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DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS:

1963/56

GROUNDWATER INVESTIGATIONS, THE GRANITES AND TENNANT CREEK AREAS, NORTHERN TERRITORY, 1962.

by

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INTRODUCTORY NOTE

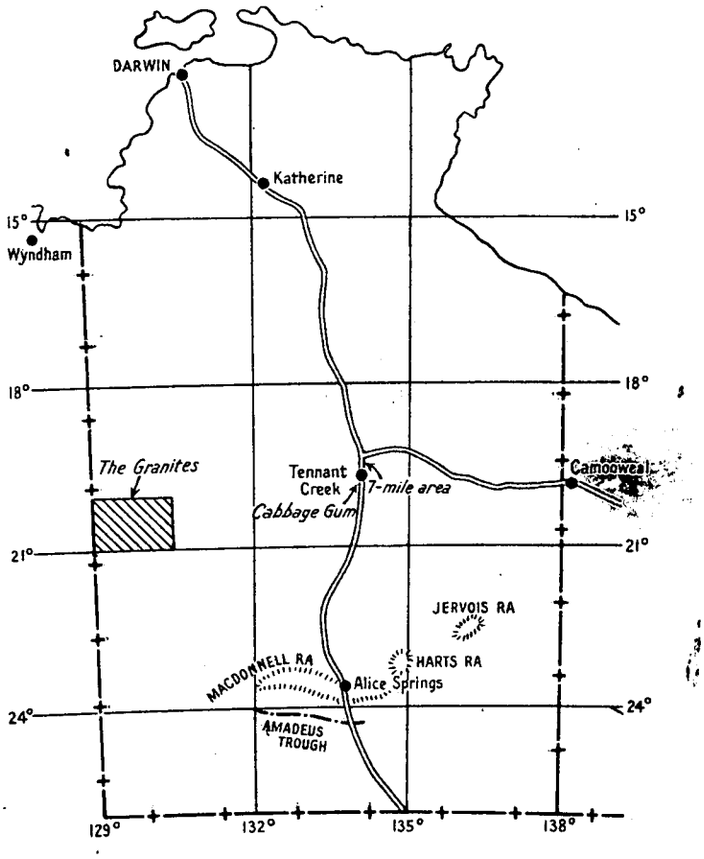
Three reports on investigations into groundwater resources during 1962 are brought together in this Record for ease of presentation. Figure 1 shows the locations of areas reported upon. In addition, Record 1962/155 by J. Barclay reports on a groundwater investigation east of Tennant Creek.

A similar Record is being produced to present the results of groundwater investigations in the Alice Springs area of Central Australia.

It is proposed that similar Records shall be issued from time to time, as required.

Figure 1

LOCALITY PLAN



Bureau of Mineral Resources, Geology and Geophysics, December, 1962

To accompany Record 1963/56

E53/14/2

GROUNDWATER PROSPECTS, GRANITES - BILLILUNA STOCK ROUTE, NORTHERN TERRITORY SECTION

by

D. Woolley

SUMMARY

A geological map of the southern half of The Granites 1:250,000 Sheet area has been prepared, based on field reconnaissance and photo-interpretation. The Precambrian basement consists of granite and various metamorphic rocks. At least two units occur which have been referred to the Palaeozoic. One is a sequence of claystone and calcareous sandstone; the other is a sequence of quartz sandstone. The relative ages of these two units are not yet known. Large areas are covered by ?Tertiary laterite, and Quaternary travertine and sand. The Palaeozoic sandstone and the Quaternary travertine have the greatest groundwater potential, and three sites for a proposed new stock route have been selected in these two units.

Results of the drilling of the reconnaissance sites are given in Appendix I.

INTRODUCTION

The area under consideration lies within The Granites 1:250,000 Sheet area. Previous geological work in this area has been confined to the Precambrian rocks in the vicinity of The Granites and Tanami Goldfields, in the extreme eastern part of the Sheet area. (Hossfeld 1938, 1940; Crohn 1961). The Sheet to the west of The Granites Sheet (Lucas Sheet) has been mapped by the Bureau of Mineral Resources (Wells 1962). Some of the formations shown on this Sheet extend across the Western Australian border into The Granites Sheet area.

The map accompanying this report (Plate 1) shows the geology of the southern half of The Granites 1:250,000 Sheet area. It was compiled by photo-interpretation, controlled by observations made in connection with the selection of bore sites. The base used for the map is the uncontrolled 4-mile photo-mosaic prepared by National Mapping Division. Since the report was written, the sites selected have been drilled.

GEOLOGY

PRECAMBRIAN

The Halls Creek Metamorphics crop out in the north-western part of the area, where they are continuous with outcrops on the Lucas Sheet. They have not been examined. Their age is regarded as Lower Proterozoic (Wells 1962).

Undifferentiated Precambrian rocks, mainly schist, slate, and quartzite, crop out in a wide belt extending west and east from The Granites, but do not crop out in the area traversed by the proposed stock route. Outcrops are generally restricted to the northern half of The Granites Sheet.

Granite crops out in several areas, and has been examined at Madam Pele's Hill, where it is well jointed and strongly weathered.

Andesite crops out in one locality, at Robbie's Knob. It is believed, on the basis of the vegetation pattern, to underlie an area of about 20 square miles. The outcrop consists of rubble and a few low hills which rise from an extensive flat plain covered by various perennial grasses; the grassed area is quite distinct from the surrounding areas which are covered by spinifex. The rock is a dark purplish colour, and consists of plagioclase phenocrysts in a very fine-grained matrix. It is generally hard and fresh in outcrop.

PALAEOZOIC

Two formations which crop out in the area have been referred to the Palaeozoic. No positive age determination is available, and their relative ages are unknown.

Lucas Beds

These beds have been defined by Wells (1962), as a result of his work in the Lucas Sheet area; there they consist of interbedded laminated claystone and calcareous sandstone. They commonly crop out in the dry lake beds in the area.

Similar beds crop out in the western part of The Granites Sheet area; some of the outcrops are continuous with those on the Lucas Sheet. Two areas of rubbly outcrop were visited in dry lake beds north of Pedestal Hill. The attitude of the beds in these areas is not known. The lithologies represented are pale grey, fine-grained, calcareous sandstone, and pale purplish-grey calcareous siltstone.

Sandstone (Un-named)

This lithological unit crops out in a discontinuous belt from the Grimwade Ridge, in the east of the area, to the Western Australian border. West of the border, the unit is referred to as the Phillipson Beds, and has been assigned an Upper Proterozoic age. (Wells 1962). On the basis of a lithological correlation with rocks in the Amadeus Basin, a Palaeozoic age is assigned to it.

The lower part of the sequence consists of a purplish-brown, medium-grained, poorly sorted, kaolinitic and slightly feldspathic sandstone, with well-rounded pebbles of quartzite scattered through it. It is thin bedded to thick-bedded, and in places (e.g. Pedestal Hill) has interbeds of purple siltstone. Ripple marks and large-scale cross bedding are prominent enough to obscure the true bedding completely. Higher in the sequence the unit is a cream, medium-grained, well-sorted, slightly kaolinitic, sandstone, with well rounded grains.

The sandstone has a regional easterly strike, and dips south at a low angle off the Precambrian basement, which it overlies unconformably. The boundary between the sandstone and basement is broken in places by faults. A structure which appears to be a shallow anticlinal nose that pitches south-west occurs about 10 miles south-west of Robbie's Knob. The Muriel Range is the southern flank of this structure.

The greatest concentrations of sand dunes on the Sheet occur in areas which are thought to be underlain by this sandstone.

No indication of the age of the unit is available except that it overlies the supposed Precambrian andesite. In the extreme west of the area, it directly overlies the Halls Creek Metamorphics, presumably unconformably. The lithology of the lower part of the unit is similar to that of the sandstone in the lower part of the Pertnjara Formation. The lithology of the higher parts of the sequence is similar to that of the Mereenie Sandstone, and the photo pattern of the outcrops in the extreme west of the area bears a striking resemblance to the photo pattern of the Mereenie Sandstone (of ?Upper Devonian age.). The outcrops were not visited. The unit is regarded as probably Upper Palaeozoic. As its outcrop is continuous with that of the Phillipson Beds on the Lucas Sheet, it is suggested that the latter are also of Upper Palaeozoic age.

The relative ages of the sandstone and the Lucas Beds are not known. The sandstone occupies a topographically higher position, but the possibility that the Lucas Beds are unconformably above the sandstone cannot be excluded.

?TERTIARY

The remnants of an extensively dissected laterite surface cover a large part of the area. The ferruginous zone of the laterite, consisting of pisolitic ironstone, can be seen in low breakaways around the edge of the outcrop areas. Lower zones of the laterite profile have not been observed, but may be present at McFarlane's Peak. The areas underlain by the laterite are covered by windblown sand, with a vegetation cover of spinifex, blue mallee, and small patches of mulga.

The laterite overlies several rock types (sandstone, andesite, and claystone and calcareous sandstone of the Lucas Beds) and appears to have been developed on each, but the products are indistinguishable. Possibly, however, it was developed on a much younger rock, perhaps of Mesozoic or Tertiary age, which has now been completely altered. Insufficient outcrops have been examined to decide between these possibilities. The age of the laterite is tentatively regarded as Tertiary, by lithological correlation.

QUATERNARY

Travertine

This material, consisting of fine-grained white limestone, underlies extensive areas. Irregular patches of opalescent chalcedony are commonly associated with the travertine, which generally crops out as low rubbly rises. The sequence supports a varied vegetation dominated by spinifex but with fairly extensive areas of mulga, herbage and various shrubs and trees. It is tentatively regarded as Pleistocene, but is possibly Tertiary in part.

Sand

Windblown sand is widespread in the area and, in the southern part particularly, sand dunes are extensively developed. The thickness of sand cover is not known. In much of the area marked on the map, the sand probably overlies additional areas of travertine. Spinifex is the dominant vegetation in these areas.

HYDROLOGY

PREVIOUS DRILLING

Two wells and one bore are known to have been constructed in The Granites Sheet area. Of these, very little information is available about Rabbit Flat Well, which is now in a state of disrepair. The Granites Bore produces several hundred gallons per hour of water having 1300 parts per million total dissolved solids. The bore is 190 feet deep, in Precambrian rocks, and the standing water level is 40 feet. Sangsters Well is fourteen feet deep, and was dug in white travertine. The water table is 12 feet below ground surface, and the well has an untested supply of stock quality water.

The prospects of obtaining useful supplies of groundwater in each of the rock units described above is indicated below.

[illegible]: Prospects in the undifferentiated Precambrian rocks probably vary with lithology and structure, but the bore at The Granites shows that useful supplies can be obtained. The rock types at The Granites do not, however, crop out in the areas in which bores are required at present.

The granite at Madam Pele's Hill is well jointed and strongly weathered, and may yield small to moderate supplies of water which would probably be of stock quality. Prospects in the other areas of granite are not known and would have to be assessed individually.

The andesite is a hard, fresh, impermeable rock, and although it is moderately jointed at the surface, prospects of obtaining groundwater from it are practically nil.

The Lucas Beds appear to have a very low permeability and are regarded as a poor prospect.

The sandstone formation, particularly in the higher parts, appears to have good porosity in outcrop, and it is thought that good supplies of moderate to good quality water should be obtainable from it. Water from the lower parts may be more saline than from the upper parts.

The total thickness of the laterite profile is not known, but since the water table in the area is probably very shallow, the profile may extend below it. If so, moderate supplies of stock quality water may be available from the laterite.

The travertine is probably the rock type with the greatest potential, and is the only one which has been tested (Sangsters Well). Good supplies should be obtainable, but the quality of water probably varies from place to place, and saline water may be present in some areas.

The Quaternary sand is unlikely to extend below the water table. It may, however, in places obscure other Quaternary deposits which are water-bearing.

PROPOSED SITES*

Dr. Abbott's Area

A site, known as Dr. Abbott's Bore, No. 1 Try, has been pegged seven miles south-east of Madam Pele's Hill. It was selected to penetrate the sandstone formation, which here dips at 10 degrees to the south-west. The depth of the piezometric surface in the area is not known, but it is probably shallow. Total depth of the hole should be less than 150 feet, and a good supply of good to moderate quality water is expected. The site is No.F52/3-4 on the attached map (Plate 1).

Wild Potato Area.

A site, known as Wild Potato Bore, No.1 Try, has been pegged approximately 3 miles west-south-west of Robbies Knob. It is in a similar geological setting to Dr. Abbott's No.1 Try, and has been sited to intersect sandstone dipping south at 10 degrees. Total depth should be less than 150 feet, and a good supply of good to moderate quality water should be obtained. The site is No. F52/3-5 on the map.

Pedestal Hill Area.

A site, known as Pedestal Hill Bore, No.1 Try, has been pegged about 5 miles north-west of Pedestal Hill. It was selected to penetrate travertine and a good supply of stock quality water from a depth of less than 100 feet is expected. The site is No.F52/3-6 on the map.

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* The results obtained from drilling on the selected sites are given in Appendix 1. It will be observed that supplies as predicted were obtained from Dr. Abbott's and Wild Potato sites but that holes in the Pedestal Hill area failed to locate adequate supplies of water.

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APPENDIX I

DRILLING RESULTS, THE GRANITES - BILLILUNA STOCK ROUTE

1. Dr. Abbott's Bore

Total depth	:	120'
Water struck	:	120'
Standing water level	:	70'
Supply	:	More than 1,000 gallons per hour (gph).
Quality	:	Domestic
Log	:	Samples were destroyed when drillers' camp was burnt. Sandstone was penetrated to total depth.

2. Wild Potato Bore

Total depth	:	115'
Water struck	:	65-95', 105-115'
Standing water level	:	60'
Supply	:	More than 1,000 gph
Quality	:	285 parts per million total dissolved solids (T.D.S.).
Log	:	0-25' Red-brown fine-grained poorly sorted clayey sandstone. 25-33' Creamy grey fine sandstone. 33-65' Red-brown fine silty sandstone. 65-95' Red-brown medium grained poorly sorted feldspathic sandstone. 95-105' Fine to medium sandstone with strongly ferruginised matrix. 105-115' Ironstone. No original texture visible. NOTE: Lithology is very similar to that of subsurface samples from sandstone at base of Pertnjarra Formation near Alice Springs.

3. Pedestal Hill No.1 Try

Total depth	:	300'
Water struck	:	Nil
Log	:	0-10' Travertine. 10-300' Grey laminated siltstone (Lucas Beds). NOTE: Subsequent drilling immediately south of Pedestal Hill failed to locate adequate supplies of water, but proved that the sandstone penetrated by the bores at the Dr. Abbott's and Wild Potato sites overlies the Lucas Beds.

GEOLOGICAL OVERLAY TO THE GRANITES MOSAIC

Bureau of Mineral Resources, Geology & Geophysics.

To accompany Record 1963/56

F52/3/3

WATER SUPPLY INVESTIGATIONS IN THE SEVEN-MILE AREA, NORTH OF TENNANT CREEK, NORTHERN TERRITORY

by

J. Barclay

SUMMARY

During the period from May 1961 to July 1962, nine diamond drill holes were drilled by Mines Branch, Northern Territory Administration, in the locality known as the 7-Mile area, situated on the Stuart Highway 7 miles north of Tennant Creek. In addition, the 7-Mile stock well was deepened from 110 feet to 148 feet in an effort to increase its capacity.

The purpose of the drilling programme was to investigate the geology and potentiality of underground water supplies in an east-west trending area of weathered granite which has a surface extent of 8 miles from east to west and one mile from north to south.

Drilling results indicate that the maximum thickness of weathered granite below the water table is near the race-course; this will be the best area for future investigations.

Accompanying this report is a sketch map of the area showing the distribution of rock types, the positions of bores drilled in the course of the programme, existing bores and the 7-Mile well. Copies of bore logs, analyses of water samples from the well and some of the bores, and a table of surface and groundwater levels, are appended.

INTRODUCTION

Previous work in the area known as the 7-Mile basin, located on the Stuart Highway 7 miles north of Tennant Creek (See Fig. 1 and Pl.1), consisted of observations on the existing 7-Mile well and on the 7-Mile, Perry's and Army bores, all of which occur within an area of half a square mile of weathered granite, the total surface extent of which is about 8 square miles. The yields of the well and bores were reported to be small (not in excess of 200 gallons per hour) but the quality of the water is good (see Appendix 3). It was considered that the area might provide additional water supplies for the township of Tennant Creek.

This report summarizes results gained from a drilling programme carried out by the Mines Branch, Northern Territory Administration, to obtain further information on the geology and potentiality of underground water supplies in the area. Nine holes were drilled and the 7-Mile stock well was deepened in the course of the present investigation.

SURFACE GEOLOGY

It will be seen from the sketch map (Plate 1) that fresh granite occurs to the north of the area under investigation. Massive granite crops out on low hills and large spheroidal boulders of granite formed by weathering are common elsewhere. The granite is porphyritic, with feldspar phenocrysts, commonly rounded, generally up to half an inch long. Recent geological mapping by geologists of the Bureau of Mineral Resources has located outcrops of aplite in the western part of the area. The granite outcrops are well-jointed and are invaded by several quartz reefs. Investigations to date suggest that the fresh granite can be excluded as a potential source of underground water supplies, owing to its impervious nature and apparent lack of major open shear zones and joints.

Sediments of the Warramunga Group crop out in the southern part of the area. Previous investigations have shown that the Warramunga sediments yield only small supplies of highly saline water and that these rocks can be classed generally as aquicludes. (Bracewell, Crohn and Hayes, 1962; Barclay, 1962.).

In the contact area between Warramunga sediments and the granite, the sediments are bleached and indurated as a result of contact-metamorphism.

North of the contact there is a zone of weathered and decomposed granite, the full surface extent of which was indicated in an unpublished report on the Tennant Creek granites of the 7-Mile area by Gregory (1959). The weathered granite belt extends from 6 miles west to about 2 miles east of the Stuart Highway, and it averages about 1 mile wide from north to south. To the west of the Stuart Highway, the site of this weathered granite is occupied by a slight east-west trending depression in which lies the main channel of the Tennant Creek. The drainage pattern is dendritic and the Tennant Creek is fed by many branches draining from the granite and the Warramunga sediments. To the east of the highway, the area underlain by the weathered granite is level to gently undulating and its eastern boundary is formed by the quartz-filled 14-Mile Fault (Ivanac, 1954).

The weathered granite is the aquifer where successful bores have been previously established, and towards which present investigations were directed.

WATER SUPPLY AND SUB-SURFACE GEOLOGY

Of the existing bores, the 7-Mile bore has supplied potable water for town use over many years and its yield is reported to be about 200 gallons/hour. The Army bore was recently recorded by Works Department as being dry, and the yield of the 7-Mile stock well is limited to about 40 gallons/hour. Perry's bore is used continuously by the owner, Mr. C. Perry, who reports that the yield is about 200 gallons/hour.

A drilling programme was initiated in May, 1961 by Mines Branch Northern Territory Administration, to test the area for additional ground water supplies for town use. Sites for six bores were chosen by J. Hays (Resident Geological Section, Darwin). The positions of four of these bores, TE. Nos. 10, 11, 12 and 14, were arranged around the 7-Mile bore and check bores TE. Nos. 9 and 13 were selected at a distance of a few feet from the 7-Mile and Army bores respectively. By June 1961, bores TE.9-12 had been drilled and drill logs compiled by P. Crohn and J. Hays (Resident Geological Section, Darwin). Subsequently, the remaining bores TE.13-17 were completed and the 7-Mile stock well deepened from 110 feet to 148 feet. Logs of the bores appear as AppendixI.

In general, the drill logs show that a surface covering of granitic sand up to 10 feet thick is present. The underlying material is granitic, but the upper part has been reworked in a few places by the action of surface waters to a maximum thickness of 28 feet. The reworked material grades sharply downwards into zones of weathered and decomposed granite below which fresh granite occurs at depths ranging from 81 feet to 191 feet below the surface. The weathered granite is generally highly kaolinized and ferruginized, while the decomposed portions are too soft to be cored and are recovered only in the form of cuttings of quartz and altered feldspars. Most of the fresh granite is porphyritic and a few specimens showed a slight gneissic texture; feldspar phenocrysts are up to half an inch in size.

Other minor igneous rock bodies encountered during the investigations are aplite, microgranite and lamprophyre, all of which are intrusive into the granite.

At the early stage of the programme, a series of surface and groundwater levels was measured at bore TE. 9-14, 7-Mile well, Perry's bore and the base of the channel of the Tennant Creek east of the highway. The appended list (Appendix 2) shows the levels recorded, which were referred to an assumed datum of 100 feet at the 7-Mile bore.

It will be seen from the list that the standing water level of bore TE.13, near the Army bore, was at 51 feet at the time of the survey, while the water in nearby bores stood at levels ranging from 87 feet to 108 feet below the surface. The reason for this anomaly is not clear, but possibly the escape of groundwater in the vicinity of TE.13 is retarded by the quartz reef of the 14-Mile Fault. Alternatively, the aquifer of bore TE.13 may be isolated from the rest of the basin, giving a perched water table, or there may be a certain amount of recharge along the fault into the basin at this point, causing a localized swell in the groundwater level.

During operations in which the 7-Mile well was deepened, a gently dipping body of impervious, weathered lampophyre was encountered at a depth of 130 feet to 138 feet. Above the lamprophyre the weathered granite was saturated from a depth of 117 feet and a slow inflow of water occurred. The weathered granite below the lamprophyre was dry to the bottom of the well at 148 feet. It is evident, therefore, that a perched zone of groundwater overlies the lamprophyre. The rate of inflow of water was not increased by deepening the well; it remained constant at about 40 gallons/hour.

The water levels elsewhere in the area ranged from 59 feet (TE.16) to 120 feet (TE.15) below the surface.

The quality of the water is generally very good. A table of analyses appears as Appendix 3. as can be seen, the samples from the bore TE. 10 contained 2,459 parts per million total dissolved salts but all others samples contained less than 400 p.p.m.

CONCLUSIONS

From the results obtained it appears that the best area for further investigations is in the vicinity of the race-course. Reference to the drill logs shows that the maximum development of weathered granite below water table occurs in this area.

Bores TE.11 and 12 were bailer-tested and, as the water levels could not be lowered by bailing, worthwhile supplies of water may be available from this deeper part of the basin.

The log of bore TE.17 indicates that the basin of weathered granite shallows considerably to the west of the highway and it is considered that a small amount of work would probably show that this area can be discounted.

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APPENDIX I

LOGS OF DRILL HOLES

DIAMOND DRILL HOLE TE. 9 AT SEVEN-MILE BORE, TENNANT CREEK.

MINES BRANCH, MAY 1961

Drill Run (in feet)	Recovery in feet and inches	Description of Core
0' - 10'	4'	Unconsolidated quartz sand.
10' - 18'	8'	Granite, slightly gneissic, slightly weathered, iron-stained in part.
18' - 26'	6"	?10in of fine-grained dyke rock.
	6'	Granite as at 10', becoming more weathered.
26' - 36'	1'	Granite, very weathered. Clayey seams in joints or small fault zones.
36' - 46'	1'6"	Granite, as above.
46' - 56'	6"	Granite as above, feldspar phenocrysts up to ½inch.
	1'	Unconsolidated sand, ?derived from decomposed granite.
56' - 66'	6"	Unconsolidated sand, as above.
66' - 86'	1'	Unconsolidated sand, slightly coarser than above.
86' - 96'	1'6"	Unconsolidated sand, as above.
	6"	Unconsolidated sand, coarser than above.
96' -111'	3"	Fragments from aplite or porphyry vein.
	9"	Unconsolidated sand.
	1'	Fragments of aplite or porphyry and of weathered granite.
111' -121'	1'	Fragments of aplite or porphyry and of Warramunga sediments or hybrid rocks.
121' -128'	1'	Weathered granite. Feldspar phenocrysts to ½ inch.
128' -134'	3"	Fragments of granite, as above. Slightly silicified.
134' -141'	1'	Unconsolidated sand, ?derived from granite.
141' -146'	3"	Granite as at 128'. Becoming more weathered towards bottom.
146' -156'	9"	Weathered coarse-grained granite.
156' -161'	6"	Fragments of silicified aplite or porphyry.
161' -171'	7'	Weathered coarse-grained granite.
171' -174'	3'	Silicified aplite or porphyry vein.
174' -176'	2'	Silicified aplite or porphyry, as above.
176' -186'	2'	Silicified aplite or porphyry, as above.
186' -191'	2'	Silicified aplite or porphyry with pegmatite veinlet.
191' -197'	5'	Coarse-grained granite, slightly gneissic, weathered near 191', becoming fresher below.
		Pink feldspar to ½ inch, less abundant quartz, common aggregates of slightly chloritised biotite.
END OF HOLE		Standing Water Level : 108'

DIAMOND DRILL HOLE TE.10; 2700 FEET WEST OF SEVEN-MILE BORE, TENNANT CREEK

Drill Run (in feet)	Recovery	Description of Core
0' - 5'	-	Bull-dust
5' - 10'	-	Granite sand
10' - 33'	22'	Slightly to moderately weathered granite, slightly iron-stained, except for leached zone at 23-27 feet.
33' - 38'	4'	Lamprophyre dyke.
38' - 40'	2'	Moderately weathered granite, some joints dip 15° - 20°, one shows ¼ inch pug coating.
40' - 51'	9'	Lamprophyre dyke
51' - 61'	-	No core. Cuttings indicate decomposed granite. No evidence of clay fraction.
61' - 71'	4'	Moderately weathered granite. Feldspar phenocrysts to ½ inch. Some joints, but no open fissures.
71' - 86'	11'	Granite as above becoming less weathered and less jointed at depth. Slight foliation dips about 20°.
86' - 92'	4'	Granite rapidly becoming fresher; Minor partings, following small shear zones, dip 15° - 20°.
92' - 96'	4'	Granite, only very slightly weathered. A few tight joints dip 45° - 60°.
96' - 100'	4'	Granite, similar to above, but quite fresh.
END OF HOLE		Standing Water Level : 85'.

DIAMOND DRILL HOLE T.E.11; 3000 FEET SOUTH OF SEVEN-MILE BORE, TENNANT CREEK

Drill Run (in feet)	Recovery	Description of Core
0'- 10'	-	Bull-dust and granite sand.
10'- 24'	14'	Reworked granitic material including quartz fragments to ½ inch. Matrix slightly clayey in part.
24'- 40'	14'	Strongly weathered and bleached aplite or finer grained granite becoming harder and slightly coarser grained towards bottom.
40'- 54'	13'	Granite, moderately to strongly bleached but less weathered than above.
54'- 58'	4'	Aplite, moderately bleached and weathered. Contacts gradational.
58'- 61'	3'	Granite, moderately weathered but only slightly bleached.
61'- 64'	3'	Lamprophyre dyke.
64'- 68'	4'	Granite, only slightly weathered.
68'- 73'	4'	Lamprophyre dyke with steeply dipping quartz veinlets to ⅛ inch.
73'- 75'	2'	Granite, slightly weathered, some vertical joints.
75'- 75'6"	6"	Quartz vein.
75'6"- 88'	11'6"	Granite, moderately weathered. Slight foliation dips about 20°. Minor shear zones, some coated by up to ¼inch of pug, dip variously between 45° and 90°. Steeply dipping 2 inches quartz vein at 88'.
88'- 96'	6'	Granite, first 12 inches somewhat silicified, next 12 inches very strongly jointed, remainder shows moderate foliation dipping 15° - 20°. Degree of alteration increases with depth.
96'-109'	11'	Granite, somewhat altered and strongly jointed. Some small quartz veins. Foliation increasing in intensity with depth and core becoming very broken.
109'-118'	5'	Granite, moderately to strongly altered. Strong foliation dips 15° - 20°. Traces of clayey pug on some foliation planes.
118'-132'	12'6"	Granite, strongly altered. Core very broken.
132'-147'	7'6"	Granite, similar to above. Foliation and alteration become less intense with depth, but some steeply dipping joints with traces of pug appear.
147'-153'	6'	Granite, only slightly altered. Feldspar phenocrysts to ½ inch, smaller quartz and biotite. Two sets of joints dip 70° in opposite directions; some are coated with thin pug seams.
153'-158'	5'	Granite similar to above, but quite fresh.
END OF HOLE		STANDING WATER LEVEL : 112'

DIAMOND DRILL HOLE TE.12; 2000 FEET EAST OF SEVEN-MILE BORE, TENNANT CREEK

Drill Run	Recovery	Description of Core
0'- 28'	18'	Reworked material of granitic origin. Some quartz fragments to 1". Matrix clayey in part.
28'- 42'	14'	Granite, strongly bleached and somewhat silicified at top, becoming less altered with depth.
42'- 46'	4'	Granite, moderately fresh. Quartz and feldspar crystals to $\frac{1}{4}$inch. No mica visible
46'- 49'	3'	Granite, similar to above. Numerous small irregular puggy shears, but no open fissures. 2 inch limonite seam (gossan?) at 48'.
49'- 57'	8'	Granite, similar to the above. Numerous small shears and silicified zones, and a few small quartz veins, all steeply dipping. Some small open fissures have developed on some of the shear planes.
57'- 69'	12'	Granite, similar to above. Sub-horizontal foliation becoming more marked with depth.
69'- 98'	27'	Granite similar to that above, becoming more altered and more strongly sheared with depth. Shears dip 70° - 80°, generally appear quite tight. A few small quartz veins including a 6 inch zone of closely spaced veinlets at 69'.
98'- 102'	4'	Granite, similar to above, Intensity of alteration increases with depth.
102'- 110'	7'	Granite, similar to above, becoming strongly altered. Shear zones, with pug seams up to $\frac{1}{4}$ inch wide, dip 50° - 60°.
110'- 131'	13'6"	Granite, similar to above. Core very much broken. Slightly clayey in parts.
131'- 143'	6'	Granite, similar to above. Core slightly less broken.
143'- 151'	8'	Granite, similar to above, becoming less altered with depth. Zone of small quartz veins at 149'. Silicified zone at 151'.
END OF HOLE		LARGE LOSSES OF DRILLING WATER AT 97' STANDING WATER LEVEL : 87'

DIAMOND DRILL CHECK HOLE AT ARMY BORE, (TE.13) IN SEVEN-MILE BORE AREA, TENNANT CREEK

Drill Run	Recovery	Description of Core
0'-30'	No core	Cuttings indicate mainly granitic material
30'-31'	6"	Quartz shale conglomerate with red clay matrix indicates base of creek sediments.
31'-32'	1'	Reworked granitic material.
32'-35'	3'	Bleached granite, moderately weathered, poorly jointed.
35'-37'	2'	Granite as above.
37'-45'	2'	Granite as above, slightly lateritized in parts.
45'-50'	6"	Granite as above, slightly lateritized in parts.
50'-95'	No core	Cuttings indicate granitic material (driller's log - soft material).
95'-100'	1'	Granite, moderately weathered.
100'-105'	1'	Granite, becoming harder and fresher.
105'-110'	1'	Granite, quite fresh, with some quartz veins up to 6 inches thick, moderately jointed, $\frac{1}{8}$ inch pug seam at 110'.
110'-116'	1'	Granite, quite fresh, moderately jointed.
116'-126'	4'	Granite as above.
126'-141'	1'	Granite, softer than above.
141'-151'	4'	Granite as above, but becoming harder at 150'.
151'-156'	1'	Granite becoming harder, moderately jointed.
156'-161'	3'	Granite becoming very hard at 158' (driller's log) fairly well jointed, slight shearing, occasional minor quartz veins.

END OF HOLE

STANDING WATER LEVEL : 51$\frac{1}{2}$ feet.

DIAMOND DRILL HOLE TE.14; 2000 FEET NORTH OF SEVEN-MILE BORE, TENNANT CREEK

Drill Run	Recovery	Description of Core
0'-10'	No core	Cuttings indicate granitic material
10'-19'	9'	Bleached granite, rounded feldspar phenocrysts, ovoid quartz grains; poorly jointed.
19'-19'6"	6"	Aplite
19'6"-22'	2'6"	Bleached granite, poorly jointed.
22' -28'	6'	Granite, poorly jointed, alternating zones of bleached and slightly lateritized granite.
28'-40'	8'	Granite as above.
40'-45'	1'	Granite as above.
45'-98'	No core	Cuttings indicate granitic material (driller's log - soft material). Granite becoming harder at 93'.
98'-107'	3'	Granite, quite hard and fresh, pink feldspar phenocrysts, many rounded; poorly jointed.
107'-110'	3'	Granite, as above.

END OF HOLE

STANDING WATER LEVEL : 76'

DIAMOND DRILL HOLE TE.15,

MARY ANNE CREEK, NORTH OF TENNANT CREEK

Drill Run	Recovery	Description of Core
0- 10'	-	Quartz pebbles and granite chippings
10'-16'	1'6"	Red and white weathered granite, fairly porous, with vugs.
16'-18'	1'	White weathered granite, as above.
18'-20'	6"	Mainly quartz vein material and weathered granite.
20'-30'	6'6"	White weathered granite, kaolinised feldspar, becomes white and red at 29'. Some quartz veining 20' - 21'.
30'-41'	5'	White and red granite, minor quartz veins.
41'-43'	1"	Quartz veining.
43'-66'	22'6"	White weathered granite, strongly kaolinised, fairly hard. Minor maounts of reddened weathered granite. Minor quartz veins from 57' to 66'.
66'-96'	27'	White and rust-coloured weathered granite with ramifying kaolinised veins and minor quartz stringers; occasional fractures with core/fracture angle of 30°.
96'-106'	3"	Weathered granite and cuttings of granitic material.
106'-116'	3'6"	White and rust-coloured weathered granite.
116'-126'	1'	Weathered granite as above, too soft for coring.
126'-193'6"	-	"Blue demon" bit in use. Cuttings indicate weathered granite becoming harder at 190 feet.
		Hole stopped due to drilling difficulties.
		STANDING WATER LEVEL : 120'6"

N.B. The weathered granite core is fairly porous and contains many vugs.

DIAMOND DRILL HOLE TE.16 BY OLD 4-MILE BORE

NORTH OF TENNANT CREEK

Drill Run	Recovery	Description of Core
0-14'	-	Cuttings indicate granite material.
14'-15'	1'	Buff and white kaolinized weathered granite.
15'-20'	4'	Weathered granite as above.
20'-30'	2'	Weathered granite as above.
30'-60'	-	Cuttings indicate kaolinized granitic material.
60'-62'	1'	Hard, kaolinized micro-granite.
62'-77'	-	Cuttings indicate kaolinized granitic material
77'-79'	1'	Hard, kaolinized microgranite.
79'-80'	3"	Microgranite as above, with quartz vein.
80'-81'6"	3"	Core of microgranite, followed by kaolinized granitic cuttings.
81'6"-87'6"	-	Cuttings indicate kaolinized granitic material.
87'6"-89'6"	2"	Hard, kaolinized microgranite.
89'6"-94'6"	-	Cuttings indicate kaolinized granitic material.
94'6"-94'7"	1"	Hard, kaolinized microgranite.
END OF HOLE		Hole stopped due to drilling difficulties.
		STANDING WATER LEVEL : 59 feet.

DIAMOND DRILL HOLE TE.17

WEST OF HIGHWAY IN 7-MILE AREA

Drill Run	Recovery	Description of Core
0' - 31'	18'	Porous, weathered porphyritic granite, slightly lateritized, slightly kaolinized, pink feldspar phenocrysts commonly rounded and up to ½ inch in size. Many small fractures at 60° to core length.
31' - 41'	3'	Porphyritic granite as above, but strongly weathered.
41' - 51'	3"	Kaolinized microgranite.
51' - 56'	-	Cuttings of granitic material.
56' - 61'	6"	Kaolinized microgranite.
61' - 81'	1'9"	Porphyritic granite, kaolinized in part. From about 76'-81' kaolinized microgranite.
81' - 87'	-	Cuttings of granitic material.
87' - 91'	1'6"	Fresher porphyritic granite, feldspar ovoids commonly bleached.
91' - 95'6"	3'3"	Quite fresh porphyritic granite, strongly jointed, some slightly faulted on planes at 50° to core length.
END OF HOLE		STANDING WATER LEVEL : 78 feet 6 inches.

7-MILE WELL
TENNANT CREEK

Depth	Description of Rock Type
0' - 130'	Strongly weathered granite, occasional quartz stringers.
130' - 134'	Weathered lamprophyre.
134' - 134' 1"	Pug seam.
134'1" - 138'	Weathered lamprophyre, finer grained.
138' - 148'	Weathered granite, becoming harder from 140'.

BOTTOM OF WELL

STANDING WATER LEVEL : 117'

20 ft. long drives at 60 ft. and 110 ft. below surface. Water table at 117' is perched on underlying impermeable lamprophyre, below which the granite is dry to 148'.

APPENDIX 2

SURFACE AND GROUNDWATER LEVELS IN THE 7-MILE AREA

Bore No.	Surface Level	Groundwater Levels from Surface First Recorded	July, 1962.
7-Mile bore	100' assumed datum	?	?
T.E.9 by 7-Mile bore.	100'	In July, 1961 108'	112'
T.E.10	107'	" " " 85'	85'
T.E.11	119'	" " " 112'	113'
T.E.12	100'	" " " 87'	88'
T.E.13	92'	" " " 51'	Hole collapsed at 6' from surface.
T.E.14	104'	" " " 76'	77'
T.E.15	?	120' Completed in January, 1962.	Hole collapsed at 8' from surface.
T.E.16	?	59' Completed in Feb. 1962.	63'
T.E.17	?	Drilled in July, 1962.	78'
Perry's bore	98'	87' (from report).....	?
7-Mile stock-well	101'	98' Deepening completed by February, 1962. Relatively high water level due to rain water held up by 10' of silt and clay at bottom of well before cleaning.	117' Perched water table.

Other Surface Levels - Bed of Tennant Creek

Bed of Creek 350' east of 7 - Mile bore	85'
Bed of Creek 400' south of 7 - Mile bore	84'
Bed of Creek 100' east of T.E.13, near Army bore.	80'

APPENDIX 3 - WATER ANALYSES: BORES IN VICINITY OF OLD TELEGRAPH STATION, TENNANT CREEK

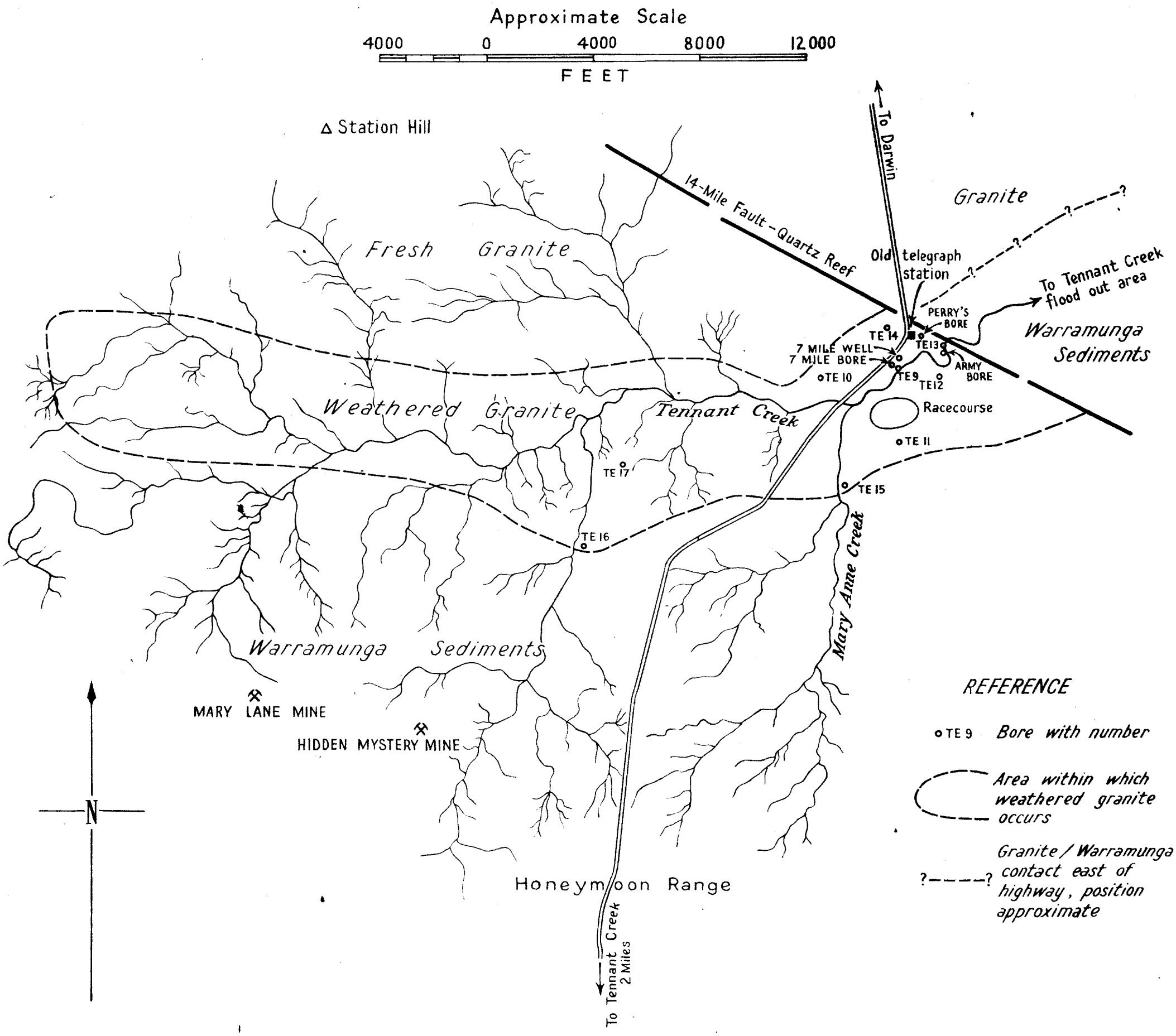
	TE.9 Check Bore at 7-Mile Bore	TE.10 West Bore	TE.11 South Bore	TE.12 East Bore	TE.13 Check Bore at Army Bore	TE.14 North Bore	Telegraph Bore	7-Mile Well
Hardness, total	62	800	130	40	46	50	48	28
temporary	62	350	130	40	46	50	48	28
permanent	-	450	-	-	-	-	-	-
Free Alkali	52	-	24	50	26	96	47	67
Chloride	35	835	52	24	15	26	20	3
Sulphate	26	435	37	5	25	5	14	10
Fluoride	0.4	1.1	0.4	0.4	0.4	0.9	0.4	0.8
Calcium	10	128	22	6	7	8	12	4
Bicarbonate	139	427	187	109	88	178	116	142
Carbonate	-	-	-	-	-	-	-	-
Sodium	54	472	56	35	30	60	41	48
Potassium	9	35	13	10	6	9	6	7
Magnesium	9	117	18	6	7	7	4	4
Nitrate	0	9	8	1	2	2	4	1
T.D.S.	282	2,459	393	196	180	296	217	220
pH.	7.1	7.8	7.4	6.8	6.5	6.8	7.3	7.4

The analyses given above were carried out by the Animal Industry Branch, Alice Springs, (between December, 1961 and February, 1962). With the exception of the sample from TE.10 in which the sulphate content is excessive, all the other samples were judged by the Analysing Officer as being chemically suitable for human consumption.

T.D.S. - Total dissolved salts.

WEATHERED GRANITE
IN THE 7-MILE AREA NORTH OF TENNANT CREEK

This sketch map was compiled from aerial photographs



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Bureau of Mineral Resources, Geology & Geophysics. December, 1962. To accompany Record 1963/56

PLATE 2

OLD TELEGRAPH STATION

North Bore ⊙ GL 104' WL
(TE 14)

Perry's Bore ⊙ GL 98' WL 87' (reported)

(TE 13)
Check Bore GL 92' WL 51' ⊙ · GL 80'
Army Bore GL 94' ⊙ WL

TENNANT CREEK

⊙ 7 Mile Well
GL 101'
WL 98'

GL 100'
7 Mile Bore ⊙ WL
Check Bore ⊙
(TE 9) GL 100'
WL 100'

GL 85'

East Bore ⊙ GL 100' WL 87'
(TE 12)

HIGHWAY

GL 84'

GL 107' WL ⊙ West Bore
(TE 10)

STUART

South Bore ⊙ GL 119' WL 112'
(TE 11)

T N

WATER DRILLING
7 MILE BORE AREA
TENNANT CREEK

500 0 500 1000 1500

Scale in feet

Compass and Tape Survey
Level by Instrument

Assumed Datum of 100 ft at 7 Mile Bore

GL - Ground Level WL - Water Level

Bureau of Mineral Resources July 1961 To accompany Record 1963/56

E53/14/18

DIAMOND DRILLING IN THE WESTERN EXTENSION OF THE CABBAGE GUM BASIN, TENNANT CREEK

by

J. Barclay.

SUMMARY

During the period from November 1961 to July 1962, seven diamond drill holes were completed in the Cabbage Gum area by the Mines Branch, N.T. Administration.

The purpose of the drilling programme was to begin investigations to determine the western limit of the potable water supply of the Cabbage Gum basin.

The results of the drilling indicate that the northern limit of the basin in this area is formed by the Warramunga sediments encountered in bores 180/95 and 175/95 (see Plate 2).

Additionally, the north-west limit may be controlled by the presence of water of unsuitable quality, as shown by the analysis of a sample from bore 155/95.

The potable water of the basin may extend to the south-west, but further investigations are necessary to confirm this.

Accompanying this report are a sketch map showing bore sites, an east-west section of the area on part of Line 95, drill logs of the several bores referred to above, and analyses of water samples from three of the bores (Plates 1 and 2, and Appendices 1-3).

INTRODUCTION

The Cabbage Gum area lies to the south of Tennant Creek and is reached by way of the Stuart Highway for a distance of 9 miles from the township (see Plate 1).

Previous investigations were initiated in the Cabbage Gum basin in 1955 by Mines Branch and it was determined that the area of potable water extends at least for a distance of 4 miles to the east and west of the Highway and is 2 miles wide. (Hays 1958; Crohn 1961; Bracewell 1961; Bracewell, Crohn and Hays 1962).

The Tennant Creek water supply is carted mainly from this basin and it is expected that reticulation to the town will be completed in the near future.

The main intention of the present programme was to begin investigations to determine the extent to which the basin continues towards the west.

GEOLOGY

Two of the bores, Nos. 175/95 and 180/95 bottomed in sandstone and mudstone of the Warramunga Group of sediments (Plate 2).

In the report on the groundwater reserves of the Cabbage Gum Basin (Bracewell, Crohn and Hays 1962, pp.4 and 18) it is

pointed out that the low yield and high salinity of the water from bores and wells sunk in Warramunga sediments generally excludes this group of rocks from consideration as a potential source for a town supply.

Of the remaining bores, three were terminated in fresh granite which is slightly gneissic (bores 155/95 , 160.63/95) or is of medium-coarse grain (bore 175/90). Bore 170/90 was drilled through zones of weathered and decomposed granite and abandoned at 162 feet because of continuing collapse of the decomposed material. The other three bores mentioned above passed through similar zones, with a final gradation from decomposed to weathered granite, and thence to underlying fresh granite. The decomposed granite could not be cored and the weathered granite cores were vuggy and porous.

Bore 160.63/95 was sited to test an outcrop of a lime-silica rich rock, here given the field name of chalcedonic limestone, which occurs fairly extensively in the Cabbage Gum area. The bore passed through 26 feet of chalcedonic limestone into superficial sediments. The chalcedonic limestone becomes more earthy in appearance with depth. A complete core was not recovered but the chalcedonic limestone possibly grades into the underlying sandstone.

Bore 163.5/100, which was sited in a large shallow topographic depression, penetrated superficial sediments to 31 feet below the collar, then intersected quartz breccia to 67 feet where a gradation to a fine-grained porous and weathered rock occurs. The porous rock, possibly microgranite, persisted to 153 feet and was followed by quartz schist to the bottom of the hole at 162 feet.

Water levels were found to stand at depths from 32 feet to 38 feet; good yields of water may be available in bores 170/90 and 175/90 owing to the apparent high permeability and porosity of the superficial sediments and underlying zones of weathered and decomposed granite.

CONCLUSIONS AND RECOMMENDATIONS

Further investigations by drilling are recommended as it is apparent that the western limits of the Cabbage Gum basin were not fully delineated by the drilling programme.

The northern edge of the basin is apparently defined by the presence of Warramunga sediments which are regarded as aquicludes.

Analyses of water samples from bores 155/95 and 160.63/95 (Appendix 2) show that the quality of the water is unsuitable for human consumption and this deterioration in quality may determine the limits of potable water supplies to the north-west.

However, on the basis of drilling to date, it is considered that an extension of potable supplies of the Cabbage Gum basin may be found by further pattern drilling in a south-westerly direction.

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APPENDIX 1 - LOGS OF DRILL HOLES

DIAMOND DRILL HOLE 170/90

Drill Run in feet	Recovery in feet	Description of Core
0-10	-	Bulldust and quartz feldspar detritus.
10-15	1½	Buff superficial sediments, porous and with small vugs.
15-16	½	Superficial sediments as above.
16-24	7	Superficial sediments as above, with some thin bands of conglomerate between 16' - 19'.
24-31	6	Superficial sediments as above, with ½" band of conglomerate at 29' overlying brown, porous, vuggy sandstone, core contact angle 45°.
31-38	6	Superficial sediments as above, becoming whiter with depth and with lateritic pebbles up to 1½", quartz pebbles also present.
38-47	3½	From 38'-42' lateritic pebbles 42'-47' White, kaolinized weathered granite.
47-56	7½	Porous, vuggy weathered granite of fairly coarse grain, and buff, red, white colours.
56-59½	3	Weathered aplite with chalcedonic cement. Small vugs and fractures.
59½-67	6	Weathered aplite as above to 60½', followed by kaolinised aplite becoming fine granite at 66'. The contact at 60½' dips at 40° to core length.
67-82	10	Kaolinized fine-grained granite with chalcedonic cement, slightly to very porous. 76'-82' coarse weathered granite.
82-112	21	Buff, white and pink weathered granite, clayey at 83'. Very porous.
112-121	9	Slightly less weathered granite, porous, coarse-grained, shears at 70° to core.
121-147	9	Buff, coarse-grained weathered granite, shears at 70° to core. Finer band of weathered granite from 132'-133'.
147-162	-	Soft ground drilled with non-coring bit. Cuttings indicate weathered granite.
END OF HOLE		Hole collapsed owing to ground becoming softer.

Standing Water level at 34'

Bailer recovered 235 galls/hr. without lowering water level.

DIAMOND DRILL HOLE 175/90

Drill Run in feet	Recovery in feet	Description of Core
0-10		Cuttings of rounded quartz grains and lateritic material.
10-31	20.5	Poorly sorted, superficial sediments, conglomerate at 12', ferruginous pebbles predominant at 24'; sediments cemented by silica, probably chalcedony.
31-40	9	Poorly sorted arkose sediment, with coarse altered feldspar up to ½", small vughs at 34', lateritic in part; chalcedonic cement.
40-46	2	40'-42' coarse lateritic pebbles in kaolin rich matrix, pebbles up to 2". 42'-46' quartz grains in kaolin-rich matrix, probably top of weathered granite.
46-63	8	White weathered granite, red lateritic in part, rare small vughs. Quartz crystals with blue tinge.
63-70	7	White weathered granite becoming buff at 69'; medium-grained, porous, few minor fractures, some lateritic patches.
70-96	22	Buff weathered granite, porous; small to coarse vughs in fractures; small knots of mica from 86'-96' and no vughs.
96-106	1½	As above, buff weathered granite, core very broken, slightly sheared; cleavage/core angle 0°-30° more weathered appearance.
106-123	17	As above, buff weathered granite, very porous, knots of mica, more weathered.
123-131	8	Weathered granite, pale with red tinge, slightly fresher; knots of mica with more regular distribution. At 123'-125' vughs and 1" quartz vein.
131-137	6	Granite, much harder, slightly fresher, medium-grained, knots of mica, still porous at 137'.
END OF HOLE		Hole stopped because of very slow penetration of harder granite.
		Standing water level at 35'.
		Bailed out hole at rate of 250 galls/hr without dropping the level. High water yield anticipated.

DIAMOND DRILL HOLE 155/95

Drill Run in feet	Recovery in feet	Description of Core
0-10		Coarse rounded cuttings of quartz and laterite.
10-16	3½	Buff medium-grained sandstone, conglomeratic in part.
16-18.5	1	Porous sandstone (?conglomeratic in part?).
18.5 -19.5	½	Sandstone as above, conglomeratic in part.
19.5 -26	6	Sandstone as above, shears at 90° to core length. Manganese staining on irregular cleavages.
26-35	7	Porous vuggy sandstone as above. Sandstone has noticeable clay content.
35-42	2	Sandstone as above, shears at 90° to core length.
42-52	2½	42'-46' Sandstone as above 46'-52' Lateritized, porous, vuggy sandstone.
52-62	5	52'-56' Paler lateritized sandstone as above 56'-62' Lateritized conglomerate, very porous and vuggy, with open fractures.
62-68	5½	Conglomerate as above but less vuggy.
68-79	10½	Buff siliceous gritty sandstone becoming a sandy grit at 79'.
79-84	3½	Buff quartz grit, very porous and vuggy. Coarse interval from 80½'-90'.
84-92	7	Quartz conglomerate mainly sub-angular fragments to ¾" size. At 85' redder in colour. From 85' the grain size decreases to ⅛", 90'-90'6" conglomerate, 90'6"-92' sandstone.
92-101	7	92'-93' Sandy grit 93'-94' Fine sandstone. Contact with sandy quartz conglomerate at 90° to core length. 94'-96' Sandy quartz conglomerate. 96'-101' Weathered coarse red granite.
101-112	4	Weathered granite as above but paler.
112-130	-	Non-coring bit. Cuttings indicate granitic material.
130-137	5	Coarse granite, weathered feldspars to ½" size. Gneissic tendency.
137-147	1½	Weathered granite as above.
147-163	-	Non-coring bit. Cuttings indicate granitic material.
163-173	4½	Coarse weathered hard granite, gneissic tendency.
		Standing water level at 32 feet.

END OF HOLE

DIAMOND DRILL HOLE 160.63/95

Drill Run in feet	Recovery in feet	Description of Core
0-10	-	Cuttings indicate chalcedonic limestone.
10-11	¼	Broken core and cuttings of chalcedonic limestone.
11-12	-	Cuttings indicate chalcedonic limestone.
12-14	½	Broken core and cuttings of chalcedonic limestone.
14-25	-	Cuttings indicate chalcedonic limestone.
25-29	3	25'-26' Cuttings indicate chalcedonic limestone. 26'-29': 3' core; superficial sediments Reddish-brown, siliceous and vuggy sandstone.
29-38	8	Superficial sediments, sandstone as above.
38-42	1	Sandstone as above and lateritic conglomerate.
42-51	8	42'-42'6" Sandstone and lateritic conglomerate. 42'6"-51' White, weathered granite.
51-96	34½	Weathered granite, kaolinized and lateritized in part. Porous and vuggy, some kaolinized feldspar.
96-136	35	Less weathered coarse granite, gneissic tendency, feldspar up to ½" size, kaolinized and lateritized, porous and vuggy. Granite becoming softer at 135'
136-152	¼	3" core of quartz pebbles. Cuttings of granitic material.
152-168	14	Weathered, fairly soft gneissic granite.
168-179	11	Gneissic granite, harder and fresher, coarse-grained.
END OF HOLE		
		Standing water level at 39 ft.
		Drill collar about 3ft. above surrounding plain.

DIAMOND DRILL HOLE 175/95

Drill Run in feet	Recovery in feet	Description of Core
0-10	-	Cuttings indicate superficial sediments.
10-13	¾	Lateritized superficial conglomeratic sediments.
13-15	1½	Sediments as above with coarser conglomerate.
15-18	-	Cuttings of laterized sediments.
18-27	1/3	18'-23' Superficial sediments as above.
	4	23'-27' Kaolinised sediments; lateritic pebbles at 27'.
27-29	2	Kaolinized sediments.
29-35	-	29'-33½' Cuttings of kaolinized sediments.
-	1½	33½'-35' Kaolinized sediments.
35-40	4	Warramunga sediments; porous vuggy sandstone with irregular veins, blebs and patches of quartz.
40-41	1	Fine sandstone, banded and sheared.
41-47	5	Fine buff sandstone, banded, sheared, with vugs and quartz stringers.
47-54	7	Fine buff sandstone with vugs, irregular veins, blebs and patches of quartz.
54-67	12	Porous, red, fine-grained siliceous sandstone with irregular stringers.
67-77	8½	67'-68' Sandstone as above. 68'-77' Banded and massive mudstone. Banding at 20° to core length.
77-87	5	Intercalated mudstones and fine sandstones, somewhat sheared.
87-96	1	Sheared mudstone, shearing parallel to core length.
		Standing water level at 33 feet.

DIAMOND DRILL HOLE 180/95

Drill Run in feet	Recovery in feet	Description of Core
0-10	-	Cuttings indicate superficial sediments.
10-12	¾	Buff superifcial sediments.
12-15	1½	Superficial sediments, i.e. porous siliceous sandstone, conglomeratic in part.
15-22	4	Sandstone as above.
22-32	7	Sandstone as above, more conglomeratic from 31'-32'.
32-42	½	Porous, iron-rich, quartz conglomerate.
42-47	½	Conglomerate as above.
47-49	-	Cuttings indicate sedimentary material.
49-57	¼	Quartz pebbles - possibly vein material.
57-67	6½	Brown Warramunga mudstone and fine-grained sandstone, somewhat schistose. Kaolinized to 66', iron-rich 66'-67'.
67-77	2½	Porous kaolinised Warramunga sediments.
77-87	-	Cuttings indicate Warramunga sediments.
87-97	½	Red, clayey, porous schist. Schistosity parallel to core length.
97-107	1	Buff schist as above.
107-128	-	Cuttings indicate sediments.
END OF HOLE		
		Standing water level is at 38 feet.

DIAMOND DRILL HOLE 163.5/100

Drill Run in feet	Recovery in feet	Description of Core
0-12	-	Cuttings of lateritic, quartz and clay particles, some ironstone grains.
12-22	7	Kaolinized, partly lateritized, clayey, medium-grained, buff sandstone, porous and vuggy.
22-25	3	Darker buff, slightly lateritized, ill-sorted sandstone to 25½ft. porous and vuggy.
25-32	5	25½'-31': Lateritic pseudo-conglomerate, particles to 1" size, porous and vuggy. 31'-32': Quartz rich, lateritized, porous and vuggy.
32-49	10½	32'-44': Quartz breccia, slightly lateritized, quartz stringers, porous and vuggy. 44'-47': quartz breccia, silicified, porous and vuggy. 47'-49': quartz breccia, lateritized, porous and vuggy.
49-57	7	Quartz breccia in alternating lateritic and siliceous zones, quartz patches up to 3" x 2", porous and vuggy.
57-66	4½	Quartz breccia as above but soft from 65' to 66'.
66-71	3 with cuttings from 69'-71	Kaolinized and silicified microgranite (?) porous and vuggy.
71-77	5½	Lateritized microgranite (?)
77-111	27	Light buff microgranite (?) lateritized, silicified and kaolinized, with ramifying fine quartz stringers, fairly porous.
111-153	-	Non-coring bit used. Cuttings of microgranite (?).
153-162	4½	Quartz schist, lateritized and kaolinized, schistosity at 0^{o} - 20^{o} to core length.
END OF HOLE		
		Standing water level at 37 feet.

APPENDIX 2 - WATER ANALYSES

CABBAGE GUM BASIN

Results in parts per million

Bore No.	155/95	160.63/95	170/90
Hardness (Calculated as $CaCO_3$)			
" Total	828	338	578
" Temporary	340	304	322
" Permanent	488	34	256
Free Alkali (Calculated as $CaCO_3$)	Nil	Nil	Nil
Chloride	670	210	470
Sulphate	317	110	225
Fluoride	2.2	2.2	1.7
Calcium	108	38	81
Biacarbonate	414	371	393
Carbonate	Nil	Nil	Nil
Sodium	345	164	323
Potassium	89	52	11
Magnesium	136	59	91
Nitrate	80	38	94
Total dissolved salts	2,161	1,044	1,690
pH	7.4	8.2	7.3

1. The sample from Bore 155/95 was considered chemically unsuitable for human consumption as the sulphate content is in excess of 250ppm. The water is suitable for stock.

2. The sample from Bore 160.63/95 was considered chemically unsuitable for human consumption due to the excess fluoride content of the water. The nitrate content is in excess of the limit normally set for children under one year.

3. The sample from Bore 170/90 was considered chemically suitable for adult human consumption. The nitrate content, however, is in excess for children under one year of age.

The samples analysed and comments on the suitability of the water were made by the Analysing Officer of the Animal Industry Branch, Alice Springs.

APPENDIX 3 - WATER ANALYSES

CABBAGE GUM AREA

Results in parts per million

Location	Artesian Bore at BMR.3	Bore, 23 mls. S.W. of Cabbage Gum; before rain.	Bore, 23 mls. S.W. of Cabbage Gum; after rain.
Date of Sampling	28.7.62	10.2.62	11.3.62
Hardness (Calculated as $CaCO_3$)			
Hardness Total	288	6620	6570
" Temporary	288	237	237
" Permanent	-	6383	6333
Free Alkali (Calculated as $CaCO_3$)	91	-	-
Chloride	250	5990	6040
Sulphate	103	2118	2078
Fluoride	2.2	-	-
Calcium	35	1164	1138
Bicarbonate	463	289	289
Carbonate	-	-	-
Sodium	245	1850	1850
Potassium	65	91	90
Magnesium	49	900	906
Nitrate	72	30	28
Total dissolved salts	1,284	12,432	12,419
pH.	7.6	7.4	7.5

The above analyses were carried out by the Animal Industry Branch, Alice Springs.

The Analysing Officer reported that the sample from BMR. No. 3 was unsuitable for human consumption because of the excess fluoride content and the nitrate level is in excess for children under 1 year of age.

The samples from the bore, 23 miles south-west of Cabbage Gum were reported to be unfit for human consumption due to the excess quantity of dissolved salts.

Plate 1

CABBAGE GUM BASIN

TENNANT CREEK N.T.

Sites of bores sunk during period November 1961 / July 1962

Scale in Feet

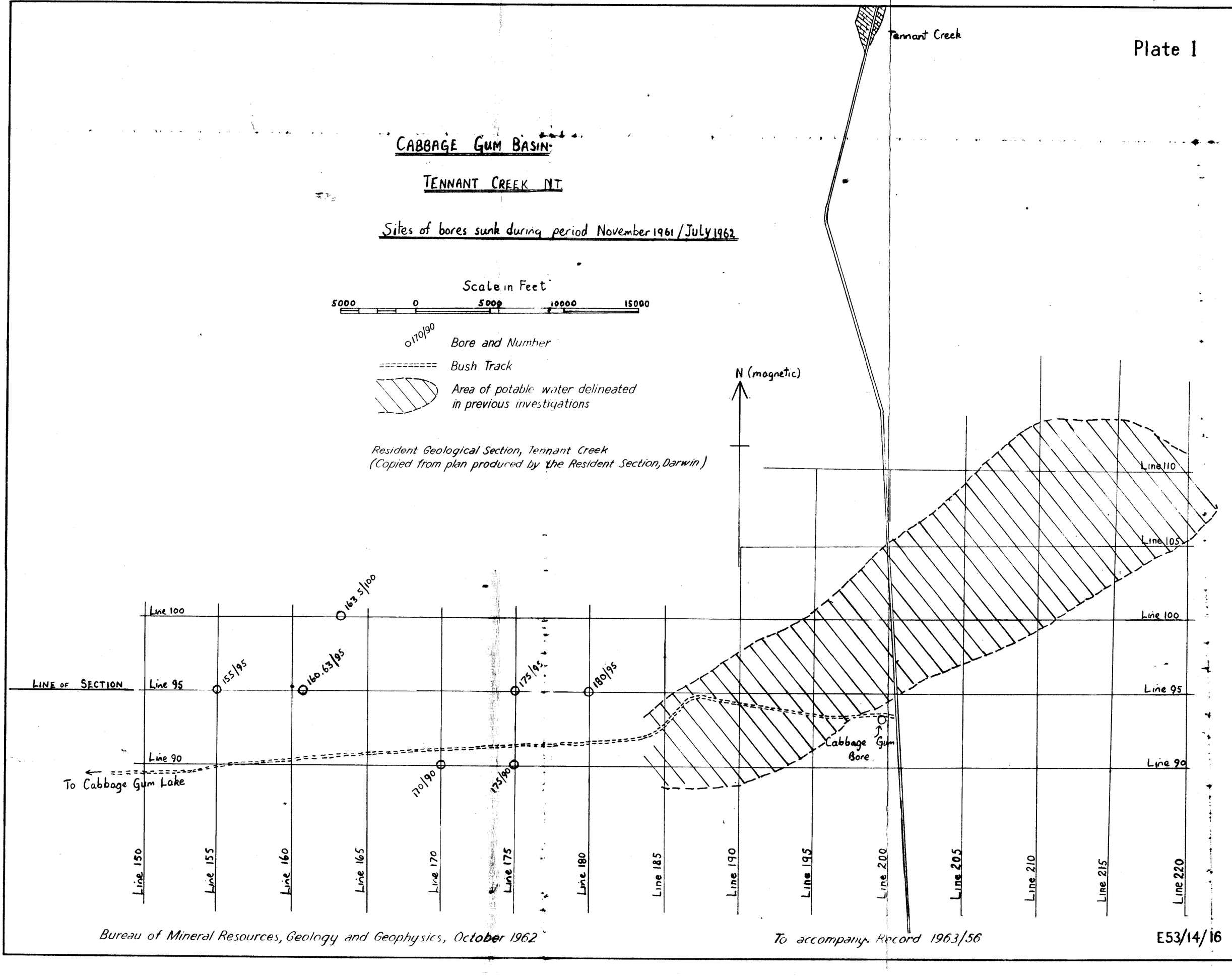
5000 0 5000 10000 15000

0170/90 Bore and Number

Bush Track

Area of potable water delineated in previous investigations

Resident Geological Section, Tennant Creek
(Copied from plan produced by the Resident Section, Darwin)



Bureau of Mineral Resources, Geology and Geophysics, October 1962

To accompany Record 1963/56

E53/14/16

PLATE 2

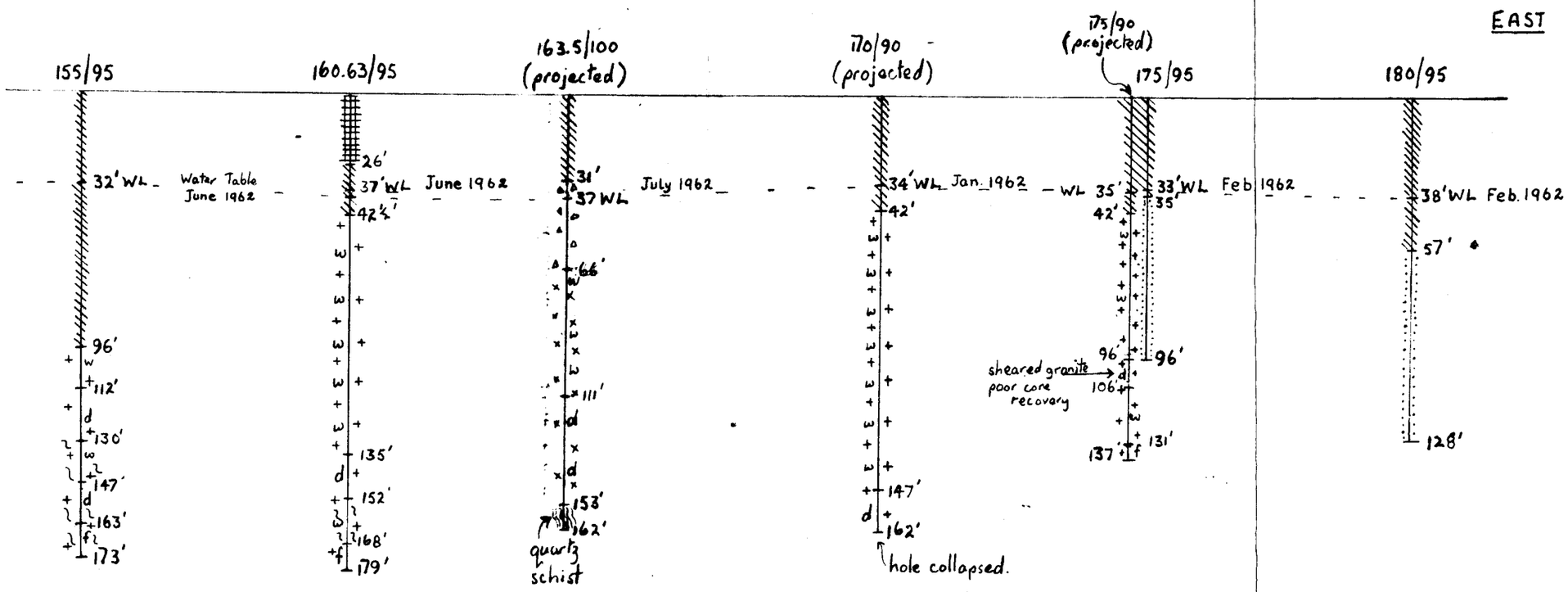
EAST-WEST SECTION on LINE 95

CABBAGE GUM BASIN.

Scales : Horizontal – 1 inch to 2500 feet
Vertical – 1 inch to 50 feet

WEST

EAST



LEGEND

- Superficial sediments
- Chalcedonic limestone
- Warramunga sediments
- Gneissic Granite
- Medium-coarse grained Granite
- Microgranite? { w Weathered, d Decomposed.
- Quartz breccia
- w Weathered Granite
- d Decomposed Granite
- f Fresh Granite
- WL 35' Standing Water Level and depth.
- 155/95 Bore Number.

Resident Geological Section, Tennant Creek, N.T.

Bureau of Mineral Resources October 1962 To accompany Record 1963/56

E53/14/17