DEPARTMENT OF
MINERALS AND ENERGY

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

1976/106

MURRUMBIDGEE PARK DRIVE, TUGGERANONG, A.C.T.
GEOLOGICAL INVESTIGATION

by

R.C.M. GOLDSMITH

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PLATES

SUMMARY

The Bureau of Mineral Resources, Geology and Geophysics has examined the geology along the route of the proposed Murrumbidgee Park Drive. The route is 14 km long and proceeds south from Kambah Pool Road through Tuggeranong to Lanyon.

The geology of the area consists of Silurian acid igneous rocks unconformably overlying shale, sandstone, and porphyritic rhyolite. High-level gravel terraces and alluvial basins occur along the length of the broad Murrumbidgee valley.

Two bridge sites, the Point Hut water-feature embankment, and some major road-cuts were investigated. Depths to suitable foundation determined by diamond-drilling range from 0-8 m at Tuggeranong Creek bridge site, 0-1 m at Strangers Creek bridge site, and 3-7 m at the Point Hut water-feature embankment. Stability problems are not expected at these sites, but a proposed 10 m deep cut south of Tuggeranong Creek is unfavourably oriented with respect to the jointing and a 45° batter is recommended.

INTRODUCTION

The Murrumbidgee Park Drive is to be constructed as the main arterial roadway through the centre of Tuggeranong, A.C.T. (see location sketch, Plate 1). The project - designed by Maunsell Partners, consulting engineers for NCDC - requires the construction of 13.5 km of three-lane dual carriageways extending from the present Kambah Pool Road in the north along the Murrumbidgee valley to Lanyon in the south (Plate1).

The Department of Construction (DC) has requested the Bureau of Mineral Resources (BMR) to provide information on the general geological features along the alignment, and on the expected subsurface conditions at the Tuggeranong Creek and Strangers Creek bridge sites and at the Point Hut water-feature site; the water-feature embankment will carry the Murrumbidgee Park Drive. A preliminary evaluation of the batter stability of the major cuts was also required.

Site investigations - between March and June 1976 - included a DC augering and back-hoe program, and a DC/BMR diamond-drilling program of four holes at Tuggeranong Creek bridge site, one hole at the Strangers Creek bridge site, and four holes at the Point Hut water-feature embankment site. Water-pressure testing was carried out in one hole to test the rock permeability in drillhole PH4. Logs of drill-hole core and the water-pressure test results are presented in Appendix 1.

GENERAL GEOLOGY

The general geology of the Tuggeranong area is shown in Plate 1, and has been described previously for the Lanyon trunk sewer (Goldsmith, 1975). The Tuggeranong valley is underlain by an Upper Silurian sequence of acid volcanics and sediments. Sandstone and siltstone were deposited in association with early volcanic activity, as agglomerate and tuffaceous sandstone are common throughout the sequence, especially in the Pine Island area, where there is evidence of a major Silurian centre of volcanic activity. These sediments, which crop out around Pine Island and to the south and west of Point Hut, have since been folded about an axis striking 140°.

Unconformably overlying the sediments are acid volcanics. Dark grey dacitic tuff crops out in the south of the area, including the Lanyon Hills and the area west of Point Hut. Pale and dark grey rhyodacite and dark grey dacitic tuff crops out in the south of the area, including the Lanyon Hills and the area west of Point Hut. Pale and dark grey rhyodacite and dark grey dacitic tuff extend from Point Hut northwards to Kambah and Weston Creek. A faulted wedge of reddish purple and green-grey rhyodacite crops out on topographically high points between Barneys Hill and Mount Taylor, directly to the north.

In more recent geological time the Murrumbidgee River has incised its channel into its broad older valley. High-level terrace gravels of probable Quaternary age are up to 30 m above the present river level. The geomorphology of this area is now controlled by entrenching of the Murrumbidgee River into the older broad valley: alluvium is accumulating in depressions in the broad valley, and upslope the alluvium grades to colluvium, which is thickest at the foot of the hills.

ENGINEERING GEOLOGY

EXCAVATION CONDITIONS

The geology, excavation conditions, and stability characteristics along the proposed route are summarized in Plate 2. In general, excavation of cuts deeper than 3-4 m will require some blasting, as these are in topographically higher areas with skeletal soils overlying rock at 2-4 m. Rock crops out in some of the locations of proposed deep cuts, and blasting will be necessary from the surface.

BATTER STABILITY

General

The batter stability of cuts over 3 m deep has been summarized in Plate 2. Generally, cuts of about 3 m in the acid volcanic rocks can be safely battered to 70-80°. Only the batters on cuts deeper than 3 m and on those along hillslopes adjacent to the Murrumbidgee River are likely to fail unless specific precautions are taken. On these slopes, which have experienced a release of stress by unloading during valley formation, joints are generally open - especially on the east bank, where they dip towards the river - and thereby contribute to failure in batters on the west-facing slopes.

After the stability is assessed during construction, lower batter angles should be selected for the west-facing side:

a) to reduce the number of joints or joint intersections undercut by the slope, and

b) to reduce the possibility of slumping in the colluvium and terrace gravels; cuts exposing these materials should be well drained.

Zones of potential instability identified during construction may require restraint by the setting of rock-bolts and wire mesh and/or the provision of drainage.

Major cuts

Stn 3700-3900 m

A 4.5-m cut at station 3700 to 3900 intersects the contact between the tuffaceous siltstone and sandstone and the dark grey dacitic tuff. This contact dips about 20° to the west, and is probably deeply weathered. Outcrop in the area is sparse and details of jointing are not known; however, a regional near-vertical joint set strikes 140° and is favourably oriented with respect to the cut.

Stn 10400-10500 m (Plate 3)

A deep section of cut is proposed between stations 10400-10500, where Murrumbidgee Park Drive will cross Lanyon trunk sewer (Goldsmith, 1975). Stations 375.4 to 491 of the buried pipeline will be within this road-cut. The roadway and associated cuts will be constructed first; then it is planned to excavate the pipeline trench (invert level 551 m RL) from the north, and approach as close as is feasible to the top of the batter slope of the road-cut (see section A-B in Plate 3). At this point trenching will cease, and a tunnel about 15 m long will be excavated beneath the batter slope to manhole (MH) 2.

This procedure will leave the batter slope for the roadway undisturbed, thus maintaining stability.

No rocks crop out over the immediate site, but dacite crops out on a hill to the northeast, where moderately to slightly weathered rock contains partly open joints with a rough surface. Two sets were observed: 90/070-080 and 90/165; shallow-dipping joints may have formed by unloading due to the downcutting of the Murrumbidgee River in its valley.

Drill hole LTS3 (Plate 3), near MH2, intersected moderately weathered dacitic tuff at 4 m depth, but a closely fractured zone between 6.5 m and 8.4 m comprises highly to extremely weathered rock. Hard and strong slightly weathered to fresh rock occurs from 8.4 m to the bottom of the hole at 14.05 m. Joints are moderately to widely spaced and many dip at 45° (probably to the west), parallel to veins of sericite and epidote (some weathered to clay).

Seismic traverse 3 (Plate 3) is one of a number of traverses completed along the line of the Lanyon trunk sewer (Koelle, 1975). Results indicate fresh rock at 8-9 m, which agrees with drilling results, and moderately weathered rock (seismic velocity 1500-1600 m/s) between 3.5 and 9.0m.

As a joint set dips 45°W, the west-facing batter for the road-cut should be no steeper than 45°. The east-facing batter can be cut to a steeper angle, about 60-70°,as the joints dip into the slope.

TUGGERANONG CREEK BRIDGE (Plate 4)

The proposed bridge consists of two carriageways spanning 90 m between abutments; each carriageway will be supported by two piers spaced 30 m apart. Green-grey dacitic tuff crops out on the steeper bluffs adjacent to Tuggeranong Creek, where it is moderately spaced. There are no dominant joint sets, but a general north-south strike is common; the dip ranges from 90° to 30°, with shallow joints dipping downslope.

Between the two bluffs, shown on the lower left and upper right of Plate 4, is a zone of closely fractured, highly weathered dacitic tuff which crops out adjacent to the southern bluff and on the bank of the creek in the north. Drill hole TCB4 also intersected this rock. This fractured zone appears to dip 40-50° to the east.

Northbound carriageway

The bedrock surface dips generally west at 5° - from the ground surface at the east abutment to 7.6 m depth at the west abutment.

East Abutment. Nearby outcrops of moderately weathered dacite with closely to moderately spaced joints indicate that this abutment will have good foundations less than 2 m from the surface.

Pier 1. Drill hole TCB5, at the site of this pier, intersected moderately weathered dacite at 1 m depth. The rock mass contains joints with limonite and clay coatings and some clay seams 1 cm thick extending to 5.25 m depth. It would not be necessary to excavate deeper than 1-2 m for a stable foundation, unless a major zone of clay seams and closely spaced joints is encountered during construction.

Pier 2. This site is located in Tuggeranong Creek. Less than about 1 m of alluvium rests on extremely weathered rock with moderately weathered rock suitable for foundation estimated at 3-4 m. The rock in nearby drill hole TCB4 is closely fractured dacitic tuff, and any deeply weathered pockets should be cleaned out and grouted.

West Abutment. Drill hole TCB4 indicated that 4.5 m of silty sand and silty clay overlies highly weathered fractured dacitic tuff. At 7.6 m the rock is moderately weathered, but the rock mass is loose, with closely spaced joints and some clay; foundation for the abutment should be possible at 7.6 m

Southbound carriageway

East Abutment. Moderately weathered rock should be found at 5 m depth, but an airphoto-lineament representing a possible shear zone passes close to the northeast edge of the abutment, and competent rock may be deeper in this section.

Pier 3. Drill hole TCB7 encountered moderately to slightly weathered rock suitable for pier foundation at 5 m. The rock mass is hard and strong, and although the joints are weathered - especially vertical joints - no clay is present.

Pier 4. Competent rock suitable for foundation is estimated at 4-5 m depth underlying about 3-4 m of alluvium and slopewash. The rock at this site, as indicated by nearby outcrops, is hard and tight with moderately spaced joints.

West Abutment. Drill hole TCB6 indicates rock suitable for foundation at 4.3 m. Alluvium and cemented slopewash material overlie weathered rock at 4 m with slightly weathered hard and strong dacite at 4.3 m.

STRANGERS CREEK BRIDGE

This bridge with twin 35-m spans crosses Strangers Creek (Plate 5) 300 m east of Pine Island Reserve. Moderately weathered rock was reached at 1.5 m in drill hole SCB1. As rubbly outcrop is abundant over both abutment sites, neither foundation conditions nor stability are expected to pose any problems. Rock suitable for abutment foundations is expected at less than 2 m depth.

POINT HUT WATER FEATURE

This site, 550 m southeast of Point Hut Crossing, is for an earth embankment - 259 m long and up to 11 m high - that will impound a small lake to the east (Plate 6). The Murrumbidgee Park Drive occupies the top of the embankment between stations 4865 and 5135 m. Foundation conditions for the embankment were determined by four diamond-drill holes. One drill hole, PH4, was water-pressure tested.

The point where the embankment crosses the creek is the narrowest part of the water-catchment area of about 10 km^2, which extends back past Tuggeranong Hill and includes the Lanyon North Basin drainage area (Kellett, in prep.). A considerable volume of surface runoff will pass through the constriction at the embankment site.

Drill-hole logs indicate that 3.5-4.5 m of silty sandy alluvium overlies very hard slightly weathered to fresh dacite. Of the four drill holes on the site drill hole PH2 (on the upper slope of a low ridge) shows the greatest thickness of moderately weathered rock, with slightly weathered rock occurring at 10.5 m. Moderately weathered rock should be suitable for the embankment foundation.

Suitable foundation for the embankment is at 4-5 m in the centre of the valley, where sandy alluvium lies almost directly on competent rock. Downstream, at the end of the proposed spillway chute, drill hole PH3 intersected open-jointed weathered rock to a depth of 7.5 m, where the rock is slightly weathered; a steeply dipping fracture zone between 9.5 - 10.9 m will need grouting.

The section in Plate 6 summarizes the subsurface conditions. Alluvium and the highly weathered rock will have to be stripped to provide a suitable foundation for the dam.

Drill hole PH4 was water-pressure tested and losses were calculated at no greater than 1 lugeon (Appendix 1). However this was measured in the hole with the best quality rock found at the site; leakages would be greater through rock near drill hole PH3. When stripping is completed, possible leakage paths can be identified and mapped more easily, and fracture in the rock can be grout.

CONCLUSIONS AND RECOMMENDATIONS

1. No major stability problems are expected in road-cuts along the proposed route. Most batters can be cut to 60° or steeper, apart from the cut 10 m deep south of Tuggeranong Creek, where unfavourably oriented joints require a batter slope of 45°.

2. Most road-cuts will have to be partly excavated by blasting as they pass through topographically high rocky areas.

3. Depth to rock suitable for foundations at the Tuggeranong Creek bridge site varies between 1 and 8 m. For the Northbound Carriageway, depth to competent rock ranges from 1 m on the east abutment to 7.6 m on the west abutment; this bedrock surface dips 5° evenly to the west. Foundations for the southbound carriageway tend to be more uniform at 4-5 m depth.

4. The Strangers Creek bridge site has suitable foundations for the abutments at about 2 m from the surface.

5. The Point Hut water feature is sited in the narrow downstream end of a large alluvial basin. Alluvium is 3.5-4.5 m thick and depth to suitable foundation ranges from 4-7 m in the centre of the valley to 3 m on the upper flanks. Alluvium and highly weathered rock should be stripped to expose moderately weathered rock which is expected to provide a suitable foundation.

6. It is recommended that a geologist visit the sites investigated during construction to map exposures and advise on stability of the cuts and foundation conditions.

REFERENCES

GOLDSMITH, R.C.M., 1975 - Lanyon trunk sewer, geological investigations, Tuggeranong, A.C.T. Bur. Miner. Resour. Aust. Rec. 1975/173 (unpubl.).

KOELLE, A., 1975 - Lanyon Trunk Sewer, seismic survey. Central Testing Res. Labs. Tech. Rep. 156.

APPENDIX 1

GEOLOGICAL LOGS OF DRILL HOLES, AND RESULTS OF WATER-PRESSURE TESTS

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT MURRUMBIDGEE PARK DRIVE
LOCATION TUGGER ANONG CK BRIDGE SITE
ANGLE FROM HORIZONTAL (θ) 90 DIRECTION —
COORDINATES E 203885·4N 589 507·1 R.L. OF COLLAR 543·5

TCB 4 HOLE NO.
SHEET 1 OF 1

Rock Type and Degree of Weathering	Description Lithology, colour, strength, etc	Casing	Graphic Log	Lift and % core recovery	Depth and size of Core	Fracture Log	RQD	Defect Frequency Intercept Angle 0 30 60 80 90	Structures Joints, veins, seams, faults, etc	Water Level	Water Pressure Test Losses (Lugeons) *
				AUGER / ROCK ROLLER	0 6 12 18+					9 15/4/76	
DACITIC TUFF EW				40	5		0		Loose and broken rock, core pieces 3-10 cm, but generally break up. Joints are limonite and clay coated, are closely spaced, weathered out in places and open. Below 6·9m clay is grey (reduced). Fractured zone 10 cm		
DACITIC TUFF HW (EW zones)	Mid-orange brown to grey-brown, soft and friable.	V		70	6		0				
		V		100	7		10				
		V		100							
DACITIC TUFF MW	Grey-green dacitic tuff, soft, can be broken by hand, green matrix, quartz and plagioclase phenocrysts	V		100	8		10		Rock mass is open and loose. Random jts in fractured zones but may dip 45°, grey clay. Crushed joints 7·8, 8·2 9·4. Core pieces 3-10 cm long.		
		V		100							
		V		100	9		10				
	END OF HOLE 9·46m	V			10						

Drill type MOLE
Feed CROWD PRESSURE
Core barrel type NMLC
Driller D of C (W. HART)
Commenced 15/4/76
Completed 15/4/76
Logged by R. GOLDSMITH
Vertical scale 1 m = 1 cm
Checked by

Notes

Fracture Log — Number of fractures per 25 cm of core. Zones of core loss blacked in.
Bedding and Joint Planes — Angles are measured relative to a plane normal to the core axis.
Defect Frequency — Number of natural defects (shears, joints, fractures) per 25 cm of core occurring at specified intercept angle range.
Water Level Measurements — ▽ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

Water Pressure Tests

* Values in lugeons should be read in conjunction with computation sheets. Test sections are indicated by blacked in strips.

Core Photograph Negative No.

Depth (m)	Black & White	Colour

M(Pf)146

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

PROJECT MURRUMBIDGEE PARK DRIVE
LOCATION TUGGERANONG CREEK BRIDGE

TCB 5
HOLE NO.

GEOLOGICAL LOG OF DRILL HOLE

ANGLE FROM HORIZONTAL (θ) 90 DIRECTION
COORDINATES E203136 N589469·2 R.L. OF COLLAR 542·8

SHEET 1 OF 1

Rock Type and Degree of Weathering	Description Lithology, colour, strength, etc	Casing	Graphic Log	Lift and % core recovery	Depth and size of Core	Fracture Log (0 6 12 18+)	RQD	Defect Frequency Intercept Angle (0 30 60 80 90)	Structures Joints, veins, seams, faults, etc	Water Level	Water Pressure Test Losses (Lugeons) *
				AUGER							
DACITE MW	Mid brown, mod. hard, but mass as a whole is weak.			60	1		30		Joints open, clay and limonite stained, some weathered out zones up to 3 cm thick (clay + grit infill). Joints generally shallow (0-30° dip). But some steep joints associated with minor sheared zones (>1 cm). Rock mass loose.		
				100	2		50				
				100	3		55				
DACITE SW	Light green-grey with pinkish colorations. Rock mass is mod. hard but weak, individ. pieces strong			100	4		50				
DACITE Fresh	Green gray, no staining porphyritic, qtz + plag. and minor orth. Very few veins			100	5		50		Joints mod. closely spaced. Sets dip 85-90°, 60° and 25°. The steepest set is limonite and clay coated to 5·25 m. + is associated with fracture zones. and curvi-planar faces. Rock mass open + loose. Minor clay-epidote joints at 5·25 - 6·8 m, mass slightly tighter.		
	EOH 6·8m				6		50				
					7						

Drill type MOLE
Feed CROWD PRESSURE
Core barrel type NMLC

Driller D of C (WHART)
Commenced 9/4/76
Completed 9/4/76
Logged by R. GOLDSMITH
Vertical scale 1m = 1cm

Checked by

Notes

Fracture Log — Number of fractures per 25 cm of core. Zones of core loss blacked in.
Bedding and Joint Planes — Angles are measured relative to a plane normal to the core axis.
Defect Frequency — Number of natural defects (shears, joints, fractures) per 25 cm of core occurring at specified intercept angle range.
Water Level Measurements — ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

Water Pressure Tests

* Values in lugeons should be read in conjunction with computation sheets. Test sections are indicated by blacked in strips.

Core Photograph Negative No.

Depth (m)	Black & White	Colour

M(Pf)146

I55/A16/1670

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT: MURRUMBIDGEE PARK DRIVE
LOCATION: TUGGERANONG CREEK BRIDGE SITE
ANGLE FROM HORIZONTAL (θ):
DIRECTION:
COORDINATES: E 203984·4 N 589524·0
R.L. OF COLLAR: 543·6
HOLE NO. TCB 6
SHEET 1 OF 1

Rock Type and Degree of Weathering	Description (Lithology, colour, strength, etc)	Graphic Log	Lift and % core recovery	Depth (m)	RQD	Structures (Joints, veins, seams, faults, etc)
			AUGER	0–3.0		
CEMENTED SLOPEWASH	Dark grey brown, core can be broken by hand		30	3.0–3.9	0	
DACITE EW-HW	Broken rock, grey brown.	v	100	3.9–4.1		Closely jointed and fractured, clay + limonite.
DACITE SW	Pink and grey, porphyritic. Some pinkish-red Fe-oxide or jasper zones (hard). Rock is hard and strong + brittle, does not crumble. Textura irregular	v	100; 100; 100.	4.1–7.0	45; 65; 65	Joints 70-90 + 30-40°. clay + limonite stained, moderately spaced + irregular, some curvilinear. No major crush zones. Mass tight.] Zone of intersection of 40 + 60° JTS.

End of Hole 7.0m

Depth scale: 1, 2, 3, 4, 5, 6, 7
Fracture Log scale: 0, 6, 12, 18+
Defect Frequency — Intercept Angle: 0, 30, 60, 80, 90
Casing | Water Level | Water Pressure Test Losses (Lugeons) *

Drill type: MOLE
Feed: CROWD PRESSURE
Core barrel type: NMLC
Driller: D of C (W. HART)
Commenced: 13/4/76
Completed: 13/4/76
Logged by: R. GOLDSMITH
Vertical scale: 1cm = 1m
Checked by:

Notes

Fracture Log — Number of fractures per 25 cm of core. Zones of core loss blacked in.
Bedding and Joint Planes — Angles are measured relative to a plane normal to the core axis.
Defect Frequency — Number of natural defects (shears, joints, fractures) per 25cm of core occurring at specified intercept angle range.
Water Level Measurements — ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

Water Pressure Tests

** Values in lugeons should be read in conjunction with computation sheets. Test sections are indicated by blacked in strips.*

Core Photograph Negative No.

Depth (m)	Black & White	Colour

M(Pf)146

I55/A16/1671

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT MURRUMBIDGEE PARK DRIVE
LOCATION TUGGERANONG CREEK BRIDGE SITE
ANGLE FROM HORIZONTAL (θ) 90° DIRECTION
COORDINATES E 2040375N 589495.99 R.L. OF COLLAR 542.1

TCB 7 HOLE NO.
SHEET 1 OF 1

Rock Type and Degree of Weathering	Description Lithology, colour, strength, etc	Casing	Graphic Log	Lift and % core recovery	Depth and size of Core	Fracture Log	RQD	Defect Frequency Intercept Angle 0 30 60 80 90	Structures Joints, veins, seams, faults, etc	Water Level	Water Pressure Test Losses (Lugeons) *
				ROCK ROLLER	NMLC	0 6 12 18+					
DACITIC TUFF HW	Orange-brown, mod. weak rock with friable material along discontinuities. EW core can be broken in hands.			100	2		0		Fe oxide and clay on joints, there is some hard rock between closely spaced joints but the mass is generally weak and loose.	▽ 8/4/76	
EW	Some loose sandy material			80	3		0				
				60	4		0				
DACITIC TUFF MW-SW	Green grey, porphyritic some fine grained patches			100	5		60		Mod. hard and strong, joints free of clay, but are flakey and weathered (MW-HW). Large crushed joints dipping 70-90°.		
	One core piece 60cm long				6		60				
	END OF HOLE 6.5m				7						

Drill type MOLE
Feed CROWD PRESSURE
Core barrel type NMLC

Driller D of C (W. HART)
Commenced 8/4/76
Completed 8/4/76
Logged by R. GOLDSMITH
Vertical scale 1 cm = 1 m

Checked by

Notes

Fracture Log — Number of fractures per 25 cm of core. Zones of core loss blacked in.
Bedding and Joint Planes — Angles are measured relative to a plane normal to the core axis.
Defect Frequency — Number of natural defects (shears, joints, fractures) per 25 cm of core occurring at specified intercept angle range.
Water Level Measurements — ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

Water Pressure Tests

* *Values in lugeons should be read in conjunction with computation sheets. Test sections are indicated by blacked in strips.*

Core Photograph Negative No.

Depth (m)	Black & White	Colour

M(Pf)146

155/A16/1672

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT: LANYON TRUNK SEWER
LOCATION: TUGGERANONG – SECTION OF SEWER WHERE IT ALIGNS WITH MURRUMBIDGEE PARK DRIVE
ANGLE FROM HORIZONTAL (θ): −90° DIRECTION: ——
COORDINATES: E 204108 N 589367 R.L. OF COLLAR: 560.5 m

HOLE NO. LTS 3
SHEET 1 OF 1

Rock Type and Degree of Weathering	Description Lithology, colour, strength, etc	Structures Joints, veins, seams, faults, etc
DACITIC TUFF HW	Light tan to mid brown, med. weak, soft – plagioclase phenocrysts weathered to white.	Joints mod. closely spaced, weathered up to 10 cm thick (no clay on faces – but limonite stains on rough joint faces. Dip 70–90°, some 0–30°.
DACITIC TUFF MW		Joints open and limonite stained, some clay and grit in weathered-out joints. Some smooth widely spaced clay-coated joints dip 60°.
DACITIC TUFF HW, some EW	Light tan to yellow brown, core can be broken by hand, gen. soft and crumbly.	Zone of closely fractured rock, joint faces clay coated. Mass is open and loose.
SW	Grey-green dacitic tuff – phenocrysts of quartz, light green plagioclase and red-brown stained quartz and Fe-oxide patches. Rock welded to form a very hard and strong mass. A network of v. thin sericite/epidote	From 8.4m the rock mass is hard and strong with mod. to widely spaced joints. Joint faces contain sericite and epidote – some weathered to clay (minor). Faces smooth to slightly rough. Dip 45° and some parallel to veins.
DACITIC TUFF Fresh		

END OF HOLE 14.05 m.

Water Level: ▼ 4.6 m. 8/4/76

Water Pressure Test Losses (Lugeons) *: invert level of pipeline

Drill type: MOLE PIONEER
Feed: CROWD PRESSURE
Core barrel type: ROCK ROLL – 0–2m, NMLC 2–14m.
Driller: D. of C.
Commenced: 1/4/76
Completed: 6/4/76
Logged by: R. GOLOSMITH
Vertical scale: 1cm = 1m
Checked by:

Notes

Fracture Log — Number of fractures per 25 cm of core. Zones of core loss blacked in.
Bedding and Joint Planes — Angles are measured relative to a plane normal to the core axis.
Defect Frequency — Number of natural defects (shears, joints, fractures) per 25 cm of core occurring at specified intercept angle range.
Water Level Measurements — ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

EW – Extremely weathered
HW – Highly weathered
MW – Moderately weathered
SW – Slightly weathered
Fr – Fresh

Water Pressure Tests

* Values in lugeons should be read in conjunction with computation sheets. Test sections are indicated by blacked in strips.

Core Photograph Negative No.

Depth (m)	Black & White	Colour

M(Pf)146

I55/A16/1668

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT MURRUMBIDGEE PARK DRIVE
LOCATION STRANGERS CREEK BRIDGE SITE
SOUTH ABUTMENT
ANGLE FROM HORIZONTAL (θ) 90° DIRECTION —
COORDINATES E204971·6 N587499·4 R.L. OF COLLAR 557·4

HOLE NO SCB 1
SHEET 1 OF 1

Rock Type and Degree of Weathering	Description Lithology, colour, strength, etc	Casing	Graphic Log	Lift and % core recovery	Depth and size of Core	Fracture Log	RQD	Defect Frequency Intercept Angle 0 30 60 80 90	Structures Joints, veins, seams, faults, etc	Water Level	Water Pressure Test Losses (Lugeons) *
DACITE EW	Slopewash and residual MW dacite fragments			ROCK ROLLER		0 6 12 18+					
MW	Brown-grey, feldspars white (altered), rock is mod. soft.			75	1		20		fract. zone 2-3m — Joints open + weathered, qtz ep + cc infilling, limonite stained.		
DACITE SW	Dark green grey, phenocrysts of quartz and plag 3-7mm in size. less common orth 2-3mm Some reddish groundmass in places. Brecciated, but welded, rock occurs at 4m.			100	2		80		Broken zone of intersecting jts. — Joints gen. slightly rough, but tight, some Fe + Mn oxide stains. Little or no clay. Rock mass hard and strong. Core pieces 15-30cm (up to 50cm)		
					3		65				
					4		50				
Fresh stained	Numerous small veins of sericite			100	5		60				
	END OF HOLE 5·95				6						

NMLC

Drill type MOLE
Feed CROWD PRESSURE
Core barrel type NMLC
Driller D of C (W. HART)
Commenced 26/5/76
Completed 27/5/76
Logged by R. GOLDSMITH
Vertical scale 1 cm = 1 m
Checked by

Notes

Fracture Log — Number of fractures per 25 cm of core. Zones of core loss blacked in.
Bedding and Joint Planes — Angles are measured relative to a plane normal to the core axis.
Defect Frequency — Number of natural defects (shears, joints, fractures) per 25 cm of core occurring at specified intercept angle range.
Water Level Measurements — ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

EW — Extremely weathered
MW — Moderately "
SW — slightly "

Water Pressure Tests

* Values in lugeons should be read in conjunction with computation sheets. Test sections are indicated by blacked in strips.

Core Photograph Negative No.

Depth (m)	Black & White	Colour

M(Pf)146

I55/A16/1673

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT MURRUMBIDGEE PARK DRIVE
LOCATION POINT HUT NUTRIENT POND - NORTH END OF EMBANKMENT ℄
ANGLE FROM HORIZONTAL (θ) 90° DIRECTION
COORDINATES E 206281·6 N 584623·4 R.L. OF COLLAR 564·33

HOLE NO PH 1
SHEET 1 OF 1

Rock Type and Degree of Weathering	Description Lithology, colour, strength, etc	Casing	Graphic Log	Lift and % core recovery	Depth and size of Core	Fracture Log	RQD	Defect Frequency Intercept Angle 0 30 60 80 90	Structures Joints, veins, seams, faults, etc	Water Level	Water Pressure Test Losses (Lugeons) *
ALLUVIUM	Black silty sand and gravel lenses. stratified, some sub-rounded to angular fragments of rhyolite.			15						AM 11/6 1·52 PM 10/6 1·78 17/6 1·6	
GRAVEL + COLLUVIUM	Loose and broken sub-rounded to angular rock fragments.			40							
DACITE HW				60			0		10 cm weath. jt. Clay		
DACITE MW	Mid grey-brown, moderately hard and strong.			100			35		Rock mass loose, some tight sections, joints moderately closely spaced and open, some rough		
DACITE SW	Dark grey-brown, porphyritic texture, phenocrysts of quartz and green altered plagioclase 2-5 mm in size, biotite is also present.			100	NMLC		80		From 6m joints are moderately spaced, partially open but no clay is present. Jts gen. contain limonite + associated with sericite and calcite veins.		
DACITE Fresh stained				100			60				
DACITE Fresh	Blue-grey, very hard and strong, slow drilling - 90cm in 2½hrs for last rem. Porphyritic quartz and plag. up to 5mm.			100			75		Rock mass as a whole is tight and strong.		
				100			100		From 9·2m staining is absent. Joints tight and mod spaced. Some minor broken zones. Epidote and calcite veins. Very hard and strong rock mass.		
				100	NX		60				
	End of Hole 11·95m.			100			90				

Drill type MOLE
Feed CROWD PRESSURE
Core barrel type NMLC 2·8-8·7m, NX 8·7m-12m
Driller DHC (W. HART)
Commenced 5/6/76
Completed 18/6/76
Logged by R. GOLDSMITH
Vertical scale 1cm = 1m
Checked by

Notes

Fracture Log — Number of fractures per 25 cm of core. Zones of core loss blacked in.
Bedding and Joint Planes — Angles are measured relative to a plane normal to the core axis.
Defect Frequency — Number of natural defects (shears, joints, fractures) per 25 cm of core occurring at specified intercept angle range.
Water Level Measurements — ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered.

Water Pressure Tests

* Values in lugeons should be read in conjunction with computation sheets. Test sections are indicated by blacked in strips.

Core Photograph Negative No.

Depth (m)	Black & White	Colour

M(Pf)146

155/A16/1674

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT MURRUMBIDGEE PARK DRIVE

LOCATION POINT HUT NUTRIENT POND, SOUTHERN END OF EMBANKMENT &

ANGLE FROM HORIZONTAL (θ) 90° DIRECTION

COORDINATES E 206281.6 N 584542.1 R.L. OF COLLAR 569.04

HOLE NO PH2

SHEET 1 OF 1

Rock Type and Degree of Weathering	Description Lithology, colour, strength, etc	Casing	Graphic Log	Lift and % core recovery	Depth and size of Core	Fracture Log (0 6 12 18+)	RQD	Defect Frequency Intercept Angle (0 30 60 80 90)	Structures Joints, veins, seams, faults, etc	Water Level	Water Pressure Test Losses (Lugeons) *
				Rock Roll							
DACITE EW	Mid brown, weak – can be broken by hand. Crushed core has a clayey sand texture			30	1		0		Rock decomposed but structure preserved in core, sand + clay infilling along joints. Very open + loose rock.		
DACITE EW–HW	Core more solid but still weak.			100	2		0				
DACITE MW	Grey brown, medium to coarse grained – porphyritic with phenos of quartz and plag, no orthoclase. From 8m – 12m plagioclase is more dominant over quartz. Core is moderately hard and strong but weakened by joints			100	3		55	3 3 2 1 1 2	2cm epidote vein		
				100	4		60	2 3 3 2 1 1 1 1	clay j+ (clay) " "		
				100	5		80	1 2 2 1			
				100	6		55	2 8 2	5cm fract. zone		
				100	7		60	2 5 3 3 3 1 1 2	fract. zone 1cm epidote vein " "	▽	7/6/76
				100	8		60	3 1 1 1 2 1	fract + weath joint " "		
				100	9		30	2 4 1 2 1 3 1	open joint 1cm epidote vein		
				100	10		50	2	fractured + weathered zone		
DACITE SW	Dark grey, porphyritic			100	11		85	2 1 1 1	Hard and strong, but joints partially open and limonite stained, no clay.		
	END OF HOLE 12.0m.				12						

Rock mass has medium strength and hardness, easy drilling. But not badly fractured. Joints are mod. spaced, planar and tight, some clay with weathered zones and limonite stains. Mass as a whole is moderately tight.

Drill type MOLE

Feed CROWD PRESSURE

Core barrel type NMLC

Driller DHC (W HART)

Commenced 1/6/76

Completed 4/6/76

Logged by R. GOLDSMITH

Vertical scale 1cm = 1m

Checked by

Notes

Fracture Log — Number of fractures per 25 cm of core. Zones of core loss blacked in

Bedding and Joint Planes — Angles are measured relative to a plane normal to the core axis

Defect Frequency — Number of natural defects (shears, joints, fractures) per 25cm of core occurring at specified intercept angle range.

Water Level Measurements — ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date

EW – Extremely weathered
HW – Highly "
MW – Moderately "
SW – Slightly "

Water Pressure Tests

* Values in lugeons should be read in conjunction with computation sheets. Test sections are indicated by blacked in strips.

Core Photograph Negative No.

Depth (m)	Black & White	Colour

M(Pf)146

I55/A16/1675

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT MURRUMBIDGEE PARK DRNE
LOCATION POINT HUT NUTRIENT POND — END OF SPILLWAY
ANGLE FROM HORIZONTAL (θ) 90° DIRECTION
COORDINATES E206200·5N 5846428 R.L. OF COLLAR 562·97

HOLE NO PH3
SHEET 1 OF 1

Rock Type and Degree of Weathering	Description Lithology, colour, strength, etc	Casing	Graphic Log	Lift and % core recovery	Depth and size of Core	Fracture Log	RQD	Defect Frequency Intercept Angle 0 30 60 80 90	Structures Joints, veins, seams, faults, etc	Water Level	Water Pressure Test Losses (Lugeons) *
SAND AND SILTY ALLUVIUM			ROCK ROLLER			0 6 12 18+					
DACITIC TUFF EW	Completely decomposed sandy-gravel texture, clay matrix. Some compact clayey core, (brown and grey clay)			100					No structure visible		
				100							
				50							
DACITIC TUFF HW - MW				100	NMLC		10	3 3 4 2 1 4 5	Rock mass is loose joints open and weathered, crumbly zones, closely spaced joints, dip 0-30° + 90°.		
DACITIC TUFF SW (MW - HW zones)	Blue-grey, hard and strong rock, some feldspar discoloration and Fe ox on joints very few veins			100			25	7 2 4 1 9 4 2 6			
				100			20	5 2 4 2 7 2			
DACITIC TUFF MW	grey-brown, stained. Mod. hard and strong but friable on joints			100			10	2 1	9.5-10.9 Broken and fractured zone, rock strong between joints, but is fragmented in jts - washed out by NX core (blocked off NMLC).		
				100			10	4 2			
SW	No stains										
DACITIC TUFF Fresh	Blue-grey porphyritic minor veining of cc and ep. (along joint planes) some slicken-sides have replaced veins One core length from 13.83 - 14.7. No stains			100	NX		80	1 2 1 1	From 10.9m to EOH the rock mass is tight and joints are tight and planar (mod. to widely spaced)		
							70	3 2 1 1	- crushed jt. 0.5cm - 60°		
				100			70	1 1 2 2	core breaks up a bit when boxed, but are parallel to veins.		
							100				
	END OF HOLE 14.7m										

Drill type FOX 108LS - 22'
Feed GRAVITY FEED
Core barrel type NMLC 3.5 - 10.3, NX 10.3 - 14.7
Driller D of C (W. HART)
Commenced 21/6/76
Completed 25/6/76
Logged by R. GOLDSMITH
Vertical scale 1 cm = 1m
Checked by

Notes

Fracture Log — Number of fractures per 25 cm of core. Zones of core loss blacked in

Bedding and Joint Planes — Angles are measured relative to a plane normal to the core axis

Defect Frequency — Number of natural defects (shears, joints, fractures) per 25 cm of core occurring at specified intercept angle range.

Water Level Measurements — ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

EW - Extremely weathered
HW - Highly "
MW - Moderately "
SW - Slightly "

Water Pressure Tests

* Values in lugeons should be read in conjunction with computation sheets. Test sections are indicated by blacked in strips.

Core Photograph Negative No.

Depth (m)	Black & White	Colour

M(Pf)146

I55/A16/1676

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT MURRUMBIDGEE PARK DRIVE

LOCATION POINT HUT NUTRIENT POND – BASE OF EMBANKMENT

ANGLE FROM HORIZONTAL (θ) 90° DIRECTION —

COORDINATES E 206296·5 N 584563·4 R.L. OF COLLAR 565·3

HOLE NO PH4

SHEET 1 OF 1

Rock Type and Degree of Weathering	Description Lithology, colour, strength, etc	Casing	Graphic Log	Lift and % core recovery	Depth and size of Core	Fracture Log (0 6 12 18+)	RQD	Defect Frequency Intercept Angle (0 30 60 90)	Structures Joints, veins, seams, faults, etc	Water Level	Water Pressure Test Losses (Lugeons) *
ALLUVIUM	Silty sand and gravel. Stratified.			ROCK ROLL 30	1–4					8/7 ▽ 7/7 ▽	2·15 2·30
EW, HW, MW. DACITE SW	Brown - to green gray, mod soft.			100	5		10	4 5	5cm thick crushed joint		
				100	6		80	4 1	Broken core		
DACITIC TUFF Fresh	Dark blue gray to green gray. Phenocrysts of quartz and plagioclase.			100	7		80	10 2	Joints weathered but gen. tight, horizontal. Some 60–70°		
				100	8		100	1	From 6·3m the rock mass is very hard and tight. Very few joints (some machine breaks). Some localized broken zones which probably contribute to water loss (minor). They are not weathered. Joints are calcite and epidote lined, no discoloration or weathering.		1 LUGEON
				100	9		80	3 2 1			
				100	10		100	2 1 1			
				100	11		80	1 1 2 2 1			
				100	12		100				0 LUGEON
				100	13		100	1 1	Veins of epidote – sericite – calcite are widely spaced. Core lengths range between 20–100cm. Very hard and strong.		
				100	14		95	2			
					15		100				
	END OF HOLE 16·0m				16						

Drill type FOX 108LS-22'

Feed GRAVITY

Core barrel type NMLC

Driller D & C (W. HART)

Commenced 28/6/76

Completed 9/7/76

Logged by R. GOLDSMITH

Vertical scale 1cm = 1m.

Checked by

Notes

Fracture Log — Number of fractures per 25 cm of core. Zones of core loss blacked in.

Bedding and Joint Planes — Angles are measured relative to a plane normal to the core axis.

Defect Frequency — Number of natural defects (shears, joints, fractures) per 25 cm of core occurring at specified intercept angle range.

Water Level Measurements — ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

Water Pressure Tests

* Values in lugeons should be read in conjunction with computation sheets. Test sections are indicated by blacked in strips.

Core Photograph Negative No.

Depth (m)	Black & White	Colour

M(Pf)146

I55/A16/1677

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

WATER PRESSURE TESTS
REDUCTION OF FIELD RESULTS

PROJECT POINT HUT WATER FEATURE FEATURE EMBANKMENT SITE HOLE NO PH4

ANGLE FROM HORIZONTAL (θ) −90 DIRECTION — R.L. OF COLLAR 565·29 SIZE OF HOLE NMLC

LOCATION POINT HUT A.C.T. PACKER TYPE HYDRAULIC DRILL LOG REF. SHEET 1 OF 1

Date	Section Tested From (m)	Section Tested To (m)	Time of Test (min)	Gauge Pressure (kPa)	Water Meter Reading Start (ℓ)	Water Meter Reading Finish (ℓ)	Water Loss (ℓ)	Leakage Rate (ℓ/m)	Length of Test Section (m)	Conversion Factor (×8m of NX Hole)	Slope Depth to Standing Water (m)	Slope Ht. Gauge to Collar (m)	Length & Size of Supply Line (m)	Water Column Pressure (kPa)	Friction Losses Supply Line (kPa)	Friction Losses Packer (kPa)	Effective Test Pressure (kPa)	Water Loss ℓ/min/m	Water Pressure Test Loss in ℓ/min/m	Remarks
	a	b	c	d	e	f	f−e=g	g/c=h	b−a=i	k*	ℓ	m	n	p+	q*	r*	d+p−q−r	k(h/i)	0·5 1·0	
7/7/76	6·0	12·1	5	80	0	0	0	0	6·1	1	2·3	0	6·0	22·5	—	—	102·5	0		
"	"	"	"	80	0	0	0	0	"	"	"	"	"	"			102·5	0		
"	"	"	"	140	0	3·5	3·5	0·7	"	"	"	"	"	"			162·5	0·11		
"	"	"	"	140	0	0·5	0·5	0·1	"	"	"	"	"	"			162·5	0·02		1 LUGEON
"	"	"	"	140	0	0	0	0	"	"	"	"	"	"			162·5	0		
"	"	"	"	200	0	5	5	1	"	"	"	"	"	"			222·5	0·16		
"	"	"	"	200	0	4·5	4·5	0·9	"	"	"	"	"	"			222·5	0·15		
"	"	"	"	140	0	0	0	0	"	"	"	"	"	"			162·5	0		
"	"	"	"	140	0	0	0	0	"	"	"	"	"	"			162·5	0		
"	"	"	"	80	0	0	0	0	"	"	"	"	"	"			102·5	0		
"	"	"	"	80	0	0	0	0	"	"	"	"	"	"			102·5	0		
"	"	"	"																	
8/7/76	10·0	16·0	5	140	0	0	0	0	6·0	"	2·15	"	12·0	21·1			161·1	0		
"	"	"	"	140	0	0	0	0	"	"	"	"	"	"			161·1	0		
"	"	"	"	200	0	0	0	0	"	"	"	"	"	"			221·1	0		
"	"	"	"	200	0	0	0	0	"	"	"	"	"	"			221·1	0		
"	"	"	"	400	0	0·5	0·5	0·1	"	"	"	"	"	"			421·1	0·02		
"	"	"	"	400	0	0	0	0	"	"	"	"	"	"			421·1	0		0 LUGEON
"	"	"	"	200	0	0	0	0	"	"	"	"	"	"			221·1	0		
"	"	"	"	200	0	0	0	0	"	"	"	"	"	"			221·1	0		
"	"	"	"	140	0	0	0	0	"	"	"	"	"	"			161·1	0		
"	"	"	"	140	0	0	0	0	"	"	"	"	"	"			161·1	0		
"	"	"	"	200	0	0	0	0	"	"	"	"	"	"			221·1	0		
"	"	"	"	200	0	0	0	0	"	"	"	"	"	"			221·1	0		
"	"	"	"	400	0	0	0	0	"	"	"	"	"	"			421·1	0		
"	"	"	"	400	0	0	0	0	"	"	"	"	"	"			421·1	0		

* Values are read from appropriate correction graphs

+ If ℓ ≤ a, p = 9·8 sinθ (ℓ + m); if ℓ > a, p = 9·8 sinθ n

W.P.T. Vertical scale 1 CM = 0·5 ℓ/min/m

Calculated by R.C. Goldsmith

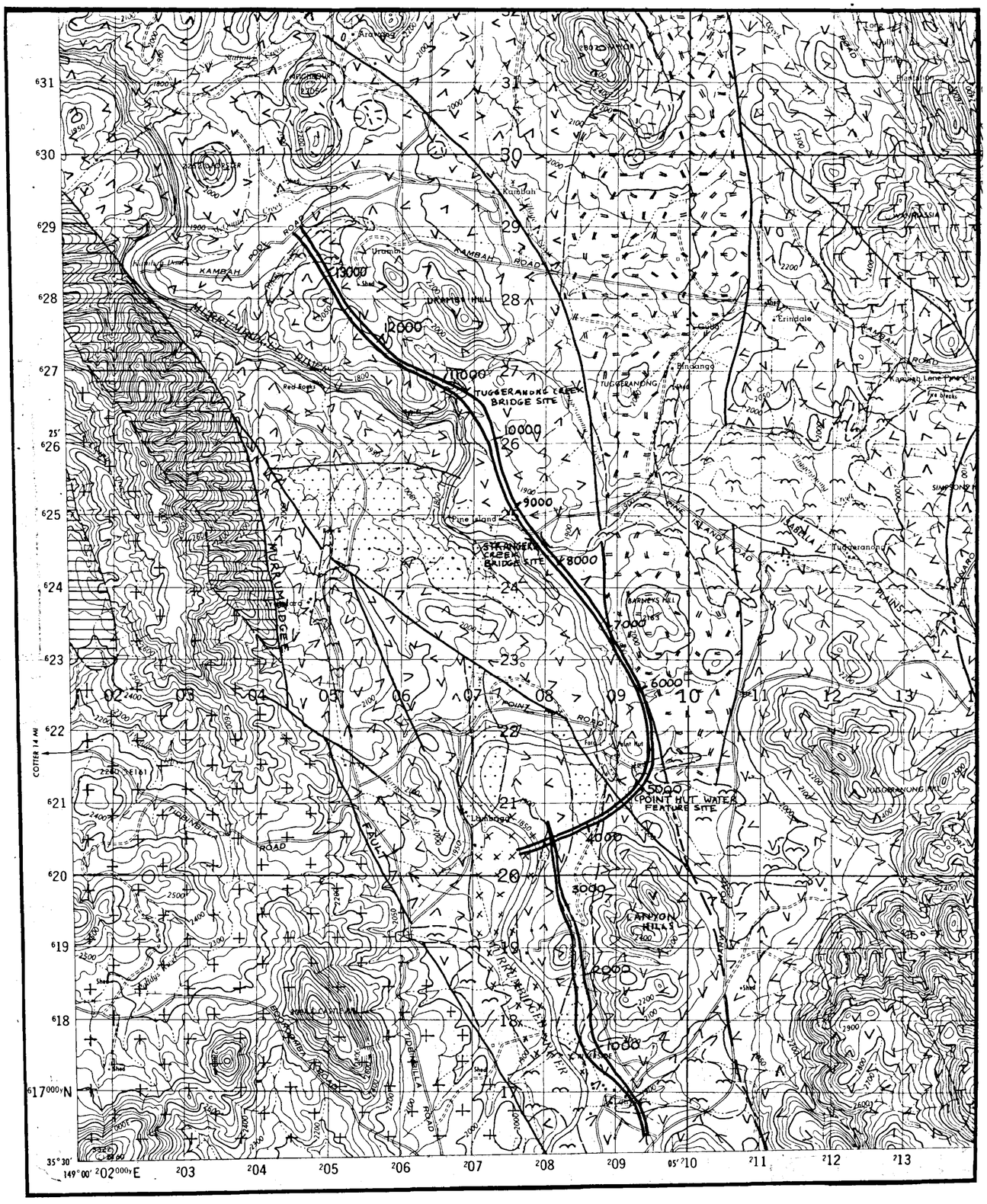
Checked by

M(P)147

155/A16/1678

MURRUMBIDGEE PARK DRIVE

General Geology, Tuggeranong, A.C.T.



1 : 50,000

1 0 1 2 3 Miles

1000 500 0 1000 2000 3000 4000 Metres

1000 500 0 1000 2000 3000 4000 Yards

CONTOUR INTERVAL 50 FEET

VERTICAL DATUM IS BASED ON MEAN SEA LEVEL, SYDNEY

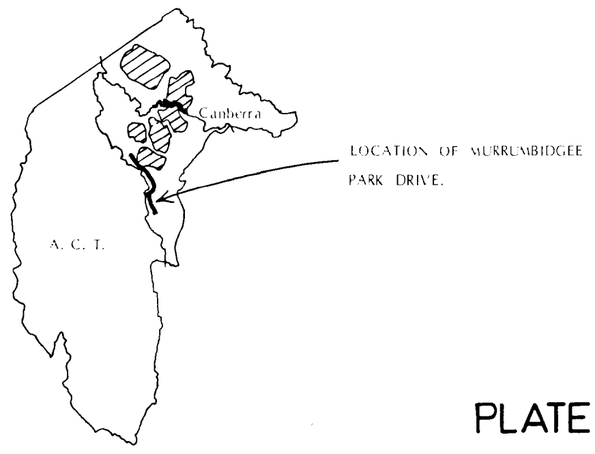
QUATERNARY		Alluvium
DEVONIAN	Murrumbidgee Batholith	Granite
UPPER SILURIAN		Pale and dark grey rhyodacite and dark grey dacitic tuff
		Pink porphyritic dacite
		Tuggeranong tuff – white and pale purple rhyolite with pink feldspar
		Sandstone, siltstone – tuffaceous, agglomerate
		"Big Pink" rhyolite
		Reddish purple and green grey rhyodacite
ORDOVICIAN		Shale, sandstone, slate, quartzite

— — — — Geological boundary, approximate,

?—?—?—? " " inferred

——— Fault

═══ Proposed roadway



N MN

PLATE 1

AMENDMENTS			
No.	Description	Author	Checked
A1			
A2			
A3			
A4			
A5			

SCALE 1 : 50 000

Base map/survey 1:50 000 SHEET 8727-III

Geology by Henderson, Goldsmith, Gardiner, Jackson, Rossiter, Saltet, et. al.

Compiled and checked: R. GOLDSMITH, Project geologist

Checked and approved: D. C. PURCELL, Senior geologist

E. G. WILSON, Supervising geologist

COMMONWEALTH OF AUSTRALIA
BUREAU OF MINERAL RESOURCES
CANBERRA, A.C.T.

TITLE GENERAL GEOLOGY TUGGERANONG A.C.T.

PROJECT MURRUMBIDGEE PARK DRIVE

To accompany Record 1976/106

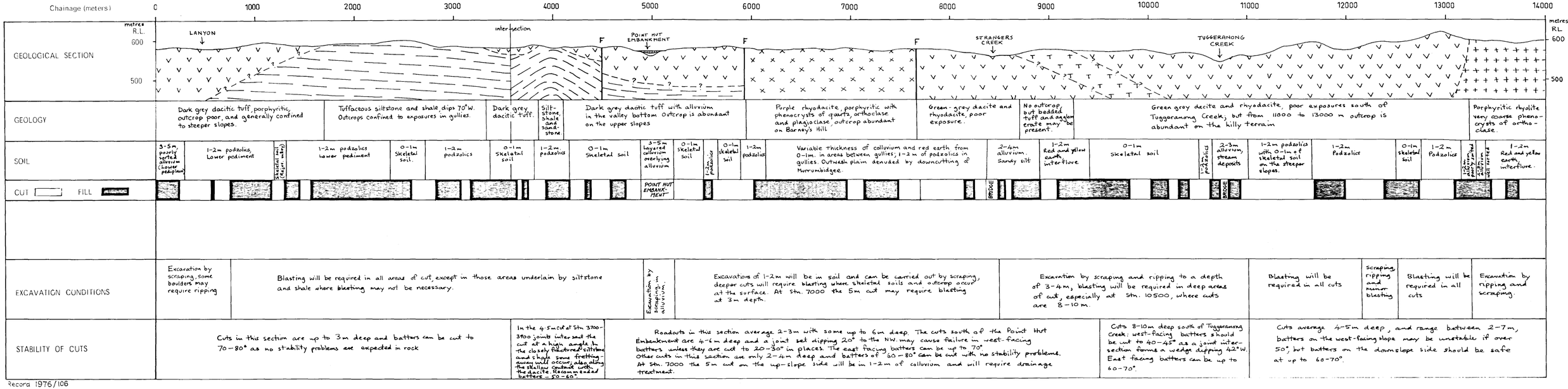
Drawn by I.H.

Drawing No 155/A16/1662

Record 1976/106

SOUTH

NORTH



Recora 1976/106

MURRUMBIDGEE PARK DRIVE
INTERPRETATIVE GEOLOGICAL SECTION ALONG PROPOSED CENTRELINE.

PLATE 2

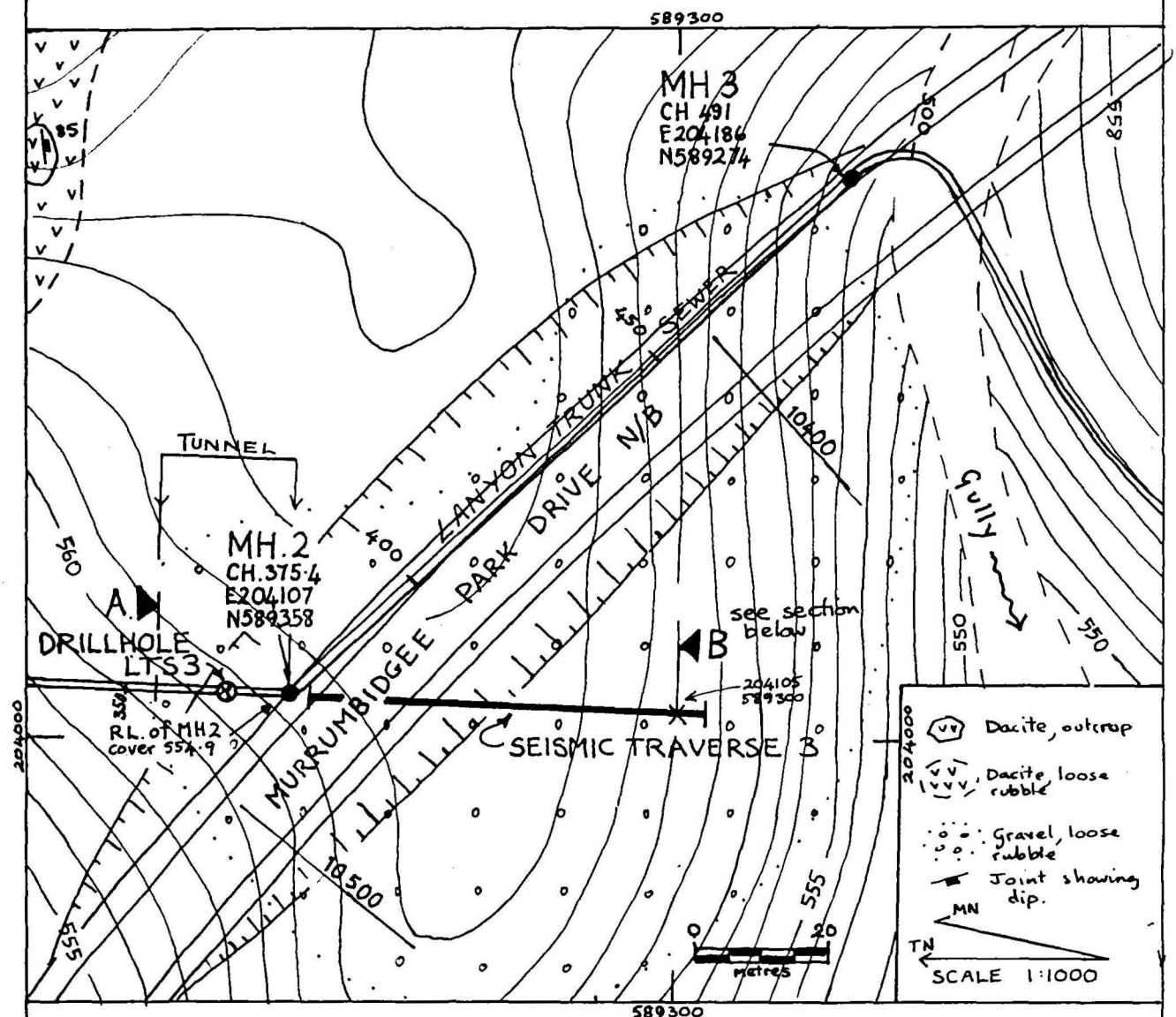
155/A16/1663

MURRUMBIDGEE PARK DRIVE / LANYON TRUNK SEWER

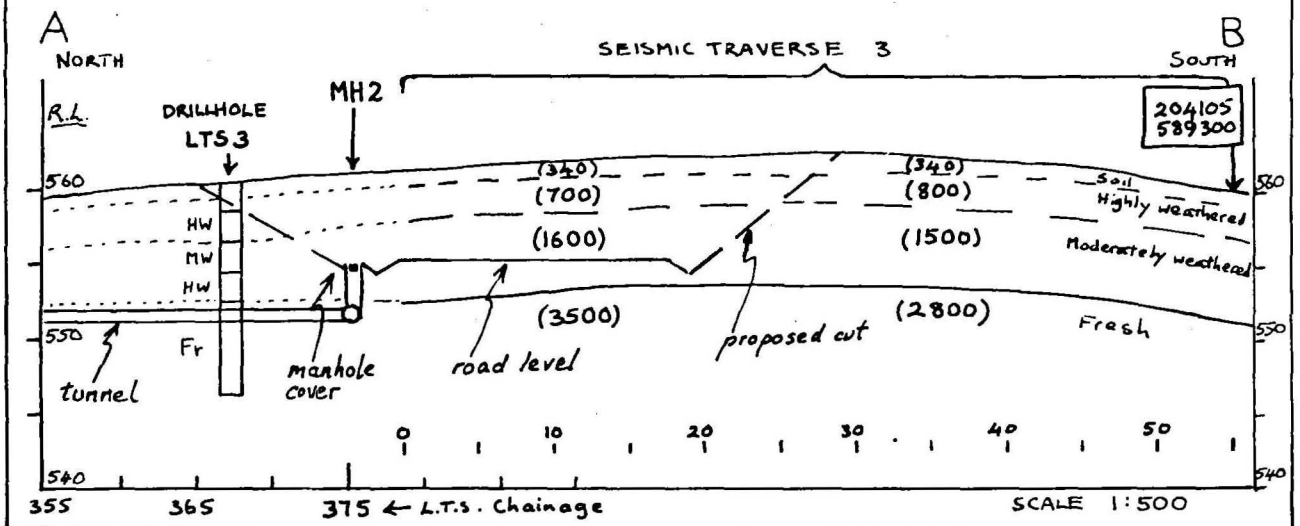
DEEP ROADCUT SECTION (CH. 10400 - 10500 m)

SECTION OF PIPELINE ROUTE (CH. 350 - 550)

MAP OF SITE



SECTION A-B SHOWING PROPOSED WORKS



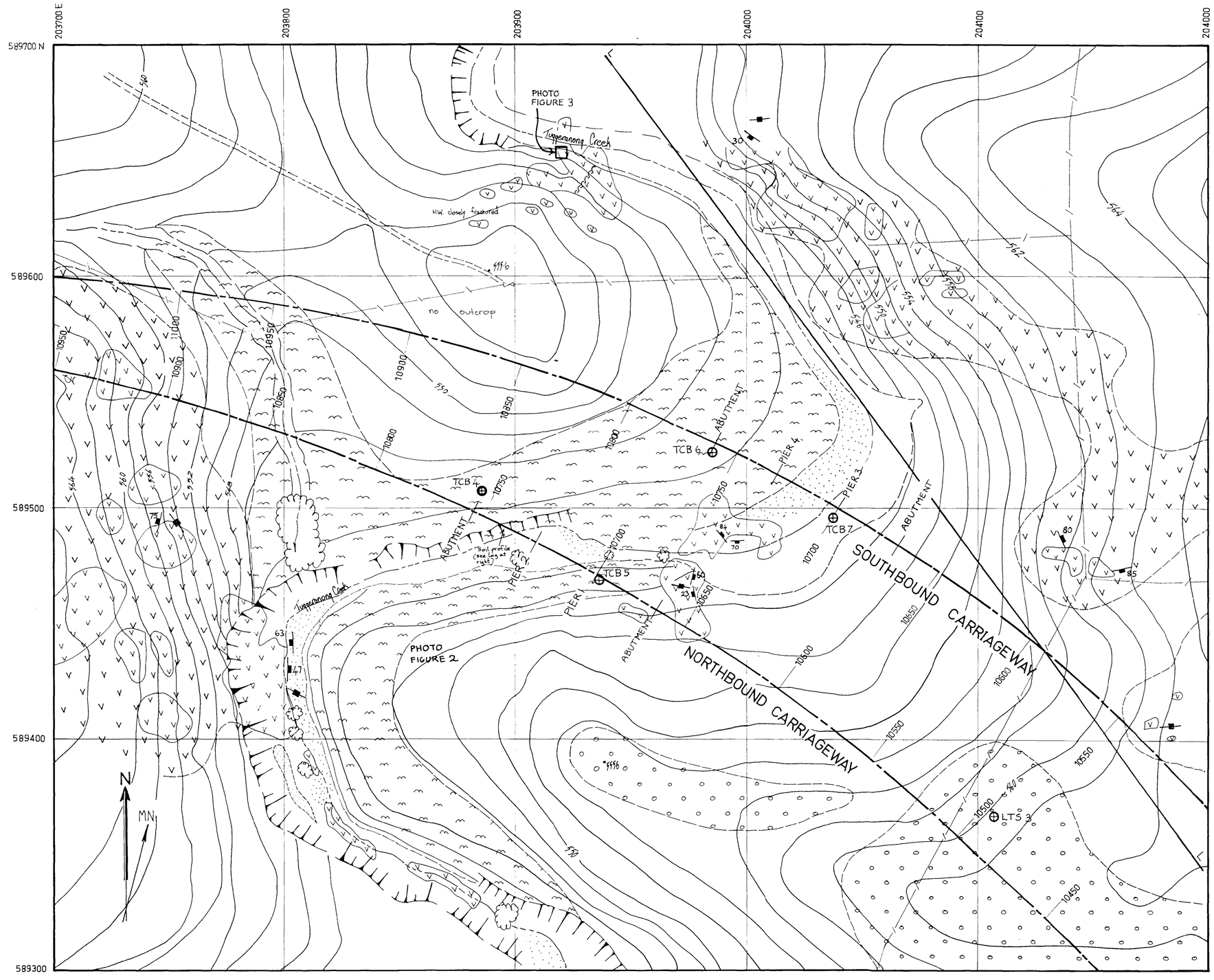
Record 1976/106

I55/A16/1664

PLATE 3

MURRUMBIDGEE PARK DRIVE

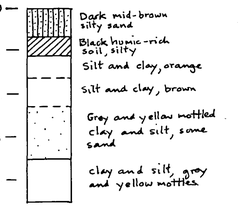
GEOLOGY OF TUGGERANONG CREEK BRIDGE SITE



Quaternary
- River Alluvium
- Terrace Alluvium

Silurian
- Dacitic Tuff

- rock outcrop
- scattered outcrop and loose boulders
- 50 joint showing dip
- joint vertical
- sheared zone
- lineament
- gully edge
- creek
- fence
- centre line of proposed road, showing chainage in metres
- ⊕ diamond drill hole



LOG OF SOIL PROFILE IN BANK OF TUGGERANONG CREEK, N/B CARRIAGEWAY STN. 10730m.

SCALE 1 : 1000

0 20 40 60 80 100
metres

Contour interval 2m.

PLATE 4

AMENDMENTS			
No.	Description	Author	Checked
A1			
A2			
A3			
A4			
A5			

SCALE (see above)

Base map/survey

Geology by R. GOLDSMITH

Compiled and checked R.C.M.G. Project geologist

Checked and approved D.C. PURCELL Senior geologist

E. G. WILSON Supervising geologist

COMMONWEALTH OF AUSTRALIA
BUREAU OF MINERAL RESOURCES
CANBERRA, A.C.T.

TITLE: GEOLOGY OF TUGGERANONG CREEK BRIDGE SITE

PROJECT: MURRUMBIDGEE PARK DRIVE

To accompany Record 1976/106

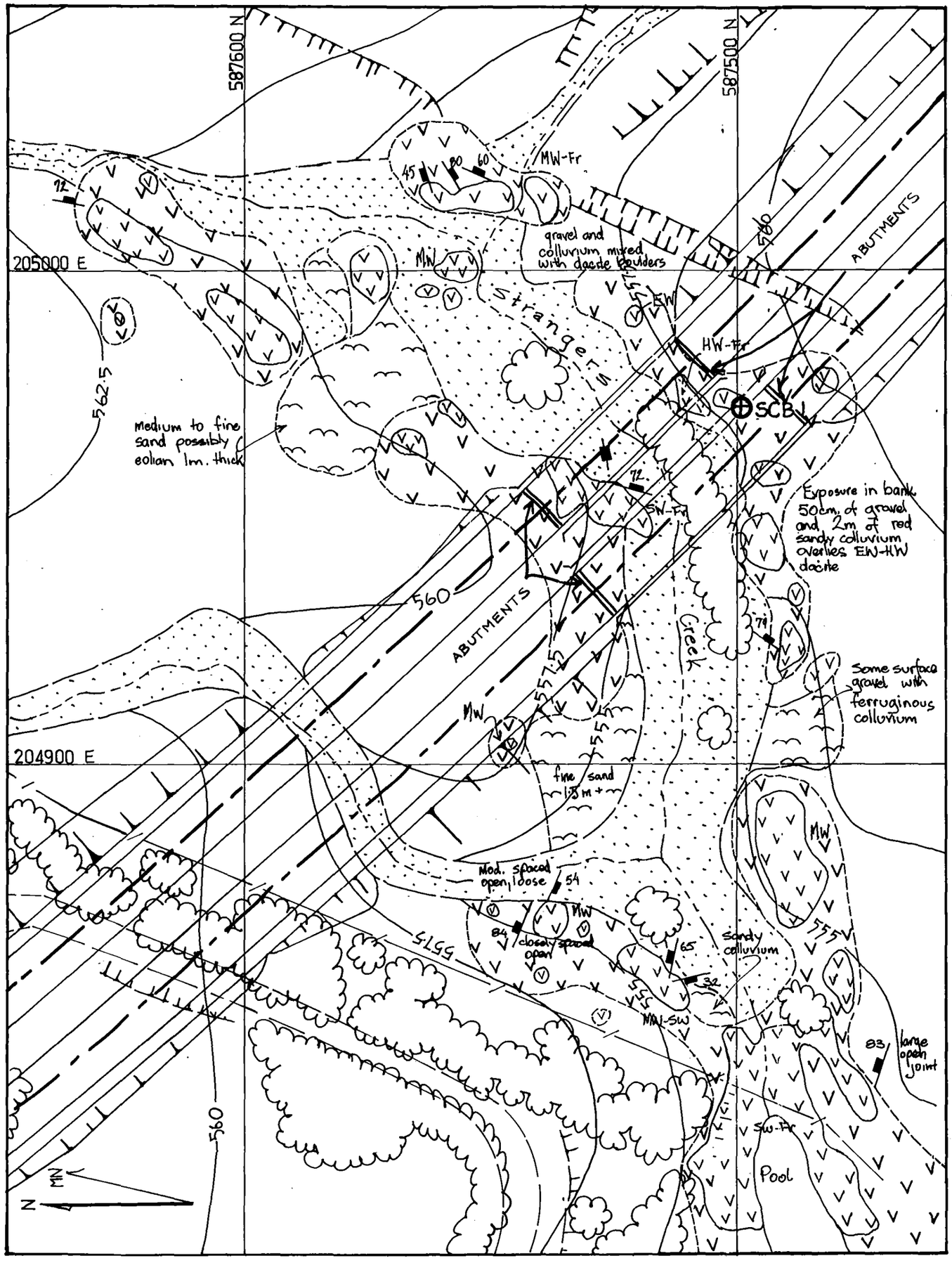
Drawn by K.

Drawing No. 155/A1/1665

Record 1976/106

MURRUMBIDGEE PARK DRIVE

GEOLOGY OF STRANGERS CREEK BRIDGE SITE



Quaternary
- River Alluvium
- Terrace Alluvium

Silurian
- Dacitic Tuff

- rock outcrop
- scattered outcrop and loose boulders
- 30 joint showing dip
- joint vertical
- gully edge
- creek
- fence
- centre line of proposed road, showing chainage in metres
- ⊕ diamond-drill hole

EW - Extremely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
Fr - Fresh

SCALE 1 : 1000

0 20 40 60 80 100

metres

Contour interval 2m.

PLATE 5

Record 1976/106

I55/A16/1666

206000 206100 E 206200 206300 E 206400 206500 E 206600 206700 E

584900 N

584800

584700 N

584600

584500 N

584400

POINT HUT ROAD

Swamp

Swamp

LINE OF SPILLWAY CHUTE

PROPOSED EMBANKMENT

PH1

PH2

PH3

PH4

TWL 571m

B

5200

5100

5000

4900

4800

A

scattered outcrop

Fence Line

MW-HW

HW

EW

45

70

MURRUMBIDGEE PARK DRIVE

GEOLOGY OF POINT HUT WATER - FEATURE SITE

Quaternary
- River Alluvium
- Terrace Alluvium

Silurian
- Dacitic Tuff

- rock outcrop
- scattered outcrop and loose boulders
- joint showing dip
- joint vertical
- shear zone
- gully edge
- creek
- fence
- centre line of proposed road, showing chainage in metres
- diamond-drill hole

N MN

SCALE 1 : 1000

0 20 40 60 80 100

metres

Contour interval 2m.

A South — B North

Embankment

PH2 EW-HW MW SW

PH4 gully EW SW ?

PH1 Alluvium EW-HW MW SW ?

Fresh

590 570 560

4800 4900 5000 5100 5200

Centreline chainage (metres)

INTERPRETATIVE GEOLOGICAL SECTION ALONG THE EMBANKMENT CENTRE LINE.

SCALE 1:2000

EW Extremely weathered.
HW Highly weathered.
MW Moderately weathered.
SW Slightly weathered.

PLATE 6

AMENDMENTS			
No.	Description	Author	Checked
A1			
A2			
A3			
A4			
A5			

SCALE

Base map/survey

Geology by R. Goldsmith

Compiled and checked R.C.M.G. Project geologist

Checked and approved Senior geologist

Supervising geologist

COMMONWEALTH OF AUSTRALIA
BUREAU OF MINERAL RESOURCES
CANBERRA, A.C.T.

TITLE GEOLOGY OF THE PT. HUT WATER FEATURES SITE

PROJECT MURRUMBIDGEE PARK DRIVE

To accompany Report 1976/106

Drawn by

Drawing No. 155/A16/1647