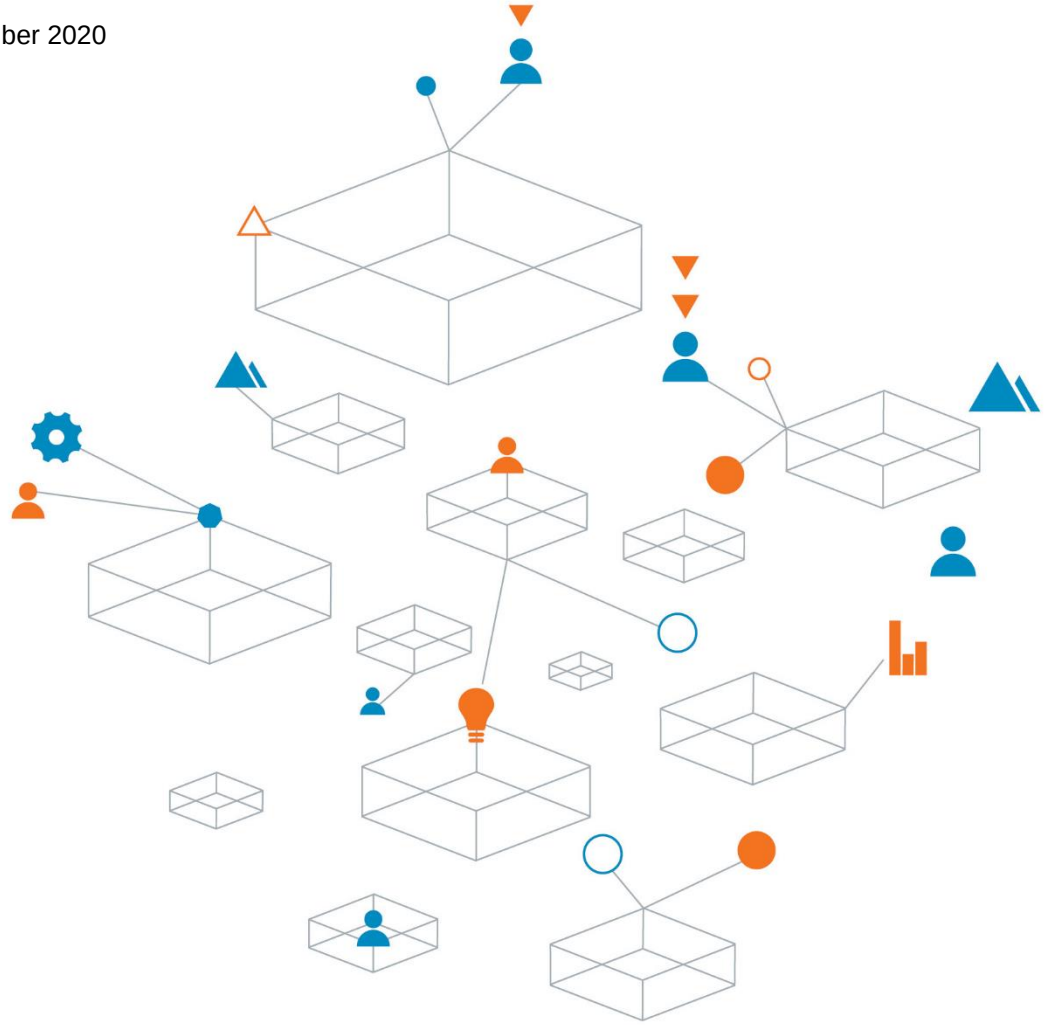
The Salvation Army Property Trust
The Salvation Army Church & Associated Buildings
23 Dalcassia Street, Hurstville
Geotechnical Desktop Assessment
SYDGE282114AB

15 December 2020



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Geotechnical Desktop Assessment: The Salvation Army Church & Associated Buildings, 23 Dalcassia Street, Hurstville

Prepared for
The Salvation Army Property Trust

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Geotechnical Desktop Study Assessment

SYDGE282114AB

Quality information

Revision history

Revision	Description	Date	Originator	Reviewer	Approver
01	Draft	11/12/2020	AJB	RT	RT
02	Final	15/12/2020	AJB	RT	RT

Distribution

Report Status	No. of copies	Format	Distributed to	Date
Final	1	PDF	Terrence Le	15/12/2020

Table of contents

Appendices

1. Introduction

This report presents the results of a geotechnical desktop assessment carried out by Coffey Geotechnics Pty Ltd (Coffey) for The Salvation Army Property Trust proposed redevelopment of 23 Dalcassia Street, Hurstville NSW ('the site'). This assessment was commissioned by Mr Terrence Le of The Salvation Army Property Trust ('the client') and was carried out in general accordance with our fee proposal, reference SYDGE282114, dated 24 November 2020.

We understand that preliminary planning for development is underway and the client requires a geotechnical assessment to support the Development Application (DA). The objectives of this assessment were to review available geotechnical information for the site (desktop study) and develop an initial geotechnical model of subsurface conditions, as a basis for comment and discussion of the geotechnical aspects of the proposed redevelopment project.

2. Proposed development

We understand the proposed redevelopment will comprise the demolition of the existing buildings at the site for construction of a mixed use multistorey building comprising residential / crisis accommodation, a community centre, a place of worship and a basement carpark.

The new building will consist of 7 above ground levels, over a four-level basement carpark. The design floor level of the lowest basement carpark level is RL48.65 metres (m), and will require bulk excavation of between 9 m to 13.5 m depth across the site.

3. Site information and description

3.1. Site identification

The site is located approximately 400 m north-west of Hurstville railway station and occupies the northeast side of Dora Street between Dalcassia Street and Bond Street. The location of the site is shown on Figure 1 and the site boundary and site layout is shown on Figure 2 in Appendix A. Site identification details are summarised in Table 1.

Table 1**: Site Identification Details**

Site address	23 Dalcassia Street, Hurstville
Site area	The site is approximately 1,700 m^2
Title identification details	Lot 1, DP 586989
Current zoning	Zone SP2 Infrastructure (Church and Community Purpose)
Current site use	Salvation Army church/community centre and associated administration office
Adjoining site uses	North: Dalcassia Street - Residential dwellings and apartments Southeast: Bond Street with residential apartments beyond. West: Commercial terraces used for restaurants and offices. East: Residential dwellings and apartments.

3.2. Site observations

A site walkover was undertaken by an experienced Coffey engineering geologist on 8 December 2020. The following summarises the key observations made during the site walkover survey:

- The site is currently occupied by four buildings (refer to Figure 2).
- Administration office building (23 Dalcassia Street), which is located on the corner of Dalcassia Street and Dora Street. The building is a former residential cottage that has been transformed as an administration office. The building is made of bricks suspended on piers with a timber extension.
- Main church building (24 Bond Street), which is located on the corner of Dora Street and Bond Street. The church building and extension are brick structures covered with a painted cement render, which appears to cover the entire lot of 24 Bond Street.
- Storage building on 22 Bond Street. The building is a former residential cottage, now used for storage of church related items, tools, disused furniture and catering items.
- Demountable Chinese church building at the rear of 22 Bond Street. It is a metal demountable shed suspended on brick piers, with a timber deck. The topography of the area comprises low rounded hills with grades up to 5°. The site is located near the top of a north facing slope, with a change in level of approximately 3 m across the site.

Three sides of the site are bounded by streets with buried services and overhead wires with connections to the 23 Dalcassia Street administration office building were observed running along Dora Road.

The north eastern side of the adjoins other residential properties.19-21 Dalcassia Street is occupied by a 3-storey brick unit block and is separated from the subject site by a driveway. No 18-20 Bond street is occupied by a two-level brick residence also with a driveway along the subject site boundary.

4. Regional geology and soils

The Sydney 1:100,000 Geological map, indicated that the site is underlain by Ashfield Shale of the Wianamatta Group of sedimentary rocks. The boundary with the underlying Hawkesbury Sandstone is mapped at lower elevation about 1 kilometre (km) to the south.

The site is located within an area of the Blacktown Soil Landscape, which typically comprises shallow residual clay over shale.

Ground conditions at a previous Coffey project located about 0.5 km from the subject site comprised approximately 3 m to 5 m of residual clay, shaley clay and very low strength shale grading into stronger shales, siltstones and laminates which were near-horizontally bedded.

The Botany Bay 1:25,000 Scale Acid Sulfate Soil Risk Map indicates the site is within an area of no known occurrence of Acid Sulfate Soils.

5. Preliminary geotechnical model

Ground conditions across the site are expected to comprise concrete and asphalt pavements and a variable thickness of shallow fill over residual silty clay and shaley clay with very low strength shale at depths of 2 m to 3 m. The Shale is anticipated to increase in strength with depth.

Table 2**: Preliminary Geotechnical Model**

Geological Formation	Estimated Materials Description	Estimated Unit Depth/Thickness	Rock Mass Classification (pells et al)
Fill	Concrete or Asphalt pavement and fill material (expected to comprise variable soils)	Depth underlying the pavement sections is expected to be relatively thin, 0.3 m (or 0.5 m including pavement thickness).	Not Applicable (NA)
Residual	Silty CLAY, Shaley CLAY and very low strength SHALE	Expect to range from 2 m to 3 m in thickness, from base of fill materials.	Some Class V and Class IV Shale
Shale	Ashfield Shale	Highly weathered (HW) to slightly weathered (SW), low and medium strength	Initially Class IV grading to Class III and Class II with depth.

6. Geotechnical considerations for proposed development

6.1. Excavations

Bulk excavations of approximately 9-13.5 m depth are anticipated for the basement car park. We would expect such excavations to encounter a thin fill layer (less than approximately 0.5 m) over 2-3 m of residual clayey and/or shaley clay soils, overlying extremely weathered to highly weathered Shale bedrock of very low to low strength. The weathered shale would then be typically underlain at depths of 5 m to 7 m by medium to high strength, moderately to slightly weathered shales.

It is expected that the fill, residual soils, and some of the weathered shales could be readily excavated using conventional earth moving plant such as large tracked excavators, equipped with toothed buckets. However, if shale of medium strength or better is encountered in the lower level of excavation, then hard rock excavation techniques such as the use of rock breakers, rock saws, or single tine ripping would be required.

6.2. Temporary Excavation batters

During construction works where there is sufficient room on site, unsupported temporary excavation batters in Fill and Residual Soil may be cut at 1.5 Horizontal (H): 1 Vertical (V) provided that:

- excavations are less than 5 m depth and above groundwater levels, and
- no surcharge loads occur at batter crest level within the zone of influence of the excavation.

As a guide in rock, 1H:1V in very low to low strength material are recommended, again provided surcharge loads are kept well clear of batter crests and that no low angle defects are observed in the bedrock.

6.3. Retention systems

Basement excavations have a potential to impact on adjacent buildings and buried services within the streets. We recommend that the location and sensitivity of such services should be assessed during detailed design works and appropriate excavation retention systems be designed to support adjacent structures and services.

Where excavation support is required the type of retention system used will depend upon the requirements for a stiff and/or watertight wall. Retention walls that could be considered feasible for this type of development are one, or a combination of the following:

- Soldier Pile Wall
- Contiguous Pile Wall

Where the use of cantilevered walls may not be feasible due to induced ground movements behind the wall, lateral stability could be provided using temporary anchors to be installed progressively as the excavation proceeds. Anchors installed beneath the adjacent properties/roads and would need the permission of landowners. Alternatively, if the use of anchors is not possible then top-down construction or internal bracing would be required.

The design of retaining walls for multi-anchored or braced walls is geotechnically complex. The relative stiffness of the wall and support system to that of the soil/rock will strongly influence the resulting earth pressure magnitude and distribution. Earth pressure coefficients adopted for design will depend on the analytical tools utilised in the design, and whether the numerical analysis methods used allow for stress re-adjustment to occur with wall movements.

Ground movements will occur as a result of excavations. In the soil and weak rock profiles that require shoring, lateral and vertical ground movements will be dependent on the design and construction of the shoring 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. Based on experience of deep basement excavations in Sydney, typical lateral movements in vertically cut rock faces are of the order of 0.5 mm to 2 mm per metre of excavation depending on rock quality and presence of bedding seams.

6.4. Potential impacts and protection of neighbouring structures and existing services

The potential impacts to, and protection of neighbouring structures and existing services must be assessed when planning and designing the proposed development.

The location, footing type, layout and founding depth for adjacent structures, roads and buried services surrounding the site must be determined prior to detailed design and planning of basement excavations. Where adjacent structures are located within the zone of influence of the excavation, the foundation stratum may experience horizontal and vertical movements from excavation induced ground movements and this should be assessed as part of excavation retention design.

We recommend that prior to the commencement of the bulk excavation works dilapidation surveys of the adjacent structures be carried out to provide a baseline record of the condition of surrounding buildings and structures as part of excavation monitoring and management works.

Where hard rock excavations of medium strength or better shale is proposed, then a pre-excavations vibration assessment must be carried out to determine whether induced excavations vibrations may impact surrounding structures. Following this initial assessment, a excavation vibration management plan, together with excavation vibration monitoring during excavations may then also be necessary.

6.5. Groundwater

It is expected that seepage is likely to occur along the fill residual soil/bedrock interfaces and through joints/defects in the bedrock. Based on Coffey experience with similar projects at sites underlain by shallow residual soils and shale bedrock any seepage into basement excavations is likely to be controllable during construction by conventional sump pumping methods for discharge into the stormwater network subject to receipt of regulatory approvals. Additionally, the subsequent drawdown and impact to surround groundwater levels/conditions is expected to also be low.

As a result, the use of a drained basement at this site is expected to be readily feasible. For a drained excavation structure, permanent floor and wall drainage will need to be maintained throughout the life of the structure. It is expected that such a drainage system would include a sub-floor drainage blanket with slotted drainage pipes and sump and pump system with the ability to effectively back flush the system for long-term maintenance.

6.6. Building foundations

It is expected that the floor of the basement excavation will comprise shale bedrock of at least low to medium strength, or possibly higher. Typically for a building of this size, it is expected that the building would be founded on conventional shallow pad and strip footings on the shale bedrock at the base of bulk excavations.

As a guide, pad footing on medium strength shale bedrock may be designed for allowable bearing pressures in the order of at least 1000 kPa. However, this would have to be assessed through site investigation and borehole drilling with the coring of bedrock.

If higher footing capacities are required, then the use of short bored piles drilled from the floor of the bulk excavations may be more appropriate for the proposed development. The table below presents preliminary geotechnical parameters for indicative pile design assessments.

Table 3: Preliminary geotechnical parameters for pile design

Material	Ultimate End Bearing Value (MPa)	Ultimate Shaft Adhesion (kPa)	Vertical Elastic Modulus E_v (MPa)
Class V - IV Shale (Weathered Ashfield Shale)	>3	50-150	150-250
Class III Shale	15	450	600
Class II Shale (Fresh Shale)	60	800	1500

Notes:

a) Assumes a minimum embedment depth of at least 0.5 m into the relevant bearing stratum or one pile dimeter, whichever is deeper.
b) Foundation unit extends to a depth of at least 5 times of pile diameter below pile toe.

For footing design, the geotechnical strength reduction factor should be calculated in accordance with AS2159-2011. A geotechnical reduction factor ϕg in the range of between 0.55 to 0.65 is likely to be available where static analysis is carried out for pile design. The geotechnical reduction factor ϕg may increase within the range of 0.65 to 0.9 where sufficient construction monitoring and pile/foundation load testing is carried out.,

If a working stress design approach is to be adopted, the maximum working stress may be assessed by dividing the ultimate values by a factor of safety of 2.5 to 3.0. Regardless of the design method, foundation settlement should also be assessed.

For all footing design, where a Serviceability End Bearing Pressure of greater than 1,000kPa is adopted, rock quality should be assessed by a cored borehole investigation.

6.7. Further geotechnical investigation

Following DA approval, it is expected that a detailed geotechnical investigation will be then carried out to support detailed design works. For the currently proposed development scheme, we expect that such a geotechnical investigation would comprise the drilling of several cored boreholes across the site to at least 3 m below the level of proposed bulk excavation floor levels. These boreholes will respond to the final DA approved design and as such this is recommended to be completed following approval of the subject DA.

Additionally, to investigate and assess groundwater conditions at the site, the installation and monitoring of groundwater standpipes will also be required.

7. Conclusion

Based on our site observations, preliminary geotechnical model, and experience on similar projects, the proposed development is considered feasible from a geotechnical perspective. In our opinion, the proposed development would present a low risk to surrounding structures and the groundwater environment, provided that appropriate site-specific investigation, design assessments, and construction monitoring normally associated with this type of development are carried out.

8. Closure

The preliminary geotechnical assessment and recommendations of this report are based on a desk study limited to regional information and existing subsurface investigation data that is not located on the site.

Subsurface conditions can be complex and vary over relatively short distances – and over time. Site specific investigations will be required to support detailed design. Detailed design and construction should not proceed based on this desk study report without further advice from us.

The attached document entitled “Important information about your Coffey report” forms an integral part of this report and presents additional information about it uses and limitations.

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.

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.

Appendix A – Figures

MAP PROJECTION: GDA2020 MGA ZONE 56

100 0 100 300 500

Scale (metres) 1:10000

drawn	AB / AW
approved	-
date	10/12/2020
scale	AS SHOWN
original size	A4

coffey
A TETRA TECH COMPANY

client: THE SALVATION ARMY

project: Geotechnical Desktop Study
23 DELCASSIA ST, HURSTVILLE, NSW

title: SITE LOCATION PLAN

project no: 754-SYDGE282114AB | figure no: FIGURE 1 | rev: A

DALCASSIA STREET

DORA STREET

BOND STREET

ADMINISTRATION OFFICE

CHINESE CHURCH

STORAGE BUILDING

SALVATION ARMY CHURCH

LEGEND

SITE BOUNDARY

revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE			

MAP PROJECTION: GDA2020 MGA ZONE 56

5 0 5 15 25

Scale (metres) 1:500

drawn	AB / AW
approved	-
date	10/12/2020
scale	AS SHOWN
original size	A3

coffey
A TETRA TECH COMPANY

client: THE SALVATION ARMY

project: Geotechnical Desktop Assessment
23 DELCASSIA ST, HURSTVILLE, NSW

title: SITE LAYOUT PLAN

project no: 754-SYDGE282114AB | figure no: FIGURE 2 | rev: A

PLOT DATE: 25/09/2020 8:56:10 AM DWG FILE: F:\1. PROJECTS\1. SYDENENV\2020\754-SYDENV279571 23 DALCASSIA ST HURSTVILLE\CAD\754-SYDEN279571-R01.DWG

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