

MELBOURNE METRO RAIL PROJECT ENVIRONMENT EFFECTS STATEMENT
INQUIRY AND ADVISORY COMMITTEE

MMRA TECHNICAL NOTE

TECHNICAL NOTE NUMBER: 047

DATE: 24 August 2016

PRECINCT: Tunnels Precinct

EES/MAP BOOK REFERENCE: Map 9 (Horizontal Alignment Plans); EES Chapter 6

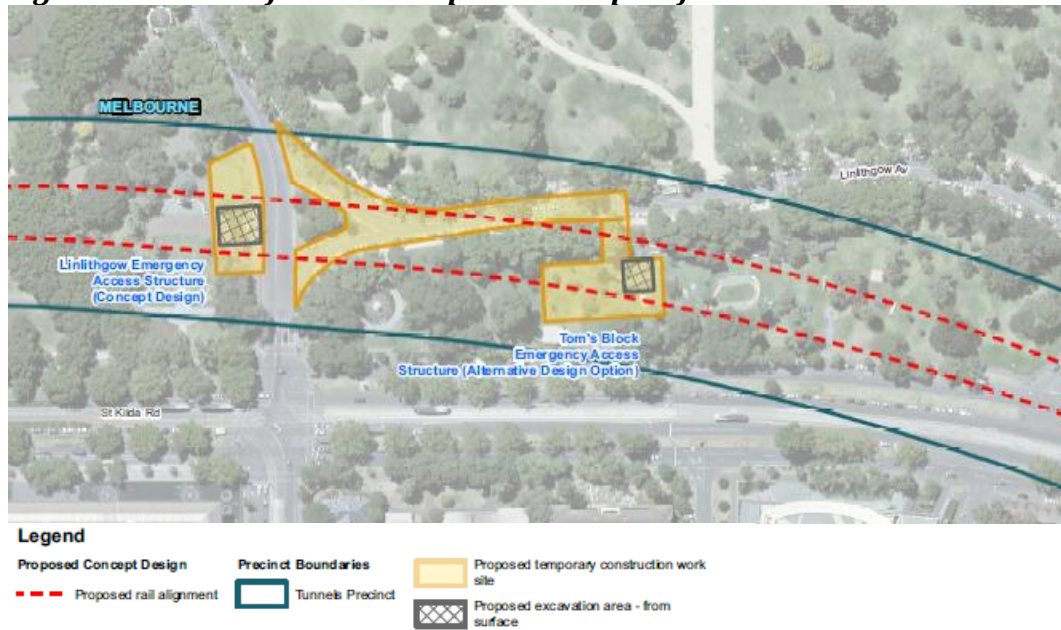
SUBJECT: Tom's Block – Ground Stabilisation Works

NOTE:

Context

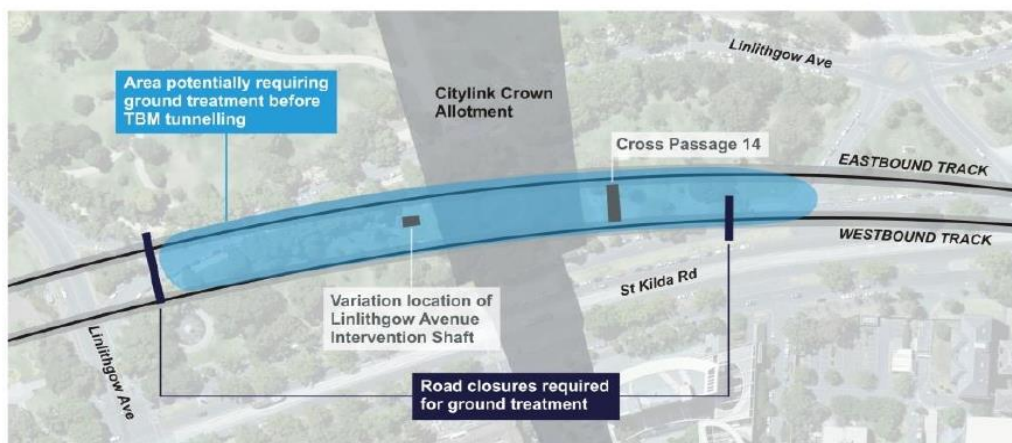
1. Chapter 6 of the EES Main Volume (at p. 6-11) advises that ground improvement works in Tom's Block near Linlithgow Avenue in the Domain parklands will be required if the rail tunnels cross over the City Link tunnels.
2. The impact of these works on trees in Tom's Block are set out in Chapter 7, and in particular Section 7.5, of the Arboriculture Impact Assessment in Technical Appendix R of the EES.
3. This Technical Note sets out more information about the need for these works, and the nature and extent of the works, should the ultimate design include a rail tunnel over the City Link.
4. The location of the Melbourne Metro tunnel horizontal alignment is depicted in Figure 1, which is Map 9 (Horizontal Alignment Plans) from the EES Map Book.

Figure 1 – Extract from EES Mapbook – Map 9 of 15



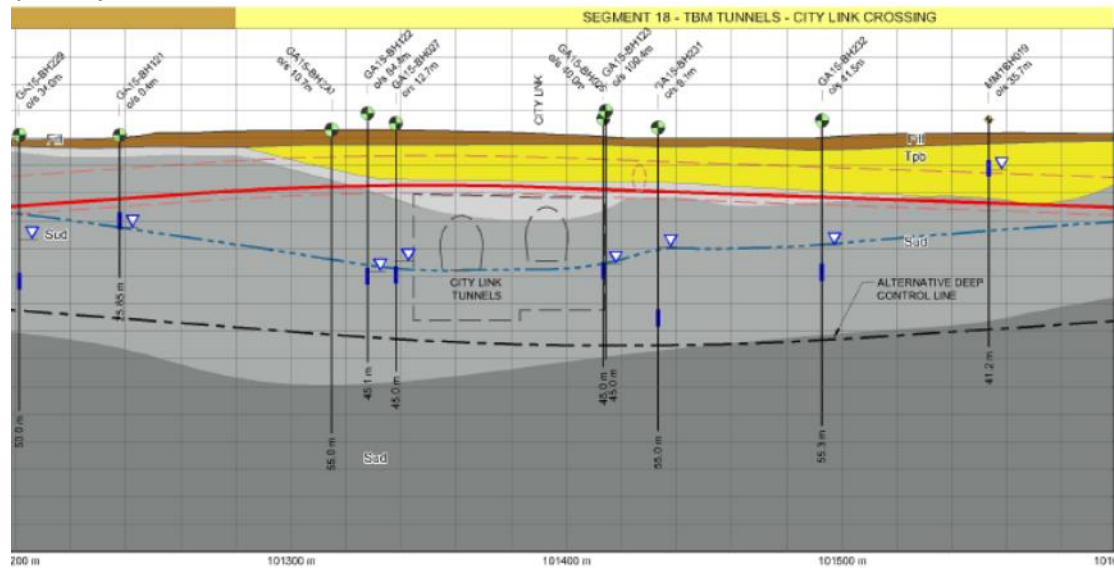
- Figure 2 is extracted from Technical Appendix P of the EES, and depicts the location of the horizontal alignment of the Melbourne Metro, the City Link Crown allotment, and the area potentially affected by ground treatment works if the rail tunnel alignment passes over the City Link tunnels.

Figure 2 – Extract from EES Technical Appendix P – Ground Movement and Land Stability



- Figures 1 and 2 identify worksite area requirements and the maximum extent of area required for potential grouting of shallow rail tunnels above City Link tunnels. It is not assumed nor expected that the grouting activities will impact upon trees outside the blue shaded area in Figure 2.
- Figure 3 identifies the vertical alignment options of the rail tunnels in the vicinity of City Link.

Figure 3 – Extract from Procurement Stage Geotechnical Interpretive Report (Rev 0)



Key considerations

8. As can be observed from Figure 3, the rail tunnel alignment above the City Link Tunnel would result in approximately 4m of soil cover (at its shallowest) between the existing ground surface and the obvert of the rail tunnel. The primary assumption made in the EES at this location is that wherever the depth of soil cover between ground surface and the obvert of the tunnel is less than the diameter of the rail tunnel (in this case, 7m), then ground treatment is assumed to be required to address potential risks of:
 - a. surface settlement, which is an important consideration here given the sandy, soft soils in this location, and
 - b. unacceptable levels of settlement from being created by tunneling operations with limited soil cover.

9. While the assumption made in the EES in relation to the requirement for ground treatment is widely used, it is not always required and invariably depends on ground conditions. For example, it may be fairly safely assumed that ground treatment will be required where there is an interface between the Brighton Group geological matrix (depicted as yellow in Figure 3) and the underlying Silurian (Melbourne) formation (depicted in grey). However, given what is presently understood to be a fairly tight matrix and cohesive Brighton Group formation at this location, ground treatment may not be required where the tunnel obvert is wholly within the Brighton Group soils.

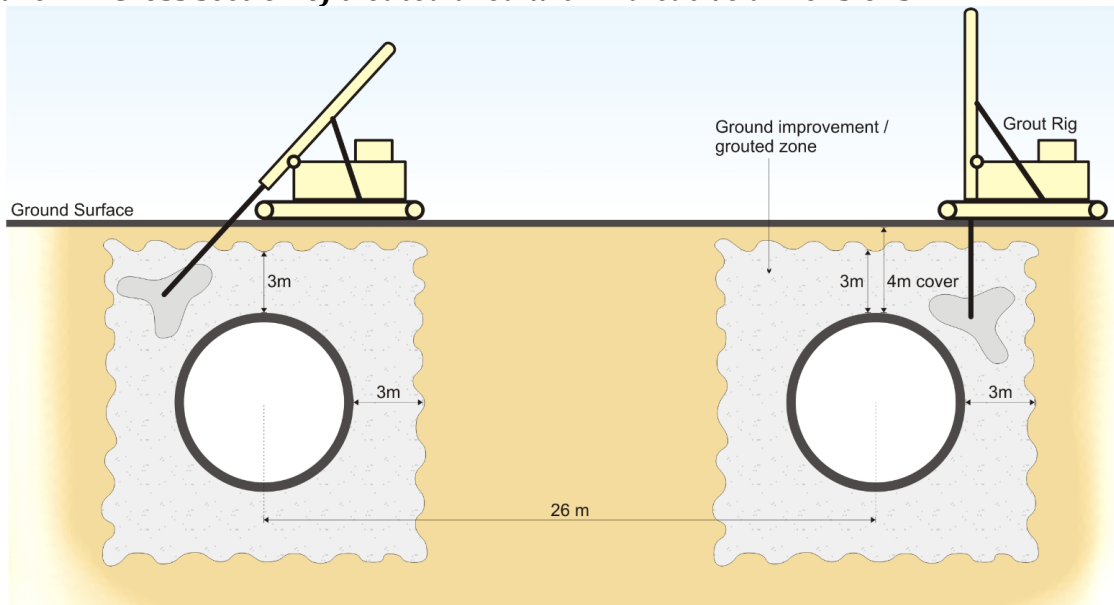
10. Alternatively, it may be possible to obviate the need for ground treatment by regulating face pressure controls on the tunnel boring machine (TBM), thereby reducing the risk of unacceptable levels of settlement being created above the TBM.

11. Either possibility would need to be confirmed during the detailed design and tender evaluation process. For the purposes of the EES, a worst-case assumption is made that neither option is available, and that ground treatment may be required to improve the characteristics of the geology in advance of the TBM tunneling through this area.

Brief description of ground stabilization works

12. Ground stabilisation can either be performed from the:
 - a. surface (primary ground treatment) with small tracked mounted rigs; or
 - b. TBM (drilling, probe ahead and grout), often referred to as secondary ground treatment.
13. Most conclusive treatment results are achieved by primary ground treatment from the ground surface.
14. Figure 4 provides an indicative cross section of the treated areas that would be possibly required for the TBM tunnels crossing over the City link Tunnels.

Figure 4 – Cross section of treated area with indicative dimensions



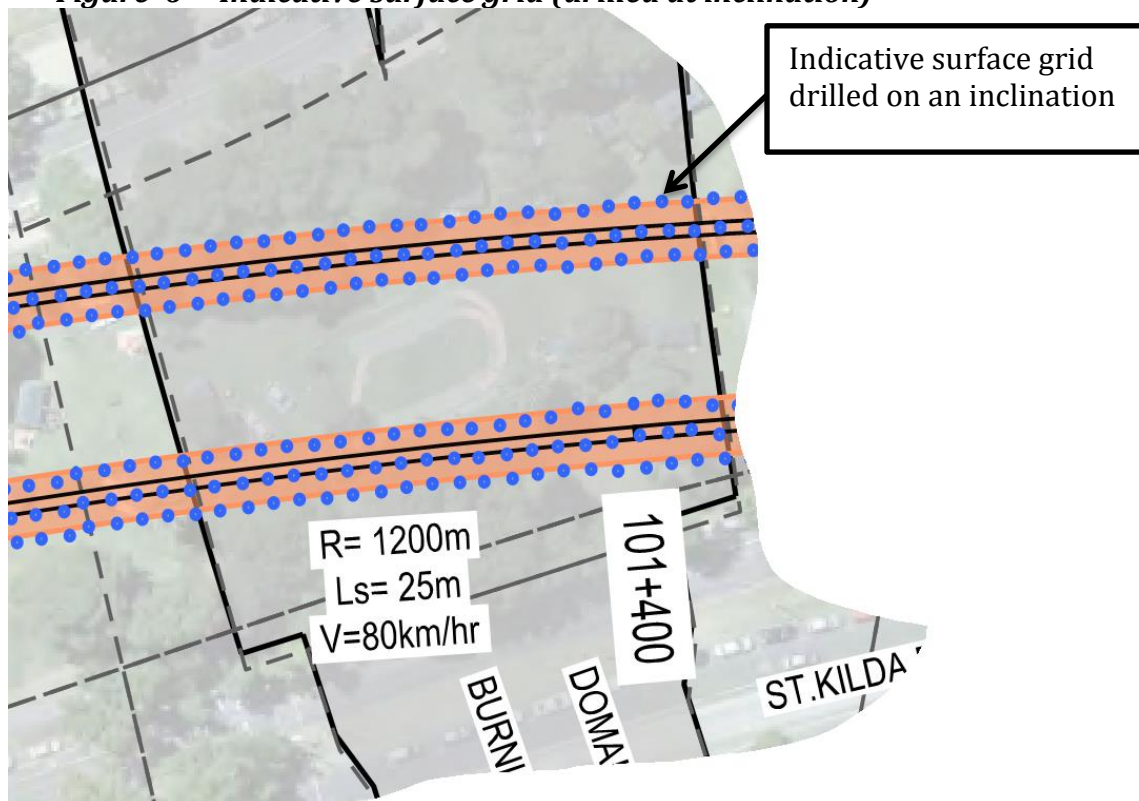
15. This method involves drilling and injecting (low pressure) cementitious grout mix to improve the geological characteristics (refer to Figure 5)

Figure 5 – Grouting Rig (example)



16. To achieve an effective coverage, a surface grid of approximately 2m centre to centre spacing (along the longitudinal length of the tunnel) would be required. It is likely the bore holes would be drilled on an inclination to target the tunnel alignment area. An Indicative grid pattern is shown in in Figure 6.

Figure 6 – Indicative surface grid (drilled at inclination)



CORRESPONDENCE:

No correspondence.

ATTACHMENTS:

No attachments.