# DA Form 1 – Development application details

Approved form (version 1.3 effective 28 September 2020) made under section 282 of the Planning Act 2016.

This form **must** be used to make a development application **involving code assessment or impact assessment**, except when applying for development involving only building work.

For a development application involving building work only, use DA Form 2 - Building work details.

For a development application involving building work associated with any other type of assessable development (i.e. material change of use, operational work or reconfiguring a lot), use this form (*DA Form 1*) and parts 4 to 6 of *DA Form 2 – Building work details*.

Unless stated otherwise, all parts of this form **must** be completed in full and all required supporting information **must** accompany the development application.

One or more additional pages may be attached as a schedule to this development application if there is insufficient space on the form to include all the necessary information.

This form and any other form relevant to the development application must be used to make a development application relating to strategic port land and Brisbane core port land under the *Transport Infrastructure Act 1994*, and airport land under the *Airport Assets (Restructuring and Disposal) Act 2008.* For the purpose of assessing a development application relating to strategic port land and Brisbane core port land, any reference to a planning scheme is taken to mean a land use plan for the strategic port land, Brisbane port land use plan for Brisbane core port land, or a land use plan for airport land.

Note: All terms used in this form have the meaning given under the Planning Act 2016, the Planning Regulation 2017, or the Development Assessment Rules (DA Rules).

# PART 1 – APPLICANT DETAILS

1) Applicant details	가 같은 것은 것이 있는 것이 있는 것은 것은 것이 있는 것이 있는 것이 있는 것이 있는 것이 있다. 
Applicant name(s) (individual or company full name)	Stephen James Prideaux
Contact name (only applicable for companies)	
Postal address (P.O. Box or street address)	1551 Mossman Daintree Rd,
Suburb	Wonga Beach
State	Queensland
Post Code	4873
Country	Australia
Contact number	0437 881 814
Email address (non-mandatory)	stephen.prideaux@icloud.com
Mobile number (non-mandatory)	0437 881 814
Fax number (non-mandatory)	
Applicant's reference number(s) (if applicable)	

#### 2) Owner's consent

2.1) Is written consent of the owner required for this development application?

Yes – the written consent of the owner(s) is attached to this development application

X No - proceed to 3)



# PART 2 – LOCATION DETAILS

3) Location of the premises (complete 3.1) or 3.2), and 3.3) as applicable) Note: Provide details below and attach a site plan for any or all premises part of the development application. For further information, see <u>DA</u> Forms Guide: Relevant plans.									
3.1) St	3.1) Street address and lot on plan								
Stre	eet address eet address er but adioining	AND IC AND IC	t on pla t on pla ent to lar	an (all lo an for a ad e.a. ie	ts must be listed n adjoining o tty, pontoon, All	d), <b>or</b> or adjac Hots mus	ent prope	rty of the	premises (appropriate for development in
	Unit No.	Street	No.	Street	Name and	Гуре			Suburb
		1551		Mossi	man Daintree	Road			Wonga Beach
a)	Postcode	Lot No	D.	Plan 1	Type and Nu	mber (e	.g. RP, SP	)	Local Government Area(s)
	4873	4		RP89	0714		1.11.11		Douglas Shire
	Unit No.	Street	No.	Street	Name and <sup>-</sup>	Гуре			Suburb
b)	Postcode	Lot No	o.	Plan <sup>-</sup>	Type and Nu	mber (e	e.g. RP, SP	")	Local Government Area(s)
0.00-0									
3.2) C e.	oordinates d g. channel dred	ot prem Iging in N	ISES (ap loreton B	propriate lay)	e for developme	nt in rem	ote areas, ou	ver part of a	lot or in water not adjoining or adjacent to land
Note; P	lace each set c	of coordin	ates in a	separate	e row.			$[1,5] \in \mathcal{C}_{1}[E_{N}]$	
	ordinates or	premis	es by K		e and latitud	Datur			Local Covernment Area(c) (Fereilischle
Longit	ude(s)		Latitud	je(s)					
		5					3304 3A94		
							her:		
ПCo	ordinates of	premis	es by e	astina	and northing		1		L
Eastin	a(s)	North	nina(s)		Zone Ref.	Datun	n		Local Government Area(s) (if applicable
v	5(-7				54	Пw	GS84		· · · · · · · · · · · · · · · · · · ·
					55	G	DA94		
					56	🗌 🗆 Ot	her:		
3.3) A	dditional pre	mises							
Ad	ditional prer	nises a	re relev	ant to	this developr	nent ap	plication a	and the de	etails of these premises have been
atta	ached in a s	chedule	e to this	develo	opment appli	cation			
	t required								
	ntify any of t	he follo	wing th	at ann	ly to the prer	nicoc a	nd provide	any rolo	vant datails
	or adjacent t		ter bod	v or wa	tercourse or	in or al	hove an a		
I in or adjacent to a water body or watercourse or in or above an aquiter									
Name of water body, watercourse of aquifer:									
Lot on plan description of strategic port land:									
	of poil auti								
		ornmo	nt for th	o tidal	oroo (Kaaalia				
Nome	of nort outh		rtidal a		area (il applica	abie).			
	airport long	tundor		nort Ac		oturina	and Dian	and) Act (	2008
	of airport	i unuer	the All	PULLAS	ออตอ (กันชอเป็น	ciunng		Isalj ACL	2000
Name	of airport:								

Listed on the Environmental Management Register (EN	IR) under the Environmental Protection Act 1994
EMR site identification:	
Listed on the Contaminated Land Register (CLR) under	r the Environmental Protection Act 1994
CLR site identification:	
	·

# 5) Are there any existing easements over the premises?

Note: Easement uses vary throughout Queensland and are to be identified correctly and accurately. For further information on easements and how they may affect the proposed development, see <u>DA Forms Guide</u>.

Yes - All easement locations, types and dimensions are included in plans submitted with this development application 🗌 No

# PART 3 – DEVELOPMENT DETAILS

## Section 1 - Aspects of development

6.1) Provide details about the first development aspect	
a) What is the type of development? (tick only one box)	
Material change of use Reconfiguring a lot Operational work Building	g work
b) What is the approval type? (tick only one box)	
Development permit Preliminary approval Preliminary approval that includes a	variation approval
c) What is the level of assessment?	
Code assessment Impact assessment (requires public notification)	
d) Provide a brief description of the proposal (e.g. 6 unit apartment building defined as multi-unit dwelling, reconfigures):	guration of 1 lot into 3
Excavation of exisiting lot	
e) Relevant plans Note: Relevant plans are required to be submitted for all aspects of this development application. For further information, see <u>Relevant plans.</u>	e <u>DA Forms guide:</u>
Relevant plans of the proposed development are attached to the development application	
6.2) Provide details about the second development aspect	
a) What is the type of development? (tick only one box)	
Material change of use Reconfiguring a lot Operational work Buildin	g work
b) What is the approval type? (tick only one box)	
Development permit Preliminary approval Preliminary approval that includes a	variation approval
c) What is the level of assessment?	
Code assessment Impact assessment (requires public notification)	
d) Provide a brief description of the proposal (e.g. 6 unit apartment building defined as multi-unit dwelling, reconfi (ots):	iguration of 1 lot into 3
e) Relevant plans Note: Relevant plans are required to be submitted for all aspects of this development application. For further information, see <u>Relevant plans</u> .	e <u>D</u> A Forms Guide:
□ □ Relevant plans of the proposed development are attached to the development application	1999 Martin Constant Science of Street Sciences
6.3) Additional aspects of development	
<ul> <li>Additional aspects of development are relevant to this development application and the details for that would be required under Part 3 Section 1 of this form have been attached to this development.</li> <li>Not required</li> </ul>	Or these aspects Ent application

# Section 2 - Further development details

7) Does the proposed development application involve any of the following?				
Material change of use	Yes – complete division 1 if assessable against a local planning instrument			
Reconfiguring a lot	Yes – complete division 2			
Operational work	Yes – complete division 3			
Building work	Yes – complete DA Form 2 – Building work details			

#### Division 1 - Material change of use

Note: This division is only required to be completed if any part of the development application involves a material change of use assessable against a local planning instrument.

8.1) Describe the proposed material ch	ange of use		
Provide a general description of the proposed use	Provide the planning scheme definition (include each definition in a new row)	Number of dwelling units <i>(if applicable)</i>	Gross floor area (m <sup>2</sup> ) ( <i>if applicable</i> )
8.2) Does the proposed use involve the	use of existing buildings on the premises?		
🗌 Yes			
No			

## Division 2 - Reconfiguring a lot

Note: This division is only required to be completed if any part of the development application involves reconfiguring a lot.

## 9.1) What is the total number of existing lots making up the premises?

9.2) What is the nature of the lot reconfiguration? (tick all applicable boxes)				
Subdivision (complete 10))				
Boundary realignment (complete 12))	Creating or changing an easement giving access to a lot from a constructed road (complete 13))			

10) Subdivision					
10.1) For this development, how many lots are being created and what is the intended use of those lots:					
Intended use of lots created	Residential	Commercial	Industrial	Other, please specify:	
Number of lots created					
10.2) Will the subdivision be st	aged?				
🗌 Yes – provide additional de	Yes – provide additional details below				
No					
How many stages will the works include?					
What stage(s) will this develop apply to?	ment application				

11) Dividing land into parts by agreement – how many parts are being created and what is the intended use of the					
parts?					
Intended use of parts created	Residential	Commercial	Industrial	Other, please specify:	
Number of parts created					

12) Boundary realignment			
12.1) What are the current	and proposed areas for each	ot comprising the premises?	
Cu	rrent lot	Pro	posed lot
Lot on plan description	Area (m <sup>2</sup> )	Lot on plan description	Area (m <sup>2</sup> )
12.2) What is the reason fo	or the boundary realignment?		

13) What are the di (attach schedule if there	mensions and are more than t	d nature of any wo easements)	vexisting easements being changed and	l/or any proposed easement?
Existing or proposed?	Width (m)	Length (m)	Purpose of the easement? (e.g. pedestrian access)	Identify the land/lot(s) benefitted by the easement
1				

#### Division 3 - Operational work

Note: This division is only required to be completed if any part of the development application involves operational work.

14.1) What is the nature of the op	perational work?	에는 사람들은 사람들은 것은 것을 가지 않는 것이 가지 않는 것을 가 같은 것을 수 있는 것을 수 있는 것을 것을 수 있는 것을 가지 않는 것을 수 있는 것을 가지 않는 것을 수 있는 것을 가지 않는 것을 같은 것을 수 있는 것을 것을 수 있는 것을 것을 수 있는 것을 수 있는 것을 수 있는 것을 수 있는 것
Road work	Stormwater	Water infrastructure
Drainage work	🔀 Earthworks	Sewage infrastructure
Landscaping	🗌 Signage	K Clearing vegetation
☐ Other – please specify:		
14.2) Is the operational work nec	essary to facilitate the creation of n	ew lots? (e.g. subdivision)
Yes – specify number of new	lots:	
No		
14.3) What is the monetary value	e of the proposed operational work?	(include GST, materials and labour)
\$15,000		

# PART 4 - ASSESSMENT MANAGER DETAILS

15) Identify the assessment manager(s) who will be assessing this development application
16) Has the local government agreed to apply a superseded planning scheme for this development application?
<ul> <li>Yes – a copy of the decision notice is attached to this development application</li> <li>The local government is taken to have agreed to the superseded planning scheme request – relevant documents attached</li> <li>No</li> </ul>

# PART 5 - REFERRAL DETAILS

17) Does this development application include any aspects that have any referral requirements?			
XNo, there are no referral requirements relevant to any development aspects identified in this development			
application – proceed to Part 6			
Matters requiring referral to the Chief Executive of the Planning Act 2016:			
Clearing native vegetation			
Contaminated land (unexploded ordnance)			
Environmentally relevant activities (ERA) (only if the ERA has not been devolved to a local government)			
Fisheries – aquaculture			
Fisheries – declared fish habitat area			
Fisheries – marine plants			
Fisheries – waterway barrier works			
Hazardous chemical facilities			
Heritage places – Queensland heritage place (on or near a Queensland heritage place)			
Infrastructure-related referrals designated premises			
Infrastructure-related referrals – state transport infrastructure			
Infrastructure-related referrals – State transport corridor and future State transport corridor			
infrastructure-related referrals – State-controlled transport tunnels and future state-controlled transport tunnels			
Infrastructure-related referrals – near a state-controlled road intersection			
C Koala habitat in SEQ region – interfering with koala habitat in koala habitat areas outside koala priority areas			
Koala habitat in SEQ region – key resource areas			
Ports – Brisbane core port land – near a State transport corridor or future State transport corridor			
Ports – Brisbane core port land – environmentally relevant activity (ERA)			
Ports – Brisbane core port land – tidal works or work in a coastal management district			
Ports – Brisbane core port land – hazardous chemical facility			
Ports – Brisbane core port land – taking or interfering with water			
Ports – Brisbane core port land – referable dams			
Ports – Brisbane core port land – fisheries			
Ports – Land within Port of Brisbane's port limits (below high-water mark)			
SEQ development area			
SEQ regional landscape and rural production area or SEQ rural living area – tourist activity or sport and recreation activity			
SEQ regional landscape and rural production area or SEQ rural living area – community activity			
SEQ regional landscape and rural production area or SEQ rural living area – indoor recreation			
SEQ regional landscape and rural production area or SEQ rural living area – urban activity			
SEQ regional landscape and rural production area or SEQ rural living area – combined use			
Tidal works or works in a coastal management district			
Reconfiguring a lot in a coastal management district or for a canal			
Erosion prone area in a coastal management district			
Urban design			
U Water-related development – taking or interfering with water			
Water-related development – removing quarry material (from a watercourse or lake)			
U Water-related development – referable dams			
Water-related development –levees (category 3 levees only)			
U Wetland protection area			
Matters requiring referral to the local government:			
Airport land			
Environmentally relevant activities (ERA) (only if the ERA has been devolved to local government)			

Heritage places – Local heritage places

Matters requiring referral to the Chief Executive of the distribution entity or transmission entity:

Infrastructure-related referrals – Electricity infrastructure

Matters requiring referral to:

- The Chief Executive of the holder of the licence, if not an individual
- The holder of the licence, if the holder of the licence is an individual

Infrastructure-related referrals - Oil and gas infrastructure

Matters requiring referral to the Brisbane City Council:

Ports – Brisbane core port land

Matters requiring referral to the Minister responsible for administering the Transport Infrastructure Act 1994:

Ports - Brisbane core port land (where inconsistent with the Brisbane port LUP for transport reasons)

Ports – Strategic port land

Matters requiring referral to the relevant port operator, if applicant is not port operator:

Ports - Land within Port of Brisbane's port limits (below high-water mark)

Matters requiring referral to the Chief Executive of the relevant port authority:

Ports - Land within limits of another port (below high-water mark)

Matters requiring referral to the Gold Coast Waterways Authority:

Tidal works or work in a coastal management district (in Gold Coast waters)

Matters requiring referral to the Queensland Fire and Emergency Service:

Tidal works or work in a coastal management district (involving a marina (more than six vessel berths))

## 18) Has any referral agency provided a referral response for this development application?

Yes – referral response(s) received and listed below are attached to this development application

Referral requirement	Referral agency	Date of referral response
Identify and describe any changes made to the prop referral response and this development application,	osed development application t or include details in a schedule	hat was the subject of the to this development application

# PART 6 – INFORMATION REQUEST

19) Information request under Part 3 of the DA Rules

Al agree to receive an information request if determined necessary for this development application

I do not agree to accept an information request for this development application

Note: By not agreeing to accept an information request I, the applicant, acknowledge:

 that this development application will be assessed and decided based on the information provided when making this development application and the assessment manager and any referral agencies relevant to the development application are not obligated under the DA Rules to accept any additional information provided by the applicant for the development application unless agreed to by the relevant parties

• Part 3 of the DA Rules will still apply if the application is an application listed under section 11.3 of the DA Rules.

Further advice about information requests is contained in the <u>DA Forms Guide</u>.

# PART 7 – FURTHER DETAILS

20) Are there any associated development applications or current approvals? (e.g. a preliminary approval)			
Yes – provide details below or include details in a schedule to this development application			
List of approval/development application references	Reference number	Date	Assessment manager
Approval     Development application			
Approval Development application			

21) Has the portable long service leave levy been paid? (only applicable to development applications involving building work or operational work)				
Yes – a copy of the receipted QLeave form is attached to this development application				
<ul> <li>No – I, the applicant will provide evidence that the portable long service leave levy has been paid before the assessment manager decides the development application. I acknowledge that the assessment manager may give a development approval only if I provide evidence that the portable long service leave levy has been paid</li> <li>Not applicable (e.g. building and construction work is less than \$150,000 excluding GST)</li> </ul>				
Amount paid	Date paid (dd/mm/yy)	QLeave levy number (A, B or E)		
\$				

22) Is this development application in response to a show cause notice or required as a result of an enforcement notice?

Yes – show cause or enforcement notice is attached

No No

## 23) Further legislative requirements

Environmentally relevant activities

23.1) Is this development application also taken to be an application for an environmental authority for an **Environmentally Relevant Activity (ERA)** under section 115 of the *Environmental Protection Act* 1994?

Yes – the required attachment (form ESR/2015/1791) for an application for an environmental authority accompanies this development application, and details are provided in the table below

No.No

**Note:** Application for an environmental authority can be found by searching "ESR/2015/1791" as a search term at <u>www.qld.gov.au</u>. An ERA requires an environmental authority to operate. See <u>www.business.qld.gov.au</u> for further information.

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Proposed ERA name:		

Multiple ERAs are applicable to this development application and the details have been attached in a schedule to this development application.

#### Hazardous chemical facilities

23.2) Is this development application for a hazardous chemical facility?

Yes – Form 69: Notification of a facility exceeding 10% of schedule 15 threshold is attached to this development application

No No

Note: See www.business.qld.gov.au for further information about hazardous chemical notifications.

Clearing native vegetation
23.3) Does this development application involve <b>clearing native vegetation</b> that requires written confirmation that the chief executive of the Vegetation Management Act 1999 is satisfied the clearing is for a relevant purpose under section 22A of the Vegetation Management Act 1999?
Yes – this development application includes written confirmation from the chief executive of the Vegetation Management Act 1999 (s22A determination)
<ul> <li>No</li> <li>Note: 1. Where a development application for operational work or material change of use requires a s22A determination and this is not included, the development application is prohibited development.</li> <li>2. See <a href="https://www.gld.gov.au/environment/land/vegetation/applying">https://www.gld.gov.au/environment/land/vegetation/applying</a> for further information on how to obtain a s22A determination.</li> </ul>
Environmental offsets
23.4) Is this development application taken to be a prescribed activity that may have a significant residual impact on a <b>prescribed environmental matter</b> under the <i>Environmental Offsets Act 2014</i> ?
Yes – I acknowledge that an environmental offset must be provided for any prescribed activity assessed as having a significant residual impact on a prescribed environmental matter
Note: The environmental offset section of the Queensland Government's website can be accessed at <u>www.qld.gov.au</u> for further information on environmental offsets.
Koala habitat in SEQ Region
23.5) Does this development application involve a material change of use, reconfiguring a lot or operational work which is assessable development under Schedule 10, Part 10 of the Planning Regulation 2017?
<ul> <li>Yes – the development application involves premises in the koala habitat area in the koala priority area</li> <li>Yes – the development application involves premises in the koala habitat area outside the koala priority area</li> </ul>
<b>Note:</b> If a koala habitat area determination has been obtained for this premises and is current over the land, it should be provided as part of this development application. See koala habitat area guidance materials at <u>www.des.qld.gov.au</u> for further information.
<u>Water resources</u> 23.6) Does this development application involve taking or interfering with underground water through an artesian or subartesian bore, taking or interfering with water in a watercourse, lake or spring, or taking overland flow water under the <i>Water Act 2000</i> ?
Water resources         23.6) Does this development application involve taking or interfering with underground water through an artesian or subartesian bore, taking or interfering with water in a watercourse, lake or spring, or taking overland flow water under the Water Act 2000?         Yes – the relevant template is completed and attached to this development application and I acknowledge that a relevant authorisation or licence under the Water Act 2000 may be required prior to commencing development
Water resources         23.6) Does this development application involve taking or interfering with underground water through an artesian or subartesian bore, taking or interfering with water in a watercourse, lake or spring, or taking overland flow water under the Water Act 2000?            Yes – the relevant template is completed and attached to this development application and I acknowledge that a relevant authorisation or licence under the Water Act 2000 may be required prior to commencing development            No            Note: Contact the Department of Natural Resources, Mines and Energy at <a href="www.dnrme.gld.gov.au">www.dnrme.gld.gov.au</a> for further information.
Water resources         23.6) Does this development application involve taking or interfering with underground water through an artesian or subartesian bore, taking or interfering with water in a watercourse, lake or spring, or taking overland flow water under the Water Act 2000?         Yes - the relevant template is completed and attached to this development application and I acknowledge that a relevant authorisation or licence under the Water Act 2000 may be required prior to commencing development         No         Note: Contact the Department of Natural Resources, Mines and Energy at www.dnrme.qld.gov.au for further information.         DA templates are available from <a href="https://planning.dsdmip.qld.gov.au/">https://planning.dsdmip.qld.gov.au/</a> . If the development application involves:
Water resources         23.6) Does this development application involve taking or interfering with underground water through an artesian or subartesian bore, taking or interfering with water in a watercourse, lake or spring, or taking overland flow water under the Water Act 2000?         Yes – the relevant template is completed and attached to this development application and I acknowledge that a relevant authorisation or licence under the Water Act 2000 may be required prior to commencing development         No         Note: Contact the Department of Natural Resources, Mines and Energy at www.dnrme.gld.gov.au for further information.         DA templates are available from <a href="https://planning.dsdmip.gld.gov.au">https://planning.dsdmip.gld.gov.au</a> . If the development application involves:         Taking or interfering with underground water through an artesian or subartesian bore: complete DA Form 1 Template 1         Taking or interfering with water in a watercourse, lake or spring: complete DA Form 1 Template 2
Water resources         23.6) Does this development application involve taking or interfering with underground water through an artesian or subartesian bore, taking or interfering with water in a watercourse, lake or spring, or taking overland flow water under the Water Act 2000?         Yes – the relevant template is completed and attached to this development application and I acknowledge that a relevant authorisation or licence under the Water Act 2000 may be required prior to commencing development         No         Note: Contact the Department of Natural Resources, Mines and Energy at www.dnrme.qld.gov.au for further information.         DA templates are available from <a href="https://planning.dsdmip.qld.gov.au">https://planning.dsdmip.qld.gov.au</a> . If the development application involves:         Taking or interfering with underground water through an artesian or subartesian bore: complete DA Form 1 Template 1         Taking overland flow water: complete DA Form 1 Template 3.
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Water resources         23.6) Does this development application involve taking or interfering with underground water through an artesian or subartesian bore, taking or interfering with water in a watercourse, lake or spring, or taking overland flow water under the Water Act 2000?            Yes – the relevant template is completed and attached to this development application and I acknowledge that a relevant authorisation or licence under the Water Act 2000 may be required prior to commencing development            XNo          Note: Contact the Department of Natural Resources, Mines and Energy at www.dnrme.gld.gov.au for further information.         DA templates are available from <a href="https://planning.dsdmip.gld.gov.au/">https://planning.dsdmip.gld.gov.au/</a> , If the development application involves:             Taking or interfering with underground water through an artesian or subartesian bore: complete DA Form 1 Template 1             Taking or interfering with water in a watercourse, lake or spring: complete DA Form1 Template 2             Taking overland flow water: complete DA Form 1 Template 3.          Waterway barrier works            23.7) Does this application involve waterway barrier works?             Yes – the relevant template is completed and attached to this development application
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Water resources         23.6) Does this development application involve taking or interfering with underground water through an artesian or subartesian bore, taking or interfering with water in a watercourse, lake or spring, or taking overland flow water under the Water Act 2000?
Water resources         23.6) Does this development application involve taking or interfering with underground water through an artesian or subartesian bore, taking or interfering with water in a watercourse, lake or spring, or taking overland flow water under the Water Act 2000?            Yes – the relevant template is completed and attached to this development application and I acknowledge that a relevant authorisation or licence under the Water Act 2000 may be required prior to commencing development            ANO          Note: Contact the Department of Natural Resources, Mines and Energy at www.dnrme.gld.gov.au for further information.             DA templates are available from https://planning.dsdmip.gld.gov.au/, fit the development application involves:             Taking or interfering with underground water through an artesian or subartesian bore: complete DA Form 1 Template 1             Taking or interfering with water in a watercourse, lake or spring: complete DA Form 1 Template 2             Taking or interfering with water in a watercourse, lake or spring: complete DA Form 1 Template 2             Taking or interfering with water in a watercourse, lake or spring: complete DA Form 1 Template 2             Taking or interfering with water in a watercourse, lake or spring: complete DA Form 1 Template 2             Taking or interfering with water in a watercourse, lake or spring: complete DA Form 1 Template 2             Taking overland flow water: complete DA Form 1 Template 3.          Waterway barrier works
Water resources         23.6) Does this development application involve taking or interfering with underground water through an artesian or subartesian bore, taking or interfering with water in a watercourse, lake or spring, or taking overland flow water under the Water Act 2000?         Yes – the relevant template is completed and attached to this development application and I acknowledge that a relevant authorisation or licence under the Water Act 2000 may be required prior to commencing development         XNo         Note: Contact the Department of Natural Resources, Mines and Energy at www.dnrme.gld.gov.au for further information.         DA templates are available from <a href="https://planning.dsdmip.gld.gov.au">https://planning.dsdmip.gld.gov.au</a> . If the development application involves:         Taking or interfering with water in a watercourse, lake or spring: complete DA Form 1 Template 1         Taking or interfering with water in a watercourse, lake or spring: complete DA Form 1 Template 2         Taking or interfering with water in a watercourse, lake or spring: complete DA Form 1 Template 1         Taking or interfering with water in a watercourse, lake or spring: complete DA Form 1 Template 2         Taking or interfering with water in a watercourse, lake or spring: complete DA Form 1 Template 3.         Waterway barrier works         23.7) Does this application involve waterway barrier works?         A templates are available from <a href="https://planning.dsdmip.gld.gov.au/">https://planning.dsdmip.gld.gov.au/</a> . For a development application involving waterway barrier works, complete DA Form 1 Template 4. <t< td=""></t<>

Quary materials from a water	ercourse or lake		
23.9) Does this development a under the <i>Water Act 2000?</i>	pplication involve the <b>remo</b> v	val of quarry materials from	a watercourse or lake
☐ Yes – I acknowledge that a えNo	quarry material allocation n	otice must be obtained prior to	commencing development
<b>Note</b> : Contact the Department of Naturn information.	ıral Resources, Mines and Energy a	at <u>www.dnrme.qld.gov.au</u> and <u>www.b</u>	<u>usiness.qld.qov.au</u> for further
Quarry materials from land u	under tidal waters		ALL AND ALL AND ALL AND
23.10) Does this development under the <i>Coastal Protection</i> a	application involve the <b>rem</b> end Management Act 1995?	oval of quarry materials fror	n land under tidal water
☐ Yes – I acknowledge that a	quarry material allocation n	otice must be obtained prior to	commencing development
Note: Contact the Department of Envi	ronment and Science at <u>www.des.</u>	<u>qld.gov.au</u> for further information.	
Referable dams			
23.11) Does this development section 343 of the Water Supp	application involve a <b>refera</b> bly (Safety and Reliability) A	ble dam required to be failure ct 2008 (the Water Supply Act	impact assessed under )?
<ul> <li>Yes – the 'Notice Accepting Supply Act is attached to the No</li> </ul>	a Failure Impact Assessme his development application	ent' from the chief executive a	dministering the Water
Note: See guidance materials at www	<u>dnrme.qld.gov.au</u> for further inforr	mation.	
Tidal work or development	vithin a coastal manageme	ent district	
23.12) Does this development	application involve tidal wo	ork or development in a coas	stal management district?
<ul> <li>Yes – the following is inclu</li> <li>Evidence the propositive proposition involves pression</li> <li>A certificate of title</li> </ul>	ded with this development a al meets the code for asses escribed tidal work)	pplication: sable development that is pre	scribed tidal work (only required
No			
Note: See guidance materials at www	<u>i.des.gld.gov.au</u> for further information	tion.	Sector Contractory
23.13) Does this development heritage register or on a place	application propose develo	pment on or adjoining a place nent's <b>Local Heritage Regist</b>	entered in the Queensland er?
$\Box$ Yes – details of the heritad	e place are provided in the	table below	
<b>⊠</b> KNo	- p		
Note: See guidance materials at www	v.des.gld.gov.au for information req	uirements regarding development of	Queensland heritage places.
Name of the heritage place:		Place ID:	
Brothels			
23.14) Does this development	application involve a mate	rial change of use for a brot	hel?
Yes – this development ap application for a brothel un	plication demonstrates how der Schedule 3 of the <i>Prost</i>	the proposal meets the code itution Regulation 2014	for a development
23.15) Does this developmen	t application involve new or	changed access to a state-co	ntrolled road?
<ul> <li>Yes – this application will I Infrastructure Act 1994 (su satisfied)</li> <li>No</li> </ul>	be taken to be an application bject to the conditions in sec	n for a decision under section ction 75 of the <i>Transport Infra</i> .	62 of the <i>Transport</i> structure Act 1994 being

#### Walkable neighbourhoods assessment benchmarks under Schedule 12A of the Planning Regulation

23.16) Does this development application involve reconfiguring a lot into 2 or more lots in certain residential zones (except rural residential zones), where at least one road is created or extended?

Yes – Schedule 12A is applicable to the development application and the assessment benchmarks contained in schedule 12A have been considered

KNO

Note: See guidance materials at www.planning.dsdmip.gld.gov.au for further information.

# PART 8 – CHECKLIST AND APPLICANT DECLARATION

24) Development application checklist	WARD AND STREET
I have identified the assessment manager in question 15 and all relevant referral requirement(s) in question 17 Note: See the Planning Regulation 2017 for referral requirements	XYes
If building work is associated with the proposed development, Parts 4 to 6 of <u>DA Form 2 –</u> <u>Building work details</u> have been completed and attached to this development application	☐ Yes ✓ Not applicable
Supporting information addressing any applicable assessment benchmarks is with the development application Note: This is a mandatory requirement and includes any relevant templates under question 23, a planning report and any technical reports required by the relevant categorising instruments (e.g. local government planning schemes, State Planning Policy, State Development Assessment Provisions). For further information, see <u>DA</u> <u>Forms Guide: Planning Report Template</u> .	X Yes
Relevant plans of the development are attached to this development application Note: Relevant plans are required to be submitted for all aspects of this development application. For further information, see <u>DA Forms Guide: Relevant plans</u> .	X Yes
The portable long service leave levy for QLeave has been paid, or will be paid before a development permit is issued (see 21)	☐ Yes ☑ Not applicable

#### 25) Applicant declaration

- By making this development application, I declare that all information in this development application is true and correct
- Where an email address is provided in Part 1 of this form, I consent to receive future electronic communications from the assessment manager and any referral agency for the development application where written information is required or permitted pursuant to sections 11 and 12 of the *Electronic Transactions Act 2001*

Note: It is unlawful to intentionally provide false or misleading information.

**Privacy** – Personal information collected in this form will be used by the assessment manager and/or chosen assessment manager, any relevant referral agency and/or building certifier (including any professional advisers which may be engaged by those entities) while processing, assessing and deciding the development application. All information relating to this development application may be available for inspection and purchase, and/or published on the assessment manager's and/or referral agency's website.

Personal information will not be disclosed for a purpose unrelated to the *Planning Act 2016*, Planning Regulation 2017 and the DA Rules except where:

- such disclosure is in accordance with the provisions about public access to documents contained in the *Planning* Act 2016 and the Planning Regulation 2017, and the access rules made under the *Planning Act 2016* and Planning Regulation 2017; or
- required by other legislation (including the Right to Information Act 2009); or
- otherwise required by law.

This information may be stored in relevant databases. The information collected will be retained as required by the *Public Records Act 2002.* 

# PART 9 – FOR COMPLETION OF THE ASSESSMENT MANAGER – FOR OFFICE USE ONLY

Date received:	Reference num	nber(s):
Notification of enga	agement of alternative assessment ma	nager
Prescribed assess	ment manager	
Name of chosen as	ssessment manager	
Date chosen asses	ssment manager engaged	
Contact number of	chosen assessment manager	
Relevant licence n manager	umber(s) of chosen assessment	

QLeave notification and payment Note: For completion by assessment manager if applicable	
Description of the work	
QLeave project number	
Amount paid (\$)	Date paid (dd/mm/yy)
Date receipted form sighted by assessment manager	
Name of officer who sighted the form	



Red Lines Approximate Property Boundary

Yellow Box Proposed site of Earthworks



Proposed site of excavation



Proposed Site of Excavation



Proposed site of excavation



## 6.2.4 Environmental management zone code

#### 6.2.4.1 Application

- (1) This code applies to assessing development in the Environmental management zone.
- (2) When using this code, reference should be made to Part 5.

#### 6.2.4.2 Purpose

(1) The purpose of the Environmental management zone code is to recognise environmentally sensitive areas and provide for houses on lots and other low impact activities where suitable.

These areas are protected from intrusion of any urban, suburban, centre or industrial land use.

- (2) The local government purpose of the code is to:
  - (a) implement the policy direction set in the Strategic Framework, in particular:
    - (i) Theme 2 : Environment and landscape values, Element 3.5.3 Biodiversity, Element 3.5.5 Scenic amenity.
  - (b) protect and buffer areas of environmental significance from inappropriate development.
- (3) The purpose of the code will be achieved through the following overall outcomes:
  - (a) Development is generally restricted to a dwelling house;
  - (b) Adverse impacts on natural systems, both on-site and on adjoining land are minimised through the location, design and management of development;
  - (c) Development reflects and responds to the natural features and environmental values of the area;
  - (d) Visual impacts are minimised through the location and design of development;
  - (e) Development does not adversely affect water quality;
  - (f) Development responds to land constraints, including but not limited to topography, vegetation, bushfire, landslide and flooding.



#### 6.2.4.3 Criteria for assessment

Table 6.2.4.3.a - Environmental management zone - assessable development

Performance outcomes	Acceptable outcomes	Response
For self-assessable and assessable development		
<b>PO1</b> The height of all buildings and structures is in keeping with the natural characteristics of the site. Buildings and structures are low-rise and not unduly visible from external sites.	AO1.1 Buildings and structures are not more than 8.5 metres and two storeys in height. Note – Height is inclusive of the roof height.	<b>Complies with AO1.1</b> There are no proposed new structures or dwellings
	Buildings have a roof height not less than 2 metres.	Complies A012.2 There are no proposed new structures or dwellings
<ul> <li>PO2</li> <li>Buildings and structures are set back to:</li> <li>(a) maintain the natural character of the area;</li> <li>(b) achieve separation from neighbouring buildings and from road frontages.</li> </ul>	<ul> <li>AO2</li> <li>Buildings and structures are set back not less than:</li> <li>(a) 40 metres from the frontage of a state controlled road;</li> <li>(b) 25 metres from the frontage to Cape Tribulation Road;</li> <li>(c) 6 metres from any other road;</li> <li>(d) 6 metres from the side and rear boundaries of the site.</li> </ul>	Complies with AO2 There are no proposed new structures or dwellings



Performance outcomes	Acceptable outcomes	Response
For assessable development		
<b>PO3</b> Development is consistent with the purpose of the Environmental management zone and protects the zone from the intrusion of inconsistent uses.	<b>AO3</b> Inconsistent uses as identified in Table 6.2.4.3.b are not established in the Environmental management zone.	<b>Complies with AO3</b> There is no material usage change associated with thus application
<b>PO4</b> The site coverage of all buildings and structures and associated services do not have an adverse effect on the environmental or scenic values of the site.	<b>PO4</b> No acceptable outcomes are prescribed.	<b>Complies with PO4</b> Dwelling has been present since early 1980's, This application is for earthworks to protect dwelling only
PO5 Development is located, designed, operated and managed to respond to the characteristics, features and constraints of the site and its surrounds. Note - Planning scheme policy – Site assessments provides guidance on identifying the characteristics, features and constraints of a site and its surrounds.	<ul> <li>AO5.1</li> <li>Buildings, structures and associated access, infrastructure and private open space are sited:</li> <li>(a) within areas of the site which are already cleared; or</li> <li>(b) within areas of the site which are environmentally degraded;</li> <li>(c) to minimise additional vegetation clearing.</li> </ul>	Complies with AO5.1 Dwelling is established, this is earthwrks only
	AO5.2 Buildings and structures and associated infrastructure are not located on slopes greater than 1 in 6 (16.6%) or on a ridgeline.	Complies with AO5.2 Dwelling is exisitng



<ul> <li>PO6</li> <li>Buildings and structures are responsive to steep slope through innovative construction techniques so as to:</li> <li>(a) maintain the geotechnical stability of slopes;</li> <li>(b) minimise cut and/or fill;</li> <li>(c) minimise the overall height of</li> </ul>	AO6.1 Where development on land steeper than 1 in 6 (16.6%) cannot be avoided, development follows the natural contours of the land and single plane concrete slab on-ground methods of construction are not utilised.	Will comply with AO6.1 The proposed earthworks exceeds 1 in 6, but it propsed to follow the natiral contours of the land removing only steep overhands and potential lashdslide locations by battering behind house.
development.	<ul> <li>AO6.2</li> <li>Access and vehicle manoeuvring and parking areas are constructed and maintained to:</li> <li>(a) minimise erosion;</li> <li>(b) minimise cut and fill;</li> <li>(c) follow the natural contours of the site</li> </ul>	<b>Complies with AO6.2</b> There is no proposal to cndict works for vehicle access
<b>PO7</b> The exterior finishes of buildings and structures are consistent with the surrounding natural environment.	<b>PO7</b> The exterior finishes and colours of buildings and structures are non-reflective and are moderately dark to darker shades of grey, green, blue and brown or the development is not visible external to the site.	<b>Complies with PO7</b> The existed painted white weasthboard home has been reclad on Colourbnd Monument Grey to blend into the natural site environment
<b>PO8</b> Development does not adversely affect the amenity of the zone and adjoining land uses in terms of traffic, noise, dust, odour, lighting or other physical or environmental impacts.	AO8 No acceptable outcomes are prescribed.	<b>Complies with AO8</b> There is no material change if usage from exisiitng primary residential purposes
<b>PO9</b> The density of development ensures that the environmental and scenic amenity values of the site and surrounding area are not adversely affected.	AO9 The maximum residential density is one dwelling house per lot.	<b>Complies with AO9</b> There is one exisiting dwelling and no proposal to change that



Performance outcomes	Acceptable outcomes	Response
<b>PO10</b> Lot reconfiguration results in no additional lots.	<b>AO10</b> No acceptable outcomes are prescribed.	<b>Complies with AO10</b> There is no application to create additional lots
Note - Boundary realignments to resolve encroachments and lot amalgamation are considered appropriate.		



#### Table 6.2.4.3.b — Inconsistent uses within the Environmental management zone

Inconsistent uses
<ul> <li>Adult store</li> <li>Agricultural supplies store</li> <li>Air services</li> <li>Aquaculture</li> <li>Bar</li> <li>Brothel</li> <li>Bulk landscape supplies</li> <li>Car wash</li> <li>Caretaker's accommodation</li> <li>Cemetery</li> <li>Child care centre</li> <li>Club</li> <li>Community care centre</li> <li>Community residence</li> <li>Community use</li> <li>Crematorium</li> <li>Cropping</li> <li>Detention facility</li> <li>Dual occupancy</li> <li>Dwelling unit</li> <li>Educational establishment</li> <li>Food and drink outlet</li> <li>Function facility</li> <li>Garden centre</li> </ul>

Note – This table does not imply that all other uses not listed in the table are automatically consistent uses within the zone. Assessable development must still demonstrate consistency through the assessment process.



## 8.2.5 Hillslopes overlay code

#### 8.2.5.1 Application

- (1) This code applies to assessing a material change of use, reconfiguring a lot, operational work or building work within the Hillslopes overlay, if:
  - (a) self assessable or assessable development where the code is identified as being applicable in the Assessment criteria for the Overlay Codes contained in the Levels of Assessment Tables in section 5.6;
  - (b) impact assessable development.
- (2) Land in the Hillslopes overlay is identified on the Hillslopes overlay map in Schedule 2 and includes the following sub-categories:
  - (a) Hillslopes constraint sub-category.
- (3) When using this code, reference should be made to Part 5.

## 8.2.5.2 Purpose

- (1) The purpose of the Hillslopes overlay code is to:
  - (a) implement the policy direction in the Strategic Framework, in particular:
    - (i) Theme 1 Settlement pattern: Element 3.4.7 Mitigation of hazards;
    - (ii) Theme 2 Environment and landscape values: Element 3.5.5 Scenic amenity.
  - (b) enable an assessment of whether development is suitable on land within the Hillslopes sub-categories.
- (2) The purpose of the code will be achieved through the following overall outcomes:
  - (a) development on hillslopes is safe, serviceable and accessible;
  - (b) the ecological values, landscape character and visual quality of the hillslopes are protected from development so as to retain the scenic backdrop to the region;
  - (c) Development on hillslopes is appropriate, having regard to the topographic constraints and environmental characteristics of the land;
  - (d) Development responds to the constraints of the site including gradient and slope stability;
  - (e) Works do not involve complex engineering solutions.



#### 8.2.5.3 Criteria for assessment

Table 8.2.5.3.a - Hillslopes overlay code -assessable development

Performance outcomes	Acceptable outcomes	Response
For self-assessable development		
<b>PO1</b> The landscape character and visual amenity quality of hillslopes areas is retained to protect the scenic backdrop to the region.	<b>AO1.1</b> Development is located on parts of the site that are not within the Hillslopes constraint sub- category as shown on the Hillslopes overlay Maps contained in schedule 2.	<b>Complies with P01</b> The dwelling is exisiitng, the earthworks are primariliy behind the home and shields the works from street view. The hoiuse is well elevated on a hillside and it would not affect the scenic backdrop.
For assessable development		
PO2	AO2.1	Does not comply with AO2.1
The landscape character and visual amenity quality of hillslopes areas is retained to protect the	Development does not occur on land with a gradient in excess of 1 in 6 (16.6%)	However
scenic backdrop to the region.	or	
	<b>AO2.2</b> Where development on land steeper than 1 in 6 (16.6%) cannot be avoided, development follows the natural contours of the site.	<b>Complies with AO2.2</b> The proposed earthworks follow the natural contours of the site
	A02.3 Access ways and driveways are: (a) constructed with surface materials that blend with the surrounding environment; (b) landscaped with dense planting to minimise the visual impact of the construction; (c) provided with erosion control measures immediately after construction	<b>AO2.3</b> There is no requirement for the creation of access ways and driveways as part of the applicatiom
	A02.4 The clearing or disturbance of vegetation is limited to clearing and disturbance that: (a) is necessary for the construction of driveways; (b) is necessary to contain the proposed	AO2.4 Complies with AO2.4



#### development;

(c) minimises canopy clearing or disturbance;(d) minimises riparian clearing or disturbance.

#### A02.5

On land with slopes greater than 1 in 6 (16.6%) or greater, alternative construction methods to concrete slab on ground are utilised (i.e. split level or post and beam constructed buildings that minimise modification to the natural terrain of the land).

#### A02.6

Development does not alter the sky line.

#### A02.7

Buildings and structures:

(a) are finished predominantly in the following exterior colours or surfaces:
(b) moderately dark to darker shades of olive green, brown, green, blue, or charcoal; or
(c) moderately dark to darker wood stains that blend with the colour and hues of the surrounding vegetation and landscape;
(d) are not finished in the following exterior colours or surfaces:
(e) pastel or terracotta colours, reds, yellows, shades of white or beige, or other bright colours that do not blend with the surrounding vegetation and landscape;

(f) reflective surface

# A02.8

Exterior colour schemes limit the use of white or other light colours to exterior trim and highlighting of architectural features

#### AO2.5

The proposed earthworks are for an excavation and battern approach to pretect the house form landslides. It follows the natural terrain and contours of the land\\\\\

#### AO2.6

The earthworks will not impact the sky line

## AO2.7

Complies with Code as there are no new buildings proposed

# A02.8

Complies with A02.8



	<ul> <li>A02.9</li> <li>Areas between the first floor (including outdoor deck areas) and ground level are screened from view.</li> <li>A02.10</li> <li>Recreational or ornamental features (including tennisycourts, ponds or swimming pools) do</li> </ul>	A02.9 Complies with A02.9 A02.10 Complies with A02.10
	not occur onvland: (a) with a gradient of 1 in 6 (16.6%) or more; (b) are designed to be sited and respond to thevnatural constraints of the land and require minimal earthworks	
P03	A03	A03
Excavation or filling does not have an adverse	Excavation or fill:	Complies with A0.3. Proposed earthworks are set
impact on the amenity, safety, stability or function of the site or adjoining premises through:	(a) is not more than 1.2 metres in height for each batter or retaining wall;	back 3m behind dwelling and would have a maximum of two batters.
(a) loss of privacy; (b) loss of access to sunlight;	(b) is setback a minimum of 2 metres from property boundaries;	
<ul><li>(c) intrusion of visual or overbearing impacts;</li><li>(d) complex engineering solutions.</li></ul>	(c) is stepped with a minimum 2 metre wide berm to incorporate landscaping in accordance with Planning scheme policy SC6.7 - Landscaping;	
	(d) does not exceed a maximum of 3 batters and	
	3 berms (i.e. not greater than 3.6 metres in	
	height) on any one lot.	
P04	AO4.1	
For development that involves reconfiguring a lot, lot layout and design is responsive to the natural	width to:	Complies with AU4.1
constraints of the land and each lot is capable of	(a) allow driveways to follow the natural contours	
being used for its intended purpose.	of the site and not exceed a gradient of 1 in 6 (16.6%);	
	(b) accommodate any changes in gradient	
	between the road and lot within the lot	
	boundary and not within the road reserve.	



AO4.2 Development does not create new lots containing land of greater than 1 in 6 (16.6%), except where a rectangular area of land of lesser grade is contained within the new lots to accommodate the intended land use, with the balance left in its natural state to the greatest extent possible. Note – The size of rectangular areas is outlined within each zone code.	A04.2 Complies with A04.2
AO4.3 Development does not alter ridgelines. AO4.4 Lots are designed to ensure rooflines of future buildings and structures do not protrude above a ridgeline.	A04.3 Complies with A04.3 A04.4 Complies with A04.4



## 8.2.7 Natural areas overlay code

#### 8.2.7.1 Application

- (1) This code applies to assessing a material change of use, reconfiguring a lot, operational work or building work within the Natural areas overlay, if:
  - (a) self-assessable or assessable development where the code is identified as being applicable in the Assessment criteria for the Overlay Codes contained in the Levels of Assessment Tables in section 5.6;
  - (b) impact assessable development.
- (2) Land in the Natural areas overlay is identified on the Natural areas overlay map in Schedule 2 and includes the following sub-categories:
  - (a) MSES Protected area;
  - (b) MSES Marine park;
  - (c) MSES Wildlife habitat;
  - (d) MSES Regulated vegetation;
  - (e) MSES Regulated vegetation (intersecting a Watercourse);
  - (f) MSES High ecological significance wetlands;
  - (g) MSES High ecological value waters (wetlands);
  - (h) MSES High ecological value waters (watercourse);
  - (i) MSES Legally secured off set area.

Note – MSES = Matters of State Environmental Significance.

(3) When using this code, reference should be made to Part 5.

#### 8.2.7.2 Purpose

- (1) The purpose of the Natural areas overlay code is to:
  - (a) implement the policy direction in the Strategic Framework, in particular:
    - (i) Theme 2: Environment and landscape values, Element 3.5.3 Biodiversity, Element 3.5.4 Coastal zones;
    - (ii) Theme 3: Natural resource management Element 3.6.2 Land and catchment management, Element 3.6.3 Primary production, forestry and fisheries.
  - (b) enable an assessment of whether development is suitable on land within the Biodiversity area overlay sub-categories.
- (2) The purpose of the code will be achieved through the following overall outcomes:
  - (a) development is avoided within:
    - (i) areas containing matters of state environmental significance (MSES);
    - (ii) other natural areas;



- (iii) wetlands and wetland buffers;
- (iv) waterways and waterway corridors.
- (b) where development cannot be avoided, development:
  - (i) protects and enhances areas containing matters of state environmental significance;
  - (ii) provides appropriate buffers;
  - (iii) protects the known populations and supporting habitat of rare and threatened flora and fauna species, as listed in the relevant State and Commonwealth legislation;
  - (iv) ensures that adverse direct or indirect impacts on areas of environmental significance are minimised through design, siting, operation, management and mitigation measures;
  - (v) does not cause adverse impacts on the integrity and quality of water in upstream or downstream catchments, including the Great Barrier Reef World Heritage Area;
  - (vi) protects and maintains ecological and hydrological functions of wetlands, waterways and waterway corridors;
  - (vii) enhances connectivity across barriers for aquatic species and habitats;
  - (viii) rehabilitates degraded areas to provide improved habitat condition, connectivity, function and extent;
  - (ix) protects areas of environmental significance from weeds, pests and invasive species.
- (c) strategic rehabilitation is directed to areas on or off site, where it is possible to achieve expanded habitats and increased connectivity.



## 8.2.7.3 Criteria for assessment

#### Table 8.2.7.3.a - Natural areas overlay code - assessable development

Performance outcomes	Acceptable outcomes	
For self-assessable and assessable development		
Protection of matters of environmental signific	ance	
PO1 Development protects matters of environmental significance.	<ul> <li>AO1.1</li> <li>Development avoids significant impact on the relevant environmental values.</li> <li>or</li> <li>AO1.2</li> <li>A report is prepared by an appropriately qualified person demonstrating to the satisfaction of the assessment manager, that the development site does not contain any matters of state and local environmental significance.</li> <li>or</li> <li>AO1.3</li> <li>Development is located, designed and operated to mitigate significant impacts on environmental values. For example, a report certified by an appropriately qualified person demonstrating to the satisfaction of the assessment manager, how the proposed development mitigates impacts. including</li> </ul>	A01.1, A01.2, A01.3 A Geotechnical Engineers report is attached
	on water quality, hydrology and biological processes.	
Management of impacts on matters of environmeters	nental significance	



PO2 Development is located, designed and constructed to avoid significant impacts on matters of environmental significance.	<ul> <li>AO2</li> <li>The design and layout of development minimises adverse impacts on ecologically important areas by: <ul> <li>(a) focusing development in cleared areas to protect existing habitat;</li> <li>(b) utilising design to consolidate density and preserve existing habitat and native vegetation;</li> <li>(c) aligning new property boundaries to maintain ecologically important areas;</li> <li>(d) ensuring that alterations to natural landforms, hydrology and drainage patterns on the development site do not negatively affect ecologically important areas;</li> <li>(e) ensuring that significant fauna habitats are protected in their environmental context; and</li> <li>(f) incorporating measures that allow for the safe movement of fauna through the site.</li> </ul> </li> </ul>	A02 Complies with A02
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Performance outcomes	Acceptable outcomes	
<b>PO3</b> An adequate buffer to areas of state environmental significance is provided and maintained.	<ul> <li>AO3.1</li> <li>A buffer for an area of state environmental significance (Wetland protection area) has a minimum width of:</li> <li>(a) 100 metres where the area is located outside Urban areas; or</li> <li>(b) 50 metres where the area is located within a Urban areas.</li> </ul>	A03.1 and A03.2 Complies with A03.1
	or AO3.2 A buffer for an area of state environmental significance is applied and maintained, the width of which is supported by an evaluation of environmental values, including the function and threats to matters of environmental significance.	
<b>PO4</b> Wetland and wetland buffer areas are maintained, protected and restored. Note – Wetland buffer areas are identified in AO3.1.	<ul> <li>AO4.1 Native vegetation within wetlands and wetland buffer areas is retained.</li> <li>AO4.2 Degraded sections of wetlands and wetland buffer areas are revegetated with endemic native plants in patterns and densities which emulate the relevant regional ecosystem.</li> </ul>	A04.1 and A04.2 Complies with A04.1
<b>PO5</b> Development avoids the introduction of non- native pest species (plant or animal), that pose a risk to ecological integrity.	<ul> <li>AO5.1 Development avoids the introduction of non-native pest species.</li> <li>AO5.2 The threat of existing pest species is controlled by adopting pest management practices for long-term ecological integrity.</li> </ul>	A05.1 and A05.2 Complies with A05.1



Ecological connectivity		
<b>PO6</b> Development protects and enhances ecological connectivity and/or habitat extent.	<b>AO6.1</b> Development retains native vegetation in areas large enough to maintain ecological values, functions and processes.	<b>A06.1 and A06.2 and A06.3</b> Compliies with A)6.1, A06.2 and A06.3
	and AO6.2 Development within an ecological corridor rehabilitates native vegetation.	
	and AO6.3 Development within a conservation corridor mitigates adverse impacts on native fauna, feeding, nesting, breeding and roosting sites and native fauna movements.	



Performance outcomes	Acceptable outcomes	
<b>PO7</b> Development minimises disturbance to matters of state environmental significance (including existing ecological corridors).	<ul> <li>AO7.1 Development avoids shading of vegetation by setting back buildings by a distance equivalent to the height of the native vegetation. and AO7.2 Development does not encroach within 10 metres of existing riparian vegetation and watercourses</li> </ul>	A07.1 and A07.2 Complies with A07.1 and A07.2
Waterways in an urban area		
<ul> <li>PO8</li> <li>Development is set back from waterways to protect and maintain: <ul> <li>(a) water quality;</li> <li>(b) hydrological functions;</li> <li>(c) ecological processes;</li> <li>(d) biodiversity values;</li> <li>(e) riparian and in-stream habitat values and connectivity;</li> <li>(f) in-stream migration.</li> </ul> </li> </ul>	AO8.1 Where a waterway is contained within an easement or a reserve required for that purpose, development does not occur within the easement or reserve; or AO8.2 Development does not occur on the part of the site affected by the waterway corridor. Note – Waterway corridors are identified within Table 8.2.7.3.b.	A08.1 and A08.2 Complies ith A08.1 and A08.2
Waterways in a non-urban area		



PO9	AO9	A09
Development is set back from waterways to	Development does not occur on that part of the	Complies with A09
protect and maintain:	site affected by a waterway corridor.	· ·
(a) water quality;		
(b) hydrological functions;	Note – Waterway corridors are identified within Table 8.2.7.3.b.	
(c) ecological processes;		
(d) biodiversity values;		
(e) riparian and in-stream habitat values and		
connectivity;		
(f) in-stream migration.		

#### Table 8.2.7.3.b — Widths of waterway corridors for waterways

Waterways classification	Waterway corridor width
Waterways in Urban areas	10 metres measured perpendicular from the top of the high bank.
Waterways in Other areas	For a dwelling house, 10 metres measured perpendicular from the top of the high bank. For all other development, 20 metres measured perpendicular from the top of the high bank.



## 8.2.9 Potential landslide hazard overlay code

#### 8.2.9.1 Application

- (1) This code applies to assessing a material change of use, reconfiguring a lot, operational work or building work within the Potential landslide hazard overlay; if
  - (a) self-assessable or assessable development where the code is identified as being applicable in the Assessment criteria for the Overlay Codes contained in the Levels of Assessment Tables in section 5.6;
  - (b) impact assessable development.
- (2) Land in the Potential landslip hazard overlay is identified on the Potential landslide hazard overlay maps in Schedule 2 and includes the following sub-categories:
  - (a) Places of potential landslide hazard sub-category.
- (3) When using this code, reference should be made to Part 5.

Note – The Potential landslide hazard overlay shows modelled areas where the factors contributing to landslip potential accumulate to provide a moderate or higher risk if certain factors are exacerbated (e.g. factors include significant vegetation clearing, filling and excavation, changes to soil characteristics, changes to overland water flow, or changes to sub-surface water flow). It shows areas that the Council has identified where landslides may occur and where land may be impacted by a landslide, but does not mean that landslides will occur or that the land will be impacted by a landslide. Other areas not contained within the potential landslide hazard overlay may sustain landslides or be impacted by landslides and consideration should be given to this issue, where appropriate.

#### 8.2.9.2 Purpose

(1) The purpose of the Potential landslide hazard overlay code is:

(a) implement the policy direction of the Strategic Framework, in particular:

(i) Theme 1: Settlement pattern Element 3.4.7 Mitigation of hazards.

- (b) enable an assessment of whether development is suitable on land within the Potential landslip hazard overlay.
- (2) The purpose of the code will be achieved through the following overall outcomes:
  - (a) development is located, designed and constructed to not put at risk the safety of people, property and the environment;
  - (b) development is not at risk from and does not pose a risk to adjacent and nearby sites from landslides;
  - (c) ensures that community infrastructure is protected from the effects of potential landslides;
  - (d) ensures that vegetation clearing, stormwater management and filling and/or excavation does not create a landslide hazard and/or rectifies potential pre-existing landslide risks;
  - (e) development does not occur where works to provide a solution for safety of people, property or the environment involves complex engineering solutions to overcome the risk, or would result in a built form or outcome that causes an adverse visual impact on the Hillslopes or Landscape values of Douglas Shire.


## 8.2.9.3 Criteria for assessment

Table 8.2.9.3.a - Potential landslide hazard overlay code - assessable development

Performance outcomes	Acceptable outcomes	
<ul> <li>PO1</li> <li>The siting and design of development does not involve complex engineering solutions and does not create or increase the potential landslide hazard risk to the site or adjoining premises through: <ul> <li>(a) building design;</li> <li>(b) increased slope;</li> <li>(c) removal of vegetation;</li> <li>(d) stability of soil;</li> <li>(e) earthworks;</li> </ul> </li> <li>(f) alteration of existing ground water or surface water paths;</li> <li>waste disposal areas.</li> </ul>	<ul> <li>AO1.1 Development is located on that part of the site not affected by the Potential landslide hazard overlay. </li> <li>Or <ul> <li>AO1.2</li> <li>Development is on an existing stable, benched site and requires no further earthworks</li> </ul> </li> <li>Or <ul> <li>AO1.3</li> <li>A competent person certifies that:</li> <li>(a) the stability of the site, including associated buildings and infrastructure, will be maintained during the course of the development and will remain stable for the life of the development;</li> <li>(b) development of the site will not increase the risk of landslide hazard activity on other land, including land above the site;</li> <li>(c) the site is not subject to the risk of landslide activity on other land;</li> <li>(d) any measures identified in a site-specific geotechnical report for stabilising the site or development have been fully implemented;</li> <li>(e) development does not concentrate existing ground water and surface water paths;</li> <li>(f) development does not incorporate on-site waste water disposal.</li> </ul> </li> </ul>	A01.1, A01.2 and A01.3 A Geotechnical Engineer conducted an exytensive survey and a copy of the report is attached



PO2 The siting and design of necessary retaining structures does not cause an adverse visual impact on landscape character or scenic amenity quality of the area.	<ul> <li>AO2</li> <li>Excavation or fill: <ul> <li>(a) is not more than 1.2 metres in height for each batter or retaining wall;</li> <li>(b) is setback a minimum of 2 metres from property boundaries;</li> <li>(c) is stepped with a minimum 2 metre wide berm to incorporate landscaping in accordance with Planning scheme policy SC6.7 – Landscaping;</li> <li>(d) does not exceed a maximum of 3 batters and 3 berms (i.e. Not greater than 3.6 metres in height) on any one lot.</li> </ul> </li> </ul>	A02 Does not comply. However, the works are behind the hoise, not visiible from adjoining properties and are necessary for the protection of the dwelling and himan life.
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Performance outcomes	Acceptable outcomes	
Additional requirements for Community infrastru	ucture	
<ul> <li>PO3</li> <li>Development for community infrastructure:</li> <li>(a) is not at risk from the potential landslide hazard areas;</li> <li>(b) will function without impediment from a landslide;</li> </ul>	<b>AO3</b> Development is designed in accordance with the recommendations of a site-specific geotechnical assessment which makes reference to the community infrastructure and its needs and function.	A03 Complies with A03
<ul> <li>(c) provides access to the infrastructure without impediment from the effects of a landslide;</li> <li>(d) does not contribute to an elevated risk of a landslide to adjoining properties.</li> </ul>	Note - A site specific geotechnical assessment will detail requirements that will address the Acceptable Outcomes of this Performance Outcome. Planning scheme policy SC6.9 – Natural hazards provides guidance on preparing a site specific geotechnical assessment.	



# 9.4.4 Filling and excavation code

## 9.4.4.1 Application

- (1) This code applies to assessing:
  - (a) operational work for filling or excavation which is self-assessable or code assessable development if this code is an applicable code identified in the assessment criteria column of a table of assessment; or
  - (b) a material change of use or reconfiguring a lot if:
    - (i) assessable development where this code is identified as a prescribed secondary code in the assessment criteria column of a table of assessment; or
    - (ii) impact assessable development, to the extent relevant.

Note—This code does not apply to building work that is regulated under the Building Code of Australia.

(2) When using this code, reference should be made to Part 5.

## 9.4.4.2 Purpose

- (1) The purpose of the Filling and excavation code is to assess the suitability of development for filling or excavation.
- (2) The purpose of the code will be achieved through the following overall outcomes:
  - (a) filling or excavation does not impact on the character or amenity of the site and surrounding areas;
  - (b) filling and excavation does not adversely impact on the environment;
  - (c) filling and excavation does not impact on water quality or drainage of upstream, downstream or adjoining properties;
  - (d) filling and excavation is designed to be fit for purpose and does not create land stability issues;
  - (e) filling and excavation works do not involve complex engineering solutions.



## 9.4.4.3 Criteria for assessment

Table 9.4.4.3.a - Filling and excavation code - for self-assessable and assessable development

Performance outcomes	Acceptable outcomes	
For self-assessable and assessable developmer	nt	
Filling and excavation - General		
<b>PO1</b> All filling and excavation work does not create a detrimental impact on the slope stability, erosion potential or visual amenity of the site or the surrounding area.	AO1.1 The height of cut and/or fill, whether retained or not, does not exceed 2 metres in height. and Cuts in excess of those stated in A1.1 above are separated by benches/ terraces with a minimum width of 1.2 metres that incorporate drainage provisions and screen planting.	A01.1 Does not comply, the bank is too steep to achieve this, however the cut and batter are hidden behind the home
	<b>AO1.2</b> Cuts are supported by batters, retaining or rock walls and associated benches/terraces are capable of supporting mature vegetation.	<b>A01.2</b> Complies with A01.2
	<b>AO1.3</b> Cuts are screened from view by the siting of the building/structure, wherever possible.	<b>A01.3</b> Complies with A01.3



Performance outcomes	Acceptable outcomes	
	<b>AO1.4</b> Topsoil from the site is retained from cuttings and reused on benches/terraces.	A01.4 Complies with A01.4
	<b>AO1.5</b> No crest of any cut or toe of any fill, or any part of any retaining wall or structure is closer than 600mm to any boundary of the property, unless the prior written approval of the adjoining landowner has been obtained.	A01.5 Complies with A01.5
	<b>AO1.6</b> Non-retained cut and/or fill on slopes are stabilised and protected against scour and erosion by suitable measures, such as grassing, landscaping or other protective/aesthetic measures.	A01.6 Complies with A01.6
Visual Impact and Site Stability		
<b>PO2</b> Filling and excavation are carried out in such a manner that the visual/scenic amenity of the area and the privacy and stability of adjoining properties is not compromised.	<ul> <li>AO2.1 The extent of filling and excavation does not exceed 40% of the site area, or 500m<sup>2</sup> whichever is the lesser,</li> <li>except that AO2.1 does not apply to reconfiguration of 5 lots or more.</li> <li>AO2.2 Filling and excavation does not occur within 2 metres of the site boundary.</li> </ul>	A02.1 Complies with A02.1 A02.2 Complies with A02.2
Flooding and drainage		



<b>PO3</b> Filling and excavation does not result in a change to the run off characteristics of a site which then have a detrimental impact on the site or nearby land or adjacent road reserves	<b>AO3.1</b> Filling and excavation does not result in the ponding of water on a site or adjacent land or road reserves.	A03.1 Complies with A03.1
	<b>AO3.2</b> Filling and excavation does not result in an increase in the flow of water across a site or any other land or road reserves.	A03.2 Complies with A03.2
	<b>AO3.3</b> Filling and excavation does not result in an increase in the volume of water or concentration of water in a watercourse and overland flow paths.	A03.3 Complies with A03.3
	<b>AO3.4</b> Filling and excavation complies with the specifications set out in Planning Scheme Policy No SC5 – FNQROC Development Manual.	A03.4 Complies with A03.4
Water quality		
<b>PO4</b> Filling and excavation does not result in a reduction of the water quality of receiving waters.	AO4 Water quality is maintained to comply with the specifications set out in Planning Scheme Policy No SC5 – FNQROC Development Manual.	A04 Complies with A04



Performance outcomes Acceptable outcomes		
Infrastructure		
<b>P05</b> Excavation and filling does not impact on Public Utilities.	<b>A05</b> Excavation and filling is clear of the zone of influence of public utilities.	A05 Complies wth A05



Douglas Partners Pty Ltd ABN 75 053 980 117 www.douglaspartners.com.au 13 Industrial Avenue Stratford QLD 4870 Phone (07) 4055 1550

Steve Prideaux 1551 Mossman Daintree Road Wonga Beach QLD 4873 Project 221800.00 28 August 2023 R.001.Rev0 AM/RT:DQ

Attention: Steve Prideaux

Email: stephen.prideaux@icloud.com

Geotechnical Inspection Proposed Bank Stabilisation 1551 Mossman Daintree Road, Wonga Beach

## 1. Introduction

In accordance with Douglas Partners Pty Ltd (DP) proposal dated 26 April 2023, a DP engineering geologist attended the above site to undertake a geotechnical inspection pertaining to the proposed stabilisation of a cut batter slope located to the rear of the existing dwelling.

The hillside allotment at 1551 Mossman Daintree Road has an area of 8059 m<sup>2</sup> and is located on the eastern slopes of the Dagmar Range. Much of the site is observed to comprise very steep slopes, which are densely vegetated with mature rainforest however, it is understood earthworks were undertaken in the 1980's to create a level building platform suitable for a residential subdivision. These earthworks included excavation of an extremely steep cut batter (ie slope) through the natural soil and rock.

At the time of inspection the cut batter height ranged from approximately 3 m to 11 m and slope angles ranged from 40° to 70°. Upslope of the crest of the cut batter face the natural slope continues at approximately 35° for approximately 300 m before the hillside crests.

We understand that ongoing instability of the batter slope has been occurring over several years, including a recent landslide which deposited a significant volume of material immediately to the north of the dwelling (refer Figure 1). Due to the risk of damage to property and/or injury to residents, remediation to reduce the risk is required. It is further understood that the preferred remediation method comprises reshaping and benching of the slope.



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Photographs of the subject site are presented in Figures 1 to 3 below.

Figure 1: View of site after March 2023 landslide. View is to the south-west.



Figure 2: View of site at time of field work. View is to the south.





Figure 3: View of site at the time of field work. View is to the north.

## 2. Scope of Works

The scope of work comprised a site walkover and mapping of exposed geology by an experienced engineering geologist, and preparation of a brief letter report providing the following:

- details of the field work carried out;
- summary sketches of the observations made during the site walkover;
- proposed batter angles for the materials observed during the field mapping;
- drainage requirements;
- results of stability analysis using proprietary software based on the proposed geometry for a single cross section; and
- preliminary approximate estimate of material volume for removal based on site mapping and proposed geometry.

## 3. Field Work Observations

Observations made during the site work were recorded on site in sketch format and are presented in the documents attached.

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It is considered that varying degrees of slope instability have occurred across the full length of the observed cut face. The following observations were made:

- slope angles in the rock cut sections are typically around 60°.
- slope angles in the soil cut sections are typically around 50°.
- small rock fall debris have accumulated behind a small timber post and panel fence (refer Figure 5).
- bulging of the post and panel fence can be observed in parts.
- landslide scarp formation was observed along the full length of the cut batter crest.
- tension cracks and minor shallow landslides were observed beyond the crest of the cut batter slope. These represent active failure mechanisms and were observed up to around 5 m back from the top of the batter.
- several trees have been cut down near the crest of the batter slope, with stumps remaining in place.
- bowing trees were observed upslope of the batter slope crest.
- a large, undermined, tree root-ball is evident adjacent to the March 2023 landslide location (refer Figure 4). It is understood a similar root ball was transported downslope in the March 2023 event.



Figure 4: View of undermined root-ball embedded in soil.





Figure 5: View of weathered and fractured rock mass.

# 3.1 Slope Geometry

Typical 'safe' batter slope angles for cuts in natural residual soils are  $26^{\circ}$  (2H:1V), and vary for rock due to the controlling influence of rock defect orientation (however are generally not steeper than  $45^{\circ}(1H:1V)$ ).



Due to the existing slope geometry on site, ie the 40° to 70° batter slope cut into a 30° to 35° degree hillslope, it is not possible to reshape the cut batter to achieve these recommended batter angles. Therefore, for the purpose of the analysis steeper slopes were adopted. The modified slope geometry modelled for analysis purposes is as follows:

From the toe of the slope, batter at a maximum slope angle of  $60^{\circ}$  within the weathered rock mass. Once the rock transitions to soil (ie at the soil rock interface) construct a bench 2 m to 3 m wide with a  $3^{\circ}$  backslope into the hillside. Continue to batter the upslope section at a maximum slope angle of  $60^{\circ}$  within the weathered rock mass. Once the rock transitions to soil (ie at the soil rock interface) construct a second bench 2 m to 3 m wide with a  $3^{\circ}$  backslope into the hillside. Continue to batter the upslope section at a maximum slope angle of  $60^{\circ}$  within the weathered rock mass. Once the rock transitions to soil (ie at the soil rock interface) construct a second bench 2 m to 3 m wide with a  $3^{\circ}$  backslope into the hillside. Continue to batter the upslope section at a maximum slope angle of  $60^{\circ}$  within the weathered rock mass. Once the rock transitions to soil (ie at the soil rock interface), flatten the batter angle to  $45^{\circ}$  and continue at this slope angle through the soil profile until the natural hillside profile is reached.



Figure 6 below presents the above description graphically.

Figure 6: Analysed modified slope geometry

## 3.2 Volume Estimate

An estimate of volume of material for excavation was undertaken for the analysed geometry. The following process was used to estimate a volume.

- a series of to scale cross sections have been drawn for every 10 m interval.
- the area of material to be removed has been estimated by summing 1 m<sup>2</sup> squares for each cross section.

• the individual volume estimates have been summed and multiplied by a bulking factor of 1.3.

It should be noted that for a more accurate estimation of material volumes a surveyor may be engaged.

Chainage	Area (m <sup>2</sup> )	Average Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )
20	44		
30	42	43	430
40	54	48	480
50	47	50.5	505
60	41	44	440
70	22	31.5	315
80	48	35	350
90	22	35	350

## Table 1: Approximate volume estimate

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Estimated total volume = 2 870 m<sup>3</sup>

Bulking factor = 1.3

Estimated total volume for excavation = 3 730 m<sup>3</sup>

## 4. Comments

# 4.1 Appreciation of Subsurface Conditions

Geological mapping of the soil and rock face was carried out by a DP engineering geologist who recorded the soil and rock profile, and measured the rock mass defects and other relevant features observed.

The surface conditions observed are described in the bullet points that follow. It should be noted that no intrusive investigation was undertaken and the sub-surface profile used in the analysis should be considered preliminary:

• **Residual Soil:** From surface across the full length of the cutting and ranging from approximately 3 m to 7 m in apparent thickness however true thickness of the soil unit is estimated to be approximately 2 m to 3 m (refer cross sections attached). The residual soil profile generally comprised brown or red brown, low plasticity clayey silt.



- Soil / Weathered Rock Transition: The residual soil is underlain by a transitional unit comprising brown hard clayey silt with irregular bands of highly weathered, inferred very low strength argillite. The true thickness of this unit is estimated to be approximately 1 m.
- **Argillite Rock:** Underlying the soil profile, highly weathered argillite was observed with exposure along the length of the cut face. The highly weathered rock is generally very low to medium strength and fractured to highly fractured.

Free groundwater was not observed during fieldwork. It should be noted, however, that groundwater levels are affected by climatic conditions and soil permeability and will therefore vary with time. Wonga Beach is located in the wet tropics and subject to wet and dry seasons, during which the groundwater levels may be prone to vary considerably.

A stereographic plot of the recorded defects is presented in Figure 7 below, noting the cut batter slope has an approximate dip direction of 025°.

Joint Set Number	Dip Angle	Dip Direction	Number of Joints Encountered
J1	50	065	14
J2	43	257	16
J3	78	025	6
J4	68	130	3

## Table 1: Summary of Observed Rock Defects



Figure 7: Stereographic plot of rock mass defects. Contours indicate intersections of recorded defects.



## 4.2 Analysis

Analysis of rock failure mechanisms and possible block sizes for a 60° rock cut face was undertaken using proprietary software (Dips and sWedge). The analysis indicates that small volume (up to 0.048m3) wedge failure is the most common rock failure mechanism. It is considered such a wedge failure in the rock mass is likely to break into small blocks during transit and impact with the ground surface. Site observations are consistent with this analysis.

Global stability analysis of the re-shaped soil batter slope was undertaken using the Slope/W software package and a factor of safety calculated for both wet and dry conditions. Effective strength parameters (ie long-term, drained conditions) were used to assess the cases with Morgenstern-Price method searching 1059 potential slip surfaces.

The soil parameters adopted in the stability analysis were inferred from published information and local experience and are presented in Table 2 below.

I			
Soil Material	Density, γ (kN/m³)	Cohesion, c' (kPa)	Friction Angle, ∳' (°)
Residual clayey silt	20	5	30
EW rock / soil	20	7	30
HW Argillite	22	30	30

## **Table 2: Adopted Geotechnical Parameters**



Results of the analysis are presented in Figures 8 and 9.

Figure 8: Results of stability analysis – dry conditions (FOS=1)





Figure 9: Results of stability analysis – piezometric line along top of rock (FOS=0.8)

A slope is usually considered of marginal stability if it has a factor of safety of between 1.0 and 1.5, and unstable if it has a factor of safety of less than 1. Therefore, the stability analysis indicates the proposed geometry (1H:1V) through the soil profile is of marginal stability under dry conditions and unstable under wet conditions.

# 4.3 Slope Stability Risk Assessment

The terminology of the Australian Geomechanics Society (AGS) Practice Note Guidelines and Commentary for Landslide Risk Management 2007, herein referred to as the AGS Guidelines, has been employed in the descriptions of hazards and the qualitative assessment of likelihood, consequence and risk of slope instability. Relevant AGS Guidelines (Geoguides LR5, LR8, and LR9) are attached.

The AGS Guidelines indicate that the regulator (i.e. Council) is the appropriate authority to set standards for risk levels but also suggests that, for most developments in existing urban areas, criteria based on "Tolerable Risk" levels are applicable because of the trade-off between the risks, the benefit of development and the cost of risk mitigation. Definitions of acceptable and tolerable risk as included in the AGS Guidelines are as follows:

**Tolerable Risk:** risks within a range that society can live with so as to secure certain benefits. It is a range of risk regarded as non-negligible and needing to be kept under review and reduced further if practicable.

Areas initially of moderate or high risk level to property may be accepted for development subject to detailed investigation to define hazards, and provided that planning and treatment options are implemented to reduce risks to acceptable levels.

**Acceptable Risk:** risk which everyone affected is prepared to accept. Action to further reduce such risk is usually not required unless reasonably practicable measures are available at low cost in terms of money, time and effort.

"Very low" or "low" risk levels are usually considered acceptable to regulators.

## 4.4 Slope Stability Hazards

The assessed existing slope instability hazards and their likelihood of occurrence are as follows:

**Hazard 1:** The potential for rotational landslides upslope of the batter crest. This hazard would most likely originate through the already disturbed (hummocky) area within approximately 5 m to 6 m from the crest. The likelihood of this failure is considered "almost certain" due to the active failure mechanisms observed.

The likelihood of this failure occurring after reshaping the cut batter is considered 'likely' due to the propensity of the very steep slopes to develop the same failure mechanisms.

**Hazard 2:** The potential for translational landslide originating upslope, beyond the hummocky area, and forming along the soil rock interface is considered "possible" due to the extremely steep slope and the exposure of the soil rock interface within the cut batter.

**Hazard 3**: The potential for low volume wedge failure through the rock mass, such as has been observed on site is considered "almost certain".

**Hazard 4**: The potential for a larger volume wedge failure through the rock mass is considered possible due to the extremely steep batter and the defect orientation.

# 4.5 Risk of Slope Instability

A slope instability risk assessment has been carried out for both the existing site conditions as observed at the time of field work, and the preferred remedial solution.

The risk levels to property have been qualitatively classified in accordance with the methods of the AGS Guidelines. Identified hazards (see Section 4.3) together with assessed risk levels, are summarised in Table 3 below.

Hazard (refer Initiating		As assessed for the slope condition at the time of field work		As assessed for the reshaped and benched batter slope analysed in Section 4.2			
above)	Factor	Likelihood	Consequence	Risk	Likelihood	Consequence	Resultant Risk
1	Heavy rain and slope disturbance	Almost certain	Medium	Very High	Likely	Medium	High
2	Heavy rain and slope disturbance	Possible	Major	High	Possible	Major	High
3	Heavy rain, and slope disturbance	Almost certain	Insignificant	Low	Almost certain	Insignificant	Low
4	Heavy rain, and slope disturbance	Possible	Minor	Medium	Possible	Minor	Medium
	Wor	st Risk		Very High			High

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Based on the results of the slope stability assessment on the slope condition at the time of field work, the slope stability risk to the existing dwelling is assessed to be "very high".

Based on the results of analysis of the preferred remedial solution comprising reshaping and benching, the landslide risk is assessed to be "high".

#### 4.6 **Concluding Remarks**

Based on the site walkover, analysis, and risk assessment the following concluding remarks are made:

- Based on the results of this assessment the risk to the current dwelling location from landslide activity is assessed to be "very high".
- Stability analysis indicates that a remedial solution comprising reshaping and benching the slope will result in a marginally stable slope when modelled under dry conditions which would continue to be prone to landslides when modelled under wet conditions.
- Reshaping the slope may reduce the immediate risk of slope instability from rotational failure through the soil mass originating in the disturbed (hummocky) ground within 5 m to 6 m of the slope crest (due to removal of the unstable surficial materials). The analysis, however, indicates similar instability is likely to continue to occur, over time, through redevelopment of the same failure mechanisms.
- Therefore, it should be recognised that even after implementing the proposed methodology of reshaping the cut face and constructing benches, the risk of future slope instability will continue to be "high".
- To mitigate slope stability risk subsurface investigation and remedial design would be required. The mapping indicates the likely design solution would involve reshaping the cut face to remove unstable material, followed by installation of soil nails and shotcrete facing to stabilise the slope.



 Whatever the remedial option, the management of stormwater at this site is paramount in avoiding 'uncontrolled' discharge, and in particular concentrated discharge, onto the very steep slopes. Any such discharge may either soften the soil cover on the slope (in the case of prolonged seepage on a wide front) or lead to gully erosion (in the case of concentrated high velocity discharge). In either case, such infiltration or scour is likely to initiate and/or propagate slope creep and/or failure.

## 5. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at 1551 Mossman Daintree Road, Wonga Beach in accordance with DP's proposal dated 26 April 2023 and acceptance received from Steve Prideaux dated 11 May 2023. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Steve Prideaux for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.



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Please contact the undersigned if you have any questions on this matter.

Yours faithfully Douglas Partners Pty Ltd

Reviewed by



Aidan McDonald Associate / Engineering Geologist

Robert Thomson Associate / Senior Engineering Geologist David Qualischefski Principal

Attachments:

About this Report Sketches AGS Geoguides



#### Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

#### Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

## **Borehole and Test Pit Logs**

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

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

#### Groundwater

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

 In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

- A localised, 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. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or 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 a perched water table.

#### Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. 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, DP 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 and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

# About this Report

#### **Site Anomalies**

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

#### Information for Contractual Purposes

Where information obtained from this report 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. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

#### **Site Inspection**

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site. **Douglas Partners** Geotechnics | Environment | Groundwater

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# PRACTICE NOTE GUIDELINES FOR LANDSLIDE RISK MANAGEMENT 2007

# APPENDIX C: – QUALITATIVE TERMINOLOGY FOR USE IN ASSESSING RISK TO PROPERTY (CONTINUED)

LIKELIHOOD CONSEQUENCES TO PROPERTY (With Indicative Approximate Cost of I			of Damage)			
	Indicative Value of Approximate Annual Probability	1: CATASTROPHIC 200%	2: MAJOR 60%	3: MEDIUM 20%	4: MINOR 5%	5: INSIGNIFICANT 0.5%
A – ALMOST CERTAIN	10-1	VH	VH	VH	Н	M or L (5)
B - LIKELY	10 <sup>-2</sup>	VH	VH	Н	М	L
C - POSSIBLE	10-3	VH	Н	М	М	VL
D - UNLIKELY	10 <sup>-4</sup>	Н	М	L	L	VL
E - RARE	10-5	М	L	L	VL	VL
F - BARELY CREDIBLE	10-6	L	VL	VL	VL	VL

## QUALITATIVE RISK ANALYSIS MATRIX – LEVEL OF RISK TO PROPERTY

Notes: (5) For Cell A5, may be subdivided such that a consequence of less than 0.1% is Low Risk.

(6) When considering a risk assessment it must be clearly stated whether it is for existing conditions or with risk control measures which may not be implemented at the current time.

## **RISK LEVEL IMPLICATIONS**

Risk Level		Example Implications (7)	
VH	VERY HIGH RISK	Unacceptable without treatment. Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to Low; may be too expensive and not practical. Work likely to cost more than value of the property.	
Н	HIGH RISK	Unacceptable without treatment. Detailed investigation, planning and implementation of treatment options required to reduce risk to Low. Work would cost a substantial sum in relation to the value of the property.	
М	MODERATE RISK	May be tolerated in certain circumstances (subject to regulator's approval) but requires investigation, planning and implementation of treatment options to reduce the risk to Low. Treatment options to reduce to Low risk should be implemented as soon as practicable.	
L	LOW RISK	Usually acceptable to regulators. Where treatment has been required to reduce the risk to this level, ongoing maintenance is required.	
VL	VERY LOW RISK	Acceptable. Manage by normal slope maintenance procedures.	

Note: (7) The implications for a particular situation are to be determined by all parties to the risk assessment and may depend on the nature of the property at risk; these are only given as a general guide.

# PRACTICE NOTE GUIDELINES FOR LANDSLIDE RISK MANAGEMENT 2007

## APPENDIX C: LANDSLIDE RISK ASSESSMENT

# QUALITATIVE TERMINOLOGY FOR USE IN ASSESSING RISK TO PROPERTY

## **QUALITATIVE MEASURES OF LIKELIHOOD**

Approximate Annual ProbabilityImplied IndicativIndicativeNotionalRecurrence IValueBoundaryImplied Indicativ		ve Landslide Interval	Description	Descriptor	Level	
10-1	5x10 <sup>-2</sup>	10 years         20 years           100 years         200 years           1000 years         2000 years		The event is expected to occur over the design life.	ALMOST CERTAIN	А
10 <sup>-2</sup>	510 <sup>-3</sup>			The event will probably occur under adverse conditions over the design life.	LIKELY	В
10-3	5X10			The event could occur under adverse conditions over the design life.	POSSIBLE	С
10-4	5x10 <sup>-4</sup>	10,000 years	2000 vears	The event might occur under very adverse circumstances over the design life.	UNLIKELY	D
10-5	$5x10^{-6}$	100,000 years	20,000 years	The event is conceivable but only under exceptional circumstances over the design life.	RARE	Е
10-6	5810	1,000,000 years	200,000 years	The event is inconceivable or fanciful over the design life.	BARELY CREDIBLE	F

Note: (1) The table should be used from left to right; use Approximate Annual Probability or Description to assign Descriptor, not vice versa.

## **QUALITATIVE MEASURES OF CONSEQUENCES TO PROPERTY**

Approximate Cost of DamageIndicativeNotionalValueBoundary		Description	Descriptor	Level
200%	1000/	Structure(s) completely destroyed and/or large scale damage requiring major engineering works for stabilisation. Could cause at least one adjacent property major consequence damage.	CATASTROPHIC	1
60%	100%	Extensive damage to most of structure, and/or extending beyond site boundaries requiring significant stabilisation works. Could cause at least one adjacent property medium consequence damage.	MAJOR	2
20%	10%	Moderate damage to some of structure, and/or significant part of site requiring large stabilisation works. Could cause at least one adjacent property minor consequence damage.	MEDIUM	3
5%	10/0	Limited damage to part of structure, and/or part of site requiring some reinstatement stabilisation works.	MINOR	4
0.5%	1/0	Little damage. (Note for high probability event (Almost Certain), this category may be subdivided at a notional boundary of 0.1%. See Risk Matrix.)	INSIGNIFICANT	5

Notes: (2) The Approximate Cost of Damage is expressed as a percentage of market value, being the cost of the improved value of the unaffected property which includes the land plus the unaffected structures.

(3) The Approximate Cost is to be an estimate of the direct cost of the damage, such as the cost of reinstatement of the damaged portion of the property (land plus structures), stabilisation works required to render the site to tolerable risk level for the landslide which has occurred and professional design fees, and consequential costs such as legal fees, temporary accommodation. It does not include additional stabilisation works to address other landslides which may affect the property.

(4) The table should be used from left to right; use Approximate Cost of Damage or Description to assign Descriptor, not vice versa

# AUSTRALIAN GEOGUIDE LR2 (LANDSLIDES)

## LANDSLIDES

#### What is a Landslide?

Any movement of a mass of rock, debris, or earth, down a slope, constitutes a "landslide". Landslides take many forms, some of which are illustrated. More information can be obtained from Geoscience Australia, or by visiting its Australian Landslide Database at <u>www.ga.gov.au/urban/factsheets/landslide.jsp</u>. Aspects of the impact of landslides on buildings are dealt with in the book "Guideline Document Landslide Hazards" published by the Australian Building Codes Board and referenced in the Building Code of Australia. This document can be purchased over the internet at the Australian Building Codes Board's website <u>www.abcb.gov.au</u>.

Landslides vary in size. They can be small and localised or very large, sometimes extending for kilometres and involving millions of tonnes of soil or rock. It is important to realise that even a 1 cubic metre boulder of soil, or rock, weighs at least 2 tonnes. If it falls, or slides, it is large enough to kill a person, crush a car, or cause serious structural damage to a house. The material in a landslide may travel downhill well beyond the point where the failure first occurred, leaving destruction in its wake. It may also leave an unstable slope in the ground behind it, which has the potential to fail again, causing the landslide to extend (regress) uphill, or expand sideways. For all these reasons, both "potential" and "actual" landslides must be taken very seriously. They present a real threat to life and property and require proper management.

Identification of landslide risk is a complex task and must be undertaken by a geotechnical practitioner (GeoGuide LR1) with specialist experience in slope stability assessment and slope stabilisation.

#### What Causes a Landslide?

Landslides occur as a result of local geological and groundwater conditions, but can be exacerbated by inappropriate development (GeoGuide LR8), exceptional weather, earthquakes and other factors. Some slopes and cliffs never seem to change, but are actually on the verge of failing. Others, often moderate slopes (Table 1), move continuously, but so slowly that it is not apparent to a casual observer. In both cases, small changes in conditions can trigger a landslide with serious consequences. Wetting up of the ground (which may involve a rise in ground water table) is the single most important cause of landslides (GeoGuide LR5). This is why they often occur during, or soon after, heavy rain. Inappropriate development often results in small scale landslides which are very expensive in human terms because of the proximity of housing and people.

#### Does a Landslide Affect You?

Any slope, cliff, cutting, or fill embankment may be a hazard which has the potential to impact on people, property, roads and services. Some tell-tale signs that might indicate that a landslide is occurring are listed below:

- open cracks, or steps, along contours
- ground water seepage, or springs
- bulging in the lower part of the slope
- hummocky ground

- trees leaning down slope, or with exposed roots
- debris/fallen rocks at the foot of a cliff
- tilted power poles, or fences
- cracked or distorted structures

These indications of instability may be seen on almost any slope and are not necessarily confined to the steeper ones (Table 1). Advice should be sought from a geotechnical practitioner if any of them are observed. Landslides do not respect property boundaries. As mentioned above they can "run-out" from above, "regress" from below, or expand sideways, so a landslide hazard affecting your property may actually exist on someone else's land.

Local councils are usually aware of slope instability problems within their jurisdiction and often have specific development and maintenance requirements. Your local council is the first place to make enquiries if you are responsible for any sort of development or own or occupy property on or near sloping land or a cliff.

#### TABLE 1 - Slope Descriptions

Appearance	Slope Angle	Maximum Gradient	Slope Characteristics	
Gentle	0°- 10°	1 on 6	Easy walking.	
Moderate	10°- 18°	1 on 3	Walkable. Can drive and m anoeuvre a car on driveway	
Steep	18°- 27°	1 on 2	Walkable with effort. Possible to drive straight up or down roughened concrete driveway, but cannot practically manoeuvre a car.	
Very Steep	27°- 45°	1 on 1	Can only climb slope by cl utching at vegetation, rocks etc.	
Extreme	45°- 64°	1 on 0.5	Need rope access to climb slope	
Cliff	64°- 84°	1 on 0.1	Appears vertical. Can absei I down.	
Vertical or Overhang	84°- 90±°	Infinite	Appears to o verhang. Abseiler likely to lose contact with the face.	

Some typical landslides which could affect residential housing are illustrated below:

# AUSTRALIAN GEOGUIDE LR2 (LANDSLIDES)

Rotational or circular slip failures (Figure 1) - can occur on moderate to very steep soil and weathered rock slopes (Table 1). The sliding surface of the moving mass tends to be deep seated. Tension cracks may open at the top of the slope and bulging may occur at the toe. The ground may move in discrete "steps" separated by long periods without movement. More rapid movement may occur after heavy rain.

**Translational slip failures (Figure 2)** - tend to occur on moderate to very steep slopes (Table 1) where soil, or weak rock, overlies stronger strata. The sliding mass is often relatively shallow. It can move, or deform slowly (creep) over long periods of time. Extensive linear cracks and hummocks sometimes form along the contours. The sliding mass may accelerate after heavy rain.

Wedge failures (Figure 3) - normally only occur on extreme slopes, or cliffs (Table 1), where discontinuities in the rock are inclined steeply downwards out of the face.

**Rock falls (Figure 3)** - tend to occur from cliffs and overhangs (Table 1).

Cliffs may remain apparently unchanged for hundreds of years. Collections of boulders at the foot of a cliff may indicate that rock falls are ongoing. Wedge failures and rock falls do not "creep". Familiarity with a particular local situation can instil a false sense of security since failure, when it occurs, is usually sudden and catastrophic.

**Debris flows and mud slides (Figure 4)** - may occur in the foothills of ranges, where erosion has formed valleys which slope down to the plains below. The valley bottoms are often lined with loose eroded material (debris) which can "flow" if it becomes saturated during and after heavy rain. Debris flows are likely to occur with little warning; they travel a long way and often involve large volumes of soil. The consequences can be devastating.

Small scale landslide Medium scale landslide







Figure 4

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

• • •	GeoGuide LR1 GeoGuide LR3 GeoGuide LR4 GeoGuide LR5	<ul><li>Introduction</li><li>Soil Slopes</li><li>Rock Slopes</li><li>Water &amp; Drainage</li></ul>	• • •	GeoGuide LR7 GeoGuide LR8 GeoGuide LR9 GeoGuide LR10	<ul> <li>Landslide Risk</li> <li>Hillside Construction</li> <li>Effluent &amp; Surface Water Disposal</li> <li>Coastal Landslides</li> </ul>
•	GeoGuide LR6	- Retaining Walls	•	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 <u>Australian Geomechanics Society</u>, 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 eologists with a particular interest in ground engineering. The GeoGuides have been funded under the Australian governments' National Disaster Mitigation Program.

# AUSTRALIAN GEOGUIDE LR5 (WATER & DRAINAGE)

## WATER, DRAINAGE & SURFACE PROTECTION

One way or another, water usually plays a critical part in initiating a landslide (GeoGuide LR2). For this reason, it is a key factor to be controlled on sites with more than a low landslide risk (GeoGuide LR7).

#### Groundwater and Groundwater Flow

The ground is permeable and water flows through it as illustrated in Figure 1. When rain falls on the ground, some of it runs along the surface ("surface water run-off") and some soaks in, becoming groundwater. Groundwater seeps downwards along any path it can find until it meets the water table: the local level below which the ground is saturated. If it reaches the water table, groundwater either comes to a halt in what is effectively underground storage, or it continues to flow downwards, often towards a spring where it can seep out and become surface water again. Above the water table the ground is said to be "partially saturated", because it contains both water and air. Suctions can develop in the partially saturated zone which have the effect of holding the ground together and reducing the risk of a landslide. Vegetation and trees in particular draw large quantities of water out of the ground on a daily basis from the partially saturated zone. This lowers the water table and increases suctions, both of which reduce the likelihood of a landslide occurring.



Figure 1 - Groundwater flow

#### Groundwater Flow and Landslides

The landslide risk in a hillside can be affected by increase in soak-away drainage or the construction of retaining walls which inhibit groundwater flow. The groundwater is likely to rise after heavy rain, but it can also rise when human interference upsets the delicate natural balance. Activities such as felling trees and earthworks can lead to:

- a reduction in the beneficial suctions in the partially saturated zone above the water table.
- increased static water pressures below the water table,
- increased hydraulic pressures due to groundwater flow,
- loss of strength, or softening, of clay rich strata,
- loss of natural cementing in some strata,
- transportation of soil particles.

Any of these effects, or a combination of them, can lead to landslides like those illustrated in GeoGuides LR2, LR3 and LR4.

#### Limiting the Effect of Water

Site clearance and construction must be carefully considered if changes in groundwater conditions are to be limited. GeoGuide LR8 considers good and poor development practices. Not surprisingly much of the advice relates to sensible treatment of water and is not repeated here. Adoption of appropriate techniques should make it possible to either maintain the current ground water table, or even cause it to drop, by limiting inflow to the ground.

If drainage measures and surface protection are relied on to keep the risk of a landslide to a tolerable level, it is important that they are inspected routinely and maintained (GeoGuide LR11).

The following techniques may be considered to limit the destabilising effects of rising groundwater due to development and are illustrated in Figure 2.



Figure 2 - Techniques used to control groundwater flow

**Surface water drains** (dish drains, or table drains) - are often used to prevent scour and limit inflow to a slope. Other than in rock, they are relatively ineffective unless they have an impermeable lining. You should clear them regularly, and as required, and not less than once a year. If you live in an area with seasonal rainfall, it is best to do this near the end of the dry season. If you notice that soil or rock debris is falling from the slope above, determine the source and take appropriate action. This may mean you have to seek advice from a geotechnical practitioner.

**Surface protection** - is sometimes used in addition to surface water drainage to prevent scour and minimise water inflow to a slope. You should inspect concrete, shotcrete or stone pitching for cracking and other signs of deterioration at least once a year. Make sure that weepholes are free of obstructions and able to drain. If the protection is deteriorating, you should seek advice from a geotechnical practitioner.

**Sub-soil drains** - are often constructed behind retaining walls and on hillsides to intercept groundwater. Their function is to remove water from the ground through an appropriate outlet. It is important that subsoil drains are designed to complement other measures being used. They should be laid in a sand, or gravel, bed and protected with a graded stone or geotextile filter to reduce the chance of clogging. Sub-soil drains should always be laid to a fall of at least 1 vertical on 100 horizontal. Ideally the high end should be brought to the surface, so it can be flushed with water from time to time as part of routine maintenance procedures.

**Deep, underground drains** - are usually only used in extreme circumstances, where the landslide risk is assessed as not being tolerable and other stabilisation measures are considered to be impractical. They work by permanently lowering the water table in a slope. They are not often used in domestic scale developments, but if you have any on your site be aware that professional maintenance is essential. If they are not maintained and stop working, the water table will rise and a landslide may even occur during normal weather conditions. Both an increase or a reduction in the normal flow from deep drains could indicate a problem if it appears to be unrelated to recent rainfall. If changes of this sort are observed, you should have the drains and your site checked by a geotechnical practitioner.

**Documentation** - design drawings and specifications for geotechnical measures intended to minimise landslide risk can be of great assistance to a geotechnical specialist, or structural engineer, called in to inspect and report on them. Copies of available documentation should be retained and passed to the new owner when the property is sold (GeoGuide LR11). You should also request details of an appropriate maintenance program for drainage works from the designer and keep that information with other relevant documentation and maintenance records.

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

<ul> <li>GeoGuide LR1 - Introduction</li> <li>GeoGuide LR2 - Landslides</li> <li>GeoGuide LR3 - Landslides in Soil</li> <li>GeoGuide LR4 - Landslides in Rock</li> <li>GeoGuide LR6 - Retaining Walls</li> </ul>	GeoGuide LR7- Landslide RiskGeoGuide LR8- Hillside ConstructionGeoGuide LR9- Effluent & Surface Water DisposalGeoGuide LR10- Coastal LandslidesGeoGuide LR11- Record Keeping
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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 <u>Australian Geomechanics Society</u>, a specialist technical society within Engineers Australia, the national peak body for all engineering disciplines in Australia, whose members are professional geotechnical engineers and engineering geologists with a particular interest in ground engineering. The GeoGuides have been funded under the Australian governments' National Disaster Mitigation Program.

# AUSTRALIAN GEOGUIDE LR6 (RETAINING WALLS)

## **RETAINING WALLS**

Retaining walls are used to support cuts and fills. Some are built in the open and backfill is placed behind them (gravity walls). Others are inserted into the ground (cast *in situ* or driven piles) and the ground is subsequently excavated on one side. Retaining walls, like all man-made structures, have a finite life. Properly engineered walls should last 50 years, or more, without needing significant repairs. However, not all walls fit this category. Some, particularly those built by inexperienced tradesmen without engineering input, can deflect and even fail because they are unable to withstand the pressures that develop in the ground around them or because the materials from which they are built deteriorate with time. Design of retaining walls more than 900mm high should be undertaken by a geotechnical practitioner or structural engineer and normally require local council approval.

Retaining walls have to withstand the weight of the ground on the high side, any water pressure forces that develop, any additional load (surcharge) on the ground surface and sometimes swelling pressures from expansive clays. These forces are resisted by the wall itself and the ground on the low side. Engineers calculate the forces that the retained ground, the water, and the surcharge impose on a wall (the disturbing force) as well as the maximum force that the wall and ground on the low side can provide to resist them (the restoring force). The ratio of the restoring force to the disturbing force is called the "factor of safety" (GeoGuide LR1). Permanent retaining walls designed in accordance with accepted engineering standards will normally have a factor of safety in the range 1.5 to 2.

<u>Never</u> add surcharge to the high side of a wall (e.g. place fill, erect a structure, stockpile bulk materials, or park vehicles) unless you know the wall has been designed with that purpose in mind.

Never more than lightly water plants on the high side of a retaining wall.

Never excavate at the toe of a retaining wall.

Any of these actions will reduce the factor of safety of the wall and could lead to failure. If in doubt about any aspect of an existing retaining wall, or changes you would like to make near one, seek advice from a geotechnical practitioner, or a structural engineer. This GeoGuide sets out basic inspection requirements for retaining walls and identifies some common signs that might indicate all is not well. GeoGuide LR11 provides information about records that should be kept.

#### **GRAVITY WALLS**

Gravity walls are so called because they rely on their own weight (the force of gravity) to hold the ground behind in place.

**Formed concrete and reinforced blockwork walls** (Figure 1) - should be built so the backfill can drain. They should be inspected at least once a year. Look for signs of tilting, bulging, cracking, or a drop in ground level on the high side, as any of these may indicate that the wall has started to fail. Look for rust staining, which may indicate that the steel reinforcement is deteriorating and the wall is losing structural strength ("concrete cancer"). Ensure that weep holes are clear and that water is able to drain at all times, as high water pressures behind the wall can lead to sudden and catastrophic failure.

**Concrete "crib" walls** (Figure 2) - should be filled with clean gravel, or "blue metal" with a nominated grading. Sometimes soil is used to reduce cost, but this is undesirable, from an engineering perspective, unless internal drainage is incorporated in the wall's construction. Without backfill drainage, a soil filled crib wall is likely to have a lower factor of safety than is required. Crib walls should be inspected as for formed concrete walls. In addition, you should check that material is not being lost through the structure of the wall, which has large gaps through it.

**Timber "crib" walls -** should be checked as for concrete crib walls. In addition, check the condition of the timber. Once individual elements show signs of rotting, it is necessary to have the wall replaced. If you are uncertain seek advice from a geotechnical practitioner, or a structural engineer.

**Masonry walls: natural stone, brick, or interlocking blocks** (Figure 3) more than about 1m high, should be wider at the bottom than at the top and include specific measures to permit drainage of the backfill. They should be checked as for formed concrete walls. Natural stone walls should be inspected for signs of deterioration of the individual blocks: strength loss, corners becoming rounded, cracks appearing, or debris from the blocks collecting at the foot of the wall.



Figure 1- Typical formed concrete wall



Figure 2 -Typical crib



Figure 3 -Typical masonry wall

# AUSTRALIAN GEOGUIDE LR6 (RETAINING WALLS)

**Old Masonry walls** (Figure 4) - Many old masonry retaining walls have not been built in accordance with modern design standards and often have a low "factor of safety" (GeoGuide LR1). They may therefore be close to failure and a minor change in their condition, or loading, could initiate collapse. You need to take particular care with such structures and seek professional advice sooner rather than later. Although masonry walls sometimes deflect significantly over long periods of time collapse, when it occurs, is usually sudden and can be catastrophic. Familiarity with a particular situation can instil a false sense of confidence.

**Reinforced soil walls** (Figure 5) - are made of compacted select fill in which layers of reinforcement are buried to form a "reinforced soil zone". The reinforcement is all important, because it holds the soil "wall" together. Reinforcement may be steel strip, or mesh, or a variety of geosynthetic ("plastic") products. The facing panels are there to protect the soil "wall" from erosion and give it a finished appearance.

Most reinforced soil walls are proprietary products. Construction should be carried out strictly in accordance with the manufacturer's instructions. Inspection and maintenance should be the same as for formed concrete and concrete block walls. If unusual materials such as timber, or used tyres, are used as a facing it should be checked to see that it is not rotting, or perishing.

#### **OTHER WALLS**

**Cantilevered and anchored walls** (Figure 6) - rely on earth pressure on the low side, rather than self-weight, to provided the restoring force and an adequate factor of safety. These walls may comprise:

- a line of touching bored piers (contiguous bored pile wall) or
- sprayed concrete panels between bored piers (shotcrete wall) or
- horizontal timber or concrete planks spanning between upright timber or steel soldier piles or
- steel sheet piles.

Depending on the form of construction and ground conditions, walls in excess of 3 m height normally require at least one row of permanent ground anchors.

#### INSPECTION

All walls should be inspected at least once a year, looking for tilting and other signs of deterioration. Concrete walls should be inspected for cracking and rust stains as for formed concrete gravity walls. Contiguous bored pile walls can have gaps between the piles - look for loss of soil from behind which can become a major difficulty if it is not corrected. Timber walls should be inspected for rot, as for timber crib walls. Steel sheet piles should be inspected for signs of rusting. In addition, you should make sure that ground anchors are maintained as described in GeoGuide LR4 under the heading "Rock bolts and rock anchors".

No drainage medium behind wall No weep holes

Figure 4 - Poorly built masonry wall



Figure 5 - Typical reinforced soil wall



Figure 6 - Typical cantilevered or anchored wall

One of the most important issues for walls is that their internal drainage systems are operational. Frequently verify that internal drainage pipes and surface interception drains around the wall are not blocked nor have become inoperative.

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

<ul> <li>GeoGuide LR1</li> <li>GeoGuide LR2</li> <li>GeoGuide LR3</li> <li>GeoGuide LR4</li> <li>GeoGuide LR5</li> </ul>	- Introduction - Landslides - Landslides in Soil - Landslides in Rock - Water & Drainage	<ul> <li>GeoGuide LR7 - Landslide Risk</li> <li>GeoGuide LR8 - Hillside Construction</li> <li>GeoGuide LR9 - Effluent &amp; Surface Water Disposal</li> <li>GeoGuide LR10 - Coastal Landslides</li> <li>GeoGuide LR11 - Record Keeping</li> </ul>
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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 <u>Australian Geomechanics Society</u>, a specialist technical society within Engineers Australia, the national peak body for all engineering disciplines in Australia, whose members are professional geotechnical engineers and engineering geologists with a particular interest in ground engineering. The GeoGuides have been funded under the Australian governments' National Disaster Mitigation Program.

# AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

## HILLSIDE CONSTRUCTION PRACTICE

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



#### WHY ARE THESE PRACTICES GOOD?

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

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

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

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

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

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

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

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

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

#### ADOPT GOOD PRACTICE ON HILLSIDE SITES
## **AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)**

# EXAMPLES OF **POOR** HILLSIDE CONSTRUCTION PRACTICE



## WHY ARE THESE PRACTICES POOR?

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

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

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

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

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

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

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

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

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

• • •	GeoGuide LR1 GeoGuide LR2 GeoGuide LR3 GeoGuide LR4	- Introduction - Landslides - Landslides in Soil - Landslides in Rock	• •	GeoGuide LR6 GeoGuide LR7 GeoGuide LR9 GeoGuide LR10	<ul> <li>Retaining Walls</li> <li>Landslide Risk</li> <li>Effluent &amp; Surface Water Disposal</li> <li>Coastal Landslides</li> </ul>
•	GeoGuide LR4	<ul> <li>Landslides in Rock</li> </ul>		GeoGuide LR10	<ul> <li>Coastal Landslides</li> </ul>
•	GeoGuide LR5	- Water & Drainage	•	GeoGuide LR11	- Record Keeping

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