

**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current conditions of approval associated with

**Development Permit No.: D/74-2021**

**Dated: 21 December 2021**

# SLOPE STABILITY ASSESSMENT AND REPORT

P.531



Prepared for: Blue Dolphin Pty Ltd  
PO Box 941  
Airlie Beach QLD 4802

Project: Slope Stability Assessment  
Lot 35 on SP285391,  
German Street  
Norman Gardens, QLD 4701

Job Reference: 2128E.P.531

Date: 18<sup>th</sup> May 2017

**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current conditions of approval associated with

**Development Permit No.: D/39-2017**

**Dated: 30 October 2018**



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## Document Information

Prepared for  
Project Name

Blue Dolphin Pty Ltd  
Insert project name

Commission

Geotechnical Investigation and Report

File Reference

2128E.P.531



Job Reference


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Date

18/05/2017

## Document Control

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A	18/05/2017	FINAL REPORT	P.Kilaverave		D.Stirling	

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## TABLE OF CONTENTS

<b>1.0</b>	<b>INTRODUCTION</b>	<b>4</b>
<b>2.0</b>	<b>SITE DESCRIPTION</b>	<b>5</b>
<b>3.0</b>	<b>INVESTIGATION WORK</b>	<b>6</b>
3.1	Background Search	6
3.2	Fieldwork	6
3.3	Laboratory Testing	6
<b>4.0</b>	<b>SUBSURFACE CONDITIONS</b>	<b>7</b>
4.1	Subsurface Strata	7
4.2	Laboratory Test Results	7
<b>5.0</b>	<b>GEOTECHNICAL ASSESSMENT</b>	<b>9</b>
5.1	Earthworks	9
5.1.1	Site Preparation	9
5.1.2	Structural Fill Placement	9
5.1.3	Excavatability	10
5.2	Batter Slopes	10
5.3	Building Footings	10
5.3.1	Footing Design Parameters	10
<b>6</b>	<b>SLOPE STABILITY ASSESSMENT</b>	<b>12</b>
<b>7</b>	<b>CONSTRUCTION INSPECTIONS</b>	<b>14</b>
<b>8</b>	<b>CONCLUSIONS AND RECOMMENDATIONS</b>	<b>15</b>

## TABLES

Table 1: Summary of Subsurface Strata .....	7
Table 2: Summary of Laboratory Test Results .....	8
Table 3: Point Load Test Results on Irregular Lump.....	8
Table 4: Maximum Unprotected Batter Slopes .....	10
Table 5: Maximum Allowable Bearing Capacities for Shallow Footings .....	11

## APPENDICES

APPENDIX A .....	GENERAL NOTES
APPENDIX B .....	SITE INVESTIGATION LOCATION PLAN
APPENDIX C.....	BOREHOLE LOGS WITH EXPLANATORY NOTES
APPENDIX D.....	LABORATORY TEST RESULTS
APPENDIX E.....	LANDSLIP HAZARD ANALYSIS
APPENDIX F .....	SLOPE MODEL ANALYSIS
APPENDIX G.....	GUIDELINES FOR HILLSIDE CONSTRUCTION

## 1.0 INTRODUCTION

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A broad scale geotechnical and slope stability investigation was carried out for the proposed subdivision development at Lot 35 on SP 285391 German Street, Norman Gardens, on behalf of Blue Dolphin Pty Ltd.

We understand the project involves the development of a four (4) lot yield residential subdivision.

The primary objective of this investigation was to satisfy the general requirements of Council which requires a slope stability assessment of the site in order to determine whether the site is suitable and feasible for development based on the existing geotechnical conditions. This includes ensuring long term stability for the development works associated with earthwork batters, retaining structures, access driveways and house pads. However, exact earthwork levels and house pad levels were not known at this time and therefore cannot be addressed in detail in our report.

The following methodology was undertaken by our Geotechnical Engineer in order to achieve the objective above.

- Carried out literature research of known areas of landslip and assessed whether this site was located within an area of instability.
- Carried out a general site walk over and general mapping of existing soil/rock conditions.
- Provided indicative site classifications as per AS2870.
- Provided recommendations on the building type considered suitable for this site.
- Commented on material encountered in relation to its use as structural fill.

At the completion of the investigation work an engineering report was prepared which included all the data gathered. The information was analysed and discussed, and conclusions and recommendations presented to satisfy the objectives of the investigation.

Authorisation to proceed with the investigation was received by this office on the 13<sup>th</sup> March 2017 from Brian Forrester representing Blue Dolphin Pty Ltd.

This report must be read in conjunction with our attached '*General Notes*', and '*Guidelines for Hillside Construction*'; Australian Geomechanics Society Journal, Volume 37, No. 2, May 2002.



## 2.0 SITE DESCRIPTION

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The site was located on the northern side of German Street with the proposed development set back approximately 30m from the existing roadway.

The site was bound by vacant allotments to the south, west and north. Vegetation to the south and west comprised grasses and occasional large trees while areas to the north were generally thinly forested. Developed allotments were located to the east comprising single storey and dual storey homes with established gardens.

The sloping surface was generally planar in shape with a minor gully developing approximately half-way down the slope towards the southern boundary of the proposed allotment 2 block. Firebreaks have been constructed along the proposed common access as indicated on Vision Surveys Drawing No: 16025-PP-01 Rev C dated 03/02/2017, allowing access to the sites from a gated entrance. The existing slopes were measured onsite to range between 27-37%.

Refer to plates 1 and 2 for typical site conditions encountered during our investigation.



Plate 1: View of the site from German Street to the North



Plate 2: View of the site from German Street to the North-East

## 3.0 INVESTIGATION WORK

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### 3.1 Background Search

As part of the slope stability assessment for the site, a literature research investigation was carried out to determine whether the site had any known published historical landslips within its boundaries.

Aerial photographic interpretation, using stereographic projection, was also carried out to assess if any physical evidence of previous landslips on the site could be observed.

### 3.2 Fieldwork

Fieldwork for the investigation was carried out on the 5<sup>th</sup> April 2017 and included the excavation of four (4) test pits at the locations shown on the Site Investigation Location Plan included in Appendix B. The material encountered at each location is described on the test pit logs included in Appendix C.

The subsurface profile was logged in general accordance with AS1726 *“Geotechnical Site Investigations”*. Strata identification was based on inspection of materials recovered from the excavated material. Insitu testing comprised Dynamic Cone Penetrometer (DCP) testing undertaken to determine the allowable bearing capacity available in the soil strata encountered. The results of DCP testing are shown on the test pit logs in Appendix C.

Disturbed samples were recovered during the field work and returned to our NATA accredited Rockhampton laboratory.

### 3.3 Laboratory Testing

Samples of representative strata were recovered and returned to our NATA accredited soils laboratory. The following tests were carried out on selected samples;

- Particle Size Distribution
- Atterberg Limits
- Point Load – Irregular Lump

The laboratory test results are included in Appendix D. Laboratory testing was carried out in accordance with Australian Standard AS1289 *‘Laboratory Testing For Engineering Purposes’*.

## 4.0 SUBSURFACE CONDITIONS

### 4.1 Subsurface Strata

The fieldwork indicated that the surface was underlain by varying ground conditions. Surface soils appeared to be of varying origin while the depth to weathered rock was dependent on the location of the excavated test pit of the slope.

Test pits TP1 and TP4 were undertaken on the lower end of the slope within proposed allotments 1 and 3 respectively, and intersected similar ground conditions. A mixture of clayey sands and gravelly clayey sands of colluvial origin were observed to overlay the weathered rock layers generally encountered at 0.8m below ground level. Soils of residual origin were only encountered at TP1 location made up of sandy clay composition with medium to high plasticity fines and hard in consistency.

TP2 and TP3 were excavated on the upper slopes of proposed allotments 3 and 4 respectively with weathered rock encountered at near surface between 0.3m to 0.6m. The overburden colluvium material generally comprised a mixture of sandy clays and sandy silts of varying plasticity and consistency.

The logs in Appendix C should be referred to for the detailed description of material encountered at each investigation location. A summary of conditions encountered at each investigation location is detailed in Table 1 below.

**Table 1: Summary of Subsurface Strata**

Location	COLLUVIUM					RESIDUAL	ROCK		TD (m)	Termination Condition
	SANDY CLAY (CI)	SANDY CLAY/GRAVELLY CLAYEY SAND (SC)	SILTY SAND (SM)	SANDY SILT (ML)	SANDY CLAY (CI/CH)	SANDY CLAY (CI/CH)	XW/DW	DW		
TP1	0.0-0.4	-	-	-	-	0.4-0.8	0.8-1.6	1.6-RD	2.9	RIPPER REFUSAL
TP2	-	0.0-0.3	-	-	-	-	-	0.3-RD	0.8	RIPPER REFUSAL
TP3	-	-	0.0-0.2	0.2-0.6	-	-	-	0.6-RD	1.2	RIPPER REFUSAL
TP4	-	0.0-0.3	-	-	0.3-0.8	-	0.8-1.6	1.6-RD	2.7	RIPPER REFUSAL

**NOTES:**

TD = Termination Depth

RD = Refusal Depth

All depths were measured from the existing surface level at the time of the investigation.

XW – Extremely Weathered

DW – Distinctly Weathered

No groundwater was encountered in any of the test pits during the investigation. However, it is possible that seepage could occur along the soil/rock interface during and after periods of wet weather.

### 4.2 Laboratory Test Results

Laboratory testing was undertaken on the predominant soil type to assess the potential reactivity ranges which could be expected and as such what indicative site classifications could result based on anticipated earthworks.

A summary of the laboratory test results are shown in Table 2 below.

**Table 2: Summary of Laboratory Test Results**

Sample Location	Sample Depth (m)	Liquid Limit %	Linear Shrinkage %	Plasticity Index %	% Passing As Sieve (mm)		
					2.36	0.425	0.075
TP1	0.4-0.8	43	8.0	19	82	54	43
TP2	1.8-2.2	37	7.0	18	19	11	8

**Table 3: Point Load Test Results on Irregular Lump**

Sample Location	Sample Depth (m)	Is (50) MPa
TP3	0.6-0.9	0.41
TS02	2.7	4.40

## 5.0 GEOTECHNICAL ASSESSMENT

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### 5.1 Earthworks

#### 5.1.1 Site Preparation

All site preparation work should be carried out in accordance with AS3798-2007 '*Guidelines on Earthworks for Commercial and Residential Developments*'.

Proposed cut/fill levels were not known at the time of preparation of this report for building platforms or lot access.

All soil containing grass and root material should be stripped from the building sites and access areas prior to construction. This material is not considered suitable for use as structural fill but may be stockpiled for possible future landscaping purposes, if required. Stripping depths will generally be in the order of around 0.2m. However, isolated areas may require a deeper stripping depth. Further, colluvium was encountered between 0.3m to 0.8m depth. It is recommended that all colluvium be excavated and recompacted where required. However, if left in place, the colluvium layer may be expected to creep further and no loading is to be placed on any colluvium.

Where any existing fill is encountered during construction stage, it is expected that this fill was not placed in accordance with recognised standards and as such must be deemed to '*uncontrolled*'. As such, removal of this fill and recompaction of the fill to the standards discussed below is recommended.

Prior to the placement of any structural fill, all colluvium must be removed and the site should be proof rolled using a minimum 10 tonne vibrating padfoot roller. Should isolated soft/loose areas be encountered during this process, this material should be removed and replaced with select fill. It is likely that where soft to firm clays, loose to medium dense sands were encountered or colluvium, that the removal of these materials will alleviate potential handling, settlement or creep issues during and after construction.

Depressions formed by the removal of vegetation should have all disturbed soil cleaned out and be backfilled with compacted select fill material.

Construction Sciences should be engaged to confirm the suitability of the stripping depth and confirm the adequacy of the newly exposed soil for fill placement.

#### 5.1.2 Structural Fill Placement

With the exception of the topsoil stratum, all materials encountered during the investigation are considered acceptable for use as structural fill provided that any pre-treatment (moisture conditioning, removal of oversize), is carried out prior to fill placement. It must be stressed that the clays on site are high plasticity and could be expected to result in stiff raft foundation types if encountered in significant thicknesses or where used as fill.

To minimise the potential for post compaction volume change due to moisture content variations, any structural clay bearing fill should be placed in loose layers not greater than 200mm thick at a moisture content in the range -2% to +3% of the standard optimum moisture content, and be compacted to a minimum dry density ratio of 95% standard compaction as per AS1289 5.1.1.

Filling should not be undertaken over colluvium strata.

Measures should be adopted to ensure that this clay fill material is not allowed to dry out prior to the placement of succeeding layers of fill and final covering with building slabs and road pavements.

It is recommended that the placement of all structural fill be inspected, tested and certified by Construction Sciences to Level 1 requirements, during the earthworks operations to ensure that all fill is placed in a '*controlled manner*', in accordance with AS3798-2007.

Where filling is to be carried out over sloping land (slope > 8H:1V), the surface of the natural material should be benched so that the fill can be '*keyed*' into the slope, allowing for a good bonding interface between structural fill and the natural. The maximum height of the step must not exceed 0.5m, and the benching must be sloped to ensure free drainage.

### 5.1.3 Excavatability

Soils above excavator refusal depth should be able to be excavated using a small dozer (e.g. Cat D6 or similar) in bulk excavations and a medium size backhoe in trench excavations. Below excavator refusal depths, larger plant, including pneumatic/hydraulic equipment, may be required in order to achieve cut depths below those achieved during our investigation.

## 5.2 Batter Slopes

For initial design purposes, previous experience in the area has indicated that the following maximum unprotected batter slopes may be adopted for the cut and fill batters on the site.

**Table 4: Maximum Unprotected Batter Slopes**

Material Type	Short Term (Maximum)	Long Term (Maximum)
Residual Clays (cut)	1V:1H	1V:2H
Colluvium	1:2H	1:3H
Fill Batters(1)	1V:2H	1V:2H
Weathered Rock	1V:1H	*

Notes:

- (1) All fill batters should be overfilled, compacted and cut back at the maximum angles recommended above and with some form of erosion protection to minimise any potential unnecessary scour effects due to weathering.
- \* Denotes requirement for detailed stability assessment.

## 5.3 Building Footings

The results of investigations and testing show that in its undisturbed state, the site would be classified as Class S - "Slightly Reactive" in accordance with *AS2870-2011 'Residential Slabs and Footings'*, with predicted ground surface movement of less than 20mm. However, due to the presence of colluvium strata and possible soil slip movement, the site would be classified as "**Class P**".

The presence of trees and their potential impact on building footings should be taken into account during the structural foundation design.

### 5.3.1 Footing Design Parameters

Based on the nature of the proposed dwelling and the subsurface conditions encountered, it is recommended that the proposed dwelling be founded into the underlying **weathered bedrock** profile. Any cut/fill areas on site will have the potential for differential settlement across the floor slab and shall be taken into consideration in the design stage.

The maximum allowable bearing capacities shown in Table 5 below are suggested for the design of high level pad or strip footings.

**Table 5: Maximum Allowable Bearing Capacities for Shallow Footings**

Founding Material	Maximum Allowable Bearing Capacity (kPa)
Dense GRAVELLY CLAY SAND (SC) (COLLUVIUM)	NR
Stiff SANDY CLAY (CI/CH) (COLLUVIUM)	NR
Very Stiff to Hard SANDY CLAY (GP) (RESIDUAL)	NR
EXTREMELY WEATHERED ROCK	450

## NOTES:

NR = Not Recommended

\*A footing inspection shall be carried out by this office to ensure bearing capacity and cleanliness at the base of the footing.

## 6 SLOPE STABILITY ASSESSMENT

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Fieldwork for this component of the investigation was carried out by a Geotechnical Engineer on 5<sup>th</sup> April 2017.

The fieldwork exercise included a broadscale inspection, where possible, of the entire site to assess the following;

- Determine slope angle
- Observe vegetation
- Note any evidence of tension cracking
- Note any evidence of seepage
- Note any evidence of soil creep
- Note any evidence of previous slips
- Geological features
- Subsurface conditions
- Drainage issues

The presence of colluvium indicates previous movement on site has occurred. No other physical evidence of previous movement, seepage, soil creep etc was observed during the mapping exercise across the site.

Reference to the Queensland Department of Mines' 1:100,000 geological series Rockhampton sheet indicates that the site is underlain by the Lakes Creek Formation comprising siltstone and lithic sandstone.

Slope angles across the site varied from approximately 16° (27%) to about 21° (37%) and generally increasing from west to east.

No architectural plans were available during the preparation of this report, however all residential buildings proposed to be constructed within the subject allotments should adopt a pole type construction founded into the underlying weathered rock profile.

All footings of the building must be founded into the underlying weathered rock profile. It is anticipated that material won from cutting during construction may be used as fill material. The use of this material as fill will be dependent upon its ability to satisfy the required specifications. No fill should be placed over the colluvium. The colluvium may be expected to creep further downslope and thus, if left in place, must not support any loads.

Where earthworks involve some cutting of the site, engineered retaining walls should be adopted to provide stability. For any retaining structures that form part of the main building structure, the conditions for material retained should be considered 'at rest' given that the retaining wall will have little tolerance for movement. All retaining walls will need to be founded into the underlying weathered bedrock strata.

Further to these parameters, in consideration for retaining structures, it is important to enable good drainage behind the structure itself to prevent excessive hydrostatic pressure. It is recommended to utilise clean granular backfill behind the wall itself and drain pipes at the base of the structure to release any water. The design should also allow for water pressure acting on the retaining structure to at-least one third the wall height in order to ensure stability in extreme situations.

In addition, material directly behind the structure should not be heavily compacted, otherwise adverse effects from increased earth pressures may affect the in service use of the structure. Compaction by hand-held equipment is recommended when placing these layers.

Any retaining wall design for the building should take into consideration the loads that may apply from adjacent sites (buildings, driveways, etc.).

The construction type as described above would be considered acceptable for this site providing the recommendations outlined in this stability assessment report are implemented and maintained for the life of



the structure. Furthermore, it is recommended that all cut batter slopes associated with the construction of these allotments be vegetated to provide additional strength and resistance to erosion potential and surficial slipping.

The stability of an area under construction will largely be a function of adequate drainage control. Therefore, it is assumed that stormwater management will be designed and constructed in accordance with recognised building practices/standards to control all drainage issues. It is strongly recommended that adequate drainage paths are installed at the top and base of the cut batters in order to control and direct runoff away from the area.

It is recommended that removal of vegetation (with the exception of topsoil stripping) be kept to a minimum and that any vegetation removal only be undertaken where it is necessary in order to construct building platforms. Furthermore, where stripping is undertaken across the building and earthworks area, re-vegetation and/or batter protection should be a requirement in order to reduce the effects of erosion.

Based on the background search and the mapping exercise, the presence of colluvium indicated previous creep movement and potential future creep movement across the site. This must be considered in the design of the structural footings.

Further to the above, a quantitative risk assessment has been assigned to the site based on the required format provided by the AGS '*Guidelines for Landslide Risk Management 2007*'. The results of this assessment indicated that the lot has a stability risk level of 'moderate'. For details of this analysis, refer to Appendix E.

A slope stability analysis was carried out using Slope/W modelling software and results indicate that the current factor of safety at the site was calculated to be 3.15, which is above the acceptable limit of 1.5. The slope analysis can be viewed in Appendix F.

From this analysis, some surficial creep may be expected to occur in the colluvium over the long term. Provided that the building is founded into the underlying weathered rock, the building should have a sufficient factor of safety against slip failure for the long-term. Furthermore, it is recommended that the building foundations be imbedded into the weathered rock profile to resist any lateral forces that may be applied from this surficial creep. There will still remain the potential for creep or slippage of the colluvium across the site.

The construction of the proposed dwelling and the driveway access road on this site is not expected to adversely affect the current global stability provided the recommendations above are adhered to and adequate civil/hydraulic and structural issues are addressed. Given the results of our assessment, provided the above recommendations are adhered to, the site is considered acceptable for its proposed usage with regards to stability. Effective subsurface and surface drainage will be critical in the maintenance of stability of the site.

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## 7 CONSTRUCTION INSPECTIONS

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It is recommended that placement of all structural fill and cut/fill batters be inspected, tested and certified where necessary, by Construction Sciences to ensure recommendations made in this report have been adhered to.

Should subsurface conditions other than those described in this report be encountered, Construction Sciences should be consulted immediately and appropriate modifications developed and implemented if necessary.

## 8 CONCLUSIONS AND RECOMMENDATIONS

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The following is a summary of the conclusions and recommendations in regard to the geotechnical investigation for the proposed subdivision development at Lot 35 on SP 285391 German Street, Norman Gardens. However, the preceding sections of this report should be read for a full description of the conclusions and recommendations.

1. The subsurface conditions, at the investigation locations generally consisted a mixture gravel, sands and clays of colluvium origin overlying weathered rock. Weathered rock was encountered at generally shallow depths between 0.3m to 0.8m with the only residual soils of sandy clay composition encountered at TP1 location from 0.6m to 0.8m interval.
2. Earthworks should be carried out in accordance with *AS3798-2007 'Guidelines on Earthworks for Commercial and Residential Developments'*. It is recommended all uncontrolled fill be replaced with controlled fill. Refer to Section 5.1 for details on full recommendations for earthwork operations.
3. Refer to section 5.2 for recommendations on maximum unprotected cut/fill batter angles for the site.
4. The results of investigations and testing show that in its undisturbed state, the site would be classified as Class S - "Slightly Reactive" in accordance with *AS2870-2011 'Residential Slabs and Footings'*, with predicted ground surface movement of less than 20mm. However, due to the presence of colluvium and potential further creep, the site would be classified as '**Class P**'.
5. It is recommended that the building be founded into the underlying weathered rock profile and footings be designed using the parameters provided in Section 5 and 6.
6. Based on our quantitative hazard rating assessment, the site has a 'moderate' risk likelihood of instability. Refer to Appendix E for results of this quantitative assessment.
7. Based on the background search, fieldwork results and the site 'walkover', evidence of previous movement was noted by the presence of colluvium. Provided the recommendations in this report are adhered to, it is considered that the site is acceptable for its proposed usage in regards to stability.
8. Effective subsurface and surface drainage will be critical in the maintenance of stability on the site.

We trust that this information is helpful. Please contact our office with any queries or if further information is required.

Yours faithfully,



Poka Kilaverave  
Geotechnical Engineer  
For Construction Sciences



David Stirling  
Senior Geotechnical Engineer

# **APPENDIX A**

## **General Notes**

## **GENERAL NOTES**

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### **GENERAL**

This report comprises the results of an investigation carried out for a specific purpose and client as defined in the introduction section(s) of the document. The report should not be used by other parties or for other purposes as it may not contain adequate or appropriate information.

### **BOREHOLE/TEST PIT LOGGING**

The information on the borehole/test pit logs has been based on a visual and tactile assessment except at the discrete locations where test information is available (field and/or laboratory results).

Reference should be made to our standard sheets for the definition of our logging procedures (Soil and Rock Descriptions).

### **GROUNDWATER**

Unless otherwise indicated the water levels noted on the borehole/test pit logs are the levels of free water or seepage recorded at the given time of measuring. The actual groundwater level may differ from this recorded level depending on material permeabilities. Further variations of this level could occur with time due to such effects as seasonal and tidal fluctuations or construction activities. Final confirmation of levels can be only made by appropriate instrumentation techniques and programmes.

### **INTERPRETATION OF RESULTS**

The discussion and recommendations contained within this report are normally based on a site evaluation from discrete borehole/test pit data. Generalised or idealized subsurface conditions (including any cross-sections contained in the report have been assumed or prepared by interpolation/extrapolation of this data. As such these conditions are an interpretation and must be considered as a guide only.

### **CHANGE IN CONDITIONS**

Local variations or anomalies in the generalised ground conditions used for this report can occur, particularly between discrete borehole/test pit locations. Furthermore, certain design or construction procedures may have been assumed in assessing the soil structure interaction behaviour of the site.

Any change in design, in construction methods, or in ground conditions as noted during construction, from those assumed in this report should be referred to this firm for appropriate assessment and comment.

### **FOUNDATION DEPTH**

Where referred to in the report, the recommended depth of any foundation (piles, caissons, footings, etc.) is an engineering estimate of the depth to which they should be constructed. The estimate is influenced and perhaps limited by the fieldwork method and testing carried out in connection with the site investigation, and other pertinent information as has been made available. The depth remains, however, an estimate and therefore liable to variation. Footing drawings, designs and specifications based upon this report should provide for variations in the final depth depending upon the ground conditions at each point of support.

### **REPRODUCTION OF REPORTS**

Where it is desired to reproduce the information contained in this report for the inclusion in the contract documents or engineering specification of the subject development, such reproduction should include at least all the relevant borehole/test pit logs and test data, together with the appropriate standard description sheets and remarks made in the written report of a factual or descriptive nature.

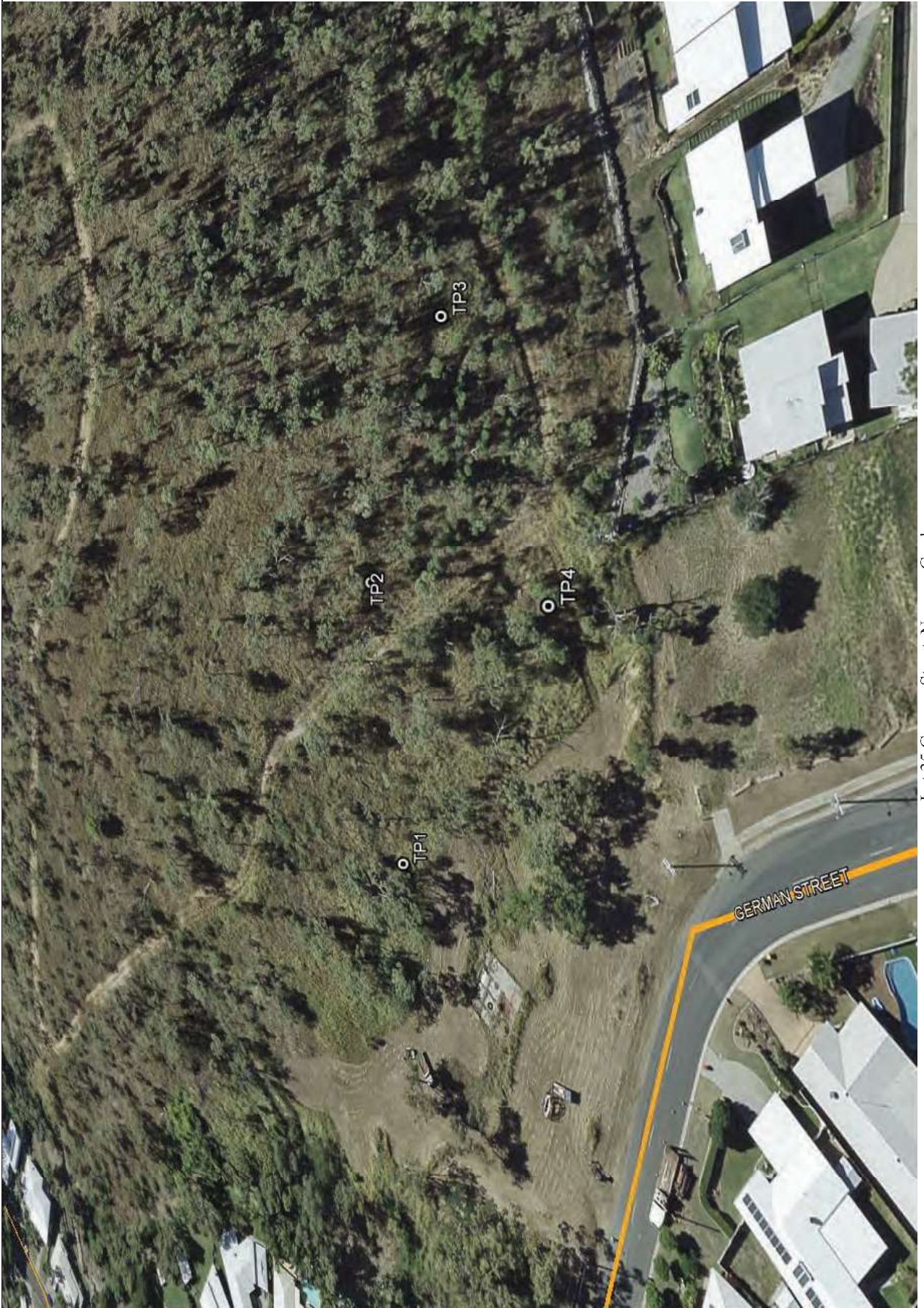
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# **APPENDIX B**

## **Site Investigation Location Plan**



SITE LOCATION PLAN



Lot 35 German Street, Norman Gardens





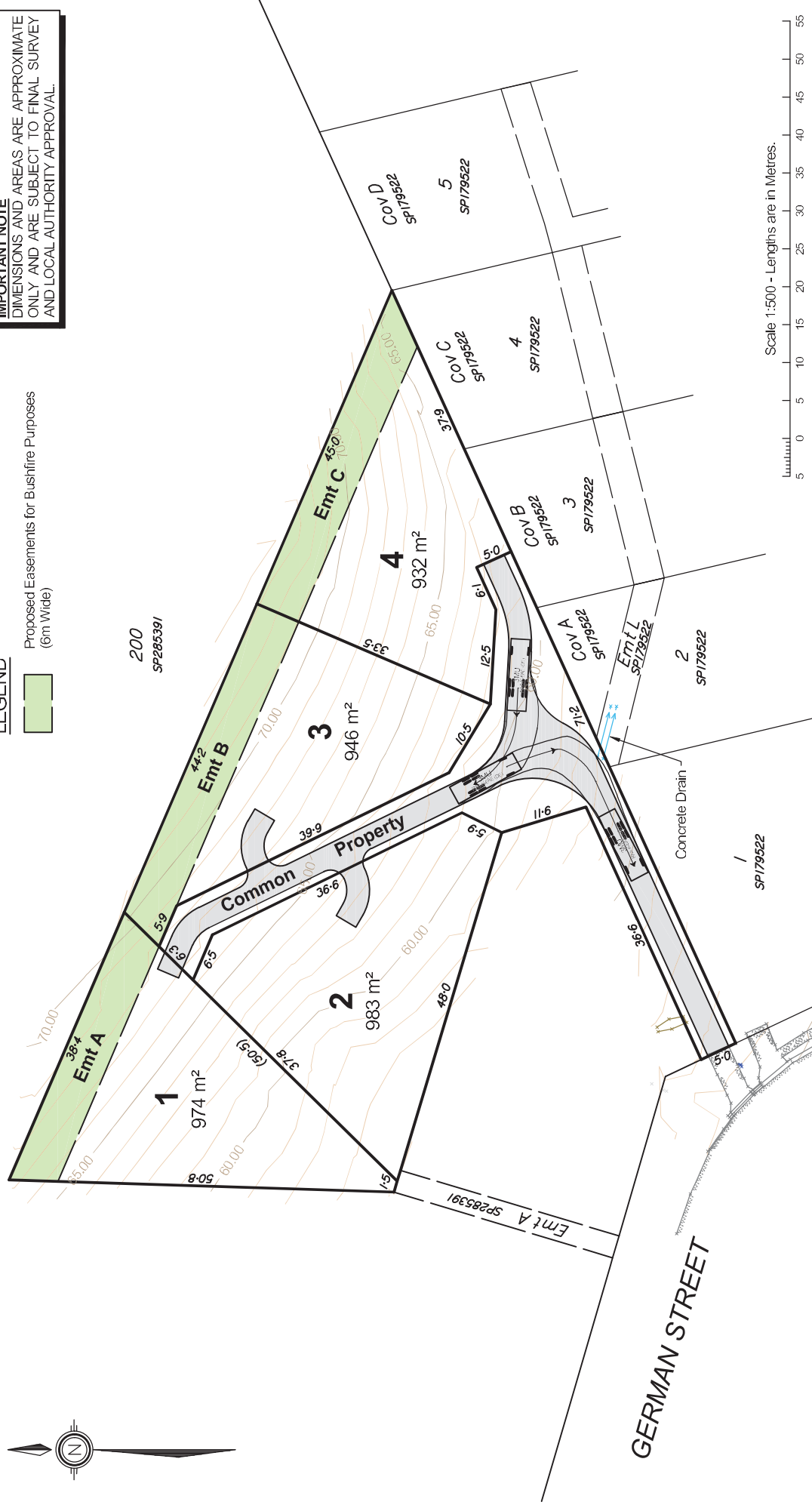
LEGEND



Proposed Easements for Bushfire Purposes  
(6m Wide)

IMPORTANT NOTE

DIMENSIONS AND AREAS ARE APPROXIMATE  
ONLY AND ARE SUBJECT TO FINAL SURVEY  
AND LOCAL AUTHORITY APPROVAL.



Scale 1:500 - Lengths are in Metres.

PROPOSAL PLAN

PROJECT: Proposed Subdivision

LOCATION: German Street, Norman Gardens

Real Property Description: Lot 35 on SP285391

CLIENT: Blue Dolphin Pty. Ltd.

Horiz. Datum: MGA Zone 56

Vert. Datum: AHD

Local Authority: Rockhampton Regional

Contour Interval: 1m



Airfile Beach | Mackay | Townsville | Rockhampton | Brisbane | Gold Coast  
E : admin@visionsurveysp4d.com.au P : 13000VISION

Scale:	1 : 500 @ A3	Drawing No:	16025-PP-01
Drawn:	AD	Sheet:	1 of 1
Surveyor:	N/A	Revision:	C

This plan was prepared as a proposed subdivision and should not be used for any other purpose. The dimensions, areas and total number of lots shown hereon are subject to field survey and also to the requirements of Council and any other authority which may have requirements under any relevant legislation. In particular, no reliance should be placed on the information on this plan for any financial dealing involving the land. This note is an integral part of the plan.

C Add Emts A - C, update lot layout & driveways

B Update boundaries

A Original Issue

Rev Description

AD BF 03/02/2017

AD BF 15/11/2016

AD BF 15/11/2016

Drawn Checked Date



# **APPENDIX C**

## **Borehole Logs with Explanatory Notes**



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# TEST PIT NUMBER TP1

PAGE 1 OF 1

CLIENT Blue Dolphin Pty Ltd PROJECT NAME Slope Stability Assessment  
PROJECT NUMBER 2128E.P.531 PROJECT LOCATION Lot 35 on SP285391 German Street, Norman Gardens  
DATE STARTED 5/4/17 COMPLETED 5/4/17 R.L. SURFACE \_\_\_\_\_ DATUM \_\_\_\_\_  
EXCAVATION CONTRACTOR Jeff Thompson Excavator Hire SLOPE --- BEARING ---  
EQUIPMENT 12T Excavator TEST PIT LOCATION Refer to Site Plan in Appendix B  
TEST PIT SIZE 0.85 X 3.0 LOGGED BY M.Walters CHECKED BY P.Kilaverave

## NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Bucket					CI	<u>SANDY CLAY (COLLUVIUM)</u> medium plasticity, dark brown, dry, very soft, fine to medium sand, with rootlets.		2
			0.5		CI/CH	<u>SANDY CLAY (RESIDUAL)</u> medium to high plasticity, brown, moist, very stiff to hard, fine to coarse sand, traces of fine to medium gravel, sub-angular.		1 1 1 21 22+
			1.0		XW/DW	<u>EXTREMELY TO DISTINCTLY WEATHERED ROCK</u> extremely low to low strength, brown/dark brown, moderately fractured, fine to coarse grained, granular texture, excavates as sandy gravel, fine to coarse gravel with cobbles/boulders, MPS 300mm.		
Ripper			1.5					
			2.0		DW	<u>DISTINCTLY WEATHERED ROCK</u> medium to high strength, brown/dark brown, moderately fractured, fine to coarse grained, granular texture, excavates as cobbles/boulders, MPS 600mm.		
			2.5					
			3.0			Test Pit Terminated at 2.9m (Ripper Refusal)		
			3.5					
			4.0					
			4.5					
			5.0					

BORE-HOLE / TEST PIT TP LOG 5.5M.GPJ GT224 LOGS.GPJ 19/4/17

## Test Pit TP1





Cardno Construction Sciences  
101 High Street  
4701  
Telephone: 49280044  
Fax: 49261286

## TEST PIT NUMBER TP2

PAGE 1 OF 1

CLIENT Blue Dolphin Pty Ltd PROJECT NAME Slope Stability Assessment  
PROJECT NUMBER 2128E.P.531 PROJECT LOCATION Lot 35 on SP285391 German Street, Norman Gardens

DATE STARTED 5/4/17 COMPLETED 5/4/17 R.L. SURFACE \_\_\_\_\_ DATUM \_\_\_\_\_  
EXCAVATION CONTRACTOR Jeff Thompson Excavator Hire SLOPE --- BEARING ---  
EQUIPMENT 12T Excavator TEST PIT LOCATION Refer to Site Plan in Appendix B  
TEST PIT SIZE 0.85 X 3.0 LOGGED BY M.Walters CHECKED BY P.Kilaverave

### NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Bucket					SC	<u>SANDY CLAY/CLAYEY SAND</u> with GRAVEL (COLLUVIUM) low to medium plasticity, brown, moist, very soft, fine to coarse sand, fine to medium gravel, sub-angular, with rootlets.		2
Ripper			0.5			<u>DISTINCTLY WEATHERED ROCK</u> high strength, brown/yellow, moderately to slightly fractured, fine to coarse grained, granular texture, excavates as sandy gravel with cobbles/boulders, MPS 600mm.		3
			1.0			Test Pit Terminated at 0.8m (Ripper Refusal)		22+
			1.5					
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

BORE-HOLE / TEST PIT TP LOG 5.5M.GPJ GT224 LOGS.GPJ 19/4/17

## Test Pit TP2





Cardno Construction Sciences  
101 High Street  
4701  
Telephone: 49280044  
Fax: 49261286

# TEST PIT NUMBER TP3

PAGE 1 OF 1

CLIENT Blue Dolphin Pty Ltd PROJECT NAME Slope Stability Assessment  
PROJECT NUMBER 2128E.P.531 PROJECT LOCATION Lot 35 on SP285391 German Street, Norman Gardens  
DATE STARTED 5/4/17 COMPLETED 5/4/17 R.L. SURFACE \_\_\_\_\_ DATUM \_\_\_\_\_  
EXCAVATION CONTRACTOR Jeff Thompson Excavator Hire SLOPE --- BEARING ---  
EQUIPMENT 12T Excavator TEST PIT LOCATION Refer to Site Plan in Appendix B  
TEST PIT SIZE 0.85 X 3.0 LOGGED BY M.Walters CHECKED BY P.Kilaverave

## NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Bucket					SM	<u>SILTY SAND (COLLUMIUM)</u> low plasticity, dark brown, moist, very loose, fine to coarse sand, trace of fine to medium gravel and cobbles, sub-angular, with rootlets.		2
Ripper			0.5		ML	<u>SANDY SILT (COLLUMIUM)</u> low plasticity, brown, moist, dense, fine to medium sand, traces of fine to medium gravel and cobbles/boulders, sub-angular.		3
					DW	<u>DISTINCTLY WEATHERED ROCK</u> medium strength, orange/brown mottled pale grey, moderately fractured, fine to coarse grained, granular texture, excavates as cobbles/boulders, MPS 1.3m.		22+
			1.0		DW	<u>DISTINCTLY WEATHERED ROCK</u> high strength, brown, moderately to slightly fractured, fine to coarse grained, granular texture, excavates as cobbles/boulders, MPS 0.6m		
			1.5			Test Pit Terminated at 1.2m (Ripper Refusal)		
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

BORE-HOLE / TEST PIT TP LOG 5.5M.GPJ GT224 LOGS.GPJ 19/4/17



## Test Pit TP3



CLIENT Blue Dolphin Pty Ltd

 PROJECT NAME Slope Stability Assessment

 PROJECT NUMBER 2128E.P.531

 PROJECT LOCATION Lot 35 on SP285391 German Street, Norman Gardens

 DATE STARTED 5/4/17

 COMPLETED 5/4/17

R.L. SURFACE \_\_\_\_\_

DATUM \_\_\_\_\_

 EXCAVATION CONTRACTOR Jeff Thompson Excavator Hire

 SLOPE ---

 BEARING ---











 EQUIPMENT 12T Excavator

 TEST PIT LOCATION Refer to Site Plan in Appendix B

 TEST PIT SIZE 0.85 X 3.0

 LOGGED BY M.Walters

 CHECKED BY P.Kilaverave
**NOTES**

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Bucket			0.5		SC	GRAVELLY CLAYEY SAND (COLLUVIUM) low plasticity, dark grey, moist, loose to medium dense, fine to coarse sand, fine to coarse gravel, sub-angular, with rootlets.		2
					CI/CH	SANDY CLAY (COLLUVIUM) medium to high plasticity, orange/brown, moist, firm, fine to medium sand, trace of fine to coarse gravel, sub-angular.		2
								3
								5
Ripper			1.0		XW/DW	EXTREMELY TO DISTINCTLY WEATHERED ROCK extremely low to low strength, seams of low to med strength, extremely fractured, fine to coarse grained, granular texture, excavates as clayey gravel, moist, medium to coarse gravel, angular.		3
								3
								4
								5
			1.5		DW	DISTINCTLY WEATHERED ROCK medium strength, brown, extremely to moderately fractured, seams of XW rock elow to vlow strength, fine to coarse grained, granular texture, excavates as gravel with cobbles, MPS 200mm.		14
								22+
			2.0		DW	DISTINCTLY WEATHERED ROCK high strength, brown/dark brown, moderately to slightly fractured, fine to coarse grained, granular texture, excavates as cobbles/boulders, MPS 500mm.		
			2.5		DW	DISTINCTLY WEATHERED ROCK high strength, brown/dark brown, moderately to slightly fractured, fine to coarse grained, granular texture, excavates as cobbles/boulders, MPS 500mm.		
			3.0		DW	DISTINCTLY WEATHERED ROCK high strength, brown/dark brown, moderately to slightly fractured, fine to coarse grained, granular texture, excavates as cobbles/boulders, MPS 500mm.		
			3.5		DW	DISTINCTLY WEATHERED ROCK high strength, brown/dark brown, moderately to slightly fractured, fine to coarse grained, granular texture, excavates as cobbles/boulders, MPS 500mm.		
			4.0		DW	DISTINCTLY WEATHERED ROCK high strength, brown/dark brown, moderately to slightly fractured, fine to coarse grained, granular texture, excavates as cobbles/boulders, MPS 500mm.		
			4.5		DW	DISTINCTLY WEATHERED ROCK high strength, brown/dark brown, moderately to slightly fractured, fine to coarse grained, granular texture, excavates as cobbles/boulders, MPS 500mm.		
			5.0		DW	DISTINCTLY WEATHERED ROCK high strength, brown/dark brown, moderately to slightly fractured, fine to coarse grained, granular texture, excavates as cobbles/boulders, MPS 500mm.		

BORE-HOLE / TEST PIT TP LOG 5.5M.GPJ GT224 LOGS.GPJ 19/4/17



## Test Pit TP4



## NOTES, DESCRIPTION & CLASSIFICATION OF SOIL

The methods of description and classification of soils used in this report are generally based on Australian Standard AS1726-1993 *Geotechnical Site Investigations*.

Soil description is based on an assessment of disturbed samples, as recovered from bores and excavations, or from undisturbed materials as seen in excavations and exposures or in undisturbed samples. Descriptions given on report sheets are an interpretation of the conditions encountered at the time of investigation.

In the case of cone or piezocone penetrometer tests, actual soil samples are not recovered and soil description is inferred based on published correlations, past experience and comparison with bore and/or test pit data (if available).

Soil classification is based on the particle size distribution of the soil and the plasticity of the portion of the material finer than 0.425mm. The description of particle size distribution and plasticity is based on the results of visual field estimation, laboratory testing or both. When assessed in the field, the properties of the soil are estimated; precise description will always require laboratory testing to define soil properties.

Where soil can be clearly identified as FILL this will be noted as the main soil type followed by a description of the composition of the fill (e.g. FILL – yellow-brown, fine to coarse grained gravelly clay fill with concrete rubble). If the soil is assessed as possibly being fill this will be noted as an additional observation.

Soils are generally described using the following sequence of terms. In certain instances, not all of the terms will be included in the soil description.

### MAIN SOIL TYPE (CLASSIFICATION GROUP SYMBOL)

- strength/density, colour, structure/grain size, secondary and minor components, additional observations

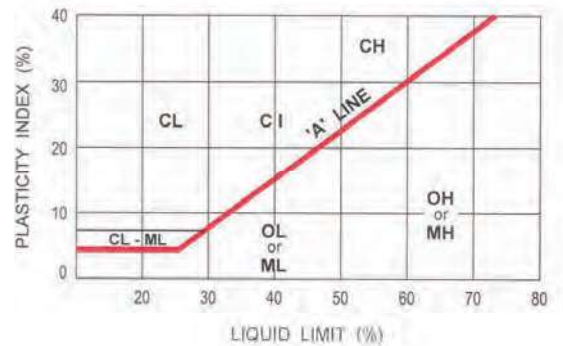
Information on the definition of descriptive and classification terms follows.

### SOIL TYPE and CLASSIFICATION GROUP SYMBOLS

	Major Divisions	Particle Size	Classification Group Symbol	Typical Names
<b>COARSE GRAINED SOILS</b> (more than half of material is larger than 0.075 mm)	BOULDERS	> 200mm		
	COBBLES	63 – 200mm		
	GRAVELS (more than half of coarse fraction is larger than 2.36mm)	Coarse: 20 – 63mm Medium: 6 – 20mm Fine: 2.36 – 6mm	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels.
			GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (more than half of coarse fraction is smaller than 2.36mm)	Coarse: 0.6 – 2.36mm Medium: 0.2 – 0.6mm Fine: 0.075 – 0.2mm	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands.
			SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
<b>FINE GRAINED SOILS</b> (more than half of material is smaller than 0.075 mm)	SILTS & CLAYS (liquid limit <50%)		ML	Inorganic silts and very fine sands, silty/clayey fine sands or clayey silts with low plasticity.
			CL and CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS & CLAYS (liquid limit >50%)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils.
			CH	Inorganic clays of high plasticity.
			OH	Organic clays of medium to high plasticity, organic silts.
	HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.

## NOTES, DESCRIPTION & CLASSIFICATION OF SOIL

### PLASTICITY CHART FOR CLASSIFICATION OF FINE GRAINED SOILS



(Reference: Australian Standard AS1726-1993 *Geotechnical site investigations*)

### DESCRIPTIVE TERMS FOR MATERIAL PROPORTIONS

Coarse Grained Soils		Fine Grained Soils	
% Fines	Modifier	% Coarse	Modifier
< 5	Omit, or use 'trace'	< 15	Omit, or use trace.
5 – 12	Describe as 'with clay/silt' as applicable.	15 – 30	Describe as 'with sand/gravel' as applicable.
> 12	Prefix soil as 'silty/clayey' as applicable	> 30	Prefix soil as 'sandy/gravelly' as applicable.

### STRENGTH TERMS – COHESIVE SOILS

Strength Term	Undrained Shear Strength	Field Guide to Strength
Very soft	< 12kPa	Exudes between the fingers when squeezed in hand.
Soft	12 – 25kPa	Can be moulded by light finger pressure.
Firm	25 – 50kPa	Can be moulded by strong finger pressure.
Stiff	50 – 100kPa	Cannot be moulded by fingers, can be indented by thumb.
Very stiff	100 – 200kPa	Can be indented by thumb nail.
Hard	> 200kPa	Can be indented with difficulty by thumb nail.

### DENSITY TERMS – NON COHESIVE SOILS

Density Term	Density Index	SPT "N"	CPT Cone Resistance
Very loose	< 15%	0 – 5	0 – 2MPa
Loose	15 – 35%	5 – 10	2 – 5MPa
Medium dense	35 – 65%	10 – 30	5 – 15MPa
Dense	65 – 85%	30 – 50	15 – 25MPa
Very dense	> 85%	> 50	> 25MPa

### COLOUR

The colour of a soil will generally be described in a 'moist' condition using simple colour terms (eg. black, grey, red, brown etc.) modified as necessary by "pale", "dark", "light" or "mottled". Borderline colours will be described as a combination of colours (eg. grey-brown).

### EXAMPLE

e.g. CLAYEY SAND (SC) – medium dense, grey-brown, fine to medium grained with silt.  
Indicates a medium dense, grey-brown, fine to medium grained clayey sand with silt.

## NOTES, DESCRIPTION & CLASSIFICATION OF ROCK

The methods of description and classification of rock used in this report are generally based on Australian Standard AS1726-1993 *Geotechnical Site Investigations*.

Rock description is based on an assessment of disturbed samples, as recovered from bores and excavations, or from undisturbed materials as seen in excavations and exposures, or in core samples. Descriptions given on report sheets are an interpretation of the conditions encountered at the time of investigation.

Notes outlining the method and terminology adopted for the description of rock defects are given below, however, detailed information on defects can generally only be determined where rock core is taken, or excavations or exposures allow detailed observation and measurement.

Rocks are generally described using the following sequence of terms. In certain instances not all of the terms will be included in the rock description.

ROCK TYPE (WEATHERING SYMBOL), strength, colour, grain size, defect frequency

Information on the definition of descriptive and classification terms follows.

### ROCK TYPE

In general, simple rock names are used rather than precise geological classifications.

### ROCK MATERIALS WEATHERING CLASSIFICATION

Term	Weathering Symbol	Definition
Residual soil	RS	Soil developed from extremely weathered rock; the mass structure and substance fabrics are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely weathered	XW	Rock is weathered to such an extent that it has 'soil' properties, ie. it either disintegrates or can be remoulded in water.
Distinctly weathered *	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Highly weathered	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock, usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.
Moderately weathered	MW	Rock substance affected by weathering to the extent that staining extends throughout the whole of the rock substance and the original colour of the fresh rock may be no longer recognisable.
Slightly weathered	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh	FR	Rock shows no sign of decomposition or staining.

\* Subdivision of this weathering grade into highly and moderately may be used where applicable.

### STRENGTH OF ROCK MATERIAL

Term	Symbol	Point Load Index $I_s$ (50)	Field guide to strength
Extremely low	EL	< 0.03MPa	Easily remoulded by hand to a material with soil properties.
Very low	VL	0.03 – 0.1MPa	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure.
Low	L	0.1 – 0.3MPa	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	M	0.3 – 1.0MPa	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High	H	1.0 – 3.0MPa	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very high	VH	3.0 – 10.0MPa	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely high	EH	> 10MPa	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Notes:

1. These terms refer to the strength of the rock material and not to the strength of the rock mass which may be considerably weaker due to the effect of rock defects.
2. The field guide visual assessment for rock strength may be used for preliminary assessment or when point load testing is not available.
3. Anisotropy of rock may affect the field assessment of strength.

## NOTES, DESCRIPTION & CLASSIFICATION OF ROCK

---

### COLOUR

The colour of a rock will generally be described in a 'moist' condition using simple colour terms (eg. black, grey, red, brown, etc) modified as necessary by 'pale', 'dark', 'light' or 'mottled'. Borderline colours will be described as a combination of colours (eg. grey-brown).

### GRAIN SIZE

Descriptive Term	Particle Size Range
Coarse grained	0.6 – 2.0mm
Medium grained	0.2 – 0.6mm
Fine grained	0.06 – 0.2mm

### DEFECT FREQUENCY

Where appropriate, a defect frequency may be recorded as part of the rock description and will be expressed as the number of natural (or interpreted natural) defects present in an equivalent one metre length of core.

### EXAMPLE

e.g. SANDSTONE (XW) – low strength, pale brown, fine to coarse grained, 3 defects per metre.

### ROCK DEFECTS

Defects are discontinuities in the rock mass and include joints, sheared zones, cleavages and bedding partings. The ability to observe and log defects will depend on the investigation methodology. Defects logged in core are described using the abbreviations noted in the following tables.

The *depth* noted in the description is measured in metres from the ground surface, the *defect angle* is measured in degrees from horizontal, and the defect *thickness* is measured normal to the plane of the defect and is in millimetres (unless otherwise noted).

Defects are generally described using the following sequence of terms:

*Depth, Defect Type, Defect Angle (dip), Surface Roughness, Infill, Thickness*

### DEFECT TYPE

B	Bedding
J	Joint
S	Shear Zone
C	Crushed Zone

### SURFACE ROUGHNESS

- i. rough or irregular, stepped
- ii. smooth, stepped
- iii. slickensided, stepped
- iv. rough or irregular, undulating
- v. smooth, undulating
- vi. slickensided, undulating
- vii. rough or irregular, planar
- viii. smooth planar
- ix. slickensided, planar

### INFILL

Infill refers to secondary minerals or other materials formed on the surface of the defect and some common descriptions are given in the following table together with their abbreviations.

Ls	limonite staining
Fe	iron staining
Cl	clay
Mn	manganese staining
Qtz	quartz
Ca	calcite
Clean	no visible infill

### EXAMPLE

3.59m, J, 90, vii, Ls, 0.1mm

Indicates a joint at 3.59m depth that is at 90° to horizontal (i.e. vertical), is rough or irregular and planar, limonite stained and 0.1mm thick.

# **APPENDIX D**

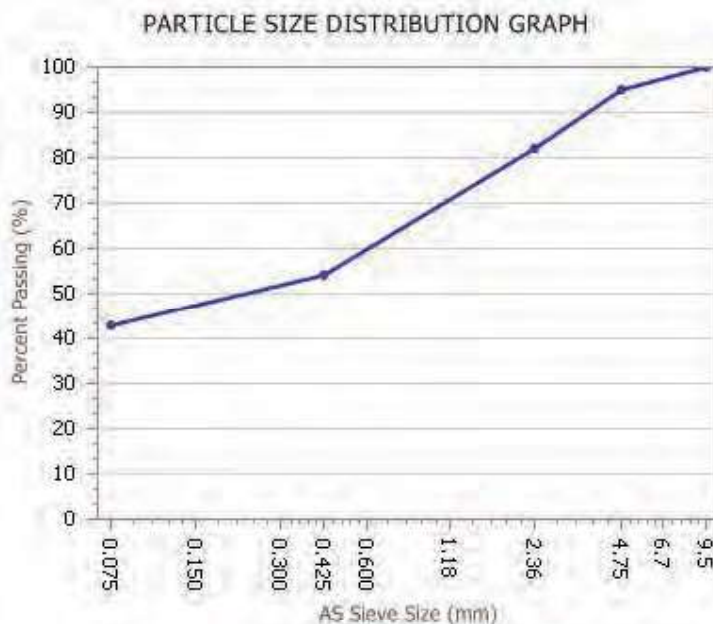
## **Laboratory Test Reports**

## QUALITY OF MATERIALS REPORT

Client:	CARDNO CONSTRUCTION SCIENCES - RTON	Report Number:	2128/R/34627-1
Client Address:	ROCKHAMPTON, 101 High Street, North Rockhampton	Project Number:	2135/P/415
Project:	General Testing - Engineering	Lot Number:	35
Location:	North Rockhampton	Internal Test Request:	2128/T/14216
Component:	BLUE DOLPHIN PTY LTD	Client Reference/s:	2128E/CC/150 - 2128E/P/531
Area Description:		Report Date / Page:	7/04/2017 Page 1 of 1



Test Procedures	AS1289.3.6.1, AS1289.3.1.2, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1		
Sample Number	2128/S/58539	Test Pit No:	TP1
Sampling Method	Tested As Received	Depth (m)	0.4-0.8
Date Sampled	5/04/2017		German Street
Sampled By	Client Sampled		North Rockhampton
Date Tested	6/04/2017	Material Source	Insitu
Att. Drying Method	Oven Dried	Material Type	Insitu
Atterberg Preparation	Dry Sieved	Material Description	-

AS Sieve (mm)	Specification Minimum	Percent Passing (%)	Specification Maximum
9.5		100	
4.75		95	
2.36		82	
0.425		54	
0.075		43	



Test Result	Specification Minimum	Result	Specification Maximum	Test Result	Specification Minimum	Result	Specification Maximum
Liquid Limit (%)		43		0.075/0.425 Fines Ratio		0.80	
Plastic Limit (%)		24		PI x 0.425 Ratio (%)		1035.5	
Plastic Index (%)		19		LS x 0.425 Ratio (%)		436.0	
Linear Shrinkage (%)		8.0		Linear Shrinkage Defects		-	

Remarks

	The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025		
	Accreditation Number:	1986	
	Corporate Site Number:	2128	
	Approved Signatory: Daniel Bryce		Form ID: W85Rep Rev 1

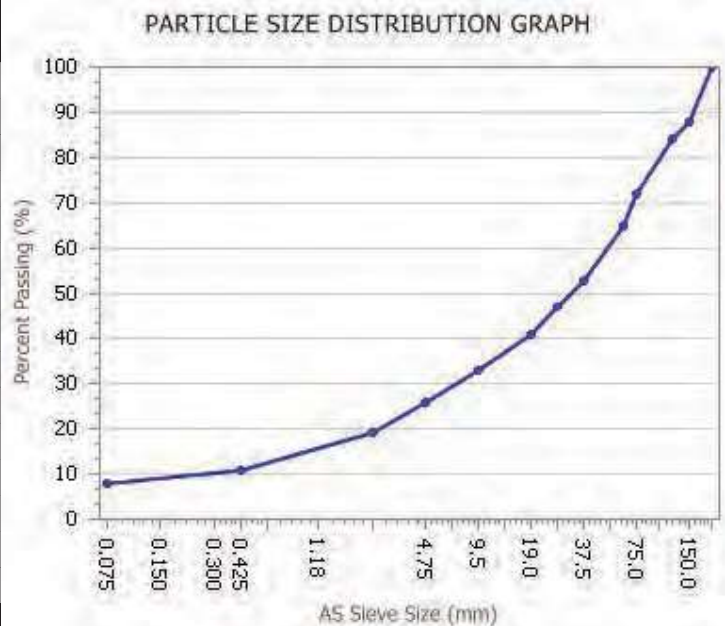


## QUALITY OF MATERIALS REPORT

Client:	CARDNO CONSTRUCTION SCIENCES - RTON	Report Number:	2128/R/34628-1
Client Address:	ROCKHAMPTON, 101 High Street, North Rockhampton	Project Number:	2135/P/415
Project:	General Testing - Engineering	Lot Number:	35
Location:	North Rockhampton	Internal Test Request:	2128/T/14216
Component:	BLUE DOLPHIN PTY LTD	Client Reference/s:	2128E/CC/150 - 2128E/P/531
Area Description:		Report Date / Page:	7/04/2017 Page 1 of 1



Test Procedures	AS1289.3.6.1, AS1289.3.1.2, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1		
Sample Number	2128/S/58540	Test Pit No:	TP4
Sampling Method	Tested As Received	Depth (m)	1.8-2.2
Date Sampled	5/04/2017		German Street
Sampled By	Client Sampled		North Rockhampton
Date Tested	7/04/2017	Material Source	Insitu
Att. Drying Method	Oven Dried	Material Type	Insitu
Atterberg Preparation	Dry Sieved	Material Description	-

AS Sieve (mm)	Specification Minimum	Percent Passing (%)	Specification Maximum
200.0		100	
150.0		88	
120.0		84	
75.0		72	
63.0		65	
37.5		53	
26.5		47	
19.0		41	
9.5		33	
4.75		26	
2.36		19	
0.425		11	
0.075		8	



Test Result	Specification Minimum	Result	Specification Maximum	Test Result	Specification Minimum	Result	Specification Maximum
Liquid Limit (%)		37		0.075/0.425 Fines Ratio		0.70	
Plastic Limit (%)		19		PI x 0.425 Ratio (%)		196.2	
Plastic Index (%)		18		LS x 0.425 Ratio (%)		76.3	
Linear Shrinkage (%)		7.0		Linear Shrinkage Defects		-	

Remarks

	The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025		
	Accreditation Number:	1986	
	Corporate Site Number:	2128	
Approved Signatory: Daniel Bryce Form ID: W85Rep Rev 1			



## REPORT - POINT LOAD STRENGTH INDEX

Client: CARDNO CONSTRUCTION SCIENCES - RTON  
 Address: 101 High Street, North Rockhampton QLD 4701  
 Project: General Testing - Engineering

Report No: 2128/R/14216-2  
 Project No: 2128/P/415  
 Request No: 2128/T/14216

Sampled By: Client  
 Tested By: DB

Method: As Received  
 Method: AS 4133.4.1

Date: 05-Apr-17  
 Date: 06-Apr-17

Laboratory Number	2128/S/58541	2128/S/58542				
Lot Number:	35	35				
Borehole/Location:	3	4				
Section Tested (m):	0.6 - 0.9	2.7				
Specimen Type:	Lump ~50mm	Lump ~50mm				
Manner of Testing:	Lump	Lump				
I <sub>s</sub> - Uncorrected Point Load Strength (MPa)	0.36	3.70				
I <sub>s(50)</sub> - Point Load Strength Index (MPa)	0.41	4.40				
Failure Mode:	Axial Splitting	Single Shear				
Storage History:	As Received	As Received				
Moisture Condition:	Dry/Moist	Dry/Moist				
Lithology	Rock	Rock				
Weakness Planes (if any)	Orientation	-	-			
	Nature	-	-			
Specimen Remarks:	-	-				
Lot Remarks:	CLIENT: BLUE DOLPHIN PTY LTD, PROJECT - German Street					



NATA Accredited Laboratory Number: 1986  
 NATA Corporate Site Number: 2128  
 This document is issued in accordance with  
 NATA accreditation requirements.  
 Accredited for compliance with ISO/IEC 17025



Name: Daniel Bryce  
 Function: Authorised Signatory  
 Date: 19-Apr-17

# **APPENDIX E**

## **Landslip Hazard Analysis**

# LANDSLIDE FREQUENCY ANALYSIS

Analysis No.: **1**

## NATURAL SHALLOW LANDSLIDES

Lot 35 on SP285391, German Street, Norman Gardens

### 1 Basic Frequency

-

### 6 Concentration of surface water

### 2 Slope Angle

Site		Level	Factor
	Less than 5° (8.75%)	L	0.1
	Between 5° and 15° (26.8%)	M	0.5
x	Between 15° and 30° (57.7%)	M	0.8
	Between 30° and 45° (100%)	H	1.2
	More than 45°	M	0.8

Site		Level	Factor
	Ridge	L	0.7
	Crest	M	0.8
	Upper slope	M	0.9
	Mid slope	H	1.2
x	Lower slope	H	1.5

### 3 Slope Shape

Site		Level	Factor
	Crest or ridge	L	0.7
x	Planar	M	0.9
	Convex	M	0.9
	Concave	H	1.5

### 7 Evidence of groundwater

Site		Level	Factor
x	None apparent	L	0.7
	Minor moistness	M	0.9
	Generally wet	H	1.5
	Surface springs	VH	3

### 8 Evidence of instability

Site		Level	Factor
x	No sign of instability	L	0.5
	Trees bent	H	1.5
	Minor irregularity	VH	2
	Major irregularity	VH	5
	Scarps	VH	10

### 4 Site geology

Site		Level	Factor
	Volcanic rock	H	1.1
x	Sedimentary rock	M	1
	Low grade metamorphic rock	M	1
	High grade metamorphic rock	L	0.9
	Granitic rock	M	1

### Summary

### 5 Material strength

Site		Level	Factor
	Rock at surface	VL	0.1
x	Residual soil < 1 m deep	L	0.5
	Residual soil 1-3 m deep	M	0.9
	Residual soil > 3 m deep	H	1.5
	Colluvial soil < 1 m deep	H	1.5
	Colluvial soil 1-3 m deep	VH	2
	Colluvial soil > 3 m deep	VH	4
	Fill (slope regrading)	VH	5

	Factor
2 Slope Angle	0.8
3 Slope Shape	0.9
4 Site geology	1
5 Material strength	0.5
6 Concentration of surface water	1.5
7 Evidence of groundwater	0.7
8 Evidence of instability	0.5

9	Relative Frequency (2x3x4x5x6x7x8)	0.19
---	------------------------------------	------

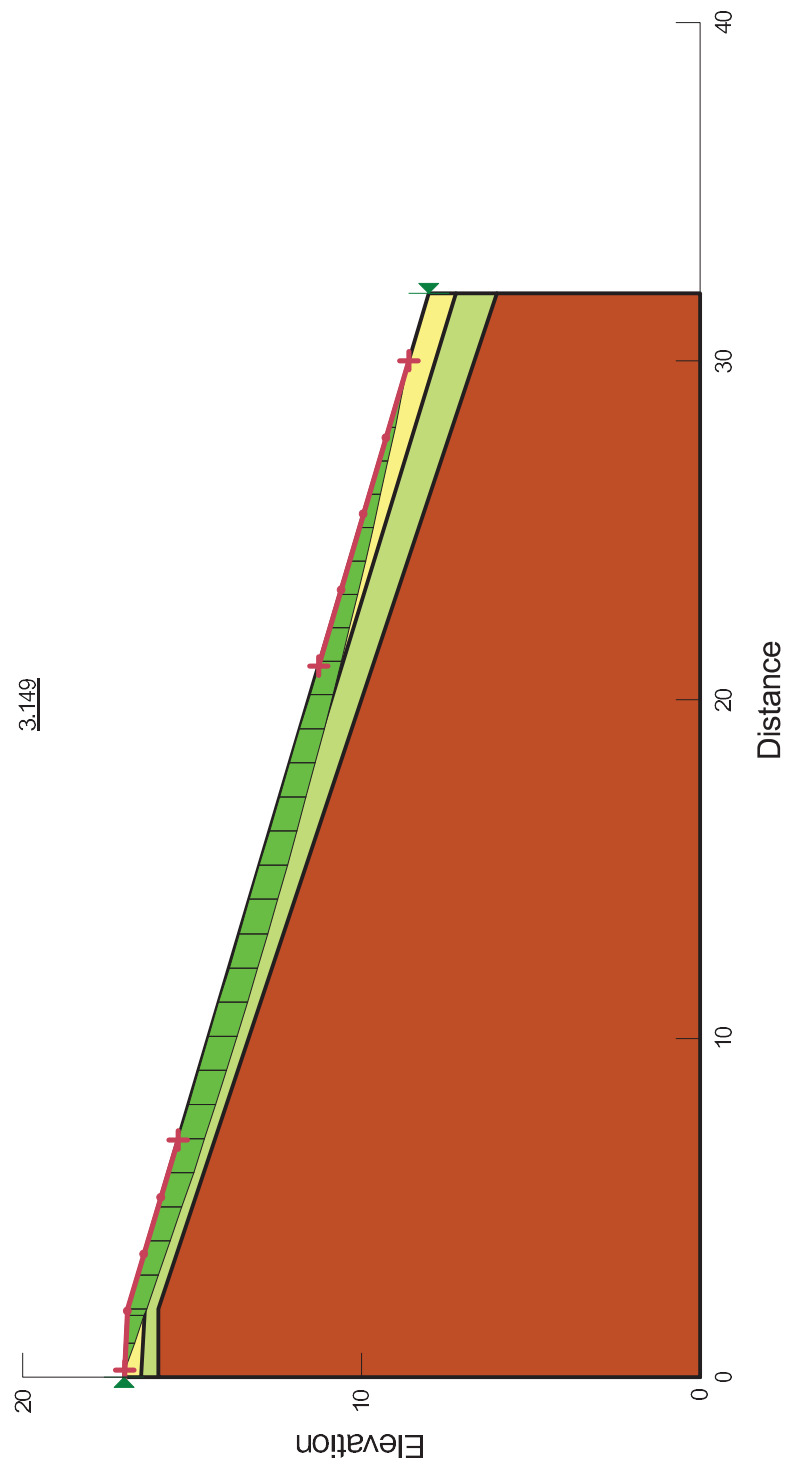
Site Frequency (1 x 9)

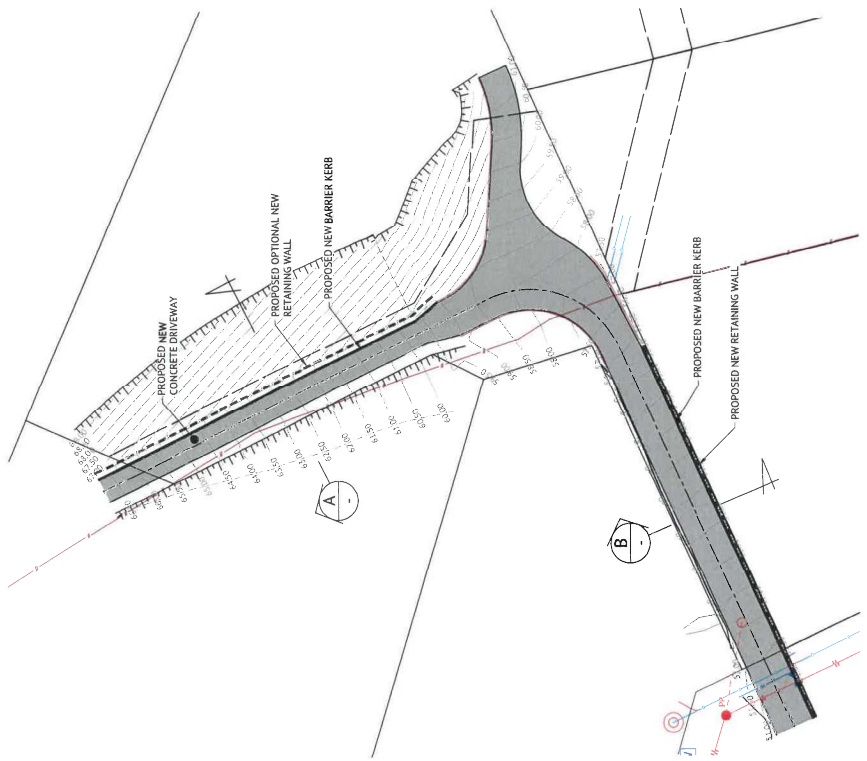
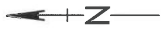
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# **APPENDIX F**

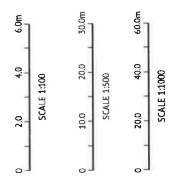
## **Slope Model Analysis**

Lot 35 on SP285391 German Street  
 Name: gravelly clayey sand (Colluvium)    Model: Mohr-Coulomb    Unit Weight: 17 kN/m<sup>3</sup>    Cohesion: 3 kPa    Phi: 28 °  
 Name: sandy clay (Residual)    Model: Mohr-Coulomb    Unit Weight: 16 kN/m<sup>3</sup>    Cohesion: 5 kPa    Phi: 24 °  
 Name: XW rock    Model: Mohr-Coulomb    Unit Weight: 19 kN/m<sup>3</sup>    Cohesion: 15 kPa    Phi: 35 °





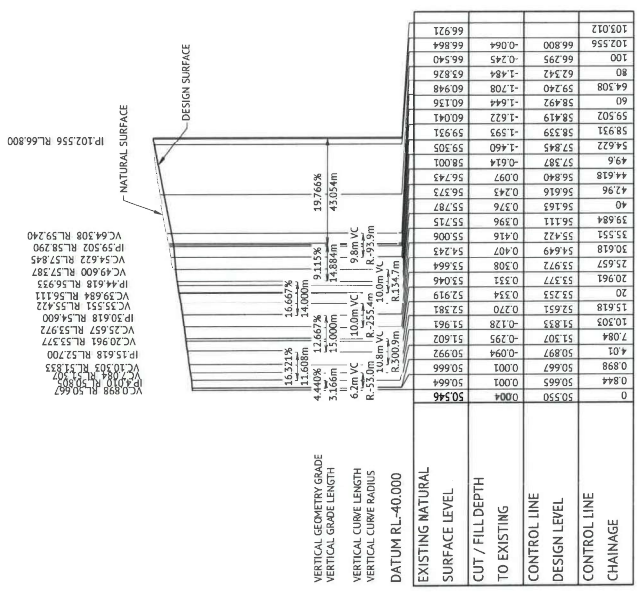
CONCEPT LAYOUT PLAN  
SCALE 1:500



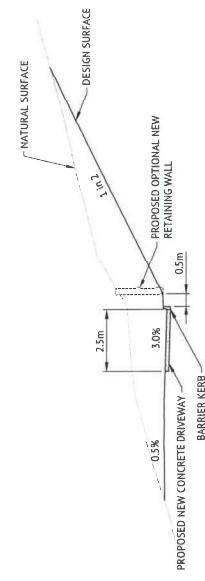
INFORMATION ONLY  
THE INFORMATION PRESENTED ON THIS PRELIMINARY PLAN IS FOR DISCUSSION PURPOSES ONLY AND IS SUBJECT TO FURTHER ENGINEERING REVIEW.

LEGEND:

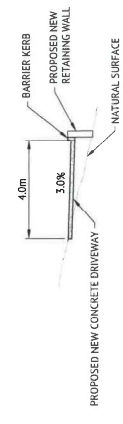
- PROPOSED NEW CONCRETE DRIVEWAY
- DESIGN SURFACE CONTOUR
- DESIGN TOP OF BATTER
- DESIGN BOTTOM OF BATTER
- EXISTING PROPERTY BOUNDARY
- EXISTING EASEMENT BOUNDARY
- EXISTING OVERHEAD ELECTRICAL
- EXISTING STORMWATER DRAINAGE
- EXISTING FENCE
- EXISTING WATERMAIN AND FITTINGS
- EXISTING TELSTRA PIT
- PROPOSED NEW KERB
- PROPOSED NEW RETAINING WALL
- OPTIONAL NEW RETAINING WALL
- PROPOSED NEW DRIVEWAY CENTRELINE



DRIVEWAY LONGITUDINAL SECTION  
SCALE 1:1000



TYPICAL SECTION A  
SCALE 1:100



TYPICAL SECTION B  
SCALE 1:100

**ROCKHAMPTON REGIONAL COUNCIL**  
**APPROVED PLANS**  
These plans are approved subject to the current conditions of approval associated with Development Permit No.: D/39-2017  
Dated: 30 October 2018

DESIGNED  
A. BAKER

CHECKED

PROJECT  
1 INTO 2 LOT SUBDIVISION

SCALE

PROJECT MANAGER

PROJECT DIRECTOR

PREPARED  
A. BAKER

DATE  
13/12/17

FOR INFORMATION ONLY

DATE  
13/12/17

FOR INFORMATION ONLY

DATE  
13/12/17

CLIENT  
BLUE DOLPHIN PTY LTD

PROJECT  
1 INTO 2 LOT SUBDIVISION

LOCATION  
GERMAN STREET, NORMAN GARDENS

SHEET NUMBER  
SKC006

REV  
1

PROJECT  
1 INTO 2 LOT SUBDIVISION

SCALE

PROJECT MANAGER

PROJECT DIRECTOR

PREPARED  
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PROJECT DIRECTOR

PREPARED  
A. BAKER

DATE  
13/12/17

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DATE  
13/12/17

FOR INFORMATION ONLY

DATE  
13/12/17

27 September 2023

Dale Webb  
Rufus Design Group  
PO Box 5134 Red Hill  
Rockhampton 4701**Reference: Amendments to Bushfire Management Plan over Lot 35SP285391**

The following amendments are in relation to *Bushfire Hazard Assessment & Management Plan. Dwelling on 35SP285391 229 German Street, Norman Gardens, 4701*. Denley Environmental, Bungundarra Queensland. Published 05/04/2021 (Denley, 2021).

The amendments are made to reflect changes in the design and location of the dwelling referenced in Denley (2021). The changes result in the relocation of the dwelling to within 50 metres of German Street, Norman Gardens and consequently emergency vehicle access requirements. Rufus Design Group Drawings indicating the changes are appended.

**Amendments**

- 1) Remove requirement for a turning circle indicated in Section 10, point 7 (Denley, 2021).
  - a) The dwelling indicated in figure 2 of Section 3, and Figure 8 of Section 9 in Denley (2021) has been relocated so that the dwelling will be no greater than 50 metres from the German Street entry point. Consequently, the turning circle required in Point 7 of Section 10 of Denley (2021) is no longer required.
- 2) Clarification on water supply for firefighting purposes (Section 11, Denley, 2021)
  - a) Section 11 of Denley (2021) indicates on-site water supply is required: **"Where a reticulated water supply is not available..."** I understand the lot has a reticulated water supply. As such there is no requirement for a dedicated on-site water storage.

**Note:** The Rockhampton Planning Scheme Bushfire Overlay Code, Table 8.2.4.3.1, PO2, AO2.1.2 indicates:

Where a reticulated water supply is not available or the development is not within eighty (80) metres of a hydrant, a water tank is provided within ten (10) metres of the building or structure...

My interpretation of AO2.1.2 is that on-site water storage is not required if the development has a reticulated water supply. I have no objection to that meaning, which is commonly specified in other QLD local government planning schemes.



Yours sincerely



Ian Denley

[DENLEY ENVIRONMENTAL](#)

Attachments: Rufus Design Group Drawings 230602 -02 to 06

**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current conditions of approval associated with

**Development Permit No.:** D/74-2021

**Dated:** 21 December 2021

# Assessment of Impacts to MES

Proposed Dwelling on Lot 35 on SP285391. 229 German Street,  
Norman Gardens, 4701

## Publication Details

**Title:** Assessment of Impacts to MES. Proposed Dwelling on Lot 35 on SP285391. 229 German Street, Norman Gardens, 4701

**Date of Publication:** 17/05/2021

**Authors:** Ian Denley.

**File Name:** 40942 assessment of impacts 35sp285391 hickey.docx

**Project Number:** 40942



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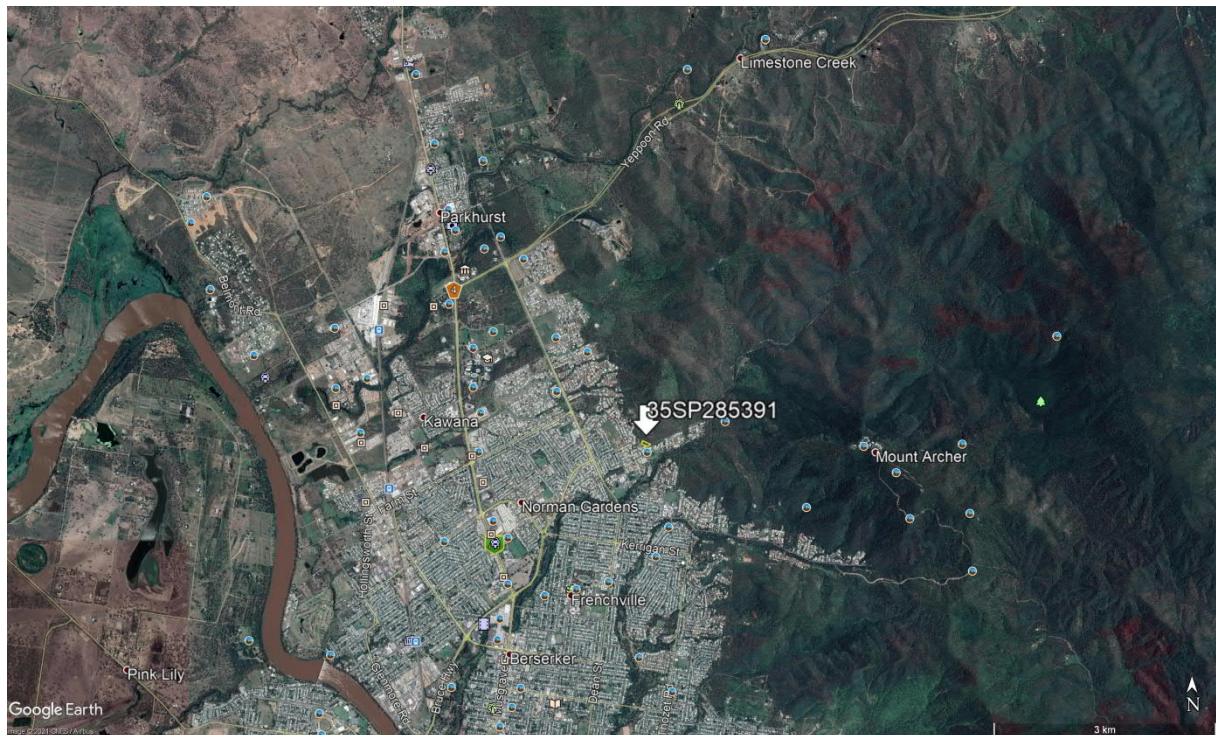
Version	Author	Recipient	Distribution type	Date
V1	Ian Denley	Brendan Standen, Reel Planning	Electronic	17/05/2021

## Table of Contents

1	Introduction.....	3
1.1	Proposed Development & Associated Impacts .....	3
2	Matters of Environmental Significance .....	4
2.1	MLES .....	4
2.2	MSES .....	4
2.2.1	Regional Ecosystems.....	4
2.2.2	Threatened Plants.....	5
2.2.3	Essential Habitat .....	5
2.3	Likelihood Analysis .....	5
2.3.1	Threatened Plants .....	6
2.3.2	Denisonia maculata.....	6
3	Conclusions & Recommendations.....	6
4	Bibliography.....	8
	Appendix.....	9

# 1 Introduction

This assessment of potential environmental impacts to Matters of Environmental Significance is in relation to a proposed dwelling, ancillary buildings, driveway and consequential landscape modification on Lot 35 on SP285391. The subject lot is located 229 German Street, Norman Gardens, 4701. See **Figure 1** for the location of Lot 35.

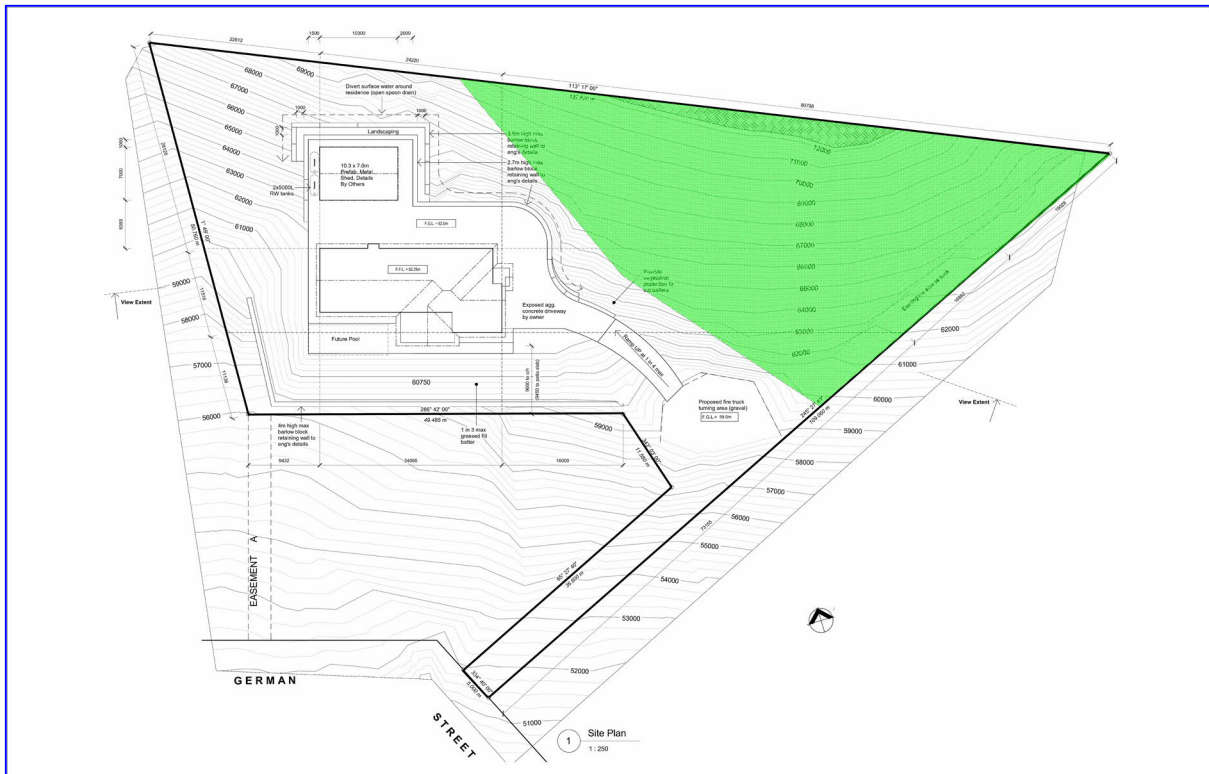


**Figure 1.** Lot 35 is located on the eastern extent of the Rockhampton urban area.

## 1.1 *Proposed Development & Associated Impacts*

The lot is approximately 4,645 m<sup>2</sup>. **Figure 2** shows the proposed layout and earthworks. The shaded green area in **Figure 2** represents the potential retention of 1,800m<sup>2</sup> of site vegetation. However, this area does not include any existing tracks and potential clearing along boundary lines for fire management lines.



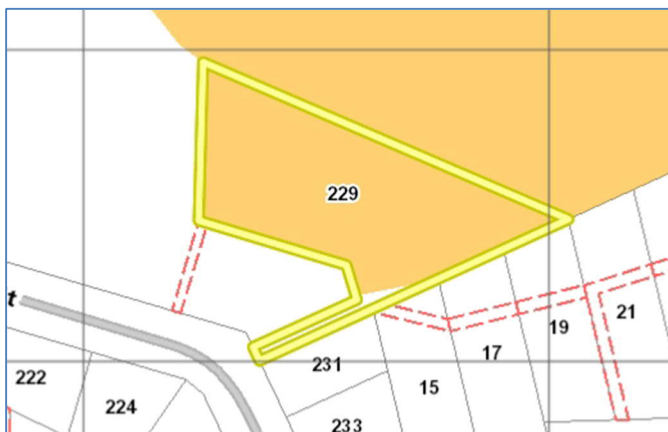


**Figure 2. The proposed location of the dwelling on the subject lot with potential areas of vegetation retention shaded green (Modified from Rufus Design Group Site Plan Drawing 201005).**

## 2 Matters of Environmental Significance

### 2.1 MLES

A large proportion of the site is identified in the RRC Planning Scheme as an *Environmental management and conservation zone* and as *MLES – High*. See Figure 3 for an extract of the RRC mapping and the Appendix for the full map.



**Figure 3. Extent of MLES – High over Lot 35.**

### 2.2 MSES

#### 2.2.1 Regional Ecosystems

The regional ecosystems mapping shows the lot as largely vegetated (**Appended**) and mapped as a mixed polygon containing Regional Ecosystems (RE) 11.12.6/11.12.4/11.12.3 in a ratio of 55/25/20. Short descriptions of these RE's are provided in **Table 1**.

**Table 1. Regional Ecosystems mapped in the Vegetation Management Supporting map as potentially occurring in the area. Short descriptions are taken from the Regional Ecosystems Descriptions Database.**

RE	Short Description	VMA Status
11.12.6	<i>Corymbia citriodora</i> open forest on igneous rocks (granite)	Least concern
11.12.4	Semi-evergreen vine thicket and microphyll vine forest on igneous rocks	Least concern
11.12.3	<i>Eucalyptus crebra</i> , <i>E. tereticornis</i> , <i>Angophora leiocarpa</i> woodland on igneous rocks especially granite	Least concern

### 2.2.2 Threatened Plants

The site is within a 'High Risk Area' on a Protected Plants Flora Survey Trigger Map (**Appended**). A 2km buffered search around the subject lot in Wildlife Online returned *Cycas ophiolitica* (Marlborough blue) and *Callicarpa thozetii*.

### 2.2.3 Essential Habitat

The site is within an area of Essential Habitat within the relevant Vegetation Management Supporting Map (**Appended**). The species indicated are *Denisonia maculata* (ornamental snake) and *Cycas ophiolitica*.

## 2.3 Likelihood Analysis

The vegetation on and adjacent to the subject lot is *Eucalyptus crebra* grassy woodland (RE 11.12.3). Regional Ecosystems 11.12.4 and 11.12.6 were not present on or near the site. Canopy trees are generally small, indicating the site may have been cleared in the past.



**Figure 4. Looking towards the subject lot from German Street. There is a large fig in the foreground with *E. crebra* woodland behind.**

Fauna habitat consists of relatively small diameter trees, some shrubby areas (largely lantana) suitably for small birds and mammals and otherwise a grassy open understorey. A



specific survey for fauna presence was not carried out. Trees were not of sufficient age or size to have developed large hollows. However, there may be small hollows in some trees.



**Figure 5. Typical *E. crebra* woodland structure on the site.**

### *2.3.1 Threatened Plants*

A protected plant flora survey was conducted to address the requirements of the Nature Conservation Act 1994 *Cycas ophiolitica* and *Callicarpa thozetii*. Neither plant was located on the site or within 100 metres of the site.

### *2.3.2 Denisonia maculata*

*Denisonia maculata* is highly unlikely to be present. The site habitat is not suitable. The species is known to prefer woodlands and open forests associated with moist areas, particularly gilgai mounds and depressions in Queensland Regional Ecosystem Land Zone 4 and also lake margins and wetlands. Preferred habitat is within, or close to, habitat that is favoured by frogs (DAWE, 2021).

## **3 Conclusions & Recommendations**

While the State Environmental mapping indicates there may be Matters of State Environmental Significance within the lot, a survey of the lot and surrounding areas indicates this was not the case. The Environmental Significance mapping in this case is an effect of buffering known records of threatened species by one to two kilometres. The trigger maps imply that investigations should be undertaken to ensure impacts to MLES are avoided or otherwise mitigated where they are present. Investigations were conducted on and around the site. While the natural ecosystems present on the site provide important contributions to general ecosystem functioning, there were no other significant matters identified (threatened fauna, flora, ecosystems etc.).

The subject lot is located in an area identified by Council as having high value MLES and as an Environmental management and conservation zone. However, the relatively small area of the lot (4,645 m<sup>2</sup>) limits the potential to conserve a significant area for conservation purposes while allowing for a dwelling and associated infrastructure.

It may be possible to retain a portion of the woodland in the eastern section of the lot. This area is also adjacent to the larger area of natural habitat to the north and east of the subject lot. As such, retention of native vegetation on the lot adjoining larger natural areas will provide an ecological buffer to a limited extent. However, consideration needs to be given to the existing fire trail in this section and essential management right to clear up to 10 metres along the boundary for bushfire protection (if the owners choose to do so).

As such mitigation of impacts to Biodiversity should have regard to Table 8.2.3.3.1 of the Rockhampton Regional Council Biodiversity Code where those provisions relate to the minimisation of potential impacts to fauna, retention of native vegetation and landscaping with local native plants.

## 4 Bibliography

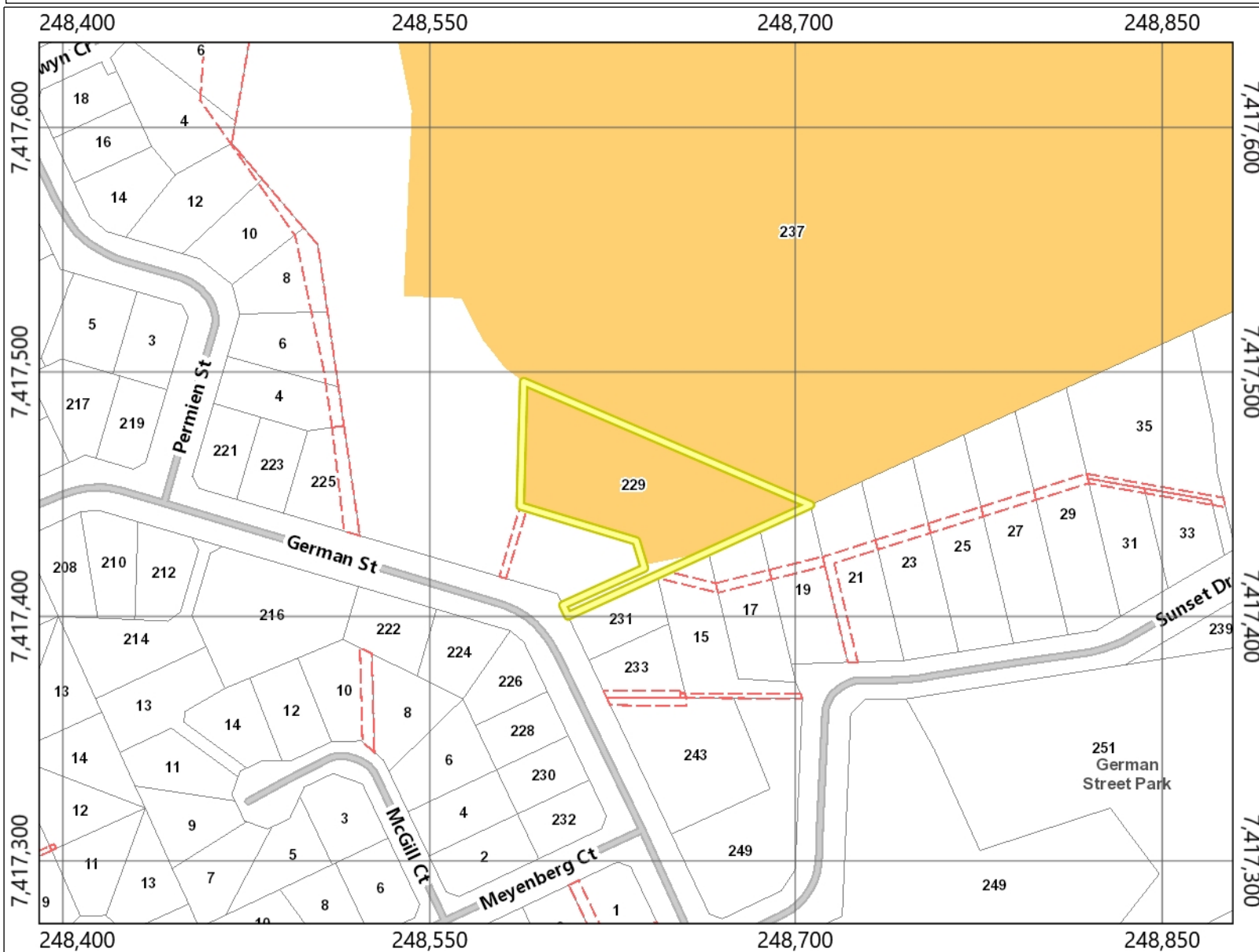
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# Appendix



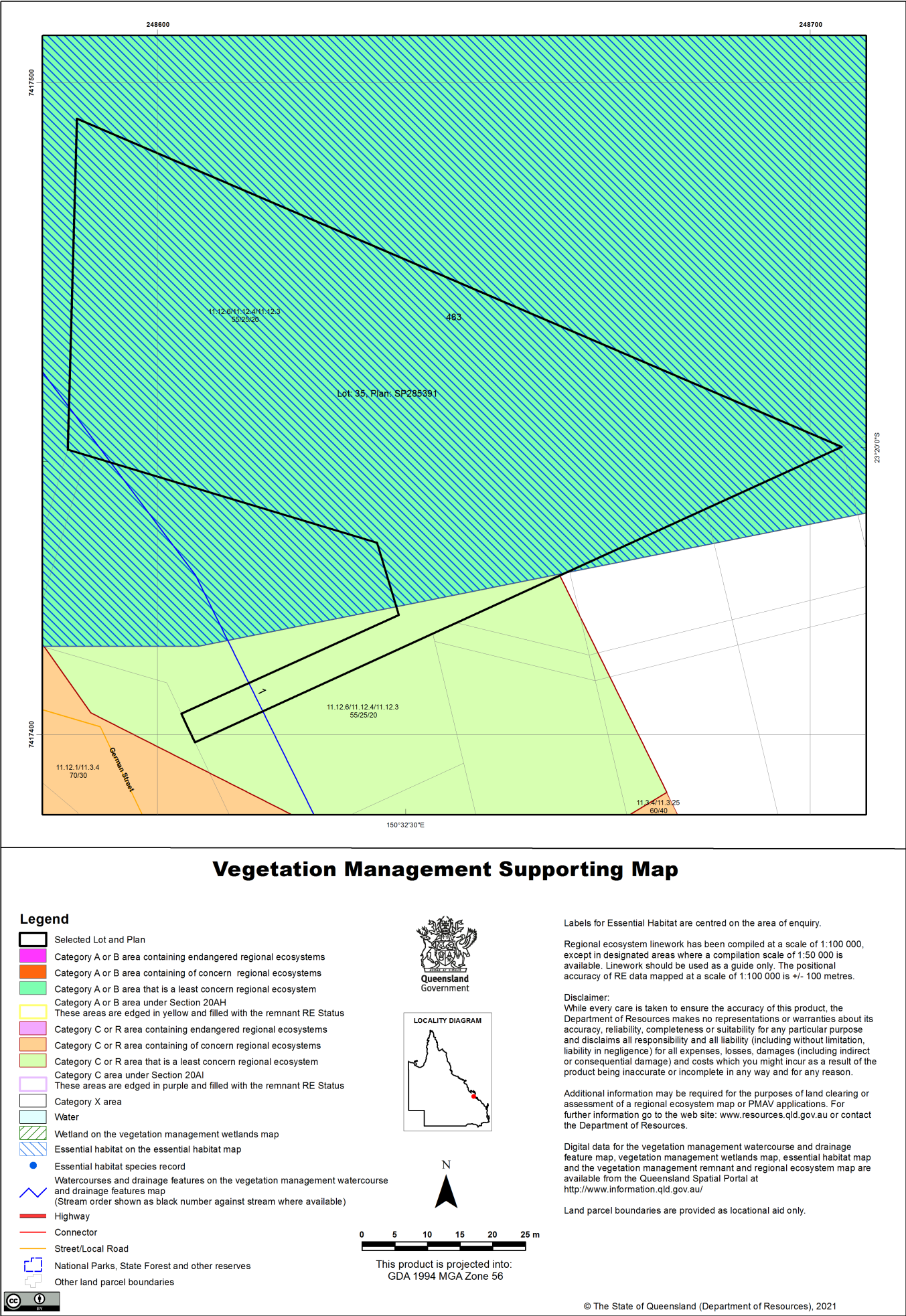
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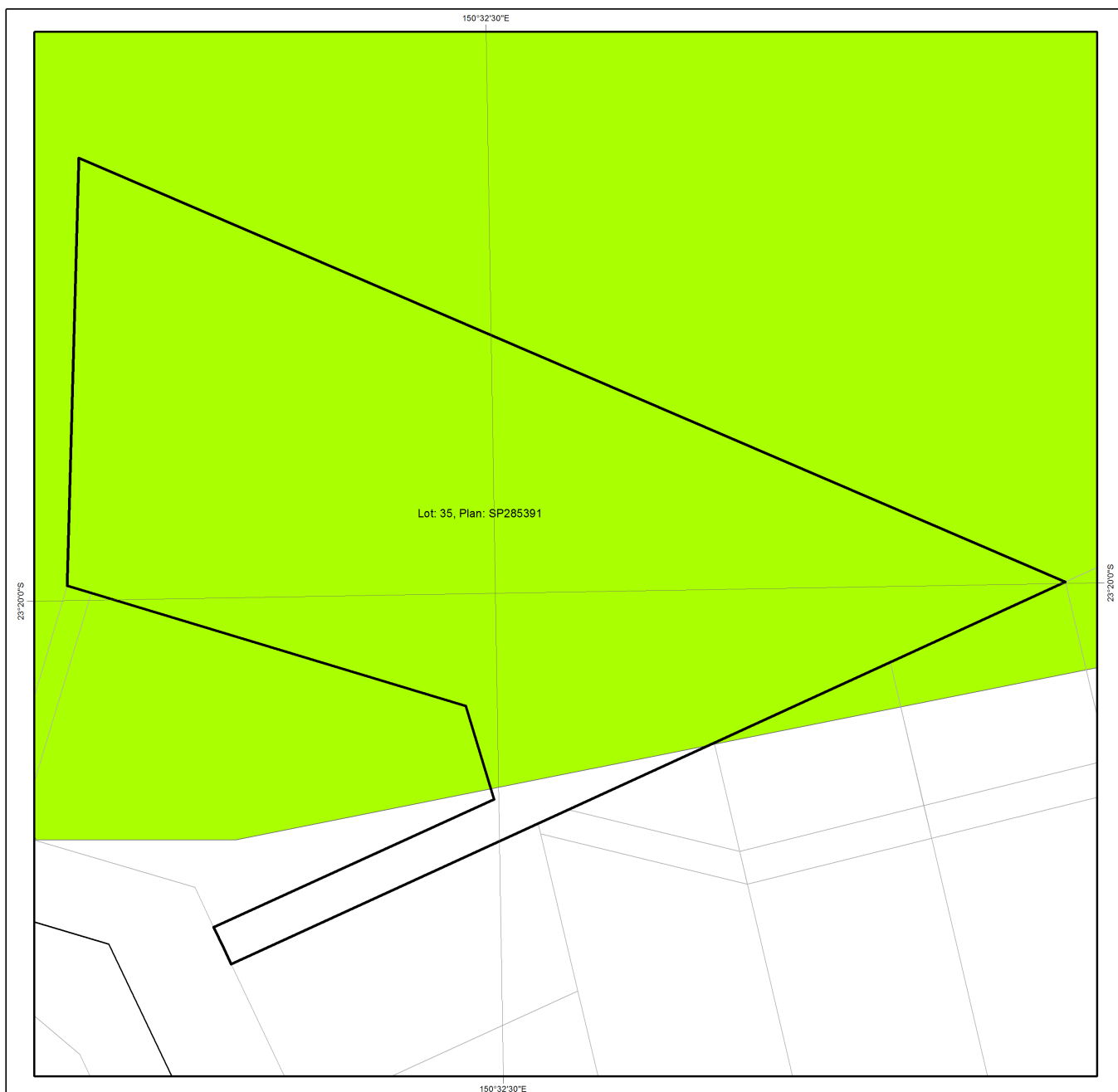
- RRC Mask
- RRC Mask
- MLES - High
- MSES Wetlands
- Roads1
  - Main roads
  - Major council roads
  - Standard council roads
  - Access roads
  - Private roads
- Easements
- Property Parcels
- Ocean
- Rivers
- DCDB Parks
- CQ LGA Boundaries










## 4.2 Vegetation management supporting map

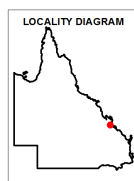




## Protected Plants Flora Survey Trigger Map

### Legend

-  Selected Lot and Plan
-  High risk area
-  Other land parcel boundaries.
-  Freeways / motorways / highways
-  Secondary roads / streets



0 4.5 9 13.5 18 22.5 m

This product is projected into:  
GDA 1994 MGA Zone 56

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

Land parcel boundaries are provided as locational aid only.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at [palm@des.qld.gov.au](mailto:palm@des.qld.gov.au)

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**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current conditions of approval associated with

**Development Permit No.: D/74-2021**

**Dated: 21 December 2021**

# **Bushfire Hazard Assessment & Management Plan**

**Dwelling on 35SP285391**

**229 German Street, Norman Gardens, 4701**

## Publication Details

**Title:** Bushfire Hazard Assessment & Management Plan. Dwelling on 35SP285391 229 German Street, Norman Gardens, 4701

**Date of Publication:** 5/04/2021

**Authors:** Ian Denley.

**File Name:** 40942 BMP\_V1.docx

**Project Number:** 40942

**Contract Number:** 40942



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Version	Author	Recipients	Distribution type
1	Ian Denley	Brendan Standen	Electronic

## Property Information

Subject Lot	35SP285391
Owners	Mark and Patricia Hickey
Street Address	229 German Street, Norman Gardens, 4701

## Acronyms and Abbreviations

AS 3959: Australian Standard 3959: 2018 Building in Bushfire Prone Areas and amendments.

BAL: Bushfire Attack Level indicated in AS3959 for site specific factors.

BHA: Bushfire Hazard Assessment

BMP: Bushfire Management Plan

QFES: Queensland Fire and Emergency Services

QRFS: Queensland Rural Fire Service

RRC: Rockhampton Regional Council

SPP: *State Planning Policy*. July 2017

SPP Guideline: *Natural hazards, risk and resilience - Bushfire. State Planning Policy – state interest guidance material*. December 2019

NCA 1992: *Nature Conservation Act* 1992

VMA 1999: *Vegetation Management Act* 1999

## Table of Contents

Bushfire Hazard Assessment .....	1
1 Introduction .....	1
2 Site Location .....	1
3 Dwelling Location.....	2
4 Broader Landscape .....	2
4.1 Site Vegetation.....	3
4.2 Slope .....	5
4.3 Surface Fuel Hazard Rating.....	5
5 BAL Results.....	7
Bushfire Management Plan .....	8
6 Purpose .....	8
6.1 Bushfire Survival Plan.....	8
6.2 Ongoing Risk Management .....	8
6.3 Responsible Agencies.....	8
7 Site Description .....	8
8 Expected Fire Behavior .....	9
9 Construction Standards and Asset Protection Zones.....	9
10 Driveways & Tracks.....	10
10.1 Alternative Access & Egress Routes .....	11
11 Water supply for firefighting purposes .....	11
12 Landscaping .....	12
13 Purchaser/Resident Education and Awareness Programs .....	13
14 References & Bibliography.....	15
15 Appendix .....	16

## List of Figures

Figure 1. The subject lot is located in Norman Gardens on the boundary of the Rockhampton residential area and the Berserker wilderness area. ....	1
Figure 2. The proposed location of the dwelling on the subject lot (Modified from Rufus Design Group Site Plan Drawing 201005). ....	2
Figure 3. Location of vegetation types in relation to the proposed dwelling site on 12.95.....	3
Figure 4. A narrow area of grasslands greater than 30cm in height located downslope from the dwelling. ....	3
Figure 5. Grassy to shrubby woodland upslope from the proposed dwelling location. Surface fuels were variable between sparse grasses and scattered patches of dense grasses and shrubs (largely lantana).....	4
Figure 6. One metre contours over 35SP285391. The driveway is indicated by the grey line. ...	5
Figure 7. A diagram of various layers of vegetation hazard used in the BAL calculation for surface fuels (taken from Hines et. al., 2010). ....	6
Figure 8. APZ distance ranges at each surface of the proposed dwelling to comply with AS3959: 2018 BAL-19.....	10
Figure 9. Example turnaround areas (Taken from Building Fire Safety Management Tool & Advisory Notes, State of Queensland (Queensland Fire and Emergency Services) 2015). ....	11



# Bushfire Hazard Assessment

## 1 Introduction

The purpose of the Bushfire Hazard Assessment is to determine the level of bushfire hazard with reference to:

- a) The Rockhampton Regional Council 8.2.4 Bushfire hazard overlay code;
- b) SPP Guideline: Natural hazards, risk and resilience - Bushfire. State Planning Policy – state interest guidance material. December 2019;
- c) The Australian Standard AS3959: 2018 Construction of buildings in bushfire-prone areas (AS3959); and
- d) Site specific factors that may influence standardised assessment methods.
- e) The AS3959 Method 2 is used to calculate appropriate Bushfire Attack Levels where an assessable vegetation hazard is within 100 metres of a subject dwelling. Subject buildings at or greater than 100 metres from the identified hazard are exempt.

The subject of this Bushfire Hazard Assessment and Management Plan is a proposed dwelling on 35SP285391 located at 229 German Street, Norman Gardens, 4701.

A plan of the dwelling location and surrounding roads, trails and access is provided in the **Appendix**.

## 2 Site Location

This BAL assessment relates to the existing dwelling and any buildings closer than 6 metres from the proposed dwelling situated on 35SP285391 located at 229 German Street, Norman Gardens, 4701. See

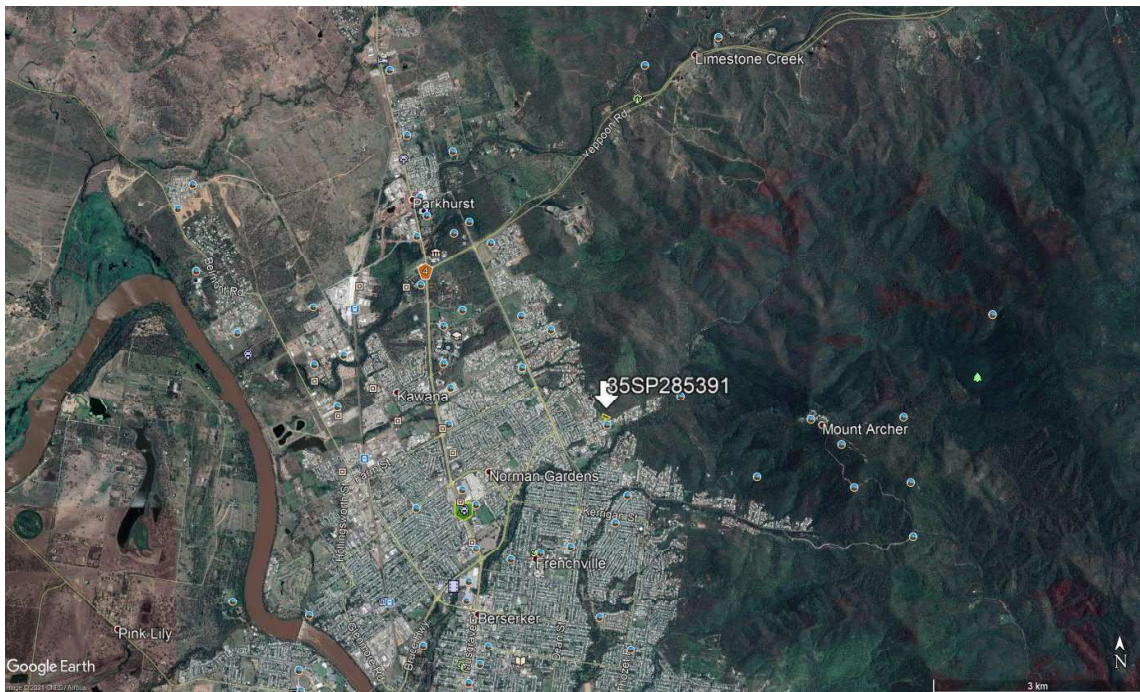


Figure 1 for the site location.

Figure 1. The subject lot is located in Norman Gardens on the boundary of the Rockhampton residential area and the Berserker wilderness area.

### 3 Dwelling Location

The location of the proposed dwelling is provided in **Appendix** and an extract is provided in **Figure 2**.

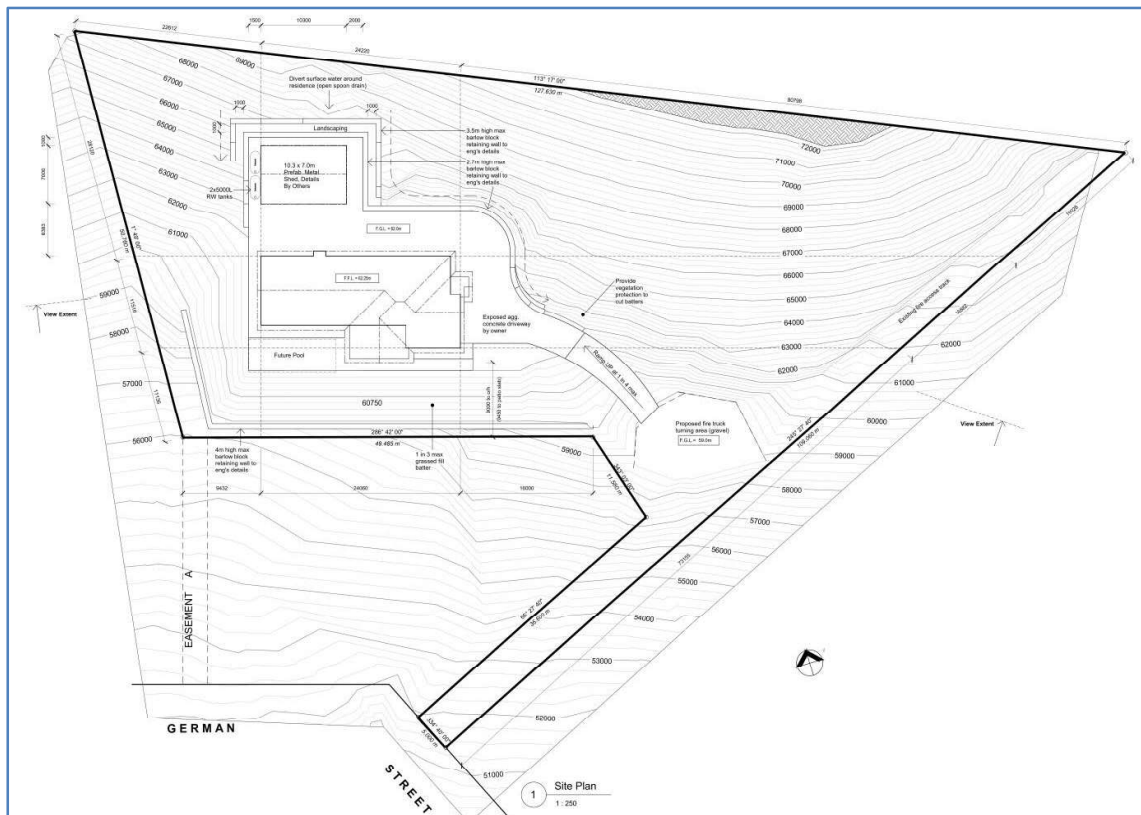


Figure 2. The proposed location of the dwelling on the subject lot (Modified from Rufus Design Group Site Plan Drawing 201005).

### 4 Broader Landscape

The subject lot is located on the junction of medium density residential areas and the Berserker Wilderness area. The lot is bounded by German Street and a row of residences facing Sunset Drive to the south, a cleared grassy area of approximately 70 metres before residential areas to the west and ironbark woodland located uphill to the north. Surrounding residential areas provide significant bushfire mitigation. The greatest threats to the site are ember attack and bushfires running largely downhill from the northeast, north to northwest.

Vegetation communities in the near area consist of ironbark woodlands with patches of semi-evergreen vine thicket in gullies and the Moore's Creek riparian area with a mixture of low flammability rainforest species and more fire prone sclerophyll species. See **Figure 3** for the location of vegetation types in relation to the dwelling site.



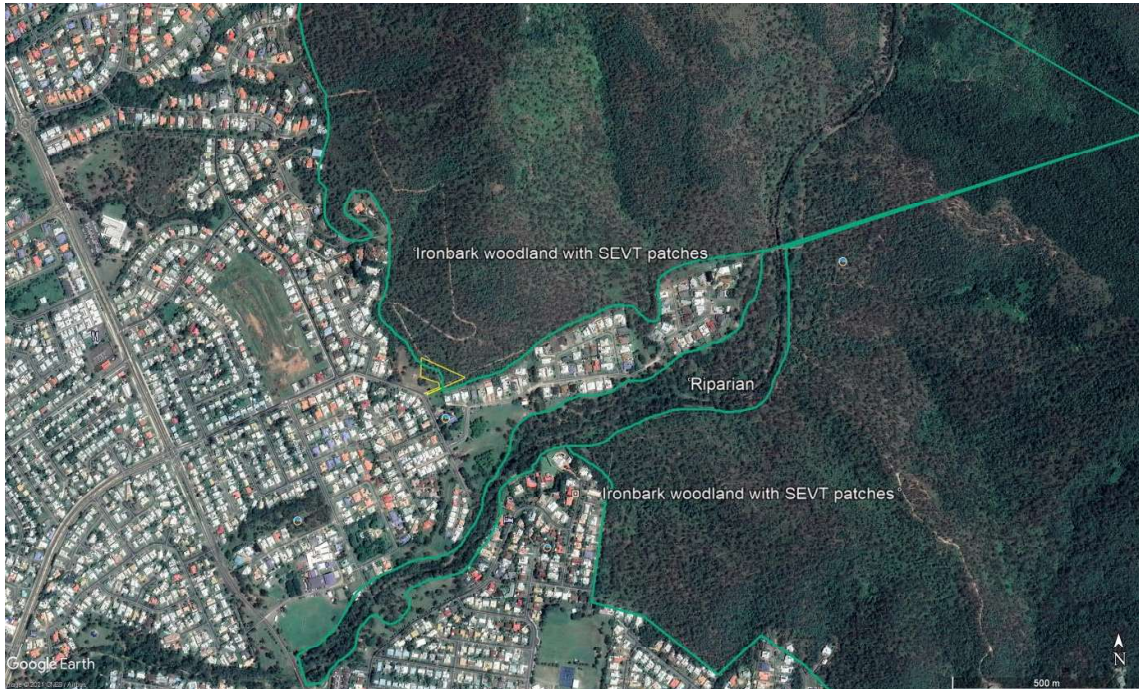


Figure 3. Location of vegetation types in relation to the proposed dwelling site on 12.95.

#### 4.1 Site Vegetation

There were two vegetation types presenting a bushfire hazard. These were; A narrow area of grasslands greater than 30cm in height located downslope from the dwelling (**Figure 4**); and; Grassy to shrubby ironbark woodlands at northwest, north and northeast aspects. The location of these vegetation types are indicated in Figure



Figure 4. A narrow area of grasslands greater than 30cm in height located downslope from the dwelling.





**Figure 5. Grassy to shrubby woodland upslope from the proposed dwelling location. Surface fuels were variable between sparse grasses and scattered patches of dense grasses and shrubs (largely lantana).**



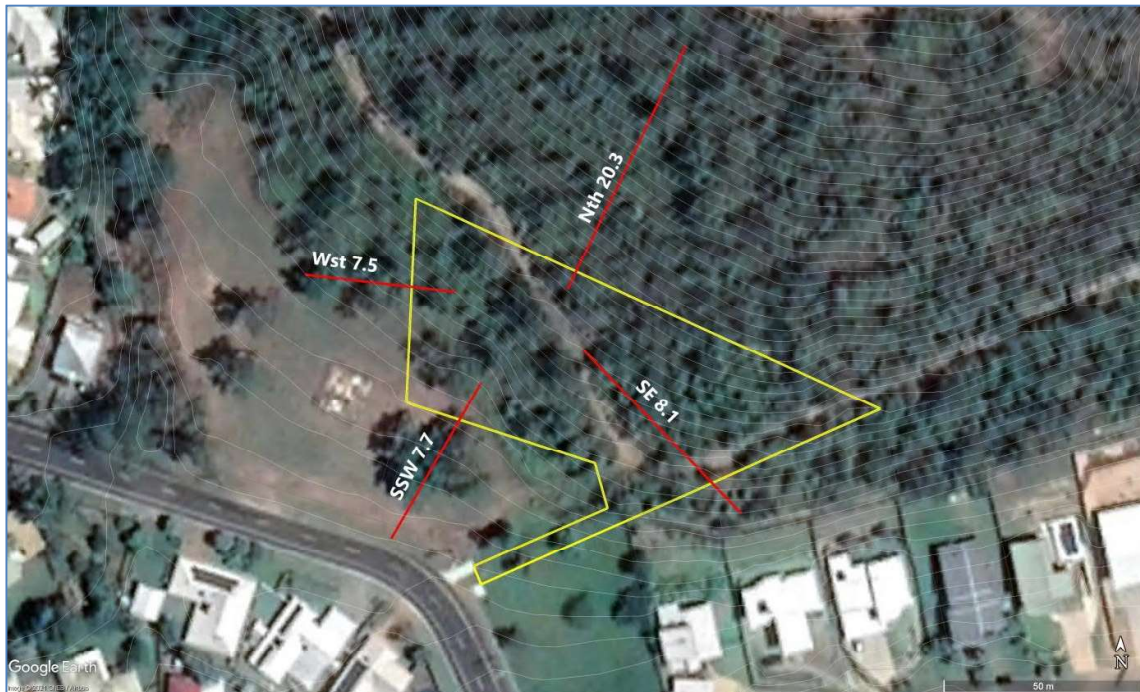
## 4.2 Slope

Degree of slope was determined using transects over one metre contours (QLD Data). Transects were located to reflect the orientation of slopes in relation to the proposed dwelling location. Contours and slope transects are shown in **Figure 6**.

**Table 1. Degree of slope in relation to the dwelling at various aspects**

Aspect	Degree of slope
N	20.3*
SE	8.1
SSW	7.7
W	7.5

\* upslope therefore effectively 0 degrees



**Figure 6. One metre contours over 35SP285391. The driveway is indicated by the grey line.**

## 4.3 Surface Fuel Hazard Rating

**Figure 7** provides a classification of vegetation layers as levels of potential fuel. Hazard ratings are given with respect to Hines *et. al.* (2010). Hines *et. al.* provides an assessment of fuel hazard on a 5 step scale from low, moderate, high, very high to extreme. These hazard ratings with respect to a vegetation layer provides an estimate of tons/ha of fuel load for that layer.

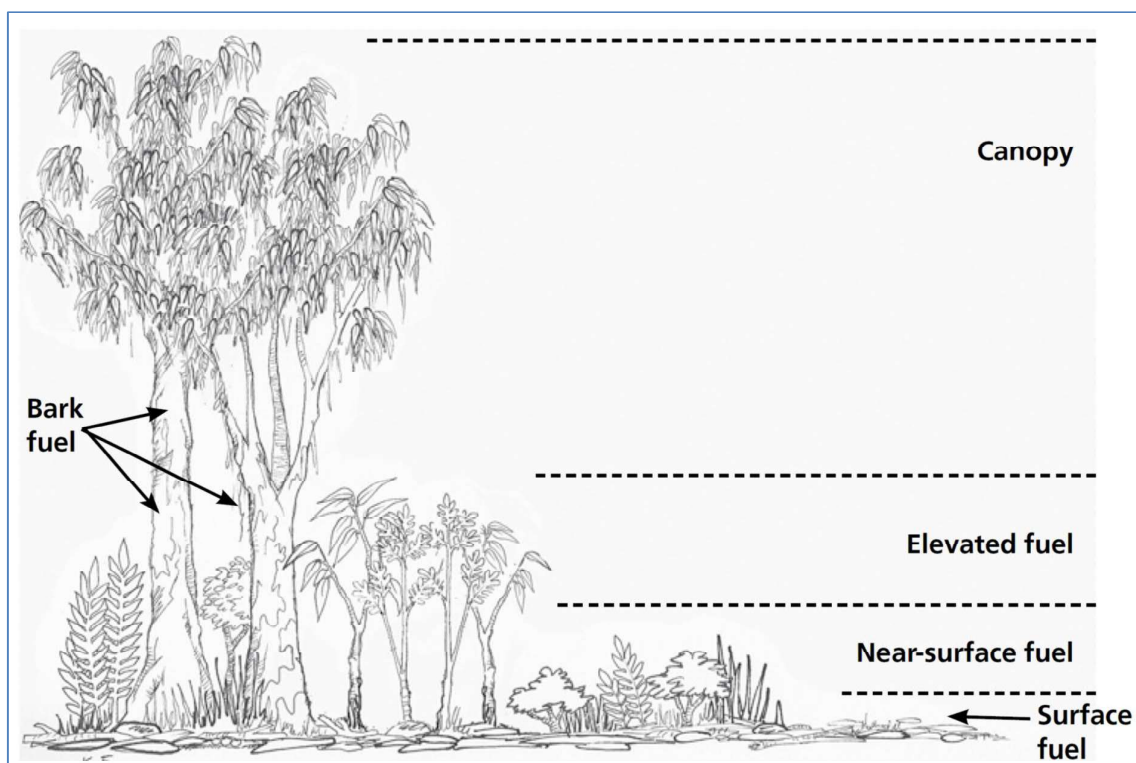


Figure 7. A diagram of various layers of vegetation hazard used in the BAL calculation for surface fuels (taken from Hines et. al., 2010).

### 1.1 Surface fuel load

Surface fuel loads are patchy over the surrounding area. Loads are generally low with patches of denser grasses and shrubs. The median value of indicative fuel loads (t/ha) for each layer of elevated fuel (Hines et. al. 2010) is provided in **Table 2**.

**Table 2. Results of estimated tons per hectare of the surface fuel loads at the site.**

Surface layer	Hazard Rating	Range (t/h)	Average value (t/h)
Bark	Moderate	1	1
Elevated fine fuel	Low to Moderate	1-2	1.5
Near-surface fine fuel	Moderate to High	2-4	3
Surface fuel	Low to Moderate	2-10	6
<b>Total (t/ha)</b>		6-16	11.5

### 4.4 Evidence of Fire

There was no evidence of recent fires at the time of the survey. However, Queensland Parks & Wildlife conduct regular fuel reduction burns in the adjacent area.

### 4.5 Site Selection

The proposed dwelling is located to ensure the APZ is contained within the subject allotment. There is otherwise insufficient area to allow for repositioning of the proposed infrastructure to lessen potential impacts to biodiversity values. Some iron bark woodland will be retained in the eastern portion of the subject lot.

#### 4.6 Environmental Considerations

The site is indicated as a 'High Risk Area on a Protected Plant Flora Survey Trigger Map'. The threatened species indicated are *Cycas ophiolitica* and *Callicarpa thozetii*. A protected plant flora survey was undertaken by Denley Environmental and neither species was located within the subject allotment or for a further 100 metres around the subject allotment.

## 5 BAL Results

BAL Calculations have been provided using Method 2 (AS3959). Surface and overall fuel loads for woodland aspects are site assessed values of 11.5 t/h for surface fuel loads and 14 t/ha overall fuel load. These values are commensurate with the QFES *SPP Bushfire Asset Protection Zone Width Zone Calculator* for *Temperate eucalypt woodlands* of 12 and 13.8 t/ha for surface and overall fuel loads (QFES, 2020). Grassland fuel loads are generic values provided in the BAL Method 2 Calculation.

A summary of results is provided in **Table 3**. See the **Appendix** for the complete AS3959: 2018 BAL Method 2 Minimum Distance results.

**Table 3. Minimum APZ ranges in metres for each aspect to comply with BAL-19. The distances are between the woodland hazard and the nearest facing surface of the dwelling.**

Aspect	Effective slope	Vegetation	APZ range (m) for BAL-19	Notes
N	0	Site woodland	9.1 to < 13.5	Retaining wall provides some shielding to radiant heat. Embers likely to circulate in enclosed areas
SE	8.1	Site woodland	13.5 to < 19.8	Retaining wall provides some shielding to radiant heat. Embers likely to circulate in enclosed areas
SSW	7.7	Grassland	9.3 to < 13.9	BAL 12.5 where grasses are managed to < 30cm tall.
W	7.5	Site woodland	8.8 to < 13.3	

# Bushfire Management Plan

## 6 Purpose

The purpose of this Bushfire Management Plan is to reduce risks from bushfire hazard to a tolerable level of risk.

The aim of the Bushfire Management Plan is to provide appropriate construction standards, setbacks, hazard maintenance and recommendations based on the identified hazard components present at the time of survey. Conditions may change over time so that owners and occupiers should be prepared to increase risk reduction when required.

Owners and occupiers must bear in mind that implementation of the Bushfire Management Plan will assist in addressing and mitigating identified fire hazards on the subject site, however, the plan does not in itself prevent the loss of life or property. Owners should consider additional mitigation measures such as those provided as recommendations in this Plan or as advised by your local Rural Fire Service Warden.

### 6.1 Bushfire Survival Plan

To assist in mitigating risk, current and future occupants should develop a **Bushfire Survival Plan**. Leaving too late, when a fire is approaching is a common cause of fatalities during a bushfire event. The decision to stay when a fire is approaching involves activating the **Bushfire Survival Plan** and undertaking planned actions before, during, and after the fire. A Bushfire Survival Plan template and/or guidance material can be obtained from the Queensland Fire and Emergency Service.

### 6.2 Ongoing Risk Management

Occupiers should implement all practical measures to prevent the loss of life and property.

It is imperative that owners and occupiers maintain hazard reduction measures so that they are at hand and functional in a bushfire emergency.

At the start of the bushfire season, revisit your bushfire survival strategy and ensure all intended measures are in place and working. Fine fuels around the house and within the Asset Protection Zone are the greatest threat to a dwelling. Ensure these areas are fuel reduced. Check all hoses; water sources; pumps etc. are adequate and functional. Ensure driveways and fire trails are adequate and suitable for firefighting vehicles.

In case of fire, immediate contact should be made with the relevant fire authority and all directions and advice should be followed.

### 6.3 Responsible Agencies

The responsible Fire Authority is the Queensland Fire and Emergency Services (QFES). The Rural Division of the QFES is responsible for bushfires. The Urban Division of the QFES is responsible for structural fires.

The Local Authority is Rockhampton Regional Council. It is the responsibility of the Council and the building certifier to ensure that the measures outlined in this Management Plan are in place prior to the occupation of any buildings that are subject to this plan.

## 7 Site Description

The subject of the Bushfire Management Plan is the proposed new dwelling on 35SP285391 located at 229 German Street, Norman Gardens, 4701.



## 8 Expected Fire Behavior

The site is largely well located within existing residential development so that radiant heat hazards are reduced from some aspects. Further protection from radiant heat will be gained from the retaining walls to the north and east. The greatest threat to the dwelling will be ember attack. As such occupiers need to ensure that flammable materials are not located against or near the dwelling. This includes garden mulches, dry shrubs, timber garden sleepers, door mats etc.

Warm, dry northeast winds are common in late spring to early summer in the local area. This period and wind direction represents the highest risk of bushfire in the area.

The likelihood of fire and fire intensity will depend on fuel accumulation. Fires are likely to be infrequent and usually burn only under severe conditions. Fires may be severe with flame lengths of 15 to 20 metres with some ember attack.

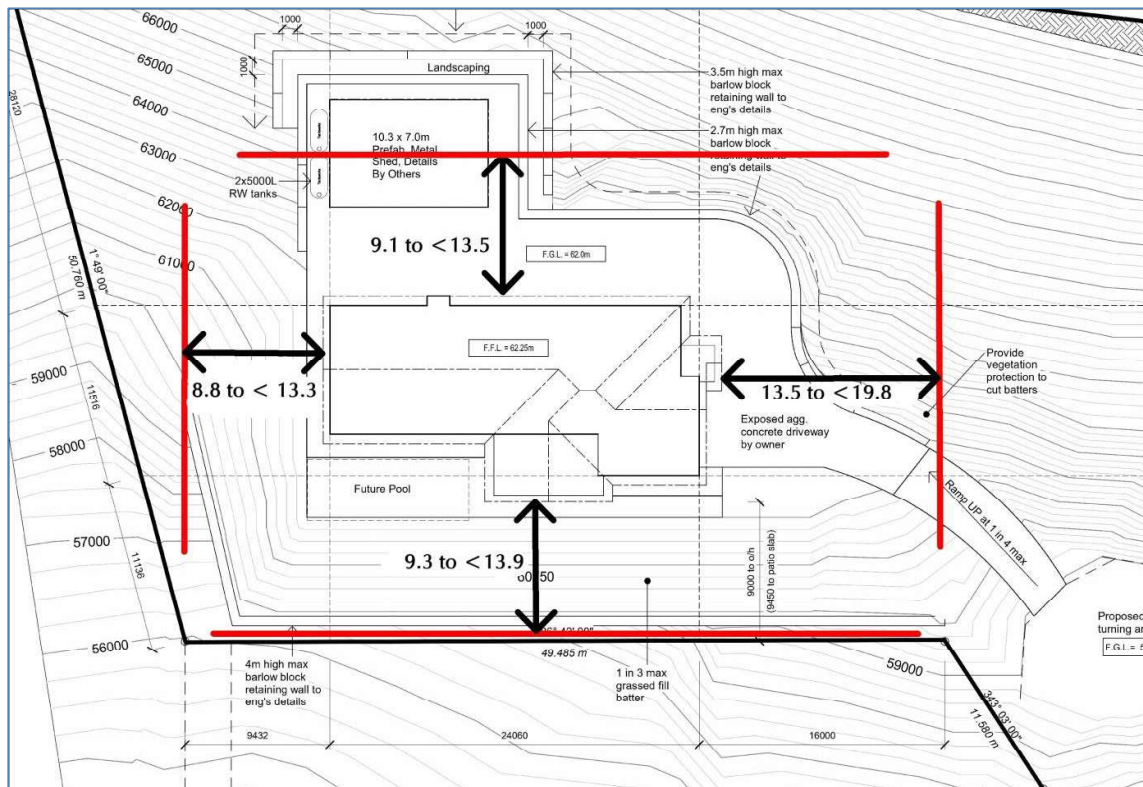
## 9 Construction Standards and Asset Protection Zones

1. The BAL Construction Standard is BAL-19 for all aspects but may be reduced to BAL-12.5 for the aspect facing German Street (SSW) where intervening tall grasses are consistently maintained to less than 30 centimetres tall.
2. Asset Protection Zones (APZ) will conform to the distances indicated in **Table 4** and **Figure 8** and in accordance with the AS3959 BAL – 19 Construction Standard.
3. The nearest surface of the dwelling must not be located closer to the hazard than the APZ ranges indicated for the BAL Construction Standard employed.
4. Non-liveable structures (garages, sheds etc.) closer than 6 metres to the dwelling are to comply with Section 3.2.3 of the AS3959: 2018.
5. Tree canopy cover in the Asset Protection Zone will be less than 10%; and
6. The nearest canopy should be located greater than 2 metres from any part of the roofline of the dwelling.

The installation of a perimeter sprinkler system is recommended. The associated pump should be able to be operated independently of the electricity grid. This may be petrol or diesel operated pump or an electric pump powered by a generator.

**Table 4. Required BAL Construction Standards and associated APZ ranges between the hazard and nearest facing surface of a dwelling.**

Aspect	APZ range (m) for BAL-19	Notes
N	9.1 to < 13.5	Retaining wall provides some shielding to radiant heat. Embers likely to circulate in enclosed areas
SE	13.5 to < 19.8	Retaining wall provides some shielding to radiant heat. Embers likely to circulate in enclosed areas
SSW	9.3 to < 13.9	BAL 12.5 can be used where grasses between the dwelling and German Street are kept to < 30cm tall.
W	8.8 to < 13.3	



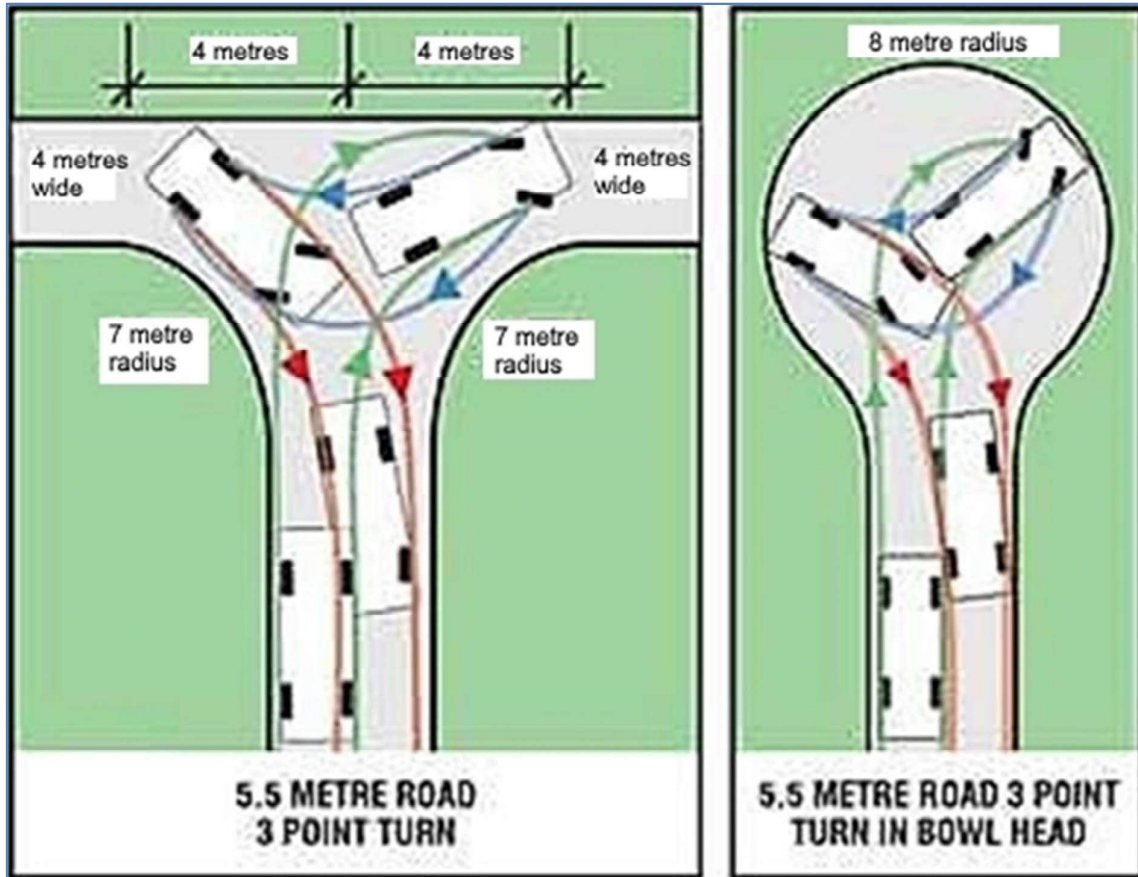


Figure 9. Example turnaround areas (Taken from Building Fire Safety Management Tool & Advisory Notes, State of Queensland (Queensland Fire and Emergency Services) 2015).

### 10.1 Alternative Access & Egress Routes

The subject lot has a well formed driveway to the building site. There are three access trails from the site in addition to the driveway. These trails have been used on occasion by the Rural Fire Service (pers. com. Clive Lohrey August 2020). Two tracks lead to Ludager Road and another to Taylor Street (see the *Error! Reference source not found.* in the **Appendix**).

## 11 Water supply for firefighting purposes

Where a reticulated water supply is not available the lot will have:

1. A dedicated on-site water storage for firefighting to be located within 10 metres of the dwelling that:
  - 1.1. Is constructed of non-combustible materials or is an underground tank;
  - 1.2. has a take-off connection from the building to the tank which is at a level that provides on-site water storage of not less than 20,000 litres;
  - 1.3. has a hardstand area allowing heavy rigid fire appliance access within six (6) metres of a tank; and
  - 1.4. has fire brigade tank fittings consisting of:
    - 1.4.1. a fifty (50) millimetre ball valve and male camlock coupling for above ground tanks; and

- 1.4.2. above ground water pipe fittings that are metal; or
- 1.4.3. for underground tanks, an access hole of 200 millimetre diameter (minimum) to allow access for suction lines.
- 1.5. Are accessible at all times to any appliance from the Queensland Fire and Emergency Services;
- 2. Other accessible water sources (e.g. accessible dam, bore or swimming pool) are to be provided with all-weather access.

## 12 Landscaping

- 1. The dwelling should be located so that it is:
  - a) 10 meters from any retained vegetation strips or small areas of vegetation;
  - b) Retained trees in the Asset Protection Zone should provide a non-continuous canopy with a total canopy cover of less than 10%; and
  - c) All dead and damaged timber is to be removed within the Setback Zone.
- 2. Lawns and Gardens within 10m width surrounding the dwelling are to be kept at no greater than 50mm in height;
- 3. Grassed areas and lawns for a further 10m are to be kept at no greater than 150mm;
- 4. The balance of the setback zone will be kept in a hazard reduced state: free of weeds (particularly lantana and guinea grass) and grasses at no greater than 200mm high: and
- 5. Landscaping trees within 10m of residences should be fire resistant species. No tree or shrub should be in contact with or overhang buildings.
- 6. All fencing and other garden structures within 10 metres of the dwelling will be constructed from non-combustible materials.

### 13 Purchaser/Resident Education and Awareness Programs

Each owner should be provided with a copy of this Fire Management Plan with an alert placed either on the title or Council rate searches that the Fire Management Plan is in existence and is to be made available to subsequent owners. The hazard ratings are to be placed on council plans and / or rate notices.

Owners should read and be familiar with the information contained in this report. Owners are responsible for maintenance of fire reduction measures on the site to reduce the risk of fire.

Owners should establish a Fire Safety Plan and Emergency Evacuation Plan for the event of fire including all suitable evacuation routes from their land and dwelling for fire from all potential directions. In the event of a fire, dialling 000 obtains emergency assistance.

Bushfire Safety Plans should include a series of time actions:

1. out of season observations for general fire safety around your house and property;
2. at the start of the fire season;
3. when very high to catastrophic conditions are announced for your area
4. when a fire is near your area;
5. when QRFS provide a watch and act or elevated warnings; and
6. when you are told to leave

Examples of Fire Safety Plans include the *Rural Property Fire Management Guide* and '*Plan Act Survive*' - *Bushfire Survival Plan*.

Residents should maintain regular contact with the Fire Brigade for local information updates and check the Queensland Rural Fire Service website for any updated fire safety guides and further information.

Additional recommendations to reduce fire risk around the dwelling are provided in **Table 5**

**Table 5. Hazard Reduction Measures: The following recommendations provide additional measures to reduce hazards around the dwelling**

Category	Issue	Action
<b>Buildings</b>	Maintenance: Buildings and Grounds	<ul style="list-style-type: none"> <li>• Clear overhanging trees and shrubs from dwellings and associated structures;</li> <li>• Point LPG gas tank relief valves away from dwellings;</li> <li>• Store flammable items well away from dwellings (e.g. woodpiles, boxes, paper);</li> <li>• Secure roof and clean gutters of dry leaf debris to eliminate an ignition source for embers;</li> <li>• Clear fuels around the house for at least 20 metres;</li> <li>• Trim under fences and remove overgrown bushes and plants;</li> <li>• Ensure surrounding grassed areas are trimmed and well-watered; and</li> <li>• Install non-flammable gutter guards.</li> <li>• Ensure door mats and other flammable material is moved away from the building when a bushfire is imminent.</li> </ul>
<b>Water</b>	Water Supply and firefighting equipment	<ul style="list-style-type: none"> <li>• Water sources for firefighting may include an accessible dam or tank with fire brigade tank fittings, a swimming pool, bore water etc. These sources should be provided with all-weather access;</li> <li>• All structures should be provided with a garden hose with metal fittings attached to the water supply at all times. The hose should be of sufficient length to reach all sides of a building; and</li> <li>• Regularly check that firefighting equipment is operational.</li> <li>• Rooftop and perimeter sprinkler systems are considered to be very effective in reducing the risk of spot fires around a dwelling.</li> </ul>
<b>Hazard Reduction</b>	Close proximity of buildings to hazardous vegetation  Hazard reduction:	<ul style="list-style-type: none"> <li>• Trees should be located at a sufficient distance away from dwellings so that when fully mature, branches do not overhang the eaves of the house.</li> <li>• Create a fuel reduction zone adjacent to a dwelling. Remove hazardous vegetation. Do not cause erosion when reducing potential fuel loads in these areas.</li> <li>• Within the hazard reduction zones, hazardous understory vegetation (dry sclerophyll species) should be removed within the setback zone of all structures. These can be replaced with fire resistant species.</li> </ul>
<b>Landscaping</b>	Growth of grasses and other fire prone vegetation in disturbed and cleared areas	<ul style="list-style-type: none"> <li>• Remove hazardous grasses and undesirable regrowth from buffer areas; and</li> <li>• Maintain all safety buffer areas free of weeds and tall grasses to maximum heights set out in this Bushfire Management Plan.</li> </ul>
	Landscaping species	<ul style="list-style-type: none"> <li>• Many species of locally occurring dry rainforest species are very effective at suppressing the spread of fire.</li> <li>• Avoid using palm trees and ferny leaved trees near the dwelling. These species are susceptible to burning.</li> </ul>



## 14 References & Bibliography

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## 15 Appendix

1. Descriptions of AS3959 Low Risk Vegetation and Exclusions of the AS3959 for certain Queensland vegetation types (NCC 2018)
2. AS3959 Method 2 results

## AS3959 Low Risk Vegetation

The AS3959-2018 identifies the following circumstances are identified as Low Risk and excluded from a BAL Assessment (AS3959-2018):

### 2.2.3.2 Exclusions—Low threat vegetation and non-vegetated areas

The following vegetation shall be excluded from a BAL assessment:

- a) Vegetation of any type that is more than 100 m from the site.
- b) Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified vegetation.
- c) Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site, or each other or of other areas of vegetation being classified vegetation.
- d) Strips of vegetation less than 20 m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified vegetation.
- e) Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.
- f) Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition, mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks.

#### NOTES:

- 1) 1 Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack (recognizable as short-cropped grass for example, to a nominal height of 100 mm).
- 2) 2 A windbreak is considered a single row of trees used as a screen or to reduce the effect of wind on the leeward side of the trees.

## National Construction Code (2019) variations to the AS3959 for Queensland.

The National Construction Code (2019) provides a variation to the AS3959 where the classified vegetation is Group F rainforest (excluding wet sclerophyll forest types), mangrove communities and grasslands under 300 mm high. Extracts are below:

### National Construction Code 2019 Volume One Queensland Qld Part G5 Construction in bushfire prone areas.

A building that is constructed in a *designated bushfire prone area* must be designed and constructed to reduce the risk of ignition from a bushfire while the fire front passes.

The *Deemed-to-Satisfy* Provisions of this Part apply to—

- (a) a Class 2 or 3 building; or
- (b) a Class 10a building or deck associated with a Class 2 or 3 building, located in a designated bushfire prone area , **but does not apply when the classified vegetation is Group F rainforest (excluding wet sclerophyll forest types), mangrove communities and grasslands under 300 mm high.**

### National Construction Code 2019 Volume Two Queensland Qld Part 3.10.5 Construction in bushfire prone areas.

3.10.5.0 is replaced with the following clause in Queensland:

- (a) Subject to (b), *Performance Requirement* P2.7.5 is satisfied for—

(i) a Class 1 building; or

a Class 10a building or deck associated with a Class 1 building, located in a *designated bushfire prone area* if it is constructed in accordance with—

(i) AS 3959; or

NASH Standard – Steel Framed Construction in Bushfire Areas.

**(b) The requirements of (a) do not apply when, in accordance with AS 3959, the classified vegetation is Group F rainforest (excluding wet sclerophyll forest types), mangrove communities and grasslands under 300 mm high.**



Calculated April 3, 2021, 1:20 pm (MDc v.4.9)

**35SP285391\_SE****Minimum Distance Calculator - AS3959-2018 (Method 2)**

Inputs		Outputs	
Fire Danger Index	40	Rate of spread	0.96 km/h
Vegetation classification	Woodland	Flame length	7.95 m
Understorey fuel load	11.5 t/ha	Flame angle	54 °, 64 °, 73 °, 78 °, 80 ° & 85 °
Total fuel load	14 t/ha	Elevation of receiver	3.21 m, 3.57 m, 3.8 m, 3.89 m, 3.91 m & 3.96 m
Vegetation height	n/a	Fire intensity	6,982 kW/m
Effective slope	8.1 °	Transmissivity	0.885, 0.873, 0.855, 0.834, 0.821 & 0.749
Site slope	0 °	Viewfactor	0.5933, 0.4316, 0.2905, 0.1968, 0.16 & 0.0438
Flame width	100 m	Minimum distance to < 40 kW/m <sup>2</sup>	6.6 m
Windspeed	n/a	Minimum distance to < 29 kW/m <sup>2</sup>	9.1 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m <sup>2</sup>	13.5 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m <sup>2</sup>	19.8 m
		Minimum distance to < 10 kW/m <sup>2</sup>	24 m

Rate of Spread - McArthur, 1973 &amp; Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 &amp; Noble et al., 1980

Elevation of receiver - Douglas &amp; Tan, 2005

Flame angle - Douglas &amp; Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas &amp; Tan, 2005



Calculated April 3, 2021, 1:22 pm (MDc v.4.9)

**35SP285391\_SSW****Minimum Distance Calculator - AS3959-2018 (Method 2)**

Inputs		Outputs	
Grassland Fire Danger Index	40	Rate of spread	8.84 km/h
Vegetation classification	Grassland	Flame length	5.4 m
Understorey fuel load	4.5 t/ha	Flame angle	54 °, 65 °, 73 °, 79 °, 81 ° & 86 °
Total fuel load	4.5 t/ha	Elevation of receiver	2.18 m, 2.44 m, 2.58 m, 2.65 m, 2.66 m & 2.69 m
Vegetation height	n/a	Fire intensity	20,566 kW/m
Effective slope	7.7 °	Transmissivity	0.891, 0.882, 0.869, 0.851, 0.841 & 0.766
Site slope	0 °	Viewfactor	0.5875, 0.4288, 0.2869, 0.1915, 0.1558 & 0.0428
Flame width	100 m	Minimum distance to < 40 kW/m <sup>2</sup>	4.6 m
Windspeed	n/a	Minimum distance to < 29 kW/m <sup>2</sup>	6.2 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m <sup>2</sup>	9.300000000000001 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m <sup>2</sup>	13.9 m
		Minimum distance to < 10 kW/m <sup>2</sup>	17 m

Rate of Spread - Noble et al. 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas &amp; Tan, 2005

Flame angle - Douglas &amp; Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas &amp; Tan, 2005





Calculated April 3, 2021, 1:21 pm (MDc v.4.9)

**35SP285391\_W****Minimum Distance Calculator - AS3959-2018 (Method 2)**

Inputs		Outputs	
Fire Danger Index	40	Rate of spread	0.55 km/h
Vegetation classification	Woodland	Flame length	5.26 m
Understorey fuel load	11.5 t/ha	Flame angle	60.5 °, 71.5 °, 80.5 °, 86.5 °, 88.5 ° & 93.5 °
Total fuel load	14 t/ha	Elevation of receiver	1.72 m, 1.72 m, 1.42 m, 0.86 m, 0.46 m & 0 m
Vegetation height	n/a	Fire intensity	3,992 kW/m
Effective slope	0 °	Transmissivity	0.891, 0.883, 0.869, 0.852, 0.841 & 0.767
Site slope	7.5 °	Viewfactor	0.5769, 0.4262, 0.2868, 0.1918, 0.1555 & 0.0427
Flame width	100 m	Minimum distance to < 40 kW/m <sup>2</sup>	4.3 m
Windspeed	n/a	Minimum distance to < 29 kW/m <sup>2</sup>	5.8 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m <sup>2</sup>	8.800000000000001 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m <sup>2</sup>	13.3 m
		Minimum distance to < 10 kW/m <sup>2</sup>	16.4 m

Rate of Spread - Mcarthur, 1973 &amp; Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 &amp; Noble et al., 1980

Elevation of receiver - Douglas &amp; Tan, 2005

Flame angle - Douglas &amp; Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas &amp; Tan, 2005



Calculated April 3, 2021, 1:19 pm (MDc v.4.9)

**35SP285391\_N****Minimum Distance Calculator - AS3959-2018 (Method 2)**

Inputs		Outputs	
Fire Danger Index	40	Rate of spread	0.55 km/h
Vegetation classification	Woodland	Flame length	5.26 m
Understorey fuel load	11.5 t/ha	Flame angle	54 °, 64 °, 73 °, 79 °, 81 ° & 86 °
Total fuel load	14 t/ha	Elevation of receiver	2.13 m, 2.36 m, 2.51 m, 2.58 m, 2.6 m & 2.62 m
Vegetation height	n/a	Fire intensity	3,992 kW/m
Effective slope	0 °	Transmissivity	0.891, 0.883, 0.869, 0.852, 0.842 & 0.767
Site slope	0 °	Viewfactor	0.5852000000000001, 0.4315, 0.2857, 0.1922, 0.1556 & 0.0427
Flame width	100 m	Minimum distance to < 40 kW/m <sup>2</sup>	4.5 m
Windspeed	n/a	Minimum distance to < 29 kW/m <sup>2</sup>	6 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m <sup>2</sup>	9.1 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m <sup>2</sup>	13.5 m
		Minimum distance to < 10 kW/m <sup>2</sup>	16.6 m

Rate of Spread - McArthur, 1973 &amp; Noble et al., 1980

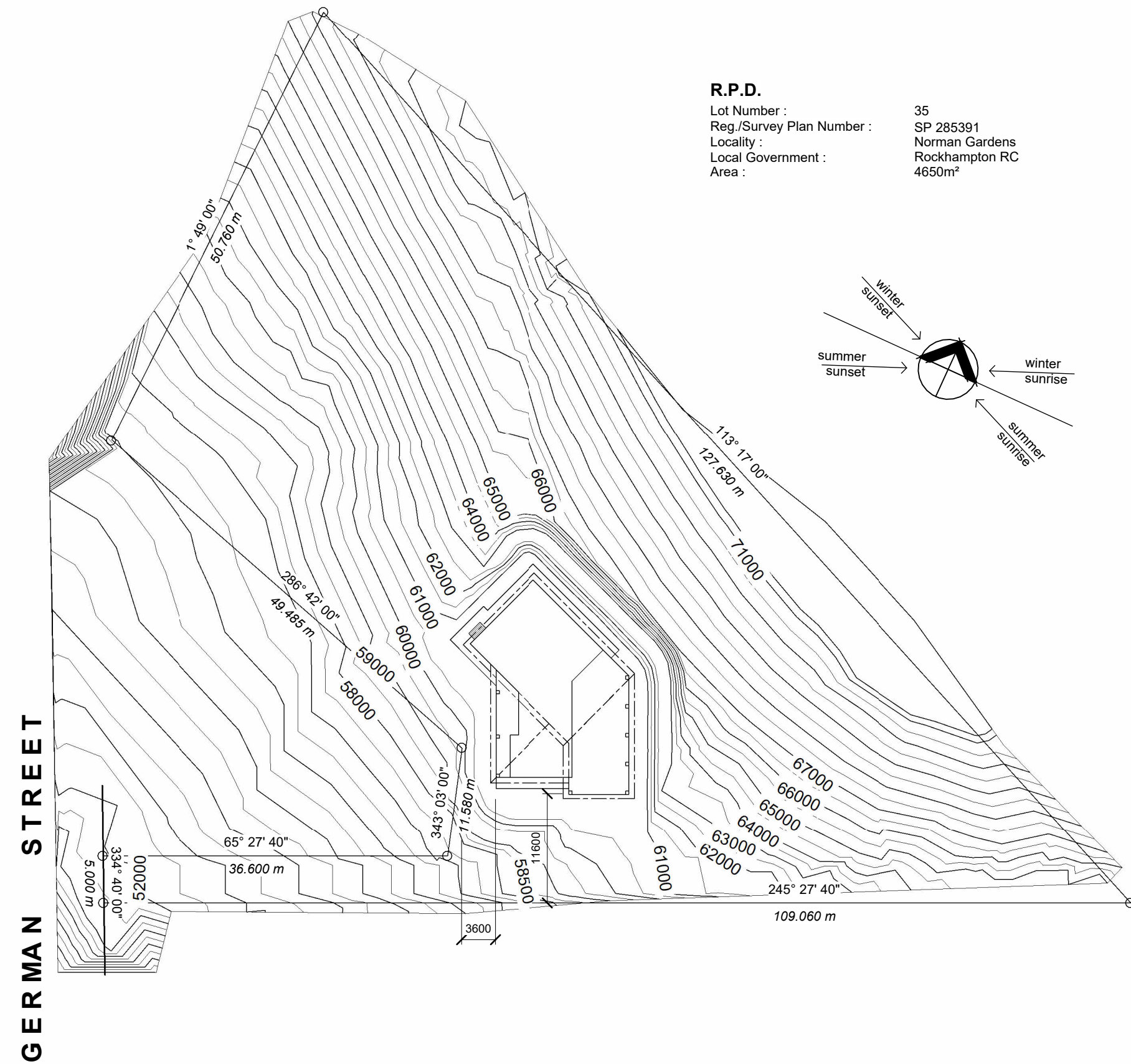
Flame length - NSW Rural Fire Service, 2001 &amp; Noble et al., 1980

Elevation of receiver - Douglas &amp; Tan, 2005

Flame angle - Douglas &amp; Tan, 2005

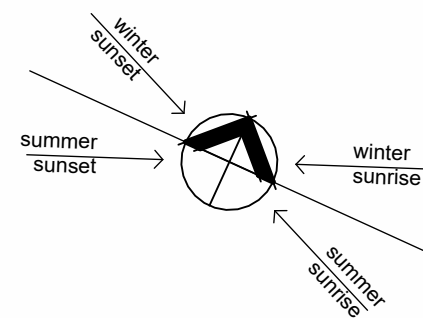
Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas &amp; Tan, 2005



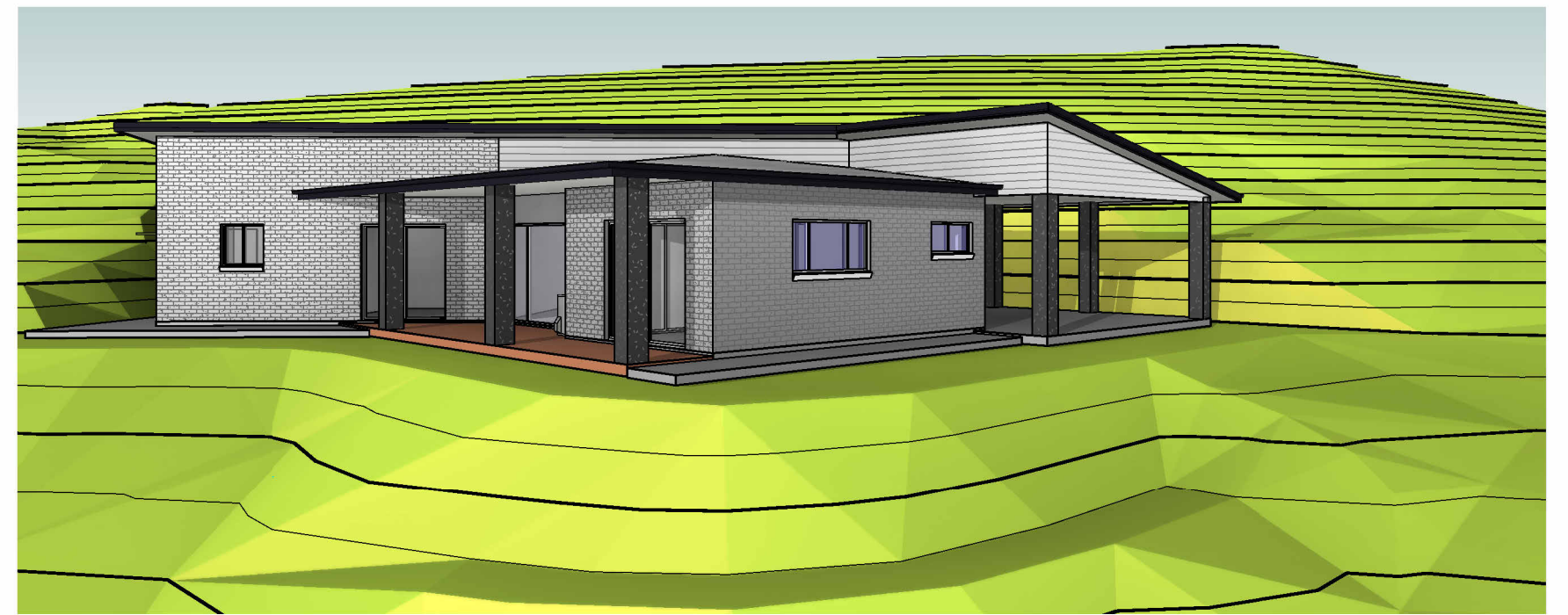


1 Site Plan Overall  
1 : 500

**R.P.D.**  
Lot Number : 35  
Reg./Survey Plan Number : SP 285391  
Locality : Norman Gardens  
Local Government : Rockhampton RC  
Area : 4650m<sup>2</sup>



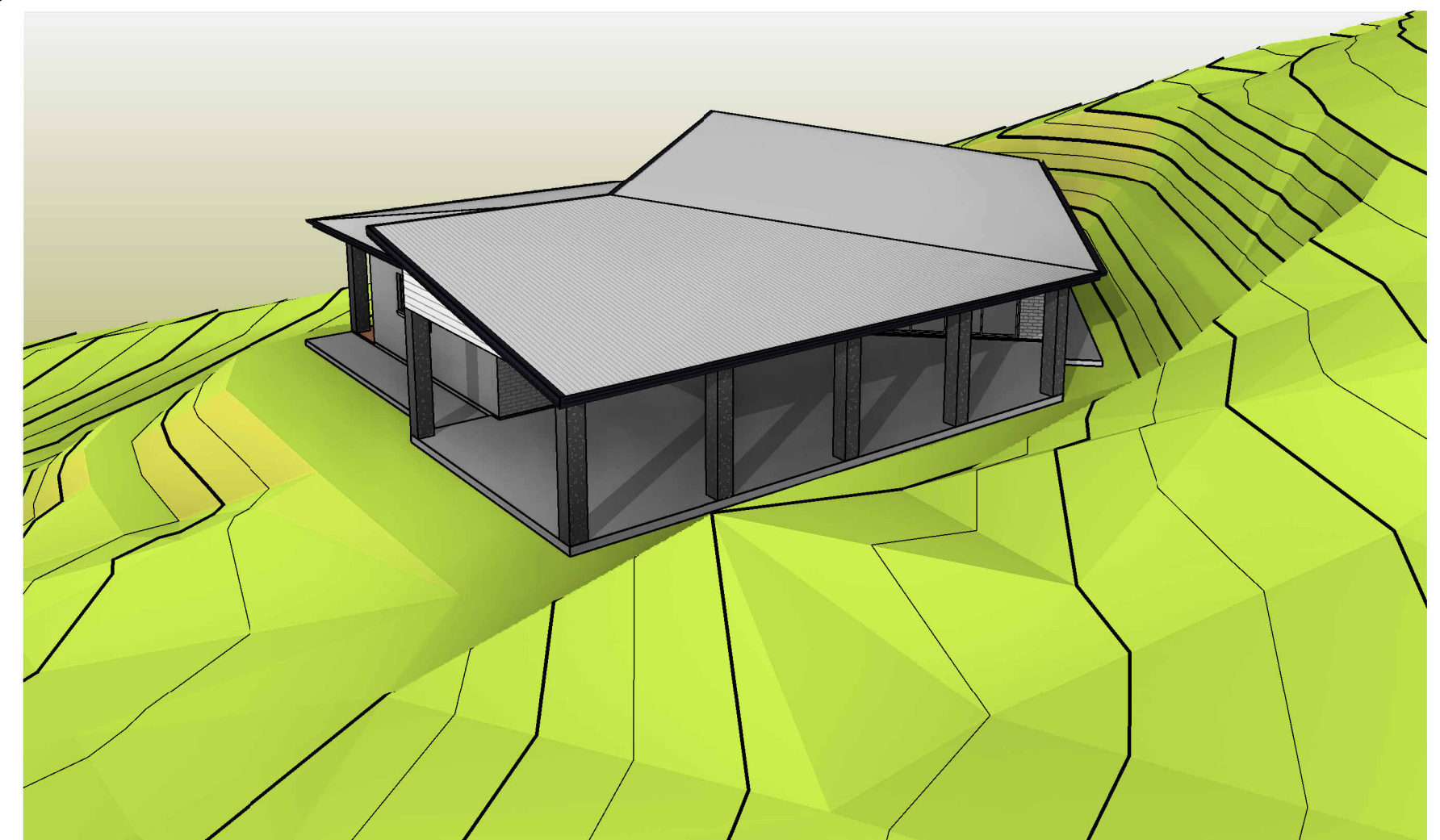
**PRELIM**  
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2 3D View 1



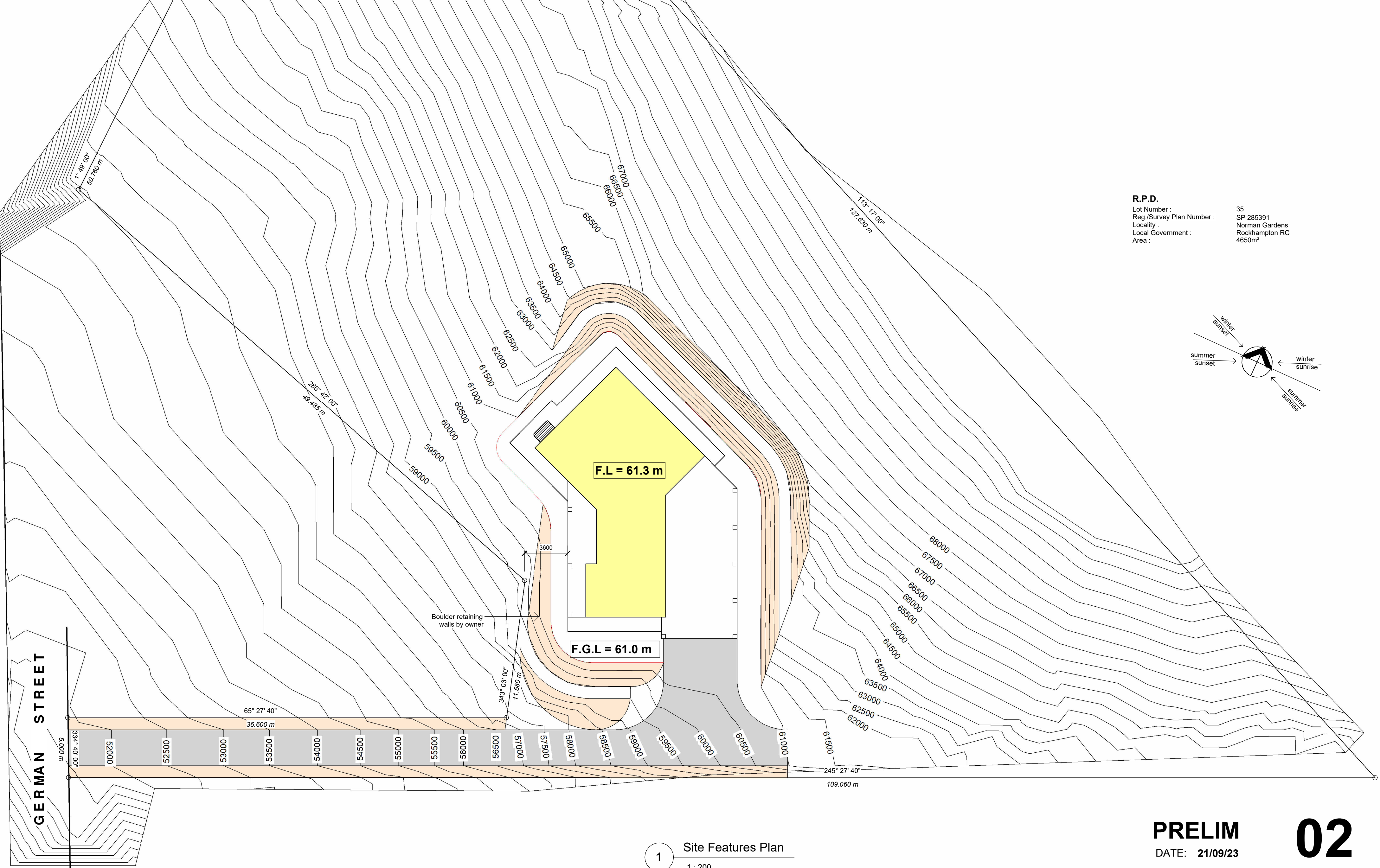
3 3D View 2



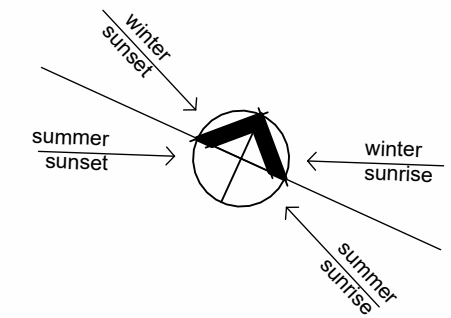
4 3D View 3

REVISIONS	PROPOSED DWELLING FOR M. HICKEY AT 229 GEERMAN STREET NORMAN GARDENS		this drawing Site Plan Overall & 3D Views		 b1 MEMBER BUILDING DESIGNERS ASSOC. OF QLD INC. Licenced under the QBSA Act Lic No. 1180286 Telephone 61 7 49288011 Facsimile 61 7 49266579 E-mail mailbox@rufusdesigngroup.com	PROJECT MANAGER : <i>D Webb</i>	WIND SPEED C2	PROJECT NUMBER 230602 - 02	
	NO.	DESCRIPTION	DATE			DRAWN : <i>D Webb</i>	PLAN SIZE: A2	SHEET 02 OF 06 SHEETS	
						CHKD :		REVISION	






**R.P.D.**  
Lot Number : 35  
Reg./Survey Plan Number : SP 285391  
Locality : Norman Gardens  
Local Government : Rockhampton RC  
Area : 4650m<sup>2</sup>

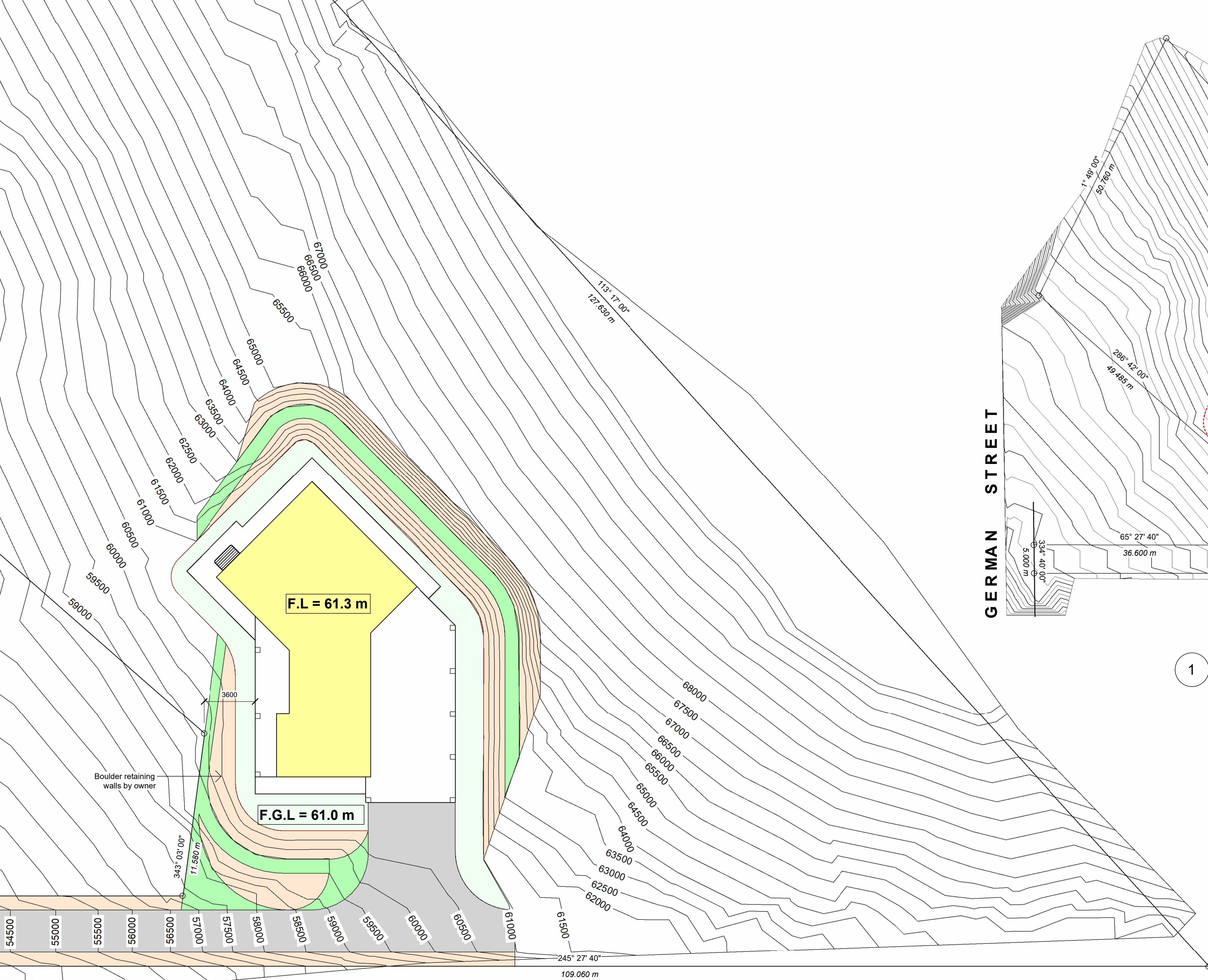


1 Site Features Plan  
1 : 200

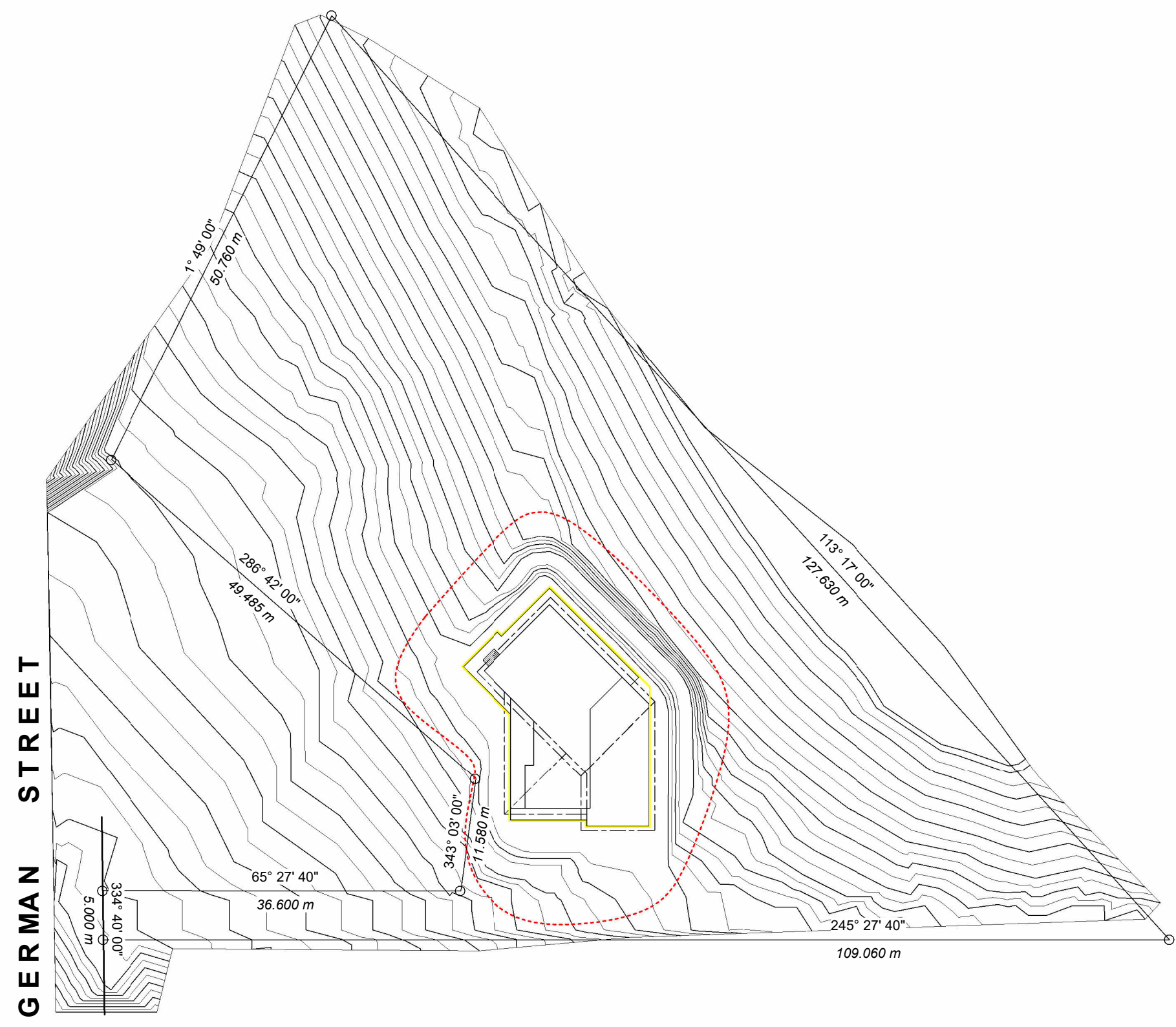
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REVISIONS			PROPOSED DWELLING FOR M. HICKEY AT 229 GEERMAN STREET NORMAN GARDENS	this drawing Site Features Plan	 b1 MEMBER BUILDING DESIGNERS ASSOC. OF QLD INC. Licenced under the QBSA Act Lic No. 1180286 Telephone 61 7 49288011 Facsimile 61 7 49266579 E-mail mailbox@rufusdesigngroup.com	PROJECT MANAGER : <i>D Webb</i>	WIND SPEED C2	PROJECT NUMBER 230602 - 03 SHEET 03 OF 06 SHEETS
	NO.	DESCRIPTION				DRAWN : <i>D Webb</i>	PLAN SIZE: A2	
						CHKD :		REVISION





2 Landscape Plan  
1 : 200



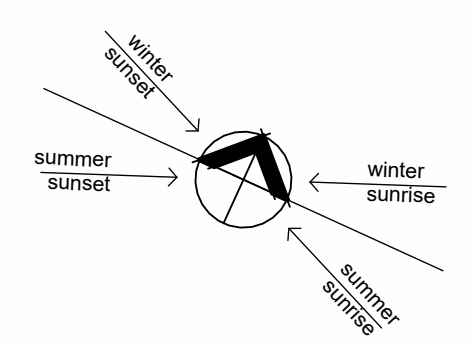
1 Site Plan - Asset Protection Zone  
1 : 500

Landscape Legend

- 2m high native shrubs
- Mowed lawn
- Native vegetation growing amongst sandstone boulder retaining walls

**R.P.D.**  
Lot Number :  
Reg./Survey Plan Number :  
Locality :  
Local Government :  
Area :

35  
SP 285391  
Norman Gardens  
Rockhampton RC  
4650m²



NO.	DESCRIPTION	DATE

PROPOSED DWELLING  
FOR M. HICKEY  
AT 229 GEERMAN STREET  
NORMAN GARDENS

this drawing  
Site Plan - Asset Protection Zone  
& Landscape Plan



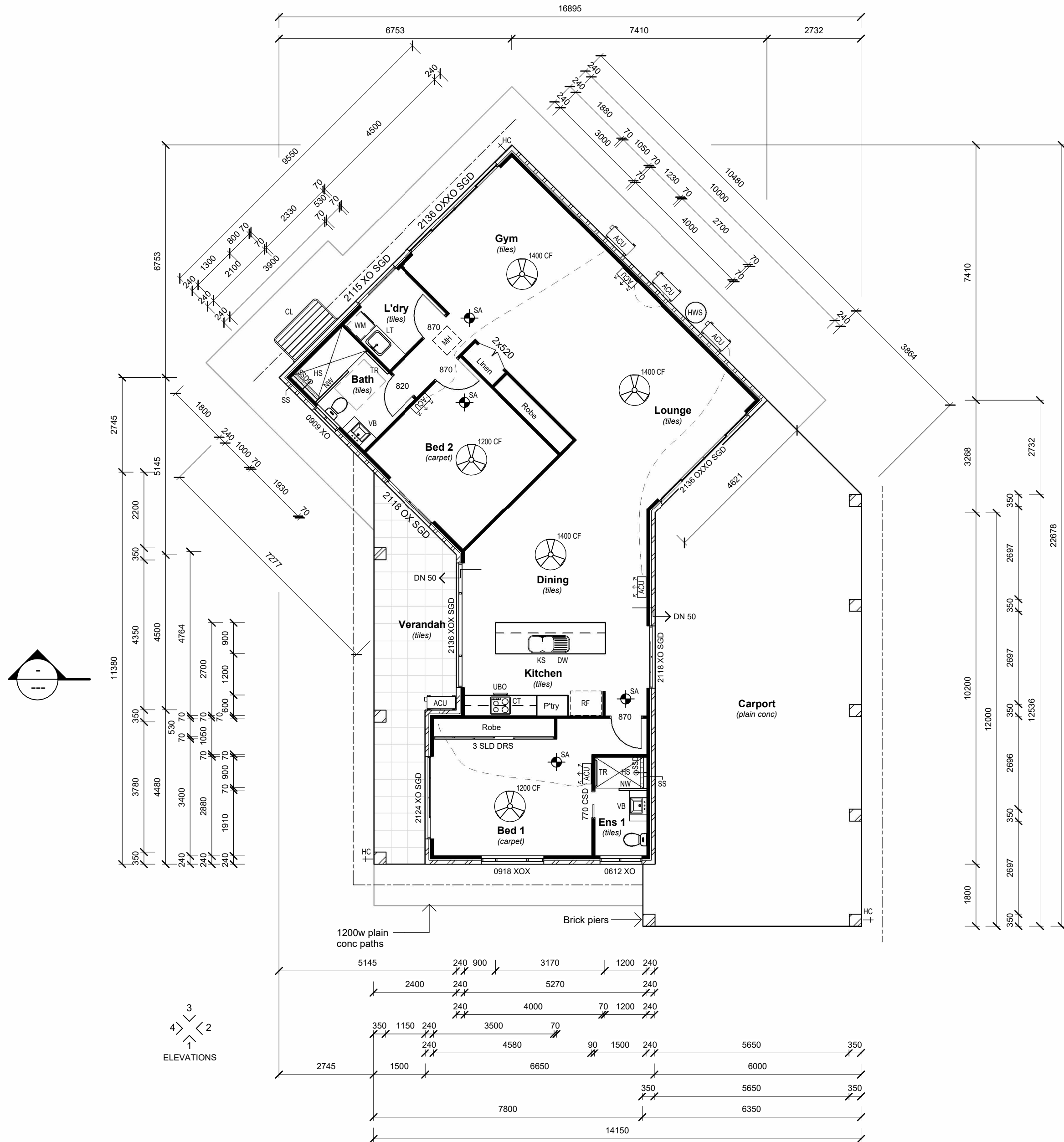
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PROJECT  
MANAGER :  
DRAWN :  
CHKD :

WIND  
SPEED  
PLAN  
SIZE:

PROJECT NUMBER  
230602 - 04  
SHEET 04 OF 06 SHEETS  
REVISION





### Window Legend

1218 - 1200 high x 1800 wide  
XO - Sliding / Fixed  
X - Sliding  
O - Fixed  
D - Double Hung  
A - Awning  
CMT - Casement  
L - Louvre  
FG - Fixed Glass  
GSW - Gas Strut Window  
Glazing to wet areas to be obscure  
Refer to EE table for remainder of Glazing

**BAL Rating** 12.5

Refer assessment by consultant

### Energy Efficiency Details

Roof Colour	Dark
Wall Colour	Dark
Roof Insulation	Anticon
Ceiling Insulation	R2.5 Batts
Wall Insulation	R1.0 Batts
Floor Insulation	Nil
Solar Power	Nil
Hot Water Unit	Electric
Glazing	Alum framed, single, tinted
Downlights	Sealed LED
Ventilation	1200 dia ceiling fans - 5 total
Floor Finishes	Refer to plan
Concessions	Nil
Energy Assessor - Lane Energy Assessments	
Accredited Assessor No. DMN/16/1733	

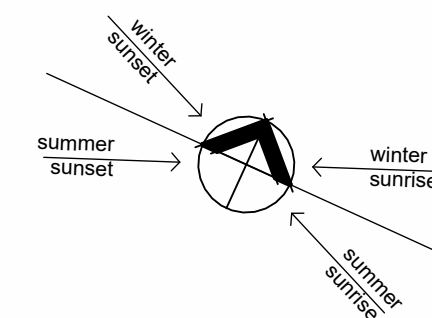
### Plan Legend

1200 CF	1200mm dia Ceiling Fan
1400 CF	1400mm dia Ceiling Fan
ACU	Air Conditioner Unit
CL	Wall mounted Clothes Line
CT	Cooktop
DP	Down Pipe
DW	Dishwasher
HC	Hose Cock
HS	Hobless Shower
HWS	Electric Hot Water System
KS	Kitchen Sink
LT	Laundry Tub
MH	Man Hole
NW	Nib Wall - 1100 high with shr screen above
RF	Refrigerator
SA	Photoelectric Smoke Alarm
SS	90w Tiled Shower shelf at 900mm above F.L.
SSD	S/steel grated strip drain
TR	Towel Rail
UBO	Under Bench Oven
VB	Vanity Basin
WM	Washing Machine with Clothes Dryer above

### Floor Areas

Verandah	20.4 m <sup>2</sup>
Carport	83.2 m <sup>2</sup>
Habitable	151.4 m <sup>2</sup>
Grand total	254.9 m <sup>2</sup>

1 Floor Plan  
1 : 100



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AT 229 GEERMAN STREET  
NORMAN GARDENS

this drawing  
Floor Plan



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PROJECT  
MANAGER : *D. Webb*  
DRAWN : *D. Webb*  
CHKD :

WIND  
SPEED C2  
PLAN  
SIZE: A2

PROJECT NUMBER  
230602 - 05  
SHEET 05 OF 06 SHEETS  
REVISION



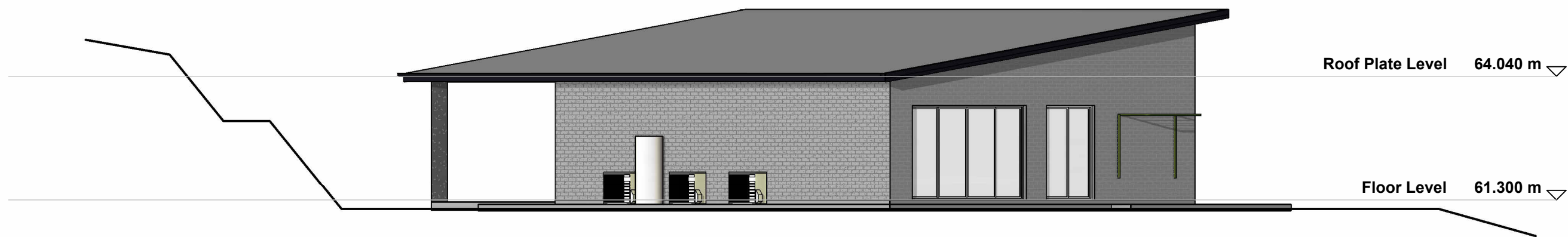
REVISIONS			
NO.	DESCRIPTION	DATE	



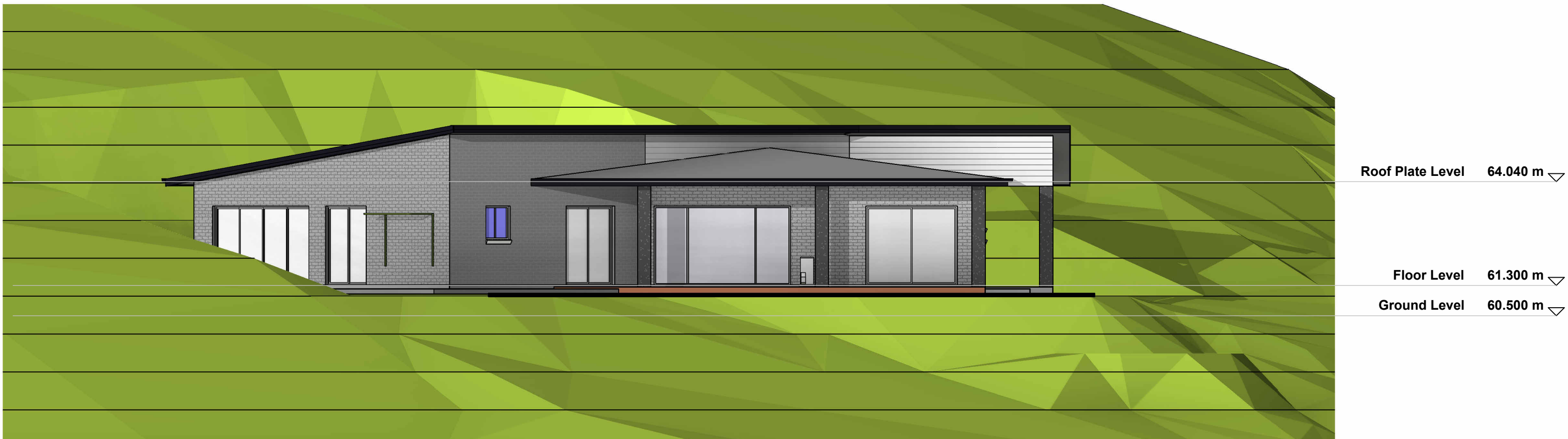
1 Elevation 1  
1 : 100



2 Elevation 2  
1 : 100



3 Elevation 3  
1 : 100



4 Elevation 4  
1 : 100

**PRELIM**  
DATE: 21/09/23  
**02**  
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PROPOSED DWELLING  
  
FOR M. HICKEY  
AT 229 GEERMAN STREET  
NORMAN GARDENS



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this drawing Elevations			
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DRAWN : <i>D Webb</i>	PLAN SIZE: A2	SHEET 06 OF 06 SHEETS	
CHKD :		REVISION	