DEPARTMENT OF MINES
SOUTH AUSTRALIA

Report on

DIAMOND LAKE GYPSUM DEPOSITS

SECTIONS 10, 16, 19, 21, 22, 23, HD. STOW

(C.D. BARTSCH)

by

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Geologist

MINERAL RESOURCES SECTION

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PLAN NO.	TITLE	SCALE
57-261	Diamond Lake Gypsum Deposits Hd. Stow	1" = 20 chains

D.M. 802/51

M.O. Report No. Refer 45/32

G.S. Report No. Refer 762

14th August, 1957.

DEPARTMENT OF MINES
SOUTH AUSTRALIA

Report on

DIAMOND LAKE GYPSUM DEPOSITS

SECTIONS 10, 16, 19, 21, 22, 23, HD. STOW

INTRODUCTION:

Gypsum deposits occurring at Diamond Lake are at present being worked at the rate of 200 tons per week by Mr. C.D. Bartsch of Nuriootpa. The area of the deposits is private property owned by Mr. E.W. Wilson of Whitwarta, with minerals alienated from the Crown.

Seed gypsum is transported by road to the South Australian Portland Cement Company's works at Angaston, a distance of approximately 60 miles. Gypsum is used in the final stages of the manufacture of cement, its purpose being to slow down the setting rate of the product.

During 1955 Mr. C.M. Willington (Mining Engineer) investigated the Diamond Lake deposits in connection with their possible use in the manufacture of plaster. A 10 ton sample of seed gypsum was taken from Section 19 by arrangement with the owner and tests were carried out at Pt. Pirie. A satisfactory plaster was made from the sample but the colour was off white, and the quantity available was estimated to be less than 4,000 tons. This quantity was insufficient to be of interest to plaster manufacturing organizations.

The South Australian Portland Cement Company now require gypsum at the rate of 200 tons per week and supplies were initially obtained from deposits approximately 3 miles south east of Blanchetown. Following the closing of the Blanchetown punt during 1956 it was necessary to find other sources of gypsum and operations then commenced at Diamond Lake. Operations are continuing at this locality although the Blanchetown deposits are again accessible.

Following an inspection in February 1957 by Mr. Willington, when the deposit was proving more extensive than when first examined, it was suggested that a more detailed geological examination be made.

The present examination was made during the period 16th-18th July and entailed the drilling of 12 test holes, from which samples were collected for assay.

LOCATION:

Diamond Lake is situated approximately 2 miles north west of Whitwarta, the main road from Balaklava to Snowtown crossing its northern end.

TOPOGRAPHY:

The lake occurs in a long and relatively narrow depression near the western boundary of the northern Adelaide Plains. Bedrock forms the prominent ridge to the west of Diamond Lake and the land surface slopes gently down to lake level. Numerous small creeks originate in the high ground to the west.

On the eastern side of the lake the surface rises to form a low ridge approximately 30 feet above lake level and trending parallel to it. Beyond, the land surface is gently undulating with occasional partly consolidated sand dunes.

The Diamond Lake depression trends north-north-easterly over a length of almost 4 miles with a maximum width of approximately ½ mile in the vicinity of Section 10. The lake itself normally occupies the northern part of the depression, merging into samphire swamp toward the south.

GEOLOGY:

The area of Diamond Lake is underlain by Tertiary to Recent deposits consisting of sand, clay and limestone and including lignite in the vicinity of Whitwarta.

Bedrock of Cambrian age occurs in the high ground to the west of the lake.

GYPSUM DEPOSITS:

Gypsum occurs as the seed and flour varieties in thin irregular deposits along the eastern margin of the depression.

Seed gypsum occurs in two long low dunes rarely exceeding 4 feet in height and stretching from Section 10 to Section 19 along the eastern shore of the lake. Further south in the area of samphire swamp two other low dunes occur, one of which lies across the depression and probably formed at a period when water in the lake reached a higher level than it does at the present time.

Seed gypsum normally forms a prominent dune along the south eastern shore of gypseous lakes in South Australia. It would have been expected that such a dune would occur opposite Section 10 at the widest part of the lake, However, only a low dune has formed here, possibly because of the presence of high ground to the north west, causing the wind speed to become slower. As a result, less gypsum would be blown up to form a dune.

Toward the southern part of the depression the dunes, although still low, contain considerably more gypsum than the one occurring on Section 10 and it appears that conditions were more favourable for deposition. This was probably the shallow water end of the lake, which dried out earlier in summer.

The gypsum occurring in these dunes is normally of good quality but extraction is difficult especially during the winter when lake level is likely to be high. In addition vegetation on the dunes presents a problem and has to be removed before the gypsum is used.

Flour gypsum is more widespread and forms a thin cover over considerable areas east of the Diamond Lake depression. The thickest deposits occur along the flanks of the ridge, immediately east of the depression, and opposite the seed dunes, from which it is probably derived. In parts this gypsum is quite impure, being mixed with varying proportions of clay.

Quarrying operations on Section 19 have shown that, in

places, good quality seed gypsum underlies the flour variety. Seed gypsum was also found to occur beneath flour on Sections 22 and 23 and in the northern part of Section 19. These occurrences appear to indicate a secondary period of deposition of the seed gypsum, probably derived from the original dunes. Although these deposits are more easily worked than the dunes, they are extremely irregular and in most cases probably small.

Several small cuts have been made on the slopes of the ridge north of the main quarry, in an area where a considerably quantity of seed gypsum was thought to occur. The area generally is covered by flour gypsum and several test holes put down revealed a worthwhile thickness of seed gypsum. Subsequent quarrying operations showed that the "seed" occurred as lenses and irregular masses in flour gypsum which often contained considerable quantities of clay.

In the main quarry the seed gypsum is partly consolidated and varies in thickness from 4 feet on the western side to 1'6" in the eastern wall, indicating that it is wedging out toward the ridge. It is expected that this feature will be common to all secondary deposits along the flank of the ridge. It is reported that testing has shown seed gypsum to extend a short distance south of the quarry but test holes near the summit of the ridge have intersected only flour gypsum.

During the present examination 12 test holes were drilled, mainly in areas where considerably quantities of flour gypsum occur. Their locations are shown on the accompanying plan. As a result of this testing it appears that the secondary deposits of seed gypsum normally occur opposite the dunes, although none were located on Section 10. In this connection it seems probable that thicker and better quality seed gypsum will occur toward the southern part of the depression.

The areas where good quality seed gypsum has been found to occur are normally of slight prominences such as that in the

vicinity of Bore No. 11. In this bore 4'6" of seed gypsum was encountered and although its extent is not known it is probably continuous to the base of the ridge. To the east the seed gypsum wedges out rapidly as none was found to occur in Bore No.12 some 17 yards east of Bore No.11.

The main quarry on Section 19 is situated in an area of slightly higher relief with a cover of flour gypsum and it seems possible that a similar deposit of seed gypsum could occur in the vicinity of Bore No.11. However, further testing would be necessary to determine the extent of the seed gypsum in this area.

GRADE:

Samples of seed gypsum from 6 boreholes have been assayed for gypsum, calcium carbonate and acid insoluble material. The results show that the seed gypsum occurring along the flank of the ridge is usually of good quality, the majority of samples assaying over 93% $CaSO_4 \cdot 2H_2O$.

A sample taken from Bore No.4 situated in a low dune adjoining Section 10 contained 75% $CaSO_4 \cdot 2H_2O$. It is doubtful whether the grade is high enough for cement manufacture and in addition reserves are small and extraction difficult especially during winter when lake level is high.

Results of analysis are as follows:-

Section No.	Bore No.	Depth	Gypsum ($CaSO_4 \cdot 2H_2O$)	Calcium Carbonate ($CaCO_3$)	Acid Insoluble Material
22	1	4'3" - 5'9"	84.4%	0.40%	10.2%
Adjoining Sec. 10	4	2' - 4'	75.0%	Nil	14.5%
19	6	2' - 4'5"	95.4%	Nil	0.75%
19	7	3'9" - 4'9"	93.4%	Nil	3.68%
19	10	1'7" - 3'3"	94.8%	0.20%	2.60%
19	10	3'3" - 6'0"	97.3%	0.10%	1.22%
23	11	1'4" - 5'10"	93.5%	0.20%	4.1%

RESERVES:

Because of the irregular manner in which gypsum has been deposited along the eastern side of Diamond Lake, it is not possible to give an estimate of reserves. It would be necessary to carry out a close pattern of drilling in order to determine the extent of seed gypsum in areas where it has been found in test bores. However, the results of such drilling may be misleading in view of the fact that seed gypsum has been found to occur as relatively small masses within flour gypsum.

Better results may be obtained by removal of overburden in the form of flour gypsum in those areas where seed gypsum occurs.

SUMMARY & CONCLUSIONS:

Seed gypsum occurs in low dunes and also as relatively small scattered deposits along the flank of the ridge on the eastern side of Diamond Lake. The latter deposits are overlain by flour gypsum of variable thickness and covering considerable areas.

The seed gypsum dunes have only been worked on a small scale, because of the difficulty of extraction when lake level is high and the necessity to remove vegetable material before the gypsum is used.

During the present examination 12 test bores were drilled along the flank of the ridge and, of these, 5 intersected good quality seed gypsum. These were Bore Nos. 1, 6, 7, 10 and 11. Bore No.4 was situated on the low dune adjoining Section 10. The results of the drilling indicate that seed gypsum wedges out rapidly toward the ridge. This feature is also shown in the main quarry on Section 19 where a thickness of approximately 4' of seed gypsum on the western side decreases to 1'6" in the east.

Small cuts north of the main quarry show that the seed gypsum occurs as irregular masses within the flour variety. Such an association probably occurs elsewhere, but further

testing is necessary before the full extent of the deposit is known.

In order to obtain some indication of reserves of seed gypsum along the flank of the ridge it would be necessary to drill a close pattern of holes in those areas where it has been found. This would involve drilling at an interval of 20 feet or less and a better method appears to be removal of overburden of flour gypsum to expose the seed below.

There are three areas in which it is suggested that removal of overburden may reveal considerable quantities of seed gypsum. These are as follows:-

(1) In the vicinity of Bore No.11 and westward to the base of the ridge. Overburden is not expected to exceed 3' in thickness.

(2) Westward from Bore No.1 where a thickness of 1'6" of seed gypsum was found at a depth of 4'3". Overburden is expected to become thinner toward the west, while the thickness of seed gypsum may increase.

(3) The area extending from Bore No.6 to Bore No.10 and westward to the base of the ridge. Although good quality gypsum has been found on the flat west of the ridge in Bore No.7, quarrying operations would be difficult as water occurs at shallow depth.

It is possible that there are other areas along the eastern shore of Diamond Lake where useful quantities of seed gypsum occur, but it is unlikely that large deposits will be found north of Section 16. It appears that the best seed gypsum deposits occur south of this Section and usually opposite the low dunes stretching along the eastern shore of the Diamond Lake depression.

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R. G. Shepherd - Geologist
Mineral Resources Section.

RGS:AGK

DIAMOND LAKE GYPSUM, HD. STOW

BORE HOLE LOGS.

Bore No. 1 — Section 22

0 - 6"	Light brown loam.
6" - 4'3"	Slightly discoloured flour gypsum, clayey below 3 feet.
4'3" - 5'9"	Light brown seed gypsum.
5'9" - 12'6"	Brown clayey flour gypsum with some seed in upper part

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Bore No. 2 — Section 10

0 - 1'9"	Red brown sandy clay.
1'9" - 7'6"	Clay with nodules of gypsum grading to clayey flour gypsum.
7'6" - 8'2"	Red sandy clay with occasional crystals of gypsum.

Bore No. 3 — Section 10

0 - 1'	Light brown flour gypsum
1' - 2'6"	Brown sandy clay with occasional gypsum crystals
2'6" - 3'2"	Red brown sandy clay with considerable gypsum.
3'2" - 4'2"	Red brown sandy clay.

Bore No. 4 — Diamond Lake, adjacent to Section 10

0 - 2'	Brown seed gypsum
2' - 4'	Light brown seed gypsum.
4' - 5'3"	Brown clayey seed gypsum.
5'3" - 5'10"	Chocolate brown clay.

Bore No.5 — Section 16

0 - 1'3"	Red brown sandy clay.
1'3" - 3'	Light brown flour gypsum becoming browner with depth.
3' - 4'	Clayey flour gypsum with occasional "seeds"
4' - 6'4"	Brown clay with occasional gypsum crystals.

BORE HOLE LOGS (Contd.)

Bore No. 6 Section 19

0 - 2'	White to light brown flour gypsum.
2' - 4'5"	Light brown seed gypsum.
4'5" - 6'2"	Brown clayey sand with some gypsum.

Bore No.7 Section19

0 - 11"	Brown gypseous clay.
11" - 2'6"	Brown flour gypsum.
2'6" - 2'9"	Brown seed gypsum.
2'9" - 3'9"	Brown clayey flour gypsum.
3'9" - 4'9"	Fine brown seed gypsum.
4'9" - 5'2"	Brown clay with occasional gypsum crystals.

Bore No. 8 Section 16

0 - 1'4"	Light brown flour gypsum.
1'4" - 2'6"	Brown clayey flour gypsum.
2'6" - 4'6"	Brown clay with occasional gypsum crystals.

Bore No.9 Section 19

0 - 1'9"	Red brown sandy clay.
1'9" - 2'9"	Brown clayey flour gypsum.
2'9" - 3'9"	Light brown flour gypsum.
3'9" - 7'	Red brown clay and flour gypsum.
7' - 7'4"	Light brown flour gypsum with occasional "seeds".
7'4" - 7'10"	Brown clay.

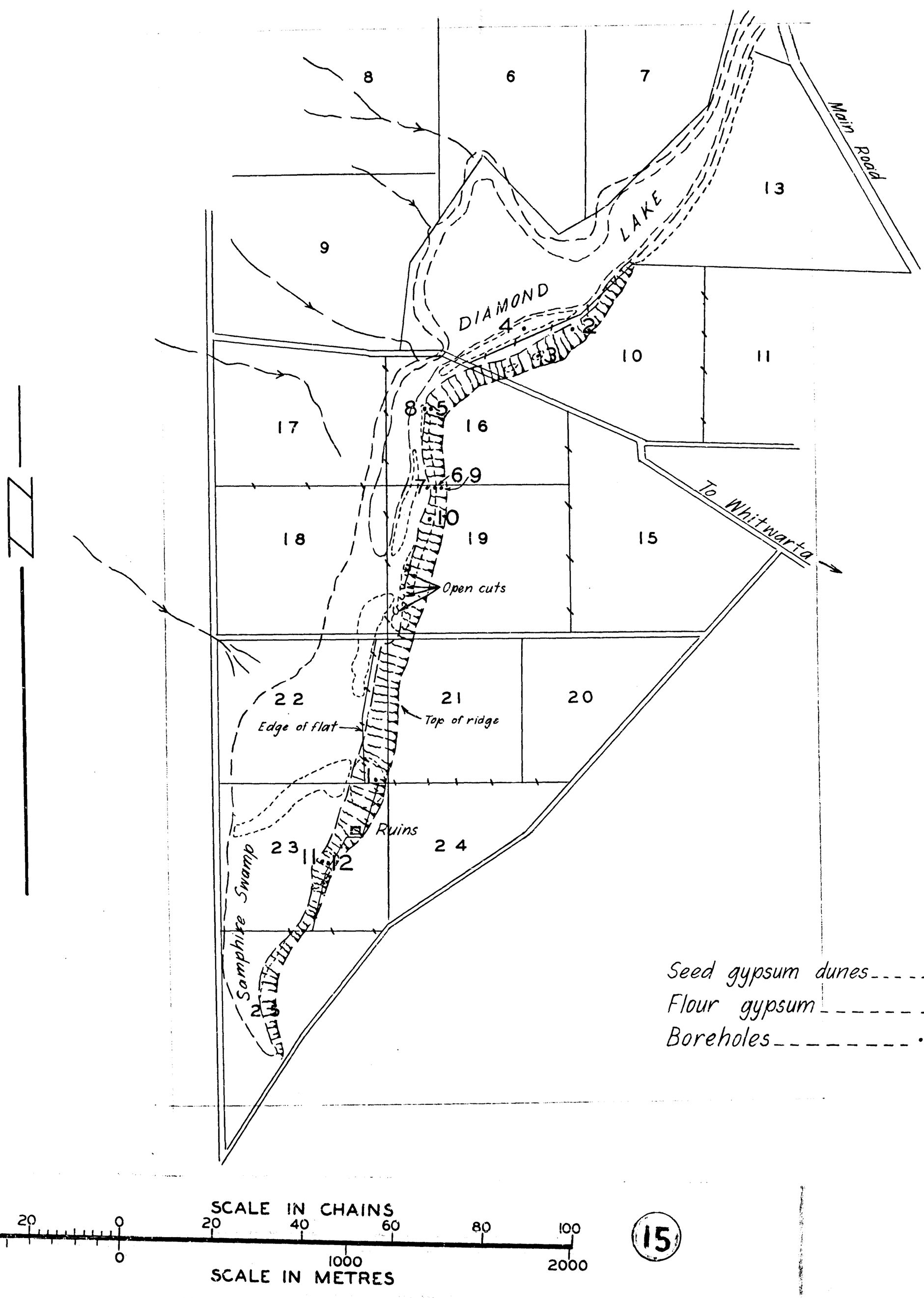
Bore No.10 Section 19

0 - 1'7"	Light brown flour gypsum.
1'7" - 3'3"	Light brown fine gypsum sand.
3'3" - 6'	Light brown seed gypsum with some flour.
6' - 6'9"	Yellow brown seed gypsum grading to flour gypsum.
6'9" - 10'1"	Clayey flour gypsum grading to clay.

BORE HOLE LOGS (Contd.)

Bore No. 11	Section 23.
0 - 1'4"	Light brown flour gypsum.
1'4" - 5'10"	Light brown coarse seed gypsum.
5'10"- 6'6"	Brown clayey flour gypsum with some seed.

Bore No.12	Section 23.
0 - 5'5"	White to light brown flour gypsum.
5'5" - 6'	Red brown clayey flour gypsum.



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To accompany report by R.G.Shepherd.

S.A. DEPARTMENT OF MINES

DIAMOND LAKE GYPSUM DEPOSITS
HD. STOW

No.	Amendment	Exd.	Date

Approved	Passed		Scale : 20chns to 1"
		Drn. R.G.S.	57·261
		Tcd. B.F.	Gd 14
Director		Cvl. R.R.	Date 1-8-57
		Exd.	

HUNDRED OF GOYDER

LAKE DIAMOND

Swamp

Fence

Fence

Open Cuts

Samphire

Ruins

To Whitwarta

8 6 7 13 4 2 F F 3 10 11 17 8 5 7 16 6 14 9 10 15 18 19 N 22 21 20 I 24 11 12 23 25

LEGEND

Seed gypsum dunes

Flour gypsum F

Boreholes 10

SCALE

CHAINS 20 0 20 40 CHAINS

57-261 R. G. Shepherd, Geologist S.A. Dept. of Mines