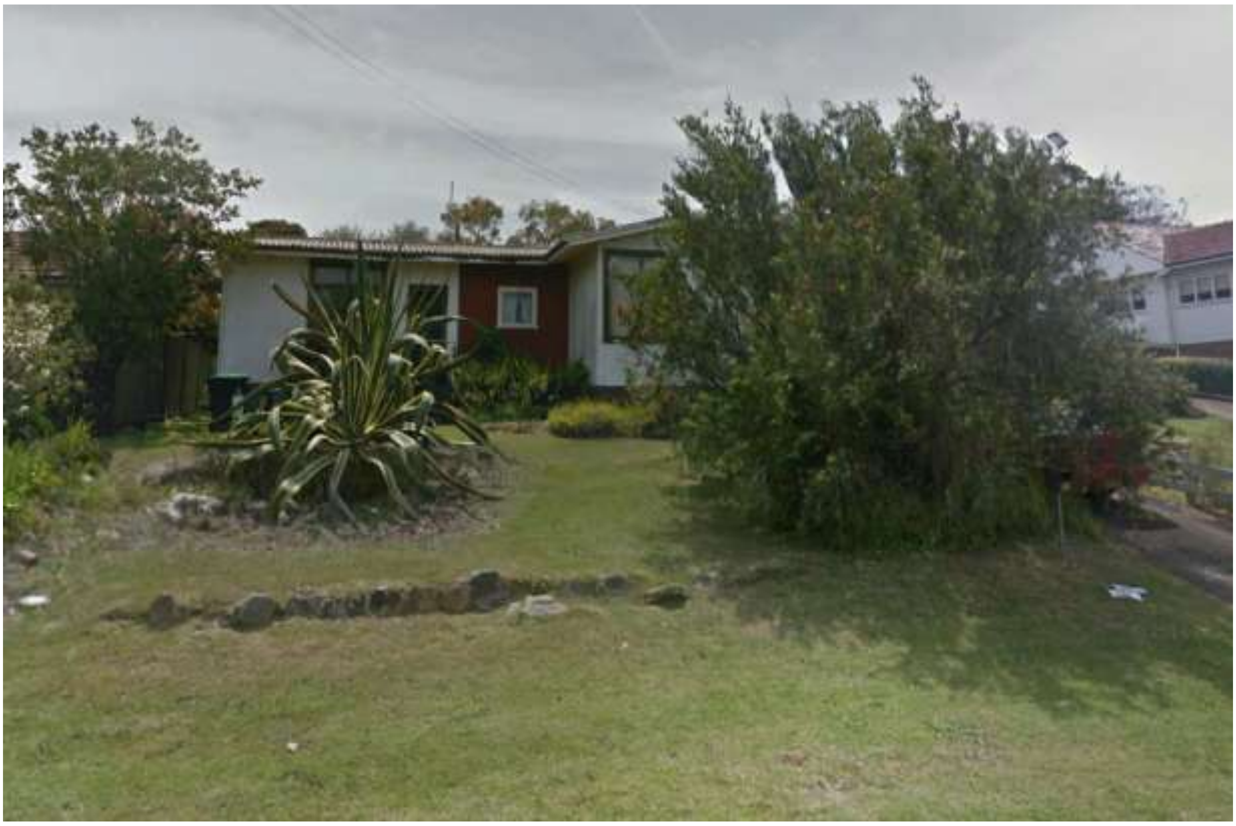
GEOTECHNICAL SITE INVESTIGATION REPORT

FOR

PROPOSED NEW DWELLING

AT

22 MONSERRA ROAD, ALLAMBIE HEIGHTS NSW 2100



Report Prepared for: Rainy Qiu

Project No: SRE/602/AH/19

Date: 21/11/2019

Soilsrock Engineering Pty Ltd

Suite 2A 32 Fisher Road, Dee Why, NSW 2099

M 0457 1150 44 **T** 02 9982 2629

E info@soilsrock.com.au **W** www.soilsrock.com.au

Distribution and Revision Register

Document details

- **Project number:** 602
- **Document number:** SRE/602/AH/19
- **Document Title:** Geotechnical Site Investigation Report for Proposed New Dwelling
- **Site Address:** 22 Monserra Road, Allambie Heights NSW 2100
- **Report Prepared for:** Rainy Qiu

Document status and review

Revision	Prepared by	Reviewed by	Approved by	Date issued
0	RC	JC	JC	21/11/2019

Distribution of copies

Revision	Electronic	Paper	Issued to
0	1	0	Rainy Qiu

The undersigned, on behalf of Soilsrock Engineering Pty Ltd, confirm that this document and all attached documents, drawings, and geotechnical results have been checked and reviewed for errors, omissions and inaccuracies.

For and on behalf of

Soilsrock Engineering Pty Ltd

Jorge Cabaco

BEng MEng MIEAust CPEng NER

Principal Geotechnical Engineer

ENGINEERS AUSTRALIA

Chartered Engineer I NER – National Engineers Registration No. 3789414

Table of Contents

APPENDICES

APPENDIX A - GEOTECHNICAL EXPLANATORY NOTES

APPENDIX B - DCP TESTS & PHOTOS LOCATION PLAN

APPENDIX C - SITE PHOTOGRAPHS

1. INTRODUCTION

This report presents the interpretation and results of the geotechnical site investigation, carried out by Soilsrock Engineering Pty Ltd for a proposed new residence at 22 Monserra Road, Allambie Heights NSW 2100.

The investigation was commissioned on 15th November 2019 by Rainy Qiu the owner of the current residence.

The works were carried out in general accordance with the email dated 13th of November 2019.

The present report assessment comprised a detailed geotechnical inspection of the property and is based on the following documents:

- Architectural Drawings prepared by Dellview Design, Dated 25/10/2019:
  - Sheet: A00, Rev: B "Perspective View";
  - Sheet: A01 "Existing Site Plan";
  - Sheet: A02 "Proposed Site Plan";
  - Sheet: A03, Rev: B "Proposed Ground Floor Plan";
  - Sheet: A04, Rev: B "Proposed First Floor Plan";
  - Sheet: A05 "Proposed Roof Plan";
  - Sheet: A06 "Proposed North Elevation";
  - Sheet: A07, Rev: A "Proposed East Elevation";
  - Sheet: A08 "Proposed South Elevation";
  - Sheet: A09 "Proposed West Elevation";

The purpose of this investigation was to assess the existing ground conditions to provide geotechnical recommendations and advice on excavation conditions and foundations design for the proposed new residence.

The following sections describe the proposed development, scope of works and factual results of the investigation. Comments and recommendations on foundations conditions for the proposed development are given in the last part of the report.

2. PROPOSED DEVELOPMENT

Based on the documents mentioned above it is understood that the existing house would be demolished to construct a new 2-storey dwelling with a pool, rear and front yard located on the ground floor. The footprint of the new dwelling will occupy most of the property land. The proposed new residence will include a 2 bedroom granny flat found on the rear yard, the house will consist of a total of 5 bedrooms, with 1 bedroom located on the ground floor, and 3 bedrooms situated on the first floor with an additional master bedroom with access to a balcony.

3. SCOPE OF WORKS

The field work for investigation was carried on the 19th of November 2019 and consisted of the following:

- Dial Before You Dig – Conduct an online buried services search at the site before field works.
- Conduct an OH&S and site walk over survey to assess local topography, geology, ground stabilization and surrounding structures;
- Photographic record of site conditions;
- 4 x Dynamic Cone Penetration tests (DCP1-DCP5) to maximum depth of 0.650m, were carried out by using a 9kg Dynamic Cone Penetrometer specialised steel cone device. The testing did follow the procedure as per AS 1289-1997, method 6.3.2;

The fieldwork was conducted by a Geotechnical Engineer and an undergraduate civil engineer in the full-time presence from Soilsrock office, which carried the testing in-situ and recorded the results.

4. SITE LOCATION AND DESCRIPTION

The subject site is rectangularly shaped within R2 - Low Density Residential area at No. 22 Monserra Road, Allambie Heights NSW 2100 identified Lot 1 in Deposited Plan (DP) 207145, with approximately 657.6 m^2 in total site area. It is delimited by the residential houses Nos.6 Forbes PL (rare section of property), Nos. 20 Monserra Rd to its North, Nos. 7 Forbes Pl (rare section of property) and 24 Monserra Road to its North-West and South-West respectively and Monserra Road to its South-East.

The existing dwelling is composed as a one-storey timber residence with a large front yard section at the entrance of the property along with some sizable bushes included, it was apparent the site exposed a slight slope, beginning at the entrance of the site following up to the top of the rare section of the residence. The property has an outdoor vehicle parking space with a concrete driveway and also has a back yard with a several bushes and trees, where at the front it is more of a wide-open sloped yard. While facing towards the house (to North-west direction) from Monserra Road, the property residence sits on a slight slope.

Based on a visual cursory inspection from the subject site and surrounding area, the existing dwelling and neighbouring residence appear in reasonably good conditions, no significant signs of ground movement or instability was found at time of inspection. Site location is shown ***in Appendix B*** and photographs of the area are attached to this report ***in Appendix C***.

5. REGIONAL GEOLOGY

From the analysis of Geology of Sydney 1:100,000 Geological Series sheet 9130, it is indicated that the site is located within the geology units of the Hawkesbury Sandstone (Rh), age of Triassic, described as "medium to coarse- grained quartz sandstone with minor shale and laminate lenses".

The Hawkesbury Sandstone areas comprises quartz sandstone with minor shale lenses. The Hawkesbury Sandstone was deposited by fluvial processes and is a quartz sandstone containing detrital grains averaging 68% quartz, 2% rock fragments and clay pellets, 1% feldspar, and 1% mica. The sandstone is dominantly medium to coarse grained but varies from fine to very coarse grained. The sandstone is moderately to poorly sorted, with subangular to surrounded grains

A reproduction of the geological map is shown on following ***Figure 1*** is based on a portion of the Sydney 1:100,00 Geological Series sheet 9130, which shows the site geological condition.

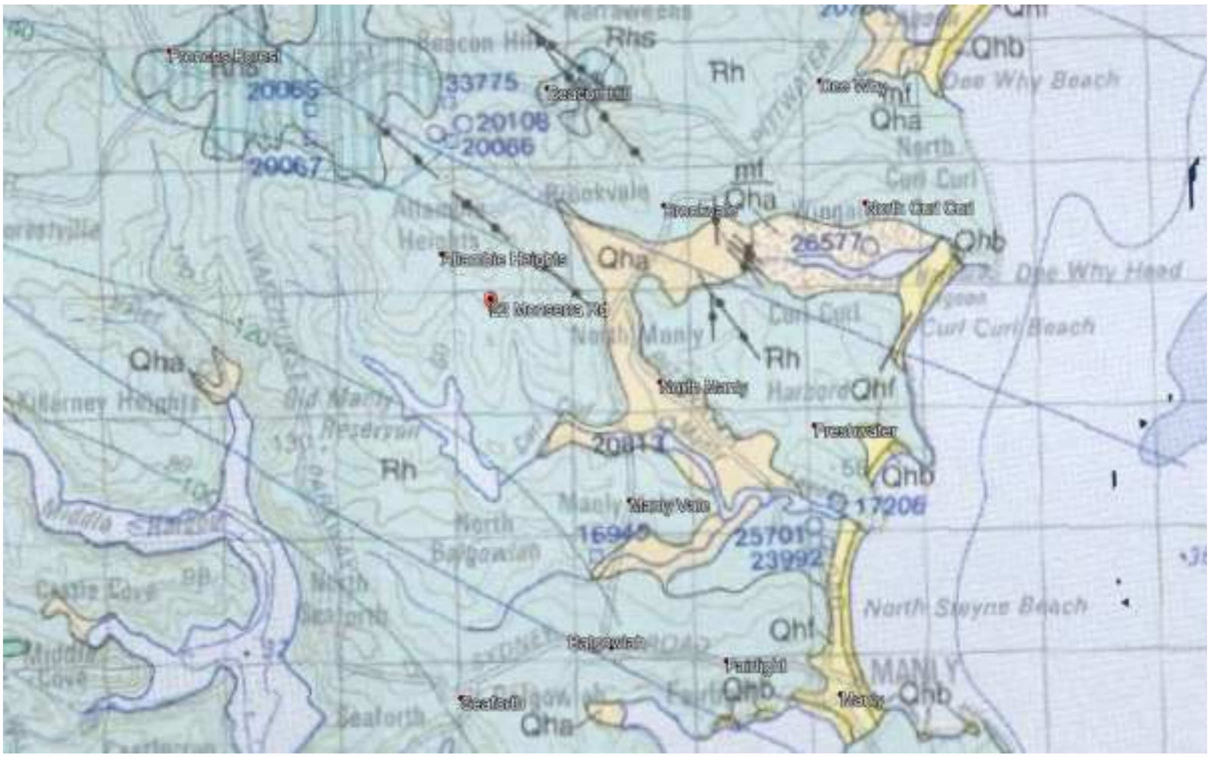


Figure 1– Extract from the Sydney 1:100,000 Geological Series Map Sheet 9130. Site area location highlighted in red/black sign.

6. RESULTS AND ANALYSIS OF THE INVESTIGATION

6.1 Subsurface Investigation

The following ***Table 1*** summarised the in-situ DCP test results and ***Table 2*** describes generically the principle strata sequentially observed and interpreted by the test results carried out on site.

Table 1 – Dynamic Cone Penetrometer tests & Hand Augers results.

Depth (m)	**DCP1** (Blows/300mm)	**DCP1** (Blows/300mm)	**DCP1** (Blows/300mm)	**DCP1** (Blows/300mm)
0-0.3	3 Bouncing @ 0.2 m	6 Bouncing @ 0.3 m	5 Bouncing @ 0.2 m	6
0.3-0.6	-	-	-	44
0.6-0.9	-	-	-	24 Bouncing @ 0.650 m

Equipment & Procedure Notes:

Equipment used: 9kg hammer, 510mm drop distance, conical tip: Standard used: AS1289.6.3.2 - 1997; the total number of blows are considered for 300mm penetration steps.

DCP Notes:

- All DCP's tests above were at refusal depths probably on top of bedrock sandstone.
- 60 blows within 300mm soil interval defined as a "refusal", no further penetration and "solid" ringing sound from slide hammer, which may indicates reaching into "Very Dense" sand layer or "hard Clay" or on top of bedrock.
- "Bouncing" indicates reached top of rock or in some cases can be due to presence of a hard obstacle like steel, rubble, flouters, boulders, cobbles or hard materials.

Table 2 – Geotechnical subsurface interpretation by DCP results.

Depth (m)	DCP1 (Blows/300mm)	DCP2 (Blows/300mm)	DCP3 (Blows/300mm)	DCP4 (Blows/300mm)
0-0.3	Very Loose Sandy Silt Bouncing @ 0.2 m	Loose Sandy Silt Bouncing @ 0.3 m	Loose Sandy Silt Bouncing @ 0.2 m	Loose Sandy Silt
0.3-0.6	-	-	-	Very Dense Sandy Silt
0.6-0.9	-	-	-	Medium Dense Sandy Silt Bouncing @ 0.650 m

Notes: No samples were provided by DCP test, thus the geotechnical interpretation above is based only on the observation carried through the soil traces left attached to the rods and tip; this subsurface interpretation is based in DCP results obtained in Table 1 and engineering judgement, it is only indicative, and some soils characteristics can be difficult to identify properly without samples. “Probably on top of rock or Bouncing” indicates reached top of rock or in some cases can be due to presence of hard obstacles such as steel, rubble, flouters, boulders, cobbles or any other hard materials.

The DCP tests and site photos locations plan are attached in ***Appendix B.***

The ***Table 3*** below assesses the strength of the relevant materials crossed by the DCP tests, based in situ tests results, soil classification, visual interpretation and extrapolation.

For detailed description of the subsurface conditions, explanation sheets about geotechnical parameters are presented in ***Appendix A.***

Table 3 – Allowable Bearing Pressure and Strength Interpreted and Extrapolated by test in situ

Depth Ranges (m)	Material Conditions	Extrapolated Bearing Pressure (kPa)	Strength (Cu / UCS) (kPa)
Based on DCP1 Result			
0.0 – 0.2	Very Loose Sands	50	Cu =20
>0.2	Bedrock – Probably Sandstone	1,000	UCS = 1,000
Based on DCP2 Result			
0.0 – 0.3	Loose Sands	70	Cu = 35
>0.3	Bedrock – Probably Sandstone	1,000	UCS = 1,000
Based on DCP3 Result			
0.0 – 0.2	Loose Sands	70	Cu = 35
>0.2	Bedrock – Probably Sandstone	1,000	UCS = 1,000
Based on DCP4 Results			
0.0 – 0.3	Loose Sands	70	Cu = 35
0.3-0.6	Very Dense Sands	480	Cu = 240
0.6-0.650	Very Dense Sands	500	Cu = 250
>0.650	Bedrock – Probably Sandstone	1,000	UCS = 1,000

Notes:

- The depth ranges of geological units as shown in above table are average thickness based on DCP test results obtained.
- The geotechnical parameters interpretation and extrapolation is based and limited to the DCP test carried on site, which are only indicative for design proposes;
- NR – Not Recommended.

6.2 Groundwater

Groundwater was not detected during the DCP tests carried for the present geotechnical investigation. In addition, the soil materials attached to the DCP rods and conical tip when extracted were dry. Groundwater can be investigated properly by further geo-hydrological assessment using a proper drilling and standpipe installation to monitor groundwater if required.

7. LANDSLIP RISK BRIEF ASSESSMENT

The site is equally located within "Area A & B – Allambie Heights Area" accordingly with the Landslip Risk Map from the Warringah Local Environment Plan 2011. Landslip Risk Area A and B is described to have slopes of <5º and 5º to 25º respectively. It is concluded that the site area has low landslip risk regarding the low slope inclination and shallow excavations necessary to construct the new dwelling.

During the site investigation and walkaround, no signs of landslip or slope instability hazards at the close vicinity of the project site was observed and recorded.

Provided the construction of the residential building is undertaken in accordance with the recommendations of this report coupled with good engineering and building practice, the construction of the new Dwelling is not expected to affect the overall stability of the site.

8. COMMENTS AND RECOMMENDATIONS

8.1 Excavation Conditions

Based on the supplied architectural concept drawing plan, it is understood that there is no deep excavation works involved for the proposed development. Small excavations below 1.0m deep are required to achieve the excavation level to construct the ground level and the foundation footings installation.

Based on the *in situ* testing the foundation excavation is expected to intersect the sandy silt soil profiles and sandstone rock. Excavation within the clayey soils and soft rock should be readily achievable using hydraulic excavators with bucket attachments. However hard rock materials will require the use of hydraulic hammers and/or rock saw cutting.

It is recommended that the demolition of the existing structures, excavation and construction techniques be adopted without causing more than 5mm/sec vibrations limit (Peak Particle

Velocity) to the existing and neighbouring residential buildings, if necessary, a vibration monitoring plan could be implemented to control vibration levels.

A Waste Classification should be carried for all the excavated materials to be disposed in accordance with NSW Environment Protection Authority (EPA) Waste Classification Guidelines Nov 2014, and under the Protection of the Environment Operations Act 1997 (POEO Act). Environmental sampling and chemical laboratory testing will need to be carried out to classify the spoil resulted from the excavation prior to disposal. This includes filling and excavated natural materials (GSW/VENM/ENM), if it is intent to be removed from the site. The type and extent of testing undertaken will depend on the final use or destination of the spoil, and requirements of the site.

7.2 Foundations – Footings & Slabs

Further to the results of the investigation above, it is recommended to install pad footings founded socket into rock with minimum depths ranges from 0.5m to 1.0m deep with the recommended allowable bearing pressures as shown in above ***Table 3***.

It is recommended the footings to be founded in an appropriated bearing pressure determined by the footings design, depending on the loads considered, size and type of footings. Either way the foundations of the building must be installed to ensure stability of the footing in competent rock strength material (loose or debris materials must be removed prior footings construction).

The founding depth must be adjusted and confirmed by the structural loads and foundations type required for the project. Once the structural loads and footings sizes have been determined, settlements analyses should be carried out to confirm the suitability of the foundation's solution adopted.

During the excavation to install the footings, it is essential the ground foundations materials to be inspected and approved by a qualified professional geotechnical engineer to ensure ground materials and bearing pressures are as expected.

All footings excavation base shall be dewatered, cleaned and free of any loose material prior to pouring. Time between footing/piles excavation and concrete pour must be kept to the minimum, and if required the bases can be protected by a blinding layer of concrete 25Mpa immediately after inspection to reduce any "loosening" effects.

All foundations should be designed and constructed in accordance with AS 2870 – 2011 – "Residential Slabs and Footing".

7.3 Subgrade Preparation for Slab-on-Ground and Pavements

For subgrade preparation if necessary, a well compacted granular course material (with maximum particle size of 37.5mm) subgrade with maximum 150mm thick layers of crushed recycled concrete or crushed sandstone (DGB20 or similar) layers it is recommended to install and be properly compacted.

The subgrade layers should be compacted using a vibratory roller to target density ratio of minimum 100% of SMDD (Standard Maximum Dry Density). Moistening of each layer will normally be necessary during compaction. At least three density tests per lot should be carried out to confirm the above specification has been achieved in accordance with AS3798 Guidelines on Earthworks for Commercial and Residential Developments.

7.4 Engineered Fill

If backfill is to support landscaped areas, an engineered fill should be carried comprising ‘clean’ sandy soils, free of organic matter and contain a maximum particle size of 37.5mm.

The engineered fill should be placed in a controlled and engineered manner compacted using a vibrating plate compactor and/or trench roller in layers not more than 150mm for non-sand materials not containing gravel-sized, or not more than 300mm for sand materials for controlled fill following AS2870-2011. Compaction should achieve minimum density index (ID) of 70%, to be proof tested by “DCP” tests Dynamic Cone Penetrometer as described in AS1289.6.3.3

7.5 Final Comments

Further to the results of the investigations and geotechnical recommendations above, providing the works are carried accordingly with this report, and good engineering and building construction practice is maintained the proposed development is suitable for the site.

The natural soils and bedrock depths with the recommended allowable geotechnical bearing capacities could vary across the site, the founding depth for foundations to be constructed could also vary. Regarding that, it is recommended an experienced professional geotechnical engineer, during the foundation’s installation, should inspect and approve the founding levels and carry all necessary density/compaction tests for subgrade and subbase preparation.

8. LIMITATIONS

The site geotechnical investigation undertaken for the present report is an estimate and interpretation of the characteristics of the soil and rock of subsurface conditions encountered during the test locations investigated. No matter how comprehensive the investigation is, site ground conditions in other test locations investigated can differ and geological conditions can be unpredictable or can reveal unforeseen conditions.

This present report analyses and forms an engineering model interpretation and opinion of the actual subsurface conditions of the points where the tests were carried. The selected in-situ tests results are indicative of actual conditions encountered. Recommendations are given based on the data testing results and visual interpretation carried by professional geotechnical and geological engineers from this office. Interpretation of the present report by others may differ from the interpretation given, there is the risk the report may be misinterpreted and Soilsrock cannot be held responsible for this.

Geotechnical reports rely on factual interpreted and judgement of information based on professional visual interpretation of soils and rock samples, in situ tests and sampling tests, which has some uncertainty due to changing unexpected ground conditions and it is far less exact than other design disciplines. Soilsrock Engineering accepts no responsibility if different unexpected ground conditions occur in locations where the investigations were not carried out.

This document is for use only of the party to whom it is addressed and for no other purpose. No responsibility is accepted to any third party who may use or rely on the whole or any part of the content of this document. If this report is altered in any way, or not reproduced in full, no responsibility will be taken for this.

APPENDIX A

GEOTECHNICAL EXPLANATORY NOTES

geotechnical | environmental | foundations

GEOTECHNICAL EXPLANATORY NOTES

The following geotechnical notes are provided, to give a better understanding of the description and classification methods and field procedures used for the interpretation and compilation of this report which is entirely based on the AS 1726-1993 – Geotechnical Investigations.

INVESTIGATIONS METHODS

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3m for a backhoe and up to 6m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site. Samples can be taken from the test pits for soils testing and analyses.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 3000mm or large in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-125mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be mixed with soils from the sides of the hole. Information from the drilling (as a distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Dynamic Cone Penetromer Tests

Dynamic penetrometer tests (DCP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rood penetrates the soil the number of blows required to penetrate each successive 300mm depth are recorded. Normally there is a depth limitation of 1.2m, but this may be extended in certain conditions by the use of extension rods. A 16mm diameter rod with a 20mm diameter cone end is driven using a 9kg hammer dropping 510mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities. Also Correlations with SPT tests can be made for Cohesion less and cohesive soils.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Proposes – Test 6.3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube under the impact of a 63kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments equal to 450mm in total. The first 150mm increment it not considered for the so-called "N" value (standard penetration resistance), which is taken from the number of blows of the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm may not be practicable and the test will be discontinued. The results are represented in the following example:

- In the case where full penetration is obtained with successive blow counts for each 150mm as follow:
    - 1 st Increment (150mm) = 2 blows
    - 2 nd Increment (150mm) = 8 blows
    - 3 rd Increment (150mm) = 15 blows
    - Representation – 2,8,15 "N" Value = 23
- In the case where the test is discontinued before the full penetration:
    - 1 st Increment (150mm) = 20 blows
    - 2 nd Increment (100mm) = 40 blows – test interrupted
    - 3 rd Increment (150mm) = not carried – test refusal
    - Representation – 20, 40/100 mm "N" Value = 40

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Correlation between DCP vs SPT for Cohesionless Soils

DCP (Blows/300mm)	SPT Value (Blows/300mm)	RELATIVE DENSITY
0-3	0-4	Very Loose
3-9	4-10	Loose
9-24	10-30	Medium Dense
24-45	30-50	Dense
>45	>50	Very Dense

Correlation Between DCP vs SPT for Cohesive Soils

DCP (Blows/300mm)	SPT Value (Blows/300mm)	CONSISTENCY
0-3	0-2	Very Soft
3-6	2-5	Soft
6-9	5-10	Medium/Firm
9-21	10-20	Stiff
21-36	20-40	Very Stiff
>36	>40	Hard

Continuous Diamond Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally affective only in cohesive soils.

DESCRIPTION AND CLASSIFICATIONS METHODS FOR SOILS AND ROCK

Descriptions include strength or density, colour, structure, soil or rock type and inclusions.

SOIL DESCRIPTIONS

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 – 200
Gravel	0.6 – 63
Sand	0.075 – 0.6
Silt	0.002 – 0.075
Clay	<0.002

Type	Sand & Gravel Particle size
Coarse gravel	36mm – 19mm
Medium gravel	19mm – 6.7mm
Fine gravel	6.7mm – 2.36mm
Coarse sand	2.36mm – 600µm
Medium sand	600µm – 212µm
Fine sand	212µm – 75µm

The proportions of secondary constituents of soils are described as:

Coarse grained soils		Fine grained soils	
%Fines	Modifier	%Coarse	Modifier
≤5	Omit, or use 'trace'	≤15	Omit, or use 'trace'
>5 - ≤12	Describe as 'with clay/silt' as applicable	>15 - ≤30	Describe as 'with clay/silt' as applicable
>12	Describe as 'with silty/clayey' as applicable	>30	Describe as 'with silty/clayey' as applicable

Definitions of grading terms used are:

- Well graded – a good representation of all particle sizes;
- Poorly graded – an excess or deficiency of particular sizes within specified range;
- Uniformly graded – an excess of a particular particle size;
- Gap graded – a deficiency of a particular particle size with the range.

Cohesive Soils

Cohesive soils, such as clays, are classified on the basics of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defines as follows:

Description	Abbreviation	Undrained shears strength (kPa)
Very soft	vs	≤12
Soft	s	>12 – ≤25
Firm	f	>25 – ≤50
Stiff	st	>50 – ≤100
Very stiff	vst	>100 – ≤200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basics of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT), or dynamic penetrometers (PSP). The relative density terms are given below:

Relative density	Abbreviation	Density index %
Very loose	vl	≤15
Loose	l	>15 – ≤35
Medium dense	md	>35 – ≤65
Dense	d	>65 – ≤85
Very dense	vd	>85

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil – derived from in-situ weathering of the underlying rock;
- Transported soils – formed somewhere else and transported by nature to the site;
- Filling – moved by man.

Transported soils may be further subdivided into:

- Alluvium – river deposits;
- Lacustrine – lake deposits;
- Aeolian – wind deposits;
- Littoral – beach deposits;
- Estuarine – tidal river deposits;
- Talus – coarse colluvium;
- Slopwash or Colluvium – transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

ROCK DESCRIPTIONS

Rock Strength

Rock strength is defined by the Point Load Strength (Is50) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standards 1726. The terms used to describe rocks strength are as follow:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approx. Unconfined Compressive Strength MPa*
Extremely low	EL	≤0.03	<0.6
Very low	VL	>0.03 – ≤0.1	0.6 – 2
Low	L	>0.1 – ≤0.3	2 – 6
Medium	M	>0.3 – ≤1.0	6 – 20
High	H	>1 – ≤3	20 – 60
Very high	VH	>3 – ≤10	60 – 200
Extremely high	EH	>10	>200

*Assumes a ratio of 20:1 for UCS to Is(50)

Degree of Weathering

The degree of weathering of rocks is classified as follows:

Term	Abbreviation	Description
Residual	RS	Soil developed on extremely weathered rock; the mass structure and substance are no longer evident.
Extremely weathered	XW	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded in water, but the texture of the original rock is still evident.
Distinctly weathered	DW	Staining and discolouration of rock substance has taken place.
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh	FR	No signs of decomposition or staining.

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20mm
Highly fragmented	Core lengths of 20 – 40mm with some fragments
Fractured	Core lengths of 40 – 200mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200 – 400mm with some shorter and longer sections
Unbroken	Core lengths mostly >1000mm

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$RQD\ \% = \frac{cumulative\ length\ of\ 'sound'\ coresections\ \geq 100mm\ long}{total\ drilled\ lenght\ of\ section\ being\ assessed}$$

Where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation or RQD.

Rock Quality Designation

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6mm
Laminated	6mm to 20mm
Very thinly bedded	20mm to 60mm
Thinly bedded	60mm to 0.2m
Medium Bedded	0.2m to 0.6m
Thickly bedded	0.6m to 2m
Very thickly bedded	> 2m

LOG SYMBOLS

Moisture Condition - Cohesive Soils:

MC > PL – Moisture content estimated to be greater than plastic limit
MC = PL - Moisture content estimated to be approximately equal to plastic limit
MC < PL - Moisture content estimated to be less than plastic limit

Moisture Condition - Cohesionless Soils:

D – Dry – Runs freely through fingers
M – Moist – Does not run freely but no free water visible on soil surface
W – Wet – Free water visible on soil surface

Strength (Consistency) - Cohesive Soils:

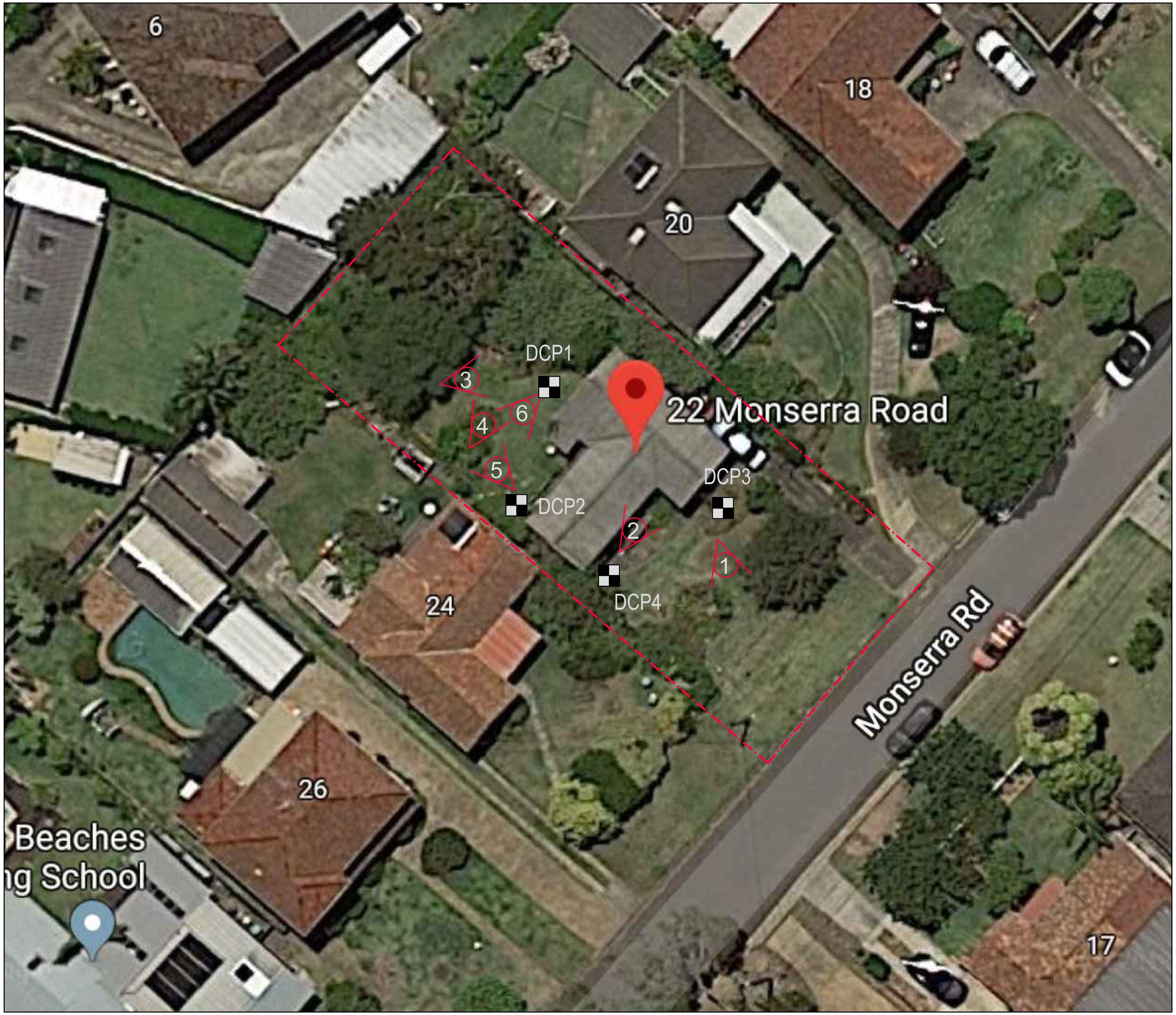
VS – Very Soft – Unconfined compressive strength less than 25 kPa
S – Soft – Unconfined compressive strength 25-50 kPa
F – Firm – Unconfined compressive strength 50-100 kPa
St – Stiff – Unconfined compressive strength 100-200 kPa
VSt – Very Stiff – Unconfined compressive strength 200-400 kPa
H – Hard - Unconfined compressive strength greater than 400 kPa

Density Index/Relative Density - Cohesionless Soils

Symbol	Density Index (ID)	Range %	SPT “N” Value Range (Blows/300mm)
VL	Very Loose	<15	0-4
L	Loose	15-35	4-10
MD	Medium Dense	35-65	10-30
D	Dense	65-85	30-50
VD	Very Dense	>85	>50

APPENDIX B

DCP TESTS & PHOTOS LOCATION PLAN



TN

LEGEND

SITE BOUNDARY (APPROX.)

DCP (Dynamic Cone Penetrometer)

PHOTO NUMBER
WITH DIRECTION OF VIEW

soilsrock
geotechnical | environmental | foundations

Soilsrock Engineering Pty. Ltd
2A/32 Fisher Road, Dee Why, NSW 2099
M: 0457 115 044 | T: (02)8065 2922
Email: info@soilsrock.com.au
www.soilsrock.com.au

CLIENT:

RAINY QIU

TITLE:

DCP & PHOTOS LOCATION PLAN
PROPOSED RESIDENTIAL NEW DEVELOPMENT
22 MONSERRA ROAD
ALLAMBIE HEIGHTS, NSW 2100

Revision	Date

DATE: 21/11/2019

SCALE: NTS

PROJECT No:
SRE/602/AH/19

CHECKED BY: JC

DESIGNED BY: MJ

Drawing No: G01

APPENDIX C

SITE PHOTOGRAPS

CLIENT:	RAINY QIU	**PAGE:**	1 of 1
PROJECT:	PROPOSED RESIDENTIAL NEW DWELLING	**DATE RECORD:**	19/11/2019
LOCATION:	22 MONSERRA ROAD, ALLAMBIE HEIGHTS NSW 2100	**LOGGED BY:**	R.C.
DATE:	20/11/2019	**CHECKED BY:**	J.C
PROJECT NO.:	SRE/602/AH/19		

SITE PHOTOGRAPHS

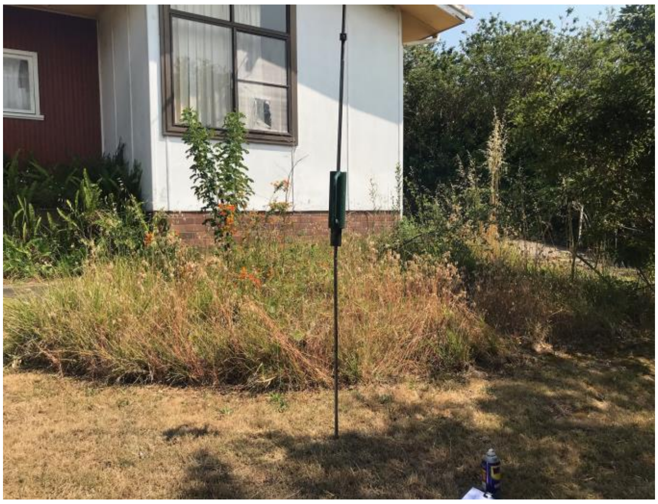


Photo 1 - North view to DCP 3 test location (front of 22 Monserra Road)

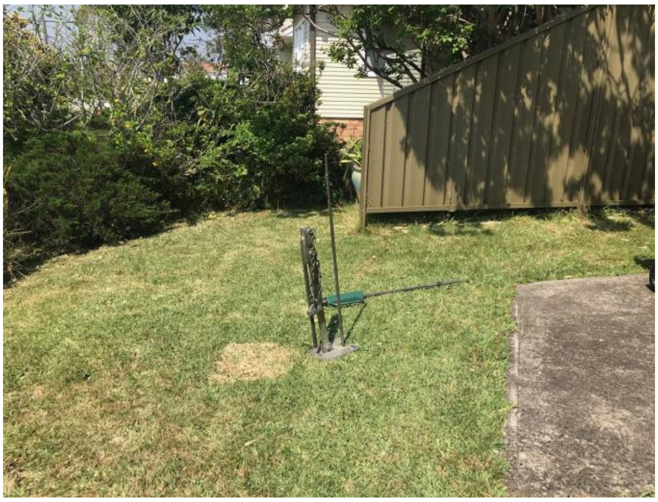


Photo 2 - South-West view facing DCP 4 test location (front of 22 Monserra Road).

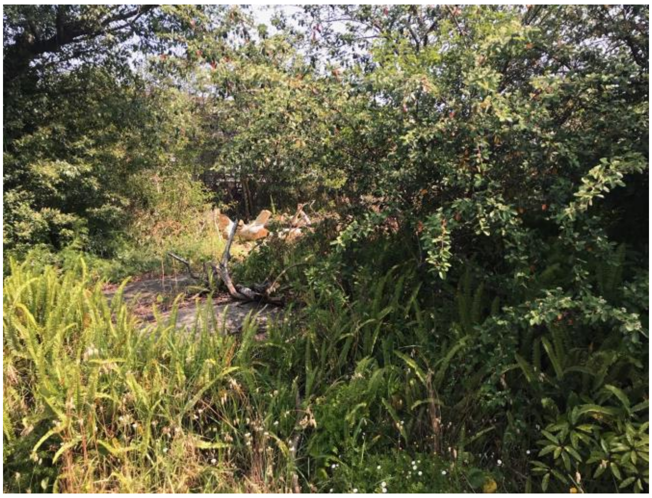


Photo 3 - North-west view facing the back of the rear yard of the residence (Backyard of 22 Monserra Road).

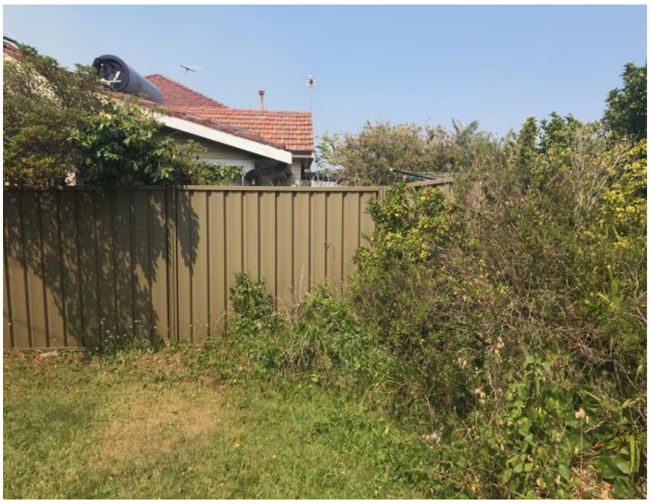


Photo 4 - North-West view facing the shed fence boundary location (Backyard of 22 Monserra Road)

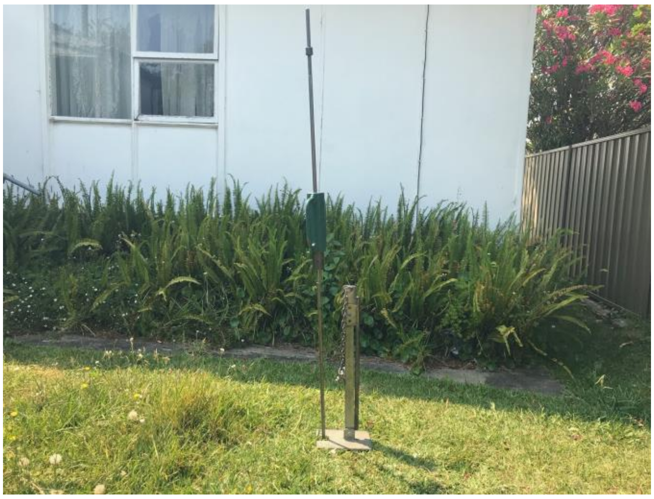


Photo 5 - Southern view facing DCP2 (back yard of 22 Monserra Road).

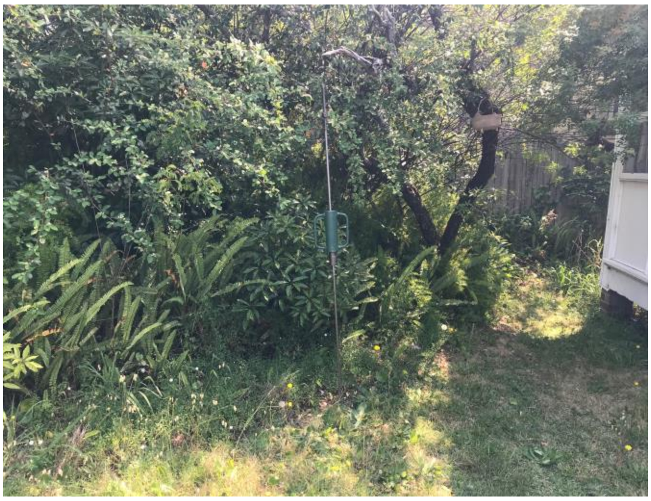


Photo 6 - South-West view facing DCP1 test location (Backyard of 22 Monserra Road).