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OCEAN MINING A.G.
TASMANIA OFFSHORE EXPLORATION PROGRAMME
REPORT OF OPERATIONS - JANUARY, 1967.

Part II

Ocean Mining A.G.,
Field Headquarters,
38 Canning Street,
Launceston, Tasmania.

February, 1967.

Feb 1967

V

SUMMARY

Steady progress was achieved in Phase II drilling during January. Forty-six holes were drilled in Ringarooma Bay and seven holes drilled in Mussel Roe Bay. By the end of January 127 holes had been drilled in Ringarooma Bay and 10 in Mussel Roe Bay.

Encouraging assay results have been received for samples from Ringarooma Bay. Results received for samples from Mussel Roe Bay are generally discouraging.

Assay results for 19 samples from the East King Island licence showed low tin, titanium and zirconium values. These samples, however, were from seven poorly sited holes drilled in adverse conditions in November and December. The principal targets at King Island have not yet been drilled.

Preliminary phosphate dredging continued in the West Tasmania Phosphate licence and 37 dredge samples were obtained.

Location Map

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MILES
MINING
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STRAIT

E. L. 2/65 3300 SQ. MILES

UTAH DEVELOPMENT CO.

In force until 18. 2. '66

(Tin, Gold and Topaz)

Flinders
Island

E. L. 21/65 3300 SQ. MILES

PLANET MINING CO. PTY. LTD.

In force until 30. 2. '66

(Cape Barren Island
Phosphate Rock)

E. L. 24/65

100 SQ. MILES

OCEAN MINING A. G.

In force until 15. 4. '66
(Minerals and Stone)

E. L. 6/65 900 SQ. MILES

S. R. M. HARVEY
(Minerals and Stone)

In force until
18. 11. '65

E. L. 5/65
80 SQ. MILES
(Minerals and Stone)

H. P. CO. LTD.

In force until
9. 11. '65

DEVONPORT

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(A) Holes 1-86
 (B) Holes 87-105

PART I PROGRESS

General

Cruise V by the Wando River started on January 4th and continued in the North East Coast licence till January 19th. Twenty-four holes were drilled in Ringarooma Bay and seven in Mussel Roe Bay during this cruise. After a short interval for crew relief and rig maintenance, the vessel returned to Ringarooma Bay for Cruise VI which started on January 26th and continued into February. Between the 26th and 31st of January, an additional 22 holes were drilled.

Assay results were received for 454 samples from 59 holes in Ringarooma Bay, for 19 samples from six holes in the East King Island licence, and for 72 samples from 10 holes in Mussel Roe Bay during the month. By the end of January assay results for 143 samples from 22 of the 127 holes drilled by then were still awaited.

All drill hole and assay data were plotted as received. The calculation of tin, titanium and zirconium grade and value proceeds satisfactorily.

More closely spaced dredge sampling in the most promising areas of the West Tasmania Phosphate licence by m.v. Aardverk proceeded steadily in January, and by the end of the month 43 samples had been obtained from the continental shelf west and south of King Island.

Scheduled and actual progress during January are compared in Table 1.

Work accomplished by the end of January is shown in Figure 1.

Progress during JanuaryPhase II Drilling

An operations log for R.V. Wando River is shown in Table 2.

Apart from the drilling time lost during five days of adverse weather Cruise V proved to be moderately successful. Even during adverse weather some results were achieved by drilling at Mussel Roe Bay when conditions were unsuitable at Ringarooma Bay, and vice versa.

TABLE 1. COMPARISON OF SCHEDULED AND ACTUAL OPERATIONS
JANUARY, 1967

R.V. WANDO RIVER

Date	Scheduled Operations	Date	Actual Operations
4-18	Cruise V, N.E. Coast, Drilling	4-19	Drilling, Ringarooma Bay, Mussel Roe Bay
19-22	Crew relief	20-25	Crew relief, maintenance
23-9 Feb	Cruise VI, East King Island	26-2 Feb	Drilling, Ringarooma Bay

M.V. AARDVERK

3-13	Dredging 30 miles to the south of King Island	3-21	Dredging to south and south west of King Island
14-16	Crew relief	22-26	Crew relief
17-31	Dredging, West Point to Macquarie Harbour	27-	Dredging, West Point

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TABLE 2.

OPERATION LOG
 JANUARY, 1967
 R.V. WANDO RIVER

Date	Licence Area	Operation	Stations Sampled
1- 3		Crew relief, routine maintenance	
4	N.E. Coast	Start Cruise V. Transit to Ringarooma Bay.	
5		Adverse weather. Transit to Mussel Roe Bay. Drilling NE 04. Rig breakdown, transit to Beauty Point.	1
6		Rig repairs. Transit to Ringarooma Bay.	
7		Drilling NE 82-84.	3
8		Drilling NE 85-89.	5
9		Drilling NE 90-94.	5
10		Adverse weather, landed samples.	
11		Adverse weather in Ringarooma Bay. Steamed to Mussel Roe Bay. Drilling NE 05-08.	4
12-14		Adverse weather. Rig maintenance.	
15		Drilling NE 09. Adverse weather.	1
16		Drilling NE 010, 011.	2
17		Transit to Ringarooma Bay. Drilling NE 95-98.	4
18		Drilling NE 99-104.	6
19		Drilling NE 105. Winch breakdown, transit to Launceston.	1
20-25		Crew relief, routine maintenance.	
26	N.E. Coast	Start Cruise VI. Transit to Ringarooma Bay.	
27		Drilling NE 106-110.	5
28		Drilling NE 111-115.	5
29		Drilling NE 116-118.	3
30		Drilling NE 119-124.	6
31		Drilling NE 125-127.	3
Total Stations			54

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AMG REFERENCE POINTS ADDED

STATE OF OMAG OPERATIONS TO JANUARY 31ST 1967

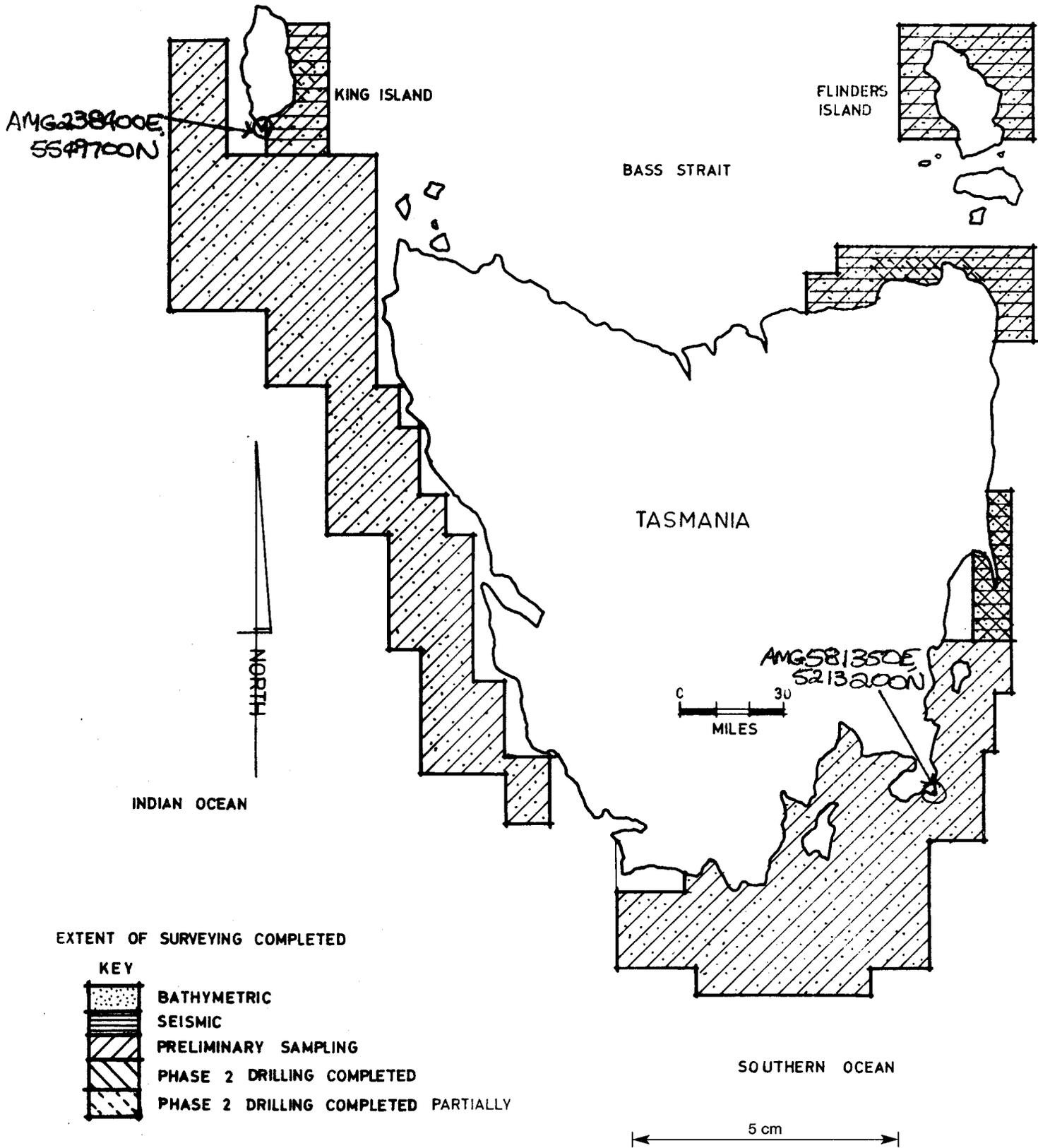


FIG 1

It became apparent from assay results received during the middle of January, and from ore grade calculations, that closer spaced drilling was required within the ore body and that the existing limit of drilling should be extended to the north west. Cruise VI, therefore, which had been scheduled to complete the drilling programme at King Island, was shortened, and programmed instead to drill 33 holes in Ringarooma Bay. Cruise VI started on the 26th January and by the end of the month 22 of these holes had been drilled. Cruise VI extended into February.

Fifty-three holes were drilled in Ringarooma and Mussel Roe Bays during January. The locations of these holes are shown in Figures 2 and 3.

Drill Hole Location

The Raydist Distance Monitoring equipment continued to function efficiently and was used for drill hole location in both Ringarooma Bay and Mussel Roe Bay. As during all previous cruises, however, horizontal sextant angles to prominent features, and radar distances at each drill hole site, were also recorded. Generally about five hours drilling time is lost in steaming between these two areas and in calibrating the Raydist on arrival, but at least eight holes resulted from these manoeuvres before the return of the vessel to Launceston for crew relief and routine maintenance on January 19th.

Preliminary Phosphate Exploration

An operations log for m.v. Aardverk is given in Table 3. Further good progress was made in sampling the West Tasmania phosphate licence during a cruise by the Aardverk to the south and west of King Island. This cruise had been programmed for mid-December, but continuously bad weather at that time had thwarted the operation. A total of 25 dredge samples was obtained from depths of between 37 and 72 fathoms.

After a short interval for crew relief and maintenance the Aardverk returned to the West King Island area and a further 12 dredge samples were obtained before the end of the month.

Although most of the sea floor is relatively flat and sandy, rock crops out in some areas. In good conditions

TABLE 3.

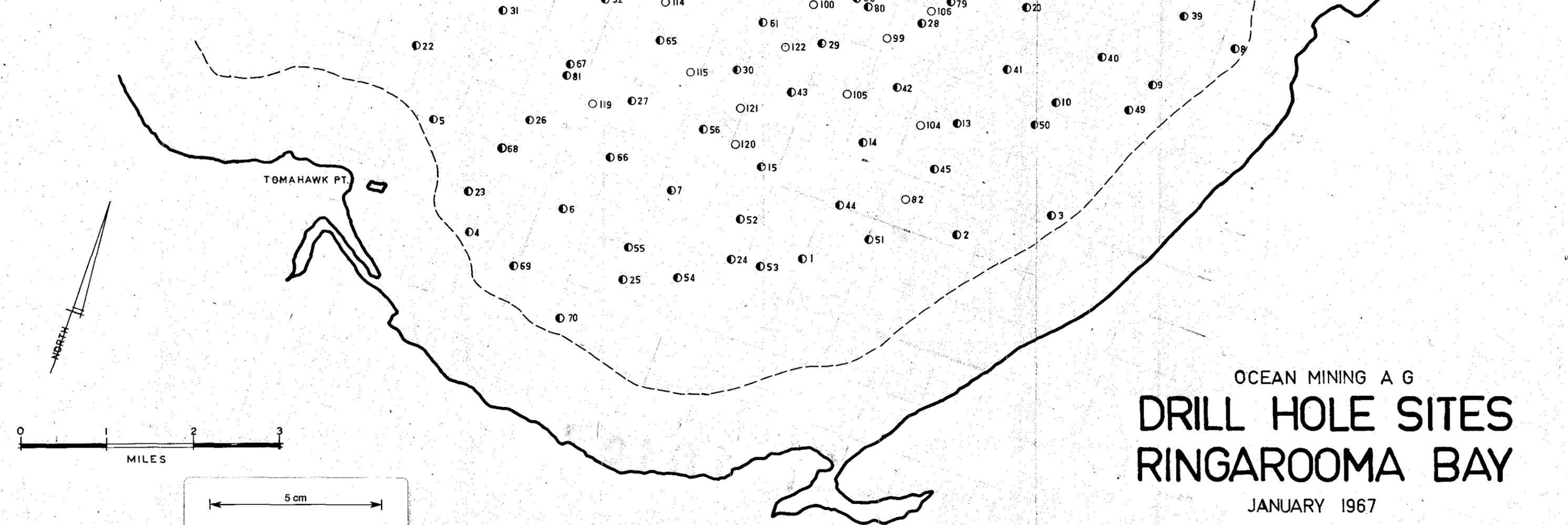
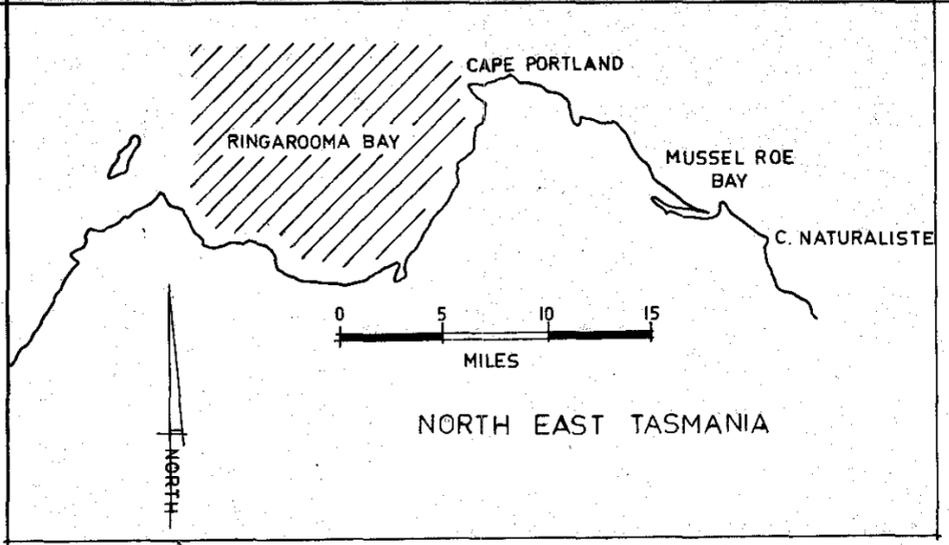
OPERATION LOG

JANUARY, 1967

M.V. AARDVERK

Date	Licence Area	Operation	Stations Sampled
1- 2	West Tasmania	Crew relief.	
3		Transit to George Town.	
4- 5		Standby, repairs to compass.	
6- 7		Transit to Area.	
8		Dredging WT 49. Winch breakdown, transit to Currie.	1
9-10		Standby for winch parts, repair winch.	
11-16		Standby, adverse weather.	
17		Transit to Area. Dredging WT 50-61.	12
18		Dredging WT 62-73.	12
19		Dredging WT 74-79	6
20-21		Transit to Launceston.	
22-26		Crew relief, maintenance.	
27		Transit to Three Hummock Island.	
28		Dredging WT 80-91.	12
29-31		Standby in Currie, adverse weather.	

Total Stations	43
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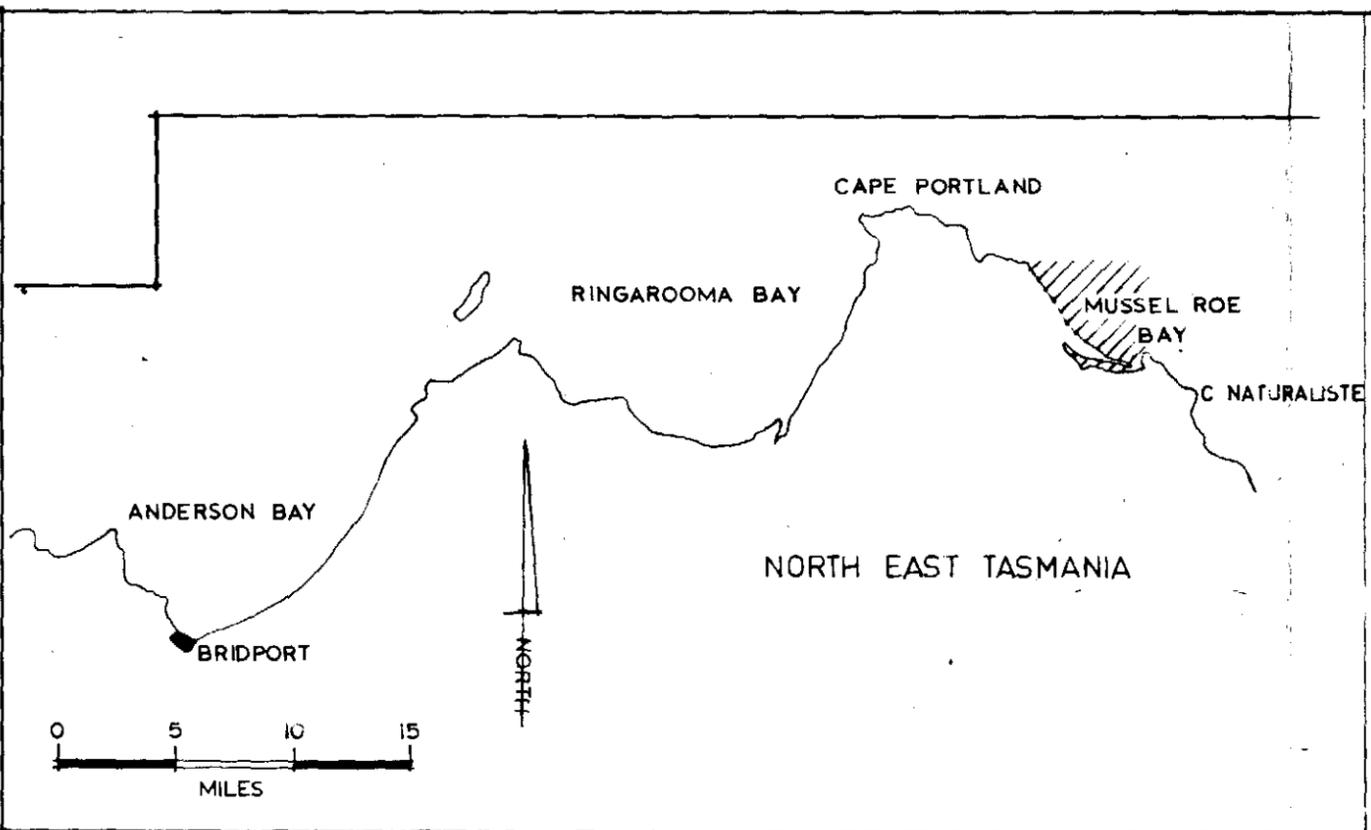
OCEAN MINING A G
DRILL HOLE SITES
RINGAROOMA BAY
JANUARY 1967

NOTE
○ HOLES DRILLED OCT. NOV. DEC. 1966
● HOLES DRILLED JANUARY 1967

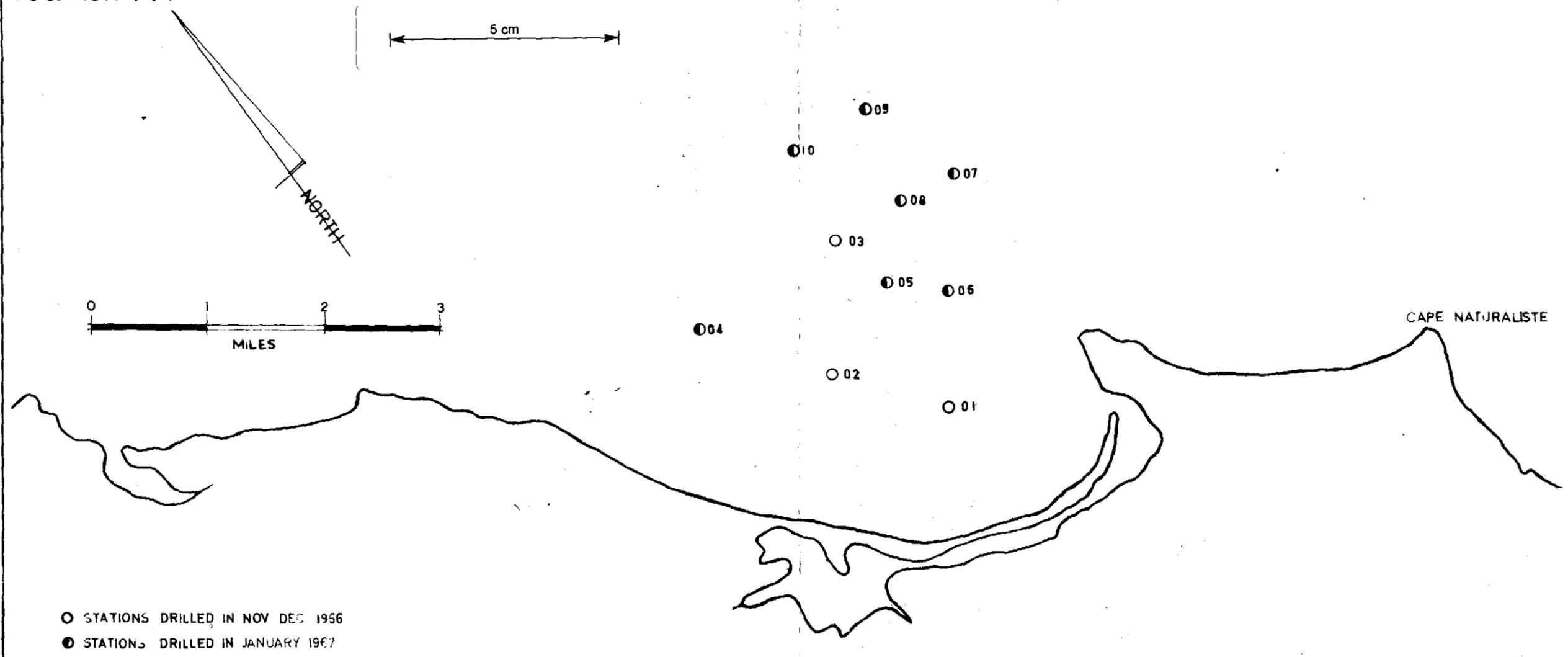
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DRILL HOLE SITES MUSSEL ROE BAY

DECEMBER 1966 (in Jan '67)



LOCATION MAP



- STATIONS DRILLED IN NOV DEC 1966
- STATIONS DRILLED IN JANUARY 1967

FIG. 3.

these areas can generally be detected with the ship's echo sounder, but in marginal sea conditions, when the efficiency of the echo sounder is reduced, areas of bedrock are not always obvious. If dredging is attempted under these conditions, fouling of the dredge becomes possible and on January 18th, this occurred. A dredge and about 100 fathoms of cable were lost.

Sample station location was determined by a combination of radar and horizontal sextant angles when within sight of land, and by dead reckoning when further offshore.

The location of all samples obtained in the West Tasmania licence by the end of January is shown in Figure 4.

Sample Processing

Four hundred and twenty eight samples were obtained from the North East Coast licence during January. All were split and submitted to the Tasmanian Department of Mines for analysis. Splits of all samples were retained at Field Headquarters and those for which high tin assays are received will be submitted to an independent authority for check analyses.

Renewal of Licences

An application was lodged with the Tasmanian Department of Mines on January 25th to renew the Cox Bight Licence (E.L. 8/66). This is due to expire on February 4th, 1967, and an extension for a further six months is being sought.

Staff

The processing of assay results, the calculation of tin, titanium and zirconium grade and value, and the preparation of maps, graphs and histograms, is currently one of the most demanding staff duties. It has not been found necessary to increase the staff complement for this work, but some reorganisation has occurred in order to reduce the time between the receipt of assay results and the production of ore grade estimates to a minimum. Although changes in personnel have occurred, the total complement has remained approximately constant through November, December and January.

Table 4 lists the staff complement as of January 31st.

TABLE 4.

STAFF COMPLEMENT

31st January, 1967.

Status	Name	Appointment	Occupation
Professional	W. Davies	Field Manager	
	D. J. Young	Staff Geologist	
	A. Scholtens	Geologist	Dredging
	P. Skipwith	Geologist	Wando River
	A. von Rahden	Senior Engineer	Wando River
	D. Lawson	Engineer/Driller	Wando River
Non-Professional	J. Beaverstock	Laboratory Tech.	Sample Processing
	A. Burgess	Draughtsman	Drafting
	A. S. R. Davies	Secretary	Administration
	L. Taylor	Typist/Secretary	Administration
	D. Griffiths	Data Processing	
	B. Izard	Rigger	Wando River
	F. Cowie	Rigger	Wando River
	L. Locsei	Rigger	Wando River
	S. Webster	Raydist Operator	Raydist maintenance
	R. W. Taylor	Seaman Aardverk	Dredging
	C. P. Blundell	Geologist Asst.	Wando River
Part time	R. D. McBain	Raydist Consultant	
Temporary staff	W. Campbell-Smith	Data Processing	
	J. Campbell-Smith	Laboratory Tech.	Sample Processing
	R. Tyson	Laboratory Tech.	Sample Processing
	G. Powers	Data Processing	
	R. Taylor	Data Processing	
Staff included in Charters	T. Chopping	Skipper m/v Aardverk	Preliminary Dredging West Tasmania
	G. W. Head	Skipper & Mate	Tender boat to
	D. Rule	m/v Tondelayo	Wando River

PART II RESULTS Jan '67

Drilling ResultsNorth East Coast

Drill hole data for the 46 holes drilled in Ringarooma Bay and for the 7 holes drilled in Mussel Roe Bay in January are presented in Table 5.

Nearly all holes in Ringarooma Bay were in relatively deep water, none being drilled in less than 15 fathoms. Core recovery was better than 94% and bedrock was reached in all but 3 holes. By the end of January, 127 holes had been drilled in Ringarooma Bay, 2,931 feet of sediment penetrated, and 984 samples obtained.

The position with respect to Mussel Roe Bay on the other hand is somewhat less satisfactory. Generally, Mussel Roe Bay is more exposed to bad weather than Ringarooma Bay and in addition it is swept by very strong tidal currents. These currents, which can run at up to four knots, make anchoring and drilling very difficult except at slack water. As a consequence of this, drilling time at each drill site is appreciably lengthened. Nevertheless, 7 holes were drilled in Mussel Roe Bay in January making a total of 10. Bedrock in all of these holes was a poorly cemented Pleistocene or Recent shell bed. This material was sufficiently well consolidated to prevent the core catcher closing in some cases, and up to 18 feet of this material has fallen from the pipe before the catcher has operated. For this reason the apparently low percentage (74.3%) of core recovered from Mussel Roe Bay is a little misleading.

Drill logs for all holes drilled in Mussel Roe Bay are presented in Figure 5.

Phosphate Sampling Results

Results of the dredging programme undertaken by m.v. Aardverk are shown in Table 6. Nodules were obtained from most of the 37 stations dredged, with nodules making up more than 25% of the sample by volume at 16 stations. The best material, judged in hand specimen, was obtained from depths between 55 and 70 fathoms, with the exception of sample 72 which was dredged from only 42 fathoms.

A positive reaction to the standard field test of ammonium molybdate and dilute nitric acid was recorded on an unusual

TABLE 5.

DRILL HOLE DATA
R.V. WANDO RIVER
JANUARY, 1967

Hole No.	Area	Date	Water Depth (ft.)	Drill Penetration (ft.)	Core Recovered (ft.)	Bedrock Reached
82	Ringarooma Bay	7th	90	6.5	6.5	Yes
83			94	43.5	43.5	No
84			115	33.0	32.5	Yes
85		8th	120	39.5	39.5	
86			118	24.5	24.5	
87			110	27.5	27.5	
88			113	31.0	31.0	
89			114	34.0	34.0	
90		9th	118	31.0	29.0	
91			120	28.5	28.5	
92			125	6.0	6.0	
93			120	21.5	21.0	
94			115	32.0	29.5	
95		17th	110	27.0	26.5	
96			112	31.0	14.0	No
97			117	17.0	17.0	Yes
98			116	37.0	35.5	
99		18th	102	17.0	15.0	
100			100	9.0	9.0	
101			103	31.0	25.5	
102			111	13.5	13.5	
103			112	28.5	26.5	
104			100	19.5	19.5	
105		19th	95	13.0	12.5	
106		27th	102	17.0	16.5	
107			116	13.0	12.5	
108			115	10.0	10.0	
109			116	27.5	27.5	
110			111	16.0	16.0	
111		28th	123	37.0	30.5	
112			120	34.0	34.0	
113			112	30.0	25.0	
114			109	44.0	44.0	
115			101	34.5	33.5	
116		29th	115	28.0	28.0	
117			116	26.0	26.0	
118			112	28.0	28.0	
119		30th	90	25.0	22.0	No

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TABLE 5 (contd.)

DRILL HOLE DATA
R.V. WANDO RIVER
JANUARY, 1967

Hole No.	Area	Date	Water Depth (ft.)	Drill Penetration (ft.)	Core Recovered (ft.)	Bedrock Reached
120	Ringarooma Bay	30th	90	31.5	31.5	Yes
121			100	48.5	40.5	
122			95	6.5	6.5	
123			110	9.0	9.0	
124		31st	116	23.5	23.5	
125			115	36.0	26.0	
126			107	40.0	39.5	
127			100	39.0	39.0	
Totals				1206	1136.5	
Core recovery					94.2%	

04	Mussel Roe Bay	5th	75	77.5	60.0	No	
05		11th	90	27.0	21.5	Yes	
06			105	21.0	21.0		
07			100	13.0	12.0		
08		16th	98	44.0	19.0	No	
09			108	34.0	30.0		
010			100	13.5	7.5		
Totals				230.0	171.0		
Core recovery					74.3%		

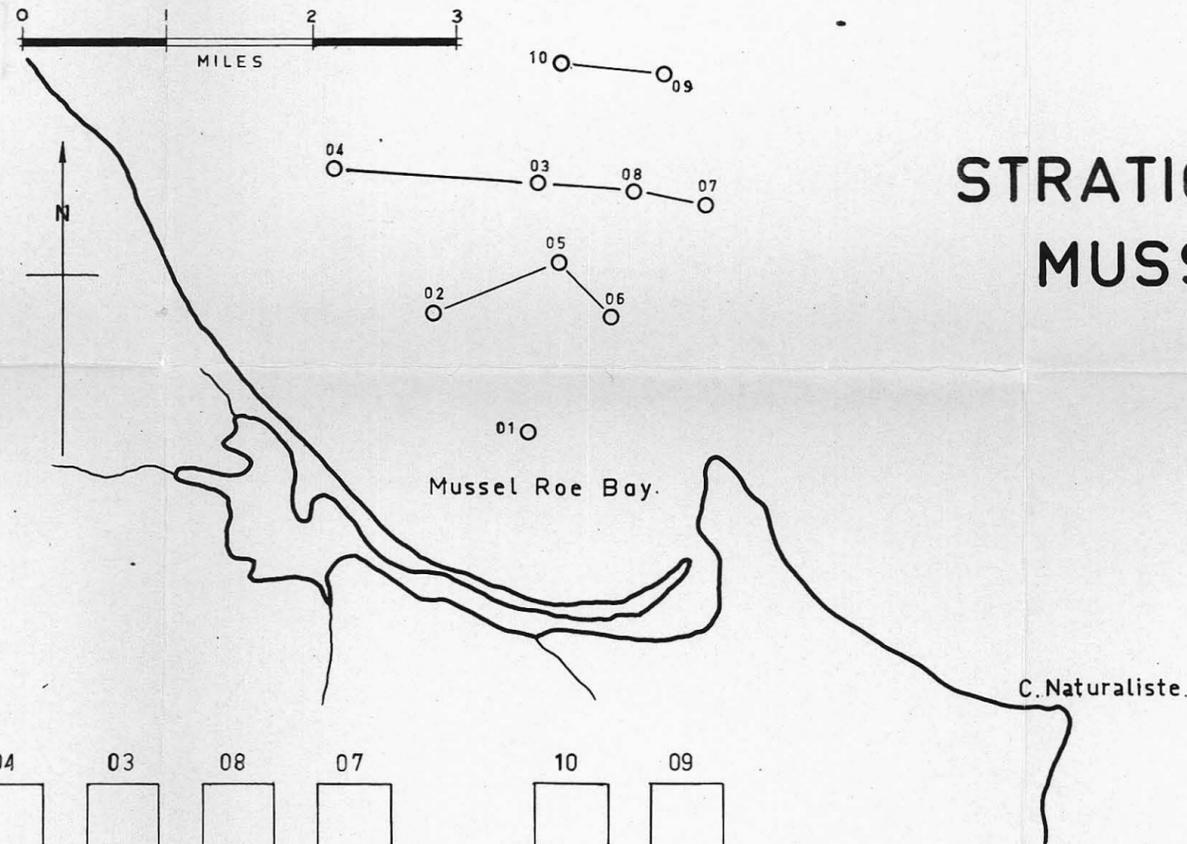
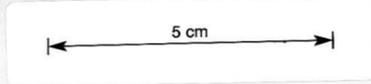
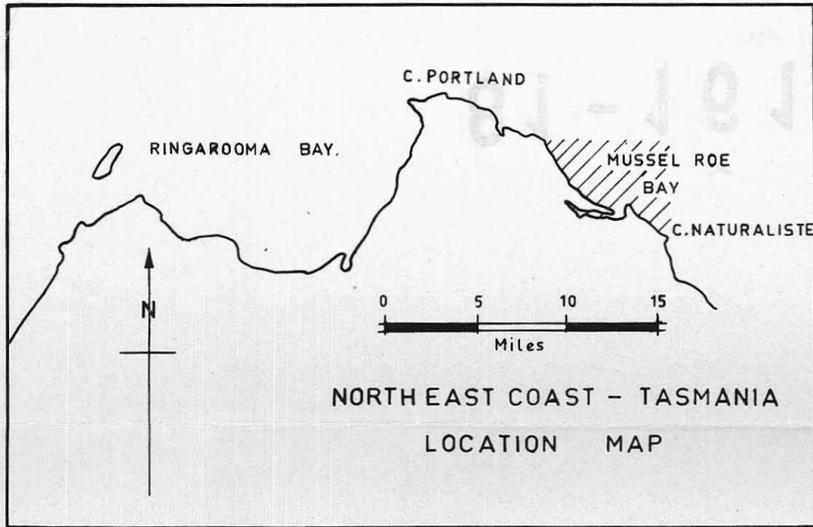
TABLE 6. SAMPLING RESULTS WEST TASMANIA
PHOSPHATE DREDGING
JANUARY, 1967

Sample No.	Date	Depth (fths)	Composition of Samples		
			Nodules	Shells Sand Coral	Soft Organisms
WT 49	8th	37	<1	-	>99
50	17th	44	20	79	<1
51		51	60	-	40
52		61	-	-	100
53		67	85	10	5
54		63	65	5	30
55		69	10	>89	<1
56		72	<1	>89	10
57		65	-	99	1
58		55	15	5	80
59		56	20	10	70
60		44	1	4	95
61		46	39	1	60
62	18th	44	25	20	55
63		55	4	95	1
64		51	75	15	10
65		67	17	5	80
66		71	30	65	5
67		62	25	74	1
68		60	-	>99	<1
69		63	-	20	80
70		52	15	5	80
71		50	-	-	-
72		42	25	25	50
73		40	50	40	10
74	19th	37	1	99	-
75		43	2	3	95

.../contd.

TABLE 6. (contd.) SAMPLING RESULTS WEST TASMANIA
 PHOSPHATE DREDGING
 JANUARY, 1967

Sample No.	Date	Depth (fths)	Composition of Samples		
			Nodules	Shells Sand Coral	Soft Organisms
WT 76	19th 28th	48	50	10	40
77		54	10	60	30
78		67	5	80	15
79		65	25	65	10
80		33	-	5	95
81		38	25	45	30
82		38	10	90	-
83		44	-	-	-
84		44	<1	9	90
85		65	50	45	5
86		69	30	40	30
87		60	45	35	20
88		66	50	35	15
89		44-53	<1	>84	15
90	43-49	15	85	-	
91	44	1	95	4	



OCEAN MINING A.G.
STRATIGRAPHIC COLUMNS
MUSSEL ROE BAY
FEBRUARY 1967.

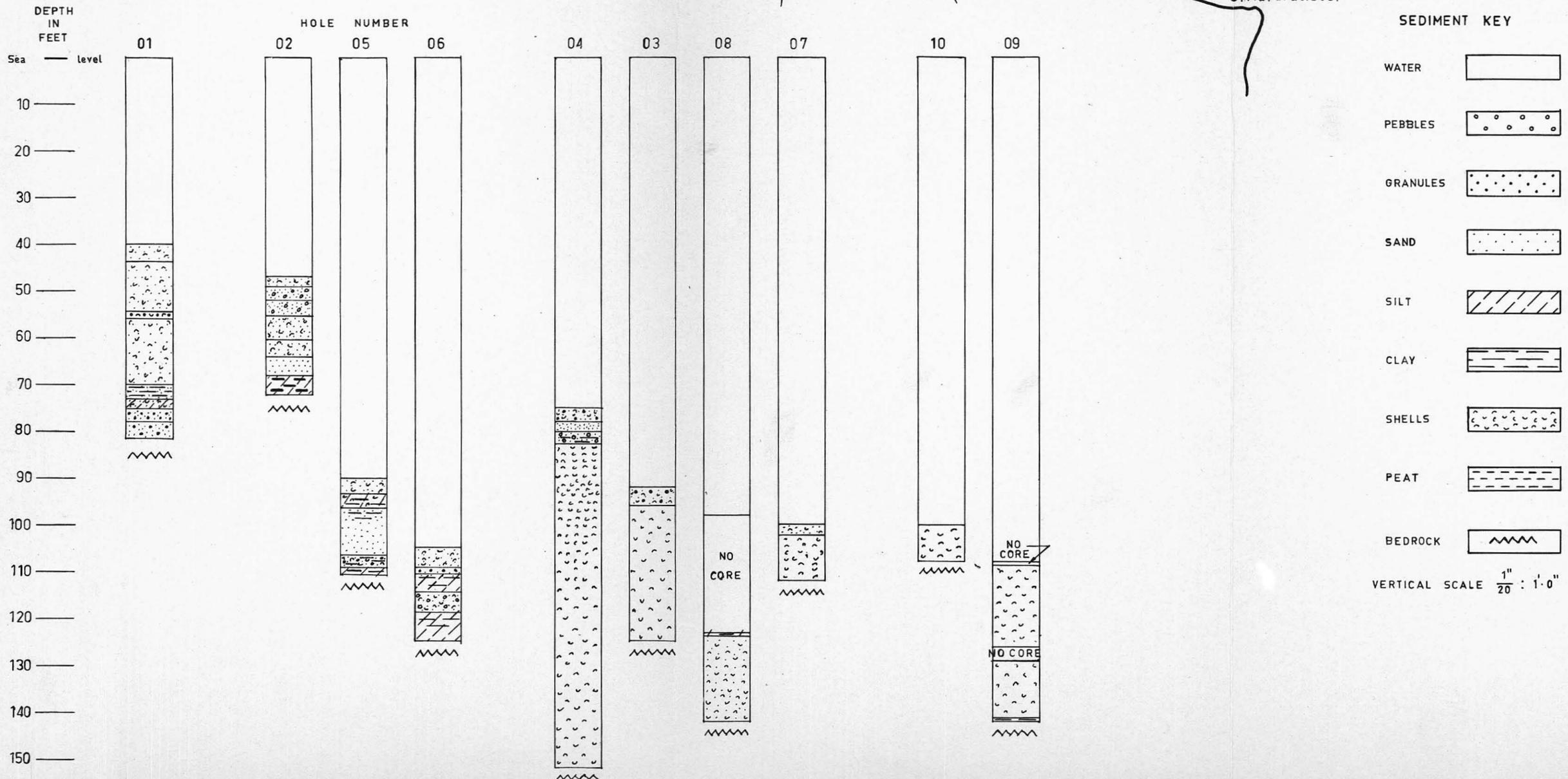


FIG. 5.

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type of phosphate nodule from stations WT51, 62 and 72. This material is dark brown, very hard and quartzitic in appearance, with some specimens from WT51 resembling a vesicular basalt. Splits from selected samples were submitted for analysis.

Mineral Dressing and Assay Results

North East Coast Licence

Ringarooma Bay

Assay results for 454 samples from 59 holes in Ringarooma Bay were received in January and are presented in Table 7. The samples are from holes numbered 23, 39, 49 to 57, 62 to 105, 110 to 113. The location of all holes is shown in Figure 2.

Very high tin, titanium and zirconium values were recorded in drill holes NE89 and NE103, and several holes (77, 79, 80, 84, 85, 92) yielded samples which assayed in excess of 100 p.p.m. tin.

The stratigraphic distribution of tin, titanium and zirconium in each of the cores assayed by February 10th is presented in Figures 6A and 6B.

Mussel Roe Bay

Assay results for hole 01 in Mussel Roe Bay, which were given in the December monthly report, contained encouraging tin values in samples 186 and 187 near the bottom of the hole. Assay results for samples from the remaining nine holes drilled in Mussel Roe Bay were received during January and are presented in Table 8. The location of these holes is shown in Figure 3. These later results, however, are generally discouraging.

East King Island Licence

Assay results for 19 samples from King Island are presented in Table 9.

Low tin, titanium and zirconium values prevail. These samples however were from seven poorly sited holes drilled in adverse conditions in November and December. The principal targets at King Island, the Naracoopa channel and Elephant Shoal, have not yet been sampled. It is planned to drill these in February during Cruise VII.

TABLE 7.

ASSAY RESULTS
NORTH EAST COAST LICENCE
RINGAROOMA BAY
JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
23	NE 498	0.10	Trace	27	69
	499	0.16	Trace	28	59
	500	0.13	1	34	101
	501	0.13	1	18	26
	502	0.08	Trace	7	17
	503(
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			Clay - not treated		
39	311	0.06	1	16	22
	312	0.05	Trace	13	16
	313	0.07	Trace	44	42
	314	0.20	21	44	69
49	346	0.08	1	38	27
50	347	0.07	8	10	18
	348	0.18	1	5	1
	349	0.11	Trace	2	Nil
51	350	0.14	38	8	45
	351	0.06	11	10	36
	352	0.03	1	3	7
	353	0.07	9	8	22
	354	0.15	23	5	16
52	355	0.13	5	8	18
53	356	0.14	2	6	14
54	357	0.18	4	10	22
55	358	0.17	2	32	66

.../contd.

TABLE 7 (contd.)

ASSAY RESULTS

NORTH EAST COAST LICENCE

RINGAROOMA BAY

JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
56	NE 359	0.25	62	18	45
	360	0.05	28	4	12
	361	0.37	49	Nil	Nil
	362	0.46	13	Nil	Nil
	363	0.19	25	6	23
	364	0.24	30	Nil	Nil
	365	0.25	2	Nil	Nil
	366	0.08	3	3	Nil
	367	0.09	8	6	19
	368	0.10	4	26	11
	369	0.09	Trace	18	30
	370	0.06	2	19	30
	57	372	0.03	24	3
371		0.12	36	13	38
373		0.02	2	2	3
374		0.09	14	5	14
375(Clay - not treated		
376(
62	414	0.06	42	13	41
	415	0.08	58	52	70
	416	0.09	10	11	29
	417	0.29	8	11	35
	418	0.12	Trace	3	4
	419	0.34	2	6	7
	420	0.02	6	4	7
	421	0.18	58	8	28
63	425	0.45	Trace	N.D.	N.D.
	426	0.72	10	N.D.	N.D.
64	428	0.32	20	30	47
	429	0.10	17	7	15
	430	0.06	4	3	7
	431	0.09	6	5	13
	432	0.40	13	9	17
	433	0.23	14	7	14
	434	0.14	3	13	14
	435	0.03	Trace	7	6
	436	0.04	1	10	15
	437	0.15	12	27	59
	438	0.25	9	22	48

.../contd.

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TABLE 7 (contd.)

ASSAY RESULTS

929024

16. ✓

NORTH EAST COAST LICENCE

RINGAROOMA BAY

JANUARY, 1967

Hole No.	Sample No.	Head Assay				
		Non Magnetic Percent	p.p.m. Metals			
			Sn	Ti	Zr	
65	NE 439	0.24	16	28	60	
	440	0.21	1	16	29	
	441	0.19	Trace	33	51	
	442	0.18	Trace	31	47	
	443	0.14	Trace	26	19	
	444		Clay - not treated			
	445	0.14	18	34	19	
	446	0.23	57	48	138	
	447	0.18	75	30	106	
	448	0.18	13	7	20	
	449	0.08	4	5	11	
	450	0.02	3	2	4	
	451	0.07	4	9	14	
	66	452	0.22	Nil	32	101
		453	0.49	Nil	24	55
454		0.36	3	51	84	
455		0.30	2	63	101	
456		0.55	3	62	85	
457		0.64	Nil	80	75	
458		1.33	Nil	82	122	
459		0.52	Nil	9	23	
460		0.11	Trace	21	35	
461		0.11	Trace	31	39	
462		0.13	Trace	50	64	
463		0.28	9	21	45	
464			Clay - not treated			
465(466(No concentrates			
67	467	0.11	Trace	34	45	
	468	0.11	5	57	89	
	469	0.09	3	60	75	
	470	0.10	10	43	60	
	471	0.07	16	9	29	
	472	0.05	2	5	20	
	473	0.04	1	5	14	
	474	0.06	2	12	20	
	475	0.06	4	10	16	
	476	0.06	6	13	20	

.../contd.

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929025 17.

TABLE 7 (contd.)

ASSAY RESULTS
NORTH EAST COAST LICENCE
RINGAROOMA BAY
JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
68	NE 477	0.23	Nil	17	30
	478	0.16	Nil	24	36
	479	0.07	Nil	11	15
	480	0.30	1	39	63
	481	0.05	10	11	19
	482	0.10	12	8	18
	483	0.13	2	Nil	8
	484	0.11	5	23	42
	485	0.09	14	19	30
	486	0.11	7	19	18
	487	0.06	1	11	25
488	0.13	1	7	22	
69	489	0.10	4	32	81
	490	0.14	2	6	24
	491	0.10	Trace	Nil	7
	492	0.08	Trace	4	9
	493	0.04	Trace	Trace	6
70	494	0.14	1	32	6
	495	0.08	4	12	28
	496	0.11	1	9	34
	497	0.15	Trace	14	55
71	506	0.43	65	19	490
	507	0.62	2	38	33
	508	0.79	2	19	17
	509	1.13	Nil	Nil	Nil
	510	1.02	2	24	15
	511	0.70	Nil	13	11
72	512	0.54	Nil	23	16
	513	0.48	Nil	41	26
	514	0.54	Nil	39	29
	515	0.42	Nil	31	18
	516(Clay - not treated		
	517(
	518	0.83	6	25	18
	519	0.60	23	14	18
	520	0.70	59	30	37
	521	1.24	5	Nil	Nil

.../contd.

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929026

18.

TABLE 7 (contd.)

ASSAY RESULTS
NORTH EAST COAST LICENCE
RINGAROOMA BAY
JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
73	NE 522	0.46	Nil	36	28
	523	0.44	Nil	41	37
	524	0.52	Nil	29	23
	525	0.46	Nil	34	4
	526	0.99	8	Nil	22
	527	0.25	9	14	19
	528	0.50	12	18	22
	529	2.95	27	Nil	44
	530	0.49	27	Nil	18
	531	1.40	Nil	Nil	21
	532	1.76	132	42	65
	74	533	4.07	Nil	Nil
534		1.34	43	40	30
535		2.77	Nil	Nil	Nil
536		1.45	6	Nil	Nil
537		2.28	5	Nil	Nil
538		3.08	Nil	Nil	Nil
539		1.11	Nil	Nil	Nil
540		0.97	6	35	43
541		4.15	Nil	Nil	Nil
75		542	0.21	4	34
	543	0.16	2	49	48
	544	0.06	7	27	3
	545	0.13	44	15	23
	546	0.16	8	12	16
	547(
	548(
	549(
550	0.23	Trace	7	19	
76	551	0.51	40	58	176
	552	0.14	8	11	17
	553	0.09	Trace	4	10
	554	0.12	Nil	8	8
	555	0.44	Nil	11	13
	556	0.08	Trace	7	11
	557	0.44	Nil	11	13
	558	0.25	Nil	8	10
	559	0.10	Trace	12	15
	560				
	561	0.19	Nil	6	4

No concentrate

No concentrate

.../contd.

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929027 19.

TABLE 7 (contd.)

ASSAY RESULTS
NORTH EAST COAST LICENCE
RINGAROOMA BAY
JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
77	NE 562	0.33	111	25	35
	563	0.13	34	13	20
	564	0.54	18	16	16
	565	0.14	24	10	16
	566	0.20	12	10	12
	567	0.88	11	26	26
	568	0.48	9	30	37
	569	0.35	1	62	64
	78	570	0.33	2	38
571		0.26	17	66	91
572		0.20	40	25	49
573		0.52	11	39	785
574		0.24	3	32	52
575		0.20	3	14	20
576		0.32	2	10	10
577		0.19	Trace	6	3
578		0.83	12	Nil	12
579				No concentrate	
580		0.35	1	21	24
581		0.17	Trace	16	20
79		582	0.68	156	158
	583	0.35	32	16	37
	584	0.68	122	Nil	15
	585	0.36	23	22	38
	586	0.31	2	37	45
	587	0.19	1	33	61
	588	0.27	Nil	18	24
	589	0.49	1	30	33
	80	590	0.49	Nil	37
591		0.26	23	24	34
592		0.15	11	11	29
593		0.21	16	Nil	30
594		0.30	Trace	22	18
595		0.18	1	13	10
596		0.37	3	16	9
597		0.25	5	26	43
598		0.27	35	12	33
599		0.40	110	10	30
600		0.40	7	Nil	9

.../contd.

TABLE 7 (contd.)

ASSAY RESULTS
NORTH EAST COAST LICENCE
RINGAROOMA BAY
JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
80 (contd)	NE 601	0.76	2	18	11
	602	0.13	1	9	14
	603	0.36	Nil	20	19
81	604	0.64	Nil	63	54
	605	0.98	Nil	67	97
	606	0.66	Nil	37	30
	607	0.91	Nil	61	69
	608	0.90	Nil	129	224
	609	0.36	Nil	50	54
	610	0.19	3	40	60
	611	0.42	6	18	26
82	612	0.44	6	13	92
	613	1.75	Nil	26	40
83	614	1.97	10	39	207
	615	3.39	7	34	51
	616	1.92	13	96	38
	617	0.50	13	35	15
	618	3.65	11	91	37
	619	2.01	6	40	40
	620	1.87	8	37	19
	621	1.79	5	45	18
	622	1.01	3	25	10
	623	0.41	4	19	8
	624	2.18	22	196	55
	625	0.38	78	42	10
	626	0.34	18	22	9
	627	0.40	4	16	8
84	628	0.30	3	38	17
	629	1.12	3	39	22
	630	0.54	3	49	19
	631	0.84	160	42	17
	632	2.44	10	49	49
	633	0.27	4	14	10
	634	0.30	3	21	12
	635	3.56	7	71	36
	636	2.03	6	41	31
	637	0.31	50	70	30

.../contd.

929029

TABLE 7 (contd.)

ASSAY RESULTS
NORTH EAST COAST LICENCE
RINGAROOMA BAY
JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
85	NE 638	0.67	3	47	24
	639	0.44	4	33	18
	640	0.61	64	76	34
	641	0.91	5	50	23
	642	2.56	13	128	51
	643	0.80	8	96	28
	644	0.71	7	75	25
	645	1.25	44	156	42
	646	1.17	134	70	228
	647	2.18	7	Nil	33
	648	0.43	2	Nil	13
	649	1.20	2	Nil	18
	650	0.43	1	Nil	9
	651	0.53	2	Nil	11
	86	652	2.26	7	34
653		1.54	6	54	139
654		1.05	7	95	110
655		0.98	4	20	44
656(
657(
658(
659(
660(
			Clay - not treated		
87	661	1.96	12	39	157
	662	1.06	4	11	58
	663	0.78	3	8	43
	664	2.04	10	Nil	82
	665	1.67	12	Nil	92
	666	1.85	4	Nil	74
	667	2.29	5	Nil	69
	668	0.98	2	20	34
	669	2.56	5	Nil	64
	670	0.83	5	8	50
	671	1.90	6	Nil	38

.../contd.

TABLE 7 (contd.)

ASSAY RESULTS

NORTH EAST COAST LICENCE

RINGAROOMA BAY

JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
88	NE 672	1.18	32	35	59
	673	0.92	13	Nil	46
	674	1.46	72	66	110
	675	1.78	5	Nil	18
	676	1.06	4	32	64
	677	2.67	11	27	53
	678	0.51	3	15	15
	679	0.74	3	11	19
	680	0.61	2	Nil	12
	681	1.76	88	18	35
	682	0.95	8	71	100
	89	683	0.45	3	14
684		2.06	515	391	453
685		2.40	79	264	276
686		1.93	116	309	415
687		0.42	21	67	48
688		0.13	2	35	40
689		0.14	1	19	25
690		0.37	2	28	28
691		0.09	1	17	16
692		0.22	1	24	17
693		0.59	2	44	47
694		0.13	1	31	23
90	695	0.70	4	32	39
	696	0.48	2	34	55
	697	0.24	1	38	37
	698	0.49	6	15	25
	699	0.59	2	30	35
	700	1.31	4	39	39
	701	0.90	3	27	41
	702	0.56	2	17	22
	703	0.77	6	23	23
	704	1.38	4	14	14
	705	2.34	7	Nil	23
	706	0.94	2	Nil	24

.../contd.

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TABLE 7 (contd.)

ASSAY RESULTS

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23. ✓

NORTH EAST COAST LICENCE

RINGAROOMA BAY

JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
91	NE 707	0.64	6	45	38
	708	0.50	2	18	23
	709	0.68	2	34	68
	710	1.08	8	16	54
	711	1.32	8	Nil	26
	712	3.96	16	Nil	Nil
	713	2.18	7	Nil	44
	714	1.17	4	Nil	23
	715	1.98	6	Nil	Nil
	716	2.01	10	Nil	30
	717	0.69	4	7	14
92	718	0.48	120	7	26
	719	2.22	31	22	89
93	720	3.35	13	Nil	67
	721	1.76	Nil	Nil	44
	722	1.02	Nil	10	20
	723	0.66	3	13	26
	724	0.96	41	19	86
	725	2.25	29	Nil	34
	726	1.18	7	Nil	18
94	727	0.62	2	19	47
	728	2.06	6	41	103
	729	1.21	2	24	48
	730	1.46	3	Nil	22
	731	1.47	3	Nil	22
	732	2.08	6	Nil	42
	733	0.65	4	7	20
	734	1.83	4	Nil	73
	735	1.81	4	Nil	72
	736	1.58	3	Nil	87
95	737	0.43	25	13	39
	738	0.29	24	22	46
	739	0.45	8	5	18
	740	0.70	5	7	18
	741	0.68	31	Nil	17
	742	2.25	43	Nil	45
	743	1.02	11	Nil	20
	744	0.91	14	Nil	18

.../contd.

TABLE 7 (contd)

ASSAY RESULTS
NORTH EAST COAST LICENCE
RINGAROOMA BAY
JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
95 (contd)	NE 745	1.77	14	Nil	18
	746	1.39	11	Nil	14
	747	1.70	12	Nil	17
96	748	2.68	27	27	67
	749	1.52	12	15	53
	750	2.07	10	21	124
	751	2.19	4	22	66
	752	1.20	4	12	36
	753	2.29	30	23	103
97	754	3.97	12	Nil	99
	755	2.14	4	21	64
	756	1.49	19	Nil	37
	757	2.20	4	Nil	22
	758	1.73	3	Nil	35
	759	0.94	3	Nil	19
98	760	2.66	5	Nil	67
	761	2.37	7	47	166
	762	1.54	5	15	39
	763	1.48	4	15	37
	764	0.97	5	15	34
	765	1.27	Nil	Nil	13
	766	2.13	11	21	64
	767	2.50	28	Nil	63
	768	2.57	10	26	77
	769	3.03	6	Nil	76
770	1.99	Nil	Nil	50	
99	771	1.39	8	Nil	70
	772	2.86	6	Nil	43
	773	0.70	2	Nil	11
	774	0.74	2	Nil	15
	775	1.44	4	Nil	29
100	776	2.64	58	Nil	66
	777	0.36	1	Nil	5
	778	0.26	2	Nil	7
	779	0.09	6	Nil	8

.../contd.

TABLE 7 (contd.)

ASSAY RESULTS

NORTH EAST COAST LICENCE

RINGAROOMA BAY

JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
101	NE 780	0.60	2	51	27.
	781	0.88	2	9	26
	782	0.36	1	43	43
	783	1.66	3	17	50
	784	0.44	1	Nil	11
	785	0.23	Trace	16	23
	786	0.42	1	29	50
	787	0.50	1	25	35
102	788	0.59	10	41	30
	789	0.27	2	5	11
	790	0.34	1	3	10
	791	0.2	Trace	Nil	6
	792		Not yet determined		
103	793	0.26	13	31	56
	794	0.31	98	11	47
	795	0.89	8	9	40
	796	1.11	361	17	106
	797	2.26	111	Nil	57
	798	0.55	6	6	14
	799	0.29	1	Nil	7
	800	0.95	15	Nil	18
104	801	1.67	3	Nil	Nil
	802	1.47	3	Nil	29
	803	1.01	49	Nil	30
	804	1.31	35	Nil	26
	805	0.48	65	Nil	10
105	806	0.21	19	25	48
	807	1.37	5	Nil	34
	808	0.35	Trace	Nil	16
	809	1.19	2	Nil	29
	810	1.10	Nil	Nil	23
110	835	0.96	68	Nil	58
	836	0.43	6	Nil	30

.../contd.

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26.

TABLE 7 (contd.)

ASSAY RESULTS
NORTH EAST COAST LICENCE
RINGAROOMA BAY
JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
111	NE 837	0.58	Nil	20	46
	838	0.46	Nil	16	37
	839	0.34	Nil	7	27
	840	1.05	2	Nil	63
	841	0.32	20	Nil	24
	842	0.76	8	Nil	34
	843	0.74	21	Nil	22
	844	2.32	23	Nil	58
	845	0.33	1	15	26
	112	846	0.46	1	14
847		0.76	2	15	57
848		0.73	Nil	Nil	33
849		1.01	2	Nil	61
850		1.88	Nil	Nil	47
851		1.01	Nil	Nil	35
852		0.31	Trace	Nil	11
853(Clay - not treated		
854(
855		0.47	1	Nil	16
113	856	1.82	4	82	255
	857	1.06	34	21	64

TABLE 8.

ASSAY RESULTS
NORTH EAST COAST LICENCE
MUSSEL ROE BAY
JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
02	NEO 1	1.23	2	18	43
	2	0.41	Nil	6	20
	3	0.16	Trace	5	16
	4	0.23	3	28	82
	5	0.21	Trace	63	83
	6	0.37	Trace	59	63
	7	0.42	Nil	28	38
03	8	0.62	27	9	40
	9	0.37	2	Nil	9
	10	0.74	Nil	Nil	7
	11	0.29	Trace	Nil	6
	12	0.36	1	Nil	7
	13	0.47	2	Nil	5
	14	0.46	1	Nil	5
	15	0.32	Nil	Nil	6
	16	1.10	Trace	Nil	11
	17	0.54	Nil	Nil	5
18	0.86	Nil	Nil	9	
04	19	0.59	32	9	75
	20	0.39	4	8	35
	21	0.52	28	10	60
	22	1.80	9	18	46
	23	1.69	3	Nil	25
	24	1.15	Nil	Nil	12
	25	0.96	Nil	Nil	14
	26	1.23	Nil	12	12
	27	1.58	Nil	Nil	16
	28	2.23	Nil	Nil	23
	29	1.63	Nil	Nil	16
	30	1.55	Nil	Nil	16
	31	0.9	Nil	Nil	9
	32	0.56	Nil	Nil	6
33	0.36	Nil	Nil	4	
34	0.68	Nil	Nil	7	
35	0.49	Nil	Nil	5	
36	0.46	Nil	Nil	5	

.../contd.

TABLE 8 (contd.)

ASSAY RESULTS
NORTH EAST COAST LICENCE
MUSSEL ROE BAY
JANUARY, 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
05	NEO 37	0.74	20	Nil	38
	38	0.33	12	Nil	12
	39	0.52	5	Nil	11
	40	0.18	1	Nil	4
	41(
	42(
	43	1.57	6	Nil	39
	44	0.95	1	Nil	23
				Clay - not treated	
06	45	0.84	4	Nil	4
	46	2.06	Nil	Nil	39
	47	0.63	1	Nil	16
	48	1.80	9	Nil	45
	49	1.63	Nil	Nil	31
	50	1.16	Nil	Nil	17
	51	1.74	Nil	Nil	23
07	52	0.97	12	Nil	39
	53	0.70	3	Nil	19
	54	0.45	4	Nil	11
	55	0.98	4	Nil	16
08	56	1.99	Nil	Nil	38
	57	0.83	2	Nil	29
	58	3.49	Nil	Nil	94
	59	1.08	6	Nil	16
	60	0.18	1	Nil	3
	61	0.63	Nil	Nil	9
09	62	0.99	14	Nil	13
	63	0.44	1	Nil	9
	64	0.30	3	Nil	6
	65	0.17	1	Nil	3
	66	0.64	Nil	Nil	13
	67	0.31	Nil	Nil	6
	68	0.77	Nil	Nil	15
	69	0.30	Nil	Nil	6
	70	0.22	Nil	Nil	4
	71	0.34	Nil	Nil	7
010	72	1.79	9	Nil	36
	73	0.46	1	Nil	7

TABLE 9.

ASSAY RESULTS
EAST KING ISLAND LICENCE
JANUARY, 1967

Hole No.	Sample No.	Head Assay				
		Non Magnetic Percent	p.p.m. Metals			
			Sn	Ti	Zr	
1	KI 1	0.06	Tr.	19	42	
2	2	0.06	Tr.	20	53	
3	3	0.03	Nil	7	22	
	4	0.03	Tr.	14	31	
	5	0.04	Nil	14	25	
	6	0.07	Nil	19	49	
	7	0.02	Tr.	8	16	
	8	0.04	Nil	13	35	
	4	9	0.02	Tr.	33	21
		10	0.02	Nil	34	13
5	11	0.04	Nil	61	46	
	12	0.03	Tr.	32	30	
6	13	0.03	Tr.	11	14	
	14	0.03	Nil	12	14	
	15	0.04	Tr.	14	16	
8	16	0.03	Tr.	27	27	
	17	0.03	Nil	27	22	
	18	0.03	Tr.	28	22	
	19	0.08	Nil	31	2	

Comparison Assay/Spectrographic Analyses

Splits of all samples for which high tin values are assayed by the Tasmanian Department of Mines are submitted periodically to the Australian Mineral Development Laboratories for check assay. The results of this comparative study are presented in Table 10.

Considering the semi-quantitative nature of the spectrographic method used, and the probability, because of the very small sample submitted to AMDEL, that the splits were not identical, the correlation between tin values seems reasonably close.

The titanium values determined by AMDEL are much higher than those determined by the Tasmanian Department of Mines because the AMDEL results include the titanium present in both rutile and ilmenite. The Tasmanian Department of Mines value on the other hand is for the titanium present in rutile only, ilmenite having been magnetically separated prior to assay.

Chrome was detected in all samples assayed by AMDEL so it seems probable that the ilmenite is not chrome free. Tests to determine the chrome content of the ilmenite are presently being conducted by the Tasmanian Department of Mines.

The zirconium content of the samples is generally below the lower limit of resolution by the spectrographic method, and none was detected by AMDEL.

Sample Density Determinations

The results of further density determinations for samples from the North East Coast licence were received in January and are presented in Table 11. Samples 01-020 (79 lb/cu.ft.) and 021-036 (77 lb/cu.ft.) consisted mostly of poorly cemented limestone of low density.

Phosphate Analyses

The results of seven P₂O₅ analyses for samples from the West Tasmania licence are presented in Table 12. The locations of the stations from which these were dredged are shown in Figure 4. A close correlation exists between the results obtained by the Tasmanian Department of Mines and the Australian Mineral Development Laboratories.

Jan '67

TABLE 10. COMPARISON OF ASSAY RESULTS

Sample No.	TIN ppm		TITANIUM ppm		ZIRCONIUM ppm	
	A	B	A	B	A	B
NE 135	196	80	16	250	44	Not detected in any samples
161	151	60	20	700	56	
187	96	60	7	500	34	
215	67	60	27	250	37	
278	121	200	13	700	40	
280	116	80	19	500	56	
325	110	80	3	600	13	
341	116	300	17	200	38	
350	38	30	8	700	45	
359	62	80	18	150	45	
361	49	25	Nil	300	Nil	
385	133	70	10	700	36	
447	75	70	30	600	106	

- A. Tasmanian Department of Mines. X-Ray Analysis.
- B. Australian Mineral Development Laboratories.
Semi-quantitative Spectrographic Analysis.

TABLE 11. SAMPLE DENSITY DETERMINATIONS
TASMANIAN DEPARTMENT OF MINES

OMAG Sample Nos.	Density lb/cu.ft.
NE 586-600	116
NE 606-611(01-020 (79
021-036	77
NE 506-530	90
NE 531-541(612-630(98

TABLE 12.

PHOSPHATE ANALYSES

JANUARY, 1967

Licence	Sample Number	Percentage P ₂ O ₅	
		Tasmanian Dept. of Mines	AMDEL
West Tasmania	WT 51	0.47	1.00
	61	1.04	1.00
	62	0.49	0.85
	64	0.10	0.80
	65	1.38	1.40
	66	0.35	1.70
	72	18.70	20.00
	73	0.98	1.10

PART III PLANS FOR FEBRUARY

Phase II Drilling

Cruise VI by the Wando River is scheduled to end on February 3rd. After a short interval for crew relief and maintenance the Wando River will return to the East King Island licence in order to complete the drilling programme scheduled for December. It is intended that 26 holes will be drilled in the vicinity of the prime targets, Sea Elephant Rock and Elephant Shoal. This cruise is programmed to finish on February 24th.

Table 13 shows a schedule for Phase II drilling in February.

Data Processing

The estimation of tin, titanium and zirconium grades and value, and the processing of all drill hole and sample data will continue throughout February.

The drawing of stratigraphic columns for all holes in the North East Coast licence, the production of histograms and graphs, and the drafting of isopach and bedrock topography maps for Ringarooma Bay is also scheduled.

Phosphate Dredging

In January a programme of closely spaced dredging of the more promising phosphate areas to the south west of King Island, off West Point, and near Macquarie Harbour, was initiated. This programme will be continued into February.

A schedule of operations is shown in Table 13.

TABLE 13.

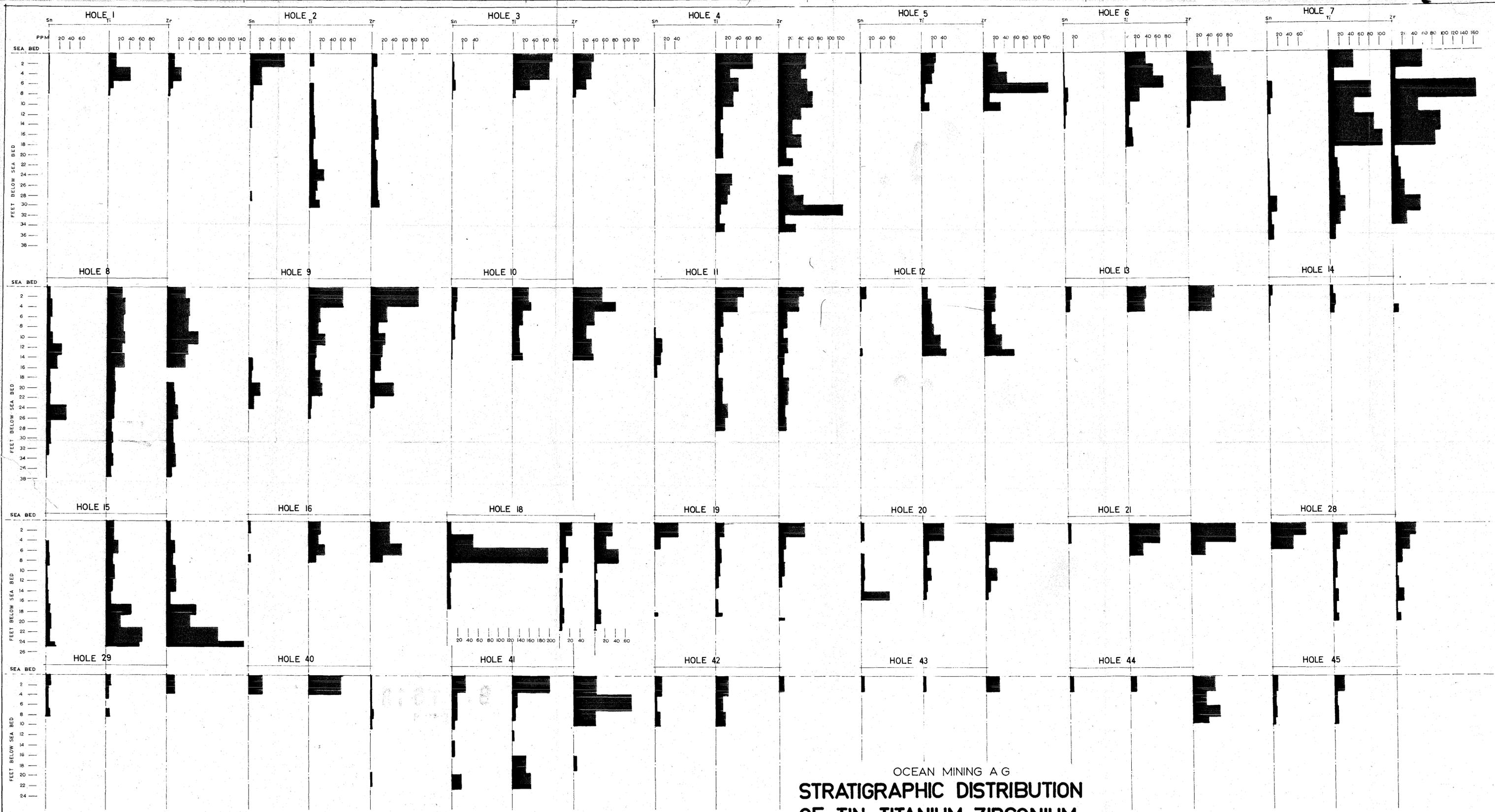
PHASE II OPERATIONS SCHEDULED FOR FEBRUARY
 DRILLING - CRUISES VI AND VII
 VESSEL - R.V. WANDO RIVER

Date	Cruise	Licence	Target Area	Occupation
Jan. 26th-Feb. 2nd	VI	N.E. Coast	Ringarooma Bay	Drilling
Feb. 7th - 24th	VII	E. King Island	Sea Elephant Bay	Drilling

PRELIMINARY PHOSPHATE DREDGING

VESSEL - M.V. AARDVERK

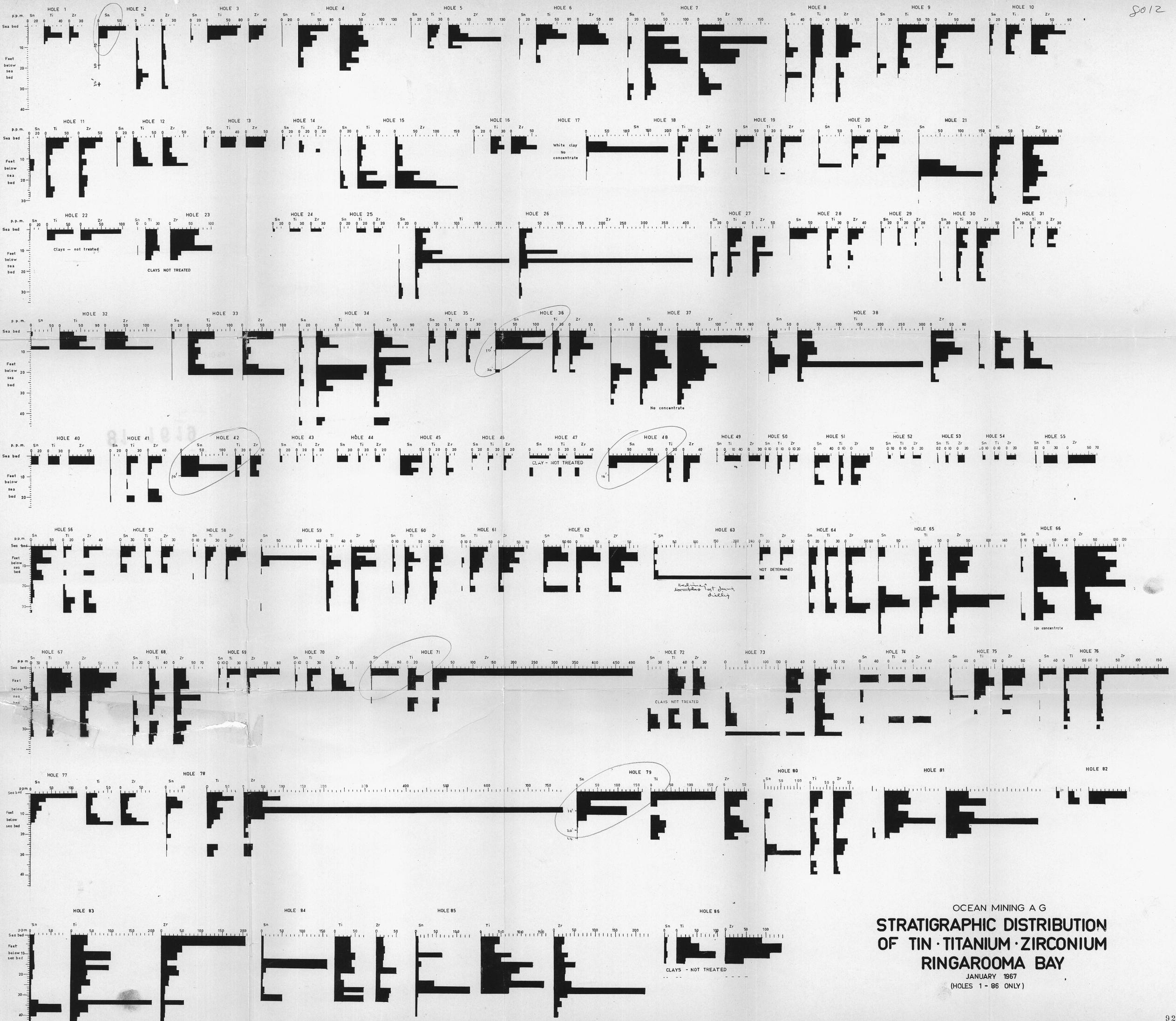
Date	Licence	Target Area	Occupation
Jan. 27th-Feb. 15th	West Tasmania	King Island to West Point	Dredging
Feb. 20th - 28th		West Point to Macquarie Harbour	Dredging



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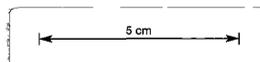


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 JANUARY 1967
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 OF TIN · TITANIUM · ZIRCONIUM
 RINGAROOMA BAY**

JANUARY 1967
 (HOLES 87-105 ONLY)



OCEAN MINING A.G.
TASMANIA OFFSHORE EXPLORATION PROGRAMME
REPORT OF OPERATIONS - FEBRUARY 1967.

Part 12

Ocean Mining A.G.,
Field Headquarters,
38 Canning Street,
Launceston, Tasmania.

March, 1967.

SUMMARY

Eleven holes were drilled in Ringarooma Bay and four holes were drilled in the East King Island licence during February. Adverse weather and sea conditions in the East King Island licence hampered Phase II drilling. A total 148 holes have been drilled in the North East Coast licence and ten in the East King Island licence.

Assay results have been received for all samples submitted to the Tasmanian Department of Mines. In addition, 12 P_2O_5 analyses have been received. Tests to determine the percentage of tin lost at each stage of sample treatment have been concluded. The gold content of three selected samples has been assayed; and the percentage of chrome present in a composite sample of ilmenite, from Ringarooma Bay, has been determined.

Preliminary phosphate dredging continued until the end of the month and 43 samples were obtained from the West Tasmania licence.

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PART I PROGRESS

General

Cruise VI by the Wando River started on January 26th and continued in the North East Coast Licence until February 2nd. Thirty-three holes were drilled in Ringarooma Bay during this cruise.

On February 7th the Wando River sailed from Launceston to drill in the East King Island Licence where it remained until February 23rd. Continuous adverse sea conditions seriously restricted drilling and only four satisfactory holes resulted.

All outstanding assay results for samples from Ringarooma Bay and East King Island were received in February.

All drill hole and assay data were plotted as received and the calculations involving tin, titanium and zirconium grades and values were completed.

Thirty-four samples were dredged from the West Tasmania Licence by m.v. Aardverk during February.

Scheduled and actual progress during February are compared in Table 1.

Work accomplished by the end of February is shown in Figure 1.

Progress during FebruaryPhase II Drilling

An operations log for R.V. Wando River is shown in Table 2.

Cruise VI to Ringarooma Bay finished on February 2nd with the completion of the 33 holes programmed for this cruise. Location of these holes is shown in Figure 2.

Drilling in the East King Island Licence during Cruise VII was seriously hampered by bad weather and rough seas. Only four holes were drilled throughout the entire cruise. Locations of the holes are shown in Figure 3.

TABLE 1. COMPARISON OF SCHEDULED AND ACTUAL OPERATIONS
FEBRUARY, 1967

R.V. WANDO RIVER

Date	Scheduled Operations	Date	Actual Operations
Jan. 26- Feb. 2	Cruise VI Ringarooma Bay	Jan. 26- Feb. 2	Drilling, Ringarooma Bay
3- 6	Crew relief	3- 6	Crew relief
7-24	Cruise VII East King Island	7-23	Drilling, East King Island

M.V. AARDVERK

Jan. 27- Feb. 15	Dredging, King Island to West Point	Jan. 25- Feb. 19	Dredging, King Island and Macquarie Harbour
16-20	Crew relief	20-28	Crew relief
20-28	Dredging, West Point to Macquarie Harbour		

05

STATE OF OMAG OPERATIONS TO FEBRUARY 28th 1967

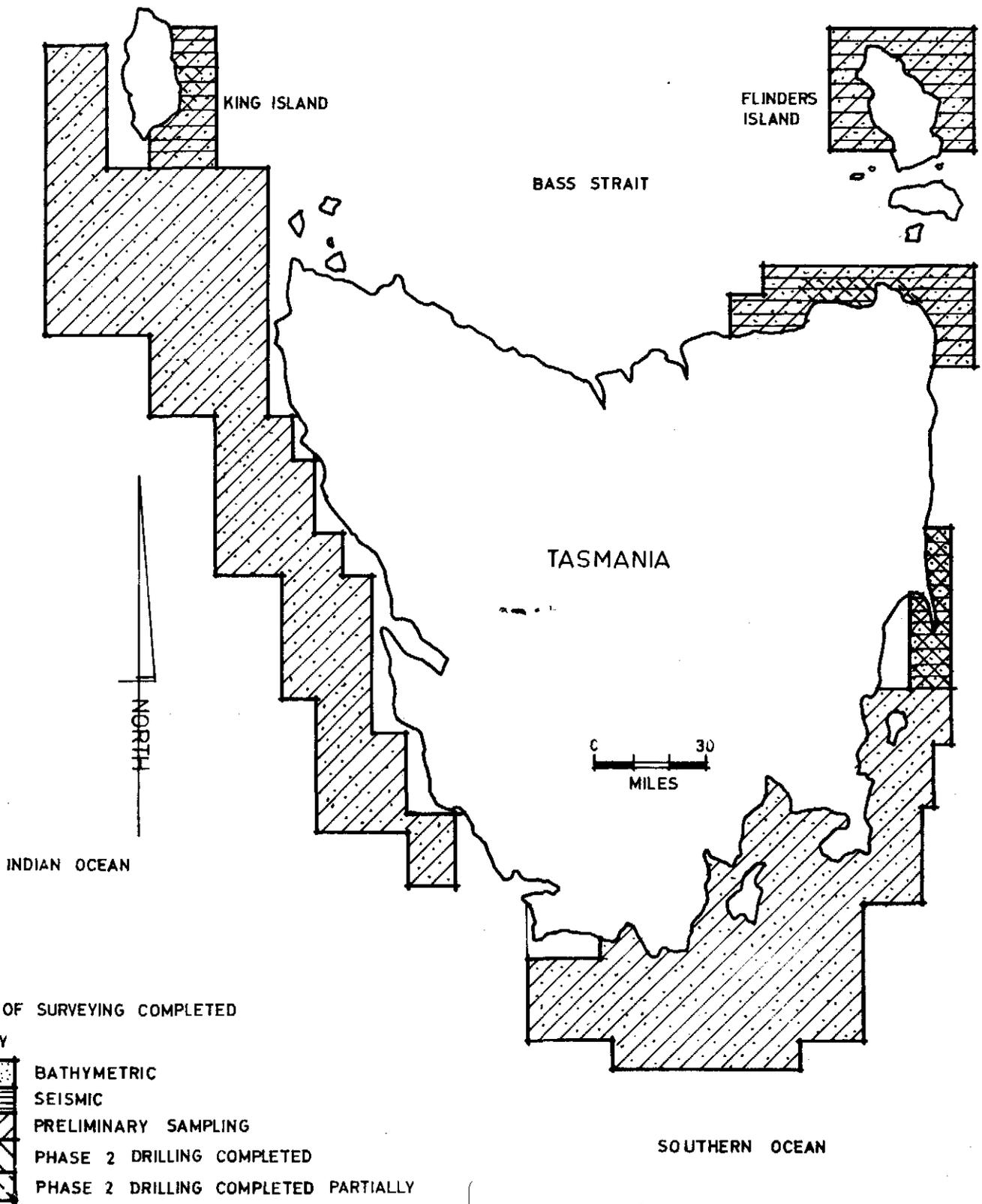


FIG 1

TABLE 2.

OPERATION LOG
FEBRUARY, 1967
R.V. WANDO RIVER

Date	Licence Area	Operation	Stations Sampled
1	N.E. Coast	Drilling NE 128-134	7
2		Drilling NE 135-138	4
3		Transit to Launceston	
4-6		Crew relief	
7-9	E.King Island	Transit to King Island	
10		Calibrating Raydist	
11		Drilling KI 8. Adverse sea conditions	1
12-19		Adverse sea conditions	
20		Drilling KI 9-11	3
21		Adverse sea conditions	
22-23		Transit to Launceston	
24-28		Crew relief	
Total Stations			15

Drill Hole Location

All holes were positioned by Raydist Distance Monitoring Equipment. Position checks by sextant, radar and theodolite were also made.

Preliminary Phosphate Exploration

An operations log for M.V. Aardverk is given in Table 3. Eight stations were sampled off West Point and 26 off Cape Sorell in water depths ranging from 40 to 90 fathoms. Sample station location was determined by horizontal sextant angles when within sight of land, and by radar and dead reckoning when further offshore.

The location of all samples obtained in the West Tasmania Licence by the end of February is shown in Figures 4 and 5.

Sample Processing

Fifty-six samples were obtained from 11 holes in Ringarooma Bay and 13 samples from four holes in the East King Island Licence. All samples were split and submitted to the Tasmanian Department of Mines for analysis.

Staff

Following receipt of all outstanding assay results and the completion of ore grade and value calculations, a reduction of staff was undertaken to compensate for the decrease in work load.

Table 4 lists the staff complement as of February 28th.

TABLE 3.

OPERATION LOG
 FEBRUARY, 1967
 M.V. AARDVERK

Date	Licence Area	Operation	Stations Sampled
1	West Tasmania	Transit from Currie to West Point	
2		Dredging W.T. 92-97	6
3		Transit to Strahan	
4		Standby Strahan	
5		Dredging W.T. 98-111	14
6		Dredging W.T. 112-123	12
7-10		Standby Strahan	
11		Transit to West Point	
12		Adverse weather	
13		Dredging W.T. 124-125	2
14		Transit to Launceston	
15-28		Crew relief, engine repairs	
Total Stations			34

TABLE 4.

STAFF COMPLEMENT

28th February, 1967.

Status	Name	Appointment	Occupation
Professional	W.Davies	Field Manager	
	D.J.Young	Staff Geologist	
	A.Scholtens	Geologist	Dredging
	P.Skipwith	Geologist	Wando River
	D. Lawson	Engineer/Driller	Wando River
Non- Professional	J. Beaverstock	Laboratory Tech.	Sample Processing
	R. Everts	Draughtsman	Drafting
	A.S.R.Davies	Secretary	Administration
	L.Taylor	Typist/Secretary	Administration
	D.Griffiths	Data Processing	
	B. Izard	Rigger	Wando River
	P. Jackson	Rigger	Wando River
	L. Locsei	Rigger	Wando River
	S. Webster	Raydist Operator	Raydist maintenance
	R.W.Taylor	Seaman Aardverk	Dredging
	C.P.Blundell	Geologist Asst.	Aardverk
J. Gillie	Draughtsman	Phase II	
Part Time	R.C.McBain	Raydist Consultant	
Temporary staff	G. Powers	Data Processing	
Staff included in Charters	T.Chopping	Skipper m/v Aardverk	Preliminary Dredging West Tasmania
	G.W. Head	Skipper & Mate	Tender boat to
	D. Rule	m/v Tondelayo	Wando River

PART II RESULTS

Drilling Results

Drill hole data for the 11 holes drilled in Ringarooma Bay and for the four holes drilled at King Island in February are presented in Table 5.

Although it is uncertain that bedrock was reached in the holes drilled in Ringarooma Bay, all sediment penetrated was recovered.

At King Island, the drill penetrated free running, medium-grained sands which often bypassed the flap of the core catcher. The flap was modified but unfortunately the forward anchoring winch was shattered by large swells thus temporarily preventing scheduled tests of the modified system. As a result of the ineffectiveness of the core catcher only 74 percent of the sediment penetrated at King Island was recovered.

Stratigraphic columns for all holes drilled in the East King Island licence are presented in Figure 6.

Phosphate Sampling Results

Results of the February dredging programme undertaken by M.V. Aardverk are presented in Table 6.

Nodules were dredged at nearly all stations, making up more than 25 percent of the sample at 21 of the 29 stations sampled. Because of the good assay result received for sample W.T. 72 which was in relatively shallow water (42 fths) several stations were sited in water depths of less than 60 fathoms. Samples from the latter stations showed negative results however, and earlier conclusions that the best material appears to be in the 70-90 fths range are still considered valid.

Assay Results

North East Coast Licence

Assay results for 230 samples from the last 33 holes drilled in Ringarooma Bay are presented in Table 7. The samples are from holes numbered NE 106 to NE 138, the locations of which are shown in Figure 2.

TABLE 5.

DRILL HOLE DATA
R.V. WANDO RIVER
FEBRUARY 1967

Hole No.	Area	Date	Water Depth (ft.)	Drill Penetration (ft.)	Core Recovered (ft.)	Bedrock Reached
NE128	Ringarooma Bay	1st	85	7.0	7.0	Yes
129			112	12.0	12.0	
130			112	18.5	18.5	
131			113	11.0	11.0	
132			115	31.5	31.5	
133			118	27.5	27.5	
134		2nd	110	16.0	16.0	
135			120	2.8	2.8	
136			115	26.5	26.5	
137			100	23.0	23.0	
138			95	15.5	15.5	
			Totals	191.3	191.3	
			Core recovery		100%	

KI 8	East King Island	11th	80	10.0	4.5	Yes
9		20th	90	18.0	15.5	
10			78	20.0	15.0	
11			85	17.0	13.0	
			Totals	65.0	48.0	
			Core recovery		74%	

TABLE 6.

SAMPLING RESULTS WEST TASMANIA

PHOSPHATE DREDGING

FEBRUARY 1967

Sample No.	Date	Depth (fths)	Composition of Samples		
			Nodules	Shells Sand Coral Clay	Soft Organisms
WT 92	2nd	40	50	35	15
93		64	60	25	15
94		59	15	70	15
95		57	-	80	20
96		57	15	80	5
97		53	-	-	-
98		5th	61	15	55
99	62		20	40	40
100	67		50	50	-
101	73		50	30	20
102	76		80	15	5
103	81		95	4	1
104	85		30	55	15
105	81		60	35	5
106	77		-	-	-
107	73		80	10	10
108	70	50	30	20	
109	56	15	80	5	
110	60	-	-	-	
111	6th	67	50	25	25
112		76	85	15	-
113		81	50	35	15
114		86	1	60	39
115		90	-	70	30
116		88	50	25	25
117		87	50	50	-
118		80	80	20	-
119		74	90	5	5
120		69	90	10	-
121	59	1	99	-	
122	63	29	70	1	
123	13th	58	65	15	20
124		44	50	5	45
125		60	-	-	-

TABLE 7.

ASSAY RESULTS

929060 10.

NORTH EAST COAST LICENCE

RINGAROOMA BAY

FEBRUARY 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
106	NE 811	0.39	4	16	31
	812	1.18	25	Nil	47
	813	0.31	Trace	Nil	11
	814	0.5	1	Nil	20
	815	0.58	2	6	43
107	816	0.69	75	Nil	45
	817	3.26	7	Nil	65
	818	1.13	2	Nil	40
	819	0.28	1	Nil	10
	820	0.32	Trace	Nil	11
108	821	0.97	21	Nil	48
	822	0.56	2	22	42
	823	0.19	2	Nil	39
109	824	0.58	23	15	55
	825	0.49	37	7	49
	826	1.76	88	Nil	35
	827	0.86	29	Nil	22
	828	1.55	5	Nil	31
	829	1.51	3	Nil	30
	830		Clay - not treated		
	831	0.48	1	Nil	12
110	832	1.71	36	Nil	77
	833	1.11	2	Nil	41
	834	1.45	3	Nil	36
	835	0.96	68	Nil	58
	836	0.43	6	Nil	30
113	856	1.82	4	82	255
	857	1.06	34	21	64
	858	0.71	4	Nil	64
	859	0.78	Nil	Nil	23
	860	1.18	2	Nil	53
	861	1.26	Nil	Nil	38
	862	1.17	6	Nil	53

.../contd.

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TABLE 7 (contd.)

ASSAY RESULTS
NORTH EAST COAST LICENCE
RINGAROOMA BAY
FEBRUARY 1967

929061

11.

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
114	NE 863	3.25	16	Nil	65
	864	0.82	Nil	25	16
	865	1.20	Nil	Nil	24
	866	0.51	Nil	Nil	8
	867	0.26	Trace	12	35
	868	0.58	6	Nil	23
	869	0.44	3	Nil	13
	870	0.68	7	Nil	17
	871	0.83	10	Nil	17
	872	2.03	144	Nil	91
	873	1.50	24	Nil	42
	874	1.12	19	Nil	22
	875	0.77	6	Nil	19
	876	0.86	2	Nil	34
115	877	1.84	4	Nil	83
	879	0.22	5	33	52
	880	0.14	12	21	41
	881	0.88	2	18	53
	882	0.59	1	15	38
	883	0.25	Trace	Nil	11
	884	0.41	Nil	Nil	16
	885	0.31	2	3	22
	886	0.72	1	Nil	14
	887	0.97	2	Nil	29
888	0.28	22	Nil	17	
116	889	3.85	3	Nil	154
	890	3.79	8	Nil	95
	891	1.37	3	14	34
	892	0.36	1	7	14
	893	0.34	1	Nil	7
	894	0.37	1	Nil	7
	895	0.70	3	Nil	18
	896	0.78	7	Nil	35
	897	1.61	6	Nil	32
117	898	1.38	6	Nil	35
	899	2.18	15	Nil	54
	900	4.73	28	Nil	118
	901	1.01	8	Nil	45
	902	0.63	3	9	44
	903	0.64	3	13	45
	904	1.34	5	Nil	87
	905	0.77	9	Nil	58

.../contd.

TABLE 7 (contd.)

ASSAY RESULTS
NORTH EAST COAST LICENCE
RINGAROOMA BAY
FEBRUARY 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
118	NE 906	0.50	10	Nil	33
	907	1.60	6	Nil	48
	908	0.74	8	Nil	19
	909	0.80	2	8	32
	910	1.25	4	Nil	25
	911	0.78	7	Nil	19
	912	0.45	5	9	31
	913	0.51	26	5	20
	914	0.48	3	5	31
119	915	0.39	5	14	88
	916	0.13	4	17	38
	917	0.24	1	6	29
	918	0.28	1	4	66
	919	0.53	1	Nil	37
	920	1.37	3	Nil	110
120	921	0.38	17	Nil	28
	922	0.62	4	Nil	22
	923	0.53	3	8	40
	924	0.24	1	Nil	6
	925	0.33	Nil	Nil	12
	926	0.36	1	5	27
	927	0.83	1	Nil	62
	928	0.38	9	Nil	11
	929	0.57	2	Nil	23
121	930	0.58	5	17	93
	931	0.52	2	16	36
	932	0.23	Trace	11	25
	933	0.20	Trace	7	12
	934	0.14	2	24	43
	935	0.23	14	Nil	17
	936	0.47	12	12	56
	937	0.39	8	Nil	23
	938	0.35	12	Nil	52
	939	0.18	8	Nil	14
	940	1.81	7	Nil	118
941	0.74	1	11	70	

.../contd.

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TABLE 7 (contd.)

929063^{13.}

ASSAY RESULTS
NORTH EAST COAST LICENCE
RINGAROOMA BAY
FEBRUARY 1967

Hole No.	Sample No.	Head Assay				
		Non Magnetic Percent	p.p.m. Metals			
			Sn	Ti	Zr	
122	NE 942	0.31	1	3	17	
	943	0.07	Trace	Nil	3	
123	944	1.60	13	Nil	40	
	945	0.05	4	Trace	3	
	946	0.04	Trace	Nil	2	
124	947	0.28	9	14	42	
	948	0.31	Trace	Nil	12	
	949	0.19	2	Nil	14	
	950	0.99	4	Nil	40	
	951	1.71	7	Nil	43	
	952			Clay - not treated		
125	953	0.28	2	8	20	
	954	0.26	1	9	27	
	955	0.83	11	8	21	
	956	0.57	5	14	48	
	957	1.01	28	10	56	
	958	0.74	42	Nil	33	
	959	2.18	78	Nil	65	
	960	0.53	13	Nil	19	
126	961	0.55	2	8	25	
	962	1.91	6	Nil	76	
	963	0.98	3	Nil	39	
	964	0.34	1	5	20	
	965	0.23	1	2	14	
	966(
	967(Clay - not treated		
	968(
	969	0.30	22	12	42	
	970	0.56	20	Nil	36	
971	0.66	66	Nil	26		
127	972	0.43	8	8	41	
	973	0.47	7	12	38	
	974	0.51	10	20	66	
	975	0.75	15	11	30	
	976	0.65	20	6	49	

.../contd.

TABLE 7 (contd.)

ASSAY RESULTS
NORTH EAST COAST LICENCE
RINGAROOMA BAY
FEBRUARY 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
127 cont.	NE 977	0.77	15	Nil	27
	978(Clay - not treated		
	979(
	980	0.82	49	8	45
	981	0.27	8	7	40
	982	1.50	30	Nil	45
	983	1.19	30	Nil	36
	984	1.60	51	Nil	48
128	985	0.17	4	Nil	8
	986	0.09	4	1	4
129	987	0.93	3	Nil	46
	988	1.05	11	Nil	26
	989		Clay - not treated		
130	990	0.68	24	Nil	24
	991	2.82	23	Nil	70
	992	0.85	3	21	38
	993	0.76	2	15	27
	994	2.12	6	Nil	53
	995	2.31	9	23	58
131	996	0.75	10	15	41
	997	0.37	1	4	13
	998	0.53	2	5	19
132	999	0.63	4	16	34
	1000	0.76	17	46	65
	1001	0.68	12	27	54
	1002	1.27	3	19	44
	1003	1.16	14	Nil	29
	1004	1.15	3	Nil	17
	1005	0.81	3	8	32
	1006	1.68	3	Nil	34
	1007	1.00	3	20	55

.../contd.

TABLE 7 (contd.)

ASSAY RESULTS

NORTH EAST COAST LICENCE

RINGAROOMA BAY

FEBRUARY 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
133	NE 1008	0.39	5	27	47
	1009	1.46	18	44	117
	1010	2.93	35	Nil	88
	1011	1.40	10	56	105
	1012	0.89	4	18	44
	1013	0.53	2	16	32
	1014	0.77	3	31	50
	1015	0.29	1	Nil	9
134	1016	1.53	8	Nil	46
	1017	1.28	5	Nil	26
	1018	1.06	3	Nil	21
	1019	1.41	4	Nil	21
135	1020	1.23	4	Nil	31
	1021	0.93	4	Nil	37
	1022	0.72	2	14	25
136	1023	0.90	4	18	31
	1024	0.84	2	42	71
	1025	0.87	3	27	31
	1026	0.85	3	17	34
	1027	0.38	Trace	15	23
	1028	2.82	8	Nil	42
	1029	3.18	13	Nil	64
137	1030	0.84	3	59	80
	1031	2.12	59	Nil	64
	1032	0.73	17	11	29
	1033	0.88	11	18	35
	1034	1.16	107	Nil	23
	1035	0.79	4	24	40
	1036	0.78	4	16	23
138	1037	1.22	4	Nil	37
	1038	0.75	2	15	30
	1039	0.52	5	31	26
	1040	1.73	7	Nil	52

These holes, along with those drilled previously, have outlined a linear orebody of approximately ten square miles. Only about 18 of the February holes were within the mineralised area as it is now defined, and of these seven yielded samples assaying better than 50 p.p.m.

It should be noted that, within the orebody, only seven holes were spaced closer than one quarter of a mile. Generally, spacing between holes was as much as, or even more than, three quarters of a mile.

The stratigraphic distribution of tin, titanium and zirconium in holes NE 87 to NE 138 is shown in Figure 7.

East King Island Licence

Assay results for 13 samples from four holes in the East King Island licence are presented in Table 8. The location of these holes is shown in Figure 3.

Although tin values are uniformly low, moderately high values for titanium and zircon are reported in hole KI 9. This hole, from which 2.5 ft of core was lost, is situated about four miles east of Naracoopa on the edge of a deep sediment-filled channel which, with Elephant Shoal, represented the principal drilling target in the licence. It is unfortunate that weather conditions precluded more effective drilling of these areas.

Comparison Assay/Spectrographic Analyses

In conformity with our policy of submitting for check assay samples for which relatively high tin values were reported, 18 samples, each containing more than 75 p.p.m. tin, were sent to the Australian Mineral Development Laboratories. The results are presented in Table 9.

Assay results for five samples resubmitted to the Tasmanian Department of Mines for tests to determine the percentage of tin lost during the cradling, tabling and magnetic separation stages of sample assay are also included in Table 9.

Some serious differences in tin assay results are apparent both between the two splits submitted to the Tasmanian Department of Mines, and between these and splits of the same sample sent to AMDEL. The discrepancies in part,

TABLE 8.

ASSAY RESULTS
EAST KING ISLAND LICENCE
FEBRUARY 1967

Hole No.	Sample No.	Head Assay			
		Non Magnetic Percent	p.p.m. Metals		
			Sn	Ti	Zr
8	KI 20	0.54	3	151	73
9	21	2.05	4	287	185
	22	2.21	4	630	442
	23	1.51	8	717	159
	24	1.49	7	74	74
	10	25	0.79	Tr.	40
11	26	0.39	Tr.	70	51
	27	0.66	Tr.	33	43
	28	0.69	Tr.	10	Nil
	29	0.18	Tr.	4	Nil
	30	0.28	Tr.	6	7
	31	0.23	Tr.	2	Nil
	32	0.49	Tr.	25	34

Feb '67

TABLE 9. COMPARISON OF ASSAY RESULTS

Sample No.	TIN p.p.m.		TITANIUM p.p.m.		ZIRCONIUM p.p.m.		
	A	B	A	B	A	B	
NE 278	121	167	200	13	700	40	Not detected in any samples
325	110	150	80	3	600	13	
341	116	218	300	17	200	38	
385	133	54	70	10	700	36	
427	237		700	5	500	15	
562	111		300	35	300	25	
582	156		120	158	500	55	
584	122		15	Nil	500	15	
599	110	93					
631	160		200	42	700	17	
646	134		25	70	800	228	
684	515		50	391	700	453	
685	79		10	264	800	276	
718	120		50	7	500	26	
796	361		150	17	1500	106	
797	111		500	Nil	800	57	
826	88		60	Nil	1200	35	
872	144		200	Nil	600	91	

A. Tasmanian Department of Mines - X-ray Analysis

B. Australian Mineral Development Laboratories -
Semi-quantitative Spectrographic Analysis

Feb '67

are probably the result of inaccurate splitting of the samples, particularly in view of the very much smaller volume required by AMDEL for spectrographic analysis. The coarse grain size of many samples also resulted, to some degree, in inaccurate splits. Nevertheless the samples submitted were thought to be roughly representative, and as a further check those showing major differences were resubmitted yet again for further checks.

The lack of correlation evident in the titanium values arises at least partly because the spectrographic method employed by AMDEL measures the titanium content of both rutile and ilmenite. The Tasmanian Department of Mines, on the other hand, only determines the titanium content of the non-magnetic fraction of the concentrate, no ilmenite therefore being assayed.

Most of the samples contained too little zircon for this element to have been detected by the spectrographic method. Zircon should perhaps have been detected in samples NE 646, 684 and 685, however, for their zircon contents are appreciably above the lower level of resolution (100-200 p.p.m. Zr) recognised for this method of analysis.

Tin losses during sample treatment

In addition to the routine check assaying of all samples for which moderately high tin values are reported, it was decided to determine the percentage of tin lost during the cradling, tabling, and magnetic separation stages of sample treatment by assaying the tin content of the respective tailings.

The results of this study are presented in Table 10. Previous head assays for these five samples are also presented in Table 10.

In all samples the weight of the magnetic fraction was very small and because of the technical problems associated with upgrading to an assayable level, the tin content of this fraction was not determined.

The percentage of tin recovered from the five samples varied between 89.3% for sample NE 599, to 100% for sample NE 341; the average being 93.8%.

TABLE 10.

Feb '67

TIN LOSSES DURING SAMPLE TREATMENT

SAMPLE NE 278

Product	Wght. Gms.	% Wght.	Sn p.p.m.	Sn % Dist.
Non. Mag. Conc.	379.4	5.95	3000	93.2
Magnetics	3.9	0.05	ND	
Cradle Tailing	2130.0	33.40	12	2.1
Table Tailing	3865.0	60.60	15	4.7
Total Tailing	5995.0	94.00	14	6.8
Comp. Head Sample	6378.3	100.00	192	100.0

Calc. Head Wt. 6.81 kg.

Sn p.p.m. recovered in Conc. (overall) 179.

SAMPLE NE 325

Product	Wght. Gms.	% Wght.	Sn p.p.m.	Sn % Dist.
Non. Mag. Conc.	300.7	3.30	4600	93.0
Magnetics	5.8	0.06	ND	
Cradle Tailing	4870.0	53.45	9	3.0
Table Tailing	3935.0	43.19	15	4.0
Total Tailing	8805.0	96.64	12	7.0
Comp. Head Sample	9111.5	100.00	163	100.0

Calc. Head Wt. 9.23 kg.

Sn p.p.m. recovered in Conc. (overall) 152.

SAMPLE NE 341

Product	Wght. Gms.	% Wght.	Sn p.p.m.	Sn % Dist.
Non. Mag. Conc.	325.5	6.77	3300	100.0
Magnetics	3.8	0.08	ND	
Cradle Tailing	2404.0	50.02	Nil	Nil
Table Tailing	2073.0	43.13	Nil	Nil
Total Tailing	4477.0	93.15	Nil	Nil
Comp. Head Sample	4806.3	100.00		100.0

Calc. Head Wt. 4.92 kg.

Sn p.p.m. recovered in Conc. (overall) 223.

.../contd.

Feb '67

TABLE 10 (contd.)

TIN LOSSES DURING SAMPLE TREATMENT

SAMPLE NE 385

Product	Wght. Gms.	% Wght.	Sn p.p.m.	Sn % Dist.
Non. Mag. Conc.	396.8	6.97	800	93.7
Magnetics	2.3	0.04	ND	
Cradle Tailing	3555.0	62.48	6	6.3
Table Tailing	1735.0	30.51	Nil	Nil
Total Tailing	5290.0	92.99	4	6.3
Comp. Head Sample	5689.1	100.00	59	100.0

Calc. Head Wt. 5.92 kg.

Sn p.p.m. recovered in Conc. (overall) 56.

SAMPLE NE 599

Product	Wght. Gms.	% Wght.	Sn p.p.m.	Sn % Dist.
Non. Mag. Conc.	584.3	7.39	1300	89.3
Magnetics	9.7	0.12	ND	
Cradle Tailing	5065.0	64.11	18	10.7
Table Tailing	2242.0	28.38	Nil	Nil
Total Tailing	7307.0	92.49	13	10.7
Comp. Head Sample	7901.0	100.00	108	100.0

Calc. Head Wt. 8.17 kg.

Sn p.p.m. recovered in Conc. (overall) 96.

Feb '67

25

The highest tin losses apparently occurred at the cradling stage and it is of interest to note that samples NE 385 and 599, from which most tin was lost, consist largely of granules and pebbles and are appreciably coarser grained and less well sorted than the other samples. In the finer grained samples tin losses during tabling exceed those during cradling. This relationship between grain size, stage of separation and tin losses may be explained largely by the following:

- (1) In the coarse grained samples some of the cassiterite is found as coarse composite grains or granules with quartz etc. These granules are occasionally sieved away during cradling.
- (2) In finer sediments there is a higher proportion of finely milled cassiterite, some even finer than two microns. This is lost during tabling after passing through the initial cradling stage.

Phosphate Analyses

The results of 12 P₂O₅ analyses for samples from the West Tasmania licence are presented in Table 11. The locations of the stations from which these were dredged are shown in Figure 4. High P₂O₅ values were reported for samples WT 101 and 107, both to the West of Macquarie Harbour in the general area from which other good phosphate samples have been dredged.

Gold Assays

Following the reported detection of gold during the cradling and tabling of some samples from Ringarooma Bay, the Tasmanian Department of Mines was requested to conduct fire assays on three samples. No gold was detected by this method but splits of the same samples were later submitted to AMDEL for spectrographic analysis and each gave positive results. These are presented in Table 12.

It is of interest to note that gold is a small but important byproduct of the Dorset Dredge which operates onshore to the south of Ringarooma Bay. From 1961 to 1965 inclusive 1,115 ounces of gold were recovered by the Dorset Dredge from 6,545,000 cubic yards of material. This represents an average of .05 grains of gold per cubic yard.

TABLE 11.

PHOSPHATE ANALYSES

FEBRUARY 1967

Licence	Sample Number	Phosphorous pentoxide P ₂ O ₅ (%)
West Tasmania	WT 81	0.20
	85	0.60
	93	0.35
	101	14.00
	102	1.45
	104	1.55
	107	1.25
	107	14.00
	112	1.85
	117	3.50
	120	1.00
	124	0.35

Feb '67

TABLE 12.

GOLD ANALYSES
AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

Hole No.	Sample No.	Gold (ozs/long ton)
60	NE 400	0.002
78	573	0.002
	578	0.003

Feb 167

Examination of Magnetic fractions for Chromium

A composite of a group of magnetic products from 13 Ringarooma Bay samples was examined by the Tasmanian Department of Mines in order to determine the percentage of chromium present in ilmenite within the magnetic fractions.

The composite sample was magnetically separated into four magnetic fractions and a non-magnetic fraction.

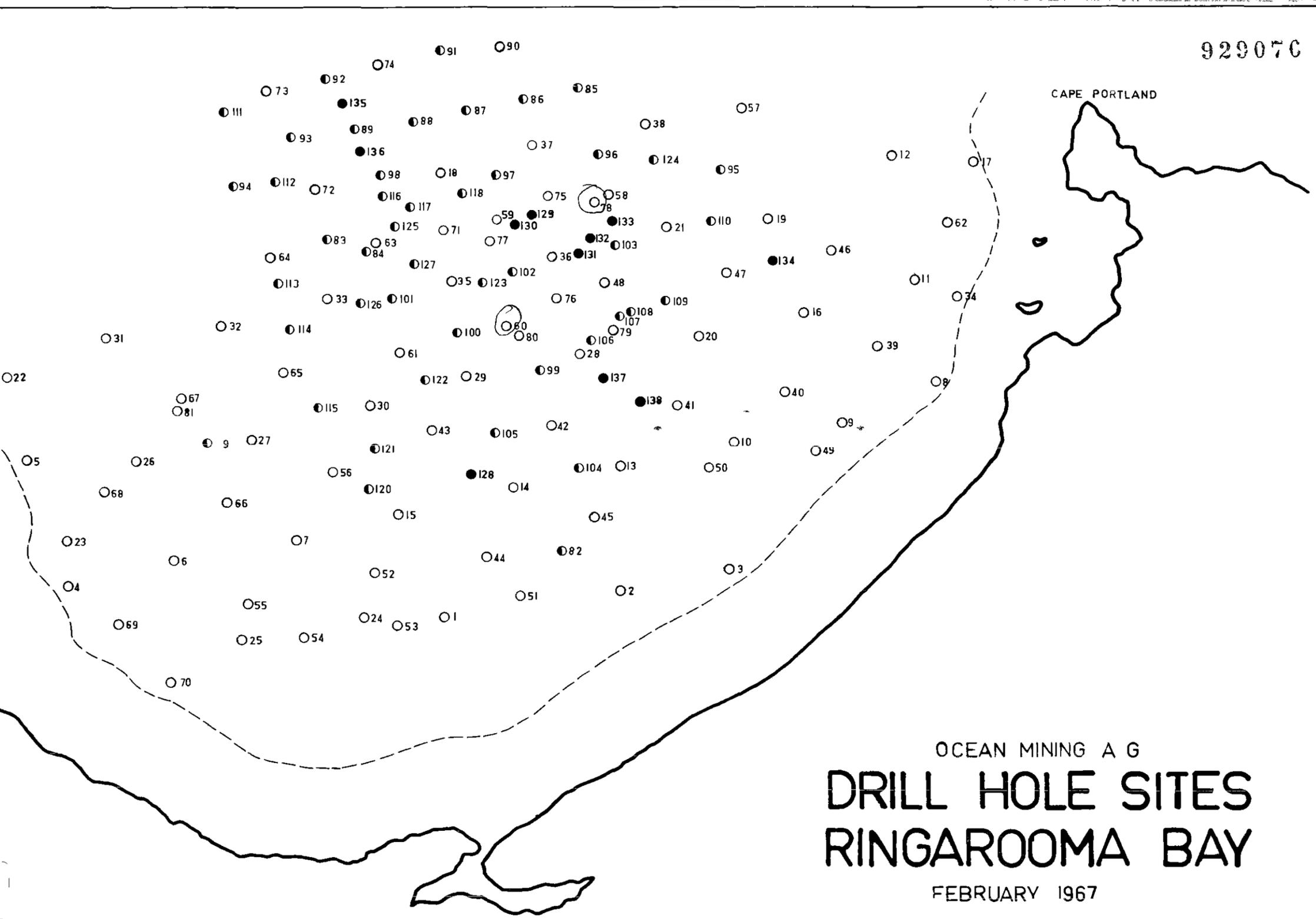
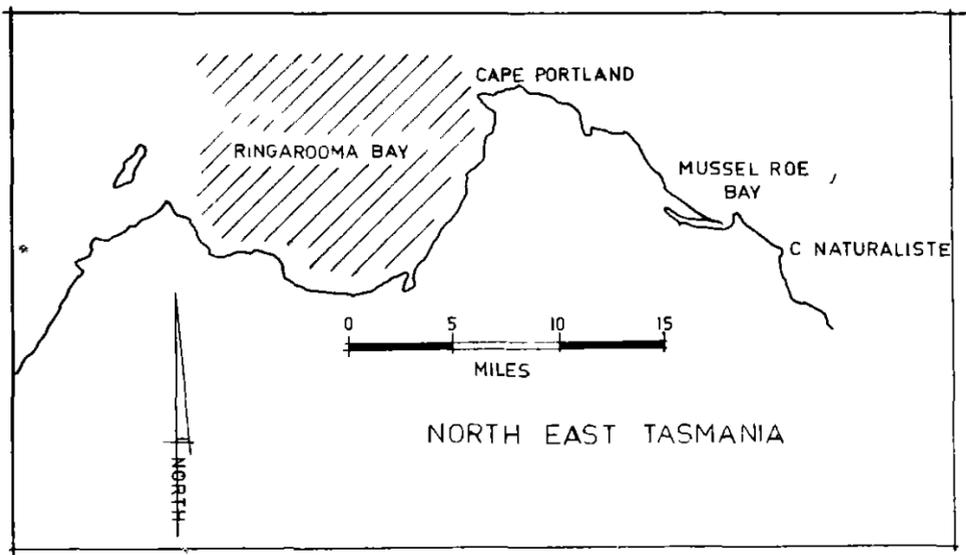
Magnetic fractions 1, 2 and 3 were examined for titanium and chromium content. Magnetic fraction 4, representing about one half of the composite sample, appeared to be mainly garnet, and was not further treated.

The group of samples used was a random selection and the bulk magnetic fractions were of small amount, generally less than 0.1 percent by weight.

The results are as follows:

Product	Percent		
	Weight	TiO ₂	Cr
Magnetic fraction 1	2.9	30.8	0.36
2	26.0	33.2	0.12
3	4.5	40.8	0.09
4	55.1	(Mainly Garnet)	
Non-Magnetic fraction	11.5		
	100.0		

For the manufacture of white pigment from ilmenite the maximum chrome (Cr₂O₃) content commercially acceptable in the mineral is approximately 0.03 percent.

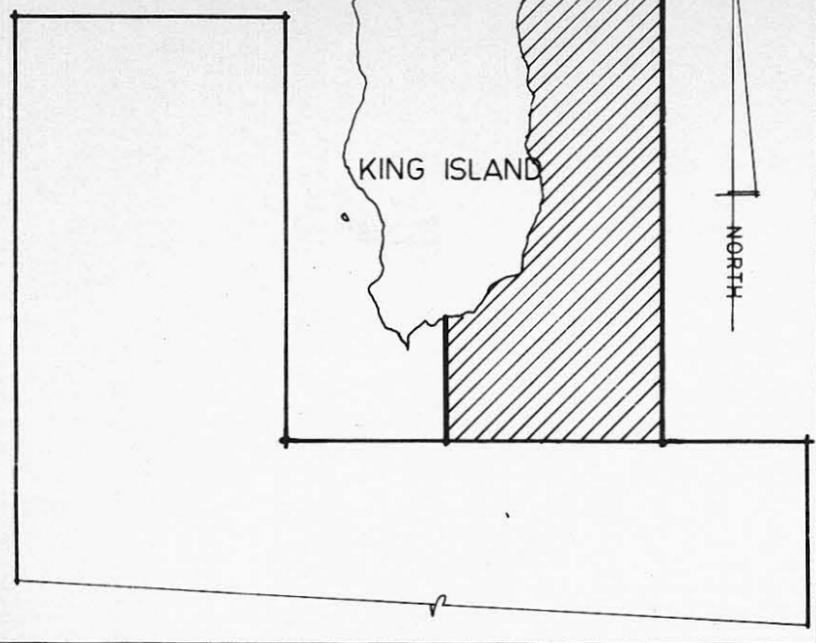


OCEAN MINING A G
DRILL HOLE SITES
RINGAROOMA BAY
FEBRUARY 1967

- NOTE
- HOLES DRILLED OCT NOV DEC 1966
 - ◐ HOLES DRILLED JANUARY 1967
 - HOLES DRILLED FEBRUARY 1967

Fig 2

FIG 2



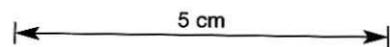
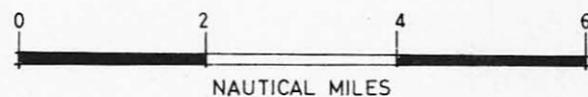
LOCATION MAP

BOULDER ROCK

LICENCE BOUNDARY

LAVINIA POINT

EAST KING ISLAND



OCEAN MINING A G DRILL HOLE SITES KING ISLAND FEBRUARY 1967

SEA ELEPHANT ROCK

NARACOOPA

FRASER BLUFF

- HOLES DRILLED IN NOV-DEC. 1966
- HOLES DRILLED IN FEBRUARY 1967

7

3

2

1

11

8

6

5

9

10

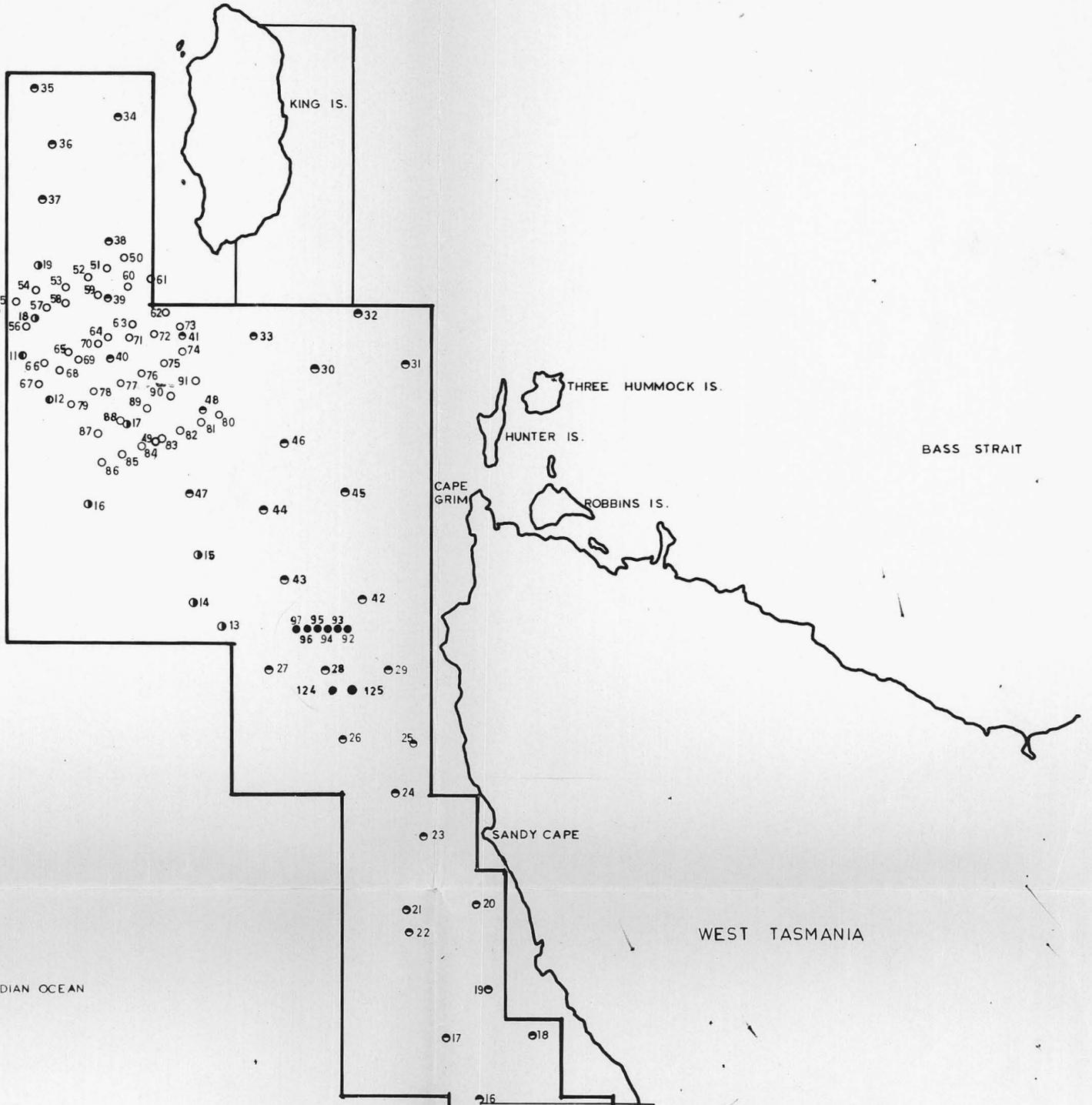
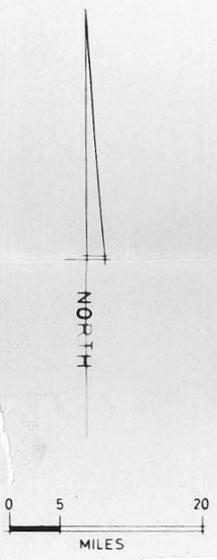
4

FIG.3

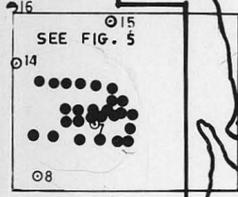
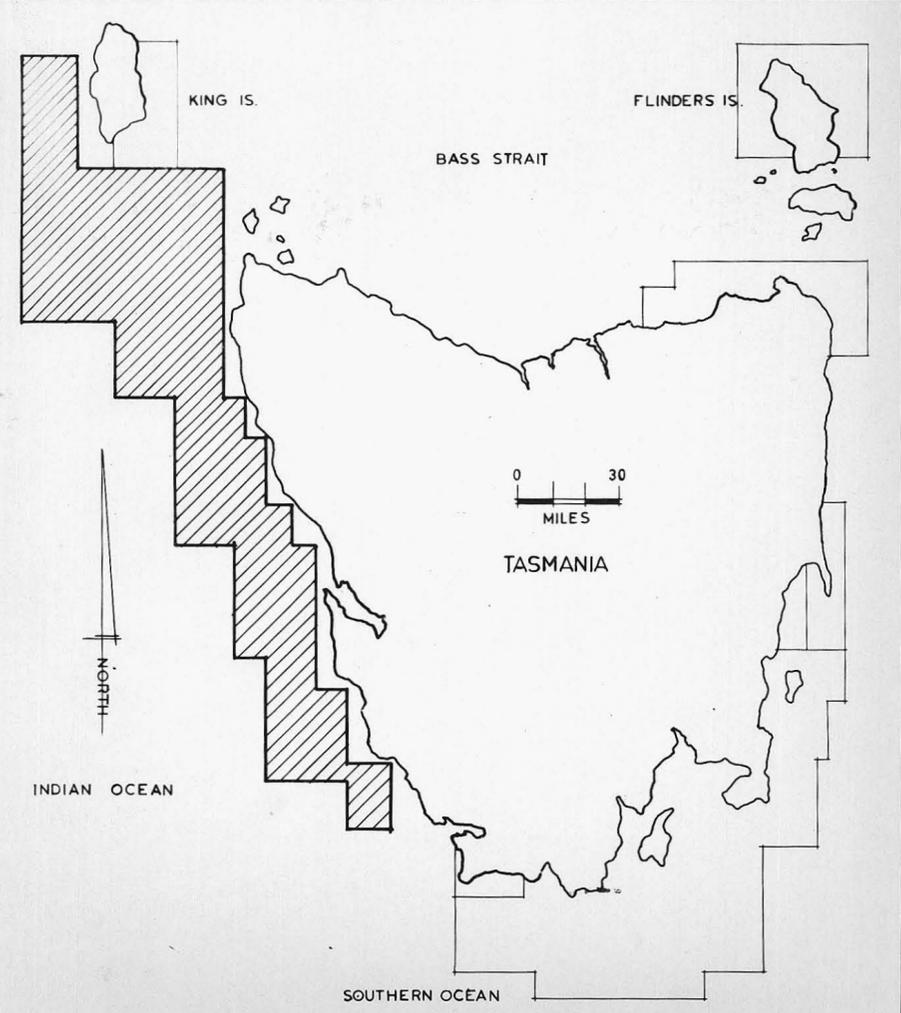
SAMPLE STATIONS WEST TASMANIA LICENCE

M/V AARDVERK
MARCH 1967 (in Feb. 1967)

01
02
03
04
05
06
07
08
09
10



LOCATION MAP



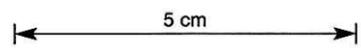
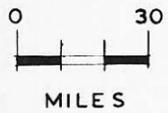
KEY

- STATIONS SAMPLED 1-12 JANUARY 1966
- STATIONS SAMPLED 13-22 AUGUST 1966
- STATIONS SAMPLED 1-15 NOVEMBER 1966
- STATIONS SAMPLED 16-18 DECEMBER 1966
- STATIONS SAMPLED 19-31 JANUARY 1967
- STATIONS SAMPLED 02-12 FEBRUARY 1967
- ◆ GRAB SAMPLES

SOUTHERN OCEAN

929078
FIG. 4
8016

INDIAN
OCEAN



OCEAN MINING AG SAMPLE STATIONS WEST TASMANIA LICENCE

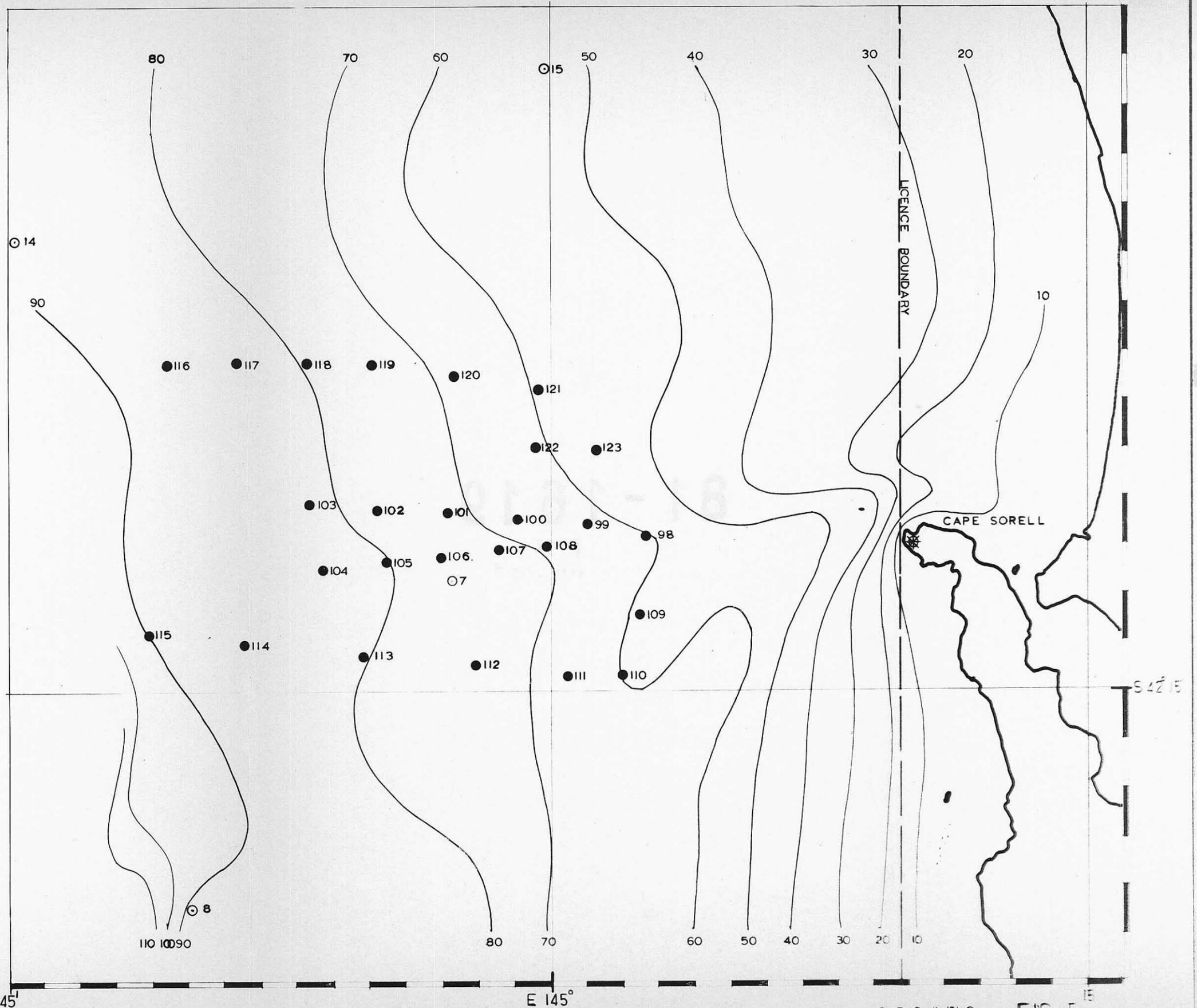
M/V AARDVERK
MARCH 1967 (in Feb '67)

KEY.

- ⊙ SAMPLE STATIONS NOVEMBER
- SAMPLE STATIONS FEBRUARY



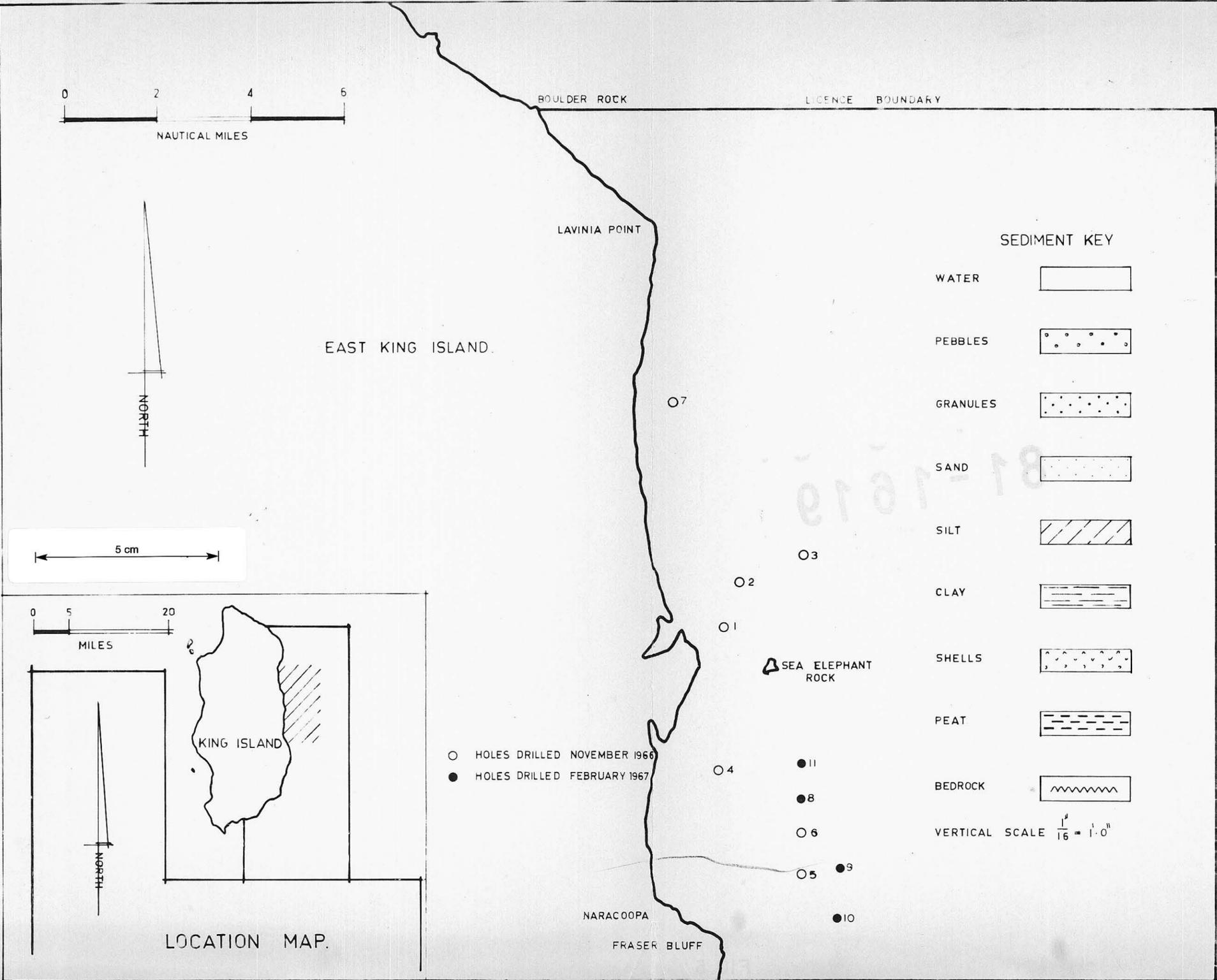
10 Fathoms.



929079 FIG. 5

OCEAN MINING A.G.
STRATIGRAPHIC COLUMNS
KING ISLAND

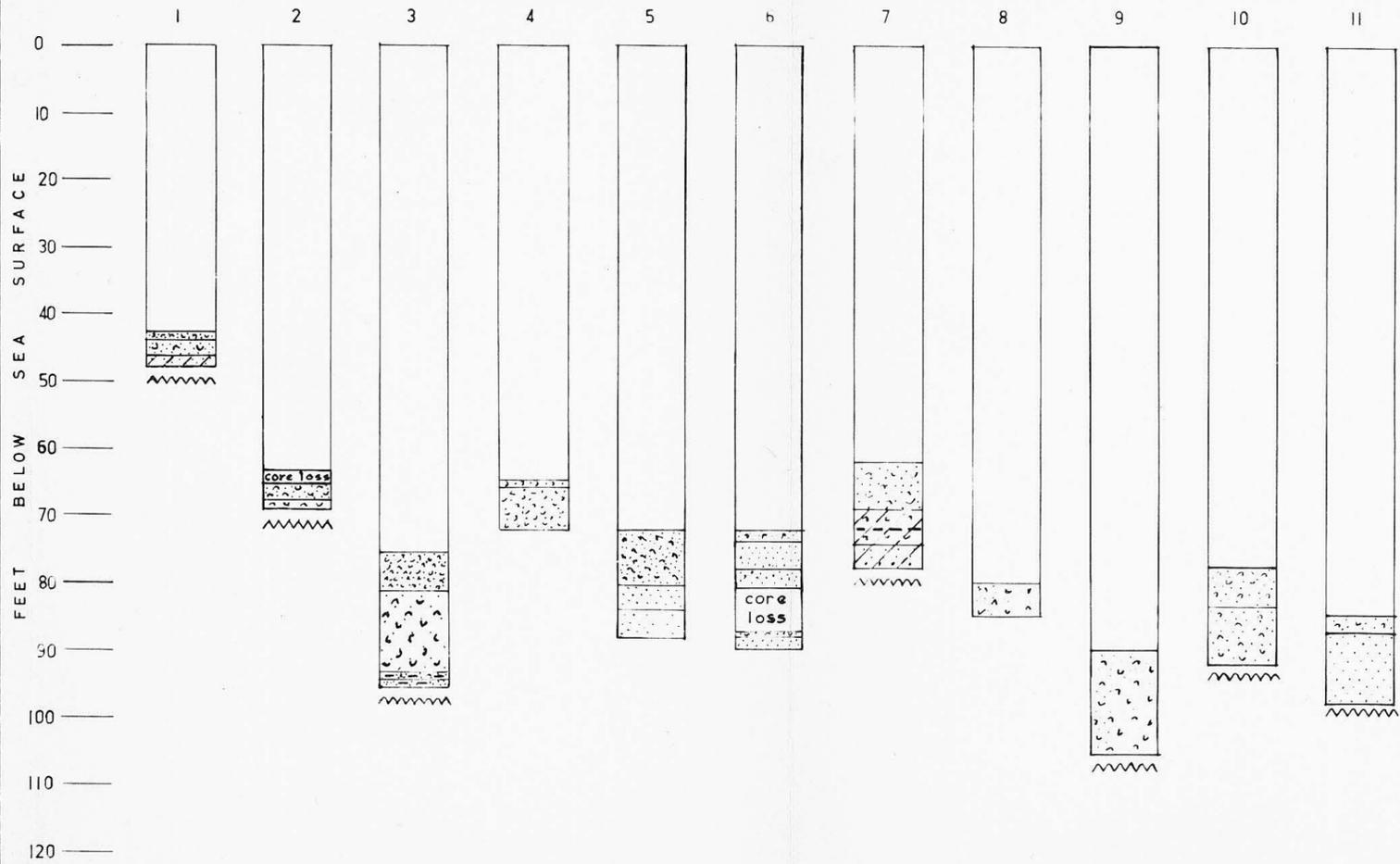
MARCH 1967



SEDIMENT KEY

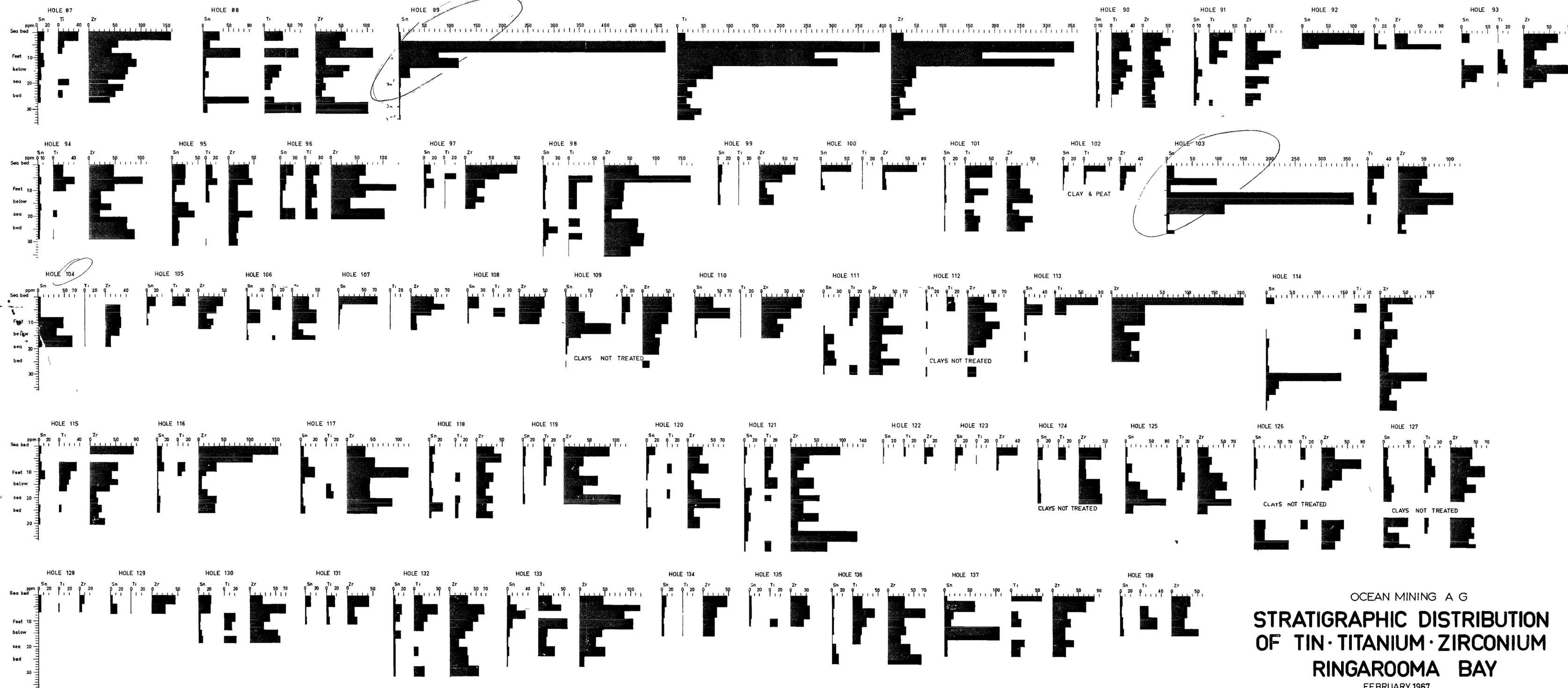
WATER	
PEBBLES	
GRANULES	
SAND	
SILT	
CLAY	
SHELLS	
PEAT	
BEDROCK	

VERTICAL SCALE $\frac{1}{16} = 1.0''$



929080

FIG. 6
8018



OCEAN MINING A G
**STRATIGRAPHIC DISTRIBUTION
 OF TIN · TITANIUM · ZIRCONIUM**
RINGAROOMA BAY

FEBRUARY 1967
 (HOLES 87-138 ONLY)

929081

OCEAN MINING A.G.
TASMANIA OFFSHORE EXPLORATION PROGRAMME
REPORT OF OPERATIONS - MARCH 1967.

Part 13

Ocean Mining A.G.
Field Headquarters,
38 Canning Street,
Launceston, Tasmania.

PROGRESS DURING MARCH

General

The Phase II drilling programme by the R.V. Wando River that has been continuing since August 1966 was completed in March. By this time 149 holes had been drilled in the North East Coast Licence, ten in the East King Island Licence, and 13 in the Oyster Bay Licence. A total of 3,701 feet of core was recovered in water depths averaging 92 feet. Thirteen hundred and twenty-four samples were submitted for assay, the results of which have been presented in previous monthly reports. Many check assays have also been conducted on selected samples.

The preliminary phosphate dredging programme by M.V. Aardverk was also completed in March. By the end of the month 227 samples had been obtained within the Central Bass Strait, West Tasmania and South Tasmania phosphate licences. Many of these, particularly from West and South Tasmania, contained phosphatic nodular material.

Work accomplished by the end of March is shown in Figure 1.

Data Study

With the completion of the Phase II sampling programme by the R.V. Wando River and the M.V. Aardverk in March, considerable emphasis during the month has been directed towards the reduction and interpretation of the drilling and dredging results. This work, which is being undertaken partly at Field Headquarters in Launceston, and partly in the Washington Offices of Ocean Mining A.G. and elsewhere, is likely to continue for some months. It includes, mainly, the carding of data for computer analysis, the production of geological maps and sections, and the calculation of ore grade, volume, and value.

Drilling Results

R.V. Wando River drilled one hole in Anderson Bay during the month. Bedrock was reached at 14 feet in uniform,

STATE OF OMAG OPERATIONS TO MARCH 1967

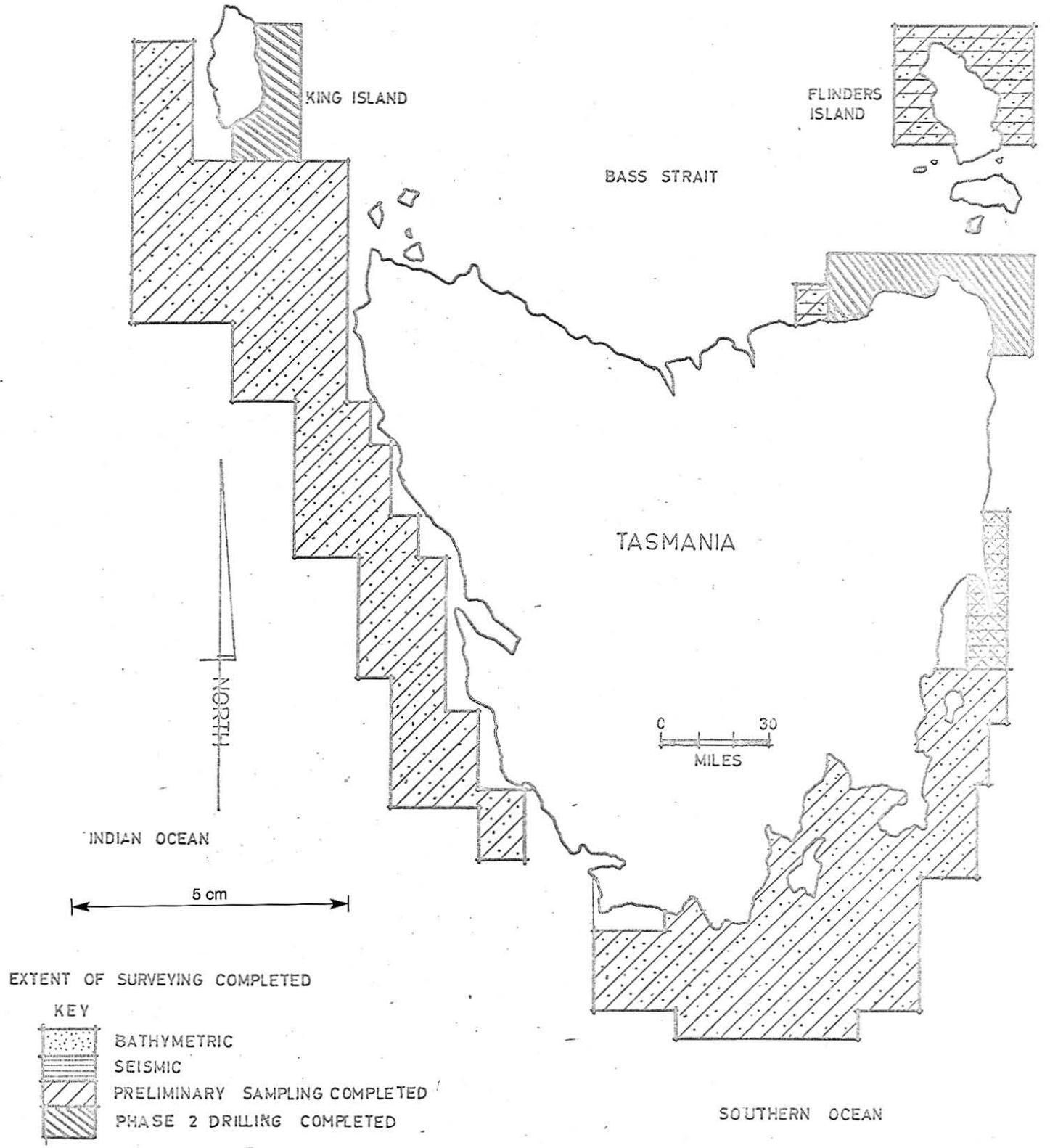


Fig. 1.

medium to coarse shelly sand. All sediment penetrated was recovered. This completed the Phase II drilling programme for Wando River and the vessel was prepared for return to Long Beach, California.

Phosphate Sampling

The preliminary phosphate sampling programme continued in the West Tasmania licence till March 10th. During this cruise five samples were obtained, three of which contained more than 50 percent of nodular material.

Seismic Profiling

To assist in the interpretation of the drilling results, in particular to locate by seismic methods the horizons from which samples showing the best assay results were obtained, the OMAG Pulse Projector and a Senior Geophysicist were recalled from Queensland. This equipment was installed aboard M.V. Tondelayo and a seismic programme was undertaken from 6th - 20th March.

During this time about 80 miles of seismic profiling was completed within a 38 square mile area of Ringarooma Bay. Positioning of the vessel during profiling was controlled by theodolite transection from two radio-equipped shore parties, and by measurement of horizontal sextant angles from the vessel itself. Bathymetric records were also kept during this study. Results of this seismic and bathymetric programme are presently being interpreted.

Licences

Following the completion of Phase II exploration in the middle of March, the following four licences were relinquished:

E.L. 24/65	-	Bridport
E.L. 25/65	-	Oyster Bay
E.L. 1/66	-	Flinders Island
E.L. 8/66	-	Southern Tasmania

Permission to modify and reduce in area E.L. 10/65 South and South-Eastern Tasmania, and to extend E.L.'s 6/65, 7/65, 1/66 and 8/66 for a further six months' period, was also sought and subsequently approved.

Staff¹

The following is the staff complement as of March 31st, 1967:

Status	Name	Appointment
Professional	W. Davies	Field Manager
	D. Young	Senior Geologist
	R. Warren	Senior Geophysicist
	A. Scholtens	Geologist
	P. Skipwith	Geologist
	D. Lawson	Engineer
Non-Professional	J. Beaverstock	Laboratory Technician
	C. Blundell	Seaman
	A. Davies	Secretary
	R. Everts	Draftsman
	D. Griffiths	Data Processing
	B. Iazard	Rigger
	P. Jackson	Rigger
	L. Locsei	Rigger
	L. Taylor	Typist/Secretary
R. Taylor	Seaman	
S. Webster	Raydist Operator	
Staff included in Charter	T. Chopping	Skipper, M.V. Aardverk

OCEAN MINING A.G.
TASMANIA OFFSHORE EXPLORATION PROGRAMME
REPORT OF OPERATIONS - APRIL, 1967.

Part 14

Ocean Mining A.G.,
Field Headquarters,
38 Canning Street,
Launceston, Tasmania.

PROGRESS DURING APRIL

General

With the completion of the Phase II drilling and dredging programmes in March, the emphasis at Field Headquarters in Launceston has been directed towards an assessment of the physical characteristics of the tin ore body in Ringarooma Bay, and an evaluation of the tonnage and value of the principle minerals within it. Plans for further prospecting for phosphate nodules in the West and South Tasmania licences have also been considered.

Data Study

This work continued from March and detailed Bathymetric, Isopach and Bedrock Topography maps, based on data obtained during drilling by the R.V. Wando River, have now been completed. Similar maps, based on the results of the Seismic programme conducted last month, are currently being prepared for comparison.

Using this more detailed information a reasonably accurate assessment of the size of the ore body and of the sediment volume within it will be made. These calculations are proceeding.

A computer study of the data supplied from Field Headquarters continues to be directed from the Washington Offices of Ocean Mining A.G.

Geological Study

A comprehensive review of all the offshore geological information is being made in order to compare the offshore and onshore environments.

A sample of cemented, shelly, bryozoan limestone obtained from near the base of Hole NE-04 in Mussel Roe Bay has been dated on its foraminiferal content by Mr. P. Quilty of the Geology Department, University of Tasmania. The limestone was found to be of Upper Oligocene-Lower Miocene age. Outcrops of marine rocks of this age have not previously been recorded onshore in this locality.

April 1967

Mining Study

In conjunction with the computer programme currently underway in the United States, mining feasibility and dredge design studies are also being conducted. Dredge design is being investigated by the parent company of Ocean Mining A.G., Ocean Science and Engineering Inc., Washington D.C.

Phosphate Analyses

Three samples of phosphatic nodular material from the West Tasmania Licence were submitted to the Metallurgical Laboratories of the Tasmanian Department of Mines for chemical analysis.

The results are as follows:

Sample No.	Per Cent					
	P ₂ O ₅	CaO	CO ₂	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂
WT 7	10.3	46.0	27.0	4.1	1.9	5.3
WT 72	19.4	43.7	15.0	7.4	1.9	2.8
WT 101	12.0	43.7	23.0	4.6	1.9	5.8

Licences

Figure 1 shows the licence areas held by Ocean Mining A.G. as of April 30th, 1967.

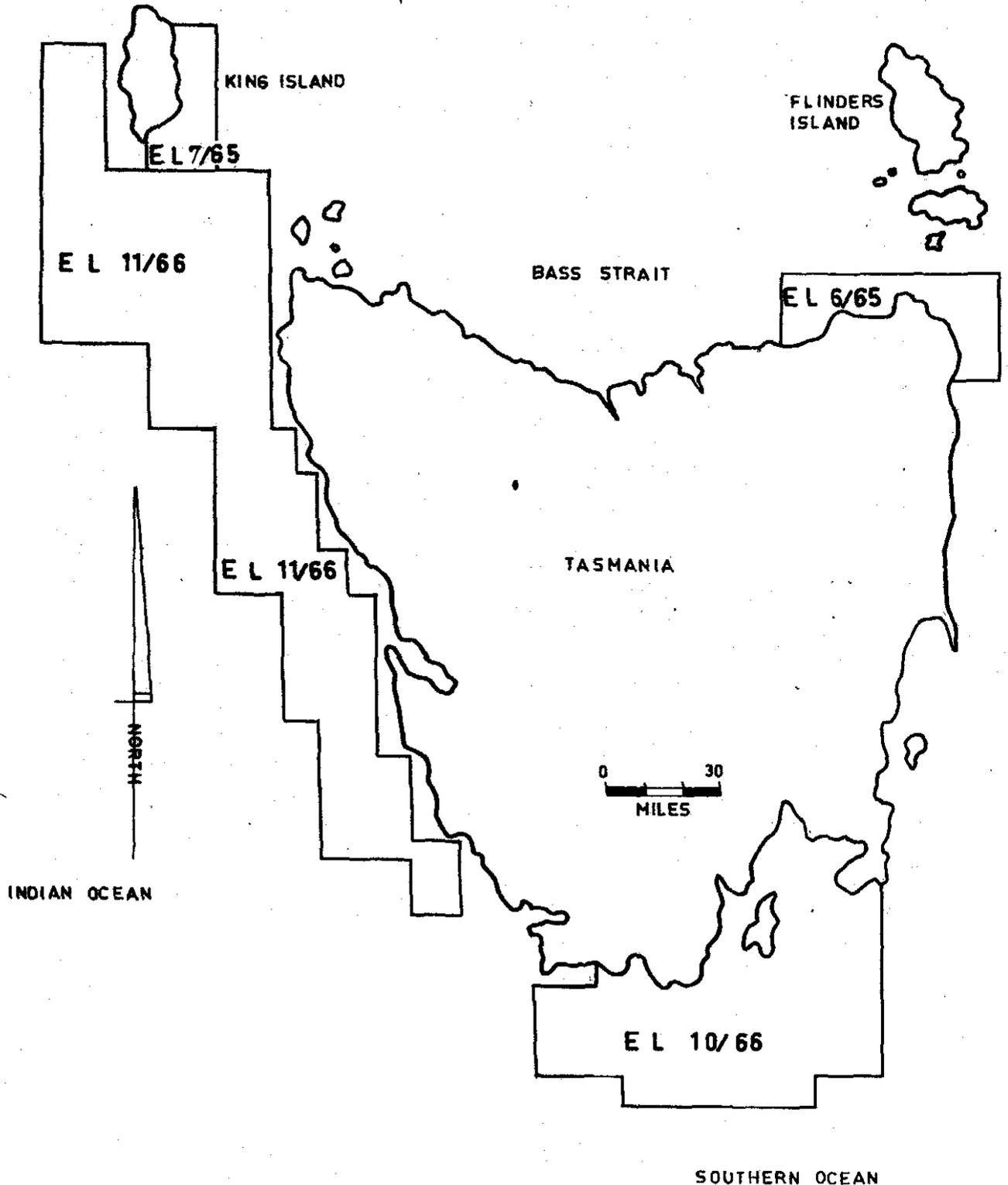
Staff

The following is the staff complement as of April 30th, 1967.

Status	Name	Appointment
Professional	W. Davies	Field Manager
	D. Young	Staff Geologist
	R. Warren	Senior Geophysicist
	A. Scholtens	Geologist
	P. Skipwith	Geologist
	D. Lawson	Engineer
Non-Professional	A. Davies	Secretary
	D. Griffiths	Draftsman
	L. Taylor	Typist/Secretary

OMAG LICENCES 31ST MARCH 1967

OCEAN MINING A. G.



5 cm

FIG. 1

OCEAN MINING A.G.

TASMANIA OFFSHORE EXPLORATION PROGRAMME

REPORT OF OPERATIONS - MAY, JUNE, 1967.

Part 15

Ocean Mining A.G.,
Field Headquarters,
38 Canning Street,
Launceston, Tasmania.

July, 1967.

PROGRESS DURING MAY AND JUNE

General

Projects initiated or continuing through April, in particular the production of bedrock topography and isopach maps based on data obtained during the detailed seismic survey conducted in Ringarooma Bay in March, and precise bathymetric charts based on drilling by the Wando River from August to February, have been completed.

Data Processing

Alternative calculations of ore grade and quantity based on the revised seismic, bathymetric and drill data by both the triangular and polygonal methods is continuing. This study is likely to continue for some time and is being undertaken in conjunction with the computer programme being conducted on behalf of the Tasmanian Offshore Exploration Company in the United States.

Mining Study

The dredge design and mining feasibility studies initiated in the United States in February are still continuing.

Duplicate Analyses

At frequent intervals during TOEC operations, duplicate samples for both tin and phosphate, were submitted to independent authorities for check assay. Table 1 lists the results of 55 samples submitted for check tin assay. These represent about five percent of the samples obtained from Ringarooma Bay. This table shows that on the whole most of the AMDEL results are lower than those from Mines Department. Of the 13 assayed by Mines at more than 50 p.p.m., and checked by AMDEL, eight were reported by AMDEL as being negative compared to Mines Department by more than 50% and five were reported by AMDEL to be positive compared to Mines Department by more than 50%; two of them NE427 and 797 being positive by 400 and 300% respectively.

With these latter exceptions the errors are probably within the limits to be expected considering the inexpensive semi-quantitative nature of the spectrographic method used by AMDEL, and the problems on our part of supplying to them a very small truly representative split of the coarse cobble sands often assayed.

Similar check assays were conducted on 16 phosphate samples and these results are shown in Table 2.

Phosphate Survey

Additional phosphate samples have been submitted to an independent authority for full chemical analysis in order to try and determine which of the better areas so far delineated contains phosphatic material most chemically suitable for treatment. The M.V. Aardverk, which was used exclusively during the phosphate programme, is presently involved in a short survey for Ocean Mining A.G. beyond this State. Following her return to Tasmania in approximately eight weeks it is intended to collect additional phosphate samples from those areas to the west of Tasmania which appear to be the most chemically suitable for acid treatment.

Staff

The following is the staff complement as of June 30th, 1967:

Status	Name	Appointment
Professional	W. Davies	Field Manager
	D. Young	Staff Geologist
	R. Warren	Senior Geophysicist
	P. Skipwith	Geologist
Non-professional	A. Davies	Secretary
	D. Griffiths	Draftsman/data processor
	L. Taylor	Typist/Secretary
	A. Burgess	Draftsman

TABLE 1.

DUPLICATE ANALYSES

TIN

(Sn p.p.m.)

Sample No.	Testing Laboratory		
	Tas. Dept. Mines	AMDEL	Tas. Dept. Mines (Check)
4/19/3	10060	10000	
3/20/5	5000	7000	
OB 862	5	5	
907	5	7	
NE 5	67	80	
20	6	3	
33	Tr.	6	
40	8	5	
134	49	4	
135	196	80	
141	43	12	
142	9	3	
149	2	2	
154	54	3	
155	2	3	
161	151	60	
176	Tr.	1	
181	1	7	
187	96	60	
191	1	3	
192	Nil	1	
215	67	60	
216	41	2	
243	Tr.	3	
278	121	200	179
280	116	80	
315	17	3	
324	15	42	
325	110	80	152
326	40	4	
328	23	12	
329	51	10	
330	24	6	
331	42	5	
332	30	2	
341	116	300	223
350	38	30	
359	62	80	
361	49	25	
385	133	70	56
427	237	700	

.../contd.

TABLE 1 (contd.) DUPLICATE ANALYSES - TIN

Sample No.	Testing Laboratory		
	Tas. Dept. Mines	AMDEL	Tas. Dept. Mines (Check)
NE 447	75	70	
562	111	300	
582	156	120	
584	122	15	
599	110		96
631	160	200	
646	134	25	
684	515	50	505
685	79	10	36
718	120	50	113
796	361	150	350
797	111	500	226
826	88	60	194
872	144	200	142

May-June 1967

TABLE 2.

DUPLICATE ANALYSES

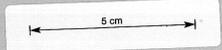
PHOSPHATE

(P₂O₅ %)

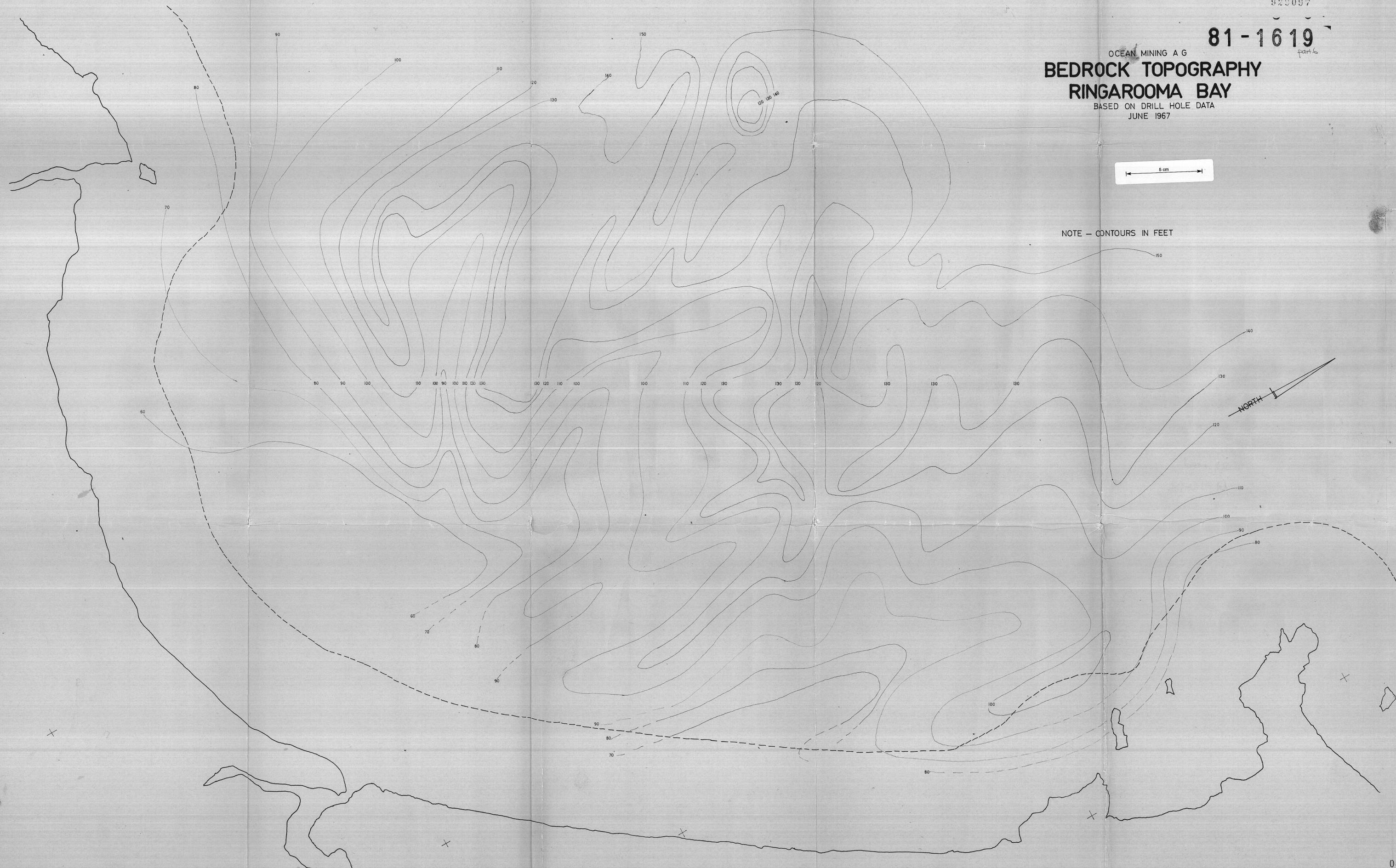
Sample No.	Testing Laboratory			
	Tas. Dept. Mines	AMDEL	Electro. Zinc Co.	Tas. Dept. Mines (Check)
WT 7	10.3	11.4		
17a		0.1	5.1	
17b		3.7	7.85	
18a		5.0	14.75	
18b		0.15	5.3	
51	0.47	1.00		
61	1.04	1.00		
62	0.49	0.85		
64	0.10	0.80		
65	1.38	1.40		
66	0.35	1.70		
72	18.70	20.00		19.4
73	0.98	1.10		
101		14.0		12.0
ST 7		1.92	3.2	
20	0.59	0.40	4.6	

81-1619
part 6

OCEAN MINING A G
BEDROCK TOPOGRAPHY
RINGAROOMA BAY
BASED ON DRILL HOLE DATA
JUNE 1967



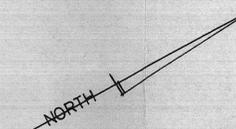
NOTE - CONTOURS IN FEET



OCEAN MINING A G
BATHYMETRIC CONTOURS
RINGAROOMA BAY
BASED ON DRILL HOLE DATA
JUNE 1967



NOTE - CONTOURS IN FEET



OCEAN MINING A.G.
TASMANIA OFFSHORE EXPLORATION PROGRAMME
REPORT OF OPERATIONS - JULY, AUGUST, 1967.

Part 16

Ocean Mining A.G.
Field Headquarters
38 Canning Street
Launceston, Tasmania. 7250

August, 1967.

PROGRESS DURING JULY AND AUGUST 1967

General

Revised bedrock topography and bathymetric maps based on data obtained during drilling by the Wando River and during the detailed seismic programme conducted in Ringarooma Bay in March, 1967, have been completed and are enclosed. They have been used to amend previous estimates of sediment volume and ore grade which had been calculated using maps drawn during Phase I and the early part of Phase II. The results of this study have been forwarded to the Head Office of Ocean Mining A.G. for inclusion into the computer study which still continues in the United States.

Mining Study

The dredge design and mining feasibility studies initiated in February are still continuing.

Phosphate Analyses

Chemical analyses for three phosphate samples submitted to an independent authority for assay are as follows.

Sample No.	Per Cent					
	P ₂ O ₅	CaO	CO ₂	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂
W.T.7	10.3	46.0	27.0	4.1	1.9	5.3
W.T.72	19.4	43.7	15.0	7.4	1.9	2.8
W.T.101	12.0	43.7	23.0	4.6	1.9	5.8

Although it might be thought that the CaO/P₂O₅ and the Fe₂O₃/P₂O₅ ratios are very high it must be borne in mind that, because of its relatively soft nodular form, it is expected that the material will be readily beneficiated by grinding and flotation. With studies to confirm this in mind it is intended to try and obtain bulk samples of about 50 pounds weight averaging around 20% P₂O₅. This programme is planned to coincide with the fair weather period expected towards the end of October and will be undertaken by R.V. Aardverk on her return from Western Australia.

It is hoped to conduct a sea bottom study with the aid of an underwater television camera at the same time. Enquiries are proceeding in an effort to obtain a marine television unit in Australia.

Staff

While the appraisal of all data continues in the United States staff from Field Headquarters have been active on other Ocean Mining Projects in Queensland and Western Australia. A reduction in the amount of time spent by various personnel employed on the Tasmanian project has therefore occurred during the period. The following is the staff complement at Field Headquarters as of August 31st.

Status	Name	Appointment
Professional	W. Davies D. Young R. Warren D. Lawson A. Scholtens	Field Manager Senior Geologist Geophysicist Engineer Geologist
Non-professional	A. Davies D. Griffiths D. Peacock	Secretary Draftsman/data processor Geophysical Assistant

OCEAN MINING A.G.

TASMANIA OFFSHORE EXPLORATION PROGRAMME

REPORT OF OPERATIONS - SEPTEMBER, OCTOBER, 1967.

Part 17

Ocean Mining A.G.
Field Headquarters,
38 Canning Street,
LAUNCESTON,
Tasmania. 7250.

October, 1967.

PROGRESS DURING SEPTEMBER AND OCTOBER

During the period R.V. Aardverk undertook a short phosphate dredging programme within a seven hundred square mile area to the north-west of King Island.

Field trials of a new 3" vibracorer were held in Bass Strait in late October. The purpose of these trials was to test the effectiveness of modifications made to the unit and to assess its ability to drill approximately 100 holes in Ringarooma Bay during the autumn fair weather period.

Phosphate Programme.

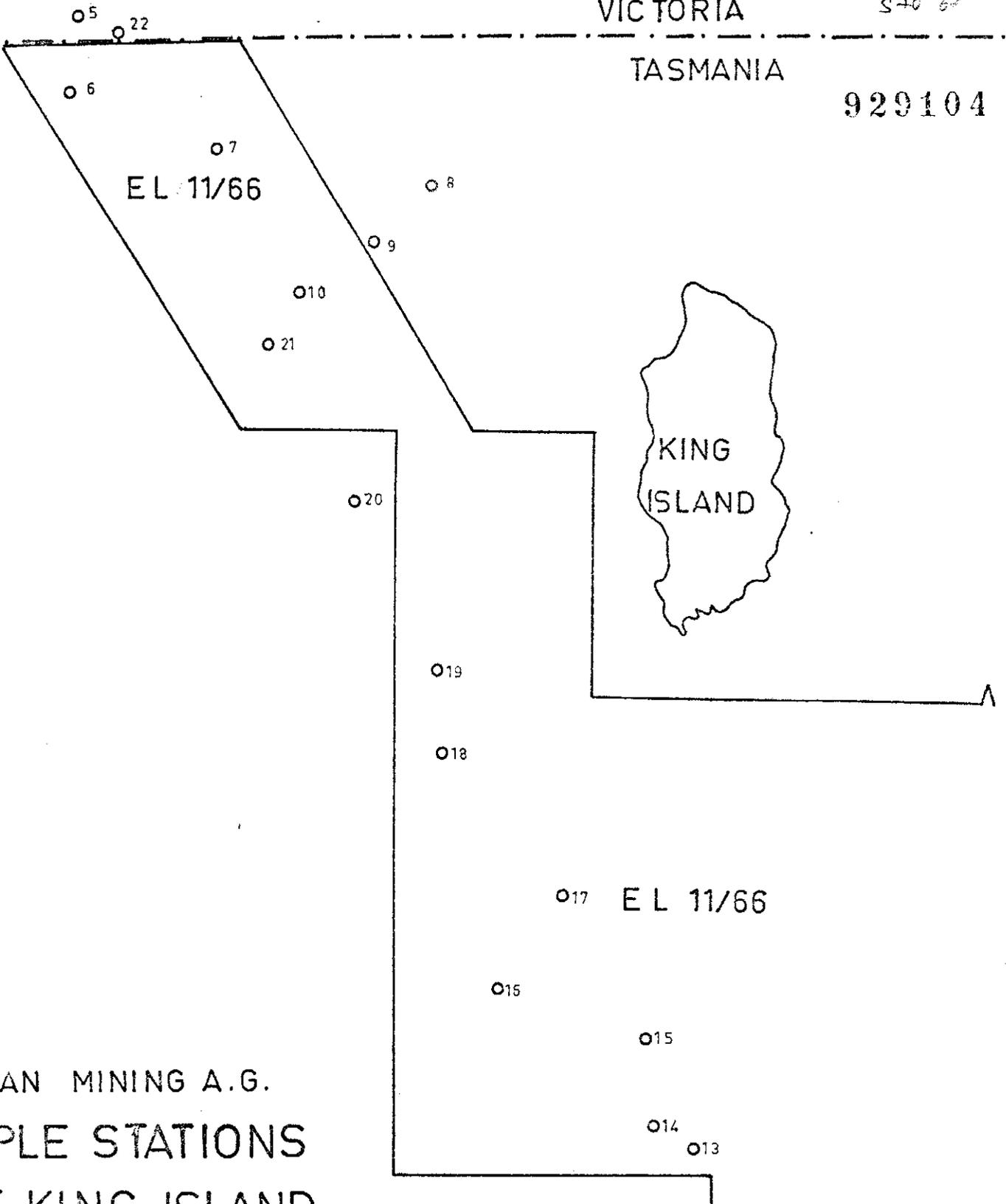
Thirteen grab samples were collected from an area to the west and north-west of King Island in January, 1966, and four dredge samples from the same area were obtained during a cruise by R.V. Aardverk in August, 1966 (see August, 1966, T.O.E.C. Report for locations). No phosphatic material was obtained during either of these cruises. However, because of the relative abundance of phosphate nodules later discovered to the south-west of King Island and because of the improvement in dredge design and dredging techniques since August, 1966, further dredging to determine the northern limit of phosphate mineralisation off Western Tasmania was scheduled for October, 1967.

The dredge samples were obtained by R.V. Aardverk during a seven days cruise in and beyond EL11/66 to the north-west of King Island. The locations of the samples obtained in Tasmanian waters are shown on Figure 1 and a description of the material obtained is given in Table 1.

Two samples, D.5 and D.8, reacted positively to the standard Nitric acid - Ammonium molybdate test for P_2O_5 . Sample D.5 contained two very hard, dark brown nodules which comprised about 1% of the sample by weight, the other 99% consisted of coral fragments and shells. Much of sample D.8 consisted of coarse sand (40%) with the remainder being coral debris shells and fibrous weed. No phosphate nodules were present but the sand reacted positively to the test for P_2O_5 and appears to be moderately phosphatic. Splits of both samples have been submitted for analysis although it is suspected that the iron and carbonate contents will be very high.

An attempt was made by R.V. Aardverk to obtain a bulk phosphate sample from a promising area to the south west of King Island.

02



OCEAN MINING A.G.
 SAMPLE STATIONS
 WEST KING ISLAND

NOVEMBER 1967

5 - 10 OCTOBER 1967

13 - 22 AUGUST 1967

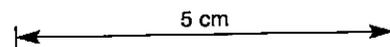


TABLE 1.

SAMPLE RESULTS
WEST KING ISLAND PHOSPHATE DREDGING
OCTOBER, 1967.

Sample No	Location	Depth (fths)	Description
D.5	142°40'E 39°10'S	74	Dense light brown hard nodules (1%) Coral debris, shells etc. (99%)
D.6	142°39'E 39°18'S	93	Ooze with coral fragments
D.7	142°58'E 39°23'S	60	Coral debris and shells
D.8	143°25'E 39°27'S	57	Shell debris, coarse sand. Sand reacts to P ₂ O ₅ tests.
D.9	143°17'E 39°32'S	58	Coral debris
D.10	143° 8'E 39°37'S	50	Coral debris and shell fragments

929105

Unfortunately, the most suitable dredge was lost in deteriorating weather conditions before this could be achieved. As a result Aardverk returned to Launceston and the cruise was terminated on November 3rd.

Vibracorer Field Trials

Because it was proven during drilling by the Wando River that much of the cassiterite in Ringarooma Bay was restricted to a relatively narrow submarine channel of the Pleistocene Ringarooma River and that generally it occurred within the upper twenty feet of the sediment column, consideration has been given to another drilling programme using less complex and cheaper drilling equipment.

The parent company of Ocean Mining A.G., Ocean Science & Engineering Inc., Washington D.C., have designed and manufactured a small three inch vibracorer unit suitable for operation by three men from a vessel similar to Aardverk. The design is based on the highly successful O.S.E. Horton Mining Sampler used with R.V. Wando River.

One of these machines is now in Tasmania and rigging and familiarisation trials were conducted with Aardverk in and off the mouth of Tamar River between November 4th and 6th.

On the whole these trials were satisfactory but some modifications to the tower and anchoring system are necessary before this unit can be relied upon to complete the proposed programme.

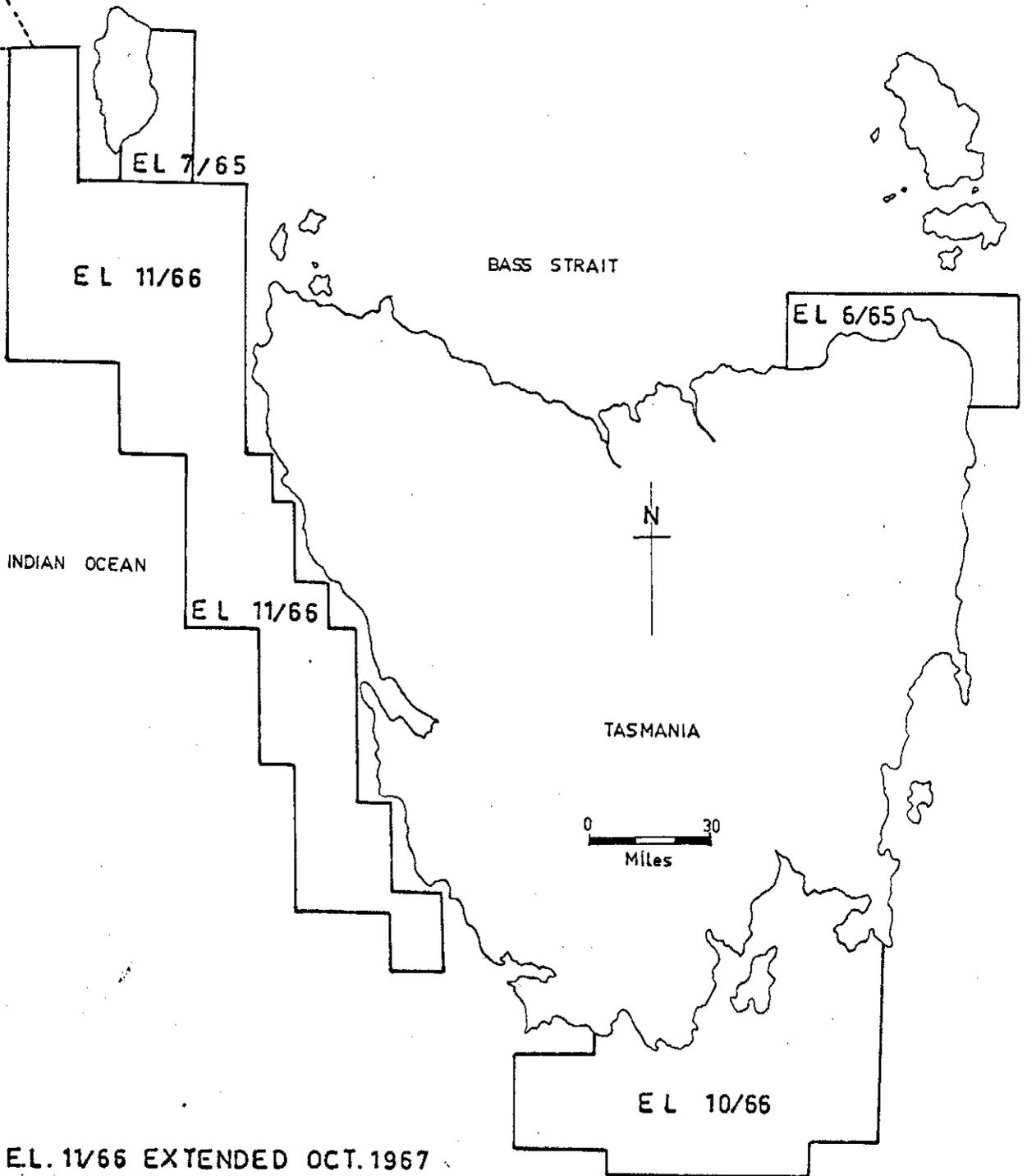
Licences

In October EL11/66 was extended by over 700 square miles to the north-west as shown on Figure 2. Figure 2 shows all Tasmanian licences held by Ocean Mining A.G. on October 31st, 1967.

Exploration Licences EL11/66 and EL10/66 expired on October 17th and have been renewed for a further six months period. Exploration Licences EL6/65 and EL7/65 expire on November 18th and an application for the renewal of these licences will be submitted.

OCEAN MINING A.G.
OMAG EXPLORATION LICENCES
NOVEMBER 1967

05



..... EL. 1V66 EXTENDED OCT. 1967

5 cm

Staff

Some reorganisation of Staff occurred in the period.
The following is the Staff Roster as of October 31st.

Status	Name	Appointment
Professional	D. Young	Senior Geologist
	W. van der Merwe	Geologist
	R. Warren	Geophysicist
	D. Lawson	Engineer
	A. Scholtens	Geologist
Non-Professional	D. Griffiths	Secretary
	D. Peacock	Geophysical Assistant
	T. Chopping	Skipper, Aardverk
	R. Davidson	Seaman
	N. Barratt	Vibracorer Operator

OCEAN MINING A.G.

TASMANIA OFFSHORE EXPLORATION PROGRAMME

REPORT OF OPERATIONS - NOVEMBER, DECEMBER, 1967.

Part 18

Ocean Mining A.G.
Field Headquarters,
38 Canning Street,
LAUNCESTON, Tasmania. 7250.

January, 1968.

SUMMARY

Detailed planning for a proposed exploration programme scheduled for the April-May fair weather period has proceeded satisfactorily.

Further modifications to the OSE SH10-1 vibracorer have been made.

Some results of the OMAG computer study undertaken in the United States have been received in Launceston.

PART I GENERAL

Principal activity during November and early December consisted of the detailed planning of a short, intense drilling programme to be conducted in Ringarooma Bay, probably in the autumn of 1968. The need for this project has recently become evident as a result of a computer study conducted by OMAG and Dr. L. F. Marcus of Columbia University. This study showed, among other things, that there exists a more than even chance of undervaluing a deposit such as the one in Ringarooma Bay with the sampling pattern and drill hole spacing that presently applies. A description of the programme and some results are given in Appendix 1.

The computer result is further supported by a consideration of the nature of similar offshore deposits, in particular when compared with the very irregular tin placers offshore from the north-east coast of Billiton Island, Indonesia.

To provide additional information concerning the grade of the deposit and to try and increase the reserves available a programme based on close spaced drilling has been planned and costed and is presently being considered by the Joint Venture participants.

O.S.E. SH10-1 Vibracorer

Field trials of this unit, with which it is proposed to do the Ringarooma Bay drilling, were held in and off the mouth of the Tamar River in October, 1967. Although, generally, the machine performed very well some modifications to the supporting tower and to the hose handling facilities were suggested. Some of these modifications have since been made but the non-availability of certain hydraulic parts has delayed some of the work.

Licences

The renewal of Exploration Licences 6/65 and 7/65, which expired on November 18th, was duly sought. In the meantime renewal has been withheld pending the submission of a satisfactory exploration programme.

Personnel

Staff engaged wholly or mostly on the Tasmanian programmes during November and December are shown in the accompanying table.

Status	Name	Appointment
Professional	D. J. Young	Project Manager
	W. v. d. Merwe	Geologist
	R. E. Warren	Geophysicist
	D. D. Lawson	Engineer
	A. L. Scholtens	Geologist
Non-Professional	D. S. Griffiths	Secretary/Draughtsman
	D. Peacock	Geophysical Assist.
	T. Chopping	Skipper, Aardverk
	R. Davidson	Seaman
	N. Barratt	Vibrocoring Operator
	R. Barratt	Vibrocoring Operator

PART II RESULTS

Phosphate

Typical examples of the two types of phosphorite nodules discovered by Ocean Mining A.G. off Western Tasmania in E.L. 11/66 were submitted to Mr. N.de B. Hornibrook, Chief Micropalaeontologist, New Zealand Geological Survey, for age determination and comparison with the Chatham Rise phosphorite nodules discovered in 1950 and later described by Norris (1964)* Mr. Hornibrook reports as follows:-

"I have sectioned your phosphorite nodules from off the West Coast of Tasmania and have to report as follows:

1. Dark nodules from off MacQuarrie Harbcour.
1st nodule has poorly sorted Polyzoa, broken Mollusc fragments and shallow water Foraminifera in the inner part of the nodules. This inner part is dark and iron or manganese stained and has an irregular, darkly stained outer surface enclosed in layers of phosphatic material. The 2nd nodule has a few poor Foraminifera and Polyzoa and consists mainly of rounded grains of what appear to be quartz.
2. Lighter nodules from 30 miles, S.W. of Port Davey.
An inner, dark brown core with poorly sorted Polyzoa and shallow water Foraminifera, with an irregular surface, is encrusted with layers of phosphatic material similar to one of the specimens from MacQuarrie Harbour.

I cannot find any evidence in either of them to suggest an age. Very similar shallow water polyzoalimestones are typical of the southern Australian Tertiary and may even be accumulating off Tasmania at present.

The Chatham Rise nodules contain a core of Miocene globigerina ooze which can be dated fairly well.

The finely layered phosphatic material on the outer part of your specimens looks to have been deposited externally around pebbles and not as a replacement."

*Norris, Robert, M. 1964: Sediments of the Chatham Rise. Dept. Sci. Ind. Res. N.Z. Oceanographic Inst. Memoir No.26.

APPENDIX 1COMPUTER SIMULATION OF RINGAROOMA BAY OFFSHORESAMPLING FOR TINSUMMARY

A computer program was designed by Dr. L. F. Marcus, Department of Geology, Columbia University, at the suggestion of F. J. Lampietti, of OMAG to investigate the Ringarooma Bay sampling results as follows:

The existing drill-hole-sample locations and their areas of influence computed by the polygonal method are stored in the computer memory at a suitable map scale (Figure 1).

A method is devised to program at the same scale any selected complex known area suitably representing an artificial alluvial deposit (Figure 2).

Two parameters, average thickness in yards and average grade in US\$ per cubic yards are specified for the artificial deposit.

The artificial deposit is thus defined by area (and shape), volume, average grade and total value.

To simulate the actual distribution of grade and thickness within the deposit, the program is further designed to allow the grade values to follow a log-normal distribution* about the average grade with specified standard deviation, 95th percentile and cut-off grades. Similarly, the thicknesses are made to follow a normal distribution about the average thickness with specified standard deviation, 95th percentile and cut off.

Next, the program is designed so that the area of the artificial deposit can be superimposed at random on the pattern of drill hole locations in Ringarooma Bay (Figure 3).

After a configuration of drill hole pattern and artificial deposit is thus obtained, the program tests which of the drill holes strike the artificial deposit.

* Based on recent data obtained in actual tin deposits, i. e. Broadhurst and Batzer 1964, Valuation of Alluvial Tin Deposits in Malaya, IMM Symposium Paper No. 5.

MP
06

For each drill hole thus striking the deposit a grade is obtained at random from the log normal distribution of grades and a thickness from the normal distribution of thicknesses.

These are equivalent for each drill hole to the values obtained from field results.

Next, the value of the deposit is estimated by multiplying, the grade and thickness data with the areas of influence of each drill hole.

For each such configuration of holes striking the deposit, the program repeats the sampling of the grade and thickness from the pre-assigned distributions, several times (usually twenty-five), each time providing a new estimate of the total value of the deposit.

Finally, the program is so written that several configurations of drill hole and artificial deposit can be tested in succession.

The results of several such tests are presented in the following. They provide a simulation of the actual data presented to a geologist confronted with the need to evaluate a deposit from a limited number of drill holes.

There are naturally a great many other factors entering into such an evaluation. The attempt is only made here to illustrate again the well known problem of exploration that, all geological and other factors being equal, any set of widely spaced drill holes is only a very inaccurate indication of the possible value of a bedded mineral deposit or that, conversely, the average grade of a deposit can vary between very wide limits until sufficient sampling had been undertaken.

INPUTS

Specifications were thus written as follows to investigate an artificial deposit of given arbitrary shape (Figure 2) with average grade ranging between 0.50 and 0.20 \$ per cubic yard (Table 1).

TABLE 1

	Deposit A	Deposit B	Deposit C	Deposit D
<u>GRADE</u>				
Average $\$/\text{yd}^3$	0.50	0.40	0.30	0.20
Standard Deviation $\$/\text{yd}^3$	0.26	0.32	0.46	0.16
95th percentile* $\$/\text{yd}^3$	1.00	1.00	1.00	0.50
Cutoff	0.20	0.20	0.20	0.20
<u>THICKNESS</u>				
Average, yds:	4			
Standard Deviation yds:	2.4			
95th percentile yds:	8			
Cutoff yds:	0			
Similar for A, B, C. & D				
<u>AREA</u>				
Square yds:	22 x 10 ⁶			
Square miles:	7.5			
<u>VOLUME</u>				
Cubic yds:	88 x 10 ⁶			
True Value US \$	44,468,736	35,574,976	26,681,232	17,787,488

* 95th percentile: 95% of all values are below the number specified.

RESULTS

Some typical machine output results are enclosed and final results are tabulated as follows:

DEPOSIT A

<u>CONFIGURATION</u>	<u>1</u>	<u>2</u>	<u>3</u>
Number holes striking deposit	22	10	33
Number of tests for Grade and thickness	25	25	25
Number of times estimated value less than true value	12	19	7
Number of times estimated value greater than true value	13	6	18
Number of times estimated value within 20% of true value	12	12	13

DEPOSIT B

<u>CONFIGURATION</u>	<u>1</u>	<u>2</u>	<u>3</u>
Number of holes striking deposit	22	10	33
Number of tests for Grade and thickness	25	25	25
Number of times estimated value less than true value	13	20	12
Number of times estimated value greater than true value	12	5	13
Number of times estimated value within 20% of true value	8	8	9

DEPOSIT C

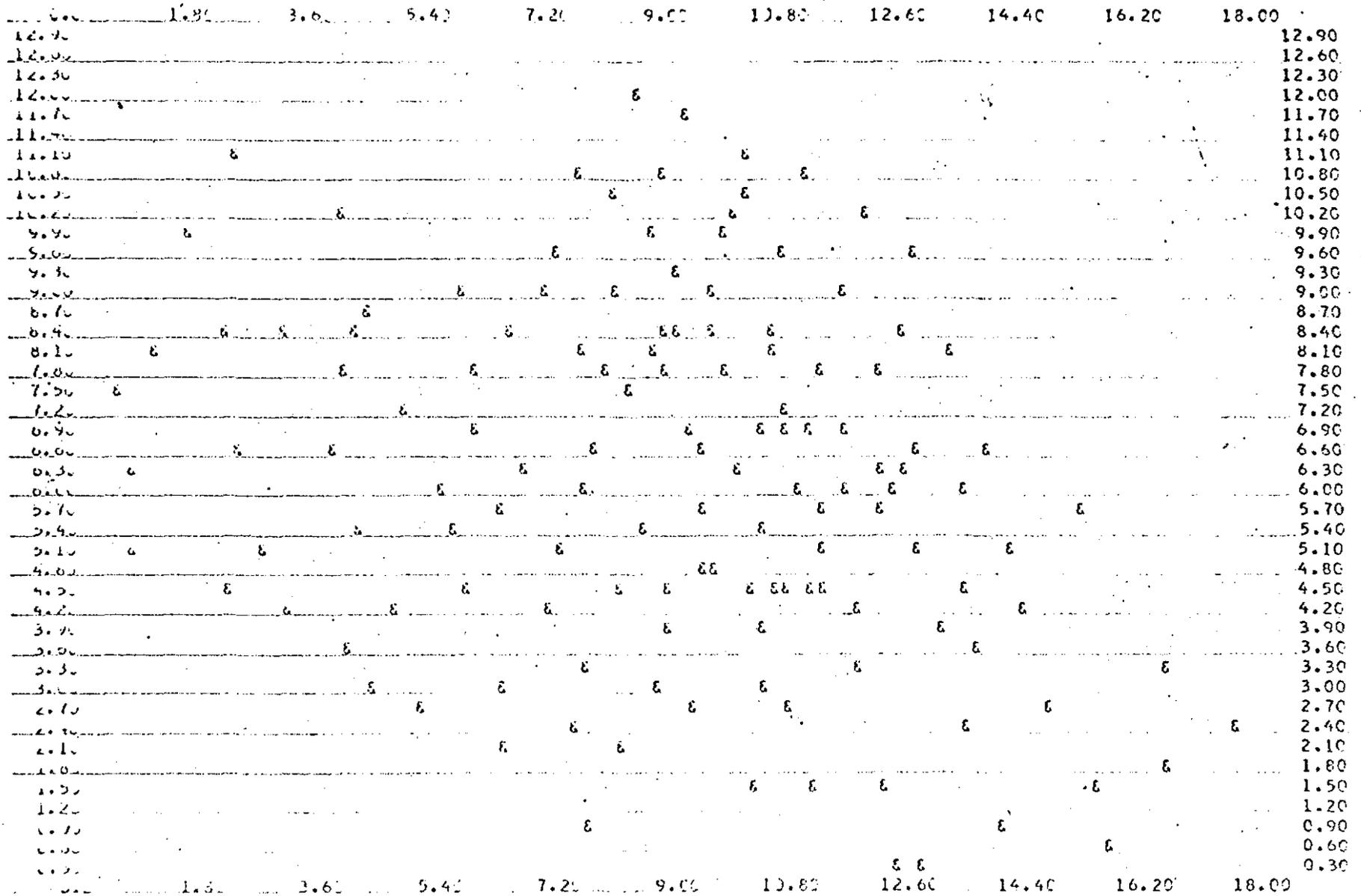
<u>CONFIGURATION</u>	<u>1</u>	<u>2</u>	<u>3</u>
Number of holes striking deposit	22	10	33
Number of tests for Grade and thickness	25	25	25
Number of times estimated value less than true value	16	22	16
Number of times estimated value greater than true value	9	3	9
Number of times estimated value within 20% of true value	6	2	3

DEPOSIT D

<u>CONFIGURATION</u>	<u>1</u>	<u>2</u>	<u>3</u>
Number of holes striking deposit	22	10	33
Number of tests for Grade and thickness	25	25	25
Number of times estimated value less than true value	18	23	19
Number of times estimated value greater than true value	7	2	6
Number of times estimated value within 20% of true value	7	3	7

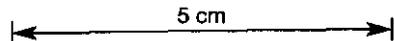
THIS IS A PLOT OF ALL OF THE HOLES IN EXPLOMATION AREA KINGARONGNA

THE ORDINATE AND ABSCISSA ARE SCALED IN UNITS OF 1000 YARDS



1 INCH = 1800 YARDS

FIGURE 1



929119

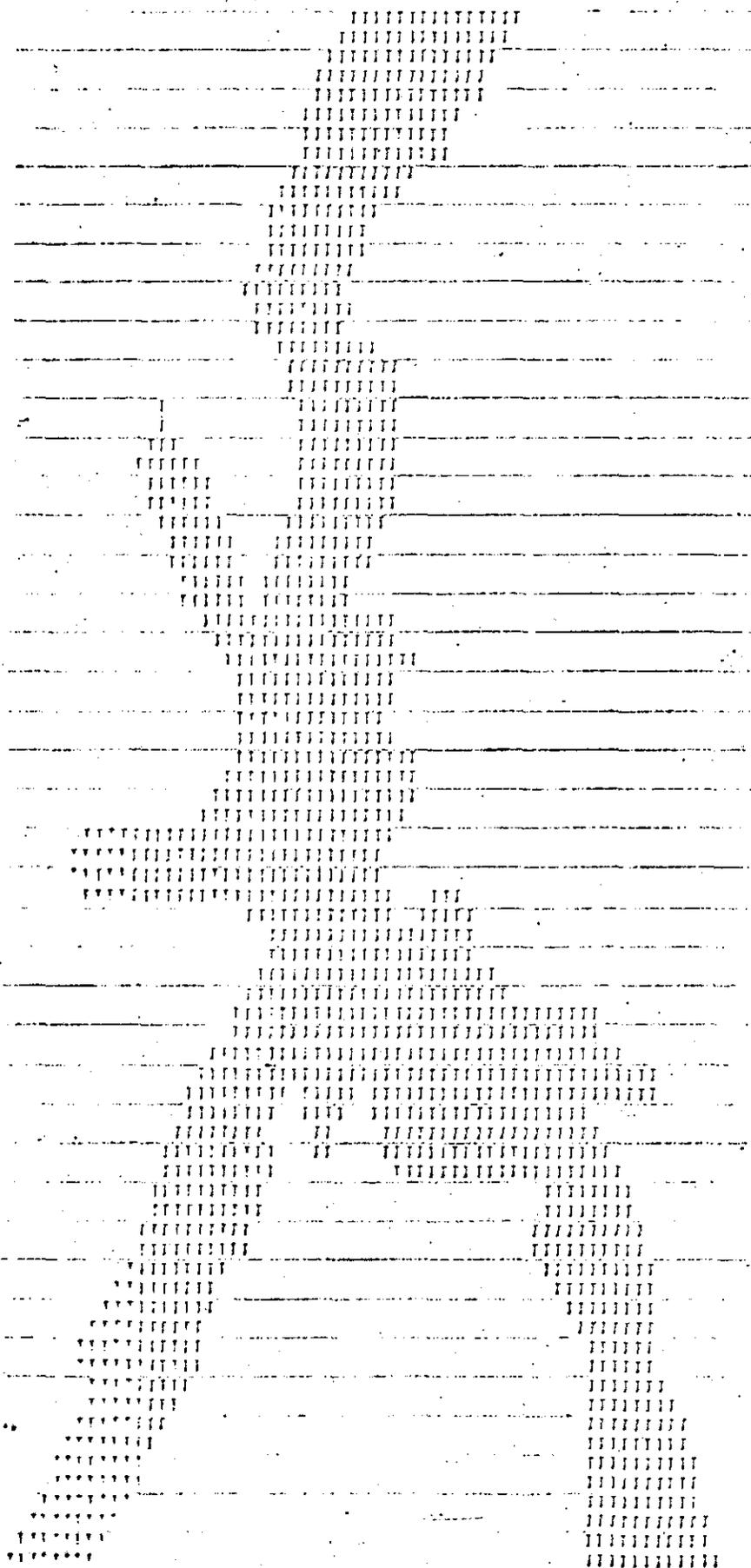
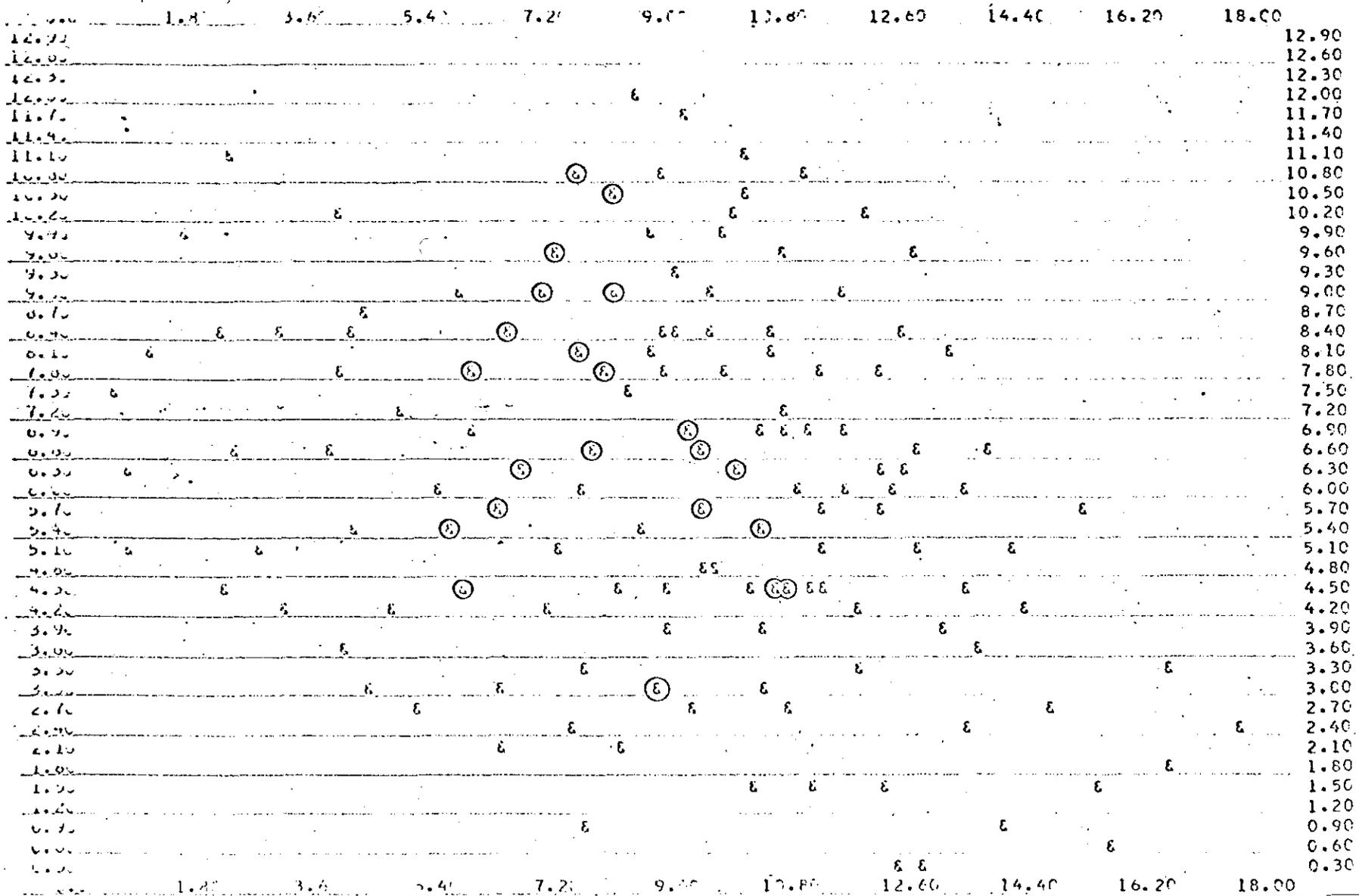


FIGURE 2
AREA OF ARTIFICIAL DEPOSIT
(not at scale of Fig. 1)

5 cm

THIS IS A PLOT OF ALL OF THE HOLES IN EXPLORATION AREA RINGARUUNA

THE ORIGINATE AND ABSCISSA ARE SCALED IN UNITS OF 1000 YARDS



1 INCH = 1000 YARDS

FIGURE 3

5 cm

DRILL HOLES FROM FIGURE 1 STRIKING DEPOSIT OF FIGURE 2 AT SAME SCALE

920121

3451.	15	7000.
79	22	8000.
875	24	8000.
883	28	7000.
909	30	8000.
97	47	9000.
8228.	170	60000.

CONFIGURATION I.

IN EACH HOLE IN DEPOSIT 1 SAMPLE 1

HOLE NO.	X-COORD.	Y-COORD.	AREA	DEPTH	GRADE	VOLUME	VALUE	AREA-VALUE
V10.21	63	4700.00	230000.00	2.75	0.26	6321525.00	1620562.00	589519.47
V31.22	695	5450.00	180000.00	2.24	0.46	4032658.00	1842427.00	822378.21
V22.23	175	8350.00	160000.00	2.0	0.0	0.0	0.0	0.0
V25.24	942	7100.00	80000.00	4.38	0.58	3840133.00	2222229.00	462948.51
V26.25	715	5850.00	30000.00	3.98	0.72	1170025.00	839223.87	215181.01
V31.26	81	5800.00	140000.00	3.38	0.49	4738153.00	2300025.00	679597.31
V24.27	127	9650.00	110000.00	2.95	0.55	3240431.00	1782446.00	605071.01
V29.28	625	7900.00	220000.00	2.42	0.46	5329765.00	2464653.00	1017350.31
V10.29	100	5550.00	70000.00	2.84	0.68	1989143.00	1362306.00	479409.61
V15.30	129	4600.00	100000.00	4.78	0.76	4697063.00	3571846.00	760442.51
V29.31	35	9100.00	60000.00	5.93	0.68	4740493.00	3220177.00	543433.31
V24.32	785	10950.00	100000.00	2.40	0.61	403102.81	246504.25	611517.01
V12.33	12	6400.00	80000.00	7.55	0.88	6036656.00	4831518.00	640290.61
V12.34	800	3250.00	80000.00	6.43	0.0	5147989.00	0.0	0.0
V12.35	105	4650.00	30000.00	5.03	0.59	1509858.00	887202.44	176281.91
V12.36	695	1500.00	70000.00	4.60	0.52	3222087.00	1688217.00	366766.01
V12.37	13	9200.00	80000.00	2.99	0.30	2390621.00	713847.44	238882.61
V14.38	675	8400.00	80000.00	4.04	0.44	3231916.00	1424417.00	352587.61
V12.39	585	5000.00	70000.00	1.83	0.49	1280254.00	623555.69	340939.31
V12.40	69	5900.00	80000.00	5.30	0.45	4236487.00	1907148.00	360137.71
V12.41	270	6750.00	40000.00	0.88	0.51	32538.60	16620.09	204312.31
V12.42	625	7950.00	60000.00	1.66	0.30	995137.00	303258.62	182844.31

SAMPLE 1 IN DEPOSIT 1

22 HOLES FELL IN DEPOSIT 1

ESTIMATED VOLUME = 83437904. CU. YD.
 ESTIMATED MEAN GRADE = \$ 0.5339 PER CU. YD.
 ESTIMATED VALUE OF DEPOSIT = \$ 33,868,96.
 TRUE VALUE OF DEPOSIT = \$ 44,687,36.

920122

IN EACH HOLE IN DEPOSIT 1 SAMPLE 2

HOLE NO.	X-COORD.	Y-COORD.	AREA	DEPTH	GRADE	VOLUME	VALUE	AREA-VALUE
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