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Postboks 3021, N-7441 Trondheim

Rapportarkivet

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7217				
Kommer fra arkiv	**Ekstern rapport nr**	**Oversendt fra**	**Fortrolig pga**	**Fortrolig fra dato:**
	Sul 451/77/25	Stavanger Staal A/S, NGU		

Tittel

Mineral Inventory Calculation, Raana nickel deposit, Norway, project 904-25

Forfatter	Dato År	Bedrift (Oppdragsgiver og/eller oppdragstaker)
Gammon J.B.	1977	Falconbridge Nikkelverk AS

Kommune	Fylke	Bergdistrikt	1: 50 000 kartblad	1: 250 000 kartblad
Ballangen	Nordland		13311	Narvik

Fagområde	Dokument type	Forekomster (forekomst, gruvefelt, undersøkelsesfelt)
Malmberegning		Råna Bruvannsfeltet
Råstoffgruppe	**Råstofftype**	
Malm/metall	Ni, Cu	

Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse

Falconbridge/Sulfidmalm ble tidlig i 1977 kontaktet av Stavanger Staal A/S for et mulig sammarbeid om videre utvikling av mineraliseringen i Råna.

Rapporten beskriver en ny malmberegning med utgangspkt. i altenative "cut-off" fra 0,3 % til 0,6 % Ni.

Det konkluderes med at det må gjøres et lønnsomhetsstudie basert på en produksjon på 1 -2 mill tonn/år med så lav som 0,3 % "cut-off". Det må gjøres metallurgiske forsøk for å se om koncgehalten kan økes fra 5-6 % Ni.

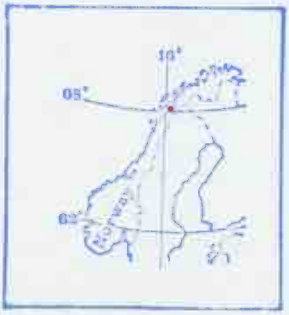
FOR FALCONBRIDGE NIKKELVERK A/S
A/S SULFIDMALM

PROJECT 904-25

Mineral Inventory Calculation
Raana nickel deposit
Norway

By

J. B. Gammon



Report No. 451/77/25

INTRODUCTION

In early 1977 the Stavanger Staal Company approached Falconbridge-Sulfidmalm as to our possible interest in joining them in further development of the nickel mineralization outlined in the Raana massif in northern Norway.

"Ore reserve calculations" to date have consisted of calculations involving all material containing greater than 0.13%-0.15% sulphide nickel as determined by bromine extraction. Non-mineralized intersections have been excluded when these exceed 6 metres in thickness. A specific gravity of 3.3 was used and all assays over 1.0% Ni were reduced to 1.0% nickel. Assay data was displayed in histogram form on drill hole sections and fully tabulated in accompanying data tables. The results of these calculations suggest that the near surface, eastern, ore zone carries 19.6 million tonnes with an average grade of 0.33% Ni, and that the deeper, western ore zone carries a total of 24 million tonnes grading 0.33% Ni in two main lenses.

In the light of our experience from other nickel deposits it seemed dubious that this average grade was high enough to provide an attractive return on capital invested. Even basing calculations on the cheapest mining methods known to us it was difficult to see how material grading 0.13% Ni could be classified in ore reserves since this does not contain enough of the pay element to cover costs of mining, milling, smelting and refining let alone repay capital invested and return a profit.

Of first priority therefore was to calculate mineral inventories using more reasonable "cut-off" grades to see if sufficient mineable material was still present to warrant further studies.

../2

METHOD

The 1:2000 scale vertical sections draughted by NGU were photographically enlarged to 1:500 scale. Pertinent assay data and intersection widths were plotted directly onto these sections. Using cut-off grades of 0.6% Ni, 0.5% Ni, 0.4% Ni and 0.3% Ni, over minimum 2 metre intersections, average assays were calculated for the total intersection lengths lying above the chosen cut-off. For the sake of simplicity, and to speed up the process, lateral influence of holes were considered to be the same as in the NGU calculations. No attempt was made to join up mineralized zones from hole to hole at this stage and tonnages are thus calculated on the basis of rectangular sided blocks. The dimensions of these blocks are shown on the appended plans and sections and the full calculations are shown on the work sheets included as an appendix. A specific gravity of 3.3 was used throughout.

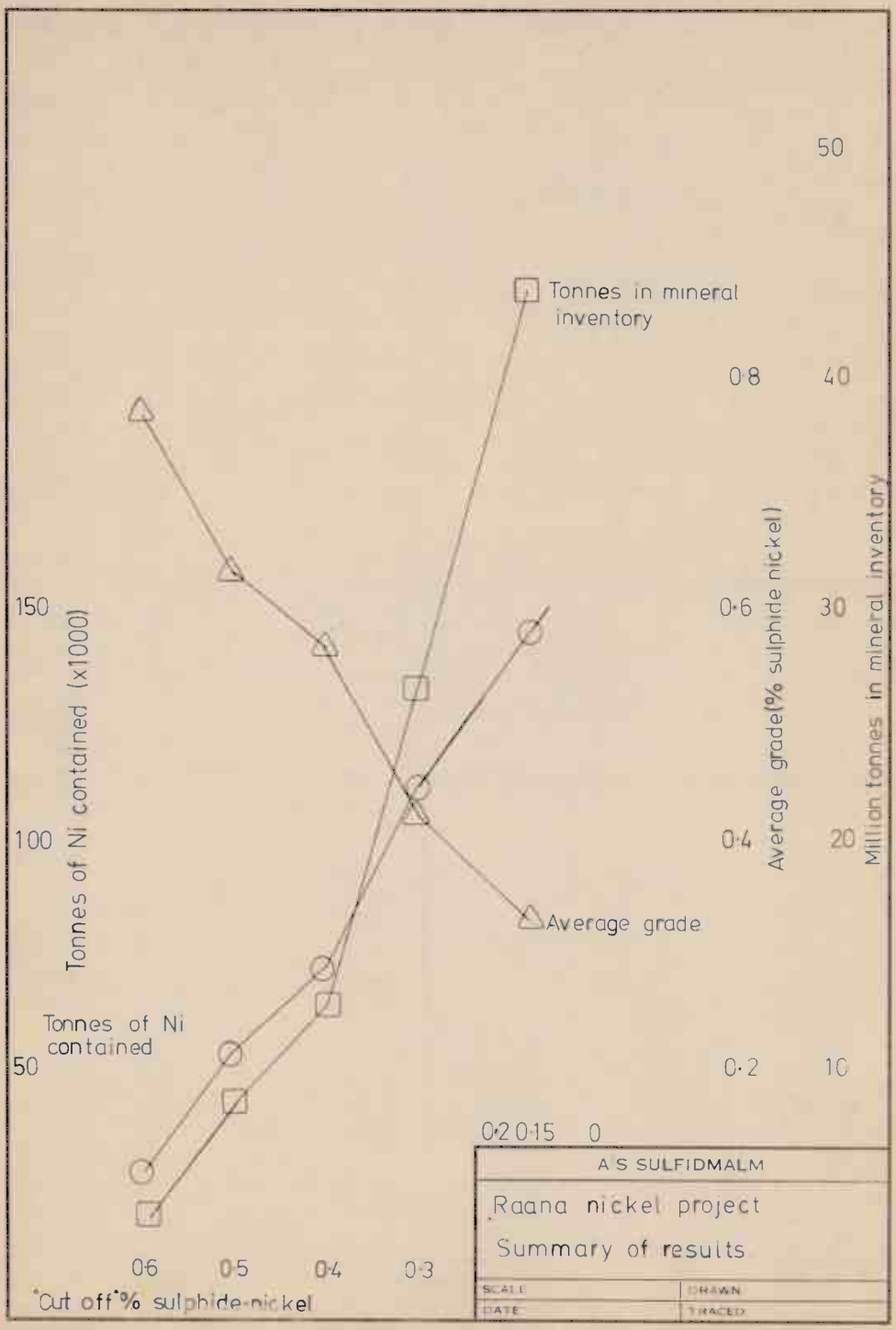
The resulting sections were then reduced xerographically back to a scale of 1:2000 and considered in relation to each other. Possibly continuous zones were then plotted onto the sections, these interpreted zones are coloured red on the attached profiles.

RESULTS

The main results of this study can be summarized as follows:

Cut off grade (%Sulphide Ni)	Million Tonnes	Average grade sulphide %Ni	Tonnes of Ni contained
0.6	3.6	0.77	27,720
0.5	8.6	0.63	54,180
0.4	12.7	0.57	72,390
0.3	26.6	0.42	111,720
0.13	44.0	0.33	145,200

../3


Tonnes in mineral inventory
Average grade
Tonnes of Ni contained
Tonnes of Ni contained (x1000)
Average grade(% sulphide nickel)
Million tonnes in mineral inventory
150
100
50
0·8
0·6
0·4
0·2
40
30
20
10
0·2 0·15 0
0·6 0·5 0·4 0·3
'Cut off' % sulphide-nickel
A S SULFIDMALM
Raana nickel project
Summary of results
SCALE
DRAWN
DATE
TRACED

The above figures are graphically displayed on figure 1. The increase in tonnage with falling cut-off grade appears to be at a constant rate from 0.6% through 0.5% to 0.4% Ni, ie an increase of ca. 2.2 m tonnes/0.05% decrease in Ni cut off grade. This figure increases dramatically to 7 m. tonnes/0.05% decrease in Ni cut-off grade in the range from 0.4% through 0.3% to 0.15% Ni. It is perhaps not surprising that the average grade thus drops more rapidly below the 0.4% cut off due to the rapid addition of greater quantities of low grade material.

What seems to be of particular interest however is the relationship of tonnes of Ni contained to changes in cut-off grade. The rate of addition of Ni contained in reserves increases noticeably during the drop from ca. 0.4% to 0.3% cut-off and then decreases again below this figure.

The conclusion must be that if mining and milling costs can possibly be reduced to a sufficiently low figure then mining material above a 0.3% cut-off will give an optimal amount of potentially recoverable nickel in the reserve.

DISCUSSION

The argument used above suggests that the 0.3% cut-off figure is the most attractive to use if costs allow. A similar conclusion is reached by inspection of the geometry of mineralized zones on the attached sections. Continuity of mineralization from hole to hole and profile to profile is much easier to demonstrate using the 0.3% cut-off than when this is raised to higher values. In addition attractive continuous widths amenable to bulk mining techniques are better developed at this lower grade.

The existing feasability study is based on attacking Zone F by open-pit methods. It is hoped that sufficient profit could be generated by this approach to repay capital investments on surface plant before developing for underground production. Calculations were based on working 9.4 million tonnes at 0.33% Ni in the pit. An additional 18.3 million tonnes of waste would have to be removed during the pit lifetime. Capital investment was calculated to be kr 130 million and the following costs were determined:

Mining	15.30	kr/tonne ore
Milling	8.84	kr/tonne ore
Other	4.54	kr/tonne ore
Total	28.68	kr/tonne ore

excluding capital payback and interest.

During the present calculation it has not been possible to ignore an interesting possibility raised by the location of Zones A and B on profiles 2250E to 2450E. These lie at elevations between sea level and +200 metres to the north-west of the planned open-pit zone. From this area to the deep tidewater south coast of the Ofotfjord is ca. 1.5 kms. The intervening ground remains to be explored but possibilities for additional mineralization in this area seem to be excellent. An access portal driven at, or near to, sea level would enable many of the milling facilities to be placed underground and would help avoid working problems due to winter cold and darkness. The mineralization present in zone A is of sufficient thickness and grade that the cut-off could be raised to say, 0.5% Ni, for initial operations giving a potential of 3 million tonn at 0.6% in Zone A with an additional million tonnes at 0.61% in Zone B. If sufficient capital were generated by this operation it may well be that Zone F could then be taken, by block caving methods, from underground thus avoiding the necessity of a pit operation at all.

../5

CONCLUSION

This study has demonstrated the location of zones of mineralization based on various cut-off grades. Nothing has been outlined that would obviously make an attractively economic ore body. However the bulk of material present is most impressive and a feasible mining operation could possibly be established if some of the following factors are considered;-

1) Grants, long-term low-interest loans, tax write-offs- and subsidies would possibly be available from the authorities. Feasability study calculations that do not take these into account will give a false picture of capital requirements, interest rates and pay-back times.

2) If mining at a rate of 1 to 2 million tonnes per year is assumed can economies of scale be sufficient to warrant treating material with a cut-off as low as 0.3% sulphide nickel and averaging only 0.42% sulphide nickel?

3) Can the ore be treated metallurgically such that a concentrate grade better than the currently indicated 5-6% Ni can be achieved?

Point 1 above has been considered in some detail by the Stavanger Staal Company who would hopefully be able to provide best estimate data in connection with any future feasability calculations.

On receipt of this report in Toronto hopefully our mining engineering department can give consideration to point 2 above.

Drill core material has been forwarded to Lakefield together with details of some of the earlier flotation tests in an attempt to upgrade the concentrate quality.

RAANA PROJECT. SUMMARY OF MINERAL INVENTORY.

0.6% sulphide-nickel cut-off

Zone A	tonnes	%Ni
2250E	804,540	0.72
2350E	306,900	0.65
2450E	130,845	0.78
2500E	247,500	0.62
Total	1,489,785	0.69%
Zone B		
2350E	406,560	0.68%
Zone C		
2450E	47,025	2.03%
Zone E		
2550E	12,375	0.62
2700E	264,000	0.73
Total	276,375	0.72%
Zone F		
2550E	49,500	0.65
2600E	213,675	1.32
2650E	42,900	2.75
2700E	320,512	0.69
2800E	264,000	0.69
2900E	529,650	0.72
Total	1,420,237	0.86%

Total indicated to date. 3,639,982 tonnes. 0.77% Ni

../2

0.5% sulphide-nickel cut-off

Zone A

	tonnes	%Ni
2150E	121,440	0.54
2250E	1,015,080	0.68
2350E	1,291,356	0.54
2450E	290,566	0.64
2500E	371,250	0.59
Toal	3,089,692	0.60%

Zone B

2250E	190,644	0.51
2350E	548,760	0.64
2450E	223,080	0.54
Total	962,484	0.61%

Zone C

2450E	47,025	2.03%

Zone E

2550E	12,375	0.62
2700E	344,850	0.69
2800E	99,000	0.51
Total	456,225	0.65%

Zone F

2550E	240,075	0.56
2600E	708,674	0.76
2650E	59,400	2.14
2700E	1,011,449	0.58
2800E	770,550	0.58
2900E	857,650	0.63
3000E	313,500	0.54
Total	3,961,298	0.64

Total indicated to date. 8,516,724 tonnes. 0.63% Ni.

0.4% sulphide-nickel cut-off

Zone A	tonnes	%Ni
2150E	121,440	0.54
2250E	1,180,641	0.65
2350E	2,202,156	0.49
2450E	778,140	0.50
2500E	618,750	0.52
Total	4,901,127	0.54%
Zone B		
2250E	348,796	0.47
2350E	887,712	0.56
2450E	454,905	0.44
Total	1,691,413	0.52%
Zone C		
2450E	35,687	1.78%
Zone E		
2550E	37,125	0.49
2700E	377,850	0.67
2800E	198,000	0.46
Total	612,975	0.59%
Zone F		
2550E	293,700	0.54
2600E	1,052,700	0.65
2700E	1,176,449	0.56
2650E	75,900	1.76
2800E	963,600	0.55
2900E	1,205,800	0.58
3000E	627,000	0.48
Total	5,395,149	0.59%
Zone G		
2700E	33,000	0.43%

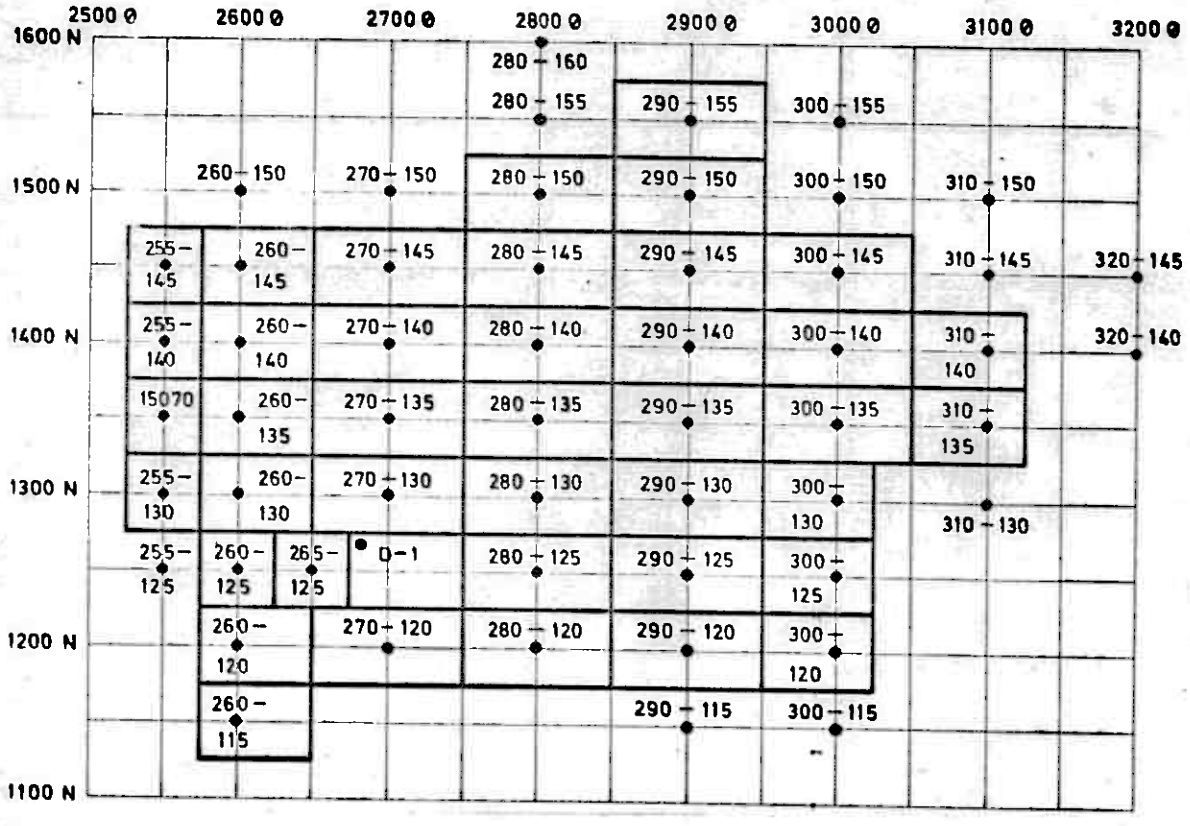
Total indicated to date 12,669,351 tonnes. 0.57% Ni.

0.3% sulphide-nickel cut-off

	tonnes	%Ni
Zone A		
2150E	503,896	0.35
2250E	1,636,041	0.33
2350E	3,737,392	0.42
2450E	3,036,660	0.37
2500E	1,027,125	0.45
Total	9,941,114	0.39%
Zone B		
2250E	2,186,365	0.34
2350E	2,146,998	0.46
2450E	1,011,945	0.40
Total	5,345,308	0.38%
Zone C		
2450E	68,062	1.51%
Zone D		
	61,875	0.29%
Zone E		
2550E	49,500	0.45
2600E	33,000	0.35
2700E	476,850	0.60
2800E	198,000	0.46
Total	757,350	0.54%
Zone F		
2550E	408,375	0.48
2600E	1,308,450	0.60
2650E	92,400	1.50
2700E	2,238,637	0.44
2800E	1,575,750	0.47
2900E	2,743,950	0.43
3000E	1,188,000	0.41
3100E	247,500	0.33
Total	9,803,062	0.47%
Zone G		
2600E	74,250	0.30
2700E	255,750	0.34
Total	330,000	0.33%
Zone H		
2600E	99,000	0.35
2700E	143,962	0.32
Total	242,962	0.33%
Zone I		
2700E	32,175	0.32%

Total indicated to date 26,581,908 tonnes. 0.42% Ni.

PROFILES



A/S SULFIDMALM	
Blocks used for calculating mineral inventory in eastern area.	
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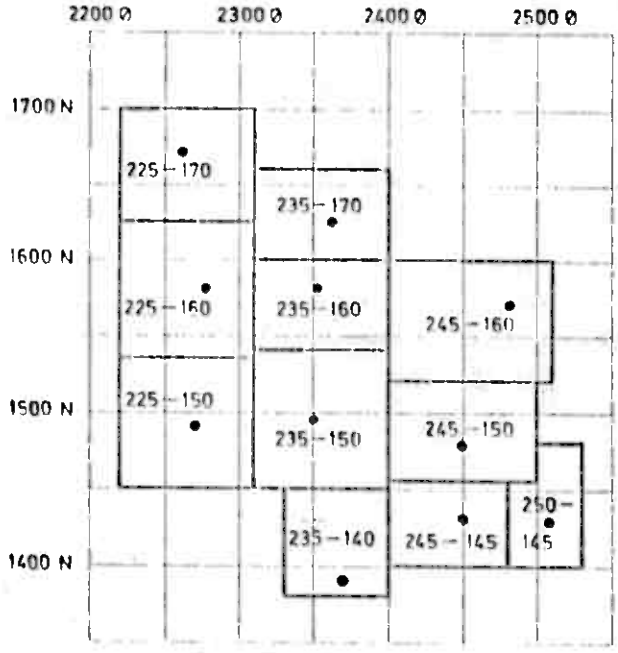
DATE	TRACED



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Blocks used in calculating mineral inventory for Zone B	
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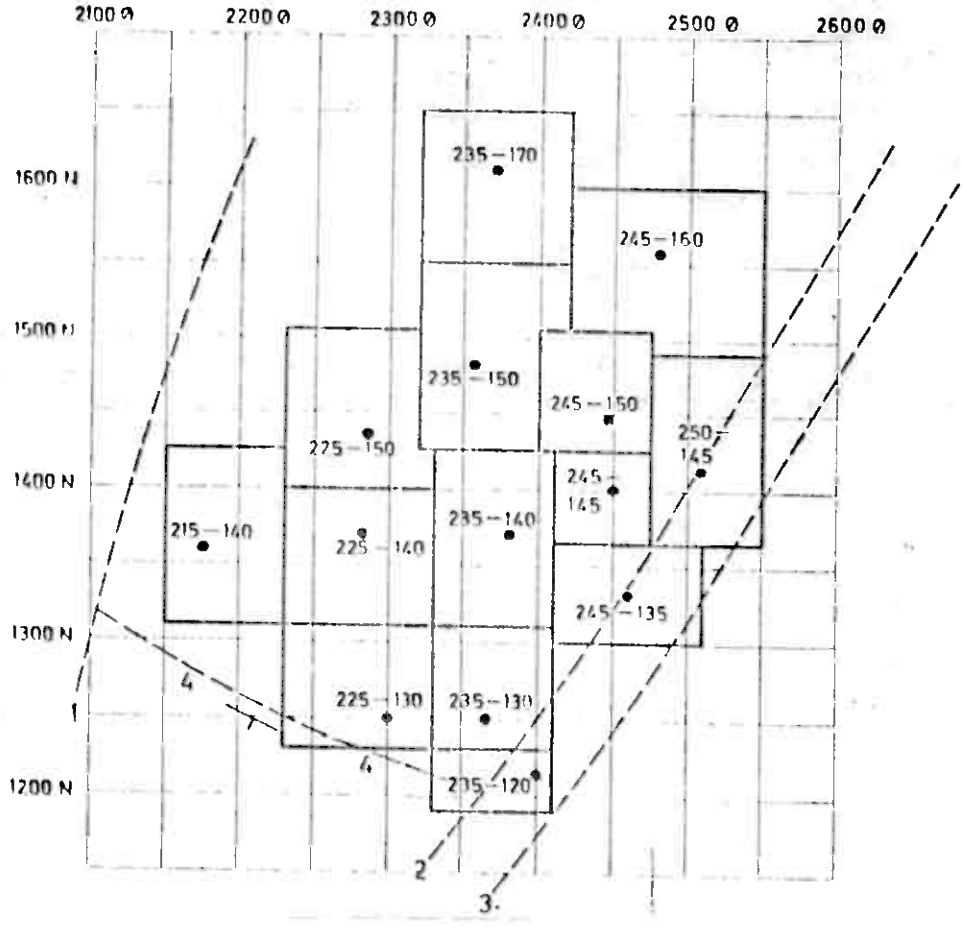
DATE	TRACED



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Blocks used for calculating mineral inventory for Zone A	
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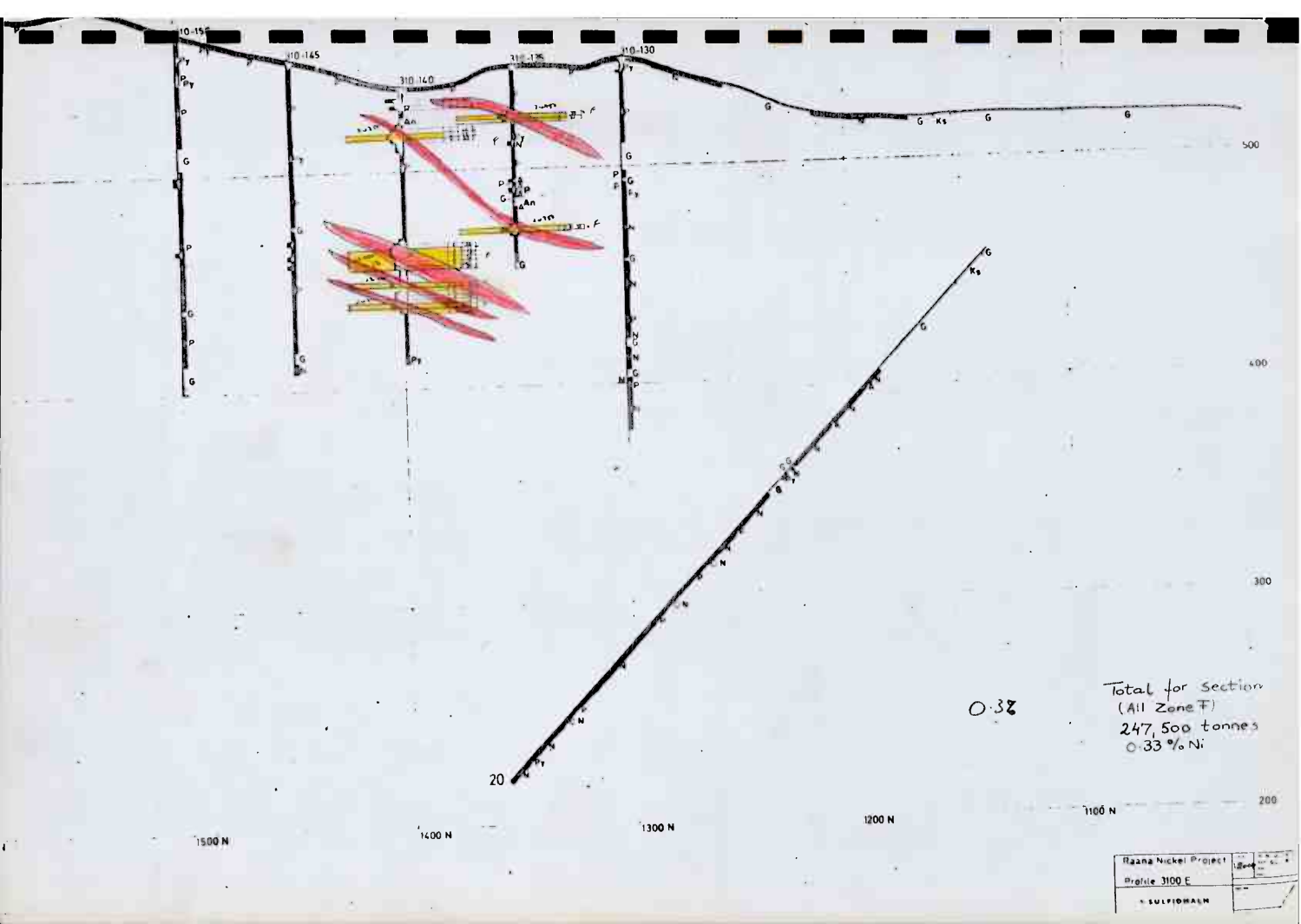
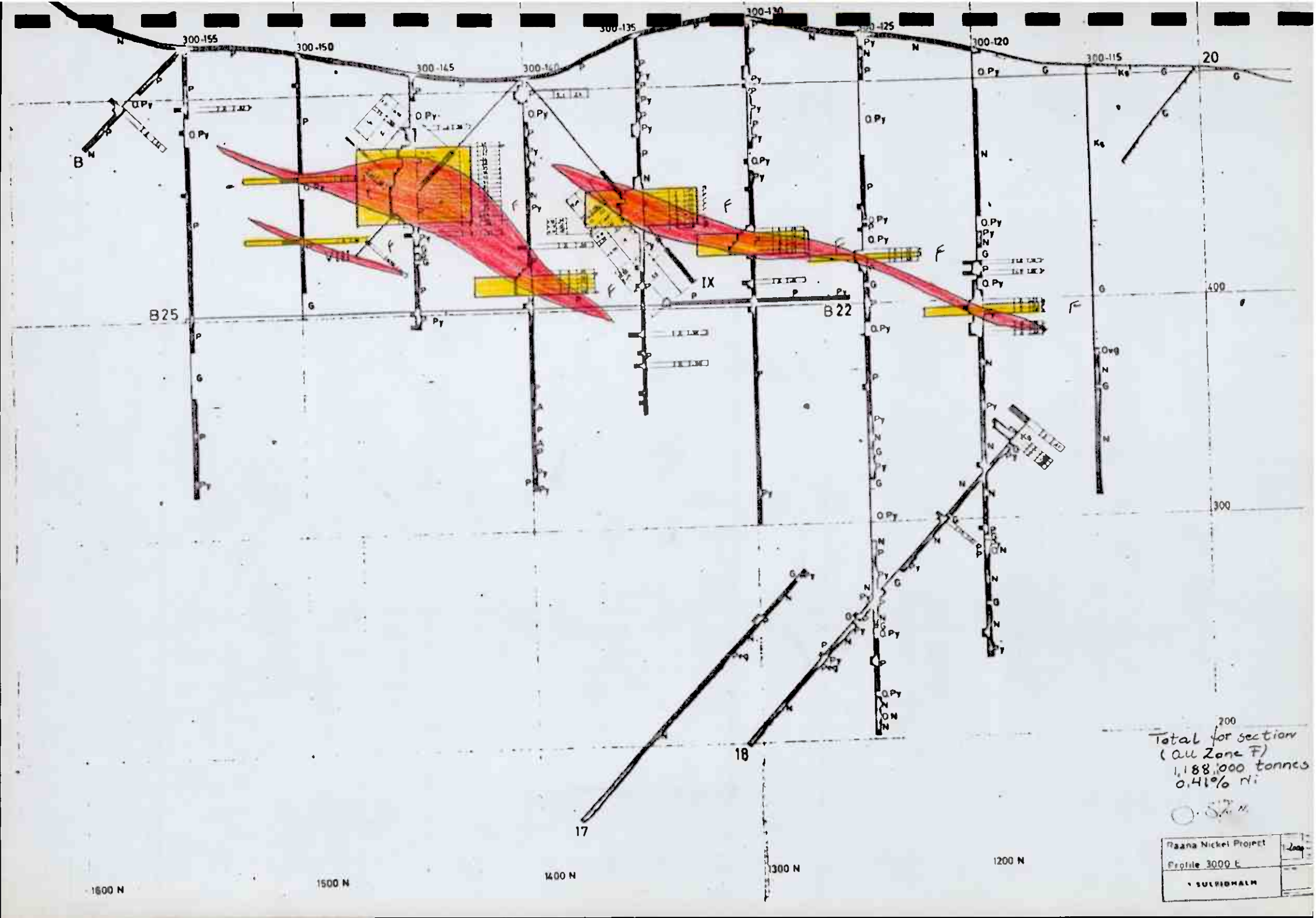
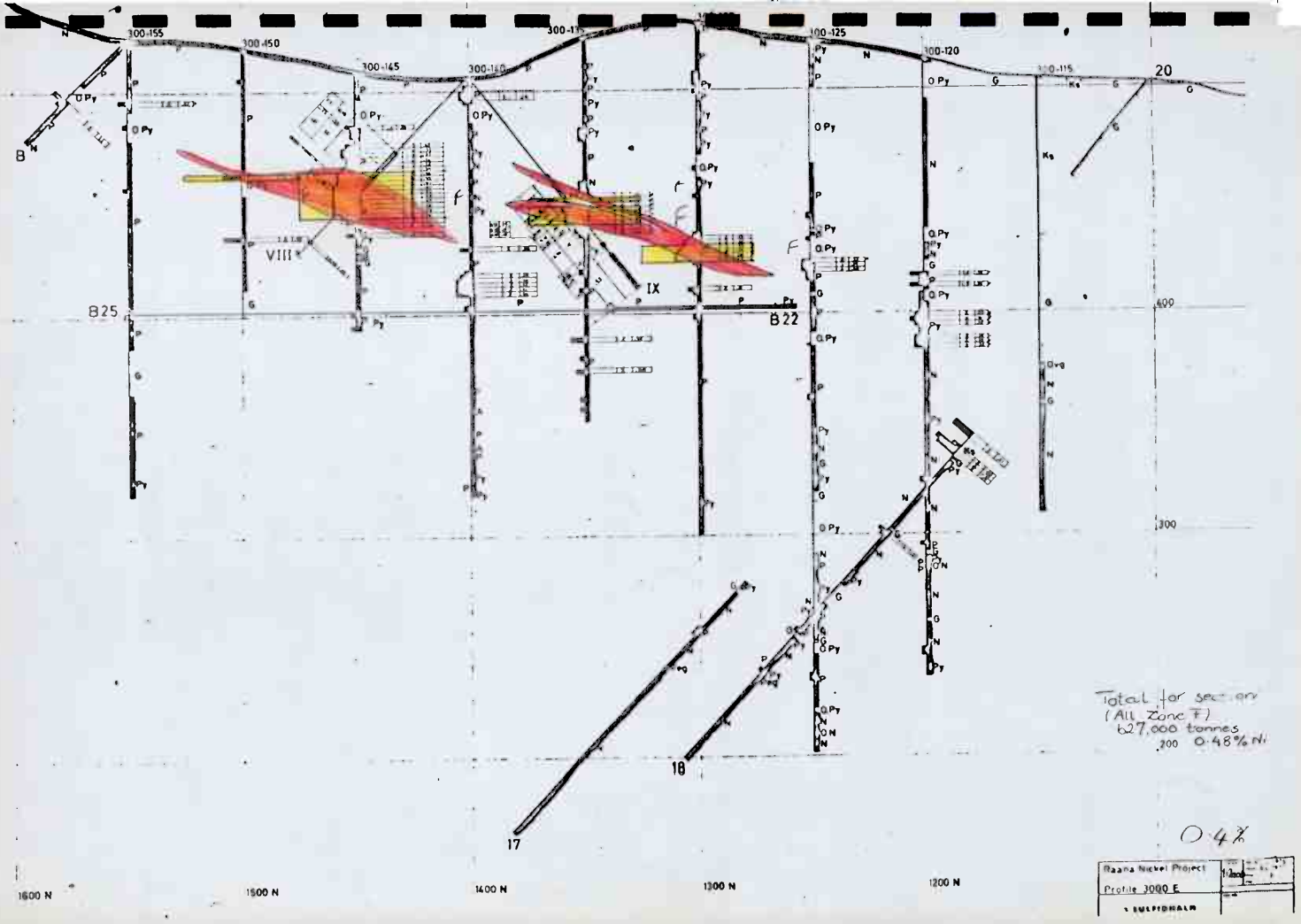
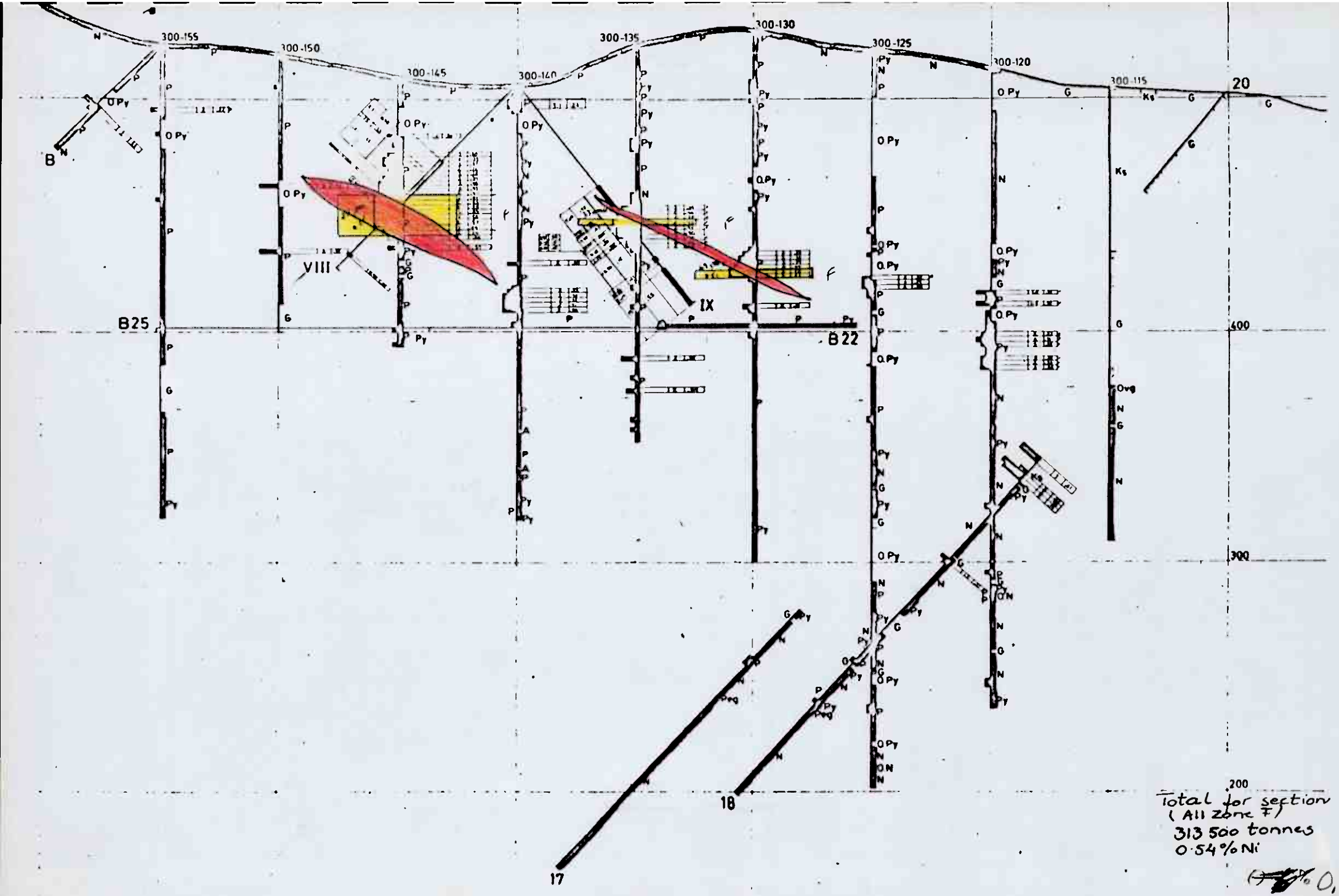
DATE	TRACED


310-150
310-145
310-140
310-135
310-130
500
400
300
200
20
1500 N
1400 N
1300 N
1200 N
1100 N
0.3%
Total for Section
(All Zone F)
247,500 tonnes
0.33 % Ni
Raana Nickel Project
Profile 3100 E
SULPHIDE


300-155
300-150
300-145
300-140
300-135
300-130
300-125
300-120
300-115
20
B
B25
B22
IX
F
O.Py
Py
P
N
G
Ks
Qwg
400
300
200
18
17
1600 N
1500 N
1400 N
1300 N
1200 N
Total for section
(all Zone F)
1,188,000 tonnes
0.41% Ni
Raana Nickel Project
Profile 3000 E
SULPHIDMATH

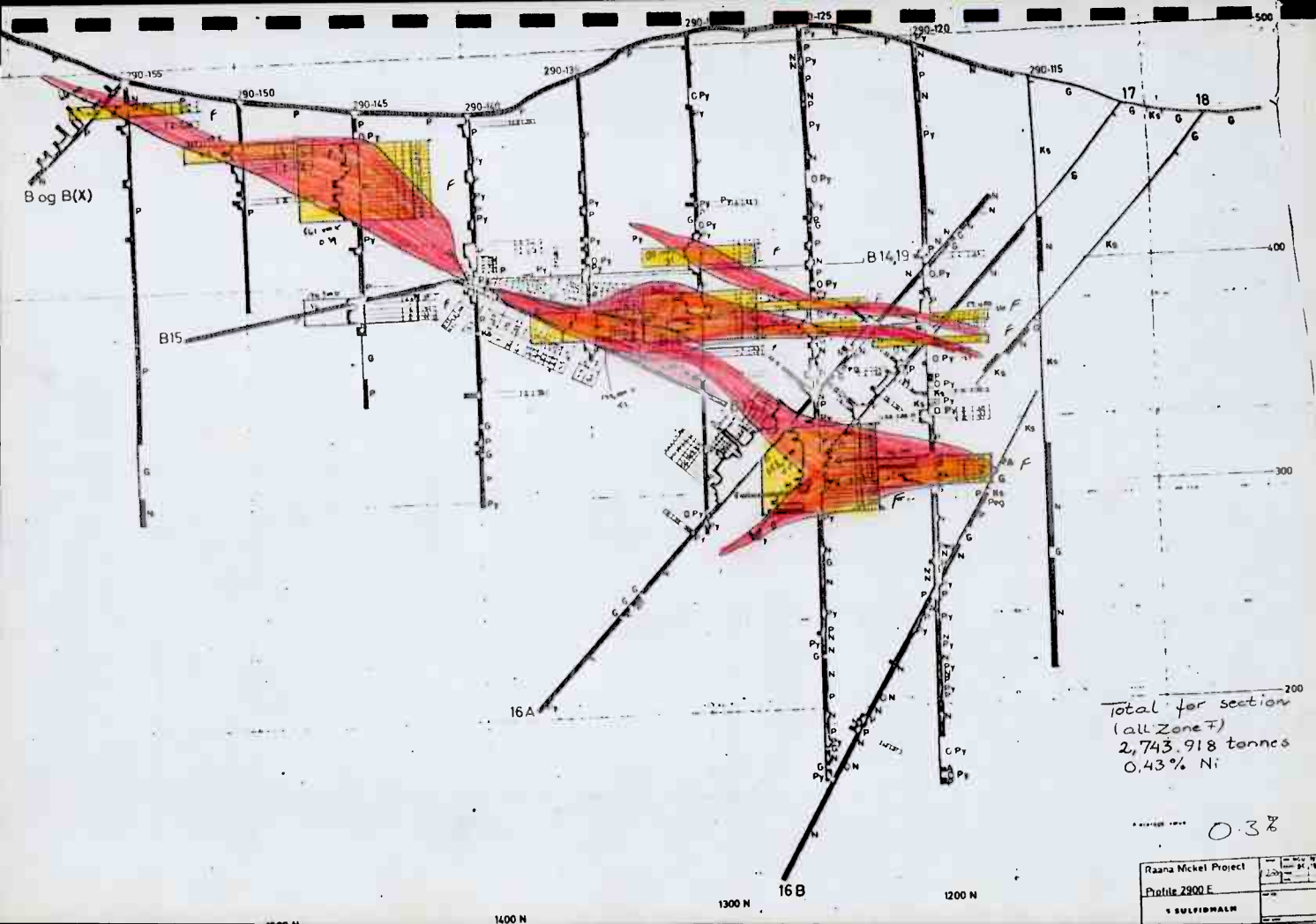

300-155
300-150
300-145
300-140
300-135
300-130
300-125
300-120
300-115
B
B25
B22
VIII
IX
20
400
300
18
17
1600 N
1500 N
1400 N
1300 N
1200 N
Total for section
(All Zone F)
627,000 tonnes
0.48% Ni
0.4%
Raana Nickel Project
Profile 3000 E
1:200
SULPHIDEALM

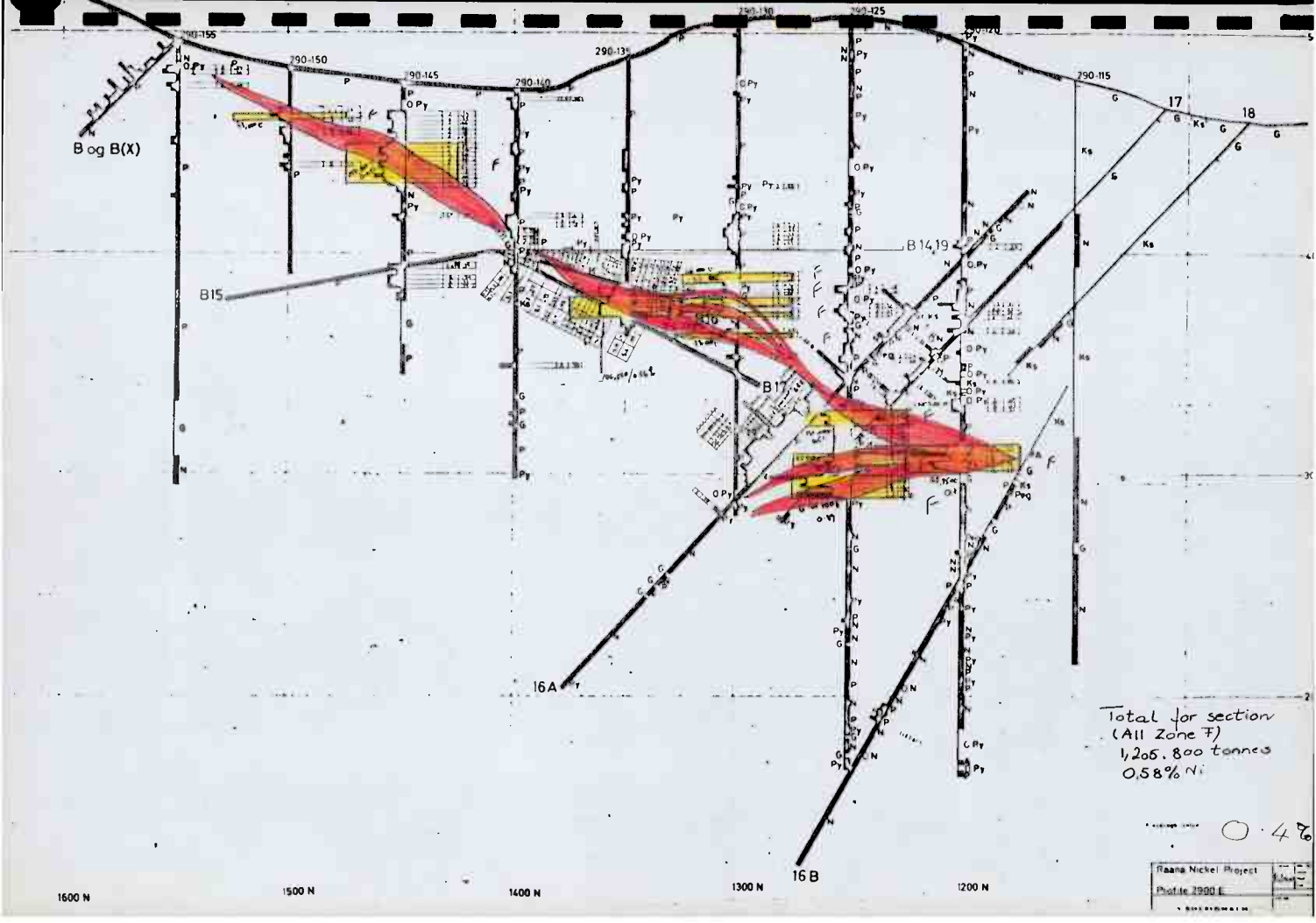


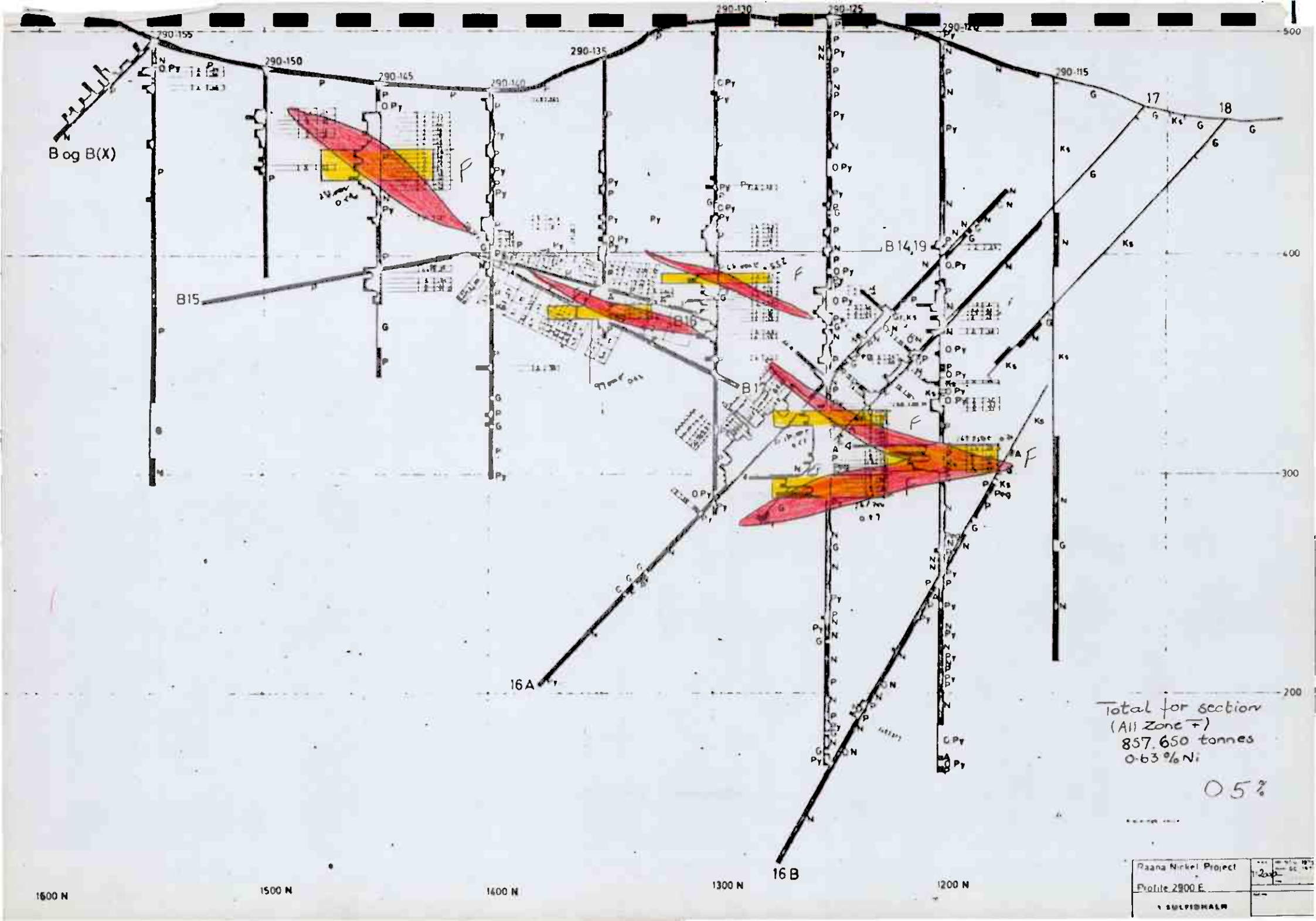
Total for section
(All zone F)
313 500 tonnes
0·54% Ni

~~0,5%~~

Raana Nickel Project
Profile 3000 E


290-155
290-150
290-145
290-140
290-135
290-125
290-120
290-115
B og B(X)
B15
B14,19
16A
16B
17
18
500
400
300
200
1400 N
1300 N
1200 N
Total for section
(all Zone F)
2,743.918 tonnes
0,43% Ni
0.3%
Raana Nickel Project
Profile 2900 E
% SULFIDHALT

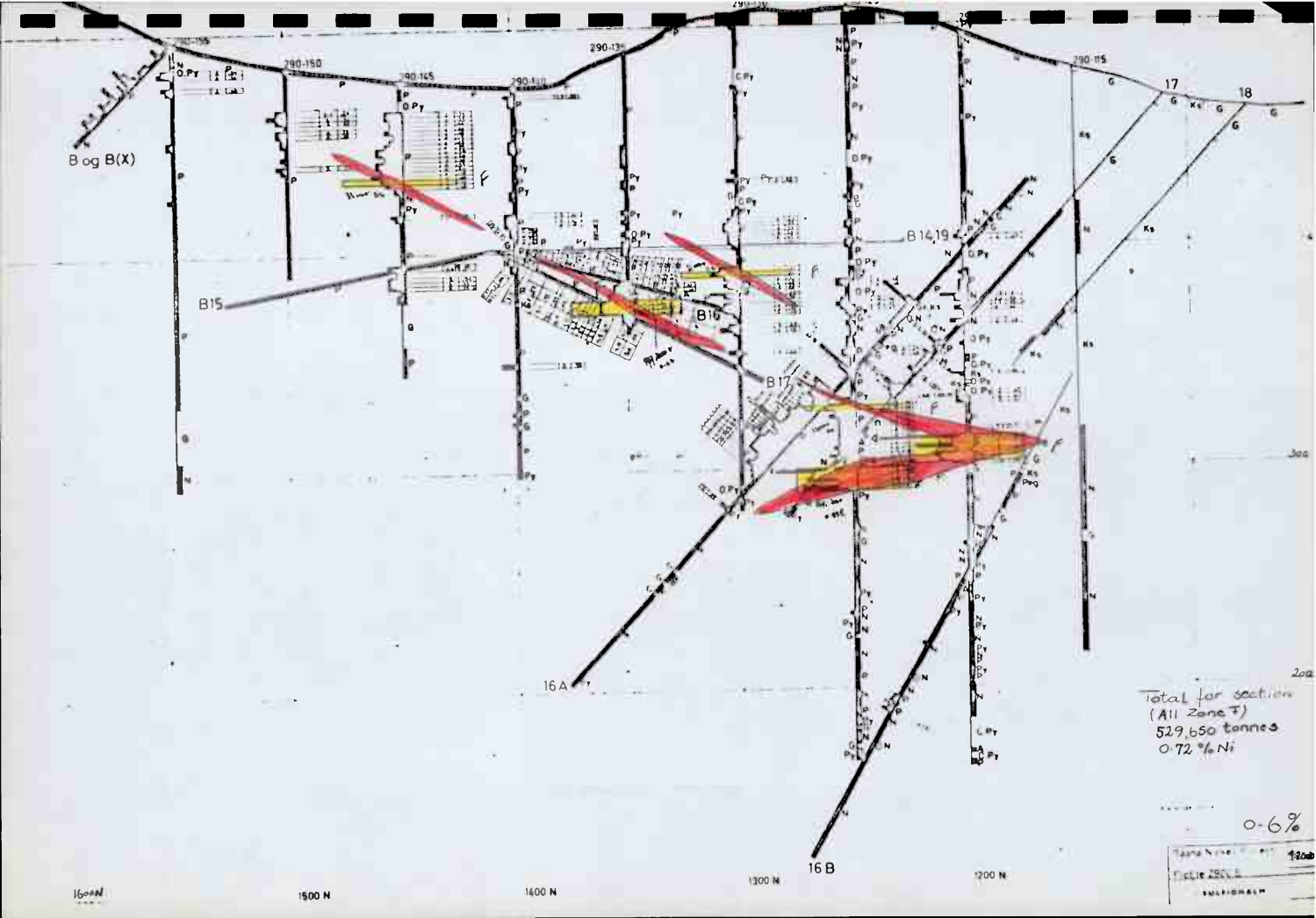

290-155
290-150
290-145
290-140
290-135
290-130
290-125
290-120
290-115
B og B(X)
B15
B16
B17
B 14,19
16 A
16 B
17
18
Total for section
(All Zone 7)
1,205,800 tonnes
0,58% Ni
0.4%
1600 N
1500 N
1400 N
1300 N
1200 N
Raana Nickel Project
Profile 2900 E

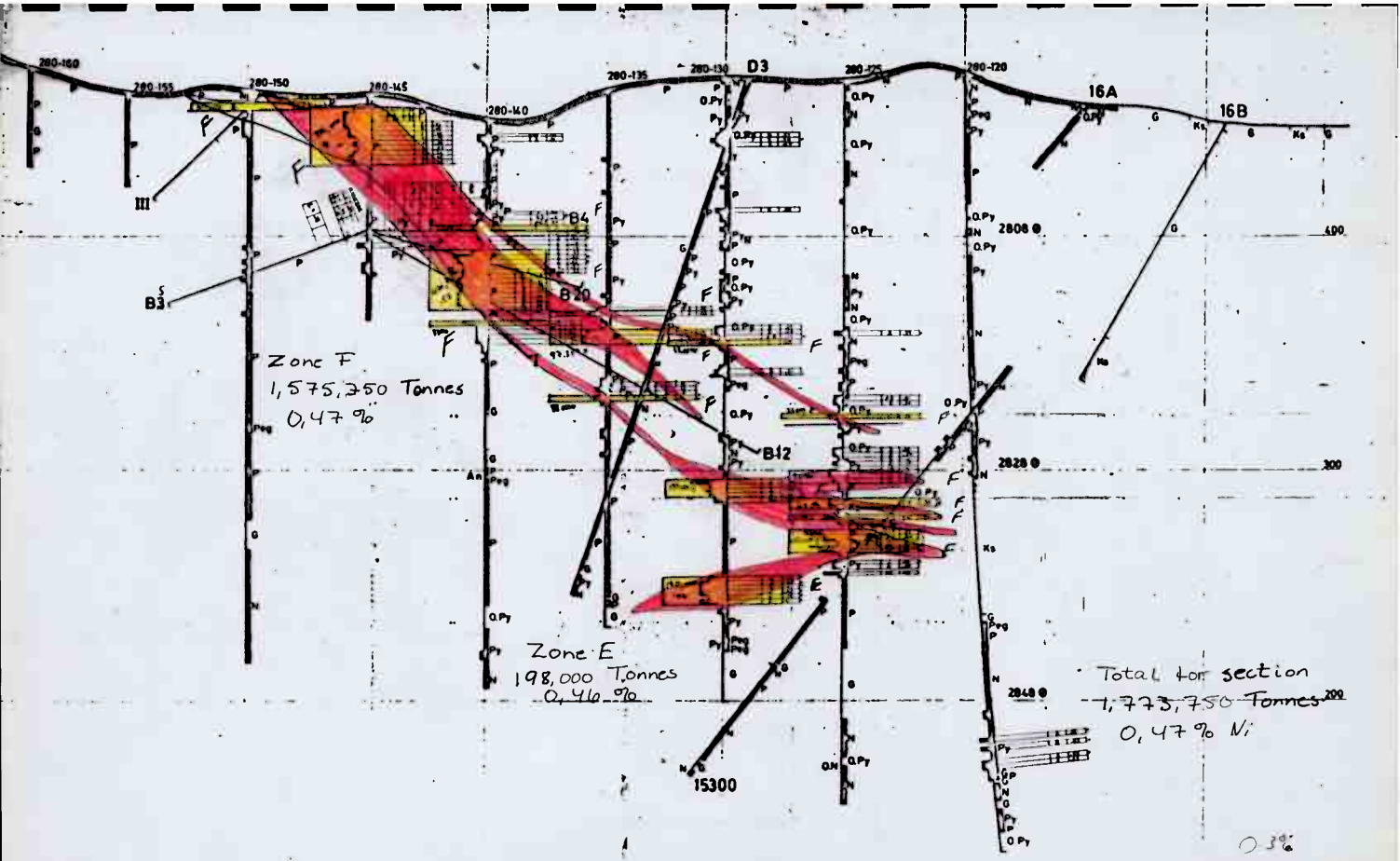


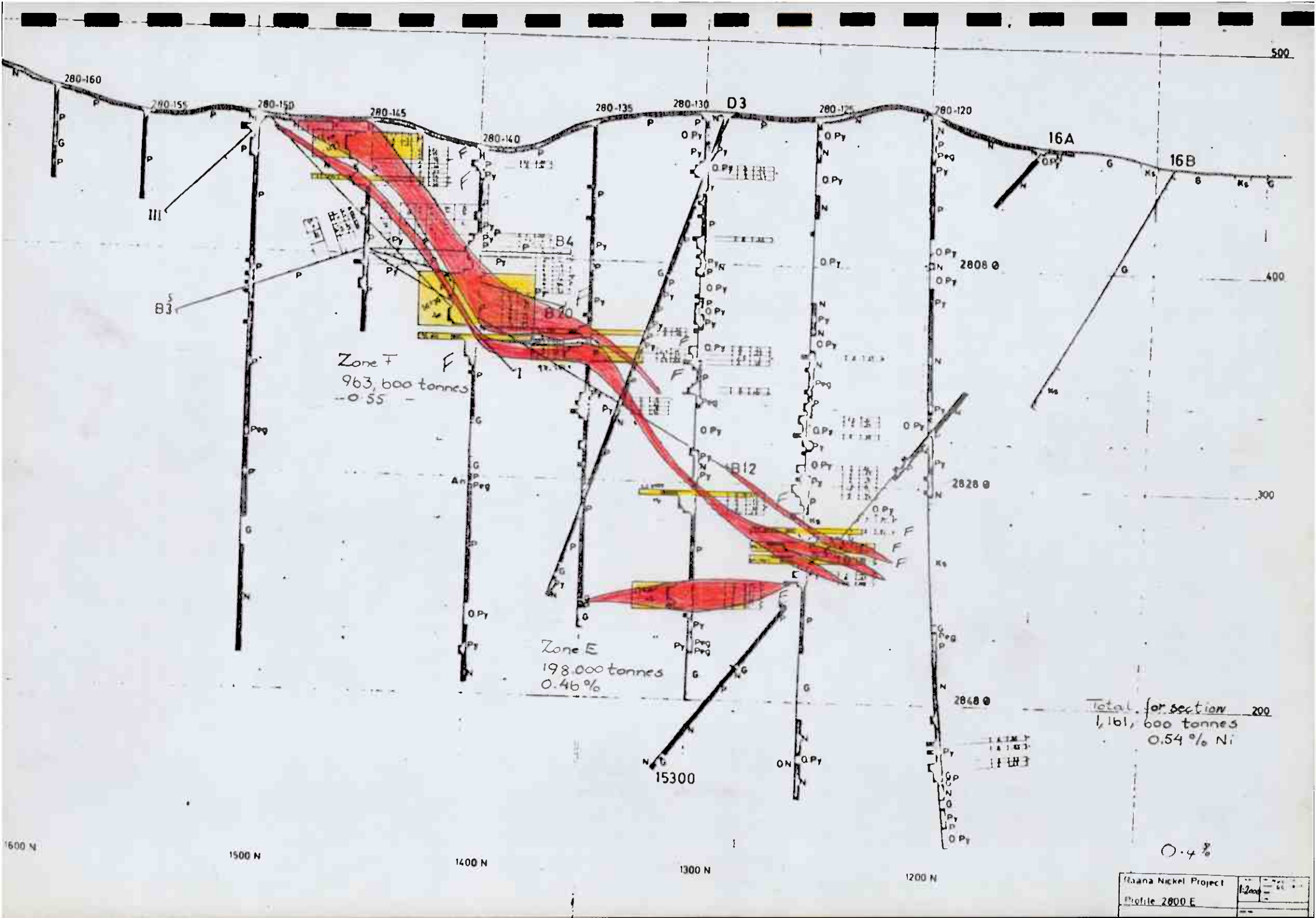
Total for section
(All Zone F)
857,650 tonnes
0.63 % Ni

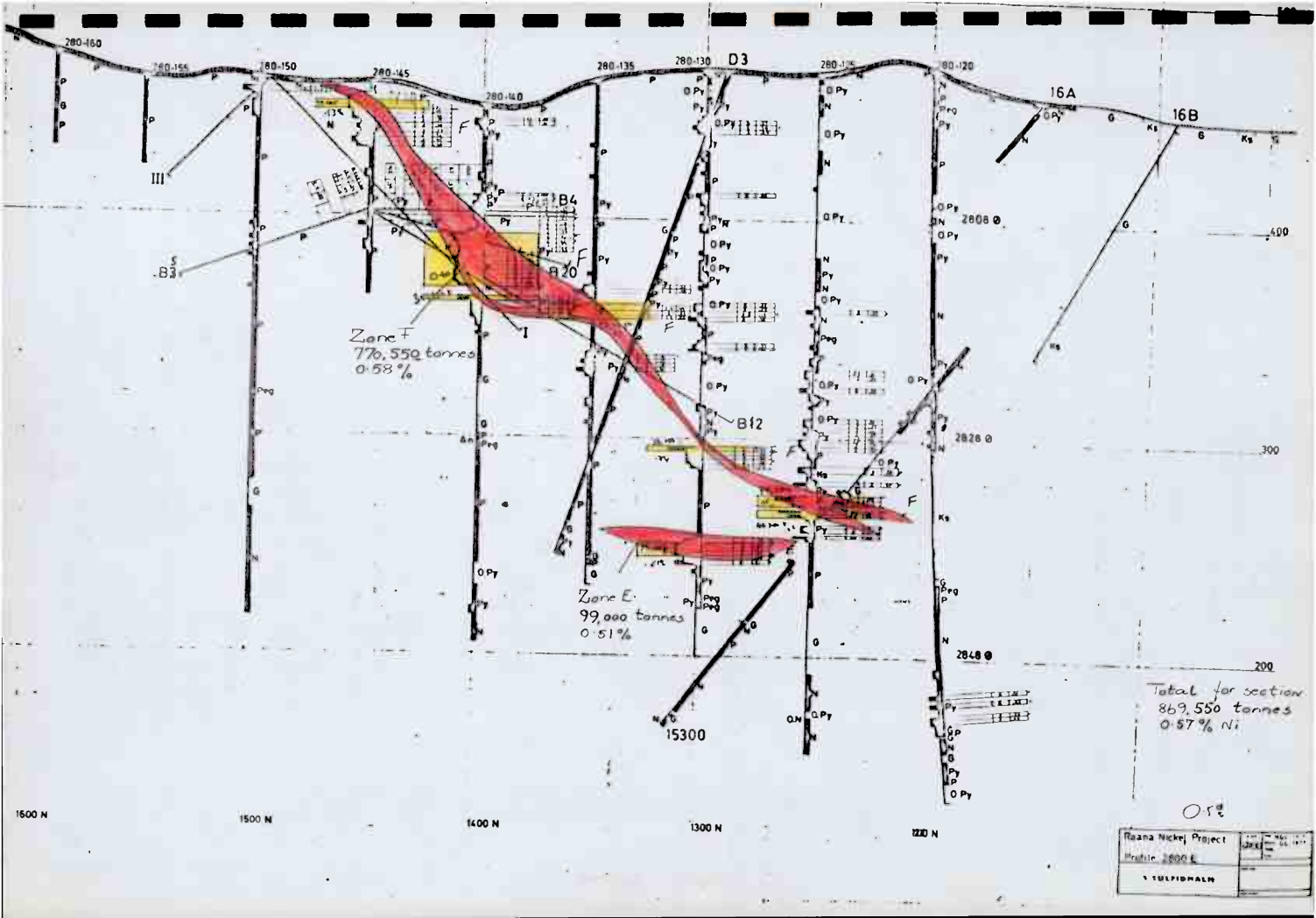
0.5 %

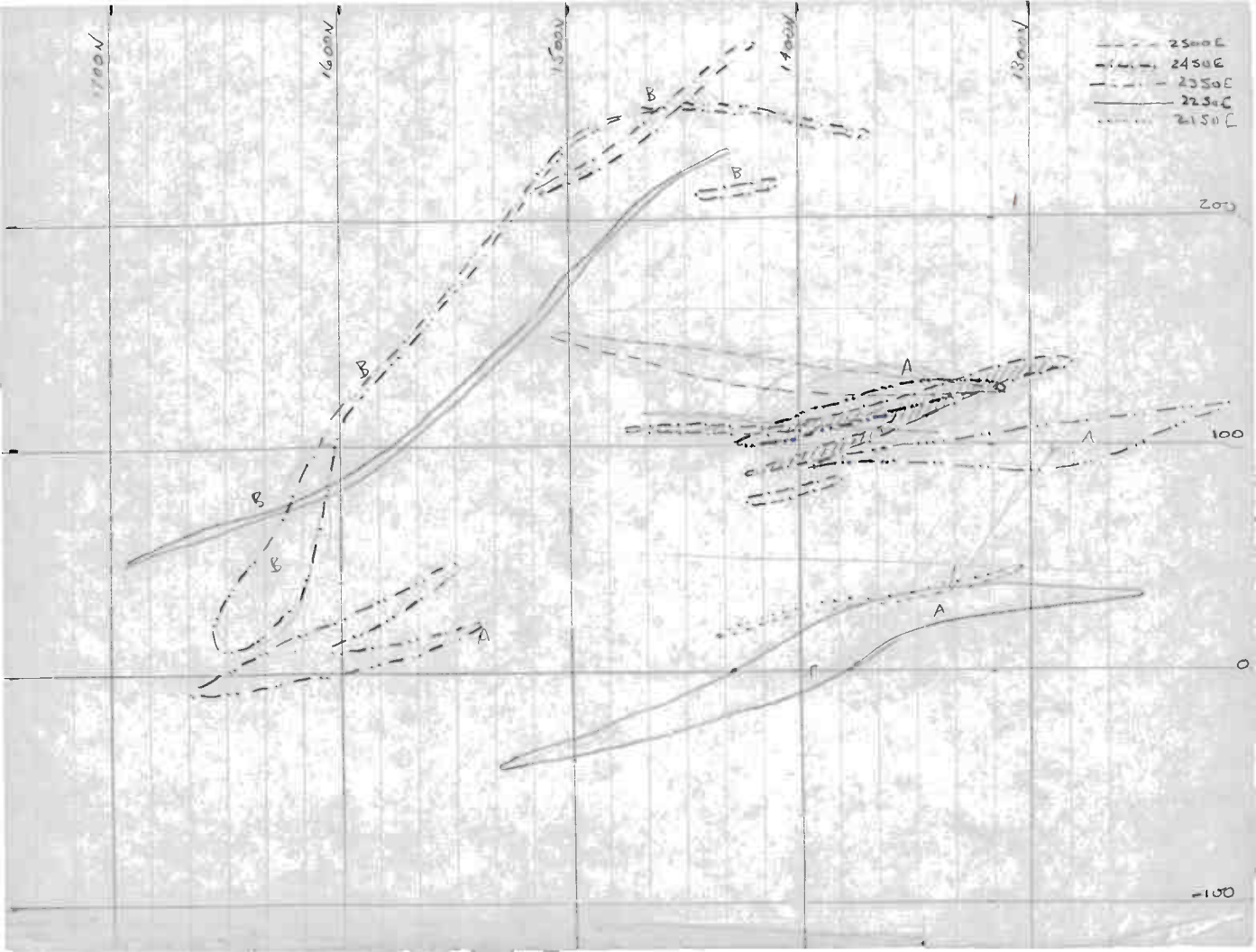
Raana Nickel Project
Profile 2900 E
1:2000
SULPHIDE

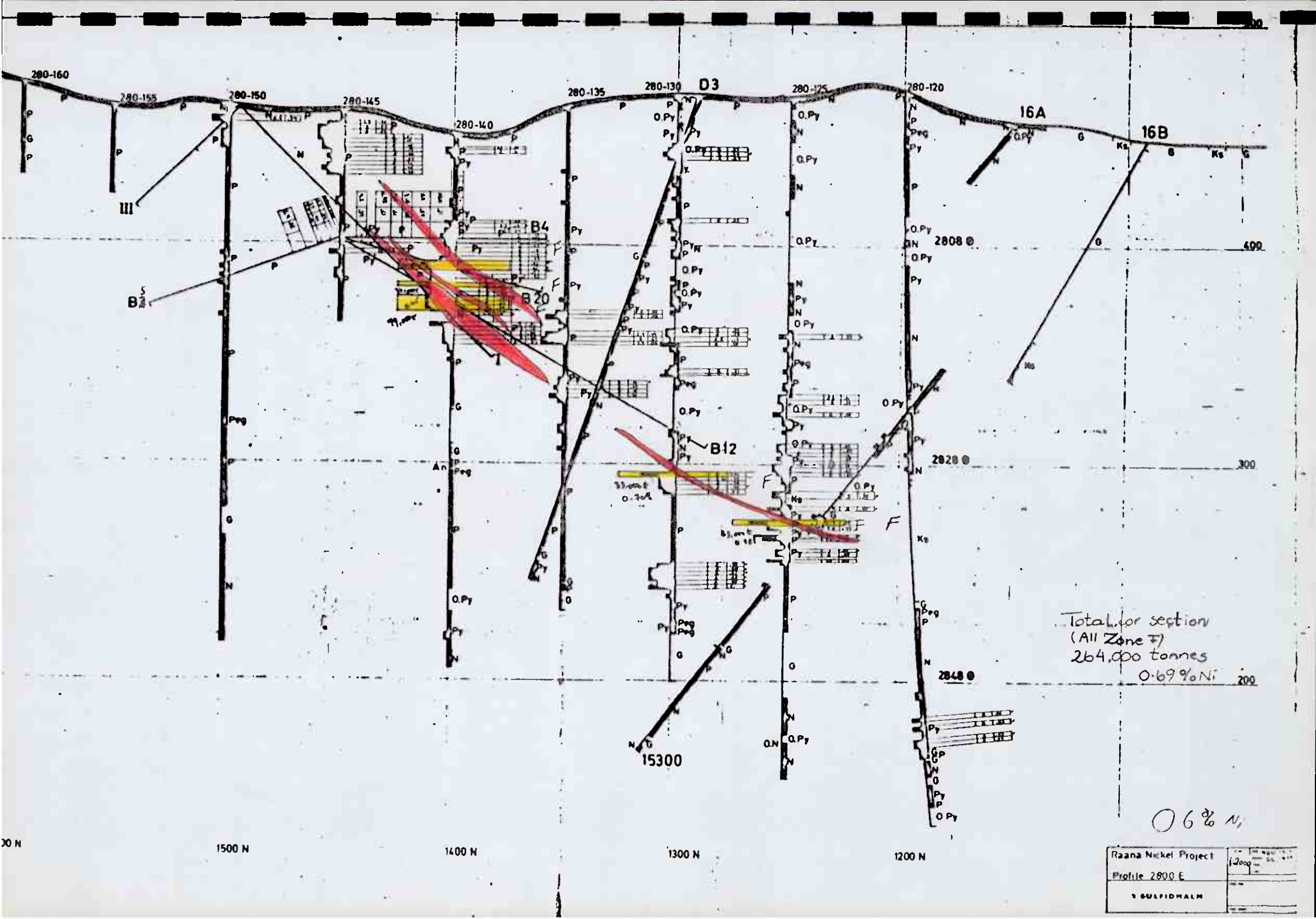

B og B(X)
290-150
290-145
290-140
290-135
290-115
17
18
B15
B16
B17
B 14,19
16 A
16 B
Total for section
(All Zone F)
529,650 tonnes
0·72 % Ni
0·6%
1600N
1500 N
1400 N
1300 N
1200 N

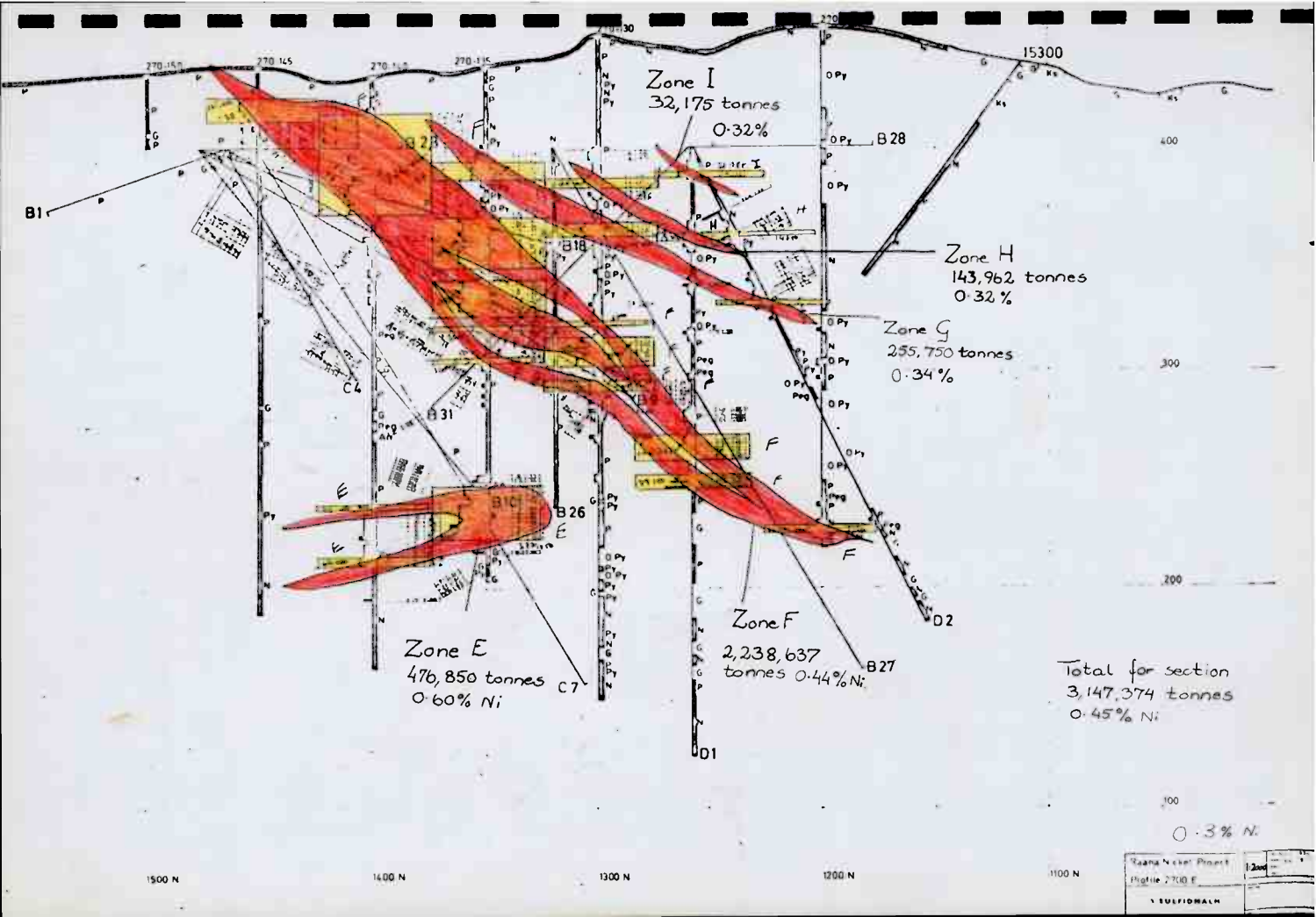

280-160
280-155
280-150
280-145
280-140
280-135
280-130
280-125
280-120
D3
16A
16B
III
B4
B20
B3
B12
Zone F
1,575,250 Tonnes
0,47 %
Zone E
198,000 Tonnes
0,46 %
Total for section
1,773,750 Tonnes
0,47 % Ni
2808
2828
2848
15300
1600 N
1500 N
1400 N
1300 N
1200 N
Rana Nickel Project
Profile 2800 E
1 SULFIDMALM

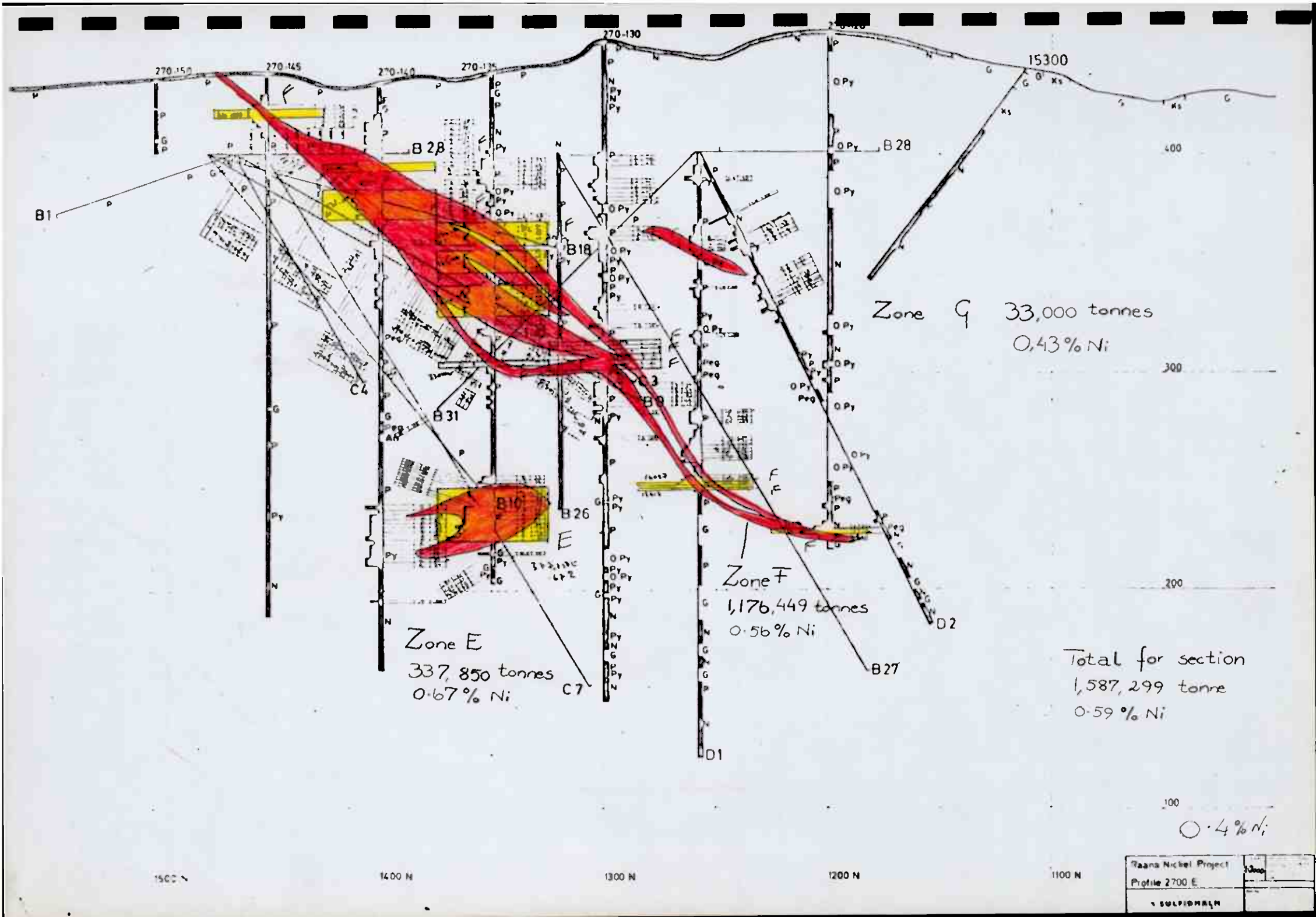

280-160
280-155
280-150
280-145
280-140
280-135
280-130
280-125
280-120
D3
16A
16B
III
B3
B4
B10
B12
2808 @
2828 @
2848 @
Zone F
963,600 tonnes
-0.55 -
Zone E
198,000 tonnes
0.46%
15300
Total for section
1,161,600 tonnes
0.54 % Ni
0.4 %
500
400
300
200
1600 N
1500 N
1400 N
1300 N
1200 N
Moana Nickel Project
Profile 2800 E
1:200

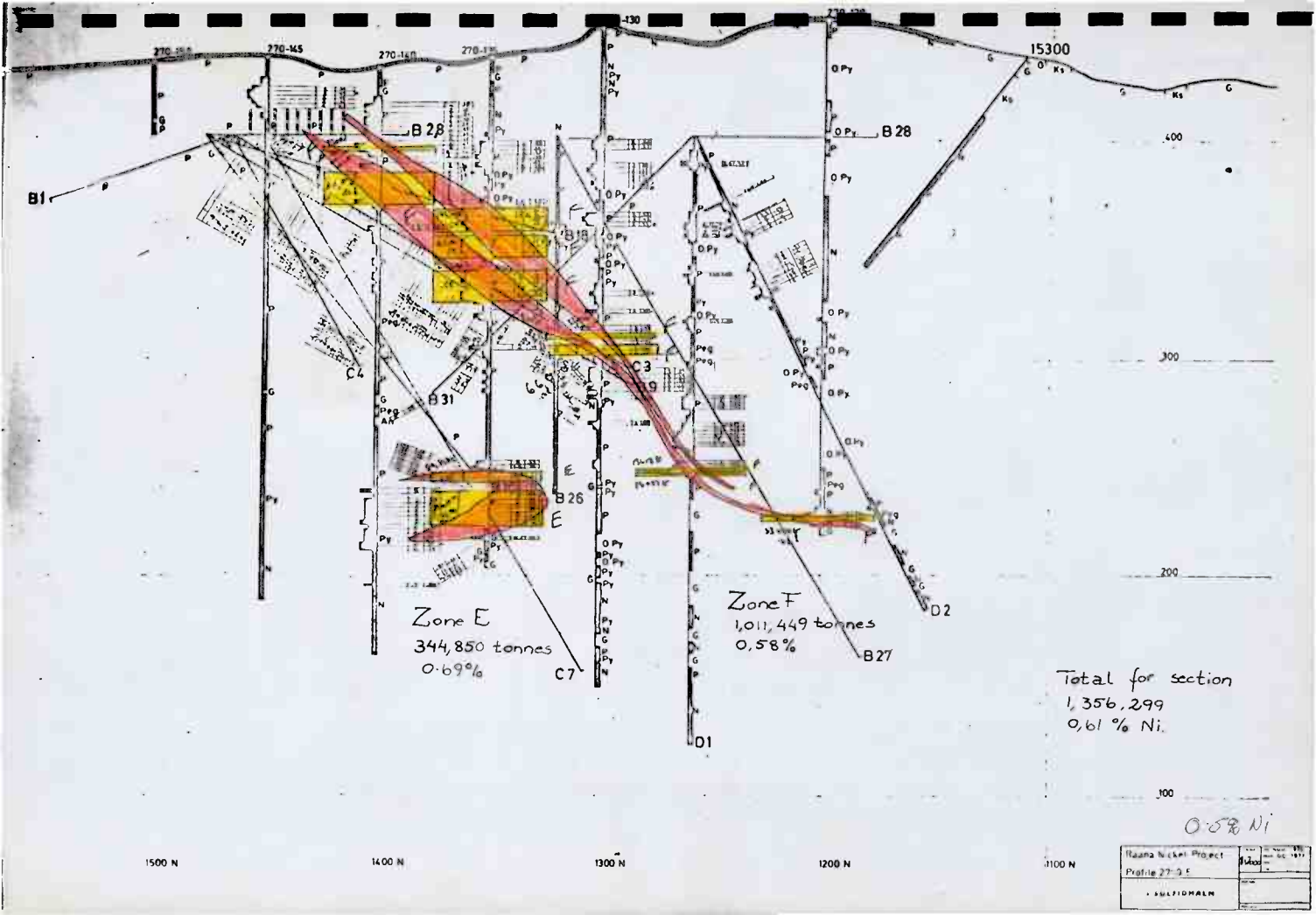

280-160
280-155
280-150
280-145
280-140
280-135
280-130
280-125
280-120
D3
16A
16B
III
B3
B4
B20
B12
I
F
Zone F
770,550 tonnes
0·58 %
Zone E
99,000 tonnes
0·51 %
15300
2808 0
2828 0
2848 0
400
300
200
Total for section
869,550 tonnes
0·57 % Ni
1600 N
1500 N
1400 N
1300 N
1200 N
Raana Nickel Project
Profile 1600 E
TULPIDMAIN

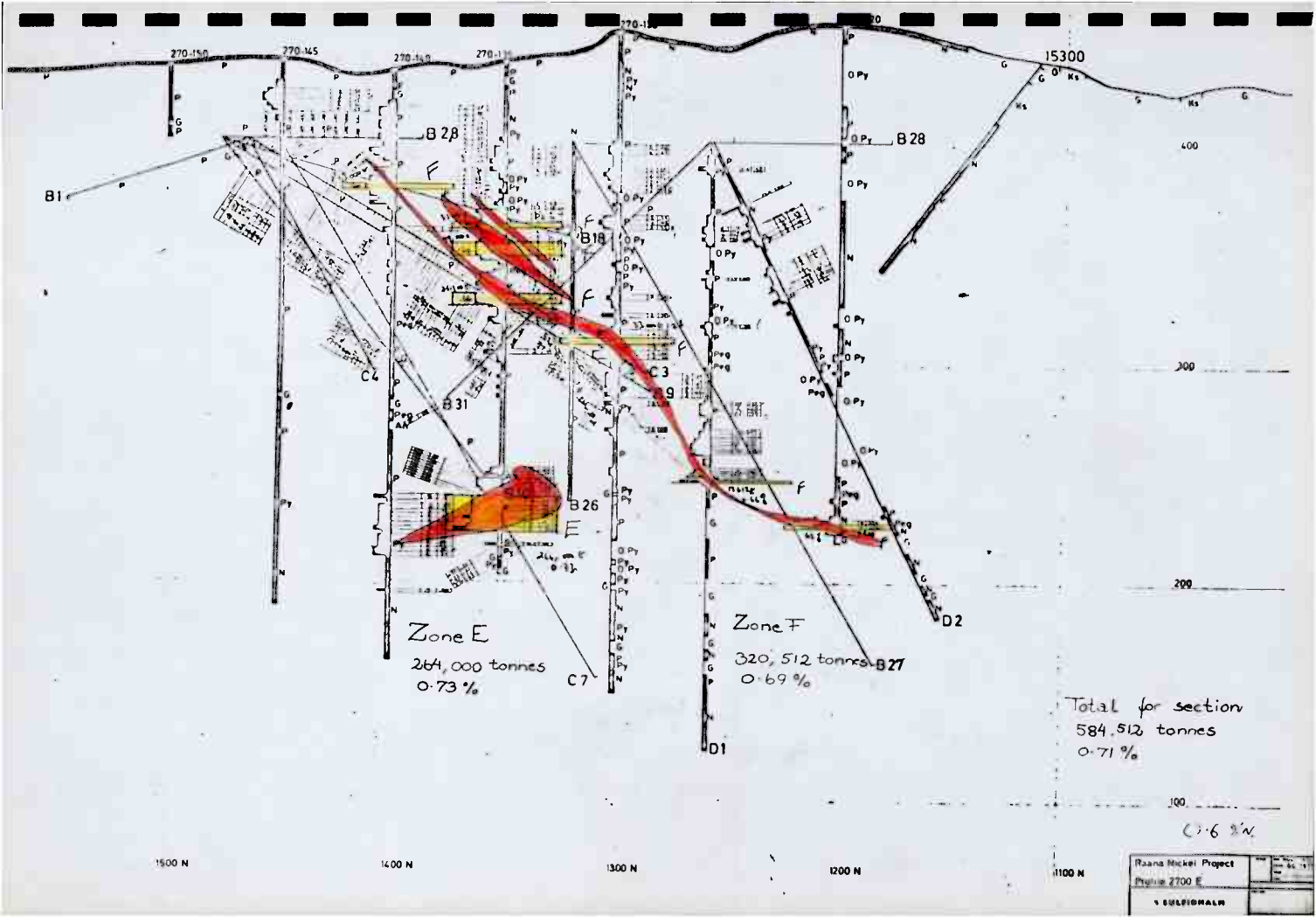

1700N
1600N
1500N
1400N
1300N
2350C
2450C
2350C
2250C
2150C
200
100
0
-100
A
B

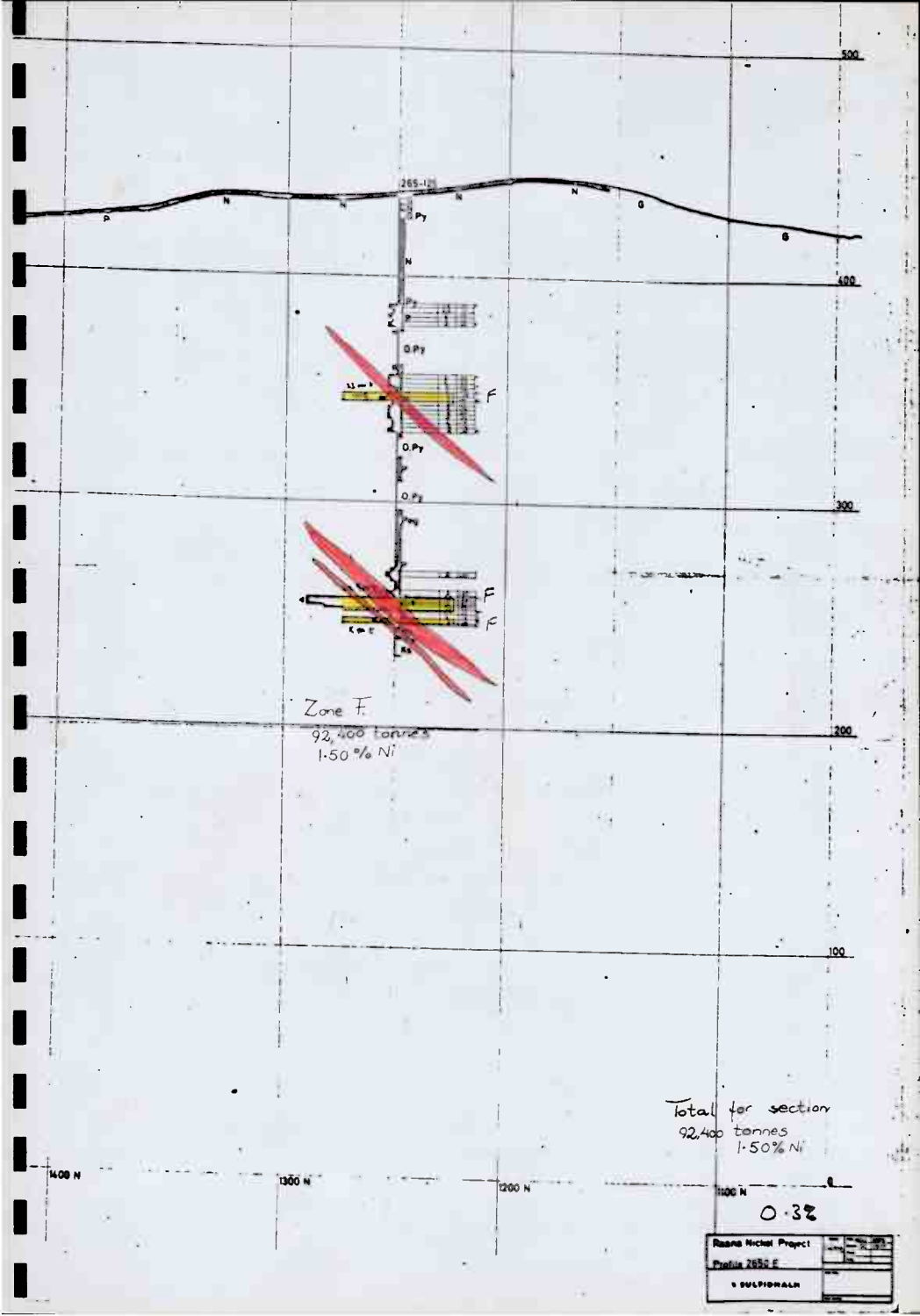

280-160
280-155
280-150
280-145
280-140
280-135
280-130
280-125
280-120
D3
16A
16B
III
B4
B20
B5
B12
2808 E
2828 E
2848 E
400
300
200
15300
1500 N
1400 N
1300 N
1200 N
Total for section
(All Zone 7)
264,000 tonnes
0·69 %Ni
0·6 % Ni
Raana Nickel Project
Profile 2800 E
SULFIDHALM
1:2000

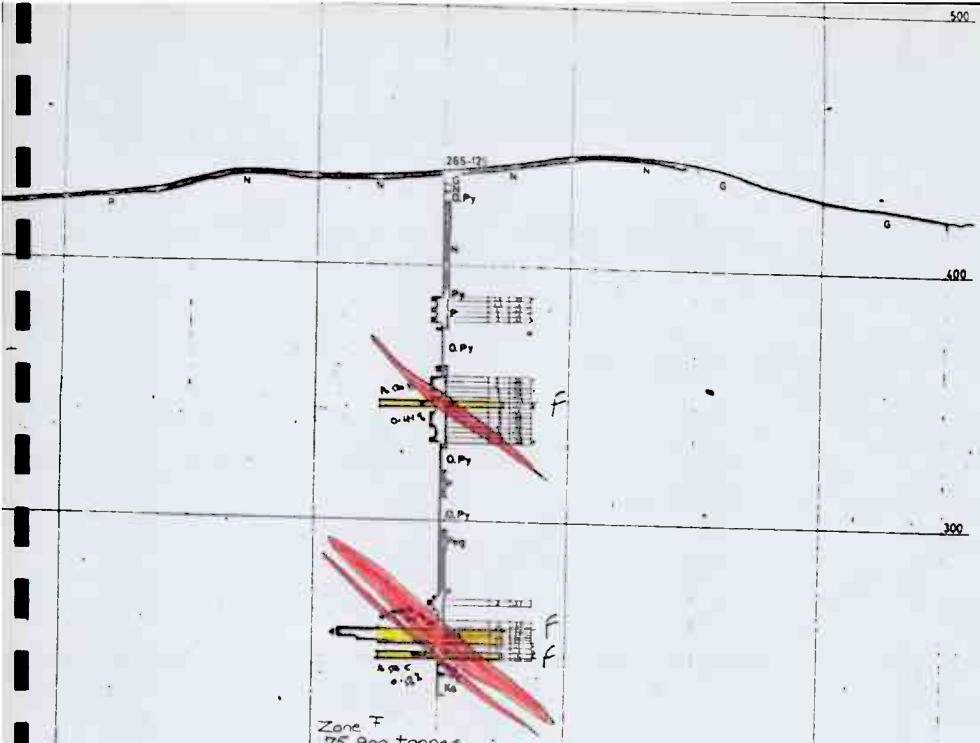

Zone I
32,175 tonnes
0·32%
Zone H
143,962 tonnes
0·32%
Zone G
255,750 tonnes
0·34%
Zone F
2,238,637
tonnes 0·44% Ni
Zone E
476,850 tonnes
0·60% Ni
Total for section
3,147,374 tonnes
0·45% Ni
0·3% Ni
B1
B18
B26
B27
B28
B31
C4
C7
D1
D2
15300
1500 N
1400 N
1300 N
1200 N
1100 N


270-150
270-145
270-140
270-135
270-130
15300
B1
B 2β
B 28
B18
B 31
B10
B 26
B9
C4
C3
C7
D1
D2
B27
Zone G
33,000 tonnes
0,43 % Ni
Zone F
1,176,449 tonnes
0·56 % Ni
Zone E
337,850 tonnes
0·67 % Ni
Total for section
1,587,299 tonne
0·59 % Ni
0·4 % Ni
400
300
200
100
1500 N
1400 N
1300 N
1200 N
1100 N
Raana Nickel Project
Profile 2700 E


270-145
270-140
270-135
430
15300
400
300
200
100
B1
B 2β
B 28
B18
C3
C4
B 31
B 26
C7
D1
D2
B27
Zone E
344,850 tonnes
0·69%
Zone F
1,011,449 tonnes
0,58%
Total for section
1,356,299
0,61 % Ni.
0·58 Ni
1500 N
1400 N
1300 N
1200 N
1100 N
Raana Nickel Project
Profile 27-0 E
SULFIDMALM


270-150
270-145
270-140
270-135
270-130
15300
B1
B2
B2A
B2B
B18
B28
B31
B26
B27
C3
C4
C7
C9
D1
D2
Zone E
264,000 tonnes
0·73 %
Zone F
320,512 tonnes
0·69 %
Total for section
584,512 tonnes
0·71 %
0·6 %N
400
300
200
100
1500 N
1400 N
1300 N
1200 N
1100 N
Raana Nickel Project
Profile 2700 E
1 SULPHIDES

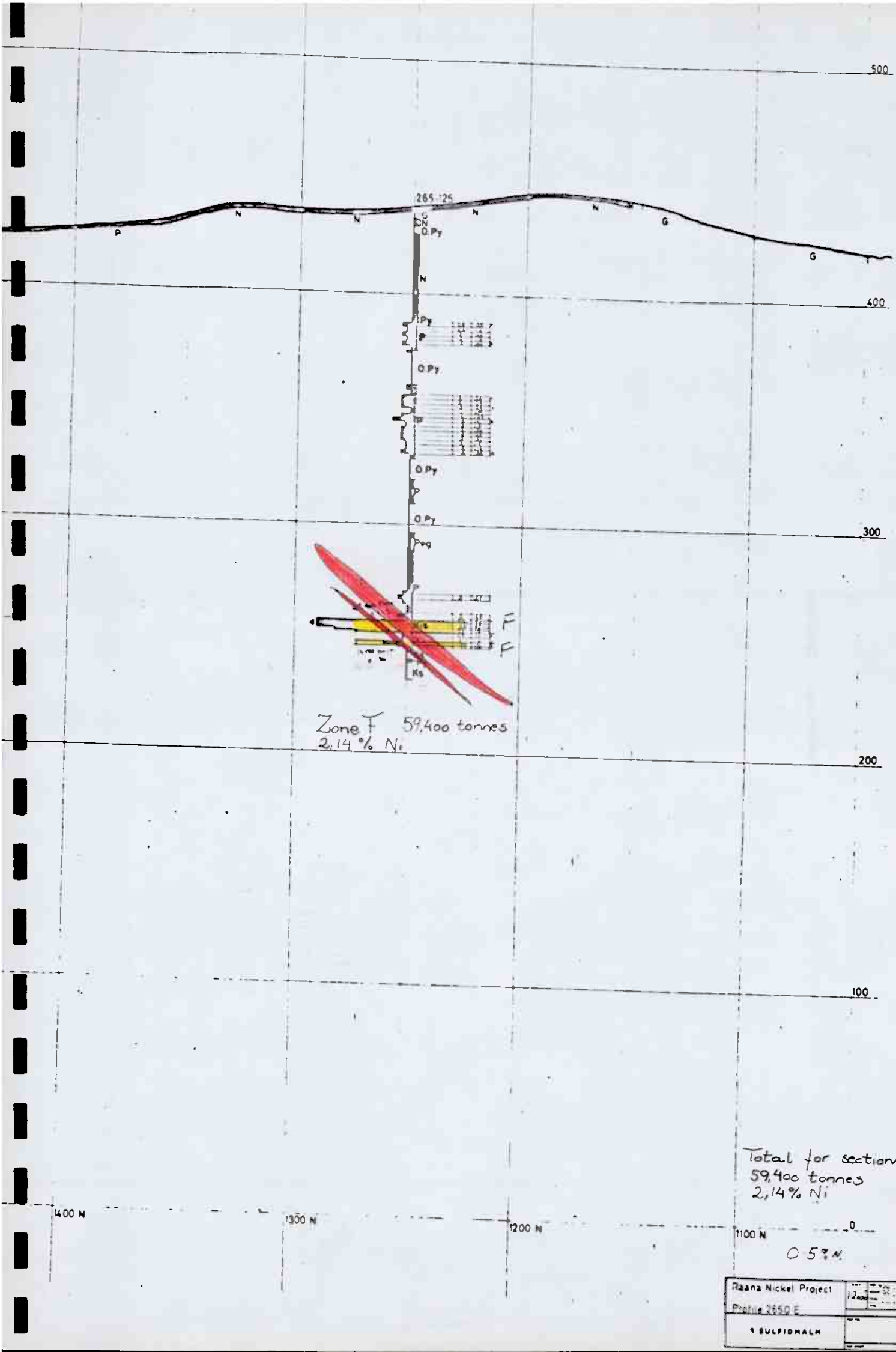

500
400
300
200
100
265-11
P
N
Py
O.Py
F
Zone F.
92,400 tonnes
1.50 % Ni
Total for section
92,400 tonnes
1.50% Ni
1400 N
1300 N
1200 N
1100 N
0
0.3%
Rabbit Nickel Project
Profile 2650 E
SULPHIDES



Total for section
75, 900 tonnes
1.76 % Ni

1400 N
1300 N
1200 N
1100 N
0
0.4% N,

Raana Nickel Project
Profile 2650 E
1:500
1 SULPHIDES


500
400
300
200
100
265.25
N
P
G
O.Py
Py
F
Ks
Zone F 59,400 tonnes
2,14 % Ni
1400 N
1300 N
1200 N
1100 N
0
0.5% N
Total for section
59,400 tonnes
2,14% Ni
Raana Nickel Project
Profile 2650 E
SULPIDMALM

500

400

300

200

100

0

265-125

P N N N N G G

0 Py

N

Py

P

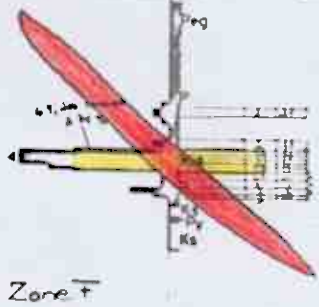
0 Py

0 Py

0 Py

Peg

Ks



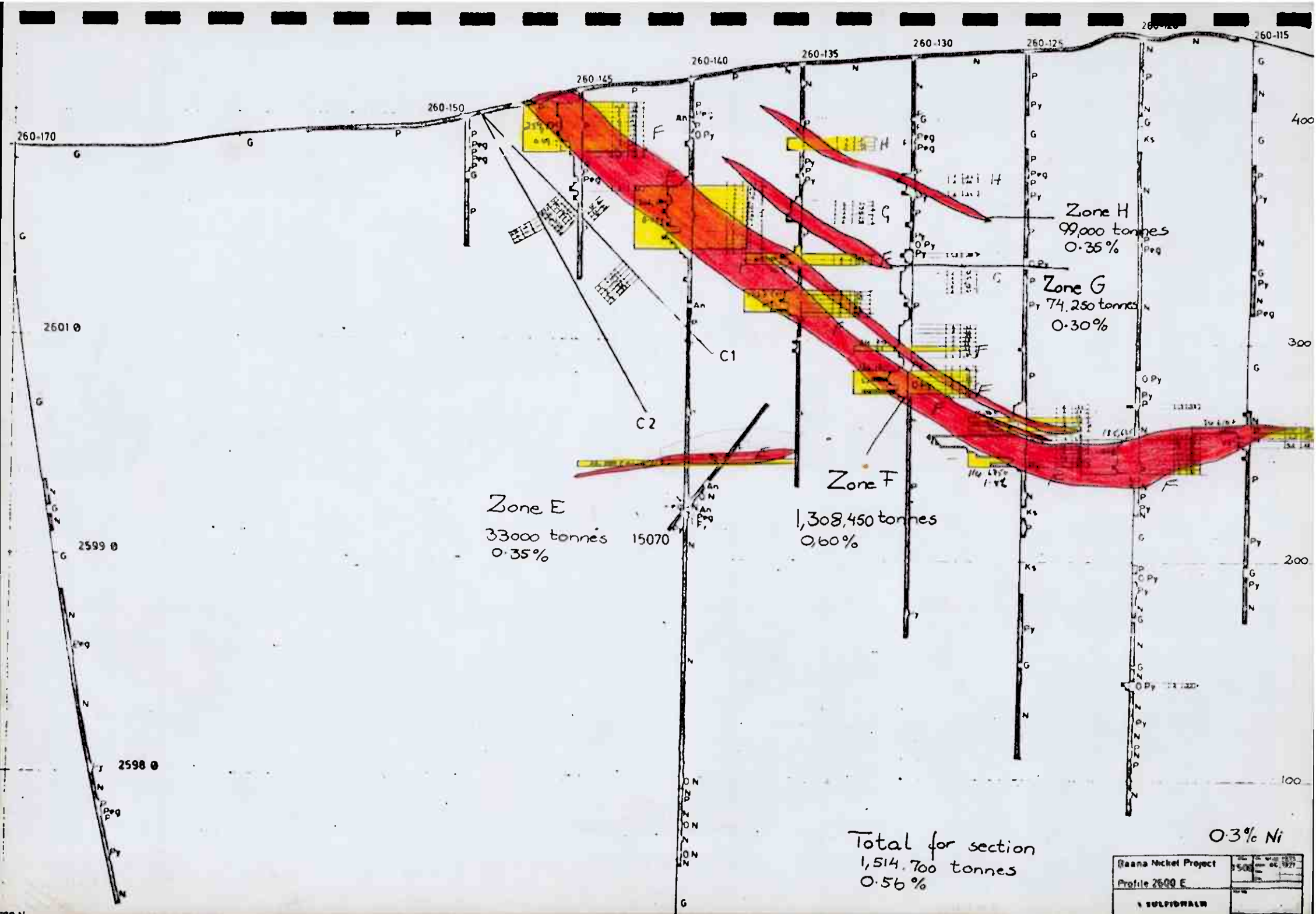
Zone F
42,900 tonnes
2,75 % Ni

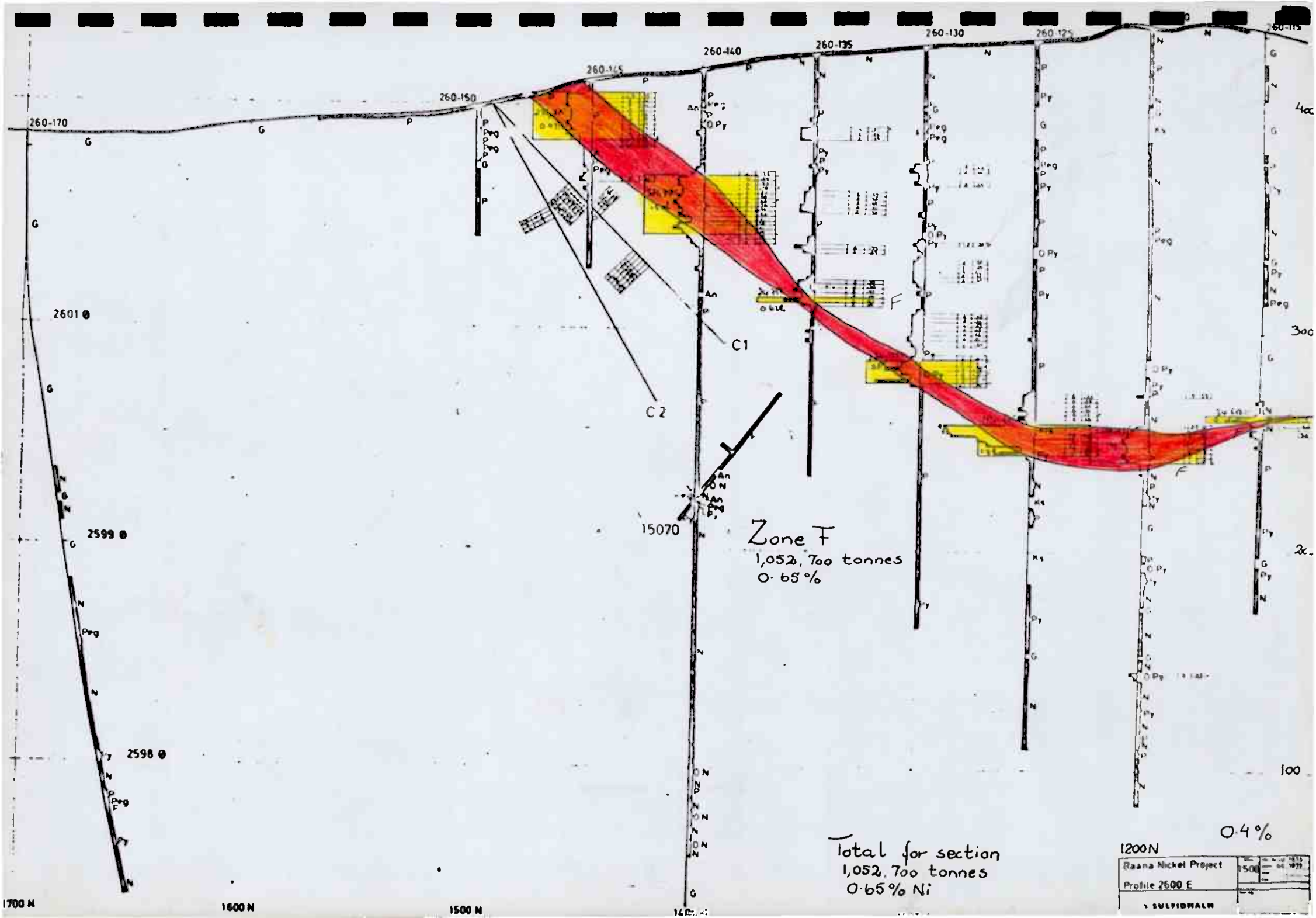
1400 N 1300 N 1200 N 1100 N

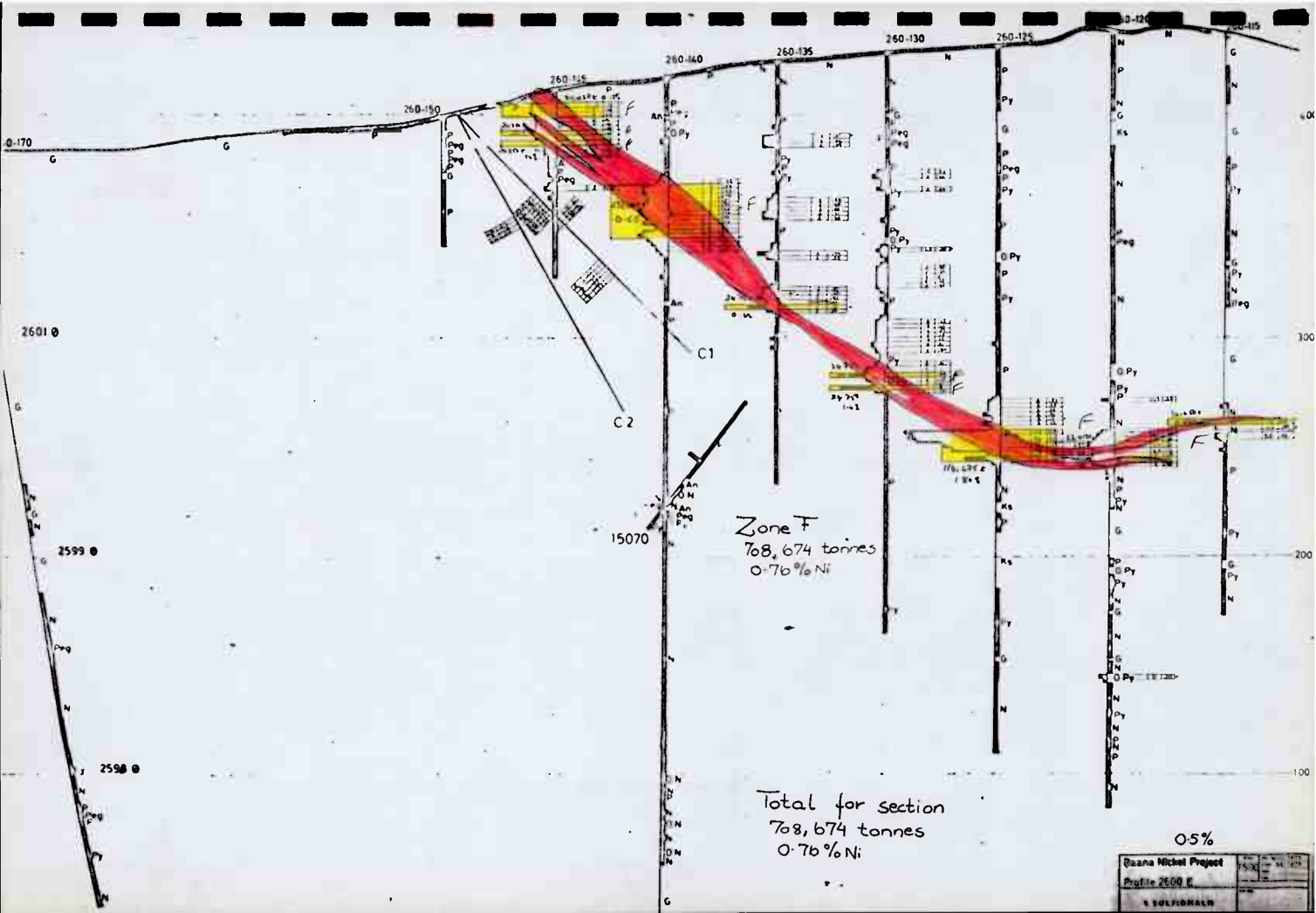
Total for section
42,900 tonnes
2,75 % Ni

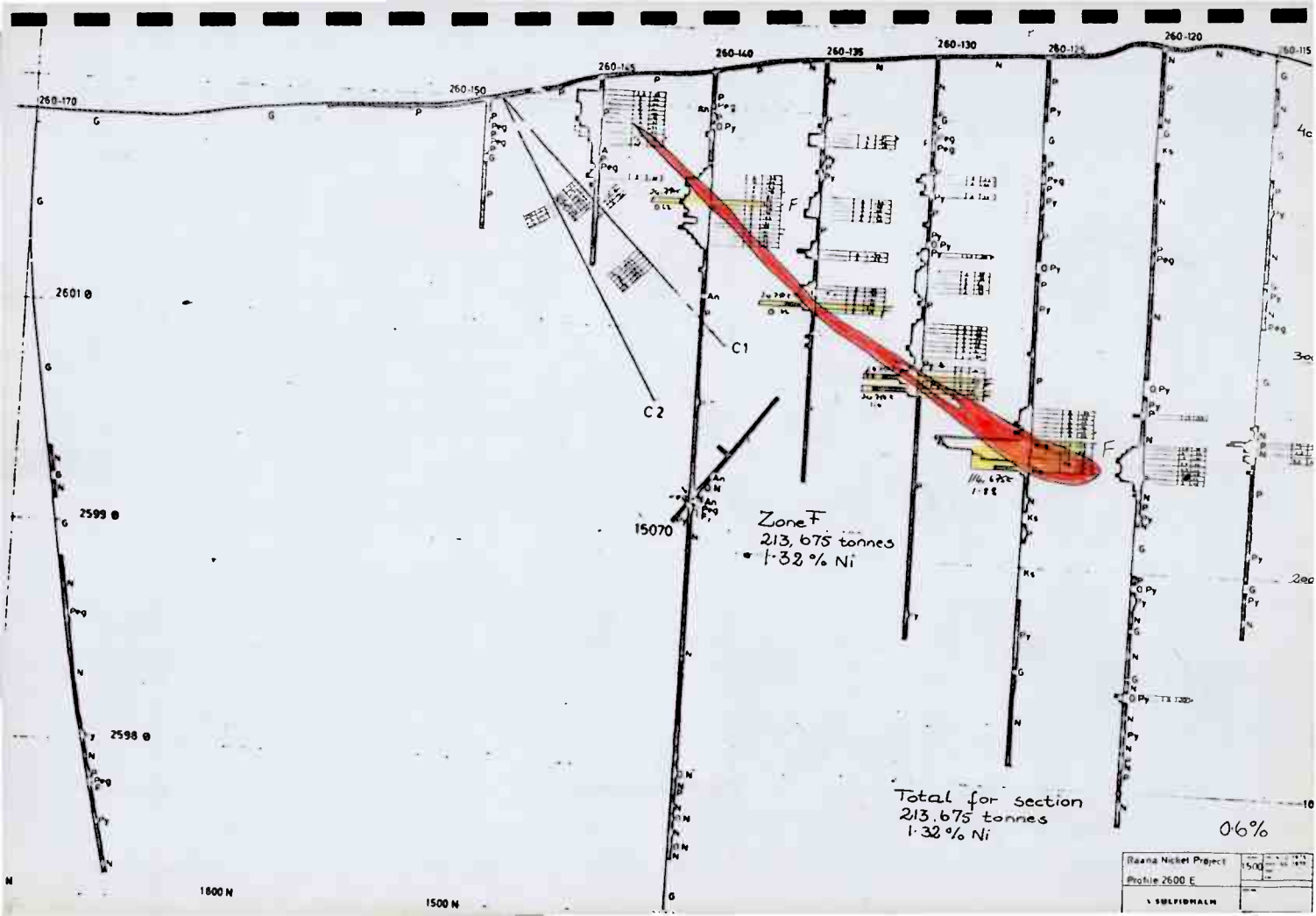
0.6% Ni

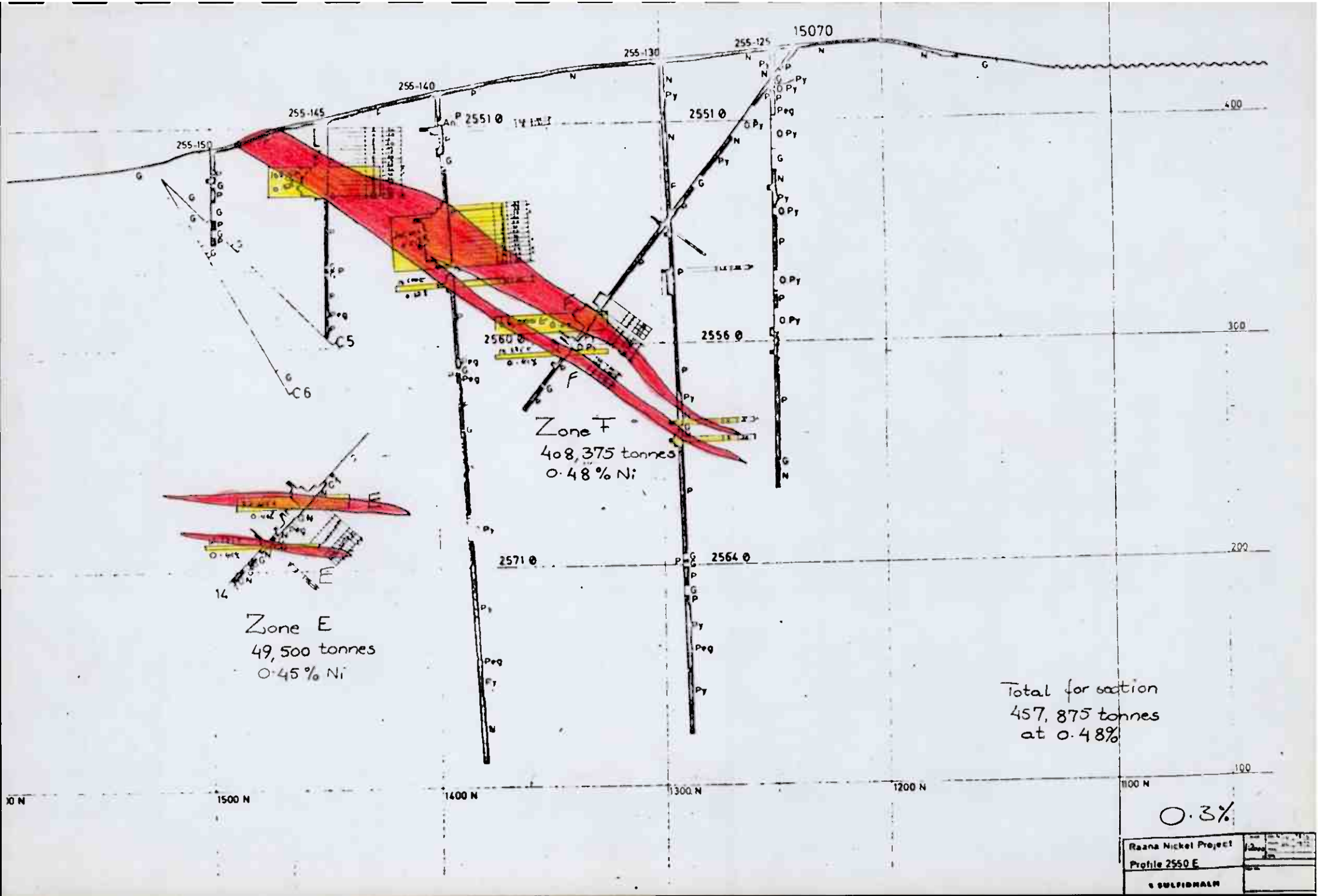
Raana Nickel Project
Profile 2650 E
SULPHIDALM

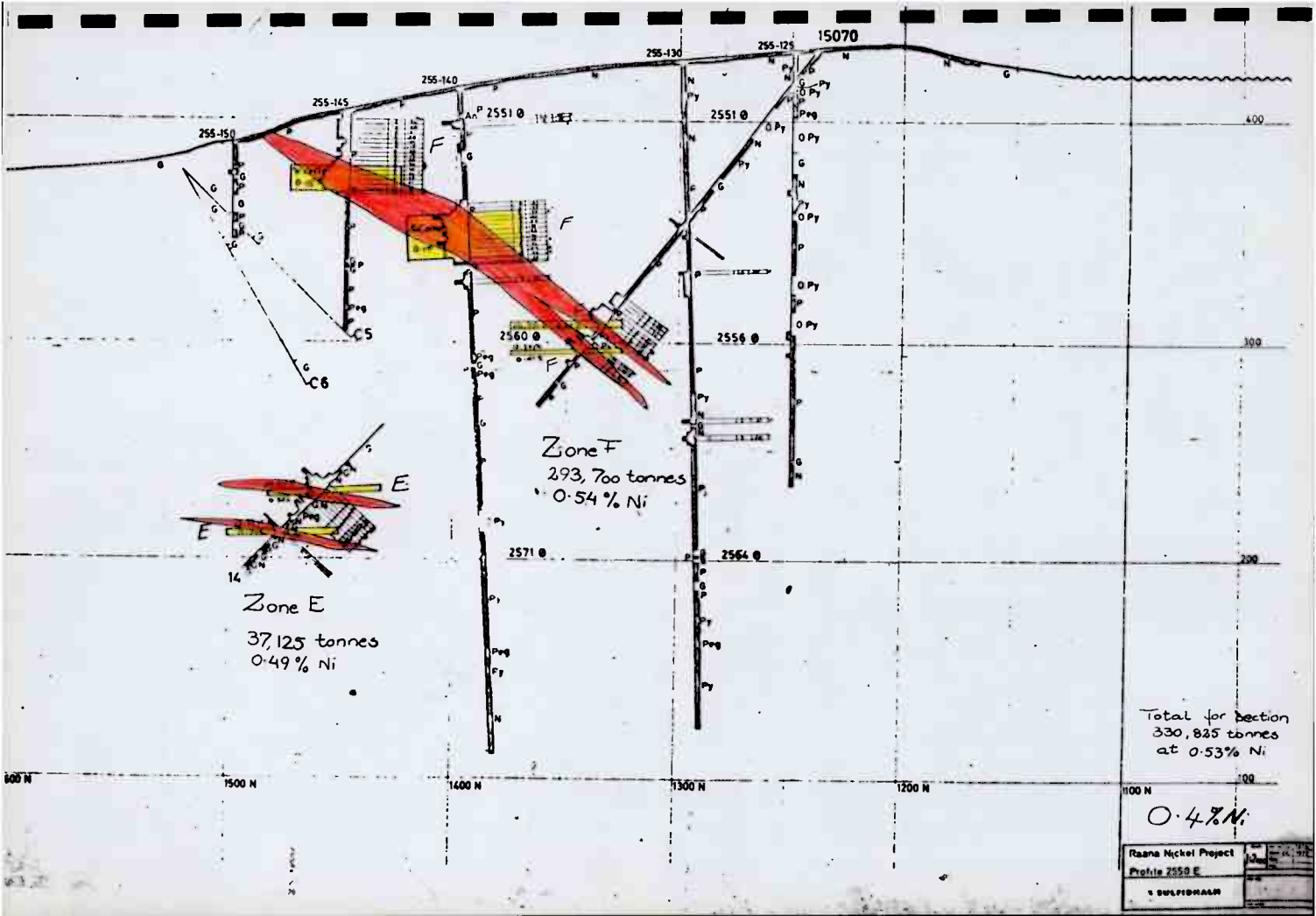

260-170
260-150
260-145
260-140
260-135
260-130
260-125
260-115
2601 0
2599 0
2598 0
400
300
200
100
F
G
H
C1
C2
Zone H
99,000 tonnes
0·35%
Zone G
74,250 tonnes
0·30%
Zone F
1,308,450 tonnes
0,60%
Zone E
33000 tonnes
0·35%
15070
Total for section
1,514,700 tonnes
0·56%
0·3% Ni
Reana Nickel Project
Profile 2600 E
SULPIDWALK

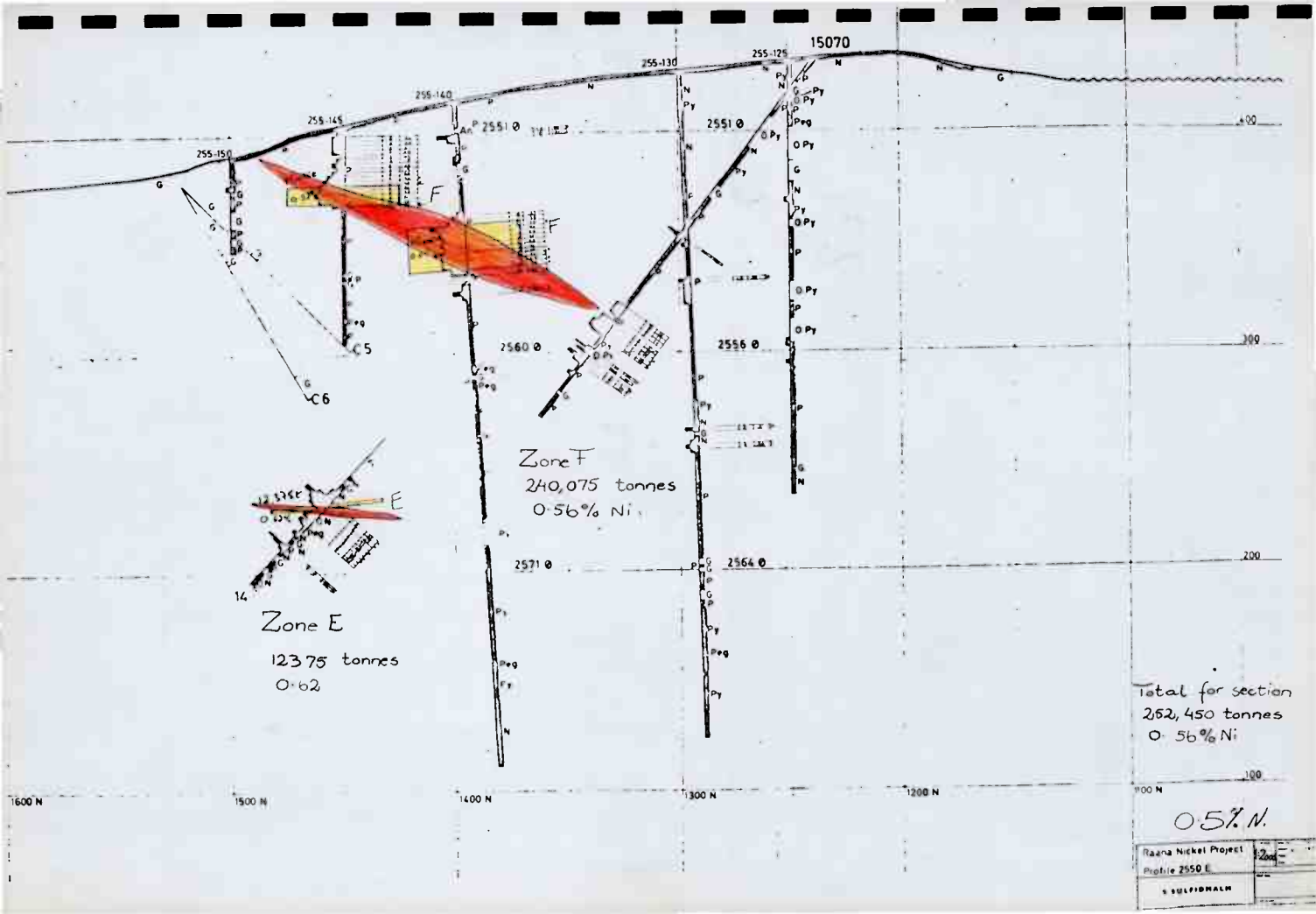

260-170
260-150
260-140
260-135
260-130
260-125
260-115
2601 ⊕
2599 ⊕
2598 ⊕
C1
C2
15070
Zone F
1,052,700 tonnes
0·65 %
Total for section
1,052,700 tonnes
0·65 % Ni
0·4 %
1200N
Raana Nickel Project
Profile 2600 E
1700 N
1600 N
1500 N

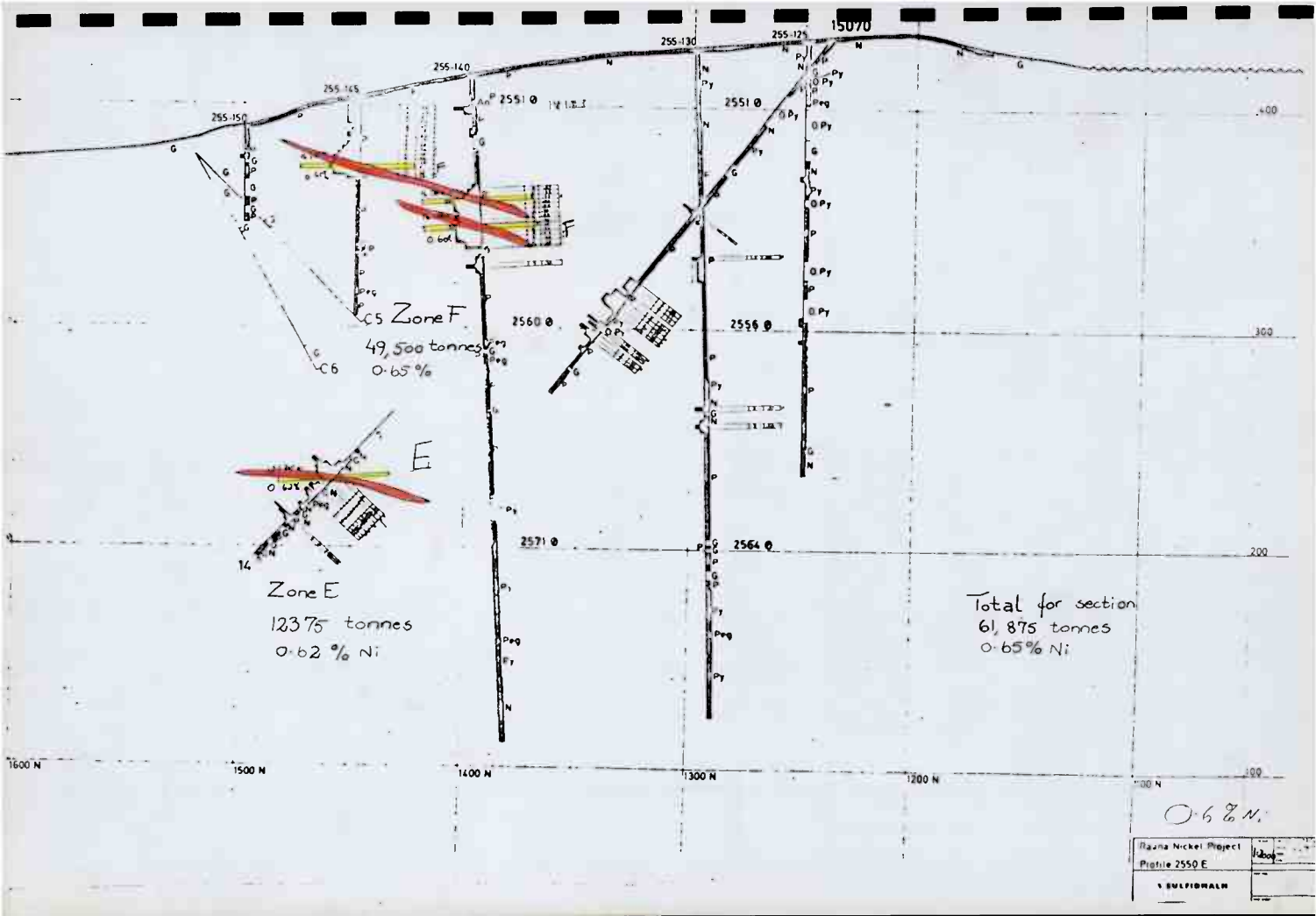

260-170
260-150
260-140
260-135
260-130
260-125
260-120
260-115
2601 0
2599 0
2598 0
C1
C2
15070
Zone F
708, 674 tonnes
0·76 % Ni
Total for section
708, 674 tonnes
0·76 % Ni
0·5%
Ozana Nickel Project
Profile 2600 E
SULPHIDES

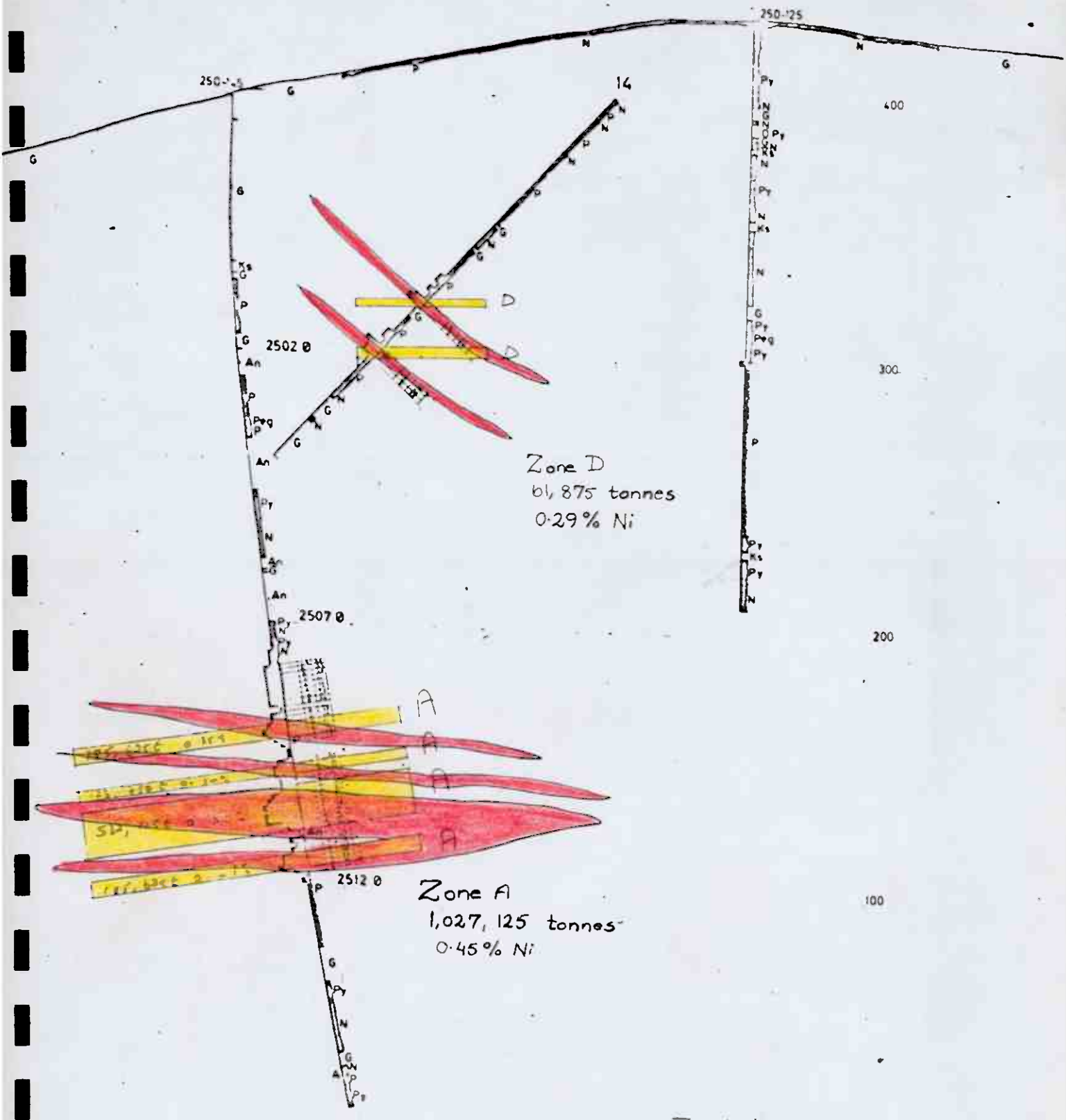

260-170
260-150
260-145
260-140
260-135
260-130
260-125
260-120
260-115
2601
2599
2598
C1
C2
F
F
15070
Zone F
213,675 tonnes
1·32 % Ni
Total for section
213,675 tonnes
1·32 % Ni
0·6%
1800 N
1500 N
Raana Nickel Project
Profile 2600 E
1500
SULPHIDE


15070
255-125
255-130
255-140
255-145
255-150
2551 0
2551 0
2560 0
2556 0
2571 0
2564 0
C5
C6
F
E
Zone F
408,375 tonnes
0·48 % Ni
Zone E
49,500 tonnes
0·45 % Ni
Total for section
457,875 tonnes
at 0.48%
0·3%
400
300
200
100
1500 N
1400 N
1300 N
1200 N
1100 N
Razna Nickel Project
Profile 2550 E
SULPHIDES


15070
255-125
255-130
255-135
255-140
255-145
255-150
2551 @
2556 @
2560 @
2564 @
2571 @
C5
C6
F
E
14
Zone F
293,700 tonnes
0·54 % Ni
Zone E
37,125 tonnes
0·49 % Ni
Total for section
330,825 tonnes
at 0·53% Ni
0·4% Ni
1500 N
1400 N
1300 N
1200 N
1100 N
Raana Nickel Project
Profile 2550 E
SULPHIDES


15070
255-125
255-130
255-140
255-145
255-150
2551 0
2551 0
2560 0
2556 0
2571 0
2564 0
F
F
C5
C6
E
14
Zone F
240,075 tonnes
0·56% Ni
Zone E
12375 tonnes
0·62
Total for section
252,450 tonnes
0·56% Ni
0·5% N.
1600 N
1500 N
1400 N
1300 N
1200 N
1100 N
Raana Nickel Project
Profile 2550 E
SULPHIDES


15070
255-130
255-125
255-140
255-145
255-150
2551 0
2551 0
2560 0
2556 0
2571 0
2564 0
C5 Zone F
49,500 tonnes
0·65 %
C6
E
Zone E
12375 tonnes
0·62 % Ni
Total for section
61, 875 tonnes
0·65% Ni
400
300
200
100
1600 N
1500 N
1400 N
1300 N
1200 N
00 N
0·6 % Ni
Razma Nickel Project
Profile 2550 E
SULPHIDMALM

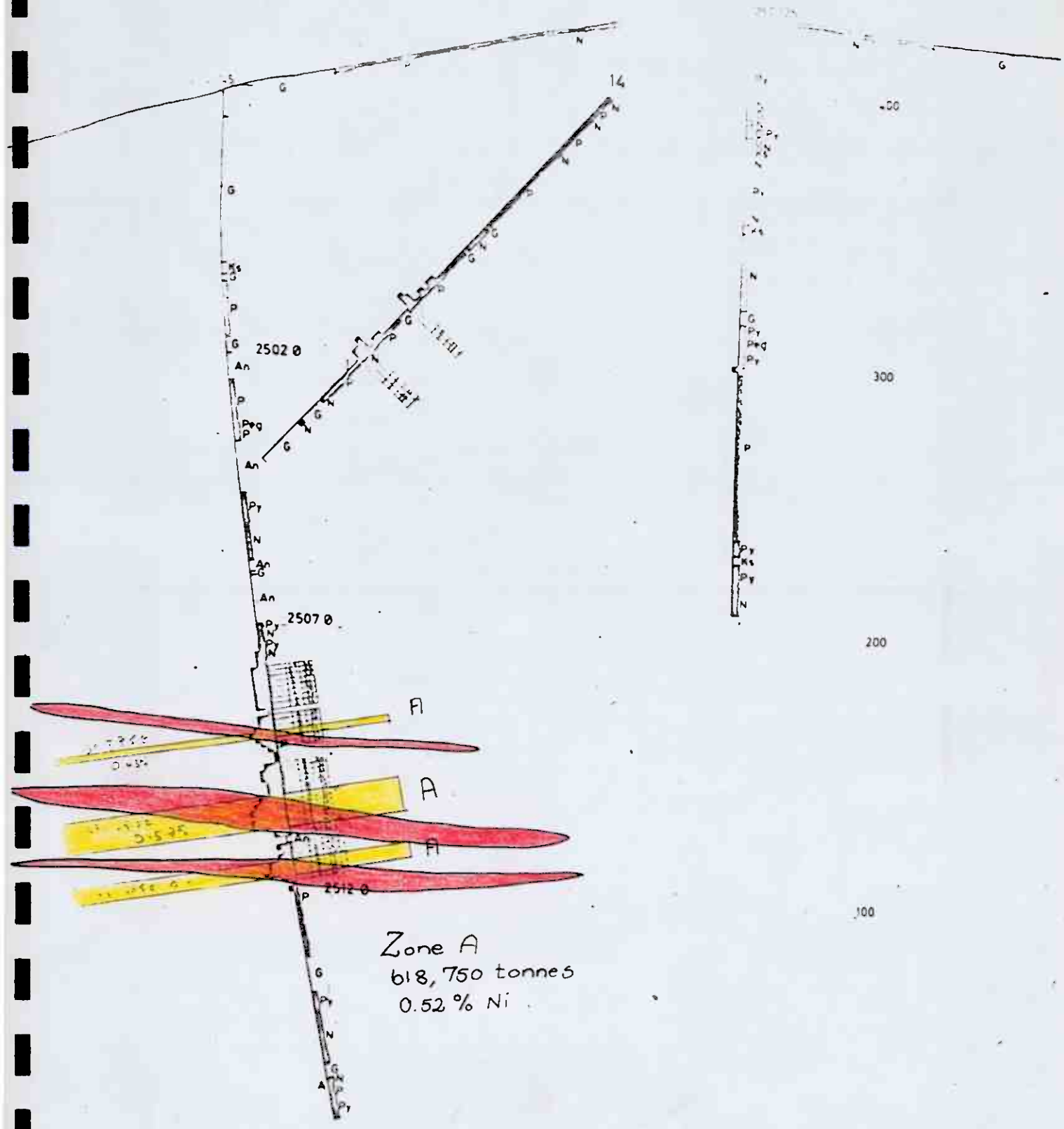


Total for section
1,089,000 tonnes
at 0,44 % Ni

0·3% Ni

2500 E

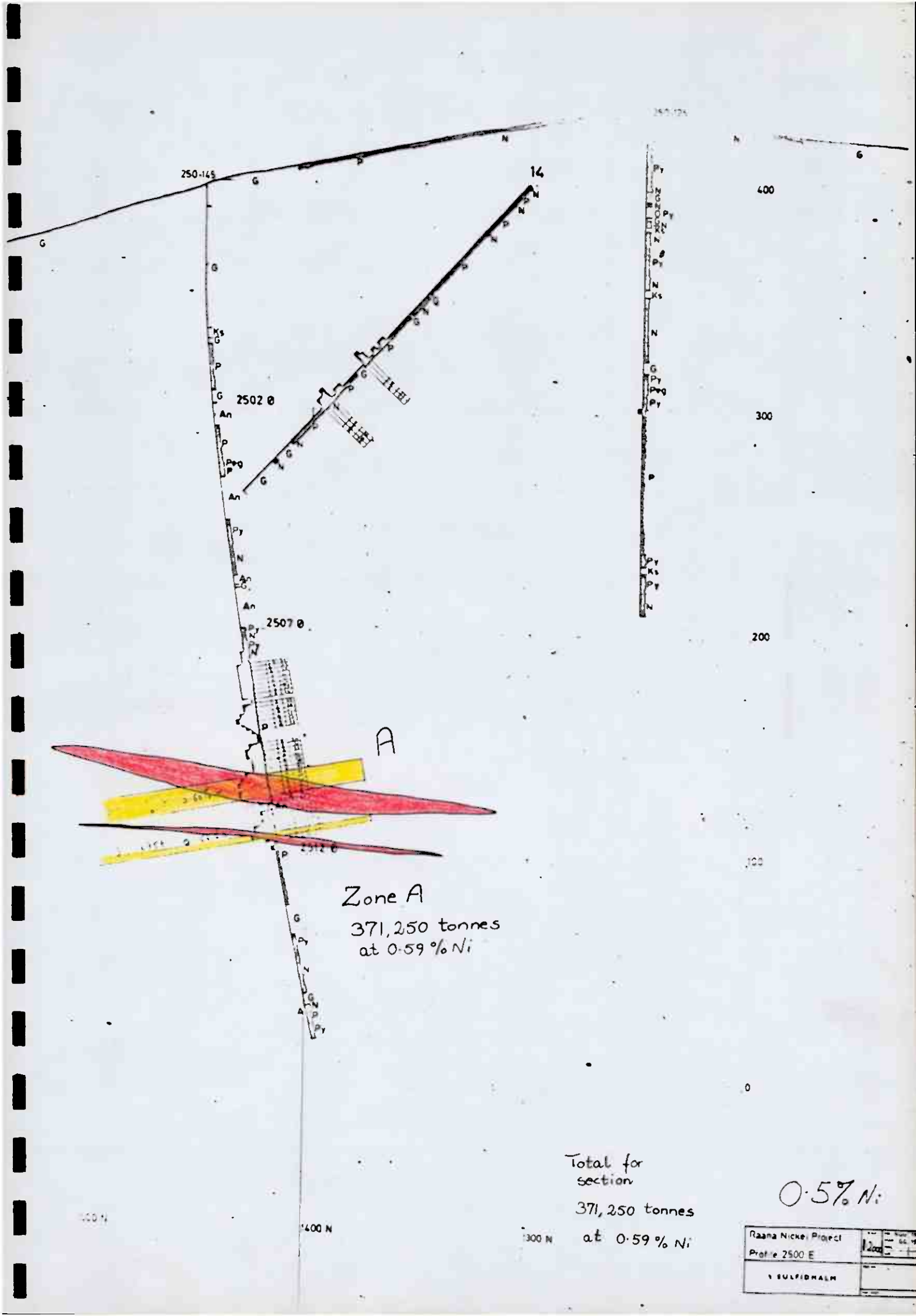
1:2000

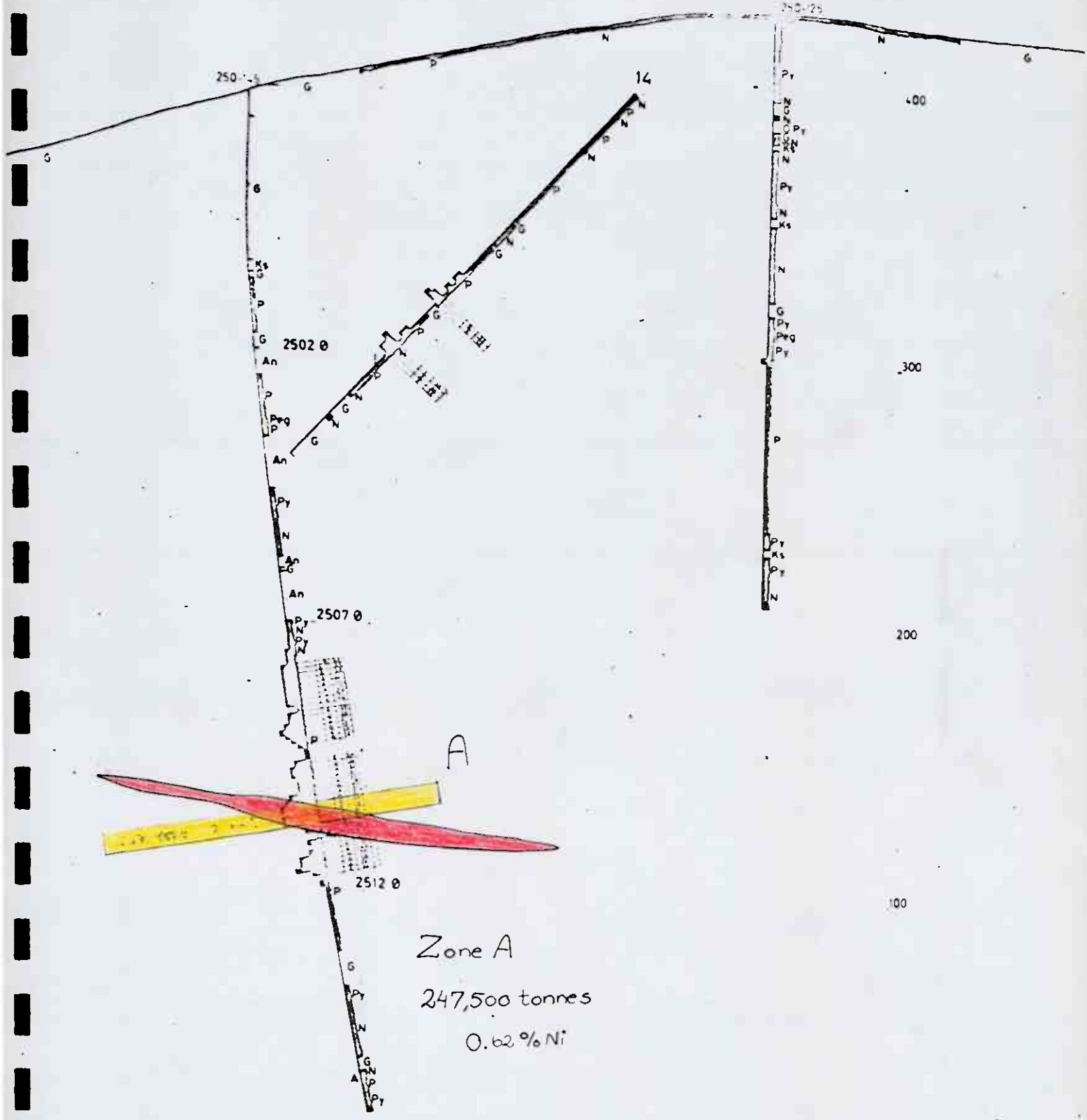


Zone A
618,750 tonnes
0.52 % Ni

Total for section
618,750 tonnes
0·52 % Ni

0·4 % Ni


250-145
14
2502 0
2507 0
2512 0
A
400
300
200
100
0
400 N
300 N
Zone A
371,250 tonnes
at 0·59 % Ni
Total for section
371,250 tonnes
at 0·59 % Ni
0·5% Ni
Raana Nickel Project
Profile 2500 E
1:200
SULFIDHALM



Zone A

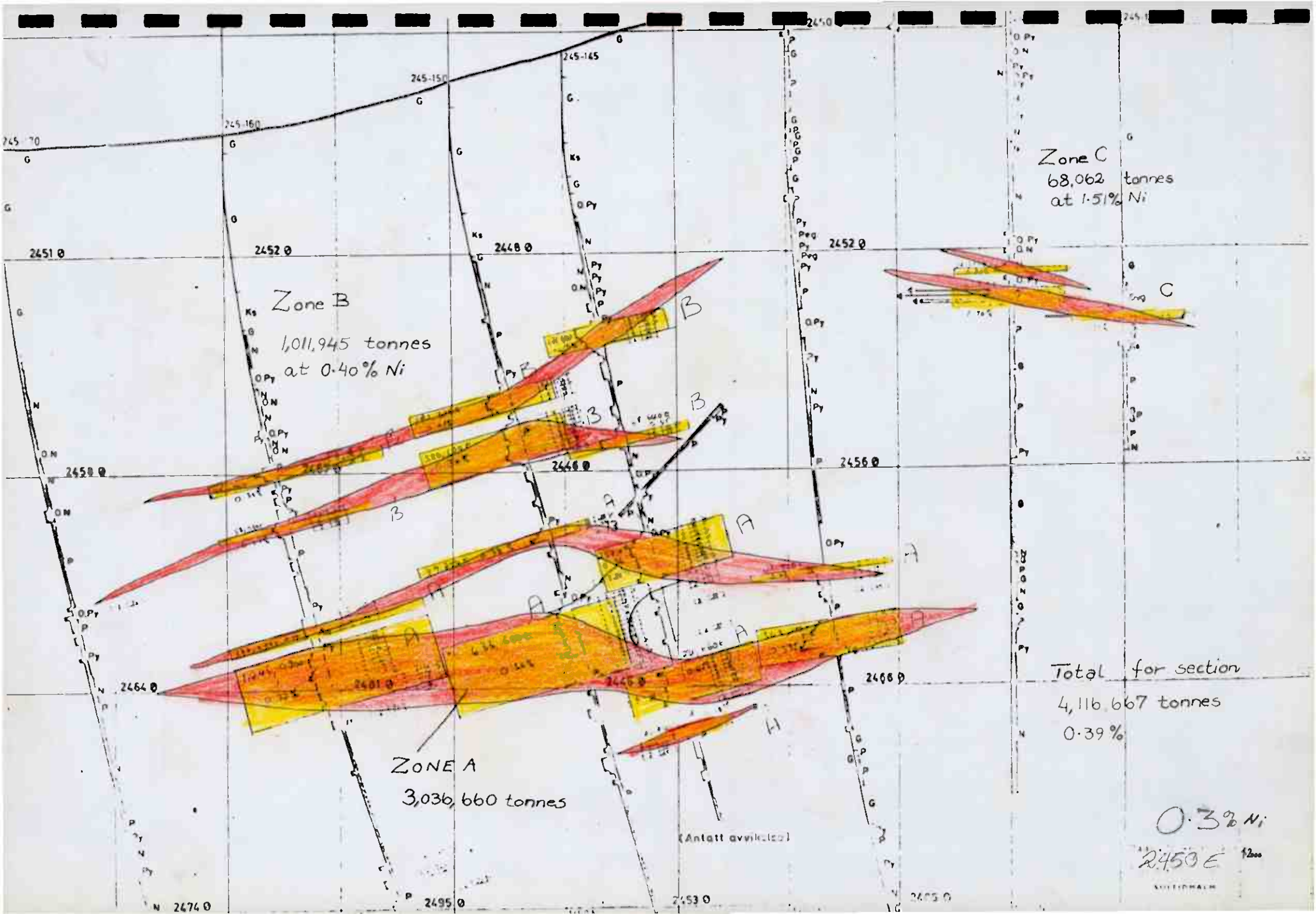
247,500 tonnes

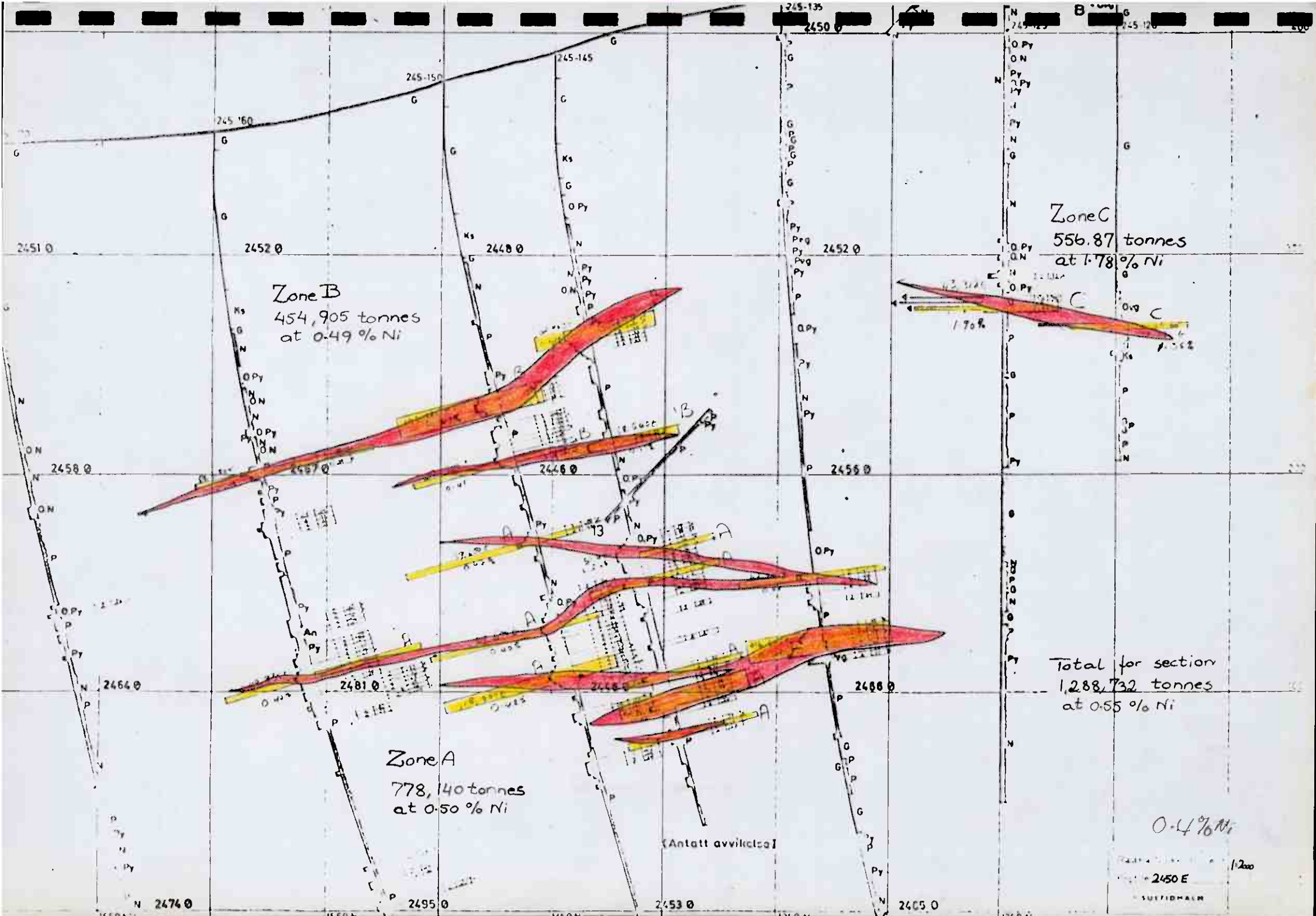
0.62 % Ni

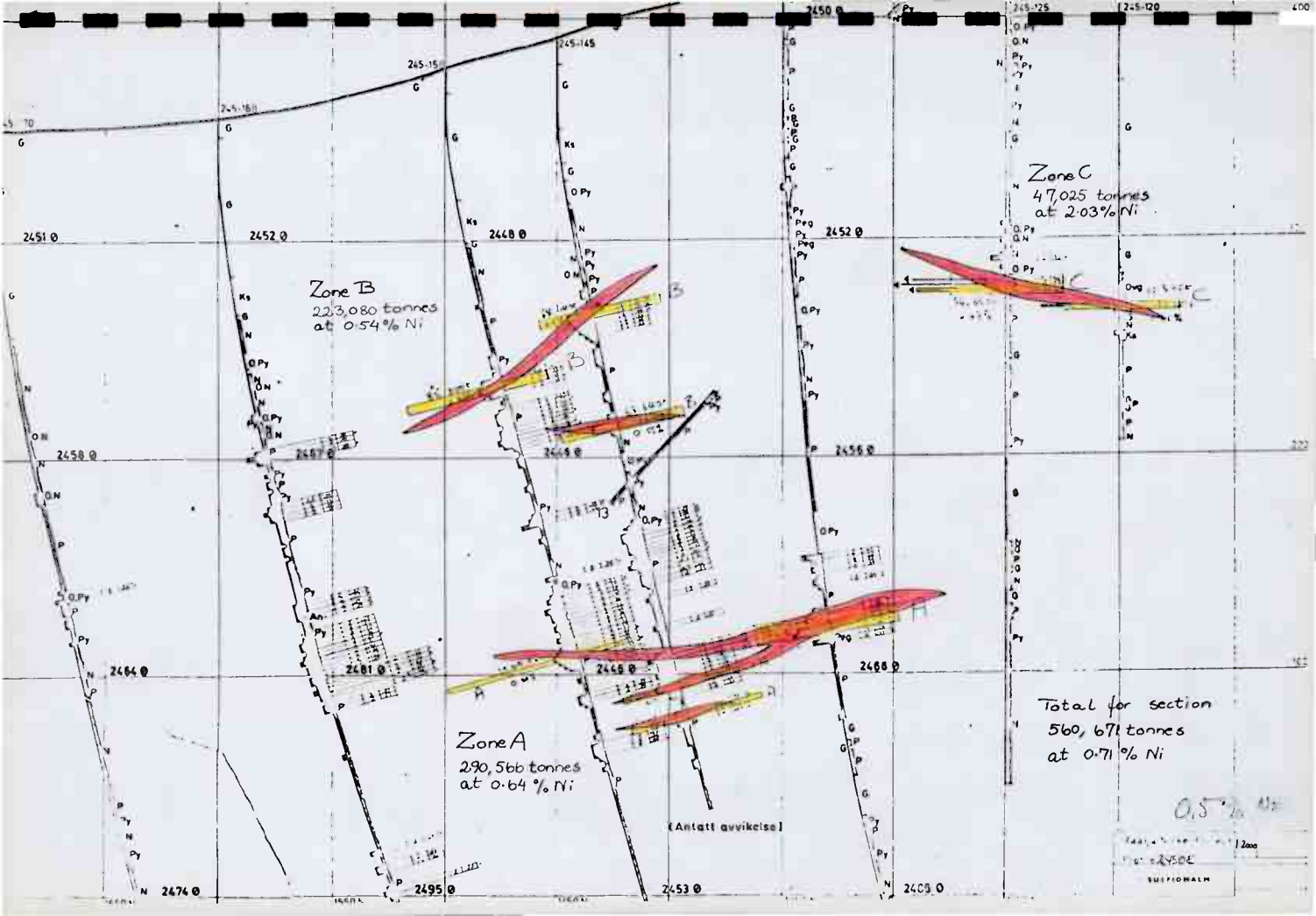
Total for section 0.6 % Ni,
247,500 tonnes
0.62 % Ni

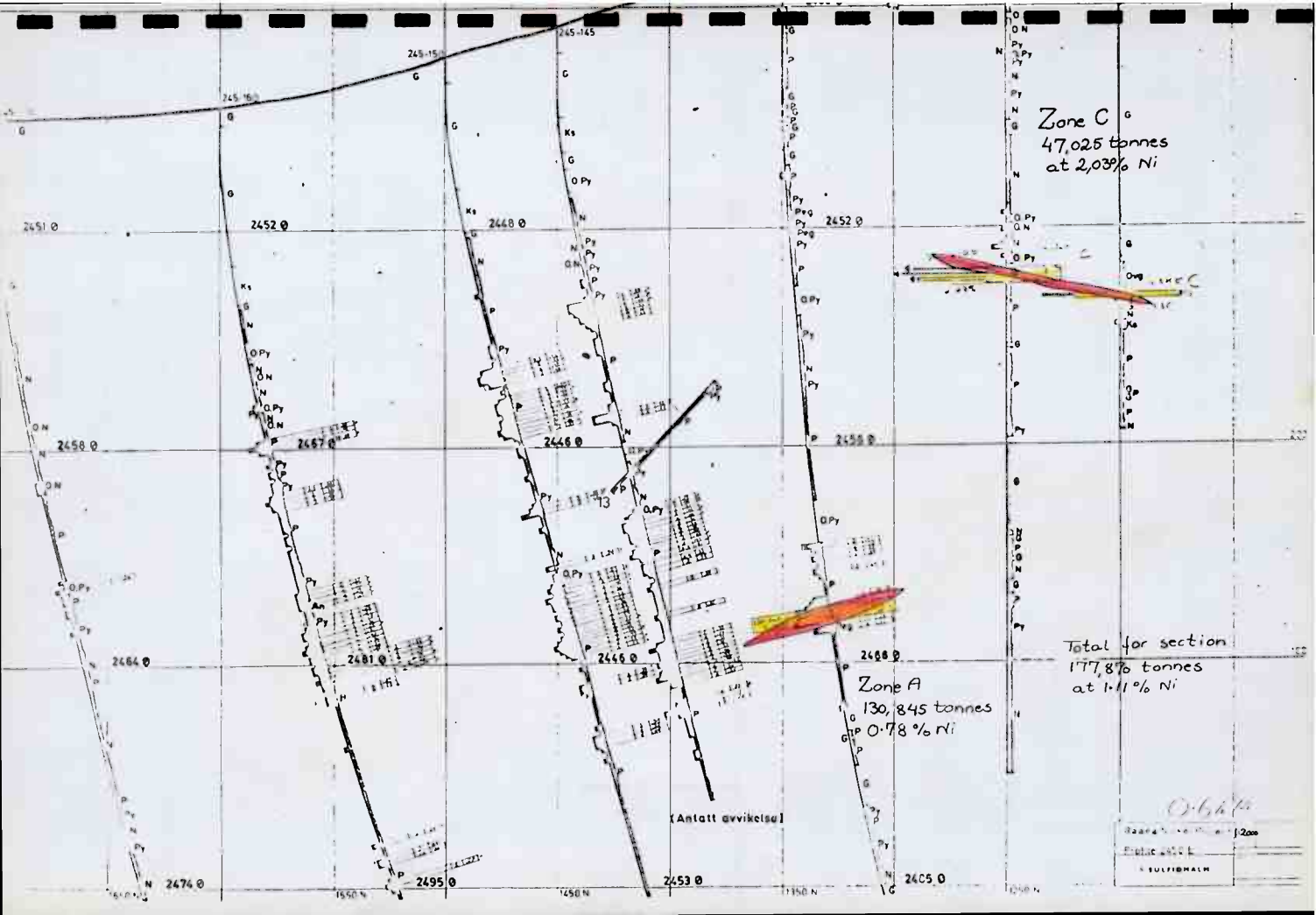
Plot = 2500 E

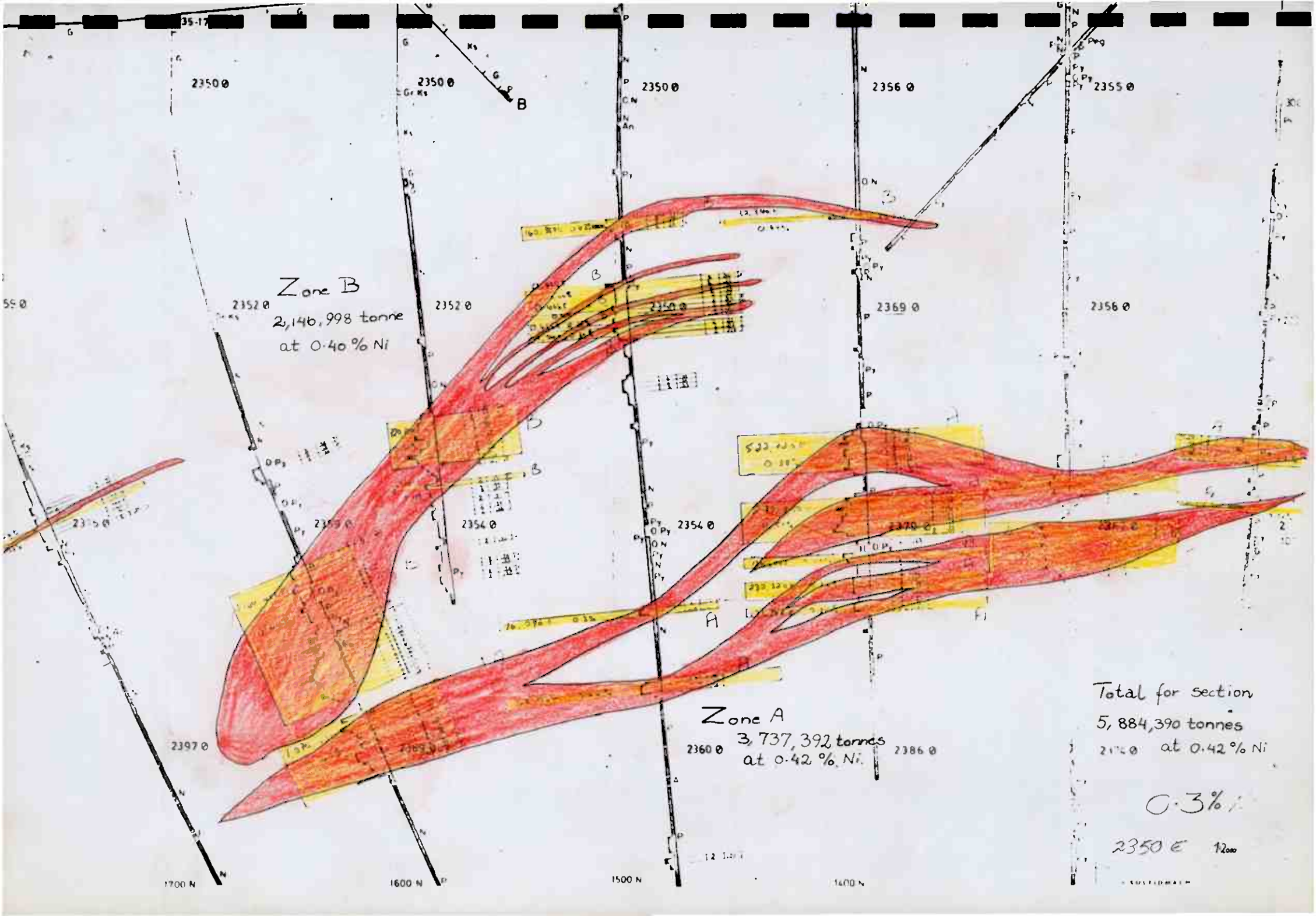
SULPHIDMALM

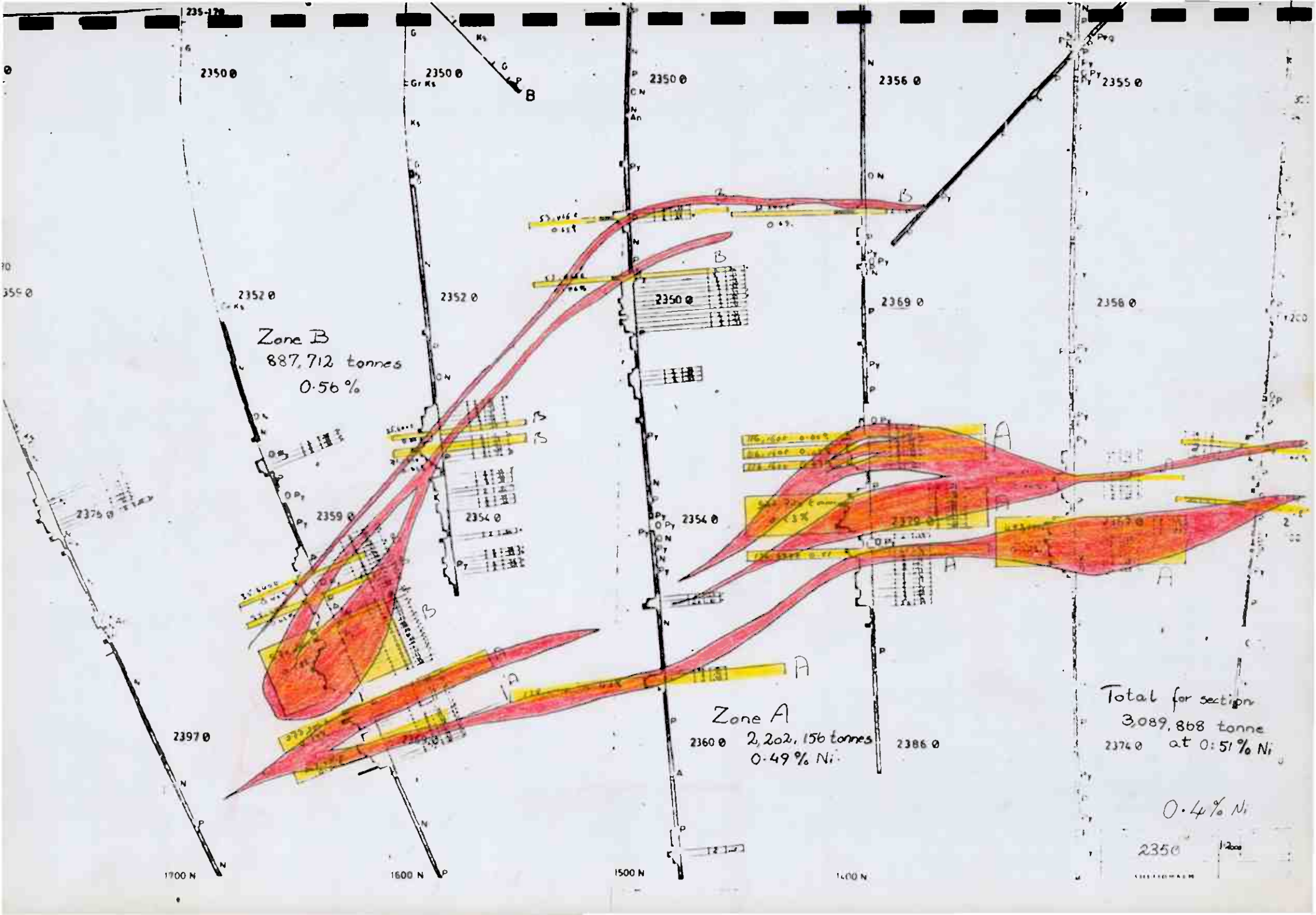

Zone B
1,011,945 tonnes
at 0·40% Ni
Zone C
68,062 tonnes
at 1·51% Ni
ZONE A
3,036,660 tonnes
Total for section
4,116,667 tonnes
0·39%
0·3% Ni
2450 E
(Antatt avvik(ling))

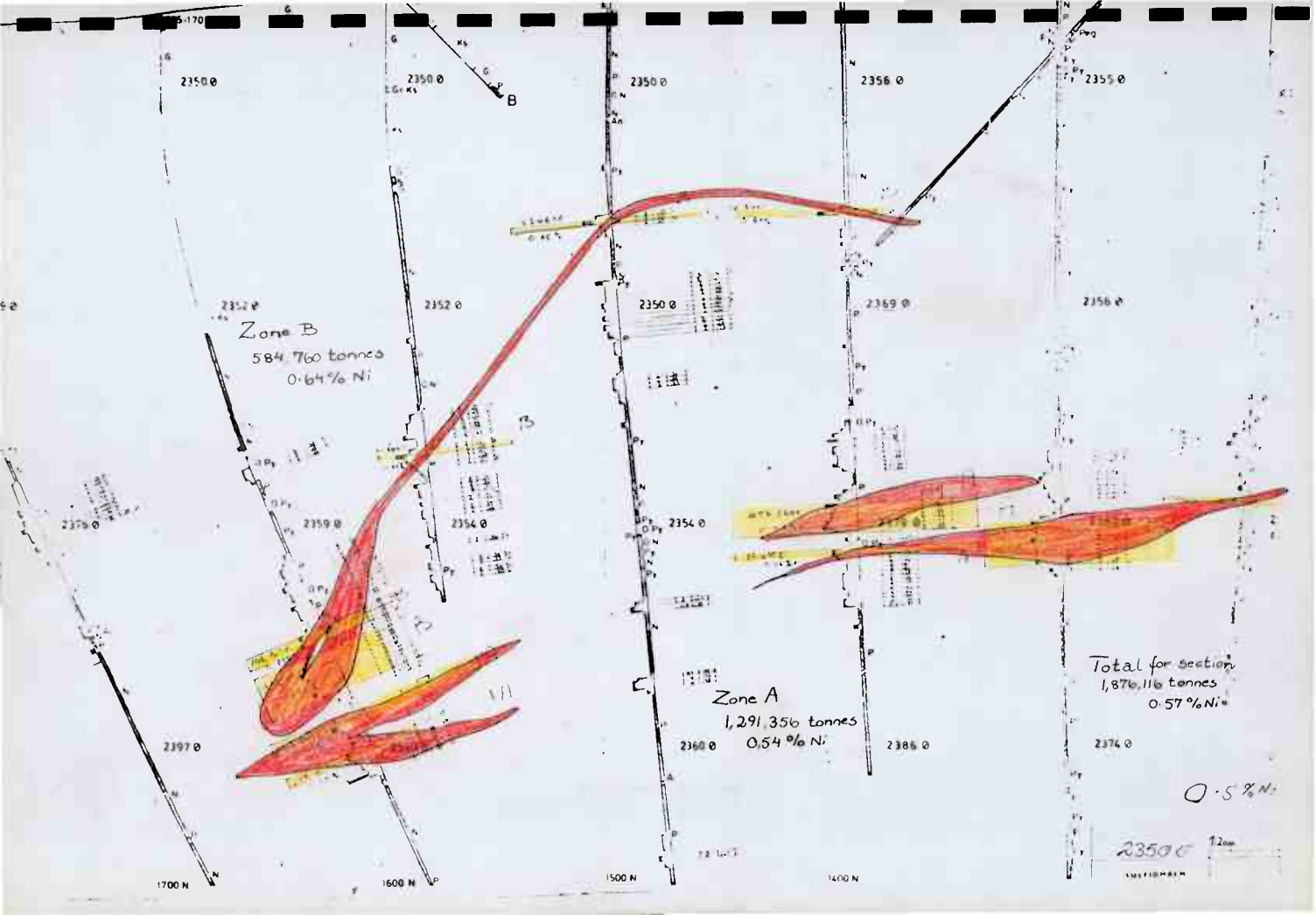

Zone B
454,905 tonnes
at 0.49 % Ni
Zone C
556.87 tonnes
at 1.78 % Ni
Zone A
778,140 tonnes
at 0.50 % Ni
Total for section
1,288,732 tonnes
at 0.55 % Ni
0.4% Ni
(Antatt avviklet)
1:200
2450 E
SUTTIDHALM

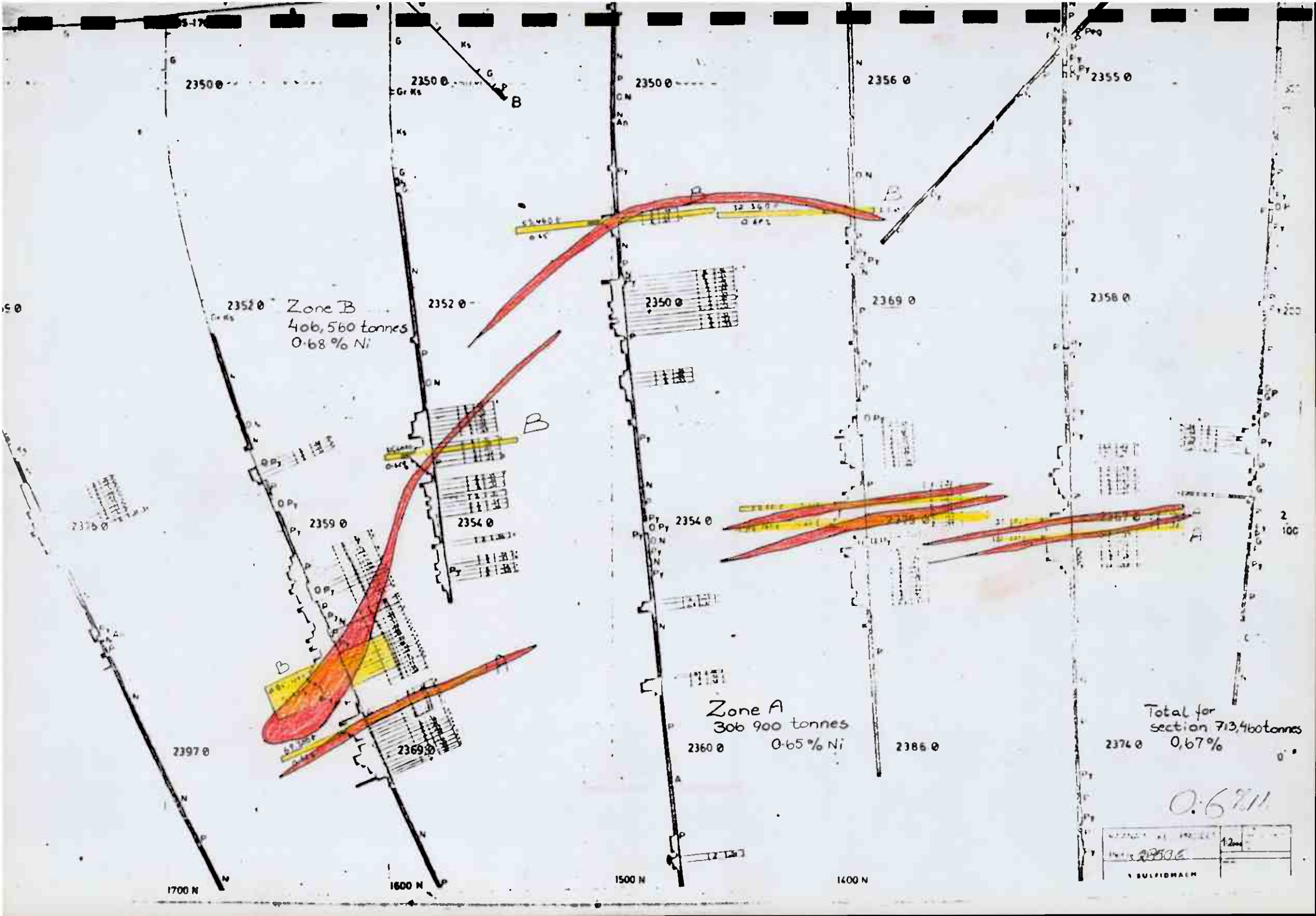

Zone B
223,080 tonnes
at 0·54% Ni
Zone C
47,025 tonnes
at 2·03% Ni
Zone A
290,566 tonnes
at 0·64% Ni
Total for section
560,671 tonnes
at 0·71% Ni
(Antatt avvikelse)
2451 Ø
2452 Ø
2448 Ø
2452 Ø
2458 Ø
2457 Ø
2456 Ø
2464 Ø
2461 Ø
2468 Ø
2474 Ø
2495 Ø
2453 Ø
2469 Ø

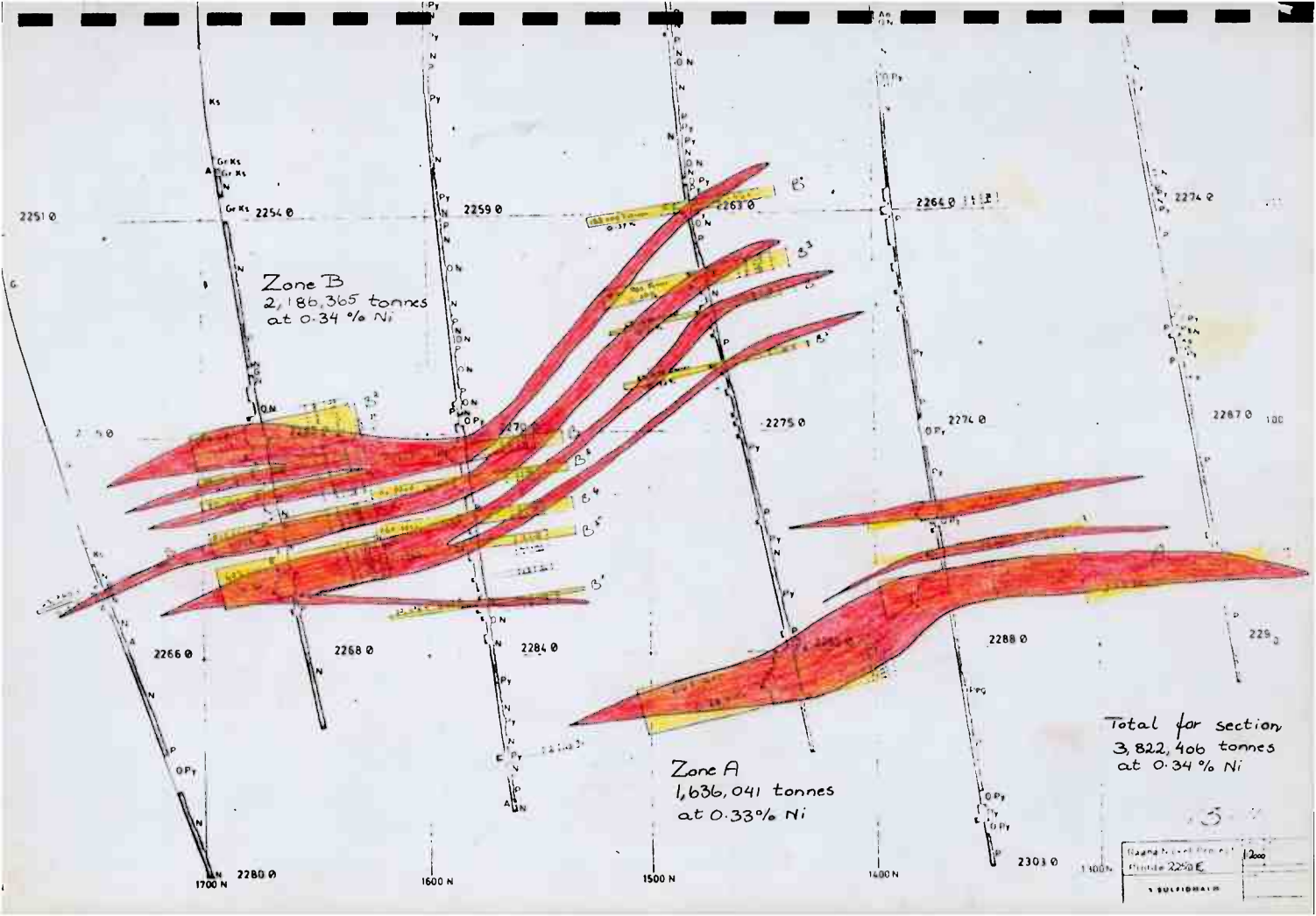

Zone C
47,025 tonnes
at 2,03% Ni
Zone A
130,845 tonnes
0·78 % Ni
Total for section
177,870 tonnes
at 1·11 % Ni
(Antatt avvikelse)
2452 Ø
2448 Ø
2458 Ø
2467 Ø
2446 Ø
2464 Ø
2481 Ø
2474 Ø
2495 Ø
2453 Ø
2465 Ø
1550 N
1450 N
1350 N

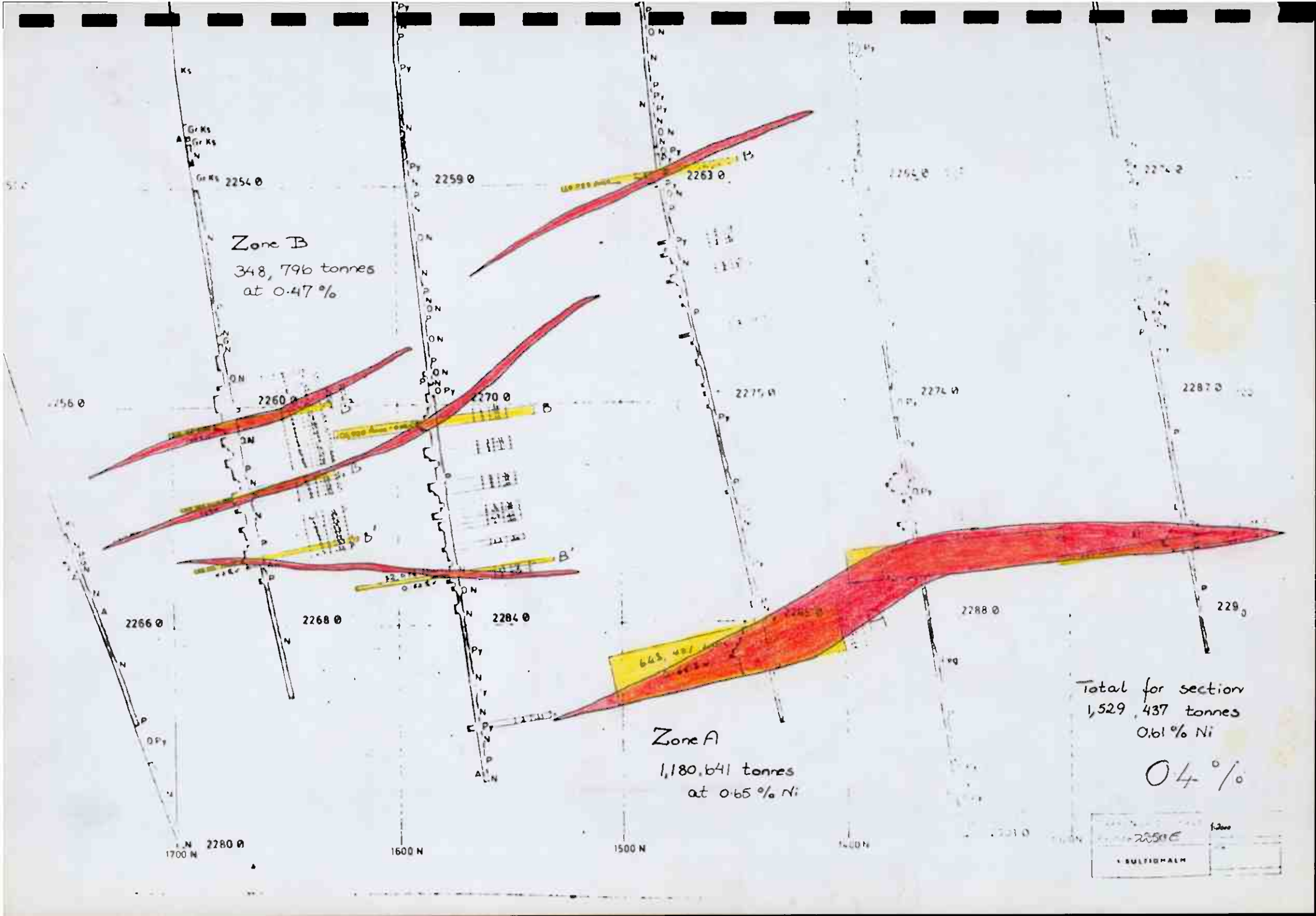

Zone B
2,146,998 tonne
at 0.40 % Ni
Zone A
3,737,392 tonnes
at 0.42 % Ni.
Total for section
5,884,390 tonnes
at 0.42 % Ni
0.3%
2350 E
1700 N
1600 N
1500 N
1400 N

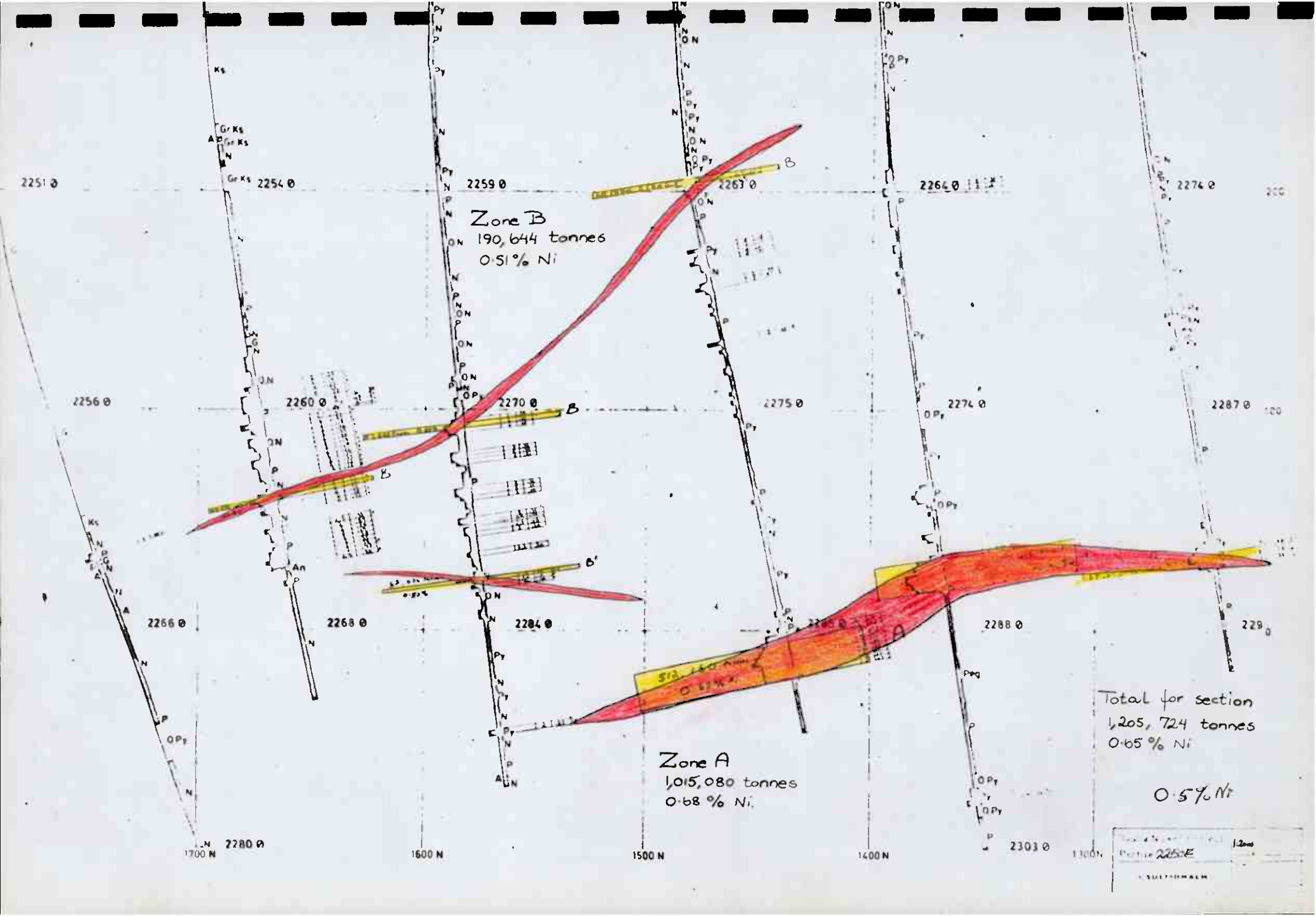

Zone B
887,712 tonnes
0·56 %
Zone A
2,202,156 tonnes
0·49 % Ni
Total for section
3,089,868 tonne
at 0:51 % Ni
0·4 % Ni
1700 N
1600 N
1500 N
1400 N

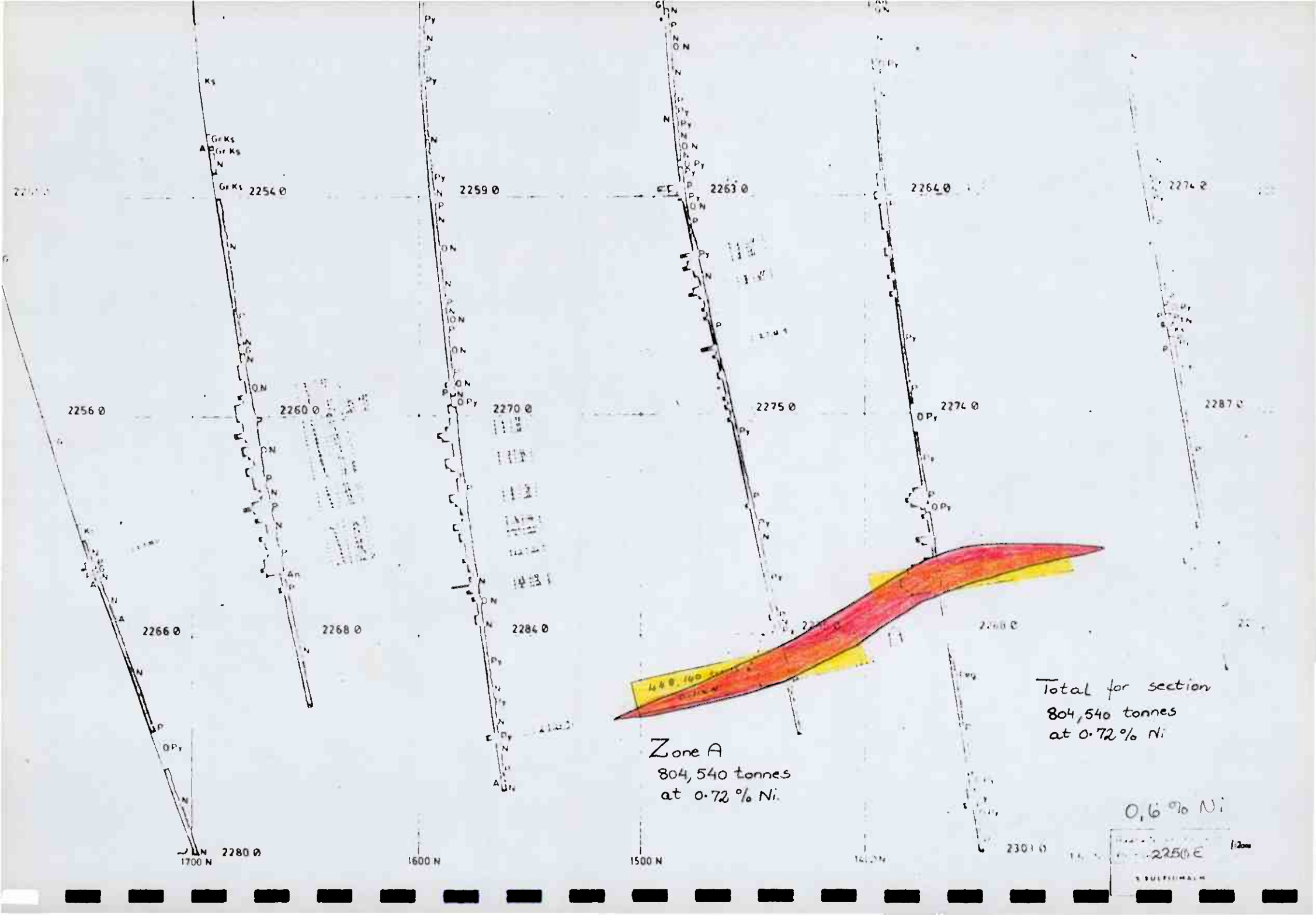

Zone B
584,760 tonnes
0.64% Ni
Zone A
1,291,356 tonnes
0.54% Ni
Total for section
1,876,116 tonnes
0.57% Ni
0.5% Ni
1700 N
1600 N
1500 N
1400 N

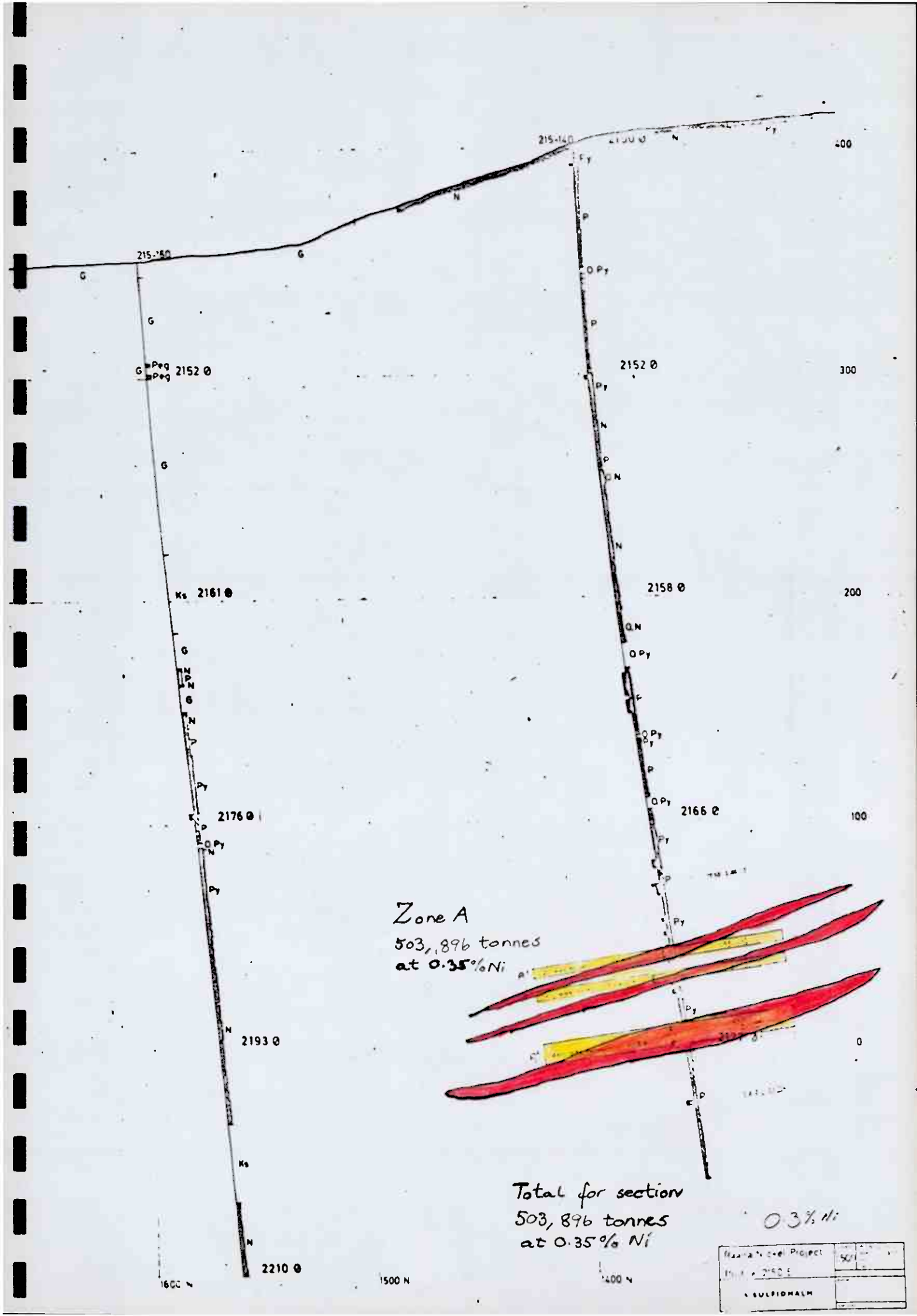

Zone B
406,560 tonnes
0.68 % Ni
Zone A
306 900 tonnes
0.65 % Ni
Total for
section 713,460tonnes
0,67%
0.67%
1700 N
1600 N
1500 N
1400 N

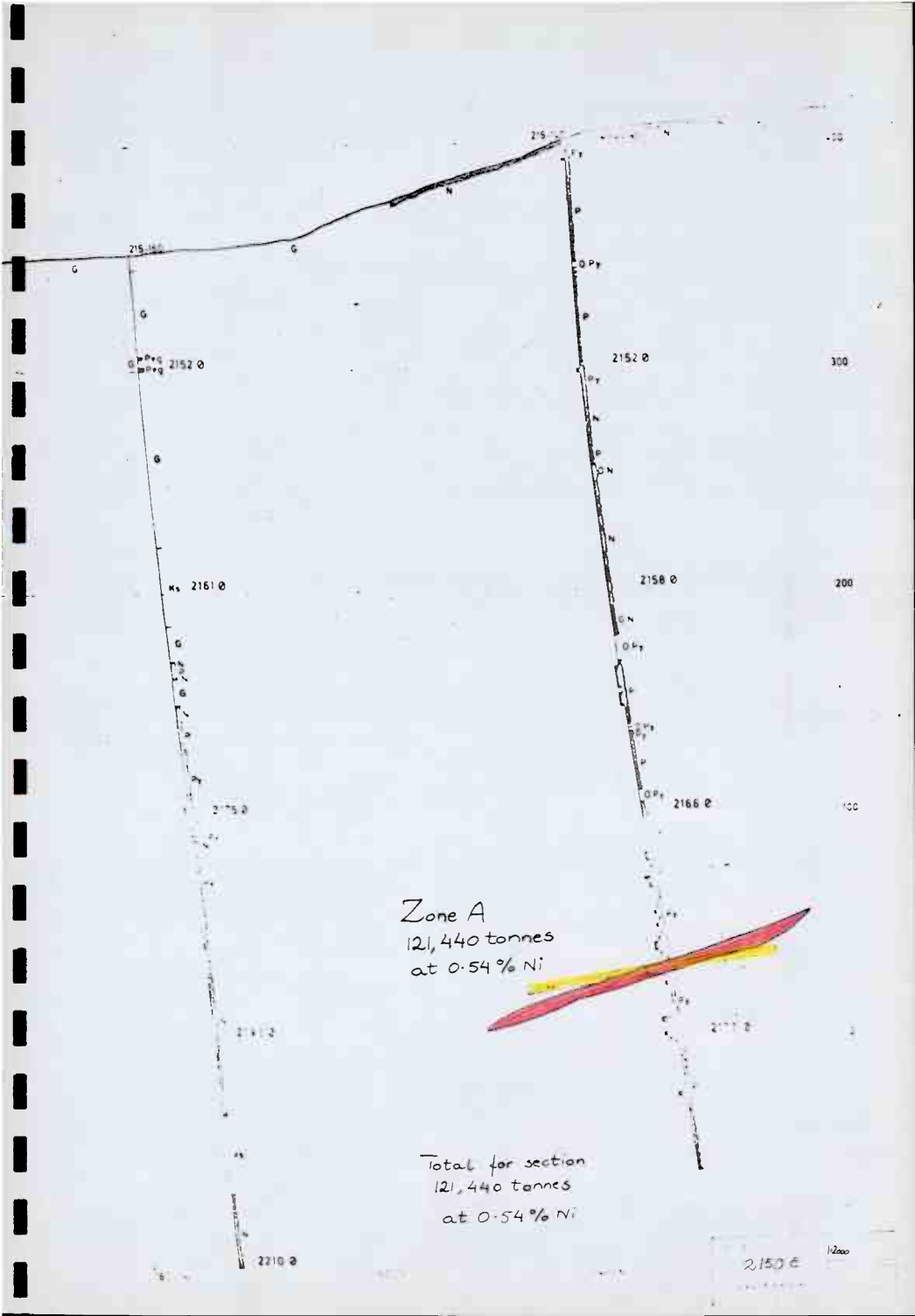

Zone B
2,186,365 tonnes
at 0.34 % Ni
Zone A
1,636,041 tonnes
at 0.33% Ni
Total for section
3,822,406 tonnes
at 0.34 % Ni
2251 0
2254 0
2259 0
2263 0
2264 0
2274 0
2275 0
2287 0
2266 0
2268 0
2284 0
2288 0
2303 0
2280 0
1700 N
1600 N
1500 N
1400 N
1300 N
Ks
Gr Ks
Py
N
P
O N

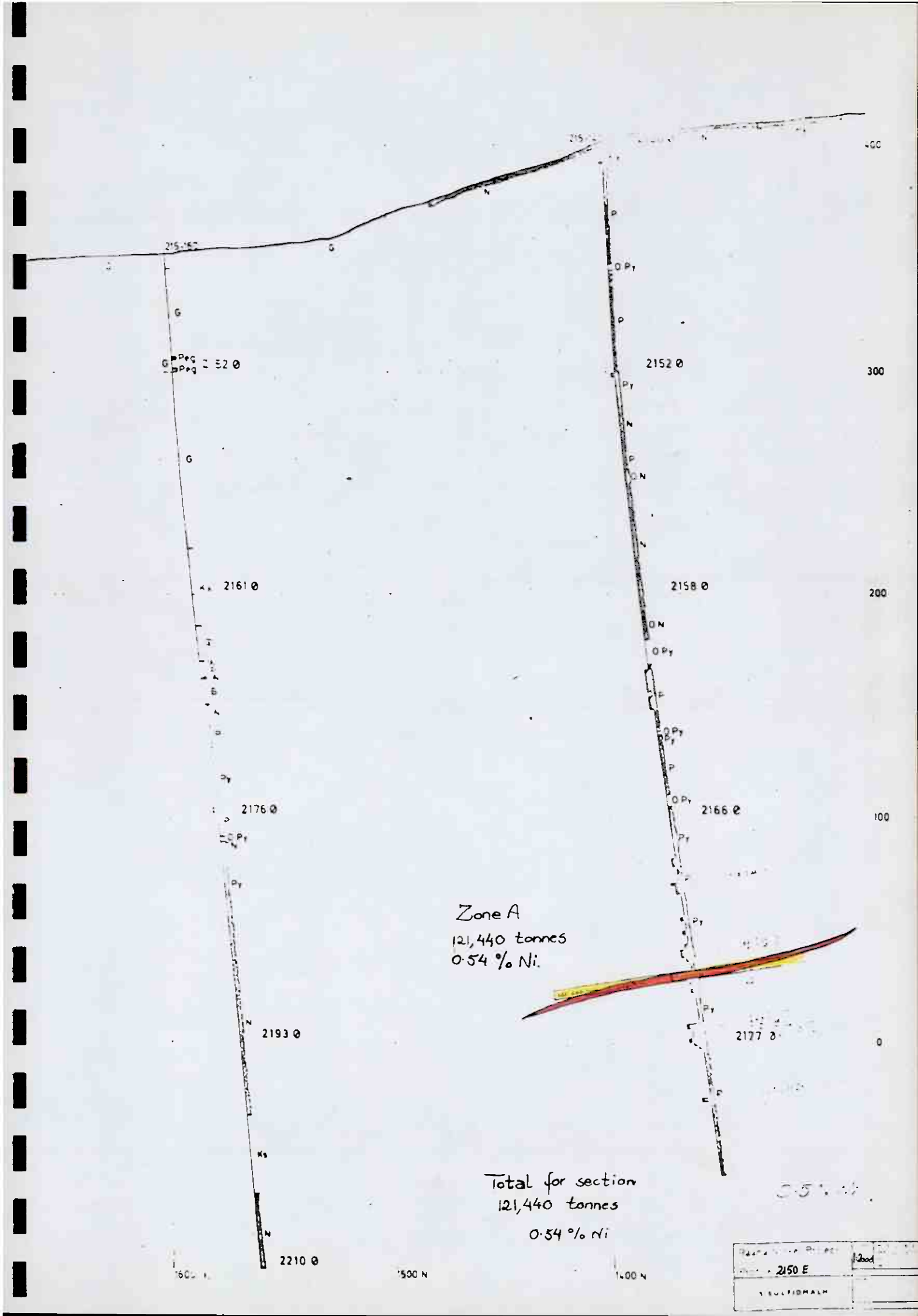

Zone B
348, 796 tonnes
at 0.47 %
Zone A
1,180,641 tonnes
at 0.65 % Ni
Total for section
1,529,437 tonnes
0.61 % Ni
04 %
2254 0
2259 0
2263 0
2260 0
2270 0
2266 0
2268 0
2284 0
2288 0
2280 0
1700 N
1600 N
1500 N


Zone B
190,644 tonnes
0·51% Ni
Zone A
1,015,080 tonnes
0·68 % Ni
Total for section
1,205,724 tonnes
0·65 % Ni
0·5% Ni
2251 0
2254 0
2259 0
2263 0
2264 0
2274 0
2256 0
2260 0
2270 0
2275 0
2287 0
2266 0
2268 0
2284 0
2288 0
2280 0
2303 0
1700 N
1600 N
1500 N
1400 N
1300 N


2254 0
2259 0
2263 0
2264 0
2274 0
2256 0
2260 0
2270 0
2275 0
2274 0
2287 0
2266 0
2268 0
2284 0
2280 0
2301 0
1700 N
1600 N
1500 N
Zone A
804, 540 tonnes
at 0·72 % Ni.
Total for section
804,540 tonnes
at 0·72 % Ni
0,6 % Ni
2250 E


215-140
215-150
400
300
200
100
0
2152 Ø
2158 Ø
2161 Ø
2176 Ø
2166 Ø
2193 Ø
2210 Ø
1600 N
1500 N
1400 N
Zone A
503,896 tonnes
at 0.35% Ni
Total for section
503,896 tonnes
at 0.35% Ni
0.3% Ni


2152 0
2161 0
2158 0
2166 0
2210 0
300
200
100
Zone A
121,440 tonnes
at 0·54 % Ni
Total for section
121,440 tonnes
at 0·54 % Ni
1/2000
2150 E


2152 0
2161 0
2158 0
2176 0
2166 0
2193 0
2177 0
2210 0
Zone A
121,440 tonnes
0·54 % Ni.
Total for section
121,440 tonnes
0·54 % Ni
1600 N
1500 N
1400 N
2150 E
SULPHIDE

CUT-OFF — 0.3 % soluble nickel

SECTION	HOLE NO	ZONE	WIDTH	AVERG. GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS.
2150E	215-140	A'	4·0	0·28	9200	36 800	121 440	34 003	Just under cut-off.
	215-140	~~A~~	4·0	0·54	9200	36 800	121 440	65 578	main Zone.
	215-140	A^2	8·6	0·29	9200	79 120	261 096	75 718	Just under cut-off.
				0·35			503 896	175 299	Total for section
2250E	225-130	A	10·6	0·39	8000	84 800	279 840	109 138	
	225-140	A	16·0	0·65	9000	144 000	475 200	308 880	
		~~A3~~	2·0	0·30	9000	18 000	59 400	17 820	
		A^4	6·0	0·33	9000	54 000	178 200	58 806	No assays, measured from section.
	225-150	A	20·1	0·64	9700	194 970	643 401	41 777	
				0·33			1,636,041	539 893	Total for Zone A
	225-150	B	5·3	0·39	7650	40 545	133 798	52 181	
	225-150	B^3	8·0	0·27	7650	61200	201 960	54 529	Central portion below cut-off.
	225-150	B^4	2·0	0·31	7650	15 300	50 490	15 652	
	225-150	B^5	2·0	0·32	7650	15 300	50 490	16 157	
	225-160	B	6·0	0·38	8100	48 600	160 380	60 944	Top third under cut-off.
	225-160	B^3	4·0	0·34	8100	32 400	106 920	36 353	
	225-160	B^4	6·0	0·33	8100	48 600	160 380	52 925	
	225-160	B^5	3·2	0·35	8100	25 920	85 536	29 938	
	225-160	B^1	1·2	0·52	8100	9720	32 076	16 679	
	225-170	B^2	16·0	0·33	6750	108 000	356 400	117 612	
	225-170	B^6	4·0	0·35	6750	27 000	89 100	31 185	
	225-170	B^7	4·0	0·35	6750	27 000	89 100	31 185	
	225-170	B, B^3	10·0	0·37	6750	67 500	222 750	82 417	
	225-170	$B^{4,5,1}$	19·0	0·32	6750	128 250	423 225	135 432	
	225-180	B	1·0	0·36	7200	7200	23 760	8554	
				0·34			2,186,365	742 743	Total for B Zones.
				0·34			3822 406	1282 635	Total for section
2350E	235-120	A	11·4	0·31	3200	36 480	120 384	37 319	
	235-120	A	1·6	·52	3200	5120	16 896	8786	
	235-130	A	8·0	·36	6800	52 400	179 520	64 627	
	235-130	A	22·0	·52	6800	149 600	493 680	256 714	
	235-140	A	18·6	·38	8800	158 406	522 720	198 633	
	235-140	A	20·0	·51	8800	176 000	580 800	296 208	
	235-140	A	4·5	·51	8800	39 600	130 680	66 647	
	235-140	A	8·0	·36	8800	70 400	232 320	82 435	
[illegible]	[illegible]	[illegible]	4·2	35	8800	[illegible]	[illegible]	42 [illegible]	

CUT-OFF — 0.3 % soluble nickel

TION	HOLE NO	ZONE	WIDTH	AVERG. GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS.
	235-150	A	2·8	0·3	10 400	29 120	96 096	28 829	
	235-150	A	4·9	·44	10 400	50 960	16 8,178	73 994	
	235-170	A	31·0	·40	10 500	325 500	1 074 150	429 660	
				·42			3 737, 392	1, 587, 741	Total Zone A
	235-140	B	2·0	·69	4900	9800	32 340	22 315	
	235-150	B	6·0	·43	8100	48 600	160 380	68 963	
	235-150	B	2·0	·46	8100	16 200	53 466	24 594	
	235-150	B	2·0	·34	8100	16 200	53 466	18 178	
	235-150	B	2·0	·32	8100	16 200	53 466	17 109	
	235-150	B	4·0	·30	8100	32 400	106 920	32 076	
	235-160	B	26·0	·32	5400	140 400	463 320	148 262	
	235-160	B	2·0	·33	5400	10 800	35 640	11 761	
	235-170	B	64·0	·44	5400	345 600	1, 140 480	501 811	
	235-180	B	2·0	·33	7200	14 400	47 520	15 682	
				0.40			2, 146, 998	860 751	Total Zone B.
				0·42			5, 884, 390	2448 492	Total for Section
2450E	245-135	A	2·0	·47	6500	13000	42 900	20 163	
	245-135	A	16·0	·53	6500	104 000	343 200	181 896	
	245-145	A	20·0	·36	3900	78 000	257 400	92 664	
	245-145	A	18·0	·42	3900	70 200	231 660	97 297	
	245-145	A	2·0	·58	3900	7 800	25 740	14 929	
	245-150	A	4·0	·38	6000	24 000	79 200	30 096	
	245-150	A	32·0	·36	6000	192 000	633 600	228 096	
	245-160	A	4·0	·29	13475	53 900	177 870	51 582	Just under cut-off.
	245-160	A	28·0	·32	13475	377 300	1245 090	398 429.	
				·37			3 036 660	1115 152	Total for Zone A.
	245-145	B	10·0	·45	5200	52 000	171 600	77 220	
	245-145	B	4·0	·51	5200	20 800	68 640	37 752	
	245-150	B	8·5	·49	6500	55 250	182 325	89 339.	
	245-150	B	18·0	·34	6500	117 000	386 100	131 274	
	245-160	B	5·0	·35	8800	44 000	145 200	50 820.	
	245-160	B	2·0	·37	8800	17 600	58 080	21 490	
	245-170			·40			1 014 945	402 595	Total for Zone B

CUT-OFF – 0.3 % Cu Cyanide Acid Sol.

Sheet 3.

SECTION	HOLE NO	ZONE	WIDTH	AVERG. GRADE	AREA (m^2)	VOLUME (m^3)	TONNES	TONNES x GRADE	REMARKS.
2450E	245-120	C	2.0	1.35	1875	3750	12 375	16 706	
	245-125	C	7.0	1.90	1875	13125	43 312	82 294	
	245-125	C	2.0	.32	1875	3750	12 375	3960	
				1.51			68 062	102 960	Total for Zone C.
				0.39%			4,116,667	1,626,007	Total for Section
2500E	250-145	A	6.0	.35	9375	56250	185 625	64 969	
	250-145	A	4.0	.34	9375	37 500	123 750	42 075	
	250-145	A	17.2	.50	9375	161 250	532 125	266 062.	
	250-145	A	6.0	.48	9375	56250	185 625	89 100	
				.45%			1,027,125	462,206	Total for Zone A.
	14	D	3.0	.32	2500	7 500	24750	7920	
	14	D	45	.27	2500	11 250	37 125	10 024	under cut - A1
				.29			61 875	17 944	Total for Zone D.
				.44			1,089,000		Total for Section
2550E	14	E	4.5	.46	2500	11250	37 125	17 077	
	14	E	1.5	.41	2500	3750	12 375	5197	
				.45			49 500	22274	Total Zone E.
	15070	F	8.0	.40	2500	20 000	66 000	26400	
	15070	F	1.5	.41	2500	3 750	12 375	5074	
	255-140	F	24.9	.51	2500	62 250	205 425	104767	
	255-140	F	2.0	.32	2500	5000	16 500	5280	
	255-140	F	13.1	.52	2500	32 750	108 075	56199	
				.48			408 375	187 720	Total Zone F
				0.48			457 875	219 994	Total for Section
2600E	15070	E	2.0	.35	5000	10 000	33 000	11 550	Total Zone E.
	260-115	F	2.8	.58	3750	17 500	36 650	20 097	
	260-120	F	15.0	.46	3750	56 250	185 625	85 387	
	260-125	F	2.0	.36	2500	5000	16 500	5 940	
	260-125	F	2.0	.32	2500	5000	16 500	5 280	
	260-125	F	13.9	1.8	2500	34 750	114 675	206415	

CUT-OFF — 0.3% sulphide nickel

Sheet 4.

SECTION	HOLE NO	ZONE	WIDTH	AVERG. GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS.
2600E	~~260-130~~	F	11.0	.57	3750	41250	136 125	77 591	
	260-130	F	2.0	.30	3750		24 750	7 425	
	260-135	F	10.0	.38	3750	37 500	123 750	47 025	
	260-135	F	4.0	.36	3750	15 000	49 500	17 820	
	260-140	F	28.0	.49	3750	105 000	346 500	169 785	
	260-145	F	21.0	.49	3750	78 750	259 875	127 339	
				.60			1308 450	781 606	Total Zone F
	260-135	G	6.0	.30	3750	22 500	74 250	22 275	Total Zone G.
	260-130	H	2.0	.36	3750	7500	24 750	8 910	
	260-135	H	6.0	.35	3750	22 500	74 250	25 987	Total Zone H
				.35			99 000	34 897	
				.56			1514 700	850 756	Total for section
2700E	270-135	E	22.9	.67	5000	114 500	377 850	253 159	
	270-140	E	4.0	.32	5000	20 000	66 000	21 120	
	270-140	E	2.0	.37	5000	10 000	33 000	12 210	
				.60			476 850	286 489	Total Zone E
	270-120	F	4.0	.46	5000	20000	66 000	30 360.	
	~~270-130~~ D1	F	7.2	.33	3750	27000	89 100	29 403	
	D1	F	11.7	.38	3750	43875	144 787	55 019.	
	270-130	F	5.0	.29	5000	25000	82 500	23 925	Just under cut-off.
	270-130	F	13.0	.52	5000	65000	214 500	111 540	
	270-130	F	2.0	.35	5000	10 000	33 000	11 550	
	270-135	F	2.0	.49	5000	10 000	33 000	16 170	
	270-135	F	2.0	.33	5000	10000	33 000	10 890	
	270-135	F	16.8	.55	5000	84 000	277 200	152 460	
	270-135	F	22.7	.56	5000	113 500	374 550	209 748	
	270-140	F	44.0	.37	5000	220 000	726 000	268 620	
	270-145	F	10.0	.38	5000	50 000	165 000	62 700	
				.44			2238 637	982 390	Total Zone F
	D2	G	1.5	.32	5000	7 500	24 750	7 920	
	270-130	G	6.0	.37	5000	30 000	99 000	36 630	
	270-135	G	8.0	.32	5000	40000	132 000	42 240	
				.34			255 750	86 790	Total Zone G.
	D2	H	1.5	.38	5000	7500	24 750	9 405	
	D1	H	4.3	.29	3750	16125	53 212	15432	Under cut-off.
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

CUT-OFF — 0.3% sulphide nickel

Sheet 5

TION	HOLE NO	ZONE	WIDTH	AVERG. GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS.
2780E				.32			143 962	45 917	Total Zone M
	D1	I	2.6	.32	3750	9750	32175	10 296	Total Zone I
				.45					
							3,147 374	1,411,922	Total for Section
2630E	265-125	F	2.0	.56	2500	5000	16 500	9240	
	265-125	F	5.2	2.75	2500	13 000	42 900	117 975	
	265-125	F	4.0	.35	2500	10 000	33000	11 550	
				1.50			92 400	138 765	Total for section (All Zone F)
2800 E.	280 -130	E	12.0	.46	5000	60 000	198 000	91 080	Total Zone E.
	280 -125	F	9.3	.49	5000	46 500	153 450	75 190	
	280-125	F	2.0	.41	5000	10 000	33 000	13 530	
	280-125	F	3.0	.30	5000	15 000	49 500	14 850	
	280-125	F	5.8	.33	5000	29 000	95 700	31 581	
	280-125	F	2.0	.30	5000	10 000	33 000	9900	
	280-130	E	8.0	.46	5000	40 000	132 000	60 720	
	280-130	F	2.0	.38	5000	10 000	33 000	12 540	
	280-135	F	2.0	.36	5000	10 000	33 000	11 880	
	280-135	F	5.9	.51	5000	29 500	97 350	49 648	
	280-135	F	2.0	.40	5000	10 000	33 000	13 200	
	280-140	F	2.0	.51	5000	10 000	33 000	16 830	
	280-140	F	25.5	.58	5000	127 500	420 750	244 035	
	280-140	F	2.0	.31	5000	10 000	33 000	10 230	
	280-145	F	24.0	.40	5000	120 000	396 000	158 400	
	280-150	F	2.5	.54	5000	12 500	41 250	14 025	
				.47			1 575 750	737 519	Total Zone F.
				.47			1,773,750	828 969	
2900E	290-120	F	11.8	0.65	5000	59 000	194 700	126 555	
	290-120	F	2.0	.38	5000	10 000	33 000	12 540	
	290-120	F	3.6	.36	5000	18 000	54 400	21 384	
	290-125	F	39.6	.55	5000	198 000	653 400	359 370	
	290-125	F	4.0	.32	5000	20 000	66 000	21 120	
	290-125	F	4.0	.34	5000	20 000	66 000	22 440	

CUT-OFF — 0.3 % sulphide nickel.

SECTION	HOLE NO	ZONE	WIDTH	AVERAGE GRADE	AREA (m^2)	VOLUME (m^3)	TONNES	TONNES x GRADE	REMARKS
2900 E	290-130	F	4.0	.36	5000	20 000	66 000	23 760.	
	290-130	F	22.0	.35	5000	110 000	363 000	127 050	
	290-130	F	8.0	.31	5000	40 000	132 000	40 920	
	290-135	F	12.0	.51	5000	60 000	198 000	100 980.	
	290-145	F	34.0	.39	5000	170 000	561 000	218 790	
	290-145	F	10.6	.32	5000	53 000	174 900	55 968	
	290-150	F	6.7	.30	5000	33 500	110 550	33165	
	290-155	F	4.0	.30	5000	20 000	66 000	19 800	
				.43			2,743,950	1,183,842	Total for section (All zone F)
3000 E.	300-120	F	4.0	.30	3750	15 000	49 500	14 850	
	300-125	F	2.0	.29	3750	7 500	24 750	7178	
	300-135	F	16.0	.39	5000	80 000	264 000	102960	
	300-130	F	10.0	.46	3750	37 500	123 750	56 925	
	300-140	F	8.0	.32	5000	40 000	132 000	42 240	
	300-145	F	32.0	.45	5000	160 000	528 000	237 600	
	300-150	F	2.0	.45	5000	10 000	33 000	14 850	
	300-150	F	2.0	.43	5000	10 000	33 000	14190	
				.41			1,188,000	485 318	
3100 E.	310-135	F	2.0	.31	3750	7500	24750	7672	
	310-135	F	2.0	.34	3750	7500	24750	8415	
	310-140	F	2.0	.33	3750	7500	24750	8167	
	310-140	F	2.0	.33	3750	7500	24750	8167	
	310-140	F	10.0	.32	3750	37 500	123 750	39 600.	
	310-140	F	2.0	.35	3750	7500	24750	8662.	
				.33			247 500	80 683	

CUT-OFF — 0.4 % Soluble nickel

SECTION	HOLE NO	ZONE	WIDTH	AVERG GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS.
2150E	215-140	A	4.0	.56	9200	36 800	121 440	65 578.	
2250E	225-130	A	4.6	.49	8 000	36 800	121 440	59 506	
	225-140	A	14.0	.70	9000	126 000	415 800	291 060	
	225-150	A	20.1	.64	9700	194 970	643 401	411 777	
				.65			1 180 641	762 343	Total for Zone A.
	225-150	B	2.4	.50	7650	18 360	60 588	30 294	
	225-160	B	4.0	.44	8100	32 400	106 920	47 045	
	225-170	B	2.0	.56	6750	13 500	44 550	24 948	
				.48			212 028	102 287	Total for Zone B
	225-160	B'	1.2	.52	8100	9720	32 076	16 679	
	225-170	B'	2.0	.47	6750	13 500	44 550	20 938	
				.49			76 626	37 617	Total for Zone B'
	225-170	B^2	2.7	.40	6750	18 225	60 142	24 057	Total for Zone B^2
				.47			348.796	163 961	Total for B Zones.
				0.61			1529 437	926 304	Total for section
2350E	235-120	A	2.0	.42	3200	6400	21 120	8870	
	235-120	A	1.6	.52	3200	5120	16 896	8786	
	235-130	A	2.0	.44	6800	13 600	44 880	5984	
	235-130	A	22.0	.52	6800	149 600	493 680	256 714	
	235-140	A	4.0	.45	8800	35 200	116 160	52 272	
	235-140	A	4.0	.42	8800	35 200	116 160	48 787.	
	235-140	A	4.0	.43	8800	35 200	116 160	49 949	
	235-140	A	18.0	.53	8800	158 400	522 720	277 042	
	235-140	A	4.5	.51	8800	39 600	130 680	66 647	
	235-150	A	4.0	.46	10 400	42 000	138 600	63 756.	
	235-170	A	8.0	.50	10 500	84 000	277 200	138 600.	
	235-170	A	6.0	.52	10 500	63 000	207 900	108 108	
				.49			2,202,156	1 085 515	Total for Zone A.
	235-140	B	2.0	.69	4900	9800	32 340	22 315	
	235-150	B	2.0	.65	8100	16 200	53 466	34 479	
	235-150	B	2.0	.46	8100	16 200	53 466	24 594	
	235-160	B	2.0	.47	5400	10 800	35 640	16 751	
	235-160	B	4.0	.53	5400	21 600	71 280	37 778	
	235-170	B	2.0	.40	5400	10 800	35 640	14 256	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

CUT-OFF – 0.4 % sulphide nickel

SECTION	HOLE NO	ZONE	WIDTH	AVERG. GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS.
2350 E	235-170	B	32.0	.58	5400	172 800	570 240	330 739	
				.56			887 712	495 881	Total for Zone B
				.51			3,089,868	1,581,396	Total for Section
2450 E	245-135	A	2.0	.47	6500	13 000	42 900	26 163	
	245-135	A	10.1	.67	6500	65 650	216 645	145 152	
	245-145	A	4.0	.46	3900	15 600	51 480	23 681	
	245-145	A	2.0	.47	3900	7 800	25 740	12 098	
	245-145	A	2.0	.54	3900	7 800	25 740	13 900	
	245-145	A	8.0	.46	3900	31 200	102 960	47 362	
	245-145	A	2.0	.58	3900	7 800	25 740	13 385	
	245-150	A	2.0	.47	6000	12 000	39 600	18 612	
	245-150	A	2.0	.40	6000	12 000	39 600	15 840	
	245-150	A	6.0	.48	6000	36 000	118 800	57 024	
	245-160	A	2.0	.42	13471	26 910	88 935	37 353	
				0.50			778 140	390 517	Total for Zone A
	245-145	B	6.0	.51	5200	31 200	102 960	52 510	
	245-145	B	4.0	.55	5200	20 800	68 640	37 752	
	245-150	B	8.5	.49	6500	55 250	182 325	89 339	
	245-150	B	2.0	.41	6500	13 000	42 900	17 589	
	245-160	B	2.0	.45	8800	17 600	58 080	26 136	
				0.49			454 905	223 326	Total for Zone B
	245-120	C	2.0	1.35	1875	3750	12 375	16 706	
	245-125	C	7.0	1.90	1875	13125	43 312	82 294	
				1.78			55 687	99 000	Total for Zone C.
				0.55			1,288,732	712 843	Total for Section
2500 E	250-145	A	2.0	.43	9375	18750	61 875	26 606	
	250-145	A	12.0	.57	9375	112 500	371 250	207 900	
	250-145	A	6.0	.48	9375	56250	185 625	89 100	
				.52			618 750	323 606	Total for section All zone A.

CUT-OFF — 0.4% Cobalt equivalent nickel

Sheet 3

SECTION	HOLE NO	ZONE	WIDTH	AVERG. GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS.
2550E	14	E	3.0	.52	2500	7500	24750	12 870	
	14	E	1.5	.45	2500	3750	12375	5 197	
				.49			37125	18 067	Total Zone E
	15070	F	3.0	.49	2500	7500	24 750	12 127	
	15070	F	1.5	.41	2500	3750	12 375	5 076	
	255-140	F	20.0	.55	2500	50 000	165 000	90 750	
	255-145	F	11.1	.55	2500	27 750	91 575	50 366	
				.54			293, 700	158 317	Total Zone F
				0.53			330 825	176 384	Total for Section
2600E	260-115	F	2.8	.58	3750	10 500	34 650	20 097.	
	260-120	F	13.0	.49	3750	48 750	160 875	78 829	
	260-125	F	13.9	1.8	2500	34 750	114 675	206 415	
	260-130	F	11.0	.57	3750	41 250	136 125	77 591	
	260-135	F	2.0	.62	3750	7 500	26 750	15 345	
	260-140	F	26.0	.50	3750	97 500	321 750	160 875	
	260-145	F	21.0	.49	3750	78 750	259 875	127 339	
				.65			1 052 700	686 491	Total for Section (All Zone F)
2700E	270-135	E	22.9	.67	5000	114 500	377 850	253 159	Total Zone E
	270-120	F	2.0	.60	5000	10 000	33 000	20 460	
	D1	F	1.1	.66	3750	4 125	13 612	8 984	
	D1	F	1.3	.56	3750	4875	16 087	9 009	
	270-130	F	4.0	.54	5000	20 000	66 000	35 640	
	270-130	F	2.0	1.20	5000	10 000	33 000	39 600	
	270-130	F	2.0	.43	5000	10 000	33 000	14 190	
	270-135	F	14.8	.58	5000	74 000	244 200	141 636	
	270-135	F	16.0	.59	5000	50 000	165 000	97 350	
	270-135	F	10.7	.58	5000	53 500	176 550	102 399	
	270-140	F	14.0	.51	5000	70 000	231 000	117 810	
	270-140	F	4.0	.47	5000	20 000	66 000	31 020	
	270-145	F	4.0	.47	5000	20 000	66 000	31 020	
	270-135	F	2.0	.49	5000	20 000	33 000	16 170	
	270-130	F	2.0	.56	5000	10000	1.176 4419	665228	Total Zone F
				.59			1,552,299	952577	Total Zone F TOTAL SECTION

CUT-OFF — 0.4% soluble nickel

SHEET 4

SECTION	HOLE NO	ZONE	WIDTH	AVERG GRADE	AREA(m²)	VOLUME(m³)	TONNES	TONNES x GRADE	REMARKS.
2650E	265-125	F.	2.0	.52	2500	5000	16 500	9240	
	265-125	F	5.2	2.75	2500	13 000	42 900	117 975	
	265-125	F	2.0	.41	2500	5000	16 500	6 765	
				1.76			75 900	133 980	Total for Section (All Zone F
2800E	280-130	E	12.0	.46	5000	60 000	198 000	91 080	Total Zone E.
	280-125	F	2.8	.52	5000	14 000	46 200	24 024	
	280-125	F	4.5	.65	5000	22 500	74 250	48 262.	
	280-125	F	2.0	.41	5000	10 000	33 000	13 530.	
	280-130	F	2.0	.71	5000	10 000	33 000	24 420	
	280-135	F	5.9	.51	5000	29 500	97 350	49 648	
	280-135	F	2.0	.40	5000	10 000	33 000	13 200.	
	280-140	F	2.0	.51	5000	10 000	33 000	16 830	
	280-140	F	23.5	.60	5000	117 500	387 750	232 650	
	280-141	F	2.0	.42	5000	10 000	33 000	14 850	
	280-145	F	11.7	.49	5000	58 500	193 050	94 594	
				.55			963 600	532 008	Total Zone F
				.54			1,161,600	623 088	Total for Section
2900E	290-120	F	10.2	0.70	5000	51 000	169 830	118 961	
	290-125	F	9.8	0.89	5000	49 000	161 700	143 913	
	290-125	F	5.2	0.43	5000	26 000	85 800	36 894	
	290-125	F	8.0	0.51	5000	40 000	130 000	67 320	
	290-130	F	2.0	0.48	5000	10 000	33 000	15 840	
	290-130	F	2.0	0.49	5000	10 000	33 000	16 170	
	290-130	F	3.0	0.44	5000	15000	49 500	21 780.	
	290-130	F	4.0	0.53	5000	20 000	66 000	34 980	
	290-135	F	8.9	0.56	5000	44 500	146 850	82 236	
	290-145	F	18.0	0.48	5000	90 000	297 000	142 560	
	290-150	F	2	0.41	5000	10 000	33 000	13530	
				0.58			1,205,850	694 188	Total for Section (All Zone F)

CUT-OFF — 0.4% cyclohexanickel

Sheet 5

SECTION	HOLE NO	ZONE	WIDTH	AVERG GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS
3000E	300-130	F	8.0	.46	3750	30 000	99 000	45 540	
	300 135	F	8.0	.44	5000	40 000	132 000	58 080	
	300-135	F	2.0	.40	5000	10 000	33 000	13 200	
	300-145	F	20.0	.52	5000	100 000	330 000	171 600	
	300-150	F	2.0	.43	5000	10 000	33 000	14 190	
				.48			627 000	302 610	
3100E									All under 0.4%

CUT-OFF — 0.5% ex Cobalt nickel

TION	HOLE NO	ZONE	WIDTH	AVERG. GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS.
2150E	215-140	A	4.0	.54	9200	36 800	121 440	65 578	Total for Section
2250E	225-130	A	3.3	.50	8000	26 400	87 120	43 560	
	225-140	A	14.0	.70	9 000	126 000	415 800	291 060	
	225-150	A	16.0	.69	9 700	155 200	512 160	353 390	
				.68			1015 080	688 010	Total for Zone A.
	225-150	B	2.4	.50	7650	18 360	60 588	30 294	
	225-160	B	2.0	.49	8 100	16 200	53 460	26 185	Just under cut-off.
	225-170	B	2.0	.56	6 750	13 500	44 550	24 948	
				.51			158 568	81 437	Total for Zone B
	225-160	B'	1.2	.52	8100	9720	32 076	16 679	Zone B' - probably too narrow.
				.51			190 644	98 116	Total for B Zones.
				.65			1,205,724	786 126	Total for Section
	235-120	A	1.6	.52	3200	5120	16 896	8 786	
2350E	235-130	A	20.0	.53	6800	136 000	448 800	237 864	
	235-140	A	14.0	.57	8800	123 200	406 560	231 739	
	235-140	A	2.5	.56	880	2200	72 600	40 656	
	235-170	A	6.0	.50	10 500	63 000	207 900	103 950	
	235-170	A	4.0	.55	10 500	42 000	138 600	76230	
				.54			1291 356	699 225	Total for Zone A
	235-140	B	2.0	.69	4900	9800	32 340	22 315	
	235-150	B	2.0	.65	8400	16200	53 466	34 479	
	235-160	B	2.0	.65	5400	10 800	35 640	23 166	
	235-170	B	6.0	.53	5400	32 400	106 920	56 668	
	235-170	B	20.80	.66	5400	108 000	356 400	235 224	
				.64			584 760	371 852	Total for Zone B
				0.57			1 876 116	1,071,077	Total for Section
2450E	245-135	A	8.1	0.71	6500	52 650	173 745	123 359	
	245-145'	A	2.00	0.54	3900	7800	25 740	13 900	
	245-145	A	2.0	0.52	3900	7800	25 740	13 385	
	245-145	A	2.0	0.58	3900	7800	25 740	14 929	
	245-150	A	2.0	0.52	6000	12 000	39 600	20592	
[redacted]				64			[redacted]	18 [redacted]	[redacted] A)

CUT-OFF – 0.5 % sulphide nickel

SECTION	HOLE NO	ZONE	WIDTH	AVERG. GRADE	AREA (m^2)	VOLUME (m^3)	TONNES	TONNES x GRADE	REMARKS.
2450E	245-145	B	4·0	·53	5200	20 800	68 640	36 379	
	245-145	B	4·0	·55	5200	20 800	68 640	37 752.	
	245-150	B	4·0	·53	6500	26 000	85 800	45474	
				·54			223,080	119 605	Total Zone B.
	245-120	C	2·0	1·35	1875	3750	12 375	16706	
	245-125	C	5·6	2·27	1875	10 500	34 650	78615	
				2·03			47 025	95 361	Total Zone C.
				·71			560 671	401 131	Total for Section.
2500E	250-145	A	16·0	·60	9375	93750	309 375	185625	
	250-145	A	2·0	·56	9375	18 750	61 875	34650	
				0·59			371 250	220 275	Total for section (All Zone A)
2550E	14	E	1·5	·62	2100	3750	12375	7672	Total Zone E
	255-146	F	20.0	·55	2500	50 000	165 000	90 750	
	255-145	F	9.1	·57	2500	22 750	75 075	42793	
				·56			240 075	133543	Total Zone F
				·56			252 450	141 215	Total for Section (All Zone F)
2600E	260-125	F	2·8	·58	3750	10 500	34 650	20 097	
	260-120	F	2·7	·58	3750	10 125	33 412	19 379	
	260-120	F	2·0	·53	3750	7 500	24 750	13 117	
	260-125	F	13·9	1·8	2500	34 750	114 675	206415	
	260-130	F	2·0	·8	3750	7 500	24 750	19 800	
	260-130	F	2·0	1·0	3750	7 500	24 750	24 750.	
	260-135	F	2·0	·62	3750	7 500	24 750	15 345	
	260-140	F	24·0	·51	3750	90 000	297 000	151 470	
	260-145	F	6·5	·53	3750	24 375	80 437	42 632	
	260-145	F	2·0	·52	3750	7500	24 750	12 870	
	260-145	F	2·0	·52	3750	7 500	24 750	12870.	
				·76			708, 674	538 745	Total for Section (All Zone F)

CUT-OFF — 0.5% cobalt nickel

SHEET 3.

TION	HOLE NO	ZONE	WIDTH	AVERG GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS.
2700E	270-135	E	16.0	.73	5000	80000	264 000	192 720	
	270-131	E	4.9	.55	5000	24 500	80 850	44 467	
				.69		~~34 500~~	344 850	237 187	Total Zone E
	270-120	F	2.0	.68	5000	10 000	33 000	20 460	
	D1	F	1.1	.66	3750	4125	13 612	8984	
	D1	F	1.3	.56	3750	4875	16 087	9009	
	270-130	F	4.0	.54	5000	20 000	66 000	35 640	
	270-130	F	2.0	1.2	5000	10 000	33 000	39 600.	
	270-135	F	14.8	.58	5000	74 000	244 200	141 636	
	270-135	F	10.0	.59	5000	50 000	165 000	97 350	
	270-131	F	10.7	.58	5000	53 500	176 550	102 399	
	270-140	F	14.0	.51	5000	70 000	231 000	117 810	
	270-140	F	2.0	.50	5000	10 000	33 000	16 500	
				.58			1,011,449	589328	Total Zone F
				.61			1,356,299	826 515	Total for Section
2650E	265-125	F	5.2	2.75	2500	13000	42 900	~~117 975~~	
	265-125	F	2.0	.56	2500	5000	16 500	9240	
				2.14			59 400	~~127 215~~	Total for Section (All Zone F)
2800E.	280-135	E	6.0	.51	5000	30 000	99 000	50490	Total Zone E.
	280-125	F	2.8	.52	5000	14 000	46 200	24024	
	280-125	F	4.5	.65	5000	22 500	74250	48262	
	280-130	F	2.0	.75	5000	10 000	33 000	24420.	
	280-135	F	5.9	.51	5000	29 500	97350	49648	
	280-140	F	2.0	.51	5000	10000	33 000	16830	
	280-140	F	23.5	.60	5000	117 500	387 750	232650.	
	280-145	F	6.0	.53	5000	30 000	99 000	52 470.	
				.58			770,550	448 304	Total Zone F
				.57			869,550	498 794	Total for Section

CUT-OFF — 0.5% s. Calculated Nickel

SECTION	HOLE NO	ZONE	WIDTH	AVERG. GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS.
2900E	290-120	F	10.3	0.70	5000	51 500	169 950	118 965	
	290-125	F	9.8	0.89	5000	49 000	161 700	143 913	
	290-125	F	8.0	0.51	5000	40 000	130 000	67 320	
	290-130	F	4.0	0.53	5000	20 000	66 000	34 980	
	290-135	F	6.0	0.62	5000	30 000	99 000	61 380	
	290-145	F	14.0	0.50	5000	70 000	231 000	115 500	
				0.63			857 650	542 058	Total for section (all zone F)
3000E	300-130	F	4.0	0.58	3750	15 000	49 500	25245	
	300-135	F	2.0	0.50	5000	10 000	33 000	16 500	
	300-145	F	14.0	0.55	5000	70 000	231 000	127 050	
				0.54			313 500	168 795	
3100E									All under 0.5%

CUT-OFF — 0.6 % Soluble nickel

SECTION	HOLE NO	ZONE	WIDTH	AVERG. GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS.
2150E.									ALL BELOW 0.6% Ni
2250E	225 - 140	A	12.0	.73	9000	108 000	356 400	260 172	
	225 - 150	A	14.0	.71	9700	135 800	448 140	318 179	
				.72			804 540	578 351	Total for section (All zone A)
2350E	235 - 130	A	2.0	.62	4800	9 600	31 680	19 642	
		A	2.0	.64	4800.	9 600	31 680	20 275	
	235 - 140	A	2.0	.61	8800	17600	58080	35 429	
		A	4.0	.68	8800	35200	116160	78 989	
	235 - 170	A	2.0	.64	10500	21 000	69 300	44352	
				.65			306 900	198 685	Total for Zone A
	235 - 140	B	2.0	.69	4900	9 800	32 340	22 315	
	235 - 150	B	2.0	.65	8100	16 200	53 460	34 479	
	235 - 160	B	2.0	.65	5400	10 800	35 640	23 166	
	235 - 170	B	16.0	.69	5400.	86 400	285 120	196 733	
				.68			406 560	276 893	Total for Zone B.
				.67			713 460	475 378	Total for section
2450E.	245 - 135	A	6.1	.78	6500	39 650	130 845	102 059	Total for ~~section~~ Zone A)
	245 - 120	C	2.0	1.35	1875	3750	12 375	16 706	
	245 - 125	C	5.6	2.27	1875	10 500	34 650	78 655	Total for Zone C.
				2.03			47025	95 361	
				1.11			177 870	197 420	Total for section
2500E	250 - 145	A	8.0	.62	9375	75 000	247 500	153 450	Total for section (All Zone A.
2550E	14	E	1.5	.62	2500	3750	12 375	7672	Total Zone E
	255 - 140	F	2.0	.60	2500	5000	16 500	9900	
	255 - 145	F	2.0	.61	2500	5000	16 500	10 065	
	255 - 140	F	2.0	.73 .65	2500	5000	13 500	32 805	Total Zone F
				.65			61875	40 482	Total for section
2600E	260 - 125	F	13.9	1.8	2500	34 750	114 675	206 415	
	260 - 130	F	2.0	.8	3750	7 500	24 750	19 800	
	260 - 130	F	2.0	1.0	3750	7 500	24 750	24 750	
	260 - 135	F	2.0	.62	3750	7 500	24 750	15 345	

CUT-OFF — 0.6 % Cu Cobalt nickel

SHEET 2

TION	HOLE NO	ZONE	WIDTH	AVERG. GRADE	AREA(m^2)	VOLUME(m^3)	TONNES	TONNES x GRADE	REMARKS.
	260 -140	F	2	.62	3750	7500	24750	15 345	TO
				1.32%			213675	281 655	Total for Section (All Zone F)
2700E	270 - 135	E	16.0	.73	5000	80 000	264 000	192720	Total for Zone E.
	270 -120	F	2.0	.62	5 000	10 000	33 000	20460	
	~~270~~ 01	F	1.1	.66	3750	4 125	13612	8984	
	270 - 130	F	2.0	1.2	5000	10 000	33000	39 600	
	270 - 135	F	4.6	.66	5000	23 000	75900	50 094	
	270 - 135	F	6.0	.64	5000	30 000	99 000	63360	
	270 - 130	F	2.0	.62	5000	10 000	33 000	20 460	
	270 -140	F	2.0	.66	5000	10 000	33000	19 800	
				.69			320 512	222 718	Total for Zone F
				.71			584 512	415 028	Total for Section
2650E	265-125	F	5.2	2.75	2500	13 000	42 902	~~117 973~~	Total for Section (All Zone F)
2800E	280 - 125	F	2.0	.88	5000	10 000	33000	29 046	
	280 - 130	F	2.0	.76	5000	10 000	33000	24420	
	280 - 140	F	6.0	.65	5000	30 000	99 000	64 350	
	280 -140	F	2.0	.60	5000	10 000	33000	19 800.	
	280 -140	F	4.0	.67	5000	20 000	66 000	44 220	
				.69			264 000	181 836	Total for section (All Zone F)
2900E	270-120	F	10.3	0.70	5 000.	51 500	169 950	118 965	
	270-125	F	9.8	0.89	5000	49 000	161 700	143 913	
	290 -125	F	2.0	0.60	5000	10 000	33 000	19 800.	
	290 -130	F	2.0	0.60	5000	10 000	33000	19 80?	
	270 -135	F	6.0	0.62	5000	30 000	99 000	61380	
	290 -145	F	2.0	0.60	5000	10000	33000	19800	Total for Section (All Zone F)
				.72			529,650	383 658	

CUT-OFF — 0.6 % soluble nickel

Sheet 3

SECTION	HOLE NO.	ZONE	WIDTH	AVERG. GRADE	AREA (m^2)	VOLUME (m^3)	TONNES	TONNES x GRADE	REMARKS
3000 E	A								All under 0.6 %.
3100 E									All under 0.6 %.

Maps

GRÅBERGTIPP

NIVÅ 510

NIVÅ 480

NIVÅ 540

480

450

300

330

360

420

450

NIVÅ 390

NIVÅ 360

GRÅBERGTIPP

NIVÅ 330

NIVÅ 300

BREKKEN

SANDSELVA

SAMMELMOLNHAGEN

LEMMEN

ARNES

FINSOSEN

FORKNESSHAUGEN

Kirkedalen

From existing feasability report showing a planned location of open pit, waste piles (gråberg tipp) and mill.

SCALE

OBS.

DRAW.

TRAC.

CHK.

MAP NO.

MAP SHEET

⅛ SULFIDMALM

P-200 P-210 P-220 P-230 P-240 P-250 P-260 P-270 P-280 P-290 P-300 P-310 P-320

1800 1700 1600 1500 1400 1300 1200 1100 1000

2000 2100 2200 2300 2400 2500 2600 2700 2800 2900 3000 3100 3200

Arneselven

Bruvann
421,3

325 350 375 400 425 450 475 500 525 550 575 600 625 650

215–160 225–160 235–160 245–160

225–150 235–150 245–150 280–150

245–145 250–145 255–145 260–145 270–145 280–145 290–145 300–145 310–145

215–140 225–140 235–140 255–140 260–140 270–140 280–140 290–140 300–140 310–140

245–135 260–135 270–135 280–135 290–135 300–135 310–135

225–130 235–130 255–130 260–130 270–130 280–130 290–130 300–130 310–130

45° 14 245–125 50° 15070 255–125 260–125 280–125 290–125 300–125

45° 13 235–120 245–120 260–120 270–120 280–120 290–120 300–120

260–115

45° 16A 45° 17 50° 15300 60° 16B 45° 18 45° 20

Location of diamond drill hole collars 1971–1974	SCALE 1:2000	DES.
		DRAW.
		TRAC.
		CHK.
% SULFIDMALM	MAP NO.	
	MAP SHEET	

N

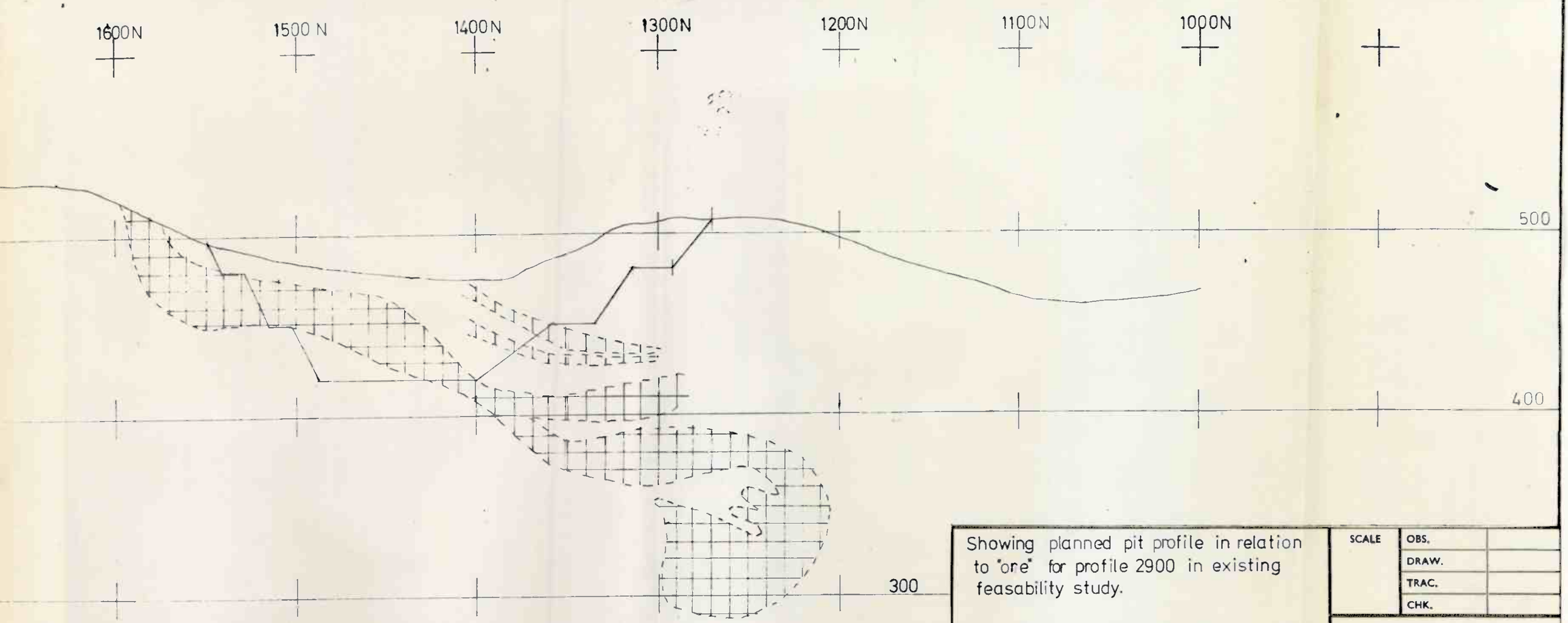
KEY:

- mica schist
- calcarous mica-schist
- contact metamorphosed mica-schist
- limestone
- quartz-norite
- norite
- peridotite
- granite
- quartz-diorite
- hornblende schist
- cover

A/S SULFIDMALM

The Raana massif - geology
alter S. Foslie, 1923

SCALE 1:100 000	DRAWN
DATE	TRACED



Showing planned pit profile in relation to "ore" for profile 2900 in existing feasability study.

SCALE	OBS.	
	DRAW.	
	TRAC.	
	CHK.	

MAP NO.

MAP SHEET

⅛ SULFIDMALM