

MULCH FOR MASS PLANTING

Place mulch in areas of mass planting to an even and minimum settled depth of 100mm using site mulch (which is a combination of leaf, timber and bark) or approved equivalent mulch as specified. (Refer notes on Recycling and Reuse of removed vegetation on this sheet)

NOTE

Use site mulch where slopes are less gentle than 1:4. For barriers and slopes greater/steeper than 1:4, use Erosion Control Matting (ECM). ECM to be installed over approved equivalent retained to manufacturer's specification. Plants are to be individually planted and backfilled in groupings and spacings as nominated on plans.

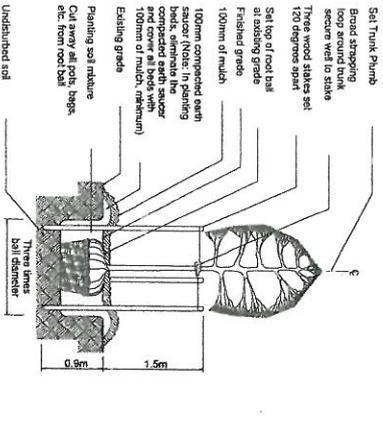
TURF

Supply and lay a grade Orinodon decay (Green Couch) where indicated on a minimum of 100mm deep top-soil that has been raked to a fine silt, lightly compacted and evenly graded. Lay turf edge to edge and roll lightly. Turf shall be top-dressed or lifted as directed to permit turf to be moved to an even height. The maximum deviation shall not exceed 50mm in any 2m length. Turf strips behind kerb, and grass-seeding to balance of verge and lots shall be by civil contractor as per civil engineer's Erosion and Sediment Control Plan.

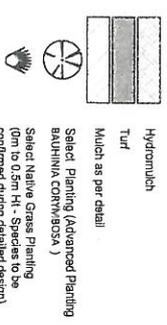
PLANTING GENERALLY

Supply and place plants according to master plant schedule and location and description on drawings. Use Agriform 10g fertilizer (N:P:K = 20:4:3:1) pellets or approved equivalent, at a rate of 1 per m² above 25mm 14mm, 2 per 200mm and 4 per 250mm and 8 per 300mm. Stake 50 plants with 200g 500x200x50mm HV Garden flags and 100 plants with 200g 500x200x50mm HV Garden flags where indicated. Garden beds are to be freely draining, mulch gardens and prepare topsoil as described above.

LARGE TREE PLANTING DETAIL
NOT TO SCALE



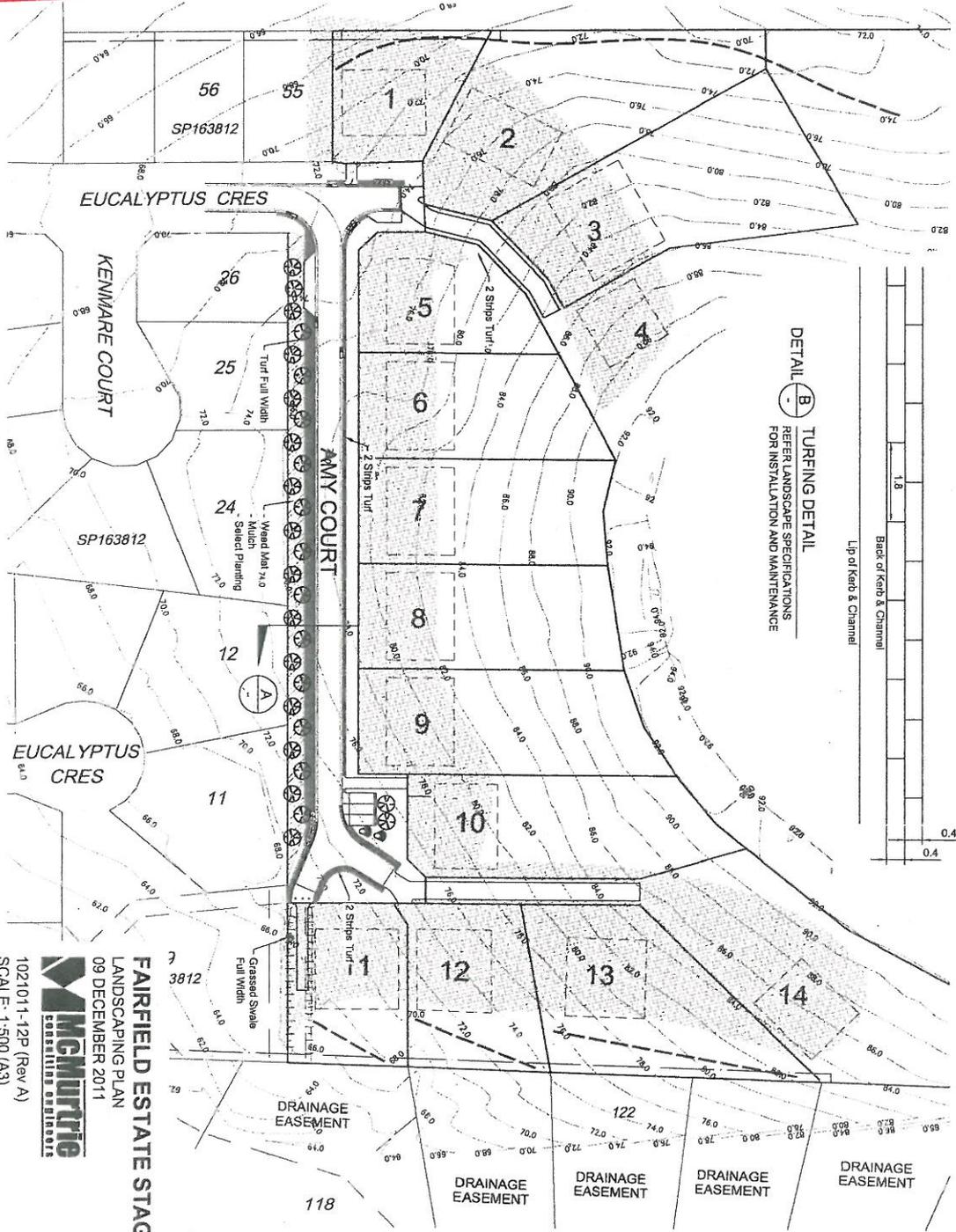
LEGEND



ROCKHAMPTON REGIONAL COUNCIL

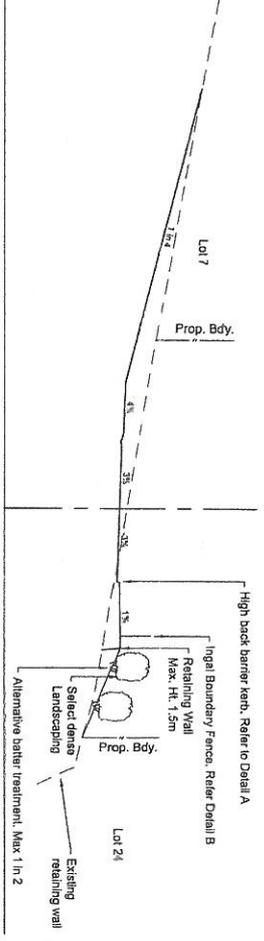
These plans are approved subject to the current conditions of approval associated with Development Permit No. D280-2011

Dated 21/7/12



DETAIL A AMY COURT SECTION
SCALE 1:200 (A3)

DETAIL B TURING DETAIL
REFER LANDSCAPE SPECIFICATIONS FOR INSTALLATION AND MAINTENANCE



FAIRFIELD ESTATE STAGE 2
LANDSCAPING PLAN
09 DECEMBER 2011
MCMURTRIE
CONSULTING ENGINEERS
1021011-12P (Rev A)
SCALE: 1:500 (A3)

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BUSHFIRE MANAGEMENT PLAN
FAIRFIELD ESTATE STAGE 2
PROPOSED 14 LOT SUBDIVISION
(CANCELLING Lot 2 on RP163918)
113 EUCALYPTUS CRESCENT, NORMAN GARDENS
4701
ROCKHAMPTON REGIONAL COUNCIL, QLD

ROCKHAMPTON REGIONAL COUNCIL
These plans are approved subject to the current
conditions of approval associated with
Development Permit No. D/280-2011
Dated 24/7/12

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1. Bushfire Management Plan

1.1 Introduction

This Bushfire Management Plan has been developed following the guidelines set out in the Rockhampton Regional Council: *Planning Policy No 12 of the Rockhampton City Plan* and the *Bushfire Risk Minimisation Code* and with reference to the State Planning Policy 1/03 Guideline "Mitigating the Adverse Impacts of Flood, Bushfire and Landslide".

1.1.1 Applicable Area

The BMP applies to the "Fairfield Estate" Stage 2 (Cancelling Lot 2 on RP163918) located at 113 Eucalyptus Crescent, Norman Gardens QLD 4701.

1.1.2 Hazard

Vegetation located on the site was assessed as a Medium Bushfire Hazard. Within woodland areas, fires are expected to be fast moving, available to fire annually to 4 years, usually with no ember attack, radiant heat for >10 m and a duration of less than 2 minutes.

1.1.3 Applicable Building Standards

All dwellings within 50m of a medium hazard and 100m of a high hazard:

- and downhill or level to the hazard are to comply with level one (1) structure as described in the AS3959-2009 Building in a Bushfire Prone Area; and
- and uphill to a bushfire hazard are to comply with level two (2) structure as described in the AS3959-2009 Building in a Bushfire Prone Area.

1.2 Warning

Residents must bear in mind that the surrounding site has been assessed as a MEDIUM FIRE HAZARD. Implementing this bushfire management plan does not guarantee that loss of life or property will not occur as a result of fire.

The Bushfire Management Plan will assist in addressing identified fire hazards on the property and in protecting life and property against bushfire. Owners should implement all practical measures into fire safety plans and escape strategies to prevent the loss of life and property. Measures should incorporate any new information additional to this assessment / management plan that will assist in the prevention of loss due to fire.

Persons on the property should take the greatest caution when there is a risk of fire. In case of fire, immediate contact should be made with the relevant fire authority and all directions and advice should be followed.

The owners must implement and maintain fire management strategies and have a fire management safety plan for the event of fire.

1.3 Applicable Standards

The following Australian standards should be referred to when construction and landscaping are undertaken:

Australian Standard AS 3959 – 2009.

AS 3959 – 2009 & amendments governs construction in a designated bushfire prone area. **AS 3959-2009** sets out requirements for the design and construction of buildings in bushfire-prone areas in order to improve their performance when they are subjected to burning debris, radiant heat or flame contact generated from a bushfire.

Although the Standard is designed to improve the performance of such buildings, there can be no guarantee, because of the variable nature of bushfires, that any one building will withstand bushfire attack on every occasion.

The Standard does not provide for measures, which would improve the surrounding area, such as, siting and landscaping. These measures are covered in **HB 36-1993**

HB 36-1993 provides information and guidance on the siting of the building and methods and materials of construction for buildings in areas designated as bushfire prone. Advice on vegetation management and landscaping measures is included.

DR 03182 establishes requirements for the design and construction of buildings in bushfire-prone areas in order to improve their performance when subjected to burning debris, radiant heat or flame contact generated from a bushfire.

1.4 Aims of the Bushfire Management Plan

Specific outcomes addressed in this Bushfire Management Plan are:

1. Development maintains the safety of people and property by:
 - a) avoiding areas of High or Medium Bushfire Hazard; or
 - b) mitigating the risk through:
 - allotment design and the siting of buildings; and
 - including firebreaks that provide adequate:
 - setbacks between buildings/structures and hazardous vegetation, and
 - access for fire-fighting/other emergency vehicles;
 - providing adequate road access for fire-fighting/other emergency vehicles and safe evacuation; and
 - providing an adequate and accessible water supply for fire fighting purposes.
2. Public safety and the environment are not adversely affected by the detrimental impacts of bushfire on hazardous materials manufactured or stored in bulk.

1.5 Responsible Agencies

The responsible Fire authority is the Queensland Fire and Rescue Service (QFRS). The Rural Division of the QFRS is responsible for bushfires. The Urban Division of the QFRS is responsible for structural fires.

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.

1.6 Consultation

Rockhampton Regional Council and the Rural Fire Brigade will be consulted prior to the implementation of this Bushfire Management Plan.

1.7 Site Location

The subject of the bushfire management plan is proposed lots 1 to 14, cancelling lot 2 on SP163918 (see AH Klerkx Drawings NR9010B and NR9010BBT dated 12 August 2011). The Local Authority is Rockhampton Regional Council.

The site (currently lot 2 on SP163918) is located to the north of Norman Road, North Rockhampton and on the western boundary of the Berserker Conservation Area. Residential properties are adjacent to the subject site to the south and west. Native dry woodland is located on the northern boundaries of the subject site. This area is managed by Rockhampton City Council.

1.8 Proposed Development

The development proposal consists of 14 allotments. Allotments are primarily residential, being between 825 to 2,768m² in area with proposed lot 4 having an area of 3.7ha.

All new lot boundaries are located below the 92m contour.

Reticulated water is available up to the 99m contour (see Engineering Report).

Allotments located adjacent to or within retained vegetation (the hazard) have been conditioned with a building envelope so that no dwelling can be located within 1.5 times the canopy height of the tallest adjacent vegetation or within 20m (whichever is the greater).

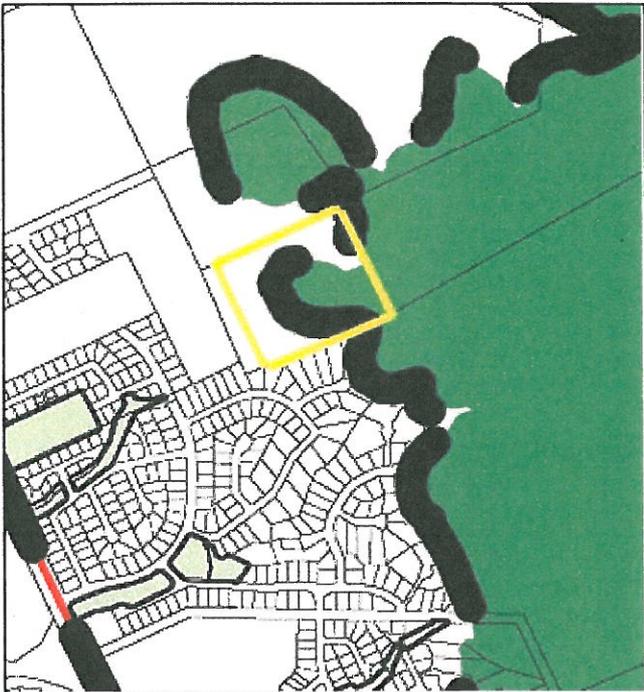


Figure 1. The subject site (indicated by the yellow line) in relation to the Berserker Range Environmental Protection Area boundary (Rockhampton City Plan) indicated by the green area bounded by a black line.

quinine berry (*Petalostigma pubescens*) and low growing lophostemon.

Ground cover was predominantly grass and herbs, sparse in wooded areas and denser in open areas. Species consisted of kangaroo grass (*Themeda triandra*), spear grass

1.9 Site Characteristics

1.9.1 Landscape

The site is located in the lower foothills of the Berserker Range. Drainage gullies are located on the northern and southern boundaries. These are separated by a spur descending from the Berserker range.

1.9.2 Slopes & Aspect

Slopes on the site range between 15 to 40%. Aspect is predominately west.

1.9.3 Vegetation

The site was a woodland to open woodland dominated by ironbark (*Eucalyptus crebra*) and bloodwood (*Corymbia erythrophloia*) with lophostemon (*Lophostemon confertus*) occurring in the southern gully.

The understorey was sparse and contained *Acacia* sp. (*aulacocarpa*), soapbush (*Alphitonia excelsa*) with

1.10 Vegetation Hazard

Vegetation hazard was assessed using the process provided in the Rockhampton City Plan (2005) *Planning Policy No. 12 – Assessment of Bushfire Hazard and Preparation of Bushfire Management Plans*.

1.10.1 Assessed Hazard

Vegetation hazard is considered to be in the **Medium** SPP 1/03 range. Ordinarily, the site hazard would be considered **High** given of the steepness of slopes and general westerly aspect. However, there were site specific conditions that were considered to mitigate overall hazard to proposed dwellings on the site.

1.10.2 Site Influences Reducing Hazard

Moderating influences to hazard are:

- The majority of dwellings will be down slope from the hazard once clearing for development has occurred.
- There were limited runs of hazardous vegetation (<100m) downhill of proposed dwelling sites.
- Downhill areas were existing residential or future residential areas with limited potential for bushfire hazard.
- The understory vegetation was very sparse in woodland areas with limited ladder fuels. Otherwise, low vegetation consisted of grasses and herbs in very sparsely wooded areas.
- An existing 15m wide firebreak is located at the base of up-sloping land within an area that could contribute to a bushfire moving toward the area (the NE boundary of the existing lot).

1.11 Evidence and History of Fire

Evidence of fire on the site consisted of some wood coal scattered over the ground and burnt small logs. There was no evidence of crown fire or recent fire. Fires generally occur in the general area approximately every 12 to 24 months. Nearby Queensland Parks & Wildlife properties are the subject of a fire management plan and planned burning.

1.12 Likely Direction of Bushfire Attack

The most likely direction of bushfire attack is:

- from the East and downhill from the Berserker Range; or
- from the North along the base of the ranges (this hazard will reduce if land to the North is developed as residential areas). An application for the development of this area into residential allotments (Cascade Gardens) has been lodged by Quarterback Group and I understand they have reached agreement with QFRS regarding bushfire management.

2. Fire Management Requirements

2.1 General Recommendations

Please refer to Table 1 for a list of recommended fire management distances and actions for all allotments.

2.2 Firebreaks and Fire Trails

The approximate location of firebreaks, fire trails (and building envelopes where required) are indicated in the appended AH Klerkx drawing number NR9010B and NR9010BBT.

2.2.1 Firebreaks

Firebreaks already exist within the property as shown on AH Klerkx drawing No. NR9010B. They are cleared to an approximate width of 10 metres. I understand a recent development application in adjoining Cascade Gardens has proposed firebreaks which QFRS has undertaken to manage. Subject to QFRS consent, it is proposed that the firebreaks in this development and those in the proposed Cascade Valley development be placed under the control of QFRS for the adoption of a joint bushfire management strategy. No clearing of trees will be required in the upgrading of the existing firebreaks. Firebreaks are located for optimum longitudinal and lateral slopes.

As indicated on drawing NR9010B, there are several existing cleared vehicular tracks and fire breaks traversing Lot 4 which are currently used by four wheel drive vehicles and with some upgrading can be made suitable for emergency services. It is not anticipated that any further clearing of trees will be required to achieve this.

Firebreak and fire trail routes are to be located so that erosion and damage to the environment is minimised and gradients are minimised. Existing Ground level gradients along the firebreaks are shown on plan NR9010B

Vegetation will form a canopy no greater than 10% within the firebreak.

Low growing vegetation within the firebreak will be maintained at a height no greater than 200mm high.

Any landscaping species within the firebreak must be resistant to burning (vine scrub species endemic to the Mt Archer gullies would be suitable).

Fencing along the NW boundaries of Lots **1 to 4** will be constructed from **non-combustible** materials.

2.2.2 Fire Trails

Fire trails will be least 6m wide in cleared width with a formed 4m width traversable by 4X4 fire fighting vehicles.

Sediment and erosion control devices in accordance with the Planning Scheme Policy No.2 – Erosion and Sediment Control Plans will be installed along fire trails where required. Provision for passing should be made at least every 400m. Trails will be made accessible to emergency services at all times.

2.3 Setback Zones.

Buildings should be sited so that the following minimum Setbacks (Setback Zones) from hazardous vegetation are achieved:

- **20metres** or **1.5 times** the predominant mature canopy tree height from a hazardous vegetation (whichever is the greater) and

- **10metres** from any retained vegetation strips or small areas of vegetation.

Trees retained near dwellings will be kept at a distance greater than the canopy height away from buildings. Large flammable vegetation (tall/bushy shrubs and trees) should be kept at a distance greater than **15m** from dwellings.

Retained trees in the **Setback Zone** should provide a non-continuous canopy with a total canopy cover of **less than 10%**.

All dead and damaged timber is to be removed within the **Setback Zone**.

2.3.1 Lawns and Gardens

- Grass and fire prone vegetation within an area of **10m** width surrounding a residence is to be kept at no greater than **50mm** in height.
- Grassed areas and lawns for a further **10m** from a residence are to be kept at no greater than **150mm**.
- All other grasses in un-forested areas will be kept at no greater than **200mm**.
- Landscaping trees within **15m** of residences must be fire resistant species. No tree or shrub should be in contact with or overhang buildings.

2.3.2 Maintenance of Fire Breaks and Internal Roads

Internal roads to the dwelling will be suitable for 2 wheel drive heavy vehicles at all times

Firebreaks will be regularly maintained and kept suitable for 4 wheel drive heavy vehicles at all times. Subject to QFRS consent, it is proposed that the firebreaks in this development and those in the adjoining proposed Cascade Valley development be placed under the control of QFRS for the adoption of a joint bushfire management strategy.

2.4 Building Locations and Building Envelopes

Where practical, the building location will be sited in locations of lowest hazard within the lot (or building envelope). Elements of the development least susceptible to fire will be sited closest to the bushfire hazard. Where practical, infrastructure on the site is to be located down slope from the hazard.

2.5 Building Design

All dwellings constructed within a fire hazard area and Safety Buffer Zone (wholly within 50m of a natural hazard) are to conform to Australian Standards for construction of buildings in bushfire-prone areas (AS 3959-1999).

2.5.1 Dwellings Within 50m of a Natural Hazard

Dwellings within 50m of the natural hazard are expected to be subject to radiant heat, not direct flame.

Dwellings located wholly within 50m of the natural hazard are to be built to **Level 1** (AS3959-2009).

Dwellings having portions of the building within 50m of the natural hazard are to have those surfaces facing the hazard built to **Level 1** (AS3959-2009).

2.6 Fire Fighting Requirements Including Infrastructure

The locations of fire hydrants are indicated in the appended McMurtrie Consulting Engineers drawing "Sewer, Water, Electrical".

All dwellings will have:

- a reliable reticulated water supply that has sufficient flow and pressure characteristics for fire fighting purposes at all times (**minimum pressure and flow is 10 litres a second at 200kPa**);

Or:

where not serviced by reticulated water;

- On-site water storage of **not less than 5,000 litres** to be located within 30m of the dwelling within a single allotment of any allotment; and
 - All water storage tanks are to have a standard 'cam coupling' attached to the tank in an accessible location to provide water for fire suppression and
 - are to be accessible at all times to any appliance from the Queensland Fire and Rescue Authority

For rural allotments, other accessible water sources (e.g. accessible dam, bore or swimming pool) are to be provided with all weather access.

Driveways to the dwelling are to be kept in a condition suitable for 2 wheel drive heavy vehicles.

Fire trails are to be kept at a minimum width of 6m, in a condition suitable for 4 wheel drive vehicles and to the satisfaction of the Fire Brigade.

2.7 Warning and Evacuation Procedures and Routes

The access and escape routes for all lots is via Eucalyptus Crescent.

The owners will establish a Fire Safety Plan and Emergency Evacuation Plan for the event of fire.

In the event of a fire, dialling 000 obtains emergency assistance.

2.8 Purchaser/Resident Education and Awareness Programs

The owner is to 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 rate notices.

2.9 Ongoing Maintenance and Response Awareness Programs

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 will establish a Fire Safety Plan and Emergency Evacuation Plan in the event of fire.

Up to date information on bushfire safety is available from the Queensland Fire and Rescue service (www.fire.qld.gov.au).

Building Standards can be obtained from Standards Australia (www.standards.org.au).

Table 1. Bushfire Management Plan: Issues and Recommended Actions. The table provides a summary of required actions and additional recommendations on reducing the risk and hazard of bushfire.

Category	Issue	Action
Buildings	Construction	<ul style="list-style-type: none"> Dwellings within 50m of a medium hazard or 100m of a high hazard are to be compliant with the required building level in 'construction of buildings in bushfire-prone areas (AS 3959-2009) unless otherwise specified in the Bushfire Management Plan; and Screens or shutters should be installed and under floor areas enclosed.
	Maintenance: Buildings and Grounds	<ul style="list-style-type: none"> Clear overhanging trees and shrubs from dwellings and associated structures; Point LPG gas tank relief valves away from dwellings; Store flammable items well away from dwellings (e.g. woodpiles, boxes, paper); Secure roof and clean gutters of dry leaf debris to eliminate an ignition source for embers; Clear fuels around the house for at least 20 metres; Trim under fences and remove overgrown bushes and plants; and Ensure surrounding grassed areas are trimmed and well-watered
Water	Water Supply and fire fighting equipment	<ul style="list-style-type: none"> All lots are to have either: <ul style="list-style-type: none"> acceptable access to a reliable reticulated water supply that has sufficient flow and pressure characteristics for fire fighting purposes at all times (minimum pressure and flow of 10 litres per second at 200kPa) <p>OR</p> <ul style="list-style-type: none"> Provide on-site water storage of not less than 5,000 litres. All water storage tanks: <ul style="list-style-type: none"> will have a standard 'cam coupling' attached to the tank in an accessible location to provide water for fire suppression and are to be accessible at all times to any appliance from the Queensland Fire and Rescue Authority water sources for fire fighting 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; All structures are to be provided with a garden hose that is attached to the water supply at all times. The hose is to be of sufficient length to reach all sides of a building; and Regularly check that fire fighting equipment is operational.
Hazard Reduction	Close proximity of buildings to hazardous vegetation Hazard reduction:	<ul style="list-style-type: none"> 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. Create a fuel reduction zone adjacent to a dwelling that is at least 1.5 times the canopy height of the surrounding vegetation. Remove hazardous vegetation. Do not cause erosion when reducing potential

Category	Issue	Action
	<p>1. Vegetation adjacent to the building envelope, with special attention to all down slope areas</p> <p>2. Vegetation adjacent to the access road</p>	<p>fuel loads in these areas.</p> <ul style="list-style-type: none"> • Grasses should be maintained at a height no greater than <ul style="list-style-type: none"> ○ 50mm within 10m of all structures; ○ 150mm within a further 10m width and ○ 200mm within a further 10m width. • 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. Where hazardous vegetation adjoins other properties, so that vegetation management is not within the control of the owner of the land, building placement should maximise setbacks from hazardous vegetation.
<p>Landscaping</p>	<p>Growth of grasses and other fire prone vegetation in disturbed and cleared areas</p> <p>LANDSCAPING SPECIES</p>	<ul style="list-style-type: none"> • Remove hazardous grasses and undesirable regrowth from buffer areas; and • Maintain all safety buffer areas free of weeds and tall grasses to a maximum height of 50cm. <ul style="list-style-type: none"> • Plant fire resistant trees and shrubs; • Ensure only evergreen species are planted; and • Landscaped vegetation within building setback zones should be of a low fire hazard. Rainforest species local to the area and fire resistant species are preferred.
<p>Access</p>	<p>Access to the building envelope</p>	<ul style="list-style-type: none"> • Driveways are to be kept in a condition suitable for 2 wheel drive heavy vehicles; • Fire trails are to be kept in a condition suitable for 4 wheel drive vehicles and to the satisfaction of the fire Brigade; • Design building layouts so that the size and shape allows for efficient emergency access to buildings for firefighting appliances; and • Locate fire/maintenance trails as close as possible to the boundaries of the lot and the adjoining bushland hazard, and the fire/maintenance trails will: <ul style="list-style-type: none"> ○ have a minimum cleared width of 6 metres; ○ have vehicular access at each end; and ○ be provided with passing bays and turning areas for fire-fighting appliances;
<p>Public Safety</p>	<p>Bushfire Safety Plan</p>	<ul style="list-style-type: none"> • Owners should establish a Fire Safety Plan and Emergency Procedures for the event of fire; • All occupants are made aware of the Fire Safety Plan and Emergency Procedures; and • Establish a fire safety and evacuation plan that includes: <ul style="list-style-type: none"> ○ alternative evacuation routes; ○ early notification to all residents of fires in the area; and

Category	Issue	Action
		o in the event of fire, all residences in the hazard zones are checked for people (where it is safe to do so).

3. Appendix

A H Klerkx
Consulting surveyor

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 Emu Park, Qld. 4710
 Telephone: 07 49 388 344
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OWNER

PEARLARM PTY LTD

PROJECT
Fairfield Estate
 PROPOSED SUBDIVISION - Stage 2
14 STANDARD LOTS

DATE: 26 July 11
 AMENDMENT: Added contours prior to rock fill

REAL PROPERTY DESCRIPTION

Lot No. : 2
 Plan : SP163918
 Orig Por : 661
 Parish : Murchison
 County : Livingstone
 L.A. : Rockhampton R C

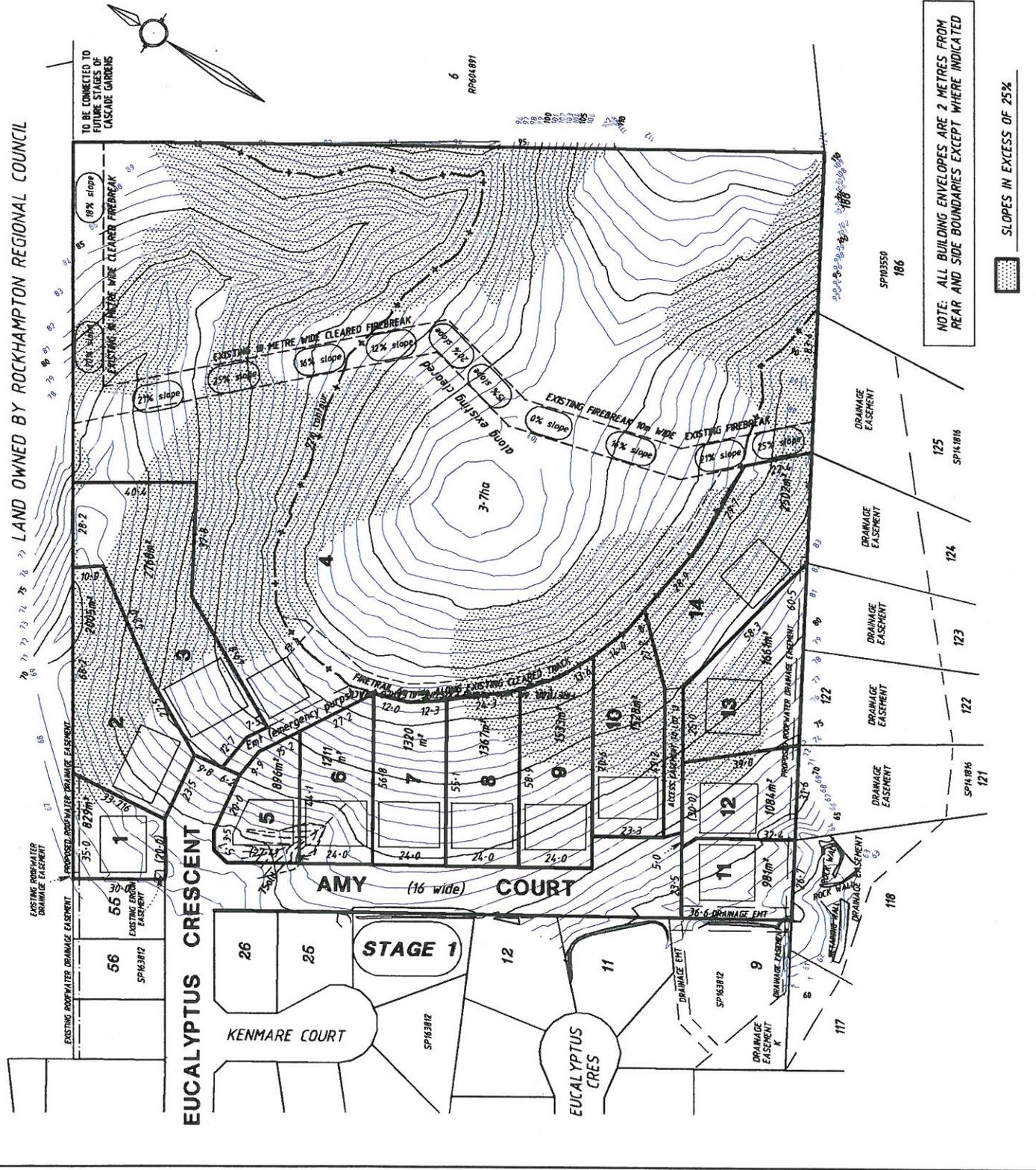
HORIZ Cadastrol
 VERT AHD
 DATUM 1-metre Contours

SCALE **1:1250**
 AT SHEET SIZE A3

Designed : A H Klerkx
 Consulting Surveyor

Date : 12 August 2011
 Drawn : A K

DRAWING NUMBER
NR9010B



NOTE: ALL BUILDING ENVELOPES ARE 2 METRES FROM REAR AND SIDE BOUNDARIES EXCEPT WHERE INDICATED

SLOPES IN EXCESS OF 25%

A H Klerkx Consulting surveyor

13 Tanby Point Close
Emu Park, Qld. 4710

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OWNER

PEARLARM PTY LTD

PROJECT

Fairfield Estate
PROPOSED SUBDIVISION—Stage 2
**BUILDING ENVELOPE
PLAN**

DATE

26 July 11 AMENDMENT
Added contours prior to rock fill

REAL PROPERTY DESCRIPTION

Lot No. : 2
Plan : SP163918
Orig Por : 661
Parish : Murchison
County : Livingstone
L.A. : Rockhampton R C

HORIZ Cadastrol

VERT AHD

1-metre Contours

SCALE **1:1250**

AT SHEET
SIZE A3

Designed : A H Klerkx
Consulting Surveyor

Date : 12 August 2011

Drawn : A K

DRAWING NUMBER

NR9010BBT

LAND OWNED BY ROCKHAMPTON REGIONAL COUNCIL

TO BE CONNECTED TO
FUTURE STAGES OF
CASCADE GARDENS

EXISTING 10 METRE WIDE CLEARED FIREBREAK

EXISTING 10 METRE WIDE CLEARED FIREBREAK

PAVED DRIVEWAY

EXISTING FIREBREAK 10m WIDE

EXISTING FIREBREAK

DENSELY TIMBERED WITH IRONBARK
AND SCRUBBY REGROWTH

186

SP103550

186

125

124

123

122

121

118

117

EXISTING ROOFWATER DRAINAGE EASEMENT

PROPOSED ROOFWATER DRAINAGE EASEMENT

EXISTING EROSION EASEMENT

PROPOSED EROSION EASEMENT

EXISTING ROOFWATER DRAINAGE EASEMENT

PROPOSED ROOFWATER DRAINAGE EASEMENT

STAGE 1

KENMARE COURT

AMY (16 wide) COURT

EUCALYPTUS CRES

EUCALYPTUS CRESCENT

EXISTING ROOFWATER DRAINAGE EASEMENT

PROPOSED ROOFWATER DRAINAGE EASEMENT

EXISTING ROOFWATER DRAINAGE EASEMENT

PROPOSED ROOFWATER DRAINAGE EASEMENT

EXISTING ROOFWATER DRAINAGE EASEMENT

PROPOSED ROOFWATER DRAINAGE EASEMENT

SP163912

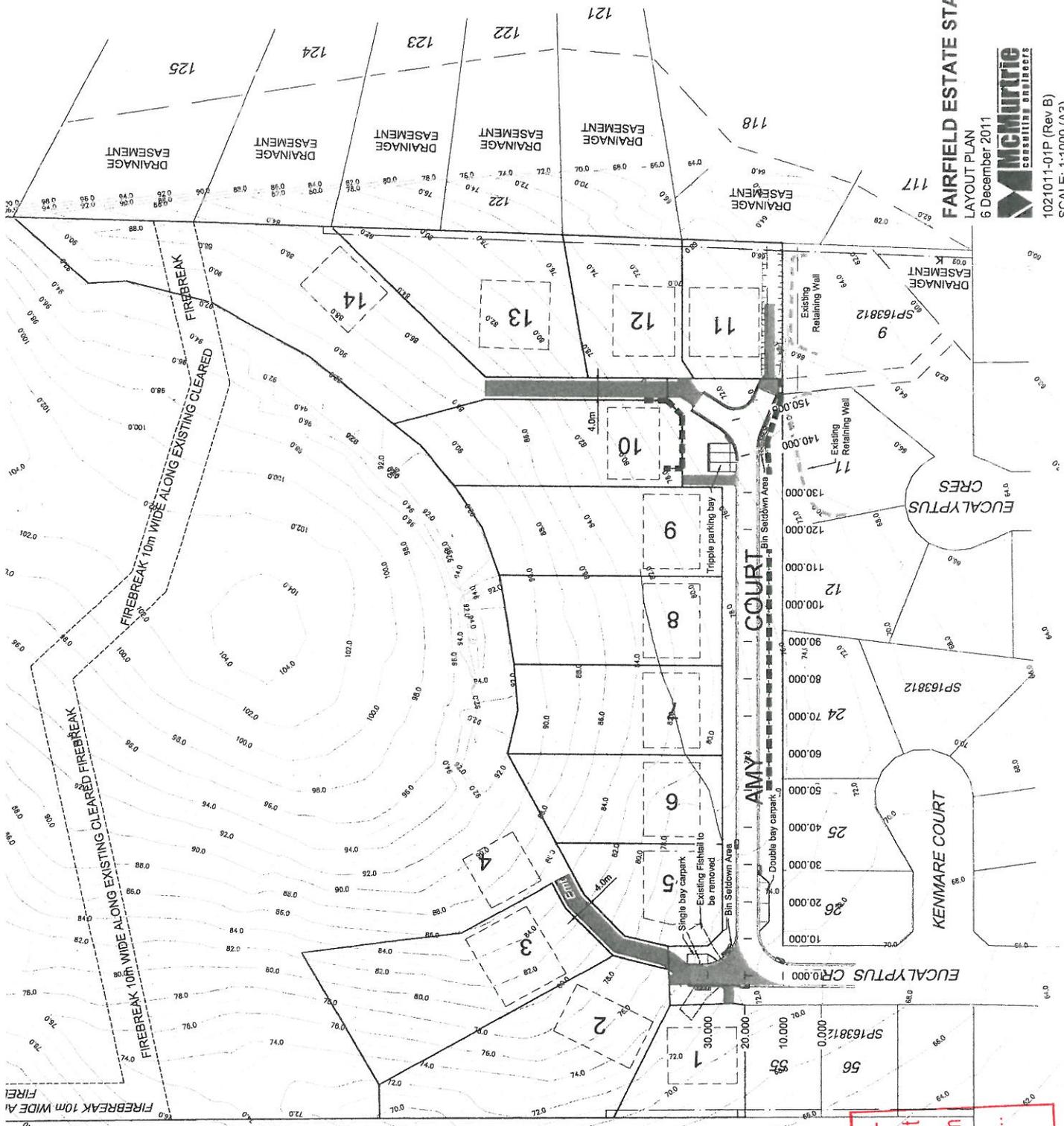
EXISTING ROOFWATER DRAINAGE EASEMENT

PROPOSED ROOFWATER DRAINAGE EASEMENT

EXISTING ROOFWATER DRAINAGE EASEMENT

PROPOSED ROOFWATER DRAIN

LAND OWNED BY ROCKHAMPTON REC



Legend:

Retaining Wall: [dashed line symbol]

ROCKHAMPTON REGIONAL COUNCIL
 These plans are approved subject to the current
 conditions of approval associated with
 Development Permit No. **D/280-2011**
 Dated **24/7/12**

FAIRFIELD ESTATE STAGE 2
LAYOUT PLAN
6 December 2011



1021011-01P (Rev B)
SCALE: 1:1000 (A3)

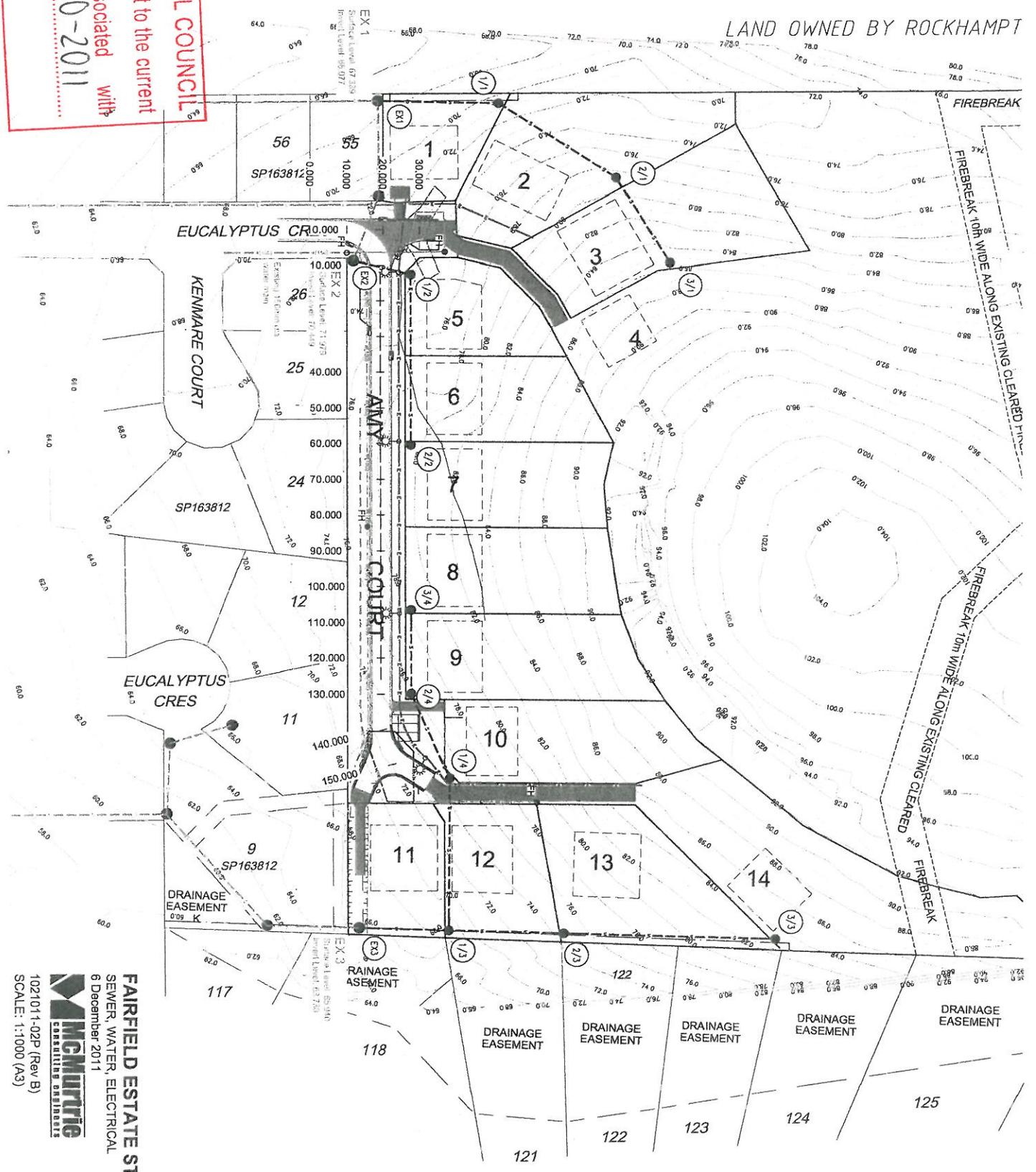
ROCKHAMPTON REGIONAL COUNCIL

These plans are approved subject to the current conditions of approval associated with Development Permit No. D1280-2011

Dated 24/7/12



LAND OWNED BY ROCKHAMPT



FAIRFIELD ESTATE STAGE 2
SEWER, WATER, ELECTRICAL
6 December 2011

McMURRIE
CONSULTING ENGINEERS

1021011-02P (Rev B)
SCALE: 1:1000 (A3)

Proposed Residential Subdivision

**Fairfield Estate Stage 2
Site-Based Stormwater
Management Plan**

**For Reconfiguration of a Lot Application
Lot 2 on SP163918
On Eucalyptus Crescent, Norman Gardens**

ROCKHAMPTON REGIONAL COUNCIL
These plans are approved subject to the current
conditions of approval associated with
Development Permit No. D/280-2011
Dated 24/7/12



1021011 Rev A

December 2011

Fairfield Estate Stage 2

Site-Based Stormwater Management Plan

A component of Reconfiguration of a Lot Application

On Eucalyptus Crescent, Norman Gardens

Submission to:

Rockhampton Regional Council
PO Box 1860
Rockhampton, Qld 4700

Prepared by:

McMurtrie Consulting Engineers
63 Charles St
North Rockhampton, Qld 4701

Rev.	Description	Sig.	Date
A	Submitted for Approval	MWW	06.12.11
Revisions			

Authorised:



.....
Ian McMurtrie
RPEQ 1347
For McMurtrie Consulting Engineers.

Proposed Residential Development – Site-Based Stormwater Management Plan

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1.0 INTRODUCTION

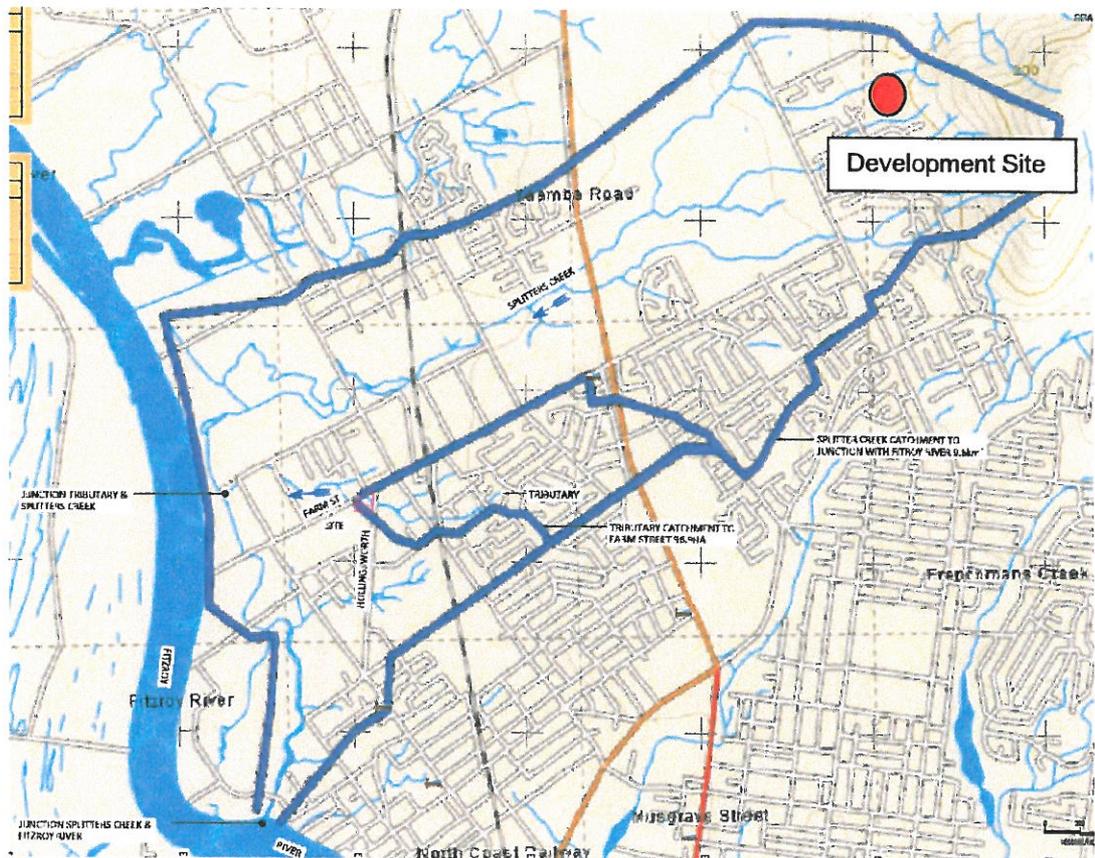
This report has been prepared to address the issues of stormwater runoff, sediment and water quality, as a component of a development application for Reconfiguration of a Lot Approval for Fairfield Estate Stage 2 on Eucalyptus Crescent Norman Gardens.

2.0 PROPOSED DEVELOPMENT: CATCHMENT AREAS

The proposed development is located at the most upstream end of the Splitters Creek catchment

Catchment areas relevant to this report are as follows:

- 1) Splitters Creek Catchment: 985 Hectares
- 2) Local development Catchment: 2.61 Hectares (0.26% of 1)



Pre and post development overview photography identifying the surrounding residential development is provided below.



Image A: Pre Development Site



Image B: Post Development Site

3.0 KEY RESOURCE DOCUMENTS

The preparation of this stormwater quality analysis is based on best management practices and the water quality objectives of the following reference documents:

- 1) *State Planning Policy 4/10 Healthy Waters. (QLD)*
- 2) *Urban Stormwater Quality Planning Guidelines 2010. (QLD)*
- 3) *Environmental Protection (Water) Policy 2009: Schedule 1, Fitzroy River Sub-basin Environmental Values and Water Quality Objectives. (QLD)*
- 4) *Queensland Water Quality Guidelines 2009 (QLD)*

4.0 STORMWATER QUALITY ANALYSIS

The following outlines the steps in managing the stormwater discharge quality control for the proposed development:

- | | |
|-------------------------------|--|
| Step 1: Risk Category | Identify the environmental values and constraints of the subject site:

The ultimate development is considered very low risk because it is small development size and significant distance from the closest formal watercourse. |
| Step 2: Pollutant Type | Identify the relevant exposure to pollutants:

The target stormwater pollutants are litter, and high sediment and nutrient loading (total nitrogen, total phosphorus). Stormwater from urban development's can potentially carry low concentrations and loads of petroleum hydrocarbons, surfactants, heavy metals and residues of pesticides and herbicides that also need to be controlled. |

- Step 3: Quality Objectives: Identify the relevant water quality objectives:**
Stormwater Quality Objectives have been detailed in Section 4.1 below.
- Step 4: Mitigation Adopt stormwater mitigation measures suitable for controlling quality of discharge in accordance with standards:**
Proposed Mitigation Measures are detailed in Section 5.2 below.
- Step 5: Detailed Design: Prepare pollutant export model using stormwater quality modeling software (MUSIC):**
MUSIC modeling has been completed to demonstrate that selected management practices will mitigate pollutant runoff. Detail summary of calculation output is provided in the following sections.
- Step 6: Construction:** During the construction phase it is essential that the site is managed to control erosion from the development area, particularly in association with clearing of surface cover and soil disturbance. Steps to control erosion during the construction phase will be addressed during the Operational Works Application in a Site Based Management Plan specific to the development. The plan will identify control measures such as:
- Phased or staged clearing/soil disturbance to coincide with dry periods (i.e. construction during the dry season);
 - Temporary cover on high erosion risk areas and rapid establishment of grass cover after soil disturbance;

- Contour bunds upstream of soil disturbance;
- Silt fences downstream of soil disturbance;
- Check dams and sediment traps at discharge points from the silt fences.

Step 7: Maintenance

Adopted stormwater quality mitigation measures will require maintenance to remove litter and sediment, manage vegetation growth in the swales and control invasive weeds. Responsibility of these assets will ultimately be transferred to the Regional Council, in conjunction with other assets at handover.

4.1 QUALITY INPUT DATA:

A preliminary analysis of stormwater discharges for the proposed development was performed using MUSIC (Model for Urban Stormwater Improvement Conceptualisation) to evaluate how the development might influence receiving waters, with specific reference to loads and concentrations of suspended solids, total nitrogen, total phosphorus and gross pollutants entering upstream in the Splitters Creek catchment. This assessment included identification of the existing (ambient) conditions, and identification of the post construction control values in accordance with the relevant Standards.

Ambient water quality condition has been obtained from Schedule 1 of the Environmental Protection (Water) Policy: Fitzroy river Sub-basin Environmental Values and Water Quality Objectives. These objectives are outlined as per the tables below.

Water area/type (refer plans WQ1305, WQ1310)	Management intent (level of protection)	Water quality objectives to protect aquatic ecosystem Ev ¹⁻¹¹
Surface fresh waters (refer plan WQ1305)		
Waters in areas: HEV m2081-2100, HEV m2113	Aquatic ecosystem— high ecological value	Maintain existing water quality (20th, 50th and 80th percentiles), habitat, biota, flow and riparian areas. Note: there is insufficient information available to establish current water quality for these waters. Refer to QWQG for details on how to establish a minimum water quality data set for deriving local 20th, 50th and 80th percentiles.
Waters in areas: HEV a2081-2085	Aquatic ecosystem— high ecological value	Achieve effectively unmodified water quality (20th, 50th and 80th percentiles of HEV waters), habitat, biota, flow and riparian areas. Note: there is insufficient information available to establish effectively unmodified water quality for these waters. Refer to QWQG for details on how to establish a minimum water quality data set for deriving local 20th, 50th and 80th percentiles.
Fitzroy River Sub-basin fresh waters:	Aquatic ecosystem— moderately disturbed	<ul style="list-style-type: none"> • ammonia N: <20 µg/L^a • oxidized N: <60 µg/L^a • organic N: <420 µg/L^a • total nitrogen: <500 µg/L^a • filterable reactive phosphorus (FRP): <20 µg/L^a • total phosphorus: <50 µg/L^a • chlorophyll a: <5.0 µg/L^a • dissolved oxygen: 85%-110% saturation^a • turbidity: <50 NTU^a • suspended solids: <85 mg/L^b • pH: 6.5-8.5^b • conductivity (EC) baseflow: <445 µS/cm^b • conductivity (EC) high flow: <250 µS/cm^b • sulfate: <15 mg/L^b • Macroinvertebrates^c: <ul style="list-style-type: none"> - Taxa richness (composite): 12-21 - Taxa richness (edge habitat): 23-33 - PET taxa richness (composite): 2-5 - PET taxa richness (edge habitat): 2-5 - SIGNAL index (composite): 3.33-3.85 - SIGNAL index (edge habitat): 3.31-4.20 - % tolerant taxa (composite): 25-50% - % tolerant taxa (edge habitat): 44-56%

Source: Table 2: Fitzroy River Sub-basin Environmental Values and Water Quality Objectives

In addition to the ambient water quality variables described above, quality control values for achieving stormwater discharge objectives stated in *Table 8.2.2 of the Queensland Water Quality Guidelines 2009: Section 8 Guidelines for Urban Stormwater* are recognized below:

Region (See Figure 2.5 of Urban Stormwater—Qld BPEM Guidelines 2009)	Minimum* reductions in mean annual loads from unmitigated development (%)			
	Suspended solids (TSS)	Total phosphorus (TP)	Total nitrogen (TN)	Gross pollutants > 5 mm
Eastern Cape York	75	60	35	90
Central and Western Cape York (north)	75	60	40	90
Central and Western Cape York (south)	80	65	40	90
Wet Tropics	80	65	40	90
Dry Tropics	80	65	40	90
Central Coast (north)	75	60	35	90
Central Coast (south)	85	70	45	90
South-east Queensland	80	60	45	90
Western districts	85	70	45	90

Source: Queensland Water Quality Guidelines 2009

Local rainfall data has been collected from the following data source:

Rockhampton Aero (Station ID 039083)

Recorded from 1 January 2005 to 31 March 2010

MUSIC modeling has been completed using a 6 minute timestep

4.2 AVAILABLE STORMWATER MITIGATION MEASURES

The proposed subdivisional layout has been designed to connect to the existing Stage 1 treatment train and to incorporate stormwater quality improvement devices established during previous stage construction.

Several stormwater mitigation measures can be implemented to reduce both the quantity of stormwater runoff and the export load of pollutants from the ultimate development. Measures that are potentially applicable include:

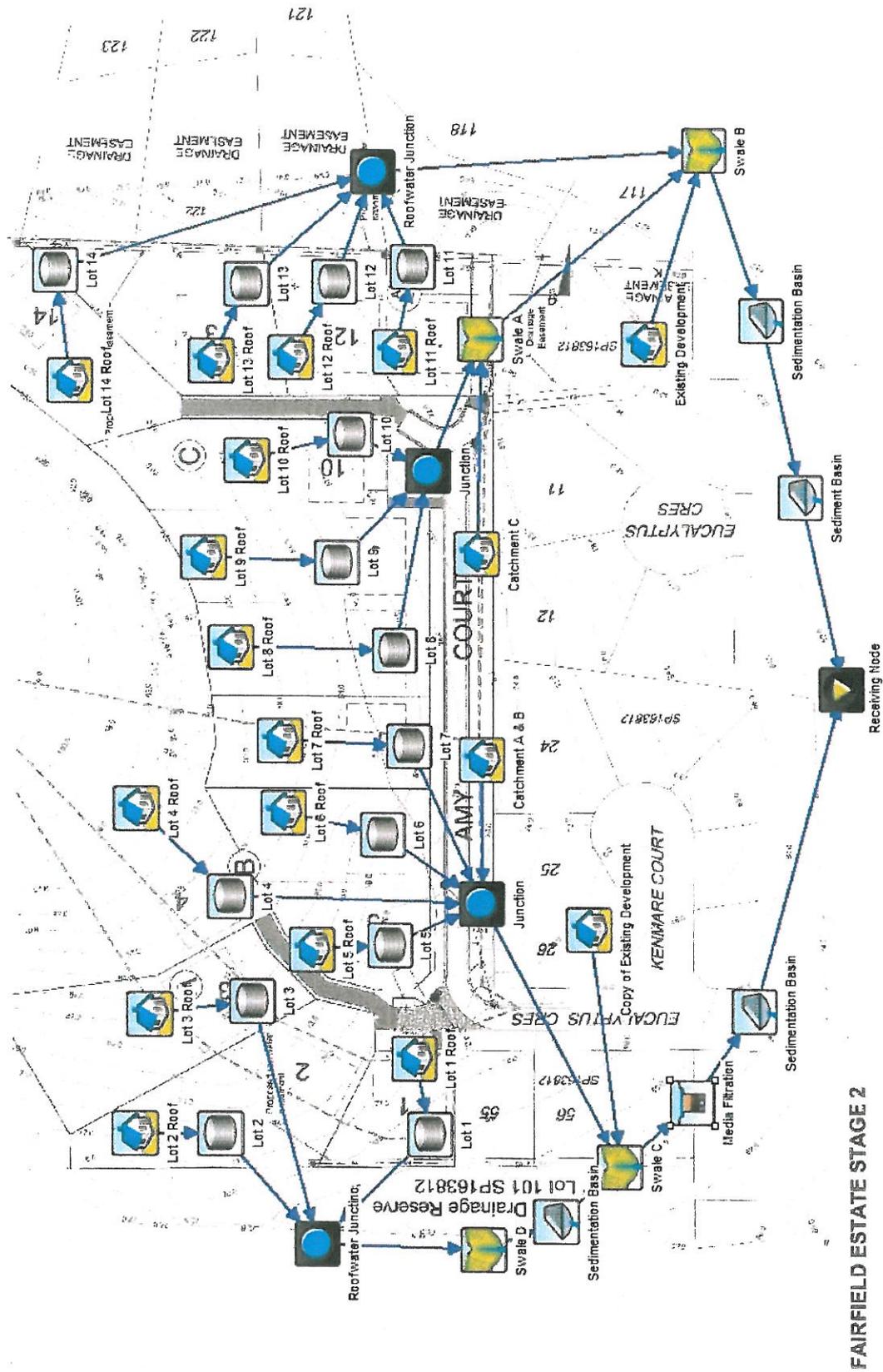
1. Source controls designed to prevent the entrainment of pollutants in stormwater generated at the pollutant source. These include 'soft' controls (public awareness, campaigns, restrictions on pesticide use etc), erosion controls, street cleaning and litter collection;

2. Runoff reduction controls that lower the volume and peak discharge of stormwater flows. These reduce the potential for off-site transfer of pollutants, and lessen the risk of downstream erosion. Structures include stormwater recycling systems such as rainwater tanks;
3. Infiltration controls that provide treatment and dispersal methods that allow filtration of stormwater through porous soils such as bio-retention basins and trenches;
4. Pollution interception controls that physically intercept and retain stormwater pollutants. Structures may include filter traps, gross pollutant traps, and constructed wetlands and grassed swales.
5. Trash racks that remove large objects and litter (plastic, bottles, cans and leaves);

4.3 THE PROPOSED TREATMENT TRAIN

The completed MUSIC assessment confirms that quality controls established during previous Stage 1 development demonstrate compliance with the desired water quality objectives. During inspection of the downstream catchment it was observed that these previously constructed SQUIDs may be needing maintenance. It is proposed that the existing SQUIDs will be rehabilitated during proposed construction. Refer Appendix A for detail of existing downstream quality controls.

Screen image from MUSIC providing concept for proposed treatment train system is detailed in the image below:



FAIRFIELD ESTATE STAGE 2

4.3.1 Rainwater Tanks

The installation of rainwater tanks in urban houses is considered current best practice in water sensitive urban design. Tanks allow households to conserve water, and provide some capacity for the additional discharge generated by increased roof areas to be absorbed.

For the proposed design, it was assumed that a 5 kL tank would be installed in each of the lots in the development. It is also assumed that the daily reuse of this stored water would be 150 L/day. Therefore based on 14 houses the daily usage rate would be approximately 2.1 kL/day for the overall development.

4.3.2 Vegetated or Grass Swales

The efficiencies of vegetated or grass swales are predictable and outcomes have been calculated through MUSIC modeling. The existing swales are located and dimensioned in Appendix A.



Photo Image: Existing grassed swale at northern end of the development.



Photo Image: Existing grass swale at southern end of the development.

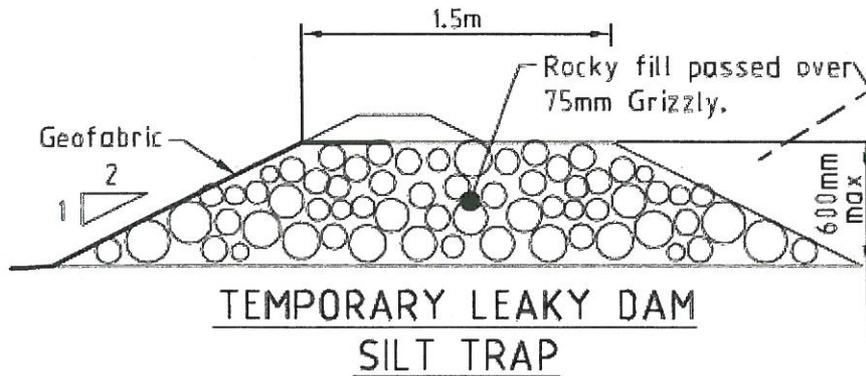
4.3.3 Sedimentation / Bio-retention Basins

Existing sedimentation basins are located directly upstream of each of the box culverts under Springfield Drive. These structures were constructed as part of Stage 1 works and will be maintained for the current subdivisional development.



Photo Image: Existing upstream rock protection including sedimentation basin

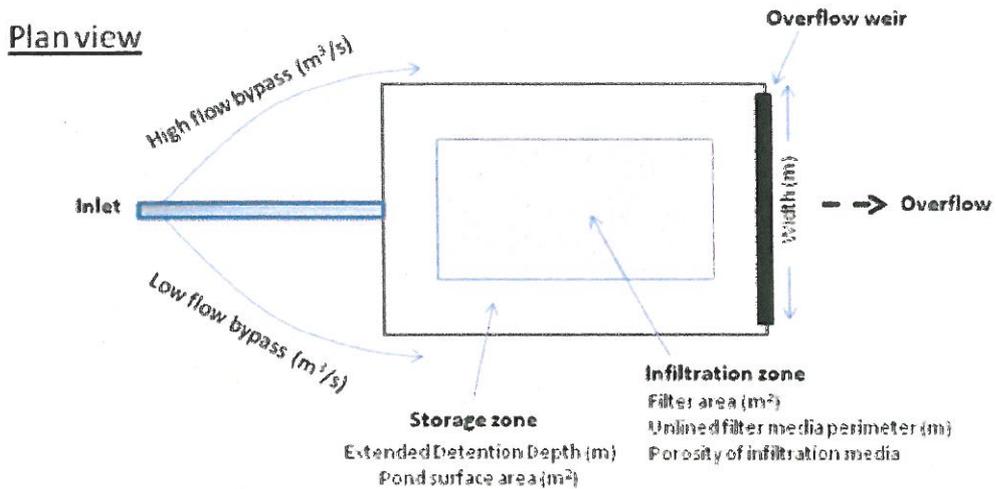
Sedimentation basins were also constructed during Stage 1 works as Leaky Dams. Refer image provided below and Appendix B for detail on Graham Scott & Associates drawing 040356/29 Rev C .



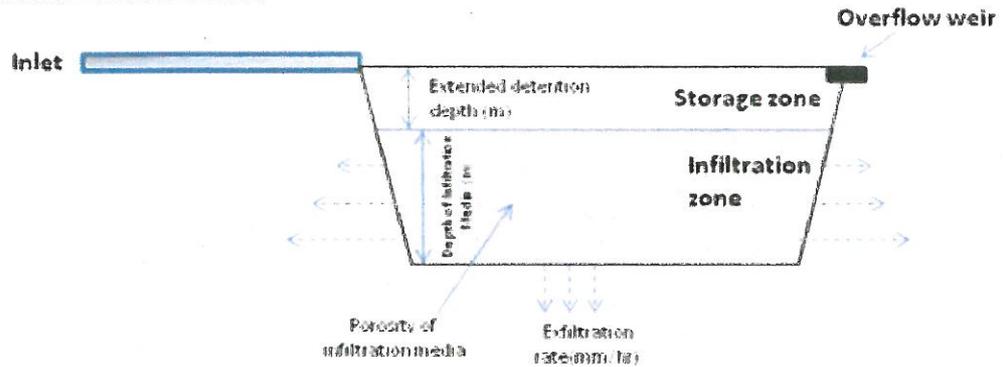
It is proposed to reinstate this structure as part of the proposed sub divisional construction.

4.3.4 Infiltration System

An existing infiltration system is located within the grassed swale at the northern end of the development. This control was constructed as part of previous development however will be fully rehabilitated as part of the proposed subdivisional development. A concept diagram of the infiltration system properties is detailed below:



Longitudinal section



Proposed Infiltration System Properties:

- Length: 5.0m
- Width: 1.0m
- Depth: 1.0m
- Exfiltration Rate: 30mm/hr (Sandy Clay)

5.0 RESULTANT DISCHARGE QUALITY

The proposed treatment train has been modeled using MUSIC software. Stormwater discharge quality has been suitably assessed as follows:

	Sources	Residual Load	% Reduction
Flow (ML/yr)	21.2	5.94	71.9
Peak Flow (m3/s)	0.994	2.61	-162.2
Total Suspended Solids (kg/yr)	3.50E3	230	93.3
Total Phosphorus (kg/yr)	7.91	1.07	86.5
Total Nitrogen (kg/yr)	57.6	13.6	76.4
Gross Pollutants (kg/yr)	562	0.00	100.0

The proposed development will integrate an effective stormwater treatment train that will provide quality control in accordance with current standards, and provide an example of best practice in stormwater design.

6.0 APPENDIX

Appendix A: Stormwater Quality Plan

Appendix B: Fairfield Estate Stage 1: Engineering Drawings

Appendix A: Stormwater Quality Plan



LAND OWNED

Proposed Stage 2
Development

Existing Stage 1
Development



**Appendix B: Fairfield Estate Stage 1
Engineering Plans**



Graham Scott & Associates Pty. Ltd.
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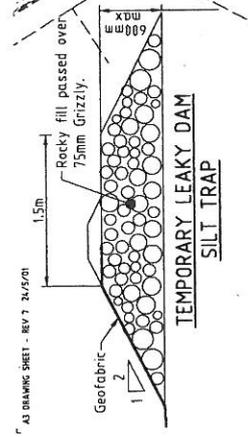
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- LEGEND**
- Silt Fences
Location of fences to be confirmed onsite by the engineer.
 - Temporary silt trap
400mm deep (typ.)

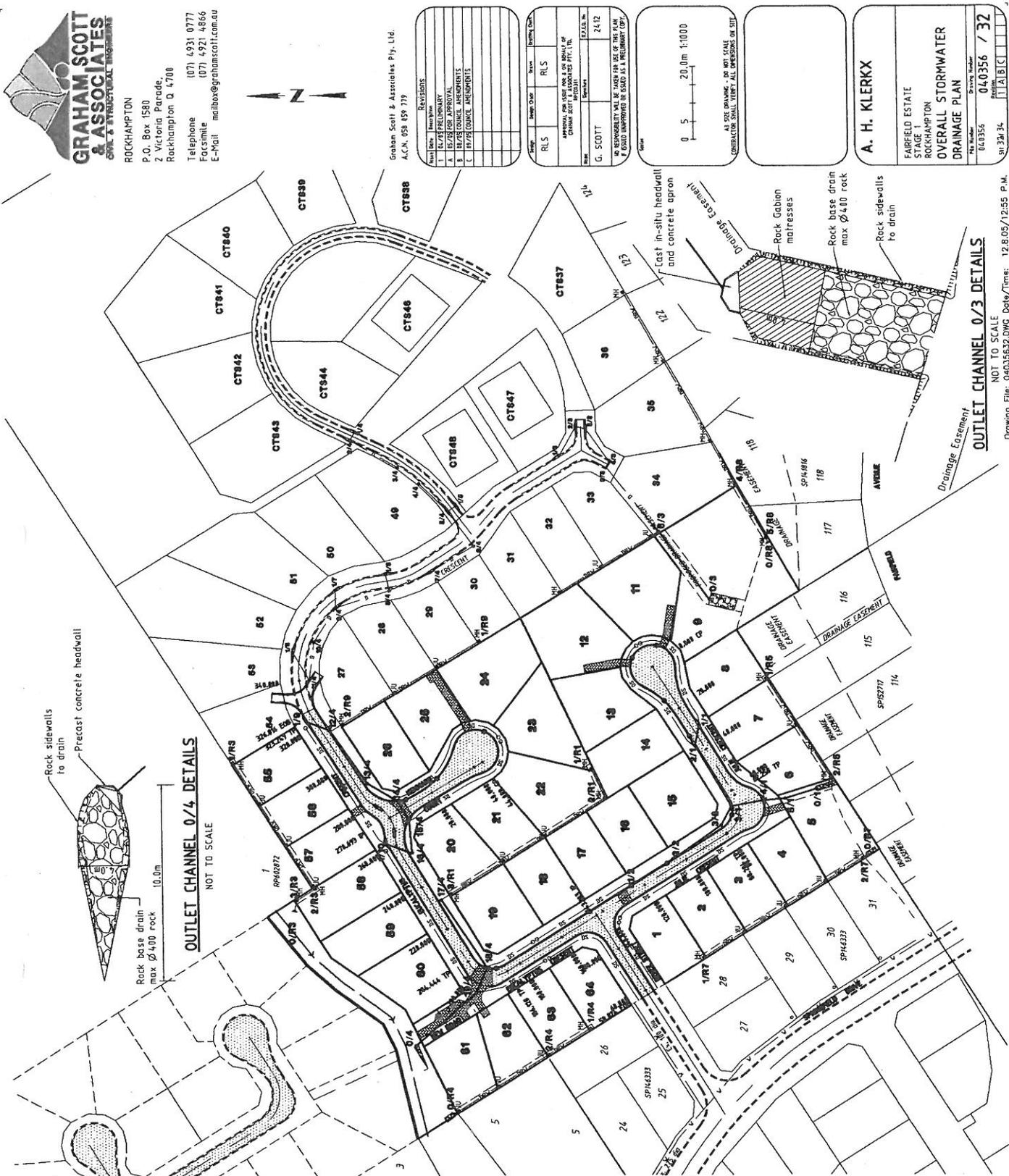
- NOTES**
- Typical Erosion Control measures to remain in place until construction is completed and vegetation established.
 - Refer to C.M.D.G. Standard Drawings for Construction Details.
 - All erosion control measures are to be confirmed onsite by the Engineer.
 - All soil erosion and sedimentation control measures to be checked, maintained and corrected where necessary, after rain events.
 - The entire construction site is to be a restricted area.
 - Material to be stockpiled on neighbouring land with silt fences to be accessed from the uphill side downstream side for erosion control.

NOTES

- All batters within lots to be 1 on 4, max.
- For details of Erosion Control measures refer Dwg 040356/29 & 30.
- All interlot drainage to be 150 dia stormwater uPVC unless noted otherwise.
(Min. grades: 150 dia = 1.0%, 225 dia = 0.5% and Min. cover: 450mm).
For interlot drainage pit & jumpup details refer CMDG SD-D-033 & GSA 310 dwg GSA-002
- All interlot drainage easements are 2.0m wide unless noted otherwise.
- All interlot drainage to be 0.75m offset from property boundary unless noted otherwise.
- Provide 1000dia sacked sliated uPVC stub pipe 3m long to upstream invert of pit/manhole.
- Karey Alloy Kerb Adaptors to be positioned 1.0m from downstream boundary.
- The contractor shall establish the extent and location of all existing services within or adjacent to the works area. All services shall be protected against accidental damage during construction of the works. The contractor shall be responsible for all costs incurred by damage to existing services
- Where work-abuts existing, all work shall be neat, smooth, workmanlike and to the Engineers Satisfaction.

LEGEND

- New Roadwork
- Stenciled concrete driveway
Refer Dwg 040356/03
- Kerb and Channel
Refer Dwg 040356/03
- Kerb inlet Pit
(Pit No./Line No.)
- 14/1 375 RCP Ex. Stormwater Manhole/Pipe Size
(Manhole No./Line No.)
- 3/1 375 RCP Stormwater Manhole/Pipe Size
(Manhole No./Line No.)
- MH
uPVC Inter-alignment Roofwater Drainage (Pipe Size)
- JU - Jump Up
MH - Roofwater Pit
- Roofwater Easement.
- Subsolt Drainage and cleannout
Refer Dwg 040356/02 & CMDG SD-D-040
- Approved roofwater kerb adaptor. (1 No.)



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Fairfield Estate

Stage 2

COVENANT

BUILDING AND DEVELOPMENT REQUIREMENTS

31 November - 2011

ROCKHAMPTON REGIONAL COUNCIL

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

Development Permit No. D/280-2011

Dated 24/7/12

ANNEXURE "A"

PLEASE READ THIS COVENANT REQUIREMENT CAREFULLY

As a resident of Fairfield Estate Stage 2, you will appreciate the assistance given by this covenant that forms part of your contract. The developer of Fairfield Estate Stage 2 will administer this covenant and answer any inquiries you may have.

The Estate offers quality of life, closeness to the University and a high standard of housing that will assist to make it a great place to live. To ensure that this standard is achieved and maintained and to secure your investment, all housing is protected by this document which sets out building and development requirements. These requirements protect your investment by ensuring that:

- houses are designed and built to achieve good designs and style, with colours that complement each other and the streetscape
- an attractive residential environment is achieved and maintained, and
- a standard of a landscaping of homes is established and satisfactorily maintained

The Covenant requirements offer peace of mind; you can invest in your allotment and home, secure in the knowledge that your neighbours are expected to meet the same requirement which protect both the built and landscaped environment of Fairfield Estate Stage 2.

- Please be sure your builder reads this covenant before the start of the construction of your home.

Special Conditions to Contract between

Pearlarm Pty Ltd (The Seller)
ABN 36 053 526 784 and

(The Buyer)

In respect of Lot on SP 163930

Parish of Murchison, County of Livingstone

Dated:

1. QUALITY ESTATE

The Buyer acknowledges and agrees with the Seller that the land is the final stage of a multi-stage development being developed by the Seller, the object of which is to establish an attractive residential area and it is desirable that supervision and control will be exercised by the Seller for the protection of the interest of the Buyer and all other owners for the time being in respect of the nature and type of construction to occur on the land and all other land within the development and in recognition of the desirability of the creation of an attractive development.

2. BUILDING LOCATION ENVELOPES

The Buyer acknowledges that any dwelling house or structure, outbuildings and garages are to be erected within the boundaries of a building envelope nominated for this allotment, in accordance with Building Envelope Plan NR9010BBT (dated 4th November 2011), a copy of which is attached to this Covenant, unless a variation is approved by Rockhampton Regional Council.

3. BUSHFIRE MANAGEMENT

The Buyer acknowledges that a **Bushfire Management Plan (BMP)** (version 4 dated 14 August 2011) and a **Property Vegetation Management Plan (PVMP)** (version 2 dated 5 September 2011) have been prepared for Fairfield Stage 2 by Denley Environmental Consultants Pty Ltd. The buyer acknowledges that he/she/they have been provided with a Bushfire Management compendium which, among other materials, includes a copy of the Bushfire Management Plan and a copy of the Property Vegetation Management Plan. The BMP and the PVMP may, among other considerations, impact your house design and fencing materials. Where there is any conflict between this Covenant and the Bushfire Management Plan or the Property Vegetation Management Plan, the Bushfire Management Plan and the Property Vegetation Management Plan shall take precedence.

3.1 Building Design Restrictions resulting from Australian Standard AS 3959-2009 (building standards for bushfire prone areas)

Section 2.5.1 of the Bushfire Management Plan states:

2.5.1 Dwellings Within 50m of a Natural Hazard

Dwellings within 50m of the natural hazard are expected to be subject to radiant heat, not direct flame.

Dwellings located wholly within 50m of the natural hazard are to be built to **Level 1** (AS3959-2009).

Dwellings having portions of the building within 50m of the natural hazard are to have those surfaces facing the hazard built to **Level 1** (AS3959-2009).

Note: The "Natural Hazard" is vegetation above the 92metre AHD contour and uncleared vegetation within allotments and adjoining the site.

Allotments may be impacted by **Level 1 (AS3959-2009)** restrictions as follows:

- a) Buildings within the Building Envelopes on **Lots 11 and 12** are not affected by Level 1 building restrictions.
- b) Buildings within the Building Envelopes on **Lots 1, 2, 5, 6, 8, 9, 10 and 13** are partly within 50 metres of the Natural Hazard and therefore buildings on those lots are to have those surfaces facing the hazard built to Level 1 (AS3959-2009).

Specifically, the following facades of buildings must be constructed to a Level 1 standard:

Lot 1: North western façade;

Lot 2: Northern façade;

Lots 5, 6, 8, 9, 10: Eastern façade;

Lot 13: Northern and Easter façade;

- c) Buildings within the Building Envelopes on Lots 3, 4, 7 and 14 are wholly within 50 metres of the Hazard and therefore buildings on those lots are to be fully built to a Level 1 (AS3959-2009) standard.

4. GEOTECHNICAL ASSESSMENT AND SLOPE STABILITY

The Buyer acknowledges that a Geotechnical Report and Stability Assessment have been prepared for Fairfield Estate Stage 2 by Soil Surveys Engineering Pty Ltd and that a copy of that Report has been provided to the buyer. The report contains recommendations in relation to house dwellings and structures to be built on the allotments. Where there is any conflict between this Covenant and the Geotechnical Report, The Geotechnical Report shall take precedence.

The report states that the Building Envelopes in Lots 1 to 12 are within the **Very Low Hazard** rated zone while the Building Envelopes on Lots 13 and 14 are rated **Low Hazard**.

Following are some (but not exhaustive) relevant extracts from the Report:

TABLE 3 **BUILDING COMMENTS**

Hazard Rating	Building Restrictions*
Very Low	No restrictions on cut and fills on site provided they are engineer designed and carried out in accordance with AS 3788-1988. Building construction methods will vary within zone with the use of normal residential type construction possible (ie. slab on ground) over most of the zone.
Low	No restrictions on cut and fills on site provided they are engineer designed and carried out in accordance with AS 3788-1988. Building construction methods will vary within zone with the use of normal residential type construction possible (ie. slab on ground) over most of the zone. The use of a more flexible construction may be required near the edges of the zone.

“Based on the field observations, published hazard mapping and subsurface conditions encountered by the test pits from the geotechnical study at this site, it is concluded that the proposed subdivision development including the future construction of residential buildings, would not adversely affect the slope stability conditions at this site.”

It further states that:

“Prior to house construction, a site specific investigation should also be carried out for each individual house site taking into account not only foundation requirements but also stability considerations for each specific development proposal, particularly within the moderately to steeply sloping portions of the site.”

The Buyer acknowledges that for lots 13 and 14, slab on ground is not permitted for houses and house types must consist of suspended timber floors founded on piers and/or posts. Pole houses are permitted on Lots 13 and 14.

Buyers of Lots 1-12 are encouraged to adopt as far as practicable the recommendations of the Geotechnical Report and to be incorporate them into house design. The final approval of building design will rest with Rockhampton Regional Council at the time of lodgement of a building application.

Following is an extract from the Geotechnical Report outlining Hazard Mitigation and Recommendations. In addition to the above specific requirements for some lots all buyers agree, where applicable, to adhere to the recommendations.

7.0 HAZARD MITIGATION & RECOMMENDATIONS

7.1 General

In order to preserve the stable condition of this site, it is considered essential that good hillside engineering construction practice be employed during development of the proposed allotments and associated access roads particularly where located on sloping land. The notes and illustrations attached in Appendix 'I' of this report outline some typical hillside construction guidelines including, earthworks, erosion control and drainage practices for hillside areas which should be taken into account as applicable.

In order to ensure long-term stability of the site upon development, the restrictions/precautions included in the following sections should also be taken into account.

7.2 Subdivisional Earthworks

The proposed subdivisional earthworks are understood to consist of the following:-

- Cuts of less than 1.0m in Lots 6 to 9.
- Fills of up to 1.8m along the south-western boundary.

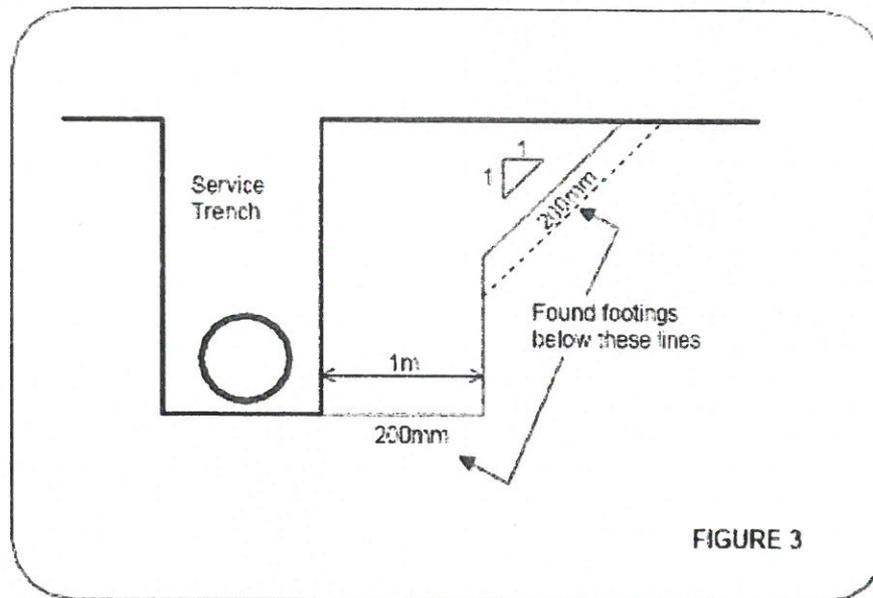
Procedures

Earthwork procedures should be carried out in a responsible manner in accordance with AS 3798-1996 'Guidelines on Earthworks for Commercial and Residential Developments'. It is recommended that the earthworks contractor make himself familiar with site conditions. Of particular note is the removal of existing fill material, eg. boulders in the depression in Lots 5 and 6.

Underground Services

Where footings are located adjacent to underground services, the footings (including retaining walls) should extend to base a minimum of 200mm below the trench base level for a distance of 1.0m out from the trench. Beyond 1.0m the footings should be taken a minimum of 200mm below an imaginary line drawn up at 45° from the trench base level (Figure 3). Notwithstanding the above comments, all temporary support must consider the site conditions and natural foundations at the time of construction.

These requirements do not override minimum footing levels.



Excavatability Comments

Based on geotechnical knowledge of excavations/earthworks on projects in the local area and the findings of the investigation, the following comments can be made on excavation characteristics:-

- Bulk Works
 - Excavation by a medium size to large excavator using a bucket of the soil and upper 500mm, or so, of the weathered rock is expected to be possible.
 - Excavation further into the weathered rock may be possible using a single tyne ripper on an excavator.
 - Below these levels, a medium to large excavator using hydraulic rock hammers will be required.
- Trenching
 - Trench excavations in the soils and upper 500mm, or so, of the weathered rock should be within the capacity of a medium size backhoe or small excavator.
 - Below these levels a larger excavator would be required for excavation further into the weathered rock.
 - In areas of shallower, stronger rock, specialised tools, eg. rock breakers, may be required.

Ripping depths can be significantly increased when the rock is bedded, laminated and highly jointed. The nature of the rock and inherent planes of weakness (clay and quartz seams) therefore play an important part in rock excavation assessment as well as logistical factors such as the manoeuvrability of the excavation plant to take advantage of (any) favourable discontinuities in the rock.

7.3 Recommendations with Respect to Construction

7.3.1 General Requirements for Development of Residential Lots

Continued long term stability of the site as well as of each allotment within the proposed development is subject to development of the site and each individual allotment within the site, taking place in accordance with the guidelines of this report and relevant Australian Standards and good building practices.

Based on the field observations, published hazard mapping and subsurface conditions encountered by the test pits from the geotechnical study at this site, it is concluded that the proposed subdivision development including the future construction of residential buildings, would not adversely effect the slope stability conditions at this site. This conclusion is qualified by the following provisos:

- The subdivisional works should be designed and constructed in accordance with sound and proper engineering principles.
- All cuts and fills are designed, supervised and certified by a suitably qualified engineer.
- Likewise, the future buildings to be constructed on the Lots should be planned designed and constructed in accordance with sound and proper engineering principles, and more specifically in accordance with good hillside construction practices (refer Appendix I).
- All construction works to be carried out in accordance with the recommendations of this report.
- All sites which contain areas of moderate Hazard ratings are to be subject to a further site specific stability assessment to confirm that the proposed development complies with the recommendations of this report and good engineering practice.
- All buildings that are to be constructed within an area that extends 20m above and 50m below any zone designated as moderate to also be subject to a further site specific stability assessment to confirm that the proposed development complies with the recommendations of this report and good engineering practice.

- The access and drainage infrastructure must be properly and effectively maintained, to ensure that all stormwater is intercepted and controlled. This requirement extends to each individual Lot, so that all owners and occupiers remain aware that ongoing maintenance of the site drainage is essential for continued site stability.

Prior to house construction a site specific investigation should also be carried out for each individual house site taking into account not only foundation requirements but also stability considerations for each specific development proposal particularly within the moderately to steeply sloping portions of the site.

The following recommendations should be adopted :-

- All engineering works should follow the appropriate codes i.e.
 - Earthworks - AS.3798-1996 'Guidelines on Earthworks for Commercial and Residential Developments'. Further general recommendations are provided in Section 7.3.1.
 - Footings for buildings - AS.2870 'Residential Slabs and Footings'.
 - Retaining structures - AS4678 'Earth Retaining Structures'.
 - Road pavements - AS3727 'Guide to Residential Pavements' or Local Council Requirements.
- Vegetation - where possible the prompt re-establishment of ground cover should be undertaken to reduce the risk of surface scour during and following rainfall. Where not possible, other forms of surface protection should be adopted.
- All filling works should be undertaken under Level 1 type supervision with particular reference to Section 2 (i) and 2 (j) of AS3798-1996.
- Gully filling - Any earthworks carried out in the existing gullies should take into consideration potential flows and their effect on surface scour. The effect of these earthworks should be to reduce the velocity of any water flow and collect seepage and overland flow into an engineer designed system to minimise any impact of the proposed fill and existing natural slopes.

7.3.2 Construction and Earthworks

Comments with respect to restrictions on construction for each hazard rating are outlined in Table 3.

TABLE 3 BUILDING COMMENTS

Hazard Rating	Building Restrictions
Very Low	No restrictions on cut and fills on site provided they are engineer designed and carried out in accordance with AS 3796-1993. Building construction methods will vary within zone with the use of normal residential type construction possible (ie. slab on ground) over most of the zone.
Low	No restrictions on cut and fills on site provided they are engineer designed and carried out in accordance with AS 3796-1993. Building construction methods will vary within zone with the use of normal residential type construction possible (ie. slab on ground) over most of the zone. The use of a more flexible construction may be required near the edges of the zone.
Moderate	Maximum cuts are restricted to 2.0m and fill heights are restricted to 1.0m and should be engineer designed and carried out in accordance with AS 3796-1996. Building construction methods will vary within zone. The use of normal residential type construction (ie. slab on ground) may be possible depending on cut and fill requirements and size of slab. However, the use of a more flexible construction is preferred for the majority of the zone.

7.4 House Types

It is recommended that in areas with slopes of 15 degrees or steeper, house types should consist of lightweight, flexible construction with suspended timber floors founded on piers and posts. Slab on ground construction is not recommended on these slopes other than for small structures such as garages, subject to detailed evaluation by an experienced geotechnical engineer.

In areas with slopes between 8 to 15 degrees, preference should also be given to non-slab on ground construction unless the ground slabs are stepped down the slope.

Where ground slopes are less than 8 degrees, slab on ground construction may be adopted.

7.5 Drainage

Appropriate drainage provisions are essential in any development. Adequate subsoil and surface drainage should also be incorporated in the driveway construction, as well as any retaining wall construction and service lines. Further specific comments can be provided once a site layout has been finalised.

Roofwater should not be discharged on the allotments, particularly on sloping sites but should be taken via piped conduits to the road drainage system, to a piped interlot drainage system or to water storage tanks. Any overflow from water storage tanks should be piped to the road drainage system or interlot drains.

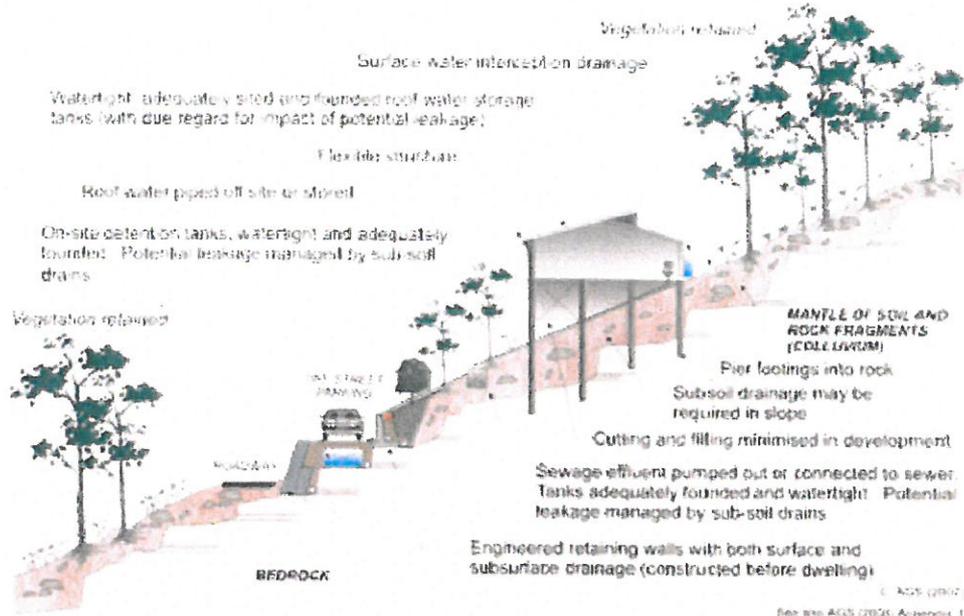
Concentrated water discharge should be dispersed over a wide zone to prevent possible confluence which may cause erosion and scour or trigger possible mass movement.

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

HILLSIDE CONSTRUCTION PRACTICE

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

EXAMPLES OF GOOD HILLSIDE CONSTRUCTION PRACTICE



WHY ARE THESE PRACTICES GOOD?

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

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

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

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

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

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

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

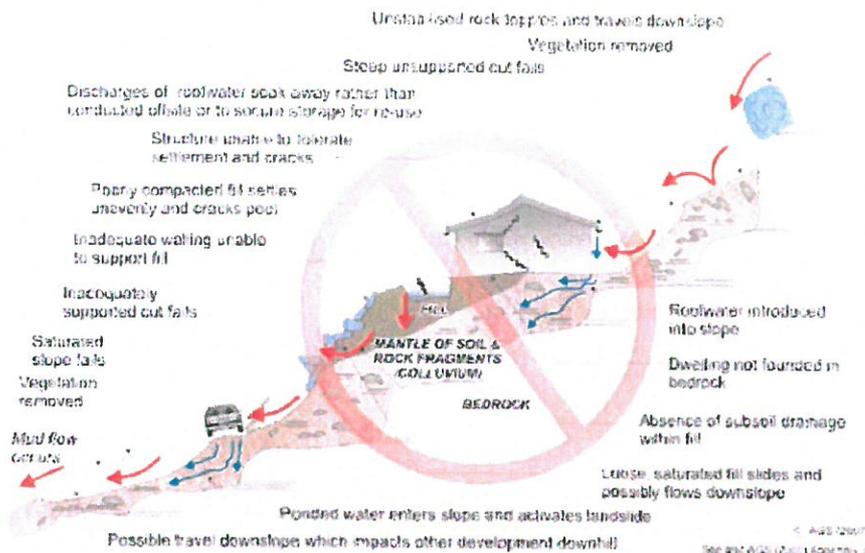
Vegetation clearance - on soil slopes has been kept to a reasonable minimum. Trees, and to a lesser extent smaller vegetation, take large quantities of water out of the ground every day. This lowers the ground water table, which in turn helps to maintain the stability of the slope. Large scale clearing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

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

ADOPT GOOD PRACTICE ON HILLSIDE SITES

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

EXAMPLES OF **POOR** HILLSIDE CONSTRUCTION PRACTICE



WHY ARE THESE PRACTICES POOR?

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

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

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

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

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

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

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

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

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

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

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

5 BUILDING HEIGHT RESTRICTIONS

The buyer agrees that the maximum height of a house at any point, including any ancillary buildings or structure (excluding a television antenna) shall not exceed:

- a. Seven metres above ground level to the height of the eaves, and
- b. Nine metres to the highest point of the roof.

The buyer further agrees that the building height at any point shall not exceed two storeys above ground level.

Additional building height restrictions apply to Lots 4 and 14. Special height restrictions are necessary for these two lots to ensure an adequate reticulated water supply. Buyers of Lots 4 and 14 acknowledge and agree that the highest floor level of any dwelling house shall not exceed a level of 92 metres AHD.

The Seller agrees that a surveyed level bench mark will be placed near each building envelope on Lots 4 and 14 by a Registered Surveyor, marked with the level of that bench mark. The Seller will provide the Buyer with a copy of plan NR9010BBT annotated with the approximate location and accurate AHD level of the bench mark, certified by a Registered Surveyor. This will be provided by the Seller to the Buyer at no cost to the Buyer.

6 SPECIFICATIONS FOR DWELLING HOUSE etc.

- a. The following specifications shall apply to any dwelling house or structure, outbuildings and garages being erected on the above-described land;
- b. Building materials and colour scheme applied to any future dwelling shall consist primarily of non-reflective materials and colours. If reflective materials form part of any future dwelling, the level of reflectivity of the material/colour shall not exceed 10% on the southern and western facades of the dwelling. Windows on the dwelling's southern and western facades must comprise non-reflective glass only. Roofing must be of a material and colour that is non-reflective.
- c. The colour scheme applied to any dwelling must contribute towards camouflaging the dwelling into the hill face's natural bush-like setting. For example, white or cream colours are prohibited on the roofs and southern and western facades due to their high reflective properties and inability to blend into the area's leafy bush-like setting. Dark greens and browns are encouraged especially upon the roof and the southern and western external facade walls.
- d. The roof shall be constructed of concrete or terracotta tiles, shingles or factory processed coloured metal sheeting. The exterior finish of all fascia and gutters shall be of factory processed colour finish and downpipes painted to blend with wall colour. The pitch of the roof shall not exceed 22.5%.
- e. The improvements constructed on the land shall be used only for a single-family residence.
- f. No second-hand or sub-standard materials shall be used in any structure including fences.
- g. External electric or gas hot water systems shall be located so as not to be visible from any public street.
- h. Concrete, slatecrete, brickcrete or clay paved driveways are to be completed at the same time as the residence and before occupation of the dwelling.

7 DWELLING HOUSE FINISHES

Galvanised iron, zinc or aluminium coated steel and corrugated cement-fibre sheeting are not allowed as either a wall or roof cladding.

Plain, painted or split faced concrete blocks are not approved for any "Building works".

These provisions assist in the protection of your investment by ensuring that an attractive residential environment is achieved.

8 DETACHED SHEDS

Garages

Detached garages cannot occur forward of the streetfront wall of the house. Where detached garages contain the external storage area, they need to incorporate the garage doors and enclosed sides.

Sheds and other structures

Sheds and other structures shall not be positioned forward of any street facing walls of the house. Sheds, lawn lockers and other structures should have a minimum setback of 1.0m from side and 2.0m from rear boundaries, and be positioned so as not to be visible from public areas.

Sheds etc. less than 20 m² in area will be permitted with wall and roof cladding in colourbond or similar with a wall height to a maximum of 2.4 metres. All sheds exceeding 20m² to a maximum of 36 m² should be constructed of materials that match the main dwelling. The roof pitch, wall height and material should also match the main dwelling.

Proprietary pre-painted lawn lockers or pre-painted metal garden sheds may be erected without approval by the Seller provided they are not plain galvanised, reflective or of a white or cream colour.

Galvanised iron, zinc or aluminium coated steel and corrugated fibre cement sheeting will not be allowed as either wall or roof cladding.

9 FENCING AND RETAINING WALLS

The fencing and retaining walls used around your home and those of your neighbours will affect the overall appearance of Fairfield Estate Stage 2.

Swimming pool surround fences shall fully comply with the Local Government requirements as to pool fencing.

Note 1: The buyer should read clause 3 above for the impact of Bushfire Management on fencing materials. Buyers of Lots 1 to 4 acknowledge and agree that **fencing** along the north western boundaries of Lots 1 to 4 will be constructed from **non-combustible** materials.

Note 1: All fences are to be fully installed on completion of construction of the dwelling prior to occupation.

Note 2: Cut and fill of an allotment is prohibited unless it is undertaken in accordance with plans and specifications prepared by a properly qualified consulting engineer. Any resulting retaining walls must be completed prior to the occupancy of the new home.

Notwithstanding the provisions of the Dividing Fences Act Qld 2011, the Buyer shall not make any claim, demand or request of the Developer for the erection of any fence or fences which the Buyer may wish to erect and it is expressly agreed between the parties hereto that the provisions of the Dividing Fences Act Qld 2011 shall have no application herein.

10 NO RELOCATABLE BUILDINGS

The Buyer shall not erect or permit to remain on the land any building previously erected on other land or any caravan, tent or living shelter of any kind.

11 NO LIVING IN INCOMPLETE DWELLINGS

The Buyer shall not live in the dwelling until it has been completed.

12 RUBBISH OR GARBAGE BINS

Rubbish and garbage bins and associated household rubbish must be screened from any view from the street except on the day of rubbish collection by the Rockhampton Regional Council.

13 SATELLITE DISHES AND TV ANTENNAE

Satellite dishes and radio masts shall be located so as not to be visible from any public street.

14 SUBDIVISION OF LARGE LOTS

The Buyer/s acknowledge that the allotment has been offered for sale as a single residential site only and the Buyer/s agree that they will not apply to the Rockhampton Regional Council or any other relevant body to reconfigure the lot or reduce its size or convert it to multiple lots.

15 CHANGE OF USE

The Buyer/s acknowledge that the land has been offered for sale as a single residential site only and as part of a planned residential estate incorporating specific designs, layouts, roads, accesses and specified facilities and accordingly, the Buyer/s agree that they will not:

- a) Apply to the Local Government or any other relevant body for permission to erect a multiple dwelling or make application for approval of a material change of use to enable the registration of a Plan or a Community Titles Scheme under the Body Corporate and Community Management Act 1997;

or

- b) Without the express consent in writing of the Seller first had and obtained sell, assign, surrender or in any way dispose of the land, whether in whole or in part, for use as a road or access to other land (including any existing or planned road or access) nor make or join with any others in making any application to the Local Government or any other authority for material change of use of the land or for permission or authority to deal with the land for such purposes nor consent to any such application.

16 LANDSCAPING AND MAINTENANCE OF THE LAND

Prior to Construction: The Buyer will not permit rubbish to accumulate or be placed on the allotment and will ensure that the grass on the allotment is mowed regularly and that the weeds are removed regularly. If in the opinion of the Seller rubbish has accumulated on the allotment or there is an excess growth of grass and weeds on the land then upon the giving of 7 days notice, the Seller and/or the Seller's agents and/or independent contractors may enter the allotment for the purpose of generally tidying up the allotment including without limitation, slashing or mowing grass and weeds growing on the allotment. The Buyer will pay to the Seller on demand the costs of carrying out such work and any other costs incidental to getting this work done.

During construction: If the Seller has grassed and/or otherwise landscaped the footpaths in front of the land or adjoining land the Buyer shall ensure (and that builders and subcontractors working on

the land shall) at all times keep the grass and/or landscape fully maintained in its original condition. The builders and sub-contractors thoroughfare will be from the kerb to the front boundary of the said lot not from adjoining lots.

After construction: The Buyer shall landscape that part of the Land between the front of the dwelling house and the front boundary of the land. Such area shall be grassed (by laying turf) within 3 months of the practical completion of the dwelling house. The Buyer shall maintain the land in a clean and tidy condition and all buildings and fences erected on the land in good order and repair to the satisfaction of the Seller.

The Seller may by itself or by its agent and with or without workmen and others at all reasonable times during daylight hours enter and view the state of the land and the buildings and fences erected on the land and the appearance of the garden areas and if considered necessary deliver to the Buyer a notice in writing requiring the Buyer to landscape or to clean and tidy the land or maintain and repair the buildings and fences.

If the Buyer fails to comply with a notice to landscape or to clean and tidy the land or to maintain and repair the buildings and fences within 7 days of receiving it the Seller and its agents or workmen may enter and carry out the matters specified in such notice at the Buyer's expense.

The Buyer shall pay the cost of carrying out such matters to the Seller on demand including any legal fees expended by the Seller in respect to this matter.

17 TREES

The Buyer acknowledges that a copy of the Bushfire Management Plan referred to in Clause 3 has been provided and agrees to implement and/or abide by the recommendations contained therein in relation to bushfire management.

Throughout the subdivision there are a number of trees, which have been retained to enhance the natural environment and provide a natural habitat for wildlife and shade in our tropical climate. The Developer aims to maintain the existing flora where possible.

Where trees need to be removed, they must be cut down and completely removed including stump from the site within 48 hours.

18 EASEMENTS

The Buyer must comply strictly with the terms and conditions of any Easement burdening the land for drainage and associated purposes and, without limitation, must:-

- (a) keep the Easement Area free from all obstruction except in connection with the normal use of the Easement Area in a manner not inconsistent with the rights and privileges granted to the Grantee;
- (b) not place on the Easement Area any soil, fence, stone, timber or fill of any substance or kind nor alter the levels or gradients of the Easement Area by excavation, extraction or contouring;

Words or phrases used in this covenant shall have the same meaning as in the Instrument of Easement.

19 VEHICLE PARKING

1. The buyer agrees to provide a minimum of two (2) on site car parking spaces, one of which must be covered.
2. At the house, no more than one (1) truck, van, utility, bus or other vehicle with a maximum Gross Vehicle Mass of 4.5 tonnes associated with or used in the employment of any resident of the house shall be permitted to be parked, stored or garaged on the site.

3. If the vehicle referred to in 2 above is not parked, stored or garaged under the house under the house or in a shed, garage or the like, it is to be stored behind the front alignment of the house to any road frontage.
4. The parking space for the vehicle mentioned in 2 above shall be in addition to the minimum two parking spaces referred to in 1 above.
5. Driveways provided into the site shall be in accordance with the Capricorn Municipal Development Guidelines.

20 CREATION OF A LIGHT NUISANCE IS NOT PERMITTED

The buyer agrees that installation of lighting for the specific purpose of being able to play a sport, in particular tennis, on the site during times when there is no daylight is not permitted.

21 SECTION 55 PROPERTY LAW ACT

This covenant is not intended to create any duty enforceable by a third party under Section 55 of the Property Law Act 1974.

22 NO MERGER

This covenant shall not merge on completion but shall continue in full force and effect and remain binding on the Buyer and the Buyer's heirs, executors, administrators, successors and assigns.

23 DEED OF COVENANT

The Buyer shall not sell or transfer the land without obtaining a deed of covenant from the Buyer or transferee in favour of the Seller (or its successors, executors, administrators or assigns) to be bound by the agreements contained in these covenants in the same manner and to the same extent as if the Buyer, transferee had signed this contract as Buyer. The Buyer will be liable for any negligence or non-compliance in this regard and on receipt of such new covenant the Buyer's obligation to the Seller shall cease.

24 BREACH OF BUILDING COVENANT

If the Buyer is in breach of any of these covenants and this Contract has not been completed then the Seller shall have the right to terminate this Contract by written notice to the Buyer. The Seller's right under this covenant shall be in addition to any other rights the Seller has against the Buyer.

25 SELLER'S LEGAL COSTS AND EXPENSES

The Buyer shall upon demand by the Seller pay all costs (as between solicitor and client) and expenses incurred by the Seller in relation to:

- (a) any letter or demand issued by the Seller or its solicitors to the Buyer requiring performance by the Buyer of its obligations under this covenant;
- (b) any notice lawfully given by the Seller to the Buyer pursuant to this covenant;
- (c) any application by the Buyer to the Seller to vary or exclude any of the obligations under this covenant (whether successful or not);
- (d) any proceedings lawfully brought by the Seller to enforce the performance by the Buyer of its obligations under this covenant including any proceedings brought by the Seller against the Buyer to recover any monies which are due and owing by the Buyer to the Seller.

.....
Buyer

.....
Seller – Pearlarm Pty Ltd
Signed by Alphonse Henry Klerkx
Sole Director Pearlarm Pty Ltd

I/We acknowledge that I/we have read and fully understand these covenants.

.....
Date



Denley Environmental Consultants Pty Ltd.
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Phone: 0428 182 247

PROPERTY VEGETATION MANAGEMENT PLAN.

DERM CONCURRENCE AGENCY POLICY FOR RECONFIGURING A LOT
(RAL) – VERSION 2, 21 OCTOBER 2009

FOR A DEVELOPMENT APPLICATION ON

LOT 2 ON SP163918, ROCKHAMPTON QLD

ROCKHAMPTON REGIONAL COUNCIL
These plans are approved subject to the current
conditions of approval associated with
Development Permit No. D1280-2011
Dated 24/7/12

Document History

Client:	Pearlarm Pty Ltd
Project:	Fairfield Stage 2
Document title:	Property Vegetation Management Plan
Document version:	1
File name:	Denley pvmp v1 final version.docx
Author:	Pty Ltd
Project Manager:	Ian Denley
Project number:	QU0033P

Revision History

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1. Acronyms Used

EPBC: Environmental Protection & Biodiversity Conservation Act 1999 (Federal)

NCA: *Nature Conservation Act 1994* (Queensland)

PMAV: Property Map of Assessable Vegetation (DNR&M, Queensland)

PVMP: Property Vegetation Management Plan (DNR&M, Queensland)

RE: Regional Ecosystems vegetation unit (Queensland Herbarium)

SPP 1/03 Guideline: Guidelines for assessing and mitigating hazard in relation to the SPP 1/03

SPP1/03: State Planning Policy 1/03, Mitigating the Adverse Impacts of Flood, Bushfire and Landslide

VMA: *Vegetation Management Act 1999* (Queensland)

FMA: Fire Management Area

2. Executive Summary

This report addresses the relevant DERM performance requirements for Reconfigure a Lot for a proposed development on Lot 2 on SP163918. The proposed development will create 14 new allotments for residential purposes.

Clearing of assessable vegetation has been assessed as potentially occurring as a consequence of a fire management area (FMA) surrounding the building envelope on proposed lot 4. Total clearing would be up to 0.05ha.

There were no trees or large shrubs within this area at the time of site inspections.

Clearing of the FMA would consist of slashing to maintain the existing grasses and other woody vegetation to a height no greater than 15 centimetres.

No large trees or shrubs would be disturbed in maintaining this portion of the FMA.

The area of clearing has been assessed as meeting the DERM RaL Performance requirements.

3. Background

3.1 Purpose

This report addresses the relevant DERM performance requirements for Reconfigure a Lot for a proposed development on Lot 2 on SP163918. The proposed development will create 14 new allotments for residential purposes comprising 12 standard lots and 2 Community Title Scheme Lots with Common Area. The applicant is Pearlarm Pty Ltd.

3.2 Lot Description

The subject lot is situated within both the Norman Road Residential Area and the Berserker Range Environmental Protection Area (BREPA). The subject lot is 6.087ha in area.

3.3 Location

The subject lot is located at the end of Eucalyptus Drive in Norman Gardens. Eucalyptus Drive is accessed from Norman Road, North Rockhampton.



Figure 1. Location of the subject allotment is indicated by the red boundary line.

3.4 Development Purpose

The proposed development is for an urban purpose. Detail on the development is contained in the Development Application.

3.5 Assessable Vegetation

The allotment is freehold land, situated partly within an area zoned as residential and partly within an area zoned as an environmental protection area (2.4ha). Regional Ecosystems Vegetation mapped within the BREPA is considered to be assessable vegetation for the purposes of the Development Application. the BREPA lies above the 92m contour in the Rockhampton Regional Council Planning Scheme. See the Development Application by A H

Consulting Surveyor for detail on the proposed lot configuration and zone maps (appended).

3.6 Essential Habitat

There is no essential habitat mapped on the subject allotment.

The surrounding area is mapped as an area of essential habitat for the Short-necked Worm-skink, *Anomalopus brevicollis*.

A site assessment was conducted and suitable habitat for the skink was not located on or near enough to the site to be affected by the proposed development.

4. Property Vegetation Management Plan

4.1 Summary

It is proposed to provide 14 residential allotments consistent with the Rockhampton Regional Council Planning Scheme guidelines for the zonings over the land.

The development application is an RaL application requiring IMPACT Assessment and public notification.

4.1.1 Zoning

The allotment comprises of 6.087ha of freehold land. Within the Rockhampton Regional Council Planning Scheme, it is situated partly within an area zoned as residential and partly within a 2.4ha area zoned as an environmental protection area (BREPA). See the development application for the planning scheme maps over the land.

4.1.2 Application of the DERM RaL Policy

This PVMP has been assessed as:

- an Urban Purpose in an Urban area for the land zoned as residential; and
- an Urban Purpose in a Non-Urban Area for the land zoned as Environmental Protection Area. Activities in this area consist of 0.05ha to be managed as a fire buffer for a dwelling within the proposed lot 4 building envelope.

4.1.3 Site Vegetation

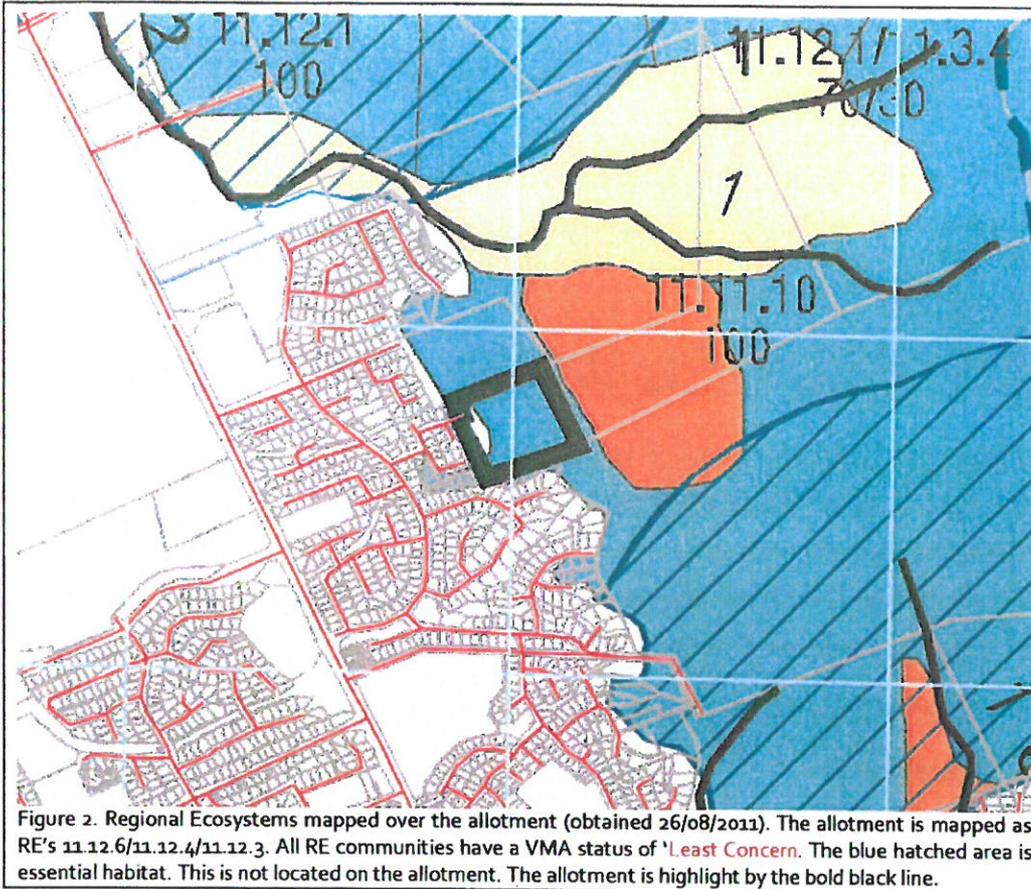
Vegetation on the subject allotment is mapped as containing RE's 11.12.6a/11.12.4/11.12.3 in a ratio of 55/25/20. See Figure 2 for an extract of the Regional Ecosystems mapping over the subject allotment.

Two independent site investigations have assessed vegetation on the allotment as consistent with RE 11.12.3. A site investigation was undertaken by Friend and Associates for the purpose of a bushfire hazard assessment. Friend determined the vegetation on the allotment to be RE 11.12.3. A subsequent investigation by Denley Environmental Consultants noted the ecologically dominant layer to be consistent only with RE 11.12.3.

4.1.4 VMA Status

The VMA status for all RE communities on the site is Of Least Concern.

The Regional Ecosystems map of the area is provided as an extract in Figure 2 and the whole map is appended to this report. An aerial image of the site is provided in Figure 1.



4.2 Proposed Clearing

Clearing is confined to specified building envelopes, access roads and easements and essential services defined in the RaL application.

All allotment boundaries are outside assessable vegetation. Lot 4 represents the balance of the land and entirely contains the area of assessable vegetation (the BREPA).

Clearing of assessable vegetation is confined to approximately 0.05ha, comprising part of a fire management area to protect a dwelling on proposed lot 4 (See Plan NR9010B in the Appendix).

There is approximately 2.4ha of assessable vegetation on the lot. Retained vegetation will be of a size that is mappable within the Regional Ecosystems Vegetation mapping and retain existing connectivity to vegetation located to the east of the allotment.

Adequate representation of the remnant vegetation will be retained and protected and the application meets all the performance requirements subject to Part P of the Brigalow Belt clearing code (addressed in Table 2 of 4.3).

4.2.1 Vegetation Management

At the time of survey there were no trees within the assessable area of the FMA associated with proposed lot 4.

Vegetation in the subject area consists of dense to medium grasses and herbs (largely

introduced). It is expected there will be small woody native shrubs and potential growth of trees within the FMA in the future

Management of this vegetation could be adequately achieved by slashing using a rubber tired tractor to reduce the potential for soil disturbance.

Low vegetation will be retained over the FMA to a maximum height of 15 centimetres. There will be no requirement to remove large trees or shrubs which could cause soil disturbance.

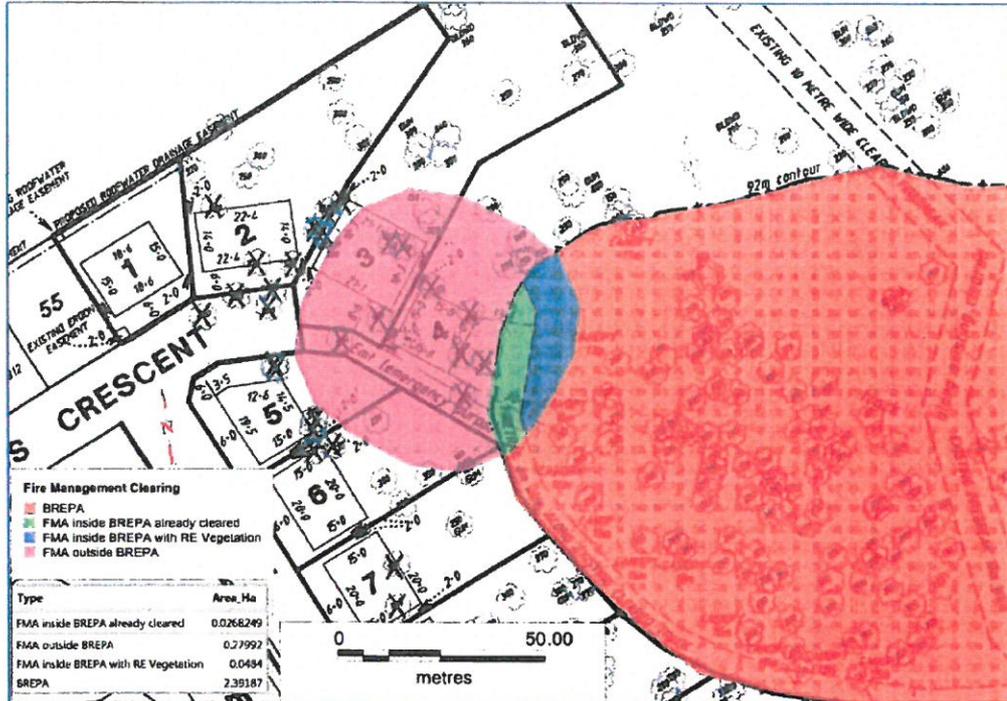


Figure 3: Fire Management Area (FMA) required for the building envelope for proposed Lot 4 is indicated by the blue area on the above figure. The FMA occupies a total of 0.05Ha of BREPA.

4.3 DERM Performance Requirements Response

Following, the DERM RaL Performance Requirements have been addressed for both the Residential zoning and the Environmental area which exist on the allotment.

4.3.1 Residential Area RaL

Clearing as a result of the RaL is for an urban purpose on freehold land. The land does not contain an endangered regional ecosystem. All proposed allotments are situated in an area indicated as an urban area as defined by the Rockhampton Regional Council Planning Scheme.

An area of 0.05ha of assessable vegetation has been proposed for clearing for fire management requirements.

Proposed clearing in the residentially zoned area meets Criteria Table F-2 in the Concurrence Agency Policy for Reconfiguring a Lot (RaL) 21 October 2009 (Table 1) and Performance Requirement Part P of the Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions – Version 2 (Table 2).

Table 1: Response to Criteria F-2 of the Concurrence Agency Policy for Reconfiguring a Lot – Version 2

	Subject	Response to PR's
	The development minimises impacts of Assessable Vegetation	Proposed clearing in assessable vegetation is limited to the extent that is necessary for establishing firebreaks associated with the proposed RaL applications. There is no suitable alternative site for fences, firebreaks, roads and infrastructure proposed.
	Addresses criteria in the relevant code	Refer to Table 2 – Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions – Version 2.

Table 2: Response to Part P of the Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions – Version 2

	Subject	Response to PR's
	Limits to clearing for public safety and infrastructure	No development is proposed within assessable vegetation. Proposed clearing is limited to the extent that is necessary for establishing necessary fences, firebreaks, roads and other built infrastructure associated with the proposed RaL applications. There is no suitable alternative site for fences, firebreaks, roads and infrastructure proposed.
	Wetlands	There are no Wetlands affected
	Watercourses	There are no Watercourses affected.

	Subject	Response to PR's
	Connectivity	<p>Proposed clearing will occur in the non-coastal subregions of the Brigalow Belt and is less than;</p> <ul style="list-style-type: none"> • 25m wide; and • 5 hectares. <p>Vegetation on the site is connected to an area of vegetation that is substantially wider than 200m (see RE map in the appendix).</p> <p>Clearing as a result of the proposed RaL will not:</p> <ul style="list-style-type: none"> • reduce the width of remnant vegetation to less than 200 metres; nor • occur where the width of remnant vegetation is less than 200 metres.
	Soil erosion	<p>Clearing will not cause land degradation and ecological processes will be maintained. No adverse effects on the environment from soil erosion will occur.</p> <p>The 0.05ha of assessable vegetation in the fire management zone proposed for clearing will be slashed to 15cms. This will ensure the roots of existing shrubs and grasses will remain to maintain stability.</p> <p>The land is able to provide home sites in compliance with the State Planning Policy on Natural Hazards having regard to land slide, and with full urban infrastructure (refer to the engineering report by McMurtrie Consulting Engineers in the development application).</p> <p>To address soil erosion all development and site management practices will comply with Queensland Urban Drainage Manual, Capricorn Municipal Development Manual, the Water Quality and Water Quantity Code and Planning Scheme Policy No. 2 'Erosion and Sediment Control Plans'. Please refer to engineering comments provided by Graham Scott & Associates in the development application.</p>
	Salinity	<p>All land down slope from the site consists of residential areas. There are no discharge areas affected.</p> <p>Clearing is less than 5 hectares and does not occur:</p> <ul style="list-style-type: none"> • in any discharge area; and • within 200 metres of any discharge area. <p>All development and site management practices will comply with Queensland Urban Drainage Manual, Capricorn Municipal Development Manual, the Water Quality and Water Quantity Code and Planning Scheme Policy No. 2 'Erosion and Sediment Control Plans'</p>
	Conserving remnant <i>endangered</i> regional ecosystems and of <i>concern</i> regional ecosystems	<p>There are no Endangered or Of Concern Regional Ecosystems affected. The site contains only Not Of Concern remnant vegetation.</p>
	Essential habitat	<p>Clearing will not occur in an area shown as essential habitat on the essential habitat map. There is no essential habitat mapped on the allotment.</p>
	Conservation status thresholds	<p>RE's 11.12.6/11.12.4/11.12.3 are not listed in Table 5 of the relevant ongoing clearing code for the area.</p>
	Acid sulfate soils	<p>There are no acid sulfate soils on the allotment.</p>

Appendix



- Biological sciences
- landscape ecology
- Environmental survey and mapping
- Environmental offset acquisition and management

5 September 2011

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A H Klerkx
Consulting surveyor

13 Tanby Point Close
 Emu Park. Qld. 4710
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 Fax: 07 49 388 310
 Mobile: 0417 388 336
 Email: klerkx@hotmail.net.au

OWNER
PEARLARM PTY LTD

PROJECT
Fairfield Estate
 PROPOSED SUBDIVISION-Stage 2
14 STANDARD LOTS

DATE : 26 July 11
AMENDMENT : Added contours prior to rock fill

REAL PROPERTY DESCRIPTION

Lot No. : 2
 Plan : SP16391B
 Orig Por : 661
 Parish : Murchison
 County : Livingstone
 L.A. : Rockhampton R C

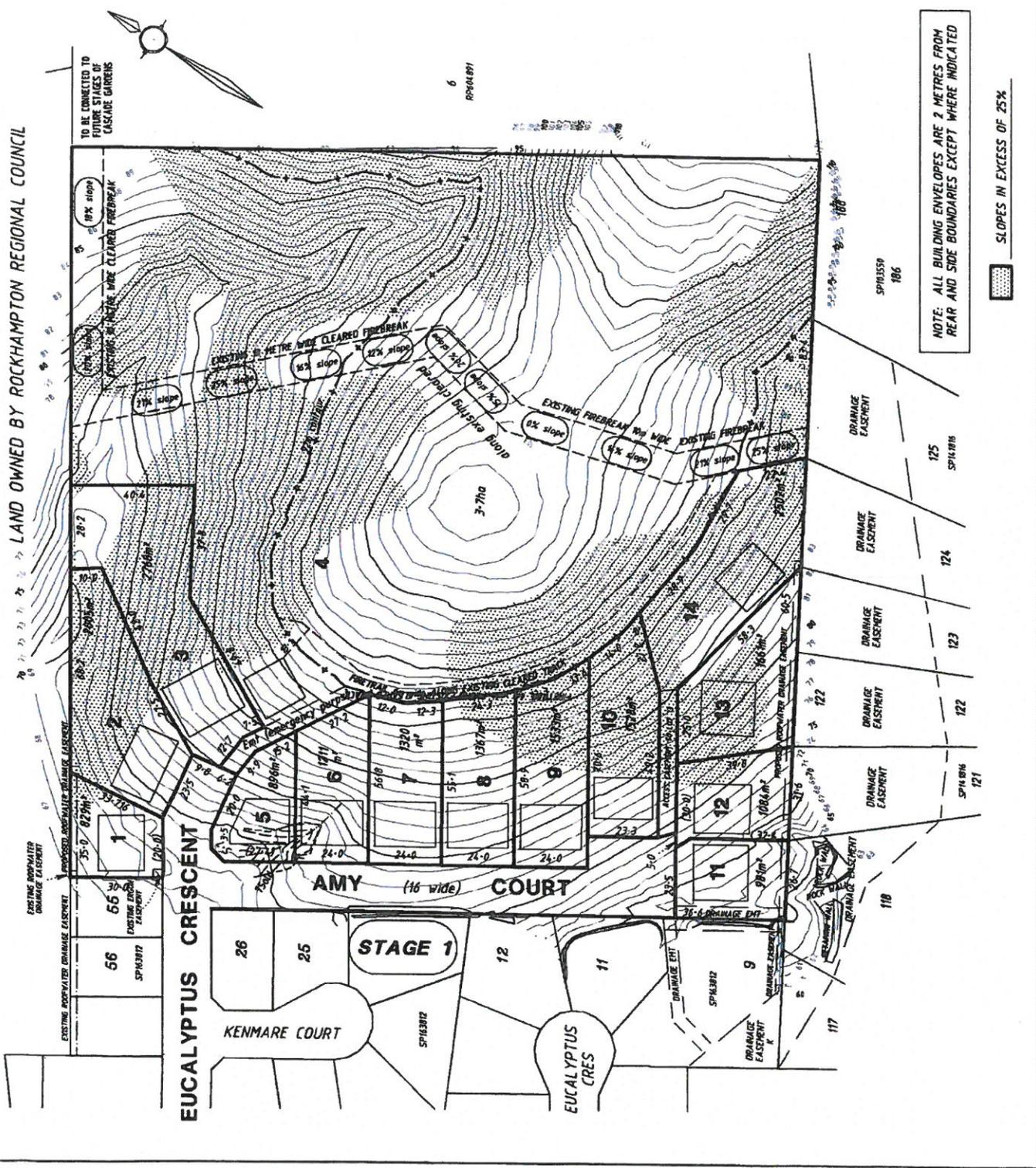
DATUM : HORIZ Cadastral
VERT : AHD
 1-metre Contours

SCALE : 1:1250
 AT SHEET SIZE A3

Designed : A H Klerkx
 Consulting Surveyor

Date : 12 August 2011
Drawn : A K
DRAWING NUMBER

NR9010B



A H Klerkx
Consulting Surveyor

13 Tanby Point Close
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 Telephone: 07 49 388 344
 Fax: 07 49 388 310
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OWNER
PEARLARM PTY LTD

PROJECT
Fairfield Estate
 PROPOSED SUBDIVISION-Stage 2
BUILDING ENVELOPE PLAN

DATE AMENDMENT
 26 July 11 Added contours prior to rock fill

REAL PROPERTY DESCRIPTION

Lot No. : 2
 Plan : SP163918
 Orig Por : 661
 Parish : Murchison
 County : Livingstone
 L.A. : Rockhampton R C

HORIZ Cadastral
 VERT AHD
 1-metre Contours

SCALE **1:1250**
 AT SHEET SIZE A3

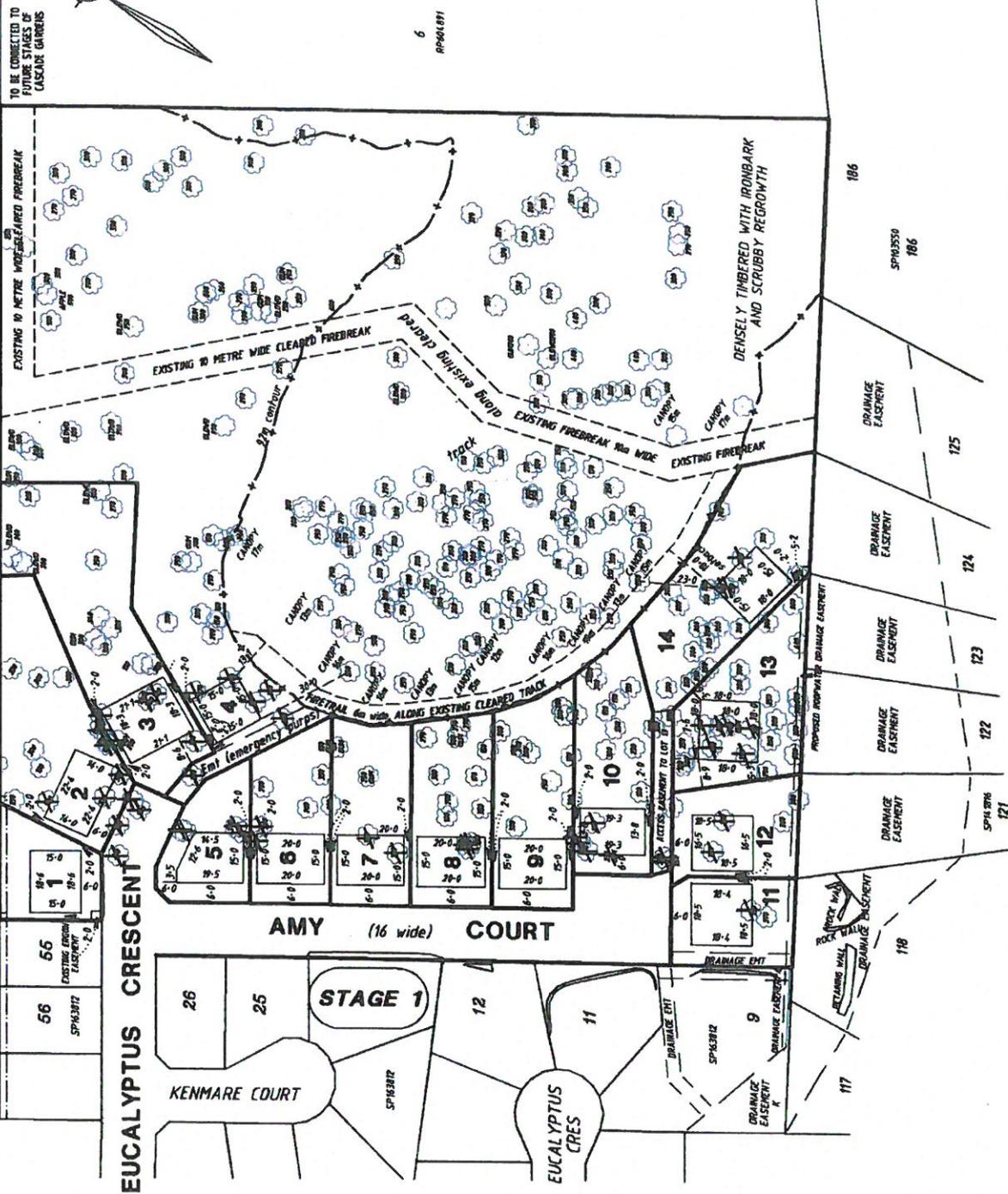
Designed : A H Klerkx
 Consulting Surveyor

Date : 12 August 2011
 Drawn : A K

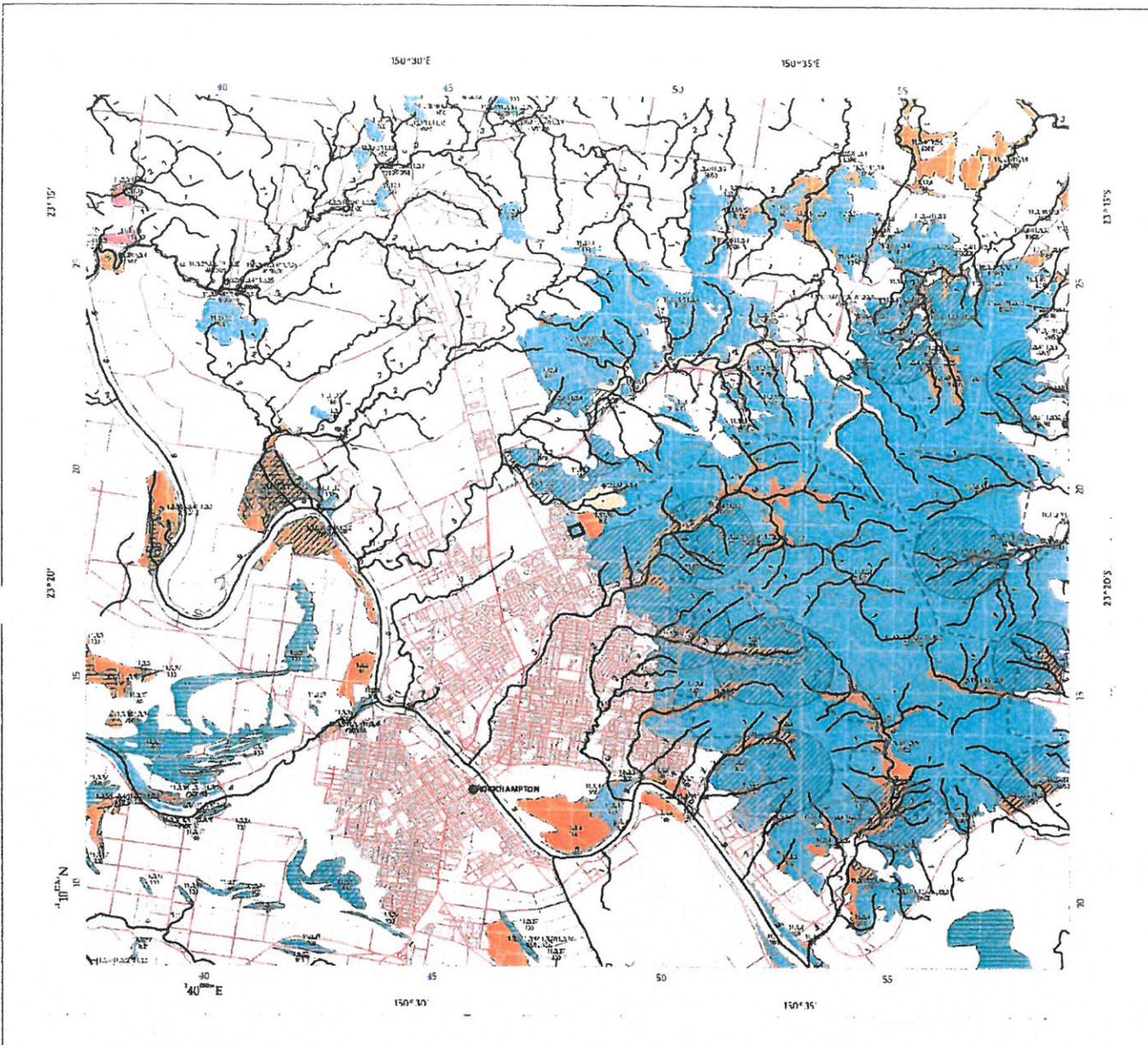
DRAWING NUMBER

NR9010BBT

LAND OWNED BY ROCKHAMPTON REGIONAL COUNCIL



TREES TO BE REMOVED
 TRUNK DIAMETER

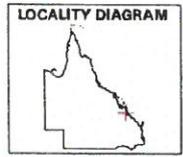


Vegetation Management Act Regional Ecosystem and Remnant Map-Version 6

- Remnant vegetation containing endangered regional ecosystems
- Dominant
- Sub-dominant
- Remnant vegetation containing of concern regional ecosystems
- Dominant
- Sub-dominant
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Great Barrier Reef Wetlands
- Vegetation Management Act Essential Habitat
For further information on VMA Essential Habitat, please see the attached VMA Essential Habitat map.
- Subject Lot
- Watercourse (Stream order shown as black number against stream where available)
- Bioregion boundary
- Roads © MapInfo Australia Pty Ltd 2009
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
Property boundaries shown are provided as a locational aid only.
- Towns

Based on 2006 Landsat TM Imagery
 Requested By: SIMON.A.JOHNSTON@GMAIL.COM
 Date: 26 Aug 11 Time: 10.38.20

Centered on Lot on Plan:
 2 SP163918
 Bioregion: Brigalow Belt



Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

A remnant map covers areas not covered by a regional ecosystem map.

Defined map areas are labelled with the regional ecosystem (RE) code along with the percentage breakdown if more than one RE occurs within the area. Detailed definitions of regional ecosystems are available from www.derm.qld.gov.au/REDD. Defined map areas smaller than 5ha may not be labelled.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/-100 metres. The extent of remnant regional ecosystems as of 2006, depicted on this map is based on rectified 2006 Landsat TM Imagery (supplied by the Statewide Landcover and Trees Study (SLATS), Department of Environment and Resource Management (DERM)).

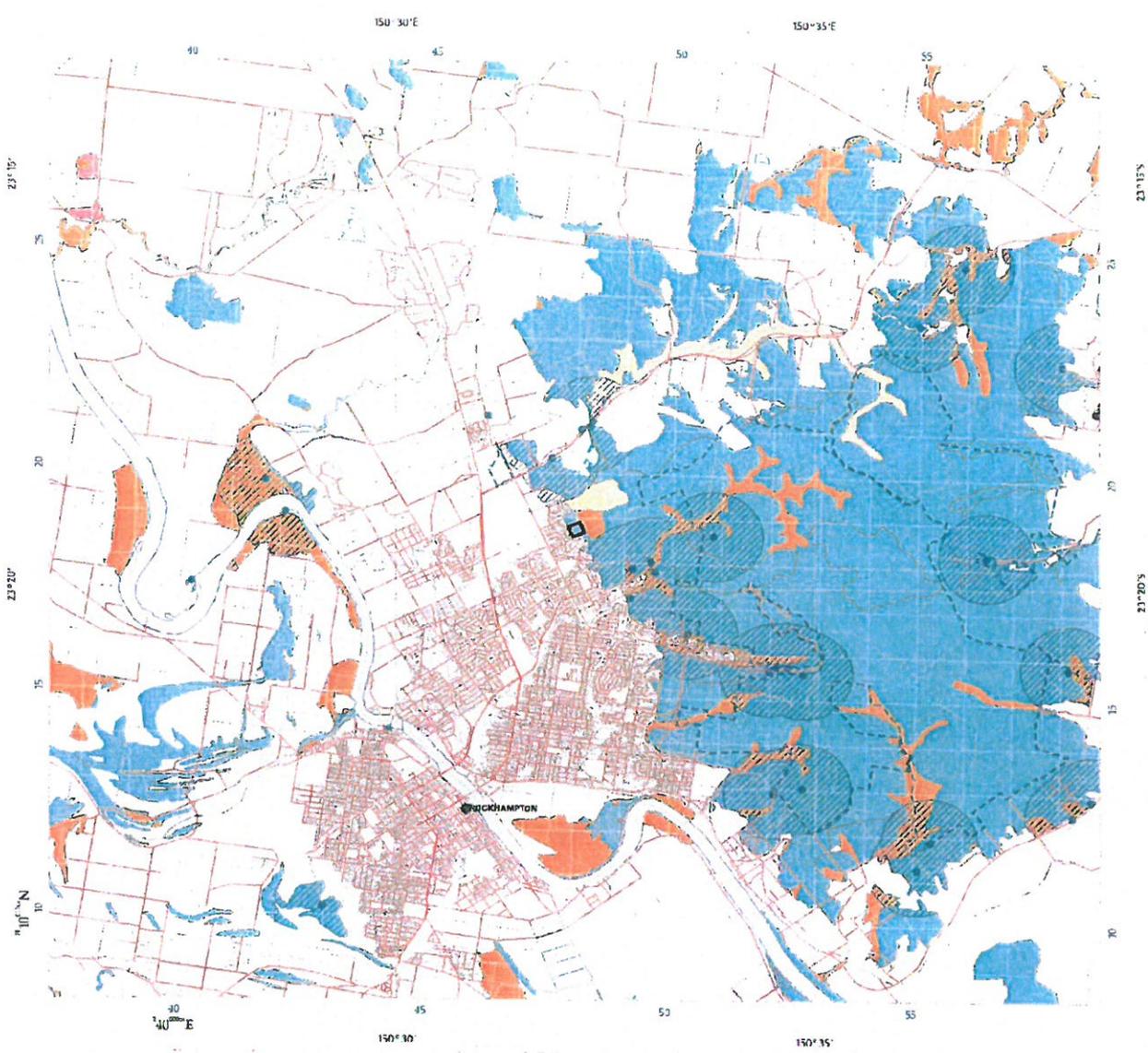
Some watercourse lines are derived from GeoScience Australia 1:250 000 mapping.

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All datasets are updated as they become available to provide the most current information as of the date shown on this map.

Additional information is required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.derm.qld.gov.au/vegetation or contact the Department of Environment and Resource Management.

Digital regional ecosystem data is available in shapfile format, for Lot on Plans from www.derm.qld.gov.au/REDATA or from DERM for larger areas.



Vegetation Management Act Essential Habitat Map Version 3.0

- Remnant vegetation containing endangered regional ecosystems
- Dominant
- Sub-dominant
- Remnant vegetation containing of concern regional ecosystems
- Dominant
- Sub-dominant
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Vegetation Management Act Essential Habitat
- Vegetation Management Act Essential Habitat Species Records
- Subject Lot
- Roads © MapInfo Australia Pty Ltd 2008
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
- Property boundaries shown are provided as a locational aid only.
- Towns

Requested By: SIMONA.JOHNSTON@GMAIL.COM
 Date: 26 Aug 11 Time: 10:39:37

Centered on Lot on Plan:
 2 SP163918



Labels for the Vegetation Management Act Essential Habitat are centred on the subject lot (1.1km surrounding and including a Lot on Plan). Labels correlate to the label field in the attached essential habitat database.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/-100 metres. The extent of remnant regional ecosystems as of 2006, depicted on this map is based on rectified 2006 Landsat TM imagery (supplied by SLATS, Department of Environment and Resource Management).

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All datasets are updated as they become available to provide the most current information as of the date shown on this map.

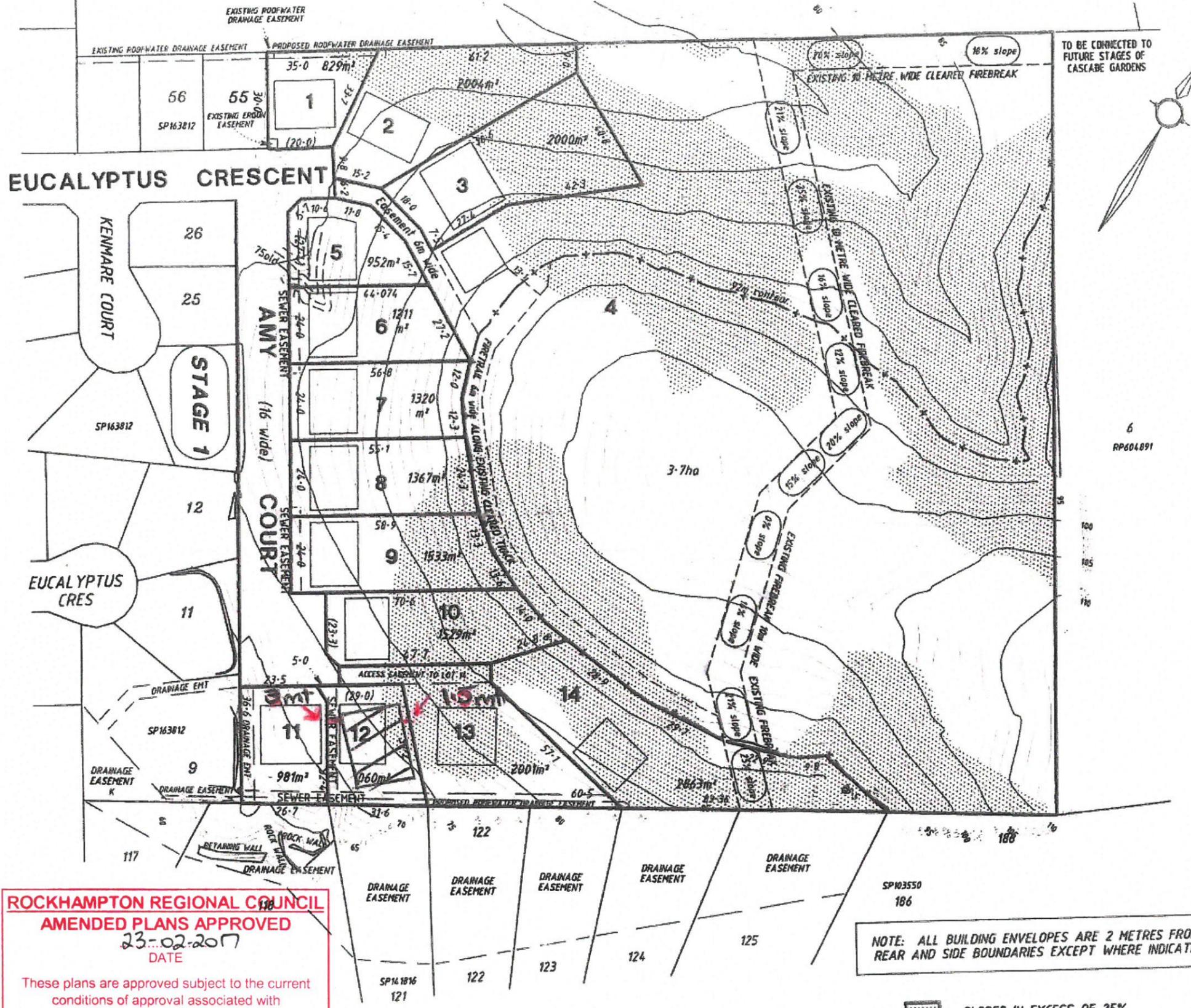
Additional information is required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.derm.qld.gov.au/vegetation or contact the Department of Environment and Resource Management.

Digital regional ecosystem data is available in shapefile format, for Lot on Plans from www.derm.qld.gov.au/REDATA or from DERM for larger areas.

Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

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LAND OWNED BY ROCKHAMPTON REGIONAL COUNCIL



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OWNER
PEARLARM PTY LTD

PROJECT
Fairfield Estate
PROPOSED SUBDIVISION-Stage 2
(AMENDED 21 February 2017)
14 STANDARD LOTS

DATE	AMENDMENT
26 July 11	Added contours prior to rock fill
21 Oct 11	Change boundaries of Lot 14 and areas lots 10,13&14
4 Nov 11	Shorten end of Eucalyptus Crescent and dimensions of Lots 2-5

REAL PROPERTY DESCRIPTION
Lot No. : 2
Plan : SP163918
Orig Por : 661
Parish : Murchison
County : Livingstone
L.A. : Rockhampton R C

DATUM
HORIZ Cadastral
VERT AHD
1-metre Contours

SCALE **1:1250** AT SHEET SIZE A3

Designed : A H Klerkx
Consulting Surveyor

Date : 4 November 2011

Drawn : A K

DRAWING NUMBER
NR9010B

ROCKHAMPTON REGIONAL COUNCIL
AMENDED PLANS APPROVED
23-02-2017
DATE

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

Development Permit No. D/280-2011 dated 24-07-2012

NOTE: ALL BUILDING ENVELOPES ARE 2 METRES FROM REAR AND SIDE BOUNDARIES EXCEPT WHERE INDICATED

SLOPES IN EXCESS OF 25%



PROJECT NO. 111-10088

JULY, 2011

PEARLARM PTY LTD

**STABILITY ASSESSMENT
RESIDENTIAL SUBDIVISION**

**EUCALYPTUS CRESCENT
NORTH ROCKHAMPTON**

ROCKHAMPTON REGIONAL COUNCIL
These plans are approved subject to the current
conditions of approval associated with
Development Permit No. 01280-2011
Dated 24/7/12

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APPENDICES

- A Notes Relating To This Report**
 - B Outcomes Measured For State Planning Policy 1/03**
 - C Site Photographs**
 - D Types of Landslides**
 - E Framework for Landslide Risk Manual**
 - F Site Investigation Maps**
 - G Test Pit Records**
 - H Site Plans**
 - I Hillside Construction Guidelines**
-

1.0 INTRODUCTION

1.1 General

This report presents the results of the geotechnical investigation and assessment carried out by Soil Surveys Engineering Pty. Limited during January 2009 for the proposed residential subdivision at Eucalyptus Crescent, North Rockhampton.

A draft report was prepared in 2009 and Council issued an RFI to clarify these points. The report was issued addressing these changes. Recently changes have been made to the lot layout and therefore another review of the original report has been prepared.

The objectives of this investigation were to assess subsurface conditions at the site in accordance with the Scope of Services detailed in Section 1.2.

1.2 Scope of Geotechnical Services

The scope of geotechnical services, detailed in our proposal 108-10088 (ref. 1-10088, 2008-12-18, PR) dated 19th December, 2008, consisted of identifying materials and material properties and groundwater conditions to enable a slope stability assessment of the site to be carried out, based on published stability reports and practices.

Comments will be provided with respect to the effect of the slope stability assessment on the engineering aspects of the development.

1.3 Controls and Procedures

This report has been prepared in accordance with:-

- National Disaster Mitigation Program (NDMP), Landslide Risk Management (LRM) Guidelines, Practice Notes and Geoguidelines as published in the "Australian Geomechanics Journal" Volume 42 No. 1 March 2007.
- State Planning Policy 1/03 (Qld) "Mitigating the Adverse Impacts of Flood, Bushfire and Landslides" (SPP 1/03).
- Rockhampton City Council (now part of the Rockhampton Regional Council) Chapter 5 Steep or unstable land code.

2.0 ASSESSMENT GUIDELINES

2.1 State Planning Policy 1/03

2.1.1 General

In 2003 the Queensland State Government adopted under the Integrated Planning Act 1997 (IPA) the following:-

- State Planning Policy 1/03 "Mitigating the Adverse Impacts of Flood, Bushfire and Landslide".
- SPP Guideline 1/03.

In accordance with the SPP 1/03, "risks to the community for proposed developments in identified Natural Hazard Management Areas should be adequately considered during design and assessment of a proposed development. Where risks are unacceptable they should be suitably minimised and/or controlled".

2.1.2 Application

The applicability of State Planning Policy 1/03 (SPP 1/03) to the development site was assessed using Figure 1 of SSP Guideline 1/03 as follows :-

- Is the development within a local government as listed in Annex 2 (A2.3) of SPP 1/03 - **Yes**
- Is the development proposal in a natural hazard management area as defined in Annex 3 (A3.4) of SPP 1/03 - **Yes**
- Does the development proposal involve any of the actions or activities listed in Annex 1 (A1.1c) of SPP 1/03 - **Yes**
- Does the development proposal involve any of the types of community infrastructure listed in Annex 1 (A1.2) of SPP 1/03 - **No**

Therefore only Outcomes 1 and 2 as defined in SPP 1/03 shall apply to the proposal, these outcomes are included in Appendix B.

2.2 Rockhampton City Council

A review of the Council's Steep or stable land code map indicates large sections of the site have slopes in excess of 15% (8.5 degrees).

3.0 DEVELOPMENT INFORMATION

3.1 Proposed Development

At present the site consists of Lot 2 on SP163918 in the Parish of Murchison.

It is our understanding at this stage that the intention is to subdivide and reconfigure the site into 14 new lots (Figure 1) that vary in size from 825m² (Lot 1) up to 3.7ha (Lot 4).

The proposed earthworks will consist of cuts of less than 1m in lots 6 to 9 with filling of up to 1.8m along the south western boundary of the site. The cuts will consist of unsupported batters of 1V:4H. This filling will be retaining using a block type retaining wall.

A preliminary drawing (040356/SK05) has been provided for the area indicating the cut and fill areas for the site.

We also understand that the Rockhampton City Council (RCC) have placed a restriction on the development limiting construction to below the 92m contour line.

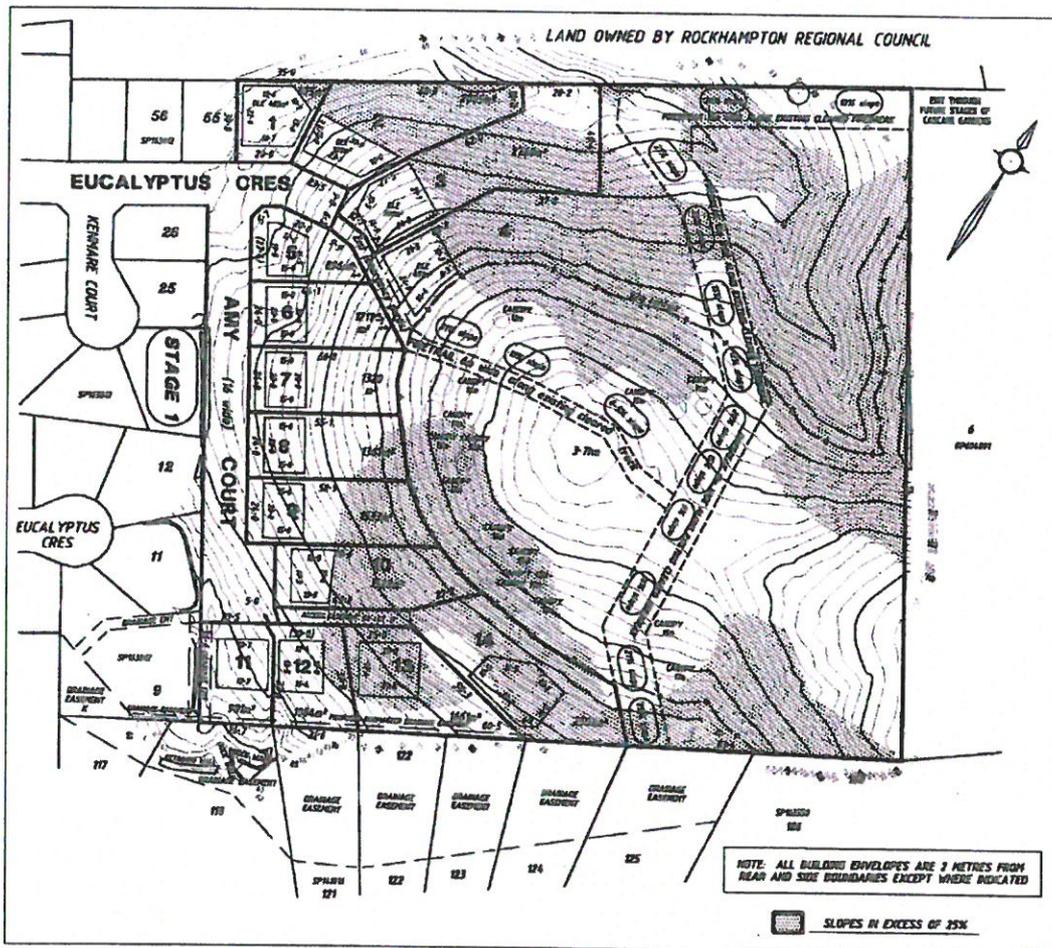


FIGURE 1 - PROVIDED PROPOSED LOT LAYOUT

3.2 Site Location

The site is :-

- Located approximately 5km north east of the centre of Rockhampton (refer Figure 2).
- Roughly square in shape (refer Figure 1).
- Bounded on all boundaries by adjoining properties and accessed via the existing Eucalyptus Crescent through Stage 1 of the development.
- Total area of approximately 6ha.
- Photographs of site are included in Appendix C.



FIGURE 2 - SITE LOCATION

4.0 HAZARDS

4.1 General Discussion On Stability Assessment

The stability of a site is usually controlled by a number of factors:-

- The existing and proposed ground surface angles
- The properties and nature of the subsurface profile
- Existing and future loadings of the site including the construction of structures and any earthworks proposed
- The groundwater regime of the site

Once the above factors have been evaluated and/or estimated, a geotechnical model is developed to establish the possible modes of failure. Based on the geotechnical failure model, the potential of a failure eventuating either in the short or long term is assessed and the site categorised accordingly.

Instability is usually associated with seepage. Near surface groundwater particularly at the toe of slopes effects the slopes stability by:-

- Reducing the insitu strength of the material
- Increasing pore pressures within the slope
- Lowering the effective "weight" of the toe material

4.2 Types of Hazards

The rate of landslide movement varies from extremely slow (millimetres to centimetres per year) to a sudden and extremely rapid (metres per second) as with rock fall or debris flow. Sudden and rapid events are the most dangerous because of the lack of warning and the high speed resulting in an increased force of impact.

Landslides may be classified into the following main types (Refer Figure D1 Appendix D):

Translational Slides: where failure occurs on a planar surface or surfaces, usually natural defects in the material such as fissures, joints or bedding. Material within the slide can remain relatively undisturbed.

Creep Slides: where failure occurs as a gradual downslope progression of slope material (often extremely slow rates). The slide area may appear relatively undisturbed and identification of the slide is often reliant on surface features.

Rotational Slides: where failure occurs through the material substance commonly on a concave surface. Material within the slide is considerably disturbed.

Topple: where failure occurs from the end over end motion of rocks down a slope. Often resulting from closely spaced sub-vertical jointed rock outcrops.

Falls: where movement is by free-falling or rolling of fragments on steep slopes with outcrops of closely jointed rock.

Flows: where, after failure along a planar or concave surface, the material is transformed into a viscous fluid consisting of soil and rock particles suspended in water.

Complex: where there is a combination of one or more of the above mechanisms.

5.0 SITE INVESTIGATION & DATA COLLECTION

5.1 General

The general processes in assessment and management of risks associated with landslides is given in detail in National Disaster Mitigation Program (NDMP), "Landslide Risk Management (LRM) Guidelines", Practice Notes and Geoguidelines as published in the Australian Geomechanics Journal Volume 42 No. 1 March 2007. Figure E1 (Appendix E) is an extract from the paper showing the typical processes in flow chart form.

As shown in Figure E1, hazard identification is an initial step in this process, and is the basis for this study. Due to unknowns associated with development applications and their influence on the surrounding environment, this study has been restricted to a qualitative evaluation of hazard rating, with respect to natural slope instability. Landslide hazard management areas were then derived from these hazard ratings.

The effects of earthquake on slope stability have not been included in this study.

The terminology adopted in this report has been designed to be consistent, as far as practicable, with national standards including the Australian New Zealand Standard AS/NZ 4360-1999 "Risk Management" and the above NDMP LRM Guidelines.

5.2 Methodology

The methodology undertaken by Soil Surveys Engineering Pty Limited in assessing the Hazard Management Areas was based on the following steps:

- A review of published information and Aerial photographs to identify areas that have potential to be affected by slope instability;
- A review of regional features including topography, geology and geomorphology;
- Identification of potential hazard zones based on topography, geology and geomorphology;
- Field investigation
- Development of a Hazard Assessment map that can be used to plan the proposed development.

This study has identified hazard ratings using a classification system consistent with the procedures detailed in the paper entitled "A Method of Zoning Landslide Hazards", prepared by McGregor and Taylor. This method has been adopted on a wide range of projects and has proven to be robust.

5.3 Published Data

The following data was reviewed:-

- Geoscience Australia Historical Landslide Database¹. No slips were recorded in the vicinity of the development site.

5.4 Regional Factors

5.4.1 Regional Geology

Based on geological plans the site is underlain by rocks of the Berserker Beds with surface accumulations of slope wash and colluvium and minor diorite intrusions. Refer Figure F1, Appendix F.

The Berserker Beds (Pb) consist of acid lapilli Tuff, Andersite and acidic flows, agglomerate, conglomerate, mudstone and sandstone.

*"There is considerable variation in rock types within the unit, including flow banded rhyolitic lavas; rhyodacitic, dacitic and andesitic welded tuffs and agglomerates; andesitic to basaltic lavas; and indurated mudstone and sandstone of volcanic derivation."*²

Following deposition in an early Permian Volcanic Arc environment, the rock underwent moderate deformation before undergoing widespread faulting in the mid to late Permian (about 250 million years ago).

It is believed that the area has undergone erosion from this time. This has resulted in areas of extensive hill wash and colluvial deposits on slopes.

Colluvial deposits consisting mainly of gravelly and boulder clay have accumulated around the bases of steeper mountains in the area. Some development of laterite within these colluvial deposits have been noted.

¹ www.ga.gov.au

² Trezise D.L., Flynn M.L. And Willmott W.F. (1983) Industrial Rock and Mineral Resources of the Rockhampton Region 1:100,000 Sheet Area, Geological Survey of Queensland Record 1983/8.

With time, soils have developed on the colluvium and parent rock. These are generally clay soils containing rock fragments of the underlying rock unit.

5.5 Assessment of Potential Hazard Zone

Refer to Section 6.0 for a detailed risk assessment of the expected hazards on the site.

5.6 Site Factors

5.6.1 Topography & Drainage

The site covers approximately 6ha to the north east of the centre of Rockhampton, Central Queensland.

The site topography (refer Figure F2, Appendix F) consists of a prominent knoll just to the east of the centre of the site, at approximately RL105m. The surface falls away from this to adjoining properties to around RL 70m. Fall to the north is into a drainage line running in a north westerly direction off the site. Slope angles were measured as between 0° and 5° on the ridge, between 5° and 12° in the western area of the site, a small area of approximately 20° to 25° near the gully line north of the site and generally approximately 15° for the remainder of the site.

Colluvium was encountered in all test pits with a maximum depth of 0.9m in TP5 but generally of <0.5m in thickness.

5.6.2 Vegetation

The majority of the site is vegetated by light to medium dense, medium to large sized trees (refer Figure F2, Appendix F). The western side adjacent to Stage 1 of the development is relatively clear with a partially grassed and gravel surface.

5.6.3 Field Investigation

The methodology of the field investigation of the site is as follows :-

- A site inspection by an Engineering Geologist experienced in the assessment of slope instability.
- A program of 11 test pits over the site to establish subsurface profiles and allow the assessment of geotechnical parameters that could effect slope stability.

The classification of soils in the field is subjective, based on the experience and judgement of the supervising geotechnical engineer and some variations in the soil description, from the actual material type may occur.

The soil classification descriptions were in general accordance with AS.1726 - 1993 Geotechnical Site Investigations.

A description of the investigation method, backhoe pits (Appendix G) and a site plan (Appendix H) showing the location of the pits are included in the Appendices.

5.6.4 Subsurface Profile & Outcrops

The subsurface profile intersected during the test pitting program consisted of:-

- Colluvium - Colluvial slope wash was identified in all test pits to depths of between 0.2m (TP6) and 0.9m (TP5). It was described as Silty Sandy and Silty Clayey GRAVELS (GP), often loose to medium dense, small to large size angular gravels and cobbles.
- Residual Soils - Silty Sandy and Gravelly Clays were encountered on site to varying depths. They were described as hard and low to medium plasticity. Angular gravel and cobbles were also encountered within the soils.
- Rock - Weathered rock was encountered in all test pits. It was described as extremely weathered to distinctly to slightly weathered Metasiltstone and Andesite, weak to moderately strong, with strong cobbles in places.

Only minor rock outcrops were encountered within the site and were noted on the cut batters of the tracks on the western part of the site and a small area of the south western facing slope.

Some boulders were noted in the depression in Lots 5 and 6. These appear to have been dumped there.

It is understood that this material was used to limit scour and was placed during the earthworks for Stage 1. It is also our understanding that the material will be removed and replaced with certified filling as part of the earthworks for this stage.

A summary of the subsurface profile is presented in Table 1 with detailed test pits included at the rear of this report (Appendix G) and a location plan (Appendix H) of test pits (Dwg. No. 108-10088-01A).

TABLE 1 SUMMARY OF THE SUBSURFACE PROFILE

Test Pit No.	RL (m)	Colluvium (m)	Residual Soil (m)	Weathered Rock (m)		Total Depth (m)
				XW	DW	
1	89.00	0.00-0.50	0.50-1.10	1.10-1.20 ¹	1.20-TD ¹	1.30
2	87.00	0.00-0.30	0.30-0.90	0.90-1.60 ¹ 1.60-TD ²	NE	1.70
3	99.00	0.00-0.40	0.40-0.60	1.00-TD ²	0.60-1.00 ¹	1.50
4	92.00	0.00-0.30	0.30-0.60	0.60-0.80 ¹	0.80-TD ¹	0.90
5	91.00	0.00-0.90	NE	NE	0.90-TD ¹	1.20*
6	96.00	0.00-0.20	NE	NE	0.20-TD ¹	0.50*
7	85.50	0.00-0.40	0.40-0.80	NE	0.80-TD ¹	1.00
8	74.00	0.00-0.50	0.50-0.60	NE	0.60-TD ¹	0.80*
9	77.00	0.00-0.30	0.30-0.40	NE	0.40-TD ¹	0.60*
10	78.50	0.00-0.40	0.40-0.60	0.60-0.80 ²	0.80-TD ²	1.00
11	78.00	0.00-0.40	0.40-0.90	NE	0.90-TD ¹	1.20*

Notes:-

- 1 - Metasiltstone; 2. Andisite
- * Machine refusal
- NE - Not Encountered
- TD - Total Depth
- All depths below existing ground level (21st January, 2009).
- RL's are extrapolated from provided contour map. Supplied by Graham Scott & Associates.

5.7 Groundwater & Seepage

Groundwater was not encountered in the test pits at the time of the investigation. However, minor seepage through the upper granular material and along the soil/rock interface may occur following periods of rainfall.

5.8 Evidence of Instability

Existing Land Slips

A site walkover was undertaken to identify any evidence of instability. No evidence of past or existing land slips were evident.

Surface Scour

No evidence of existing erosion was seen on the site. However, small bare areas within drainage zones could be areas of possible recent scour.

Soil Creep

Several individual trees were noted to have slightly leaning or bowed trunks on the steeper parts of the site. These are considered to be indicative of soil creep, with the affected trees being progressively tilted by the slow movement of soil down the slope. The degree of tilting or bowing of these trees is considered to be a sign of relatively minor movements, and is typical for trees growing on a slope.

6.0 RISK ASSESSMENT

6.1 General

The site was assessed and zoned using the method as outlined in MacGregor and Taylor¹ (2001). The method has been adopted as a slope stability assessment tool and used in both the Gold Coast and Redlands Shire regional stability assessments.

6.2 Assessment Method - Natural Shallow Landslide

As noted in Section 5.6, the site generally consists of soils over shallow weathered metasedimentary and igneous rock and landslides are expected to be relatively shallow in this type of subsurface profile.

The method for natural shallow landslides requires the site to be assessed using eight parameters which provide a score depending upon the parameter being assessed. This score is collated and the result is related to a specific Hazard Rating.

The parameters that are assessed consist of :-

1. Basic Frequency (estimated frequency of a landslide event for a regional area) - generally assessed based on geology, geomorphology, historical landslide events, observed evidence, local rainfall, vegetation and geological judgement.
2. Slope angle - generally the steeper the slope the greater the risk of slope instability developing. A slope angle analysis was undertaken using 1m contours supplied by Graham Scott & Associates. Values adopted:-
 - Slope angles <5 deg. = 0.1
 - Slope angles 5-15 deg. = 0.5
 - Slope angles 15-30 deg = 0.8
3. Slope shape - provide indications of slope development. Based on supplied contour plans. Value adopted:-
 - Planar/convex = 0.9
 - Concave = 1.5
4. Site Geology - engineering performance can depend on geotechnical/geological properties of the underlying soils and rock. Based on the regional geology map and site inspection, all stages are deemed to be underlain by volcanic rock. Value Adopted = 1.1

¹ McGregor P. and B. Taylor (2001) A Method of Zoning Landslide Hazard, Australian Geomechanic Journal Volume 36, No. 3 September 2001

5. Material Strength - assesses the relative thickness of soil, colluvium and rock. As noted in Section 5.6.4, eleven test pits were noted over the site. The general soil profile consisted of a surficial colluvial layer (<1m thick) underlain by residual soil (except TP5 and TP6) with weathered rock encountered at depths from 0.2m to 1.1m. In general, the majority of the site was assumed as <1.0m of colluvial soil. Values adopted:-

- Colluvial soil <1m deep = 1.5

6. Concentration of surface water - water is one of the prime triggering parameters of slope instability. Based on supplied contour plans.

Values adopted:-

- Ridge = 0.7
- Upper Slope = 0.9
- Mid Slope = 1.2

7. Concentration of groundwater. Generally none noted. Value adopted:-

- None apparent = 0.7

8. Past evidence of instability - if slips have occurred previously they are more likely to re occur in the same area. Whilst there was no sign of instability observed on the site.

Value adopted:-

- No sign of instability = 0.5

6.3 Evaluation of Likelihood Rating

The site was assessed based on the parameters noted above. The method essentially calculates a relative frequency of slope instability for the site based on multiplying parameters as outlined in Section 6.2. This can then be used to assess the hazard rating of the site using the table below.

TABLE 2 **LIKELIHOOD RATING**

Relative Frequency	Hazard Rating
< 0.2	Very Low
0.2 to 0.6	Low
0.6 to 2.0	Moderate
2.0 to 6.0	High
> 6.0	Very High

6.4 Specific Hazard Rating of Site

Drawing 108-10088-02A (Appendix H) outlines the assessed hazard rating zones for the site.

In general, the subdivision was rated as very low to moderate hazard rating. Refer to Section 7.0 for specific comments with respect to building recommendations for each zone.

A review of this section would suggest that the very low and low zones could not be considered restrictive. Moderate has some restrictions, however we understand that these zones will be outside the proposed development area.

7.0 HAZARD MITIGATION & RECOMMENDATIONS

7.1 General

In order to preserve the stable condition of this site, it is considered essential that good hillside engineering construction practice be employed during development of the proposed allotments and associated access roads particularly where located on sloping land. The notes and illustrations attached in Appendix 'I' of this report outline some typical hillside construction guidelines including, earthworks, erosion control and drainage practices for hillside areas which should be taken into account as applicable.

In order to ensure long-term stability of the site upon development, the restrictions/precautions included in the following sections should also be taken into account.

7.2 Subdivisional Earthworks

The proposed subdivisional earthworks are understood to consist of the following:-

- Cuts of less than 1.0m in Lots 6 to 9.
- Fills of up to 1.8m along the south-western boundary.

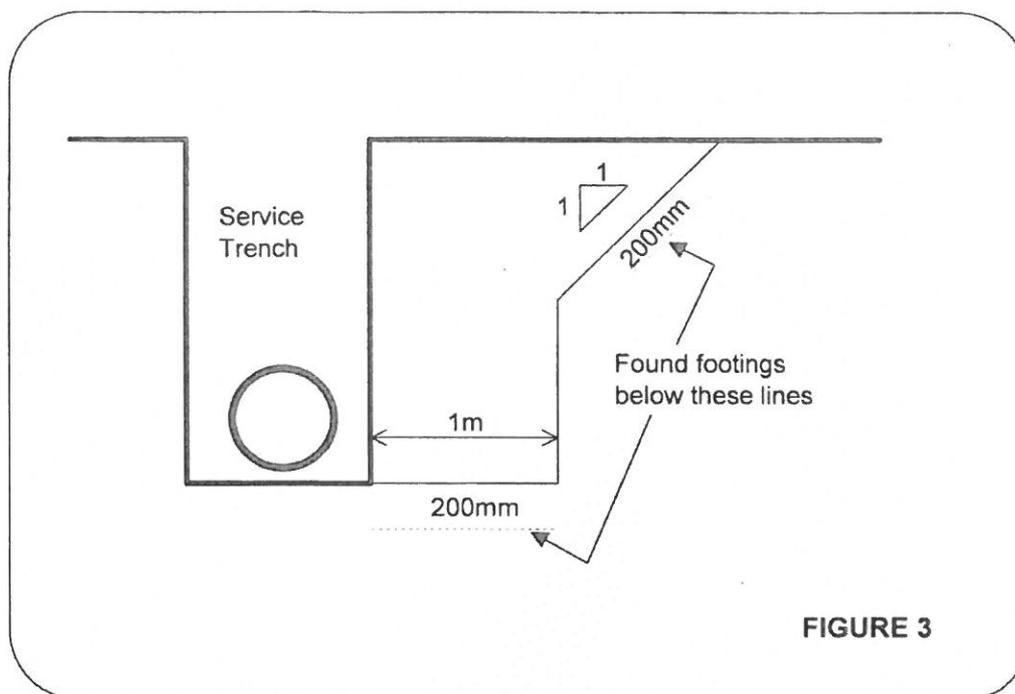
Procedures

Earthwork procedures should be carried out in a responsible manner in accordance with AS 3798-1996 'Guidelines on Earthworks for Commercial and Residential Developments'. It is recommended that the earthworks contractor make himself familiar with site conditions. Of particular note is the removal of existing fill material, eg. boulders in the depression in Lots 5 and 6.

Underground Services

Where footings are located adjacent to underground services, the footings (including retaining walls) should extend to base a minimum of 200mm below the trench base level for a distance of 1.0m out from the trench. Beyond 1.0m the footings should be taken a minimum of 200mm below an imaginary line drawn up at 45° from the trench base level (Figure 3). Notwithstanding the above comments, all temporary support must consider the site conditions and natural foundations at the time of construction.

These requirements do not override minimum footing levels.



Excavatability Comments

Based on geotechnical knowledge of excavations/earthworks on projects in the local area and the findings of the investigation, the following comments can be made on excavation characteristics:-

- Bulk Works
 - Excavation by a medium size to large excavator using a bucket of the soil and upper 500mm, or so, of the weathered rock is expected to be possible.
 - Excavation further into the weathered rock may be possible using a single tyne ripper on an excavator.
 - Below these levels, a medium to large excavator using hydraulic rock hammers will be required.
- Trenching
 - Trench excavations in the soils and upper 500mm, or so, of the weathered rock should be within the capacity of a medium size backhoe or small excavator.
 - Below these levels a larger excavator would be required for excavation further into the weathered rock.
 - In areas of shallower, stronger rock, specialised tools, eg. rock breakers, may be required.

Ripping depths can be significantly increased when the rock is bedded, laminated and highly jointed. The nature of the rock and inherent planes of weakness (clay and quartz seams) therefore play an important part in rock excavation assessment as well as logistical factors such as the manoeuvrability of the excavation plant to take advantage of (any) favourable discontinuities in the rock.

7.3 Recommendations with Respect to Construction

7.3.1 General Requirements for Development of Residential Lots

Continued long term stability of the site as well as of each allotment within the proposed development is subject to development of the site and each individual allotment within the site, taking place in accordance with the guidelines of this report and relevant Australian Standards and good building practices.

Based on the field observations, published hazard mapping and subsurface conditions encountered by the test pits from the geotechnical study at this site, it is concluded that the proposed subdivision development including the future construction of residential buildings, would not adversely effect the slope stability conditions at this site. This conclusion is qualified by the following provisos:

- The subdivisional works should be designed and constructed in accordance with sound and proper engineering principles.
- All cuts and fills are designed, supervised and certified by a suitably qualified engineer.
- Likewise, the future buildings to be constructed on the Lots should be planned designed and constructed in accordance with sound and proper engineering principles, and more specifically in accordance with good hillside construction practices (refer Appendix I).
- All construction works to be carried out in accordance with the recommendations of this report.
- All sites which contain areas of moderate Hazard ratings are to be subject to a further site specific stability assessment to confirm that the proposed development complies with the recommendations of this report and good engineering practice.
- All buildings that are to be constructed within an area that extends 20m above and 50m below any zone designated as moderate to also be subject to a further site specific stability assessment to confirm that the proposed development complies with the recommendations of this report and good engineering practice.

- The access and drainage infrastructure must be properly and effectively maintained, to ensure that all stormwater is intercepted and controlled. This requirement extends to each individual Lot, so that all owners and occupiers remain aware that ongoing maintenance of the site drainage is essential for continued site stability.

Prior to house construction a site specific investigation should also be carried out for each individual house site taking into account not only foundation requirements but also stability considerations for each specific development proposal particularly within the moderately to steeply sloping portions of the site.

The following recommendations should be adopted :-

- All engineering works should follow the appropriate codes i.e.
 - Earthworks - AS.3798-1996 "Guidelines on Earthworks for Commercial and Residential Developments". Further general recommendations are provided in Section 7.3.1.
 - Footings for buildings - AS.2870 'Residential Slabs and Footings'.
 - Retaining structures - AS4678 'Earth Retaining Structures'.
 - Road pavements - AS3727 'Guide to Residential Pavements' or Local Council Requirements.
- Vegetation - where possible the prompt re-establishment of ground cover should be undertaken to reduce the risk of surface scour during and following rainfall. Where not possible, other forms of surface protection should be adopted.
- All filling works should be undertaken under Level 1 type supervision with particular reference to Section 2 (i) and 2 (j) of AS3798-1996.
- Gully filling - Any earthworks carried out in the existing gullies should take into consideration potential flows and their effect on surface scour. The effect of these earthworks should be to reduce the velocity of any water flow and collect seepage and overland flow into an engineer designed system to minimise any impact of the proposed fill and existing natural slopes.

7.3.2 Construction and Earthworks

Comments with respect to restrictions on construction for each hazard rating are outlined in Table 3.

TABLE 3 **BUILDING COMMENTS**

Hazard Rating	Building Restrictions*
Very Low	No restrictions on cut and fills on site provided they are engineer designed and carried out in accordance with AS 3798-1996. Building construction methods will vary within zone with the use of normal residential type construction possible (ie. slab on ground) over most of the zone.
Low	No restrictions on cut and fills on site provided they are engineer designed and carried out in accordance with AS 3798-1996. Building construction methods will vary within zone with the use of normal residential type construction possible (ie. slab on ground) over most of the zone. The use of a more flexible construction may be required near the edges of the zone.
Moderate	Maximum cuts are restricted to 3.0m and fill heights are restricted to 1.0m and should be engineer designed and carried out in accordance with AS 3798-1996. Building construction methods will vary within zone. The use of normal residential type construction (ie. slab on ground) may be possible depending on cut and fill requirements and size of slab. However, the use of a more flexible construction is preferred for the majority of the zone.

7.4 House Types

It is recommended that in areas with slopes of 15 degrees or steeper, house types should consist of lightweight, flexible construction with suspended timber floors founded on piers and posts. Slab on ground construction is not recommended on these slopes other than for small structures such as garages, subject to detailed evaluation by an experienced geotechnical engineer.

In areas with slopes between 8 to 15 degrees, preference should also be given to non-slab on ground construction unless the ground slabs are stepped down the slope.

Where ground slopes are less than 8 degrees, slab on ground construction may be adopted.

7.5 Drainage

Appropriate drainage provisions are essential in any development. Adequate subsoil and surface drainage should also be incorporated in the driveway construction, as well as any retaining wall construction and service lines. Further specific comments can be provided once a site layout has been finalised.

Roofwater should not be discharged on the allotments, particularly on sloping sites but should be taken via piped conduits to the road drainage system, to a piped interlot drainage system or to water storage tanks. Any overflow from water storage tanks should be piped to the road drainage system or interlot drains.

Concentrated water discharge should be dispersed over a wide zone to prevent possible confluence which may cause erosion and scour or trigger possible mass movement.

7.6 Disposal of Liquids

It is understood that discharge to a piped sewage system is to be provided for all of the subdivision.

However, if discharge to a piped sewage system is not provided, effluent should not be disposed of via absorption trenches on steeply sloping sites, say, with slopes greater than about 9 degrees (about 15%).

Instead, a domestic treatment plant and sprinkler system could be used in these areas. Any sprinkler area should not be located immediately above or below a house site. The location of a sprinkler discharge area should also be reviewed by an experienced geotechnical engineer with respect to stability issues on a particular site. Any on-site sewage disposal system would also be subject to a site specific evaluation in accordance with local Council requirements.

N.P. Disposal of stormwater using soakaways or rubble pits may be possible but would need careful investigation and design.

8.0 LIMITATIONS

We have prepared this report for the use of Pearlarm Pty Ltd for design purposes in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has not been prepared for use by parties other than Pearlarm Pty Ltd or their associated consultants. It may not contain sufficient information for purposes of other parties or for other uses.

Soil Surveys Engineering offer a documentation review service to verify that the intent of geotechnical recommendations is properly reflected in the design. It is recommended that the client avail themselves of this service; our standard rates will apply.



G. BURKITT
ENGINEERING GEOLOGIST



N. T. PERKINS (RPEQ 7527)
PRINCIPAL ENGINEERING GEOLOGIST

for and on behalf of
SOIL SURVEYS ENGINEERING PTY LIMITED

APPENDICES

APPENDIX A
NOTES RELATING TO THIS REPORT

INTRODUCTION

These notes are provided by Soil Surveys Engineering Pty Limited (the Company) to complement the geotechnical report in regard to classification methods and field procedures. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited information about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such information obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and at the time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

Soils - The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726-1993 (Geotechnical Site Investigations), where appropriate. In general, descriptions cover the following properties - soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the dominant particle size and behaviour as set out in AS 1726-1993.

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, shear vane, laboratory testing or engineering examination. The strength terms are defined in AS1726-1993 Table A4.

Non-cohesive soils are classified on the basis of relative density usually based on insitu testing or engineering examination (see AS1726-1993 Table A5).

Rocks - Rock types are classified by their geological names (AS1726-1993 Table A6), together with

descriptive terms regarding weathering (AS1726-1993 Table A9), strength (refer Table 1 below), defects (AS1726-1993 Table A10), etc. Where strength testing (ie Point Loads) is carried out, AS1726-1993 Table A8 is used. Where relevant, further information regarding rock classification is attached.

Table 1 Estimated strength descriptions given to rock based on engineering examination

Strength Term	Approximate Qu (MPa)
Extremely Weak	< 1.0
Very Weak	1.0 - 5.0
Weak	5.0 - 25
Medium Strong	25 - 50
Strong	50 - 100
Very Strong	100 - 250
Extremely Strong	> 250

Ref ISRM "Suggested Methods for the Quantitative Description of Discontinuities in Rock Masses"

SAMPLING

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

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon sample disturbance, (information on strength and structure).

Undisturbed samples are taken by pushing a thin walled sample tube, usually 50mm diameter (U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength, volume change potential and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

TEST LOCATIONS

Test locations (e.g. boreholes, CPT's, test pits etc.) were based on available access at the time of testing (access may need to be provided "by others"). Test locations may have been shifted if access was not suitable.

Unless noted otherwise, accuracy of test locations are to the accuracy of hand held GPS equipment.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application.

Test Pits - These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling - A borehole of 50 to 100mm diameter is advanced by manually operated equipment. Refusal of the augers can occur on a variety of materials such as hard clay, gravel or rock fragments and does not necessarily indicate rock level.

Continuous Spiral Flight Augers - The borehole is advanced using 75 to 300 mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling or insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the augers. Information from the drilling (as distinct from specific sampling) is of relatively lower reliability due to remoulding, inclusion of cuttings from above or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table has a lower reliability than augering above the water table. Various drill bits are attached to the base of the augers during

the drilling. The depth of refusal of the different bit types can provide information as to the strength of the material encountered. Generally two different bit types are used. The 'V' bit is a V shaped steel bit and the 'TC' bit is a tungsten carbide tipped screw type bit.

Wash Boring - The borehole is usually advanced by a rotary bit with water or fluid pumped down the hollow drill rods and returned up in the space between the rods and the soil or casing, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from "feel" and rate of penetration. More accurate information on soil strata is gained by regular testing and sampling using the Standard Penetration Test (SPT) and undisturbed thin walled tube samples (U50).

Mud Stabilized Drilling - Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilize the borehole. The term "mud" encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from regular intact sampling (eg. from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling - A continuous core sample is obtained using a diamond or tungsten carbide tipped core barrel. Provided full core recovery is achieved (which is not always possible in very weak rocks and granular soils), this technique provides a very reliable method of investigation. In rocks, NMLC coring (nominal 52 mm diameter) is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses is determined on site by the supervisor. If the location of the loss is uncertain, it is placed at the top end of the run, when the core is placed in a storage tray and recorded on the log.

Standard Penetration Tests - Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" - Test 6.3.1.

exist between static cone and nearby borehole information.

Portable Dynamic Cone Penetrometers - Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 100mm increments of penetration.

The DCP comprises a Cone of 20 mm diameter with 30 degree taper attached to steel rods of smaller section.

The cone end is driven with a 9 kg hammer falling 510 mm (AS. 1289 Test 6.3.2). The test was developed initially for pavement subgrade investigations, and empirical correlations of the test results with California Bearing Ratio have been published by various Road Authorities. The Company has developed their own correlations with Standard Penetration tests and Density Index tests in sands.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems.

- Although groundwater may be present in lower permeability soils, it may enter the hole slowly or perhaps not at all during the time the hole is open.

- A localized perched water table may lead to an erroneous indication of the true water table.

- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.

- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be bailed out of the bore and mud must be washed out of the hole or "reverted" if water observations are to be made.

More reliable measurements can be made by use of standpipes which are read after stabilizing at periods ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg. bricks, steel, etc.) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is important to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms and the attached explanatory notes summarize important aspects of the Laboratory Test Procedures adopted.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. The information provided in Soil Surveys Engineering reports is opinion and interpretation and not factual. The client/contractor increases their risk by not retaining the person who authored the geotechnical report, to carry out site inspection and review (overseeing role) during construction, to confirm opinion and interpretation expressed in the report is accurate. Where the report has been prepared for a specific design proposal the information and interpretation may not be relevant if the design proposal is changed. If this happens, the Company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. Since the test sites in any exploration represent a very small proportion of the total site and since the exploration only identifies actual ground conditions at the test sites, even under the best circumstances actual conditions may vary from those inferred to exist. No responsibility is taken for:-

- Unexpected variations in ground and/or groundwater conditions.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of other persons.
- Any work where the company is not given the opportunity to supervise the construction using the Companies designs/recommendations.

If differences occur, the Company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

In the event that conditions encountered on site during construction appear to vary from those expected from the information contained in the report, the Company requests that it immediately be notified. Most problems are more readily resolved when conditions are exposed than at some later stage, well after the event.

Extreme events including but not limited to the results of climate change, eg. flood levels above previously identified levels, beach scour or erosion beyond normal expectations (as identified by local authorities) extreme rainfall events, war, espionage, sabotage may result in different conditions between time of investigation and time of construction.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Construction Contracts (1987)", published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances, where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

REVIEW OF DESIGN

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer. We would be happy to assist in this regard as an extension of our investigation commission. Construction drawings should be reviewed by Soil Surveys Engineering, with sufficient time to allow changes if required, prior to inspections.

Otherwise Soil Surveys Engineering reserves the right to refuse to carry out inspections.

SITE INSPECTION

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

- i) Site visits during construction to confirm reported ground conditions
- ii) Site visits to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, the stability of a filled or excavated slope; or
- iii) Full-time engineering presence on site.

In the vast majority of cases it is advantageous to the principal for the geotechnical engineer who wrote the investigation report to be involved in the construction stage of the project.

The geotechnical engineer cannot take responsibility for variations in encountered conditions, where he is not given the opportunity to review plans for the proposed development with sufficient time to allow review and make changes to the proposed development if required, and where he is not given the opportunity to inspect the site and oversee construction methods with regard to site conditions with sufficient time to observe all relevant site conditions and operations.

RESPONSIBLE USE OF GEOTECHNICAL INFORMATION

Recommendations in our report are for design purposes only and provided on the basis that inspections are carried out to allow finalisation of opinions and recommendations contained in our report.

The geotechnical investigation consisting of field and laboratory testing has been carried out to indicate typical conditions by indicating conditions and parameters at the specific locations of boreholes/test pits. Subsurface conditions are indicated at these locations only and the inference of conditions between or away from these locations (interpolation and extrapolation) involves a certain degree of risk. Persons inferring such conditions or carrying out such inferences should do so with a degree of caution and

conservatism which is commensurate with the consequences of the risk of error.

Estimates of volumes based on our findings require interpolation and extrapolation between test locations and as such may be significantly different from actual volumes.

APPENDIX B
OUTCOMES MEASURED FOR STATE
PLANNING POLICY 1/03

Outcome 1 : Within natural hazard management areas, development to which this SPP applies is compatible with the nature of the natural hazard¹, except where:

- The development proposal is a development commitment² ; or
- There is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal

Outcome 2 : Development that is not compatible with the nature of the natural hazard but is otherwise consistent with Outcome 1:

- Minimizes as far as practicable the adverse impacts from natural hazards ; and
- Does not result in an unacceptable risk³ to people or property

¹ Refer to Section 9 Glossary of SPP 1/03

² Refer to Section 9 Glossary of SPP 1/03

³ Refer to Section 9 Glossary of SPP 1/03



APPENDIX C
SITE PHOTOGRAPHS

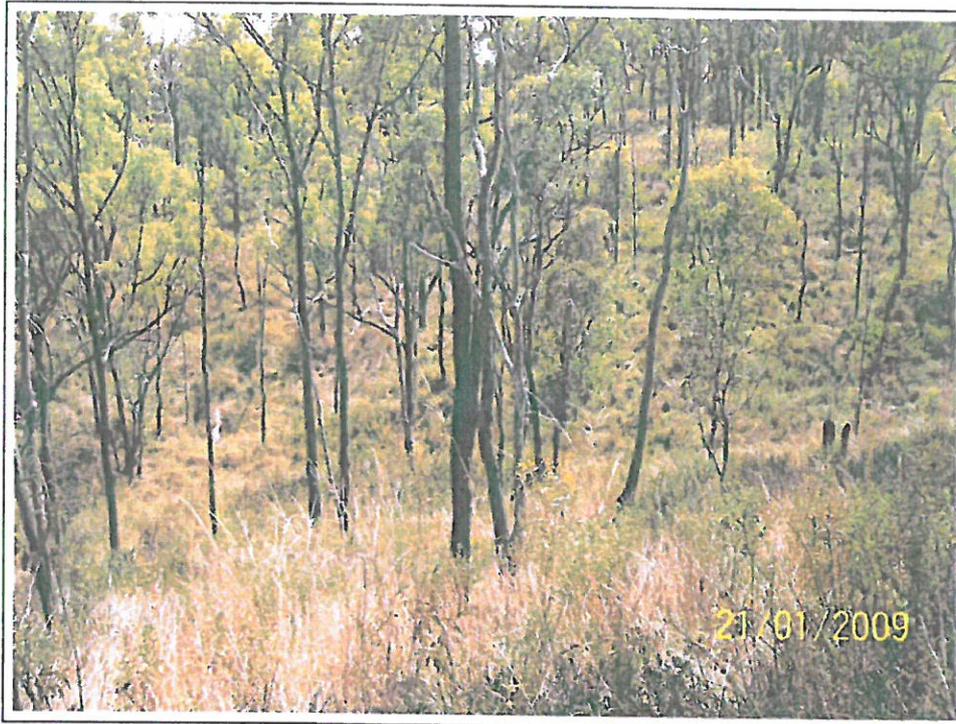
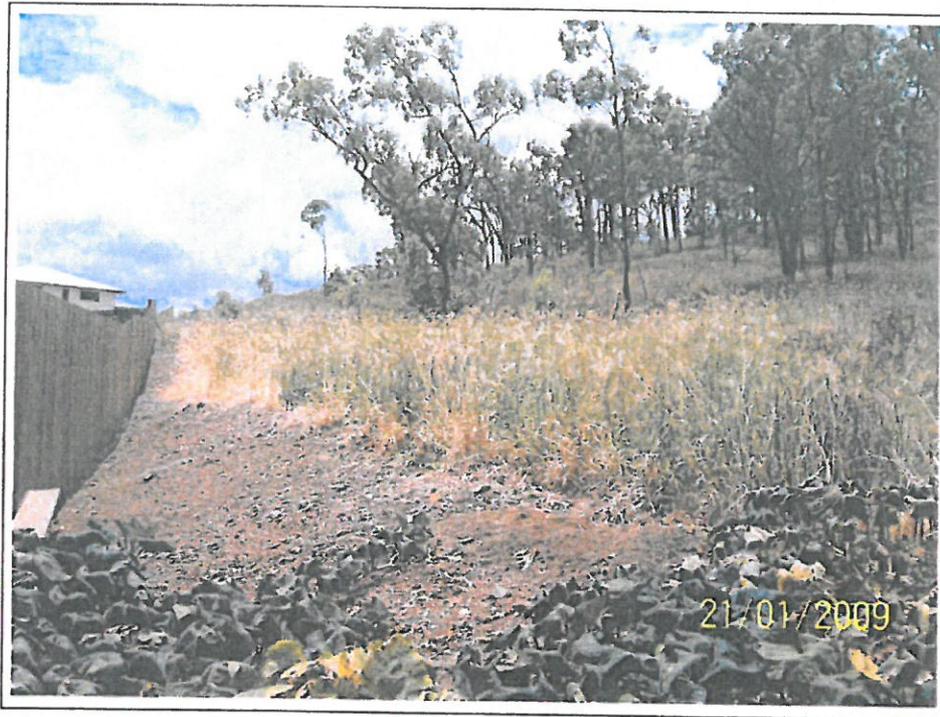


PLATE 1 - NORTHERN GULLY IN LOT 42, LOOKING NORTH



PLATE 2 - SITE AT TP7, LOOKING EAST



**PLATE 3 - SITE LOOKING ALONG WESTERN BOUNDARY WITH
STAGE 1, LOOKING NORTH WEST**

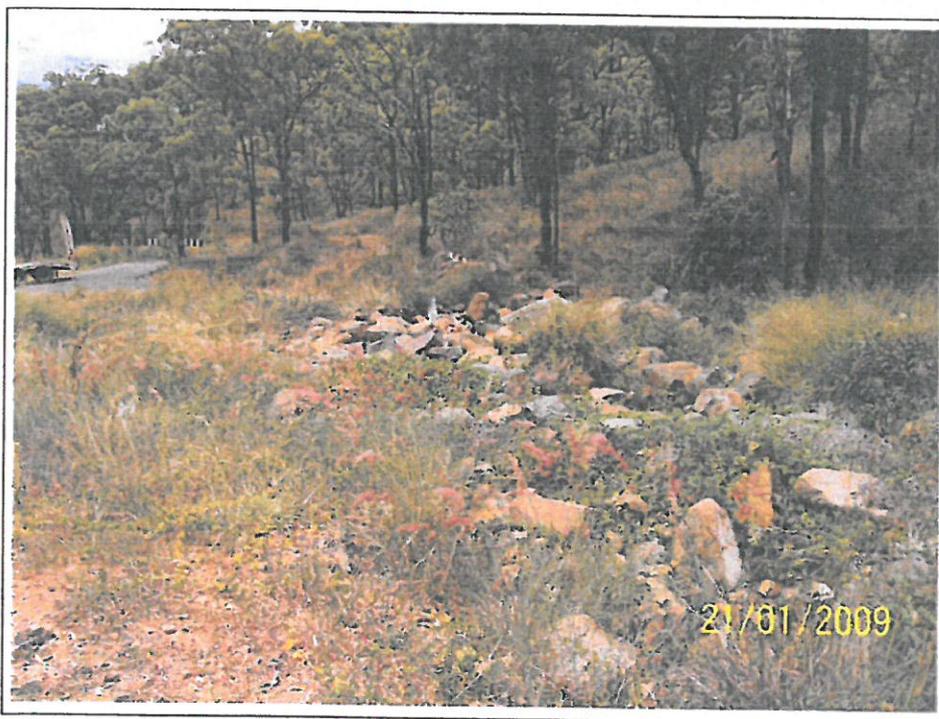


PLATE 4 - BOULDER FILLED GULLY ADJACENT TO TP10, LOOKING NORTH

APPENDIX D

TYPES OF LANDSLIDES

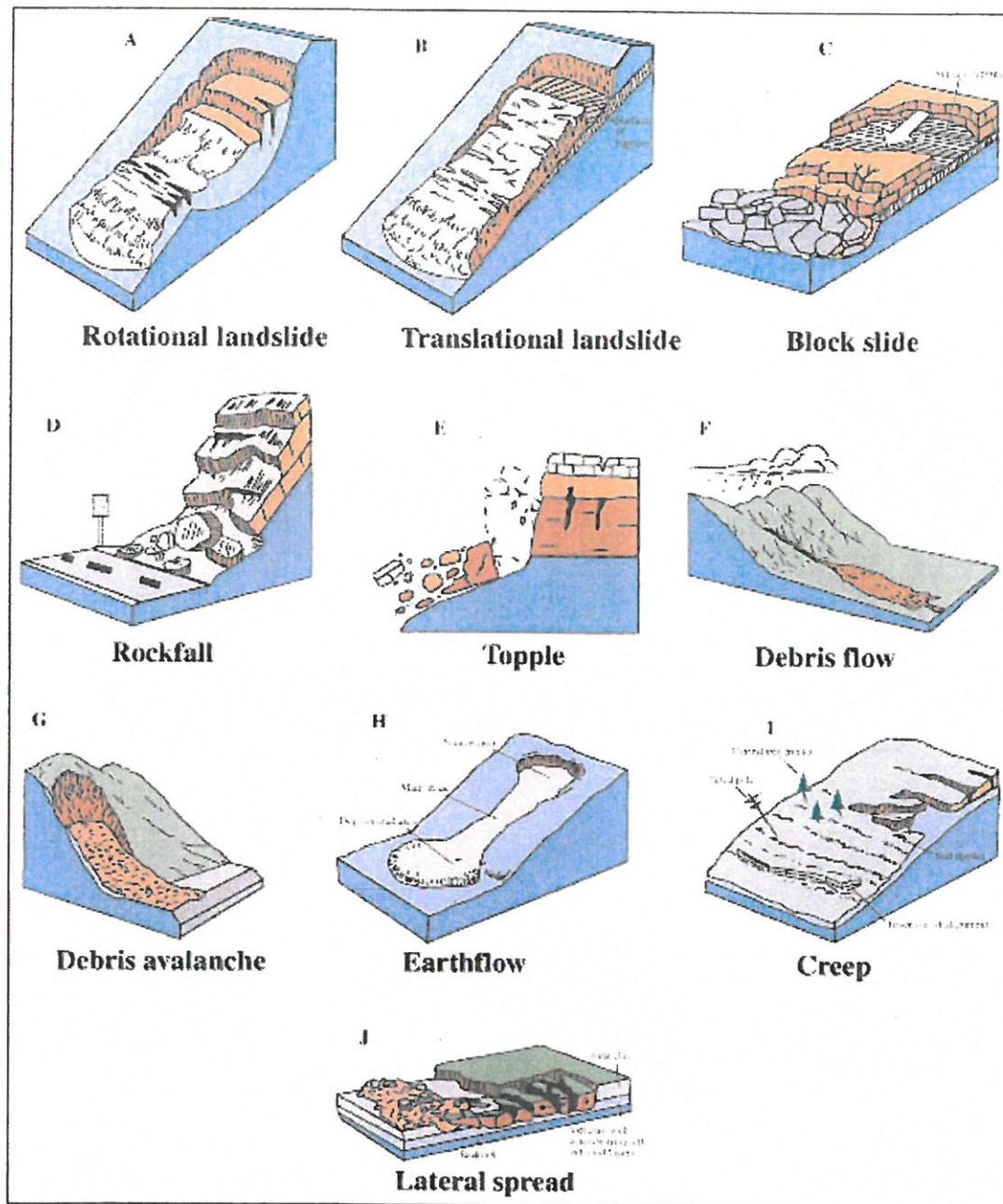


FIGURE D1 TYPES OF LANDSLIDES

Ref : USGS Fact Sheet 2004-3072.

APPENDIX E
FRAMEWORK FOR LANDSLIDES
RISK MANUAL



APPENDIX F
SITE INVESTIGATION MAPS

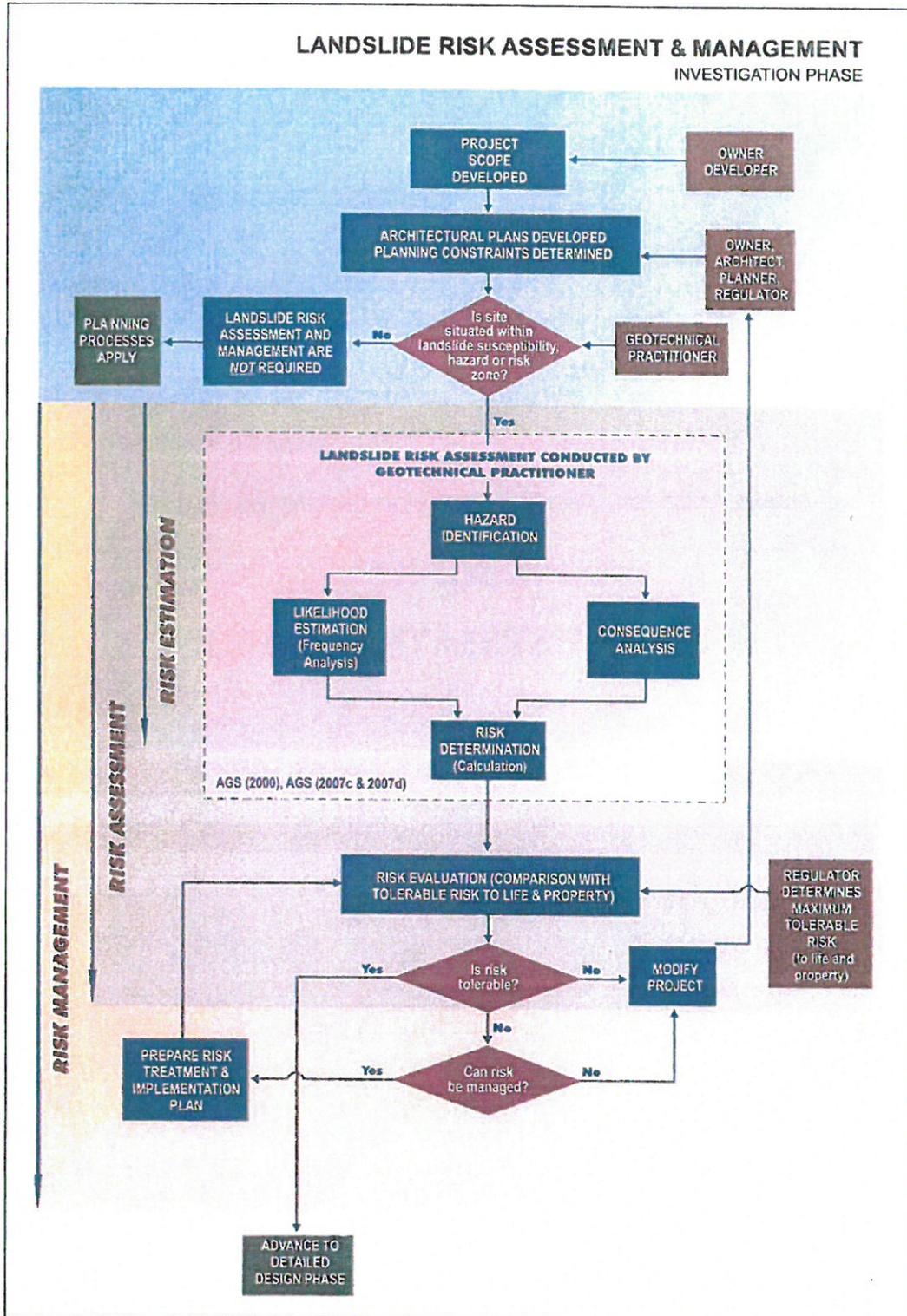


FIGURE E1 LRM FLOWCHART

Extract from "Landslide Risk Management Concepts and Guidelines", Australian Geomechanics Society Journal, Volume 37 No. 2, May 2002.

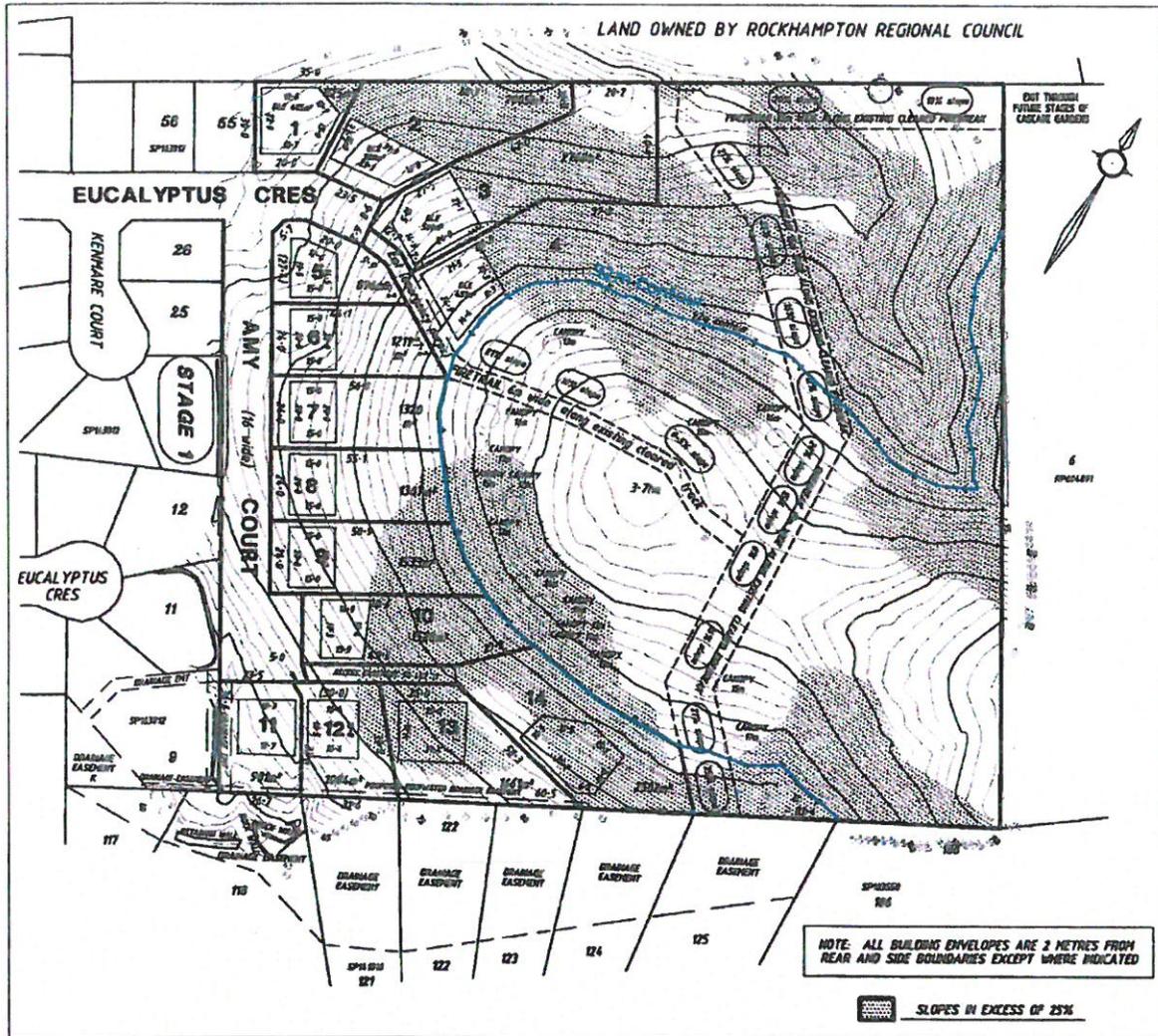


FIGURE F3 - TOPOGRAPHY - SLOPE ANGLE

APPENDIX G
TEST PIT RECORDS



Test Pit Number : 1

Project Number : 107-10088

Project Name : Proposed Subdivision

Location : Eucalyptus Cres., Rockhampton

Client : Graham Scott & Associates

Date : 21/01/2009

Page : 1

Easting : 248064 Northing : 7418772 RL : 89.00

Logger : GB Machine : 12 tonne Excavator

Depth	Graphic	Description	Samples and Remarks
0.5		COLLUVIUM, Silty Sandy Gravel, loose, brown.	
0.50		Silty CLAY (CI) Hard, medium plasticity, red orange brown, trace of gravel.	D
1.0			
1.10		METASILTSTONE (XW) Weak, light grey brown.	
1.20			
1.30		METASILTSTONE (DW-SW) Moderately strong to strong, grey brown, angular fragments.	
1.5		Test Pit Terminated 1.30m	
2.0			
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			

COMMENTS

1) Groundwater not observed.

Approved:

Date : 31/2/09



Test Pit Number : 2

Project Number : 107-10088

Project Name : Proposed Subdivision

Location : Eucalyptus Cres., Rockhampton

Client : Graham Scott & Associates

Date : 21/01/2009

Page : 1

Easting : 248015

Northing : 7418804

RL : 87.00

Logger : GB

Machine : 12 tonne Excavator

Depth	Graphic	Description	Samples and Remarks
0.30		COLLUVIUM, Silty Sandy Gravel, loose, brown.	
0.5		Silty CLAY (CI) Hard, medium plasticity, red orange brown, trace of gravel.	
0.90		METASILTSTONE (XW) Weak, light grey brown.	
1.60		ANDESITE (XW-DW) Weak to moderately strong, yellow brown, cobbles.	
1.70		Test Pit Terminated 1.70m	
2.0			
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			

COMMENTS

1) Groundwater not observed.

Approved :

Date : 8/12/09



Consulting Geotechnical engineers RPECO No. 195
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PO Box 2
Buddina Q 4578
Ph 61 7 5493 1733
Fax 61 7 5493 2837

Test Pit Number : 3

Project Number : 107-10088

Project Name : Proposed Subdivision

Easting : 248010 Northing : 7418759 RL : 99.00

Location : Eucalyptus Cres., Rockhampton

Logger : GB Machine : 12 tonne Excavator

Client : Graham Scott & Associates

Date : 21/01/2009

Page : 1

Depth	Graphic	Description	Samples and Remarks
0.40		COLLUVIUM, Silty Sandy Gravel, loose, brown.	
0.50		Sandy CLAY (CI) Hard, medium plasticity, red brown, trace of gravel and cobbles.	
0.60		METASILTSTONE/CHERT (DW) Moderately strong to strong, orange grey, angular fragments.	
1.00		ANDESITE (XW) Weak, yellow brown.	D
1.50		Test Pit Terminated 1.50m	
2.00			
2.50			
3.00			
3.50			
4.00			
4.50			
5.00			

COMMENTS

1) Groundwater not observed.

Approved:
Date : 9/12/09



Test Pit Number : 4

Project Number : 107-10088

Project Name : Proposed Subdivision

Easting : 247948

Northing : 7418731

RL : 92.00

Location : Eucalyptus Cres., Rockhampton

Logger : GB

Machine : 12 tonne Excavator

Client : Graham Scott & Associates

Date : 21/01/2009

Page : 1

Depth	Graphic	Description	Samples and Remarks
0.30		COLLUVIUM, Silty Sandy Gravel, loose, brown.	
0.5		Gravelly CLAY (CL) Hard, low plasticity, mottled yellow brown, trace of sand.	D
0.60		METASILTSTONE (XW) Weak, orange yellow.	
0.80		METASILTSTONE (DW) Moderately strong to strong, grey brown.	
0.90		Test Pit Terminated 0.90m	

COMMENTS

1) Groundwater not observed.

Approved:
Date : 31/1/09



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Test Pit Number : 5

Project Number : 107-10088

Project Name : Proposed Subdivision

Easting : 247988

Northing : 7418671

RL : 91.00

Location : Eucalyptus Cres., Rockhampton

Logger : GB

Machine : 12 tonne Excavator

Client : Graham Scott & Associates

Date : 21/01/2009

Page : 1

Depth	Graphic	Description	Samples and Remarks
0.5		COLLUVIUM Silty Clayey Gravel, Loose to medium dense, pale grey,	
1.0		METASILTSTONE (DW) Moderately strong to strong, light grey brown.	
1.20		Test Pit Terminated 1.20m	
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			

COMMENTS

1) Groundwater not observed. 2) Excavator refusal at 1.2m.

Approved:
Date : 21/2/09



Test Pit Number : 6

Project Number : 107-10088

Project Name : Proposed Subdivision

Easting : 248009 Northing : 7418672 RL : 96.00

Location : Eucalyptus Cres., Rockhampton

Logger : GB Machine : 12 tonne Excavator

Client : Graham Scott & Associates

Date : 21/01/2009

Page : 1

Depth	Graphic	Description	Samples and Remarks
0.20		COLLUVIUM Silty Clayey Gravel, Loose to medium dense, pale grey,	
0.50		METASILTSTONE (DW) Moderately strong to strong, light grey brown, highly fractured.	
		Test Pit Terminated 0.50m	

COMMENTS

1) Groundwater not observed. 2) Excavator refusal at 0.5m

Approved :
Date : 21/2/09



Test Pit Number : 7

Project Number : 107-10088

Project Name : Proposed Subdivision

Location : Eucalyptus Cres., Rockhampton

Client : Graham Scott & Associates

Date : 21/01/2009

Page : 1

Easting : 248022 Northing : 7418637 RL : 85.50

Logger : GB Machine : 12 tonne Excavator

Depth	Graphic	Description	Samples and Remarks
0.40		COLLUVIUM Silty Clayey Gravel, Loose to medium dense, pale grey,	
0.5		Sandy CLAY (CI) Hard, medium plasticity, yellow brown, traces of gravel.	D
0.80		METASILTSTONE (DW) Moderately strong to strong, light grey brown, highly fractured.	
1.0		Test Pit Terminated 1.00m	
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			

COMMENTS

1) Groundwater not observed.

Approved:
Date : 9 / 2 / 09



Test Pit Number : 8

Project Number : 107-10088

Project Name : Proposed Subdivision

Easting : 247969 Northing : 7418608 RL : 74.00

Location : Eucalyptus Cres., Rockhampton

Logger : GB Machine : 12 tonne Excavator

Client : Graham Scott & Associates

Date : 21/01/2009

Page : 1

Depth	Graphic	Description	Samples and Remarks
0.5		COLLUVIUM Silty Clayey Gravel, Loose to medium dense, pale grey,	
0.50		Sandy CLAY (CI) Hard, medium plasticity, yellow brown, traces of gravel	
0.60		METASILTSTONE (DW) Moderately strong to strong, brown grey.	
0.80		Test Pit Terminated 0.80m	
1.0			
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			

COMMENTS

1) Groundwater not observed. 2) Excavator refusal at 0.8m

Approved:
Date : 21/01/09



Test Pit Number : 9

Project Number : 107-10088

Project Name : Proposed Subdivision

Location : Eucalyptus Cres., Rockhampton

Client : Graham Scott & Associates

Date : 21/01/2009

Page : 1

Easting : 247915 Northing : 7418665 RL : 77.50

Logger : GB Machine : 12 tonne Excavator

Depth	Graphic	Description	Samples and Remarks
0.30		COLLUVIUM Silty Clayey Gravel, Loose to medium dense, pale grey,	
0.40		Sandy CLAY (CI) Hard, medium plasticity, yellow brown, traces of gravel.	
0.60		METASILTSTONE (DW) Moderately strong to strong, yellow brown.	
		Test Pit Terminated 0.60m	
1.0			
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			

COMMENTS

1) Groundwater not observed. 2) Excavator refusal at 0.6m

Approved :
Date : 21/2/09



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Test Pit Number : 10

Project Number : 107-10088

Project Name : Proposed Subdivision

Easting : 247895 Northing : 7418709 RL : 78.50

Location : Eucalyptus Cres., Rockhampton

Logger : GB Machine : 12 tonne Excavator

Client : Graham Scott & Associates

Date : 21/01/2009

Page : 1

Depth	Graphic	Description	Samples and Remarks
0.40		COLLUVIUM Silty Clayey Gravel, Loose to medium dense, pale grey,	
0.60		Gravelly CLAY (CI) Hard, medium plasticity, yellow brown.	
0.80		ANDESITE (XW) Weak, yellow brown.	
1.00		ANDESITE (DW) Moderately strong, yellow brown.	
		Test Pit Terminated 1.00m	

COMMENTS

1) Groundwater not observed.

Approved:
Date : 9/2/09



Test Pit Number : 11

Project Number : 107-10088

Project Name : Proposed Subdivision

Location : Eucalyptus Cres., Rockhampton

Client : Graham Scott & Associates

Date : 21/01/2009

Page : 1

Easting : 247903

Northing : 7418788

RL : 78.00

Logger : GB

Machine : 12 tonne Excavator

Depth	Graphic	Description	Samples and Remarks
0.40		COLLUVIUM Silty Clayey Gravel, Loose to medium dense, pale grey, angular cobbles.	
0.90		Gravelly CLAY (CI) Hard, medium plasticity, yellow brown.	
1.20		METASILTSTONE (DW-SW) Moderately strong to strong, dark grey brown, cobbles and boulders.	
1.20		Test Pit Terminated 1.20m	

COMMENTS

1) Groundwater not observed. 2) Excavator refusal at 1.2m

Approved: 
Date : 21/2/09



**APPENDIX H
SITE PLANS**

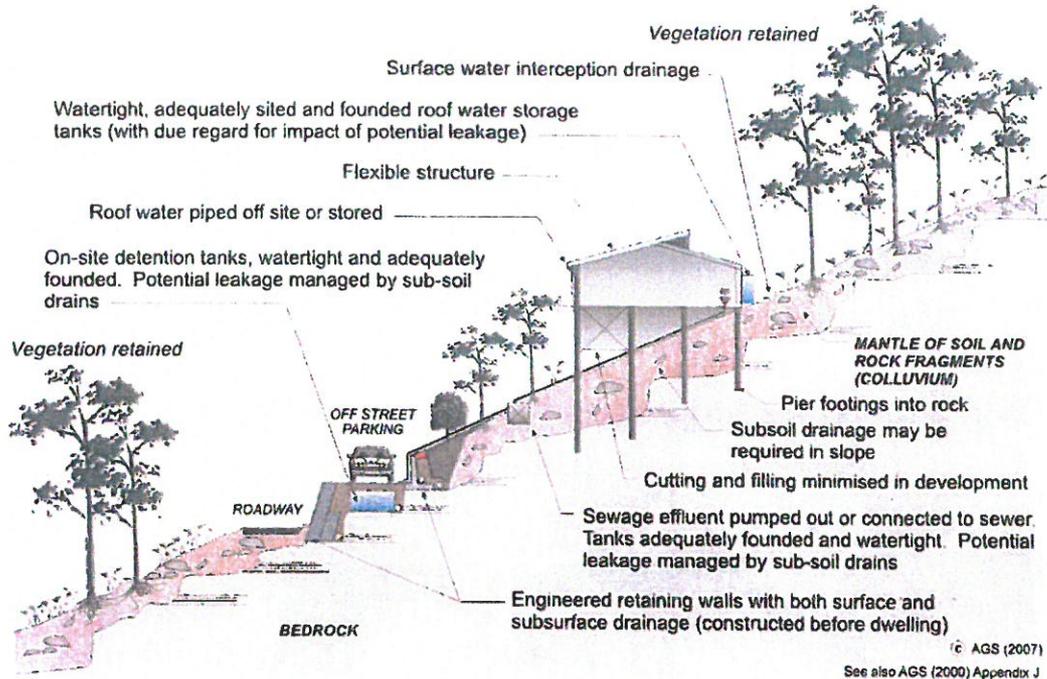
APPENDIX I
HILLSIDE CONSTRUCTION GUIDELINES
EXTRACT FROM AUSTRALIAN
GEOMECHANICS
VOL 42 NO. 1 MARCH 2007

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

HILLSIDE CONSTRUCTION PRACTICE

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

EXAMPLES OF GOOD HILLSIDE CONSTRUCTION PRACTICE



WHY ARE THESE PRACTICES GOOD?

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

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

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

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

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

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

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

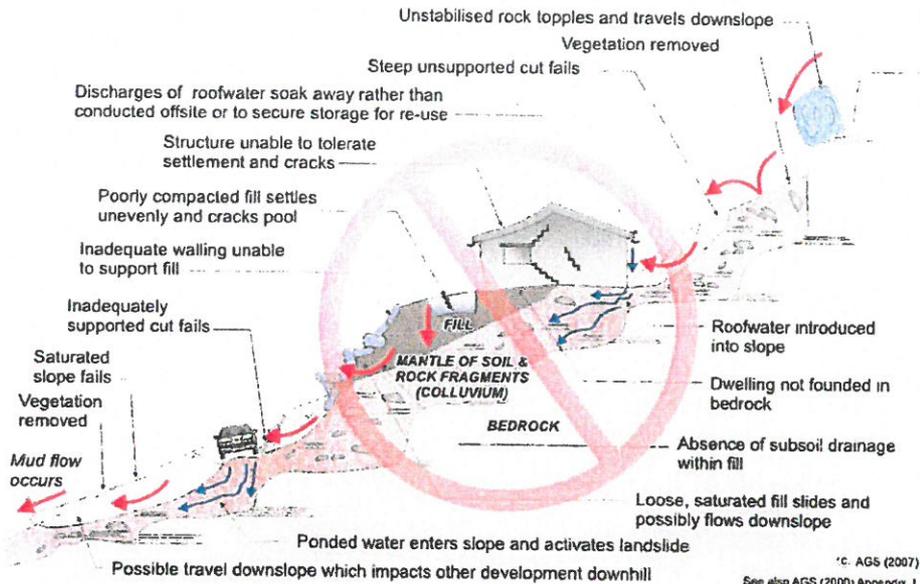
Vegetation clearance - on soil slopes has been kept to a reasonable minimum. Trees, and to a lesser extent smaller vegetation, take large quantities of water out of the ground every day. This lowers the ground water table, which in turn helps to maintain the stability of the slope. Large scale clearing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

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

ADOPT GOOD PRACTICE ON HILLSIDE SITES

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

EXAMPLES OF **POOR** HILLSIDE CONSTRUCTION PRACTICE



WHY ARE THESE PRACTICES POOR?

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

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

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

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

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

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

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

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

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

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

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

Fairfield Estate

Stage 2

COVENANT

BUILDING AND DEVELOPMENT REQUIREMENTS

31 November - 2011

ROCKHAMPTON REGIONAL COUNCIL
These plans are approved subject to the current conditions of approval associated with
Development Permit No. <u>D/280-2011</u>
Dated <u>24/7/12</u>

ANNEXURE "A"

PLEASE READ THIS COVENANT REQUIREMENT CAREFULLY

As a resident of Fairfield Estate Stage 2, you will appreciate the assistance given by this covenant that forms part of your contract. The developer of Fairfield Estate Stage 2 will administer this covenant and answer any inquiries you may have.

The Estate offers quality of life, closeness to the University and a high standard of housing that will assist to make it a great place to live. To ensure that this standard is achieved and maintained and to secure your investment, all housing is protected by this document which sets out building and development requirements. These requirements protect your investment by ensuring that:

- houses are designed and built to achieve good designs and style, with colours that complement each other and the streetscape
- an attractive residential environment is achieved and maintained, and
- a standard of a landscaping of homes is established and satisfactorily maintained

The Covenant requirements offer peace of mind; you can invest in your allotment and home, secure in the knowledge that your neighbours are expected to meet the same requirement which protect both the built and landscaped environment of Fairfield Estate Stage 2.

- Please be sure your builder reads this covenant before the start of the construction of your home.

Special Conditions to Contract between

Pearlarm Pty Ltd (The Seller)
ABN 36 053 526 784 and

(The Buyer)

In respect of Lot on SP 163930

Parish of Murchison, County of Livingstone

Dated:

1. QUALITY ESTATE

The Buyer acknowledges and agrees with the Seller that the land is the final stage of a multi-stage development being developed by the Seller, the object of which is to establish an attractive residential area and it is desirable that supervision and control will be exercised by the Seller for the protection of the interest of the Buyer and all other owners for the time being in respect of the nature and type of construction to occur on the land and all other land within the development and in recognition of the desirability of the creation of an attractive development.

2. BUILDING LOCATION ENVELOPES

The Buyer acknowledges that any dwelling house or structure, outbuildings and garages are to be erected within the boundaries of a building envelope nominated for this allotment, in accordance with Building Envelope Plan NR9010BBT (dated 4th November 2011), a copy of which is attached to this Covenant, unless a variation is approved by Rockhampton Regional Council.

3. BUSHFIRE MANAGEMENT

The Buyer acknowledges that a **Bushfire Management Plan (BMP)** (version 4 dated 14 August 2011) and a **Property Vegetation Management Plan (PVMP)** (version 2 dated 5 September 2011) have been prepared for Fairfield Stage 2 by Denley Environmental Consultants Pty Ltd. The buyer acknowledges that he/she/they have been provided with a Bushfire Management compendium which, among other materials, includes a copy of the Bushfire Management Plan and a copy of the Property Vegetation Management Plan. The BMP and the PVMP may, among other considerations, impact your house design and fencing materials. Where there is any conflict between this Covenant and the Bushfire Management Plan or the Property Vegetation Management Plan, the Bushfire Management Plan and the Property Vegetation Management Plan shall take precedence.

3.1 Building Design Restrictions resulting from Australian Standard AS 3959-2009 (building standards for bushfire prone areas)

Section 2.5.1 of the Bushfire Management Plan states:

2.5.1 Dwellings Within 50m of a Natural Hazard

Dwellings within 50m of the natural hazard are expected to be subject to radiant heat, not direct flame.

Dwellings located wholly within 50m of the natural hazard are to be built to Level 1 (AS3959-2009).

Dwellings having portions of the building within 50m of the natural hazard are to have those surfaces facing the hazard built to Level 1 (AS3959-2009).

Note: The "Natural Hazard" is vegetation above the 92metre AHD contour and uncleared vegetation within allotments and adjoining the site.

Allotments may be impacted by Level 1 (AS3959-2009) restrictions as follows:

- a) Buildings within the Building Envelopes on Lots 11 and 12 are not affected by Level 1 building restrictions.
- b) Buildings within the Building Envelopes on Lots 1, 2, 5, 6, 8, 9, 10 and 13 are partly within 50 metres of the Natural Hazard and therefore buildings on those lots are to have those surfaces facing the hazard built to Level 1 (AS3959-2009).

Specifically, the following facades of buildings must be constructed to a Level 1 standard:

Lot 1: North western façade;

Lot 2: Northern façade;

Lots 5, 6, 8, 9, 10: Eastern façade;

Lot 13: Northern and Easter façade;

- c) Buildings within the Building Envelopes on Lots 3, 4, 7 and 14 are wholly within 50 metres of the Hazard and therefore buildings on those lots are to be fully built to a Level 1 (AS3959-2009) standard.

4. GEOTECHNICAL ASSESSMENT AND SLOPE STABILITY

The Buyer acknowledges that a Geotechnical Report and Stability Assessment have been prepared for Fairfield Estate Stage 2 by Soil Surveys Engineering Pty Ltd and that a copy of that Report has been provided to the buyer. The report contains recommendations in relation to house dwellings and structures to be built on the allotments. Where there is any conflict between this Covenant and the Geotechnical Report, The Geotechnical Report shall take precedence.

The report states that the Building Envelopes in Lots 1 to 12 are within the **Very Low Hazard** rated zone while the Building Envelopes on Lots 13 and 14 are rated **Low Hazard**.

Following are some (but not exhaustive) relevant extracts from the Report:

TABLE 3 **BUILDING COMMENTS**

Hazard Rating	Building Restrictions*
Very Low	No restrictions on cut and fills on site provided they are engineer designed and carried out in accordance with AS 3788-1996. Building construction methods will vary within zone with the use of normal residential type construction possible (ie. slab on ground) over most of the zone.
Low	No restrictions on cut and fills on site provided they are engineer designed and carried out in accordance with AS 3788-1996. Building construction methods will vary within zone with the use of normal residential type construction possible (ie. slab on ground) over most of the zone. The use of a more flexible construction may be required near the edges of the zone.

“Based on the field observations, published hazard mapping and subsurface conditions encountered by the test pits from the geotechnical study at this site, it is concluded that the proposed subdivision development including the future construction of residential buildings, would not adversely affect the slope stability conditions at this site.”

It further states that:

“Prior to house construction, a site specific investigation should also be carried out for each individual house site taking into account not only foundation requirements but also stability considerations for each specific development proposal, particularly within the moderately to steeply sloping portions of the site.”

The Buyer acknowledges that for lots 13 and 14, slab on ground is not permitted for houses and house types must consist of suspended timber floors founded on piers and/or posts. Pole houses are permitted on Lots 13 and 14.

Buyers of Lots 1-12 are encouraged to adopt as far as practicable the recommendations of the Geotechnical Report and to be incorporate them into house design. The final approval of building design will rest with Rockhampton Regional Council at the time of lodgement of a building application.

Following is an extract from the Geotechnical Report outlining Hazard Mitigation and Recommendations. In addition to the above specific requirements for some lots all buyers agree, where applicable, to adhere to the recommendations.

7.0 HAZARD MITIGATION & RECOMMENDATIONS

7.1 General

In order to preserve the stable condition of this site, it is considered essential that good hillside engineering construction practice be employed during development of the proposed allotments and associated access roads particularly where located on sloping land. The notes and illustrations attached in Appendix 'I' of this report outline some typical hillside construction guidelines including, earthworks, erosion control and drainage practices for hillside areas which should be taken into account as applicable.

In order to ensure long-term stability of the site upon development, the restrictions/precautions included in the following sections should also be taken into account.

7.2 Subdivisional Earthworks

The proposed subdivisional earthworks are understood to consist of the following:-

- Cuts of less than 1.0m in Lots 6 to 9.
- Fills of up to 1.8m along the south-western boundary.

Procedures

Earthwork procedures should be carried out in a responsible manner in accordance with AS 3798-1996 'Guidelines on Earthworks for Commercial and Residential Developments'. It is recommended that the earthworks contractor make himself familiar with site conditions. Of particular note is the removal of existing fill material, eg. boulders in the depression in Lots 5 and 6.

Underground Services

Where footings are located adjacent to underground services, the footings (including retaining walls) should extend to base a minimum of 200mm below the trench base level for a distance of 1.0m out from the trench. Beyond 1.0m the footings should be taken a minimum of 200mm below an imaginary line drawn up at 45° from the trench base level (Figure 3). Notwithstanding the above comments, all temporary support must consider the site conditions and natural foundations at the time of construction.

These requirements do not override minimum footing levels.

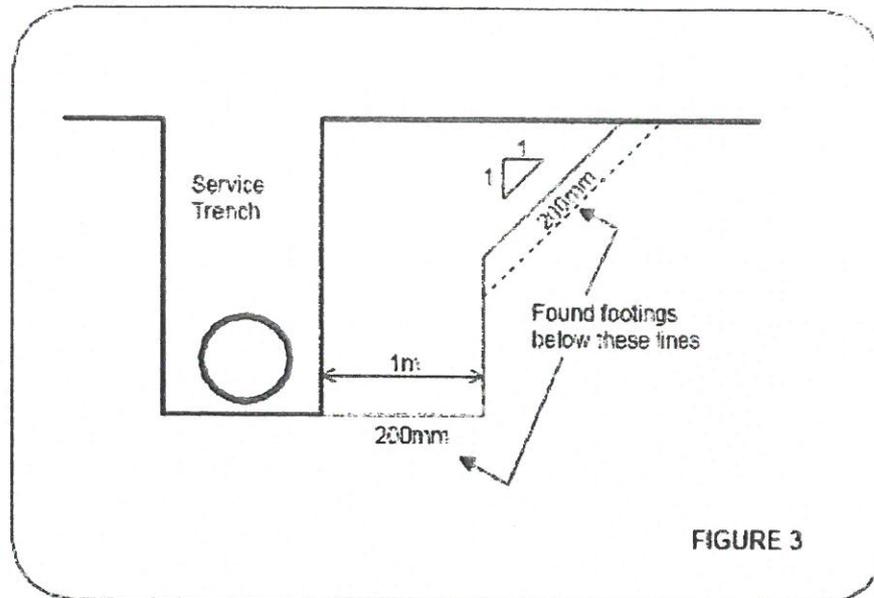


FIGURE 3

Excavatability Comments

Based on geotechnical knowledge of excavations/earthworks on projects in the local area and the findings of the investigation, the following comments can be made on excavation characteristics:-

- Bulk Works

- Excavation by a medium size to large excavator using a bucket of the soil and upper 500mm, or so, of the weathered rock is expected to be possible.
- Excavation further into the weathered rock may be possible using a single tyne ripper on an excavator.
- Below these levels, a medium to large excavator using hydraulic rock hammers will be required.

- Trenching

- Trench excavations in the soils and upper 500mm, or so, of the weathered rock should be within the capacity of a medium size backhoe or small excavator.
- Below these levels a larger excavator would be required for excavation further into the weathered rock.
- In areas of shallower, stronger rock, specialised tools, eg. rock breakers, may be required.

Ripping depths can be significantly increased when the rock is bedded, laminated and highly jointed. The nature of the rock and inherent planes of weakness (clay and quartz seams) therefore play an important part in rock excavation assessment as well as logistical factors such as the manoeuvrability of the excavation plant to take advantage of (any) favourable discontinuities in the rock.

7.3 Recommendations with Respect to Construction

7.3.1 General Requirements for Development of Residential Lots

Continued long term stability of the site as well as of each allotment within the proposed development is subject to development of the site and each individual allotment within the site, taking place in accordance with the guidelines of this report and relevant Australian Standards and good building practices.

Based on the field observations, published hazard mapping and subsurface conditions encountered by the test pits from the geotechnical study at this site, it is concluded that the proposed subdivision development including the future construction of residential buildings, would not adversely effect the slope stability conditions at this site. This conclusion is qualified by the following provisos:

- The subdivisional works should be designed and constructed in accordance with sound and proper engineering principles.
- All cuts and fills are designed, supervised and certified by a suitably qualified engineer.
- Likewise, the future buildings to be constructed on the Lots should be planned designed and constructed in accordance with sound and proper engineering principles, and more specifically in accordance with good hillside construction practices (refer Appendix 1).
- All construction works to be carried out in accordance with the recommendations of this report.
- All sites which contain areas of moderate Hazard ratings are to be subject to a further site specific stability assessment to confirm that the proposed development complies with the recommendations of this report and good engineering practice.
- All buildings that are to be constructed within an area that extends 20m above and 50m below any zone designated as moderate to also be subject to a further site specific stability assessment to confirm that the proposed development complies with the recommendations of this report and good engineering practice.

- The access and drainage infrastructure must be properly and effectively maintained, to ensure that all stormwater is intercepted and controlled. This requirement extends to each individual Lot, so that all owners and occupiers remain aware that ongoing maintenance of the site drainage is essential for continued site stability.

Prior to house construction a site specific investigation should also be carried out for each individual house site taking into account not only foundation requirements but also stability considerations for each specific development proposal particularly within the moderately to steeply sloping portions of the site.

The following recommendations should be adopted :-

- All engineering works should follow the appropriate codes i.e.
 - Earthworks - AS.3798-1996 'Guidelines on Earthworks for Commercial and Residential Developments'. Further general recommendations are provided in Section 7.3.1.
 - Footings for buildings - AS.2870 'Residential Slabs and Footings'.
 - Retaining structures - AS4678 'Earth Retaining Structures'.
 - Road pavements - AS3727 'Guide to Residential Pavements' or Local Council Requirements.
- Vegetation - where possible the prompt re-establishment of ground cover should be undertaken to reduce the risk of surface scour during and following rainfall. Where not possible, other forms of surface protection should be adopted.
- All filling works should be undertaken under Level 1 type supervision with particular reference to Section 2 (i) and 2 (j) of AS3798-1996.
- Gully filling - Any earthworks carried out in the existing gullies should take into consideration potential flows and their effect on surface scour. The effect of these earthworks should be to reduce the velocity of any water flow and collect seepage and overland flow into an engineer designed system to minimise any impact of the proposed fill and existing natural slopes.

7.3.2 Construction and Earthworks

Comments with respect to restrictions on construction for each hazard rating are outlined in Table 3.

TABLE 3 BUILDING COMMENTS

Hazard Rating	Building Restrictions'
Very Low	No restrictions on cut and fills on site provided they are engineer designed and carried out in accordance with AS 3796-1999. Building construction methods will vary within zone with the use of normal residential type construction possible (ie. slab on ground) over most of the zone.
Low	No restrictions on cut and fills on site provided they are engineer designed and carried out in accordance with AS 3796-1999. Building construction methods will vary within zone with the use of normal residential type construction possible (ie. slab on ground) over most of the zone. The use of a more flexible construction may be required near the edges of the zone.
Moderate	Maximum cuts are restricted to 2.0m and fill heights are restricted to 1.0m and should be engineer designed and carried out in accordance with AS 3796-1999. Building construction methods will vary within zone. The use of normal residential type construction (ie. slab on ground) may be possible depending on cut and fill requirements and size of slope. However, the use of a more flexible construction is preferred for the majority of the zone.

7.4 House Types

It is recommended that in areas with slopes of 15 degrees or steeper, house types should consist of lightweight, flexible construction with suspended timber floors founded on piers and posts. Slab on ground construction is not recommended on these slopes other than for small structures such as garages, subject to detailed evaluation by an experienced geotechnical engineer.

In areas with slopes between 8 to 15 degrees, preference should also be given to non-slab on ground construction unless the ground slabs are stepped down the slope.

Where ground slopes are less than 8 degrees, slab on ground construction may be adopted.

7.5 Drainage

Appropriate drainage provisions are essential in any development. Adequate subsoil and surface drainage should also be incorporated in the driveway construction, as well as any retaining wall construction and service lines. Further specific comments can be provided once a site layout has been finalised.

Roofwater should not be discharged on the allotments, particularly on sloping sites but should be taken via piped conduits to the road drainage system, to a piped interlot drainage system or to water storage tanks. Any overflow from water storage tanks should be piped to the road drainage system or interlot drains.

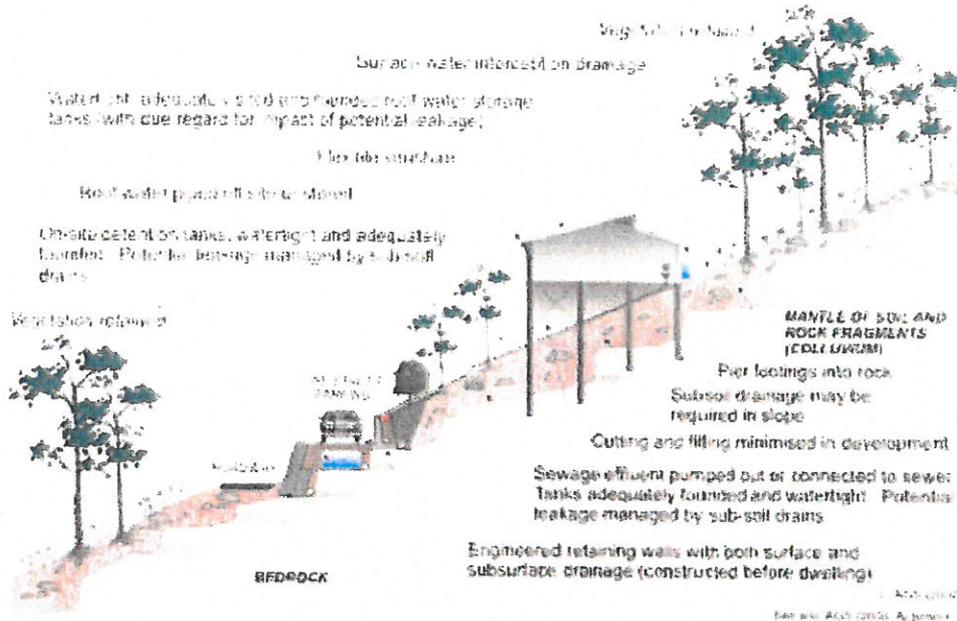
Concentrated water discharge should be dispersed over a wide zone to prevent possible confluence which may cause erosion and scour or trigger possible mass movement.

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

HILLSIDE CONSTRUCTION PRACTICE

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

EXAMPLES OF GOOD HILLSIDE CONSTRUCTION PRACTICE



WHY ARE THESE PRACTICES GOOD?

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

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

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

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

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

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

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

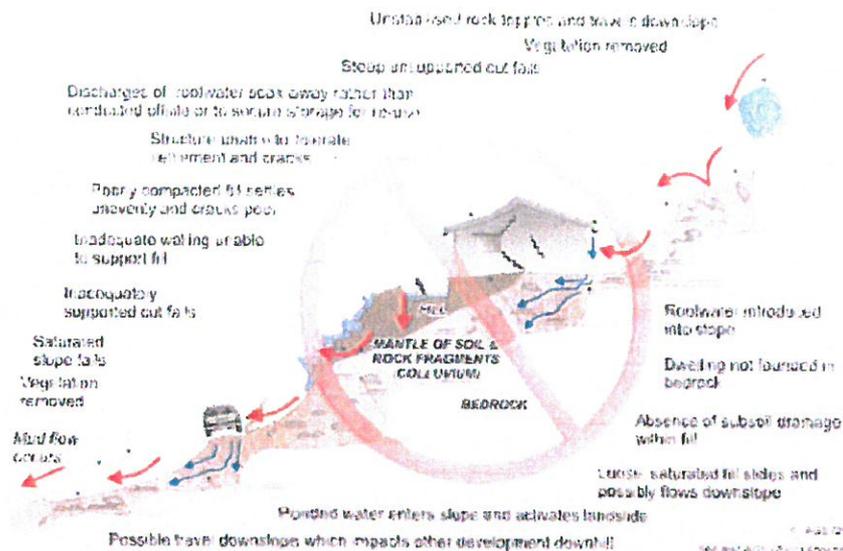
Vegetation clearance - on soil slopes has been kept to a reasonable minimum. Trees, and to a lesser extent smaller vegetation, take large quantities of water out of the ground every day. This lowers the ground water table, which in turn helps to maintain the stability of the slope. Large scale clearing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

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

ADOPT GOOD PRACTICE ON HILLSIDE SITES

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

EXAMPLES OF POOR HILLSIDE CONSTRUCTION PRACTICE



WHY ARE THESE PRACTICES POOR?

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

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

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

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

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

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

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

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

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

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

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

5 BUILDING HEIGHT RESTRICTIONS

The buyer agrees that the maximum height of a house at any point, including any ancillary buildings or structure (excluding a television antenna) shall not exceed:

- a. Seven metres above ground level to the height of the eaves, and
- b. Nine metres to the highest point of the roof.

The buyer further agrees that the building height at any point shall not exceed two storeys above ground level.

Additional building height restrictions apply to Lots 4 and 14. Special height restrictions are necessary for these two lots to ensure an adequate reticulated water supply. Buyers of Lots 4 and 14 acknowledge and agree that the highest floor level of any dwelling house shall not exceed a level of 92 metres AHD.

The Seller agrees that a surveyed level bench mark will be placed near each building envelope on Lots 4 and 14 by a Registered Surveyor, marked with the level of that bench mark. The Seller will provide the Buyer with a copy of plan NR9010BBT annotated with the approximate location and accurate AHD level of the bench mark, certified by a Registered Surveyor. This will be provided by the Seller to the Buyer at no cost to the Buyer.

6 SPECIFICATIONS FOR DWELLING HOUSE etc.

- a. The following specifications shall apply to any dwelling house or structure, outbuildings and garages being erected on the above-described land;
- b. Building materials and colour scheme applied to any future dwelling shall consist primarily of non-reflective materials and colours. If reflective materials form part of any future dwelling, the level of reflectivity of the material/colour shall not exceed 10% on the southern and western facades of the dwelling. Windows on the dwelling's southern and western facades must comprise non-reflective glass only. Roofing must be of a material and colour that is non-reflective.
- c. The colour scheme applied to any dwelling must contribute towards camouflaging the dwelling into the hill face's natural bush-like setting. For example, white or cream colours are prohibited on the roofs and southern and western facades due to their high reflective properties and inability to blend into the area's leafy bush-like setting. Dark greens and browns are encouraged especially upon the roof and the southern and western external facade walls.
- d. The roof shall be constructed of concrete or terracotta tiles, shingles or factory processed coloured metal sheeting. The exterior finish of all fascia and gutters shall be of factory processed colour finish and downpipes painted to blend with wall colour. The pitch of the roof shall not exceed 22.5%.
- e. The improvements constructed on the land shall be used only for a single-family residence.
- f. No second-hand or sub-standard materials shall be used in any structure including fences.
- g. External electric or gas hot water systems shall be located so as not to be visible from any public street.
- h. Concrete, slatecrete, brickcrete or clay paved driveways are to be completed at the same time as the residence and before occupation of the dwelling.

7 DWELLING HOUSE FINISHES

Galvanised iron, zinc or aluminium coated steel and corrugated cement-fibre sheeting are not allowed as either a wall or roof cladding.

Plain, painted or split faced concrete blocks are not approved for any "Building works".

These provisions assist in the protection of your investment by ensuring that an attractive residential environment is achieved.

8 DETACHED SHEDS

Garages

Detached garages cannot occur forward of the streetfront wall of the house. Where detached garages contain the external storage area, they need to incorporate the garage doors and enclosed sides.

Sheds and other structures

Sheds and other structures shall not be positioned forward of any street facing walls of the house. Sheds, lawn lockers and other structures should have a minimum setback of 1.0m from side and 2.0m from rear boundaries, and be positioned so as not to be visible from public areas.

Sheds etc. less than 20 m² in area will be permitted with wall and roof cladding in colourbond or similar with a wall height to a maximum of 2.4 metres. All sheds exceeding 20m² to a maximum of 36 m² should be constructed of materials that match the main dwelling. The roof pitch, wall height and material should also match the main dwelling.

Proprietary pre-painted lawn lockers or pre-painted metal garden sheds may be erected without approval by the Seller provided they are not plain galvanised, reflective or of a white or cream colour.

Galvanised iron, zinc or aluminium coated steel and corrugated fibre cement sheeting will not be allowed as either wall or roof cladding.

9 FENCING AND RETAINING WALLS

The fencing and retaining walls used around your home and those of your neighbours will affect the overall appearance of Fairfield Estate Stage 2.

Swimming pool surround fences shall fully comply with the Local Government requirements as to pool fencing.

Note 1: The buyer should read clause 3 above for the impact of Bushfire Management on fencing materials. Buyers of Lots 1 to 4 acknowledge and agree that fencing along the north western boundaries of Lots 1 to 4 will be constructed from non-combustible materials.

Note 1: All fences are to be fully installed on completion of construction of the dwelling prior to occupation.

Note 2: Cut and fill of an allotment is prohibited unless it is undertaken in accordance with plans and specifications prepared by a properly qualified consulting engineer. Any resulting retaining walls must be completed prior to the occupancy of the new home.

Notwithstanding the provisions of the Dividing Fences Act Qld 2011, the Buyer shall not make any claim, demand or request of the Developer for the erection of any fence or fences which the Buyer may wish to erect and it is expressly agreed between the parties hereto that the provisions of the Dividing Fences Act Qld 2011 shall have no application herein.

10 NO RELOCATABLE BUILDINGS

The Buyer shall not erect or permit to remain on the land any building previously erected on other land or any caravan, tent or living shelter of any kind.

11 NO LIVING IN INCOMPLETE DWELLINGS

The Buyer shall not live in the dwelling until it has been completed.

12 RUBBISH OR GARBAGE BINS

Rubbish and garbage bins and associated household rubbish must be screened from any view from the street except on the day of rubbish collection by the Rockhampton Regional Council.

13 SATELLITE DISHES AND TV ANTENNAE

Satellite dishes and radio masts shall be located so as not to be visible from any public street.

14 SUBDIVISION OF LARGE LOTS

The Buyer/s acknowledge that the allotment has been offered for sale as a single residential site only and the Buyer/s agree that they will not apply to the Rockhampton Regional Council or any other relevant body to reconfigure the lot or reduce its size or convert it to multiple lots.

15 CHANGE OF USE

The Buyer/s acknowledge that the land has been offered for sale as a single residential site only and as part of a planned residential estate incorporating specific designs, layouts, roads, accesses and specified facilities and accordingly, the Buyer/s agree that they will not:

- a) Apply to the Local Government or any other relevant body for permission to erect a multiple dwelling or make application for approval of a material change of use to enable the registration of a Plan or a Community Titles Scheme under the Body Corporate and Community Management Act 1997;

or

- b) Without the express consent in writing of the Seller first had and obtained sell, assign, surrender or in any way dispose of the land, whether in whole or in part, for use as a road or access to other land (including any existing or planned road or access) nor make or join with any others in making any application to the Local Government or any other authority for material change of use of the land or for permission or authority to deal with the land for such purposes nor consent to any such application.

16 LANDSCAPING AND MAINTENANCE OF THE LAND

Prior to Construction: The Buyer will not permit rubbish to accumulate or be placed on the allotment and will ensure that the grass on the allotment is mowed regularly and that the weeds are removed regularly. If in the opinion of the Seller rubbish has accumulated on the allotment or there is an excess growth of grass and weeds on the land then upon the giving of 7 days notice, the Seller and/or the Seller's agents and/or independent contractors may enter the allotment for the purpose of generally tidying up the allotment including without limitation, slashing or mowing grass and weeds growing on the allotment. The Buyer will pay to the Seller on demand the costs of carrying out such work and any other costs incidental to getting this work done.

During construction: If the Seller has grassed and/or otherwise landscaped the footpaths in front of the land or adjoining land the Buyer shall ensure (and that builders and subcontractors working on

the land shall) at all times keep the grass and/or landscape fully maintained in its original condition. The builders and sub-contractors thoroughfare will be from the kerb to the front boundary of the said lot not from adjoining lots.

After construction: The Buyer shall landscape that part of the Land between the front of the dwelling house and the front boundary of the land. Such area shall be grassed (by laying turf) within 3 months of the practical completion of the dwelling house. The Buyer shall maintain the land in a clean and tidy condition and all buildings and fences erected on the land in good order and repair to the satisfaction of the Seller.

The Seller may by itself or by its agent and with or without workmen and others at all reasonable times during daylight hours enter and view the state of the land and the buildings and fences erected on the land and the appearance of the garden areas and if considered necessary deliver to the Buyer a notice in writing requiring the Buyer to landscape or to clean and tidy the land or maintain and repair the buildings and fences.

If the Buyer fails to comply with a notice to landscape or to clean and tidy the land or to maintain and repair the buildings and fences within 7 days of receiving it the Seller and its agents or workmen may enter and carry out the matters specified in such notice at the Buyer's expense.

The Buyer shall pay the cost of carrying out such matters to the Seller on demand including any legal fees expended by the Seller in respect to this matter.

17 TREES

The Buyer acknowledges that a copy of the Bushfire Management Plan referred to in Clause 3 has been provided and agrees to implement and/or abide by the recommendations contained therein in relation to bushfire management.

Throughout the subdivision there are a number of trees, which have been retained to enhance the natural environment and provide a natural habitat for wildlife and shade in our tropical climate. The Developer aims to maintain the existing flora where possible.

Where trees need to be removed, they must be cut down and completely removed including stump from the site within 48 hours.

18 EASEMENTS

The Buyer must comply strictly with the terms and conditions of any Easement burdening the land for drainage and associated purposes and, without limitation, must:-

- (a) keep the Easement Area free from all obstruction except in connection with the normal use of the Easement Area in a manner not inconsistent with the rights and privileges granted to the Grantee;
- (b) not place on the Easement Area any soil, fence, stone, timber or fill of any substance or kind nor alter the levels or gradients of the Easement Area by excavation, extraction or contouring;

Words or phrases used in this covenant shall have the same meaning as in the Instrument of Easement.

19 VEHICLE PARKING

1. The buyer agrees to provide a minimum of two (2) on site car parking spaces, one of which must be covered.
2. At the house, no more than one (1) truck, van, utility, bus or other vehicle with a maximum Gross Vehicle Mass of 4.5 tonnes associated with or used in the employment of any resident of the house shall be permitted to be parked, stored or garaged on the site.

3. If the vehicle referred to in 2 above is not parked, stored or garaged under the house under the house or in a shed, garage or the like, it is to be stored behind the front alignment of the house to any road frontage.
4. The parking space for the vehicle mentioned in 2 above shall be in addition to the minimum two parking spaces referred to in 1 above.
5. Driveways provided into the site shall be in accordance with the Capricorn Municipal Development Guidelines.

20 CREATION OF A LIGHT NUISANCE IS NOT PERMITTED

The buyer agrees that installation of lighting for the specific purpose of being able to play a sport, in particular tennis, on the site during times when there is no daylight is not permitted.

21 SECTION 55 PROPERTY LAW ACT

This covenant is not intended to create any duty enforceable by a third party under Section 55 of the Property Law Act 1974.

22 NO MERGER

This covenant shall not merge on completion but shall continue in full force and effect and remain binding on the Buyer and the Buyer's heirs, executors, administrators, successors and assigns.

23 DEED OF COVENANT

The Buyer shall not sell or transfer the land without obtaining a deed of covenant from the Buyer or transferee in favour of the Seller (or its successors, executors, administrators or assigns) to be bound by the agreements contained in these covenants in the same manner and to the same extent as if the Buyer, transferee had signed this contract as Buyer. The Buyer will be liable for any negligence or non-compliance in this regard and on receipt of such new covenant the Buyer's obligation to the Seller shall cease.

24 BREACH OF BUILDING COVENANT

If the Buyer is in breach of any of these covenants and this Contract has not been completed then the Seller shall have the right to terminate this Contract by written notice to the Buyer. The Seller's right under this covenant shall be in addition to any other rights the Seller has against the Buyer.

25 SELLER'S LEGAL COSTS AND EXPENSES

The Buyer shall upon demand by the Seller pay all costs (as between solicitor and client) and expenses incurred by the Seller in relation to:

- (a) any letter or demand issued by the Seller or its solicitors to the Buyer requiring performance by the Buyer of its obligations under this covenant;
- (b) any notice lawfully given by the Seller to the Buyer pursuant to this covenant;
- (c) any application by the Buyer to the Seller to vary or exclude any of the obligations under this covenant (whether successful or not);
- (d) any proceedings lawfully brought by the Seller to enforce the performance by the Buyer of its obligations under this covenant including any proceedings brought by the Seller against the Buyer to recover any monies which are due and owing by the Buyer to the Seller.

.....
Buyer

.....
Seller – Pearlarm Pty Ltd
Signed by Alphonse Henry Klerkx
Sole Director Pearlarm Pty Ltd

I/We acknowledge that I/we have read and fully understand these covenants.

.....
Date



Denley Environmental Consultants Pty Ltd.
ABN: 97 119 141 454
PO Box 1988 Yeppoon QLD 4703.
Email: ian@denley.com.au
Phone: 0428 182 247

PROPERTY VEGETATION MANAGEMENT PLAN.
DERM CONCURRENCE AGENCY POLICY FOR RECONFIGURING A LOT
(RAL) – VERSION 2, 21 OCTOBER 2009
FOR A DEVELOPMENT APPLICATION ON
LOT 2 ON SP163918, ROCKHAMPTON QLD

ROCKHAMPTON REGIONAL COUNCIL

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

Development Permit No. D1280-2011

Dated 24/7/12

Document History

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Project Manager:	Ian Denley
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1. Acronyms Used

EPBC: Environmental Protection & Biodiversity Conservation Act 1999 (Federal)

NCA: *Nature Conservation Act 1994* (Queensland)

PMAV: Property Map of Assessable Vegetation (DNR&M, Queensland)

PVMP: Property Vegetation Management Plan (DNR&M, Queensland)

RE: Regional Ecosystems vegetation unit (Queensland Herbarium)

SPP 1/03 Guideline: Guidelines for assessing and mitigating hazard in relation to the SPP 1/03

SPP1/03: State Planning Policy 1/03, Mitigating the Adverse Impacts of Flood, Bushfire and Landslide

VMA: *Vegetation Management Act 1999* (Queensland)

FMA: Fire Management Area



2. Executive Summary

This report addresses the relevant DERM performance requirements for Reconfigure a Lot for a proposed development on Lot 2 on SP163918. The proposed development will create 14 new allotments for residential purposes.

Clearing of assessable vegetation has been assessed as potentially occurring as a consequence of a fire management area (FMA) surrounding the building envelope on proposed lot 4. Total clearing would be up to 0.05ha.

There were no trees or large shrubs within this area at the time of site inspections.

Clearing of the FMA would consist of slashing to maintain the existing grasses and other woody vegetation to a height no greater than 15 centimetres.

No large trees or shrubs would be disturbed in maintaining this portion of the FMA.

The area of clearing has been assessed as meeting the DERM RaL Performance requirements.

3. Background

3.1 Purpose

This report addresses the relevant DERM performance requirements for Reconfigure a Lot for a proposed development on Lot 2 on SP163918. The proposed development will create 14 new allotments for residential purposes comprising 12 standard lots and 2 Community Title Scheme Lots with Common Area. The applicant is Pearlarm Pty Ltd.

3.2 Lot Description

The subject lot is situated within both the Norman Road Residential Area and the Berserker Range Environmental Protection Area (BREPA). The subject lot is 6.087ha in area.

3.3 Location

The subject lot is located at the end of Eucalyptus Drive in Norman Gardens. Eucalyptus Drive is accessed from Norman Road, North Rockhampton.



Figure 1. Location of the subject allotment is indicated by the red boundary line.

3.4 Development Purpose

The proposed development is for an urban purpose. Detail on the development is contained in the Development Application.

3.5 Assessable Vegetation

The allotment is freehold land, situated partly within an area zoned as residential and partly within an area zoned as an environmental protection area (2.4ha). Regional Ecosystems Vegetation mapped within the BREPA is considered to be assessable vegetation for the purposes of the Development Application. the BREPA lies above the 92m contour in the Rockhampton Regional Council Planning Scheme. See the Development Application by A H



- Biological sciences
- landscape ecology
- Environmental survey and mapping
- Environmental offset acquisition and management

Consulting Surveyor for detail on the proposed lot configuration and zone maps (appended).

3.6 Essential Habitat

There is no essential habitat mapped on the subject allotment.

The surrounding area is mapped as an area of essential habitat for the Short-necked Wormskink, *Anomalopus brevicollis*.

A site assessment was conducted and suitable habitat for the skink was not located on or near enough to the site to be affected by the proposed development.

4. Property Vegetation Management Plan

4.1 Summary

It is proposed to provide 14 residential allotments consistent with the Rockhampton Regional Council Planning Scheme guidelines for the zonings over the land.

The development application is an RaL application requiring IMPACT Assessment and public notification.

4.1.1 Zoning

The allotment comprises of 6.087ha of freehold land. Within the Rockhampton Regional Council Planning Scheme, it is situated partly within an area zoned as residential and partly within a 2.4ha area zoned as an environmental protection area (BREPA). See the development application for the planning scheme maps over the land.

4.1.2 Application of the DERM RaL Policy

This PVMP has been assessed as:

- an Urban Purpose in an Urban area for the land zoned as residential; and
- an Urban Purpose in a Non-Urban Area for the land zoned as Environmental Protection Area. Activities in this area consist of 0.05ha to be managed as a fire buffer for a dwelling within the proposed lot 4 building envelope.

4.1.3 Site Vegetation

Vegetation on the subject allotment is mapped as containing RE's 11.12.6a/11.12.4/11.12.3 in a ratio of 55/25/20. See Figure 2 for an extract of the Regional Ecosystems mapping over the subject allotment.

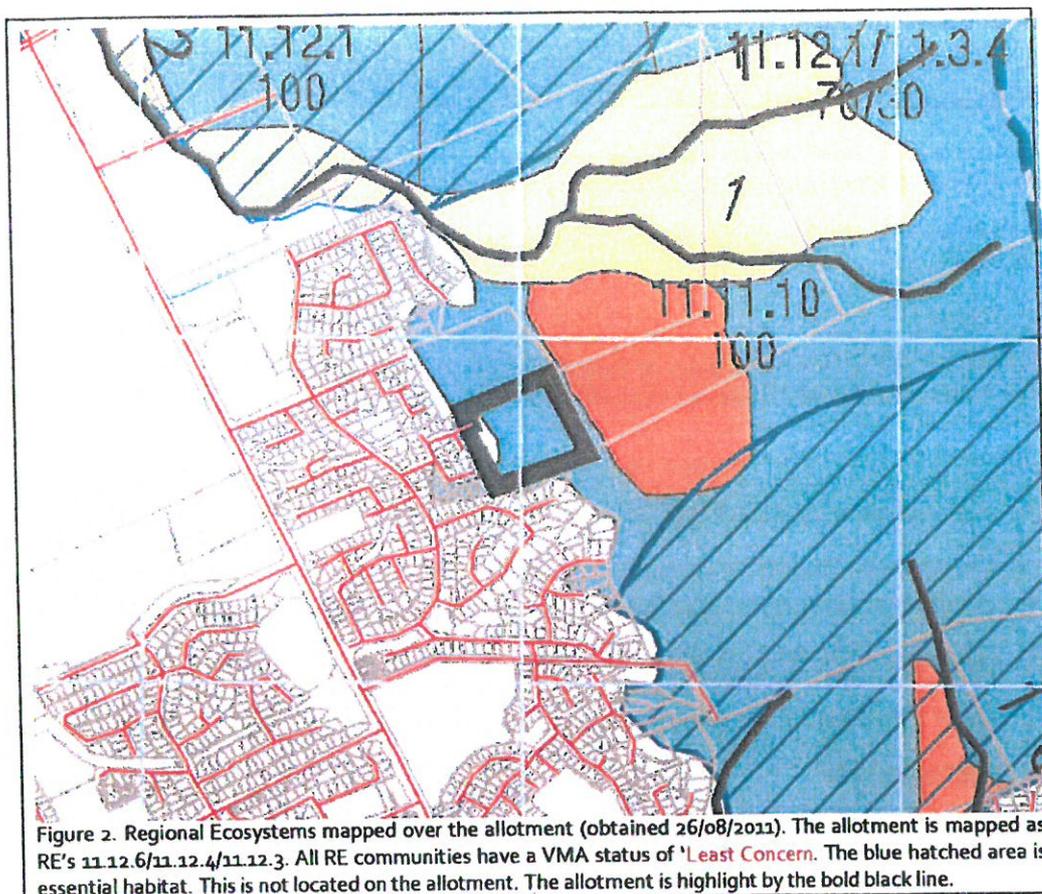
Two independent site investigations have assessed vegetation on the allotment as consistent with RE 11.12.3. A site investigation was undertaken by Friend and Associates for the purpose of a bushfire hazard assessment. Friend determined the vegetation on the allotment to be RE 11.12.3. A subsequent investigation by Denley Environmental Consultants noted the ecologically dominant layer to be consistent only with RE 11.12.3.

4.1.4 VMA Status

The VMA status for all RE communities on the site is Of Least Concern.

The Regional Ecosystems map of the area is provided as an extract in Figure 2 and the whole map is appended to this report. An aerial image of the site is provided in Figure 1.





4.2 Proposed Clearing

Clearing is confined to specified building envelopes, access roads and easements and essential services defined in the RaL application.

All allotment boundaries are outside assessable vegetation. Lot 4 represents the balance of the land and entirely contains the area of assessable vegetation (the BREPA).

Clearing of assessable vegetation is confined to approximately 0.05ha, comprising part of a fire management area to protect a dwelling on proposed lot 4 (See Plan NRg010B in the Appendix).

There is approximately 2.4ha of assessable vegetation on the lot. Retained vegetation will be of a size that is mappable within the Regional Ecosystems Vegetation mapping and retain existing connectivity to vegetation located to the east of the allotment.

Adequate representation of the remnant vegetation will be retained and protected and the application meets all the performance requirements subject to Part P of the Brigalow Belt clearing code (addressed in Table 2 of 4.3).

4.2.1 Vegetation Management

At the time of survey there were no trees within the assessable area of the FMA associated with proposed lot 4.

Vegetation in the subject area consists of dense to medium grasses and herbs (largely

introduced). It is expected there will be small woody native shrubs and potential growth of trees within the FMA in the future

Management of this vegetation could be adequately achieved by slashing using a rubber tired tractor to reduce the potential for soil disturbance.

Low vegetation will be retained over the FMA to a maximum height of 15 centimetres. There will be no requirement to remove large trees or shrubs which could cause soil disturbance.

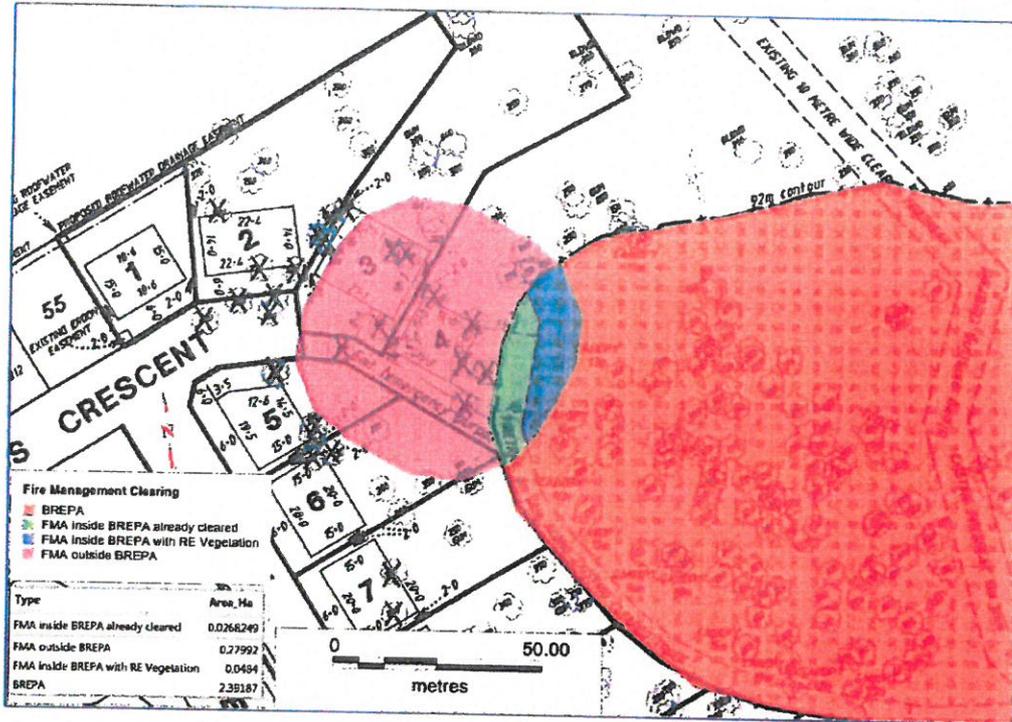


Figure 3: Fire Management Area (FMA) required for the building envelope for proposed Lot 4 is indicated by the blue area on the above figure. The FMA occupies a total of 0.05Ha of BREPA.



4.3 DERM Performance Requirements Response

Following, the DERM RaL Performance Requirements have been addressed for both the Residential zoning and the Environmental area which exist on the allotment.

4.3.1 Residential Area RaL

Clearing as a result of the RaL is for an urban purpose on freehold land. The land does not contain an endangered regional ecosystem. All proposed allotments are situated in an area indicated as an urban area as defined by the Rockhampton Regional Council Planning Scheme.

An area of 0.05ha of assessable vegetation has been proposed for clearing for fire management requirements.

Proposed clearing in the residentially zoned area meets Criteria Table F-2 in the Concurrence Agency Policy for Reconfiguring a Lot (RaL) 21 October 2009 (Table 1) and Performance Requirement Part P of the Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions – Version 2 (Table 2).

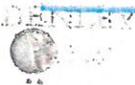
Table 1: Response to Criteria F-2 of the Concurrence Agency Policy for Reconfiguring a Lot – Version 2

	Subject	Response to PR's
	The development minimises impacts of Assessable Vegetation	Proposed clearing in assessable vegetation is limited to the extent that is necessary for establishing firebreaks associated with the proposed RaL applications. There is no suitable alternative site for fences, firebreaks, roads and infrastructure proposed.
	Addresses criteria in the relevant code	Refer to Table 2 – Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions – Version 2.

Table 2: Response to Part P of the Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions – Version 2

	Subject	Response to PR's
	Limits to clearing for public safety and infrastructure	No development is proposed within assessable vegetation. Proposed clearing is limited to the extent that is necessary for establishing necessary fences, firebreaks, roads and other built infrastructure associated with the proposed RaL applications. There is no suitable alternative site for fences, firebreaks, roads and infrastructure proposed.
	Wetlands	There are no Wetlands affected
	Watercourses	There are no Watercourses affected.

	Subject	Response to PR's
	Connectivity	<p>Proposed clearing will occur in the non-coastal subregions of the Brigalow Belt and is less than;</p> <ul style="list-style-type: none"> • 25m wide; and • 5 hectares. <p>Vegetation on the site is connected to an area of vegetation that is substantially wider than 200m (see RE map in the appendix).</p> <p>Clearing as a result of the proposed RaL will not:</p> <ul style="list-style-type: none"> • reduce the width of remnant vegetation to less than 200 metres; nor • occur where the width of remnant vegetation is less than 200 metres.
	Soil erosion	<p>Clearing will not cause land degradation and ecological processes will be maintained. No adverse effects on the environment from soil erosion will occur.</p> <p>The 0.05ha of assessable vegetation in the fire management zone proposed for clearing will be slashed to 15cms. This will ensure the roots of existing shrubs and grasses will remain to maintain stability.</p> <p>The land is able to provide home sites in compliance with the State Planning Policy on Natural Hazards having regard to land slide, and with full urban infrastructure (refer to the engineering report by McMurtrie Consulting Engineers in the development application).</p> <p>To address soil erosion all development and site management practices will comply with Queensland Urban Drainage Manual, Capricorn Municipal Development Manual, the Water Quality and Water Quantity Code and Planning Scheme Policy No. 2 'Erosion and Sediment Control Plans'. Please refer to engineering comments provided by Graham Scott & Associates in the development application.</p>
	Salinity	<p>All land down slope from the site consists of residential areas. There are no discharge areas affected.</p> <p>Clearing is less than 5 hectares and does not occur:</p> <ul style="list-style-type: none"> • in any discharge area; and • within 200 metres of any discharge area. <p>All development and site management practices will comply with Queensland Urban Drainage Manual, Capricorn Municipal Development Manual, the Water Quality and Water Quantity Code and Planning Scheme Policy No. 2 'Erosion and Sediment Control Plans'</p>
	Conserving remnant endangered regional ecosystems and of concern regional ecosystems	<p>There are no Endangered or Of Concern Regional Ecosystems affected. The site contains only Not Of Concern remnant vegetation.</p>
	Essential habitat	<p>Clearing will not occur in an area shown as essential habitat on the essential habitat map. There is no essential habitat mapped on the allotment.</p>
	Conservation status thresholds	<p>RE's 11.12.6/11.12.4/11.12.3 are not listed in Table 5 of the relevant ongoing clearing code for the area.</p>
	Acid sulfate soils	<p>There are no acid sulfate soils on the allotment.</p>



Appendix



- Biological sciences
- landscape ecology
- Environmental survey and mapping
- Environmental offset acquisition and management

5 September 2011

file: denley pvmp v1 final version.docx

A H Klerkx
Consulting surveyor

13 Tanby Point Close
 Emu Park. Qld. 4770
 Telephone: 07 49 388 344
 Fax: 07 49 388 310
 Mobile: 0417 388 336
 Email: klerkx@hotmail.net.au

OWNER
PEARLARM PTY LTD

PROJECT
Fairfield Estate
 PROPOSED SUBDIVISION-Stage 2
14 STANDARD LOTS

DATE : 26 July 11
AMENDMENT : Added contours prior to rock fill

REAL PROPERTY DESCRIPTION

Lot No. : 2
 Plan : SP163918
 Orig Por : 661
 Parish : Murchison
 County : Livingstone
 L.A. : Rockhampton R C

DATUM
 HORIZ : Cadastral
 VERT : AHD
 1-metre Contours

SCALE : 1:1250
 AT SHEET SIZE A3

Designed : A H Klerkx
 Consulting Surveyor

Date : 12 August 2011

Drawn : A K

DRAWING NUMBER

NR9010B

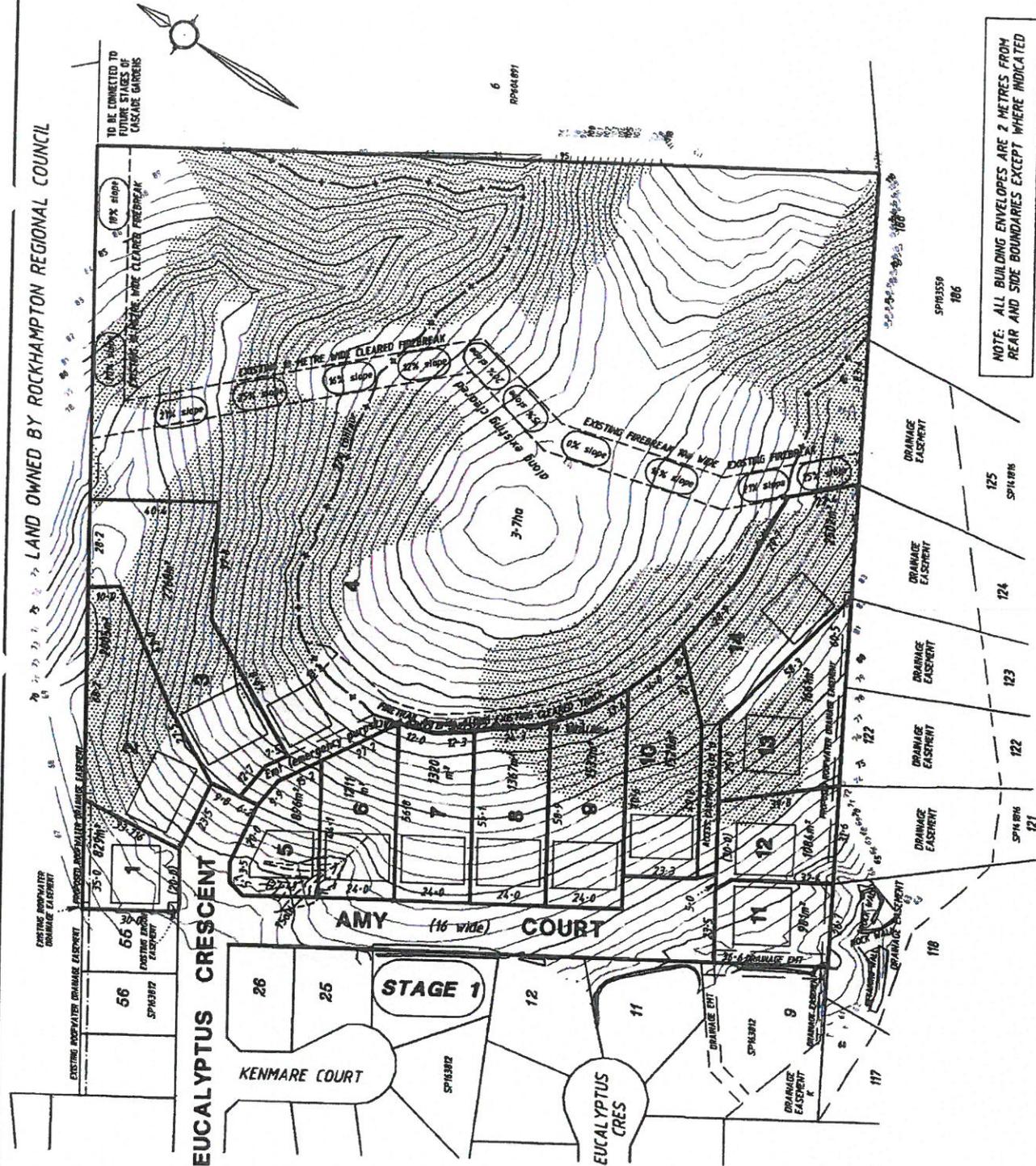
LAND OWNED BY ROCKHAMPTON REGIONAL COUNCIL

TO BE CONNECTED TO
 FUTURE STAKES OF
 CASCARE GARRIS

6
 RP044081

NOTE: ALL BUILDING ENVELOPES ARE 2 METRES FROM
 REAR AND SIDE BOUNDARIES EXCEPT WHERE INDICATED

SLOPES IN EXCESS OF 25%



A H Klerkx
Consulting surveyor

13 Tanby Point Close
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 Fax: 07 49 388 310
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OWNER
PEARLARM PTY LTD

PROJECT
Fairfield Estate
 PROPOSED SUBDIVISION-Stage 2
BUILDING ENVELOPE
PLAN

DATE
 28 July 11
 AMENDMENT
 Added contours prior to rock fill

REAL PROPERTY
DESCRIPTION

Lot No. : 2
 Plan : SP163918
 Orig Por : 861
 Parish : Murchison
 County : Livingstone
 L.A. : Rockhampton R C

HORIZ
 Cadastral

VERT
 AHD
 1-metre Contours

SCALE
1:1250
 AT SHEET
 SIZE A3

Designed : A H Klerkx
 Consulting Surveyor

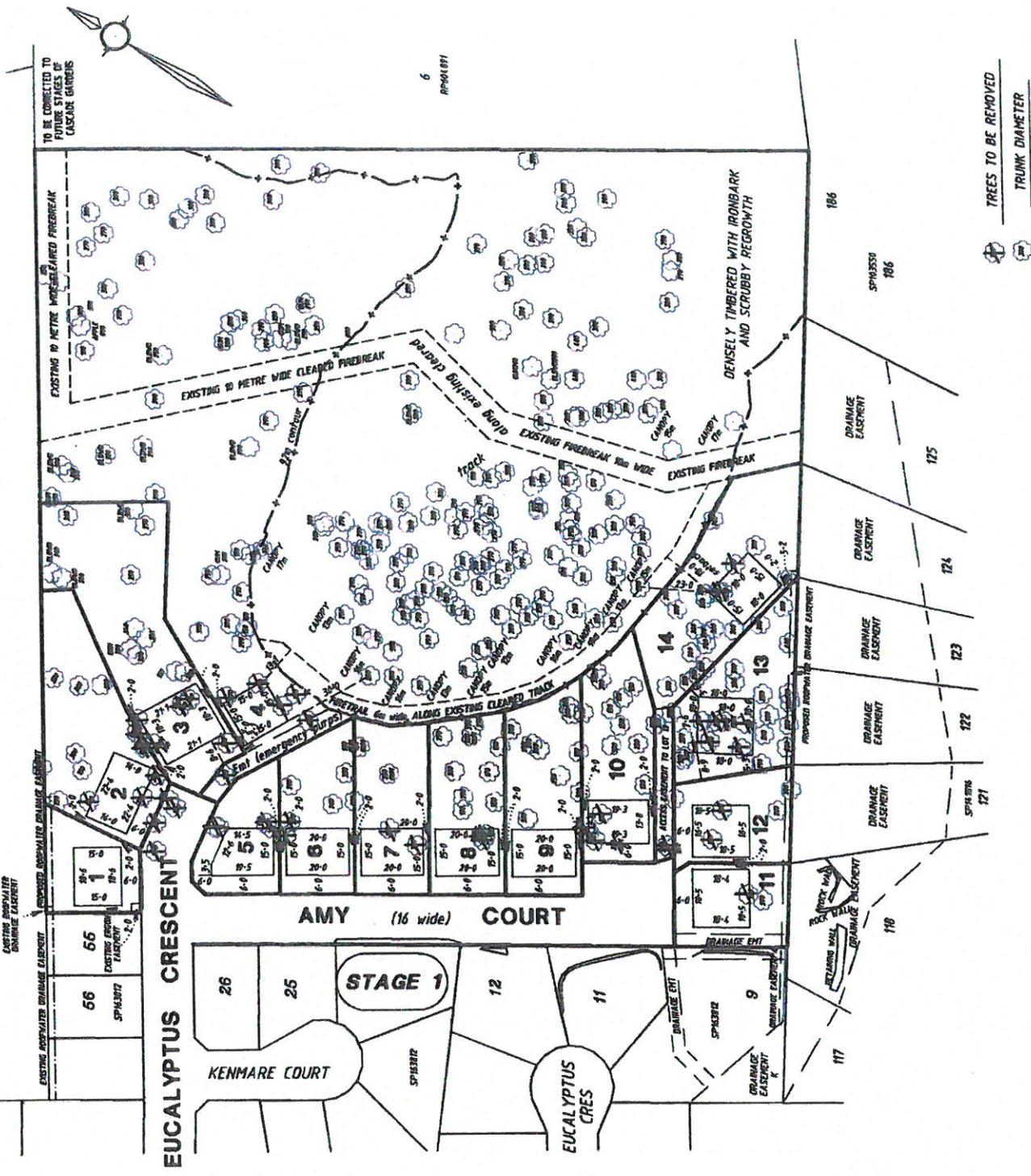
Date : 12 August 2011

Drawn : A K

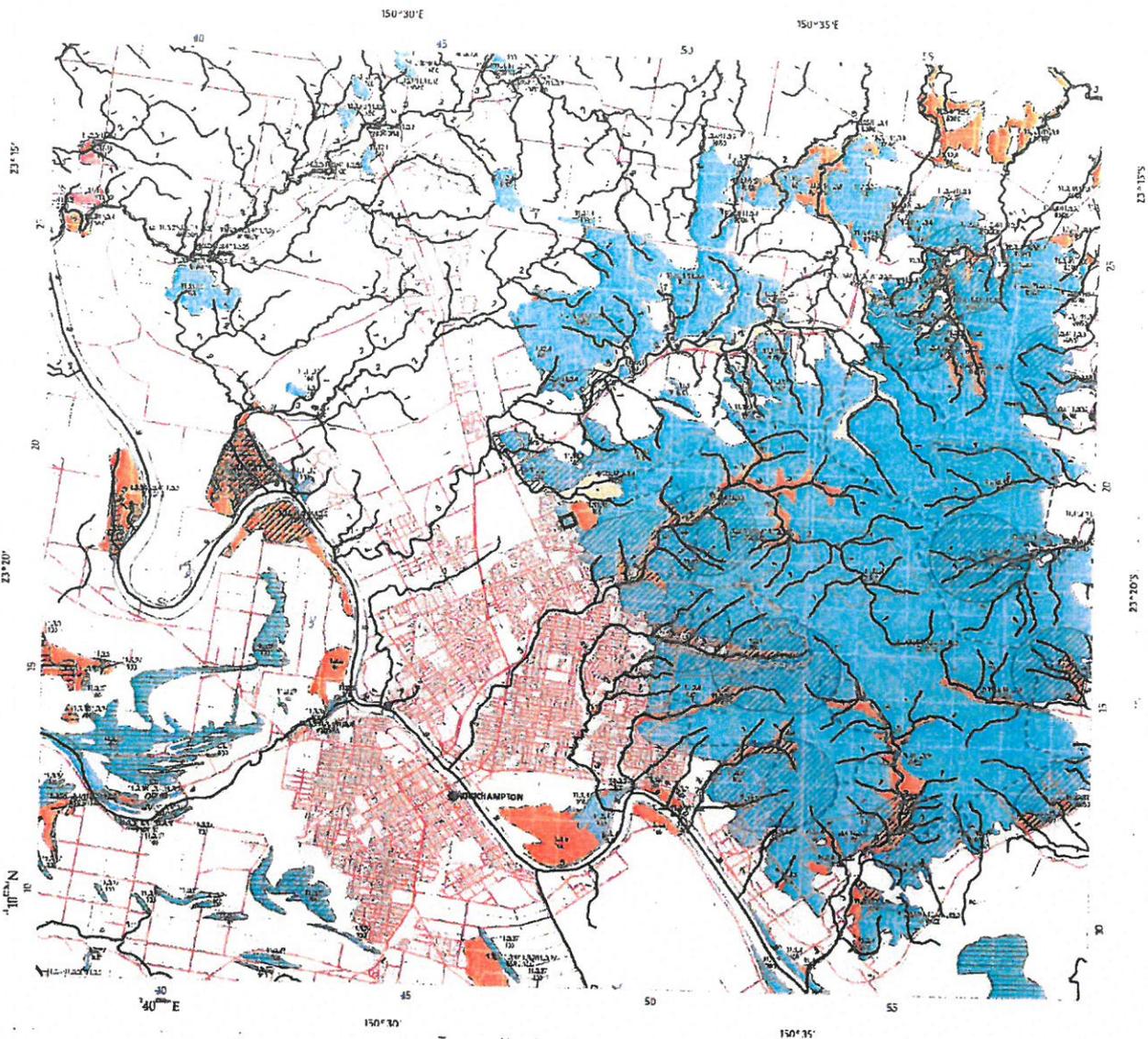
DRAWING NUMBER

NR9010BBT

LAND OWNED BY ROCKHAMPTON REGIONAL COUNCIL



TREES TO BE REMOVED
 TRUNK DIAMETER



Vegetation Management Act Regional Ecosystem and Remnant Map-Version 6

Based on 2006 Landsat TM Imagery

Requested By: SIMON.A.JOHNSTON@GMAIL.COM
Date: 26 Aug 11 Time: 10.39.20

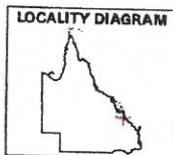
Centered on Lot on Plan:
25P163918

Bioregion: Brigalow Belt

- Remnant vegetation containing endangered regional ecosystems
- Dominant
- Sub-dominant
- Remnant vegetation containing of concern regional ecosystems
- Dominant
- Sub-dominant
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Great Barrier Reef Wetlands
- Vegetation Management Act Essential Habitat
- For further information on VMA Essential Habitat, please see the attached VMA Essential Habitat map.
- Subject Lot
- Watercourse (Stream order shown as black number against stream where available)
- Bioregion boundary
- Roads © MapInfo Australia Pty Ltd 2009
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
- Property boundaries shown are provided as a locational aid only.
- Towns



Queensland Government



Horizontal Datum: Geocentric Datum of Australia 1994 (GDA84)

A remnant map covers areas not covered by a regional ecosystem map.

Defined map areas are labelled with the regional ecosystem (RE) code along with the percentage breakdown if more than one RE occurs within the area. Detailed definitions of regional ecosystems are available from www.derm.qld.gov.au/REDD. Defined map areas smaller than 5ha may not be labelled.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/-100 metres. The extent of remnant regional ecosystems as of 2006, depicted on this map is based on rectified 2006 Landsat TM imagery (supplied by the Statewide Landcover and Trees Study (SLATS), Department of Environment and Resource Management (DERM)).

Some watercourse lines are derived from GeoScience Australia 1:250 000 mapping.

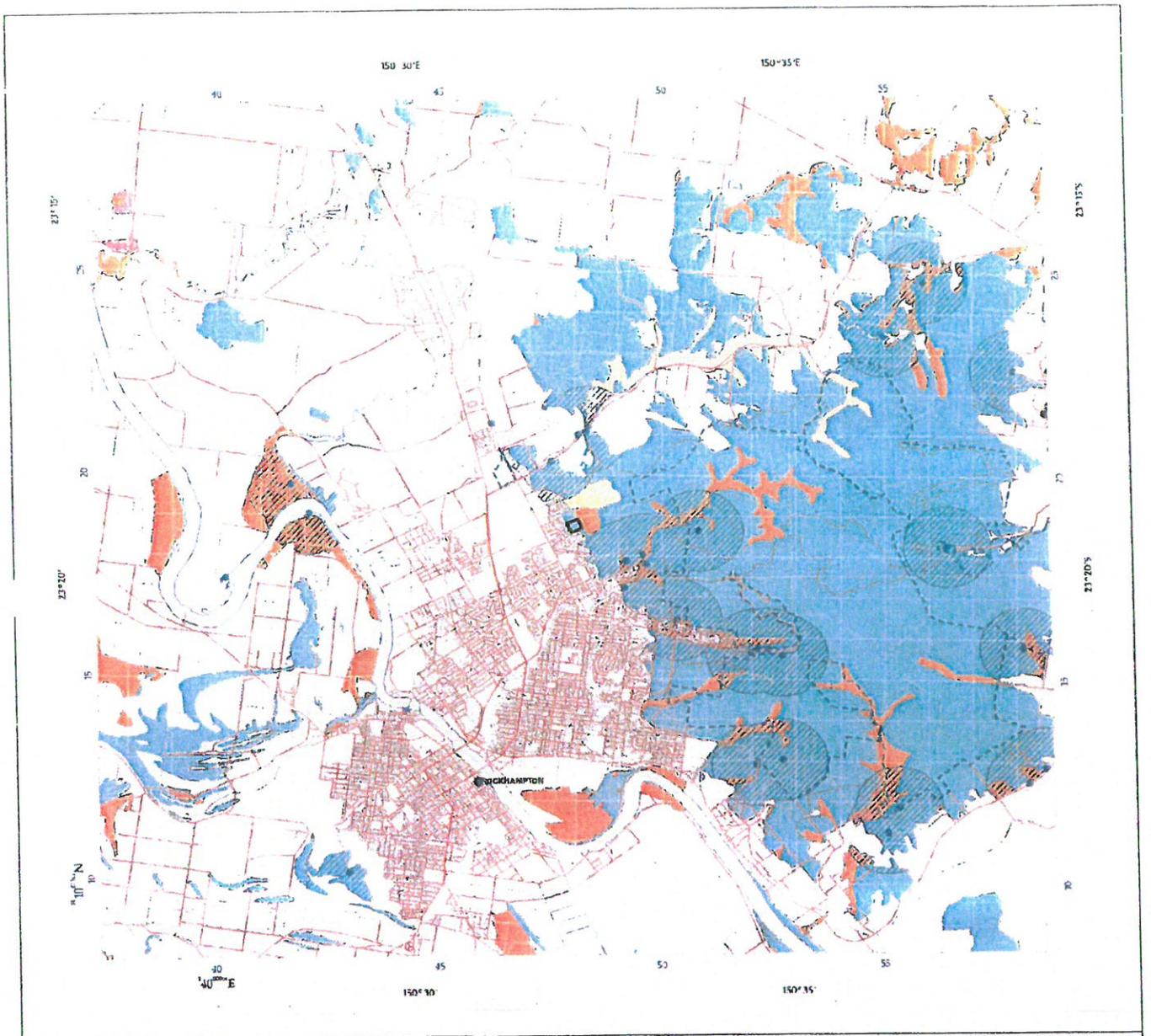
Disclaimer:

While every care is taken to ensure the accuracy of this product, the Department of Environment and Resource Management and MapInfo Australia Pty Ltd, makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

All datasets are updated as they become available to provide the most current information as of the date shown on this map.

Additional information is required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.derm.qld.gov.au/vegetation or contact the Department of Environment and Resource Management.

Digital regional ecosystem data is available in shapefile format, for Lot on Plans from www.derm.qld.gov.au/REDATA or from DERM for larger areas.



Vegetation Management Act Essential Habitat Map Version 3.0

- Remnant vegetation containing endangered regional ecosystems
 - Dominant
 - Sub-dominant
- Remnant vegetation containing of concern regional ecosystems
 - Dominant
 - Sub-dominant
- Remnant vegetation that is a least concern regional ecosystem
 - Non-remnant
- Remnant vegetation under Section 20AH of the VMA
 - Non-remnant
 - Plantation Forest
 - Dam or Reservoir
 - Remnant Vegetation
 - PMAV Category X area
 - Vegetation Management Act Essential Habitat
 - Vegetation Management Act Essential Habitat Species Records
- Subject Lot
 - Roads © MapInfo Australia Pty Ltd 2008
 - National Park, Conservation Area State Forest and other reserves
 - Cadastral line
- Property boundaries shown are provided as a locational aid only.
- Towns

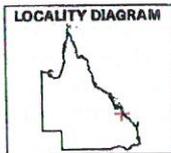
Requested By: SIMON.A.JOHNSTON@GMAIL.COM
Date: 26 Aug 11 Time: 10.39.37

Centered on Lot on Plan:
2 SP163818



Queensland Government

LOCALITY DIAGRAM



2000 0 2000m

Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

Labels for the Vegetation Management Act Essential Habitat are centred on the subject lot (1.1km surrounding and including a Lot on Plan). Labels correlate to the label field in the attached essential habitat database.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/-100 metres. The extent of remnant regional ecosystems as of 2006, depicted on this map is based on rectified 2006 Landsat TM Imagery (supplied by SLATS, Department of Environment and Resource Management).

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