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1986/49. Spear bores near the mouth of the Arthur River.

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Abstract

Spears in shallow dune sand at the Lands Department ranger's house at the mouth of the Arthur River appear capable of delivering sufficient water to supply the nearby camping area, as well as for the lawn around the house.

The relatively low salinity of the water indicates that it should be suitable for most purposes. Bacterial analysis is suggested if the water is to be used for drinking.

INTRODUCTION

The Lands Department requested an examination of groundwater prospects at their Arthur River Crossing camping area, as well as for use around the ranger's residence. Inspection of aerial photographs showed that sand dunes occur in the general area, and spears in the sand were regarded as a possible source of water. Surface inspection showed that a strong spring occurs near the eastern edge of the enclosure around the residence and seepages are also present on the slopes to the river.

GEOLOGY

Largely stabilised dunes extend up to about 2.5 km inland from the mouth of the Arthur River. The dunes are underlain by Precambrian quartzite, phyllite and siltstone, which crop out over extensive parts of the surrounding region.

Just upstream from the Arthur River bridge, where the camping area and ranger's house are situated, the presence of quartzite rock in the cutting down to the old punt indicates that a limited thickness of sand is present. The quartzite has a north-easterly dip and phyllite with a similar dip underlies the quartzite at river level. A thin layer of rounded gravel overlies the quartzite and is probably associated with an old terrace around the Arthur River. The dune sand overlies this gravel.

The size range of the sand is shown in Figure 2. Examination of the sand under magnification indicates that approximately 5-10% of the content is shell fragments, while most of the remainder is angular to subrounded quartz. A small proportion consists of dark minerals which, although not positively identified, are probably mainly magnetite or ilmenite. Minor amounts of zircon also occur. Dunes at greater elevation to the north contain a greater proportion of shell fragments.

SPEAR INSTALLATION

Hole 1 struck basement rock at a slightly shallower depth than the bores on the western side of the enclosure (fig. 1), so spears were installed in the latter area because of the greater depth of saturated sand. The results of these installations are given at the end of the logs in each case. A little sand was delivered with the water in Hole 2 for a time and this can be explained by the slightly wider screen opening used than in the other two holes (it may also explain the greater yield). The water eventually cleared as coarser grains were retained on the outside of the screen.

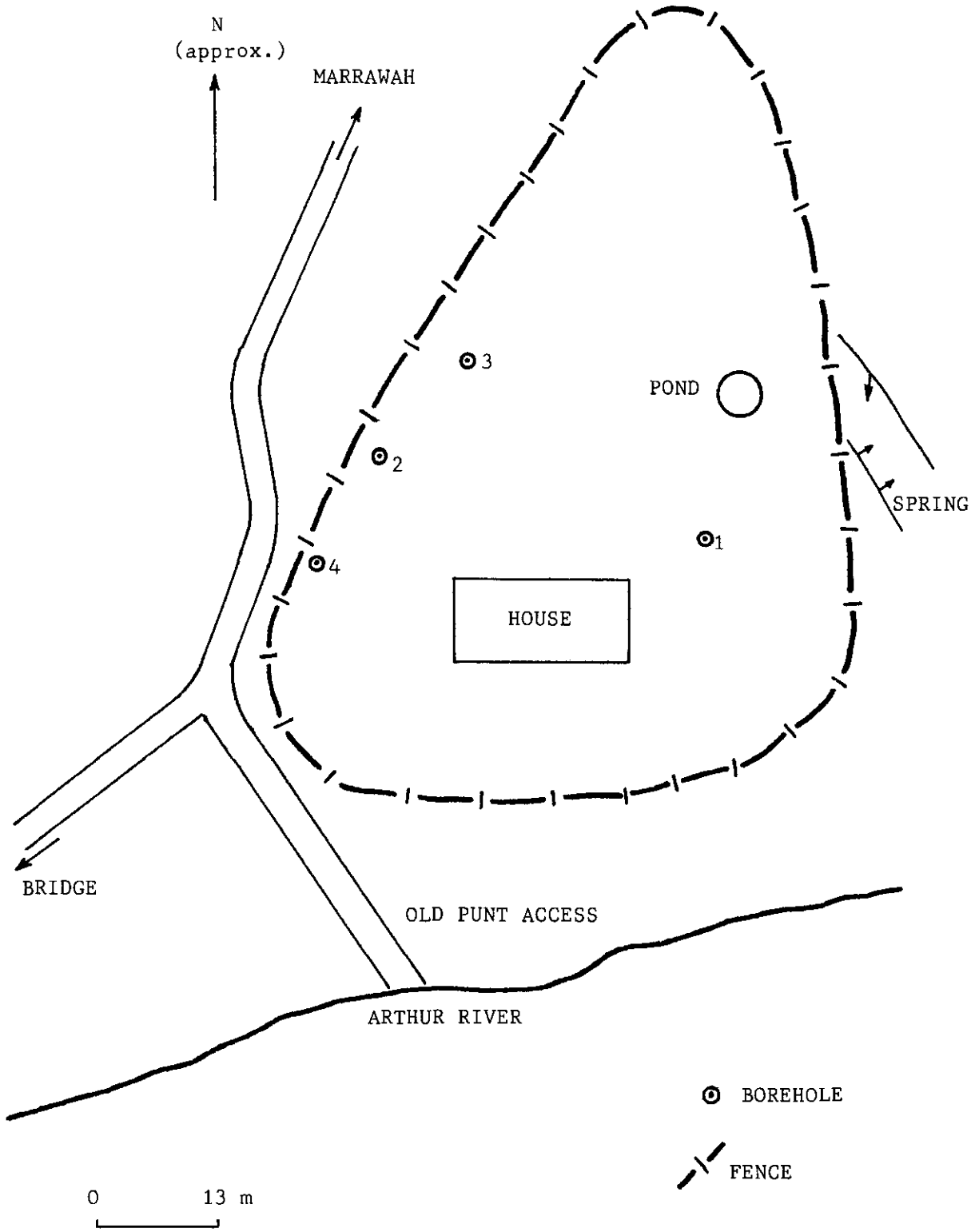

Figure 1. *Sketch plan of area surrounding ranger's house, Arthur River*

5 cm

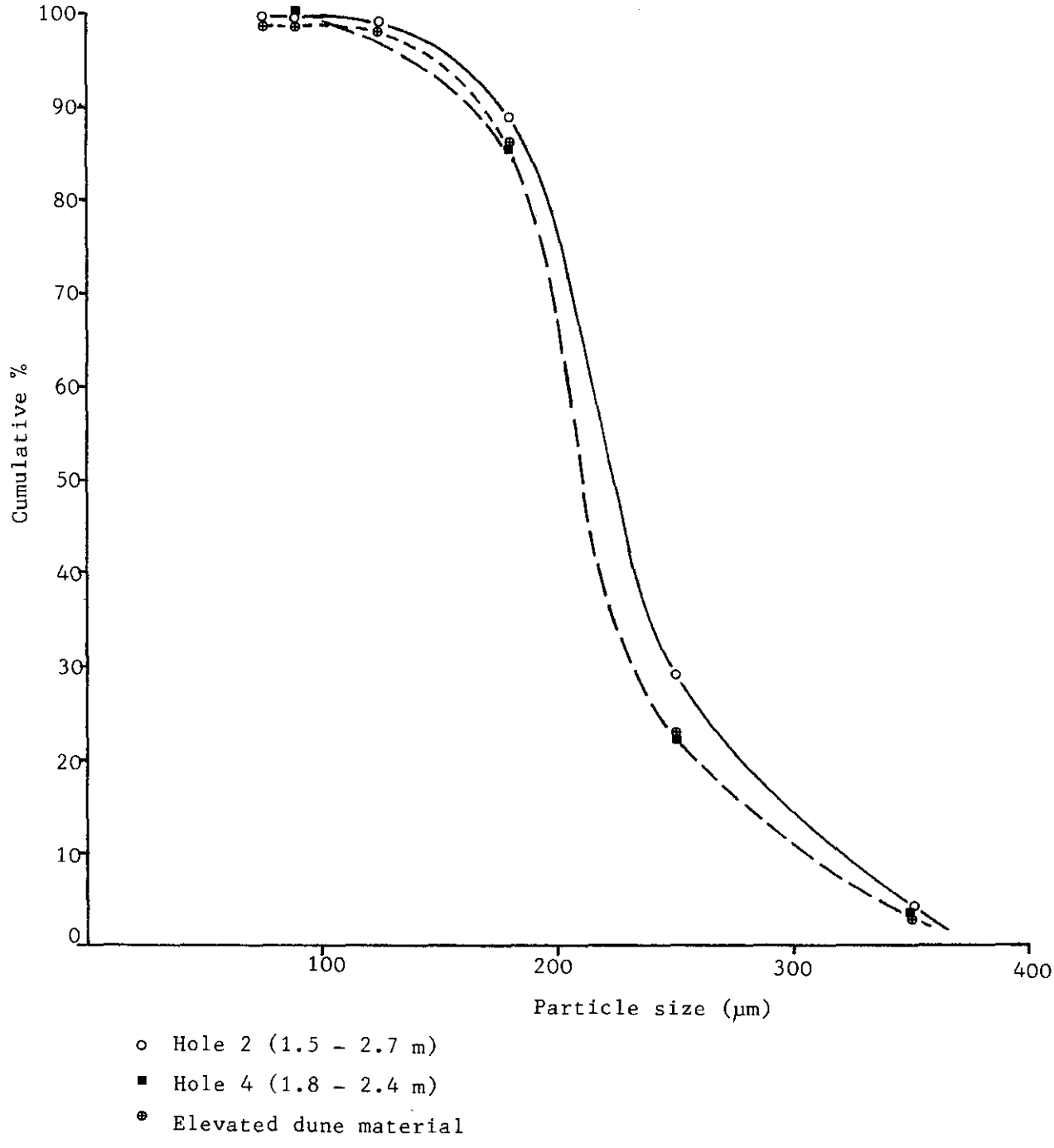

Figure 2. *Grading curves of sand samples, Arthur River.*

5 cm

The other two spears cleared rapidly, mainly because of the smaller screen opening. Some 20-30% of the sand is coarser than the screen opening width for these two spears (~0.25 mm) so that coarser material would pack around the outside of the screen quite quickly. Even when Hole 4 was pumped using suction from the top and output more than doubled, the water cleared quickly.

Although the spears were pumped separately, there is not likely to be great interference between them when pumped together, provided the output is not too great. If suction pipes are used inside the spears, an output of some 22-25 litres per minute (300-350 gallons per hour) over considerable periods is likely. From the pump tests, a yield of some 35 *l*/min is suggested and this may be obtainable over lengthy pumping periods. As indicated above, by applying suction to the top of the spears greater yields are obtained. If this system of pumping is to be used it should be only applied on spears in Holes 3 and 4, as sand problems may eventuate in Hole 2 because of the larger screen opening. It may be possible to obtain up to 38 *l*/min (500 gph) of water using this method.

WATER QUALITY

Water samples were taken from Holes 2 and 3 towards the end of pump testing and analysed at the Department of Mines Laboratory at Launceston, with the following results:-

	Hole 2	*Hole 3*
pH	7.0	7.2
Conductivity (µS/cm)	950	960
Item (mg/l)		
CO_3	nil	nil
HCO_3	310	300
Cl	160	165
SO_4	17.5	25
Ca	105	100
Mg	11.5	12.0
Fe	<0.1	<0.1
Al	<0.2	<0.2
K	3.6	3.4
Na	89	105
TDS	650	630
Hardness - Permanent	52	59
- Temporary	250	250
Alkalinity as $CaCO_3$	250	250

Water of this quality should be useable for most purposes (e.g. garden) except perhaps for the most salt-sensitive plants, lawns, septic tank and cold water supply for domestic use. If used in hot water services, damage to the heating element may result.

Bacterial problems are considered unlikely, but if the water is to be used for drinking, tests should be made. These can be undertaken by arrangement with the Government Analyst or the Department of Agriculture.

DRILL HOLE LOGS

Hole 1

0.0-0.3 m blackish sandy soil
0.3-0.6 m light grey quartz sand
0.6-0.9 m brown sand
0.9-2.7 m grey sand becoming darker towards end

Further drilling prevented by hard rock

Hole 2

0.0-0.6 m blackish grey sandy soil passing into grey sand
0.6-0.9 m brown sand
0.9-3.4 m light yellow sand
3.4-3.7 m grey sand with some clay and organic matter, some wood fragments, one rounded quartzite fragment 30 mm across.

Further drilling prevented by hard rock.

A 0.6 m long screen (No. 15), 50 mm in diameter, was installed to a depth of 2.82 m and pumped for about 1.5 hours when the final output was at the rate of about 14 *l*/min (180 gph). The standing water level was at 0.84 m. The water had an electrical conductivity of about 1050 µS/cm, indicating a salinity of about 700 mg/*l*. A sample was collected for chemical analysis.

Hole 3

A similar sequence to that in Hole 2 was obtained, with a thicker section of organic-rich material at the base. A 0.6 m long (No. 10), 50 mm diameter screen was installed to a depth of 2.87 m and pumped for 45 minutes at approximately 10 *l*/min (140 gph). The standing water level was at 0.9 m. Conductivity was measured at 970 µS/cm, suggesting about 680 mg/*l* dissolved solids.

Hole 4

This was drilled to about 3.7 m with only a little organic-rich sand at the base before hard rock was struck.

A spear was installed to 2.80 m using a No. 10 screen, 50 mm in diameter and 0.6 m long. The hole was pumped at about 10 *l*/min (140 gph) for about 30 minutes. The standing water level was about 1.25 m below the surface. The electrical conductivity was measured at 920 µS/cm (about 650 mg/*l*).

The above three spears were tested using a suction pipe inside the spear. The spear in Hole 4 was pumped by using suction from the top of the spear. This increased the output to some 22 *l*/min (about 300 gph). The same ratio of increase in output could be expected from the other spears.

CONCLUSIONS

Sufficient water of reasonable quality appears to be available from shallow dune deposits to supply the camping area and ranger's garden.

The three spears installed, if pumped together, should be capable of supplying 23 to 38 *l*/min of water (300-500 gph) over extended periods. A pump with some flexibility of output (but not higher than this range) is suggested, as summer output may be a little lower than that available in winter.

[6 August 1986]