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KEYNOTE ADDRESS

STRATEGIC CHALLENGES FACING ROAD AGENCIES

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Abstract:

The main focus of this paper will be on strategic challenges facing road agencies and possible strategies to address these issues.

The Roads and Traffic Authority's (RTA) vision is for a safe, sustainable and efficient road transport system for the people of NSW.

This presentation will detail the RTA's agenda over the next five years and include discussion on the significant challenges associated with our Blueprint agenda. The RTA's Blueprint agenda sets the priorities and milestones for the short term, it does not cover all aspects of the RTA's operations but it clearly demonstrates our focus areas. These are the tasks we have set ourselves to achieve in the shorter term:

- Managing Sydney Roads
- Managing Rural and Regional Roads
- Transporting Freight
- Improving Maintenance
- Advancing Business Opportunities
- Improving Road Safety
- Improving Services
- Maintaining Organisational Skills
- Addressing Significant Environmental Issues. [return to table](#)

KEYNOTE ADDRESS

KEYNOTE ADDRESS

THE DEVELOPMENT OF TRANSPORT NETWORKS IN NEW SOUTH WALES, 1860-94

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Abstract

This address covers the development of transport and transport networks in New South Wales in the 19th Century. The influences on transport and how it occurred during the fledging years of the colony set the scene for future development and growth in the 20th Century and may well influence what happens in the 21st Century.

In planning and developing expansion of transport networks and systems, it is often very useful to be aware of and appreciate how existing networks and systems developed. Often situations have changed little in some areas and therefore some valuable lessons can be learnt from decisions, events and development in bygone years. This serves as a useful means of learning from past actions.

Keywords: agricultural production, paddle steamers, railways, river transport, roads.

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KEYNOTE ADDRESS
BUILDING AUSTRALIA'S FUTURE: OUR TRANSPORT AND COMMUNICATIONS CHALLENGES

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Abstract

There is no doubt that the delivery of quality infrastructure, particularly transport and communications infrastructure, is critical to underpin our export-driven economy and to protect and enhance our enviable Australian lifestyle.

A lively debate is underway about how we fix our ageing infrastructure, remove bottlenecks that impede economic growth and who should pay for it.

This paper discusses the lack of a co-ordinated and planned approach to the provision of transport and telecommunications infrastructure and makes some points about a better way for business and government at various levels to improve infrastructure delivery in the future. [return to table](#)

KEYNOTE ADDRESS
THE ORIGINS OF THE GRAFTON-SOUTH BRISBANE RAILWAY PROJECT

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Abstract

The Grafton-South Brisbane railway was the first result of the Commonwealth's attempt to unify Australia's railway gauges and was a genuinely national project, largely funded by the Commonwealth. It was the first inter-capital railway deliberately built as such in the country. Its conception varied greatly from previous colonial and state railways, which had been built to meet the needs of each colony or state, without consideration of national interests. Defence was a factor in railway building for the first time. A Commonwealth Royal Commission recommended how uniformity of Australia's railway gauges could be achieved in 1921, but the Grafton-South Brisbane railway was the only project to be funded as a direct result of the Royal Commission, due to hostility from the Victorian and South Australian governments in particular. As such, it marked a beginning of what was to be the long-delayed national project of railway gauge standardisation.

Keywords: standard gauge railways, 1921 Royal Commission, Commonwealth railway policy, interstate commerce, defence, state government railway policy. [return to table](#)

KEYNOTE ADDRESS
ADVANCED TRAIN MANAGEMENT SYSTEM AND AUSTRALIA'S FUTURE FREIGHT TRANSPORT CHALLENGE

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Abstract

The Australian Rail Track Corporation was established in 1998 to facilitate a national standard gauge rail network. This paper addresses the key issues of replacement of infrastructure, increasing market share and solutions. The Advanced Train Management System is outlined to increase the capacity and flexibility of the rail network and some of the opportunities that exist for this strategy.

The challenges to the future freight transport is linked to market forces, fuel prices and carbon trading scheme. Various scenario outcomes are explored and presented to show the opportunity for rail freight. [return to table](#)

TECHNICAL PAPERS

SEEK FIRST TO UNDERSTAND BEFORE BEING UNDERSTOOD

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Abstract

The power industry has plans for an unprecedented level of capital expenditure over the next decade on projects that are required to meet increasing demand and reliability and the replacement of aging infrastructure. A substantial proportion of this expenditure will be spent on overhead lines and major substations, assets that elicit increasingly more hostile reactions from the community. The mere suggestion of a proposal for a new sub-transmission line often brings out the "nimby's" on mass, making the job of the power industry increasingly more difficult.

Overhead lines, underground cables and substations can inevitably impact on landholders and the community. Community scrutiny is increasing. Communities and individuals are better educated and informed, and are able to rally more readily than ever to demand involvement in the decision making about project outcomes. Informed and well organised communities can delay the roll out of major works. The community wants and deserves better justification, analysis and reasoning behind decisions.

If stakeholder engagement is done well, it can lead to innovative solutions and stronger relationships with local communities, built on mutual respect and understanding. This involves a shift in mindset for infrastructure providers and their project teams. Through genuine engagement of key stakeholders, infrastructure providers can tap into the ideas and problem solving abilities from within communities to assist in identifying innovative solutions that are far more acceptable to all parties.

This paper reflects on past and present attitudes and community consultation practices and proposes a fresh approach that combines the technical skill and knowledge of engineers with a genuine desire to listen and understand landholders and the community. These partnerships can generate thought provoking ideas for achieving creative and technically sound solutions that are embraced by the community and landholders.

The authors draw on experience and observation gained in community consultation and landholder negotiation in a major power infrastructure project in the Clarence Valley.

Key Words: community consultation, infrastructure projects, stakeholder engagement, e-participation.

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TRANSPORT SYSTEM EFFICIENCY TRADEOFFS

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Abstract

A first principles analysis presents a systems perspective broad-brush overview of the design limits of transport systems to sustainably provide socio-economically valuable services. Motivated by future possible constraints both on greenhouse emissions (to reduce climate change risk) and fuel availability (due to diminishing global supplies), the primary focus is environmental performance: fuel demand and greenhouse emissions, given consideration of service performance: the quantity; reliability; and timeliness of material movements. Other measures: non-greenhouse pollution; health impacts; material resource use; land-use; financial cost; and service flexibility, will not be discussed systematically.

The transport value chain (cf the energy conversion chain of Lovins 2004) provides the service of the translocation of material (or information) payload over a net distance. This induces a logistics and network design dependent demand for gross movement across a gross distance, which then induces the final demand for resource usage that is dependent on traditional engineering efficiencies. Constraints on potential efficiency are investigated in broadly quantitative terms, considering the use of alternative fuels and drives. Crude quantitative models are used to explore, in less quantitatively precise terms, the potential performance of alternative network designs. Noting that the ultimate motivation for payload translocation is the valuable conjunction of material or information, urban

design, land-use planning, logistic redesign, and other ways of spatially re-organising socio-economic activity are briefly mentioned.

Keywords: First principles, Greenhouse, Infrastructure, Transport, Sustainability, Systems Analysis

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UNCOVERING AND UNDERSTANDING AUSTRALIA'S FIRST RAILWAY

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Abstract

In 1831 the Australian Agricultural Company (AACo.) began operations of its first coal mine in Newcastle to serve the growing colony of New South Wales. It honoured an agreement (and Charter of 1824) to take over the sourcing of coal from the NSW Government, which since 1801, had been carried out inefficiently using convict labour under supervision of the military.

The mine was developed on 'The Hill' overlooking Newcastle Harbour and was connected to a staith (coal loader) on the wharf by a railway. With an official opening date of 10th December 1831, the railway can rightly be claimed as Australia's first. For many years, however, little was known about the design, history or archaeology of this railway to give this assertion substance and credibility.

The paper will first explain the historical background to the AACo.'s coal mine & railway based on evidence unavailable until recently. This evidence includes sketches of the mine and accounts from the AACo.'s records. It suggests that the AACo. carefully designed and resourced their first mines with technology of the time (c 1826), as used for mines in the north of England.

In a second part the paper will describe recent archaeological evidence and research which confirms that the design of the mine and the supply of equipment for the railway was of a high standard for that time (c1826). The opportunity to do this follows a serendipitous uncovering of an iron relic from the early AACo. mines by local historian and co-author, David Campbell.

Recent research concerning early railway technology has provided an understanding of this relic and its historic provenance. International inquiries have led to the discovery that the railway line may be contemporary in design and supply with some of the very early English railways. Railway historians in the UK are also surprised that a rare, cast iron 'fish-belly' rail section, similar to that used on their famous Stockton to Darlington Railway of 1825, could be associated with a railway in Australia.

Keywords: railway, heritage, engineering heritage, Australian Agricultural Co., coal mine, history.

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SLURRY PIPELINES – PAST, PRESENT AND FUTURE

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Abstract

The world's first long distance mineral slurry pipeline was built in Australia in 1967 for the Savage River magnetite concentrate mine in Tasmania. Since then, in the Australasian region, the following slurry pipelines have been built: the 24 km Gladstone limestone pipeline; the 18 km N.Z. Steel iron sand pipeline; the 304 km Century zinc/lead concentrate pipeline; and most recently the 62 km OneSteel Whyalla magnetite pipeline commissioned in 2007.

The current paper reviews the development of long distance pipeline technology, describes the existing pipelines in the Australian region and considers the engineering, construction, operation and current status and future of long distance slurry pipelines in Australia.

Keywords: coal pipeline, slurry pipeline [return to table](#)

THE HUNTER RAIL CAR – A VERSATILE DESIGN SOLUTION FOR REGIONAL RAIL TRANSPORT

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Abstract

Rolling Stock orders in Australia are often for small numbers of vehicles with sophisticated requirements. The design cost associated with these small orders is a significant percentage of the total vehicle cost. A versatile design solution has the potential to satisfy various applications that may be required in the future in an economically sensible manner.

The Hunter Rail Car was primarily designed to provide an urban/regional rail transport solution for the Hunter Valley. During the concept design stage the Hunter Rail Car was configured in such a way to enable convenient modification for other applications such as intercity travel over longer distances.

This paper describes how the design configuration of the Hunter Rail Car was developed to be able to accommodate a variety of configurations to suit different suburban and regional rail transport applications. The paper also provides some insight into rail vehicle acquisition and typical considerations for the design of passenger rail vehicles.

All fourteen Hunter Rail Cars have been delivered to RailCorp and are providing a successful, reliable service.

Keywords: regional rail transport, versatile/ adaptable/ flexible/modular design [*return to table*](#)

AMERICAN BRIDGES OF THE NORTH COAST RAILWAY, NSW

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Abstract

The North Coast Railway of New South Wales from Maitland to South Grafton, 1911-1923, was the first trunk line of the NSW railway network built to uniform standards for track and structures, particularly the underbridges. Unlike the earlier trunk lines, North, West and South of Sydney, which were progressively upgraded to main line standards, the North Coast Railway was designed and built to main line standards to ensure reliable long-term cost-effective performance compatible with the projected extension of the standard gauge railway to Brisbane.

Importantly, all the steel trusses, steel girders and transom-topped timber spans were based on American bridge technology including the **American Railway Engineering Association Design Code**.

The original steel bridges continue in service (the timber bridges having been replaced by welded steel girders) and now constitute a family of historical bridges of high heritage significance.

This paper summarizes the background to the change from British bridges to the new designs by eminent bridge engineer J W Roberts, culminating in closing the gap across the Clarence River in 1932 with an American double-deck bascule bridge.

Keywords: Engineering heritage, railway, bridges, bascule, American, North Coast, Clarence River.

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DRAY TO STEAMER: ROAD TRANSPORT CONNECTIONS BETWEEN COAST AND TABLELANDS IN NORTHERN NSW

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Abstract

This paper provides background to the various road transport routes between Grafton on the North Coast and the Northern Tablelands of New South Wales and why the Grafton-Glen Innes line was eventually chosen. The development of the Grafton-Glen Innes link and its evolution through to the contemporary line are discussed along with some unique circumstances and events of that period.

Not only was local competition active among towns vying for direct road links, but also competing with the burgeoning rail network, expanding throughout NSW. Eventually rail won out and remained the dominant form of land transport in the area well into the 20th century. However, that win had some losses in other areas, resulting in change to town and population dynamics and patterns of settlement.

Keywords: Bennett, Dalmorton tunnel, Grafton-Glen Innes, Gwydir Highway, Lawrence, Tenterfield.

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LARGE ROAD BRIDGES IN NORTHERN NSW: 19TH CENTURY EVOLUTION FROM TIMBER TO IRON AND BACK AGAIN

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Abstract

This paper describes the evolution of large road bridges in NSW, citing examples of various timber and iron genres in Northern NSW. In particular it highlights the high proportion of iron bridges constructed in Northern NSW over approximately a 25-year period from c. 1870. Various postulates are canvassed as to why that might have been so.

Financial astringency forced the engineering profession to account for deteriorating economic conditions and political imperatives. Typical of such major changes was a dramatic swing from substantive and expensive iron road bridges to more slender, astutely designed and economical timber truss bridges. These colonially-designed 'lean and mean' timber truss bridges were a far cry from the earlier, stockier, high maintenance versions that were inherited from British/European designs. In some respects such innovative local design was a symbolic way of releasing the restraining shackles of the colonial past and the spawning of a new nation.

For over 40 years these new-style timber bridges, of successively improved forms, dominated timber truss bridge construction in NSW, to the extent that NSW was euphemistically known as the 'timber bridge State'. It was not until innovations and improvements were made in steel production, steel-fixing and concrete technology in the early 1930s that the newer materials started to replace timber.

Keywords: Allen truss, Bennett, Dare truss, de Burgh truss, lattice iron bridges, McDonald truss, Old PWD truss, timber truss bridges. [return to table](#)

SPATIAL/POLITICAL RELATIONS AND THE UNCERTAINTY OF REGIONAL RAILWAYS

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Abstract

The recent history of Australia's regional railways indicates a degree of government policy inertia, constrained by our system of governance as well as reliance on competition as a solution to inefficiencies in transport. The approach taken by governments to reforming regional railway systems was placed under the same blanket of competition policy-derived measures: creating competing businesses by way of privatisation and 'open access' to

tracks, or at least allowing competitors for the government's operator in the case of Queensland, onto the States' tracks. An inquiry into the condition of Victoria's regional network has indicated that, at best, this approach has been inadequate. During 2008, the New South Wales Government implicitly acknowledged the shortcomings of competition-dependent policy by restoring some assets to public ownership. It also appears that insufficient consideration was given to the spatial arrangement of the main line and regional systems, which in the light of experience in Canada and the USA, appear to be better treated separately due to different conditions and constraints on branch lines and the greater productivities available on main lines.

Following some analysis of the branch line system of New South Wales, the paper attempts to propose that a political/geographical analysis in company with the basic economics of railway operation would point towards different plans for branch and main line systems and avoid the conditions now threatening regional freight railways. Such plans should be accompanied by a different approach to regional-central government relations and reconsideration of Commonwealth, State and Local Government roles in regional transport development. This paper mentions the recent history of local-central government relations in Australia, highlighting the present difficulties faced by local interests in developing rail services for local industrial development. It places regional transport issues in that context before suggesting some ways to give greater certainty to sustainable transport options, both passenger and freight, for regional Australia.

Keywords: administration, freight, policy, railway, region [return to table](#)

BROADBAND: NEW HIGHWAYS FOR REGIONAL DEVELOPMENT IN THE 21ST CENTURY

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Abstract

Broadband has been the subject of serial inquiries since the Broadband Services Expert Group reported in 1994. Rarely has a subject been so heavily inquired about without, apparently until recently, a great deal of action. Like transport infrastructure it is not an end in itself but a means to an end. Broadband communications is as essential infrastructure in today's economy as is road and rail: this importance is perhaps not so readily realised. The user of broadband is the economy, the digital economy, which is critically dependent on appropriate engineering of this infrastructure and in its investment. Like road and rail, broadband infrastructure has to be engineered with changing user needs in mind. This paper will explore the issues faced by engineers and engineering in the development of broadband networks and the critical needs of the digital economy (including in the management of other (eg utility, road and transport) infrastructure. The paper will also consider the need for connectedness of people and services, the importance of connecting information systems (including advanced computing capabilities) and the contribution to be made by broadband in addressing sustainability.

Keywords: broadband, telecommunications, digital economy [return to table](#)

RURAL FENCING

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Abstract

This paper addresses some of the engineering aspects of post and wire fencing in rural New South Wales. Many different post sizes and materials are used and the wire properties and layout also show wide variations. The basic structural properties of these systems are examined and comments made on the desired outcomes. Some suggestions are made in an effort to provide a logical basis for the choice of fencing systems for the intended site and use.

The paper concludes with a brief discussion of steel W - beam (guardfence) and wire rope road safety barrier systems to demonstrate their similarities with rural fence systems.

Keywords: fence posts, road safety barriers, rural fences, structural behavior, wires [return to table](#)

TWENTIETH CENTURY DELIVERY USE OF HORSES

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Abstract

This paper is essentially a record of the author's actual eyewitness experiences. Although references have been checked and are listed in the bibliography, they mainly enable a documentary comparison of the author's experiences with what appears to be the experiences in other cities in both Australia and abroad. There is a brief conclusion stated but most readers should find those conclusions self-evident anyway.

Keywords: horse, milk, garbage, ice, ice-cream, baker

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THE SYDNEY TO BRISBANE RAILWAY: YESTERDAY, TODAY AND TOMORROW

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Abstract

The paper outlines the development of the Sydney-Brisbane 'coastal' railway which includes the Sydney-Maitland section completed in 1889; the linking up of branch lines between Maitland and Kyogle by 1923; and the completion of the Kyogle-South Brisbane section in 1930. Comment is given on the present state of the Sydney-Brisbane railway (which has 40% of its length on tight radius curves) and the ongoing upgrading of the Pacific Highway along with a decline in rail's modal share of corridor freight from about 24% in 1996 to less than 12% today.

In addition to the track upgrading due to be completed by 2010 by the Australian Rail Track Corporation, the paper recommends not only upgrading the present Strathfield to Hexham section, but also consideration of rail deviations north of Hexham. The resulting improvement in rail freight efficiency and competitiveness from construction of a 'fit for purpose' Sydney-Brisbane railway could give rail a 50% share of line haul freight. Compared with a projected 5% share by 2014 this upgrade would save 52 million of litres of diesel each year as well as reduce greenhouse gas emissions and reduce external costs by over \$90M per annum. A major track upgrade would also allow for faster passenger train services and improve road safety.

Keywords: Fuel savings, modal shares, rail deviations, time savings

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REFLECTIONS ON THE C.38 CLASS AND OVERHAUL OF HERITAGE STEAM LOCOMOTIVE 3801

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ABSTRACT

This paper outlines some of the history behind the introduction of the famous NSWGR 38 Class passenger locomotives, including influences on the design of the locomotive. The story then focuses on locomotive 3801 which was preserved in the mid 1960s for tourist steam hauled trains, its rebuilding in the 1980s and its impending boiler replacement and heavy overhaul which will ensure it continues in heritage service for years to come.

Keywords: steam locomotive, design influences, performance, preservation, boiler replacement, overhaul

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PORTS, FERRIES AND BRIDGES: CLARENCE VALLEY'S TRANSPORT ENGINEERING HERITAGE

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Abstract

In the late 19th and early 20th century coastal shipping provided the only reliable transport link between the Clarence Valley, in northern New South Wales (NSW) and Sydney. Towns such as Grafton, Lawrence and Maclean developed as ports, which also served the NSW Northern Tablelands region prior to construction of a railway to that area. Engineering infrastructure developed to support shipping included extensive port entrance works, a dry dock at Ashby, associated road transport links, vehicular ferries and bridges. Following completion of the Sydney to South Grafton railway in 1923, reliance on coastal shipping declined and cessation of regular trade in 1954 made much of the port infrastructure redundant. The transport engineering infrastructure developed in the Clarence Valley, primarily in support of coastal shipping, provides a rich engineering heritage and examples of engineering technological development in the late 19th and early 20th centuries.

Keywords: bridges, engineering heritage, ports, vehicular ferries

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HOW TO STOP THE ROT? CONTINUOUS MONITORING OF SHORT SPAN TIMBER BRIDGES

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Abstract

This paper presents the results of an investigation of a prototype system for determining the daily structural performance of timber beam bridges. Local Government authorities in New South Wales are reported to be responsible for 2500 timber bridges. The lack of appropriate resources thwarts satisfactory maintenance, thus the need to identify a low cost method of continuously measuring the health of individual spans.

Measurement of bridge girder deflection has been variously reported as an effective indicator of performance. Many existing measurement techniques apply to bridge measurement, but few can be applied to short span timber bridges with appropriate accuracy or suitable mounting method. One technique, adapted to gather typical data has been applied to a sample bridge.

Data, representative of the normal traffic flow over the sample structure, were used to develop a method of identifying structural health. The data comprised deflection measurements for a typical 24-hour period with daily reports interpreted for their temporal behaviour pattern. This monitoring technique will lead to the identification of component lifetime in the presence of degradation and enable the replacement of components prior to wear out. It will also allow for more precision in setting particular load limits for bridges while enabling a more effective prioritisation of remedial work.

Keywords: timber beam bridge, continuous monitoring, girder deflection

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BEST PRACTICE IN PLANNING TRANSPORT INFRASTRUCTURE FOR REGIONAL AUSTRALIA

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Abstract

In the mid 1990's regional organisations were taking an interest in transport as it served regional economies. The Northern Rivers regional economic development unit in 1995 commissioned a study of the economic and other benefits from rapid upgrading the Summerland Way. This paper reviews that work, examines the outcome from it and considers the broad appraisal process for transport infrastructure. The work used techniques developed by one of the authors from several decades of examining regional economies from the transportation viewpoint.

The aim of the various state environmental planning and assessment acts, of the 1970's and 1980's, was to provide for a broader view to be taken of development and its consequences and to give a voice to the various interests in the outcome. Although the environmental assessment process has generally served the community well for several decades the process would appear to be out of control, in terms of properly reflecting community views, in terms of cost and time and in terms of public credibility with the outcome.

This paper uses the Summerland Way studies to review the place of the environmental assessment process, and examines ways to reduce the time to assess the environmental acceptability of infrastructure development proposals. Several other regional road corridors are also commented on as illustrations of the process.

Keywords: transport planning, evaluation, regional economics

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RISK MANAGEMENT AND FINANCIAL MODELLING PROVIDE THE RATIONALE FOR DURABILITY DESIGN

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Abstract

This paper discusses the shortcomings in existing Australian Standards in relation to durability design, and the consequent effect on clear financial modelling of alternative durability specifications and various design lives. The concept of applying risk assessment methods to appraise elements of durability specifications is introduced. A suggestion to standardise durability modelling based on the structural design approach is included. Some key elements of a durability plan are discussed.

Keywords: risk, finance, modelling, durability, concrete, marine, infrastructure

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LEVEL CROSSING ROAD AND RAIL SAFETY REVIEW: A HOLISTIC APPROACH

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Abstract

There are 9400 at-grade level crossings throughout Australia. Only 24% have active control. Recent accidents involving at-grade level crossings, particularly in Victoria and South Australia, have raised public emotion and accelerated upgrade of level crossings. Level crossing accidents can be catastrophic, as was the case with a recent accident in Victoria involving a semi-trailer and a passenger train, which claimed 11 lives.

In NSW the Roads and Traffic Authority (RTA) has been leading the way in improving safety at rural and urban level crossings. GHD, with the support of the RTA Hunter Region, has developed a holistic safety review process where issues are identified at a level crossing for the road and rail approaches in conjunction with the road/rail interface. The review is broadly modelled on the Austroads Road Safety audit process.

Road and rail knowledge is brought together to form an audit team that carries out day and night audits of level crossing infrastructure as well as observing road and rail traffic operation and behavior. Modelling of emergency braking distances for trains is also undertaken and considered as part of the safety issues.

A safety review report, incorporating the findings along with risk assessment ratings, is considered by stakeholders (Council, RTA and relevant Rail Authorities) who collectively decide mitigation of safety issues as well as identifying areas of financial responsibility and funding.

The extent and depth of the review process and resultant findings forms an encompassing overview of the crossing safety issues, which are then considered in the design of the proposed upgrade, and in so doing providing a better outcome for road and rail users.

KEYWORDS:

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TECHNOLOGY AND OPERATIONS FOR A RAIL FREIGHT RENAISSANCE

Geoffrey P. Sandford
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Abstract

This paper presents a range of solutions to the low market penetration by rail in the road competitive domain and as a supplementary purpose to draw attention to certain prospective traffics made feasible by changing agricultural practices. In comparing rail transport with all other land transport modes (road, pipeline, barge) we find sharply contrasting characteristics that thankfully all favour rail in their respective ways.

Keywords: Intermodal, locomotives, rolling stock, wagons *return to table*