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Project 99739.00
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HDS

Attention: Gareth Bird (Ethos Urban Pty Ltd)

Email: gbird@ethosurban.com

**Preliminary Geotechnical Assessment**
**Proposed Billboard Sign Monopole**
**Western Distributor North, Pyrmont**

## 1. Introduction

A billboard sign supported on a monopole is proposed to be installed on the north-western side of the L1 Dulwich Hill Line (light rail), within land controlled by Sydney Trains and at a location which is adjacent to and on the eastern side of the Western Distributor, Pyrmont. This geotechnical assessment has been prepared by Douglas Partners Pty Ltd (DP) to support a development application (DA) for the site.

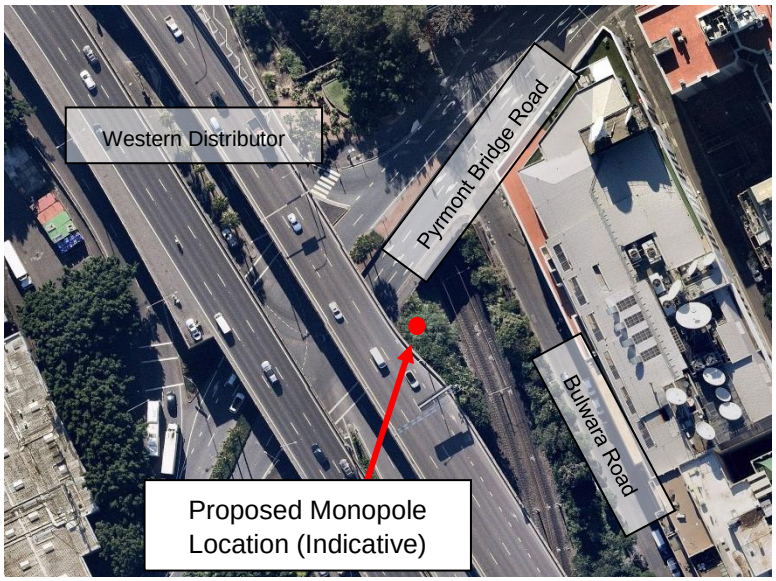
The preliminary geotechnical assessment has included a site inspection (from nearby vantage points outside of the rail corridor), a review of published information, and a review of DP archives for site investigations completed near to the site.

This advice is intended to provide a general overview of the subsurface geotechnical conditions likely to be encountered at the proposed monopole location. Detailed site investigations will be required at a later stage of the project to provide detailed geotechnical information for planning and construction purposes.

## 2. Site Description

The proposed position of the monopole is within the rail corridor to the east of the Western Distributor and on the southern side of Pyrmont Bridge Road, at the crest of a rail cutting and within a flat, vegetated, relatively narrow area (about 3-4 m wide: between the cutting crest and the rail corridor boundary fence). A few small trees and shrubs were also present in this area. An aerial photograph showing the indicative monopole location is given in Figure 1.

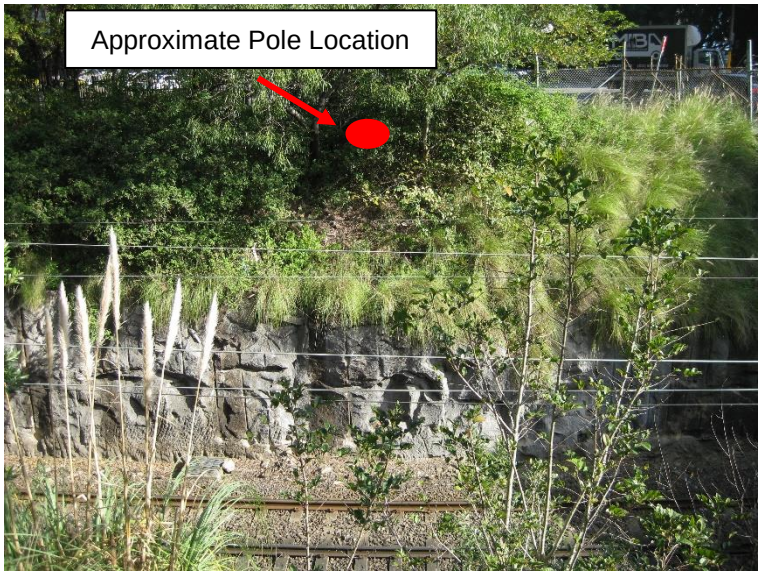
Figure 1: Proposed Monopole Location




The rail cutting is about 5 m high. The lower 2-3 m is sub-vertical with exposed sandstone bedrock which appears to be medium to high strength as there are closely-spaced pre-split blast holes visible on the face. The upper part of the cutting is covered with soil and vegetation and has an average slope of about 1.5H:1V. DP predicts that this section probably comprises about 1 m of stepped and benched low strength rock overlain by about 1 m of soil.

A pedestrian footpath and asphalt-surfaced access laneway (with gated entry) are present on the western side of the corridor boundary fence. Columns supporting the Western Distributor viaduct are present nearby. A site photograph is presented as Figure 2.

Figure 2: Site photograph at the proposed monopole location



## 3. Data Sources

Data sources reviewed for the preliminary geotechnical assessment included:

- Topographic maps with elevation contours, NSW Department of Lands (obtained April 2009);
- Mapping data of the distribution of potential acid sulfate soils, NSW Department of Land and Water Conservation, 1:25 000 Acid Sulfate Soil Risk Map for Prospect-Parramatta River (Edition 2, December 1997);
- Database of groundwater bore construction details and driller logs, sourced from WaterNSW;
- NSW Public Works Geotechnical Reports, sourced from the NSW Geoscientific Data Warehouse (specifically, report 'Bauhaus House Development Site, Yellowblock Sandstone Investigation', Harris Street, Gipps Street and Ada Place, Report 99-GE63A, dated September 1999);
- Sydney 1:100 000 Soils Landscape Mapping Sheet, Soil Conservation Service of NSW;
- Sydney 1:100 000 Geological Series Sheet, Geological Survey of NSW;
- Geotechnical Investigation Summary Report, 'Multi-Storey Housing Development, 134-164 Bulwara Road, Pyrmont', D.J. Douglas and Partners Pty Ltd (Ref: 19969, dated April 1994); and
- Geotechnical Investigation Report, 'Report on Geotechnical Investigation for Commercial Re-development', 100-132 Bulwara Road, Pyrmont', D.J. Douglas and Partners Pty Ltd (Ref: 12248, dated July 1989).

## 4. Review of Information

A review of the available information indicates the following:

- The proposed monopole site is located above the crest of a 5 m high railway cutting;
- The geological series sheet indicates that the site is underlain by Hawkesbury Sandstone of Triassic Age;
- The soil landscape map sheet indicates that residual sandy clay soils of the Gymea group are likely to be present at the site, which are described as shallow to moderately deep (0.3-1 m) Yellow Earths and Earthy Sands on crests and inside of benches;
- Acid sulfate soil (ASS) risk maps indicate that ASS is not likely to be present at the site; and
- Inspection of the exposures in the railway cutting, together with nearby geotechnical investigations indicate that the typical sub-surface profile (excluding imported fill materials) is residual clayey sand overlying low strength sandstone (with some extremely low strength bands and seams), over medium to high strength sandstone.

## 5. Likely Subsurface Profile

Based on the available geotechnical information and the site inspection, the subsurface profile at the proposed location of the monopole is likely to be:

- Imported fill and construction materials (e.g. asphalt, road base gravel, sand) to 0.5-1 m depth;
- Residual clayey sand soil to 1-2 m depth;
- Very low strength sandstone with extremely low strength bands and seams to 2-3 m depth; over
- Medium to high strength sandstone.

## 6. Geotechnical Constraints

The site of the proposed monopole is located above an existing rail cutting and near to footings for the Western Distributor. The impact of the project on the stability of these features needs to be considered both during construction and in the long term. In addition, the capacity of the ground to resist both vertical and lateral forces will be reduced above the base of the cutting.

Ideally the monopole should be supported on footings taken to below the level of the base of the cutting. This would require drilling or excavation to depths of about 5 m through soils, weathered sandstone and then medium to high strength sandstone. Drilling through the medium to high strength sandstone will require a large piling rig with suitable rock cutting tools.

## 7. Possible Foundation System Options

For this site the monopole should preferably be founded on bored piles drilled down to below the level of the adjacent cutting, and founded in the medium to high strength sandstone. Given the apparent quality of the sandstone exposed in the cutting and depending on the loads applied by the monopole foundations it may be possible to stop the piles above the level of base of the cutting within the medium to high strength sandstone.

A pad footing founded in the sandstone below depths of about 2 m may also be possible, however, the effects of such footings on the stability of the cutting would need to be considered in more detail. In addition, the allowable bearing pressure and resistance to lateral forces will be reduced due to the presence of the adjacent cutting which would mean that the pad would have to be very large.

While drilling of bored piles should be relatively straight-forward through the expected subsurface materials, placing a large piling rig above the crest of the cutting could potentially cause stability issues during construction. The risk of the piling rig causing a section of the rail cutting to fail or the risk of the piling rig toppling onto the railway line will also need to be considered.

Consideration should also be given as to whether sufficient space exists for a monopole between the base of the cutting and the railway line, which appears to be relatively narrow at this location.

## 8. Risks and Opportunities

Risks that should be considered during design and construction at this site include:

- the potential presence of buried or overhead services;
- working close to existing rail infrastructure;
- possible train exclusion zones or other management measures, if construction work is to proceed outside of a track possession period;
- risk of rockfall or debris slide from the batter slope during excavation work;
- access for drilling machinery, concrete supply, and removal of spoil;
- pedestrian management along the nearby footpath;
- impact of the proposed construction equipment on the global stability of the existing rail cutting;
- the need to ensure the temporary stability of the sides of a pad footing excavation, including while workers are within the excavation: this will probably require the excavation sides to be benched and battered, which may not be feasible given the other site constraints;
- difficulty in drilling piles through medium to high strength sandstone, particularly if a smaller piling machine is to be used at the site;
- the possibility of drilling casing being required to prevent collapse of the upper section of the pile hole during drilling; and
- the need to ensure existing viaduct footings are not disturbed or affected by the selected monopole foundation system.

Opportunities which may be considered are:

- locating the monopole at the toe of the existing rail cutting to avoid stability issues. This option would require sufficient space to be available within the rail corridor, between the base of the cutting and the railway line (which does not appear to be available);
- cutting a 'slot' for the monopole into the side of the existing cutting, and founding the monopole at the toe of the cutting; and
- potentially using a small drilling rig to install a number of mini-piles (about 100 mm diameter), which are tied together at the ground surface with a pile cap to support the monopole.

## 9. Recommendations for Further Investigation

The following detailed site investigation is recommended at this site:

- Drilling a cored borehole at the monopole location to determine the depths to top of weathered rock and medium strength rock. The borehole should extend to at least 3 m below the toe of the existing rock cutting;
- Mapping of the existing rock cutting to identify any areas of potential instability. Any such mapping would have to be carried out during a track possession; and

- Stability analysis of the rail cutting.

## 10. Limitations

Douglas Partners (DP) has prepared this report for this project at Western Distributor North (Pyrmont Bridge Road), Pyrmont, in accordance with DP's proposal SYD200574 dated 4 June 2020. Acceptance was received from Ethos Urban Pty Ltd via an email dated 2 July 2020, and endorsed by Sydney Trains. The work was carried out under a modified Ethos Urban consultancy agreement. This report is provided for the exclusive use of Ethos Urban Pty Ltd or their agents for this project only and for the purposes as described in the report. It should not be used by or be relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

DP's advice is based upon published information sources and the conditions observed during a site inspection from outside of the rail corridor boundary fence. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site and may also be limited by site accessibility.

This report must be read in conjunction with all of the attached pages and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion for development application purposes rather than instructions for construction.

The scope for work for this report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of filling of unknown origin be noted in the report it should be recognised that there may be some risk that such filling may contain contaminants and hazardous building materials.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical components set out in this

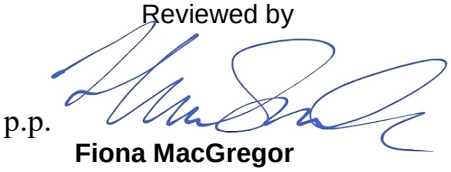
report and to their application by the project designers to project design, construction, maintenance and demolition.

Please contact the undersigned if you have any questions on this matter.

Yours faithfully
**Douglas Partners Pty Ltd**

**Huw Smith**
Associate

Reviewed by



p.p. **Fiona MacGregor**
Principal

Attachments: About this Report

# About this Report

Douglas Partners

## 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 conditions 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.