DEPARTMENT OF MINERALS AND ENERGY

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1974/118

GOOGONG WATER SUPPLY PROJECT
PUMP STATION
FOUNDATION INVESTIGATION 1974

by

G.B. Simpson

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SUMMARY

Five seismic traverses and 13 diamond-drill holes were put down at the site of the Googong Pump station. The results indicate that the weathering at the site is not uniform.

Excavation of a surface layer of between 0.5 m and 2.0 m should be possible by mechanical ripping. Below that depth the excavation will require blasting; some heavy blasting will be required in the pump house between seismic traverses C and D, and in the substation in the area of maximum excavation.

The pump house and substation will be founded mostly on slightly weathered rock.

INTRODUCTION

The Bureau of Mineral Resources (BMR) undertook the foundation investigation of the Googong Pump Station site in February 1974 at the request of the Department of Housing and Construction (DHC).

The facility consists of a pump house, electrical substation, and car parking area (Fig. 2). The pump house and substation require a maximum excavation of 7 m.

The Engineering Geophysics sub-section of BMR made 5 Seismic traverses across the site, and 13 diamond-drill holes were sited and put down by the Central Testing and Research Laboratory (CTRL) of DHC. The diamond-drill core was logged by BMR.

ENGINEERING GEOLOGY

Geology of site

The western part of the site is underlain by dacite and the eastern part by a microcline-epidote zone of the Googong granite (Fig. 1).

The dacite is green-grey, with a foliation striking between 020° and 040° and dipping between 70°W and 90°. Near the granite contact the dacite is contaminated by bands of quartz-epidote and quartz-feldspar.

Seismic and Diamond drilling results

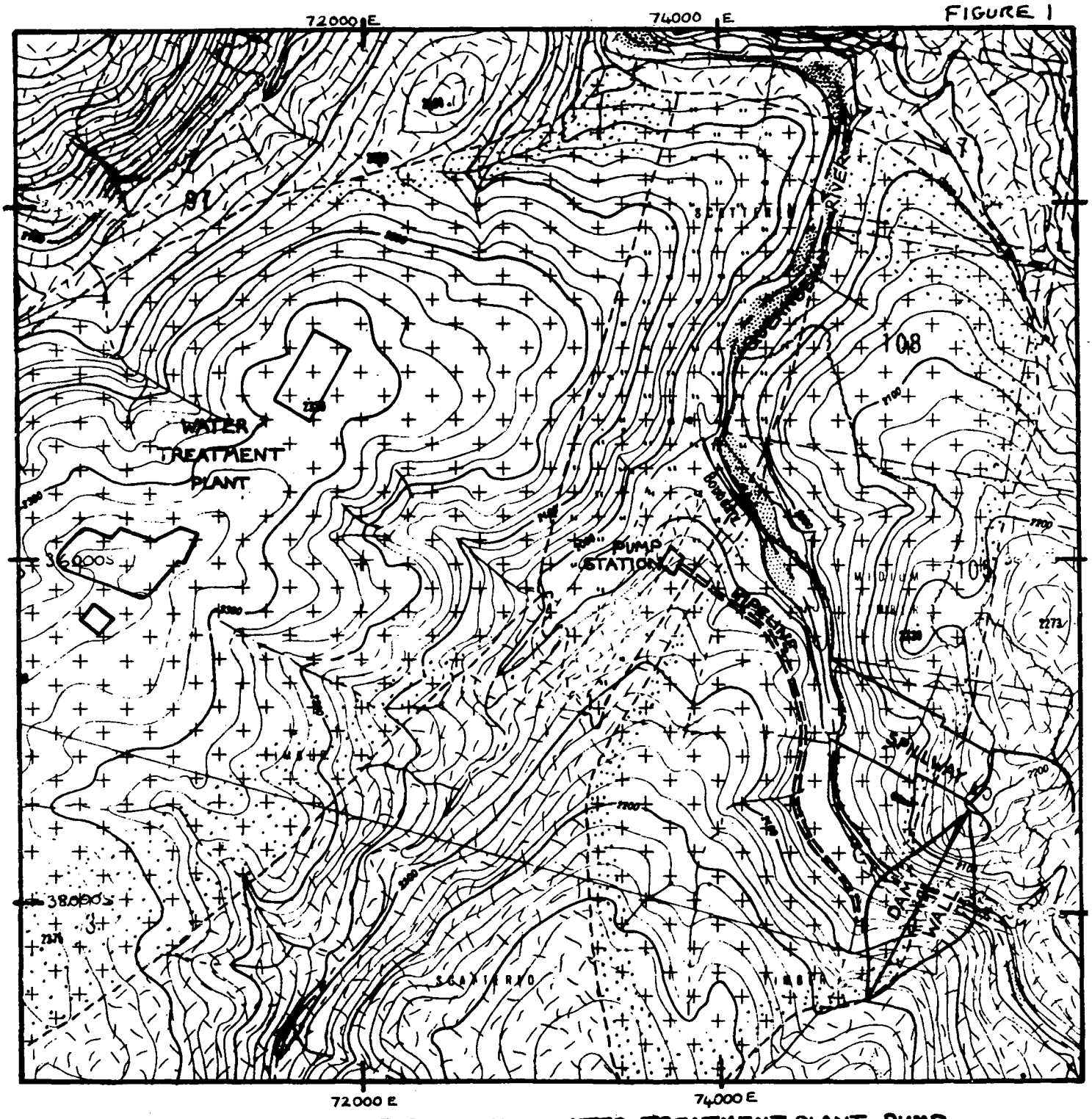
The seismic and diamond drilling results do not show a very good correlation (Plates 1 and 2). The seismic method used gives average velocities over horizontal distances of up to 20 m for the various seismic layers. The diamond-drilling, however, gives the change of weathering and rock condition with depth at a specific point.

The seismic results show a considerable variation in the average velocities of the intermediate layer, and the diamond drilling shows that the depth and degree of weathering is variable between drill holes. Such results may indicate cores of resistant rock in more highly weathered material.

Excavation conditions

Pump house and Substation. The seismic and diamond-drilling results indicate that a surface layer of between 0.5 m and 2 m may be excavated by mechanical ripping. Below 0.5 m to

FIGURE 1



LOCATION & REGIONAL GEOLOGY OF THE GOOGONG WATER TREATMENT PLANT, PUMP STATION AND PIPELINE (after. M.R. Stauffer 1967)

SCALE

0 500 1000 metres

N

Microdine - epidote band in Googong granite
Fine-grained porphyritic granite margin
Googong granite
} Siluro-Devonian

Dacite - Colinton Volcanics - Silurian

Geological boundary (approximate)

FIGURE 2

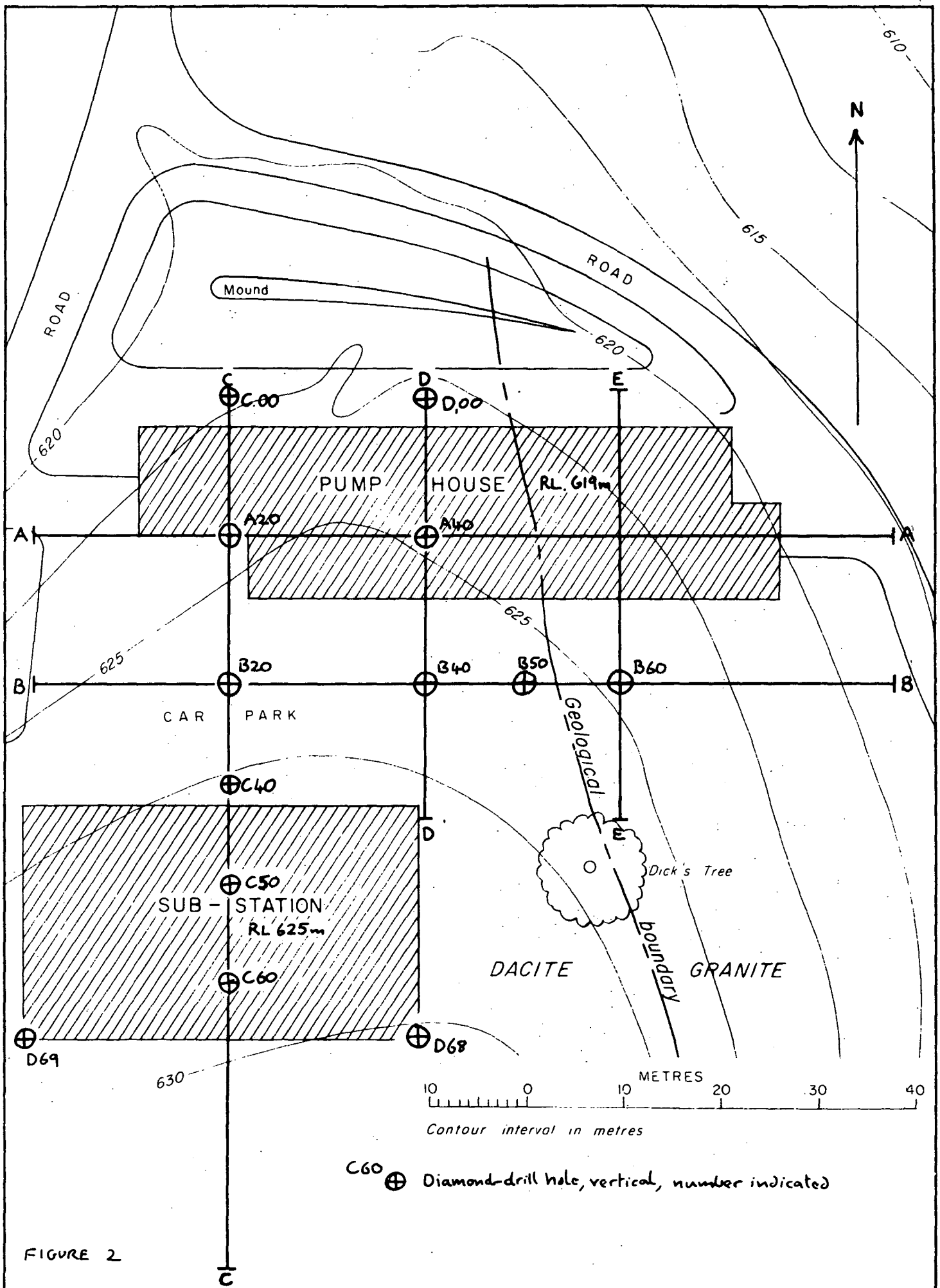
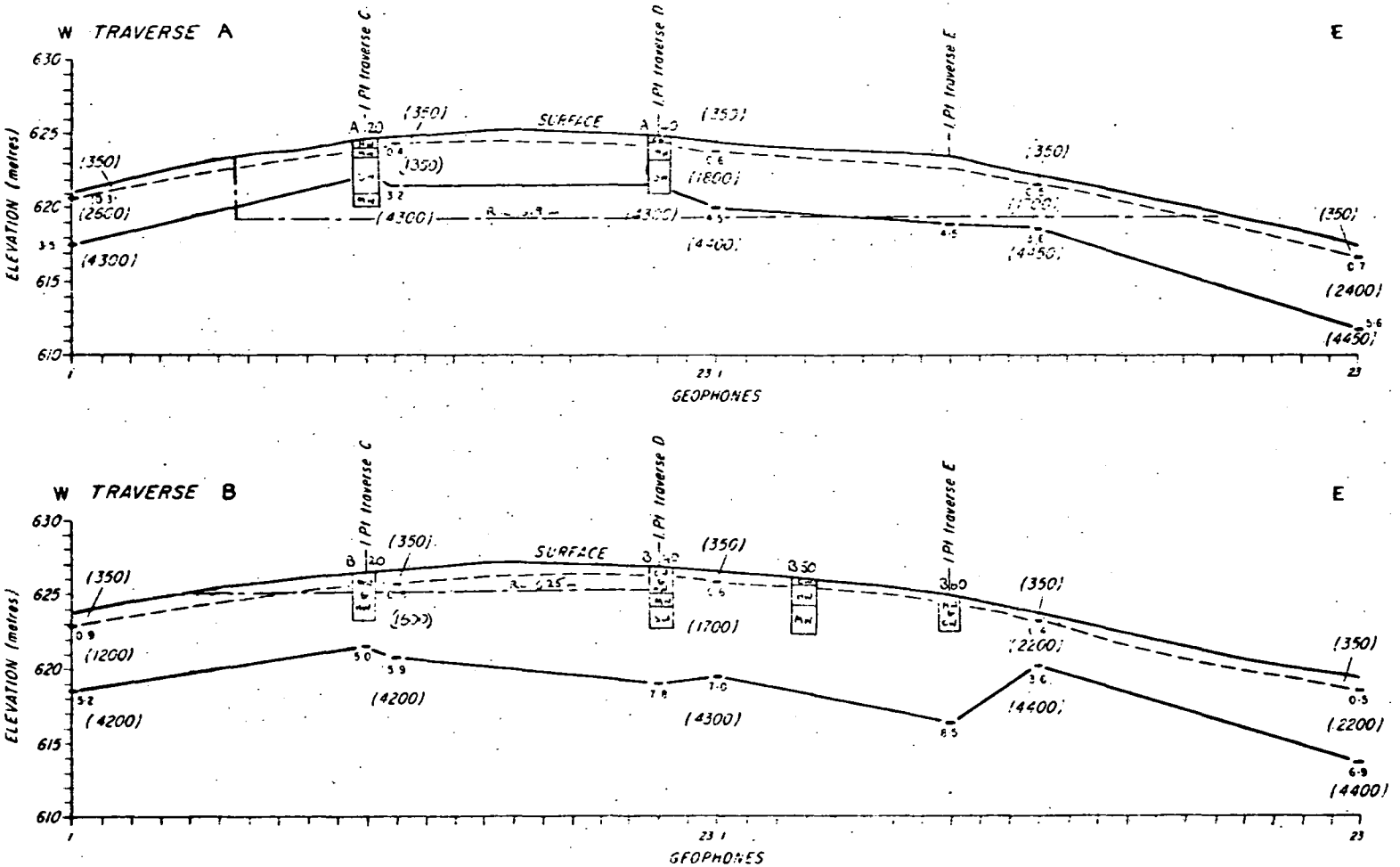


FIGURE 2

GOOGONG PUMP STATION SITE, LOCATION OF TRAVERSES AND GEOLOGY

Record 1974/118

I55/A16/1159



LEGEND

5·2 Depth to refractor (metres)

(4200) Seismic velocity in formation (metres/second)

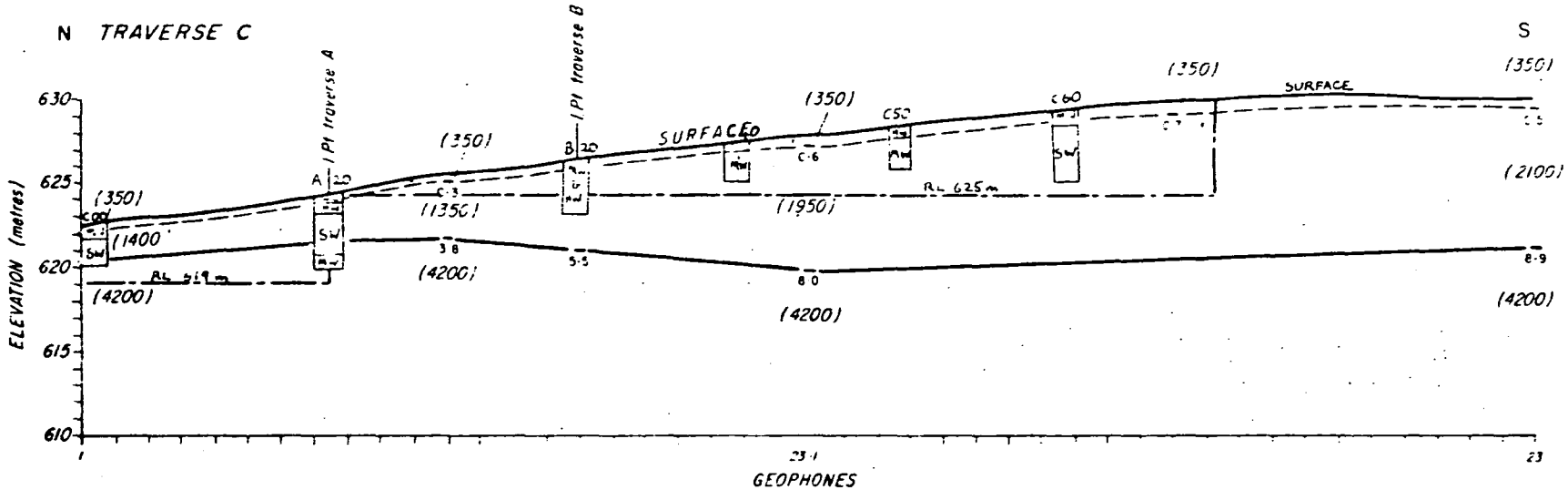
A 20 Diamond-drill hole showing weathering number indicated

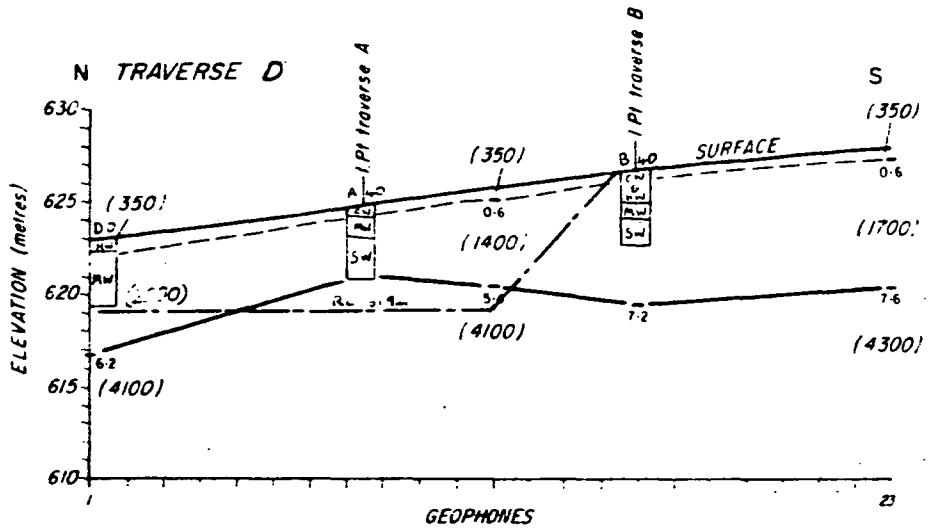
Cw completely weathered
Hw highly weathered
Mw moderately weathered
Sw slightly weathered

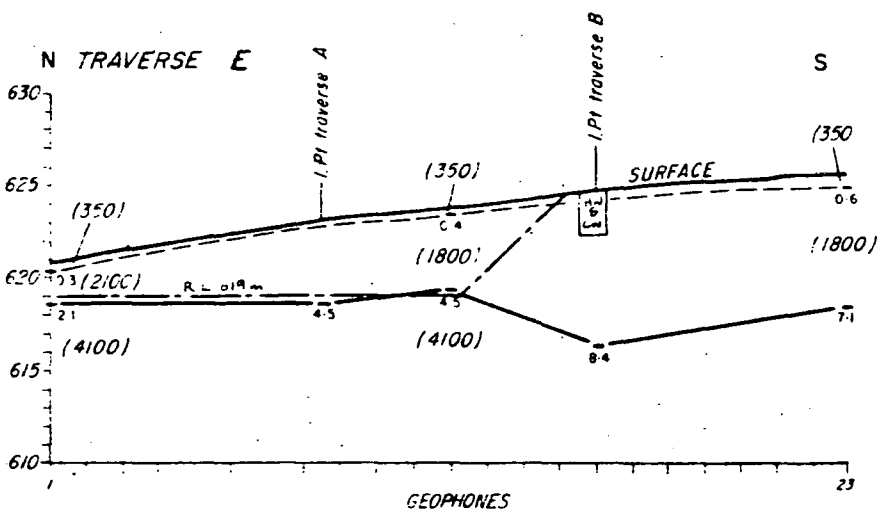
——— Limit of proposed excavation

METRES
10 0 10 20

SCALE	COMMONWEALTH OF AUSTRALIA BUREAU OF MINERAL RESOURCES CANBERRA, A.C.T.
Base map/survey DCT	TITLE SEISMIC TRAVERSES A, and B showing weathering in drill holes
Geologist(s) G.B. Simpson	PROJECT Geelong Pump Station
Surveyed and checked / Project geologist; Checked and approved / Senior geologist	
Supervising geologist	Record No. 1974/118; Drawn by G.B.S; Drawing No. 1551/A10/1160







LEGEND

6·2 Depth to refractor (metres)

(4100) Seismic velocity in formation (metres/second)

DO Diamond-drill hole, showing weathering number indicated

CW completely weathered
HW highly weathered
MW moderately weathered
SW slightly weathered

Proposed limit of excavation

METRES
10 0 10 20

SCALE	COMMONWEALTH OF AUSTRALIA BUREAU OF MINERAL RESOURCES CANBERRA, A.C.T.
Base map/survey DCT	TITLE SEISMIC TRAVERSES C, D & E. showing weathering in drill holes
Surveyed by G.B. SIMPSON	
Compiled and checked GBS Project geologist	PROJECT Goonyella Preliminary Station
Supervising geologist	To accompany Report 1974/161 Drawn SH Traced Plan No. 1161

2.0 m, the excavation will require blasting; some heavy blasting will be required in the area between seismic traverses C and D in the pump house, and in the areas of maximum excavation in the substation.

Car park. The excavation for the car park will be mostly achieved by ripping.

Foundation conditions

The pump house and sub-station will be founded mostly on slightly weathered rock. Pockets and seams of moderately and highly weathered rock may be encountered at the maximum excavation depth, however these will not be extensive and should not affect the stability of the foundations.

CONCLUSIONS

1. Seismic and drilling results show that weathering at the site is variable and not of a uniformly layered type.

2. A surface layer of between 0.5 m and 2.0 m may be excavated by ripping.

3. Below 0.5 m to 2.0 m the excavation for the pump house and substation will require blasting; some heavy blasting will be required in the pump house between seismic traverses C and D, and in the area of maximum excavation in the substation.

4. The car park will mostly be excavated by ripping.

5. The pump house and sub-station will be mostly founded on slightly weathered rock.

REFERENCES

McDOWELL, M., & MICHAIL, F.N., - 1974 Googong Water Supply Pipeline, Pumping Station Site and Dam Site Access Road - Seismic Refraction Survey 1973 and 1974. Bur. Miner. Resour. Aust. Rec. (in prep.).

STAUFFER, M.R., 1967 - The problem of conical folding around the Barrack Creek Adamellite, Queanbeyan, New South Wales. J. geol. Soc. Aust., 14(1), 49-56.

APPENDIX I

DEFINITIONS OF TERMS USED

WEATHERING OF ROCK

FRESH	:	No discolouration or loss in strength.
FRESH STAINED	:	Limonitic staining along fractures, rock otherwise fresh and shows no loss of strength.
SLIGHTLY WEATHERED	:	Rock is slightly discoloured, but not noticeably lower in strength than the fresh rock.
MODERATELY WEATHERED	:	Rock is discoloured and noticeably weakened; N - size drill core generally cannot be broken by hand across the rock fabric.
HIGHLY WEATHERED	:	Rock is discoloured and weakened; N - size drill core can generally be broken by hand across the rock fabric.
COMPLETELY WEATHERED	:	Rock is decomposed to a soil, but the original rock fabric is mostly preserved.

APPENDIX 2

Geological logs of diamond-drill holes

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PROJECT GOOGONG WATER SUPPLY
LOCATION Pump station - Pump house

HOLE NO A 2

GEOLOGICAL LOG OF DRILL HOLE

ANGLE FROM HORIZONTAL (θ) -90 DIRECTION vertical
COORDINATES R.L. OF COLLAR

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) *
DACITE Highly weathered DACITE moderately weathered DACITE Slightly weathered DACITE moderately and highly weathered	DACITE - green-grey foliated at 70° QEp and QF material common. Slightly weathered dacite is hard and strong HOLE ENDS 4.55m				NMLC 1 2 3 4 5		10 90 40		Prominent joints at 70° parallel to foliation also at 80° and 30° 3.75 to 4.20 Fractured zone at 45°. Surfaces limonite - stained.	NO WATER	NOT WATER PRESSURE TESTED

RQD. Rock Quality Designation expresses the percentage of core longer than 10cm per run of core

Drill type FOA
Feed HYDRAULIC
Core barrel type Triple tube Stationary split inner tube
Driller DHC (CTRL)
Commenced 6.3.74
Completed 6.3.74
Logged by G.B. Simpson
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.

DACITE
QEp Quartz-epidote
QF Quartz-felspar

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

Record 1974/118

155/A16/1165

M(Pf)146

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT GOOGONG WATER SUPPLY
LOCATION PUMP STATION - PUMP HOUSE
ANGLE FROM HORIZONTAL (θ) -90 DIRECTION vertical
COORDINATES R.L. OF COLLAR

HOLE NO A40
SHEET 1 OF 1

Rock Type and Degree of Weathering	Description Lithology, colour, strength, etc	Depth and size of Core	RQD	Structures Joints, veins, seams, faults, etc	Water Level	Water Pressure Test Losses (Lugeons) *
CORE LOSS	CORE LOSS	NMLC	0	1.15 to 1.3 weathered seam @ 30°. HW and CW dacite fragments and clay	NO WATER	NOT WATER PRESSURE TESTED
DACITE CW & HW						
DACITE Moderately and slightly weathered	DACITE foliated at 60°, QEp and QF material common. Green-grey colour. Moderately and slightly weathered rock is hard and strong	1, 2	85			
DACITE slightly weathered		3		3.65 Clay seam @ 30° 3cm wide		
	HOLE ENDS 3.80m	4				

RQD. Rock Quality Designation expresses the percentage of core longer than 10cm per run of core

Drill type FOX
Feed HYDRAULIC
Core barrel type Triple tube Stationary inner split tube
Driller [illegible]
Commenced 26.2.74
Completed 26.2.74
Logged by G.R. SIMPSON
Vertical scale 1:50
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.

DACITE
CW Completely weathered
HW Highly weathered
QEp Quartz-epidote
QF Quartz-felspar

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

Record 1974/118 155/A16/1164 M(Pf)146

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PROJECT GOOGONG WATER SUPPLY
LOCATION PUMP STATION

HOLE NO. B20

GEOLOGICAL LOG OF DRILL HOLE

ANGLE FROM HORIZONTAL (θ) -90 DIRECTION vertical
COORDINATES R.L. OF COLLAR

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) *
DACITE HW DACITE MW	Dacite, grey-green foliated @ 50°. QF and QEp material common				N/MLC 1		20		Weathered fractured zones @ 1.25 30cm wide @ 45° 2m 10cm wide @ 20°	NO WATER	NOT WATER PRESSURE TESTED
CORE LOSS	CORE LOSS										
DACITE MW and HW					2		0		2.75 20cm wide @ 50° 3.10 15cm wide @ 10°		
					3		10				
	HOLE ENDS at 3.25m										

R.Q.D. Rock Quality Designation expresses the percentage of core longer than 10cm per run of core

Drill type FOX
Feed HYDRAULIC
Core barrel type Triple tube stationary split inner tube
Driller DHC (CTRL)
Commenced 1.3.74
Completed 1.3.74
Logged by G.B. Simpson
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.

DACITE
HW Highly weathered
MW Moderately weathered
QF Quartz-feldspar
QEp Quartz-epidote

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

Record 1974/118

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT GOOGONG WATER SUPPLY
LOCATION PUMP STATION — CRIB WALL
ANGLE FROM HORIZONTAL (θ) -90 DIRECTION vertical
COORDINATES R.L. OF COLLAR

HOLE NO B40
SHEET 1 OF 1

Rock Type and Degree of Weathering	Description Lithology, colour, strength, etc	Depth and size of Core	RQD	Structures Joints, veins, seams, faults, etc	Water Level	Water Pressure Test Losses (Lugeons) *
CORE LOSS	CORE LOSS					
DACITE HW and CW						
CORE LOSS	CORE LOSS					
DACITE completely weathered and highly weathered	Green-grey dacite foliated @ 60°	N/MLC 1	10	10° and 45° fractures prevailing	NO WATER	NOT WATER PRESSURE TESTED
DACITE moderately weathered		2				
DACITE slightly weathered		3	100			
	HOLE ENDS 4·20m	4 5				

Fracture Log: 0 6 12 18+

Defect Frequency — Intercept Angle: 0 30 60 80 90

ROD. Rock Quality Designation expresses the percentage of core longer than 10cm per run of core

Drill type FOX
Feed HYDRAULIC
Core barrel type Triple tube. Stationary split inner tube
Driller DHC CONTR.
Commenced 5.3.74
Completed 6.3.74
Logged by G.B. Simpson
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.

[X] Dacite
CW Completely weathered
HW Highly 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

Record 1974/118 155/A16/1168 M(Pf)146

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

PROJECT GOOGONG WATER SUPPLY
LOCATION PUMP STATION - PUMP HOUSE

HOLE NO 350

GEOLOGICAL LOG OF DRILL HOLE

ANGLE FROM HORIZONTAL (θ) -90 DIRECTION vertical
COORDINATES R.L. OF COLLAR

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 HW and CW DACITE MW and HW silicified in parts DACITE moderately weathered	Dacite green-grey with QF material common as contamination foliated @ 70° silicified between 0.5m and 2.75m		Si		NMLC 1 2 3	0 6 12 18+	10 95		5°, 30° and 80° fractures prevailing 1.75 fractured zone 10cm wide @ 45°	NO WATER	NOT WATER PRESSURE TESTED
	HOLE ENDS AT 3.95m				4 5						

RQD Rock Quality Designation expresses the percentage of core longer than 10cm per run of core

Drill type FOX
Feed HYDRAULIC
Core barrel type Triple tube Stationary split inner tube
Driller DHC (CTRL)
Commenced 2.3.74
Completed 4.3.74
Logged by G.B. Simpson
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

Dacite
Si silicified
CW completely weathered
HW highly weathered
MW moderately 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

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

PROJECT GOOGONG WATER SUPPLY
LOCATION PUMP STATION - CRIB WALL

HOLE NO. B60

GEOLOGICAL LOG OF DRILL HOLE

ANGLE FROM HORIZONTAL (θ) -90 DIRECTION vertical
COORDINATES R.L. OF COLLAR

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) *
GRANITE HW			+		NMLC					NO WATER	NOT WATER PRESSURE TESTED
CORE LOSS	CORE LOSS				1						
GRANITE HW & CW	limonite-stained grayite fragments and gravelly-		+				0				
CORE LOSS	CORE LOSS										
GRANITE CW	clay		+		2						
			+								
	HOLE ENDS 2.55 m				3						

R.Q.D. Rock Quality Designation expresses the percentage of core longer than 10 cm per run of core

Drill type Fox
Feed HYDRAULIC
Core barrel type Triple tube Stationary split inner tube
Driller DHC (CSIRL)
Commenced 2.3.74
Completed 2.3.74
Logged by G.B. Simpson
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.

[+] Granite
CW completely weathered
HW highly 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

Record 1974/118 155/A16/1172 M(Pf)146

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

PROJECT GOOGONG WATER SUPPLY
LOCATION Pump station - pump house

HOLE NO C00

GEOLOGICAL LOG OF DRILL HOLE

ANGLE FROM HORIZONTAL (θ) -90 DIRECTION vertical
COORDINATES R.L. OF COLLAR

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) *
DACITE MW and HW DACITE slightly weathered	Dacite - green grey cleaved in parts and foliated @ 70° QF and QEp material common. Slightly weathered rock is hard and strong				NMLC 1 2		0 80		70°, 90° and 30° fractures prevailing. Joint surfaces limonite stained.	NO WATER	NOT WATER PRESSURE TESTED
	HOLE ENDS 2·68m				3						

RQD Rock Quality Designation expresses the percentage of core longer than 10cm per run of core

Drill type FOX
Feed HYDRAULIC
Core barrel type Triple tube Stationary split inner tube
Driller DHC (CSIRO)
Commenced 28.2.74
Completed 28.2.74
Logged by G.B. Simpson
Vertical scale 1cm = 1m
Checked by

Notes

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

DACITE
QEp Quartz-epidote
HW Highly weathered
MW Moderately weathered
QF Quartz-Felspar

Record 1974/118

155/A16/1171

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 GOOGONG WATER SUPPLY
LOCATION PUMP STATION — SUBSTATION CAR PARK SITE

HOLE NO. C40

GEOLOGICAL LOG OF DRILL HOLE

ANGLE FROM HORIZONTAL (θ) -90 DIRECTION Vertical
COORDINATES R.L. OF COLLAR

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) *
CORE LOSS DACITE CW & HW DACITE Moderately weathered	CORE LOSS DACITE - Green grey foliated @ 50° QF and QEp material common. Moderately weathered rock is hard and strong				NMLC 1 2		0 75		1m 5cm wide clay-filled fractured zone @ 30° AFS 3mm 1.75 - 20cm wide fractured zone @ 45°, clay on surfaces	NO WATER	NOT WATER PRESSURE TESTED
	HOLE ENDS 2.3m				3						

RQD Rock Quality Designation expresses the percentage of core longer than 10cm per run of core

Drill type Fox
Feed HYDRAULIC
Core barrel type Triple tube Stationary split inner tube
Driller DHC (CTRL)
Commenced 25.2.74
Completed 26.2.74
Logged by G.B.Simpson
Vertical scale 1cm = 1m
Checked by

Notes

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

DACITE
QF Quartz-felspar
QEp Quartz-epidote
AFS Average fragment size

Record 1974/118

155/A16/1162

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 GOOGONG WATER SUPPLY
LOCATION PUMP STATION - SUBSTATION SITE

HOLE NO. C50

GEOLOGICAL LOG OF DRILL HOLE

ANGLE FROM HORIZONTAL (θ) -90 DIRECTION vertical
COORDINATES R.L. OF COLLAR

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) *
DACITE CW & HW	Green-grey dacite. limonite-stained near fractured zones. Moderately weathered rock is hard and strong				NMLC		0		30° and 70° fractures prevailing	No water	NOT WATER PRESSURE TESTED
DACITE Moderately weathered							90				
DACITE HW & CW					2		0		2.25 to 2.50 clay filled fracture zone		
	HOLE ENDS 2.5m				3						

R.Q.D. Rock Quality Designation expresses the percentage of core longer than 10cm per run of core

Drill type FOX
Feed HYDRAULIC
Core barrel type Triple tube Stationary split inner tube
Driller DHC (CTRL)
Commenced 23.2.74
Completed 23.2.74
Logged by G.B. Simpson
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.

CW = completely weathered
HW = highly weathered

Dacite

Record 1974/118

155/A16/1173

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

GEOLOGICAL LOG OF DRILL HOLE

PROJECT GOOGONG WATER SUPPLY
LOCATION PUMP STATION — SUBSTATION SITE
ANGLE FROM HORIZONTAL (θ) -90 DIRECTION vertical
COORDINATES R.L. OF COLLAR

HOLE NO. C60
SHEET 1 OF 1

Rock Type and Degree of Weathering	Description Lithology, colour, strength, etc	Casing	Graphic Log	Lith. 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) *
CORE LOSS	CORE LOSS				N/LC		20				
DACITE MW & HW					1						
DACITE MW & SW	Green-grey dacite, foliated at 45°. Quartz-Felspar veins common. Slightly and moderately weathered rock is hard and strong								1m Quartz vein 1cm wide at 30°	NO WATER	NOT WATER PRESSURE TESTED
DACITE Slightly weathered					2		80				
					3				28.5 to 29.0 6cm wide clay-filled fracture zone AFS 0.5 cm.		
					4						
	HOLE ENDS AT 4.35m				5						

R.Q.D. Rock Quality Designation expresses the percentage of core longer than 10cm per run of core

Drill type FOX
Feed Hydraulic
Core barrel type Triple tube Stationary split inner tube
Driller D.H.C. (CSIRL)
Commenced 23.2.74
Completed 23.2.74
Logged by G.B. SIMPSON
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.

EX Dacite
HW Highly weathered
MW Moderately weathered
SW Slightly weathered
AFS Average Fragement size

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

Record 1974/118 155/A16/1163 M(Pf)146

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

PROJECT GOOGONG WATER SUPPLY
LOCATION PUMP STATION - SE. CORNER OF SUB-STATION

HOLE NO. D68

GEOLOGICAL LOG OF DRILL HOLE

ANGLE FROM HORIZONTAL (θ) -90 DIRECTION vertical
COORDINATES R.L. OF COLLAR

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) *
DACITE HW and CW	limonite stained), clay coated fragments of dacite				NMLC 1		0		Rock highly fractured except in silicified zone	NO WATER	NOT WATER PRESSURE TESTED
SILICIFIED DACITE Fresh-stained	White silicified dacite quartz phenocrysts up to 2mm		Si Si Si		2		40				
DACITE MW	Green-grey to brown limonite-stained dacite highly weathered dacite is weak and moderately hard.				3		0		3m clay-filled fractured zone 20cm wide		
DACITE Highly weathered					4						
					5				5m clay-filled fractured zone, 10cm wide		
					6		50				
	HOLE ENDS 6.5m				7						

RQD Rock Quality Designation expresses the percentage of core longer than 10 cm per run of core

Drill type FOX
Feed HYDRAULIC
Core barrel type Triple Tube Stationary split inner tube
Driller DHC (CTRL)
Commenced 7.3.74
Completed 8.3.74
Logged by G.B. Simpson
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.

DACITE
Si Silicified
CW completely weathered
HW highly weathered
MW moderately weathered

Record 1974/118 155/A16/1166

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 GOULBURN WATER SUPPLY
LOCATION PUMP STATION — PUMP HOUSE

HOLE NO D5

GEOLOGICAL LOG OF DRILL HOLE

ANGLE FROM HORIZONTAL (θ) -90 DIRECTION Vertical
COORDINATES R.L. OF COLLAR

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) *
DACITE HW DACITE HW and MW silicified DACITE moderately weathered	DACITE - green-grey white where silicified. foliated @ 60° QF and QEp material common		Si		NMLC 1 2 3		40 80		0.70 clay seam 40 cm wide @ 20° 1.70 Fractured zone with clay, 20cm wide, 45° and 20° fractures prevailing	NO WATER	NOT WATER PRESSURE TESTED
	HOLE ENDS 3.50m				4						

RQD Rock Quality Designation expresses the percentage of core longer than 10cm per run of core

Drill type Fox
Feed HYDRAULIC
Core barrel type Triple tube Stationary split inner tube
Driller DHS (BTRL)
Commenced 27.2.74
Completed 27.2.74
Logged by G.B. SIMPSON
Vertical scale 1cm = 1m
Checked by

Notes

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

D Dacite
Si silicified
QF Quartz - Felspar
QEp Quartz - epidote
HW Highly weathered
MW Moderately 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

Record 1974/118

155/A16/1174

M(Pf)146

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

PROJECT GOOGONG WATER SUPPLY
LOCATION PUMP STATION - SW Corner of Substation

HOLE NO 2 A1

GEOLOGICAL LOG OF DRILL HOLE

ANGLE FROM HORIZONTAL (θ) -90 DIRECTION Vertical
COORDINATES R.L. OF COLLAR

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) *
SURF LOSS	CORE LOSS					0 6 12 18+					
DACITE CW and HW	Dacite - green-grey, fractured at 70°, 30° and QEp material common				NMLC 1		0		70°, 30° and 10° fractures prevailing	NO WATER	NOT WATER PRESSURE TESTED
DACITE HW									1.5 HW fractured zone 10cm wide @ 10°		
DACITE moderately weathered					2						
DACITE moderately and highly weathered					3		30				
DACITE highly weathered					4				±25 HW fractured zone 25cm wide at 45°		
	HOLE ENDS AT 5.20m				5		0				
					6						

RQD Rock Quality Designation expresses the percentage of core longer than 10cm per run of core

Drill type FDA
Feed Hydraulic
Core barrel type Triple tube stationary split inner tube
Driller DISC (CTRL)
Commenced 9.3.74
Completed 12.3.74
Logged by G.B. Simpson
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.

DACITE
CW completely weathered
HW highly weathered
QEp Quartz-epidote
QF Quartz-felspar

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

Record 1974/118 155/A16/1167 M(Pf)146