Building 1 Basement Parking Option Construction, Geotechnical & Environmental Report

Australian Technology Park, Eveleigh, Sydney

Revision	Status	Date
A	For Department of Planning Submission	20th April 2016

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Issue Register

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1. Introduction

This report has been prepared to outline and assess the construction & environmental issues associated with construction of basement parking for the proposed Building 1, Lot 9 at the Australian Technology Park (ATP), Eveleigh, Sydney. It has been developed for inclusion in the response to the Department of Planning comments on the submitted State Significant Development Application (SSDA).

1.1 Project Overview

The ATP site is strategically located approximately 5km south of the Sydney CBD, 8km north of Sydney airport and within 200m of Redfern Railway Station. The site, with an overall area of some 13.2 hectares, is located within the City of Sydney local government area (LGA). Refer to Figure 1 below for a graphic representation of the site location and context.

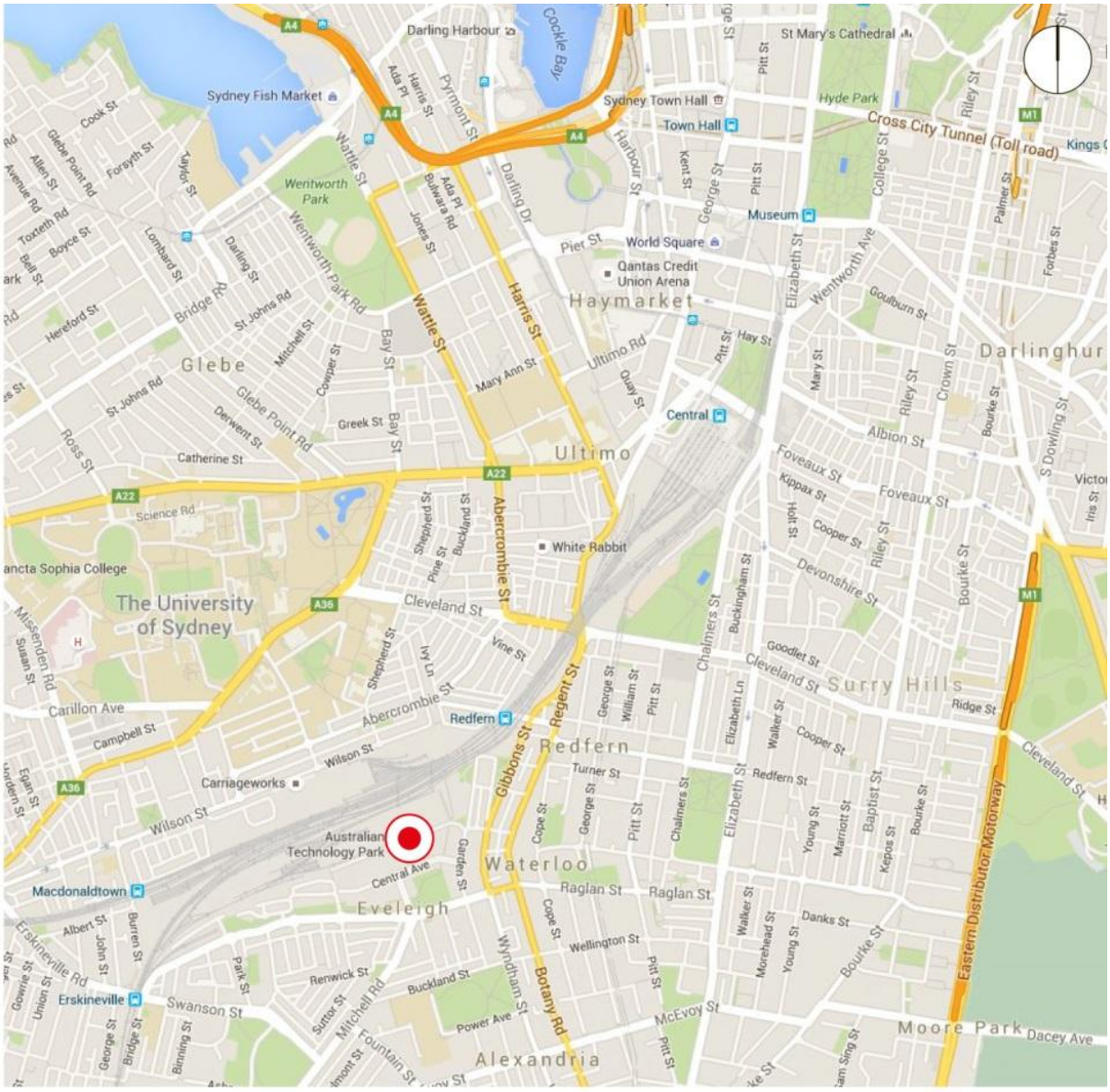

Figure 1: Site Location

Three key sites remain undeveloped within the ATP site and are presently used for at-grade worker and special event car parking. These sites are:

- Lot 8 in DP 1136859 – site area circa 1,937m2;
- Lot 9 in DP 1136859 – site area circa 8,299m2; and
- Lot 12 in DP 1136859 – site area circa 11,850m2.

Figure 2 provides an aerial image of the ATP site along with identifying the three development sites.

A summary of the proposed Building 1 on Lot 9 is detailed as follows:

- Construction of a 9 storey (including plant) commercial office building, with ground level retail and childcare centre, comprising a total of 46,832m^2 GFA (Building 1);

Figure 2: Aerial View of the site

2 Geotechnical Constraints

As per Douglas Partners Geotechnical Response to Submissions letter 84955.01.R.006.Rev1, attached in Appendix A, basement level car parking was considered in the concept design stage but was rejected due to the inherent geotechnical risks associated with:

1) The proximity of the existing Illawarra railway tunnel to the South of the proposed Building 1.
2) Increased disturbance to the surrounding area and properties due to bulk excavation of contaminated & natural fill and associated dewatering required for same.
3) Construction of a water tight basement in botany sands with a high water table and the associated cost implications.
4) Potential for flooding of the constructed basement both during construction and as a fully operational building due to the proximity of the adjacent Tennis Court and Vice Chancellor's Oval flood basins.

2.1 Existing Illawarra Railway Tunnel

The location of the existing Illawarra Railway Tunnel adjacent to the Lot 9 / proposed Building 1 is shown in Figure 3 below. The tunnel is located about 6m in plan from the south-west corner of proposed Building 1.

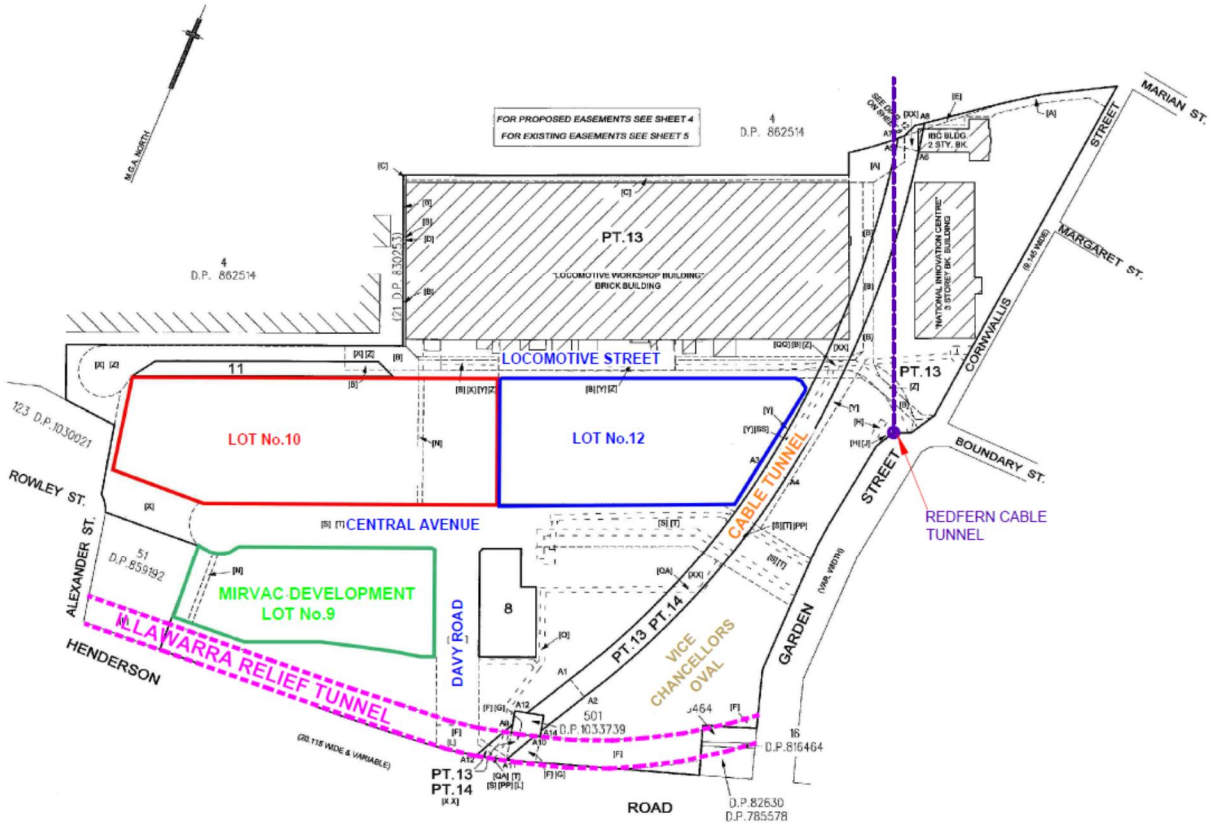

Figure 3: Location of Illawarra Relief Railway Tunnel

As per Douglas Partners Rail Infrastructure Letter 84995.01.R.001.Rev1 attached in Appendix B, during the construction phase for Building 1, a 5m wide exclusion zone would need to be established parallel to the rail easement boundary above the tunnel. No large earthmoving machinery or crane should be allowed in this exclusion zone.

2.2 Based on a potential excavation depth of 6.9m and the subsurface conditions, the following geotechnical risks are identified:

- Disturbance of contaminated fill. As per JBS&G letter 51142/103479 L002 Rev1 attached in Appendix C, disposal of contaminated fill materials to a licensed landfill would be required. The large increased quantity of material may have significant implication to the Green Star and Ecologically Sustainable Development objectives and will not meet waste minimisation objectives of the Waste / Avoidance and Resource Recovery Act 2001. The large quantity of contaminated fill that would be required to be exported off site would add a significant amount of cost and time to the project. The large bulk excavation would also add a significant number of truck movements in and around the ATP site – this is discussed further in Section 3.1 below.

2.3 Bulk Excavation and Associated Dewatering

- Excavation in saturated sands that would require dewatering. The wet sand would be difficult to handle, can't be stockpiled and may also be contaminated.

- The de-watering process could induce settlement in areas adjacent to the excavation. Settlement of the Illawarra rail tunnel, adjacent childcare centre, pavements and services in the footpath along Davy Road and Central Avenue would be a concern. The cone of depression of the drawdown around the site would be extensive due to the high permeability of the sand. Any shoring system employed to enable the excavation of the saturated materials would need to be watertight and socketed into rock to reduce the need for continuous dewatering during construction. This shoring system, such as a secant pile wall, would likely have to go to a depth of approximately 12m which would add a significant amount of cost to the project.

  Other retaining systems such as sheet piles or diaphragm wall could be considered. Sheet piles would be installed using a vibration hammer which could potentially cause excessive noise and vibration near the rail tunnel, adjacent childcare, nearby residential and established commercial buildings. A sheet pile wall solution could result in higher displacements unless fully supported by anchors or bracing. It would also be less water tight than a secant pile wall solution and it is likely that continuous dewatering during construction would be required. Both of these factors could lead to settlement of sands around the site and ultimately excessive settlement of adjacent buildings, structures and services. A diaphragm wall option could be a good technical solution however it requires a specialist contractor with local experience. This option is likely to be a slow process given the large linear meterage of basement perimeter which would make it an expensive solution from both a cost and time perspective.

- Shoring of the excavation will require temporary tie-back anchors in the sand. It is unlikely that sufficient space would be available between the proposed shoring and the railway tunnel easement to develop the required bond length. Alternative solutions, such as internal propping, could be considered but these are likely to be a hindrance to the basement construction. The increased interaction with and potential effects on the rail tunnel will require full review and approval by the rail authorities and their engineers. This process is likely to have a program impact to the development. Monitoring equipment will be required to be set up within the tunnel and an alarm system set up for any vibration limit exceedances. Once alarm trigger levels have been reached, works will need to cease and be re-evaluated to maintain vibrations within acceptable limits.

- The basement in the saturated soils would require a full hydrostatic slab which would add additional cost and time to the project. A fully tanked basement would need to be constructed which would require a waterproof membrane to the hydrostatic slab and basement walls.

2.4 Potential for Flooding

- As outlined in AT&L letter ref "15-336-ATP Flooding Letter", attached in Appendix D, on-site detention for all stormwater runoff generated within the ATP site is provided within the public oval (also known as Vice Chancellor's Oval) and tennis courts to the South and East of Building 1. See location plan in Figure 4 below.

Figure 4: Location of Stormwater Detention Basins

- The top water level within the basin for the 100 year ARI is RL 15.750.

- The existing level of Central Avenue to the North of Building 1, where the current proposed vehicle entry points for the building are located, vary from 16.230 at the intersection with Davy Road to RL 16.310 to the West of Central Avenue. A proposed basement RL will be approximately at RL 10.050 which is significantly lower than the 100 year ARI flood level.

- Introducing a below ground basement carpark within Building 1 will increase the risk of overland flows and stormwater surcharging back into the basement. There would be a high risk of flood waters entering the basement both during construction and as a fully operational building. As the basement would more than likely contain key power and communications infrastructure, lifts and other equipment susceptible to flood water damage, the use of flood barriers and gates would need to be considered as part of the design. This infrastructure would be a major aspect of the anchor tenant's business continuity and any risk of damage to same would be a concern. A flood water pump out system may also be required which would require additional pump pits and pumps within the basement sub floor and / or plantroom. The incorporation of these flood defence mechanisms would have a significant cost and time impact on the project.

- The safest course of action is to avoid excavation of the Building 1 site and maintain the existing ground level as the lowest level of new car parking.

- A consequence of introducing basement car parking would be that services tanks will need to be relocated from the mezzanine floor to the roof plant floor. This would likely add to the bulk massing of the roof plant area which is contrary to what is trying to be achieved.

3 Vehicle Movements / Traffic Management

3.1 Introduction

The introduction of a basement into the proposed Building 1 will have significant impact to the quantity of vehicle movements on both internal and external roads of the ATP precinct. The quantity of soil to be exported off site is estimated to be approximately 65,000m3. This would equate to approximately 9,000 No. truck movements throughout the bulk excavation phase of the basement. The construction of a contiguous secant pile wall would involve the exportation of approximately 4,000m3 of spoil material and the importation of approximately 3,200m3 of concrete. This would equate to the addition of approximately 1,700 No. truck movements. Between the two activities, this equates to approximately 10,700 No. additional truck movements for Building 1 alone. As there would then be an overlap of bulk excavations on both Buildings 1 and 2, this would increase the projects overall bulk excavation period by a minimum of 3 months resulting in a greater duration of inconvenience for existing ATP residents. The overall combined bulk excavation period would be approximately 12 months. The expected overall increase in duration for the construction of Building 1 as a result of the addition of basement parking is 7 months.

The significant increase in the quantity of truck movements throughout the early stage of the proposed Building 1 construction would have an impact on the existing roads, childcare facility, Media City, NICTA, Biomed buildings and residential properties on Henderson Road.

3.2 Access and Egress to site

Vehicles

During mobilisation and site excavation, construction related traffic will enter the site off Henderson Road via Davy Road. It is proposed to construct a temporary construction traffic egress roadway to the West of Building 1. With a basement car park option for Building 1, this exit route would need to be checked for surcharge loading on the proposed basement retaining wall along the West side. The significant increase in truck movements along this route may have an impact on the existing childcare centre immediately adjacent.

If surcharge loading did not permit the use of the temporary exit route to the West of Building 1, this would significantly increase the interaction with Building 2 construction traffic and therefore increase the likelihood of congestion / interfacing issues on Central Avenue. The majority of Building 2 construction traffic will exit via Central Avenue onto Garden Street. Construction traffic for the Community Centre Building will enter Central Avenue via Garden Street, turn left onto Davy Road and exit Davy Road onto Henderson Road. The introduction of a basement into Building 1 could potentially hinder proposed one way construction traffic systems which would have a negative impact on existing tenants and road users within an already established community and road network.

3.3 Disruption to Traffic Flows

The simultaneous construction of basements with bulk excavation for both Buildings 1 & 2 will likely cause disruption to traffic flows within the ATP and in the surrounding areas. As there would likely be a stagger of approximately 3 months between commencements of bulk excavation, there would be an increase in the overall disruption period to existing ATP users & residents. The overall combined bulk excavation period would be approximately 12 months. The bulk excavations for both buildings would overlap for a period of approximately 5 months. During this period, the combined quantity of truck movements would expected to be in the order of 200 No. per day.

3.4 Pedestrian and Traffic Management

The increase in truck movements will increase pedestrian / vehicle interface on Davy Road, Central Avenue and Henderson Road.

3.5 Construction Staging, Description and Duration

The following is a summary of the proposed construction staging and estimated durations for the project;

Element	Description	Duration
1. Site Establishment	Set up hoardings and site amenities	1 month
2. Earthworks	Building 1: Perimeter Contiguous Secant Pile wall construction, Foundation Piling, bulk excavation and detailed excavation	8 months
3. Construction	Building 1: Construction of multi storey building including integrated fitout works	23 months
4. Public Domain Works	Stage 1	14 months

The expected overall increase in duration for the project as a result of the addition of basement parking is 7 months.

3.6 Additional Truck Movements

- Export off site of 600 – 800m3 / day by truck and trailer for Building 1.
- Concrete trucks for piling / construction of secant pile wall.
- Number of truck movements per day during bulk excavation days = 100 truck movements per day.
- Approximately 10,700 No. additional truck movements for Building 1 only.
- Number of truck movements per day during combined bulk excavation days (Building 1 + Building 2) = 200 No. truck movements per day.
- It is expected that the additional truck movements when simultaneous with Building 2 truck movements would create adverse impact on the surrounding road network and local residents.

4 Noise and Vibration Management

4.1 Introduction

Renzo Tonin & Associates have prepared a letter titled “Australian Technology Park – Noise and Vibration Response to DP&E”, see attached in Appendix E. The letter provides clarification and details around construction and operational impacts to the existing adjacent Alexandria Child Care facility. The noise management levels for the ATP development with respect to this child care centre are as follows:

Table 3: Noise management levels at other noise sensitive land uses

Land use	Where objective applies	Management level $L_{Aeq\ (15\ min)}$
E1 - Child care	Internal noise level	45 dB(A)
	External noise level - Active recreation areas	65 dB(A)

The introduction of basement parking and associated bulk dig would require larger and noisier bulk earthmoving machinery. The use of large excavators, dozers, rock hammers and dump trucks will be required. The likelihood of achieving the stipulated equivalent noise levels during the bulk dig operations are extremely low and the likelihood of exceeding them for large periods of the bulk earthworks are high.

The introduction of basement parking would also increase the likelihood of excessive vibrations impacting the child care centre. Vibration monitoring equipment would need to be set up at appropriate locations to quantify the vibrations

and trigger alarms for any exceedances. It is noted that the report supports the current design of having no basement as it limits disruption to the surrounding residential receivers and adjacent Alexandria childcare centre.

5 Construction Waste Management

As per JBS&G advice, the large increased quantity of material may have significant implication to the Green Star and Ecologically Sustainable Development objectives and will not meet waste minimisation objectives of the Waste / Avoidance and Resource Recovery Act 2001. The large quantity of contaminated fill and natural fill that would be required to be exported / disposed of off-site would add a significant amount of cost and time to the project.

The figure below details the general principles for prevention of waste. Due to geotechnical constraints, the most probable option for construction of basement car parking for Building 1 would be to export excavated material to landfill. According to the hierarchy of waste prevention principles, this would be the least favourable option.

Figure 5: Waste prevention principles

6 Air Quality

Air quality monitoring will be carried out throughout the excavation phase of the Project. This will be limited to excavation phases of the Project with additional monitoring required being assessed on a monthly basis.

Dust created by construction related activities, typically becomes more prominent during windy conditions, and will be dealt with by way of water suppression. Other measures for dust suppression include:

- Stockpiles of spoil to be covered and/or emulsion spray added to stockpile;
- In windy conditions, the frequency of water suppression will be increased;
- The construction site will be maintained and kept clean. Where suitable, the use of mechanical sweepers and covered waste bins will be utilised;
- Completed surfaces will be kept clean;
- Controlled site access will be maintained with vehicle wash down / clean down facilities to be established to maintain access roads;
- All materials transported from site in trucks will be appropriately covered.

Air quality monitoring devices will be installed to neighbouring buildings, or in sensitive areas, if required following consultation with stakeholders and assessment by suitably qualified professionals. The addition of a basement to Building 1 would require more frequent air quality monitoring over a longer period of time. The current design proposal of no basement will require significantly lower controls in order to maintain air quality levels than a basement option.

7 Site Specific Issues

7.1.1 Contamination

JBS&G Pty Ltd have undertaken a contamination assessment of the location for the proposed Australian Technology Park development. Reference is to be made to JBS&G reports titled '*Australian Technology Park Detailed Site Assessment, 9th December 2015 51142/101779 (Rev C)*' and '*Australian Technology Park Remedial Action Plan, 8th December 2015 51142/102080 (Rev C)*'.

Mirvac shall implement the (RAP) to identify and manage the remediation process on site, obtain a Remediation and Validation Report and Site Auditor sign off prior to completion. Contaminated material would need to be disposed of off-site to a suitable landfill at a significant additional cost to the project.

7.1.2 Heritage

Heritage Consultant Curio Projects have prepared a Heritage Impact Assessment for the development. The Heritage Impact Assessment was included as part of the SSDA submission. The introduction of a basement into Building 1 would increase the Archaeological disturbance of the site. Mirvac would need to liaise with Curio Projects during the planning and excavation phases to manage any potential Heritage and Archaeological Issues associated with the introduction of basement car parking.

8 Program & Cost

The addition of basement car parking into Building 1 would have the following time and cost impact to the construction of Building 1:

- One Level Basement = 5.5 month delay and a cost impact of $30 - $35m
- Two Level Basement = 7 months delay and a cost impact of $35 - $40m

9 Conclusions and Summary

Following review and consideration of all aspects associated with the introduction of basement level car parking within the proposed Building 1, it is considered that the current design, with no basement levels, is the most practical, constructible and economical design solution for the project. The introduction of a basement will have significant impact to the current residents and businesses both in and surrounding the ATP precinct. Construction of a basement should be avoided due to the following risks and issues associated with the Lot 9 site:

1) The proximity of the existing Illawarra railway tunnel to the South of the proposed Building 1 and associated exclusion zones, vibration monitoring, groundwater drawdown and settlement.

2) Increased disturbance to the surrounding area and properties due to construction of basement retaining structure, bulk excavation of contaminated & natural fill and associated dewatering required for same.

3) Significant increase in the quantity of truck movements throughout the ATP precinct and on local roads.

4) Construction of a water tight basement in botany sands with a high water table and hence saturated sands.

5) Noise and vibration impacts to the railway tunnel, Alexandria childcare centre and Media City.

6) Potential for flooding of the constructed basement both during construction and as a fully operational building due to the basement RL being much lower than the 100 year ARI flood level and the proximity of the adjacent Tennis Court and Vice Chancellor's Oval flood basins.

Appendix A:

Prepared by: Douglas Partners

Douglas Partners
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Project 84955.01
8 April 2016
R.006.Rev1
JAM

Attention: Barry Steedman

Email: barry.steedman@mirvac.com

Dear Sirs

Geotechnical Response to Submissions
ATP Development, Buildings 1, 2 and 3
ATP Park Eveleigh

1. Introduction

This document is a brief reply to the "Response to Submissions" that were received in relation to the proposed development of Buildings 1, 2 and 3 at the Australian Technology Park, Eveleigh, NSW. The submissions with a geotechnical component were related to Building 1, on Lot 9 and were concerned with:

a) massing of the building and potential to relocate car parking areas underground
b) request by Sydney Trains to provide additional information related to construction methods and potential rail tunnel interface issues.

This geotechnical response was prepared using data collated previously.

2. Scope of Works

Douglas Partners Pty Ltd (DP) carried out an initial desktop assessment of the likely subsurface conditions at the proposed development site (Building 1), which was followed by a geotechnical site investigation comprising drilling of four boreholes into rock.

3. Comments

3.1 Building 1 Underground Car Park Option

To reduce the mass of Building 1, the relocation of the proposed car parking space into basement levels was suggested for consideration. Basement level car parking was considered in the concept stage design but was rejected due to the inherent geotechnical risks associated with the proximity of the railway tunnel and increased potential to disturbance to the surrounding area, together with the related cost implications. Details of the geotechnical risks are described below.

The subsurface conditions within the footprint of Building 1 comprise 2-3 m of sandy filling (± sandstone, rubble, ash and contamination) overlying in situ sands to a depth of about 6-7 m, which are in turn underlain by residual clay. The top of rock is at a depth of about 10-12 m and rock that may be considered as a suitable foundation strata was encountered from a depth of about 14-15 m. Both the filling and the in situ sands are saturated with groundwater with water level at a depth of about 2-2.5 m.

The existing railway tunnel is located about 6 m in plan from the south-western corner of Building 1 and preliminary information indicates that its crown is likely to be at a depth of about 5 m with the invert at a depth of about 10 m.

Assuming a two level basement car park, excavation to a depth of about 6 m would be required. Assessment of the subsurface conditions indicated that all of the basement excavation would be in either imported and contaminated sandy sandstone filling or in the in situ sands. Based on the potential excavation depths and the subsurface conditions, the following geotechnical risks were identified:

- Disturbance of contaminated filling.
- Excavation in saturated sands that would require de-watering. The wet sand is difficult to handle, can't be stockpiled even after de-watering and may also be contaminated.
- The de-watering process could induce settlement in areas adjacent to the excavation. Any shoring system employed to enable the excavation of the saturated materials would need to be watertight and socketed into rock to reduce the need for continuous de-watering during construction.
- Shoring of the excavation is likely to require temporary tie-back anchors in the sand. It is unlikely that sufficient space would be available between the proposed shoring and the railway tunnel easement to develop the required bond length.
- De-watering induced settlement of the surrounding area could affect the structural stability of the railway tunnel, the childcare centre, pavements and buried services.
- The de-watering would need to be designed for potential removal of large volumes of groundwater due to the high permeability of the sand and shallow groundwater.
- The cone of depression of the drawdown around the site would be extensive due to the high permeability of the sand.
- The basement would need to be fully tanked to exclude the need for permanent de-watering. The fully tanked basement could have a damming effect on the upstream side with negative environmental effects and lowering of the water levels on the downstream side and possibly inducing settlement.
- The basement in the saturated soil would require a full hydrostatic slab.
- The timeframe for the excavation and construction of Building 1 would increase significantly and introduce a large number of truck movements on the local roads.
- Ongoing seepage management would be expected.

While there are engineering solutions for the mitigation of some of the above listed geotechnical risks, residual risks to adjacent properties and the excavation will remain throughout the construction and service life of the project. Consequently, the above ground car parking option for Building 1 was considered more appropriate compared to the basement solution.

3.2 Rail Tunnel Interface Issues

As part of the DA application process, DP has prepared a desktop study regarding the potential interaction between the proposed Building 1 and the existing railway tunnel (Report No. 84955.01.R001.Rev1, dated 12 November 2015). The study considered the typical Sydney Rail requirements (RailCorp Technical Brief, 2009), the known or estimated subsurface conditions and the design features of Building 1 at the time of the study.

The conclusions of the study are as follows:

- Based on the estimated depth of the tunnel adjacent to Building 1 and that the building is proposed to be founded on rock at a depth of more than 10 m, the rail requirements do not pose a geotechnical constraint for the foundations of the proposed building, as they will be outside of the "zone of influence" of the existing tunnel. The proposed foundation method of bored piles or similar, 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 Finite Element Analysis.

Recent design indicates that a truck access is proposed from Henderson Road to Lot 9 in the south-western corner, which will cross the tunnel alignment at surface level. Once accurate design information is received from Sydney Trains for the existing rail tunnel, the potential impact of the proposed crossing, together with any load limitations (if required) will be assessed.

Mirvac Construction and DP have established contact with Sydney Trains (ST) to brief the relevant ST departments about the proposed works. At the same time, Mirvac Construction and DP applied to access the ST "data room" to acquire the as-constructed drawings for the existing railway tunnel. The design information will be used to establish the spatial relationship between the existing tunnel and the proposed structures and if required, redesign the structures to reduce the risk of impact on the tunnel.

In summary, since the proposed development doesn't contain basement excavation and all foundations are proposed to be founded outside of the zone of influence, the risk of potential negative interaction between the development and the existing railway tunnel is low. Initial discussions with ST

indicated that the supplied geotechnical information is adequate for the current stage of the project however, additional information will be required as the project design progresses.

3.2.1 Dilapidation Survey

In addition to the review of the tunnel information, once it becomes available, a dilapidation survey will be carried out of the existing tunnel to prepare a pre-construction record of the condition of the tunnel lining. The findings of the dilapidation survey will be confirmed on site with representatives of ST.
A similar dilapidation survey will be carried out at the completion of the construction phase.

The spatial extent and timing of the dilapidation surveys will be coordinated between Mirvac Construction and ST.

Considering that no bulk excavation is planned, DP considers that there would be no requirements for monitoring instrumentation in the tunnel.

4. Limitations

Douglas Partners (DP) has prepared this report for this project at ATP Park Eveleigh. This report is provided for the exclusive use of Mirvac Construction for this project only and for the purposes as described in the report. It should not be used by or 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.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this assessment. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations.

This report must be read in conjunction with all of the attached 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.

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

Yours faithfully
Douglas Partners Pty Ltd

Josef Major
Senior Engineering Geologist

Reviewed by

pp

Hugh Burbidge
Senior Associate

Attachments: About this Report

Appendix B:

Prepared by: Douglas Partners

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84955.01.R.001.Rev1
12 November 2015
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

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

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.

Appendix C:

Prepared by: JBS&G

JBS&G 51142/103479
L002 (Response to Submissions - ATP Development) Rev 1

7 April 2016

Barry Steedman
Mirvac Projects Pty Ltd
Via email: barry.steedman@mirvac.com

Response to Submissions – ATP Development

Dear Barry,

1. Introduction

JBS&G Australia Pty Ltd (JBS&G) have been engaged by Mirvac Projects Pty Ltd (Mirvac) for the provision of environmental consultancy services associated with the remediation and redevelopment of a portion of the Australian Technology Park (ATP), herein referred to as the site. As part of this engagement, Mirvac have requested JBS&G to provide supporting evidence to close out the following enquires/comments:

Comments from the Department and Council – Consideration to be given to the form and mass of Building 1 including relocation of parking to basements.

As discussed in the draft remedial action plan (RAP), available site characterisation data has identified fill material containing, in some instances, concentrations of carcinogenic PAH compounds (including benzo(a)pyrene TEQ), TRH / TPH, heavy metal (principally copper, nickel and lead) and asbestos (friable) in exceedance of ecological-based assessment criteria, and at relatively few locations, the adopted health-based criteria as relevant to the proposed future permissible land uses.

Based on the reported contaminant threshold concentrations, fill materials require remediation / management with respect to proposed permissible land uses which has been incorporated into the current development approach.

Should the proposed parking arrangements be modified to accommodate basement parking rather than at grade, fill materials would require off-site disposal to a landfill lawfully able to accept them. In doing so, consideration should be given to the following:

- Disposal of fill materials to landfill may have significant implication to the Green Star and Ecologically Sustainable Development objectives, and will not meet waste minimisation objectives of the *Waste/Avoidance and Resource Recovery Act 2001*;
- The NSW waste hierarchy prefers on-site retention of fill by means of cap / cover as opposed to off-site disposal to landfill. As such, excavation of fill materials and disposal to landfill is not acquiescent with current EPA guidance;
- Changes to the design would need to consider the increase in truck movements. Based on review of the current design plans, all fill materials are proposed to be retained on site, thus reducing truck movements and disruption to ATP tenants and the surrounding community;
- Consideration needs to be given ATP neighbours including the childcare centre. The additional bulk excavation activities to facilitate basement parking has the potential to result in increased dust emissions,

- Shallow groundwater conditions are present within this portion of the ATP site. As such, consideration needs to be given to the design of the basement and the potential for long term ongoing groundwater management (i.e. treatment of any basement groundwater ingress before being discharged to sewer under a trade waste agreement with Sydney Water or similar); and
- To facilitate bulk excavation activities, a dewatering license may be required to be obtained from the NSW Department of Primary Industry (previously the NSW Office of Water).

Contamination and Remediation – Clarify groundwater contamination and remediation method. Mirvac to engage with JBS&G plus the auditor to ensure the release of the Site Auditor Statement.

Previous interim Site Audit Reports noted that groundwater has been assessed as part of the greater ATP site and that no groundwater remediation is considered to be required. Reference should be made to Site Auditor advice Ramboll (2015[1]).

As discussed in the RAP prepared for the site, groundwater conditions are considered typical of inner Sydney urban environments with slightly elevated heavy's metals, and to a lesser extent PAHs, and do not require specific remediation with respect to protection of the environment. In addition, site fill materials have been reported as having non to low leachable properties and do not represent an unacceptable migration risk to groundwater. As such, groundwater remediation is not considered warranted.

JBS&G consider that groundwater has been adequately assessed and will be managed via the Site Audit process.

Other

JBS&G recommend that Mirvac seek staged sign-offs to ensure development conditions do not require a Site Audit Statement for the entire site before a construction certificate (or similar) is issued.

Should you require clarification, please contact the undersigned on 02 8245 0300 or by email ncussen@jbsg.com.au.

Yours sincerely:

Nathan Cussen
Senior Consultant
JBS&G Australia Pty Ltd

Reviewed/Approved by:

Andrei Woinarski
Principal
JBS&G Australia Pty Ltd

[1] Draft *Site Audit Report Public Open Space Areas, Australian Technology Park, Eveleigh*. Ramboll Environ Australia Pty Ltd dated September 2015 (Ramboll 2015)

Appendix D:

Prepared by: AT&L

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10th April 2016

Mirvac Projects Pty Ltd
Level 26
60 Margaret Street
Sydney NSW 2000

Your Ref:
Our Ref: 15-336-ATP Flooding Letter
Direct phone: 02 9439 1777

Attention Dimitri Roussakis

Dear Dimitri,

ATP Development – Building 1 Stormwater Flooding Letter

Please find below our response to the comments provided by the Department and Council on the following:

Consideration to be given to the form and mass of Building 1 including relocation of parking to basements.

As noted within the attached ATP Services Memo dated 2nd November 2015, on-site detention for all stormwater runoff generated within the ATP site is provided within the public oval and tennis courts to the north of Henderson Road. A Stormwater Management Report has been undertaken by Woolacotts Engineers in September 2005. This report summarises the top water level within the basin for the 100 year ARI event is RL 15.75.

The existing level of Central Road to the north of Building 1 where the likely vehicle entry points for the building will be located vary from RL16.23 at the intersection with Davy Road to RL 16.31 to the west of Central Avenue. This is only approximately 500mm above the 100 year ARI flood level.

Given the high level of the known 100yr ARI flood level immediately surrounding Building 1, it is our recommendation as professional civil engineers that there should be no excavation for a basement carpark. It is our recommendation the existing ground level should act as the ground level carpark. Introducing a below ground basement carpark beneath Building 1 will increase the risk of overland flows and stormwater surcharging back into the basement. This water would then need to be dealt with via a pump out system.

From a flooding perspective the safest course of action is to maintain the ground levels as they are for carparking and raise the retail and commercial floor levels to suit. This will ensure all ground floor levels are set the minimum freeboard level above the 100 year ARI level to meet Council's flooding guidelines.

Please feel free to discuss if you have any queries.

Yours sincerely

Andrew Tweedie BEng Civil MIEAust CPEng
Senior Civil Engineer
02 9439 1777

Appendix E:

Prepared by: Renzo Tonin

18 April 2016
TH615-02F05 (r0) DPE Response

Mirvac Projects Pty Ltd
Dimitri Roussakis
dimitri.roussakis@mirvac.com

From: Glenn Wheatley [GWheatley@renzotonin.com.au]

Australian Technology Park - Noise and vibration response to DP&E

1 Introduction

Following the NSW Department of Planning & Environment's (DP&E) review of the Development Application acoustic assessment prepared by Renzo Tonin & Associates [TH615-02F03 (r6) ('DA report')] for the proposed development at Australian Technology Park (ATP) [SSD 7317], further information regarding the assessment of impacts upon the neighbouring Alexandria Child Care, located at 41 Henderson Road, has been requested by DP&E.

It has been requested that greater clarification and details around construction and operational impacts to the existing adjoining child care, and specific mitigation measures to be employed to minimise impacts.

2 Assessment overview

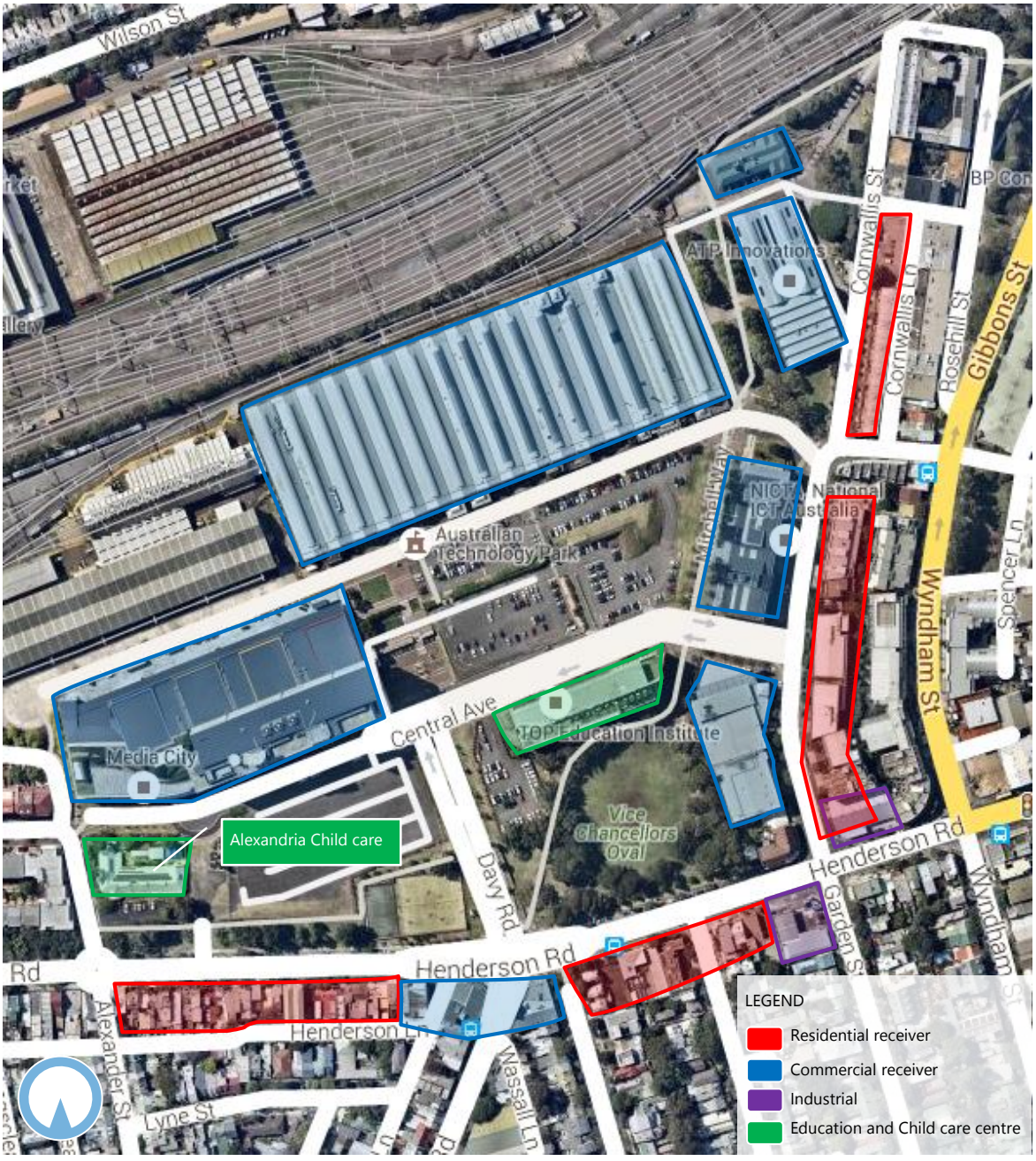
The DA acoustic assessment was carried out in accordance with the Secretary's Environmental Assessment Requirements (SEARs). As outlined in the DA report, the relevant policies and guidelines were addressed as follows:

Policy or guideline	Assessment outline	DA Report section
NSW Industrial Noise Policy [1]	Operational noise from the development and its potential impact on surrounding development	Section 3
Interim Construction Noise Guideline [2]	Assessment of noise during the construction phase of the development and its potential impact on surrounding development	Section 6
Assessing Vibration: A Technical Guideline [3]	The primary potential for vibration impact generated by the development is during construction phase. Also referenced in the State Environmental Planning Policy – Infrastructure 2007 with regard to rail vibration.	Section 6
Road Noise Policy [4]	Assessment of road traffic generated by the development on the local road network and its potential impact on surrounding development.	Section 5

Policy or guideline	Assessment outline	DA Report section
State Environmental Planning Policy – Infrastructure 2007 [5]	Assessment of noise onto the development from busy roads and rail corridors.	Section 4
Development Near Rail Corridors and Busy Road-Interim Guideline [6]	Supporting guideline for the State Environmental Planning Policy – Infrastructure 2007.	Section 5

The DA report identified the Alexandria Child Care centre in Figure 3 of the report, reproduced below.

Figure 1: Site and receiver locations



3 Operational stage

3.1 Site activities

3.1.1 Noise goals

Table 1 (Table 4 of report) summarises the noise emission goals for the ATP development with respect to the Alexandria Child Care centre.

Table 1: Operational noise targets, dB(A)

Location	Representative noise monitor	Period	RBL, dB(A)*	INP criteria	
				$L_{Aeq(15min)}$ intrusive	$L_{Aeq(period)}$ amenity
Other noise sensitive receiver locations					
E1 - Child care	School classroom	When in use	n/a	n/a	40 (internal)
	Active Recreation	When in use	n/a	n/a	55

3.1.2 Predicted noise levels

Table 6 of the DA report presented predicted noise levels only for the nearest most potentially affected receivers, being the residential premises on Henderson Road. It is noted that the primary operational noise sources, such as the child care centres, gymnasium and retail uses are well removed from the neighbouring child care centre and the external noise criteria applicable to the residential premises is more stringent than for the child care centre. An assessment has however been carried out (presented in Table 2) which demonstrates compliance.

Table 2: External noise prediction summary

Assessment location	Noise source	Predicted noise level, dB(A)	Project noise goal, dB(A)
E1 - Alexandria Child care - 41 Henderson Rd	Child care B1 (90 children outside)	18	
	Child care Community (90 children outside)	21	
	B1 - Retail external patrons	25	
	B2 - Retail external patrons	36	
	Community - North external patrons	15	
	Community - South external patrons	9	
	Community – Gymnasium*	7	
	TOTAL	**37**	**55**

Notes: * Low frequency content assessed, but correction not required due to low overall contribution at receiver.

As noted in the DA report, mechanical plant serving the development will also require acoustic design. However, the detailed equipment specification required to carry out the acoustic assessment is not detailed at the DA stage of a development and therefore, as is standard, will be required to be assessed

and certified by an appropriately qualified acoustic consultant at a late stage of the development, typically prior to the commencement of construction.

3.2 Road traffic noise

The assessment of noise generated by additional traffic on the local road network was assessed in Section 4 of the report. The assessment focused on Henderson Road and Garden Street, for which compliance was revealed. It is noted that the traffic assessment prepared by GTA consultants for the DA [7] identified no change in traffic volumes along Alexander Street, which may otherwise impact the child care centre.

4 Construction stage

4.1 Criteria

The construction noise and vibration assessment was presented in Section 6 of the DA report.

In accordance with the NSW EPAs *Interim Construction Noise Guideline* (ICNG) the following criteria were set out for the neighbouring child care centre.

Table 3: Noise management levels at other noise sensitive land uses

Land use	Where objective applies	Management level $L_{Aeq\ (15\ min)}$
E1 - Child care	Internal noise level	45 dB(A)
	External noise level - Active recreation areas	65 dB(A)

Vibration criteria were discussed in Section 6.5, addressing both human comfort and structural damage.

4.2 Construction noise assessment and mitigation

The construction noise assessment was presented in Table 19 of the DA report, and the noise predictions to the Alexandria Child care centre are reproduced below. The assessment revealed only marginal exceedance of the ICNG targets. Of particular note is that Building 1, being closest to the child care centre, does not have a basement level, and therefore bulk excavation is not required. Bulk excavation typically requires use of potentially intrusive equipment such as rock hammers, and has therefore been minimised in proximity to the child care centre.

Table 4: Summary of predicted L_{Aeq} levels

Receiver	Predicted L_{Aeq} noise levels, dB(A)		Noise management level, dB(A)	
	Stage 1 and 2 Earthworks (excavation)	Stage 1 and 2 Construction (structures)	Noise affected	Highly noise affected
E1 - Child care centre - internal	49	46	45	-
E1 - Child care centre - external	69	66	65	75

Notwithstanding these findings, a detailed mitigation and management strategy will be prepared for the works, for which preliminary and high level measures were outlined in the acoustic report. Specifically, for the Alexandria Child Care centre, it is expected that direct consultation will be required to confirm any areas or times of the day at which the centre may be particularly sensitive to noise (e.g. sleeping times, outdoor play etc.). This consultation will also assist to establish whether specific mitigation measures are warranted for the child care centre.

4.3 Construction vibration assessment and mitigation

The vibration assessment concluded that the child care centre was unlikely to be impacted by excessive vibration. It is noted that Building 1 does not include a basement level, and therefore bulk excavation is not required. This significantly reduces the need for any vibration intensive equipment to be utilised in proximity to the Alexandria child care centre and the duration of construction works for Building 1.

Notwithstanding these findings, it was recommended that vibration measurements are carried out on site to confirm site-specific minimum working distances for vibration intensive activities.

5 Conclusion

In response to requests from DP&E this document has detailed the noise and vibration assessment carried out for the ATP development with regard to the neighbouring Alexandria Child Care centre at 41 Henderson Road. While the receiver was identified and assessed as part of the DA acoustic assessment, additional information, particularly in regard to the operational phase of the development. It is noted that further detailed acoustic assessment and design will be an integral component of the design development phase of the project and will required to address outstanding aspects such as mechanical plant noise emission.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Authorised
18.04.2016	Issued		0	GW		GW

Important Disclaimer:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

This document is issued subject to review and authorisation by the Team Leader noted by the initials printed in the last column above. If no initials appear, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

This document is prepared for the particular requirements of our Client which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Renzo Tonin & Associates. The information herein should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

References

[1] NSW EPA, NSW Industrial Noise Policy, Sydney: NSW EPA, 2000.

[2] Department of Environment and Climate Change NSW, "Interim Construction Noise Guideline," Department of Environment and Climate Change NSW, Sydney, 2009.

[3] Department of Environment and Conservation (NSW), "Assessing Vibration: A technical guideline," Department of Environment and Conservation (NSW), Sydney, 2006.

[4] NSW EPA, NSW Road Noise Policy, Sydney: NSW EPA, 2012.

[5] NSW Government, "State Environmental Planning Policy (Infrastructure)," Sydney, 2007.

[6] NSW Department of Planning, "Development in Rail Corridors and Busy Roads – Interim Guideline," NSW Department of Planning, Sydney, 2008.

[7] GTA Consultants, "Australian Technology Park, Eveleigh Redevelopment - Transport Impact Assessment 15S1478000 A-Dr2," GTA Consultants, Sydney, 2015.