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coffey.com

13 March 2018

Our ref: 754-SYDEN216171-RO2

Rose Property Group Pty Ltd
51 Riley Street
Woolloomooloo NSW 2011

Attention: Nick Jackman

Dear Nick,

Preliminary geotechnical study for Development Application at Fisher Rd, Dee Why, NSW

Rose Property Group is planning redevelopment of their site at Fisher Rd, Dee Why. In 2011, Coffey prepared a Geotechnical Study (Ref GEOTLCOV24292AA-AB, dated 29 June 2011) regarding the site with reference to the architectural concept plans at that time. Attached are our 2011 geotechnical study and the development plans on which that study was based, together with the current development concept.

The current development concept has not changed with respect to the development footprint. An additional residential level has been added to each of the three proposed buildings, and a commercial level is proposed in one building. Although not shown on the attached concept drawing, we understand that an additional basement level may be added to one or more of the proposed buildings.

We are not aware of any material changes to the built environment immediately surrounding the proposed development, since our 2011 report. Due to the site position within the local terrain and geology, we do not expect the above referenced design amendments to substantially affect the geotechnical feasibility of the development. We consider that our 2011 geotechnical study provides sufficient geotechnical information and recommendations for preliminary planning purposes and to support a development application for this substantially similar development.

There should be low risk to surrounding properties and infrastructure provided that appropriate intrusive site investigations, design assessments, good construction practices and construction monitoring normally associated with this type of development are carried out.

Please read the attachment to our 2011 Study entitled ‘Important information about your Coffey report’, which provides useful information on the uses and limitation of this geotechnical advice. Please contact the undersigned if you have any questions or queries regarding this letter.

For and on behalf of Coffey

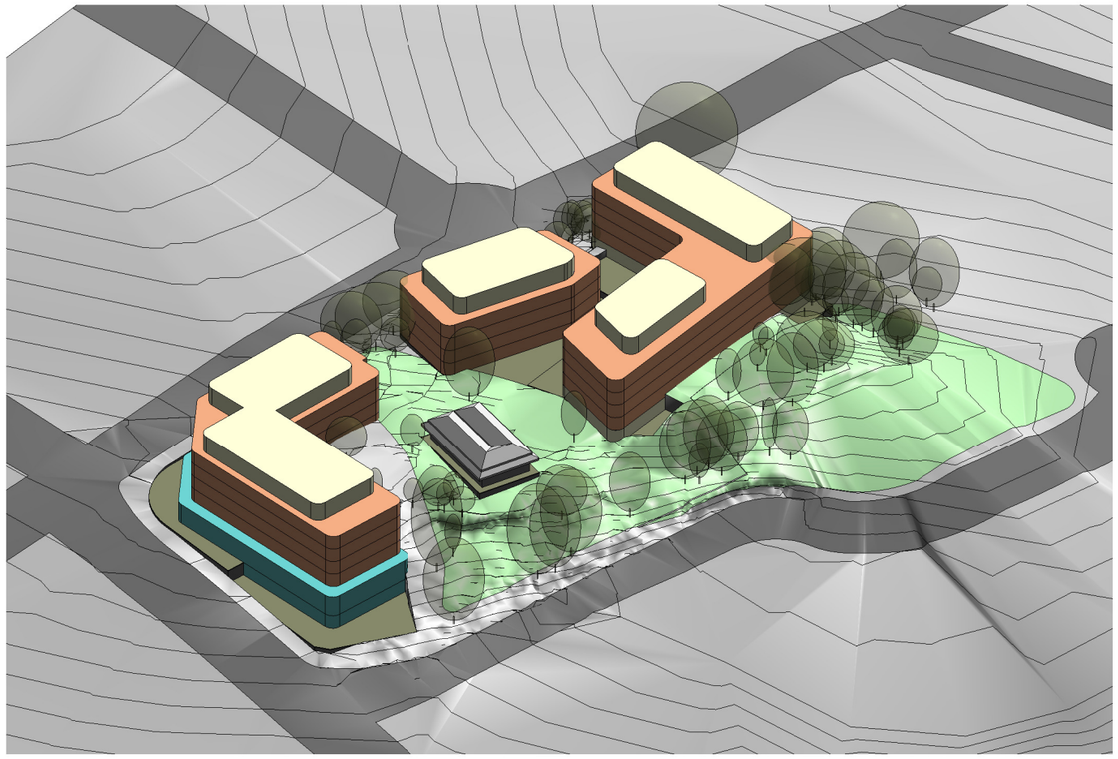
Russell Copeman
Geotechnical Engineer

Attachments:

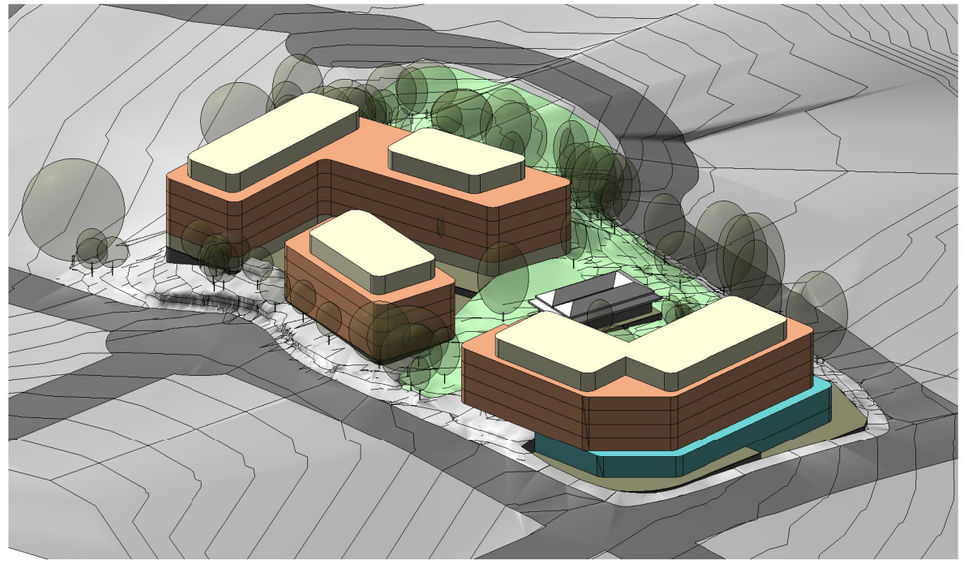
1. Recent architectural concept
2. Coffey 2011 Geotechnical Study (reference GEOTLCOV24292AA-AB)

1 View - North East

2 View - North West



3 View - South East



approved stage 1 building envelope

additional commercial level

additional residential levels

4 View - South West

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GEOTECHNICAL STUDY
PROPOSED RESIDENTIAL BUILDING DEVELOPMENT 15 - 23 FISHER ROAD, DEE WHY, NSW

The Salvation Army

GEOTLCOV24292AA-AB
29 June 2011

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

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

29 June 2011

The Salvation Army
C/- HASSELL
Level 2, 88 Cumberland Street
Sydney NSW 2000

Attention: David Hunter

Dear David

RE: Geotechnical Study at 15- 23 Fisher Road, Dee Why

We are pleased to present this geotechnical study report for the proposed redevelopment of 15 – 23 Fisher Road, Dee Why, NSW which has been prepared to support a development application to Warringah Council.

If you have any comments or queries, please contact either Sven Padina or the undersigned on 99111000.

For and on behalf of Coffey Geotechnics Pty Ltd

Peter Waddell

Principal Geotechnical Engineer

Distribution: Original held by Coffey Geotechnics Pty Ltd

1 electronic copy and 3 hard copies to HASSELL

Coffey Geotechnics Pty Ltd ABN 93 056 929 483
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CONTENTS

1 INTRODUCTION

This report presents the results of a geotechnical study carried out by Coffey Geotechnics Pty Ltd (Coffey) for the proposed redevelopment of 15 – 23 Fisher Road, Dee Why, NSW. The study was commissioned by Mr David Hunter of HASSELL on behalf of The Salvation Army and was carried out in general accordance with fee proposal reference GEOTLCOV24292AA-AA, dated 21 April 2011.

The report is intended to support a development application to Warringah Council.

A Stage 1 contamination study for the project is also being carried out by Coffey and the findings will be presented in a separate report.

2 PROPOSED DEVELOPMENT

Based on the supplied architectural plans by HASSELL, Coffey understands that it is proposed to demolish existing residential structures and construct three residential apartment buildings (Buildings A, B and C). A historic building situated towards the centre of the site will be retained as part of the proposed development.

The extent of the proposed development is presented on Figure 1 and on the appended concept plans.

Proposed Building A is positioned in the northern end of the site and comprises five levels. Proposed Building B is positioned towards the western end of the site adjacent to Fisher Road and comprises four levels. Proposed Building C is situated in the southern portion of the site and comprises five levels.

A connected basement carpark level is proposed beneath all three buildings. The finished floor level varies from RL33.69m to RL34.63m through Buildings A and B and uniformly RL32.5m beneath building C. A second basement carpark level is proposed beneath Building A between RL37.2 and 38.8m.

A vehicle turning bay and access to basements is proposed to be constructed along the northern site boundary, utilising an existing driveway off Fisher Road.

3 SITE DESCRIPTION

The irregular shaped site measures approximately 10,400m² in plan area and is bounded by Fisher Road to the west, St David Ave to the South and Civic Drive to the east. A densely vegetated reserve is located along the northeast boundary and a residential property is situated immediately to the north.

The existing survey plans show that ground levels vary from RL28m within the lower, southeast corner of the site to approximate RL40m at the northern end of the site.

3.1 Site Walkover Assessment

A site walkover assessment was carried out by a geotechnical engineer on Wednesday 8 June 2011 and observations are described below.

The site is situated over a knob of elevated land that has been modified by construction of landscaped terraced areas and the single and double storey brick buildings that presently occupy the site.

Sandstone was exposed at surface level at numerous locations across the site. The sandstone was generally fine to medium grained, slightly weathered to fresh, medium and high strength. Thin horizontal bands of extremely weathered, very low strength sandstone were present within the upper 1m of a rock cutting located within the more elevated, northern portion of the site (refer photograph 1).

Photograph 1 –Sandstone Cut Supporting Terraced Platform

The ground within the more elevated, northern and central portions of the site was typically gently to moderately sloping terraces with vertical cuts within the natural sandstone or fill supported by sandstone block walls and/or concrete retaining walls.

Towards the perimeters of the site, ground levels generally sloped down towards the surrounding property boundaries at gentle to steep grades, terminating as sloping batters or cut faces within the sandstone. An exception was the 1.5m to 3m high block wall located along part of the western boundary, opposite the Fisher Road roundabout. The wall appeared in good condition and of more recent construction. A vegetated garden area and concrete carpark were located immediately above the wall.

Through the lower, southern portions of the site, the ground was typically gently sloping with existing buildings founded within shallow cuts or suspended over the rocky terrain.

An approximately 0.5m to 3.5m high cut lies along the southern site boundary adjacent to St David Ave. The cutting was predominantly fresh, massive sandstone of high strength (refer photograph 2, above). A number of large sandstone boulders were also observed above this cut.

Photograph 2 – Sandstone Cutting along Southern Boundary

As shown in photograph 3, sandstone rock outcrops were also exposed in the steep, vegetated slope towards the northern boundary. The upper 2m to 3m of the slope appeared to have been landscaped and over steepened by placement of fill associated with the upslope building platform. Vertical cuts in sandstone were observed at the toe of the slope and likely to be associated with construction of the existing driveway and residential building.

Photograph 3 – Sandstone Exposures in North Facing Slope

4 PRELIMINARY GEOTECHNICAL MODEL

4.1 Regional Geology

The Sydney 1:100,000 Geological Map produced by the Geological Survey of NSW indicates that the site is underlain by the Hawkesbury Sandstone, described as medium to coarse grained sandstone with minor shale and laminite lenses.

Previous subsurface investigations by Coffey within Dee Why reveal the depth to sandstone increases to the east of the site and is overlain by an increasingly thicker deposit of alluvium.

4.2 Interpreted Subsurface Conditions

Based on the regional geology and our observations, the site is expected to be underlain by Class IV and better quality sandstone in accordance with the rock classification system presented in Pells *et al* (1998). A relatively shallow capping of residual clay soil and extremely weathered sandstone may also be present over more elevated or undeveloped parts of the site.

Localised areas of fill should be expected across the site, particularly in the existing terraced platforms observed within the central and northern portions of the site. The height of these platforms relative to the sandstone exposures suggests fill depths typically between 1m and 2m depth.

5 PRELIMINARY DISCUSSION AND RECOMMENDATIONS

Based on the results of this geotechnical study and our previous experience on similar projects, the proposed development is considered geotechnically feasible. There should be relatively low risk to surrounding properties and infrastructure provided that additional site investigations, design assessments and construction monitoring normally associated with this type of development is carried out, and good construction practice is followed.

5.1 Excavation Conditions and Support

The variations in ground elevations and basement floor levels across the site will result in varying depths bulk excavation. Approximate depths derived from the supplied survey plans are as follows:

- Building A: Typically between 6m to 7.5m;
- Building B: Typically 3m;
- Building C: Typically between 1.5m and 4m but up to 5.5m in localised areas and less than 0.5m in the southeast corner of the basement.

Localised deeper excavations will be required for foundations and lift pits.

Excavatability

Excavation of the fill and residual soil should be able to be achieved using an excavator. Excavation of the underlying sandstone will be difficult and will require ripping with a bulldozer. In high strength rock productivity is likely to be low. Rock saws and hydraulic impact hammers are likely to be required to assist in excavation.

The use of impact hammers for bulk excavation, trimming sides of excavation and for detailed excavation would cause vibrations that could damage vibration sensitive structures and services, such as the existing Pacific Lodge building.

Cut Batters

For temporary and permanent batters in soil or extremely weathered rock, respective batters of 1.5H:1V and 2H:1V should be practicable. A 3H:1V or shallower batter is recommended for long term maintenance of grassed batters.

Retaining

Where excavations at this site cannot be battered; fill, soil and more weathered sandstone could be supported using perimeter retaining/shoring walls such as conventional soldier piles, steel walers and timber lagging, or shotcrete and mesh infill panels. The soldier piles should be concreted in a predrilled rock socket founded within better quality rock.

Subject to further investigations, design of shoring walls should be based on a triangular pressure distribution adopting the earth pressure coefficients recommended in Table 1. Coefficients are provided for the following cases

- Case 1 = temporary retention, no adjacent footings.
- Case 2 = permanent retention, no adjacent footings.
- Case 3 = adjacent footings and hence need to limit movement.

Table 1: Preliminary Earth Pressure Coefficients

Geotechnical Unit	Value of Lateral Earth Pressure Coefficient, K [(1)]			Passive Earth Pressure Coefficient, K_p [(1,2)]	Bulk Density (kN/m^3)
	Case 1	Case 2	Case 3		
Fill, Residual Soil and Extremely Weathered Sandstone	0.3	0.35	0.5	2.5	20
Class III or better Sandstone	-	-	-	3.7	24

Note:

(1) These values are only applicable for a horizontal ground surface.

(2) Passive earth pressure coefficients for rock have been reduced to allow for potential defects in rock mass.

Where ground anchors are required to restrict retaining wall movement, or where there is a need to limit ground movement, higher earth pressure coefficients should be adopted. We recommend an earth pressure coefficient of 0.5 for propped or anchored retaining walls where movements are restrained and a trapezoidal earth pressure distribution.

Hydrostatic pressures should be added to earth pressures unless walls can be provided with effective drainage, and surcharge loads such as adjacent footings should also be considered.

Rock Face Support

Vertical cuts within Class IV or better sandstone should be feasible provided appropriate support is installed. Table 2 presents typical permanent rock face support requirements for the various rock types expected to be encountered at this site.

Table 2 : Preliminary Assessments of Support Requirements

Materials	Support Options
Class IV Sandstone	• Pattern bolting in fractured zones and in any low strength sandstone, • Mesh supported by 0.5m long dowels and shotcrete (minimum 75 mm thick) or fibre reinforced shotcrete, with adequate drainage.
Class III or better Sandstone	• Localised mesh supported by 0.5m long dowels and shotcrete (minimum 75 mm thick) or fibre reinforced shotcrete of fractured zones • Isolated bolting of potential unstable rock wedges

Specific rock support requirements in un-shored sections of excavations can only be assessed during excavation. An experienced geotechnical engineer/engineering geologist should carry out regular inspections as excavation progresses (at least every 2m depth of excavation).

5.2 Groundwater

Due to the elevated level of proposed basements relative to surrounding ground levels, groundwater inflows into proposed excavations are expected to be limited to joints, faults and bedding planes within the excavated sandstone faces and along the soil - bedrock interface.

Where groundwater is encountered within the excavation, dewatering should be achieved using sump and pump techniques. Dewatering is unlikely to result in any substantial lowering of the local groundwater table or cause adverse impact to surrounding land or infrastructure.

A permanent drained basement should be practical.

5.3 Foundations

Class III or better sandstone is expected to be exposed at basement excavation level.

The preliminary design of rafts, strip, pad footings and bored piles founded in sandstone may be designed in accordance with the serviceability design parameters presented below which are based on the recommendations presented by Pells *et al* (1998):

Class IV Sandstone

- Allowable End Bearing Pressure = 3,500kPa
- Allowable Shaft Adhesion = 350kPa

Class III or better Sandstone

- Allowable End Bearing Pressure = 6,000kPa
- Allowable Shaft Adhesion = 600kPa

To adopt the above parameters, footings should have a minimum embedment of 0.3m into the relevant founding material and bases should be cleaned of debris.

The recommended allowable end bearing pressures have adopted a settlement criterion of less than 1% of the least footing dimension.

Shaft adhesion should only be adopted for piles with a minimum embedment of 2 pile diameters into the relevant bearing stratum.

Subsurface investigations would be required to confirm the class of rock at foundation level and further geotechnical assessment of appropriate foundation design parameters should be carried out prior to detailed design.

5.4 Earthquake Design

AS1170.4-2007 Structural Design Actions Part 4: Earthquake Actions in Australia indicates that Sydney has a Hazard Factor (Z) of 0.08. The Site Sub-soil Classes for the site with a surface layer of no more than 3m depth of soil or weathered rock is assessed to be:

Class B_e Rock: defined as rock with a compressive strength between 1 and 50 MPa or an average shear-wave velocity over the top 30m greater than 360m/s, and not underlain by materials having a compressive strength less than 0.8 MPa or an average shear wave velocity less than 300 m/s.

5.5 Additional Investigations

Site specific geotechnical investigations are recommended to support detailed design and should include cored boreholes within proposed building footprints to confirm the preliminary geotechnical model and foundation design parameters.

Investigations should ideally be undertaken following demolition of existing buildings to enable access for a drilling rig across the site.

6 LIMITATIONS

The preliminary geotechnical assessment and recommendations presented in this report are based on limited site observations. Ground conditions can vary over relatively short distances and further site specific investigation and construction stage geotechnical assessments should be considered to manage geotechnical risk.

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

For and on behalf of Coffey Geotechnics Pty Ltd

Peter Waddell

Principal Geotechnical Engineer

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	MM / MH
approved	PW
date	28/26/11
scale	1:1000
original size	A4

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client: THE SALVATION ARMY

project: GEOTECHNICAL STUDY
15-23 FISHER ROAD, DEE WHY, NSW

title: SITE PLAN

project no: GEOTLCOV24292AA

figure no: FIGURE 1

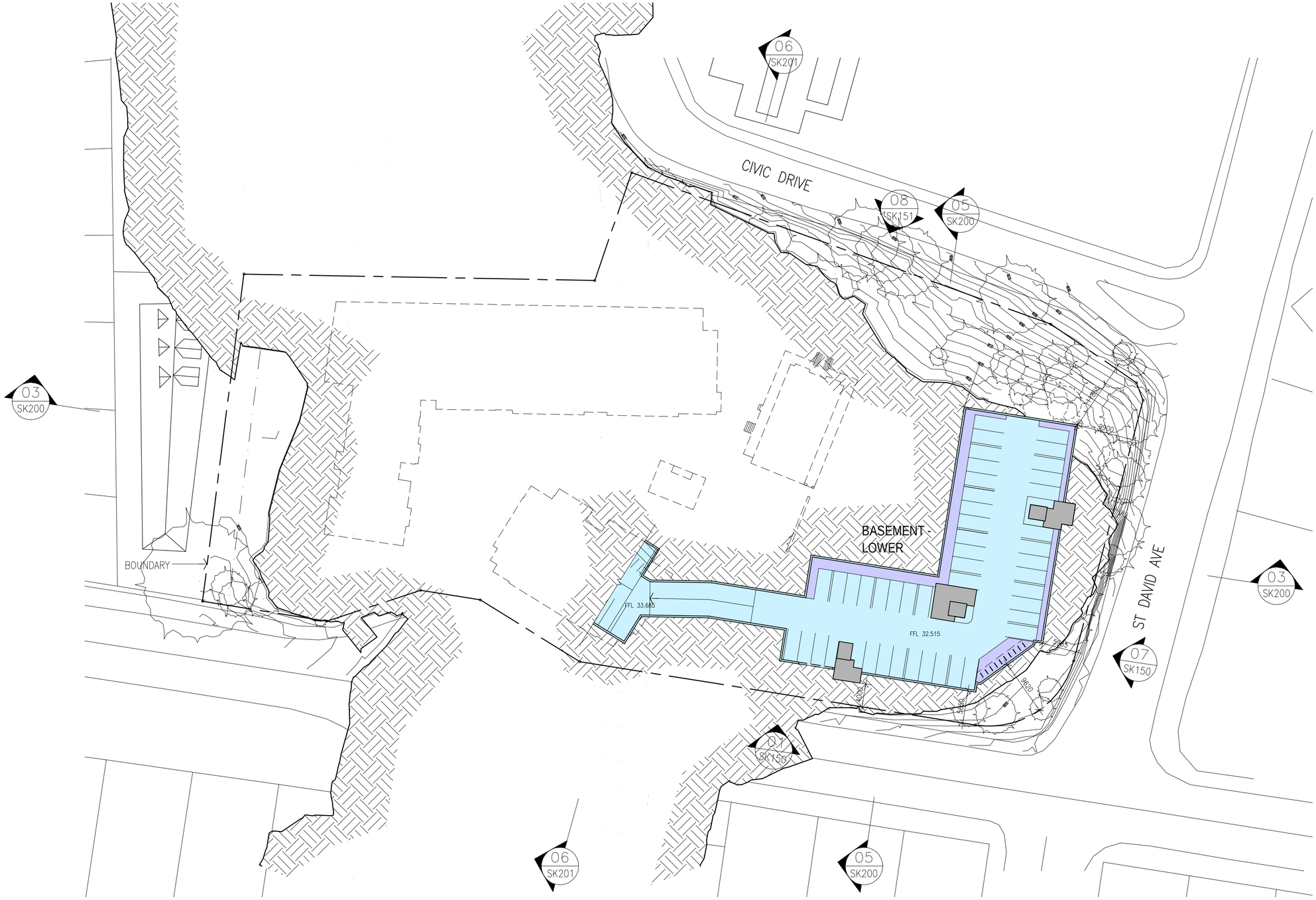
Appendix A

HASSELL Concept Development Plans

HASSELL

NOTES:

- EXISTING TREES WITH HEIGHTS >5m SHOWN ONLY. SPREADS AND POSITIONS SHOWN ACCORDING TO REGISTERED SURVEY DRAWING.
- SOLID / GLAZED ELEMENTS SHOWN INDICATIVELY.



01 - BASEMENT LEVEL B2
1:500 AT A2

0 5M 10M 20M
1:500 AT A2

Client	Project	Drawing	Drawing No	Project No	Date	Scale	Drawn By
The Salvation Army	15 Fisher Road Stage 1 DA Proposal	Basement Plan RL 33.600	SK-100	PSA7733	11.10.2010	1:500 @ A2	SM

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NOTES:

- EXISTING TREES WITH HEIGHTS >5m SHOWN ONLY. SPREADS AND POSITIONS SHOWN ACCORDING TO REGISTERED SURVEY DRAWING.
- SOLID / GLAZED ELEMENTS SHOWN INDICATIVELY.

LEGEND

- COMMERCIAL / RETAIL
- CAR PARKING
- STORAGE
- CORE
- APARTMENT – INTERNAL
- APARTMENT – BALCONY
- EXISTING TREE RETAINED
- EXISTING TREE REMOVED

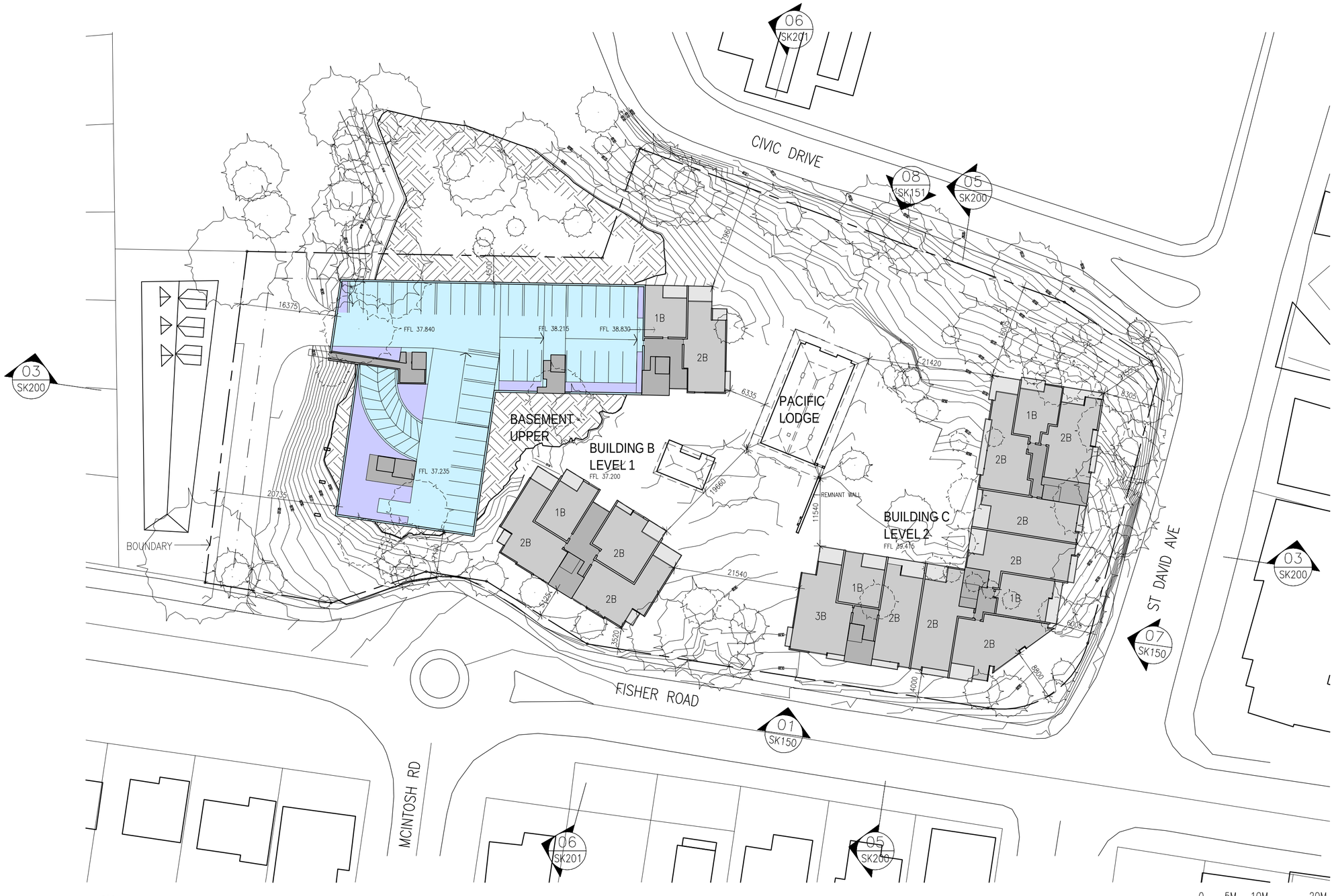
01 - SITE PLAN
1:500 AT A2

Client	Project	Drawing	Drawing No	Project No	Date	Scale	Drawn By
The Salvation Army	15 Fisher Road Stage 1 DA Proposal	Site Plan RL 36.200	SK-101	PSA7733	11.10.2010	1:500 @ A2	SM

NOTES:

- EXISTING TREES WITH HEIGHTS >5m SHOWN ONLY. SPREADS AND POSITIONS SHOWN ACCORDING TO REGISTERED SURVEY DRAWING.
- SOLID / GLAZED ELEMENTS SHOWN INDICATIVELY.

HASSELL



LEGEND

- COMMERCIAL / RETAIL
- CAR PARKING
- STORAGE
- CORE
- APARTMENT – INTERNAL
- APARTMENT – BALCONY
- EXISTING TREE RETAINED
- EXISTING TREE REMOVED

01 / - SITE PLAN
1:500 AT A2

0 5M 10M 20M
1:500 AT A2

Client	Project	Drawing	Drawing No	Project No	Date	Scale	Drawn By
The Salvation Army	15 Fisher Road Stage 1 DA Proposal	Site Plan RL 39.600	SK-102	PSA7733	11.10.2010	1:500 @ A2	SM

NOTES:

- EXISTING TREES WITH HEIGHTS >5m SHOWN ONLY. SPREADS AND POSITIONS SHOWN ACCORDING TO REGISTERED SURVEY DRAWING.
- SOLID / GLAZED ELEMENTS SHOWN INDICATIVELY.

HASSELL

LEGEND

- COMMERCIAL / RETAIL
- CAR PARKING
- STORAGE
- CORE
- APARTMENT – INTERNAL
- APARTMENT – BALCONY
- EXISTING TREE RETAINED
- EXISTING TREE REMOVED

01 / - SITE PLAN
1:500 AT A2

0 5M 10M 20M
1:500 AT A2

Client	Project	Drawing	Drawing No	Project No	Date	Scale	Drawn By
The Salvation Army	15 Fisher Road Stage 1 DA Proposal	Site Plan RL42.000	SK-103	PSA7733	11.10.2010	1:500 @ A2	SM

NOTES:

- EXISTING TREES WITH HEIGHTS >5m SHOWN ONLY. SPREADS AND POSITIONS SHOWN ACCORDING TO REGISTERED SURVEY DRAWING.
- SOLID / GLAZED ELEMENTS SHOWN INDICATIVELY.

HASSELL

LEGEND

- COMMERCIAL / RETAIL
- CAR PARKING
- STORAGE
- CORE
- APARTMENT – INTERNAL
- APARTMENT – BALCONY
- EXISTING TREE RETAINED
- EXISTING TREE REMOVED

01 / - SITE PLAN
1:500 AT A2

0 5M 10M 20M
1:500 AT A2

Client	Project	Drawing	Drawing No	Project No	Date	Scale	Drawn By
The Salvation Army	15 Fisher Road Stage 1 DA Proposal	Site Plan RL45.000	SK-104	PSA7733	11.10.2010	1:500 @ A2	SM