UNSW SYDNEY

Capabilities portfolio

August 2025

UNSW Water Research Laboratory

About WRL

The Water Research Laboratory is a world-leading fundamental and applied research organisation tackling the most challenging water engineering problems faced by the world today.

Based on Sydney's Northern Beaches and part of the School of Civil and Environmental Engineering at UNSW Sydney, our globally esteemed laboratory is home to advanced facilities, equipment and personnel comprising the most experienced and creative problem solvers in their respective areas of research and industry.

For over 60 years we have successfully bridged the gap between industry and academia. Combining professional engineers and scientists completing commercial projects for industry and government, with an academic team focused on high quality education and research.

Our areas of expertise include:

- Coastal, ocean and estuarine engineering and management
- River flow, floodplain management and catchment hydrology
- Eco engineering, wetland restoration, environmental studies, and climate change adaptation
- Groundwater research and management
- Hydraulic engineering and environmental fluid mechanics

Coastal, ocean and estuarine engineering and management

Key areas

- Offshore and coastal structures
- Ports, harbours, marinas, breakwaters & dredging operations
- Sea level rise
- Coastal and estuarine processes
- Foreshore protection & management studies
- Coastline monitoring and analysis
- Coastal zone management

Established in 1959, WRL is widely regarded as an industry leader of Coastal Engineering practice in Australia.

Investigations utilising state-of-the-art technologies in both numerical (spectral and phase resolving wave) and physical (2D flume and 3D basin) model studies include wave generation and propagation, wave run-up and overtopping, wave forces and stability of coastal structures, littoral sediment transport, tidal hydrodynamics and entrance stability, coastal and estuarine morphology, beach and shoreline erosion and estuarine sedimentation. Automated coastal imaging techniques are applied for both pre-, during, and post- assessment of the full range of coastal engineering and management activities.

Particular areas of expertise include coastal and process understanding, sea level rise effects, coastal hazard definition and inundation studies, foreshore revetment design and testing, coastal zone management, dredging and beach nourishment, design optimisation of coastal structures, harbours, ports and marinas, ‘real time’ coastal monitoring and measurement utilising leading-edge coastal imaging techniques, impact assessment of nearshore coastal structures on beach planform, peer review and forensic coastal engineering.

River flow, floodplain management and catchment hydrology

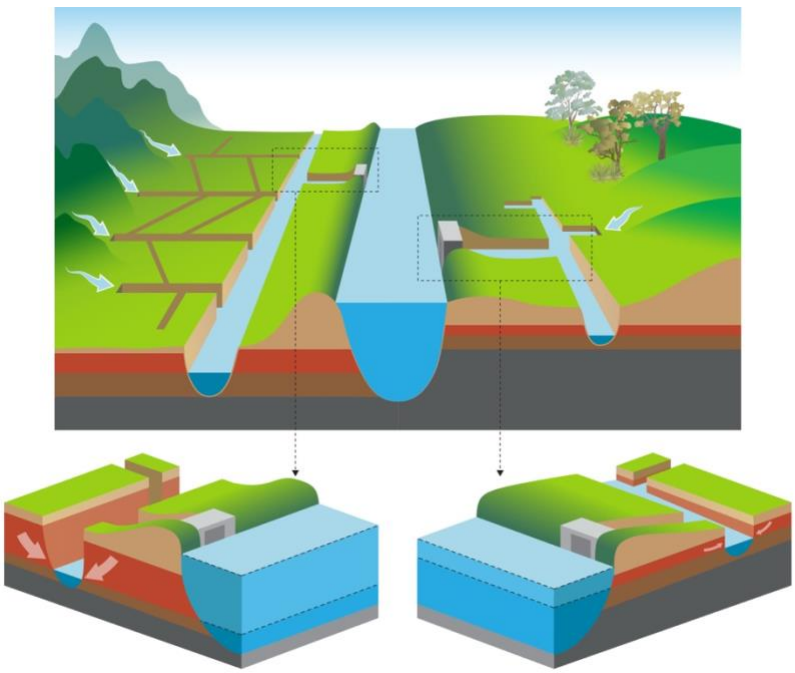
Key areas

- Hydrology and water quality in urban and rural catchments
- Flow, sediment transport and geomorphic behaviour of rivers
- Environmental flows
- Reservoir dynamics and water quality
- Floodplain modelling
- Flood risk & hazard assessment
- Water budgets

The team of engineers at the Water Research Laboratory have specialist expertise to provide solutions for critical water resource issues including catchment hydrology and runoff quality, water budgeting, reservoir operations, environmental flows and the sedimentation, geomorphology and flooding of rivers.

With a strong foundation in the fundamentals, WRL is well placed to make proper use of hydrological and hydraulic models, to understand their strengths and weaknesses and to ensure models are properly calibrated and interpreted. WRL combines these skills with other expert services of groundwater to provide a holistic analysis of catchment hydrology and water resources.

Recent studies have concentrated on the water quality of road runoff, harvesting of catchment runoff in a western reservoir, environmental flow regimes to protect riverine flood plain ecology, design of a sediment trap slot to reduce riverine sediment loads and improvement of water quality in drinking water reservoirs through management and engineering options.



Eco engineering, wetland restoration, environmental studies, and climate change adaptation

Key areas

- Climate change adaptation/impacts
- Sewage outfalls, desalination impacts and pollutant releases
- Restoration of wetlands and estuaries
- Boat wake wave impacts and management
- Study design and monitoring in oceans, estuaries, rivers & lakes
- Environmental data collection
- Environmental modelling

Eco engineering combines the resources of groups within the Water Research Laboratory to provide an integrated assessment of environmental impacts. Teams comprising engineers, scientists and technicians are formed to best address the needs of each client, resulting in a unique, tailored solution to the assignment. Emphasis is placed on understanding the processes which dominate the movement and dispersion of pollutants, with each project uniquely designed, managed and executed.

WRL personnel are highly experienced in providing innovative answers to complex Environmental Engineering questions throughout Australia and overseas. Work centres around three major areas of investigation: Identification and quantification of pollutants discharged to the environment; the movement of pollutants through the domain of interest; and their impacts en-route and at their final resting place.

WRL places a high emphasis on the measurement and understanding of the physical processes occurring in the environment, so that the interaction with ecological processes can be best understood. WRL understands the importance of quantifying environmental effects so that decision making and planning can be undertaken.

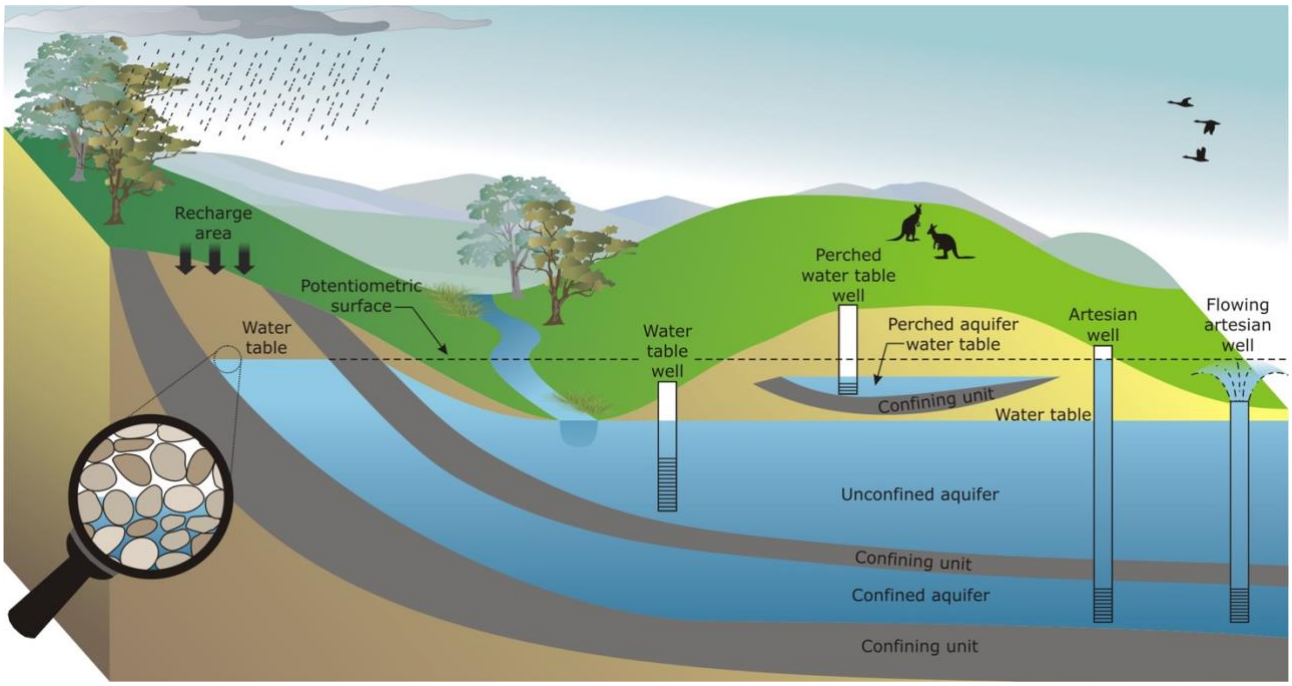
Groundwater research and management

Key areas

- PFAS and chemicals of concern
- Leakage assessment
- Groundwater supply
- Groundwater quality
- Coastal dune aquifers
- Fate of contaminants

The Water Research Laboratory has a team of hydrogeologists and environmental engineers who are highly regarded for groundwater problem solving. This team is recognised in Australia and internationally for project services and applied research in; geophysical imaging and borehole tomography of the subsurface; groundwater chemistry and geochemical indicators of leakage through clay barrier systems.

A pragmatic approach to solving groundwater problems is adopted by project staff, in consultation with industry and government agencies. Studies generally commence with a desktop investigation followed by design and implementation of specific data collection programs.



WRL has extensive borehole, geophysics and logging instrumentation along with numerical models and chemistry laboratory facilities to aid with data interpretation and process understanding. The application of these expert groundwater services include: effluent reuse and disposal, salinisation, water budgets, groundwater quality, transport and fate of contaminants, acid sulphate soils and leakage through clay barriers.

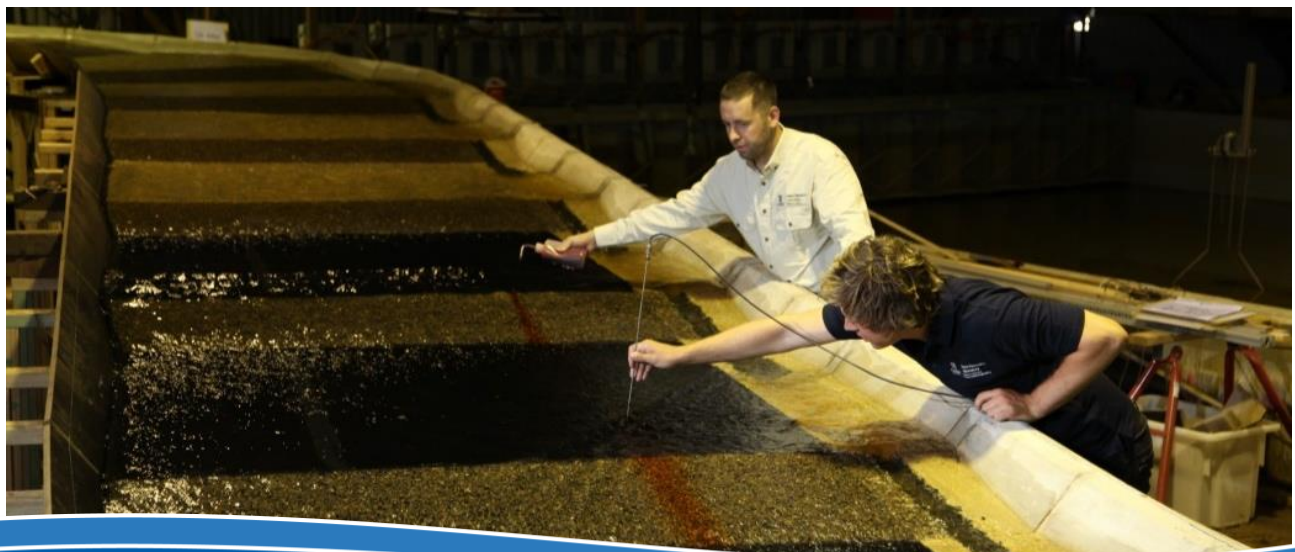
Hydraulic engineering and environmental fluid mechanics

Key areas

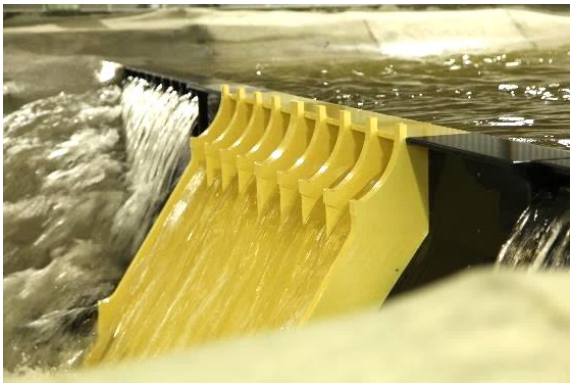
- Hydraulics of industrial plants
- Performance of hydraulic structures
- Outfall hydraulics
- Pipes, pumps and open channel flow

The Water Research Laboratory has several decades experience in the research, investigation and application of fundamental and applied civil engineering hydraulics. This field of expertise encompasses performance assessment of hydraulic structures such as dam outlet works, energy dissipaters, ocean outfalls, spillways and levees and plants such as pump stations, hydro and thermal power stations, water and wastewater treatment plants. WRL also has a depth of experience and equipment for the accurate measurement of flows and flow patterns.

Studies are undertaken as either desktop studies, field measurement studies, numerical modelling (CFD) or physical model laboratory studies. A strong understanding of the fundamentals of flow, cavitation, flow paths, pressure waves, turbulence, multi-phase flow and sediment transport ensures that effective and appropriate levels of study are undertaken. When hydraulic behaviour is crucial to the operations of large (or small) infrastructure, WRL can utilise its knowledge and experience, specialist hydraulic laboratories and instrumentation to provide robust and cost saving solutions.



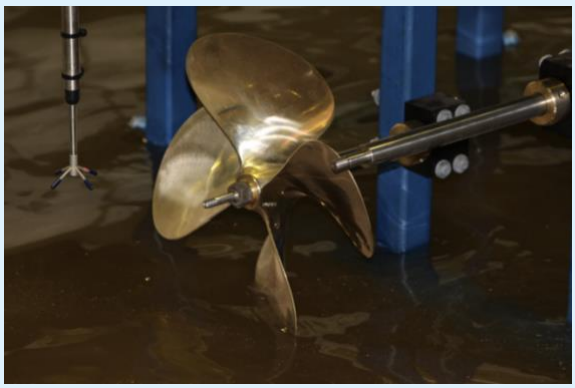
Project highlights



Somerset Dam physical model

WRL was commissioned by Seqwater to model the existing dam at Somerset. With our physical model of the dam, we were able to test various proposed designs to support a dam safety upgrade. The stability of the hydraulic jump and channel scour were extensively studied, with a number of design changes required to achieve safe operating conditions. This was the first site specific dam model to use 2D Lidar and DTCP in measurement of flows.

Managing the infrastructure impacts of the new mega-ships



With the increasing size of ocean liners and cargo vessels, many newer and larger ships are equipped with their own systems for manoeuvring and berthing in confined areas - a role that was once performed by tugboats. WRL has recently opened a dedicated prop-wash facility for physical modelling the effects of ship side thruster forces on existing armoured berths and ports.

This new facility consists of a 4 m by 7 m, 1.4 m deep basin in which a model of the port infrastructure (often with a mobile bed included) and erosion protection solutions can be installed and tested. The basin is equipped with four submersible frequency-controlled power motor units and various sized propellers, which can simulate a wide range of vessel types.

From acidic nightmare to wetland paradise

Winner of a Green Globe Award for Natural Environment Sustainability, this ongoing project has determined priority areas for wetland creation at Big Swamp, detailed innovative on-ground methods, modelled flooding impacts and undertaken large scale on-ground works to restore and create new wetlands. Big Swamp is a series of drained agricultural floodplains located on the Manning River estuary in NSW.

Once known for its abundant bird population, the system has undergone major hydrologic modifications over the past, due to the construction of an extensive floodplain drainage network system and floodgates. For many years, the site has been listed as one of the three worst acid sulfate soil hotspots in NSW. To date, our team have contributed to over 700 hectares of degraded landscapes being restored into functioning wetlands; including 80 hectares of new tidal wetlands. It has also elevated ground water levels above the acidic soil layer, and re-inundated over 620 hectares, encouraging the migratory birds to return.

Affordable coastal protection project

Erosion and recession of shorelines is a significant concern to many Pacific Island countries at the frontline of climate change. WRL have been working with the Pacific Region Infrastructure Facility and Tonkin + Taylor to investigate coastal protection options used across the Pacific region, and to build on this knowledge to develop more innovative and cost effective coastal protection solutions.

The objective was to identify and develop coastal protection solutions that maximise the use of local materials and labour while, at the same time, minimising the need for imported goods and equipment – characteristics that are unique to individual islands of the region. The project not only catalogued and evaluated existing approaches to shoreline protection based on technical, social and environmental criteria; it also included a range of scale physical modelling tests to assist with developing design guidance for several of the innovative protection options identified as having high potential.

World-leading coastal monitoring system

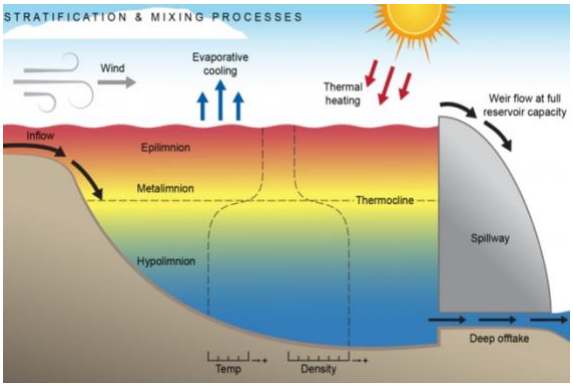
WRL's mainstream Coastal Imaging program has achieved significant milestones recently, becoming the largest Coastal Imaging network in the world. With 45 cameras now providing continuous coverage of over 30 km of Gold Coast coastline, we have completed what is the most advanced beach monitoring system globally in collaboration with geospatial mapping specialists, Geoplex. The project being reconised with a NSW Asia-Pacific Spatial Excellence Award (APSEA) in the Technical Excellence category.

The cameras are installed along high-rise rooftops and lifeguard towers to provide images of the coastline and then combined with image-based mapping of spatial data. This information is analysed and displayed on a live dashboard to view and assess beach conditions.

Supporting increased aquaculture production through reduced harvest closures

In partnership with the NSW Food Authority and supported by local councils, WRL is using non-toxic dye tracer to map 11 selected NSW river systems that support oyster growers. From the Tweed in the north, down to Pambula on the far south coast, the data gathered will be used to develop detailed computer models simulating the river currents, and how a potential sewage or pollution spill will spread and dilute once in an estuary.

It is hoped that this information will avoid the need to shut entire river systems to oyster harvesting in the future, where currently if there is a sewage spill, the whole estuary is closed to oyster harvesting. The models produced by WRL will be crucial decision-making tools and will help ease the pressure on oyster growers.



Cold water pollution: What is it, and how can we limit its environmental impacts?

Cold water pollution is a serious environmental issue affecting the river systems downstream of large storage dams. Dams are often fitted with offtakes that withdraw water from deep parts of the reservoir. In summer, increased temperatures warm the water in rivers and at the surface of dams; however, this warming does not extend down to the deep waters at the bottom of the dam, resulting in cold water being released into the downstream river environment. This cold water significantly impacts the migration, breeding and growth of fish for many tens of kilometres downstream from a dam.

WRL investigated a variety of systems that could artificially mix the dam water, resulting in a constant temperature from the surface to the bed. Our study concluded that bubble plumes (created through pumping air to the bottom of the dam) are a feasible option for this strategy, if coupled with renewable energy.

Floodwaters can turn cars into deathtraps

In a world first, WRL engineers have discovered just how easily cars can be washed away by even the smallest currents - making crossing of floodwaters a dangerous and potentially life-threatening decision. Replicating scenarios faced by many stranded motorists, WRL tested how small and large cars behave when they encounter flash floods in a specially configured test tank using actual cars, rather than previous experiments that have relied on vehicle miniatures. The research has shown just how little water it takes to make even a large vehicle unstable, with the cars becoming vulnerable to moving once the depth of water reached the floor of the car. Even in low water depths and slow flow speeds, floodwaters had a powerful enough force to make the cars float away.

CoastSnap: Community beach monitoring

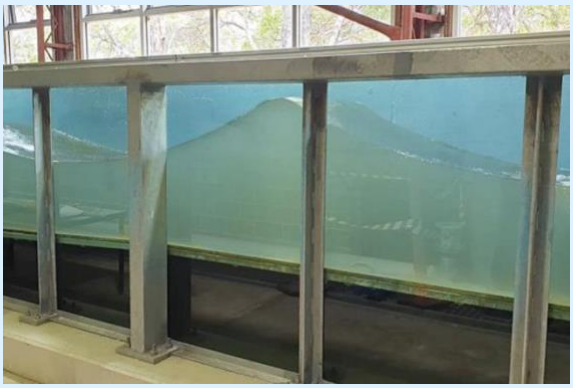
CoastSnap is a global citizen science network that harnesses community captured photos to monitor changing coastlines. From humble beginnings on Sydney's Northern Beaches, CoastSnap has grown exponentially, with tens of thousands of photos taken from over 300 CoastSnap Beach Monitoring Stations worldwide!

The simple system provides a platform for community members to snap images of a beach from a fixed position using their smartphones and share the images via a purposely built CoastSnap App. WRL has created a package of tools to analyse the crowd-sourced imagery, which can quantify erosion and accretion of beaches using nothing more than photos posted by members of our community. The aim of CoastSnap is to turn this incredible amount of information into something that can be used to understand how coastlines change through time – whether it be due to rising sea levels, extreme storms or other factors. Ultimately, this information can be used to improve the way coastlines are managed into the future.

Major facilities

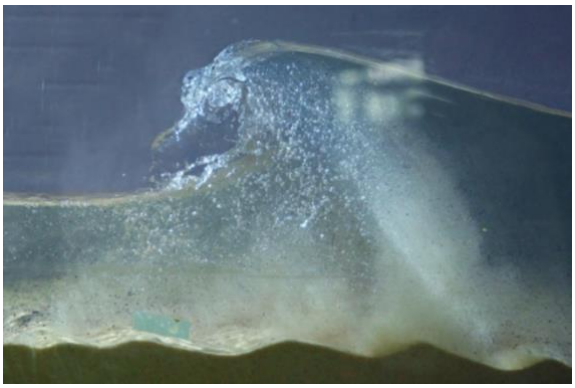
0.4 m tilting flume

WRL's newest flume measures 10 m in length, 0.4 m in width and 0.8 m in depth. The flume floor is constructed of acrylic and the walls are constructed from glass, allowing our engineers to make visual observations of the sides and bed of the flume. The flume is equipped with a winch that can lift the flume to a grade of 10%, allowing the flume to be used in a wide range of flow conditions. The recirculation system can produce flow rates of up to 130 L/s, allowing the flume to quickly test the effect of both slope and flow rate on stability, sedimentation or a range of other parameters.



0.9 m wave and open channel flume

WRL's 0.9 m wave flume measures approximately 36 m in length, 0.9 m in width, and 1.6 m in depth. The flume walls are primarily constructed of brick, with a large glass paneled section where models are constructed, allowing visual observations to be made throughout testing. The permanent floor of the flume is constructed of concrete, although site specific two-dimensional bathymetric profiles can be reproduced in the flume using an adjustable elevated timber floor system.



1.2 m wave flume

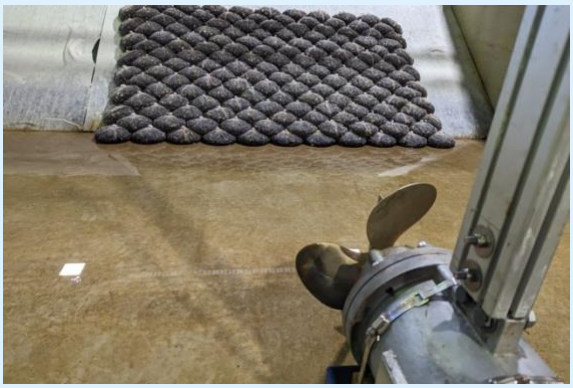
Our 1.2 m flume is our flagship physical modelling facility which is regularly used to optimize coastal structures around the world. Measuring in at 1.2 m wide x 1.6 m deep x 44 m long; our technicians and engineers construct and test bespoke 2D models in this flume with scales ranging between 1:10 to 1:50 and model waves up to 0.4 m.

3 m wave flume

Our 3 m wave flume is one of the largest flumes in Australia. It is 32 m long by 3 m wide by 1.3 m deep and has a level floor. The new HR Wallingford wave generating paddle occupies 3 m of flume length, giving a useable length of 29 m. Bathymetry is added (when required) by installing either a sand or plywood bed to the required slope. The size of the flume means that quasi three-dimensional tests of structures such as breakwater heads can be undertaken at large scale without the expense of a fully three-dimensional basin model.

Wave basin

WRL's wave basin is used for wide range of coastal studies including coastal structures, breakwater and harbour models and beach morphology investigations. Our basin underwent a complete rebuild in 2022 increasing in size, depth and capability, creating a coastal investigation facility unique to Australia. Our basin is capable of testing long-crested or short-crested waves, sensitivity testing to a range of wave directions, for both operational and extreme wave conditions, using our segmented wave maker.



Prop-wash basin

WRL has a dedicated prop-wash facility for the physical modelling of the effects of ship side thruster forces and vessel propeller wash on port and coastal infrastructure. This facility consists of a 4 m x 7 m x 1.4 m deep basin in which project specific bathymetry, mobile sediments and breakwater armour can be installed. The basin is equipped with four submersible frequency-controlled power motor units and various sized propellers which can simulate a wide range of thrusters or Azipods and vessel types.

Spillway flume

Our spillway facility is a unique open channel flow facility allowing continuous uncontrolled and gated spillway experiments with large flow rates. Large flow rates and high Reynolds numbers are needed to limit scale effects and to provide reliable design guidelines for prototype scale hydraulic structures.

The people of WRL

Academics

Associate Professor Kristen Splinter, *Managing Director*
Kristen is the Managing Director of WRL. Kristen's area of expertise is in Coastal Engineering. Her research covers broad topics including storm to inter-annual shoreline change monitoring and modelling; coastal erosion and beach recovery; dune erosion; remote sensing of the coastal environment; and reef-top hydrodynamics. Kristen has a strong desire to support and encourage more women into the discipline. She currently advocates for better gender equity within the Faculty as a member of the Equity, Diversity and Inclusion Committee, and Chair of the Faculty of Engineering Gender, Equity and Diversity Working Group, and internationally as a committee member of the Women in Coastal Geosciences and Engineering (WICGE).

Associate Professor Martin Andersen
Martin has been with WRL since 2006 and has been part of the Connected Waters Initiative (CWI) where he has worked on a large research project for the Cotton Catchment Communities CRC, investigating surface water groundwater interactions. Martin's primary research interest is groundwater geochemistry with practical applications for water resources and water quality problems.

Associate Professor Stefan Felder, *Deputy Director*
Stefan is an expert in physical modelling of turbulent free-surface flows. His research interests include transitional open-channel flows and air-water flows in hydraulic structures. Stefan has gained experience at several hydraulic laboratories in Germany, the UK and Australia. Stefan teaches undergraduate and postgraduate courses in water engineering with special focus on fluid mechanics and hydraulics.

Professor William Glamore
Will has been with WRL since 2003 and has managed and undertaken several large studies during this time. His primary fields of interest are related to estuarine hydrodynamics and water quality including restoration of estuarine environments, acid sulphate soils, coastal wetlands and boat wake waves. He is currently co-lead in "Project Halo", a large Nature-based solution project focusing on mangrove restoration in Fiji.

Associate Professor Mitchell Harley, *Scientia Fellow*
Mitch specialises in the field of coastal morphodynamics, wave climatology, coastal modelling and early warning systems for coastal hazards. His research has led to several seminal publications in distinguished journals such as the Journal of Geophysical Research, the International Journal of Climatology, Coastal Engineering, Geomorphology and Natural Hazards Earth System Sciences, and is cited in the latest IPCC report on impacts, adaption and vulnerability to climate change.

Dr Yongjing Mao
Mao is an expert in integrating coastal morphology knowledge with remote sensing and machine learning methods to understand shoreline changes and predict future states at regional, continental, and global scales. His research interests include the application of remote sensing, deep learning, and data assimilation to shoreline monitoring and modelling, with a focus on improving satellite-derived shoreline mapping through SAR-Optical fusion, employing data assimilation for shoreline modelling, and using innovative deep learning spatio-temporal models to predict future shoreline changes.

Dr Laura Montano

Laura is an Associate Lecturer in Humanitarian Engineering at the School of Civil and Environmental Engineering. She holds a PhD in hydraulic engineering from UNSW, for which she obtained the Dean's Award for Outstanding Thesis (Top 10% of the theses). Laura holds a Bachelor of Environmental Engineering and a Master of Science in Civil Engineering with an emphasis in Hydraulic Resources from Universidad de Los Andes, Bogota, Colombia. Laura is currently part of “Project Halo” a multidisciplinary project investigating mangrove restoration projects as an option to increase resilience and adaptation in Pacific Islands' communities.

Professor Denis O’Carroll, *Deputy Head of School (Research)*

Denis has ongoing research projects developing nanometals for contaminated site remediation, investigating the environmental fate and ecotoxicity of nanoparticles released from commercial products, improving the understanding of the fate of nonaqueous phase liquids in the subsurface and developing climate change mitigation measures in urban areas.

Professor Ian Turner, *Deputy Head of School (Industry and Innovation)*

Ian is a Professor and is also Deputy Head of School, Civil & Environmental Engineering. From 2014 to 2020 Ian was the Managing Director of WRL. He is a Senior Coastal Specialist in WRL’s Coast and Estuary investigations group. Ian’s current research interests include beach groundwater dynamics and sediment transport at the beach face, monitoring of coastal change and impacts of climate variability, coastal erosion control and coastal management, and coastal aquifer hydrogeology.

Project Engineers

Dr Francois Flocard, *Director - Industry Research*
Francois has over 15 years of applied experience working on a range of consulting engineering projects in coastal engineering and the marine renewable energy sector. Francois has managed projects in the fields of coastal hazards, coastal structures, climate change adaptation, physical and numerical modelling, and coastal monitoring. Francois is also an expert in the field of marine renewables; having managed the installation of a 250 kW pilot device in Victoria and led several large studies related to wave dynamics and wave energy conversion. Francois brings to WRL the combined attributes of a practical engineering background and academic analysis to resolve complex coastal and hydraulic problems.

James Carley, *Principal Coastal Engineer*
James specialises in coastal processes, coastal hazards and physical modelling. James is one of Australia's foremost experts in the practical application of coastal process models and has extensive experience with the best currently available numerical and analytical models from around the world. James has undertaken detailed studies of beaches throughout Australia, the South Pacific, South-East Asia and the Middle East involving a review of historical events, prediction of future response to storms, climate change and sea level rise, and beach response to structures.

Fred Chaaya, *Senior Project Engineer*
Fred completed a double degree in Civil and Environmental Engineering, with a focus towards aspects of water engineering including hydraulics and coastal engineering. Fred is a proficient physical modeller, developing a sound understanding of complex hydraulic processes through laboratory testing of dam spillways, cruise ship prop-wash and coastal flume modelling. He is adept in a wide range of instrumentation and modelling skills, as well as model design, construction and operation. Fred's practical skills and extemporaneous problem-solving have been an asset to several projects involving field investigations and monitoring instrumentation installations.

Jonathan Chan, *Project Engineer*
Jonathan completed his Bachelor of Environmental Engineering and Computer Science at UNSW. His Honours Thesis investigated the variability of shoreline behaviour along the east coast of Australia, which contributed to him receiving a DN Foster Award in coastal engineering. Jonathan has extended his understanding of coastal and hydraulic processes through physical model testing of breakwater structures and dam spillways. He has experience with environmental data collection and has applied his computer science background conducting data analysis and visualisation.

Ian Coghlan, *Principal Coastal Engineer*
Ian has many years of experience working at WRL and has undertaken and managed a range of projects primarily in the fields of coastal structures, coastal processes and hydraulic structures. These studies include physical modelling, numerical modelling, desktop analysis, field investigations and data analysis. Ian is an Australian expert in 2D and quasi 3D flume physical modelling with expertise in the application of physical models for assessing coastal and marine structures and is also an expert in numerical modelling of rivers, estuaries and oceans and analysing large datasets.

Dr Reilly Cox, *Project Engineer*
Reilly is a Project Engineer experienced in experimental and numerical analysis with a focus towards hydraulics. He completed his PhD assessing safe fish passage in closed conduit systems at UNSW. As part of his PhD, he utilised physical models, Lagrangian sensors and CFD analysis. He has demonstrated courses for the UNSW School of Civil and Environmental Engineering over several years including Fluid Mechanics, Water and Wastewater Engineering and Advanced Water Engineering.

Dr Tommy Fellowes, *Project Engineer*

Tommy completed a PhD in 2020, focusing on the coastal processes of open coast beaches classifying them and their storm response. He has over 5 years of experience working on a range of projects investigating processes of beaches, estuaries, coral reefs, and coral reef islands. Tommy is a recognised expert in coastal processes, having worked on projects with collaborators from industry, government, and academia in Australia, New Zealand, the USA, and the Pacific. In 2024, he completed a 4-year postdoctoral research project, investigating climate threats to coral islands in Australia and Tuvalu, quantified climate drivers of island stability and developed a coral island vulnerability assessment.

Daniel Gilbert, *Project Engineer*

Daniel completed a degree of Civil Engineering at UNSW, with a focus towards aspects of water engineering including water quality, hydrology and groundwater. As a part of his studies, he completed an honours thesis performing an assessment of emerging PFAS present in landfill leachate, building upon previous work he completed as a research assistant at UNSW. Daniel has gained experience working on a wide range of projects, solving complex water-related problems and developing a sound understanding of coastal wetland hydrodynamics and fundamental hydraulic processes in the laboratory and field.

Alice Harrison, *Principal Engineer*

Alice has the unique qualifications of being a specialist water engineer with a background in economics, having completed both a Bachelor of Civil Engineering and Bachelor of Commerce. Alice is interested in estuary and coastal processes and works to bridge the gap between engineers, economists, and decision makers to improve coastal and estuary management. Her work is highly varied, from detailed hydrodynamic modelling to inform coastal floodplain and estuary management, to extensive fieldwork in both pristine and degraded environments, to completing cost-benefit analysis for large scale wetland restoration projects in NSW. Alice is particularly interested in the growing and evolving field of environmental economics, with a focus towards ensuring that the true value of the environment is acknowledged and accounted for by decision makers.

Dr Daniel Howe, *Project Engineer*

Dan is a Project Engineer with 10 years' experience in physical modelling of coastal processes and structures. He completed his PhD in swash zone dynamics which included experimental work in prototype-scale wave tanks in Germany and The Netherlands. In addition to experimental work, Dan is experienced in water and wastewater hydraulics and the design of water pipelines and pumping stations. He has a strong background in real-time coastal environmental monitoring and wave forecast systems. He also has expertise in software development, data acquisition systems, data analysis, and visualisation of large complex datasets.

Margot Mason, *Project Engineer*

Margot completed a Bachelor of Science in Hydrologic Sciences and Policy and a Master of Water Engineering. This has given her a strong background in ecology and environmental processes, in addition to technical engineering skills. She works primarily in numerical modelling using the RMA modelling suite, which is capable of both hydrodynamic and water quality modelling. She has worked in Australian Carbon Markets in both blue and green carbon, and has remote sensing experience, including experience with drone mapping using photogrammetry and the use of publicly available satellite data.

Brett Miller, *Principal Engineer*

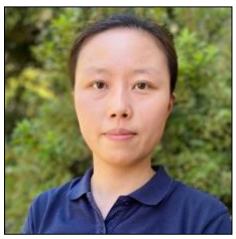
Brett is a leader in solving hydraulics and water quality problems associated with engineering and the environment. His skills are founded on a strong understanding of fundamental fluid mechanics, mathematics and both physical and numerical modelling. He has worked on many large multi-disciplinary teams where his strong management and communication skills have ensured that his specialist technical knowledge can be incorporated and understood. Brett is one of Australia's most experienced hydrodynamic, water quality and sediment transport modellers with more than 50 projects modelling oceans, estuaries, rivers, lakes and reservoirs. Brett is an international expert in all aspects of both wastewater and desalination outfalls. He has worked on over 30 outfall projects throughout Australia, the Pacific and South-East Asia.

Vincent Miller, *Project Engineer*

Vincent completed a bachelor's degree in chemical engineering at UNSW, with a focus towards aspects of water engineering including hydraulics and water quality/treatment. As part of his studies, he completed an Honours thesis investigating techniques to maximise critical mineral allocation using climate. Vincent has become a proficient physical modeller, working on various dam spillway and coastal models. He is also adept in a wide range of modelling skills, engineering software's and the use of both chemical/hydraulic instrumentation.

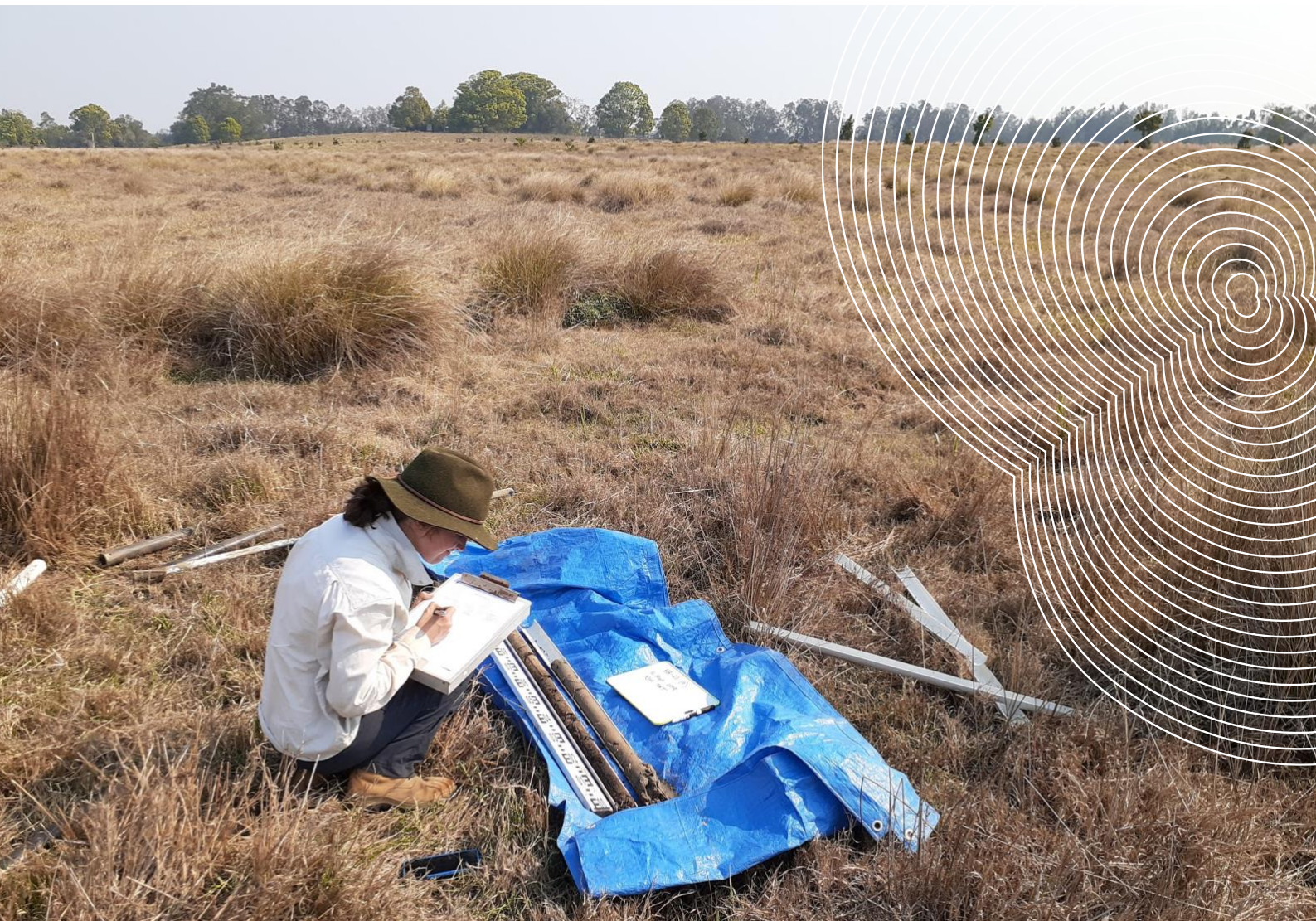
Toby Tucker, *Principal Engineer*

Toby has gained extensive experience working on various projects including groundwater, hydraulic modelling, flood mitigation, floodplain management, estuarine water quality and processes, coastal engineering and wetland restoration. Toby is an experienced field engineer and adept at data collection; enabling him to develop expertise in numerical modelling, and a proficiency in using remote sensing and GIS techniques to address complications that arise in the field of water engineering. Toby's experience has been recognised by Engineers Australia where he is a Chartered Professional Engineer (CPEng) in Environmental Engineering and is registered on the National Engineering Register (NER).



Dr Jin Zhu, *Project Engineer*

Jin has expertise in drinking water quality, river restoration, green remediation of soil and groundwater. With over 9 years of experience in water engineering, Jin has worked on river remediation, soil and groundwater remediation, and biogenic taste and odour in drinking water supplies. Before joining WRL projects team in May 2024, she completed a PhD at the Water Research Centre, UNSW Sydney. Jin has been closely working with Australian industry collaborators from WaterNSW, Sydney Water and Melbourne Water. She is inspired to solve the real-world water problems by engaging with internal and external collaborators in water sectors.



Research Associates

Nadav Cohen

Nadav completed his PhD at WRL in 2025, with his research focussing on potential dual use applications of Wave Energy Converters (WEC) at the coast. His PhD explored the feasibility of deploying WEC arrays to manage coastal erosion and in the vicinity of ports whether WECs may be a solution to reduce long-wave resonance. Based on large-scale physical model experiments in WRL's wave flumes and wave basin, he examined specific WEC control strategies, device interactions and array layouts.

Dr Stefano Conti

Stefano completed his PhD at WRL in 2025, as part of the Discovery Project on "Quantifying the impact of infiltration on dune erosion under waves and surges". The interaction between waves, water levels and sediment transport is an open research question. Stefano advanced the knowledge in the discipline by performing a physical experiment in the wave flume measuring the levels of infiltration and pore pressure in the dune face under the attack of waves and tides.

Dr Aditya Deshmukh

Aditya completed his PhD at WRL in 2025, studying "the coastal impacts of extreme storms in a warming climate." The objective of his research was to undertake detailed wave and coastal erosion modelling studies using high resolution simulated winds to determine the future impacts of extreme storms such as East Coast Lows (ECLs) in various climate changing scenarios. Previously Aditya has worked as a Project Scientist within an operational oceanographic government sector, where he was actively involved in the development of an ocean state forecast system for Indian ocean rim countries using numerical wave modelling.

Dr Brad Henderson

Brad completed his PhD at WRL in 2025, examining "optimising coastal floodplains for environmental services and agriculture". His PhD research focussed on predicting possible restored wetland types and extent across coastal floodplains, based on hydrological and ecological conditions, to evaluate environmental and economic costs/benefits. The research also investigated the impacts of restoration and sea level rise on agriculture as well as future farming practices, including carbon farming.

Dr Jasmin Martino

Jasmin is an aquatic ecologist dedicated to applying fundamental biological understanding to solve real-world sustainability challenges. Her research has spanned a diverse range of topics, employing chemical and engineered tools for management of finfish and octopus fisheries, food traceability, and restoration of riverine fish passage. At UNSW, Jasmin integrates fish biology with hydraulic engineering to tackle the critical issue of barriers to freshwater fish migration. She develops and implements novel pipe fishways, such as the Tube Fishway, as adaptable and cost-effective solutions for reconnecting fish passage. Jasmin's research involves both simulated and live fish experiments using full-scale lab models, alongside field deployments across Australian riverine ecosystems.

Salman Sharifazari

Salman completed his PhD studies at UNSW in 2025. His PhD project improved understanding of the impact of climate change on water resources for small oceanic islands in the Indian Ocean. He uses tree-ring data to understand the climate of the past and obtain the full range of climate variability, especially for rainfall recharge. The long-term rainfall-recharge series was then applied to a 3D density-dependent groundwater model to understand the fresh groundwater lens response to climate variability. Salman has 5 years of academic experience as a lecturer in Iran. He also worked for 4 years in the water industry, completing projects across a range of disciplines, including hydrology, irrigation networks, and water infrastructure.

Dr Dana Tothova
Dana is currently part of “Project Halo” a multidisciplinary project investigating mangrove restoration projects as an option to increase resilience and adaptation in Pacific Islands' communities. Researchers from UNSW Sydney and the University of the South Pacific (USP) will transfer two large-scale nature-based solutions developed at UNSW and pilot them in Viti Levu, Fiji. In partnership with local communities, the research team will seek to re-instate natural tidal flows and revitalise the local mangrove ecosystems for the benefit of people and the environment.

Dr Kate Waddington
Kate completed her PhD studies at WRL in 2024, researching the remediation and rehabilitation of estuarine wetlands. In NSW, coastal floodplains can be significantly affected by acid-sulfate soils and deoxygenation, or blackwater events, contributing to the degradation of adjoining estuarine ecosystems; with associated adverse impacts on local industry and infrastructure. Kate is an expert in the prioritisation of catchments using multi-criteria decision analysis to assist in targeting remediation projects to optimise environmental, social and economic outcomes.

Associated Academics

Emeritus Professor Ian Acworth
Ian was the Gary Johnston Professor of Water Management, a joint Chair between the School of Civil and Environmental Engineering in the Faculty of Engineering and the School of Biology, Earth and Environmental Sciences in the Faculty of Science. He is the past Director of the Connected Waters Initiative Research Centre at UNSW and the Project Director for the DIISRTE Groundwater EIF project.

Honorary Associate Professor Ron Cox
Ron has extensive research experience in water, coastal and environmental engineering and management, working with industry and government within Australia and overseas. In 2008 Ron was awarded Engineers Australia's prestigious Sir John Holland Award for Civil Engineer of the Year, in recognition for his long standing and continuing contribution to the profession and community, particularly in the field of coastal engineering.

Associate Professor Andrew Dansie
Dansie is the Academic Lead, Humanitarian Engineering at UNSW Sydney and a Senior Lecturer in the UNSW Water Research Centre. A scientist by training, Dansie has over 19 years of international development experience within transboundary water and coastal resources across six continents. Dansie is recognised by the UN as an expert in large-scale ecosystem management, with particular expertise in the interconnectivity between land and ocean and ecosystem-human interdependence. He is currently co-lead in “Project Halo”, a large Nature-based solution project focusing on mangrove restoration in Fiji.

Professor Ian King
Professor Ian King is an internationally recognised expert in the application of state-of-the-art computer simulation techniques to practical engineering problems and has pioneered the application of the Finite Element Methods to water resource problems. He is the principal author of the RMA suite of finite element models that are in worldwide use by governmental agencies and the consulting profession.

Professional and Technical

Anna Blacka, *Graphics & Communication*
Anna has worked in Graphics and Communication at WRL since 2008. She has a Bachelor of Design (Visual Communication) and is a specialist in scientific communication across visual, web, and social media platforms. Anna holds a specific skill set in the production of scientific illustrations including infographics, diagrams and technical figures that are used in academic publications, consulting investigations, outreach and community engagement. She is an expert in communicating scientific concepts through illustration, enabling understanding of complex technical ideas in an engaging and accessible way to both technical and non-technical audiences.

Grace Carlino, *Administration Assistant*
Grace joined WRL in 2016, having worked in all areas of accounting for both sole traders and large businesses; including administration, client relations, bookkeeping, payroll, income tax, BAS and superannuation. Her responsibilities include accounts payable and receivable, credit card reconciliations, expense reimbursements, stock ordering and control, travel bookings and daily support for the other administrative staff.

Dave Clouston, *Workshop Technical Officer*
Dave is a specialist craftsperson, assisting both WRL project staff and academic staff with the design and construction of physical models. He is also responsible for assisting students with test structures and the set-up of their instrumentation.

Aaron Colusso, *Senior Technical Officer*
Aaron has a BSc (Applied Physics), BSc (Honours) and a PhD in Materials Science. His PhD focused on the photo-redox properties of tungsten oxide mesostructures, and their suitability as photochromic (colour-changing) films. This would allow for passive thermal and UV radiation absorbing films to be placed on windows, leading to energy savings. Aaron's primary role at WRL is to facilitate activities in the Chemistry Laboratory.

Katie Jacka, *Publications Officer*
Katie joined WRL in 2021 as an Administrative Assistant and Publications Officer. Located in the Reception Office, Katie welcomes WRL's visitors and students. In the role of Publications Officer, she is responsible for the proof reading, editing, production and distribution of the WRL Technical Report series. Katie's career has been in secretarial and administration and she has worked in a diverse range of companies including charity, financial, legal and public relations.

Ross Mathews, *Administration Assistant*
Ross has been an Administrative Assistant at WRL since 1990. He has extensive experience in administrative procedures at UNSW, with his responsibilities including; accounts payable and receivable, credit card reconciliations, petty cash, orders, asset management, motor vehicle maintenance and keys.

Larry Paice, *Workshop Supervisor*
Larry joined the WRL team in 2010 as a specialist craftsperson and workshop supervisor, assisting both WRL project staff and academic staff with the design and construction of physical models. He is also responsible for assisting students with test structures and the set-up of their instrumentation. Larry comes as a highly experienced carpenter offering background in high-end residential carpentry and joinery. Larry currently holds a carpenter and builders licence.

Rob Thompson, *IT Technical Officer*
Rob has worked as WRL's in-house IT Technical Officer since 2006 and is responsible for maintaining all WRL's software and hardware systems. Since 2010 Rob has also worked on the design and operation of WRL's camera-based wetland environmental monitoring program at Tomago. Rob is experienced in the design and operation of remote and wireless image collection systems.