



Opus Research





INTRODUCING OPUS RESEARCH

I am delighted to introduce Opus Research's brochure profiling our services and capabilities.

The team at Opus Research is committed to making the world work better.

Opus Research provides a broad range of high quality research, specialist consultancy and laboratory services to improve the design and performance of infrastructure for commercial and government clients.

Built on a proud history that dates back more than 50 years to the New Zealand Ministry of Works, Opus Research was established to undertake experimental research and to inform the design and construction of major national infrastructure projects such as hydroelectric dams and state highways.

Today, our team include engineers, chemists, physicists, materials scientists, environmental scientists, geographers and behavioural scientists. We work in multi-disciplinary teams to address challenges as diverse as transportation safety, the performance of roads, and the resilience of communities and business to major natural hazard events.

To complement our research we provide specialist consultancy services, as well as materials testing and analysis services for a wide range of engineering construction materials. Our management and operating practices are accredited to the International Quality Management System, ISO 9001, and many of our laboratory services have ISO 17025 accreditation.

We are always looking for opportunities to apply our capabilities and expertise to benefit our clients. Please contact me or one of the Opus Research team if we can assist you in any way.



PETER BENFELL

Opus Research Leader

e. Peter.Benfell@opus.co.nz



OUR SECTORS



TRANSPORTATION

Opus Research provides a wide range of services in the land transportation sector. Our work includes research around road networks, public transport, active transport modes such as walking and cycling, and the integration of transport with land use. While traditionally roading has been a major focus, we also work with rail and ports, assisting our clients in the planning, development, operation and maintenance of their infrastructure assets. Our clients include a variety of asset controlling authorities, planning agencies, private developers and transport operators.



BUILDINGS, STRUCTURES AND UTILITIES

We provide a variety of services to support both the design and durability of new and existing buildings, structures and utilities. These services range from the wind impacts of building designs to the maintenance and durability of a multitude of concrete structures and the resilience of underground services. We also undertake seismic refraction and reflection surveys. As a result, our clients include architects, commercial property developers, as well as asset owners and managers.



ENVIRONMENTAL

Much of Opus Research's work is focused on achieving more environmentally sustainable infrastructure, which includes understanding the effects infrastructure has on the adjacent community such as noise and air emissions. This work includes research to better quantify these effects, and assessment of particular infrastructure projects to identify their effect and advise on mitigation where necessary. Our clients include transport planners and operators, as well as central and local government agencies.



SOCIETY AND BUSINESS

We work to improve the health and resilience of both society and business through providing research and consultancy services to government, businesses and communities, including building increased resilience to natural hazards and developing improved liveability of cities. We also assist our clients in developing their long-term infrastructure strategies and plans, as well as helping to review the effectiveness of their existing policies and strategies.



OUR SERVICES



CONCRETE DURABILITY ASSESSMENT

Even concrete can deteriorate, affecting the serviceability of any structure made from it.

Opus Research puts its extensive experience to good use in providing an independent service for the condition assessment, maintenance and repair of concrete structures. This type of specialist diagnosis is increasingly being used as an asset management tool to assist in the planning of maintenance and expenditure. Assessment work is carried out throughout New Zealand as well as in Australia and the Pacific Islands.

Our concrete technologists are trained to operate in virtually any situation, including heights, confined spaces, waste water environments, from floating platforms or boats, and on State Highways. They combine a detailed visual inspection with specialist instrumented testing, which can establish the cause and extent of any deterioration, as well as identifying technically appropriate and cost effective options to fix it. For structures with little or no deterioration, assessments can help inform the development of a long-term maintenance and repair strategy including options for proactive maintenance. Deterioration modelling is used as a tool to predict the remaining life of structures.



ENVIRONMENTAL EFFECTS AND MITIGATION

In terms of the effect they have on the people in our communities, noise, ground vibration and emissions into the air are most often the three top environmental side effects of transport and infrastructure that are of concern to communities.

Managing them requires in-depth knowledge of five key, interlinked factors:

- How the activity generates noise, ground vibrations, or air emissions;
- How to effectively measure the noise, ground vibrations or air emissions;
- How the transmission of noise, ground vibrations, or air emissions conveys and influences the effects to the adjacent community;
- How the community responds to these effects and
- How the effects can be meaningfully mitigated, as well as the benefits and costs of that mitigation.

Opus Research's team brings all of these factors together. For example, when it comes to road traffic noise, we have researched how different road surface types affect the level of noise generated, how communities respond to noise and how the noise generated by a road influences the value of adjacent properties. This knowledge is then used to inform national standards or is incorporated in policy or guidance documents such as those produced by New Zealand Transport Agency.

The research also provides a strong technical base for providing environmental assessments of specific projects such as new roads or the construction of major infrastructure. As part of these assessments, we regularly provide independent expert evidence to councils, Board of Inquiry or Environment Court hearings.



FUTURE INFRASTRUCTURE SOLUTIONS

Building on their knowledge of present day infrastructure and how people interact with it, our team are able to assess what the future is likely to demand of infrastructure assets so that clients develop the most resilient and efficient solutions.

The highly effective and reliable tools we have established for use in hypothetical scenarios can be used to develop a robust and sophisticated understanding of likely future behaviour, creating the opportunity to test innovative but potentially higher risk interventions.

We can look at solutions across a range of topics – from transport to urban planning, housing to natural hazards – and collaborating closely with our clients is essential to ensure we develop realistic situations.



MEASUREMENT DEVICES AND INSTRUMENTATION

Opus Research's instrumentation and mechatronics engineers are skilled in applying current technology to any measurement, computer interfacing or data collection problem you may have.

We have particular expertise in designing, developing, operating and repairing measurement and control systems used in the laboratory and in the field. Through software development, we can also assist in extending, improving and streamlining existing data measurement, collection and analysis systems.

We can provide:

- Electronic and software design and development
- Refurbishment, repair, and upgrading of existing instruments
- Automated laboratory equipment and processes
- Data acquisition
- Signal processing
- Data analysis
- Technical evaluation of new technologies
- Compliance testing against New Zealand or international standards and specifications
- Instrument calibration.



MATERIALS TESTING AND ANALYSIS

Opus Research offers materials testing and analysis services for a wide range of engineering construction materials, and we are accredited by International Accreditation New Zealand to ISO 17025 for many of those tests. Whether laboratory-based or on-site, this testing provides the information required to carry out specialist advisory and consultancy services.

We pride ourselves on our ability to develop new test methodologies and we frequently carry out non-routine tests in order to meet our clients' needs.

Our materials testing includes:

- **Soils:** Our comprehensive soil testing laboratory offers a wide range of tests, primarily so that geotechnical and pavement engineers can define the engineering properties required to design foundations for a variety of structures.
- **Bituminous materials:** We have an extensive testing laboratory with experience in the assessment and testing of a wide range of bitumen-based materials. We perform the full suite of tests required by NZTA in their M1 specification on roading bitumens. We can also test asphaltic concrete to ensure it complies with NZTA's M10 specification including on-site removal of cores to determine density and compaction.
- **Aggregates:** Our testing ensures roading applications meet the relevant NZTA specifications. We are also equipped to carry out repeat load triaxial testing of pavement materials, as well as polished stone value testing.
- **Concrete:** Concrete testing is carried out in accordance with a variety of New Zealand, Australian and other international standards to determine fresh or hardened concrete properties, concrete, stone and clay paver performance, and cement quality.
- **Structures:** We operate a structural testing laboratory based around an extensive range of loading, measurement and data logging equipment with the capability to test a variety of materials and components under simulated load. The laboratory has a strong floor that allows virtually any material or structure, to be tested. Dynamic testing may be used to simulate seismic or cyclic loading using a range of servo-controlled test machines and actuators with capacities ranging between 5 tonnes and 200 tonnes. A shake table is used to test the earthquake resilience of a variety of materials and components. Static testing may be carried out on the strong floor using jacks and calibrated load cells or using a range of universal test machines with capacities between 1 tonne and 100 tonnes.



RESEARCH DESIGN AND EVALUATION

When assessing policies, programmes and other operational options, many organisations need independent research and evaluation services.

We offer standalone research and evaluation services that can support robust decision-making, working independently or alongside partner organisations according to what is best for each client. To do that, we draw on a large number of qualitative and quantitative research techniques and tools, including reviews, interviews, observation, data and trend analysis, and statistical modelling.



RESILIENCE TO NATURAL HAZARDS

The knowledge gained from Opus Research's body of research around natural hazards makes an important contribution to strategies and policies to build and strengthen New Zealand's resilience to hazard events.

Our work covers more traditional topics – such as wind loads and liquefaction – but also extends to topical issues including the use of social media in emergency management and the acceptance of the risk posed by older commercial and heritage buildings.

Opus Research is leading a project looking into the lessons from the Christchurch earthquakes when it comes to improving the resilience of underground infrastructure. And, our work within the Natural Hazards Research Platform investigates the social science aspects of resilience and recovery from natural hazards.

In this field we work closely with emergency managers, planners policy makers, business and community organisations, and infrastructure owners.



ROADING PERFORMANCE AND DESIGN

Understanding the behaviour of road and pavement materials is fundamental in developing cost effective and sustainable road surfacings.

Our team uses a wide range of advanced techniques to improve the engineering performance and durability of existing roading materials, surfacing and pavements, as well as working on non-standard and modified materials. Opus Research is also developing sustainable solutions based on renewable biomass raw materials, recycling and extreme long-life pavements.

Our research and service areas include:

- Pavements and aggregates
- Pavement design
- 3D Finite Element Analysis
- Repeated Load Triaxial testing of aggregates
- Subgrade testing and analysis
- Stabilisation
- Unsealed Roads
- Bitumen chemistry and rheology
- Chip seal and asphalt surfacings
- Biomaterials in roading
- Bitumen emulsions.
- Recycling of roading materials
- Environmental effects.



SOCIO-ECONOMIC RESEARCH AND EVALUATION

Understanding the motivation behind public behaviour is a key aspect in identifying and prioritising possible mechanisms for change.

Opus Research's applied social researchers examine public attitudes, behaviour and decision making in relation to complex social and economic problems, and the results of this work underpins business cases, policy direction, design interventions and targeted social marketing campaigns.

Our research and evaluation services include:

- Prioritising behaviour change interventions
- Community based social marketing
- Programme evaluation
- Developing indicators of social and economic performance
- Economic analysis (including willingness to pay studies)
- Geographic impact evaluation (using Geographic Information System Mapping)
- Monitoring customer satisfaction
- Identifying impacts of environmental factors (including social and health outcomes).



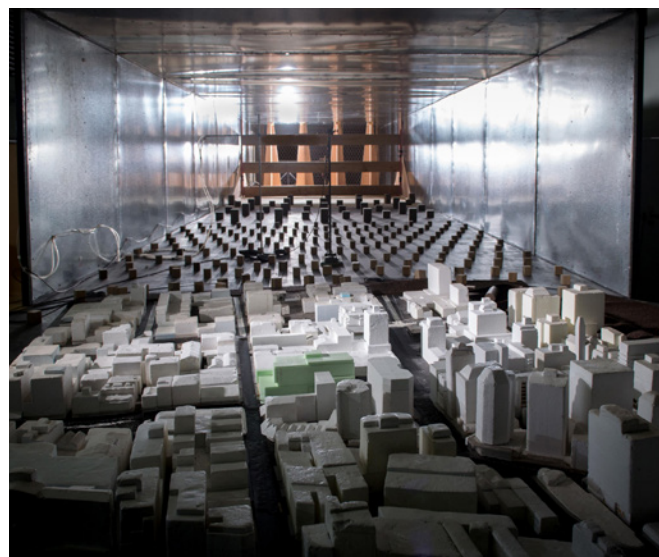
TRANSPORT AND BUILDING SAFETY

Preventing injury in transport and the built environment is a key focus for Opus Research.

Our team includes some of New Zealand's top researchers in the areas of statistical crash modelling, slip and skid testing, structural integrity and human factors evaluations. Many of our researchers sit on safety focused review panels as well as offer expert reviews for safety focused journals and specialist technical advice regarding safety initiatives and standards.

Our research and testing services include:

- Crash Analysis System (CAS) interrogation
- Safety management of road networks (through KiwiRAP and crash prediction models)
- Road crash reconstruction using PC Crash
- Skid resistance (e.g. GripTester surveys and British Pendulum Testing)
- Pedestrian slip testing
- Building safety standards
- Instrumentation and data capture
- Evaluation of safety interventions
- Structural integrity testing (in particular concrete structures)
- Human factors evaluations (including human performance testing).



WIND ENGINEERING AND INDUSTRIAL AERODYNAMICS

Because wind and airflows can directly impact on performance, safety and comfort, they are an important consideration in the design of infrastructure and vehicles, which requires specialist techniques and knowledge.

Opus Research covers all disciplines required for full-scale and model studies of wind and air flows, including instrumentation technology, aerodynamics and fluid mechanics, vibration and structural dynamics, and wind tunnel testing.

These services are highly valued for a wide range of applications, including:

- Wind tunnel testing of buildings and structures at model scale
- Measurement of wind forces on buildings and structures
- Design of structures for wind effects
- The response of structures to wind
- Wind effects on pedestrians
- Wind speed over hills
- Air pollution
- Full-scale testing of wind effects on structures and components
- Product evaluation – performance relating to air flow
- On-site wind speed measurements
- Vibration monitoring
- Wind energy.

FOR FURTHER INFORMATION CONTACT

CONCRETE DURABILITY ASSESSMENT

Sheldon Bruce
t. +64 4 587 0607
e. Sheldon.Bruce@opus.co.nz

Sue Freitag
t. +64 4 587 0613
e. Sue.Freitag@opus.co.nz

ENVIRONMENTAL EFFECTS AND MITIGATION

Vince Dravitzki
t. +64 4 587 0638
e. Vince.Dravitzki@opus.co.nz

Tiffany Lester
t. +64 4 587 0662
e. Tiffany.Lester@opus.co.nz

FUTURE INFRASTRUCTURE SOLUTIONS

Vince Dravitzki
t. +64 4 587 0638
e. Vince.Dravitzki@opus.co.nz

Jared Thomas
t. +64 4 587 0675
e. Jared.Thomas@opus.co.nz

MATERIALS TESTING AND ANALYSIS

Soils

Sheldon Bruce
t. +64 4 587 0607
e. Sheldon.Bruce@opus.co.nz

Bituminous materials and aggregates

Gary Bentley
t. +64 4 587 0634
e. Gary.Bentley@opus.co.nz

Concrete

David Wong
t. +64 4 587 0619
e. David.Wong@opus.co.nz

Structures

Guillaume Roux
t. +64 4 587 0603
e. Guillaume.Roux@opus.co.nz

MEASUREMENT DEVICES AND INSTRUMENTATION

Peter Cenek
t. +64 4 587 0637
e. Peter.Cenek@opus.co.nz

Russell Kean
t. +64 4 587 0691
e. Russell.Kean@opus.co.nz

RESEARCH DESIGN AND EVALUATION

Jared Thomas
t. +64 4 587 0675
e. Jared.Thomas@opus.co.nz

RESILIENCE TO NATURAL HAZARDS

Vivienne Ivory
t. +64 4 587 0636
e. Vivienne.Ivory@opus.co.nz

Rosslyn McLachlan
t. +64 4 587 0699
e. Rosslyn.McLachlan@opus.co.nz

ROADING PERFORMANCE AND DESIGN

Kym Neaylon
t. +64 4 587 0629
e. Kym.Neaylon@opus.co.nz

Phil Herrington
t. +64 4 587 0615
e. Phil.Herrington@opus.co.nz

SOCIO-ECONOMIC RESEARCH AND EVALUATION

Jared Thomas
t. +64 4 587 0675
e. Jared.Thomas@opus.co.nz

Vivienne Ivory
t. +64 4 587 0636
e. Vivienne.Ivory@opus.co.nz

TRANSPORT AND BUILDING SAFETY

Bill Frith
t. +64 4 587 0690
e. William.Frith@opus.co.nz

Peter Cenek
t. +64 4 587 0637
e. Peter.Cenek@opus.co.nz

WIND ENGINEERING AND INDUSTRIAL AERODYNAMICS

Paul Carpenter
t. +64 4 587 0600
e. Paul.Carpenter@opus.co.nz

Neil Jamieson
t. +64 4 587 0617
e. Neil.Jamieson@opus.co.nz

Opus Research

33 The Esplanade, Petone 5012
PO Box 30 845, Lower Hutt
Wellington, New Zealand
t. +64 4 587 0600
f. +64 4 587 0604

Opus International Consultants
www.opus.co.nz/opus-research

