UR1980-44

1/18

1980/44. Interim report on the slope stability of G.C. Burgess and Forrest Estate subdivisions at Rostella Road, Dilston

W.R. Moore

Abstract

The subdivisions inspected comprise a flat terrace bordering a scarp of 19° - 21° that slopes down to the River Tamar floodplain. Slope failure has occurred on this scarp, and from the surface inspection appears to be an active retrogressive failure (possibly a multiple slip circle) being kept active by subsurface drainage of the terrace in an upper capping layer.

Subsurface investigation by trenching, drilling and refraction seismic survey showed no capping layer present, and no aquifers were seen in the clay where exposed or drilled. Three clay layers were present, with a surface clay loam soil (OH-OL), a weathered transitional layer of yellow-brown clay (CH), and an unweathered grey and grey mottled red clay (CH) of the Launceston Group of Tertiary age sediments. The clays were highly plastic when wet and were soft and saturated in the upper two layers. The unweathered clay was mostly dry and stiff to hard, and considered a competent rock when dry.

Fissured clay was seen in the one trench in the failed zone, and the unweathered clays were moist. Seismic velocities were lower in the failed zone and stepped, compared with the terrace area. The clay has a low permeability and with no aquifers present in the upper 3 - 8 m investigated, subsurface drainage of the terrace towards the cliffs appears unlikely. That the slope is sensitive is shown in a nearby house, where a broken sewerage line has reactivated movement. An alternative hypothesis for the mode of failure of the slope is suggested, involving normal cliff retreat erosion.

The area was subdivided into three zones; a failed zone, a buffer zone, and stable zone. It is recommended that limited building only occur in the stable zone and all drainage be away from the failed zone. A buffer zone exists between these two zones where the trenches showed small moist areas.

INTRODUCTION

This interim slope stability report is based on a subsurface investigation undertaken to provide geological information for three authorities; the Tamar Regional Master Planning Authority, the Health Services Department and the Lilydale Municipal Council, all of whom are concerned with the decision of sanctioning the two proposed subdivisions.

The two subdivisions, on adjoining land at Dilston [EQ052246], have the same slope stability problem; this problem is a steep scarp that runs through the southern half of the subdivisions. The scarp forms the edge of a river terrace overlooking the River Tamar. Along this scarp landslips have occurred in the recent past and in localised areas have been reactivated, causing structural problems to nearby houses and severe damage to one house.

For this reason a detailed subsurface investigation was necessary and this investigation included ten backhoe trenches, eighteen auger drill holes and two seismic spreads (fig. 1). Laboratory testing of the clays to find their strength properties is currently being undertaken, and will be

followed by some detailed surveying and stability analysis calculations. These laboratory results and stability analyses, together with detailed logs of the trenching and drilling plus the laboratory results and calculations, will not be available for some time and will be the subject of a final report. These results will only be concerned with the failed area on which no building is contemplated or even possible, and will not alter or influence the geological conclusions of this interim report. It is on the basis of these geological conclusions that the three authorities will judge the feasibility of the two subdivisions. Therefore, there is no justification in withholding the information which would delay these decisions until all the information was available in the final report.

SURFACE GEOLOGICAL EXAMINATION OF THE TWO SUBDIVISIONS

Previous geological assessment of the area for slope stability had been confined to surface examination by P.C. Stevenson in 1978, and by the author in 1980. Both private reports were extremely pessimistic and cautious. The slope face is steep (19 - 21°) and has a series of recent failures, and appeared to be an active retrogressive failure of a multiple rotational slide (Shuster and Krizek, 1978). The author thought that a capping layer existed along the top of the scarp and beneath the terrace which was composed of a residual, sandy soil with minor areas of thin terrace gravel overlying a clay loam soil and a clay subsoil grading down to the sediments of the Launceston Group of Tertiary Age (Longman, 1966). Close to the surface in this capping layer minor thin sandstone or siltstone beds or lenses and ironstone bands were anticipated, and through which groundwater could drain off the flat terrace area, migrating towards the slope face and constantly reactivating the failure. In addition the shallow septic tank investigation holes exposed clays which were seen to be highly plastic and prone to failure.

Near the base of the cliff, probably close to river level, a thicker sandstone bed or a harder horizon was anticipated to be present, on which the multiple slide planes would daylight somewhere on the surface of the River Tamar floodplain.

SUBSURFACE INVESTIGATION

Trenching and auger drilling

Trenching showed that the superficial grey sand on the terrace surface was a residual deposit, while later drilling confirmed its distribution as irregular and patchy. The greatest recorded thickness was 150 mm. Only the occasional small quartz pebble was found scattered within the sand, but no discrete terrace gravel deposits were found.

With such a limited thickness and irregular distribution, these sediments are unlikely to form an aquifer which will allow the movement of groundwater towards the slope face. From the measurements taken of the water table during permeability tests, it appears that the water table will be confined to the clay loam soil layer beneath the surface sand.

The true soil of the subdivisions is not the superficial sand but the dark grey clay loam. This soil cover varies from 250 to 600 mm and it is classified as an organic clay with generally a high but variable plasticity (Moon, 1980). This soil is soft to very soft and moist and is underlain by a transitional layer of yellow-brown clay. The boundary separating these two layers is distinct.

The clay of the transitional layer averages over one metre thick, and is high plasticity (CH) and moist, generally soft, and with rare limonite and bauxitic nodules. The lack of strength of this transitional layer was illustrated by the numerous trench walls that collapsed shortly after they had been dug.

Beneath the transitional clay layer is the unweathered, grey and grey-red mottled clay of the Launceston Group of Tertiary age. The boundary separting the grey clay from the overlying weathered clay was sharp. The unweathered clay was dry in the majority of trenches and its compressive strength was stiff to very stiff and increased gradually to hard at the trench bottom where the backhoe reached the point of refusal. The clay was highly plastic (CH) when wet and a few thin zones or seams of wet, highly plastic clay were seen in Trenches 5, 6, 7 and 8 near the scarp edge or over the break in slope (Appendix 1).

No sand, sandy silt or silt beds or lenses were seen in any of the trenches or holes drilled. All excavations showed a uniform lithology of three layers; a surface layer of a clay loam organic soil overlying a weak incompetent moist layer of orange-yellow or brown clay forming a weathered transitional layer with a sharp break from the third layer of unweathered dry clay, which was stiff to very stiff and grey and grey-red mottled coloured.

Small soft areas of moist to very moist clay were only seen in the walls of trenches dug close to the slope edge in the buffer zone, and these were of minor thickness. Only in Trench 4 was water seen; this was not flowing and was located at the transitional and third layer interface. Only in Trench 6, situated in the failed zone, was fissured clay found.

Permeability of the clay layers

Even though the trenching and drilling were undertaken after heavy rain, none of the trenches made water and only one of the eighteen drill holes (Hole 7) made any water (40 mm) in the twelve hours they were left open.

Trench 1 was left open to the bottom of the transitional layer and filled with 0.5 m of water, and then an observation bore was drilled less than one metre from its edge. No water had infiltrated to the hole in the 12 hours that it was left open. Another observation hole was also drilled at less than one metre from the trench and filled with water from a hose. Water movement only occurred in the upper soil layer but could not be seen on the nearby trench wall. When the hose was turned off the water level stabilised rapidly at the base of the soil layer and remained there for the 24 hours. Both the subsurface clay layers were saturated but had a low permeability. This was illustrated in Trench 10 which was dug close to the soft marshy overflow area of a septic tank. No water was present in the trench or on the wall adjoining the overflow area.

As there were no aquifers present in the upper clay layers exposed in the trenches or found in the drilling, the clay is aquiclude and the amount of drainage from the terrace by groundwater to the failed scarp must be minimal.

DEEP DRILLING

In an attempt to see if there was a change in lithology at depth, a

deep hole on site 18 was attempted. Unfortunately the auger drill was too light and a depth of only five metres was reached before the dry hard clay stopped the machine. If a heavier auger drill or a diamond drill becomes available an investigation deep hole will be attempted by the Department. Even the limited depth drilled of five metres indicated that the dry third impervious clay layer would prevent any extra water from stormwater drains or septic tanks reaching any deep aquifer.

SEISMIC INVESTIGATION

The seismic spreads indicated that three velocity layers were present in the clay; a surface velocity layer of 200 - 250 m/s, a second velocity layer of 350 - 500 m/s and a third layer of 850 - 1000 m/s. No stepping was present in these velocities. The depth of these layers coincides approximately with the three layers exposed in the trenches. The third hard clay layer, with a velocity 800 - 1000 m/s, continues to a depth of 8 - 10 m. Greater depth penetration could not have been obtained without the use of unacceptably large amounts of explosives in a built-up area.

The section of the seismic spread that extended over the break in slope to the steeper section of the scarp showed significantly lower velocities than on the terrace. Noticeable stepping was present in the velocities of this failed zone. This stepping is thought to be due to fissures in the clay.

SUGGESTED ALTERNATIVE MODEL FOR SLOPE FAILURE

The model, as suggested by the surface geology, of an active retrogressive failure by a multiple series of slip circle failures appears unlikely from the subsurface investigation. There is no capping layer in the top 8 - 10 m beneath the terrace with aquifers which would allow groundwater to drain towards the scarp face. The surface water drainage is away from the cliff for most of the terrace and the subsurface drainage negligible because of the clay. The existence of a deeper aquifer draining towards the cliff face is possible, but if it is present it does not surface within the boundaries of the subdivision and is not likely to receive water through the clay layers known to be present.

Therefore, it appears a more likely model is that the failures are the result of undercutting of the toe of the scarp by a flood of the River Tamar. This flood was probably very recent geologically (100 - 150 years), giving the failures their young and stepped appearance. Such a type of cliff retreat would be likely to be slower and more sporadic than that visualised by the first model of a retrogressive failure constantly activated by subsurface drainage.

That reactivation is possible and a danger, and the slope stability is sensitive to drainage, is shown by a failure at a nearby house, where severe damage is occurring. The slope failure is clearly due to a broken sewerage pipe to the septic tank, situated at the edge of the scarp.

CONCLUSIONS

(1) Recent slope failure has occurred along the scarp by a mechanism which is yet unproved. These failures have the appearance of being recent and young.

(2) Slope failure reactivation has occurred on nearby blocks and damage to some houses is occurring from broken sewerage and stormwater drains by putting excess water on this slope.

(3) Normal cliff retreat will proceed, but it can be accelerated by draining excess water on to this slope.

(4) On the failed zone fissured clay has been found in Trench 6 and moist layers have also been found in this trench and trenches in the buffer zone.

(5) Fissuring is indicated seismically in the failed zone.

(6) On the terrace the clay soil and subsoil layers are moist and are saturated. The underlying clay is dry and stiff to hard, but when it becomes wet it is highly plastic and soft, as are the two upper clay layers. When dry, the unweathered clay is a competent rock but loses its strength on becoming wet.

(7) The surface clay loam soil, the transition subsoil clay, and grey unweathered clay all have low permeabilities and transmissivity. Any subsurface drainage of the groundwater towards the cliff beneath the terrace appears unlikely. The amount of water the soil and subsoil layer of the terrace can absorb is limited, and any excess of water from septic tanks and stormwater drains must rely on evaporation and surface drainage.

(8) No lenses or thin beds of sand, silt or ironstone layers were found in the clay to act as aquifers for subsurface drainage towards the slope.

(9) Aquifers deeper than the five metres drilled and 8 - 10 m seismically explored are possible below the terrace area, but if they are present there is no evidence that they surface in the two subdivision areas. They are also unlikely to receive any extra water from septic tanks etc. in the stable zone, unless by widely spaced deep fissuring not encountered in the trenches or drill holes or indicated seismically on the terrace.

(10) The surface run-off on the terrace is away from the cliff.

RECOMMENDATIONS

(1) No building should be allowed on the failed zone or the buffer zone. All buildings be confined to the stable areas of the blocks.

(2) One house per block be permitted for each subdivision.

(3) All septic tanks, swimming pools etc. be situated on the stable zone.

(4) All septic tank overflow and stormwater be drained away from the scarp towards Rostella Road.

(5) The existing trees be preserved in the failed zone. Any trees removed from this area should be replaced.

(6) It would be prudent to seal off the existing septic tank with its overflow and any stormwater drains of the Forrest home that flow into this failed zone and replace these with a tank and drains that flow towards the road.

(7) With the aim of increasing the evaporation rate the overflow drain from any septic tank be sand moulded.

REFERENCES

LONGMAN, M.J. 1966. One mile geological map series. K/55-7-39. Launceston. *Explan.Rep.Dep.Mines Tasm.*

MOON, A.T. 1980. Notes on engineering logging of soils and rocks. *Unpubl. Rep.Dep.Mines Tasm.* 1980/1.

SCHUSTER, R.L.; KRIZEK, R.J. 1978. *Landslides analysis and control. Special Report 176. Transportation Research Board.* National Academy of Sciences : Washington.

[13 November 1980]

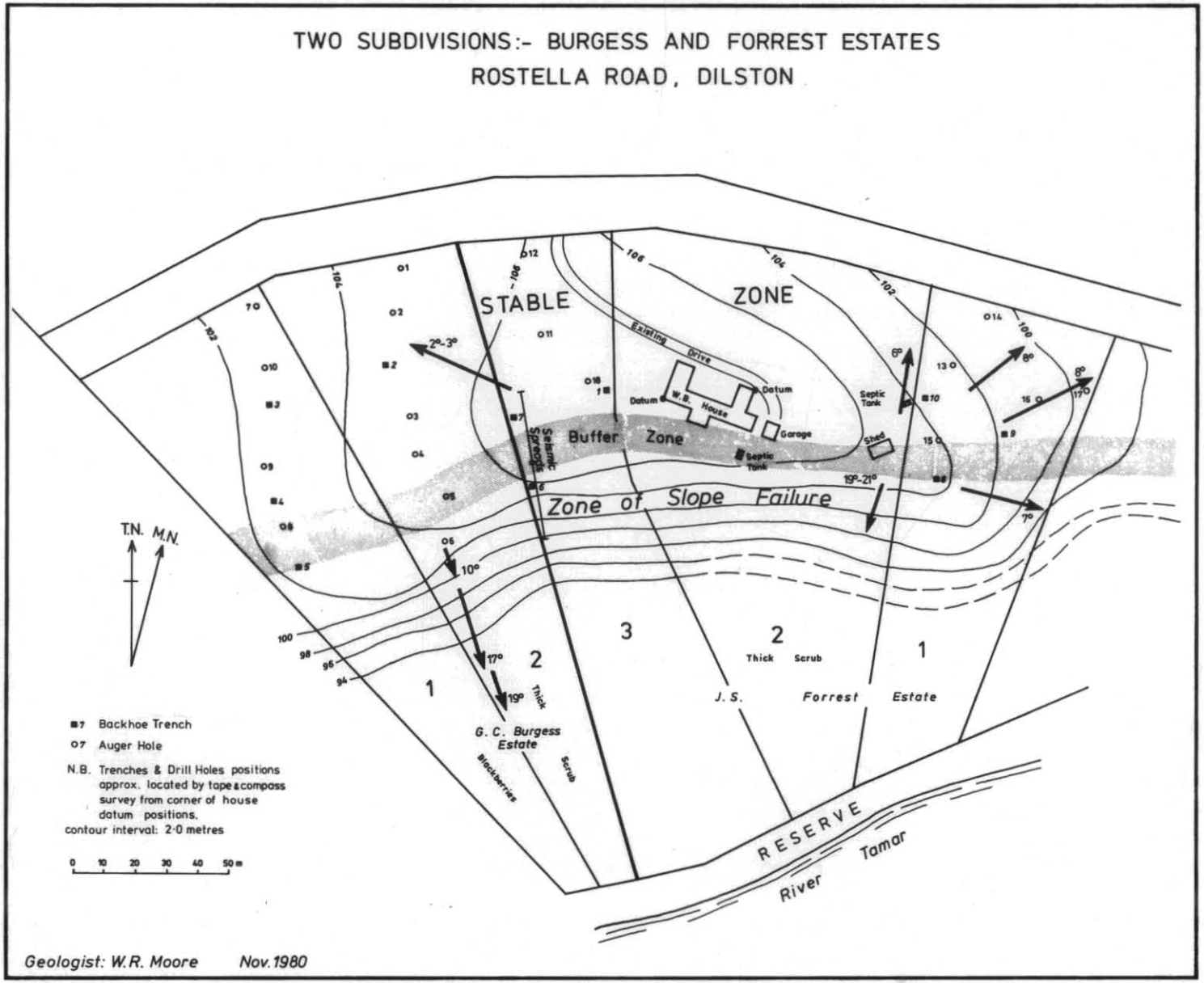

TWO SUBDIVISIONS:- BURGESS AND FORREST ESTATES
ROSTELLA ROAD, DILSTON
STABLE
ZONE
Existing Drive
Buffer Zone
Zone of Slope Failure
Septic Tank
Shed
Garage
Datum
W.B. House
Seepage
T.N.
M.N.
2°-3°
10°
17°
19°
19°-21°
6°
8°
7°
Thick Scrub
J. S. Forrest Estate
G. C. Burgess Estate
Blackberries
Scrub
RESERVE
River Tamar
■7 Backhoe Trench
O7 Auger Hole
N.B. Trenches & Drill Holes positions approx. located by tape & compass survey from corner of house datum positions.
contour interval: 2·0 metres
0 10 20 30 40 50 m
Geologist: W.R. Moore Nov. 1980

Figure 1.

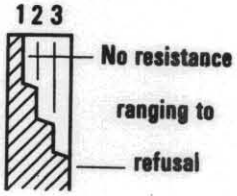
5 cm

TASMANIA DEPARTMENT OF MINES

EXPLANATION SHEET FOR ENGINEERING LOGS

Borehole and excavation log

Penetration



Water

Notes - samples and tests

U50	Undistributed 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

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.

TASMANIA DEPARTMENT OF MINES

5 cm

ENGINEERING LOG – EXCAVATION

excavation no. 1

sheet 1 of 1

9/18

project Subdivision proposals

location G.C. Burgess & Forrest Estate Rostella Road, Dilston

co-ordinates EQ052246

R.L. 32.3 m (106')

excavation dimensions 1.5m x 2m x 2.6m deep

exposure type pit

equipment backhoe

operator M. & G. Contractors

pit commenced 7.10.80

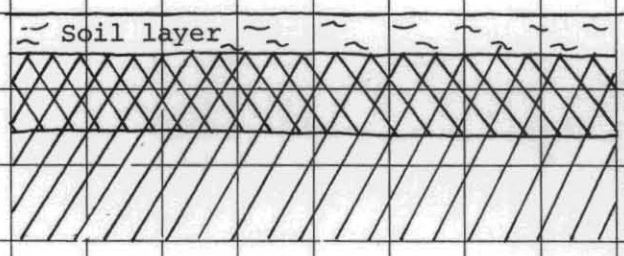
pit completed 7.10.80

logged by W.R. Moore

checked by R.C. Donaldson

penetration 1 2 3	support	water	notes samples, tests	metres R.L.	metres 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
	None	Nil			0		OL	Clay loam soil, grey-brown. Medium to low plasticity.	W	VS		A soil horizon
			S1		0.5		CL-CH	Clay, brown. Medium to high plasticity. Trace ironstone nodules >100 mm, with roots present	M	F		Transitional zone and B horizon
			S2		1.6							
			S3		2		CH	Clay, grey - with redstaining, high plasticity, with trace oxidized nodules (red) and ironstone (limonitic and bauxitic colour). Nodules small, 30-50 mm.	D	V St		Unweathered clay of Launceston Tertiary Beds
					2.6			Hole stopped as backhoe close to refusal and trench collapsing.				*N.B.* No fissuring observed or water.
					3							

sketch



Water table from observation bore.

sharp Transition.....

Moist clay. Transitional zone

Clear boundary

Grey. Dry clay - No water or sand.

Becoming harder.

TASMANIA DEPARTMENT OF MINES

5 cm

ENGINEERING LOG – EXCAVATION

excavation no. 2

sheet 1 of 1

10/18

project Subdivision proposals

location G.C.Burgess & Forrest Estate Rostella Road, Dilston

co-ordinates EQ052246

R.L. 32.0 m (105')

excavation dimensions 1.5 m x 2 m x 2.6 m deep

exposure type pit

equipment backhoe

operator M & G. Contractors

pit commenced 7.10.80

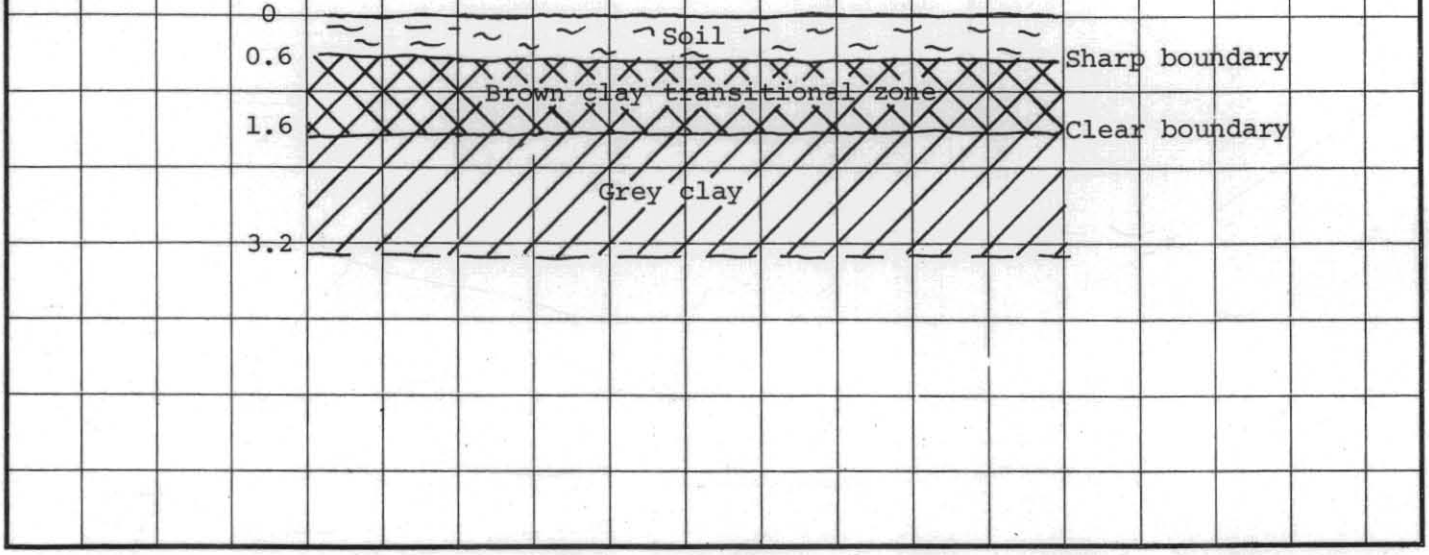
pit completed 7.10.80

logged by W.R. Moore

checked by R.C. Donaldson, A.T. Moon

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
	None	Nil		0.6		OL-OH	Clay loam soil, dark grey. Medium to high plasticity.	W	VS		A soil horizon
				1		CH	Clay, brown, high plasticity. Trace ironstone nodules	M	S ↓ F		Transitional weathering zone. B horizon.
				1.6		CH	Clay, grey with red mottled streaks. High plasticity - trace 'bauxitic' and limonitic nodules	D	St to VSt		Unweathered clay of Launceston Beds.
				3			? ? ? ? ? ? ?				
				3.2			Trench collapsed before trench base examined. Reported to be at refusal at depth of 3.2 m.				

sketch



TASMANIA DEPARTMENT OF MINES

5 cm

excavation no. 3

sheet 1 of 1

11/18

ENGINEERING LOG – EXCAVATION

project Subdivision proposals

location G.C. Burgess & Forrest Estate
Rostella Road, Dilston

co-ordinates EQ052246

R.L. 31.4 m (103')

excavation dimensions 1.5 m - 2 m x 2.5 m x 2.6 m deep

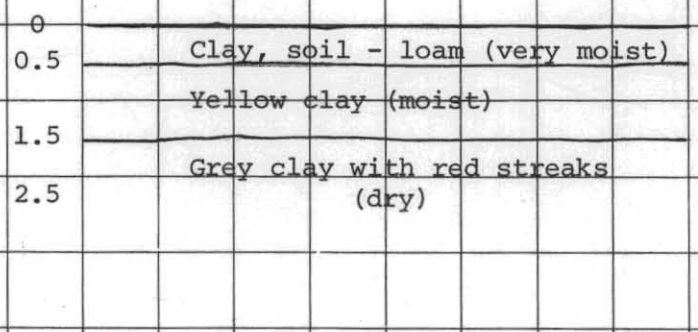
exposure type trench
equipment backhoe

operator M. & G. Contractors

pit commenced 7.10.80
pit completed 7.10.80
logged by W.R. Moore
checked by R.C. Donaldson
A.T. Moon

penetration 1 2 3	support	water	notes samples, tests	metres R.L.	metres 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
	None	Nil			0.5		OL	Clay loam, dark grey. Medium plasticity	W	S		A soil horizon
					1		CH	Clay, yellow-brown. Medium to high plasticity. Trace ironstone nodules	M	S ↓ F		Transitional clay horizon B.
			Shear Box S4 →		1.5		CH	Clay, light grey. Highly plastic clay with red streaks. Trace 'bauxitic' and limonitic nodules	D	St ↓ VSt		Mainly unweathered clay of Launceston Beds
					2							
					2.5			Backhoe stopped at refusal.				

sketch



TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – EXCAVATION

5 cm

excavation no. 4

sheet 1 of 1

12/18

project Subdivision proposals

location G.C. Burgess and Forrest Estate Rostella Road, Dilston

co-ordinates EQ052246

R.L. 31.4 (102')

excavation dimensions 1.5m x 2m x 2.3 m deep

exposure type pit

equipment backhoe

operator M. & G. Contractors

pit commenced 7.10.80

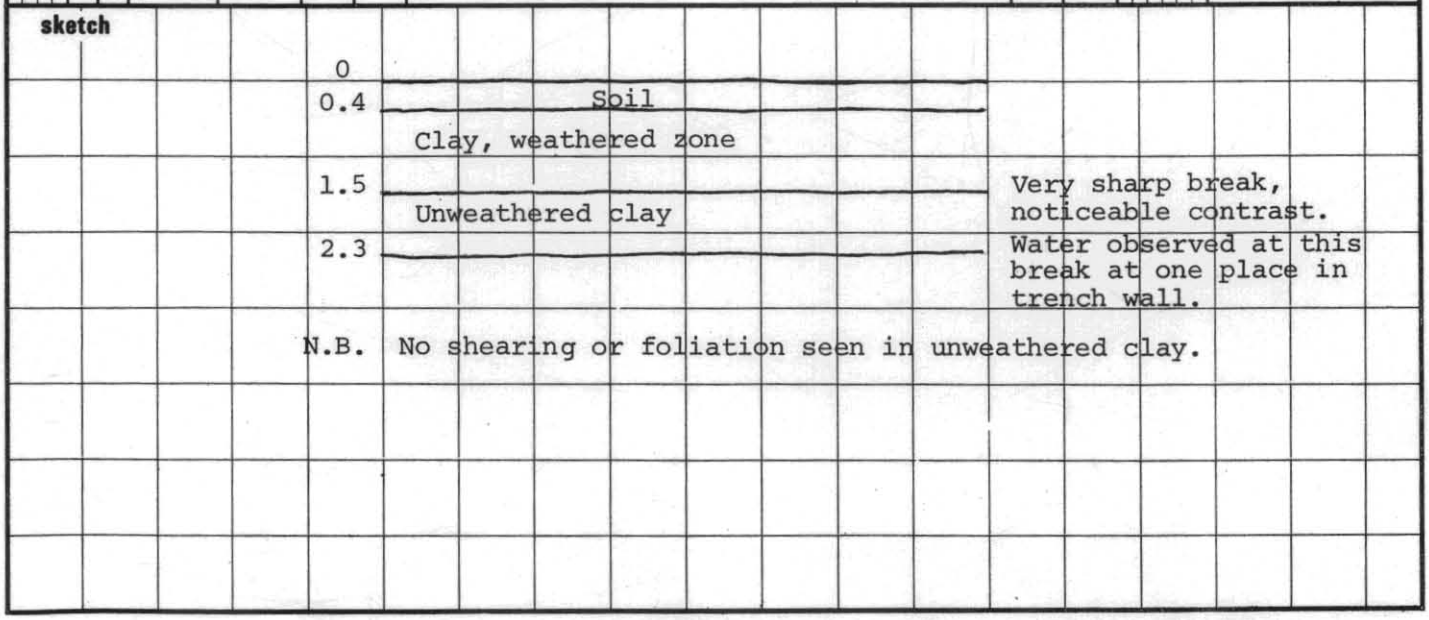
pit completed 7.10.80

logged by W.R. Moore

checked by R.C.Donaldson
A.T. Moon

penetration 1 2 3	support	water	notes samples, tests	metres R.L.	metres 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
	None	↓			0.4		OL	Clay-loam soil, dark grey to dark brown. Medium plasticity.	M	VS		Soil horizon
					1		CH	Clay, yellow-brown to grey-brown. Medium to high plasticity with some ironstone nodules	M	S		Transitional weathering horizon.
					1.8							
					2		CH	Clay, light grey with red streaks. High plasticity.	D	VSt		Unweathered clay
					2.3			Close to refusal. trench collapsed in weathered zone.				

sketch



N.B. No shearing or foliation seen in unweathered clay.

TASMANIA DEPARTMENT OF MINES

5 cm

ENGINEERING LOG – EXCAVATION

excavation no. 5

sheet 1 of 1

project Subdivision proposals

location G.C. Burgess and Forrest Estate
Rostella Road, Dilston

co-ordinates EQ052246

R.L. 31.0 m (102')

excavation dimensions
1.5 m x 2 m x 2.4 m deep

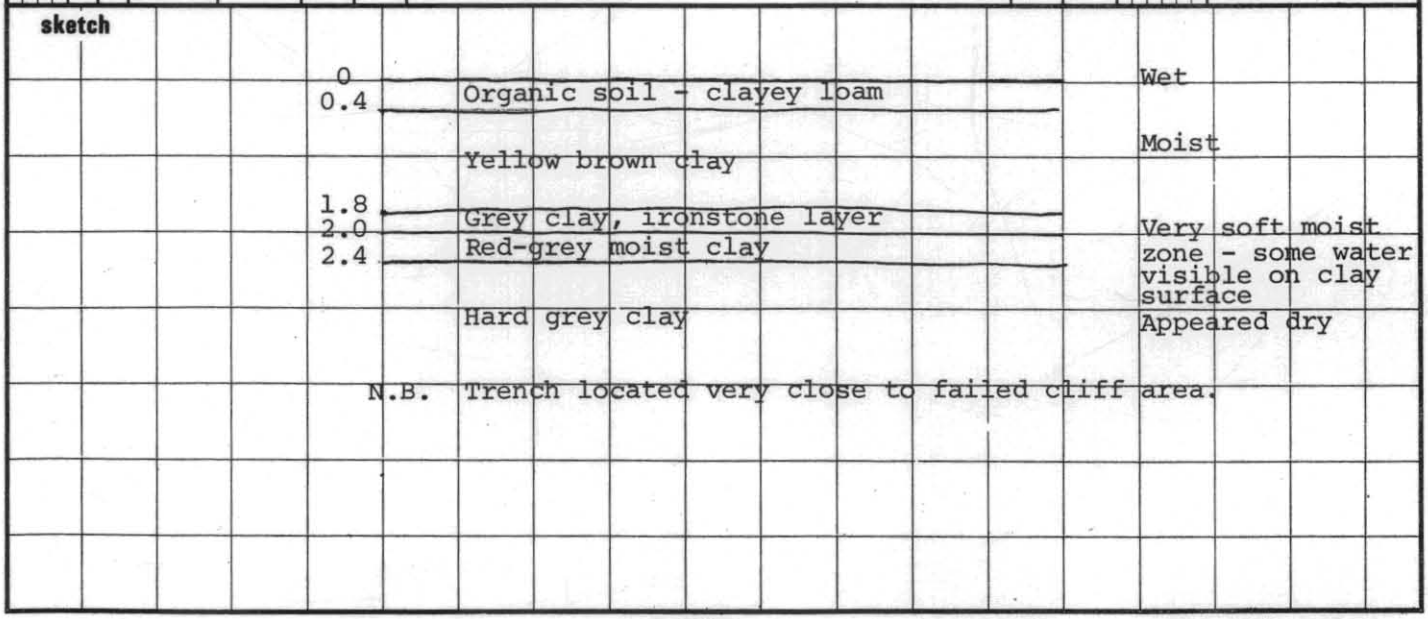
exposure type pit
equipment backhoe

operator M. & G. Contractors

pit commenced 7.10.80
pit completed 7.10.80
logged by W.R. Moore
checked by R.C. Donaldson
A.T. Moon

penetration 1 2 3	support	water	notes samples, tests	metres R.L.	metres 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
	None	Nil			0.4		OL-OH	Clay, loam soil, dark grey - dark brown. Medium plasticity	M	VS		Soil horizon
			Shear Box S5				CH	Clay, brown. High plasticity with trace ironstone.	M	F		Transitional weathered zone
					1.8							
			→		2.0		CH	Clay, grey red ironstone layer, high plasticity.	W	S		Soft zone
					2.4		CH	Clay, grey-red. High plasticity, moist but drier at base.	M	F		Moist zone
								Trench collapsed - bottom not examined fully, but appeared from spoil heap to be dry and stiff clay.	D	VSt		Unweathered hard clay.

sketch



TASMANIA DEPARTMENT OF MINES

5 cm

ENGINEERING LOG – EXCAVATION

excavation no. 6

sheet 1 of 1

14/18

project Subdivision proposals

location G.C. Burgess and Forrest Estate Rostella Road, Dilston

co-ordinates EQ052246

R.L. 32.0 m (105')

excavation dimensions 2.0 m x 2.0 m x 3.0 m

exposure type pit

equipment backhoe

operator M. & G. Contractors

pit commenced 7.10.80

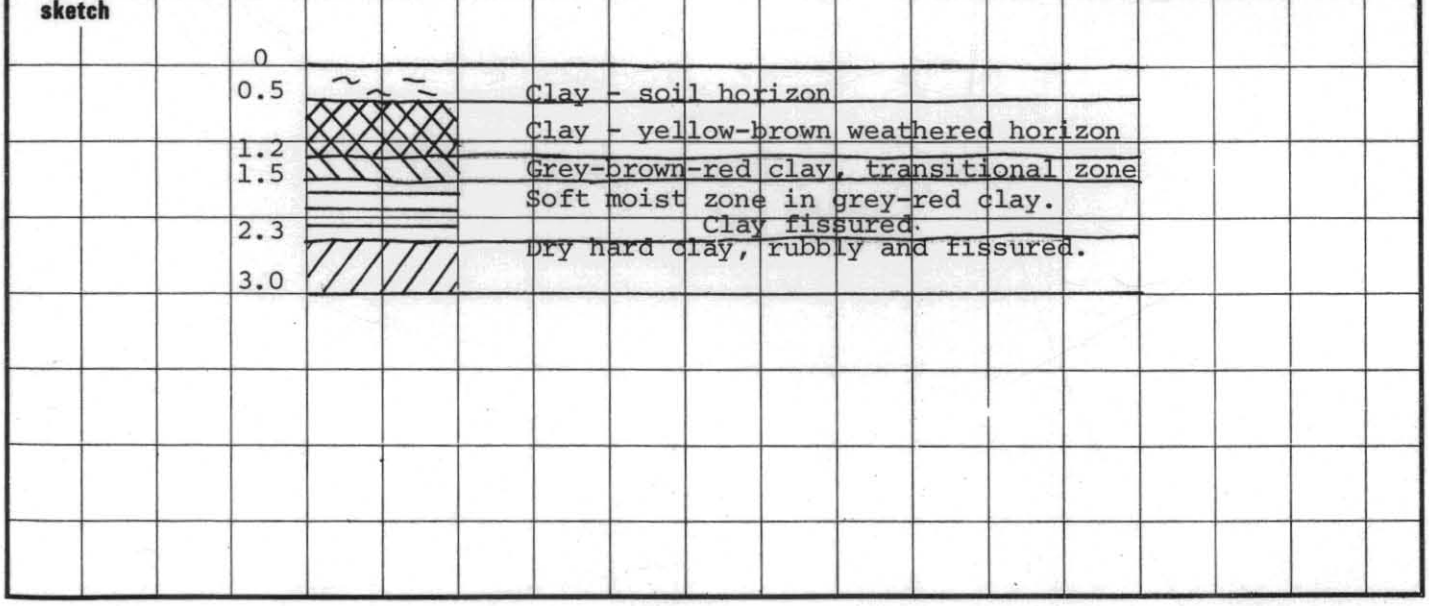
pit completed 7.10.80

logged by W.R. Moore

checked by R.C. Donaldson, A.T. Moon

penetration 1 2 3	support	water	notes samples, tests	metres R.L.	metres 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
					0.5		OL-OH	Clay loam, dark brown. Medium plasticity.	W	VS		A soil horizon
					1.2		CH	Clay, brown-yellow. Highly plastic with trace ironstone nodules.	M	S ↓ F		Transitional weathered zone
			Shear Box S6 →		1.5		CH	Clay, grey-brown to grey-red. High plasticity	D	F		Transitional unweathered zone
								Clay, grey-red. High plasticity clay, fissured and rubbly in appearance.	M	VS		Moist - soft zone
					2.3			Clay, grey-red with high plasticity, limonite and red nodules. Not examined in detail because trench collapsing.	M	F- VSt		Unweathered zone - clay still fissured.
					3.0							No slickensides seen.

sketch



44-14

TASMANIA DEPARTMENT OF MINES

5 cm

ENGINEERING LOG – EXCAVATION

excavation no. 7 15/18

sheet 1 of 1

project Subdivision proposals

location G.C. Burgess and Forrest Estate
Rostella Road, Dilston

co-ordinates EQ052246

R.L. 32.6 m (107')

excavation dimensions
2 m x 2 m x 2.6 m

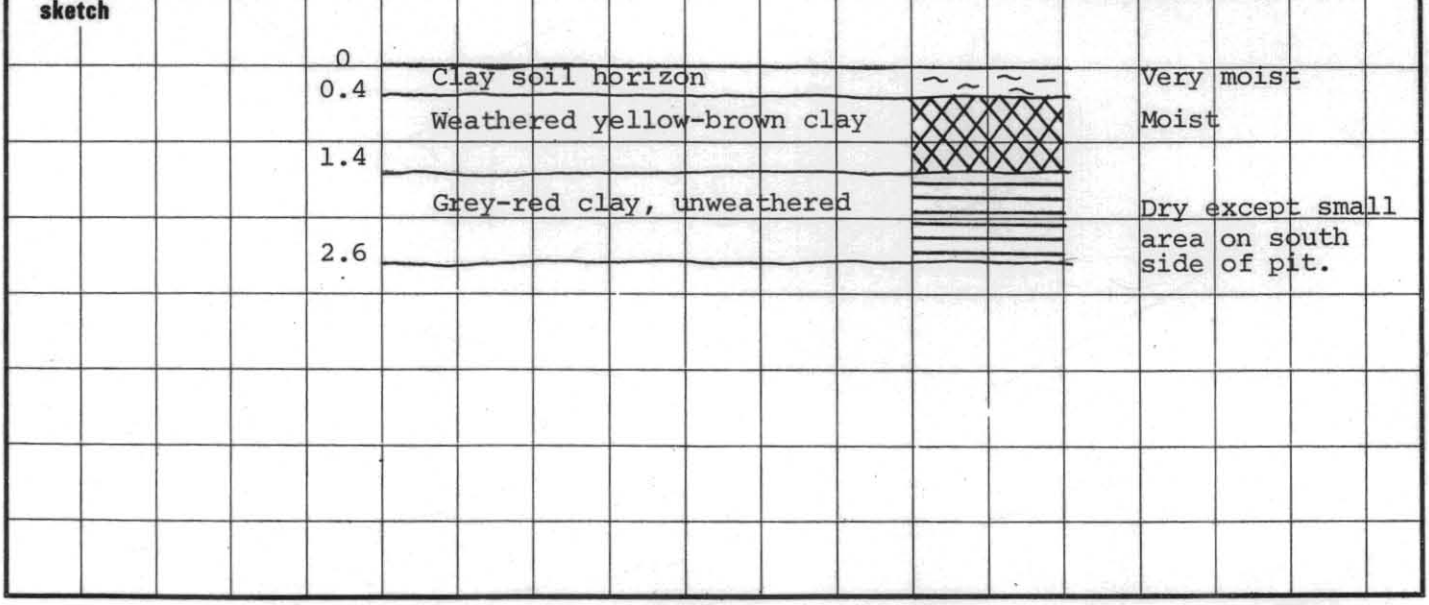
exposure type pit
equipment backhoe

operator M. & G. Contractors

pit commenced 7.10.80
pit completed 7.10.80
logged by W.R. Moore
checked by R.C. Donaldson
A.T. Moon

penetration 1 2 3	support	water	notes samples, tests	metres R.L.	metres 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
	None				0.4		OL OH	Clay loam, dark brown - dark grey. Medium plasticity.	M	VS		A soil horizon
							CH	Clay, yellow-brown. High plasticity. Trace iron nodules.	M	S		Transitional weathered zone
					1.4		OH	Clay, grey-red streaks. High plasticity.	D	St — VSt		Unweathered Launceston Tertiary clay
					2.6			Trench stopped - near refusal N.B. Small moist zone on south side of trench.				

sketch



TASMANIA DEPARTMENT OF MINES

5 cm

ENGINEERING LOG – EXCAVATION

excavation no. 8 16/18

sheet 1 of 1

project Subdivision proposals

location G.C. Burgess and Forrest Estate Rostella Road, Dilston

co-ordinates EQ055246

R.L. 32 m (105')

excavation dimensions 2 m x 2 m x 2 m

exposure type pit

equipment backhoe

operator M. & G. Contractors

pit commenced 7.10.80

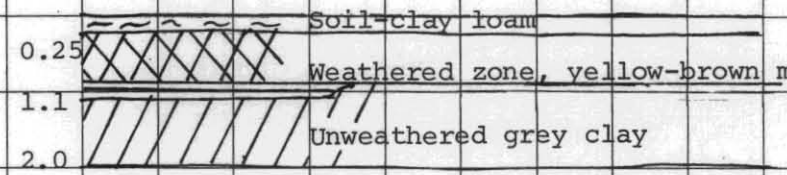
pit completed 7.10.80

logged by W.R. Moore

checked by R.C. Donaldson, A.T. Moon

penetration 1 2 3	support	water	notes samples, tests	metres R.L.	metres 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
	None				0.25		OH	Clay loam, dark brown. High plasticity	VM	VS		A soil horizon
			Shear Box S7 →		0.8		CH	Clay, yellow-brown. High plasticity	M	VS		Weathered zone
					1.1		CH	Clay, grey-red - light grey. High plasticity.	M	VS		Only on west side of trench
					2.0		CH	Clay, grey. High plasticity with trace red bauxitic streaks.	D	St		Tertiary clay Launceston Beds
								Backhoe slipping because of slope. Trench stopped.				

sketch



TASMANIA DEPARTMENT OF MINES

5 cm

ENGINEERING LOG – EXCAVATION

excavation no. 9

sheet 1 of 1

17/18

project Subdivision proposals

location G.C. Burgess and Forrest Estate
Rostella Road, Dilston

co-ordinates EQ055246

R.L. 32.1 m (102')

excavation dimensions
2 m x 2 m x 1.8 m

exposure type pit

equipment backhoe

operator M. & G. Contractors

pit commenced 7.10.80

pit completed 7.10.80

logged by W.R. Moore

checked by R.C. Donaldson
A.T. Moon

penetration 1 2 3	support	water	notes samples, tests	metres R.L.	metres 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
	None				0.3		OH	Clay loam, dark brown. Medium - high plasticity.	M	S		A soil horizon
							CH	Clay, yellow-brown. High plasticity	M	S		Transitional weathered zone
					1.0			Clay, grey. High plasticity	D	St		Tertiary clay Launceston Beds
					1.8			Backhoe slipping, trench stopped. Not at refusal.				
					2.0							

sketch

0.0		
0.3	Dark grey-brown clay loam	Moist - soft
1.0	Weathered yellow-brown clay	Moist - soft
1.8	Grey. Unweathered clay	Dry stiff. No water or soft zones present.

TASMANIA DEPARTMENT OF MINES

5 cm

ENGINEERING LOG – EXCAVATION

excavation no. 10

sheet 1 of 1

18/18

project Subdivision proposals

location G.C. Burgess and Forrest Estate, Rostella Road, Dilston

co-ordinates EQ 055245

R.L. 32 m (104')

excavation dimensions 2 m x 2 m x 2 m

exposure type pit

equipment backhoe

operator M. & G. Contractors

pit commenced 7.10.80

pit completed 7.10.80

logged by W.R. Moore

checked by R.C. Donaldson, A.T. Moon

penetration 1 2 3	support	water	notes samples, tests	metres R.L.	metres 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
	None				0.3		OH	Clay loam, dark grey-brown. High plasticity.	M	S		A soil horizon
					1.0		CH	Clay, yellow-brown. High plasticity.	M	S		Transitional weathered zone.
					1.9		CH	Clay, grey with red mottled areas. High plasticity.	D	St		Tertiary clay Launceston Beds
								Trench located <1 m from soft, wet spongy area from outlet overflow of septic tank. Trench dry below weathered surface zone. Not at refusal - backhoe slipping backwards.				

sketch