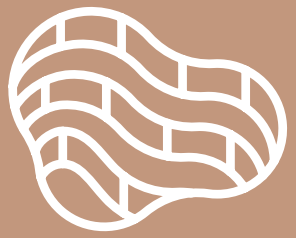
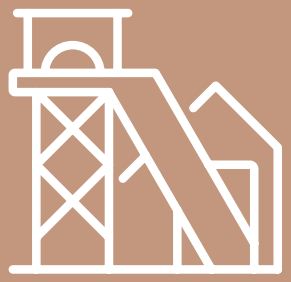
ACARP





2025

Welcome to our 2025 ACARP Report

ACARP has been renewed through to 30 June 2030, with the Memorandum of Understanding with the Federal Government now signed. This milestone is a testament to the strong collaboration between ACARP, the Minerals Council of Australia and the Department of Industry, Science and Resources, and represents a significant achievement for our members, researchers, and our dedicated volunteer base of more than 230 passionate industry professionals.

This spirit of collaboration continues to underpin ACARP's success, delivering meaningful outcomes for the industry and positioning us to plan confidently for the post-2030 extension.

ACARP remains a highly effective platform for industry partnership, with renewed engagement from many of the industry bodies and ongoing contributions from long-standing participants at board, committee, task group, and industry monitor levels. This year, we are delighted to welcome many new faces to these roles, enhancing our diversity and strengthening our connections with producers and key stakeholders. These additions significantly boost ACARP's capacity and value to the industry.

As ACARP marks its 33rd year, we continue to deliver critical research for the black coal industry. Amid a global energy transition, ongoing international conflicts driving market volatility, and persistent skills and labour shortages in Australia, the resolute Australian coal industry has once again provided the ACARP funding and support for research to meet industry needs. We continue to lead the development and implementation of best practice sustainable mining.

Our strategy of emphasising energy transition-related emissions mitigation, measurement, and management research remains imperative and effective, while our unwavering focus on improving workplace safety and efficiency ensures we stay at the forefront of current and emerging issues.

In 2025, ACARP funded 41 new projects with a total value of $12.46 million, including 5 projects outside the funding cycle, highlighting its responsiveness to industry needs. As of end November, there were 157 projects underway, with a total ACARP funding of $81.93 million. Industry and researcher collaboration, together with in-kind support, multiplies the real value of the research ACARP funds, and remain cornerstones of ACARP's success.

I extend my sincere thanks to everyone involved in ACARP for another year of outstanding achievements. As we move into 2026, ACARP is well positioned to continue providing leadership in world-class black coal research across Australia.

Please enjoy the 2025 ACARP Report.

John Grieves
Chairperson, Australian Coal Research Limited Board

ACARP – the Australian black coal industry's research program - is the nation's pre-eminent coal research funding organisation. It was established in 1992 and is fully funded by a levy of 5 cents per tonne of product coal paid by all Australian black coal producers.

ACARP is a collaborative program that utilises the industry's technical competence together with the broader research and science community to develop technologies and solutions to the many challenges facing our industry. This program helps producers to combine their expertise and resources and share the risks and rewards.

The sustainable production of coal remains the primary objective of the program. Major regional issues such as emissions measurement and management ,water resource management, automation and impact of noise and dust on local communities are of major importance, as are safety and productivity.

Key facts:

- Invests approximately $17 million annually in research projects.
- Is fully funded by Australian black coal producers via a levy of five cents per tonne of product coal, currently committed to June 2030.
- Operates under a Memorandum of Understanding between the Commonwealth Government and the Minerals Council of Australia.
- The technical strength and industry focus is provided by the 230 senior technical people who are members of the technical committees, task groups and Industry Monitors.
- ACARP research projects are hosted at many mine sites.
- Has awarded $473.22 million in direct funding to 2,140 projects since ACARP's inception in 1992.

This publication documents how the ACARP levy contributions have been invested during 2025.

People are the most important aspect of ACARP and are listed in this report falling into 4 categories.

- The Researchers who undertake each project.
- Industry committee and task group members who evaluate and guide each proposal and provide funding recommendations.
- Industry Monitors who provide technical guidance for projects.
- The Board which provides corporate and program governance.

BOARD
- Strategic objectives
- Allocation of funds
- Corporate governance

RESEARCH COMMITTEE
- Program overview - technical
- Definition of strategic projects
- Sustainability issues

TECHNICAL COMMITTEES

Underground
Open Cut
Coal Preparation
Technical Market Support
Mine Site Greenhouse Gas Mitigation
- Definition of priorities
- Project selection
- Technical oversight
- Nomination of Industry Monitors

Task Groups

Provide technical understanding and advice on priorities and proposals to the technical committees

- Environment
- Geology
- Health and Safety
- Maintenance and Equipment (open cut)
- Roadway Development
- Rock Mechanics
- Strata Control
- Ventilation

Industry Monitors

Provide technical guidance and ensure project results are adopted by industry

Vision

To assist the Australian black coal industry develop and adopt world leading sustainable mining practices and, through collaboration, to ensure a sustainable position for the global use of coal.

Mission

Utilise the collective technical competence and resources of the Australian black coal industry to develop and manage a comprehensive research program which, through technological and process innovation, assists coal producers achieve their financial, environmental and social objectives for sustainable development.

To maintain their position as world leaders, Australian coal producers must be profitable, innovative and, at the same time, mindful of their social and environmental obligations. Through ACARP, they combine their expertise and resources to direct and fund world class research that benefits the whole industry. As a leader in research and development within the coal industry, ACARP has expanded its research capacity, with a primary focus on reducing emissions and minimising the environmental impact of the industry. Today our projects cover a wide range of subjects, from developing and enhancing technology to reduce production costs, to improving safety for mine workers and to measuring our impact on the communities within which we operate.

STRATEGIC OBJECTIVES

- Enhance the level of industry engagement with the work of ACARP researchers and its application in industry
- Develop and maintain a statement outlining ACARP's view of its role in addressing the risk and priorities of members
- Broaden and deepen relationships and collaboration with researchers and develop integrated research capabilities and alliances
- Enhance the strategic nature of funding sources, level and allocation
- Maintain a high quality committee and task group capability

KEY RESEARCH PRIORITY AREAS

Research driving minimised emissions and environmental impact of industry

Underground	Open Cut	Coal Preparation	Technical Market Support	Mine Site Greenhouse Gas Mitigation
• Minimise scope 1 and 2 emissions • Management of seam gas in ventilation and optimising gas drainage systems • Extending automation and roadway development technologies • Improved understanding of geological conditions to be encountered prior to mining	• Lowering / removing emissions generation activities • Alternative land use post mining beyond the traditional vegetation replacement • Water contamination, use and efficiency management • Tailings management alternatives • Improved collection and utilisation of data to generate understanding of geological conditions in mine planning	• Optimal tailings management and closure practices • Energy and water efficiency • Remote and autonomous development technologies on stockpiles • Asset utilisation, maintainability and reliability	• Research using the pilot scale HELE testing facility with complementary techniques • Metallurgical coke and PCI to support low carbon blast furnace ironmaking • Coal to coke conversion and coke performance linked back to properties of coal • Laboratory scale demonstration of potential new large scale products from coal and waste product	• Innovative means for safe mitigation and accurate measurement of fugitive mine site gas emissions

ACRL Board of Directors and Alternates *

DIRECTORS

Christopher Bourke	Chief Operating Officer	TerraCom
Justin Clout	Head of Technical	BHP Mitsubishi Alliance
John Desouza	Head of Internal Assurance	Jellinbah Group
Tony Egan	Manager Project Governance	Glencore Coal Assets Australia
Matthew Fellowes	Executive Director	ACRL
Frank Fulham	Executive General Manager – Technical Support & Projects	Yancoal
John Grieves	Tenements Manager	QCoal Group
Brian Neilsen	Director of Engineering – Open Cut Mining	Peabody Australia
John O'Connell	General Manager - Planning	Batchfire Resources
Paul O'Loughlin	Technical Services Manager	MACH Energy
Georgina Rees	Lead Geoscience	Anglo American Steelmaking Coal
Robert Simpson	Manager – Acquisition Integration	Whitehaven Coal
Simon Thomas	General Manager - Dendrobium Mine	GM-3 Illawarra Coal
Scott Weatherall	Manager, Feasibility and Studies	Coronado Global Resources

ALTERNATE DIRECTORS

Andrew Lau	Mine Closure Manager	Yancoal Australia

* Directors and Alternate Directors serving at 31 December 2025

Research Committee

The Research Committee, together with the Executive Director, is responsible for the overall operation and strategic direction of ACARP research. It takes a whole of industry view, striking a balance between the priorities of the five technical committees, short term operational challenges and longer term strategic issues. The individual technical committees develop detailed research priorities and select projects in their respective areas, addressing critical issues such as safety, licence to operate, cost effective resource utilisation and market support.

Communicating project outcomes is vital. The Research Committee encourages constructive engagement with government and community groups. ACARP also provides high quality technical information to key industry organisations. The technical committees publicise their individual project results through on site demonstrations, focussed seminars, conference papers, journal articles, focussed E-Newsletters, and the ACARP website.

Responsibilities

The Australian coal mining industry works to address sustainability issues over the longer term to support mining companies to retain their licence to operate. ACARP has responded by funding the development of new and innovative technologies and practices that will help producers achieve their financial, environmental and social goals.

Research is undertaken that is driving minimised emissions and environmental impact of industry. Each of the technical committees has identified key priority areas of research to support this.

Health and Safety

Health and safety, which reflects the industry's aspiration for a zero harm workplace, remains an important priority for the program.

Community and the Environment

The cumulative effects of coal mining are assuming a greater importance in Australia, and a more collaborative approach is needed to assess and understand the complex range of economic, social and environmental impacts of new mine development and the expansion of existing ones. ACARP continues to support research in this important area.

Productivity

ACARP has a strong focus on increasing recoverable coal yield and reducing the cost of production. The coal preparation area continues to invest in research designed to improve plant efficiency and the underground producers are focussed on extending automation and roadway development technologies. In open cut operations the productivity focus is on improving equipment performance and reliability.

A portion of the funding is set aside for major projects that the Research Committee and Board deem strategically important for the entire industry.

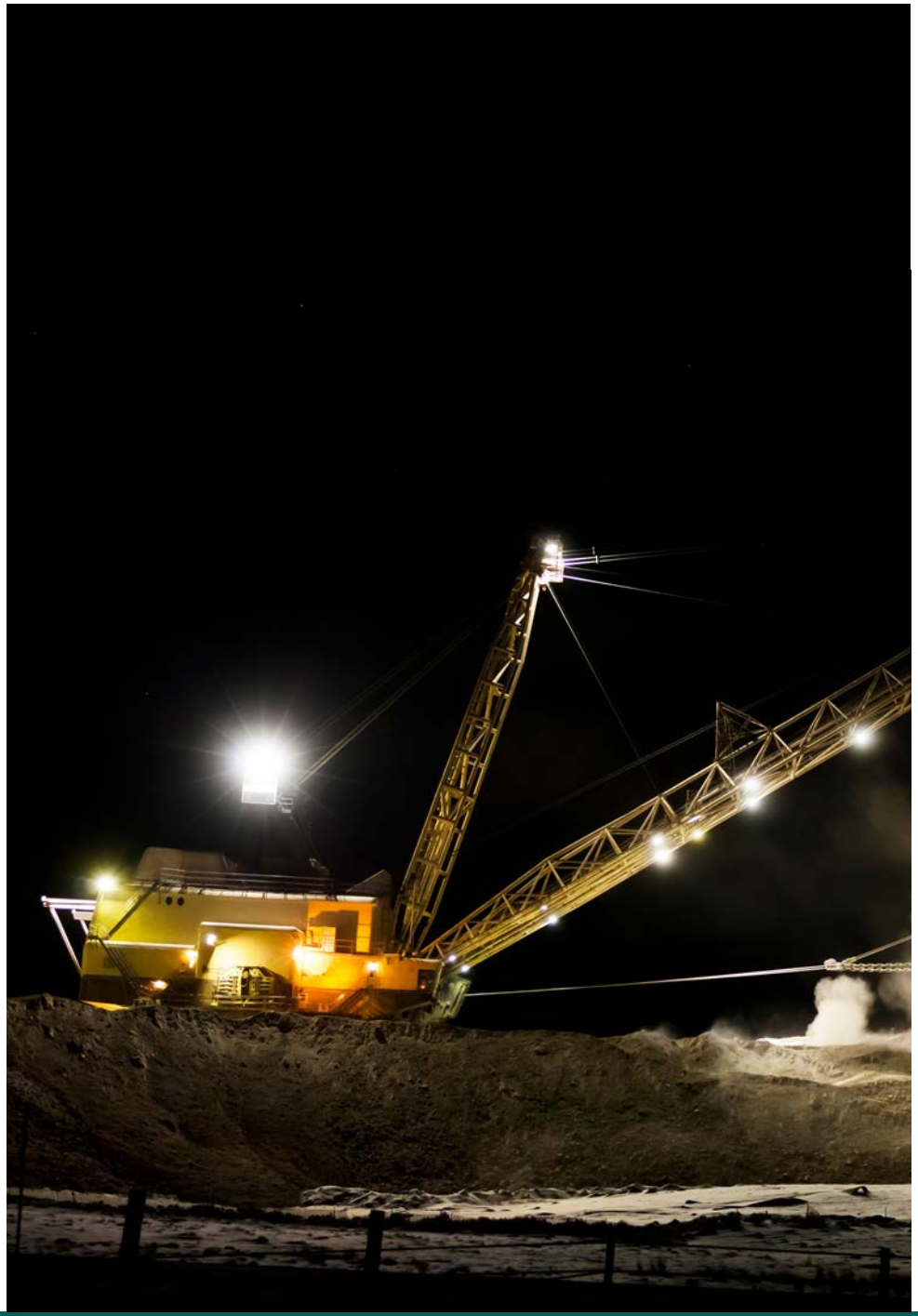
COMMITTEE MEMBERS

John Grieves (co-chair)	**Tenements Manager**	**QCoal Services**
Tony Egan (co-chair)	**Manager, Project Governance**	**Glencore Coal Assets Australia**
Sam Anderson	Global Head of Corporate Sustainability	Peabody Australia
Luke Dimech	BMA Principal Process Engineering	BMA
Jonas Good	Principal Marketing Strategy	BHP
Graeme Harris	Manager Technical Marketing and Logistics	Kestrel Coal Resources
Ben Klaassen	Principal Climate Reporting	BMA
Andrew Lau	Mine Closure Manager	Yancoal
Frank Mercuri	Coal Processing Manager	Anglo American Steelmaking Coal
Paul O'Grady	Group Manager - Technical Services	Glencore Coal Assets Australia
Sandy Tickell	Group Manager Carbon Planning and Abatement	Glencore Coal Assets Australia

Funding for projects is summarised in the following table in categories that demonstrate the diversity of projects supported by the ACARP program.

CURRENT OR COMPLETED DURING YEAR

Category		No of Projects	ACARP Funding
Underground	Coal Burst	5	$1,753,313
	Detection and Prevention of Fires and Explosions	2	$546,200
	Environment - Subsidence and Mine Water	2	$1,366,395
	Health and Safety	9	$4,403,394
	Maintenance and Equipment	4	$2,753,573
	Mining Technology and Production	10	$7,354,896
	Roadway Development	3	$10,353,332
	Strata Control and Windblasts	16	$3,950,516
	Ventilation, Gas Drainage and Monitoring	14	$7,248,304
Open Cut	Drilling and Blasting	4	$1,272,960
	Environment	12	$9,008,262
	General	1	$83,000
	Geology	7	$1,530,170
	Health and Safety	1	$152,000
	Maintenance and Equipment	5	$780,651
	Rock Mechanics	7	$2,406,516
Coal Preparation	Dewatering	7	$1,917,340
	Environmental Improvement	3	$1,997,880
	Fine Coal	11	$6,317,229
	General	3	$579,028
	Gravity Separation	5	$940,222
	Maintenance and Equipment	3	$1,278,397
	Process Control	3	$684,268
Technical Market Support	General	4	$1,812,851
	Maritime Regulation	1	$4,169,012
	Metallurgical Coal	27	$3,793,191
	Thermal Coal	2	$1,274,324
Mine Site Greenhouse Gas Mitigation		11	$7,187,456
Scholarships		6	$1,980,000
Total		**188**	**$88,894,680**



NEW FUNDING

ACARP supports projects with immediate need outside the yearly funding round. These projects are included within this report as new funding.

Category	No of Projects	ACARP Funding	Total Funding
Underground	12	$3,847,813	$5,884,440
Open Cut	9	$2,058,483	$2,480,045
Coal Preparation	8	$2,147,715	$3,627,101
Technical Market Support	7	$1,159,283	$1,426,822
Mine Site Greenhouse Gas Mitigation	4	$2,916,939	$3,997,161
Scholarships	1	$330,000	$330,000
Total	**41**	**$12,460,233**	**$17,745,569**

Total Funding includes in-kind support provided by the researcher and host mine as identified in the research proposal.

The resultant leverage i.e. Total funding ÷ ACARP Funding = 1.42 times meaning that for every $1.00 of ACARP funding research there is $0.42 of in-kind support (note this leverage varies project by project).

ACARP is focussed on research aimed at minimising emissions and reducing the environmental impact of the industry. The Underground Committee has identified the following key priority areas to support this goal:

- Minimise scope 1 and 2 emissions.
- Management of seam gas in ventilation and optimising gas drainage systems.
- Extending automation and roadway development technologies.
- Improved understanding of geological conditions to be encountered prior to mining.

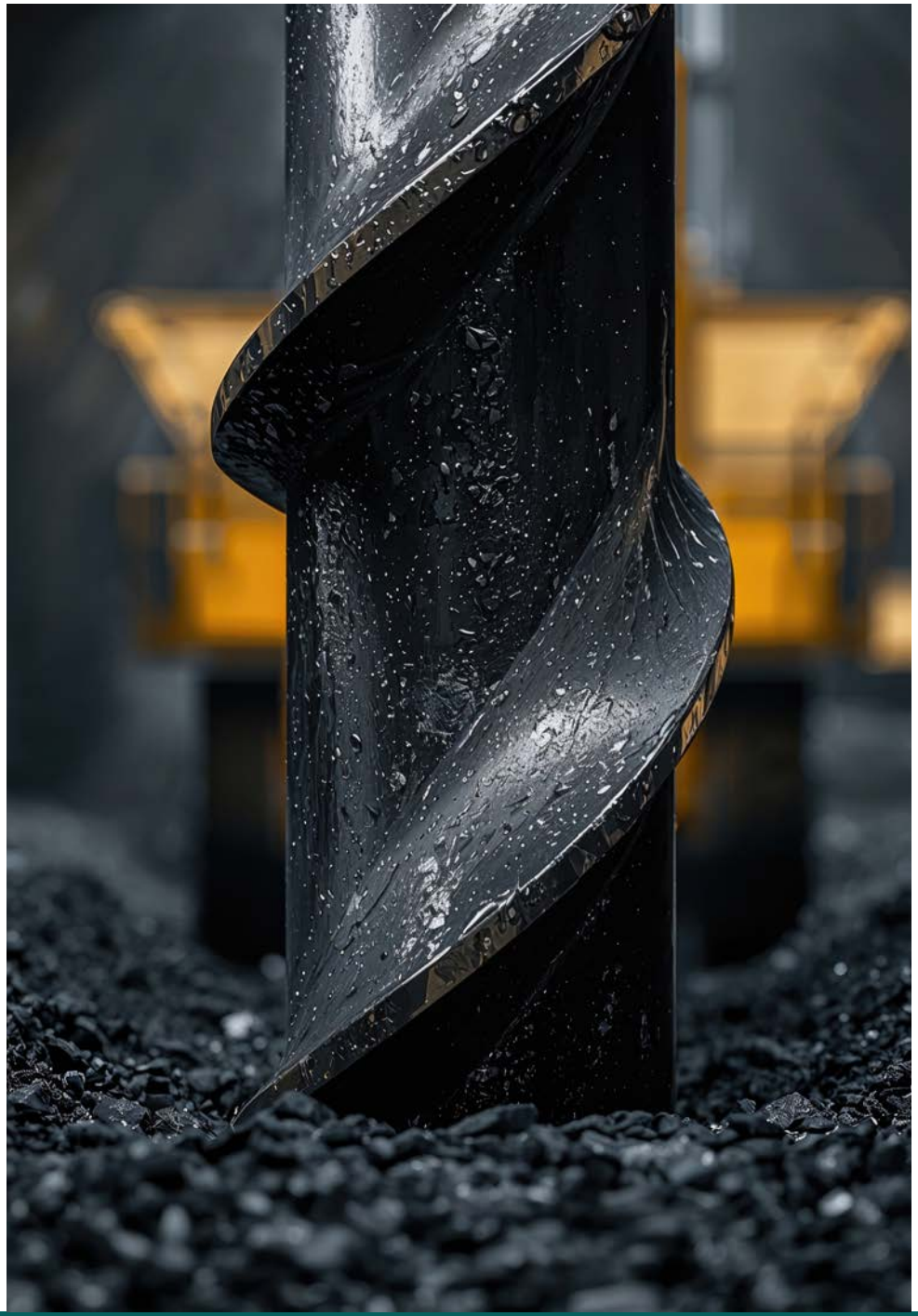
A significant goal of the underground research program is to achieve zero fatalities while minimising negative effects on the workforce, environment, equipment and the resource. This is reflected in the targeted occupational health and safety program, strengthening ventilation and gas management technology, minimising exposure to coal dust and diesel particulates, minimising risks from fires, explosions and coal bursts, advancing emergency response technologies and addressing workplace health risks.

The program's research assists producers to adopt new and innovative technologies that reduce operating costs, along with improved exploration methods and better management of the risks associated with ground control. The industry is also determined to improve roadway driveage rates.

The environmental impacts of mining are assuming a greater importance and must be managed to the satisfaction of the community. Complementary priorities include development of intrinsically safe electrical vehicles to facilitate the reduction of diesel particulates in the underground work environment. ACARP recognises the importance of continuous improvement in this area to ensure the industry maintains broad community support.

COMMITTEE MEMBERS

Paul O'Grady (co-chair)	**Group Manager - Technical Services**	**Glencore Coal Assets Australia**
Michael Barker	Senior Project Manager	Whitehaven Coal
Dennis Black	Manager Technical Services	GM3
Peter Corbett	General Manager Technical	Centennial Coal
Bob Coutts	Superintendent Geology & Geotechnical	BHP Coal
Ryan Davidson	Mining Engineering Manager	Yancoal
Frank Fulham	Executive General Manager - Technical Support & Projects	Yancoal
Ravindu Goonawardene	Geotechnical Manager (Open Cut & Underground)	Anglo American Steelmaking Coal
John Grieves	Tenements Manager	QCoal Services
Raymond Howard	Chief Mining Engineer	Yancoal
Brad Lucke	Operations Manager	Plumpton Group
Jimmy Martin	Superintendent Strategic Mine Planning	BHP
Van Oppel	Manager Mine Planning	BHP
Peter Quinn	Mining Engineering Manager	GM3
Patrycja Sheffield	Group Manager Mining Engineering & Business Development	Centennial Coal
Matt Tsang	Regional Geotechnical Manager	Anglo American Steelmaking Coal
Nic Tucker	Technical Services manager	Peabody Australia
Matt Wang	Mechanical Engineering Manager	Yancoal
Steve Winter	Technical Services Manager	Kestrel Coal Resources
Dave Young	General Manager Engineering & Operational Support Service	Centennial Coal



PROJECTS UNDER MANAGEMENT

Category	No of Projects	ACARP Funding
Coal Burst	5	$1,753,313
Detection and Prevention of Fires and Explosions	2	$546,200
Environment - Subsidence and Mine Water	2	$1,366,395
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NEW FUNDING

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No of Projects	ACARP Funding	Total Funding
12	$3,847,813	$5,884,440

Total Funding includes in-kind support provided by the researcher and host mine identified in the research proposal.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Coal Burst			
Complete	**Management of Coal Bursts and Pillar Burst in Deep Mines C27020** Murat Karakus, University of Adelaide $380,240	Frank Fulham, Yancoal Patrycja Sheffield and Peter Corbett, Centennial Coal Paul O'Grady, Glencore Coal Assets Australia Roger Byrnes, Byrnes Geotechnical Russell Thomas, GM3 Appin Mine Brad Elvy, Brad Elvy Mining Services Ian Stone, Juraz	Coal bursts are sudden, violent ejections of coal or rock into the mine workings. They occur without warning and are a significant hazard for people working in deep underground coal mines. This project developed coal burst mitigation methods. Using continuum mechanics principles, a new damage model was developed for coal and pillar bursts in deep mines under high stress. This research enabled mine personnel to model and predict damage from coal bursts.
Complete	**Microfracture Analysis as a Trigger for Coal Bursts C28012** Yvette Heritage, SCT Operations $498,000	Frank Fulham, Yancoal Patrycja Sheffield and Peter Corbett, Centennial Coal Paul O'Grady, Glencore Coal Assets Australia Roger Byrnes, Byrnes Geotechnical Russell Thomas, GM3 Appin Mine Brad Elvy, Brad Elvy Mining Services Ian Stone, Juraz	Gas related coal bursts can be generated in coal with an elevated pore space or an increased frequency of micro fractures. The ability to analyse the geometry of micro fracture fabrics is challenging and not feasible using optical methods. Stage of this project 1 consisted of optical assessment of porosity, with a focus on the assessment microfractures using newly available and cost accessible CT scanning to render a full 3D volume of the samples for a better evaluation of microfracture characteristics. Stage 2 aimed to define the zones around dykes and faults in which the coal is structurally modified and capable of generating sufficient gas related energy to initiate a coal burst.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Complete	**In-situ Stress Measurements using Cored Coal/Rocks for Coal Burst Management C29010** Murat Karakus, University of Adelaide $228,600	Brad Elvy, Brad Elvy Mining Services Frank Fulham, Yancoal Patrycja Sheffield, Centennial Coal Paul O'Grady, Glencore Coal Assets Australia Peter Corbett, Centennial Coal Roger Byrnes, Byrnes Geotechnical Russell Thomas, GM3 Appin Mine Ian Stone, Juraz	It is challenging to measure in situ stress in areas at great depth when access is only available via exploration boreholes. It is also challenging to access the areas above longwall face where a high-stress concentration is expected. Knowing in situ stress magnitudes and their orientations are critical in managing coal burst. This project aimed to develop a new method based on deformation rate analysis and acoustic energy to calculate the magnitude and principal directions of in situ stresses from cored rocks.
Complete	**Coal Burst Research Findings C33014** Winton Gale, SCT Operations $388,000	Frank Fulham, Yancoal Patrycja Sheffield and Peter Corbett, Centennial Coal Paul O'Grady, Glencore Coal Assets Australia Roger Byrnes, Byrnes Geotechnical Russell Thomas, GM3 Appin Mine Ian Stone, Juraz	Risk assessment and management of dynamic burst events are hampered by the inability to apply threshold characteristics from one seam to another as the threshold values are dictated by local geological characteristics. This project examined the threshold energy requirement for a range of 'generic' mined seams, provide guidance on the factors that should be considered in risk analyses, and estimate the threshold values associated with dynamic bursts. The energy threshold values will be converted into stress, gas pressure and seismic magnitude, which are more readily applied to mining practice.
Current	**Investigation of Pre-Installation of Optic Fibre Cable in Exploration Holes for Longwall Weighting and Coal Burst Monitoring C35014** Joey Duan, CSIRO $258,473	Tim Dean, Anglo American Steelmaking Coal Ian Stone, Juraz	Distributed optic fibre sensing (DOFS) has been proven to be more effective than geophones for microseismic monitoring of ground conditions. This project will develop a novel optic fibre installation approach for assessing longwall weighting progress and coal burst risks using multiple geo-exploration holes for DOFS microseismic monitoring. This new method will enable mine operators to obtain fracturing event locations with high reliability and spatial resolution in a more cost effective manner compared with using geophones.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Detection and Prevention of Fires and Explosions			
Complete	**Use of Compressed Air Foams (CAFs) to Alter Goaf Air Circuits and Mitigate Spontaneous Combustion Events C28013** Alaster Wylie, Mines Rescue $392,500	David Webb, Glencore Coal Assets Australia Martin Mackinnon, Whitehaven Coal Paul Wild, Anglo American Steelmaking Coal Peter Baker, BHP	Spontaneous combustion in the goafs of longwall mines is a serious hazard. Compressed air foam has been used in Turkey, the Czech Republic and China to bring spontaneous combustion under control. This technology, which is inexpensive and simple to use, had not be tested nor deployed under Australian conditions. In this project, a full system ready for deployment was procured, deployed in an underground longwall panel, and the cost and effectiveness of this technique evaluated. The system has been retained by New South Wales Mines Rescue.
Current	**Investigation into the Thermal Ignition Caused by IS Power Supplies C29026** Sean Muller, Simtars $153,700	Brad Lucke, Plumpton Group Jarod Chadwick, Glencore Coal Assets Australia	It is difficult to comply with intrinsically safe standards when cabling is installed on mining machines in confined areas and is subjected to a regular build-up of dust and other flammable materials. This project aims to determine the fault conditions arising in an intrinsically safe electrical circuit that could ignite combustible material on a mining machine. Researchers will examine the role and extent that combustible material accumulation can cause or contribute to the risk of equipment fires when ignited by intrinsically safe power supplies, and the parameters to be considered in installing an intrinsically safe circuit in an area where there could be an accumulation of flammable materials.
Environment - Subsidence and Mine Water			
Current	**Pilot Scale Membrane Distillation Crystalliser (MDC) with Renewable Heat Source for Mine Water Brine Management C33021** Ramesh Thiruvenkatachari, CSIRO $969,195	Paul O'Grady, Glencore Coal Assets Australia	Acid mine water and highly saline reverse osmosis brines can be treated by low thermal based membrane distillation process coupled with a crystalliser (MDC) process. This process concentrates challenging mine waters to saturation levels and reduces their volume, with simultaneous recovery of reusable quality water. This project aims to undertake a mine site demonstration of the MDC system at Glencore Collinsville mine. Saline and acid mine drainage and mine impacted water will be treated under mine site conditions.
Current	**Rehabilitation Options for Ponded Areas Due to Longwall Coal Mining C35016** Louisa Rochford, University of Queensland $397,200	Jason Fittler, Anglo American Steelmaking Coal Michael Moore, Yancoal Australia	Little research has been undertaken into the most appropriate options for rehabilitating land subsided by longwall mining in Australia. This project will investigate the implications of retaining ponded areas from longwall mining, including their contribution to environmental values. Researchers will analyse the impacts on site topography and drainage, surface hydrology, geomorphology, soil hydrology, water quality and geochemistry, fauna and flora.
Health and Safety			
Current	**Proximity Detection Systems Specification for Underground Coal Mining Machines C24010** Sean Muller, Simtars $565,988	Brad Lucke, Plumpton Group Frank Fulham, Yancoal Michael Barker, Whitehaven Coal	While the increase in the size and speed of mobile mining and support equipment underground has created many operational benefits, poor visibility has emerged as a significant safety hazard. This project will investigate the most prominent collision scenarios in underground coal mines and test the available proximity detection systems against a set of standard scenarios. Human factors and simple management tools that need to be considered when designing and implementing effective collision awareness and avoidance strategies will also be investigated.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Personal Real Time Dust/Particulate Monitor (Direct Mass Based Measurement) C28029** Peter Phaedonos, Lear Siegler Australasia $1,521,730	Brad Lucke, Plumpton Group Glenn Owens, Detekd Ian Marshall, BHP	The effects of exposure to respirable coal dust in large and sustained doses leads to health effects, such as coal workers pneumoconiosis. The personal dust monitor (PDM), a device worn to measure the quantity of hazardous airborne particulates, logs and records exposure levels and provides warnings to the user if dangerous levels are reached. The original device, which uses tapered element oscillating microbalance technology, was the result of a collaboration between NIOSH, MSHA and the US mining industry. The objective of this project is to use the existing technology to develop a PDM that is suitable for use in Australian underground coal mines. The PDM will be portable, ergonomic, rugged and rated for use in explosive environments. This additional support will enable SIMTARS to complete intrinsically safe certification of a personal dust monitor (PDM). The PDM is portable, ergonomic, rugged and rated for use in explosive environments of Australian coal mines.
Current	**Silica Analysis of Dust on PDM filters: Phase 2 Optimisation and Field Demonstration of the Developed Methodology C33001** Yonggang Jin, CSIRO $516,700	Andrew Lau, Yancoal	The overall objective of this research is to develop a methodology of free silica analysis for dust particles collected on the PDM filters. The research started with proof-of-concept methodology development with laboratory generated dust samples, followed by methodology validation with dust samples collected from a coal mine operation, and combination of the developed methodology with the NIOSH FAST field-based tool for crystalline silica monitoring at mines. Phase 1 of the project explored an approach to enable free silica analysis for the PDM filter sample, and further expand the applicability of the PDM in silica monitoring based on the success of the PDM in reducing miners' exposure to coal dust. The overall goal of the research was to establish a new approach based on the PDM method to achieve both real time monitoring of respirable coal dust from a coal mine operation and end-of-shift measurement of hazardous respirable silica in coal dust PDM filter samples. In the second phase, researchers will optimise the methodology via laboratory testing then conduct onsite analysis of RCS at the end of shift.
Current	**Respirable Dust Reference Testing Method and Dust Chamber Facility C33012** Sean Muller, Simtars $215,950	Andrew Lau, Yancoal Tony Egan, Glencore Coal Assets Australia	Concerns about the accuracy and ability of respirable dust measurement devices used in Australian coal mines to comply with AS2985 highlight the need for a testing facility in Australia. In collaboration with NIOSH, Simtars is building a respirable dust chamber equivalent to facilities in the USA and UK. The chamber will be an important verification and reference tool for regulators, original equipment manufacturers and other researchers. The aim of this project is to establish the methodology for the respirable dust chamber as a reference tool for cyclones and devices used in the coal mining industry.
Current	**Resilience and Mental Health in Mining Pilot Program C34006** Rebecca Mitchell, Macquarie University $476,099	To be confirmed	Mining has unique factors that contribute to mine employee stress and resilience. A pilot workplace resilience intervention program that supports and strengthens mine employee psychological resilience and mental health will be developed, implemented and evaluated. Based on the pilot evaluation, researchers will provide guidance on the requirements and design features of an effective and scalable resilience intervention program that is specifically tailored to the Australian coal mining industry.
Complete	**Evaluating Toxicity of Different Types of Respirable Crystalline Silica Particles to Lung Cells and Tissues C34007** Gordon Xu, University of Queensland $207,950	Andrew Lau, Yancoal Tony Egan, Glencore Coal Assets Australia	Silica dust is one of the world's most significant causes of occupational diseases, including the lung disease silicosis. Coal mine workers are exposed to different types of respirable crystalline silica (RCS) dusts related to where they work and what tasks they undertake. This project aimed to evaluate the toxicity of three typical RCS particles, i.e. freshly generated, hydrated and aged, on lung cells, and understand their levels of acute risk to lung tissues in the mouse model.
Current	**Advanced Breathing Apparatus with Gas Membrane Modules C34023** Victor Chang, Monash University $298,436	Lee Earnshaw, Peabody Australia Coal Paul Wild, Anglo American Steelmaking Coal	The self contained self rescuer (SCSR) is an essential supporting device for underground employees encountering adverse conditions. In a previous project, researchers developed a lightweight membrane that is able to separate oxygen and carbon dioxide, which enables carbon dioxide to be removed from the closed loop breathing system. This means that no exothermic heat is released and that the device can be smaller and lighter than existing SCSRs. This project will further develop the membrane technology with the aim of integrating it into an existing SCSR design.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Advanced Lung Function Assessments for Diagnosis of Coal Mine Dust Lung Disease (CMDLD): The Next Step Towards a Better Health Surveillance Program C36006** Catherine Jones, I-MED Queensland $186,832	Andrew Lau, Yancoal Shane Apps, Peabody Australia Coal	This study will investigate whether a new advanced lung function test - Lung Ventilation Analysis Software (LVAS) - can improve the diagnosis of Coal Mine Dust Lung Disease (CMDLD), compared to the current mainstay test of spirometry. Previous projects showed most individuals subsequently diagnosed with CMDLD had no lung function impairments on their spirometry and that spirometry incorrectly identified lung function abnormalities in otherwise healthy individuals. LVAS could enable the earlier detection of lung diseases and reduce the need for additional tests. If confirmed by this project, introduction of LVAS testing could lead to a more effective health surveillance program for CMDLD and minimise harm to affected individuals.
Current	**Role of Particle Surface Characteristics in CWP Risk C37009** Graeme Zosky, University of Tasmania $413,709	Andrew Lau and Frank Fulham, Yancoal Brad Lucke, Plumpton Group Shane Apps, Peabody Australia Coal	Coal worker's pneumoconiosis (CWP) is an irreversible lung disease associated with inhalation of coal dust. This project builds on previous ACARP-funded work that suggests that mitochondrial dysfunction is likely to be the central mechanism regulating cell injury in response to coal dusts. We will explore this further to investigate the link between coal dust chemistry and the development of CWP. This work will help industry to prioritise risk mitigation and identify biomarkers of exposure and potential treatments for workers.
Maintenance and Equipment			
Complete	**Ceramic Wall Flow Filter Commercialisation C33009** Bradley Drury, PPK Mining Equipment $888,778	Andrew Esdaile, Glencore Coal Assets Australia Steve Coffee, Gear M Illawarra Met Coal Trevor Hartley, Centennial Coal	The purpose of this project was to develop a commercially available improved diesel particulate filter (DPF) for widespread use in underground coal mines. Project C26070, undertaken by Orbital, demonstrated that a ceramic wall flow filter can effectively filter diesel particulate matter (DPM) emissions. This project allows filter design refinements for retro fitting, testing against regulatory requirements and approval for commercial use.
Current	**Specialised Instrumentation and Data Processing for Real Time FEA Condition Monitoring of AFC Chain C33017** Ryan Norris, Vayeron $185,000	Brad Lucke, Plumpton Group Jarrod Sampson, Glencore Coal Assets Australia	Armoured face conveyor (AFC) chain failure causes serious production delays and associated costs for longwall operators, accounting for up to 27% of longwall failures. This project will develop a closed loop quasi real time prototype AFC chain link to model real time stress and strain monitoring.
Current	**Prototype Battery Electric Load Haul Dump C33026** Lewis Grainger, 3ME Technology $1,431,295	Brad Lucke, Plumpton Group Dave Young, Centennial Coal Matt Wang, Yancoal Australia	The focus of this project is to develop and provide evidence that battery technology will support heavier platforms and can operate in the demanding underground environment without impacting production activities. The project will also prove the LHD retrofit model which aims to convert existing diesel powered platforms to battery power.
Current	**Ex.P Enclosure Designs C35013** Peter Reid, CSIRO $248,500	Brad Lucke, Plumpton Group Colin Hoyle, Glencore Coal Assets Australia Dave Young, Centennial Coal	Flameproof enclosures enable the use of electrical equipment in coal mining operations where there is risk of exposure to explosive atmospheres. However, existing enclosures are not suitable for all contexts. This project will develop a system that employs pressurisation of the enclosure in conjunction with facility to de-energise enclosure equipment if the pressure is compromised. The resulting design/s will represent a new approach to quickly designing and manufacturing enclosures for use in zone 1 environments.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
New	**Optically Powered Gas Monitoring Network - Yellow Finch - 2000 C38003** Zourab Brodzeli, PhoenixZ $810,332	Ben McCamley, BHP Brad Lucke, Plumpton Group Dave Young, Centennial Coal Jonathan Harris, Glencore Coal Assets Australia	This project aims to transition the intrinsically safe Gas Monitoring Network – Finch-2000 – from proof of concept to a market ready product for underground coal mines. Finch-2000 represents a major advancement in mining safety being the first fully optical, intrinsically safe gas monitoring system capable of operating in hazardous and power-deprived environments.
Mining Technology and Production			
Current	**Development of a Safer Underground Explosive C20033** Duncan Chalmers, University of New South Wales $468,000	Brad Elvy, Brad Elvy Mining Services Paul Wild, Anglo American Steelmaking Coal Rob Nowell, Longwall Solutions Russell Thomas, GM3 Appin Mine	Underground mines resort to the use of explosives to break extremely hard materials that intrude into coal seams. Since there is no longer P5 explosive available for delay firing, mines resort to using type 1 explosive. Confusion arises as to how these explosives can be safely used. Currently permitted explosives are being used outside the recommended guidelines as published by the Buxton Testing Authority in the UK. In order that they can be used safely, mines are conducting risk assessments to manage the incendive hazard that possibly could be created by a cut off shot and additionally managing the deflagration hazard with the same risk assessment when using P1 explosives. This project developed an alternate test regime that adequately assesses the deflagration risk of an explosive. The information gained from this testing provides additional data to change the testing regime for permitted explosives.
Current	**Longwall Floor Horizon Sensing C28018** Andrew Strange, CSIRO $269,680	Jarod Chadwick, Glencore Coal Assets Australia	Effective longwall horizon control is essential for safety and productivity in underground coal mines. The key to achieving this outcome is a reliable means of actively sensing the geological strata. A prototype radar sensing system was demonstrated in a previous project but it is not yet ready for installation on a production longwall. Mines still rely on manual monitoring to infer seam geology, which limits the potential to introduce fully automated longwall mining. This project will extend the outcomes of the previous project to deliver a reliable coal floor thickness sensor that is ready for sustained use in an automatic longwall horizon control system. The physically compact system will be encased in an approved dielectric flameproof enclosure.
Complete	**Alternative Flameproof Enclosure Protection Techniques C29033** Peter Reid, CSIRO $272,000	Brad Lucke, Plumpton Group Colin Hoyle, Glencore Coal Assets Australia	Flameproof enclosures enable the use of electrical equipment in coal mines where an explosive atmosphere may be present, but they are not sufficient in circumstances which exceed the specified ratings. Researchers developed a module capable of sensing the internal pressure of the enclosure, using redundant sensing techniques, and ensure the intrinsically-safe power supply is disconnected from the payload in the event of pressure loss. Researchers will investigate ways to pressurise the enclosure, re-pressurise it after inspection, and maintain a minimum pressure. The prototypes represent a new approach to achieving enclosure certification in zones 1 and 2 and will be able to be deployed on an operating longwall face.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current New	**Self-Drilling Bolt Automation C34003** Mark Levey, OKA Rock Bolt Technologies $2,567,744 Current $420,000 New	Roadway Development Task Group	This project focusses on adapting new technology to current mining equipment to allow semi-automation of roof bolting. Pending the success of the current project of semi-automating a self-drill rock bolt, this stage's objective is to remove remaining barriers for end users of the technology. It aligns with ACARP's goals of improved safety, productivity and efficiency in the development of underground roadways. This final stage of this project will conduct a two-stage final underground trial to test the improvements, reliability and register productivity increases gained by using this system. This further testing will particularly seek modification required within the installer lid, and ensure the system is compatible with CM rib bolters. This research is focusing on adapting the technology to current mining equipment to allow semi-automation of roof bolting, but the system can also be used in manual control.
Current	**Assistive Shuttle Car: Development of an Industry Ready Guidance System: Stage 3 C34015** Andrew Strange, CSIRO $205,395	Roadway Development Task Group	This stage of this project will draw on the outcomes of previous stages to provide shuttle car operators with machine guidance information to achieve greater consistency and safety. Shuttle cars transfer coal from the working face to the conveyor, which is highly repetitive and entirely manual, affecting development performance and health and safety of operators. A new assistive guidance system will deliver safe and consistent steering recommendations to the operator through an in-cab display. This system will help accelerate further introduction of remote and automated roadway capability.
Current	**Effects of Rock Weathering on Life-of-mine Roadway Stability C34024** Zhongwei Chen, University of Queensland $312,534	Brian Vorster, Glencore Coal Assets Australia Matt Tsang, Anglo American Steelmaking Coal	Understanding and predicting the nature and impact of time-dependent weathering on roadway stability is a significant technical challenge in underground coal mines. A more effective and sophisticated method of quantifying rock degradation over time is required. This project aims to develop a rock weathering testing methodology appropriate for the underground coal mining environment. Researchers will identify dominant weathering mechanisms, determine the quantitative correlations of a suite of rock weathering assessment parameters and provide a reference table for users to apply a de-rating to roof support design. They will then develop a detailed procedure for implementing the weathering effect into numerical modelling software and conduct a sensitivity study to illustrate the timeframe required for roof re-support.
Current	**Advancing Remote and Automated Capability for Longwall and Roadway Development C35004** Andrew Strange, CSIRO $2,517,000	Roadway Development Task Group	This stage of this project will address challenges in delivering the next generation of advanced remote, automated, and integrated mining systems to achieve safer, cleaner, and more efficient underground mining. The project aims to advance remote underground mining operation capabilities by targeting specific technology developments in areas of high strategic need and opportunity for industry. This will be done by utilising the flexible industry directed project model; focussed research and development to provide solutions to industry challenges and controlled evaluations of technology developments.
Complete	**Longwall Remote Operations – Face Mapping Robot C35009** Luke Dyer, Quantum Engineering and Consulting Group $170,000	Duane Witkowski and Jarod Chadwick, Glencore Coal Assets Australia	Underground mines are transitioning from on-face to off-face longwall operations. While many advancements in technology have been made, there are significant deployment and execution issues. Researchers designed, built and performed on-face tests with a manually propelled prototype robot. The aim was to determine whether the data captured is suitable for the various automation systems currently in use.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current New	**Planar Reflecting Radio Antenna (PRRA) for Underground Coal Mines C36013** Tommy Chaung, Roobuck $360,000 Current $340,000 New	Dave Young, Centennial Coal Jarod Chadwick and Jonathan Harris, Glencore Coal Assets Australia	This project aims to commercialise a passive, intrinsically safe antenna system that extends wireless coverage into non-line-of-sight underground tunnels without the need for power or cabling. Building on the previous stage of this project the research team will ruggedise the Planar Reflecting Radio Antenna for harsh mining conditions, certify it to IECEx standards, and validate it through long term field trials. The antenna improves connectivity for automation, safety systems, and remote monitoring, supporting reduced emissions and enhanced operational efficiency. The project will advance the technology to TRL 9, enabling scalable, low cost wireless infrastructure for underground coal mines.
Current	**Roof Support Location using Wireless Ranging C36014** Matt van de Werken, CSIRO $212,543	Brad Elvy, Brad Elvy Mining Services Tom Hudson, Moolarben Coal Operations	One of the problems associated with automation in longwall mining is when roof supports are left behind. If a roof support doesn't progress, the hydraulic, water and electrical lines between it and its neighbours can be stretched, sometimes to the point of failure, causing significant downtime. The roof support automation system has several mechanisms to detect this issue, however failure of the drive mechanism also often coincides with a failure of the detection system. This project will develop a prototype system for real-time tracking of roof support location in an underground coal mine to detect when a roof support has been left behind. This system could also be used to sense the gate end alignment.
New	**Investigating 5G Networks for Longwall and Development C38001** Mark Dunn, CSIRO $90,750	Roadway Development Task Group	The Australian underground coal mining sector relies on legacy communication systems, all of which are struggling to keep pace with the demands of modern automation, real-time monitoring, and predictive maintenance. While 5G NR cellular technology has demonstrated its value in underground mining internationally its feasibility, compliance, and technical suitability for Australian longwall coal mining remain unproven. This project will critically evaluate the feasibility of deploying 5G NR cellular networks in Australian longwall coal mines, combining structured technical review, targeted industry engagement, and practical small-scale underground field testing.
New	**Mapping Hydraulic Integrity C38015** Michael Condie, Gricon Industries $188,000	Jarod Chadwick, Glencore Coal Assets Australia Steve Winter, Kestrel Coal Resources	This project aims to develop a portable device that measures hydraulic flow and pressure in real time along the longwall face, helping operators detect issues before they cause equipment failure. Current systems rely on fixed sensors at central points, which lack the resolution to pinpoint localised problems, leading to delayed diagnostics and costly downtime. The proposed handheld tool will use high-precision sensors, data logging, and visualisation software to support routine checks and targeted troubleshooting. The 18 month program includes lab testing and underground trials, with a focus on durability, usability, and future safety certification. If successful, the device will improve predictive maintenance, longwall automation, and operational safety across Australian coal mines.
Roadway Development			
Current	**Underground Coal Mine Gateroad Development Continuous Haulage System C27076** Mick Whelan, Premron CHS $9,773,528	Roadway Development Task Group	Premron's Continuous Haulage System (CHS) utilises the Premron "Enclosed Belt System", which has been proven in above ground installations worldwide and now proven in prototype testing over the last 4-5 years at Premron's Gladstone facility. The overall goal is to improve gateroad development in an underground coal mine application, by way of significant improvements in safety, productivity, performance and acceptance of this new technology. This system will be used to remove coal from the face and transport the coal to the panel conveyor, hence removing the requirement for shuttle cars and providing the Australian coal industry with a safe and continuous coal haulage method. The aim of this project is to take the full mine compliant Premron CHS (CHS - 180m system) and trial it in a gateroad development panel within an Australian coal mine for a period of 3 to 6 months. This will prove its performance, mine integration and to demonstrate any potential improvements within a gateroad development process.
Complete	**Light Weight Composite Conveyor Support Structures C33013** Ganga Prusty, University of New South Wales $499,804	Roadway Development Task Group	This project focussed on the commercialisation of lightweight fibre-reinforced polymer (FRP) composite conveyor support structures as an innovative alternative to traditional steel systems in the mining industry. The development process began with the selection of suitable composite materials, followed by the design, manufacturing, and laboratory testing of prototype frames. A comprehensive field trial was undertaken to evaluate the structural performance of the composite frames under real-world mining conditions.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Complete	**Floor Horizon Control for Roadway Development C33020** Andrew Strange, CSIRO $80,000	Roadway Development Task Group	Effective horizon control is essential for safety and productivity in roadway development in underground mines. Existing horizon control methods rely on sparse borehole data or seismic surveys used in conjunction with visual tracking of geological features behind the miner. A floor coal/stone thickness sensor that can be deployed on a continuous miner is needed. This project tested the enclosure and associated cables on the miner.
New	**Industrial Guideline for Adoption of Lightweight Composite Frame Structures for Mine Environments C38035** Ganga Prusty, University of New South Wales $417,182	Roadway Development Task Group	This stage of the project aims to commercialise lightweight glass fibre-reinforced polymer conveyor frames for mining, building on successful lab and field trials that showed strong mechanical performance and fire safety compliance. Compared to steel, the composite frames are 65% lighter, easier to install, corrosion-resistant, and meet Fire Resistant Anti-Static standards, making them safer and more efficient for underground use. The next phase will optimise frame design, develop installation guidelines, and create a costing model to support industry adoption. The modular design allows rapid assembly and relocation, reducing manual handling risks, downtime, and maintenance costs. The project will deliver validated prototypes, industry guidelines, and training to support widespread deployment.
Strata Control and Windblasts			
Complete	**Optimising the Cablebolt Pre-Tensioning Practice to Control Roadway Roof Failure Using Advanced Combined Axial and Shear Testing Facility C28020** Hossein Masoumi, Monash University $165,000	Brian Vorster, Glencore Coal Assets Australia Patrycja Sheffield and Peter Corbett, Centennial Coal	There are conflicting views on the cause of shear failure of cable bolts under high shear displacement and an absence of guidance on how to determine the optimum pre tensioning level. In this project an extensive field and laboratory study, combined with analytical and numerical modelling, will be undertaken. Results from this research and earlier studies will then be used for extrapolation to field conditions and a guideline developed for the field application.
Current	**Definition and Quantification of Long Term Stability of Coal Pillar Systems C29014** Ismet Canbulat, University of New South Wales $230,000	Matt Tsang, Anglo American Steelmaking Coal Peter Corbett, Centennial Coal Russell Thomas, GM3 Appin Mine	There is an increasing emphasis on ensuring that underground pillars are stable and do not cause subsidence. This project aims to define and quantify the long-term stability of coal pillar systems. Using the three pillar system failure modes: (1) pillar failures due to pillar spalling (i.e. reduced pillar width), (2) pillar failures due to continuous roof failures (i.e. increasing mining heights), and (3) pillar failures due to weakened floor. The project's outcomes will enable geotechnical engineers to design long-term pillar systems and to quantify the stability of older pillars.
Complete	**Mechanical Assessment of Time Dependent (Creep) Behaviour of Coal and Coal Measure Rocks Under Uniaxial and Triaxial Conditions Based on Experimental and Analytical Methodologies C29019** Amin Heidarpour, Monash University $205,000	Brian Vorster, Glencore Coal Assets Australia	Creep behaviour of coal and coal strata is critical for geotechnical engineering decisions; however, understanding of this phenomenon is limited to the collected field data by different monitoring techniques. The objective of this research was to investigate the time dependent behaviour of coal and coal measure rocks by conducting experiments under various timeframes ranging from a month to a year or more. Researchers used creep loading frames in temperature and humidity controlled conditions which replicate the underground mining environment.
Current	**Mechanical Investigation of Two Critical Standing Support Systems (Timber Chock and Pumpable Crib) in Underground Coal Mines C29022** Javad Hashemi, Swinburne University $295,000	Bob Coutts and Dan Payne, BHP Brian Vorster, Glencore Coal Assets Australia Patrycja Sheffield, Centennial Coal	Timber chocks and pumpable crib are two standing supports used in almost all the underground coal operations in New South Wales and Queensland. However, the performance of timber chocks, particularly under complex shear and/or vertical ground movements, is not well understood. Researchers will provide an update on the mechanical behaviour of timber chocks currently in the market and identify the extent to which each type of timber chock and pumpable crib is used in Australia. In addition, a testing standard will be developed for the selected standing supports based on mechanical parameters, such as loading rates, offset loading, torsional loading, compressive and shear loadings.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Improved Model Upscaling of Overburden Hydraulic Conductivity for Input into Groundwater Models C33024** Yvette Heritage, SCT Operations $230,000	Bob Coutts, BHP Gary Brassington, Gear M Illawarra Met Coal Peter Corbett, Centennial Coal	This extension to this project aims to validate a proposed new method of determining relative vertical conductivity above longwall panels in a real application of a mine site groundwater model, in collaboration with groundwater modellers. The anticipated outcome is a new approach to determining site specific hydraulic conductivity above longwall panels for practical input into groundwater models. Providing more realistic site-specific estimates of overburden hydraulic conductivity will improve assessment of aquifer protection and groundwater inflow estimation.
Complete	**Carbolt – Pre Commercial Fixed Length Carbolt Prototype C34018** David John, Mining3 $360,088	Alex Wright, Yancoal Australia Bob Coutts, BHP Peter Quinn, Gear M Illawarra Met Coal	This project aims to develop a pre-commercial, fixed-length, carbon fibre based roof bolt prototype to provide tensile and shear strata support. The flexible Carbolt will be designed to be installed in a manner similar to standard rebar rock bolts and provide a non-corroding alternative to existing rebar roof bolts, which includes the ability to be re-tensioned. Researchers aim to characterise and statistically analyse the shear and tension load capacity of the Carbolt through a series of trials.
Current	**Roof Beam Support Assessment Tool C34021** Terry Medhurst, Resource Geotechnical $230,000	Brian Vorster, Glencore Coal Assets Australia Roger Byrnes, Byrnes Geotechnical	In previous projects, an analytical roadway development framework was established for measuring support load and roof convergence. This data can be matched and updated against roof monitoring data. The model relies on inputs from the geophysical strata rating and roof bolt characteristics. In this project, researchers will convert outputs from the previous work into a practical site-based software tool to accompany existing design methods.
Current	**Risk Based Model for Forecasting Longwall Face Cavity Development C34022** Chengguo Zhang, University of New South Wales $173,200	Matt Martin Matt Tsang, Anglo American Steelmaking Coal	Cavity development across the longwall face can cause substantial production losses and pose significant safety risks to mine workers during recovery operations. Previous research into longwall roof cavities has primarily focussed on individual causes, such as equipment, shield pressures, geology, in situ stresses and geotechnical setting. In this project, researchers will adopt a holistic assessment of all causes that, in combination, can result in the formation of a roof cavity. The project aims to produce a risk based approach for assessing the likelihood of cavity development; a set of predetermined controls to mitigate the risk of cavity development; and a proposed hierarchy of longwall fall-of-ground severity linked to these controls, based on the escalating level of risk.
Current	**Optimum Design of Pillars with Various Sizes and Shapes at Increasing Stress Environment C35008** Mehdi Serati, University of Queensland $172,000	Brian Vorster, Glencore Coal Assets Australia John Grieves, QCoal Services Peter Corbett, Centennial Coal	Geological conditions in underground operations may require mine designs that incorporate small, irregular-shaped pillars that do not meet factor-of-safety requirements. This project aims to develop a methodology to effectively design small pillars in high-stress environments. The project will include physical and numerical modelling. The large-scale laboratory pillar experiments will be conducted using a multi-axis substructure testing system.
Current	**Causes for Swelling and/or Bearing Capacity Floor Failures in a Pillar System Under Varying Geological and Geotechnical Environments C35010** Serkan Saydam, University of New South Wales $298,300	Brian Vorster, Glencore Coal Assets Australia Peter Corbett, Centennial Coal	This is the second stage of a study that aims to develop a framework for reliable assessment, prediction and control of swelling and bearing capacity failures in underground coal mines. The project will use experimental, analytical and numerical methods to conduct multidisciplinary research into the failures of coal mine floors and pillar foundations.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Revolutionizing In-Situ Stress Measurement: Extension - Field Trial of the DilaStress Tool C35011** Hamid Roshan, University of New South Wales $419,000	Brian Vorster, Glencore Coal Assets Australia Patrycja Sheffield, Centennial Coal	Understanding in-situ stress conditions is paramount for the safety, efficiency, and productivity of coal mining operations. Currently, overcoring is he preferred technique to measure-situ stress in underground mining. However, it is often hindered by the considerable time, investment, operational complexities, and high costs. This challenge was tackled in a previous stage of this project by developing DilaStress to create an efficient downhole stress measurement technique and associated Tool. This study will field test the DilaStress tool for insitu stress estimation.
Current	**Next Generation Fibre Glass (FG) Rock Bolts with Robust Shear Strength Properties to Replace Steel Rock Bolts C36010** Ali Mirzaghorbanali, University of Southern Queensland $147,998	Dennis Black, GM3 Peter Corbett, Centennial Coal	This project aims to improve the shear strength properties of fibreglass (FG) rock bolts, paving the way for large scale manufacture, and replacement of steel rock bolts. The FG bolts would be safer and easier to handle and install and, being corrosion resistant, would significantly improve reliability and safety. The manufacture of FG bolts would also produce fewer carbon emissions than steel bolts. Prototypes will be produced at the advanced facilities at UniSQ.
Current	**Field Investigations on the Optimum Design of Pillars at Increasing Stress Environments C37012** Mehdi Serati, University of Queensland $249,720	Brian Vorster, Glencore Coal Assets Australia Peter Corbett, Centennial Coal	A continuation of a previous project, this project will conduct field trials to test laboratory and numerical modelling that, if confirmed, has the potential to improve underground coal mine pillar design, leading to potential additional revenue per longwall panel. It's hoped field testing will establish new design principles for deep pillars in increasing stress environments, which will enable the coal industry to optimise mine layouts at the increasing depths many mines are facing. While pillar design techniques in underground coal have evolved significantly, methods for the estimation of pillar load have remained largely unchanged. There is a clear need for a new design methodology that produces more realistic factor of safety values for pillars.
Current	**Investigation to Determine the Influence of Stress Magnitude on the Growth Rate of Hydraulic Fractures C37015** Ken Mills, SCT Operations $200,000	Ben Forrest and Michael Barker, Whitehaven Coal Brian Vorster, Glencore Coal Assets Australia	Hydraulic fracturing can be used to pre-condition overburden strata to improve longwall face conditions and caving behaviour when mining below massive sandstones and conglomerates. This project hopes to confirm whether the cost of hydraulic fracture pre-conditioning can be reduced by up to 30% by reducing the number of injection boreholes and optimising the layout of the remaining boreholes.
Current	**Cost Effective, Low Water Sensitivity, and Fast Curing Geopolymer Grout for Cable Bolt Encapsulation to Enhance Cable Bolting Installation Practices C37020** Ali Mirzaghorbanali, University of Southern Queensland $148,010	Ben Yang, Anglo American Steelmaking Coal Samantha Grimsey, Kestrel Coal Resources	This project aims to develop an innovative geopolymer grout mixture tailored for coal mining applications, with pumpability and strength properties comparable to conventional grout. Adopting geopolymer technology to develop cost effective, low-water-sensitivity, and fast curing grout is projected to significantly enhance cable bolting installation practice. The research team believes that the geopolymer grout technology is a suitable alternative to conventional cementitious grout.
Current	**Longwall System Health and the Implications to Strata Control and Automation – Improving Industry Understanding, Monitoring Techniques and Numerical Model Validation C37024** Adrian Rippon, SCT Operations $427,200	Samantha Grimsey, Kestrel Coal Resources Stephen Giese, Anglo American Steelmaking Coal	The main objective of the project is to improve the underground coal industry's understanding of the longwall hydraulic system and its impact on strata control. The study aims to highlight the limitations of current hydraulic pressure monitoring techniques that may fail to identify fatal flaws in the longwall system health and may also hinder automation processes leading to poorer longwall conditions and reduced productivity. The study also aims to investigate an alternative monitoring system to accurately measure the force being applied to the roof by the longwall powered supports. Such a monitoring system would also help to validate numerical model outputs, improve longwall automation, reduce production delays, and reduce operator exposure to higher-risk activities conducted on the longwall face for strata control remediation.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
New	**Small Scale Stress Rotation in Coalfields through 3D Geomechanical Modelling: Causes and Consequences C38008** Mojtaba Rajabi, University of Queensland $259,655	Brian Vorster, Glencore Coal Assets Australia Matt Tsang, Anglo American Steelmaking Coal	This project aims to explain why stress rotations happen and estimate where and to what extent they are likely to occur, especially around high-risk areas like faults and dykes. These stress changes increase the risk of coal bursts, roof failures, gas outbursts, slope instability, and other safety and operational challenges. Current 2D modelling tools miss key stress components. The team will build high-resolution 3D geomechanical models using real-world data to better simulate and forecast stress behaviour. A set of practical guidelines will be developed to help forecast stress rotation, giving mining engineers tools to estimate how stress might change relative to distance from geological structures. This will directly support safer and more effective decision-making for both underground and open cut mines, particularly in managing gas drainage, ground control, and mine design.
New	**3D Experimental and Image Analysis of Cleat Networks for Improved Characterisation of Coal Mechanical and Fluid Flow Properties C38009** Yulai Zhang, Australian National University $256,725	Matt Tsang, Anglo American Steelmaking Coal Patrycja Sheffield, Centennial Coal Samantha Grimsey, Kestrel Coal Resources	This project aims to improve how coal strength and fluid flow are predicted by analysing the 3D structure of cleat networks—tiny fractures that influence coal behaviour. Using advanced imaging and mechanical testing, cleat characteristics such as spacing, orientation, and intensity will be mapped and then linked to coal strength using the Hoek-Brown failure criterion. The study includes dynamic 4D scanning during stress tests to observe how fractures form and evolve in real time. These insights will help build more accurate models for mine design, safety, and gas drainage planning. Ultimately, the project will deliver better tools for characterising coal and predicting its mechanical performance across different mining conditions.
New	**Triaxial Full Coverage Instrumented Rock Bolt C38014** Graham Wylie, SCT Operations $250,000	Ben Yang, Anglo American Steelmaking Coal Brian Vorster, Glencore Coal Assets Australia	This project aims to develop a triaxial, full coverage instrumented rock bolt that measures axial strain and detects shear-induced bending direction. Unlike traditional bolts that monitor limited sections in one plane, this design uses sensors spaced at 120° intervals to capture strain across the entire bolt length. It installs like standard SCT bolts and is built for long term durability in harsh underground environments. The enhanced data will improve roof support design by identifying load distribution, resin bond integrity, and roof convergence. The project promises a more robust, cost effective alternative to current monitoring systems.
New	**Pre-tension Modelling for Rock and Cable Bolts C38016** Gaetano Venticinque, SCT Operations $181,000	Matt Tsang, Anglo American Steelmaking Coal Patrycja Sheffield, Centennial Coal Samantha Grimsey, Kestrel Coal Resources	Pre-tensioning of rock and cable bolt systems is critical to effective ground control in underground coal mines. However, there is a significant gap in the understanding of proper pre-tension implementation, particularly within popular geotechnical software packages such as FLAC3D, 3DEC and PFC, leading to inconsistent modelling. This project will establish a validated methodology for the correct implementation of pre-tension in numerical modelling of rock and cable bolt systems in FLAC3D, with outcomes also applicable to 3DEC and PFC. The research aims to enhance the reliability of ground support designs, which will improve the safety of underground coal mines.
Ventilation, Gas Drainage and Monitoring			
Current	**New Approaches to Mine Gas Analysis and Ratios C25072** Sean Muller, Simtars $416,192	John Grieves, QCoal Services	The spontaneous combustion of coal is a serious hazard. A good understanding of the coal gas indicators and how they behave as the coal temperature changes is necessary to detect and effectively treat a coal self heating event. The main objectives of this project are to conduct a survey of the gases found in mine goafs, working areas and gas drainage samples from New South Wales and Queensland mines and compare the gases present with the low temperature heating fingerprint. The researchers will identify any new gas indicators that can be detected using the gas chromatographs.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Complete	**Automatic Leak Detection for Tube Bundle Systems C27035** Sean Muller, Simtars $220,000	John Grieves, QCoal Services	Tube bundles are an integral part of gas monitoring systems in underground coal mines. They provide an early warning of spontaneous combustion, validate real time sensor readings and provide invaluable information during a mine fire/ exploration. However, the current manual integrity testing of tube bundles is time consuming. In this project, a fully automated integrity testing system prototype is being developed based on information gathered on the flow rates and pressures of tubes. The prototype will be able to be retrofitted to any tube bundle system, regardless of the supplier.
Current	**Effect of Occlusions by Coal and Stone Dust on the Sensitivity and Time Response of Methane Gas Detectors in Underground Coal Mines C28027** Ian Webster, Ampcontrol $90,000	John Grieves, QCoal Services	The accuracy and response time of new machine-mounted and handheld gas detectors is established through compliance to nominated standards; however, the degradation of performance-in-service of these detectors is not well documented. Preliminary work has demonstrated that the build-up of coal and stone dust on catalytic methane sensors reduces the sensitivity of the detector and increases its response time. This project aims to verify and quantify the susceptibility of real-time methane detectors to occlusion by coal and stone dust using two methods: controlled laboratory testing of typical methane sensing devices and a qualitative survey of real-time methane sensors in service in underground coal mines.
Complete	**Evaluation of Explosion Resistant Ventilation Control Devices and Determining Explosion Risk Exclusion Zones C29018** Alex Remennikov, University of Wollongong $534,484	David Webb, Glencore Coal Assets Australia John Grieves, QCoal Services Paul Wild, Anglo American Steelmaking Coal Russell Thomas, GM3 Appin Mine Tim Huston, Kestrel Coal Resources	The throw of debris and fragments is one of the most dominant effects in underground coal mine explosion events and consequently the required safety distances and exclusion zones around mine entries should be determined. Greater knowledge of the explosion generation of debris inside and outside underground coal mines is required to develop scientifically validated exclusion zones for both blast overpressure and projectile hazards. This project investigated the propagation of debris within drifts and shafts and outside mine openings and establish the relationship between the angle of incline of portals and projectile/debris risks to mine site infrastructure. Researchers validated experimentally the existing procedures in DoD Explosives Safety Board and US Army documents for predicting debris velocities for coal mine explosion scenarios and define the appropriate exclusion zones for explosion risk for coal mine infrastructure.
Complete	**Appraisal of Gas Indicators from Goaf Drainage Holes for Spontaneous Combustion and Explosion Risk Management: Stage 2 C34011** Guangyao Si, University of New South Wales $223,254	David Webb, Glencore Coal Assets Australia John Grieves, QCoal Services Paul Wild, Anglo American Steelmaking Coal	The intensive application of goaf drainage has raised concern that strong suction pressure caused by multiple goaf holes may accelerate ventilation air leakage and oxygen migration into the deep goaf, increasing the risk of self-heating. Building upon the extensive goaf drainage data collected in previous research, this project investigated the effect of intensive goaf drainage on ventilation airflow leakage and dynamic goaf environment variation using CFD models.
Current	**Borehole Tools to Deal with Outbursting, Coal Bursting and Gas Drainage C34014** Ian Gray, Sigra $2,176,576	Ventilation Task Group	There are extensive strata data that could be gathered and interpreted automatically during the borehole drilling process. Researchers have been developing a suite of underground in-seam borehole tools to deal with outbursts, coal bursts and gas drainage. The suite of tools is founded on a high-speed electronics communication system which will enable two-way data transfer along the drill string. The system will be compatible with multiple down-hole sensors. In this extension project, researchers will build the calliper log, surface test it and obtain approvals before conducting underground field trials.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Studies of Coal Toughness and Gas Sorption Dynamics for Outburst Risk Management C35015** Ting Ren, University of Wollongong $275,000	Ventilation Task Group	Coal toughness coefficient is used internationally as an indicator of coal and gas outburst risk. To improve confidence in outburst risk assessment, coal toughness and its relationship with other coal mechanical and proximate properties need to be evaluated. In this project, researchers will conduct systematic studies of coal toughness, geo-mechanical properties and gas sorption dynamics with different coals sourced from underground coal mines in New South Wales and Queensland. A standard coal toughness test and coal toughness coefficient index database will be developed.
Current	**Practical Implications of Oxygen Deficiency on the Determination of Graham's Ratio in Longwall Goafs C36003** Sean Muller, Simtars $64,350	David Webb, Glencore Coal Assets Australia John Grieves, QCoal Services	Graham's ratio is a commonly used indicator for measuring the intensity of the oxidation of coal in underground mine atmospheres. The basis of Graham's ratio is the conversation efficiency of oxygen to carbon monoxide. Graham's ratio uses the nitrogen in a sample for the calculation of oxygen deficiency. This allows for dilution by methane and carbon dioxide seam gases. Nitrogen however is commonly added to goaf atmosphere's through inertisation such as nitrogen or exhaust gases, which can cause Graham's ratio to be underestimated. This project will investigate the practical implications for the interpretation of Graham's ratio and other indicators in the presence of an oxygen deficient atmosphere in longwall goafs.
Current	**Optimisation of Goaf Management Strategies C36005** Rao Balusu, CSIRO $1,443,557	Ventilation Task Group	Gas emissions from working longwall and the adjacent goaf areas are the major contributors to ventilation air methane in gassy underground coal mines. The main objective of this project is to develop optimum goaf management strategies to maximise goaf gas drainage, reduce oxygen ingress into the longwall goaf, and minimise fugitive emissions. The project will also investigate the feasibility of using proactive inertisation on both MG & TG sides of the goaf and in adjacent goaf areas, and other alternative goaf management strategies to maximise goaf gas capture, reduce oxygen ingress into the longwall goaf and minimise fugitive emissions from coal mines.
Current	**Borehole Tools – Caliper Log C36011** Ian Gray, Sigra $424,160	Ventilation Task Group	This project aims to complete a suite of underground in seam (UIS) borehole tools to deal with the problems of outbursts, coal bursts and gas drainage. Outbursts of coal and gas are a significant risk to the health and safety of mine personnel. The backbone of the suite of tools is a high speed electronic communication system, which enables two way data transfer along the drill string. The components that are part of the project are a drill rig monitoring system, a survey module, a downhole torque and thrust sensor to obtain near-bit information and a packer test system that mirrors the drill stem test tool currently used in surface drilled boreholes. The challenge of this project is to produce a 12-arm caliper that will detect hole ovality and breakout and that will work in a borehole drilled at 96mm diameter and extend to about 130 mm.
Current	**Rotary Steering System Field Trial and Developments C36012** Ian Gray, Sigra $449,600	Ventilation Task Group	This extension project will test the Sigra rotary steering tool (RSS) for use in underground inseam drilling situations, and trial the system in cross-measure drilling. The benefit of an RSS system is that it can prevent the drill string becoming trapped in boggy ground and increase productivity by delivering higher thrust to the bit than current down-hole motors and raise penetration rates during directional cross-measure drilling. The development of this tool could result in significant cost savings by reducing the need to hire equipment.
Current	**Intelligent Integrated Distributed Fibre Optic Sensing Technologies C36015** Yi Duan, CSIRO $568,317	Ben Yang, Anglo American Steelmaking Coal Dennis Black, GM3 Peter Corbett, Centennial Coal	This project responds to the industry's desire for continued innovation in integrated distributed fibre optic sensing technologies to improve seismic, temperature and strain monitoring in underground coal mines. Distributed fibre optic sensing systems offer comprehensive monitoring and are more cost effective. Outcomes from this research will be demonstration of distributed temperature sensing for continuous temperature profiling of underground roadway for ventilation and spon-com management, the feasibility of strain and microseismic monitoring on pillars, with proper installation procedure and interpretation methods developed, and a deep-learning pipeline-based software prototype for real-time distributed acoustic sensing data processing.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Determination of New Criteria for the Approval of P5 Type Permitted Explosives C37004** Duncan Chalmers, University of New South Wales $273,000	Brad Elvy, Brad Elvy Mining Services Paul O'Grady, Glencore Coal Assets Australia Paul Wild, Anglo American Steelmaking Coal Russell Thomas, GM3 Appin Mine	This project aims to develop permitted explosives with a lower power delivery during detonation. If successful, industry with the support of the researcher will engage with the Queensland Explosives Inspectorate to seek permission for P5 permitted explosives to be used in underground coal mines. A change in the criteria would allow for the continued development of emulsion-based permitted explosives, further improving the safety of underground coal mine operations.
Current New	**Frictional Ignition – Water Spray Standards, their Basis and Effectiveness with Modern Mining Environment C37006** Yong Sun, CSIRO $89,814 Current $452,169 New	David Webb, Glencore Coal Assets Australia Steve Winter, Kestrel Coal Resources	This project aims to identify the requirements for which drums/sprays should be designed to optimise the use of water sprays to minimise the FI risk for modern mining equipment. In the first stage of the work program the researchers will collate the history, base data and type of equipment used to generate the original, subsequent and up to the current generation British Coal standards via literature review and interviewing the relevant personnel involved in drafting the original and subsequent UK standards. Outcomes will develop a program of works that determines the applicability or otherwise of the standards to current operations and formulate understanding of the nature of the variance from the existing standards. Stage 2 of this project involves testing water spray combinations to improve ignition control. This stage will use lab experiments to study spray effects on cutting temperature. Results could lead to updated standards and safer mining practices.
New	**Spontaneous Combustion Hazard Likelihood Assessment and Operational Management for Australian Coal Mines C38007** Basil Beamish, B3 Mining Services $182,000	Ventilation Task Group	Over the past 10 years there have been significant advances in hazard likelihood assessment and operational practices for monitoring, control and mitigation of spontaneous combustion in coal mines. This project aims to document these advances in practical modules that can be delivered to industry personnel in a short course format as well as being made available online. The modules will be concise and directed at helping industry to apply leading practice that maximises the reduction of the spontaneous combustion hazard risk for site-specific conditions.

ACARP is focussed on research aimed at minimising emissions and reducing the environmental impact of the industry. The Open Cut Committee has identified the following key priority areas to support this goal.

The key open cut research priority areas are:

- Lowering/removing emissions generation activities.
- Alternative land use post mining beyond the traditional vegetation replacement.
- Water contamination, use and efficiency management.
- Tailings management alternatives.
- Precious metals extraction from mining and beneficiation processes.

The primary goal of the open cut research program is to achieve zero fatalities while minimising negative effects on the workforce, environment, equipment and the resource. This is reflected in the targeted occupational health and safety program particularly related to dust and mental health. Rehabilitation activities particularly targeting management of voids and soil regeneration has grown in importance as the broader community and mine owners' expectations increase regarding social licence to operate.

Research that addresses the science on all aspects of rehabilitation and the minimisation of mining impacts on neighbouring communities is a key priority and it will continue to consume a significant component of the open cut research budget.

COMMITTEE MEMBERS

Tony Egan (co-chair)	**Manager, Project Governance**	**Glencore Coal Assets Australia**
Andrew Lau (co-chair)	**Mine Closure Manager**	**Yancoal**
Craig Bancroft	Manager Environment	BMA
Shaun Booth	Group Manager Resource Development and Technology	Glencore Coal Assets Australia
Robert Brown	Principal Mining Engineer	Jellinbah Group
Tyson Burkitt	Engineering and Maintenance Manager (GCAA)	Glencore Coal Assets Australia
Brett Domrow	Mine Planning Manager	New Hope Group
Jason Fittler	Environment Manager	Anglo American Steelmaking Coal
Myf Godfrey	Superintendent Planning and Strategy	BMA
Ravindu Goonawardene	Geotechnical Manager (Open Cut & Underground)	Anglo American Steelmaking Coal
Tim Gray	Project Engineer – Engineering	Glencore Coal Assets Australia
Sean Halliday	Lead Operating Excellence	Anglo American Steelmaking Coal
Gareth Johnson	Technical Services Superintendent	HVO
Andrew Micallef	Technical Assurance Manager	Anglo American Steelmaking Coal
Brian Neilsen	Director of Engineering - Open Cut Mining	Peabody Australia
Paul O'Loughlin	Technical Services Manager	MACH Energy
Rae O'Brien	Group Executive, Australia East	Thiess
Troy O'Reilly	Risk & Compliance Advisor, Mining Operations	Stanwell Corporation
Matt Staff	Group Asset Manager	Yancoal
Matt Tsang	Regional Geotechnical Manager	Anglo American Steelmaking Coal
Peter Walsh	Project Manager	Glencore Coal Assets Australia
John Watson	Director - Environment and Community	Glencore Coal Assets Australia
Brendan Wilkins	Group Manager - Emissions	Anglo American Steelmaking Coal

PROJECTS UNDER MANAGEMENT

Category	No of Projects	ACARP Funding
Drilling and Blasting	4	$1,272,960
Environment	12	$9,008,262
General	1	$83,000
Geology	7	$1,530,170
Health and Safety	1	$152,000
Maintenance and Equipment	5	$780,651
Rock Mechanics	7	$2,406,516

NEW FUNDING

ACARP supports projects with immediate need outside the yearly funding round. These projects are included within this report as new funding.

No of Projects	ACARP Funding	Total Funding
9	$2,058,483	$2,480,045

Total Funding includes in-kind support provided by the researcher and host mine identified in the research proposal.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Drilling and Blasting			
Current	**Evaluation of Production Trials of HP Explosives C27024** Alan Tordoir, Mining3 $477,920	Andrew Lau, Yancoal Brett Domrow, New Hope Group	The aim of this project is to design and manufacture a specialised, inert to hydrogen peroxide (H202), contamination free MMU to produce and deliver bulk quantities of H2O2 based explosives. The MMU targets production rates of 300 kg/min, with a minimum rate of 75kg/min. The MMU will comply to safety and security for mine site scale blast performance. In this project mine site trial blasts of increasing size will be trailed to ensure a successful demonstration of blasting approaching a full-scale blast. The MMU design will ensure that the unit can be subsequently used for further trials and detonation displays.
Current	**Production Trials in Two States of HP Explosives with Custom MMU C33041** Alan Tordoir, Mining3 $342,034	Andrew Lau, Yancoal Brett Domrow, New Hope Group	Researchers have developed a new, stabilised hydrogen peroxide based emulsion explosive with 25 day sleep time. In this project they will use a prototype mobile processing unit to expand demonstrations beyond earlier preliminary trials. Near production scale blasts will be conducted to address technical hurdles.
Current	**Mining Explosive Sensitisation using Chemical Free Methods C35028** Alan Tordoir, Mining3 $297,256	Andrew Lau, Yancoal Brett Domrow, New Hope Group	The objective of this project is to further enable and improve bulk hydrogen peroxide (H2O2)-based emulsion mixtures to deliver the benefits of 'green explosives' with lower community and environmental impacts. Researchers will design and manufacture a prototype sealed high-emission UV-radiation static mixer-based unit for workshop-based and small-scale field experimentation to sensitise H2O2-based emulsion mixtures.
Current	**Segregation Testing of Category 2 Explosive Transport Boxes C37010** Lee Julian, Blast Ability International $155,750	Andrew Rose and Tim Gray, Glencore Coal Assets Australia	The transport and use of explosives at coal mines is a principal hazard. Detonators and high explosives (HE) are typically transported from the magazine to the shot in two dedicated carry boxes on one vehicle. For safety reasons, detonators classified as Division 1.1B and explosives of different explosives classification may not be transported in the same vehicle unless in compliance with the Australian Code for the Transport of Explosives by Road and Rail. This requires an effective means of segregation demonstrated to prevent sympathetic detonation. The main benefit to industry from this project is a demonstrated means to confirm effective segregation to prevent sympathetic detonation of incompatible explosives. This will lead to increased safety in the transport of explosives at coal mines.
Environment			
Current	**Saline Pit Lakes as Aquatic Ecosystems: A Design Manual for Closure C29049** Mark Lund, Edith Cowan University $1,089,226	Andrew Lau, Yancoal John Watson, Glencore Coal Assets Australia	Pit lakes are one of the greatest legacies of open cut mining, but they are not well understood. The broad aim of this extension project is to produce a state-of-the-art design manual for saline pit lakes to assist companies prepare for closure. Researchers will continue and broaden the current biophysical monitoring program to include new pit lakes. They will document the range of interannual variability in the biophysical data and long term trends in lake ecosystem development. They will also investigate how the use of floating vegetated islands could enhance riparian development at closure and during lake fill.
Current	**New Landscape Evolution Model for Assessing Rehabilitation Designs C34025** Greg Hancock, University of Newcastle $875,391	Chris Quinn, Rix's Creek Jason Fittler, Anglo American Steelmaking Coal	This project aims to develop a new set of tools that can be used to assess the long-term sustainability of post mining landforms and reduce environmental risk. As part of this work, researchers will test and develop the State Space Soil Production and Assessment Model (SSSPAM), which will incorporate all features of the SIBERA model. The researchers will develop an accompanying database of parameters that can be used across a range of sites, materials and climates. A further goal is to redevelop the SIBERIA model so that it is available to the industry.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Microalgae Cultivation as a Low Cost Method for Desalinating Void Water and Generator of Post Mining Bioeconomic Activity from Final Voids C34027** Leigh Trevaskis, Valarion; Ben Hankamer, University of Queensland $3,155,904	Andrew Lau, Yancoal Jason Fittler, Anglo American Steelmaking Coal John Watson, Glencore Coal Assets Australia Trudy Mazucco, BHP	The objective of this stage of this project is to fast track the scale-up of micro-algae cultivation as a post mining land use for final voids. These micro-algae systems would generate economic opportunities, regional jobs, lower operational CO2eq emissions, manage void water salinity, extract heavy metals and support adjacent agricultural applications. This is stage three of the project, which has already produced extensive foundational work and is focussed on scaling downstream micro-algae biomass processing methods.
Complete	**High Interest Native Plant Pittosporum Angustifolium for Mine Rehabilitation: Key Strain Identification and Germplasm Propagation Investigation C34035** Ryan Anderson, RNA Environmental Services $197,401	Andrew Lau, Yancoal Andrew Micallef, Anglo American Steelmaking Coal	Pittosporum angustifolium (Gumby Gumby) is a drought resistant plant found in semi-arid regions on highly weathered skeletal sandy soils. It is an ethno-pharmaceutical plant species reputed to have beneficial properties for prostate cancer patients. It also has potential as a mined land rehabilitation species. Two known parent plants have been identified in the Bouldercombe region of Central Queensland. This project produced Gumby Gumby tubestock suitable for field implementation. Researchers developed a robust practical methodology for successful propagation of the species and assayed anti-cancer properties of phytochemical active ingredients.
Current	**Delineating Water Tables and Flow Pathways Inside Spoil Piles to Support Water Quality Predictions C35021** Mansour Edraki, University of Queensland $297,420	Andrew Lau, Yancoal	Spoil piles have a highly heterogeneous composition and internal structure due to different dumping strategies and overburden material. In this project, researchers will define the spatial distribution of major flow pathways and water tables in spoil piles to support accurate prediction of spoil seepage water flow and quality. They will also produce instructions on how to use the data to improve spoil pile hydrology and water quality prediction models.
Current	**Management Strategies for Invasive Leucaena on Coal Mine Sites C35026** Shane Campbell, University of Queensland $531,528	Andrew Lau, Yancoal Craig Bushell, Morne van Zyl and Melissa Brunner, Glencore Coal Assets Australia Hardy Wincen, Stanmore Resources	Leucaena (Leucaena leucocephala) is a leguminous tree introduced to Australia from central America for use as a forage for livestock production. It is a major environmental weed in sub-tropical and tropical regions. This project aims to develop strategies to effectively manage leucaena in rehabilitation on coal mine sites.
Complete	**Renewable Energy as Post Mining Land Use C35029** Claire Cote, University of Queensland $186,628	Jason Fittler, Anglo American Steelmaking Coal Michael Moore and Raymond Howard, Yancoal Australia Morné van Zyl, Glencore Coal Assets Australia	Renewable energy produced by solar and wind has vast potential in the Bowen and Surat basins. However, the pathway to implementation is not clear. High-level guidance is available but it is difficult to translate the recommendations into actions on the ground as regulatory barriers and planning constraints are not fully understood. This project undertook two case studies to examine how renewable energy projects can be established on a mining lease and gain acceptance from regulators and stakeholders. Recommendations are made on how to update the regulatory and planning frameworks to encourage and accommodate renewable energy as a post mining land use.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Erosion and Sediment Control Framework for Queensland Mines – Calibration and Validation C35030** Robynne Chrystal, University of Queensland $347,196	Andrew Lau, Yancoal Jason Fittler, Anglo American Steelmaking Coal	This project will verify and validate the technical guidelines that were developed in a previous ACARP project for the design and implementation of erosion and sediment control plans for Queensland coal mines.
Current	**Predicting the Long Term Erosional Behaviour of High Walls C36018** Greg Hancock, University of Newcastle $443,980	Andrew Lau, Yancoal Chris Quinn, Rix's Creek Jason Fittler, Anglo American Steelmaking Coal	This project seeks to develop a more rigorous understanding of highwall erosion and develop a predictive tool to assess it. This will lead to improved landscape performance and safety, improved environmental outcomes, and improved post-mining landscape design. Models currently exist that can theoretically predict the behaviour of mine highwalls, but there is a lack of reliable model input data to calibrate and validate these models. This work will provide baseline data for advanced understanding of mine highwall erosion and develop parameters for input into numerical models for high wall erosional behaviour and validate a predictive model for the erosion of highwalls.
Current	**Semi Autonomous Bulldozers for Mine Site Rehabilitation C36020** Ross McAree, University of Queensland $498,218	Andrew Lau, Yancoal Brian Neilsen, Peabody Australia Coal Jonathan Miln and Teo Di Pasquale, Thiess Simon Zillman, Hastings Deering, Australia	Challenges facing industry regarding the user of dozer operation for rehabilitation are the financial cost of rehabilitation, availability of skilled people and environmental issues. These challenges could be significantly alleviated through the development and deployment of semi-automated bulldozers. Recent research found that human operated bulldozers achieved 56 percent of the maximum productivity potential, compared with productivity rates of up to 92 percent when missions for semi-autonomous bulldozers were autonomously planned. This project will develop, demonstrate, and evaluate the capability to undertake a substantial proportion of the bulk earthwork for mine-land rehabilitation using semi-autonomous bulldozers with enhanced mission planning to optimise performance.
Current	**Validation of a Landform Design and Management System for Sloped Grazing PMLU C36042** Leigh Trevaskis, Valarion $688,080	Andrew Lau, Yancoal Hardy Wincen, Stanmore Resources Melissa Brunner and Morné van Zyl, Glencore Coal Assets Australia	This project will address knowledge gaps in the effect of grazing on sloped rehabilitated land. The work aims to help mining companies to justify the approval of grazing as a post mining land use (PMLU) based on stability indicators, rather than a one-size-fits-all slope gradient ceiling. Currently there is little confidence in grazing as PMLU on slopes greater than 12 percent in the Bown Basin, and this project aims to obtain robust data on livestock behavioural patterns and their impact on slope gradients up to 30 percent. The project will also assess the feasibility of developing a grazing PMLU landform evolution model that accounts for the impact of livestock behavioural patterns on a range of slopes up to 20 percent and develop best practice guidelines for managing livestock on sloped grazing PMLU.
Current	**Using Large Floating Islands to Promote Aquatic and Terrestrial Biodiversity in Pit Lakes C36043** Mark Lund, Edith Cowan University $697,290	Andrew Lau, Yancoal John Watson, Glencore Coal Assets Australia	The main objective of this project is to evaluate the use of large aquatic floating islands (AFI) to enhance aquatic and terrestrial biodiversity in pit lakes, particularly during prolonged lake filling. Previous research has demonstrated that pit lakes as aquatic ecosystems are potentially a viable, sustainable, and economically responsible option for post-mining land use. However, these ecosystems cannot be established before the lake is full, creating a long period where the aquatic ecosystem is unlikely to meet regulator and public expectations. The broad goal of this research is to develop the use of large-scale AFIs as a tool for miners to develop or improve biodiversity in their pit lakes, making them suitable for closure as aquatic ecosystems or demonstrating improvement for non-use management areas.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
New	**Investigating Pittosporum Angustifolium for Mine Rehabilitation: Key Strain Identification, Medical and Environmental Applications and Germplasm Propagation Investigation C38002** Ryan Anderson, RNA Environmental Services $235,548	Andrew Lau, Yancoal Andrew Micallef, Anglo American Steelmaking Coal	Extending outcomes from project C34035, this project aims to clarify the relative contribution genetics and soil type makeup to anticancer activity to guide medicinal plantation PMLU development; and to create a hygienic plant material store from verified medicinal plants to safeguard high value genetics and to evaluate self-rooting clonal propagation as a method for supplying PMLU plant requirements to secure data and genetics required to deliver a scalable medicinal Gumby Gumby post mining land use that generates economic activity and reduces topsoil requirements.
New	**Do Erosion Control Structures on Post Mining Landscapes Need to be Removed to Reduce Erosion Risk and Management Liability? C38017** Greg Hancock, University of Newcastle $468,360	Andrew Lau, Yancoal Chris Quinn, Rix's Creek Jason Fittler, Anglo American Steelmaking Coal	This project investigates whether erosion control structures like contour drains and benches should be removed from post mining landscapes to reduce long-term erosion risk and liability. While some structures have failed and caused gullying, others remain stable over decades, prompting a need for site specific assessment. The project will use field inspections, LiDAR analysis and landscape evolution modelling to evaluate stability and maintenance requirements. Controlled experiments will compare retained versus removed structures to assess environmental impact. The research findings aim to guide cost effective, defensible mine rehabilitation practices and improve regulatory confidence.
New	**Reducing Coal Tailings by Valorisation of Coal Measure Clays for Low Carbon Concrete C38018** Hassan Baji, Central Queensland University $115,325	Andrew Lau, Yancoal Shaun Booth, Glencore Coal Assets Australia	This project proposes harvesting kaolinite rich clays from coal seams during mining—rather than discarding them in tailings dams—and using them as supplementary cementitious materials (SCMs) in low carbon concrete. These clays show strong pozzolanic reactivity and are abundant in regions like the Bowen Basin, offering a high value alternative to traditional SCMs like fly ash, supplies of which are in decline. The approach reduces tailings volume, water use, and environmental risk, while creating new revenue streams for coal producers and supporting decarbonisation in both mining and construction. The research will characterise clay properties, optimise activation methods, design concrete mixes to meet Australian Standards, and assess cost and CO_2 savings.
New	**Reducing Low Frequency Noise Emitted from Heavy Vehicles and Enclosures in Open Cut Coal Mines C38019** Paul Williams, University of Technology Sydney $235,466	Brendan Wilkins, Anglo American Steelmaking Coal Tim Gray, Glencore Coal Assets Australia	This project aims to reduce low-frequency noise (31–500 Hz) from heavy vehicles and enclosures in open cut coal mines. Prior research showed that common acoustic louvres are ineffective at blocking these low frequencies. The team will develop new louvre designs using advanced materials called metamaterials, which can absorb low-frequency sound more effectively. These designs will be tested using computer simulations and lab experiments, with a focus on maintaining airflow, safety, and weight requirements. The outcome will be a practical, industry-ready solution that improves worker health, safety, and environmental noise control.
General			
Current	**Thermally Enhanced Floating Solar Still System for Reducing a Mine's Reliance on Raw Water Allocations and Achieving a Drought Resilient Post Mining Land Use for Final Voids C37013** Leigh Trevaskis, Valarion $83,000	Andrew Lau, Yancoal Angus Ball, Jellinbah Group Shaun Booth, Glencore Coal Assets Australia	This project aims to design, manufacture, and performance test a scalable, thermally enhanced floating solar still and rain harvester prototype on a Bowen Basin mine site. The proposed technology aims to unlock saline mine affected void water to reduce a mine site's reliance on raw water allocations and deliver a resilient post mining land use for sustainable food production from final voids.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Geology			
Complete	**Guideline for Standardising Structure Interpretation in ATV/OTV Logs C34020** Mojtaba Rajabi, University of Queensland $163,415	Brian Vorster, Glencore Coal Assets Australia Matt Tsang, Anglo American Steelmaking Coal	Borehole image logs, such as ATV and OTV, provide accurate orientated images from borehole walls that are considered replacements for manual cores. However, there is no accepted guideline nor nomenclature for the interpretation of structures from ATV/OTV logs for Australian coal basins. This project proposed the developed of a guideline for processing, analysis and interpretation of structures in ATV/OTV as a means of reducing the inconsistencies and misinterpretations from image log interpretations.
Current	**Recovery of Critical Minerals from Coal and Coal Production Waste C35023** Nerrida Scott, CSIRO $154,000	Andrew Lau, Yancoal Caroline Lang, Shaun Booth and Jeremy Byrnes, Glencore Coal Assets Australia	There are currently global supply chain challenges for heavy rare earth elements (REE), particularly dysprosium. In this project, researchers will utilise research that is currently being undertaken to assess the potential of coal, coal bearing strata and production waste as unconventional sources of REEs and other critical minerals. They will use advanced characterisation techniques to develop innovative and environmentally benign recovery technologies for minerals that are found in Australian waste streams to be economic.
Complete	**CSR Predictions and Correlations Definition C35025** Chris McMahon, McMahon Coal Quality Resources $35,880	Alison Burke, BHP Maurizio Tonelli, Glencore Coal Assets Australia	In this project, researchers defined the effectiveness of coke strength after reaction (CSR) predictors for product coals of varying coal quality characteristics. Researchers conducted a comparative analysis of published equations, chart data (that can be converted to formulas), data obtained from existing research and estimators produced in that research. Several deposits and coal types were evaluated. The outcome is a guide for improving CSR predictor accuracy and thereby improving resource / reserve / marketing product accuracy.
Current	**Real Time Prediction of Coal Top Through Guided Borehole Radar Wave Imaging for Open Cut Blast Hole Drilling C35047** Wayne Stasinowsky, CSIRO $496,730	Jack Woollett, Glencore Coal Assets Australia Troy O'Reilly, Stanwell Corporation	Damage to the top of coal seams caused by incorrect blast stand-off distances is a significant issue within the Australian coal industry with annual losses estimated at AUD$4 billion. There is currently no technology available in the open cut environment to remedy this issue. Three previous project stages have demonstrated that a conventional borehole radar (BHR) can be integrated onto a drill string to generate look-ahead waves for imaging and predicting the coal seam top in real-time, while drilling blast-holes. This final stage seeks to deliver a commercially ready real-time coal-top guidance system prototype for blast-hole drilling that will allow a protective layer of overburden.
Current	**Validation of LIBS Technology for Downhole Resource Evaluation C36022** Joe Perkins, CSIRO $276,020	Jason Schumacher, Yancoal Mark Laycock, Glencore Coal Assets Australia Sudipta Nag, BHP	Laser Induced Breakdown Spectroscopy (LIBS) shows promise as a rapid method to evaluate coal properties. However, it has yet to be successfully adapted for use downhole. LIBS can provide real time measurements, making it highly valuable for on-site and in-situ analysis of coal. This project will fast track the adaptation of a downhole LIBS sensor for coal by developing a comprehensive coal core derived calibration model, integrating LIBS spectral information into washability models using processed core samples, and conducting field testing using a pre-commercial LIBS downhole tool.
Current	**Automated Optical and Acoustic Televiewer Drill Data Mapping for Improved Subsurface Analysis C37027** Simit Raval, University of New South Wales $206,875	Ben Forrest, Whitehaven Coal Matt Tsang, Anglo American Steelmaking Coal Myf Godfrey, BHP	Acoustic and optical televiewer (ATV and OTV) tools enhance the understanding and management of geotechnical environments in mining operations.These tools provide high-resolution, oriented images of borehole walls, enabling the detailed assessment of structural geology and borehole stability. The manual interpretation of ATV and OTV data, however, is both time-consuming and subject to human error, presenting a significant bottleneck in data processing.This project aims to leverage machine/deep learning algorithms for the examination of ATV/OTV drill data to improve the efficiency and accuracy of data interpretation and reduce costs and labour intensity.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Multiscale Fracture Analysis and Modelling for Improved Geomechanical Assessments C37028** Michael Munro, GMEK $197,250	Leigh Bergin, Stanmore Resources Matt Tsang, Anglo American Steelmaking Coal	The main objective of this project is to provide a more realistic and quantifiable methodology to assess the principal geotechnical hazards in highwall slopes, ultimately improving the safety and efficiency of mining operations. The aim is to significantly enhance the understanding of fractured rock masses at coal mines by integrating more data and key geologic drivers into modelling.
New	**Transforming Coal Tailings into Sustainable Concrete for Transport Infrastructure C38006** Hassan Baji, Central Queensland University $208,801	Andrew Lau, Yancoal Luke Dimech, BMA Nigel Seto, Pembroke Resources Shaun Booth, Glencore Coal Assets Australia	This project proposes repurposing coal tailings as a supplementary cementitious material (SCM) in concrete used for roads and bridges, turning mine waste into a valuable construction resource. Led by CQUniversity and supported by Holcim Australia, NTRO, BMA, and Pembroke Resources, the initiative builds on prior ACARP research and aims to optimise mix designs, conduct lab and pilot-scale testing, and assess lifecycle benefits. The approach includes sourcing tailings, designing concrete to meet Australian standards, and evaluating performance through strength, durability, and environmental impact testing. With declining availability of traditional SCMs like fly ash, treated coal tailings offer a sustainable alternative that supports decarbonisation goals. If successful, the project will reduce rehabilitation liabilities, create new revenue streams, and position coal tailings as a high value input for infrastructure development.
New	**CSR Predictions and Correlations Definition – Moranbah and Fairhills Coal Measures C38021** Chris McMahon, McMahon Coal Quality Resources $26,680	Graeme Harris, Kestrel Coal Resources Myf Godfrey, BHP Shaun Booth, Glencore Coal Assets Australia	This project extends earlier research on predicting Coke Strength after Reaction (CSR) from routine coal quality tests, focusing now on the Moranbah and Fairhill Coal Measures. CSR is a key pricing factor for coking coal but difficult and costly to test directly, especially from borecore samples. Existing prediction models will be evaluated, and new ones developed with better accuracy using statistical analysis of coal quality proxies. Outcomes will help producers assess resource value more confidently and reduce reliance on expensive lab testing. The final guide will support improved marketing, reserve estimation, and technical decision making for Queensland coking coal deposits.
Health and Safety			
Current	**Live Monitoring of Workplace Exposures In Surface Mobile Equipment C36033** Andrew Westaway, SafeOperate $152,000	Shane Apps, Peabody Australia Coal	This project will establish and deploy a system that enables continuous live monitoring of exposures to various hazardous workplace agents at mines with the data recorded and transferred to a centralised database. The information generated by the system will be used to identify exposure exceedances and trigger real-time alerts. More effective management of these health hazards including proactive detection of changes in exposure and faster responses will reduce injuries and illnesses and, subsequently, cost.
Maintenance and Equipment			
Complete	**Dozer Suspension Seat to Reduce Body Vibration C33034** Danellie Lynas, University of Queensland $83,107	Shane Apps, Peabody Australia Coal Tim Gray, Glencore Coal Assets Australia Troy O'Reilly, Stanwell Corporation	Long term exposure to whole body vibration causes a range of adverse health effects, particularly back disorders. Dozers operate on a variety of surfaces, including the coal floor, basalt and softer overburden, which expose operators to whole body vibration transmitted through the seat. This project aimed to evaluate the effectiveness of an innovative passive vibration and movement cancelling seat prototype in reducing dozer operator exposures to excessive whole body vibration during normal operation at surface coal mines; but this was not achieved.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Complete	**Radar Tyre Monitor System C33036** Luke Powell, CSIRO $132,382	Brendan Wilkins, Anglo American Steelmaking Coal Rob Fraser and Tim Gray, Glencore Coal Assets Australia	This extension to this project will develop and trial a low cost radar based tyre monitoring device to detect indications of potentially catastrophic and deadly tyre failure. The monitor will extend and complement existing technology to substantially decrease downtime and improve convenience of use. The previous stage demonstrated a compact radar system's ability to detect internal and external tyre damage in a controlled environment. An extended field trial is now required to prove the monitoring capabilities of a continuous scanning system on an in-service vehicle.
Complete New	**In-situ Slew Bearing Scanner for Shovels C36019** Matthew Robinson, Ascribe Engineering $150,000 Current $40,300 New	Brendan Wilkins, Anglo American Steelmaking Coal Tim Gray and Tyson Burkitt, Glencore Coal Assets Australia	This project aimed to develop a miniaturised scanner to examine slew bearing rails on shovels to provide mine sites with more accurate assessment of their condition and remaining life. Improved knowledge of the condition of the slew bearing enables longer operation of the bearing, while reducing the operational risk of a sudden failure. The miniature scanner will also improve safety by removing the need for manual inspection in the shovel's confined space. Such scanners are already available for draglines but are too large for installation on shovels.
Complete	**People and Process: Case Review on Human Systems Integration and OTR Tyre Handling Mobile Plant in Mining Operations C37007** Sara Pazell, ViVA! Health at Work $150,162	Brendan Wilkins, Anglo American Steelmaking Coal Rob Fraser, Tim Gray and Tony Egan, Glencore Coal Assets Australia	Off-the-road (OTR) tyre handling operations expose technicians to fatal hazards. An approach that adequately considers people and processes when selecting and using tyre-handling equipment leads to safer working conditions by mitigating fatal hazards and improving the design of systems or equipment. This project aims to improve the understanding of how decision makers influence the integration of OTR tyre handling equipment in mining maintenance services, and to address the needs of current and future mines with a person-centred, systems view on resilient and reliable tyre handling operations.
Current	**Concept to Produce Pure Plant Oil Economically for Captive use at Mine Site to Replace Diesel C37021** Charles Easton, Green Biofuels Australia $265,000	Andrew Lau, Yancoal Myf Godfrey, BHP Shaun Booth, Glencore Coal Assets Australia	The Australia Government has introduced a financial penalty mechanism to encourage facilities that have Scope 1 emissions above 100,000 T CO2-e per year to reduce their emissions by 4.9% annually. For most mines, most Scope 1 emissions come from the use of diesel fuel. This project will provide an economically viable way to reduce Scope 1 emissions by using a locally grown Pure Plant Oil (PPO) to replace mineral diesel in haul trucks and other mining equipment. The project focusses on production of PPO from Pongamia, and to encourage uptake of PPO production, methods will be developed to enable oil production in year one and increase as the Pongamia trees mature through innovative intercropping of oil seed species.
Overburden Removal			
New	**Enhanced Bulk Movement Planning for Semi-Autonomous Rehabilitation C38020** Ross McAree, University of Queensland $687,503	Andrew Lau, Yancoal Brian Neilsen, Peabody Australia Coal Jonathan Miln and Teo Di Pasquale, Thiess Simon Zillman, Hastings Deering, Australia	This project aims to automate bulk material movement planning for semi-autonomous bulldozers used in mine site rehabilitation. It addresses a key bottleneck where current design tools don't provide the detailed work-block sequences needed for autonomous execution, forcing supervisors to manually bridge the gap. The team will enhance existing algorithms to handle complex terrain and integrate them with industry-standard design workflows. This will allow dozers to operate more efficiently, helping scale rehabilitation efforts to meet Queensland's and New South Wales' ambitious land rehabilitation targets. The project supports faster, safer, and more cost effective rehabilitation using advanced automation.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Rock Mechanics			
Current	**System for Rock Fall Analysis Field Trial C29005** Marc Elmouttie, CSIRO $321,268	Matt Tsang, Anglo American Steelmaking Coal	Systems to detect, monitor and analyse rock falls in open cut mining operations have the potential to improve operational safety, improve calibration of rock fall simulators and provide quantitative data to justify current standoff designs. A monitoring system that can accumulate a large database of rock fall events across the full strike length of highwalls was designed in an earlier stage of this project. In this extension, the prototype system underwent a field trial. The overall project aim was to support development of a commercially available rockfall monitoring system capable of accurately identifying rockfall events, locations and trajectories across the full strike of highwall, potentially in real time.
Current	**Machine Learning for Rockfall Analysis C33040** Klaus Thoeni, University of Newcastle $342,240	Matt Tsang, Anglo American Steelmaking Coal	Rockfall is a major safety hazard in open pit mines. The ability to gather extensive rockfall data along a full strike length of highwall and effectively use this data to predict the rock trajectory and the associated hazard is challenging as their variability can significantly influence rockfall motion characteristics. This project will expand the previously developed machine learning and artificial intelligence approaches to include more site-specific information, such as stratigraphy, geology and geostructural mapping and using such data for both training and validation purposes.
Current	**Quantifying Hoek-Brown Disturbance Factor (D) for Coal Measures Through an Integrated Laboratory and Numerical Modelling Approach C35022** Italo Onederra, University of Queensland $672,162	Matt Tsang, Anglo American Steelmaking Coal Peter Chern, Coronado Coal	At present, in slope stability analysis, the Hoek-Brown Disturbance Factor (D) is assumed to remain constant, failing to reflect expected variability. In response, the previous stage of this project sought to refine techniques for defining D by establishing more realistic blast-induced damage profiles. This project extends that work, focusing on the validation of our new blast damage predictive model. The primary objective is to conduct targeted blast monitoring campaigns to validate the model's accuracy.
Current	**From Open Pit to Pumped Hydro Energy Storage, a Focus on Low Wall Stability C36017** Olivier Buzzi, University of Newcastle $405,500	Andrew Lau, Yancoal Shaun Booth and Tyron Domenici, Glencore Coal Assets Australia Troy O'Reilly, Stanwell Corporation	This project is a first step to transforming residual voids on open cut mines into viable pumped-hydro energy schemes as it answers questions of low-wall stability that are specific to their operation. This project aims to determine why a low-wall might fail due to water level fluctuations associated with pumped hydro and provide guidance on mitigating geotechnical failure risks. This project could provide the industry with a viable post mining alternative land use beyond traditional vegetation replacement.
Current	**Measuring the Tensile Strength of Thin Units in Coal Measure Rocks using a Comminution Approach C36021** Katerina Savinova, University of Queensland $214,100	Andrew Lau, Yancoal Jianping Li, BHP Matt Tsang, Anglo American Steelmaking Coal	This project will provide valuable insights and tools to geotechnical engineers and mining professionals, enabling them to better characterise and understand coal measures, ultimately leading to safer and more efficient mining practices. Most slope failures and ground instability in Australian coal mines occur due to extension strain and tensile fracture initiation and propagation. However, commonly used rock mass strength criteria assume shear failure. There is a need to measure intact tensile strength to develop site-dependent properties for design. Core sampling difficulties often preclude sourcing and measuring the strength of thin units in coal measure rocks. To address this problem, a solution can be borrowed from comminution and applied to the mining/geotechnical sector, which has the potential to derive rock tensile strength from rock chips or drilled mini core of a representative sample.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**"SCANDY" - A handheld Imaging System for Real Time Spoil Categorisation C36023** Simit Raval, University of New South Wales $178,050	Jacques Strydom, Anglo American Steelmaking Coal Tim Vangsness, BHP	This handheld imaging system will aid the assessment of coal spoil piles in real time to enable proactive risk management and timely interventions to prevent failures. This would contribute to long term dump stability. Once implemented, the system could also offer real time guidance to operators through ground inspections about optimal unloading areas to further enhance stability and prevent imbalanced dumping. The long term sustainability of rehabilitation efforts in dump environments is a critical concern within the mining industry and successful rehabilitation is reliant on accurate material characterisation and mapping.
Current	**Improved Change Detection for Low Cost Terrestrial Photogrammetric Monitoring Based on Deep Learning C37011** Klaus Thoeni, University of Newcastle $273,196	Ben Forrest, Whitehaven Coal Gareth Johnson, Hunter Valley Operations	The main objective of this research is to develop an improved change detection algorithm that can accurately detect rockfall events and slope instabilities by utilising deep learning techniques. It follows on from a previous project, which developed a low-cost photogrammetric monitoring system that enables identification of rockfall sources on the rock surface and measure detached volumes. However, the system requires improvements to enable more efficient and flexible application on site. Rockfall and slope stability hazards can have significant safety and financial consequences in open cut mines. Cost efficient monitoring of tailing dams, waste dumps and highwalls during and post mining is of paramount importance to current operations and for future use of remaining voids and rock faces beyond the life of the mine.
New	**Guideline for Groundwater Pressure Measurement, Interpretation, and Modelling for Slope Stability C38004** John Simmons, Sherwood Geotechnical and Research Services $40,500	Matt Tsang, Anglo American Steelmaking Coal	This project will develop guidelines to address knowledge gaps with regards to the strong influence of groundwater pressure on mine slope stability, where recent reviews highlight inconsistent and sometimes inadequate practices in groundwater monitoring and modelling that feed into Factor of Safety and Strength Reduction Factor calculations. Key issues include the use of early-installed, far-field monitoring points that do not capture mining-induced drawdown; poorly positioned downhole sensors that miss key aquifers and aquitards; overly localised finite-element models that generate unrealistic drawdown profiles; simplified SRF stress-path simulations that ignore staged excavation effects; and reliance on generic hydraulic conductivity values rather than site-specific geological controls. Together, these shortcomings reduce data relevance, introduce modelling errors, and can ultimately lead to inaccurate slope designs and suboptimal mining decisions.

ACARP is focussed on research aimed at minimising emissions and reducing the environmental impact of the industry. The Coal Preparation Committee has identified the following key priority areas to support this goal:

- Optimal tailings management and closure practices.
- Energy and water efficiency.
- Remote and autonomous development technologies on stockpiles.
- Asset utilisation, maintainability and reliability.

The Coal Preparation Committee has established complementary strategies with three key components of maintenance, improved recovery, and plant capacity while maintaining the current high standards of safety.

Increase in yield of fine coal through agglomeration is particularly targeted while maintaining research that seeks to minimise the contribution of coal processing on the environment, e.g. by reusing tailing for soil enhancement, minimising emissions, reducing water consumption and finding ways to use lower quality water without adversely impacting on process efficiency. It is also critical to maximise the yield of product quality coal at minimum cost.

COMMITTEE MEMBERS

Luke Dimech (co-chair)	**BMA Principal Process Engineering**	**BMA**
Frank Mercuri (co-chair)	**Coal Processing Manager**	**Anglo American Steelmaking Coal**
Elie Bassil	Project Manager	Glencore Coal Assets Australia
Brydon Brown	CHPP Production Superintendent	Peabody Australia
Tom Buckby	Group CHPP Maintenance Superintendent	Glencore Coal Assets Australia
Dan Delahunty	Coal Quality and Logistics Superintendent	Yancoal Australia
Chris Denyer	Coal Processing Specialist	Anglo American Steelmaking Coal
Araz Ejtemaei	Specialist System Dynamics	BHP
Jenny Goh	Group Process Engineer	Glencore Coal Assets Australia
Connor Gregory	Manager Coal Improvement and Technology Operations - Mining	Stanwell Corporation
Alistair Harriman	Group Manager - CHPP	Whitehaven Coal
David Hensley	Principal Process Engineer	Kestrel Coal Resources
Chris Huth	Electrical and Controls Advisor, Operations	Sedgman
Thomas Ilott	Superintendent of Remote Operations	Whitehaven Coal
Chris Jackson	Group Manager CHPP's	Glencore Coal Assets Australia
Josh Kowalczuk	CHPP Manager, Mt Owen CHPP	Glencore Coal Assets Australia
Jack Lauder	Group Process Engineer (North)	Glencore Coal Assets Australia
Zachary Maytom	Planning/Logistics Coordinator	Peabody Australia
Dan Mujic	Senior Process Engineer Thiess Lake Vermont	Thiess
Ben Murphy	Manager Engineering	Coronado Global
Chris Nethercott	Manager Systems and Innovation	Sedgman
Jenny Park	Process Engineer (South)	Glencore Coal Assets Australia
Dan Perkins	CHPP Manager	Coronado Global
Jimmy Pollack	Principal Process Engineer	Golding
Ed Provan	Senior Process Engineer – Oaky Creek CHPP	Glencore Coal Assets Australia
Mel Robbins	Superintendent Quality Governance	BHP
Chloe Scholtz	Process Engineer	Bengalla
Jason Schumacher	Coal Quality Engineer	Yancoal
Nigel Seto	Senior Process Engineer	Pembroke Resources
Colin Surawski	Senior Process Engineer	Yancoal
Clinton Vanderkruk	Capcoal CHPP Manager	Anglo American Steelmaking Coal
Tom Wilson	CHPP Manager	MACH Energy

PROJECTS UNDER MANAGEMENT

Category	No of Projects	ACARP Funding
Dewatering	7	$1,917,340
Environmental Improvement	3	$1,997,880
Fine Coal	11	$6,317,229
General	3	$579,028
Gravity Separation	5	$940,222
Maintenance and Equipment	3	$1,278,397
Process Control	3	$684,268

NEW FUNDING

ACARP supports projects with immediate need outside the yearly funding round. These projects are included within this report as new funding.

No of Projects	ACARP Funding	Total Funding
8	$2,147,715	$3,627,101

Total Funding includes in-kind support provided by the researcher and host mine identified in the research proposal.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Dewatering			
Current	**Tailings Management - Dewatering Flume Site Trials C29060** Craig Wheeler, University of Newcastle $278,500	Jenny Park and Peter Shumack, Glencore Coal Assets Australia	Dewatering of tailings can be a complex and expensive process. An open flume provides a simple method for dewatering slurries at a disposal site. Using this method, concentration of solids entering the tailings dam is increased and water recovered and recycled back to the preparation plant before deposition into the dam. A pilot scale open flume was tested in a previous project, successfully dewatering coal slurries without the addition of flocculent. The aim of this project is to design and build a full-scale flume to be trialled on site.
Complete	**Emerging Pulsed Power Technology for Dewatering Mineral Tailings C33049** Mansour Edraki, University of Queensland $277,630	Dan Delahunty, Yancoal Australia Jack Lauder, Glencore Coal Assets Australia	Mechanical dewatering of wet tailings is expensive and eliminating final moisture remains challenging. The overall aim of this project was to design a tailing dewatering system (batch mode) using pulsed power technology as an emerging technique for separation of water and solid of mine tailings.
Complete	**Dewatering Efficiency of Fine Flotation Concentrates by De-Aerating Froth Products - Plant Demonstration C33050** Yongjun Peng, University of Queensland $627,923	Frank Mercuri, Anglo American Steelmaking Coal Luke Dimech, BMA Shivank Vijayakumar, BHP	The presence of tenacious froth in coal preparation plants significantly decreases the dewatering efficiency in thickening and filtration. To address this issue, two pilot scale froth deaeration units were designed, manufactured and successfully tested in coal preparation plants. In this project, large, fully automated, demonstration scale mechanical and vacuum deaerators were run continuously in selected plants to identify optimum operating conditions and control strategies.
Current	**Hybrid Microwave Technology for Dry Stacked Tailings Applications C33051** Christian Antonio, University of Queensland $121,335	Connor Gregory, Stanwell Corporation Frank Mercuri, Anglo American Steelmaking Coal	Dry stack tailings are an alternative method to storing wet tailings in dams; however, conventional dewatering techniques, such as thickeners and filtration, do not sufficiently reduce tailings moisture. This project will use hybrid microwave technology to reduce the tailings moisture content to the level required for dry stacking. This technique has less operational and capital costs than traditional methods.
Current	**Cost Effective Approach for Coal Tailings Dewatering using Semi Inverted (SIV) Hydrocyclones C34051** Christian Antonio, University of Queensland $174,500	Connor Gregory, Stanwell Corporation Jenny Goh, Glencore Coal Assets Australia Tom Wilson, MACH Energy Australia	Dry stack tailings reduce the space required for waste storage and decrease the potential environmental and geotechnical risks of tailings storage facilities. However conventional technologies to dewater tailings are ineffective. This project will use semi-inverted hydrocyclone technology to split the thickener's underflow into a coarse stream (underflow product), with reduced moisture content, and a fines stream (overflow product). This process will enable fine clay particles to be captured in the fines stream and, consequently, improve the efficiency of downstream dewatering units.
Complete	**Improving the Dewatering of Fine Coal Tailings by Minimising Micro-Nano Bubbles C35032** Yongjun Peng, University of Queensland $238,470	Connor Gregory, Stanwell Corporation Han Hooi, BHP Tom Henshaw, Glencore Coal Assets Australia	Dewatering fine coal for tailings disposal and water recycling has been a major challenge in the coal industry. This project focussed on minimising micro-nano bubbles to improve the dewatering of fine coal tailings. The aim was to increase water recycling by reducing cake moisture from mechanical dewatering and improve the handability and stability of dewatered tailings for improvements in pit disposal.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Green and Effective Reagents for Centrifugal Dewatering C36025** Liguang Wang, University of Queensland $198,982	Chris Denyer, Anglo American Steelmaking Coal Connor Gregory, Stanwell Corporation Jenny Park, Glencore Coal Assets Australia	This project will help minimise greenhouse gas emissions and the environmental impact of the Australian coal industry by improving the dewatering of fine and ultra-fine coals and tailings. This will be achieved by finding more effective and environmentally responsible reagents to reduce product moisture and improve solids recovery of fine and ultrafine coal in the dewatering processes. This would reduce tailings disposal and maximise water recovery and recycling. The existing processes result in loss of valuable fresh fine coal to effluents, loss of profit for Australian coal producers and the creation of a potential environmental liability with increased burden to tailings disposal. Specialty dewatering aids have been developed, but there is no clear guide to reagents suitable for dewatering of Australian black coals and tailings.
Environmental Improvement			
Current	**Tailings to Topsoil C29042** Ken Williams, University of Newcastle $765,300	Bill Baxter, Yancoal Australia Paul O'Loughlin, MACH Energy Australia	This project aimed to develop and deliver a transformational alternative technology to the management of coal tailings; that is, an integrated bulk material emplacement technology tailored for soil improvement. A purpose-built mobile dewatering plant was central to the interface between the tailings to topsoil emplacement. The delivery system integrates the conventional slurry tailings transport mechanisms with an innovative high-efficiency solids separation mobile tailings handling plant. In the extension to the project plant growth measurement, soil profile analysis and microbial identification was used in greenhouse and in-situ field trials to identify the benefits and challenges of using tailings and the effect on different plant species during site rehabilitation.
Current	**Non-invasive and Real Time Monitoring of Slurry Tailings Density and Velocity in the Transmission Pipeline using Electrical Resistance Tomography Method C35033** David Williams, University of Queensland $259,000	Peter Shumack, Glencore Coal Assets Australia	The most common in-situ method of measuring slurry coal density and velocity in a transmission pipeline uses Gamma rays which have a high radioactive risk. This data is used to assess water use efficiency to enhance water recycling. In this project, researchers aim to develop a holistic monitoring solution to measure the density and velocity of transported slurry coal tailings directly from the transmitting pipeline using electrical resistivity tomography.
Current	**Cost Effective Rehabilitation of Tailings Dams C35048** Mike Coal; Carmen Castor; CSER Research $973,580	Andrew Lau, Yancoal Shaun Booth and Brooke York, Glencore Coal Assets Australia	Ecological factors and the physics and chemistry of soil media are critical to the success of flora species in mine rehabilitation. This project aims to develop a final landscape plan for tailings dams and surrounds by testing tailings and rehabilitation amelioration techniques to maximise plant diversity. Researchers also aim to maximise the root-microbe associations in key plant functional groups that are linked to sustainable nutrient acquisition and cycling on spoil placement areas and tailings dams.
Fine Coal			
Current	**Full Scale Beneficiation of Coal Fines by Novel Agglomeration C34002** Kevin Galvin, University of Newcastle $4,568,256	Jack Lauder, Jenny Goh and Paul Sainsbury, Glencore Coal Assets Australia Jason Schumacher, Yancoal Luke Dimech and PeiPei Wang, BMA	Concentrated water in oil emulsion can be highly effective in achieving ultrafast and ultrafine particle recovery while delivering a low ash and moisture product. This project will investigate the scale-up of a novel fine coal agglomeration technology through a study at full-scale. The work to be undertaken involves the design, commissioning and operation of the novel agglomeration technology known as 3D Binder Flotation. The feed source is expected to be a fine coal tailings stream suitable for the thermal market. The study seeks to quantify the scale-up using feed rates of up to 500 m3/h in terms of yield, ash, moisture and economic benefits. The novel agglomeration technology offers the prospects of a low capital investment for processing the fine coal tailings stream normally sent to the thickener.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Optimising the Diesel Droplet Size in Coal Preparation Plants C34040** Yongjun Peng, University of Queensland $231,157	Chris Denyer, Anglo American Steelmaking Coal Han Hooi, BHP Jason Schumacher, Yancoal	Optimising the droplet size of diesel emulsion in coal flotation can improve flotation, reduce diesel consumption and quickly mix the diesel and coal slurry without the need for conditioning tanks. This project seeks to determine the optimal diesel droplet size in coal preparation plants and then implement the most suitable diesel emulsification system with online droplet size measurement and control in the plants.
Current	**In Plant Demonstration of the Next Generation Flotation System C34043** Liguang Wang, University of Queensland $258,347	Elie Bassil and Nic Roberts, Glencore Coal Assets Australia	A recent research breakthrough shows that microbubbles smaller than 100µm can be cheaply generated under oscillatory flow by connecting a diffuser/sparger to the outlet of a fluidic oscillator. The technique significantly reduces reagent use and energy consumption. In this project, researchers will develop a prototype fluidic oscillator to optimise the sparging system and provide detailed scale-up information.
Complete	**Real Time Automatic Measurement of Frother Distribution in a Coal Preparation Plant C34045** Liguang Wang, University of Queensland $124,560	Chris Denyer, Anglo American Steelmaking Coal Peter Shumack, Glencore Coal Assets Australia	A new frother concentration measuring technique, based on quantifying the specific interaction between frother molecules and a formulated liquid, was developed in a previous project. This project will further assess and demonstrate a cheap and simple prototype system for real-time, automatic measurement of frother concentrations. The aim of the system is to manage frother consumption and water reuse to maximise coal recovery and prevent the overfrothing ('froth out') problem.
Complete	**Froth Flotation Predicted v Actual Definition C35024** Chris McMahon, McMahon Coal Quality Resources $41,360	Jason Schumacher, Yancoal Jenny Goh, Glencore Coal Assets Australia Mel Robbins, BHP	Correct outcomes in froth flotation yield predictions for product ash from bore core exploration is critical to resource predictive potential, market evaluation and economic mining outcomes. This project aimed to produce a guide for estimating accuracy of froth flotation predicted data by type of testing. Using existing data, several froth flotation methods from bore cores, including the pseudo-density method (with efficiency factors trialled to fit data) were evaluated against actual data.
Current	**Demonstrating Better Classifying Cyclones C35031** Andrew Vince, Elsa Consulting Group $377,475	Clinton Vanderkruk, Anglo American Steelmaking Coal Jack Lauder and Jenny Park, Glencore Coal Assets Australia Jimmy Pollack, Golding	In the late 1990s, the Rong classifying cyclone concept (RCCC) demonstrated significant improvement in cyclone performance, but the design technology was not progressed. A three-month assessment of the RCCC in 2022 concluded that small changes in the way it is tested could lead to a successful industrial demonstration. This project will produce Tromp curves for different particle sizes which can be used to objectively compare the RCCC with any other device.
Complete	**Working Effectively with Swelling Clays in Fine Coal Flotation to Improve Product Quality and Recovery C35034** Ngoc Nguyen, University of Queensland $200,304	Ed Provan and Jack Lauder, Glencore Coal Assets Australia Jason Schumacher, Yancoal Luke Dimech, BMA	Fine clays in coal flotation can negatively impact the recovery, ash content and moisture of fine coal concentrates. This project aims to use wash water bias and clay suppressants to reduce the product ash (clay) thus increasing yeild.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**3D Particle Surface Composition Analysis for Flotation Using Micro-CT C35035** Rohan Stanger, University of Newcastle $81,730	Araz Ejtemaei, BHP	Micro computed tomography (micro-CT) is a non-destructive, X-ray-based technology that provides 3-dimensional information on the internal structure of solid objects. This project will determine the efficacy of using micro-CT 3-dimensional analysis for flotation characterisation. If successful, the technique will provide an avenue for faster and more representative characterisation of ultrafine particles for the flotation circuit.
Current	**Side-by-Side Analysis of Coal by Automated Micro-CT and Commercial Laboratory Testing C36026** Rohan Stanger, University of Newcastle $167,432	Mel Robbins, BHP Michael Saxby, Glencore Coal Assets Australia Tom Wilson, MACH Energy Australia	The outcome of the project will be a robust evaluation of automated coal analysis by micro-CT. Analysis time, accuracy, and uncertainty will be compared against standard commercial laboratory testing to provide a basis for commercial investment in this technology. The benefits to industry would be faster analytical services for size and density distributions, potentially at much lower cost. Other benefits are reduced exposure to heavy organic liquids for laboratory personnel and improved data, reducing uncertainty across the coal industry from borecore evaluation through to process diagnostics.
Current	**Testing a Novel Flotation Concept for Coal C36029** Nerrida Scott, CSIRO $88,204	Frank Mercuri, Anglo American Steelmaking Coal Jenny Goh and Michael Saxby, Glencore Coal Assets Australia	Most existing flotation equipment consumes considerable space in coal handling and preparation plants. The drawback of existing designs is that, as the scale of flotation equipment becomes larger, costly inefficiencies are introduced. This project's flotation concept augments the performance of existing units without the need for a high cost upgrade. The project will test a low cost, prototype flotation unit for floating coal on a very small footprint, suitable for applications such as tailings fine coal recovery or similar space-restricted applications. Benefits include cost effective recovery of fine coal tailings on a small footprint, and after further development, retrofitting into existing plant as an auxiliary flotation system.
Current	**Industrial Particle Sampling Systems for the Particle Profiler in Fine and Ultra-Fine Circuits C37016** Rohan Stanger, University of Newcastle $178,404	Chris Denyer, Anglo American Steelmaking Coal Jenny Goh and Michael Saxby, Glencore Coal Assets Australia	Particle Profiler technology has been developed over successive ACARP projects to measure particle size and density distributions in a dilute stream. For online monitoring of fine coal circuits, the technology now needs to be implemented in a coal preparation plant. This project will develop two small sampling systems and make two particle profiler units more durable for online analysis of fine coal and ultrafine coal streams. This is considered the final stage of development to evaluate the technology's operation in-plant. The benefits to industry will be a new level of precision in monitoring the fine circuits of a coal preparation plant.
New	**Handling Effectively with Swelling Clays to Reduce the Ash Content of Coal Flotation Concentrates C38023** Ngoc Nguyen, University of Queensland $295,586	Chris Denyer, Anglo American Steelmaking Coal David Hensley, Kestrel Coal Resources Jack Lauder, Glencore Coal Assets Australia Tom Loweke, BMA	This project aims to reduce ash content in coal flotation concentrates by targeting swelling clays using magnesium-based clay depressants. Building on prior research, the team will use advanced XRD techniques to analyse clay types and test reagents under real process water conditions. The project is structured in two parts: lab-scale validation across five mines, and site trials at two locations using various flotation cells. If successful, the approach offers a low cost, scalable solution that improves coal quality without altering existing flotation circuits.
New	**Mitigating Fine Ash Entrainment in Coal Flotation Through Innovative Lamella Plate Integration C38024** Yongjun Peng, University of Queensland $152,024	Frank Mercuri, Anglo American Steelmaking Coal Luke Dimech, BMA	This project proposes installing angled lamella plates inside flotation cells to reduce fine ash entrainment, a major barrier to producing low-ash coal. The plates enhance particle separation by accelerating ash settling while allowing coal–bubble aggregates to rise cleanly, improving product quality without chemicals or major plant changes. Lab trials using 3D-printed prototypes showed up to 30% ash reduction and maintained high combustible recovery, with promising results across mechanical, Jameson, and column cells. If successful, the technology offers a scalable, low-risk way to boosts yield, and enhance tailings reprocessing by enabling recovery from ash-rich waste streams.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
General			
Complete	**Quantitative Based Structural Integrity Evaluations Using Modal Parameters Estimation C28061** Fidel Gonzalez, Mincka Engineering $363,651	Chris Jackson and Peter Shumack, Glencore Coal Assets Australia	Structural integrity of equipment and infrastructure is a significant risk for coal mining operations. Evaluations of structural conditions are conducted using subjective methods, such as visual inspections. This project developed a technique for reliable, cost-effective and objective structural condition assessments of mining infrastructure. The technique uses a set of tools that enable data capture, structural simulation, visualisation of structural parameters and analysis to be categorised based on the level of risk to the organisation.
Current	**Coal Tailings and Co-disposal Literature Study C34032** Ben Gill, Excalibur Mining Systems $125,000	Peter Walsh and Tom Buckby, Glencore Coal Assets Australia	Global tailings dam failures have put the spotlight on coal tailings and storage. A coal tailings and co-disposal literature review will be conducted to summarise key learnings and identify research gaps. This data will help ACARP committees to direct future research.
Current	**Improved Measurement of Coal Bulk Density C37017** Aleksej Lavrinec, University of Newcastle $90,377	Mel Robbins, BHP Tom Buckby, Glencore Coal Assets Australia Tom Wilson, MACH Energy Australia	This project will develop an improved method for determining coal bulk density. The Australian Standard (AS 3899-2002) test is not widely used as it is deficient in its applicability to Australia's higher ranked coals and can result in erroneous measurements. This project will result in the definition of a new method for determining coal bulk density and a draft update of the AS 3899 standard will be proposed.
Gravity Separation			
Complete	**Clay Type Effect on Magnetite Medium Properties in Dense Medium Cyclones C34046** Clint McNally, CSIRO $155,488	Chris Denyer and Frank Mercuri, Anglo American Steelmaking Coal	Dense medium cyclone operation relies on the correct density and viscosity of the dense medium to efficiently separate material in the cyclone. This project investigated the effects of different types of clays, typically found in Australia's coal seams, on the stability of the correct medium and the resulting impact of DMC operation.
Current	**Using Clay Stabilised Medium for the Separation of Small Coal in a Dense Medium Cyclone C34048** Andrew Taylor, CSIRO $204,432	Chris Denyer and Frank Mercuri, Anglo American Steelmaking Coal	Recent technical advances in circuit control instrumentation and magnetic separation devices have led to a resurgence of small dense medium cyclones in South Africa and China. DMC circuits for cleaning small coal (-2mm by 0.1mm) can produce higher yields than equivalent gravity-based circuits. They can also provide better control over the separation density of the process. This project aims to demonstrate that small coal can be successfully processed in a DMC with good cut point control, good magnetite recovery and high yields compared with the same coal processed through a spiral circuit and Reflux Classifier. The focus of the research is to develop a business case for the operation of a small coal circuit in Australian plants.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current / New	**DMC Efficiency Improvement Using an Applied Magnetic Field C36024** Quentin Campbell, Julius Kruttschnitt Mineral Research Centre $205,050 Current $139,822 New	Araz Ejtemaei, BHP Frank Mercuri, Anglo American Steelmaking Coal Harry Lee-Jones, BMA Jack Lauder, Glencore Coal Assets Australia	This project stage extends earlier research on improving dense medium cyclone performance using magnetic fields to stabilise low density magnetite media. Advanced instrumentation will be installed to measure flow and density in real time, helping understand how magnetic fields affect cyclone stability and separation efficiency. They aim to compare magnetic stabilisation with traditional clay additives, and test whether coarser magnetite can be used without compromising performance. Computational modelling will support deeper insights into magnetic effects inside the cyclone. Ultimately, the project seeks to produce cleaner coal with lower ash content, reduced medium losses, and more consistent operating conditions.
Current	**Measurement of DMC Wear using 3D Laser Technology C36030** Nerrida Scott, CSIRO $175,422	Dan Perkins, Coronado Coal Luke Winkelman, Glencore Coal Assets Australia	Following on from proof-of-concept work, this project extension aims to further develop the precision and practical use of 3D laser technology to measure wear in a Dense Medium Cyclone (DMC). Follow-up scanning for internal wear in the DMC used in the previous project will provide before and after wear comparisons over the course of the DMC's life. The project will also compare the performance of hand-held and mounted scanners to see if sufficient data can be obtained to overcome the need for a mounting system. Use of this instrument will improve the health and safety of personnel performing these measurements by removing the need to enter the confined space of the DMC. The technology could also improve equipment design to improve maintenance practices, reducing risk to maintenance personnel and preventing downtime. Another benefit could be the development of data analytical tools including AI, machine learning, and digital twins.
Current / New	**Banana Screen Capacity and Efficiency C37008** Chris Thornton, CTE Coal $199,830 Current $99,330 New	Dan Delahunty, Yancoal Australia Jenny Park, Glencore Coal Assets Australia	This stage of this project builds on previous research showing that particle residence time—not bed depth—is the key factor affecting drainage efficiency in banana screens. Current screen designs focus on bed depth, which has minimal impact, leading to suboptimal performance. The study proposes reducing screen frequency and installing weirs in the drain section to slow particle velocity and improve drainage. Trials will be conducted at various sites using dual-module plants to compare modified and unmodified screens side by side. The staged trial will optimise screen stroke, frequency, cross dams, and spray water, aiming to define accurate operating windows and improve moisture control. Unlike the full proposal, this version retains existing screen apertures and focuses solely on cross dam installation. If successful, the findings could lead to industry wide improvements in screen efficiency across varied coal types and plant configurations.
Maintenance and Equipment			
Complete	**Autonomous Stockpile Dozing: Quantifying Viability C35036** Ross McAree, University of Queensland $352,797	Chris Huth, Sedgman Chris Jackson and Peter Shumack, Glencore Coal Assets Australia Frank Mercuri, Anglo American Steelmaking Coal Jimmy Pollack, Golding	When constructing and reclaiming coal stockpiles, dozer operators are at risk of engulfment. Semi-autonomous dozers have comparable productivity to human-operated dozers without the risk to people. This project addressed the viability of utilising automated bulldozers for coal stockpile operations. Researchers quantified the effort dozers expend in material movement, developed planning algorithms for semi-autonomous dozer movements then compared planning algorithms with human operator practice.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Coal Stockpile Management for Remote Bulldozers through Enhanced Situational Awareness C36027** Ross McAree, University of Queensland $734,000	Bryce Ayscough, BHP Clinton Vanderkruk, Anglo American Steelmaking Coal Michael Booth, Glencore Coal Assets Australia	This project aims to enhance the safety, efficiency, and accuracy of managing coal stockyards by improving remote operator situational awareness and decision making on stockpiles. This will be done by providing real time topography maps and material movement decision support. This assistance would guide operators in making informed decisions on how best to extend and reclaim stockpiles under non-line-of-site remote control. The expected outcome of the work is pre-commercial technology demonstrating the potential benefits of enhanced situational awareness for stockpile management.
Current New	**Continuous Stockpile Cavity Warning System - Feasibility Assessment C36028** Wayne Stasinowsky, CSIRO $191,600 Current $599,869 New	Connor Gregory, Stanwell Corporation Michael Booth and Tom Buckby, Glencore Coal Assets Australia	Dozer accidents on coal stockpiles continue to occur despite safety guidelines. They most often occur when the dozer operator cannot see any indication of a void hazard. There have been several incidents in Australia and overseas where a stockpile dozer has fallen, or been inadvertently driven, into a draw-down hole with serious consequences. A warning system in the dozer cab would reduce the likelihood of a dozer traversing a dangerous area. The objective of stage 1 of this project is to examine and report on the feasibility of an upwards-looking radar system to detect stockpile voids and improve the safety of dozer drivers on stockpiles. The system could also inform the operators of water content and location. The logistics of installation and operation of the system will also be included in the research. Stage 2 of this project aims to prevent dozer accidents caused by hidden voids in coal stockpiles. It proposes installing an upwards looking radar array at the base of stockpiles to detect cavity formation in real time, enhancing safety and potentially mapping moisture levels. Building on a successful feasibility study, the project seeks funding to develop, test, and refine a full-scale system. The system will be trialled for 24 months at an operating mine. The technology could be commercialised and integrated into autonomous dozer systems, offering both safety and operational benefits.
New	**Operational Improvements to the Existing Installed TBS Fleet C38025** Bob Drummond, Coal River Engineering $236,168	Chris Denyer, Anglo American Steelmaking Coal Jack Lauder, Glencore Coal Assets Australia	This project aims to upgrade aging Teetered Bed Separator (TBS) machines used in fine coal processing by resolving key operational issues that limit their efficiency. Although TBS units offer low-ash separation for coking coal, many of the 25 remaining machines in Australia are more than 20 years old and based on outdated designs. The study will address problems like poor feed distribution, uneven reject discharge, and nozzle maintenance challenges through pilot testing and engineering redesigns. The goal is to develop a “Next Gen TBS” that matches the footprint and interfaces of existing units, allowing low cost replacement without major plant changes. The 15 month project will benchmark improvements on site and support commercialisation if successful.
New	**Standardising Risk Based Maintenance Execution using a Digital Twin Framework for CHPPs C38026** Fidel Gonzalez, Mincka Engineering $439,160	Chris Jackson, Glencore Coal Assets Australia Frank Mercuri, Anglo American Steelmaking Coal	The efficient management of structural and surface defects in coal preparation plants (CHPPs) can be problematic, leading to delays, rework, and defects. This project will create a digital twin system that helps teams identify, prioritise, and plan repairs more effectively. It builds on two earlier ACARP projects that developed tools for structural monitoring and AI-based defect classification. The new system will include mobile 3D scanning, AI-generated repair workpacks, and a decision-making tool called the Operational Matrix. The matrix considers things like defect severity, and rate, how close it is to critical equipment, and how easy it is to access and fix. The goal is to reduce guesswork, improve shutdown planning, and make sure the most important repairs are done first. Field trials have already started at two Queensland sites, and this project will refine the system for broader use across the industry. Expected benefits include fewer delays, lower maintenance costs, and significant savings.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Process Control			
Complete	**Soft Sensor for Predicting Dense Medium Cyclones Performance C34039** Gordon Forbes, University of Queensland $189,300	Araz Ejtemaei and Rick Jeuken, BHP Frank Mercuri, Anglo American Steelmaking Coal Peter Shumack, Glencore Coal Assets Australia	Even with the increasing level of instrumentation and data generation in modern minerals processing plants, some key process variables cannot be measured or are only measured on shift basis. The lack of real-time data prevents process control strategies and process optimisation to be carried out for some processes. This project aimed to develop a soft sensor model for monitoring the performance of dense medium cyclones (DMCs), including yield, water split and partition efficiency in real time.
Current	**Real Time Monitoring and Control of Froth Flotation C34044** Liguang Wang, University of Queensland $262,437	Chris Denyer, Anglo American Steelmaking Coal Chris Huth, Sedgman Josh Kowalczuk, Glencore Coal Assets Australia Rick Jeuken, BHP	Many coal flotation plants experience large daily variations in recovery but do not have effective real-time flotation performance measurement tools for process control and optimisation. In this project, researchers will assess and demonstrate an affordable, safe, accurate and easy-to-use real-time monitoring system that can be integrated into autonomous control of coal preparation. They will combine drag sensor and AI-based machine vision.
Current	**Simulation Enabled Digital Twin for the Control, Design and Optimisation of a Teeter Bed Separator C34052** Kym Runge, Julius Kruttschnitt Mineral Research Centre $232,531	Chris Denyer, Anglo American Steelmaking Coal Chris Jackson, Glencore Coal Assets Australia	Up to a fifth of in-plant material in Queensland metallurgical coal preparation plants is too fine to be efficiently upgraded using a dense medium cyclone and too coarse to be separated using froth flotation. This middling fraction (typically -2+0.35mm) is processed using hydraulic classifiers, such as teeter bed separators. In this project, researchers will use a combined experimental and simulation-based approach to develop a computational model that can be used as the basis of a performance-maximising advanced control strategy for the teeter bed separator.
New	**Long Term Monitoring of Dilute Magnetite Using EIS for Magnetite Loss Mitigation C38022** Clint McNally, CSIRO $185,756	Frank Mercuri, Anglo American Steelmaking Coal Luke Dimech, BMA	This research aims to reduce costly magnetite losses in coal handling and preparation plants by replacing outdated manual monitoring methods with a real-time, digital solution. Building on prior research, the project will refine and deploy an Electric Impedance Spectroscopy (EIS) system to continuously measure dilute magnetite concentrations in slurry streams. The system will be tested on site with a semi-permanent installation designed to operate for up to 12 months and deliver accurate, actionable data. Compared to existing expensive and complex alternatives the EIS approach offers a compact, low cost, inline monitoring tool. The project seeks to improve process control, reduce waste, and provide a scalable solution for industry wide adoption.

ACARP is focussed on research aimed at minimising emissions and reducing the environmental impact of the industry. The Technical Market Support Committee has identified the following key priority areas to support this goal:

- Research using the pilot-scale HELE testing facility with complementary techniques.
- Metallurgical coke and PCI to support low-carbon blast furnace ironmaking.
- Coal to coke conversion and coke performance linked back to properties of coal.
- Laboratory-scale demonstration of potential new large-scale products from coal and waste products.

Understanding the properties of Australian coals which impact on market acceptance and value in use is a major goal for research, particularly where the research outcomes represent an advantage over coals from international competitors. A specific priority is understanding the environmental performance of Australian coals and whether they will conform to emerging legislative regimes and changes in the market as it pushes to become more sustainable, both domestically and internationally.

The Technical Market Support Committee continues to support research regarding the safe transport and shipping of coal.

COMMITTEE MEMBERS

Jonas Good (co-chair)	**Principal Marketing Strategy**	**BHP**
Graeme Harris (co-chair)	**Manager Technical Marketing and Logistics**	**Kestrel Coal Resources**
Nick Andriopoulos	Principal - Technical Marketing	Anglo American Steelmaking Coal
Shaun Booth	Group Manager Resource Development and Technology	Glencore Coal Assets Australia
James Bottle	Principal, Technical Marketing	Jellinbah Group
Stephen Brant	Principal Technical Marketing	BHP
Jeremy Byrnes	Technical Specialist and Coal Quality Manager	Glencore Coal Assets Australia
Anthony Edwards	Process Engineer	Whitehaven Coal
Sean Flanagan	Director Delivery and Coal Quality	Coronado Global
Jane Lawson	Product Analyst	Yancoal
Fiona McKenzie	Coal Quality and Logistics Coordinator	New Hope Group
Frank Mercuri	Coal Processing Manager	Anglo American Steelmaking Coal
Geoff O'Meley	Coal Technical Officer	M Resources
Oliver Scholes	General Manager - Marketing Technical	Whitehaven Coal
Cameron Tasker	Manager Technical Marketing	Xcoal Energy & Resources Australia
Chris Urzaa	GM Marketing & Logistics	Pembroke Olive Downs
Greg Wickman	General Manager - Marketing	New Hope Group

PROJECTS UNDER MANAGEMENT

Category	No of Projects	ACARP Funding
General	4	$1,812,851
Maritime Regulation	1	$4,169,012
Metallurgical Coal	27	$3,793,191
Thermal Coal	2	$1,274,324

NEW FUNDING

ACARP supports projects with immediate need outside the yearly funding round. These projects are included within this report as new funding.

No of Projects	ACARP Funding	Total Funding
7	$1,159,283	$1,426,822

Total Funding includes in-kind support provided by the researcher and host mine as identified in the research proposal.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
General			
Current	**Coal Sample Bank C25053** Aedita Crouch, CSIRO $668,939	Graeme Harris, Kestrel Coal Resources Jonas Good, BHP	CSIRO has been operating the ACARP coal sample bank since early 2017, providing management services, sample storage facilities, receipt and provision of the samples, and the provision of a confidential database. A coal sample bank enables common samples to be used by researchers so that results from different studies on the same coal can be compared directly.
Current	**Management of SA and ISO Coal Technical Committees Work Programs C26003** Barry Isherwood, Carbon Connections Consulting $497,750	Graeme Harris, Kestrel Coal Resources	This project provides funding for a coal industry representative to continue working on ISO coal technical committees work programs.
Current	**Australian Participation in Development of ISO Methods for Sampling, Analysis and Coal Preparation and National Technical Committee Support C26037** Ben Russell, Standards Australia $448,625	Graeme Harris, Kestrel Coal Resources	Since 2005 ACARP has co-funded Australian representation on key International Standard Organization (ISO) committees of relevance to coal exports and to the Standards Australia National Mirror Committee MN-001. This investment enables Australia to influence and shape the international development of methods for sampling, analysis and coal preparation standards.
Current	**Digital Petrographic Atlas of Australian Coals - Maintaining the Knowledge C33065** Joan Esterle, University of Queensland $197,537	Graeme Harris, Kestrel Coal Resources Sean Flanagan, Coronado Coal	Researchers will create a digital petrographic atlas of Australian coals that includes data on maceral, micro lithotype and mineral composition at different ranks, and case studies that assist with conceptual mine scale models of coal quality variation. A library of scanned petrographic images of product coals from different Australian basins and formations will also be developed to illustrate the variation in rank, grade and type. The main reference point and framework for this project will be the ACARP coal sample bank.
Maritime Regulation			
Current	**Maritime Regulation Project C27001** Ash Goodwin, Goodwin Port Solutions $4,169,012	Graeme Harris, Kestrel Coal Resources	The project includes research to investigate the accuracy, repeatability and reliability when testing coal cargoes for self-heating potential. Experimental work was finalised in 2022 with the project report and recommended regulatory responses provided to the Australian Maritime Safety Authority and the International Maritime Organisation's Sub-Committee on Carriage of Cargoes and Containers (CCC) for consideration. AMSA continues to lead work to progress amendments to the International Maritime Solid Bulk Cargoes (IMSBC) Code via informal correspondence group discussions with IMO stakeholders. As an interim measure, AMSA has issued Certificate of Approval No. 8024, allowing coals meeting specified criteria to be classified and shipped as materials hazardous only in bulk (MHB). This approval is available on the AMSA website and is valid until 31 December 2026.
New	**Streamlining Moisture Management Procedure Submissions: An Industry Led Approach C38032** Ash Goodwin, Goodwin Port Solutions $73,800	Graeme Harris, Kestrel Coal Resources Jane Lawson, Yancoal Jeremy Byrnes, Glencore Coal Assets Australia Jonas Good, BHP	The International Maritime Organisation (IMO) requires coal producers whose products have a Transportable Moisture Limit to develop Moisture Management Procedures (MMPs) to ensure the safe shipping of cargoes. Producers have identified challenges in developing MMPs. Whilst an industry template for MMPs exists, it was developed 10 years ago and has not been substantially updated since. This project will update the existing MMP template to help producers prepare submissions aligned with regulatory expectations. The project is expected to deliver significant benefits to coal producers through reduced administrative burden, more consistent and higher quality MMPs, reduced approval duration and improved safety by promoting best practice moisture management.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Metallurgical Coal			
Complete	**International Round Robin for Coke Reactivity Index, Coke Strength after Reaction and I600 C34063** Lauren Williamson, CSIRO $77,800	Graeme Harris, Kestrel Coal Resources	Modified coke drum tests have been developed to overcome the challenge of producing the 50kg of coke needed for a full suite of coke testing. I600 is one of these tests, but it is not yet covered in any national or international standard. This project updated the understanding of CSR and CRI practice across a group of international laboratories by conducting a round robin using two cokes produced in a pilot scale coke oven. The project also investigated the extent that I600 is used in coke testing laboratories and determined its potential as a standard test.
Complete	**Examination of Contraction Pre and Post Resolidification using a High Temperature Dilatation Rig C35037** David Jenkins, University of Newcastle $99,250	Cameron Tasker, Xcoal Energy & Resources Australia Graeme Harris, Kestrel Coal Resources	A clear understanding of coke contraction can help to better predict key factors associated with coke quality. A mismatch in contraction and chemical processes around re-solidification may affect IMDC-RMDC bonding, which has been linked to coke strength issues. This project assessed the contraction behaviour of various coals, covering a range of rank and coal measures, to identify how prevalent this phenomenon is and its utility in coal blends.
Complete	**Microalgae Blending for Low Carbon Metallurgical Coke Production C35038** Arash Tahmasebi, University of Newcastle $172,000	Nick Andriopoulos, Anglo American Steelmaking Coal Stephen Brant, BHP	Biomass is being used in blast furnace ironmaking to reduce environmental impacts and production costs. In this project, researchers evaluated the impact of microalgae blending on the coking behaviour, coke properties and coke gasification performance of selected coals. In particular, assessing the impact of microalgae on thermoplastic and rheological behaviour, internal gas pressure development and the quality of coke.
Complete	**Impact of Coal Grain Composition and Macerals Association on Fluidity Development in the Plastic Layer of Australian Coals C35039** Arash Tahmasebi, University of Newcastle $141,600	Graeme Harris, Kestrel Coal Resources Stephen Brant, BHP	A better understanding of fluidity development in coal with representative particle size distributions is key to improving coke quality prediction models. This project aims to improve the fundamental understanding of thermoplasticity development in a wide range of Australian coals. By determining the drivers of “real” fluidity in these coals, researchers expect to improve coke quality prediction models. They will combine coal grain analysis and micro-CT expertise.
Current	**Changes in Combustibility of Coal when Co-Combusted with Hydrogen Rich Fuels in PCI C35040** Liza Elliott, University of Newcastle $218,367	Cameron Tasker, Xcoal Energy & Resources Australia Caroline Lang and Jeremy Byrnes, Glencore Coal Assets Australia James Bottle, Jellinbah Group Oliver Scholes, Whitehaven Coal	Hydrogen-rich fuels are starting to be injected into the blast furnace via the tuyere. Little is known about the consequences of adding these fuels, which are expected to be more reactive than coal. This project aims to determine coal reactivity impacts of co-combusting hydrogen rich fuels (e.g. biomass, plastics, coke ovens gas, ammonia and hydrogen). The combustibility of solid fuels will be assessed using the drop tube furnace technique then a thermo-gravimetric analyser will be used to measure the reactivity of these materials individually and when co-combusted with coal.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Effect from the Co-Combustion of Coal and Biomass on Production of Fine Particles (<PM10) C35041** Liza Elliott, University of Newcastle $228,531	Cameron Tasker, Xcoal Energy & Resources Australia Caroline Lang and Jeremy Byrnes, Glencore Coal Assets Australia Oliver Scholes, Whitehaven Coal	Many power stations are looking to reduce their carbon dioxide emissions with the addition of biomass to the feed coal for combustion. The proportion of fine particles produced during co-combustion is expected to increase dramatically. This project aims to assess the scope of fine particle emissions produced during combustion of biomass and the interactions expected between biomass and coal when these fine particles are forming during co-combustion.
Current	**Physical and Chemical Interactions Between Charcoal and Coal During Coking C35042** Karen Steel, University of Queensland $135,694	Graeme Harris, Kestrel Coal Resources	The blending of biomass in coking blends has been largely unsuccessful because its raw and charcoal forms cause a loss of fluidity. The loss of liquid then prevents the blend from undergoing expansion and fusion, leading to a loss of coke strength. The porosity also makes the coke more reactive. In this project, researchers aim to overcome this constraint by blending charcoal with specific coals that have high volatile matter content and high fluidity so that the volatiles adsorb into the micro- and meso-pores and carbonise, thereby filling the pores. The high fluidity will enable the coal to interact with the charcoal, flowing into its rough macropore surface and curing to form a bond via a “lock and key” mechanism.
Complete	**Abrasion Resistance of Coke Under Hydrogen Reduction Blast Furnace Conditions C35043** Hannah Lomas, University of Newcastle $159,416	Nick Andriopoulos, Anglo American Steelmaking Coal Oliver Scholes, Whitehaven Coal Stephen Brant, BHP	The hydrogen enriched blast furnace is emerging as a viable technology that reduces the carbon footprint of blast furnace ironmaking, but little is known about its impact on coke quality. This project evaluated the impact of reaction conditions that simulate both the conventional and the hydrogen reduction blast furnace on coke abrasion resistance. Correlations between conventional coke quality indices and abrasion resistance were developed.
Current	**What We Now Know about Coking Coals and Coke C35044** Lauren Williamson, CSIRO $96,284	Lauren North, BHP	Decarbonising ironmaking requires cutting edge research on coke formation and structure. Since 2014, 35 ACARP projects have been completed on the technical marketing of coking coals and their outcomes have influenced the industry’s understanding about what makes a good coke. The primary objective of this project is to integrate these research findings into one collection to determine future areas of research.
Complete	**Impacts of Chemical Structure Transformation in the Plastic Layer on the Microtexture Development during Coking C35045** Soonho Lee, Royal Melbourne Institute of Technology $158,900	Nick Andriopoulos, Anglo American Steelmaking Coal	There have been many attempts to study correlations between coke microtexture and coke quality. However, there has been a lack of understanding of the underlying chemistry of microtexture formation during coking. This project investigated the underlying mechanisms of microtexture development during coking and the role of chemical structure change during plastic layer formation. Pearson petrography analysis and micro-FTIR chemical mapping techniques were used.
Complete	**Gasification Reactivity and Degradation of Coke Lumps Under Simulated Conventional and Oxygen Rich Blast Furnace Processes C35046** Apsara Jayasekara, Geoscience Australia $98,500	Nick Andriopoulos, Anglo American Steelmaking Coal	Interest in oxygen-enriched blast furnaces (OBF) is escalating although little is known about the coke reactivity and coke degradation mechanisms under these conditions. This project investigated the coke quality requirements to support OBF using laboratory-scale experiments under controlled OBF reaction environments.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Complete	**Physical and Chemical Structure Characterisation of Biomass for Biocoke Production C36004** Arash Tahmasebi, University of Newcastle $54,100	Cameron Tasker, Xcoal Energy & Resources Australia Graeme Harris, Kestrel Coal Resources Nick Andriopoulos, Anglo American Steelmaking Coal Shaun Booth, Glencore Coal Assets Australia Stephen Brant, BHP	This project is the initial part of an integrated program of research to better understand the biomass and coal quality requirements for biocoke production for blast furnace ironmaking. The findings of this scoping study inform biomass selection to produce pilot oven coke samples to be used in a suite of projects being undertaken.
Current	**Structural Optimisation and Reactivity Evaluation of Ferro Coke Produced using Australian Coals C36031** Arash Tahmasebi, University of Newcastle $167,000	Cameron Tasker, Xcoal Energy & Resources Australia Graeme Harris, Kestrel Coal Resources Nick Andriopoulos, Anglo American Steelmaking Coal Stephen Brant, BHP	The use of highly-reactive ferro-coke is among strategies proposed to reduce production costs and the environmental impact of blast furnace ironmaking. The objective of the project is to examine the suitability of Australian coals for ferro-coke production and to develop a new understanding of the mechanism of microstructure formation and reactivity of ferro-coke.
Current	**Impact of Biomass on Coke Microstructure Evolution and Gas Diffusion During CO2 Gasification C36032** Arash Tahmasebi, University of Newcastle $169,000	Graeme Harris, Kestrel Coal Resources Nick Andriopoulos, Anglo American Steelmaking Coal Sean Flanagan, Coronado Coal Shaun Booth, Glencore Coal Assets Australia	A previous project revealed limited success in biomass blending due to the negative impacts on coke quality, and recommended further research on optimising species, biomass pre-treatment, coking technology, and coal blend design. This project forms part of an integrated program of research to improve the knowledge of the impacts of biomass addition on the coking performance and quality of coke generated from Australian coals. The aim of this project is to examine the impacts of biomass addition on the mechanism of carbon conversion during CO2 gasification and to evaluate the changes in coke microstructure during gasification reactions. This new knowledge will contribute to the understanding of how biocoke can be effectively utilised in blast furnace ironmaking.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Sugar Coated Coal: Determining if Glucose Addition Can Improve Coke Quality of Coal-Biomass Blends C36034** Callum Mainstone, ALS Coal $111,622	Caroline Lang and Shaun Booth, Glencore Coal Assets Australia Graeme Harris, Kestrel Coal Resources Nick Andriopoulos, Anglo American Steelmaking Coal Sean Flanagan, Coronado Coal	Including biomass in coal blends for coke production is a preferred method to achieve reduced carbon emissions, as changes to key metallurgical infrastructure are not required. However, adding plant dry matter biomass to coke reduces its quality, even in low concentrations. Adding glucose to other forms of biomass such as lignin prior to blending with coal may result in improved coke strength. Glucose can be sourced from agricultural, textile and forestry waste that does not compete with food production for land or water. This project will conduct a series of coking trials to determine the effectiveness of using glucose to contribute bio-carbon to coking coal blends and the potential to enable higher ash coals to be utilised.
Current	**Microstructure Characterisation and Simulation of Bio-additives in Coke C36035** Edward Bissaker, University of Newcastle $114,200	Graeme Harris, Kestrel Coal Resources Nick Andriopoulos, Anglo American Steelmaking Coal Sean Flanagan, Coronado Coal Shaun Booth, Glencore Coal Assets Australia	With the increasing interest in ”sustainable coke making” there is a need to understand the impact of biomass on coke microstructure, and which coke microstructures best accommodate the addition of biomass. A recent PhD project developed novel techniques for characterising coke microstructure and simulating microstructures of cokes. Extending this to coke microstructures containing biomass is a step towards a predictive tool for optimal biomass blending. This project addresses priorities including the development of metallurgical coke and PCI to support low-carbon blast furnace ironmaking, the impact on coking-coal quality requirements and steelmaking emissions through coal blend additives and better understanding of coal to coke conversion and coke performance to support the technical marketing of Australian coking coals.
Current	**Biochar-Coke Integration for Improved Coke Strength and Performance C36036** Pramod Koshy, University of New South Wales $244,400	Graeme Harris, Kestrel Coal Resources Nick Andriopoulos, Anglo American Steelmaking Coal Sean Flanagan, Coronado Coal Shaun Booth, Glencore Coal Assets Australia	The addition of biochar from Australian hardwood plant species will help to improve the environmental sustainability of the coke making and ironmaking processes. This project aims to enhance biomass utilisation in coal blends to improve environmental sustainability, without compromising the properties and performance of the resultant cokes in ironmaking. It will assess the impact of blending biochars in high-addition ratios with coals of varying properties to prepare pilot-oven cokes and to determine the high-temperature properties and performance of the cokes under blast furnace conditions. The research is part of a suite of projects aimed at understanding the effects of biomass addition on the properties and performance of biocokes to ensure the long-term market viability of Australian coals and cokes.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Exploring the Effects of Bio-char and Torrefied Biomass Addition on the Microtexture of Bio-coke C36037** Soonho Lee, Royal Melbourne Institute of Technology $155,000	Graeme Harris, Kestrel Coal Resources Nick Andriopoulos, Anglo American Steelmaking Coal Sean Flanagan, Coronado Coal Shaun Booth, Glencore Coal Assets Australia	One strategy to reduce carbon emissions in blast furnace ironmaking is to incorporate sustainable biomass such as biochar and torrefied biomass as a substitute energy source. However, studies have shown the utilisation of woody biomass in coke making reduces coke strength. This project builds upon significant advancements in understanding the development of coke microtexture and microstructure from a series of previous projects and will be simultaneously explored in other projects proposed by the researchers. It is a vital aspect of a research initiative aimed at better understanding changes in coal quality requirements for biocoke production in blast furnace ironmaking.
Complete	**Effects of Ash Minerals on Coke Reactivity under Hydrogen Injection, Low CO2 Blast Furnace Conditions C36038** Ray Longbottom, University of Wollongong $51,290	Cameron Tasker, Xcoal Energy & Resources Australia Nick Andriopoulos, Anglo American Steelmaking Coal	As low CO2 blast furnace practices are adopted by steelmakers, the use of hydrogen in the furnace will increase. It is therefore imperative to understand coke quality requirements and performance under these new conditions. The main objective of this project is to quantify the impact of mineralogy on the reactivity of metallurgical coke using a laboratory tool called a coke analogue, at temperatures of 1,100°C and higher using hydrogen-containing gas mixtures. The secondary objective is to use the coke analogue to assess the temperature at which the reaction between hydrogen-containing gases and coke becomes significant.
Current	**Alternative Thermal Processing of Coal Pilot Extruded Coke and Supercapacitor Demonstration C36039** Rohan Stanger, University of Newcastle $157,178	Graeme Harris, Kestrel Coal Resources Nick Andriopoulos, Anglo American Steelmaking Coal Peter Austin, BlueScope Steel Sean Flanagan, Coronado Coal Shaun Booth, Glencore Coal Assets Australia	The objectives of this project are to produce extruded cokes at pilot scale with mixtures of coal and hydrothermal liquefaction biocarbons, and to produce a prototype supercapacitor for energy storage. The pilot extruded cokes will be assessed for coke strength and provide the first evidence for a new type of biocarbon additive. The prototype supercapacitor unit will provide metrics on charging rates and response, efficiency, and overall footprint. Extruded cokes are expected to have improved mixing qualities, particularly with bio-materials, and coal based supercapacitors could open new markets in stationary energy storage and reduce overall emissions associated with its use.
Current	**Tracking the Carbonisation Performance of Vitrinite Macerals C36040** Karen Steel, University of Queensland $108,664	Lauren North, BHP Oliver Scholes, Whitehaven Coal	Knowledge of the specific vitrinite properties that give rise to the best quality coke would be beneficial to coke-makers for their blend formulations and could help identify which Australian coals could attract a higher price, owing to their superior properties. The objective of this project is to reveal the composition of vitrinite that leads to optimal coke properties. The project will compare coals of different rank from three different Australian coal measures, as well as overseas coals, for comparison. The knowledge gained on vitrinite behaviour during coking is also expected to assist biocoke research that is trying to overcome the detrimental effects that the addition of biomass has on coal fluidity.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Quantifying Biochar Interactions with Coal for Coke Making C36041** Lauren Williamson, CSIRO $141,683	Graeme Harris, Kestrel Coal Resources Nick Andriopoulos, Anglo American Steelmaking Coal Sean Flanagan, Coronado Coal Shaun Booth, Glencore Coal Assets Australia	In a bid to reduce greenhouse gas emissions, biomass is being trialled to determine how much can be blended with coal and still produce satisfactory coke. Usually, the more biomass added, the decreased coke strength, limiting the amount of biomass that can be used. The goal of this project is to systematically study biomass addition. As part of a suite of proposed ACARP research, this project will quantify the relationship between biomass char surface area, size distribution and their impact on coke properties. If it were shown that the particle size and surface area of the chars produced by biomass were the main factors determining how much biomass could be added to the blend, this would increase the flexibility in supply of the raw materials.
Current	**Mechanism of Biocoke Formation in Stamp Charged Cokemaking C37018** Arash Tahmasebi, University of Newcastle $170,200	Jane Lawson, Yancoal Stephen Brant, BHP	Partial substitution of coking coal with renewable biomass is identified as a promising way to reduce emissions in blast furnace (BF) ironmaking. However, use of biomass can weaken the coke microstructure and accelerate coke degradation in the BF. This research will test whether these shortcomings can be mitigated by reducing porosity and improving the bonding to the coke matrix. This project is part of a current integrated program of research to improve understanding of raw material requirements for biocoke production for BF ironmaking.
Current	**Reactivity of Coke RMDC, IMDC and Biochar with H2O Under Hydrogen Reduction Blast Furnace Conditions C37019** Arash Tahmasebi, University of Newcastle $169,900	Lauren North and Stephen Brant, BHP	The introduction of hydrogen gas into the blast furnace (BF) is emerging as a viable method of reducing the carbon footprint of BF ironmaking. However, it is important to understand how the degradation of coke under such conditions differs in comparison with conventional BF ironmaking and identify the effect on coke quality.
Current	**Fate of Bio-alkalis During the Carbonisation of Coal and Biomass Blends C37022** Salman Khoshk Rish, University of Newcastle $95,740	Graeme Harris, Kestrel Coal Resources Jonas Good, BHP Nick Andriopoulos, Anglo American Steelmaking Coal	One of the promising avenues for reducing emissions during blast furnace (BF) iron making is the partial substitution of coking coal with renewable biomass. However, woody and grass biomass resources contain high concentrations of alkali and alkaline earth metals (AAEM), which negatively impact the reactivity and structural strength of coke within the blast furnace. The selection of appropriate biomass entails consideration of several factors, including the alkali content of the biomass. The project will further the research the retention of AAEMs during coking. In addition, we aim to further understand the retention mechanisms of the detrimental ash concentrates in bio-coke.
Current	**Mechanism of Reactivity and Microstructure Evolution of Stamp Charged Cokes During Reaction with CO2 C37025** Arash Tahmasebi, University of Newcastle $169,825	Graeme Harris, Kestrel Coal Resources Lauren North, BHP Nick Andriopoulos, Anglo American Steelmaking Coal	Because of strong demand and decreasing reserves of premium coking coals, stamp charging is a promising approach to improve utilisation of low-quality coal. A previous ACARP project improved the understanding of the mechanism of coke formation under stamped conditions. The main objective of this project is to examine the impacts of stamp charging on the mechanism of coke degradation under CO2 and corresponding gas diffusion. The expected outcomes will benefit the Australian coal industry through an improved understanding of how cokes made from Australian coals under stamp charging behave in blast furnace ironmaking, thus increasing the sales confidence of Australian coals in relevant markets.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Coal and Biomass Properties Affecting Cokemaking for Coal-Biomass Blends C37026** Karen Steel, University of Queensland $127,047	Geoff O'Meley, M Resources Nick Andriopoulos, Anglo American Steelmaking Coal Stephen Brant, BHP	The blending of biomass in coking blends has been largely unsuccessful. Biomass in its raw form or charcoal form causes fluidity losses leading to a loss of coke strength. The knowledge gained from this project is expected to help technical marketers communicate with cokemakers attempting to blend biomass with coal. This project relates to the importance of ensuring the long-term viability of Australian metallurgical and thermal coals in a carbon constrained world.
New	**Mechanisms of Fluidity Reduction During Coking of Coal-Biomass Blends: A Microtexture Analysis Approach C38027** Soonho Lee, Royal Melbourne Institute of Technology $231,400	Graeme Harris, Kestrel Coal Resources Jonas Good and Stephen Brant, BHP	The goal of this research is to support low emission steelmaking by enabling more flexible coal–biomass blending without compromising coke strength or reactivity. Building on previous ACARP research, this project will use a number of Australian coals blended with torrefied and biochar bamboo/acacia at 10% ratios, and examine how coal rank, maceral content, and biomass pre-treatment affect fluidity and coke quality.
New	**Lateral Distribution of Coking Coal Across a Charge C38028** Callum Mainstone, ALS Coal $138,045	Cameron Tasker, Xcoal Energy & Resources Australia Geoff O'Meley, M Resources	As existing mines dig deeper into their deposits, there is a trend for the coal rank to increase and volatile content to decrease, leading to higher coking pressures during carbonisation that presents a hazard for oven operation. In addition, depleting reserves of premium hard coking coal and growth in global steel production have prompted higher proportions of semi-soft coking coals to be used in blends that must be compacted to achieve similar coke quality. This too causes an increase in coking pressure that must be managed to prevent damage to ovens. This project seeks to test a blend preparation method of laterally distributing coal to concentrate coal types towards the wall or centre of a charge to improve coking properties compared to a homogenous blend. Five pilot- scale charges will be coked with internal gas pressure and wall force recorded and the impacts on coke quality measured. If successful, this would be a new strategy to reduce wall force and pushing force in ovens using high-pressure or stamped coals while promoting the unique benefits of Australia's Rangal coals.
New	**Optimising the Performance of Australian Semi-Soft Coking Coals C38029** Callum Mainstone, ALS Coal $121,525	Graeme Harris, Kestrel Coal Resources Jane Lawson, Yancoal Oliver Scholes, Whitehaven Coal	This project seeks to promote the use of Australian semi-soft coking coals by quantifying the impact of coal preparation on product coke. With premium coking coal supplies declining, semi-soft coals are increasingly used in steel making but require careful preparation to maintain strength and reduce oven pressure. The study will trial two representative coals from the Hunter Valley and Bowen Basin, adjusting bulk density, particle size, and moisture using a novel waste-derived hydrocarbon binder. ALS Coal will measure coke yield, strength, porosity, and size distribution across multiple charge conditions. The goal is to demonstrate that low cost Australian coals can meet global steelmaking standards when processed optimally, supporting their market competitiveness and broader adoption.
New	**Mechanism of Microtexture Formation under Stamped Coking Conditions C38030** Arash Tahmasebi, University of Newcastle $257,400	Graeme Harris, Kestrel Coal Resources Jonas Good and Stephen Brant, BHP	The goal of this study is to help coal producers better predict coke performance and improve confidence in Australian coals for stamped coking applications in global markets. Stamped charging is used to improve coke quality and reduce costs by allowing more low-quality coal in the blend. This process increases the density of the coal charge, which changes how coke forms during heating. Higher density leads to stronger coke with fewer pores and better bonding between particles. The project will study how different coals and blends behave under stamping using advanced imaging and spectroscopy. It will map how coke structure evolves from coal to final product and identify what drives these changes.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
New	**Impact of H2O Gasification on Coke Breakage Mechanisms and Size Distribution of Fines C38031** Hannah Lomas, University of Newcastle $169,760	Graeme Harris, Kestrel Coal Resources Stephen Brant, BHP	The goal of this research is to understand how hydrogen based furnaces affect coke durability so that producers can adjust coke quality and keep furnaces running efficiently. Steelmakers are starting to use hydrogen in blast furnaces to reduce carbon emissions. This process creates water vapour, which reacts with coke and may cause it to break apart more easily. Earlier studies showed that coke breaks down faster when exposed to water vapour than to carbon dioxide. This project will test how coke behaves after being partially reacted with water vapour and carbon dioxide using lab equipment that simulates furnace conditions. Researchers will look at how much the coke breaks, what kinds of fine particles it produces, and how its internal structure changes. Imaging tools will be used to track damage and link it to the type of coal used to make the coke.
New	**Combustion Performance of Higher Swelling Coals under HELE (High Efficiency, Low Emissions) - Supercritical Conditions C38033** Callum Mainstone, ALS Coal $167,353	Cameron Tasker, Xcoal Energy & Resources Australia Fiona McKenzie and Greg Wickman, New Hope Group Graeme Harris, Kestrel Coal Resources Jane Lawson, Yancoal	This project investigates whether higher swelling coals—typically used for steelmaking—can perform effectively in thermal power stations under supercritical conditions. Market shifts have made thermal coal more valuable than some metallurgical grades, prompting interest in repurposing these coals. The study will compare combustion performance, emissions, and operational risks (like mill caking and burner blockages) across swelling and non-swelling coal types and blends. Trials will be conducted at ALS's pilot-scale combustion facility to simulate power station conditions. Results could help coal producers make faster, more informed decisions when market conditions favour thermal coal use.
Thermal Coal			
Complete	**Feasibility Study, Upgrade and Commissioning of ALS-ACIRL Pilot Scale Combustion Test Facility C35005** Luke Beattie, ALS Coal $584,284	Greg Wickman, New Hope Group Jane Lawson, Yancoal Oliver Scholes, Whitehaven Coal	There is no pilot scale facility within Australia that can evaluate combustion performance under HELE conditions, whilst co-firing with biomass. This project undertook a feasibility study to upgrade the current subcritical pilot scale combustion facility so that it mimics HELE combustion and allows co-firing with biomass. HELE coal/biomass combustion research was undertaken in the upgraded facility by studying HELE combustion of two previously tested coals, along with evaluation of combustion performance when co-firing with 5% & 10% biomass.
Current	**Comparison of Ash Deposition of Coal and Biomass Blends in Laboratory, Pilot Scale and Industrial Scale C37023** Liza Elliott, University of Newcastle $690,040	Caroline Lang, Glencore Coal Assets Australia Chris Urzaa, Pembroke Olive Downs Jane Lawson, Yancoal	One way to reduce net carbon emissions from the combustion of coal is by replacing a proportion of the coal with biomass in steel making furnaces. However, technical issues mean replacement is typically limited to less than 4 percent. Even small additions can lead to issues with milling and handleability. Heating the biomass (Torrefaction) to remove moisture and some of the lighter volatile matter overcomes milling issues however, whether raw or torrefied, little is known about the impact on ash deposition during co-combustion. This study aims to assess the deposition of ash during the co-combustion of Australian coal and biomass and biochar at laboratory, pilot, and industrial scale.

ACARP is focussed on research aimed at minimising emissions and reducing the environmental impact of the industry. The Mine Site Greenhouse Gas Mitigation Committee has identified the need for innovative means for safe mitigation and accurate measurement of fugitive mine site gas emissions as a key priority area to support this goal.

Australian coal producers need to report greenhouse gas emissions from mining operations and where possible reduce those emissions. Fugitive seam gases have been identified as the largest contributor of greenhouse gas emissions from coal mines. The Mine Site Greenhouse Gas Mitigation Committee supports a range of activities in this area and is increasingly targeting the measurement and mitigation of the methane in underground mine ventilation air.

COMMITTEE MEMBERS

Ben Klaassen (co-chair)	**Principal Climate Reporting**	**BMA**
Sandy Tickell (co-chair)	**Group Manager Carbon Planning and Abatement**	**Glencore Coal Assets Australia**
Sam Anderson	Global Head of Corporate Sustainability	Peabody Australia
Angus Ball	Manager Sustainability	Jellinbah Group
Marie Bergeron	Engineer - Decarbonisation	Whitehaven Coal
Nathan Bongers	Engineering and Project Manager	LETA
Andrew Boyd	Managing Director and CEO	Qmetco
Lynden Cini	Group Manager Environment Compliance and GHG Reporting	Whitehaven Coal
Carla Esquivel	Carbon Reporting Manager	QCoal Group
Bob Gallagher	Technical Resources Manager	Stanwell Corporation
John Grieves	Tenements Manager	QCoal Services
Iain Hornshaw	Manager, Sustainability	Yancoal
Nick Linacre	Principal Advisor - Climate Change	MCA
Steve Malss	Director Low Emission Technologies	LETA
Helen McCarthy	Principal Carbon Transition	Kestrel Coal Resources
Peter Morris	Principal Advisor	MCA
Scott Nairn	Head of Sustainability and Environment	Stanmore Resources
Brendan Newham	Senior Engineer - Emissions	Whitehaven Coal
De Nicholls	Superintendent Gas & NMT	BMA
Paul O'Loughlin	Technical Services Manager	MACH Energy
Alexandra O'Donoghue	ESG Lead	Bravus
Sam Palmer	Environment and Climate Change Manager	Glencore Coal Assets Australia
Jim Sandford	Technical Advisor	
Russell Thomas	Technical Services Manager	GM3 Appin Mine
Dane Traeger	Gas Drainage Superintendent	Peabody Australia

PROJECTS UNDER MANAGEMENT

Category	No of Projects	ACARP Funding
Mine Site Greenhouse Gas Mitigation	11	$7,187,456

NEW FUNDING

ACARP supports projects with immediate need outside the yearly funding round. These projects are included within this report as new funding.

No of Projects	ACARP Funding	Total Funding
4	$2,916,939	$3,997,161

Total Funding includes in-kind support provided by the researcher and host mine identified in the research proposal.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Technical Development Unit (TDU) for Catalytic Conversion of VAM C28078** Michael Stockenhuber, University of Technology Sydney $1,040,592	Jim Sandford Russell Thomas, GM3 Appin Mine	Two barriers to the implementation of VAM technologies are the significant ongoing energy input requirements, especially the additional energy loads imposed on ventilation systems, and stringent heat recovery requirements. Omitting the need for an external heat source to the VAM mitigation system when it is operating at steady-state is challenging due to the high gas flow rates and the normally high operational temperature. This project will investigate the operation of a VAM unit at temperatures as low as 300 degrees C using a suitable catalyst, air pulse and heat recovery system. The air pulsing system regenerates the catalyst under operating conditions to enable low temperature operation of the VAM treatment system. The extension aims to develop a technical development unit for catalytic conversion of ventilation air methane, targeting the maintenance of high levels of conversion (>90%) at low temperature (<500 degrees C) for extend operational periods. The project will examine scalability, operating parameters and other development issues.
Current	**Airbag Inspired Explosion Suppression System for Mitigation of VAM Explosions C33068** Behdad Moghtaderi, University of Newcastle $583,073	David Webb, Glencore Coal Assets Australia Jim Sandford Russell Thomas, GM3 Appin Mine	Previous research has shown that in typical capture ducts a VAM explosion must be suppressed in less than 1.2 seconds to avoid flashbacks into the mine. There are no existing systems that can meet this threshold. In this project researchers aim to develop a simple, low cost system to suppress VAM explosions – rapid action inflation nitrogen bag obstruction explosion suppression (RAINBOES). Preliminary calculations suggest that RAINBOES could fully control a deflagration event in 0.7 seconds.
Current New	**Satellite Remote Sensing - A New Tool for Coal Mine Emissions Management C34008** Damon Roddis, Zephyr Environmental $2,096,725 Current $280,000 New	Andrew Lau, Yancoal Ben Klaassen, BHP Jim Sandford John Watson, Glencore Coal Assets Australia Scott Nairn, Stanmore Resources	This project builds on previous project stages work to test emerging atmospheric measurement systems for measuring methane emissions from open cut coal mines. It proposes two complementary approaches: Periodic Emissions Monitoring (PEM) using drones and flux hoods, and Continuous Emissions Monitoring (CEM) using fixed sensors and open-path technologies. After evaluating nine techniques, the team selected three for PEM and identified several viable options for CEM based on field trials. This is the literature review desktop design and planning stage for a hypothetical periodic monitoring arrangement.
Current	**Optimisation of Operational Parameters of Catalytic Reactor for the Oxidation of Ventilation Air Methane C35049** Michael Stockenhuber, University of Technology Sydney $238,464	Jim Sandford Russell Thomas, GM3 Appin Mine	Catalytic oxidation offers a potential technology for the mitigation of ventilation air methane (VAM) emissions. A VAM catalytic system has been developed over several projects. In this project, researchers will explore how the system reacts to potential changes in feed conditions and how it will be implemented in a pilot-scale reactor. Researchers will determine the requirements to achieve the desired VAM conversion with a structured catalyst support and assess the inherent safety under such conditions.
Current	**Open Cut Fugitive Greenhouse Gas Emissions C36001** Andy Self, Australian Coal Mining Consultants $227,500	Ben Klaassen and De Nicholls, BHP David Webb and Sandy Tickell, Glencore Coal Assets Australia Iain Hornshaw, Yancoal Jim Sandford	This project will analysis of the possible methods of reducing fugitive gas emissions and identify and document the next phase of research which would lead to a plan for the minimisation of fugitive gas emissions from open cut coal mines. The benefits to industry will be to develop a more detailed identification and analysis of viable predrainage strategy options in order to mitigate against fugitive open cut gas emissions which will deliver a path forward for effective open cut gas fugitive emissions management.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Investigation into the Technical Feasibility of In-Pit Gas Capture for Open Cut GHG Mitigation C36002** Christian Boucher, GeoGAS $404,000	David Webb and Sandy Tickell, Glencore Coal Assets Australia De Nicholls, BHP Iain Hornshaw, Yancoal Jim Sandford	In this project researchers will determine how open cut mining modifies the coal seam gas reservoir and how these changes could be leveraged to provide a more cost effective way of capturing gas from within the operating pit for the purpose of fugitive emission mitigation.
Current	**Assessment of Sensors and Airflow Modelling for their Suitability to Quantify Methane Emissions in Open Cut mines C36007** Simit Raval, University of New South Wales $534,880	Ben Klaassen, BHP Iain Hornshaw, Yancoal Jim Sandford John Grieves, QCoal Services Sandy Tickell, Glencore Coal Assets Australia	This project examines the ability of emerging atmospheric measurement technologies to accurately measure fugitive mine site gas emissions in real time, to inform NGER inventory reporting. Traditional point based instruments are unable to capture methane concentrations over a wide area. To address this issue, it's proposed to conduct a comprehensive desktop study to investigate capabilities of various sensors and then subject the selected sensors to comprehensive testing. The project will provide an evidence based outcome for the coal industry covering selection of sensors, strategies for data capture, and influence of airflow modelling through to utilisation of machine learning based mathematical models to estimate methane emissions.
Current	**Low Cost Precious Metal Free Honeycomb Monolithic VAM Catalysts and their Catalytic Activity and Stability Under Water and Dust Bearing Conditions C36008** Yonggang Jin, CSIRO $352,820	Jim Sandford Paul Wild, Anglo American Steelmaking Coal Russell Thomas and Victoria Longley, GM3 Appin Mine	Catalytic oxidation of ventilation air methane (VAM) shows promise in the development of effective technologies to mitigate VAM emissions, with substantial advantages in safety and cost over conventional thermal mitigation technologies. This project aims to develop low cost honeycomb monolithic catalysts (HMC) based on the high performance precious-metal-free catalyst material newly developed by the CSIRO, and evaluate HMCs' catalytic activity and stability with a simulated VAM stream. The direct benefits to the coal industry are accelerated development of high performance cost effective catalytic VAM mitigators and greatly lower the cost of VAM abatement.
Current	**Methane Matters: Updates on Relevant Advances for Coal Mine Emissions C37002** Simit Raval, University of New South Wales $161,890	Mine Site GHG Mitigation Committee	The coal mining industry is focussed on the accurate measurement of greenhouse gas emissions inventory, a priority for both operators and regulators. Scientific challenges in methane measurement are gaining attention worldwide. To navigate this complex landscape, this project will monitor advances in methane emission estimates across sensors, models, and policy frameworks. It will conduct a comprehensive search of scientific literature, white papers, workshops, and news articles, also examining relevant regulatory policies at global and local levels. Special emphasis will be placed on the applicability and significance of these technologies and policies for the coal mining sector, where accurate methane estimation is crucial and under scrutiny.
Current	**Effect of Reactor Size and Operating Parameters on Intrinsic Safety of Catalytic Oxidation Systems for Mitigation of VAM Emissions C37014** Michael Stockenhuber, University of Technology Sydney $952,512	Helen McCarthy, Kestrel Coal Resources Jim Sandford Russell Thomas, GM3 Appin Mine	This project seeks to progress recent ACARP studies on the safe operation of catalytic systems for the mitigation of Ventilation Air Methane (VAM) emissions. VAM emissions are one of the major greenhouse emissions associated with the mining sector, and technology to significantly reduce them is critical for the financial viability of coal mining. The methane concentration in the VAM stream is typically below 1 percent, and unable to be combusted by conventional means, resulting in the emission of large volumes of methane. Thermal reactors have been proposed to mitigate the emissions; however, these operate at very high temperatures, initially require large energy input and footprints and are unable to process very lean methane streams. Catalytic oxidisers have the potential to overcome these challenges.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Current	**Investigations into the Mechanics of Gas Flow and Gas Drainage to Inform Accounting Methodologies for Open Cut Fugitive Emissions C37029** Christian Boucher, GeoGAS $595,000	Ben Klaassen and De Nicholls, BHP Iain Hornshaw, Yancoal Jim Sandford Murray Little and Sandy Tickell, Glencore Coal Assets Australia	Changes to the government's Safeguard Mechanism have introduced financial incentives for open cut mining operations to mitigate their Scope 1 emissions. Under these changes, all operations must report their annual emissions using NGERS Method 2 by FY2027 and underpinned by project C20005 guideline methodology. These guidelines were developed before the recent Safeguard Mechanism updates and do not address gas drained ahead of mining for the purpose of fugitive emission mitigation. To address this gap, the project will investigate gas flow mechanics and pre-drainage in an open cut mining context. The findings will support the development of suitable accounting methodology that reflects the reduction that gas drainage provides for a sites fugitive emission annual reporting.
New	**Nitrogen and Other Uncertainties in the Gas Content of Coal C38010** Chris McMahon, McMahon Coal Quality Resources $118,680	De Nicholls, BHP Dennis Black, GM3 Jim Sandford Murray Little, Glencore Coal Assets Australia	This project investigates how the origin of nitrogen, and sampling and testing methods affect the quantification and treatment of nitrogen measurements in coal-seam gas, which are critical for greenhouse gas reporting. The study will review literature, ACARP guidelines, and emissions calculation methods, and assess borehole classification and uncertainty modelling. It will also incorporate findings from industry workshops and feedback from ACARP monitors to refine recommendations. The expected benefits arising from the examination of effects and review of calculation methodology will be better definition of methods of sampling, testing and evaluation for use, with consideration of nitrogen origins.
New	**Assessing Variability of Coal Mine Methane Emissions with Ground, UAV, and Satellite Sensors C38011** Simit Raval, University of New South Wales $2,232,000	Ben Klaassen, BHP Iain Hornshaw, Yancoal Jim Sandford Sandy Tickell, Glencore Coal Assets Australia	This project will test a mix of emerging technologies for atmospheric measurement —ground sensors, drones (UAVs), and satellites—to test their ability to measure methane more accurately and continuously (real time) at mine sites. The team will study how emissions change with weather, geology, mine layout, and operations, using advanced modelling and sensor data.
New	**Quantification of Fugitive Methane Emissions from Open Cut Mines with CALPUFF-IDM C38012** Francoise Robe, RWDI Australia $286,259	Alexandra O'Donoghue, Bravus Mining & Resources Andrew Lau, Yancoal Ben Klaassen, BHP Jim Sandford John Watson, Glencore Coal Assets Australia Scott Nairn, Stanmore Resources	This project seeks to investigate the suitability of using CALPUFF-IDM method to monitor and quantify fugitive emissions from Australian open cut coal mines. It has been successfully employed in Canadian Oil Sands operations to support regulatory annual greenhouse gas reporting. This technique combines air quality sensors and weather data to track methane in near real-time and map where it's coming from across a mine site. This is the desktop design and planning stage for a hypothetical continuous monitoring arrangement.

The industry sees ACARP's support for its PhD scholarship program as having many benefits, from the outcomes of the research itself which is of great interest to producers, through to what is seen to be more important; being the long term sustainability of the workforce. Scholarships support those who have worked within industry for more than 3 years who wish to upgrade their skills to this higher academic level, which in turn produces very highly trained people working back in the industry.

The support is in the form of a tax free scholarship awarded on the recommendation of the Research Committee.

UNDER MANAGEMENT

Category	No of Projects	ACARP Funding
Scholarships	6	$1,980,000

NEW FUNDING

No of Projects	ACARP Funding	Total Funding
1	$330,000	$330,000

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Complete	**Coal Mass Rating with regards to Outburst and Coal Burst C29080** James Anderson, University of New South Wales $330,000	Brad Elvy, Brad Elvy Mining Services	The aim of this PhD is to prove that carbonate bonded coal has an increased mass strength, influencing the potential of coal to outburst and coal burst. The hypothesises tested, suggest that the bonding of the coal mass with carbonate mineralisation increase the coal mass rating (CMR). The CMR of a coal seam is the controlling factor that controls the ability of the coal mass to hold en masse energy. Two hypotheses will be tested. With the supporting evidence from a literature review of a link between carbonate mineralisation and historical bursting events, the collection of coal samples from various seams will be conducted for analysis and testing. A comparison of the testing results will provide supporting evidence as to the relationship between the occurrence of carbonates within the coal and the resultant CMR.
Current	**Environmental Noise Assessment and Management C25076** Tim Procter, Griffith University $330,000	John Watson, Glencore Coal Assets Australia	Environmental noise is recognised by the World Health Organization as one of the most common pollutants and is becoming a greater community concern. There has been a divergence between how mining companies manage noise impacts and the process used by approval/regulatory agencies. This project will determine the most appropriate 'best practice' approach for the predictive noise modelling of mining operations and then the subsequent measurement and assessment of noise compliance for the respective operations.
Complete	**Mission Planning for Autonomous Dozers C33074** Benjamin Peacock, University of Queensland $330,000	Brian Neilsen, Peabody Australia Coal Shaun Booth, Glencore Coal Assets Australia	The mining industry is increasingly embracing automation as a means of enabling safer, more efficient, and cheaper production. Ongoing research and development of automation within the industry helps to provide sustainability for the future. This research addresses the challenge of mission planning for autonomous dozers, specifically in the application of stockpile dozing operations with the incentive to increase safety, increase productivity, and decrease operating cost.

STATUS	PROJECT, RESEARCHER, FUNDING	MONITORS	OVERVIEW
Complete	**Understanding Horizontal Closure and its Impact on Deformation and Height of Fracture C33073** Adam Lines, University of Newcastle $330,000	John Grieves, QCoal Services Matt Tsang, Anglo American Steelmaking Coal	Currently most Australian underground coal mines estimate the height of fracture when designing ground support using suspension methods. This estimated height of fracture is often only a range and is based on several assumptions. This research will look to validate these assumptions and provide design tools using recent advancements in technology that allow more precise and accurate methods of prediction. The benefits to industry include increased understanding of the relationship between horizontal closure and height of fracture, application and interpretation methods of state-of-the-art technology, and the development of design tools to incorporate in suspension methods to ensure more accurate estimations of height of fracture.
Current	**Optimisation of Ground Consolidation Practices in Longwall Coal Mining Applications C34067** Richard Campbell, University of New South Wales $330,000	Dan Payne, BHP	This project addresses several of the industry priorities, from improved technical understanding of the deposit to improved productivity through targeted strata control and management especially around the longwall. The outcomes from this PhD will provide quantification in the improvement in rock mass conditions as a result of ground consolidation using various polymeric resins, microfine grouts and other products currently available. The work will mechanically test each of the products including injection pressures, permeability and flowrates in the lab and then undertake detailed examination of the results within the fracture network prior to validation in the underground environment.
Current	**Optimisation of Pre-Driven Recovery Road Design for Improved Longwall Relocation Efficiency C37031** Marc Henderson, University of Queensland $330,000	Dan Payne, BHP Matt Tsang, Anglo American Steelmaking Coal	Pre-Driven Recovery Roads (PDRRs) are increasingly utilized in Australian coal mining to expedite longwall recovery, with substantial productivity benefits reported. However, broader industry acceptance remains limited due to perceived strata risk and costs associated with mitigating controls. This project outlines research aimed at overcoming limitations in current PDRR design by providing the industry with a forward-looking, standardized design framework. This framework will enable PDRR design that is optimised for the specific geological environment - leading to improved safety, reduced cost and enhanced longwall recovery efficiency.
New	**Development and Evaluation of Air-Lifted Wick Drains for Enhanced Consolidation of Tailings Dams C38034** Igor Saraiva Vaz, Sigra $330,000	To be determined when Scholarship starts	The goal of this PhD is to develop a system of wick drains with air lift so that consolidation of tailings would be expedited and will be achieved to a greater level than by natural drainage or the use of normal wick drains without air lift. The vision is to be able install a field of wick drains each supplied with compressed air. This situation lends itself to a solar powered compressor which is ideal in the Australian environment. A final component of the PhD and thesis will focus on establishing a structured database and data collection to demonstrate the performance, advantages, and practical feasibility of air-lifted wick drains across different sites. This database will provide an evidence base for commercial adoption and serve as a design reference for future applications.

INCOME

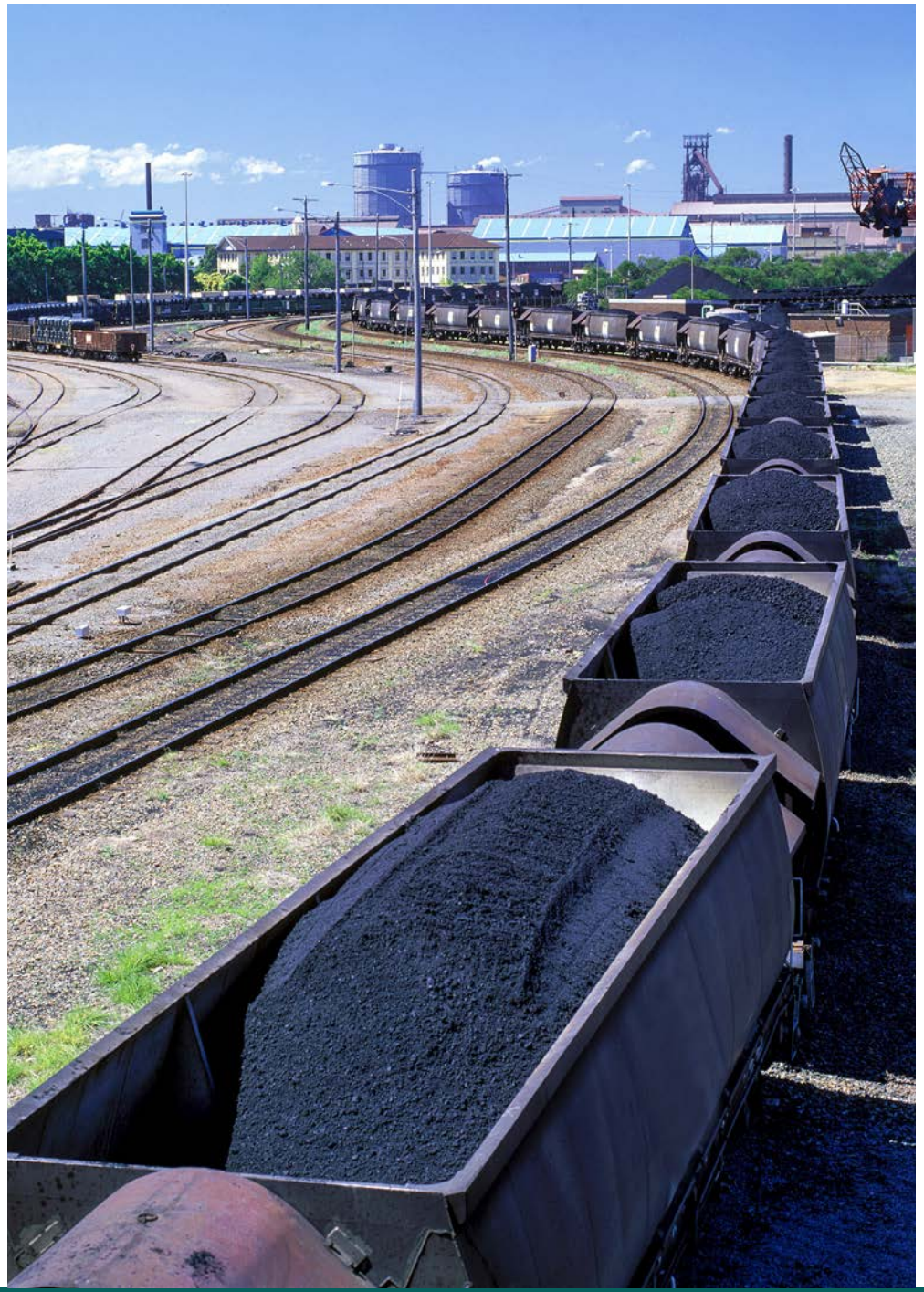
	24/25	23/24	22/23	21/22
Levy	**$17,920,957**	$18,024,703	$17,234,490	$18,303,574
Interest	**$1,127,449**	$1,297,300	$899,746	$187,608
Other	**$106,825**	$10,735	$210,909	$4,637
Total	**$19,155,231**	$19,332,738	$18,345,145	$18,495,819

EXPENDITURE

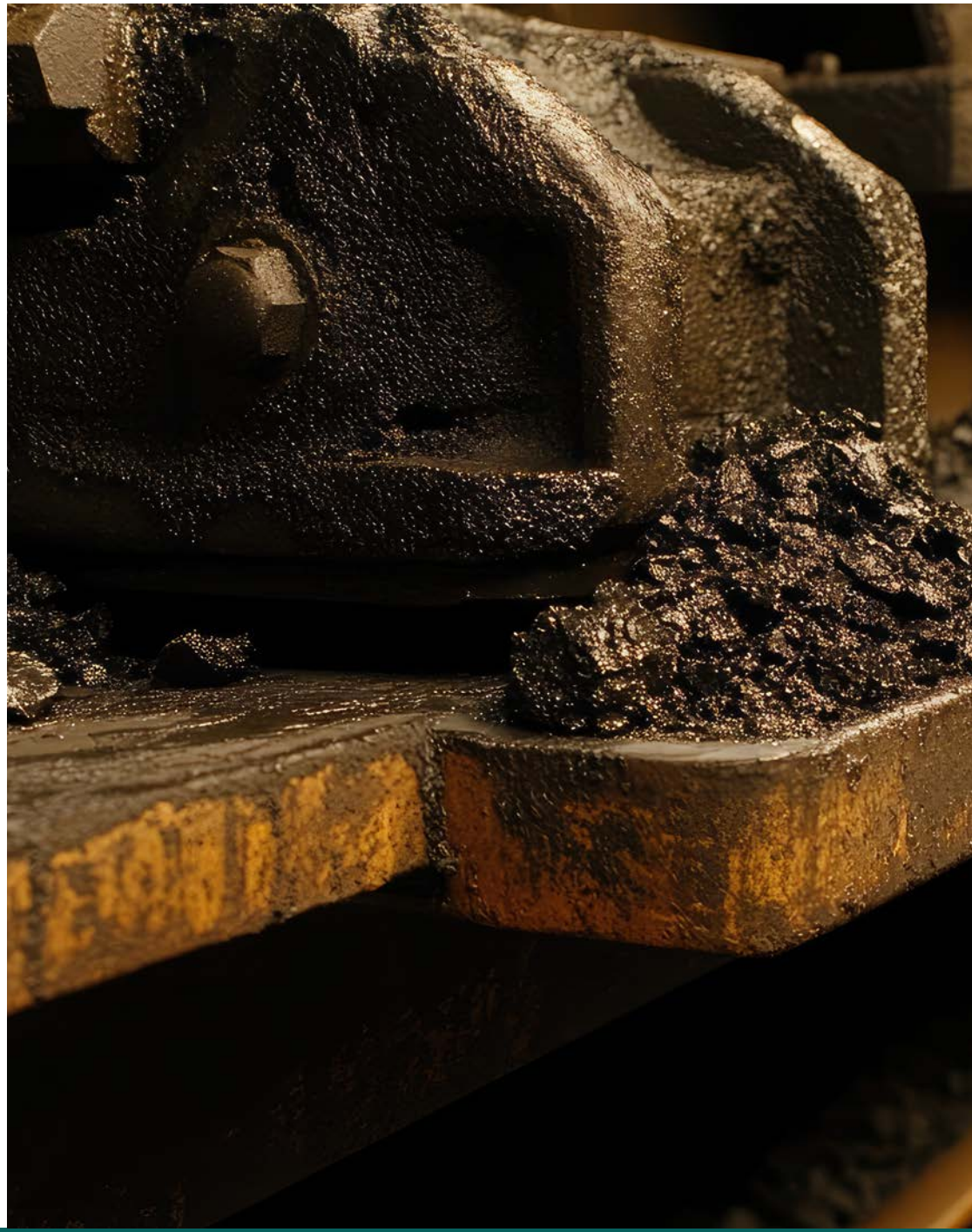
	24/25	23/24	22/23	21/22
Research Projects	**$16,982,627**	$21,693,557	$21,063,972	$19,524,279
Program Management	**$712,336**	$983,994	$759,343	$689,053
Project Administration	**$1,994,683**	$2,085,693	$1,989,300	$1,855,743
Total	**$19,689,646**	$24,763,244	$23,812,615	$22,069,075

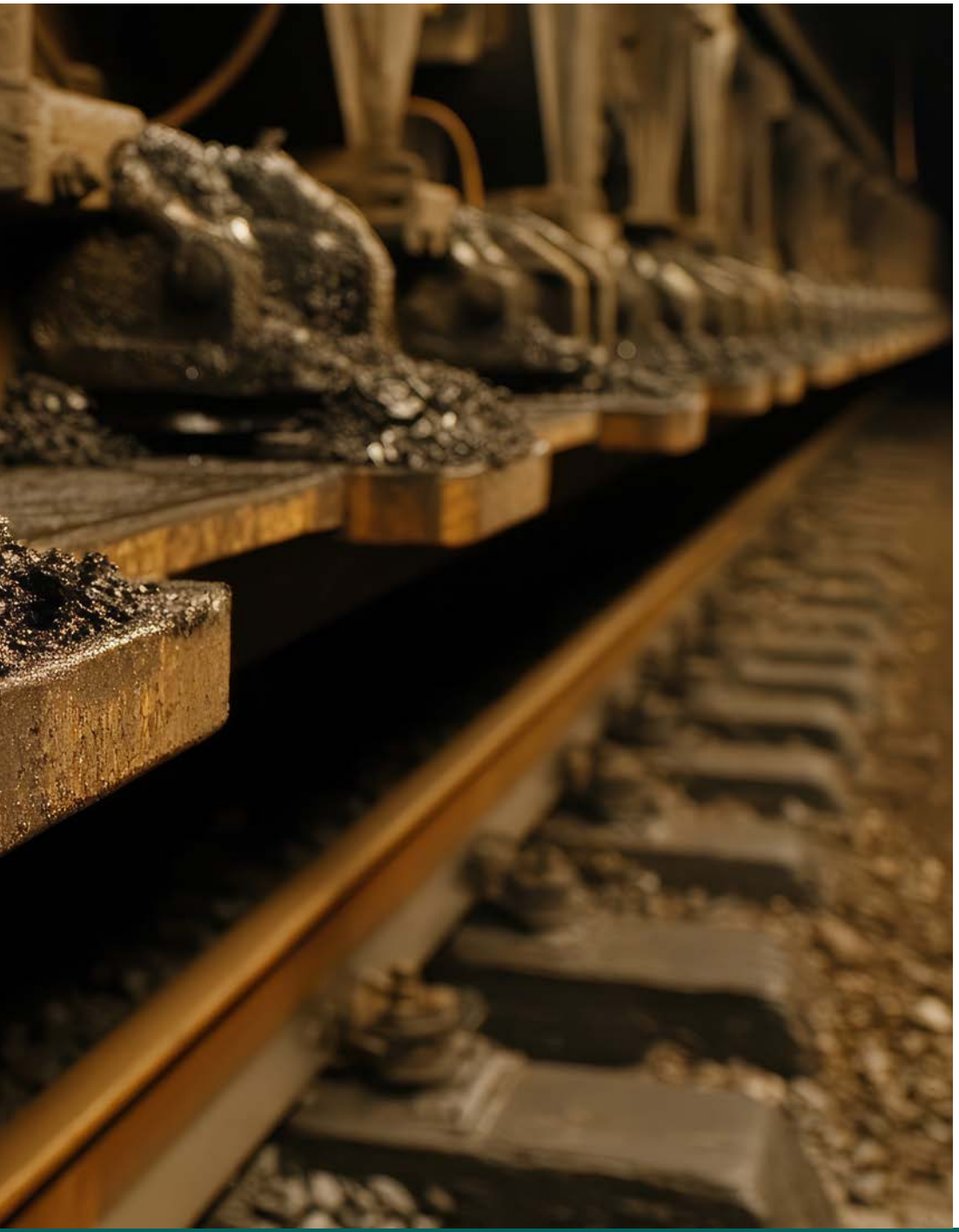
OUTSTANDING COMMITMENT FOR RESEARCH AT 30 JUNE 2025

	24/25	23/24	22/23	21/22
Projects Started	**$17,244,815**	$23,255,098	$29,830,064	$30,314,885
Projects Yet to Start	**$6,382,086**	$6,947,921	$3,896,587	$4,286,805
Total	**$23,626,901**	$30,203,019	$33,726,651	$34,601,690



March 21	**Call for Proposals** - Announcement in “The Australian” - Distribution of Research Priorities Newsletter
April 29	**Closing Date for Short Proposals**
July	**Short Proposal Selection Meetings**
July 10	**Call for Long Proposals**
August 19	**Closing Date for Long Proposals**
October	**Long Proposal Selection Meetings**
December (mid)	**Proposal Outcomes Advised**





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