Version 3 – March 2013

Form 15—Compliance Certificate for building Design or Specification

NOTE	**This is to be used for the purposes of section 10 of the *Building Act 1975* and/or section 46 of the *Building Regulation 2006*.** **RESTRICTION: A building certifier (class B) can only give a compliance certificate about whether building work complies with the BCA or a provision of the QDC. A building certifier (Class B) can not give a certificate regarding QDC boundary clearance and site cover provisions.**
1. Property description **This section need only be completed if details of street address and property description are applicable.** **EG. In the case of (standard/generic) pool design/shell manufacture and/or patio and carport systems this section may not be applicable.** The description must identify all land the subject of the application. The lot & plan details (eg. SP / RP) are shown on title documents or a rates notice. If the plan is not registered by title, provide previous lot and plan details.	Street address *(include no., street, suburb / locality & postcode)* 30 Moonie Avenue Murarrie Qld Postcode 4172 Lot & plan details *(attach list if necessary)* Lot 110 on SP118320 In which local government area is the land situated? Brisbane City Council
2. Description of component/s certified Clearly describe the extent of work covered by this certificate, e.g. all structural aspects of the steel roof beams.	Slab & Footing Design
3. Basis of certification Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications, were relied upon.	NCC 2015, AS 2870
4. Reference documentation Clearly identify any relevant documentation, e.g. numbered structural engineering plans.	East Coast Geotechnical Pty Ltd Report Ref. G16/059 dated 01/04/2016

LOCAL GOVERNMENT USE ONLY

Date received		Reference Number/s	

5. Building certifier reference number

Building certifier reference number

6. Competent person details

A competent person for building work, means a person who is assessed by the building certifier for the work as competent to practise in an aspect of the building and specification design, of the building work because of the individual's skill, experience and qualifications in the aspect. The competent person must also be registered or licensed under a law applying in the State to practice the aspect.

If no relevant law requires the individual to be licensed or registered to be able to give the help, the certifier must assess the individual as having appropriate experience, qualifications or skills to be able to give the help.

If the chief executive issues any guidelines for assessing a competent person, the building certifier must use the guidelines when assessing the person.

Name (*in full*)

Lindsay Edmund Baguley

Company name *if applicable*

East Coast Geotechnical Pty Ltd

Contact person

Johan Brink

Phone no. *business hours*

07 3711 7622

Mobile no.

Fax no.

07 3711 7007

Email address

manager@eastcoast-geotech.com.au

Postal address

PO Box 31

Acacia Ridge QLD Postcode 4110

Licence class

Licence number

RPEQ 4566

Date approval to inspect received from building certifier

7. Signature of competent person

This certificate must be signed by the individual assessed by the building certifier as competent.

Signature

Date

01/04/2016

EAST COAST GEOTECHNICAL PTY LTD

ACN 065-058-095
ABN 66-382-660-160

CONSULTING ENGINEERS

18A IRIS PLACE ACACIA RIDGE QLD 4110
PO BOX 31 ACACIA RIDGE DC QLD 4110

Ph: 07 3711 7622
Fax: 07 3711 7007
E-MAIL: manager@eastcoast-geotech.com.au
WEB SITE: www.eastcoast-geotech.com.au

Enquiries to: **Johan Brink**

1st April 2016

CLIENT: **STEVE RYAN**
30 MOONIE AVENUE
MURARRIE QLD 4172

PROJECT: **30 MOONIE AVENUE**
MURARRIE

REF NO: **G16/059**

COMMISSION: **1.** Site classification in accordance with Section 2 of A.S. 2870

2. Slab and footing recommendations.

SITE CLASSIFICATION:

After considering the results of our limited site investigation (recorded elsewhere in the report) at the time of our testing we have classified this site as:

Class "P" due to trees

In accordance with AS 2870.

The attached design has allowed for the influence of the proposed earthworks, tree growth or removal described in our "Site Preparation" details.

ENGINEER CERTIFICATION:

As the signatory of this report is a Registered Professional Engineer of Queensland and N.P.E.R, the footing recommendations in this report take precedence over all other drawings pertaining to this report.

The only other documents that can take precedence over this report are those with a later date signed by this author, or those signed by another R.P.E.Q. or N.P.E.R.

PREAMBLE:

Both the builder and the potential owner/occupier of the proposed dwelling should be aware that the satisfactory performance of the footing system for the life expectancy of the structure is dependent on several factors.

The three most significant factors include: the compatibility of the proposed footing system to the soil conditions, the ability of the builder (or his agent) to construct the footing system in accordance with our guidelines as well as in accordance with good building practice, and finally **the ability of the owner/occupier to maintain the structure and its surrounds (i.e. garden areas) in a sensible and responsible manner.**

This report must be read and considered as a whole i.e. all of our recommendation, foundation sections and appendices must be read, considered and followed by all people involved in this project to ensure adequate long term performance of the footing system and the structure it supports. If soil conditions vary from that indicated in the report, this office must be notified to assess the suitability of the proposed footings.

SITE PREPARATION DETAILS:

We recommend using a footing system as per the attached details on the prepared construction pad. All significant organic material and debris should be scraped from the construction pad.

BUILDING AND SITE DESCRIPTION:

The proposed development is the construction of a garden and pool store room attached to the existing house.
The perimeter walls will be clad.
The internal walls will be framed.
The preferred flooring system will be a stiffened raft.
The allotment is on the south side of the street.
The construction area is virtually flat.
Vegetation on the construction area (and nearby surrounds) has been scraped clear.
Site drainage is poor to fair.

UNDERGROUND SERVICES:

At the time of writing this report we had not been informed of any underground services on or adjacent to this allotment which may affect the proposed structure.

FOOTING SPECIFICATIONS:

Perimeter Footing Details:

These footings must be reinforced as shown on the attached details and must be founded a minimum of **300 mm** into the recommended founding material so as to retain the intended structural adequacy. The recommended founding material is:

" Natural Stiff Clay "

Where the depth to suitable founding material is significant, the footing should be supported on bulk piers or drilled piers as required.

Pier & Pad Footing Reinforcement:

Where the depth of drilled piers exceeds 1500 mm below finished ground level, they are to be reinforced with 4 x N12 bars tied with an R6 spiral ligature at 300 mm pitch. Where the depth exceeds 4000 mm the reinforcement shall be 4 x N16 bars tied with an R10 spiral ligature at 300 mm pitch.

Slab Details:

The slab shall be 100 mm minimum thickness reinforced with SL82 or equivalent. The slab must be tied to the footings with starter bars as shown.

Concrete Specifications:

All concrete shall have a minimum 28 day strength of 20 MPa unless notified otherwise. All concrete must be adequately compacted. Mechanical vibration and curing of slabs is strongly recommended.

Brittle Floor Coverings:

Where extensive areas of brittle tiles are proposed, we recommend one or more of the following additional requirements to reduce the likelihood of cracking.

Tie a layer of SL52 fabric to the recommended slab fabric and offset this mesh by 100 mm in each direction.

Use rubber based adhesives when affixing the tiles.

Delay the laying of tiles for as long as possible (at least 3 months, but preferably 6 months after the slab has been poured).

Tiling is not recommended on non-structural slabs.

TESTING PROGRAM:

2 test sites were established with a nominal 100 mm diameter hand auger.

The locations are shown on accompanying sketch and excavated to the depths indicated on the log section. Numerous samples were collected and hand classified.

Test Site	Depth (mm)	LS (%)	Estimated I_{ss} (%)
2	600	12	3

The resistance of the soils encountered was tested with an approved 9 kg penetrometer (DCP) and the results recorded at the appropriate levels on the attached log section.

The resistance of the soils encountered was tested with an approved pocket penetrometer (PP) and the results recorded at the appropriate levels on the attached log section.

FINDINGS:

The soil profiles encountered are shown on the attached log section. No water table was encountered during our testing program.

We anticipate water seepage where the more permeable strata overlies the less permeable strata, which may cause some problems in excavating down to this level or deeper. This seepage may also cause collapse of excavations which will increase concrete volumes significantly above those normally anticipated. Furthermore, if a delay occurs between the time the footing is excavated and when the concrete is placed, the recommended foundation soil may soften, loosen or collapse, which will require further excavations and further increase in concrete volumes.

Using the methods outlined in AS2870 we have calculated the characteristic surface movement (y_s) and the maximum potential surface moment due to the tree induced suction change in addition to the normal design suction change (y_{tmax}) for the appropriate soil profiles:

Test Site	Predicted Surface Movement (mm)	
2	y_s	30 – 40
	$y_{t\ max}$	20 – 30

For design purposes, the paper titled 'The Revised Residential Slabs and Footings Standard AS2870-2011' (Beal, 2011) and Appendix H in AS2870 suggest that an equivalent y_s can be calculated with the following formula:

$$y_{s.equivalent} = (0.7y_s + y_t) / 0.7$$

We have used this method for our design.

Fill was encountered at the following depths below our test surface level:

Test Site	Depth (mm)
1	500 +
2	600 +

At the time of writing this report, we had not been given any documentation complying to AS 3798, therefore this fill must be described as fill other than controlled fill.

In our opinion this fill is relatively shallow and will not adversely affect the proposed footing system (i.e. this fill is within the approved limits specified in AS 2870.

Rock is anticipated (based on DCP) at the following depths below our test surface level:

Test Site	Extremely Weathered (mm)
1	1200
2	2000

Our onsite testing refused at the following depths:

Test Site	Depth (mm)
1	500
2	600

ALLOWABLE BEARING PRESSURE:

The bearing pressure of the strata encountered has been determined using principles outlined in A.S. 2870 and A.S. 1726-1993.

An allowable bearing pressure of 100 kPa may be used at all levels in the natural medium dense or firm soil profile and this value increases to 150 kPa at depths of 300 mm and deeper into the natural stiff / very stiff clay.

An allowable bearing pressure of 300 kPa is available in the extremely weathered rock.

EAST COAST GEOTECHNICAL PTY LTD

Lindsay Baguley
Manager
B.E., M.I.E. Aust, NPER No 70130
R.P.E.Q. No 4566
Q.B.C.C. Nominee Licence 31545
N.S.W. Contractor Licence 75467C

QBCC SUBSIDENCE POLICY REQUIREMENTS

We have reviewed the following information that was supplied to us:

Provided	Not Provided	Not Applicable	
✓			Plan of survey
✓			Photographs of site and surrounds
✓			Contour survey
✓			Location of trees
	✓		Overland flow provisions
✓			Architectural plans
			Land Searches in:
	✓		Slope Stability
	✓		Flooding
	✓		Easements
	✓		Vegetation protection
			Fill:
	✓		Disclosure plan
	✓		Level 1 certification
			Underground Services:
✓			Sewer
✓			Stormwater
	✓		Gas
✓			Power
✓			Telecommunications

EAST COAST GROUP OF COMPANIES

EASTCOAST GEOTECHNICAL PTY. LTD.

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URL: www.eastcoast-geotech.com.au

SITE SKETCH

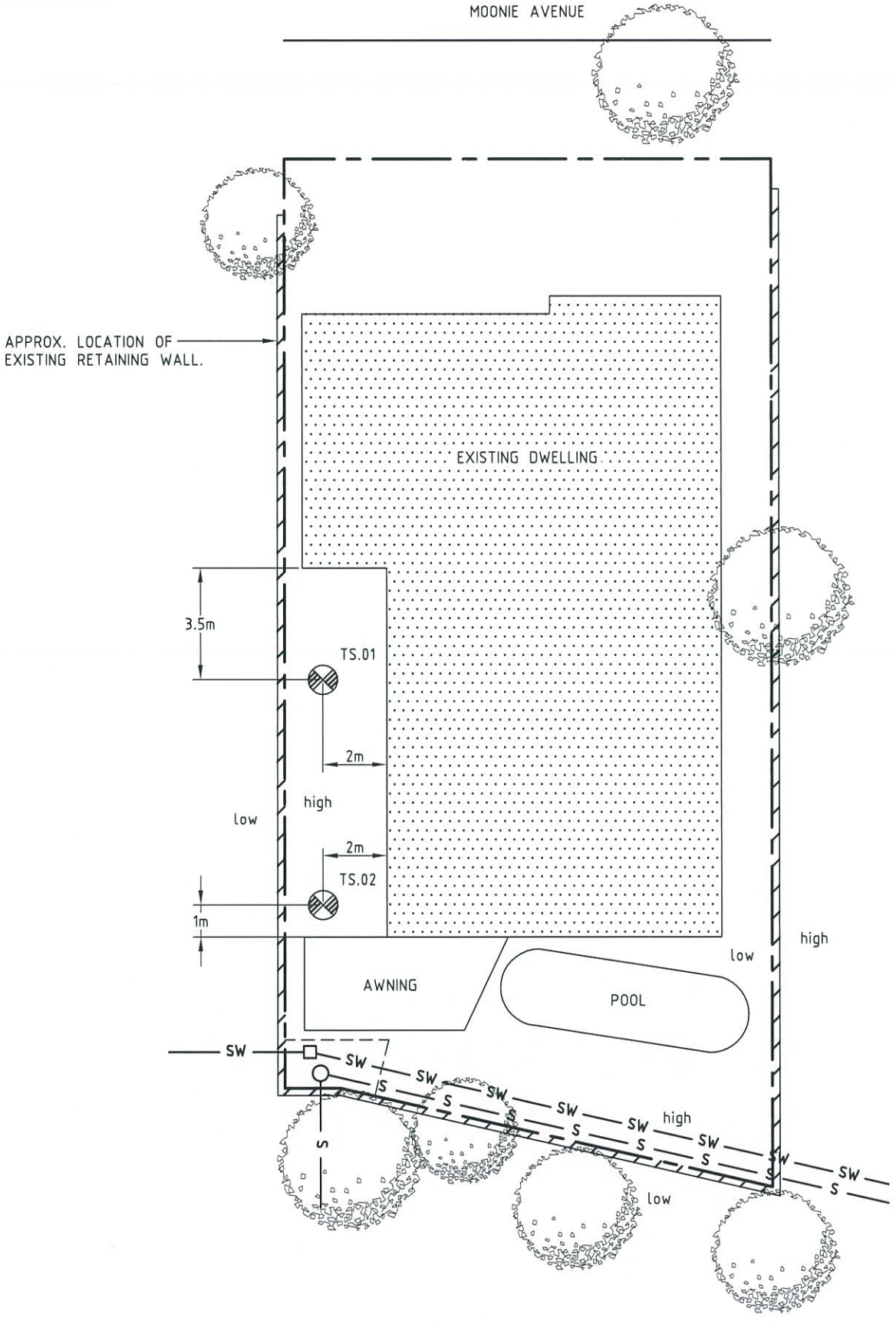
30 MOONIE AVENUE
MURARRIE, QLD, 4172

REFERENCE NUMBER
G16/059

DATE
29-03-2065

SITE SKETCH

NOT TO SCALE
ALL DIMENSIONS ARE
APPROXIMATE ONLY



TEST SITE

FALL DIRECTION

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BORE LOG SECTION

30 MOONIE AVENUE

MURARRIE, QLD, 4172

REFERENCE NUMBER G16/059

DATE 29-03-2065

TEST SITE 01

LOCATION: REFER TO SITE SKETCH

DEPTH (m)	DESCRIPTION SOIL TYPE, COLOUR, CONSISTENCY	FILL	DCP	PP
	FILL-Uncontrolled silty sand (dk.gy)			
	fine/ medium grain sand, moist & loose		3	
	silty sandy clay (br)		4	
	some fine/ medium gravel, fine grain sand		3	
	dry & stiff		4	
0.5	U.T.P-with hand auger		6	
			6	
			7	
			8	
			6	
1.0			7	
			20	
1.5				
2.0				
2.5				
3.0				
3.5				
4.0				
4.5				
5.0				

TEST SITE 02

LOCATION: REFER TO SITE SKETCH

DEPTH (m)	DESCRIPTION SOIL TYPE, COLOUR, CONSISTENCY	FILL	DCP	PP
	FILL-Uncontrolled silty sand (dk.gy)		1	
	fine/ medium grain sand, moist & loose		3	
	silty sandy clay (br)		2	
	some fine/ medium gravel, fine grain sand		3	
	dry & stiff		2	
0.5			3	
	U.T.P-with hand auger		3	
			4	
			5	
			7	
1.0			12	
			10	
			8	
			7	
1.5			7	
			7	
			8	
			13	
			HB	
2.0				
2.5				
3.0				
3.5				
4.0				
4.5				
5.0				

LEGEND

DCP= dynamic cone penetrometer, PP= pocket penetrometer
S.W.L=standing water level, U.T.P.= unable to penetrate
pl.=pale, dk.=dark, bk=black, bl=blue, br=brown, grn=green, gy=grey, or=orange,rd=red, wh=white, yllw=yellow

Some alluvial topsoil's are indistinguishable from fill in boreholes. When these have similar bearing capacities as fill, they may be logged as fill. Similarly some fill could be logged as natural soil.

LEGEND

⊗ APPROXIMATE LOCATION OF BORE HOLE TEST SITE

NOTES:

SITE PREPARATION

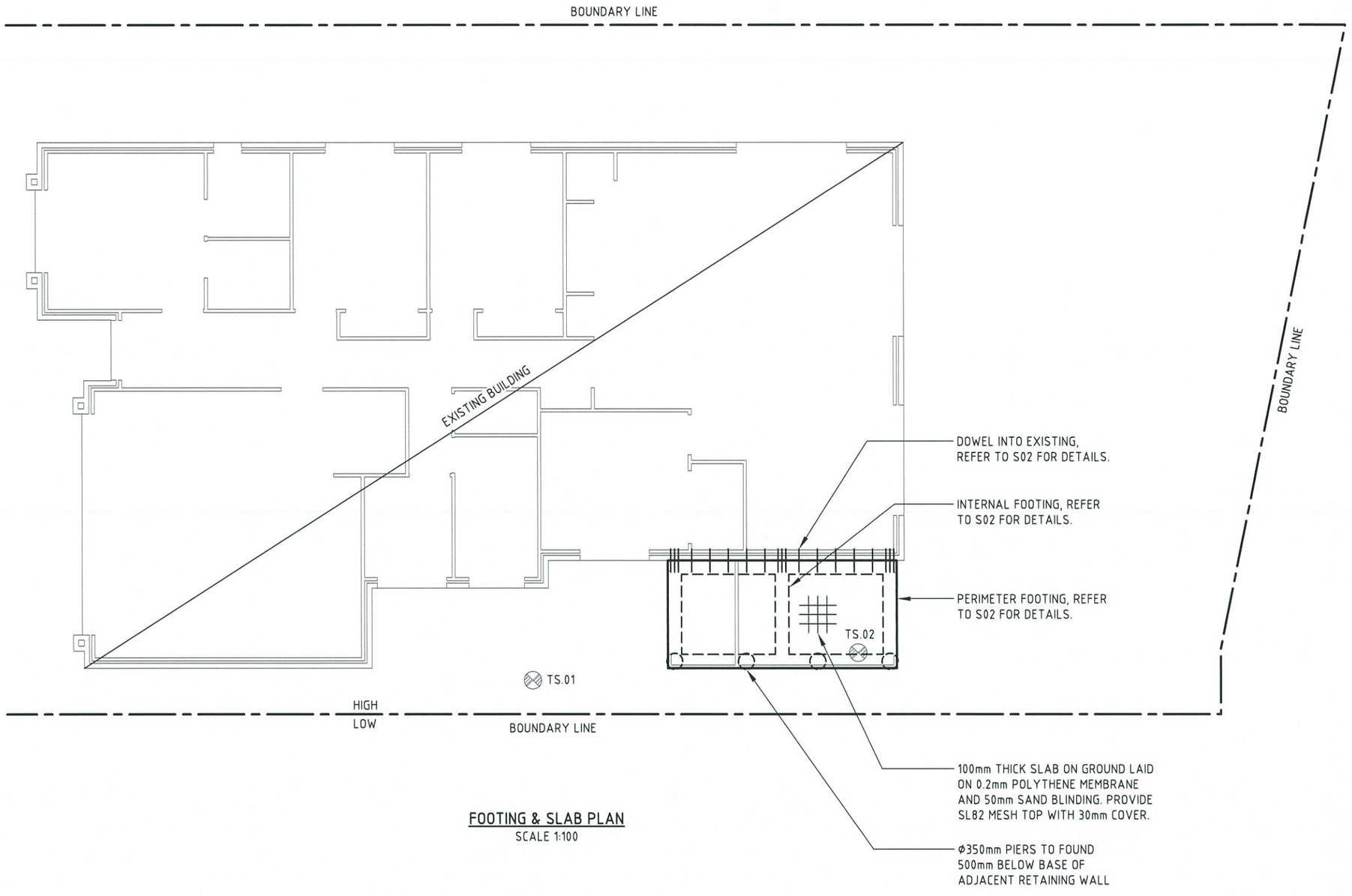
- THE CONSTRUCTION PAD IS TO BE CLEARED OF ALL LOOSE MATERIAL. THE PAD IS TO BE PREPARED IN ACCORDANCE WITH SITE PREPARATION DETAILS, NOTED ON THE DRAWINGS.
- STRIP AND REMOVE FROM SITE. ALL VEGETATION, TOP SOIL AND DELETERIOUS MATERIAL.
- FILL MATERIAL UNDER SLABS AND BUILDING ELEMENTS TO BE MADE UP FROM SELECT FILL. (CBR 15 OR GREATED AND P.I. LESS THAN 12%).
- COMPACT ALL FILL MATERIAL IN NOT GREATER THAN 150mm DEPTH LAYERS, TO 95% STANDARD COMPACTION (OR 65% MIN. DENSITY INDEX IF SAND) IN ACCORDANCE WITH TEST 5.1.1 & 5.3.1 OF AS1289. FILL DEPTH IS NOT TO EXCEED 300mm.

CONCRETE

- CONCRETE SPECIFICATION:
  f'c = 20 MPa MINIMUM AT 28 DAYS.
  WE RECOMMEND ALL CONCRETE BE ADEQUATELY COMPACTED BY A MECHANICAL VIBRATOR AND CURED.
- CONTRACTOR TO DETERMINE LOCATION & DEPTH OF ALL SERVICES PRIOR TO ANY EXCAVATIONS. IF THE DEPTH OF ANY UNDERGROUND SERVICE IS MORE THAN THE DISTANCE AWAY FROM THE FOOTINGS, THEN THIS OFFICE MUST BE CONTACTED FOR A REDESIGN.
- DRILL ⌀16mm HOLES 250mm DEEP INTO EXISTING CONCRETE. CLEAN OUT HOLES PRIOR TO THE INSTALLATION OF EPOXIED N12 DOWEL BARS, USING RAMSET CHEMSET RE0502 INJECTION SYSTEM OR EQUIVALENT.
- SOME DIFFERENTIAL MOVEMENT MUST BE EXPECTED BETWEEN THE NEW, EXISTING SLAB, AND FOOTING SYSTEMS. FULL HEIGHT ARTICULATION SHOULD BE INCORPORATED INTO THE STRUCTURE, INCLUDING THE ROOF.
- ENGINEER TO INSPECT ALL FOOTINGS PRIOR TO CONCRETE POUR. A MINIMUM OF 24 HOURS NOTICE IS REQUIRED.

REINFORCEMENT LAPS

BAR SIZE	LAP LENGTH
N12	600mm



FOOTING & SLAB PLAN
SCALE 1:100

THIS DRAWING IS INDICATIVE ONLY AND MAY REQUIRE VARIATIONS TO SUIT ACTUAL SITE CONDITIONS

SCALE 1:100 0 1000 2000 3000

AMENDMENTS

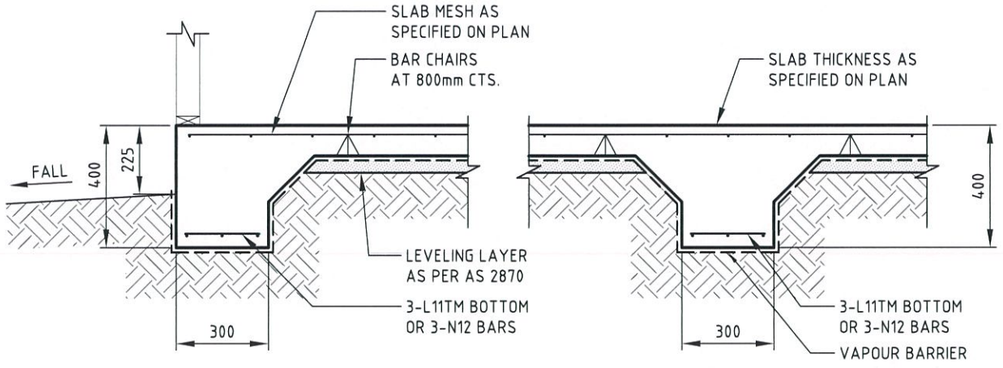
REVISION	DATE	DESCRIPTION	APPROVED

EASTCOAST GEOTECHNICAL PTY. LTD.
POSTAL ADDRESS: P.O. BOX 31, ACACIA RIDGE. QLD. 4110
PHONE: (07) 3711 7622 FAX: (07) 3711 7007
URL: www.eastcoast-geotech.com.au

DRAWING TITLE: FOOTING AND SLAB PLAN
PROJECT: NO. 30 MOONIE AVENUE MURARRIE, QLD, 4172

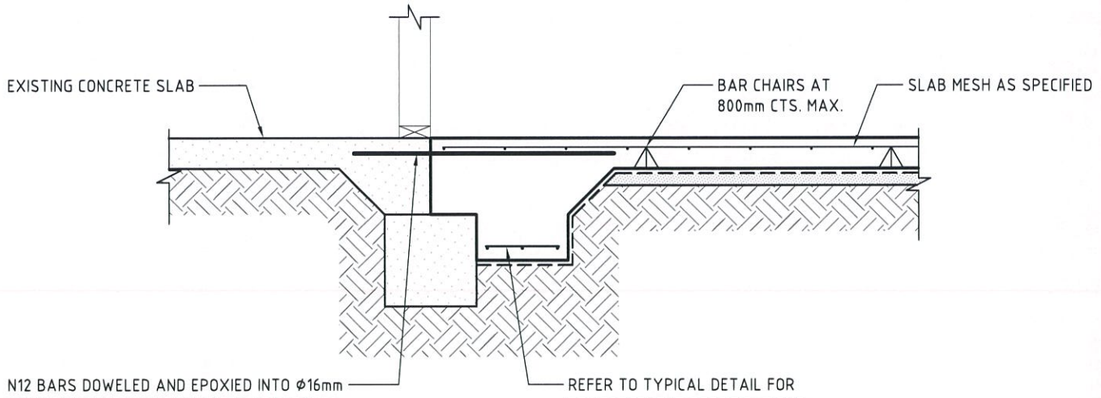
DATE: 04/04/2016
DESIGN: J.B.
DRAWN: J.A.
SHEET SIZE: A3
REFERENCE NUMBER: G16/059
DWG. NO.: S01
REVISION: 1

EAST COAST GROUP OF COMPANIES

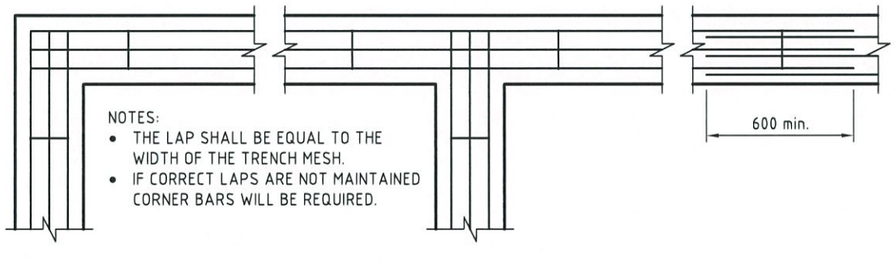


PERIMETER FOOTING
SCALE 1:20

INTERNAL FOOTING
SCALE 1:20



DETAIL WHERE NEW SLAB ABUTS EXISTING SLAB
SCALE 1:20



TYPICAL LAPPING DETAIL
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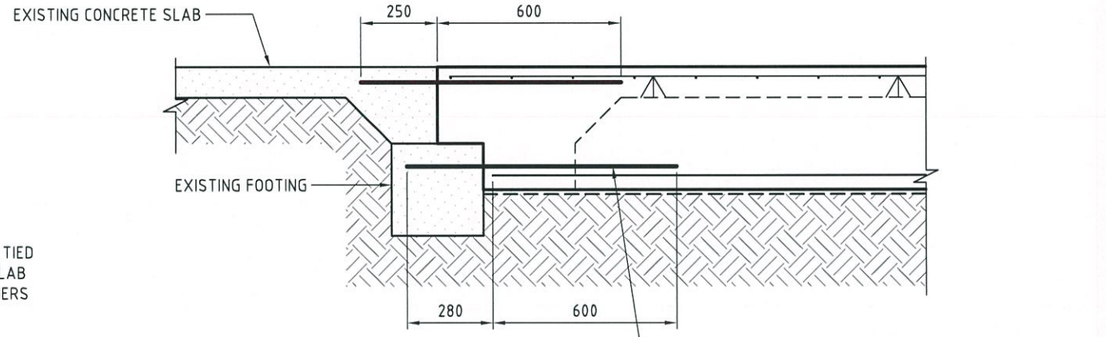

DETAIL WHERE NEW FOOTING ABUTS EXISTING FOOTING
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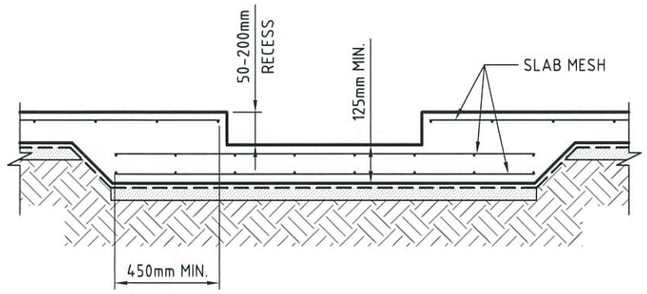
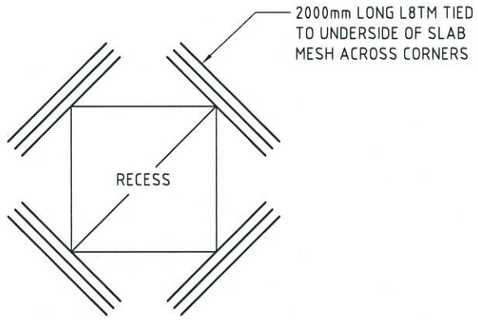


TYPICAL SLAB RECESS
SCALE 1:20



PLAN DETAIL
SCALE 1:20

THIS DRAWING IS INDICATIVE ONLY AND MAY REQUIRE VARIATIONS TO SUIT ACTUAL SITE CONDITIONS

SCALE 1:100 0 1000 2000 3000

AMENDMENTS

REVISION	DATE	DESCRIPTION	APPROVED

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URL: www.eastcoast-geotech.com.au

DRAWING TITLE: CONCRETE DETAILS

PROJECT: NO. 30 MOONIE AVENUE
MURARRIE, QLD, 4172

DATE: 04/04/2016
DESIGN: J.B.
DRAWN: J.A.
SHEET SIZE: A3

REFERENCE NUMBER: G16/059
DWG. NO.: S02
REVISION: 1

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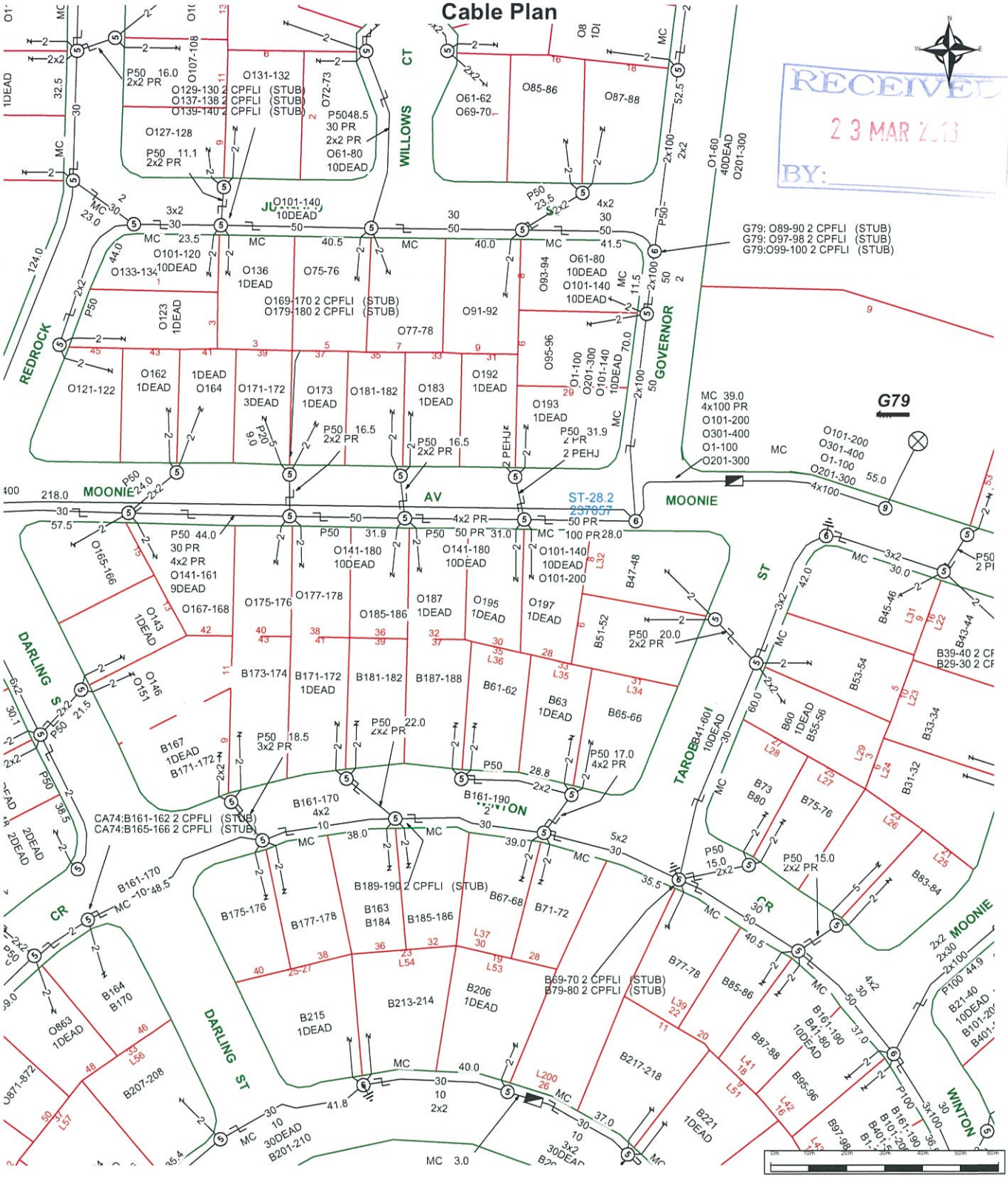
Cable Plan



Telstra	For all Telstra DBYD plan enquiries - email - Telstra.Plans@team.telstra.com For urgent onsite contact only - ph 1800 653 935 (bus hrs)
TELSTRA CORPORATION LIMITED A.C.N. 051 775 556	
Generated On 23/03/2016 16:30:32	Sequence Number: 51739851
	CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

The above plan must be viewed in conjunction with the Mains Cable Plan on the following page

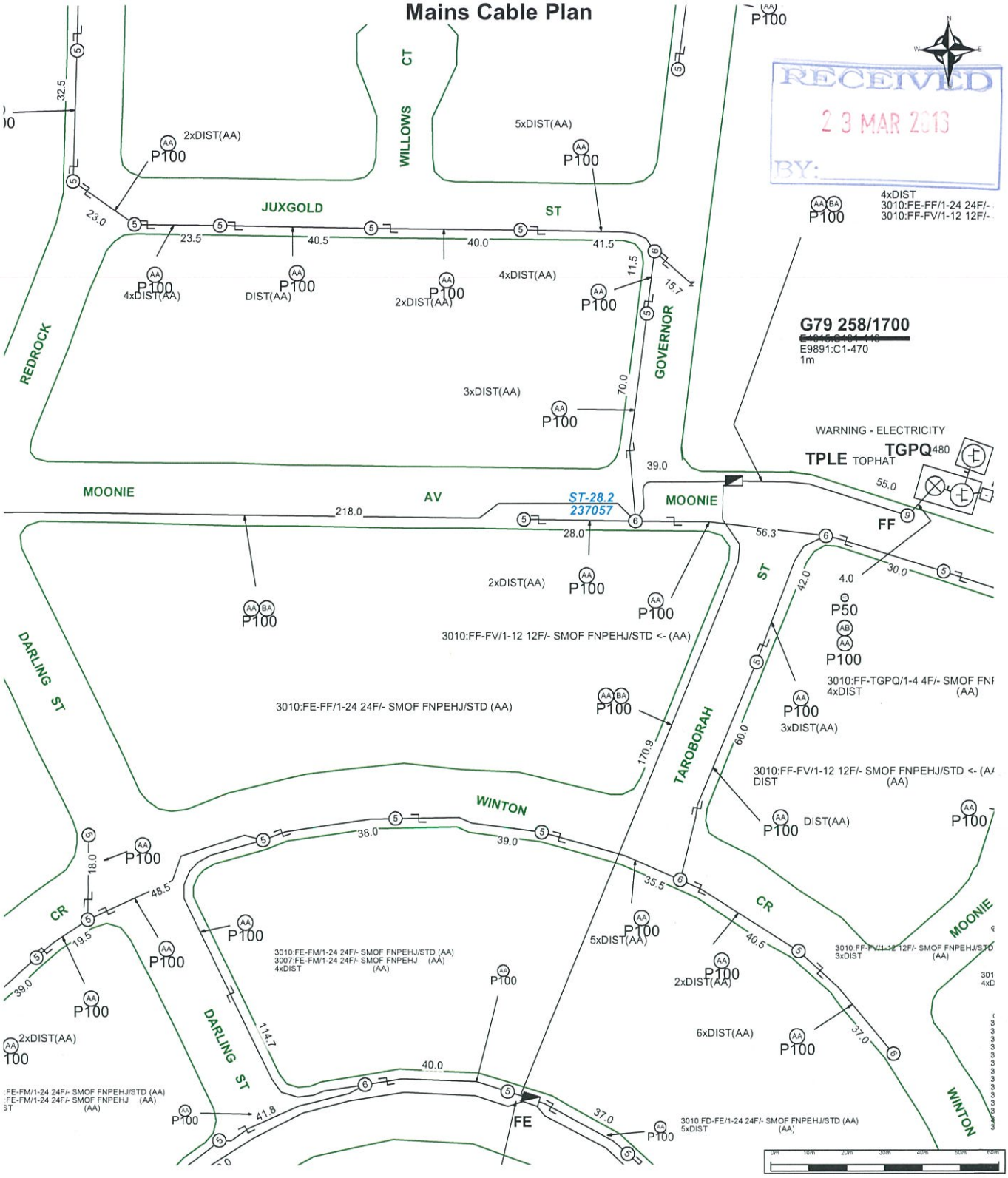
WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information supplied in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

Telstra plans and information supplied are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.

Mains Cable Plan



Telstra For all Telstra DBYD plan enquiries - email - Telstra.Plans@team.telstra.com For urgent onsite contact only - ph 1800 653 935 (bus hrs)	Sequence Number: 51739851
TELSTRA CORPORATION LIMITED A.C.N. 051 775 556	CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.
Generated On 23/03/2016 16:30:41	

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information supplied in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

Telstra plans and information supplied are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.

PAPER SIZE A3 Map has been designed to be reproduced in colour

All underground cables shall be treated as being energised. Where a cable is located that is not represented on the ENERGEX EnerGISe DBYD map, then ENERGEX shall be contacted immediately.

For Emergency Situations Please call 13 19 62

energex

EnerGISe
DBYD

Date: 23 Mar 16 Time: 15.28.19
Requested By: DBYD

SCALE 1:1000

20 0 20m

Enquiry No: 51739850

STRIP No: 1

- Ground Transformer
- Cubicle Transformer
- Ring Main Unit
- Metering Unit
- Link Pillar
- Service Pillar
- Junction Pillar
- Pit
- Cable Joint
- Cable Termination
- Cable Marker
- Street Light Pole
- Earth
- Works Order Polygon
- Cable Voltage Less Than 33kV
- Cable Voltage 33kV or Higher
- Direct-Lay Cable
- Conduit
- Multi-Section Duct
- Trench
- Cable Tray
- Tunnel

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23 MAR 2016
BY:

INDEX TO SHEETS

1

LOCALITY DIAGRAM

This output provides details of the ENERGEX electrical network. As variations may exist no responsibility is incurred by ENERGEX for the accuracy or completeness of the information provided. Exact positions of cables and electrical connectivity should be confirmed on site.

UNCONTROLLED COPY

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Queensland Urban Utilities - Water & Sewer Infrastructure

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Queensland Urban Utilities

DBYD - Queensland Urban Utilities
Water & Sewer Infrastructure

DBYD Reference No: 51739852

Date DBYD Ref Recieved: 23/03/2016 4:25:00 PM
Date DBYD Job to Commence: 30/03/2016 12:00:00 AM
Date DBYD Map Produced: 23/03/2016
This Map is valid for 30 days

Produced By: Queensland Urban Utilities

GDA

Sewer
- Infrastructure
- Major Infrastructure
- Network Pipelines
- Recycled Water Pipelines
- Network Structures

Water
- Infrastructure
- Major Infrastructure
- Network Pipelines
- Network Structures

N

Map Scale 1:1000

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BY:

The plans are indicative and approximate only and provided without warranties of any kind, express or implied including in relation to accuracy, completeness, correctness, currency or fitness for purpose.

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This plan should be used as guide only. Any dimensions should be confirmed on site by the relevant authority.

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BCC Stormwater and Cable Networks

Sequence Number: 51739849

Scale = 1:1000

Metres 20 40

Date: Mar 23, 2016

Location:

6962743

509292 N 509482

6962533

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REPORT LIMITATIONS
DESIGN

Under normal circumstances the soil profiles reported in our Site Classification Section should be representative of the soil conditions over this site, however in some cases, soil conditions can change dramatically over short distances, therefore even careful exploration programmes may not locate all the variations. If footing excavations reveal soil conditions differing from those shown in the attached report, we recommend that we be immediately notified so that further exploration can be carried out and the designer of the footings then notified to consider the influence of the changes to the design.

In writing this report, we have also considered all the information supplied to us by the client. Should the client or his agent have omitted to supply us with the relevant information, our report may be irrelevant and/or inappropriate. We do not take responsibility for the consequences in such cases and we will make an additional charge if as a result, more testing or re-writing of the report is necessary.

If we are commissioned to inspect any footing excavations or slab preparations on this site, **then 24 hours notice is required.** At this inspection, if we form the opinion that site preparations are different from the criteria on which we based our recommendations, then the client must be prepared to vary the design at our request and pay any reasonable costs incurred.

This report has been signed in blue ink. If the signature on this report is in black ink, you are reading a photocopy. This report may be copied in full. If any doubt exists to the number of pages in the reports, we should be consulted to compare this report with our master copy which is kept in our office.

In all of our design work we have interpreted a load bearing wall as defined in section 1.7.30 of A.S. 2870. Therefore conventional single storey house **do not** have internal load bearing walls and in high-set houses, only walls which transmit a force of >10 kN/m to the slab and/or footings are interpreted as being load-bearing. In our designs we detail a slab thickening because of our interpretation of the load bearing wall requirements and/or because of the site conditions – ie. soil reactivity.

We do not detail slab thickenings to conform to wind bracing, as assessment of the wind bracing is beyond the scope of this report. However in the case where a bracing wall is to be bolted to a slab, and the wall is not located over a slab thickening, the slab is to be locally thickened in the area of the proposed bolts in accordance with manufacturer's specifications.

If the attached design is a ground slab, unless otherwise specified the design assumes that hard floor tiles will be restricted to conventional wet areas ie. bathrooms and laundries.

The recommendations contained in this report have not taken into consideration the long-term effects of any previous, current or potential subsurface work by mining companies or potential slope instability problems. At the time of writing this report, neither our client (nor his agent) nor the local authority had made us aware that these problems may be affecting this allotment. If a mining subsidence or slope stability assessment is required for this allotment to obtain building approval, we can arrange for this to be done, but that type of report is beyond the scope of our commission and fees in this report.

All concrete and the placement of concrete and reinforcement must conform to the relevant sections of Section 6 of AS 2870.
All concrete shall not be less than 25MPa grade with 20mm. (less if concrete is to be pumped) nominal maximum aggregate size (N25 grade).

The recommendations contained in this report are in accordance with our interpretation of the relevant building codes. Therefore, providing that all our recommendations are adhered to, the attached engineer designed footing system will give adequate performance for the life expectancy of the structure, hence, if the reader of this report considers that certain sections require clarification, we are available for phone consultations during normal office hours. Any changes made to our recommendations by persons **not authorised by this company** will legally be interpreted as that person assuming the responsibility for the long-term performance of the footing system.
The Ys calculation in this report has been carried out using the Calculation Method, which is covered, under the scope of AS 2870. This method uses a depth of soil suction change and a change in suction (Δu) as recommended by A.S. 2870 and what we believe appropriate for this area. (The classification also includes the effect of trees on-site if applicable)

The range of classification in A.S. 2870 (the most severe is Class E) is as follows:

Predicted surface movement	Class
Yt max + Ys = 0-10	A
Yt max + Ys <20mm	S
Yt max + Ys = 20-40mm	M
Yt max + Ys =40-60mm	H1
Yt max + Ys =60-75mm	H2
Yt max + Ys >75mm	E

A.S. 2870 also has a Class P for problem sites.

APPENDIX 1
GENERAL BUILDING
RECOMMENDATIONS

Our appendices I, II and III summarise the relevant parts of Section 5 & 6 of A.S. 2870. The C.S.I.R.O. have also produced a guide for homeowners entitled "Guide to Homeowners on Foundation Maintenance and Footing Performance" by P.F. Walsh. This document is similar to appendix B & C of A.S. 2870 and is in our opinion easier to read. All the above literature is available from our office upon request.

Our client must be made aware that our attached design is also reliant on reasonable long-term management and if our client is not the future owner, then it is our client's responsibility to pass on this information. Furthermore, the more severe the site classification, the more important site management is in achieving adequate performance out of a footing system.

Correct drainage is a most important part of our recommendations and design. If the site is not prepared correctly, excessive soil moisture may accumulate in some areas, which may lead to wall and/or floor movements. In general, the soil surface should be sloped away from the building at approximately 1:20 for a minimum width of 1200mm In high rainfall areas or where the original ground slope is greater than 1:10, an effective drainage system should be installed to divert the surface water away from the building area. In general, efficient spoon drains will be adequate. Roof water should be diverted away from the building as soon as possible. Where building delays occur, temporary downpipes may be necessary (refer attached "Typical Drainage Arrangement" sketch).

If the removal of pre-existing structure or vegetation disturbs the natural soil profile at the recommended foundation depths, then we recommend the local deepening of the footings to a minimum depth of 200mm below this level.

Unless stated otherwise in this report, or unless specified by other consultants, all relevant codes must be adhered to.

In class M, H or E soil profiles (as well as some P sites) minor floor and wall movements are inevitable, therefore we make the following additional general construction recommendations to minimise their effects:

In some Class M sites and all Class H and E sites, a well articulated construction method must be adopted. Furthermore, Section 5 & 6 of A.S. 2870 should be consulted when designing the structure on these sites.

Avoid: large archways, wing walls that are attached to the main building walls, narrow isolated wall panels near corners and brickwork over doors and windows where possible.

Isolate the superstructure of extensions from the original structure to allow for differential movement but the floor systems must be pinned.

Arrange plumbing fixtures so that the slab and beam penetration is kept to a minimum and where necessary sleeved to allow for movement with closed cell polythene or similar material, as specified in Appendix VI – Service Penetrations. Where the penetration is within 150mm of the base of a beam or footing, the depth of this footing element should be deepened by approximately twice the diameter of the penetration. This clause is particularly relevant on Class M, H and E sites.

Particular attention should be given to all drainage and plumbing trenches so that they do not introduce water to the foundation soil, do not allow greater soil moisture evaporation and/or destabilise the footings. Specifically, any trenches under the floor or within 1.5 metres of the building should be sloped away from the shed and should be back-filled with clay or weak mortar in the top 300mm.

Deep excavations such as garages partly underground, cellars, indoor pools etc. will change the foundation clay moisture, therefore extra care should be taken to protect the soil moisture stability in the surrounding area.

Notwithstanding the recommendations made in this report, we also recommend that wherever footings are close to any excavation or easement, they should be deepened so that the projection from the underside of the excavation to the underside of the footings, make an angle not exceeding 30° in sandy soils and 40° in clayey soils (to the horizontal). We do not recommend using a steeper angle unless sufficient testing is carried out to indicate otherwise, or unless the footings in the relevant area are founded on or are very close to solid rock. Deep excavations close to existing footings must also comply with the above guidelines.
Where we have been made aware that an existing easement is close to the proposed structure, if the information supplied has sufficient detail, then our recommendations will clearly cater for the easement.

On Class M, H, E and P sites, external water taps should be over a grate or be positioned so that water spillage **will not** shed water onto the footings. The establishment of these grates is generally beyond the scope of a building contract.

On class M, H, E and P sites if a rainwater tank (or similar) is to be sited within 6 metres of a structural footing, then we should be consulted.

APPENDIX II

OWNER'S RESPONSIBILITY

The footings we have recommended require that the owner, builder or others do not allow the soil moisture content to alter significantly during the life of the building. **The owner/occupier is the only person who can maintain stable moisture conditions near the footings.** The following precautions are strongly recommended:

LONG TERM SITE MANAGEMENT

The ground surrounding the building site must be graded and drained so that water is shed away from the house area.

Trees or dense shrubs must be kept well away from the building. This distance depends upon the species and soil conditions, however a typical distance is three quarters the mature height or twice the mature "canopy" diameter, which ever is greater. Where there are a number of trees in line, this distance should be doubled.

Trees that are in a neighbouring property and are near the limits of these distances can be tolerated only if the soil near the building is protected from moisture changes.

All reactive soils should be protected from situations that may cause changes in moisture content.

Any watering regime should consider the whole yard and be aimed at maintaining constant soil moisture content across the site.

In all types of soil conditions, if an automatic watering system is installed close to the footings – ie. within 2.5metres, instability problems may occur. Before installing such a system, we strongly recommend that the proposal be submitted to us for comment, as additional precautions may have to be taken.

APPENDIX III

SITE DRAINAGE

To ensure that adequate site drainage is maintained during construction, where site cuts deeper than 250mm are made, the earthworks should incorporate a spoon drain, (with a suitable outflow) at the base of the cut. Furthermore, where delays in construction occur, it may be necessary to use temporary down pipes to ensure roof run-off does not contribute to on-site drainage problems.

TYPICAL DRAINAGE DETAILS

APPENDIX IV - DEFINITIONS

In our log section we describe filled ground as stated below. It must be remembered that when sampling boreholes, particularly in alluvial soils, some top soils and other soft natural soils are indistinguishable from fill, therefore can be logged as fill.

All sites with fill deeper than the limits prescribed in AS2870 have been classified as class "P". A "Yt max + Ys" (Predicted surface movement including provisions for tree effect) has also been supplied. The design engineer must make allowances for both possible limited bearing and reactivity affecting the footings.

CONTROLLED FILL Fill which has been placed under supervision and at the time of writing this report we have received written certification from a Geotechnical Testing Authority that this fill complies with Level 1 responsibility as defined in AS3798.
Certification of fill as controlled must not be equated to STABLE conditions for foundation design. This certification is a statement of the quality of the fill and an assurance that it was placed in a professional manner. There are two parameters which influence footing design and they are the strength of the strata and the potential for the strata to change volume with changes in seasonal conditions.
These two parameters are of equal importance to AS3798 certification. Where certification at a minimum of 95% standard compaction has been achieved, we recommend adopting a safe bearing pressure for design purposes of 100kPa. If certification is at a minimum 98% standard compaction, we recommend increasing the safe bearing to 150kPa.

UNCONTROLLED FILL Fill other than controlled fill consists of many forms as follows. In all cases consideration should be given to design by engineering principles.

SUB-DIVISIONAL FILL In general, sub-divisional fill has all characteristics of controlled fill, except it has not been tested and documented in such a way to allow it to be certified in accordance with AS3798. In some cases the fill was placed prior to the advent of AS3798, in other instances, insufficient testing was undertaken to allow Level 1 or Level 2 certification. In most cases the fill will be suitable to support a raft slab.

CONSOLIDATED FILL This fill generally is formed as part of the house construction platform and is in our opinion sufficient to support the proposed slab panels of a residential slab, but inadequate to support loads transmitted by footings or edge beams, which must be piered down to suitable strata.

UNCONSOLIDATED FILL All slabs and footings in these filled areas must be piered or piled down to suitable levels in the more competent strata. This fill is also more prone to collapse during excavation, and allowances should be made for additional concrete volumes. This fill can also be considered uncontrolled fill

UNSTABLE FILL This type of fill has a high void ratio and may undergo significant differential settlement under load and may settle under its own weight. In these areas piers or piles must be considered as the foundation medium and the attached log sections should be studied to see whether the fill contains material which may hinder drilling of piers or driving of piles (ie boulders, cobbles, concrete, pieces or other debris).

VIRTUALLY FLAT Visually assessed as minor levelling only required to form a level construction pad.

GENTLY SLOPING Visually assessed as having gradients less than 1:25 across the building area.

MODERATELY SLOPING Visually assessed as having gradients in the order of 1:12 to 1:25

STEEPLY SLOPING Visually assessed as having gradients in the order of 1:5 to 1:12

VERY STEEPLY SLOPING Visually assessed as having gradients steeper than 1:5

UNEXCAVATABLE ROCK Any material which is similar to that described in Clause 1.8.47 of AS 2870. Strong material including shaley material and strongly cemented sand or gravel that does not soften in water. Material that cannot **readily** be excavated by a conventional backhoe with a normal bucket* may be taken to be rock.

EXCAVATABLE ROCK A rock-like material which does not shrink or swell with changes in soil moisture, but is readily excavatable with a conventional backhoe with a normal bucket.*
* A rubber tyred machine similar in power to a Case 580 series using a bucket width similar to the designed trench width.

GRAVEL Coarse soil particles, larger than sand size, but less than 60mm in diameter.

ROCK FLOATERS Pieces of rock in a soil profile larger than 60mm but can range up to well over a metre in diameter. Where these rock floaters form a layer of mat within the soil profile and difficulty is encountered in excavating them, subject to the geotechnical consultant, they may be taken to be the same as excavatable rock. For the purpose of this report cobbles and boulders are the same as rock floaters.

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RETAINING WALLS / FENCES

SITE VISITS

INSPECTIONS & CERTIFICATION

PERCOLATION TESTING

DENSITY TESTING

CBR TESTS

CONTAMINATION TESTING

SLOPE STABILITY

SITE MANAGEMENT ON SMALL DEVELOPMENTS

SUBDIVISIONAL AREA INVESTIGATION & CERTIFICATION OF EARTHWORKS

STRUCTURAL DESIGN

INVESTIGATION OF STRUCTURAL FAILURES

TIMBER MINI-PILING

BORE HOLE DRILLING

STEEL SCREW PILING

SHEET PILING