ASPIRE
Town Planning and Project Services

2 June 2026

Chief Executive Officer
Douglas Shire Council
64-66 Front Street
MOSSMAN QLD 4873

Attention: Kieren Nyko

Delivered via email: kieren.nyko@douglas.qld.gov.au
enquiries@douglas.qld.gov.au

RE: RESPONSE TO INFORMATION REQUEST – DEVELOPMENT APPLICATION FOR A MATERIAL CHANGE OF USE (DWELLING HOUSE, ANCILLARY SHED AND HOME BASED BUSINESS) OVER LAND AT 129 RYKERS ROAD, CAPE TRIBULATION, MORE FORMALLY DESCRIBED AS LOT 2 ON RP732553

Council ref: MCUC 2026_5939/1

Aspire Town Planning and Project Services have been engaged and act on behalf of Kais Kasem, the Land Owner and Applicant in relation to the above described property and Development Application. We make reference to Council's correspondence dated 25 May 2026, seeking further information regarding the Development Application.

In accordance with s13.2 of the Development Assessment Rules v3.0, please accept the following as the Applicant's response to all of the requested items.

Council Item 1 - Proposed Plans (Caretaker's Accommodation)

As outlined in the application material, the proposed plans include a Caretaker's accommodation which has not been applied for as part of the development application.

Advice Note: Council Officers acknowledge that the cover letter specifies that a Caretaker's accommodation use is not being applied for as part of the development application however the proposed plans do not reflect this.

To remove any ambiguity, the applicant is requested to remove the Caretaker's accommodation from the proposed drawings or alternatively clearly notate the proposed drawings to make it clear that the Caretaker's accommodation does not form part of the development application or the proposed drawings.

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ABN. 79 851 193 691

Applicant Response to Item 1

We confirm that it is not the intention of the Development Application to seek approval for the Caretakers Accommodation. To make this explicitly clear the Drawing Set has been revised to remove the Caretakers Accommodation, and is included under Attachment 1.

Council Item 2 - Driveway Rectification Works (Geotechnical Certification)

Council Officers note that the hillside supporting the existing concrete driveway at CH108 has been significantly impacted by a landslip event however the application material does not provide any engineering design or technical reporting to identify how this landslip will be managed.

Advice Note: The application triggers assessment against the Potential landslide hazard overlay code and therefore Council Officers consider it a reasonable expectation that a competent person, being a geotechnical engineer certifies the stability of the site, including associated buildings and infrastructure such as the driveway to confirm that any landslip risk or existing damage will be appropriately managed to ensure the site remains stable for the life of the development.

Furthermore, if rectification works are being proposed then an operational works application may be required.

Applicant Response to Item 2

Council notes that the hillside supporting the existing concrete driveway at CH108 has been impacted by a landslip event and requests further information regarding the management of the landslip.

The Applicant advises that the affected section of driveway forms part of an existing access driveway that was originally constructed approximately 18 years ago and remained functional following the extreme rainfall and landslip events associated with Severe Tropical Cyclone Jasper in December 2023. The proposed works comprise emergency remediation and repair of a localised section of the existing driveway that was damaged during this event.

A site-specific Landslide Hazard Assessment Statement prepared by George Thirkell, RPEQ 7279, together with detailed engineering drawings prepared by Shell Engineers, has been submitted in support of the application, refer to Attachment 2. The assessment concludes that the proposed remediation works will maintain the stability of the site and associated infrastructure for the life of the development and will not increase the risk of landslip activity on adjoining land. The report further confirms that the proposed drainage and structural improvement works represent an enhancement to the existing situation and have been specifically designed to improve the resilience of the driveway following the unprecedented rainfall event associated with Cyclone Jasper.

The engineering design includes:

- Construction of a reinforced edge beam and pier footing system to support the affected section of driveway;
- Improvements to surface drainage through provision of a new drainage channel;
- Redirection of overland flow paths away from the compromised batter;
- Soil movement is 15m^3, less than 25m^3 moving from one side of the road to the other, to be compacted for a new edge. No excavation or fill is being exported or imported.
- Stabilisation of disturbed areas; and

- Ongoing drainage management measures to minimise groundwater and surface water impacts.

Importantly, the engineering assessment confirms that the proposed works will not concentrate groundwater or surface water flows, will not increase the risk of landslip on adjoining land, and will maintain the long-term stability of the site.

No vegetation clearing is proposed or required to undertake the remediation works. The works are confined to an existing disturbed section of driveway and associated drainage infrastructure. The proposed repairs are limited in extent and are intended to restore and improve the functionality and safety of existing infrastructure rather than facilitate new development. The engineering report further notes that natural revegetation of the affected landslip area is anticipated to occur.

With respect to Operational Works, it is the Applicant's opinion that a separate Operational Works approval is not required. The proposed works constitute emergency repair and maintenance of an existing driveway and associated drainage infrastructure that has been damaged by a natural disaster event. The works do not involve vegetation clearing, the creation of new development footprints or significant earthworks beyond those necessary to stabilise and repair the existing infrastructure. Accordingly, it is submitted that the proposed remediation works are more appropriately characterised as repair and maintenance works rather than assessable Operational Works.

Council Item 3 - On-site Sewerage Disposal Report

The applicant is requested to provide an on-site sewerage disposal report prepared in accordance with the Plumbing and Drainage Act 2018 and FNQROC Development Manual.

Advice Note: The report is required to ensure that the development can adequately treat and dispose of wastewater and should include nominated clearances to watercourses and vegetated areas.

Applicant Response to Item 3

In support we attach the original Onsite Sewerage Assessment Report prepared by ETS, refer to Attachment 3.

Council Item 4 - Building Colours and Materials

The applicant is requested to provide a building materials and colours schedule for the proposed Dwelling house and associated structures.

Advice Note: Due to the subject site being identified within the Hillslopes overlay area and Landscape values overlay, the abovementioned information is requested to ensure the built form is appropriate within the surrounding environment.

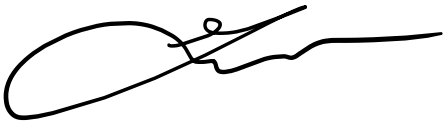
Applicant Response to Item 4

The revised drawings specify building materials and colours on elevations, refer to Attachment 1.

Conclusion

Thank you for your time and consideration of this Response to Information Request. If you have any further questions or issues please do not hesitate to contact the undersigned.

Regards,



Daniel Favier
Senior Town Planner
ASPIRE Town Planning and Project Services

Attachment 1
Revised Plan Set

PROPOSED RESIDENCE INCLUDING BUNGALOWS, CARPORT AND CARETAKER'S COTTAGE

CLIENT: K. Kasem ADDRESS: 129 Rykers Road Cape Tribulation QLD 4873

SHEET	SHEET NAME	REVISION	REVISION DESCRIPTION
BD00	TITLE SHEET AND DRAWING SCHEDULE	A	DEVELOPMENT APPROVAL
BD01	SITE PLAN	B	DEVELOPMENT APPROVAL - REVISED
BD02	EXISTING MAIN RESIDENCE FLOOR PLAN	A	DEVELOPMENT APPROVAL
BD03	EXISTING NORTHERN AND EASTERN ELEVATIONS	A	DEVELOPMENT APPROVAL
BD04	EXISTING SOUTHERN AND WESTERN ELEVATIONS	A	DEVELOPMENT APPROVAL
BD05	EXISTING MAIN RESIDENCE ROOF PLAN	A	DEVELOPMENT APPROVAL
BD06	EXISTING BUNGALOW A FLOOR PLAN	A	DEVELOPMENT APPROVAL
BD07	EXISTING BUNGALOW A ELEVATIONS	A	DEVELOPMENT APPROVAL
BD08	EXISTING BUNGALOW A ROOF PLAN	A	DEVELOPMENT APPROVAL
BD09	EXISTING BUNGALOW B AND C FLOOR PLAN	A	DEVELOPMENT APPROVAL
BD10	EXISTING BUNGALOW B AND C ELEVATIONS	A	DEVELOPMENT APPROVAL
BD11	EXISTING BUNGALOW B AND C ROOF PLAN	A	DEVELOPMENT APPROVAL
BD12	EXISTING CARPORT FLOOR AND ROOF PLAN	A	DEVELOPMENT APPROVAL
BD13	EXISTING CARPORT ELEVATIONS	A	DEVELOPMENT APPROVAL

NOT FOR CONSTRUCTION

SHELL ENGINEERS
STRUCTURAL CIVIL BUILDING DESIGN
Innovation & Experience

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REV	DESCRIPTION	DATE
P1	PRELIMINARY - CLIENT REVIEW	14/08/2025
P2	PRELIMINARY - CLIENT REVIEW	18/11/2025
A	DEVELOPMENT APPROVAL	25/11/2025

CLIENT
K. KASEM

PROJECT
PROPOSED RESIDENCE AT 129 RYKERS ROAD CAPE TRIBULATION QLD 4873

DRAWING TITLE
TITLE SHEET AND DRAWING SCHEDULE

SCALE	DATE	DRAWN	CHECKED
A3	27/05/2026 3:25:12 PM	AB/ML	-

PROJECT NO.	DWG NO.	REV
25-038-DE	BD00	A

RP DATA: 2RP732553	
LOT AREA (APPROX):	239910 m²
EXISTING RESIDENCE:	187 m²
EXISTING SHED:	103 m²
TOTAL ADDITIONS:	709 m²
TOTAL UNDER ROOF:	999 m²
SITE COVERAGE:	0.4 %

AREA BREAKDOWN UNDER ROOF	
EXISTING HOUSE:	187 m²
ADDITION TO EXISTING HOUSE:	103 m²
BUNGALOW A:	102 m²
BUNGALOW B:	102 m²
BUNGALOW C:	114 m²
CARPORT, LNDRY, PLANT:	74 m²
POOL & PATIO:	62 m²
CARETAKER'S CABIN:	152 m²
EXISTING SHED:	103 m²
TOTAL UNDER ROOF:	999 m²

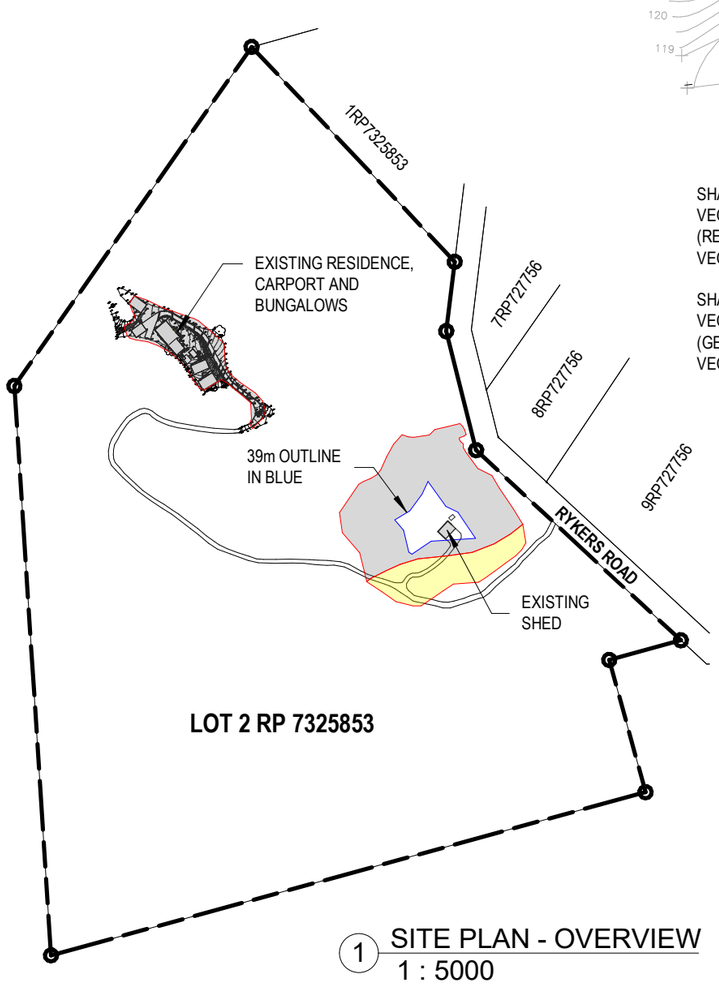
IMPORTANT NOTE:

- LEVELS AND SURVEY PLAN SHOWN FOR RESIDENCE, CARPORT AND BUNGALOWS ARE BASED ON CONSTRUCTION ISSUED DRAWINGS.
- SITE PLAN OVERVIEW WITH LOCATION OF EXISTING BUILDINGS, TRACK AND DRIVEWAY ESTABLISHED FROM QUEENSLAND GLOBE SATELLITE IMAGERY.

NORTH

SHADED AREAS IN YELLOW: REGULATED VEGETATION MANAGEMENT - CATEGORY R (REEF RE-GROWTH WATER COURSE VEGETATION)

SHADED AREAS IN GREY: REGULATED VEGETATION MANAGEMENT - CATEGORY X (GENERALLY EXEMPT FROM THE VEGETATION MANAGEMENT ACT)



1 SITE PLAN - OVERVIEW
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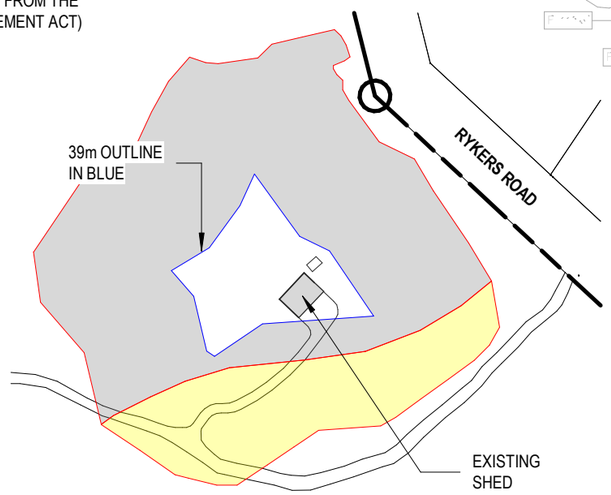

2 SITE PLAN - SHED AND CARETAKERS
1 : 2000

3 SITE PLAN - RESIDENCE
1 : 350

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A	DEVELOPMENT APPROVAL	25/11/2025
B	DEVELOPMENT APPROVAL - REVISED	09/04/2026

CLIENT: **K. KASEM**

PROJECT: **PROPOSED RESIDENCE AT 129 RYKERS ROAD CAPE TRIBULATION QLD 4873**

DRAWING TITLE: **SITE PLAN**

SCALE	DATE	DRAWN	CHECKED
As indicated A3	27/05/2026 3:25:13 PM	AB/ML	-

PROJECT NO.	DWG NO.	REV
25-038-DE	BD01	B

NORTH

MAIN RESIDENCE DOOR SCHEDULE

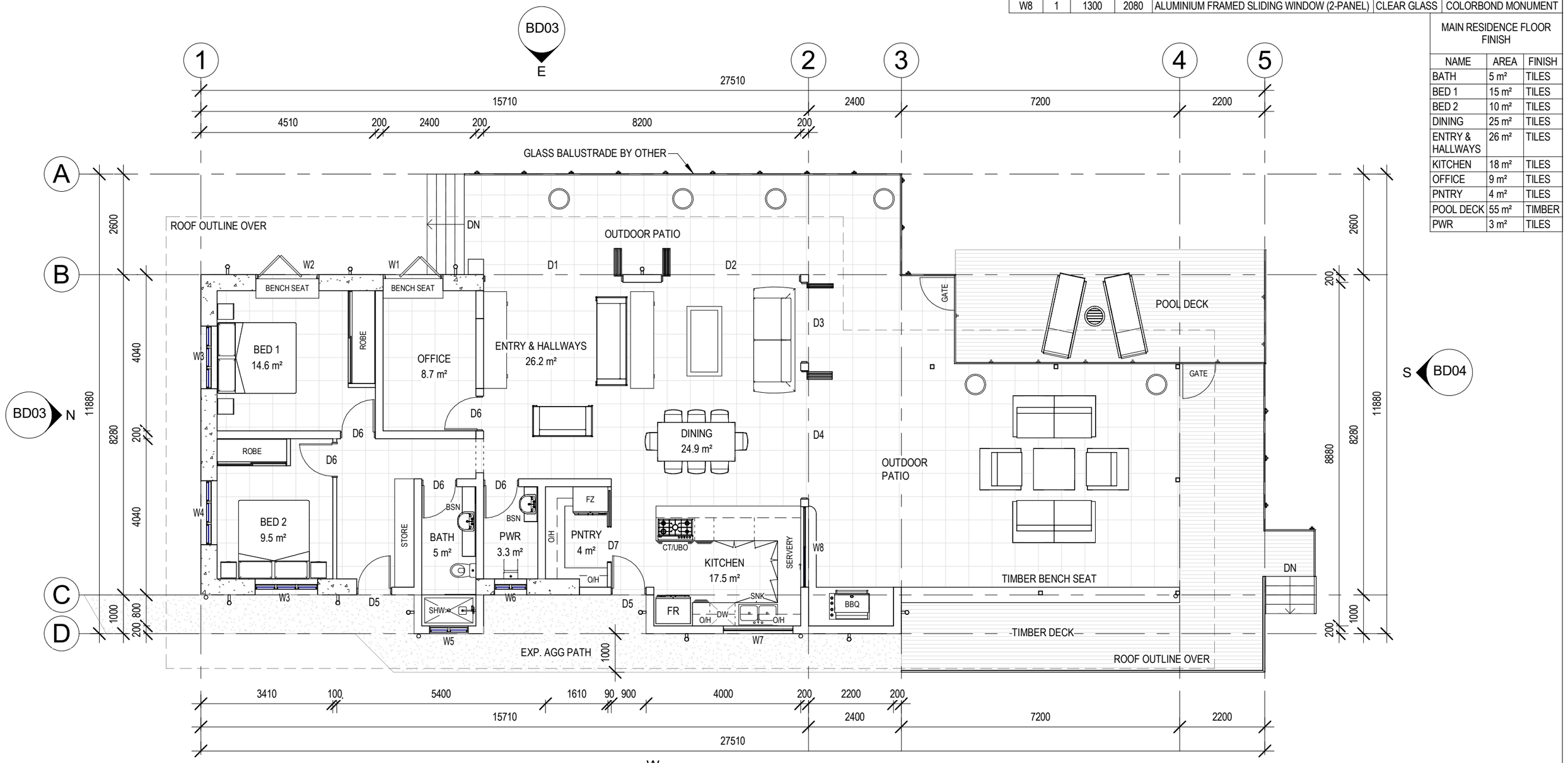
CODE	QTY	HEIGHT	WIDTH	DESCRIPTION	FRAME FINISH
D1	1	2300	3600	ALUMINIUM FRAMED BI-FOLD DOOR WITH CLEAR GLAZING	COLORBOND MONUMENT
D2	1	2300	3600	ALUMINIUM FRAMED BI-FOLD DOOR WITH CLEAR GLAZING	COLORBOND MONUMENT
D3	1	2300	2080	ALUMINIUM FRAMED BI-FOLD DOOR WITH CLEAR GLAZING	COLORBOND MONUMENT
D4	1	2300	3320	ALUMINIUM FRAMED BI-FOLD DOOR WITH CLEAR GLAZING	COLORBOND MONUMENT
D5	2	2400	900	EXTERNAL SINGLE SOLID CORE HINGED TIMBER DOOR	PAINTED FINISH
D6	5	2300	900	INTERNAL SINGLE SEMI HOLLOW CORE HINGED TIMBER DOOR	PAINTED FINISH
D7	1	2340	920	INTERNAL SEMI HOLLOW CORE DOUBLE CAVITY SLIDER DOOR	PAINTED FINISH

MAIN RESIDENCE WINDOW SCHEDULE

CODE	QTY	HEIGHT	WIDTH	DESCRIPTION	GLASS	FRAME FINISH
W1	1	1600	1545	ALUMINIUM FRAMED BI-FOLD WINDOW (2-PANEL)	CLEAR GLASS	COLORBOND MONUMENT
W2	1	1600	1630	ALUMINIUM FRAMED BI-FOLD WINDOW (2-PANEL)	CLEAR GLASS	COLORBOND MONUMENT
W3	2	1600	1620	ALUMINIUM FRAMED LOUVRE WINDOW (3-BAY)	CLEAR GLASS	COLORBOND MONUMENT
W4	1	1600	1650	ALUMINIUM FRAMED LOUVRE WINDOW (3-BAY)	CLEAR GLASS	COLORBOND MONUMENT
W5	1	1200	1000	ALUMINIUM FRAMED LOUVRE WINDOW (2-BAY)	OBSCURE	COLORBOND MONUMENT
W6	1	1200	830	ALUMINIUM FRAMED LOUVRE WINDOW (2-BAY)	OBSCURE	COLORBOND MONUMENT
W7	1	800	1800	ALUMINIUM FRAMED FIXED WINDOW	CLEAR GLASS	COLORBOND MONUMENT
W8	1	1300	2080	ALUMINIUM FRAMED SLIDING WINDOW (2-PANEL)	CLEAR GLASS	COLORBOND MONUMENT

MAIN RESIDENCE FLOOR FINISH

NAME	AREA	FINISH
BATH	5 m²	TILES
BED 1	15 m²	TILES
BED 2	10 m²	TILES
DINING	25 m²	TILES
ENTRY & HALLWAYS	26 m²	TILES
KITCHEN	18 m²	TILES
OFFICE	9 m²	TILES
PNTRY	4 m²	TILES
POOL DECK	55 m²	TIMBER
PWR	3 m²	TILES



3 EX. MAIN RESIDENCE FLOOR PLAN
1 : 100

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PROJECT
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CLIENT
K. KASEM

DRAWING TITLE
EXISTING MAIN RESIDENCE FLOOR PLAN

SCALE	DATE	DRAWN	CHECKED
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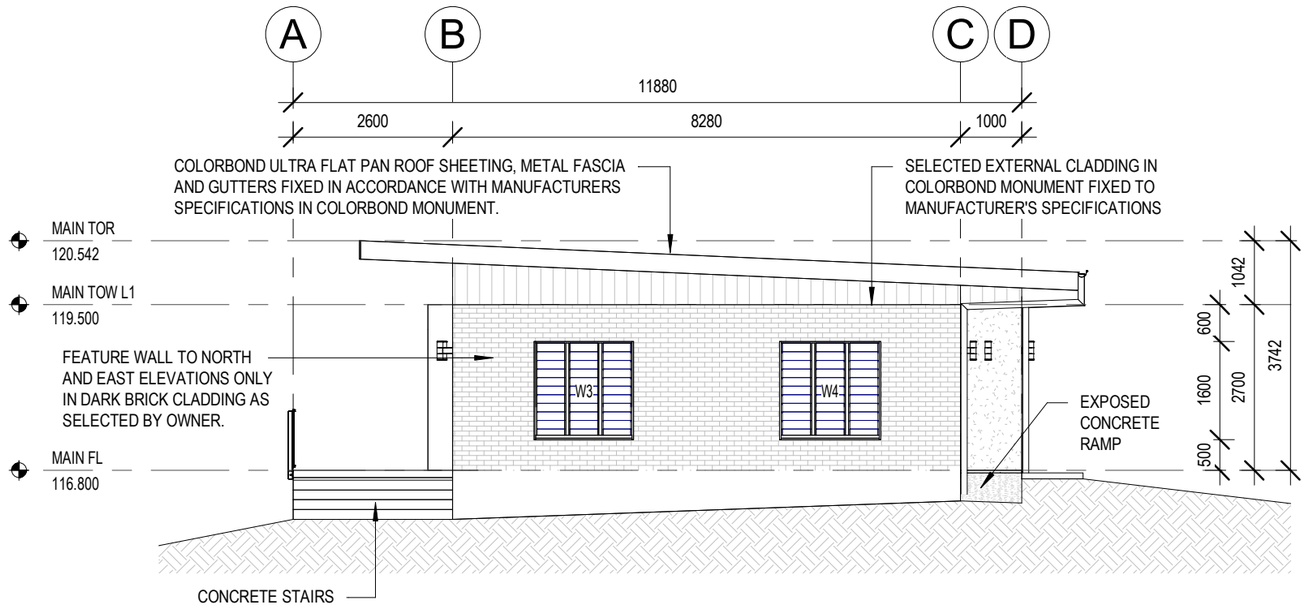
PROJECT NO.	DWG NO.	REV
25-038-DE	BD02	A



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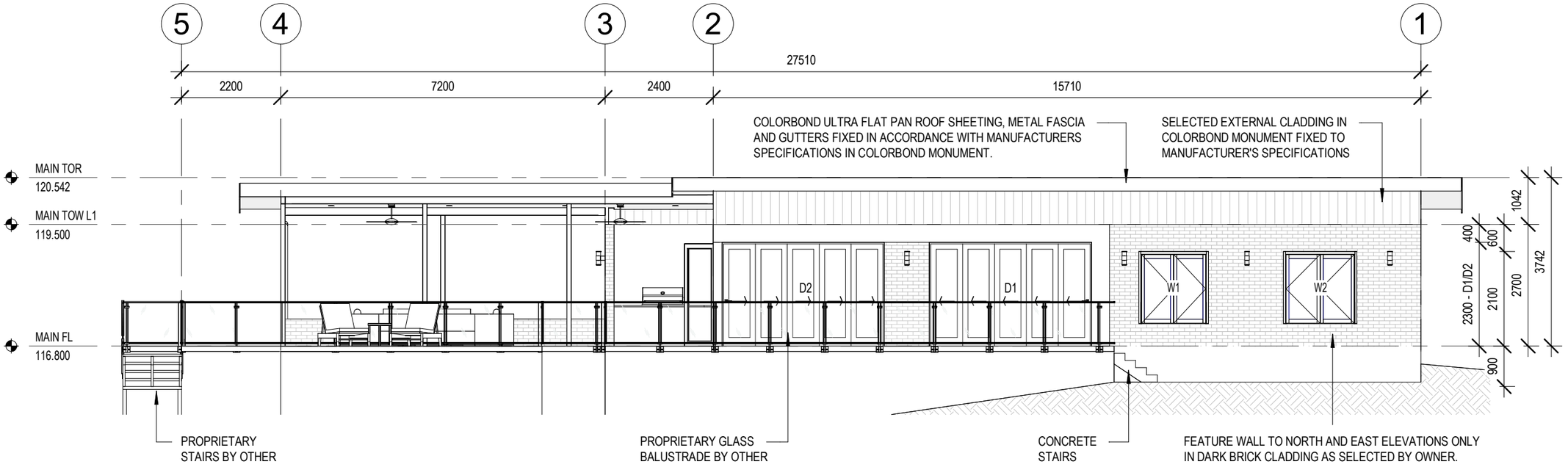

E EASTERN ELEVATION
1 : 100

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DRAWING TITLE
EXISTING NORTHERN AND EASTERN ELEVATIONS

SCALE	DATE	DRAWN	CHECKED
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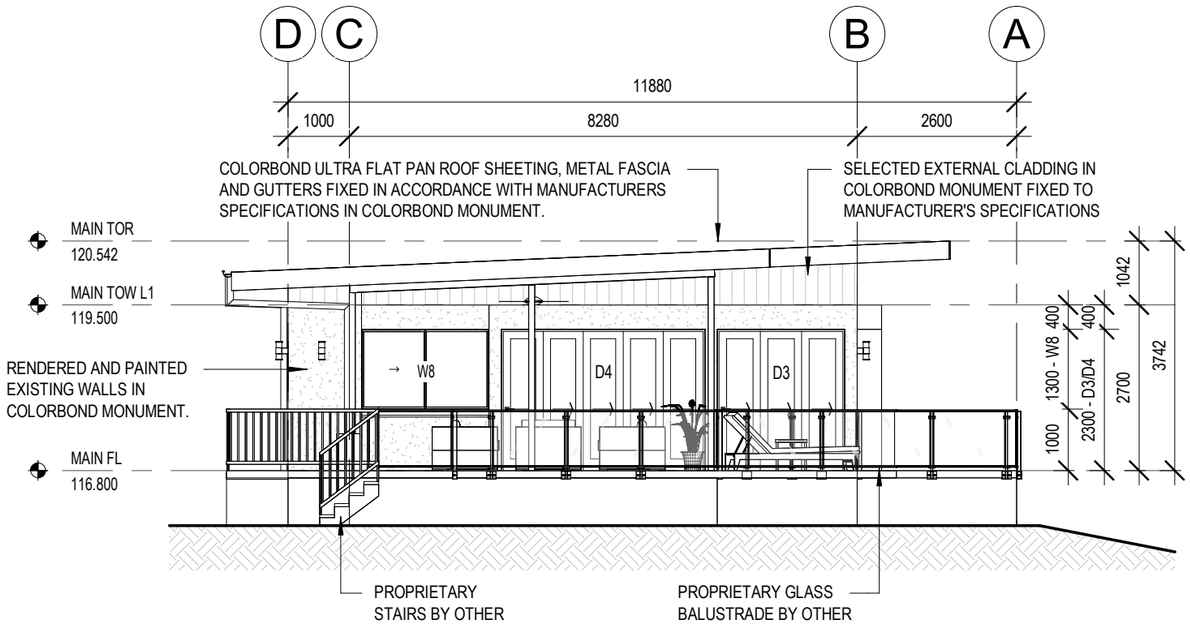
PROJECT NO.	DWG NO.	REV
25-038-DE	BD03	A



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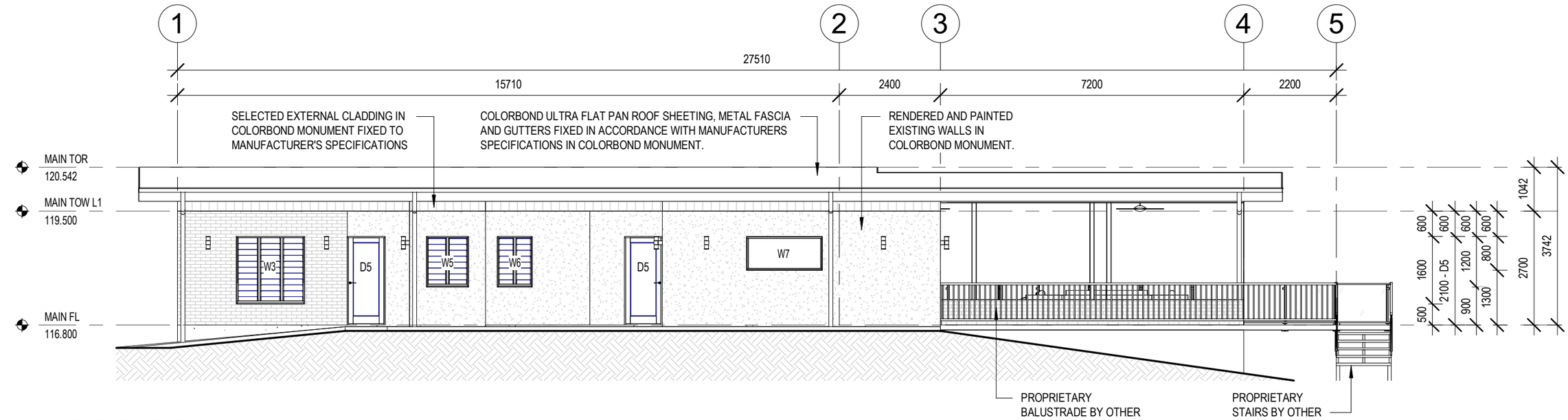

W WESTERN ELEVATION
1 : 100

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DRAWING TITLE
EXISTING SOUTHERN AND WESTERN ELEVATIONS

SCALE	DATE	DRAWN	CHECKED
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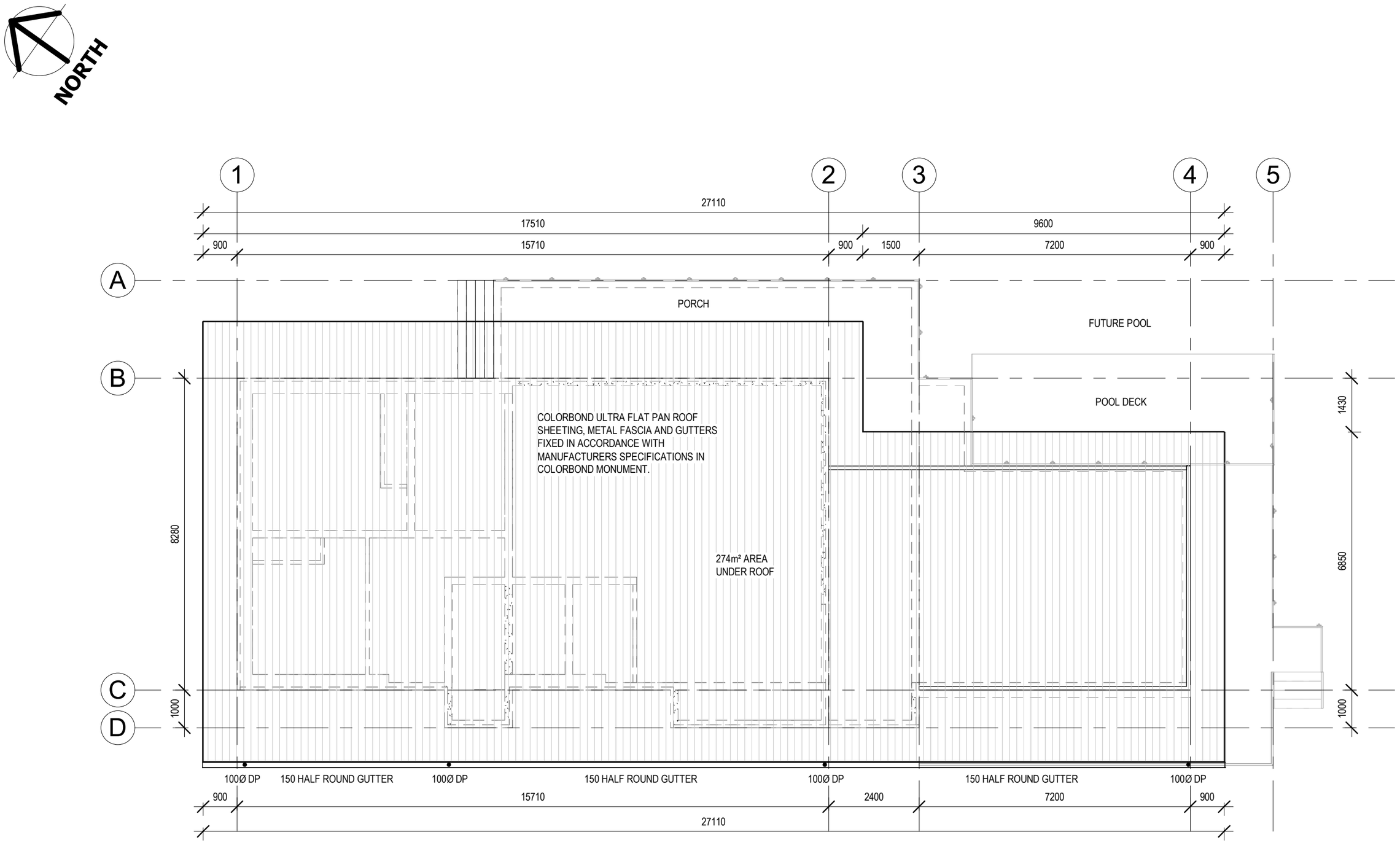
PROJECT NO.	DWG NO.	REV
25-038-DE	BD04	A



4 EX. MAIN RESIDENCE ROOF PLAN
1 : 100

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DRAWING TITLE
EXISTING MAIN RESIDENCE ROOF PLAN

SCALE	DATE	DRAWN	CHECKED
1 : 100 A3	27/05/2026 3:25:19 PM	AB/ML	-

PROJECT NO.	DWG NO.	REV
25-038-DE	BD05	A

NORTH

BUNGALOW A DOOR SCHEDULE

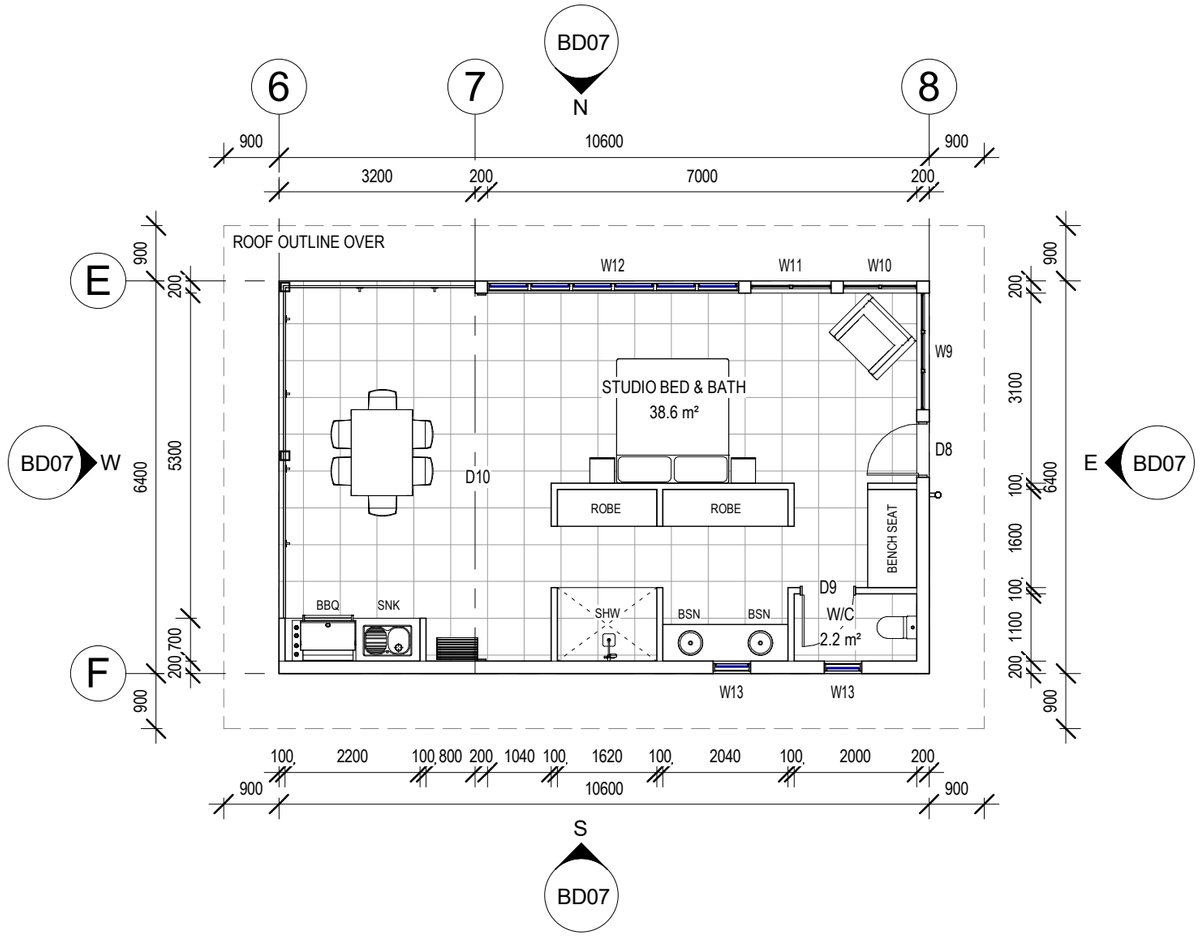
CODE	QTY	HEIGHT	WIDTH	DESCRIPTION	FRAME FINISH
D8	1	2400	900	EXTERNAL SINGLE SOLID CORE HINGED TIMBER DOOR	PAINTED FINISH
D9	1	2400	900	INTERNAL SINGLE SEMI HOLLOW CORE HINGED TIMBER DOOR	PAINTED FINISH
D10	1	2300	6000	ALUMINIUM FRAMED BI-FOLD DOOR WITH CLEAR GLAZING	CLEAR ANODISED

BUNGALOW A WINDOW SCHEDULE

MARK	HEIGHT	WIDTH	DESCRIPTION	GLASS	FRAME FINISH
W9	2400	1900	ALUMINIUM FRAMED FIXED WINDOW (3-PANELS)	CLEAR GLASS	CLEAR ANODISED
W10	2400	1200	ALUMINIUM FRAMED FIXED WINDOW (2-PANELS)	CLEAR GLASS	CLEAR ANODISED
W11	2400	1305	ALUMINIUM FRAMED FIXED WINDOW (2-PANELS)	CLEAR GLASS	CLEAR ANODISED
W12	2400	4095	ALUMINIUM FRAMED LOUVRE WINDOW (6-BAY)	CLEAR GLASS	CLEAR ANODISED
W13	700	610	ALUMINIUM FRAMED LOUVRE WINDOW (1-BAY)	OBSCURE	CLEAR ANODISED

BUNGALOW A FLOOR FINISH

NAME	AREA	FINISH
STUDIO BED & BATH	39 m²	TILES
W/C	2 m²	TILES



4 EX. BUNGALOW A FLOOR PLAN
1 : 100

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EXISTING BUNGALOW A FLOOR PLAN

SCALE	DATE	DRAWN	CHECKED
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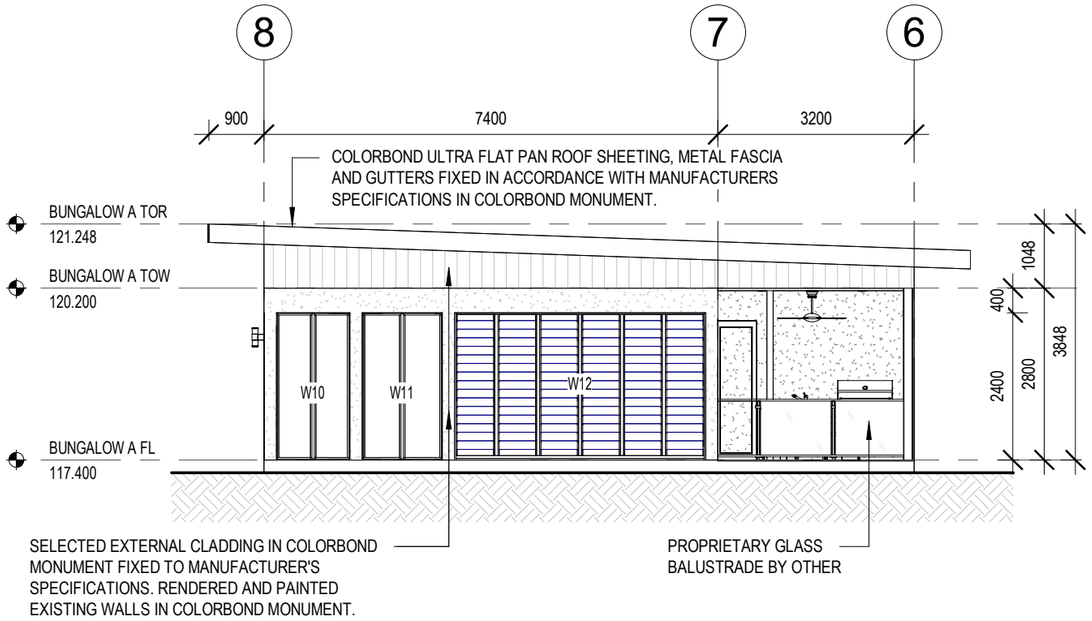
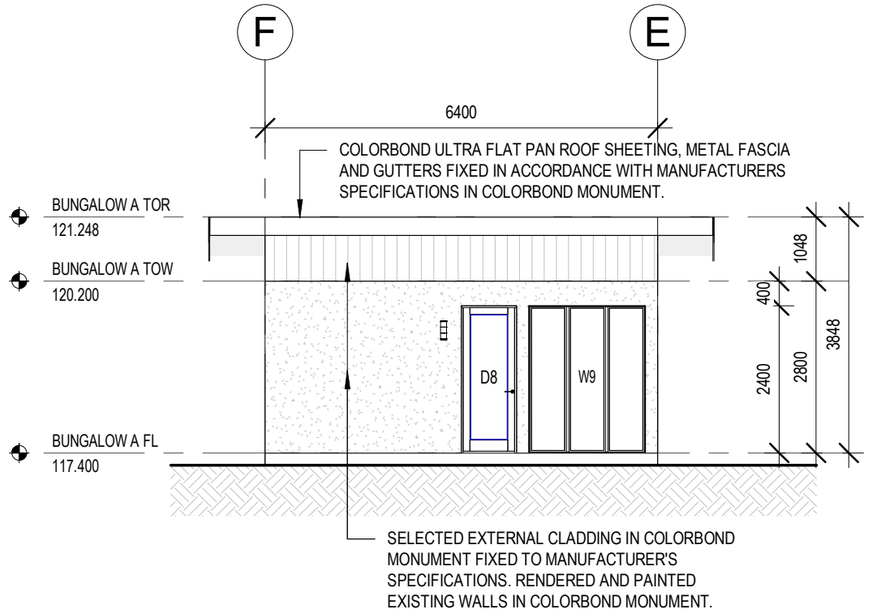
PROJECT NO.	DWG NO.	REV
25-038-DE	BD06	A



N NORTHERN BUNGALOW A ELEVATION
1 : 100



E EASTERN BUNGALOW A ELEVATION
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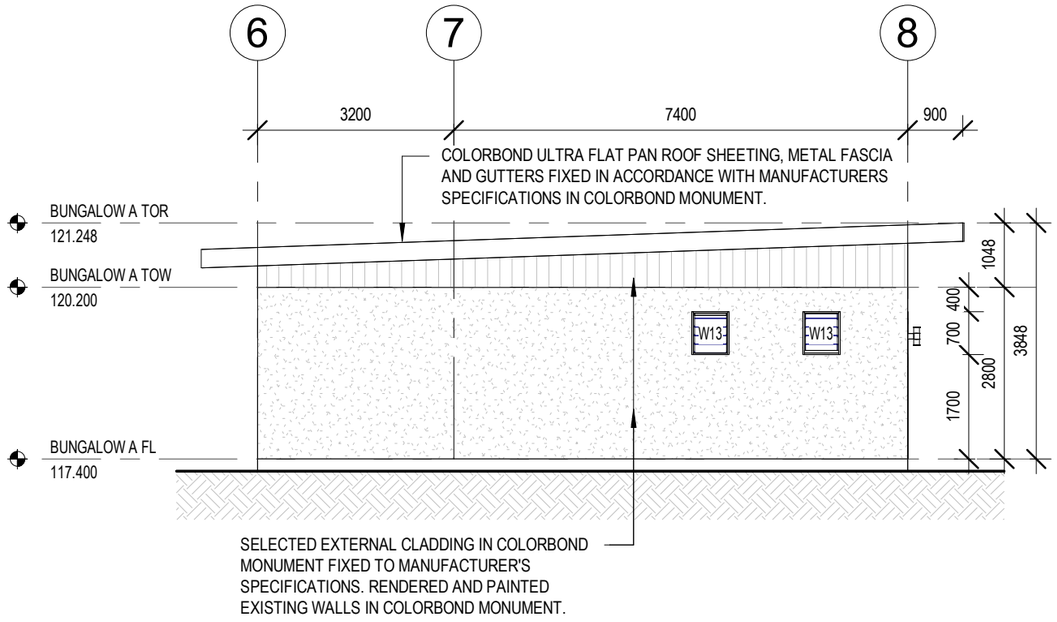

S SOUTHERN BUNGALOW A ELEVATION
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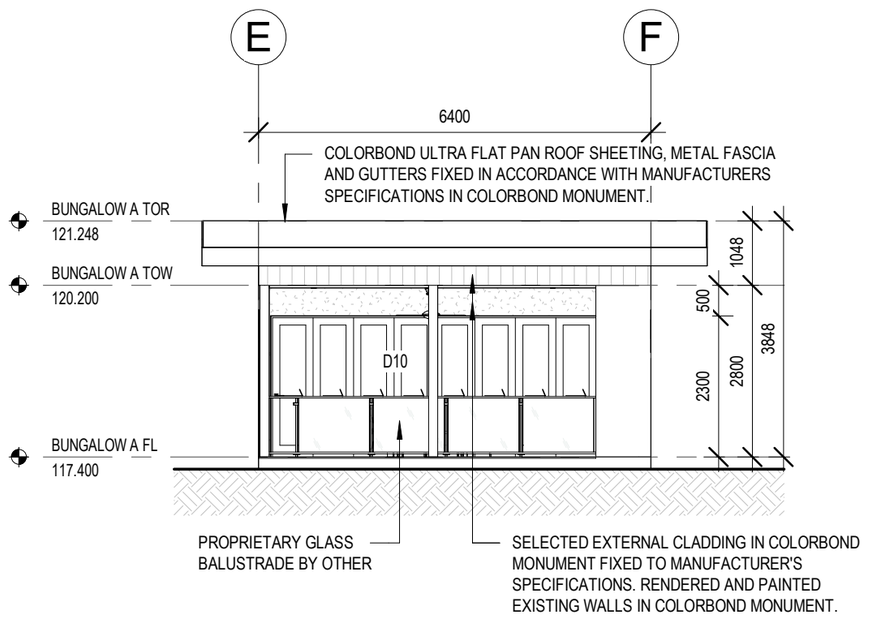

W WESTERN BUNGALOW A ELEVATION
1 : 100

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PROPOSED RESIDENCE AT 129 RYKERS ROAD CAPE TRIBULATION QLD 4873

DRAWING TITLE
EXISTING BUNGALOW A ELEVATIONS

SCALE	DATE	DRAWN	CHECKED
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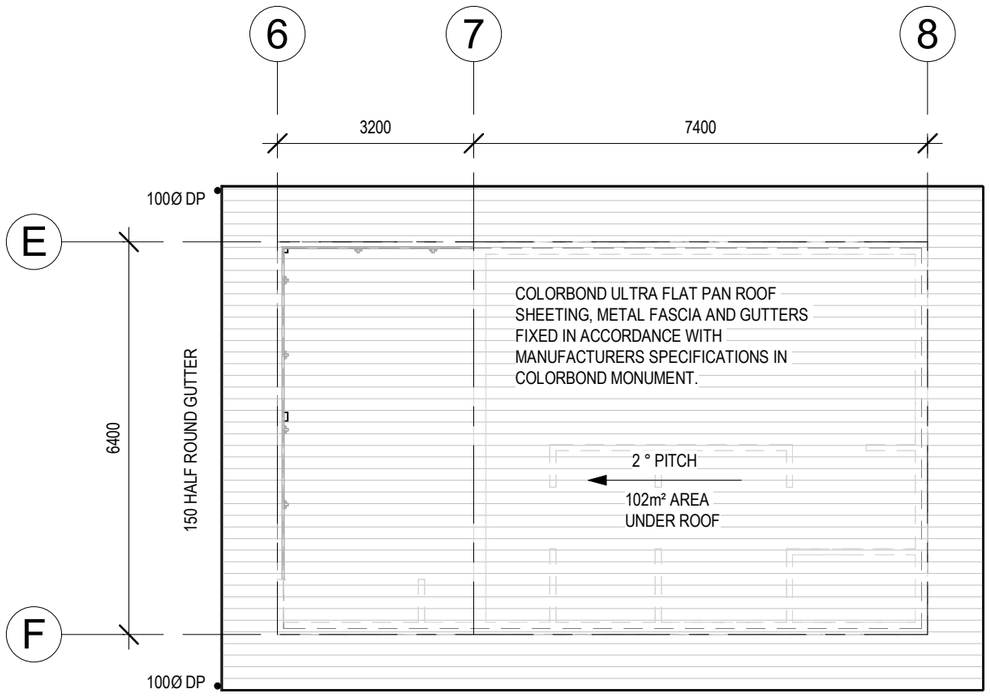
PROJECT NO.	DWG NO.	REV
25-038-DE	BD07	A

NORTH



5 EX. BUNGALOW A ROOF PLAN
1 : 100

NOT FOR CONSTRUCTION

SHELL ENGINEERS
STRUCTURAL CIVIL
BUILDING DESIGN
Innovation & Experience

ABN 896791471876 MEDIUM RISE
RPEQ 7279 MIEAust QBCC 15511205

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TEL 4276 1900
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REV	DESCRIPTION	DATE
A	DEVELOPMENT APPROVAL	25/11/2025

CLIENT
K. KASEM

PROJECT
PROPOSED RESIDENCE AT 129 RYKERS ROAD CAPE TRIBULATION QLD 4873

DRAWING TITLE
EXISTING BUNGALOW A ROOF PLAN

SCALE	DATE	DRAWN	CHECKED
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PROJECT NO.	DWG NO.	REV
25-038-DE	BD08	A

NORTH

BUNGALOW B & C DOOR SCHEDULE

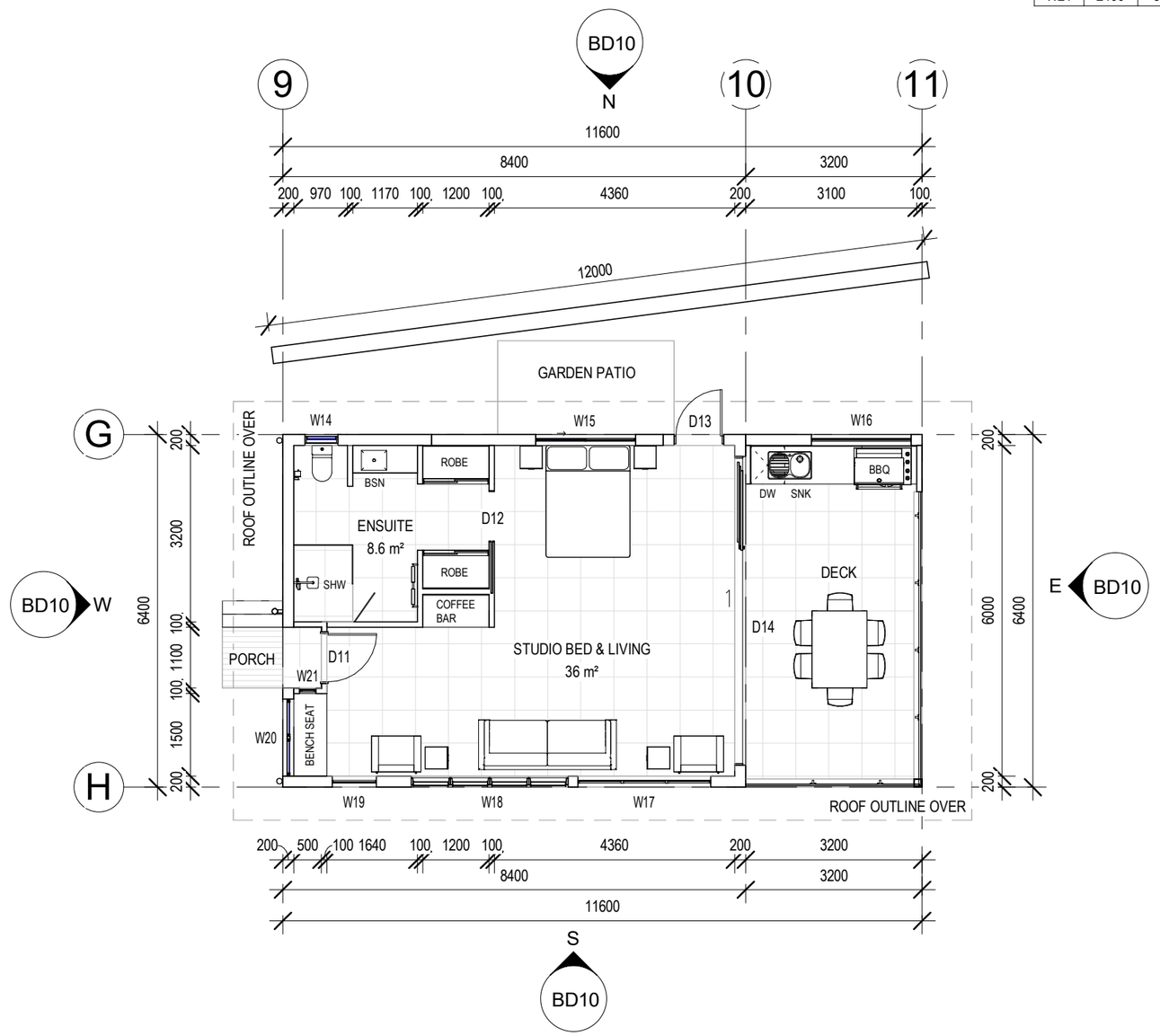
CODE	QTY	HEIGHT	WIDTH	DESCRIPTION	FRAME FINISH
D11	1	2400	900	EXTERNAL SINGLE SOLID CORE HINGED TIMBER DOOR	PAINTED FINISH
D12	1	2400	920	INTERNAL SINGLE SEMI HOLLOW CORE CAVITY SLIDING DOOR	PAINTED FINISH
D13	1	3000	940	EXTERNAL SINGLE SOLID CORE HINGED TIMBER DOOR WITH CLEAR GLAZING	PAINTED FINISH
D14	1	2400	2400	ALUMINIUM FRAMED SLIDING GLASS POCKET DOOR	CLEAR ANODISED

BUNGALOW B & C WINDOW SCHEDULE

MARK	HEIGHT	WIDTH	DESCRIPTION	GLASS	FRAME FINISH
W14	600	600	ALUMINIUM FRAMED LOUVRE WINDOW (1-BAY)	OBSCURE	CLEAR ANODISED
W15	1200	1810	ALUMINIUM FRAMED SLIDING WINDOW (2-PANEL)	CLEAR GLASS	CLEAR ANODISED
W16	1100	1810	ALUMINIUM FRAMED FIXED WINDOW	CLEAR GLASS	CLEAR ANODISED
W17	2400	2410	ALUMINIUM FRAMED FIXED WINDOW (3-PANELS)	CLEAR GLASS	CLEAR ANODISED
W18	2400	2845	ALUMINIUM FRAMED LOUVRE WINDOW (4-BAY)	CLEAR GLASS	CLEAR ANODISED
W19	2400	800	ALUMINIUM FRAMED FIXED WINDOW	CLEAR GLASS	CLEAR ANODISED
W20	1200	1400	ALUMINIUM FRAMED AWNING WINDOW (2-PANELS)	CLEAR GLASS	CLEAR ANODISED
W21	2400	300	ALUMINIUM FRAMED FIXED WINDOW	CLEAR GLASS	CLEAR ANODISED

BUNGALOW B & C FLOOR FINISH

NAME	AREA	FINISH
DECK	19 m²	TILES
ENSUITE	9 m²	TILES
STUDIO BED & LIVING	36 m²	TILES



6 EX. BUNGALOW FLOOR PLAN
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NOT FOR CONSTRUCTION

SHELL ENGINEERS
STRUCTURAL CIVIL BUILDING DESIGN
Innovation & Experience

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A	DEVELOPMENT APPROVAL	25/11/2025

PROJECT
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CLIENT
K. KASEM

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EXISTING BUNGALOW B AND C FLOOR PLAN

SCALE	DATE	DRAWN	CHECKED
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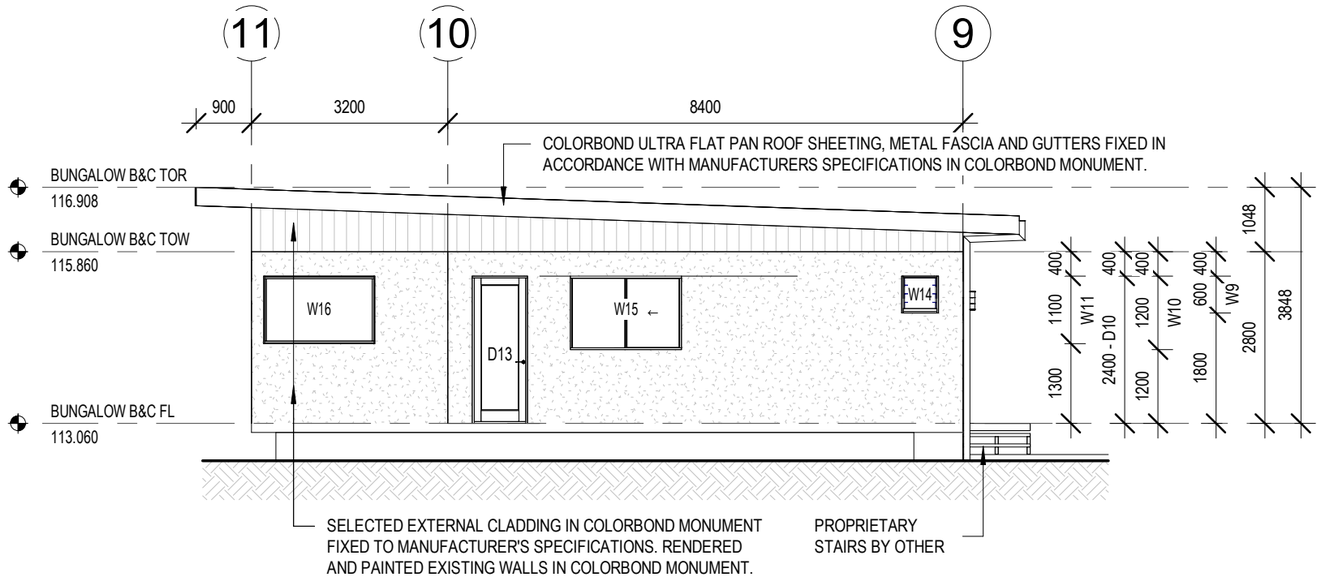

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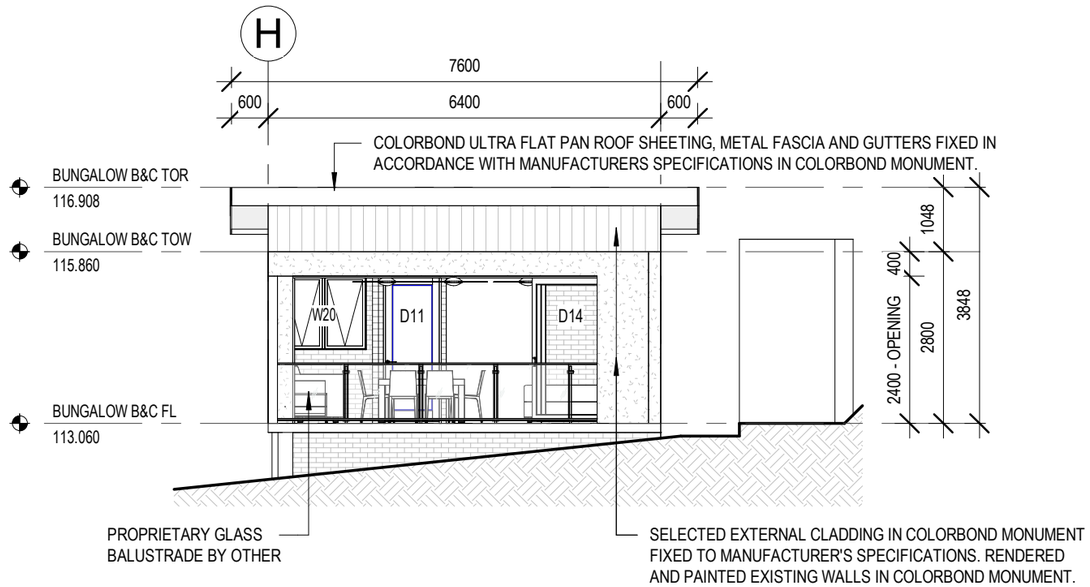

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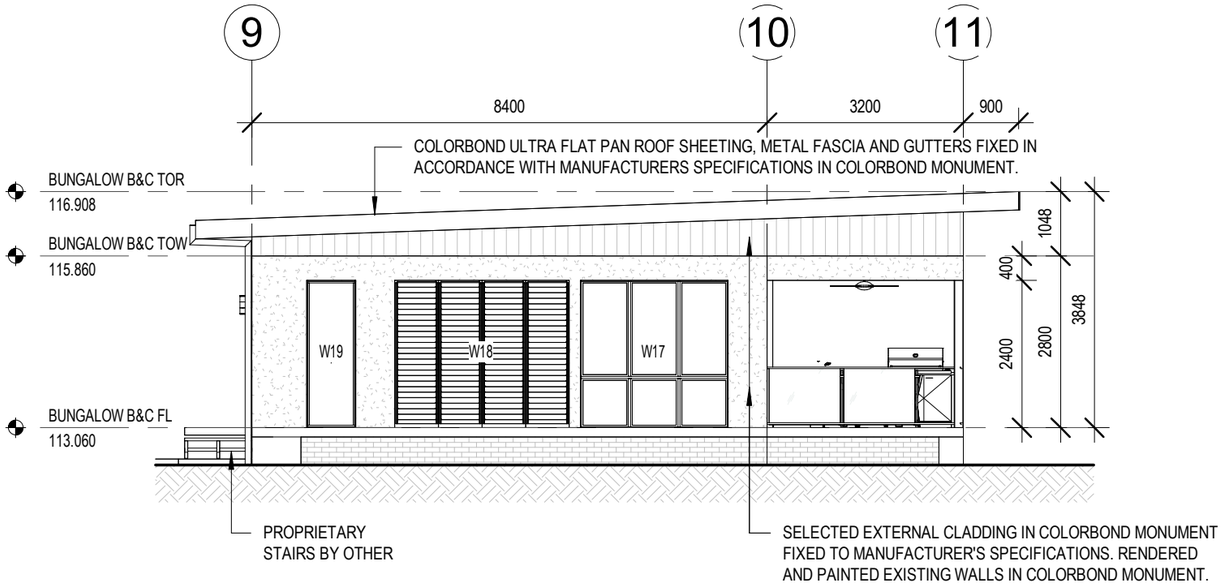

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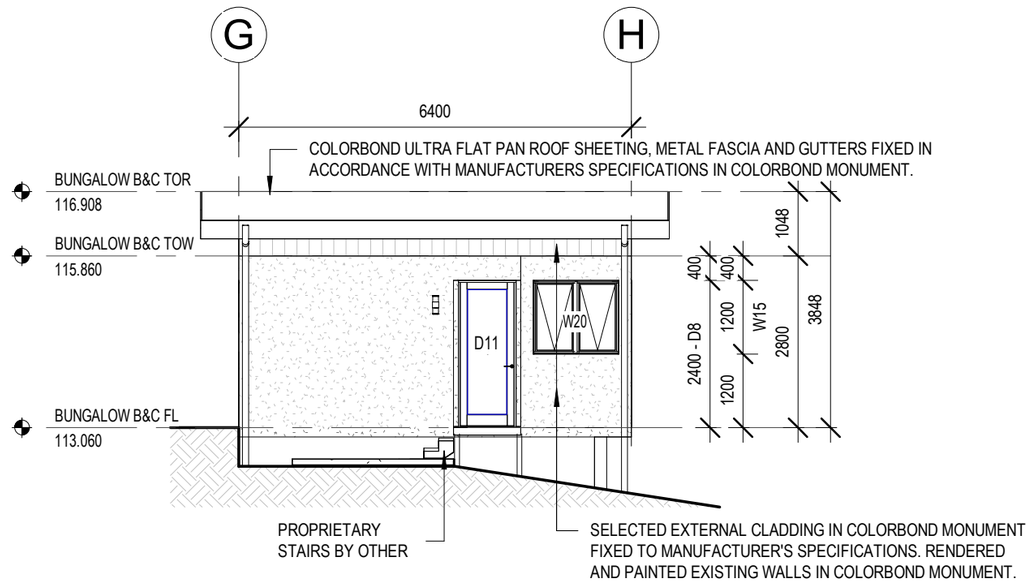

W WESTERN BUNGALOW B & C ELEVATION
1 : 100

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CLIENT
K. KASEM

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EXISTING BUNGALOW B AND C ELEVATIONS

SCALE	DATE	DRAWN	CHECKED
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PROJECT NO.	DWG NO.	REV
25-038-DE	BD10	A

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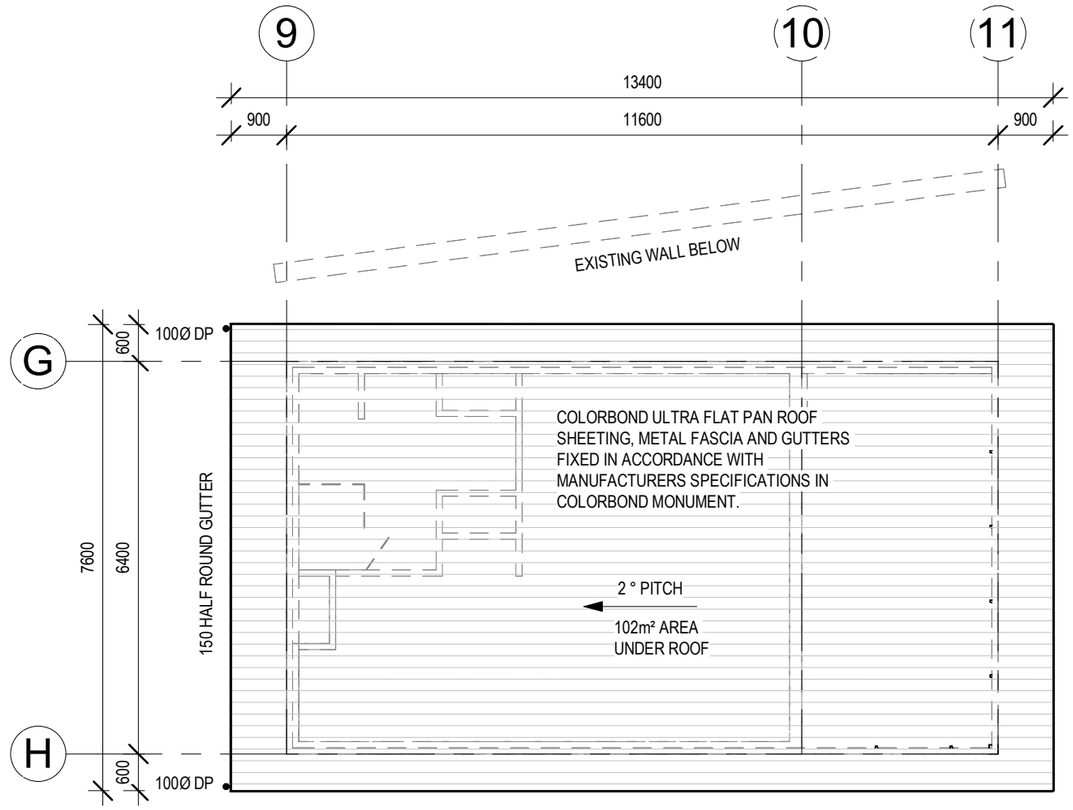

7 EX. BUNGALOW ROOF PLAN
1 : 100

NOT FOR CONSTRUCTION

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1 : 100 A3	27/05/2026 3:25:23 PM	ML	-

PROJECT NO.	DWG NO.	REV
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NORTH

CARPORT DOOR SCHEDULE					
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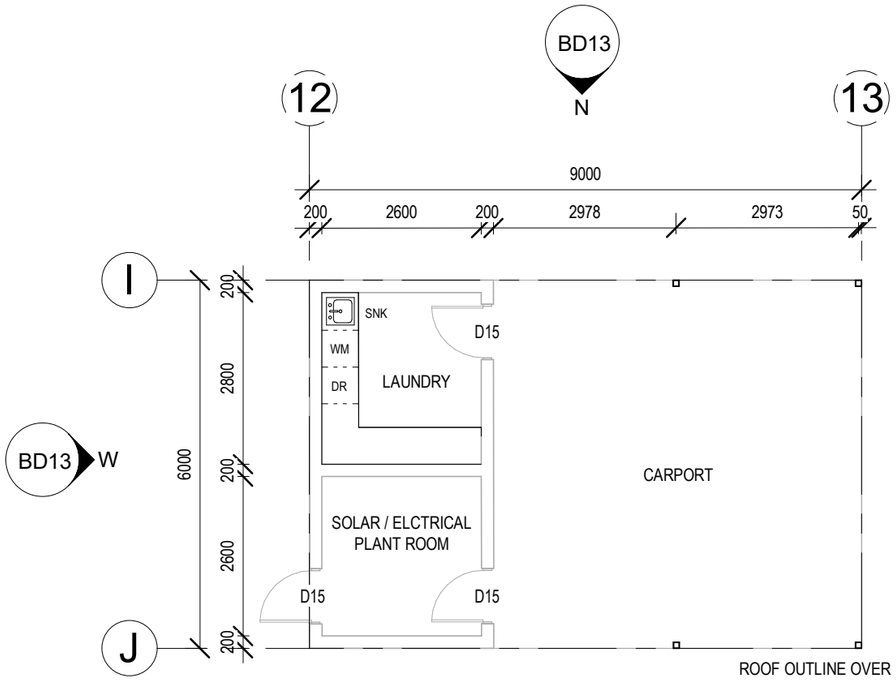

8 EX. CARPORT FLOOR PLAN
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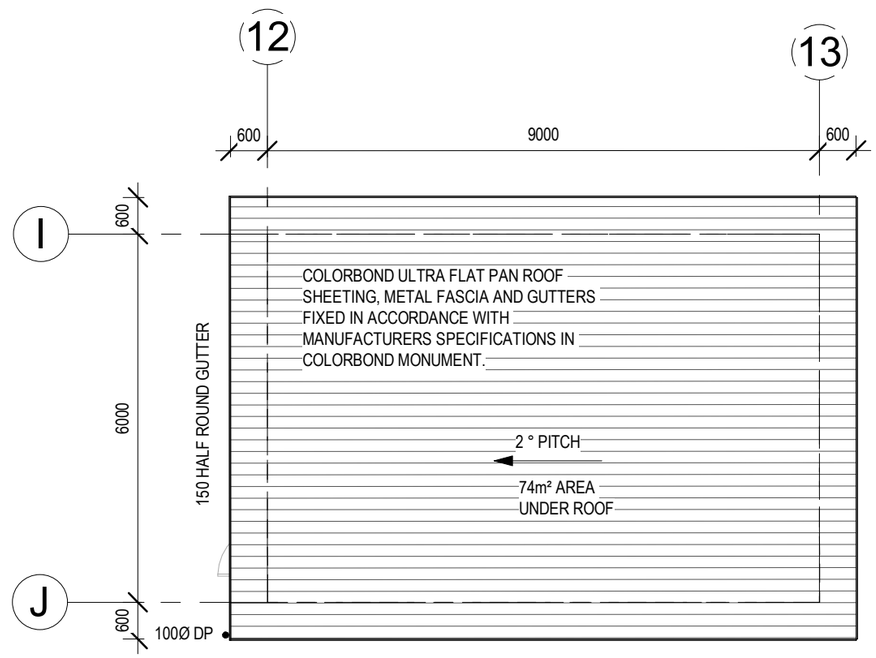

9 EX. CARPORT ROOF PLAN
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SCALE	DATE	DRAWN	CHECKED
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PROJECT NO.	DWG NO.	REV
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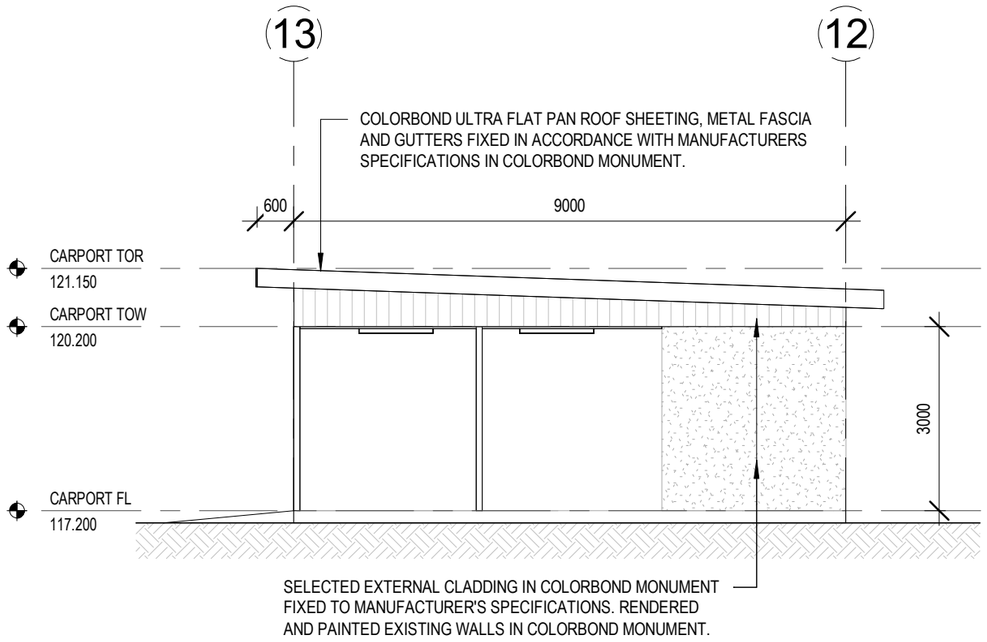

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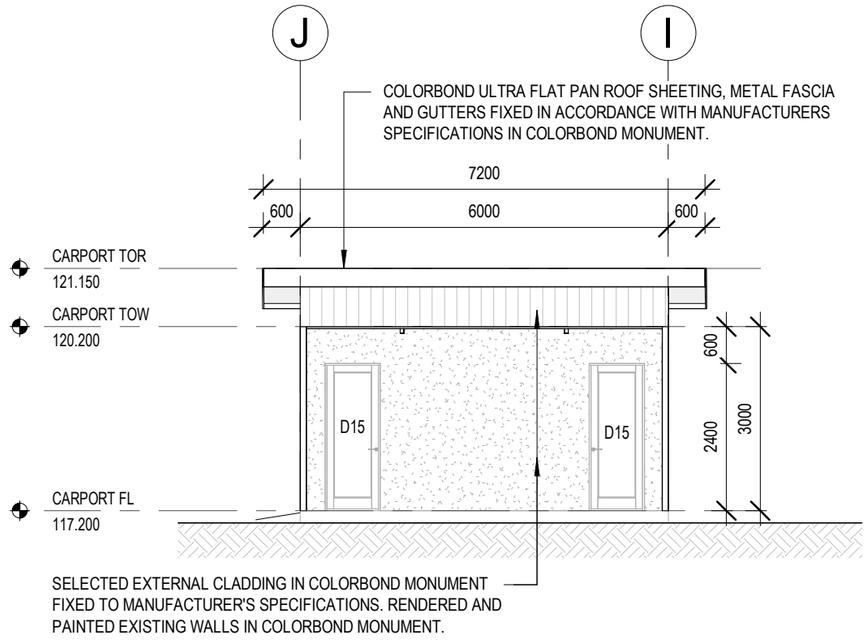

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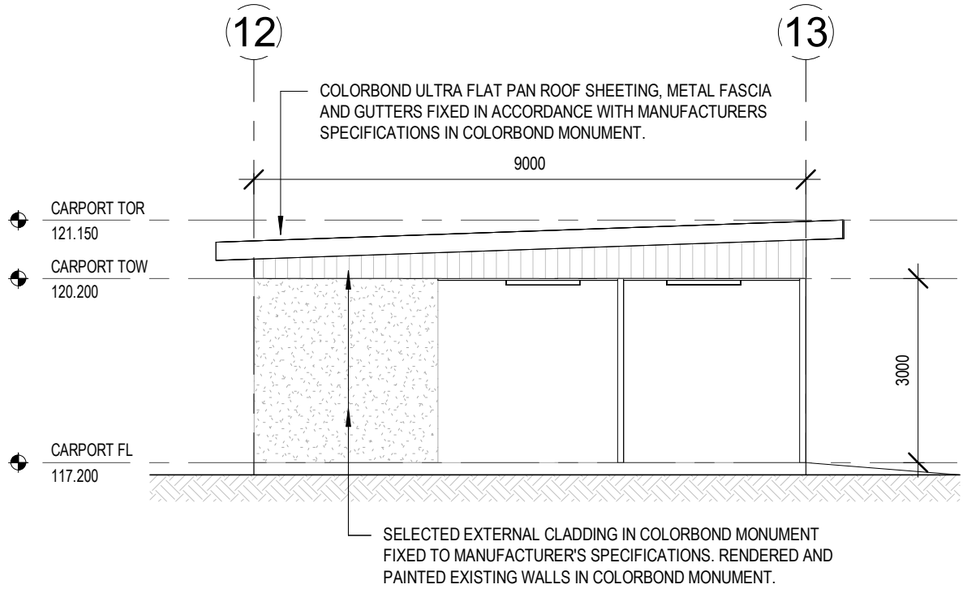

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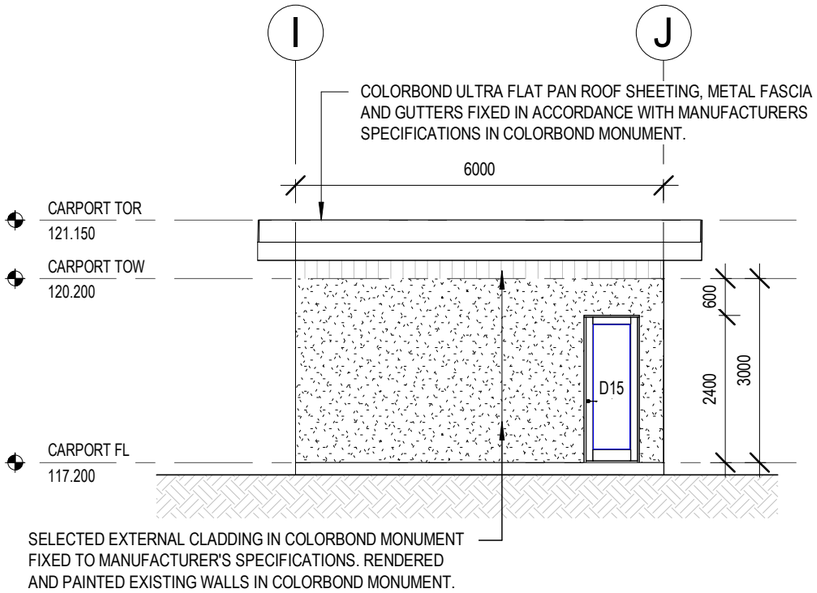

W WESTERN CARPORT ELEVATION
1 : 100

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CLIENT
K. KASEM

DRAWING TITLE
EXISTING CARPORT ELEVATIONS

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PROJECT NO.	DWG NO.	REV
25-038-DE	BD13	A

Attachment 2

Landslide Hazard Assessment Statement and RPEQ Engineering Drawings

Note: RPEQ Engineering Drawings issued separately due to password protection

SHELL
ENGINEERS
STRUCTURAL CIVIL
BUILDING DESIGN
Innovation & Experience

Potential Landslide Hazard

Engineers Statement

Property: 129 Rykers Road, Cape Tribulation
(Lot 2 RP732553)

Prepared for: K. Kasem

Job Number: 25-038-DE

Contents

Attachments

1 – Site Photos
2 – ETS Soil Report July 2007
3 – Earth Test Soil Report July 2025

SHELL Engineers Structural Civil and Building Design

George Thirkell B.Eng (Civil) RPEQ 7279 (Civil and Structural)
MIEAust CPEng NERS APEC Engineer IntPE (Aus) QBCC Design 1211127

A trading name of Blue Shell Investments PL ABN 89679147187. 9 Palm Avenue, Parramatta Park QLD 4870.
PO Box 952, Edge Hill, QLD 4870. Phone: 07 42761900:admin@shell.net.au WWW: thirkell.com.au

Date	Revision No.	Reason for Issue	Author	Reviewer	Approved Name	Signature	RPEQ
2/06/2026	FINAL	Client Report	GT	ET	George Thirkell		7279

1. Introduction

The purpose of this statement is to provide details on potential landslide hazard risk for the subject property for a 20-metre section of the approximate 715 metre long access driveway to comply with relevant development approval processes and responsibilities pertaining to the Queensland Building & Construction Commission for building contractors. A small section of the 18-year-old driveway was compromised by severe tropical cyclone Jasper in 2023 which is recorded to have exceeded the 100-year ARI design Code and Standard design parameters. However, it has been a test, and the proposed building work will improve the driveway ensuring future resilience subject to maintenance.

The report analyses and applies soils data provided by ETS in July 2007 and by Earth Test for the roadside remediation in July 2025.

This report outlines the results of the investigation, laboratory testing, analysis and interpretive reporting on the following items:

- All factual information resulting from the investigation (investigation methodologies, detailed desktop review, test location plans, bore logs).
- Summary of subsurface conditions and adopted subsurface conditions, including groundwater.
- Stability assessment in accordance with Australian Geomechanics Society (AGS) guidelines.
- Hillside construction.
- Earthworks and site comments.
- Site movements.
- Foundation and allowable bearing pressures.

The report should be read in conjunction with SHELL Engineers drawings 3.C01 to 3.C04 by George Thirkell RPEQ 7279 Civil & Structural Engineer

2. QBCC Subsidence Policy

The Queensland Building & Construction Commission's Subsidence Policy directs engineers and building contractors to design and build to *minimise the incidence of footing and slab movement and subsequent damage to homes. This in turn will reduce contractor's rectification costs, and ultimately, the burden that industry bears due to problems created by defective work.* (Queensland Building and Construction Commission, 2021)

The contractor (C) must supply the site classifier (SC) with the information in Table 1 and the SC must satisfy themselves that all of the "relevant" information has been considered.

If the contractor does not supply all of the information listed below and does not wish the SC to recover said information (at cost), the contractor may be in breach of the no-fault provisions of the QBCC's Policy for Rectification of Building Work and may be held responsible for subsidence or settlement of a building.

Table 1 QBCC Subsidence Policy Compliance Responsibilities

Element	Supplied/Considered
Property description and site address	✓
Plan and/or survey	✓
Contour of the site	✓
Location of trees, vegetation etc identified	✓
Location and identification of potential overland flow	✓
The footprint of proposed building and platform levels	✓
Location of proposed or existing cut and fill	✓

In accordance with the Engineering Design for the subject property, SHELL Engineers comply with the following (extract from the QBCC Subsidence Policy):

vi. *for reactive clay sites the laboratory test and soil test report include ISS and YS values (obtained by shrink and swell tests) in accordance with Australian Standard AS1289 and AS2870.*

vii. *the design takes into account site conditions (eg location of trees, easements, fill etc) including all information provided to the engineer about location, site identification and land searches referred to in paragraphs (a)(i), (a)(ii) and (a)(iii);*

viii*. the design includes photographs of the site to correctly identify onsite and adjoining site topography prior to site specific earthworks;*

ix. *the design complies with all relevant Australian Standards including AS2870, AS3600 and AS3700;*

x. *the design is certified by an engineer (RPEQ); and*

xi*. the design drawings include the selected footing systems, any special site works, means of diverting surface water away from the slab, actual location of control joints in brick and masonry construction (including necessary control joints in internal linings),location of retaining walls, and*

xii. *requirements for articulation (flexible joints) in storm water and sanitary drainage.*

NOTE: Irrespective of whether these details (articulated joints, control joints, special site works, etc), are shown on the engineer's or architectural drawings, they must be certified by an engineer (RPEQ).

3. Qualified Registered Practicing Engineers Statement

The Australian Building Codes Land risk Hazards Handbook (Australian Building Codes Board, 2015) identifies requirements for specialist advice from a geotechnical engineer which is considered fulfilled by the ETS investigation carried out in July 2007 and the Earth Test Investigation carried out in July 2025 (refer to Attachments 2 and 3).

I, George Thirkell, am a registered professional engineer appropriately experienced in slope stability investigations and have the following qualifications and experience:

- Bachelor of Engineering (Civil), University of Queensland.
- Registered Professional Engineer of Queensland (RPEQ) 7279 Structural and Civil.
- Member of the Institute of Engineers Australia (MIEAust) Structural and Civil Colleges.
- Chartered Practising Engineer (CPEng).
- APEC Engineer IntPE (Aus): Asia-Pacific Region and India, Ireland, South Africa, Sri Lanka, and the United Kingdom
- Listed on the National Engineers Register (NER);
- Northern Territory Building Practitioners Board Registration as a Certifying Engineer (Structural) NT BPB Reg No 354471ES
- Engineering Training Institute of Australia: Forensic Engineering Professional Development.
- Associate Diploma of Building Design, Central Queensland University.
- Member of the Building Designers Association of Queensland.
- QBCC Contractor's licence (1211127) and Nominee Supervisor's licence (1164409) in the class of 'Building Design – Medium Rise'.

I have over 30 years of engineering and design experience in a wide range of projects, providing services in scheme and detailed design, documentation, inspection, and construction survey.

I have provided civil and structural engineering consultancy services that require competency in slope stability investigations the most recent relevant to the subject property being earthworks, slope stability and drainage in 2024 for the Department of the Environment, Tourism, Science and Innovation (DETSI) for Mt Windsor National Park roads remediation post severe tropical cyclone Jasper

I state that I am a registered professional engineer appropriately experienced in slope stability investigations and engineering design and have provided an appropriate design solution for the proposed private driveway remediation.

As a qualified registered practising engineer, I supply the following statement that responds to the acceptable outcomes of the Douglas Shire Council planning scheme *8.2.9 Potential landslide hazard overlay code A01.3.*

(a) the stability of the site, including associated buildings and infrastructure, will be maintained during the course of the development and will remain stable for the life of the development;

Earthworks and drainage procedures will be carried out in accordance with the National Construction Codes of Australia, Vol 2, Part 3.1.1 and 3.1.2. The proposed works will also meet the

requirements of:

- AS 4678 – Earth retaining structures
- AS/NZS 3500.3.2 – 1998 – National Plumbing and Drainage Code – Stormwater Drainage – Acceptable Solutions.

Engineering inspections also assess and provide instructions to the builder and owner during construction.

(b) development of the site will not increase the risk of Landslip activity on other land, including land above the site;

Remediation of the driveway, when carried out with our instructions, will not increase the risk of Landslip.

(c) the site is not subject to the risk of Landslip activity on other land;

The site was established (building work commenced) as a residential property in 2007 and would not be subject to further landslip risk. The 2023 severe cyclone Jasper exceeded the 1 in 100-year ARI design requirements for the bungalows and the driveway (see section 4.1 below). The proposed work is an improvement based on the test of the 1 in 100 year event.

(d) any measures identified in a site-specific geotechnical report for stabilising the site or development have been fully implemented;

A site-specific landslip assessment is hereby submitted.

(e) development does not concentrate existing ground water and surface water paths;

The proposed excavation works will not concentrate existing groundwater and surface water paths. The works will be designed to accommodate the natural flow of groundwater and surface water paths.

(f) development does not incorporate on-site wastewater disposal."

The road remediation work, which is subject to the Landslide Hazard Assessment, is separated to the house site where the proposed work to complete the residence does incorporate on-site wastewater disposal generally in accordance with the ETS July 2007 (Report No C07-316) Onsite Sewerage Assessment.

4. Site Details

4.1 Detailed Site Description

The bungalows (under construction) are situated on a mountain ridge. A small 20 metre section of the approximate 715 metres access driveway has had a landslip to the downward side caused by severe tropical Cyclone Jasper in 2023. The cyclone crossed the coast 30km north at Wujal Wujal as a category 2 system then stalled as a tropical low-pressure system over the Cape York Peninsula for the next several days (Bureau of Meterology, 2026). A major flood peak of 14.85 m was recorded at the Daintree Village on 18 December

2023. This peak flood level was 2 metres higher than the previous record of 12.60 m in January 2019. (Bureau of Meterology , 2025). Jasper is the most rainfall-intensive tropical cyclone to affect Australia in recorded history with a 7-day total precipitation of 2,252mm recorded at the Bairds (Daintree River) rainfall station (JBA The Flood People, 2023). The entire Douglas Shire was impacted with major flooding, landslips, overnight evacuations, homes destroyed, water infrastructure, and roads collapsing. (Douglas Shire Council, 2026).

The flooding exceeded 1 in 100-year ARI design parameters, testing infrastructure in the region and at the subject property. However, the access driveway, that was constructed circa 2007 (18 years old) of 100mm thick concrete pavement with culverts and drainage in accordance with Codes and Standards performed well. The section of driveway nearest the landslip remains stable, traversable and fit for purposes. The extreme flood event has tested the driveway which can now be improved by widening at this point for safety, and the drainage also improved. The landslip area will have natural vegetation re-growth which is typically fast in the tropical rainforest ecosystem (Wet Tropics Management Authority, 2026).

4.2 Geology

Soil reports (CSIRO G.G. Murtha, 1989) (MAP CSIRO by G.G. Murtha and M.G. Cannon and C.D. Smith, 1988), classify the soil type as M1 (Mountainous Unit) dominantly Galmara (Ga) reddish brown clay loam A1; weakly developed A2; red or yellowish red clay loam to light medium clay B horizon with weak to moderate structure; strongly weathered saprolite from 90 cm inferred to be residual soil derived from the weathering of the volcanic bedrock of McDowall Range and Mount Sorrow.

.

4.3 Ground Water

The soil reports records that *at the time of the fieldwork, groundwater was not observed in the test pits to the depths investigated.*

4.4 Vegetation

Mature trees were observed throughout the site during the walkover assessment. At the landslip area mature trees did exhibit misshapen or curved trunks, indicators for previous slope instability, such as downhill soil creep. However immediately around the ridge and benched sections close to the bungalows, the mature vegetation was well formed.

4.5 Structures

During the walkover assessment, the existing building and driveway were observed and is structurally sound.

4.6 Fieldwork & Results

The July 2007 ETS soil report records very soft to firm foundation conditions from surface level to depths of approximately 2.2m across the site. Stiff to very stiff silty clay (Residual Soil/Extremely Weathered Materials) was then encountered from depths of 2.2m to 3.2m (stiff to very stiff layer was encountered at 0.7m depth in test pit TP2). Due to the very soft to soft soils and the steep slopes encountered, the Site may be classified CLASS – P. This was confirmed by the July 2025 Earthtest report.

5. Site Classification

Based on the site investigation findings and subsequent laboratory testing the site is classified as **CLASS "P"**

6. Land Stability Analysis

Landslips are caused when a soil or rock mass has reduced friction resistance, usually attributed to groundwater, resulting in the material being unable to maintain its self-weight, leading to slope failure.

The Australian Geomechanics Society (AGS) developed a set of tools and procedures for assessing the stability of a slope. The guidelines also identify that the regulator typically sets the standard for tolerable risk levels. AGS defines tolerable risk as "*risks within a range that society can live with so as to secure certain benefits. It is a range of risk regarded as non-negligible and needing to be kept under review and reduced further if practicable".*

AGS defines acceptable risk as "*risk which everyone affected is prepared to accept. Action to further reduce such risk is usually not required unless reasonably practicable measures are available at low cost in terms of money, time and effort.*".
AGS and regulators generally accept risk levels of "low" or lower as a level of acceptable risk.

7. Hillslope Construction

The engineered design of the proposed driveway remediation works provide slope stability and mitigate landslip as follows:

- No additional imported fill is to be placed at this site.
- All footings should be founded on stiff natural soil to the engineers approval.
- Cut-off and surface drainage is implemented to mitigate water from the upper slope and reduce hydrostatic pressure on the retaining structures.
- Drainage systems will be subjected to regular inspections to ensure no adverse moisture conditioning of the subsurface conditions, which can trigger instability.
- Overland flow paths will be carefully directed to minimise erosion possibility to approved outlet points.

7.1 Earthworks

The following comments are provided in relation to earthworks.

- Earthworks pertain to drainage and are minimal.
- Although no standard exists for the moisture content of soils, it is recommended that the site soils be placed at or near optimum moisture content (OMC) for general earthworks operations. This increases efficiency during earthworks operations. A +/- 2% range of OMC is recommended for general earthworks.
- Site soils proposed for use to fill areas will have a maximum particle size of 75 mm or be observed to break down under the energy of compactive equipment.
- Fill will be step-keyed into the existing slope.
- Fill materials will be placed in horizontal layers with a maximum placement thickness of 200 mm. The materials will be compacted to a minimum dry density ratio of 95% relative to Standard compactive effort.
- Fill material will be subject to potential settlement post-placement. Well-compacted fill placed in accordance with AS3798 and otherwise, good earthworks procedure should typically be subject to settlement in the order of 0.5% to 1.0% of the fill thickness over a log cycle.

7.2 Foundations

In accordance with the ETS and Earthest reports footings shall be founded in stiff natural soil.

If you should have any queries regarding this report, please do not hesitate to contact the undersigned at your convenience.

Yours sincerely,

George Thirkell
B. Eng (Civil) RPEQ 7279 (Civil and Structural) MIEAust CPEng NERS APEC Engineer IntPE (Aus)
NT BPB 354471ES QBCC Design Medium Rise 1211127

References

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Attachment 1: Site Photographs

	Photo 1: 20 metre section of driveway (715 metre long driveway) impacted by Cyclone Jasper exceeding 1 in 100 year water volumes, producing landslip which provides an opportunity to improve the driveway drainage.
	Photo 2: Close up view of photo 1.

Attachment 2

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SITE CLASSIFICATION REPORT C07-316-001R RYKERS ROAD, CAPE TRIBULATION QLD 4879

CUSTOMER	Chris Van Dyke Design	**REPORT:**	C07-316-001R
POSTAL ADDRESS	PO BOX 236	**DATE:**	13 July 2007
	CLIFTON BEACH QLD 4879	**ORDER No:**	*
INSPECTION DATE:	1 July 2007	**BSA NO:**	*

1. Authorisation and Scope

A site investigation was carried out at Rykers Road – Cape Tribulation, to determine the foundation conditions and classify the site for construction of a proposed unit development.

The investigation was requested and authorised by Yvette Johnstone.

The scope of the investigation allowed for backhoe test pits to be excavated to inspect the subsoil profile, with logging of soil types and evaluation of the subsoil density conditions. It is noted that dynamic cone penetrometer tests (DCP) were also conducted to supplement information observed during the excavation of the test pits.

The results of the field tests were to be evaluated, the site classification determined for the foundation, and a report provided to the customer.

2. Site Description

The site is on a mountain ridge in Cape Tribulation. Site observations taken during the fieldwork are presented in the Site Plan Attached. Generally, the site of interest is gently sloping along the crest of the ridge, with steeper slopes (in the order of approximately 45° to 65°) located on the each of the downhill sides. At the time of the investigation the site and downhill slopes were heavily vegetated which hindered detailed observation of overall site.

3. Site Investigation/Testing

Insitu testing was carried out by Dynamic Cone Penetrometer tests at locations P1 –P16 (see site plan and Dynamic Cone Penetrometer Report enclosed) to evaluate the foundation density conditions. Three backhoe test pits were excavated to observe the subsoil profile in the location of the test pits (Marked TP1 to TP3 on the Site Plan). The test pits also allowed disturbed samples for laboratory testing to be collected.

4. Laboratory Testing

A single Atterberg Limit test was conducted on a sample collected in test pit TP1 taken at a depth of 0.6-0.8m (Atterberg Limits Test Report is enclosed).

5. Evaluation of Foundation Conditions

The Dynamic Cone Penetrometer tests revealed very soft to firm foundation conditions from surface level to depths of approximately 2.2m across the site. Stiff to very stiff silty clay (Residual Soil / Extremely Weathered Material) was then encountered from depths of 2.2m to 3.2m (Stiff to very stiff layer was encountered at 0.7m depth in test pit TP2).

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RYKERS ROAD, CAPE TRIBULATION QLD 4879

The Atterberg Limits tests indicate the subsoil is moderately reactive to changes in moisture content with an estimated predicted ground surface movement (y_s) of approximately 25 – 35mm.

At the time of investigation, the water table was not encountered. However, it should be noted, that groundwater levels are affected by climatic conditions and by soil permeability, therefore groundwater levels may vary with time.

Site Classification

Due to the very soft to soft soils and the steep slopes encountered during the investigation, the Site may be classified **CLASS – P** for footings designed in accordance with Australian Standard 2870 "Residential Slabs and Footings – Construction" and advice should be sought from a Qualified Engineer (a professional engineer with academic qualifications in geotechnical or structural engineering who also has extensive experience in the design of footing systems for houses or similar structures).

Note: This classification is subject to review should any cut earthworks in excess of 0.5m or any filling be carried out.

Note: The Structural Engineer should adhere to the requirements of AS 2870 "Residential Slabs & Footings – Construction" in relation to the founding of footings below the line of influence of an existing feature/excavation (e.g. retaining walls, underground services, effluent pits, unsupported batters, creeks, etc).

Note: RESPONSIBILITIES. (A.S.2870 Supp 1). Footing design and construction involves a number of steps; site classification, selection of the footing system, structural design, construction in accordance with the required design details and construction methods, and proper maintenance. In addition to the builder, this process may involve an engineer, the Building Authority, the owner, and all parties who share responsibility for any failure. In particular, the owner has a responsibility to ensure the site is properly maintained.

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SITE CLASSIFICATION REPORT C07-316-001R
RYKERS ROAD, CAPE TRIBULATION QLD 4879

NOTE: Because this investigation is limited in scope and extent, it is possible that areas may exist which differ from those shown on the test hole records and used in the site classification. Should any variation from the reported conditions be encountered during excavation work, a Building Services Authority Registered Site Classifier or a Registered Practising Engineer must be notified immediately so that reappraisal of the classification can be made. Attention is drawn to the present or any future owners of their responsibilities for foundation maintenance as detailed in A.S. 2870 (Appendix A) and CSIRO Brochure "Foundation Maintenance and Footing Performance: A Homeowner's Guide."

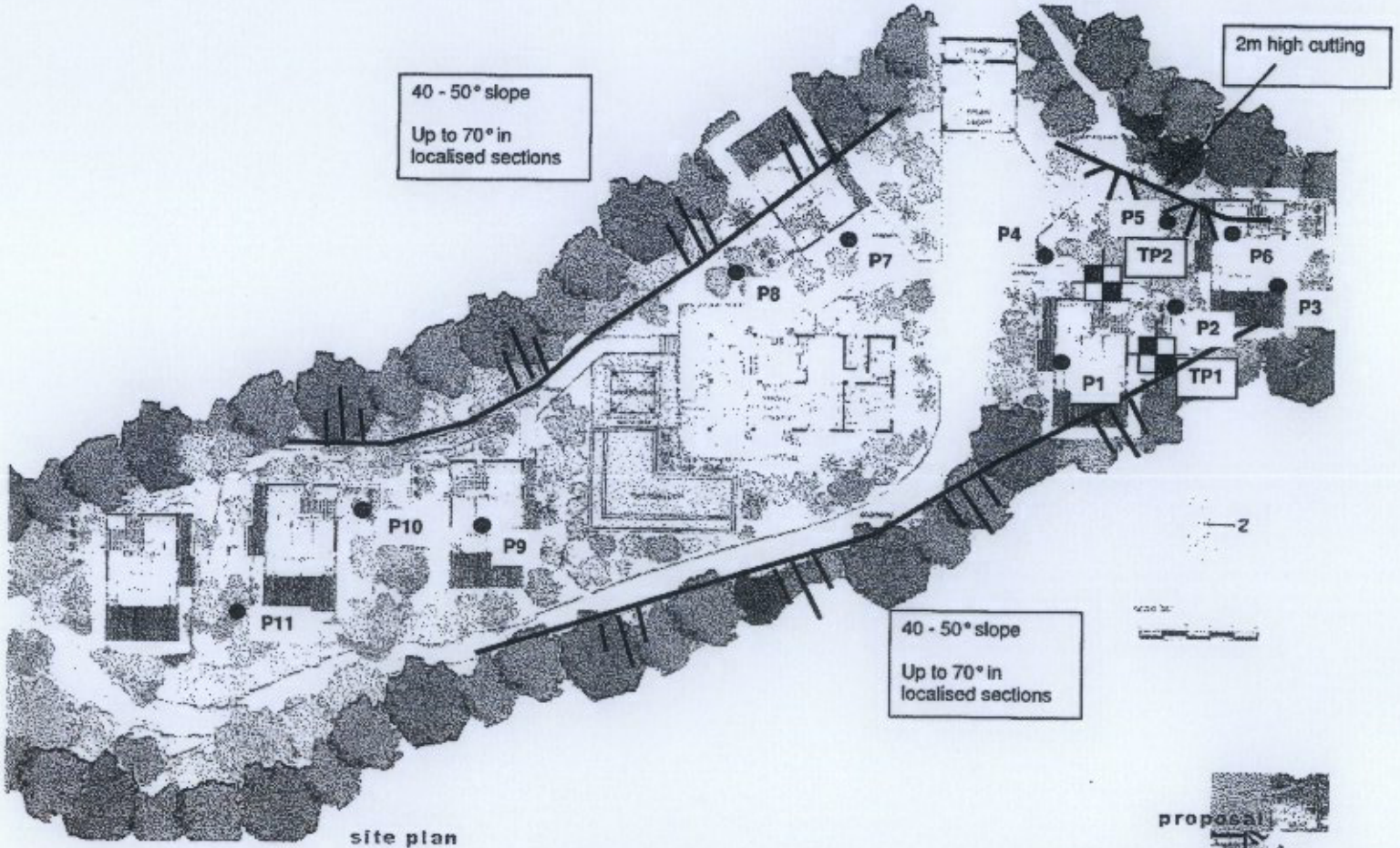
SIGNED: M. Ganza

Michael Ganza (RPEQ 4449)
DIRECTOR

References:

1. A.S.1726 – Geotechnical Site Investigations
2. A.S. 2870 - 1996 Residential Slabs and Footings - Construction.
3. A.S. 3798 - Guidelines on Earthworks for Commercial and Residential Developments.

Attached: Dynamic Cone Penetrometer Report, Site Investigation Report, and Atterberg Limits Report and Site Plan.
CSIRO Brochure " Foundation Maintenance and Footing Performance: A Homeowner's Guide".



site plan

NOTE:
Original drawing supplied by Chris Van Dyke Designs

LEGEND

- Test Pit number and location
- DCP test number and location

ETS GEOTECHNICAL & MATERIALS TESTING

Cairns

DRAWN BY: CP	DATE: 16/07/2007	Chris Van Dyke Designs Rykers Road Development, Cape Tribulation	FIGURE NO. 1
APPROVED BY: KJ	SCALE: NTS	Site and Fieldwork Locations	JOB NO. C07-316

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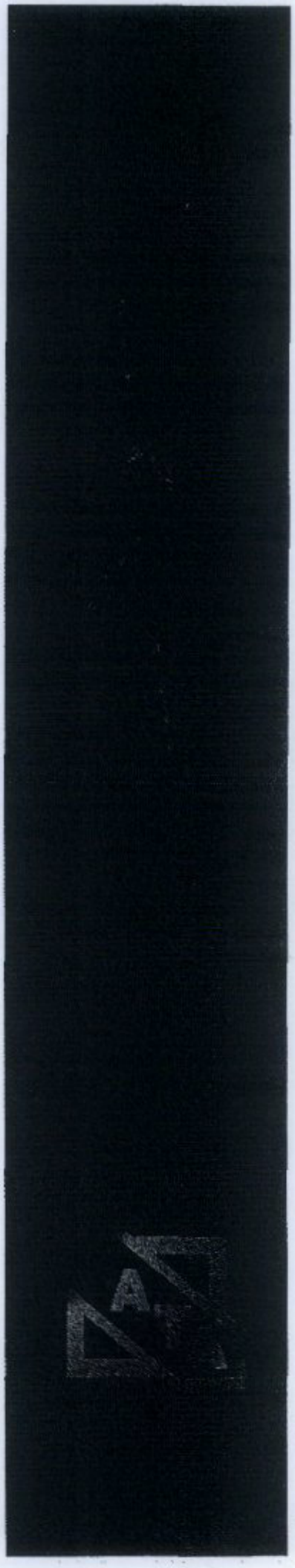
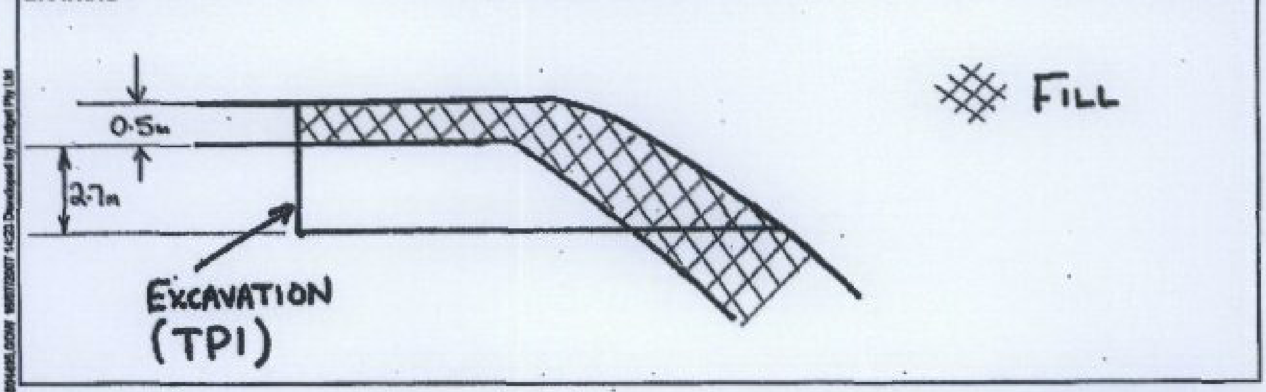


ETS GEOTECHNICAL & MATERIAL TESTING

HOLE NO.:	TP1	**SHEET:**	1 OF 1
CLIENT:	Chris Van Dyke Design	**JOB NO:**	C07-316
PROJECT:	Rykers Road Development	**DATE:**	1/7/07
LOGGED BY:	KJ	**REVIEWED BY:**	KJ
DRILL MODEL:	Backhoe	**RL:**	
HOLE DIAMETER:	-	**COORDINATES:**	

DEPTH (m)	TECHNIQUE	SUPPORT	WATER	SAMPLE OR FIELD TEST	USCS SYMBOL	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS	PENETRATION 1 2 3
0.0 – 0.5	BH	N	Not Encountered		CI-CH		SILTY CLAY: red - dark brown, medium to high plasticity, trace fine to medium grained sand, trace fine grained gravel	M	S	FILL	
0.5 – 2.2				D 0.60 - 0.80 m	CI-CH		SILTY CLAY: red - dark brown with mottled pale grey and yellow, medium to high plasticity, trace fine to medium grained sand, trace fine grained gravel		VS S - F		
2.2 – 3.2				B 2.20 - 3.20 m	CI-CH		SILTY CLAY: red - dark brown with mottled pale grey, medium to high plasticity, with gravel		St - VSt	RESIDUAL SOIL / EXTREMELY WEATHERED ROCK (SLATE)	
3.2							TEST TP1 TERMINATED AT 3.20 m				

DRAWING



TECHNIQUE		SAMPLES AND TESTING		CONSISTENCY/DENSITY		MOISTURE CONDITION		PENETRATION	
AD/T	auger drilling with tc-bit	B	bulk disturbed sample	*Fines*		D	dry	0	no resistance
AD/V	auger drilling with v-bit	BLK	block sample	VS	very soft	M	moist		to
AS	auger screwing	D	small disturbed sample	S	soft	W	wet	4	absolute refusal
AT	air track	LB	large bulk disturbed sample	F	firm				
CT	cable tool	M	mazier type sample	St	stiff				
DB	washbore drag bit	P	piston sample	VSt	very stiff				
DT	diatube	SPT	standard penetration test	H	hard				
HA	hand auger	U	undisturbed tube dia mm						
MZ	mazier	PP	pocket penetrometer (UCS) kPa	*Coarse*					
RR	rock roller			VL	very loose				
WB	washbore			L	loose				
SUPPORT		**WATER**		MD	medium dense				
C	casing		standing water level	D	dense				
M	mud/polymer		inflow	VD	very dense				
N	none		partial loss						
T	timber		complete loss						
W	water								

NOTES

HOLE NO.:	TP2	**SHEET :**	1 OF 1
CLIENT:	Chris Van Dyke Design	**JOB NO :**	C07-316
PROJECT:	Rykers Road Development	**DATE:**	1/7/07
LOGGED BY:	KJ	**REVIEWED BY:**	KJ
DRILL MODEL:	Backhoe	**RL:**	
HOLE DIAMETER:		**COORDINATES:**	

DEPTH (m)	TECHNIQUE	SUPPORT	WATER	SAMPLE OR FIELD TEST	USCS SYMBOL	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS	PENETRATION 1 2 3
0.5	BH	N	Not Encountered		CI-CH		SILTY CLAY: red - dark brown, medium to high plasticity, trace fine to medium grained sand, trace fine grained gravel	M	VS - S	FILL?	
1.0					CI-CH		SILTY CLAY: red - dark brown, medium to high plasticity, with fine grained gravel		St - VSt	RESIDUAL SOIL / EXTREMELY WEATHERED ROCK (SLATE)	
2.0										Very Low Strength Rock	
3.0											
3.5							TEST TP2 TERMINATED AT 3.20 m				

DRAWING

TECHNIQUE
- AD/T auger drilling with tc-bit
- AD/V auger drilling with v-bit
- AS auger screwing
- AT air track
- CT cable tool
- DB washbore drag bit
- DT diatube
- HA hand auger
- MZ mazier
- RR rock roller
- WB washbore

SUPPORT
- C casing
- M mudpolymer
- N none
- T timber
- W water

SAMPLES AND TESTING
- B bulk disturbed sample
- BLK block sample
- D small disturbed sample
- LB large bulk disturbed sample
- M mazier type sample
- P pision sample
- SPT standard penetration test
- U undisturbed tube dia mm
- PP pocket penetrometer (UCS) kPa

WATER
- ▽ standing water level
- ▸— inflow
- —◂ partial loss
- —◂ complete loss

CONSISTENCY/DENSITY

Fines
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard

Coarse
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

MOISTURE CONDITION
- D dry
- M moist
- W wet

PENETRATION
- 0 no resistance
- to
- 4 absolute refusal

NOTES

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DYNAMIC CONE PENETROMETER TEST -- REPORT

A.S. 1289 6.3.2

CLIENT	Chris Van Dyke Design PO Box 236 CLIFTON BEACH QLD 4879	**REPORT NUMBER**	C07-316-001
JOB NO	C07-316	**REPORT DATE**	13-Jul-07
		TEST DATE	01-Jul-07
PROJECT	Rykers Road Development Cape Tribulation	**TECHNICIAN**	D.K.
SAMPLE LOCATION (See Site Plan)		**CLIENT ORDER No.**	*
SAMPLE DESCRIPTION (Soil Profile)		**CLIENT JOB No.**	*

DEPTH	*TEST COMMENCED AT				0.0 m BELOW SURFACE LEVEL					
(Metres)	SITE:	P1	SITE:	P2	SITE:	P3	SITE:	P4	SITE:	P5
	No. Blows	Np	No. Blows	Np	No. Blows	Np	No. Blows	Np	No. Blows	Np
0.0 -- -- 0.1	3		2		3		3		2	
0.1 -- -- 0.2	2		2		2		2		3	
0.2 -- -- 0.3	1	6	1	5	1	6	2	7	2	7
0.3 -- -- 0.4	1		1		1		1		1	
0.4 -- -- 0.5	1		1		1		1		1	
0.5 -- -- 0.6	1	3	1	3	2	4	1	3	1	3
0.6 -- -- 0.7	2		1		3		1		2	
0.7 -- -- 0.8	1		2		5		2		1	
0.8 -- -- 0.9	1	4	3	6	6	14	3	6	2	5
0.9 -- -- 1.0	1		3		5		4		3	
1.0 -- -- 1.1	2		3		3		4		3	
1.1 -- -- 1.2	2	5	3	9	5	13	3	11	4	10
1.2 -- -- 1.3	2		3		4		3		4	
1.3 -- -- 1.4	2		3		4		4		5	
1.4 -- -- 1.5	3	7	3	9	4	12	5	12	4	13
1.5 -- -- 1.6	3									
1.6 -- -- 1.7										
1.7 -- -- 1.8										
1.8 -- -- 1.9										
1.9 -- -- 2.0										
2.0 -- -- 2.1										
2.1 -- -- 2.2										
2.2 -- -- 2.3										
2.3 -- -- 2.4										
2.4 -- -- 2.5										
WATER TABLE:	'Not encountered'				MOISTURE CONDITION				Moist	

(Np) : Penetration Resistance
= blows per 300 mm

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SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Regional Laboratory Manager
DATED: 13/07/2007
ETS Regional Laboratory: CAIRNS

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DYNAMIC CONE PENETROMETER TEST – REPORT

A.S. 1289 6.3.2

CLIENT	Chris Van Dyke Design PO Box 236 CLIFTON BEACH QLD 4879	REPORT NUMBER	C07-316-002
JOB NO	C07-316	REPORT DATE	13-Jul-07
PROJECT	Rykers Road Development Cape Tribulation	TEST DATE	01-Jul-07
		TECHNICIAN	D.K.
SAMPLE LOCATION (See Site Plan)		CLIENT ORDER No.	*
SAMPLE DESCRIPTION (Soil Profile)		CLIENT JOB No.	*

DEPTH	*TEST COMMENCED AT						0.0 m BELOW SURFACE LEVEL			
(Metres)	SITE:	P6	SITE:	P7	SITE:	P8	SITE:	P9	SITE:	P10
	No. Blows	Np	No. Blows	Np	No. Blows	Np	No. Blows	Np	No. Blows	Np
0.0 – – 0.1	2		1		2		0		2	
0.1 – – 0.2	2		2		2		1		6	
0.2 – – 0.3	1	5	2	5	2	6	2	3	2	10
0.3 – – 0.4	1		2		2		3		2	
0.4 – – 0.5	2		2		3		2		2	
0.5 – – 0.6	1	4	2	6	3	8	2	7	1	5
0.6 – – 0.7	5		2		4		1		1	
0.7 – – 0.8	5		2		5		2		1	
0.8 – – 0.9	4	14	3	7	8	17	4	7	2	4
0.9 – – 1.0	3		4		10		6		1	
1.0 – – 1.1	3		6		5		7		9	
1.1 – – 1.2	4	10	6	16	4	19	6	19	9	19
1.2 – – 1.3	4		7		3		6		13	
1.3 – – 1.4	4		7		4		6		9	
1.4 – – 1.5	5	13	6	20	5	12	6	18	9	31
1.5 – – 1.6										
1.6 – – 1.7										
1.7 – – 1.8										
1.8 – – 1.9										
1.9 – – 2.0										
2.0 – – 2.1										
2.1 – – 2.2										
2.2 – – 2.3										
2.3 – – 2.4										
2.4 – – 2.5										
WATER TABLE:	'Not encountered'				MOISTURE CONDITION		Moist			

(Np) : Penetration Resistance
= blows per 300 mm

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Regional Laboratory Manager
DATED: 13/07/2007
ETS Regional Laboratory: CAIRNS

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DYNAMIC CONE PENETROMETER TEST -- REPORT

A.S. 1289 6.3.2

CLIENT	Chris Van Dyke Design PO Box 236 CLIFTON BEACH QLD 4879	**REPORT NUMBER**	C07-316-003
JOB NO	C07-316	**REPORT DATE**	13-Jul-07
		TEST DATE	01-Jul-07
PROJECT	Rykers Road Development Cape Tribulation	**TECHNICIAN**	D.K
SAMPLE LOCATION (See Site Plan)		**CLIENT ORDER No.**	*
SAMPLE DESCRIPTION (Soil Profile)		**CLIENT JOB No.**	*

DEPTH (Metres)	*TEST COMMENCED AT 0.0 m BELOW SURFACE LEVEL									
	SITE: P11		SITE:		SITE:		SITE:		SITE:	
	No. Blows	Np	No. Blows	Np	No. Blows	Np	No. Blows	Np	No. Blows	Np
0.0 -- -- 0.1	0									
0.1 -- -- 0.2	2									
0.2 -- -- 0.3	2	4								
0.3 -- -- 0.4	2									
0.4 -- -- 0.5	2									
0.5 -- -- 0.6	2	6								
0.6 -- -- 0.7	2									
0.7 -- -- 0.8	3									
0.8 -- -- 0.9	3	8								
0.9 -- -- 1.0	3									
1.0 -- -- 1.1	4									
1.1 -- -- 1.2	5	12								
1.2 -- -- 1.3	4									
1.3 -- -- 1.4	5									
1.4 -- -- 1.5	6	15								
1.5 -- -- 1.6										
1.6 -- -- 1.7										
1.7 -- -- 1.8										
1.8 -- -- 1.9										
1.9 -- -- 2.0										
2.0 -- -- 2.1										
2.1 -- -- 2.2										
2.2 -- -- 2.3										
2.3 -- -- 2.4										
2.4 -- -- 2.5										
WATER TABLE:	'Not encountered'				MOISTURE CONDITION		Moist			

(Np) : Penetration Resistance
= blows per 300 mm

NATA
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SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Regional Laboratory Manager
DATED: 13/07/2007
ETS Regional Laboratory: CAIRNS

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ATTERBERG LIMITS TEST REPORT

Client	Chris Van Dyke Design PO Box 236 CLIFTON BEACH QLD 4873	**Report No.**	C07-316-01
		Report Date	6-Jul-07
Project	Rykers Road Development CAPE TRIBULATION QLD 4873	**Client Order No.**	*
Sample Location	Testpit 1 @ 0.6 - 0.8m	**Client Job No**	*
		Sampled by **Date**	D.K. 1-Jul-07
Sample Description Silty CLAY (CL-CI) low - medium plasticity, red brown with a trace of fine-medium grained sand and fine gravel.		**Tested by** **Date**	D.K. 3-Jul-07

ATTERBERG LIMITS

TEST METHOD		Sample 1 Result	Sample 2 Result	Sample 3 Result	Sample 4 Result
Liquid Limit	A.S.1289 3.1.2 - 1995	49%	*	*	*
Plastic Limit	A.S.1289 3.2.1 - 1995	24%	*	*	*
Plasticity Index	A.S.1289 3.3.1 - 1995	25%	*	*	*
Linear Shrinkage	A.S.1289 3.4.1 - 1995	12.8%	*	*	*
Length Of Shrinkage Mould (mm)		250mm	*	*	*
Insitu Moisture Content	A.S. 1289 2.1.1 - 1992	27.4%	*	*	*

Sample History AIR DRIED
Sample Preparation DRY SIEVED
Moisture content To : AS1289 2.1.1

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SIGNATURE:
SIGNED BY: Darren Koch
POSITION: Laboratory Manager
DATED: 06-Jul-07
Regional Laboratory: CAIRNS

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfil the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. *No one except you* should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you* – should apply the report for any purpose or project except the one originally contemplated.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include : the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, *do not rely on a geotechnical engineering report* that was :

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical change that can erode the reliability of an existing geotechnical engineering report include those that affect :

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *Geotechnical Engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by : the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions *only* at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgement to render an *opinion* about subsurface conditions throughout the site. Actual subsurface conditions may differ – sometimes significantly – from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgement and opinion. Geotechnical engineers can finalise their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for*

the report's recommendations if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognise that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognise that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce such risks, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labelled "limitations", many of these provisions indicate where geotechnical engineers responsibilities begin and end, to help others recognise their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to *perform a geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Rely on Your Geotechnical Engineer for Additional Assistance

Membership in ASFE exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE member geotechnical engineer for more information

ASFE PROFESSIONAL FIRMS PRACTICING IN THE GEOSCIENCES
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Foundation Maintenance and Footing Performance: A Homeowner's Guide

CSIRO

BTF 18
replaces
Information
Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction

There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion

All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation

This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil

All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure

This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth

Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation

Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

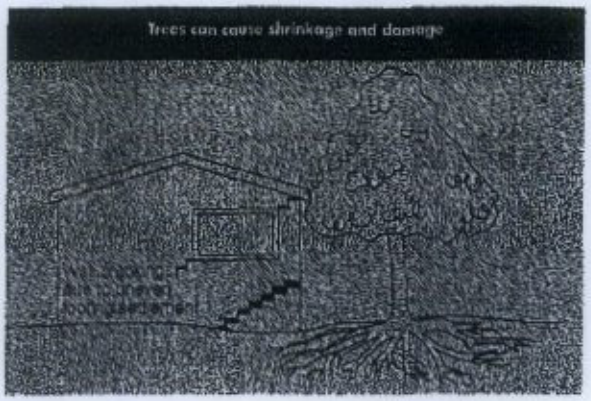
Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay

Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots

In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself

Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures

Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

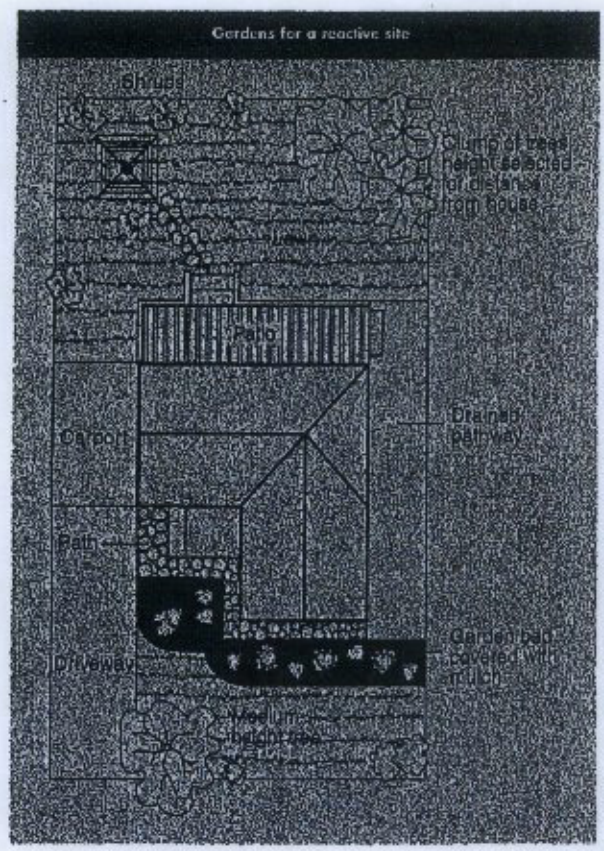
It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lower FAIB, MIAMA, Partner, Construction Diagnosis.

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Attachment 3

Site Investigation

For

Thirkell Consulting Engineers & Building Design

At

129 Rykers Road

Cape Tribulation

Postal address: Earth Test, PO Box 1042, Tolga, Qld 4882. Phone: 4095 4734
e-mail: info@earthtest.com.au

INTRODUCTION:

Earth Test has been engaged by Thirkell Consulting Engineers & Building Design to carry out a Site Investigation at 129 Rykers Road, Cape Tribulation.

It is understood the intention is to investigate causes of pavement damage at the site.

Site testing was carried out in July 2025.

SITE FACTORS:

The site was identified by the sites address, a photo was taken to confirm the sites identity.

The location of the proposed test sites was marked with paint. Test locations were nominated by the client.

Twelve Dynamic Cone Penetrometer tests were performed at locations DCP1 through to DCP12 as shown on the site plan.

Site Testing at 129 Rykers Road, Cape Tribulation.

DYNAMIC CONE PENETROMETER REPORT
AS 1289.6.3.2

CLIENT: Thirkell Consulting Engineers & Building Design.

PROJECT: 129 Rykers Road, Cape Tribulation.

SAMPLE DETAILS: Sites "DCP1, DCP2, DCP3, DCP4, DCP5 & DCP6." as per site plan.

REPORT DATE: 04/08/2025

SAMPLE No: SI 660-25

DATE SAMPLED: 31/07/2025

Tested By: G. Negri

DEPTH (Metres)	Site: DCP1	Site: DCP2	Site: DCP3	Site: DCP4	Site: DCP5	Site: DCP6
	No Blows	No Blows	No Blows	No Blows	No Blows	No Blows
0.0 – 0.1	3	Drilled	1	2	Drilled	1
0.1 – 0.2	5	3	2	4	2	2
0.2 – 0.3	4	3	2	5	3	2
0.3 – 0.4	4	5	2	5	3	1
0.4 – 0.5	4	5	2	5	3	2
0.5 – 0.6	5	4	2	6	3	1
0.6 – 0.7	8	4	2	6	3	2
0.7 – 0.8	11	4	2	7	3	1
0.8 – 0.9	8	6	2	6	3	1
0.9 – 1.0	8	5	2	8	3	1
1.0 – 1.1	11	4	2	8	3	2
1.1 – 1.2	15	5	2	7	4	1
1.2 – 1.3	Stopped	6	2	9	4	2
1.3 – 1.4		4	3	10	4	3
1.4 – 1.5		Stopped	3	Stopped	Stopped	4
1.5 – 1.6			Stopped			Stopped
1.6 – 1.7						
1.7 – 1.8						
1.8 – 1.9						
1.9 – 2.0						
2.0 – 2.1						

DYNAMIC CONE PENETROMETER REPORT
AS 1289.6.3.2

CLIENT: Thirkell Consulting Engineers & Building Design.

PROJECT: 129 Rykers Road, Cape Tribulation.

SAMPLE DETAILS: Sites "DCP7, DCP8, DCP9, DCP10, DCP11 & DCP12." as per site plan.

REPORT DATE: 04/08/2025

SAMPLE No: SI 660-25

DATE SAMPLED: 31/07/2025

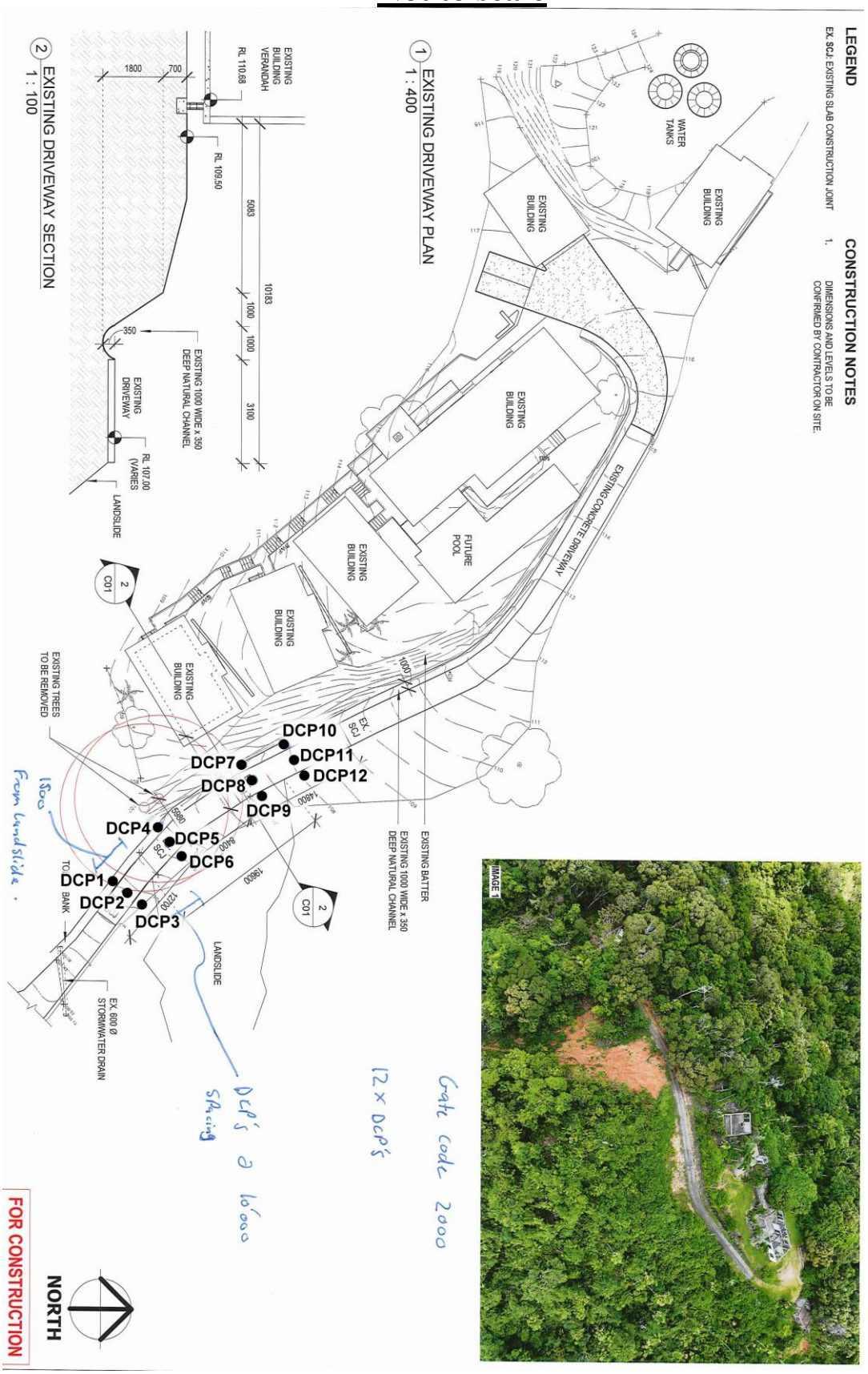
Tested By: G. Negri

DEPTH (Metres)	Site: DCP7	Site: DCP8	Site: DCP9	Site: DCP10	Site: DCP11	Site: DCP12
	No Blows	No Blows	No Blows	No Blows	No Blows	No Blows
0.0 – 0.1	2	Drilled	2	3	Drilled	7
0.1 – 0.2	3	5	5	5	9	9
0.2 – 0.3	5	5	7	6	11	13
0.3 – 0.4	4	7	5	5	25/80mm	10
0.4 – 0.5	5	5	4	4	Stopped	8
0.5 – 0.6	8	6	3	5		7
0.6 – 0.7	10	5	3	6		8
0.7 – 0.8	12	4	3	7		7
0.8 – 0.9	10	3	6	14		8
0.9 – 1.0	13	4	3	16		10
1.0 – 1.1	Stopped	7	3	Stopped		12
1.1 – 1.2		6	2			13
1.2 – 1.3		8	3			15
1.3 – 1.4		7	4			15
1.4 – 1.5		Stopped	Stopped			Stopped
1.5 – 1.6						
1.6 – 1.7						
1.7 – 1.8						
1.8 – 1.9						
1.9 – 2.0						
2.0 – 2.1						

SITE PLAN

129 Rykers Road, Cape Tribulation.

Not to scale



Attachment 3
Onsite Sewerage Assessment Report

CHRIS VAN DYKE DESIGNS

ONSITE SEWERAGE ASSESSMENT

LOT 2, RP 732553 CAPE TRIBULATION
Report No C07-316

July 2007

Revision No. A

Engineering Testing Services (Cairns) Pty Ltd
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Document Status							
Revision No.	*Author*	*Reviewer*	*Reason for Issue*	*Approved for Issue*			
				Name	*Signature*	*Date*	*RPEQ No*
A	C Pennisi	M. Ganza	Draft				

TABLE OF CONTENTS

1.0 INTRODUCTION

Engineering Testing Services Pty Ltd (ETS) have been engaged by Chris Van Dyke Designs to assess the suitability of installing an on-site sewage treatment and effluent disposal system for a proposed seven (7) bedroom unit development at Lot 2, RP 732553 Rykers Road, Cape Tribulation.

The following Australian Standards and Codes for the treatment and disposal of on-site effluent were used to prepare this report:

- AS1547 – 2000 'On-site domestic-wastewater management'.
- AS3500 – 2003 'Plumbing and Drainage Code'
- Queensland Plumbing & Drainage Act 2002'
- Queensland Department of Local Government, Planning, Sport & Recreation – "Queensland Plumbing & Wastewater Code."

1.1 Real Property Description

- Lot No: 2
- RP No: 732553
- Area: 3500m^2 (approximately)
- Parish: Noah
- County: Solander
- Local Authority: Douglas Shire Council

2.0 SITE AND SOIL EVALUATION

2.1 Site Assessment

SITE FACTOR	RESULT
Area	3500 m^2 (approximate)
Slope	40-60% North of site, 10-15% on site
Shape	Linear Divergent
Exposure	Good
Erosion and Land Slip	Nil
Boulders and Rock Outcrops	Nil
Vegetation	Orchid
Water Course	Rykers Creek - 100m to South West
Water Bore	Nil
Water Table	Not Encountered.
Cut and Fill	Nil
Flooding	N/A.
Channelled Runoff	Overland Flow.
Soil Surface Condition	Moist
Other Site Specific Factors	N/A.

2.2 Soil Assessment

SOIL PROPERTY	RESULT
Colour	Red Brown
Texture	Clay Loam
Structure	Weak
Permeability	0.12 – 0.5m/day
Soil Category	4
Resultant Design Irrigation Rate, DIR (mm/week)	25mm/week (secondary effluent)

3.0 SYSTEM SIZING FACTORS

3.1 Potable Water Supply

Reticulated	N/A
Spring extraction	Yes
Bore / well	Yes
Rainwater	N/A

3.2 Estimation of Daily Flows

Typical domestic wastewater flow design allowances are presented in Appendix 4.2D of AS1547: 2000. For a seven (7) bedroom dwelling with standard water reduction fixtures a typical wastewater flow allowance would be 180 L/person/day with spring extraction water supply.

As per AS1547:2000, a population equivalent of ten and a half (10.5) persons has been used for the design flow rate for the seven (7) bedroom dwelling.

Classification	*No.*	*Flow (L/Unit/day)*	*Total Flow (L/day)*
Persons	10.5	180	1,890

To ensure the integrity of the system standard water reducing fixtures should be incorporated into the design to minimize water consumption.

3.3 Wastewater Treatment Units

It is recommended an aerated waste water treatment system (AWTS) be used on site with a minimum capacity of 3000 liters per day. The slightly larger system is recommended due to possible surge loads.

4.0 On-Site Sewerage Disposal

4.1 Method of Disposal

Disposal via subsurface irrigation is recommended.

4.2 Design Irrigation Rate

Table 4.2A4 of AS1547:2000 recommends a design irrigation rate (DIR) for Category 4 soils of 25 mm per week for effluent on the basis that sub-surface or covered drip irrigation systems are utilised for effluent disposal.

The final configuration will be decided on site once all garden and grassed areas to be used have been determined.

4.3 Required Irrigation Area

In accordance with the selected DIR, a drip irrigation area of approximately 530 m^2 is required for the treated effluent. This area has been determined by dividing the weekly effluent flow by the design irrigation rate.

It is recommended that;

- The drip irrigation area is located into the designated lawn areas and prepared garden beds.

A shallow sub-surface drip irrigation system is installed at around 100mm depth into the soil in grassed or other suitable vegetated areas using a system of dosed distribution of effluent from perforated small diameter pipes or dripper lines.

Covered drip irrigation systems utilise a cover of mulch to prevent contact with the irrigation lines placed directly on the soil surface using a system of dosed distribution of effluent from perforated small diameter pipes or dripper lines.

5.0 SYSTEM INSTALLATION REQUIREMENTS

5.1 General

The system and all of its components shall be designed and installed by a licensed plumber in accordance with the manufacturer's recommendations and the relevant Australian Standards and Codes.

5.2 Available Reserve Area

AS 1547:2000 Clause, 4.2.3.4 requires a reserve area of 100% of the design area to be available on site for the expansion of a land application facility. Councils have the option of reducing or waiving this requirement for secondary or advanced secondary treated effluent.

The 100% requirement can be satisfied as illustrated on Figure 1 Appendix A.

5.3 Earthworks and Stormwater

The allotment shall be graded to ensure that stormwater does not pass over the land application areas. All roof stormwater shall be collected and piped to a suitable discharge point.

6.0 SUMMARY & RECOMMENDATIONS

Date of Inspection	1/07/2007
Location of Site:	Lot 2 RP732553 Rykers Road
Owner's Name:	Mr Jock Glough
Local Government:	Douglas Shire Council
Building Type:	7 Bedroom Development
Site Area:	3500m^2
Design Daily Flow:	1890 L/d
Soil Category:	4
Soil Conditioning:	Apply Gypsum to the base of the land application area at a rate of 1kg per square metre mixed to a depth of 200 mm.
Wastewater treatment:	3000 litre per day aerated wastewater treatment system (AWTS)
Design Irrigation Rate:	25 mm/week
Disposal:	Sub-Surface or Covered Surface Drip Irrigation
Dimensions of Land Application Facility:	530 m^2
Reserve Area:	100% available

The installation of the treatment and disposal system shall be inspected by Engineering Testing Services (Cairns) Pty Ltd to ensure the intent of the design is met.

This report is based on the information provided by the client. If any aspect of the site preparation or proposed construction changes from that originally advised, the Engineer shall be notified so that any amendments can be made. Should soil or environmental conditions encountered on the site differ significantly from those indicated, the Engineer shall be notified before proceeding, as modifications to the design may be required.

Pollution Exclusion

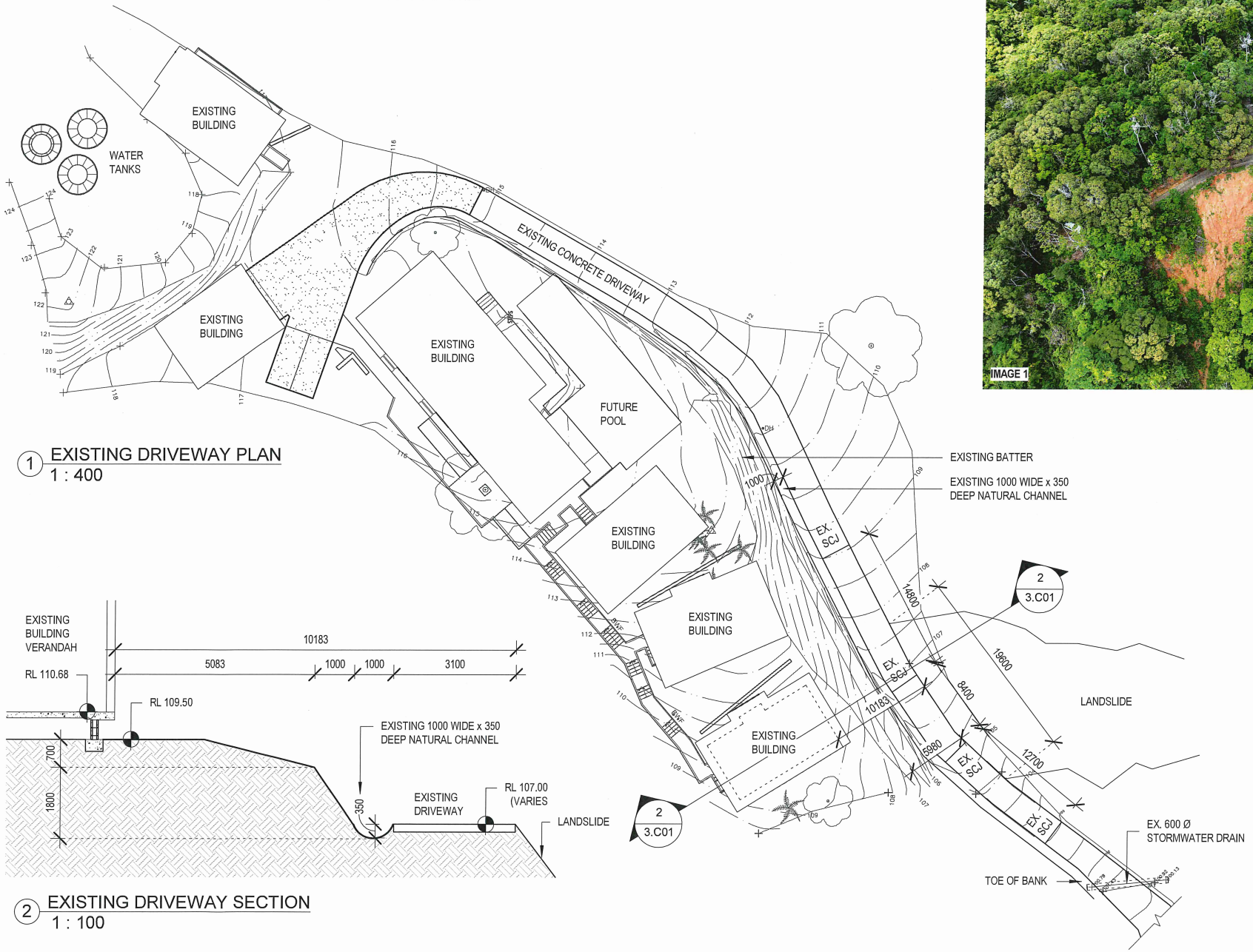
Engineering Testing Services (Cairns) Pty Ltd, its employees and sub-consultants shall not be liable in respect of any claim for Personal Injury or Damage to Property including costs and expenses incurred in preventing, removing, nullifying or clean-up caused by or arising directly or indirectly out of actual, alleged or threatened discharge, dispersal, release or escape of smoke, vapour, soot, fumes, acids, alkalis, toxic chemical, liquids or gases, waste materials or other irritants, contaminants or pollutants into or upon any property, land, the atmosphere or any water course or body of water (including groundwater).

LEGEND

EX. SCJ: EXISTING SLAB CONSTRUCTION JOINT

CONSTRUCTION NOTES

1. DIMENSIONS AND LEVELS TO BE CONFIRMED BY CONTRACTOR ON SITE.



1 EXISTING DRIVEWAY PLAN
1 : 400

2 EXISTING DRIVEWAY SECTION
1 : 100

WE HEREBY CERTIFY THE STRUCTURAL ELEMENTS AS SHOWN ON OUR DRAWINGS TO BE READ IN CONJUNCTION WITH THOSE LISTED IN OUR DOCUMENT ISSUE REGISTER AND OR FORM 15.

SIGNED DATE 27/05/2026

GEORGE THIRKELL (RPEQ 7279)
SHELL ENGINEERS STRUCTURAL & CIVIL BUILDING DESIGN
ABN 896791471876
MIEAUST CPEng, NER

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QLD 4870
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EMAIL : admin@shell.net.au

NORTH

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REV	DESCRIPTION	DATE
A	CONSTRUCTION ISSUE	27/05/2026

PROJECT
DRIVEWAY RECTIFICATION AT 129 RYKERS ROAD CAPE TRIBULATION QLD 4873

CLIENT
K. KASEM

DRAWING TITLE
EXISTING DRIVEWAY PLAN

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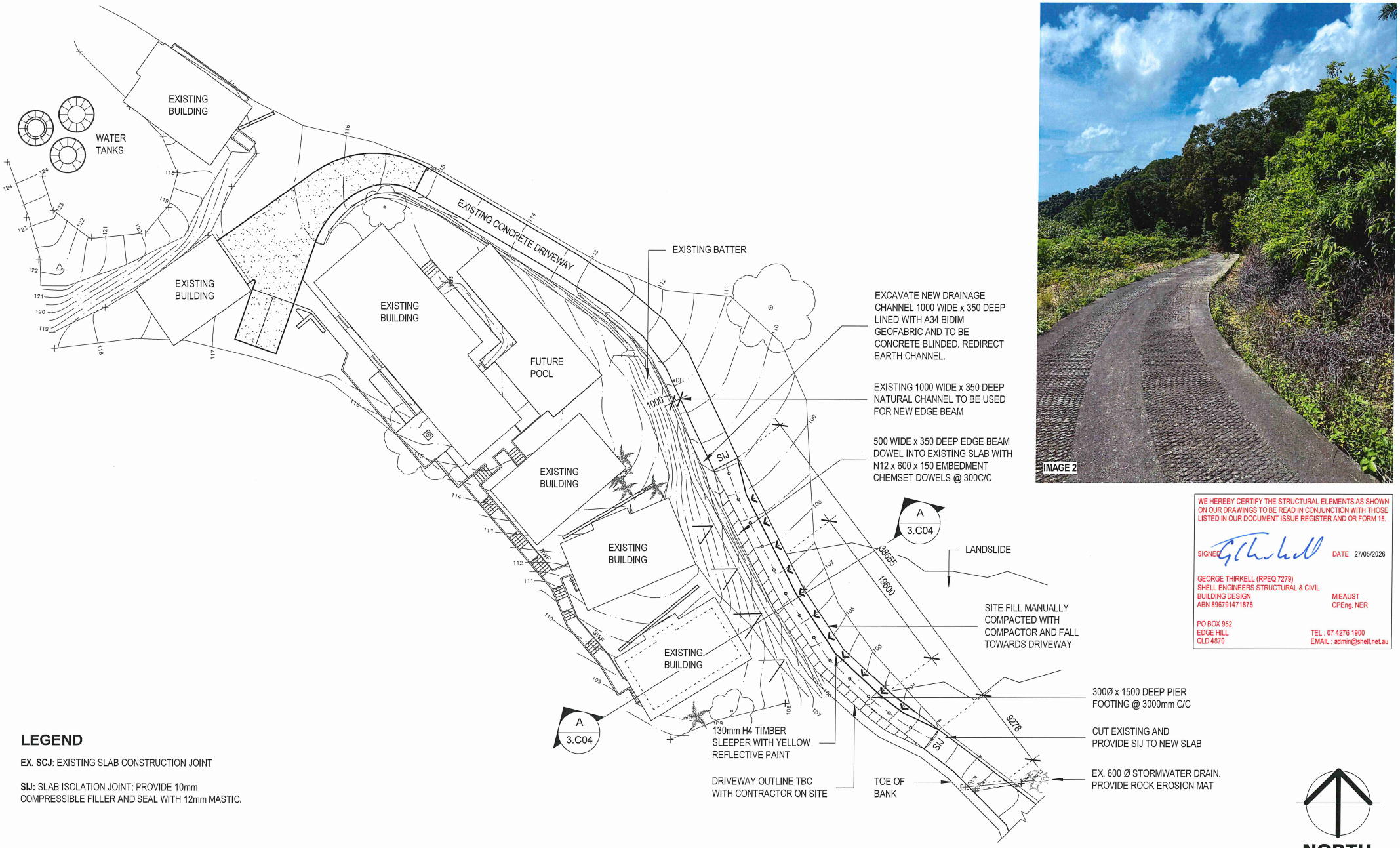

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LEGEND

EX. SCJ: EXISTING SLAB CONSTRUCTION JOINT

SIJ: SLAB ISOLATION JOINT: PROVIDE 10mm COMPRESSIBLE FILLER AND SEAL WITH 12mm MASTIC.

NORTH

1 PROPOSED DRIVEWAY PLAN
1 : 400

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PROPOSED DRIVEWAY PLAN

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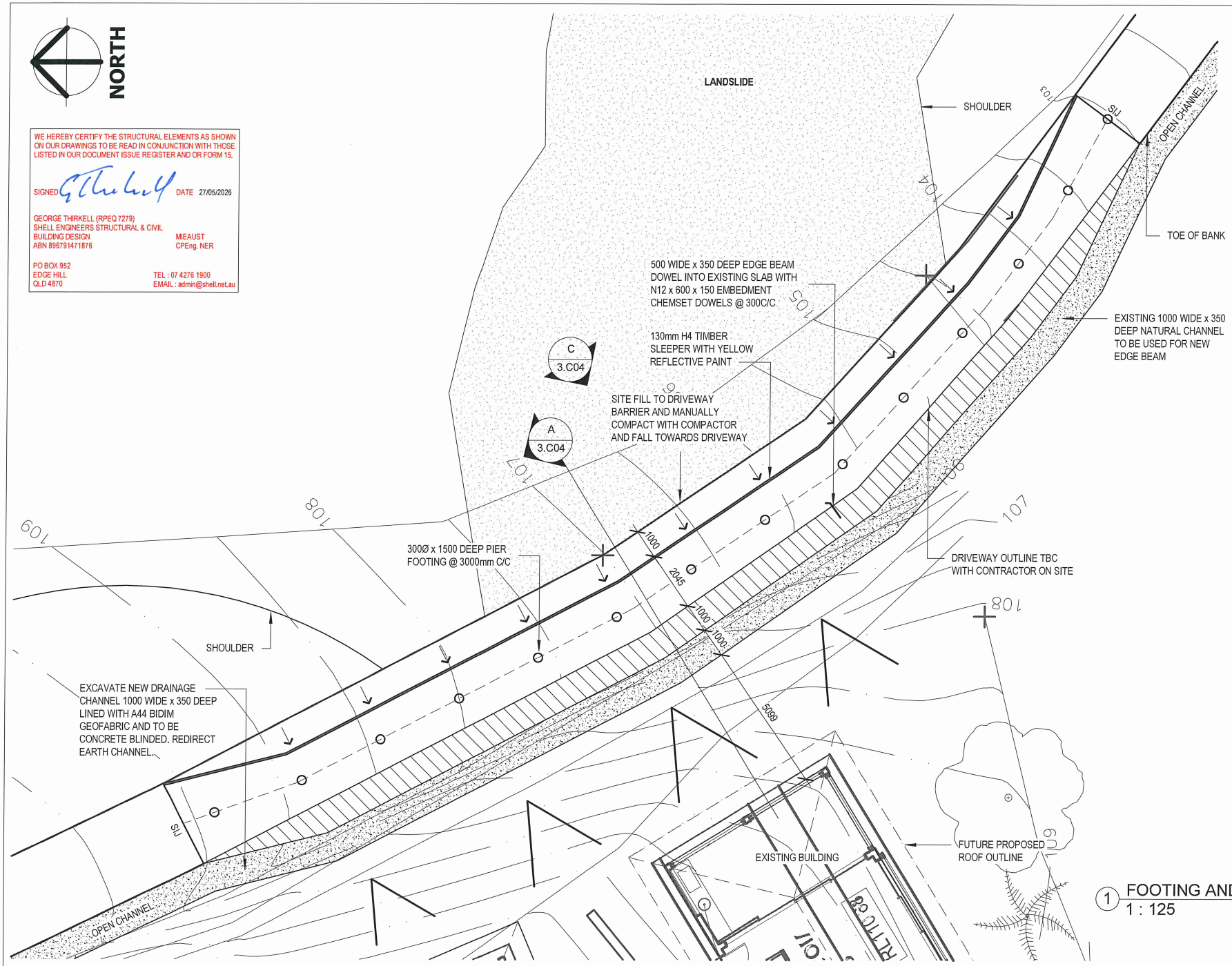

1 FOOTING AND SLAB PLAN
1 : 125

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FOOTING NOTES

1. REFER N-SERIES DRAWING NOTES FOR FULL SPECIFICATIONS & SOIL REPORT REFERENCE.
2. CONCRETE SHALL BE N32 TO SPECIFICATIONS.
3. INSPECTION OF EXCAVATION REQUIRED. ENGINEER TO CONFIRM DESIGN
4. MINIMUM CLEAR COVER TO REINFORCEMENT:

	N32
SURFACE IN CONTACT WITH GROUND WITH MEMBRANE	30
SURFACE IN CONTACT WITH GROUND WITHOUT MEMBRANE	45
INTERNAL SURFACES	20
COVER TO EMBEDED PIPES AND CONDUITS	20
EXPOSED SURFACES < 1kM FROM COAST	45
EXPOSED SURFACES > 1kM FROM COAST	40

5. PROVIDE 10mm x 10mm CHAMFERS TO ALL EXPOSED CONCRETE EDGES.
6. REFER CONCRETE NOTES FOR JOINT SPECIFICATIONS & SEALANT.
7. **SKJ:** SLAB KEY JOINT. DANLEY EXPANDA JOINT.
8. **SC:** SAW CUT OF 25mm DEEP x 3mm WIDE. DEPRESS MESH REINFORCEMENT LOCALLY AND CUT EVERY SECOND BAR
9. **SIJ:** SLAB ISOLATION JOINT: PROVIDE 10mm COMPRESSIBLE FILLER AND SEAL WITH 12mm MASTIC.
10. **SCJ:** SLAB CONTROL JOINT. DANLEY DIAMOND DOWEL JOINT.
11. **EX. SCJ:** EXISTING SLAB CONTROL JOINT.

FOR CONSTRUCTION

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PROJECT: DRIVEWAY RECTIFICATION AT 129 RYKERS ROAD CAPE TRIBULATION QLD 4873

CLIENT: K. KASEM

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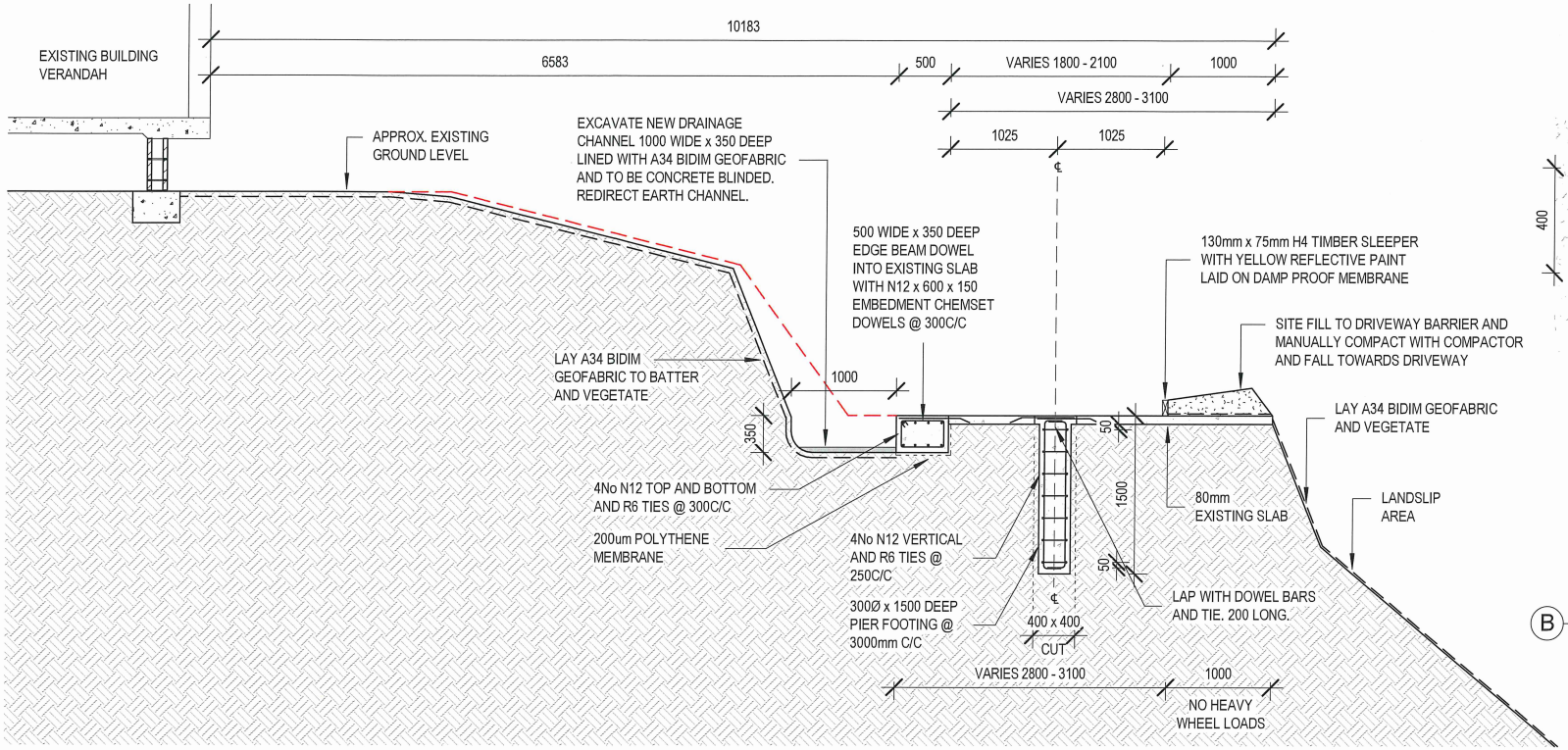

A PROPOSED DRIVEWAY SECTION A
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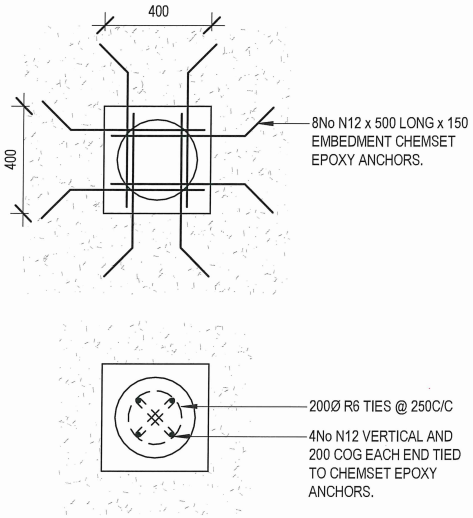

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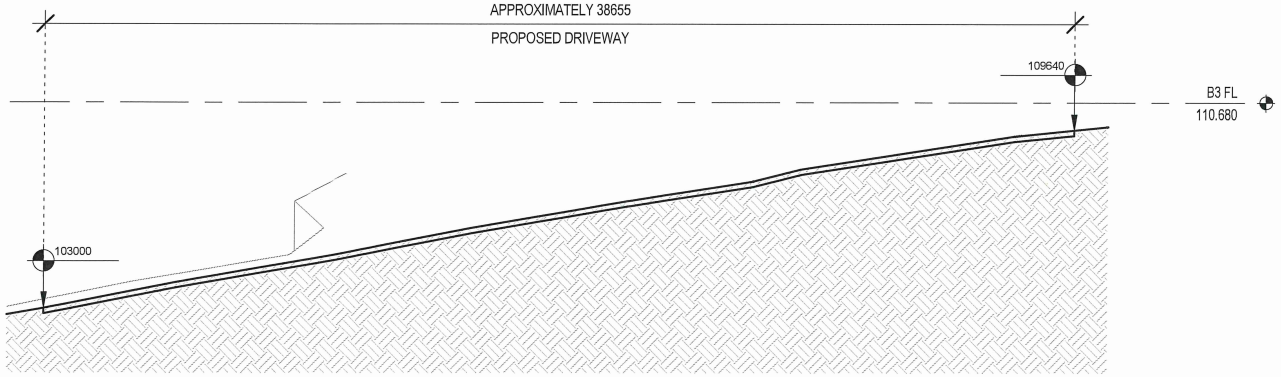

C PROPOSED DRIVEWAY ELEVATION
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CLIENT
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DRAWING TITLE
PROPOSED DRIVEWAY SECTIONS

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