NOTES:
-REFER TO LAST PAGES IN THE ARCHITECTURAL DRAWING SET FOR GENERAL NOTES.

Council Agenda - 21 March 2019
Agenda Item 8.1 - Attachment 2
Plans to be endorsed
24-26 Queechy Road Norwood

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EXTERIOR LIGHTING

Exterior lighting to illuminate pathways & carparking areas must be controlled by a sensor & shielded to prevent direct light being emitted outside the site.

CONTOURS

Contours are indicitive only for the site.
Refer Elevations for accurate representation of existing ground levels. The contours on this plan are to be used for the sole purpose of approvals & construction of this proposal & are to be used for no other future purpose.

(B99 SWEPT PATH DESIGN TEMPLATE)

SITEWORKS

1. Site to be prepared in accordance with engineers or surveyors report if applicable.
2. Site to be excavated or filled to indicated levels.
3. Excavation and filling of the site to de in accordance with BCA part 3.1 and AS2870.
4. Drainage works to be in accordance with BCA part 3.1 and AS3500.3.2
5. Surface drainage —finished ground to fall away from building for a minimum distance of 1000 at 1:20 minimum and to a point where ponding will not occur.
6. Downpipes to be connected into Council stormwater as soon as the roof is installed.
7. Install AG drain prior to footing excavation. See Drainage Plan for location.
8. Excavated material placed up-slope of AG drain. To be removed when building works are complete and used as fill on site for any low points. Install a sediment fence on the downslope side of material.
9. Construction vehicles to be parked on the street only, to prevent transferring debris onto the Street.
10. Finished slab level to be:
11. 150mm above finished ground level.
12. 50mm above paved surfaces.
13. prevent ponding of water under suspended floors.

SITE SERVICES

Electricity, Gas, Telephone, Water, Stormwater & Sewer Services locations are to be determined on site & connected as per local authority requirements.

Site Plan

1:300

adams building design

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ABN 71 048 418 121
acc. # CC886J

Rev.	Date	Description
8		
7		
6		
5	25.01.19	Building Approval
4	14.01.19	Planning App 2
3	06.12.18	Planning Approval
2	05.12.18	Prelim DA
1	21.11.18	Concept # 1

Project :
Proposed Townhouses
24-26 Queechy Road,
Norwood, Launceston

Drawing Title :
Site Plan

Client :
Luke Gul

Scale : 1 : 300

Starting Date : 01.03.18

Plot Date :
5/03/2019 4:05:23 PM

Planning Approval

Project No.	Drawing No.
010318	3 /16

NOTES:
-REFER TO LAST PAGES IN THE ARCHITECTURAL DRAWING SET FOR GENERAL NOTES.

PLANNING EXHIBITED DOCUMENTS

Ref. No: DA 0708/2018
Date advertised: 09/02/2019
Planning Administration

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CONTOURS

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Refer Elevations for accurate representation of existing ground levels. The contours on this plan are to be used for the sole purpose of approvals & construction of this proposal & are to be used for no other future purpose.

SITE SERVICES

Electricity, Gas, Telephone, Water, Stormwater & Sewer Services locations are to be determined on site & connected as per local authority requirements.

NOTE:
GREEN SHADING INDICATES 100mm SELECTED GARDEN BED MULCH
(PROVIDE TREATED PINE EDGING TO ASSIST MULCH RETENTION UNLESS ADJACENT TO BUILDING, PAVING, RETAINING WALLS, FENCES OR CONCRETE.

SITEWORKS

1. Site to be prepared in accordance with engineers or surveyors report if applicable.
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12. 50mm above paved surfaces.
13. prevent ponding of water under suspended floors.

NOTE:
REFER PLANT SCHEDULE & EXCAVATION BATTER GRADIENTS NEXT PAGE.

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2	05.12.18	Prelim DA
1	21.11.18	Concept # 1

Project :
Proposed Townhouses
24-26 Queechy Road,
Norwood, Launceston

Drawing Title :
Site Landscaping Plan

Client :
Luke Gul

Scale : 1 : 300
Starting Date : 01.03.18
Plot Date : 14/01/2019 3:49:12 PM

Planning App 2

Project No. 010318
Drawing No. 4 /16

NOTES:
-REFER TO LAST PAGES IN THE ARCHITECTURAL DRAWING SET FOR GENERAL NOTES.

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PLANT SCHEDULE

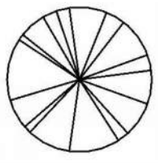
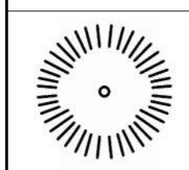
TREE	-SILVER BIRCH (betula pendula) - mature height approx 10m	-CALIFORNIA PEPPER TREE (Schinus Molle) - mature height approx 4-5 m	-ORNAMENTAL PEAR (pyrus calleryana) - mature height approx 7 m
			
SHRUB	-PITTOSPORUM (tenuifolium 'tom thumb') - mature height approx 5m.	-MEXICAN ORANGE BLOSSOM (choisya ternata) - mature height approx 2.0m	-DIOSMA (Coleonema pulchellum) - mature height approx 1.5M m
			
GROUND COVER	-NATIVE FLAX LILY (dianella tasmanica) mature height approx 1.0m	-SEDGE (carex species) mature height approx 1.0m	-LUTCHUENSIS JUNIPER(Juniperus Taxifloia) mature height approx 0.3m
			

Table 3.1.1.1
UNPROTECTED EMBANKMENTS

Elevation

SOIL TYPE		EMBANKMENT SLOPES H:L	
(*see Part 3.2.4 for material description)		Compacted fill (see Part 3.2)	Cut
Stable rock (A*)		2:3	8:1
Sand (A*)		1:2	1:2
Silt (P*)		1:4	1:4
Clay	Firm clay	1:3	1:2.5
	Soft clay	Not suitable	1:2.5
Soft soils (P*)		Not suitable	Not suitable

Notes:

1. Retaining walls or other types of soil retaining methods must be installed where—
   (a) the embankment slope is steeper than that described in this Table; or
   (b) the soil type is not described in this Table.
2. Embankments that are to be left exposed at the end of the construction works must be stabilised by vegetation or similar works to prevent soil erosion.

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1	21.11.18	Concept # 1

Project :
Proposed Townhouses
24-26 Queechy Road,
Norwood, Launceston

Drawing Title :
Plant Schedule

Client :
Luke Gul

Scale : **Planning App 2**

Starting Date : 01.03.18

Plot Date :
14/01/2019 3:49:12 PM

Project No. 010318

Drawing No. 5 /16

NOTES:
-REFER TO LAST PAGES IN THE ARCHITECTURAL DRAWING SET FOR GENERAL NOTES.

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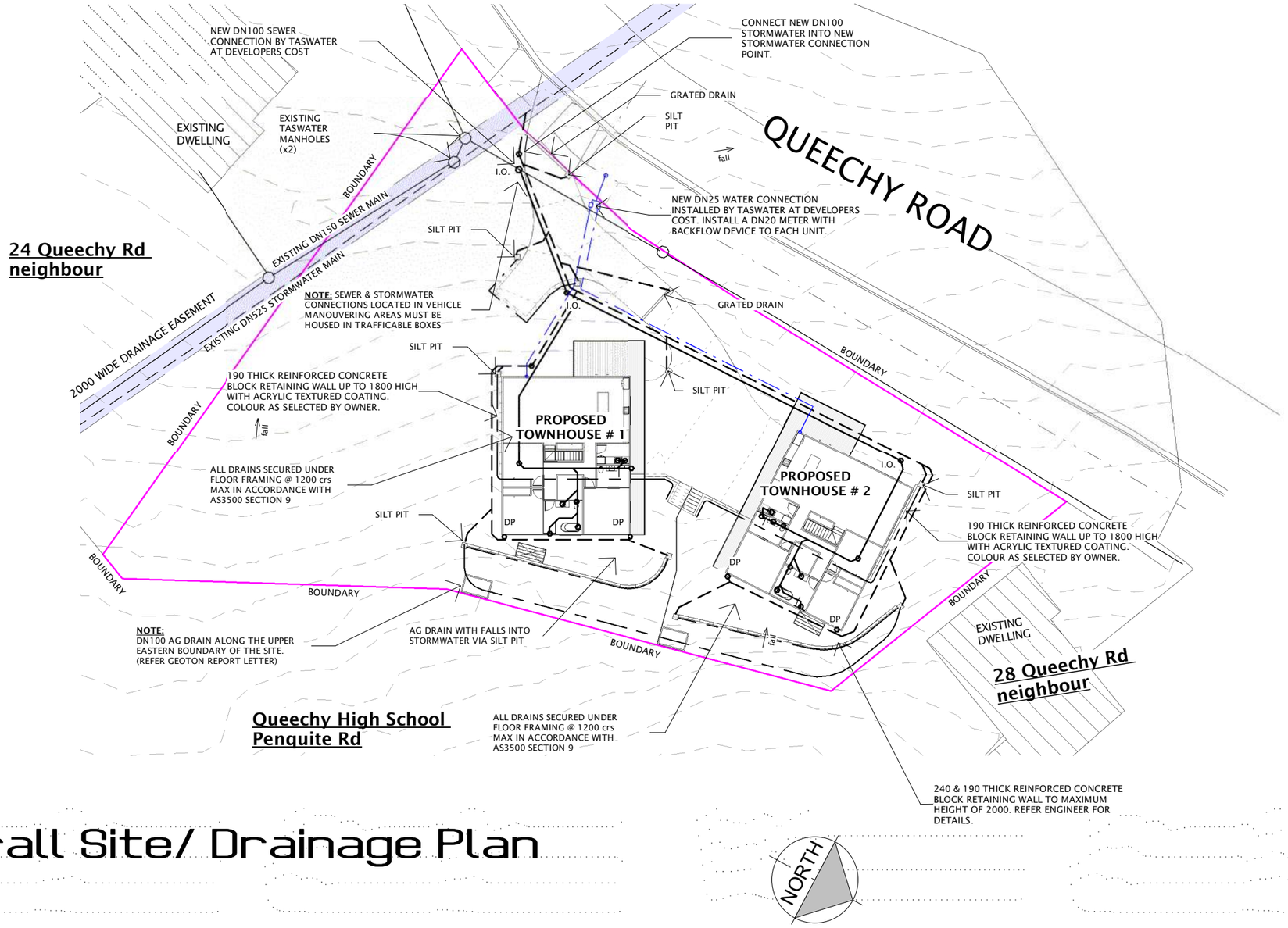
TASWATER NOTES

1. PROPERTY CONNECTIONS LOCATED IN VEHICLE MANOEUVRING AREAS MUST BE HOUSED IN TRAFFICABLE BOXES.
2. ANY REMOVAL/SUPPLY AND INSTALLATION OF WATER METERS AND/OR THE REMOVAL OF REDUNDANT AND/OR INSTALLATION OF NEW AND MODIFIED PROPERTY SERVICE CONNECTIONS MUST BE CARRIED OUT BY TASWATER AT THE DEVELOPER'S COST.
3. PRIOR TO COMMENCING CONSTRUCTION/USE OF THE DEVELOPMENT, ANY WATER CONNECTION UTILISED FOR CONSTRUCTION/THE DEVELOPMENT MUST HAVE A BACKFLOW PREVENTION DEVICE AND WATER METER INSTALLED, TO THE SATISFACTION OF TASWATER.



Overall Site/ Drainage Plan

1:400

PLUMBING NOTES

REACTIVE SITES - where they penetrate through external footings, stormwater, sewer, Drain waste, & vent pipes are to be lagged & flexible connections are to be provided adjacent to the footings prior to connection to the drainage to comply with AS2870-1996 Section 5.5. Additional requirements for class H & E sites.

PLUMBING LEGEND

1. WC
2. URINAL
3. KITCHEN SINK
4. BASIN / VANITY
5. BATH
6. SHOWER
7. WASH TROUGH
8. WASHING MACHINE
9. DISHWASHER

I.O. - INSPECTION OUTLET
ORG - OVERFLOW RELEIF GULLY
DP - DOWNPIPE
EV - DN50 VENT TO AIR
M - WATER METER

PLUMBING LEGEND

EXISTING STORMWATER
EXISTING SEWER
EXISTING WATER
NEW STORMWATER
NEW DOWNPIPE S/W
NEW SEWER
NEW WATER
NEW AG DRAIN

PLUMBING NOTES

1. All plumbing work to comply with AS 3500 parts 1,2,3 & 4, and the Local Council plumbing regulations.
2. Hot water from the HWC is to be tempered to 50°C.
3. Hot & cold reticulation lines to be DN20 with DN15 branches to individual fixtures.
4. Drain all surface water away from footings in accordance with BCA part 3.1.2.3.
5. The building Contractor must locate the connection points to the mains to verify that their positions & depths are as shown on the endorsed plans. Such verification must be completed as the first task of the building works.
6. Installation of ORG is to comply with AS3500 part 2 clauses 4.6.6.6 (minimum height below lowest fixture = 150mm) & 4.6.6.7 (Minimum height above surrounding ground finished surface level = 75mm)
7. New Sewer = DN100 pvc @ 1:60 falls min.
8. New Stormwater = DN100 pvc @ 1:100 falls min.(UNLESS NOTED OTHERWISE)
9. Grated drains to be installed via a gas sealed pit.
10. STANDARD DRAIN SIZES
    TROUGH: DN50
    SINK: DN50
    WC: DN100
    STORMWATER: DN100
12. WATER PIPE SIZES
    COLD WATER: DN 20 WITH DN16 BRANCHES
    HOT WATER: DN 20 WITH DN 16 BRANCHES

13. HOT WATER INSTALLATION SHALL DELIVER HOT WATER TO ALL SANITARY FIXTURES AT THE FOLLOWING TEMPERATURES:
    BATH BASIN & SHOWER: 50deg C
    KITCHEN SINK & LAUNDRY: 60deg C

14. ALL WORKS ARE TO BE IN ACCORDANCE WITH THE WATER SUPPLY CODE OF AUSTRALIA WSA 03 -2011-3.1 VERSION 3.1 MRWA EDITION V2.0 AND SEWERAGE CODE OF AUSTRALIA MELBOURNE RETAIL WATER AGENCIES CODE WSA 02—2014-3.1 MRWA VERSION AND TASWATER'S SUPPLEMENTS TO THESE CODES.

15. BUILDER & PLUMBER TO REFERENCE GEOTON P/L GEOTECHNICAL REVIEW & LANDSLIP RISK ASSESSMENT (GL17367Bc) FOR ADVICE REGARDING EXCAVATIONS & SITE DRAINAGE. PLEASE ADVISE OF ANY DISCREPANCIES BETWEEN ARCHITECTURAL, ENGINEERING & GEOTECHNICAL ADVICE.

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Rev.	Date	Description
8		
7		
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5		
4	14.01.19	Planning App 2
3	06.12.18	Planning Approval
2	05.12.18	Prelim DA
1	21.11.18	Concept # 1

Project :
Proposed Townhouses
24-26 Queechy Road,
Norwood, Launceston

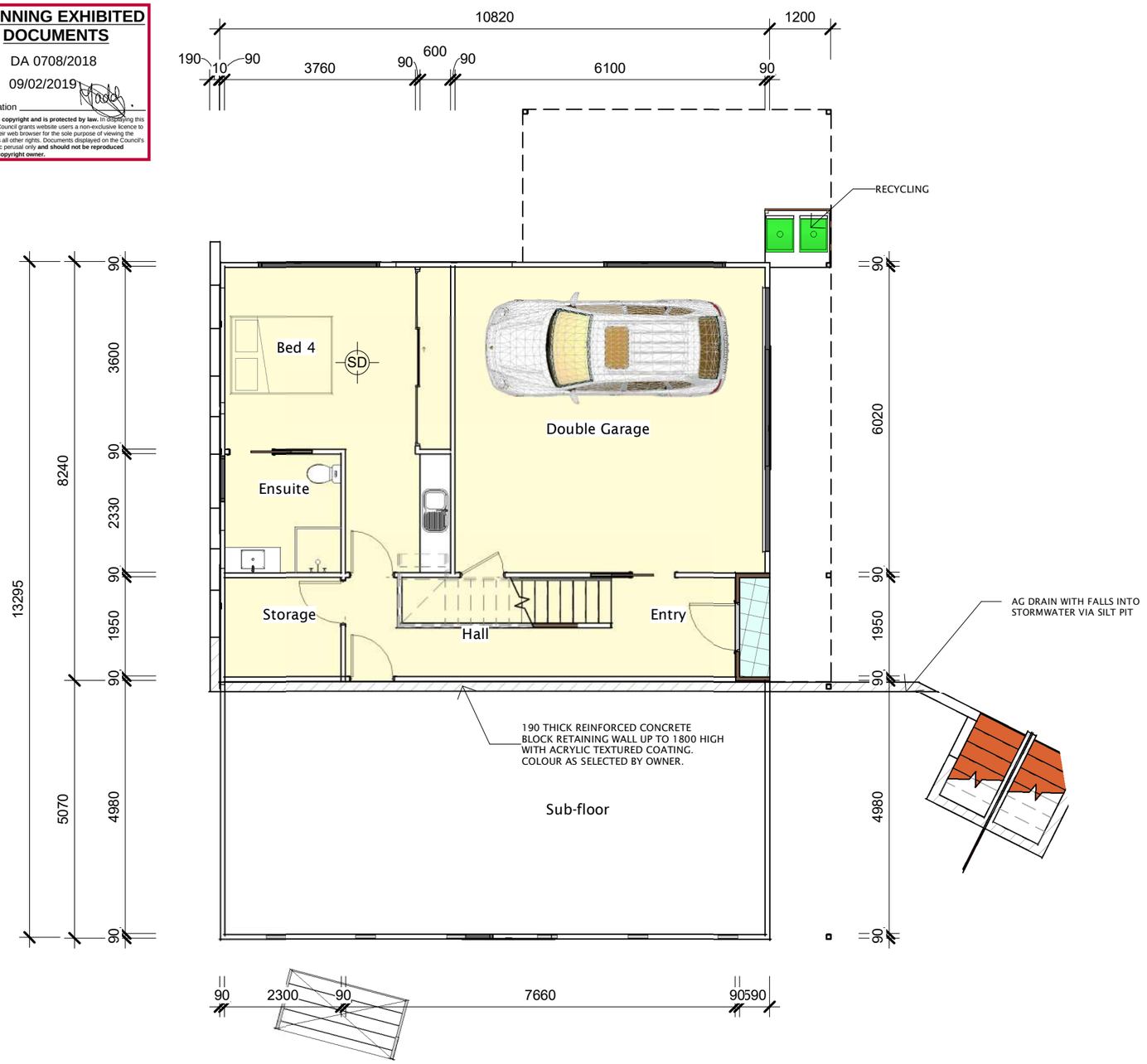
Drawing Title :
Overall Site Drainage Plan

Client :
Luke Gul

Scale : 1 : 400
Planning App 2
Starting Date : 01.03.18
Plot Date :
14/01/2019 3:49:12 PM
Project No. 010318
Drawing No. 6 /16

NOTES: -REFER TO LAST PAGES IN THE ARCHITECTURAL DRAWING SET FOR GENERAL NOTES.

Area Schedule (Gross Building)		
Name	**Area**	**Area (Squares)**
TH #2 Upper Deck Area	34.97 m²	3.76
TH # 2 Upper Floor Area	143.20 m²	15.40
TH#2 Lower Floor Area	89.16 m²	9.59
TH# 1 Lower Floor Area	87.95 m²	9.46
TH# 1 Upper Floor Area	143.20 m²	15.40
TH# 1Upper Deck Area	34.97 m²	3.76
	533.44 m²	57.36



Lower Floor Townhouse # 1

1:100

(TOWNHOUSE # 1)

NORTH

SD - HARDWIRED SMOKE DETECTORS IN ACCORDANCE WITH BCA PART 3.7.2 & AS 3786. (LINKED)

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Planning App 2 A3

No.	Date	Description
8		
7		
6		
5		
4	14.01.19	Planning App 2
3	06.12.18	Planning Approval
2	05.12.18	Prelim DA
1	21.11.18	Concept # 1

Project :
Proposed Townhouses
24-26 Queechy Road,
Norwood, Launceston

Client :
Luke Gul

Drawing Title :
Lower Floor Plan
(Townhouse # 1)

Scale : 1 : 100

Starting Date : 01.03.18

Plot Date : 14/01/2019 3:49:13 PM

Project No.	Drawing No.
010318	7 /16

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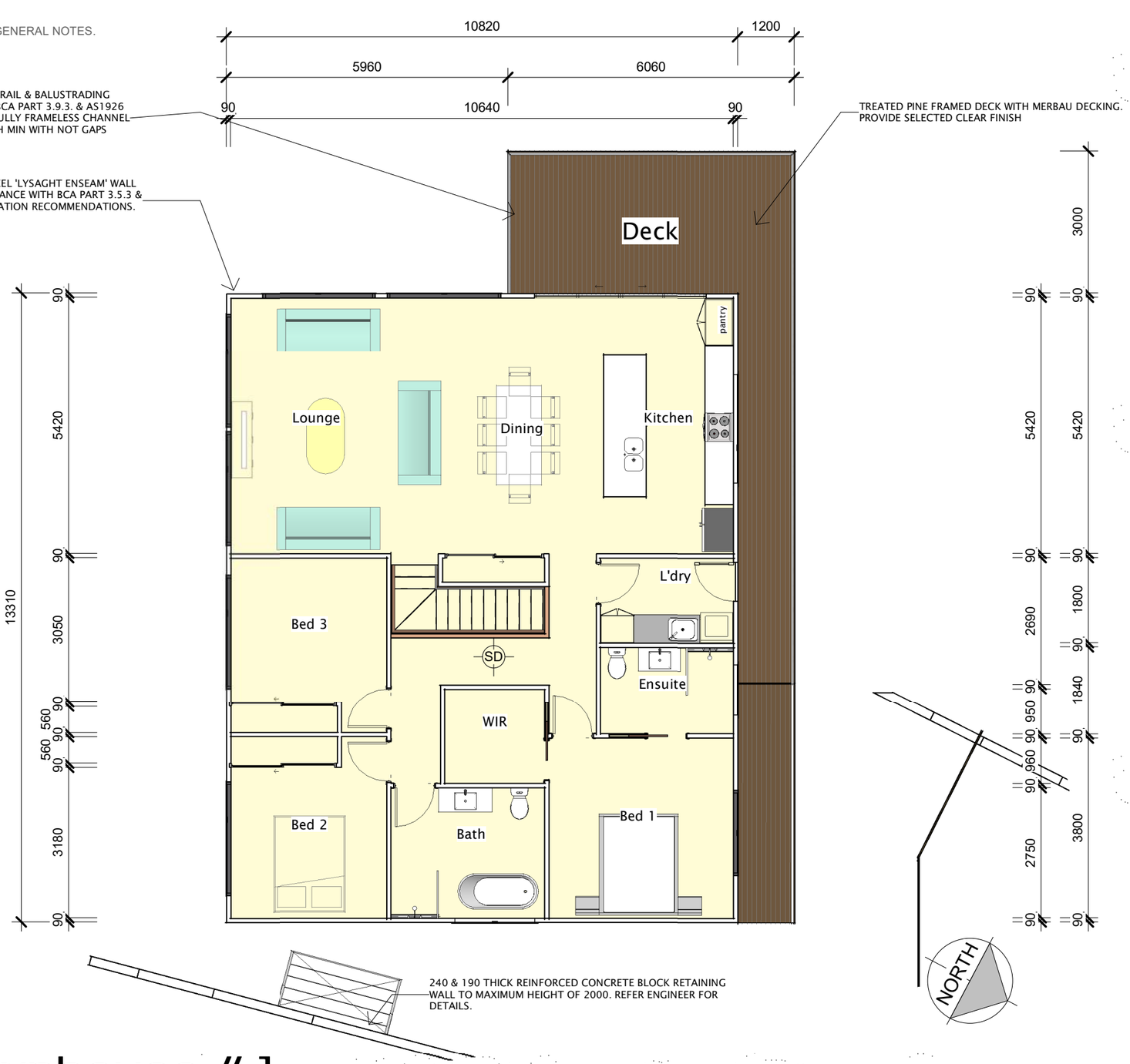
NOTES: -REFER TO LAST PAGES IN THE ARCHITECTURAL DRAWING SET FOR GENERAL NOTES.

STAINLESS STEEL & GLASS HANDRAIL & BALUSTRADING SYSTEM IN ACCORDANCE WITH BCA PART 3.9.3. & AS1926 PARTS 1 & 2. (NOM. 'EVERTON' FULLY FRAMELESS CHANNEL BALUSTRADE SYSTEM. 1000 HIGH MIN WITH NOT GAPS EXCEEDING 120mm)

VERTICAL COLORBOND STEEL 'LYSAGHT ENSEAM' WALL CLADDING ALL IN ACCORDANCE WITH BCA PART 3.5.3 & MANUFACTURERS INSTALLATION RECOMMENDATIONS. MONUMENT COLOLUR

TREATED PINE FRAMED DECK WITH MERBAU DECKING. PROVIDE SELECTED CLEAR FINISH



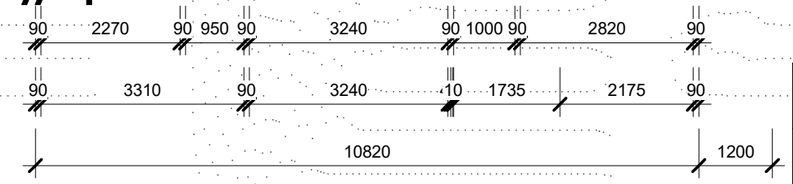
240 & 190 THICK REINFORCED CONCRETE BLOCK RETAINING WALL TO MAXIMUM HEIGHT OF 2000. REFER ENGINEER FOR DETAILS.

Upper Floor Townhouse # 1

1 : 100

SD - HARDWIRED SMOKE DETECTORS IN ACCORDANCE WITH BCA PART 3.7.2 & AS 3786. (LINKED)

(TOWNHOUSE # 1)



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Planning App 2 A3

No.	Date	Description
4	14.01.19	Planning App 2
3	06.12.18	Planning Approval
2	05.12.18	Prelim DA
1	21.11.18	Concept # 1

Project :
Proposed Townhouses
24-26 Queechy Road,
Norwood, Launceston

Client :
Luke Gul

Drawing Title :
Upper Floor Plan
(Townhouse # 1)

Scale : 1 : 100

Starting Date : 01.03.18

Plot Date : 14/01/2019 3:49:13 PM

Project No. 010318

Drawing No. 8 /16

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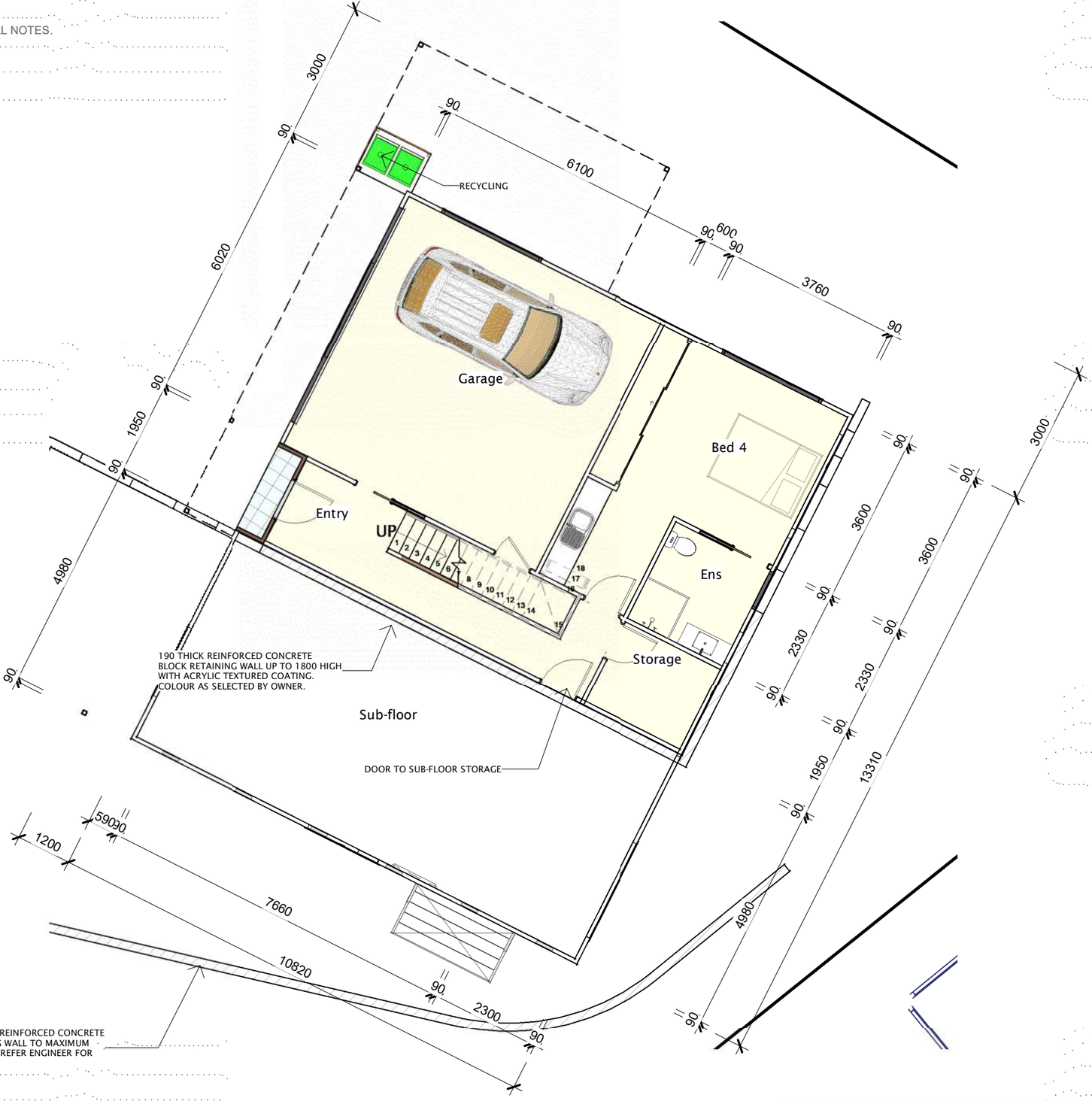
PLANNING EXHIBITED DOCUMENTS

Ref. No: DA 0708/2018
Date advertised: 09/02/2019
Planning Administration _____



(TOWNHOUSE # 2)

Lower Floor Townhouse 2

1 : 100

Area Schedule (Gross Building)		
Name	**Area**	**Area (Squares)**
TH #2 Upper Deck Area	34.97 m²	3.76
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Planning App 2 A3

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Project :
Proposed Townhouses
24-26 Queechy Road,
Norwood, Launceston

Client :
Luke Gul

Drawing Title :
Lower Floor Plan
(Townhouse # 2)

Scale : 1 : 100

Starting Date : 01.03.18

Plot Date : 14/01/2019 3:49:14 PM

Project No. 010318

Drawing No. 9 /16

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NOTES: -REFER TO LAST PAGES IN THE ARCHITECTURAL DRAWING SET FOR GENERAL NOTES.

NORTH

Upper Floor Townhouse # 2

1:100

(TOWNHOUSE # 2)

Area Schedule (Gross Building)

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Project :
Proposed Townhouses
24-26 Queechy Road,
Norwood, Launceston

Client :
Luke Gul

Drawing Title :
Upper Floor Plan
(Townhouse # 2)

Scale : 1 : 100

Starting Date : 01.03.18

Plot Date : 14/01/2019 3:49:14 PM

Project No. 010318

Drawing No. 10/16

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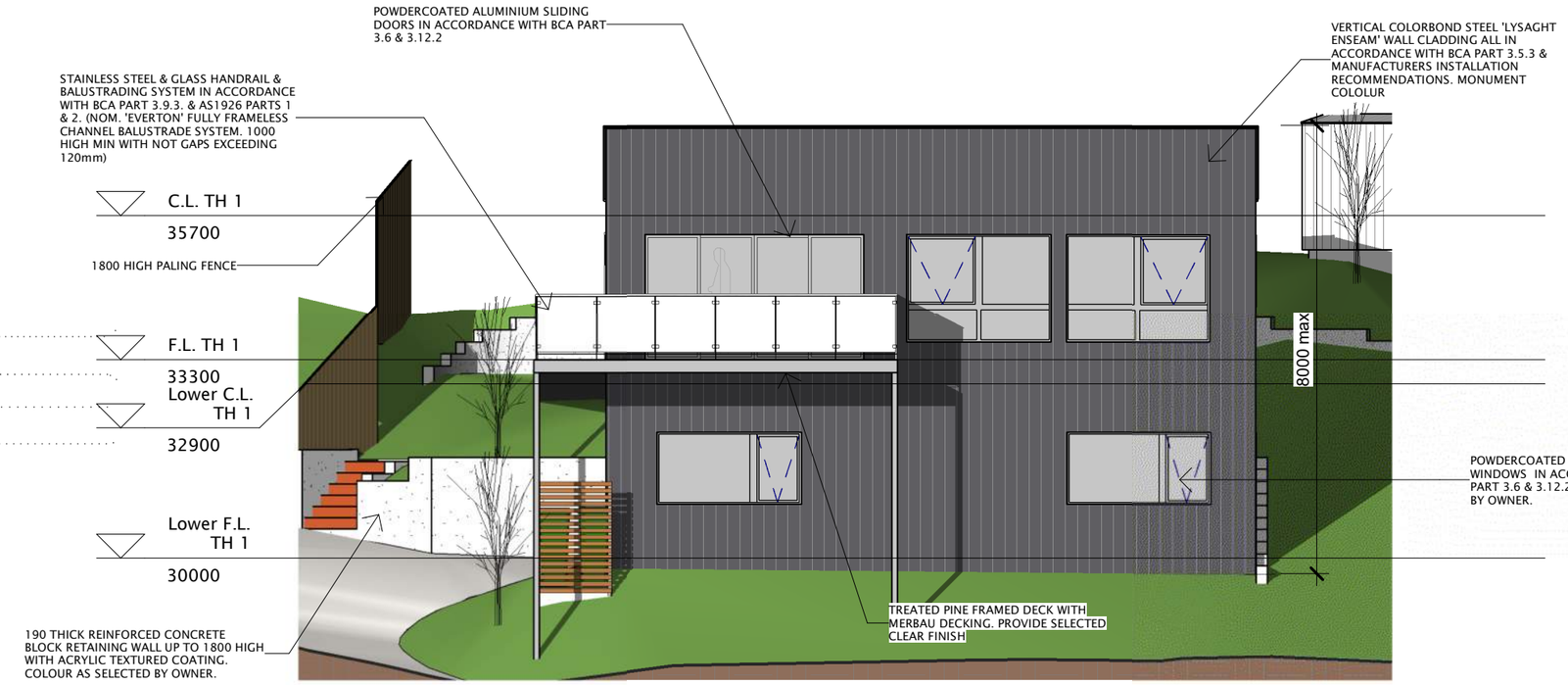
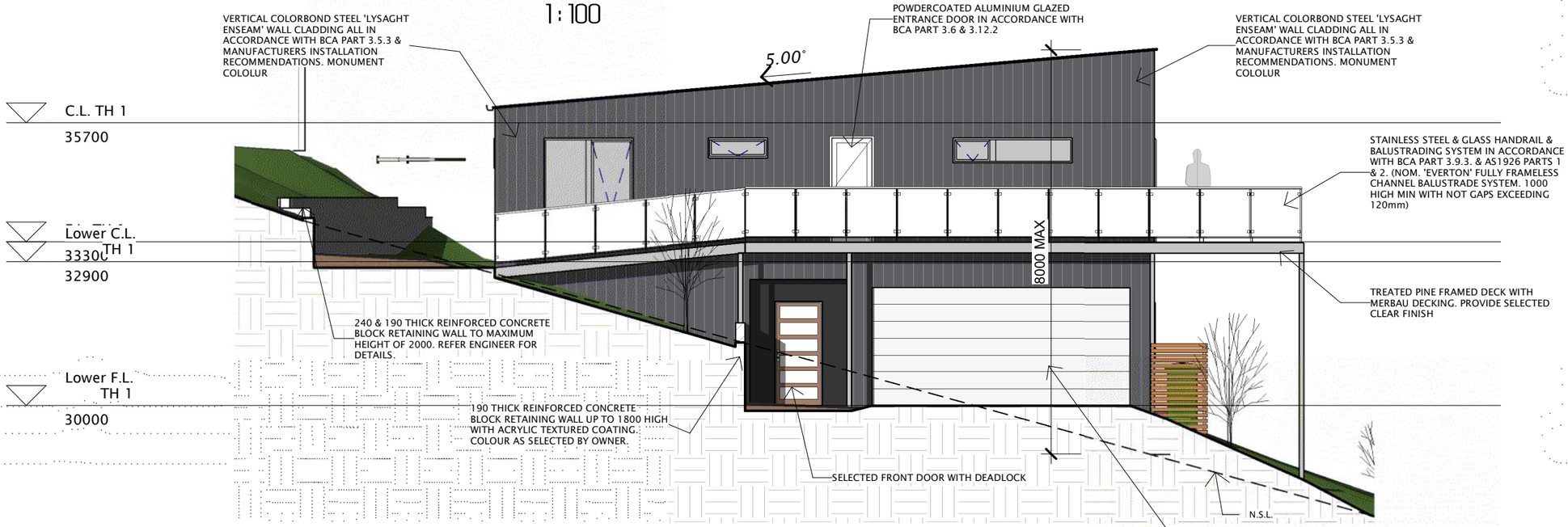


Townhouse 1 West Elevation

1 : 100



Townhouse 1 North Elevation

1 : 100

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Project :
Proposed Townhouses
24-26 Queechy Road,
Norwood, Launceston

Client :
Luke Gul

Drawing Title :
Elevations (sheet 1)

Scale : 1 : 100

Starting Date : 01.03.18

Plot Date : 14/01/2019 3:49:15 PM

Project No.	Drawing No.
010318	11/16

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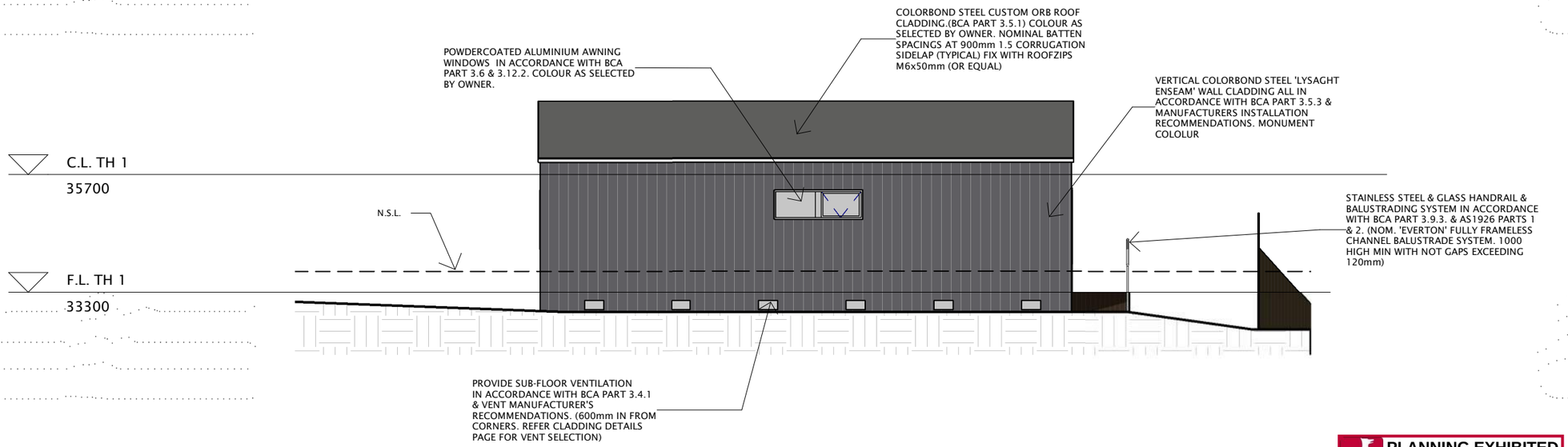
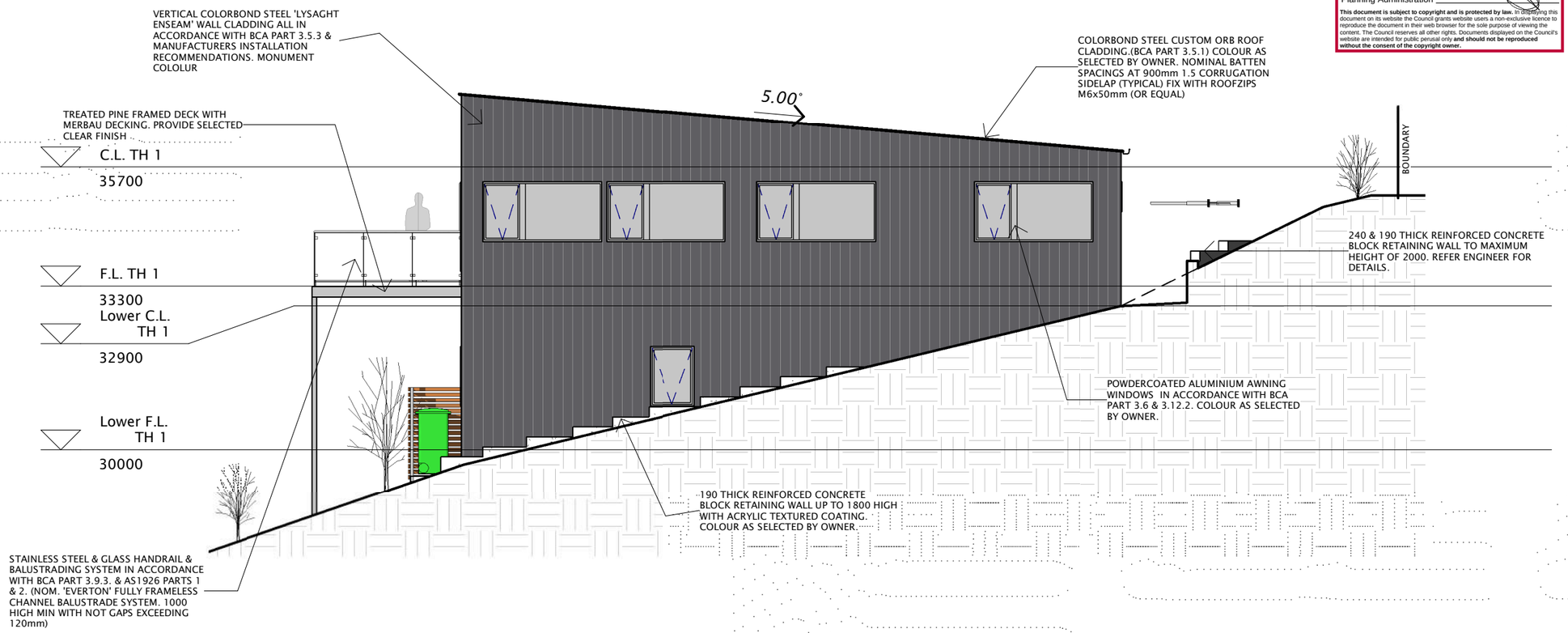


Townhouse 1 East Elevation

1:100



Townhouse 1 South Elevation

1:100

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Planning App 2 A3

No.	Date	Description
8		
7		
6		
5		
4	14.01.19	Planning App 2
3	06.12.18	Planning Approval
2	05.12.18	Prelim DA
1	21.11.18	Concept # 1

Project :
Proposed Townhouses
24-26 Queechy Road,
Norwood, Launceston

Client :
Luke Gul

Drawing Title :
Elevations (sheet 2)

Scale : 1 : 100

Starting Date : 01.03.18

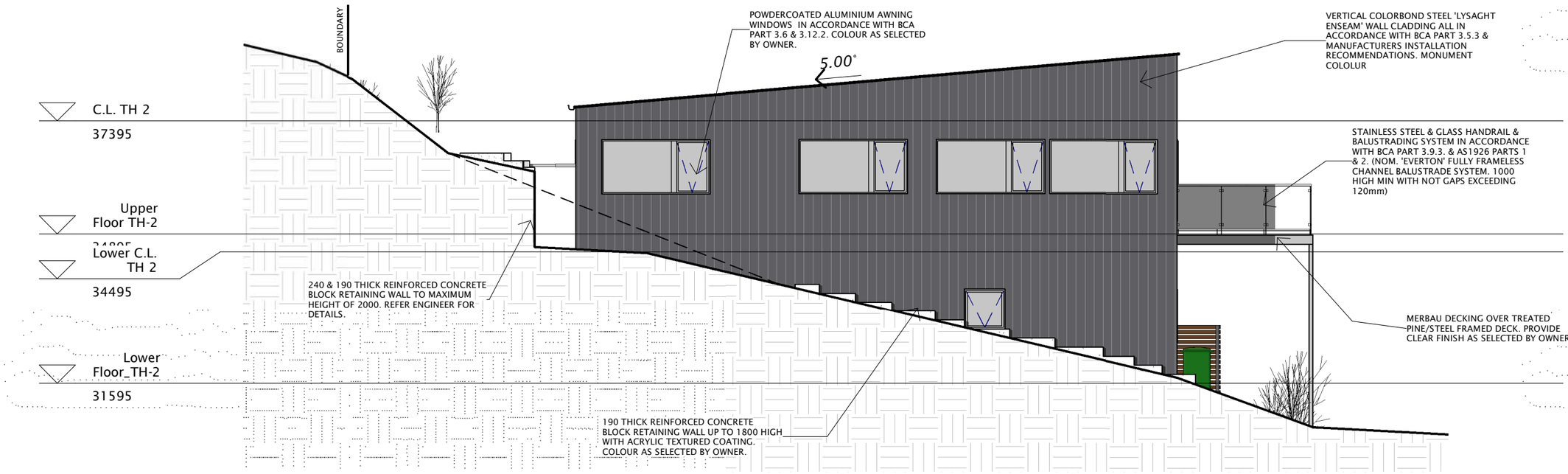
Plot Date : 14/01/2019 3:49:16 PM

Project No.	Drawing No.
010318	12/16

NOTES: -REFER TO LAST PAGES IN THE ARCHITECTURAL DRAWING SET FOR GENERAL NOTES.

Townhouse 2 West Elevation

1:100



Townhouse 2 North Elevation

1:100

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Planning App 2 A3

No.	Date	Description
5		
4	14.01.19	Planning App 2
3	06.12.18	Planning Approval
2	05.12.18	Prelim DA
1	21.11.18	Concept # 1

Project :
Proposed Townhouses
24-26 Queechy Road,
Norwood, Launceston

Client :
Luke Gul

Drawing Title :
Elevations (sheet 3)

Scale : 1 : 100

Starting Date : 01.03.18

Plot Date : 14/01/2019 3:49:17 PM

Project No.	Drawing No.
010318	13/16

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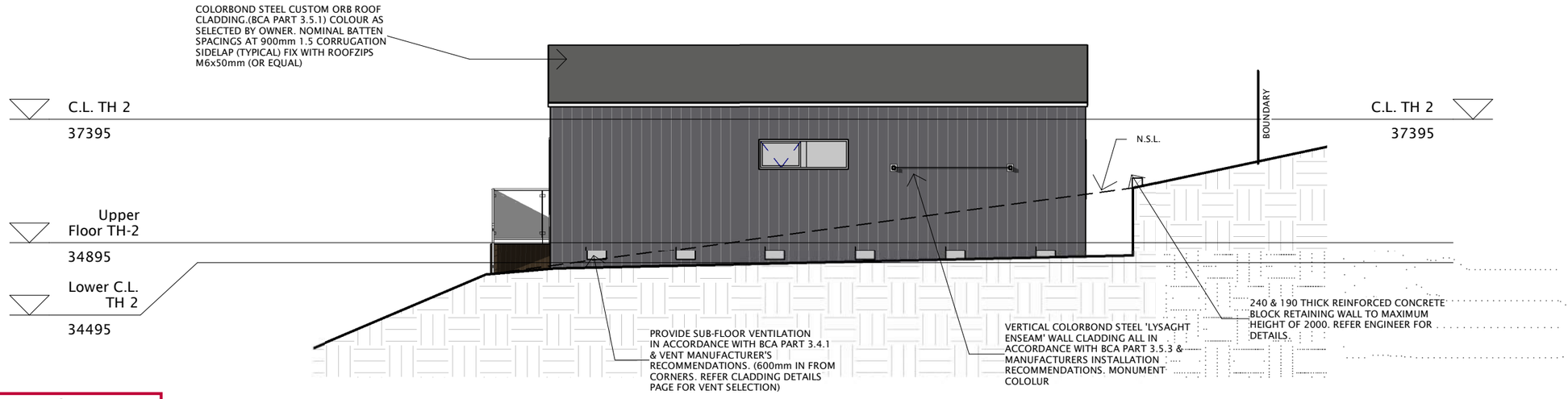
NOTES: -REFER TO LAST PAGES IN THE ARCHITECTURAL DRAWING SET FOR GENERAL NOTES.



Townhouse 2 East Elevation

1:100

Townhouse 2 South Elevation

1:100

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Planning App 2 A3

No.	Date	Description
8		
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1	21.11.18	Concept # 1

Project :
Proposed Townhouses
24-26 Queechy Road,
Norwood, Launceston

Client :
Luke Gul

Drawing Title :
Elevations (sheet 4)

Scale : 1 : 100

Starting Date : 01.03.18

Plot Date : 14/01/2019 3:49:19 PM

Project No.	Drawing No.
010318	14/16

Planning Compliance Report (RevB)

Monday, 14 January 2019

Addressing Interim Planning Scheme

2015 Launceston City Council

Proposed

Townhouses at 24-26 Queechy Rd, Launceston, TAS 7250

Client

Luke Gul

Zone: 10.0 General Residential

Planning Overlay: Landslip Code

A: 170 Abbott Street, Newstead, Launceston, TAS. 7250 M: 0411 294 351 **E :** leigh@adamsbuildingdesign.com.au

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Introduction

This report aims to demonstrate compliance with relevant planning standards for a Townhouses at 24-26 Queechy Rd, Launceston, TAS 7250, Launceston, TAS.
The report aims to take into consideration the intent, values and objectives of the Launceston City Council Interim Planning Scheme 2015, with amendments, and address all scheme standards applicable to this development. This report is based on proposed development works to be carried out, completed and maintained by the applicant & owner. The proposed development relies on Performance Criteria to satisfy relevant planning standards and is to be read in conjunction with drawings submitted for the development.

Development Details

The proposed development comprises proposed Townhouses at 24-26 Queechy Rd, Launceston, TAS 7250

Use Class: Residential

Site Area: 2050 m2

Area Schedule (Gross Building)		
Name	Area	Area (Squares)
TH #2 Upper Deck Area	34.97 m²	3.76
TH # 2 Upper Floor Area	143.20 m²	15.40
TH#2 Lower Floor Area	89.16 m²	9.59
TH# 1 Lower Floor Area	87.95 m²	9.46
TH# 1 Upper Floor Area	143.20 m²	15.40
TH# 1Upper Deck Area	34.97 m²	3.76
	533.44 m²	57.36

Applicable Planning Standards & Codes

The following zone standards and codes of the Launceston City Council Interim Planning Scheme 2015 are applicable to the proposed development:

10.4.2 Setbacks and building envelope for all dwellings
10.4.3 Site coverage and private open space for all dwellings
10.4.12 Earthworks and retaining walls (retaining walls 2600 MAX)
E3.0 Landslide Code
E6.1.1 Construction of parking areas

All Zone standards & codes that are not applicable (N/A) or are compliant with the acceptable solutions have not been listed.

Interim Planning Scheme Considerations

PART D ZONES

10.0 General Residential Zone

10.4.2 Setbacks and building envelope for all dwellings

Objective:

To control the siting and scale of dwellings to:
(a) provide reasonably consistent separation between dwellings on adjacent sites and a dwelling and its frontage; and
(b) assist in the attenuation of traffic noise or any other detrimental impacts from roads with high traffic volumes; and
(c) provide consistency in the apparent scale, bulk, massing and proportion of dwellings; and
(d) provide separation between dwellings on adjacent sites to provide reasonable opportunity for daylight and sunlight to enter habitable rooms and private open space.

Performance Criteria	Response
P1 A dwelling must: (a) have a setback from a frontage that is compatible with the existing dwellings in the street, taking into account any topographical constraints; and (b) if abutting a road identified in Table 10.4.2, include additional design elements that assist in attenuating traffic noise or any other detrimental impacts associated with proximity to the road.	P1a) Frontage setbacks along Queechy Road vary considerably & at least 7 dwellings are setback 4500 or less (including 20,31,33,45,55,56 & 65 Queechy Rd). At 3500 to the upper deck & 5822 to the building footprint, Townhouse # 2 has a frontage setback that is compatible with the existing dwellings in the street

10.4.3 Site coverage and private open space for all dwellings

Objective:

To provide:

(a) for outdoor recreation and the operational needs of the residents; and
(b) opportunities for the planting of gardens and landscaping; and
(c) private open space that is integrated with the living areas of the dwelling; and
(d) private open space that has access to sunlight.

Performance Criteria	Response
P2 A dwelling must have private open space that: (a) includes an area that is capable of serving as an extension of the dwelling for outdoor relaxation, dining, entertaining and children's play and that is: (i) conveniently located in relation to a living area of the dwelling; and (ii) orientated to take advantage of sunlight.	P2 The primary areas of open space for each Townhouse are the decks which are located between the frontage & the dwellings. The Decks measure 6000 long x 3000 wide. the decks do not satisfy the Acceptable solutions, but they do meet the performance criteria: a) are capable of serving as an extension to the dwelling for outdoor relaxation, dining, entertaining & children's play when paired with the secondary open space on the eastern side of each dwelling at ground level. i) the decks are conveniently located in relation to the living area of the dwellings for the abovementioned activities & the backyard to the

	East can be easily accessed via the walkway along the side of each dwelling. ii) the decks are oriented to the western side of each dwelling to take full advantage of direct sunlight which is unobstructed due in part to the steepness of the site.

10.4.12 Earthworks and retaining walls

To ensure that earthworks and retaining walls are appropriate to the site and respect the amenity of adjoining lots.

Performance Criteria	Response
A1 Earthworks and retaining walls must be designed and located so as not to have an unreasonable impact on the amenity of adjoining lots, having regard to: (a) the topography of the site; (b) the appearance, scale, and extent of the works; (c) overlooking and overshadowing of adjoining lots; (d) the type of construction of the works; (e) the need for the works; (f) any impact on adjoining structures; (g) the management of groundwater and stormwater; and (h) the potential for loss of topsoil or soil erosion.	A1 The proposed excavation & retaining walls for each dwelling lower floor is approximately 2600mm below natural surface level, which is more than the 1m max in the acceptable solutions. Some reinforced concrete retaining walls (approx. 2100 high) are also required for the swept paths & driveways. a) the steepness of the site (1:3) requires a deep cut to enable undercover carparking for 2 cars for each dwelling & also driveway access. b) the excavation & retaining wall for the driveways will be visible from street although the visual impacts will be minimised by the distance from the street (approx. 6.) c)N/A. d)reinforced concrete block retaining walls designed by an engineer. e) the excavation is required to provide a level platform for covered parking spaces for 2 cars each dwelling & driveway access. f) The impact on adjoining structures will be minimised by setbacks from boundaries which are 4m minimum. g) Refer drainage plan in the drawing set. h) The potential for loss of topsoil or soil erosion will be mitigated by adopting batter gradients compatible with the soil type & ag drains connected to the stormwater system via silt pits. The excavation batters (which are only located at the rear of each dwelling & are less than 1m in height) will also be planted out with suitable native vegetation which will help stabilise the slope & keep the ground intact.

PART E CODES

E1.0 Bushfire Prone Areas Code

BAL LOW

E2.0 Potentially Contaminated Land Code

N/A

E3.0 Landslip Code

Refer Landslip Risk Assessment (report # GL 17367A Geoton – Tony Barriera)

E4.0 Road and Railway Assets Code

N/A

E5.0 Flood Prone Areas Code

N/A

E6.0 Car Parking and Sustainable Transport Code

E6.6.1 Construction of parking areas

Objective: **To ensure that parking areas are constructed to an appropriate standard.**	
Performance Criteria	**Response**
P1 All parking, access ways, manoeuvring and circulation spaces must be readily identifiable and constructed to ensure that they are useable in all weather conditions, having regard to: (a) the nature of the use; (b) the topography of the land; (c) the drainage system available; (d) the likelihood of transporting sediment or debris from the site onto a road or public place; (e) the likelihood of generating dust; and (f)the nature of the proposed surfacing and line marking.	P1 All parking, access ways, manoeuvring and circulation spaces are a gradient of 10% or less, provided with a concrete all-weather seal with spoon drains connected to the public stormwater system via silt pits. Some of the driveway sections are up to 25% max but any unreasonable impacts of the steep gradient are minimised with generous driveway widths, good visibility & a broomed concrete surface.

E7.0 Scenic Management Code

N/A

E8.0 Biodiversity Code

N/A

E9.0 Water Quality Code

N/A

E10.0 Recreation and Open Space Code

N/A

E11.0 Environmental Impacts and Attenuation Code

N/A

E12.0 Airports Impact Management Code

N/A

E13.0 Local Historic Heritage Code

N/A

E14.0 Coastal Code

N/A

E15.0 Telecommunications Code

N/A

E16.0 Invermay/Inveresk flood inundation area code

N/A

E17.0 Cataract Gorge Management Area Code

N/A

E18.0 Signs Code

N/A

E19.0 Development Plan Code

N/A

GEOTON Pty Ltd
Geotechnical Consultants

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www.geoton.com.au

25 January 2019

Reference No. GL17367Cd

APEXIA Building Solutions
23 Eldonhurst Drive
NEWSTEAD TAS 7250

Attention: Mr Luke Gul

Dear Sir

RE: Geotechnical Review
Proposed Residential Development
24-26 Queechy Road, Norwood

At your request, Geoton provides the following comments regarding a geotechnical review of revised design drawings of a proposed townhouse development at the above-mentioned site.

Geoton Pty Ltd has previously carried out a geotechnical Landslide Risk Assessment for the above-mentioned site, our Reference No. GL17367Ab, dated 4 December 2018. A geotechnical review of previous design drawings was carried out, our reference GL17367Bc, dated 17 August 2018.

This geotechnical review has been carried out to confirm that the recommendations of our previous landslide risk assessment report have been incorporated in the proposed design.

The following design drawings were provided for review:

- Architectural Design Drawings for preliminary DA, prepared by Adams Building Design, project No. 010318, plot dated 5 December 2018.

The proposed development is for two townhouses on the site. Each townhouse has 3 bedrooms on an upper level, with a double garage, a fourth bedroom and an ensuite underneath. In addition to the retained excavation for the lower floor, the upper floor will also be excavated into the uphill somewhat and fully retained with engineered retaining walls.

The townhouses are shown as being of flexible and lightweight construction as per the recommendations of our previous report.

Our previous report also recommended that any building located on the existing cut and bench must be supported on bored piers or screw piles founded through the uncontrolled fill and 3m into the underlying very stiff natural clay soils. As such, the site classification of

CLASS P can be proportioned to a **CLASS H2**, with an available allowable bearing pressure of **100kPa** for the bored piers founded as above.

As recommended in our previous report, 'cuts and fills on the site should be minimised, and these should be limited to less than 1.5m in height and battered at slope angles no steeper than 1 vertical to 3 horizontal (1V:3H) for fill batters and 1V:2.5H for cut batters or alternatively these should be retained'. Cuts and fills greater than 1.5m in height should be retained with structurally designed retaining walls by a suitably qualified engineer and reviewed by an experienced geotechnical practitioner

Surface and subsurface drainage is to be provided behind and uphill of the townhouses and the retaining walls.

It is considered that the proposed development is generally in keeping with the recommendations of our previous report and we consider that it would not adversely impact on the slope stability of the site or the immediate surrounding areas provided good hill side practices and the recommendations of our previous report are adhered to, and the buildings and retaining walls are designed by a suitably qualified engineer.

We trust that this report fulfils your current requirements. Should you require clarification of any aspect of this report, please contact Tony Barriera on (03) 6326 5001.

For and on behalf of Geoton Pty Ltd

Tony Barriera

Director

Attachments: Limitations of report

GEOTON Pty Ltd

Geotechnical Consultants - Limitations of report

These notes have been prepared to assist in the interpretation and understanding of the limitations of this report.

Project specific criteria

The report has been developed on the basis of unique project specific requirements as understood by Geoton and applies only to the site investigated. Project criteria are typically identified in the Client brief and the associated proposal prepared by Geoton and may include risk factors arising from limitations on scope imposed by the Client. The report should not be used without further consultation if significant changes to the project occur. No responsibility for problems that might occur due to changed factors will be accepted without consultation.

Subsurface variations with time

Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. In the event of significant delays in the commencement of a project, further advice should be sought.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and at the time they are taken. All available data is interpreted by professionals to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, as it is virtually impossible to provide a definitive subsurface profile which includes all the possible variabilities inherent in soil and rock masses.

Report Recommendations

The report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until earthworks and/or foundation construction is almost complete and therefore the report recommendations can only be regarded as preliminary. Where variations in conditions are encountered, further advice should be sought.

Specific purposes

This report should not be applied to any project other than that originally specified at the time the report was issued.

Interpretation by others

Geoton will not be responsible for interpretations of site data or the report findings by others involved in the design and construction process. Where any confusion exists, clarification should be sought from Geoton.

Report integrity

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Geoenvironmental issues

This report does not cover issues of site contamination unless specifically required to do so by the client. In the absence of such a request, Geoton take no responsibility for such issues.

GEOTON Pty Ltd

Geotechnical Consultants

LANDSLIDE RISK ASSESSMENT AND MANAGEMENT REPORT

Mr Beichuan Wang

24 - 26 Queechy Road, Norwood

Reference: GL17367Ab
Date: 4 December 2017

GEOTON Pty Ltd

Geotechnical Consultants

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4 December 2017

Reference No. GL17367Ab

Mr Beichuan Wang
26 Miller Drive
HAPPY VALLEY SA 5159

Dear Sir

RE: Landslide Risk Assessment and Management Report
24 - 26 Queechy Road, Norwood

We have pleasure in submitting herein our report detailing the results of the landslide risk assessment conducted at the above site.

Should you require clarification of any aspect of this report, please contact Tony Barriera on 03 6326 5001.

For and on behalf of Geoton Pty Ltd

Tony Barriera

Director

CONTENTS

Appendices

1 INTRODUCTION

A limited scope investigation has been conducted for Mr Beichuan Wang at the site of a proposed residential development at 24 - 26 Queechy Road, Norwood.

A review of the hazard planning map on the Land Information System Tasmania (LIST) website indicates that the site is mapped within a medium landslide hazard band. As such, a landslide risk assessment is required to satisfy ground hazard code requirements for the Council Interim Planning Scheme.

In addition, the investigation has been conducted to provide the following:

- Recommendations for good hillside practices to maintain or possibly lower the potential landslide risks;
- Landslide mitigation methods required to maintain an acceptable LOW landslide hazard; and
- Basic drainage and building recommendations for the site.

The following documentation has been provided:

- Contour survey plan of the site, prepared by Cohen & Associates Pty Ltd, reference No. 28-75 (7563), dated 09/10/17; and
- Plan showing the potential location of the house, unreferenced, undated.

We understand that the proposed development will consist of a three-bedroom house potentially located on the lower slope towards the western boundary of the site or on the upper cut to fill bench.

2 BACKGROUND

2.1 Geology

The Mineral Resources Tasmania (MRT) Digital Geological Atlas, 1:25,000 Series, Launceston sheet, indicates that the site is located on Tertiary aged sediments consisting of poorly consolidated clay, silt, and clayey labile sand with rare gravel and lignite; some iron oxide-cemented layers and concretions; some leaf fossils.

An extract of the Geology sheet is provided as Figure 1.

2.2 Landslide Hazards

2.2.1 Landslide Inventory

Examination of the MRT Tasmanian Landslide Hazard series, Launceston – Landslide Inventory sheet, 1:25,000 scale, indicates that the site is mapped within a fossil or old dormant deep landslide (Landslide ID No 1924) with activity unknown.

Two other fossil or old dormant landslides (Landslide ID Nos 1925 and 1926) with activity unknown are also mapped approximately 80m and 150m towards the northeast.

An extract of the Landslide Inventory sheet is provided as Figure 2.

2.2.2 Geomorphology

Examination of the MRT Tasmanian Landslide Hazard series, Launceston - Geomorphology sheet, 1:25,000 scale, indicates that the site is generally mapped within an area with hill slopes of 13º to 35º, with the southwestern portion of the site mapped as having flatter slope angles of 7º to 13º. The sheet also indicates that the site is mapped as being on younger slopes on Tertiary aged sediments.

An extract of the Geomorphology sheet is provided as Figure 3.

2.2.3 Slide Susceptibility

Examination of the MRT Tasmanian Landslide Hazard series, Launceston – Slide Susceptibility sheet, 1:25,000 scale, indicates that the site is generally mapped within a source area, i.e. an area of hillside with the potential to form a slope failure, identified largely on the basis of slope angle and geology. The sheet also indicates that the site is mapped as a landslide of unknown activity.

An extract of the Slide Susceptibility sheet is provided as Figure 4.

2.2.4 Potential Landslide Hazards

Examination of the MRT Tasmanian Landslide Hazard series, Launceston - Potential Landslide Hazards sheet, 1:25,000 scale, indicates that the site is generally mapped as a Tb zone, i.e. “area above higher threshold angle of 12º which is determined that approximately represents a median value at which the landslides in the study area occur”.

An extract of the Potential Landslide Hazards sheet is provided as Figure 5.

2.2.5 MRT Advisory Landslide Maps

A review of the Mineral Resources Tasmania (MRT) – Tamar Valley Advisory Landslide maps, 1: 25,000 scale, Prospect sheet shows the site as being within a CLASS IV zone, i.e. “old landslides and adjacent areas, with apparent failure now inactive. No building recommended without land stability assessment, generally requiring subsurface investigation”.

2.3 MRT Reports

No report relating to the subject site was found on the MRT database.

However, a number of reports on landslides in the surrounding areas of Newstead and Norwood, with similar geology and geomorphology were reviewed. The reports provide a good historical background of the area in addition to their technical content. Data and findings of the reports relevant to this study are summarized in point form below:

- The Tertiary aged sediments were deposited under deltaic conditions in which the locus of deposition changes rapidly. Both lenses and sheets can be expected in the area. (Weldon);

- "The area ... lies on clays, sands, soft sandstone and thin ironstones of the Launceston beds of Tertiary age. These materials are known to cause landsliding in the Tamar Valley.... High shrinkage soils occur over the area and foundations should be designed accordingly" (Stevenson);
- "Tertiary clay which is fissured and in places contains thin 'sandy' layers which appear to carry water. ... cause of damage to the house is due to the alteration of the in soil moisture..." (Jennings); and
- "The cause of the recently reported house cracking in Sandown Road is thought to be from shrinkage in the underlying clay resulting from the prolonged drought of 1982-84." (Moore).

3 FIELD INVESTIGATION

The field investigation was conducted between 19 and 24 October 2017 and involved the drilling of 3 boreholes by a trailer mounted hollow flight auger rig to the investigated or auger refusal depths of between 2.0m and 11.25m, and the digging of 4 test pits by a 7-tonne excavator to the investigated or near refusal depths of between 2.7m and 3.4m.

Standard Penetration Tests (SPT) were conducted at regular depths within the boreholes. In addition, in-situ vane shear strength and pocket penetrometer tests were conducted on the encountered soils, with sampling of the clay soils encountered being conducted for subsequent laboratory testing.

The logs of the boreholes and test pits are included in Appendix A with their locations shown in Figure 6 attached.

The results of the field and laboratory tests are shown in the borehole and test pit logs, whilst the laboratory test results are also summarised in Section 4.3 below.

4 SITE CONDITION

4.1 Site Description

The site is located on the south-eastern uphill side of Queechy Road, just where the road starts to climb with a moderate grade of about 15º. The ground surface within the front downhill western corner of the site has a gentle rise of 3º to 4º towards the east, becoming steeper at about 18º to 21º before becoming locally steeper up a fill batter slope of a near level cut to fill bench with slope angles of 28º to 34º, see Plate 1. On the uphill side of the cut to fill bench there is a steep excavated cut batter with slope angles of about 30º with the ground surface uphill of the cut batter flattening somewhat to about 13º to 17º, see Plates 2 and 3. A track has been cut in along the southern boundary of the site to access the cut to fill bench located in the upper portion of the site, see Plate 4.

Vegetation over the site generally has a long dense grass cover, whilst the cut to fill bench has a moderate to patchy cover of grass. There are several large, mature trees over the site.

There is no obvious sign of any recent landslide movement or seepages having occurred at the site.

4.2 Subsurface Conditions

The investigation indicated that the soil profile varied over the site.

Borehole BH1 encountered fill of clayey silt to a depth of 0.4m, overlying natural medium plasticity sandy clay to a depth of 2.0m, overlying medium to coarse grained clayey sand to a depth of 4.0m, overlying fine to coarse grained silty sand to a depth of 7.0m, underlain by fine grained clayey sand to the auger refusal depth of 7.9m on very dense silty sand.

Borehole BH2 encountered fill of silty sand to a depth of 0.4m, overlying natural medium grained silty sand to a depth of 1.4m, overlying high plasticity silty clay to a depth of 3.8m, overlying fine to medium grained silty sand to a depth of 5.2m, underlain by high plasticity silty clay to the auger refusal depth of 11.25m on hard silty clay.

Borehole BH3 encountered fill of sandy clay/silty sand to a depth of 1.2m, underlain by natural medium plasticity sandy clay to the investigated depth of 2.0m.

Test Pit TP1 encountered fill of clayey silt/sandy silt to a depth of 0.6m, overlying silty sand topsoil to a depth of 0.8m, underlain by natural fine grained silty sand to the near refusal depth of 3.4m on very dense silty sand.

Test Pits TP2 and TP3 encountered silty sand topsoil to depths of 0.2m, overlying medium/high plasticity silty clay to depths of 2.4m to 2.5m, underlain by low plasticity sandy silt to the near refusal depths of 2.7m to 2.8m on very dense sandy silt.

Test Pit TP4 encountered fill of sandy silt/silty sand and silty clay to a depth of 1.0m, underlain by natural high plasticity silty clay to the investigated depth of 3.0m.

Groundwater seepages were encountered in the Borehole BH2 with the water level measured at a depth of 10.0m on 24/10/2017.

The SPT results indicate that N values of greater than 15 were generally achieved in the natural soils within the Boreholes BH1 and BH2, with N values of approximately 30 encountered in the very dense silty sand layers, and when approaching the auger refusal depths.

Full details of soil conditions encountered are presented on the borehole and test pit logs.

4.3 Laboratory Testing

The laboratory test results are summarised below:

Table 1: Summary of Laboratory Test Results

SAMPLE	**BH1** 2.0-2.25m	**BH2** 2.3m-2.6m	**BH2** 8.3m-8.5m
Liquid Limit (%)	55	73	87
Plastic Limit (%)	23	27	31
Plasticity Index (%)	32	46	56
Linear Shrinkage (%)	11	12	11.5
Class	CH	CH	CH

Published correlations between Plastic Index and effective friction angle indicate that the laboratory tested high plasticity clay soils (CH) sampled from the Borehole BH1, which is in close proximity to the cut to fill bench, would have effective friction angle values of approximately between 24º and 29º if undisturbed, and 18º if remoulded.

5 SLOPE STABILITY ANALYSES

Based on the encountered surface and subsurface conditions at the site, slope stability analyses have been conducted on the critical Section AA within the site, see Figure 6.

5.1 General

A slope stability analysis gives a numerical value for the Factor of Safety (FOS) against the failure of a nominated failure surface. In simple terms, the FOS is the ratio of sliding (activating) forces to resisting forces along the failure surface. Activating forces are generally weight of soil at the high end of a slope while resisting forces derive from the shear strength of the materials intersected by the failure surface. A FOS of 1.0 represents a condition of incipient failure or limiting equilibrium. A FOS of greater than 1.0 indicates that the slope should not fail, while a FOS of less than 1.0 indicates that failure could occur.

Two different analysed scenarios are presented in the following table along with the corresponding minimum acceptable FOS adopted as acceptance criteria.

Table 2: Analysed Scenarios and Acceptance Criteria

Analysed Scenarios	**Minimum Acceptable FOS**	**Shear Strength**
Long-term	1.5	Effective Strength
Short-term	1.3	Undrained Strength

Slope stability analyses were conducted in the two-dimensional, limit equilibrium based computer program Rocscience SLIDE version 7, utilising Morgenstern-Price method. Graphical outputs of the stability analyses are provided in Appendix C.

5.2 Development of Geotechnical Models

The four major elements of a geotechnical model for slope stability analysis are:

- Ground surface topography;
- Loading on the slope;
- Groundwater profile; and
- Shear strengths of subsurface materials (Strength Profile).

5.2.1 Ground Surface Topography

Section AA was mapped out based on the contour map prepared by Cohen & Associates Pty Ltd.

5.2.2 Loading on Slopes

Distributed loads of 25kPa were applied to the stability analyses in consideration of the weight of potential dwellings on the slopes.

5.2.3 Groundwater Profile

Groundwater level was recorded at a depth of 10.0m within the Borehole BH2 which is located at the lowest western corner of the site. However, the findings of this investigation suggest that the site is well drained due to its close proximity to a hill crest and the relatively steep slopes on site. Therefore, groundwater is considered not prominent and thus has been omitted from the model.

5.2.4 Geology Profiles and Material Parameters Adopted

The geology profile was simplified and defined based on the findings of the geotechnical investigation. Table 3 below summarises the soil strength parameters adopted in the modelling.

Table 3: Geotechnical Parameters Adopted in Analyses

Materials	Unit Weight (kN/m^3)	Effective Strength Parameters		Undrained Strength Parameters	
		Cohesion, c' (kPa)	Friction Angle, Φ' (º)	Cohesion, c_u (kPa)	Friction Angle, Φ_u (º)
Hard Natural	20	3	33	200	0
Very Stiff Natural	19	5	27	100	0
Firm Fill	17	0	18	25	0

5.3 Analysis of Results

Table 4 below summarises the various FOS for different scenarios.

Table 4: Factors of Safety for different scenarios

Sections	Scenarios	Long-term (Effective Strength)	Short-term (Undrained Strength)
Section AA	No Load	0.46*	N/A
	Loaded	0.46*	2.79

*** Lower than the minimum acceptable FOS**

The results of the stability analyses indicate that the slope in the Section AA will have FOS higher than the minimum acceptable value under the short-term scenario, but fail to achieve the minimum acceptable FOS under the long-term scenario.

For the long-term analyses, potential slip surfaces with FOS not higher than 1.5 are presented in the graphical outputs. It can be seen that, the low FOS results are only for localised failures within the very steep unretained fill batter slope. If no load is applied on the cut to fill bench, shallow failures of depths less than 1.2m may occur within the existing fill batter. However, if a 25kPa distributed load is applied on the cut to fill bench, the potential failing area will extend into the natural very stiff clay soils up to a depth of approximately 2m.

Also, there is a potential risk of a small shallow failure at the toe of the slope within the western downhill portion of the site.

The stability analyses indicated that shallow failures are likely to occur within the existing fill batter and at the toe of the slope within the western downhill portion of the site in the long term. However, the risk is manageable and can be reduced if proper remedial measures are implemented and the recommendations provided within Section 7 of this report are adhered to.

6 LANDSLIDE RISK ASSESSMENT

The qualitative likelihood, consequence and risk terms used in this report for risk to property are given in Appendix D. The risk terms are defined by a matrix that brings together different combinations of likelihood and consequence. Risk matrices help to communicate the results of risk assessment, rank risks, set priorities and develop transparent approaches to decision making. The notes attached to the tables and terms and the comments on response to risk in Appendix D are intended to help explain the risk assessment and management process.

The investigation and site walk-over revealed no evidence of any recent landslide activity or any spring activity in close proximity to the proposed building envelopes. However, the unprotected very steep cut and fill batter slopes of the cut to fill bench is a concern.

In order to address any potential land instability hazard within the proposed development area a landslide risk assessment has been conducted on the following:

- Small to Medium Scale Failure – The landslide risk assessment for small to medium scale failure typically relates to shallow slides and earth or debris flows. Shallow slides are typically small (<1,000m^3) and usually less than 5m in depth. Earth or debris flows are often triggered by the action of torrential rain and often occur as a consequence of an initial slide failure which, if ground conditions are wet enough, will then develop into a rapidly moving flow.
- Large Scale Failure – The landslide risk assessment for large scale failure typically relates to deep-seated landslides. Deep-seated landslides are typically large (>1,000m^3) and usually greater than 5m in depth. Deep-seated landslides typically consist of the following landslide types: rotational soil slides, translational soil slides, soil slides that can be transitional into soil flows, and block or complex spreads.
- Run Out Failure – The landslide risk assessment for run-out failure relates to the land upslope of the site failing and/or moving earth, debris or rock potentially moving down-slope from the source area and impacting on the site.

In our experience, regulating authorities allow developments to proceed with VERY LOW to LOW risk.

The outcomes of the landslide risk assessments conducted below only apply if the recommendations within Section 7 of this report are adhered to.

6.1 Small to Medium Scale Failure

In light of the findings of this investigation, including geomorphology, geological conditions, slope angles, field and laboratory testing, and stability analyses, the likelihood of a small to medium scale failure affecting the proposed development areas is considered LIKELY (fill batter slope), with the potential consequences assessed to be MEDIUM.

Therefore, the corresponding qualitative risk for a small to medium failure occurring within the proposed development areas is assessed as HIGH.

However, should the recommendations provided within Section 7 of this report be adhered to, the likelihood of a small to medium scale failure can be reduced to UNLIKELY with MEDIUM potential consequences, and the corresponding qualitative risk can be reduced to LOW.

6.2 Large Scale Failure

In light of the findings of this investigation, including geomorphology, geological conditions, slope angles, field and laboratory testing, stability analyses and recommendations provided within Section 7 of this report, the likelihood of a large scale failure affecting the proposed developments is considered RARE, with the potential consequences assessed to be MAJOR.

Therefore, subject to compliance with the recommendations within Section 7 of this report, the corresponding qualitative risk for a large scale failure occurring within the proposed development areas is assessed as LOW.

6.3 Run Out Failure

In light of the findings of this investigation, including geomorphology, geological conditions, slope angles, field and laboratory testing, and stability analyses, the likelihood of the run out of a failure occurring on the slopes uphill of the proposed development areas encroaching on the proposed development areas is considered LIKELY, with the potential consequences assessed to be MINOR.

Therefore, the corresponding qualitative risk for a run out failure affecting the proposed development areas is assessed as MEDIUM.

However, should the recommendations provided within Section 7 of this report be adhered to, the likelihood of a run out failure can be reduced to UNLIKELY with MINOR potential consequences, and the corresponding qualitative risk can be reduced to LOW.

7 DISCUSSION AND RECOMMENDATIONS

7.1 General

Based on the findings of the investigation and the above landslide risk assessments, we consider that the proposed development would not adversely impact on the site and immediate surroundings nor significantly increase its current assessed landslide risk, provided the development adheres to the principles of good hillside practice, and the recommendations below are included in the design and development of the site. An information sheet entitled “Some Guidelines for Hillside Construction” adapted from the Journal of the Australian Geomechanics Society, volume 42, Number 1, dated March 2007, is presented in Appendix E.

7.2 Cuts and Fills

- **The existing cut and fill batters should be retained with structurally designed retaining walls by a suitably qualified structural engineer, with appropriate design parameters determined from further geotechnical investigation and testing, and reviewed by an experienced geotechnical practitioner;**
- Alternatively, the steep fill batter material should be removed;
- The slope stability at the toe of the slope within the western downhill portion of the site should be improved by either placing additional toe support of about 1m of fill or retaining the toe;
- Cuts and fills on the site should be minimised, and these should be limited to less than 1.5m in height and battered at slope angles no steeper than 1 vertical to 3 horizontal (1V:3H) for fill batters and 1V:2.5H for cut batters or alternatively these should be retained; and
- Cuts and fills greater than 1.5m in height should be retained with structurally designed retaining walls by a suitably qualified engineer and reviewed by an experienced geotechnical practitioner.

7.3 Buildings

- **Any building on the existing cut to fill bench must be flexible and lightweight, otherwise building on the existing cut to fill bench should be avoided;**
- **The footings of any building on the existing cut to fill bench must be bored piers or screw piles founded through the uncontrolled fill and at least 3m into the underlying very stiff natural clay soils, otherwise building on the existing cut to fill bench should be avoided;**
- The other recommended building area will be within the flatter front western downhill portion of the site;
- All footings should be founded through any fill into the underlying natural soils, provided the natural soils have an allowable bearing capacity of 100kPa. Site-specific Site Classifications will be required to provide site-specific footing recommendations and depths;
- All footings should be designed by a suitably qualified engineer and take into consideration possible lateral loading of moving soil and the structure; and
- The design plan for any development must be reviewed by an experienced geotechnical practitioner prior to construction and will require additional more detailed investigation and analyses prior to being approved.

7.4 Drainage

- A surface water cut off drain should be installed along the upper eastern boundary of the site;
- Adequate subsurface and/or surface drainage should be provided uphill of any structures, including buildings, retaining walls and cut/fill batters;
- All roof downpipes and collected surface and subsurface water should be piped and discharged to the council or street stormwater system;
- No uncontrolled discharge of collected surface water onto the ground surface or through absorption trenches is permitted on the site;
- Should any seepage or groundwater be encountered during site or footing excavations, it is recommended that subsoil drainage be provided to discharge to the council or street stormwater system; and
- Any water, drainage or sewage leak must be repaired, as soon as possible.

7.5 Erosion control

- Maintain vegetation on the surrounding slopes, in particular, the uphill and downhill slopes of the proposed development.

7.6 Service trenches

- All service trenches to be run up and down slope at every opportunity. No cross-slope trenches >1m deep in areas with ground slopes greater than 10º without specific geotechnical design and specification (would include issues such as minimum grade for base of trench, backfill in short sections across the slope and subsoil drain requirements); and
- Subsoil drains should be placed within service trenches discharging to the council stormwater system.

7.7 Existing Large Trees Removal

There are a few very large pine trees on the site. These trees generally have a shallow root system and are considered a potential risk to being uprooted during severe winds. We recommend that these be removed. Removing these large pine trees should not adversely impact on the stability of the site.

8 SITE CLASSIFICATION

Insofar as it may be applicable, after allowing due consideration of the site geology, drainage and soil conditions, and because of the potential risk of landslides and the presence of fill to depths greater than 0.8m, the site has been classified as:

CLASS P (AS 2870)

This classification is based on the general conditions of the site and applicable only for ground conditions encountered at the time of this investigation. If cut or fill earthworks are carried out, then the Site Classification will need to be re-assessed, and possibly changed.

9 GEOTECHNICAL REVIEW

It is recommended that the drawings of any proposed development be reviewed by an experienced geotechnical practitioner to ensure that it is in keeping with good hillside practices and recommendations provided within Section 7. Further site-specific investigation and testing should also be conducted to provide site-specific footing recommendations and depths.

10 LIMITATIONS

The findings contained within the report are the result of discrete/specific sampling methodologies used in accordance with normal practices and standards, with some variations as indicated in the report. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points. Variations in soil conditions may occur in areas of the site not specifically covered by the field investigation. The base of all footing or beam excavations should therefore be inspected to ensure that the founding medium meets the requirements referenced herein with respect to type and strength of founding material.

REFERENCES

AS 1726 – 2017 Geotechnical site investigation

AS 2870 – 2011 Residential Slabs and Footings

AS/NZS ISO 31000:2009 Risk management – Principles and guidelines

Australian Geomechanics Society (2007) – Practice note guidelines for landslide risk management 2007, Australian Geomechanics Journal, Vol 42, No. 1

Weldon B.D. (1990) – Shallow subsurface investigation of a proposed subdivision at Newstead, MRT UR1990_26.

Moore W.R., (1984) – Subsurface movement in expansive clay: An alternative explanation for house cracking at Sandown Road, Launceston, MRT *UR1984_59*

Stevenson P C (1984) – Stability assessment of a proposed subdivision at Beverley Hills Road, Punchbowl, Launceston, *MRT UR1984_23*

Knights C.J., (1977) – Damage to a house at Punchbowl Road, Launceston, *MRT UR1977_20*

Jennings I.B., (1975) – Damage to a house at Ellison Street, Punchbowl, Launceston, MRT *UR1975_18*

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Geotechnical Consultants - Limitations of report

These notes have been prepared to assist in the interpretation and understanding of the limitations of this report.

Project specific criteria

The report has been developed on the basis of unique project specific requirements as understood by Geoton and applies only to the site investigated. Project criteria are typically identified in the Client brief and the associated proposal prepared by Geoton and may include risk factors arising from limitations on scope imposed by the Client. The report should not be used without further consultation if significant changes to the project occur. No responsibility for problems that might occur due to changed factors will be accepted without consultation.

Subsurface variations with time

Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. In the event of significant delays in the commencement of a project, further advice should be sought.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and at the time they are taken. All available data is interpreted by professionals to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, as it is virtually impossible to provide a definitive subsurface profile which includes all the possible variabilities inherent in soil and rock masses.

Report Recommendations

The report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until earthworks and/or foundation construction is almost complete and therefore the report recommendations can only be regarded as preliminary. Where variations in conditions are encountered, further advice should be sought.

Specific purposes

This report should not be applied to any project other than that originally specified at the time the report was issued.

Interpretation by others

Geoton will not be responsible for interpretations of site data or the report findings by others involved in the design and construction process. Where any confusion exists, clarification should be sought from Geoton.

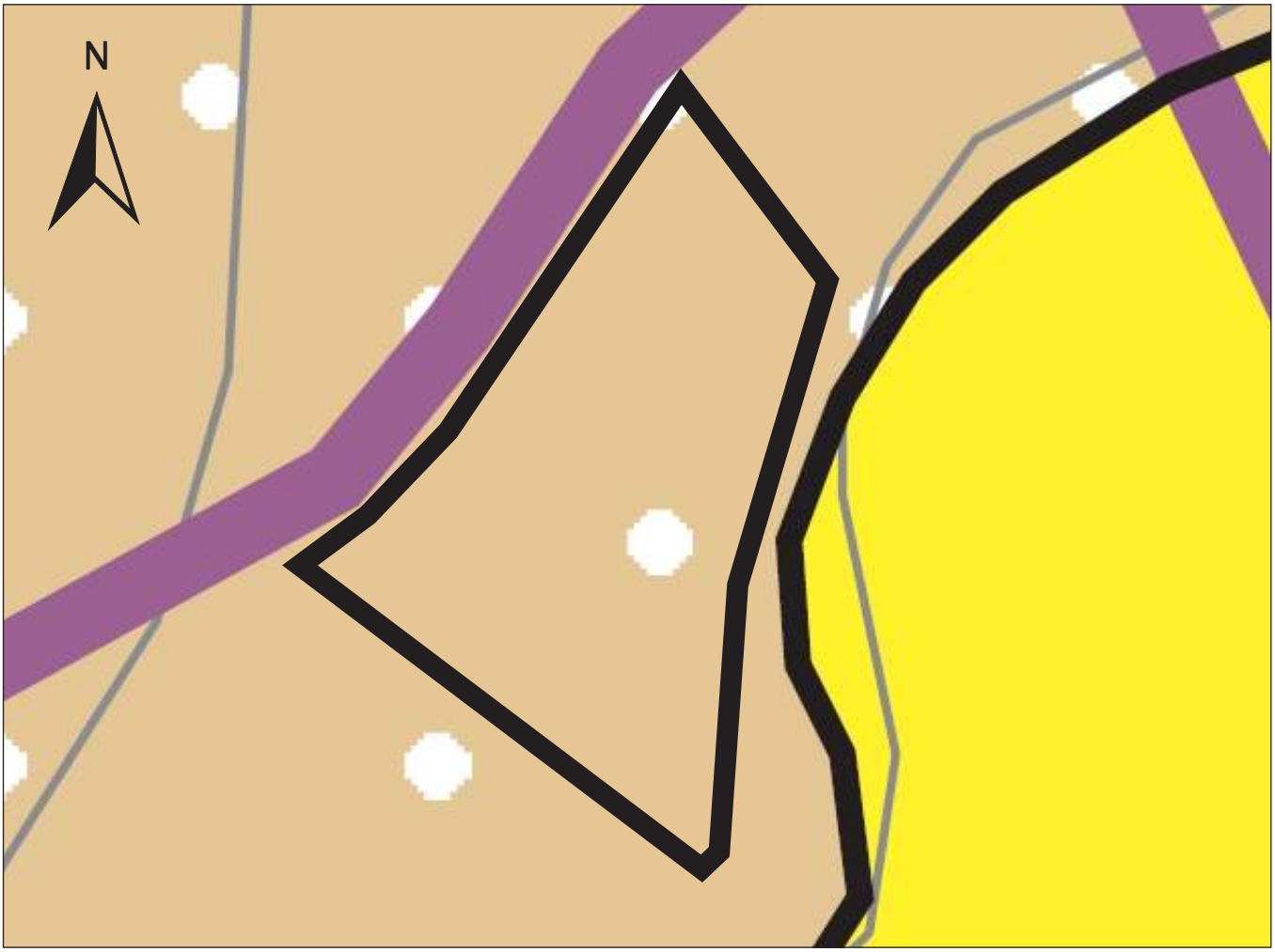
Report integrity

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Geoenvironmental issues

This report does not cover issues of site contamination unless specifically required to do so by the client. In the absence of such a request, Geoton take no responsibility for such issues.

Figures



Approximate Scale (m)

0 10 20 30 40 50

MAP EXTRACT FROM - MRT TASMANIAN LANDSLIDE HAZARD SERIES : LAUNCESTON - GEOLOGY

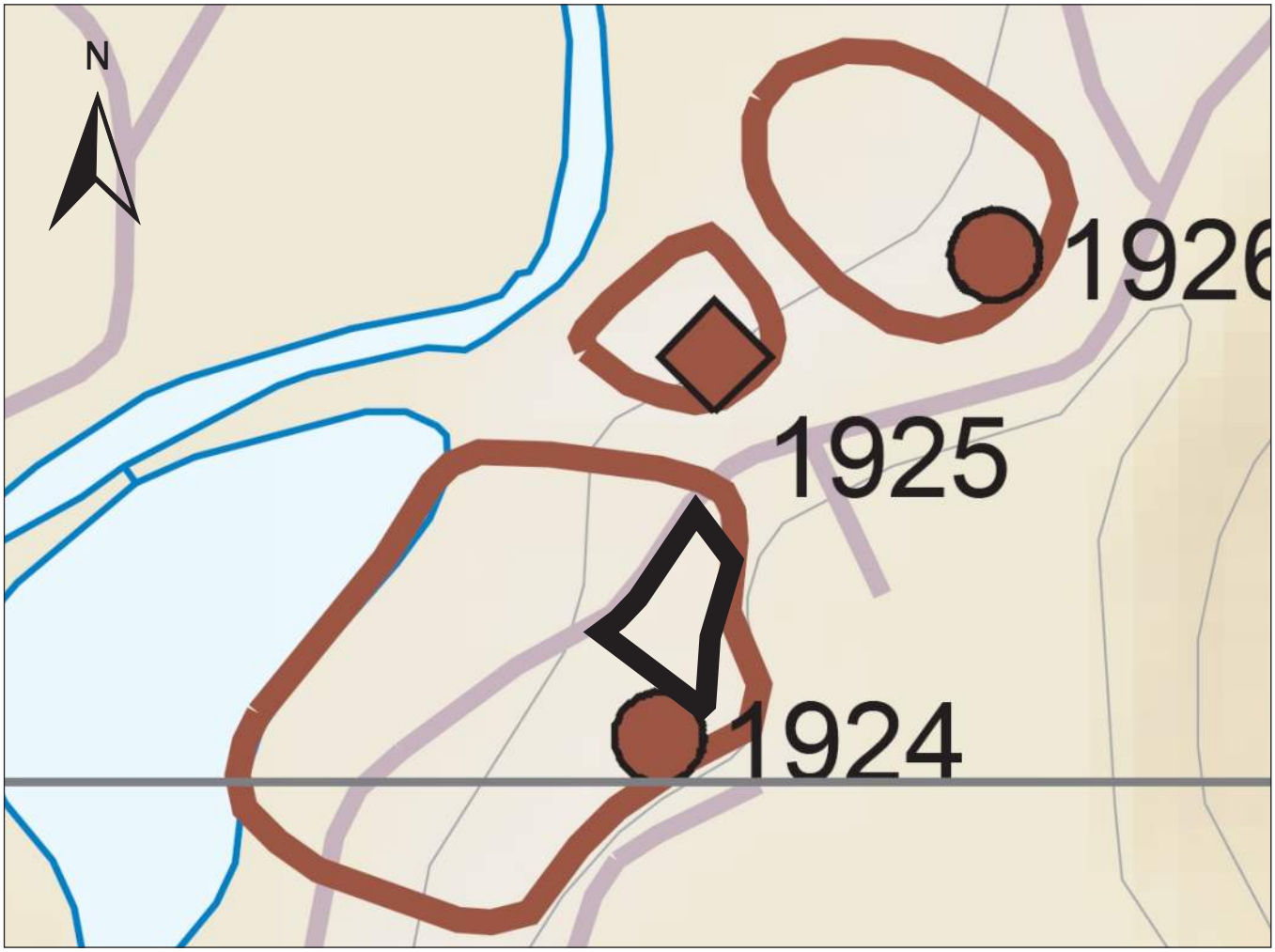
Tsa

Tertiary aged partly consolidated clay, silt and clayey labile sand with rare gravel and lignite; some iron oxide-cemented layers and concentrations; some leaf fossils (Tsa).

TQa

Quaternary aged late Cainozoic terrace deposits of siliceous and dolerite-derived gravel and sand, cemented by iron oxides in places (TQa).

GEOTON Pty Ltd		client:	MR BEICHUAN WANG
		project:	24-26 QUEECHY ROAD NORWOOD
date	30/11/2017	drawn	SZ
scale	As shown	approved	TB
		title:	GEOLOGY SHEET
original size	A4	rev	
		project no:	GL17367A
		figure no.	1



Approximate Scale (m)

0 40 80 120 160 200

MAP EXTRACT FROM - MRT TASMANIAN LANDSLIDE HAZARD SERIES : LAUNCESTON - LANDSLIDE INVENTORY

Landslide Features

- **Landslide, recent or active**
- **Landslide, activity unknown**
- **Possible landslide**

- **Recent or active earth or debris flow.**
- **Recent or active rock or soil slide.**
- **Recent or active rock fall.**
- **Recent or active unclassified.**
- **Possible landslide, activity not specified.**

- **Earth or debris flow, activity unknown.**
- **Rock or soil slide, activity unknown**
- **Rock fall, activity unknown.**
- **Unclassified type, activity unknown.**
- **Block or complex spread, activity unknown.**

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		project:	24-26 QUEECHY ROAD NORWOOD
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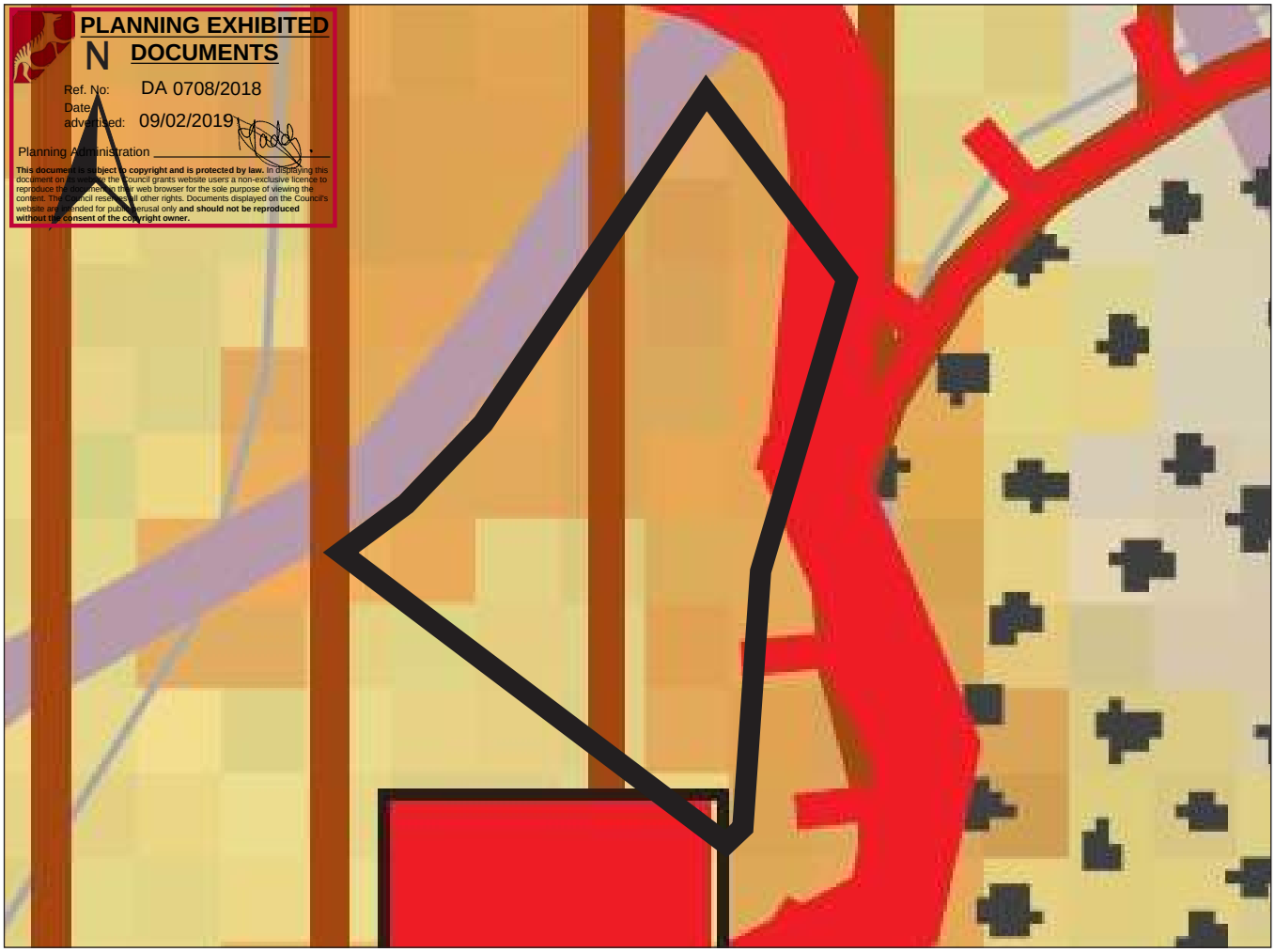
scale	As shown	approved	TB
original size	A4	rev	
		title:	LANDSLIDE INVENTORY SHEET
		project no:	GL17367A
		figure no.	2



Approximate Scale (m)

0 10 20 30 40 50

MAP EXTRACT FROM - MRT TASMANIAN LANDSLIDE HAZARD SERIES : LAUNCESTON - GEOMORPHOLOGY

Selected Geomorphic Components

- Alluvial fan
- Artificial deposit
- Dune
- Floodplain
- Slope deposit
- Terrace
- Structural surface, horizontal or dipping
- Residual surface
- Surface, type uncertain
- Perched valley floor
- Strath terrace
- Talus / colluvium covered Tertiary sediments
- Younger slopes on Tertiary sediments
- Deeply weathered dolerite
- Landslide

Slope Data

- 0 - 2 degrees
- 2 - 7 degrees
- 7 - 13 degrees
- 13 - 35 degrees
- 35 - 42 degrees
- > 42 degrees

- Escarpment
- Inner gorge escarpment of the Cataract Gorge
- Terrace edge
- Lineament visible on aerial photographs.
- Fault - position approximate
- Fault - inferred and position approximate
- Fault - concealed.
- Municipality boundary
- 1:5000 / 1:25,000 boundary for DEM derivatives
- Landslide point
- Significant knickpoints
- Dip direction and dip of structural slope (5)
- Quarry (derived from MRT DEPOSITS database) - Includes both active and historic features

Note: The techniques used to create the slope layer tends to underestimate values along cliffs.

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		project:	24-26 QUEECHY ROAD NORWOOD
date	30/11/2017	drawn	SZ
scale	As shown	approved	TB
original size	A4	rev	
title:	GEOMORPHOLOGY SHEET		
project no:	GL17367A	figure no.	3

MAP EXTRACT FROM - MRT TASMANIAN LANDSLIDE HAZARD SERIES : LAUNCESTON - SLIDE SUSCEPTIBILITY

Susceptibility Zones for First Time Failure

- **Regression area**
- **Source area**
- **Runout area**

Regression area: An area up-slope of a source area that could fail following a deep-seated landslide movement (a.k.a retrogression or set-back area)

Source area: An area of hillside with the potential to form a slope failure, identified largely on the basis of slope angle and geology

Runout area: An area down-slope of a source area where the moving earth, debris or rock can potentially travel

Approximate Scale (m)

0 10 20 30 40 50

Susceptibility Zones for Landslide Reactivation

- **Landslide, recent or active**
- **Landslide, activity unknown**
- **Possible landslide, activity unknown**

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scale	As shown	approved	TB
original size	A4	rev	

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title: SLIDE SUSCEPTIBILITY SHEET

project no: GE17367A

figure no. 4

Approximate Scale (m)

0 10 20 30 40 50

MAP EXTRACT FROM - MRT TASMANIAN LANDSLIDE HAZARD SERIES : LAUNCESTON - POTENTIAL LANDSLIDE HAZARDS

Modelled Landslide Hazard Zones

- Area above higher threshhold (Tb)
- Area above lower threshold (Ta)
- Buffer zone

Other Potential Hazard Zones

- Younger slope on Tertiary sediments from Geomorphology map
- Tertiary sediments derived from Geology map

Landslide Polygons

- Recent or active deep seated landslide
- Recent or active shallow slide
- Fossil or dormant deep seated landslide
- Fossil or dormant shallow slide

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scale	As shown	approved	TB
original size	A4	rev	

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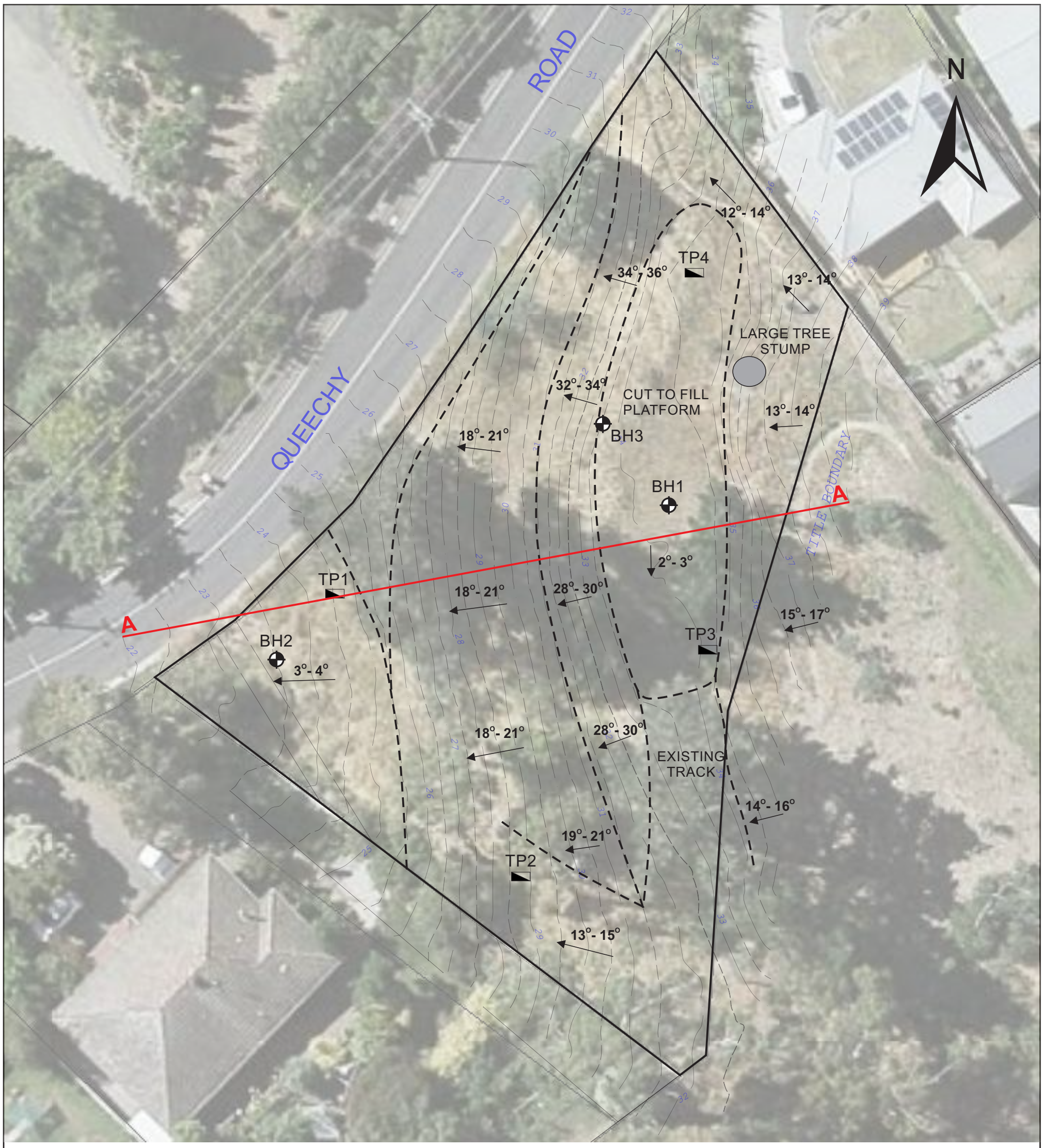
title: POTENTIAL LANDSLIDE HAZARDS SHEET

project no: GL17367A

figure no. 5



Legend

BH1 — Approximate Borehole Location

TP1 — Approximate Borehole Location

– – – – Approximate Change in Slope

8° → Approximate Slope Angle

PLANNING EXHIBITED DOCUMENTS

Ref. No: DA 0708/2018

Date advertised: 09/02/2019

Planning Administration _____

Approximate Scale (m)

0 5 10 15 20 25

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				project:	24-26 QUEECHY ROAD NORWOOD
date	30/11/2017	drawn	MB/SZ		
scale	As shown	approved	TB	title:	SITE PLAN
original size	A3	rev		project no: GL17367A	figure no. 6

Appendix A

Borehole Logs

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ENGINEERING BOREHOLE LOG

Geotechnical Consultants
PO Box 522 Prospect TAS 7250
Unit 24, 16-18 Goodman Court, Invermay TAS
T (03) 6326 5001

Borehole no. BH1
Sheet no. 1 of 1
Job no. GL17367A

Client : Mr Beichuan Wang
Project : Landslide Risk Assessment
Location : 24 - 26 Queechy Road, Norwood

Date : 23/10/2017
Logged By : MB

Drill model : Gemco
Hole diameter : 150mm

Easting:
Northing:

Slope: 90°
Bearing: -

RL Surface :
Datum :

Method	Support	Penetration	Water	Notes Samples Tests	Depth (m)	Graphic log	Classification Symbol	Material Description	Moisture condition	Consistency density, index	Structure, additional observations
								FILL - Clayey Silt, low plasticity, brown mottled grey, mixed sub-angular gravel, with medium grained sand	M/D	F	FILL bricks and concrete, glass
											NATURAL
							Cl	SANDY CLAY - medium plasticity, brown mottled grey/pink/white, with silt	M	VSt	roots/root fibers V = 124 kPa
					1.00						
				SPT @1.5m 3,6,11 N = 17	2.00						
							SC	CLAYEY SAND - medium to coarse grained, high plasticity clay, grey mottled orange, with silt	M/D	D/ VD	D (2.0-2.25m) PI=32% LL=55% LS=11%
				SPT @3.0m 4,11,12 N = 23	3.00			becoming grey mottled orange and brown			
AD	N				4.00		SM	SILTY SAND - fine to medium grained, grey mottled orange	D	D/ VD	hollow flight auger refusal
					5.00			becoming medium to coarse grained, brown mottled white/grey/black		VD	@ 4.5m, switched to solid tip
				SPT @6.0m 11,12,13 N = 25	6.00			becoming grey mottled brown, with clay	D/M	D	resumed hollow flight auger @6.0m
					7.00						
				SPT @7.5m 9,15,17 N = 32			SC	CLAYEY SAND - fine grained, brown/ grey, low plasticity clay	D/M	VD	
					8.00			Borehole BH1 auger refusal @ 7.9m on very dense silty sand			

ENGINEERING BOREHOLE LOG

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Borehole no. BH2
Sheet no. 1 of 2
Job no. GL17367A

Client : Mr Beichuan Wang
Project : Landslide Risk Assessment
Location : 24 - 26 Queechy Road, Norwood
Date : 23/10/2017
Logged By : MB

Drill model : Gemco
Hole diameter : 150mm
Easting:
Northing:
Slope: 90°
Bearing: -
RL Surface :
Datum :

Method	Support	Penetration	Water	Notes Samples Tests	Depth (m)	Graphic log	Classification Symbol	Material Description	Moisture condition	Consistency density, index	Structure, additional observations
AD	N							FILL - Silty Sand, fine to medium grained, dark brown, with fine angular gravel	D	MD	FILL brick fragments
										VD	NATURAL root fibres
							SM	SILTY SAND - medium grained, brown mottled red and black, with fine sub-angular gravel	D		
				SPT	1.00						
				@1.5m 8,8,9 N = 17			CH	SILTY CLAY - high plasticity, red/ brown mottled grey, trace fine sub-angular gravel, with medium grained sand	D	H/F	
					2.00				M	H	D (2.3-2.6m) PI=46% LL=73% LS=12%
				SPT	3.00						
				@3.0m 5,7,9 N = 16							
					4.00		SM	SILTY SAND - fine to medium grained, brown mottled white/yellow, cemented, trace clay	D	VD	
				SPT							
				@4.5m 10,13,14 N = 27	5.00						
							CH	SILTY CLAY - high plasticity, grey mottled orange, with fine rounded gravel	M	VSt	
				SPT	6.00			becoming grey mottled orange and pink			
				@6.0m 7,11,14 N = 25				becoming brown/grey mottled orange and pink			
					7.00						
				SPT							
				@7.5m 5,8,11 N = 19	8.00			Continued next page			

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ENGINEERING BOREHOLE LOG

Borehole no. BH2
Sheet no. 2 of 2
Job no. GL17367A

Client : Mr Beichuan Wang
Project : Landslide Risk Assessment
Location : 24 - 26 Queechy Road, Norwood
Date : 24/10/2017
Logged By : MB

Drill model : Gemco
Hole diameter : 150mm
Easting:
Northing:
Slope: 90°
Bearing: -
RL Surface :
Datum :

Method	Support	Penetration	Water	Notes Samples Tests	Depth (m)	Graphic log	Classification Symbol	Material Description	Moisture condition	Consistency density, index	Structure, additional observations
											drilling stopped 23/10/2017
											drilling resumed 24/10/2017
											D (8.3-8.5m) PI=56% LL=87% LS=11.5%
AD	N			SPT @9.0m 8,14,18 N = 32	9.00			becoming red mottled orange and grey, increase in sand		H	
			▽		10.0						groundwater recorded @ 10.0m on 24/10/2017
				SPT @10.5m 6,14,16 N = 30	11.0			becoming brown/purple mottled orange, with iron stone layers			
								Borehole BH2 refusal @ 11.25m on hard silty clay			
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

ENGINEERING BOREHOLE LOG

GEOTON Pty Ltd
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Unit 24, 16-18 Goodman Court, Invermay TAS
T (03) 6326 5001

Borehole no. BH3
Sheet no. 1 of 1
Job no. GL17367A

Client : Mr Beichuan Wang
Project : Landslide Risk Assessment
Location : 24 - 26 Queechy Road, Norwood
Date : 24/10/2017
Logged By : MB

Drill model : Gemco
Hole diameter : 150mm
Easting:
Northing:
Slope: 90°
Bearing: -
RL Surface :
Datum :

Method	Support	Penetration	Water	Notes Samples Tests	Depth (m)	Graphic log	Classification Symbol	Material Description	Moisture condition	Consistency density, index	Structure, additional observations
AD	N				1.00			FILL - Sandy Clay/Silty Sand, brown mottled orange, fine to medium grained sand, mixed gravel			FILL roots V = 85 kPa
					2.00		CI	SANDY CLAY - medium plasticity, grey mottled orange	M	VSt	NATURAL V = 128 kPa
					3.00			Borehole BH3 terminated @ 2.0m			
					4.00						
					5.00						
					6.00						
					7.00						
					8.00						

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ENGINEERING EXCAVATION LOG

Test Pit no. TP1
Sheet no. 1 of 1
Job no. GL17367A

Client : Mr Beichuan Wang
Project : Landslide Risk Assessment
Location : 24 - 26 Queechy Road, Norwood
Date : 19/10/2017
Logged By : MB

Excavator: Kobelco 7-Tonne
Bucket: 1.2m Mud
Length:
Easting:
Northing:
RL Surface :
Datum :

Method	Support	Penetration	Water	Notes Samples Tests	Depth (m)	Graphic log	Classification Symbol	Material Description	Moisture condition	Consistency density, index	Structure, additional observations
								FILL - Clayey Silt/Sandy Silt, brown mottled orange/red, with cobbles and boulders	M/D	MD	FILL roots, concrete fragments, bricks
					0.50						
							SM	TOPSOIL - Silty Sand, fine to medium grained, brown, with fine to medium sub-rounded gravel	M/D	D	TOPSOIL V > 140 kPa root fibers
										D	NATURAL V > 140 kPa
					1.00		SM	SILTY SAND - fine grained, brown, with clay, weakly cemented	D		
										VD	PP > 500 kPa switched to 450mm bucket
EX	N				1.50						V > 140 kPa
					2.00			becoming brown/orange mottled red and black			V > 140 kPa
					2.50			becoming moderately cemented, little to no clay			switched to auger
					3.00						
					3.50			Test Pit TP1 near refusal @ 3.4m on very dense silty sand			
					4.00						

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ENGINEERING EXCAVATION LOG

Test Pit no. TP2
Sheet no. 1 of 1
Job no. GL17367A

Client : Mr Beichuan Wang
Project : Landslide Risk Assessment
Location : 24 - 26 Queechy Road, Norwood
Date : 19/10/2017
Logged By : MB

Excavator: Kobelco 7-Tonne
Bucket: 450mm
Length:
Easting:
Northing:
RL Surface :
Datum :

Method	Support	Penetration	Water	Notes Samples Tests	Depth (m)	Graphic log	Classification Symbol	Material Description	Moisture condition	Consistency density, index	Structure, additional observations
EX	N							TOPSOIL - Silty Sand, fine grained, brown	D	L	TOPSOIL root fibres
					0.50		CH	SILTY CLAY - high plasticity, brown/ orange mottled red/black, with rounded gravel, with cobbles and boulders	M	VSt	V > 140 kPa V = 110 kPa
					1.00			becoming brown/orange mottled pink, with rounded medium gravel			large burnt roots
					1.50						V > 140 kPa
					2.00						V = 138 kPa
					2.50		ML	SANDY SILT - low plasticity, grey mottled orange, fine grained sand	D	VD	PP = 400 kPa PP > 500 kPa
					3.00			Test Pit TP2 near refusal @ 2.8m on very dense sandy silt			
					3.50						
					4.00						

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ENGINEERING EXCAVATION LOG

Test Pit no. TP3
Sheet no. 1 of 1
Job no. GL17367A

Client : Mr Beichuan Wang
Project : Landslide Risk Assessment
Location : 24 - 26 Queechy Road, Norwood
Date : 19/10/2017
Logged By : MB

Excavator: Kobelco 7-Tonne
Bucket: 450mm
Length:
Easting:
Northing:
RL Surface :
Datum :

Method	Support	Penetration	Water	Notes Samples Tests	Depth (m)	Graphic log	Classification Symbol	Material Description	Moisture condition	Consistency density, index	Structure, additional observations
EX	N							TOPSOIL - Silty Sand, fine grained, brown	D	L	TOPSOIL root fibres
					0.50		CI	SILTY CLAY - medium plasticity, brown mottled grey/orange, trace medium grained sand	M	VSt	root fibres V = 110 kPa
					1.00			becoming grey mottled orange, with medium grained sand, weakly cemented	M/D	VSt /H	V = 138 kPa
					1.50				M/D	H	V > 140 kPa
					2.00						V > 140 kPa PP > 500 kPa
					2.50		ML	SANDY SILT - low plasticity, grey mottled orange, medium grained sand	D	VD	
					3.00			Test Pit TP3 near refusal @ 2.7m on very dense sandy silt			
					3.50						
					4.00						

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Tel (03) 6326 5001

ENGINEERING EXCAVATION LOG

Test Pit no. TP4
Sheet no. 1 of 1
Job no. GL17367A

Client : Mr Beichuan Wang
Project : Landslide Risk Assessment
Location : 24 - 26 Queechy Road, Norwood
Date : 19/10/2017
Logged By : MB

Excavator: Kobelco 7-Tonne
Bucket: 450mm
Length:
Easting:
Northing:
RL Surface :
Datum :

Method	Support	Penetration	Water	Notes Samples Tests	Depth (m)	Graphic log	Classification Symbol	Material Description	Moisture condition	Consistency density, index	Structure, additional observations
								FILL - Sandy Silt/Silty Sand, brown, fine grained sand	M	MD	FILL root fibres/roots
					0.50			FILL - Silty Clay, high plasticity, orange/brown mottled grey, with fine to medium grained sand	M	St	V = 60 kPa
EX	N				1.00		CH	SILTY CLAY - high plasticity, grey mottled orange/red	M	VSt	NATURAL V = 110 kPa
					1.50						V = 112 kPa
					2.00						V = 100 kPa
					2.50						PP = 260 - 280 kPa
					3.00						PP = 240 - 260 kPa
					3.50			Test Pit TP4 terminated @ 3.0m			
					4.00						

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Investigation Log Explanation Sheet

Method – Borehole

TERM	Description
AS	Auger Screwing*
AD	Auger Drilling*
RR	Roller / Tricone
W	Washbore
CT	Cable Tool
HA	Hand Auger
DT	Diatube
B	Blank Bit
V	V Bit
T	TC Bit

* Bit shown by suffix e.g. ADT

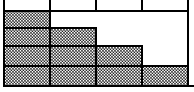
Method – Excavation

TERM	Description
N	Natural exposure
X	Existing excavation
H	Backhoe bucket
B	Bulldozer blade
R	Ripper
E	Excavator

Support

TERM	Description
M	Mud
N	Nil
C	Casing
S	Shoring

Penetration

1	2	3	4	
				No resistance ranging to refusal

Water

Symbol	Description
	Water inflow
	Water outflow
	17/3/08 water on date shown

Notes, samples, tests

TERM	Description
U_{50}	Undisturbed sample 50 mm diameter
U_{63}	Undisturbed sample 63 mm diameter
D	Disturbed sample
N	Standard Penetration Test (SPT)
N*	SPT – sample recovered
N_C	SPT with solid cone
V	Vane Shear
PP	Pocket Penetrometer
P	Pressumeter
B_S	Bulk sample
E	Environmental Sample
R	Refusal
DCP	Dynamic Cone Penetrometer (blows/100mm)

Classification symbols and soil description

Based on unified classification system

Moisture

TERM	Description
D	Dry
M	Moist
W	Wet
W_P	Plastic Limit
W_L	Liquid Limit

Consistency/Density index

TERM	Description
VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	Very dense

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Soil Description Explanation Sheet(1of 2)

DEFINITION:

In engineering terms soil includes every type of uncemented or partially cemented inorganic or organic material found in the ground. In practice, if the material can be remoulded or disintegrated by hand in its field condition or in water it is described as a soil. Other materials are described using rock description terms.

CLASSIFICATION SYMBOL & SOIL NAME

Soils are described in accordance with the Unified Classification System (UCS) as shown in the table on Sheet 2.

PARTICLE SIZE DESCRIPTIVE TERMS

NAME	SUBDIVISION	SIZE
Boulders		>200 mm
Cobbles		63 mm to 200 mm
Gravel	coarse	20 mm to 63 mm
	medium	6 mm to 20 mm
	fine	2.36 mm to 6 mm
Sand	coarse	600 µm to 2.36 mm
	medium	200 µm to 600 µm
	Fine	75 µm to 200 µm

MOISTURE CONDITION

Dry Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.

Moist Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.

Wet As for moist but with free water forming on hands when handled.

CONSISTENCY OF COHESIVE SOILS

TERM	UNDRAINED STRENGTH s_u (kPa)	FIELD GUIDE
Very Soft	<12	A finger can be pushed well into the soil with little effort.
Soft	12 - 25	A finger can be pushed into the soil to about 25mm depth.
Firm	25 - 50	The soil can be indented about 5mm with the thumb, but not penetrated.
Stiff	50 - 100	The surface of the soil can be indented with the thumb, but not penetrated.
Very Stiff	100 - 200	The surface of the soil can be marked, but not indented with thumb pressure.
Hard	>200	The surface of the soil can be marked only with the thumbnail.
Friable	–	Crumbles or powders when scraped by thumbnail.

DENSITY OF GRANULAR SOILS

TERM	DENSITY INDEX (%)
Very loose	Less than 15
Loose	15 - 35
Medium Dense	35 - 65
Dense	65 - 85
Very Dense	Greater than 85

MINOR COMPONENTS

TERM	ASSESSMENT GUIDE	PROPORTION OF MINOR COMPONENT IN:
Trace of	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component.	Coarse grained soils: <5% Fine grained soils: <15%
With some	Presence easily detected by feel or eye, soil properties little different to general properties of primary component.	Coarse grained soils: 5 - 12% Fine grained soils: 15 - 30%

SOIL STRUCTURE

ZONING		CEMENTING	
Layers	Continuous across exposure or sample.	Weakly cemented	Easily broken up by hand in air or water.
Lenses	Discontinuous layers of lenticular shape.	Moderately cemented	Effort is required to break up the soil by hand in air or water.
Pockets	Irregular inclusions of different material.		

GEOLOGICAL ORIGIN

WEATHERED IN PLACE SOILS

Extremely weathered material	Structure and fabric of parent rock visible.
Residual soil	Structure and fabric of parent rock not visible.

TRANSPORTED SOILS

Aeolian soil	Deposited by wind.
Alluvial soil	Deposited by streams and rivers.
Colluvial soil	Deposited on slopes (transported downslope by gravity).
Fill	Man made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils
Lacustrine soil	Deposited by lakes.
Marine soil	Deposited in ocean basins, bays, beaches and estuaries.

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Soil Description Explanation Sheet (2 of 2)

SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60 mm and basing fractions on estimated mass)							**USC**	**PRIMARY NAME**
COARSE GRAINED SOILS More than 50% of materials less than 63 mm is larger than 0.075 mm	(About the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than 2.0 mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.			GW	GRAVEL
				Predominantly one size or a range of sizes with more intermediate sizes missing.			GP	GRAVEL
			GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below)			GM	SILTY GRAVEL
				Plastic fines (for identification procedures see CL below)			GC	CLAYEY GRAVEL
		SANDS More than half of coarse fraction is smaller than 2.0 mm	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate sizes missing			SW	SAND
				Predominantly one size or a range of sizes with some intermediate sizes missing.			SP	SAND
			SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).			SM	SILTY SAND
				Plastic fines (for identification procedures see CL below).			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% of Material less than 63 mm is smaller than 0.075 mm	(A 0.075 mm particle is about the smallest particle visible to the naked eye)		IDENTIFICATION PROCEDURES ON FRACTIONS <0.2 mm.					
		SILTS & CLAYS Liquid limit less than 50	**DRY STRENGTH**	**DILATANCY**	**TOUGHNESS**			
			None to Low	Quick to slow	None		ML	SILT
			Medium to High	None	Medium		CL	CLAY
			Low to medium	Slow to very slow	Low		OL	ORGANIC SILT
		SILTS & CLAYS Liquid limit greater than 50	Low to medium	Slow to very slow	Low to medium		MH	SILT
			High	None	High		CH	CLAY
			Medium to High	None	Low to medium		OH	ORGANIC CLAY
HIGHLY ORGANIC SOILS			Readily identified by colour, odour, spongy feel and frequently by fibrous texture.				Pt	PEAT

● Low plasticity – Liquid Limit WL less than 35%. ● Medium plasticity – WL between 35% and 50%.

COMMON DEFECTS IN SOIL

TERM	**DEFINITION**	**DIAGRAM**
PARTING	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (eg bedding). May be open or closed.	
JOINT	A surface or crack across which the soil has little or no tensile strength but which is not parallel or sub parallel to layering. May be open or closed. The term 'fissure' may be used for irregular joints <0.2 m in length.	
SHEARED ZONE	Zone in clayey soil with roughly parallel near planar, curved or undulating boundaries containing closely spaced, smooth or slickensided, curved intersecting joints which divide the mass into lenticular or wedge shaped blocks.	
SHEARED SURFACE	A near planar curved or undulating, smooth, polished or slickensided surface in clayey soil. The polished or slickensided surface indicates that movement (in many cases very little) has occurred along the defect.	

TERM	**DEFINITION**	**DIAGRAM**
SOFTENED ZONE	A zone in clayey soil, usually adjacent to a defect in which the soil has a higher moisture content than elsewhere.	
TUBE	Tubular cavity. May occur singly or as one of a large number of separate or inter-connected tubes. Walls often coated with clay or strengthened by denser packing of grains. May contain organic matter	
TUBE CAST	Roughly cylindrical elongated body of soil different from the soil mass in which it occurs. In some cases the soil which makes up the tube cast is cemented.	
INFILLED SEAM	Sheet or wall like body of soil substance or mass with roughly planar to irregular near parallel boundaries which cuts through a soil mass. Formed by infilling of open joints.	

Appendix B

Photographs

PLATE 1 - THE STEEP FILL BATTER SLOPES IN THE CENTRAL PORTION OF THE SITE LOOKING TO THE SOUTH

PLATE 2 - THE CUT TO FILL BENCH LOOKING TO THE SOUTH

GEOTON Pty Ltd				client:	MR BEICHUAN WANG
				project:	24-26 QUEECHY ROAD NORWOOD
title:	PHOTOGRAPH				
date:	23/10/2017	original size	A4	project no.	GL17367A
				figure no.	PLATES 1 & 2

PLATE 3 - THE SLOPES UPHILL OF THE CUT TO FILL PLATFORM LOOKING TO THE SOUTH

PLATE 4 - THE EXISTING TRACK LOOKING TO THE SOUTH

GEOTON Pty Ltd				client:	MR BEICHUAN WANG	
				project:	24-26 QUEECHY ROAD NORWOOD	
title:	PHOTOGRAPH					
date:	23/10/2017	original size	A4	project no:	GL17367A	figure no. PLATES 3 & 4

Appendix C

Stability Analyses

SLIDEINTERPRET 7.030

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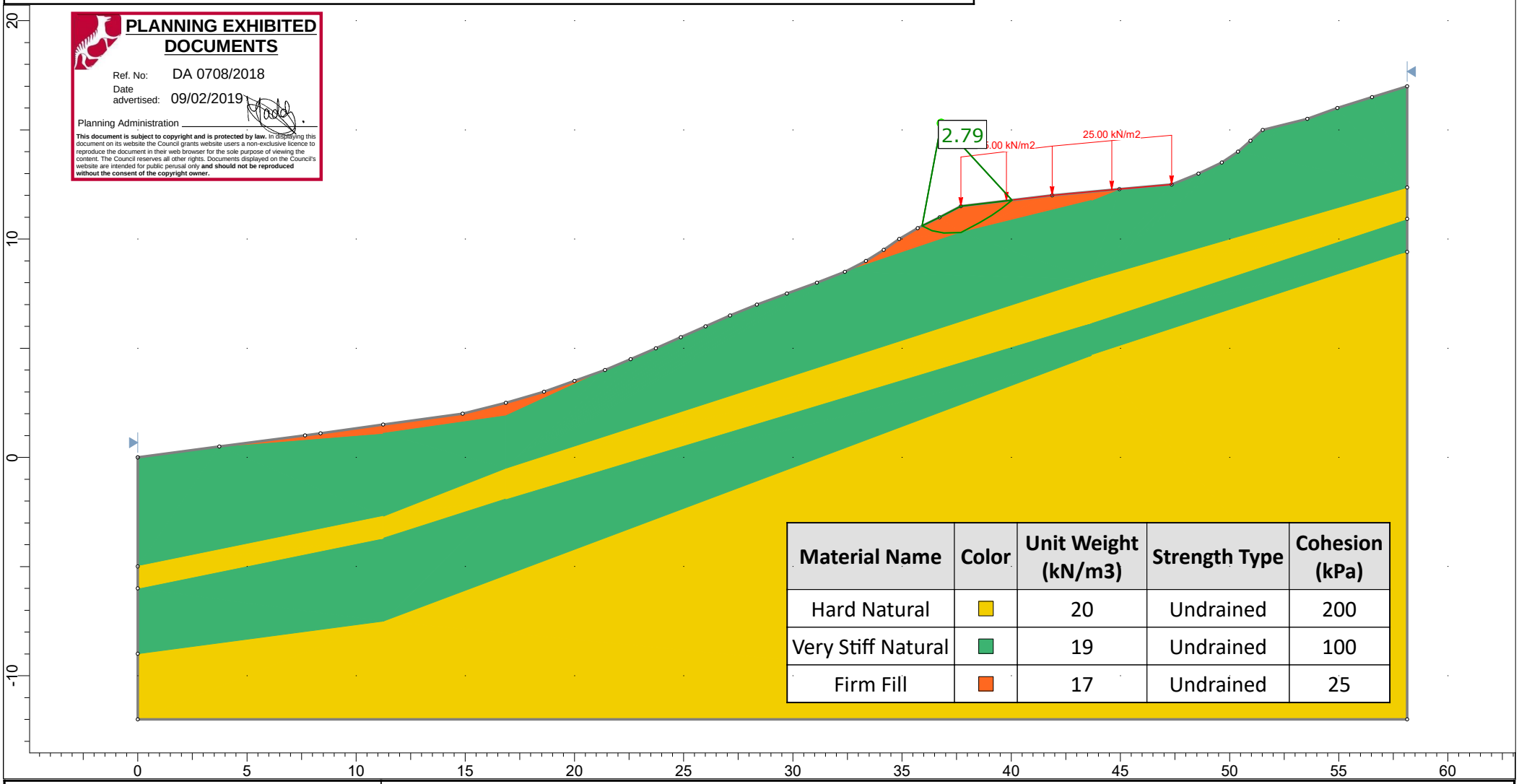
24-26 Queechy Road, Norwood



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)
Hard Natural		20	Undrained	200
Very Stiff Natural		19	Undrained	100
Firm Fill		17	Undrained	25

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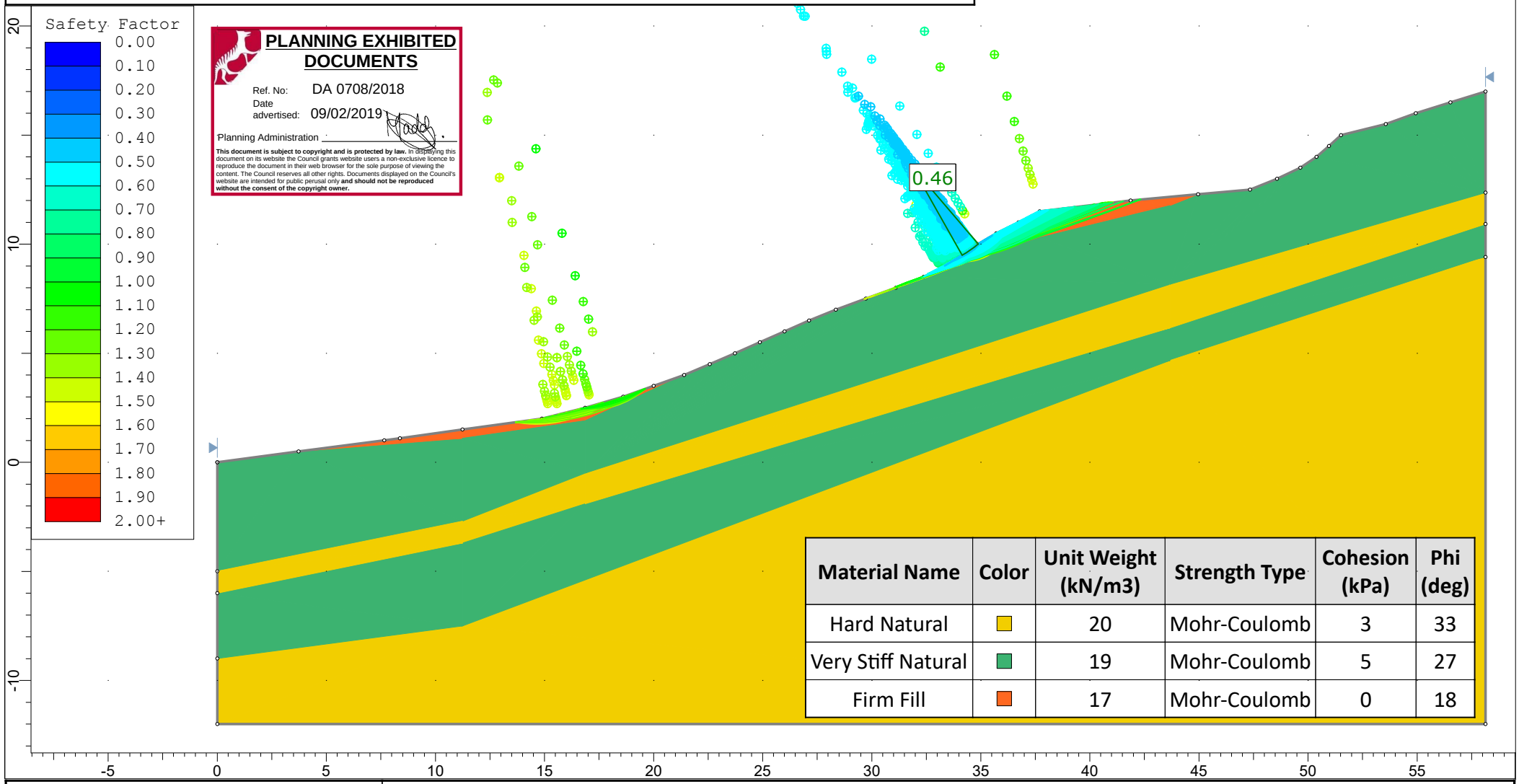
SLIDEINTERPRET 7.030

Project	24-26 Queechy Road, Norwood			
Analysis Description	Short-term, Loaded			
Drawn By	SZ	*Scale*	1:250	*Company* Geoton
Date	27/11/2017			*File Name*

SLIDEINTERPRET 7.030

GEOTON Pty Ltd

24-26 Queechy Road, Norwood



PLANNING EXHIBITED DOCUMENTS

Ref. No: DA 0708/2018
Date advertised: 09/02/2019

Planning Administration

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Hard Natural		20	Mohr-Coulomb	3	33
Very Stiff Natural		19	Mohr-Coulomb	5	27
Firm Fill		17	Mohr-Coulomb	0	18

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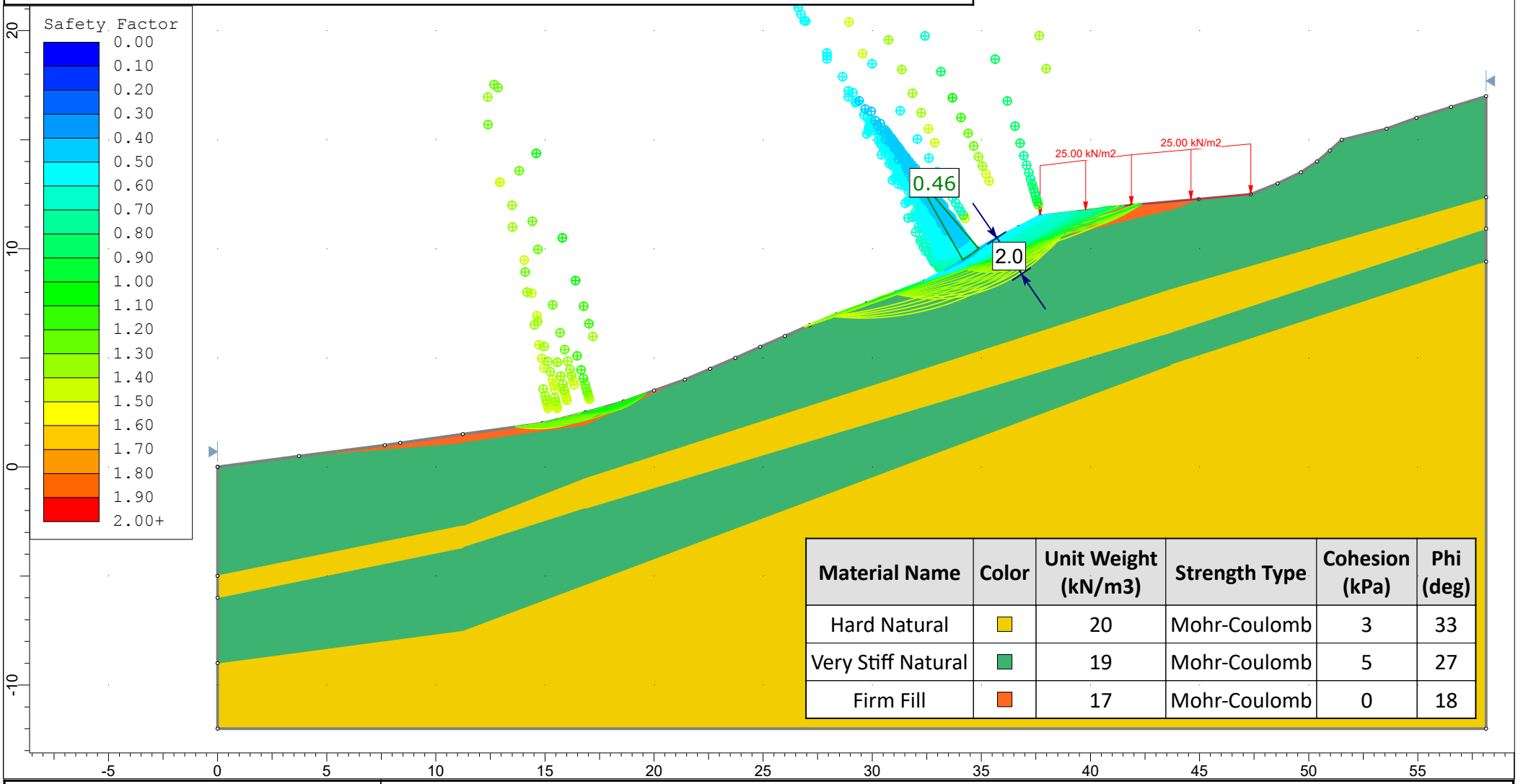
SLIDEINTERPRET 7.030

Project	24-26 Queechy Road, Norwood			
Analysis Description	Long-term, Slip Surfaces of FOS=<1.5			
Drawn By	SZ	*Scale*	1:250	*Company* Geoton
Date	27/11/2017			*File Name*

SLIDEINTERPRET 7.030

GEOTON Pty Ltd

24-26 Queechy Road, Norwood



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Hard Natural		20	Mohr-Coulomb	3	33
Very Stiff Natural		19	Mohr-Coulomb	5	27
Firm Fill		17	Mohr-Coulomb	0	18

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SLIDEINTERPRET 7.030

Project	24-26 Queechy Road, Norwood				
Analysis Description	Long-term, Loaded, Slip Surfaces of FOS=<1.5				
Drawn By	SZ	*Scale*	1:250	*Company*	Geoton
Date	27/11/2017			*File Name*	

Appendix D

Qualitative Terminology for Use in Assessing Risk to Property

QUALITATIVE TERMINOLOGY FOR USE IN ASSESSING RISK TO PROPERTY

QUALITATIVE MEASURES OF LIKELIHOOD

Approximate Annual Probability		Implied Indicative Landslide Recurrence Interval		Description	Descriptor	Level
Indicative Value	Notional Boundary					
10^{-1}	5x10-2	10 years	20 years	The event is expected to occur over the design life.	ALMOST CERTAIN	A
10-2	5x10-3	100 years	200 years	The event will probably occur under adverse conditions over the design life.	LIKELY	B
10-3	5x10-4	1000 years	2000 years	The event could occur under adverse conditions over the design life.	POSSIBLE	C
10-4	5x10-5	10,000 years	20,000 years	The event might occur under very adverse circumstances over the design life.	UNLIKELY	D
10-5	5x10-6	100,000 years	200,000 years	The event is conceivable but only under exceptional circumstances over the design life.	RARE	E
10-6		1,000,000 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 Damage		Description	Descriptor	Level
Indicative Value	Notional Boundary			
200%	100%	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%	40%	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%	1%	Limited damage to part of structure, and/or part of site requiring some reinstatement stabilisation works.	MINOR	4
0.5%		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), stabilization 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

QUALITATIVE TERMINOLOGY FOR USE IN ASSESSING RISK TO PROPERTY (CONTINUED)

QUALITATIVE RISK ANALYSIS MATRIX – LEVEL OF RISK TO PROPERTY

LIKELIHOOD		CONSEQUENCES TO PROPERTY (With Indicative Approximate Cost 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	H	M or L (5)
B - LIKELY	10^{-2}	VH	VH	H	M	L
C - POSSIBLE	10^{-3}	VH	H	M	M	VL
D - UNLIKELY	10^{-4}	H	M	L	L	VL
E - RARE	10^{-5}	M	L	L	VL	VL
F - BARELY CREDIBLE	10^{-6}	L	VL	VL	VL	VL

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.
H	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.
M	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

Appendix E

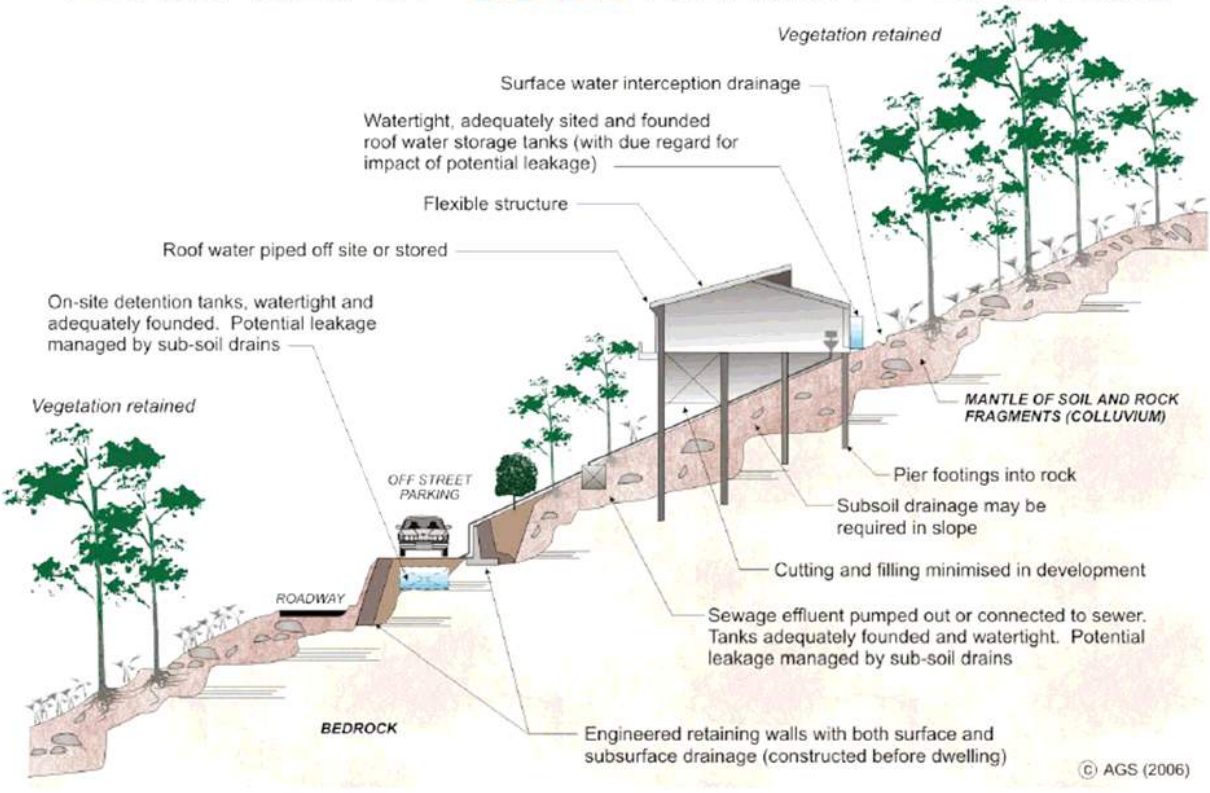
Some Guidelines for Hillside Construction

PRACTICE NOTE GUIDELINES FOR LANDSLIDE RISK MANAGEMENT 2007

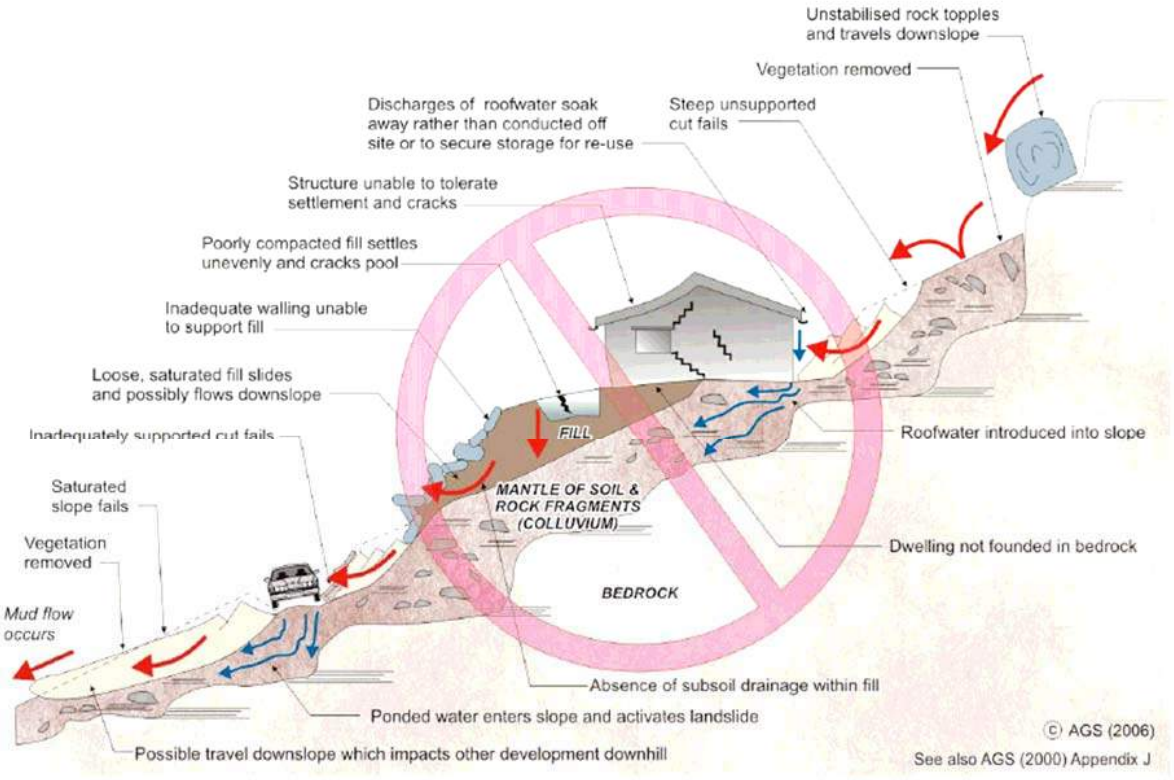
APPENDIX - SOME GUIDELINES FOR HILLSIDE CONSTRUCTION

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

EXAMPLES OF GOOD HILLSIDE PRACTICE



EXAMPLES OF POOR HILLSIDE PRACTICE



Appendix F

Certificate Forms

CERTIFICATE OF QUALIFIED PERSON – ASSESSABLE ITEM

Section 321

Form **55**

To: Mr Beichuan Wang *Owner /Agent*
26 Miller Drive *Address*
HAPPY VALLEY SA 5159 *Suburb/postcode*

Qualified person details:

Qualified person: Tony Barriera - Geoton Pty. Ltd.
Address: PO Box 522 Phone No: 03 6326 5001
Prospect Tas 7250 Fax No:
Licence No: CC6220 P Email address: tbarriera@geoton.com.au

Qualifications and Insurance details: Tony Barriera – BE, MSc
Chartered Professional Engineer
NER - Civil, Geotechnical
Lloyd's of London - XL4888016794
(description from Column 3 of the Director's Determination - Certificates by Qualified Persons for Assessable Items

Speciality area of expertise: Geotechnical Engineering
(description from Column 4 of the Director's Determination - Certificates by Qualified Persons for Assessable Items)

Details of work:

Address: 24 – 26 Queechy Road Lot No: 31
Norwood Tas 7250 Certificate of title No: 21308/31

The assessable item related to this certificate: Classification of foundation conditions according to AS2870 - 2011

(description of the assessable item being certified)
Assessable item includes –
- *a material;*
- *a design*
- *a form of construction*
- *a document*
- *testing of a component, building system or plumbing system*
- *an inspection, or assessment, performed*

Certificate details:

Certificate type: Foundation Site Classification – AS2870
(description from Column 1 of Schedule 1 of the Director's Determination - Certificates by Qualified Persons for Assessable Items n)

This certificate is in relation to the above assessable item, at any stage, as part of - *(tick one)*

building work, plumbing work or plumbing installation or demolition work: ☐

or

a building, temporary structure or plumbing installation: X

In issuing this certificate the following matters are relevant –

Documents:	Geoton Pty Ltd, Report Reference No. GL17367Ab, dated 04/12/2017
Relevant calculations:	Refer to report
References:	AS 1726 – 2017 Geotechnical site investigation AS 2870 – 2011 Residential Slabs and Footings

Substance of Certificate: *(what it is that is being certified)*

Site Classification in accordance to AS2870 - 2011
Findings and recommendations of report

Scope and/or Limitations

The classification applies to the site as investigated at the time and does not account for any future alteration to foundation conditions resulting from earthworks, drainage condition changes or site maintenance variations.

I certify the matters described in this certificate.

	Signed:	*Certificate No:*	*Date:*
Qualified person:		GL17367Ab	04/12/2017