



Terraforce retaining system considered most feasible for supporting road widening in Australia

Esperance is a small town situated near the southern most tip of Western Australia and following the development of the Ravensthorpe Nickel Mine (RNO), traffic to and from the Port of Esperance would increase radically, especially on Hughes road, the safest option for a large fleet of trucks to gain access to the mine.

With this in mind it was essential to widen the road to accommodate this escalation of traffic. Initially, it was decided that there was insufficient width between the proposed widened road and the existing conveyor trestle for a footing to be designed which could counter the overturning moments generated by a 4m high retaining structure, but careful planning revealed that a retaining structure - using Terraforce L11 blocks - was the only feasible option for the project at hand.

Behind the scenes

It was estimated that, once the mine is fully operational, 450,000 to 500,000 tons per annum of prilled sulphur will be imported and approximately 220,000 ton per annum of mixed nickel hydroxide (around 7,800 containers per annum) will be exported in containers.

A fleet of purpose-built dedicated trucks (92 ton payload) will transport sulphur and containers to

and from the Port of Esperance, adding up to approximately 24 truck trips to the Port per day (one truck per hour). Each truck, arriving from the RNP mine site, will have its full container unloaded into the container stack.

A separate fleet of trucks will transport sulphur (via a 120,000 ton sulphur storage shed) from Esperance to the RNO mine site.

It was imperative, from a planning point of view, to generate as many options as possible to cater for the following scenarios:

- Blocked rail crossing (it was roughly estimated that the present crossing would be blocked around 45% of the time)
- A completely 'full' container storage area to the west of the existing rail corridor
- Accommodating truck movements during the unloading / loading of a container ship (i.e. Berth 2 operational scenario)

Given the above, it became apparent that Hughes Road was a vital safe 'alternative' means of accessing the sulphur storage facility and 'auxiliary' container storage area (east of the rail corridor).

Due to the safety concerns with truck egress through the existing road network within the Port, the widening of Hughes Road to facilitate two way truck flow clearly offered the best theoretical solution.



There were two options available to widen Hughes Road:

- Retain the existing extensive batter on the southern side
- Retain the existing batter on the northern ('lower') side

On safety grounds, retaining the existing 'lower' batter on the northern side was the only option worthy of consideration.

Deciding on a retaining structure

The following retaining options were considered:

1. Brick veneer, cavity filled wall
2. Reinforced concrete using conventional formwork
3. Sheet piling
4. A double layer gravity retaining wall using interlocking blocks

The first option was fairly pricy per m². Another

limiting factor was the present shortage of bricklayers and the lengthy duration this type of mechanism would take to construct.

Option 2 would also be very expensive. There are also obvious access problems associated with the erection of conventional formwork.

The mobilisation costs for option 3 are generally high, but this may still have offered the most cost effective solution. However, given the presence of rock 'floaters' in the existing road profile, one could not afford the risk of 'refusal' during the piling operation. On balance, option 4 offered the most cost effective - about 20% cheaper than option 1 and 2 - and practical solution.

Proposed design and construction method

The proposed design included an initial 1m high vertical section of Terraforce L11 blocks dry stacked in two layers on a reinforced concrete foundation. Above this level the rows were stepped back to a maximum height of 4,2m.

To provide a safe barrier kerb for upcoming earthmoving operations above the wall, both layers of blocks were packed to the top of the wall with the top row filled with concrete.

Subsurface drainage measures were not required due to the draining nature of in-situ sandy soil. The footing was installed by a recognised concrete contractor, who was paid per m³ of concrete laid, with all materials, namely concrete and steel reinforcing supplied separately by the Esperance Port Authority. Work commenced at the lowest, most critical sections of the existing batter and continued progressively along the 450m long



section retained. In total, over 22 000 blocks were delivered to the site from Geraldton - 1,200 km north of Esperance.

Blockmaker - Blockmakers Geraldton WA
 Main Contractor - Ballantyne Earthmoving
 Block Installer - Ian Mumme
 Engineer - Layton Baker, Esperance WA

www.maxiwall.com or www.terraforce.com
 Design Manual for composite retaining walls available on request. (1995 by Colin Alston - Ontario)