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Environmental - Remediation - Engineering - Laboratories - Drilling

SE08151-A MC:MC

7th December 2009

Ward Civil

PO Box 1067

NORTH RYDE BC NSW 2113

ATTENTION: Mr Emmanuel Mountakis

Dear Sir,

RE: Shipping Container Storage Hardstand Area

Gate 55B, Port Botany

Geotechnical assessment

As requested, a Senior Engineering Geologist from Aargus Engineering (formerly known as Brink & Associates) has reviewed the design of an existing hard stand area used for storage of shipping containers.

We understand that this area is currently used for storage of empty shipping containers stacked five high and that it is proposed to increase this height to six high.

We also understand that the platform is 1.5m thick, constructed of ripped sandstone compacted in 200mm layers. The sandstone is surfaced with a 200mm thick roadbase layer. Compaction control testing was carried out by Brink & Associates.

This assessment is based on the following assumptions:

- An empty 40 foot shipping container weighs up to 3700kg.
- The empty shipping containers sit on four pads, each measuring 150mm square, one on each corner of the container.

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- The containers are manoeuvred using a solid rubber tyred forklift of about 20 tonne static weight. This forklift is assumed to have an axle loading of up to 36 tonnes fully loaded. However, the same forklift is likely to only have a maximum axle loading of about 22 tonnes when loaded with the existing shipping containers.
- The forklift has four tyres per axle.
- The solid rubber tyres of the forklift are each about 300mm wide and contact the ground over a width of about 50mm.
- The existing platform is in good condition.

Based on the forgoing, we consider the following:

- The total maximum weight of 5 empty shipping containers (existing conditions) could be up to 18.5 tonnes.
- The total maximum weight of 6 empty shipping containers (proposed conditions) could be up to 22.2 tonnes.
- The combined surface area of the four 150mm square pads on the shipping container corners totals 0.09m^2 .
- The total surface area of the forklift rubber tyres contacting the ground is about 0.06m^2 .

As such:

- Shipping containers stacked 5 high would exert a maximum bearing pressure of about 2050kPa on the platform.
- Shipping containers stacked 6 high would exert a maximum bearing pressure of about 2460kPa on the platform.
- The forklift with 20 tonne axle load would exert a static bearing pressure of about 3330kPa on the platform.

Based on the foregoing, we consider that the current static loading of the forklift exceeds the maximum expected loading of the shipping containers stacked 6 high. Furthermore, the dynamic loading of the forklift will be greater than the static loading detailed above.

We note that the above bearing pressures are temporary and over time may result in long term settlements of about 50mm, with differential settlements of about 25mm.

Based on the pavement construction being 1.5m thick, the expected loading transferred through to the pavement sub-grade materials is expected to be about 20kPa.

Should the above conditions and assumptions be acceptable, we consider the existing platform to be suitable for supporting the shipping containers stacked six high.

Should the above conditions and assumptions be unacceptable, testing of the platform including plate bearing testing may be carried out to confirm the adequacy of the platform for support of the proposed loadings.

This assessment is based on information provided by Ward Civil. No site inspection or subsurface investigation was carried out to confirm the validity of the information provided to us. If site conditions differ from those provided to us and detailed in this report, this report should be reviewed and reassessed based on the differing conditions.

Please do not hesitate to contact the undersigned if you require any further information.

For and on behalf of

Aargus Engineering

A handwritten signature in black ink, appearing to read 'M Cupitt', written in a cursive style.

Matthew Cupitt BSc (App Geol)

Senior Engineering Geologist