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JAM:ss

Attention: Mr Barry Steedman

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Dear Barry

Geotechnical Report – Potential Interaction with Rail Infrastructure
Australian Technology Park, Eveleigh, NSW

1. Introduction

This document presents the findings of a preliminary assessment of the potential for interaction between the proposed new buildings at the Australian Technology Park (ATP), Eveleigh and the existing Illawarra Relief Tunnel, owned by RailCorp. The assessment was carried out to allow preparation of preliminary designs, suitable for submission with the development application (DA).

The development at the ATP will comprise:

- a nine storey Building 1 on Lot 9 – no basement levels
- a seven storey Building 2 on Lot 12 – with two lower ground/basement levels
- a four storey Community Centre Building on Lot 8 – no basement levels.

At the time of this assessment, all three sites were being used as open space car parking lots. It is understood that an adjacent open public space, referred to as the Vice Chancellors Oval, may also be used as temporary stockpiling area during the construction phase of the proposed development.

The aims of the assessment were to identify the spatial relationship of the proposed buildings and the existing railway infrastructure and the potential geotechnical constraints related to the potential interaction of the two.

2. Site conditions

Based on the data shown on the supplied survey plans and design data previously acquired from RailCorp, it appears that Lot 12 is about 100 m from the existing tunnel, while Lot 8 is about 40 m away. Due to these distances, the potential for interaction between the existing tunnel and the proposed buildings is negligible. Building 1, proposed for Lot 9 along Henderson Road is oriented roughly east to west, while the rail tunnel is mapped as being parallel to Henderson Road with an

east-south-east to west-north-west direction. The south-eastern corner of the proposed Building 1 is about 30 m from the mapped rail tunnel while the south-western corner appears to be about 6 m away.

The surface elevation of the south-western corner of Lot 9 is about RL 16 m Australian Height Datum (AHD). Survey data sourced from RailCorp for the tunnel at Garden Street, some 300 m to the east of the proposed Building 1 indicates that at that location the flat top tunnel has an approximately 5 m of cover and that the tunnel roughly follows the surface topography. The Illawarra Relief Tunnel daylights at Park Street, about 620 m to the west of Lot 9. The top of the rail tunnel is estimated to be at a depth of about 5 m at its nearest approach to the proposed Building 1.

The existing tunnel crosses the Vice Chancellors Oval in a roughly east to west direction within the southern third of the grassed area. Based on survey data at hand the existing cover over the tunnel appears to be about 5 m.

2.1 RailCorp Requirements

A technical brief for guiding the review of geotechnical and structural design of developments adjacent to rail infrastructure was issued in 2009 (RailCorp). In this document the design/assessment guidelines for the Illawarra Relief and other flat top tunnels indicate the following:

- *UDL of 150 kPa on top of the tunnel at a strata 300 mm above the external top surface of the tunnel or 6150 mm above rail level, whichever is greater.*
- *The level of any footing is to be below a line drawn at 45 degree from the base of the footings to the base of the brick wall.*
- *Prior to commencement of work for the building foundations, it will be necessary for a dilapidation report of RailCorp tunnels and infrastructure to be carried out by a representative of the Developer and Contractor for the project with RailCorp's Regional External Party Works Manager.*
- *The Developer would be required to carry out a 3D Finite Element Analysis (FEA) to satisfy RailCorp of the effects on the tunnel lining by the excavation for the proposed Development....*

The brief document also states that attenuation of vibration from the rail tunnel is the responsibility of the developer.

3. Comments

Based on the supplied concept stage drawings of the proposed building and on the rail tunnel requirements, the following geotechnical constraints have been identified:

- Based on the estimated depth of the tunnel adjacent to Building 1, the line drawn from the base of the existing tunnel is estimated to intercept the ground surface at the southern boundary of the proposed building. Consequently, all footings for the building will need to be founded below the current surface level. Since the building is proposed to be founded on

rock, which is estimated to be at RL 6 m AHD, at an approximate depth of 10 m, the rail requirements do not pose a geotechnical constraint for the foundations of the proposed building. The proposed foundation method of bored piles socketed into rock is a viable foundation method.

- During the demolition and construction phase for Building 1 an approximately 5 m wide exclusion zone should be established parallel to the boundary with the rail easement above the tunnel. No large earthmoving machinery or crane should be allowed in this exclusion zone and weight restriction should be in place for material storage.
- A dilapidation survey will need to be completed for the section of the tunnel parallel to Building 1, i.e. from the corner of Davey and Henderson Roads to the south-western corner of Lot 9.
- No bulk excavation is planned for Building 1, therefore in DP's opinion there should be no need to carry out a 3D FEA.
- Should the Vice Chancellors Oval be used for stockpiling excavated filling or other materials, the stockpile should be restricted to the area north of the tunnel. If the portion of the oval over the tunnel is required, the stockpile height will need to be restricted to a maximum of 2 m.

3.1 Suggested Further Action

It appears that the proposed development is largely unaffected by the existing rail tunnel, provided that adequate exclusion zones are maintained. However, to ensure compliance with RailCorp requirements and to reduce risk of accidental adverse effects on the tunnels, the following actions by Mirvac are suggested:

- prepare a letter to RailCorp authorising Douglas Partners to acquire detailed tunnel drawings from RailCorp's data room, extending from Garden Street to Alexander Street. The approximate rail chainage for the required section is FROM TRS 0 – 78 – 09-06 to TRS 1 – 38 – 00-00.
- mark out the rail tunnel corridor on the ground and ensure adequate exclusion zones are enforced
- incorporate the exclusion zone into the stockpile scheduling/management for the Vice Chancellors Oval
- commission the required dilapidation survey of the existing rail tunnel.

3.2 Cable Tunnel

The St Peters to Haymarket Transgrid Cable Tunnel crosses the area in a south-west to north-west direction, beneath the Vice Chancellors Oval and adjacent to, and to the east of Lot 12. The available "as constructed" drawings indicate that the cable tunnel is at a depth of about 30 m. The existing Redfern Cable tunnel runs roughly in a north – south direction, east of Lot 12 and about 3 m above the Transgrid tunnel. The proposed development on Lot 12 or the stockpiling on the oval is not expected to affect the two existing cable tunnels. However, the owners of the tunnels should be notified regarding the proposed activities.

4. References

RailCorp, 2009, Brief for review of geotechnical and structural design for developments adjacent to or above rail corridor for external third party works performed under the NSW State Environment Planning Policy (Infrastructure) 2007.

Yours faithfully
Douglas Partners Pty Ltd

Josef Major
Senior Engineering Geologist

John C Braybrooke
Principal Engineering Geologist

Attachments: About this Report

About this Report

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that condit ions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.