

004802

WHITEHORSE COPPER MINES

NORTH STAR AREA

SUMMARY REPORT & RECOMMENDATIONS

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May, 1982

Summary

A buried limestone reef, found one mile south of the Little Chief Mine (Fig. 1) contains copper mineralization similar to that of the Little Chief - Middle Chief Zones, in skarn zones near the intrusive contact. The best mineralization was found near the base of the limestone reef where it is in contact with siltstone and greywacke at depths from 1400 to 1800'. Gold-silver content in the mineralization is comparable to that of the Little - Middle Chief zones.

The mineralization is erratic, being partly controlled by proximity to the intrusive contact which is irregular and variably gradational. Twenty diamond drill holes with an aggregate footage of 33,000' have been drilled on the property. No mineable reserves have been established in the area which should be considered as an exploration target. A figure of 800,000 tons at 1.5% copper is indicated for the footwall zone from drilling on sections 32 S and 36 S. High grade mineralization (48' @ 5% Cu) in silicate skarn, two hundred feet above the footwall contact may follow the contact of a diorite apophysis intersected 400' west.

A pulse E.M. survey using a Geonics E.M. 37 unit indicated a conductive zone along the north contact of the pendant for a distance of 3600'. Five holes drilled to test the indicated conductive zone have failed to intersect any mineralized zones or explain the survey results adequately.

Approximately \$1 million has been spent on the property to April, 1982 when the 1982 program was cancelled due to economic restrictions and the planned early shutdown of the mine.

The area is considered by the writer to offer excellent potential for the existence of ore zones which could be accessible from the Little Chief underground workings. Mineralization has been intersected over a distance of 2000' and a favourable contact may exist at depth for a distance of 10,000' around the pendant.

Recommendations

The value of the North Star area as an exploration target is critically dependent on the availability of the Little Chief underground workings and the Whitehorse Copper Mine plant facilities. Funds to explore the area adequately are unlikely to be available from W.C.M. or H.B.E.D. in the near future. It is therefore recommended that:

1. A joint venture partner be sought to continue the exploration program on the North Star property with W.C.M. remaining the operator if a mineable ore deposit is found. An interest of 40% for an expenditure of \$1 million is suggested. A commitment to drill a minimum of 15,000' within one year is recommended; this could be waived if early results justified driving out to the area from Little Chief underground workings.
2. If the foregoing recommendation is not consummated and H.B.E.D. retains the property, it is recommended that, if funds became available, exploration of the area be continued.
 - a) An orientation survey using borehole pulse E.M. should be done to determine whether zones known to exist could be detected by the survey of barren holes in the area (e.g. a survey of NS 18 to detect zones intersected in NS 15). If the orientation survey is successful, it should be extended to other areas, and followed up by drilling.
 - b) Drilling should be continued:
 1. to determine the limit of the pendant and mineralization to the south east. A preliminary hole at 2E drilled west @ -70°, 1800' is suggested on section 38 50 S, 40 S, or 42 S.
 2. to follow the high grade mineralization in NS 15 to the north and west. A vertical hole at 6W on 32 S or 34 S is suggested to a depth of 1600'.

2. b) 3. to follow the north contact of the pendant west from the BL @ 28 S which has not been adequately explored. The dip of the intrusive is unknown and low grade mineralization intersected in NS 11 can be expected to improve toward the intrusive contact (compare section 36). A hole drilled on section 71 400 E from 45 675 N at -75° S is suggested. This contact should be followed west and north towards Valerie. If the reef grades out to the north, the zone of facies change from carbonate to clastic sediment facies, near the intrusive is an attractive target. Such a zone probably exists along the Valerie contact. Check mapping, detailed ground mag and short drill holes are recommended to establish the attitude of the top of the limestone reef before deep drilling is attempted. Similar work is suggested west and southwest of NS 19 where a similar environment may occur.
- c) Dr. Gregg Morrison (P.H.D. Whitehorse Copper Belt) whose work contributed a great deal to the understanding of the setting of the deposits, will be working in Alaska during the summer and will be visiting Whitehorse. His services should be solicited to review all data and to suggest a model for the reef topography north and south of the pendant.
- d) Remnants of the carbonate and clastic sediment sequence may exist in the diorite between the south end of Little Chief and the North Star pendant. If difficulties with correlation of pulse EM response with the location of known conductive zones can be resolved, it is recommended that this area be covered by a Deep E.M. survey.

Introduction

Reinterpretation of geological and geophysical data in the North Star area in 1975, remapping (R. Reid), magnetic surveys and drilling of a broad low intensity I.P. anomaly led to the discovery of a large, nearly completely buried, flat lying limestone reef. This carbonate unit was extensively skarnified, near its contact with diorite of the Whitehorse Batholith, at the upper contact with overlying dioritized clastic sediments and at the footwall contact with underlying metasediments. Copper mineralization has been found in each of these skarn zones, with that near the shallow dipping footwall contact near the intrusive, at depths from 1400' to 1800', being most attractive.

The area was considered attractive because of, the similarity of the skarn zones to those of Little Chief, the size of the pendant and its proximity to the Little Chief workings and the W.C.M. plant. Only five holes were drilled in the area from 1975 to 1980 due to budget restrictions. In 1980, in hole NS 8, forty feet of massive magnetite with traces of copper mineralization was intersected at a depth of 1400', followed by 113' of silicate skarn which graded 0.52% copper.

A pulse E.M. survey using a Geonics E.M. 37 unit was completed by Geophysicon Ltd (Calgary) in 1981 using both a standard loop configuration and a mise a la masse system in which an electrode was located in the conductive magnetite intersected in NS 8. Five holes drilled to test an indicated conductive zone, extending for 3600' along the north contact of the pendant, failed to explain the results adequately.

Drilling southeast of NS 8 in late 1981 intersected good to high grade copper mineralization in intersection lengths of up to 48' and indicated true widths of up to 40'. Mineralization has been intersected over a horizontal distance of 2000' and has not been cut off along strike. The drilling program was cancelled in March 1982 due to economic restrictions and a planned early shutdown for the mine.

Work in the area has been hampered by the depth to the most favourable contact (\pm 1500'), the irregularity of the intrusive contact and the restriction of "ore" grade widths, to within a few hundred feet of the intrusive.

Evaluation of Results

1. High Grade Zone

The high grade silicate skarn zone (48' - 5% Cu) intersected in NS 15 in section 3600 S, two hundred feet above the footwall contact, has not been extended by the wedged hole NS 15 W₂ (120' E, 16' - 1.05% Cu) or NS 5, 250' south (0.8' - 8.4% Cu). NS 18,400' west of NS 15 was in a diorite apophysis below 600'. The high grade zone may follow along the contact of this diorite to the north and west. A 10' intersection at 3.34% Cu on section 32 S in NS 14 probably correlates with that in NS 15. Borehole pulse E.M. may be of some assistance in delineating this zone.

2. Footwall Zone

The footwall zone intersected on 32 S and 36 S is located at the base of the limestone at the contact with underlying clastic sediments. This zone only exists where this contact is within three or four hundred feet of the intrusive contact. Mineralization in this flat to shallow dipping zone is identical to that of Little Chief consisting of chalcopyrite, bornite and valleriite in a magnetite serpentine phlogopite skarn. The grade and thickness of this zone can change very quickly grading from a barren weakly skarnified contact towards the intrusive. On section 36 S the zone changes from 10' at 0.98% to 47' at 1.53% in a distance of 160' with the grade of the mineralization in the latter intersection being 2%, but including an 11' dyke.

This zone can not be considered to be cut off by drilling on sections 70 600 E and 71 400 E. Holes 19 and 20 probably intersected the footwall contact too far from the intrusive while hole NS 11 on section 71 400 E did intersect weakly mineralized magnetite skarn which may improve in thickness and grade towards the intrusive contact. A hole layed out to intersect the zone a few hundred feet closer to the contact would determine whether ore grade mineralization does extend to this area. While the zone may generally be in the order of 1000 - 2000 tons/horizontal foot, the potential strike length and the likely existence of irregularities in the intrusive contact which could be expected to yield better mineralized zones, make it attractive.

The footwall zone may also extend to the southeast of section 38 50 S. Generally the grade of mineralization has improved in this direction. The southeast limb of the North Star pendant is interpreted, to be 600' wide on 38 50 S and could reasonably be expected to extend several hundred feet southeast. There is a suggestion of steepening of the upper contact from banding in the core and good grade mineralization intersected in NS 5 near the upper limestone contact. If the attitude of the footwall were to steepen or the limestone reef grade out in this direction conditions would exist for more pervasive skarnification and ore deposition.

Hangingwall Zones

Narrow, widespread, erratic mineralization has been intersected at or near the upper skarn contact with the dioritized clastic sediments. These intersections were generally in the order of a few feet but do suggest that where the upper and lower contacts converge near the intrusive contact would be an attractive locus for ore deposition.

Other Considerations

The Craigmont model of G. Morrison (P.H.D. Thesis 1981) located the Craigmont underground ore zone at the facies change from reef limestone to clastic sediments. The North Star reef is shown to be grading out to the East on section 32 S and 28 S changing from 1500' thickness (NS 19 - 20) to 900' (NS 9 & 11). However, it was still 900' thick where intruded by the Whitehorse Batholith.

If no major fault exists between the North Star pendant and V 17 the North Star reef must grade out completely to the North. No limestone equivalent to that at North Star was intersected in V 17 drilled to a depth of 3,555'. The area where the limestone grades out along the Valerie contact would be an attractive target area and may be in the order of 2,000' from the Little Chief underground workings. The south contact of the pendant and the possible extension at depth of the reef to the southwest along the contact should also be considered as areas which could contain favourable contacts at depth.

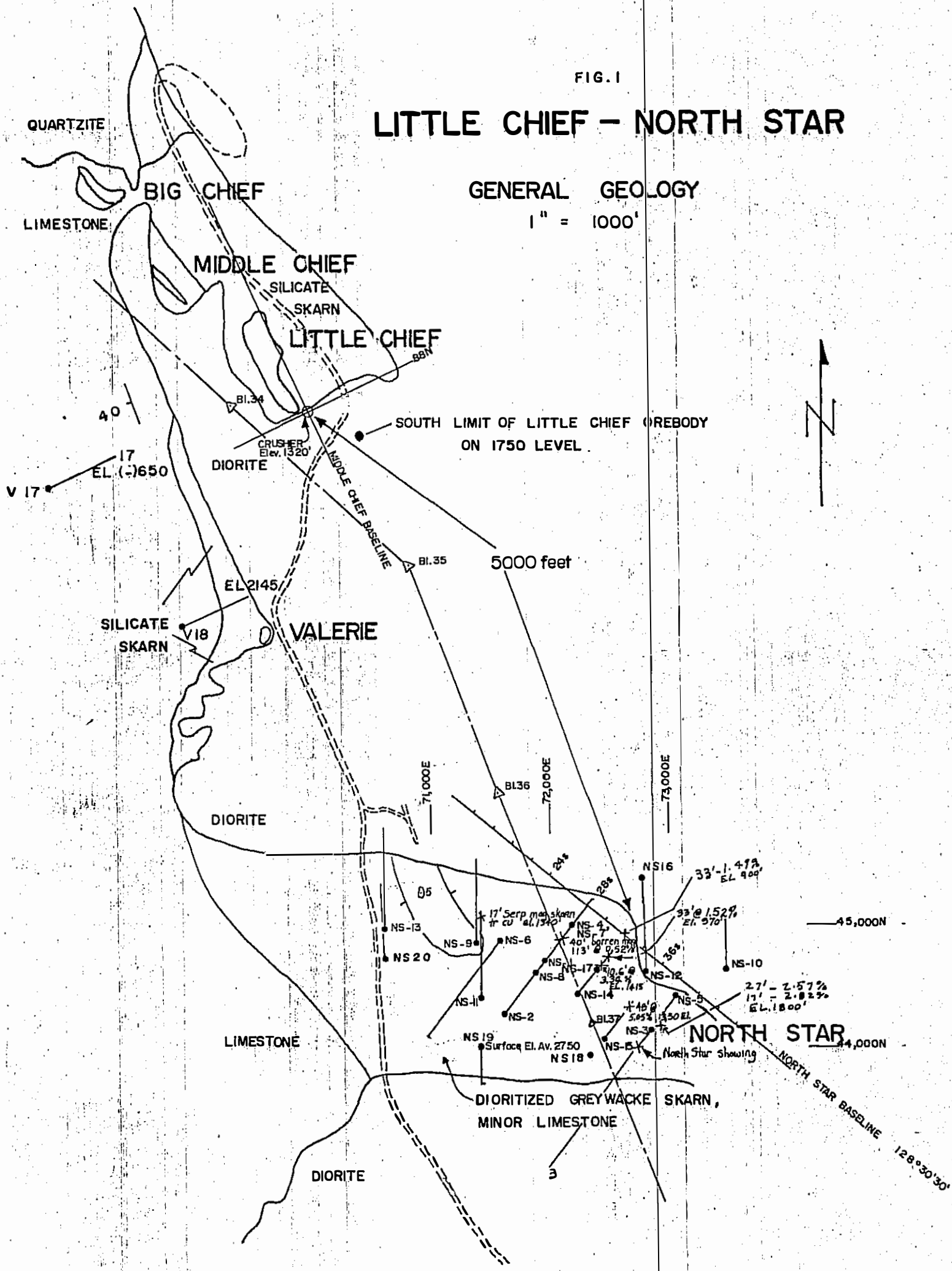
The diorite between the North Star Pendant and Little Chief may contain remnants of limestone and clastic sediments at depth. Some of the "diorite" in this area may be equivalent to the "dioritized" clastic sediments overlying the limestone reef. If confidence in interpretation and correlation of "Deep E.M." response to location of known conductive zones can be established, this area along with the contacts north and south of the pendant should be surveyed.

FIG. 1

LITTLE CHIEF - NORTH STAR

GENERAL GEOLOGY

1" = 1000'



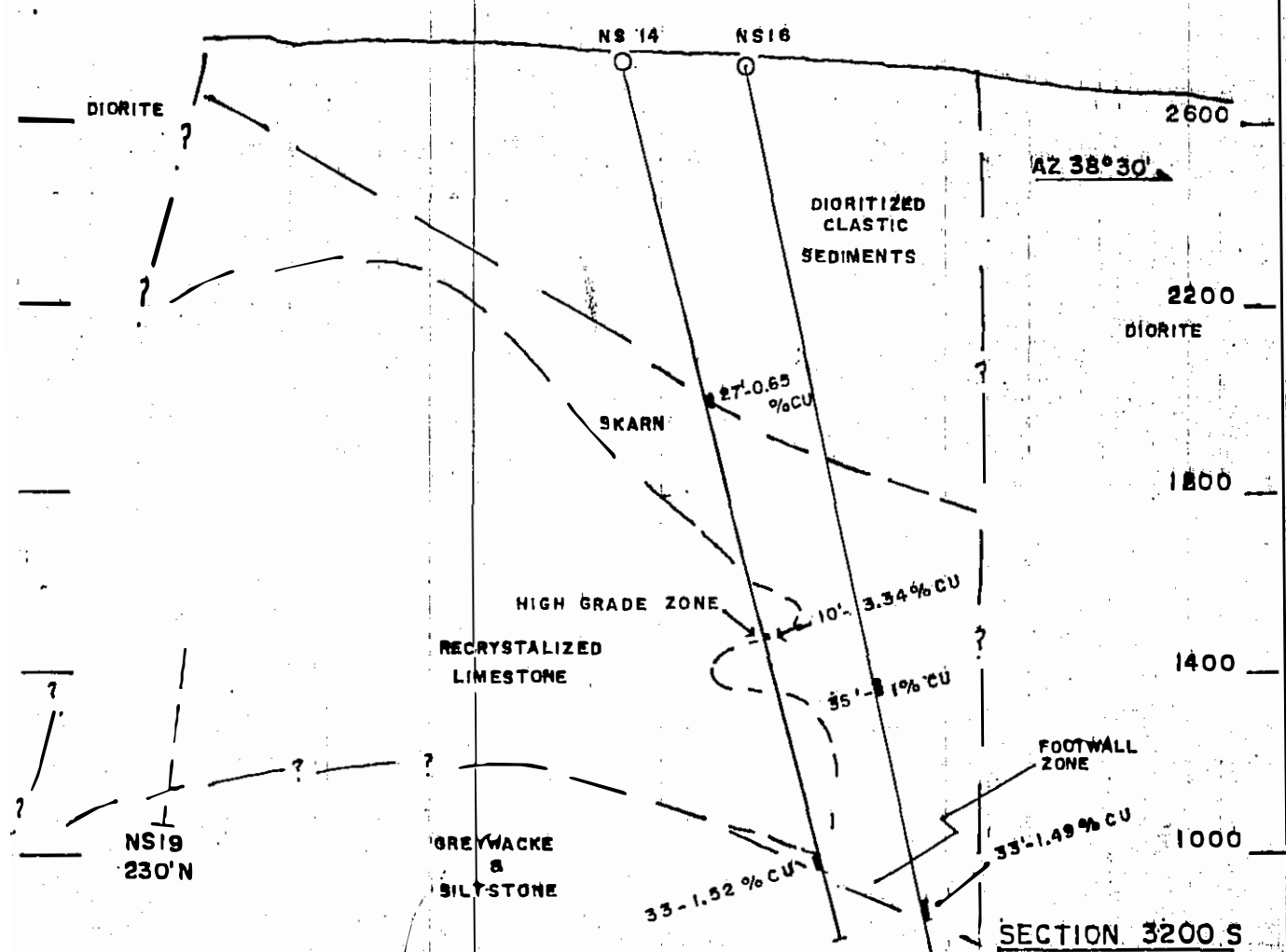
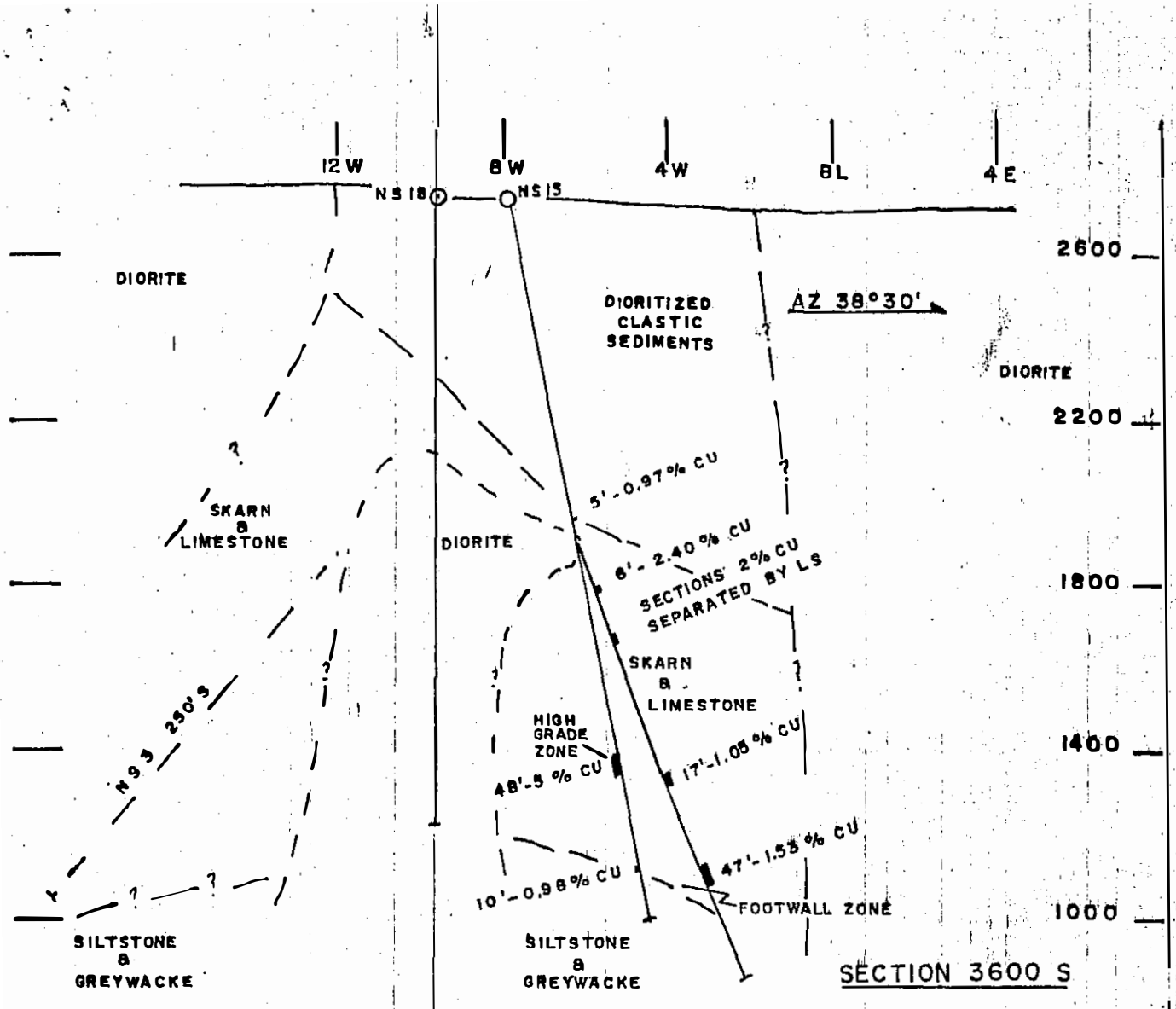


FIG. 2
 NORTH STAR
 SCHEMATIC SECTIONS
 1"=400' A.H MAY 1982