CASE STUDY

Sepon

Sepon, Savannakhet Province, LAOS, Southeast Asia

Reinforced Earth Walls
TerraMet®

Owner:	Oxiana
Consultants:	Ausenco Limited, Bateman Engineering
Contractor:	Ausenco Limited, Khanong Development Group
Construction:	Oct. 2002–Aug. 2004

Background

Laos (Lao People's Democratic Republic), a landlocked, sparsely populated country is isolated from foreign influence. From the fertile lowlands of the Mekong River valley to the rugged Annamite highlands, rivers and mountains dominate Laos. Coupled with sparse transport infrastructure, some regions are difficult and timeous to access.

Oxiana, an Australian based international mining and exploration company owns and operates Laos' largest foreign investment, the US$350M Sepon Mining Project. The Sepon project comprises a 1947 km² contract area located approximately 40km north of the town of Sepon, in the Savannakhet province of south-central Laos.

Challenge

The Sepon mining project was commissioned as a multi-stage development:

1. A gold mining project, Sepon Gold, began operation in 2002. This formed the first phase of the project as gold processing is technically simpler, the infrastructure required can be developed more quickly at a lower cost and ultimately the project could be used to generate cash flow for the secondary, major component of the project: Sepon Copper (Khanong Copper Project).
2. Sepon Copper is believed to have some of the world's best, untapped copper reserves due to it high-grade copper ore and low-cost production.
3. Sepon Gold expansion, doubling throughput from Sepon Gold.

For each of the three mines, dump structures were required.

Traditionally dump structures are constructed using fill embankments that are reinforced with synthetic material to increase their design capacity and enable them to withstand vertical and horizontal loads exerted by mining vehicles on top of the structure.

Solution

Ausenco was the EPCM (Engineering, Procurement, Construction and Management) contractor for the Sepon Gold Project. The detailed engineering for the Sepon Copper Project was awarded to a joint venture formed between Brisbane-based Ausenco Limited and Bateman Engineering Limited. The Khanong Development Group (KDG) was responsible for the engineering and ultimately the construction of part of the site infrastructure too.

The Reinforced Earth Company was approached to assist in the design, supply and full time on-site construction assistance for each of the dump structures.

Main Picture: Sepon Copper – View of backfill, reinforcing straps, gravel drain behind structure, front face and panels ready for installation.

Above: Sepon Gold - Galvanized Steel facing Panels

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Mining infrastructure

Left: Sepon Gold. Dump Structure and Primary Crusher Construction

	Area (m^2)	Max. Height (m)	Vertical Loads (kN)	Horizontal Bridge Loads (kN)	Vertical Bridge Loads (kN)
Sepon Gold	417	11.9	CAT 988 FEL (GVM = 450kN)	225 (Live Load)	
Sepon Copper	633	11.2	CAT D400E (GVM = 680) CAT 988G (GVM = 604)	170 & 579	670 (Dead Load) 515 (Live Load)
Sepon Gold Expansion	1070	16.45	Komatsu 605 (GVM = 1100kN) CAT 988 FEL (GVM = 620kN)	600 (Live Load)	900 (Dead Load) 1100 (Live Load

A Reinforced Earth Structure constructed from TerraMet® was selected as the best solution. A TerraMet® structure comprises galvanised steel reinforcing strips, select backfill and lightweight galvanised semi-elliptical steel panels for the front face. The panels are 375mm high, 3m long and weigh about 36kg each. Alternatives which were considered included the in-situ casting of concrete on site, rejected due to potential complication of remote product development or the use of precast concrete panels, rejected due to their significant impact on increased transport costs. For comparative purposes, a 20ft shipping container has capacity for 40-50 m^2 of concrete facing panels verses 250 m^2 of steel facing panels.

Special features/benefits

The very remote site was accessed from Australia using various flights to reach the Laotian capital, Vientiane, followed by an extended (10 hour) rough four wheel drive journey on unsealed jungle tracks along the notorious Ho Chi Min Trail: a network of dirt paths and gravel roads used in the Vietnam War, and even a motorboat ride over the famous Mekong River.

The logistics path for the materials onto site was equally lengthy and complicated. It involved shipment from Australia into the Port of Laem Chabang (Bangkok), trucking to Mukdahan (Thai border), barge transfer across the Mekong River to Savannakhet (Lao side of border), and then to trucking to site.

Initially minor problems were encountered sourcing suitable backfill on site as there are no existing quarries. Suitable river sand was sourced from a few kilometres away, albeit containing war remenants, which needed to be removed.

Benefits of TerraMet® include:

- Suited to remote sites where economics of getting materials to site are of utmost importance.
- Lightweight to transport.
- 30 year design life for galvanized steel.

Other difficult working conditions making this a unique project for RECO were:

- Hot humid climate with regular tropical downpours and seasonal flooding during the monsoonal wet season (June-September).
- The threat of UXO (unexploded ordinance), left over from the Vietnam war.

Project specifications

System	TerraMet®
Finish	Galvanised Steel
Structure	Dump Structure
Area	As above
Max. Height	As above
Design life	30 years

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