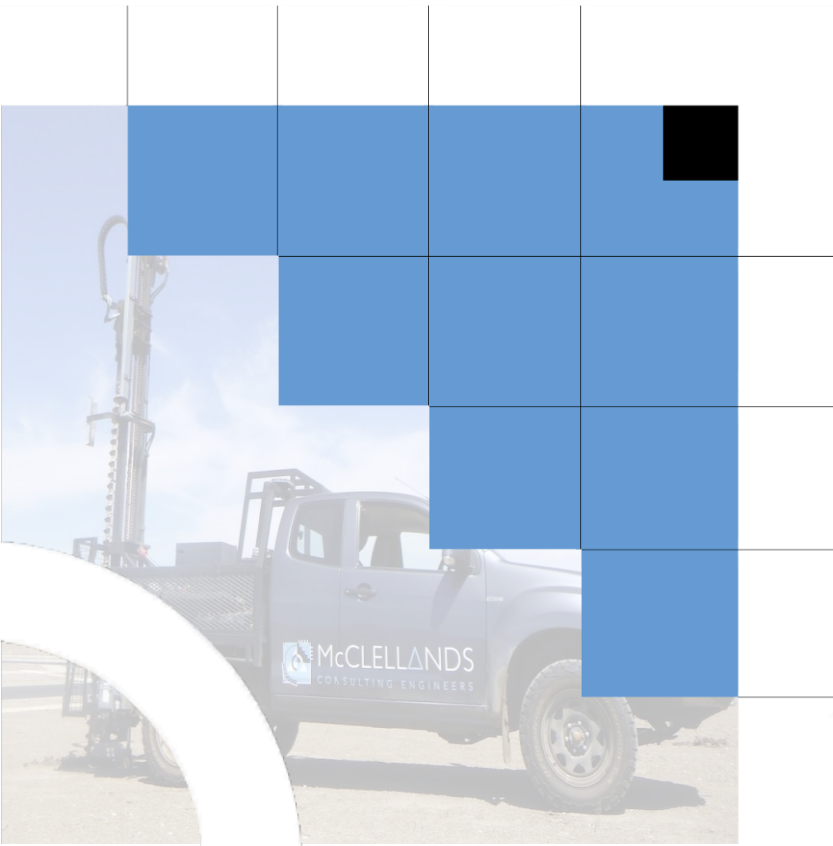




SOIL SITE CLASSIFICATION FOR RESIDENTIAL CONSTRUCTION



CLIENT:
McClellands Consulting Engineers

PROJECT:
Alterations to Existing Building
201 Armstrong Street North,
Soldiers Hill

REPORT No: 240001 SR01

REVISION: -

DATE: 2 February 2024





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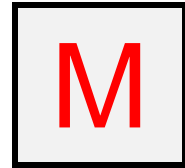


EXECUTIVE SUMMARY

SUMMARY OF REPORT RESULTS

We have classified the site at the proposed building envelope as:

Class M: Moderately reactive clays, which can experience moderate ground movement from normal moisture changes in accordance with AS 2870 – 2011.



The above summary of results is not to be considered in isolation. It is to be read in conjunction with the entirety of this report and particularly given the context of the limitations outlined in the report.

DOCUMENT INFORMATION

PROJECT: Alterations to Existing Building
LOCATION: 201 Armstrong Street North,
Soldiers Hill
CLIENT: McClellands Consulting Engineers
REPORT No: 240001 SR01 **DATE:** 2 February 2024
REVISION: -
REVIEWED: Todd J McClelland **PREPARED:** Jeremy P Lucey
BEng (Civil) (Hons), GradIEAust
(No. 8087446)
APPROVED:

Todd J McClelland
MIEAust CPEng (No. 1366805) NER PE0002139
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1. INTRODUCTION

1.1. SCOPE OF WORK

Undertake a limited site investigation to determine site and soil conditions for the purpose of classifying the site in accordance with AS 2870 – 2011 and providing foundation soil information for structural footing design.

1.2. PROPOSED CONSTRUCTION

Proposed Construction:	Double storey, articulated masonry veneer, extension to building
Proposed Footings:	Stiffened Raft, Waffle Raft, Ground Isolated Flat Slab, Pad Footings, Strip Footings, Bored Piers, Screw Piles, Trench Slots, Industrial Paving Slab, Paving Slab
Proposed Cut by Owner or Builder:	Nil
Proposed Fill by Owner or Builder:	<0.4m

1.3. REFERENCE DOCUMENTATION

AS 2870 - 2011 Residential Slabs and Footings
 AS 1726 - 2017 Geotechnical Site Investigations
 AS 3600 - 2018 Concrete Structures
 AS 2159 - 2009 Piling – Design and Installation
 AS 3798 - 2007 Guidelines on Earthworks for Commercial & Residential Developments
 AS 4773.1 & .2 – 2015 Masonry in Small Buildings
 TN61 - Articulated Walling - Cement Concrete & Aggregates Australia
 BTF18 - Foundation Maintenance & Footing Performance - A Home Owners Guide – CSIRO
 FFSV Practice Note 7 – Guide to Foundation Maintenance for Reactive Sites
 Fact Sheet - Minimising Foundation Movement and Damage To Your House – VBA

1.4. REPORT LIMITATIONS & RECOMMENDATION PROCEDURE

Recommendations are provided based on the soil profiles encountered at the specific test sites identified, interpolation of table D2 of AS2870 given the identified local geology and climate, whilst also considering our experience with the performance of other buildings and footings in this area. It is neither economically feasible nor practical to determine all subsurface site conditions given the type of building and footing system proposed. The test sites have been selected to provide an indication of overall site conditions at the location where construction is proposed, however, variations can occur. This is not a comprehensive investigation, but a guide to the conditions throughout the designated area where construction is proposed. The recommendations are specific for the type of structure identified, building location identified and the site conditions at the time of investigation as described in this report. Site conditions that differ to those outlined, either in the past or with future changes, will alter the recommendations provided, unless otherwise outlined in the report. Changes to site conditions include planting or removing trees, cut or fill works in excess of 400mm, demolition or addition of structures, demolition or addition of ground paving, alterations to or failing to maintain site drainage such as dams, channels and drains etc, addition or removal of in-ground tanks or pools. We must be notified of and provide written approval to proceed with construction: for any known pre-existing site conditions that are not outlined in this report; where site conditions encountered do not coincide with those described in this report; or where site conditions are changed prior to construction of the building. Tree information provided is approximate only and is based on a lay person's observations, identifiable tree tags or available landscaping drawings. We recommend the tree information is confirmed by an arborist or other suitably qualified person by our client, prior to commencing construction. Recommendations for footing design are to be reconsidered and/or updated if alternative advice is obtained. It is beyond the scope of this investigation to comment on site contamination or slope stability.

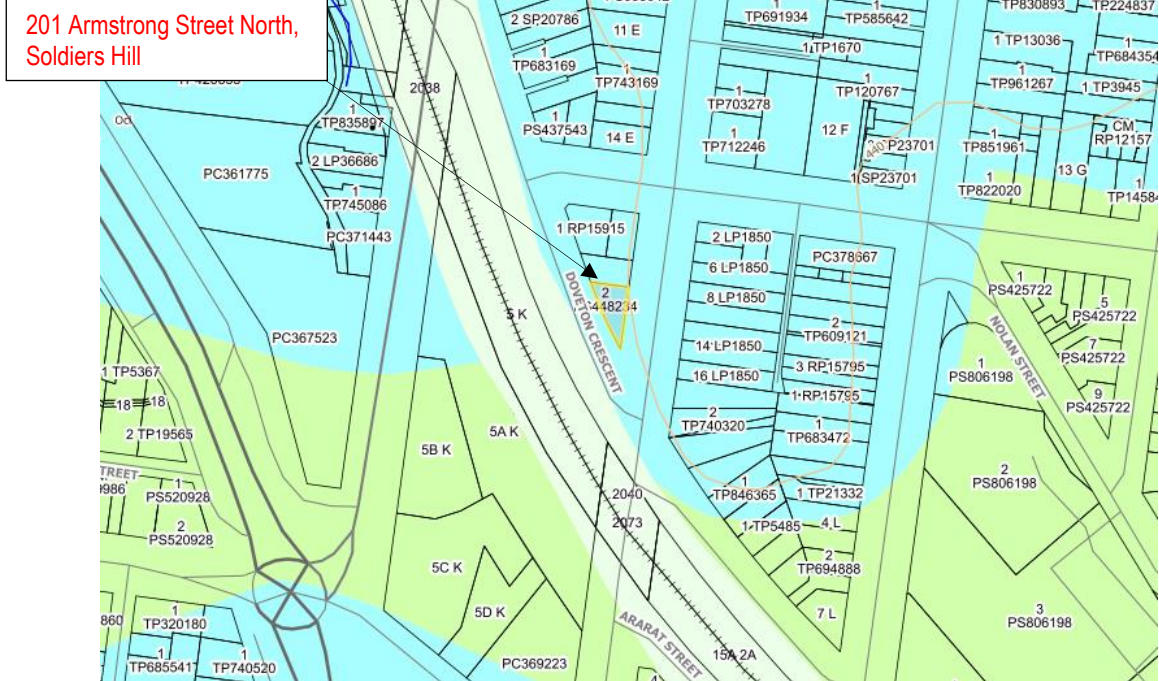




2. SITE AND SOIL INVESTIGATION

2.1. SITE LOCATION

Location and geological map (DoEDJT&R – Geovic interactive mapping application)



2.2. HISTORICAL AERIAL IMAGERY

We have reviewed historical aerial imagery from a variety of sources on this site in the area of the proposed building, over the time period 2010 to 2023. Any significant features identified are outlined below.

Trees:	Identified - Refer sections below for details
Dams or Waterbodies:	Nil
Buildings:	Buildings Identified - Refer sections below for details
Previous Earthworks:	Identified - Site cut and fill earthworks between May 2023 and Sep. 2023
Lush Areas:	Nil
Other Features:	-

2.3. EXISTING EARTHWORKS IDENTIFIED (PRIOR TO SOIL INVESTIGATION)

Source:	Subdivision design drawings provided
Depth Range:	0.4m maximum cut identified 0.2m maximum fill identified

2.4. MINING

We have not been engaged to specifically search and provide detailed information on previous mining activity. We have however reviewed Vicmine report details data regarding mine occurrences within a 250m range of the subject site from the Department of Economic Development, Jobs, Transport and Resources Geovic interactive mapping application.

Mining Activity:	Mining area, however no mine surface openings are identified within close proximity of this site
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2.5. SITE DESCRIPTION

Allotment:	Commercial property
Ground Cover:	Maintained grass cover with areas of paving
Trees:	Trees identified – Refer attached Site Investigation Plan for details
Location (T1):	Refer attached Site Investigation Plan
Botanical Name:	Unknown
Common Name:	Unspecified deciduous tree(s) (large)
Mature Height:	>8m
Mature Canopy Dia:	>8m
Stage of Growth:	Mature
Observed Height:	10 to 15m
Observed Canopy Dia:	5 to 10m
Number:	Single to a group of
Location (T2):	Refer attached Site Investigation Plan
Botanical Name:	Unknown
Common Name:	Unspecified native tree(s) (large)
Mature Height:	>8m
Mature Canopy Dia:	>8m
Stage of Growth:	Mature
Observed Height:	15 to 20m
Observed Canopy Dia:	10 to 15m
Number:	Single to a group of
Topography:	Moderate surface fall to the east, across the proposed development site
Surface Drainage:	Fair
Ground Condition:	Dry
Other Features:	Existing brick office with strip and stump pad footing system

Refer to the Site Investigation Plan in the appendices for further information





2.6. SITE PHOTOGRAPHS



PH1. View over the property from the front

2.7. SOIL INVESTIGATIONS

A subsurface soil investigation has been undertaken on this site. Soil profile results, from a visual tactile assessment of the disturbed samples taken, are included in the appendices. The soil investigation locations are as shown in the plan included in the appendices.



Borehole BH1



Borehole BH2

2.8. GEOLOGY

Geological information is provided with reference to the Department of Economic Development, Jobs, Transport and Resources, Earth Resources Geovic interactive mapping application, from which an extract is included above.

Current Geological Unit Code (seamless geology project 2011):	Ocl
Former (equivalent) Unit Codes:	Oll
Geological Name:	Castlemaine Group - Lancefieldian
Former (equivalent) Names:	Castlemaine Supergroup
Geological Age:	Early Ordovician
Geological Origin:	Sedimentary (deep marine turbidites and hemipelagic sediments)
Geological Description:	Sandstone, mudstone, black shale and minor granule quartz conglomerate: mostly thick-bedded sandstone, coarse- to fine-grained, often graded, moderately to well sorted.
Conditions observed on-site:	Consistent with above
Soil Group to Table D1. AS2870:	Group 3

2.9. CLIMATE

With reference to Figure D2 of AS2870 and our own interpolation of climate data, the site is located in Victorian Climate Zone 2



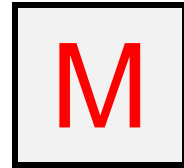


3. RECOMMENDATIONS

3.1. SITE CLASSIFICATION

We have classified the site at the proposed building envelope as:

Class M: Moderately reactive clays, which can experience moderate ground movement from normal moisture changes in accordance with AS 2870 – 2011.



3.2. FOUNDING CONDITIONS

Recommended founding conditions are summarised in the Founding Conditions Table below.

Foundation Soil (or deeper)	Estimated Design Bearing Pressure	AS2870-2011 recommended minimum depth below finished ground level (D)	Minimum penetration into foundation soil (P)	Indicative depth of foundation soil below existing ground level, from soil profiles (X)
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Stiffened Raft Slab

Firm pale brown / grey CLAYEY SILT	50kPa	100mm	100mm	100mm
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Waffle Raft Slab

Firm pale brown / grey CLAYEY SILT	50kPa	100mm	-	100mm
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Strip Footings

Very stiff orange / brown, yellow SILTY CLAY	100kPa	525mm	150mm	400 to 500mm
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Pad and Stump Footings

Very stiff orange / brown, yellow SILTY CLAY	100kPa	600mm	150mm	400 to 500mm
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Engineer Designed Deep Isolated Footings (Bored Piers / Trench Slots / Screw Piles)

Very stiff orange / brown, yellow SILTY CLAY	250kPa	Not Specified	800mm	400 to 500mm
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Footing founding depths will vary but will likely be the greater of D or X+P.

Rolled fill, that is in accordance with CI 6.4.2 of AS2870-2011, may be used under raft slab internal non-loadbearing elements, only where the depth of total fill (including any existing fill which is proof rolled) is typically no deeper than 400mm.

3.3. FOOTING DESIGN

- Conventional raft slab, strip, stump and pad footing systems may be considered on this site.
- Footings are to be designed and constructed with appropriate care and attention in accordance with AS2870-2011, the Victorian Building Regulations (VBR) and the National Construction Code (NCC) for the site classification and undisturbed in-situ founding conditions identified above.



- Standard deemed-to-satisfy designs in accordance with Section 3 of AS2870-2011 may be considered.
- Alternatively an engineer design footing system in accordance with Section 4 of AS2870-2011 and AS3600-2018 may be considered for increased durability and/or economy.
- Footings are to be founded in undisturbed natural in-situ soils as outlined in the founding conditions table above.

3.4. **SPECIAL COMMENTS**

Existing Vegetation – Low to Moderate Soil Reactivity

Significant vegetation has been identified on or within close proximity of this site. Optimum footing performance is achieved when trees and large shrubs are not within close proximity of the proposed building. The low to moderate reactive nature of soils on this site means that abnormal soil moisture conditions caused by trees should not have a significant impact on the proposed building.

Existing Site Infrastructure

Significant infrastructure exists on this site. Voids may be present from existing, demolished or removed buildings, footings, services and other landscaping works. Significant depths of topsoil, organic matter or disturbed surface soils may be present.

All loadbearing footings should be founded as recommended in the Founding Conditions Table in undisturbed soil. Localised deepening of footings passing through or adjacent backfilled or open voids may be required. All service bedding sands and gravels should be removed from beneath and adjacent the building envelope. Backfill soil for voids should be of the same type and compacted to the equivalent density of adjoining in-situ soils. Carefully inspect all excavations to ensure a suitable founding material has been reached, contact this office as required. Strip all topsoil, organic matter and disturbed soil from beneath the proposed building works. Ensure any existing services within the proposed building envelope are properly diverted, disconnected and adequately blocked to prevent water collecting or passing under or adjacent to new buildings.

Weathered Rock

Weathered rock was encountered in boreholes and visually observed across this site. This material is likely to be readily excavated at shallow depths by standard excavation equipment. Solid rock may be encountered in some locations and will lead to excavation difficulties.





4. ADDITIONAL INFORMATION

4.1. DRAINAGE & PLUMBING

The recommendations outlined within this report are applicable only where effective site drainage is provided both during construction and for the life of the building. The building perimeter shall be properly drained to prevent ponding of water against or near the building, by grading the surrounding ground surface away from the building (min grade 1:20) for at least 1m to an approved drainage system which discharges to the site Legal Point of Discharge. It is recommended that the builder or property owner install a continuous concrete path around the entire building perimeter to assist in maintaining stable moisture conditions. Ground beneath sub-floor framing systems should be graded to allow water escape and prevent ponding. Divert all water away from the building during construction by use of temporary downpipes and drains as required. Do not leave prepared site benches exposed for significant time periods.

Particular attention should be given to ensuring that plumbing trenches slope away from buildings so as not to introduce water to or near footings. Service trenches and drainage pipes adjacent and under footings should be avoided. Where this is not possible, trenches under or within 1.5m of the building should be backfilled with clay or concrete to prevent the ingress of water beneath footings. Penetrations of slab beams and footings should be avoided but if absolutely required, they should be sleeved to allow for movement. Provide flexible connections to drains where connecting to or emerging from under buildings on Class H series, E and P sites. The builder is to ensure any existing services within the proposed building envelope are properly diverted, disconnected or adequately blocked to prevent water collecting or passing under or adjacent to new buildings. Leaks in plumbing pipes, downpipes, guttering and fixtures should be promptly repaired by building owners and occupiers, to limit long term ingress of water into foundation soils. The hot water system and/or air conditioner overflow is to be diverted to a collection and disposal system away from footings. Excessive or irregular watering of gardens is not recommended.

4.2. VEGETATION

Strip all surface vegetation, topsoil, organic matter or loose surface soils from beneath the building envelope prior to commencing construction. Trees and large shrubs can have a severe effect on footing performance when inappropriately selected and located, with subsequent aesthetic and structural damage to buildings possible. As an approximate guide and unless noted otherwise, trees and large shrubs should not be located closer to the building than a distance equal to their mature height, although specific factors that may increase or decrease this distance include species selection, the number of trees and the site classification. Trees on the subject and adjacent sites / areas should not be planted or permitted to develop such that they infringe this buffer, without regard to appropriate footing design, protection, care and maintenance provisions. The building owner / builder or building design must contact this office or the footing design engineer for further advice if vegetation is planned or planted which will possibly infringe the appropriate buffer distance. Garden beds should be avoided directly adjacent the building, with paving or other impermeable surfaces recommended against the building perimeter. Excessive or under watering of gardens adjacent buildings can have a severe impact on building performance. Our recommendations consider site conditions at the time of investigation, information made available to us and the proposed and/or likely building location.

4.3. FILLING

Care has been taken to identify any filling on this site, however fill can sometimes be difficult to detect, under the scope of this investigation, for instance when it is site area sourced, well compacted fill. We recommend our client and the property owner check with relevant organisations (eg: Subdivision Developer, Council, Water Authorities, Department of Primary Industries / Sustainability and Environment, etc.) to locate possible former dam sites, mines, creeks, drains, other similar features and areas where subdivision developers may have placed fill. Site filling may be required as part of site preparation or footing construction works and should be considered during footing design on this site. Fill placement is to be undertaken in accordance with AS2870 – 2011, ensuring adequate





stripping, moisture control and compaction. Founding conditions outlined in the Founding Conditions Table are to be adhered to. Refer to the report limitations section, where fill is to be placed in excess of 400mm deep.

4.4. EXCAVATIONS

Footings adjacent excavations will need to be deepened below the indicative founding depths described previously. Excavations may include service trenches and other excavations for the proposed building, service trenches for the provision of property services or voids (filled or open) from previous site infrastructure. Excavations may be open or backfilled with soil. We recommend the builder and footing designer contact local service authorities to determine the details of any in-ground services and the services are proof located on site by the builder. Where footings are close to excavations, that part of the footing must be deepened, so that the projection from the underside of the footing to the bottom of the excavation makes an angle not exceeding 45 degrees to the horizontal for clay soils and 30 degrees for sandy and silty soils.

4.5. INSPECTIONS

Unless noted otherwise, the Builder and Building Surveyor / Approving Engineer are responsible for inspecting all excavations to ensure the recommended and suitable founding soils have been reached. Report any variations or discrepancies from the logged soil profile results to this office for advice and approval to proceed. An inspection by a representative from this office is desirable at footing excavation stage to confirm soil types and site conditions identified.

4.6. MOVEMENT & ARTICULATION

Minor cracking in buildings is to be expected and may be caused by shrinkage of timber, plaster or concrete, by brick growth or by soil movement. This minor cracking is generally of little structural significance and does not detract from the performance or durability of the building. AS2870 recognises that it is not economically feasible to design footings to eliminate all possibilities for cracking and as such minor footing movement and resultant building cracking may occur. Designing and constructing footings in accordance with this report and for the minimum requirements of AS2870, provides for a low likelihood but still present possibility of significant footing movement and resultant significant building cracking or performance problems. If the building owner, occupier or builder would like to further reduce the likelihood of footing movement, building cracking or performance problems, please liaise with the design engineer to discuss the possibility of designing footings that exceed the requirements of AS2870. Articulation of brickwork, as set out in Technical Note TN61 (www.concrete.net.au) and AS4773, will assist in limiting brickwork cracking due to footing movement and brick growth. The maximum recommended spacing of joints is provided in the reference documentation.

4.7. MAINTENANCE

The recommendations outlined within this report are applicable only with effective site and building maintenance. The aim of effective site and building maintenance, in reference to footing performance, is to ensure a stable and uniform moisture regime is provided to foundation soils for the life of the building. It must be recognised that rational and economic footing design, as outlined in AS2870 – 2011, embraces the philosophy that optimum footing performance can only be achieved with effective site maintenance to maintain normal moisture conditions. Essential components of effective site and building maintenance are discussed in preceding sections, with greater detail being provided in CSIRO Publication BTF 18 “Foundation Maintenance & Footing Performance” (www.publish.csiro.au), the Foundation and Footing Society Victoria Practice Note 7 – “Guide to Foundation Maintenance for Reactive Sites” and the Victorian Building Authority publication “Minimising Foundation Movement and Damage to Your Home”. Builders, building owners and occupiers must be aware of the contents of these publications and this report. It is our client’s responsibility to provide the builder, building owner and occupier with a copy of this report. We recommend this report, the referenced information and any footing design documentation is passed from the building owner to future owners.

Any queries concerning the content of this report should be directed to our office.








APPENDICES

APPENDIX A SITE INVESTIGATION PLAN



LEGEND	
 BOREHOLE	T_ TREE REFERENCE
 TEST PIT	→ SLOPE DIRECTION





APPENDIX C ADDITIONAL SITE PHOTOGRAPHS

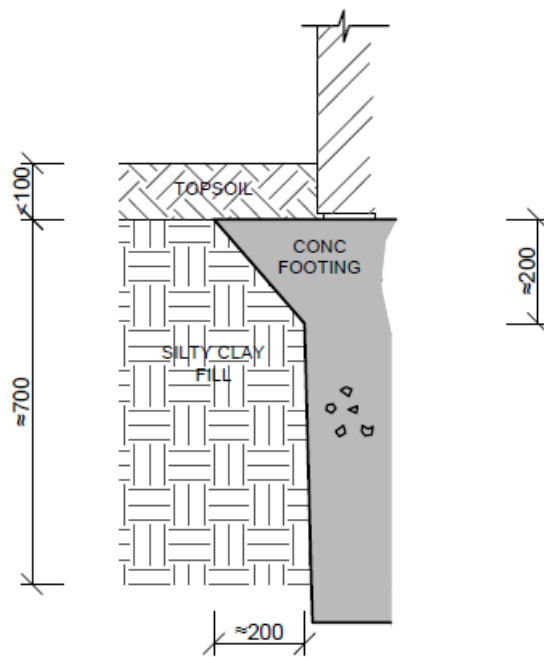


PH2. Footing Probe Test Pit TP1



PH3. Footing Probe Test Pit TP1

APPENDIX D FOOTING PROBE TEST PIT PROFILE



TEST PIT TP1 - SECTION FOOTING PROBE

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