DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO. 81/36
CONSTRUCTION SAND SURVEY
MORGAN AREA
- DISTRICT COUNCIL OF MORGAN -

GEOLOGICAL SURVEY

by

D.C. SCOTT

MINERAL RESOURCES SECTION

DME.NO.206/79

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DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept.Bk.No. 81/36
DME No. 206/79

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ABSTRACT

A ridge of coarse, Holocene, Coonambidgal Formation sand, in the Morgan Conservation Park, has been the traditional source of sand for the district. The Department for the Environment has refused the District Council of Morgan further access to this deposit.

A survey for alternative sources located a potential deposit in the River Murray valley, 7 km east of Morgan and two other possible sources nearby. However, this deposit is inferior to the Morgan pit as a maximum thickness of only 0.5 m of suitable sand is interbedded with finer material. Drilling is required to evaluate the deposit. Mining at these sites, unlike the Morgan pit, would require removal of large quantities of overburden, creating a visual scar in an environmentally sensitive area. Two other sand deposits indentified during the survey are too fine to warrant further investigation.

Prior to further investigation, negotiations with the Department for the Environment are recommended to find an acceptable mining method for the existing deposit. The District Council is prepared to rehabilitate the mined area and mine the required annual production, of about 500 tonnes, in one operation to reduce impact.

INTRODUCTION

A request to locate an alternative source of construction sand was made by the District Clerk of Morgan, Mr. E.J. Commane, in March 1979. The current pit, on section 316, hundred Cadell, lies within the Morgan Conservation Park, now controlled by the Department for the Environment. An application for further sand mining has been refused.

R. Salisbury, Council Overseer, reported that until the recent closure, approximately 500 tonnes per year were mined from the pit, which has been used for more than 60 years. Other deposits in the area have been tried but are unsatisfactory. Due to transportation costs, sources outside the district are expensive e.g. sand from Gawler costs about $20 per tonne. The Council is prepared to rehabilitate the pit (see Pls.1 and 2) and conduct mining operations in an acceptable manner.

The District Clerk was interviewed and the pit inspected on 23rd January 1980, by J.G. Olliver (Supervising Geologist), A.M.Pain (Senior Geologist) and P.D. Johnson (Geologist) and again on 26th March 1980, by P.D. Johnson and the author. The investigation was undertaken between 28th April and 1st May 1980, with the assistance of S.J. Ewen (Field Assistant).

Six sand samples collected during the survey were submitted to the Australian Mineral Development Laboratories (AMDEL) for size analyses, results are detailed in the Appendix with locations shown on Figure 2.

GEOLOGICAL SETTING

The accompanying regional geology plan and stratigraphic table (Fig. 1) are based on RENMARK (Firman 1971). The geology of the Murray Basin is summarised below from Firman (1973).

Oldest sediments exposed in the Morgan area are sandy limestone and calcarenite overlain in part by estuarine oysterbeds with quartz sand interbeds. These Tertiary deposits crop out in cliffs, up to 45 m high, along the Murray River valley and are overlain by Pleistocene fossil soil, sand and clay horizons.

Large areas, south of Morgan and ~~west~~ east ? of the river, are mantled with Bunyip Sand. This Holocene, aeolian, red-brown, quartz sand is fine to medium grained and occurs as dunes or spreads on the Pleistocene sediments.

The youngest deposits within the area comprise clay, silt and sand of Coonambidgal Formation in and adjacent to the present stream channels within the Murray River tract. Within these generally fine grained, grey sediments are occasional zones of coarser white to pale yellow-brown sand.

FIELD SURVEY

Method of Investigation

During the preliminary inspections, it was apparent that the most prospective area would be the flats, adjacent to the River Murray. Away from the river valley, aeolian dune sand and associated sand spreads are too fine grained for construction purposes and suitable only for filling sand.

The investigation was confined mainly to the river flood plain, between Cadell and Murbko (see Fig. 2). South Australian Department of Lands coloured aerial photographs (Survey 2175, scale 1:35 000) were examined stereoscopically. All features, such as possible sand ridges or spreads, were marked for later field inspection.

Results of Investigation

Most of the features observed stereoscopically in the river valley, are old river levees or ridges formed during flooding. White spreads are generally silty sand, derived from grey sandy silt which comprises most of the riverine deposits.

Sand deposits identified during the survey are shown on Figure 2, together with sample locations. These deposits are discussed below as well as the Morgan and Cadell sand pits.

Deposit 1: Ridge, about 300 m long and up to 10 m high, similar to the ridge at the Morgan pit. However, the bulk of the sand is fine to medium grained. Even the coarsest sand which is exposed in a small pit near the base of the ridge, is outside specification.

Deposit 2: Spread of pale yellow, mainly fine with some coarser grained sand. The sand does not meet construction sand specification, but is suitable for plaster sand. This deposit is the only one tested outside the river valley and is much coarser than the usually reddish, fine grained aeolian sand in the region.

Deposit 3: Spread of white, mainly fine to medium grained sand overlying layers of coarser sand. Maximum thickness of coarser sand encountered in a hand auger hole was 0.7 m, represented by sample A451/80. Even this material is marginally too fine to meet specification.

Deposit 4: White, coarser sand as a spread is near two ridges of finer grained sand. Several hand auger holes were drilled near sample point A450/80. Layers of coarser sand, up to 0.5 m thick, were encountered similar to Deposit 3. Sizing is close to that from the Morgan pit (see Appendix).

Drilling is required to locate mineable thicknesses of sand and establish reserves. Mining in this locality would require removal of substantial quantities of fine grained material above the coarser sand.

Deposit 5: Large deposit of white, fine to medium grained sand. No sand suitable for construction purposes was encountered, this deposit was not sampled.

Cadell sand pit: Lenticular bed of coarse sand, up to 2.5 m thick in the pit, with silty bands and carbonate inclusions. Finer, silty sand is exposed near the base of the pit. These Loxton Sands are overlain by cemented oyster shells of the Northwest Bend Formation; minimum thickness near the pit is 2 m.

This pit is used by the Engineering and Water Supply Department as a source of construction sand for channels within the Cadell Irrigation Area. Small quantities have been used by the Morgan Council, but access to the sand is limited by overburden between 2 and 10 m thick which was previously ripped and removed for road construction. The above Department will not permit further use of the sand by the Council.

Morgan sand pit: Sand ridge approximately 350 m long, 50 m wide and up to 8 m high. The pale brown sand is mainly fine to coarse grained with a few narrow greyish silty lenses up to 20 cm thick. Workings are confined to the eastern end, where mining has been conducted in an unsystematic manner down to approximately 1.5 m below the river flat (see Pls. 1 and 2).

RESULTS OF TESTING

Six samples were forwarded to AMDEL for sieve analyses, results are plotted graphically in the Appendix, together with the grading limits for natural fine aggregates as defined by Australian Standard (A.S.) 1465-1974.

Sand size grading can also be represented by two parameters:-

(a) The Fineness Modulus (F.M.) on a "fines free" basis.

(b) The Fines content - the percentage of minus 0.075 mm material which represents silt and/or clay content

To meet specification A.S. 1465-1974, the sand must have a F.M. in the range 1.35 to 4.00 inclusive and a maximum Fines content of 5 per cent.

Results are summarised in Table 1 from data in the Appendix.

TABLE 1

SUMMARY OF RESULTS

Deposit	1	2	3	4	Cadell pit	Morgan pit
Sample No.	A453/80	A452/80	A451/80	A450/80	A449/80	A448/80
F.M.	1.30	1.24	1.36	1.64	1.61	1.67
Fines (%)	1	2	1	1	5	2

Sand from Deposits 1 and 2 is too fine to warrant further investigation. Whilst samples from Deposit 3 and the Cadell pit meet the above criteria they are marginally outside A.S. 1465-1975 (see Appendix). Sand from Deposit 4 has similar sizing to that from the present Morgan pit which conforms to A.S. 1465-1974.

CONCLUSIONS AND RECOMMENDATIONS

A deposit within the Morgan Conservation Park has been a traditional source of construction sand in the area. A survey to

locate an alternative source followed refusal by the Department for the Environment, of the District Council's application to continue using this deposit.

Preliminary investigations indicated that potential deposits of construction sand would be confined to Holocene sediments of the Murray River valley. This generally fine grained alluvium, of Coonambidgal Formation, contains occasional zones of coarse, clean sand.

The survey located a deposit 7 km east of Morgan(Deposit 4), with sizing close to sand from the Morgan pit. However, this site has the following disadvantages compared to the Morgan Pit:

- a known thickness of only 0.5 m compared to 8 m at the pit.
- substantial quantities of overburden would have to be removed.
- further evaluation required to locate mineable thicknesses and establish reserves.
- the removal of overburden, which would create a significant visual impact in an environmentally sensitive area, near the Murray River.

Two other potential deposits of clean, white sand were found(Deposits 3 and 5), but sizing is below specification. They may warrant further investigation should Deposit 4 prove unsatisfactory. Sand from Deposits 1 and 2 is too fine for further consideration.

Prior to further investigation, negotiations between the Department for the Environment and the Environment and Resource Management Branch of this Department are recommended to determine an acceptable method of mining at the Morgan pit. The District Council is prepared to rehabilitate the mined out area and

conduct future mining in a manner that will minimise the visual impact. The effects of mining could be further reduced by obtaining a year's supply, of approximately 500t, in one operation and stockpiling on council property.

D.C. Scott

D.C. SCOTT

GEOLOGIST

REFERENCES

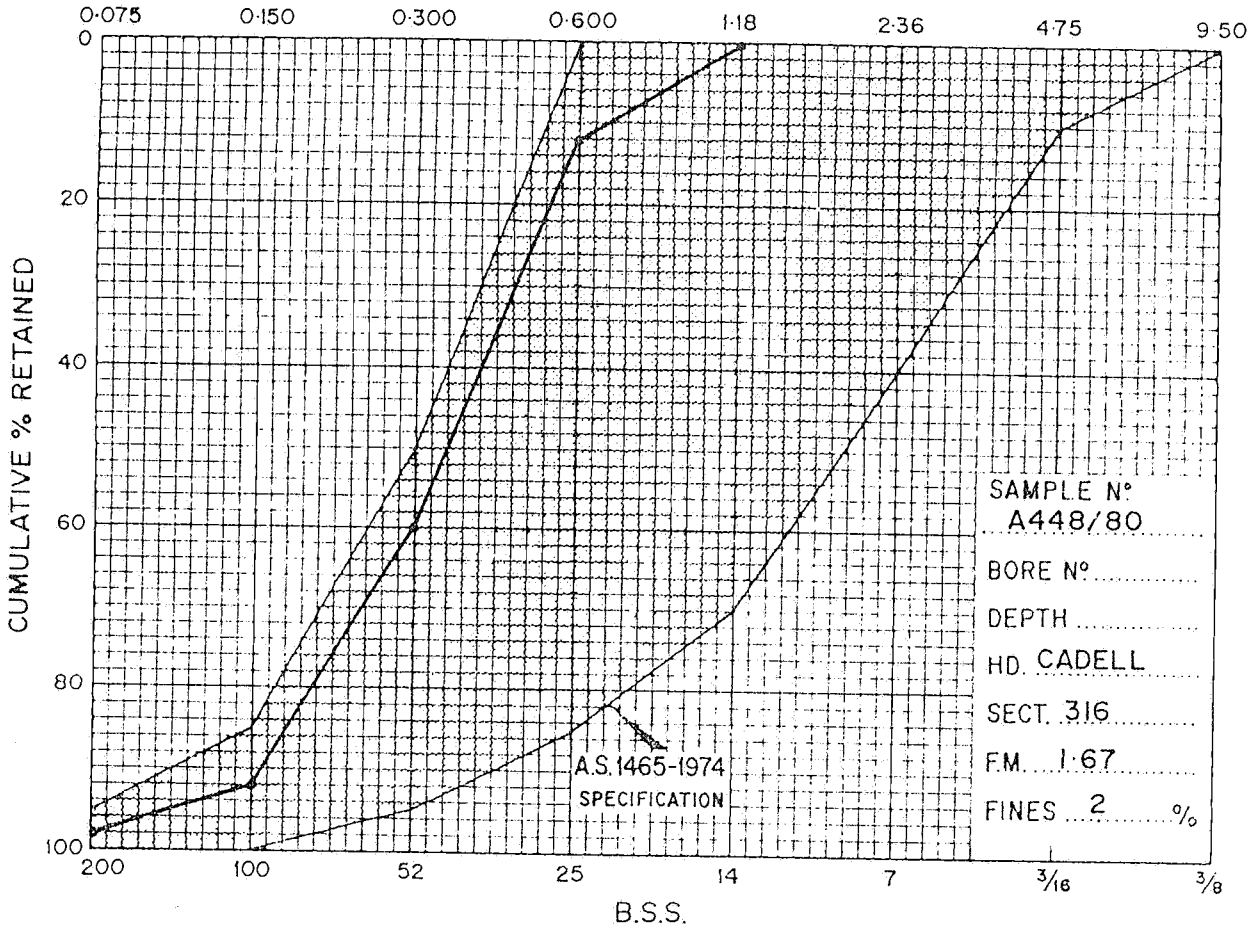
Firman, J.B., 1971. RENMARK map sheet, Geological Atlas of South Australia, 1:250 000 series, geol. Surv. S. Aust.

Firman, J.B., 1973. Regional stratigraphy of surficial deposits in the Murray Basin and Gambier Embayment. Rep. Invest., geol. Surv. S. Aust., 39: 68 pp.

APPENDIX
Sieve sizing analyses
Graphical plots
Extracted from AMDEL report
MD 5197/80

by

Lyn J. Day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0·150
0·300
0·600
1·18
2·36
4·75
9·50
mm.
0
20
40
60
80
100
CUMULATIVE % RETAINED
200
100
52
25
14
7
3/16
3/8
B.S.S.
A.S.1465-1974
SPECIFICATION
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A448/80
BORE N°
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HD. CADELL
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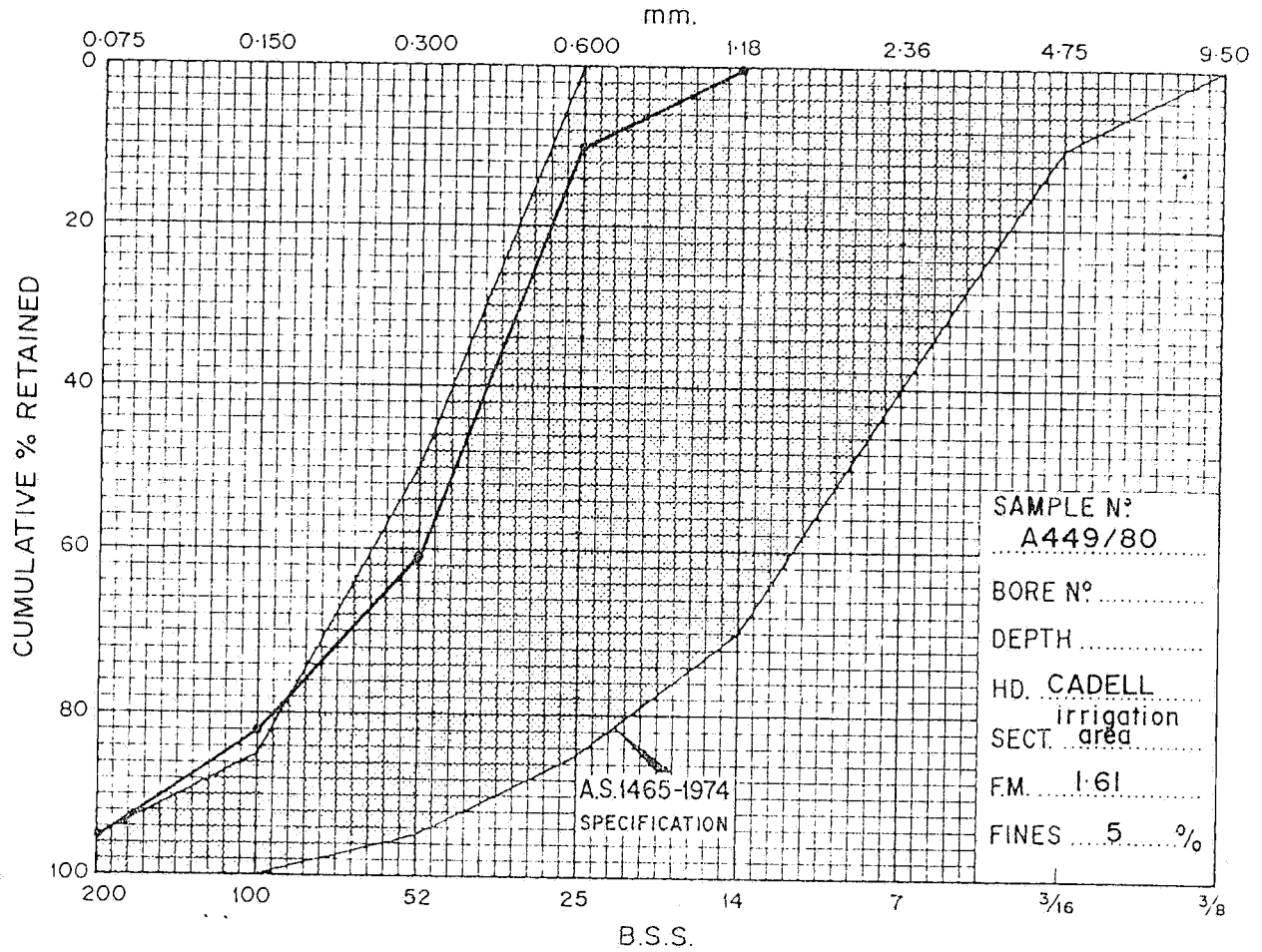
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CUMULATIVE % RETAINED
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52
25
14
7
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B.S.S.
A.S.1465-1974
SPECIFICATION
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A449/80
BORE N°
DEPTH
HD. CADELL
SECT. irrigation area
F.M. 1·61
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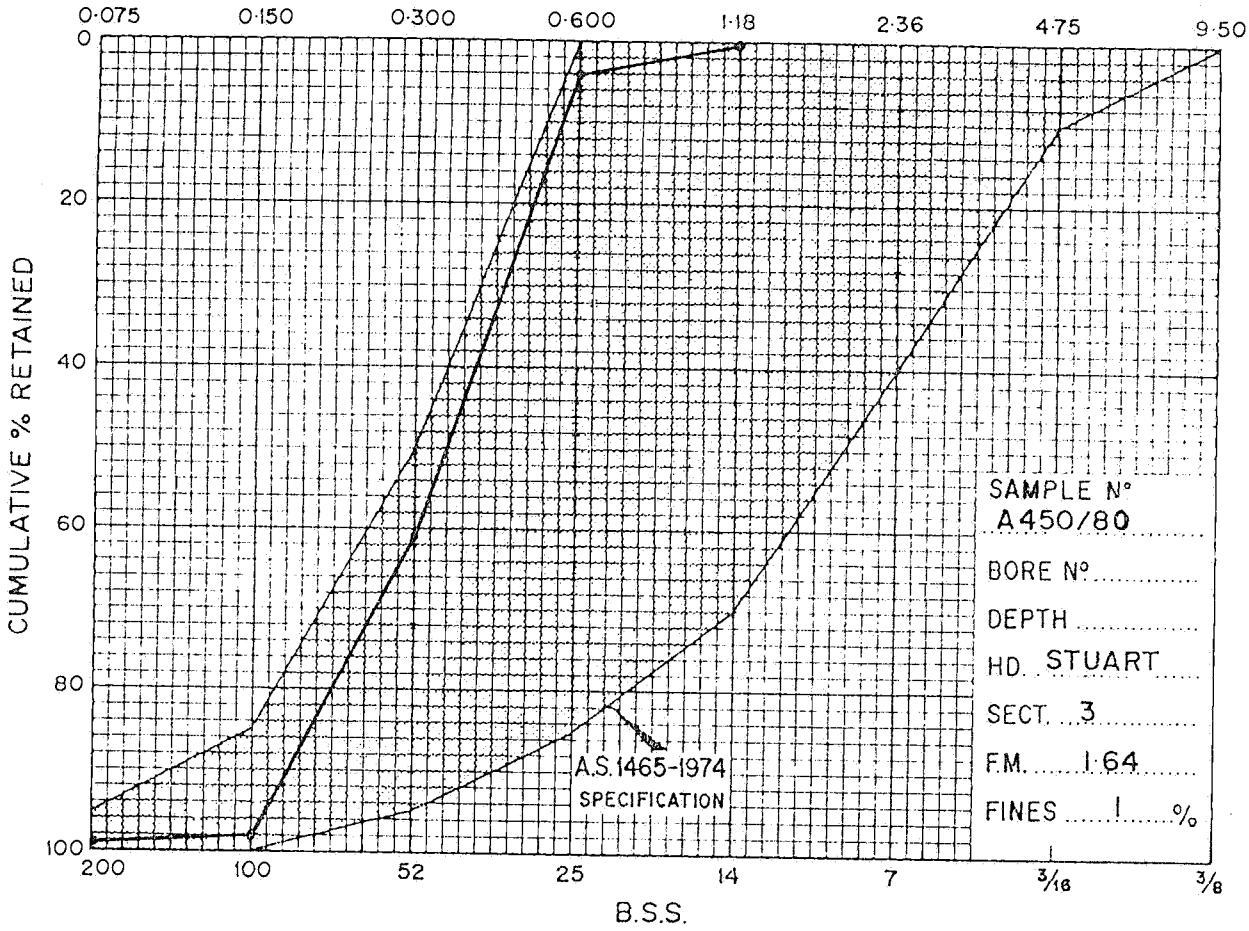
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0·600
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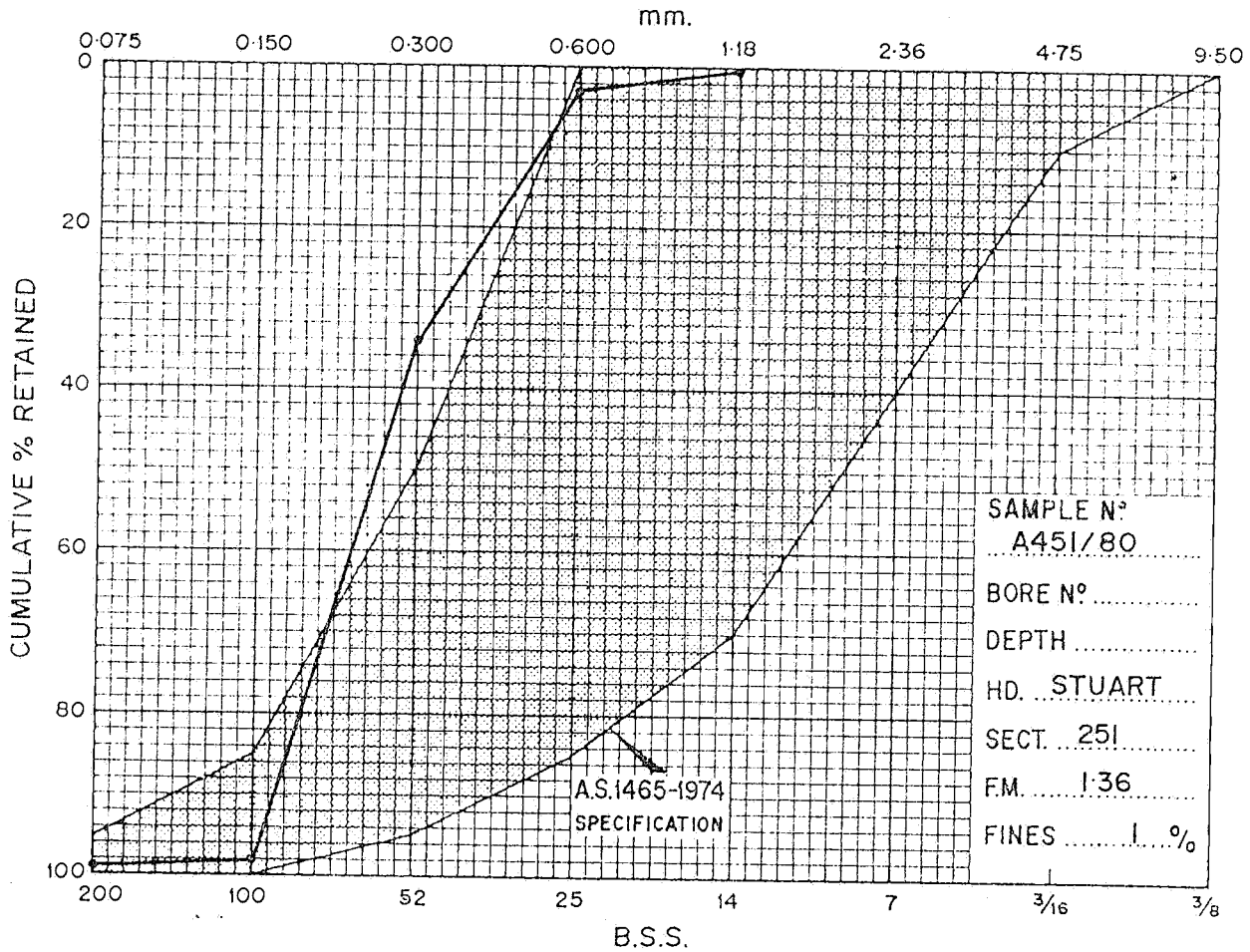
3/16
3/8
B.S.S.
A.S.1465-1974
SPECIFICATION
SAMPLE N°
A450/80
BORE N°
DEPTH
HD. STUART
SECT. 3
F.M. 1·64
FINES 1 %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3/8
B.S.S.
A.S.1465-1974
SPECIFICATION
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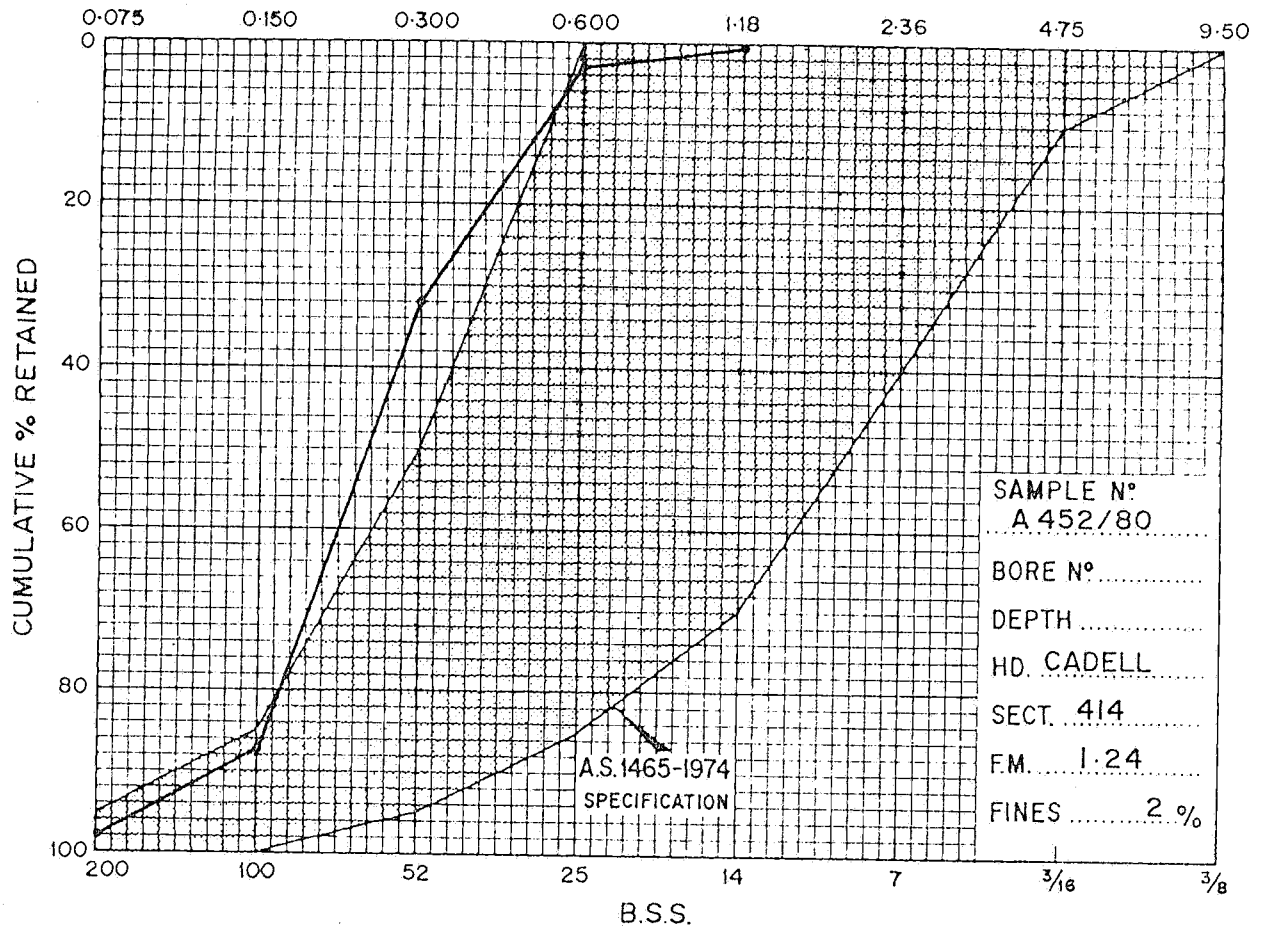
A451/80
BORE N°
DEPTH
HD. STUART
SECT. 251
F.M. 1·36
FINES 1 %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CUMULATIVE % RETAINED
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B.S.S.
A.S.1465-1974
SPECIFICATION
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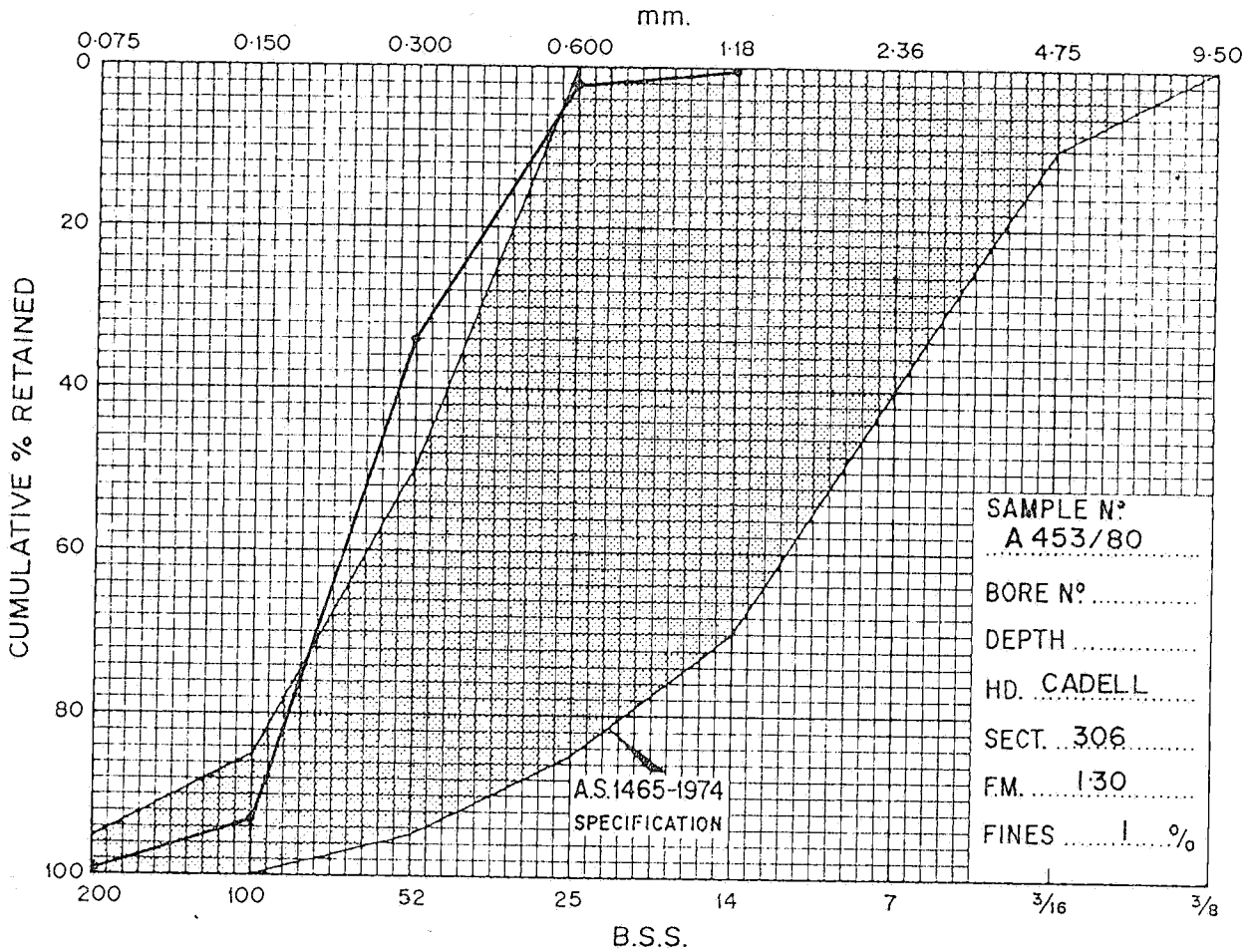
A 452/80
BORE N°
DEPTH
HD. CADELL
SECT. 414
F.M. 1·24
FINES 2 %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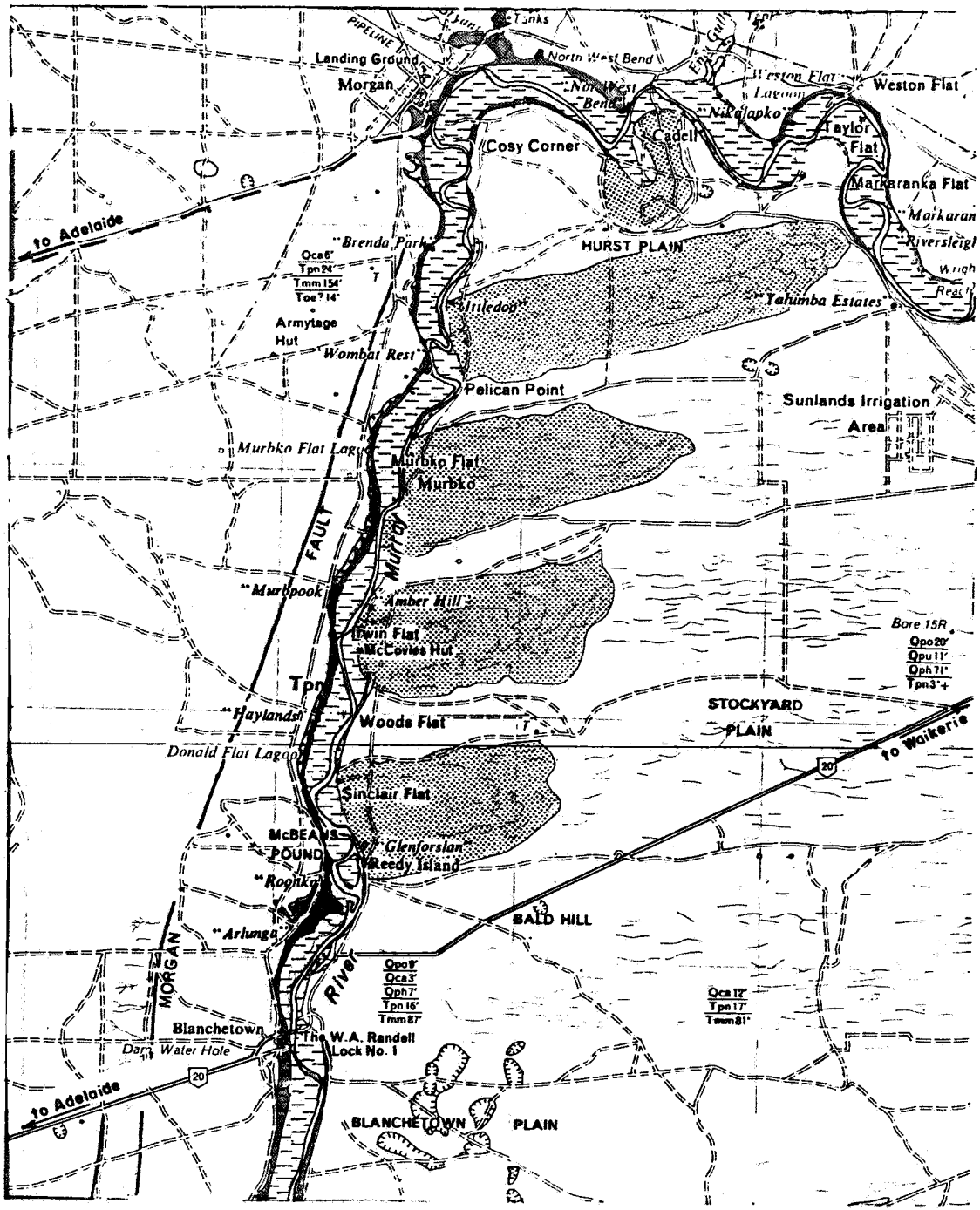
2·36
4·75
9·50
mm.
0
20
40
60
80
100
CUMULATIVE % RETAINED
200
100
52
25
14
7
3/16
3/8
B.S.S.
A.S.1465-1974
SPECIFICATION
SAMPLE N°
A 453/80
BORE N°
DEPTH
HD. CADELL
SECT. 306
F.M. 1·30
FINES 1 %

Plate 1: Sand Survey - Morgan area, April 1980
Pit face of the existing Morgan deposit, looking eastwards.

Plate 2: Sand Survey - Morgan area, April 1980
Worked-out area at the Morgan deposit looking southwards. District Council of Morgan has offered to rehabilitate to an approved plan.



LEGEND

QUATERNARY — HOLOCENE

COONAMBIDGAL FORMATION: Grey alluvium of the Murray River system, clay, silt and sand.

BUNYIP SAND: Aeolian red-brown quartz sand. Occurs as dunes or spread.

QUATERNARY — PLEISTOCENE

Undifferentiated fossil soil, sand and clay.

TERTIARY

Undifferentiated oyster beds with interbedded quartz sand, sandy limestone and calcarenite.

Kilometres 5 0 5 Kilometres

SCALE

Main road.

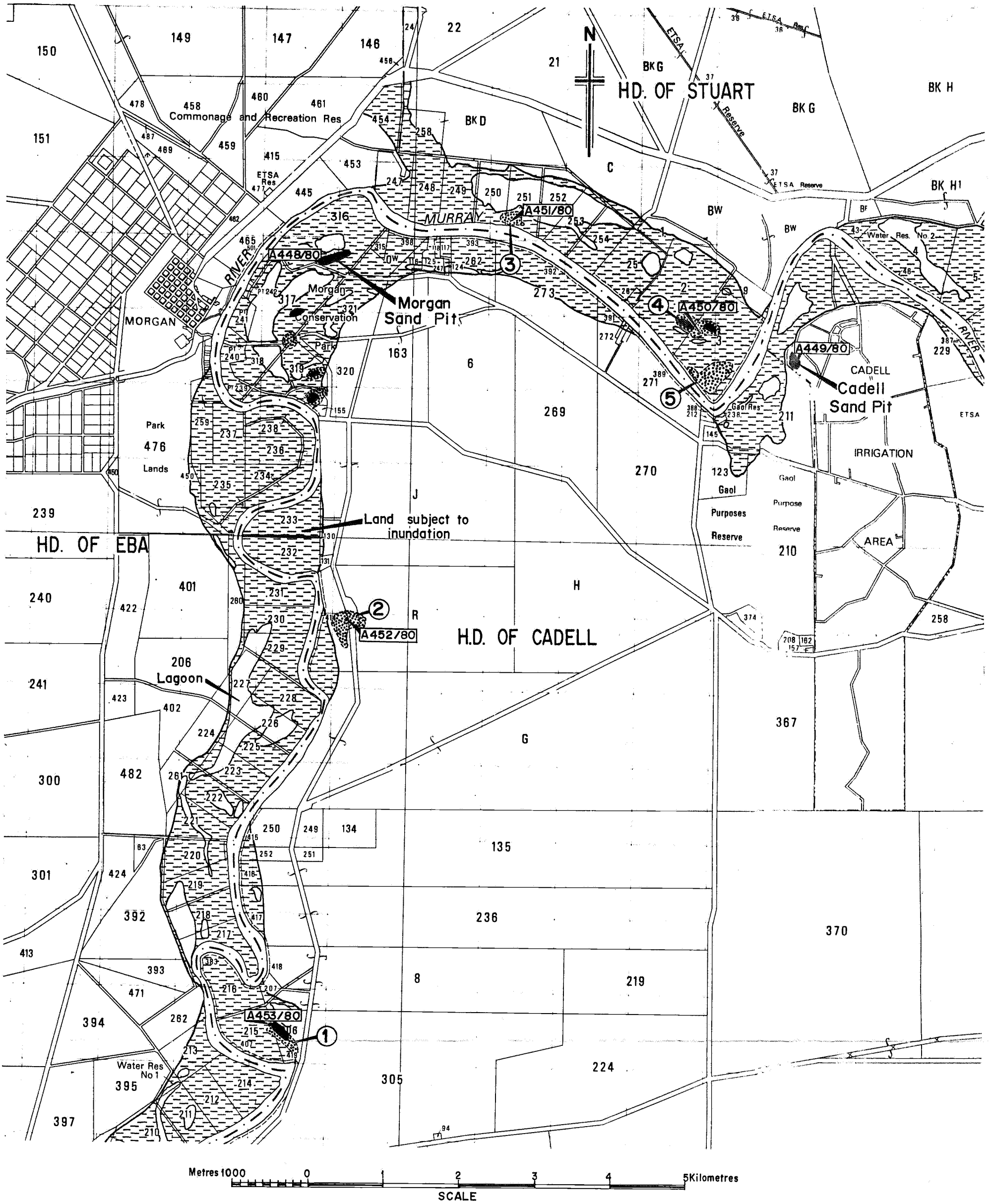
Secondary road.

Geological boundary.

FIG. 1

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED D.C.S.	L.W. Wright 12/5/81 for C.D.O. DATE
CONSTRUCTION SAND SURVEY MORGAN AREA LOCATION AND REGIONAL GEOLOGY	DRAWN S.R.	SCALE 1:250 000
	DATE 24/3/81	PLAN NUMBER S 15372
	CHECKED	

2337



LEGEND

① Sand ridge and deposit number.

Sand spread.

A453/80 Sample location.

394/395 Section boundary and number.

FIG. 2

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

CONSTRUCTION SAND SURVEY
MORGAN AREA
LOCATION OF SAND DEPOSITS

COMPILED D.C.S.	L.C. Wright 12/5/81 C.D.O. DATE
DRAWN S R	SCALE 1:50 000
DATE 20/3/81	PLAN NUMBER 81-230
CHECKED	

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