

GROUNDED EXPERTISE

James Taylor and Associates Pty Ltd 301/115 Military Road Neutral Bay, NSW 2089 Project 232711.00 12 November 2024 R.001.Rev0 RM

Attention: James Taylor Email: jtaylor@jamestaylorassociates.com.au

# Report on Geotechnical Testing Proposed Residential Development 3 Lauderdale Avenue, Fairlight, NSW

## 1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents the results of geotechnical testing undertaken for a proposed residential development at 3 Lauderdale Avenue, Fairlight, NSW (the site). It is understood that geotechnical testing is required to provide preliminary information on top of rock levels.

The supplied information indicates that the proposed development will comprise construction of a new driveway ramp and residential building with a single level basement. Maximum excavation depths of about 2.5 m are anticipated.

The aim of the testing was to obtain preliminary information on subsurface conditions at the site to provide comments on subsurface profile, foundation design and excavation conditions.

The geotechnical testing included an inspection of the site and features, in situ penetrometer testing and one borehole to inspect near-surface material. Details of the field work and relevant comments are provided in this report.

Information that was provided by James Taylor and Associates Pty Ltd (JT) for use in this investigation included:

- Preliminary architectural drawings prepared by Baxter & Jacobson Architects (Project 443-01, Drawings SK-1210, SK-1211 and SK-1402 (Issue 5), all dated 11 October 2024; and
- Survey plan prepared by Survey Plus (Drawing No. 21974\_DET (Rev C), dated 28 September 2023)

This report must be read in conjunction with all attachments.



## 2. Site Description

The site is located at 3 Lauderdale Avenue, Fairlight and is a rectangular shaped lot covering an area of approximately 765 m<sup>2</sup>. The site is located between Lauderdale Avenue to the north and Fairlight Walk and Sydney Harbour foreshore to the south. To the east and west, the site is bounded by multi-storey and two-storey residential buildings, respectively.

The site is currently occupied by a two-storey brick residential building, situated within the southern portion of the site, surrounded by concrete and sandstone block pavements, garden beds and lawn areas.

The northern portion of the site is occupied by a single-storey brick garage structure (northeastern corner) and grassed lawn landscaped area supported by sandstone and brick retaining walls with heights ranging from 0.2 m (north) to 1.7 m (south). The retaining walls provide separation to an existing concrete driveway and metal carport along the western boundary terminating in the central portion of the site.

The site has an overall difference in elevation of about 5.5 m from the northern boundary at about RL 15.0 m to the lower southern property boundary at about RL 9.5 m (relative to Australian Height Datum, AHD), giving an average slope angle of approximately 6.5°.

## 3. Regional Geology and Mapping

### 3.1 Geology

Reference to the Sydney 1:100,000 Geological Series Sheet and inspection of the area surrounding the site indicates that the site is underlain by Hawkesbury Sandstone. Hawkesbury Sandstone is of Triassic age and typically comprises medium to coarse grained sandstone, both massive and cross-bedded, generally with two sets of steeply dipping joints striking NNE and ESE.

Hawkesbury Sandstone was visible in the central western portion of the site immediately north of the existing two-storey building, on the Harbour foreshore and immediately adjacent to the southern boundary in Fairlight Walk.

### 3.2 Hydrogeology

Reference to the registered groundwater bore data from WaterNSW indicates that there are two groundwater monitoring wells located 750 m north-east and 800 m north-west of the site (Bore IDs: 106341 and 108323) with standing water levels of 18.3 m and 8.0 m, respectively. This is equivalent to groundwater levels between RL 3.7 m and RL 9.0 m.

### 3.3 Acid Sulfate Soils

The 1:25,000 Acid Sulfate Soil Risk Map (1994-1998, NSW Department of Environment and Climate Change) indicates that the site in located within an area not known to contain acid sulfate soils. The mapping indicates the presence of a high-risk zone (HEm) downslope of the site within Sydney Harbour sediment. This material is at a much lower elevation than the site, about 40 m south of the site boundary and is highly unlikely to be present within the site.



## 4. Field Methods and Results

The field work was carried out on 1 November 2024 and included the drilling of one hand-augered borehole (test location 1), six dynamic cone penetrometer tests (DCP 1 to 6), one dynamic penetrometer test (DPT 1), site inspection and mapping of areas of exposed rock outcrop.

The ground surface levels at the borehole locations were measured relative to AHD using a differential global positioning system (dGPS) receiver, which is generally accurate to within  $\pm 0.1$  m. The approximate locations of the borehole and penetrometer tests are shown on the attached annotated survey drawing.

The hand-augered borehole at test location 1 indicated about 75 mm of dark brown silty sand topsoil fill overlying brown gravelly sand fill with auger refusal occurring on sandstone cobbles or boulders at a depth of 0.3 m.

Penetrometer tests (DCP 1 to 6 and DPT 1) were conducted at 7 accessible locations across the site, as shown in the attached annotated drawing, where each penetrometer test encountered bouncing hammer refusal at depths ranging from 0.2 m to 1.15 m, with the exception of DCP 5 which refused on brick pavers underlying a garden bed. The DPT test was undertaken at test location 1 where a relatively deep soil profile was identified. The result indicates the sandy fill is of variable consistency, generally equivalent to a loose to medium-dense sand, with higher blow counts interpreted as gravel and cobble inclusions within the soil fill. The bouncing hammer refusal for the DCPs/DPT indicates hard material, inferred as at least low strength sandstone bedrock. However, it is possible that the refusal was on buried obstructions in the fill, such as boulders or concrete.

The penetrometer results are attached, as well as a test location plan. The level of penetrometer refusal (in RL m), inferred as the top of rock (TOR), is also shown in the attached drawing and at the bottom of the penetrometer test results sheet. It is noted that these TOR levels are indicative only and based on interpretation of the penetrometer results. Boreholes or test pits on site would be necessary to accurately identify the top of rock.

The walkover inspection indicated the following:

- Medium strength sandstone outcrop was observed within the rock platform along the harbour foreshore.
- Medium strength sandstone outcrop was observed between the southern boundary and Fairlight Walk.
- Medium strength sandstone outcrop was observed directly north of the existing two-storey building, stepping down in an east to west direction.

## 5. Comments

### 5.1 **Proposed Development**

The supplied information indicates that the proposed development is to comprise construction of a new driveway ramp along the western boundary and a residential building with a single level basement within the central portion of the site.



The proposed driveway ramp finished levels grade from about RL14.5 m at the northern boundary to about RL10.3 m at its southern end, terminating in the central portion of the site. Excavation depths are expected to grade from 0 m at the northern boundary to about 2.5 m at its southern extent.

The proposed basement level will have a finished floor level of RL 10.3 m, with further excavation likely necessary to allow room for a slab and ground preparation, resulting in an estimated bulk excavation level of about RL 10 m and an expected maximum excavation depth of about 2.5 m, with localised deeper excavations required for footings.

#### 5.2 Dilapidation Surveys

Prior to the commencement of excavation work on the site, it is recommended that dilapidation (existing building condition) surveys be undertaken on neighbouring buildings close to the proposed excavations, as well as footpaths and roads adjacent to the site boundaries. The condition of any heritage items on and surrounding the site should also be documented. The purpose of a dilapidation survey is to document any existing defects so that any potential claims for damage due to construction related activities can be accurately assessed.

#### 5.3 Site Preparation

Any existing fill that is required to support pavements will need to be reworked to reduce the potential for unacceptable settlements associated with poorly or variably compacted fill. New fill should also be placed in accordance with a specification (e.g. 98% Standard compaction within 2% of optimum moisture content, or similar).

From a geotechnical perspective, the existing sandy fill is likely to be suitable for re-use as engineered fill, provided that it is free of oversize particles (>100 mm) and deleterious material.

The suitability of re-using site-won fill and natural soil should also be considered from a contamination perspective. If fill is imported to the site, then the engineering properties (e.g. plasticity, reactivity, CBR, etc.) should ideally be equivalent, or superior, to the existing materials on site.

#### 5.4 Foundations

To reduce the risk of differential movement or settlement, it is recommended that all footings be founded on intact sandstone bedrock, for which an allowable design bearing pressure of 700 kPa is appropriate for at least low strength sandstone. Higher bearing pressures would be feasible with a more detailed rock-coring investigation, if required.

After footing excavations are complete, and prior to placement of steel and pouring of concrete, the sandstone founding stratums for all footings should be inspected by a geotechnical engineer to confirm that the foundation materials are suitable for the design pressures.

Foundations proportioned on the above allowable bearing pressure would be expected to experience total settlements of less than 1% of the footing width under the applied working load.



#### 5.5 **Excavation Conditions and Support**

The supplied information indicates that the proposed driveway ramp and basement will require excavations up to a maximum depth of about 2.5 m below existing site levels (deepest towards the central portion of the site). It is expected that the excavation will encounter shallow granular fill and possibly clay or sandy clay soils (not encountered in investigation), underlain by sandstone bedrock that is likely to be low, medium and high strength close to the top of rock level.

Fill should be readily removed using conventional hydraulically operated earthmoving equipment with bucket attachments. Sandstone bedrock excavation will require rock saws, rotary mill heads or hydraulic rock breaking equipment.

Where space permits, temporary and permanent batters within the fill/soil profile could be used. The suggested batter angles for temporary and permanent excavations in sandy fill and clay with a vertical height of less than 3 m is 1.5H:1V (Horizontal:Vertical) in the short term and 2:1 (H:V) or flatter for permanent slopes.

Low to medium strength and stronger sandstone will generally stand vertically unsupported, unless unfavourably oriented jointing is present. It will be necessary to undertake regular geotechnical inspections during excavation to assess stability of the rock and to check for adverse jointing to determine if, and where, localised rock face support measures such as shotcrete, rock bolts, bracing or propping are required. Staged rock excavation should be considered along the western boundary close to adjacent structures.

The proposed ramp and basement excavation is offset from the western property boundary by approximately 0.9 m, with rock depths in this area estimated to be between 0.3 m and 0.7 m, indicating temporary batters through the soil profile and vertical cuts through the rock may be feasible. Where space does not permit the construction of temporary batters, it may be necessary to install shoring walls to support the surface soils.

#### 5.6 Groundwater

Given the proximity of Sydney Harbour, the regional groundwater table is expected to be within bedrock at approximately sea level, or slightly higher. Seepage water may be present within the fill and soils, particularly at the interface with less permeable clay or sandstone bedrock. The volume of seepage water will fluctuate with climatic and human influences. Seepage will typically increase following periods of wet weather, and there may be minimal seepage following prolonged dry periods. It is expected that any seepage inflows during excavation could be managed with typical site drainage or a sump and pump system.

## 6. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 3 Lauderdale Avenue, Fairlight, NSW in line with Douglas' proposal dated 28 October 2024 and acceptance received from James Taylor of James Taylor and Associates Pty Ltd dated 31 October 2024. The work was carried out under Douglas' Engagement. This report is provided for the exclusive use of James Taylor and Associates Pty Ltd 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 Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas 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 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 Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

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. Douglas 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 Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

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

Yours faithfully Douglas Partners Pty Ltd

Reviewed by

Peter Oitmaa Principal

**Richard Muller** Geotechnical Engineer

Attachments: About this Report DCP Results Annotated Survey Drawing Showing Test Locations



#### Introduction

These notes are provided to amplify DP's inspection report in regard to the limitations of carrying out inspection work. Not all notes are necessarily relevant to this report.

#### Standards

This inspection report has been prepared by qualified personnel to current engineering standards of interpretation and analysis.

#### Copyright and Limits of Use

This inspection report is the property of DP and is provided for the exclusive use of the client for the specific project and purpose as described in the report. It should not be used by a third party for any purpose other than to confirm that the construction works addressed in the report have been inspected as described. Use of the inspection report is limited in accordance with the Conditions of Engagement for the commission.

DP does not undertake to guarantee the works of the contractors or relieve them of their responsibility to produce a completed product conforming to the design.

#### Reports

This inspection report may include advice or opinion that is based on engineering and/or geological interpretation, information provided by the client or the client's agent, and information gained from:

- an investigation report for the project (if available to DP);
- inspection of the work, exposed ground conditions, excavation spoil and performance of excavating equipment while DP was on site;
- investigation and testing that was carried out during the site inspection;
- anecdotal information provided by authoritative site personnel; and
- DP's experience and knowledge of local geology.

Such information may be limited by the frequency of any inspection or testing that was able to be practically carried out, including possible site or cost constraints imposed by the client/contractor(s). For these reasons, the reliability of this inspection report is limited by the scope of information on which it relies.

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

- unexpected variations in subsurface conditions that are not evident from the inspection; and
- the actions of contractors responding to commercial pressures.

Should these issues occur, then additional advice should be sought from DP and, if required, amendments made.

This inspection report must be read in conjunction with any attached information. This inspection report should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions from review by others of this inspection report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this inspection report.







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## **Dynamic Cone Penetrometer (DCP) Test Results**

<b>Client:</b> James Taylor and Associates Pty Ltd <b>Project:</b> Proposed Residential Development <b>Location:</b> 3 Lauderdale Avenue, Fairlight, 2094								Project No:23Date:0Page No:0		52711.00 01/11/24 1 of 1	
Test ID	DCP 1	DCP 2	DCP 3	DCP 4	DCP 5	DCP 6		DPT 1			
RL (AHD)	13.5	13.6	10.1	9.7	11.7	13.8		13.5			
Depth (m)	Penetration Resistance										
0.00 - 0.15	3	1	2	1	2/10	6		3			
0.15 - 0.30	3	3/50	2	1		9		3			
0.30 - 0.45	4		3	3		12/75		8			
0.45 - 0.60	5		4	10				7			
0.60 - 0.75	3		3/10	5/20				2			
0.75 - 0.90	4							3			
0.90 - 1.05	6							4			
1.05 - 1.20	8/100							12/70			
Remarks	RB	RB	RB	RB	RB	RB		RB			
Inferred Top of Rock (TOR) RL (AHD)	12.3	13.4	9.5	9.0	-	13.5		12.3			

Notes: DCP 5 refusal on brick pavers underlying garden bed

Method:	AS 1289.6.3.2 - Dynamic Cone Penetrometer	Tested By:	RM
Remarks:	D =Discontinued, B = Hammer Bouncing, E = Excavated	Checked By:	MAB
	R = Refusal, 24/110 indicates 24 blows for 110 mm penetration		



<b>REVISION / DATE</b>		
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REVISION / DATE	REVISION DETAILS	SURVEY BY	DRAWN BY	CHECKED BY		Sydney P 02 9651 2921	DATE OF SURVEY	25.11.2022 & 10.02.2023	DRAWING TITLE
					surveyplus	into@surveyplus.com.au	ORIGIN OF LEVELS	PM 912 RL 13.280 (AHD)	PLAN SHOWI
		['			land development consultants	Byron Bay P 02 6672 1256 office@surveyplus.com.au			
C 28.09.2023	AMEND BOUNDARY IDENTIFICATION NOTES	-	LN	LN	We make it easy. We make it hannen		ORIGIN OF COORDS	LUCAL	
B 10.02.2023	ADDITIONAL SURVEY INFORMATION	DO	JC	DO	www.surveyplus.com.au	office@surveyplus.com.au		0 5m	Νο 3ΙΔΗΠ
A 05.12.2022	AS SURVEYED ON SITE	DO	RS	DO			CONTOOR INTERVAL	0.511	





gm-
STUART JOHN HILDEBRAND REGISTERED SURVEYOR NSW NO. SU008832

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