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**MT LYELL - ANNUAL REPORT
SPL 94**

KING RIVER DELTA 1970-71

BY

**J P MCKIBBEN
APR71**

CONTENTS

	<u>PAGE</u>
1. INTRODUCTION	1
2. PREVIOUS WORK 1969 - 1970	1
3. WORK COMPLETED 1970 - 1971	1
3.1 General	
3.1.1 Manpower & Access	1
3.1.2 Base Map Drafting	2
3.1.3 Gridding	2
3.1.4 Training of Samplers	2
3.1.5 Equipment	2
3.2 Sampling	3
3.3 Sample Results	3
3.3.1 Pyrite Distribution	3
3.3.2 Copper Distribution	4
3.4 Spatial Distribution of Pyrite Grade	4
3.4.1 Interval 0 - 5 feet	4
3.4.2 Interval 5 - 10 feet	5
3.5 Bulk Sampling and Tonnage Estimation	5
3.5.1 Bulk Sampling	5
3.5.2 Tonnage Estimation	6
4. WORK RECOMMENDED 1971 - 1972	6
4.1 Manpower	6
4.2 Access	6
4.3 Gridding	7
4.4 Sampling	7
5. BUDGET	7

APPENDED FIGURES

KR 1	King River Delta	} In pocket at rear.
KR 2	Pyrite : Interval 0 - 5 feet	
KR 3	Pyrite : Interval 5 - 10 feet	
KR 4	Pyrite Grade Distribution Histograms	

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1. INTRODUCTION

S.P.L. 94 of 9 square miles, was issued on the 13th October, 1970. The following report discusses work performed by the Mt. Lyall Mining & Railway Co. Ltd. between that date and 25th April, 1971, in addition to planned work for the coming field season.

S.P.L. 94 was acquired to enable the pyrite potential of the delta sand deposits at the mouth of the King River to be evaluated. The delta sediments presented a potential source of easily recoverable pyrite which could be supplied to the plant of North-West Acid Pty. Ltd. for sulphuric acid production.

2. PREVIOUS WORK 1969 - 1970

An aerial colour photo survey of the King River entrance was flown by Australian Aerial Mapping Pty. Ltd. on 29th January, 1970. The survey consisted of seven photographs taken at an altitude of 3,000 ft. and covered the entire delta area.

3. WORK COMPLETED 1970 - 1971

3.1 General

3.1.1 Manpower and Access

Two students were engaged for a period of two months (January - February, 1971) on the licence area, carrying out systematic sampling of the delta sands. One geologist has been employed periodically for supervision and in analysis and interpretation of sampling data.

Access to the area is good. Road access can be obtained to within a quarter of a mile of the delta, along the old Strahan-Queenstown rail formation.

A large proportion of the sampling was carried out by the samplers walking over the delta surface.

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Additional samples in the King River and around the submerged toe of the delta were taken from a small dinghy.

3.1.2 Base Map Drafting

A base map (Fig. 1) of the King River delta area was prepared on a scale of 1" = 500' using the colour aerial photographs assembled into an uncontrolled mosaic. This was subsequently enlarged to a scale of 1" = 200'.

3.1.3 Gridding

Following base map drafting a series of 24 prominent survey markers were plane-table surveyed in on the delta surface. These markers form a broad, defined grid system which was used for sample location control.

The grid lines were pegged at 100 ft. intervals to form a 1,200 ft. square grid over the delta. A further 230 pegs were placed in this grid.

3.1.4 Training of Samplers

An experienced sampler from Associated Minerals Consolidated Ltd., was engaged for a period of 5 days in January, 1971 to train two members of the Mt. Lyell staff in sampling techniques suitable for sampling the unconsolidated pyritic sand deposits of the delta.

3.1.5 Equipment

Specialised sand sampling equipment was purchased. This equipment comprised a 1½ inch diameter sand auger and a 1 inch diameter stainless steel suction sand sampler. A device to enable sample sites in

submerged areas to be relocated was constructed at Mt. Lyell.

3.2 Sampling

A total of 476 samples of delta sand were taken and submitted for analysis.

Samples in dry sand were taken with the sand auger. In wet sand, it was necessary to use the suction sampler to recover samples.

General sampling depths were to ten feet deep with some samples being taken to depths of 15 and 20 feet. Problems encountered in sampling at depth included re-cemented limonitic horizons and coarse gravel beds which effectively prevented penetration with the sampling equipment available. However sample recovery was good and sufficient information was obtained for a preliminary appraisal of the area to be made.

3.3 Sample Results

All samples were assayed for Cu and pyrite contents. The results have been plotted and contoured (Figs. 2 & 3).

Analysis of the results obtained indicates the following distributions:

3.3.1 Pyrite Distribution

(a) Interval 0 - 5 feet:

Pyrite grades in the top 5 feet of the delta sands have a normal distribution with mean value of 257 samples being 6.57% FeS₂ (Standard deviation = 3.08) (See Fig. 4a).

(b) Interval 5 - 10 feet:

Pyrite grades in the interval 5 to 10 feet deep are negatively skewed with mean value of 205 samples being 4.29% FeS_2 (Fig. 4b).

Examination of the distribution histogram suggested that the curve is composed of two separate populations. Consequently an analysis was made of the distribution of higher grade pyrite around the delta toe.

The resulting histogram (Fig. 4c) shows a normal distribution with mean value of 6.83% FeS_2 (Standard deviation = 2.69). The significance of this is that, in the 5 - 10 feet interval, pyrite grades in the delta toe are closely similar to those in the 0 - 5 feet interval. The "deepening" of pyrite grade towards the delta toe considerably increases the potential tonnage of pyrite in the delta area.

3.3.2 Copper Distribution

Copper grades throughout all samples averaged 0.16% Cu. The average copper grade in the top 5 feet of delta sands is only slightly higher at 0.18% Cu.

3.4 Spatial Distribution of Pyrite Grade

Examination of pyrite grade distribution over the delta area, as shown in Fig. 2 & 3, shows the following features.

3.4.1 Interval 0 - 5 feet

Pyrite grades correlate reasonably closely with sites of old delta channels. In contouring these results an attempt was made to align the contours

with structures observed on the aerial photographs.

In general, zones of high grade pyrite (10% FeS_2) are closely correlated to old channel courses.

This observation is also valid upstream in the King River where sand deposits on the banks contain high grade pyrite.

3.4.2 Interval 5 - 10 feet

Pyrite grades increase towards the toe of the delta; with lower grades being restricted essentially to a wide belt across the bed of the delta area.

The higher grade (5% FeS_2) zones at this depth appear to lie in areas between old delta channels.

At present, insufficient information is available to enable more specific statements to be made regarding the spatial distribution of pyrite grades.

3.5 Bulk Sampling and Tonnage Estimation

3.5.1 Bulk Sampling

A series of three 100 lb. samples of delta sands from high, medium and low grade pyrite areas are currently being metallurgically tested to determine the feasibility of beneficiation.

Significant results determined from these bulk samples are tabulated below:

Sample No.	Average Grade of Area Sampled	% H_2O	Bulk Density lbs./cu. ft.	S.G. of Solids
A	15.5% FeS_2	26.2	118	2.93
B	7.7%	14.7	91.3	2.81
C	5.5%	13.9	96.2	2.89

3.5.2 Tonnage Estimation

Bulk density estimates based on the above bulk samples have been used to give a preliminary estimate of the possible tonnage available.

A minimum tonnage in the top five feet of delta sands, over the exposed area of the delta is indicated to be 300,000 tons of pyrite. This estimate assumes an overall grade of 5% FeS₂ for the exposed delta sands.

Further tonnage potential is present around the submerged delta toe and along the banks of the King River for some distance upstream from the delta. As yet insufficient data has been collected to allow a prediction of likely grades and tonnages in these areas to be made.

The indicated tonnages are sufficient to justify further detailed assessment of the deposit.

4. WORK RECOMMENDED 1971 - 1972

4.1 Mannpower

During the coming field season it is recommended that two samplers be assigned to the area. A geologist will be required part-time for supervision.

4.2 Access

It will be necessary to hire a boat with outboard motor, and possibly a small barge for the entire sampling program. This is required because a large proportion of the sampling will be carried out over submerged portions of the delta and in the King River.

4.3 Gridding

Further survey markers for sample location control will be required. These should be placed early in the field season, preferably in late August.

4.4 Sampling

More detailed sampling is required over the exposed portion of the delta to more closely define the distribution patterns of pyrite and to give optimum results for statistical analysis.

This would require the following sampling:

1. Complete the portions of the present grid which were not sampled.
2. "Fill-in" the cells of the present grid with series of samples spaced at 300 ft. centres to give complete coverage of the entire delta.
3. In addition, the submerged toe of the delta and the deposits on the banks and in the bed of the King River are to be systematically sampled.
4. Some deeper sampling will be required to broadly establish the depth and potential of the delta sands in various areas. Further investigations on sampling techniques at greater depths in unconsolidated sediments is required at this stage.

5. BUDGET

A budget of \$2,000 to cover most of the program recommended above was proposed by L.A. Newham (Memorandum : 8th February, 1971).

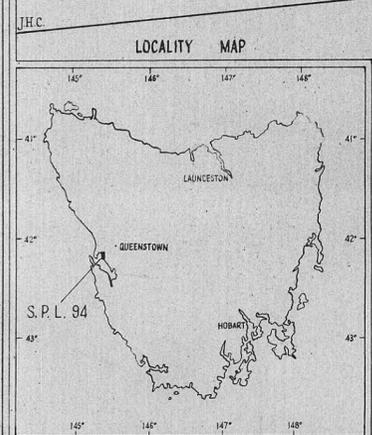
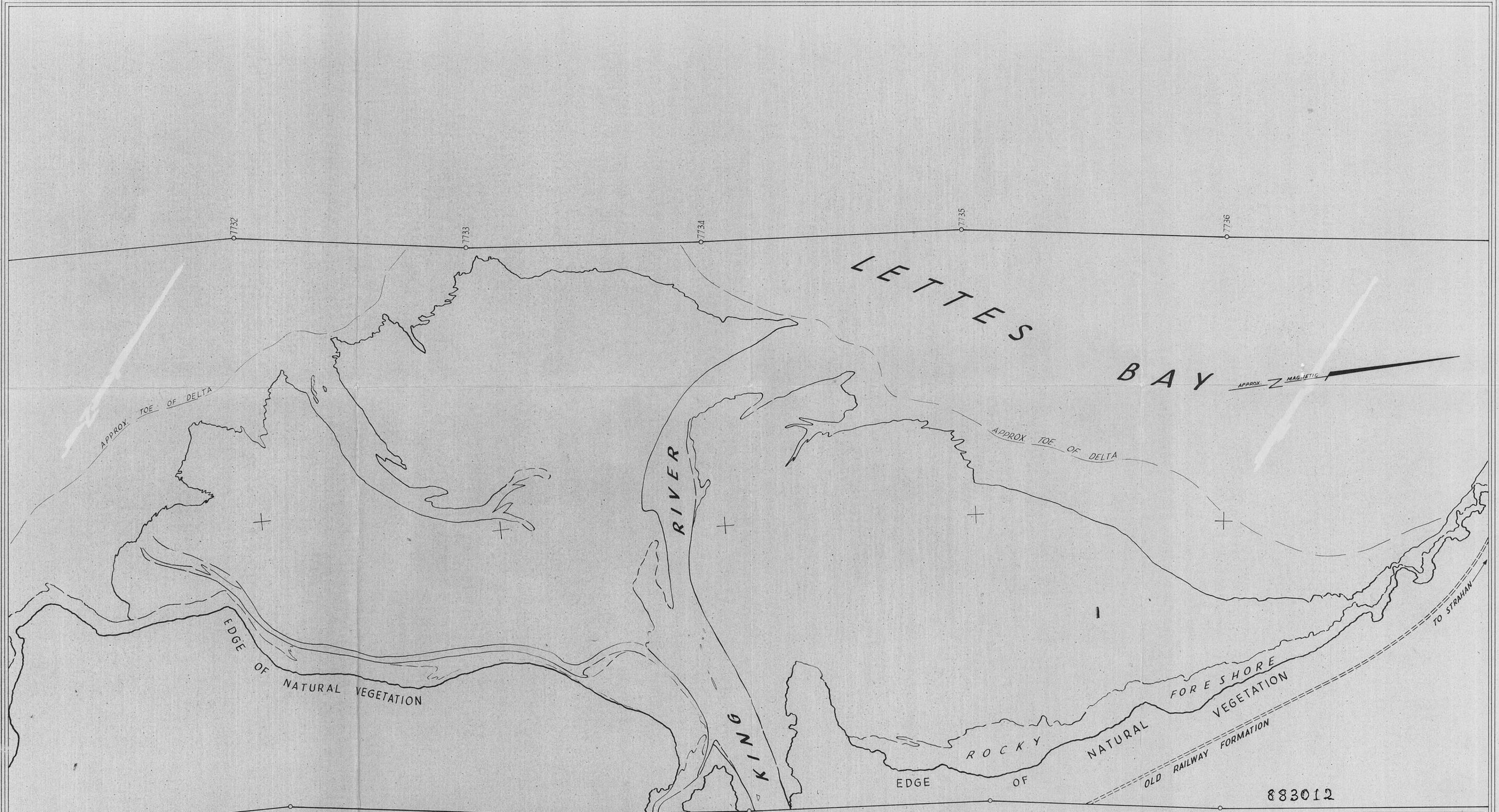
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The budget comprises:

5.1	Salaries (Geologist, 2 Samplers)	\$1,000
5.2	Accommodation and equipment	\$ 250
5.3	Consulting (A.M.C.)	\$ 350
5.4	Hire of boat	\$ 300
		<u>\$2,000</u>

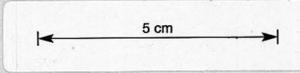
It is felt that this may be inadequate if deep sampling equipment is required. At this stage it is not known what cost may be involved in a program of deeper drilling - a figure of \$2,000 to \$3,000 could be required to carry out such a program.

J. P. McKibben



- 7732 AERIAL PHOTO NUMBER
- o BOUNDARY PHOTO COVER
- + PHOTO CENTRE POINT

BASE MAP FROM AERIAL PHOTOS BY
 AUSTRALIAN AERIAL MAPPING PTY. LTD.
 FLOWN 28/1/70



THE MT. LYELL M. & R. CO. LTD. EXPLORATION DEPARTMENT	SCALE: - 1" = 500'	DRAWING No KR - 1
	DATE: - 12-1-1971	
KING RIVER DELTA (PORTION OF S.P.L. 94)		1026

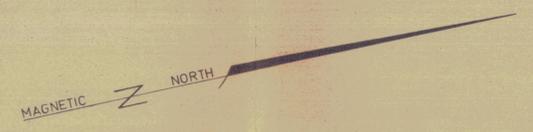
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LETTE'S

BAY

RIVER

KING



APPROXIMATE STRAND LINE

APPROXIMATE STRAND LINE

MARSHES

VEGETATION

NATURAL

MARSHES

VEGETATION

NATURAL

- > 10% FeS₂
- 5-10% FeS₂
- 0-5% FeS₂

1027



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GEOLOGICAL DEPARTMENT

KING RIVER DELTA
PYRITE (%)
INTERVAL 0-5 FEET

DRAWN BY: R.G.W.
CHECKED BY: HULL
DATE: 12-3-71
SCALE: 1" = 200'

KR. 2

LETTÉ'S

BAY

RIVER

KING

MAGNETIC NORTH

APPROXIMATE STRAND LINE

APPROXIMATE STRAND LINE

NATURAL

MARSHES

VEGETATION

NATURAL

MARSHES

VEGETATION

- > 10% FeS₂
- 5-10% FeS₂
- 0-5% FeS₂

5m

1028

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THE MOUNT LYELL M. & R. COY. LTD.
GEOLOGICAL DEPARTMENT

KING RIVER DELTA

PYRITE (%)
INTERVAL 5-10 FEET

DRAWN BY R.G.W.

TRACED BY

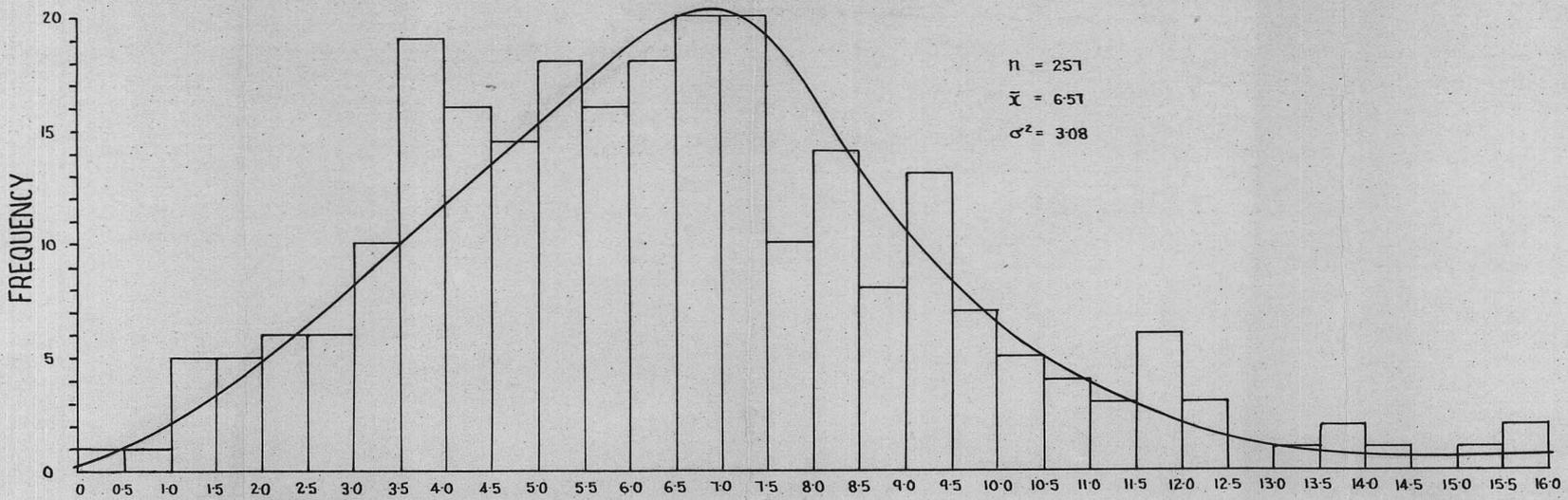
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DATE 12-3-71

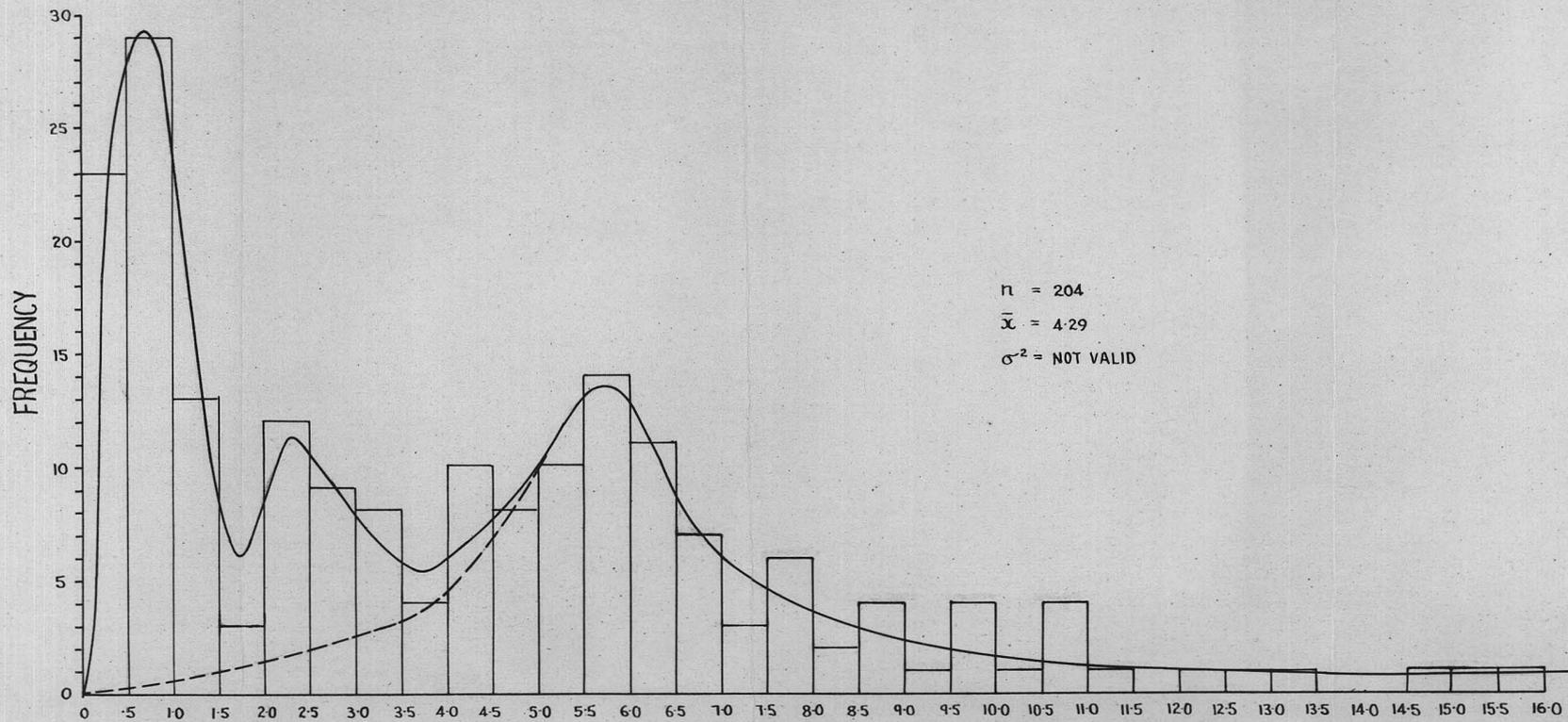
SCALE 1" = 200'

KR. 3

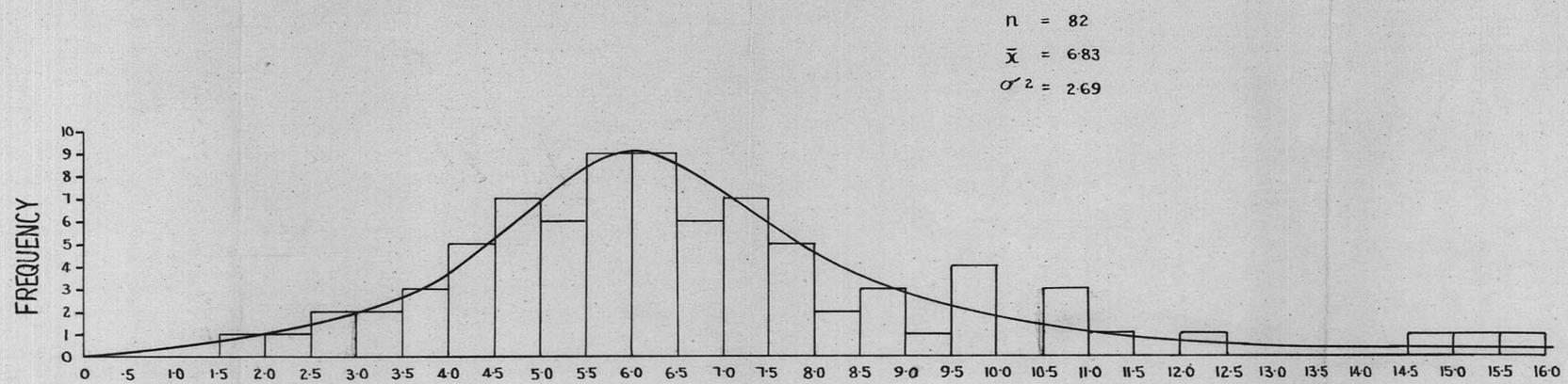
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(A) PYRITE GRADE
0-5' INTERVAL



(B) PYRITE GRADE
5-10' INTERVAL



(C) PYRITE GRADE
5-10' INTERVAL
DELTA TOE

5 cm

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GEOLOGICAL DEPARTMENT

KING RIVER DELTA
PYRITE GRADE
DISTRIBUTION HISTOGRAMS

DRAWN J.P.M.

TRACED R.G.W.

CHECKED *[Signature]*

DATE 26-4-71

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