



CONTENTS

INTRODUCTION

2 Introduction

4 Underground Projects

22 Open Cut Projects

38 Coal Preparation Projects

- **50** Technical Market Support Projects
- 59 Mine Site Greenhouse Mitigation Projects
- 62 PhD Scholarships
- **65** 2016 Proposal Timetable
- 66 Contacts

ACARP – the Australian coal industry's research program - was established in 1992 through a Memorandum of Understanding between the Australian Coal Association Executive and the Federal Government. When the Australian Coal Association was disbanded in 2012 the MOU was transferred to the Minerals Council of Australia.

ACARP is funded by a levy of 5 cents per tonne of product coal paid by all Australian black coal producers, who voluntarily cooperate to develop technologies and solutions that help meet their obligations to the community, while maintaining the industry's position as a world leader in a highly competitive global market. This cooperation allows producers to combine their expertise and resources and share both the risks and the benefits to the industry as a whole.

Sustainable production of coal on all levels has been embraced as a core business value by Australian coal companies. Major regional issues such as water resource management and impact of noise and dust on local communities are all of primary importance, as are safety and productivity in all aspects of mine site operation.

This publication documents how the ACARP industry levy has been invested during 2015 to assist the Australian coal industry develop and adopt world leading sustainable mining practices through collaboration.

PEOPLE

The people listed through this report fall into 3 categories.

- Firstly, those who are undertaking the project the Researchers.
- Secondly, those who recommend the project be funded, being the industry members of the 5 technical committees.
- Thirdly, one or more industry representatives who are appointed to act as Industry Monitors for each project. The Monitors are charged with providing technical guidance and ensuring any advances are actioned across the whole industry.

PROJECTS

This report highlights all the projects that were current during 2015 together with the new projects that have been selected. The overview summarises the challenges being addressed and the approach being taken.

FUNDING APPROVED 2015

CATEGORY	No of Projects	ACARP Funding	Total Funding
Underground	26	\$5,552,568	\$7,498,470
Open Cut	19	\$5,511,863	\$7,205,094
Coal Preparation	17	\$2,395,961	\$4,658,741
Technical Market Support	13	\$1,697,363	\$3,018,880
Mine Site Greenhouse Mitigation	1	\$352,865	\$1,242,265
Scholarships	3	\$990,000	\$990,000
Total	79	\$16,500,620	\$24,613,450

The resultant leverage = Total funding \div ACARP Funding = 1.49 times

CATEGORY	No of Projects	ACARP Funding
Underground	62	\$22,940,598
Open Cut	56	\$24,124,093
Coal Preparation	40	\$8,346,158
Technical Market Support	23	\$6,756,743
Mine Site Greenhouse Mitigation	9	\$2,885,977
Scholarships	6	\$1,903,322
Total	197	\$67,209,931



UNDERGROUND PROJECTS

The primary goal of the underground research program is to achieve a sustainable record of zero fatalities. This is reflected in the occupational health and safety program; strengthening ventilation and gas management technology, minimising risks from fires and explosions, advancing emergency response technologies and addressing workplace health risks.

The second goal is to assist operators to adopt new and innovative technologies that offer lower operating costs, along with improved exploration methods and better management of the risks associated with ground control. The industry continues to be determined to improve roadway drivage rates.

The environmental impacts of mining must be minimised and managed to the satisfaction of the community. Priorities include discharge management and improved reliability of subsidence predictions. The program recognises the importance of continuous improvement in this area to ensure the coal industry maintains broad community support.

COMMITTEE MEMBERS

Brad Elvy	Analysis and Improvement Specialist (Co-Chair)	South32 Illawarra Coal
Jim Sandford	Project Manager, Coal Assets Australia (Co-Chair)	Glencore
Bharath Belle	Group Ventilation Manager	Anglo American
Gary Brassington	Manager Approvals	South32 Illawarra Coal
Greg Briggs	General Manager Machine Engineering	Centennial Coal
Peter Brisbane	General Manager Technical Services	Bandanna Energy (Administrators Appointed)
Paul Buddery	Principal Underground Geotechnical Engineer	Anglo American
Steve Burgess	Executive General Manager Engineering & Operations Support	Centennial Coal
John Grieves	Manager – Infrastructure & Project Development	Caledon
Dieter Haage	Head of Mining Excellence - Underground	Anglo American
Mick Kelly	Manager Directional Studies	BHP Billiton Coal
Bernie Kirsch	Regional Environmental Manager West	Centennial Coal
Andrew Lovell	General Manager Strategic Mine Planning, Coal Australia	Rio Tinto
Brad Lucke	Principal Electrical Engineer – QLD	Glencore
Liam Mildon	-	Rio Tinto
Rae O'Brien	Group Manager - Tech Services (South)	Glencore
Paul O'Grady	Group Manager - Technical Services (North)	Glencore
Dan Payne	Manager Geotechnical Services	BHP Billiton Coal
Richard Porteous	Manager Projects	Glencore
Andrea Rutley	Head of Geosciences	Anglo American
Stephen Schaller	Specialist Emerging Markets, Productivity Division Coal Australia	Rio Tinto

Ken Singer	Manager Mine Control (UMM)	BMA
Peter Smith	General Manager HS	Centennial Coal
Trevor Stay	General Manager Gas	Anglo American
Andrew Swiericzuk	Project Manager-Studies, Coal Australia	Rio Tinto

FUNDING APPROVED 2015

	No of Projects	ACARP Funding	Total Funding
2015	26	\$5,552,568	\$7,498,470
2014	23	\$6,346,269	\$11,485,909
2013	20	\$4,780,342	\$10,524,373

CATEGORY	No of Projects	ACARP Funding
Detection and Prevention of Fires and Explosions	3	\$2,269,085
Environment - Subsidence and Mine Water	3	\$917,480
Exploration	8	\$1,851,837
Maintenance	6	\$1,576,648
Mining Technology and Production	9	\$3,872,326
Occupational Health and Safety	8	\$2,317,743
Roadway Development	4	\$3,788,094
Strata Control and Windblasts	12	\$3,380,411
Ventilation, Gas Drainage and Monitoring	9	\$2,966,974



UNDER	UNDERGROUND					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Detectio	n and Prevention of Fires and Explosions					
Current	Airo-Dust - Parameter Testing C20002 Mining Attachments (Qld) Matt Ryan	1,339,085	Bharath Belle, Anglo American Steven Winter, Glencore Peter Brisbane, Bandanna Energy (Administrators Appointed) Jim Sandford, Glencore	Coal dust explosions occur when a cloud of coal dust is raised into suspension and ignited, usually by a methane explosion. The coal industry must combat this risk by applying stone dust onto the roof and sides throughout mine roadways. The incombustible stone dust dilutes the concentration of combustible coal dust to form an inert cloud. A new method of applying stone dust as foam has been trialled and tested under project C16014. The applied material is a mixture of water, stonedust, compressed air and Airo-Dust™ additive which forms a highly vesicular foamed product when sprayed onto the roadways. The process significantly reduces air-borne dust generation allowing coal production to continue in parallel with the application of stone dust. Additional testing was undertaken through this project to achieve acceptance of the process for use in underground coal mines in Australia.		
Current	Cheaper and More Effective Inertant Than Stone Dust C21016 SkillPro Services David Humphreys	470,000	Peter Brisbane, Bandanna Energy (Administrators Appointed) Bharath Belle, Anglo American	This project will refine and test a recently invented water adsorbent polymer that aims to replace traditional stone dust. The polymer, which is a more effective inertant, can be hydrated underground; vastly reducing the material handling mass and thereby reducing costs. Stakeholder engagement with mines inspectorates and unions will be conducted under this project. The polymer will be tested at the large scale explosion testing facility at Kloppersbos in South Africa.		
Current	Potential Lightning Impacts on Underground Coal Mines C22003 University of Queensland David Cliff	460,000	Brad Elvy, South32 Illawarra Coal Greg Briggs, Centennial Coal Peter Henderson, Glencore Jim Sandford, Glencore	Concern over the potential for lightning to cause harm in the underground coal mining environment has been generated from the findings of the SAGO mine disaster in 2006 in the USA. The MSHA investigation report identified another twelve instances where lightning is the most likely ignition source of explosions within sealed areas since 1986. The objective of this research was to develop and apply computer models to evaluate the potential lightning impacts on underground coal mining. These models may be utilised to assist in the design of effective controls.		

Environment - Subsidence and Mine Water

Current	Standardised Subsidence Information Management System C20038 NSW Department of Trade and Investment Gang Li	655,000	Phil Enright, Centennial Mandalong Dan Payne, BHP Billiton Coal	Subsidence data from New South Wales underground coal mines spanning back three decades is being preserved and transferred from various original formats into a standardised information management system. The extension project will enable industry stakeholders to interrogate the system for subsidence knowledge, prediction and assessment in order to make more informed decisions about resource recovery and subsidence risk management.
Current	Impact of Mine Subsidence on Threatened Ecological Communities C22019 Eco Logical Australia Paul Frazier	93,680	Carl Grant, Anglo American Gary Brassington, South32 Illawarra Coal	Longwall mine subsidence is recognised by state and federal governments as a process that threatens to impact surface environments. Current approval requirements for impact monitoring vary from site to site. A standard monitoring methodology may assist industry to meet approval requirements and streamline the monitoring process. This project used quantitative means to assess the impact of longwall mine subsidence on bluegrass and brigalow communities across several longwall mining areas. In addition, an integrated monitoring method that combines targeted field survey with remote sensing analysis was developed and tested over several mine areas to lead industry best practice.

UNDER	GROUND			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Managing and Conserving Native Plant Species in the Mining Environment C24013 Royal Botanic Gardens and Domains Trust, Sydney Cathy Offord	168,800	Bernie Kirsch, Centennial Coal Gary Brassington, South32 Illawarra Coal	The woody shrub genus Persoonia, which is found on mine sites, has nine species listed as 'at risk' or 'of concern' in New South Wales. Researchers will explore how to effectively propagate these species (rare and common) for mine rehabilitation work; and what the most appropriate ex situ conservation options are. This work will lead to better conservation of rare species on mine leases and increase the likelihood of successful use of common and rare species in mine rehabilitation work.
New	Change Detection in Complex Vegetation Communities C25056 University of Queensland Andrew Fletcher Richard Mather	274,700	Gary Brassington, South32 Illawarra Coal Bernie Kirsch, Centennial Coal	The accurate and reliable reporting of changes to overlying vegetation and/or surface geology is a key priority for satisfying the operating conditions of underground mining operations. A timely and sensitive means for demonstrating compliance and good stewardship that is robust, comprehensive and cost efficient is needed. In this project an open source data processing framework will be used to develop a change detection tool, which will allow site personnel to incorporate a range of data, assess and report on change over time across surface vegetation and substrate conditions. This will be achieved by using recently available small unmanned aerial systems that overcome the historic need for expert external remote sensing data collection.
Explorati	on			
Current	Advanced Logging Tool C16018 CRCMining Eddie Prochon	440,322	Jim Sandford, Glencore	In advanced borehole logging tool was developed to improve geological definition and geotechnical assessment of coal deposits. The tool contains upwards and downwards looking directional natural gamma and density sensors. It samples at 80 millimetre intervals to provide a high-resolution data set that can be interpreted to determine the seam profile and define geological and sedimentary structures. The tool logs to memory and is deployed inside the drill string. In this extension the logging tool will be reconfigured to reduce the risk of losing the gamma radiation source down the borehole, and two additional geophysical logging tool modules will be added. The new modules will be suitable for certification as intrinsically safe for use in underground mines.
Current	In-seam Wireless Drill String Communications System C21019 Eddie Prochon	262,400	Brad Elvy, South32 Illawarra Coal Peter Brisbane, Bandanna Energy (Administrators Appointed) Jim Sandford, Glencore	The Mecca system is generally used in underground inseam drilling for communications and directional drill control. However this system is very expensive, non retrievable and does not enable geological wireline tools to be pumped down the inside. In this project CRCMining built on successful past work to develop an alternate technology. The project further developed an electro magnetic telemetry system called inseam wireless drill string to facilitate real time bidirectional telemetry between the drill and the bottom hole assembly. The technology will provide a wireless data rate of 1,000 bits per second, thereby enabling transmission of high resolution navigation data, drill control messages and geosensing data in real time.
Current	Enhancing Fault Detection by Seismic Diffraction Imaging C22016 CSIRO Binzhong Zhou Peter Hatherly	240,475	Steve Walker, Anglo American	Modern underground coal mining requires certainty about geological faults and other structural features. While locating faults with throws greater than 5-10 metres has been generally accepted for seismic surveys, the ability to resolve the more subtle faults, shears and features is still a challenge. New techniques for enhancing small fault detection by imaging the diffractions often associated with fault structures were developed, thereby improving the efficiency and effectiveness of detecting anomalies and discontinuities ahead of mining.
Current	Borehole Data Standard for the Australian Coal Industry - Phase 2 C22017 GeoCheck Brett Larkin David Green	120,000	Patrick Tyrrell, New Hope Group Tim Buddle, Anglo American	There are currently a large number of coal exploration data formats and dictionaries being used in the Australian coal industry which lead to inefficiency and data transfer costs when geologists move between projects and companies. A set of standards for geological, geotechnical and geophysical logging of exploration data has been developed. Under this extension project, CoalLog was revised and updated with photographs, formation and seam codes, lithology plotting symbols and a format for the addition of metadata to downhole geophysical data (LAS) files. A standard training manual for geological and geotechnical logging of Australian coal industry boreholes has been developed.

UNDER	JROUND					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Current	Coal Quality From Geophysical Logs for Enhanced Resource Estimation C23015 CSIRO Binzhong Zhou Graham O'Brien	225,240	Barry Lay, BMA Patrick Tyrrell, New Hope Group	Coal quality parameters such as ash content, density, volatile matter and insitu moisture are important to the coal mining industry from mine planning, design, extraction and beneficiation through to utilisation. These parameters are traditionally obtained through laboratory analysis of drill core samples. This process is expensive and time consuming. This project will deliver a new methodology prototype software for deriving coal quality parameters through analysis of routinely acquired wireline data and documented trials of conventional and advanced statistical methods for improved parameter correlation and estimation.		
Current	Automatic Determination of Lithology Boundaries From Downhole Geophysical Logs C24016 GeoCheck Brett Larkin	76,000	Patrick Tyrrell, New Hope Group Malcolm Ives, Centennial Coal	Coal geologists spend excessive time adjusting lithology boundary depths in their logs to corresponding depths derived from downhole geophysical logs. This project will improve the efficiency and effectiveness of this process by providing a computer assisted method to make 80% to 90% of the adjustments. Researchers will develop methods to automatically compare computer generated lithology boundary depths with those recorded in geologists' logs and ascertain whether the depths of each hole have been adjusted to geophysics.		
Current	Use of Core Scanning and Hand Held Xray Fluorescence Analysis in Coal Quality Assessment C24025 University of New South Wales Colin Ward	157,400	Malcolm Ives, Centennial Coal Patrick Tyrrell, New Hope Group	Low cost methodologies for rapidly measuring the nature and concentration of the principal inorganic element in coal are needed. This project will develop and validate new technologies for detailed non destructive chemical analysis of cored and in situ coal seams using laboratory based core scanning and hand held portable X ray fluorescence techniques. This will enable variations in ash percentage, ash composition, sulphur and phosphorus in coal seams to be mapped at much higher spatial resolution than is currently possible.		
Current	In Seam Wireless Drill Strong Communication System: Phase 2 C24065 University of Queensland CRCMining Eddie Prochon	330,000	Brad Elvy, South32 Illawarra Coal Peter Brisbane, Bandanna Energy (Administrators Appointed) Jim Sandford, Glencore	CRCMining is developing a system called in seam wireless drill string (ISWDS) that provides high data rate, bidirectional wireless communication between the BHA and the drill rig in the hazardous conditions of underground in seam (UIS) drilling. In phase one of the project the performance of the wireless EM signal was successfully assessed using a research prototype tool. This project will develop a commercially operable tool for UIS drilling in cross panel application; conduct "Ex ia" assessments in order to conduct tests in exploration holes; assess and optimise performance towards 1200m distance; and provide a business case and commercialisation strategy. The prototype will be certified for hazardous area and will be integrated into CRCMining's other equipment designs.		
New	Seismic Diffraction Imaging for Improved Structural Detection in Complex Geological Environments C25067 CSIRO Binzhong Zhou	178,000	Holly Withington, New Hope Group Patrick Tyrrell, New Hope Group Paul O'Grady, Glencore	Faults and dykes are the most significant geological structures with the potential to disrupt underground coal mining operations. Seismic reflection surveys can locate faults with throws greater than five to 10 metres. However, detection of faults with smaller throws, shears and dykes with widths of a few metres remains a challenge to seismic methods. This project will develop new filtering techniques to extract the seismic diffraction signals from reflection seismic data with multiple coal seam and strata dipping at different angles. The new technique will improve the efficiency and effectiveness of detecting the anomalies and discontinuities ahead of mining in a complex geological environment.		
Mainten	Maintenance					
Current	Big Tyre: Non Pneumatic Non Solid Wheel C18020 Big Tyre Bruce Louden	555,000	Barry Moore, Centennial Coal Keith Cardew, Peabody Energy Australia	In a number of applications the coal industry utilizes solid tyres, however they come with some negative OH&S impacts. This project will develop a non-pneumatic wheel specifically designed for underground mining that will overcome a range of inherent disadvantages associated with pneumatic tyres, foam-filled tyres, and solid wheels. The research contractor has committed to develop and supply underground mines with the first production wheels - meeting or exceeding load and torque capacities of comparable tyres, with the following beneficial outcomes over conventional tyres and wheels: improved safety, improved productivity and reduced machine maintenance costs		

2015 PEOPLE AND PROJECTS REPORT

UNDER	GROUND			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Cutterhead Reliability Assessor for Underground Coal Mining C22013 CSIRO Xing Li	222,100	Tom Nicholson, Centennial Coal Graeme Relf, South32 Illawarra Coal	Continuous miner cutter heads are complex systems. The drum is one of the most critical components that affects cutterhead reliability and picks are key components of the drum. This project analysed the effect of pick tip material property, pick attack angle, drum rotational speed and tram speed on pick reliability. As a result, engineers and operators are able to assess the risk of pick failure under various mining conditions and develop maintenance strategies to improve reliability and productivity.
Current	Use of Plastic Metal in Underground Coal Mines for Minor Repair on Flameproof Equipment C23005 Simtars Bipin Parmar David Turner	182,298	Mark Spinks, Anglo American Mark Lydon, Glencore	Repairing flameproof equipment in-situ underground presents a safety hazard. This extension project will investigate the performance of a number of plastic metal products at various compositions and prepared under various environmental conditions. Researchers will recommend properties that need to be considered when selecting plastic metal products for use on certified flameproof and other explosion protected equipment in underground coal mines.
Current	Fatigue Life Determination of DN20 D-section 420 Stainless Steel Staples C23011 BMT WBM Daniel Carpenter	55,000	Trevor Hartley, Centennial Coal	A standard longwall hydraulic system includes several lineal kilometres of hosing and thousands of fittings. A common fitting used in longwall systems is the staple lock, available in many sizes from numerous manufacturers. Staple fatigue is a risk in this environment. However, information available from manufacturers is insufficient to assess staple fatigue in different applications. This project scientifically established the fatigue performance characteristics of a specific type of stainless steel staples, characterised the relationship between working pressure and fatigue life, and compared the fatigue life of two types of staples to determine which has a superior lifespan.
Current	Longwall Hydraulic System Over Pressurisation Hazards Prevention C24007 Asset Performance Improvements Henry Bartosiewicz	292,250	Shayne Gillett, Centennial Coal Jarrod Sampson, Glencore	Over pressurisation issues have been identified with longwall system hydraulic monitoring programs. Researchers will work with OEMs to understand and determine the nature, extent and causes of these pressure surge problems in different longwall systems design, age and operating conditions.
Current	Distributed Acoustic Conveyor Monitoring C24014 University of Queensland CRCMining Saiied Aminossadati	270,000	Peter Brisbane, Bandanna Energy (Administrators Appointed) Jim Sandford, Glencore Brad Elvy, South32 Illawarra Coal Steve Amor, Anglo American	This team of researchers is developing a novel conveyor condition monitoring (CCM) system that can improve safety and provide substantial financial benefits to the mining industry by detecting the faulty idlers long before they fail. The proposed CCM system incorporates a single fibre optic cable installed on the frame of a conveyor belt and is capable of detecting the acoustic and vibration signals generated by faulty conveyor components. The aim of this project is to develop the concept for underground coal conveyor systems.
New	Distributed Acoustic Conveyor Monitoring - Phase 3 C25054 University of Queensland CRCMining Saiied Aminossadati Paul Wilson	380,986	Kevin Rowe, Glencore Clinton Vanderkruk, Anglo American Brad Lucke, Glencore Peter Brisbane, Bandanna Energy (Administrators Appointed)	This third phase is an extension of project C24014 which aims to develop robust event detection capability in the time domain, so that the time to failure characteristic of idlers can be understood and embodied in advanced algorithms.

UNDER	GROUND			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
New	Photocatalytic Destruction of Diesel Particulate Matter (DPM) C25063 CSIRO Yonggang Jin	178,400	Greg Briggs, Centennial Coal Brad Lucke, Glencore	The particulate matter emission generated in diesel engines – diesel particulate matter (DPM) – has been classified as a Group 1 human carcinogen by the World Health Organisation. DPM control in underground coal mines has been an ongoing problem for many years. Controlling tailpipe emissions is a reliable and effective way to reduce the exposure of mine workers to DPM by controlling its input into the mine environment. Compared with the common passive filter approach, deployment of photocatalytic destruction is a more active and direct way to mitigate DPM emissions. This project will explore and develop a novel approach for better control of tailpipe DPM emissions by photocatalytic oxidation of DPM under ultraviolet irradiation into carbon dioxide.
New	Optimisation of Shuttle Car Steering Systems C25070 BMT WBM Daniel Carpenter	38,400	Graeme Relf, South32 Illawarra Coal Anthony Livingstone, Centennial Coal	Maintaining good roads in underground mines is particularly difficult at intersections where machines perform tight turns. Shuttle cars operate frequently at these locations where they are required to make tight turns. Their cornering behaviour has a significant impact on the road condition. This project aims to minimise this type of roadway damage by determining the ideal shuttle car steering component geometry that minimises lateral tyre sliding 'scrub'.
New	Towing Force Measurement of Various Mining Equipment : Part 2 C25071 BMT WBM Daniel Carpenter	41,600	Graeme Relf, South32 Illawarra Coal Anthony Livingstone, Centennial Coal	Inspections of open cut heavy and light vehicle towing equipment has shown that a large proportion of equipment is damaged due to overloading. An earlier project designed, manufactured and calibrated an instrumented towing force measuring pin. In this project researchers will test the equipment in 'real world' conditions in a longer trial. The signal conditioning and data logging hardware will be modified to suit underground conditions.
New	Wall Flow (DOC+DPF) Type System to Replace Existing Wet Element Filter Systmes used in Typical LHD in Underground Operations C25073 Orbital Australia Nick Coplin	519,240	Andy Withers, Peabody Energy Graeme Relf, South32 Illawarra Coal Bharath Belle, Anglo American Shayne Gillett, Centennial Coal	The need to protect workers from diesel particulate matter (DPM) has led the underground coal mining industry to install disposable filter systems on its vehicles. While the disposable filters are efficient at removing significant DPM they have high operating costs, and improper installation or damage leaves workers exposed to high levels of DPM. In order to address these issues, a prototype wall flow filter system will be examined in heavy duty engine testing facilities to replicate LHD in field operations. These filters do not need regular replacing which reduces the chance of improper installation and seal damage. Being a permanent system, the filters cannot be removed by a driver.

Mining Technology and Production

Current	Development of a Safer Underground Explosive C20033	323,500	Brad Elvy, South32 Illawarra Coal	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
	University of New South Wales			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
	Andres Castro Duncan Chalmers			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 is developing an alternate test regime that adequately assesses the
				deflagration risk of an explosive. The information gained from this testing will provide additional data to change the testing regime for permitted explosives.

UNDER	UNDERGROUND					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Current	Full Panorama View (360) Video and Laser Flameproof Enclosure C21021 CSIRO Ron McPhee Zak Jecny	251,760	Mark Perry, Centennial Coal Brad Lucke, Glencore Peter Henderson, Glencore	The use of laser and video instrumentation underground is limited by the absence of a safe flameproof enclosure that is functional and intrinsically safe. This project is addressing the design, construction and certification for a novel design of a flameproof enclosure to accommodate full panorama laser and video viewing. The enclosure will deliver improved performance in many areas of underground machine automation including creep-retreat monitoring, collision avoidance, equipment and personnel recognition, pillar and panel locations and many of the future safety related systems integral to the development of autonomous underground equipment.		
Current	New Manufacturing Technique for Radio Transparent (Dielectric) Flameproof Enclosures C21022 CSIRO Ron McPhee	196,980	Mark Perry, Centennial Coal Brad Lucke, Glencore Peter Henderson, Glencore	Although there are numerous practical underground applications for radio transparent flameproof enclosures, these applications have not been fully developed because there is no suitable non metallic flameproof enclosure technology. Some exciting applications on the development horizon for radio frequency instruments include collision avoidance, identification of resource boundaries using one of the many forms of radar sensing, and local communications portals using wifi systems. This project is developing the fundamental techniques required to produce radio frequency, transparent flameproof enclosures using combinations of metallic and non metallic materials and the latest selective laser sintering techniques.		
Current	Automated Mining Horizon Control Using Real Time Coal Seam Sensing C22014 CSIRO Jonathon Ralston	268,800	Dion Pastars, BMA Peter Brisbane, Bandanna Energy (Administrators Appointed)	Achieving effective mining horizon control is critical for safety and productivity in underground roadway development and longwall mining. Automation is seen as a way to improve horizon control performance. However, a major issue preventing its widespread introduction is the lack of reliable instrumentation to sense where cutting horizons are relative to the seam roof and floor during mining. This project developed a new prototype sensing system designed to measure the coal thickness to roof and floor rock, together with a report including comprehensive system performance measurements. It will be non-intrinsically safe and deployed using antennas which directly contact the roof or floor.		
Current	CM Self Guidance: System Hardening and Underground Deployment C22015 CSIRO David Reid	926,255	Roadway Development Task Group	The goal of the CM2010 initiative is to demonstrate an integrated, remotely supervised, high capacity roadway development system. A major component of this initiative is the development of a navigation and control system to realise a practical self steering continuous miner. This technology will also provide real-time machine position and operational information essential for the integration of support and haulage components. In this project, the technology outcomes demonstrated on the Phoenix in C18023 will be made more robust so they can be installed on an operational continuous miner underground.		
Current	Towing Force Measurement of Various Mining Equipment C23012 BMT WBM Daniel Carpenter	36,000	Graeme Relf, South32 Illawarra Coal Anthony Livingstone, Centennial Coal	Heavy and light equipment is towed frequently at open cut coal mines. The principle risks involved with the failure of towing components include uncontrolled release of energy when components fail and unplanned movements or loss of control when components fail. Regulators have recommended that all mines review their towing, pulling and snigging operations. The project aimed to measure the towing forces using strain gauged and calibrated equipment and data logging equipment for a range of machinery and towing equipment in a true mining environment. This data was processed to identify the key variables required for the design and specification of safe towing equipment.		
Current	Water Jet Cable Bolt Drilling Tool Development and Field Demonstration C23020 University of Queensland Scott Adam	350,171	Brad Elvy, South32 Illawarra Coal Peter Brisbane, Bandanna Energy (Administrators Appointed) Jim Sandford, Glencore Peter Corbett, Centennial Angus Place	Current rock bolt drilling techniques and equipment present an operational risk in underground coal mines. A field tested water jet drilling tool prototype capable of meeting safety, hole quality and productivity requirements for cable bolt drilling will be developed in this project. The water jet system will be capable of continuously drilling holes of different lengths using high pressure water jets without requiring the manual addition of individual rods during the drilling process and will improve drilling productivity. The first commercial version is expected to include the prototype attached on the end of a flexible high pressure hose.		

UNDER	UNDERGROUND					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Current	Dynamic Longwall Equipment Location Model C24021 CSIRO Jonathon Ralston	73,860	Mick Kelly, BMA Luke Dyer, Glencore	Collisions between the shearer and roof supports due to equipment failure or operator error can occur during longwall operations, significantly impacting safety and productivity. This project will develop a mathematical model that accurately computes the location of longwall equipment in real time.		
Current	Gateroad Development Continuous Haulage System: Stage 3 C24023 Premron Mick Whelan	1,445,000	Roadway Development Task Group	The need for shuttle cars at the coal face will be eliminated if the Premron CHS continuous haulage system is introduced to underground mines, resulting in safety, productivity and performance improvements. In this final stage of the project, Premron will manufacture a full scale, full length (150m), mine compliant system and install it above ground on a monorail test rig. Once it has been certified by the Mines Inspector, the next step will be an underground trial on a non productive panel.		
New	Self Drilling Bolt Automation C25058 OKA Rock Bolt Technologies Mark Levey	500,000	Roadway Development Task Group	The aim of this project is to validate a series of roof support system technical evaluations within a performance trial in an underground environment. To develop and build a fit for purpose underground drill rig retrofit, researchers will use the learnings from a preliminary underground trial of about 100 bolts using equipment developed for a surface workshop prototype. The retrofit will be a non hazardous zone compliant drill rig using the OKA self drilling rock bolt technology.		
New	Bolter Miner for Rapid Longwall Development: Phase A C25061 Sandvik Mining and Construction Australia Barry Wright Winton Gale	92,000	Roadway Development Task Group	The aim of this project is to create a functional specification for the ground support element of a bolter miner that is suitable for an Australian geotechnical environment. The main focus will be on the ground support element to ensure any changes required to the machine design lead to a fit for purpose system design for the Australian geotechnical environment including additional drilling and bolting data intelligence monitoring. This is the first part of a proposed larger project which will lead to finalisation of the functional and requirement specification for a bolter miner (with a new ground support element suitable for the Australian geotechnical environment) and then a trial at an underground mine.		
New	Longwall Floor Coal Horizon Sensor C25064 CSIRO Jonathon Ralston	213,736	Paul Buddery, Anglo American Rae O'Brien, Glencore	Achieving effective mining horizon control is essential for safe and productive underground longwall mining. There are currently no known commercial sensing systems available. This project will prototype a measurement solution based on ground penetrating radar. The guidance information can be integrated into an existing LASC enabled longwall leading to a step change in mining horizon control performance. The main outcome of this project will be new information to improve longwall mining horizon control performance.		
New	Optimising Electrical Protection System Strategies and Technologies C25069 ResTech Clint Bruin	174,350	Greg Briggs, Centennial Coal Brad Lucke, Glencore	The incidence of nuisance tripping on protection equipment for earth fault limited power systems in underground mines has been increasing, leading to production interruptions. Protection equipment must comply with the relevant standards but it is difficult for these standards to keep pace with changes in technology. Researchers will analyse and demonstrate how some parts of existing standards for electrical protection systems inadvertently prevent improvements in performance without increasing safety. In addition, they will identify technologies and techniques that should reduce nuisance tripping, enhance equipment availability and deliver increased production without degrading the proven safety performance of the established regime.		
Occupati	Occupational Health and Safety					
Current	Emergency Response: Mine Entry Data Management C19010 Queensland Mines Rescue Service Darren Brady Steve Tonegato	333,740	Peter Brisbane, Bandanna Energy (Administrators Appointed) Bharath Belle, Anglo American John Grieves, Caledon	Strategies, systems and hardware, which have the potential to provide the information decision-makers need during or following an underground coal mine incident, were identified in previous projects. A proof-of-concept software tool was developed to help determine whether mines rescue teams could enter/re-enter a mine. The aim of this extension project was to identify existing and future strategies and hardware which have the potential to protect underground infrastructure such as tube bundle sample lines and data/communication cables which deliver samples and information required in emergency situations.		

2015 PEOPLE AND PROJECTS REPORT

UNDER	JROUND			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	IS and Non Invasive Detection of Pressure in Hydraulic Hoses Underground C21009 Custom Fluidpower Bob Nolan Graeme Vennell Neil Martin Livui Schintee	394,320	Barry Moore, Centennial Coal Keith Cardew, Peabody Energy Australia	In the coal industry the risk of workplace injuries involving fluid under pressure is very high. These incidences often relate to fluid injection and severe body injuries from contact with fluid under pressure. High pressure fluid/oil in hydraulic systems is lethal if a fluid line connection point is opened or hose failure occurs. In the four years preceding commencement of this project there were been 161 fluid injection injury claims lodged across the NSW coal industry. With the support of an earlier ACARP project, Custom Fluidpower developed a prototype device that can inform operators if there is pressure in a hydraulic hose. This project is reworking the device to ensure it is intrinsically safe and suitable for use in underground coal mines.
Current	Reducing Diesel Particulate Matter in Underground Mines by Optimising Design and Operation of Diesel Exhaust Systems C23013 Monash University Daya Dayawansa	275,000	Trevor Hartley, Centennial Coal	Diesel machinery in underground coal mines elevates diesel particulate levels. This project aims to help reduce diesel particulate matter (DPM) levels in Australian underground coal mine environments. This will be achieved by investigating the performance of existing diesel engine systems. The project is investigating improvements that can be made to the overall diesel exhaust system, including the scrubber, filter and other components in order to reduce DPM levels.
Current	Establish 'At Risk' Distance from Hydraulics C24009 University of New South Wales Bill Walsh Gary Nauer	26,908	Occupational Health Task Group	High pressure injection from hydraulic equipment is an occupational risk in the mining industry. This project will determine a measurable 'at risk' distance for workers from hydraulic systems of the three primary fluids used in coal mining at different pressures. Knowing the 'at risk' distance will lead to the use of more effective controls, such as screens and barriers, thereby reducing the exposure to high pressure hydraulics.
Current	Collision Awareness - Capability of Underground Mine Vehicle Proximity Detection Systems C24010 Simtars Andre De Kock	482,300	Jim Sandford, Glencore Brad Lucke, Glencore Peter Nelson, Centennial 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.
Current	Holistic Evaluation of Diesel Exhaust Filters and Related Measuring Instrumentation C24022 Queensland University of Technology Julian Greenwood Zoran Ristovski	247,250	Bharath Belle, Anglo American Peter Brisbane, Bandanna Energy (Administrators Appointed)	Ultra fine (<100 nanometres) particles are not frequently measured in mining related diesel particulate matter (DPM) studies. However, the New South Wales Inspectorate is reviewing all aspects of DPM monitoring and measurement. This project will determine how well current and new types of diesel exhaust filters deal with ultra fine particles. It will also assess the applicability of potential measurement instruments to test filters and equipment in mining conditions.

UNDERGROUND

STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Real Time Wet and Dry Bulb Temperature Monitoring Systems For Use In Underground Mines - Implementation Challenges C24026 CSIRO Manoj Khanal	97,545	Peter Brisbane, Bandanna Energy (Administrators Appointed) Bharath Belle, Anglo American	Accurately measuring dry and wet bulb temperatures at different critical locations in underground coal mines remains a challenge. Without this information it is difficult to manage mine safety issues, such as weakening roadways, change in strata properties, spontaneous combustion, fires and ventilation problems. This project will review the current state of the art real time temperature monitoring systems applicable to underground mines, identify the challenges of using dry and wet bulb temperature monitoring systems, and identify suitable technology to deliver real time wet and dry bulb temperature data. If a suitable system is not commercially available, researchers will report on preliminary investigations into the design of a suitable intrinsically safe certified instrument.
Current	Alternative Electronic Spark Test Apparatus: Phase 3 C24066 University of Queensland Enver Bajram	460,680	Peter Henderson, Glencore Greg Briggs, Centennial Coal	A more consistent and more easily calibrated spark testing device is needed for underground coal mines as a reliable alternative to the spark testing apparatus (STA). This project will develop an electronic spark tester (EST) prototype that extends the functionality of the current STA. Devices being tested for intrinsically safe approval would be connected to the EST in a similar manner to the current STA, however compliance would be tested by measuring the output performance of the device under a controlled set of electronic stimuli. This provides a test result containing a well defined measure of performance relative to the required standard.



UNDER	UNDERGROUND					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Roadway	Development					
Current & New	CM2010 Roadway Development Improvement - Project Support C17010 Patchwork Mining Gary Gibson	1,084,850 Current 148,875 new	Roadway Development Task Group	An industry wide survey conducted by ACARP, Joy Global and Sandvik has identified what is needed to develop an integrated roadway development system for underground coal mines, potential technology gaps and R&D priorities. This project will provide the ongoing resources and project support to enable the Roadway Development Task Group to pursue its Roadway Development 2020 R&D Strategy comprising the development of key enabling technologies, and to support both ACARP's leadership role and its contribution towards development of an integrated roadway development system.		
Current	Polymer Based Alternative to Steel Mesh for Coal Mine Strata Reinforcement and Confinement (ToughSkin) C20041 University of Wollongong Ernest Baafi	1,502,189	Roadway Development Task Group	A prototype ToughSkin product has now been developed that can replace steel mesh for strata reinforcement and confinement in underground coal mines. The product can be remotely applied, thereby eliminating the need for personnel in the immediate face area when used in conjunction with automated bolting systems. In this extension project, ToughSkin will undergo formal regulatory testing, an underground application methodology and parameters will be developed, geotechnical characterisation of the product will be completed and an associated geotechnical design model will be developed.		
Current	Gateroad Development Continuous Haulage System C23017 Premron Mick Whelan	690,000	Roadway Development Task Group	Shuttle cars remain the principal method of coal clearance from behind the continuous miner despite the ageing technology and ongoing inadequacies. The continuous miner cannot mine continuously as it must stop and wait for the next shuttle car which can have a cycle time of up to five minutes. The Premron continuous haulage system uses the Premron enclosed belt system, which has been proven in above ground installations worldwide. This system will be used to remove coal from the face and transport it to the panel belt, thereby removing the need for shuttle cars and providing the Australian coal industry with a safe and continuous coal haulage system. To minimise risk and ensure acceptance by the mining industry, further above ground testing is needed using a simulation of an underground gateroad 'S' bend. The simulation ensures the collection of more accurate data and further performance tests of the trolley tram and conveyor system.		
Current	HiTrack/SEBS Continuous Haulage System C23018 Scott Technology Australia Michael Pietsch Sean Starling	511,055	Roadway Development Task Group	A significant impediment to increasing development metres per operating hour in underground coal mines is the current reliance on shuttle cars as the interface between the continuous miner and the face and panel conveyor. ACARP is funding research into continuous haulage systems. The HiTrack – ICS system was selected as a system worthy of further research. This project addresses some of the key risks that would prevent this system from being used underground.		
New	Review of Roof Support Options for Next Generation Continuous Miners C25003 SCT Operations Winton Gale	43,000	Roadway Development Task Group	To make a significant improvement in development rates, a continuous miner system needs to be able to stabilise the roof as part of the cutting operation. Support of the face area for a machine that has the mobility of a continuous miner is the primary limitation. This project will explore the options to reduce or eliminate this limitation. Researchers will define the range of roof deformation mechanisms and the reinforcement approach required in terms of timing and location about the face; review the sensitivity of alternate roadway shapes on support requirements; and put forward a range of options which may allow decoupling of the face support requirement from the cutting cycles of continuous miners.		
New	Automated Long Tendon Installation System C25068 Conway Engineering Des Conway	184,500	Roadway Development Task Group	Achieving stable roof conditions in underground mines is a safety priority for the Australian coal industry. Cable bolts (long tendons) are one of the mechanisms commonly used to address this challenge. This project will develop a prototype 'Spinning Lobster' (Tornado) cable bolt pusher which will enable long tendons to be fully resin encapsulated thereby removing the need for post grouting. Researchers believe this technology will be the first step towards the development of an automated long tendon installation system.		

UNDER	JNDERGROUND					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
New	Polymer based Alternative to Steel Mesh for Coal Mine Strata Confinement (ToughSkin): Spray Application and Approvals Testing C25074 University of Wollongong Ernest Baafi Warren Mahoney	285,567	Roadway Development Task Group	This project is the next stage of the ToughSkin program in which researchers have been developing an alternative skin confinement system for underground mines. The aim is to develop a material which not only replaces steel mesh but has enhanced strata confinement capabilities and can be remotely applied. This will eliminate the need for personnel in the immediate face area when the confinement system is used in conjunction with automated bolting systems. In this project researchers will complete the development of a three part spray application system which is capable of preparing the large scale 'as applied' sheets for regulatory and geomechanical testing. Surface trials of the spray system will be undertaken as well as large scale laboratory based geomechanical testing to verify the skin confinement capabilities.		
Strata Co	ntrol and Windblasts					
Current	New Testing Procedure for the Assessment of Resin Performance for Improved Encapsulated Roof Bolt Installation C21011 University of Wollongong Najdat Aziz	190,000	Dan Payne, BHP Billiton Coal Anna Mills, Anglo American Rae O'Brien, Glencore Brian Vorster, Glencore Roger Byrnes, South32 Illawarra Coal	In underground coal mining, the resin bond between the rock bolt and the strata is one of the critical elements of roof bolting, yet the Australian coal industry does not have an agreed standard test procedure. This project developed one, enabling comparisons to be made fairly across a growing range of resin products.		
Current	Improving Cavity Prediction on Longwall Faces through a Combination of Reliable Convergence, Canopy Attitude and Leg Pressure Monitoring C21013 Golder Associates Bob Trueman	696,625	Paul Buddery, Anglo American Peter Corbett, Centennial Angus Place Dion Pastars, BMA	Most Australian coal mines now have shield leg pressure monitoring in real time to aid the identification of potential roof control problems. However, there has been a critical load cycle feature missing, which has limited the usefulness of the monitoring. The CSIRO tilt sensor technology will be used at two mines to develop reliable precursors to cavity formation, supplementing those already existing from leg pressure monitoring. The technology will also be used to determine whether cavity prediction in longwall operations can be determined much more accurately from leg pressure, shield convergence data and canopy tilt data combined compared with leg pressure data alone.		
Current	Real Time Seismic Roof Condition Mapping Ahead of Longwall Mining C21020 CSIRO Xun Luo	331,620	Roger Byrnes, South32 Illawarra Coal Peter Corbett,Centennial Angus Place Anna Mills, Anglo American	CSIRO has developed a passive seismic tomographic technology which can use the longwall shearer as the seismic source to image roof conditions – stress and degree of fracturing – ahead of the advancing face. This allows mines to proactively respond to difficult roof conditions. This project used recently developed intrinsically safe geophones to conduct a full scale demonstration for real time monitoring ahead of mining at selected longwall panels. The project will provide the mining industry with an easy to use tool to obtain information, in real time, about the distribution of stress and geological anomalies across a broad area ahead of the longwall face.		
Current	Optimisation of Roof Bolt Length Based on Improved Resin Performance C21023 Mine Advice Russell Frith	200,000	Gavin Lowing, Peabody Energy Australia Rae O'Brien, Glencore Dan Payne, BHP Billiton Coal	New roof bolt resins developed in the United States are being introduced into the Australian coal industry. This project evaluated the resins then demonstrated the potential for reducing roof bolt length without affecting geotechnical risk. Unlike the less viscous Australian resins, the US resins do not appear to suffer from mixing problems in the upper 300 millimetres to 600 millimetres of a roof bolt.		

UNDER	JNDERGROUND					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Current	Practitioners Handbook on Managing Geotechnical Risk in Underground Coal Mining C22004 Galvin and Associates Jim Galvin	369,000	Anna Mills, Anglo American Dan Payne, BHP Billiton Coal Paul O'Grady, Glencore	This project is a continuation of project C14014 to develop a textbook in 2 volumes to assist coal operators in developing their strata management plans and bring together a reference document to support those responsible for strata management. The project is partially supported by the Minerals Council of Australia.		
Current	Roadway Roof Support Design using the Geophysics Strata Rating C22008 PDR Engineers Terry Medhurst	152,000	Anna Mills, Anglo American Gavin Lowing, Peabody Energy Australia Roger Byrnes, South32 Illawarra Coal Ismet Canbulat, UNSW	Roof falls still occur in underground coal mines and are the result of a complex interaction between roof characteristics, support type and installation, stress and geometry. Wider spans, weak roof and stress are key issues. In this project, existing roof monitoring data and a geophysics based model of strata conditions will be analysed to assess roadway roof design. An analytical model was developed to quantify stress related impacts and strain/displacement.		
Current	Optimising the Selection of Fully Grouted Cablebolts in Varying Geotechnical Environments C22010 University of New South Wales Paul Hagan	150,000	Peter Corbett, Centennial Angus Place Dan Payne, BHP Billiton Coal Paul O'Grady, Glencore Brian McCowan, Glencore	Increasingly cable bolts are being relied upon to maintain the integrity of roof strata and provide a safe work environment in difficult mining conditions. However the mechanisms by which cable bolts interact with roof strata to provide support is not widely known. This project established an Australian axial and shear pull testing standard for fully grouted cable bolts. The impact of the different components in the cable bolting system on load transfer can be determined by studying the effect of cable geometry, grout strength, grout stiffness, grout additives, rock strength, hole size and hole profile on anchorage performance. The performance of the two main types of cable bolts being used in the industry was assessed in situ.		
Current	Definition of Coal Mine Roof Failure Mechanisms C23008 SCT Operations Winton Gale	430,000	Brian McCowan, Glencore Roger Byrnes, South32 Illawarra Coal	The stability of coal mine roadways is dependent on the mechanism of failure of the roof strata and the reinforcement system used. Roof instability and falls of ground can occur if the reinforcement system is inappropriate for the actual mechanism of roof failure. In this project an existing database of coal mine roof failures will be extended to include a wider range of mining environments so that the reinforcement systems can be implemented with greater understanding of the roof deformation mechanisms. State of the art monitoring equipment and analysis methods will be used to assess roadway stability and deformation mechanics.		
Current & New	Shear Testing of the Major Australian Cable Types under Different Pretension Loads C24012 University of Wollongong Najdat Aziz	250,000 Current 139,600 New	Stephen Schaller, Rio Tinto Brian McCowan, Glencore Roger Byrnes, South32 Illawarra Coal	Australia has the largest number of different high capacity, pretensioned, post grouted cable bolts in the world. This project will shear test major cable types under different pretension loads. A megabolt single shear apparatus will be used to determine the cable shear strength values and to determine the debonded and/or decoupled cable length during shearing. Optical fibre technology, the Fiber Bragg Grating sensing system, will be used to delineate the cable debonding length.		
Current	Convergence Based Roof Support Design C24015 PDR Engineers Terry Medhurst	196,000	Anna Mills, Anglo American Gavin Lowing, Peabody Energy Australia Roger Byrnes, South32 Illawarra Coal Brian Vorster, Glencore	Mining at increasing depths of cover in weaker and more variable strata conditions and greater emphasis on optimisation of mining practice is driving the need for improvements in roof support design. The ability to identify specific factors affecting roof support performance can be limited. Several investigations at Bowen Basin mines have demonstrated the capabilities of a newly developed analytical model to quantify the relationship between support practice and roof convergence. This project aims to extend the approach to a more general framework and design methodology applicable to all underground mines.		

UNDER	UNDERGROUND					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Current	Cable Bolt Performance Under Axial Loading and Subject to Varying Geotechnical Conditions C24018	117,823	Peter Corbett, Centennial Angus Place Paul O'Grady, Glencore	The wide variety of performance levels across the cable bolt design spectrum makes it difficult to select the most appropriate design for specific underground environments. This project will provide definitive performance characteristics of the five major types of cable bolt design under different ground conditions – including stiffness, peak load and post peak load capacity – so the design of underground support systems can be optimized.		
	University of New South Wales Paul Hagan		Brian McCowan, Glencore	underground support systems can be optimised.		
Current	Assessment of Longwall Mining Induced Connective Fracturing of Overburden Strata C24020 CSIRO Deepak Adhikary	297,343	Dan Payne, BHP Billiton Coal Peter Corbett, Centennial Angus Place Richard Porteous, Glencore Ben Duthie, BMA	The height of connective fracturing and complete water drainage above mined longwall panels are not well understood and are strongly contested topics among industry professionals. This project will quantify the extent of connective fracturing above these panels – one of the most important parameters required to assess mining impact on groundwater. It will also expand scientific understanding of the strata caving mechanics during longwall mining and quantify the height of complete groundwater drainage above longwall panels.		
New	Review of Australian and International Coal Burst Experience and Control Technologies: Scoping Study and Stage 1 C25004	404,000	Bharath Belle, Anglo American Brad Elvy, South32 Illawarra Coal Roger Byrnes, South32 Illawarra Coal Brian McCowan, Glencore	One of the most difficult, longstanding engineering problems associated with coal mining is the catastrophic and dynamic failure of coal mine structures known as bursts. Limited work has been conducted on coal bursts in Australia. This project will develop preliminary coal burst risk identification and control guidelines for Australian underground coal mines through a review and evaluation of international coal burst experiences and technologies.		
	University of New South Wales Ismet Canbulat					
New	Review of Rib Failure Mechanisms and Performance of Rib Support C25057 SCT Operations Yvette Heritage	186,500	Paul Buddery, Anglo American Roger Byrnes, South32 Illawarra Coal Brian McCowan, Glencore	Rib failure is an ongoing occurrence in underground coal mines which has safety and longwall retreat reliability implications. Recent fatalities in underground coal mines have involved incidents of rib failure. Researchers will assess the effectiveness of current industry rib support patterns with regards to the nature of yielding through field measurement and modelling. The mechanics of rib deformation over the life of the mine will be investigated and effective support identified to control the different mechanisms of rib deformation in order to prevent rib failure.		
New	Intrinsically Safe, Integrated Wireless Communications Network with a Distributed Array of Geotechnical Sensors C25059 SCT Operations	339,787	Brian Vorster, Glencore Peter Corbett, Centennial Angus Place	The ability to measure ground response provides the basis for managing strata control hazards in underground coal mines. Historically the application of hard wired automatic roof deformation monitoring has been used at various mine sites with differing levels of success. This project will develop a wireless enabled strata monitoring system to interface with the intrinsically safe Holville roof Alert communications and power backbone. This will provide a rapid, robust and cost effective solution to implementing a distributed array of wireless enabled strata monitoring cost mines.		
	Stuart MacGregor					
New	Borehole Shear Monitoring Device for Routine Application in Roadways C25060 SCT Operations	149,863	Brian Vorster, Glencore Brian McCowan, Glencore Peter Corbett, Centennial Angus Place	Traditionally inclinometers and shear strips have been used to evaluate shear along discrete interfaces in underground roadways. However probe type inclinometers and grouted casings are not suited to routine underground coal mine roadway applications. This project will develop a cost effective, intrinsically safe, routine, shear monitoring instrument for deployment in ungrouted boreholes based on MEMS tiltmeter sensors. An intrinsically safe, handheld readout unit for MEMS based tiltmeters will also be developed to integrate with TARP based implementation.		
	Stuart MacGregor		Roger Byrnes, South32 Illawarra Coal			

UNDER	UNDERGROUND					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
New	Roadway Stability Monitoring System C25062 CSIRO Chad Hargrave	189,435	Jim Sandford, Glencore Paul Buddery, Anglo American Brian McCowan, Glencore	Structural failure of underground mine gateroads is a major safety and productivity issue in the mining industry. Roadway roof falls and rib collapses are very difficult to predict and can be extremely hazardous. This project will develop and trial a new, radar based, sensor technology for gateroad convergence monitoring. The proposed system will scan the underground roadway structure and localise key features such as roof/rib bolts, faults, guttering and other critical support or geological structures. Information regarding the relative movement of these critical structures can then be overlaid onto a location map.		
Ventilati	on, Gas Drainage and Monitoring					
Current	Information Dissemination for the Management of Spontaneous Combustion C18013 University of Queensland Darren Brady David Cliff	109,000	John Grieves, Caledon	Following the Moura No 2 mine disaster in 1994 ACARP funded the development of educational resources to improve the understanding of the management of spontaneous combustion. These resources included the "green" – Spontaneous Combustion in Australian Underground Coal Mines, "red" – Spontaneous Combustion in Australian Underground Coal Mines, "red" – Spontaneous Combustion in Australian Underground Coal Mines, A handbook for Mine Workers, and "blue" books – Spontaneous Combustion in Australian Underground Coal Mines – A handbook for Mine Workers, and "blue" books – Spontaneous Combustion in Australian Underground Coal Mines – A manual for Mine Personnel. Since the time these resources were developed much has changed, including legislation, and there have been many advances in research. The way spontaneous combustion is managed has also developed significantly. This project overhauled these documents as well as provide other mechanisms such as web based information packages to encourage best practice spontaneous combustion management.		
Current	Development of an Alternative Electronic Spark Test Apparatus C20006 Bart Pienaar Paul Lever Scott Adam	997,557	Greg Briggs, Centennial Coal Peter Henderson, Glencore	Two projects using a spark test apparatus (STA) to check intrinsically safe (IS) electrical circuits have found that the STA is unreliable and unrepeatable. This project took the experimental design and research prototype developed in a previous project to a pre-commercial prototype. An improved electronic spark tester (incorporating the latest spark model) and several reference power supplies were developed and manufactured, and the operational performance of the tester was validated.		
Current	Controlling Heatings and Gas Leakage Using Innovative Polymer Gel - Pilot Plant Scale Testing C20039 CSIRO Sheng Xue	226,100	Ken Lewthwaite, Anglo American Peter Brisbane, Bandanna Energy (Administrators Appointed)	Heatings and gas leakage are two of the major safety issues in coal mines. If not managed they can result in production delays and ultimately mine explosions. Unfortunately slurries and foams used to limit gas flow are of limited effectiveness and inertisation is only applicable in the early stages of a heating. Polymer gels are know to be more effective in this environment and were further developed through this project. This project lead to a commercial application of the polymer gels, their preparation and delivery systems in the Australian coal industry. The gels should lead to enhanced mine safety and improvement in the technique for timely and rapid intervention to spontaneous combustion, excessive gas leakage and explosions. This project built upon a substantial body of work undertaken by CSIRO in spontaneous combustion and gas control.		
Current	Development of Guidelines for the Measurement and Reporting of Fugitive Emissions from Underground Coal Mines C21002 PacificMGM Dennis Black	60,480	Jim Sandford, Glencore	Accurately measuring fugitive emissions from operating Australian underground coal mines has been problematic. A documented set of guidelines has been developed for mine personnel to use when establishing systems to measure and record fugitive emissions. The guidelines provide a methodology for establishing fugitive emission measurement standards that satisfy the requirements of the National Greenhouse Energy Reporting System. In particular, the guidelines address the measurement of gas emissions from ventilation shafts, gas drainage systems and fugitive emission reduction processes such as flaring and power generation.		
Current	Improved Efficiency of Gas Capture From Boreholes Under Active Longwall Panels C23009 SCT Operations Winton Gale	380,000	David Webb, Glencore Brad Elvy, South32 Illawarra Coal	The effectiveness of gas drainage boreholes during longwall operations is essential to the productivity and viability of underground coal mines. Downholes are used to intersect gas migration from the coal seams below the seam prior to it reporting to the goaf and face area. This requires an understanding of the fracture permeability, stress redistributions, gas sources, the fracture connectivity to the goaf or boreholes, and borehole stability. The aim of this project is to determine the permeability of the fracture zones, the stability of the boreholes, the flow networks established and the gas pressures at various depths in the interburden between the goaf and the lower seam/s. This information is essential to develop better systems of gas capture.		

UNDER	UNDERGROUND					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Current	Outburst Risk Determination - Data Review and Analysis Component C23014 Sigra lan Gray Jeff Wood	261,185	Russell Thomas, South32 Illawarra Coal Bharath Belle, Anglo American Andrew Lewis, Glencore	The objectives of this project were to provide the Australian coal industry with new guidelines for determining outburst risk by using an energy approach. The intention was to provide parameters additional to the conventional gas content and gas composition measurements to allow a more informed appraisal of the real risk of outbursting in particular scenarios. A review of Australian and international outburst experience was undertaken to determine key outburst related parameters. These critical parameters were applied to determine energy release mechanisms and a methodology was developed to apply a range of measurements to the outburst risk management process.		
Current	High Speed In-Seam Drilling System for Effective Gas Drainage C24008 University of Queensland Joel Kok Scott Adam	216,000	Peter Brisbane, Bandanna Energy (Administrators Appointed) Jim Sandford, Glencore Brad Elvy, South32 Illawarra Coal Peter Corbett, Centennial Angus Place	CRCMining's waterjet high speed drilling technology could revolutionise underground in seam drilling. The waterjet's rapid and continuous drilling eliminates the manual handling hazards associated with conventional drilling and increases drilling productivity by 100%. This two phase project will address the technical risks through a program of targeted laboratory based work followed by a field validation trial at Wambo underground mine.		
Current	Field Trials of Nitrogen Injection into UIS Directional Boreholes to Enhance Gas Drainage in Low Permeable Seams C24019 University of Wollongong Frank Hungerford Ting Ren	336,152	Brad Elvy, South32 Illawarra Coal Bharath Belle, Anglo American	Pre gas drainage using inseam boreholes has played a critical role in reducing high insitu gas content below threshold limits thereby allowing normal mining activities to be undertaken safely. However reducing gas content below these levels within a given drainage lead time has been challenging. This project will field prove the concept of using enhanced gas drainage by nitrogen injection into underground inseam boreholes in coal mines extracting gassy and low permeable seams. Researchers will identify the most suitable environment for this technology and associated design parameters, and will develop the operating procedures.		
Current	Drilling for Outburst Risk Determination C24024 Sigra Ian Gray	380,500	Russell Thomas, South32 Illawarra Coal Bharath Belle, Anglo American Andrew Lewis, Glencore	Although gas drainage and other management techniques have reduced the incidence of gas outbursts in Australian underground coal mines, the physical impacts of particle injection and the noxious gases produced, make them extremely hazardous. This project will use underground drilling trials to retrieve coal cuttings at high speeds. The cuttings will be desorbed and a subsample crushed to yield the residual gas content. This process will provide information on the gas content, diffusion coefficient and particle size characteristics of coal samples and the volume of coal produced compared with the volume of the hole nominally cut. These measurements will then be used in conjunction with the sorption isotherm to determine outburst risk.		
New	Ventilation and Gas Management - Underground Coal Mines C25001 Bruce Robertson Andrew Self	100,000	Bharath Belle, Anglo American John Grieves, Caledon Jim Sandford, Glencore Peter Brisbane, Bandanna Energy (Administrators Appointed)	While Australian coal mine ventilation practice is world class and has improved significantly over the past few decades, the residual risks to mineworkers and assets are not as low as they could be. This project will review current ventilation and gas management practices to identify gaps and shortcomings and propose a range of initiatives for the industry to bolster capability and reduce ventilation risk. This will be achieved through analysis of current practice by reviewing recent publications and consulting with industry representatives.		

UNDERGROUND

STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
New	Specific Gas Emission Patterns from Different Coal Seams C25065 CSIRO Rao Balusu	277,340	Jim Sandford, Glencore John Grieves, Caledon Bharath Belle, Anglo American	Most of the current specific gas emission prediction methods used in Australia are based on European empirical methods with a number of input assumptions. For longwall emission predictions, the issue is to estimate the volume of gas that will be released from different roof and floor seams during the production phase as distinct from that released after sealing. This project will characterise goaf gas emissions patterns from different coal seams and develop appropriate gas emission prediction models for Australian mining conditions.
New	Gas Management and Risk Mitigation Strategies for Longwalls C25066 CSIRO Rao Balusu	289,000	Jim Sandford, Glencore John Grieves, Caledon Bharath Belle, Anglo American	Gas is one of the critical factors that will constrain production in highly gassy longwall mines. To achieve high production rates in highly gassy mines, a step change in the ventilation and gas management systems and strategies is needed. This project will develop optimum goaf gas management and risk mitigation strategies for highly gassy longwall mines in order to achieve benchmark production rates.
New	New Approaches to Mine Gas Analysis and Ratios C25072 Simtars Fiona Clarkson	103,689	John Grieves, Caledon Mick Kelly, BMA Bharath Belle, Anglo American	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.
General				
New	Can Multi-Source Long Wall Data be Used Cost Effectively to Identify Commercially Significant Operational Improvements? C25055 Luscan Capital Jamie Hodgkinson	120,000	Steve Amor, Anglo American Bharath Belle, Anglo American Brad Lucke, Glencore Peter Corbett, Centennial Angus Place Jim Sandford, Glencore	Mining operations collect large volumes of longwall data but often lack the bandwidth to systematically drive operational improvements from such data. Valuable production data is collected and stored in isolated functional systems that are not conducive to cross system data analysis and decision making. Multi source operational, geospatial and time stamped data is large in volume, time consuming to analyse and difficult for subject matter experts to use efficiently. This project will explore the question: Can multi source longwall data be used cost effectively to identify commercially significant operational improvements? A candidate list of five production scenarios with complex data sets has been identified – hazard events, mine planning, longwall top coal caving, precision cutting on longwalls, and vehicle operator fatigue in open cut mining fleets.

OPEN CUT PROJECTS

Safety, productivity and the right to operate are concerns that will continue to direct research in the open cut area. Each seems to grow in importance as the broader community and mine owners' expectations increase. Mines must achieve zero fatalities and ongoing reductions in lost time injuries if they are to continue to enjoy a right to operate.

Given the large areas impacted upon by open cut mines, it is critical that research addresses the science of rehabilitation and the minimisation of mining impacts on neighbouring communities. This priority area will continue to consume a significant component of the open cut research budget. The management of water remains a significant component of this work.

COMMITTEE MEMBERS

Tony Egan	Manager, Project Governance, Coal Assets Australia (Co-Chair)	Glencore
Don McNeil	Principal Advisor - Mine Operations Improvement, Coal Australia (Co-Chair)	Rio Tinto
Chris Agosto	EME Procurement Superintendent	Mt Arthur Coal
Steve Amor	Principal Technology Open Forum - Sustainability	Anglo American
Tim Baitch	Principal Mining Engineer	Anglo American
Shaun Booth	Resource Development	Glencore
Keith Cardew	Principal Maintenance Engineer	Peabody Energy Australia
Shaun Cleary	Projects Manager	Cobbora Holding Company
Brett Domrow	Chief Mining Engineer	New Hope Group
David Drew	Senior Mining Engineer	Wesfarmers Curragh
Jason Fittler	Environment Manager	Anglo American
Lindsay Ford	Project Manager	Glencore
David Goodale	Open Cut Asset Management Manager – Australia & Canada	Anglo American
Ross Gooley	Environmental Superintendent	Sojitz Minerva Mining
Tim Gray	Engineering Manager - Surface Operations	Glencore
Win Klass	Senior Mining Engineer - OC Development & Business Improvement	Glencore
Andrew Lau	Regional Technical Services Manager, Open Cut Operations Eastern Region	Yancoal Australia
Brian Neilsen	Director - Strategic Mine Planning	Peabody Energy Australia
Troy O'Reilly	Risk & Compliance Advisor, Mining Operations	Stanwell Corporation
Simon Orton	Manager Analysis & Improvement Integrated Operations	BMA
Carl Pritchard	General Manager Technical Services	Jellinbah Group

Stuart Ritchie	Manager - Environmentt, Coal Australia	Rio Tinto
Richard Ruddock	Resource Geology Manager, Coal Australia	Rio Tinto
Patrick Tyrrell	Geology Manager & SSE Resource Development	New Hope Group
Kane Usher	Innovation Lead, Productivity Division, Coal Australia	Rio Tinto
Liam Wilson	Manager Health & Safety	Rio Tinto Coal Australia

FUNDING APPROVED 2015

	No of Projects	ACARP Funding	Total Funding
2015	19	\$5,511,863	\$7,205,094
2014	18	\$4,269,996	\$15,968,495
2013	18	\$4,320,731	\$7,634,739

CATEGORY	No of Projects	ACARP Funding
Major Projects	1	\$4,229,733
Drilling and Blasting	3	\$1,066,874
Environment	26	\$6,666,481
Geology	9	\$2,785,585
Maintenance and Equipment	5	\$6,262,440
Mining and the Community	1	\$153,000
Occupational Health and Equipment Safety	7	\$1,363,097
Overburden Removal	4	\$1,596,883



OPEN Cl	OPEN CUT					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Major Pro	jects					
Current	RISKGATE C20003 University of Queensland Philipp Kirsch	4,229,733	Tony Egan, Glencore	An interactive online risk management system developed by MISHC using industry expertise is being used by coal industry personnel to understand and control selected major incidents. RISKGATE has 18 modules (tasks) including Fitness for Work which was completed in 2014. In this extension project, the RISKGATE team will comprehensively review all modules (cross-reference between modules, ensure consistent language and approach to issues), revise modules in response to user feedback, and convert the collision module into a vehicle interaction module.		
Drilling a	nd Blasting					
Current	RAB Drill Rig Top of Coal Detection While Drilling C21005	459,340	Vishwa Bhushan, Rio Tinto Coal Australia	Accurately detecting the top of a coal seam before blasting is integral to efficient coal recovery. Currently coal is mapped using geophysical methods from an exploration drill rig ahead of mining which is expensive and resource intensive. A prototype measurement while drilling system is being constructed that can search for and detect the presence of the coal sear while		
	CRCMining Scott Adam		Kirk Henderson, Peabody Energy Australia	routinely drilling blast holes. This project fully characterised the prototype and will test its performance in the field.		
Current	Improved Blast Outcomes by Integrating Structural and Blast Modelling C23028	255,007	Vishwa Bhushan, Rio Tinto Coal Australia Steve Simmons, Anglo American	The performance and safety of drill and blast operations could be improved if this project to produce a prototype software tool is successful. The objective of this project is to produce improved blast induced fragmentation through better blast design, based on more accurate representation of rock mass structures in blast analysis software and improved prediction and management of		
	University of Queensland		David Drew, Wesfarmers Curragh blast related hazards, such as face	blast related hazards, such as face bursts.		
	Marc Elmouttie					
	Sarma Kanchibotla					
Current	Alternative and Sustainable Explosive Formulations to Eliminate Nitrogen Oxide Emissions C23029	352,527	27 Vishwa Bhushan, Rio Tinto Coal Australia Steve Simmons, Anglo American 28 Government directives to stop blasting activities due to nitrogen oxide (NOx) fume production. This project developed and evaluated the detonation performance of higher levels of control against the NOx fume hazard. This included an improved f	Government directives to stop blasting activities due to nitrogen oxide (NOx) fume incidents have led to costly delays in production. This project developed and evaluated the detonation performance of explosive formulations that could provide higher levels of control against the NOx fume hazard. This included an improved formulation that adequately matches the		
	University of Queensland Italo Onederra		David Drew, Wesfarmers Curragh	ammonium nitrate as the main oxidising agent in order to completely eliminate the potential of NOx by products.		
New	Alternative and Sustainable Explosive Formulations to Eliminate Nitrogen Oxide Emissions: Stage 2 C25005	297,199	Chris Bartley, New Hope Group Travis Zolnikov, Glencore Steve Simmons, Anglo American	This project will extend the research program to continue with both the further development of HP mixtures and the potential development of Hybrid HP/AN explosive products, as recommended by the monitors from project C23029 .		
	University of Queensland Italo Onederra		Vishwa Bhushan, Rio Tinto Coal Australia			
			David Diew, wesianners Cullayn			

OPEN Cl	OPEN CUT					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Environm	nent					
Current	Guidelines for Establishing Ecologically Sustainable Discharge Criteria in Seasonally Flowing Streams C19024	238,000	Claire Cote, Anglo American Stuart Ritchie, Rio Tinto	Recent reports have highlighted the lack of appropriate data and analysis in assessing local and cumulative impacts of saline mine site discharges on the aquatic environment in the Bowen Bain. This project improved the understanding of the impact saline water discharged from mine sites has on seasonally flowing streams and their ecosystem function. In particular it focussed		
	University of Queensland Sue Vink			on the processes that control the movement of saits in these streams and assessed the impacts of saits on the fundamental ecological processes driving ecosystem function.		
Current	Current Soil Organic Matter and Green Carbon in 253,200 Rehabilitation: Their Role in the Carbon Balance C19029	253,200	Craig Lockhart, Peabody Energy Australia Bernie Kirsch, Centennial Coal	Successful rehabilitation is commonly associated with the successful establishment of vegetation. One way to compare vegetation is through the accumulation and storage of plant carbon, recently referred to as green carbon. Decomposition of organic matter originating from green carbon will add to organic carbon stored in soils and is a key parameter for soil formation. Decomposed organic carbon is incorporated and accumulated in the soil over space and time as soil organic matter (SOM). This		
Un Tho	University of Queensland Thomas Baumgartl			project quantified the rate of accumulation of SOM on rehabilitated sites over time and the contribution of different types of vegetation and land management on increasing SOM in soils.		
Current	Sustainable Management of Plantations for Rehabilitation, Carbon and Wood Products C20015	187,068	187,068 John Hindmarsh, Rix's Creek Bill Baxter, Rio Tinto Coal Australia	Since 1999 a number of replicated research trials have been established on mine lands in the Hunter Valley, to assess the viability of tree plantations as a post mining land use and to assess the economic and environmental benefits of buffer land planting. This project will quantify the benefits of early thinning (year 10) and maximise the long term survival and health of these trials. It will also provide data mid rotation (15 years), at which stage final growth projections are much more reliable. The growth data will allow longer term yields to be estimated, ensuring that mines have a sound basis upon which to make decisions on species, location and management of future stands.		
	Industry & Investment NSW Georgina Kelly					
Current	Hydraulic Connectivity Between Mines and Adjacent River and Groundwater Systems in the Hunter River Valley C20022	377,810	377,810	10 John Watson, Glencore Andrew Speechly, Rio Tinto Coal Australia	This project will improve the understanding of the hydraulic connectivity between mines and adjacent river and groundwat systems in the Hunter River Valley and other Australian coal mining regions. It will also develop a set of criteria for assessin the mining impact on the rivers and aquifers. The work will combine mathematical modelling and field measurements of k hydrogeological and hydraulic parameters within the study area. A mathematical model is being developed to simulate the	
	University of Queensland Detlef Bringemeier Ling Li			interactions between the mines and adjacent aquifer systems.		
Current	Assessing Environmental Safety of In-pit Disposal of Tailings C20027	268,600	Craig Lockhart, Peabody Energy Australia	Disposal of tailings into voids is considered beneficial due to the reduction of environmental risk compared to above ground storage. The successful use of voids for tailings requires guaranteed environmental safety. Concerns raised by in pit tailings disposed regional ground water and sufferent environmental safety.		
	University of Queensland Thomas Baumgartl			disposal relate primarily to the risk to local or regional ground water and surface water contamination and within the tailings to salt transport to the surface and its risk of mobilisation by runoff and dust. This project investigated the long term environmentar risk caused by in pit tailings disposal by simulating the hydrological and geochemical behaviour of in pit tailings for a number of different settings.		

OPEN CI	JPEN CUT					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Current	Tool to Assess Mining Impacts on River Condition C21031 Central Queensland University Claire Sellens	325,945	Craig Lockhart, Peabody Energy Australia Stuart Ritchie, Rio Tinto	The management of mining impacts on rivers and other aquatic ecosystems at a local and regional level is a key priority for the coal industry. The industry needs to be able to accurately monitor and assess its onsite and downstream impacts on water quality. Existing guidelines and predictive models for river health are not suitable for assessing mine site impacts because they are typically determined from steady state conditions. This project is developing a region specific tool for assessing the condition of temporary streams on Central Queensland mines. Changes to the macroinvertebrate communities during the wet and dry cycles are being examined to determine the effect of change on aquatic health assessments, a predictive modelling tool for assessing river health is being developed, and the feasibility of alternative approaches to assessing the health of streams is being explored.		
Current	Physical and Detonation Characteristics of Bulk Explosives to Minimise Post Blast Fume Generation in Deep Hole, Soft Ground and Wet Conditions C21036 JKTech Sarma Kanchibotla	400,000	Steve Simmons, Anglo American Vishwa Bhushan, Rio Tinto Coal Australia Lindsay Ford, Glencore	Post blast fumes (NOx) from coal overburden blasting remain an industry concern. The generation of blast fumes is not well understood as many factors contribute to this process. There is however agreement that the conditions leading to NOx fumes are associated with fuel deficiencies or incomplete detonation of the explosive product. This project supplemented the current developments of project C20016 and used the instrumentation developed in this project to determine the physical and detonation characteristics of bulk explosives and its impact on fumes generation through field measurements.		
Current	Real Time Monitoring and Prediction of Open Cut Blast Fumes C22025 CSIRO Darren Moore	356,880	Steve Simmons, Anglo American Paul Veivers, Stanwell Corporation	Toxic fumes can be produced through the use of ammonium nitrate fuel oil (ANFO) explosives for blasting in open cut coal mining operations. Knowledge of the behaviour of a blast plume is vital to the optimal management of a fume event. The aim of this project was to develop and demonstrate a system to better monitor and predict blast fume concentrations in open cut coal coal mines. Current fume and weather measurements and up to date plume predictions will be made available to mine operators in real time via a map based iPhone app and web interface.		
Current	Managing Dig: Ensuring Currency in an Invaluable Resource C22026 University of Queensland Andrew Fletcher	137,520	Ann Perkins, Rio Tinto Coal Australia	The Dig coal mine rehabilitation bibliograhic database was developed to provide industry, government, researchers and other interested parties with reference information relevant to the rehabilitation of land after coal mining. In order to enable ongoing use and to maximise its value, continual updating, maintenance and improvements are necessary. This project will further improve the technology, features, searchability and provision of knowledge in the database, with ongoing emphasis on the uploading of new material and general maintenance.		
Current	Australian Specific Dust Emission Factors for Coal Mines C22027 Pacific Environment Operations Damon Roddis Judith Cox	413,292	John Watson, Glencore	Understanding the level of emissions from dust generating activities (and the level of control that can be achieved) is critically important at the environmental assessment stage of a mine and for operational purposes. The ability to more accurately assess air quality impacts is particularly relevant to the Hunter Valley as annual average concentrations of PM10 are approaching the assessment criterion set by regulators. As a result there are parts of the Hunter Valley where even minor increments in PM10 concentrations of a few micrograms per cubic metre of air can result in the assessment criterion being exceeded. This project updated the emission factors used to estimate dust emissions from coal mines.		
Current	Salinity Tolerance of Freshwater Organisms from the Southern and Western Coalfields C23010 University of Queensland Sue Vink	177,000	Bernie Kirsch, Centennial Coal Gary Brassington, South32 Illawarra Coal	Mine water releases are regulated by salinity (measured as electrical conductivity), pH and concentration limits for a number of other constituents, including heavy metals. Local guidelines should be developed from tests conducted using locally collected organisms and tests solutions that have a composition similar to natural stream waters. The overall objective of this work is to produce toxicity datasets for the Southern and Western coalfields in New South Wales that can be used to develop local salinity guidelines. The work is being conducted using field caught and laboratory reared organisms tested with artificial mine water solutions diluted with artificial creek waters. This method will remove the confounding effects of other constituents that may be toxic and present in mine water solutions.		

STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Stygofauna in Australian Groundwater Systems: Extent of Knowledge C23019 CSIRO Olga Barron	49,800	Bernie Kirsch, Centennial Coal	An alternative to Mecca style drill rods is needed for underground in seam drilling. Not only would the development of a high speed, compliant, wireless communication technology provide an alternate communication system for underground in seam drilling that would enable a wider range of enhanced geological surveying technologies to be used, but it would provide improved safety and would significantly reduce operating capital costs. Building on earlier research, this project is developing the concept into a high performance prototype. As part of this work, preliminary assessments for regulatory compliance will be conducted, the prototype will be demonstrated in an underground in seam borehole at depths of 600 metres, and a business case and commercialisation strategy will be developed.
Current	Quantification of PM2.5 Particulate Emission Rates from Mining Operations C23021 Air Noise Environment Claire Richardson	277,359	John Watson, Glencore Jason Fittler, Anglo American	The control of dust has been a fundamental part of mine environmental management plans for many decades. This extension project built on previous work that confirmed the validity of a PM2.5 dust fraction sampling methodology and developed an initial database of PM2.5 emission rates. This project determined reliable particulate emission rates for the PM2.5 dust fraction for a range of coal mining activities. The initial dataset was extended by completing additional field work.
Current	Coal Pit Lake Closure by River Flow Through: Risks and Opportunities C23025 Edith Cowan University Mark Lund	362,714	Scott Diggles, Rio Tinto Coal Australia Colm Harkin, Premier Coal	Many Australian coal mines have pit lakes that will increase in salinity over time due to evapo concentration. Increased catchments and river diversions may offer opportunities for these saline pit lakes to reduce or maintain their salinities. One way of substantially increasing the pit lake's catchment is to connect the lake to a river or stream. This scenario was field demonstrated at Lake Kepwari, where benefits to biodiversity and water quality as a result of a river breach were noted. In addition to assessing the environmental impacts of this process, the project is developing a national standard protocol for monitoring seasonal rivers that could be applied by the coal industry to manage river flow throughs (either accidental or planned), as part of a mine closure strategy.
Current	Reducing Analytical and Water Quality Monitoring Costs Using Diffusive Gradients in Thin Film Technique C23027 University of Queensland Sue Vink	163,000	Claire Cote, Anglo American John Merritt, Burton	Environmental authorities of Bowen Basin mines require considerable investment in manual water sampling and analysis for dissolved heavy metals and arsenic. Water sampling for analysis of metal and metalloid concentrations is required upstream and downstream of the mine during water releases. This project is evaluating a new time integrated approach to assessing water quality in the Fitzroy catchment. The novel in situ sampling technique – diffusive gradients in thin (DGT) films – could potentially replace numerous water samples and will provide a far more representative view of in steam concentrations over the deployment period.
Current	Collaborative Performance Trajectories for Diversion Licence Relinquishment C23030 Alluvium Consulting Australia Rohan Lucas	204,470	Claire Cote, Anglo American John Merritt, Burton Scott Diggles, Rio Tinto Coal Australia	Currently there are no clear river/creek diversion criteria that enable the mining industry, regulators and stakeholders to track diversion conditions and understand the measures required to achieve licence relinquishment. Researchers are working with the mining industry and the Queensland Department of Natural Resources and Mines to develop a process and terms of reference for stakeholder involvement in diversion licence relinquishment, to establish physical form and vegetation criteria, and trial a combined social and scientific approach to defining and assessing outcomes for diversions at licence relinquishment.
Current	Pilot Scale Integrated Forward and Reverse Osmosis System for Mine Water Reuse C23031 CSIRO Ramesh Thiruvenkatachari	258,237	John Watson, Glencore Claire Cote, Anglo American	This project offers the coal industry a novel, cost effective desalination technology that produces higher water recovery and reduction in mine site brine storage volumes. A laboratory scale, osmotically driven process (the driving force for water transfer across a membrane is osmotic instead of hydraulic pressure) has been integrated with a reverse osmosis unit to treat mine affected water, producing a steady stream of reusable quality water, thereby eliminating extensive pre treatment steps that are generally required for reverse osmosis. This project is developing a pilot scale, integrated treatment system that can process 1m3 of water per day and will complete a preliminary technical and economic assessment of the technology.

STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Real Time Mine Specific Upper Air Data For Use In The Management of Mine Noise, Dust, Blast Fume and Overpressure C23032	165,160	John Watson, Glencore Andrew Speechly, Rio Tinto Coal Australia	Real time, upper air data is needed at coal mines because standard onsite weather stations cannot provide the necessary data on upper air weather conditions which affect the transport of emissions or the propagation of noise from mine sites. Useful real time and predictive systems cannot be developed without such data. This project verifying whether upper air data soundings in a central location can be used to provide accurate, real time upper air weather data specific to each mine in a region. If so, a framework will be provided to roll out cost effective, real time and predictive systems in any region.
	Aleks Todoroski			
Current	Study of Sustainability and Profitability of Grazing on Mine Rehabilitated Land in the Upper Hunter C23053	200,000	Nigel Charnock, Glencore Bill Baxter, Rio Tinto Coal Australia	The grazing capacity of rehabilitated pastures is not yet fully known and, in many cases, results and grazing benefits have not been fully documented. This project is addressing the community concerns through a grazing study on two mine sites in the Upper Hunter Valley. The mines are providing two areas which have been mined and rehabilitated and two analogue (native)
	NSW Department of Primary Industries Lester McCormick Neil Griffiths			pasture sites. The four sites will be fenced to allow grazing by four herds of weaner steers (10 head per site). The data collected will be used to analyse the sustainability of the study area and will be compared with data collected from the analogue sites. Animal health and weight will be a significant focus of the project. Stakeholders and regulators are involved in the development and implementation of the study.
Current	Development of a Toolbox for Fish Health Assessment in Aquatic Ecosystems Associated With Coal Industries C24029	97,740	Claire Cote, Anglo American	The Fitzroy Basin communities consider water and the associated riverine ecosystems to be key environmental assets, and they require an assurance that mining companies can manage and mitigate their environmental impacts. This project will develop practical indicators of fish health that are applicable to monitoring in coal mining regions, thereby helping to improve overall aquatic ecosystem health assessments and informing regional water management.
	Central Queensland University Nicole Flint Sue Vink			
Current	Verification of the Vertical Distribution of Dust from Mining Activities C24030	321,433	John Watson, Glencore Kris Sheehan, BMA	Results from dust dispersion models are heavily relied upon during the approvals phase of mining projects to assess potential for adverse dust impacts on human health. This project aims to give the mining industry and regulators increased confidence in the results required by dust dispersion models by uside thing and improving the mathed bleggy applied to each superside the mining industry and regulators.
	Advanced Environmental Dynamics Darlene Heuff			Researchers will collect continuous field data over 12 months, providing a far wider range of atmospheric conditions than be achieved through short term, campaign based field programs.
Current	urrent Cost Efficient, Empirically Based Framework Using Integrated Datasets to Demonstrate Rehabilitation Quality C24031	297,484	 Pieter Swart, Glencore Paul Veivers, Stanwell Corporation Bernie Kirsch, Centennial Coal 	Current methods of monitoring and assessing open cut coal mine rehabilitation are costly and time consuming. Detailed airborne imagery can cover large areas in one snapshot and, if processed automatically, may be a cost effective tool for mine rehabilitation assessment. This project seeks to develop a common, cost effective framework, informed by empirical data, to assess rehabilitation quality that is focused on assessing relinquishment risk. As part of this work researchers will develop an automatid system to detect changes in mine rehabilitation conditions that flaces that for ground investigation.
	University of Queensland Peter Erskine			automateu system to detect changes in mine renabilitation conditions that hags areas for ground investigation.
Current	Applying Risk Based Principles of Dispersive Mine Spoil Behaviour to Facilitate Development of Cost Effective Best Management Practices C24033	476,104	476,104 Stuart Ritchie, Rio Tinto Ross Gooley, Sojitz Minerva Mining Craig Lockhart, Peabody Energy Australia	A significant number of Bowen Basin coal mines have dispersive spoil which makes rehabilitation difficult and costly. The liability for rehabilitating these dispersive spoil dumps is around \$3 billion. However, there is no definitive guideline or best management practices for the application of consistent, reliable, proven and cost effective approaches to managing dispersive spoil. To address the issue, researchers will develop a set of best management practices, risk based decision tools and a framework and a process for understanding the trade offs between risks and costs.
	Tree Crop Technologies		Jason Fittler, Anglo American	namework, and a process for anticistationing the trade ons between risks and costs.
	Glenn Dale Steven Raine			

STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Incorporating Salinity into the Source Catchments Model for the Fitzroy Basin C24036 BMT WBM Nathan Johnston Tony Weber	304,000	Steve Downes, Glencore Scott Diggles, Rio Tinto Coal Australia John Merritt, Burton	High salinity in freshwater catchments impacts upon freshwater organisms and ecosystem health, as well as other environmental values such as suitability for drinking water, livestock watering and crop rotation. How saline mine water releases relate to broader catchment salinity issues within the Fitzroy Basin is not well understood. This project will use the Fitzroy Basin Source Model and previous modelling and research to produce a model for salinity processes in the Fitzroy. This information will then be incorporated within the source model to provide a platform for assessing future scenarios and the effectiveness of management actions.
Current	Quantifying Coal Dust in Urban Samples C24038 CSIRO David Wainright Graham O'Brien	176,765	Tim Manton, South32 Illawarra Coal Stuart Ritchie, Rio Tinto Bernie Kirsch, Centennial Coal	Coal dust can be generated during mining, transportation and coal usage. Although coal is often only one of the constituents present in dust near towns, along rail corridors and at ports, there is a general perception that all black dust is coal and that a high proportion of the dust is respirable. This project will use CSIRO's coal grain analysis system to analyse samples provided by residents in urban areas who are concerned with coal dust accumulation at their properties. In addition, researchers will develop a procedure for analysing and reporting results for community supplied dust samples which are not only scientifically rigorous, but are also accepted by the general community. Free image viewing software will be developed and provided community members with the analysis results.
Current	'MRC Wiki' Mine Rehabilitation and Closure Knowledge Management Platform - Implementation for Central Queensland Coal Mines C24067 University of Queensland Corinne Unger	176,900	Simon Orton, BMA Craig Lockhart, Peabody Energy Australia Stuart Ritchie, Rio Tinto	The original project identified Wiki as the most suitable tool to address the mine rehabilitation knowledge management needs in the Central Queensland mining region. In this extension project, CMLR will develop a mine rehabilitation and closure wiki (MRC Wiki) to provide access to a live repository of CQ coal mine specific rehabilitation practice information. Providing a platform for uploading information and holding discussion forums which can be managed by a regional practitioner network enables the new system to be kept alive, driven by users and information needs as they evolve over time.
New	Guidelines that Address Uncertainty in Coal Mine Pit Void Closure C25030 Amanzi Consulting Dave Salmon	122,200	Hayden Leary, Qcoal Jason Fittler, Anglo American Pieter Swart, Glencore	The closure of open cut mine voids to ensure safe, physically stable, non polluting, post mining land use is a challenging process. This project will provide guidelines aimed at reducing the uncertainty of regulator and community acceptance of rehabilitation actions by a mine. Guidelines will be produced that will allow outcomes based approaches for closure options, inform residual risk discussion and will be such that relinquishment of pits voids could be achieved.
New	Closure Criteria for River Diversions: An Alternative to Reference Sites C25031 Edith Cowan University Melanie Blanchette	232,293	Digby Short, Ashton Coal John Watson, Glencore	The use of reference sites for establishing closure criteria in areas disturbed by mining activities (such as river diversions) is accepted by regulators across Australia. Sites are considered rehabilitated when their condition approximates that of a natural co occurring reference site. However, this approach often creates unrealistic targets for miners seeking to close rehabilitated lands. In this project researchers will evaluate a new, more achievable approach to the closure of mine sites by comparing rehabilitated sites to the natural variability of the local environment, rather than specific reference sites. The outcome of this new approach to closure criteria will allow miners to create realistic and definable targets for relinquishing rehabilitation land, potentially simplifying closure and project approvals.
New	Long Term Salt Generation from Coal Spoils C25039 University of Queensland Mansour Edraki Neil McIntyre	239,150	Claire Cote, Anglo American Scott Diggles, Rio Tinto Coal Australia John Merritt, Burton	Coal mine spoil has the potential to contribute significant salt loads to final voids where there is out of pit emplacement to the surface and groundwater receiving environment. Existing models used to provide information on final void water quality and post mining residual risks to surface and groundwater quality are limited by confidence in the data underpinning salt generation rates and duration. This research will develop estimates of long term salt generation rates for sampled classes of coal mine spoil piles that can be used in conjunction with water balance models to predict long term final void salinity levels or the residual risk to receiving surface water or groundwater environments. A process for improving the precision of estimates and the extension to additional classes of spoil piles will also be developed.

OPEN C	OPEN CUT					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Geology						
CurrentImplications of Self Weight, Wetting Up and Weathering Induced Settlements of High Coal Mine Spoil on Stored Volume and Stability C1902242University of Queensland David Williams42	427,000) Nicole Tucker, BMA Shaun Booth, Glencore Chris Agosto, Mt Arthur Coal	Australian open cut coal mines are extending to ever increasing depths. The economic viability of these deep open pits is dependent on the design, sizing, geotechnical stability assessment, and cost estimation of in-pit and out-of-pit high spoil piles. These elements, in turn, are influenced by the impact of bulking and subsequent self-weight, wetting up and weathering-induced settlements of the volume. This extension project more fully investigated an extended range of spoil types and subjected them to a greater range of laboratory testing, and added spoil settlement field monitoring data and any			
	University of Queensland David Williams			geological instabilities collected by participating mines. It also further validated and calibrated the numerical predictive tools being developed.		
Current	Reliable Geotechnical Stability Assessment for Very High Spoil Dumps C20019	486,500	Jack Krajewski, Rio Tinto Coal Australia Nicole Tucker, BMA	Existing procedures are inadequate for the design of very high dumps because they introduce significant uncertainties into risk assessments of instability hazards for life-of-mine plans. This project is providing geotechnical specialists with shear strength, groundwater pressure, and recommended stability assessment procedures for designing very high spoil dumps, greater than		
University of Newcastle Sarah Bligh, Thiess 120m, with adequate safety. These	120m, with adequate safety. These outcomes will be published and explained to practitioners at targeted workshops.					
	John Simmons Shaun Stenhen Fityus	Shaun Booth, Glencore				
Current	Energy Adsorption Collisions between Ultra Class Haul Trucks and Windrows C21032	382,715	Brett Domrow, New Hope Group Shaun Booth, Glencore Don McNeil, Rio Tinto	Existing approaches to designing energy absorption safety barriers (safety berms) are not adequate for the new generation of large (ultra class) haul trucks. Because full scale on site testing is not possible due to safety issues, researchers will use numerical modelling to simulate trucks impacting safety berms at various velocities and approach angles. The outcome will be more		
	University of Newcastle		Sarah Bligh, Thiess	rigorous guidelines for the design of safety berms on hauf roads that cater to ultra class trucks travelling at high velocity.		
	Anna Giacomini Klaus Thoeni		Chris Agosto, Mt Arthur Coal			
Current	Tertiary Volcanic Fields of Eastern Australia: Implications for Mining and Coal Quality C22023	179,250	Richard Ruddock, Rio Tinto Greg Jones, JB Mining Kirk Henderson, Peabody	Tertiary volcanic fields cover significant portions of the coal basins in eastern Qld which has implications for coal production and exploration. These lavas and their intrusive equivalents impede seismic exploration, impact coal quality and create geotechnical challenges. This project aims to address these issues through field and laboratory work that concentrates on lavas and intrusions from mines in this region. Samples from mines in attract out the set of the coal duril core will be used.		
	University of Queensland		Energy Australia	non mines in this region. Samples non mines, natural outclops and unit core will be used.		
Current	Charles verder	288 800	Richard Ruddock Rio Tinto	The ACAPP Supermodel 2000 project provided a regional context in which to develop predictive models for overburden		
Current	the Rangal-Baralaba-Bandanna Coal Measures in the Bowen and Galilee Basins C22028	200,000	Tim Buddle, Anglo American Barry Lay, BMA	geotechnical behaviour in mines operating in the Moranbah-German Creek coal measures. Mining conditions in the Rangal, Baralaba and Bandanna coal measures are varied and, in places, structurally complex. This project will develop a regional stratigraphic framework for the Rangal-Baralaba-Bandanna coal measures in the Bowen and Galilee basins. The links between		
	University of Queensland		ганик тупен, мем поре бтойр	of thick stacked coals, and type and degree of structure deformation. The output will be a 'go to' reference for the industry that		
	Joan Esterle Ronato Silwa			will improve the understanding of the key aspects of Australia's coal basins.		
	Ivenate SIIWd					

STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Non Destructive Characterisation of Borehole Coal Samples using X CT Technology C23024 University of Queensland Anh Nguyen	200,000	Barry Lay, BMA Richard Ruddock, Rio Tinto Patrick Tyrrell, New Hope Group Shaun Booth, Glencore	Exploration and development of new coal mines and mine plan strategies depend exclusively on the characterisation of borehole coal samples. This project developed a novel nondestructive technique to characterise borehole coal samples using x-ray computed tomography, which is safe, environmentally friendly, fast and cost effective.
Current	Rockfall Hazard Matrix For Risk Reduction In Mine Sites C23026 University of Newcastle Anna Giacomini Federica Ferrari Klaus Thoeni	259,590	Shaun Booth, Glencore Mark Sjoberg, Rio Tinto Coal Australia Gift Makusha, Anglo American Jordan Wilson, BMA Chris Agosto, Mt Arthur Coal Sarah Bligh, Thiess	Rock falls represent a serious hazard in open cut mines, threatening human lives, machinery and portal structures for underground entry located at the toe of highwalls. A set of tools specifically designed for coal mining environments will be developed to provide practitioners with more rigorous guidance on rock fall management strategies. The procedure is incorporating field observations (historical records), mitigation measures, established analytical and numerical tools (empirical run outs estimates, rock fall trajectory simulation), and the latest research developments in rock fall hazard assessment and zoning (3D photogrammetry, block modelling and intensity frequency matrix). This work should help mine personnel to generate hazard zoning maps that can be regularly updated and site specific matrices of mitigating measures.
Current	Supermodel 2015 - Fault Characterisation in Permian to Jurassic Coal Measures C24032 University of Queensland Joan Esterle Renate Sliwa	316,730	Richard Ruddock, Rio Tinto	The series of Supermodel projects have developed a regional stratigraphic framework for the Rangal and the Moranbah coal measures and their equivalents in the Bowen and Galilee basins. This project will build on that work by providing detailed characterisation of fault structures in the context of basin evolution, overprinting events, and past and present day stress regimes.
Current	Rotary Air Blast Drill Rig Top of Coal Detection While Drilling: Phase 3 Production Prototype C24064 University of Queensland Enver Bajram Scott Adam	245,000	Steve Simmons, Anglo American Kirk Henderson, Peabody Energy Australia Vishwa Bhushan, Rio Tinto Coal Australia Andrew Denman, BMA	It is widely accepted in the coal industry that accurate control of overburden blast hole depth can significantly improve mine profitability through reduced coal loss and dilution. Ideally, blast holes would be drilled to a predetermined stand off from the top of coal interface; however, the current techniques for seam mapping do not provide an accurate surface profile at the local scale required for effective stand off control. The aim of this project is to complete pre commercial development of a measurement while drilling system that can accurately detect the top of coal interface being reached by the drill.
New	Guidelines for Estimating Rock Mass Strength from Laboratory Properties C25025 University of New South Wales Ismet Canbulat Marc Ruest	396,685	Gavin Lowing, Peabody Energy Australia Gift Makusha, Anglo American	A successful mine geotechnical design requires a thorough understanding of the geological conditions and properties of the rock mass at the relevant problem scale. In this project researchers will use rock mass classification methods to guide the reduction of laboratory strengths to appropriate field values and synthetic rock mass (SRM) to further guide and validate the methodology developed. The SRM approach will be used to accurately and completely characterise the mechanical properties of Australian coal measures and the mechanics of behaviour observed in situ. Researchers will also identify under what geotechnical conditions rock mass strength is not the dominant factor governing stability and when structural control becomes the key issue.
New	Prediction of Particle Size Distribution and Washability from Borehole Sample Constituents Using XCT C25027 University of Queensland Anh Nguyen	200,000	Stella Martinez, BHP Billiton Coal Richard Ruddock, Rio Tinto Michael Young, Glencore Shaun Booth, Glencore Patrick Tyrrell, New Hope Group	Xray computed tomography (XCT) is a non destructive method of characterising borehole coal samples that is also environmentally safe, fast and cost effective. This project will extend the use of the developed XCT to characterise different coal constituents (bands of bright, dull coal and stones) of borehole coal samples for mine planning, for processing strategy, and for exploration of new coal deposits.

STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
New	Acquisition of Coal Quality by Semi Automatic Analysis of CoreScan Images C25028 University of Queensland Emmy Manlapig	205,600	Noel Pranoto, BMA Patrick Tyrrell, New Hope Group Richard Ruddock, Rio Tinto Justin Manalo, BMA Mark Laycock, Glencore	Knowing the nature of the coal enables its processing properties to be predicted, such as size distribution, washability and product quality. A method called regional estimation of geoscience information (REGI) has been developed to apply the images derived from hyperspectral scanning to map the processing attributes for each portion of the drill core sample. The objective of this proof of concept project is to test the core imaging technique and the associated REGI method as a rapid, non destructive method for characterising the processing attributes and the product quality including rank, type and grade for drill core samples.
New	Coal Subsurface Mapping for Open Cut Selective Mining C25035 CSIRO Andrew Strange	182,772	Brett Domrow, New Hope Group David Drew, Wesfarmers Curragh	There is a need for a reliable coal seam sensing system to provide selective mining capabilities for open cut mining operations. Currently operators are required to manually adjust the material extraction depth based on cues, such as sight or vibration as the machine cuts the strata. This project aims to develop a prototype subsurface survey system that can measure coal thickness from the top of the coal surface down to the coal interburden interface. The system will enable advanced planning of the extraction process and provide selective mining/waste removal capability to the operators in the cab.
New	Shear Strength Characterisation of In Pit Mud to Ensure Low Wall Stability C25040 University of Queensland Adrian Smith David Williams	210,000	Gavin Lowing, Peabody Energy Australia Shaun Booth, Glencore	Removing extensive deposits of mud from previously flooded open cut mining pits is very expensive. Working at Bowen Basin mines that have been flooded, researchers will identify spoil and floor materials that do not require removal prior to the spoiling because they do not substantially degrade on wetting up and are, therefore, unlikely to promote low wall spoil pile geotechnical instability.
Maintena	nce and Equipment			
Current	DC Motor Duty Meter C16030 CRCMining Galina Mirzaeva Terry Summers	551,066	Kane Usher, Rio Tinto Mark Spinks, Anglo American Tony Egan, Glencore	The approach being taken through this project is different from most maintenance management in that rather than watching for a manifestation of deterioration and trying to locate the cause, this project is tracking possible "cause" and is maintaining a work record. The approach taken is to relate the motor condition to its duty rather than to faults, hence the title 'DC Motor Duty Meter'. This work should lead to motors being changed out when they need to be rather than when they are scheduled to be. The completed stage one of the project examined current distribution in the brushes and the magnitude of the load and its dynamics. This next stage the focus is on the digital drive, the commutator surface temperature and the mechanical vibration of the motor case and brush holders.
Current	Automated Swing Loading System for Electric Mining Shovels C16031 CRCMining Ross McAree	4,809,907	SLAP Steering Group	The fourth phase of this project will further develop and demonstrate an automated digging system for electric mining shovels, building on work completed already in the shovel load assist project (SLAP). Conceived as truck loading 'at the press of a button', the project will use terrain mapping technology and a digging and multi-pass loading control system that will plan and execute digs that are efficient, safe and robust. The system will also quantify shovel performance in terms of machine productivity, dipper payloads, shovel cycle times and achieved load distribution in the truck.
Current	Powerlinkoz High Voltage Electrical Connection System (PLO) C20030 Connec John Keir	450,000	Tony Egan, Glencore Barrie Alley, Centennial Coal David Lincoln, Centennial Coal	The existing high voltage cable plugs are prone to fault and connection failures and are difficult to handle. This project will improve the safety, reliability and operability of a part of the systems of cables, plugs and receptacles that provide electrical power to mining equipment. The proposed plugs will make greater use of alternative light weight materials in construction.

OPEN CI	Л			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Synthetic Rope Prototype Development Program for Dragline Application C22022	295,000	Shaun Booth, Glencore Tony Egan, Glencore	Opportunities may exist to improve dragline rope life, reduce rope mass, reduce dynamic loads on boom structures and use more economical and environmentally friendly consumables by using synthetic rope. Building on work done in C20026, this project develop a quarter-scale prototype synthetic high modulus poly ethylene (HMPE) rope.
	AMOG Olaf Rutgrink			
Current	AC Motor Duty Meter for Excavating Machines: Part 2 C24035	156,467	Simon Orton, BMA Mark Spinks, Anglo American	Off the shelf condition monitoring tools for AC motors typically diagnose motor condition by analysing vibrations, electric current or magnetic leakage flux in frequency domain. However, the process is disruptive to normal equipment operation. By using internal sensor instrumentation with miniature Hall Effect flux sensors inside the motor air gap, researchers expect to
	University of Newcastle Tony Egan, Glencor Galina Mirzaeva	Tony Egan, Glencore	overcome this issue. As part of this project an AC duty meter prototype will be developed for diagnosing and predicting three major groups of faults. The AC duty meter prototype tool will be tested and validated on a laboratory scale induction motor, then tested and validated on a full scale induction motor with assistance from OEMs at their premises.	
New	Mining Truck Tyre Integrity Monitoring C25034 CSIRO Garry Einicke	162,965	Kane Usher, Rio Tinto Brian Mahar, BMA	'Zipper' failure is the name given to the rupture of a tyre wall due to rapid progressive rupture of cords within a tyre's structural carcass or casing. This phenomenon has led to the explosive failure of tyres which has been responsible for injuries and fatalities at Australian coal mines. In December 2014, Queensland's Central Coroner recommended that mines introduce an annual process to ensure that tyres are operated within their design parameters and that every tyre undergoes integrity testing. However there is no tyre integrity testing technology available. This project will develop portable technology for automatically diagnosing the structural integrity of mine truck tyres, develop an analysis or engineering method to establish the level of deterioration where the tyre should be discarded, and transfer the developed technology to a commercial partner for use at mine sites.
New	Dynacut Fundamental Development and Scalability Testing for High Capacity Mining of Coal Overburden C25041 University of Queensland Brad Neilson Steve Powell	540,000	Kane Usher, Rio Tinto Simon Orton, BMA Tim Baitch, Anglo American Steve Amor, Anglo American	Dynacut technology enables the excavation of hard rock using comparatively small and lightweight equipment as a continuous process in surface and underground mining applications. Current continuous cutting systems cannot economically cut material above about 40 MPa. This multi phase project aims to further improve Dynacut technology and demonstrate its cutting performance across the range of target overburden materials. The strategy is to develop a purpose built continuous cutting system for coal mine overburden. A structured concept testing program will be undertaken to prove the scalability and applicability of the technology to this type of mining.

OPEN Cl	JT			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Mining a	nd the Community			
Current	Improving the Understanding and Management of the Cumulative Impacts of Coal Mining and other Land Uses in Regions with Diversified Economies C22029 University of Queensland Jo-Anne Everingham	153,000	Craig Lockhart, Peabody Energy Australia Carl Grant, Anglo American	In the past decade a range of planning and policy instruments and new institutions have been introduced to manage the cumulative impacts of mining, but it is unclear how these could function to manage multiple industries. This project investigated methods for operators, various levels of government and co-existing industries to more effectively manage cumulative impacts. Key deliverables included models, recommendations and guidance that integrate the various tools being used into a systems approach to cumulative impacts governance; a framework that maps stakeholder roles; and a stakeholder engagement flowchart.
New	Collaboration to Maximise the Benefits and Acceptance of Land Packages for Post Mining Leases C25032 Central Queensland University Jo-Anne Everingham John Rolfe	239,215	Stuart Ritchie, Rio Tinto John Merritt, Burton	The Bowen Basin has no track record of full mine closure with lease relinquishment. Identifying the appropriate process to facilitate the transition to a post mining landscape that meets the expectations of the relevant communities and land users, and assessing the overall success of such an approach, remains a key challenge. The approach the regulators and mining companies are taking to closure could well be focused at the wrong scale: it is concerned with the subsets and interdependencies of soil, vegetation and water components rather than taking an overall view of the productive and other beneficial uses of the landscape in an integrated sense. The project will focus on addressing the broader scale of thinking, using holistic appraisal to consider local community needs and preferences. It will also test the use of a local expert panel to identify the conditions and suitable mix of agricultural uses and other functions for a mine lease to be completed, in order to gain acceptance by the local community and agricultural sector.
Occupatio	onal Health and Equipment Safety			
Current	Working Well: Mental Health and Coal Mining C22045 University of Newcastle Brian Kelly Robyn Considine	353,227	Shane Apps, Peabody Energy Australia Liam Wilson, Rio Tinto Coal Australia Judy Bertram, QMC	Mental health problems and their impact on workplace safety and productivity is a growing issue for the mining industry. There is some evidence of an association between mental illness and reduced productivity and injury at work. However, no methodologically sound studies have been conducted on these issues in the Australian coal mining industry. This project determined the extent and impacts of mental health problems in the coal industry. It aimed to identify the patterns of mental health problems among coal industry employees, the factors associated with these problems and the impact on employee health, workplace safety and productivity.
Current	Methods for Selecting and Optimising Critical Controls C23007 University of Queensland Maureen Hassall Chris Doran Jim Joy Marcus Punch	250,000	Tony Egan, Glencore	The coal industry has reached a point where further reduction of health and safety risk may require substantial new capital and operating costs. The industry's traditional 'trial and error' approach to investigating new engineering controls is costly and potentially inefficient for selecting complex controls. This project developed generic control effectiveness analysis methods that can be applied at three levels – site, corporate and specialist – to match the specific risk reduction requirements for new control technologies. The method aims to optimise the safety outcomes and cost benefit of major investments intended to reduce risk.
Current	Managing Whole Body Vibration at Surface Coal Mines C23022 University of Queensland Robin Burgess-Limerick	165,800	Ross Di Corleto, Rio Tinto Global HSEC Troy O'Reilly, Stanwell Corporation Allan Gordon, Anglo American Ellen Roots, Glencore	Operators of surface mining equipment are exposed to whole body vibration through the seat. Prolonged exposure to high amplitude whole body vibration causes serious long term health effects, particularly back disorders. The objectives of the project are to validate a simple and cost effective whole body vibration measurement device suitable for use by mine health and safety staff and to demonstrate and evaluate the implementation of the device as part of a comprehensive whole body vibration management program to reduce vibration exposure associated with surface coal mining equipment.

2015 PEOPLE AND PROJECTS REPORT

STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Optimising the Implementation Critical Control Management Planning using a Management of Change Approach C24006 University of Queensland Maureen Hassall Jim Joy	125,000	Tony Egan, Glencore	Critical control management planning (CCMP) is a major step change being undertaken across the Australian coal industry. However it is not yet clear what tactical and strategic impacts CCMP may have on stakeholders and organisation processes. This project will produce a plan for an effective and efficient step change in operational risk management to the CCMP approach across the industry; a set of recommended improvements to existing industry initiatives; and a list of new projects to facilitate this change.
Current	Safety Integrity Level Validation for Satellite Navigation Technologies C24027 GPSat Systems Australia Graeme Hooper Joe Austin-Crowe Joe Fleming	142,750	Chris Doran, Anglo American Tony Egan, Glencore Kane Usher, Rio Tinto	Safety integrity level (SIL) AS61508 assessments for projects reliant on the global navigation satellite system (GNSS), such as mining machine automation projects, are not currently possible. In this project a methodology will be developed to validate GNSS equipment. As a result of this work, manufacturer hardware (specific vendor, model and firmware revision) could be pre qualified, enabling them to be included in SIL related systems.
Current	Interface Design for Haul Truck Proximity Detections Systems C24028 University of Queensland Robin Burgess-Limerick	235,620	Gavin White, Rio Tinto Coal Australia Aaron Power, Rio Tinto Coal Australia Kane Usher, Rio Tinto Tony Egan, Glencore Allan Gordon, Anglo American	Visibility restrictions inherent in the design of haul trucks can sometimes prevent drivers from seeing other vehicles. After market proximity detection systems have been developed to overcome this issue; however, there are no standards or guidelines available to help equipment designers. Using a haul truck simulator and other methods, researchers will evaluate existing proximity detection systems designed to convey advisory information to truck drivers and develop specifications for proximity detection system interfaces.
Current	Proximity Detection Device Open Specification C24034 CSIRO Mark Dunn	90,700	Gavin White, Rio Tinto Coal Australia Aaron Power, Rio Tinto Coal Australia Kane Usher, Rio Tinto Tony Egan, Glencore Brad Lucke, Glencore Chris Doran, Anglo American	There are many proximity detection systems for mobile mining equipment on the market, each with its own proprietary hardware, communication, logging and warning systems and methods. The absence of interoperability between systems is slowing down the uptake of this technology across the industry. As part of this project researchers will work with OEMs to develop industry wide supported platforms for open cut mines. In particular, an open specification set for above ground proximity detection systems will be developed based on the LASC open system interconnection model initially developed by CSIRO for longwall automation.
New	Earthmover Tyre Inflation Safety Device: Preliminary Investigation C25024 Simtars Tilman Rasche Tom Klinge	74,400	Shannon Woodward, BMA Tony Egan, Glencore	Tyre maintenance involves working with pressurised vessels and is a highly hazardous activity. Sudden disintegration of a tyre and rim assembly during the inflation process can result in severe and often fatal injuries to the tyre service person and bystanders from the airblast and high velocity rim or tyre components/fragments. This project will investigate the issues associated with tyre inflation and determine whether a mobile earthmover tyre inflation protection barrier or a large inflation safety cage is a viable protective measure.

OPEN Cl	JT			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
New	Reducing Risk Taking Among Australian Coal Miners C25026 University of Newcastle Anna Giacomini Mark Rubin	302,235	Patrick Tyrrell, New Hope Group Liam Wilson, Rio Tinto Coal Australia	In a mining context, dangerous risk taking is defined any behaviour that deviates from prescribed risk controls with the potential to lead to serious accidents, injuries, and fatalities. This project will identify the psychological causes of dangerous risk taking behaviour among Australian coal miners and develop, test, and produce a practical intervention that will result in a significant reduction in this type of behaviour. Key outcomes will include an industry friendly manual that explains how to implement the intervention at mine sites across Australia as well as a numerical tool that can be used to evaluate the effectiveness of the intervention.
New	Practical Application of Open Path Boundary Monitoring for Operational Dust Control C25029 Pacific Environment Operations Damon Roddis	135,432	Andrew Speechly, Rio Tinto Coal Australia John Watson, Glencore	Open path monitoring measures the flux of a given air emission along a path length of hundreds of metres rather than relying on a single monitoring point which may fail to detect emissions along, and beyond the site boundary due to its static location. Open path systems have been used at petrochemical refineries, landfills and post closure industrial sites to detect volatile organic compounds and other gases. However, there has been limited application of this technology to the detection of fugitive particulate matter within the mining and extractive industries. This research will deliver a proof of concept for an open path boundary monitoring system for operational dust control. Researchers will demonstrate that open path techniques can be configured to detect particulate matter movements beyond the site boundary in a meaningful way, including validation against conventional particulate matter monitoring techniques.
New	Automated Musculoskeletal Disorder Risk Assessment C25033 JointAction Group Steve Cowley	293,232	Simon Worland, Rio Tinto Coal Australia Steve Amor, Anglo American	Musculoskeletal injuries are the most common injury type experienced in the Australian coal industry. This project will develop an application for use on a phone or tablet device, paired with small wearable sensor devices to conduct quantitative ergonomic risk assessment. The user friendly application will remove the need for musculoskeletal disorder (MSD) specialist expertise in the conduct of a risk assessment, minimise disruption of normal work, reduce costs, provide greater accuracy and reliability of data collection and analysis across similar tasks, and automatically transfer risk assessment reports to a central location.
New	Risk Control Knowledge: Determining Best Practice from Case Study Analysis C25036 University of Queensland Jim Joy, Maureen Hassall	259,500	Tony Egan, Glencore Allan Gordon, Anglo American Mike Oswell, Anglo American, OHS Task Group	Enhancing the effectiveness and management of risk controls should deliver improved outcomes. This project will identify best practice application of the proposed critical control methodology. Two detailed case studies that demonstrate best practice application of the recommended methods for selecting and optimising risk controls and managing critical controls will be developed. The case study information will determine the feasibility and business case for sharing of critical controls knowledge that will help the Australian coal mining industry better manage fatality risks.
New	Health-e Mines: Virtual Health System to Improve Mental Health, Reduce Alcohol/Other Drug Use and Fatigue Related Problems C25037 University of Newcastle, University of New South Wales Brian Kelly, Frances Kay-Lambkin	289,985	Tony Egan, Glencore OHS Task Group	Mental health problems cost the Australian coal mine industry more than \$147 million each year. Researchers will develop and evaluate an online portal (Health e Mines) that will link coal mining employees, workplaces and health professionals with direct access to confidential, accessible, private and evidence based programs for mental health, addiction, and related physical health concerns. Health e Mines will be developed as a website that will be both PC and smart phone compatible, and will be complemented by the development of a smart phone app.
Overburd	en Removal			
Current	Automated Design of Multi Pass Dragline Strips Using 3D-Dig C21028 Earth Technology Murray Phillips	115,000	Andrew Walker, Wesfarmers Resources Bridget Perkins, Anglo American Lindsay Ford, Glencore Tim Baitch, Anglo American	The well accepted 3D ² Dig software has proven to be an effective tool for accounting for spoil transport and placement in dragline operations. It is able to very accurately predict prime and rehandle volumes, estimate spoil fit and communicate the resultant design. This project is extending the software and developing a system to automate the design of a complete, multi pass dragline strip. The system will allow for blast profiles and dozing as well as dragline operation. The auxiliary stripping requirements will be determined for each block prior the main strip simulation. A graphical interface will be provided to allow users to sequence the strip by blocks, passes and sub passes.

2015 PEOPLE AND PROJECTS REPORT

OPEN C	JT			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Dragline Automation System: Optimal Excavation Sequencing C23033 University of Queensland Kevin Austin Ross McAree	649,360	Tim Baitch, Anglo American Win Klass, Glencore Kane Usher, Rio Tinto Steve Amor, Anglo American Simon Orton, BMA David Drew, Wesfarmers Curragh Geoff Gribble, Wesfarmers Resources	Improving dragline performance through automation is the overall objective of this project. It is focussing on the development and implementation of a dig sequence technology that identifies the optimal sequence of dragline operations and movements that most efficiently excavate a block of material. This operator assist technology provides operators with instantaneous position, digging and dumping guidance and should result in faster average cycle time and positioning time, a higher degree of compliance to the desired final pit geometry, a reduction in rework and rehandling of material, and pre warning of potential pit issues such as spoil bound scenarios.
Current	Quantifying Development Risks for a High Capacity Surface Mining Continuous Cutting System in Waste C24011 University of Queensland Steve Powell	491,123	Shaun Booth, Glencore Greg Doyle, Rio Tinto Coal Australia Steve Amor, Anglo American Simon Orton, BMA Tim Baitch, Anglo American Tony Egan, Glencore Hans Hayes, Anglo American	The main impediment to developing a high capacity, continuous surface mining system for overburden in Australian open cut coal mines is the ability to efficiently cut the massive formations (typically sandstone). The objectives of this project were to develop an alternate method to drill/blast/shovel/truck to extract waste rock material in open cut mines by 2020; generate concept designs for a high capacity, continuous cutting system; and assess the feasibility and risks of the technologies that show potential to deliver significantly lower costs per tonne excavated.
Current	Automated Bulk Dozer Push: Reducing the Cost of Overburden Removal C24037 University of Queensland Ross McAree	341,400	Kane Usher, Rio Tinto Simon Orton, BMA Tony Egan, Glencore Don McNeil, Rio Tinto Bridget Perkins, Anglo American Tim Baitch, Anglo American Geoff Gribble, Wesfarmers Resources Hans Hayes, Anglo American	The Caterpillar SATS semi autonomous tractor system for D11T dozers is capable of executing push to an edge bulk dozing and has been successfully used for dragline bench preparation. However, it cannot currently execute a pivot push with back stacking strategy which is favoured to minimise rehandle. This project will extend the capability of SATS so it can perform pivot push with back stacking, and test the system at an Australian coal mine.
New	Dragline Excavation Sequencing: Phase 2 C25038 University of Queensland Andrew Jessett Ross McAree	1,129,000	Simon Orton, BMA Geoff Gribble, Wesfarmers Resources David Drew, Wesfarmers Curragh Steve Amor, Anglo American Tim Baitch, Anglo American Win Klass, Glencore	Dragline excavation sequencing is a complex problem with many input variables. Each decision impacts future possible decisions and finding ways to solve for these is technically challenging and not fully explored. This is complicated by multiple competing objectives that are coupled to the decision points within an excavation sequence. This project will develop and demonstrate an on board operator decision support tool that provides guidance on excavation sequencing and test the hypothesis that this enables faster, more consistent production rates, improved conformance to the intended design, and better utilisation of spoil room.

COAL PREPARATION

The coal preparation plant is an integral part of the total mine operation and seeks to minimise its contribution to environmental impacts, eg by 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.

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

COMMITTEE MEMBERS

Dion Lucke	Principal Advisor – Processing (Co-Chair)	Rio Tinto Technology & Innovation
Kevin Rowe	Group Manager of CHPPs (Co-Chair)	Glencore
Daniel Delahunty	Process Engineer	Stratford Coal
Alvaro Diaz Lema	Group Process Engineer	Glencore
Phillip Enderby	Manager, Ravensworth CHPP and Coal Terminal	Glencore
Ryan Flanagan	Group Process Engineer	Glencore
Rebecca Fleming	Coal Processing Specialist	Rio Tinto
Rod Fox	General Manager - Coal Processing & Operational Projects	Whitehaven Coal
Alistair Harriman	Director – Process Engineering	Peabody Energy Australia
Phil Howes	CPP Engineer	South32 Illawarra Coal
Frank Mercuri	Coal Processing Specialist	Anglo American
Justin O'Neill	Senior Process Engineer	Peabody Energy Australia
Naomi Pritchard	-	BMA
Clinton Vanderkruk	Coal Processing Manager Australia & Canada	Anglo American
Tom Wilson	Process Engineer	Anglo American
Michael Young	Principal Metallurgist – Minerals Processing	Glencore

FUNDING APPROVED 2015

	No of Projects	ACARP Funding	Total Funding
2015	17	\$2,395,961	\$4,658,741
2014	15	\$2,017,563	\$2,752,522
2013	14	\$1,973,450	\$4,247,096

CATEGORY	No of Projects	ACARP Funding
Major Projects	1	\$1,318,748
Dewatering	5	\$1,162,513
Environmental Improvement	1	\$228,000
Fine Coal	19	\$2,773,257
Gravity Separation	9	\$2,238,086
Process Control	1	\$236,685
General	4	\$388,869



COAL PI	REPARATION			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Major Pro	ojects			
Current	Reflux Classifier to 4mm Top Size - Full Scale Trial (Construction of Test Rig) C22046	1,318,748	Kevin Rowe, Glencore Phillip Enderby, Glencore	This project will move an innovative process improvement from the laboratory to a trial in an operating plant. A larger size feed, up to 4mm, will be directed to the Reflux Classifier, thereby reducing the load to dense medium cyclones. The work has the potential to increase plant throughput for a given capital expenditure. The project has a committed host site, and strong engineering and
	University of Newcastle Kevin Galvin			scientine support.
Dewateri	ng			
Current	Belt Press Filter Optimisation Handbook C23040 Quality Process Solutions	153,550	Kevin Rowe, Glencore Phil Howes, South32 Illawarra Coal	Limited understanding of the key operational parameters that affect belt press filter performance can lead to increased operational expenditure and increased maintenance costs, and decreases in plant availability due to excessively high filter product moisture and equipment failure. The objective of this project was to provide the Australian coal industry with a useful, supplier independent handle describing the performance of belt press filters under a range of aparting conditions and providing practical techniques to
	Darren Mathewson		Penny Walker, Bengalla	optimise the design, operation and maintenance of these filter installations.
Current	Application of Screw Press Filtration to Tailings Dewatering C23041 Bilcrest Stuart Whitton	303,314	Alistair Harriman, Peabody Energy Australia	The applicability and utility of a screw press to the dewatering of coal beneficiation plant tailings were investigated during a field pilot plant trial. Dilution strata and tailings were sampled in order to characterise those materials and run bench scale flocculation and filtration tests. This was followed by an extended pilot trial in the field, sample collection and reporting. A pilot pressure filter and the screw press filter was assessed during the trial to compare the effectiveness of the two technologies.
Current	Improving the Dewatering Efficiency of Fine Flotation Concentrates by De-Aerating Froth Products C24040 University of Queensland Yongjun Peng	213,600	Alvaro Diaz Lema, Glencore Frank Mercuri, Anglo American Michael Young, Glencore	Increased salinity in mine water is causing froth handling problems in downstream processes. In this project a model will be developed to predict froth stability and the moisture of dewatered flotation concentrates in saline mine water. Dewatering efficiency of fine flotation concentrates will be improved using de aerating froth products. A laboratory scale de aeration froth column with foam destroyers will be designed, fabricated, tested and optimised. Physical and chemical pre treatments will be combined to minimise energy consumption and reagent cost while maximising the dewatering efficiency.
Current	Steam Pressure Filtration Targeting Step Change Reductions in Filtercake Product Moistures C24047 QCC Resources Andrew Swanson	297,049	Ryan Flanagan, Glencore Frank Mercuri, Anglo American	The principle of using laser diffraction as a means of measuring a volume size distribution in slurry is well established. The coal industry has not yet adopted routine online particle size analysis for any process unit operations. This project will introduce online particle size monitoring as a tool in optimising fine coal recovery. It will assess whether the SPI500i device can produce accurate and reliable data on the size distribution of solids in fine coal slurries within coal preparation circuits.
Current	Thickener Underflow Monitor C24048 Clean Process Technologies	195,000	Phillip Enderby, Glencore Justin O'Neill, Peabody Energy Australia	Dewatering fine tailings material is becoming an important component of the coal mining process, particularly given the challenges around constructing, managing and rehabilitating tailings dams. This project will develop an instrument that is capable of accurately and reliably measuring the quality of the thickener underflow in an operating coal preparation plant environment. The instrument will measure the solids and water loadings and the dynamic and kinematic viscosity of tailings slurry which are not currently reliably
	Noel Lambert			nline. This information will enable the thickener and downstream processes to be optimised.

COAL PI	REPARATION			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
New	Optimising the Performance of Solid Bowl Centrifuge for Tailing Dewatering C25010	125,560	Ryan Flanagan, Glencore Michael Young, Glencore	Dewatering ultrafine tailings is capital and energy intensive. Regulators are increasing environmental and water conservational requirements for tailings dams. Rix's Creek coal washery has trialled the use of a solid bowl centrifuge for tailings dewatering,
	University of Newcastle Rohan Stanger			and operational performance of the installed solid bowl centrifuge. The intention is to identify optimal and problematic feed materials and investigate the fundamental reasons for the changes in processing.
New	Dewatering of Ultrafine Coals and Tailings by Centrifugation: Pilot Scale Studies C25012	220,000	Michael Young, Glencore Naomi Pritchard, BMA	Dewatering of ultrafine coal products is difficult and costly. The current dewatering processes for fine coals are also not efficient for moisture reduction and solid recovery. This project will investigate the feasibility of the high g centrifugal decanters in dewatering fine coals and tailings from Australian mines at pilot scale and compare the results from full scale work undertaken by Somerset
	University of Queensland Anh Nguyen			International Australian and its industry partners.
New	Improving Solids Recovery and Moisture Reduction in Ultrafine Coal Dewatering C25018	184,000	Justin O'Neill, Peabody Energy Australia Michael Young, Glencore	Wet processes are predominantly used in coal preparation plants to remove mineral matter from raw coals. Recovery of high quality coals in fine and ultrafine fractions is one of the challenges faced by Australian coal producers. However, the processes used to dewater ultrafine coals are inefficient in terms of moisture reduction and/or solids recovery. This project will improve ultrafine coal dewater ultrafine coals on particle size particular is an analyzed of the dewater ultrafine coal by a solid structure and the solid structure and the face ultrafine coal dewater ultrafine coals are inefficient in terms of moisture reduction and/or solids recovery. This project will improve ultrafine coal dewater ultrafine coals are inefficient in terms of moisture reductions of the solid structure and for the solid structure and the solid structu
	University of Queensland Liguang Wang			coal particles to improve the solids recovery of SBCs. Researchers will examine the potential of the selected chemical reagents for dewatering particles of different surface properties and size ranges and explore how operating variables affect the dewatering efficiency and operating cost.
Environm	ental Improvement			
Current	Improved Dewatering, Management and Rehabilitation of Problematic, Clay Rich Coal Mine Tailings C20047	228,000	Rahul Patel, Peabody Energy Australia Dave Osborne, ACARP	Clay rich coal mine tailings are difficult to process, manage and rehabilitate. As a result large tailings storage areas are commonly required for surface disposal. This project undertook a systematic review and assessment of current and emerging technologies and options for the dewatering, management and rehabilitation of problematic, clay rich coal mine tailings and the associated water, with
	University of Queensland David Williams Stuart Whitton			the aim of optimising failings dewatering, management and achieving lease surrender. It focused on alternatives and enhancements to existing mechanical dewatering methods for treating clay rich tailings and also methods for improving tailings disposal management and stabilising the deposited tailings material.
New	Test Procedures to Achieve More Cost Effective Minimisation of Coal Dust Emission During Rail Transport C25006	40,000	John Watson, Glencore Stuart Ritchie, Rio Tinto	In Queensland, surface veneer chemical solution is applied to the surface of coal in rail wagons prior to departure from mine sites to minimise coal dust emissions during rail transport from mine to port. However the existing test procedures are focused on the worst case scenario. This project will refine wind tunnel test procedures, resulting in more cost effective coal surface treatment options, while
	Introspec Marketing Services John Planner			still achieving effective dust management.
Fine Coal				
Current	Full Scale Trial of the Reflux Classifier to at Least 4mm Top-Size C19001	185,200	Tom Wilson, Anglo American	In this project a full scale reflux classifier is undergoing a plant trial at the Bloomfield coal preparation plant near Newcastle to investigate the separation efficiency for 0.25 to 4mm particle size feed and to determine the limits on the solids throughput. It is investigation that a value the separation efficiency for 0.25 to 4mm particle size feed and to determine the limits on the solids throughput. It is
	University of Newcastle Kevin Galvin		Kevin Rowe, Glencore	investigating the extent to which previous work conducted during the pilot can be scaled up.

COAL PI	OAL PREPARATION				
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW	
Current	Enhanced Flotation and Desliming Using a Reflux Flotation Cell C20043 University of Newcastle Kevin Galvin	229,100	Tom Wilson, Anglo American Phillip Enderby, Glencore Kevin Rowe, Glencore	The project addressed the major problem that exists in many NSW coal operations in recovering fine coal by providing a powerful method for rejecting slimes from a flotation froth product. With the improved desliming performance there will also be significant benefits for producing higher yield of metallurgical coal, at a given ash, and the benefits could also be extended to include beneficiation of ultra low ash coal. This project investigated the potential to achieve improved fine coal flotation performance and significant desliming using a device that resembles an inverted reflux classifier.	
Current	Full Scale Gravity-Desliming Using Cascading Reflux Classifiers C20052 University of Newcastle Kevin Galvin	215,480	Kevin Rowe, Glencore Tom Wilson, Anglo American	This project addresses a major problem found in many NSW coal operations when recovering and desliming fine coal, and also in producing metallurgical coal, at a given ash. The objective is to investigate the performance of cascading reflux classifiers in the gravity separation and desliming of fine coal at full-scale, and in turn assess the scale-up achieved. This work will provide the information needed to assess whether this new approach for producing a clean fine coal product can be achieved at the same level of performance as observed in the laboratory or at pilot scale. The potential for recovering a further 3% yield could lead to significant additional mine revenue.	
Current	Maximising Flotation Kinetics C21049 University of Newcastle Kevin Galvin	179,100	Paul Revell, Anglo American Dion Lucke, Rio Tinto Technology & Innovation	This project investigated the potential to maximise flotation kinetics by a factor of between 10 and 100-fold. With the increased kinetics it should be possible to use a relatively small device to process dilute feeds (such as cyclone overflows) and concentrate the product by a factor of 5 to 10-fold. This concentrated feed would then be sent at a greatly reduced flow rate to conventional flotation cells to achieve the required level of product upgrade, reducing the very significant capital investment by more than five-fold. This work was undertaken using an inverted reflux classifier that incorporated a novel feed downcomer consisting of parallel, closely spaced channels and a lower system of parallel inclined plates to prevent bubble loss to tailings.	
Current	Generalised Model of the Reflux Classifier using Computer Simulations Based on the Discrete Element Method (DEM) C22030 University of Newcastle Kevin Galvin	103,700	Kevin Rowe, Glencore	The Reflux Classifier offers lower composite Ep values than other technologies, providing potential to control the cut point down to the low levels required for metallurgical coal product. A new computational model of the Reflux Classifier will be developed to quantify partition curves and associated EP and D50 values across the relevant size range. As a result of this work, plant personnel will be able to determine the best place to insert pressure transducers for measuring and controlling the system.	
Current	Measurement and Control of the Reflux Classifier C22032 University of Newcastle Kevin Galvin	132,730	Kevin Rowe, Glencore	A pilot scale study of the Reflux Classifier will be carried out to establish the best way to operate and control the separator. Ludowici Australia will provide a new RC300 fitted with six pressure transducers, with the potential to record the full bed profile in real time, together with the response of the PID controller. A basis for properly measuring and interpreting the suspension density measurements of the lower bed and, in turn, a generalised approach to ensuring optimal underflow control will be established.	
Current	Comparison of Column and Mechanical Flotation Technologies C23034 BA Firth Bruce Firth	27,250	Frank Mercuri, Anglo American Justin O'Neill, Peabody Energy Australia Dave Osborne, ACARP	A comparison of the effectiveness of column and mechanical flotation technologies was undertaken in this project to determine the best technology for fine coal processing, including the possibility of mixing the two technologies. The comprehensive final report provides a set of conclusions that could guide the industry in technology selection, and a set of flotation project recommendations with clearly defined objectives which could be adopted by suitable research groups.	
Current	Improved Flotation Recovery and Reduced Cost Via Adjusting Frother Chemistry and Froth Behaviour C23035 University of Queensland Liguang Wang	129,000	Rebecca Fleming, Rio Tinto Michael Young, Glencore	Coal flotation practice is expensive. A promising approach to reducing flotation costs is to use more effective chemical reagents, especially non ionic surfactants (frothers). This project is demonstrating the effectiveness of a novel frother for improving coal flotation performance and reducing reagent cost. A technique to measure the concentration of residual frother in process water is being developed and a real time diagnostic tool for maximising the separation efficiency of coal flotation will be evaluated.	

COAL PI	JOAL PREPARATION				
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW	
Current	New Approach to Coarse Coal Flotation C23036 University of Newcastle Kevin Galvin	141,457	Tom Wilson, Anglo American Phillip Enderby, Glencore Kevin Rowe, Glencore	There are significant coal losses from flotation due to oversized particles entering the flotation circuit by passing through worn screens and via the cyclone overflow. Conventional flotation fails to recover a significant fraction of these coarse particles. This laboratory scale project is providing an understanding of the coarse particle (up to two millimetres) flotation mechanism and the precise conditions required to succeed. The introduction of robust flotation technology could deliver an increase in plant yield of up to two per cent.	
Current	Improving the Treatment of Clay Minerals in Coal Flotation in Saline Water - Plant Tests C23038 University of Queensland Yongjun Peng	253,176	Tom Wilson, Anglo American Michael Young, Glencore	Clay minerals commonly occur in coal deposits and decrease the combustible recovery in flotation while deteriorating the product quality. Flotation of high clay coal is currently not possible. Methodologies to mitigate deleterious effects from clay minerals were developed in a previous project and will be tested during plant trials at Oaky Creek and Peak Downs mines. The trials will provide the process information needed to specify and design the implementation in a full scale plant, and provide opportunities to study, define and optimise parameters that cannot be properly studied at a laboratory scale, such as the change of coal and water quality, recycle of reagents and the impact of downstream processes. The trials will also provide mine personnel who will commission future full scale plants with operating experience and training.	
Current	Characterisation and Flotation of Oxidised Coal C23039 University of Queensland Yongjun Peng	168,600	Frank Mercuri, Anglo American Michael Young, Glencore	A previous project clearly demonstrated that x-ray photoelectron spectroscopy (XPS) could be used to detect and quantify the non oxidised and oxidised areas on the coal surface, and new technologies could be developed to improve the flotation of coal with surface oxidation. In this project, a rigorous methodology is being developed using XPS to determine non oxidised and oxidised surfaces on coal obtained from different pits, stockpiles and flotation feeds, rejects and products. An oxidation index will also be developed to predict coal flotation behaviour.	
Current	Improvement of Hydrodynamic Behaviours in Large Coal Flotation Cells C23044 CSIRO Shenggen Hu	194,865	Frank Mercuri, Anglo American Paul Revell, Anglo American	The objective of this project was to improve the hydrodynamic behaviours of Microcel columns and Jameson cells by designing and constructing simple and cost effective modifications to reduce undesirable hydrodynamic behaviours. The performance of modifications concepts for Jameson cells was evaluated in laboratory scale tests and plant based experiments were carried out to determine the effectiveness of modifications on Microcel columns. The low cost modifications should also improve product yield and flotation plant capacity, and enhance the understanding of the hydrodynamic characteristics of large flotation cells.	
Current	Impact of Sub Optimal Operation C24039 BA Firth Bruce Firth	32,000	Dion Lucke, Rio Tinto Technology & Innovation Ryan Flanagan, Glencore	Although some research has been undertaken on the sub optimal operation of coal preparation plants and unplanned downtime, variation in the approaches used makes it difficult to compare the outcomes. There has also been little recognition of the importance of run of mine washability in this work. Following a comprehensive literature review, the project will develop a methodology for codifying poor operation situations and unplanned downtime events. Case studies will be used to quantify the impact of the poor operation and run of mine washability.	
Current	Improving Coal Flotation With Oscillatory Air Supply C24041 University of Queensland Liguang Wang	108,000	Frank Mercuri, Anglo American Diego Dal'Molin, Rio Tinto Coal Australia Kevin Rowe, Glencore Michael Young, Glencore	Ultrafine and fine coal flotation can be considerably improved by microbubbles. A recent research breakthrough shows that microbubbles smaller than 100µm can be cheaply generated from oscillatory air flow. This project will improve coal flotation performance and reduce operating costs by installing a cheap and compact device to supply oscillatory air flow to existing flotation cells. The outcome of this work will be improved flotation performance, reduced frother dosage and decreased energy consumption.	
Current	Pilot Scale Study of Fast Flotation C24042 University of Newcastle Kevin Galvin	95,180	Kevin Rowe, Glencore Ryan Flanagan, Glencore	Until recently, processing high value coal from tailings dams has been considered uneconomic. This project will establish a low capital cost solution for reducing the volume of fine waste sent to tailings and generating a high value product. The aim of the project is to develop a small, compact two stage flotation system capable of generating a clean coal product from the cyclone overflow.	

COAL PI	REPARATION			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Simultaneous Gravity Separation and Desliming of Fine Coal - A Novel Concept C24043	141,380	Tom Wilson, Anglo American Alvaro Diaz Lema, Glencore	Flotation currently provides only a single stage option for achieving simultaneous gravity separation and desliming of fine coal in the one vessel. In this project a Reflux Classifier will be inverted. The gangue and slimes will be rejected together via a more dilute underflow, leaving behind a clean coal product that emerges as a concentrated overflow. This innovation will allow the plant to recover
	University of Newcastle Kevin Galvin			much finer coal without the need for flotation. This laboratory scale work will provide the basis for a commercialisation pathway via additional programs at pilot and full scale.
Current	Adaptation of Coal Grain Analysis to Improve Yield Estimation C24045	120,456	Dion Lucke, Rio Tinto Technology & Innovation	Predicting flotation yield and concentrate quality based on resource samples in coal preparation plants has been challenging. This project aims to find an accurate measure of the true flotability of fines in the resource. To achieve this the CSIRO coal grain analysis
	QCC Resources		Michael Young, Glencore	analysed and practical flotation model parameters for each grain type generated. The work should provide sufficient information to
	Andrew Swanson Bruce Atkinson			differentiate grain response to dose rate.
Current	Online Particle Size Monitoring in Coal Preparation C24046	168,570	Phillip Enderby, Glencore Rebecca Fleming, Rio Tinto	Pressure filtration is an effective technique for improving dewatering of fine coals; however it has high capital costs, complicated structure and significant operating costs. A pilot scale testing program will be undertaken to confirm that high pressure air filtration
	QCC Resources Brad Garraway		supplemented with steam can achieve the dewatering the filter cake moisture and filtration rate based on the operating process variables. A key outcome of this work New South Wales thermal coal operations for the succe	supplemented with steam can achieve the dewatering potential indicated by earlier work. Guidelines will be developed for predicting the filter cake moisture and filtration rate based on the filter feed coal quality using the established operating ranges for the various operating process variables. A key outcome of this work will be the prediction of potential increases in recovery and sales revenue in New South Wales thermal coal operations for the successful implementation of this technology.



COAL PI	OAL PREPARATION				
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW	
Current	Performance Enhanced Diesel Collector for Coal Flotation C24049 CSIRO Shenggen Hu	148,013	Clinton Vanderkruk, Anglo American Alvaro Diaz Lema, Glencore	The natural hydrophobicity of coal in flotation is usually enhanced by adding oily collectors, such as diesel, which is an expensive process. Technologies are needed to reduce the consumption of the diesel oil collector while maintaining good flotation performance and reducing treatment costs. This project will validate the performance enhanced diesel collector at preparation plant scale, which is expected to increase recovery of coarser and fine coal particles and improve flotation yield of low to middle rank coals by up to 20%.	
New	3D Flotation of Fine Coal C25008 University of Newcastle Kevin Galvin	185,260	Ryan Flanagan, Glencore Tom Wilson, Anglo American	Fine coal beneficiation could be achieved using a single stage separation device up to 1000 times faster than conventional flotation. This novel 3D flotation technology shears the feed and binder through an orifice plate, producing buoyant agglomerates that separate from the coarser portion of the gangue. This allows the product to be recovered and washed over a screen then mechanically dewatered. In this project a laboratory pilot scale trial will be conducted to assess the separation performance across a range of coals.	
New	Rapid Extraction of Frothers from Process Water C25009 University of Newcastle James Dickinson	122,965	Frank Mercuri, Anglo American Kevin Rowe, Glencore Alvaro Diaz Lema, Glencore	The concentration of frother used in froth flotation is ideally selected to maximise the recovery of the coal. However, residual frother remaining in the process water results in downstream frothing issues. Consequently compromises are often sought in the amount of frother used to avoid downstream frothing issues at the expense of flotation circuit performance and a significant loss in fine coal yield. This project will investigate the frother extraction rate achievable using a laboratory reflux flotation cell, aiming to achieve extraction rates up to 10 times higher than achieved by existing technology.	
New	Evaluation of Residual Frother Minimisation Strategies C25013 CSIRO Philip Ofori	167,714	Justin O'Neill, Peabody Energy Australia Frank Mercuri, Anglo American	The Australian coal industry has experienced persistent problems associated with residual frother induced frothing in other parts of the plant. A number of solutions have been suggested and, in some cases, applied to minimise frothing caused by residual frother. This project will quantify the effectiveness of methodologies to mitigate excess frothing in coal preparation plants and further develop a portable frother detector that can be used to determine frother distribution in process and recycle streams.	
New	Plant Scale Testing of Safe Aerosol Frother Addition to Reduce Residual Frother and Reagent Costs C25014 CSIRO Philip Ofori	165,582	Justin O'Neill, Peabody Energy Australia Alvaro Diaz Lema, Glencore	Frother addition in coal flotation is essential for the formation of a sufficient number of stable bubbles to maximise bubble surface area to carry the hydrophobic particles to the froth zone. The presence of high levels of residual frother causes major operational issues and down time. Adding the frother to the gas phase as an aerosol to enable the frother molecules to more effectively concentrate at the interfaces being created could reduce the frother demand and residual frother in process water. This project will examine the implementation methodology and effectiveness of this approach in a large scale Jameson cell at a mine site.	
New	Leveraging Detailed Maceral Component Information from CGA C25017 QCC Resources Bruce Atkinson Karryn Warren	71,696	Michael Young, Glencore Dion Lucke, Rio Tinto Technology & Innovation Justin O'Neill, Peabody Energy Australia	Coal grain analysis (CGA) is an extremely attractive method for characterising coal. It provides an absolute measure of coal matter types and mineral matter on a particulate basis, which allows particle types to be classified by density, as well as their degree of 'compositeness' or heterogeneity. This project will further develop the software so component maceral and mineral sizes for each grain size can be determined. This will enable a more fundamental characterisation of the coal and mineral matter in each particle size and grain class, and will provide direct information on the liberation potential from any specific particle size. This project will further develop the CGA coal characterisation imaging software so that information may be generated as a matter of routine.	
New	Flotation Tailings Online Measurement C25020 A & B Mylec Todd McDonald	45,200	Naomi Pritchard, BMA Alvaro Diaz Lema, Glencore	Laboratory ash results are generally seen as the best method to monitor coal flotation performance. Due to the time lag between the acquisition of the samples and the reported analysis, there is the potential for further loss of flotation performance. In addition, it is often difficult to adjust flotation performance parameters to fully evaluate their impact on the performance of the circuit. This project will provide a proof of concept evaluation of a MPOF2 optical ash meter in providing an instantaneous indication of the flotation tailings stream.	

COAL PI	COAL PREPARATION				
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW	
New	Coarse Particle Flotation for the Plant of the Future C25021 University of Newcastle Graeme Jameson	148,169	Clinton Vanderkruk, Anglo American Michael Young, Glencore	Graeme Jameson's NovaCell is a new type of flotation machine in which particles are recovered in a fluidised bed. Although developed to process base metal sulphides, which are impossible to float in existing technologies, coal from a Hunter Valley operation was successfully processed in 2015. This project will determine the maximum size at which coal particles can be recovered in the NovaCell operated in continuous mode. Feed samples will be sourced from the Bulga coal preparation plant.	
Gravity S	eparation				
Current	CPP Feed Washability Prediction from Small Topsize Samples C18041 QCC Resources Andrew Swanson	737,688	Ryan Flanagan, Glencore Dion Lucke, Rio Tinto Technology & Innovation	Preliminary research has shown that it is possible to totally change the way in which coal is characterised for a wide range of purposes, including washability prediction, using coal grain analysis. Coal gain analysis will be evaluated to determine whether it can predict washabilities of different coal sections (different seam/plies) based on full characterisation of a shallower or deeper ply by using further samples from a large diameter borecore testing program.	
Current	Linkage of Dynamic Changes in DMC Circuits to Plant Conditions C20050 CSIRO Mike O'Brien Peter Holtham	492,502	Ryan Flanagan, Glencore Frank Mercuri, Anglo American	DMC circuits are responsible for producing more than \$25 billion of product coal in Australia. The link between the process dynamics of a DMC circuit and prevailing plant operation has been the subject of previous research. C17037 led to a number of new online monitoring devices incorporated into the host mine's DMC circuit. In this extension project, a better management approach will be defined to mitigate the dynamic impacts of the mining and preparation processes on plant efficiency. The significant research findings will be detailed in a handbook, including potential remedial actions. 'The Intelligent Plant' diagnostic system will also be updated.	
Current	Monitoring and Prediction of Catastrophic Multi Sloped Screen Failures C21053 CSIRO Mike O'Brien	260,024	Phillip Enderby, Glencore Clinton Vanderkruk, Anglo American	Multi sloped (banana) screens are commonly used in Australian coal preparation plants for desliming and drain and rinse applications. While these screens have gained widespread acceptance, they are susceptible to mechanical failure. With the current trend for increasing the capacity and size of these screens, the potential for damage should one fail is high. This project is determining the mechanism of failure. It will trial numerous non-destructive testing techniques such as vibration monitoring, pressure monitoring, acoustic monitoring, strain gauges and a novel technique based on research at Monash University to measure the cyclic deformation. It is the cyclic nature of the force that can cause irreversible dislocations at the surface of the material, leading to deformation structures that can initiate the catastrophic failure.	
Current	Investigation of the Graviton Separator at Pilot Scale C22031 University of Newcastle Kevin Galvin	271,120	Kevin Rowe, Glencore	This project will develop a continuous steady state separator consisting of Reflux Classifiers located within a centrifuge. This device, known as the Graviton, will be developed and investigated. This technology could replace flotation and provide new options for desliming, eliminating the need for flotation reagents.	
Current	Affect of G Force on Banana Screen Efficiency C23037 CSIRO Mike O'Brien	36,200	Phillip Enderby, Glencore Justin O'Neill, Peabody Energy Australia	Large, multi sloped screens, particularly screens over four metres in width, are subject to failure. The time between failures and the extent of the failure depends on the screen duty and use. This project is determining the effect of reducing the G force on the performance of a large, multi slope banana screen. If successful, the resulting reduction in force may influence the frequency of screen failures and extend the life of screen components and support structures.	
Current	Economic Effect of Low Non Magnetic Material in Correct Medium C23046 CSIRO Mike O'Brien	60,652	Phillip Enderby, Glencore Penny Walker, Bengalla Frank Mercuri, Anglo American	The amount of non magnetic material in the correct medium is an important variable that affects the efficient operation of the dense medium cyclone at low correct medium densities. This project is providing coal producers with detailed cost estimates of low, non magnetic material in the correct medium over a broad range of coal washabilities and plant operating procedures as a result of stoppages or control strategies.	

2015 PEOPLE AND PROJECTS REPORT

COAL PI	REPARATION			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	RFID Residence Time Modelling C24044 CSIRO Mike O'Brien Nerrida Scott	29,155	Rebecca Fleming, Rio Tinto Justin O'Neill, Peabody Energy Australia	Dynamic modelling of dense medium circuits (DMCs) requires collection of information to determine residence times in various parts of the circuits. This project will further develop the hypothesis that density of coarse particles influences the residence times in the DMC and that different sized tracer particles produce discrepancies in partitioning efficiency. Residence time measurements of plant extremities will also be undertaken. The outcome will be better dynamic model verification tools to determine DMC and coal circuit behaviour.
Current	Options for the Addition and Control of Non Magnetic Material in Correct Medium C24050 CSIRO Mike O'Brien	205,490	Clinton Vanderkruk, Anglo American Justin O'Neill, Peabody Energy Australia	When operating at correct medium densities, the amount of non magnetic material in the dense medium cyclone (DMC) significantly affects its operational efficiency. Because the quantity of non magnetic material is not monitored, plant operators may be unaware of the negative impacts for several hours. This project will investigate various options for controlling the level of this material, including new pipework to enable material from the thickener underflow to be added and a distributor from the magnetic separator to divert the water containing clays to the correct medium sump. A standard operating procedure will also be developed. This project will reduce the amount of coal lost from inefficient operation due to changes in medium quality.
Current	Effect of Particle Crowding at the Vortex Finder and Spigot on Cyclone Operation C24051 CSIRO Mike O'Brien	145,255	Alvaro Diaz Lema, Glencore Frank Mercuri, Anglo American	The medium to coal ratio, the density of the medium in the underflow and the volumetric amount of particle exiting the dense medium cyclone (DMC) via the vortex finder contribute to particle crowding in the cyclone and this affects medium stability. This project will quantify the changes in DMC operational conditions with respect to particle crowding of the vortex finder and spigot. The outcomes have the potential to improve DMC management and increase saleable coal.
New	Pilot Plant Scale Testing of Modified Downcomer in Jameson Cell C25015 CSIRO Shenggen Hu	184,149	Frank Mercuri, Anglo American Michael Young, Glencore	Jameson cell technology is the most commonly used coal flotation cell technology in Australia. Short circuiting between the downcomer and the tailings exits can occur in the Jameson cell due to fast and intensive mixing. In order to minimise the detachment caused by the high shear stress and reduce the 'short circuiting' to the tailings exit, the downcomer was modified in a small pilot scale Jameson cell. This project will carry out large, pilot scale investigations of the modified downcomer at a mine site for a comprehensive assessment of improved combustibles recovery and scalability.
New	G Force Reduction and Failure Monitoring of Multi-sloped Screens C25016 CSIRO Mike O'Brien	190,282	Phillip Enderby, Glencore Clinton Vanderkruk, Anglo American	Multi slope screen failures are a significant issue in the coal industry and seem to be increasing with larger screen sizes. These failures result in lost production, damage to screen components and supports, and may pose a serious safety risk following a catastrophic failure. This project will demonstrate the long term effects of reducing the g forces on desliming and drain and rinse screens on screening efficiency and SDRs. It will also show the long term viability of monitoring screens for potential failures and provide long term records of the screens' operation, movement and failure indicators.
Process C	ontrol			
Current	Advanced Control and Optimisation of DMC Operation C22033 CSIRO Shenggen Hu	236,685	Tom Wilson, Anglo American Rahul Patel, Peabody Energy Australia	The goal of an effective dense medium cyclone (DMC) is to select operating conditions that will maximise the plant to a quality constraint imposed by customer's specifications or overall plant performance. Theoretical analysis shows that the total yield from a coal preparation plant may be maximised by operating all parallel unit operations at a constant incremental ash. The objective of this project is to develop, implement and demonstrate an advanced control system that optimises DMC operating conditions under which a target product ash and/or a given incremental ash can be achieved.
New	Effect of Flotation Water Chemistry on Coal Chemistry, Fluidity and Coke Quality C25011 University of New South Wales Noel Lambert, Seher Ata	150,000	Michael Young, Glencore Rebecca Fleming, Rio Tinto	Metallurgical coals are usually washed prior to use and this consumes huge volumes of water. Replacing fresh water with recycled water, dam water, or saline water can impact coal composition, coal fluidity, and ultimately the coke quality due to the presence of inorganic compounds. This project will determine the impact of the chemical composition of process water on the modification of coal compositions and the subsequent implications on coal fluidity and coke quality.

COAL P	REPARATION			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
General				
Current	Database Management C15060 QCC Resources Andrew Swanson Bruce Atkinson	280,416	Phillip Enderby, Glencore	This database provides a singular reference for coal preparation equipment performance data, which encompasses all unit operations including sizing and dewatering. It is accessible to all Australian coal industry personnel, associated consultants and researchers.
Current	Impact of Sample Preparation Procedure on CGA Result C23042 QCC Resources Bruce Atkinson	35,202	Dion Lucke, Rio Tinto Technology & Innovation	Different laboratories use different forms of grinding mills and the concept of generating minimum fines is operator dependent. This project evaluated whether the variability of sample preparation have an impact on coal grain analysis data. Researchers assessed the different methods of sample preparation typically employed by commercial laboratories to identify any impact on coal grain analysis in terms of the coal grain maceral and mineral distribution, assessed different means of sample preparation to identify any impact on grain size distribution, and provided a recommendation for sample preparation methods for subsequent coal grain analysis testing, if any material impact is identified.
Current	Product Coal Loss Due to Inappropriate Focus on Ep C23043 QCC Resources Bruce Atkinson	29,836	Dion Lucke, Rio Tinto Technology & Innovation	The coal preparation fraternity is used to focussing on Ep(75/25) values when people consider separation equipment performance. However, Ep only describes a small part of the picture, and in many cases the Ep value is completely irrelevant or even misleading. The Ep value has little to no impact on the misplaced material as is highlighted by the partition curves. The amount of misplaced material is dominated by the 'tails' of the partition curve, which provide details of bypassed material. The low density tail is the 'ultimate' quantity of misplaced low RD material, and the high density tail is the 'ultimate' quantity of contamination by sinks material in the product. This project provided a more practical definition for the curve tails, such that t0 and t1 are left solely as curve fit parameters. The outcomes provide a means for all data assessors to calculate the information uniformly and by a means that has physical significance.
Current	Application of ACARP DMC R&D between CSIRO and JKMRC C24052 CSIRO Mike O'Brien	43,415	Dion Lucke, Rio Tinto Technology & Innovation Kevin Rowe, Glencore	A significant body of research has been undertaken on DMC instrumentation, DMC online yield determination, medium quality, effect of non magnetics, drain and rinse screens, online washability prediction and medium stability issues. The project synthesised this knowledge and developed a seminar for plant operators, engineers and other stakeholders and produced a printed set of proceedings, which includes case studies.
New	Derrick Stack Sizer In Plant Evaluation C25007 WPE Process Equipment Brian Packer Darren Mathewson	150,800	Rebecca Fleming, Rio Tinto Naomi Pritchard, BMA	Millions of tonnes of saleable quality, ultrafine coal are discarded from preparation plants into tailings dams along with the high ash slimes material. Based purely on the principle of size classification, the Derrick Stack Sizer is a small footprint, high capacity technology capable of recovering coal from fine waste streams and reducing the ash value of existing fine product streams. There are no Derrick stack sizers installed in Australian plants. Trials will be conducted at three preparation plants to assess the benefits of Derrick stack sizers aronge of site specific circumstances.

COAL PREPARATION

STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
New	Adaptation of Coal Grain Analysis to Improve Yield Estimation: Ext C24045 C25019	165,584	Michael Young, Glencore Dion Lucke, Rio Tinto Technology & Innovation	e A major problem with coal preparation plant yield prediction is how to accurately predict flotation yield. Previous research has demonstrated that the flotation response can be related to the grain types. This project will assess up to six full scale flotation circu in order to analyse what is occurring at a fundamental level using coal grain analysis. Practical flotation model parameters will be generated for each grain type. If the flotation response for each grain type differs by rank, researchers will relate the flotation model parameters will be generated for each grain type.
	QCC Resources Bruce Atkinson			to coal rank.
New	Coal Preparation Promotional Tour 2016 C25022	79,000	Coal Preparation Committee	This project incorporates an international biennial tour of coal preparation plants and meetings with plant process managers and engineers to disseminate the results of coal preparation research funded by ACARP. The tour is also used to identify key achievements
	Petan Enterprises Peter Newling			in coal preparation around the world and promote the role ACARP plays as the biggest supporter of coal research in Australia.



TECHNICAL MARKET SUPPORT PROJECTS

Understanding the properties of Australian coals which impact on market acceptance and value in use is a major goal for research, particularly where they 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, both domestically and internationally.

COMMITTEE MEMBERS

Kim Hockings	Technical Specialist (Co-Chair)	BHP Billiton Coal
Chris Stanford	Manager Technical Marketing (Co-Chair)	Peabody Energy
Nick Andriopoulos	Technical Marketing Specialist	Anglo American
Morgan Blake	General Marketing Manager	Peabody Coal Sales Australia
Stephen Brant	Technical Specialist	BHP Billiton Coal
Jeremy Byrnes	Logistics Superintendent	Glencore
Ashley Conroy	Group Advisor – Coal Technology and Marketing Operations	Rio Tinto Copper & Coal
Phil David	Acting Executive General Manager Production	Stanwell
Andrew Fikkers		Glencore
Sean Flanagan	Manager, Coal Technology	Wesfarmers Curragh
Graeme Harris	Principal Coal Technologist	Rio Tinto Energy
Tim Manton	Manager Coal Quality & Utilisation	South32 Illawarra Coal
Greg Wickman	Marketing Manager	New Hope Group
Michael Young	Principal Metallurgist – Minerals Processing	Glencore

FUNDING APPROVED 2015

	No of Projects	ACARP Funding	Total Funding
2015	13	\$1,697,363	\$3,018,880
2014	12	\$3,701,459	\$4,564,325
2013	12	\$1,409,979	\$1,969,933

CATEGORY	No of Projects	ACARP Funding
Major Projects	3	\$2,888,325
Metallurgical Coal	16	\$2,883,450
General	4	\$984,968



TECHNIC	ECHNICAL MARKET SUPPORT				
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW	
Major Pro	jects				
Current	Transportable Moisture Limits for Coal: Stage 1 C22040 CSIRO David McCallum Ken Williams Ralph Holmes	703,625	Transportable Moisture Limit Steering Group	There are three methods available for measuring transportable moisture limit as specified in the International Maritime Solid Bulk Cargoes Code. Depending on its classification under the code, cargoes that may liquefy must specify a transportable moisture limit and an assurance provided that the moisture content for the cargo is below its specified transportable moisture limit. This project sought to better understand the conditions under which liquefaction may occur as well as the suitability and/or relative performance of current methods for measuring transportable moisture limit, including investigation of alternative test methods if none of the current methods prove to be suitable.	
Current	Transportable Moisture Limits for Coal: Stage 2 C24001 University of Newcastle Ken Williams Tobias Krull	1,381,000	Transportable Moisture Limit Steering Group	In 2014, this project delivered a modified test method for measuring the transportable moisture limit for coal products. This work was undertaken in response to amendments to the International Maritime Organisations International Maritime Solid Bulk Cargoes (IMSBC) code. In December 2014, the test was approved for use by the Australian Maritime Safety Authority (AMSA), and the test published on the AMSA Cargoes website. (http://www.amsa.gov.au/vessels/ship-safety/cargoes-and-dangerous-goods/). The approval of this test method provides a scientifically proven method to ensure that global coal shipments continue to occur in a safe manner.	
Current & New	Transportable Moisture Limit Project - International Maritime Organisation Implementation Phase C24062 Goodwin Port Solutions Ash Goodwin	803,700 Current 250,100 new	Transportable Moisture Limit Steering Group	A modified test procedure has been developed to determine the transportable moisture limit for coal in accordance with the requirements of the International Maritime Organisation's International Maritime Solid Bulk Cargoes code. It was approved for use in Australia in December 2014 by the Australian Maritime Safety Authority (AMSA). This project extension will provide the necessary technical support to AMSA for the formal adoption of the method by International Maritime Organization in 2016 and 2017.	
Metallurg	ical Coal				
Current	Application of Optical and SEM Imaging to Characterise Cokes for Strength and Reactivity C18043 ALS Coal Lauren Johnson Philip Bennett	348,800	Graeme Harris, Rio Tinto Energy Kim Hockings, BHP Billiton Coal Tim Manton, South32 Illawarra Coal Dave Osborne, ACARP	Predicting the influence that coal properties have on coke properties (particularly microstructural and microtextual features) is critical to understanding the true value of coals. Using recent advances in microscopy and mathematical techniques to interpret complex images, an imaging system for coke has been developed which will assist in interpreting coke microstructure and microtexture. In this extension project these image analysis techniques will be applied to a larger range of cokes to ascertain if the parameters determined can relate to coke strength, in particular coke drum indices. The use of a robust coke imaging system will assist coking coal producers to identify the reasons why a certain coal has good cold or hot strength or why it has poor coking characteristics.	
Current	Quality of Stamp Charged Cokes and Stampability of Coals at Small Scale C22035 ALS Coal Lauren Johnson	114,530	Chris Stanford, Peabody Energy Sean Flanagan, Wesfarmers Curragh	Stamp charging of coals is widely used to improve the productivity and coke quality in coke making operations where poorer quality coking coals are prevalent as this type of technology affords increased flexibility in the coals that can be used within a blend. An important consideration for operators that make use of stamp charging is the stampability, which is defined as the amount of energy that is required to pack the coal to the target bulk density. The objectives of this project were to implement a standard procedure to determine the stampability of a coal or coal blend and demonstrate the use of stamp charging at small scale to investigate coals being considered for stamp charging operations.	

TECHNIC	CAL MARKET SUPPORT			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Implications of Coke Oven Testing Conditions C22039 ALS Coal Philip Bennett	217,766	Chris Stanford, Peabody Energy Graeme Harris, Rio Tinto Energy	Although small scale coke tests are being used increasingly as cheaper alternatives to pilot scale coke making, they are less able to make coke that has properties and quality similar to pilot or commercial cokes made from the same coal. If the coke making technique is not correctly optimised there is a risk that these tests may understate the coke strength after reaction (CSR) for Australian cokes compared with CSR from a pilot or battery coke. This project identified the critical factors that distinguish coke reactivity index (CRI)/CSR measurements of cokes made in small scale coke tests and developed a methodology that will allow Australian producers to better interpret CSR results on cokes produced under different coking conditions.
Current	Mechanistic Model for the Understanding of the Sole Heated Oven C23047 University of Newcastle David Jenkins Merrick Mahoney	169,000	Kim Hockings, BHP Billiton Coal Chris Stanford, Peabody Energy	Sole heated ovens are an important tool for understanding the coking behaviour of coals. Despite their widespread use, fundamental understanding of the processes driving the results of sole heated ovens is poor. This project aims to improve the understanding of the processes occurring in sole heated ovens and to use this information to improve knowledge of the behaviour of coal in the plastic state.
Current	Links Between Microstructure Development In Softening Coal and the Characteristics Controlling Coke Quality C23048 University of Queensland David Jenkins Karen Steel	241,885	Oliver Scholes, Vale International SA Nick Andriopoulos, Anglo American Chris Stanford, Peabody Energy	The fundamental mechanisms by which a particular coal or blend produces a strong coke is still largely unknown. This project obtained key insights into the microstructural features dictating coke strength and how those structures form. To achieve this goal the project combined micro computed tomography analysis and rheometry. The insights obtained are expected to help improve prediction models and to improve the strength of particular coals.
Current & New	Coke Analogue to Examine the Effect of Mineralogy on Coke Reactivity: Part 2 C23049 University of Wollongong Brian Monaghan	313,008 Current 156,300 New	Oliver Scholes, Vale International SA Tim Manton, South32 Illawarra Coal Kim Hockings, BHP Billiton Coal	The coke reactivity test (CRI/CSR) data are considered key metrics of a coke's quality as they correlates with blast furnace performance. It is desirable to predict the reactivity of coke from its key characteristics. Unfortunately this is, in part, limited by unknown or non quantified effects of coke minerals on the reactivity. The principal aim of this project is to understand the impact of mineralogy on the reactivity of metallurgical coke using a coke analogue material in a pseudo CRI test.
Current	Optical Image Analysis of Coke Structure and the Effects of Structural Parameters on Coke Strength C23051 CSIRO Eugene Donskoi Merrick Mahoney	147,416	Ashley Conroy, Rio Tinto Copper & Coal Oliver Scholes, Vale International SA	Understanding of the dependence of coke strength on its structure and the relationship of these structures to coal properties will help optimise coal blend formulation. This project applied novel structural and characterisation techniques to high resolution optical photomicrographs of coke to understand the dependence between coke strength, its structural characteristics and the parent coal blend. Combined with other research showing how coke structures develop during pyrolysis, this work could help develop projects leading to coke strength improvements, predictive models for use in blending studies and evaluation of coal resources.

TECHNI	CAL MARKET SUPPORT			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Extension of a Theoretically Based Coke Strength Index to Small Scale Coke Oven Samples and Adhesion Controlled Cokes C23056 ALS Coal Frank Shi Philip Bennett	126,100	Chris Stanford, Peabody Energy Oliver Scholes, Vale International SA Graeme Harris, Rio Tinto Energy	Small scale coke testing offers considerable savings in testing costs and is the only option when evaluating bore core samples. At present there is no coking strength test that can be conducted on limited quality of coke that shows reasonable correlation to standard drum tests that are routinely performed on pilot scale cokes. This project aims to address this issue by testing the applicability of the JKMRC breakage model to cokes that exhibit adhesion controlled breakage, extending the modelling of breakage to include coke produced in the small scale coke oven (8kg) where the strength of the coke is determined by the modified micum or the drum test, and recommending a suitable method for the preparation of coke Nippon Steel Corporation (NSC) reactivity test.
Current	Effect of Coke Reactivity Upon Coke Strength With Focus on Microstructure C24053 CSIRO David Jenkins Merrick Mahoney	161,032	Stephen Brant, BHP Billiton Coal Nick Andriopoulos, Anglo American Oliver Scholes, Vale International SA	The NSC developed coke strength after reaction (CSR) index is used as a key indicator of the suitability of a coke for use in blast furnace and is a key consideration in determining coal price. Producers need to understand how cokes made from their coals perform in the CSR test. This project will compare micro CT analysis of cokes before, during and after reaction in order to determine the key differences between them. As a result, researchers will be able to identify the components of microstructure which are most affected by the reactions.
Current	In-situ Study of the Plastic Layer Formation in Coking Coals using a Lab Scale Test Furnace C24054 University of Newcastle Jianglong Yu Merrick Mahoney	147,630	Chris Stanford, Peabody Energy Sean Flanagan, Wesfarmers Curragh Michael Young, Glencore Oliver Scholes, Vale International SA	The link between coal chemistry and the coking behaviour and carrying capacity of Australian coking coals and competing international coals is not well understood. An in situ investigation will be undertaken on the formation, migration and characteristics of the plastic layers of these coals during coking. The migration speed, temperature history and internal gas pressure of the plastic layer will be measured during coking.
Current	Physical and Chemical Interactions Occurring During Cokemaking and their Influence on Coke Strength C24055 University of Queensland Karen Steel Wei Xie	118,510	Graeme Harris, Rio Tinto Energy Nick Andriopoulos, Anglo American Oliver Scholes, Vale International SA	Interactions between components during coking – including components within an individual coal and components within a blend of coals – play a key role in coke strength development. The precise nature of these interactions is not known. This project will isolate the physical and chemical interactions, quantify them and determine which have an overriding influence on strength development. This work will provide new insights into poorly understood coke blend behaviour and identify new methods of exploiting the interactions to help optimise the use of Australian coals in cokemaking.
Current	Relationship Between Internal Pressure and Coke Strength and Implications For Semi Soft Coking Coals in Blends C24056 ALS Coal Karen Steel Philip Bennett	174,147	Stephen Brant, BHP Billiton Coal Nick Andriopoulos, Anglo American Morgan Blake, Peabody Coal Sales Australia Ashley Conroy, Rio Tinto Copper & Coal Oliver Scholes, Vale International SA	Coke is not necessarily a linear combination of the quality of the component coals. When the proportion of semi soft coking coal in the blend exceeds a certain level, there is a sudden drop off in tumble drum strength. The precise location of this sudden drop in coke quality and whether it occurs across all semi soft coking coals is not known. This project will develop a standardised approach to evaluating the contribution of coking coals in blends, which will result in better than linear coke strength behaviour and help reduce oven wall pressure.

TECHNIC	ECHNICAL MARKET SUPPORT						
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW			
Current	Estimating the Fusible Content of Individual Coal Grains and its Application in Cokemaking C24057 CSIRO David Jenkins Karryn Warren Merrick Mahoney	230,026	Kim Hockings, BHP Billiton Coal Nick Andriopoulos, Anglo American Oliver Scholes, Vale International SA	The link between coal grain composition of the coke oven feed and the final coke microstructure and coke strength is not well understood. This project will use enhanced coal grain analysis, the analysis of 3D microstructure of coke from computed tomography scanning and the analysis of fracture surfaces using fractographic techniques to explore these relationships. The outcomes of this work will be a better understanding of the sensitivities to inert grind for different coals, and how to use coal grain analysis to optimise the preparation of coal for coking and in the prediction of coke strength.			
Current	Microscopic Properties of Coal and Coke: Comparing Coal Grains with the Optical Properties of Coke and Determining their Relationship C24058 ALS Coal Bill Cash Philip Bennett	42,600	Kim Hockings, BHP Billiton Coal Stephen Brant, BHP Billiton Coal Oliver Scholes, Vale International SA	Variation in the fusibility of inertinite macerals and the heterogeneous nature of coal grains make it difficult to predict the relationship between coal petrographic analysis and coke microstructure. However, coal grain analysis (CGA) can quantify the heterogeneous nature of coal grains. This project will determine the relationship between CGA and coke microstructure to provide a reliable prediction method and determine whether this method could be used in a commercial laboratory. This information could be used by coal producers to recommend milling strategies to optimise coking performance.			



TECHNI	CAL MARKET SUPPORT			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Volatile Release During Pulverised Coal Injection as a Factor in Determining Combustibility C24059 University of Newcastle Liza Elliot Terry Wall	149,000	Nick Andriopoulos, Anglo American Chris Stanford, Peabody Energy Michael Young, Glencore Phil David, Stanwell	It is not clear why some low volatile coals have good combustion performance in the PCI process compared with other coals. This project will use coals previously studied in BHP Billiton Coal's PCI rig to determine the volatile released during pyrolysis at PCI heating rates in addition to whole coals and temperatures on maceral concentrates.
Current	Structural Differences Between Coking Coals of the Sydney Basin and Other Sources C24060 CSIRO Richard Sakurovs	182,000	Morgan Blake, Peabody Coal Sales Australia Kim Hockings, BHP Billiton Coal	Cokes made from Australian coals of relatively low fluidity can have better strength and reactivity values than their equivalent European or American coals with the same low fluidity. However, low fluidity remains an issue in contract negotiations for Australian coals, which are often penalised. This project aims to better predict the behaviour of cokes from their coal properties. Small angle scattering, gas sorption and release behaviour will be used to examine a range of coals and cokes to identify differences in their microstructure and gas transport characteristics.
New	Mechanistic Model of Coke Development in a Coke Oven Situation C25042 CSIRO David Jenkins Merrick Mahoney	159,105	Oliver Scholes, Vale International SA Kim Hockings, BHP Billiton Coal Graeme Harris, Rio Tinto Energy Chris Stanford, Peabody Energy	The standard approach to evaluate the potential of coals or blends to create good quality coke is to use laboratory tests (dilatometer, plastometers, sole heated ovens etc). However these tests have limitations. This project will combine the various approaches into a 'whole of oven' model with models of post re solidification shrinkage. The outcome of this work will be a model that measures of coke quality at macro scale, such as lump size prediction, as well as micro scale measures, such as pore structure.
New	Strength of Interfaces in Coke and its Influence on Coke Abrasion C25043 CSIRO Hannah Lomas Richard Sakurovs	120,410	Stephen Brant, BHP Billiton Coal Kim Hockings, BHP Billiton Coal	Tribology is the science and engineering of interacting surfaces in motion. Applying the method to coke is novel. Researchers have used tribology to better understand the strength and nature of the interfaces between different solid phase components and their impact on coke strength. In this project they aim to develop the ability to predict the nature of the bonding between inert and reactive maceral derived cokes from coal properties and then identify a path to improve coke strength prediction and its resistance to abrasion. This project will determine the impact of the differing wear mechanisms for the components coals, blends and specific vitrinite /inertinite rich fractions investigated for blend design on the ability to predict coke strength from the component coal/ maceral mix properties.
New	Assessment of In-situ High Temperature Strength of Cokes C25045 University of New South Wales Michael Drew Pramod Koshy	44,000	Nick Andriopoulos, Anglo American	Researchers believe the popular NSC type test may be underestimating the coking quality of at least some semi hard coals which tend to display high cold strengths. Cokes made from semi hard coals may display higher strengths in the high temperature zones of a blast furnace, compared with the strengths measured at relatively lower temperatures in popular tests. This project aims to test this hypothesis using unique high temperature facilities and to determine the in situ variations in strengths of cokes with progressive increase in treatment temperatures.
New	Using High Range Mass Spectrometry to Study the Link between Coal Structure, Coke Strength and Thermoplastic Chemistry in Blends C25046	104,240	Kim Hockings, BHP Billiton Coal Nick Andriopoulos, Anglo American	Current coking coal tests measure the bulk properties of coal but are rarely additive. This creates uncertainty in blend design and difficulties in marketing new coals to new customers. What is not known is what each coal in a blend contributes chemically to the development of coke structure and strength. This project will determine the differences in thermoplastic components produced during coking. The aim is to determine how coals break down at a molecular level to form a strong coke and if blending can chemically influence this process.
	University of Newcastle Rohan Stanger			

TECHNIC	CAL MARKET SUPPORT			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
New	Automated Optical Image Analysis of Coke Texture and Structure and their Connection with Coke Porosity, Reactivity, Strength and Parent Coal Blend C25048	149,913	Sean Flanagan, Wesfarmers Curragh Oliver Scholes, Vale International SA	Comprehension of the connection between coke reactivity and coke strength and the properties of the original coal blend is one of the major technical marketing support tasks required for a deep understanding of coke as a whole and as a prediction of coke quality from initial coal blends. This project will create a more integrated understanding of coke through the correlation between texture, structure, porosity distribution, strength and reactivity, as well as parent coal blend properties. The research outcome will be a novel automated image analysis methods for coke texture and structure characterisation.
	CSIRO Eugene Donskoi			
New	Fusibility of Coal Blends and Behaviours of Minerals in Coking C25049 CSIRO Merrick Mahoney Priyanthi Hapugoda	172,860	Chris Stanford, Peabody Energy Susan Ellis, BHP Billiton Coal Stephen Brant, BHP Billiton Coal	Coal grain analysis (CGA) provides reflectance and composition information on individual coal particles. New understanding of the size and chemical changes undergone by minerals during the process of coke making has emerged. This project will evaluate the fusible reflectance range for major Australian coking coal basins using CGA, identify the major minerals in the different basins and the way they transform during coking without the need for coal and coke ashing.
New	Links Between Microstructure Development in Softening Coal and the Characteristics Controlling Coke Quality C25051 University of Newcastle David Jenkins Merrick Mahoney	139,715	Oliver Scholes, Vale International SA Nick Andriopoulos, Anglo American Chris Stanford, Peabody Energy	During the past three years computed tomography determination of three dimensional structure of coke has been developed as a tool for understanding the impact of coke microstructure on coke strength. This project will provide insights for the development of improved prediction of the coking behaviour of coals and how to optimise blends. In particular, it will further develop understanding of the relationships between key microstructural features of coke and coke failure mechanisms and strength indices, microstructure features of carbonisation and how different inertinite types can influence structure development by modifying processes in the plastic layer.
New	Concentrating Coke Oven Sized Inertinite Particles to Study their Behaviour in Targeted Coking Blends C25052 University of Newcastle Wei Xie	91,690	Tim Manton, South32 Illawarra Coal Michael Young, Glencore	Australian coking coals can contain a large proportion of inertinites that are fusible. These fusible qualities are desirable for coke making but cannot be easily determined from the original coal. Rules of thumb exist which divide the semi fusinite into 'reactive' and 'inert' amounts, however, the validity for Australian coals is uncertain. This project will attempt to link the thermal behaviour of inertinite concentrates with the standard whole coal reflectogram to confirm and develop the assumption that low reflecting inertinites are fusible. The focus will be to understand how macerals of intermediate reflectance behave in a coke blend, in particular, to determine if the fusibility of these semi inerts change when blended with coals of different rank.
General				
Current	Australian Participation in Development of ISO Methods for Sampling, Analysis and Coal Preparation and National Technical Committee Support C15003 Standards Australia Ahshanur Rashid	551,768	Technical Market Support Committee	Payments for coal sales contracts are based on a sampling and analysis certificates. These certificates are based on International Standards Organization (ISO) standards in most cases. It is important to retain the ability to influence developments and/or changes to International Standards to ensure Australian coal industry interests are properly accommodated. To this end, an Australian delegation has been attending ISO meetings since 1982. ACARP assumed responsibility for funding attendance in 2005, supporting 4 delegates. ISO meetings are held every 2 years, and funding is approved in 2 year blocks. This project will continue to support the delegation through 2015 and 2016.

TECHNIC	CAL MARKET SUPPORT			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Investigation of Factors Which May Cause Coal Flow Problems During Discharge from Rail Wagons C22034 Introspec Marketing Services John Planner	136,160	Chris Stanford, Peabody Energy Sean Flanagan, Wesfarmers Curragh Dave Osborne, ACARP	'Sticky' coal is an ongoing issue in the transportation of product coal as it can increase the unloading time of trains at the port resulting in costly delays. A coal is classified as being 'sticky' when it is hung up in rail wagons, or when mechanical assistance, such as vibration, is required to empty wagons during unloading. In this project, laboratory tests and field trials will be conducted to evaluate three proposed methods of improving the flow of sticky coal times from rail wagons, thereby achieving a reduction in train unloading delays.
Current	Development of CGA Maceral Chemistry and Optical Mineral Marker Database C23050 CSIRO Priyanthi Hapugoda	167,040	Graeme Harris, Rio Tinto Energy Stephen Brant, BHP Billiton Coal	A database containing information on maceral chemistry and maceral reflectance relationships for Australian coals has been developed. This project is adding information on another six coals to this database. In addition, methods are being developed for estimating the proximate and ultimate properties and mineral species abundance for each individual particle in coal particles up to four millimetres in size, and for obtaining quantitative size information on the mineral species and
Current	Revised Dustiness and Dust Extinction Moisture Testing Method (Update of AS 4156.6) C23054 University of Newcastle Alan Roberts Dusan Ilic John Planner	130,000	Chris Stanford, Peabody Energy Tim Manton, South32 Illawarra Coal	A reliable, science based method for testing coal dustiness and dust extinction moisture was developed for the purpose of producing a future Australian Standard. The existing standard will be updated to reflect the new test method and will incorporate a relationship between the different airborne particle size ranges and effects on both environment and health. The standard will include advice on optimal moisture level with respect to dust extinction moisture level.
New	Trace Elements in Coal: Status of Test Methods in Use and Applicability C25044 QCC Resources Ian Anderberg	92,630	Graeme Harris, Rio Tinto Energy Tim Manton, South32 Illawarra Coal	The analysis of trace elements in coal has always been important for environmental and trading reasons, however recently there has been an increased focus due to implementation of limits on trace element concentrations for coal imported into China. Coals traded into China are subject to limits imposed by the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ). This project will identify any high level technical concerns that may exist between the Chinese and the Australian standard test methods that may be of immediate concern to the Australian coal industry.
New	International Carbonisation and Coke Testing Round Robin C25047 ALS Coal Philip Bennett	86,500	Oliver Scholes, Vale International SA Ashley Conroy, Rio Tinto Copper & Coal Chris Stanford, Peabody Energy	Because laboratories around the world use their own method for coke making the Australian coal industry needs to understand how the differences in the coking procedures impact on the resultant coke quality. In this project researchers will conduct an international round robin on coking the same coal sample in Australia, Japan, China, France, Germany and Canada, test the resultant coke, collate the results of this round robin, and report on the findings.
New	Overview of Outcomes of ACARP and NERDDC - Supported Research Into the Utilisation of Coking Coals 1978-2014 C25050 CSIRO Richard Sakurovs	130,000	Chris Stanford, Peabody Energy Kim Hockings, BHP Billiton Coal Ashley Conroy, Rio Tinto Copper & Coal	The Australian coal industry has funded a substantial body of work on coking quality, coking behaviour and analytical methods. Many of the findings of this work have not been published in the open literature and researchers entering the field are unlikely to be aware of them. The primary objective of this project is to present an overview and synthesise the main findings of this work to make it more accessible to the coal industry and to integrate the findings to develop a clearer picture of coal properties, their relationship to coke and coke properties.

MINE SITE GREENHOUSE MITIGATION PROJECTS

Australian coal producers need to report greenhouse gas emissions from mining operations and where possible to act to reduce those emissions. Fugitive seam gases have been clearly identified as the largest contributor to greenhouse emissions from coal mines. The Mine Site Greenhouse Mitigation Committee has been funding a range of activities in this area since its formation in 1998, and is increasingly targeting two technical challenges for the industry; estimation of fugitive methane emissions from open cut operations and mitigation of the methane in underground mine ventilation air.

COMMITTEE MEMBERS

Alex Zapantis	Principal Adviser, Climate Change (Chair)	Rio Tinto Copper & Coal
Donna Dryden	General Manager Sustainability	Centennial Coal
Ben Klaassen	Principal Environment A & I	BHP Billiton Coal
Andrew Monaghan	Manager – Great Wall Project (Cook Expansion Project)	Caledon
Alex Neels	Manager Energy and Emissions	Peabody Energy Australia
Jim Sandford	Project Manager, Coal Assets Australia	Glencore
Trevor Stay	General Manager Gas	Anglo American

FUNDING APPROVED 2015

	No of Projects	ACARP Funding	Total Funding
2015	1	\$352,865	\$1,092,265
2014	3	\$608,880	\$1,027,720
2013	4	\$687,516	\$1,207,512

CATEGORY	No of Projects	ACARP Funding
Mine Site Greenhouse Mitigation	9	\$2,885,977

MINE SIT	MINE SITE GREENHOUSE MITIGATION					
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW		
Current	VAM Enrichment with a Two Stage Adsorption Process C19054 CSIRO Jun-Seok Bae Shi Su	468,506	Trevor Stay, Anglo American Jim Sandford, Glencore	Treatment of ventilation air methane (VAM) with cost-effective technologies has been an ongoing challenge due to its high volumetric flow rate and low, variable methane concentrations. This project aims to enrich VAM concentrations to more than 25 per cent volume using a two stage VAM adsorption process at the existing large scale test unit at CSIRO's QCAT facility. A methodology will be developed to ensure operational safety in the course of methane enrichment and operational parameters will be identified for a scale up.		
Current	Particulate Matter Characteristics of Mine Ventilation Air For Designing Methane Mitigation Technologies C21063 CSIRO Stuart Day	222,408	Trevor Stay, Anglo American Jim Sandford, Glencore	A number of experimental technologies intended to remove methane from ventilation air have been developed. While these systems show considerable promise, some designs are affected by dust in the airstream. Other systems are designed to tolerate a certain amount of dust but this level and the effect of particle characteristics such as size and shape have yet to be determined. This project quantified the amount and size distribution of particulate matter entrained in the ventilation air at the outlet. The material was comprehensively characterised in terms of its chemical and mineralogical composition. The information obtained through this project may greatly assist in the selection and design of appropriate methane mitigation technology.		
Current	Catalytic Combustion of VAM - Effect of Changing Composition and Concentration of Gases C21064 University of Newcastle Bogdan Diugogorski Eric Kennedy Michael Stockenhuber	756,977	Trevor Stay, Anglo American Jim Sandford, Glencore	Catalytic combustion technology is being developed to mitigate ventilation air methane (VAM). Previous research has found that high levels of methane conversion could be achieved under mild conditions (lower temperatures), using a low reactor volume, and that excellent overall conversion performance could be achieved, even under conditions of varying methane concentrations. This project developed test protocols for technical and commercial assessment of catalysts as well as fast deactivation methods/protocols to reduce costs and time. The protocols will be used as a VAM assessment tool and will help mine personnel choose technological options for pilot plant and full scale VAM mitigation systems.		
Current	Flame Arresting Mechanisms and Flameproof Device for VAM Mitigation C21065 CSIRO Shi Su	359,970	Trevor Stay, Anglo American Jim Sandford, Glencore	The integration of ventilation air methane (VAM) mitigation technologies which employ high temperature regenerative beds to abate methane have the potential to create a new hazard. An explosive mixture of methane could be directly ducted to a potential ignition source in the mitigation unit. Therefore, a safe ducting method is required to capture ventilation air flow for its treatment in any commercial mitigation unit. This project is providing the Australian coal industry with knowledge of flame arresting mechanisms, and a prototype flameproof device which can be installed in the ventilation air intake of a mitigation unit. It will enable coal mines to safely implement VAM mitigation technologies at their sites.		
Current	Development Of New Generation Carbon Composites For VAM Capture C22041 CSIRO Jun-Seok Bae	239,800	Jim Sandford, Glencore	There is presently no universally viable, proven technology for capturing coal mine ventilation air methane (VAM). A range of cost effective technologies is needed to capture and use dilute VAM depending on specific site and general market conditions. This project aimed to enhance the VAM capture by more than 30% by synthesising and characterising new carbon composites derived from macadamia nut shells and carbon nanotubes. The adsorption performance of the new carbon composite adsorbents was tested using existing laboratory scale equipment. This should determine optimum operational parameters and methane adsorption.		
Current	Development of VAM Abatement Technology Assessment Tool C23004 University of Newcastle Behdad Moghtaderi	55,689	Jim Sandford, Glencore	This project developed a ventilation air technology assessment tool that will be available to the industry to examine the merit of alternate technical paths to the removal or reduction of underground mine ventilation air. It is assisting to assess the basic performance characteristics of different abatement processes.		

MINE SIT	E GREENHOUSE MITIGATION			
STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Novel Stone Dust Looping Process for Mitigation of Ventilation Air Methane C23052	409,397 Current 352,865	Trevor Stay, Anglo American Jim Sandford, Glencore	Stone dust looping (SDL) involves the cyclic calcination (thermal decomposition) and carbonation of a sorbent to convert the methane content of VAM into CO2. Preliminary studies have shown that limestone, a naturally occurring sorbent, is an effective reactant and is cheaply available at mines. This project will conduct pilot scale demonstration, reactor scale up and economic assessment studies of
α	University of Newcastle	New		a multipurpose fluidised bed reactor that has already been designed and fabricated.
New	Kalpit Shah			
Current	Improving Methods for Quantifying Fugitive Emissions from Open Cut Coal Mining C24017 CSIRO Stuart Day	224,110	Ben Klaassen, BHP Billiton Coal Jim Sandford, Glencore	Fugitive emissions from coal mining are the largest source of greenhouse gas emissions from the Australian coal industry and, under carbon pricing legislation, potentially represent a major cost to mine operators. To address this issue, the feasibility of using inverse methods and plume traversing techniques to improve the accuracy and precision of greenhouse gas emissions measurements will be rigorously assessed. Once the preferred method for determining fugitive emissions has been confirmed, researchers will design a full scale trial of the method.
Current	Proof of Concept Photocatalytic Destruction of Methane for Coal Mining Fugitive Emissions Abatement C24061 CSIRO Yonggang Jin	149,120	Jim Sandford, Glencore Alex Zapantis, Rio Tinto Copper & Coal	Open cut coal mines are the second largest source of fugitive emissions, accounting for more than 30% of fugitive coal mine emissions. This project will use photocatalytic oxidation of methane into carbon dioxide as a means of abating fugitive emissions from coal mining. The multiple stage project will start with proof of concept, followed by exploration of effective photocatalysts and large scale prototype photoreactor development and site trials.



PHD SCHOLARSHIPS



The Australian coal industry is keen to support those who work in the industry to upgrade their skills by undertaking PhD on research of interest to the producers. The support is in the form of a tax free scholarship awarded on the recommendation of the Research Committee. Potentially, scholarships can cover the full range of challenges facing the industry.

FUNDING APPROVED 2015

	No of Projects	ACARP Funding	Total Funding
2015	3	\$990,000	\$990,000
2014	1	\$330,000	\$330,000
2013	-		

CATEGORY	No of Projects	ACARP Funding
Scholarships	6	\$1,903,322

PHD SCHOLARSHIPS

STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
Current	Geotechnical Stability of Coal Mine Dumps and Co-disposal of Tailings Waste C21007 University of Newcastle Kai Koosmen	300,000	Research Committee	The full impacts of combined rejects placement within spoil dumps are not fully understood by the coal industry. Current management practices are based on empirical experience that coarse rejects dumping and small tailings cells have not posed any significant operational stability problems. This PhD research project is examining the strength and moisture properties of mixtures of coal preparation plant bulk press filter fine rejects and coarse plant rejects when encapsulated in overburden spoil within waste dumps. In particular, reliable shear strength and moisture content change models will be developed for the rejects and spoil materials.
Current	Gas Distribution is Fundamental to Estimation and Management of Fugitive Emissions C21061 University of Queensland Agi Burra	330,000	Jim Sandford, Glencore	The ability to determine site based emissions and develop cost effective in situ gas distribution models offers the coal industry significant benefits by reducing financial exposure to likely carbon tax liabilities. This PhD research project will allow the industry to reduce carbon tax exposure and offer an approach for more targeted and cost effective gas exploration and modelling for emissions estimation. The project presented a case for considering gas distributions in the context of geological controls to reduce uncertainty in the understanding and interpretations of gas characteristics encountered in various geological environments. It investigated the relationships between gas and coal parameters; and identified exploration tools to streamline the available exploration and modelling resources.
Current	Dynamic Analysis of Dense Medium Circuits C22002 University of Queensland Nerrida Scott	330,000	Jeremy Byrnes, Glencore	Dense Medium Cyclones are a key component of coal processing. This project will utilise instrumentation and information collected from project C17037, Joint Evaluation of Monitoring Instrumentation for Dense Medium Cyclones, to analyse the dynamic changes in a DMC circuit with the intention of developing a dynamic model that provides producers with a guideline on critical drivers for dynamic DMC performance. Part of the Thesis submission will include guidelines for coal handling and preparation plants on the levers that a plant can utilise to enhance dynamic control of DMC circuit performance.
Current	Improved Situation Awareness for Autonomous Equipment using Computer Vision C22047 Queensland University of Technology Alex Bewley	330,000	Hans Hayes, Anglo American	This project potentially provides a path to an alternate approach to locating moving and stationary objects. In the industries pursuit of a system that provides collision avoidance as a failsafe, the use of radar, lasers, radio and GPS has figured prominently. This program will look to develop a tracking system utilising a higher level of situational awareness from visual data. The capture of visual data and real time analysis of a massive volume of data will be the key to realizing this system and its subsequent introduction to the mining industry.
Current	Bowen Basin Spoil Classification For Improved Rehabilitation C24063 University of Queensland Bevan Emmerton	330,000	Bernie Kirsch, Centennial Coal Ross Gooley, Sojitz Minerva Mining Pieter Swart, Glencore	Mine spoils and mined landscapes represent a large and ongoing liability to operating coal mines. Achieving liability minimisation concurrent with cost minimisation requires that contiguous areas are identified and that appropriate data is collected at a scale that demonstrates confidence in the quality of the rehabilitated outcomes. This work will further define the characteristics of some challenging Bowen Basin spoil types so that rehabilitation methodologies can be tuned specifically towards identified spoil types which have predictable behavioural characteristics.

PHD SCHOLARSHIPS

STATUS	PROJECT / RESEARCHER	ACARP \$	INDUSTRY MONITORS	OVERVIEW
New	Environmental Noise Assessment and Management C25076 Griffith University Tim Procter	330,000	John Watson, Glencore	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.
New	Assssessing Coal Properties and Their Effects on Coking Performance: A Data Mining Approach C25077 University of Newcastle Lauren North	330,000	Kim Hockings, BHP Billiton Coal	With the wealth of data being generated about coals and their coking properties through test facilities and operating plants, alternative processes to traditional and emerging experimental characterisation or data regression techniques need to be explored to capitalise on this information. This project will assess current and emerging coke and coke characterisation tests for prime and non prime coking coals; apply emerging coal and coke characterisation tests to areas where there are gaps in the data; and investigate coal performance against current coke quality metrics using data mining.
New	Guidelines to Estimate the Rock Mass Strength and Probabilistic Design Approaches for Open Cut Coal Mine Slopes C25078 University of New South Wales Alison McQuillan	330,000	Dan Payne, BHP Billiton Coal	An important consideration in the design of slopes in open cut coal mines is to use the rock mass strength rather than the intact laboratory strength. Few studies have been completed for soft rocks relating the effect of discontinuities to intact rock strength. This project will develop a set of reliable guidelines to downgrade laboratory strength of intact rock to rock mass strength and a framework for the reliable probabilistic analysis of slope stability.

2016 PROPOSAL TIMELINE

APRIL 9	Call for Proposals Announcement in "The Australian" Distribution of 2016 Research Priorities Newsletter
MAY 11	Closing Date for Short Proposals
JULY	Short Proposal Selection Meetings
JULY 29	Call for Long Proposals
AUGUST 31	Closing Date for Long Proposals
OCTOBER	Long Proposal Selection Meetings
DECEMBER 9	Confirmation of Successful Proposals



PROGRAM MANAGEMENT

Australian Coal Research Limited

ABN 85 054 118 277

Level 8, Suite 12, Christie Centre 320 Adelaide Street Brisbane Qld 4000

Phone 07 3010 9717

Mark Bennetts Executive Director markb@acarp.com.au

Terry Reilly Levy Administrator terryr@acarp.com.au

PROJECT ADMINISTRATION

Australian Research Administration Pty Ltd

ABN 34 083 934 570 12th Floor, 167 Eagle Street Brisbane Qld 4000 PO Box 7148 Riverside Centre Old 4001

Phone 07 3225 3600

Roger Wischusen Manager roger@acarp.com.au

Anne Mabardi Administration Manager anne@acarp.com.au

Nicole Youngman Administration Assistant nicole@acarp.com.au

RESEARCH COORDINATORS

Neil Alston Mine Site Greenhouse Mitigation neil-cath@live.com.au

Peter Bergin Underground NSW peter.bergin@optusnet.com.au

John Brett Open Cut - Mining johkim@bigpond.net.au

Cam Davidson Open Cut – Mining cwrd1@me.com

Russell Howarth Underground NSW rhowarth@integritynet.com.au

Bevan Kathage Underground Qld kathmin@bigpond.net.au

Peter Newling Coal Preparation pgn@bigpond.net.au

Dave Osborne Technical Market Support dave.g.osborne@bigpond.com

Keith Smith Open Cut - Environment keith.d.smith@bigpond.com

