JK Geotechnics
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23 January2018
Ref No. 29807ZRlet

Taylor Lauder Bersten Pty Ltd
Level 6, 1 James Place
NORTH SYDNEY NSW 206O

ATTENTION: Savas Christoforidis

Dear Sir

**PRELIMINARY GEOTECHNICAL ADVICE ON INTERACTION WITH THE EPPING CHATSWOOD RAIL TUNNEL**
**THE PROPOSED ARTS PRECINCT, MACQUARIE UNIVERSITY, NSW**

We confirm that JK Geotechnics have prepared two geotechnical reports for the proposed arts precinct at Macquarie University (Ref. 29807ZRrpt Rev. 1, dated 6 June 2017 and 29807ZRrpt2, dated 8 December 2017). We have been provided with 'Rail Corridor Impact Study – Main Works' drawing (Drawing Numbers APP STR-SK0012 Issue B, dated 20 September 2017) prepared by Taylor Lauder Bersten Pty Ltd (TLB).

Based on a review of the provided TLB drawing and our reports, the proposed works over the footprint of the rail corridor will include refurbishment of the existing Buildings W6A and W6B with removal of selected sections of the buildings required and new footings. The refurbishment of Building W6A will include a new nine storey central core replacing the existing nine storey portion of the building.

The proposed bored pier footings (maximum bearing pressure 3000kPa) have been detailed to be founded at a maximum depth of 5.2m below existing surface levels (RL57.98m). The proposed pier footings will be designed to be founded in Class IV sandstone bedrock suitable for an allowable bearing pressure of 3,500kPa, in accordance with the advice presented in our report.

The proposed pad footings (maximum bearing pressure of 500kPa) have been detailed to be founded at RL62m in Class V sandstone bedrock.

As indicated on the TLB drawing, the upper boundary of the First Reserve will be at approximately RL39m; approximately 19m below the proposed maximum founding depth of the bored pier footings and off-set approximately 12.3m to the south of the First Reserve southern boundary. The TLB drawing also includes approximate pressure bulbs for the individual piles, pad footings and the new nine storey core, based on the attached Sketch A. The pressure bulbs were assessed by the undersigned based on pressure distribution curves (with depth) well established in the geotechnical literature and using the dimensions of the footings and the 19m square plan dimension of the new nine storey building.

Based on our experience of 2D and 3D finite element analyses of buildings constructed over, and adjacent to, road and rail tunnels, and our estimation of the likely pressure distribution, with depth, in our opinion:

- The unloading associated with the demolition of selected sections of the nine storey building and subsequent reloading as the proposed refurbishment is constructed (including new footings and new nine storey central core) will have negligible net impacts at the depth of the tunnel.
- The pressure bulbs below the toes of individual piles and pad footings will be relatively localised and minimal bearing pressure will be imposed at a depth equivalent to 2B (where B is the pile diameter, in metres) and 3B (where B is the footing width, in metres).

- The proposed depth of the new piles will be similar to the existing piles. The current pressure distribution associated with the pile group is expected to essentially remain unchanged. We assume that as part of the design of the tunnel, the impact of the existing buildings on the tunnel was assessed and the tunnel designed accordingly.

On the basis of the above, we consider that there will be negligible additional loads/bearing pressures impacting the First Reserve, or the tunnel, associated with proposed footings.

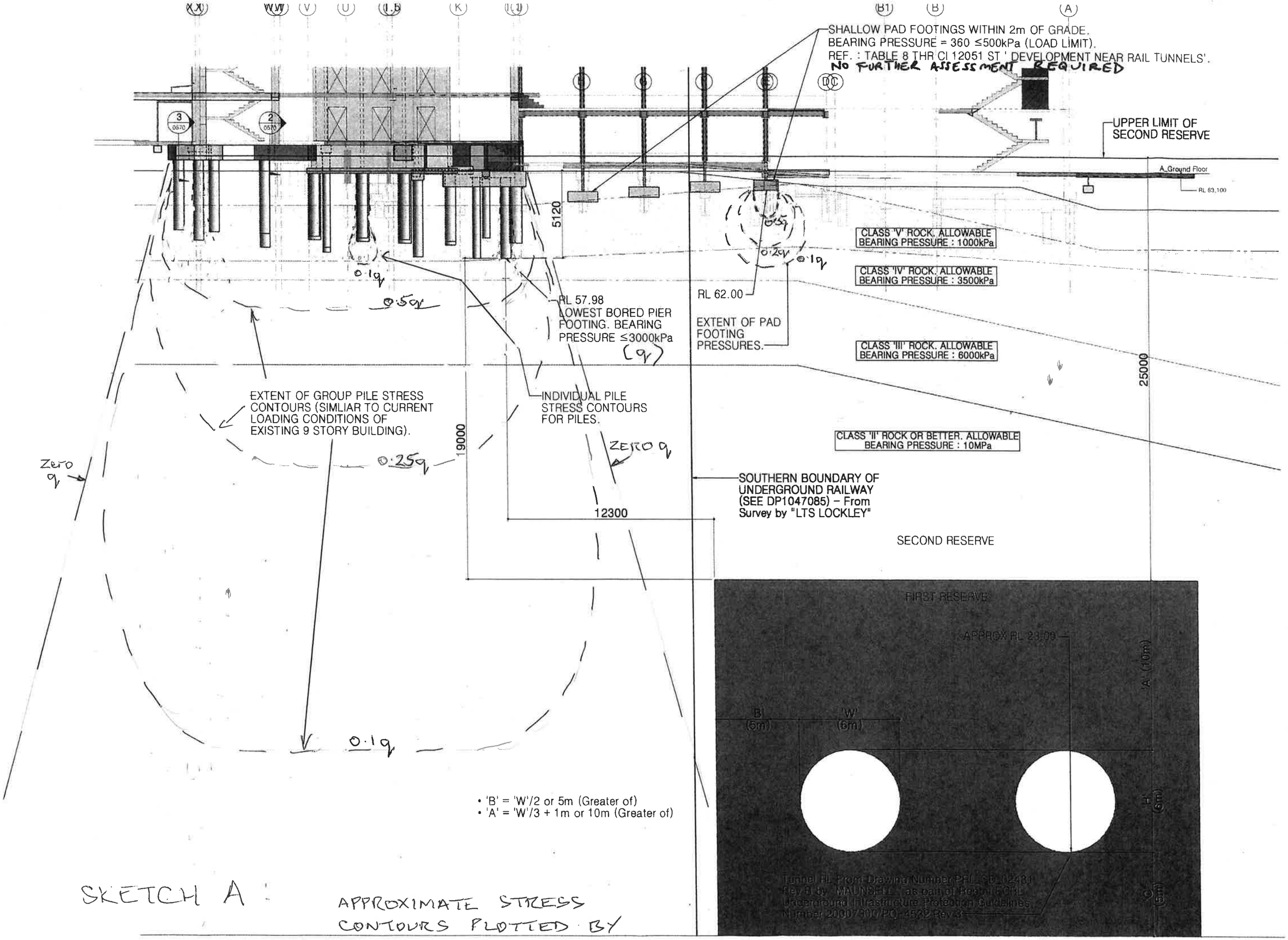
The pad footings are expected to be excavated using bucket attachments to tracked excavators. The piles will be drilled using bored piling techniques and penetrate Class IV sandstone which, based on our investigation results will be of low and medium strength. The piling rig auger attachment is expected to be fitted with conventional tungsten carbide 'rock teeth' to penetrate the bedrock. Any vibrations associated with these footing excavation techniques, in our experience, will be of low magnitude, and will have dissipated to barely perceptible levels at the tunnel crown. We therefore do not consider that vibration monitoring of the tunnel will be required.

In conclusion, it is our opinion that the development will have no negative impact on the rail corridor or the integrity of the infrastructure through its loading and ground deformation.

Should you require any further information regarding the above, please do not hesitate to contact the undersigned.

Yours faithfully
For and on behalf of
JK GEOTECHNICS

**Paul Roberts**
Senior Associate | Engineering Geologist




SKETCH A :

APPROXIMATE STRESS CONTOURS PLOTTED BY JK GEOTECHNICS → see letter 29807ZRlet