+61 7 5561 8699
www.edgece.com
58 Kingston Drive
Helensvale
QLD 4212
Australia

3 August 2021

Job Number : 200650 – 39 Emmett Rd, Crafers West

To Werner Webber,

We, EDGE Consulting Engineers, being professional engineers, certify that the design and construction of the walls at the above mentioned address were based on the drawings as outlined below:

- EDGE Consulting Structural Drawings for Project No. 200650 Drawings S01[C05] and S02[C02]

This work is designed in accordance with the principles of structural and geotechnical engineering, to carry loadings specified in the National Construction Code of Australia, Australian Standards and relevant guidelines as outlined below:

- AS/NZS 1170.0:2002 – Structural Design Actions – General Principles
- AS/NZS 1170.1:2002 – Structural Design Actions – Permanent, Imposed and Other Actions
- AS4678-2002 – Earth Retaining Structures
- AS2159-1995 – Piling Design and Installation
- OB Geotechnics – Report on Retaining Walls and Global Stability Analysis dated 8/05/20 Job P119OBN
- OB Geotechnics – Letter and the amended Report on Retaining Walls and Global Stability Analysis dated 05/07/21 Job P119OBN-Rev1

Yours faithfully,

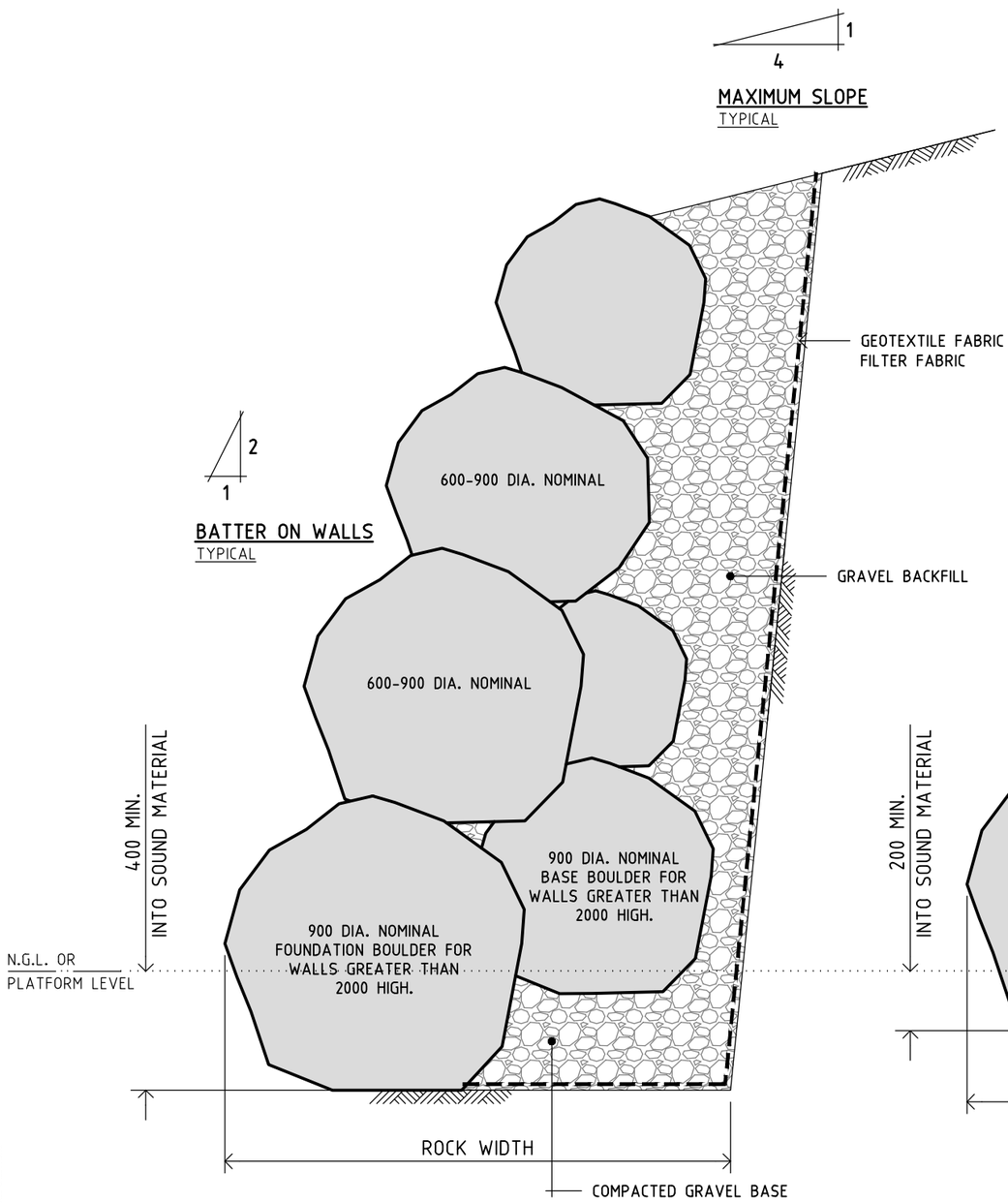
Tim Peters
B.Eng M.Eng MIEAust
CPEngAust NER

RETAINING WALL SCHEDULE

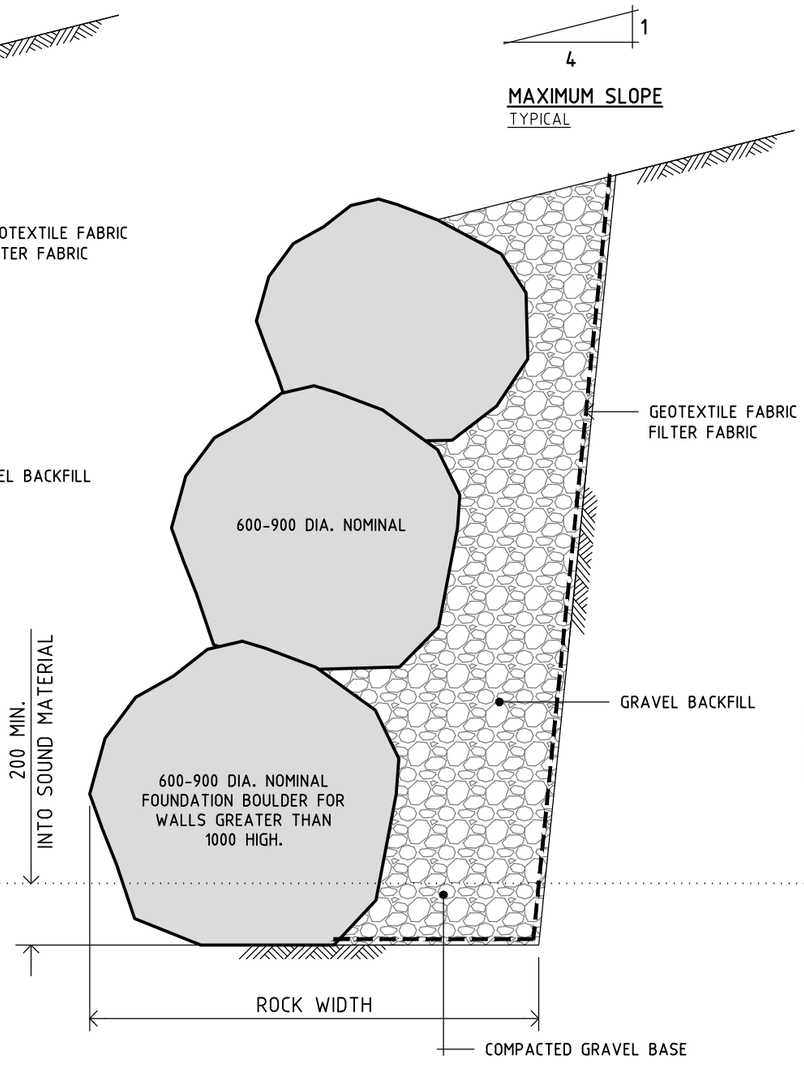
RETAINING HEIGHT	ROCK WIDTH	GRAVEL BASE DEPTH
UP TO 1000	800mm NOMINAL	400mm NOMINAL
1000-2000	1000mm NOMINAL	400mm NOMINAL
2000-3000	2900mm NOMINAL	400mm NOMINAL
3000-4000	3000mm NOMINAL	400mm NOMINAL
4000-5000	3700mm NOMINAL	400mm NOMINAL
5000-6000	4000mm NOMINAL	400mm NOMINAL

NOTE

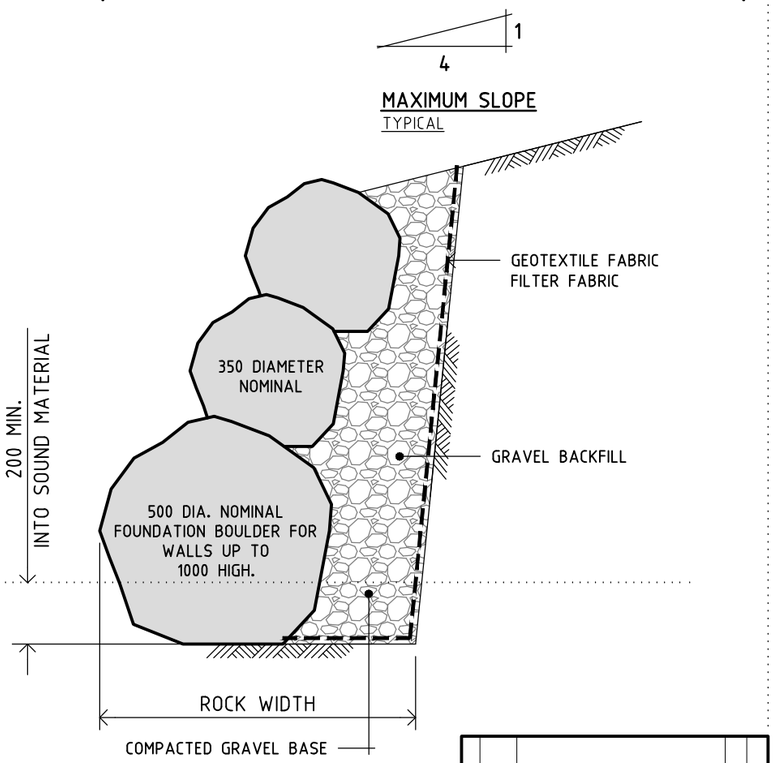
WHERE THESE WIDTHS CANNOT BE ACHIEVED ON SITE,
PROVIDE 450mm DIAMETER CONCRETE PILES AT 2000mm CENTRES.
PILES TO EXTEND MINIMUM 3000mm BELOW BASE OF WALL.



2000-3000 HIGH WALL
SCALE 1:20



1000-2000 HIGH WALL
SCALE 1:20



UP TO 1000 HIGH WALL
SCALE 1:20

CONSTRUCTION METHOD

1. PLACE FOUNDATION BOULDER BELOW PLATFORM LEVEL TO RETAIN CUT OR BELOW NATURAL GROUND TO RETAIN FILL. (DEPTHS AS NOTED)
2. PLACE BASE BOULDER AS REQUIRED.
3. PLACE GRAVEL BACKFILL BEHIND FOUNDATION AND BASE BOULDERS IN LAYERS.
4. CONTINUE PLACING BOULDERS AND GRAVEL BACKFILL IN LAYERS BEHIND UNTIL DESIGN PROFILE IS ACHIEVED.

PARAMETERS

GRAVEL BACKFILL WEIGHT	20 kN/m3
GRAVEL BACKFILL ANGLE	28 DEGREES
MAXIMUM SURCHARGE	5 kPa
MAXIMUM WATER PRESSURE HEIGHT	1/3 OF WALL HEIGHT

Rev	Date	Description	By	Chk
C05	02.08.21	ISSUED FOR CONSTRUCTION	BC	TMP
C04	30.07.21	ISSUED FOR CONSTRUCTION	BC	TMP
C03	06.07.21	ISSUED FOR CONSTRUCTION	BC	TMP
C02	10.05.21	ISSUED FOR CONSTRUCTION	BC	TMP
C01	22.02.21	ISSUED FOR CONSTRUCTION	BC	TMP

EDGE
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Queensland, 4212,
Australia
t: +61 7 5561 8699
e: goldcoast@edgece.com

DO NOT SCALE DRAWINGS. IF IN DOUBT, ASK!

Project Name
39 EMMETT ROAD
CRAFERS WEST

Client
ULRICH SCHADE

Designed	Drawn	Checked	Scale @ A3
T.M.P.	B.C.	T.M.P.	1:20

Drawing Title
ROCK RETAINING WALL
SHEET 1

Project No.
200650

ISSUED FOR CONSTRUCTION

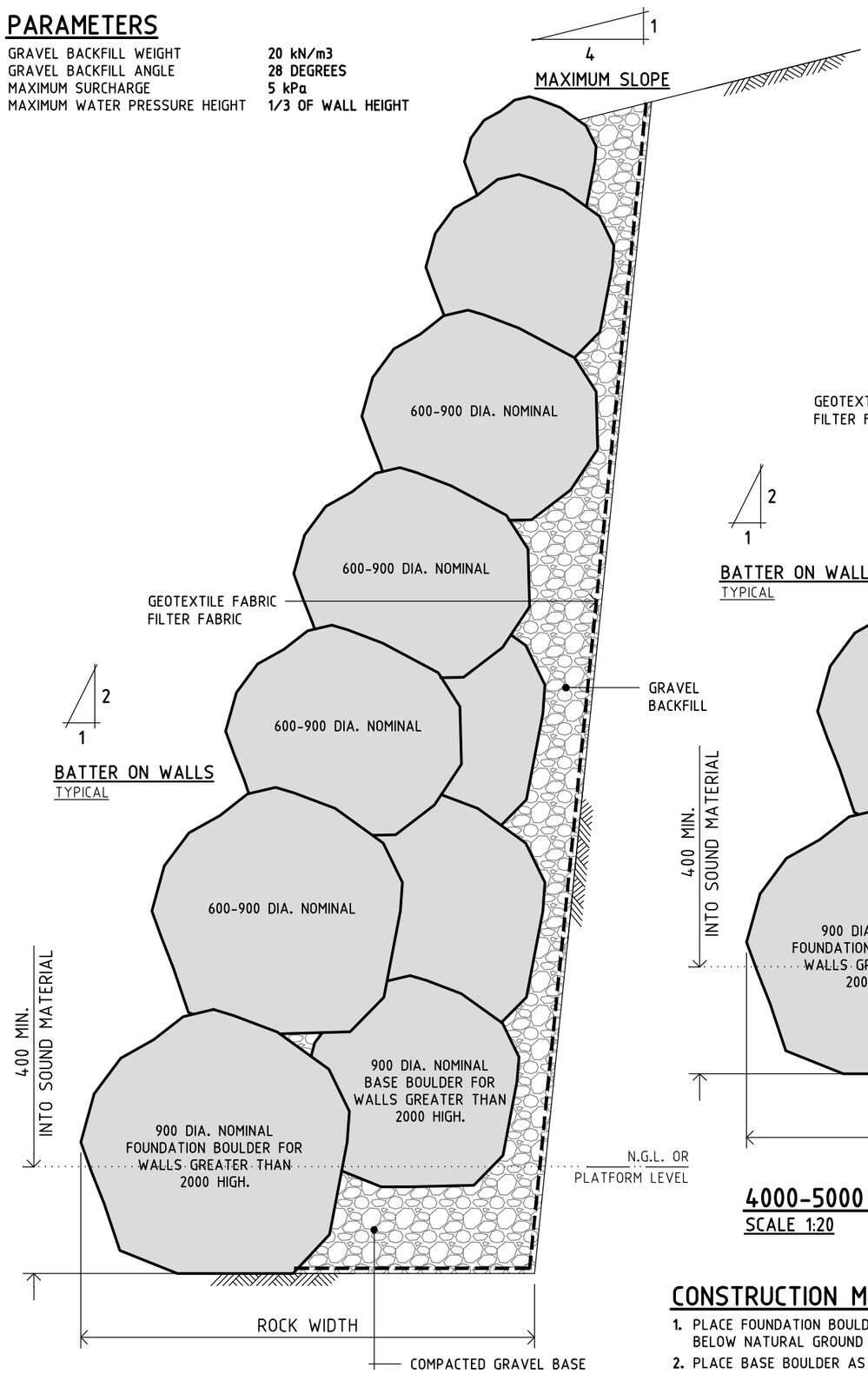
Drawing No.
S01

Revision
C05

0 mm 5 10 15 20 25

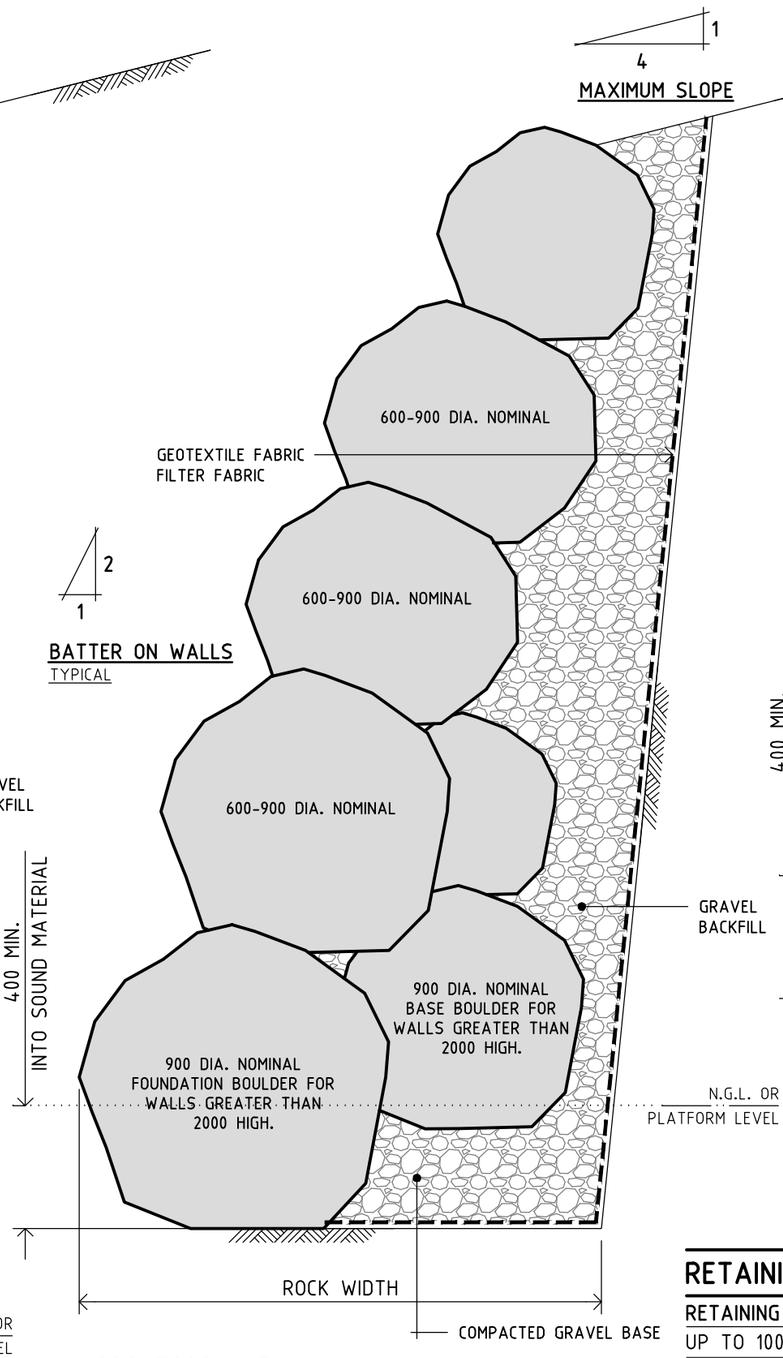
PARAMETERS

GRAVEL BACKFILL WEIGHT	**20 kN/m3**
GRAVEL BACKFILL ANGLE	**28 DEGREES**
MAXIMUM SURCHARGE	**5 kPa**
MAXIMUM WATER PRESSURE HEIGHT	**1/3 OF WALL HEIGHT**



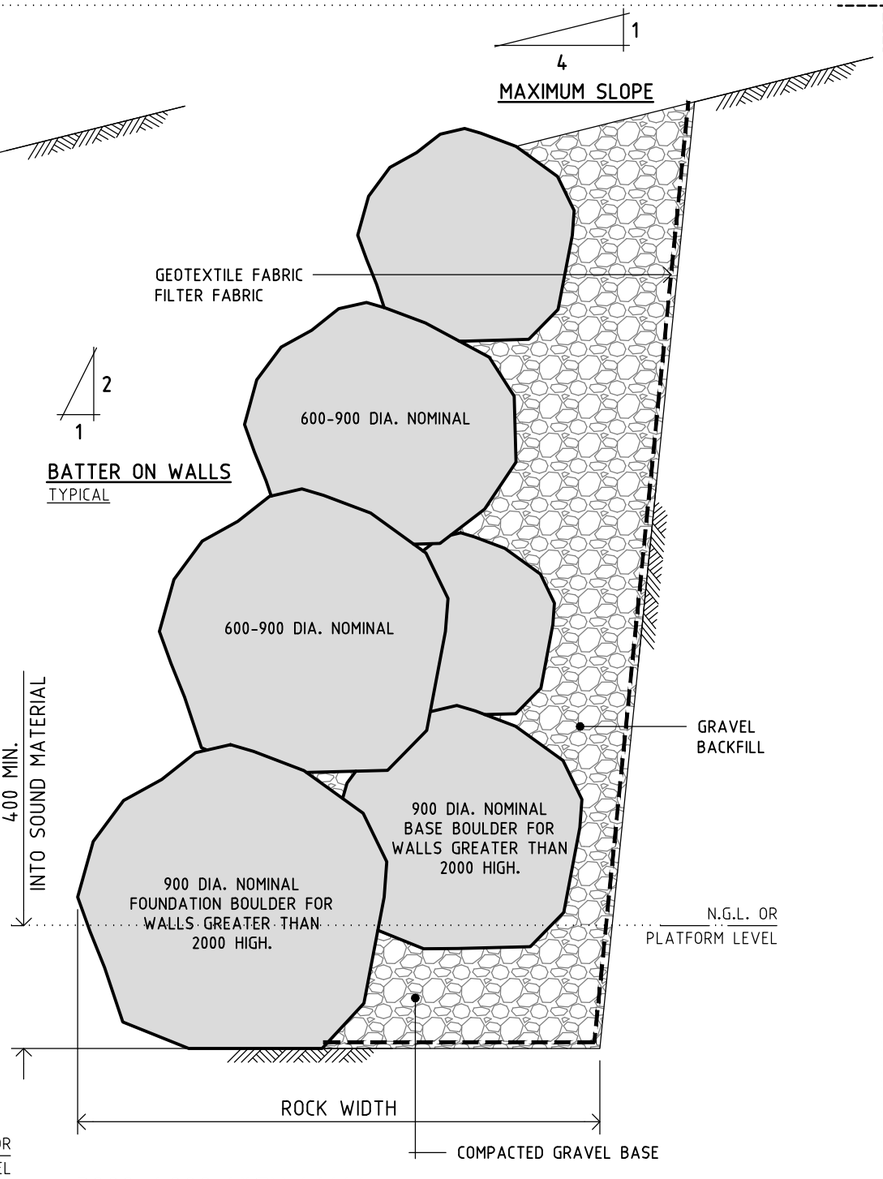
5000-6000 HIGH WALL

SCALE 1:20



4000-5000 HIGH WALL

SCALE 1:20



3000-4000 HIGH WALL

SCALE 1:20

CONSTRUCTION METHOD

1. PLACE FOUNDATION BOULDER BELOW PLATFORM LEVEL TO RETAIN CUT OR BELOW NATURAL GROUND TO RETAIN FILL. (DEPTHS AS NOTED)
2. PLACE BASE BOULDER AS REQUIRED.
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RETAINING WALL SCHEDULE

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NOTE

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Rev	Date	Description	By	Chk
C02	02.08.21	ISSUED FOR CONSTRUCTION	BC	TMP
C01	30.07.21	ISSUED FOR CONSTRUCTION	BC	TMP

EDGE
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Queensland, 4212,
Australia
t: +61 7 5561 8699
E: goldcoast@edgece.com

Project Name: **39 EMMETT ROAD CRAFERS WEST**

Client: **ULRICH SCHADE**

Designed	Drawn	Checked	Scale @ A3
T.M.P.	B.C.	T.M.P.	1:20

Drawing Title: **ROCK RETAINING WALL SHEET 2**

Project No.: **200650**

ISSUED FOR CONSTRUCTION

Drawing No.: **S02**

Revision: **C02**

0 mm 5 10 15 20 25

ABN - 3162 9127 742

E – admin@cardinaleng.com.au

W – www.cardinalengineeringptyltd.com.au

A – Shop 6/1-15 Lexington Rd, Springwood QLD 4127

3rd August 2021

RE: Proposed Development for 39 Emmett Road, Crafters West – Boulder Retaining Wall - Independent Structural Engineering Design Review

To Ulrich Schade,

Cardinal Engineering has been engaged to undertake a 3rd party engineering design review of the proposed rock gravity retaining walls for the 39 Emmett Rd, Crafters West development on 12/07/21.

The following documentation was provided for this review:

- Edge Consulting Engineers – Civil Design Drawings Rev P2 dated 04/09/20 Job 200650
- Edge Consulting Engineers – Structural Rock Retaining Wall Drawings Rev C03 dated 6/07/21 Job 200650
- Edge Consulting Engineers - Structural Rock Retaining Wall Drawings Rev C05 / C02 dated 2/08/21 Job 200650
- OB Geotechnics – Report on Retaining Walls and Global Stability Analysis dated 8/05/20 Job P119OBN
- OB Geotechnics – Letter and the amended Report on Retaining Walls and Global Stability Analysis dated 05/07/21 Job P119OBN-Rev1 (attached in **Appendix A**)

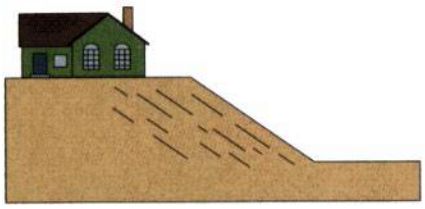
A structural design review has been undertaken on the information provided above and a summary of our recommendations / assumptions are presented in **Appendix B** of this letter.

If there are any queries regarding the information provided within this letter, please feel free to contact me directly to discuss in further detail.

Warm regards,

Adrian Wong
DIRECTOR
(RPEQ 16342, CPENG, NER, MIEAUST)
E – ADRIAN.WONG@CARDINALENG.COM.AU
M – 0412 228 822
D – 3/08/21

APPENDIX A



PROPOSAL

OB Geotechnics
Consulting Geotechnical Engineering Services

8/90-96 Jonson Street, Byron Bay, NSW 2481
Email: office@obgeotechnics.com.au
Web: https://www.obgeotechnics.com.au
Phone:1300 355 740

To: **Ulrich Schade**

C/C:

Email: ulrichschade@gmail.com

Ref No: **P119 Adelaide** **Date:** **05 July 2021**

From: **Oded Ben-Nun**

Re: **Retaining Wall**
39 Emmet Road, Crafers West, Adelaide

OB Geotechnics initially designed a 3-tiered retaining wall at the above address. However, due to space constraints, we understand that a change in the design has resulted in a 6.0m high single tier retaining wall.

OB Geotechnics carried out a global stability analysis for the 6.0m high single tier retaining wall. Based on the results, the analysed cross section of the proposed building envelope and retaining walls indicated a theoretical FOS against global instability of at least 1.5, which is considered acceptable for long term conditions.

This analysis does not account for the internal stability, overturning and sliding resistance of the boulder retaining wall. The structural integrity of the boulder wall, along with a 'safety in design' report should be undertaken by and certified by the wall designers (Edge Consulting Engineers) to the full height of 6.0m.

We trust this information is sufficient for your purposes. However, should you require any further information please do not hesitate to contact the undersigned.

For and on behalf of OB Geotechnics

Dr Oded Ben-Nun
MIEAust (Civil, Structural), CPEng, RPEQ
Senior Geotechnical Consulting Engineer

OB Geothechnics

Email: office@obgeotechnics.com.au
Web: https://www.obgeotechnics.com.au
Mobile: 0414753130
8/90-96 Jonson Street, Byron Bay, NSW 2481

OB Geotechnics

Consulting Geotechnical Engineering Services

REPORT ON RETAINING WALLS AND GLOBAL STABILITY ANALYSIS

PREPARED FOR

The Owner – Ulrich Schade

AT

39 Emmet Road, Crafers West, SA 5152

05 July 2021
Project Ref:
P119OBN-Rev1

OB Geotechnics
8/90-96 Jonson Street, Byron Bay, NSW 2481
Email: office@obgeotechnics.com.au
Web: https://www.obgeotechnics.com.au
Mobile: 0414753130

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2	SUBSURFACE CONDITIONS		1
3	GLOBAL STABILITY ANALYSIS		2
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	3.2	Global Stability Analysis Results	4
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APPENDIX A: FIGURE 1: SITE LOCATION PLAN
FIGURE 2: TEST LOCATION PLAN
APPENDIX B: BOREHOLE LOGS BY OTHERS
APPENDIX C: GLOBAL STABILITY ANALYSIS RESULTS
APPENDIX D: GUIDANCE MATERIAL
APPENDIX E: DRAWINGS

1 INTRODUCTION

This report presents updated results of a geotechnical global stability analysis for the proposed retaining walls at 39 Emmet Road, Crafers West, Adelaide. The investigation was commissioned by email from Mr Ulrich Schade, the owner, dated 20th May 2020, to complete this analysis. The commission was based on our fee proposal (Ref. P119_REV1 Adelaide), dated 20th May 2021. A Site Location Plan is presented as Figure 1.

The following plans have been provided to OB Geotechnics, and are attached in Appendix E:

- Bulk Earthworks Layout Plan, Project No. 200650, Drawing No. C201, Revision P4, dated 4 September 2020), by Edge Consulting Engineers.
- Rock Retaining Wall Drawing, Project No. 200650, Drawing No. S01, Revision C02, dated 10 May 2021), by Edge Consulting Engineers.
- Working Drawings, Job No. 19-02680, Sheets No. 1 to 10, Issue K, dated 11 May 2021), by HarvanDesign Building Designers.
- Cross-sections of the new 6.0m high retaining walls, drawn and provided by client

Based on the new provided engineering drawings and client provided sketches and images the following earthworks was adopted:

- Cut to maximum depth of 4.0m in south-western corner of the lot.
- 'Level 1' compacted engineering fill to maximum depth of 6.0m with a boulder wall retaining the fill batter, which slopes between 65˚ - 70˚, situated north east of the new dwelling and termed Retaining Wall 3.
- A minimum 1.5m high by 3 m wide T-junction roadway, placed against the toe of Retaining Wall 3. Road placed and compacted in accordance with 'Level 1' engineering fill requirement.

Please note this earthworks description is limited to the earthworks associated with the design cross-section review for geotechnical slope stability.

2 SUBSURFACE CONDITIONS

We have been provided with a geotechnical investigation information, carried out by RCI Consulting Engineers, Job No. 25043, dated 7 March 2018. This investigation included the drilling of three boreholes (BH1 to BH3) to maximum depths of 2.0m (BH1), 0.9m (BH2) and 0.8m (BH3). Additional field investigation was carried out by Colin R Walker & Associates, job No. F06820, dated 28 April 2020. This investigation includes the drilling of two additional boreholes BH4 and BH5 to maximum depths of 2.0m (BH4) and 1.3m (BH5).

The boreholes disclosed topsoil, overlying a generalised subsurface profile comprising Silty/Clayey Sand, Sandy Clay and Weathered Rock. The boreholes test locations are indicated on attached Test Location (Figure 2).

For a more detailed description of the subsurface profile encountered at each borehole location, reference should be made to the attached borehole logs. A summary of some of the more pertinent subsurface issues or considerations is outlined below:

Silty/Clayey Sand: silty sand was encountered from surface level in all boreholes and was about 0.25m thick

Sandy Clay: Low plasticity Sandy Clay residual soil was encountered from beneath the Silty/Clayey Sand layer and extended to the bedrock depths. The Sandy Clay was assessed to contain a moisture content estimated to be approximately less to the plastic limit.

Weathered Rock: Weathered bedrock was encountered in all the boreholes at depths of 1.85m (BH1), 0.85m (BH2), 0.75m (BH3), 1.6m (BH4) and 1.15m (BH5). On first contact the rock was predominantly assessed to be distinctly (occasionally extremely) weathered and of very low to low (occasionally extremely low or low to medium) strength.

Groundwater: All boreholes were 'dry' during and on completion of drilling. Groundwater seepage was not encountered during and after completion of drilling. It should be noted that groundwater levels can be expected to vary with seasonal and climatic conditions.

3 GLOBAL STABILITY ANALYSIS

The global stability analysis was updated using the revised provided plans, sections, and images along with the information gathered during the site investigation works (completed by others). A simplified cross section was selected, on the basis of the ‘worst case’ and used as the geotechnical model of the proposed retaining walls. Cross Section A-A was the selected cross section, shown on Figure 2 in Appendix A. The geotechnical model was then implemented in a limit equilibrium stability analysis software, Slope/W with the Morgenstein-Price method to predict the Factor of Safety (FoS) available for global stability. In this type of analysis, several potential slip circles are assumed, and the factor of safety for each of the assumed slip circles is calculated. The minimum factor of safety amongst those assumed slip circles is considered to be the factor of safety for the retaining wall.

3.1 Geotechnical Parameters

The geotechnical model is based on the subsurface conditions encountered in the boreholes drilled during geotechnical investigation carried out by others. The geotechnical models divide the subsurface profile into several constituting soil and bedrock units. Geotechnical units for soils and weathered bedrock, were modelled using the Mohr-Coulomb constitutive model. Geotechnical parameters for each geotechnical unit were selected based on the borehole information and empirical correlations well established in geotechnical engineering. In our selection of parameters, consideration was given to the inherent uncertainty associated with natural, non-engineered materials such as variations of rock strength, cross bedding, anisotropy etc. In this regard, we consider that conservative geotechnical parameters have been adopted. The adopted geotechnical parameters for each geotechnical unit are presented in the following table.

Material	Bulk Density (Kn/m^3)	C' (kPa)	Φ (degrees)
Silty Sand	18	0.2	30
Sandy Clay	19	2	28
Weathered Rock	23	10	33
Engineering Fill	20	2	28
Boulder Wall	24*	*High strength model adopted for boulder walls	
Gravel Base	17	0	38

Table 1: Proposed Geotechnical Parameters

Figure A below shows the adopted geotechnical model used in the global stability analysis.

The following assumptions were made in this global stability assessment:

- A surcharge load of 25kPa was applied 3m away from the top of the proposed retaining wall to account for loads to be imposed by the new dwelling.

- A 1.5m high by 3m wide ‘level 1’ compacted roadway made of engineering fill is to be constructed at the toe of the lower retaining wall to from part of the T-junction roadway.

- A phreatic surface was also included to allow for seepage effects during the wet season.

-

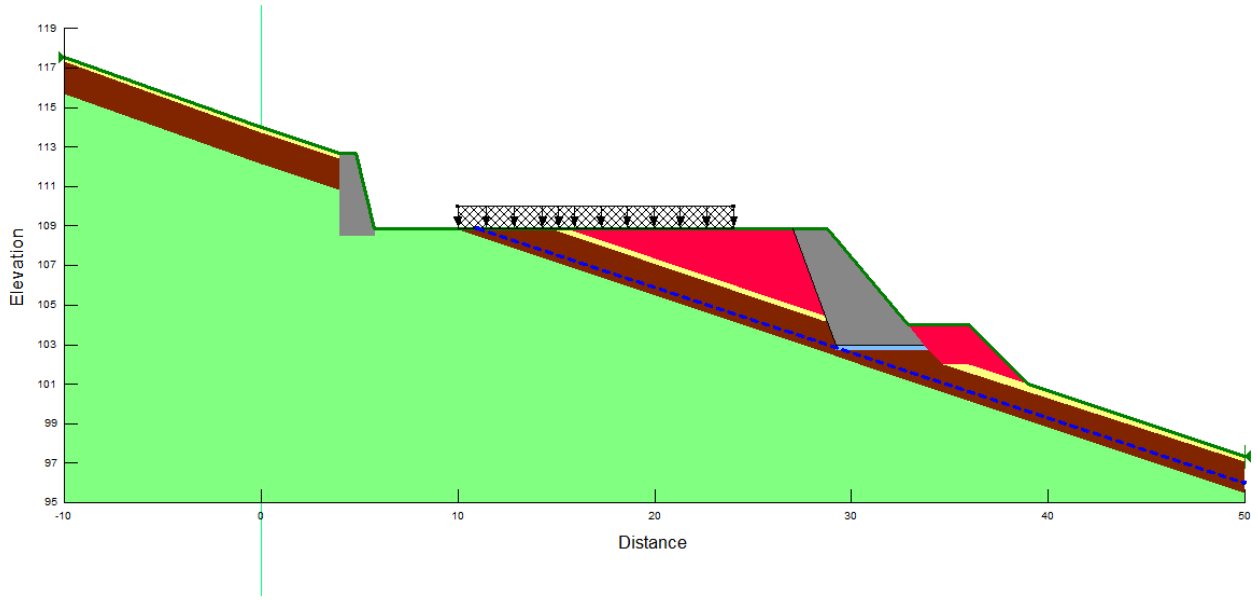


Figure A: model adopted, Section A-A

3.2 Global Stability Analysis Results

The results of the global stability analyses are attached in Appendix D and assess the global stability of the upper and lower boulder walls. The results of the Factor of Safety for the global stability analysis are presented in Table 2.

Figure	Cross Section	Factor of Safety
3	A-A	2.17
4	A-A	1.79

Table 2: Result of Global Stability Analysis

Based on the results, the analysed cross section of the proposed building envelope and retaining walls indicated a theoretical FOS against global instability of at least 1.5, which is considered acceptable for long term conditions.

This analysis does not account for the internal stability, overturning and sliding resistance of the boulder wall retaining walls themselves. The structural integrity of the boulder walls, along with 'safety in design' report of the retaining walls will be undertaken by and certified by wall designers

(Edge Consulting Engineers) to the full height of 6.0m. Furthermore, OB geotechnics do not take responsibility for the integrity of the any of the on-site retaining walls.

4 LIMITATIONS

The recommendations given in this report are based on the information provided regarding the proposed development with the findings of site investigation by others. Any change in the proposed development or building location may require additional testing and all recommendations should be reviewed

Occasionally, the subsurface conditions between the completed test locations may be found to be different (or may be interpreted to be different) from those expected. Variation can also occur with groundwater conditions, especially after climatic changes. If such differences appear to exist, we recommend that you immediately contact this office.

This report has been prepared for the particular development described above and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

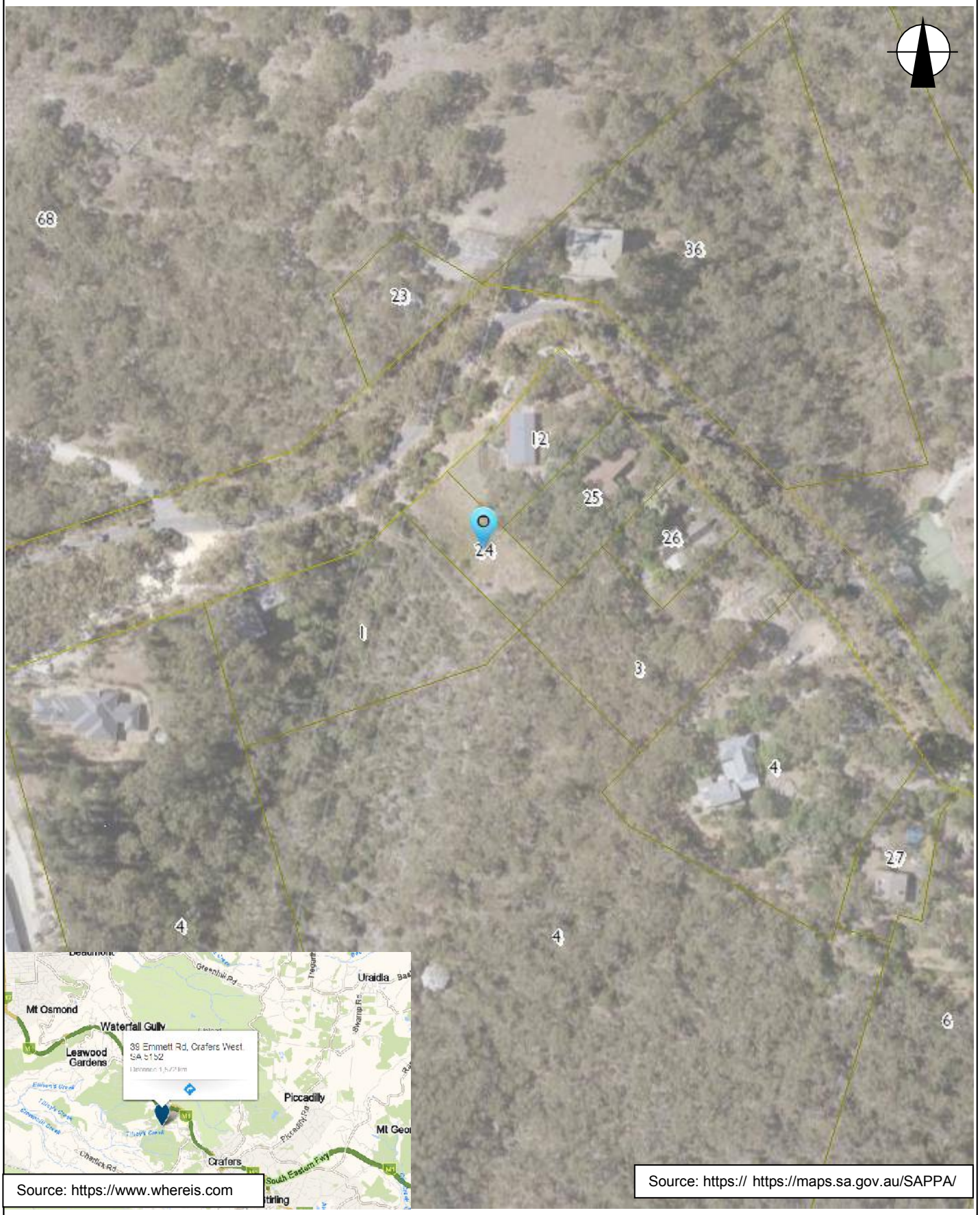
For and on behalf of OB Geotechnics

Dr Oded Ben-Nun
MIEAust (Civil, Structural), CPEng, RPEQ
Senior Geotechnical Consulting Engineer

OB Geothechnics
Email: office@obgeotechnics.com.au
Web: https://www.obgeotechnics.com.au
Mobile: 0414753130
8/90-96 Jonson Street, Byron Bay, NSW 2481

APPENDIX A:

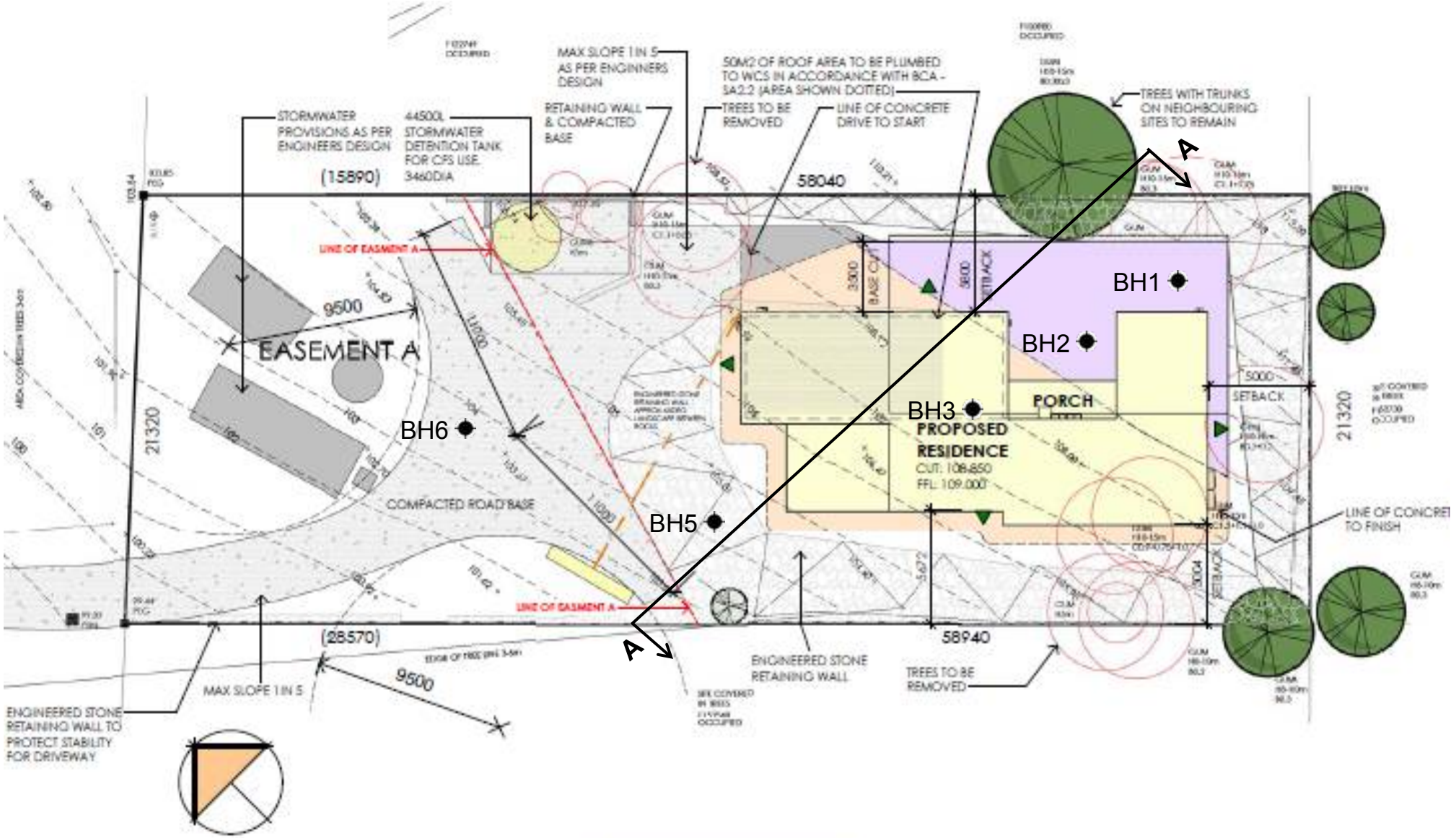
FIGURE 1: SITE LOCATION PLAN
FIGURE 2: TEST LOCATION PLAN



Source: https://www.whereis.com

Source: https:// https://maps.sa.gov.au/SAPPA/

Title:	**SITE LOCATION PLAN**	**OB Geothechnics**
Location:	39 Emmet Road, Crafers West, SA 5152	
Report No: P119OBN	Figure No: 1	
OB Geotechnics		



LEGEND

LOCATION OF BOREHOLES TESTS

Title: **TEST LOCATION AND CROSS SECTION A-A**

Location: 39 Emmet Road, Crafers West, SA 5152

Report No: P119OBN

Figure No: 2

OB Geotechnics

OB Geotechnics

APPENDIX B:

BOREHOLE LOGS BY OTHERS

COLIN R WALKER & ASSOCIATES PTY LTD

81 SYDENHAM RD, NORWOOD S.A. 5067 Telephone: (08) 8231 4150

SURFACE SOIL BORELOG

SITE: 39 EMMETT RD. CRAFERS WEST
JOB NO: F06820
DATE: 4.05.20

HOLE 1	HOLE 2	COLOUR	TEXTURE	M.C	SOIL DESCRIPTION	SYMBOL	EST Ipt.	REACT	BEARING
0-0.15	0-0.1	Grey Brown	Friable	Moist	Silty Sand	SM	0	-	L-LM
0.15-0.3	0.1-.025	Orange Brown	Friable	Damp	Clayey Sand	SC	0.005	VL	L-M
0.3-0.95	0.25-0.7	Red-Brown, Orange/Yellow mottled	Hard	≤PL	Silty, Sandy Clay	CL,ML	0.03	H	H
0.95-1.25	0.7-0.9	Orange/White	Firm	<PL	Very Silty/Clayey Weathered Siltstone Seams	ML	0.015	L/M	L-M
1.25-1.6	0.9-1.15	Orange/White/Brown	Friable	Damp	Clayey Sandy Silt, some Siltstone fragments	ML	0.005	VL	MH-H
1.6-2.0	1.15-1.3	Orange/Yell/Brown	Friable	Dry	Siltstone fragments, medium to coarse grained	-	0	-	H-VH
refusal	refusal								
Ys 26	Ys 19								

SITE DETAILS/REMARKS:

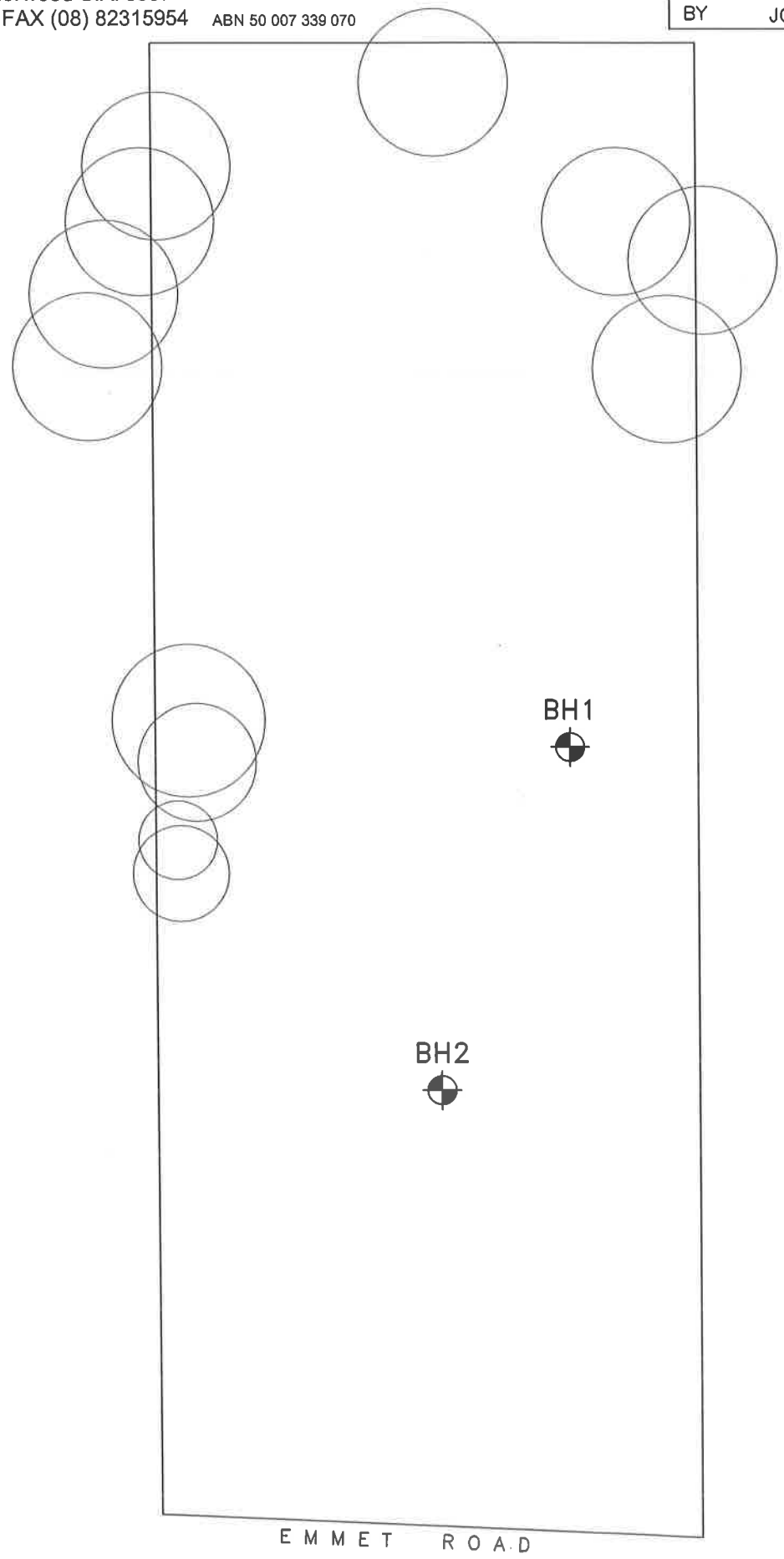
SAMPLING METHOD: Rock Auger
LOGGING: JF

A Site Level/Contour Plan is required to establish site falls and levels.
No water table encountered during soil sample recovery.
Site Classification **CLASS: "M-D"** where sampled, prior to consideration of any other effects.
Classifier: Colin R Walker & Associates Pty Ltd

CRW CONSULTING ENGINEERS

COLIN R WALKER & ASSOCIATES PTY LTD
81 Sydenham Rd. Norwood S.A. 5067
PH (08) 82314150 FAX (08) 82315954 ABN 50 007 339 070

39 EMMET RD. CRAFERS WEST S.A.	
JOB NO.	F06820
DATE	4.05.20
BY	JCW



APPROXIMATE BOREHOLE LOCATION PLAN APPROX 1:250

GENERAL NOTES ON SURFACE SOIL BORELOG

SOIL CLASSIFICATION

Soils are classified in accordance with the Unified Soil Classification System', and where possible with special reference to the Bulletin 46, Geological Survey of SA 'The Soils and Geology of the Adelaide Area'.

UNIFIED SOILS CLASSIFICATIONS (USC)

GP	Gravel	:	poorly graded; gravel sand mixtures, little or no fines.
GM	Gravel	:	excess silty fines, poorly graded gravel-sand-silt mixtures.
GC	Gravel	:	excess clayey fines; poorly graded gravel-sand-clay mixtures.
SW	Sand	:	well graded.
SP	Sand	:	poorly graded; poorly graded sands, gravely sands, little or no fines.
SM	Sand	:	excess silty fines; poorly graded sand-silt mixtures.
SC	Sand	:	excess clayey fines; poorly graded sand-clay mixtures.
ML	Silt	:	low plasticity; inorganic silts and very fine silty or clayey sands rock flour.
CL	Clay	:	low plasticity; inorganic clays of low to medium plasticity, gravely clay, sand, clays, silty clays, lean clays.
OL	Organic	:	low plasticity; organic silts and silt clays of low plasticity.
MH	Silt	:	high plasticity, inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
CH	Clay	:	high plasticity; inorganic clays of high plasticity, fat clays.
OH	Organic	:	high plasticity; organic clays of medium to high plasticity.

REACTIVITY

Reactivity is defined as the potential for a soil to undergo changes in volume with variation in moisture content. The reactivity is measured in terms of 'Instability Index' (Ipt%).

Term	Reactivity		Instability Index		
VL	Very Low	.....	0	to	0.5%
L	Low	.....	0.5%	to	1.0%
LM	Low to Medium	.....	1.0%	to	1.5%
M	Medium	.....	1.5%	to	2.0%
MH	Medium to High	.....	2.0%	to	2.5%
H	High	.....	2.5%	to	3.5%
VH	Very High	.....	3.5%	to	5.0%
EH	Extremely High	.....	5.0%	to	6.0%

MOISTURE CONTENT

Moisture content is measured as being relative to the plastic limit (PL) of the soil.

BEARING STRENGTH

Bearing strength is visually assessed, and relates to the in-situ strength at the time of logging. Bearing strength varies significantly with changes in soil moisture content, and it must be noted that any siteworks which expose and enable saturation of soils, may result in a reduction in bearing strength.

Term	Description		
VL	Very Low	.....	<50 kPa
L	Low	.....	50 - 100 kPa
M	Medium	.....	100 - 200 kPa
H	High	.....	200 - 400 kPa

SITE CLASSIFICATION

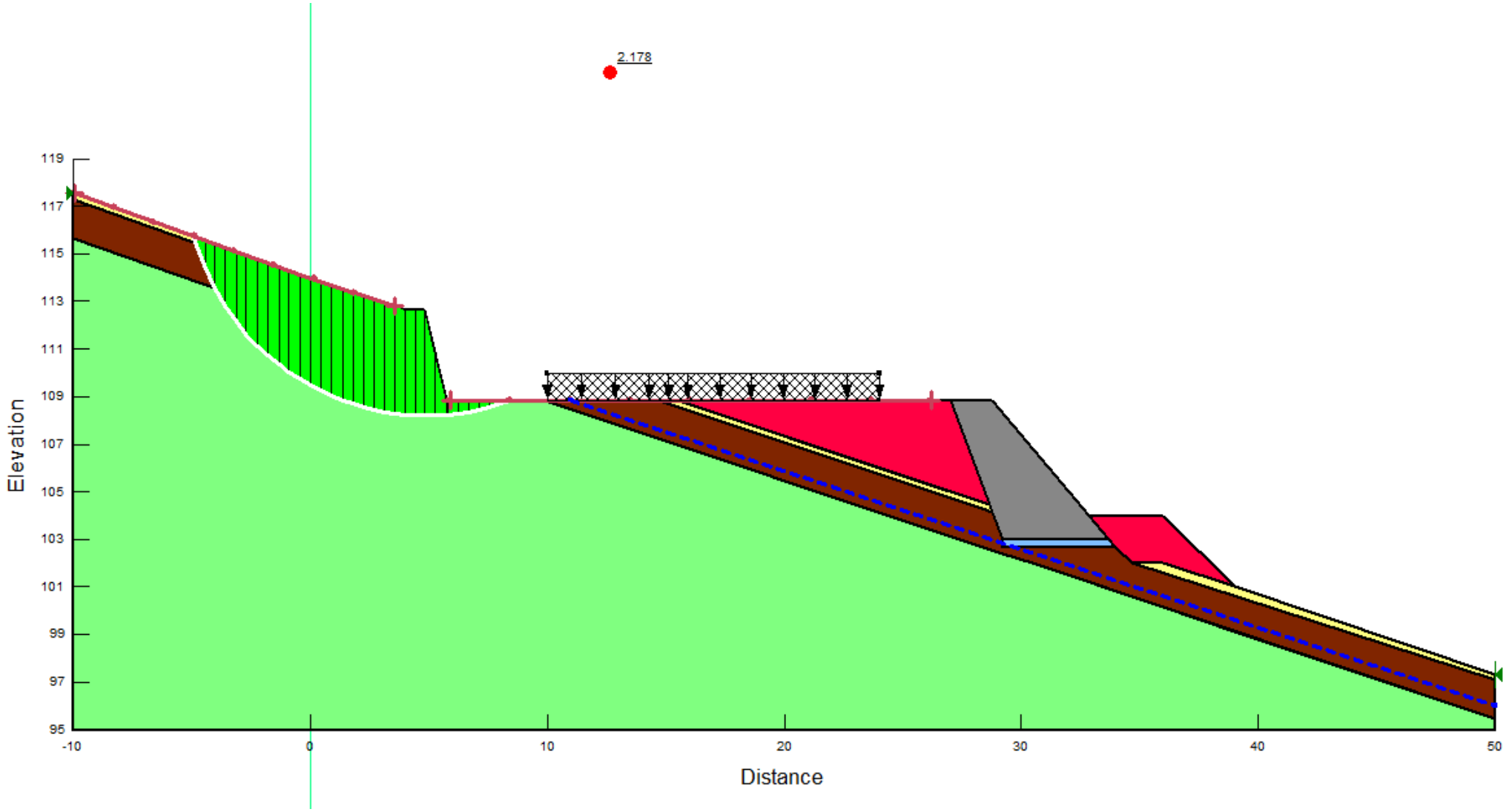
Foundation	Character	Class	Ys (mm)
Sand and Rock Silt and Some Clay	Stable	A S - D	0mm < Y_s ≤20mm
Moderately Reactive Clay Highly Reactive Clay Extremely Reactive Clay	Reactive	M - D H1 - D H2 - D E - D	20mm < Y_s ≤40mm 40mm < Y_s ≤60mm 60mm < Y_s ≤75mm Y_s >75mm
Sand Material Other Than Sand	Controlled Fill	A A to P	
Mine Subsidence Uncontrolled Fill Landslip Soft Collapsing Soils	Problem		

ABBREVIATIONS FOR SAMPLING METHODS

PT	Push Tube	PDPT	Portable Dynamic Push Tube
DPT	Dynamic Push Tube	HA	Hand Auger
AV	V – Bit	BH	Back Hoe
AR	Rock Bit	EX	Excavator

APPENDIX C:

GLOBAL STABILITY ANALYSIS RESULTS



LEGEND

Factor of Safety

Title:
Global Stability Analysis Section A-A – UPPER RETAINING WALL

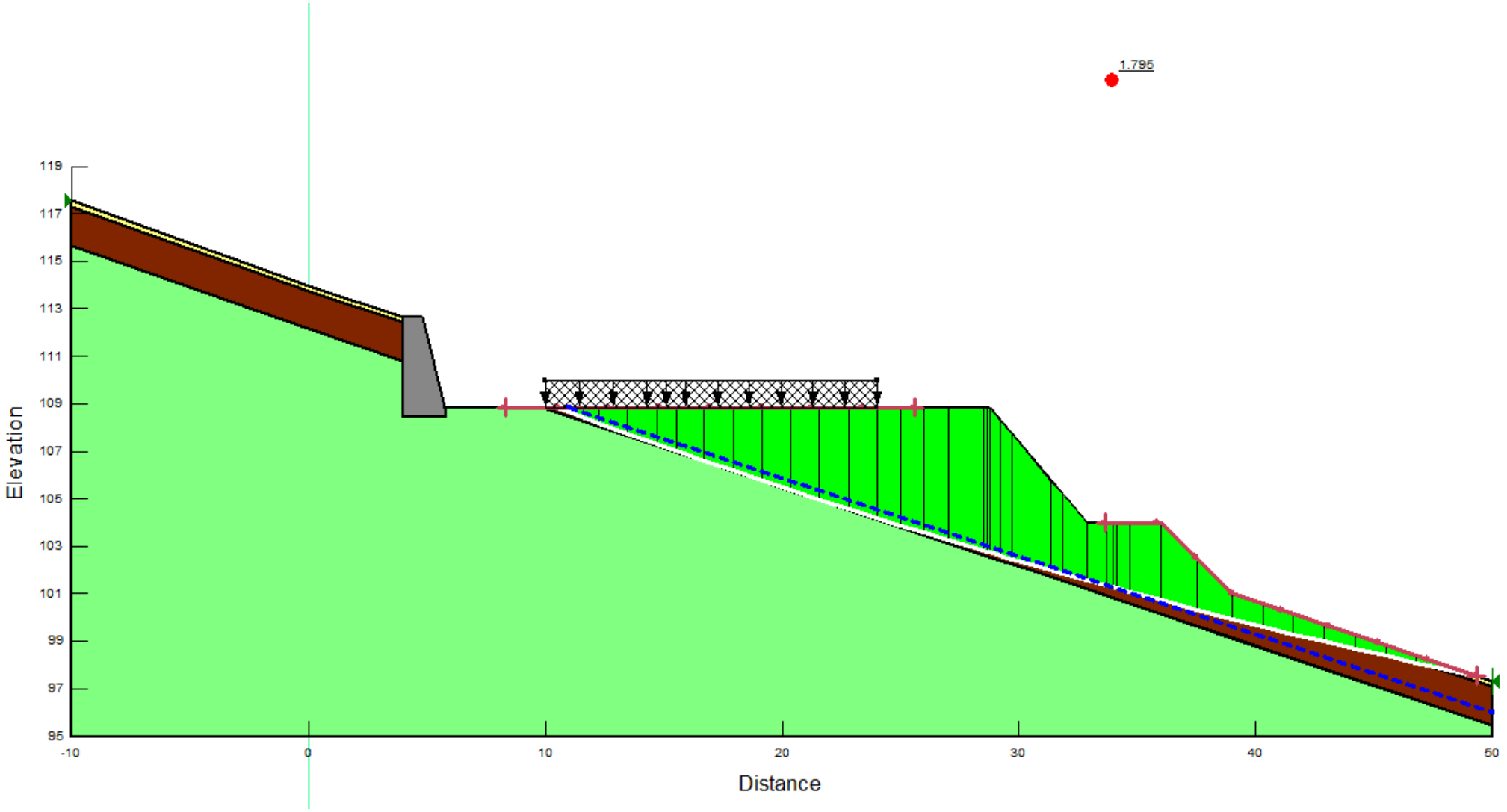
Location: 39 Emmet Road, Crafers West, SA 5152

Report No: P119OBN

Figure No: 3

OB Geotechnics

OB Geothechnics



LEGEND

Factor of Safety

Title:
Global Stability Analysis Section A-A – LOWER RETAINING WALL

Location: 39 Emmet Road, Crafers West, SA 5152

Report No: P119OBN

Figure No: 4

OB Geotechnics

OB Geothechnics

APPENDIX D:

GUIDANCE MATERIAL

LANDSLIDE RISK

Concept of Risk

Risk is a familiar term, but what does it really mean? It can be defined as *"a measure of the probability and severity of an adverse effect to health, property, or the environment."* This definition may seem a bit complicated. In relation to landslides, geotechnical practitioners (GeoGuide LR1) are required to assess risk in terms of the likelihood that a particular landslide will occur and the possible consequences. This is called landslide risk assessment. The consequences of a landslide are many and varied, but our concerns normally focus on loss of, or damage to, property and loss of life.

Landslide Risk Assessment

Some local councils in Australia are aware of the potential for landslides within their jurisdiction and have responded by designating specific “landslide hazard zones". Development in these areas is often covered by special regulations. If you are contemplating building, or buying an existing house, particularly in a hilly area, or near cliffs, go first for information to your local council.

Landslide risk assessment must be undertaken by a geotechnical practitioner. It may involve visual inspection, geological mapping, geotechnical investigation and monitoring to identify:

- potential landslides (there may be more than one that could impact on your site)
- the likelihood that they will occur
- the damage that could result
- the cost of disruption and repairs and
- the extent to which lives could be lost.

Risk assessment is a predictive exercise, but since the ground and the processes involved are complex, prediction tends to lack precision. If you commission a landslide risk assessment for a particular site you should expect to receive a report prepared in accordance with current professional guidelines and in a form that is acceptable to your local council, or planning authority.

Risk to Property

Table 1 indicates the terms used to describe risk to property. Each risk level depends on an assessment of how likely a landslide is to occur and its consequences in dollar terms. "Likelihood" is the chance of it happening in any one year, as indicated in Table 2. "Consequences" are related to the cost of repairs and temporary loss of use if a landslide occurs. These two factors are combined by the geotechnical practitioner to determine the Qualitative Risk.

TABLE 2: LIKELIHOOD

Likelihood	Annual Probability
Almost Certain	1:10
Likely	1:100
Possible	1:1,000
Unlikely	1:10,000
Rare	1:100,000
Barely credible	1:1,000,000

The terms "unacceptable", "may be tolerated", etc. in Table 1 indicate how most people react to an assessed risk level. However, some people will always be more prepared, or better able, to tolerate a higher risk level than others.

Some local councils and planning authorities stipulate a maximum tolerable level of risk to property for developments within their jurisdictions. In these situations the risk must be assessed by a geotechnical practitioner. If stabilisation works are needed to meet the stipulated requirements these will normally have to be carried out as part of the development, or consent will be withheld.

TABLE 1: RISK TO PROPERTY

Qualitative Risk		Significance - Geotechnical engineering requirements
Very high	VH	**Unacceptable** without treatment. Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to Low. May be too expensive and not practical. Work likely to cost more than the value of the property.
High	H	**Unacceptable** without treatment. Detailed investigation, planning and implementation of treatment options required to reduce risk to acceptable level. Work would cost a substantial sum in relation to the value of the property.
Moderate	M	**May be tolerated** in certain circumstances (subject to regulator's approval) but requires investigation, planning and implementation of treatment options to reduce the risk to Low. Treatment options to reduce to Low risk should be implemented as soon as possible.
Low	L	**Usually acceptable** to regulators. Where treatment has been needed to reduce the risk to this level, ongoing maintenance is required.
Very Low	VL	**Acceptable**. Manage by normal slope maintenance procedures.

AUSTRALIAN GEOGUIDE LR7 (LANDSLIDE RISK)

Risk to Life

Most of us have some difficulty grappling with the concept of risk and deciding whether, or not, we are prepared to accept it. However, without doing any sort of analysis, or commissioning a report from an "expert", we all take risks every day. One of them is the risk of being killed in an accident. This is worth thinking about, because it tells us a lot about ourselves and can help to put an assessed risk into a meaningful context. By identifying activities that we either are, or are not, prepared to engage in we can get some indication of the maximum level of risk that we are prepared to take. This knowledge can help us to decide whether we really are able to accept a particular risk, or to tolerate a particular likelihood of loss, or damage, to our property (Table 2).

In Table 3, data from NSW for the years 1998 to 2002, and other sources, is presented. A risk of 1 in 100,000 means that, in any one year, 1 person is killed for every 100,000 people undertaking that particular activity. The NSW data assumes that the whole population undertakes the activity. That is, we are all at risk of being killed in a fire, or of choking on our food, but it is reasonable to assume that only people who go deep sea fishing run a risk of being killed while doing it.

It can be seen that the risks of dying as a result of falling, using a motor vehicle, or engaging in water-related activities (including bathing) are all greater than 1:100,000 and yet few people actively avoid situations where these risks are present. Some people are averse to flying and yet it represents a lower risk than choking to death on food. Importantly, the data also indicate that, even when the risk of dying as a consequence of a particular event is very small, it could still happen to any one of us any day. If this were not so, no one would ever be struck by lightning.

Most local councils and planning authorities that stipulate a tolerable risk to property also stipulate a tolerable risk to life. The AGS Practice Note Guideline recommends that 1:100,000 is tolerable in newly developed areas, where works can be carried out as part of the development to limit risk. The tolerable level is raised to 1:10,000 in established areas, where specific landslide hazards may have existed for many years. The distinction is deliberate and intended to prevent the concept of landslide risk management, for its own sake, becoming an unreasonable financial burden on existing communities. Acceptable risk is usually taken to be one tenth of the tolerable risk (1:1,000,000 for new developments and 1:100,000 for established areas) and efforts should be made to attain these where it is practicable and financially realistic to do so.

TABLE 3: RISK TO LIFE

Risk (deaths per participant per year)	**Activity/Event Leading to Death** (NSW data unless noted)
1:1,000	Deep sea fishing (UK)
1:1,000 to 1:10,000	Motor cycling, horse riding , ultra-light flying (Canada)
1:23,000	Motor vehicle use
1:30,000	Fall
1:70,000	Drowning
1:180,000	Fire/burn
1:660,000	Choking on food
1:1,000,000	Scheduled airlines (Canada)
1:2,300,000	Train travel
1:32,000,000	Lightning strike

More information relevant to your particular situation may be found in other AUSTRALIAN GEOGUIDES:

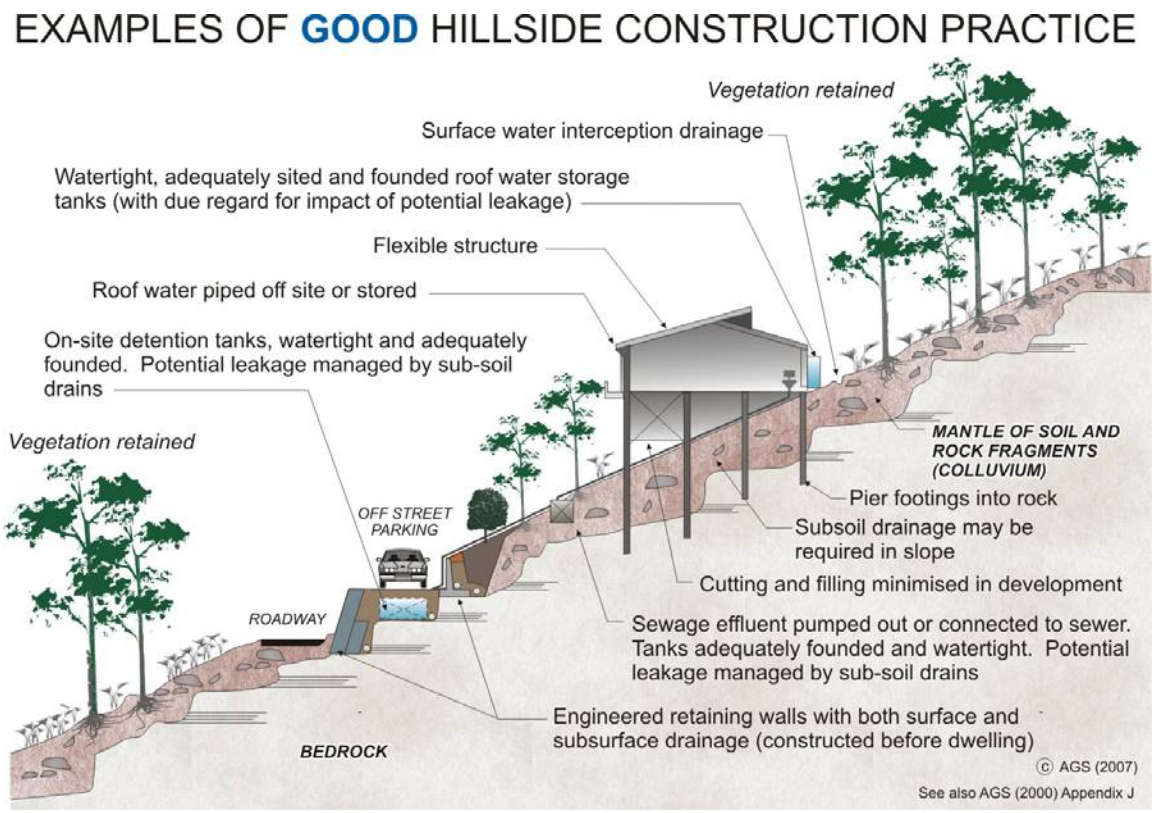
- GeoGuide LR1 - Introduction
- GeoGuide LR2 - Landslides
- GeoGuide LR3 - Landslides in Soil
- GeoGuide LR4 - Landslides in Rock
- GeoGuide LR5 - Water & Drainage
- GeoGuide LR6 - Retaining Walls
- GeoGuide LR8 - Hillside Construction
- GeoGuide LR9 - Effluent & Surface Water Disposal
- GeoGuide LR10 - Coastal Landslides
- GeoGuide LR11 - Record Keeping

The Australian GeoGuides (LR series) are a set of publications intended for property owners; local councils; planning authorities; developers; insurers; lawyers and, in fact, anyone who lives with, or has an interest in, a natural or engineered slope, a cutting, or an excavation. They are intended to help you understand why slopes and retaining structures can be a hazard and what can be done with appropriate professional advice and local council approval (if required) to remove, reduce, or minimise the risk they represent. The GeoGuides have been prepared by the Australian Geomechanics Society, a specialist technical society within Engineers Australia, the national peak body for all engineering disciplines in Australia, whose members are professional geotechnical engineers and engineering geologists with a particular interest in ground engineering. The GeoGuides have been funded under the Australian governments' National Disaster Mitigation Program.

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

HILLSIDE CONSTRUCTION PRACTICE

Sensible development practices are required when building on hillsides, particularly if the hillside has more than a low risk of instability (GeoGuide LR7). Only building techniques intended to maintain, or reduce, the overall level of landslide risk should be considered. Examples of good hillside construction practice are illustrated below.



WHY ARE THESE PRACTICES GOOD?

Roadways and parking areas - are paved and incorporate kerbs which prevent water discharging straight into the hillside (GeoGuide LR5).

Cuttings - are supported by retaining walls (GeoGuide LR6).

Retaining walls - are engineer designed to withstand the lateral earth pressures and surcharges expected, and include drains to prevent water pressures developing in the backfill. Where the ground slopes steeply down towards the high side of a retaining wall, the disturbing force (see GeoGuide LR6) can be two or more times that in level ground. Retaining walls must be designed taking these forces into account.

Sewage - whether treated or not is either taken away in pipes or contained in properly founded tanks so it cannot soak into the ground.

Surface water - from roofs and other hard surfaces is piped away to a suitable discharge point rather than being allowed to infiltrate into the ground. Preferably, the discharge point will be in a natural creek where ground water exits, rather than enters, the ground. Shallow, lined, drains on the surface can fulfil the same purpose (GeoGuide LR5).

Surface loads - are minimised. No fill embankments have been built. The house is a lightweight structure. Foundation loads have been taken down below the level at which a landslide is likely to occur and, preferably, to rock. This sort of construction is probably not applicable to soil slopes (GeoGuide LR3). If you are uncertain whether your site has rock near the surface, or is essentially a soil slope, you should engage a geotechnical practitioner to find out.

Flexible structures - have been used because they can tolerate a certain amount of movement with minimal signs of distress and maintain their functionality.

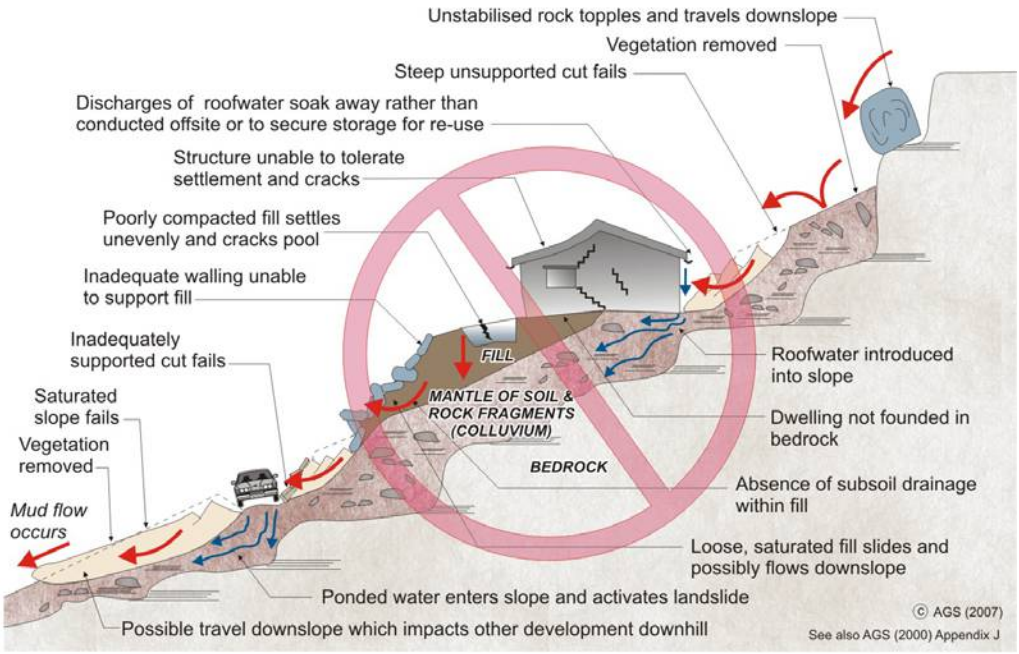
Vegetation clearance - on soil slopes has been kept to a reasonable minimum. Trees, and to a lesser extent smaller vegetation, take large quantities of water out of the ground every day. This lowers the ground water table, which in turn helps to maintain the stability of the slope. Large scale clearing can result in a rise in water table with a consequent increase in the likelihood of a landslide (GeoGuide LR5). An exception may have to be made to this rule on steep rock slopes where trees have little effect on the water table, but their roots pose a landslide hazard by dislodging boulders.

Possible effects of ignoring good construction practices are illustrated on page 2. Unfortunately, these poor construction practices are not as unusual as you might think and are often chosen because, on the face of it, they will save the developer, or owner, money. You should not lose sight of the fact that the cost and anguish associated with any one of the disasters illustrated, is likely to more than wipe out any apparent savings at the outset.

ADOPT GOOD PRACTICE ON HILLSIDE SITES

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

EXAMPLES OF **POOR** HILLSIDE CONSTRUCTION PRACTICE



WHY ARE THESE PRACTICES POOR?

Roadways and parking areas - are unsurfaced and lack proper table drains (gutters) causing surface water to pond and soak into the ground.

Cut and fill - has been used to balance earthworks quantities and level the site leaving unstable cut faces and added large surface loads to the ground. Failure to compact the fill properly has led to settlement, which will probably continue for several years after completion. The house and pool have been built on the fill and have settled with it and cracked. Leakage from the cracked pool and the applied surface loads from the fill have combined to cause landslides.

Retaining walls - have been avoided, to minimise cost, and hand placed rock walls used instead. Without applying engineering design principles, the walls have failed to provide the required support to the ground and have failed, creating a very dangerous situation.

A heavy, rigid, house - has been built on shallow, conventional, footings. Not only has the brickwork cracked because of the resulting ground movements, but it has also become involved in a man-made landslide.

Soak-away drainage - has been used for sewage and surface water run-off from roofs and pavements. This water soaks into the ground and raises the water table (GeoGuide LR5). Subsoil drains that run along the contours should be avoided for the same reason. If felt necessary, subsoil drains should run steeply downhill in a chevron, or herring bone, pattern. This may conflict with the requirements for effluent and surface water disposal (GeoGuide LR9) and if so, you will need to seek professional advice.

Rock debris - from landslides higher up on the slope seems likely to pass through the site. Such locations are often referred to by geotechnical practitioners as "debris flow paths". Rock is normally even denser than ordinary fill, so even quite modest boulders are likely to weigh many tonnes and do a lot of damage once they start to roll. Boulders have been known to travel hundreds of metres downhill leaving behind a trail of destruction.

Vegetation - has been completely cleared, leading to a possible rise in the water table and increased landslide risk (GeoGuide LR5).

DON'T CUT CORNERS ON HILLSIDE SITES - OBTAIN ADVICE FROM A GEOTECHNICAL PRACTITIONER

More information relevant to your particular situation may be found in other Australian GeoGuides:

- GeoGuide LR1 - Introduction
- GeoGuide LR2 - Landslides
- GeoGuide LR3 - Landslides in Soil
- GeoGuide LR4 - Landslides in Rock
- GeoGuide LR5 - Water & Drainage
- GeoGuide LR6 - Retaining Walls
- GeoGuide LR7 - Landslide Risk
- GeoGuide LR9 - Effluent & Surface Water Disposal
- GeoGuide LR10 - Coastal Landslides
- GeoGuide LR11 - Record Keeping

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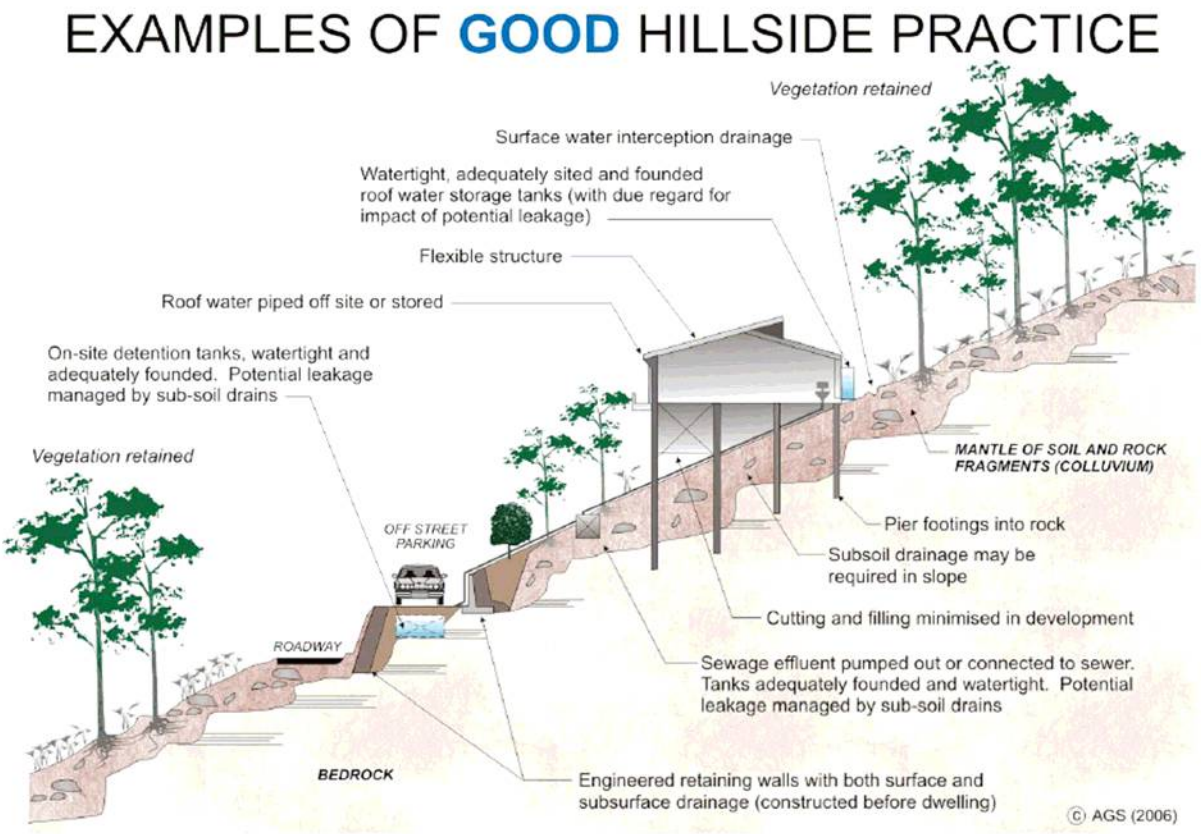
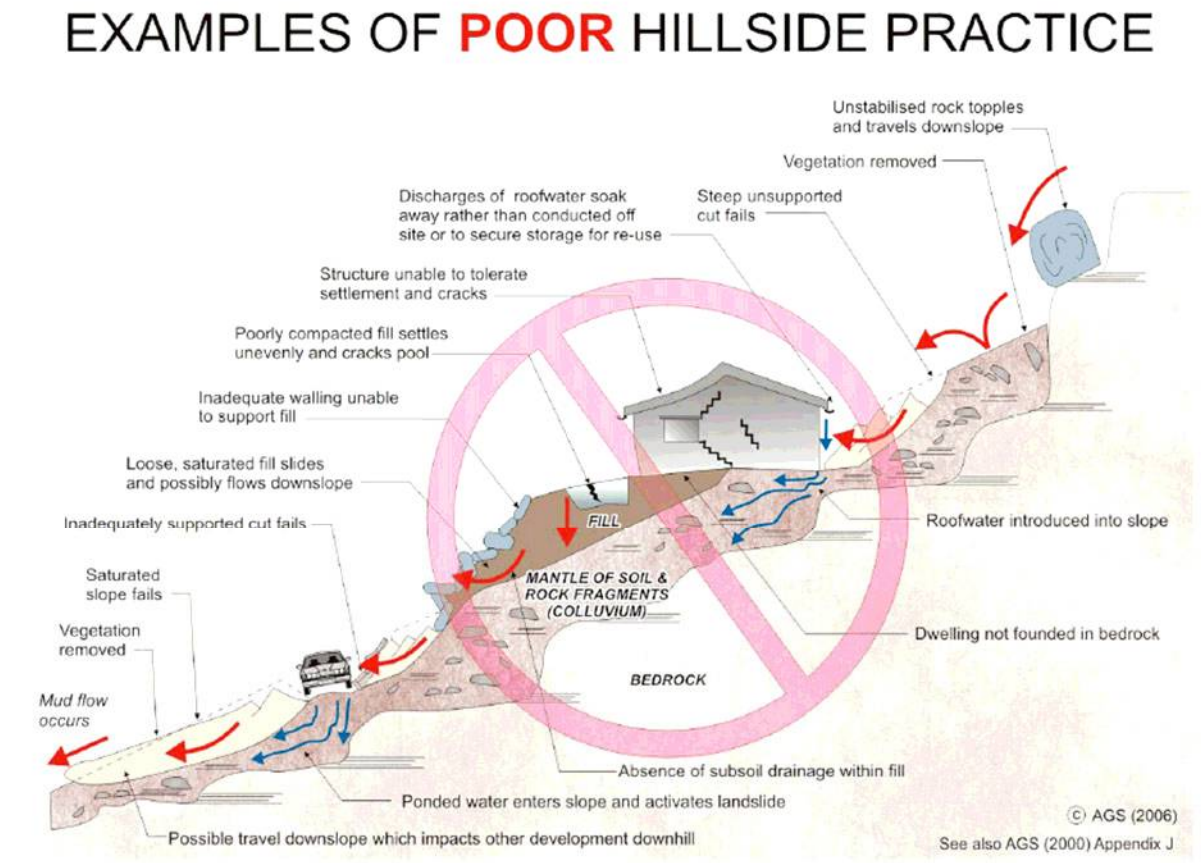
APPENDIX G - SOME GUIDELINES FOR HILLSIDE CONSTRUCTION

	GOOD ENGINEERING PRACTICE	*POOR ENGINEERING PRACTICE*
ADVICE		
GEOTECHNICAL ASSESSMENT	Obtain advice from a qualified, experienced geotechnical practitioner at early stage of planning and before site works.	Prepare detailed plan and start site works before geotechnical advice.
PLANNING		
SITE PLANNING	Having obtained geotechnical advice, plan the development with the risk arising from the identified hazards and consequences in mind.	Plan development without regard for the Risk.
DESIGN AND CONSTRUCTION		
HOUSE DESIGN	Use flexible structures which incorporate properly designed brickwork, timber or steel frames, timber or panel cladding. Consider use of split levels. Use decks for recreational areas where appropriate.	Floor plans which require extensive cutting and filling. Movement intolerant structures.
SITE CLEARING	Retain natural vegetation wherever practicable.	Indiscriminately clear the site.
ACCESS & DRIVEWAYS	Satisfy requirements below for cuts, fills, retaining walls and drainage. Council specifications for grades may need to be modified. Driveways and parking areas may need to be fully supported on piers.	Excavate and fill for site access before geotechnical advice.
EARTHWORKS	Retain natural contours wherever possible.	Indiscriminatory bulk earthworks.
CUTS	Minimise depth. Support with engineered retaining walls or batter to appropriate slope. Provide drainage measures and erosion control.	Large scale cuts and benching. Unsupported cuts. Ignore drainage requirements
FILLS	Minimise height. Strip vegetation and topsoil and key into natural slopes prior to filling. Use clean fill materials and compact to engineering standards. Batter to appropriate slope or support with engineered retaining wall. Provide surface drainage and appropriate subsurface drainage.	Loose or poorly compacted fill, which if it fails, may flow a considerable distance including onto property below. Block natural drainage lines. Fill over existing vegetation and topsoil. Include stumps, trees, vegetation, topsoil, boulders, building rubble etc in fill.
ROCK OUTCROPS & BOULDERS	Remove or stabilise boulders which may have unacceptable risk. Support rock faces where necessary.	Disturb or undercut detached blocks or boulders.
RETAINING WALLS	Engineer design to resist applied soil and water forces. Found on rock where practicable. Provide subsurface drainage within wall backfill and surface drainage on slope above. Construct wall as soon as possible after cut/fill operation.	Construct a structurally inadequate wall such as sandstone flagging, brick or unreinforced blockwork. Lack of subsurface drains and weepholes.
FOOTINGS	Found within rock where practicable. Use rows of piers or strip footings oriented up and down slope. Design for lateral creep pressures if necessary. Backfill footing excavations to exclude ingress of surface water.	Found on topsoil, loose fill, detached boulders or undercut cliffs.
SWIMMING POOLS	Engineer designed. Support on piers to rock where practicable. Provide with under-drainage and gravity drain outlet where practicable. Design for high soil pressures which may develop on uphill side whilst there may be little or no lateral support on downhill side.	
DRAINAGE		
SURFACE	Provide at tops of cut and fill slopes. Discharge to street drainage or natural water courses. Provide general falls to prevent blockage by siltation and incorporate silt traps. Line to minimise infiltration and make flexible where possible. Special structures to dissipate energy at changes of slope and/or direction.	Discharge at top of fills and cuts. Allow water to pond on bench areas.
SUBSURFACE	Provide filter around subsurface drain. Provide drain behind retaining walls. Use flexible pipelines with access for maintenance. Prevent inflow of surface water.	Discharge roof runoff into absorption trenches.
SEPTIC & SULLAGE	Usually requires pump-out or mains sewer systems; absorption trenches may be possible in some areas if risk is acceptable. Storage tanks should be water-tight and adequately founded.	Discharge sullage directly onto and into slopes. Use absorption trenches without consideration of landslide risk.
EROSION CONTROL & LANDSCAPING	Control erosion as this may lead to instability. Revegetate cleared area.	Failure to observe earthworks and drainage recommendations when landscaping.
DRAWINGS AND SITE VISITS DURING CONSTRUCTION		
DRAWINGS	Building Application drawings should be viewed by geotechnical consultant	
SITE VISITS	Site Visits by consultant may be appropriate during construction/	
INSPECTION AND MAINTENANCE BY OWNER		
OWNER'S RESPONSIBILITY	Clean drainage systems; repair broken joints in drains and leaks in supply pipes. Where structural distress is evident see advice. If seepage observed, determine causes or seek advice on consequences.	


EXAMPLES OF GOOD HILLSIDE PRACTICE
Vegetation retained
Surface water interception drainage
Watertight, adequately sited and founded roof water storage tanks (with due regard for impact of potential leakage)
Flexible structure
Roof water piped off site or stored
On-site detention tanks, watertight and adequately founded. Potential leakage managed by sub-soil drains
Vegetation retained
OFF STREET PARKING
ROADWAY
BEDROCK
MANTLE OF SOIL AND ROCK FRAGMENTS (COLLUVIUM)
Pier footings into rock
Subsoil drainage may be required in slope
Cutting and filling minimised in development
Sewage effluent pumped out or connected to sewer. Tanks adequately founded and watertight. Potential leakage managed by sub-soil drains
Engineered retaining walls with both surface and subsurface drainage (constructed before dwelling)
© AGS (2006)


EXAMPLES OF POOR HILLSIDE PRACTICE
Unstabilised rock topples and travels downslope
Vegetation removed
Discharges of roofwater soak away rather than conducted off site or to secure storage for re-use
Steep unsupported cut fails
Structure unable to tolerate settlement and cracks
Poorly compacted fill settles unevenly and cracks pool
Inadequate walling unable to support fill
Loose, saturated fill slides and possibly flows downslope
Inadequately supported cut fails
FILL
Roofwater introduced into slope
Saturated slope fails
MANTLE OF SOIL & ROCK FRAGMENTS (COLLUVIUM)
Vegetation removed
Dwelling not founded in bedrock
BEDROCK
Mud flow occurs
Absence of subsoil drainage within fill
Ponded water enters slope and activates landslide
Possible travel downslope which impacts other development downhill
© AGS (2006)
See also AGS (2000) Appendix J

APPENDIX E:

DRAWINGS

GENERAL NOTES (NCC 2019 BCA Vol 2)

- ALL MATERIALS AND WORK PRACTICES SHALL COMPLY WITH, BUT NOT LIMITED TO THE BUILDING REGULATIONS 2018, NATIONAL CONSTRUCTION CODE SERIES 2019, THE BUILDING CODE OF AUSTRALIA VOL 2 AND ALL RELEVANT CURRENT AUSTRALIAN STANDARDS (AS AMENDED) REFERRED TO THEREIN.
- UNLESS OTHERWISE SPECIFIED THE TERM BCA SHALL REFER TO NATIONAL CONSTRUCTION CODE SERIES 2019 BUILDING CODE OF AUSTRALIA VOLUME 2
ALL MATERIALS AND CONSTRUCTION PRACTICE SHALL MEET THE PERFORMANCE REQUIREMENTS OF THE BCA. WHERE A PERFORMANCE SOLUTION IS PROPOSED THEN, PRIOR TO IMPLEMENTATION OR INSTALLATION, IT FIRST MUST BE ASSESSED AND APPROVED BY THE RELEVANT BUILDING SURVEYOR AS MEETING THE PERFORMANCE REQUIREMENTS OF THE BCA.
- GLAZING INCLUDING SAFETY GLAZING SHALL BE INSTALLED TO A SIZE, TYPE & THICKNESS SO AS TO COMPLY WITH;
  - BCA PART 3.6 FOR CLASS 1 AND 10 BUILDINGS WITHIN A DESIGN WIND SPEED OF NOT MORE THAN N3, AND
  - BCA VOL 1 PART B1.4 FOR CLASS 2 TO 9 BUILDINGS
- WATERPROOFING OF WET AREAS, BEING BATHROOMS, SHOWERS, SHOWER ROOMS, LAUNDRIES, SANITARY COMPARTMENTS AND THE LIKE SHALL BE PROVIDED IN ACCORDANCE WITH AS 3740-2010: WATERPROOFING OF DOMESTIC WET AREAS.

SUSTAINABILITY MEASURES FOR NEW CLASS 1 BUILDINGS.

THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ANY HOUSE ENERGY RATING (HERS) REPORT AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE STAMPED PLANS ENDORSED BY THE ACCREDITED THERMAL PERFORMANCE ASSESSOR WITHOUT ALTERATION.

SITE BUSHFIRE ATTACK ASSESSMENT.

REFERENCE DOCUMENT AS 3959-2018 CONSTRUCTION OF BUILDINGS IN BUSHFIRE PRONE AREAS.
- THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT STRUCTURAL AND ALL OTHER CONSULTANTS DRAWINGS/ DETAILS AND WITH ANY OTHER WRITTEN INSTRUCTIONS ISSUED IN THE COURSE OF THE CONTRACT.
- SITE PLAN MEASUREMENTS IN MILLIMETRES - ALL OTHER MEASUREMENTS IN MILLIMETRES U.N.O.
- FIGURED DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS.
THE BUILDER SHALL TAKE ALL STEPS NECESSARY TO ENSURE THE STABILITY AND GENERAL WATER TIGHTNESS OF ALL NEW AND/OR EXISTING STRUCTURES DURING ALL WORKS.
- THE BUILDER AND SUBCONTRACTORS SHALL CHECK AND VERIFY ALL DIMENSIONS, SETBACKS, LEVELS AND SPECIFICATIONS AND ALL OTHER RELEVANT DOCUMENTATION PRIOR TO THE COMMENCEMENT OF ANY WORKS. REPORT ALL DISCREPANCIES TO THIS OFFICE FOR CLARIFICATION

SITE CLASSIFICATION

SITE CLASSIFICATION AS CLASS:	TBC
REFER TO SOIL REPORT NO:	TBC
BY:	TBC

STORMWATER

90mmØ (UPTO 250m2) OR 100mmØ (OVER 250m2) CLASS 6 UPVC STORMWATER LINE LAID TO A MINIMUM GRADE OF 1:100 AND CONNECTED TO THE LEGAL POINT OF STORMWATER DISCHARGE. PROVIDE INSPECTION OPENINGS AT 9000MM C/C AND AT EACH CHANGE OF DIRECTION. THE COVER TO UNDERGROUND STORMWATER DRAINS SHALL BE NOT LESS THAN
100MM UNDER SOIL
50MM UNDER PAVED OR CONCRETE AREAS
- 100MM UNDER UNREINFORCED CONCRETE OR PAVED DRIVEWAYS
- 75MM UNDER REINFORCED CONCRETE DRIVEWAYS

AUTHORITIES/CONSULTANTS

MUNICIPALITY NAME:	ADELAIDE HILLS COUNCIL
SEWAGE AUTHORITY:	TBC
CONSULTING STRUCTURAL ENGINEER:	TBC
GEOTECHNICAL ENGINEER:	TBC
THERMAL PERFORMANCE ASSESSOR:	TBC

- STEP SIZES (OTHER THAN FOR SPIRAL STAIRS) TO BE:
- RISERS (R) 190MM MAXIMUM AND 115MM MINIMUM
- GOING (G) 355MM MAXIMUM AND 240MM MINIMUM
- 2R + 1G = 700MM MAXIMUM AND 550MM MINIMUM
- WITH LESS THAN 125MM MAXIMUM GAP BETWEEN OPEN TREADS
ALL TREADS, LANDINGS AND THE LIKE TO HAVE A SLIP RESISTANCE CLASSIFICATIONOF P3 OR R10 FOR DRY SURFACE CONDITIONS AND P4 OR R11 FOR WET SURFACE CONDITIONS, OR A NOSING STRIP WITH A SLIP RESISTANCE CLASSIFICATION OF P3 FOR DRY SURFACE CONDITIONS AND P4 FOR WET SURFACE CONDITIONS.
PROVIDE BARRIERS WHERE CHANGE IN LEVEL EXCEEDS 1000MM ABOVE THE SURFACE BENEATH LANDINGS, RAMPS AND/OR TREADS. BARRIERS (OTHER THAN TENSIONED WIRE BALUSTRADES) TO BE:
1000MM MIN. ABOVE FINISHED SURFACE LEVEL OF BALCONIES, LANDINGS OR THE LIKE, AND
- 865MM MIN. ABOVE FINISHED SURFACE LEVEL OF STAIR NOSING OR RAMP, AND
- VERTICAL WITH LESS THAN 125MM GAP BETWEEN, AND
ANY HORIZONTAL ELEMENT WITHIN THE BALUSTRADE BETWEEN 150MM AND 760MM ABOVE THE FLOOR MUST NOT FACILITATE CLIMBING WHERE CHANGES IN LEVEL EXCEEDS 4000MM ABOVE THE SURFACE BENEATH LANDINGS, RAMPS AND/OR TREADS.
WIRE BARRIER CONSTRUCTION TO COMPLY WITH NCC 2019 BCA PART 3.9.2.3 FOR CLASS 1 AND 10 BUILDINGS AND NCC 2019 BCA VOLUME 1 PART D2.16 FOR OTHER CLASSES OF BUILDINGS.
- TOP OF HAND RAILS TO BE 865MM MINIMUM ABOVE STAIR NOSING AND FLOOR SURFACE OF RAMPS.
- WINDOW SIZES NOMINATED ARE NOMINAL ONLY. ACTUAL SIZE MAY VARY ACCORDING TO MANUFACTURER. WINDOWS TO BE FLASHED ALL AROUND.
WHERE THE BUILDING (EXCLUDES A DETACHED CLASS 10) IS LOCATED IN A TERMITE PRONE AREA THE AREA TO UNDERSIDE OF BUILDING AND PERIMETER IS TO BE PROVIDED WITH A TERMITE MANAGEMENT SYSTEM.
- CONCRETE STUMPS: UP TO 1400MM LONG TO BE 100MM X 100MM (1 NO. H.D. WIRE) 1401MM TO 1800MM LONG TO BE 100MM X 100MM (2 NO. H.D. WIRES) 1801MM TO 3000MM LONG TO BE 125MM X 125MM (2 NO. H.D. WIRES)
100MM X 100MM STUMPS EXCEEDING 1200MM ABOVE GROUND LEVEL TO BE BRACED WHERE NO PERIMETER BASE BRICKWORK PROVIDED.
- BUILDINGS IN MARINE OR OTHER EXPOSURE ENVIRONMENTS SHALL HAVE MASONRY UNITS, MORTAR AND ALL BUILT IN COMPONENTS AND THE LIKE COMPLYING WITH THE DURABILITY REQUIREMENTS OF TABLE 4.1 OF AS4773.1 2015 MASONRY IN SMALL BUILDINGS PART 1:DESIGN
- EXTERNAL WALL TO BE PROVIDED WITH AS 4200.1 COMPLIANT VAPOUR PERMEABLE MEMBRANES INSTALLED IN ACCORDANCE WITH AS 4200.2
ALL STORMWATER TO BE TAKEN TO THE LEGAL POINT OF DISCHARGE TO THE RELEVANT AUTHORITIES APPROVAL.
- INSTALLATION OF ALL SERVICES SHALL COMPLY WITH THE RESPECTIVE SUPPLY AUTHORITY REQUIREMENTS.
EXHAUST SYSTEMS INSTALLED IN A KITCHEN, BATHROOM, SANITARY COMPARTMENT OR LAUNDRY MUST HAVE A MINIMUM FLOW RATE OF 25 L/S FOR A BATHROOM OR SANITARY COMPARTMENT AND 40 L/S FOR A KITCHEN OR LAUNDRY AND MUST BE DISCHARGED DIRECTLY OR VIA A SHAFT OR DUCT TO OUTDOOR AIR.
- THE BUILDER AND SUBCONTRACTOR SHALL ENSURE THAT ALL STORMWATER DRAINS, SEWER PIPES AND THE LIKE ARE LOCATED AT A SUFFICIENT DISTANCE FROM ANY BUILDINGS FOOTING AND/OR SLAB EDGE BEAMS SO AS TO PREVENT GENERAL MOISTURE PENETRATION, DAMPNESS, WEAKENING AND UNDERMINING OF ANY BUILDING AND ITS FOOTING SYSTEM.
- THESE PLANS HAVE BEEN PREPARED FOR THE EXCLUSIVE USE BY THE CLIENT OF HARVAN DESIGN (THE DESIGNER) FOR THE PURPOSE EXPRESSLY NOTIFIED TO THE DESIGNER. ANY OTHER PERSON WHO USES OR RELIES ON THESE PLANS WITHOUT THE DESIGNER'S WRITTEN CONSENT DOES SO AT THEIR OWN RISK AND NO RESPONSIBILITY IS ACCEPTED BY THE DESIGNER FOR SUCH USE AND/ OR RELIANCE.
A BUILDING PERMIT IS REQUIRED PRIOR TO THE COMMENCEMENT OF THESE WORKS. THE RELEASE OF THESE DOCUMENTS IS CONDITIONAL TO THE OWNER OBTAINING THE REQUIRED BUILDING PERMIT.
- THE CLIENT AND/OR THE CLIENT'S BUILDER SHALL NOT MODIFY OR AMEND THE PLANS WITHOUT THE KNOWLEDGE AND CONSENT OF HARVAN DESIGN EXCEPT WHERE A REGISTERED BUILDING SURVEYOR MAKES MINOR NECESSARY CHANGES TO FACILITATE THE BUILDING PERMIT APPLICATION AND THAT SUCH CHANGES ARE PROMPTLY REPORTED BACK TO HARVAN DESIGN.
THE APPROVAL BY THIS OFFICE OF A SUBSTITUTE MATERIAL, WORK PRACTICE, VARIATION OR THE LIKE IS NOT AN AUTHORISATION FOR ITS USE OR A CONTRACT VARIATION. ALL VARIATIONS MUST BE ACCEPTED BY ALL PARTIES TO THE AGREEMENT AND WHERE APPLICABLE THE RELEVANT BUILDING SURVEYOR PRIOR TO IMPLEMENTING ANY VARIATION.
THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT STRUCTURAL AND ALL OTHER CONSULTANTS' DRAWINGS/DETAILS AND WITH ANY OTHER WRITTEN INSTRUCTIONS ISSUED IN THE COURSE OF THE CONTRACT.
ALL MEASUREMENTS IN MILLIMETRES UNLESS NOTED OTHERWISE.
FIGURED DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS.
THE BUILDER SHALL TAKE ALL STEPS NECESSARY TO ENSURE THE STABILITY AND GENERAL WATER TIGHTNESS OF ALL NEW AND/OR EXISTING STRUCTURES DURING ALL WORKS.
THE BUILDER AND SUBCONTRACTORS SHALL CHECK AND VERIFY ALL DIMENSIONS, SETBACKS, LEVELS AND SPECIFICATIONS AND ALL OTHER RELEVANT DOCUMENTATION PRIOR TO THE COMMENCEMENT OF ANY WORKS. REPORT ALL DISCREPANCIES TO THIS OFFICE FOR CLARIFICATION.
INSTALLATION OF ALL SERVICES SHALL COMPLY WITH THE RESPECTIVE SUPPLY AUTHORITY REQUIREMENTS.

BUSHFIRE ATTACK LEVEL:-(BAL)

BAL-FZ - DIRECT EXPOSURE TO FLAMES FROM FIRE FRONT IN ADDITION TO HEAT FLUX AND EMBER ATTACK

ALL HOMES TO COMPLY WITH AS 3959-2018 (BAL)

WIND SPEED ASSESSMENT:

MAXIMUM DESIGN GUST WIND SPEED FOR THIS SITE IS:

TBC

IMPORTANT NOTE:

THE WIND SPEED CALCULATION IS TAKEN FROM THE JOB SPECIFIC SOIL REPORT (FRONT PAGE)

STANDARD HOMES ARE DESIGNED TO SUIT A MINIMUM WIND GUST SPEED OF 33 m/s

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ISSUE	AMENDMENT DETAILS
A	INITIAL SKETCH DESIGN ACA- 15/07/2019
B	SKETCH REVISION ACA - 19/07/2019
C	AMENDMET TO SKETCH ACA - 07/08/2019
D	INITIAL WORKING DRAWINGS - DURISOL REVIEW ACA - 28/11/2019
E	INITIAL WORKING DRAWINGS ACA - 06/12/2019
F	AMENDMENTS AS PER ENGINEERING ADVICE ACA - 12/02/2020
G	AMEND AS PER URGENT REQUEST ACA - 14/02/2020
H	AMEND AS PER WRITTEN REQUEST - ENERGY VALUES ACA - 27/02/2020
I	AMEND FOR BP ACA - 19/03/2020
J	MINOR WINDOW PLACEMENT AMMENDMENT ACA - 16/04/2021
K	AMEND AS PER CLIENT REQUEST - RETAINING WALLS AS CONSTRUCTED ACA - 11/05/2021
L	
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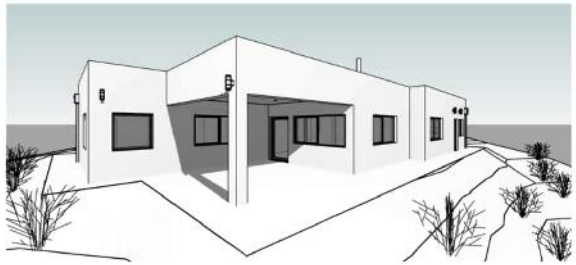

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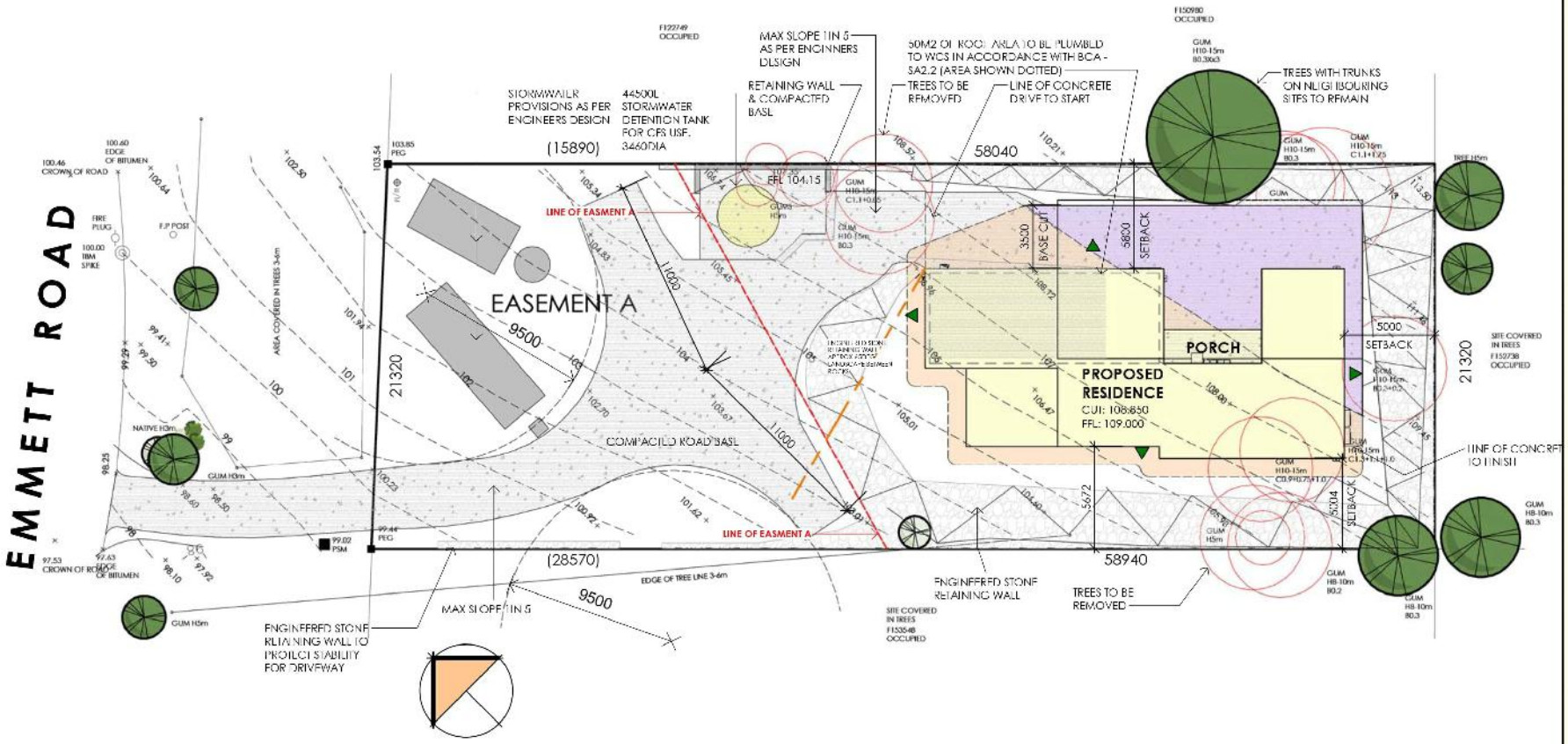
proposed: **HOUSE - SKETCH DESIGN** for: **U. SCHADE & A. TENG** address: **39 EMMETT ROAD CRAFTERS WEST, 5152**

WORKING DRAWINGS

drawing: **GENERAL NOTES**

drawn: **ACA** date: **18/07/19** scale:

sheet: **1** of **10** issue: **K** date: **11/05/21** job no.: **19-02680**



BUSHFIRE ATTACK LEVEL FLAME ZONE

SUBFLOOR SUPPORTS
SUBFLOOR SUPPORTS ENCLOSURE BY EXTERNAL WALL OR NON-COMBUSTIBLE WITH AN FRL 30/-/- OR BE TESTED FOR BUSHFIRE RESISTANCE TO AS1530.8.2

FLOORS
CONCRETE SLAB ON GROUND, ENCLOSURE BY EXTERNAL WALL OR PROTECTION OF UNDERSIDE WITH A NON COMBUSTIBLE MATERIAL SUCH AS FIBRE CEMENT SHEET OR BE NON COMBUSTIBLE OR BE TESTED FOR BUSHFIRE RESISTANCE TO AS1530.8.1

EXTERNAL WALLS
WALLS MADE FROM NON COMBUSTIBLE MATERIAL (eg MASONRY, BRICK VENEER, MUD BRICK, CONCRETE, ATRATED CONCRETE) WITH A MINIMUM OF 90mm IN THICKNESS
OR
A SYSTEM COMPLYING WITH AS1530.8.2 WHEN TESTED FROM THE OUTSIDE.
OR
A SYSTEM WITH AN FRL OF 30/30/30 OR -/30/30 WHEN TESTED FROM THE OUTSIDE.
OR
A COMBINATION OF ANY OF THE ITEMS ABOVE.
ALL JOINTS IN THE EXTERNAL SURFACE MATERIAL OF THE WALLS SHALL BE COVERED SEALED, OVERLAPPED, BACK OR BUTT JOINTED TO PREVENT GAPS GREATER THAN 3mm
ALTERNATIVELY, SARKING TYPE MATERIAL MAY BE APPLIED OVER THE FRAME PRIOR TO FIXING ANY EXTERNAL CLADDING.
VENTS AND WEEPHOLES IN EXTERNAL WALLS SHALL BE SCREENED WITH A MESH WITH A MAXIMUM APERTURE OF 2mm MADE OF CORROSION RESISTANT STEEL OR BRONZE.

EXTERNAL WINDOWS
SHALL BE COMPLETELY PROTECTED BY A BUSHFIRE SHUTTER
OR
THE OPENABLE PORTION OF THE WINDOW SHALL BE SCREENED WITH A MESH WITH A MAXIMUM APERTURE OF 2mm, MADE OF CORROSION RESISTANT STEEL OR BRONZE; AND EITHER
- THE WINDOW SYSTEM SHALL HAVE AN FRL OF AT LEAST -/30/- OR
- THE WINDOW SYSTEM SHALL COMPLY WITH AS1530.8.2 WHEN TESTED FROM THE OUTSIDE.

EXTERNAL DOORS
SIDE HUNG EXTERNAL DOORS INCLUDING FRENCH DOORS, PANEL FOLD OR BIFOLD DOORS SHALL COMPLY WITH THE FOLLOWING:
THEY SHALL BE COMPLETELY PROTECTED BY A BUSHFIRE SHUTTER SLIDING DOORS SHALL BE COMPLETELY PROTECTED BY A BUSHFIRE SHUTTER.

ROOFS
THE ROOF OR ROOF SYSTEM SHALL COMPLY WITH ONE OF THE FOLLOWING:
- A SYSTEM COMPLYING WITH 1530.8.2 WHEN TESTED FROM THE OUTSIDE.
- A SYSTEM WITH AN FRL OF 30/30/30 OR -/30/30 WHEN TESTED FROM THE OUTSIDE.
ROOF AND WALL JUNCTIONS SHALL BE SEALED TO PREVENT OPENINGS GREATER THAN 3mm ROOF VENTILATION OPENINGS SHALL BE FITTED WITH NON COMBUSTIBLE EMBER GUARDS.
ROOF MOUNTED EVAPORATIVE COOLERS ARE EXCLUDED FROM THIS LEVEL.

VERANDAHS & DECKS
ENCLOSED SUB FLOOR SPACE OR NON COMBUSTIBLE SUPPORTS, FRAMING OF DECKS, VERANDAS, RAMPS OR LANDINGS SHALL BE OF NON COMBUSTIBLE MATERIAL. DECKING TO BE NON COMBUSTIBLE OR FIBRE CEMENT SHEET AND HAVE NO GAPS.

SITE ANALYSIS

GARDEN AREA REQ'D FOR GRZ & NRZ ZONES ONLY:
400 - 500m2 = 25% | 501 - 650m2 = 30% | 650m2+ = 35%

GARDEN AREA	729.63 m²	58.51%
NON-COMPLIANT GARDEN AREA	0.00 m²	0.00%
TOTAL PERMEABLE SPACE	729.63 m²	58.51%
SITE COVER	198.91 m²	15.95%
PAVED AREA	0.00 m²	0.00%
DRIVEWAY AREA	318.45 m²	25.54%
TOTAL HARD COVER	517.36 m²	41.49%
SITE AREA	1246.99 m²	100.00%

SITE CUT/FILL LEGEND & NOTES
DENOTES AREA OF SITE CUT
DENOTES AREA OF SITE FILL

SITE CUT & FILL NOTE
PROVIDE SITE CUT OF 4000mm & FILL 40000mm OVER BUILDING AREA & PROVIDE AN ADDITION SCRAPE TO GARAGE TO ACCOMODATE A
86 mm STEPDOWN NOTE: 45° BATTER ANGLE

NOTE:
PENETRATIONS THROUGH THE SISALATION PAPER ART TO BE TAPED AROUND CAREFULLY TO ENSURE ANY GAPS ARE SEALED.

TREE REMOVAL
IT IS THE RESPONSIBILITY OF THE OWNER TO UNDERTAKE ANY TREE REMOVAL INCLUDING OBTAINING ANY NECESSARY PERMITS, & TO PROVIDE A SITE CLEAR OF ANY VEGETATION & DEBRIS, TO THE SATISFACTION OF THE BUILDER PRIOR TO COMMENCEMENT OF WORKS

ROOF GARDEN IS NON- TRAFFICABLE

SITE PLAN TO BE READ IN CONJUNCTION WITH ENGINEERING RETAINING STORM WATER PLAN AND WASTE MANAGEMENT PLAN

DRAINAGE NOTES:

ELECTRICIAN TO SUPPLY EXTERNAL POWER OUTLETS TO APPOINTED AREAS OF THE SITE - TO CLIENT INSTRUCTIONS

GAS FIRE PLACE TO BE INSTALLED TO AS 4558-2011
WATERPROOFING OF WET AREAS WILL BE IN ACCORDANCE WITH AS3740-2010 AND BCA TABLE 3.8.1.1
SMOKE ALARMS WILL BE HARDWIRED IN ACCORDANCE WITH AS3786-2014

6 STAR ENERGY REQUIREMENTS:
AS PER ENERGY REPORT

250 WIDE DURISOL BLOCKS
U VALUE = 0.389
R VALUE = 2.571

EARTH ROOF
R10

WINDOWS
MINIMUM U VALUE - 0.85
SHC 0.28

BOUNDARY FENCE(S) REQUIRED
PROVIDE TIMBER PALING PERIMETER FENCING TO A MINIMUM HEIGHT OF 1800mm WITH CAPPING & EXPOSED POSTS TO ANY UNFENCED BOUNDARIES PRIOR TO OBTAINING A CERTIFICATE OF OCCUPANCY PERMIT.

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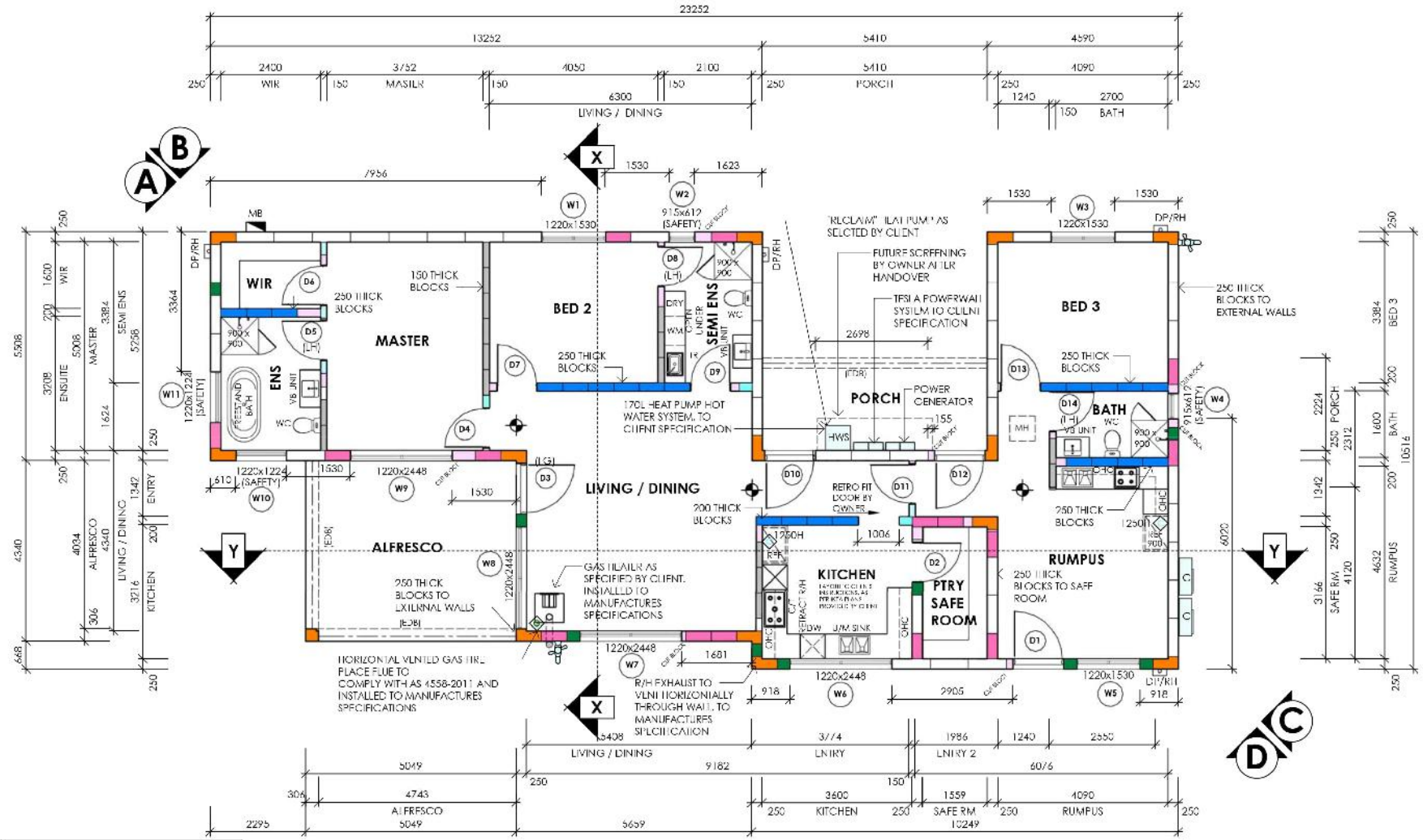
proposed: **HOUSE - SKETCH DESIGN** for: **U. SCHADE & A. TENG** address: **39 EMMETT ROAD CRAFTERS WEST, 5152**

drawing: **SITE PLAN** **WORKING DRAWINGS**

drawn: **ACA** date: **18/07/19** scale: **1 : 250** sheet: **2** of **10** issue: **K** date: **11/05/21** job no.: **19-02680**



BLOCK SCHEDULE

250 BLOCKS

- FULL 250 BLOCK
- 250 CORNER BLOCK
- 2/3 250 BLOCK
- 1/3 250 BLOCK
- CUT TO SUIT
- 250 CUT BLOCK

200 BLOCKS

- FULL 200 BLOCK
- 200 CORNER BLOCK
- 2/3 200 BLOCK
- 1/3 200 BLOCK
- CUT TO SUIT
- CUT 200 BLOCK

150 BLOCKS

- FULL 150 BLOCK
- 1/2 200 BLOCK
- CUT TO SUIT
- CUT 200 BLOCK

AREAS TABLE

AREAS	(m²)	(SQ)
GROUND FLOOR	175.52 m²	18.89
SUB TOTAL:	175.52 m²	18.89
OURDOOR LIVING	21.91 m²	2.36
PORCH	8.79 m²	0.95
TOTAL OTHER	30.70 m²	3.30
GRAND TOTAL	206.21 m²	22.20

GENERAL NOTES:

SMOKE ALARMS WILL BE HARDWIRED IN ACCORDANCE WITH AS3786-2014

ALL GLAZING TO COMPLY WITH AS 1288

ROLLER SHUTTERS TO BE FITTED TO ALL EXTERNAL WINDOWS AND DOORS

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proposed: **HOUSE - SKETCH DESIGN**

for: **U. SCHADE & A. TENG**

address: **39 EMMETT ROAD CRAFTERS WEST, 5152**

WORKING DRAWINGS

drawing: **GROUND FLOOR PLAN**

drawn: **ACA** date: **18/07/19** scale: **As indicated** sheet: **3** of **10** issue: **K** date: **11/05/21** job no.: **19-02680**

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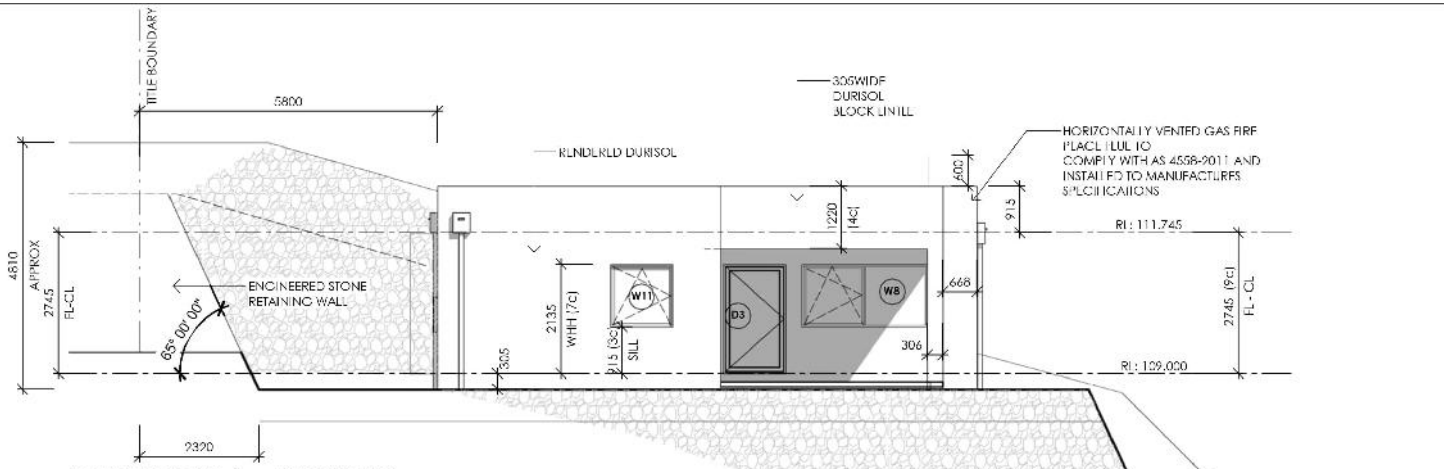
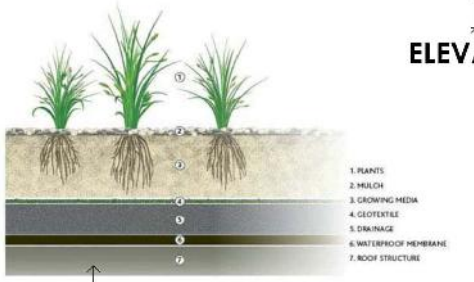
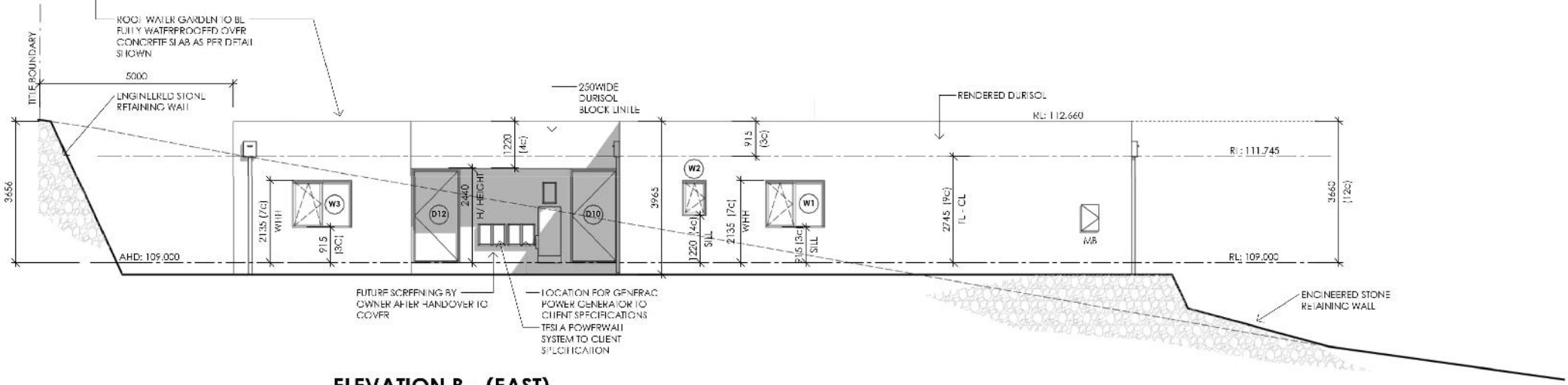


ELEVATION A - (NORTH)





ELEVATION B - (EAST)

EXTERNAL DOOR THRESHOLDS:
THRESHOLDS OF EXTERNAL DOORS TO BE NO GREATER THAN 230MM ABOVE THE ADJOINING SURFACE

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WORKING DRAWINGS

drawing: **ELEVATIONS**

drawn: **ACA** date: **18/07/19** scale: **1 : 100** sheet: **4** of **10** issue: **K** date: **11/05/21** job no.: **19-02680**

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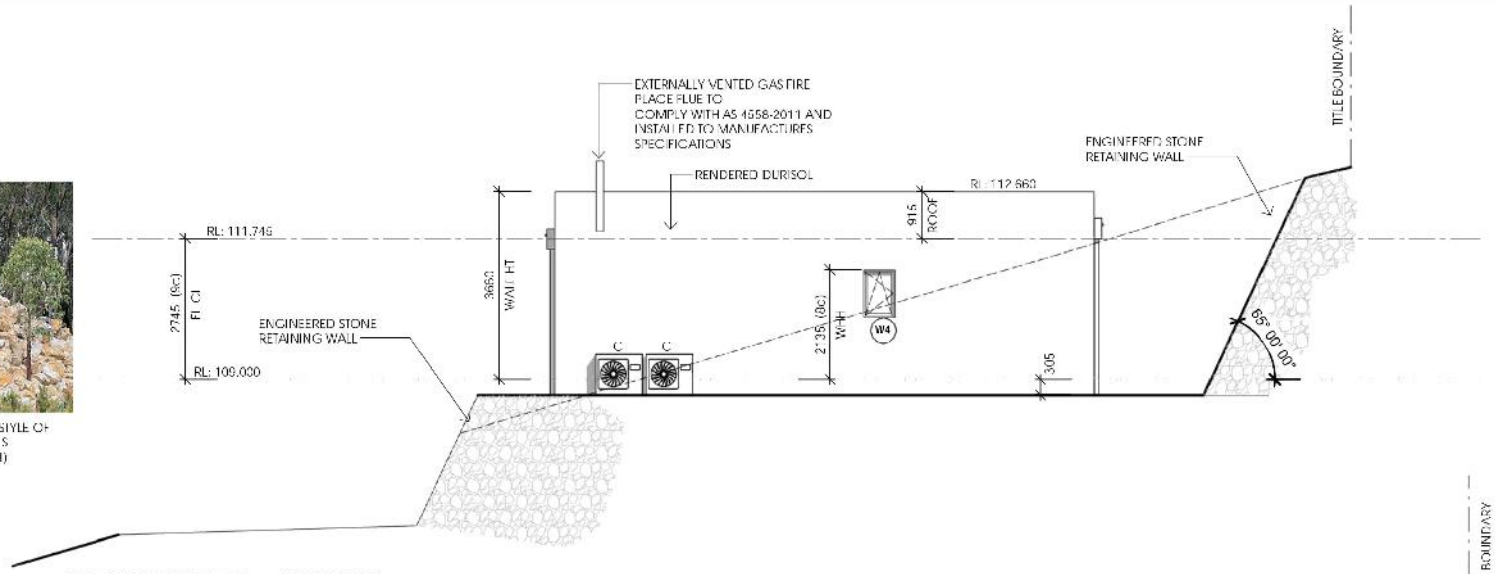
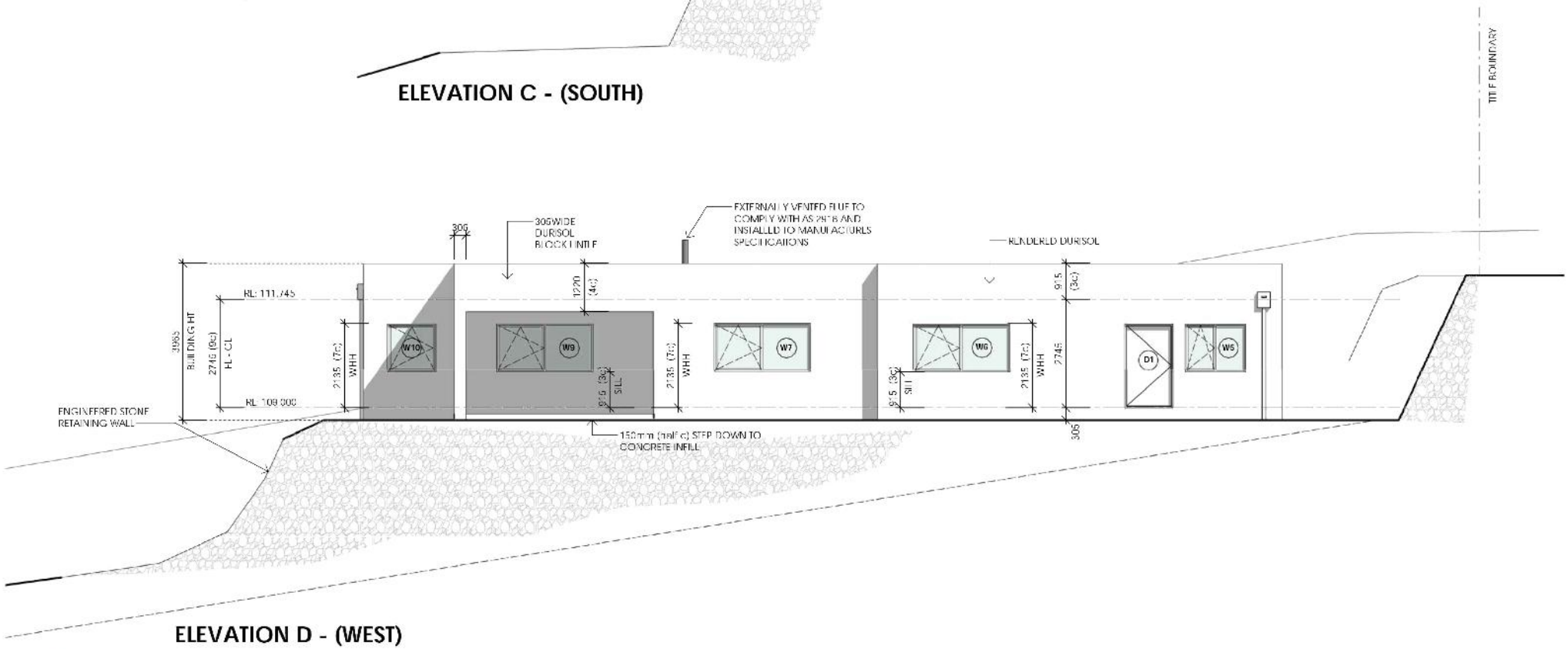
IMAGE OF INTENDED STYLE OF ROCK RETAINING WALLS (TO ENGINEERS DESIGN)



ELEVATION C - (SOUTH)



ELEVATION D - (WEST)

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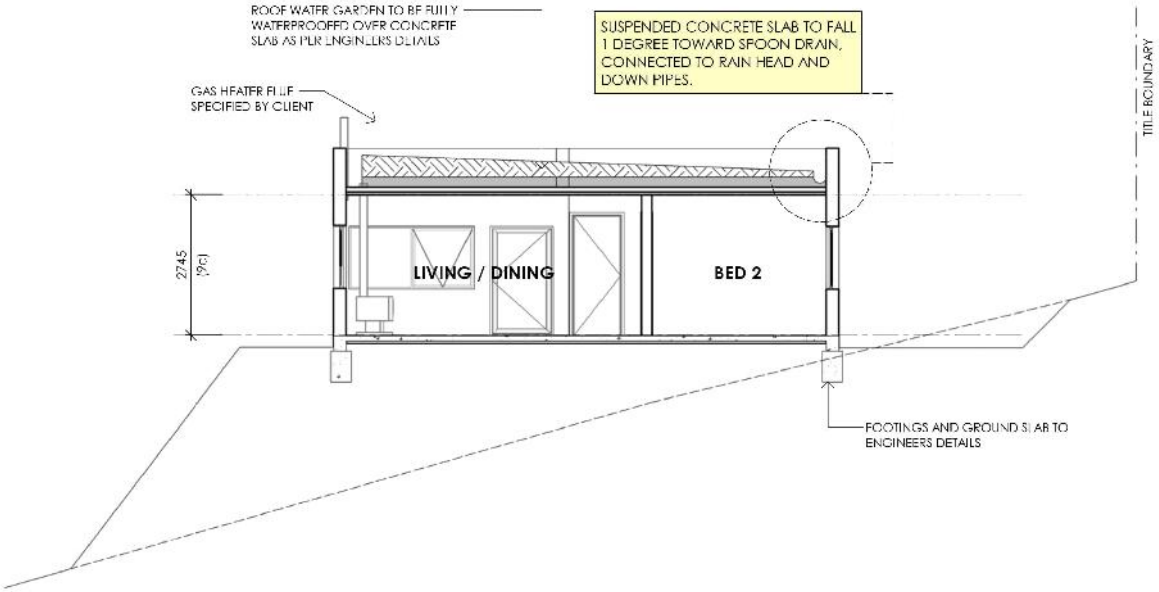
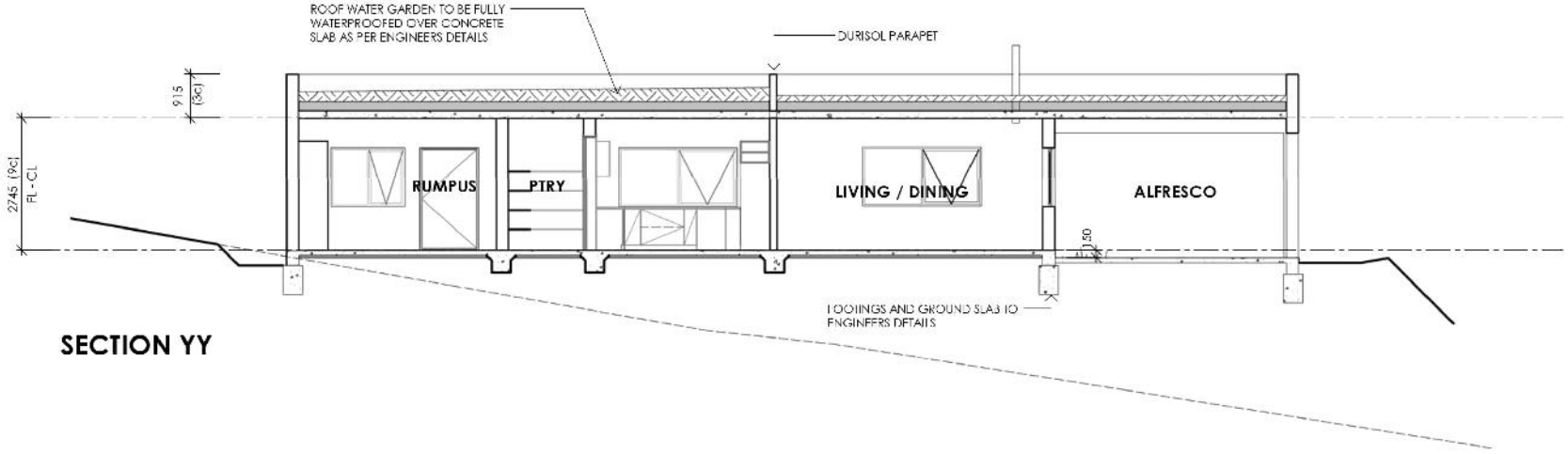
WORKING DRAWINGS

drawing: **ELEVATIONS**

drawn: **ACA** date: **18/07/19** scale: **1 : 100** sheet: **5** of **10** issue: **K** date: **11/05/21** job no : **19-02680**



SECTION XX



SECTION YY

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proposed: **HOUSE - SKETCH DESIGN**
for: **U. SCHADE & A. TENG**
drawing: **SECTION**
address: **39 EMMETT ROAD CRAFTERS WEST, 5152**

WORKING DRAWINGS

drawn: **ACA** date: **18/07/19** scale: **1 : 100**
sheet: **6** of **10** issue: **K** date: **11/05/21** job no.: **19-02680**

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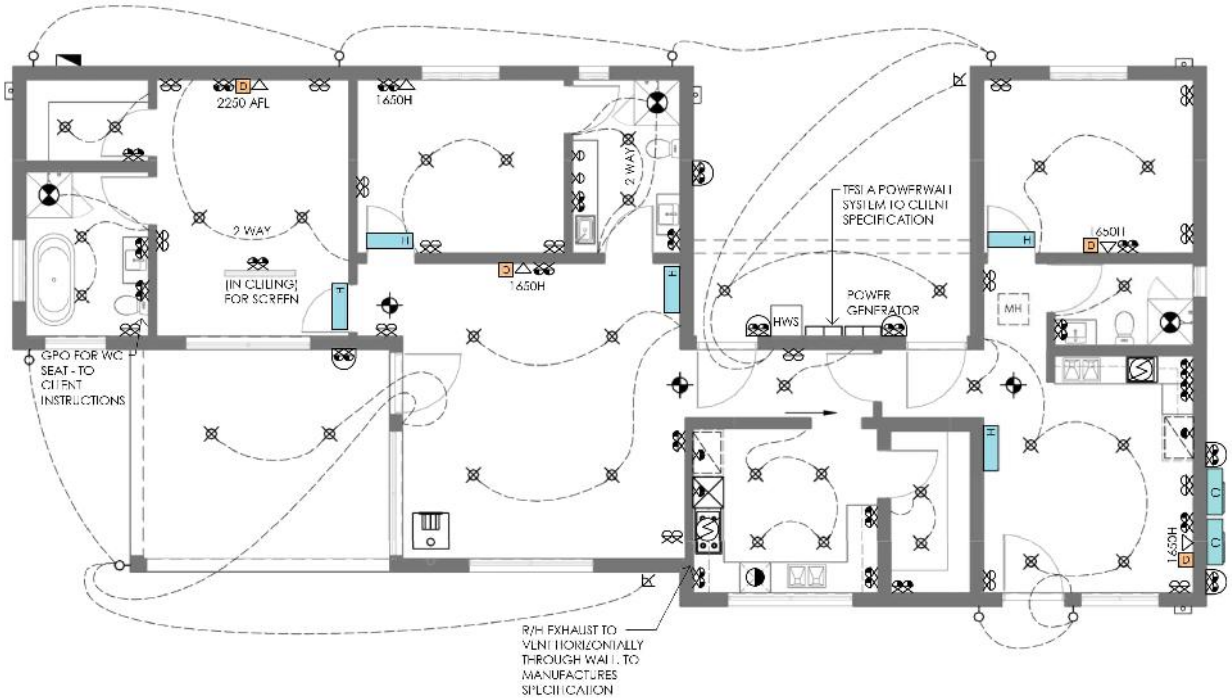
HEATING/COOLING VENTS:

THE LOCATION OF THE HEATER / COOLER AND VENT LOCATION IS UP TO THE DISCRETION OF THE INSTALLER AND MAY VARY PENDING TRUSS LOCATION

ARTIFICIAL LIGHTING TABLE

FLOOR AREA	169.30 m²	WATTAGE ALLOWED	819 w
POR./OUT AREA	17.91 m²	WATTAGE ALLOWED	72 w
GARAGE AREA	36.41 m²	WATTAGE ALLOWED	109 w
TOTAL AREA	216.62 m²	**ALLOWABLE WATTS**	**992 w**
HOUSE 5 W/m²		NO. OF GLOBES USED	TOTAL WATTS
FLUORESCENT GLOBES	15 w	16	240 w
LED DOWNLIGHTS	9 w	0	0 w
FLUORO TUBES	36 w	0	0 w
		HOUSE TOTAL	**240 w**
POR./OUT 4 W/m²			
FLUORESCENT GLOBES	15 w	2	30 w
LED DOWNLIGHTS	9 w	0	0 w
FLUORO TUBES	36 w	0	0 w
		PORCH TOTAL	**30 w**
GARAGE 3 W/m²			
FLUORESCENT GLOBES	15 w	1	15 w
LED DOWNLIGHTS	9 w	0	0 w
FLUORO TUBES	36 w	0	0 w
		GARAGE TOTAL	**15 w**



UNDERFLOOR HEATING MATS IN SCREED TO MANUFACTURES SPECIFICATION HOTWIREHEATING.COM.AU

ELECTRICIAN TO INSTALL PROVISIONS FOR TESLA POWER WALL SYSTEM.

ELECTRICIAN TO INSTALL PROVISIONS FOR TESLA POWER WALL SYSTEM.

ELECTRICIAN TO INSTALL HANDOVER SOCKET FOR GENERAC POWER GENERATOR. TO CLIENT SPECIFICATIONS

ELECTRICIAN TO SUPPLY EXTERNAL POWER OUTLETS TO APPOINTED AREAS OF THE SITE - TO CLIENT ISTRUCTIONS

LIGHTING LEGEND

- CEILING LIGHT BATTEN HOLDER
- 90mm DOWNLIGHT
- 70mm DOWNLIGHT
- 50mm DOWNLIGHT
- WALL STAIR LIGHT
- EXTERNAL LIGHT POINT
- HEATER/FAN & LIGHT - 2 GLOBE
- HEATER/FAN & LIGHT - 4 GLOBE
- JB JUNCTION BOX
- CEILING FAN
- CEILING FAN WITH LIGHT
- PARA FLOOD LIGHT - SINGLE
- PARA FLOOD LIGHT DOUBLE
- ROUND FLUORO
- 1200 1200 FLUORO - SINGLE
- 1200 1200 FLUORO - DOUBLE
- WALL LIGHT BATTEN HOLDER
- MOTION SENSOR
- CEILING EXHAUST FAN
- CEILING EXHAUST FAN SWITCHED WITH LIGHT
- SUSPENDED PENDANT

HEAT/COOL LEGEND

- CEILING HEATING DUCT (APPROX)
- DUCTED HEATING UNIT IN CEILING
- CEILING HEAT/COOL DUCT
- REV CYCLE DUCTED HEAT/COOL UNIT
- T THERMOSTAT
- RA RETURN AIR
- F EVAPORATIVE COOLING DUCT
- EVAPORATIVE COOLING UNIT
- C AC CONDENSOR UNIT
- I AC HEAD UNIT
- ACU COOLING UNIT

POWER LEGEND

- SINGLE GPO - 300mm
- SINGLE GPO - 1100mm
- SINGLE GPO - 1350mm
- SINGLE GPO - EXTERNAL
- SINGLE GPO - FOR DISHWASHER
- SINGLE GPO - FOR MICROWAVE
- DOUBLE GPO - 300mm
- DOUBLE GPO - 1100mm
- DOUBLE GPO - 1350mm
- DOUBLE GPO - EXTERNAL
- TELEVISION POINT
- TELEPHONE POINT
- METER BOX
- SMOKE DETECTORS (INTERCONNECTED)
- UBO & RHOOD CONNECTIONS
- D DATA POINT WIRED TO NBN
- NBN NBN BOX

DUCTED VACUUM

- DV DUCTED VACUUM UNIT & SCPO
- DUCTED VACUUM OUTLET

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proposed: **HOUSE - SKETCH DESIGN** for: **U. SCHADE & A. TENG** address: **39 EMMETT ROAD CRAFTERS WEST, 5152**

WORKING DRAWINGS

drawing: **GROUND ELECTRICAL PLAN**

drawn: **ACA** date: **18/07/19** scale: **1 : 100** sheet: **7** of **10** issue: **K** date: **11/05/21** job no.: **19-02680**

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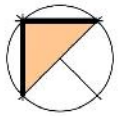
TILES

TIMBER

	0.00 m²
CARPET	0.00 m²
TILES	35.64 m²
TIMBER	133.55 m²



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HARVANDESIGN
BUILDING DESIGNERS

proposed: **HOUSE - SKETCH DESIGN**

for: **U. SCHADE & A. TENG**

address: **39 EMMETT ROAD CRAFTERS WEST, 5152**

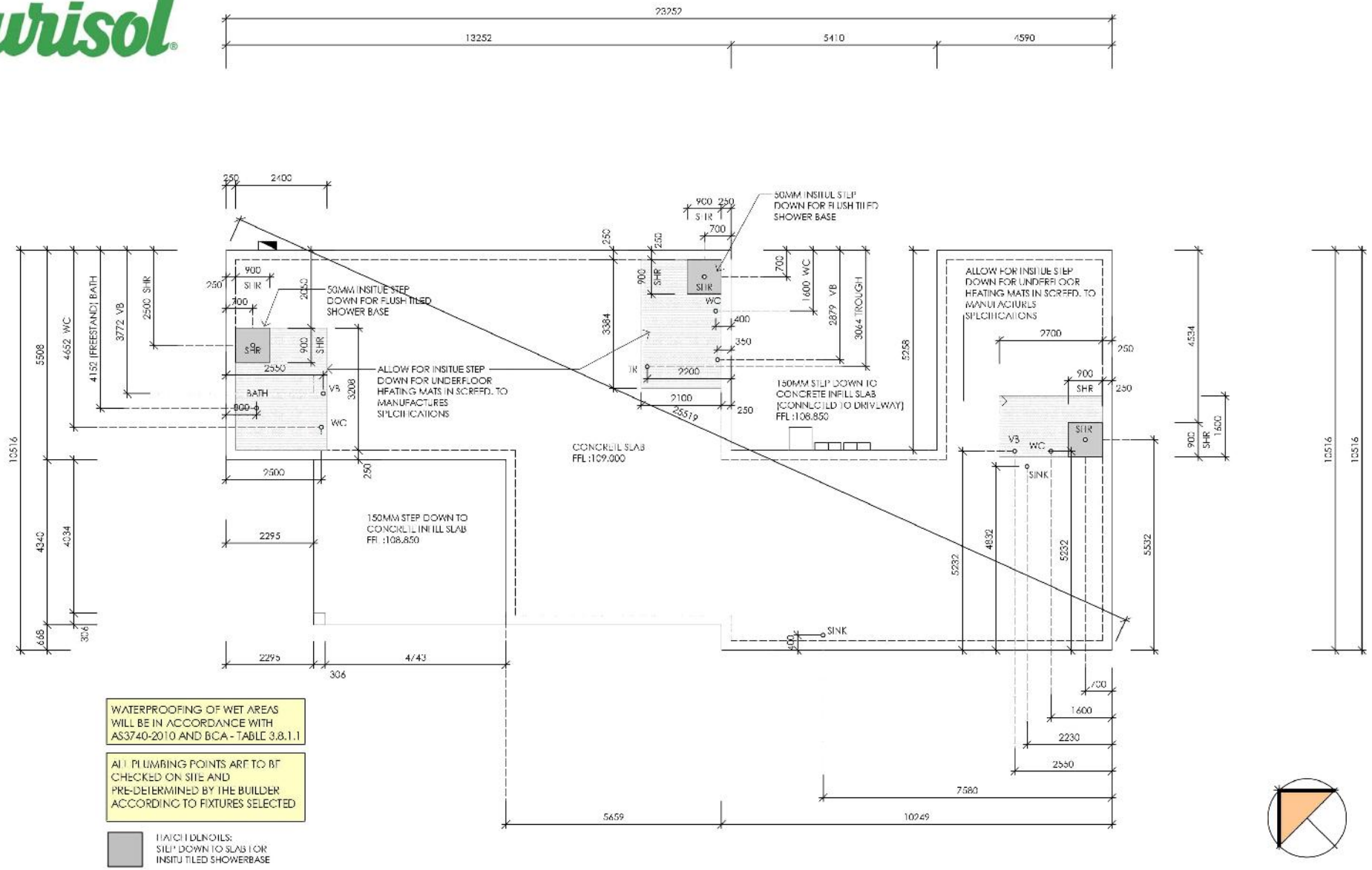
WORKING DRAWINGS

drawing: **GROUND FLOOR COVERINGS**

drawn: **ACA** date: **18/07/19** scale: **1 : 100**

sheet: **8** of **10** issue: **K** date: **11/05/21** job no.: **19-02680**

Durisol



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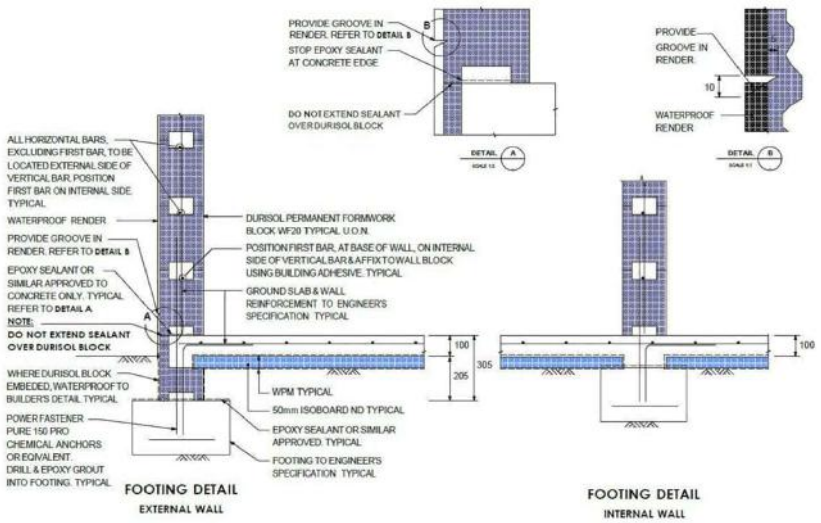
HARVANDESIGN BUILDING DESIGNERS

proposed: **HOUSE - SKETCH DESIGN**
for: **U. SCHADE & A. TENG**
drawing: **SETOUT PLAN**
address: **39 EMMETT ROAD CRAFTERS WEST, 5152**

WORKING DRAWINGS

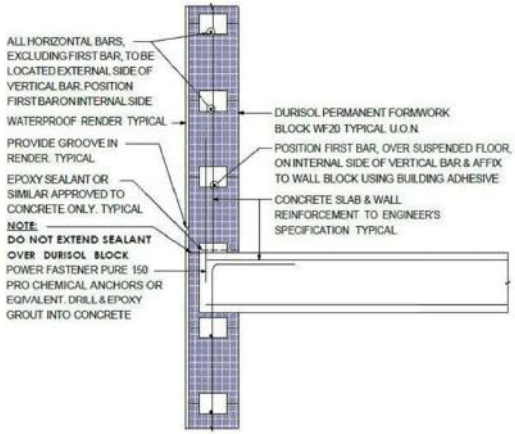
drawn: ACA date: 18/07/19 scale: 1 : 100
sheet: 9 of 10 issue: K date: 11/05/21 job no.: **19-02680**

Durisol

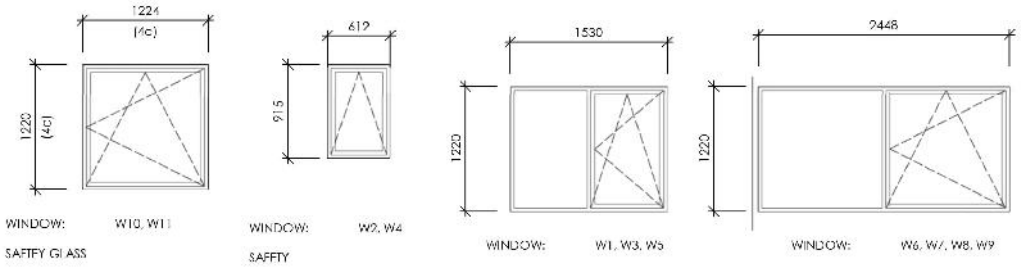


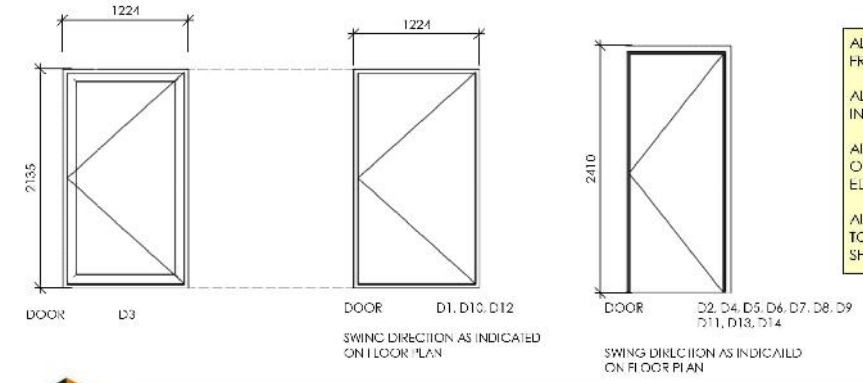
FOOTING DETAIL
EXTERNAL WALL

FOOTING DETAIL
INTERNAL WALL



SUSPENDED FLOOR DETAIL
IN SITU CONCRETE





ALL WINDOWS ARE TO EXTERNAL FRAME. (TO FIT BETWEEN BLOCKS)

ALL WINDOWS ARE TRIPLE GLAZED INTERNORM KF500

ALL WINDOWS AS TILT AND TURN OPERATION AS INDICATED ON ELEVATIONS

ALL WINDOWS AND EXTERNAL DOOR TO BE FITTED WITH ROLLER/FIRE SHUTTERS

WINDOW SCHEDULE

Quantity	Height	Width	Style	Double Glazing	Obscure Glazing	Safety Glass	Comments
2	915	612	AWN			(SAFETY)	
2	1220	1224	AWN			(SAFETY)	
3	1220	1530	AWN				
4	1220	2448	AWN				
total Quantity : 11							

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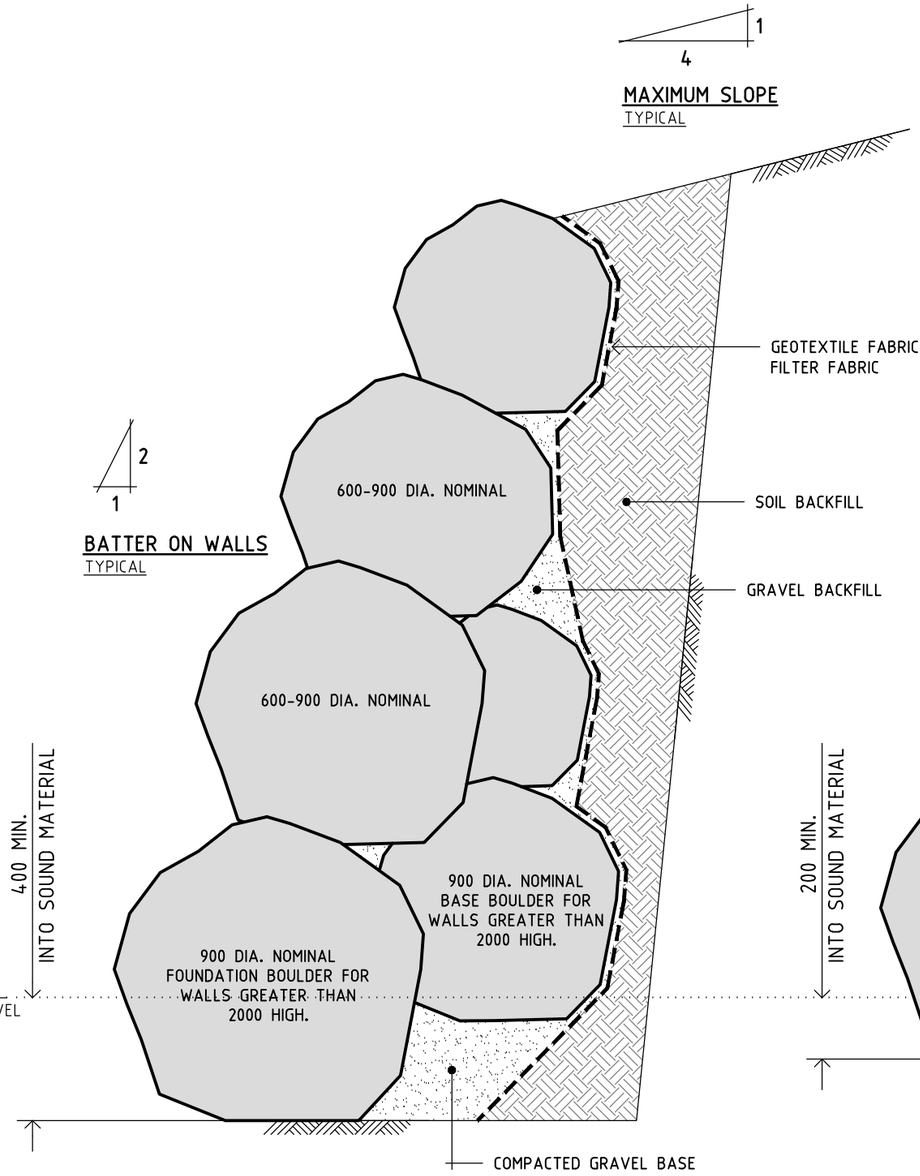
HARVANDESIGN
BUILDING DESIGNERS

proposed: **HOUSE - SKETCH DESIGN** for: **U. SCHADE & A. TENG** address: **39 EMMETT ROAD CRAFTERS WEST, 5152**

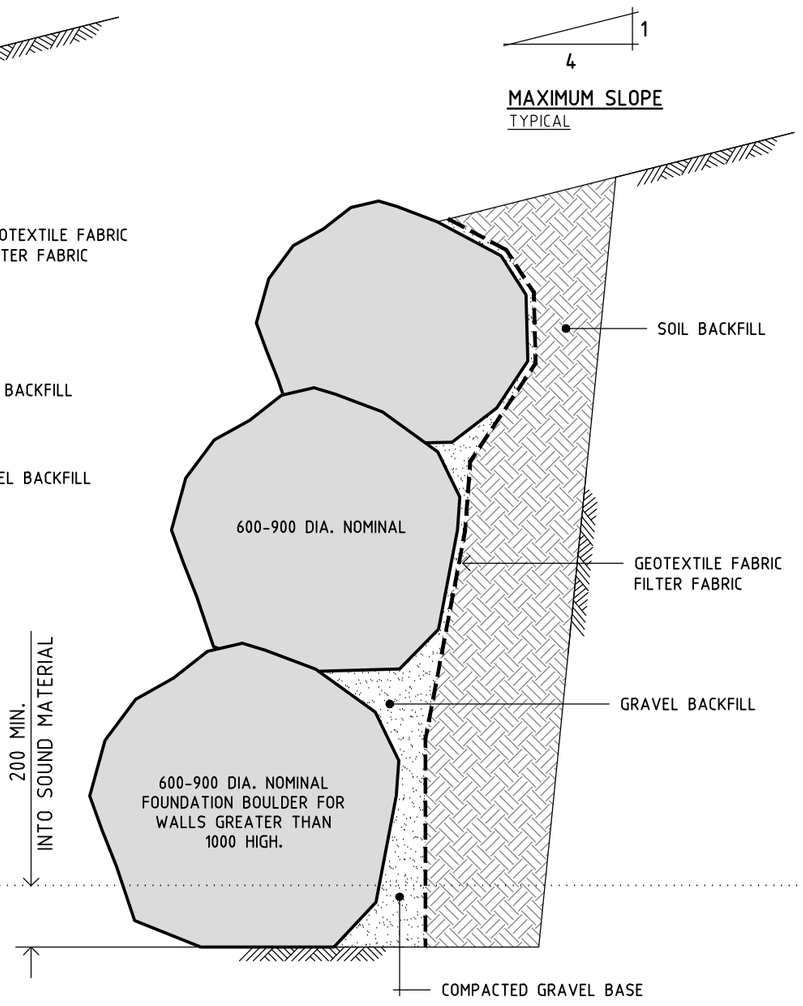
WORKING DRAWINGS

drawing: **DETAILS & WINDOW SCHEDULE**

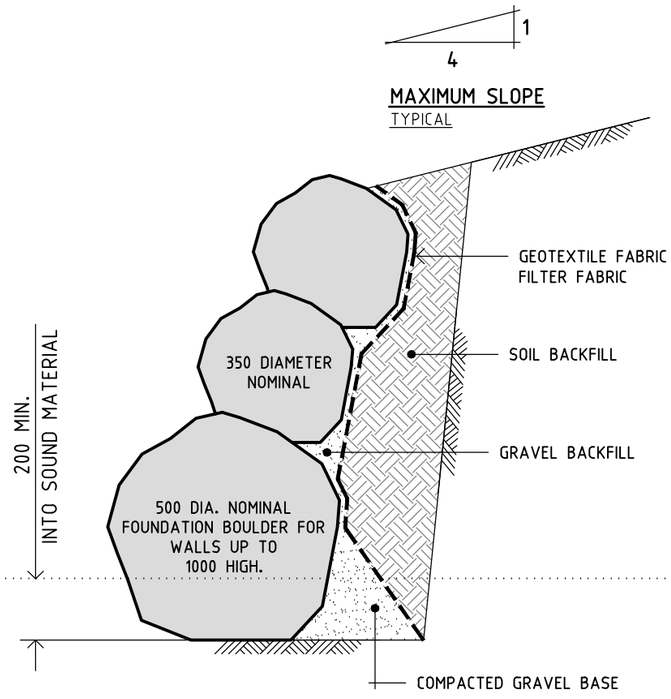
drawn: **ACA** date: **18/07/19** scale: **1 : 50** sheet: **10** of **10** issue: **K** date: **11/05/21** job no.: **19-02680**



2000-3000 HIGH WALL
SCALE 1:20



1000-2000 HIGH WALL
SCALE 1:20



1000 HIGH WALL
SCALE 1:20

NOTE
CAN ACHIEVE MAXIMUM 6m HIGH WALL IF SECTION IS USED
ON A 90 DEGREE INTERNAL CORNER WITH
MINIMUM 4m RETURN IN EACH DIRECTION.

CONSTRUCTION METHOD

1. PLACE FOUNDATION BOULDER BELOW PLATFORM LEVEL TO RETAIN CUT OR BELOW NATURAL GROUND TO RETAIN FILL. (DEPTHS AS NOTED)
2. PLACE BASE BOULDER AS REQUIRED.
3. PLACE SOIL BEHIND FOUNDATION AND BASE BOULDERS AND COMPACT IN LAYERS.
4. CONTINUE PLACING BOULDERS AND COMPACTING SOIL IN LAYERS BEHIND UNTIL DESIGN PROFILE IS ACHIEVED

Rev	Date	Description	By	Chk
C03	06.07.21	ISSUED FOR CONSTRUCTION	BC	TMP
C02	10.05.21	ISSUED FOR CONSTRUCTION	BC	TMP
C01	22.02.21	ISSUED FOR CONSTRUCTION	BC	TMP

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Project Name
39 EMMETT ROAD
CRAFERS WEST

Client
ULRICH SCHADE

Designed	Drawn	Checked	Scale @ A3
T.M.P.	B.C.	T.M.P.	1:20

Drawing Title
ROCK RETAINING WALL

Project No. **200650**

ISSUED FOR CONSTRUCTION

Drawing No. **S01**

Revision **C03**

0 mm 5 10 15 20 25

Room & Floor Names - Confirmed with Client / Vendor (Where possible)

Attached External Living Areas shown (Decks/Patios)

Outbuildings (Sheds, etc) / External features (eg Water Tanks, etc)

Custom Legend / Additional Instructions (If Needed)

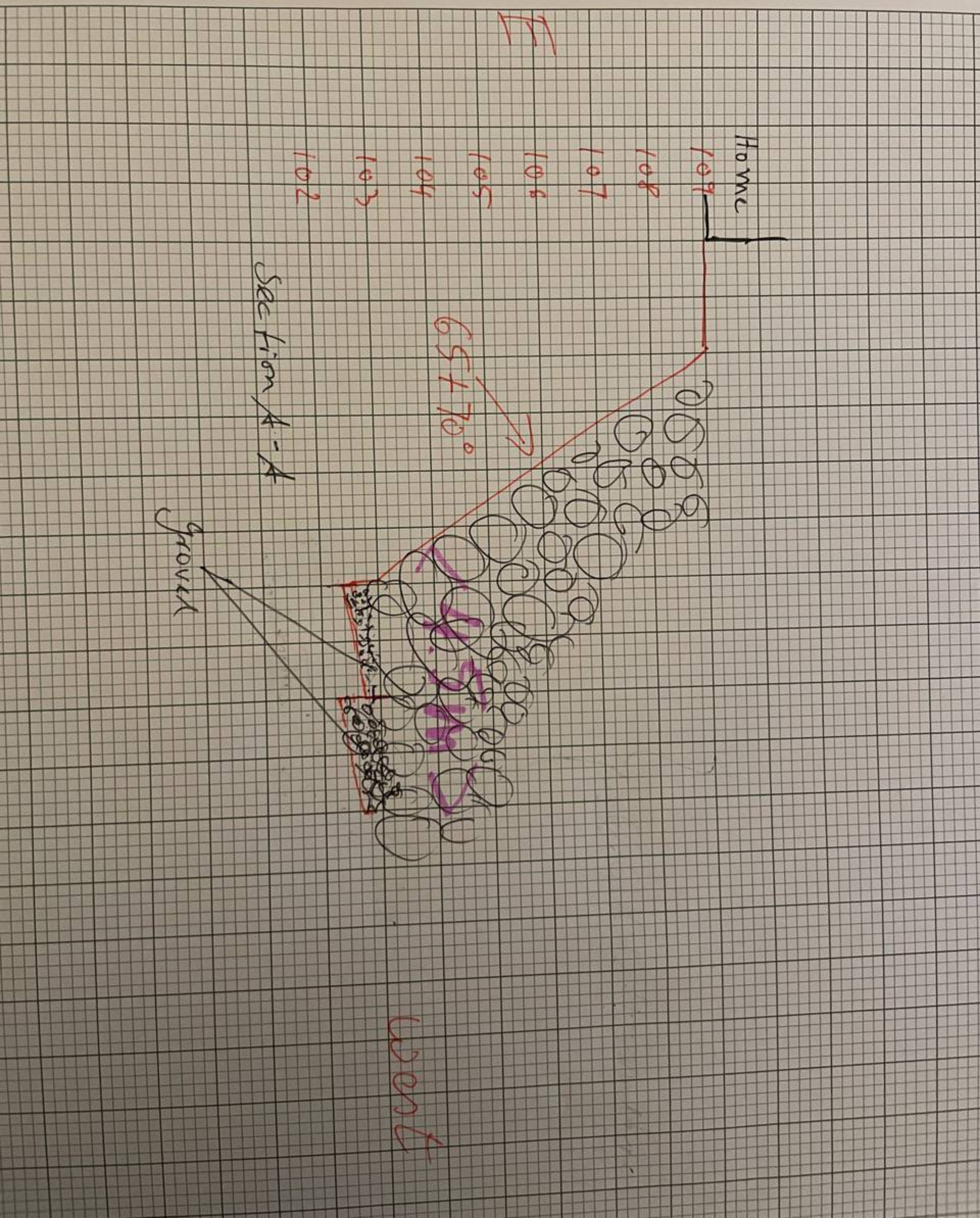
Walls marked in Red

Virtual Walk Through to check

PAGE OF

DIAKRIT

SEEING IS BELIEVING™



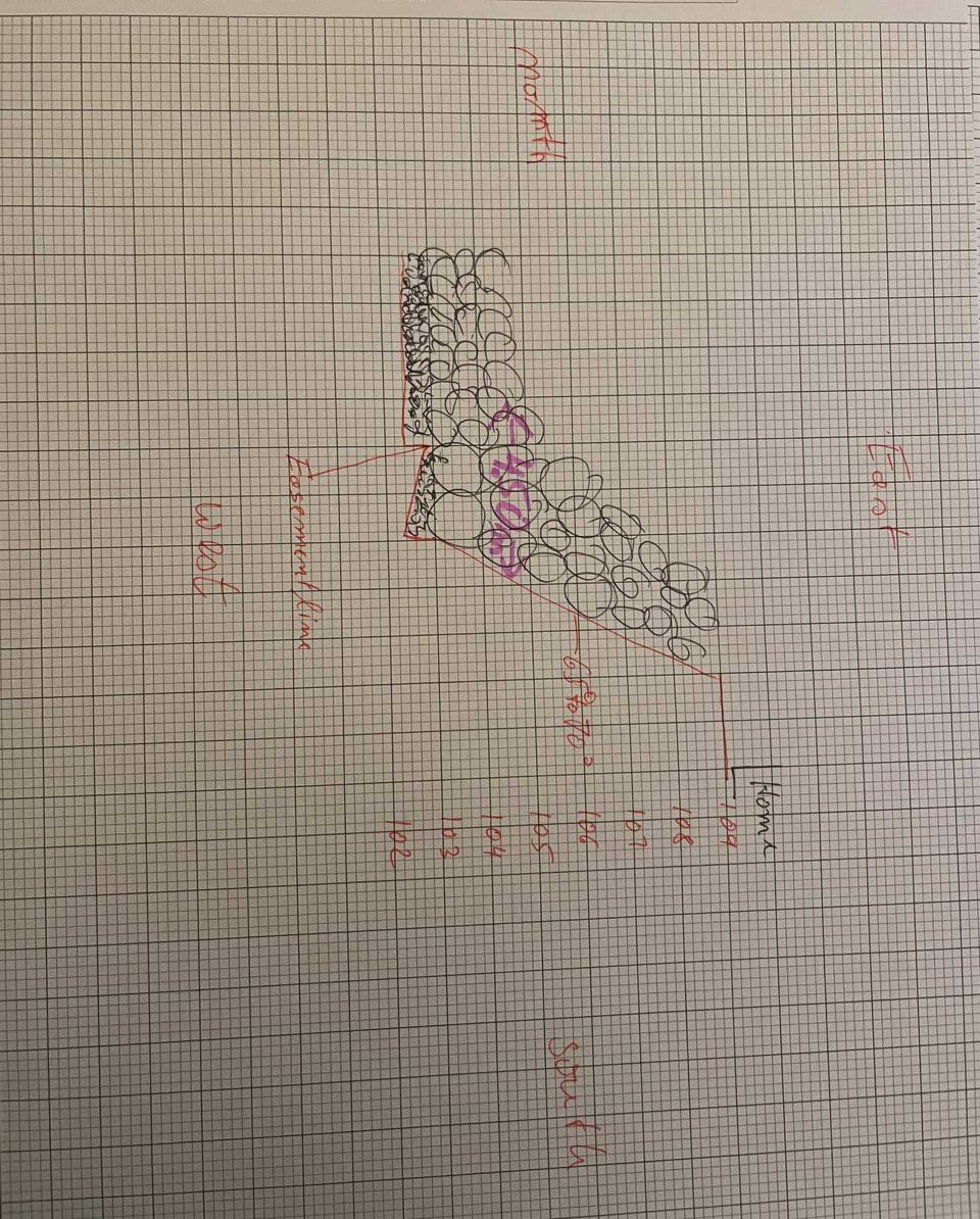
COMPASS POINT

- [ ] Site Plan Images & Block details (If Needed)
- [ ] Entrance Arrow & North Arrow
- [ ] Room & Floor Names - Confirmed with Client / Vendor (Where possible)
- [ ] Custom Legend / Additional Instructions (If Needed)
- [ ] Doors, Windows & Features
- [ ] Attached External Living Areas shown (Decks/Patios)
- [ ] Walls marked in Red
- [ ] Clear Dimensions (Min 2 measurements per space)
- [ ] Outbuildings (Sheds, etc) / External features (eg Water Tanks, etc)
- [ ] Virtual Walk Through to check

SKETCH BY

PAGE OF

DIAKRIT
SEEING IS BELIEVING™



W

Home

109

108

107

106

105

104

103

102

S

65-70°

2 - 2.5 metre thick

N

compacted fill to support the rockwool ≈ 1.5 inches

E

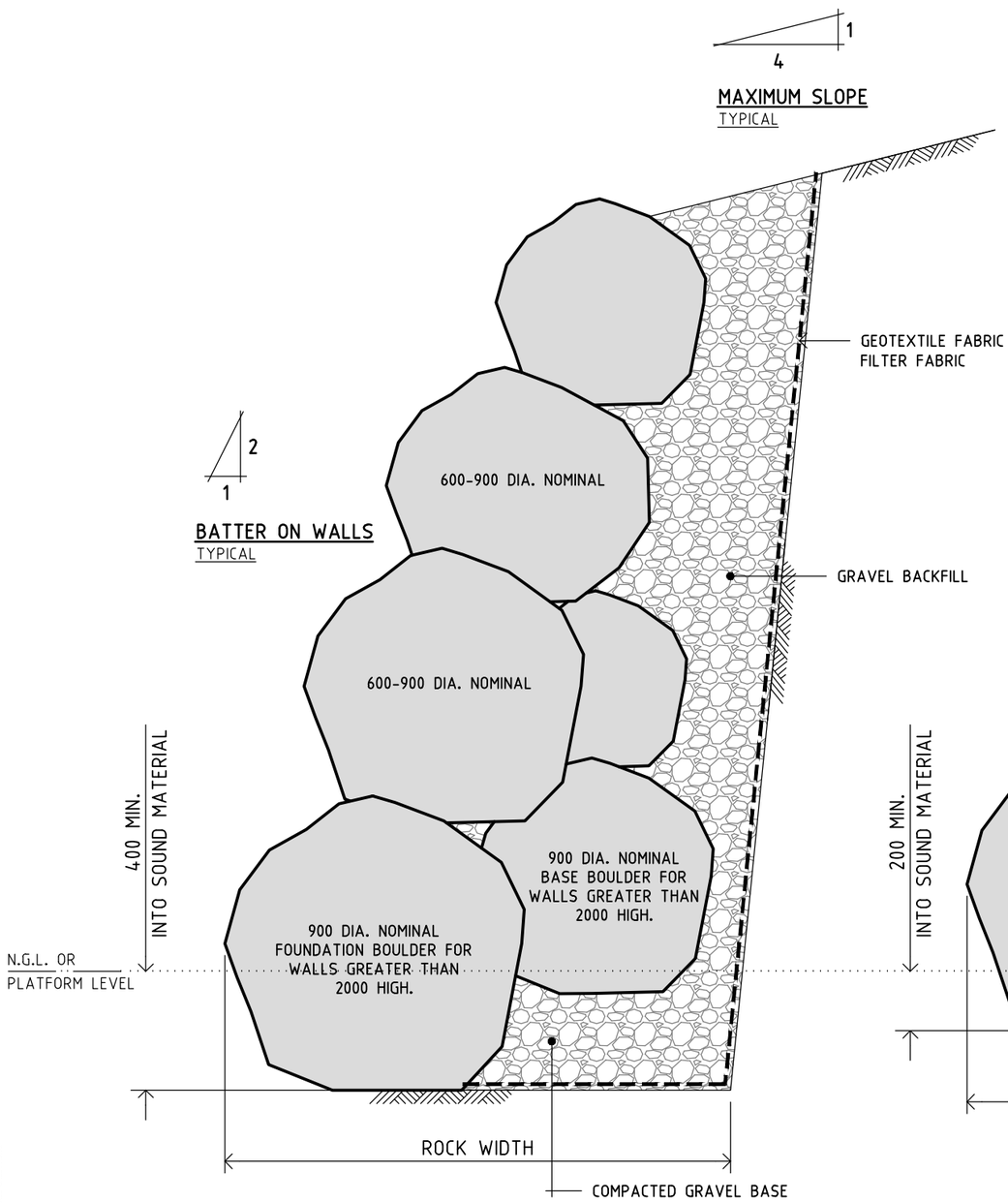
APPENDIX B

RETAINING WALL SCHEDULE

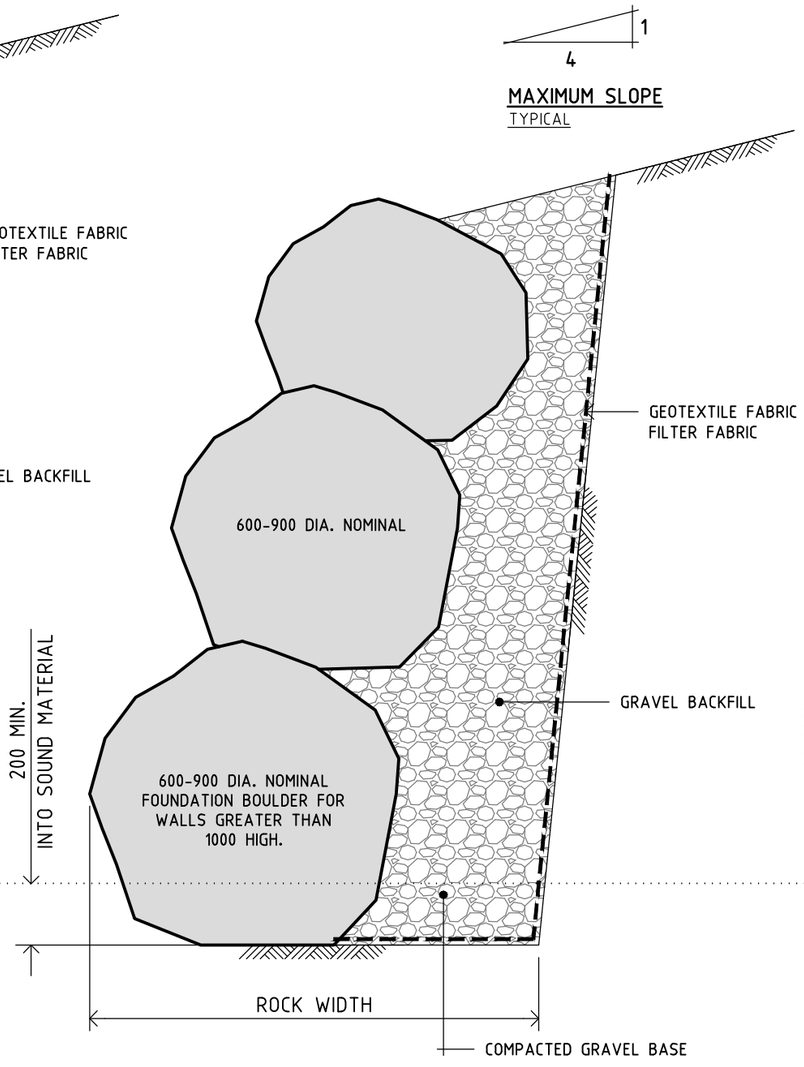
RETAINING HEIGHT	ROCK WIDTH	GRAVEL BASE DEPTH
UP TO 1000	800mm NOMINAL	400mm NOMINAL
1000-2000	1000mm NOMINAL	400mm NOMINAL
2000-3000	2900mm NOMINAL	400mm NOMINAL
3000-4000	3000mm NOMINAL	400mm NOMINAL
4000-5000	3700mm NOMINAL	400mm NOMINAL
5000-6000	4000mm NOMINAL	400mm NOMINAL

NOTE

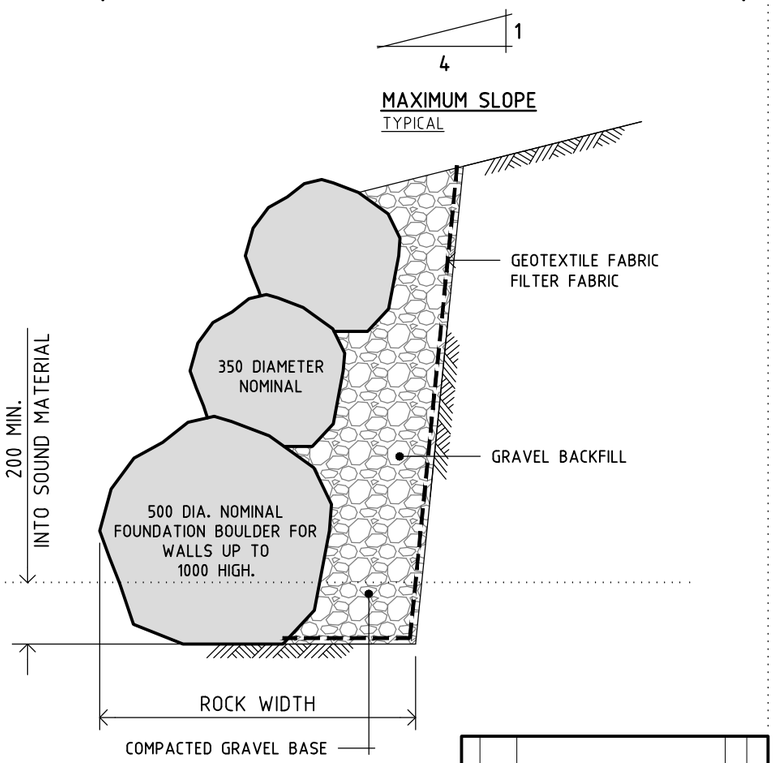
WHERE THESE WIDTHS CANNOT BE ACHIEVED ON SITE,
PROVIDE 450mm DIAMETER CONCRETE PILES AT 2000mm CENTRES.
PILES TO EXTEND MINIMUM 3000mm BELOW BASE OF WALL.



2000-3000 HIGH WALL
SCALE 1:20



1000-2000 HIGH WALL
SCALE 1:20



UP TO 1000 HIGH WALL
SCALE 1:20

CONSTRUCTION METHOD

1. PLACE FOUNDATION BOULDER BELOW PLATFORM LEVEL TO RETAIN CUT OR BELOW NATURAL GROUND TO RETAIN FILL. (DEPTHS AS NOTED)
2. PLACE BASE BOULDER AS REQUIRED.
3. PLACE GRAVEL BACKFILL BEHIND FOUNDATION AND BASE BOULDERS IN LAYERS.
4. CONTINUE PLACING BOULDERS AND GRAVEL BACKFILL IN LAYERS BEHIND UNTIL DESIGN PROFILE IS ACHIEVED.

PARAMETERS

GRAVEL BACKFILL WEIGHT	20 kN/m3
GRAVEL BACKFILL ANGLE	28 DEGREES
MAXIMUM SURCHARGE	5 kPa
MAXIMUM WATER PRESSURE HEIGHT	1/3 OF WALL HEIGHT

Rev	Date	Description	By	Chk
C05	02.08.21	ISSUED FOR CONSTRUCTION	BC	TMP
C04	30.07.21	ISSUED FOR CONSTRUCTION	BC	TMP
C03	06.07.21	ISSUED FOR CONSTRUCTION	BC	TMP
C02	10.05.21	ISSUED FOR CONSTRUCTION	BC	TMP
C01	22.02.21	ISSUED FOR CONSTRUCTION	BC	TMP

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t: +61 7 5561 8699
e: goldcoast@edgece.com

DO NOT SCALE DRAWINGS. IF IN DOUBT, ASK!

Project Name
39 EMMETT ROAD
CRAFERS WEST

Client
ULRICH SCHADE

Designed	Drawn	Checked	Scale @ A3
T.M.P.	B.C.	T.M.P.	1:20

Drawing Title
ROCK RETAINING WALL
SHEET 1

Project No.
200650

ISSUED FOR CONSTRUCTION

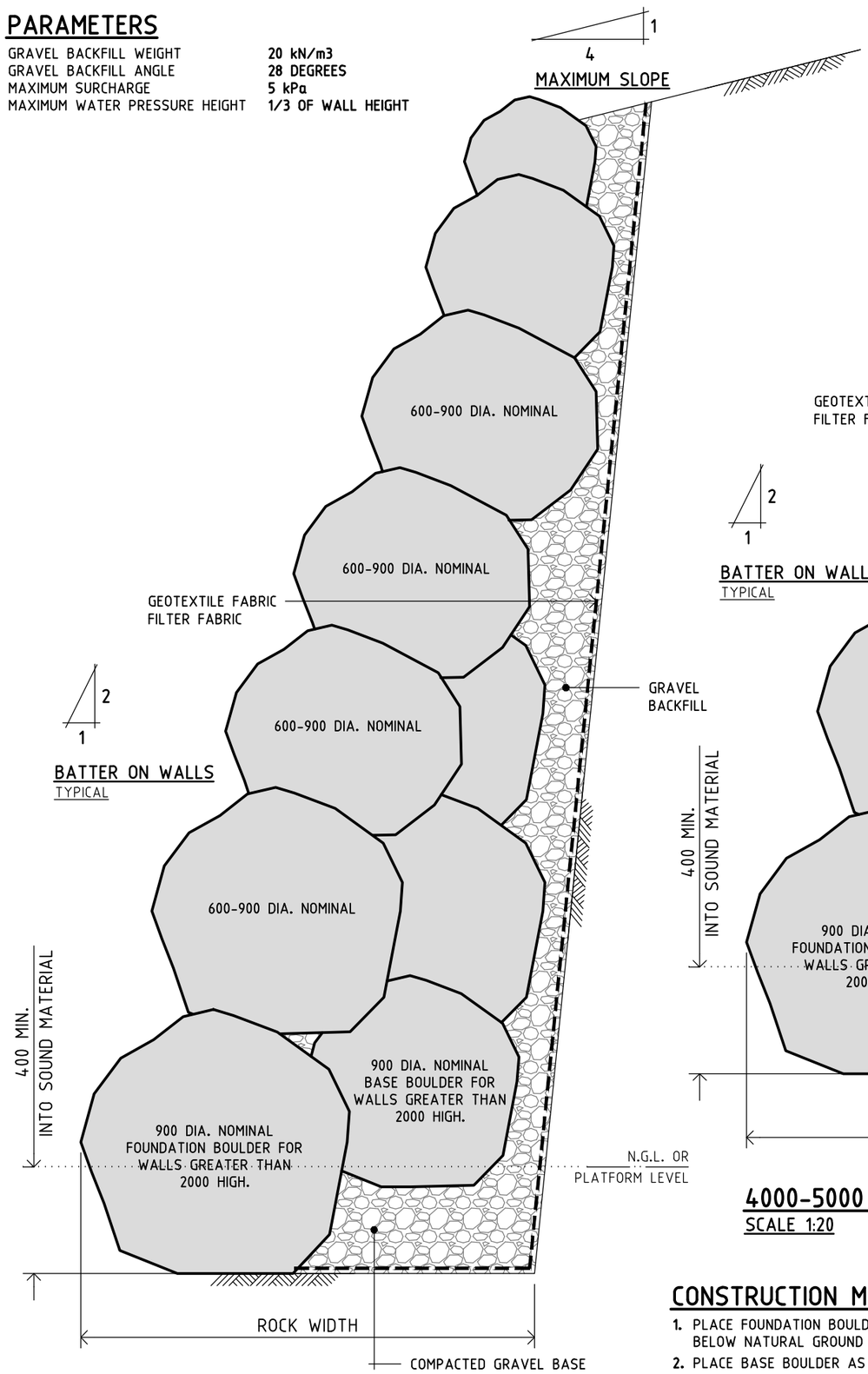
Drawing No.
S01

Revision
C05

0 mm 5 10 15 20 25

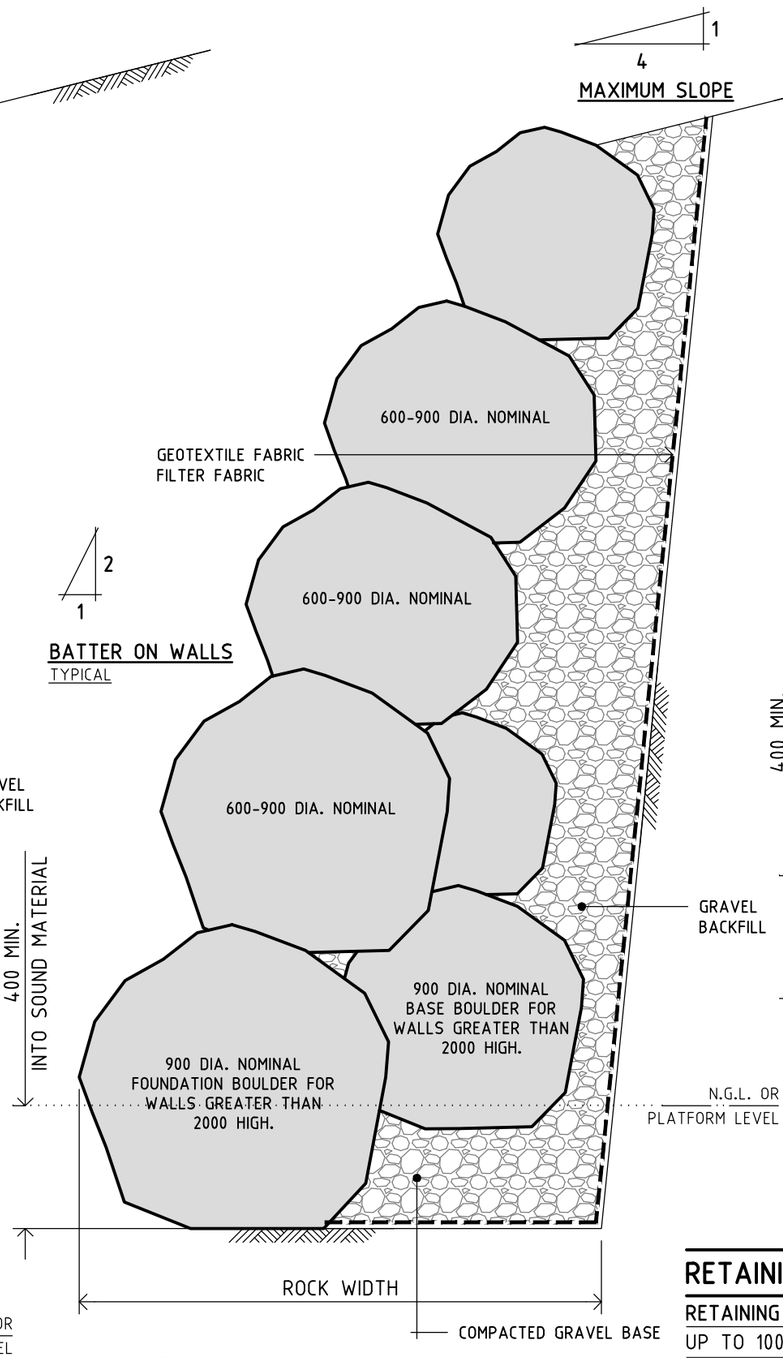
PARAMETERS

GRAVEL BACKFILL WEIGHT	**20 kN/m3**
GRAVEL BACKFILL ANGLE	**28 DEGREES**
MAXIMUM SURCHARGE	**5 kPa**
MAXIMUM WATER PRESSURE HEIGHT	**1/3 OF WALL HEIGHT**



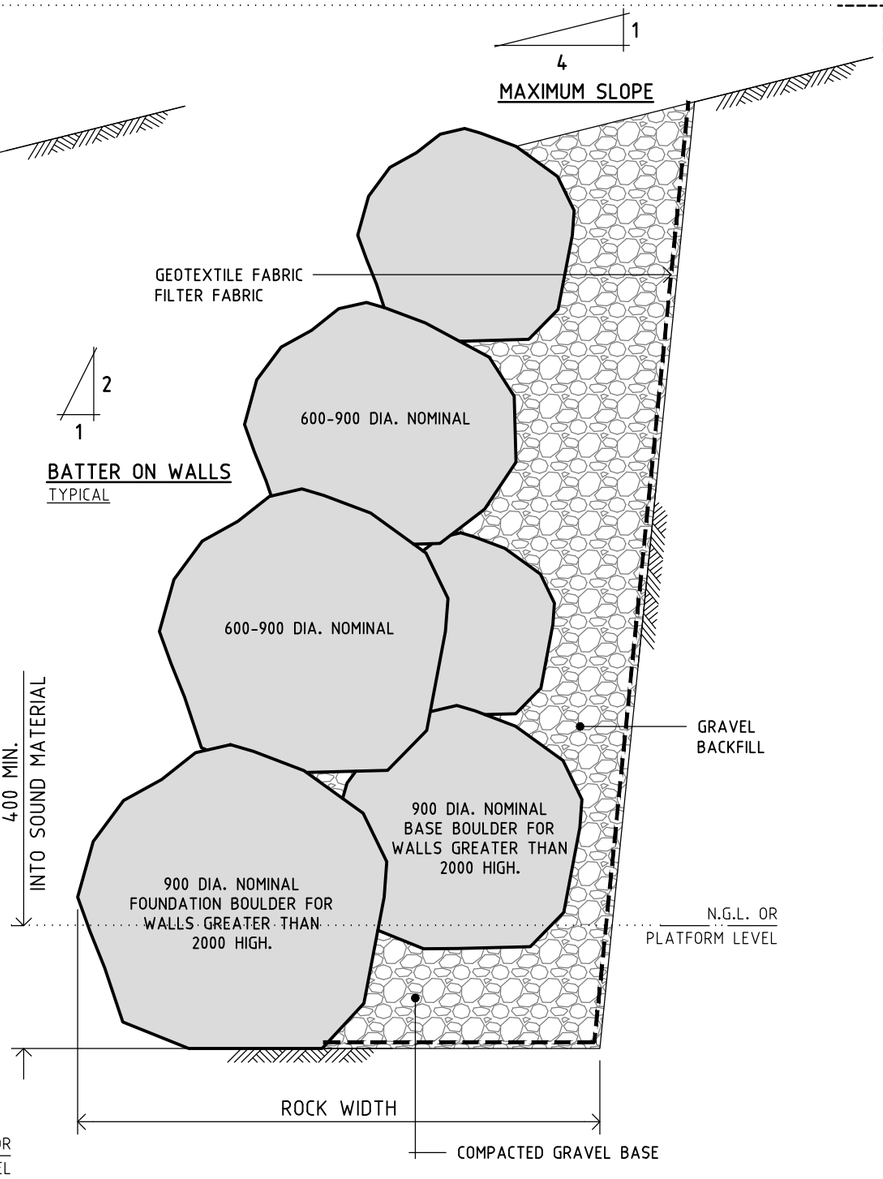
5000-6000 HIGH WALL

SCALE 1:20



4000-5000 HIGH WALL

SCALE 1:20



3000-4000 HIGH WALL

SCALE 1:20

CONSTRUCTION METHOD

1. PLACE FOUNDATION BOULDER BELOW PLATFORM LEVEL TO RETAIN CUT OR BELOW NATURAL GROUND TO RETAIN FILL. (DEPTHS AS NOTED)
2. PLACE BASE BOULDER AS REQUIRED.
3. PLACE GRAVEL BACKFILL BEHIND FOUNDATION AND BASE BOULDERS IN LAYERS.
4. CONTINUE PLACING BOULDERS AND GRAVEL BACKFILL IN LAYERS BEHIND UNTIL DESIGN PROFILE IS ACHIEVED.

RETAINING WALL SCHEDULE

RETAINING HEIGHT	ROCK WIDTH	GRAVEL BASE DEPTH
UP TO 1000	800mm NOMINAL	400mm NOMINAL
1000-2000	1000mm NOMINAL	400mm NOMINAL
2000-3000	2900mm NOMINAL	400mm NOMINAL
3000-4000	3000mm NOMINAL	400mm NOMINAL
4000-5000	3700mm NOMINAL	400mm NOMINAL
5000-6000	4000mm NOMINAL	400mm NOMINAL

NOTE

WHERE THESE WIDTHS CANNOT BE ACHIEVED ON SITE, PROVIDE 450mm DIAMETER CONCRETE PILES AT 2000mm CENTRES. PILES TO EXTEND MINIMUM 3000mm BELOW BASE OF WALL.

Rev	Date	Description	By	Chk
C02	02.08.21	ISSUED FOR CONSTRUCTION	BC	TMP
C01	30.07.21	ISSUED FOR CONSTRUCTION	BC	TMP

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E: goldcoast@edgece.com

Project Name: **39 EMMETT ROAD CRAFERS WEST**

Client: **ULRICH SCHADE**

Designed	Drawn	Checked	Scale @ A3
T.M.P.	B.C.	T.M.P.	1:20

Drawing Title: **ROCK RETAINING WALL SHEET 2**

Project No.: **200650**

ISSUED FOR CONSTRUCTION

Drawing No.: **S02**

Revision: **C02**

0 mm 5 10 15 20 25