier provisions could be applied.

Points Noted

Graeme Wild commented that all truck excise taxes go into the Land Transport Fund while only part of the car excise taxes do so. Can this be checked?

There is a new form of road funding called Crown Appropriation which is a payment from the Consolidated Fund to the LTF. At present this only to projects in Auckland and Wellington although something is coming for the Bay of Plenty. Apparently, the difference with this funding (unlike the RDR) is that Government, not LTNZ, decides where it will be spent – can this be checked?

Perhaps CTI should be eligible for LTNZ subsidy as a reduction in tyre pressure from 100 to 80 psi can reduce ESAs by 50%.

Marlborough District Council analysis showed that the cheapest option for the District to cope with logging traffic was to change 428 km of sealed road into unsealed surfaces. This highlights the fact that the higher cost of sealed roads are a benefit to others, not the forestry industry. Therefore, if a higher cost (sealed) option is chosen for non-economic reasons, then those higher costs should be borne by those who benefit. MDC are strong advocates for this “exacerbator principle”.

Bill Turner, Gisborne District Council, is still trundling out the line that because rates have to fund depreciation, it is an extra cost to ratepayers. The additional rate revenue goes into the fund where it can be used to capital works which means that ratepayers have less need to borrow or pay for those works = NO effective change in rate bills. Even his Council’s Chief Financial Officer agrees with this, but Bill keeps trotting it out.

LTNZ only allows “output” contracts, so therefore cannot use hourly hire rates etc that relate to “inputs”. Some TLAs get around this using hire rates quoted as part of output contracts. This is just one aspect of the serious problem of the LTNZ/TLA system discouraging competition by the use of bureaucratic processes and rules that are reasonable for very large contracts but totally inappropriate for smaller jobs (less than about \$2 million). Critical area for NZFOA to discuss constructively with LGNZ and LTNZ.

Afternoon Tea
3.30pm – 3.45pm

Bill Dyck Facilitator

General Discussion
Conclusions
Follow up Action
Where to from here?