



A back-country road in Central Otago – the district council's roading infrastructure team manage and maintain just over 1900 km of public roads, of which 1400 km are unsealed

PHOTO BY DAVID WALL



A grader on Thomsons Gorge Road in the Cromwell high-country – the new system assists the operational and tactical management of unsealed roads by monitoring and adjusting grading programmes



Springtime on the unsealed roads of the Maniototo District – with budgets constrained by a small ratepayer base, the council's engineering staff and contractors draw on a long track record of innovation to deliver a safe, reliable and affordable roading network

PHOTO BY DAVID WALL

Managing unsealed roads – the lifeline of the NZ economy

Central Otago District Council, like many predominantly rural councils, has a very high proportion of unsealed roads to maintain, but the use of a cutting-edge tool from IDS is maximising the performance of their unsealed road network whilst helping the industry.

Central Otago District Council (CODC) covers an area of 10,000 sq km with a population of around 20,000. This largely rural and diverse region boasts New Zealand's only true continental climate, with low average rainfall and annual maximum and minimum temperatures ranging between plus 40 and minus 20 degrees C.

Small townships are surrounded by wild rivers, stunning snow-capped mountains, and expansive valleys. The area supports strong farming, horticulture and viticulture industries and remains a tourism hot-spot.

CODC's roading infrastructure team manage and maintain just over 1900 km of public roads, of which 1400 km are unsealed. They face several unique infrastructure management challenges. With budgets constrained by a small ratepayer base, the council's engineering staff and contractors draw on a long track record of innovation to deliver a safe, reliable and affordable roading network.

THE CHALLENGE

Andy Bartlett, the asset engineer at CODC, wanted to answer a number of questions about his council's unsealed roads network. At the time there was a strong demand for an unsealed roads model in New Zealand, but there was nothing available in the industry.

New Zealand's gravel roads play a massive role in our economy. Up to 40% of the roading networks across the country are gravel, and 80% of our primary industry economic trips start on these roads.

IDS, a New Zealand charitable organisation, provides industry leadership in the development, advocacy and implementation of evidence-based decision-making for infrastructure. It utilises specialised applications from Canadian software company Deighton Associates. Deighton's dTIMS software allows IDS to develop asset performance modelling tools specifically for New Zealand.

IDS is managed by Dr Theuns Henning, a global expert in asset infrastructure management. "Councils



PHOTO BY DAVID WALL

A gravel road and one-lane bridge in the depths of a Central Otago winter – the new system helps contractors by improving planning and decision-making and allowing more effective operational management

and wanted to do the same on their network of unsealed roads.

WORKING TOGETHER

CODC and IDS worked together to create an unsealed roads modelling tool using dTIMS, with the council sponsoring the development. It would deliver answers not only for the CODC's unsealed road network questions, but also provide a valuable tool for the industry. "It's important with a technical development like this to get collaboration across the industry, with contractors, councils and asset owners, to ensure we develop a comprehensive tool that addresses all needs," says Dr Henning.

have historically had little evidence for them to substantiate their investment into unsealed roads or answer specific questions about their networks. These roads are an essential asset in our roading network, and managing ratepayer expectations of their maintenance is also paramount," Dr Henning explains. "Unfortunately, most of the international unsealed road modelling tools we evaluated came with high data needs and a lack of useful reporting."

Mr Bartlett says Julie Muir, who heads up CODC's infrastructure services, had been advocating the research underpinning the unsealed roads performance framework for the last seven years. "Our council had taken great efforts to understand the issues on our network and we wanted to capture and futureproof that good work."

He says they had already experienced great returns in using the dTIMS system on their sealed roads and water networks,

DATA COLLECTION AND USE

In his former role as the council's roading engineer, Mr Bartlett started using the collected data and analytical work from their network in 2016.

"It was the beginning of the process of developing a strategic response to maintaining levels of service on our district's unsealed roads and monitoring performance and network condition against our available budget," he says. "We've focused our most recent data collection work to fill in knowledge gaps of the network."

These strands of work have been brought together in the unsealed roads model. "This data and my knowledge of our roading network essentially allowed each part of the model to be built and configured to my understanding of our conditions 'on the ground'."

Andy Bartlett says they aimed to create a system delivering a framework that would allow CODC to develop asset management programmes. "Our goal is to provide the highest achievable service levels for our communities within a constrained budget. It isn't necessarily just about saving money, but ensuring what we invest delivers the 'right work, in the right place, at the right time'. The dTIMS optimisation and budget strategies have become a very powerful tool to deliver across the complex balance of these factors."

SUPPORTING CONTRACTORS

Dr Henning says the system also helps contractors by improving planning and decision-making and allowing more effective operational management. "It provides more clarity on the specific works required for an unsealed network, something that, up to now, was a challenge to determine. With better, more efficient planning and execution of their work, contractors' opportunities for profitability improve."

Mr Bartlett agrees. "The system is designed to support a range of the

operational and tactical decisions taken by contractors, work supervisors, grader operators and roading engineers with regards to managing unsealed roads," he says. "This complex process can then be communicated back to managers, decision-makers and stakeholders as part of our activity management planning."

"The model gives us completely new tools to present the unsealed roads works programme, our past performance and our desired outcomes against budget and resourcing scenarios in ways that were not possible until now."

In essence, the system assists the operational and tactical management of unsealed roads by monitoring and adjusting grading programmes on the basis of road class, traffic volume, customer feedback and inspections; minimising road condition deterioration and gravel loss through selecting appropriate material from existing borrow pits, taking account of direct costs (material plus haulage) and long-term costs (e.g. grading needs); and provides an ongoing performance reporting framework that highlights areas of specific issues, such as customer complaints, safety issues and high routine maintenance costs.

OUTCOMES AND THE FUTURE

One of the key outcomes of the project for CODC was a modelled representation of their unsealed road network that reflects 'on the ground' situations. "We can take a tactical and strategic approach to unsealed road asset management which we couldn't do before. The system captures knowledge that has often only been held in the minds of a few local experts. It allows us to apply it to advanced asset management frameworks," says Mr Bartlett.

"We have earmarked around \$6.5 million of operational and capital investment for the management of key infrastructure assets. Taking a step back has given us an incredible opportunity and allowed us to optimise these funds and begin to balance the wide range of work programmes within our region."

Results from CODC's unsealed road

analysis will be part of developing their strategic and programme business cases for the 2021-24 activity management plan and creating a targeted network/site validation inspection to ensure model recommendations fit with what is seen on the unsealed roads.

"I think the collaborative nature of IDS projects like this provides huge benefits for our industry," Andy Bartlett concludes. "We can access cutting-edge research and new approaches being worked on at experimental and 'prototype' stages. We can engage national and international experts to directly assist with projects, build close working relationships with academics, engineers, and modellers, and support the use of 'big data' and specialised software, such as Deighton Associates' dTIMS system."

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Initial group session at the launch of the unsealed roads model at the University of Auckland's Newmarket Campus

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