

ENGINEERING EXCELLENCE AWARDS 2009

ENGINEERING BETTER COMMUNITIES

Engineers Australia Queensland Division's 2009 Engineering Excellence Awards highlighted the engineering innovation of 38 projects at a gala event held on Friday 2 October at the Brisbane Convention and Exhibition Centre.

The annual event attracted representation from all corners of Queensland's engineering community to celebrate the incredible achievements of the profession. Engineers Australia Queensland Division received highly competitive and diverse project submissions, all vying for the honour of an Engineering Excellence Award.

"Queensland is often at the forefront of the engineering profession and we are renowned for driving some of the most progressive and innovative engineering projects in the country," said Queensland Division President Andrew Chapman.

"This year, we had a number of projects nominated for the Engineering Excellence Awards that were based on managing one of Queensland's most valuable resources, which is water," Chapman said. "This reflects how important engineers are in developing sustainable communities in drought-prone Queensland and our ability to adapt to climate change."

The top award of the night, the R.W. Hakwen Award, went to the design and construction of the Tugan Bypass. This \$543 million project also won the Project Infrastructure category. The judging panel were impressed with the magnitude and complexity of the project, which included tunnelling under an operational international airport runway adjacent to environmentally sensitive wetlands.

Congratulations to all of the winners and entrants for making the 2009 Engineering Excellence Awards another quality event. The judges were impressed with the high standard of the projects nominated this year, and we now look forward to showcasing the 2010 accomplishments of the engineering profession.

BUILDINGS AND STRUCTURES



ENGINEERING EXCELLENCE AWARD

Queensland Tennis Centre

submitted by Sinclair Knight Merz, Populous, Mirvac



The 5,500 seat Pat Rafter Arena, with its 'Queenslander' style stadium roof, is the showpiece of the new Queensland Tennis Centre in Tennyson. The main roof structure is an innovative design with 6,500m² roof with open sides for ventilation, using 5,000m² Ortech roof sandwich panels (Duro panels manufactured from wheat or rice straw for noise suppression) and 1,500m² from PTFE fabric to allow natural light. The project was delivered ahead of schedule, under budget and meeting all stringent criteria, including the overriding need to have the facility ready for the Brisbane International Tennis tournament in January 2009. Bringing international tennis back to Queensland, it is the first facility in Australia to offer all three Grand Slam surfaces: clay, grass and cushion acrylic. The judges were impressed with the project team's thorough attention to sustainability issues, highly innovative structural design, and delivering the project ahead of schedule and under budget.

HIGH COMMENDATION

Brisbane International Airport Terminal Expansion Project Stages 1 and 2A (i)

submitted by Aurecon



This \$300m expansion and upgrade of Brisbane International Airport comprised approximately 77,000m² of new works and refurbished areas, and 6,500m² of transport shelters and external buildings. Engineering aspects included 20m concrete-filled steel tube columns, a parallel beam steel floor system, open space enhanced by reducing the number roof support and innovative arrangements to avoid overloading existing pile groups. Aurecon provided ecologically sustainable design strategies that resulted in genuine energy, water and waste savings in both the new extension and the existing terminal building.

FINALIST

Southbank Education and Training Precinct

submitted by Arup



The \$230m redevelopment of the Southbank Institute of Technology provides 30,000 students with state-of-the-art facilities, consolidating three geographically separated education campuses into a single inner-city campus. Key engineering innovations included the use of advanced analytical and design techniques, comprehensive 3D modelling, and the development of new ways of constructing highly efficient flat plate post-tensioned buildings.

CONTROL SYSTEMS, NETWORKS, INFORMATION SYSTEMS AND TELECOMMUNICATIONS

ENGINEERING EXCELLENCE AWARD

SCORS

submitted by Sedgman Limited, ASE Pty Ltd



SCORS is an innovative production monitoring and reporting system initiated for Sedgman's Coal Handling and Preparation Plants (CHPPs) to address major shortcomings with previous systems. SCORS automatically integrates production data via SCADA systems from a number of sources and manually entered data into an overarching information management system. This has enabled realisation of several innovations that are changing the way CHPPs are run, including increased visibility of business rules and data validation, real time production data collection and dissemination systems and multi-site data repositories.

HIGH COMMENDATION

Bulk Water Transport Integrated Communications and Control

submitted by Southern Regional Water Pipeline Alliance (SRWPA) – KBR, Abigroup, McConnell Dowell, LinkWater Projects



Central control is essential for the existing and the new assets comprising the South-East Queensland Water Grid, spread across a 200km geographical area, to ensure efficient water distribution to where it is needed most. KBR designed a state-of-the-art centralised control system, based on a high-speed fibre optic data network, allowing for integration with the existing water assets in the region to facilitate cost-effective management, operation and maintenance of the Water Grid by LinkWater.

FINALIST

Polaris Data Centre

submitted by Thiess Pty Ltd



Springfield Land Corporation engaged Thiess to design and construct the \$123m Polaris Data Centre, hosting high security mission-critical IT systems of government departments and utilities as well as local and international companies. Polaris security includes biometric fingerprint testing, CCTV cameras, bullet proof glass, round the clock security and purpose-built mantraps. Engineered, designed, procured, constructed and commissioned to meet the fast-tracked 18 month construction schedule and budgetary parameters, all without the benefit of any existing benchmarks as it was the first Tier 3+ facility in Australia.

ENVIRONMENT



ENGINEERING EXCELLENCE AWARD

Recycled Water Management on the Gold Coast – Policy to Future Strategy

submitted by Sinclair Knight Merz (SKM) in collaboration with Gold Coast Water



This project recognises recycled water as a valuable resource and addresses ways to harness its potential, contributing to long-term recycled water planning. Leading the way in the sustainable use of water resources, the strategy provides fit-for-purpose solutions across the residential, agricultural, industrial and commercial sectors, including the irrigation of public spaces.

HIGH COMMENDATION

Mamu Rainforest Canopy Walkway

submitted by Arup



An elevated tree-top walkway through lush rainforest in a North Queensland Wet Tropics natural heritage and Aboriginal cultural heritage area, it is the largest project ever undertaken in a Queensland National Park. The project included over 1km of on-grade footpath through the rain forest, 370m of elevated walkway perched on the edge of the Johnstone River Valley, a 40m high canopy viewing tower and an 8m long cantilever tower.

FINALIST

Coochiemudlo island Wastewater Project

submitted by Parsons Brinckerhoff (PB)



Redland Shire Council commissioned PB to investigate and develop a new sewerage system on the island to prevent septic tank contamination leaking into Moreton Bay. The environmental reserve necessitated special precautions for the native vegetation and seagrass beds supporting local dugongs. The best option was to convey raw sewage to the mainland for treatment at Victoria Point Wastewater Treatment Plant, using long-distance horizontal directional drilling.

PRODUCTS AND MANUFACTURING FACILITIES

ENGINEERING EXCELLENCE AWARD

Dalrymple Bay Coal Terminal Bunds 4A and 5A

submitted by BMD Constructions Pty Ltd, Aurecon Hatch, DBCT Management



This \$54m project was for the design and construction of Machinery Bunds 4A and 5A, with a unique cantilever wall system providing the best compromise between desirable structural attributes and speed of construction. With a robust and practical retaining wall system suited to the harsh industrial environment, this structure will provide a 40 to 50 year maintenance-free design life. The judges were especially impressed with the cost-effective solution that minimised the on-site construction phase.

PROJECT INFRASTRUCTURE

ENGINEERING EXCELLENCE AWARD AND R.W. HAWKEN AWARD

Creating Tugun Bypass

submitted by PacificLink Alliance – SMEC Australia Pty Ltd, Department of Main Roads, Abigroup



This \$543million project is for design/construction of a seven kilometre dual carriageway highway between Queensland's Gold Coast and northern New South Wales. Work included a 1km tunnel, two major road interchanges, six bridges, and substantial earth works. Significant challenges included building a 'top down' tunnel in a swamp under an airport flight path, adjacent to an environmentally sensitive wetland area and specifically constructing the tunnel 12m below the water table.

HIGH COMMENDATION

Lake Manchester Dam Upgrade

submitted by McConnell Dowell Constructors Pty Ltd



The upgrade of this 26 megalitres water storage facility, built over 90 years ago, was reactivated in 2005 to ensure it met current large dam safety standards. With a total cost of \$71m over two years, the detailed dam design included raising the crest by 5.7m to prevent overtopping, strengthening the concrete dam with 69 post-tensioned crest and toe anchors, replacement of inlet/outlet towers, realignment of spillway entrance and construction of a new concrete lined spillway. A world-first anchoring solution incorporated both vertical and inclined post-tensioned anchors to increase sliding friction forces on the dam wall.

PROJECT INFRASTRUCTURE CONT.



HIGH COMMENDATION

Inner Northern Busway (Queen Street to Upper Roma Street)

submitted by INB Hub Alliance –

Queensland Transport, AECOM, Coffey, Edaw AECOM, Leighton Contractors, Bligh Voller Nield



The \$320m Inner Northern Busway (INB) Queen Street to Upper Roma Street is a key element in the Queensland Government's world-class busway system and connects Brisbane's CBD, northern, eastern and future western bus transit routes. Encompassing a 1.2km busway, 500m tunnel and two major busway stations within existing city structures, it is the first fully integrated transport service in Brisbane with complete end-of-trip facilities.

FINALISTS

Sunshine Motorway Upgrade (Maroochydore Road to Pacific Road)

submitted by Seymour Whyte



A construction contract to upgrade a 5.5km section of the existing Sunshine Motorway from two to four lanes, build a new southbound carriageway, change a two lane roundabout to four signalised intersections and construct two new overpasses and entry/exit ramps. The project involved innovative retaining walls, noise barriers, extensive culvert works and major landscaping requirements, all in an environmentally sensitive area.

Port of Brisbane Reclaimed Land Development Trial Project

submitted by Port of Brisbane Corporation, Coffey Geotechnics, Coffey Projects



The Port of Brisbane expansion is provided within a 4.6km bund into Moreton Bay enclosing a 235ha sub-tidal area, which is progressively being filled with dredged materials from the shipping channels. Investigations were carried out to determine how acceptable foundation conditions could be achieved without using expensive rigid piles for all infrastructure. Trials highlighted the benefits of wick and vacuum treatment, indicating that the development timeframe could be reduced from 50 years to 5-7 years.

The Water Highway

submitted by Southern Regional Water Pipeline Alliance –

Kellogg Brown & Root Pty Ltd, Abigroup Limited, McConnell Dowell Corporation Ltd



The Alliance investigated, modelled, designed and constructed a series of pipelines that form the South-East Queensland water grid interconnection, a network is capable of transferring up to 217 megalitres of potable water per day. Work covered an area approximately the size of Tasmania and includes 150km of pipelines, six major pump stations, four major reservoirs, four water quality facilities, 21 off-takes and substantial associated infrastructure.

PROJECT INFRASTRUCTURE CONT.

Woody Point Jetty – Restoring a Local Icon

submitted by Kellogg Brown & Root Pty Ltd (KBR)



This replacement jetty is 230m long and 6m wide and consists of octagonal pre-stressed concrete piles, pre-stressed concrete beams and timber deck. Wave and storm loads were critical design considerations as modelling found that the new jetty could be subjected to waves up to 3.5m high in a 1-in-500 year storm event. This \$9.4m project was funded as part of Queensland's 150th anniversary celebrations and acknowledges its maritime heritage with a timber deck recycled from Mackay Sugar Wharf.

PROJECT MANAGEMENT

ENGINEERING EXCELLENCE AWARD

Tully Alliance

submitted by Tully Alliance – Department of Transport and Main Roads, Thiess Pty Ltd, AECOM, BMD Constructions, Albem Operations



The Tully Alliance project involved full reconstruction of a 15.5km alignment of National Highway in the high rainfall area near Tully in North Queensland. Work involved construction of 700m of bridges, 82 major culverts, dedicated passageways for the protection and conservation of natural wildlife, and road designs specific to improving flood immunity. Sustainable materials and design processes were incorporated into energy efficient methods that reduced the embodied energy of the road infrastructure, providing multiple purpose solutions with whole-of-life benefits.

HIGH COMMENDATION

Western Corridor Recycled Water Project

submitted by WaterSecure



This project in South East Queensland is stated to be the third largest advanced water treatment scheme in the world, the largest in the southern hemisphere, and the first indirect potable reuse scheme in the world that will release significant quantities of water into existing surface water storages. The project's supply network of more than 200km of large diameter underground pipework, three advanced water treatment plants, storage tanks and pumping stations has the capacity to deliver up to 232 megalitres of purified recycled water a day to three power stations, industrial and agricultural customers.

PROJECT MANAGEMENT CONT.



HIGH COMMENDATION

Water Matters for Townsville

submitted by Water Matters Alliance



Townsville City Council adopted a vision of reusing 90% of all wastewater across Australia's largest provincial city and engaged Water Matters Alliance, comprised of Abigroup Contractors, Aquatec-Maxcon, GHD, Townsville City Council and United Group Infrastructure. A \$65m upgrade of Cleveland Bay Wastewater Treatment Facility (CBWTF) was completed, providing high quality recycled water for civic and commercial use as part of a major \$110m program of water and wastewater upgrade works.

FINALISTS

Burke Alliance

submitted by Burke Alliance



This Alliance between Department of Main Roads and RoadTek was formed to plan, design and construct works to widen to eight metres 130km of the Burke Development Road from Cloncurry to Burke and Wills Junction. The works were completed 18 months ahead of schedule and under budget, permitting an additional 12km of road widening. The Alliance team addressed the project challenges in several ways and commenced by cutting pre-construction costs and determining pavement designs that used economical-to-produce and readily available materials in the area.

Fortitude Valley Station Refurbishment

submitted by QR Passenger Pty Ltd, Bovis Lend Lease



The Fortitude Valley Station (previously Brunswick Street) refurbishment project was achieved using project management and engineering that saw innovative solutions overcome numerous challenges. Unknown factors in the existing building and lack of drawings made for a complex project from the start. Deviating from traditional station design, the new design took inspiration from music and art to create a themed station that reflects the surrounding environment.

Townsville Ring Road – Linking Our Communities

submitted by Department of Main Roads, Thiess Pty Ltd, AECOM



The Ring Road is a 7km stretch of motorway providing the missing link in the National Highway route north west of Townsville and improving access to key facilities in the area. The \$119m project involved the reduction of the Harvey Range Road overpass bridge width by two metres, simplification of formwork system for this overpass, revision of the Beck Drive Bridge abutment design to provide for future upgrade, special culverts in Bohle plains, and a particular pavement design unique to North Queensland. Significant project savings enabled the funding additional upgrades to Harvey Range Road within the original project timeframe.



REPORTS, PROCEDURES AND SYSTEMS

ENGINEERING EXCELLENCE AWARD

Gold Coast Water's Integrated Management System – A Framework for Engineering Excellence
submitted by Gold Coast City Council, Gold Coast Water



This system ensures that Gold Coast Water's (GCW's) core engineering business functions are executed as part of a wider framework, encompassing environmental, safety, risk management and continuous improvement. Decreasing yields from traditional water sources and increasing pressure from legislation and the community have driven the search for innovative ways to sustainably manage growth and the demand on water. The judges were impressed with the well-documented procedures tied to international standards and a management system that integrated world's best practice.

HIGH COMMENDATIONS

Ipswich to Springfield Public Transport Corridor Study Review of Environmental Factors and Environmental Impact Study
submitted by Parsons Brinckerhoff (PB), Queensland Department of Transport and Main Roads



Recognising the need for high-quality public transport between Ipswich and Springfield, Queensland Transport (QT) engaged PB to conduct a series of studies to determine the best alignment for a public transport corridor. This corridor was to be suitable for a busway or heavy commuter rail between Ipswich and Springfield via Ripley and permit QT to proceed with corridor preservation. The preferred corridor is approximately 25km in length with nine stations, each serving its specific surrounding catchment. The study required detailed engineering and environmental analysis, as topographical changes over the corridor options were extremely challenging, as was the need to take account of mine subsidence.

Inner City Rail Capacity Study (ICRCS)
submitted by AECOM, Parsons Brinckerhoff



This ICRCS was undertaken for Queensland Transport and details projects, estimated costs, staging and timing for Brisbane's future inner city rail network. The study necessitated integrated engineering recommendations with land use planning, environmental and economic considerations before reducing 40 possible options to three. These final options overcame a range of technical constraints leading to the development of key solutions such as tunnel depth and station locations



FINALISTS

Eastern Busway Concept Development and Impact Management Plan

submitted by Aurecon



The proposal is for a two-lane dedicated busway, approximately 17.7km in length linking Boggo Road Busway at Buranda to Capalaba via Stones Corner, generally following Old Cleveland Road corridor. A Management Overview Strategy was developed as a guiding document to inform all future stages of the project about minimum performance requirements throughout development of concept design and community consultation.

Gold Coast Rapid Transit Concept Design and Impact Management Plan

submitted by GHD



In 2006, GHD was commissioned to assess the benefits and impacts of a rapid bus and light rail system for the Gold Coast, including delivering in two stages over 30km, running between Helensvale to Southport, Surfers Paradise, Broadbeach and ultimately Coolangatta. In 2008, Queensland Government and Gold Coast City Council confirmed preference for light rail as the new public transport system for the Gold Coast. The concept design and impact plan included detailed assessment of economic impacts of travel and access benefits as well as numerous indirect benefits, considering types of vehicles, traffic congestion, associated road and structural works. A number of environmental studies were included to identify significant locations, species and habitats, as well as long-term sustainability.

RESEARCH, DEVELOPMENT AND INNOVATION

ENGINEERING EXCELLENCE AWARD

OPTIDRAG

submitted by Ground Breaking Innovations Pty Ltd



OPTIDRAG is designed to optimise dragline operator performance. With less than 30 minutes testing, a mine can determine how well a person is capable of performing, even if they have never touched the controls. Up to \$2m per dragline per year could be saved by replacing below-average performance operators. OPTIDRAG is now being used by mines in Australia and South Africa. The judges were impressed with the multifaceted performance measure of OPTIDRAG covering productivity, maintenance and safety.

RESEARCH, DEVELOPMENT AND INNOVATION CONT.

HIGH COMMENDATIONS

CQMS HURRICANE – Changing the Climate in Dragline Bucket Design

submitted by Leslie Consulting Pty Ltd



The CQMS Hurricane aims to find the balance between longevity and production and to increase the science in relation to dragline bucket design. The design was developed through intensive modelling and scale testing, resulting in a bucket providing handling characteristics with superior digging performance.

Queensland State Archives – Stage 2

submitted by Project Services



This \$63m facility doubled existing capacity for long-term safe and secure storage of archival records at Runcorn, providing a stable internal environment for controlled air temperature, humidity and natural light. Completed 2½ months ahead of schedule and substantially below budget, the design resulted in reduction in energy consumption for combined Stages 1 & 2 to 50% below previous Stage 1 energy consumption. The project trialled and tested e-tender, e-contract administration and significant testing of 4D construction programming for Building Information Modelling.

FINALISTS

Engineering the Last Ride in Automotive Luxury Allonge GSB

submitted by Leslie Consulting Pty Ltd



The development of a custom hearse vehicle, minimising production cost with integrated single body construction and reduced delivery times. An efficient, simple manufacture assembly system ensures Australian assembly into the future.

Soul InTension

submitted by Piling Contractors Pty Ltd and Grocon Constructions (Qld) Pty Ltd



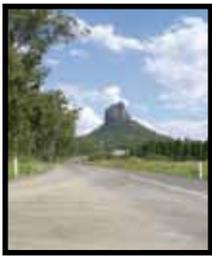
This project demonstrated a superior approach to the design and construction of the foundations for an ocean-front high-rise on the Gold Coast. Research and development on the unique piling requirements for foundations to secure a 77 storey, 277m high apartment tower resulted in reduced bored pile diameters of 1500mm, 1800mm and 2200mm founded up to 45m below the working platform.

RESEARCH, DEVELOPMENT AND INNOVATION CONT.



The Role of Long Term Pavement Performance Study for Optimising the Pavement Maintenance Budget

submitted by Griffith University, SMEC, Gold Coast City Council, Caboolture Shire Council, Caloundra City Council, Ipswich City Council, Logan City Council, Redland City Council



Collaborative research project modelling the impact of traffic volumes, pavement thickness and age, and environmental influence on pavement deterioration. This project demonstrated the application of innovative engineering knowledge to enhance pavement performance predictions, with case studies showing that a substantial reduction in pavement management costs can be achieved.

SMALL BUSINESS VENTURES/PROJECTS

HIGH COMMENDATION

Train Loadout Upgrade - Commissioning Engineering

submitted by INETE Pty Ltd



This project is at Goonyella Riverside Mine in the Bowen Basin, where INETE was engaged to manage commissioning of mechanical and electrical components of the mine's enhanced train loadout facility. The project was carried out in five stages over a two-year period, with major works in 2007-08, increasing the loadout capacity from 2500t to 5000t of coal per hour.

FINALIST

Corridor Assessment Report, Sunrise Hills to Pacific Paradise, Proposed 132kV Powerline

submitted by PSA Consulting



In April 2008, PSA Consulting was engaged by Energex to investigate corridor options for a 35km 132kV powerline on the Sunshine Coast and to identify potential new substation sites. Significant environmental constraints influenced potential corridors relating to National parks, sensitive wetlands, plus issues regarding Electric and Magnetic Fields (EMFs). Innovative engineering solutions included siting of poles, pole height, line spacing, line clearance and selected undergrounding.

RESOURCE DEVELOPMENT

ENGINEERING EXCELLENCE AWARD

F-111 Program

submitted by Boeing Defence Australia Ltd



For almost 15 years, Boeing Defence Australia has created innovative engineering solutions for the Royal Australian Air Force F-111 aircraft resources, ensuring air superiority despite the emergence of more modern fighter/bomber aircraft. Australia has been the world's sole operator of the F-111 since 1998, necessitating the adoption of a number of initiatives including an upgrade of avionics, and new hardware/software installations to ensure optimum performance. The judges were impressed with the success achieved by local engineers in keeping this valuable resource operational in a rapidly changing and increasingly demanding environment.

FINALIST

Lake Vermont Coal Handling and Preparation Plant (CHPP)

submitted by Thiess Sedgman Joint Venture (TSJV)



A \$115m project to wash, size and process 5.6 million tonnes of coal a year at Lake Vermont Mine in Central Queensland. Work commenced on site in March 2008 and the project was completed in time by February 2009. Time and resources were saved and safety improved by fabricating large parts off-site, on-ground preassembly of floor sections, and applying Sedgman's innovative Bay Plant design that allowed components to be moved into different design configurations.

OVERALL AWARDS



SUSTAINABILITY

Sponsored by Project Services

Water Matters for Townsville

Water Matters Alliance – Abigroup Contractors, Aquatec-Maxcon, GHD, Townsville City Council, United Group Infrastructure



Townsville City Council adopted a vision of reusing 90% of the city's wastewater. The Water Matters Alliance undertook a \$110 million dollar upgrade of water and wastewater works to provide high quality recycled water for civic and commercial use. The judges were impressed with promotion of engineering sustainability through innovation and collaboration, and their adherence to strict EPA conditions for the Great Barrier Reef World Heritage Area.

INNOVATION

Sponsored by KarelCAD

Port of Brisbane Reclaimed Land Development Trial Project

Port of Brisbane Corporation, Coffey Geotechnics, Coffey Projects



To meet the demand of increased trade at the Port of Brisbane, the expansion and development of a 235ha land reclamation project is underway. Internationally renowned ground improvement specialists were invited to conduct full-scale land reclamation trials, testing a variety of techniques and condit the innovative research into various methods of pre-consolidation of reclamation, and believe there is the potential to utilise the ground-breaking technology developed by ports around the world.

COMMUNITY ENGAGEMENT

Townsville Ring Road – Linking Our Communities

Department of Transport and Main Roads, Thiess Pty Ltd, AECOM



The \$119 million Ring Road project was to build the missing link in the National Highway north-west of Townsville and to improve access to key facilities in the area. The judges believe the project team demonstrated outstanding community engagement, with exhaustive communication strategies covering the lifespan of the project, plus advanced mitigation plans for any local communities who may have been adversely impacted by the extensive roadworks.