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Preliminary Report

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REPPARFJORD COPPER DEPOSIT

in 11.2651

FINNMARK, NORWAY

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## PRELIMINARY REPORT

REPPARFJORD COPPER DEPOSIT

in

FINNMARK, NORWAY

by

C. W. Archibald

September, 1956



# THE REPPARFJORD COPPER DEPOSITS

## NORWAY

### LOCATION

The deposits are in **Finnmark**, Norway; from 1 1/4 to 3 3/4 miles south-west of the bottom of Repparfjord (see plates 1 and 2).

The nearest town of any size is Hammerfest which is approximately 30 miles north-west of the property by road.

The boundary line of the concession on which the copper deposits occur is shown in approximate position only as an exact survey of this line would have to be made. The concession comprises 11.5 square miles and is described as follows: From the western shore of Repparfjord about 1.23 miles from the bottom of Repparfjord, in a south-western direction, along the highest ridge between Vestra Ariselv and Dyb Elven a length of 4.35 miles, thence due east to Repparfjord main river (Stor-Elven), thence N.W. along the river to its mouth, thence north-westerly along the Repparfjord shore to the point of beginning.

### ACCESS

The concession can be reached by road in summertime (see plate 2) and by boat from Hammerfest in the winter time.

Access to the deposits from the main road can only be made on foot at the present time as part of the wagon road to the deposits is otherwise impassable due to a subsidence for about 50 feet and other parts of the road are in a poor state of repair. Very little work with a small crew of men and a bull-dozer would permit jeep travel which would be ideal for hauling supplies and say a diamond drill. This wagon road roughly parallels the course of a small river (Ariselv) which flows down the valley into Repparfjord.

It is approximately 1 mile up the 'mine' wagon road from the main Hammerfest road to the first adit in the hillside (Han's Adit). In this portion of the wagon road, the rise is quite steep and a portion of the wagon road is built up by stone on a south-easterly dipping rock face.

From Han's Adit, the wagon road has a gradually lessening rise which continues up a valley to the mountain top where the Brathammer and Skiffergangen veins are situated.

On the north-west side of the road (see plate 4) are the Ulveryggen copper deposits on the mountain of that name. These deposits are from 200 to 500 feet from the wagon road and from 75 to 250 feet above the elevation of this road (and hence the Ariselv river).

#### POWER, TRANSPORTATION, COMMUNICATION.

At the present time, only a low voltage, low frequency line serves hammerfest and some of the neighbouring communities. A 60,000 volt line is supposed to be installed for this general area within two years. Any power needed before this time would necessarily be diesel.

Transportation by sea is the cheapest and most practical. Small coastal steamers call daily at Hammerfest and go to Repparfjord twice weekly during the winter months. Ocean going freighters can get in to very nearly the bottom end of Repparfjord where an ore loading point could be made. The fjord is ice-free in winter time.

Planes fly daily to Hammerfest from Oslo (weather permitting) and a road (adjoining the concession) also goes to Oslo and Sweden.

Telephone and telegraph communications follow the above-mentioned road.

#### TOPOGRAPHY AND NATURAL RESOURCES

The ground on the concession has light to no overburden (from

an elevation slightly above Han's adit which is above the tree line) and shows at least 50% rock outcropping.

The whole concession is in low (3,000') mountains sloping up from Repparfjord.

Small, stunted birch cover the lower parts of the mountains to an elevation of 800 - 900 feet. This birch is privately owned and a source of fire wood only.

Several small lakes, ponds and mountain streams form a well distributed source of year round water supply and from which source a power supply estimated at 4,000 HP. could be obtained.

#### C L I M A T E

Because of the proximity of the gulf stream, the climate is moderate the year round.

Summer months are from the first of June to the end of September with midnight sun from mid-May to 21st July.

During winter months, the temperature may fall as low as  $+ 15^{\circ}\text{F}$  occasionally and the sun is not on the horizon from November 21 to January 23rd.

Snowfall is not severe but snowmobiles replace busses about December and run to about the 1st of May.

#### GEOLOGY

See plate 3 for general geology of the region.

The Ulveryggen ores as shown on plate 5 occurs in what is called 'sparagmite' but which I believe to be greywacke with small bands of conglomerate. This greywacke strikes almost north-east, south-west and dips steeply ( $75^{\circ}$  -  $85^{\circ}$ ) to the north-west. North-east, closer to Repparfjord



the rocks are more strongly folded with the dip of the rock changing to the south-east.

It is most probable that the ore deposition was of a later date than that of the country rock. Ore has been disseminated through the rock with richer, lenticular bodies or impregnations following the dip and strike of the country rock.

These Ulveryggen ores are described by Stallman (in his 1913 report) as being in a metamorphosed granite similar in character to the cupriferous monzonite occurrences in Utah.

The mineral bearing rock is about 750 feet wide and extends southwest from Repparfjord a distance of  $2\frac{1}{2}$  miles. Mineralization is bornite, chalcocite and chalcopyrite, predominant in the order in which they were named.

#### PREVIOUS WORK

Copper was discovered on what is now part of the concession in 1902 and on Ulveryggen mountain in the concession in 1904.

During various stages of development and ownership up to the present time, some work has been done to explore the property, but considering the number of years of its known existence, this work has been extremely limited.

In the Ulveryggen deposits, some rock trenches were blasted and sampled; some cross-cuts and drives were put in from the side of the mountain below the trenches, and a very limited amount of diamond drilling was also done from the side of the mountain. No record of the diamond drill logs (believed to be 5 holes) is available.

The Brathammer deposit (quartz and calcite with chalcopyrite) was visited on my trip, but due to snow and the present condition of the adits,

I was unable to see what if anything remained of this deposit or vein. Local history has it that this vein and the 'Skiffergangen' vein which intersected the Brathammer were mined out and shipped sometime after 1917. Assays of the ore shipments are not available but it is believed to have run 5% copper.

#### ORE DEPOSITS

Although there are other deposits of copper reported on the concession, I will deal entirely with what are known as the Ulveryggen deposits which I have shown on plate 5.

Area 1 which comprises the area about Erik's adit, shows very little ore in the one rock trench above the underground work. However, excellent ore is shown in the adit (grade of which was verified by samples taken) and more work should be done on surface to see if this ore does not outcrop.

A second rock trench approximately 325 feet west of the one above the adit also shows ore and the area between the two should be investigated.

I have proposed only one rock trench to the East of the trench now in existence above Erik's adit but it is quite possible that more trenches are needed in this area. As the copper is leached from the surface rock it is at times difficult if not impossible to follow ore deposition by looking at the surface rock.

I have also shown 2 proposed diamond holes for this area. One to cut the area between the two above-mentioned trenches and the other to cut at depth the deposit outlined in the underground work. This is again a minimum, as in all probability, at least one more hole will be necessary east of the most easterly proposed hole.

Area number 2 shows 3 lenses totalling 1795 tons per vertical foot and averaging 1.57% copper.



The most northerly lens is small (325 tons per vertical foot); comparatively narrow, and only grading 1.1% copper. This lens could be discounted in ore calculations unless the further rock trenches proposed for this lens show a higher assay.

The centre lens of the three in this area is good grade and good width if samples from the two trenches are average grade. At least three more rock trenches are necessary to competently sample this lens.

The most southerly of the three ore zones, or that immediately above John's adit is shown as running 1.32% copper whereas both trenches cutting this lens on surface show a higher grade and portions (see circled underground assay map) at the level of John's adit show still higher grade. Not only is another rock trench necessary on this lens but a re-sampling of the existing rock trenches as it appears that this lens will grade close to 2% copper.

Just below this lens, in the John's adit, there appear to be three small but separate zones of copper ore which total a higher tonnage and show better grade than is evidenced on surface. For tonnage calculations however, only the lower grade surface ore body was added to the total.

Three long diamond drill holes all at  $-45^{\circ}$  are proposed for this area as shown on plate 5.

Area number 3 like number 2 shows 3 lenses; only two of which were calculated in the tonnage.

The most northerly lens (that not included in the tonnage) shows over 2% copper in one trench but this was not picked up in the adit directly below.

The central lens has been calculated at two different grades but was averaged without enough samples. More rock trenches as shown are needed.

The most southerly lens in this area again needs more rock trenches and sampling. It is very possible that this zone and the centre one could be mined as one and the trenches should be located with this in mind.

Three diamond drill holes are proposed as shown on plate 5.

Area 4 is the most extensive of all the zones.

Trenches and samples in this area should be carefully spotted with the possibility in mind of mining two or more of the ore zones as one.

The area that assayed 1.6% copper to the north of the zones in this area should be carefully checked.

See plate number 6 and 7 for a cross-section of this area as taken from an old report.

Six drill holes are proposed for this area as shown on plate 5 and they should yield more geological information as to the occurrence of zones than in any other area.

Area number 5 is quite small compared to area number 4 and just north of this zone should be thoroughly prospected for other zones of mineralization.

Two trenches and two diamond drill holes are laid out for future investigation of this zone.

Area 6 has again not enough work done on it to fully evaluate it. Three trenches and two diamond drill holes are needed as shown on plate 5 for this work.

Area number 7 with 620 tons per vertical foot grading 1.39% copper is below the general average. At least four additional trenches are needed to check the grade of this zone. If grade does not stand up to its present average, the diamond drill holes laid out on plate 5 will not be necessary.

The small trenches to the north-east of this zone, north-east of the small pond, show near to 1% copper. Dependent on the above check sampling in the additional trenches I would suggest that either the diamond drill hole as laid out, be continued to the north side of the pond or another hole be spotted to cut the area beneath the pond.

In the seven areas shown on plate 5, there are 12,500 tons per vertical foot averaging 1.60% copper. A slightly lower tonnage (10,790 tons per vertical foot) would increase the grade to 1.66%.

To the north-east of area number 1, prospecting should be done, as it is very possible that more lenses or impregnations may be discovered on line of strike. Overburden is very slight but as the line of strike is descending the mountain, the cover gradually increases. Some indications of copper can be found as far away as Han's adit (see plate 4) which is one quarter mile from area number 1.

Plates numbered 6 and 7; taken from Stallman's Report, show sections through Kyadraten and Triangein tunnels. These sections give some ideas of the vertical deposition of the ore zones and they, along with the adits and other underground workings would tend to indicate at least 1,500,000 tons of ore grading better than 1.5% copper to the level of the lowest present workings.



There is no reason to suppose that these old workings were at the lowest level of the ore and although one impregnation may disappear at a depth equal to its length, others will occur at greater depth.

#### S U M M A R Y   A N D   C O N C L U S I O N S

- (1)            There is a vast quantity of ore; roughly 12,500 tons per vertical foot averaging better than 1.5% copper content, which had been disclosed by exploration up to 1914.
- (2)            Additional ore on the strike of the present zones can undoubtedly be discovered both north-east and south-west of those shown on plate 5.
- (3)            There is some sub-surface enrichment due to leaching or weathering of the top 6 inches to 1 foot of the surface rock. To compensate for this, all exceptionally high assays have been cut entirely and the figures for tonnage and grade have been purposely held at a minimum until more exploratory work and check sampling is done.
- (4)            With one exception, all the check samples taken September 1956 have shown a higher copper content than those shown by previous samples. (See plate 5).
- (5)            A good amount of exploratory work and prospecting is necessary to check the grade of the various zones; test for continuity to depth and to know where the best position would be for plant and tailings disposal. The trenches and diamond drill holes I have proposed as seen on plate 5 are to be considered only as a preliminary survey and further work can be later laid out using the knowledge gained in this preliminary work.
- (6)            It might be possible to combine for mining several of the ore zones (as in area number 4, plate 5).
- (7)            Dilution by 'wall-rock' will not be as serious here as in most mining areas as most of the ground is impregnated with copper mineralization and any dilution will have a certain amount of copper content.

(8) Mining the first 300 feet in depth can be done very cheaply by driving adits from near the stream bed which parallels the copper deposits (see plate 4). This would obviate the use of shafts for this depth and with raises to surface, a semi open-pit operation could be utilized. With a central conveyor running down-hill near this stream, the concentrating plant could be positioned nearer the loading point in the fjord with a greatly reduced cost in handling and transportation of ore and concentrates.

Later, when shafts are necessary, the operation would be able to pay for this phase of the mining.

The vein matter as well as foot and hanging walls are in a hard rock which will stand well.

(9) Partly due to the above-mentioned type of mining with which the operation could be started; partially due to the position of the ore bodies and their relation to the topography and sea-coast and also due in part to the country in which this ore is located, primary costs of plant and operation would be considerably lower than in other parts of the world.

(10) Lack of overburden, proximity to a deep harbour and comparatively cheap labour also will be a factor of economical operation.

(11) The minerals found in the ore zones are bornite, chalcocite and a little chalcopyrite which should give a high percentage concentrate.

(12) The ore carries some gold and silver (see attached assay sheets) which will also add to the overall profit.

#### RECOMMENDATIONS:

This property shows the brightest prospects for becoming a producing mine and as such should have a thorough job of exploration done on it. On the thoroughness of the job and the extent to which ore is outlined will depend the size of the operation. A mining program should not be considered until this

work is completed.

Rock trenching and diamond drilling as shown on plate 5 would be in the nature of a preliminary exploration prior to drilling for depth and prospecting for other ore zones along line of strike. This preliminary drilling would constitute 10,000 feet. The amount of additional drilling needed would be decided by the results obtained by this preliminary drilling.



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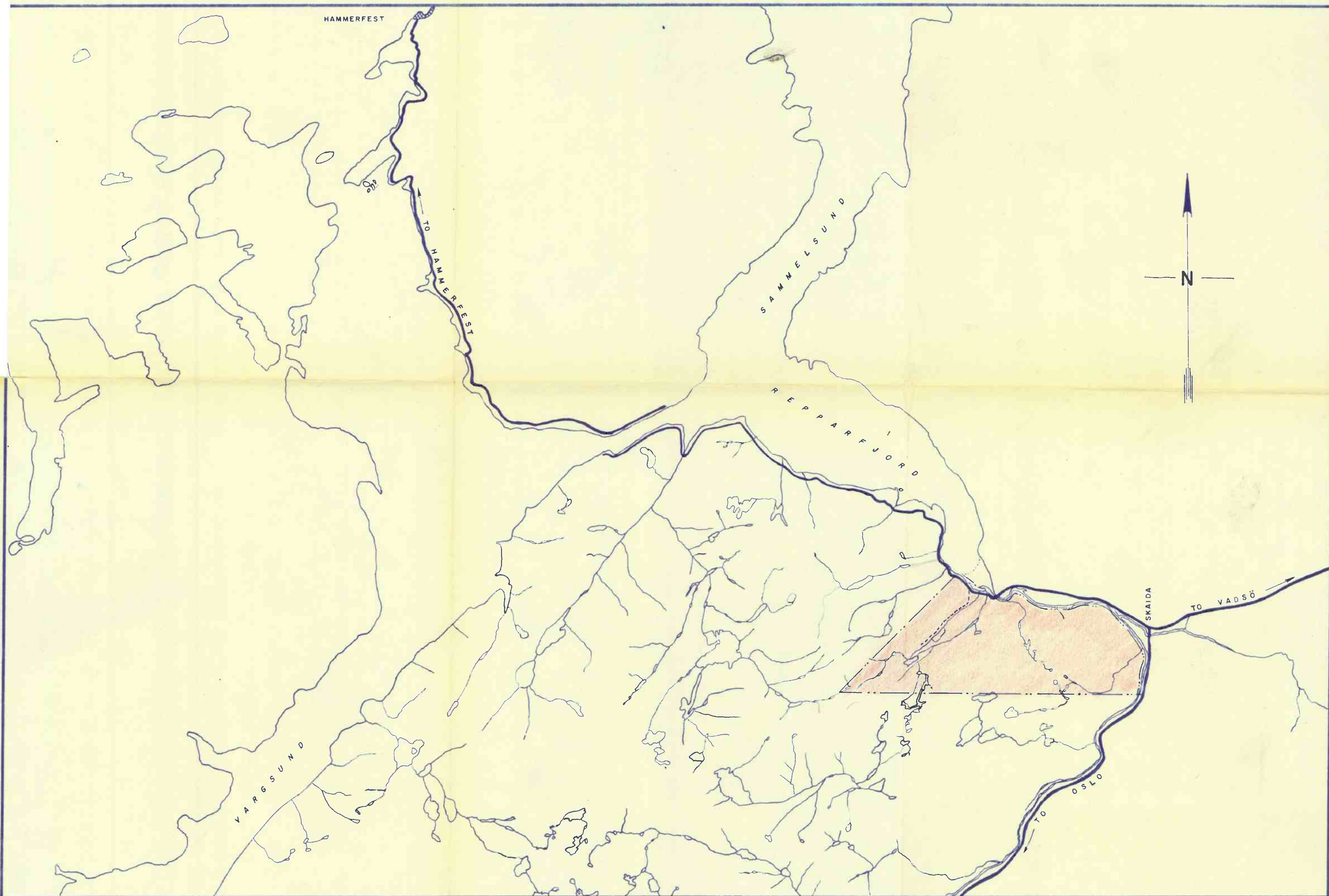


## A P P E N D I C E S

Plate 1	Location of Concession in Norway
" 2	Plan of General Area showing approximate position of Concession
" 3	Plan showing General Geology
" 4	Plan of Part of the Concession showing Position of Old Workings
" 5	Plan of Old Trenches and Workings with Assays on Ulveryggen Mountain
" 6	Sketch Section at Triangein - Segmentet
" 7	Sketch Section at Kyadraten Adit
" 8	Sketch Section at Olle's Adit
" 9	Section through A - A from plate #4







**LEGEND**

- APPROXIMATE BOUNDARY OF CONCESSION
- MAIN ROAD
- - - WAGON ROAD
- ..... BOUNDARY - DEEP AND SHALLOW WATER

**PLAN**

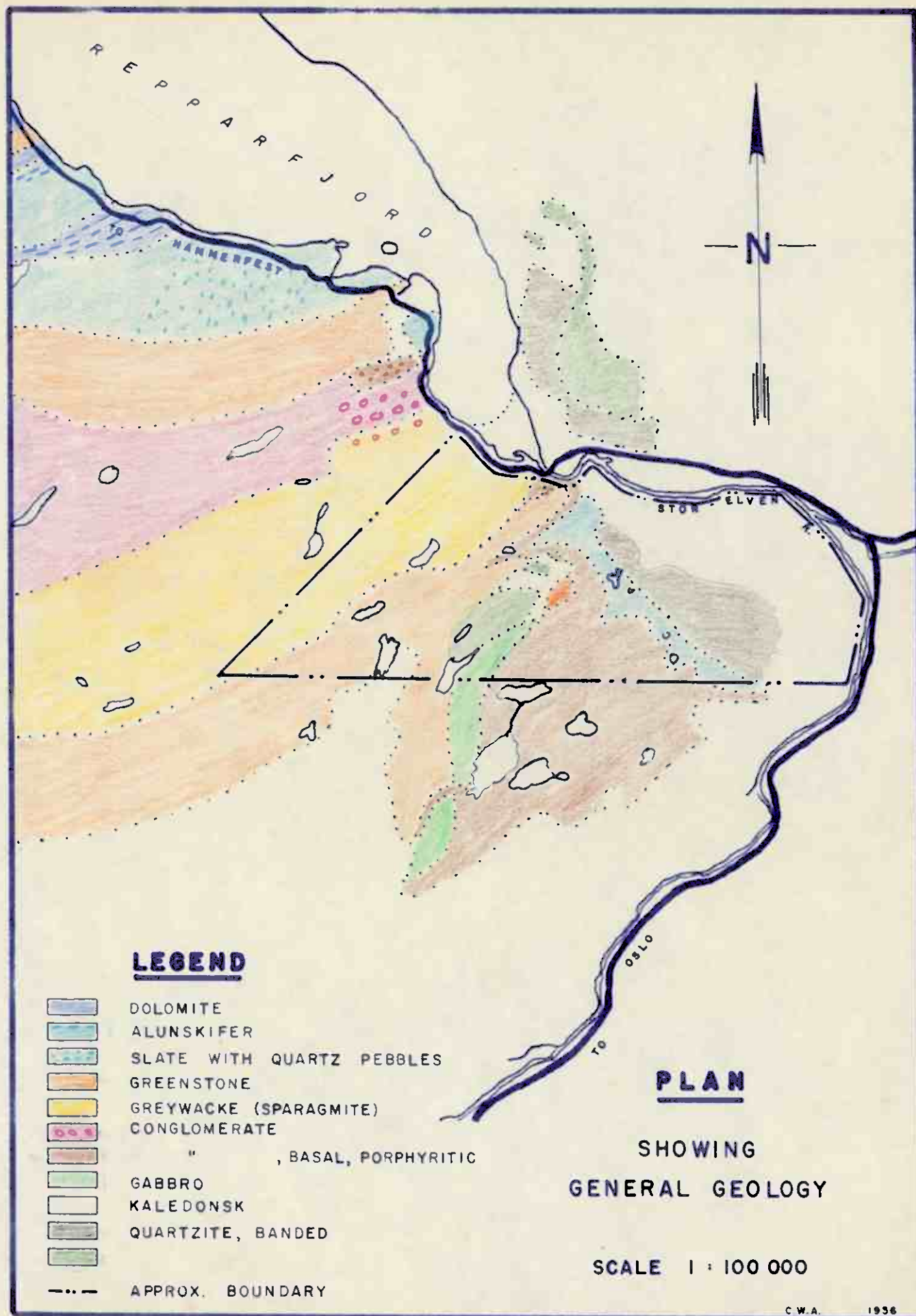
OF  
GENERAL AREA  
SHOWING

APPROXIMATE POSITION OF CONCESSION

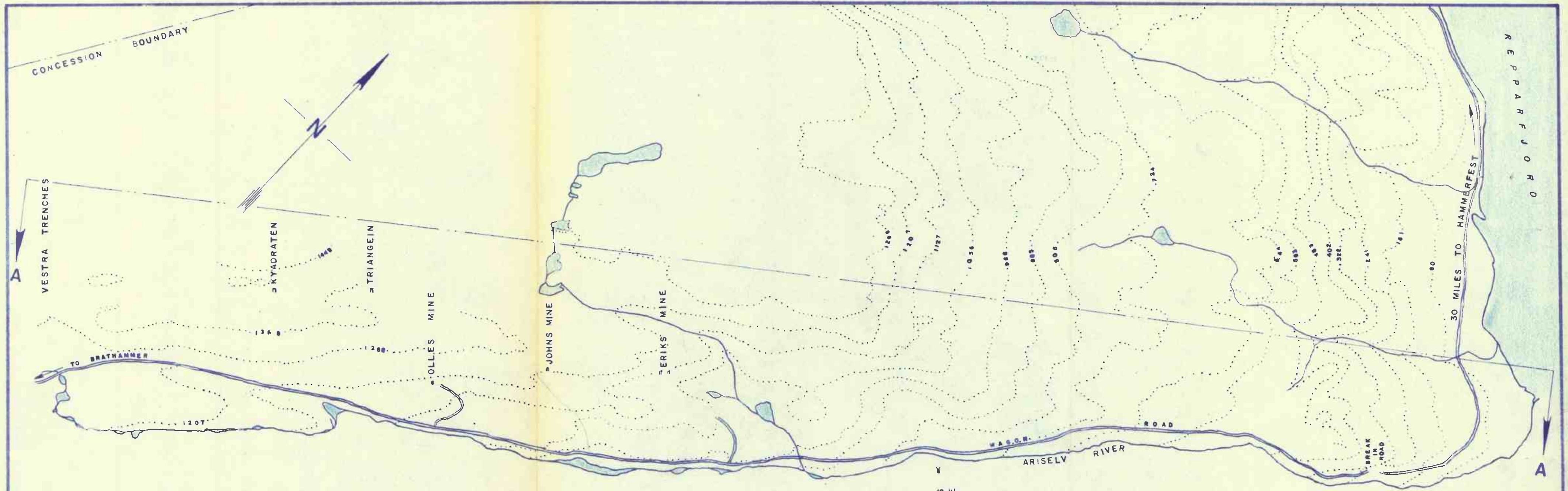
SCALE 1 : 100 000

C.W.A. 1958









## LEGEND

- 25 --- CONTOUR LINE (AT 25 METER INTERVAL)
- ADIT ENTRANCE

## PLAN

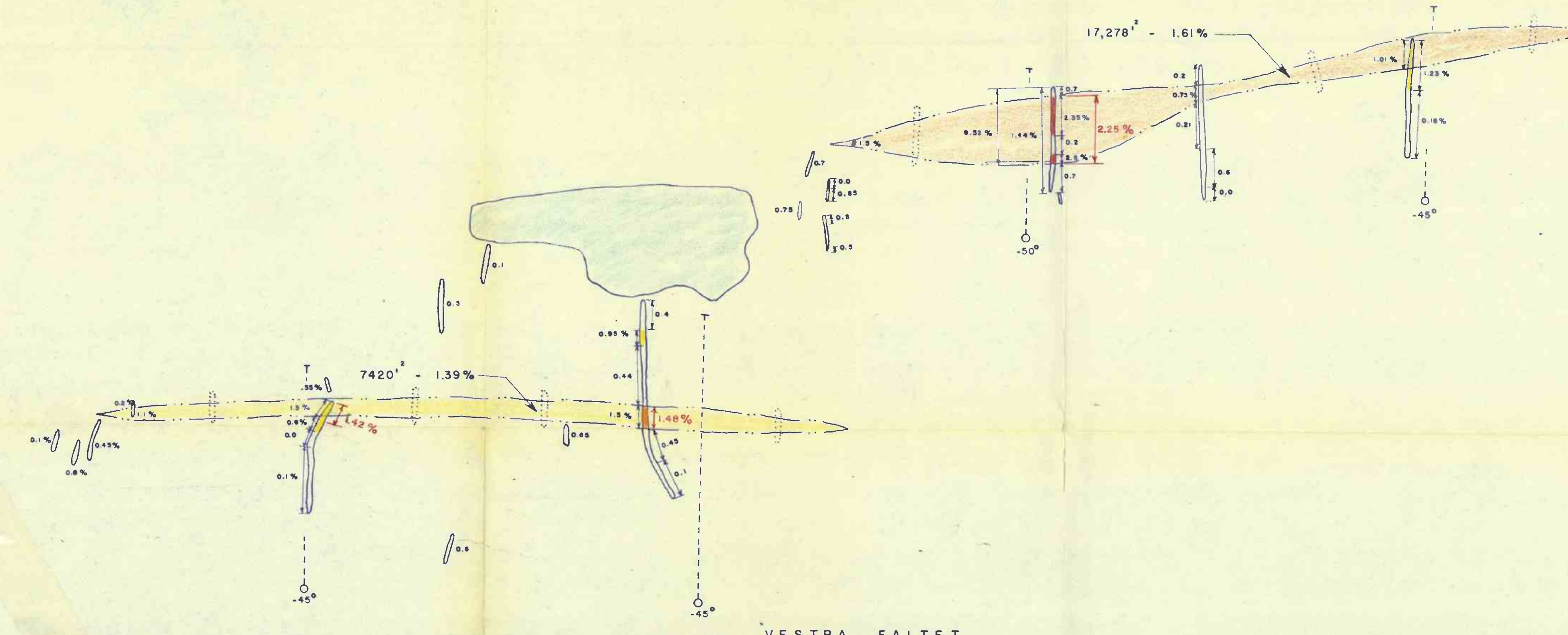
OF PART OF THE CONCESSION  
SHOWING  
POSITION OF OLD WORKINGS

SCALE 1 : 4 000

$$1 \text{ cm} = 4000 \text{ m} = 40 \text{ m}$$

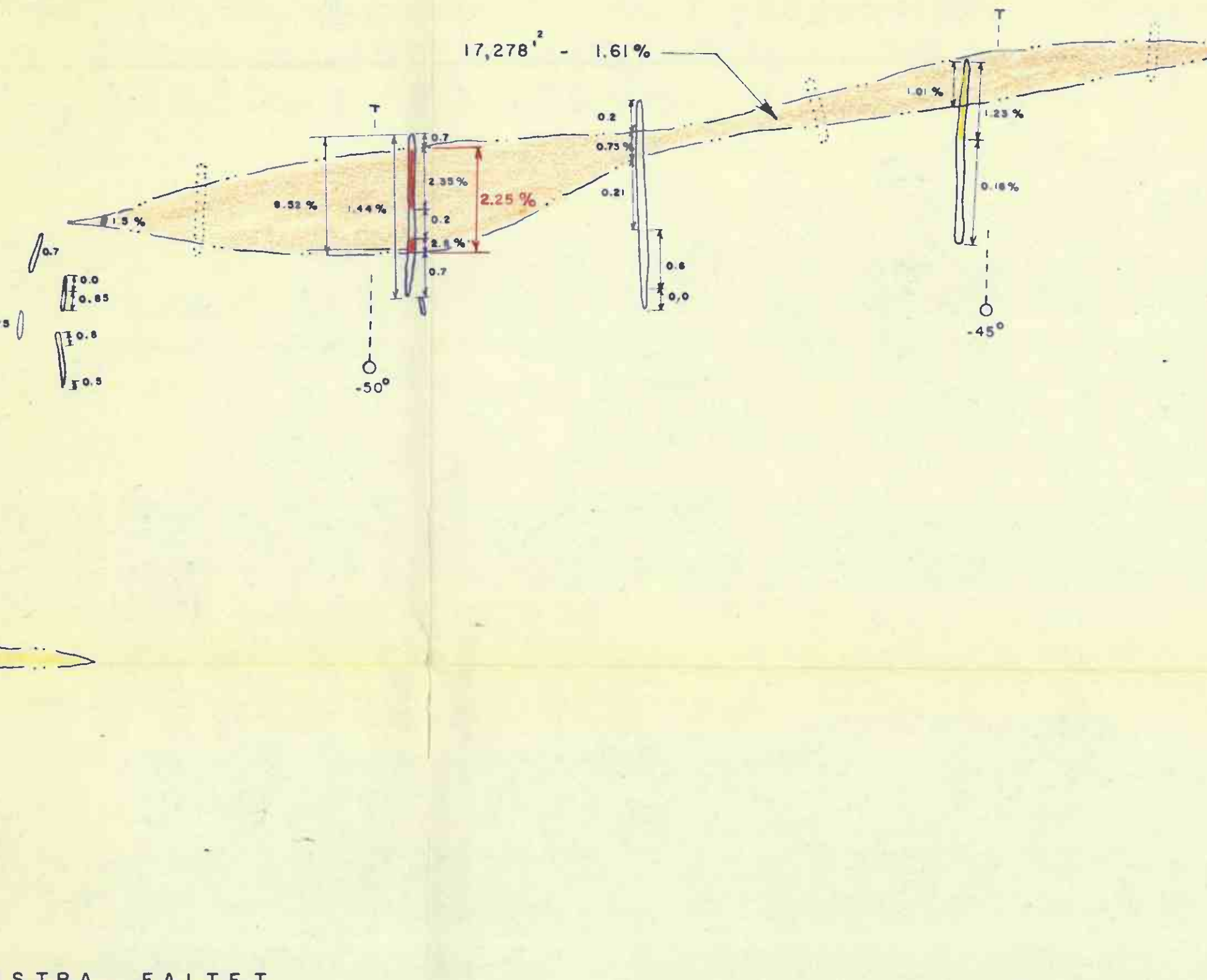
$$1 \text{ km} = \frac{1000}{40} = 25 \text{ cm}$$





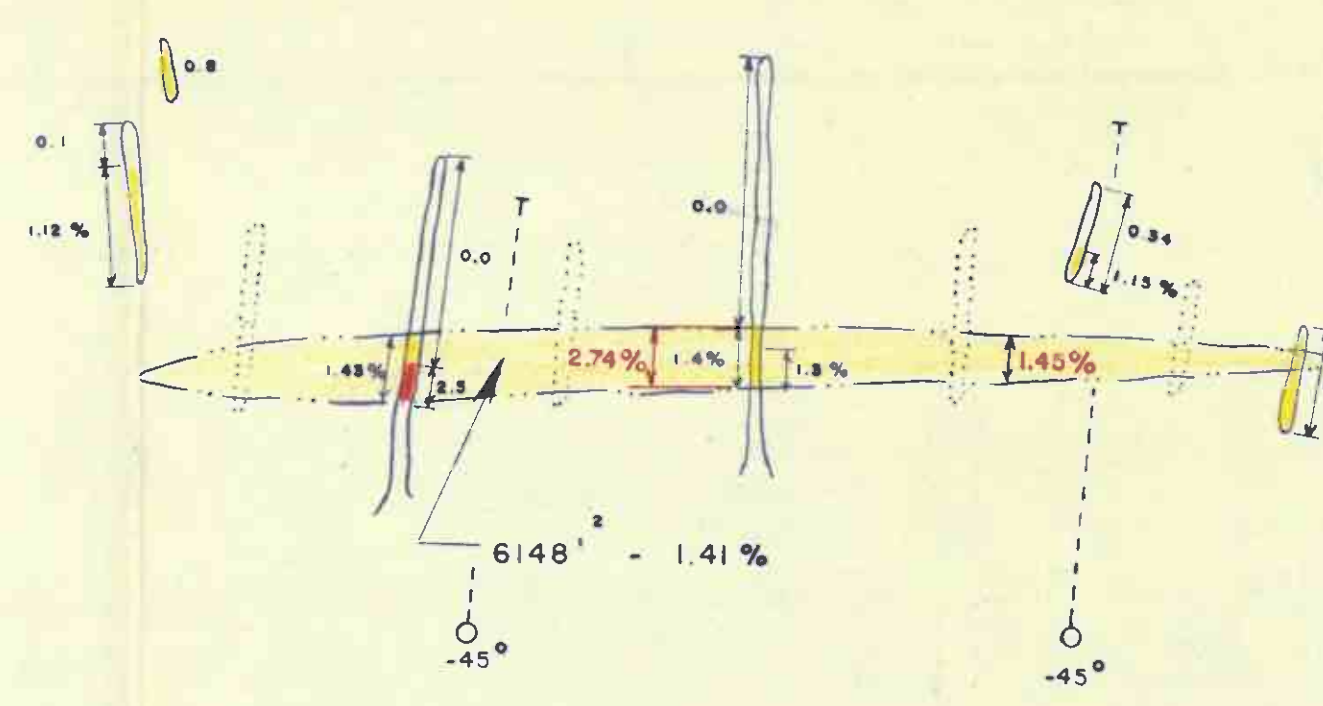
#### AREA 7

7420 SQ. FT. (620 TONS / VERT. FT.) AT 1.39%



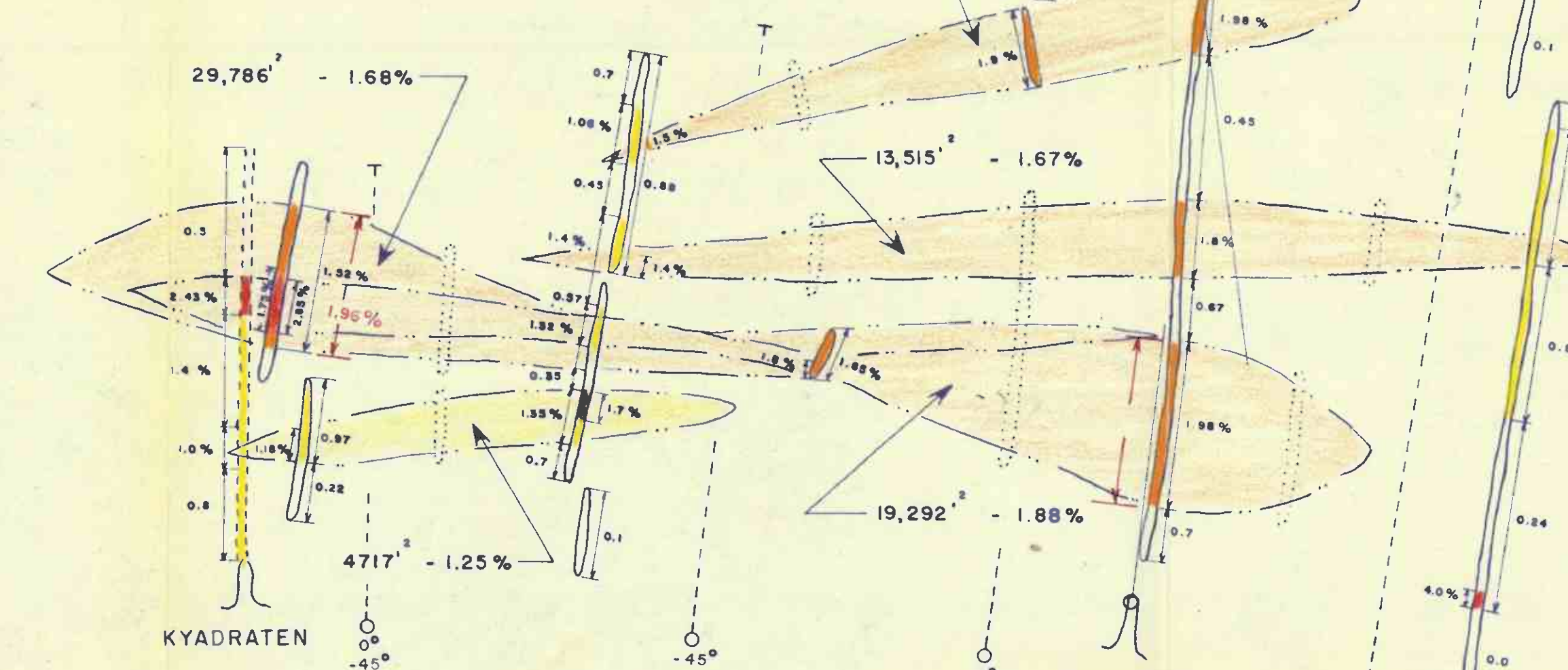
#### AREA 6

17278 SQ. FT. (1440 TONS / VERT. FT.) AT 1.61%



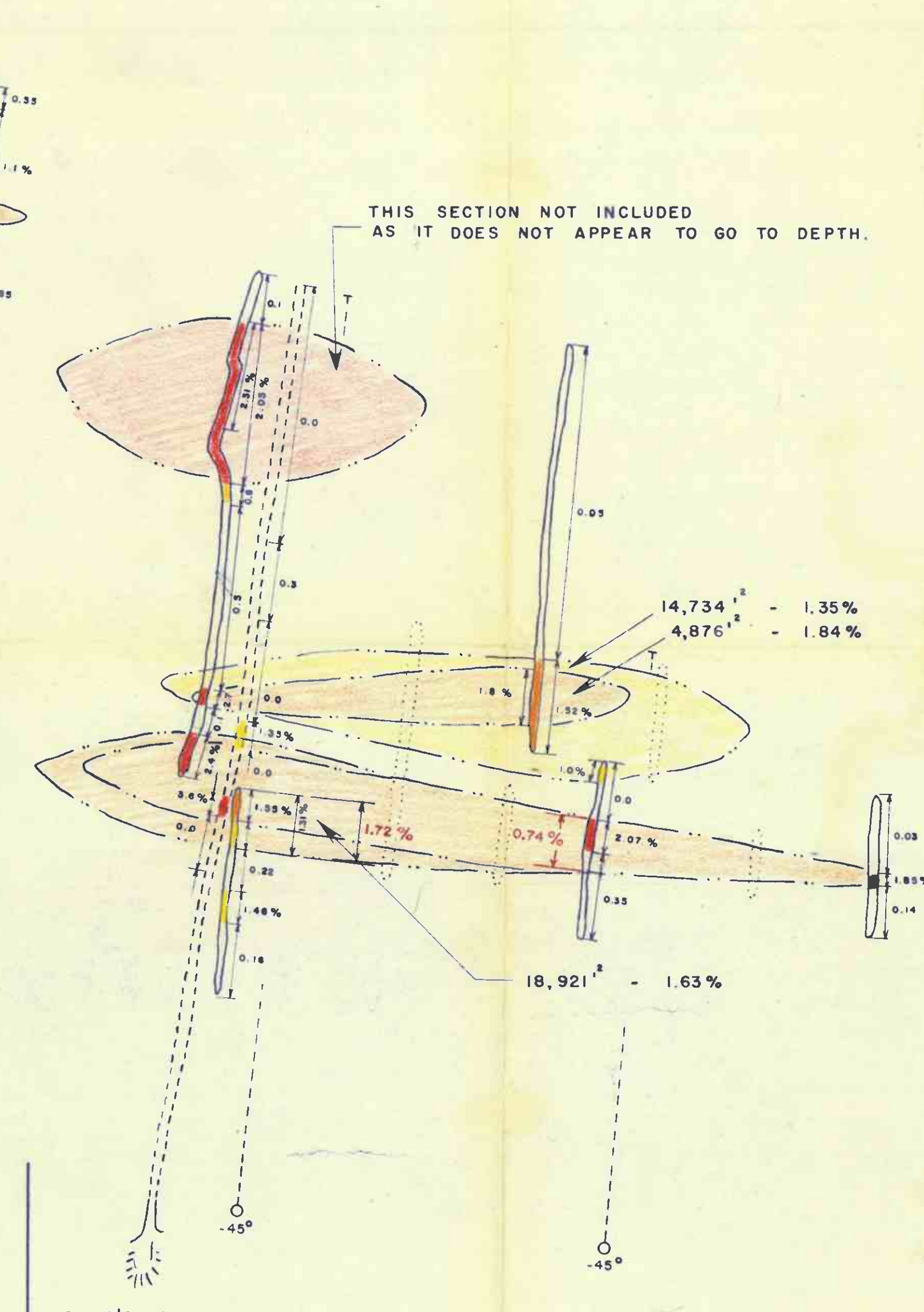
#### AREA 5

6148 SQ. FT. (510 TONS / VERT. FT.) AT 1.41%



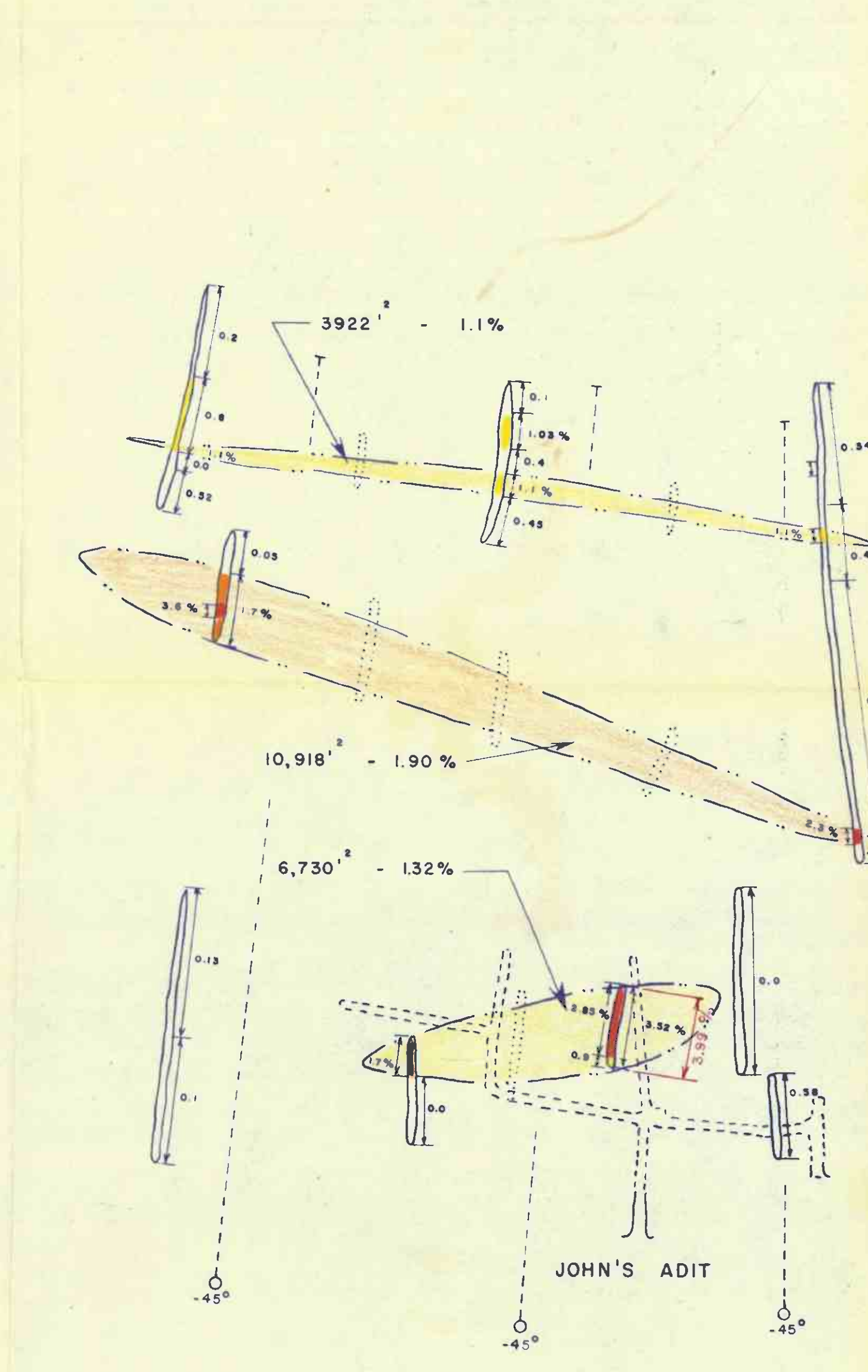
#### AREA 4

10865 SQ. FT. (900 TONS / VERT. FT.) AT 1.85%  
 13515 SQ. FT. (1120 TONS / VERT. FT.) AT 1.67%  
 19292 SQ. FT. (1600 TONS / VERT. FT.) AT 1.88% OR 2480 TONS AT 1.68%  
 4717 SQ. FT. (390 TONS / VERT. FT.) AT 1.25%  
 TOTAL = 4010 TONS / VERT. FT. AT 1.75% OR 4890 TONS AT 1.67%



#### AREA 3

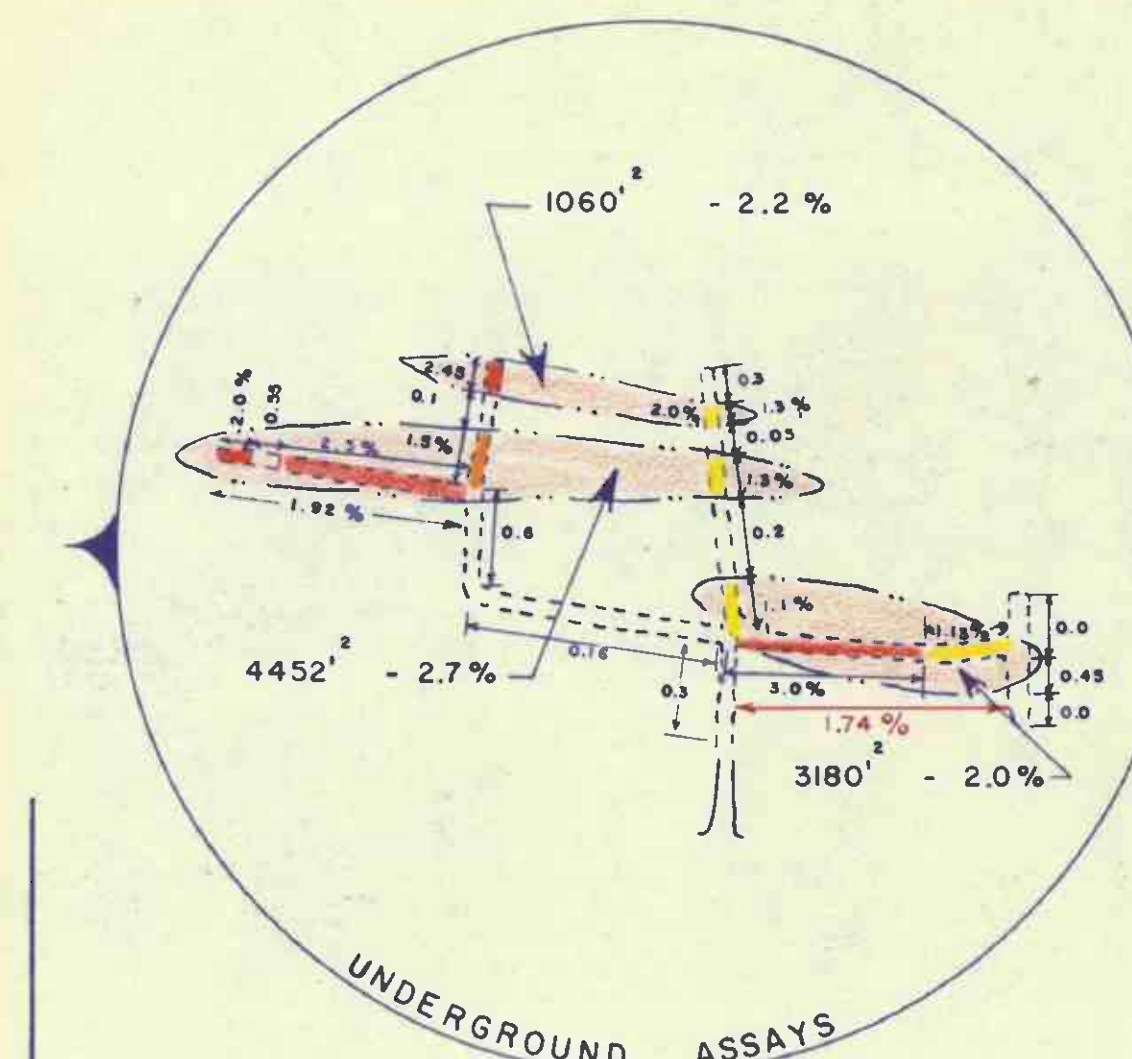
14734 SQ. FT. (1230 TONS / VERT. FT.) AT 1.35% OR 400 TONS AT 1.84%  
 18921 SQ. FT. (1575 TONS / VERT. FT.) AT 1.63%  
 TOTAL = 2805 TONS / VERT. FT. AT 1.50% OR 1975 TONS AT 1.67%



#### AREA 2

3922 SQ. FT. (325 TONS / VERT. FT.) AT 1.1%  
 10918 SQ. FT. (910 TONS / VERT. FT.) AT 1.90%  
 6730 SQ. FT. (560 TONS / VERT. FT.) AT 1.32%  
 TOTAL = 1795 TONS / VERT. FT. AT 1.57%

- LEGEND**
- 1.6% CHECK SAMPLES TAKEN 1956
  - SECTIONS OVER 2% COPPER
  - SECTIONS BETWEEN 1.5 & 2% COPPER
  - SECTIONS UNDER 1.5% COPPER
  - TRENCH
  - UNDERGROUND ADITS
  - DIAMOND DRILL HOLE
  - PROPOSED DIAMOND DRILL HOLE
  - OUTLINE OF ORE ZONES
  - PROPOSED TRENCH

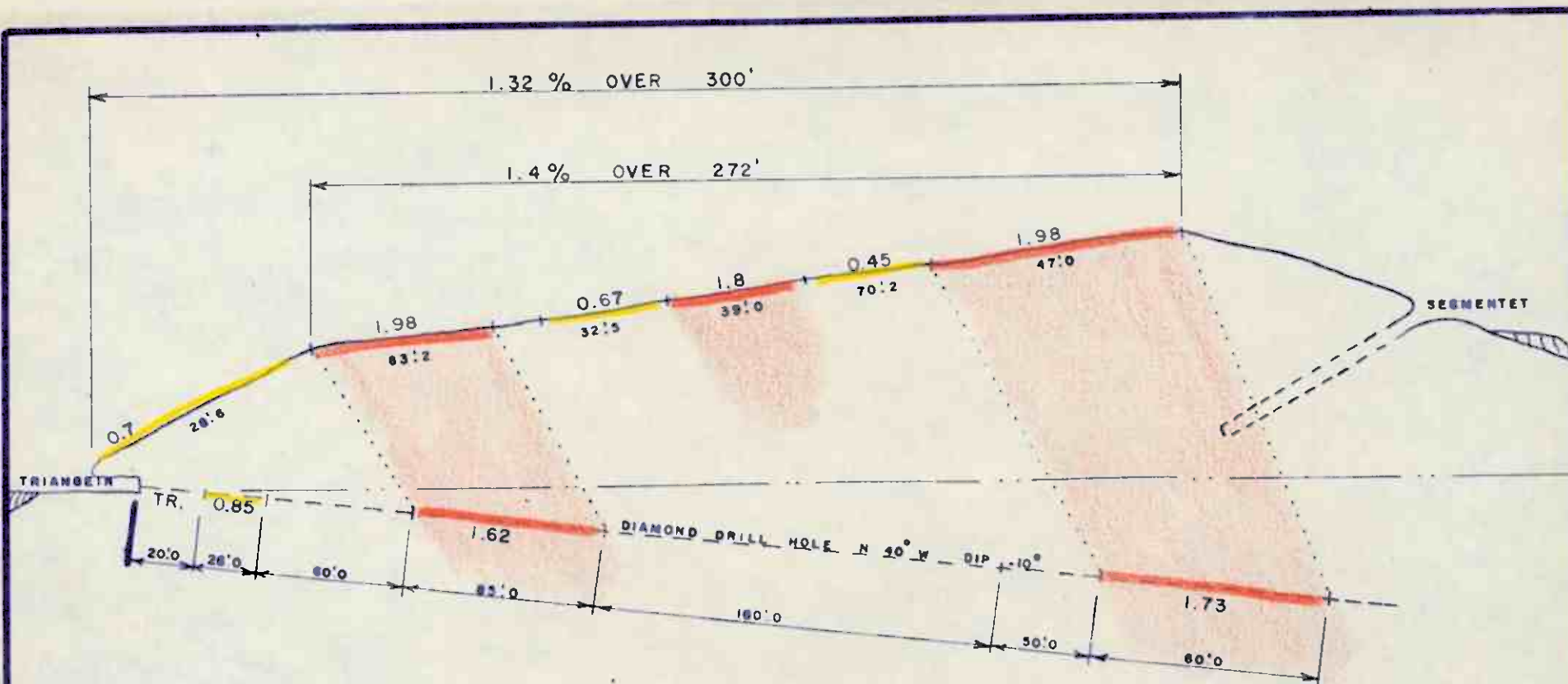


#### AREA 1

5300 SQ. FT. (440 TONS / VERT. FT.) AT 2.04% (UNDERGROUND)

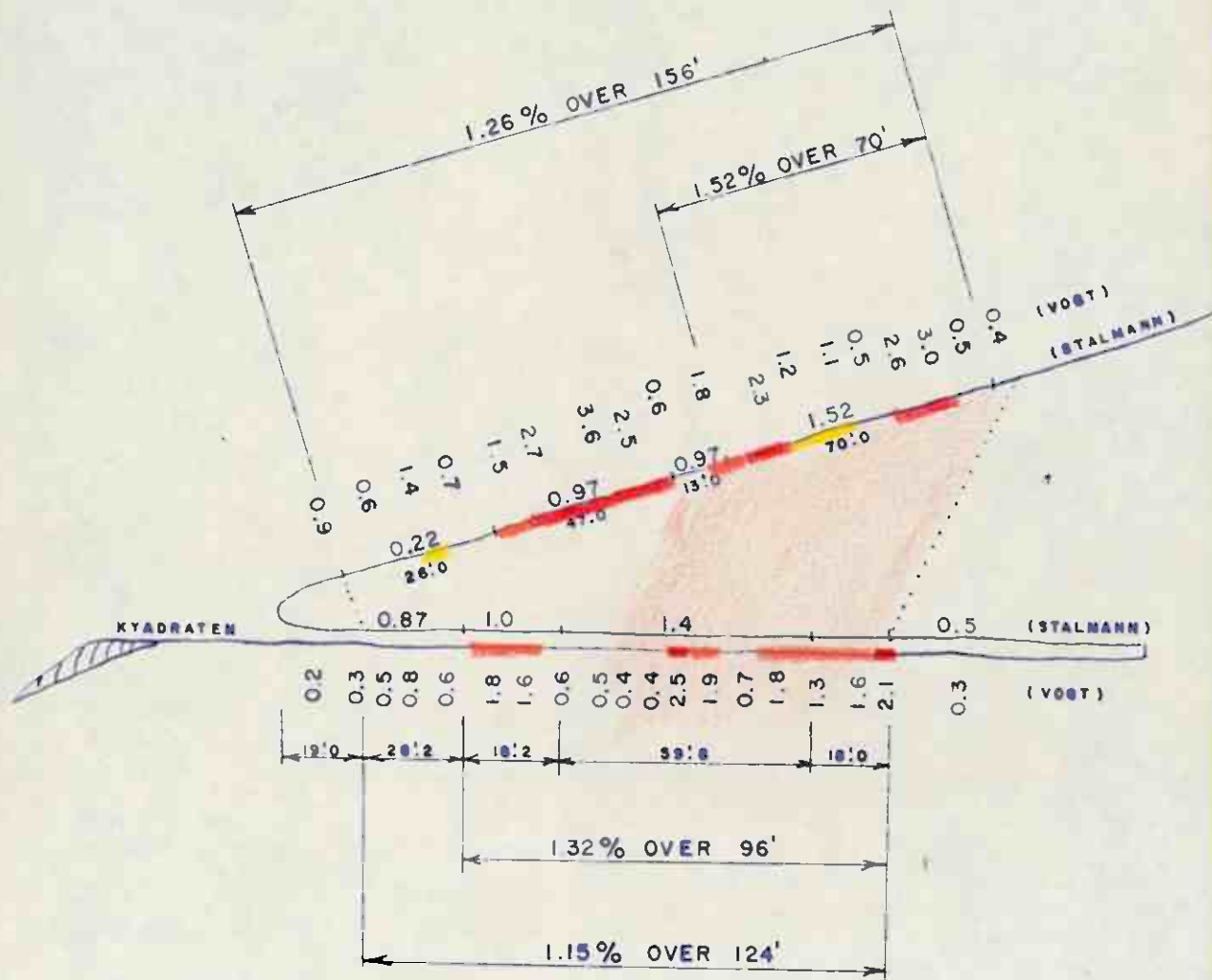
PLAN  
 OF  
 OLD TRENCHES AND WORKINGS  
 WITH ASSAYS  
 ON  
 ULVERYGGEN MOUNTAIN  
 REPPARFJORD, NORWAY  
 SCALE 1:800





SKETCH SECTION  
AT  
TRIANGEIN - SEGMENTET

TAKEN FROM AN OLD REPORT



SKETCH SECTION  
AT  
KYADRATEN ADIT

TAKEN FROM AN OLD REPORT

