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DEPARTMENT OF
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BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

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GEOLOGICAL INVESTIGATIONS TENNENT DAMSITE, A.C.T. 1970

by

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SUMMARY

Tennent Damsite on the Gudgenby River, 32 km south of Canberra, is one of two alternative sites for Canberra's next major water supply dam. The other site is on the Queanbeyan River at Googong. Tennent Damsite was investigated initially during 1966-1968, and further investigations were carried out during 1970. The damsite is situated in a gorge on the Gudgenby River; the river valley widens upstream to the south to provide a suitable reservoir. The entire reservoir area lies within granitic rocks - Tharwa Adamellite in the north and Clear Range Granodiorite in the south. The meridional-trending Murrumbidgee Fault lies about 1.5 km east of the damsite.

The damsite is underlain by adamellite with a foliation in a north-northwest direction. The bedrock is strongly jointed in two directions - parallel to the foliation and at right angles to it; both joint systems are near-vertical. Shallow-dipping joints at various orientations are also present. A major fault trending north-northwest, with an associated shear zone and minor faults, occur on the east bank. Most of the adamellite is a grey colour except east of the fault, where some of it is pink.

The depth of weathering at the site is variable. Rounded and sub-rounded boulders of fresh and slightly weathered adamellite are prominent on the west abutment and lower part of the east abutment. The depth to fresh rock ranges from zero at river level to at least 23 m on the upper part of the west abutment. Weathering in the shear zone on the upper part of the east abutment is deeper than elsewhere and zones of highly weathered rock are found at depths of more than 30 m. Dykes and veins of aplite are present in large outcrops at river level, and also in the shear zone on the east abutment.

For the 220-foot (67 m) high dam proposed an earth and rockfill dam would be suited to the site. Foundation preparation in the earth-core and filter zone area would involve the removal of overburden and weathered rock, shaping and dental treatment. The rockfill zone would require only the removal of overburden and possibly some shaping. The depth of overburden and weathered rock to be removed from the earth-core and filter zones would generally range up to about 1.2 m on the west abutment and up to more than 4 m on the east abutment. Generally similar, though slightly lesser, depths of material would need to be removed for the rock-fill core; narrow zones of highly weathered rock need not be removed. There is little or no overburden or weathered rock on the lower parts of each abutment but considerable shaping and dental treatment would be required. Both curtain and blanket grouting would be required; permeabilities of 14 lugeons or less indicate that grout takes should be low, probably averaging less than 10 cubic feet of cement per 100 sq. feet of rock surface for the blanket grouting, and less than 0.5 cubic feet per lineal foot of grout for the curtain grouting.

The proposed location of the spillway on the west abutment requires further investigation to determine the exact alignments; the most suitable location for the spillway crest is probably on the knoll east of the saddle. The problem of scour of superficial sediments and weathered rock will require special attention. A small dam in the saddle will be needed. Two routes for the diversion tunnel in the east abutment have been considered. The shorter route west of the shear zone has advantages geologically; however an extension 30 m long through the rockfill zone would be required at the southern end. Water inflow into the tunnel would be small, probably less than 25 l per minute per 30 m of tunnel.

A source of earth-core material has been proved 1.2 km east of the damsite. A proposed rockfill quarry on a spur on the west bank, immediately south of the damsite, has been proved by drilling. Small deposits of sand for fine aggregate have been noted along the Gudgenby River, but the required quantity has not been proved. Coarse aggregate could be obtained by crushing rock from the rockfill quarry. A suitable source of filter zone material has yet to be determined; if no suitable gravel is found crushed rock from the rockfill quarry may have to be used.

INTRODUCTION

Tennent Damsite on the Gudgenby River is one of two alternative sites currently (August 1971) being considered for the next major water storage dam for Canberra. The other site, which is at present favoured, is at Googong on the Queanbeyan River. Tennent Damsite is 5 km south of Tharwa and 32 km south of Canberra (Fig. 1). The site is named after nearby Mount Tennent.

Initial geological investigations were carried out at the site during 1966-1968, and a report subsequently issued (Buchhorn, 1968) indicated generally favourable conditions for the construction of an earth and rock fill dam about 220 feet (67 m) high. A wide shear zone on the upper part of the east abutment, however, was considered to be a major defect.

From January 1970, additional investigations were carried out, including geological mapping, drilling and seismic work at the damsite, and reconnaissance mapping of the reservoir area. The geological mapping was done mainly by the author, except for costeans on the east bank, which were mapped by D.C. Purcell. The drilling was done by a team from the Snowy Mountains Engineering Corporation (SMEC) and the seismic work by members of the Engineering Geophysics Group of the Bureau of Mineral Resources (BMR). Most of the site was cleared under contract to the Commonwealth Department of Works (CDW) of the thick ti-tree scrub which had hampered the earlier investigations. Several costeans were excavated by CDW to expose rock on the east abutment, and along the proposed spillway alignment.

The Watermore Boring Co. of Pascoe Vale, Melbourne, carried out a program of augering and percussion drilling for earth core material in selected areas, mostly within the reservoir area. Soil samples were tested by the CDW Central Testing and Research Laboratories (CTRL) in Melbourne.

This report incorporates the results of recent investigations in a general discussion of geology and engineering geology of the damsite. The results of the seismic work have been issued as a separate report by the Engineering Geophysics Group, BMR (Dolan, 1972).

PHYSIOGRAPHY

The Gudgenby River and its tributary the Naas River flow in a northerly direction, and the Gudgenby River joins the Murrumbidgee River, another north-flowing stream, about 1.5 km south of Tharwa and about 3 km north of the damsite (Fig. 1). The northerly direction of the rivers and adjacent divides such as Clear Range east of the Naas River is controlled by the regional structural trend of the granitic rocks. The Naas River, and the Gudgenby River below its junction with the Naas, follow the eastern side of a broad gently undulating valley up to one and a half kilometres in width. The Gudgenby River becomes gradually entrenched to the north of its confluence with the Naas River until it flows within a gorge 60 m deep at the proposed damsite. Below the gorge the valley widens. The relief of the surrounding area is considerable, ranging from 594 m above sea level at the damsite itself to more than 1370 m on Mount Tennent.

REGIONAL GEOLOGY

The damsite and reservoir area are occupied by granitic rocks of the Murrumbidgee Batholith, which occupies much of the southern part of the A.C.T. About 1.5 km east of the damsite the Murrumbidgee Fault (Plate 1) separates granitic rocks of the batholith from sedimentary and volcanic rocks to the east. The fault strikes north as a line of quartz reefs.

The Murrumbidgee Batholith (Snelling, 1960) in the reservoir area consists of two rock types - the Tharwa Adamellite, which occurs at the damsite and in the northern part of the reservoir area, and the Clear Range Granodiorite, which occurs in the southern part of the reservoir area (Plate 1). The boundary between the two types is gradational.

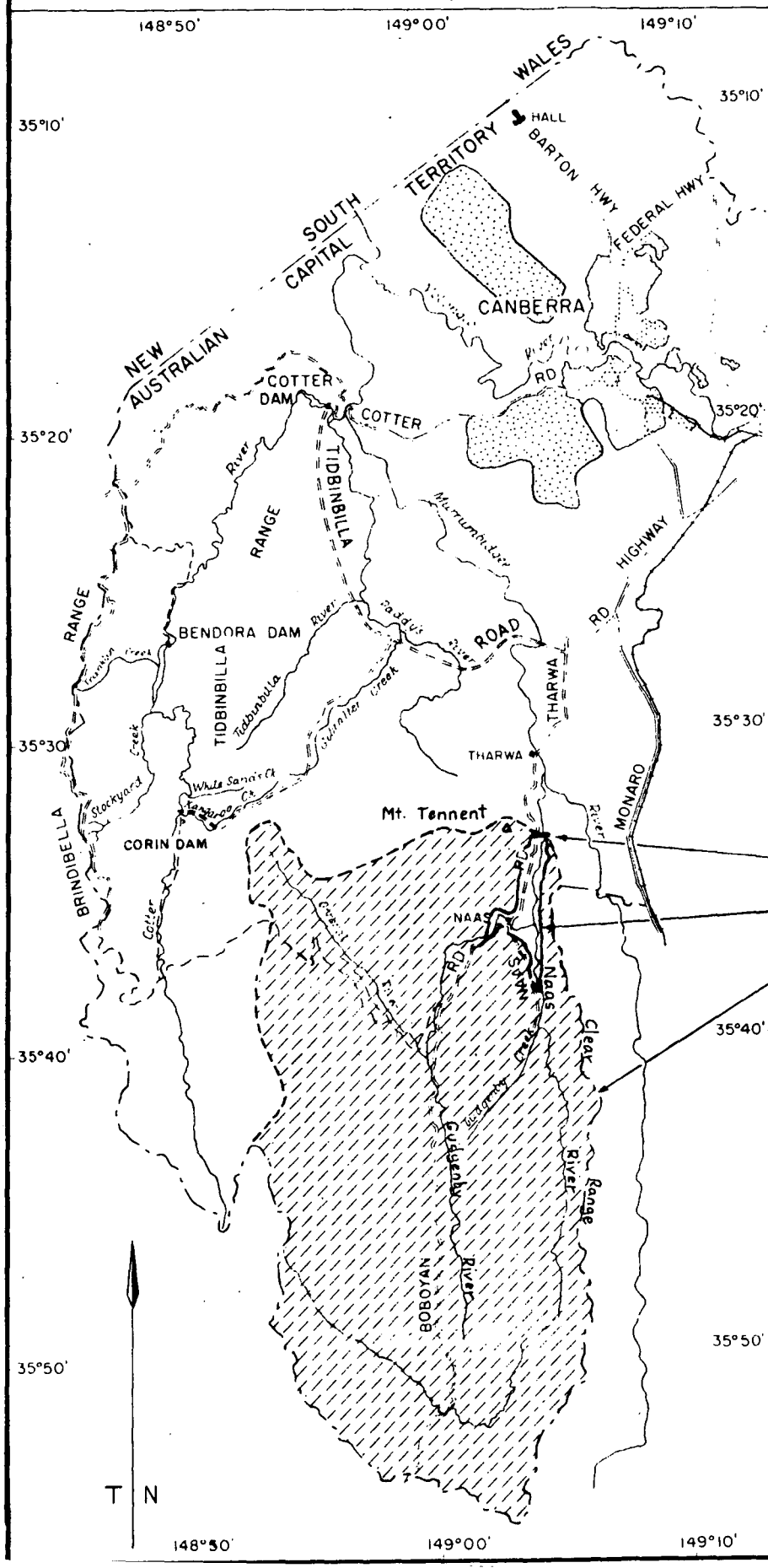
The Tharwa Adamellite has a primary lineation marked by xenoliths and a secondary metamorphic foliation. The Clear Range Granodiorite differs from it in containing a higher ratio of plagioclase feldspar to potash feldspar, and more biotite. The Granodiorite has a primary lineation marked by numerous xenoliths, but mostly lacks the secondary foliation of the Adamellite (Snelling, 1960; Mackenzie, 1966).

In the north of the area near the damsite, the foliation in the Adamellite trends slightly west of north, and dips at about 80° to the west. Towards the southwest of the reservoir area the strike of the foliation where present in the Granodiorite is slightly east of north, and dips at about 80° to the east.

FIG. 1

TENNENT DAMSITE A.C.T.
LOCALITY MAP

0 10 20 30 KM.
0 6 12 18 MILES



REFERENCE

- Built up area
- Railway
- Highway
- Principal Rd.
- Secondary Rd.
- Vehicle Track
- Territorial Boundary

Damsite
Reservoir
Catchment area

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To accompany Record 19

A zone of intense faulting and shearing in the right abutment of the damsite can be traced both north and south, and appears to follow the steep-sided east bank of the Gudgenby-Naas Rivers. Outcrops are small and sparse in the faulted and sheared zone; aplite and quartz are common.

East of the Murrumbidgee Fault the sedimentary rocks dip at about 70° to the east, and probably underlie the volcanic rocks that lie farther to the east. The sediments consist predominantly of siltstone with minor sandstone and shale. Fossils have not been found.

DAMSITE GEOLOGY

LITHOLOGY

Most of the damsite, including the west abutment, the river bed, and the lower part of the east abutment, is underlain by coarse-grained foliated adamellite (Plates 2 & 3). Where fresh, the adamellite is pale grey, and is very hard and strong; it consists predominantly of quartz and feldspar in about equal proportions, together with a small amount of biotite and muscovite; both potash feldspar and plagioclase are present (Buchhorn, 1968).

On the upper part of the east abutment pink adamellite has been encountered in drill cores and costeans. The rock is porphyritic with phenocrysts of quartz, plagioclase, and microcline in a groundmass of quartz and feldspar; minor amounts of muscovite, epidote, chlorite, and opaque minerals are present (Buchhorn, 1968). The rock has been affected by shearing and is moderately hard but brittle, even where fresh.

East of the pink adamellite, sheared grey adamellite has been exposed in the costean at river level. It has also been found on the east abutment above the damsite.

Dykes and veins of quartz, aplite, and pegmatite have been mapped along the river and in the costeans, and have been intersected by drill holes on the east abutment.

STRUCTURE

Foliation

A foliation is present in most outcrops and drill core throughout the damsite, particularly on the west abutment and in the river bed. The foliation is caused by the sub-parallel alignment of biotite, and its alteration

products, and of tabular quartz aggregates and granulated quartz and feldspar (Buchhorn, 1968).

The foliation has a consistent orientation on the west abutment and in the river bed, where it strikes at approximately 165°* and dips at about 80° to the west. On the upper part of the east abutment the foliation has been affected by shearing and faulting, and tends to be less distinct and more variable in attitude. Representative foliation directions are plotted on Plates 2 & 3.

Jointing

Two major steeply dipping joint sets are found on the west abutment, in the river bed and on the lower part of the east abutment (Buchhorn's joint sets 1 and 2). The orientation within each joint set ranges considerably but they average about 070/90** (set 1) and 165/90 (set 2) (see Fig. 2); set 2 joints are approximately parallel to the foliation. Both of these sets of joints are persistant throughout the damsite area.

Other joints showing a range of orientations can be seen in the river bed and on the steep parts of the abutments. Generally joints at a particular orientation are numerous and prominent locally, but do not persist throughout the damsite area. Joints of all sets mentioned above are generally widely spaced.

Joints in the sheared adamellite on the upper part of the east abutment are moderately to closely spaced. In the costeans on the upper part of the east abutment one major steeply dipping set is present (attitude 090/90), but other joints at a variety of orientations are also present (see Fig. 3). Joints are closely spaced in the pink adamellite and aplite close to the major fault. Cemented joints filled with quartz or feldspar are common.

Near the surface throughout the damsite area joints are commonly filled with highly or completely weathered rock and are impermeable. In the slightly to moderately weathered rock, water pressure testing indicates that joints tend to be slightly open (see Plate 4). At greater depth in fresh rock they are expected to be tight. Tight joints were encountered below river level in drill hole DG3.

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* All bearings in this report are true (grid) bearings. They differ from those given in Buchhorn, 1968, which are magnetic bearings.

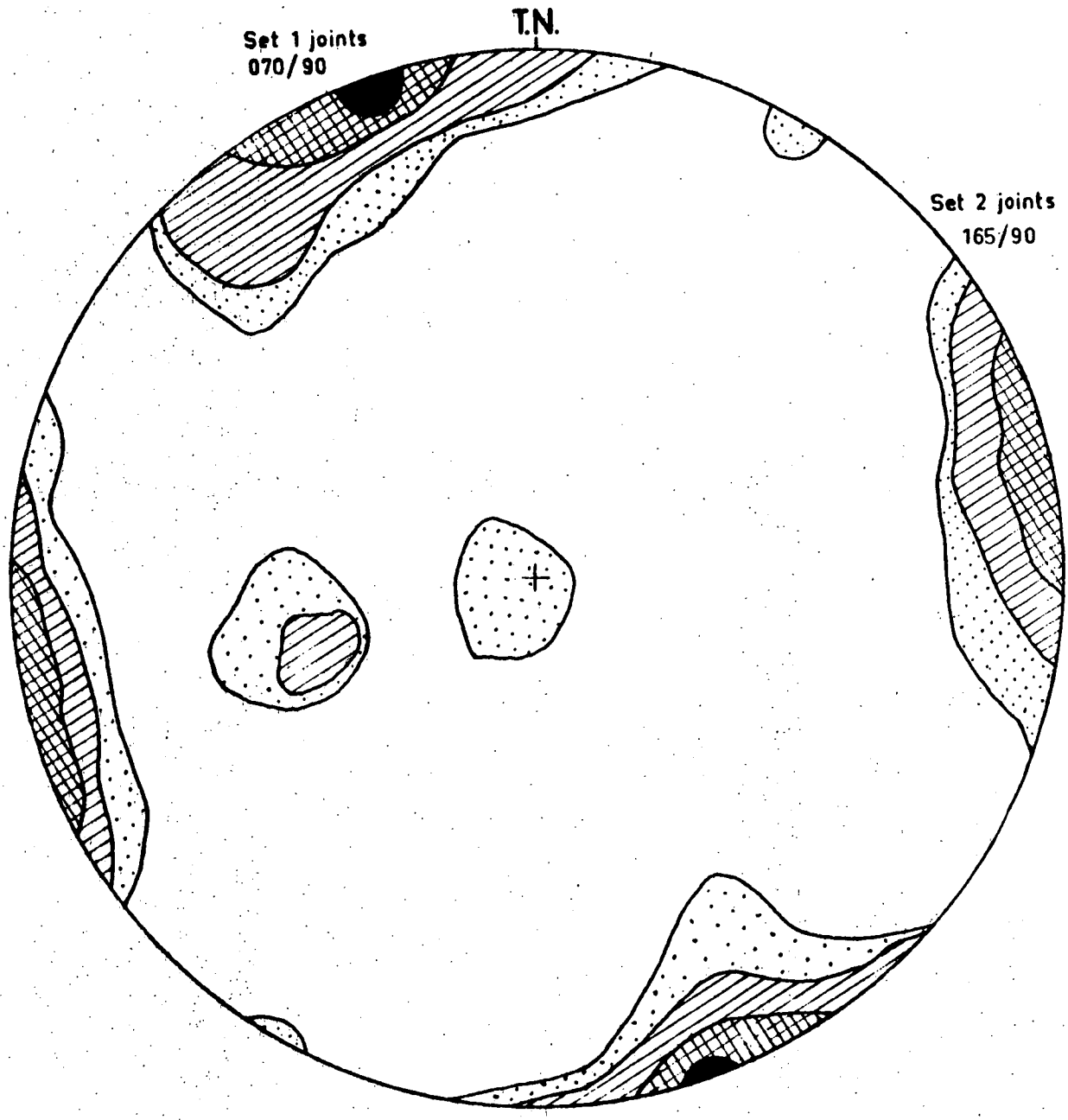
** That is, strike 070°, dip vertical.

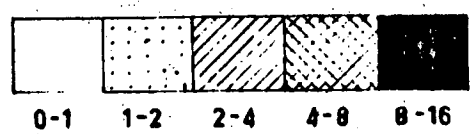
Fig. 2

TENNENT DAMSITE

STEREOGRAM OF JOINTS IN RIVER BED AND ON WEST BANK

Schmidt equal area net, lower hemisphere





Percentage of points per percentage of area. 840 points (poles to joints) were plotted

After Buchhorn, 1968

To accompany Record 1973/24

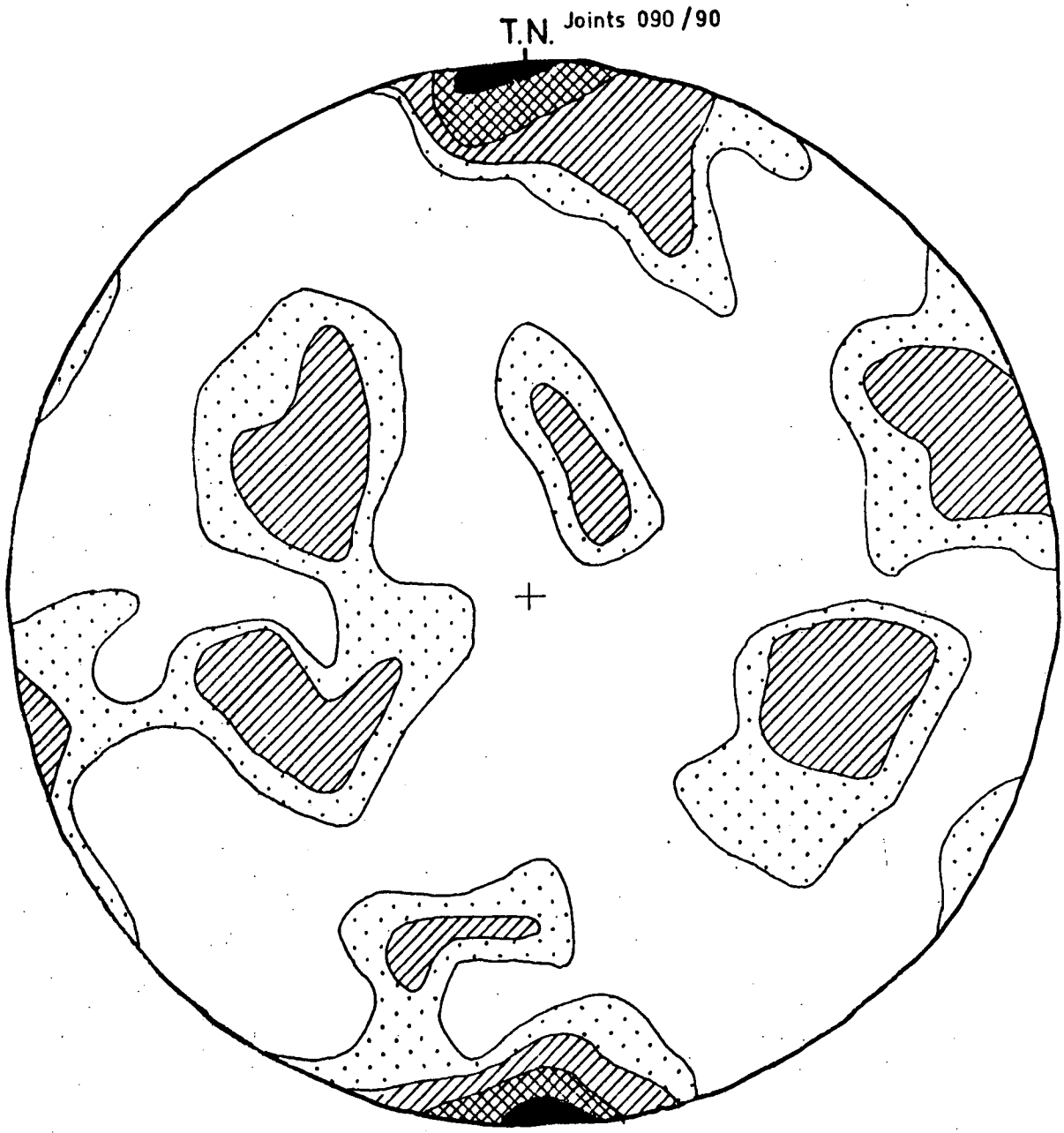
I55/A16/965

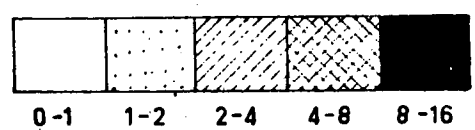
Fig. 3

TENNENT DAMSITE

STEREOGRAM OF JOINTS IN COSTEANS ON UPPER PART OF EAST BANK

Schmidt equal area net, lower hemisphere





Percentage of points per percentage of area. 102 points (poles to joints) were plotted

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I55/A16/964

Bureau of Mineral Resources, Geology and Geophysics, July 1971

Faulting

One major fault has been exposed in the costeans on the east abutment (Plates 2, 3 & 4), and has been recognized in drill hole DG 1. The fault strikes slightly west of north and dips at about 70° to the east. The fault zone is about 4.5 m wide as revealed in the costeans, and contains highly to completely weathered crushed rock. In drill hole DG 1 the fault is indicated by poor core recovery between 90 and 145 feet (see log, Appendix 2) and appears to be wider than indicated in the costeans; this may be due to a zone of highly weathered rock adjacent to the fault at depth.

Minor faults with clay seams and slickensiding were detected in the costeans on the east abutment (Plates 5 & 6) and in the drill holes. They are very prominent in costean F at river level, near the proposed site of the inlet portal for the diversion tunnel (Plate 6). Other possible faults of unknown orientation have been intersected in drill holes DG 2 from 68'4" to 68'11", and DD 6 from 61'4" to 62'5". A few small clean-cut faults and some containing narrow zones of crushed and cemented rock (mylonite) are exposed in the outcrops along the river.

Dykes and Veins

Aplite dykes and veins occur in the large outcrops close to the river and in the shear zone on the east abutment (Plates 3, 5, & 6). Along the river they are up to 2 m wide, commonly strike parallel or sub-parallel to the foliation (i.e. north-northwest) and are generally near-vertical. The orientation of the aplite dykes in drill hole DD5A on the east abutment is not known, but they are probably parallel to the fault zone. Those aplite dykes and veins along the river which are parallel to the foliation are straight and as much as 45 m long; those not parallel to the foliation are less numerous, smaller, and generally sinuous. Pegmatite dykes are rare, less than 15 cm wide, and are curved or branching. Quartz veins are not common except at one locality at the downstream end of the gorge and in costean F (Plate 6). Veins of mylonite along small faults are present in a few places in the outcrops along the river.

WEATHERING

The weathering pattern at the damsite is related mainly to the presence or absence of strong shearing. Thus for the purposes of this discussion the damsite area is divided into a western zone which includes the unsheared grey adamellite found on the west abutment, in the river bed and on the lower part of the east abutment, and an eastern zone which includes the sheared pink and grey adamellite on the upper part of the east abutment. The zones are shown on Plate 2.

Western Zone

In the western zone large boulders and tors of fresh or slightly weathered grey adamellite are surrounded, and in places underlain, by moderately or highly weathered rock. Deep weathering along joints is encountered in the drill holes. In places this weathering is no more than a narrow zone of iron staining, but in two drill holes, DD6 and DG2, a small fault or a major joint is surrounded by a zone of weathered rock. In drill hole DD6 a probable small fault from 61'4" to 62'5" affects the nature of weathering within a zone from 59'0" to 65'6"; similarly a faunt in drill hole DG2 from 68'4" to 68'11" affects a zone from 55'6" to 81'6" in the hole. It should be noted, however, that the true width of a weathered zone in a drill hole depends on the angle at which it is intersected; in both the above cases the orientation of the fault and weathered zone is unknown.

Despite the zones of deep weathering observed in some drill holes the general depth of highly to completely weathered rock in the western zone is not great. Table 1 shows the depth of weathering in the drill holes on the west abutment and in the river bed. The holes are listed in order of increasing RL of the drill hole collar to show a general tendency towards increased depth* of weathering with height above river level. This feature is also apparent on the cross-section (Plate 4) which is derived from both the drilling and seismic results. Additional information on depths of weathering near the surface in the western zone was obtained from costeans G, H, J, K, and L.

TABLE 1

Depths of weathering in drill holes on west abutment and in river bed.

DRILL HOLE	COLLAR RL (feet)	DEPTH TO BASE OF HIGHLY TO COMPLETELY WEATHERED ROCK (feet)	DEPTH TO FRESH ROCK (feet)
DG3	1945	0	0
DD7	2008	5	14
DD8	2062	9	>38
DD9	2092	10	>36
DD4	2098	0	32
DD6	2127	15	37
DG2	2141	5	76

* For inclined drill holes the depth shown is the vertical depth from the surface, not the slope depth. Depths are to the nearest foot.

Eastern Zone

In the eastern zone of weathering, in the sheared zone on the upper part of the east abutment, weathering is deeper than on the west abutment; outcrops are sparse and small. The seismic results indicate that the depth of highly and completely weathered rock ranges from 3 to 6 m. The drill core and costeans, however, indicate that weathering is irregular, particularly in the grey adamellite immediately west of the fault zone. Zones of highly weathered rock are found in drill holes DG1 and DD5A at depths of more than 30 m. Weathering in the pink adamellite as seen in drill hole DD5 is more uniform than in the grey adamellite and is mostly moderate. Variable weathering was also encountered in drill hole DD10, which was drilled at a low angle (30°) in an attempt to gain undisturbed samples of highly weathered rock for strength testing. However, the quality of the samples was unsatisfactory. The hole was not logged.

The seismic results in the eastern zone of weathering (Dolan, 1972) show that the highest velocity refractor is at a depth of about 18 to 24 m. However, there is no close correlation of this refractor with the drilling results, since highly weathered rock may occur down to 35 m (vertical depth) as in drill hole DG1. Further drilling is needed in this area to test the seismic results and to determine more exactly the effect of the fault on the weathering profile.

ENGINEERING GEOLOGY

DAMSITE FOUNDATION PREPARATION

Preliminary designs by CDW (October 1970) envisage an earth and rockfill dam about 67 m high with a curved axis as shown on Plate 2. The following notes outline the foundation preparation and treatment that will be required before placement of the dam.

Removal of Overburden and Weathered Rock

Before laying the earth-core and filter zone, all soil and highly to completely weathered rock should be removed, and the surface of the sound rock cleaned of loose material with a high-pressure water jet. On the lower part of the west abutment and along the river overburden, not more than about 50 cm thick covers fresh rock. In much of this area large rock outcrops are present and only the removal of loose boulders will be required. On the upper part of the west abutment the seismic results indicate that soil and highly to completely

weathered rock is about 1.2 m thick; it contains loose boulders and tors, some of which are partly buried, and these will need to be removed. On the lower part of the east abutment west of the shear zone the outcrop mapping and seismic results indicate that there is from 0 to 3.5 m of soil and highly to completely weathered rock with loose tors and boulders that will need to be removed. On the upper part of the east abutment, in the shear zone, the drilling and seismic results indicate that soil and highly to completely weathered rock averages about 4 m thick; however, the irregular distribution of weathering in the drill holes and costeans indicates that the thickness of unsuitable foundation material in this area varies widely. Additional drilling or augering and possibly seismic traverses are recommended on the upper part of the east abutment to determine more accurately the amount of soil and highly to completely weathered rocks that will need to be removed.

Preparatory work on the rockfill zone will require the removal of all soil, large boulders, and completely weathered rock, so that the rockfill will rest on a foundation of moderately weathered rock. Highly weathered rock in narrow zones need not be removed, but large areas of such rock should not remain. The depth of material to be removed will in places be a little less than for the earth-core and filter zones, particularly on the upper parts of each abutment. Care will be required in all zones to ensure that large outcrops remaining on the prepared surface consist of firmly emplaced in situ rock; all other material must be removed, and this may include rocks of large dimensions.

Shaping and Dental Treatment

The treatment of the foundations for the earth-core and filter zones requires that the final surface should be shaped in such a way that no voids will remain between earth core material and the foundations; it should also be shaped so that a firm bond can be attained between the earth core and the foundations. On the lower parts of the abutments, large outcrops with smooth, steep joint faces will require shaping to provide a rough surface for better adhesion and to ensure that slopes do not exceed 2:1; some of the more massive outcrops in and close to the river may require similar treatment. Much of this treatment will require the removal of rock by blasting; however, infilling of re-entrant voids with concrete will probably be needed in places. Dental treatment, involving the filling of all open joints, will be necessary.

On the upper part of the east abutment, zones of highly weathered rock, including the main fault zone, will require excavation and backfilling with concrete. The depth of excavation will depend on the condition of the rock encountered in the zones, the condition of the surrounding rock and the width of the zones.

Grouting

Blanket and curtain grouting will be required. Curtain grouting will be required along the axis of the dam to beyond the spillway and saddle dam and for some distance beyond the dam on the east abutment. Blanket grouting will be required within the entire area of the core zone foundations.

The exact lateral extent and depth of the grout curtain cannot be predicted at this stage without further drilling. Water pressure testing of drill holes (Plate 4) indicates that the lower limit of open-jointed rock is probably at about river level (RL 1950 feet) under the east abutment, and somewhat higher under the west abutment where drill hole DG2 apparently reached the zone of tightly jointed rock. The negligible water losses in drill hole DG3 indicate that there is no zone of open jointing under the river bed.

Water pressure testing of the drill holes indicates that grout consumption generally will be low. The greatest permeabilities were 14 and 10 lugeons in sections of drill holes DD5A and DG1 respectively. Both of these results were obtained from test sections close to the major fault and indicate that a shatter zone of open joints occurs in the shear zone adjacent to the fault. The fault itself is at least partly filled with clay and would be less permeable than the adjacent rock. An approximate indication of grout takes is possible from a comparison of permeabilities and grout takes at Bendora Dam (Hill 1964). For the blanket grouting average takes of less than 10 cubic feet of cement per 100 square feet of rock surface can probably be expected and for the curtain grouting average takes of less than 0.5 cubic feet of cement per lineal foot of grout hole. However in making comparisons allowance must be made for the different rock type at Bendora Dam. Grout takes for the blanket grouting will probably be less than for the curtain grouting because joints near the surface are filled with clay or weathered material.

There is no possibility of serious leakage from the reservoir other than at the damsite. The shortest leakage path is on the east side of the reservoir area through a saddle near the proposed borrow area for earth fill. It is about 1.5 km long and no structures which would provide a leakage path were detected.

SPILLWAY

A possible location for the spillway crest is in the centre of the saddle on the west abutment (Plates 2, 3 & 4). Alternatively, the spillway crest could be placed in the knoll east of the saddle or at some location

between the saddle and the knoll. As the proposed top water level of 2150 feet is more than 10 feet higher than the crest of the saddle, a small saddle dam will be required if the spillway crest is placed on the knoll. An earth and rock dam would probably be the most suitable.

Two drill holes, DG2 and DD6, and several seismic traverses (Dolan, 1972) and costeans were designed to test possible spillway alighments. Drill hole DG2 intersected slightly to moderately weathered rock at 1.8 m. DD6 intersected slightly weathered rock at 4.5 m overlain by moderately to highly weathered rock; the greater depth to sound rock in DD6 is probably related to weathering along a small shear zone, since outcrops of slightly weathered rock occur close to this hole.

The seismic results indicate moderately weathered rock at depths between 1.2 and 2.7 m; depths are greatest in the depression north of the saddle and least on the ridge to the east of the depression. Costeans G, H and J (Plates 3 and 7) revealed moderately to highly weathered bedrock from 60 cm to 2.5 m below the surface. Costean K (Plates 2 & 7) at the lower end of the proposed spillway revealed soil and scree up to 3.5 m thick and Costean L (Plates 2 & 7) did not reach rock at 1.8 m. Costeans G, H, and J revealed no sign of a deeply weathered fault zone extending northeast from DG2.

In most places the spillway will be satisfactorily founded on slightly to moderately weathered rock; deeper excavation of pockets of highly and completely weathered rock and backfilling with cement may be necessary in places to provide a firm foundation. Generally foundation excavations would have to be deeper in the depression north of the saddle than on the ridge east of the depression. However, large tors of fresh and slightly weathered rock would have to be removed on the ridge. The exact alignment, length, and design of the spillway structure requires further investigations; however, the proposed top water level indicates that a smaller crest structure could be built on the knoll than in the saddle. The final alignment will depend to some extent on geological conditions, but will also have to be a compromise with engineering requirements, such as gradient and direction of water discharge.

The discharge area of the spillway may have to be treated in some way to avoid excessive scour of the soil and scree at the base of the steep slope north of drill hole DD6. Seismic traverses ee' and pp' indicate up to 6.5 m of soil and scree; much of the soil and scree is visible in costeans K and L.

DIVERSION TUNNEL

The route originally proposed for the diversion tunnel in the east abutment followed seismic traverses RR' and QQ' (Plate 2). Most of this route would be in sheared rock, and a tunnel in such rock would probably need considerable support. The structural interpretation shown on Plate 2 and also in cross section on Plate 4 indicates that pink adamellite, similar to that found at a higher level in DD5, would be encountered along much of the route. The inlet portal of this route would be in sheared rock.

Another route, proposed in 1970, lies in the grey adamellite on the lower part of the east bank west of the shear zone. The grey adamellite is stronger than the pink adamellite giving better tunnelling conditions, but for this route the inlet portal would lie in the rockfill zone of the dam, and would therefore require an inlet structure about 30 m long as a shield around which to place the rockfill (see Plate 2). Another disadvantage of this route is that the tunnel direction would almost parallel the foliation and a major joint system, both of which strike at 165°; this parallelism could result in some overbreak. However, this tunnel route would be about 270 m long compared with 400 m for the original location. Another advantage is that the inlet portal would be in sound rock instead of the soft, decomposed, and strongly sheared rock exposed in Costean F.

Groundwater inflow into a tunnel in the grey adamellite is not expected to be large. Measurements of groundwater levels in drill hole DD5A indicate that in no place would the water table be more than 6 m above tunnel level. Therefore any water inflow could be expected to diminish fairly rapidly as the water table is lowered around the tunnel. Water losses in DD5A and groundwater levels indicate that the maximum initial water inflow per 30 m of tunnel in the grey adamellite is likely to be less than 25 l per minute.

CONSTRUCTION MATERIALS

Rockfill

A rockfill quarry site has been selected immediately upstream of the damsite on the west bank (Plate 2). The proposed site was investigated by drill holes DD7, DD8 and DD9 and 6 seismic traverses. The drill holes encountered fresh or slightly weathered grey adamellite at depths between 4.2 and 11.5 m; overlying the fresh or slightly weathered rock is a zone of slightly to moderately weathered rock which in turn is overlain by up to 3 m of soil and highly to completely weathered rock. The seismic results (Dolan, 1972) indicate fresh to slightly weathered rock at depths between 4.5 and 12 m, and up to 1.5 m and soil and completely weathered rock. The average depth to fresh or slightly weathered rock from the seismic results is about 8 m.

Both drill holes and the seismic results indicate that there is a general increase in depth to fresh rock with height above river level. Although the depth to fresh or slightly weathered rock is greater than desirable, much of the moderately weathered rock would probably be suitable for rockfill, provided it is mixed with the fresh rock. It is estimated that this site could provide the 900 000 m^3 of rockfill required.

Earth-Core Material

Thirteen areas were tested for earth-core material by augering and percussion drilling (Plate 1). The results are contained in a report by the Department of Works Central Testing and Research Laboratories (Report No. 73) and the following notes are based on the conclusions in the report. The most promising source is Area 1, about 1.2 km east of the damsite. The material consists partly of alluvium and partly of decomposed adamellite. It is estimated that there are 400 000 m^3 of material, which is considerably more than the required amount of about 230 000 m^3. A major disadvantage of this area is that it is outside the reservoir area and would not be submerged when the dam fills.

Area 4, near the west abutment of the proposed dam also contains suitable material; however, the amount of material in this area is less than the total volume required. Other areas, which are all within the reservoir area, and which possibly contain suitable material, are Areas 7, 8, 10 and 11. The thickness of material in these areas, however, is not great and a large surface area would have to be worked to provide sufficient material. Also some of the material in these areas contains unweathered biotite mica which may hinder compaction. The remaining areas are either too small or do not contain suitable material.

Filter-Zone Material

Crushed rock from the rockfill quarry is likely to provide the most satisfactory source of filter zone material. However, possible deposits of river gravel along the Gudgenby River near the damsite could be investigated as an alternative.

Concrete Aggregate

Coarse aggregate could be obtained by crushing rock from the rockfill quarry. Pyrite and chlorite are known to be present in small amounts and tests would be necessary to determine reactivity with cement. Sand for fine aggregate could be obtained from sources presently being worked along the Murrumbidgee River or from the numerous small deposits on the Gudgenby and Naas Rivers. Resources along the Gudgenby River have not been proved.

SEISMICITY

Seismic activity in the Canberra region is fairly common but of low magnitude, generally not exceeding 3 on the Richter Scale (Cleary, 1967); greater magnitudes have, however, been recorded near Gunning. Two tremors between 1958 and 1961 with epicentres close to the Murrumbidgee Fault are shown by Cleary; these tremors recorded magnitudes of 2 1/4 and 2 3/4. The Murrumbidgee Fault lies 1.6 km east of the damsite at its closest point.

CONCLUSIONS

1. Most of the site is geologically suitable for the construction of an earth and rockfill dam; some constructional problems may be encountered from a major fault and shear zone on the east bank.

2. Foundation preparation and treatment will require the removal of overburden and highly to completely weathered rock. Depths of this material generally range from 0 to 1 m on the west abutment and from 0 to more than 4 m on the east abutment. All overburden and highly to completely weathered rock will need to be removed for the earth-core and filter zone, but for the rockfill core some highly weathered rock in narrow zones need not be removed. Some shaping and dental treatment in the core zone area, particularly near river level, will be needed. Both blanket and curtain grouting will be required; grout takes should not be large.

3. The proposed location of the spillway on the west abutment is geologically feasible, but further investigation will be needed to determine its exact alignment. The discharge area may have to be treated to avoid excessive scour. A small dam in the saddle will be required.

4. The more favourable route geologically for the diversion tunnel is in the grey adamellite on the east abutment west of the fault zone rather than along the original route in the shear zone following seismic traverses RR' and QQ'.

5. Sources of earth core material and rockfill have been proved close to the damsite. Some small deposits of sand for fine aggregate have been noted along the Gudgenby River but the quantity required will have to be proved. A suitable source of filter-zone material has yet to be determined.

FURTHER INVESTIGATIONS

Further investigations at the design stage of the dam will be required, and should include the following.

1. Additional drill holes should be put down along the dam axis to confirm that the proposed alignment is the most suitable. These holes should be located to give more information on foundation conditions, particularly on the east abutment, and so that the required depth of the grout curtain can be determined by water pressure tests. Further investigations on the amount of material to be removed on the upper part of the east abutment are also required.

2. The most favourable alignment for the spillway should be selected, based on present information, and further investigations designed to confirm its suitability or otherwise.

3. A decision on the alignment of the diversion tunnel should be followed by drilling at the portal sites and possibly at other points to determine the suitability of the alignment and to give more information on expected excavating conditions and support requirements.

4. As both rockfill and earthfill requirements have been proved no further investigations for these materials are required.

5. Systematic mapping and testing of sand and possible gravel deposits for filter-zone material and fine aggregate should be carried out along the Gudgenby and Naas Rivers within the storage area of the dam.

ACKNOWLEDGMENTS

The geological investigations were carried out in co-operation with officers of the Commonwealth Department of Works, Canberra. In particular they were responsible for organizing the diamond drilling and costeaning at the damsite, the results of which have been incorporated in this report.

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APPENDIX 1

DEFINITION OF SEMI-QUANTATIVE DESCRIPTIVE TERMS

Bedding

Laminated	- Less than 10 mm thick
Thinly bedded	- 10 mm to 100 mm thick
Thickly bedded	- More than 100 mm thick

Grain Size

Coarse-grained	- 1 mm to 4 mm in diameter
Medium-grained	- 1/4 mm to 1 mm in diameter
Fine-grained	- Less than 1/4 mm in diameter

Hardness of Rock

Hard to very hard	- Impossible to scratch with a knife blade
Moderately hard	- Shallow scratches with a knife blade
Soft	- Deep scratches with a knife blade

Joint Spacing

Closely spaced	- Joints spaced less than 15 cm apart
Moderately spaced	- Joints spaced between 15 cm and 90 cm apart
Widely spaced	- Joints spaced more than 90 cm apart

Percussive Strength of Rock

Strong to very strong	- Cannot be broken by repeated blows with a hammer
Moderately strong	- Rock broken by 3 or 4 blows
Weak	- Rock broken by 1 blow

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 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

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.

LOCATION East Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL 70° DIRECTION 277°

COORDINATES E19272, S85375 (Stromlo Co-ords) R.L. 2152 feet

HOLE NO. D.G.1

SHEET 1 OF 3

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	LIFT & % CORE RECOVERY	STRUCTURES JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES	WATER LEVEL	WATER PRESSURE TEST
ADAMELLITE moderately weathered	Pale pink-brown, coarse-grained, moderately hard, moderately weak rock Max. core length 8", mode 4". Numerous joints** parallel to foliation and in other directions		NX casing; NMLC; 10'; 20'; 30'; 40'; 50'; 60'; 70'; 80'			1'3" soil & decomp. rock; ½" to 2" fragments; 5'8"; 6'3"; 7'2" < 1" fragments; 9'8"; 10'1" 1"-2" fragments; 11'4" ½-1" fragments; 20'8" ½"-2" fragments; 21'0"; 24'5" < 1" fragments; 25'0"; 29'2" ½"-2" fragments; 29'9"; Foliation at 70°; 44'1" < 1" fragments; 44'3"; 47'7" ½"-2" fragments; 48'5"; 50'11"; 51'11" < 1" fragments; 52'7"; 53'5" < 2" fragments; 55'9"; 56'9"; 57'7"; 58'4" core loss; 59'4" < 1" fragments; 60'8"; 61'4" ½" of decomposed & broken rock, dip 70°; 62'2"; 64'5" 1"-2" fragments; 65'0"; 72'1" < 1" fragments; 72'10"; 73'4" ½"-2" fragments; Foliation at 70°		0 0.25 0.5; 5psi; 10psi; 15psi; 20psi; 25psi Permeability zero; 5psi; 15psi Permeability 1 lugeon*; 25psi; 35psi; 5psi; 20psi Permeability <1 lugeon; 40psi; 60psi

NO PHOTO /12 /14 /16 M702/17 /18 M702/19 /20 M716/5 /21 M702/22 M702/23 /24 /25 /26 /27 M716/6 /28 /29 M702/30 M716/8

DRILL TYPE Boyles hydraulic

CORE BARREL TYPE NMLC triple tube, split inner tube

DRILLER M. Parcell

COMMENCED 28/1/68

COMPLETED 10/2/68

LOGGED BY G.A.M. Henderson

VERTICAL SCALE 10 feet : 1 inch

FRACTURE LOG Number of fractures per foot of core. Zones of core loss are blacked in

BEDDING AND JOINT PLANES Angles are measured relative to a plane normal to the core axis

** For joint directions see joint stereogram for costeans.

* 1 lugeon ≈ a loss of 0.05 gall./min./ft. at 100psi pressure

WATER PRESSURE TESTS

PACKER TYPE N mechanical

SUPPLY TYPE N rod

VERTICAL SCALE 50psi : 1 inch

PHOTOGRAPHIC REFERENCE SYSTEM

BLACK AND WHITE BMR film no. and frame no. e.g. M702/17

COLOUR

M(Pt)99

155/A16/966

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT: TENNENT DAMSITE, GUDGENBY RIVER A.C.T.
LOCATION: East Bank near Proposed Dam Axis
ANGLE FROM HORIZONTAL: 70° DIRECTION: 277°
COORDINATES: E19272, S85375 RL: 2152 feet

HOLE NO: D.G.1
SHEET 2 OF 3

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION (LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC)	DEPTH & SIZE OF CORE	STRUCTURE (JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES)	WATER PRESSURE TEST	PHOTO REF NO
ADAMELLITE moderately weathered	Pale pink-brown, coarse-grained, mod. hard mod. weak rock. Max. core length 8", mode 4"	90' – 90'0"	85'5" – 85'9" < ½" fragments	5 psi, 25 psi, 55 psi, 75 psi. Permeability zero	/31, M704/33, /34, M716/8
ADAMELLITE highly to completely weathered	Brown sandy clay and decomposed rock	90'0" – 145'0" (100', 110'0", 112'8", 116'4", 121'9", 130', 140')			M704/35, M704/36, /37, M715/10, M715/12
	moderately to highly weathered adamellite	110'0" – 112'8"			
	moderately to highly weathered adamellite Max. core length 6"	116'4" – 121'9"			
ADAMELLITE slightly to moderately weathered	Pale pink-brown, coarse-grained, moderately hard and strong rock. Max. core length 1'0", mode 5"	145'0" – 160' (150')	Foliation at 60°; 157'0" – 157'3" < ¼" fragments	30 psi, 70 psi, 110 psi, 130 psi. Permeability 10 lugeons	M716/14

DRILL TYPE: Boyles
FEED: hydraulic
CORE BARREL TYPE: NMLC triple tube, split inner tube
DRILLER: M Parcell
COMMENCED: 28/1/68
COMPLETED: 10/2/68
LOGGED BY: G.A.M. Henderson
VERTICAL SCALE: 10 feet: 1 inch

NOTES

FRACTURE LOG: Number of fractures per foot of core. Zones of core loss are blocked in.

BEDDING AND JOINT PLANES: Angles are measured relative to a plane normal to the core axis.

WATER PRESSURE TESTS
PACKER TYPE: N mechanical
SUPPLY LINE: N rod
VERTICAL SCALE: 100 psi : 1 inch
Figures given are gauge pressures.
Test sections are indicated graphically by blocked in strips.

PHOTOGRAPH REFERENCE SYSTEM
BLACK AND WHITE: B.M.R. film no. and frame no. eg. M702/33
COLOUR:

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT: TENNENT DAMSITE, GUDGENBY RIVER A.C.T.
LOCATION: East Bank near Proposed Dam Axis
ANGLE FROM HORIZONTAL: 70° DIRECTION: 277°
COORDINATES: E19272, S85375 RL: 2152 feet

HOLE NO: D.G.1
SHEET 3 OF 3

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION	GRAPHIC	DEPTH & SIZE OF CORE	FRACTURE	% CORE RECOVERY	CASING	STRUCTURE: JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES	WATER LEVEL	WATER PRESSURE TEST: Loss in gallons per minute per foot	CORE BOX NO.
ADAMELLITE	as from 145' - 160'	×	161'2"				162'11" < 1" fragments 163'4"		See previous sheet	M716/1
APLITE moderately weathered	highly weathered adamellite. Max. core length 2"	×	165'2"							
	Pale pink, fine-grained, mod. hard, weak rock. Max. core length 5"	×	167'9"							
		×	170'				172'6" 1" to ½" fragments 172'10"		40psi	
		×	178'4"				178'5" < ½" fragments 178'9"		80psi 120psi Permeability 1 lugeon 160psi	
ADAMELLITE slightly weathered	Pale grey, coarse-grained, hard strong rock. Max. core length 1'8", mode 1'0"	+	190'						35psi Permeability 7 lugeons 75psi 110psi	M716/2
		+	200'							
		+	208'6"							
ADAMELLITE moderately weathered	highly weathered rock	+	209'3"					212' 29/3/68	50psi	
	Grey-brown, coarse-grained, mod. hard & strong. Max. core length 7", mode 4"	+	218'0"				218'4" 1" to ½" fragments 219'9"		100psi Permeability 2 lugeons 150psi	M716/3
QUARTZO-FELDSPATHIC DYKE	Mod. weath., white, mod. hard, mod. weak rock	+	220'						200psi	
			224'5"							
	END OF HOLE						224'5"	HOLE DRY 12/3/68		

DRILL TYPE: Boyles
FEED: hydraulic
CORE BARREL TYPE: NMLC triple tube, split inner tube
DRILLER: M. Parcell
COMMENCED: 28/1/68
COMPLETED: 10/2/68
LOGGED BY: G.D.M. Henderson
VERTICAL SCALE: 10 feet: 1 inch

NOTES

FRACTURE LOG: Number of fractures per foot of core. Zones of core loss are blocked in.
BEDDING AND JOINT PLANES: Angles are measured relative to a plane normal to the core axis.

WATER PRESSURE TESTS
PACKER TYPE: N mechanical
SUPPLY LINE: N rod
VERTICAL SCALE: 100 psi: 1 inch
Figures given are gauge pressures
Test sections are indicated graphically, & blocked in strip

PHOTOGRAPHIC REFERENCE SYSTEM
BLACK AND WHITE: B.M.R. film no. 1 frame no. 9 M716/4
COLOUR

M(Pf)99

I55/A16/96

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT: TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.

LOCATION: West Bank near Proposed Spillway

ANGLE FROM HORIZONTAL: 60° DIRECTION: 272°

COORDINATES: E17926, S85402 R.L. 2141 Feet

HOLE NO: **D.G.2** SHEET 1 OF 2

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION (LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC)	DEPTH & SIZE OF CORE	STRUCTURES (JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES)	WATER LEVEL	WATER PRESSURE TEST (Loss in gallons per minute per foot)	PHOTO REF NO
	Soil and decomp. rock	NX casing 3'2"	3'2"			NO PHOTO
ADAMELLITE	Highly weathered	6'1"	6'1" < 2" fragments			11/11
ADAMELLITE slightly to moderately weathered	Pale brown, coarse-grained, moderately hard and strong rock. Max. core length 2'2"	NMLC 10'	Foliation at 60°			11/12, Mb13/12
			14'8"–14'11" < 2" fragments			11/14
			17'9"–18'0" < 1" fragments			
		20'	19'2" < 2" fragments			
			Joint parallel to core at right angle to foliation	25' 12/6/68		11/15, M701/3
		30'		32' 13/3/68	5 psi, 10 psi, 25 psi — Permeability zero	Mb13/16, 11/17
		40'				11/17,18/19, Mb13/19
			44'6" 1" white clay seam at 55°			Mb11/20
		50'	48'4"–48'7" brown decomposed rock and clay		5 psi, 15 psi, 25 psi, 35 psi — Permeability 2 lugeons	Mb11/21, Mb11/22
		55'0"	Foliation at 70°			
APLITE		55'6"				
ADAMELLITE moderately weathered	Pale brown, coarse-grained, mod. hard, mod. weak rock. Max. core length 7", mode 4"	63'2"	63'2"			11/24, 11/25
ADAMELLITE highly weathered	Mostly white, coarse-grained soft weak rock. Max. core length 2"	69'0"	64'2" core loss, broken throughout; 68'4"–68'11" brown sandy clay		5 psi, 20 psi, 40 psi, 60 psi — Permeability 41 lugeon	M701/4, 11/26, 11/27
ADAMELLITE moderately weathered	Pale brown, coarse-grained mod. hard, mod. weak rock. Max. core length 4"	75'2"				11/28
ADAMELLITE slightly to mod. weath.	Pale brown coarse-gr. mod. hard and strong rock. Max. core length 8"	80'	78'10"–79'0" 1" fracture & clay at 45°			Mb11/24

DRILL TYPE: Minidrill
FEED: hydraulic
CORE BARREL TYPE: NMLC triple tube, split inner tube
DRILLER: B. McDonald
COMMENCED: 13/1/68
COMPLETED: 17/1/68
LOGGED BY: G.G.M. Henderson
VERTICAL SCALE: 10 feet : 1 inch

NOTES

FRACTURE LOG — Number of fractures per foot of core. Zones of core loss are blocked in.
BEDDING AND JOINT PLANES — Angles are measured relative to a plane normal to the core axis.

WATER PRESSURE TESTS
PACKER TYPE: N mechanical
SUPPLY LINE: N rod
VERTICAL SCALE: 50 psi : 1 inch
Figures given are gauge pressures
Test sections are indicated graphically by blocked in strips

PHOTOGRAPH REFERENCE SYSTEM
BLACK AND WHITE: Bulk film no. and frame no., e.g. Mb11/13
COLOUR:

M(Pf)99

155/A16/967

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.

LOCATION West Bank near Proposed Spillway

ANGLE FROM HORIZONTAL 60° DIRECTION 272°

COORDINATES E17926, S85402 R.L. 2141 feet

HOLE NO D.G.2

SHEET 2 OF 2

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION (MINERALOGY, COLOUR, STRENGTH, HARDNESS, ETC)	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	LIFT & % CORE RECOVERY	CASING	STRUCTURES (JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES)	WATER LEVEL	WATER PRESSURE TEST (Loss in gallons per minute per foot)	CORE BOX	PHOTO REF NO CORE NO
ADAMELLITE	see previous sheet	+	81'6"				80'5" < 1" fragments				M699/20 M699/21 M699/22 M699/23 M699/24 M699/25
ADAMELLITE fresh to sl. weathered	Pale grey, coarse-grained, hard; strong rock. Max. core length 1'7"	+	87'6"				87'3" 2 iron-stained joints at 60° & 70°		5psi 25psi 50psi 75psi		M701/3
ADAMELLITE fresh	Pale grey, coarse-grained, very hard and strong rock. Max. core length 5'6"	+	90'				91'10" iron-stained joint at 20°				
		+	100'						5psi 25psi 50psi 75psi		M701/1
		+	110'4"								
	END OF HOLE						110' 4"				

DRILL TYPE Mindrill
FEED hydraulic
CORE BARREL TYPE NMLC triple tube, split inner tube.
DRILLED B. McDonald
COMMENCED 13/1/68
COMPLETED 17/1/68
LOGGED B. S.B.M. Henderson
VERTICAL SCALE 10 feet : 1 inch

NOTES

FRACTURE LOG Number of fractures per foot of core. Zones of core loss are blocked in.
BEDDING AND JOINT PLANES - Angles are measured relative to a plane normal to the core axis.

WATER PRESSURE TESTS

PACKER TYPE N mechanical
SUPPLY LINE EW rod
VERTICAL SCALE 100 psi : 1 inch.
Figures given are gauge pressures
Test sections are indicated graphically by blocked in strips

PHOTOGRAPH REFERENCE SYSTEM

BLACK AND WHITE B.M.R. film no.
Wide frame no. e.g.
M699/20
COLOUR

M(Pf)99

155/A16/967

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT: TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.
LOCATION: River Bed near Proposed Dam Axis
ANGLE FROM HORIZONTAL: 60°
DIRECTION: 267°
COORDINATES: E18640, S85425 (Stromlo Co-ords)
R.L. 1945 feet

HOLE NO. D.G.3

SHEET 1 OF 1

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	LIFT & % CORE RECOVERY	CASING	STRUCTURES JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES	WATER LEVEL	WATER PRESSURE TEST Loss in gallons per minute per foot	PHOTO REF. NO.
ADAMELLITE fresh	Pale grey, coarse-grained very hard and strong rock. Max. core length 4'0" mode 1'6"	+ \ + \ + \ + \ + \ + \ + \ + \ + \ +	10' 20' 30' 40' 50'3"					Zero	5psi, 15psi, 25psi, 35psi Permeability zero; 15psi, 25psi, 35psi, 45psi Permeability zero	NO PHOTO; M702/2; M702/3; 14; M701/5; M701/6; M702/6; M702/7; M702/8; M702/9; M702/10; 11
	END OF HOLE						50' 3"			

DRILL TYPE: Boyles
FEED: hydraulic
CORE BARREL TYPE: NMLC triple tube, split inner tube
DRILLER: M. Parcell
COMMENCED: 15/1/68
COMPLETED: 23/1/68
LOGGED BY: [illegible]
VERTICAL SCALE: 10 feet: 1 inch

NOTES

FRACTURE LOG: Number of fractures per foot of core. Zones of core loss are blocked in.
BEDDING AND JOINT PLANES – Angles are measured relative to a plane normal to the core axis.

WATER PRESSURE TESTS
PACKER TYPE: N mechanical
SUPPLY LINE: N rod
VERTICAL SCALE: 50psi : 1 inch
Figures given are gauge pressures. Test sections are indicated graphically by blocked in strips.

PHOTOGRAPH REFERENCE SYSTEM
BLACK AND WHITE: B.M.R. film no. and frame no., e.g. M702/2
COLOUR

M(Pf)99

155/A16/968

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.

LOCATION West Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL 45° DIRECTION 312°

COORDINATES E18425, S85402 (Stromlo Co-ords) R.L. 2098 feet

HOLE NO. D.D. 4

SHEET 1 OF 1

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	LIFT & % CORE RECOVERY	CASING	STRUCTURES JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES	WATER LEVEL	WATER PRESSURE TEST Loss in gallons per minute per foot	PHOTO REF NO CORE BOX / CORE BARREL
ADAMELLITE	Slightly weathered		2'0"				Most joints show slickensides			NO PHOTOS / A7 / I8 / M1037/19 / /20 / NO PHOTO / M1037/21 / M1037/22 / M1037/23 / NO PHOTO / M1037/24
ADAMELLITE fresh	Coarse-grained, pale grey, very hard and strong rock.		NX 6'5" NMLC				6'0" 3 irregular joints, iron stained and 1" of slight weath. at each. 9'4" 11'4"	4' 04/9/70		
							12' 04/9/70		@5psi @10psi @15psi	Permeability 4 lugeons*
							15'0" iron stained joint at 70°, parallel to foliation. (170/80W)			
			18'0"				18'0" 4 joints at 45° (072/825?) 19'0"			
ADAMELLITE slightly weathered	Coarse-grained, pale, hard strong rock.						24'5" iron stained joint at 70°, parallel to foliation (170/80W)			
			29'0"							
ADAMELLITE fresh	Coarse-grained, pale grey, very hard and strong rock.						33'2" iron stained joint at 50°, (120/40SW) slight weathering for 2".	34' 27/7/70	@10psi	Permeability 5 lugeons*
	slightly weath.		39'2" 40'8"				39'6" iron stained joint at 70°, parallel to foliation (170/80W)		@20psi	
									@30psi	
	slightly weath.		46'5" 47'1"				46'9" iron stained joints at 60° and 45° (012/16W? & 072/825)			
			50'0"							
	END OF HOLE						50' 0"			

DRILL TYPE Boyles
FEED hydraulic
CORE BARREL TYPE NMLC triple tube, split inner tube
DRILLER A. Warner
COMMENCED 3/6/70
COMPLETED 8/6/70
LOGGED BY G.A.M. Henderson
VERTICAL SCALE 10 feet : 1 inch

NOTES

FRACTURE LOG - Number of fractures per foot of core. Zones of core loss are blacked in.
BEDDING AND JOINT PLANES - Angles are measured relative to a plane normal to the core axis.

Graphic log is represented in vertical plane striking parallel to direction of drill hole, i.e. 312°. Foliation is inferred to dip steeply to the west, attitude 170/80W approx. Joints are shown at inferred apparent dip.
Fracture log includes both joints and fractures due to drilling.

* 1 lugeon ≈ a loss of 0.05 gall./min/ft. at 100 p.s.i. pressure

WATER PRESSURE TESTS
PACKER TYPE N mechanical
SUPPLY LINE N rod
VERTICAL SCALE 20 psi : 1 inch
Figures given are gauge pressures
Test sections are indicated graphically, by blacker in strips

PHOTOGRAPH REFERENCE SYSTEM
BLACK AND WHITE B.M.R. film no. and frame no. e.g. M1037/19
COLOUR

M(Pf) 99

I55/A16/969

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.

LOCATION East Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL 45° DIRECTION 107°

COORDINATES E 19282, S 85392 (Stromlo Co-ords) R.L. 2150 feet

HOLE NO D.D.5

SHEET 1 OF 2

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	LIFT & % CORE RECOVERY	CASING	STRUCTURES JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES	WATER LEVEL	WATER PRESSURE TEST Loss in gallons per minute per foot	PHOTO REF NO CORE BOX / CORE CAMERA
ADAMELLITE moderately weathered	Pale pink-brown, coarse grained, moderately hard, moderately weak rock. Max. core length 8", mode 2"-4". Numerous joints** parallel to foliation and in other directions		NX casing				Core broken throughout		0 0.25 0.5	No PHOTOS
			NMLC				5'0"			
							7'6" < ½" fragments			
							8'0" Foliation at 25°			
							12'9" < 1" fragments			
							13'11" brown sandy material and small frags			
									5psi	
			20'0"				19'10" < 1" fragments		10psi Permeability zero	MIDH/2
-ADAMELLITE slightly to moderately weathered	Pale pink-brown, coarse grained, moderately hard, moderately weak rock. Max. core length 9", mode 3"-5". Numerous joints** parallel to foliation and in other directions						20'3" < ½" fragments		15psi	MIDH/3
							23'1" 23'4"	25' 25/6/70		MIDH/4
							34'10" < 1" fragments			MIDH/4
							35'9" sandy material			
							37'2" < 1" fragments		20psi	7
			40'0"				40'0" < 1" fragments		25psi Permeability < 1 lugeon*	MIDH/8
							40'6" 42'5" < 1" fragments		30psi	MIDH/9
							42'9"			MIDH/10
							46'1" broken rock and sandy material			MIDH/11
							47'6" Foliation at 45°		20psi	MIDH/12
							53'7" < 1" fragments			13
							55'2" < 2" fragments			
							56'7" < 1" fragments			14
							56'10" 58'4" < ½" fragments		Permeability 1 lugeon*	
			60'0"				58'6"		35psi	MIDH/13
							67'2" < 2" fragments		50psi	15
							68'3" < ½" frags with clay			MIDH/16
							70'4" < 1" fragments			
							< 2" fragments			
							73'0"		see Sheet 2	
			80'0"				79'4" < ½" fragments	80' 1/7/70		

DRILL TYPE Boyles
FEED hydraulic
CORE BARREL TYPE NMLC triple tube, split inner tube
DRILLER A. Warner
COMMENCED 19/6/70
COMPLETED 1/7/70
LOGGED BY G.A.M. Henderson
VERTICAL SCALE 10 feet: 1 inch

NOTES

FRACTURE LOG - Number of fractures per foot of core. Zones of core loss are blacked in.
BEDDING AND JOINT PLANES - Angles are measured relative to a plane normal to the core axis.

** For joints directions see joint stereogram for costeans

* 1 lugeon ≈ a loss of 0.05 gall./min./ft. at 100 psi pressure

WATER PRESSURE TESTS
PACKER TYPE N mechanical
SUPPLY LINE N rod
VERTICAL SCALE 20psi : 1 inch
Figures given are gauge pressures
Test sections are indicated graphically by blanked in strips

PHOTOGRAPH REFERENCE SYSTEM
BLACK AND WHITE B.M.R. film no. and frame no. e.g. MIDH1/2
COLOUR

M(Pf)99

I65/A16/970

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.

LOCATION East Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL 45° DIRECTION 107°

COORDINATES E19282, S85392 (Stromlo Co-ords.) R.L. 2150 feet

HOLE NO D.D.5

SHEET 2 OF 2

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	LIFT & % CORE RECOVERY	CASING	STRUCTURES JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES	WATER LEVEL	WATER PRESSURE TEST Loss in gallons per minute per foot	PHOTO REF CORE BOX	PHOTO REF CORE NO.
ADAMELLITE slightly to moderately weathered	Pale pink-brown, coarse-grained, mod. hard, moderately weak rock. Max. core length 10". Numerous joints** parallel to foliation and in other directions		NMLC				82'0" 2-3" core lengths c. < 1" 84'8" frags & sandy material 86'1" < 2" fragments 86'10" 89'5" < 2" fragments 91'9" 92'11" < 2" fragments some sandy material 97'2" 98'6" core loss 100'0" < 2" fragments Foliation at 45° 104'0" < 1" fragments 105'3" 106'6" < ¼" fragments and sandy clay 106'10" 110'10" < ¼" fragments 111'1" 118'11" < 1" fragments clay 122'4" < 1" fragments and sandy material 125'6" 125'8" < ½" fragments 125'10"		0.25 0.5 25psi 35psi Permeability 2 lugeons* 55psi 30psi 60psi Permeability < 1 lugeon* 90psi 25psi 50psi Permeability 3 lugeons* 75psi		M1041/17 M1041/18 M1041/19 M1041/20 M1041/21 M1041/22 M1041/23 M1041/24 M1041/25 M1041/26 M1041/27 M1041/28 M1041/29 M1041/30 M1041/31 M1041/32 M1041/33 M1041/34 M1041/35
ADAMELLITE slightly to moderately weathered	Pale grey, coarse-grained, mod. hard and strong rock. Max. core length 8". Slightly weathered, sl. pinkish adamellite. Slightly weathered pale grey adamellite		120'0" 125'6" 134'9" 139'6" 148'6" 153'0"				130'6" < 2" fragments sandy material 131'10" sandy clay 133'4" Foliation at 45° 145'7" < 1" fragments 145'9" 149'0" sandy material sandy clay < ½" fragments 151'11" < ¼" fragments		25psi 50psi Permeability 3 lugeons* 75psi 50psi 75psi 100psi Permi. 5 lugeons* 125psi		
ADAMELLITE slightly weathered	Pale, slightly pinkish, coarse-grained, mod. hard and strong rock. Max. length 11"		160'0" 166'4"				158'8" sandy material 161'0" < 1" fragments				

END OF HOLE 166'4"

** For joint directions see joint stereogram of costeans

* 1 lugeon ≈ a loss of 0.05 gall./min./ft. at 100psi pressure

DRILL TYPE Boyles
FEED hydraulic
CORE BARREL TYPE NMLC triple tube, split inner tube
DRILLER A. Warner
COMMENCED 19/6/70
COMPLETED 1/7/70
LOGGED BY G.A.M. Henderson
VERTICAL SCALE 10 feet: 1 inch

WATER PRESSURE TESTS
PACKER TYPE N mechanical
SUPPLY LINE N rod
VERTICAL SCALE 50psi : 1 inch
Figures given are gauge pressures
Test sections are indicated graphically by packer symbols

PHOTOGRAPH REFERENCE SYSTEM
BLACK AND WHITE B.M.R. film no. and frame no. e.g. M104/17
COLOUR

M(Pf)99

X

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.

LOCATION East Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL 45° DIRECTION 100°

COORDINATES E 19085 , S 85384 (Stromlo Co-ords) R.L. 2072 feet

HOLE NO D.D.5A

SHEET 1 OF 3

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	LIFT & % CORE RECOVERY	CASING	STRUCTURES JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES	WATER LEVEL	WATER PRESSURE TEST Loss in gallons per minute per foot
ADAMELLITE completely weathered	Mostly pale coloured sandy material		NX casing 8'6" NMLC 16'4"				Numerous joints** throughout parallel to foliation and in other directions		
ADAMELLITE moderately to highly weathered	Pale, coarse-grained, mod. hard and strong to soft, weak rock. Max. core length 1'4", mode 4"-8".		25'8"				19'11" < 1" fragments 20'9" 23'3" < 1/4" fragments 24'8" < 1" fragments 25'8" core loss 26'8"	15' 22/6/70 24' 25/6/70	10psi 20psi 30psi
ADAMELLITE highly to completely weathered	Brown, mostly soft, weak, broken rock and mod. weath. rock sandy material mod. weath. rock		29'4" 31'2" 35'0" 36'1" 48'4"				39'2" core loss 40'0" 43'10" 45'0" core loss 46'10" 48'0" core loss		20psi 30psi Permeability < 1 lugeon*
APLITE	Pink, sl. weath., hard		50'4"				50'0" 52'0" < 1" fragments		40psi
ADAMELLITE moderately weathered	Pale brown, coarse-grained, moderately hard and strong rock. Max. core length 1'0"		68'0"				53'8" greenish clay 53'11" 59'2" brown sandy clay 60'10" brown sandy clay 61'6" 67'7" brown sandy clay 68'0"		25psi 35psi Permeability 1 lugeon*
ADAMELLITE slightly weathered	Pale grey, coarse-grained hard, strong rock. Max. core length 1'3"		80'0"				Foliation at 45° 79'10" < 1/4" fragments		50psi see Sheet 2

DRILL TYPE Boyles
FEED gravity
CORE BARREL TYPE NMLC triple tube, split inner tube
DRILLER M. Dziwulski
COMMENCED 18/6/70
COMPLETED 6/7/70
LOGGED BY G.A.M. Henderson
VERTICAL SCALE 10 feet : 1 inch

NOTES

FRACTURE LOG - Number of fractures per foot of core. Zones of core loss are blacked in.
BEDDING AND JOINT PLANES - Angles are measured relative to a plane normal to the core axis.

** For joint directions see joint stereogram for costeans

* 1 lugeon ≈ a loss of 0·05 gall./min./ft. at 100psi pressure

WATER PRESSURE TEST
PACKER TYPE N mechanical
SUPPLY LINE N. rod
VERTICAL SCALE 20psi : 1 inch
Figures given are gauge pressures
Test sections are indicated graphically by thickness of line

PHOTOGRAPH REFERENCE
BLACK AND WHITE B.M.R. film no. and frame no. e.g. M1039/10
COLOUR

M(Pf)99
I55/A16/971

M1039/10 /11 /12 M1039/13 /14 M1039/15 /16 M1039/17 /18 NO PHOTOS M1039/22 M1039/23 M1039/24 /25

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.

LOCATION East Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL 45° DIRECTION 100°

COORDINATES E19085, S85384 (Stromlo Co-ords.) R.L. 2072 feet

HOLE NO D.D.5A

SHEET 2 OF 3

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	LIFT & % CORE RECOVERY	STRUCTURES JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES	WATER LEVEL	WATER PRESSURE TEST Loss in gallons per minute per foot
ADAMELLITE slightly weathered	Pale grey, coarse-grained, hard, strong rock. Max. core length 1'3"		80'0"			Numerous joints** to 130 feet, parallel to foliation and in other directions		0·0 0·25 0·5
	QUARTZO-FELDSPATHIC DYKE, sl. weath.		90'0"					25psi
			92'6"			92'4" < 1" fragments	86' 30/6/70	40psi Permeability zero
						92'8" < 1/4" fragments		
						93'5"		55psi
			99'0"				98' 26/6/70	
QUARTZO-FELDSPATHIC DYKE slightly weathered	Pale grey and white, hard, mod. strong to strong rock. Max. core length 1'2"							25psi
								50psi Permeability 4 lugeons*
								75psi
			111'6"			110'9" < 1" fragments		
ADAMELLITE mod. to highly weathered	Pale, coarse-grained, mod. hard to soft & weak. Max. core length 3"					112'0" core loss		
						115'0" < 1" fragments		
						116'4" core loss		
						117'2" < 1" fragments		
			118'5"			118'2"		
ADAMELLITE slightly to mod. weathered	Pale, sl. pinkish, coarse-gr. hard, mod. strong to strong rock. Max. core length 2'0"					118'5"		25psi
						121'6" rock broken along joint parallel to core axis		
						122'8"		50psi Permeability 4 lugeons*
			125'0"			125'8"		
ADAMELLITE highly weath.	Brown, soft, weak rock					128'4" core loss		75psi
			129'6"			128'6" clay		
						129'6" < 1" frags & sandy mat.		
ADAMELLITE moderately weathered	Brown, coarse-grained, mod. hard and strong rock Max. core length 6".		136'2"				125' 2/7/70	
ADAMELLITE fresh to slightly weathered, iron-stained joints	Pale grey, coarse-grained, hard, strong rock. Max. core length 1'6", mode 8".					142'0" Joints at 45° & 50° at right angles	140' 4/7/70	25psi
						147'4" Joint at 60°, near horiz.		50psi
						148'6" Joint at 75°, dip steep South.		
						151'6" < 2" fragments		Permeability 14 lugeons
						151'11"		75psi
						Foliation at 50°		
			160'0"			157'6" Joint at 40°, strike N-W., dip near vert.		see Sheet 3

M1039/25 M1039/26 M1039/27 M1039/28 M1039/29 M1039/30 /31 /32 M1039/33 M1039/34 /35 M1039/36 M1039/37 NO PHOTOS

DRILL TYPE Boyles
FEED gravity
CORE BARREL TYPE NMLC triple tube, split inner tube
DRILLER M. Dziwulski
COMMENCED 18/6/70
COMPLETED 6/7/70
LOGGED BY G.A.M. Henderson
VERTICAL SCALE 10 feet: 1 inch

NOTES

FRACTURE LOG Number of fractures per foot of core. Zones of core loss are blocked in.

BEDDING AND JOINT PLANES - Angles are measured relative to a plane normal to the core axis.

** For joint directions see joint stereogram for costeans

* 1 lugeon ≈ a loss of 0·05 gall./min./ft. at 100psi pressure

WATER PRESSURE TESTS
PACKER TYPE N mechanical
SUPPLY LINE N rod
VERTICAL SCALE 50psi : 1inch
Figures given are gauge pressures
Test sections are indicated graphically by pecked lines

PHOTOGRAPH REFERENCE SYSTEM
BLACK AND WHITE B.M.R. film no. and frame no. e.g. M1039/25
COLOUR

M(Pf)99

I55/A16/971

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.

LOCATION East Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL 45° DIRECTION 100°

COORDINATES E 19085, S 85384 (Stromlo Co-ords.) RL 2072 feet

HOLE NO D.D.5A

SHEET 3 OF 3

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	LIFT & % CORE RECOVERY	CASING	STRUCTURES JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES	WATER LEVEL	WATER PRESSURE TEST Loss in gallons per minute per foot	CORE BOX	CORE SAMPLE
ADAMELLITE	see Sheet 2	+	160'0" 163'0"				162'6" clean joint at 45° parallel to foliation		0·0 0·25 0·5		
APLITE fresh to slightly weathered	Pink, fine-grained, hard, strong rock. Max. core length 8".						168'0" foliation at 40°		50psi 75psi 100psi Permeability 6 lugeons*		
							171'0" < 2" fragments				
			173'4"				172'0"				
ADAMELLITE fresh to slightly weathered	Pale pinkish, coarse-grained, hard, strong rock. Max. core length 1'10".	x					178'0" sandy clay 178'4"				
							181'8" iron-stained joints at 20° & 35°		50psi		
							186'0" < ½" fragments		75psi Permeability < 1 lugeon*		
							188'1" ½" clay seam				
									100psi		
							196'0" clean joint at 70°				
			200'0"				199'6" ½" clay seam				
	END OF HOLE						200'0"				

NO PHOTOS

DRILL TYPE Boyles
FEED gravity
CORE BARREL TYPE NMLC triple tube, split inner tube
DRILLER M. Dziewulski
COMMENCED 18/6/70
COMPLETED 6/7/70
LOGGED BY G.A.M. Henderson
VERTICAL SCALE 10 feet: 1 inch

NOTES

FRACTURE LOG :- Number of fractures per foot of core. Zones of core loss are blacked in.
BEDDING AND JOINT PLANES – Angles are measured relative to a plane normal to the core axis.

* 1 lugeon ≈ a loss of 0·05 gall./min./ft. at 100psi pressure

WATER PRESSURE TESTS
PACKER TYPE N. mechanical
SUPPLY LINE N. rod
VERTICAL SCALE 50psi : 1 inch
Figures given are gauge pressures
Test sections are indicated graphically, by blacken'n strips

PHOTOGRAPH REFERENCE SYSTEM
BLACK AND WHITE B.M.R. film no. and frame no. e.g.
COLOUR

M(Pf)99

I55/A16/971

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.

LOCATION Near Proposed Spillway

ANGLE FROM HORIZONTAL 90° DIRECTION

COORDINATES E18357, S85036 (Stromlo Co-ords) R.L. 2127 feet

HOLE NO. D.D. 6

SHEET 1 OF 1

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION (LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC)	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	LIFT & % CORE RECOVERY	CASING	STRUCTURES (JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES)	WATER LEVEL	WATER PRESSURE TEST (Loss in gallons per minute per foot)	PHOTO REF NO: CORE BOX	PHOTO REF NO: CORE MARKER
SOIL			1'9"								
ADAMELLITE moderately weathered	Coarse-grained, pale, moderately hard and strong rock		NX casing 6'0"					6' 25/5/70			
			7'6"								
ADAMELLITE mod. to highly weathered	Coarse-grained, pale, moderately hard and strong rock		NMLC 14'7"				12'8" shear zone with sericite at 80° 14'0"				
ADAMELLITE slightly weathered	Slightly to mod. weath. adamellite		18'0" 20'0"				Foliation at 70°				
	Coarse-grained, pale, hard, strong rock						22'0" weathered joint with clay 22'3"		0 5psi 10psi 15psi Permeability zero		
			37'2"				37'2" 4 iron-stained joints at 20° 39'2"		10psi 15psi Permeability < 1 lugeon*		
ADAMELLITE fresh	Coarse-grained, pale grey, very hard and strong rock. Max. core length 5'.						42'2" iron-stained joint at 80°, parallel to foliation (167/80W) 47' iron-stained joint at 70°, parallel to foliation	50' 26/5/70	30psi 20psi 30psi Permeability 8 lugeons* 40psi 50psi		
	Slightly weathered adamellite		69'0" 65'0"				61'4" major joint at 70°-80° completely weathered 62'5" core washed away	65' 27/7/70			
			71'2"								
	END OF HOLE						71' 2"				

NO PHOTOS M1037/2 /3 M1037/4 /5 M1037/6 M1037/7 M1037/8 M1037/9 M1037/10 /11 M1037/12 /13

DRILL TYPE Boyles
FEED hydraulic
CORE BARREL TYPE NMLC triple tube, split inner tube
DRILLER A. Warner
COMMENCED 19/5/70
COMPLETED 26/5/70
LOGGED BY C.A.M. Henderson
VERTICAL SCALE 10ft. : 1inch

NOTES

FRACTURE LOG - Number of fractures per foot of core. Zones of core loss are blacked in.
BEDDING AND JOINT PLANES - Angles are measured relative to a plane normal to the core axis.

Graphic log is represented in plane at right angles to strike of foliation and looking north. Strike of plane is 077° (true bearing). Foliation is inferred to dip steeply to the west. Joints are shown at inferred apparent dips.

* 1 lugeon ≈ a loss of 0·05 gall./min./ft. at 100psi pressure

WATER PRESSURE TESTS
PACKER TYPE N. mechanical
SUPPLY LINE N. rod
VERTICAL SCALE 20psi : 1 inch
Figures given are gauge pressures
Test sections are indicated graphically, by blanked in strips

PHOTOGRAPH REFERENCE SYSTEM
BLACK AND WHITE B.M.R. film no. and frame no. e.g. M1037/2
COLOUR

M(Pf)99

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.

LOCATION Proposed Rock Quarry

ANGLE FROM HORIZONTAL 90° DIRECTION

COORDINATES E 19143, S 86168 (Stromlo Co-ords) R.L. 2008 feet

HOLE NO. D.D. 7

SHEET 1 OF 1

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	LIFT & % CORE RECOVERY	CASING	STRUCTURES JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES	WATER LEVEL	WATER PRESSURE TEST Loss in gallons per minute per foot
SAND	Coarse, yellow-brown, clean		NX casing 5'0"						
ADAMELLITE slightly to moderately weathered	Coarse-grained, pale, moderately hard and strong rock.		6'6" NMLC				7'2" Broken zone 8'3" 11'2" iron-stained joint at 60°		Hole not water pressure tested
ADAMELLITE fresh	Coarse-grained, pale grey, very hard and strong rock		13'8"				16'8" iron-stained joint at 45° 20'2" iron-stained joint at 80° Foliation at 80°		
APLITE fresh	Med.-grained, pale grey		28'3" 30'7"				29'6" iron-stained joint at 30°		
	END OF HOLE						30' 7"		

NO PHOTOS M1037/28 M1037/29 NO PHOTOS

DRILL TYPE E1000 Mindrill
FEED hydraulic
CORE BARREL TYPE NMLC triple tube, split inner tube
DRILLER M.R. Parcell
COMMENCED 11/6/70
COMPLETED 16/6/70
LOGGED BY C.A.M. Henderson
VERTICAL SCALE 10 feet: 1 inch

NOTES

FRACTURE LOG Number of fractures per foot of core. Zones of core loss are blacked in.
BEDDING AND JOINT PLANES – Angles are measured relative to a plane normal to the core axis

Graphic log is represented in plane at right angles to strike of foliation and looking north. Strike of plane is 077° (true bearing). Foliation is inferred to dip steeply to the west. Joints are shown at inferred apparent dips.

WATER PRESSURE TESTS

PACKER TYPE
SUPPLY LINE
VERTICAL SCALE
Figures given are gauge pressures
Test sections are indicated graphically by thickening of the vertical line

PHOTOGRAPH REFERENCE SYSTEM

BLACK AND WHITE B.M.R. film no. and frame no. e.g. M1037/28
COLOUR

M(Pf) 99
I55/A16/973

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT TENNENT DAMSITE, GUDGENBY RIVER, A.C.T.

LOCATION Proposed Rock Quarry

ANGLE FROM HORIZONTAL 90° DIRECTION

COORDINATES E18949, S86139 (Stromlo Co-ords) R.L. 2062 feet

D.D. 8

SHEET 1 OF 1

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	LIFT & % CORE RECOVERY	CASING	STRUCTURES JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES	WATER LEVEL	WATER PRESSURE TEST Loss in gallons per minute per foot
SAND	Coarse, yellow-brown, clean.		NX casing 8'7"						
ADAMELLITE moderately weathered	Coarse-grained, pale, moderately hard and strong rock. Max. core length 1'4"		10'0" NMLC 25'0"				11'6" Broken zone 12'4" Numerous iron stained joints throughout shown on graphic log		Hole not water pressure tested.
ADAMELLITE slightly to moderately weathered	Coarse-grained, pale, hard, strong rock. Max. core length 3'0".		38'0"				Foliation at 70°		
ADAMELLITE slightly weath.	Hard, strong rock.		41'1"						
	END OF HOLE						41'1"		

NO PHOTOS M1039/5 M1039/6 /7 M1039/8 M1037/25 /26 /27

DRILL TYPE E1000 Mindrill
FEED hydraulic
CORE BARREL TYPE NMLC triple tube, split inner tube
DRILLER M.R. Parcell
COMMENCED 5/6/70
COMPLETED 9/6/70
LOGGED BY G.A.M. Henderson
VERTICAL SCALE 10 feet : 1 inch

NOTES

FRACTURE LOG - Number of fractures per foot of core. Zones of core loss are blocked in.
BEDDING AND JOINT PLANES - Angles are measured relative to a plane normal to the core axis.

Graphic log is represented in plane at right angles to strike of foliation and looking north. Strike of plane is 077° (true bearing). Foliation is inferred to dip steeply to the west. Joints are shown at inferred apparent dips.

WATER PRESSURE TESTS

PACKER TYPE
SUPPLY LINE
VERTICAL SCALE
Figures given are gauge pressures. Test sections not indicated graphically on plotted log.

PHOTOGRAPH REFERENCE SYSTEM
BLACK AND WHITE B.M.R. film no. and frame no. e.g. M1039/5
COLOUR

M(Pf)99
I55/A16/974

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT TENNENT DAMSITE, GUDGENBY RIVER N.S.T.

LOCATION Proposed Rock Quarry

ANGLE FROM HORIZONTAL 90° DIRECTION

COORDINATES E18752 . S86129 (Stromlo Co-ords.) R.L. 2092 feet

HOLE NO D.D.9

SHEET 1 OF 1

ROCK TYPE & DEGREE OF WEATHERING	DESCRIPTION LITHOLOGY, COLOUR, STRENGTH, HARDNESS, ETC	GRAPHIC LOG	DEPTH & SIZE OF CORE	FRACTURE LOG	% CORE RECOVERY	CASING	STRUCTURES JOINTS, VEINS, SEAMS, FAULTS, CRUSHED ZONES	WATER LEVEL	WATER PRESSURE TEST Loss in gallons per minute per foot	PHOTO REF. NO. CORE BOX	CORE
SOIL			NX casing 3'4"				3'4"				
ADAMELLITE moderately weathered	Pale, coarse-grained, mostly soft weak rock	coarse sand	5'0"				5'0" Broken rock. Max. size 1"				
			7'7"				7'7" Broken rock. Max. size 1"	8'			
			9'9"				8'6"	02/9/72			
ADAMELLITE slightly to moderately weathered	Pale, coarse-grained, mod. hard and strong rock. Max. core length 1'0", mode 6".		NMLC				19' Quartz vein 3" thick at 80°, parallel to foliation. Broken zone 18'8" - 18'11"		Hole not water pressure tested		
			21'10"				22'9" Iron-stained joint at 60° at right angles to foliation				
ADAMELLITE slightly weathered	Pale, coarse-grained, hard strong rock. Max. core length 2'10".		36'6"				34' Iron-stained joint at 75°, strikes at 45° to foliation				
	END OF HOLE						36' 6"				

NO PHOTOS

M1037/14

M1037/15

M1037/16

DRILL TYPE E1000 Mindrill

FEED hydraulic

CORE BARREL TYPE NMLC triple tube, split inner tube

DRILLER A. Warner

COMMENCED 28/5/70

COMPLETED 2/6/70

LOGGED BY G.A.M. Henderson

VERTICAL SCALE 10 feet : 1 inch

NOTES

FRACTURE LOG :- Number of fractures per foot of core. Zones of core loss are blacked in.

BEDDING AND JOINT PLANES – Angles are measured relative to a plane normal to the core axis.

Graphic log is represented in plane at right angles to strike of foliation and looking north. Strike of plane is 077° (true bearing). Foliation is inferred to dip steeply to the west. Joints are shown at inferred apparent dip.

WATER PRESSURE TESTS

PACKER TYPE

SUPPLY LINE

VERTICAL SCALE

Figures given are gauge pressures
Test sections are indicated graphically by blacked in strips

PHOTOGRAPH REFERENCE SYSTEM

BLACK AND WHITE B.M.R. film no. and frame no. e.g. M1037/14

COLOUR

M(Pt)99

I55/A16/975

APPENDIX 3A

METHOD OF WATER PRESSURE TESTING AND COMPUTATION

Water pressure testing, whereby water is introduced under pressure into a section of drill hole and the water loss measured, was carried out in all drill holes except DD7, DD8 and DD9. Testing was done in 20 foot sections down from the highest level the packer would seal in each hole. Pressure in the test sections was maintained by a mindrill pump capable of delivering water at a maximum pressure of 150 pounds per square inch. All testing was done using a mechanical packer.

In the computation sheets the field results are reduced to give water losses in gallons per minute per foot of drill hole, and to give the effective pressures in the test section. Rock permeabilities are also calculated. The method is adapted from the Snowy Mountains Authority Engineering Geology Manual.

The water loss (t), in gallons per minute per foot of drill hole, is obtained from the formula:

$$t = \frac{kh}{i}$$

where k = a conversion factor, theoretically derived, which allows for leakage paths at the ends of test sections different from those at the centre of test sections.

h = the leakage rate in gallons per minute

i = the length of the test section in feet

The effective pressure (s), in pounds per square inch, is obtained from the formula:

$$s = d + p - q - r$$

where d = the gauge pressure

q = the loss of pressure in the supply line

r = the loss of pressure in the packer

The calculation of the water column pressure (p) depends on whether the slope depth in feet to the water table (1) is greater or less than the slope depth to the test section (a)

If 1<a the formula used is

$$p = 0.44 \sin \Theta (1+m)$$

where Θ = the slope of the drill hole in degrees

m = the slope height of the pressure gauge from the collar of the drill hole

If 1>a the formula used is

$$p = 0.44 \sin \Theta n$$

where n = the length of the supply line.

The pressure losses in the supply line and packer depend on the rate of water loss in the test section. To obtain these pressure losses graphs derived from calibration tests carried out at Corin Dam site (Best, 1969) were used.

The water losses at the respective effective pressures were used to determine, from a graph, the joint permeabilities in lugeons.

To compute the approximate leakage of ground water into the diversion tunnel the following procedure is adopted. The leakage per foot of drill hole at the effective pressure in the test section is converted to the leakage that would occur from the groundwater pressure at the roof of the tunnel. It is then multiplied by a factor of 1.6 which, in a 10-foot diameter tunnel, gives the leakage per foot of tunnel for a 100-foot long section of tunnel.

The factors for different diameter tunnels are given in Snowy Manual but source of calculations not mentioned.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS
WATER PRESSURE TESTS
REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE — FEATURE East Bank near Proposed Dam Axis — HOLE NO. D.G.1

ANGLE FROM HORIZONTAL (θ) 70° — DIRECTION 277° — R.L. OF COLLAR 2152 feet — SIZE OF HOLE N — SHEET 1 OF 4

LOCATION E 19272, S 85375 — PACKER TYPE mechanical — DRILL LOG REF

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (± 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (psi)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPL TYPE & CAPACITY OF PUMP, ETC.
	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 x h/i	
29/1/68	23·1	43·0	5	5	0·0	0·0	0·0	0·0	20·0	1·0	5?	0	30' N rod	2·0	0·0	0·0	7	0·0	
			5	10	0·0	0·0	0·0	0·0							0·0	0·0	12	0·0	Permeability zero
			5	15	0·0	0·0	0·0	0·0							0·0	0·0	17	0·0	
			5	20	0·0	0·0	0·0	0·0							0·0	0·0	22	0·0	
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	27	0·0	
30/1/68	40·7	60·7	5	5	0·0	0·5	0·5	0·1	20·0	1·0	8?	0	50' N rod	3·5	0·0	0·0	8·5	0·01	
			5	5	0·5	1·0	0·5	0·1							0·0	0·0	8·5	0·01	
			5	5	1·0	1·5	0·5	0·1							0·0	0·0	8·5	0·01	
			5	15	0·0	1·5	1·5	0·3							0·0	0·0	18·5	0·02	
			5	15	1·5	3·0	1·5	0·3							0·0	0·0	18·5	0·02	
			5	15	3·0	4·5	1·5	0·3							0·0	0·0	18·5	0·02	
			5	25	0·0	2·0	2·0	0·4							0·0	0·0	28·5	0·02	
			5	25	2·0	4·0	2·0	0·4							0·0	0·0	28·5	0·02	Permeability 2 lugeons
			5	25	4·0	6·5	2·5	0·5							0·0	0·0	28·5	0·03	
			5	35	0·0	3·0	3·0	0·6							0·0	0·0	38·5	0·03	
			5	35	3·0	5·5	2·5	0·5							0·0	0·0	38·5	0·03	
			5	35	5·5	8·0	2·5	0·5							0·0	0·0	38·5	0·03	
			5	25	0·0	2·0	2·0	0·4							0·0	0·0	28·5	0·02	
			5	25	2·0	3·5	1·5	0·3							0·0	0·0	28·5	0·02	
			5	25	3·5	5·0	1·5	0·3							0·0	0·0	28·5	0·02	
			5	15	0·0	1·0	1·0	0·2							0·0	0·0	18·5	0·01	
			5	15	1·0	1·75	0·75	0·15							0·0	0·0	18·5	0·01	
			5	15	1·75	2·5	0·75	0·15							0·0	0·0	18·5	0·01	
			5	5	0·0	0·0	0·0	0·0							0·0	0·0	8·5	0·0	
			5	5	0·0	0·0	0·0	0·0							0·0	0·0	8·5	0·0	

* Values are read from appropriate correction graphs.

+ If ℓ ≤ a, p = 0·44. sin θ. (ℓ + m); if ℓ > a, p = 0·44. sin θ. n.

FILE No 155/A16/976

M(Pf) 107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

WATER PRESSURE TESTS

REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE — FEATURE East Bank near Proposed Dam Axis — HOLE NO. D.G.1

ANGLE FROM HORIZONTAL (θ) 70° — DIRECTION 277° — R.L. OF COLLAR 2152 feet — SIZE OF HOLE N — SHEET 2 OF 4

LOCATION E 19272, S 85375 — PACKER TYPE mechanical — DRILL LOG REF

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (≈ 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT. GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (psi.)	FRICTION LOSSES PACKER (psi.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY TYPE & CAPACITY OF PUMP, ETC.
	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 x h/i	
31/1/68	58.8	78.8	5	5	0.0	0.0	0.0	0.0	20.0	1.0	19?	0	60' N rod	8.0	0.0	0.0	13	0.0	
			5	20	0.0	0.0	0.0	0.0							0.0	0.0	28	0.0	
			5	40	0.0	0.0	0.0	0.0							0.0	0.0	48	0.0	Permeability < 1 lugeon
			5	60	0.0	0.5	0.5	0.1							0.0	0.0	68	0.01	
			5	60	0.5	1.0	0.5	0.1							0.0	0.0	68	0.01	
			5	60	1.0	1.5	0.5	0.1							0.0	0.0	68	0.01	
			5	40	0.0	0.0	0.0	0.0							0.0	0.0	48	0.0	
31/1/68	75.8	95.8	5	5	0.0	0.0	0.0	0.0	20.0	1.0	25?	0	80' N rod	10.5	0.0	0.0	15.5	0.0	
			5	5	0.0	0.0	0.0	0.0							0.0	0.0	15.5	0.0	
			5	25	0.0	0.0	0.0	0.0							0.0	0.0	35.5	0.0	
			5	25	0.0	0.0	0.0	0.0							0.0	0.0	35.5	0.0	Permeability zero
			5	55	0.0	0.0	0.0	0.0							0.0	0.0	65.5	0.0	
			5	55	0.0	0.0	0.0	0.0							0.0	0.0	65.5	0.0	
			5	75	0.0	0.0	0.0	0.0							0.0	0.0	85.5	0.0	
			5	75	0.0	0.0	0.0	0.0							0.0	0.0	85.5	0.0	
1/2/68	95.0	115.0																	not tested, packer would not seal
7/2/68	115.0	145.0																	

* Values are read from appropriate correction graphs

+ If ℓ ≤ a, p = 0.44. sin θ (ℓ + m); if ℓ > a, p = 0.44. sin θ. n.

FILE No 155/A16/976

M(Pf) 107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

WATER PRESSURE TESTS

REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE FEATURE East Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL (θ) 70° DIRECTION 277° R.L. OF COLLAR 2152 feet SIZE OF HOLE N

LOCATION E19272, S85375 PACKER TYPE mechanical DRILL LOG REF

HOLE NO. D.G.1

SHEET 3 OF 4

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (≈ 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT. GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (p.s.i.)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY, TYPE & CAPACITY OF PUMP, ETC.
	a	b	c	d	e	f	f-e=g	9/c=h	b-a=i	k*	ℓ	m	n	p+	q*	r*	d+p-q-r	k x h/i	
9/2/68	148·1	168·1	5	30	0·0	13·75	13·75	2·75	20·0	1·0	0?	0	150'	0·0	0·0	0·0	30·0	0·14	
			5	30	13·75	27·5	13·75	2·75					N rod		0·0	0·0	30·0	0·14	
			5	30	27·5	41·0	13·5	2·7							0·0	0·0	30·0	0·14	
			5	70	0·0	28·0	28·0	5·6							1·0	0·5	68·5	0·28	
			5	70	28·0	59·0	31·0	6·2							1·0	1·0	68·0	0·31	
			5	70	59·0	90·5	31·5	6·3							1·0	1·0	68·0	0·32	Permeability 10 lugeons
			5	110	0·0	35·5	35·5	7·1							1·0	1·0	108·0	0·36	
			5	110	35·5	71·0	35·5	7·1							1·0	1·0	108·0	0·36	
			5	130	0·0	68·5	68·5	13·7							4·0	3·5	122·5	0·69	
			5	130	68·5	137·0	68·5	13·7							4·0	3·5	122·5	0·69	
			5	110	0·0	36·0	36·0	7·2							1·0	1·0	108·0	0·36	
			5	110	36·0	72·0	36·0	7·2							1·0	1·0	108·0	0·36	
			5	70	0·0	32·0	32·0	6·4							1·0	1·0	68·0	0·32	
			5	70	32·0	64·0	32·0	6·4							1·0	1·0	68·0	0·32	
			5	30	0·0	13·5	13·5	2·7							0·0	0·0	30·0	0·14	
			5	30	13·5	27·0	13·5	2·7							0·0	0·0	30·0	0·14	
9/2/68	168·5	188·5	5	40	0·0	2·0	2·0	0·4	20·0	1·0	0?	0	170'	0·0	0·0	0·0	40	0·02	
			5	40	2·0	4·0	2·0	0·4					N rod		0·0	0·0	40	0·02	
			5	40	4·0	6·0	2·0	0·4							0·0	0·0	40	0·02	
			5	80	0·0	5·0	5·0	1·0							0·0	0·0	80	0·05	
			5	80	5·0	9·5	4·5	0·9							0·0	0·0	80	0·05	
			5	80	9·5	14·5	5·0	1·0							0·0	0·0	80	0·05	
			5	120	0·0	7·0	7·0	1·4							0·0	0·0	120	0·07	Permeability 1 lugeon
			5	120	7·0	14·0	7·0	1·4							0·0	0·0	120	0·07	
			5	120	14·0	20·5	6·5	1·3							0·0	0·0	120	0·07	
			5	160	0·0	8·0	8·0	1·6							0·0	0·0	160	0·08	
			5	160	8·0	16·0	8·0	1·6							0·0	0·0	160	0·08	
			5	120	0·0	6·0	6·0	1·2							0·0	0·0	120	0·06	
			5	120	6·0	12·0	6·0	1·2							0·0	0·0	120	0·06	
			5	80	0·0	3·5	3·5	0·7							0·0	0·0	80	0·04	
			5	80	3·5	7·0	3·5	0·7							0·0	0·0	80	0·04	
			5	40	0·0	0·0	0·0	0·0							0·0	0·0	40	0·0	
			5	40	0·0	0·0	0·0	0·0							0·0	0·0	40	0·0	

* Values are read from appropriate correction graphs.

+ If $\ell \leq a$, $p = 0.44 \sin\theta \, (\ell + m)$; if $\ell > a$, $p = 0.44 \sin\theta \, n$.

FILE No 155/916/976

M(P1)107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS
WATER PRESSURE TESTS
REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE FEATURE East Bank near Proposed Dam Axis HOLE NO. D.G.1
ANGLE FROM HORIZONTAL (θ) 70° DIRECTION R.L. OF COLLAR 2152 feet SIZE OF HOLE N
LOCATION E19272, S85375 PACKER TYPE mechanical DRILL LOG REF. SHEET 4 OF 4

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft)	CONVERSION FACTOR (≈ 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft)	SLOPE HT. GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (p.s.i.)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY, TYPE & CAPACITY OF PUMP ETC.
	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 x h/i	
10/2/68	189·2	209·2	S	35	0·0	34·5	34·5	6·9	20·0	1·0	168?	0	190'	70·0	1·5	1·0	102·5	0·35	
			S	35	34·5	69·0	34·5	6·9					N rod		1·5	1·0	102·5	0·35	
			S	75	0·0	45·5	45·5	9·1							2·5	1·5	141·0	0·46	
			S	75	45·5	91·5	46·0	9·2							2·5	1·5	141·0	0·46	
			S	110	0·0	61·0	61·0	12·2							4·0	3·0	173·0	0·61	Permeability
			S	110	61·0	122·0	61·0	12·2							4·0	3·0	173·0	0·61	7 lugeons
			S	75	0·0	46·5	46·5	9·3							2·5	1·5	141·0	0·47	
			S	75	46·5	93·0	46·5	9·3							2·5	1·5	141·0	0·47	
			S	35	0·0	35·0	35·0	7·0							1·5	1·0	102·5	0·35	
			S	35	35·0	70·0	35·0	7·0							1·5	1·0	102·5	0·35	
10/2/68	209·0	224·4	S	50	0·0	4·0	4·0	0·8	15·4	1·0	0?	0	210'	0·0	0·0	0·0	50	0·05	
			S	50	4·0	8·0	4·0	0·8					N rod		0·0	0·0	50	0·05	
			S	100	0·0	7·0	7·0	1·4							0·0	0·0	100	0·10	
			S	100	7·0	14·0	7·0	1·4							0·0	0·0	100	0·10	
			S	150	0·0	10·0	10·0	2·0							0·0	0·0	150	0·13	Permeability
			S	150	10·0	20·0	10·0	2·0							0·0	0·0	150	0·13	2 lugeons
			S	200	0·0	12·0	12·0	2·4							0·0	0·0	200	0·16	
			S	200	12·0	23·0	11·0	2·2							0·0	0·0	200	0·14	
			S	150	0·0	9·0	9·0	1·8							0·0	0·0	150	0·12	
			S	150	9·0	17·0	8·0	1·6							0·0	0·0	150	0·10	
			S	100	0·0	5·0	5·0	1·0							0·0	0·0	100	0·06	
			S	100	5·0	10·0	5·0	1·0							0·0	0·0	100	0·06	
			S	50	0·0	3·0	3·0	0·6							0·0	0·0	50	0·04	

* Values are read from appropriate correction graphs.

+ If ℓ ≤ a, p = 0·44. sin θ. (ℓ + m); if ℓ > a, p = 0·44. sin θ. n.

FILE No. 155/A16/976

M(Pf) 107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

WATER PRESSURE TESTS

REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE FEATURE West Bank near Proposed Spillway

ANGLE FROM HORIZONTAL (θ) 60° DIRECTION 272° R.L. OF COLLAR 2141 feet SIZE OF HOLE N

LOCATION E17926, S85402 PACKER TYPE mechanical DRILL LOG REF.

HOLE NO. D.G.2

SHEET 1 OF 2

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (≡20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft)	SLOPE HT GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (p.s.i.)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY TYPE & CAPACITY OF PUMP, ETC
	a	b	c	d	e	f	f-e=g	9/c=h	b-a=i	k*	ℓ	m	n	p+	q*	r*	d+p-q-r	k x ℓ/i	
15/1/68	20·4	40·4	5	5	0·0	0·0	0·0	0·0	20·0	1·0	0?	0	30'	0·0	0·0	0·0	5	0·0	
			5	5	0·0	0·0	0·0	0·0					N rod		0·0	0·0	5	0·0	
			5	5	0·0	0·0	0·0	0·0							0·0	0·0	5	0·0	
			5	10	0·0	0·0	0·0	0·0							0·0	0·0	10	0·0	Permeability zero
			5	10	0·0	0·0	0·0	0·0							0·0	0·0	10	0·0	
			5	10	0·0	0·0	0·0	0·0							0·0	0·0	10	0·0	
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	
15/1/68	40·3	60·3	5	5	0·0	0·0	0·0	0·0	20·0	1·0	0?	0	50'	0·0	0·0	0·0	5	0·0	
			5	5	0·0	0·0	0·0	0·0					N rod		0·0	0·0	5	0·0	
			5	15	0·0	0·5	0·5	0·1							0·0	0·0	15	0·01	
			5	15	0·5	1·0	0·5	0·1							0·0	0·0	15	0·01	
			5	15	1·0	1·5	0·5	0·1							0·0	0·0	15	0·01	Permeability 2 lugeons
			5	25	0·0	1·0	1·0	0·2							0·0	0·0	25	0·01	
			5	25	1·0	2·0	1·0	0·2							0·0	0·0	25	0·01	
			5	25	2·0	3·0	1·0	0·2							0·0	0·0	25	0·01	
			5	35	0·0	2·5	2·5	0·5							0·0	0·0	35	0·03	
			5	35	2·5	5·0	2·5	0·5							0·0	0·0	35	0·03	
			5	35	5·0	7·5	2·5	0·5							0·0	0·0	35	0·03	
16/1/68	59·4	79·4	5	5	0·0	0·0	0·0	0·0	20·0	1·0	0?	0	70'	0·0	0·0	0·0	5	0·0	
			5	5	0·0	0·0	0·0	0·0					N rod		0·0	0·0	5	0·0	
			5	20	0·0	0·0	0·0	0·0							0·0	0·0	20	0·0	
			5	20	0·0	0·0	0·0	0·0							0·0	0·0	20	0·0	Permeability <1 lugeon
			5	40	0·0	0·5	0·5	0·1							0·0	0·0	40	0·01	
			5	40	0·5	1·0	0·5	0·1							0·0	0·0	40	0·01	
			5	40	1·0	1·5	0·5	0·1							0·0	0·0	40	0·01	
			5	60	0·0	1·0	1·0	0·2							0·0	0·0	60	0·01	
			5	60	1·0	2·0	1·0	0·2							0·0	0·0	60	0·01	
			5	60	2·0	3·0	1·0	0·2							0·0	0·0	60	0·01	

* Values are read from appropriate correction graphs.

+ If ℓ ≤ a, p = 0·44. sin θ. (ℓ + m); if ℓ > a, p = 0·44. sin θ. n.

FILE No 155/A16/977

M(P)S (C)

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS
WATER PRESSURE TESTS
REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE FEATURE West Bank near Proposed Spillway
ANGLE FROM HORIZONTAL (θ) 60° DIRECTION 272° R.L. OF COLLAR 2141 feet SIZE OF HOLE N
LOCATION E17926, S85402 PACKER TYPE mechanical DRILL LOG REF.

HOLE NO. D.G.2
SHEET 2 OF 2

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (≈ 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT. GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (p.s.i.)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY TYPE & CAPACITY OF PUMP, ETC.
	a	b	c	d	e	f	f-e=g	9/c=h	b-a=i	k*	ℓ	m	n	p+	q*	r*	d+p-q-r	k x h/i	
17/1/68	79·2	100·2	5	5	0·0	0·0	0·0	0·0	21·0	1·0	0?	0	90'	0·0	0·0	0·0	5	0·0	
			5	5	0·0	0·0	0·0	0·0					N rod		0·0	0·0	5	0·0	
			5	25	0·0	0·5	0·5	0·1							0·0	0·0	25	0·0	
			5	25	0·5	1·0	0·5	0·1							0·0	0·0	25	0·0	
			5	50	0·0	2·0	2·0	0·4							0·0	0·0	50	0·02	
			5	50	2·0	4·0	2·0	0·4							0·0	0·0	50	0·02	
			5	50	4·0	6·0	2·0	0·4							0·0	0·0	50	0·02	Permeability
			5	75	0·0	3·0	3·0	0·6							0·0	0·0	75	0·03	1 lugeon
			5	75	3·0	6·5	3·5	0·7							0·0	0·0	75	0·03	
			5	75	6·5	9·5	3·0	0·6							0·0	0·0	75	0·03	
			5	75	0·0	3·0	3·0	0·6							0·0	0·0	75	0·03	
			5	75	3·0	6·0	3·0	0·6							0·0	0·0	75	0·03	
			5	75	6·0	9·0	3·0	0·6							0·0	0·0	75	0·03	
			5	50	0·0	1·5	1·5	0·3							0·0	0·0	50	0·01	
			5	50	1·5	3·0	1·5	0·3							0·0	0·0	50	0·01	
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	
17/1/68	100·3	110·3	5	5	0·0	0·0	0·0	0·0	20·0	1·0	0?	0	110'	0·0	0·0	0·0	5	0·0	
			5	5	0·0	0·0	0·0	0·0					N rod		0·0	0·0	5	0·0	
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	Permeability
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	zero
			5	50	0·0	0·0	0·0	0·0							0·0	0·0	50	0·0	
			5	50	0·0	0·0	0·0	0·0							0·0	0·0	50	0·0	
			5	75	0·0	0·0	0·0	0·0							0·0	0·0	75	0·0	
			5	75	0·0	0·0	0·0	0·0							0·0	0·0	75	0·0	

* Values are read from appropriate correction graphs.

+ If ℓ ≤ a, p = 0·44. sin θ. (ℓ + m); if ℓ > a, p = 0·44. sin θ. n.

FILE No. 155/A16/977

M(Pf) 107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS
WATER PRESSURE TESTS
REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE FEATURE River Bed near Proposed Dam Axis
ANGLE FROM HORIZONTAL (θ) 60° DIRECTION 267° R.L. OF COLLAR 1945 feet SIZE OF HOLE N
LOCATION E18640, S85425 PACKER TYPE mechanical DRILL LOG REF.

HOLE NO. D.G.3
SHEET 1 OF 1

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (a 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT. GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (p.s.i.)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY, TYPE & CAPACITY OF PUMP, ETC.
	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 x h/i	
23/1/68	18·3	38·3	5	35	0·0	0·0	0·0	0·0	20·0	1·0	0	0	20'	0·0	0·0	0·0	35	0·0	
			5	35	0·0	0·0	0·0	0·0					N rod		0·0	0·0	35	0·0	
			5	35	0·0	0·0	0·0	0·0							0·0	0·0	35	0·0	
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	Permeability zero
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	
			5	15	0·0	0·0	0·0	0·0							0·0	0·0	15	0·0	
			5	15	0·0	0·0	0·0	0·0							0·0	0·0	15	0·0	
			5	15	0·0	0·0	0·0	0·0							0·0	0·0	15	0·0	
			5	5	0·0	0·0	0·0	0·0							0·0	0·0	5	0·0	
			5	5	0·0	0·0	0·0	0·0							0·0	0·0	5	0·0	
24/1/68	30·3	50·3	5	15	0·0	0·0	0·0	0·0	20·0	1·0	0	0	40'	0·0	0·0	0·0	15	0·0	
			5	15	0·0	0·0	0·0	0·0					N rod		0·0	0·0	15	0·0	
			5	15	0·0	0·0	0·0	0·0							0·0	0·0	15	0·0	
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	Permeability zero
			5	25	0·0	0·0	0·0	0·0							0·0	0·0	25	0·0	
			5	35	0·0	0·0	0·0	0·0							0·0	0·0	35	0·0	
			5	35	0·0	0·0	0·0	0·0							0·0	0·0	35	0·0	
			5	35	0·0	0·0	0·0	0·0							0·0	0·0	35	0·0	
			5	45	0·0	0·0	0·0	0·0							0·0	0·0	45	0·0	
			5	45	0·0	0·0	0·0	0·0							0·0	0·0	45	0·0	
			5	45	0·0	0·0	0·0	0·0							0·0	0·0	45	0·0	

* Values are read from appropriate correction graphs.

+ If ℓ ≤ a, p = 0·44. sin θ. (ℓ+m); if ℓ > a, p = 0·44. sin θ. n.

FILE No. 155/A16/978

M(Pf) 107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

WATER PRESSURE TESTS

REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE FEATURE West Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL (θ) 45° DIRECTION 312° R.L. OF COLLAR 2098 feet SIZE OF HOLE N

LOCATION E18425, S85402 PACKER TYPE mechanical DRILL LOG REF.

HOLE NO. D.D.4 SHEET 1 OF 1.

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (≠ 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (psi)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY, TYPE & CAPACITY OF PUMP, ETC.
	a	b	c	d	e	f	f-e=g	%c=h	b-a=i	k*	ℓ	m	n	p+	q*	r*	d+p-q-r	k x h/i	
5/6/70	7·3	27·3	5	5	0·0	0·0	0·0	0·0	20·0	1·0	0?	0	10	0	0·0	0·0	5	0·0	
			5	5	0·0	0·0	0·0	0·0					N rod		0·0	0·0	5	0·0	
			5	10	0·0	0·5	0·5	0·1							0·0	0·0	10	0·01	Permeability
			5	10	0·0	0·5	0·5	0·1							0·0	0·0	10	0·01	4 lugeons
			5	15	0·0	3·0	3·0	0·6							0·0	0·0	15	0·03	
			5	15	0·0	3·0	3·0	0·6							0·0	0·0	15	0·03	
8/6/70	30·0	50·0	5	10	0·0	1·12	1·12	0·22	20·0	1·0	0?	0	30	0	0·0	0·0	10	0·01	
			5	10	0·0	1·12	1·12	0·22					N rod		0·0	0·0	10	0·01	
			5	20	0·0	3·5	3·5	0·7							0·0	0·0	20	0·04	Permeability
			5	20	0·0	3·5	3·5	0·7							0·0	0·0	20	0·04	5 lugeons
			5	30	0·0	6·38	6·38	1·28							0·0	0·0	30	0·06	
			5	30	0·0	6·38	6·38	1·28							0·0	0·0	30	0·06	

* Values are read from appropriate correction graphs.

+ If ℓ ≤ a, p = 0·44. sin θ. (ℓ + m); if ℓ > a, p = 0·44. sin θ. n.

FILE No I55/A16/979

M(P1) 107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

WATER PRESSURE TESTS

REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE FEATURE East Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL (θ) 45° DIRECTION 104° R.L. OF COLLAR 2150 feet SIZE OF HOLE N

LOCATION E19282, S85392 PACKER TYPE mechanical DRILL LOG REF.

HOLE NO. D.D.5

SHEET 1 OF 3

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (≡ 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (p.s.i.)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY TYPE & CAPACITY OF PUMP, ETC.
	a	b	c	d	e	f	f-e=g	9/c=h	b-a=i	k *	ℓ	m	n	p +	q *	r *	d+p-q-r	k x h/i	
22/6/70	10·0	30·0	5	5	0·0	0·0	0·0	0·0	20·0	1·0	b?	0	20	2·0	0·0	0.0	7	0·0	
			5	5	0·0	0·0	0·0	0·0					N rod		0·0	0.0	7	0·0	Permeability zero
			5	10	0·0	0·0	0·0	0·0							0·0	0·0	12	0·0	
			5	10	0·0	0·0	0·0	0·0							0·0	0·0	12	0·0	
			5	15	0·0	0·0	0·0	0·0							0·0	0·0	17	0·0	
			5	15	0·0	0·0	0·0	0·0							0·0	0·0	17	0·0	
22/6/70	30·1	50·1	5	20	0·0	0·0	0·0	0·0	20·0	1·0	b?	0	40	2·0	0·0	0·0	22	0·0	
			5	20	0·0	0·0	0·0	0·0					N rod		0·0	0·0	22	0·0	
			5	25	0·0	0·38	0·38	0·08							0·0	0·0	27	0·0	
			5	25	0·38	0·75	0·37	0·07							0·0	0·0	27	0·0	Permeability
			5	30	0·0	0·63	0·63	0·13							0·0	0·0	32	0·01	< 1 lugeon
			5	30	0·63	1·25	0·62	0·12							0·0	0·0	32	0·01	
			5	25	0·0	0·25	0·25	0·05							0·0	0·0	27	0·0	
			5	25	0·25	0·5	0·25	0·05							0·0	0·0	27	0·0	
			5	20	0·0	0·0	0·0	0·0							0·0	0·0	22	0·0	
			5	20	0·0	0·0	0·0	0·0							0·0	0·0	22	0·0	
23/6/70	49·3	69·3	5	20	0·0	0·25	0·25	0·05	20·0	1·0	7?	0	60	2·0	0·0	0·0	22	0·0	
			5	20	0·25	0·5	0·25	0·05					N rod		0·0	0·0	22	0·0	
			5	35	0·0	2·0	2·0	0·4							0·0	0·0	37	0·02	
			5	35	2·0	4·0	2·0	0·4							0·0	0·0	37	0·02	Permeability
			5	50	0·0	2·38	2·38	0·48							0·0	0·0	52	0·02	1 lugeon
			5	50	2·38	4·75	2·37	0·47							0·0	0·0	52	0·02	
			5	35	0·0	0·25	0·25	0·05							0·0	0·0	37	0·0	
			5	35	0·25	0·5	0·25	0·05							0·0	0·0	37	0·0	
			5	20	0·0	0·13	0·13	0·03							0·0	0·0	22	0·0	
			5	20	0·13	0·25	0·12	0·02							0·0	0·0	22	0·0	

* Values are read from appropriate correction graphs.

+ If ℓ ≤ a, p = 0·44. sin θ. (ℓ + m); if ℓ > a, p = 0·44. sin θ. n.

FILE No 155/A16/980

M(P4):07

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS
WATER PRESSURE TESTS
REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE — FEATURE East Bank near Proposed Dam Axis — HOLE NO D.D.5

ANGLE FROM HORIZONTAL (θ) 45° — DIRECTION 104° — R.L. OF COLLAR 2150 feet — SIZE OF HOLE N — SHEET 2 OF 3

LOCATION E19282, S85392 — PACKER TYPE mechanical — DRILL LOG REF.

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (≈20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (p.s.i.)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY, TYPE & CAPACITY OF PUMP, ETC.
	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 x h/i	
25/6/70	70·2	90·2	5	25	0·0	2·25	2·25	0·45	20·0	1·0	7?	0	80	2·0	0·0	0·0	27	0·02	
			5	25	2·25	4·5	2·25	0·45					N rod		0·0	0·0	27	0·02	
			5	35	0·0	2·88	2·88	0·58							0·0	0·0	37	0·03	
			5	35	2·88	5·25	2·37	0·47							0·0	0·0	37	0·02	Permeability
			5	35	5·25	7·63	2·38	0·48							0·0	0·0	37	0·02	2 lugeons
			5	55	0·0	4·0	4·0	0·8							0·0	0·0	57	0·04	
			5	55	4·0	8·0	4·0	0·8							0·0	0·0	57	0·04	
			5	35	0·0	2·25	2·25	0·45							0·0	0·0	37	0·02	
			5	35	2·25	4·5	2·25	0·45							0·0	0·0	37	0·02	
			5	25	0·0	1·5	1·5	0·3							0·0	0·0	27	0·02	
			5	25	1·5	3·0	1·5	0·3							0·0	0·0	27	0·02	
26/6/70	88·8	108·8	5	30	0·0	0·0	0·0	0·0	20·0	1·0	25?	0	90	7·5	0·0	0·0	37·5	0·0	
			5	30	0·0	0·0	0·0	0·0					N rod		0·0	0·0	37·5	0·0	
			5	60	0·0	2·25	2·25	0·45							0·0	0·0	67·5	0·02	
			5	60	2·25	4·5	2·25	0·45							0·0	0·0	67·5	0·02	Permeability
			5	80	0·0	2·75	2·75	0·55							0·0	0·0	87·5	0·03	< 1 lugeon
			5	80	2·75	5·5	2·75	0·55							0·0	0·0	87·5	0·03	
			5	60	0·0	1·13	1·13	0·23							0·0	0·0	67·5	0·01	
			5	60	1·13	2·25	1·12	0·22							0·0	0·0	67·5	0·01	
			5	30	0·0	0·0	0·0	0·0							0·0	0·0	37·5	0·0	
			5	30	0·0	0·0	0·0	0·0							0·0	0·0	37·5	0·0	
29/6/70	109·0	130·4	5	25	0·0	1·81	1·81	0·36	21·4	1·0	0?	0	110	7·5	0·0	0·0	25	0·02	
			5	25	1·81	3·63	1·82	0·36					N rod		0·0	0·0	25	0·02	
			5	50	0·0	5·5	5·5	1·1							0·0	0·0	50	0·05	
			5	50	5·5	11·0	5·5	1·1							0·0	0·0	50	0·05	Permeability
			5	75	0·0	11·5	11·5	2·3							0·0	0·0	75	0·11	3 lugeons
			5	75	11·5	23·0	11·5	2·3							0·0	0·0	75	0·11	
			5	50	0·0	5·5	5·5	1·1							0·0	0·0	50	0·05	
			5	50	5·5	11·0	5·5	1·1							0·0	0·0	50	0·05	
			5	25	0·0	1·75	1·75	0·35							0·0	0·0	25	0·02	
			5	25	1·75	3·5	1·75	0·35							0·0	0·0	25	0·02	

* Values are read from appropriate correction graphs

+ If $\ell \leq a$, $p = 0.44 \sin\theta (\ell + m)$; if $\ell > a$ $p = 0.44 \sin\theta (a + m)$

FILE No 155/A16/980

M(Pf) 107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

WATER PRESSURE TESTS

REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE FEATURE East Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL (θ) 45° DIRECTION 104° R.L. OF COLLAR 2150 feet SIZE OF HOLE N

LOCATION E 19282, S 85392 PACKER TYPE mechanical DRILL LOG REF.

HOLE NO. D.D.5 SHEET 3 OF 3

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (≡ 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (p.s.i.)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY, TYPE & CAPACITY OF PUMP ETC
	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 x h/i	
30/6/70	128·5	148·5	5	25	0·0	2·0	2·0	0·4	20·0	1·0	0?	0	130	8·5	0·0	0·0	25	0·02	
			5	25	2·0	4·0	2·0	0·4					N rod		0·0	0·0	25	0·02	
			5	50	0·0	6·0	6·0	1·2							0·0	0·0	50	0·06	Permeability
			5	50	6·0	12·0	6·0	1·2							0·0	0·0	50	0·06	3 lugeons
			5	75	0·0	12·0	12·0	2·4							0·0	0·0	75	0·12	
			5	75	12·0	24·0	12·0	2·4							0·0	0·0	75	0·12	
			5	50	0·0	6·0	6·0	1·2							0·0	0·0	50	0·06	
			5	25	0·0	2·0	2·0	0·4							0·0	0·0	25	0·02	
1/7/70	146·3	166·3	5	50	0·0	22·25	22·25	4·45	20·0	1·0	107?	0	150	33·0	0·5	0·5	82	0·22	
			5	50	22·25	44·5	22·25	4·45					N rod		0·5	0·5	82	0·22	
			5	75	0·0	26·25	26·25	5·25							0·5	0·5	107	0·26	
			5	75	26·25	52·5	26·25	5·25							0·5	0·5	107	0·26	Permeability
			5	100	0·0	31·75	31·75	6·35							1·0	1·0	131	0·32	5 lugeons
			5	100	31·75	63·25	31·5	6·3							1·0	1·0	131	0·32	
			5	125	0·0	38·38	38·38	7·68							1·5	1·0	155·5	0·38	
			5	125	38·38	76·75	38·37	7·67							1·5	1·0	155·5	0·38	
			5	100	0·0	31·75	31·75	6·35							1·0	1·0	131	0·32	
			5	75	0·0	26·25	26·25	5·25							0·5	0·5	107	0·26	
			5	50	0·0	22·25	22·25	4·45							0·5	0·5	82	0·22	

* Values are read from appropriate correction graphs.

+ If ℓ ≤ a, p = 0·44. sin θ. (ℓ + m); if ℓ > a, p = 0·44. sin θ. n.

FILE No 155/A1b/980

M(Pf) 107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS
WATER PRESSURE TESTS
REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE — FEATURE East Bank near Proposed Dam Axis — HOLE NO. D.D.5A
ANGLE FROM HORIZONTAL (θ) 45° — DIRECTION 094° — R.L. OF COLLAR 2072 feet — SIZE OF HOLE N
LOCATION E19085, S85384 — PACKER TYPE mechanical — DRILL LOG REF. — SHEET 1 OF 3

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft)	CONVERSION FACTOR (a 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft)	SLOPE HT GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (psi.)	FRICTION LOSSES PACKER (psi.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS (SEALING PROPERTIES, WATER SUPPLY, TYPE & CAPACITY OF PUMP, ETC.)
	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 x h/i	
20/6/70	17·0	37·0	5	10	0·0	0·0	0·0	0·0	20·0	1·0	16?	0	20	5·0	0·0	0·0	15	0·0	
			5	10	0·0	0·0	0·0	0·0					N rod		0·0	0·0	15	0·0	
			5	20	0·0	0·25	0·25	0·05							0·0	0·0	25	0·0	
			5	20	0·25	0·5	0·25	0·05							0·0	0·0	25	0·0	Permeability
			5	30	2·0	2·5	0·5	0·1							0·0	0·0	35	0·01	< 1 lugeon
			5	30	2·5	3·0	0·5	0·1							0·0	0·0	35	0·01	
			5	20	3·5	3·63	0·13	0·03							0·0	0·0	25	0·0	
			5	20	3·63	3·63	0·0	0·0							0·0	0·0	25	0·0	
			5	10	3·63	3·63	0·0	0·0							0·0	0·0	15	0·0	
			5	10	3·63	3·63	0·0	0·0							0·0	0·0	15	0·0	
22/6/70	37·0	57·0	5	20	0·0	0·31	0·31	0·06	20·0	1·0	16?	0	40	5·0	0·0	0·0	25	0·0	
			5	20	0·31	0·31	0·0	0·0					N rod		0·0	0·0	25	0·0	
			5	20	0·31	0·31	0·0	0·0							0·0	0·0	25	0·0	
			5	30	1·0	1·75	0·75	0·15							0·0	0·0	35	0·01	Permeability
			5	30	1·75	2·5	0·75	0·15							0·0	0·0	35	0·01	< 1 lugeon
			5	40	3·0	3·88	0·88	0·18							0·0	0·0	45	0·01	
			5	40	3·88	4·75	0·87	0·17							0·0	0·0	45	0·01	
			5	30	5·0	5·0	0·0	0·0							0·0	0·0	35	0·0	
			5	30	5·0	5·0	0·0	0·0							0·0	0·0	35	0·0	
			5	20	5·0	5·0	0·0	0·0							0·0	0·0	25	0·0	
			5	20	5·0	5·0	0·0	0·0							0·0	0·0	25	0·0	
22/6/70	57·0	76·5	5	25	0·0	1·75	1·75	0·35	19·5	1·0	24?	0	60	7·5	0·0	0·0	32·5	0·02	
			5	25	1·75	3·25	1·5	0·3					N rod		0·0	0·0	32·5	0·02	
			5	25	3·25	4·5	1·25	0·25							0·0	0·0	32·5	0·01	
			5	25	4·5	5·0	1·0	0·2							0·0	0·0	32·5	0·01	
			5	35	7·0	8·75	1·75	0·35							0·0	0·0	42·5	0·02	Permeability
			5	35	8·75	10·0	1·25	0·25							0·0	0·0	42·5	0·01	1 lugeon
			5	35	10·0	11·5	1·5	0·3							0·0	0·0	42·5	0·02	
			5	35	11·5	12·75	1·25	0·25							0·0	0·0	42·5	0·01	
			5	50	15·0	17·63	2·63	0·53							0·0	0·0	57·5	0·03	
			5	50	17·63	19·75	2·12	0·42							0·0	0·0	57·5	0·02	
			5	50	19·75	21·63	1·88	0·38							0·0	0·0	57·5	0·02	
			5	50	21·63	23·5	1·87	0·37							0·0	0·0	57·5	0·02	
			5	35	0·0	1·0	1·0	0·2							0·0	0·0	42·5	0·01	
			5	35	1·0	1·75	0·75	0·15							0·0	0·0	42·5	0·01	
			5	35	1·75	2·5	0·75	0·15							0·0	0·0	42·5	0·01	
	(cont.)																		

* Values are read from appropriate correction graphs.

+ If ℓ ≤ a, p = 0·44. sin θ. (ℓ + m); if ℓ > a, p = 0·44. sin θ. n.

FILE No. 155/A16/981

M.P.C. 107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

WATER PRESSURE TESTS

REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE FEATURE East Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL (θ) 45° DIRECTION 094° R.L. OF COLLAR 2072 feet SIZE OF HOLE N

LOCATION E19085, S85384 PACKER TYPE mechanical DRILL LOG REF.

HOLE NO. DD. 5A SHEET 2 OF 3

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (a 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (p.s.i.)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY, TYPE & CAPACITY OF PUMP, ETC.
	a	b	c	d	e	f	f-e=g	%c=h	b-a=i	k*	ℓ	m	n	p+	q*	r*	d+p-q-r	k x %i	
23/6/70	57·0	76·5	5	25	3·0	3·0	0·0	0·0	19·5	1·0	24	0	60	7·5	0·0	0·0	32·5	0·0	
	(cont.)		5	25	3·0	3·0	0·0	0·0					N rod		0·0	0·0	32·5	0·0	
24/6/70	76·5	95·8	5	25	0·0	0·0	0·0	0·0	19·3	1·0	24	0	80	7·5	0·0	0·0	32·5	0·0	
			5	25	0·0	0·0	0·0	0·0					N rod		0·0	0·0	32·5	0·0	Permeability zero
			5	40	0·0	0·0	0·0	0·0							0·0	0·0	47·5	0·0	
			5	40	0·0	0·0	0·0	0·0							0·0	0·0	47·5	0·0	
			5	55	0·0	0·0	0·0	0·0							0·0	0·0	62·5	0·0	
			5	55	0·0	0·0	0·0	0·0							0·0	0·0	62·5	0·0	
25/6/70	95·8	116·3	5	25	0·0	3·25	3·25	0·65	20·5	1·0	24	0	100	7·5	0·0	0·0	32·5	0·03	
			5	25	3·25	6·5	3·25	0·65					N rod		0·0	0·0	32·5	0·03	
			5	50	10·0	17·75	7·75	1·55							0·0	0·0	57·5	0·08	
			5	50	17·75	26·0	8·25	1·65							0·0	0·0	57·5	0·08	
			5	50	26·0	35·38	9·38	1·88							0·0	0·0	57·5	0·09	Permeability
			5	50	35·38	44·0	8·62	1·72							0·0	0·0	57·5	0·09	4 lugeons
			5	75	50·0	65·0	15·0	3·0							0·0	0·0	82·5	0·15	
			5	75	65·0	80·0	15·0	3·0							0·0	0·0	82·5	0·15	
			5	50	0·0	8·63	8·63	1·73							0·0	0·0	57·5	0·09	
			5	50	8·63	17·25	8·62	1·72							0·0	0·0	57·5	0·09	
			5	25	10·0	14·88	4·88	0·98							0·0	0·0	32·5	0·05	
			5	25	14·88	19·75	4·87	0·97							0·0	0·0	32·5	0·05	
30/6/70	116·1	136·1	5	25	0·0	3·0	3·0	0·6	20·0	1·0	0?	0	120	0·0	0·0	0·0	25	0·03	
			5	25	3·0	6·0	3·0	0·6					N rod		0·0	0·0	25	0·03	
			5	50	10·0	17·5	7·5	1·5							0·0	0·0	50	0·08	
			5	50	17·5	25·0	7·5	1·5							0·0	0·0	50	0·08	
			5	75	0·0	14·25	14·25	2·85							0·0	0·0	75	0·14	Permeability
			5	75	14·25	28·75	14·5	2·9							0·0	0·0	75	0·15	
			5	75	28·75	43·0	14·25	2·85							0·0	0·0	75	0·14	4 lugeons
			5	50	0·0	7·0	7·0	1·4							0·0	0·0	50	0·07	
			5	50	7·0	14·0	7·0	1·4							0·0	0·0	50	0·07	
			5	25	17·0	20·0	3·0	0·6							0·0	0·0	25	0·03	
			5	25	20·0	23·0	3·0	0·6							0·0	0·0	25	0·03	

* Values are read from appropriate correction graphs.

+ If ℓ ≤ a, p = 0·44. sin θ. (ℓ + m); if ℓ > a, p = 0·44. sin θ. n

FILE No 155/A16/981

M(Pf) 107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

WATER PRESSURE TESTS

REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE FEATURE East Bank near Proposed Dam Axis

ANGLE FROM HORIZONTAL (θ) 45° DIRECTION 094° R.L. OF COLLAR 2072 feet SIZE OF HOLE N

LOCATION E19085, S85384 PACKER TYPE mechanical DRILL LOG REF

HOLE NO. D.D.5A

SHEET 3 OF 3

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (± 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (p.s.i.)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY, TYPE & CAPACITY OF PUMP, ETC
	a	b	c	d	e	f	f-e=g	9/c=h	b-a=i	k*	ℓ	m	n	p+	q*	r*	d+p-q-r	k x h/i	
1/7/70	136·3	156·3	5	25	0·0	4·75	4·75	0·95	20·0	1·0	0?	0	140	0·0	0·0	0·0	25	0·05	
			5	25	4·75	9·5	4·75	0·95					N rod		0·0	0·0	25	0·05	
			5	50	20·0	43·0	23·0	4·6							0·5	0·5	49	0·23	
			5	50	43·0	66·0	23·0	4·6							0·5	0·5	49	0·23	Permeability 14 lugeons
			5	75	0·0	45·0	45·0	9·0							1·5	1·5	72	0·45	
			5	75	45·0	90·0	45·0	9·0							1·5	1·5	72	0·45	
			5	50	0·0	30·0	30·0	6·0							1·0	0·5	48	0·3	
			5	50	30·0	60·0	30·0	6·0							1·0	0·5	48	0·3	
			5	25	0·0	20·0	20·0	4·0							0·5	0·5	24	0·2	
			5	25	20·0	40·0	20·0	4·0							0·5	0·5	24	0·2	
3/7/70	156·3	177·6	5	50	0·0	15·0	15·0	3·0	21·3	1·0	42?	0	160	13·0	0·0	0·0	63	0·14	
			5	50	15·0	30·0	15·0	3·0					N rod		0·0	0·0	63	0·14	
			5	75	50·0	71·0	21·0	4·2							0·5	0·5	87	0·2	
			5	75	71·0	92·0	21·0	4·2							0·5	0·5	87	0·2	Permeability 6 lugeons
			5	100	0·0	27·0	27·0	5·4							1·0	0·5	111·5	0·26	
			5	100	27·0	55·0	28·0	5·6							1·0	0·5	111·5	0·27	
			5	100	55·0	83·0	28·0	5·6							1·0	0·5	111·5	0·27	
			5	75	0·0	22·0	22·0	4·4							0·5	0·5	87	0·21	
			5	75	22·0	44·0	22·0	4·4							0·5	0·5	87	0·21	
			5	50	60·0	76·0	16·0	3·2							0·0	0·0	63	0·15	
			5	50	76·0	92·0	16·0	3·2							0·0	0·0	63	0·15	
6/7/70	177·3	200·0	5	50	0·0	3·13	3·13	0·63	22·7	1·0	140?	0	180	43·0	0·0	0·0	93	0·03	
			5	50	3·13	6·25	3·12	0·62					N rod		0·0	0·0	93	0·03	
			5	75	8·0	11·75	3·75	0·75							0·0	0·0	118	0·04	
			5	75	11·75	15·0	3·25	0·65							0·0	0·0	118	0·03	
			5	75	15·0	17·5	2·5	0·5							0·0	0·0	118	0·02	Permeability < 1 lugeon
			5	75	17·5	20·0	2·5	0·5							0·0	0·0	118	0·02	
			5	100	21·0	24·0	3·0	0·6							0·0	0·0	143	0·03	
			5	100	24·0	27·0	3·0	0·6							0·0	0·0	143	0·03	
			5	75	30·0	32·5	2·5	0·5							0·0	0·0	118	0·02	
			5	75	32·5	35·0	2·5	0·5							0·0	0·0	118	0·02	
			5	50	38·0	40·0	2·0	0·4							0·0	0·0	93	0·02	
			5	50	40·0	42·0	2·0	0·4							0·0	0·0	93	0·02	

* Values are read from appropriate correction graphs

+ If ℓ ≤ a, p = 0·44. sin θ. (ℓ + m); if ℓ > a, p = 0·44. sin θ. n.

FILE No 155/A16/981

M(Pf) 107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

WATER PRESSURE TESTS

REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE FEATURE Near Proposed Spillway

ANGLE FROM HORIZONTAL (θ) 90° DIRECTION R.L. OF COLLAR 2127 feet SIZE OF HOLE N

LOCATION E18357, S85036 PACKER TYPE mechanical DRILL LOG REF

HOLE NO. D.D.6 SHEET 1 OF 2

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (≡ 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT. GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (p.s.i.)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY, TYPE & CAPACITY OF PUMP, ETC.
	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 x h/i	
22/5/70	16·4	36·4	5	5	0·0	0·0	0·0	0·0	20·0	1·0	6?	0	20	2·5	0·0	0·0	7·5	0·0	
			5	5	0·0	0·0	0·0	0·0					N rod		0·0	0·0	7·5	0·0	Permeability zero
			5	10	0·0	0·0	0·0	0·0							0·0	0·0	12·5	0·0	
			5	10	0·0	0·0	0·0	0·0							0·0	0·0	12·5	0·0	
			5	15	0·0	0·0	0·0	0·0							0·0	0·0	17·5	0·0	
			5	15	0·0	0·0	0·0	0·0							0·0	0·0	17·5	0·0	
24/5/70	37·0	57·0	5	10	0·0	0·0	0·0	0·0	20·0	1·0	6?	0	40	2·5	0·0	0·0	12·5	0·0	
			5	10	0·0	0·0	0·0	0·0					N rod		0·0	0·0	12·5	0·0	
			5	15	0·0	0·5	0·5	0·1							0·0	0·0	17·5	0·01	Permeability < 1 lugeon
			5	15	0·0	0·5	0·5	0·1							0·0	0·0	17·5	0·01	
			5	30	0·0	1·0	1·0	0·2							0·0	0·0	32·5	0·01	
			5	30	0·0	1·0	1·0	0·2							0·0	0·0	32·5	0·01	
26/5/70	51·2	71·2	5	20	0·0	5·5	5·5	1·1	20·0	1·0	60?	0	60	22·5	0·0	0·0	42·5	0·06	
			5	20	0·0	5·5	5·5	1·1					N rod		0·0	0·0	42·5	0·06	
			5	30	0·0	16·0	16·0	3·2							0·0	0·0	52·5	0·16	Permeability 16 lugeons
			5	30	0·0	16·0	16·0	3·2							0·0	0·0	52·5	0·16	
			5	50	0·0	55·0	55·0	11·0							1·0	2·5	69	0·55	
			5	50	0·0	55·0	55·0	11·0							1·0	2·5	69	0·55	

* Values are read from appropriate correction graphs.

+ If $\ell \leq a$, $p = 0.44 \sin\theta\,(\ell + m)$; if $\ell > a$, $p = 0.44 \sin\theta\,n$.

FILE No. 155/A16/981

M(Pt) 107

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS
WATER PRESSURE TESTS
REDUCTION OF FIELD RESULTS

PROJECT TENNENT DAMSITE — FEATURE Near Proposed Spillway — HOLE NO. D.D. 6
ANGLE FROM HORIZONTAL (θ) 90° — DIRECTION — R.L. OF COLLAR 2127 feet — SIZE OF HOLE N — SHEET 2 OF 2
LOCATION E18357, S85036 — PACKER TYPE mechanical — DRILL LOG REF

DATE	SECTION TESTED FROM (ft.)	SECTION TESTED TO (ft.)	TIME OF TEST (min.)	GAUGE PRESSURE (p.s.i.)	WATER METER READINGS START (galls.)	WATER METER READINGS FINISH (galls.)	WATER LOSS (galls.)	LEAKAGE RATE (g.p.m.)	LENGTH OF TEST SECTION (ft.)	CONVERSION FACTOR (≡ 20' of NX hole)	SLOPE DEPTH TO STANDING WATER (ft.)	SLOPE HT. GAUGE TO COLLAR (ft.)	LENGTH & SIZE OF SUPPLY LINE	WATER COLUMN PRESSURE (p.s.i.)	FRICTION LOSSES SUPPLY LINE (p.s.i.)	FRICTION LOSSES PACKER (p.s.i.)	EFFECTIVE TEST PRESSURE (p.s.i.)	WATER LOSS (g.p.m. per ft)	REMARKS SEALING PROPERTIES, WATER SUPPLY TYPE & CAPACITY OF PUMP, ETC.
	a	b	c	d	e	f	f-e=g	9/c=h	b-a=i	k *	ℓ	m	n	p +	q *	r *	d+p-q-r	k x h/i	
11/6/70	51·2	71·2	5	20	14·5	19·0	4·5	0·9	20·0	1·0	62?	0	60	22·5	0·0	0·0	42·5	0·05	
	(re-test)		5	20	19·0	22·63	3·63	0·73			>51		Nrod	22·5	0·0	0·0	42·5	0·04	
			5	20	22·63	26·25	3·62	0·72			>51			22·5	0·0	0·0	42·5	0·04	
			5	30	35·75	40·0	4·25	0·85			>51			22·5	0·0	0·0	52·5	0·04	
			5	30	40·0	44·13	4·13	0·83			>51			22·5	0·0	0·0	52·5	0·04	
			5	40	46·0	53·25	7·25	1·45			>51			22·5	0·0	0·0	62·5	0·07	
			5	40	53·25	60·25	7·0	1·4			>51			22·5	0·0	0·0	62·5	0·07	
			5	50	62·5	87·0	24·5	4·9			>51			22·5	0·0	0·5	72	0·25	Permeability & lugeons
			5	50	87·0	112·5	25·5	5·1			51?			22·5	0·0	0·5	72	0·26	
			5	50	112·5	134·0	21·5	4·3			31?			13·5	0·0	0·5	63	0·22	
			5	50	134·0	153·5	19·5	3·9			20?			9·0	0·0	0·5	58·5	0·2	
			5	50	153·5	172·0	18·5	3·7			15?			6·5	0·0	0·5	56	0·19	
			5	50	172·0	189·5	17·5	3·5			10?			4·5	0·0	0·5	54	0·18	
			5	50	189·5	206·0	16·5	3·3			7?			3·0	0·0	0·0	53	0·17	Depths to standing water calculated theoretically
			5	40	209·0	222·0	13·0	2·6			4?			2·0	0·0	0·0	42	0·13	
			5	40	222·0	234·0	12·0	2·4			2?			1·0	0·0	0·0	41	0·12	
			5	40	234·0	246·0	12·0	2·4			2?			1·0	0·0	0·0	41	0·12	
			5	30	247·0	255·0	8·0	1·6			2?			1·0	0·0	0·0	31	0·08	
			5	30	255·0	263·0	8·0	1·6			2?			1·0	0·0	0·0	31	0·08	
			5	20	264·0	269·5	5·5	1·1			2?			1·0	0·0	0·0	21	0·06	
			5	20	269·5	276·0	5·5	1·1			2?			1·0	0·0	0·0	21	0·06	

* Values are read from appropriate correction graphs.

+ If ℓ ≤ a, p = 0·44. sin θ. (ℓ + m); if ℓ > a, p = 0·44. sin θ. n.

FILE No. 155/A16/982

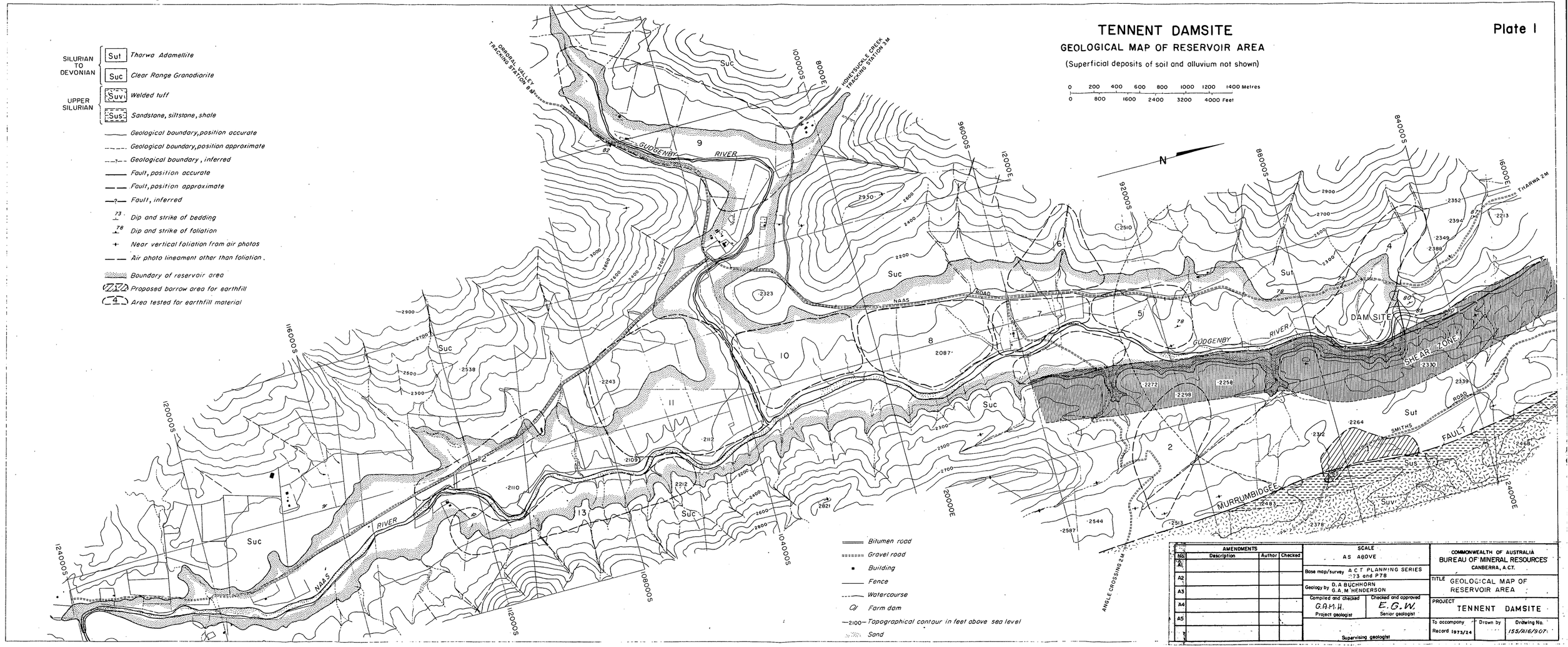
M(Pf) 107

TENNENT DAMSITE

GEOLOGICAL MAP OF RESERVOIR AREA

(Superficial deposits of soil and alluvium not shown)

Plate I

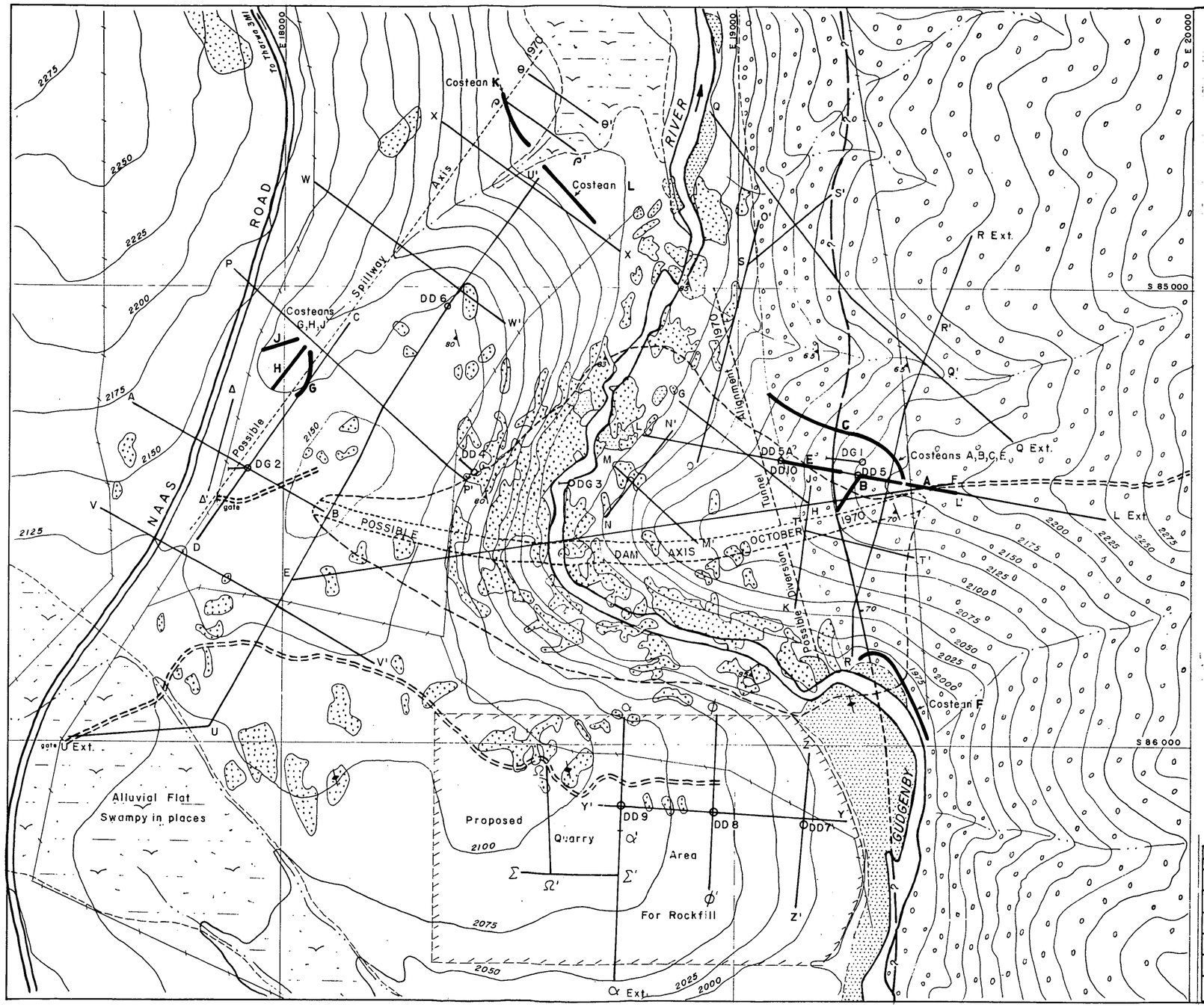


AMENDMENTS			SCALE	COMMONWEALTH OF AUSTRALIA
No.	Description	Author / Checked	AS ABOVE	BUREAU OF MINERAL RESOURCES CANBERRA, A.C.T.
A1			Base map/survey A.C.T. PLANNING SERIES 1973 and 1978	TITLE GEOLOGICAL MAP OF RESERVOIR AREA
A2			Geology by D. A. BUCHHORN, G. A. M. HENDERSON	
A3			Compiled and checked G.A.M.H. Project geologist; Checked and approved E.G.W. Senior geologist	PROJECT TENNENT DAMSITE
A4			Supervising geologist	To accompany Record 1973/24; Drawn by; Drawing No. 155/A16/907
A5				

TENNENT DAMSITE

GENERALIZED GEOLOGICAL MAP OF DAMSITE AREA SHOWING SITE INVESTIGATIONS

0 50 150 250 350 metres
0 200 400 600 feet



N

Adamellite, grey, large outcrops in situ

Boulders, scree, soil and small grey adamellite outcrops

Scree, soil and small outcrops of sheared grey and pink adamellite

Clayey and sandy alluvium

Sand

Geological boundary, position accurate

Geological boundary, position approximate

Geological boundary, inferred

Fault, position accurate, showing inferred dip
Fault, position approximate
Fault, inferred
Fault, concealed
(minor faults not shown)

Dip and strike of foliation

Strike of vertical foliation

DD6 Diamond-drill hole, vertical
DD5 Diamond-drill hole, inclined
(holes designated DG were drilled during 1966-67 investigation)

V——V' Seismic traverse (for profiles see BMR Records 1968/88 and 1972/7)

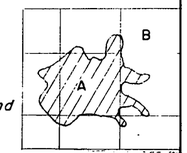
G Bulldozed costean

Gravel road
Vehicle track
Fence
Watercourse

2100 Topographical contour in feet above sea level

A Geology from plane table survey at 1" : 40' and tape and compass mapping

B Geology from reconnaissance and photogrammetry



AMENDMENTS			
No.	Description	Author	Checked
A1			
A2			
A3			
A4			
A5			

SCALE: AS ABOVE

Base map/survey: 1/200 Dept. of Inter. surv. Dec 1966; 1:40 BMR plane table surv. 66-67
Grid in feet based on Mt. Stromlo datum

Geology by D.A. BUCKHORN, G.A.M. HENDERSON, D.E. MACKENZIE, I. RAINE, I.D. LOITERTON

Compiled and checked: G.A.M.H. Project geologist

Checked and approved: E.G.W. Senior geologist

Supervising geologist

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

TITLE: AS ABOVE

PROJECT: TENNENT DAMSITE

To accompany Record 1973/24

Drawn by

Drawing No. 155/A16/932

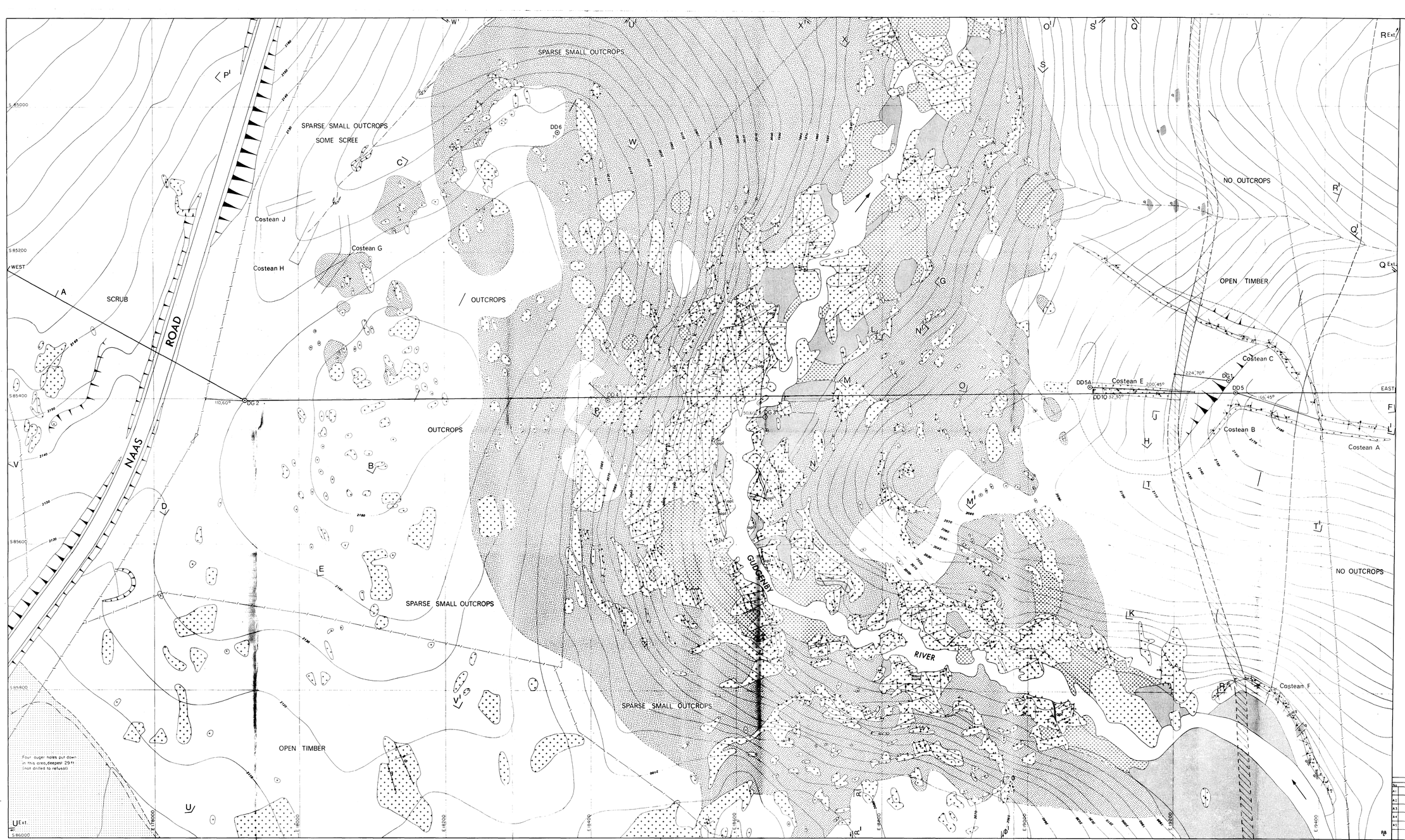


PLATE 3

TENNENT DAMSITE

DETAILED GEOLOGY

0 10 20 30 40 50 metres

0 50 100 150 feet

N

- Soil
- Scree and soil
- Sand
- Alluvium
- Adamellite boulders
- Pink adamellite outcrop
- Grey adamellite outcrop

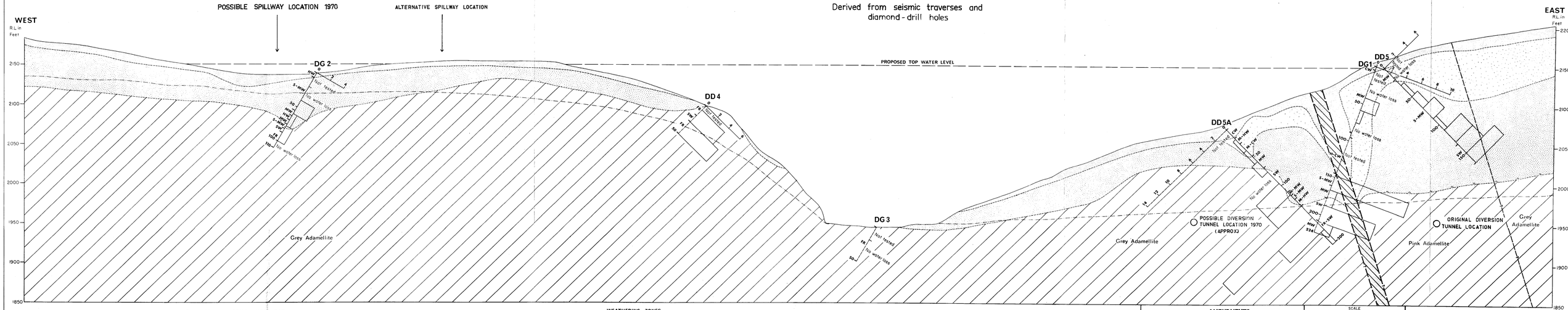
- Soil and rock boundary, accurate
- Soil and rock boundary, approximate
- Geological boundary, accurate
- Geological boundary, approximate
- Dyke, dip near-vertical
- Dip and strike of vein
- Strike of near-vertical vein
- q Quartz chl Chlorite
- opl Aplite myl Mylonite
- peg Pegmatite
- Dip and strike of foliation
- Strike of near-vertical foliation
- Dip and strike of joint
- Strike of near-vertical joint
- Near horizontal joint
- Steep joint face showing dip
- Joint exposed in cliff
- Dip and strike of clay seam
- Strike of near-vertical clay seam
- Major fault zone, boundaries accurate, approximate or concealed as shown
- Clean fault
- Fault with crushed zone
- Erosion gully
- Watercourse
- Earth bank or cliff > 6 feet high
- Fence and gate
- Topographic contour in feet above M.S.L. Coordinates are in feet based on Mt Stromlo datum
- DD6 Diamond-drill hole, vertical, showing depth in feet
- DD5 Diamond-drill hole showing depth, inclination and direction (holes designated D.G were drilled during 1966-67 investigation)
- R R' Seismic traverse showing ends and turning points
- WEST EAST Cross section (see Plate 4)

AMENDMENTS				SCALE	COMMONWEALTH OF AUSTRALIA
No.	Description	Author	Checked	As above	BUREAU OF MINERAL RESOURCES CANBERRA A.C.T.
A1				Base map Survey: B.M.R. plane table survey	
A2				Geology by: D. A. Buchhorn et al	TITLE: DETAILED GEOLOGY OF DAMSITE
A3				Compiled and checked: G.R.M.H. Project geologist	Traced and captured: E.G.W. Senior geologist
A4					PROJECT: TENNENT DAMSITE
A5				Supervising Geologist	To accompany Record 1971/44 — Drawn by: P.L. BLYTH — Drawing No. 155/AAL/940

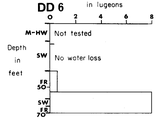
TENNENT DAMSITE
INTERPRETIVE GEOLOGICAL CROSS SECTION

Derived from seismic traverses and diamond-drill holes

PLATE 4



Note. *The drill hole DD6 which serves also as the reference is not on the section line*



DRILL HOLE DATA

Diamond-drill hole with water pressure test results shown graphically as permeabilities in lugeons.
Holes DG1, DG3, DD4 & DD5A have been projected to section and are shown dashed

WEATHERING SYMBOLS

CW	*Completely weathered*
HW	*Highly weathered*
MW	*Moderately weathered*
SW	*Slightly weathered*
FR	*Fresh*

WEATHERING ZONES

Soil and highly to completely weathered adamellite (may include tors of slightly weathered rock)

Moderately to highly weathered adamellite

Slightly to moderately weathered adamellite

Fresh to slightly weathered adamellite

0 10 20 30 40 50 metres

0 50 100 150 feet

Boundary of weathering zone, approximate

Boundary of weathering zone, inferred

Estimated mean piezometric surface based on water level measurements in drill holes

Geological boundary, approximate and inferred as shown

Major fault zone, approximate and inferred as shown

AMENDMENTS

No.	DESCRIPTION	AUTHOR	DATE	CHECKED	DATE
A1					
A2					
A3					
A4					
A5					
A6					

SCALE: AS SHOWN

BASE MAP/SURVEY: B.M.R. PLANE TABLE SURVEY

GEOLOGY BY: D.A. BUCHHORN ET AL

COMPILED AND CHECKED: C.A.M.H. — PROJECT GEOLOGIST

CHECKED AND APPROVED: E.G.W. — SENIOR GEOLOGIST

SUPERVISING GEOLOGIST

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

TITLE: **INTERPRETIVE GEOLOGICAL CROSS SECTION**

PROJECT: **TENNENT DAMSITE**

TO ACCOMPANY RECORD 1973/34

DRAWN BY: P.L. BLYTHE

DRAWING NUMBER: 155/A16/952

TENNENT DAMSITE

PLATE 5

GEOLOGICAL LOGS OF COSTEANS ON UPPER PART OF EAST BANK

Bureau of Mineral Resources, Geology and Geophysics, December 1970

To accompany Record 1973/24

I55/A16/961

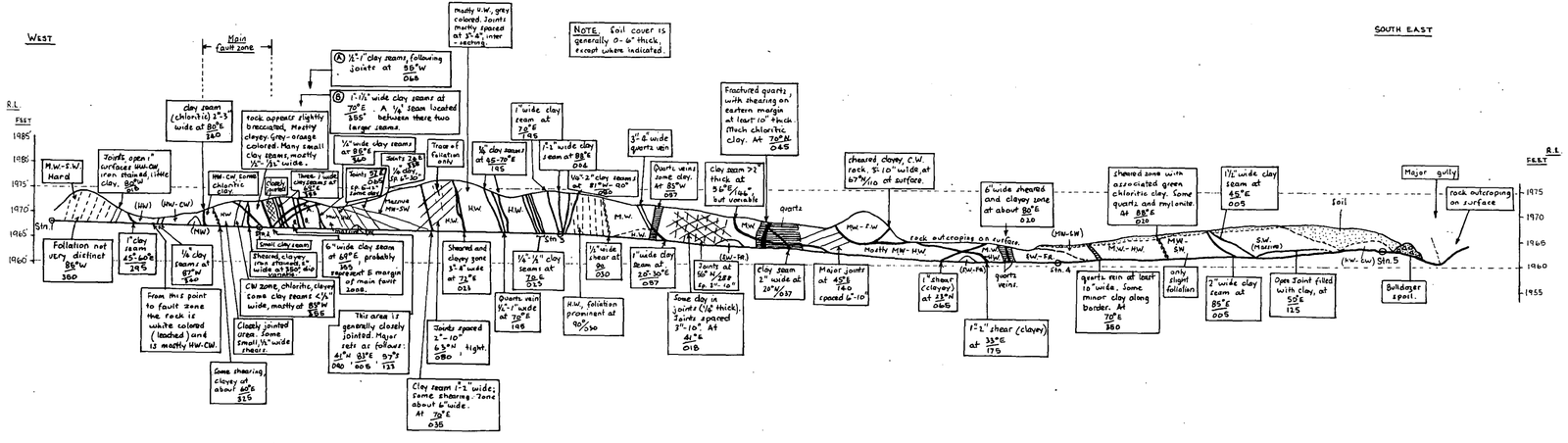
TENNENT DAMSITE

GEOLOGICAL LOG OF COSTEAN F ON EAST BANK NEAR PROPOSED INLET PORTAL

SCALE

FEET 20 0 20 40 60

METRES 5 0 5 10 15



Grid Stromlo co-ordinates in feet

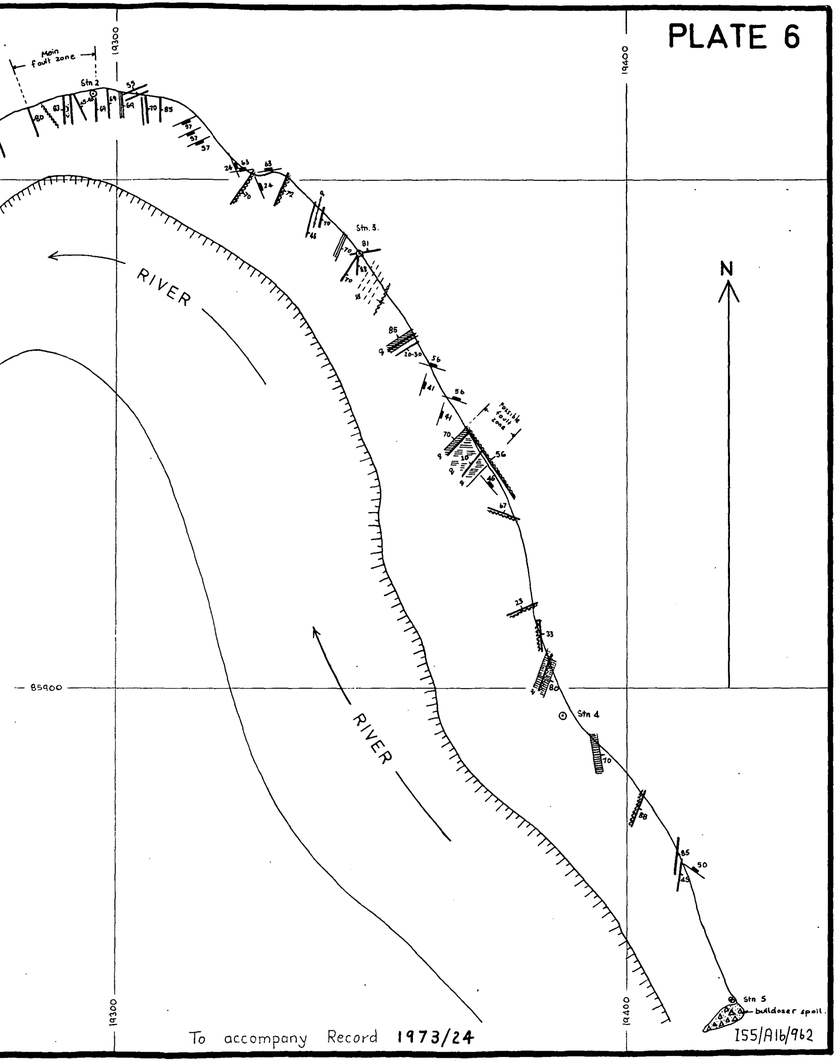


PLATE 6

Bureau of Mineral Resources, Geology of Geophysics, January 1971

To accompany Record 1973/24

155/A16/962

PLATE 7

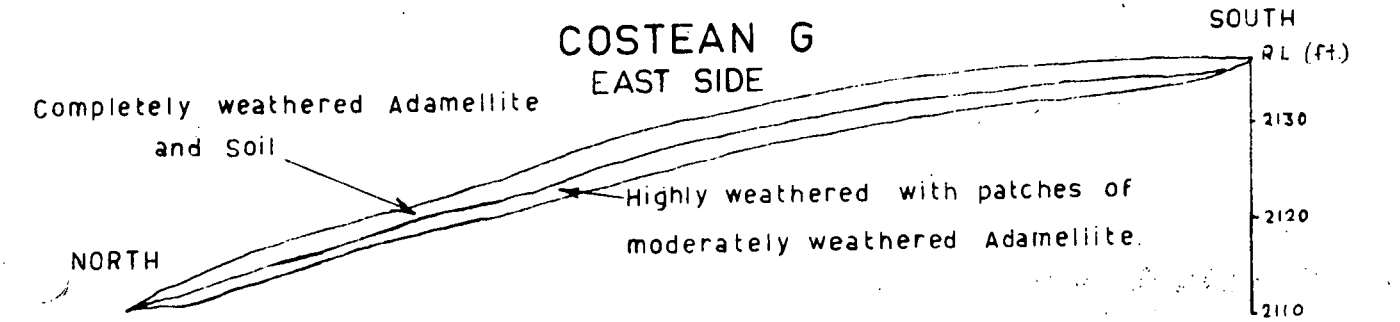
GEOLOGICAL LOGS OF COSTEANS ON WEST BANK.

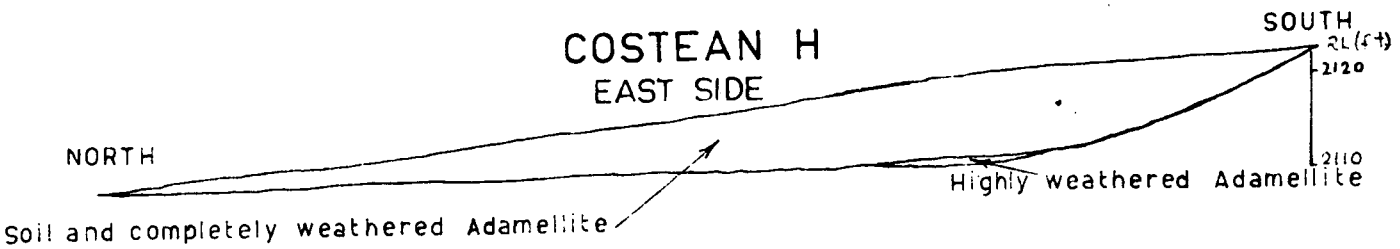
For locations of costeans see Plate 2

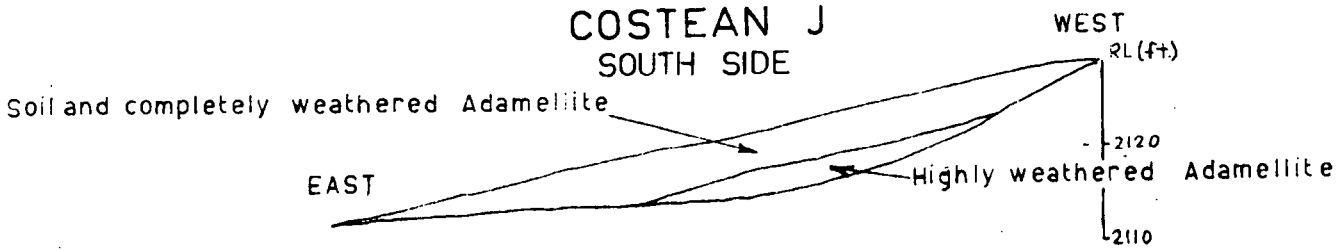
SCALE

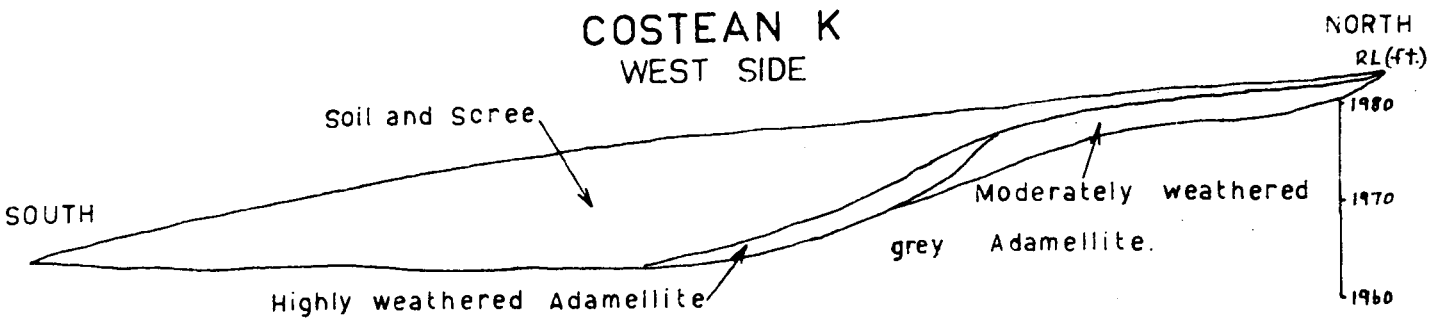
20 0 20 40 60 feet

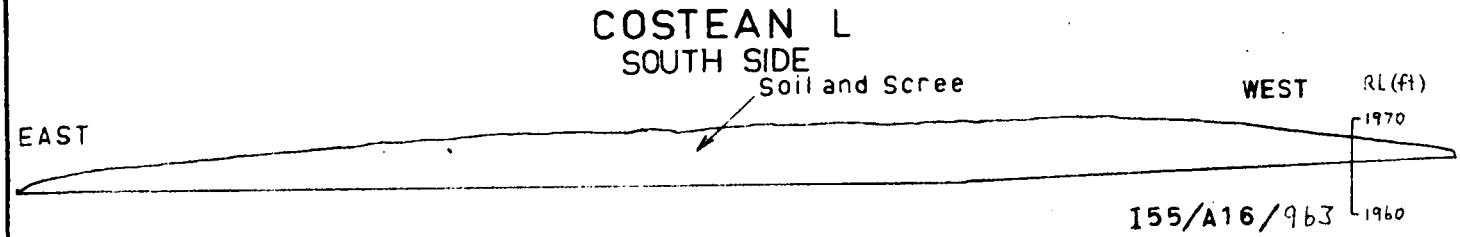
5 0 5 10 15 metres











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