1979/51. Foundation Conditions at Norwood House, Norwood

D.J. Sloane

Abstract

An area of land around Norwood House, Norwood, can be divided into three topographic regions. These regions are the North Esk River floodplain, a steeply sloping (25°) area containing an active and old landslips and a flat plateau region considered suitable for development. The plateau area is underlain by Tertiary sediments to a depth of at least 29 m and the uppermost sediments consist of clay (CH), sandy clay (CH) and clayey sand (SC). The clay has consistent geomechanical properties over the area with high plasticity, liquid limit and linear shrinkage. This latter property must be considered when designing the foundations of buildings.

The currently active landslip is a headscarp failure of an older landslip. Water issuing from a clayey sand aquifer at a depth of 13 m below the plateau area is saturating the hillslope materials, causing the current instability. Surface drainage of the landslip area and the planting of trees is considered to be the least expensive method of attempting to stabilise the slip area. Every attempt should be made to preserve the existing trees along the steeply sloping area.

INTRODUCTION

At a request from the Board of Management of the Masonic Peace Haven of Northern Tasmania Inc., foundation investigations were conducted on a 15.29 ha area of land situated between Penquite Road and the Hobart-Launceston railway line [EQ147107]. A 5 ha portion of the area is considered suitable for immediate development and this was investigated in detail. Norwood House, originally Mount Vernon, and its associated outbuildings are the only buildings located on this land. The Board required comments on the instability of part of the area and advice as to measures which could improve the stability of a currently active landslip. Information was also required as to foundation conditions on the area adjacent to Penquite Road. Proposed development consists of units and administration facilities for a new Masonic Peace Haven.

A series of seven shallow auger holes were drilled to a depth of three metres in the area between Norwood House and Penquite Road. These holes were sited to provide a representative sample of shallow foundation conditions over the area. Bag samples and drive tube samples were taken in selected areas. Two deep (15 m) auger holes were also sampled. One auger hole was located at the edge of the plateau region adjacent to the active landslip to determine if, and at what depth, underground water from the Tertiary sediments was entering the landslip area. A diamond drill hole was also drilled adjacent to the auger hole to provide cored samples of the Tertiary sediments. A 10 m deep auger hole was also drilled in the centre of the area between the house and Penquite Road. Samples from both the cored hole and the latter auger hole are not yet available and will be reported on at a later date.

TOPOGRAPHY

The area can be divided into three distinct topographic units (fig.1). These are (1) The North Esk River floodplain

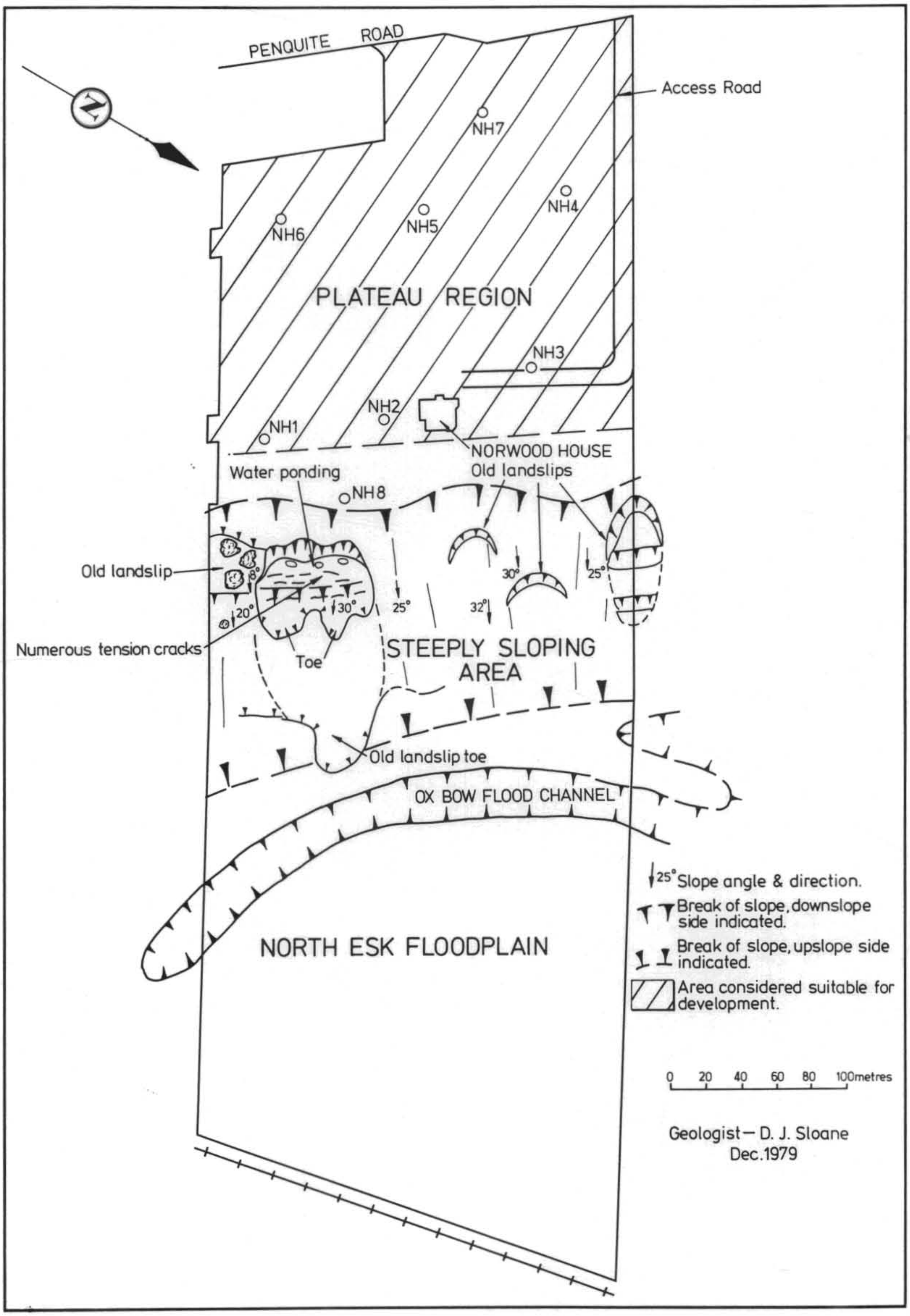
PENQUITE ROAD
Access Road
NH7
NH6
NH5
NH4
PLATEAU REGION
NH3
NH2
NH1
NORWOOD HOUSE
Water ponding
Old landslips
NH8
Old landslip
Numerous tension cracks
Toe
STEEPLY SLOPING AREA
Old landslip toe
OX BOW FLOOD CHANNEL
NORTH ESK FLOODPLAIN
25° Slope angle & direction.
Break of slope, downslope side indicated.
Break of slope, upslope side indicated.
Area considered suitable for development.
0 20 40 60 80 100metres
Geologist — D. J. Sloane
Dec. 1979
5 cm

Figure 1.

(2) The steeply sloping escarpment adjacent to and west of the floodplain

(3) The flat plateau region adjacent to Penquite Road and on which Norwood House is situated.

North Esk River floodplain

This area is subject to complete inundation by the floodwaters of the North Esk River. The area is obviously unsuitable for development unless large amounts of fill are used, both for reclamation and levee construction. Care is essential in floodplain works as confining of floodwaters to a narrower floodplain may cause flood problems elsewhere. Floodplain sediments often contain large amounts of water which cause consolidation problems when fill or structures are placed on them, producing differential settlement. No investigation of the floodplain was conducted due to flood conditions present at the time. Investigations could be conducted at a later date if development of the area is considered desirable, although this is likely to be costly.

Steeply sloping escarpment

This area has an average slope of about 25° with some slopes as high as 32°. One large currently active landslip and several old landslips are present. The steep slopes with underlying Tertiary clay and the landslip evidence indicate that development of this area is not advisable. The area is located in Zone V of the Tamar Valley Landslip Zone Map, an area described as 'active landslips and adjacent areas'.

Plateau

The area between Norwood House and Penquite Road is virtually flat and appears well drained. The area appears suitable for development and is located in Zone II of the Tamar Valley Landslip Zone Map, an area described as 'stable ground, but on soft rocks. Strict adherence to existing building code'. Foundation investigations were conducted on this area.

GEOLOGY

The geological map of the area (Longman, 1964) indicates that the underlying rocks consist of Tertiary lacustrine sediments composed of clay, sandstone and lignite.

Shallow auger drilling

The seven shallow auger holes (2.7 m deep) all revealed similar materials underlying the plateau area. The detailed logs are presented in Appendix 1 and the results are summarised below:

Depth (m)	*Description*
0 - 0.3	SILTY SAND (SM). Medium to fine quartz sand and silt. Brown to yellowish brown. Approximately 10% plastic fines. Some ironstone concretions and ironstone gravel. Some well rounded quartzite pebbles. Generally dry and loose.
0.3 - 2.7	CLAY and SANDY CLAY (CH). Moderate to high plasticity. Mottled yellowish brown, reddish brown and some light grey. Some medium quartz sand. Some ironstone gravel and well rounded quartzite pebbles to 20 mm diameter. Dry to moist and hard to very stiff.

Occasional lenses of CLAYEY SAND (SC). Medium quartz sand. Yellowish brown. Also occasional GRAVELLY CLAY (CL). To 30% ironstone and quartz gravel. Brown with reddish brown mottles.

Minor variations occur over the area but these are mainly restricted to a variable sand and occasional gravel content. Variations are considered to be lensoid in structure. X-ray diffraction analysis of two samples indicates a quartz and kaolinite clay mineral composition.

Deep auger drilling

The detailed geological log of the deep (22 m) Gemco auger hole located just above the headscarp of the active landslip is included in Appendix 1. In summary, the sediments consist of:

Depth (m)	*Description*
0 - 3.5	CLAY (CH). High plasticity. Mottled yellowish brown, reddish brown and greyish yellow brown. Some medium to fine quartz sand and trace ironstone gravel and concretions to 15 mm diameter.
3.5 - 12.7	SANDY CLAY (CH). High plasticity. Bright brown to yellowish brown. Some medium sand and quartz granules. Some well rounded quartzite pebbles (from 3.5 m to 7 m). Moist and stiff.
12.6 - 14.5	SANDY CLAY (CH). High plasticity. Bright brown to bright yellowish. 30% to 40% medium quartz sand. Very moist, moisture content approximately liquid. Very soft.
14.5 - 16.4	CLAY (CH). High plasticity. Bright brown with red mottles. Some medium sand and ironstone gravel. Stiff and moist.
16.4 - 21.9	CLAY (CH). High plasticity. Grey with some olive brown mottling. Trace medium quartz sand and ironstone gravel. Stiff and moist.
End - 21.9	

A clayey sand aquifer was intersected in the auger hole at a depth of 12.6 m to 14.5 m. A Gemco diamond drill hole was also drilled adjacent to the deep auger hole. All samples are not yet available from this hole, but some unusual laminated sediments were sampled and some sandstone was encountered at the base of the slope. The geology appears to be basically similar to that exposed along the access road to the Norwood sewage treatment plant, where clayey sediments containing well rounded quartzite pebbles and cobbles are exposed in the upper part of the sequence and laminated feldspathic sandstone containing leaf and plant stem fragments are exposed at the foot of the escarpment. The diamond drill hole will be reported on at a later date as further analysis is to be performed on the laminated mudstones and detailed logging is to be completed when samples become available.

ACTIVE LANDSLIP

An active landslip has occurred on the steeply sloping area adjacent to Norwood House. The slip can be attributed to water originating from a clayey sand aquifer at a depth of 12.6 m to 14.5 m below the plateau area adjacent to Norwood House. This water has saturated the clayey Tertiary sediments and slope mantle deposits which undoubtedly exist, which when combined with the steep slopes of the area, has caused instability. The removal of trees is also a major contributing factor, as the area where the active landslip has occurred has been cleared of trees, while the adjacent area has not. The adjacent area contains old landslips which appear to have stabilised, probably due to the eucalypt vegetation. The currently active landslip appears to be a reactivation or a head scarp failure of a much older slip which has large pine trees growing on the old toe. These trees are estimated to be about 100 years old.

CLAY ANALYSIS - GEOMECHANICAL PROPERTIES

A total of six samples have been tested for various properties. The results are summarised below and in Table 1. Most samples were taken at a depth of 1.0 to 1.9 m.

Liquid limit

Liquid limits (6 samples) varied from 94% to 123% and are considered to be high. The clay can be classified as of high plasticity and compressibility on Casagrandes (1948) plasticity chart classification. The average value for the liquid limit over the area is 108%.

Plastic limit

Plastic limits (6 samples) varied from 26.8% to 29%, averaged at 27.5% and are considered to be in the low range and consistent with a kaolinite clay mineral composition.

Plasticity index

This value indicates the moisture content range over which the clay remains plastic. Values ranged from 66% to 94% and averaged 81%. The values are considered to be high and indicate high toughness and dry strength of the clay.

Linear Shrinkage

Six samples tested ranged from 19% to 25% with an average value of 21.5%. These shrinkage values are considered high and indicate the shrinkage potential of the soil on wetting and subsequent drying.

Vane shear tests

In situ vane shear tests provide an indication of the shearing resistance of the clay. Readings were all above 120 kPa.

Drained, slow shear-box testing

Angles of internal friction (ϕ) were determined on two samples. These gave values of 27° from an undisturbed sample from hole NH7 and 23° on a disturbed sample from NH5.

Dispersion

The clays are not dispersive.

Clay geomechanical properties can be considered consistent over the area investigated. The high linear shrinkage values imply caution when designing foundations of buildings.

Table 1. CLAY PROPERTIES, NORWOOD HOUSE, NORWOOD

Hole Number	Type of Sample	Depth (m)	Liquid limit (%)	Plastic limit (%)	Plasticity index	Linear Shrinkage (%)	Angle of internal friction (ϕ)
NH2	Disturbed	1.0	97	28	69	19	
NH3	Disturbed	1.4	123	29	94	21	
NH4	Disturbed	1.7	102	26	76	24	
NH5	Disturbed	1.4	120.4	26.8	93.6	25	23°
NH6	Disturbed	1.6	94	28	66	20	
NH7	Undisturbed	2.7	113.6	27.4	86.2	20	27°

CONCLUSIONS

Of the three topographic regions into which the area can be divided, only one is considered immediately suitable for development. The North Esk River floodplain will require fill and probably levee construction, may alter the flood characteristics of the North Esk River and could develop consolidation problems. The area was not investigated due to flood conditions at the time. The hillslope section is steep, has one active landslip and several old landslips and is considered an unstable area and therefore unsuitable for development. The area considered immediately suitable for development is the plateau area between Norwood House and Penquite Road. From information obtained from seven shallow auger holes, the area is underlain by clay and sandy clay (CH), clayey sand (SC) and gravelly clay (CL). Six samples were tested for Atterberg Limits, dispersion, and linear shrinkages and were found to have high liquid limits, plasticity, compressibility, toughness and dry strength. *In situ* vane shear tests gave results above 120 kPa. Linear shrinkages measured were high, indicating the shrinkage potential of the clay on wetting and subsequent drying.

The physical properties of the clay, especially shrinkage, must be considered when designing foundations for proposed buildings. Problems have occurred in several parts of Launceston where foundations have been inadequate for expansion and shrinkage of the surrounding clay, resulting in cracking of walls and foundations.

The area appears well drained, although not inspected during periods of high rainfall. Surface drainage should be maintained and improved if necessary.

Referring to previous comments, it is undesirable to develop the steeply sloping area adjacent to Norwood House. The stability of the area can be maintained and attempts may be made to stabilise the existing active landslip. This landslip has occurred in an area along the hillslope which has been cleared of trees. This is considered to have been a contributing factor in the development of this landslip. It is therefore unwise to remove any trees from the steeply sloping area. More trees could be planted in the old landslip areas and certainly on the active landslip area. Species of eucalypt, pine and oak trees are suitable but the advice of the Department of Agriculture or Forestry Commission can be sought. Obviously a quick growing, deep rooting tree is required which can grow in a variety of conditions, including wet seepage areas. Surface drainage of the active landslip will also contribute to stabilisation. Some ponding has occurred at the base of the headscarp. This should be drained from the area and drainage maintained to prevent water accumulating on the slip area. The aquifer intersected by drilling should intersect the hillslope in the region of the water ponding, assuming the aquifer is horizontal. Efficient draining of this area could prevent most of the water from penetrating the slip mass.

Further stabilisation techniques could prove expensive but include, in approximate order of increasing expenditure:

(1) A herringbone French drain system with rockfill and 'agpipe';

(2) Horizontal drainage pipes, drilled to intersect the aquifer;

(3) Lime stabilisation by drilling a grid of vertical holes over the area and backfilling with lime or a lime-clay mix;

(4) Vertical drainage pipes drilled above the slip area to intersect the aquifer, with water to be pumped from these holes;

(5) Pile driving, soil anchors etc.

Access and expense are the major drawbacks to the above techniques or combination of techniques. Further investigation is required before determining the suitability of the techniques outlined.

A thirty metre zone in which development should not occur is required, west from the upper break of slope of the steeply sloping region.

REFERENCES

CASAGRANDES, A. 1948. Classification and identification of soils. *Trans ASCE* 113:901-992.

LONGMAN, M.J. 1964. One mile geological map series. K/55-7-39. Launceston. *Department of Mines, Tasmania*.

[6 December 1979]

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – BOREHOLE

borehole no. NH1

sheet 1 of 1

9/17

project Masonic Peace Haven | location Norwood House, Launceston

co-ordinates EQ147107
R.L. 50 m
inclination
bearing

drill type Proline
drill method Auger screw
drill fluid

hole commenced 10.7.1979
hole completed 10.7.1979
drilled by E. Johnson
logged by J. Sloane
checked by

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		SM	SILTY SAND: Fine quartz sand and silt. Dull yellowish-brown	M	L		Topsoil
							CH	CLAY: High plasticity. Yellowish-brown with reddish-brown mottles. Some fine quartz sand.	D	H		
			D		1.0							
							CH	CLAY and SANDY CLAY: Medium plasticity clay and low plasticity sandy clay. Mottled dark reddish-brown bright yellowish-brown and light grey. Some medium quartz sand.	D	H		Lenses of lower plasticity sandy clay in darker coloured higher plasticity clay.
			D		2.0							
					END	?-?						
					3.0							

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – BOREHOLE

borehole no. NH2

sheet 1 of 1

10/17

project Masonic Peace Haven | location Norwood House, Launceston

co-ordinates EQ147107 | drill type Proline | hole commenced 10.7.1979
drill method Auger screw | hole completed 10.7.1979
R.L. 50 m | drilled by E. Johnson
inclination | drill fluid | logged by J. Sloane
bearing | 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		SM	SILTY SAND: Silt-medium quartz sand. Dark brown. Some well rounded quartz pebbles to 20 mm diameter.	D	L		A1 soil horizon
						SC	CLAYEY SAND: Dull yellowish-brown. Medium quartz sand.	M	S		
			D	1.0		CH	CLAY: High plasticity. Bright yellowish-brown. Trace fine sand.	M	VSt		
			D	2.0		CH	SANDY CLAY: High plasticity. Some medium quartz sand. Mottled reddish-brown, greyish-yellow-brown bright yellowish-brown.	M	VSt		Lenses of sandier clay.
				END 3.0	?·?						

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – BOREHOLE

borehole no. NH3

sheet 1 of 1

11/17

project Masonic Peace Haven

location Norwood House, Launceston

co-ordinates EQ147107

R.L. 49.5 m

inclination

bearing

drill type Proline

drill method Auger screw

drill fluid

hole commenced 10.7.1979

hole completed 10.7.1979

drilled by E. Johnson

logged by J. Sloane

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
			D	0		SM	SILTY SAND: Medium quartz sand and silt. Some ironstone concretions of cemented sand to 30 mm diameter.	D	L		A1 soil horizon
			D			CH	CLAY: High plasticity. Yellowish-brown. Some ironstone gravel and medium quartz sand.	M	VSt		
			D	1.0		CH	SANDY CLAY: High plasticity. Mottled reddish-brown, bright yellowish-brown, greyish-yellow-brown.	M	VSt		
			D	2.0		CL	GRAVELLY CLAY: Medium plasticity. To 30% ironstone gravel and minor quartz gravel. Brown with reddish-brown mottles.	M	VSt		
				END 3.0							

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – BOREHOLE

borehole no. NH4

sheet 1 of 1

12/17

project	Masonic Peace Haven	location	Norwood House, Launceston

co-ordinates	EQ147107	drill type	Proline	hole commenced	11.7.1979
		drill method	Auger screw	hole completed	11.7.1979
R.L.	49.3 m			drilled by	E. Johnson
inclination		drill fluid		logged by	J. Sloane
bearing				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		SM	SILTY SAND: Medium quartz sand and silt. Some ironstone gravel. Dull yellowish-brown	D	L		
							IRONSTONE layer - cemented sand	D	H		Ironstone a result of groundwater perching?
			D	1.0		CH	CLAY: High plasticity. Yellowish-brown. Trace medium sand.	M	VSt		Slight hollow in this area.
			D	2.0		CH	SANDY CLAY: Medium plasticity. Brown and yellowish-brown with reddish-brown mottles. Some ironstone gravel. Well rounded quartz pebble layer as shown. Some lenses of grey sandy clay.	M	VSt		
			D	END							
				3.0							

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – BOREHOLE

borehole no. NH5

sheet 1 of 1

13/17

project Masonic Peace Haven   location Norwood House, Launceston

co-ordinates	EQ147107	drill type	Proline	hole commenced	11.7.1979
		drill method	Auger screw	hole completed	11.7.1979
R.L.	50 m			drilled by	E. Johnson
inclination		drill fluid		logged by	J. Sloane
bearing				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		SM	SILTY SAND: Medium quartz sand and silt. Some ironstone gravel. Dull yellowish-brown.	D	L		
						CH	SANDY CLAY: Medium plasticity. Dull yellowish-brown. Some medium quartz sand.	M	S		
						CH	CLAY: High plasticity. Dull yellowish-brown with reddish-brown mottles.	M	VSt		
			D UD75	1.0							
						SC	CLAYEY SAND: Medium quartz sand. Yellowish-brown, some reddish-brown mottles.	M	VSt		
			D	2.0							
						CH	SANDY CLAY: High plasticity. Yellow-brown. Some ironstone gravel. Some organic particles(?)	M	VSt		
			D	END							

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – BOREHOLE

borehole no. NH6

sheet 1 of 1

14/17

project Masonic Peace Haven

location Norwood House, Launceston

co-ordinates EQ147107

R.L. 50.3 m

inclination

bearing

drill type Proline

drill method Auger screw

drill fluid

hole commenced 11.7.1979

hole completed 11.7.1979

drilled by E. Johnson

logged by J. Sloane

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		SM	SILTY SAND: Medium quartz sand and silt. Dull yellowish-brown	D	L		
			D	1.0		CH	CLAY: High plasticity. Yellowish-brown with reddish-brown mottles. Some fine-medium quartz sand.	M	VSt		
			D	2.0		CH	SANDY CLAY: Medium plasticity. Yellowish-brown with reddish-brown mottles. Some ironstone gravel and medium quartz sand.	M	VSt		
			D	END		CH	CLAY: Moderate plasticity. Some ironstone gravel. Reddish-brown with some yellow-brown mottles.	M	VSt		

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – BOREHOLE

borehole no. NH7

sheet 1 of 1

15/17

project Masonic Peace Haven   location Norwood House, Launceston

co-ordinates	EQ147107	drill type	Proline	hole commenced	11.7.1979
		drill method	Auger screw	hole completed	11.7.1979
R.L.	50 m			drilled by	E. Johnson
inclination		drill fluid		logged by	J. Sloane
bearing				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		SM	SILTY SAND: Medium quartz sand and silt. Yellowish-brown	M	L		
			D			SC	CLAYEY SAND: Low plasticity. Medium to fine sand. Yellowish-brown, some ironstone gravel.	M	L		
			D	1.0		CH	CLAY: High plasticity. Yellowish-brown. Some fine sand and ironstone gravel.	M	VSt		
			D	2.0		CH	CLAY: High plasticity. Brown with reddish-brown mottles. Some ironstone concretions and gravel.	M	VSt		
			D	END	?-?						

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – BOREHOLE

borehole no. NH8

sheet 1 of 2

16/17

project	Masonic Peace Haven	location	Norwood House, Launceston
co-ordinates	EQ147107	drill type	Proline
		drill method	Auger screw
R.L.	49 m	hole commenced	18.8.1979
inclination		hole completed	23.8.1979
bearing		drilled by	J. Hammersley
		drill fluid	
		logged by	J. Sloane
		checked by	

notes samples, tests	depth (metres)	classification symbol	material	moisture condition	consistency density index	structure, geology
	0	SM	SILTY SAND: Medium to fine quartz sand and silt. Dull yellowish-brown.	D	L	Topsoil
D, D	2.0	CH	CLAY: High plasticity. Yellowish-brown with some reddish-brown and greyish-yellow-brown mottles. Some medium quartz sand. Trace iron-stone concretions to 15 mm diameter.	M	St	
D	4.0, 6.0	CH	SANDY CLAY: High plasticity. Bright brown with some dark red mottles. Some quartz pebbles to 55 mm diameter of high roundness medium sphericity. Some medium-coarse sand, some iron-stone gravel.	M	St	
D, D	8.0		As above SANDY CLAY: High plasticity. Contains 10% granular quartz to 4 mm diameter, low sphericity, low to moderate roundness.		VSt	
D, 26.7.79	10.0, 12.0	CH	SANDY CLAY: High plasticity. Yellowish-brown. Some medium quartz sand.	M	F	
	14.0	SC	CLAYEY SAND: High plasticity. Fine-medium quartz sand. Bright yellowish-brown with bright brown and greyish-yellow-brown mottling or layering.	M≅L	L VS	
	16.0		CLAY: High plasticity. Bright brown with red mottles. Some medium quartz sand and ironstone gravel	M	F	
D, M	18.0, 20.0	CH	CLAY: High plasticity. Grey Trace medium sand and ironstone gravel.	M	St	

5 cm

TASMANIA DEPARTMENT OF MINES

ENGINEERING LOG – BOREHOLE

borehole no.	NH8
sheet 2 of 2	

17/17

project	Masonic Peace Haven	location	Norwood House, Launceston

co-ordinates	EQ147107	drill type	Proline	hole commenced	18.8.1979
R.L.	49 m	drill method	Auger screw	hole completed	23.8.1979
inclination		drill fluid		drilled by	J. Hammersley
bearing				logged by	J. Sloane
				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
				20.0			Some olive-brown mottling				
				22.0							

5 cm