Rept. Bk. No. 46/192
G.S. No. 1043
D.M. 486/58
HYD. 551

DEPARTMENT OF MINES
SOUTH AUSTRALIA

REPORT ON OCCURRENCE OF SALINE PATCHES

SECTION 231, HD. YANKALILLA

- E. A. WIRTH -

This property was inspected on 29/5/58.

REQUIREMENTS:

Advice on the possibility of eliminating saline patches occurring on the more gentle slopes. These patches are reported to be increasing in size and gradually extending up the slopes.

LOCATION, TOPOGRAPHY:

Lying immediately west of Mt. Hayfield, the property occupies undulating country rising to over 1,100 feet above sea level. Drainage is westerly toward Blackfellows Creek, which flows northerly and eventually joins the Yankalilla River. Average rainfall is approximately 35 inches per annum.

GEOLOGY, HYDROLOGY:

This property has been examined twice previously by geologists of the Mines Department in 1951 and 1952 with regard to underground water supplies. As was stated in previous reports bedrock consists of dense micaceous quartzites grading in parts to quartzitic schists. These rocks are part of the Kanmantoo Group, (Lower Palaeozoic) and occur over a wide area of Fleurieu Peninsula.

Within the property bedrock is obscured by lateritic deposits of clay with some gravel, except in some of the gullies where there are occasional prominent outcrops.

As a result of the previous inspections, dams were recommended as the most likely means of obtaining irrigation supplies A number of dams have been constructed and the water is used for irrigation and stock purposes.

After 2 years' irrigation from a dam in a gully toward the north eastern corner of the property, saline patches appeared, and the pasture began to die off. Irrigation of this particular area was subsequently stopped but the saline patches continued to increase in size, and now cover a considerable area.

The saline seepages are confined to the lower parts of the gullies where the slopes are quite gentle, and the steeper slopes do not appear to be affected except where bedrock outcrops and causes the sub-surface water to rise to the surface.

In the areas where saline seepages occur, lateritic clay lies at shallow depth, generally less than 1 foot. This clay is yellow brown in colour, dense, and apparently almost impervious, so that water entering the soil at higher levels tends to move downslope along the upper surface of the clay. The rate of movement of this water is extremely slow because of the clayey nature of the soil and as a result it is able to dissolve some of the soluble salts in the soil. As the water moves downslope to the flatter area toward the base of the gully its rate of movement is slowed still further and the soil becomes almost saturated. Evaporation, particularly in summer, will greatly increase the salinity of the water, to such an extent that plants cease to grow, and eventually die.

Because of the extremely poor drainage of the soil, irrigation of the area is likely to accentuate the problem. Although it was reported that irrigation water used on the worst affected area contained approximately 7 grains per gallon, this would be increased considerably by evaporation and solution of salts from the soil in adjacent areas.

Several attempts at drainage of the affected area have been carried out but apparently with little success. Two contour trenches which are now approximately 18 inches deep have been excavated on the slope above the saline patches, with the object of draining away excess soil water before evaporation increases its salinity.

At the time of the present inspection the saline area had extended up the slope above the lower of the two trenches, indicating that this method is not effective, at least on the lower slopes. It also shows that there is very poor subsurface drainage and the only real effect of the trenches is to remove wate actually flowing over the surface. Deepening of the trenches, which are already into the yellow clay, is unlikely to result in better drainage of the soil moisture and is therefore not recommended.

Recently, a ripper was used over the saline area in a direction parallel to the slope with the object of breaking up the soil and allowing freer drainage. It is too early to assess the possible benefits of this action, but in view of the clayey nature of the soil and the general waterlogging of the area it is unlikely that much good will result. Because the soil is saturated, any openings created by the ripper are not likely to persist for any length of time.

The area upslope of the saline patches is completely cleared of trees to the top of the ridge, where a metalled road has been constructed. Prior to clearing the native vegetation no saline seepages were known and it is believed that their occurrence is a direct result of clearing. During the inspection in 1951 a spring in the main gully toward the southern boundary of the Section was sampled and contained 360 grains per gallon. This spring is situated in an area which had already been partly cleared at that time.

It is considered that the native vegetation, which was apparently quite dense, transpired at a much greater rate than the pasture, and as a result a much greater volume of water now remains in the soil and gradually moves down the slope. Water would also tend to flow from the road surface and enter the soil, particularly during winter.

The overall effect is the formation of a perched water table lying on the yellow clay, the water moving very slowly down slope. The slow movement of the water enables it to dissolve some of the salts in the soil, and these are concentrated by evaporation at lower levels, where the water emerges at the surface.

The only effective remedy appears to be to restore the original balance between precipitation and transpiration losses by replanting with trees on at least a part of the slopes above the saline patches, and advice on this is considered more properly a matter for the Department of Agriculture. The trees should preferably be of a type which transpire large quantities of moisture in order to reduce as much as possible the movement of soil water down the slope. To reduce evaporation in the affected areas it might be possible to plant salt resistant grasses. These may also help in preventing further spread of the saline areas. Advice on the use of such grasses should also be sought from the Department of Agriculture.

CONCLUSIONS & RECOMMENDATIONS:

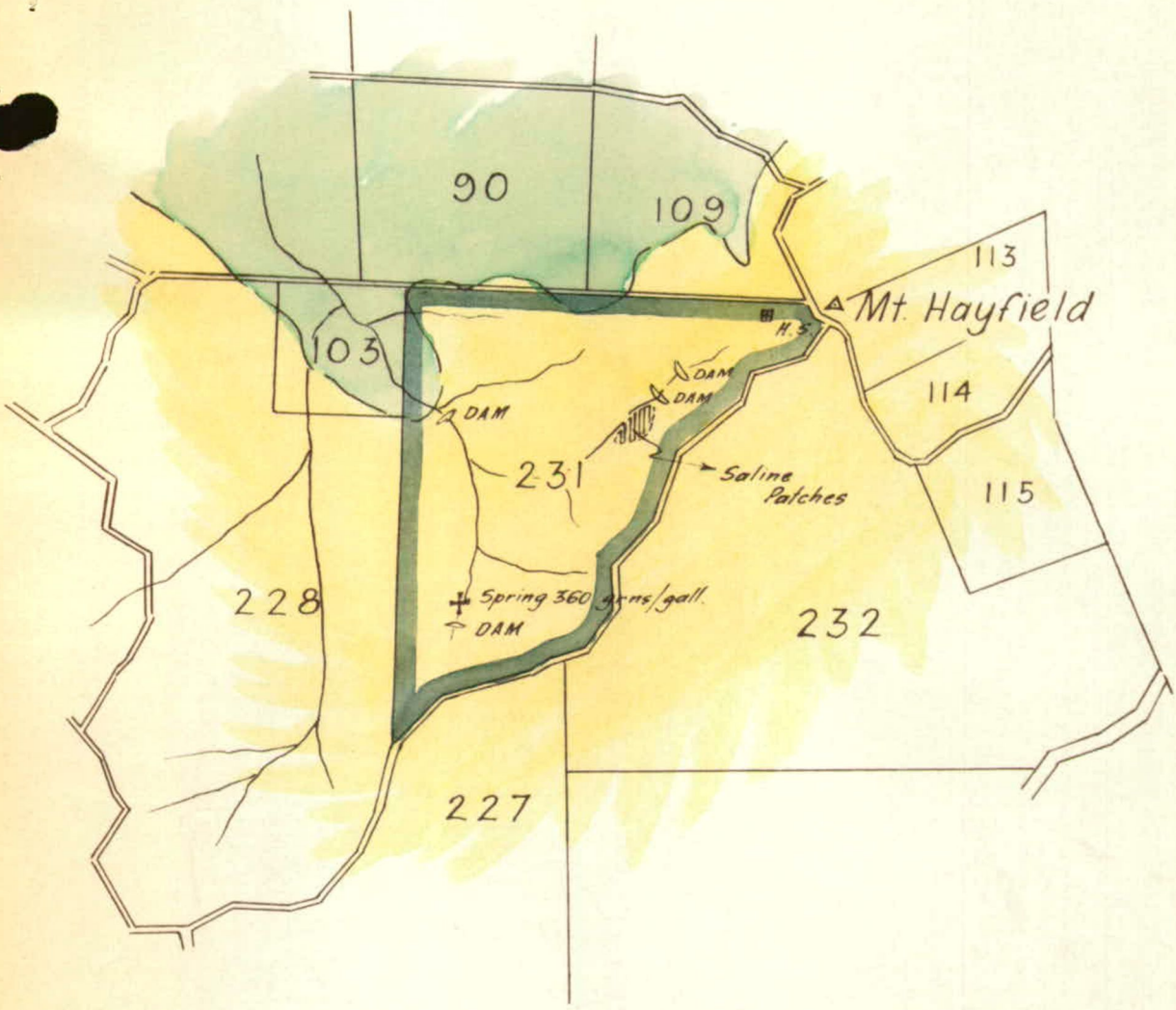
Saline patches occurring on the lower slopes of a gully toward the eastern boundary of the property appear to be a direct result of clearing the slopes above. Lateritic clay occurring at shallow depth is almost impervious, and the decreased transpiration following clearing, together with irrigation, has formed a perched water table. This water dissolves salts from the soil and eventually emerges at a lower level, where evaporation raises the salinity to the point where pastures die.

It is suggested that the only effective control is an agricultural one, directed at reducing the soil moisture and eventually eliminating the saline areas. A System of drains would not appear to be effective and is not recommended.

As irrigation is probably a factor in the development of saline areas, it may have to be confined to the more steeply sloping parts of the property where there is good subsurface drainage, and this may require soil tests. The Department of Agriculture could probably advise on areas suitable for irrigation.

R.G. Shepherd
Geologist
HYDROLOGY

RGS:AGK
10/6/58



? TERTIARY

Lateritic clay & gravel _____

LOWER PALEOZOIC

Kanmantoo Group - micaceous quartzites & mica schist. _____

To accompany report by R.G. Shepherd

S.A. DEPARTMENT OF MINES

Approved	Plotted	Dr. B.F.	Geological Survey of Hd. Yankalilla Sec. 231		40 chns. to 1 in.
		Tcd.			Hc 5. 1839
		Ckd.			
Director		Ex.	E. A. WIRTH		9·6·58

A. 1111/50
Hyd 12/5

DEPARTMENT OF MINES.

SOUTH AUSTRALIA.

UNDERGROUND WATER INSPECTION

ON SECTION 231, HD. YANKALILLA

The property of Mr. E.A. Wirth.

Location.

The property covers about 519 acres and is situated about 5½ miles S.S.W. of Yankalilla, between Mt. Hayfield and Blackfellow's Creek.

Requirements.

Mr. Wirth hopes to run about 2,000 sheep and 100 beef cattle on this property. Water is also wanted for domestic and garden use. This would entail a total consumption of about 6-7000 gallons per day. It is desired to build a homestead on a ridge at the mid-northern end of the property and to have the water supply as close as possible.

Physiography.

The south-eastern boundary of the property approximately coincides with the top of the range, of which Mt. Hayfield(1159 ft. forms the highest point. The ground generally slopes away to the west and a number of small tributary creeks unite near the centre of the property to form one major tributary of Blackfellow's Creek. The northern and eastern portions of the property are covered in thick scrub.

Geology.

On the higher country there are numerous outcrops of lateritic ironstone. Elsewhere, mainly in the gullies there are limited exposures of a banded micaceous quartzite (in part schistose). Cleavages in this rock are in a north easterly direction while bedding planes also appear to dip east to north east at an average angle of 25-30°, but possibly ranging up to 90°. The rock is fairly hard and dense, but cleavage and bedding planes may provide some sub-surface openings.

Climate.

The average annual rainfall at Yankalilla is 22.32 inches, and at Myponga and Inman Valley just over 29 inches. Probably the rainfall is over 30 inches in the ranges but no figures are available. There is a pronounced winter maximum.

Existing Water Supplies.

At the time of inspection after a dry summer there was a small flow of water from a soakage in a creek towards the south-western corner of the property. This water analysed 360 grains per gallon of soluble salts and is thus only suitable for stock. This probably constitutes a permanent spring. No attempts have been made in the area to investigate water supplies in hard rock along the range, although springs are not uncommon.

Underground Water Prospects.

The country is unexplored with regard to underground water possibilities, but the presence of springs suggests the rocks may carry reasonable supplies. On available evidence the most favourable spot for drilling would probably be just upstream from the spring. The nature and dip of the quartzite is however fairly uniform over the property, and an attempt to find water by drilling water in a gully near the proposed site for the homestead is probably warranted.

Recommendations.

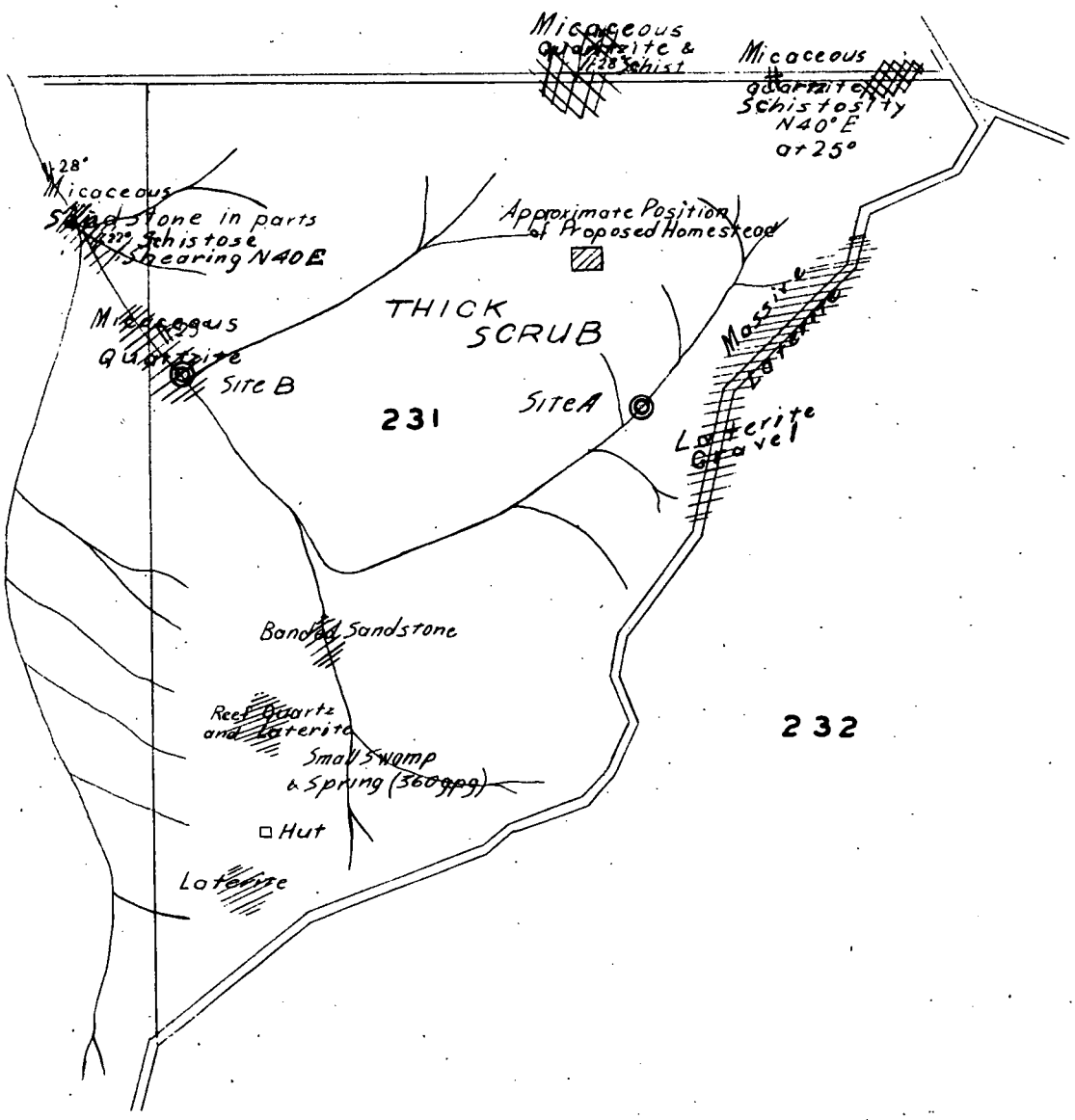
1. A bore 150-300 ft. be drilled in the gully in the vicinity of site A. It will be necessary first to partly clear the land in the area to determine whether this site is accessible for a drilling plant.

2. Should site A be unsuccessful, a second attempt could be made in the main creek where it crosses the western boundary of the property. - Site B.

3. Should both sites be unsuccessful the spring could be further explored - otherwise Mr. Wirth would have to rely on dams and rainwater tanks.

(signature)

ASSISTANT GEOLOGIST.



Survey by G.W. Cochrane

S. A. G. DEPT. OF MINES

Approved	Passed	Drn W.D.R.	Underground Water Survey	L. M. Req.	Scale 40 Chns to 1in
		Tcd	Sec 231 HD YANKALILLA		S 424
		Ckd	Mr E. A Wirth		
Director	C.D.	Exd.			Date 8-5-51 Hc 7