

# TUNNELING TO A LEGACY

CONSTRUCTED BY : Transcity  
CONSTRUCTION VALUE : \$1.5 billion  
COMPLETION DATE : 2015

Legacy Way is Brisbane City Council's 4.6km road tunnel that will connect the Western Freeway at Toowong with the Inner City Bypass (ICB) at Kelvin Grove. Once open in 2015, Legacy Way will almost halve peak hour travel times between the Centenary Bridge and the ICB.

**Transcity has achieved another major milestone on Brisbane City Council's Legacy Way tunnel with the project now 80% complete.**

Lord Mayor Graham Quirk said the milestone demonstrated the significant progress that had been made on the 4.6 kilometre tunnel, which will link the Western Freeway at Toowong with the Inner City Bypass (ICB) at Kelvin Grove.

"The Legacy Way project is reaching the final stages of work" Cr Quirk said. "To date more than 80% of the overall project has been completed and we are now well underway with the mechanical and electrical fit-out of the tunnels."

Transcity Project Director, Jose Antonio Sanchez, said the progress made on the mechanical and electrical (M & E) fit-out marks a major milestone in the delivery of Brisbane's newest infrastructure project.

"Reaching 80% completion is a major achievement and highlights our progression towards completion of construction by 2015," Mr Sanchez said. "Our team is on track to accomplish our construction deadlines to ensure the tunnel is operational for Brisbane commuters by 2015."

Mr Sanchez said the M & E fit-out had started on the project with works to undertake the installation of a number of key tunnel features. "Our M & E fit-out is being delivered by MECA, an alliance

between Transcity and RCR O'Donnell Griffin," said Mr Sanchez. "The alliance will be delivering a range of fit-out activities including the installation of jet fans for ventilation, fire deluge systems to assist in the unlikely event of a fire as well as the closed circuit television cabling and systems required for operation," Mr Sanchez said.

"All mechanical and electrical activities will be completed towards the end of 2014, with work then to begin on the commissioning and testing of the tunnel in preparation for the opening completion."

Legacy Way is Brisbane City Council's 4.6 kilometre road tunnel that will connect the Western Freeway at Toowong with the Inner City

Bypass (ICB) at Kelvin Grove. It will provide an alternative route to local roads for traffic leaving the Western Freeway and travelling to and from the ICB. Once open in 2015, Legacy Way will almost halve peak hour travel times between the Centenary Bridge and the ICB.

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# PREMIUM QUALITY ALL THE WAY

**Premium Plant and Haulage Pty Ltd was engaged to remove spoil for the Legacy Way project.** The company is a successful Queensland based earthmoving company. It provides transport, haulage, logistics, bulk excavation and plant hire services to the oil, gas, mining, major projects, and construction sectors.

“The company's versatility, advanced management systems and ability to problem solve allow the delivery of reliability and certainty for every project both large and small,” said a company spokesperson. “Today, Premium has built and sustained a reputation for working with clients to deliver on instructions as cost effectively as possible.”

The spoil to be removed from both the eastern and western portals of the Legacy Way project in preparation for tunnelling was approximately 500,000 tonnes.

Premium was required to source local buyers for the clean fill being exported in order to deliver savings on the project as well as finding cost

effective tip solutions for the unsuitable material. Premium established a dedicated team to meet this challenge and to ensure the project received the attention it needed to make it a success.

Premium recruited a large fleet of modern trucks to operate across Brisbane and managed the logistics. Premium fitted state of the art tracking systems to the fleet which enabled it to generate reports detailing the route taken for each journey and where each load was deposited.

At the same time the company ensured compliance with all work, health and safety regulations and environmental legislation and their subcontractors accordingly. Premium takes pride in “successfully meeting all of the demands of the project without any major incident or hold up”.

Premium has worked on many large projects. The Benaraby to Mt Larcom (Bruce Highway Reconstruction Works) in the Fitzroy region of Queensland is one such project. This project is part of Operation Queensland - the largest reconstruction effort in Queensland's

history. Fulton Hogan engaged Premium to haul a large volume of quarry material to site for the reconstruction works. Premium's mobilisation of a substantially large haulage fleet and equipment to site within a short timeframe was a significant achievement.

Another project Premium was involved with is the new Queensland Children's Hospital which will be the primary specialist, paediatric hospital in Queensland. Delta Group engaged Premium to provide haulage and disposal options to remove 130,000 cubic metres of material from site, including 60,000 cubic metres of contaminated waste. Located adjacent to the existing Mater Hospital precinct in South Brisbane, work was undertaken within a highly constrained area that included two high schools, heavy vehicular and pedestrian traffic and critical emergency services.

Premium drew on its extensive industry experience to address and manage potential risks, ensure public safety, ensure minimal impacts and provide cost effective and efficient haulage services.

One of Premium's recent projects is the Hay Point Expansion Project. Bechtel engaged Premium to sort, load and cart 90,000 tonnes of Armour Rock to create the sea wall at Hay Point. Other projects include the Caterpillar America (Yatala Project) where CIP engaged Premium for the bulk excavation of 350,000 tonnes of material and Devport's Beach Development project at Mackay where Premium was engaged to source, load and cart 50,000 cubic metres of compactable material. Carbrook Golf Course engaged Premium to remediate the manmade lakes on its course. This involved the import and compaction of large volumes of fill material.

“Premium works hard towards developing individual strategies to provide clients with tailored solutions that are cost and time efficient,” said a company spokesperson.

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Showcasing Ecoblanket's results after two years



Before application



The one-step application process in action



Showcasing Ecoblanket's results after four months

## AWARD-WINNING ENVIRONMENTAL INNOVATION TRANSFORMS LEGACY WAY

The landmark Legacy Way project showcases the environmental transformation possible through Ecoblanket, a world-leading groundcover process. Ecoblanket was applied to more than 6 ha of highly visible cut and fill batters across Legacy Way to provide stabilisation and rehabilitation.

Leading environmental management consultancy, RPS, chose Ecoblanket to address the project's environmental challenges. These included soil stabilisation on steep and very high batters, erosion and sediment control, habitat and nature conservation, helping to create a "green gateway" to local suburbs, and carbon sequestration. The results have exceeded expectations, with more than 200,000 healthy plants flourishing across the site.

"Ecoblanket is the world's most advanced groundcover solution, made from 100% organic materials," says Tony Rees, Founder and Managing Director of exclusive Ecoblanket licence holder, Groundworks

Australia and winner of the 2014 Minister's Award for Leadership in Sustainability at the Queensland Premier's Sustainability Awards. "It is an environmentally-friendly, smart and proven process that can be used almost anywhere soil has been disturbed."

"We're achieving sustainable revegetation results in many cases where other methods have failed to survive beyond one year. The critical feature of Ecoblanket's success is that we understand and test the soil on each site and tailor Ecoblanket to each unique environment."

Liquid and green waste is first converted into nutrient-rich organics that form the basis of the proprietary Ecoblanket process. On Legacy Way, up to 18,000 tonnes of green waste from a local council was saved from landfill and composted as part of Ecoblanket's organics material. Then, using soil and other environmental tests, Groundworks adapted Ecoblanket to the site and selected native seeds to optimise habitat establishment and biodiversity.

The team designed three different seed mixes tailored to suit the project's varying height limits. Vegetation closer to the road was designed to reach 2-metre heights, while vegetation further away will eventually reach 10-metre heights. Seeds were 'planted' into the instant, high-quality organics material using a non-invasive, pneumatic (blown on) process via state-of-the-art machinery that can treat thousands of square metres per day.

Ecoblanket's results have exceeded expectations. Through the staged delivery process, the project never had uncovered soil in areas contracted to Groundworks, resulting in best practice dust suppression and sediment control. The application of Ecoblanket also delivered immediate erosion control, with less than 0.5% erosion. The site achieved exceptional results in the strike rate of cover crop, with Ecoblanket guaranteeing a 90% or higher strike rate when instructions are followed. It stabilised poor soils on the site's long slopes and prevented water runoff issues.

Based on independent research, the Legacy Way Ecoblanket is estimated to sequester approximately 4,200 tonnes of CO<sub>2</sub> over the next 28-years. The use of Ecoblanket also resulted in cost savings, with the cost of traditional methods for the project estimated at up to three times that of Groundworks' services. In addition, as Ecoblanket was delivered via Express Blower trucks, no workers were needed to traverse dangerous

batters, significantly improving efficiency and safety. "Ecoblanket outperforms when it comes to immediate results and rapid growth rates...and the value from an operations and maintenance perspective is outstanding," says Tony. "It offers the market's least expensive whole-of-life solution for unmatched erosion control and revegetation."

For Legacy Way, Groundworks, and industry partner NuGrow, won the 2013 Waste Recycling Industry Association's Queensland Innovation Award. Groundworks also won the 2013 IECA Australasia Environmental Excellence Award in Innovation for Ecoblanket. In 2014, Groundworks was a finalist in the prestigious Banksia Sustainability Awards and United Nations Association of Australia World Environment Day Awards.

Ecoblanket has been used on major infrastructure projects, resources and mine sites, and development projects. Groundworks' current contracts include major road upgrades and several CSG-sector dams around Queensland as well as further work packages for Legacy Way. Case studies of previous Groundworks projects are available at [www.ecoblanket.com.au](http://www.ecoblanket.com.au).

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## KNECHTING THE LEGACY

**Herrenknecht Australia Pty Ltd, together with Herrenknecht AG head office, has been involved in the Legacy Way project from the start of the construction process.** “Herrenknecht is the leading provider of holistic technical solutions in mechanised tunnelling - for all diameters, in all geologies and areas of application (railway, metro, road, utility, pipelines, hydropower, mining and exploration),” said a company spokesperson.

The two Herrenknecht Double Shield Tunnel Boring Machines (TBMs) used for the Legacy Way project were used for the Clem Jones Tunnel beneath the Brisbane River; one of the largest infrastructure projects ever to be completed in Queensland.

The Herrenknecht Double Shield TBMs are suitable for the excavation of long tunnels in hard rock, which is the predominant geological condition for Legacy Way. A double shield TBM is a custom-built machine which simultaneously excavates and lines the tunnel, while removing the excavated material from the tunnelling area. Each TBM was assembled within a custom-built TBM launch box at the project’s western worksite in Toowong.

It took approximately three months to assemble the 50 large steel segments and only six and nine months respectively for the TBMs to complete the journey from the western portal at Toowong to the eastern portal at Kelvin Grove. In the process the TBMs set a new world record for machines of their size. Each machine is 12.4 metres in diameter, approximately 110 metres in length and weighs approximately 2,800 tonnes. The first TBM was launched in August 2012 and the second TBM was launched in October 2012. Named “Annabell” (S-647) and “Joyce” (S-648) they have each excavated 4.3 kilometres for Legacy Way.

The Herrenknecht Group contributed to the jobsite operation with a conveyor belt for removing excavated material, the TBM’s navigation system (VMT) and multi-service vehicles for transporting the material

in the tunnel (Techni-Métal Systèmes). The TBM’s tunnelling excavation proceeded at record-breaking speed at times, excavating approximately 1 million cubic metres of rock and dirt. The TBMs lined the tunnel with 38,700 precast concrete segments to form the tunnel walls. These segments, each weighing approximately 7.5 tonnes, created an interlocking system which ensures a safe concrete shell for the tunnel walls.

Herrenknecht Australia and Conveyor division H+E worked closely with Transcity on the Legacy Way project in order to create innovative solutions. For the first time on an Australian tunnel project, road base back filling of a tunnel was done by reversing the TBM conveyor system.

The Legacy Way project was also the first time a mobile installation gantry was used in Australia to install the pre-cast smoke duct slabs. The Smoke Duct Slab Erection Gantry was custom designed and assembled by Herrenknecht Australia. Also, a custom designed and built pneumatic controlled drilling rig was used for drilling anchor holes and installing mechanical anchors in a vertical-overhead position. The pneumatic control allows the operator to brace the rig against the concrete and run the drill feed. This eliminates manual handling and improves the hole accuracy and operator safety.

“Building on our unique expertise and experience, we provide technical solutions which are optimally adapted to the project, says a company spokesperson. “Together with our customers, we are able to overcome all challenges and create robust, sustainable tunnel structures – precisely where they are needed.”

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Legacy Way, QLD

## LEADING THE WAY IN ROAD SAFETY

As a dedicated road and traffic engineering consultancy specialising in road and transport safety, Transafe's work spans large and small infrastructure projects within both the public and private sectors. The company was engaged on the Legacy Way project as the principle road safety auditor, providing road design and traffic management advice at both the desktop stage and in the field. Transafe worked closely with the Transcity JV construction team to ensure the safety of workers, motorists, cyclists and pedestrians throughout the project. The construction team in conjunction with Transafe set new benchmarks in safety management.

As its name suggests, safety is Transafe's priority, bringing together Australia's leading road safety professionals. The company's traffic engineers, senior road safety auditors and audit team leaders are accredited in all Australian states and specialise in assessing and providing advice at all stages of infrastructure and transport projects. For federally funded projects, Transafe meets the National Code of Compliance requirements.

Its core business of road safety auditing allows Transafe to remain independent of the project team, ensuring it provides impartial, professional advice. This helps the project team meet the latest guidelines, standards and industry best practice.

Transafe also provides specialist audits to the transport industry (such as route audits) and public transport departments (including train/tram platform stops, town centre revitalisations, bus interchanges, bicycle paths, shared paths and DDA compliance). Its road safety audit reports focus only on relevant issues, saving a project team the hassle of addressing irrelevant and peripheral issues, reducing project time and costs. Transafe also provides transport engineering services, risk analysis and hazard management, project development, and expert witness and dispute resolution.

In addition to the Legacy Way project and Western Freeway Upgrade (Queensland), Transafe continue to be an integral member of several major infrastructure projects in Australia. These projects include the Moreton Bay Rail Project and Cairns Bruce Highway Upgrade in Queensland, Victoria's Koo Wee Rup Bypass, Ringwood Railway Station and Interchange Project, Warragul Railway Station Upgrade and Western Highway Duplication, and the Sydney Light Rail Project.



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## SCAFFOLDING LEGACY



Cogent Scaffolding offers specialised, scaffolding services to the commercial construction, industrial, civil and resource industries throughout Queensland. The company has been an integral part of the Legacy Way project for 3 years. The company started work on the project when the 2 imported tunnel boring machines (TBMs) were brought into action in order to help put them together. When completed each TBM weighed approximately 2,800 tonnes and was 12.4 metres in diameter and approximately 110 metres in length.

Cogent Scaffolding had highly experienced teams working 24 hours a day to build scaffolding around the TBMs as they were being assembled piece by piece. Cogent Scaffolding ensured that all points of each TBM could be accessed and that each of the thousands of necessary parts required, could be fitted safely and efficiently. It took 2 months for the work on each machine to be completed before tunnelling began. The scaffolding was then dismantled. Once the TBMs finished tunnelling scaffolding was erected to pull the machines apart and then again dismantled.

Formwork was also required for the construction of the bridges which act as entries and exits for the tunnels. The fitting out of tunnels,

which is proceeding, requires scaffolding for the various trades and Cogent Scaffolding is providing this as required. Altogether, between 500-600 tonnes of scaffolding is constantly being moved around the site. Cogent Scaffolding's experience has enabled the company to come up with safe solutions to the challenging aspects of the project, like the challenge of erecting scaffolding in tight and confined spaces.

Cogent Scaffolding has worked with some of the biggest names in the construction industry. Other projects Cogent Scaffolding is currently working on in Queensland include Circa Nundah village, Arena in South Brisbane and Rhapsody in Surfers Paradise. The company has recently completed the Indooroopilly Shopping Centre, The Corso in North Lakes and The Gasworks in Newstead. "We have the best team of scaffolders out there," said Director, Dan O'Brien

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