CASE STUDY

Moreton Bay Rail Link Project

Moreton Bay, QLD, Australia

Reinforced Earth® retaining walls
TerraPlus®

Owner: TMR QLD
Consultants: AECOM
Contractor: Thiess Pty Ltd
Construction: Jan 2014 – Jun 2016

Background:

The Moreton Bay Rail Link Project provides a dedicated public transport link for one of the fastest growing regions in Queensland. Scheduled for completion in 2016, this heavy rail project provides a safe and reliable transport network. It will ease road congestion and reduce travel time to Brisbane's central business district (CBD) for the 6,000 people expected to use the service daily.

The project will deliver a 12.6 km dual-track passenger rail line between Petrie and Kippa-Ring and includes 6 new railway stations. Other features of the project include a grade separated rail connection to the Caboolture line at Petrie, and 22 bridge structures to provide grade separation of road and rail.

The Department of Transport and Main Roads (TMR) is the lead agency for the delivery of the project working in collaboration with Queensland Rail and Moreton Bay Regional Council. Thiess Pty Ltd was awarded the contract to design and build the Moreton Bay Rail project with the major construction starting in January 2014.

The Reinforced Earth Company (RECO) was contracted to design and supply Reinforced Earth® bridge abutment walls, covering an area of 3,235 sqm, for 6 structures at different locations across the project.

Challenges:

RECO's scope of works included the design and supply of Reinforced Earth® piled bridge abutment walls for the following structures:

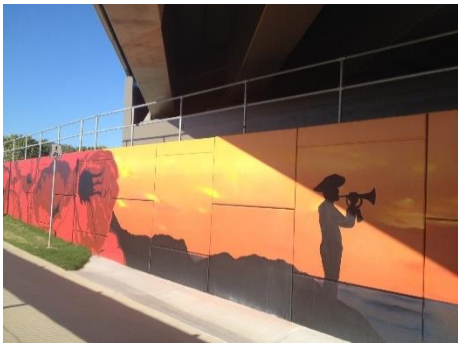
- Rail over road bridge at Dohles Rocks Road
- Rail over road bridge at Brays Road
- Rail over road bridge and support for the railway station at Duffield Road
- Rail over road bridge at Goodfellows Road
- Rail over rail bridge at Grade Separation
- Road over rail bridge at Mango Hill.

These designs needed to be coherent between the design of new associated structures and existing infrastructure across the project. A major challenge was to minimise disruption to existing infrastructure during construction.

For instance in order for the rail line to pass over Dohles Rocks Road and Goodfellows Road, the tracks were built on earth embankments through this area. The height of the rail embankment varies along the project length and in this area is approximately 6-8 metres high.

Embankment settlements, lateral movements of the subsoil, seasonal moisture changes and flood level requirements were a design consideration.

Railways differ from highway loads in regards to intensity, frequency and associated vibrations. Different load ratings needed to be applied during the design process.



Main picture: Brays Road during construction
Above first picture: Goodfellows Road
Above second picture: Mango Hill
Above third picture: Duffield Road

REINFORCED EARTH
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Transport infrastructure

Left: Duffield Road during construction
Above: Dohles Rocks Road during construction

Solutions:
The Reinforced Earth® structures combine selected granular, engineered backfill with steel reinforcements and a modular facing system which together create a mass gravity retaining wall. These structures are capable of supporting their own weight together with very high dead and live loads imposed by associated structures and vehicles.

The technique is adaptable to walls of any practical height which is evident in the variety of wall configurations designed for this project. The Reinforced Earth® structures ranged in height from 5m to 10m and in length from 15m to 102m to accommodate the variations in the height of the rail and road embankments.

The method has been used extensively to build structures under railway tracks because of its significant load bearing capacity and its effective absorption of vibrations. Reinforced Earth® structures reduce highly concentrated superstructure loads to acceptable uniform bearing pressures at the foundation level.

They are typically founded at a shallow depth enabling the construction contractor to work outside the area influenced by road or rail traffic. Thus the construction of overpasses combining Reinforced Earth® abutments and bridge decks of prefabricated girders or beams create a minimum of inconvenience to traffic. Crushed rock foundation improvements were included under the shallow foundations to assist in draining the water table when at full height.

Conclusion:
Each wall utilizes the Reinforced Earth® TerraPlus® precast concrete facing system in a plain finish creating a perfect platform for customised painted finishes. The project will showcase a collection of themed murals on bridge structures and noise walls as an aid in deterring graffiti. A local artist, David Houghton, was chosen to oversee the design and production of the artwork. Some of the local groups who contributed to the themes include the Pine Rivers Historical Society, Anzac Memorial Committee and the North Lakes YMCA.

Right: Mango Hill Bridge abutment

Project specifications

System	Reinforced Earth® retaining walls with a TerraPlus® precast concrete facing system
Finish	Smooth grey concrete
Structures	6 Reinforced Earth® Bridge Abutment walls for Road over rail Rail over road Rail over Rail structures
Area	3,235 sqm (total)
Height	From 5m to 10m
Length	625 Lm (Total)
Design loads	20 kPa (road over rail) 50 kPa (rail over road) 65 kPa (rail over rail)
Design life	100 years

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