DEPARTMENT OF MINES

SOUTH AUSTRALIA

ADMINISTRATION BRANCH

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REVIEW OF POST WAR BORING OPERATIONS

By

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REVIEW OF POST WAR BORING OPERATIONS

ABSTRACT

A review of post war boring operations in the field of percussion and diamond drilling as carried out by the Boring Branch of the South Australian Department of Mines.

A total of 11,929 bores have been completed for various purposes and 1,245,101 feet drilled during the period 1945-1955. Water boring operations have provided a total of 81 million gallons of water per day.

Boring plant performance in relation to plant strength and establishment is dealt with in detail.

INTRODUCTION

From the period of formation of the Mines Department Boring Branch in 1931, boring operations were carried out on a comparatively modest scale approximating ten thousand feet of drilling each year, with an establishment of five operational drilling plants, principally to meet the geological needs of the Department, and a limited amount of drilling for water supply purposes.

At the close of World War II it was foreseen that a much increased tempo of mineral exploration would be demanded of the Mines Department in order to keep pace with post war industrial rehabilitation, of the mineral industry, and that demand for boring services in the fields of subsurface water development, and civil construction work would increase to a degree far beyond the capacity of the then existing boring organisation.

To meet such demand a programme of expansion was inaugurated in 1945, and continued to a point of culmination in 1953, where the Boring Branch had been organised, expanded, and equipped, to carry out all boring commitments likely to be encountered in South Australia.

It is the purpose of this review to summate the activities of the Boring Branch, and work carried out during this period of post war expansion.

BORING OPERATIONS

During the period 1945-1955 the boring operations carried out in all fields of activity amount to 1,245,101 feet drilled and 11,929 bores completed.

The three principal fields of operation have been:-

(a) Percussion drilling for subsurface water supply development.

(b) Percussion drilling for mineral exploration, and civil engineering construction purposes.

(c) Diamond Drilling for mineral exploration and civil engineering construction purposes.

A limited amount of rotary drilling has also been carried out for mineral and hydrological investigation work.

Annual drilling performances are summarized in the accompanying tabulation.

SUMMARY OF DRILLING OPERATIONS 1945-1955

Year	Percussion Drilling				Diamond Drilling		Rotary Drilling		Total Drilling	
	Water Development		Other Purposes		All Purposes		All Purposes			
	Bores	Footage	Bores	Footage	Bores	Footage	Bores	Footage	Bores	Footage
1945	48	12,969	45	5,437	40	8,571	-	-	133	26,977
1946	188	34,428	90	9,127	55	10,953	-	-	333	54,508
1947	296	40,581	86	9,937	87	8,911	-	-	469	59,429
1948	240	30,727	349	20,200	70	17,725	-	-	659	68,652
1949	313	34,050	533	45,822	150	15,948	-	-	996	95,820
1950	373	27,485	730	82,492	119	10,832	-	-	1,222	120,809
1951	451	37,532	639	75,919	69	10,970	-	-	1,159	124,421
1952	344	45,742	840	82,850	64	19,412	2	2,118	1,250	150,122
1953	518	62,141	1,214	112,078	131	34,670	9	6,102	1,872	214,991
1954	393	44,607	1,227	87,874	347	45,298	1	528	1,968	178,307
1955	527	47,402	882	47,784	459	55,879	-	-	1,868	151,065
Total	3,691	417,664	6,635	579,520	1,591	239,169	12	8,748	11,929	1,245,101

PERCUSSION DRILLING - SUBSURFACE WATER DEVELOPMENT

The following are the principal subsurface water developmental works which have been carried out during the ten year period under review:-

METROPOLITAN AREA - AUXILIARY WATER SUPPLY

On behalf of the Engineering and Water Supply Department during the period 1945 to 1951 a total of 78 eight inch bores varying in depth from 300 to 500 ft. were constructed at strategic points throughout the Metropolitan Area of Adelaide, enabling subsurface water to be reticulated throughout the mains in times of emergency.

Footage drilled during the construction of these bores totalled 29,725 ft., and total potential yield of the scheme was approximately 20 million gallons per day.

LAND DEVELOPMENT EXECUTIVE - SOLDIER SETTLEMENT SCHEME

On behalf of the Land Development Executive for the establishment of farm water supply on Soldier Settlement blocks, a total of 1,012 bores have been constructed and 50,925 feet drilled on this project, which commenced in 1945, and is still continuing.

The work carried out to date is as follows:-

Settlement Area	Period	Bores Completed	Footage Drilled
Lower Southeast	1946-1955	741	30,411
Wanilla (Eyre Peninsula)	1948-1950	109	6,880
Upper Southeast	1951	36	6,844
Kangaroo Island	1948	9	699
Lower Yorke Peninsula	1954	15	1,061
Culburra	1955	102	5,030
Total to date		1,012	50,925

LONG RANGE WEAPONS ESTABLISHMENT - WATER SUPPLY

To establish water supplies for the Commonwealth defence projects at Woomera and Maralinga, a total of 6,972 feet of drilling has been done and 23 water bores completed during the period 1952 to 1955.

RURAL WATER SUPPLIES

On behalf of the Engineering and Water Supply Department approximately 50 bores have been constructed for country township water supply, and extensive hydrological investigations undertaken to develop other areas for pastoral and irrigation purposes. Two projects worthy of mention are:-

The Walloway Basin in the far north where 4,721 feet were drilled in the construction of 16 bores during 1946 and 1947.

The Lincoln Basin, where from 1946 to 1950 4,013 feet have been drilled in the construction of 73 bores at Uley-Wanilla.

FORESTRY DEVELOPMENT

On behalf of the Woods and Forests Department subsurface water supplies are regularly being established for saw milling, fire fighting and forest staff domestic purposes. To date 3,086 feet have been drilled in the construction of 28 bores.

MISCELLANEOUS GOVERNMENTAL AUTHORITY - WATER SUPPLIES

Since 1945 a total of 26,050 feet has been drilled and 186 bores of various sizes from 4" to 10" constructed on behalf of numerous Government authorities including the following:-

South Australian Railways

Architect-in-Chief's Department

Agriculture Department

Commonwealth Department of Works

PASTORAL, AGRICULTURAL AND DOMESTIC SUPPLIES

Subsurface water development for private individuals represents considerably more than half of the entire work of this nature undertaken by the Department. Since 1945 up to 1955 the total boring work done is represented as follows:-

	No. Bores	Footage Drilled
Governmental work	1,370	108,659
Private individuals	2,300	308,862
Total	3,670	417,521

Details of the principal work, for whom and when carried out are summarized in tabular form at the conclusion of this report.

SUBSURFACE WATER DEVELOPMENT

Year	Footage Drilled	Bores Constructed			Per Cent Production	Water Developed Millions Galls. Per Day
		Dry	Production	Total		
1946	34,428	20	168	188	89	7.0
1947	40,581	20	270	296	91	6.9
1948	30,727	31	209	240	87	8.7
1949	34,050	80	233	313	75	5.0
1950	27,485	81	292	373	78	6.4
1951	37,532	48	370	418	89	6.0
1952	45,742	55	333	388	86	9.0
1953	62,141	64	443	518	86	10.0
1954	44,607	85	308	393	79	7.5
1955	47,402	97	430	527	82	14.8
Ten Years	417,664	581	3,056	3,654	84	81.3

It is of interest to note that over the ten year post war period bores sunk for the development of subsurface water supply have made available for usage a potential 81 million gallons per day, a quantity equivalent to the mean summer consumption from all reservoirs in the Metropolitan area.

PERCUSSION DRILLING OTHER THAN SUBSURFACE WATER DEVELOPMENT

Percussion drilling work carried out, other than for development of subsurface water supply, has been adapted to a very wide field of application for mineral exploration, soil and foundation test work, blast holes, drainage and observation bores.

Many State and Commonwealth Government Departments, as well as private individuals and organisations, are utilizing the drilling service on an ever increasing scale. This is well illustrated in the accompanying tabulation, which shows how the annual footage drilled increased from 5,000 feet in 1945 to a peak of 112,000 in 1953, and is continuing at the rate of 50,000 feet per annum.

Principal among the projects carried out are:-

MINERAL EXPLORATION

Over the period 1945 to 1954 exploration and proving of the State coal resources has been carried by the Department of Mines and the following work done.

Coal Field	Bores Completed	Footage Drilled
Leigh Creek	3,193	388,219
Moorlands	447	50,326
Inkerman - Balaclava	11	3,343
Whitwarta	30	4,476
Total	3,681	446,364

In addition to coal exploration, 348 bores and 20,569 feet of drilling was done on behalf of the Government in the exploration and testing of iron ore resources, brick and ceramic clays, gypsum and numbersof other industrial minerals.

Miscellaneous mineral exploration work carried out on behalf of private organisation amounted to 343 bores and 19,835 feet drilled.

BLAST HOLES

Prior to the Electricity Trust of South Australia carrying out its own drilling work in connection with the mining of coal at Leigh Creek, 317 bores totalling 7,917 feet of drilling were completed for coal blasting purposes.

Similar blast hole drilling is being carried out for the Engineering and Water Supply Department in the construction of the South Para Reservoir .

To date 1,159 holes totalling 75,212 feet have been drilled for this purpose since 1953.

FOUNDATION TESTING

To provide information for the design of buildings, bridges, wharves and other civil structures, rapidly increasing use is being made of bore holes to reveal the load bearing nature of supporting strata, both by Government and private construction authorities. Work of this nature carried out since 1948 has been:-

	Bores	Footage Drilled
Government construction work	464	20,051
Private " "	84	3,234

Government Authorities concerned have been:-

Engineering and Water Supply Department

Highways and Local Government Department

South Australian Railways

Electricity Trust of South Australia

South Australian Harbors Board

Architect-in-Chief's Department

Commonwealth Department of Works

DRAINAGE AND OBSERVATION BORES

Since 1949 there has been a constant demand, particularly by Government construction authorities, for the construction of drainage bores for the disposal of storm waters, septic tank effluent, and land drainage.

Work completed since 1949 to 1955 has been as follows:-

	No. of Bores	Footage Drilled
Government Requirements	35	2,556
Private Requirements	252	16,058
Total	287	18,614

OIL EXPLORATION

Drilling work on exploration for oil commenced in 1955 at Wilkatana for Santos Ltd.

Present indications are that there will be considerable demand for this work both by the Government and private enterprise.

An analysis of the percussion drilling carried out other than for subsurface water development, appears in summarized form at the conclusion of this report.

DIAMOND DRILLING

During the period under review from 1945 to 1955 a total of 1,591 holes, and approximately 239,000 feet have been drilled in connection with a wide variety of projects, embracing principally mineral exploration, foundation testing for dam sites, and harbour works.

URANIUM

In the field of mineral exploration, prime attention has been paid to the search for uranium bearing minerals. Drilling carried out on the various uranium occurrences investigated to date is as follows:-

Locality	Period	No. of Bores	Footage Drilled
Radium Hill	1947-1955	273	84,361
Mount Painter	1945-1956	39	7,944
Houghton	1950-1953	17	1,587
Crocker Well	1953-1955	160	32,550
Myponga	1954-1955	22	2,307
Miscellaneous	1954-1955	18	2,159
Total		529	130,908

On the Radium Hill Project during the period 1953-1955 the drilling was carried out by contract on behalf of the Department of Mines.

Footage drilled amounted to 50,506 feet and 153 drill holes completed.

COPPER

Since 1945 exploration for copper in the Wallaroo-Moonta district has been carried on more or less continuously as an adjunct to various geological and geophysical surveys in search of copper. To date 37 holes and 13,751 feet have been drilled, unfortunately without locating any mineral deposit of economic significance.

A number of other copper occurrences throughout the State have been examined over this period by diamond drilling, and work to date comprises 13 drill holes and 3,229 feet of drilling.

MISCELLANEOUS MINERALS

Diamond drilling in connection with the testing and examination of other mineral deposits including talc, magnesite, graphite and lead has amounted to 10,779 feet drilled and 46 holes completed.

IRON ORE

During the period 1950-1952 a limited amount of exceedingly difficult drilling was carried out at Iron Knob on behalf of the Broken Hill Proprietary Co. Ltd. Since 1952, Government exploration has been continued in search of new iron ore deposits in the Middleback Ranges. Drilling completed to date has been as follows:-

	Period	No. of Bores	Footage Drilled
Broken Hill Pty. Co.	1950-1952	7	1,060
Department of Mines	1952-1955	32	15,287

QUARRY TEST WORK

During the period 1945-1949 a considerable amount of drilling has been undertaken on behalf of commercial interests in the testing of industrial mineral deposits for quarrying purposes. Also included in this category is the test drilling of quarry sites for road building aggregates, principally on behalf of the Highways and Local Government Department.

This work may be summated as follows:-

Locality	Material	Interest	No. Bores	Footage Drilled
Ardrossan	Dolomite	B.H.P. Co.	10	1,622
Reynella	Limestone	S.A. Portland Cement	18	1,478
Angaston	Marble	" " "	16	4,560
Rapid Bay	Limestone	B.H.P. Co.	11	1,652
Penrice	Marble	I.C.I. (Aust.)	53	14,990
Stansbury	Limestone	Adelaide Cement Co.	6	622
Various	Aggregate	H. & L.G.	99	7,018
	Total		213	31,942

DAM AND RESERVOIR CONSTRUCTION

On behalf of the Engineering and Water Supply Department, the geological examination and testing of proposed storage dam sites is carried out by diamond drilling.

Projects examined to date have been:-

Locality	Period	No. Bores	Feet Drilled
Copley	1947	8	389
Aroona	1951-1954	29	465
Clarendon	1947-1948	36	1,788
Myponga	1949-1950	37	3,242
Kangaroo Creek	1951	12	603
Hindmarsh Valley	1955	17	917
South Para	1954-1955	221	19,671
Total		360	27,075

FOUNDATION TESTING

In connection with the construction of harbor works, shipping wharves and berths, etc., specialised test drilling work on behalf of the South Australian Harbor Board carried out since 1947 has amounted to 276 holes completed and 5,089 feet drilled.

In the accompanying tabulations of diamond drilling operations 1945-1955, details of the principal work undertaken are shown.

DRILLING PLANT ESTABLISHMENT AND PERFORMANCE DATA

A tabulation has been prepared in an endeavour to relate drilling performance to the number of drilling plants on strength and in actual operation.

The nature of the drilling work undertaken, however, varies so greatly that it is not possible to arrive at any conclusion other than a wide approximation of the performance expected of a plant and the number of bores likely to be drilled.

In broad terms, 40 per cent of the plants held on strength may be expected to operate continuously throughout the year, and return a performance of between two and four thousand feet of drilling.

BORING PLANT AND EQUIPMENT

In 1945 the Boring Branch equipment comprised eight diamond drilling plants and eight percussion drilling plants, some of which was temporary wartime equipment constructed in the Departmental workshop, whilst other plants were near obsolete, having been purchased twenty years or more previously. The problem of meeting drilling commitments was rendered more acute by the extreme shortage of drilling staff and personnel. Demobilisation of the armed services had not then commenced, consequently it was only possible to maintain five drilling plants in operation.

When demobilization commenced in 1946 and drilling personnel became more readily available, eleven percussion and one additional diamond drilling plants were purchased. From this period onwards drilling equipment was acquired as circumstances demanded, and drilling personnel became available.

The problem of drilling personnel became so acute in 1949 that it was found expedient to institute a school for the training of drillers. As a result, considerable expansion was effected in 1950 by the purchase of an additional twelve modern percussion drilling plants to carry out the urgent need for exploration of the Leigh Creek coalfield.

By 1954 boring plant strength had been built up to 47 percussion and 22 diamond drilling plants. This number, however, included obsolete and worn out plants which have since been disposed of, leaving a present strength of 32 percussion and 22 diamond drilling plants.

The accompanying tabulations list details of the boring plant establishment from 1944 to 1956, the types of plant, cost of purchase, and period of service obtained.

It is of interest to note that fifteen percussion drilling plants after an average service life of 8 years, returned 57 per cent of the purchase value at disposal.

BORING PLANT PERFORMANCE

An attempt has been made, shown in the accompanying tabulations, to arrive at an average measure of performance, i.e. the number of bores and footage drilled per plant each year for purposes of annual comparison.

It will be noted from the tabulations over the period 1950-1956, for which accurate records are available, that percussion plant performance on subsurface water development ranges from 2,000 to 4,000 feet per annum, whereas on drilling work other than subsurface water development performance ranges from 4,000 to 7,000 feet per annum. Similarly diamond drilling performance varies widely from 2,000 to 4,000 feet per year.

So many factors invluence the drilling performance, that it is difficult to postulate, except between wide limits, what duty might reasonably be expected of a boring plant engaged on a variety of projects during a yearly operation.

SERVICEABILITY OF BORING PLANTS

A perusal of the accompanying tabulations shows that of the total plants on strength the average number actively drilling is 75 per cent of the percussion plants, both on water development and mineral exploration; and 40 per cent of the diamond drilling plants.

Lost operational time is accounted for by necessary overhaul and maintenance lack of suitable drilling crews for specific projects, plant movement from project to project, and particularly in the case of diamond drilling, the limited field of use for which any particular type of diamond drilling plant can be adapted.

The wide range and type of drilling work to which the Boring Branch is committed makes it necessary to keep on strength plants suitable for all occasions.

The following are details of the drilling plant fleet at present operated by the Department of Mines:-

PERCUSSION DRILLING PLANTS

Number	Make	Type	Date of Purchase
3	Ruston Bucyrus	W.22	1948
3	Ruston Bucyrus	W.22	1949
12	Ruston Bucyrus	W.22	1950
6	Ruston Bucyrus	W.22	1952
1	Ruston Bucyrus	RW.22	1954
1	Department of Mines	Model 100	1948
1	" " "	Model 200	1948
1	Bethune	-	1948
1	Bethune	Model 400	1951
2	Bethune	" "	1952
1	Hydromaster	1800 Mk.III	1956
32			

ROTARY DRILLING PLANTS

Number	Make	Type	Date of Purchase
1	Conrad Stork	-	1956

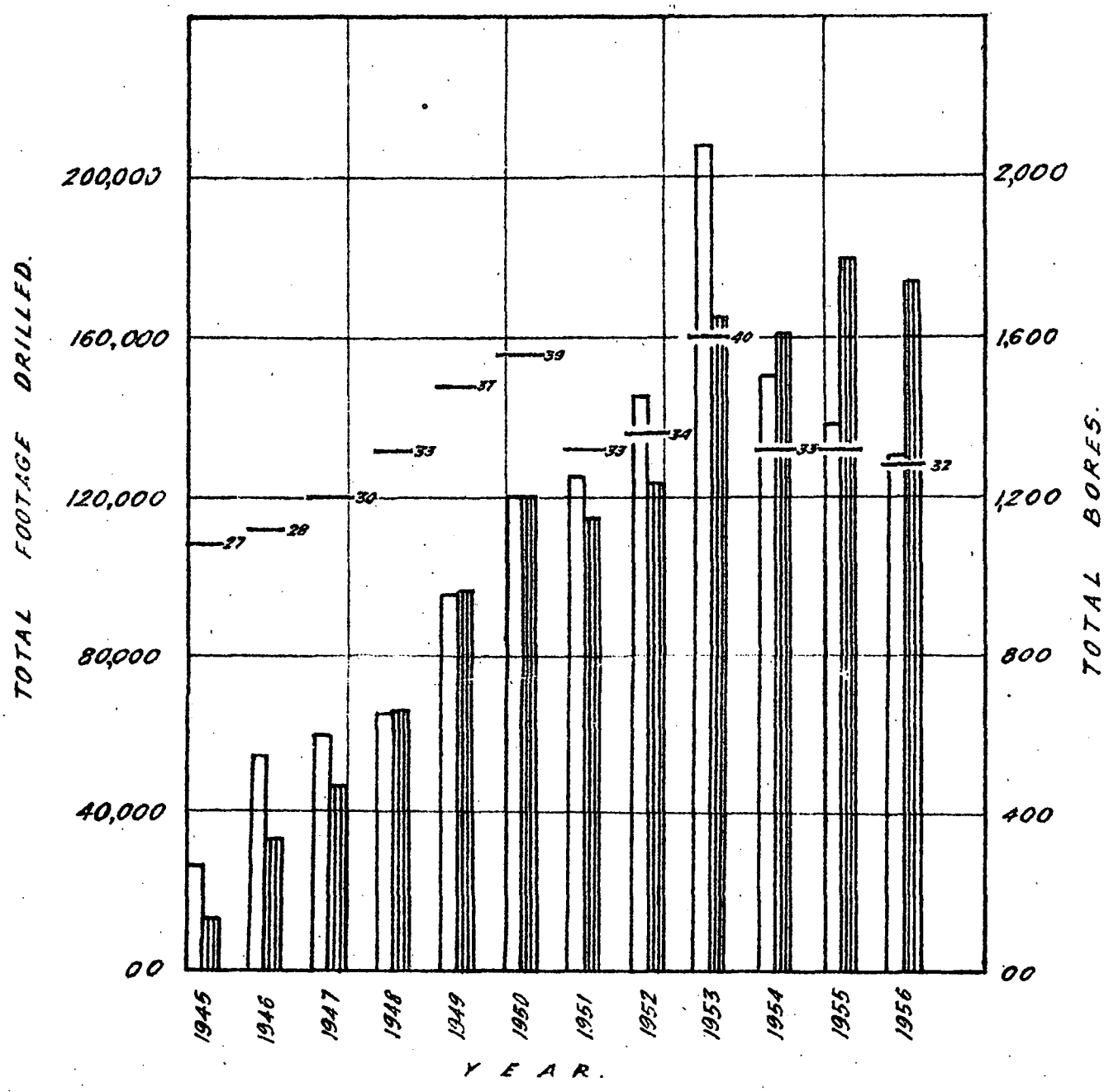
DIAMOND DRILLING PLANTS

1	Mindrill	A.2000	1954
2	Mindrill	E.2000	1954
1	Mindrill	EM.500	1954
2	Mindrill	E.1000	1955
1	Mindrill	E. 300	1955
1	Mindrill	E.1000	1956
1	Department of Mines	Pioneer E.500	1948
2	Mindrill	E.1000	1954
1	Mindrill	J.V.41	1944
1	Mindrill	E.H.500	1948
2	Mindrill	E.1000	1948
1	Department of Mines	E.H.500	1949
1	Mindrill	A.1500	1950
1	Boyles Bros.	31/40	1954
1	Mindrill	E.500	1951
3	Mindrill	A.2000	1951
22			

11/2/57

TOTAL FOOTAGE BORES DRILLED

NUMBER OF PLANTS OPERATING.



S.A. DEPARTMENT OF MINES					
Approved	Passed	Drn.	GRAPH OF BORING ACTIVITIES 1945 — 1956	D.M.	Scale —
		Tcd. M.J.F.		Req.	S 1406 MD.
		Ckd. R.R.			
Director		Exd.			Date 29·1·57

PERCUSSION DRILLING PLANT PERFORMANCE DATA 1945-1955. TABLE 1

Year	Percussion Drilling other than Water Development						Subsurface Water Development						All Percussion Drilling						
	Drilling Performance		No. of drilling plants		Annual average per plant		Drilling Performance		No. of drilling plants		Annual average per plant		Drilling Performance		Number of Drilling Plants			Annual Average per plant	
	Feet	Bores	Max. Operating	Av. Operating	Feet	Bores	Feet	Bores	Max. Operating	Av. Operating	Feet	Bores	Feet	Bores	Strength	Max. Operating	Av. Operating	Feet	Bores
1945	5,437	45	N.A.	N.A.	N.A.	N.A.	12,969	48	N.A.	N.A.	N.A.	N.A.	18,406	93	8	5	5	3,700	19
1946	9,127	90	"	"	"	"	34,428	188	"	"	"	"	43,555	278	19	N.A.	N.A.	N.A.	N.A.
1947	9,937	86	"	"	"	"	40,581	296	"	"	"	"	50,518	382	21	"	"	"	"
1948	20,200	349	"	"	"	"	30,727	240	"	"	"	"	50,927	589	28	"	"	"	"
1949	45,822	533	"	"	"	"	34,050	313	"	"	"	"	79,872	846	31	"	"	"	"
1950	82,492	730	19	15.2	5,400	48	27,485	373	17	12.8	2,200	29	109,977	1,103	41	36	28.0	4,000	40
1951	75,919	639	19	13.5	5,600	47	37,532	451	18	14.2	2,600	31	113,451	1,090	40	37	27.7	4,100	40
1952	82,850	840	19	12.6	4,400	66	45,742	344	18	14.2	3,200	24	128,592	1,184	48	37	26.8	4,800	44
1953	112,078	1,214	17	15.1	7,400	80	62,141	518	19	14.8	4,200	35	174,219	1,732	47	36	29.9	5,800	58
1954	87,874	1,227	16	11.2	7,700	110	44,607	393	16	12.6	3,500	31	132,481	1,620	33	32	23.8	5,600	56
1955	47,784	882	12	9.1	5,200	97	47,402	527	18	12.6	3,800	42	95,186	1,409	32	30	21.7	4,400	44
1956[x]	56,000	910	19	13.3	4,200	68	33,000	300	15	8.2	4,000	37	89,000	1,210	32	34	21.5	4,100	42

[x]Estimated on 10 months operation

SUBSURFACE WATER DEVELOPMENT - PRINCIPAL PROJECTS

TABLE 2

Behalf of	Job Nature	1945		1946		1947		1948		1949		1950		1951		1952		1953		1954		1955		Total	
		Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet
E. & W.S.	Metropolitan Area auxiliary water supply Salisbury	23	9,315	13	5,365	2	914	-	-	10	4,091	14	3,829	6	2,060	6	2,381	-	-	-	-	-	-	74	27,955
E. & W.S.	Uley-Wanilla Water Supply	-	-	8	865	-	-	23	1,222	21	868	21	1,058	-	-	-	-	-	-	-	-	-	-	73	4,013
E. & W.S.	Pekina-Walloway Basin	-	-	7	2,598	9	2,123	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	4,721
Lands	Soldier Settlement - Southeast Lower	-	-	30	2,925	130	9,285	34	2,006	81	2,623	127	4,459	126	3,777	69	1,902	67	1,610	40	743	37	1,087	741	30,411
"	" " - Wanilla	-	-	-	-	-	-	11	886	56	3,358	42	2,636	-	-	-	-	-	-	-	-	-	-	109	6,880
"	" " - Kangaroo Island	-	-	-	-	-	-	9	699	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	699
"	" " - Upper Southeast	-	-	-	-	-	-	-	-	-	-	-	-	36	6,844	-	-	-	-	-	-	-	-	36	6,844
Woods and Forests	Timber Milling Development - Southeast	-	-	-	-	5	357	5	609	2	215	-	-	1	150	6	493	7	965	1	220	1	80	28	3,086
Sundry Govt.		-	-	-	-	-	-	11	1,707	5	1,347	41	7,018	31	1,854	17	4,028	18	1,464	17	4,300	24	2,296	164	24,014
A-in-C		-	-	-	-	-	-	1	200	1	44	-	-	6	821	-	-	2	100	5	306	7	565	22	2,036
S.E.D.B.	Drainage Bores	-	-	-	-	-	-	-	-	-	-	-	-	14	232	27	387	-	-	-	-	-	-	41	619
Drainage		-	-	-	-	-	-	-	-	-	-	-	-	-	-	28	1,208	12	1,094	23	2,831	55	5,808	-	-
L.R.W.E.	Woomera and Maralinga	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	707	4	851	7	1,578	5	3,656	23	6,792
E. & W.S.	Town Supplies	5 per annum																							
Lands	Soldier Settlement - York Peninsula	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	1,061	-	-	15	1,061
"	" " - Culburra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	102	5,030	102	5,030

PERCUSSION DRILLING - SUBSURFACE WATER 1945-1956

TABLE 3

Year	Lands		E. & W.S.		A-in-C		Forests		Other Govt.		Mines		Total Govt.		Private Hire		Grand Total	
	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet
1945	-	-	23	9,315	—	-	-	-	-	-	2	199	25	9,514	23	3,455	48	12,969
1946	30	2,925	11	5,365	-	-	-	-	-	-	-	-	41	8,290	147	26,138	188	34,428
1947	130	9,285	2	321	-	-	5	357	-	-	-	-	137	9,963	159	30,618	296	40,581
1948	54	3,591	29	2,089	1	200	5	609	11	1,707	-	-	100	8,196	140	22,581	240	30,727
1949	143	6,543	42	6,830	1	44	2	215	5	1,347	-	-	193	14,979	120	19,071	313	34,050
1950	169	7,095	35	4,887	-	-	-	-	-	-	-	-	204	11,982	148	15,310	373	27,485
1951	154	5,026	19	6,892	6	821	1	150	31	1,854	2	331	251	15,674	200	21,858	451	37,532
1952	62	1,901	11	4,255	-	-	5	410	10	2,159	3	368	98	9,398	246	36,344	344	45,742
1953	62	1,522	4	427	1	40	4	965	3	485	6	272	87	3,711	431	58,430	518	62,141
1954	39	2,486	5	1,332	1	221	2	220	5	1,406	16	1,814	77	7,478	316	37,129	393	44,607
1955	133	6,502	3	744	6	1,377	1	80	-	-	14	772	157	9,474	370	37,928	527	47,402
11 Years	976	46,876	184	42,457	16	2,703	25	3,006	65	8,958	43	3,756	1,370	108,659	2,300	308,862	3,691	417,664

PERCUSSION DRILLING OTHER THAN WATER - DETAIL OF PRINCIPAL WORKS UNDERTAKEN

TABLE 4

Behalf of	Job Nature	1945		1946		1947		1948		1949		1950		1951		1952		1953		1954		1955		Total	
		Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet
Mines Dept.	Leigh Creek - Coal Exploration	43	5,308	44	5,523	26	2,668	38	4,440	232	25,970	468	56,957	371	54,236	591	76,412	899	100,756	481	55,989	-	-	3,193	388,219
"	Moorlands - "	-	-	46	3,604	57	6,426	52	5,266	99	10,666	116	14,716	74	9,146	3	502	-	-	-	-	-	-	447	50,326
"	Inkerman - "	-	-	-	-	3	843	8	2,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	3,343
"	Whitwarta - "	-	-	-	-	-	-	-	-	22	3,674	5	697	3	105	-	-	-	-	-	-	-	-	30	4,476
Private	Foundation Testing	-	-	-	-	-	-	11	980	-	-	-	-	4	133	39	666	13	636	11	538	6	281	84	3,234
Govt.	" "	2	129	-	-	-	-	10	879	20	700	62	2,771	83	4,387	44	1,392	63	2,045	162	6,428	18	1,320	464	20,051
Private	Drainage Bores	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	355	8	368	25	1,833	35	2,556
Govt.	" "	-	-	-	-	-	-	-	-	9	1,029	6	427	28	2,280	27	387	10	239	15	2,463	30	3,975	125	11,300
Private	Mineral Exploration	-	-	-	-	-	-	19	368	24	1,169	7	1,794	19	2,284	102	2,709	10	408	18	1,286	74	9,817	343	19,835
Govt.	" "	-	-	-	-	-	-	12	504	-	-	61	4,899	84	3,297	-	-	68	3,386	117	7,811	6	671	348	20,569
E.T.S.A.	Blast Holes (Leigh Creek)	-	-	-	-	-	-	199	5,303	118	2,614	-	-	-	-	-	-	-	-	-	-	-	-	317	7,917
E. & W.S.	Blast Holes (South Para Dam)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	149	3,753	415	12,991	595	24,468	1,159	75,212
E. & W.S.	Observation Bores (Foundation Springs)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	127	4,758	127	4,758
Mines Dept.	Oil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	661	1	661
	Total	45	5,437	90	9,127	86	9,937	349	20,200	533	45,822	730	82,492	639	75,919	840	82,850	1,214	112,078	1,227	87,874	882	47,784	6,635	579,520

DIAMOND DRILLING OPERATIONS 1945-1955

TABLE 5

DETAIL OF THE PRINCIPAL WORK UNDERTAKEN

Behalf of	Project	1945		1946		1947		1948		1949		1950		1951		1952		1953		1954		1955		Total	
		Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet	Bores	Feet
Mines Dep.	Uranium - Mt. Painter	5	846	-	-	4	1,529	9	1,815	12	2,566	9	1,188	-	-	-	-	-	-	-	-	-	-	39	7,944
" "	" - Radium Hill	-	-	-	-	5	851	15	3,708	27	6,288	19	5,035	27	7,659	27	10,314	70	22,826	29	14,952	54	12,728	273	84,361
" "	" - Houghton	-	-	-	-	-	-	-	-	-	-	6	620	-	-	-	-	11	967	-	-	-	-	17	1,587
" "	" - Crocker Well	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	4,312	68	12,193	60	16,045	160	32,550
" "	" - Myponga	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	2,227	2	80	22	2,307
" "	" - Miscellan.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	1,718	5	441	18	2,159
" "	Copper - Wallaroo-Moonta	5	1,540	4	1,179	1	1,508	8	3,331	2	830	1	321	4	886	6	1,899	-	-	4	1,556	2	701	37	13,751
" "	" - Miscellan.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	918	7	2,011	2	300	-	-	13	3,229
" "	Miscellaneous Mineral	5	964	1	330	4	816	-	-	-	-	-	-	5	1,032	5	2,834	2	1,045	-	-	24	3,758	46	10,779
Govt.	Quarry Site Investigations	-	-	-	-	22	667	4	329	35	2,348	7	609	9	327	17	1,974	4	604	-	-	1	160	99	7,018
S.A.H.B.	Test Holes Harbours etc.	-	-	-	-	2	20	-	-	50	788	37	994	-	-	-	-	-	-	58	1,187	129	2,100	276	5,089
Private Enterprise	Limestone - Ardrossan	2	396	2	456	-	-	6	770	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	1,622
"	" - Reynella	8	513	10	965	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	1,478
"	" - Angaston	7	1,970	-	-	6	1,286	-	-	3	1,304	-	-	-	-	-	-	-	-	-	-	-	-	16	4,560
"	" - Rapid Bay	-	-	11	1,652	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	1,652
"	" - Penrice	8	2,342	26	6,371	-	-	19	6,277	-	-	-	-	-	-	-	-	-	-	-	-	-	-	53	14,990
"	" - Stansbury	-	-	-	-	4	406	2	216	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	622
E. & W.S.	Damsite - Hindmarsh Valley	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	917	17	917
"	" - South Para	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77	8,609	144	11,062	221	19,671
"	" - Copley	-	-	-	-	8	389	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	389
"	" - Aroona	-	-	-	-	-	-	-	-	-	-	-	-	10	152	-	-	-	-	19	313	-	-	29	465
"	" - Clarendon	-	-	-	-	29	1,438	7	350	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36	1,788
"	" - Myponga	-	-	-	-	-	-	-	-	17	1,711	20	1,531	-	-	-	-	-	-	-	-	-	-	37	3,242
"	" - Kangaroo Creek	-	-	-	-	-	-	-	-	-	-	-	-	12	603	-	-	-	-	-	-	-	-	12	603
Govt.	Miscellaneous Work	-	-	-	-	-	-	-	-	4	113	16	14	-	-	-	-	-	-	48	72	-	-	68	199
B.H.P.	Iron Ore - Investigations	-	-	-	-	-	-	-	-	-	-	4	526	2	312	1	222	-	-	-	-	-	-	7	1,060
Mines Dep.	" " "	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	942	5	2,908	4	1,553	21	9,884	32	15,287
		40	8,571	55	10,953	87	8,911	70	17,725	150	15,948	119	10,832	69	10,970	64	19,412	131	34,667	347	45,298	459	55,879	1,591	239,169

DIAMOND DRILLING PLANT PERFORMANCE 1945-1956 TABLE 6

Year	Drilling Performance		Number of drilling plants			Average Plant Performance	
	Footage Drilled	No.of Bores	On Strength	Maximum Operating	Average Operating	Footage Drilled	No.of Bores
1945	8,571	40	8	N.A.	5	1,700	8
1946	10,953	55	9	N.A.	8.6	1,800	9
1947	8,911	87	10	N.A.	7	1,250	12
1948	17,725	70	14	N.A.	9	2,000	8
1949	15,948	150	16	N.A.	N.A.	-	-
1950	10,832	119	18	10	7.4	1,450	16
1951	10,970	69	17	8	5.4	2,000	13
1952	19,412	64	18	11	7.2	2,700	9
1953	34,670	131	15	11	9.4	3,700	14
1954	30,346	317	22	12	8.1	3,700	39
1955	43,151	405	25	15	11.5	3,300	38
1956*	31,000	158	22	10	8.6	3,600	18

*Estimated on 10 months operation.

NOTE: Radium Hill contract drilling excluded from the above totals.

DEPARTMENT OF MINES

TABLE 7

BORING PLANT ESTABLISHMENT

Year	Percussion			Diamond			Rotary			Waggon		
	Purchased	Disposed	Balance	Purchased	Disposed	Balance	Purchased	Disposed	Balance	Purchased	Disposed	Balanc
Prior to 31/12/1944	8	-	8	7	-	7						
1945	-	-	8	1	-	8						
1946	11	-	19	1	-	9						
1947	2	-	21	1	-	10						
1948	7	-	28	4	-	14						
1949	3	-	31	2	-	16						
1950	12	2	41	2	-	18						
1951	1	2	40	3	4	17						
1952	8	-	48	1	-	18	1	-	1			
1953	-	1	47	-	3	15	-	-	1	2	-	2
1954	1	15	33	7	-	22	-	-	1	-	-	2
1955	1	2	32	3	-	25	-	1	-	-	2	-
1956	1	1	32	1	4	22	1	-	1	-	-	-

PERCUSSION BORING PLANTS

TABLE 8

No.	Make	Type	Source of Funds	Cost Price £ s. d.	Date of Purchase	Date of Sale	Selling Price £ s. d.
1	Duffield	Model 100	Revenue	257 19 1	1933	1951	25 0 0
1	Ruston Bucyrus	W 22	Loan	3,241 11 7	1952	-	-
2	Department of Mines	Model 250	Revenue	409 6 1	1938	1953	75 0 0Est.
2	Ruston Bucyrus	22 RW	Loan	2,810 0 0	1954	-	-
3	Department of Mines		Revenue	300 0 0	1930	1950	100 0 0
3	Ruston Bucyrus	W 22	Loan	3,241 11 7	1952	-	-
4	Department of Mines		Revenue	720 0 0	1938	1954	Scrapped
4	Ruston Bucyrus	W 22	Loan	3,241 11 7	1952	-	-
5	Horwood Bagshaw	Model 1000	Revenue	350 0 0	1910	1950	85 0 0
5	Ruston Bucyrus	W 22	Loan	3,241 11 7	1952	-	-
6	Horwood Bagshaw	Model 500	Revenue	1,086 11 4	1947	1955	650 0 0
6	Hydromaster	1880/2	Loan	8,334 4 6	1956	-	-
7	Horwood Bagshaw	Model 500	Revenue	1,086 11 4	1948	1955	341 5 0
7	Hydromaster	1800 MKIII	Loan	7,834 2 2	1955	1956	7,414 12 2
8	Horwood Bagshaw	Model 150	Revenue	400 0 0	1947	1954	25 0 0
8	Ruston Bucyrus	W 22	Loan	3,241 11 8	1952	-	-
9	Department of Mines	Winch Plant	Revenue	200 0 0	1939	1951	35 0 0
9	Ruston Bucyrus	W 22	Loan	3,241 11 8	1952	-	-
10	Department of Mines	Model 100	Revenue	386 9 0	1948	-	-
11	" " "	Model 200	Loan	776 11 2	1948	-	-
12	Bethune		"	2,458 4 6	1948	-	-
13	Ruston Bucyrus	W 22	"	2,701 4 11	1948	-	-
14	" "	"	"	2,701 4 11	1948	-	-
15	" "	"	"	2,701 4 10	1948	-	-
16	Horwood Bagshaw	Model 500	Revenue	503 0 0	1946	1954	400 0 0
17	Ruston Bucyrus	W 22	Loan	2,582 3 11	1949	-	-
18	Horwood Bagshaw	Model 500	Revenue	957 10 3	1944	1954	243 15 0
19	Ruston Bucyrus	W 22	Loan	2,601 1 5	1949	-	-
20	" "	"	"	2,586 16 7	1949	-	-
21	" "	"	"	2,724 6 1	1950	-	-
22	" "	"	"	2,940 17 8	1950	-	-
23	Horwood Bagshaw	Model 500	Revenue	863 0 0	1944	1954	292 10 0
24	" "	" "	"	503 0 0	1946	1954	390 0 0
25	" "	" "	"	577 12 0	1946	1954	365 12 6
26	" "	" "	"	513 5 0	1946	1954	297 7 6
27	Ruston Bucyrus	W 22	Loan	2,841 0 10	1950	-	-
28	Horwood Bagshaw	Model 500	Revenue	503 0 0	1946	1954	414 7 6
29	" "	" "	"	424 12 11	1946	1954	443 12 6
30	" "	" "	"	503 0 0	1946	1954	585 0 0
31	" "	" "	"	503 0 0	1946	1954	292 10 0
32	Ruston Bucyrus	W 22	Loan	2,127 0 4	1950	-	-
33	Horwood Bagshaw	Model 500	Revenue	452 11 1	1946	1954	243 15 0
34	" "	" "	"	430 0 0	1946	1954	146 5 0
35	" "	" "	"	518 8 6	1946	1954	390 0 0
36	Ruston Bucyrus	W 22	Loan	3,020 12 5	1950	-	-
37	" "	"	"	2,718 16 1	1950	-	-
38	" "	"	"	2,725 3 0	1950	-	-
39	" "	"	"	2,723 11 5	1950	-	-
40	" "	"	"	2,723 5 7	1950	-	-
41	" "	"	"	2,727 15 0	1950	-	-
42	" "	"	"	2,704 11 3	1950	-	-
43	" "	"	"	2,726 19 5	1950	-	-
44	Bethune	Model 400	"	1,295 0 0	1951	-	-
45	"	" "	"	1,514 12 3	1952	-	-
46	"	" "	"	1,514 12 4	1952	-	-

DIAMOND DRILLING PLANTS

TABLE 9

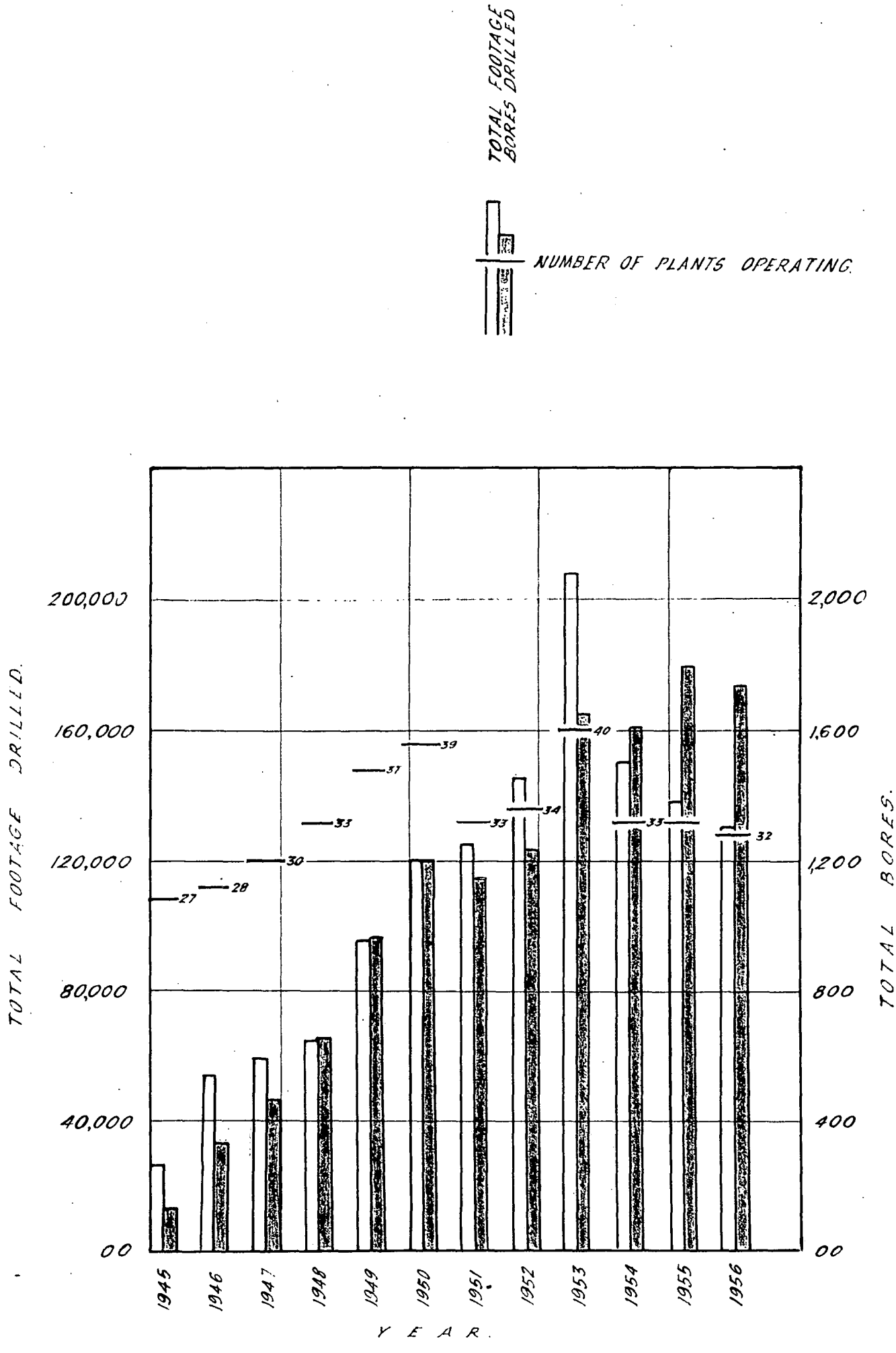
D.M. No.	Make	Model	Source of Funds	Cost Price	Date of Purchase	Date of Disposal	Selling Price
				£ s. d.			£ s. d.
1	Sullivan	Model CS	Revenue	350 0 0	1890	1951	32 10 0
1A[x]	Mindrill	A2000	Loan	2,767 12 10	1954	-	-
2	Sullivan	Model CS	Revenue	350 0 0	1890	1951	21 10 0
2A[x]	Mindrill	E2000	Loan	1,950 0 0	1954	-	-
3	Sullivan	Model N	Revenue	500 0 0	1911	1951	21 10 0
3A[x]	Mindrill	E2000	Loan	1,950 0 0	1954	-	-
4	Buda	-	Revenue	350 0 0	1930	1951	Scrapped
4A[x]	Mindrill	EM500	Loan	100 0 0	1954	-	-
5	Sullivan	Model 22	Revenue	853 16 3	1942	1956	13 0 0
5	Mindrill	E1000	Loan	2,517 12 0	1955	-	-
6	Sullivan	Model 22	Revenue	500 0 0	1944	1956	13 0 0
6	Mindrill	E300	Loan	1,085 10 2	1955	-	-
7	Sullivan	Model 12	Revenue	780 6 10	1945	1956	14 0 0
7	Mindrill	E1000	Loan	2,922 10 10	1956	-	-
8	Dept. of Mines	Pioneer E500	"	592 9 10	1948	-	-
9	Boyles Bros.	Model S-2	Revenue	415 0 0	1946	1953	Scrapped
9A	Mindrill	E1000	Loan	903 14 2	1954	-	-
10	Mindrill	J V 41	Trust Fund	300 0 0	1944	-	-
11	Mitchell	Model G10E	Revenue	100 0 0	1947	1953	Scrapped
11	Mindrill	E1000	Loan	903 14 2	1954	-	-
12	"	EH500	Trust Fund	300 0 0	1948	-	-
13	"	E1000	Revenue	715 0 0	1948	-	-
14	"	E1000	"	890 0 0	1948	-	-
15	Dept. of Mines	EH500	Loan	332 16 3	1949	-	-
16	Mindrill	EM500	"	355 7 6	1949	1956	Written off
16	"	E1000	"	2,731 10 6	1955	-	-
17	"	A1500	"	1,205 5 3	1950	-	-
18	"	JV-83/40	"	172 0 0	1950	1953	121 16 8
18	Boyles Bros.	31/40	"	550 0 0	1954	-	-
19	Mindrill	E500	"	676 0 0	1951	-	-
20	"	A2000	"	2,381 15 0	1951	-	-
21	"	A2000	"	2,736 5 0	1951	-	-
22	"	A2000	"	2,717 6 11	1952	-	-

[x] Purchased from Radium Hill Project
Source of Funds: Loan = Loan Works - Mines Department

OTHER DRILLING PLANTS

D.M. No.	Make	Model	Source of Funds	Cost Price	Date of Purchase	Date of Disposal	Selling Price
			ROTARY				
1	Failing	Rotary	Loan	36,346 4 7	1952	1955	18,000 0 0
	Conrad	"	"	4,477 0 0	1956	-	-
			WAGGON				
1	-	Model D318	Loan	7,234 2 11	1953	1955	7,234 2 11
2	-	" "	"	7,234 2 11	1953	1955	4,920 2 3 Est.

Addendum II



S.A. DEPARTMENT OF MINES

		M.J.T. Ch. R.R.	GRAPH OF BORING ACTIVITIES 1945 — 1956		S 1406 MD. Date 29-1-57