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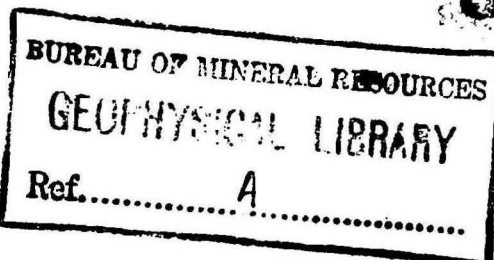
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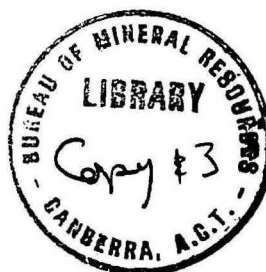
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SOURCES OF SAND IN AND NEAR CANBERRA CITY DISTRICT, A.C.T.

INVESTIGATIONS COMPLETED BEFORE JULY, 1958.

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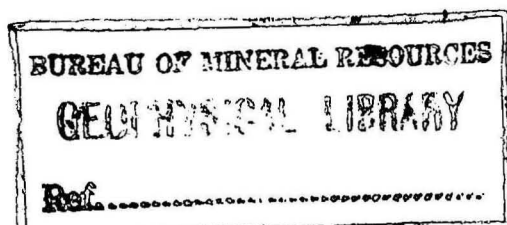
D. E. Gardner

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D. E. Gardner

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INVESTIGATIONS COMPLETED BEFORE JULY, 1958

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1. Summary of reserves of sand along different sections of Molonglo River Valley.
2. Molonglo Valley - Coarse sand in river channel and river flats. Summary descriptions of individual deposits including the smaller deposits.
3. Sand in Jerrabomberra Creek.
4. Fine sand: Brief notes on individual deposits.

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1. Locality of sand deposits near Canberra, A.C.T.  
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2. Canberra sand investigations: Kingston area.  
Scale 1 inch = 200 feet.
3. Canberra sand investigations: Duntroon Bridge deposit. Scale 1 inch = 100 feet.
4. Honeysuckle sand deposits. Scale 1 inch = 200 feet.
5. Aeolian sand: Sullivans Creek deposit.  
Scale 1 inch = 100 feet.



### SUMMARY

Relatively large deposits of coarse sand occur in the channel and flats of the Molonglo River and minor deposits in Jerrabomberra Creek. The main reserves of fine aeolian sand have been found in the Honeysuckle area, and smaller deposits occur at several other localities along the slopes of the river valley.

The coarse sand was investigated in a rapid reconnaissance survey during which an approximate estimate of possible reserves was made. To obtain reliable figures of reserves it will be necessary to test the deposits by boring and sampling. The main deposits of fine sand have been investigated more completely and estimates of probable and possible reserves are given for some deposits.

Total estimated reserves, excluding those in small deposits are:-

#### Coarse sand.

##### Probable reserves

In river channel, above dry season water level	68,000 cu. yd.
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##### Possible reserves

(not including probable reserves)

Above dry season water level in river flats	415,000 cu. yd.
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Below dry season river level, possible reserves per 1 yard thickness of sand

In river channel	72,000 cu. yd.
In river flats	190,000 cu. yd.

#### Fine sand.

Honeysuckle area

Probable reserves	165,000 cu. yd.
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### INTRODUCTION

The Department of Works is providing equipment to sample sand deposits in and near Canberra, with the purpose of establishing figures of reserves and grade. Preliminary mapping and sampling has already been done by the Bureau of Mineral Resources, and its results are summarized in this report.

Deposits of fine aeolian or wind-blown sand were mapped and partly sampled early in 1955 by G. M. Burton and others. Early in 1957 the writer investigated several deposits of coarse sand and in August of the same year made an extensive reconnaissance survey along the Molonglo River and Jerrabomberra Creek. The localities of the sand deposits are shown in Plate 1 at the end of this report. Plans of areas that have been mapped are given in Plates 2 to 5.

Deposits farther afield, some of which are of considerable importance because of their size, e.g. Murrumbidgee River sand near Tharwa, or because of the quality of their sand, e.g. fine sand at Currandooley near Lake George, are not included in this report.

### GEOLOGICAL BACKGROUND (Öpik, 1953)

Deposits of coarse sand occur within the valleys of the Molonglo River and Jerrabomberra Creek. They originated through abrasion and sorting of the harder fragments released from weathered rocks.

At several localities along the slopes of the Molonglo valley fine sand occurs in remnants of former dunes. It was blown up by the wind from the river bed and river flats and perhaps from the shores of lakes that formerly covered much of the Canberra area.

The lakes, apparently of Pleistocene age, are now represented by beds of clay, sandy and silty clay and lenses of sand and gravel that were deposited within the plains and basins of the Canberra area. Their lower beds are at some depth below river level, and the upper beds are at least 45 feet above the river flats.

Appropriate conditions for dune-building prevailed during and at the end of the Pleistocene, when the extreme climates that marked the culminations of the glacial and interglacial periods were accompanied by marked seasonal fluctuations in rainfall and wind velocity. Large volumes of coarse sediment transported in streams from the highlands during pluvial periods and seasonal thaws may have provided the material for dune building in succeeding intervals of dessication. Anemometer records in Canberra (Pryor, 1954) show that the strongest winds and those which record the highest mileages blow from the west and north-west. The winds that prevail in time blow from the east and south-east. Winds from the south may blow steadily and strongly for two or three days in succession. The Canberra fine sands could well have been deposited by winds from these directions. The most extensive deposits are due to the westerlies and north-westerlies.

### COARSE SAND

#### GENERAL

Coarse sand and gravel occurs in the channels of the Molonglo River and Jerrabomberra Creek and in river flats formed by shifting of the river channel. The sediment in the channels is clean and apart from any screening which may be needed is suitable for immediate use. In the river flats the sand and gravel is usually covered by 2 to 3 feet of loam. Beneath the loam it may be clean or it may contain a small proportion of clay or mud that can be removed by washing. Reserves in the river flats are probably very large.

At several localities deposits of sand and gravel have been found within the lake sediments described under "Geological Background". Generally speaking they contain a high proportion of clay and weathered pebbles, and are covered by deep clayey overburden. At a few localities the sand and gravel of the lake beds has been exposed by river erosion.

### TYPES OF DEPOSITS

The following types of coarse-sand deposits are recorded:-

1. Clean loose sand in the river channel, free of overburden and above dry-season water-level.
2. Clean loose sand in the channel, free of overburden, and mainly below dry-season water level, filling an earlier river channel or former deep pool.
3. Sand in alluvial flats, generally covered by loam.

At several localities sand above water level (type 1) in the channel continues down beneath the water (type 2). For the purpose of estimating reserves the sand above water has been regarded separately from that below.

Most deposits of the first type in the vicinity of Canberra have been worked by trucks fitted with Berryman loaders. Where the sand continues below water level some of it is dragged from a shallow depth using the same equipment. In the Duntroon area Army personnel have used mechanical shovels for loading. Deposits of this type are probably partly replenished annually during the flood season.

Deposits of the second type, viz. clean loose sand below dry season water-level probably contain much larger reserves. They can be worked by dredging, by drag line, and by pumping. A privately owned plant in the Duntroon area is exploiting a deposit of this type.

Deposits of the third type, viz. sand in river flats, contain by far the largest potential reserves. For several reasons they have not been exploited to any marked extent. Some of the flats are cultivated; others used for grazing. The sand is covered by loam, commonly 2 to 3 feet thick, and probably in most of the deposits is not clean enough to use unless washed. The sand is rarely exposed at the surface and some exploratory boring has to be done to find it. Where the deposits have been exposed in river banks they have been worked, e.g. at Duntroon, at Acton west of the golf links, and near Corkhills Weir at Yarralumla. It is possible that the sand in the flats goes down to some depth below the dry season water-level of the river.

Details of occurrence and reserves of deposits of each type are given below.

### SAND ABOVE WATER IN RIVER CHANNEL

Occurrence. Sand mixed with varying proportions of gravel is deposited on the convex or inner sides of river bends, along river banks probably on the convex sides of gentle curves, and in the lee of obstructions such as rock-outcrops. The deposits are largest where the channel is relatively wide and deep and the current weak. The sand is deposited below the high water level of rainy seasons and is exposed as the river subsides during the dry season.

Reserves. Total probable reserves of sand above dry season water level in the channel of the Molonglo River amount to 98,000 cu. yd. and possible reserves an additional 73,000 cu. yd. distributed as shown in Table 1. Some details

concerning the larger deposits appear in Table 2. Information available on the smaller deposits is summarized in Appendix 1.

Table 1. Molonglo River Channel. Distribution of sand above dry season water level in deposits of differing dimensions

Maximum size of deposit in cu. yd.	1,000	2,000	4,000	8,000	16,000
<u>Aggregate Reserves of sand</u>					
Probable	9,800	8,800	14,500		65,000
Possible (not including probable reserves -	-	-	2,700	22,000	48,000

Table 2.

Sand in Molonglo River Channel

Deposits with Probable Large Reserves

Locality and Coordinates (Plate 1)	Probable Reserves in cu. yd. A. above dry season water level. B. per yard thickness below dry season water level.	Approximate Dimensions, (in feet) and Remarks.
In bend of river opposite Government House. E300 N100 to E310 N90	A. 16,000 B. 16,000	1000'x150'x3'. Probably not available for working Dredging of this area would be advantageous in removing sand from pool above weir.
Immediately downstream from ford north-east of Govt. Hse. E340 N110 to E340 N120	A. 3,000 B. 10,000	350'x90'x3'. Relatively large proportion of gravel above water. Probably less gravel below water.
Western side of bend of river immediately west of golf links. E445 N120 to E445 N105	A. 12,000 B. ?	750'x250'x3'. Contains large proportion of gravel, perhaps 30% up to 2" to 3" diameter.

Bend of river opposite Power Station Kingston E600 NO40 to E615 NO30	A. 9,000 B. 8,000	1500'x85'x2'. Between river channel and edge of flat. Near weir, surface sand is clean and coarse. Silt occurs on surface upstream: probably sand beneath. 1500'x85'. One borehole here early 1957 showed sand down to 13 ft. below water level; clean, coarse.
Flood channel that runs west from main channel a few hundred feet upstream from Jerrabookbra Creek. E625 NO40	A. 15,000 B. 10,000 (?)	Length 800', width 300', surf area 10,000 sq. yd. This deposit has been mapped by plane table and alidade. Clean coarse sand and some gravel at surface. The sand may be merely a thin covering over loam, or it may continue to some depth, filling an earlier river channel.
Immediately upstream from bridge at Duntroon E740 NO70 to E740 NO50	A. 13,000 B. 19,000	1200'x100'x3'. Some of the surface sand is mixed with gravel. Part of this deposit has been mapped by plane table and alidade (Plate 3 ). 1:700 x 100
Immediately downstream from Lloyd's Crossing, Fyshwick. E755 NO05 to E760 S005	A. ? B. 9,000	Large reserves above water have been worked. A fair quantity remains, but is mixed with rubbish and loam. 800'x100'.
Total	A. 68,000 B. 72,000.	

#### SAND IN RIVER CHANNEL BELOW DRY SEASON WATER LEVEL.

Occurrence. The principal deposits below water level fill or partly fill earlier deep channels commonly in comparatively straight or broadly curved stretches of the river. In most of these deposits the surface of the sand rises above dry season water level.

Reserves. The probable thickness of sand below water level cannot be estimated by inspection. Where a deposit runs into a deep channel or pool, either laterally or at its downstream end, it is probable that the thickness of the



sand at least equals the depth of the water. In Tables 2 and 3 estimates are given of the probable reserves per one yard thickness of sand below water level. The actual thickness could be ascertained by boring. At a sand washing plant operating near Duntroon the sand is said to persist down to 15 feet below water level. If this applies to other deposits the possible reserves of Tables 2 and 3 could be large.

Table 3. Molonglo River: Distribution of sand below dry season water level in deposits of differing dimensions.

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Maximum size of deposit in cubic yards	1,000	2,000	4,000	8,000	16,000	Over 16,000
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Aggregate probable reserves per 1 yard thickness of sand below water level	2,700	1,500	2,500	8,000	45,000	19,000
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Additional information on the larger of the deposits below water level is given in Table 2. Estimates of reserves for all such deposits are summarized in Appendix 1.

#### "BERM" DEPOSITS.

The sand deposits above water level described above consist typically of clean loose sand in the river bed and there is little doubt concerning their probable extension down at least to water level. Deposits of a somewhat different type are those that occur on narrow berms or "benches" that extend between the dry-season river channel and the bank that encloses the wider channel of flood waters. Their surfaces are sensibly flat, 4 to 6 feet above dry season water level and several feet lower than the surface of the flood-plain.

Commonly the surface is grassed and supports a growth of willows. It is not clear whether the sand is a thin veneer covering the surface of a bench cut by flood waters into loamy and clayey alluvium or whether the sand continues to some depth. The largest deposits of this type are shown in Table 4. A little testing by auger holes would disclose the thickness of the sand.

#### JERRABOMBERRA CREEK.

An estimated total of 24,500 cu. yd. of sand occurs in Jerrabomberra Creek above dry season water level between Canberra Avenue, Fyshwick, and the A.C.T. border. The deposits are thin and not amenable to large scale working. They are described in Appendix 3.

Table 4. Molonglo River Channel. "Berm" deposits with possible large reserves of sand.

Locality and Coordinates (Plate 1)	Possible reserves cu. yd.	Approximate dimensions in feet and remarks
Yarralumla, north of Zoological Park E375 N150	8,000	400'x100'x6' A narrow, flat-topped grassy bench or berm at edge of river; shows coarse sand beneath 2'9" of soil, fine sand and a little loam. Could be tested by approx. 8 boreholes.
Duntroon, approximately 1/2 mile south of bridge on east side of river. E745 N40 to E745 N30	28,000	900'x200'x4' Narrow sloping flat or wide bank. Large proportion of gravel at surface; probably less beneath. Needs pitting or boring to test thickness of deposit and proportions of sand and gravel.
Approx. 1 mile N.N.W. of Harman Naval Station, in east bank of river E820 S085 to E815 S105	20,000	2000'x100'x3' A bench or berm 4' to 8' above dry season water level, covered by medium-grained sand. Probably a thin covering over loam but in view of possible large reserves it warrants testing by boring at, say, 200 foot intervals.

#### SAND IN RIVER FLATS.

Occurrence. Flats commonly occur at river-bends at varying height above the river channel. Some but not all of them contain sand deposits.

Some river bends were formed or enlarged by erosion of the bank on the outside of the curve. As the river channel gradually shifted, coarse sediments was deposited along the inner bank. With continued shifting of the channel this coarse sediment was left in the backwaters of the stream, to be covered by silt, loam and mud during flood seasons. The thickness of the loamy overburden ranges from a foot or less up to more than 8 feet. The possible thickness of the sand depends on the depth to which the shifting channel was cut. Near the Power Station at Kingston the sand at one site tested by boring goes down to at least 21 feet below the surface of the flat (13 feet below river level when the hole was bored.

Some river flats have been formed through superficial sheet erosion by flood waters that have flowed directly across a bend. They may be thinly covered by sand and loam deposited from the flood waters and below the surface consist mainly of silt, loam and clay. The two types of flat cannot be distinguished with certainty in a reconnaissance examination, and the possibility that sand deposits occur beneath the surface can be tested only by boring or pit sinking. Even where a flat terminates in a steep bank at the river, the underlying sand is rarely exposed. River currents quickly work out friable sand from the bank and the loamy overburden held together by plant-roots sags down to form the side of the bank. As a result the flat appears to be composed entirely of loam.

Reserves. Total estimated possible reserves of sand above dry season river level in river flats amounts to 448,000 cu. yd. This is distributed in deposits of differing dimensions, summarized in Table 5.

Table 5. Molonglo River Flats. Distribution of possible sand reserves above dry season water level in deposits of differing dimensions

Maximum size of deposit in cu.yd.	4,000	8,000	16,000	Over 16,000
Aggregate possible reserves		13,000	20,000	415,000

The thickness of each deposit was estimated to be equal to the height of the flat above dry season water level, less 3 feet of loamy overburden. All estimates were made simply by inspection; not by measurement. It is probable that at some localities the sand goes down deeper than dry season river level. In the flat opposite the Power Station at Kingston it has been found in one borehole to be 13 feet deeper. Possible reserves below water level in the larger deposits amount to 190,000 cu. yd. per 1 yard thickness of sand below water. Whether or not these possible reserves do exist can be ascertained by boring. Additional data on the deposits containing large reserves are given in Table 6.

Table 6. Molonglo River Flats. Sand Deposits with large possible reserves

Locality and coordinates (Plate 1).	A. Possible reserves cu.yd. above water	B. (possible reserves per yard thickness of sand below water)	Approximate dimensions in feet, and remarks.
West side of river west of Golf Links, Acton E435 N130 to E445 N110	A. 80,000	B. (40,000)	Surface area 40,000 sq. yd. Possible thickness 6ft. Clean coarse sand exposed at one locality in bank beneath 4 ft. of overburden consisting of 2 bands of coarse sand alternating with loam or clay.



Flat between Lennox Crossing and C'wlth Bridge, on southern side of river. E510 N130	A 20,000  B 10,000	Surface area approx. 10,000 sq. yd. Possible thickness 6'. Probably the site of an earlier river channel. This area was formerly ploughed but it is not being cultivated now.
Flat opposite Power Station, Kingston. E590 N050 to E625 N035	A 70,000  B 35,000	Surface area approx. 150,000 sq. yd. Assume $\frac{1}{4}$ area underlain by sand. Possible thickness 6 ft.  Large probable reserves have been indicated near footpath to Duntroon in area bored by Mr. Grunberg. Note large probable reserves in same area in channels Tables 5 and 6.
Flat on north side of river $\frac{1}{4}$ to $\frac{1}{2}$ mile south-west of Duntroon bridge E700 N055 to E715 N060	A 150,000  B 50,000	Surface area approx. 50,000 sq. yd. Possible thickness 9 ft. Clean coarse sand exposed in river bank at one locality beneath 2 ft. of loam. In southern part a loam pit has exposed clean coarse sand at a depth of 2 ft. to 3 ft.
East side of river approx. one third the distance from Duntroon bridge to Lloyd's Crossing E750 N040	A 60,000  B 30,000	Surface area approx. 30,000 sq. yd. Possible thickness 6 ft. Flat covered by sand and gravel back to few hundred feet from river. An old river channel or flood channel runs at far edge of flat 400 ft. from present channel. Flat not cultivated but probably used for grazing.
Remnant of flat approx. $\frac{1}{4}$ mile north of Lloyd's Crossing on east side of river, Duntroon area. E760 N010	A 35,000  B 25,000	Surface area approx. 27,000 sq. yd. Possible thickness 4 ft. A low flat between river channel and higher bank about 300' east. A fairly thick growth of willow. In part where exposed at river bank it consists of coarse sand beneath 1 ft. to 2 ft. of loam. The sand is dark and a little clayey. Note possible reserves of 9,000 cu. yd. per yard thickness of sand below water immediately upstream from here (Table 6).
Total		
	A 415,000	
	B 190,000	

# FINE SAND

Occurrence. The aeolian deposits accumulated on earlier slopes, filled hollows, and spilled over ridges and divides. Some dunes became elongated in the direction of prevailing winds, and some formed topographic basins where deposited against pre-existing slopes. Generally speaking they have no well-marked topographic expression. Some can be recognised by the sandy soil that overlies them, by sand around animal burrows, and by the presence of a characteristic vegetation.

The principal known deposits available for exploitation are in the "Honeysuckle" area near the eastern boundary of Canberra City District. The "Sullivan Creek" Deposit  $\frac{1}{4}$  mile north of the junction of Sullivan Creek and Molonglo River is rapidly being worked out. It is likely that small reserves are covered by buildings and other improvements of Duntroon Military College. A large deposit, now practically worked out, formerly covered much of Cork Hill in front of Parliament House and extended westwards across Commonwealth Avenue into the eastern section of the Royal Canberra Golf Links. The e and smaller deposits are listed in Table 8.

Reserves. Estimated reserves of fine sand are summarized in Table 7. No allowance has been made in these figures for loss during extraction or for unexpected thinning of the deposits; both these factors could be important and could diminish the reserves by as much as 50%. The Honeysuckle area had not been fully tested by the time this report was written and further work on it is now in progress. The results will not be included here. Deposits for which figures of reserves cannot yet be given are listed in Appendix 4.

Table 7. Reserves of Fine Sand

Deposit and coordinates Plate 1	Approx. Av. Thickness ft.	Gross Reserves Cu. Yd.
<u>Honeysuckle area.</u> E870 to S050 to E870 to S105		
See plate 4		
G	7	70,000
B	9	45,000
H	5	10,000
C	5	<u>10,000</u>
		135,000
F	3	8,000
A	3	6,000
E	3	6,000
D	3	5,000
J	3	<u>5,000</u>
		30,000
Abattoirs	3' to 6'	7,000
E 870 S 150		

Golf links  
E 520 N 110 5' 10,000

Sullivans Creek  
E 415 N 160  
See Plate 5 50,000 \*

Total 232,000

\* Reserves (est.) remaining at end of July, 1958. This comprises est. 30,000 cu. yd. in fenced portion of deposit and 20,000 cu. yd. south of fenced portion.

# SUMMARY OF RESERVES

Total estimated reserves of sand are summarized in Table 8, and the size distribution of the deposits is indicated in Table 9.

Table 8 - Total Sand Reserves

	Reserves in Cubic Yards		
	Above dry season water level		Possible reserves per yard thickness of sand below water.
	Probable	Possible	
Loose clean sand in channel of Molonglo River *	98,000	73,000	79,000
Molonglo River flats *		448,000	177,000
Loose clean sand in bed of Jerrabomberra Creek *	24,500		19,000
Fine sand in aeolian deposits	122,000 ø		

\* Estimated by inspection during reconnaissance survey.

ø Subject to further testing.

Table 9. Molonglo Valley Sand Reserves: Size Distribution of Deposits

Type of Deposit	Aggregate reserves in deposits of the following maximum sizes, in cubic yards.					
	1,000	2,000	4,000	8,000	16,000	Over 16,000
<u>Sand in river channel</u>						
Above water						
Probable	9,800	8,800	14,500		65,000	
Possible			2,700	22,000	48,000	

Below water Probable reserves per yard thickness	2,700	1,500	2,500	8,000	45,000	19,000
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#### River Flats

Above water

Possible	13,000	20,000	415,000
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Below water.

Possible reserves per yard thick- ness of sand	10,000	10,000	157,000
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Aeolian Deposits	2,000	35,000	30,000	165,000
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#### NOTES ON UTILIZATION OF DEPOSITS

The deposits in the river channel above dry season water level can be readily worked without much preparatory testing and specialized equipment. However their reserves are relatively small. Large supplies of sand can be obtained from the river flats and below water level in the river channel.

#### Sand in River Channel above Dry Season Water level (Table 2).

The best deposit is in the bend of the river opposite Government House. Removal of this sand would serve a useful purpose in clearing the channel and pool above the weir. If sand were also taken from below water level at least 50,000 cu. yd. would be obtained. Of the other deposits, those immediately west of the golf links (12,000 cu. yd.) and immediately upstream from the bridge at Duntroon (13,000 cu. yd.) contain a relatively large proportion of grav. Losses in screening might be unduly large. The deposits in the Power Station area (9,000 cu. yd. and 15,000 cu. yd.) are readily accessible but preliminary sampling from boreholes would be needed to ensure that the sand is clean beneath the surface and has at least the thickness indicated in Table 2. The possible deposit  $\frac{1}{2}$  mile south of Duntroon Bridge (28,000 cu. yd) is worthy of testing in this way.

#### Sand in River Channel below Dry Season Water Level (Table 2).

The deposit with the largest estimated reserves is opposite Government House at Yarralumla. As noted above it has a further advantage in that it is overlain by the best deposit of sand above water level. Second to this is the deposit immediately upstream from Duntroon Bridge. It too is covered by large reserves of sand (and gravel) above water level.

The deposits in the Power Station area need preliminary testing. The thickness of the sand below water level in any of the deposits is not known. Before a reliable estimate of reserves could be made this would need to be ascertained by boring.

River Flats (Table 5). By far the largest potential reserves of sand are those of the river flats, both above and below dry season water level. The flats are not cultivated but have a limited use for grazing. Any of the flats included in Table 5 warrants investigation by boring and sampling.

Aeolian Sand. Unlike the river sands which to some extent are replenished annually, the fine sands are a product of past climatic conditions and are not now being built or replenished. Unless action is taken to conserve them the reserves will decrease rapidly. Sullivans Creek deposit was estimated to contain approximately 100,000 cu. yd. in October, 1957, shortly after it had been opened. By July 1958 it had been more than half worked out. A deposit on Cork Hill north of Parliament House contained in 1955 an estimated 75,000 cu. yd. of sand that could be extracted. By the end of 1957 it had been worked out. It must be noted though that relatively large quantities of sand that could have been taken out were lost through wasteful methods of working. This commonly occurs at the Canberra sand pits and it calls for some supervision of the working of the pits and possibly some restriction on the usage of the sand.

In this fine dune-sand considerable variation in grain size may be expected through a deposit. At Honeysuckle the finer material has been found to occur towards the south and south-east, i.e. the downwind end of the deposit. Mechanical analyses of some samples are given in Table 10. Thin seams of clayey and iron-stained sand are present but similar bands have not prevented the working other Canberra deposits. It is possible that the sands contain disseminated organic material, and should be tested for its presence before being used for concrete.

Consideration could be given to the possible use of the fine marginal sections of these deposits for hot-mix bitumen filler. Their aeolian nature suggests that the very fine fractions may be free of plastic material. Most of the marginal portions of the deposits which might be useful for this purpose would not normally be considered worth working for plasterer's sand.

Table 10. Mechanical analysis of some dune sands, Canberra area, A.C.T. Including for comparison analyses of Currandooley sands.

Deposit	Percentage Retained by Sieve							
	+18	+36	+60	+100	+120	+150	+200	-200
American War Memorial	1.9	26.1	18.8	23.9	5.8	4.7	0.3	18.6
Duntroon hillside	3.1	33.1	37.0	16.1	3.8	3.0	0.1	3.8
sandpit	3.8	39.1	40.0	12.5	2.0	1.1	0.3	1.4
Honeysuckle pit	9.2	38.3	28.1	11.6	2.6	2.4	0.3	7.5
random	4.5	35.2	23.5	9.1	2.4	2.1	0.4	22.9
Abattoirs	10.2	51.9	25.4	5.2	1.3	1.4	0.2	4.3
Currandooley Lake George	0.5	15.1	41.1	+85 20.3)	15.6	3.7	1.2	2.7
	0.1	3.0	16.4	14.3)	22.7	10.3	6.6	25.0
	-	0.7	5.8	8.5)	18.0	15.0	10.7	41.0
	0.1	4.0	18.6	28.6	11.2	11.7	0.3	28.2
	0.1	4.6	17.7	31.5	9.6	10.8	0.5	25.2

#### EQUIPMENT FOR TESTING DEPOSITS

Testing of the deposits amounts simply to obtaining samples to ascertain the extension of the sand in depth and its quality. This is satisfactorily done by boring either with manually operated or power-driven equipment. Probably the most satisfactory power-driven equipment comprise a light percussion-drilling, or churn-drilling rig including cutting bit, sand-pump and casing. The cutting bit would not be used a great deal. Occasionally it would be needed to break up gravel to facilitate casing the hole. The manually operated equipment comprises a post-hole digger, sand pump, light casing, auger to turn inside casing where desirable and auxiliary items such as chain tongs, clamp for casing etc. Satisfactory equipment of this kind is held by the Bureau.

#### REFERENCES

- OPIK, A.A., 1953 - Geological map of Canberra. Bur.Min. Resour.Aust., A.C.T. G2-12.
- PRYOR, L.D., 1954 - From Canberra, a Nation's Capital, ed. H.L.White Pt. 2, 43. Climate. ANZAAS, 30th Meeting, Canberra.



APPENDIX 1.

Summary of Reserves of Sand along Different Sections of Molonglo River Valley

Locality	Reserves in Cu. Yd.		
	Above water		Below water Possible reserves per one yd. thick- ness of sand below water.
From 1 $\frac{1}{4}$ miles downstream from Coppins Crossing to Greenhills Bridge	<u>Loose Sand in Channel</u>		
	Probable	10,800	
	Possible	8,000	2,500
	Total	18,800	2,500 per yd.
Greenhills Bridge to Ford north- east of Government House	<u>Loose Sand in Channel</u>		
	Probable	24,000	41,000 per yd.
Ford north-east of Government House to Corkhills Weir	<u>Loose Sand in Channel</u>		
	Possible	14,000	No est.
Corkhills Weir to ford west of Golf Links	<u>Loose sand in Channel</u>		
	Probable	14,000	No est.
	<u>Sand in River Flats</u>		
	Possible	89,000	45,000
	Total	103,000	45,000 per yd.
Lennox Crossing to Kings Avenue Crossing	<u>Loose Sand in Channel</u>		
	Probable	2,600	500
	<u>Sand in River flats</u>		
	Possible	27,000	10,000
	Total	29,600	10,500

Locality	Reserves in Cu. Yd.	
	Above water	Below water Possible reserves per one yd. thick- ness of sand below water.
Powerhouse area to Bridge at Duntroon	<u>Loose sand in Channel</u>	
	Probable 30,750	20,200
	<u>Sand in River Flats</u>	
	Possible 226,000	87,000
	Total 256,750	107,200
Bridge at Duntroon to Lloyds Crossing	<u>Loose Sand in Channel</u>	
	Probable 13,000	28,000
	Possible 28,000	
	<u>Sand in River Flats</u>	
	Possible 106,000	35,000
	Total 147,000	63,000
Lloyds Crossing upstream to Abattoirs	<u>Loose sand in Channel</u>	
	Probable 3,000	No est.
	Possible 22,700	Unlikely



Section of River	Coordinate of Deposit (Plate 1)	Type of Deposit	Dimensions in feet (approx.) and estimates of reserves in cu. yd. (approx.)	Remarks
Downstream	E70 N80	Sand at edge of channel	200' x 100' x 5'; approx. 1,800 cu. yd.	Coarse sand.
from	E90 N45	Sand in channel at river bend	150' x 60' x 1'6"; 500 cu. yd.	Clean medium and coarse sand.
Coppins	E105N60	Sand at edge of channel. Probably goes down to some depth below water.	300' x 60' x 4' Above water 2,500 cu. yd. Below water 2,500 cu. yd. per yard thickness of sand.	Clean, coarse sand.
Crossing	E110 N70 to E120 N70	Sand at edge of channel	300' x 60' x 4'; 3000 cu. yd.	Clean coarse sand. Deposit continues for approx. 1000 feet but sand is mixed with porphyry boulders. Boulders may occur beneath surface of deposit.
Coppins	E190 N75	Sand at river bank	100' x 50' x 3'; 500 cu. yd.	
Crossing	E190 N80	Sand at river bank	Dimensions not recorded. Rough estimate 500-1000 cu. yd.	Sand with porphyry boulders.
to				
Government	E170 N70	Sand in channel	100' x 50' x 6'; 1000 cu. yd.	
House				
Weir	E110 N40	Sand at edge of channel and in channel	300' x 50' x 2'; 1000 cu. yd.	
	E165 N00	Sand in river bank	Possible 600' x 60' x 6' Possible 8000 cu. yd.	Mainly medium grained. River channel and valley sides rocky. Boulders may occur at shallow depth below surface of sand.
	E170 S010	Sand in river channel at bend.	Probably about 3000 cu. yd. sand in part mixed with gravel and large boulders.	Wide area around bend is scoured and mainly rocky. Irregular deposits of sand and gravel with large boulders. River is bridged here.
	E250 N020	Sand in river channel in lee of porphyry outcrop.	200' x 60' x 4' Above water 1,500 cu. yd. Below water 1,500 cu. yd. per yard depth.	Accessible from southern bank, but bank fairly high and steep.
	E280 N095	Sand and gravel at edge of channel	400' x 50' x 3'; 2000 cu. yd.	Downslope towards river the deposit is stony and gravelly. Stones and gravel may occur at shallow depth beneath surface of sand.
	E300 N100	Sand at edge of channel	200' x 50' x 4'; 1,500 cu. yd.	Medium grained sand at surface.

Government House Weir to Sullivans Creek	E300 N100 to E310 N90	Sand at edge of bank and in channel; probably continues below water	1000' x 150' x 3' Above water 16,000 cu. yd. Below water probable 16,000 cu. yd. per yard thickness of sand.	Clean coarse sand. Removing this sand would improve river channel and pool above weir.
	E340 N110	Sand and gravel at edge of channel, above water	350' x 90' x 3'; 3,000 cu. yd.	Relatively large proportions of gravel above water. Probably less below surface.
	E340 N110 to E340 N120	Continues below water	Below water 1000' x 90'. Possible 10,000 cu. yd. per yard thickness of sand.	
	E365 N150	Sand at edge of channel in bend	400' x 150' x 3'; 6,000 cu. yd.	River can be forded from the south; alternatively the deposit can be reached by a track from the north.
	E375 N150	Sand in river bank	Possible 400' x 100' x 6'; 8,000 cu. yd.	Section exposed, from surface 0 - 9" soil; 9" - 2'3" fine to medium sand; 2'3" - 2'9" loam; below 2'9" clean coarse sand exposed to 4'3", below which the bank is covered by fallen material.
	E380 N165	Sand and gravel in channel	The deposit has been worked, but no appreciable sand at time of inspection.	
	E390 N450	Low flat in part underlain by sand	Investigated early in 1957 when boreholes put down to depth of 9 feet. No appreciable reserves of sand. (Report held by B.M.R.).	
	E385 N130 to E410 N115	At Corkhills Weir Flat underlain in part by sand, also sand and gravel in channel	Considerable reserves in the flat and channel have been nearly worked out. (Possible reserves in flat were estimated in October, 1956 to total 62,000 cu. yd.).	
	E430 N135	Coarse sand in channel	200' x 50' x 1'; 400 cu. yd.	
	E435 N130 to E445 N110	Alluvial flat	Surface area approx. 40,000 sq. yd. Possible 40,000 cu. yd. per yard thickness of sand.	Possible sand deposit beneath covering of loam. In bank where exposed by Berryman loader working channel sand, clean coarse sand occurs in flat beneath 4' of overburden consisting of 2 bands of coarse sand alternating with loam or clay.
Sullivans Creek to Lennox Crossing	E435 N130	Sand in river channel	200' x 50' x 1'6"; 600 cu. yd.	
	E445 N130	Sand and gravel in channel	300' x 50' x 2'; 1000 cu. yd.	
	E445 N120 to E445 N105	Sand at edge of channel and in channel	750' x 250' x 3' 12,000 cu. yd.	Large proportion of gravel, perhaps 30%, mainly 2" to 3".
	E450 N115 to E455 N105	Large area of sand and gravel in channel. River flat containing sand covered by loam	Nearly worked out. Has been worked in extensive pits. Unworked area perhaps 300' x 100'. Possibly 2' of sand; possible 9,000 cu. yd.	Sand in non-worked part of flat is in part at least a little clayey and needs washing.  At one locality on pit bottom clean coarse sand occurs beneath 2" of black mud or clay. Possibly considerable reserves of sand below water.

Sullivan's Creek	E510 N115	Sand at edge of channel	200' x 100' x 3'; 2000 cu. yd.	In part covered by willows. Probably goes below water level but area small.
to Lennox Crossing	E510 N120	Remnant of small river flat	Probably 200' x 100' x 6'; 4000 cu. yd. Possibly 10' thickness of sand instead of 6', giving an additional 3,000 cu. yd.	Sand occurs beneath loam. The area has been worked.
Lennox Crossing to Commonwealth Bridge	E510 N130	Small river flat. Possible sand below surface	Surface approx. 600' x 150' Possible 20,000 cu. yd.	Formerly cultivated, but not at present. A fair amount of coarse sand shows where surface has been ploughed. May be superficial.
Commonwealth Bridge to Scotts Crossing	E540 N135	Sand bank at edge of channel. Probably continues below water.	100' x 40' x 4' Above water 600 cu. yd. Below water 500 cu. yd. per yard thickness.	
Kings Ave. to Power Station Weir	E605 N070	Sand bank at edge of channel. Deep pool; may be considerable thickness of sand below water.	160' x 40' x 3' Above water 700 cu. yd. Below water 700 cu. yd. per yard thickness of sand.	
	E590 N040	Bank at edge of channel. Probably continues below water.	100' x 50' x 2'. Above water 350 cu. yd. Below water 600 cu. yd. per yard thickness of sand.	
Power Station Weir to Duntroon Bridge	E600 N040 to E615 N030	Bank at edge of river channel, continues below water.	1500' x 85' x 2'. Above water probable 9000 cu. yd. Below water from weir to 600 ft. upstream probable 8000 cu. yd. per yard thickness of sand.	Sand at surface clean and coarse near Power Station Weir. At about 100 feet up river the surface is covered by fine sand and silt. Probable coarse clean sand occurs at a shallow depth below this.
	E625 N040	Sand and gravel in flood channel, possibly an earlier main channel. May continue below water level.	Length 800 feet, maximum width 300 ft., area approx. 10,000 sq. yd. Above water probable 15,000 cu. yd. Below water possible 10,000 cu. yd. per yard thickness of sand.	This area has been mapped by plane table and alidade. Near the river, the sand at the surface is mixed with large proportion of gravel. Probably less gravel below surface. This flood channel may be underlain by loam at a shallow depth.
	E590 N050 to E625 N035	Large flat crossed by former channels or flood channels of river. In part it contains coarse sand beneath a covering of loam.	Length 2,300 ft., width up to 900 ft. Area 150,000 sq. yd. Possibly one quarter of area underlain by sand. 70,000 cu. yd. Below water level, possible 37,000 cu. yd. per yard thickness of sand.	Boring in vicinity of weir by Mr. Grunberg shows that sand continues in places to 13 feet below river level. Probable reserves indicated by results of boring are large.
	E635 N040	Medium and coarse sand at edge of channel.	100' x 50' x 2'; 400 cu. yd.	The sand is partly covered by a skin of loam deposited onto the surface from flood waters.
	E650 N 070	Bank of fine sand in small embayment.	150' x 40' x 3'; 600 cu. yd.	This fine sand may be derived from erosion of lake beds. If so it may be very thin.

Power Station	E 680 N 070	Medium and coarse sand with gravel in channel	800' x 150' largely worked. Probably 3000 to 4000 cu. yd. remains	Needs washing and screening.
Weir to	"	River flat containing loose coarse sand beneath loamy overburden	Length 410'. Width as far as fence of grazing paddock 50' Possible thickness 10'; 6000 cu. yd.	Overburden where exposed is 4' of loam and clay containing 1'6" of coarse clean sand. Area available for working restricted by grazing paddock.
Duntroon Bridge, continued				
	E 700 N 055	Bank of medium sand at edge of channel	180' x 40' x 3'; 800 cu. yd.	
	E 700 N055 to E715 N060	River flat. Sand occurs beneath loam.	1200' x 400' x 9'. Probably contains further 200' in width beyond fence at north. South of fence possible 150,000 cu. yd.	In south of area a pit worked for loam has exposed clean coarse sand at a depth of 2 ft. to 3 ft. Clean coarse sand exposed in portion of river bank.
	E 715 N 055	Clean coarse sand at edge of channel. Probably continues below water.	200' x 40' x 3'. Above water 900 cu. yd. Below water 900 cu. yd. per yard depth of sand.	
	E 740 N 070 to E 740 N 050	Sand in channel. Probably goes to considerable depth below water level.	Above water 1300' x 100' x 3' Approx. 13,000 cu. yd.	Approx. two thirds of this deposit mapped by plane table and alidade. Report by B.M.R.
Duntroon Bridge to			Below water area 1700' x 100' 19,000 cu. yd. per yard depth of sand.	Sand above water partly mixed with gravel.
Lloyds Crossing	E 750 N 055	River flat. Sand covered by loam.	Surface dimensions, including a cultivated, fenced portion, equal 600' x 300'. Excluding cultivated portion, 500' x 100'. Thickness probably 6 ft. Excluding cultivated portion 11,000 cu. yd.	In river bank clean coarse sand at least 5 ft. thick exposed beneath 2 to 3 ft. of loam. Fence 100' from river restricts area available for working.
	E 745 N 045	Medium grained sand at edge of channel	360' x 50' x 4'; 3000 cu. yd.	Thickness of sand should be tested.
	E 750 N 040	River flat	Approx. 900' x 300' x 6' Possible 60,000 cu. yd.	Flat covered by sand and gravel back to 400' from river. May be only superficial and underlain by lake sediments. Old river channel or flood channel runs behind flat parallel to present channel and about 400' from it. Flat probably used for grazing but is not cultivated.
	E 745 N 045 to E 745 N 030	Narrow sloping flat or wide bank	900' x 210' x 4' Possible 28,000 cu. yd. sand and gravel.	Large proportion of gravel at surface. May be less below surface.
	E745 N 030 to E 755 N 015	Narrow river flat and sand in channel	Flat approx. 1000' x 200'. Not examined closely and no estimate made. Sand in channel about 800' x 100'.	Privately separated sand washing plant erected on flat. Sand is being taken from river channel by drag line.

Duntroon Bridge to Lloyds Crossing continued.	E 760 N 010	Remnant of flat. Sand covered by loam.	Possible 800' x 300' x 4' Possible 35,000 cu. yd.	Low flat between river channel and higher bank of lake sediment about 300 ft. to east. A fairly thick growth of willow. In front where exposed in river bank it consists of coarse sand beneath 1' to 2' of loam. Sand is dark, a little clayey and would have to be washed. This flat may be underlain in part by lake sediments.
	Below water E 755 N 005 to E 755 S 005	Sand at edge of river channel Partly covered by loam.	Above water: length 1000 ft. width variable, up to 100 ft. Thickness up to 6 ft. but variable. Confused by earlier working. No estimate made.	Sand mainly covered by variable thickness of loam and may be a lake deposit. Some of it is re-washed and free of overburden. A thick growth of willow. Much garbage in places.
	Below water E 755 N 005 to E 760 S 005	Sand in channel below water.	Below water possible 800' x 100' Possible 9,000 cu. yd. per yard depth of sand below water.	Similar to deposit operated at washing plant a short distance down-stream.
Upstream from  Lloyds Crossing	E 770 S 020	Fine to medium sand on "bench" at edge of channel	400' x 60'; possible 2,700 cu. yd. per yard thickness of sand.	Bench 8 ft. above water level covered by fine to medium sand. Probably cut by flood waters into lake sediment and sand deposit may be very thin.
	E 820 S 085 to E 815 S 105	Medium-grained sand on "bench" at edge of channel.	Length 2000', width 100'. Possible reserves 20,000 cu. yd. per yard thickness of sand.	A bench 4 ft. to 8 ft. above river level covered by medium grained sand. Probably cut by flood waters into lake sediment, and sand deposit may be very thin.
	E 815 S 110	Clean medium and coarse sand at edge of channel	600' x 60' x 2'; 3000 cu. yd.	No ready access.

## APPENDIX 3.

## Sand in Jerrabomberrà Creek.

Section of Creek	Coordinates of deposit (Plate 1)	Type of Deposit	Dimensions in feet (approx.) and estimates of reserves in cu. yd. (approx.)	Remarks
Railway bridge to Canberra Avenue	E 675 S 040 E 800 S 090	Sand in creek bed, forming flat- surfaced deposits a little above creek level. Continues below water level.	Above water sand for 60% of the section (2,400 ft.), approx. 70' wide, 6" thick; 800 cu. yd. Below water probably 1' sand 1,600 cu. yd.	Coarse-medium to coarse-grained, 6" to 9" above water. Has been worked from bank by trucks with Berryman loader. A little grass and mud in places.
	E 670 S 075	As above	1000' x 30' Above water 6" thick; 500 cu. yd. Below water 1' thick; 1000 cu. yd.	The lens-shaped deposits are situated alternately at one bank and then the other. The channel curves between them.
Canberra Avenue to Narrabundah	E 680 S 090 E 670 S 095 to E 670 S 105	Sand at edge of channel in bend Sand in creek bed	250' x 45' x 4'6", 1,800 cu. yd. 1000' x 30' to 40' Above water 6" to 9"	At northern end of this deposit is a notice prohibiting removal of sand. Water main crosses creek. Patches have been worked. No estimate made.
Lane	E 670 S 110 to E 705 S 135	Coarse clean sand in creek bed. Continues below water.	For about 70% of this section (length 3,600') deposits 50' to 60' wide, about 1' above water (7,000 cu. yd.) and 1' below water (7,000 cu. yd.).	Probably about 1000' worked prior to investigation. Access may not be available along the entire section.
	E 705 S 135 to E 705 S 145	As above	Sand along 60% of this section (600') width 50'. Above water 6" (300 cu. yd.) Below water 1' (600 cu. yd.).	A small amount of sand has been taken from here.
	E 705 S 150	Sand at edge of channel	200' x 40' x 2'6"; 700 cu. yd.	Has been partly worked.
	E 705 S 150 to E 715 S 160	Sand in creek bed. Continues below water.	Sand over 70% of this section (1600') Width 30' to 60'. Ave. height above water 9" (1,400 cu. yd.). Below water 1' (1,800 cu. yd.).	
	E 715 S 165 to E 720 S 180	Sand in creek bed. Continues below water level.	Deposit over 70% of this section (1500'), 40'-60' wide. Above water 6" to 9" (1,500 cu. yd.). Below water 1' (3,000 cu. yd.).	Trucks have removed a little of this sand.
Narrabundah Lane to Tharwa Road	E 725 S 190 E 725 S 195 to E 740 S 210	Sand near edge of channel Sand in creek bed	250' x 80' x 2' 1,500 cu. yd. Deposits over 70% of this section (1200'); 30' wide. Above water 6" to 12" (700 cu. yd.). Below water possible 12" (900 cu. yd.).	About 500' north of farm buildings. Now almost worked out. Has been worked a little from the banks.
	E 740 S 215	As above	Length 400'; width 40' to 60'. Above water 6" to 12" (500 cu. yd.). Below water possible 1' (800 cu. yd.).	Has been worked a little from banks.

Narrabundah Lane to Tharwa Road	E 740 S 215 to E 740 S 230	As above	Length 400'; width 20' to 30'. Above water 2'. Allowing 50% worked out, reserves 400 cu. yd. Below water 1'6". Allowing 50% worked out, 300 cu. yd.	About 50% of this worked below water to depth of 1'6".
	E 740 S 230 to E 740 S 250	As above	Length 1000'. Width 40' to 60'. About $\frac{1}{3}$ worked out. Above water 2' (2,500 cu. yd.). Below water 1'6" (1,800 cu. yd.).	About one third worked.
	E 740 S 265	Sand at edge of channel in slight bend	150' x 40' x 2'; 400 cu. yd.	
	E 745 S 280	Sand and gravel near edge of channel	500' x 100' x 2'; 3,500 cu. yd.	Needs screening to remove gravel.
	E 750 S 305 to E 750 S 345	Formerly sand in creek bed. Continued below water.	Mainly worked out. Length 3000'; width 60'. Former reserves: Above water 1' 7,000 cu. yd. Below water 1' 7,000 cu. yd.	Deposits have been worked in part by Berryman loaders in trucks operating from banks. In part, sand has been pushed by bulldozer to edge of bank. Not much workable sand remains.
	E 745 S 345 to E 750 S 360	As above	800' x 60' Above water 1' (1,700 cu. yd.) Below water 1' (1,700 cu. yd.)	
Tharwa Road to A.C.T. Boundary	E 750 S 370	Sand and gravel at river bend.	150' x 40' x 3'; 600 cu. yd.	Appears to be more gravel than sand.

APPENDIX 4. Fine Sand: Brief Notes on Individual Deposits

Locality	Coordinates Plate 1	Remarks
Yarralumla Creek Deposit	E280N070	Deposit on valley slope of Molonglo extending over length of approx. 1000' northwards from Yarralumla Creek. Small pits show approx. 2'6" of lightly indurated sand over 2' of loose sand. Not investigated.
Sullivans Creek Deposit	E415N160	Plan of deposit shown on Plate <sup>5</sup> Sand deposited behind a former steep cliff of hard sandstone and shale. Maximum thickness approx. 30'. Reserves August, 1957 before pit opened approx. 110,000 cu. yd. of clean sand. Reserves July, 1958 approx. 50,000 cu.yd.
	E400N160	A smaller deposit approx. 300' westward over crest of ridge from Sullivans Creek Deposit. Not yet investigated.
Golf Links Deposit	E520N110	In north eastern part of Royal Golf Links practice fairways, Acton. Actually, an extension of the Parliament House deposit. Reserves approx. 10,000 cu. yd. Possible construction of a weir at site of Lennox Crossing, or impending rise of water level due to construction of a weir elsewhere, may allow exploitation of the deposit.
Parliament House Deposit	E555N105	Sand deposited against northern, western and north-eastern slopes of Cork Hill, approx. $\frac{1}{2}$ mile north of Parliament House. Thickness ranged from 2' to 6'. Early 1955 reserves estimated to be 100,000 cu. yd. of which possibly as much as 25% would probably be wasted during extraction. By the end of 1957 the deposit had been virtually exhausted. Wastage in working was high.
American War Memorial	E645N095	A small deposit immediately south-east of American War Memorial. Average thickness variable, up to 8'; reserves 5 to 10,000 cu. yd. Area around War Memorial is improved and deposit can not now be worked.
Duntroon Deposit	E675N095	Within grounds of Royal Military College. Reserve approx. 15,000 cu.yd. Not available for working except possibly on limited scale by Military College.



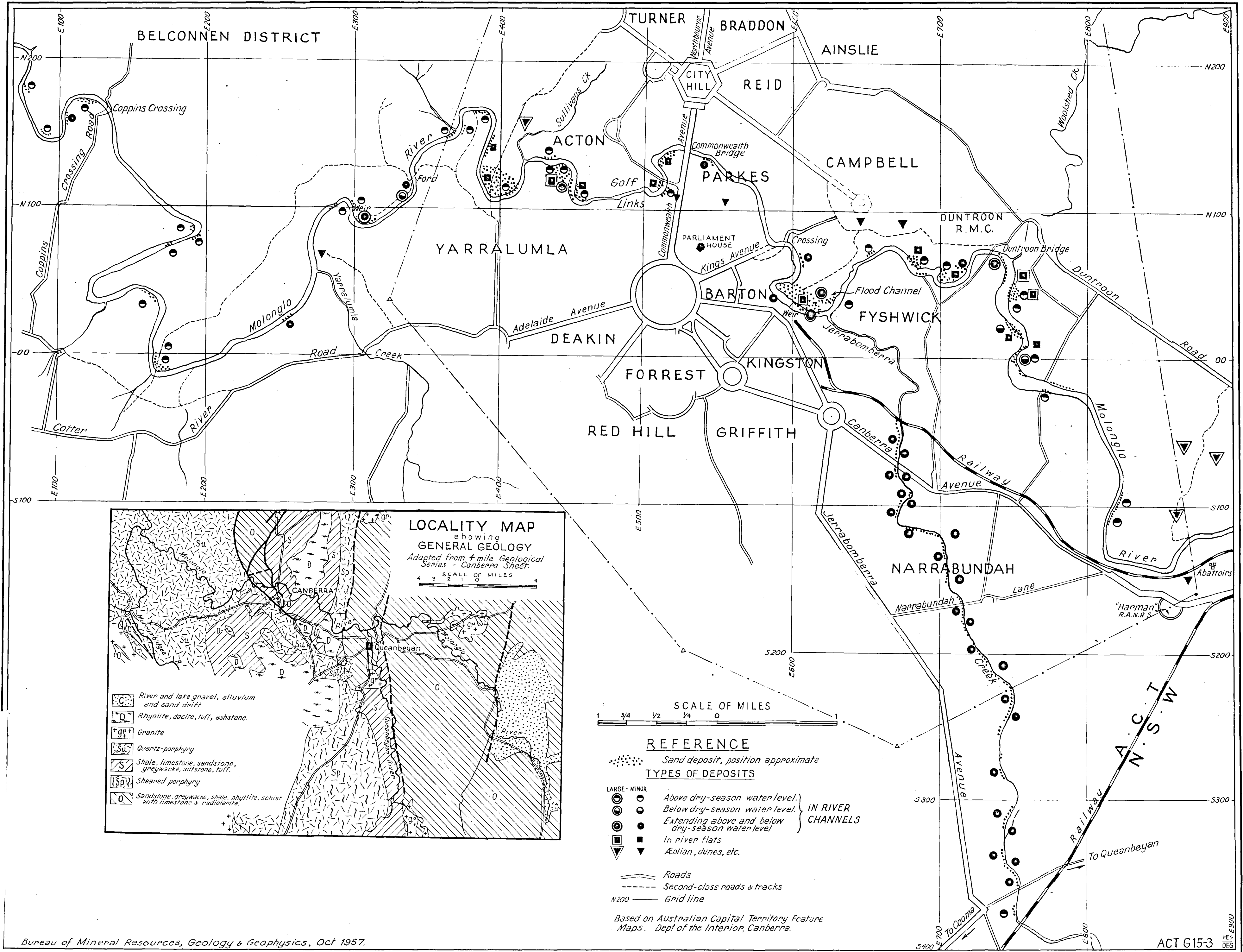
APPENDIX 4. Continued.

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Fyshwiok Deposit (?)		Deposit reported within area enclosed between Jerrabomberra Creek and large bend of river north of the Creek. Not investigated.
<hr/>		
Honeysuckle Deposits	E870S050 to S105	A group of relatively large deposits about 1 mile s.s.e. of Fairbairn Airport. Reserves in deposits tested up to July, 1958 amount to an estimated 165,000 cu.yd. Max. thickness exceeds 10' (the maximum depth of test holes).
<hr/>		
Abattoirs Deposit	E870S150	Two relatively small thin deposits; one west of the abattoirs contains approximately 5000 cu. yd. and the other a little further north, across the railway line contains approx. 2,000 cu. yd. Working would be impaired by the abattoirs' effluent drain.

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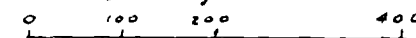
# LOCALITIES OF SAND DEPOSITS NEAR CANBERRA, A.C.T.



CANBERRA SAND INVESTIGATIONS

KINGSTON AREA.

Scale of Feet



Low bank

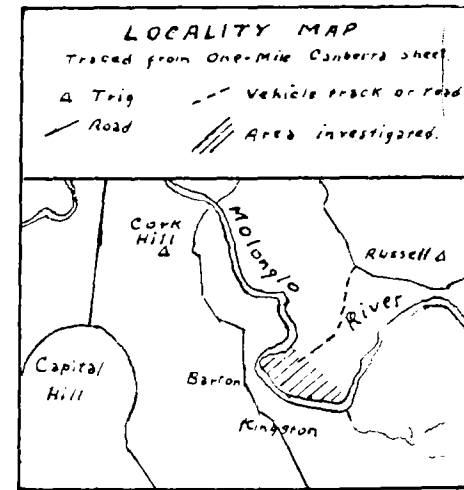
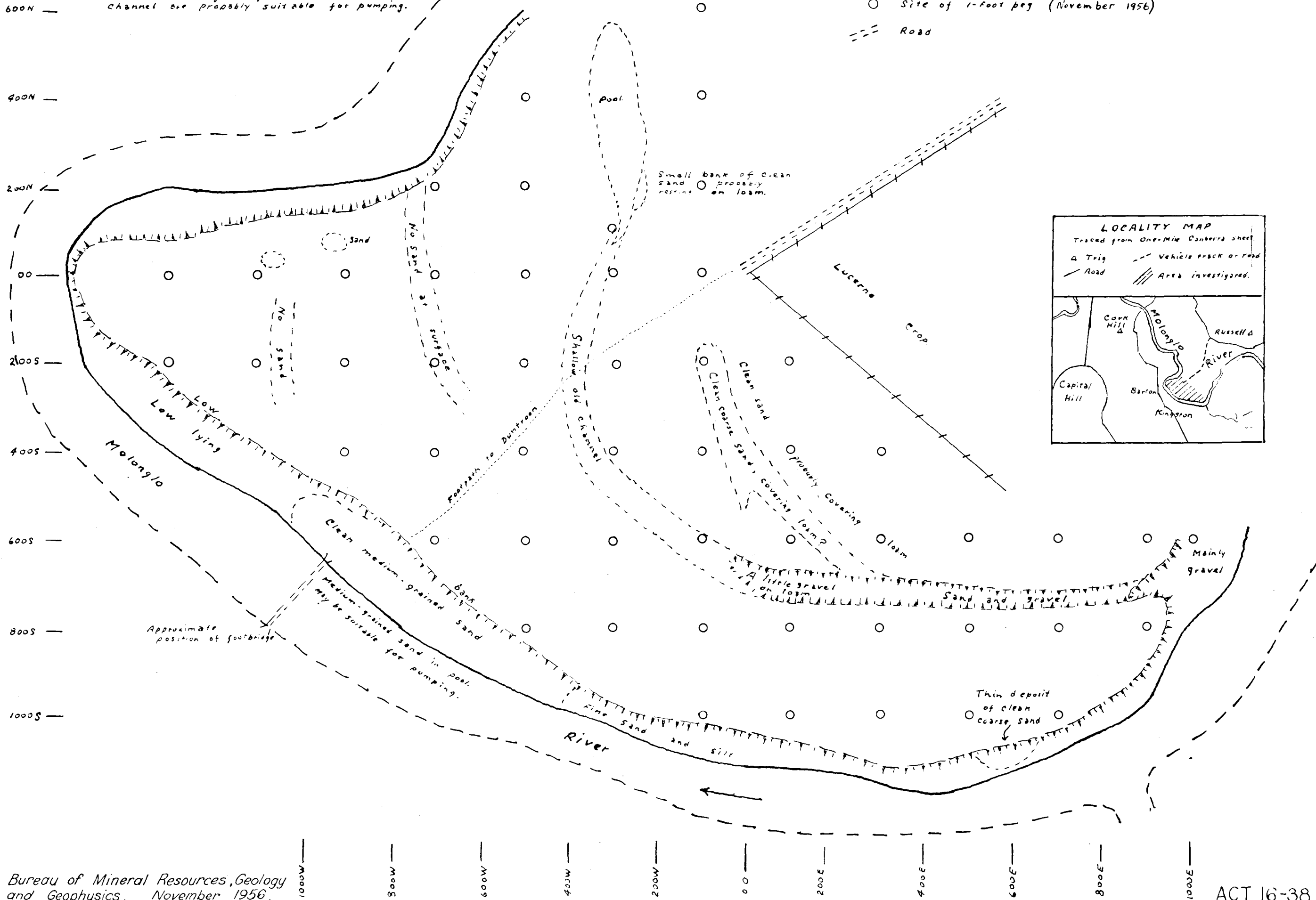


Site of 1-foot peg (November 1956)



Road

An alluvial flat, mainly soil and loam at surface and in low banks.  
 Traces of old river channels. Buried sand deposits may exist adjacent to these. Could be tested by pitting or boring.  
 Clean coarse sand in some channels are probably are probably thin deposits of 1956 flood-waters.  
 Deposit of clean medium-grained sand in bank near footbridge and in river channel are probably suitable for pumping.



CANBERRA

SAND INVESTIGATIONS  
DUNTAUGH BRIDGE DEPOSIT.

Scale: 0 100 200 (Ft.)  
Reference.

••• Sand and gravel

4 / Contour based on assumed datum  
20' at A.

— Fence

== Track (vehicle)

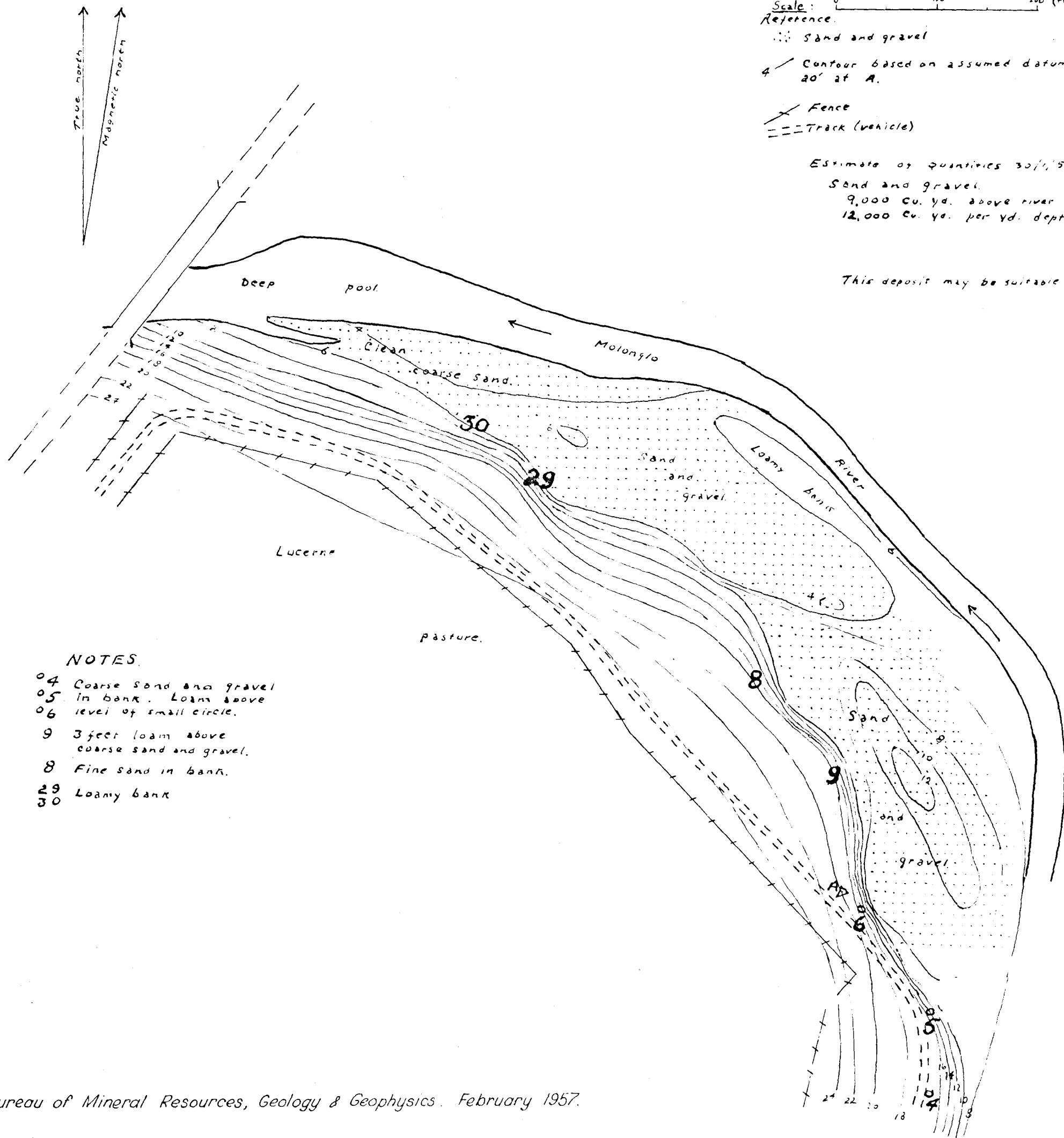
Estimate of quantities 30/1/57

Sand and gravel.

9,000 Cu. yd. above river level.

12,000 Cu. yd. per yd. depth below river level

This deposit may be suitable for working by dredge or drag line.



NOTES.

- 04 Coarse sand and gravel
- 05 in bank. Loam above
- 06 level of small circle.
- 9 3 feet loam above
- coarse sand and gravel.
- 8 Fine sand in bank.
- 29 Loamy bank
- 30

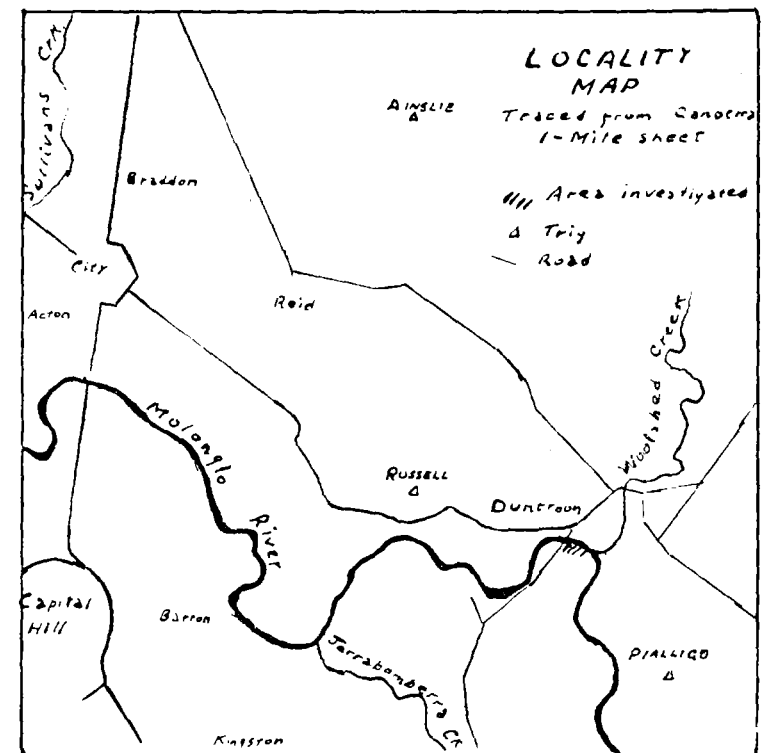
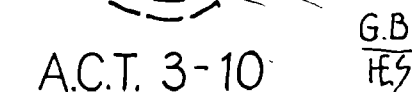


PLATE 4





# ÆOLIAN SAND

## SULLIVANS CREEK DEPOSIT

PLATE 5.

### Reference

- - - Approximate boundary of deposit.
- 45' — Contour based on assumed datum.
- + + + Fence

