DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
HYDROLOGY SECTION

PROGRESS REPORT NO. 1

RIVER MURRAY DRAINAGE INVESTIGATION

by

G.T. ROBERTS
Geologist

Rept. Bk. No. 60/36
G.S. No. 3087
Hyd. 1657
D.M. 1086/63

1st March, 1965

Section

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ABSTRACT

A review is given of the progress of the investigation into the drainage problems in the irrigation areas of the River Murray.

Drilling and geological survey work have been carried out over the past four months. Both percussion and rotary machines have been used, and 53 holes have been completed to date. The area surveyed lies on the Eastern bank of the River Murray, between Swan Reach and Cadell and covers an area of about 100 square miles. This represents approximately 25% of the total area involved in the investigation.

One private irrigation scheme (Greenways) and one proposed development (Swan Reach) have been drilled in some detail. Drilling has evaluated the potentialities of six other minor zones. Detailed work has also started in the Waikerie area to examine the effectiveness of the drainage bores already in existence and to propose sites and depths for future bores.

INTRODUCTION

The River Murray Drainage Investigation began in August 1963 following a request from the Department of Agriculture. It was originally noted by Mr. Till, the Horticultural Research Officer, that clays lying comparatively near the surface could cause build up of excess irrigation water in the new irrigation areas east of Waikerie and at Swan Reach.

The first Mines Department survey took the form of a reconnaissance of the whole riverine belt from Murray Bridge to the Victorian border, to establish the extent of the impermeable clay horizons. The Quaternary succession was broadly established and the underlying Tertiary sediments were studied as possible drainage media. In his report, P.G. Miller collated

all the available information and suggested a broad pattern for future work.

Further discussions took place at the Department of Agriculture in October 1964 as a result of which detailed proposals were drawn up, assigning priority to the developing areas of the Waikerie district, Lyrup Heights and Nildottie.

THE INVESTIGATION PROGRAMME

The first detailed work was carried out in November 1964 on Sunlands Irrigation Scheme, Waikerie, when a drainage bore was drilled with a cable tool rig at the request of the Sunlands Board to solve a specific problem of water logging. The hole was cored to 109 feet and enabled a realistic assessment to be made of drainage potentialities in the various strata penetrated.

The same procedure was adopted in subsequent cored holes on Greenways Irrigation Scheme, Nildottie, Ramco Heights Irrigation Scheme, Waikerie, and in Waikerie Township. A deeper open hole was also drilled on the proposed Swan Reach Irrigation Scheme. At each of these bores the Morgan Limestone proved to be the most satisfactory drainage medium, although in the Waikerie area there is evidence that the Morgan Limestone becomes more marly eastwards from Sunlands and is therefore likely to be less satisfactory.

Attempts were made at each of the above bores to carry out tests to establish the drainage capability of the Morgan Limestone, by means of a "slug test". This method involves running a 'slug' of water into the bore as rapidly as possible until the hole is full, and then measuring the recession of the water level. Unfortunately, technical difficulties associated with small diameter holes proved insuperable and future tests will involve normal pump tests or special techniques such as the "two well" method.

A Failing rotary machine was made available for the investigation in mid-January 1965. This rig has been used almost

exclusively for shallow holes to prove the presence of the main aquiclude, provisionally named the 'Blanchetown Formation' by Spence. Some holes have also been carried down to establish the level of the top of the Morgan Limestone.

The drilling programme has been supported by field mapping along the cliffs of the River Murray and examination of exposures to the East and South of the River for a distance of up to ten miles. This work, coupled with examination of air photographs, has enabled a wider picture to be obtained of the extension of the "Blanchetown Formation" clay. Detailed maps showing the limits of the clay are in preparation.

Comparison of cliff sections with results obtained from the cored holes at Nildottie and in the Waikerie area has shown that the variation of strata is often rapid, and cliff sections are not sufficient to forecast conditions likely to obtain away from the river in the irrigation areas.

Important stratigraphical results are anticipated from the palaeontological examination of cores now in hand.

A short exploratory resistivity survey of the Waikerie-Renmark area was carried out in November 1964 by J.J. Hussin to see if electrical resistivity techniques could be used to supplement the results from bores. The results were good in some areas and inconclusive in others, and further work using this technique will be done when more powerful equipment becomes available.

DETAILED RESULTS

Area A

(Greenways Irrigation Scheme)

This area will be the subject of a separate report. Drilling was carried out in some detail with one deep cored hole (107 ft.) and eleven shallow holes (483 ft.) and this proved to be the correct approach as the geological picture evolved. The 'Blanchetown Formation' clay was located on the eastern half of the area (see map) and drainage prospects were

established as good over the whole scheme.

Area B

(Including the proposed Swan Reach Irrigation Scheme)

A separate report is also proposed for this area in view of proposals to establish a major irrigation scheme covering an area of about 550 acres.

A total of 19 holes (677 ft.) were drilled proving that an extensive area exists with excellent drainage prospects, because of the unsuspected absence of the 'Blanchetown Formation' clay. The investigation of the area remains incomplete because of the refusal of one major land owner to allow test holes to be drilled on his property. Present indications are that the potentially good area could be doubled or trebled in size in an easterly direction from the present proposal. Drilling to prove this would, however, be imperative if the land owner decided to co-operate in the future because of the unpredictable nature of the Swan Reach area.

Area C

Four check holes (154 ft.) were drilled across this questionable area. No clays are visible along the river cliffs and minor areas are under apparently successful irrigation nearby. Unfavourable results, with thick impermeable clays, were obtained along the main road at a distance of from 2 to 3 miles from the river. Any proposals to extend the present small irrigated areas should be accompanied by further drilling to establish the 'feather' edge of the clay.

Area D

A superficially attractive area exists east of Blanchetown. Recent dune sands are widespread and, in places, relatively thick. Some irrigation of vines is carried out and the main property owner intends to increase the area under irrigation in the near future.

Six holes (320 ft.) were drilled, all of which located the 'Blanchetown Formation' clay. A hole near the irrigated area recorded seepage water in the sands overlying the clay. This is an indication of future trouble, but good drainage is available in the underlying Morgan Limestone.

Areas E, F, G, & H

The areas north of the Blanchetown-Waikerie road become progressively less attractive from an agricultural point of view. The Recent dune sands tend to be very calcareous and little development has taken place except for small blocks near the homesteads on the river bank.

A total of 9 holes (361 ft.) were drilled and the main areas of occurrence of the 'Blanchetown Formation' clay have been established. Areas E and F appear to have the best potentiality for development but in both cases the nature of the dune cover may result in small discontinuous blocks suitable for irrigation. Certain more attractive areas may exist east of the Blanchetown - Cadell road but no drilling has been carried out because of the distance from the river.

CONCLUSIONS

The value of the present drilling programme has been clearly established; areas of potential drainage trouble have been delineated on an established irrigation scheme (Greenways) and a proposed major scheme (Swan Reach) has been shown to be clear of impermeable clays except for a small unimportant area at the western end (see map).

Tests carried out in the Morgan Limestone at Greenways and Swan Reach show that good drainage is available for large quantities of irrigation seepage water.

Skeleton drilling, together with examination of available surface exposures, has demarcated the areas underlain by the 'Blanchetown Formation' clay from Swan Reach to Cadell.

The preliminary work carried out in the Cadell - Waikerie area has shown that lateral variations in lithology of the Pata/Morgan Limestone sequence are probably responsible for past difficulties experienced in underground drainage. In view of the importance of this aspect of the irrigation development now being carried out in the Ramco Heights - Sunlands area further work is indicated to enable accurate advice to be given as further drainage bores become necessary.

FUTURE PROGRAMME

The basic programme of selected deep cored holes to establish the geological succession and drainage potential followed up a series of shallow holes to delineate the extent of the "Blanchetown Formation" clay sheet should be continued upstream to the Victorian border.

A simple programme such as the one reported on above involves an expenditure of the order of £1000 per month. A further one month's work is envisaged as a minimum for the Cadell - Waikerie area after which the survey will move upstream towards Lyrup Heights. It is estimated that approximately £4,000 will be needed to cover anticipated expenditure up to the end of June 1965.

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HYDROLOGY

GTR:AGK
1/3/65

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Morgan

CADELL

H

G

F

MURBKO

E

HOLDER

WAIKERIE

D

Blanchetown

PAISLEY

C

B

NILDOTTIE

A

Vide Enlargement No. 1.

Vide Enlargement No. 2.

Swan Reach

Sunlands No.1

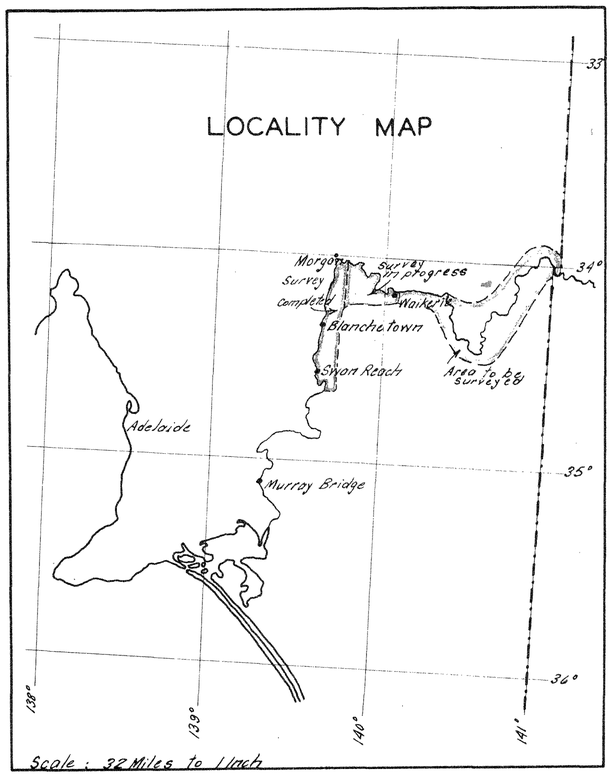
Waikerie

Waikerie Hospital Bore

Ramco Heights No.1

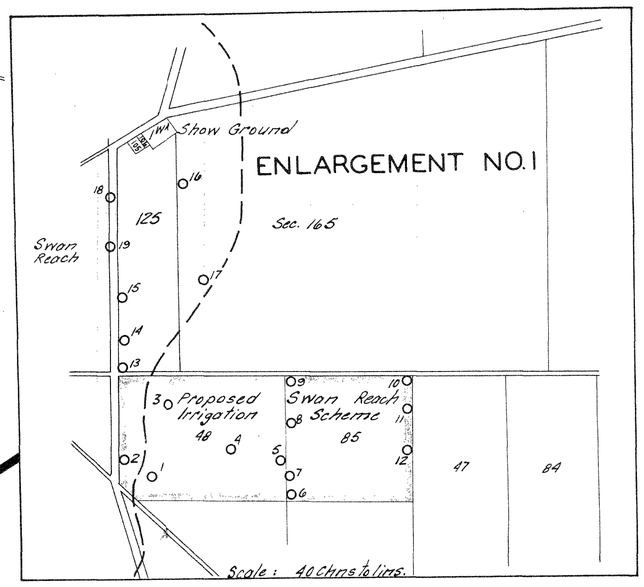
N

LOCALITY MAP



Scale : 32 Miles to 1 Inch

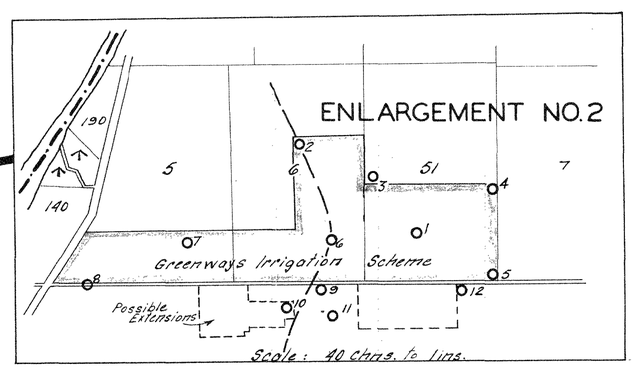
ENLARGEMENT NO.1



Scale : 40 Chns to 1 ins.

Clay

ENLARGEMENT NO.2



Scale : 40 Chns. to 1 ins.

SCALE

Miles 2 1 0 2 4 6 Miles

To accompany report by G.T. Roberts

S.A. DEPT. OF MINES

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RIVER MURRAY DRAINAGE INVESTIGATION

PROGRESS MAP NO. 1

Associated Drawing	No.	No.	Amendment	Exd.	Date

Req, No.
D.M.
Compiled from

Approved	Passed		Scale As shown
		Drn.	65-128
		Tcd. B.L.S.	Ja 1/3+6/7
Director of Mines		Ckd.	
		Exd.	Date 26-2-65