coffey geotechnics
SPECIALISTS MANAGING THE EARTH

GEOTECHNICAL DESK STUDY
71-79 MACQUARIE STREET, SYDNEY, NSW

AMP Capital

GEOTLCOV24261AA-AD
17 June 2011

Coffey Geotechnics Pty Ltd ABN 93 056 929 483
8/12 Mars Road Lane Cove West NSW 2066 Australia

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SPECIALISTS MANAGING THE EARTH

17 June 2011

Mirvac Projects Pty Ltd
Level 26, 60 Margaret St
Sydney NSW 2000

Attention: Nicole Vince

RE: GEOTECHNICAL DESK STUDY

71-79 MACQUARIE STREET, SYDNEY, NSW

Coffey Geotechnics Pty Ltd is pleased to present the results of a geotechnical desk study carried out for the proposed redevelopment of 71-79 Macquarie Street, Sydney, NSW. This document has been prepared to support the Part 3A Concept Plan application to the Department of Planning for the project.

If you require further information please contact the undersigned on 9911 1000.

For and on behalf of Coffey Geotechnics Pty Ltd

Sven Padina

Associate Geotechnical Engineer

Patrick Wong

Senior Principal

Distribution: Original held by Coffey Geotechnics Pty Ltd
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1 PDF to Mirvac Projects Pty Ltd

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CONTENTS

1 INTRODUCTION

This report presents the results of a geotechnical desk study carried out by Coffey Geotechnics Pty Ltd (Coffey) for the proposed redevelopment of the 71-79 Macquarie Street, Sydney CBD. The desk study was carried out in general accordance with our proposal GEOTLCOV24261AA-AA, dated 31 March 2010, to support a Part 3A Concept Plan application to the Department of Planning for the project.

The objectives of the desk study are to develop a preliminary geotechnical model of subsurface conditions at the site as a basis for preliminary assessment of the proposed geotechnical aspect for the project including:

- Excavation conditions.
- Excavation support.
- Likely groundwater conditions.
- Protection of neighbouring structures including the elevated Cahill Expressway and rail line.
- Suitable footing types and foundation design.
- Further geotechnical involvement.

In parallel to this geotechnical desktop study, a Phase 1 contamination study for the project is being carried out by Coffey Environments Pty Ltd with the results presented in a separate report.

2 DIRECTOR GENERAL REQUIREMENTS

A summary of the Director General Requirements (DGR) this report aims to comment on is presented in Table 1 overleaf.

Table 1: Summary of Relevant DGRs

Item No.	DGR	Report Reference
8.1	Assess the geotechnical and contamination issues associated with the construction of the building, associated promenade and pedestrian link between Macquarie Street and Circular Quay.	This report discusses geotechnical aspects of the proposed development, refer Section 6. Contamination issues discussed in a separate report produced by Coffey Environments
9.2	A geotechnical and structural report (Rail Corridor)	This report discusses geotechnical aspects of the proposed development and provides information for preliminary design of structural support., refer Section 6.4
11.2	A geotechnical and structural report (Cahill Expressway)	This report discusses geotechnical aspects of the proposed development and provides information for preliminary design of structural support, refer Section 6.4
22.8	Geotechnical Report – prepared by a recognised professional which assess the risk of geotechnical failure on the site and identifies design solutions and works to be carried out to ensure the stability of the land and structures and safety of persons	Covered by entire report, including the need to carry out additional investigations for detailed design and construction monitoring requirements.

3 THE SITE & PROPOSED DEVELOPMENT

As shown in the attached Figure 1, Site Location Plan, the site is located in the south east corner of Circular Quay. The site itself is bounded by Macquarie Street to the east, the elevated Cahill Expressway and rail line to the south, Circular Quay foreshore promenade to the west, and the Quay Grand building to the north.

Presently the site is occupied by an existing multi storey building comprising two basement levels and 18 floors.

Figure 2 presents sketch sections of the presently proposed new building foot print and cross section. The proposed new building will be largely within the same height envelope as the existing building, extending up to RL67.23m with a multi story basement extending down to at least RL-14.8m, i.e. at least 17.6m below the current Circular Quay foreshore promenade surface levels. The lower portion of the building is also to be extended to the west, toward Circular Quay, similar to the current building height and footprint of the adjacent Quay Grand Building.

4 DESK STUDY INFORMATION

In summary the sources of information used for this desk study were as follows;

- Review of available published geological/geotechnical information including regional geological maps, geological notes, and Australian Geomechanics papers/maps.
- Review of previous Coffey geotechnical investigation reports and projects from the area.
- Internet search including government departments such as NSW DIP, Mineral Resources and historical societies.

In addition to the above sources of information a walk over site inspection was carried out by a Coffey Geotechnical Engineer.

The results from the desktop study and site investigation are discussed in the following sections, the attached Figure 3, Geotechnical Information Plan, show the location of the relevant features including previously borehole locations and inferred top of bedrock contours.

4.1 Geology

The 1:100,000 Sydney Geological Sheet indicates the site is underlain by Hawkesbury Sandstone and is immediately adjacent to the reclamation fill placed to form the current Circular Quay foreshore. In summary these two units are described on the geological sheet and notes as follows:

- Hawkesbury Sandstone: medium to coarse grained, with very minor shale and laminite bands and lenses.
- Fill: dredged estuarine sand and mud, demolition rubble, industrial and household waste.

The Australian Geomechanics plan of major near vertical structural features in the Sydney CBD by Pells et al (2004) indicates the GPO Fault Zone may be located immediately to the north of the site trending approximately north-north east to south-south west. Typically the GPO Fault Zone comprises a near vertical band up to 20m wide of highly weathered sandstone with near vertical parallel shear zones and clay infilled joints.

Hawkesbury Sandstone comprises horizontal massive and cross-bedded units of medium to high strength sandstone with occasional thin bands or lenses of siltstone and shale breccia. The thickness of sandstone beds typically ranges from 0.6 to 2m thick with bedding plane contacts typically being pervasive and traceable for distances in excess of 30m.

The major joint set in Hawkesbury Sandstone comprise a north-north east trending sub-vertical joint set with a typical spacing between joints of 2m to 5m, and typical length in of 3-30m, however localised “joint swarms” of closely spaced parallel joints (typically of 0.3-0.5m spacing) do also occur. In addition to this major joint set there is a less dominant joint set running perpendicular to the NNE set having a typical joint spacing of 8-10m.

4.2 Site Historical Background

Ongoing development of the Sydney Cove/Circular Quay area through the 19th and 20th centuries has resulted in significant land reclamation over the estuarine mud flats, creating the present day harbour foreshore and Circular Quay. Based on the available data, the area between the western boundary and the shoreline sea wall may contain up to 2-3m depth of fill material placed as part of this reclamation works.

Prior to the construction of the current building, the site was occupied by a series of sandstone warehouses built c1880s with galleries extending under Macquarie Street. If these galleries were not removed and/or infilled during construction of the existing building then large voids may still be present under Macquarie Street.

As part of early Sydney civil works the Bennelong Sewer tunnel was constructed from the north east end of the Sydney system at approximately the intersection of Alfred and Phillip Streets, located under Macquarie Street to Bennelong Point. It is understood that the sewer tunnel comprised a 0.5m diameter sandstone block lined tunnel and with reference to historical maps, and if still in existence may pass very close to, or even cross, the south eastern corner of the site. It is recommended that enquires be made to Sydney Water to determine whether the tunnel still exists and if so, details be obtained on its actual location and present condition.

4.3 Coffey Investigations in the Locality

Coffey's local experience includes geotechnical investigation and construction monitoring at the following sites along Macquarie Street;

- The Quay Grand Development at 61-69 Macquarie Street.
- Bennelong Centre Project at 1 Macquarie Street.
- Opera House Car Park at Bennelong Point, on the eastern side of Macquarie Street.

Figure 3 presents an inferred bedrock contour plan, based upon investigation results from neighbouring properties and the construction of the Cahill Expressway. Coffey expects bedrock depths in the northern west corner of the site will vary between about 0.5m to 1m below existing surface levels. It is noted that the rock surface may exist as a series of steps and benches rather than a smooth slope.

Excavations for the Bennelong Centre and Quay Grand developments encountered variable thickness fill up to 3m deep underlain by Hawkesbury Sandstone bedrock. The Hawkesbury Sandstone was demonstrated to be a competent material capable of supporting large buildings and be excavated with vertical faces requiring minor rock face support. Typically, the sandstone comprised thickly bedded massive and cross-bedded units of medium to high strength sandstone (i.e. Pells et al Class III to I) with a pervasive band of siltstone/shale breccia 0.5-1.0m thick at about RL–8m to RL-10m AHD.

Figure 4 attached is a photo from Coffey files taken of the southern excavation face during the construction of the Quay Grand. In this photo the existing building basement levels are clearly evident together with the siltstone/shale breccia band. It is noted that the majority of groundwater seepage observed during excavation was from this band and along the western excavation face grouting and shotcrete was required to reduce inflows.

4.4 Site Inspection

As part of this study a site inspection was carried out by a Coffey Geotechnical Engineer comprising the following;

- A walk along Macquarie Street in the vicinity of the site and Opera House forecourt cutting.
- A walk along the Circular Quay promenade in the vicinity of the site.
- Entry to the existing building car park.
- Entry to the Quay Grand building car park.

In summary the key observations from this walk over inspection were as follows;

- In the existing building car park there were no accessible rock exposures as the basement is entirely lined with brick and/or concrete walls.
- In the Quay Grand building lower basement levels the eastern and western excavated rock faces are still exposed and the following was evident:
    - At some locations there was localised seepage from individual joints.
    - On the eastern side of Level 3 there is a 0.5-1.0m thick band of shale/siltstone from which there is water seepage, on the western side of this level the bed was covered by a concrete panel.
    - The occurrence of seepage locations increased with depth and at from each there was significant iron oxide deposition.
    - All visible rock bolt heads were significantly corroded.
    - From discussion with the maintenance manager it is understood that inflow are controlled using open drain and sumps with frequent pumping, however no records of extracted water volumes are made. Additionally the lower basement level flooded once due to corrosion and failure of the drainage system piping. Stainless steel piping has also been trialled but these too rapidly corrode and are presently being replaced with high density PVC pressure pipes as required.
- There is a Cahill Expressway pylon and the adjoin rail tunnel portal structure located approximately 5m to the south of the current building footprint.
- The eastern side of Macquarie Street is in cut comprising a vertical unsupported sandstone cut with a 1m to 2 m high sandstone block work wall on top presumably supporting overlying soils and weathered rock. However in the vicinity of the Opera House car park exit ramp the block work wall spans the full height of the of the cutting. This full height retention may indicate either a depression in the local topography such as a pre-existing drainage gulley, or a zone of fractured or weathered rock such as a joint swarm requiring additional support. If this additional retention is due to rock mass feature with a NNE trend then such a feature may run through the subject site.
- There was no visible evidence of the GPO Fault Zone along the Macquarie Street cut or Opera House forecourt cut indicating that this feature is not likely to be present in the subject site.

- On the Circular Quay promenade directly opposite the site there is a single level glass clad cafe that was estimated to be within 5m of western edge of the proposed new building footprint.

5 PRELIMINARY GEOTECHNICAL MODEL

As based on the site information, discussions, and observation presented in Section 3 a preliminary geotechnical model of the site has been developed and is presented in Table 2 below. The rock units are defined in both terms of their rock mass characteristics, and inferred rock mass quality as based on Pells et al (1998) system of rock mass classification for Sydney sandstones.

Table 2: Preliminary Geotechnical Model

Unit	Approx Depth (Reduced Level mAHD)	Unit Description	Inferred Pells Rock Mass Classification
1	0m to 1.5m (North west corner of site only) (RL 2.6 to RL1.1m)	Fill: Variable material confined to the north west corner of the proposed new building footprint with a potentially stepped increase in depth towards the foreshore.	N/A
2	0-3.0m (RL 0m to -0.5m)	Sandstone: Weathered, low to medium strength	Class III Sandstone
3	3.0-10.5m RL-0.5 to RL-8.0m	Sandstone: Fresh, high strength, moderately to widely spaced defects.	Class I/II Sandstone
4	10.5-12.5m (RL-8m to RL-10m)	Interbedded Sandstone and a band of Siltstone/Shale breccia up to 1.0m thick.	Class IV/III Sandstone (Generalisation, unit expected to contain class IV/III shale and III/II sandstone)
5	>12.5m (<RL-10m)	Sandstone, Fresh, high strength, moderately to widely spaced defects. May contain bands or lenses of siltstone/shale breccia up to 0.5m thick.	Class I/II Sandstone

The existing building lower basement floor is expected to be underlain by slightly weathered to fresh Class I/II sandstone rock.

Borehole and construction information from the adjacent Quay Grand Building indicated that there were two distinct groundwater regimes as follows;

- Perched near surface groundwater associated with the fill materials and weathered rock that is strongly influenced by tidal fluctuations.
- A deeper groundwater system associated with the Hawkesbury Sandstone, with rock joints, bedding planes, and seams providing the drainage pathways for this system. It is likely that this groundwater system at the site would be depressed by the adjacent Quay Grand basement excavation.

6 PRELIMINARY DISCUSSION AND RECOMMENDATIONS

6.1 Excavation Conditions

Proposed bulk excavation for the basement is likely to extend to at least RL-14.8m AHD and it is anticipated the majority of this excavation will be in Class I/II sandstone. On this basis it is expected that excavation by ripping will be extremely difficult even with heavy dozers (i.e. Cat D10) due to the confined space of the basement excavation and widely spaced nature of rock defects.

The use of hydraulic impact hammers for bulk excavation, trimming sides of excavations, and for detailed excavation will cause vibrations that may damage vibration sensitive structures and services due to induced vibrations. Rock saws may be required to avoid both over break and excessive vibrations below the existing basement walls and adjacent to vibration sensitive structures and services. The proximity of the excavations to the Quay Grand basement structure, Cahill Expressway foundations, existing cafe, and any other vibration sensitive structures such as heritage wall, drains, etc should be taken into consideration when selecting suitable excavation methods. Planning for the excavation of the basement is to include mitigation measures to minimise the impact of the project on such adjoining structures.

Rock cores from the site should be obtained prior to commencing excavation and be inspected by prospective excavation contractors to enable then to make their own judgement on methodology, plant selection and likely productivity.

Condition surveys should be carried out on neighbouring structures prior to commencing excavation, and vibration monitoring carried out during excavation to confirm that vibrations are not causing damage to sensitive structures.

6.2 Excavation Support

6.2.1 Retaining Walls

It is anticipated that the majority of the existing basement excavation is in bedrock and presently the existing basement walls may only be retaining a nominal depth of soil/fill. Where it is proposed to extent the current excavation footprint west toward Circular Quay it is expected that the retention of up to 1.5m depth of fill soils (i.e. Unit 1) may be required and these soils could contain perched water. On this basis, the retaining system may need to also provide a barrier to water inflows from the retained

strata, it is expected that a conventional contiguous pile or temporary sheet pile and anchored wall will be necessary to achieve this.

For preliminary assessment of retaining walls, a uniform lateral earth pressure distribution of 12.5 kPa is recommend for the support of up to 1.5m of fill. This pressure distribution includes an allowance for a uniform surcharge of 10kPa, but does not include surcharges due to adjacent footings and hydrostatic pressures.

6.2.2 Support of Rock Excavation

Excavations in Hawkesbury Sandstone should be able to be cut vertically provided geotechnical assessment is carried out progressively and support installed. Rock bolt support, possibly supplemented with shotcrete and mesh may be necessary in the upper Unit 2 weathered sections of bedrock. In the Unit 3, 4, and 5 rock support may be limited to rock bolting of potentially unstable blocks. Particular attention should be paid to the assessment of outward projecting excavation corners. If sub-vertical joints cross such a corner, potentially unstable wedge type blocks can require extensive bolting.

To assess the need for bolting and rock face support we recommended that the rock faces be geotechnically assessed at the following stages:

- After the 1m depth of excavation below the existing basement level or 1m depth below any new retaining wall; and
- After each 1.5m depth increment of excavation thereafter.

Typical vertical excavations for basements in the Sydney CBD have not required the construction of a internal wall, and in some cases no protection has been required at all. However if an internal wall is required for serviceability or aesthetic reasons then performance Coffey recommends the use of either a shotcrete and mesh or thin panel wall with suitable drainage formed against the rock. Such drainage measures will depend on the likely groundwater inflows to be determined, however likely methods may include wick drains, geo-grid ‘egg box’ drainage or free draining pea gravel. Cladding walls to be constructed against the rock face should be well articulated, and should not be constructed until all excavation induced movements have ceased. Waterproofing on the inside face of the cladding is likely to be required to minimise seepage.

6.3 Groundwater

Proposed basement excavations will be below the inferred groundwater table and as noted in Section 5.2.2 above it is expected that any required retention will also have to be able to act as a barrier to water inflows from Unit 1 fill materials.

During excavation, groundwater inflows will occur from the rock mass via encountered defect and seams within the underlying rock mass either through the mass itself, along defects or at the base of the basement wall. Groundwater flows during excavation within the bedrock may be able to be managed by a drainage system. Where unacceptable groundwater inflows occur in the rock mass, targeted shotcrete or formation grouting may be required to reduce inflows.

Extensive dewatering of the adjacent fill soils is not desirable as this could lead to consolidation settlement of the fill adjacent to the site and may need special permits to discharge off site. Therefore, it is essential to maintain the integrity of the cut-off provided by retaining walls and carry out appropriate

treatment of joints or other defects near the base of the wall that may provide hydraulic connection to the groundwater within the fill.

A detailed assessment and design of groundwater management is beyond the scope of this desk study and should be addressed during any further site investigation or design works.

6.4 Protection of Neighbouring Structures

The footing layout, founding depths, and loads for adjoining structures were not known at the time of this study. Once the details of neighbouring foundations are known then the need for vibration control, underpinning, or alternative excavation support measures in the vicinity of adjacent foundations will need to be assessed as part of future investigations and geotechnical design works.

6.4.1 Support of Adjacent Structures

Where it is determined that the stability of adjoining structures may be effected by excavation works it is expected that additional investigation and geotechnical/structural assessment and design works would be carried out to determine both the degree of effect, and where necessary the design assessment and design of suitable additional support measures.

As a guide the range of additional support measures along excavation boundaries potentially includes;

- Additional bolting.
- Pattern bolting and shotcrete.
- Deep retaining piles.

Where it is deemed that additional detailed assessment and design is required close consultation between the project geotechnical structural engineers will be necessary with potentially 3-dimensional finite element analyses of ground conditions to assess possible load influences, resulting ground movements, and additional excavation support requirements for the proposed basement excavation, supplemented by a comprehensive movement and vibration monitoring of the progressive effects of the excavation during construction.

6.4.2 Excavation Induced Ground Movements

Ground movements will occur as a result of basement excavations. For the fill/soil and weathered rock strata requiring retention, lateral and vertical ground movements will be dependent on the design and construction of the retention system. Experience and published data suggest that lateral movements of an adequately designed and installed retention system in soil and weathered rock will be between 0.2% and 0.5% of the retained height. The extent of the horizontal movement behind the excavation face typically varies from 1.5 to 3 times the excavated height.

Whilst Class I, II, and III Hawkesbury Sandstone is often self-supporting, it typically has high “locked in” lateral stresses that can be relieved by basement or other excavations, resulting in inwards movements of the rock mass of typically 0.5mm to 2 mm (average about 1mm) per metre depth of excavation. In addition, the lateral stresses can cause shearing movements along seams and bedding planes, resulting in differential movement. The amount and timing of ground movement will be dependent on the depth of excavation, and the location and condition of bedding defects and seams. At this site it is likely that some stress relief would have taken place due to the excavation of the Quay Grand site immediately to the north, based on experience we expect that excavation induced lateral movements are more likely to be around 0.5mm per meter depth of excavation as a result.

As noted in section 5.3.1 above it is expected that close consultation between the project geotechnical structural engineers will be required to asses both the effect of ground movement on adjoining structures and possible management/mitigation measures.

6.5 Foundations

Where excavation is taken to at least 17.6m depth (RL-14.8m) is likely that pad, strip or piled footings may be founded on Class II sandstone or better. Higher level footings, either outside the basement footprint or for retaining wall footings, are recommended to be founded within the weathered Unit 2 (Class III) sandstone.

As a guide for preliminary design of strip, pad or bored piles founded on sandstone the serviceability design parameters presented in the following Table 3 should be adopted.

Table 3: Preliminary Pad and Strip Foundation Design Parameters

Unit	Serviceability End Bearing Pressure (kPa)
Class III Sandstone (Unit 2)	6,000
Class II Sandstone (Unit 5)	10,000

To adopt the parameters in the above table, footings should have a minimum embedment of 0.3m into the relevant class of rock and bases should be cleaned of debris.

Settlement of footings designed using the above serviceability end bearing pressures parameters should result in settlements <1% of the least footing dimension.

For footings located near the edge of an excavation, for example the retaining wall footings, the boundary footing pressure should be 60% of the pressure for a footing remote from the boundary. A boundary footing is defined as one where the distance from the centre of the footing to the boundary is less than the footing width normal to the boundary.

Prior to concreting, all footings should be inspected by a geotechnical engineer or engineering geologist to assess the exposed material. Where the required serviceability bearing pressure is greater than 2000kPa footing assessments should also include spoon testing of strip and pad footings or cored boreholes at pile locations, to assess whether defects below the base of the footings are within tolerable limits for the respective rock class. Inspection of the footings may result in down-grading of design pressures or deepening of footings.

At detailed design stage the use of higher design bearing pressures may be feasible by adopting a Limit State design approach.

6.6 Recommended Monitoring Measures

A geotechnical monitoring programme should be implemented during the construction phase as a check of design assumptions and to enable excavation support to be installed progressively as required by the revealed conditions. The programme should include, as a minimum, the following components:

- Surface survey points located on existing structures, on any retaining wall and on the ground surface out from the excavation. Carry out survey monitoring weekly during construction. These points should provide for accurate recording of vertical and horizontal movements.
- Undertake regular geotechnical assessments of exposed rock faces at no more than 1.5m depth intervals. Install rock face support as required.
- Vibration monitoring on adjacent structures, such as any heritage items and the pylons for the Cahill Expressway.

6.7 Limitations and Further Geotechnical Involvement

The preliminary geotechnical assessment and recommendations presented in this report are based on a desk study limited to boreholes located outside of the site boundaries. Ground conditions can vary over relatively short distances and site specific investigation and construction stage geotechnical assessments should be considered to manage geotechnical risk.

We recommend that a minimum of five cored boreholes be drilled on site to approximately 5m deeper that the lowest proposed basement floor level, with an assessment of the rock mass permeability to be undertaken by insitu testing in at least 2 locations.

7 CONCLUSION

The attached document entitled “Important Information about your Coffey Report” provides additional information on the uses and limitations of this report.

Based on the results of this desk top study, and our previous experience on similar projects, the proposed development is considered geotechnical feasible and presents a low risk to the surrounding structures provided that appropriate additional site investigations, design assessments, and construction monitoring normally associated with this type of development in the Sydney CBD are carried out.

For and on behalf of Coffey Geotechnics Pty Ltd

Sven Padina

Associate Geotechnical Engineer

Patrick Wong

Senior Principal

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Important information about your **Coffey** Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

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Important information about your **Coffey** Report

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other project design professionals who are affected by the report. Have Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

Data should not be separated from the report*

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment.
Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Coffey for information relating to geoenvironmental issues.

Rely on Coffey for additional assistance

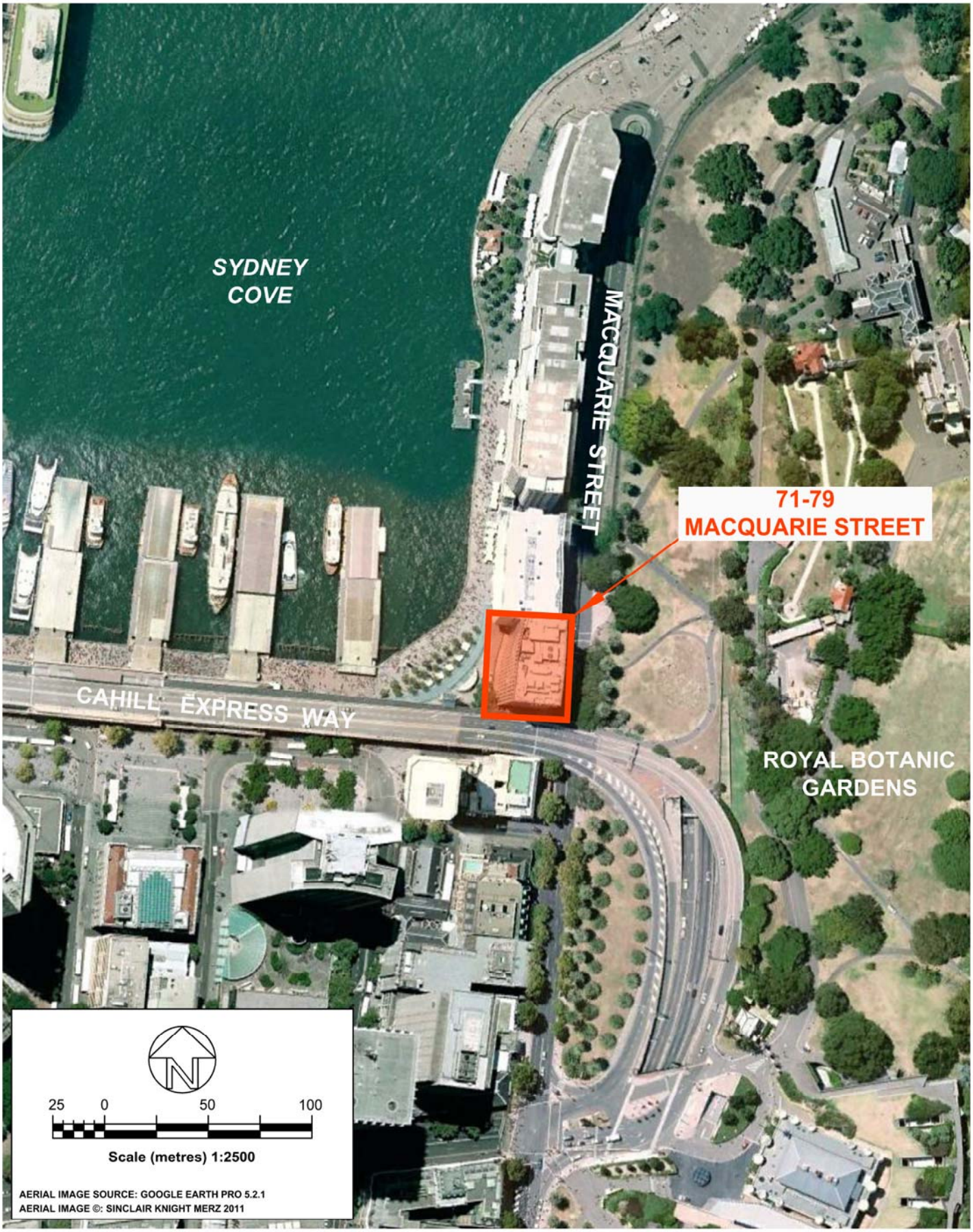
Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

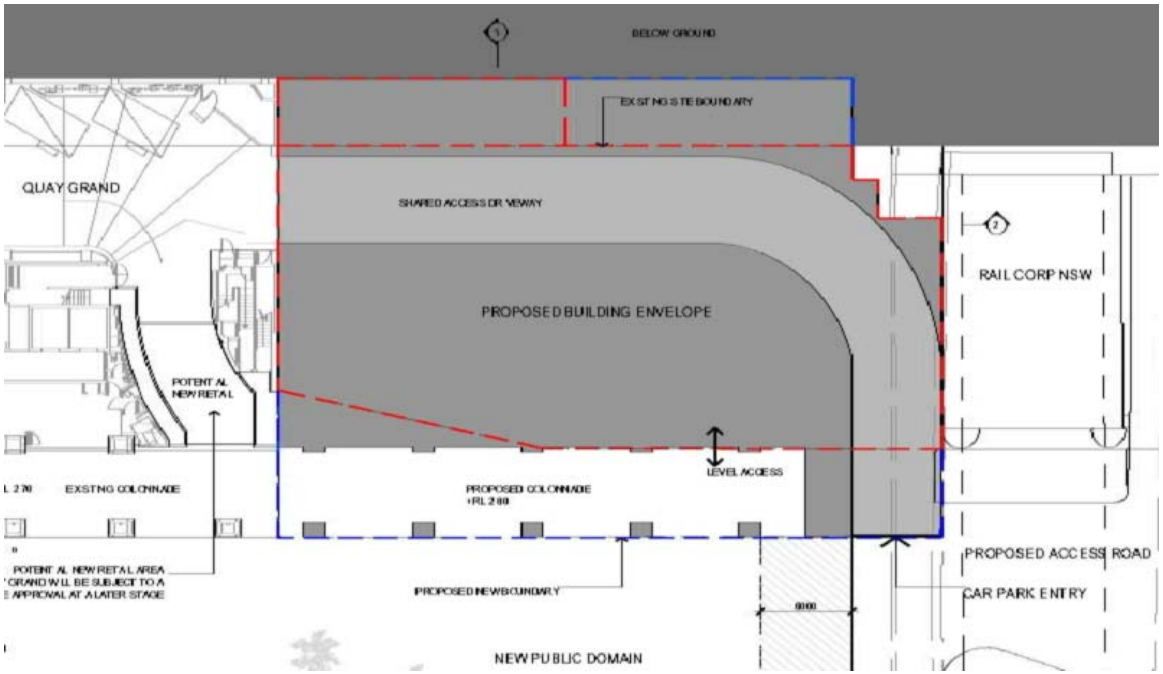
Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

* For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical information in Construction Contracts" published by the Institution of Engineers Australia, National headquarters, Canberra, 1987.

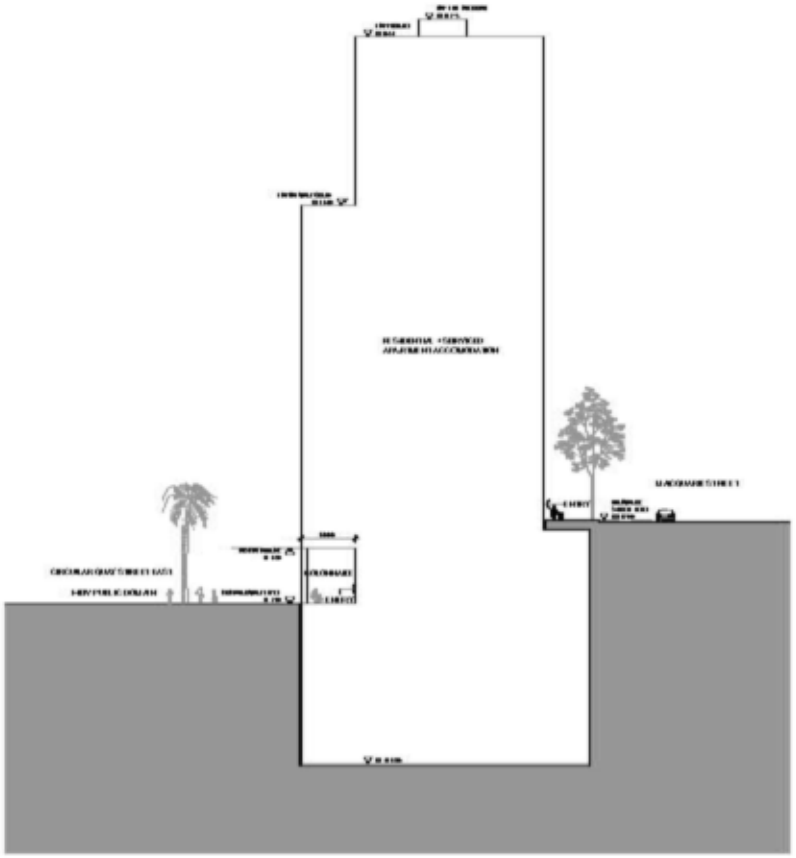
Figures



drawn	SP / AW	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client:	MIRVAC PROJECTS PTY LTD
approved			project:	PROPOSED REDEVELOPMENT 71-79 MACQUARIE STREET, SYDNEY
date	14/04/11		title:	SITE LOCATION PLAN
scale	1:2500		project no: GEOTLCOV24261AA	figure no: FIGURE 1
original size	A4			



PROPOSED BUILDING FOOT PRINT



PROPOSED BUILDING CROSS SECTION

	drawn	SP / AW	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client:	MIRVAC PROJECTS PTY LTD
	approved	SP		project:	PROPOSED REDEVELOPMENT 71-79 MACQUARIE STREET, SYDNEY
	date	16/06/11		title:	PROPOSED BUILDING FOOT PRINT AND CROSS SECTION
	scale	NTS		project no: GEOTLCOV24261AA	figure no: FIGURE 2
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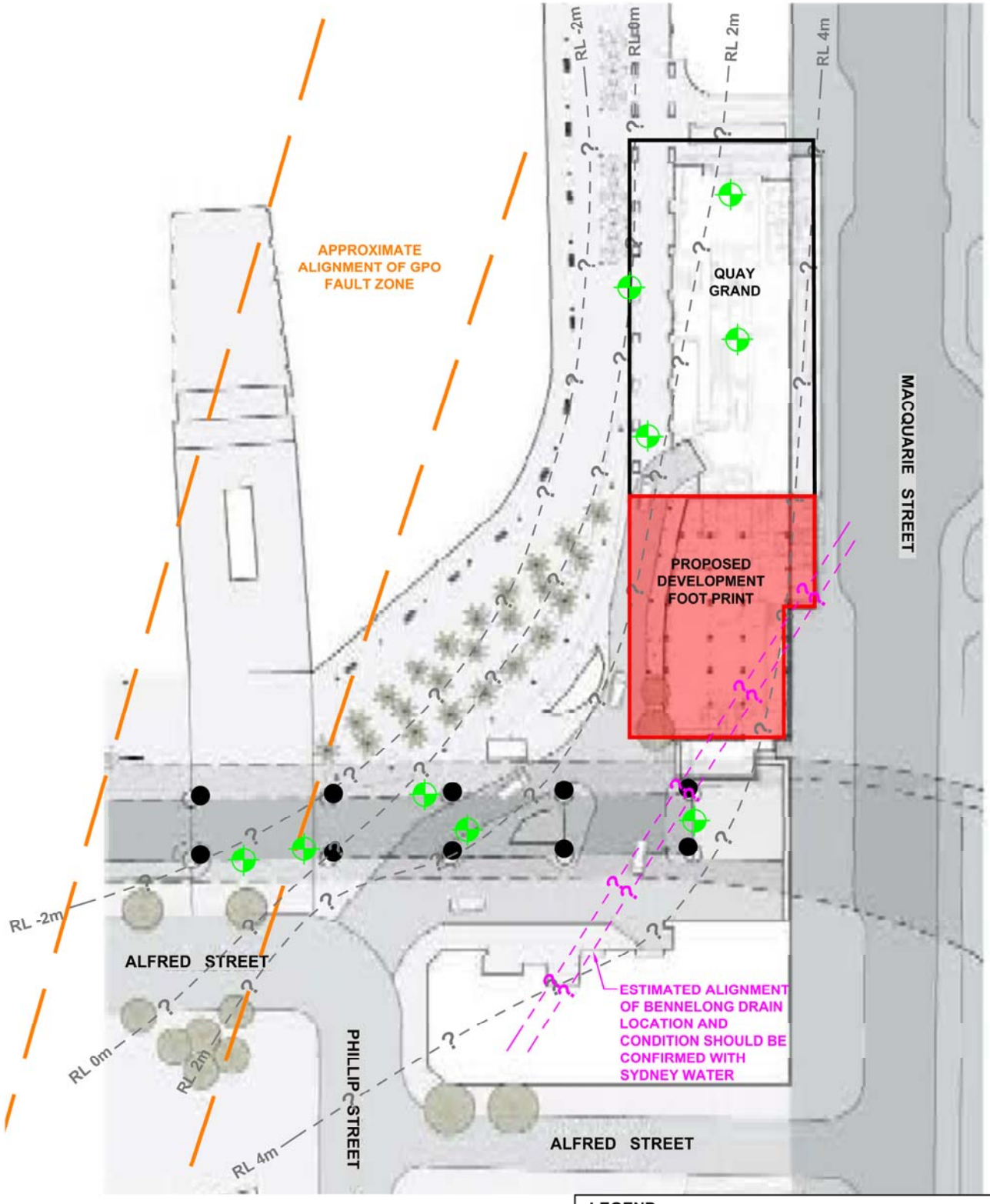


drawn	SP / AW
approved	
date	15/04/11
scale	1:2500
original size	A4

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

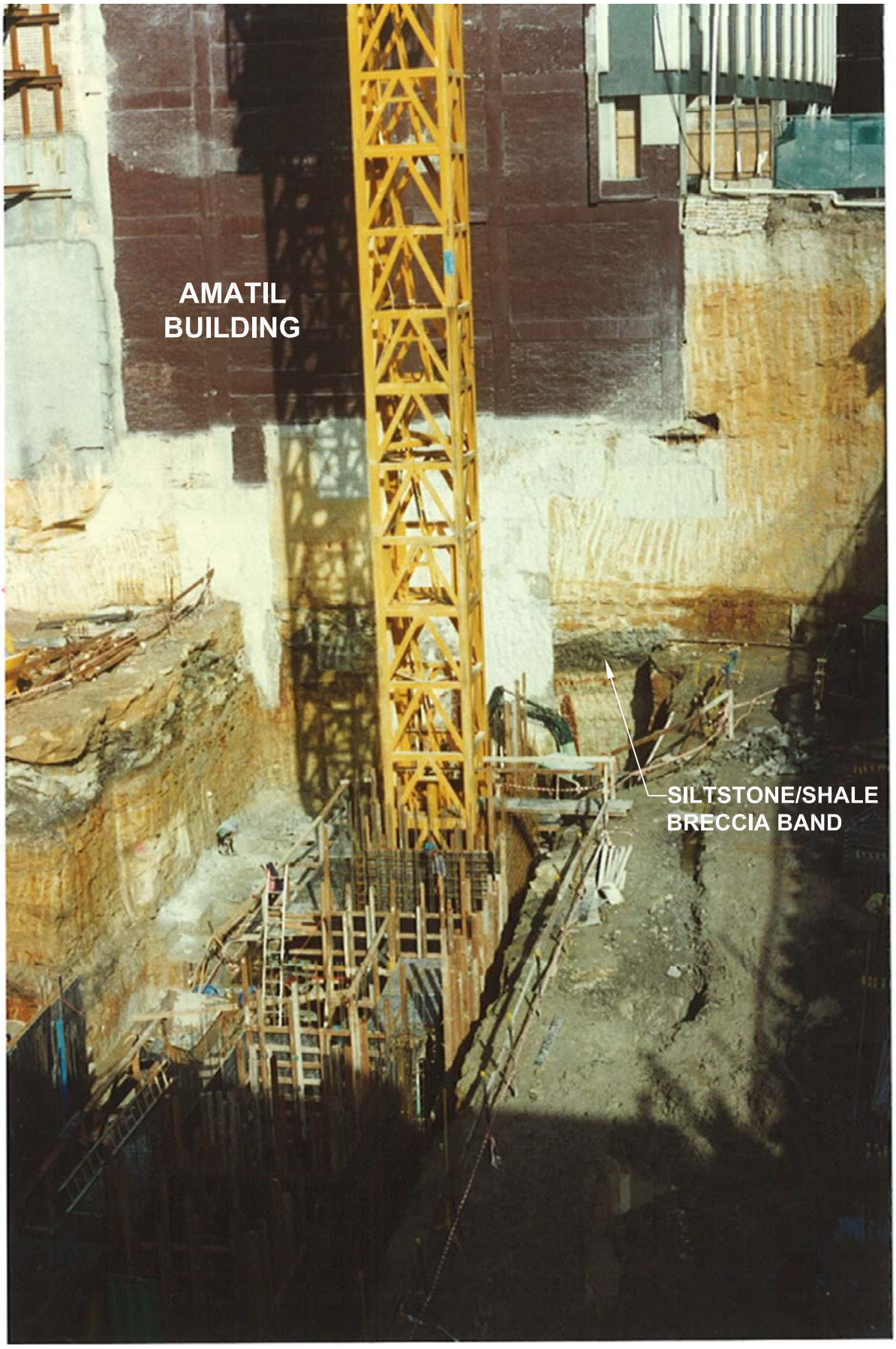
client: MIRVAC PROJECTS PTY LTD

project: PROPOSED REDEVELOPMENT
71-79 MACQUARIE STREET, SYDNEY

title: GEOTECHNICAL INFORMATION PLAN

project no: GEOTLCOV24261AA

figure no: FIGURE 3



drawn	SP / AW	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client: MIRVAC PROJECTS PTY LTD	
approved			project: PROPOSED REDEVELOPMENT 71-79 MACQUARIE STREET, SYDNEY	
date	15/04/11		title: QUAY GRAND SOUTHERN EXCAVATION FACE	
scale	NTS		project no: GEOTLCOV24261AA	figure no: FIGURE 4
original size	A4			