

13 February 2017  
Ref No. 28777LA2let

The Star Sydney  
80 Pyrmont Street  
Pyrmont NSW 2009

ATTENTION: Mr Scott Harrison

Dear Sir

**GEOTECHNICAL ASSESSMENT**  
**PROPOSED MODIFICATION 14 WORKS**  
**THE STAR, 80 PYRMONT STREET**  
**PYRMONT, NSW**

**INTRODUCTION**

Further to your request on 9 February 2017, we have reviewed the supplied preliminary architectural drawings prepared by DWP Suturs (Project No. 303457, Drawing Nos. MOD14-A10B1<sup>C</sup>, MOD14-A10B2<sup>C</sup>, MOD14-A10B3<sup>B</sup>, MOD14-A10B4<sup>B</sup>). From a geotechnical perspective, we understand that the proposed development comprises:

- Construction of a lift between Levels B01 and B04, adjacent to Grid Lines J/32. We have assumed that the lift over-run pit will require excavation to a maximum depth of 2m below Level B04. The lift pit will be exposed on the northern side of the lower Level B05 car park.
- An infrastructure upgrade on Level B02, between Grid Lines J & N and Grid Lines 34 & 37. Additional loads will be placed on existing columns and footings.
- Installation of new diesel fuel storage tanks and a new stormwater pump and filter on Level B04, between Grid Lines K & N, and Grid Lines 33 & 35. These facilities will be installed immediately outside the developed Level B04 footprint (below the B03 slab) and will require minor excavation into the existing basement cut profile.

The location of the proposed Modification 14 works is shown on the attached Figure 1. DWP Suturs Drawing No. MOD14-A10B4<sup>B</sup> forms the basis of Figure 1. We understand that Level B04 is at RL96.2m. The survey datum is 100m below the Australian Height Datum (AHD).

We have completed a desktop study of the previous geotechnical investigations and inspections completed by Jeffery and Katauskas Pty Ltd (now trading as JK Geotechnics) between 1992 & 1995 for the 'Sydney Casino Project'. Based on the information obtained, we have developed a preliminary geotechnical model



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for the proposed Modification 14 works area, and present our preliminary comments and recommendations on excavation conditions and drainage.

### **Preliminary Geotechnical Model**

The 1:100,000 series geological map of Sydney (Geological Survey of NSW, Geological Series Sheet 9130) indicates the site to be underlain by Hawkesbury Sandstone.

Fourteen previous cored boreholes were drilled by JK Geotechnics within the proposed Modification 14 works area footprint, at the locations shown on the attached Figure 1. A summary of the pertinent details encountered in the previous boreholes is tabulated below:

| Borehole | Surface RL (m)<br>[100m below AHD] | Approximate Grid Location        | Top of Sandstone Bedrock |        | Borehole Termination |        |
|----------|------------------------------------|----------------------------------|--------------------------|--------|----------------------|--------|
|          |                                    |                                  | Depth (m)                | RL (m) | Depth (m)            | RL (m) |
| C2293    | 93.3                               | H/32                             | 0.0                      | 93.3   | 4.93                 | 88.4   |
| C2294    | 96.0                               | H/33                             | 0.0                      | 96.0   | 5.10                 | 90.9   |
| J34/35   | 97.0                               | J/between 34 & 35                | 0.0                      | 97.0   | 4.50                 | 92.5   |
| C22164   | 102.0                              | Between H & J<br>Between 35 & 36 | 0.24 <sup>Note 1</sup>   | 101.8  | 3.09                 | 98.9   |
| C22126   | 93.4                               | K/32                             | 0.0                      | 93.4   | 6.19                 | 87.2   |
| C22129   | 95.9                               | K/34                             | 0.0                      | 95.9   | 4.88                 | 91.0   |
| C22131   | 102.7                              | K/36                             | 0.8 <sup>Note 1</sup>    | 101.9  | 6.70                 | 96.0   |
| C22139   | 93.4                               | L/31                             | 0.0                      | 93.4   | 4.76                 | 88.6   |
| C22145   | 101.9                              | L/35                             | 2.4 <sup>Note 1</sup>    | 99.5   | 6.50                 | 95.4   |
| M32      | 93.4                               | M/32                             | 0.0                      | 93.4   | 4.80                 | 88.6   |
| MN35     | 101.2                              | Between M & N/35                 | 1.9 <sup>Note 1</sup>    | 99.3   | 5.85                 | 95.4   |
| MN36     | 101.4                              | Between M & N/36                 | 1.2 <sup>Note 1</sup>    | 100.2  | 5.00                 | 96.4   |
| C2439    | 96.1                               | N/31                             | 0.15 <sup>Note 1</sup>   | 95.9   | 6.72                 | 89.4   |
| N33      | 96.0                               | N/33                             | 0.0                      | 96.0   | 4.70                 | 92.3   |

Note 1: The bedrock was covered by granular fill.

The sandstone bedrock was typically of medium and high strength. No groundwater observations were made in the boreholes due to the introduced drill flush water associated with rock coring.

We note that the boreholes were drilled either close to, or on completion of bulk excavation. Where the sandstone depth is at the surface (ie. at 0.0m depth), the actual original bedrock surface level is expected to be higher.



## **PRELIMINARY COMMENTS AND RECOMMENDATIONS**

### **Hydrogeological Issues**

The proposed minor excavations are all located within the footprint of the existing basement levels, and above original basement bulk excavation level (ie. Level B05). It is our opinion that the proposed minor excavations will not interfere with regional groundwater flows. We therefore consider that the impact of the proposed development on groundwater flows at the site will be negligible.

### **Excavation**

Based on the results of our assessment, we expect that the proposed lift pit excavation (below Level B04) will extend into sandstone bedrock, and into the cut face exposed along the northern side of the lower Level B05. The minor excavations for the installation of the new diesel fuel storage tanks, stormwater pump and filter on Level B04 are expected to extend into existing granular fill and sandstone bedrock.

Prior to any excavation commencing, reference should be made to the Safe Work Australia 'Excavation Work Code of Practice' dated July 2015.

Due to the limited site access, the soil and rock excavation will most likely need to be carried out using hand equipment; for example, shovels and jackhammers. Grid sawing the surface of the bedrock with a concrete saw would facilitate removal of the sandstone when using jackhammers. Dust suppression by spraying with water should be carried out whenever concrete saws are being used.

Care must be taken during excavation not to undermine or remove support from existing footings. If any excavation reveals the base of a footing, then all work must cease and JK Geotechnics immediately contacted for inspection and further advice.

Excavations through granular soils should be temporarily battered back at no steeper than 1 Vertical (V) on 1.5 Horizontal (H) on condition that surcharge loads are kept well clear of the crests. Once the structural design has been completed, further advice should be sought with respect to the long-term retention detail; that is, permanent batter slopes and/or retaining walls.

We expect that good quality, medium strength and stronger sandstone (without adverse defects) can be cut vertically. Notwithstanding, all vertically cut rock faces must be inspected by an experienced geotechnical engineer on completion of excavation to identify features which may require stabilisation (eg. underpinning, rock bolting and/or shotcrete and mesh). Provision must be made in the construction program and budget for the inspections and stabilisation works. As the dowels and rock bolts will be



permanent, consideration must be given to long-term corrosion. Stainless steel bolts or hot dipped galvanised bolts with protective sheathing may be required.

### **Drainage**

Groundwater inflows into the proposed excavations may occur as local seepage flows above the soil/bedrock interface, and through joints and bedding partings within the bedrock profile, particularly after heavy rain. We recommend that all cut faces and retaining walls incorporate spoon drains and/or subsoil drains to intercept potential seepage. Seepage volumes into the excavations are expected to be of limited volume and controllable by sump and pump methods and/or gravity drainage methods. Discharge from the drainage system should be piped to the stormwater system. The excavation should be monitored by the contractor and JK Geotechnics as it progresses to confirm the drainage requirements.

### **Additional Geotechnical Input**

Once the structural design has been completed, a detailed assessment of the existing footings and foundation materials will need to be carried out by JK Geotechnics for the proposed column strengthening works. Similarly, once the design of the proposed new diesel fuel storage tanks, stormwater pump and filter has been finalised, then further geotechnical advice should be sought from JK Geotechnics with respect to footings and slabs-on-grade.

### **GENERAL COMMENTS**

A waste classification will need to be assigned to any soil excavated from the site prior to offsite disposal. Subject to the appropriate testing, material can be classified as Virgin Excavated Natural Material (VENM), General Solid, Restricted Solid or Hazardous Waste. Analysis takes seven to 10 working days to complete, therefore, an adequate allowance should be included in the construction program unless testing is completed prior to construction. If contamination is encountered, then substantial further testing (and associated delays) should be expected. We strongly recommend that this issue is addressed prior to the commencement of excavation on site.

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

Yours faithfully  
For and on behalf of  
JK GEOTECHNICS



**Andrew Jackaman**  
Senior Associate | Geotechnical Engineer

Encl. Figure 1: Location Plan of Relevant Previous Boreholes at Level B04

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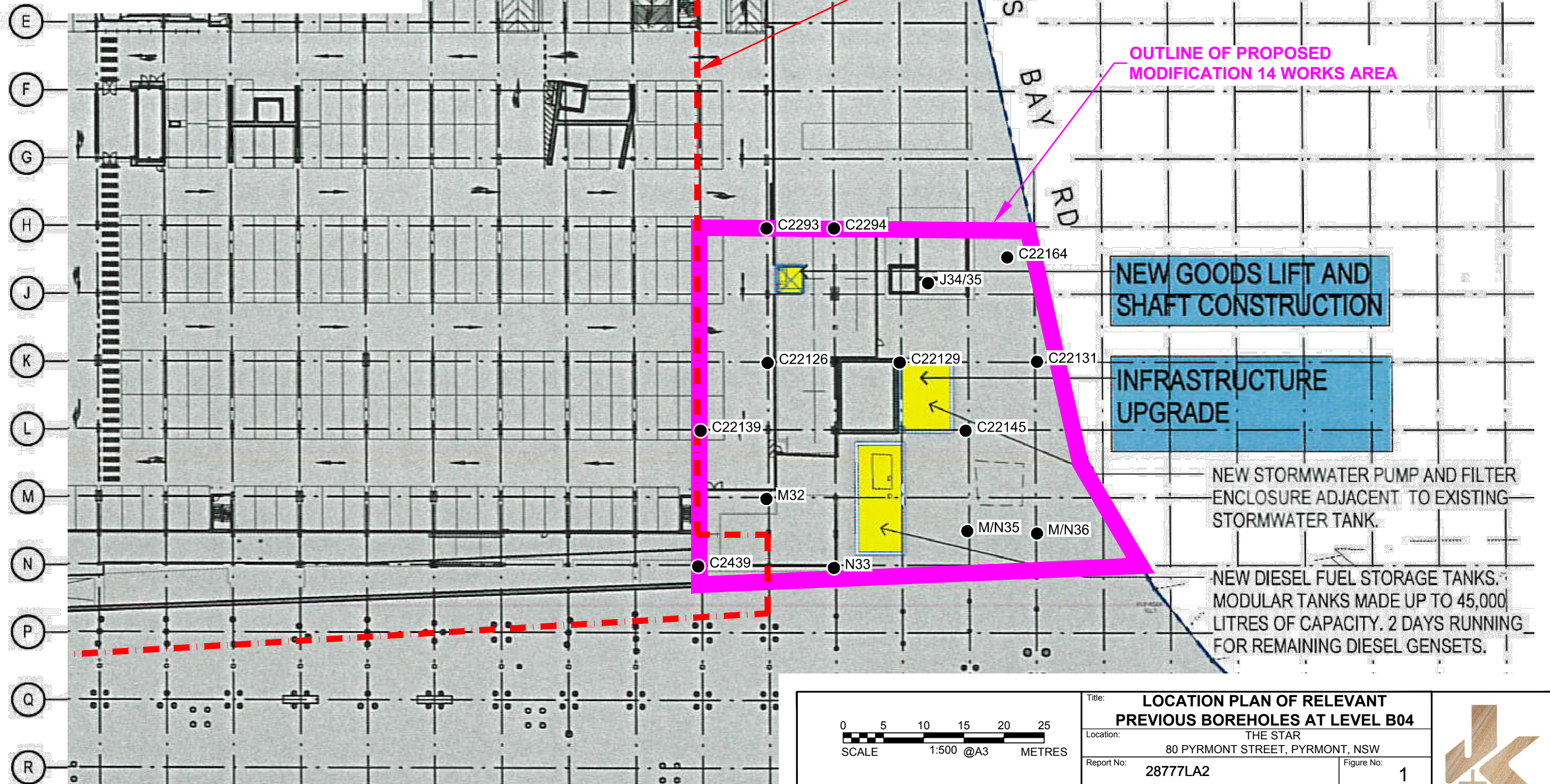
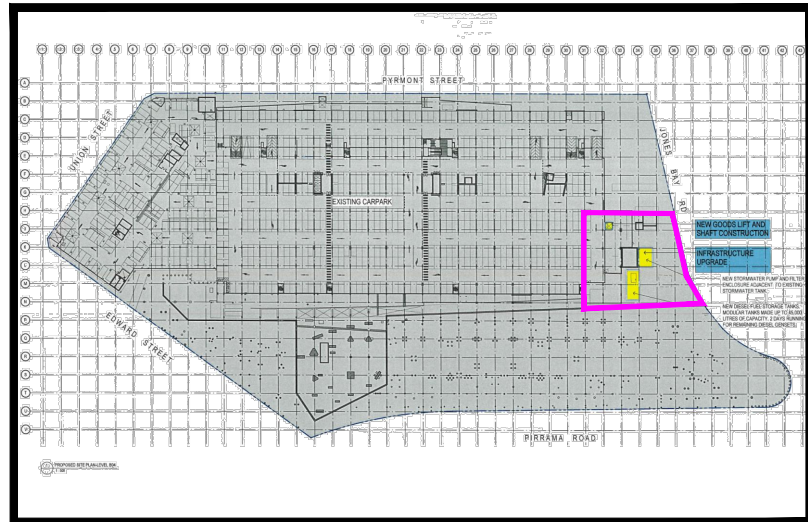
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SCALE 1:500 @A3 METRES

This plan should be read in conjunction with the JK Geotechnics report.

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|-------------------------------------------------------------------------|---------------------|
| Title: <b>LOCATION PLAN OF RELEVANT PREVIOUS BOREHOLES AT LEVEL B04</b> |                     |
| Location: <b>THE STAR</b><br>80 PYRMONT STREET, PYRMONT, NSW            |                     |
| Report No: <b>28777LA2</b>                                              | Figure No: <b>1</b> |
| <b>JK Geotechnics</b>                                                   |                     |

