1988/19. Examination of Pleasant Hills Subdivision Stage III

B. D. Weldon

Abstract

An investigation of the proposed stage III subdivision for Vos Nominees Pty Ltd at Pleasant Hills has been undertaken. Geomorphological features in the area suggest that landslides have occurred in the geological past. Combinations of slope and underlying materials are used to delineate areas considered unsuitable for housing development and certain areas are excluded. A seepage issuing near a body of wind blown sand is considered to have contributed to a more recent landslide feature. Drainage of the seepage is required.

Introduction

Slope classificationn at the proposed Pleasant Hills subdivision for Vos Nominees Pty Ltd by Weldon (1986) identified areas which were at risk with respect to slope stability. Phase III of the subdivision has now been planned and as some of the at risk areas are included in the proposal, a more detailed examination was requested by Campbell Smith, Phelps Pedley Pty Ltd who act on behalf of the developer. It is understood that all of stage III will be sewered.

The majority of stage III occurs within zone IV of the provisional Tamar Valley Landslip Zone Map 3877 (Windermere), i.e. old landslips and adjacent areas. In the southwestern and southern portions the land is classified as Zone I, i.e. stable ground on hard rocks.

Twelve test pits were excavated and logged on 24 May 1988. The pits were dug by a Domino DIG tracked mini-excavator. The location of the test pits are shown on Figure 1. The engineering logs prepared from the exposures are attached as Appendix 1.

Geological setting

The majority of the area under consideration is covered by a veneer of Quaternary age high plasticity clayey soils derived from the weathering of Tertiary age basalt which occurs on the higher ground, and Tertiary age sediments known as the Launceston Beds (fig. 1). These soils have moved downslope by soil creep processes over geological time obscuring the boundary between the basalt and the sediments. Around the southwestern and southern portions of stage III, Jurassic age dolerite crops out. The extent of the dolerite is also obscured by the veneer of soils.

Slope classification

The slopes steeper than 12° have been delineated on Figure 2. Those portions which are underlain by dolerite or basalt are not expected to present stability problems. However where the underlying materials are Tertiary sediments caution is required.

Discussion

The steeper slope segment on proposed lots 118 and 121 are considered to be underlain by Tertiary sediments. These are exposed in gully erosion on proposed lot 118. Development on these slopes should be excluded as indicated on Figure 3.

On proposed lots 83 and 84 a body of fine sand, probably wind blown, occurs on the steeper slope portion. The slope flattens about midway along proposed lot 84 and towards the rear of proposed lot 83. Seepages issue in this area and these appear to feed a waterhole on proposed lot 89. The origin of the seepages is unknown but it is speculated that they mark the base of the basalt as is seen elsewhere in the Tamar Valley. The seepages probably wetted the wind blown sand causing it to accumulate and not be blown away by subsequent winds.

Proposed lot 89 is relatively flat but continuing downslope and below the proposed road reservation, a steeper slope segment occurs near proposed lots 94 and 95. An old landslide feature occurs on lot 95 and its head scarp is probably the steeper slope segment adjacent the road reserve. The landslide was probably lubricated by the seepages issuing above the waterhole on proposed lot 89.

Development on proposed lot 84 and the steeper portion of proposed lot 83 should be excluded as indicated on Figure 3. Development should not be allowed in the vicinity of the waterhole on proposed lot 89. The waterhole should be infilled with free draining materials (coarse gravel and boulders with little or no fines) an outlet provided and the seepages also should be properly drained.

Development on the old landslide feature on proposed lot 95 should be restricted as indicated on Figure 3. Rearrangement of proposed lots 94 and 95 would produce a more satisfactory subdivisional plan.

The soils on the steeper slope segments of proposed lots 125, 126, 128 and 131 appear to contain materials which if allowed to become saturated or undercut could become prone to mass movements involving shallow (less than 2 m deep) landslide movements. This is not seen as an impediment to the proposed development provided potential landowners follow 'good house-keeping practices' and maintain drainage and properly retain cuttings and fillings.

Conclusions

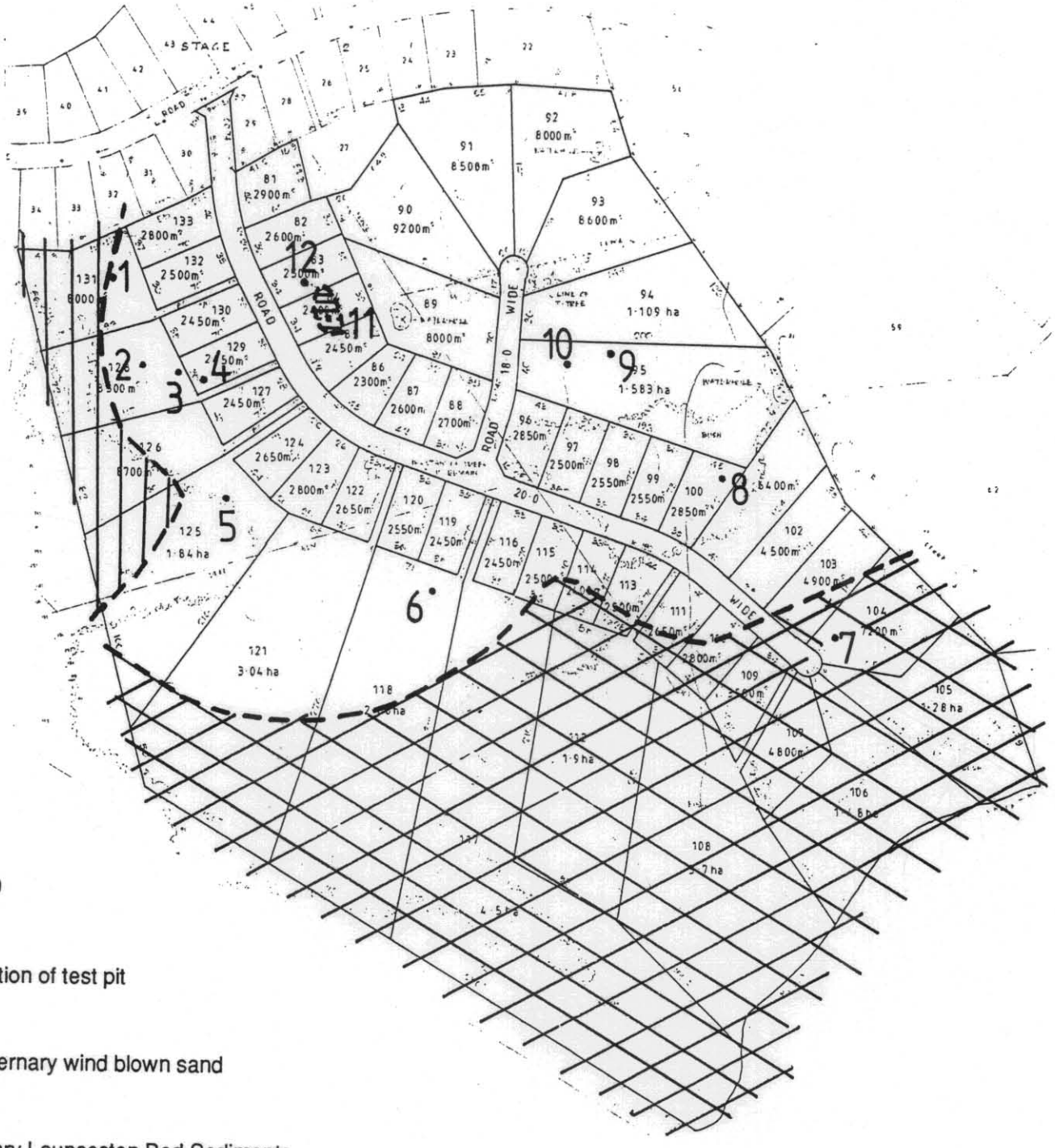
The proposed development of stage III Pleasant Hills has been examined. Certain areas with steeper slopes and underlying soft rocks (Tertiary and Quaternary age

sediments) should be excluded for building purposes. These areas are delineated on Figure 3.

References

WELDON, B.D. 1986 Slope stability at a proposed subdivision at Rosevears. *Unpubl. Rep. Dep. Mines Tasm.* 1986/76

[23 June 1988]



LEGEND

Location of test pit

Quaternary wind blown sand

Tertiary Launceston Bed Sediments

Tertiary basalt

Jurassic dolerite

Figure 1. 1 : 5 000 scale plan showing location of test pits and geology. Pleasant Hills subdivision, stage III.

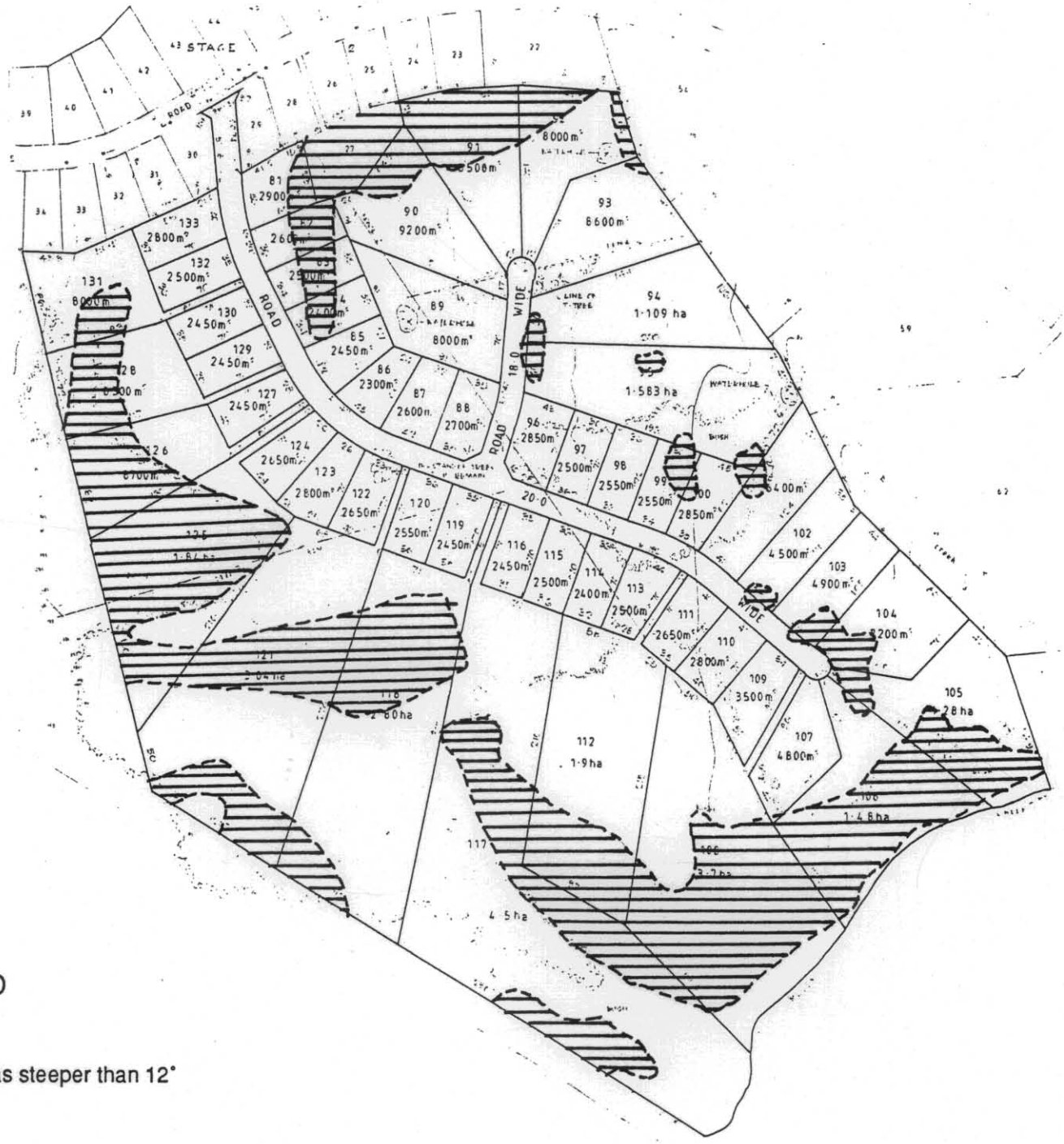
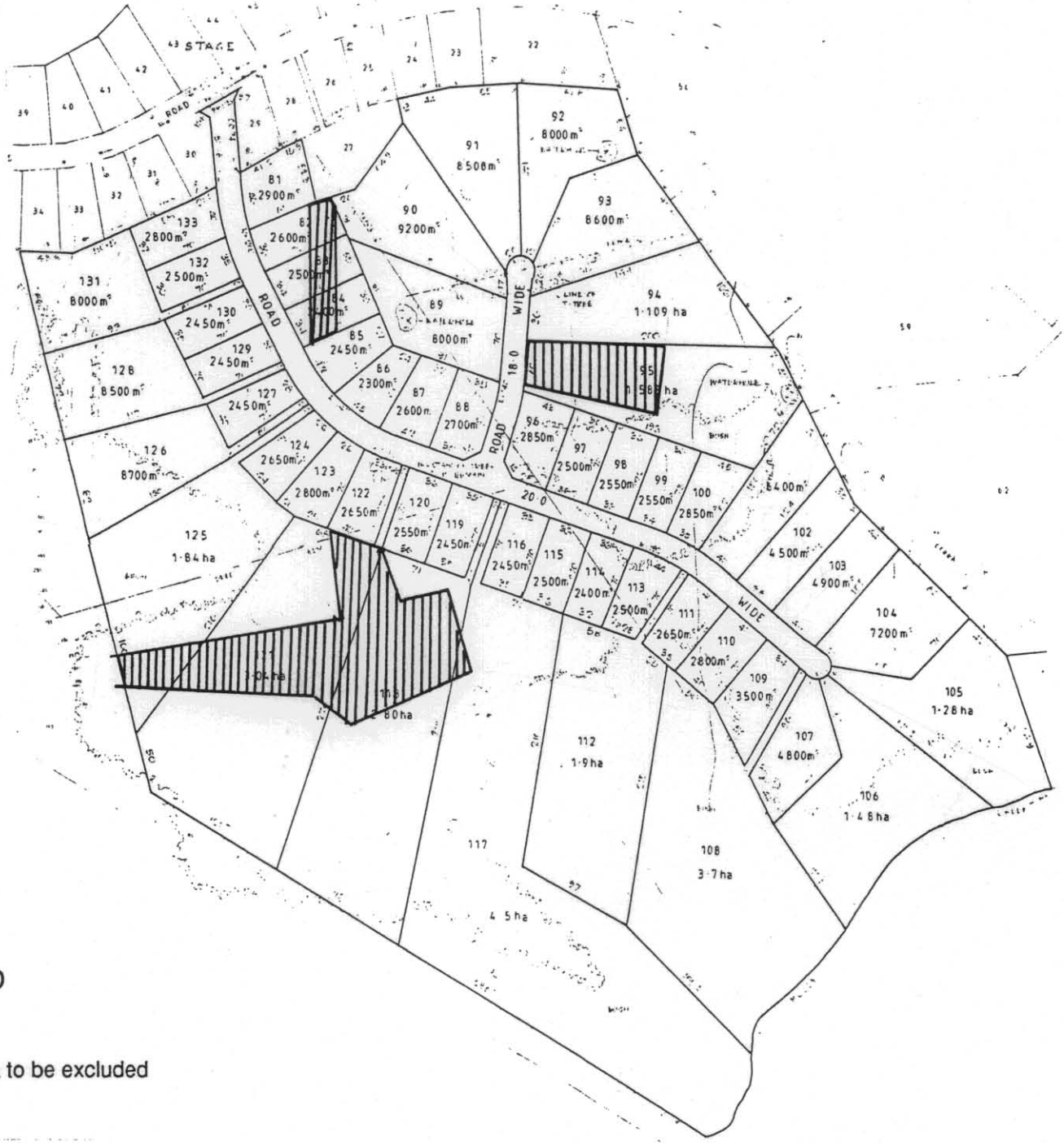


Figure 2. 1 : 5 000 scale plan showing areas which are steeper than 12°. Pleasant Hills proposed subdivision, stage III.

5 cm



LEGEND

Area to be excluded

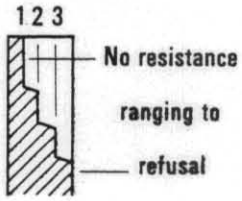
Figure 3. 1 : 5 000 scale plan showing areas which are **NOT SUITABLE** for building and where development should be **EXCLUDED.** Pleasant Hills proposed subdivision, stage III.

5 cm

EXPLANATION SHEET FOR ENGINEERING LOGS

Borehole and excavation log

Penetration



Water

22 Jan, 80 Water level on date shown.

Water inflow.

Water outflow.

Notes - samples and tests

U50	Undisturbed sample 50mm diameter.
D	Disturbed sample.
N	Standard penetrometer blow count for 300mm.
N*	SPT + sample.

Material classification

Based on Unified Soil Classification System.

In Graphic Log materials are represented by clear contrasting symbols consistent for each project.

Moisture content

D	Dry, looks and feel dry.
M	Moist, no free water on hand when remoulding.
W	Wet, free water on hand when remoulding.
LL	Liquid limit.
PL	Plastic limit.
PI	Plasticity Index.

eg. M > PL – Moist, moisture content greater than the plastic limit.

Consistency

		hand penetrometer (kPa)
VS	Very soft.	< 25
S	Soft.	25 - 50
F	Firm.	50 - 100
St	Stiff.	100 - 200
VSt	Very stiff.	200 - 400
H	Hard.	> 400
Fb	Friable.	

Notes: X on log is test result

— is range of results.

Density index

		%
VL	Very loose.	0 - 15
L	Loose.	15 - 35
MD	Medium dense.	35 - 65
D	Dense.	65 - 85
VD	Very Dense	85 - 100

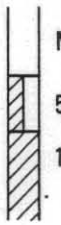
Cored borehole log

Case - lift

Casing used.

Barrel withdrawn.

Fluid loss



No loss

50% loss

100% loss.

Lugeons

Lugeon units (μL) are a measure of rock mass permeability. For a 46 to 74mm diameter borehole 1 Lugeon is defined as a rate of loss of 1 litre per metre per minute. 1 Lugeon is roughly equivalent to a permeability of 1×10^{-4} mm/sec.

Graphic log

No core.

Rock substances represented by clear, contrasting symbols consistent for each project.

Weathering

Fr	Fresh.
SW	Slightly weathered.
HW	Highly weathered.
EW	Extremely weathered.

Strength

		point load strength index $I_{s\,(50)}$ (MPa)
EL	Extremely low.	< 0·03
VL	Very low.	0·03 - 0·1
L	Low.	0·1 - 0·3
M	Medium.	0·3 - 1
H	High	1 - 3
VH	Very high.	3 - 10
EH	Extremely high.	> 10

Note: X on log is test result.

Significant defects

Significant defects shown graphically.

Joint.

Sheared zone.

Crushed seam.

Infill seam.

Extremely weathered seam.

7/10

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

excavation no. 1
sheet 1 of 1

project PLEASANT HILLS STAGE III location Proposed Lot 131

co-ordinates
R.L.
excavation dimensions 3.5 x 0.6m

exposure type test pit
equipment DOMINO DIG
operator

pit commenced 24-5-88
pit completed 24-5-88
logged by R. WELDON
checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
				0.30		CH	CLAY: dark brown high plasticity roots and rootlets some mod. weathered fine grained basalt gravel	M >P.L.	St	x x	
				0.5 / 0.70		CH	CLAY: red-brown high plasticity with some moderate to slightly weathered fine grained basalt boulders to 300mm	M >P.L.	St	x x	
				1 / 1.20		GC	CLAYEY GRAVEL - BOULDERS: light brown to yellow clay with remnant basalt texture surrounding moderately weathered kernels of fine grained basalt	M	MD-D	x x x	
				2			END of EXCAVATION				

sketch

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

excavation no. 2
sheet 1 of 1

project PLEASANT HILLS STAGE III location Proposed Lot 128

co-ordinates
R.L.
excavation dimensions 4 x 0.6m

exposure type test pit
equipment DOMINO DIG
operator

pit commenced 24-5-88
pit completed 24-5-88
logged by A. WELDON
checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
				0.25		CH	CLAY: dark brown high plasticity, roots rootlets some fine grained moderately weathered fine - medium size basalt gravel	M >PL.	St	x	
				0.45		CH	CLAY: red-brown high plasticity, roots some fine grained moderately weathered fine to medium size basalt gravel	M >PL.	St	x x x	
				1.30		GC	CLAYEY GRAVEL: orange-red-brown high plasticity clay surrounding moderately weathered coarse size basalt gravel & boulders	M	MD		
				1.50		GC	CLAYEY GRAVEL: as above but light brown to yellow and with remnant basaltic texture	M	D		
				2			END of EXCAVATION				

sketch

5 cm

9/18

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

excavation no. 3
sheet 1 of 1

project PLEASANT HILLS STAGE III location Proposed Lot 128

co-ordinates
R.L.
excavation dimensions 3 x 0.6 m

exposure type test pit
equipment DOMINO DIG
operator

pit commenced 24-5-88
pit completed 24-5-88
logged by A. WELDON
checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
				0.50		CH	CLAY: dark brown high plasticity occassional moderately weathered fine grained fine size basalt gravel	M >PL	St	x x x	
				0.75			BASALT: fine grained slightly weathered to fresh	M	VD		
				1			END of EXCAVATION				

sketch

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

excavation no. 4
sheet 1 of 1

project PLEASANT HILLS STAGE III location Proposed Lot 129

co-ordinates
R.L.
excavation dimensions 4·2 x 0·6 m

exposure type test pit
equipment DOMINO DIG
operator

pit commenced 24-5-88
pit completed 24-5-88
logged by B. WELDON
checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
				0.20		CH	CLAY: dark brown, high plasticity, roots, rootlets	M >PL.	St		
				0.65		CH	CLAY: red-brown high plasticity with some fine grained moderately weathered fine to medium size basalt gravel	M >PL.	St		
				1.00		CH	CLAY: grey-red-brown high plasticity with pockets of grey-yellow clay which is very moist	M >PL	VSt - St		
				1.30			BASALT: fine grained moderately to slightly weathered				
				2			END of EXCAVATION				

sketch

5 cm

11/18

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

excavation no. 5

sheet 1 of 1

project PLEASANT HILLS STAGE III location Proposed Lot 125

co-ordinates

R.L.

excavation dimensions 4·2 x 0·6 m

exposure type test pit

equipment DOMINO DIG

operator

pit commenced 24-5-88

pit completed 24-5-88

logged by B. WELDON

checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
				0.30		CH	CLAY: dark brown high plasticity roots rootlets, fine size basalt gravel	M >P.L.	St		
				0.90		CH	CLAY: brown, high plasticity, contains pockets of brown-grey clay which are very moist.	M to W >P.L.	F-VSt		pocket of very moist clay
				1 1.50		GC	CLAYEY GRAVEL: red-brown-yellow clay surrounding fine grained moderately weathered medium size basalt gravel and some boulders of basalt in various orientations	M > P.L.	VSt		some shiny surfaces about basalt gravel and boulders
				2			END of EXCAVATION				

sketch

5 cm

12/18

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

excavation no. 6
sheet 1 of 1

project PLEASANT HILLS STAGE III location Proposed Lot 11B

co-ordinates
R.L.
excavation dimensions

exposure type test pit
equipment DOMINO DIG
operator

pit commenced 24-5-88
pit completed 24-5-88
logged by B. WELDON
checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
				0.25		CL	SILTY CLAY: dark grey - black moderate plasticity, roots, rootlets	M >PL.	St		
				0.75		CH	CLAY: yellow-brown high plasticity rootlets occasional limonitic to haematitic nodules	M >PL.	St		
				1			SILTSTONE: brown - yellow - grey moderately to weakly cemented silt and fine sand grains				subvertical joints, planar, smooth, some clay lining.
				1.65							
				2			END of EXCAVATION				

sketch

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

excavation no. 7

sheet 1 of 1

project PLEASANT HILLS STAGE III location Proposed Lot 104

co-ordinates

R.L.

excavation dimensions 4.5 x 0.6 m

exposure type test pit

equipment DOMINO DIG

operator

pit commenced 24-5-88

pit completed 24-5-88

logged by B. WELDON

checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa 25 50 100 200 400	structure, geology
				0.15		CL	SILTY CLAY: dark grey-black, moderate plasticity, roots, rootlets	M St-L	F		
				0.45		CH	CLAY: dark grey-brown, high plasticity roots and some dolerite boulders (MW-HW)	M St-L	F		
				0.95		CH	CLAY: mottled yellow-grey with sand size grains of extremely weathered dolerite, moderate to high plasticity	M ~PL	St-VSt		
				1.50		SC	SANDY CLAY: mottled grey-yellow moderate to high plasticity remnant doleritic texture	M ~PL	H		In situ weathered dolerite
				2			END OF EXCAVATION				

sketch

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

excavation no. 8
sheet 1 of 1

project PLEASANT HILLS STAGE III location Proposed Lot 100

co-ordinates
R.L.
excavation dimensions 45 x 0.6 m

exposure type test pit
equipment DOMINO DIG
operator

pit commenced 24-5-88
pit completed 24-5-88
logged by B. WELDON
checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
				0.15		CL	SILTY CLAY: dark grey moderate plasticity	M	Fb		
				0.40		CH	CLAY: grey-brown, high plasticity moisture content much greater than plastic limit	M >P.L	F		
				1.00		CH	CLAY: mottled yellow-brown-grey high plasticity, moisture content greater than plastic limit	M >P.L	VSt		
				1.60		CH	CLAY: grey, high plasticity, moisture content greater than plastic limit	M	H		occassional slickensides on samples brought to surface.
				2			END of EXCAVATION				

sketch

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

excavation no. 9
sheet 1 of 1

project PLEASANT HILLS STAGE III location Proposed Lot 95

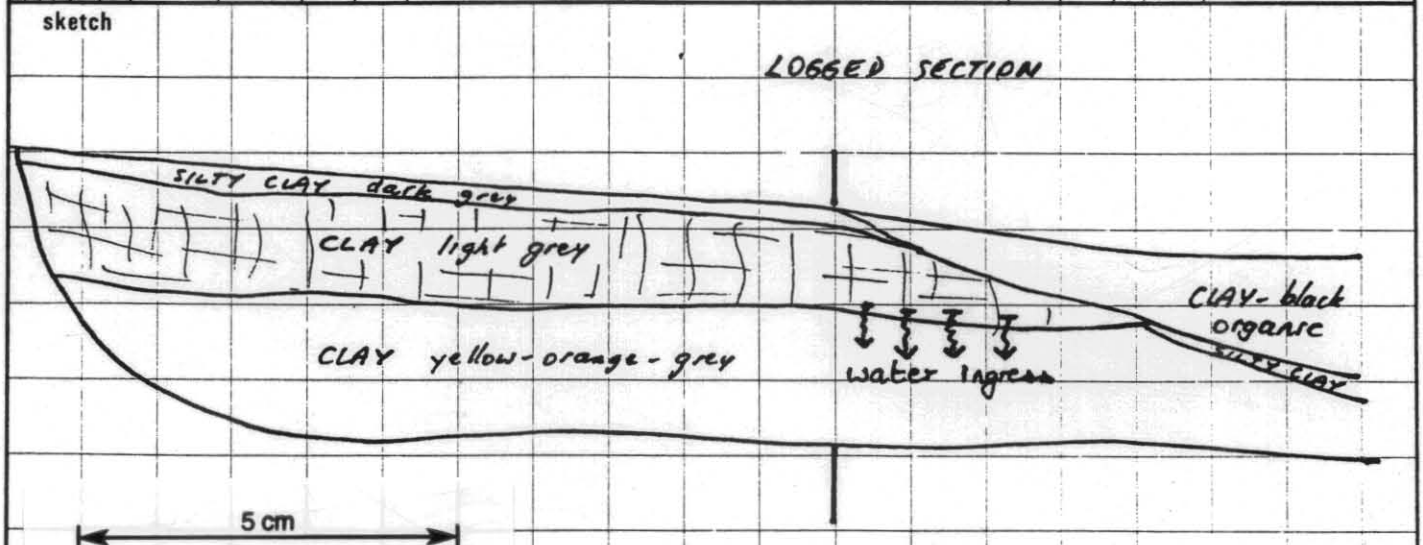
co-ordinates
R.L.
excavation dimensions 7.2 x 0.6 m

exposure type test pit
equipment DOMINO DIG
operator

pit commenced 26-5-88
pit completed 26-5-88
logged by B. WELDON
checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
				0.10		CL	SILTY CLAY: dark grey moderate plasticity	M	Fb		
						CH	CLAY: light grey, high plasticity blocky pedal structure with brown to darker grey clay linings on peds pocket penetrometer >300 kPa material appears to be "loose"	M <P.L.	VSt	x x x	appears to be disturbed – old landslide material
				0.80							
				1		CH	CLAY: yellow-orange-grey. high plasticity. some silty clay lenses, weakly cemented	M >P.L.	St-VSt	x x x	'in situ' Tertiary sediments
				1.60							
				2			END of EXCAVATION				

sketch



TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

excavation no. 10
sheet 1 of 1

project PLEASANT HILLS STAGE III location Proposed Lot 95

co-ordinates
R.L.
excavation dimensions 4.8 x 0.6 m

exposure type test pit
equipment DOMINO DIG
operator

pit commenced 24-5-88
pit completed 24-5-88
logged by B. WELDON
checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
				0.15		CH	CLAY: dark brown, high plasticity, roots	M >P.L.	F		
						CH	CLAY: mottled red-brown, high plasticity with occassional, sub rounded, fine-grained basalt boulders to 350mm ϕ	M >P.L.	St		
				0.70		CH	CLAY: brown high plasticity some silty clay lenses	M <P.L.	H		
				1 1.20		CH	CLAY: grey-brown high plasticity blocky pedal structure with occassional darker grey to brown thin layer (<1mm) lining on pedal surfaces	M < P.L.	VSt -H		
				1.90							
				2			END of EXCAVATION				

sketch

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

excavation no. 11
sheet 1 of 1

project PLEASANT HILLS STAGE III location Proposed Lot 84

co-ordinates
R.L.
excavation dimensions 5.2 x 0.6m

exposure type test pit
equipment DOMINO DIG
operator

pit commenced 24-5-88
pit completed 24-5-88
logged by B. WELDON
checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
				0.25		SP	SAND: dark brown - black, fine grained sub rounded quartz grains, roots	M	L		
				0.75		SP	SAND: light brown fine grained subrounded quartz grains	M	L		
				1 / 1.60		SP	SAND: as above but yellow in colour and contains pockets or lenses of grey to brown medium plasticity clay.	D-M	L		
				2 / 2.50		SP	SAND: as above but yellow-brown in colour contains pockets and lenses of grey - brown medium plasticity clay and occassional green coloured clay and sand layers	M	MD		
							END of EXCAVATION				

sketch

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

excavation no. 12
sheet 1 of 1

project PLEASANT HILLS STAGE III location Proposed Lot 83

co-ordinates
R.L.
excavation dimensions 5.2 x 0.6m

exposure type test pit
equipment DOMINO DIG
operator

pit commenced 24-5-88
pit completed 24-5-88
logged by B. WELDON
checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa 25 50 100 200 400	structure, geology
				0.20		CL	SILTY CLAY: dark brown - black. moderate plasticity, roots + rootlets	M	Fb		
				0.45		CH	CLAY: dark brown high plasticity rootlets	M >P.L.	St-VSt		
				1.05		GC	GRAVELLY CLAY WITH BOULDERS: brown high plasticity clay surrounding fine grained boulders of basalt. sub-angular	M >P.L.	VSt		
				1.30		CH	CLAY: yellow-brown moderate to high plasticity, partially cemented	M ~P.L.	H		
				1.90		CH	CLAY: dark to medium grey. high plasticity clay with poorly developed pedal structure	M <P.L.	H		
				2			END OF EXCAVATION				

sketch

5 cm