GEOPEKO LIMITED

KING ISLAND

REPORT No. KI/73/5

RESTRICTED
FILE

REPORT ON THE STATE OF THE PRIMARY ORE RESERVE,

No. 1 OREBODY, AS AT JUNE 26, 1973.

by

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**ISG COORDINATES
REFER REPORT 70-0676**

KING ISLAND   AUGUST, 1973.

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INTRODUCTION

At the commencement of the 1973-74 financial year the Primary Ore Reserve of the No. 1 Orebody was reported by King Island Scheelite Ltd. and Geopeko Ltd. at 369.200 tonnes at an average grade of 0.61% WO_3. The reserve was composed of 323,300 tonnes at 0.62% WO_3 ore in situ and 45.900 tonnes at an estimated grade of 0.5% WO_3 on the high grade stockpiles.

A Secondary Reserve composed of the secondary mining blocks and the low grade stockpiles was stated as 232,300 tonnes at 0.31% WO_3.

This report is a detailed appraisal of the mining blocks constituting the Primary Ore Reserve with comments on the reliability of each block and the confidence that may be placed on the reserve.

SUMMARY

The Primary Ore Reserve in situ can be subdivided into the following grade divisions :-

$\leqslant$ 0.30% WO_3	7,000 tonnes
0.31 - 0.40% WO_3	37,300 tonnes
0.41 - 0.50% WO_3	106,700 tonnes
0.51 - 0.60% WO_3	65,200 tonnes
0.61 - 0.70% WO_3	28,900 tonnes
$\geqslant$ 0.71% WO_3	78,200 tonnes

Planned dilution of 27% is incorporated in the Primary Ore Reserve in situ.

Only eight of the twenty six Primary Mining blocks remaining at 26.6.73 have an estimated grade above the desired mill head grade of 0.60% WO_3. These blocks represent 33% of the Primary Ore Reserve in situ.

CONCLUSIONS

1. As only 29% of the total Primary Ore Reserve is
    estimated at a grade greater than 0.60% WO_3 the
    liklihood of maintaining a suitable mill head
    grade throughout 1973-74 will depend very much on
    several high grade blocks and in particular on a
    0.98% WO_3 block on 20 bench.

2. The estimated grade of a mining block is determined
    from the grade of ore in the block and the degree of
    planned dilution.

3. The confidence that may be placed on the estimated
    grade of a mining block is increased by :

    a. the greater the number of DDH's used to
        define the ore within the block.

    b. the greater the number of assays used to
        determine the grade of ore within the block.

    c. the smaller the variation between the
        individual assays.

4. The relationship of planned dilution to actual
    dilution may vary from block to block. It may depend
    upon the nature of the mineralisation, whether the
    block is mined parallel to or across the strike and
    whether the block is mined over the total bench height
    or initially as a half bench.

    For example dilution in the footwall mining blocks
    is best reduced when they are mined parallel to the
    strike.

5. Assays derived from bulk sampling of percussion holes
    drilled for blasting purposes have been shown to be
    very unreliable in the past and can only be used as
    a broad guide for planning and grade control purposes.

6. The separate firing of "ore" and "waste" blast holes
    and close control with a U.V. lamp have been shown to
    be the most effective method of grade control.

7. Mining blocks constructed about one diamond drill hole
    have been very unreliable in the past. eg. 0.70% WO_3
    mining block, 17 bench centre.

8.   Drilling sections which are of the order of 40m apart
        are too **widespaced** for detailed ore definition now ·
        that the lower parts of the orebody are being mined.
        Here the ore has broken up into numerous and often
        apparently discontinuous stringers.

9.   No further diamond drilling is warranted in the Open
        Cut proper although a small amount will be required
        in the Wedgeblock for ore definition should the
        decision be taken to extend mining operations into
        this area.

10.   There is no potential for any significant increase
        in the ore resource at depth.

RECOMMENDATIONS

1.   The high grade (+0.60% WO$_3$) blocks must be stockpiled to permit upgrading of the lower grade blocks as they are extracted.

2.   Bulk blast hole assaying of all firings in or near ore blocks should continue, as should the U.V. lamping of these firings.

3.   A survey record of these blast holes should be kept.

4.   Where the design of the Open Cut permits consideration should be given to reducing dilution by mining parallel to the strike and/or mining in half benches.

ACTION SHEET

PRIMARY ORE RESERVE - METHOD OF CALCULATION

The design and subsequent tonnage and grade estimates for each of the primary mining blocks (and secondary blocks) was carried out in the following manner.

Geological cross sections were constructed and ore outlines drawn using a 0.25% WO_3 cut-off. The ore outlines so drawn represented a series of sub-lenses, within the principal C lens horizon, which were then correlated between sections using the geological unit within which the sub-lens occurred as the main basis for correlation.

The grade of the sub-lenses was then determined between bench levels and between sections. Lines were constructed such as to bisect the angles formed by the diamond drill holes on section so that each intersection could be assigned an area of influence which extended half way to adjacent drill holes. The area of influence of any DDH was given the mean arithmetic grade of the appropriate ore intersection. The grade of each sub-lens between adjacent sections was determined using a simple proportional area method.

The tonnage of each sub-lens between bench levels and adjacent sections was derived by calculating the volume using the Truncated Cone formula and employing a constant S.G. of 3.3

In this way a total Geological Ore Resource of the No. 1 Orebody was built up.

The shape of the mining blocks was then designed. These were designed on section to include as much ore and as little waste as possible within a block of realistic mining dimensions. A minimum width of 9 metres was assumed. A trapezoidal cross sectional shape was assumed for the mining blocks on the hangingwall side as these are usually mined across the strike as the new bench level is established, and a parallelogram cross sectional shape for the footwall blocks as they are usually mined parallel to the strike. The blocks were then drawn on bench plans taking into account the strike of the strata and any discontinuity due to faults or aplites.

Tonnages of the mining blocks were calculated by planimetering the area on bench plans allowing a 9 metre height between benches. A constant S.G. of 3.3 was used.

The grade of the mining blocks was determined making use of the ore resource grades already derived. Cross sectional views of the mining blocks were planimetered to determine the ore/waste ratio and hence the degree of planned dilution, and then a simple grade calculation was conducted based on proportional areas. Waste in a mining block was given a constant assay value of 0.05% WO_3.

Secondary mining blocks were designed about the fringes of the Primary blocks to take into account any ore not included in the Primary reserve. Tonnage and grade calculations were conducted in the manner described for the Primary blocks. Percent planned dilution was not calculated for the Secondary blocks but would probably be of the order of twice that planned for the Primary blocks.

RELIABILITY OF THE ESTIMATED GRADE OF THE MINING BLOCKS

The estimated grade of a mining block is determined by considering,

    a. the grade of <u>ore</u> in the block
    and
    b. the degree of planned dilution.

Obviously the more confidently these two factors can be forecast the closer the <u>estimated</u> grade will approach the <u>actual</u> grade.

The accuracy with which the grade of ore within the block is known can vary considerably from block to block. The number of drill holes used to define the ore within a block, and the number of assays that can be employed to assess the grade, as well as the variation in grade between the individual assays are all important in assessing the degree of confidence with which the mean grade is known.

To illustrate this point consider the following example. The ore within the 0.55% block on 20 bench is defined by 5 assays in DDH 125 which show a substantial variation about the mean of 1.31% WO_3 (Fig. 21). At the 90% confidence interval the grade varies 0.47% WO_3 about the mean, or in other words the estimated block grade varies between 0.37% and 0.74% WO_3 at this level of confidence. Alternately consider another example where only one hole is used but there are a greater number of assays with a smaller variation. The 0.48% WO_3 block on 17 bench west is defined by 16 assays in DDH 446 which give a mean grade of 0.53% WO_3. In this instance at the 90% level of confidence the mean has a variation of $\pm$ 0.12% WO_3 which would cause the estimated block grade to vary between 0.37% and 0.59% WO_3.
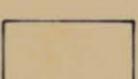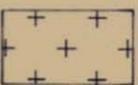
The degree of planned dilution is calculated as a simple ore/waste ratio from the geological sections involved in the design of the mining block but the relationship of the <u>planned</u> to the <u>actual</u> dilution can vary from block to block. Whether the block is mined parallel to or across the strike, the nature of the mineralisation within the block which may allow "ore" blast holes to be fired separately to "waste" holes and whether the block is mined first as a half bench (say in the case of a dropcut) or mined over the total bench height throughout are all factors which may affect the actual dilution of a mining block.

REFERENCES
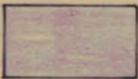
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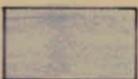
B Lens marble
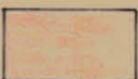
B Lens ore (cut-off 0·25 % WO_3)
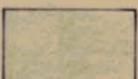
Biotite hornfels
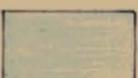
Pyroxene garnet hornfels
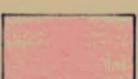
Mineralized C Lens skarn (cut-off 0·25 % WO_3)
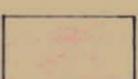
Unmineralized C Lens skarn
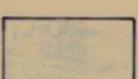
Marble marker beds

Banded footwall beds

Quartzite

Aplite

Fault
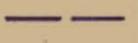
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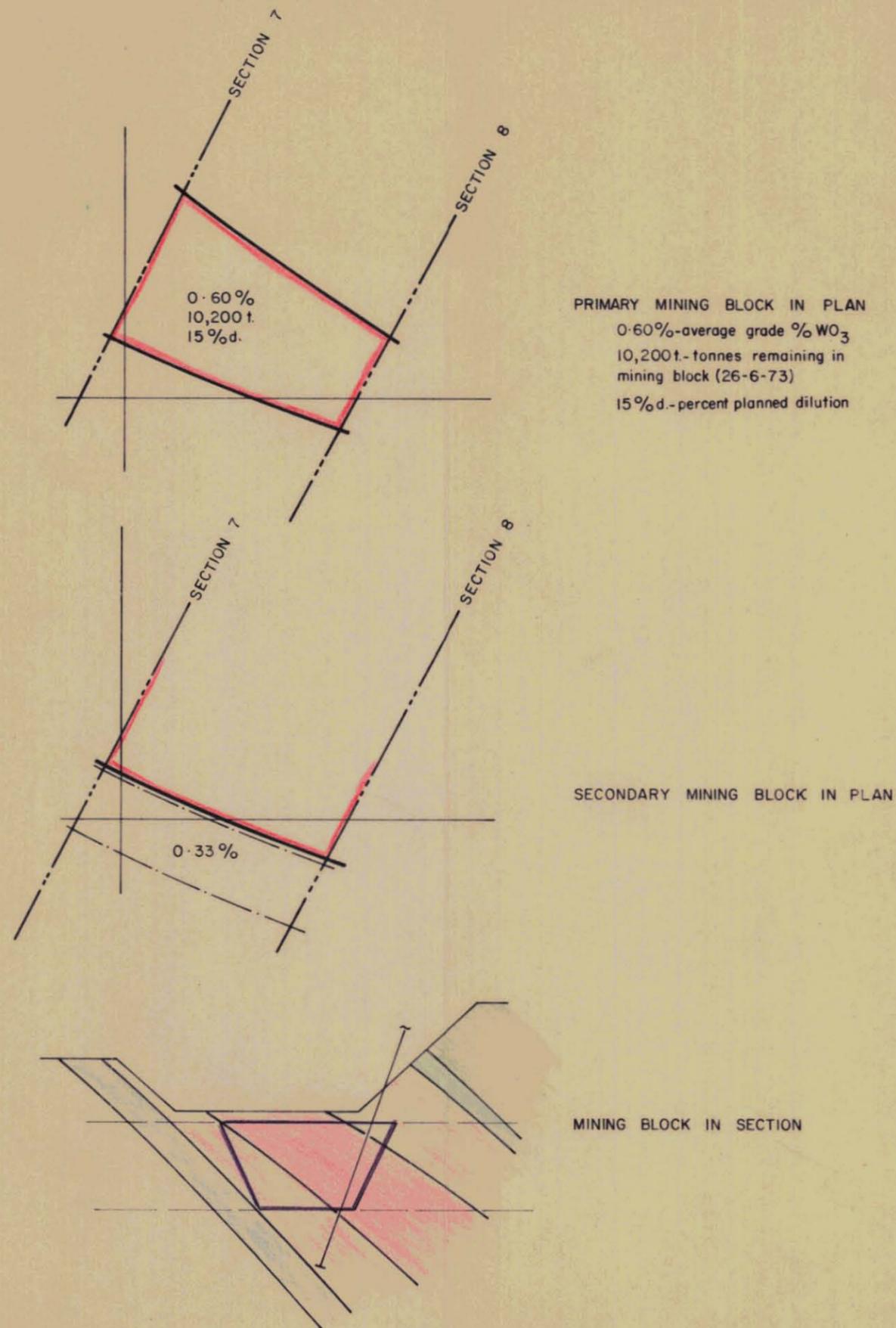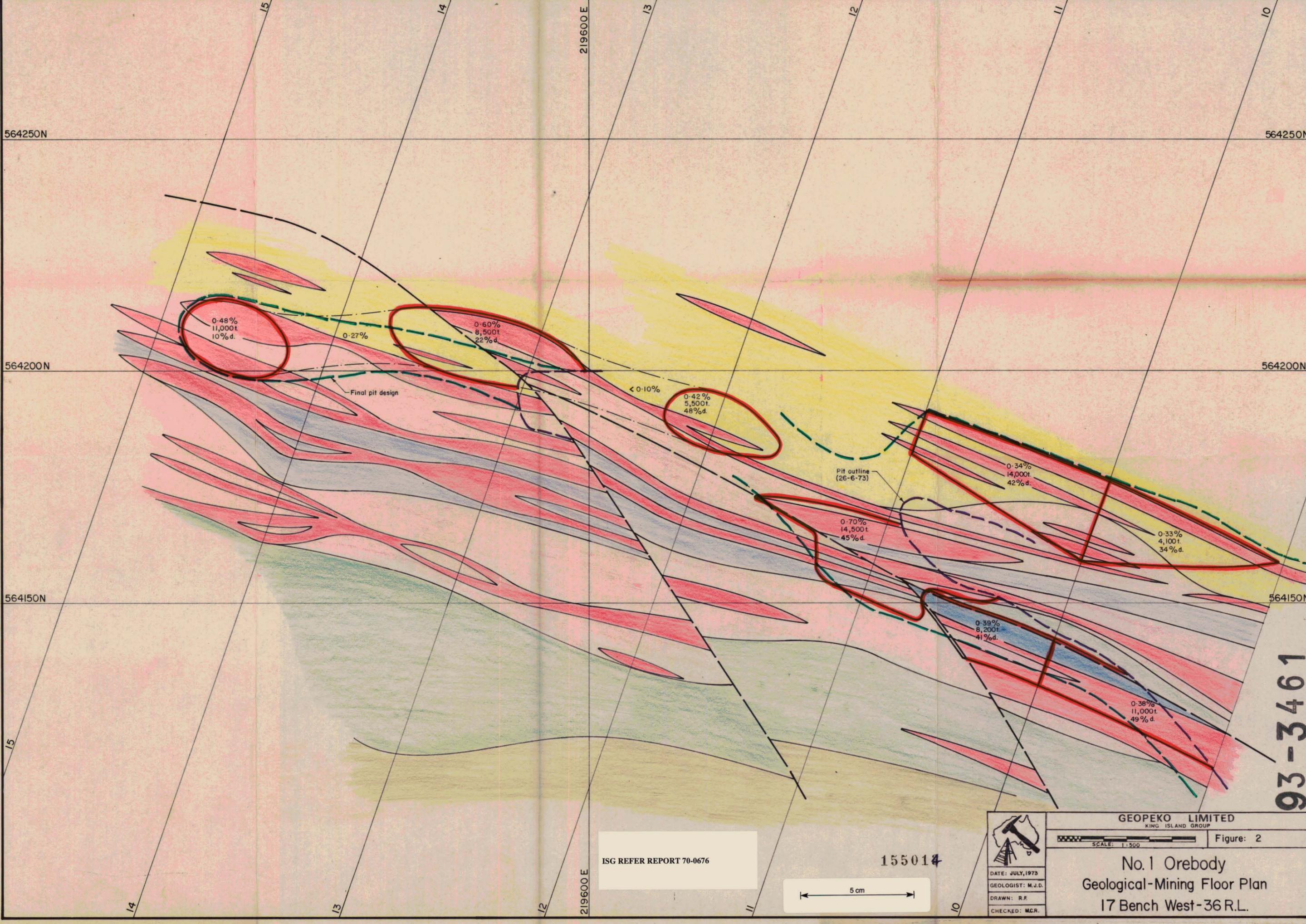
Final pit design

SECTION 7

SECTION 8

0·60 %
10,200 t.
15 % d.

PRIMARY MINING BLOCK IN PLAN
0·60 %-average grade % WO_3
10,200 t.- tonnes remaining in
mining block (26-6-73)
15 % d.- percent planned dilution

SECTION 7

SECTION 8

0·33 %

SECONDARY MINING BLOCK IN PLAN

MINING BLOCK IN SECTION
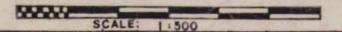
155 013

Figure: 1

No. 1 Orebody
Geological-Mining Floor Plan
17 Bench West - 36 R.L.

564250N

564200N

564150N

219600 E

0·48%
11,000 t.
10% d.

0·27%

0·60%
8,500 t.
22% d.

< 0·10%

0·42%
5,500 t.
48% d.

Final pit design

0·34%
14,000 t.
42% d.

Pit outline
(26-6-73)

0·70%
14,500 t.
45% d.

0·33%
4,100 t.
34% d.

0·39%
8,200 t.
41% d.

0·38%
11,000 t.
49% d.

93-3461

155014

GEOPEKO   LIMITED
KING ISLAND GROUP

SCALE: 1:500

Figure: 2

DATE: JULY, 1973
GEOLOGIST: M.J.D.
DRAWN: R.F.
CHECKED: M.C.R.

5 cm

564200 N

564200 N

219700 E
219800 E
219900 E
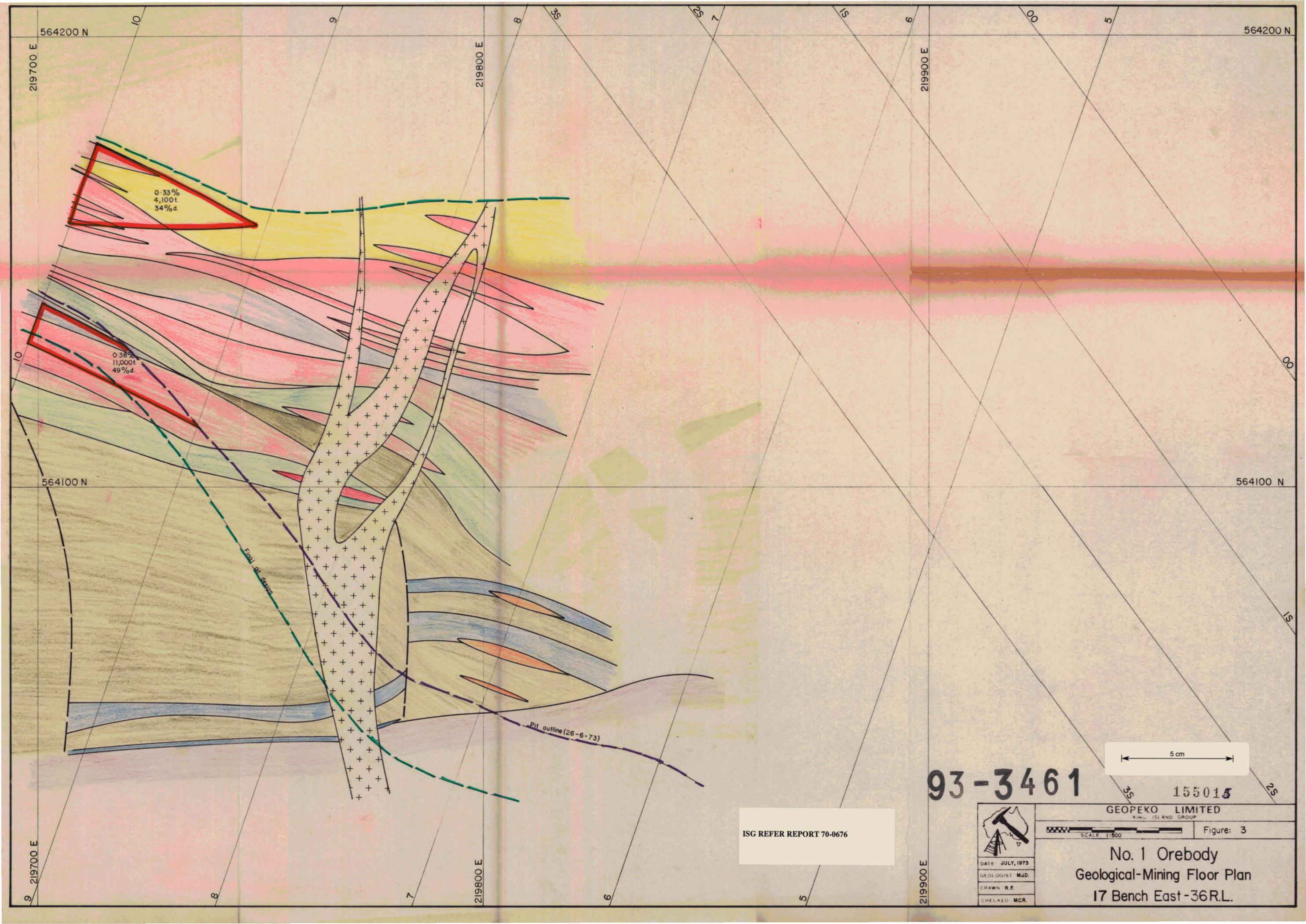
0·33%
4,100 t.
34% d.

0·38%
11,000 t.
49% d.

564100 N

564100 N

Final pit design

Pit outline (26-6-73)

93-3461

155015

5 cm

GEOPEKO LIMITED
KING ISLAND GROUP

SCALE 1:500

Figure: 3

DATE JULY, 1973
GEOLOGIST M.J.D.
DRAWN R.F.
CHECKED M.C.R.
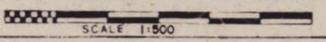
No. 1 Orebody
Geological-Mining Floor Plan
17 Bench East - 36 R.L.

Figure: 4
Scale 1:500

SAMPLE DRILLING 16 BENCH WEST

219550 E

SECTION 13

564200N

0.52/20'
0.24/24'
0.33/20'
0.16/25'
0.48%
0.26/25'

0.24/25'
0.38/25'
0.11/25'

0.29/25'
0.06/25'
0.06/25'
0.63/14'
1.04/15'
0.09/25'
0.05/25'
0.18/25'
0.60%
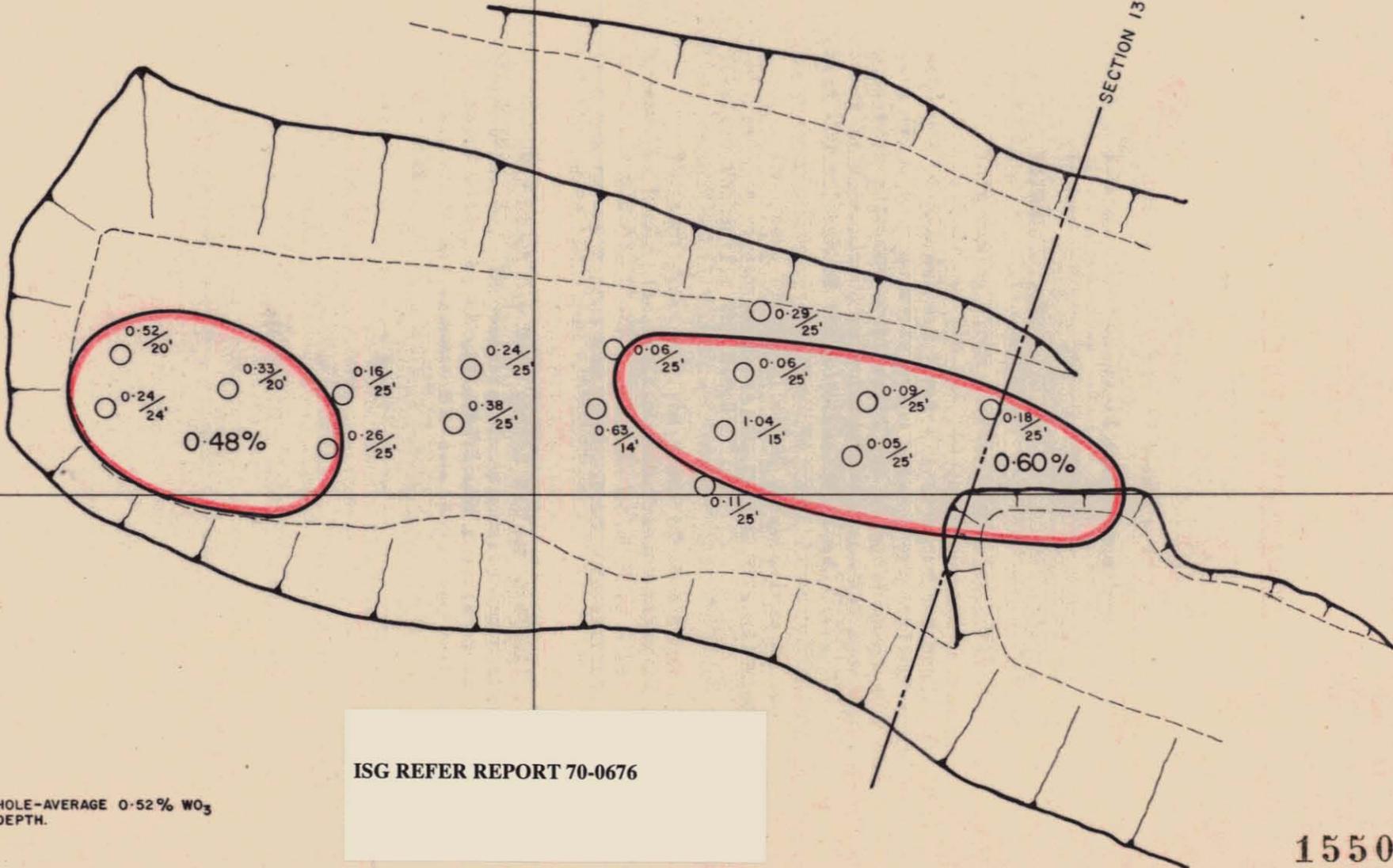
LEGEND:

0.52/20' PERCUSSION HOLE-AVERAGE 0.52% WO₃
          OVER 20 FT. DEPTH.

ISG REFER REPORT 70-0676

155016

5 cm

DISCUSSION OF MINING BLOCKS

Location   :   17 bench west

Tonnage   :   11,000 tonnes

Grade   :   0.48% WO_3

Planned dilution :   10%

This mining block is based on section $14\frac{1}{2}$ where three diamond drill holes, DDH 446, 448 and 450 have defined a sequence of mineralised lower C lens skarn and banded footwall beds (Fig. 5). No correlation between ore outlines could be made with adjacent sections 14 and 15 and consequently the block is represented as a large pod extending approximately half way to each of the adjacent sections.

The grade of the block is derived from an ore intersection of 16m at 0.53% WO_3 in DDH 446, allowing a 10% dilution factor for the block.

The confidence for the grade of this block can be considered high. The corresponding mining block on the bench above was a 0.58% block mined out during Nov. - Dec. 1972 and from memory the tonnes and grade of the ore extracted was close to that estimated.

The block has been tested by four percussion sample holes (Fig. 4). The results are generally lower than the estimated mining block grade although several of the holes were very wet which may account for some scheelite washing away in the fines.

155018

564200N

219500E

0·48%‰

SECTION 14½

446 448

pgh

bh

gh

PIT OUTLINE (26-6-73)

RAMP

BACKFILLED

450

F

F

bh

ch

gh

ch

16 BENCH
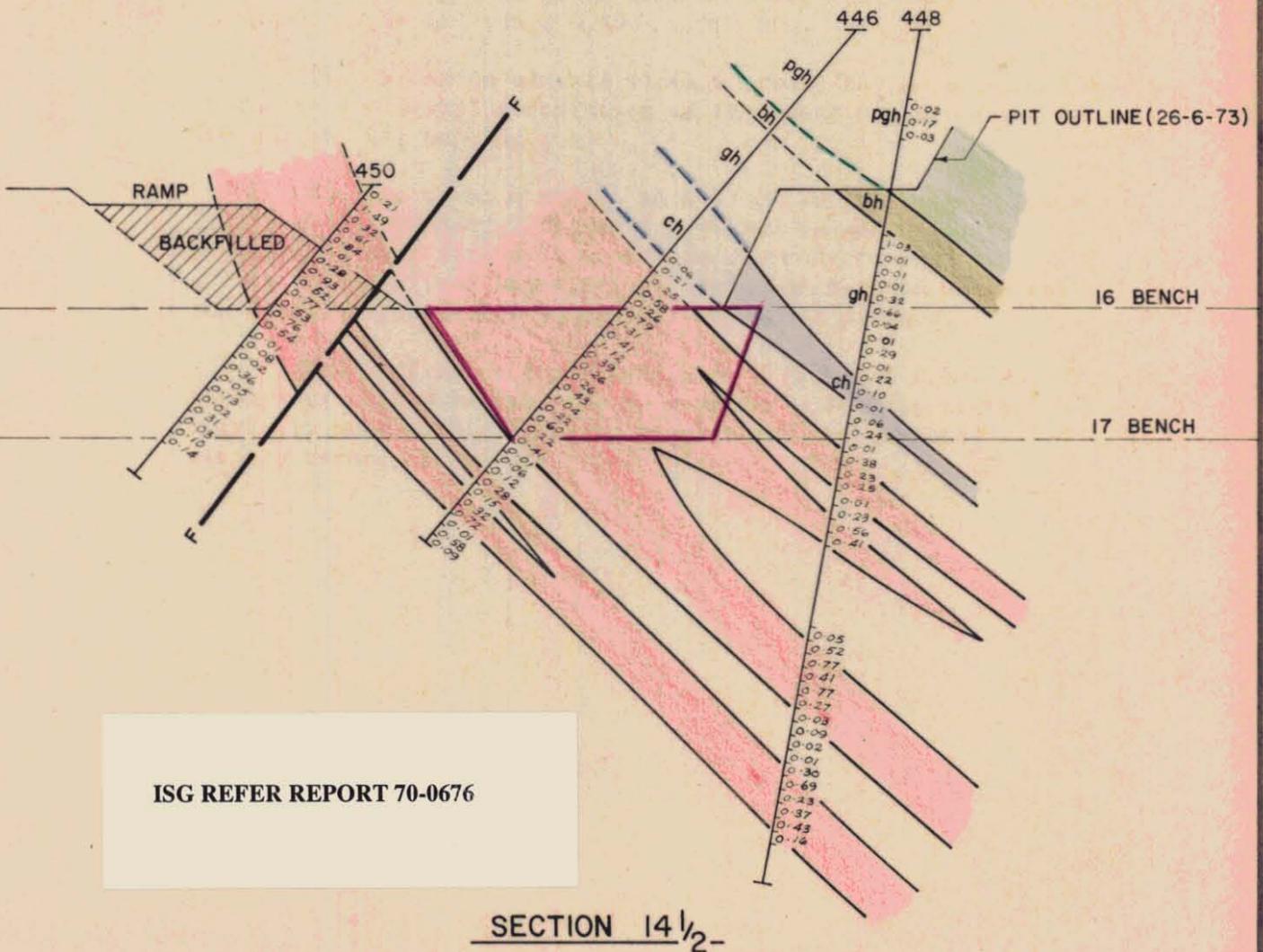
17 BENCH

ISG REFER REPORT 70-0676

SECTION 14½

5 cm

Figure: 5
Scale 1:500m

Location	:	17 bench west
Tonnage	:	8,500 tonnes
Grade	:	0.60% WO_3
Planned dilution	:	22%

Mining of this block commenced in March 1973 but was soon suspended when only 500 tonnes were mined due to the low grade.

A program of percussion hole sampling was carried out over the block and the surrounding area (Fig. 4) and the results were very poor.

The principal evidence for the block is DDH's 103 and 432 on section 13 which both pass through the block (Fig. 6). DDH 103 was drilled in 1953 and is unsurveyed and some doubt may exist as to its exact location however DDH 432 was drilled in 1972 mainly to verify the results of DDH 103. The assay results returned from DDH 432 were generally lower and also a previously unsuspected band of waste 3.5m wide was defined. If DDH 103 does not influence the grade of the block as indicated in Fig. 6 then the true grade will be lower than that estimated and probably in the range 0.45 – 0.50% WO_3.

The extension of this block westward beyond section 13½ is due to geological correlation on that section as defined by DDH 439 and Pit mapping.

The ore to be mined in this block is mineralised lower C lens skarn and banded footwall beds and is sure to be represented as a series of mineralised stringers enclosed within unmineralised skarn and silicate hornfels in which case the actual dilution may be greater than that planned.

The confidence for maintaining a grade of 0.60% WO_3 throughout this block must now be considered low due to the extremely poor sample drilling results and the expected stringy nature of the ore.

219600E

0·60%

564200N

SECTION 13 1/2

SECTION 13

SECTION 13

F

F

103

432

430

gh

ch

PIT OUTLINE
(26-6-73)

16   BENCH

16 1/2 BENCH

0·50
0·37
0·26
0·48
0·11
0·88
0·83
0·93
0·95
0·52
0·02
0·02
0·02
0·02
0·02
0·04
1·44
0·37
0·75
0·40

SECTION 13

F

F

439

RAMP
BACKFILLED

PIT OUTLINE
(26-6-73)

16   BENCH

16 1/2 BENCH

1·29
0·88
0·28
0·04
0·16
1·07
0·09
0·66
0·28
0·22
1·04
1·11
0·48
0·10
0·05
0·03
0·04

0·12
0·35
0·24
0·38
0·24
0·24
0·38
0·08
0·35

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|← 5 cm →|

SECTION 13 1/2

Location   :   17 bench west

Tonnage   :   5,500 tonnes

Grade   :   0.42% WO_3

Planned dilution :   48%

Due to the position of the main ramp in the western
end of the Pit this block will not be mined.

The tonnage has not been included in the total Primary
Ore Reserve.

155022

SECTION 12

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Figure: 7
Scale 1:500m

Location   :   17 bench centre

Tonnage   :   14,500 tonnes

Grade   :   0.70% WO_3

Planned dilution :   45%

This block has been retained within the total Primary Ore Resource at present although serious doubt must exist as to the validity of the block.

Mining of the block commenced in Period 12 1972-73 and approximately 10,000 tonnes of ore at a grade of the order of 0.70% WO_3 was mined up until mid Period 13 when there was a sharp reduction in grade. An intensive percussion hole sample program was carried out over the remainder of the block (Fig. 9) which indicated that only low grade ore may exist.

The evidence for the block was based entirely upon section 11 and then mainly on one drill hole DDH 447 drilled in 1972. DDH 447 indicated a 5m band of ore averaging 1.97% WO_3 on the footwall of a fault and this ore was also inferred on the hangingwall of the fault. The position of the fault as shown in Fig. 8 has been confirmed by Pit mapping.

Mining of the block has to date concentrated mainly along the lower grade or footwall side of the block although two firings have taken place on the hangingwall side early in Period 2 1973-74. Blast hole results from the first firing averaged 0.49% WO_3 over 5 holes and the second firing 0.83% WO_3 over 8 holes. These results are encouraging and suggest that more mill grade ore may exist in the block than the sample drilling results indicated. However confidence in the remaining 14,500 tonnes of ore in the block averaging 0.70% WO_3 is not high.

155024

219700E

F

0.70 %

564150N

F

F

206

PIT OUTLINE
(26-6-73)

F

447

16 BENCH

17 BENCH

F

<0.10
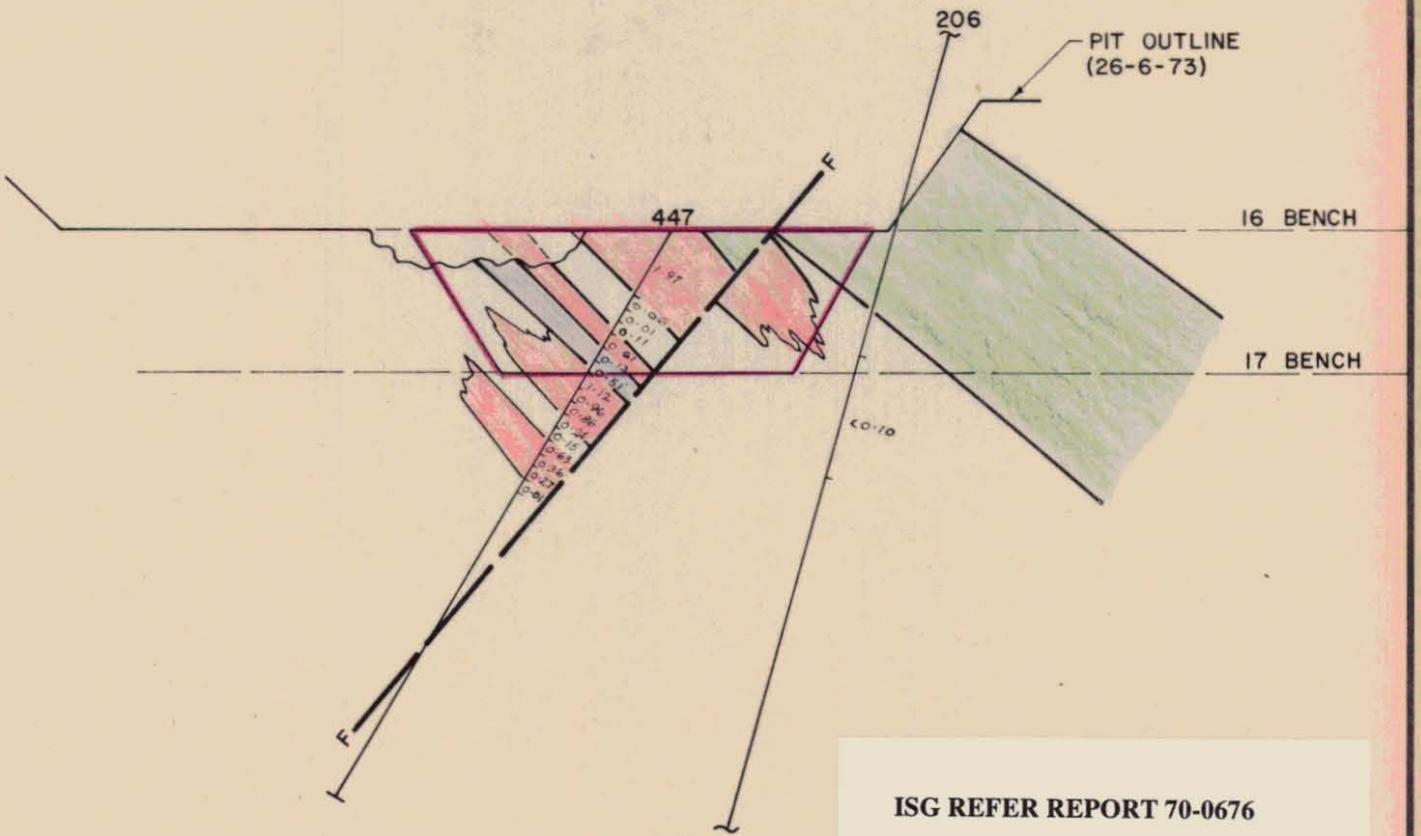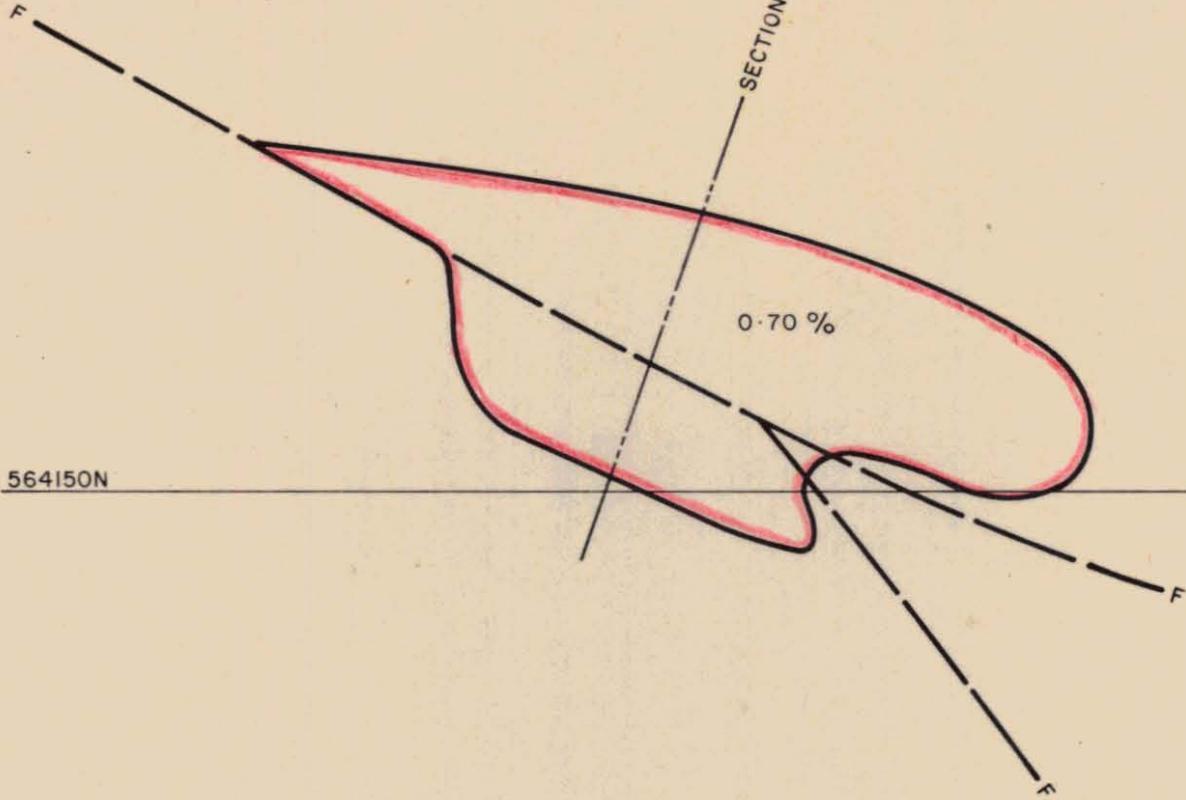
ISG REFER REPORT 70-0676

SECTION II

5 cm
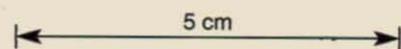
Figure: 8
Scale 1:500m

155025
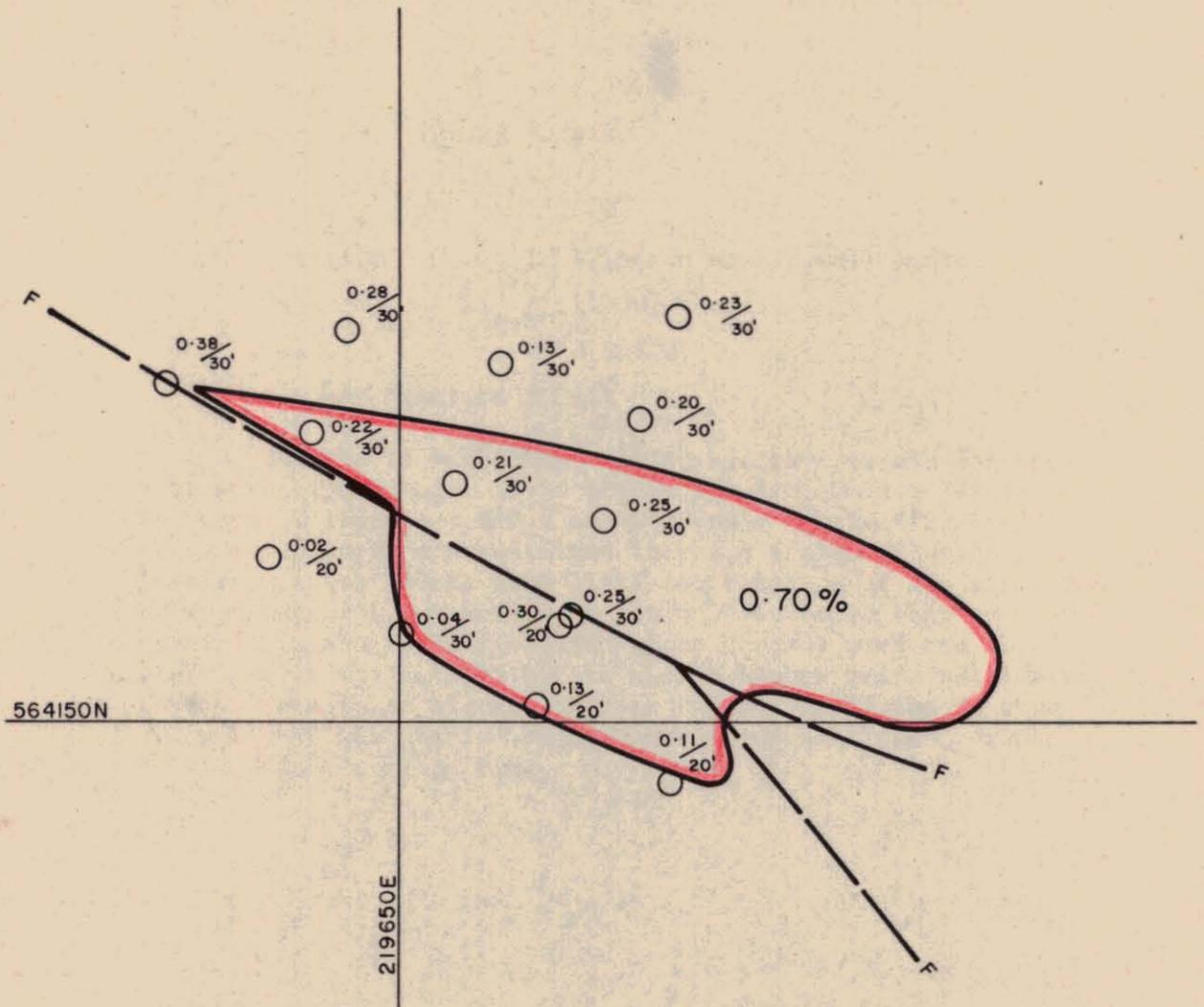
LEGEND:

$\frac{0 \cdot 30}{20'}$ PERCUSSION HOLE - AVERAGE 0·30% WO₃ OVER 20 FT. DEPTH.

SAMPLE DRILLING 16 BENCH CENTRE

|←——— 5 cm ———→|

Figure: 9
Scale 1:500m

Location   :   17 bench hangingwall centre

Tonnage   :   8,200 tonnes

Grade   :   0.39% WO_3

Planned dilution :   41%

and

Location   :   17 bench hangingwall centre

Tonnage   :   11,000 tonnes

Grade   :   0.38% WO_3

Planned dilution :   49%

   The ore in both these mining blocks consists for the most part of irregular stringers in Pyroxene Garnet Hornfels and upper C lens as defined on sections 9 and 10 (Fig. 10). It is immediately apparent that there is a high dilution factor in these blocks with little correlation of ore stringers between adjacent sections. It can only be hoped that by careful planning of firings and close control with the UV. lamp that it may be possible to mine a higher grade but lesser tonnage from these blocks. Strict control of blocks in these areas before has enabled small tonnages of mill grade ore to be mined from time to time.

155027

564150N

SECTION 10

SECTION 9

0·39 %

0·38 %

219700E

102

421

PIT OUTLINE
(26·6·73)

16 BENCH

17 BENCH

SECTION 10

ISG REFER REPORT 70-0676

271

205

453

452   16 BENCH

PIT OUTLINE
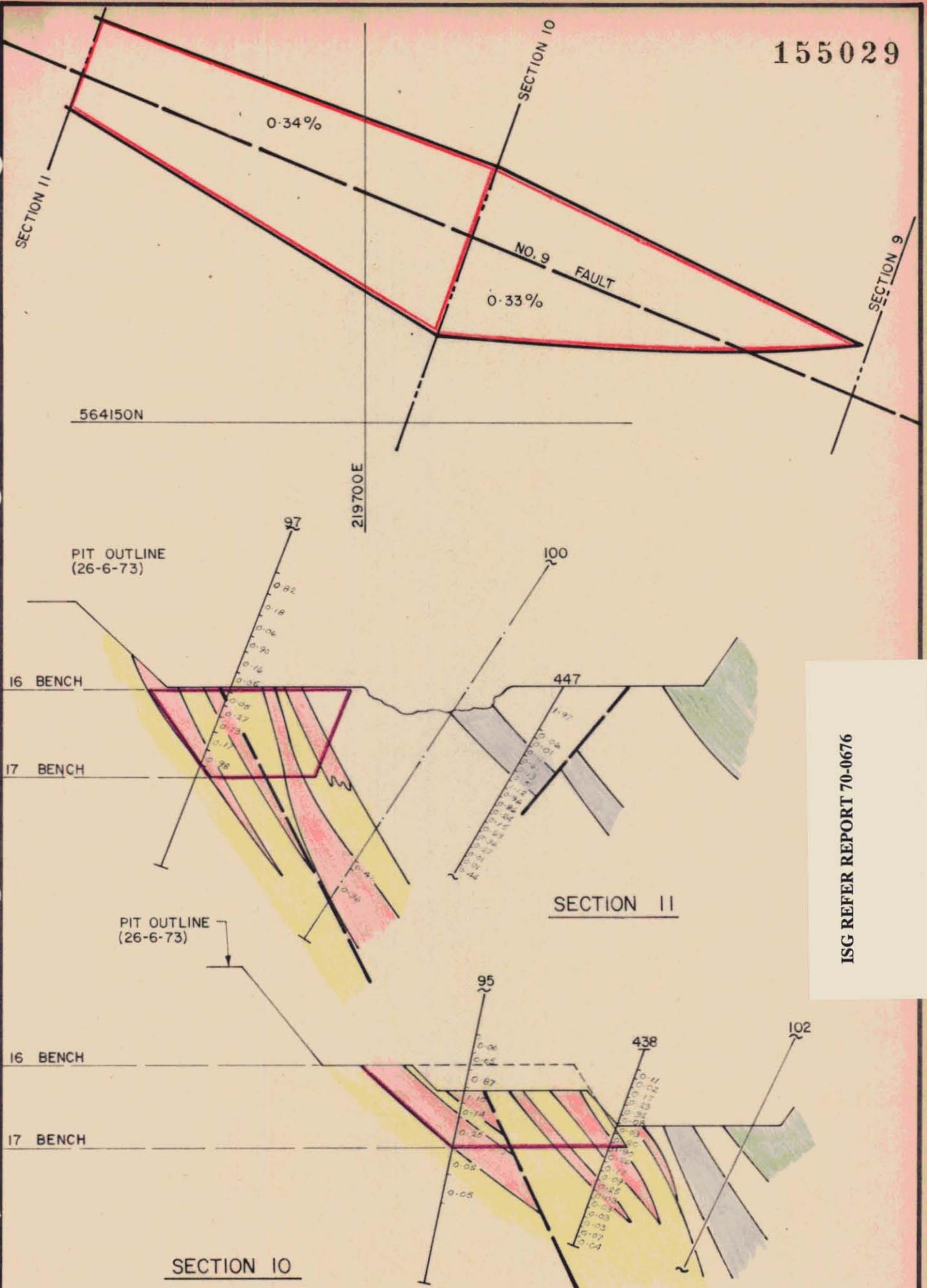(26·6·73)

17 BENCH

SECTION 9

5 cm

Figure: 10
Scale 1:500m

Location	:	17 bench footwall centre
Tonnage	:	14,000 tonnes
Grade	:	0.34% WO_3
Planned dilution	:	42%

and

Location	:	17 bench footwall centre
Tonnage	:	4,100 tonnes
Grade	:	0.33% WO_3
Planned dilution	:	34%

These blocks presently form a part of the main ramp from 16 to 17 bench although access to the blocks can now be gained from 17 bench on the hangingwall side.

Ore in these blocks is represented by irregular replacement of the footwall beds. The dilution factor is high but some high grading may be possible as the blocks are mined out parallel·to the strike. Past experience has shown this to be the best method of mining the footwall blocks as it is often possible to separate unmineralised layers providing that they are at least 1.5 - 2.0m wide, from between the ore horizons. It is virtually impossible to reduce dilution when the footwall blocks are mined across the strike.

155029

SECTION 10

SECTION 11

SECTION 9

0·34%

NO. 9   FAULT

0·33%

564150N

219700E

97

100

PIT OUTLINE
(26-6-73)

16 BENCH

447

17 BENCH

ISG REFER REPORT 70-0676

PIT OUTLINE
(26-6-73)

SECTION   11

95

16 BENCH

438

102

17 BENCH

SECTION 10

5 cm
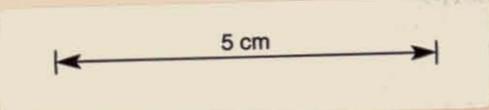
Figure: 11
Scale 1:500m
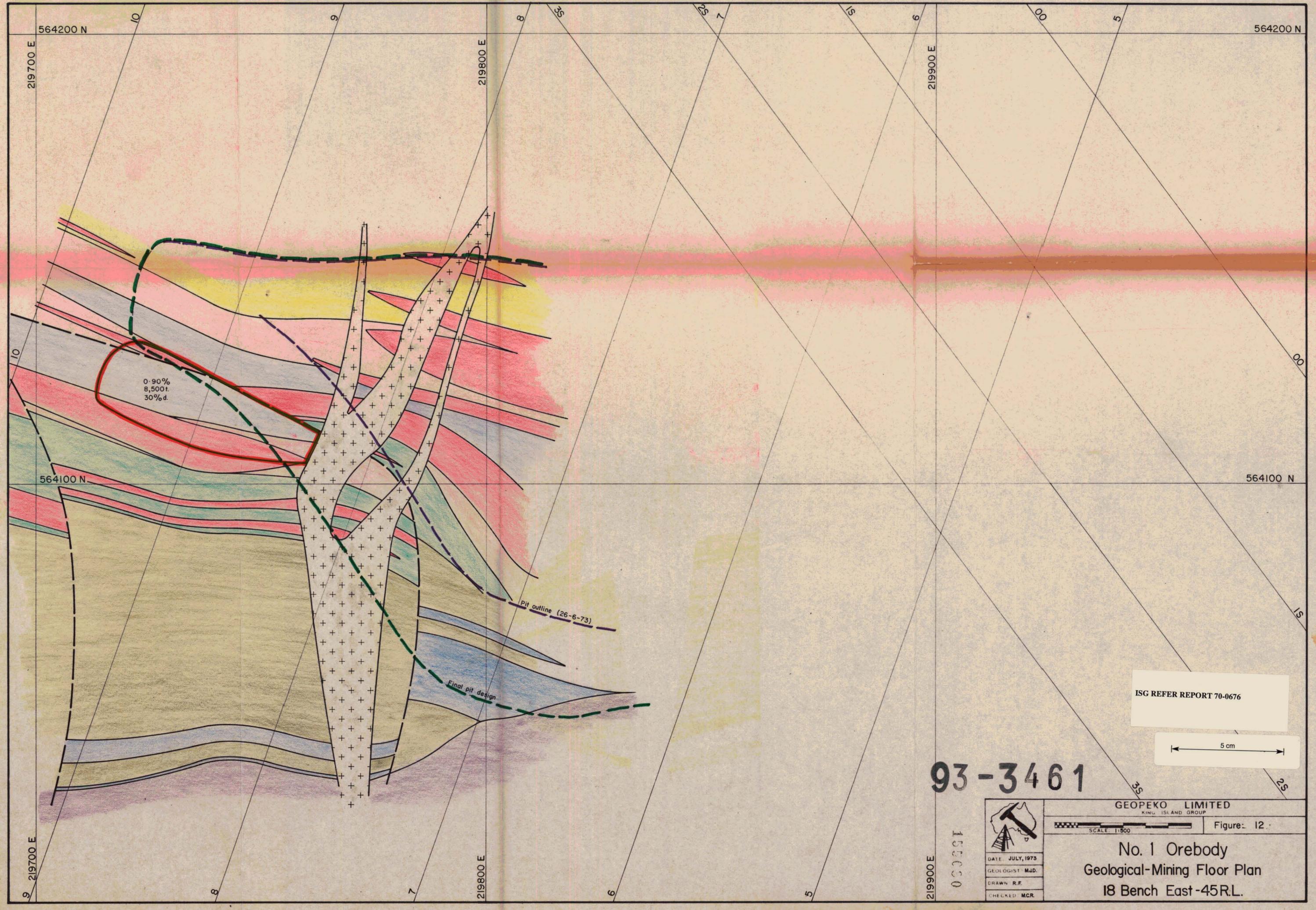
0·90%
8,500t.
30%d.

Pit outline (26-6-73)

Final pit design

564200 N

564100 N

219700 E

219800 E

219900 E

ISG REFER REPORT 70-0676

5 cm

93-3461

Location   : 18 bench east

Tonnage   : 8,700 tonnes

Grade   : 0.90% WO_3

Planned dilution : 30%

Mineralisation in this high grade block is represented
by upper C lens skarn and Pyroxene Garnet Hornfels (Fig. 13).
The block is terminated in the east by the aplite dyke (Fig. 12)
and in the west it is taken halfway to section 10. Although
the block does correlate through to section 10 (see DDH 421,
Fig. 10).

Only the eastern footwall portion of this block will
be mined as a high stripping ratio prevents extraction of the
total block.

Unfortunately section 9 indicates that the part of the
block to be removed will probably be of a lower grade than the
grade estimated for the block as a whole.

155032

SECTION 9

219750 E

564100N

0·90 %

F

F

SECTION 9

271

205

pgh

F

453

PIT OUTLINE
(26·6·73)

16 BENCH

452

17 BENCH

18 BENCH

ch

ch

ch

0.18
0.01
1.12
1.03
0.20
0.19
1.8

8.20
0.81
1.80
2.90
2.70
0.82
0.43
0.55
0.31
0.15

0.01
0.26
1.17
0.26
0.01

F

F

5 cm

Figure: 13
Scale 1:500m
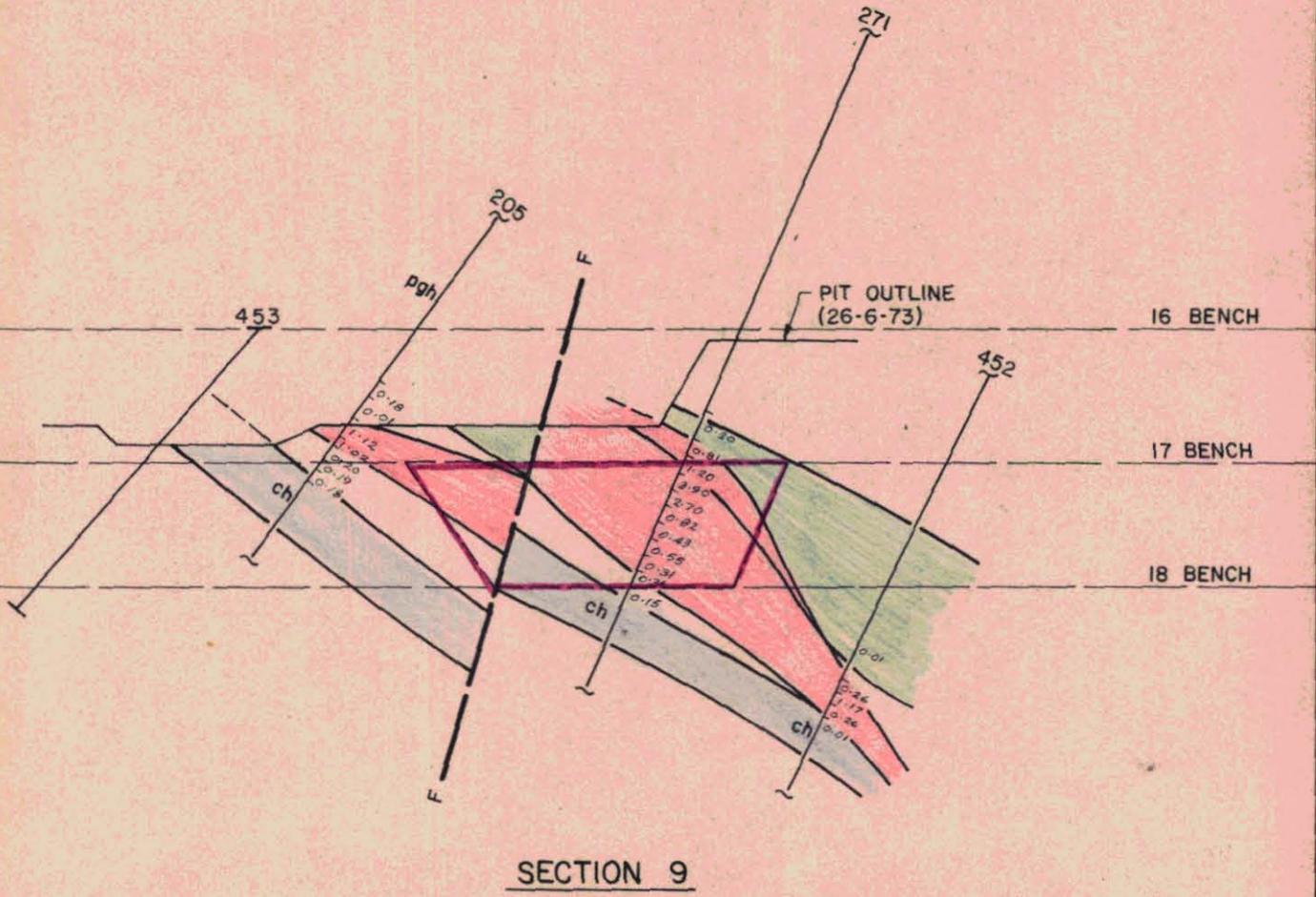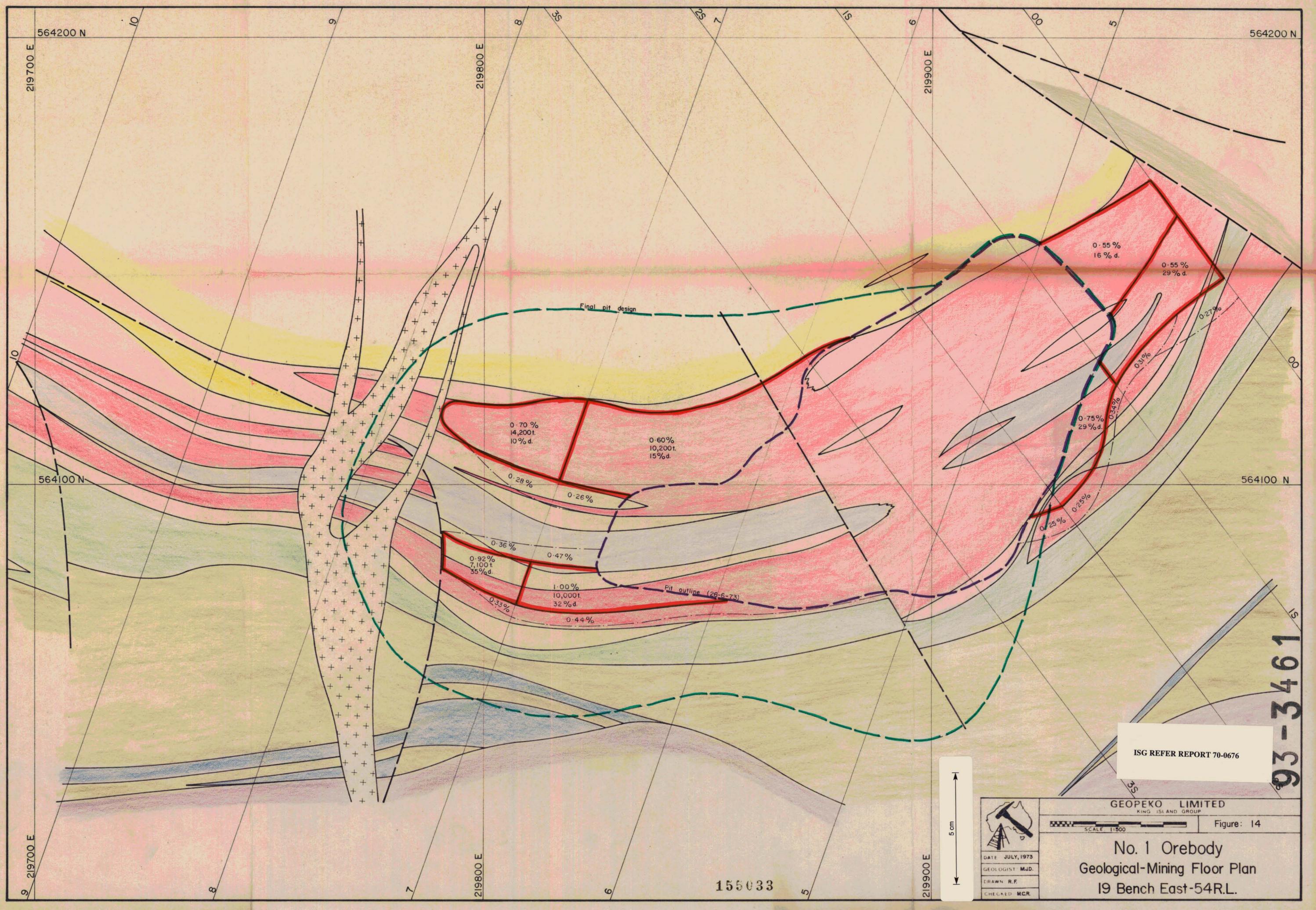
Final pit design

0·55 %
16 % d.

0·55 %
29 % d.

0·27%

0·70 %
14,200 t.
10 % d.

0·60%
10,200 t.
15 % d.

0·30%

0·75 %
29 % d.

0·34%

0·28 %

0·26 %

0·25 %

0·25 %

0·36 %

0·47 %

0·92 %
7,100 t.
35 % d.

1·00 %
10,000 t.
32 % d.

Pit outline (26-6-73)

0·33 %

0·44 %

564100 N   564100 N

93-3461

155033

5 cm

GEOPEKO LIMITED
KING ISLAND GROUP

SCALE 1:500

Figure: 14

DATE JULY, 1973
GEOLOGIST M.J.D.
DRAWN R.F.
CHECKED M.C.R.

No. 1 Orebody
Geological-Mining Floor Plan
19 Bench East-54 R.L.

Location	:	19 bench hangingwall east
Tonnage	:	10,000 tonnes
Grade	:	1.00% WO_3
Planned dilution	:	32%

More than half of this high grade block has already been extracted.

The confidence in this block should be high due to good correlation of geology and ore outlines both on section and between sections 6 and 7 (Fig. 15). The ore in the block is all high grade mineralised upper C lens with only moderate dilution.

Considerable discussion has taken place regarding the accuracy of the estimated grade and the following comments apply. Blast hole assay records indicate that when mining of the block first commenced near section 6 in April 1973 the grade was in excess of 1.00% WO_3 but diminished to approximately 0.70% WO_3 as mining progressed westward towards section 7. It is pointed out that as the block has been mined progressively westwards only the footwall portion has been mined across the strike. The shallow 30° - 40° dip of the strata is introducing unavoidable dilution, in excess of the planned dilution. Mine records show that 16,700 tonnes were mined from 19 hangingwall during period 12 (1972-73), the major part of which would have been derived from this block. In period 13 10,900 tonnes were mined of which would all have been extracted from this block. However mine schedules show that the block has only been reduced by 12,600 tonnes during period 12 and 13 and so it is clearly evident that the block has been substantially diluted.

155035

219800 E

1·00 %

SECTION 7

SECTION 6

564050 N

435   213

PIT OUTLINE
(26-6-73)

0·16
0·26
0·04
1·46
1·87
2·42
1·84
1·60
1·82

0·05
1·60
2·10
1·53
3·76
0·76
0·62
0·82
0·06
0·06

18   BENCH

164   19   BENCH

SECTION 6

207

125

0·03
1·60
1·64
1·39
1·41
1·76
1·28
0·23
0·23
0·09
0·02

0·05

0·06

0·17
0·67
1·98
2·15
0·68
0·22
0·05

18   BENCH

19   BENCH

SECTION 7

ISG REFER REPORT 70-0676

|← 5 cm →|
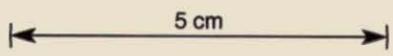
Figure: 15
Scale 1:500m
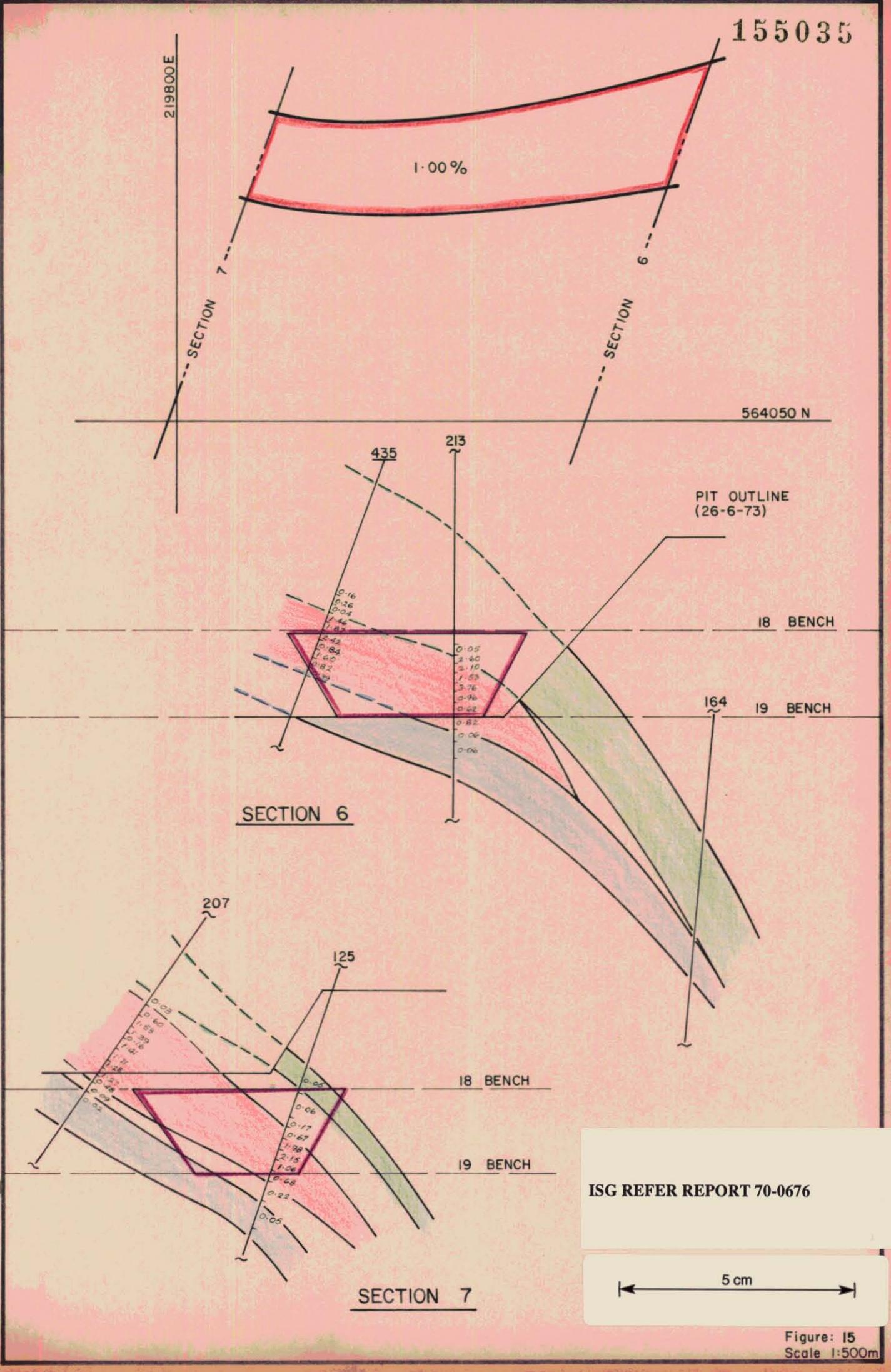
Location   : 19 bench

Tonnage   : 7,100 tonnes

Grade   : 0.92% WO_3

Planned dilution : 35%

The ore in this high grade block is entirely garnet skarn of the upper C lens while the waste content is mostly unmineralised skarn (Fig. 16).

Good correlation on section between DDH's 125 and 207 indicates a high degree of confidence in the ore outline and high grade ore intersections in both DDH's augurs well for the accuracy of the estimated grade.

This block is terminated westward by a fault (Fig. 14) however recent Pit mapping suggests that this fault may lie within the aplite in which event the block would extend a further 10m westward and increase the reserve by 3 - 4,000 tonnes.

155037

SECTION 7

219850 E

564100 N

0·92 %

125

207

PIT OUTLINE
(26·6·73)

0·03
0·60
1·53
0·72
1·41
1·7
1·27
0·68
0·09
0·02

0·06

18   BENCH

0·08
0·17
0·67
1·98
2·75
1·06
0·68

19   BENCH

0·22

0·05

176

SECTION 7

ISG REFER REPORT 70-0676

5 cm

Figure: 16
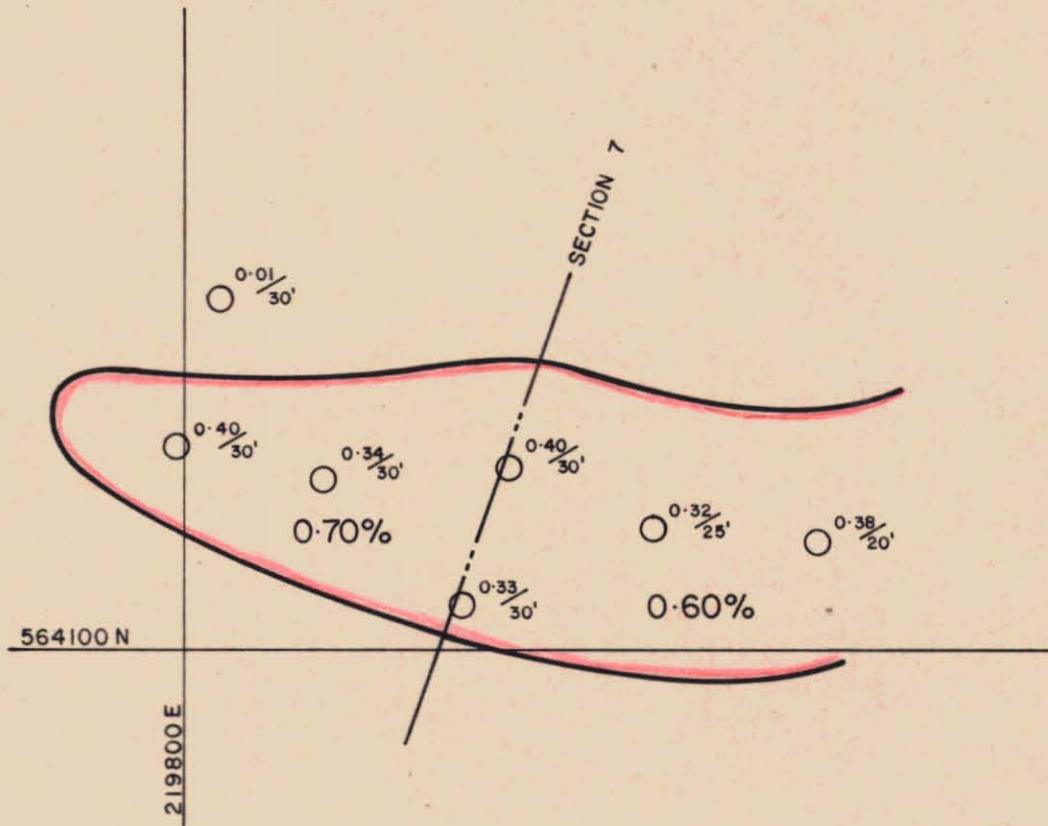Scale 1:500m

Location   : 19 bench footwall east

Tonnage   : 10,200 tonnes

Grade   : 0.60% WO_3

Planned dilution : 15%

This block forms a part of the 18-19 bench ramp and the most part of the tonnage that now remains is in the west end of the block near section 7.

The ore in the block is almost entirely lower C lens with some minor mineralised footwall beds.

Mining operations have been conducted in this block since early 1973 and the ore removed to date would average approximately 0.45 - 0.50% WO_3. Some sample drilling was carried out over the block and the adjacent 0.70% WO_3 block (Fig. 17) and the results did not substantiate the block grades.

Pattern sample drilling of this nature has shown itself to be very unreliable in the past eg. 0.70% WO_3 block, 17 bench centre, and the expectation remains that the grade of ore in the block will increase towards section 7, where the ore is clearly of a higher grade than section 6, with less dilution (Fig. 18), to give an average grade of 0.60% WO_3 for the whole of the block.

155039

SECTION 7

○ 0.01/30'

○ 0.40/30'   ○ 0.34/30'   ○ 0.40/30'

0.70%   ○ 0.32/25'   ○ 0.38/20'

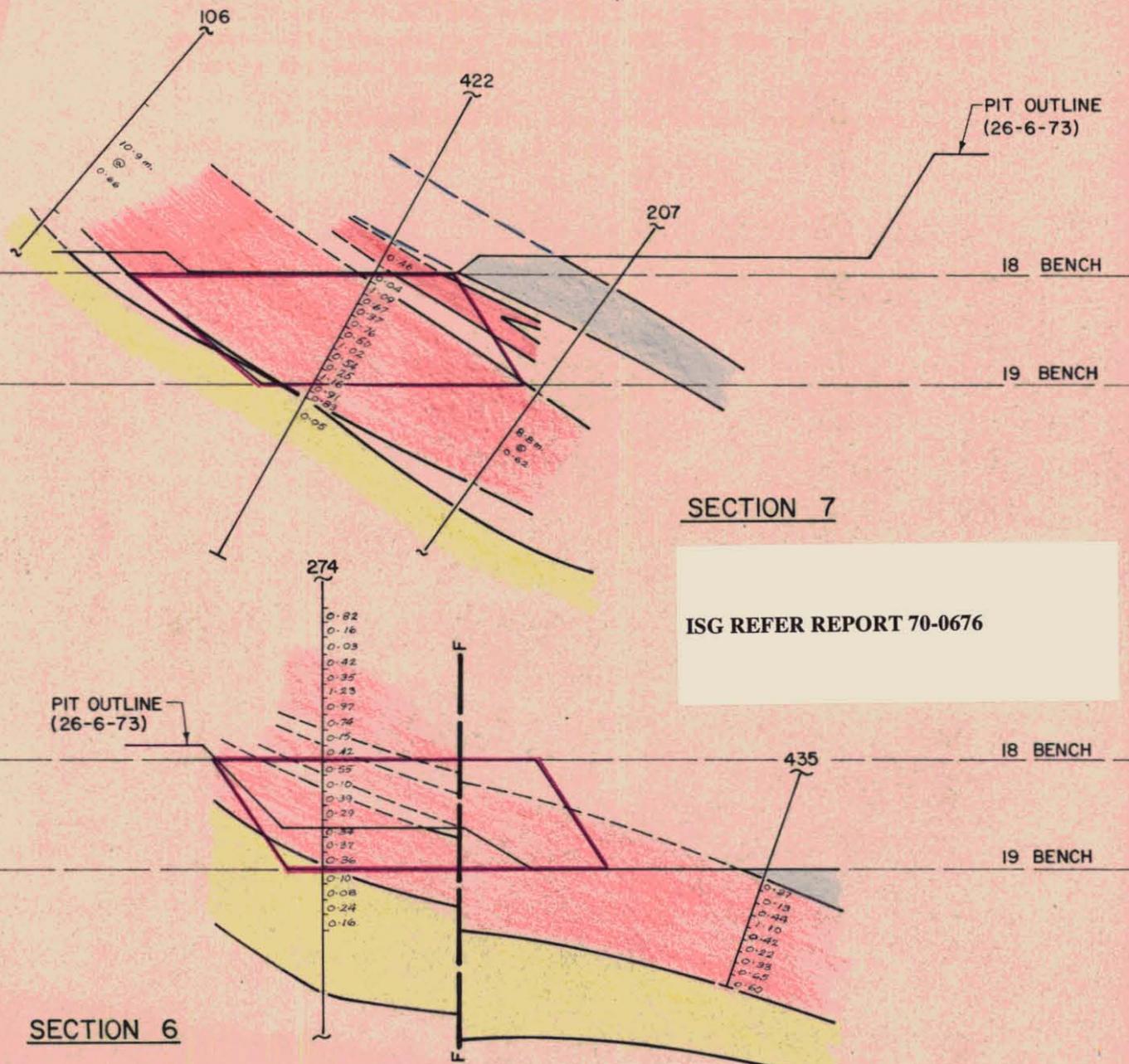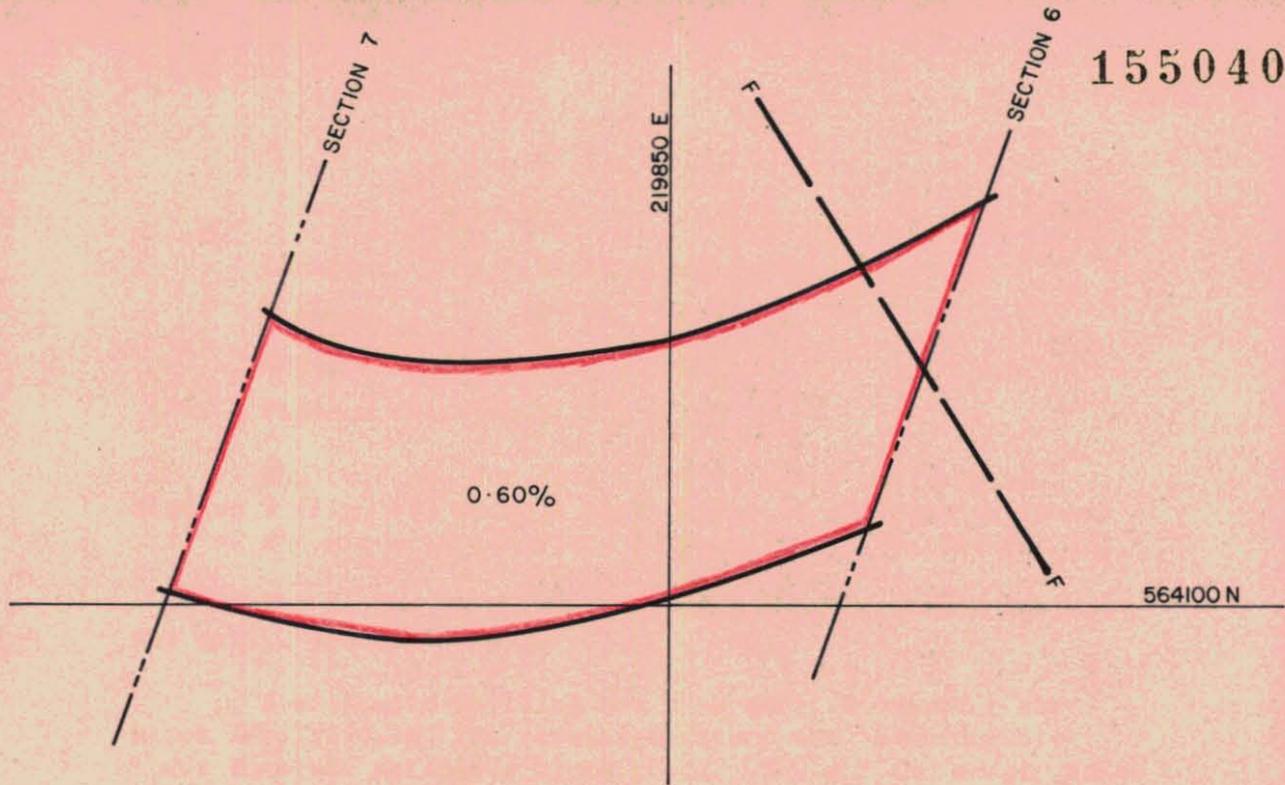564100 N   ○ 0.33/30'   0.60%

219800 E

LEGEND:

0.40/30'   PERCUSSION HOLE-AVERAGE 0.40% WO₃
            OVER 30 FT. DEPTH.

ISG REFER REPORT 70-0676

SAMPLE DRILLING 18 BENCH EAST

|← 5 cm →|

Figure: 17
Scale 1:500m

155040

SECTION 7

SECTION 6

219850 E

F

F

0·60%

564100 N

106

10·9 m. @ 0·46

422

PIT OUTLINE
(26-6-73)

207

18 BENCH

0·46
1·04
1·09
0·67
·97
0·76
0·56
1·02
0·54
1·45
0·91
0·84
0·05

8·8 m. @ 0·42

19 BENCH

SECTION 7

ISG REFER REPORT 70-0676

274

0·82
0·16
0·03
0·42
0·35
1·23
0·97
0·74
0·15
0·42
0·55
0·10
0·39
0·29
0·34
0·37
0·36
0·10
0·08
0·24
0·16

PIT OUTLINE
(26-6-73)

F

435

18 BENCH

0·27
0·13
0·48
1·10
0·42
0·22
0·33
0·65
0·60

19 BENCH

SECTION 6
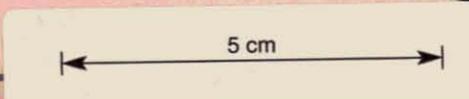
F

5 cm

Figure: 18
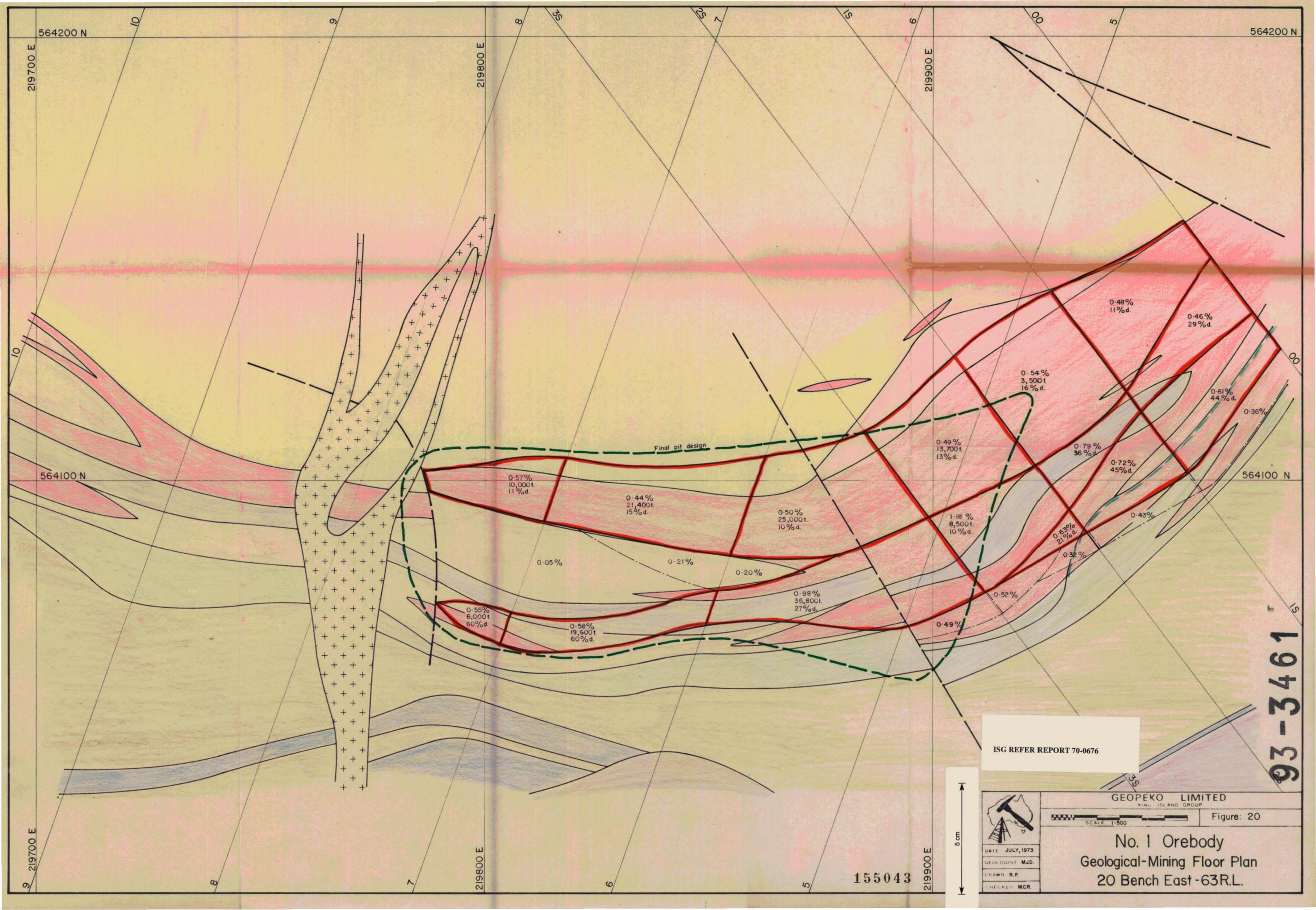Scale 1:500m

Location   : 19 bench footwall east

Tonnage   : 14,200 tonnes

Grade   : 0.70% WO_3

Planned dilution   : 10%

The evidence for this block is based entirely on section 7 (Fig. 19) where a high degree of correlation in ore outline and grade is exhibited between DDH's 106, 422 and 207.

The block is thinned and terminated westward against the aplite dyke (Fig. 14).

Some sample drilling has been carried out over the block (Fig. 17) and the results returned were considerably lower than the estimated block grade. However the sample hole which averaged 0.40% WO_3 over 30 feet on section 7 did not substantiate the assay results of DDH 422 but yet tested almost exactly the same ground.

Notwithstanding the sample drilling results the confidence for this block is high.

155042

564100 N

219800 E

0·70 %

SECTION 7

ISG REFER REPORT 70-0676

106

422

207

PIT OUTLINE
(26-6-73)

18 BENCH

125

19 BENCH

10·9m
@
0·46

0·46
0·04
1·09
0·67
0·37
0·76
0·50
1·02
0·54
0·25

0·91
0·83
0·06

8·8m
@
0·62

SECTION 7

5 cm

Figure: 19
Scale 1:500m

564200 N

564200 N

564100 N

564100 N

Final pit design

0·48%
11%d.

0·46%
29%d.

0·54%
3,500t.
16%d.

0·61%
44%d.

0·36%

0·49%
13,700t.
13%d.

0·79%
36%d.

0·72%
45%d.

0·57%
10,000t.
11%d.

0·44%
21,400t.
15%d.

0·50%
25,000t.
10%d.

1·18%
8,500t.
10%d.

0·43%

0·05%

0·21%

0·20%

0·63%
21%d.

0·32%

0·98%
36,800t.
27%d.

0·55%
6,000t.
60%d.

0·58%
19,600t.
60%d.

0·52%

0·49%

5 cm

GEOPEKO LIMITED
KING ISLAND GROUP

SCALE 1:500

Figure: 20

DATE JULY, 1973
GEOLOGIST M.J.D.
DRAWN R.F.
CHECKED M.C.R.

No. 1 Orebody
Geological-Mining Floor Plan
20 Bench East - 63 R.L.

93 - 3461
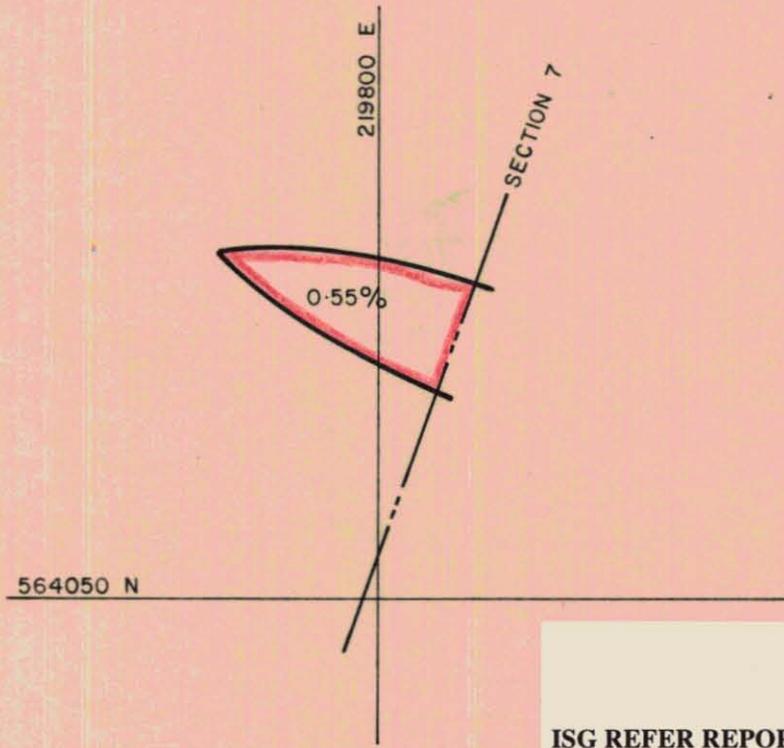
155043

Location   : 20 bench hangingwall east

Tonnage   : 6,000 tonnes

Grade   : 0.55% WO_3

Planned dilution : 60%

The basis of this block is a 6.1m intersection averaging 1.31% WO_3 made by DDH 125 just above the block on section 7 (Fig. 21).
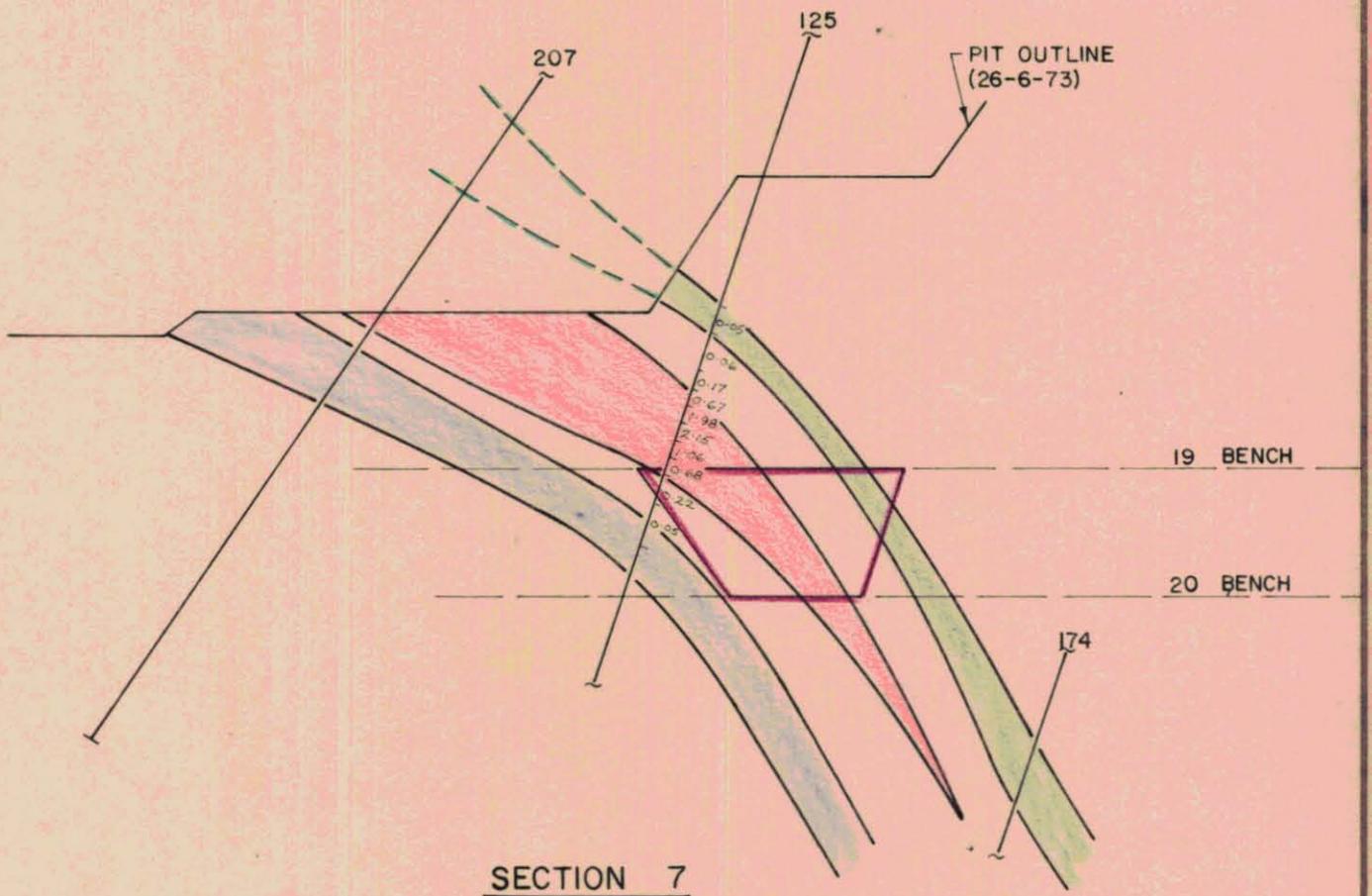
The ore in the block is expected to be high grade mineralised upper C lens skarn probably dispersed into a number of small stringers as the ore horizon thins to extinction between DDH's 125 and 174.

This block has been designed at the narrowest width of 9m but dilution is still expected to be very high as the confines of the Pit at this level will require that the block is mined either across the strike or parallel to the strike retreating from north to south. Neither method will lend itself to high grading the block.

The block is terminated westward by a fault (Fig. 20) which recent Pit mapping now suggests lies within the aplite in which event some small extra tonnage may be available by extending the block westward to the aplite.

155045

219800 E

SECTION 7

0·55%

564050 N

ISG REFER REPORT 70-0676

207

125

174

PIT OUTLINE
(26-6-73)

0·05
0·06
0·17
0·67
1·98
2·15
1·06
0·68
0·22
0·05

19 BENCH

20 BENCH

SECTION 7

5 cm

Figure: 21
Scale 1:500m

Location	:	20 bench hangingwall east
Tonnage	:	19,600 tonnes
Grade	:	0.58% WO_3
Planned dilution	:	60%

Ore in this block is expected to be high grade skarn or the upper C lens but very stringy in nature as the horizons thin to extinction down-dip (Fig. 22).

Dilution in this block will be extremely high and very close grade control will be required to ensure that a satisfactory grade of ore is extracted.

155047

SECTION 6

SECTION 7

PIT OUTLINE
(26-6-73)

19 BENCH

20 BENCH

ISG REFER REPORT 70-0676

5 cm
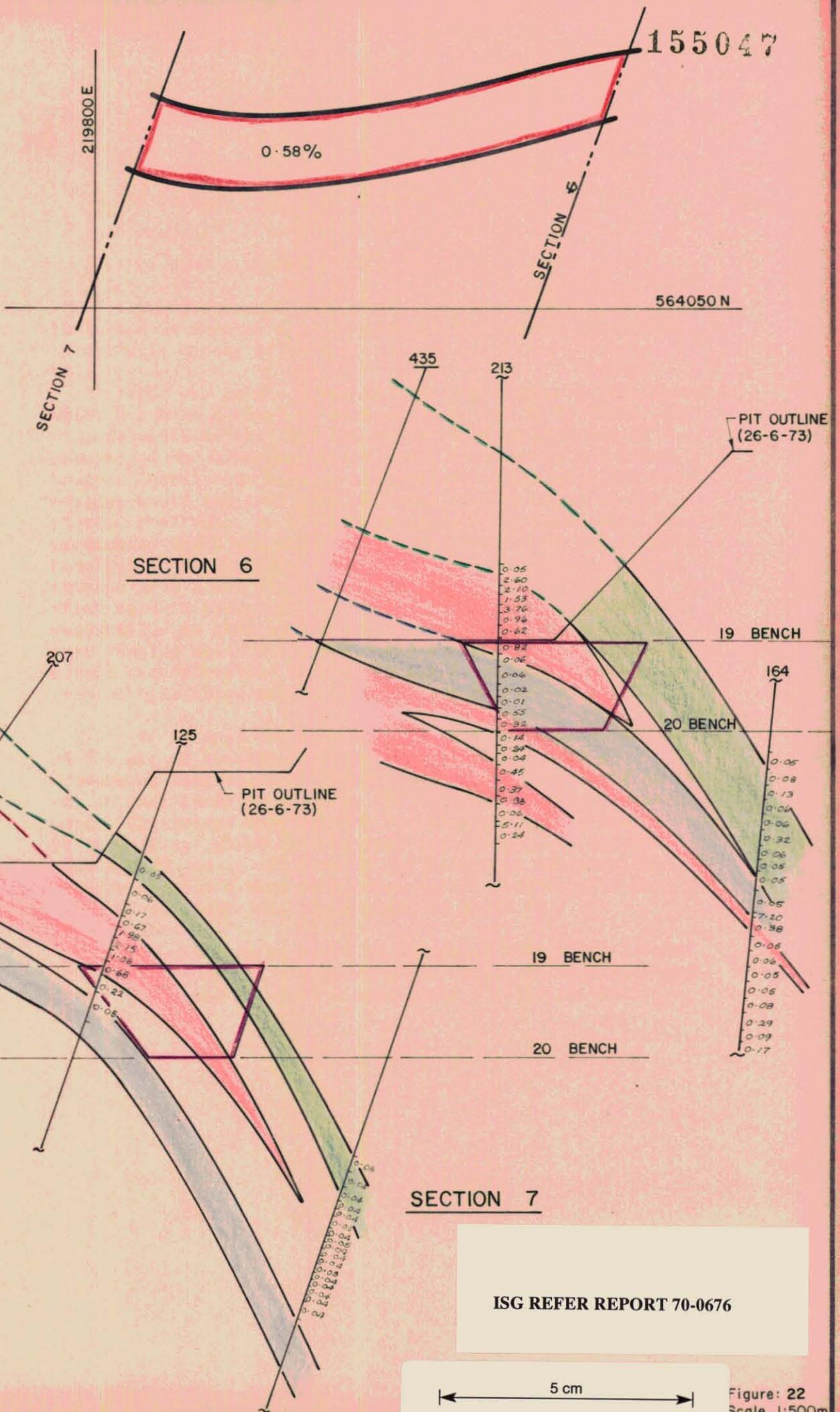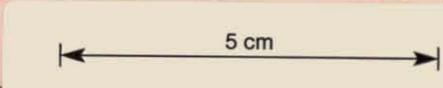
Figure: 22
Scale 1:500m

Location   : 20 bench hangingwall east

Tonnage   : 36,800 tonnes

Grade   : 0.98% WO_3

Planned dilution : 27%

The outcome of this block will have significant influence on whether a grade of 0.60% WO_3 can be maintained to the mill during 1973-74.

The ore in the block is high grade upper C lens skarn which has been defined on sections 5,6, and 3S by three diamond drill holes. DDH 166 was drilled in 1957 and is unsurveyed and consequently its exact location is not known, however correlation between the geology in the hole and Pit mapping would indicate that the hole is very close to its plotted position. In 1972 the half-core remaining from the previously split ore intersection was assayed by X.R.F. which resulted in the average grade of the ore intersection being reduced from 1.06% WO_3 to 0.98% WO_3. The 1972 assays are those used in the grade determination of this block. DDH 213 was drilled in 1968 and is also unsurveyed. The crushed core samples which were previously assayed by the colorimetric method were reassayed in 1972 by X.R.F. and the reassays are used in this calculation. DDH 433 was drilled in 1972.
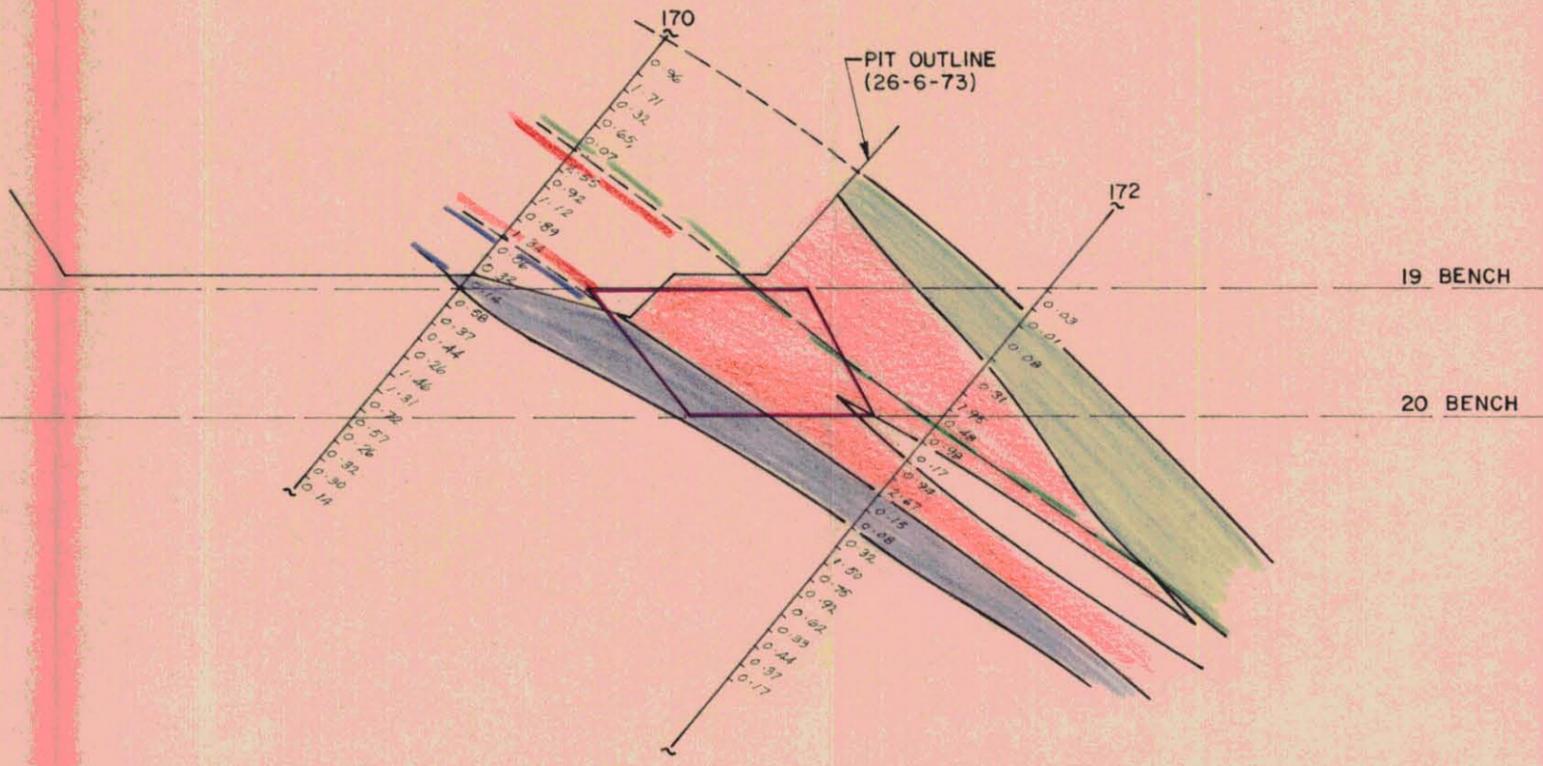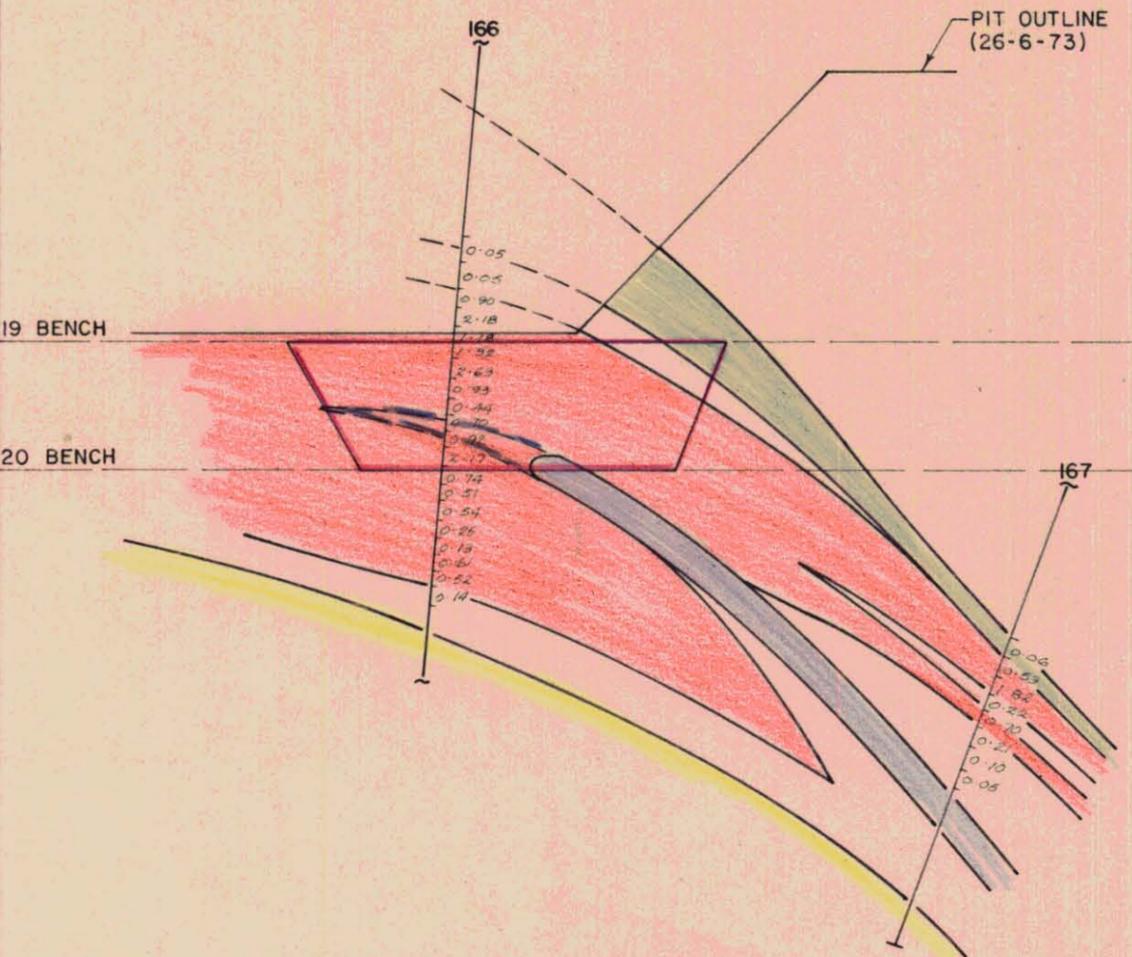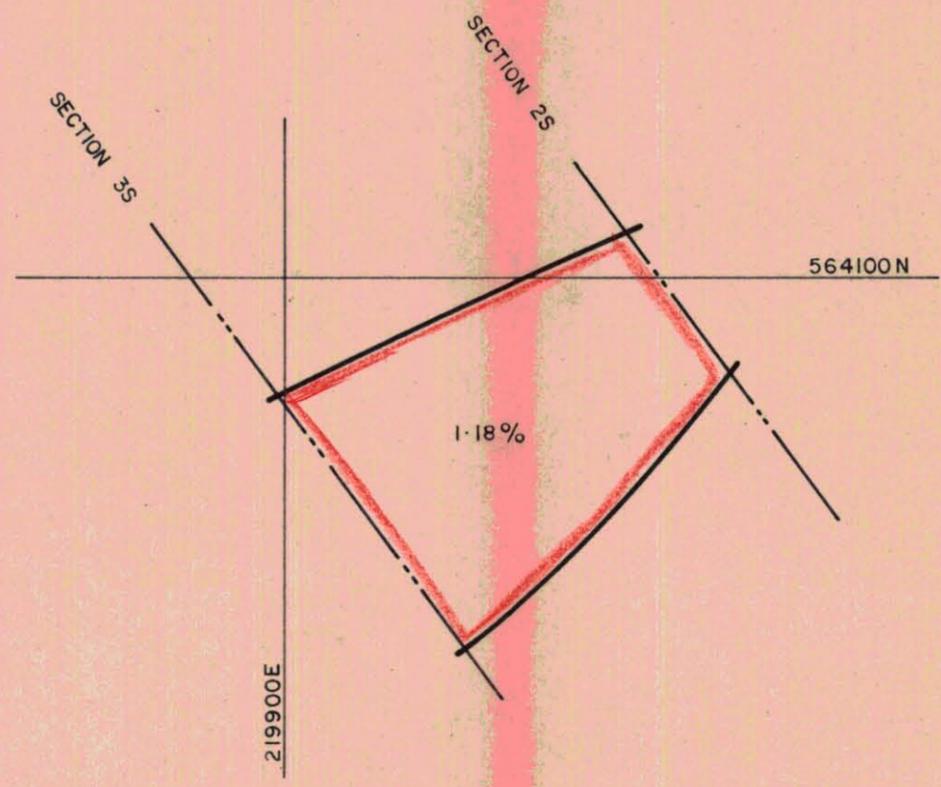
It is apparent from Fig. 23 that the massive nature of the ore on section 3S diminishes westwards with a consequent increase in dilution however the continuity of the ore on section 3S as shown by DDH 166 must be regarded with care. The assays from DDH 166 indicate the marble marker to be mineralised which is certainly not the case on adjacent sections 2S and 6. If most of the marker is unmineralised towards section 6 then much closer grade control will be required to ensure the block grade of 0.98% WO_3.

An encouraging point in favour of this block is that the corresponding mining block on 19 bench, between sections 6 and 3S was extracted at a grade very similar to that estimated.

155049

ISG REFER REPORT 70-0676

0·98 %

SECTION 6
SECTION 3S
SECTION 5
F
F

564050 N

219850 E

SECTION 6
213
PIT OUTLINE
(26-6-73)
164

19 BENCH

20 BENCH

0·06
2·60
2·10
1·58
3·76
0·96
0·62
0·82
0·30
0·06
0·02
0·01
0·55
0·32
0·14
0·24
0·04
0·45
0·37
0·38
0·06
5·11
0·24

0·05
0·08
0·13
0·06

0·32
0·06
0·05
0·05

0·05
0·38
0·05
0·08

0·05
0·29
0·09
0·17

SECTION 6

SECTION 5
SECTION 3S
433
PIT OUTLINE
(26-6-73)
F
272

0·06
0·08
0·04
0·03
0·07
0·04
0·04
1·76
0·82
1·30
·93
2·21
0·40
1·40
1·12
0·32
1·52
1·67
1·47
0·05
0·22
0·09
0·04
0·23
0·30

0·09
0·17
0·52
0·38
0·58
0·20
0·18
0·37
0·40
0·34
1·00
0·32
0·45
0·60

F

SECTION 5

SECTION 3S
166
PIT OUTLINE
(26-6-73)
167

19 BENCH

20 BENCH

0·30
0·06
0·05
0·06
0·20
0·05
0·05
0·90
2·18
1·18
1·32
2·65
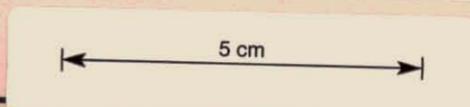0·93
0·44
0·70
0·92
2·34
0·51
0·54
0·25
0·63
0·52
0·14

0·06
0·53
0·82
0·22
0·70
0·21
0·10
0·05

SECTION 3S

5 cm

Figure: 23
Scale: 1:500

Location	:	20 bench hangingwall east
Tonnage	:	8,900 tonnes
Grade	:	1.18% WO_3
Planned dilution	:	Approx. 10%

The final design of the open cut allows for only a small portion of the 1.18% WO_3 block to be mined (Fig. 20) and that part of the block is clearly tested by DDH 166 (Fig. 24).

Dilution in the block should be low but much will depend on the degree of mineralisation of the marble marker which is shown as mineralised in DDH 166. In the event of it being unmineralised consideration could be given to working the block as a half bench.
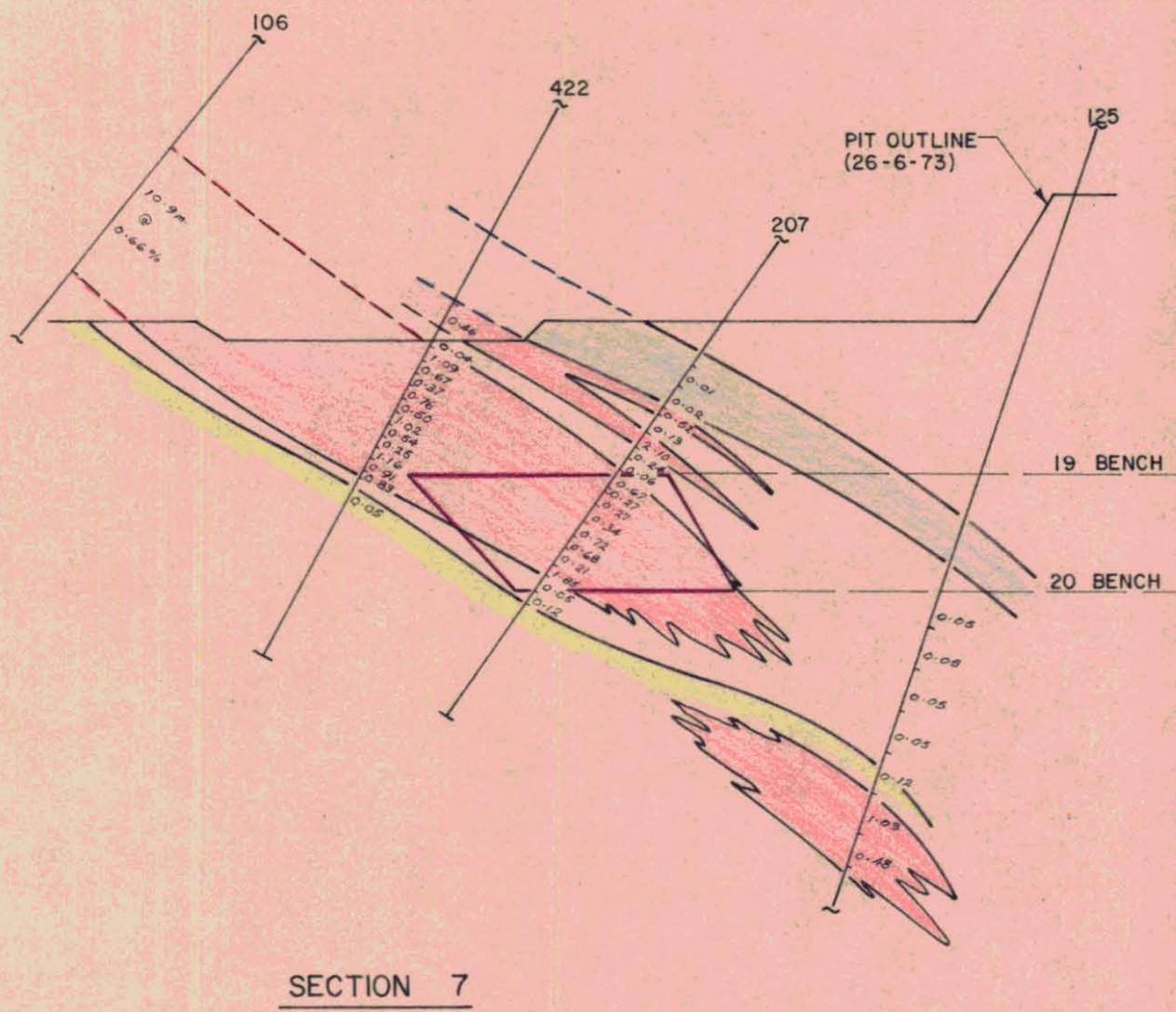
SECTION 3S

SECTION 2S

SECTION 3S

SECTION 2S

564100N

219900E

1·18%

PIT OUTLINE
(26-6-73)

PIT OUTLINE
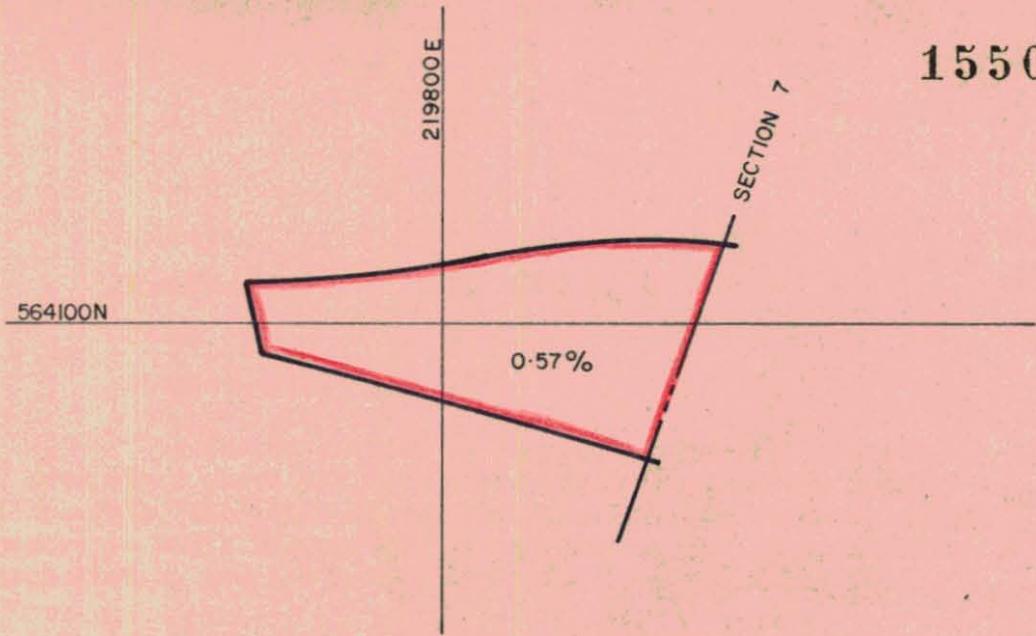(26-6-73)

19 BENCH
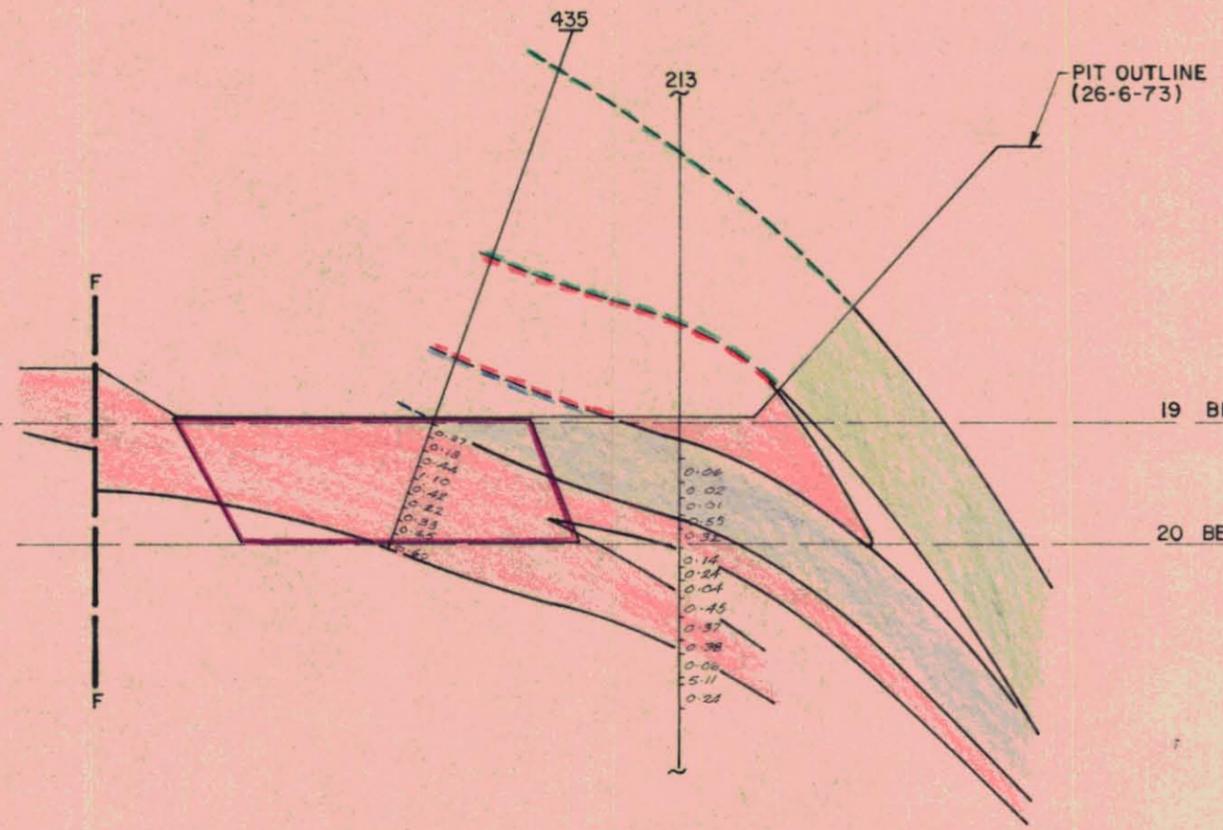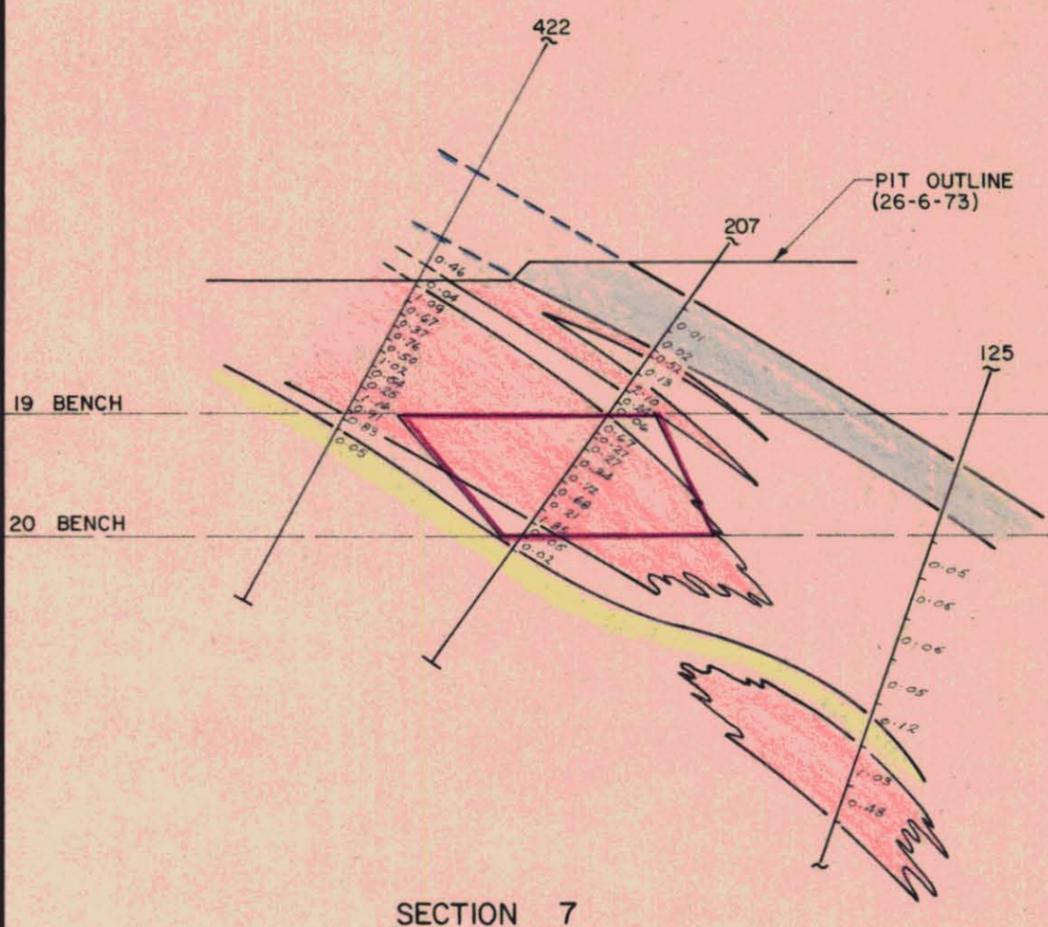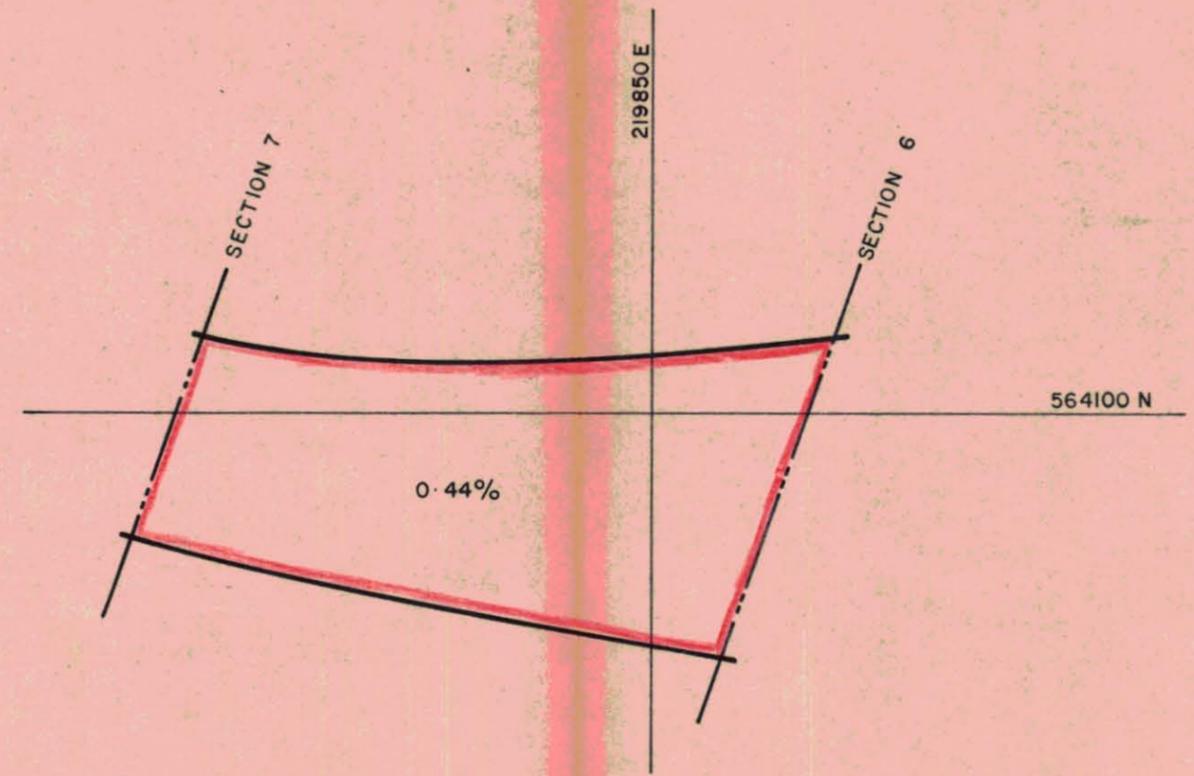
20 BENCH

19 BENCH

20 BENCH

166

167

170

172

ISG REFER REPORT 70-0676

5 cm

Figure: 24
Scale: 1:500m

Location	:	20 bench footwall east
Tonnage	:	10,000 tonnes
Grade	:	0.57% WO_3
Planned dilution	:	11%

This block is well defined on section 7 by DDH 207 (Fig. 25). Good correlation in ore outline and grade on this section infers a high degree of confidence in the block but probably the best indicator will be the degree of success with which the corresponding block is mined on the bench above. Mining operations have not yet commenced in the 0.70% WO_3 block on 19 bench footwall east.
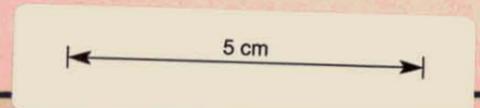
155053

219800 E

SECTION 7

564100N

0·57 %

106

422

125

PIT OUTLINE
(26 - 6 - 73)

207

10·9m.
@
0·66%

0·46
0·04
1·09
0·67
0·37
0·76
1·00
1·02
0·54
1·16
0·26
0·91
0·83
0·05

0·01
0·02
0·61
0·13
2·10
0·06
0·62
0·27
0·34
0·72
0·48
0·41
1·06
0·12

19 BENCH

20 BENCH

0·05
0·06
0·05
0·05
0·12
1·03
0·48

SECTION 7

ISG REFER REPORT 70-0676

5 cm

Figure: 25
Scale 1:500m

Location   :   20 bench footwall east

Tonnage   :   21,400 tonnes

Grade   :   0.44% WO_3

Planned dilution :   15%

This footwall block is composed of mineralised lower
C lens skarn which has been well defined on sections 6 and 7
(Fig. 26). The grade of the mineralisation is variable as the
assays in DDH's 207 and 435 illustrate but the expectation is
high that an average grade of 0.44% WO_3 can be maintained.

155000

219850 E

SECTION 7

SECTION 6

564100 N

0·44%

422

207

125

19 BENCH

20 BENCH

PIT OUTLINE
(26-6-73)

0·46
0·67
0·37
0·76
0·05

0·03

SECTION 7

435

213

PIT OUTLINE
(26-6-73)

F

F

19 BENCH

19 BENCH

20 BENCH

20 BENCH

PIT OUTLINE
(26-6-73)

0·04
0·02
0·01
0·55
0·32
0·14
0·24
0·04
0·45
0·37
0·78
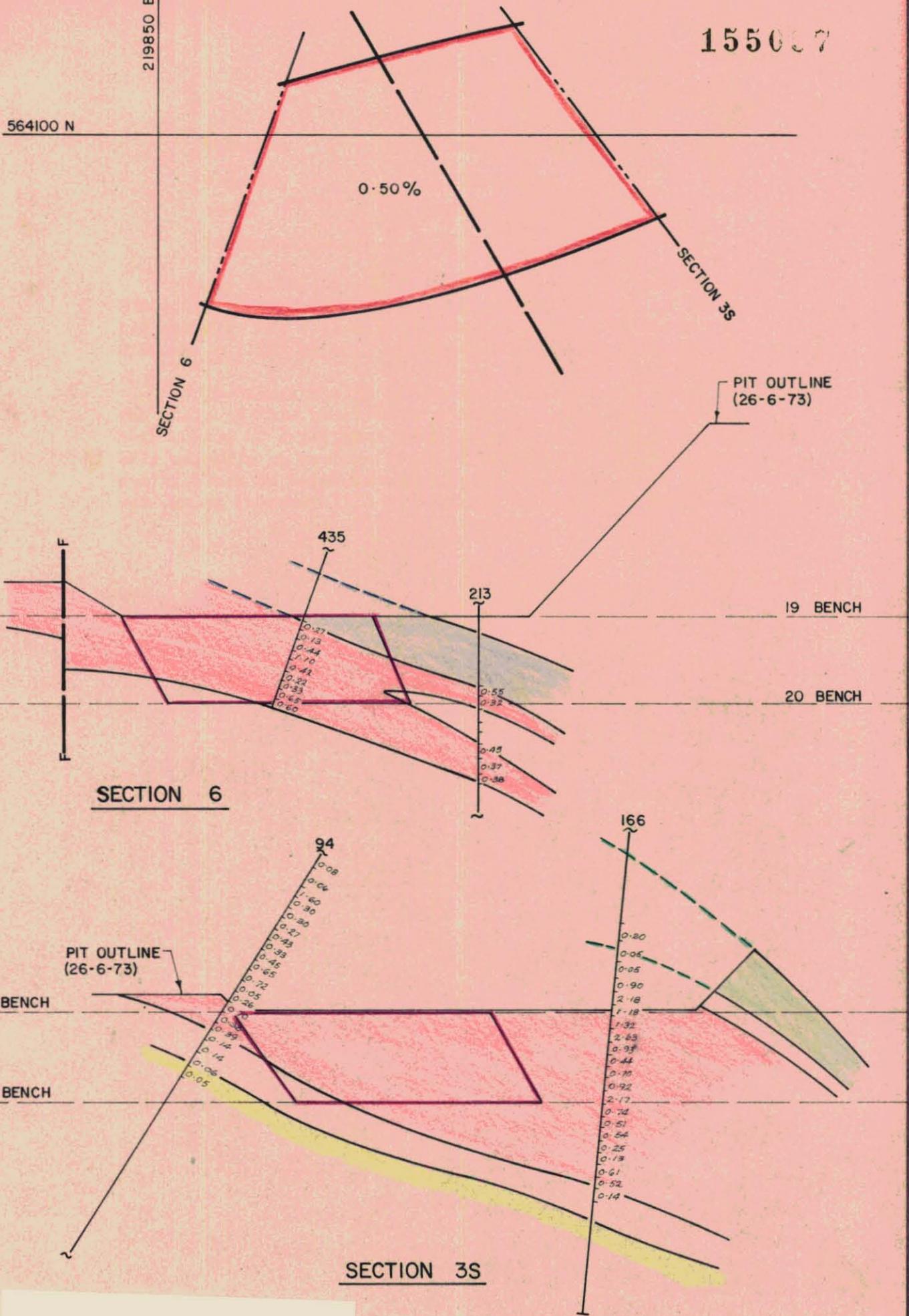0·08
5·11
0·21

SECTION 6

ISG REFER REPORT 70-0676

5 cm

Figure: 26
Scale: 1:500

Location   : 20 bench footwall east

Tonnage   : 25,000 tonnes

Grade   : 0.50% WO_3

Planned dilution : 10%

Diamond drill hole information used in the design of this block is widespaced although good geological correlation exists (Fig. 27).

A wide variation in assays occur and it is evident that the grade of the ore in the block on section 6 is lower (0.44% WO_3) than that on section 3S (0.60% WO_3). It can therefore be expected that the grade of the block will be higher in the east, ie. closer to section 3S but an average grade of 0.50% WO_3 for the total block can be expected.

219850 E

564100 N

0·50 %

SECTION 6

SECTION 3S

PIT OUTLINE
(26-6-73)

435

213

19 BENCH

0·27
0·13
1·70
0·41
0·22
0·33
0·65
0·60

0·55
0·32

0·45
0·37
0·38

20 BENCH

SECTION   6

94
0·08
0·06
1·60
0·90
0·27
0·33
0·45
0·72
0·05
0·26

166
0·20
0·05
0·05
0·90
2·18
1·18
1·32
2·63
0·93
0·44
0·10
0·92
2·17
0·74
0·51
0·54
0·25
0·13
0·61
0·52
0·14

PIT OUTLINE
(26-6-73)

19 BENCH

0·39
0·14
0·14
0·06
0·05

20 BENCH

SECTION   3S

ISG REFER REPORT 70-0676

5 cm

Figure: 27
Scale 1:500m

155057

Location   : 20 bench footwall east

Tonnage   : 13,700 tonnes

Grade   : 0.49% WO_3

Planned dilution : 13%

Ore in this block is well defined on section 2S where
DDH 436 was drilled in 1972 to verify the results of DDH's
170 and 171, but less well defined on section 3S where the
diamond drilling is more widespaced, (Fig. 28).

The final design of the Open Cut does not allow for
the whole of this block to be mined (Fig. 20) but there is a
high degree of confidence that the part of the block to be mined
will maintain an average grade of 0.49% WO_3. The corresponding
mining block on bench 19 was a 0.51% WO_3 block which was mined
out during February 1973 without any tonnage or grade difficulties.

ISG REFER REPORT 70-0676

Figure: 28
Scale 1:500m

15500

0.54 %

SECTION 1S

SECTION 2S

564100 N

219900E

PIT OUTLINE
(26·6·73)

171

1·49
1·39
1·60
0·43
1·02
0·71
0·38
0·23

0·23
0·52
0·01
0·03

436

0·62
0·16
0·37
0·36
0·53
0·44
0·24
0·45
0·73
0·13
0·88
0·26
1·8
0·26
0·39
0·15
0·32
0·30
0·14

170

2·55
0·92
1·12
1·34
1·06
0·32

0·6
0·38
0·37
0·44
1·46
1·31
0·72
0·57
0·26

172

2·67
0·15
0·28
0·32
1·50
0·75
0·62
0·39
0·44
0·27
0·17

19 BENCH

20 BENCH

SECTION 2S

ISG REFER REPORT 70-0676

|←——— 5 cm ———→|

Figure: 29
Scale 1:500m
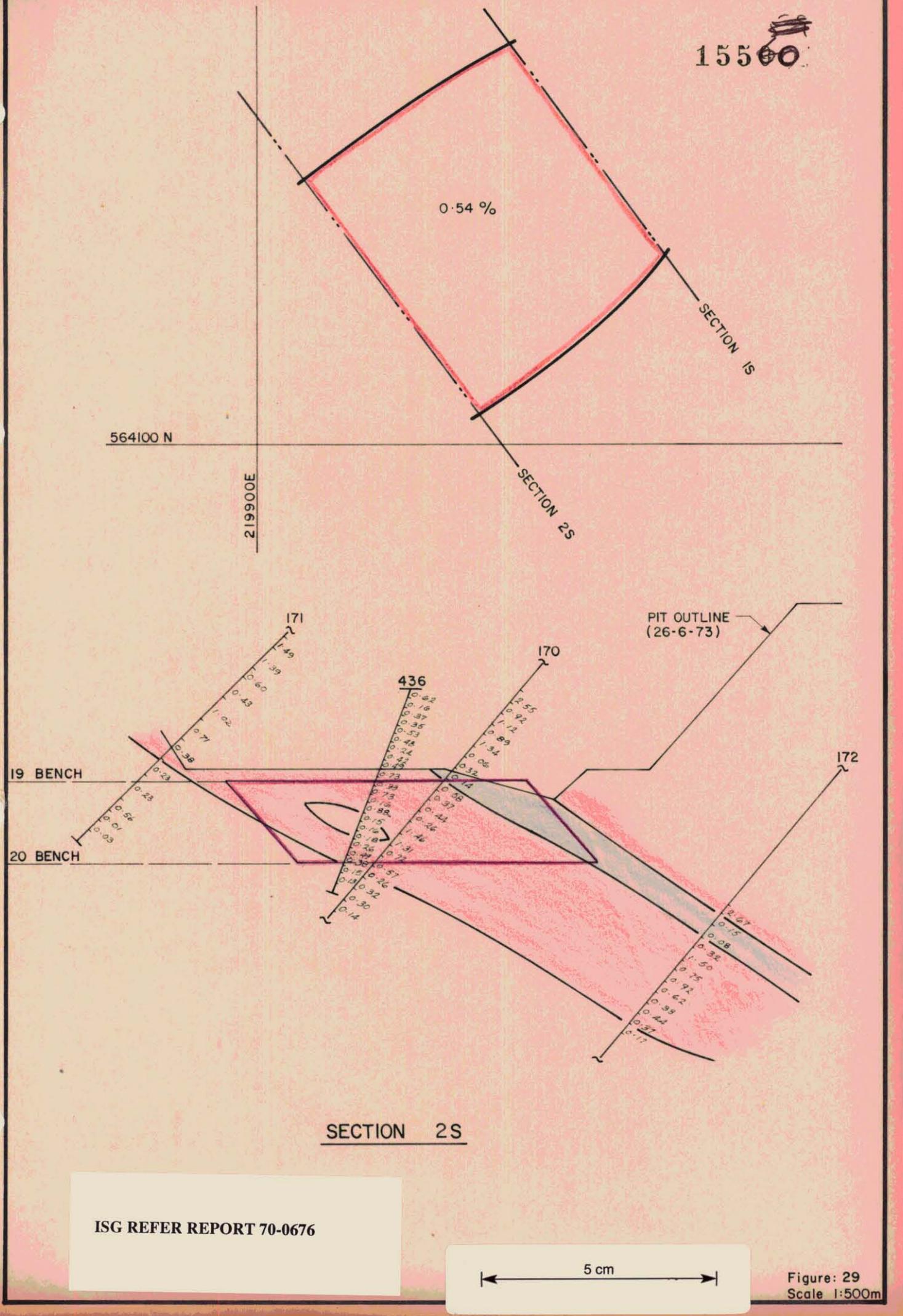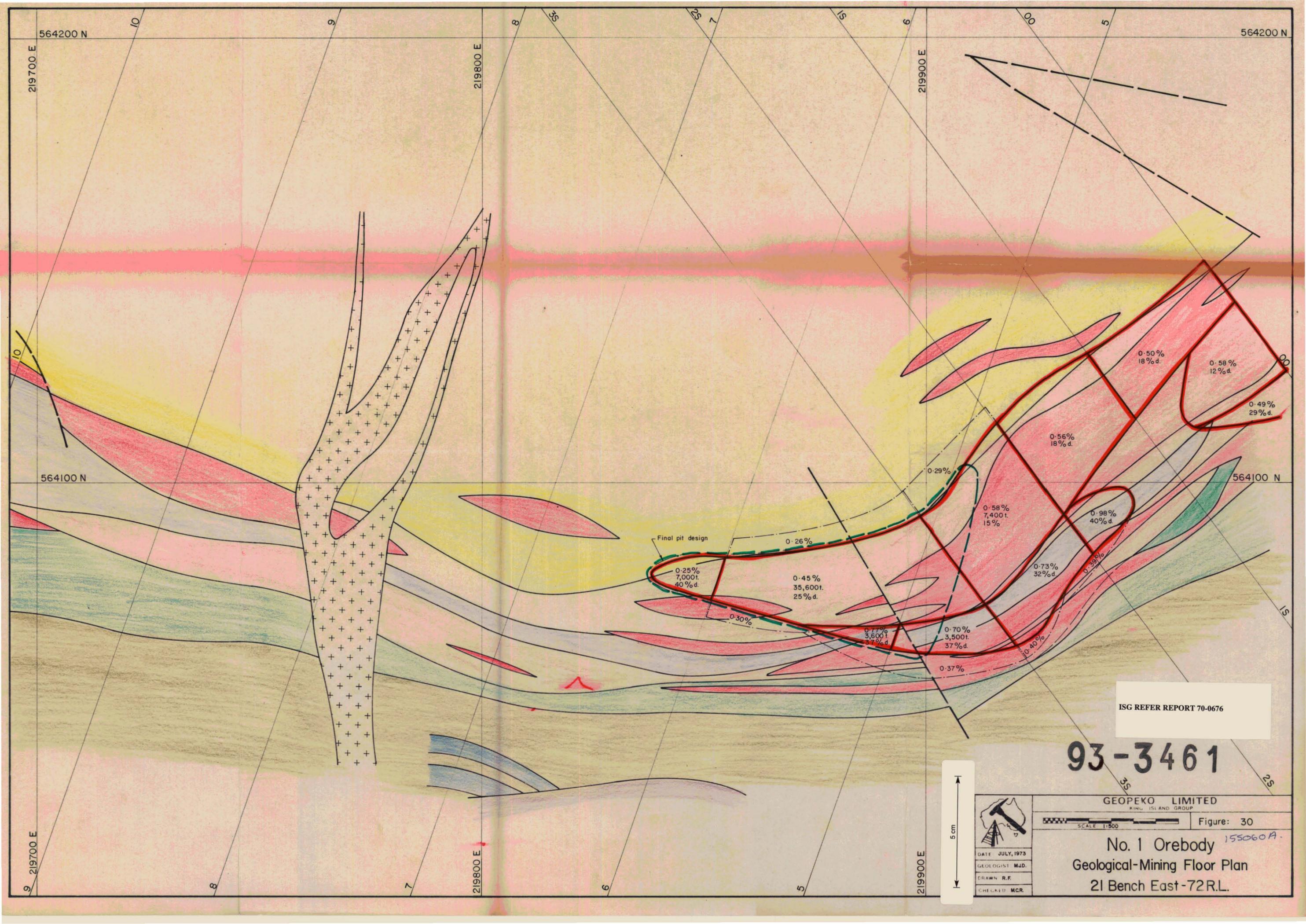
564100 N
564100 N

219700 E
219800 E
219900 E

Final pit design

0.25%
7,000t.
40%d.

0.45%
35,600t.
25%d.

0.26%

0.29%

0.30%

0.37%

0.56%
18%d.

0.50%
18%d.

0.58%
12%d.

0.49%
29%d.

0.58%
7,400t.
15%

0.98%
40%d.

0.73%
32%d.

0.70%
3,500t.
37%d.

93-3461

155060A

5 cm

GEOPEKO LIMITED
KING ISLAND GROUP

SCALE 1:500

Figure: 30

No. 1 Orebody
Geological-Mining Floor Plan
21 Bench East - 72 R.L.

Location   :   20 bench footwall east

Tonnage   :   3,500 tonnes

Grade   :   0.54% WO_3

Planned dilution :   Approx. 16%

Only a very small proportion of this block will be mined (Fig. 20) and that part to be mined is well defined on section 2S by DDH's 170 and 436.

DDH 436 has indicated that areas of waste will occur in the lower C lens skarn and the degree of actual dilution may vary from that planned however a grade of 0.54% should be attained.

Location   : 21 bench east

Tonnage   : 7,000 tonnes

Grade   : 0.25% WO_3

Planned dilution : 40%

This is the lowest grade mining block included within the Primary Ore Reserve and is based entirely on DDH 213 on section 6 (Fig. 31). The mineralisation is patchy low grade lower C lens skarn and the block will be highly diluted.
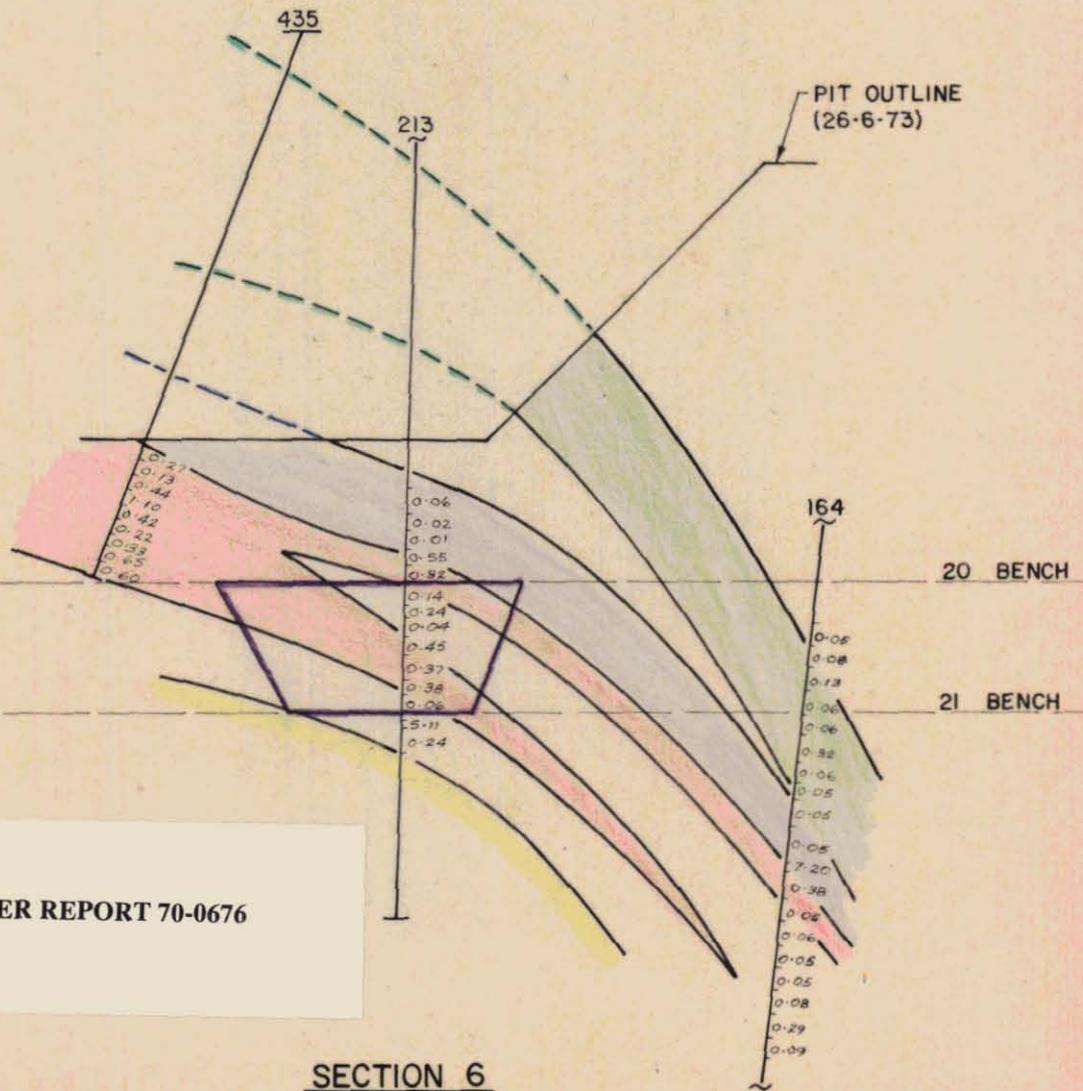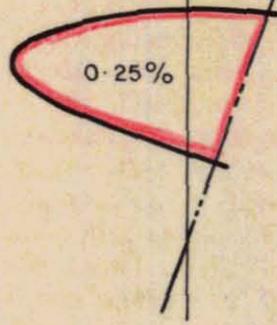
Close grade control may enable the block to be upgraded slightly but it seems unlikely that any part will achieve mill grade.
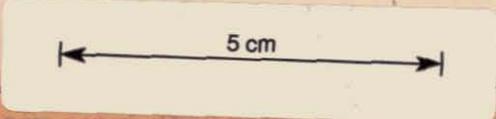
155063

564100 N

219850 E

SECTION 6

0·25%

435

213

PIT OUTLINE
(26·6·73)

164

20 BENCH

21 BENCH

0·27
0·13
0·44
1·10
0·42
0·22
0·33
0·65
0·60

0·04
0·02
0·01
0·55
0·92
0·14
0·24
0·04
0·45
0·37
0·38
0·06
5·11
0·24

0·05
0·08
0·13
0·06
0·06
0·92
0·06
0·05
0·05

0·05
7·20
0·38
0·06
0·05
0·05
0·08
0·29
0·09

SECTION 6

5 cm

Figure: 31
Scale 1:500m

Location	:	21 bench east
Tonnage	:	35,600 tonnes
Grade	:	0.45% WO_3
Planned dilution	:	25%

        The confidence in maintaining an average grade of
0.45% WO_3 throughout this block is difficult to assess.   The
block is very large (Fig. 30) and the drilling widespread
(Figs. 32 and 33) which makes correlation difficult between
adjacent sections.   The ore to be mined is virtually the
lowest part of the lower orebody and the mineralisation is
sure to be represented as a series of pods and stringers
very heavily diluted.   The actual grade of the block hinges
a great deal on the validity of section 3S which is only very
slightly diluted and exhibits a grade for ore on the section
at the 21 bench level of 0.70% WO_3.   This grade is heavily
influenced by two assays of 0.92% and 2.17% in DDH 166.   In
any event it is apparent that the grade of ore in the block
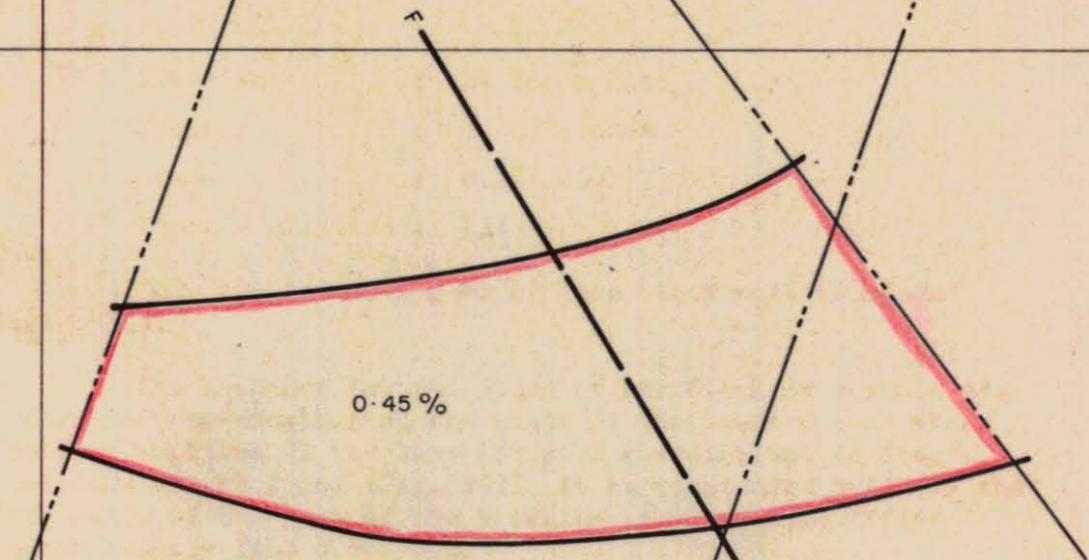is higher in the east, ie. towards section 3S.

SECTION 6

SECTION 3S

SECTION 5

219850 E

564100 N

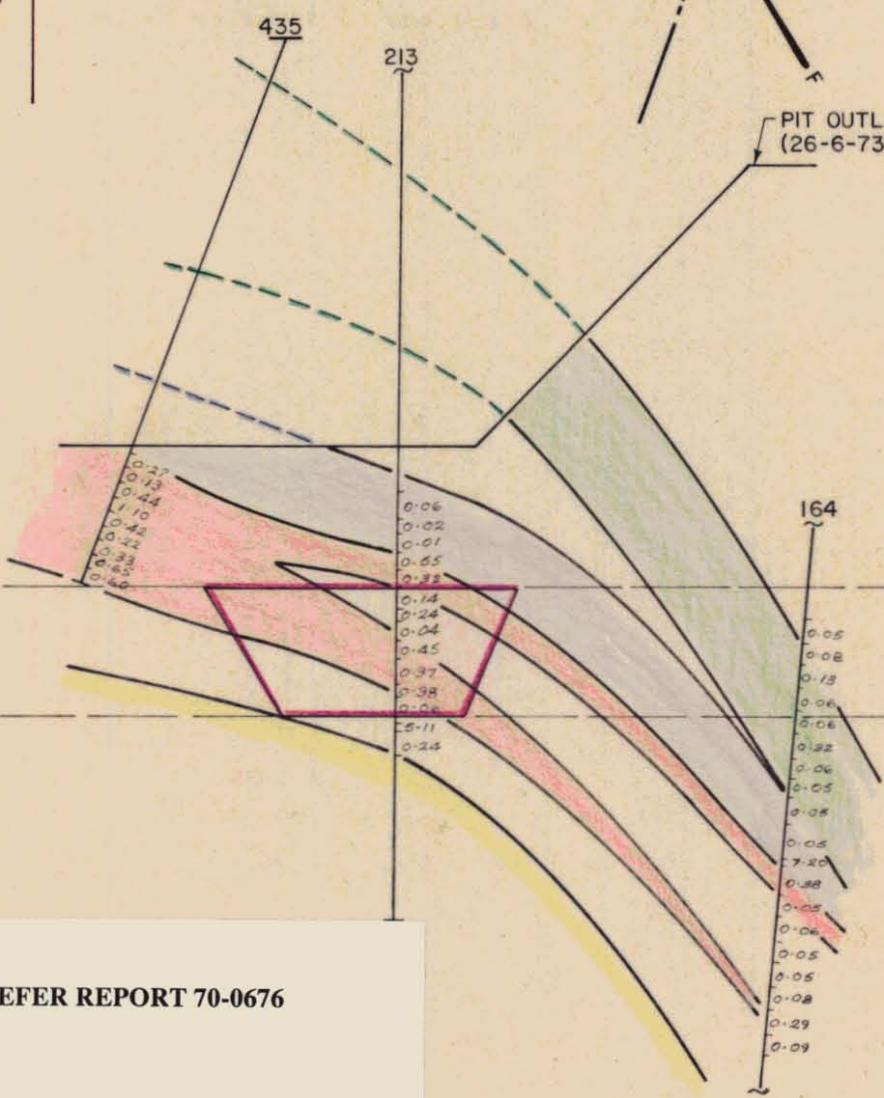0·45 %

435

213

PIT OUTLINE
(26-6-73)

F

F

164

20 BENCH

21 BENCH

0·27
0·13
0·44
1·10
0·42
0·22
0·33
0·65
0·60

0·06
0·02
0·01
0·65
0·33

0·14
0·24
0·04
0·45
0·37
0·98
0·06

5·11
0·24

0·05
0·08
0·13
0·06
0·06
0·22
0·06
0·05
0·08
0·06
7·20
0·38
0·05
0·06
0·05
0·05
0·08
0·29
0·09

ISG REFER REPORT 70-0676

SECTION 6

5 cm
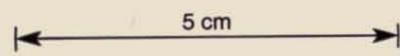
Figure: 32
Scale 1:500m

Location	:	21 bench east
Tonnage	:	7,400 tonnes
Grade	:	0.58% WO_3
Planned dilution	:	15%

Only the footwall part of this block will be mined (Fig. 30).

The evidence for the grade of the block as a whole was determined by considering the grade of the lower C lens skarn between sections 2S and 3S where good correlations in ore outlines can be found (Fig. 34). It is considered unlikely that the grade of the part of the block to be mined will differ significantly from 0.58% WO_3.

As is common with most of the 21 bench blocks the ore to be mined is lower C lens skarn.

155067

PIT OUTLINE
(26-6-73)

SECTION 3S

433

272

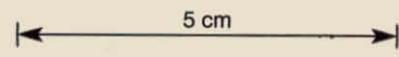20 BENCH

21 BENCH

SECTION 5

PIT OUTLINE
(26-6-73)

166

167

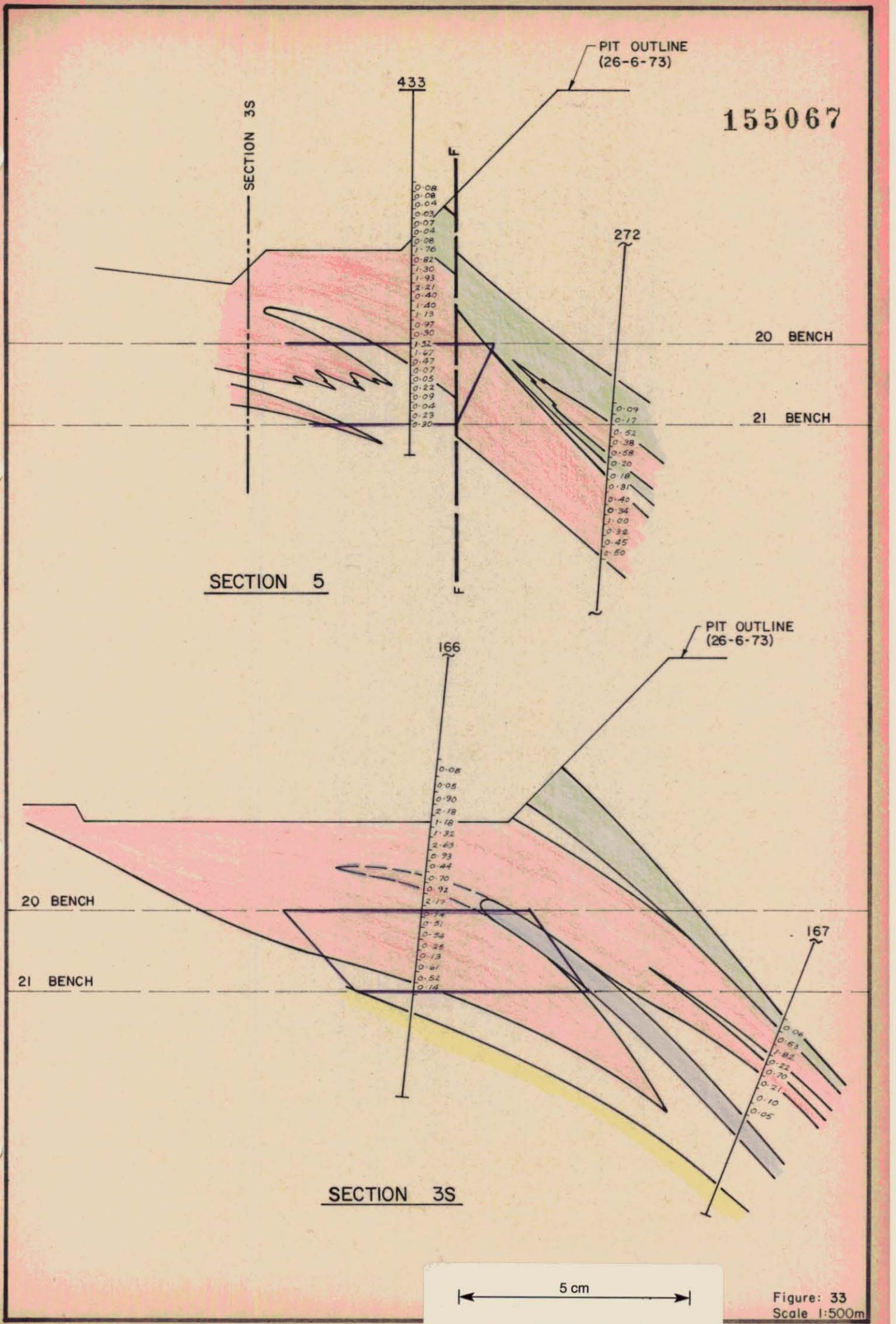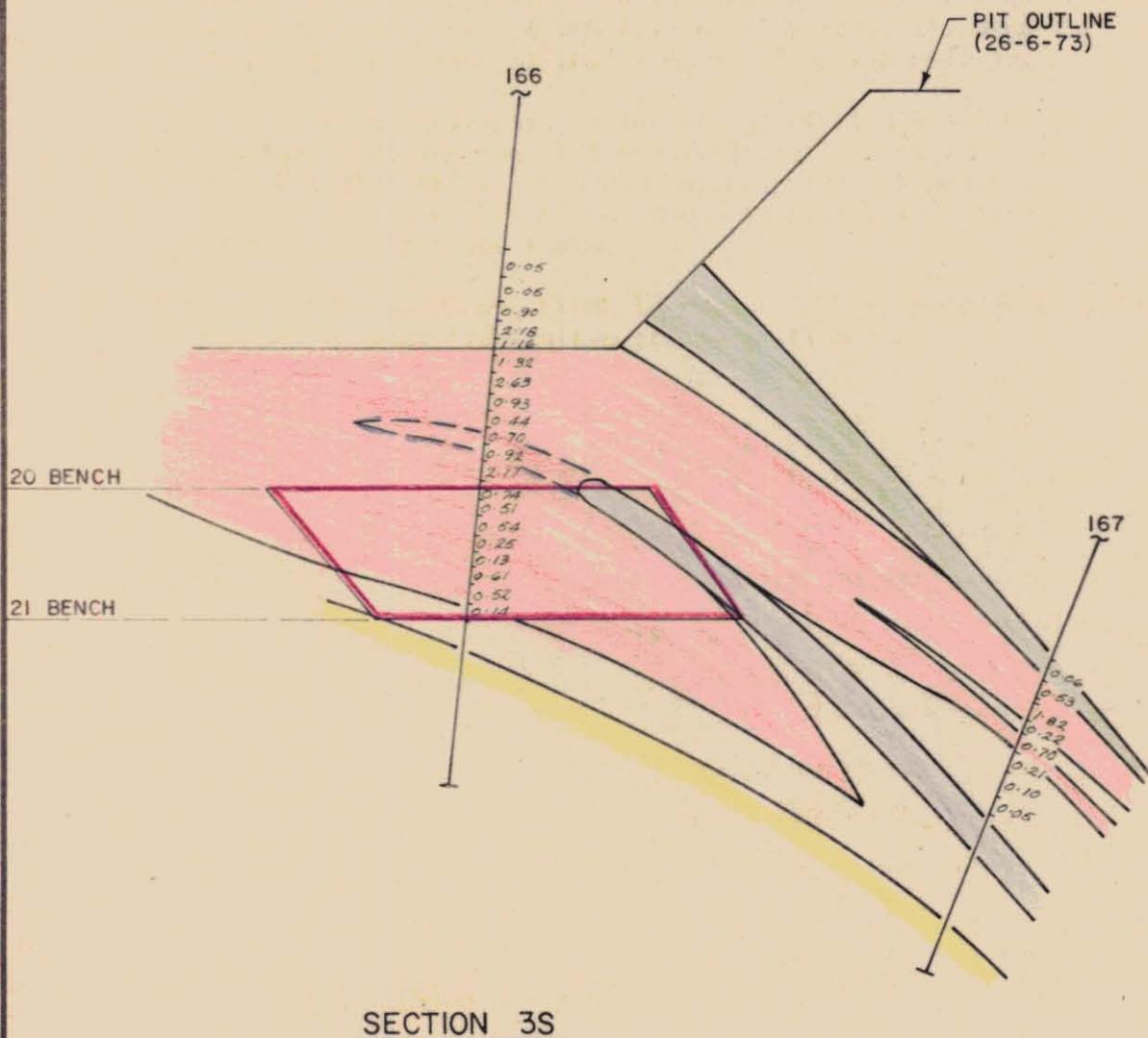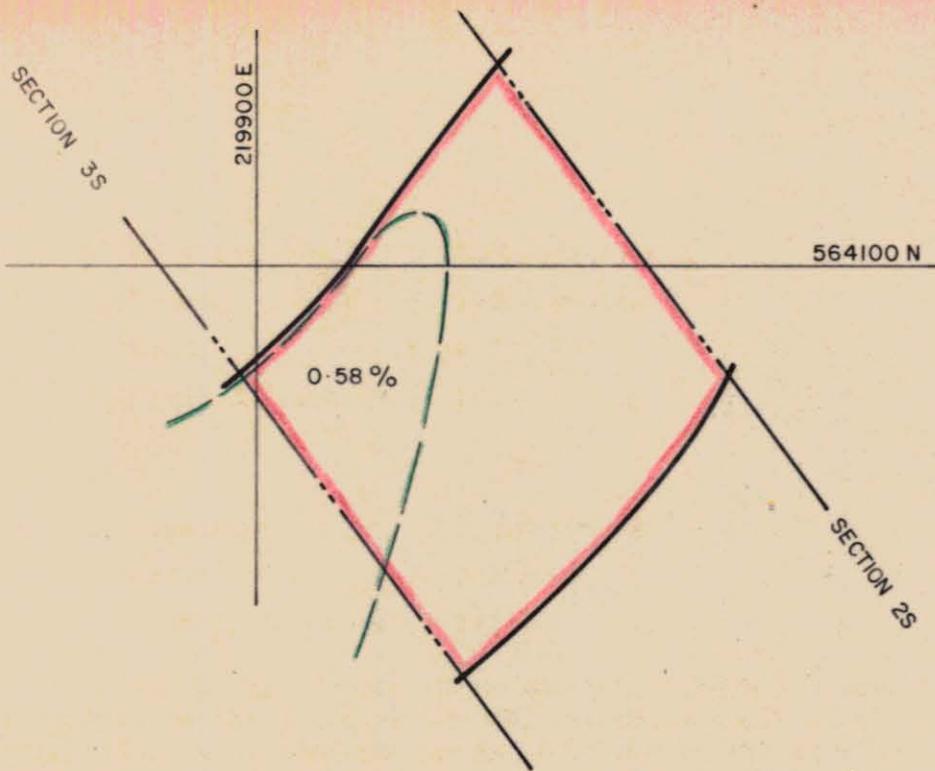20 BENCH

21 BENCH

SECTION 3S

5 cm

Figure: 33
Scale 1:500m

155068

SECTION 3S

219900 E

564100 N

SECTION 2S

0·58 %

PIT OUTLINE
(26-6-73)

166

0·05
0·05
0·90
2·18
1·16
1·92
2·69
0·93
0·44
0·70
0·92
2·11
0·74
0·51
0·54
0·26
0·13
0·61
0·52
0·14

167

0·06
0·53
1·82
0·22
0·70
0·21
0·10
0·05

20 BENCH

21 BENCH

SECTION 3S

5 cm

Figure: 34
Scale 1:500m

Location   :   21 bench east

Tonnage   :   3,500 tonnes

Grade   :   0.77% WO_3

Planned dilution   :   37%

<div align="center">and</div>

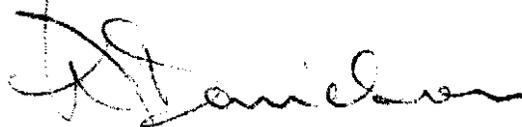Tonnage   :   3,500 tonnes

Grade   :   0.70% WO_3

Planned dilution   :   37%

The grade of both these small hangingwall blocks is dependent on the grade of DDH 433 extending south of the fault (Fig. 35). Assessing the grade of blocks by the area of influence method, as explained previously, means that the major part of the ore in the block would be under the influence of DDH 433 and at a grade of 1.28% WO_3. Should the grade not extend across the fault then the ore in the block will be more under the influence of DDH 272 in which case, allowing for dilution, the grade of the block would be sub mill grade.
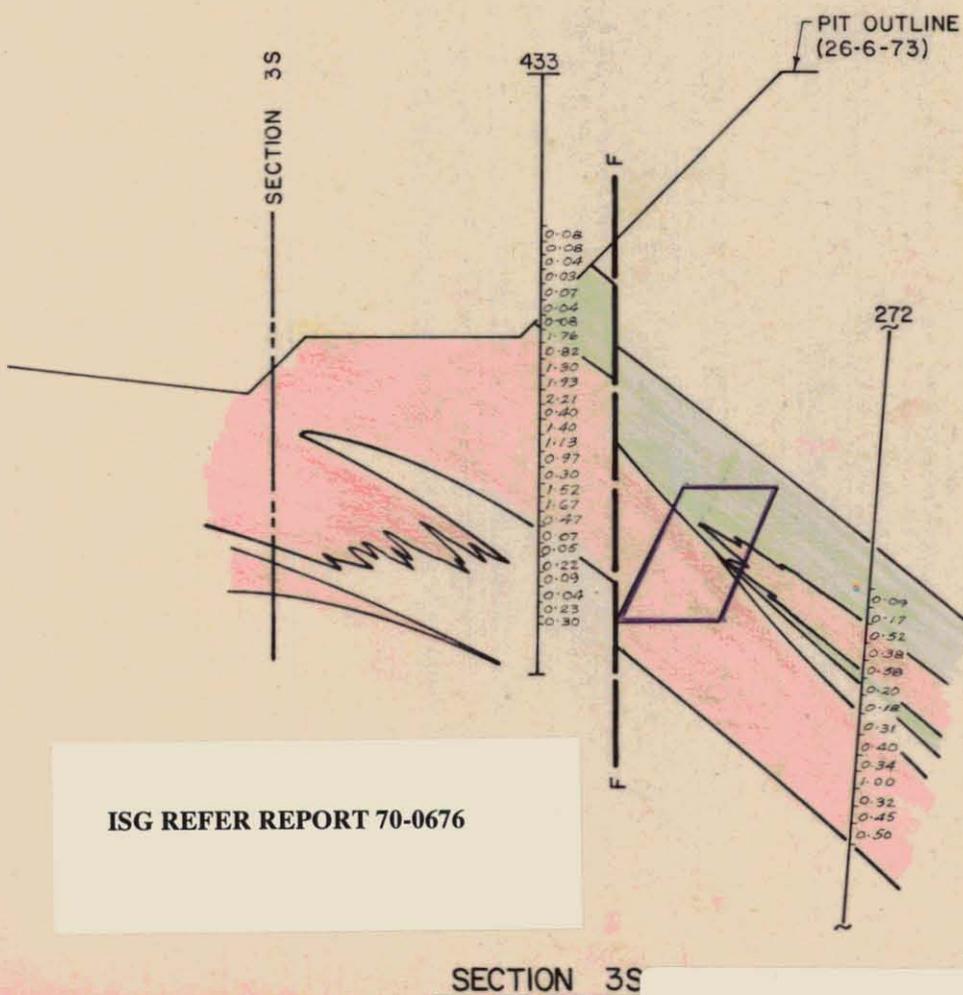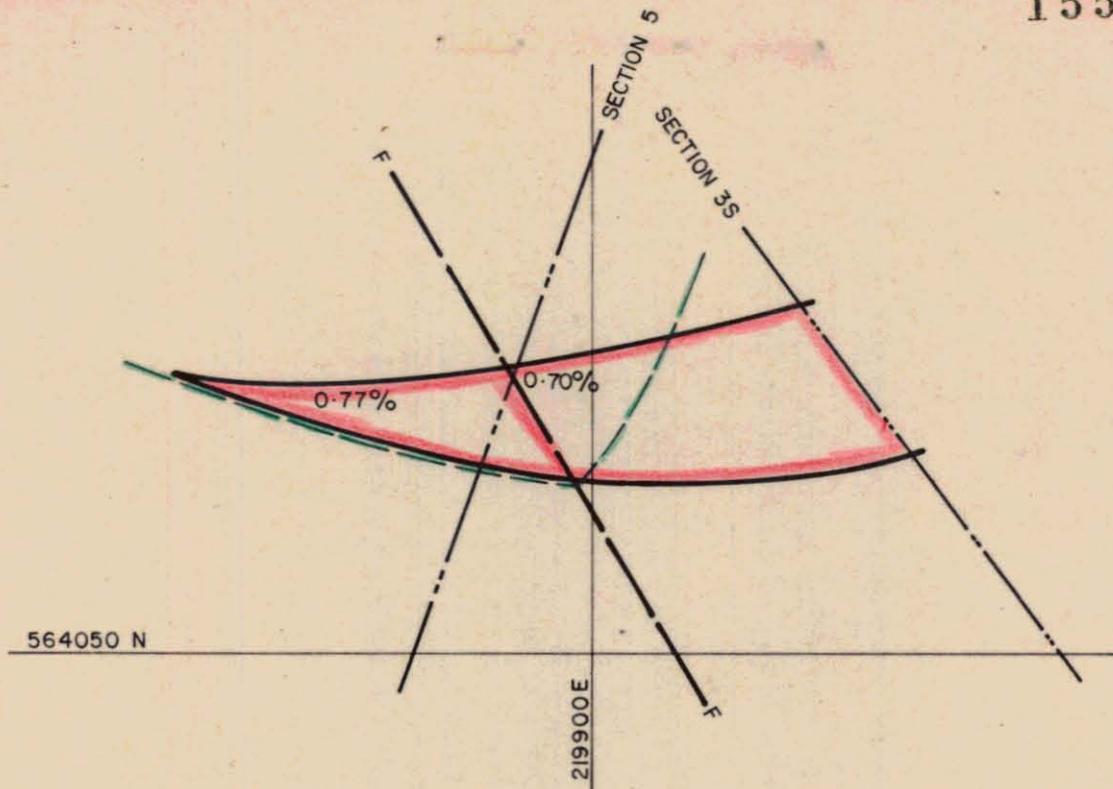
Past experience in the mining of blocks on the higher benches would suggest that the fault is of such small relative movement that the grade would extend across, however in previous instances there has not been such a significant grade variation across the fault.

The 0.70% WO_3 block is downgraded slightly from 0.77% WO_3 due to some lower grade ore on section 3S.

GEOPEKO LIMITED,

M. J. DANIELSON
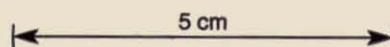MINE GEOLOGIST.

155070

0·77%

0·70%

SECTION 5

SECTION 3S

F

F

564050 N

219900 E

SECTION 3S

433

PIT OUTLINE
(26·6·73)

F

272

0·08
0·08
0·04
0·03
0·07
0·04
0·08
1·76
0·82
1·90
1·93
2·21
0·40
1·40
1·13
0·97
0·30
1·52
1·67
0·47
0·07
0·05
0·22
0·09
0·04
0·23
0·30

0·09
0·17
0·52
0·38
0·58
0·20
0·18
0·31
0·40
0·34
1·00
0·32
0·45
0·50

F

ISG REFER REPORT 70-0676

SECTION 3S

5 cm

Figure: 35
Scale 1:500m