GEOLOGY OF WINDFALL CANYON

NICKEL PLATE MOUNTAIN

HEDLEY, BRITISH COLUMBIA

BY

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OVERVIEW

Surface geological mapping and sampling were done during July and part of August in Windfall Canyon from Exploration Syndicate's 1913 Camp Cliffton area at 4700 feet to the top of Windfall Ridge at 6100 feet. The canyon lies on the northwest side of Nickel Plate Mountain, Hedley, British Columbia, and trends to the northeast. It is enclosed on either side by large, vertical cliffs which spread slightly apart around Camp Cliffton. The floor, covered in talus of all kinds and sizes, slopes down an average 30°. Some areas are densely forested. The combination of a steep slope, an incoherent jumble of rock debris, and frequent rock falls along the cliff faces make traversing the area difficult and risky.

The canyon was mapped by two men using a compass (with hand level and clinometer) and topolite. A staked grid was surveyed in by this method at the outset; all subsequent measurements were tied into it. The only permanent point used was the N.W. Copperfield cornerpost. The traverse extends from here northward for roughly 300 meters where it intersects the southwesterly grid line extending into the canyon. Accuracy is limited, especially towards the southwest end, because the traverse is open; as well, the claims are from a 1951 Kelowna Exploration Company's composite plan and the contours extrapolated from a National Topographic Survey Map - Hedley 92H/8 - blown up to 1:5000 from 1:50,000. However, the geology was mapped accurately along the intersection between the cliff walls and the canyon floor and the map is a good representation of the rocks present and their attitudes.

Thirty-four chip samples were taken at various locations numbered on the map in a series from 36777 to 36811. Once the gold, silver, and copper assay results come back from the lab, an accurate idea of the type of sulphide mineralization presant in the canyon will be obtained.

OVERVIEW (continued)

A Pi Diagram analysis was done for the attitudes of planes of beds, joints, and dikes measured along the canyon walls. Although the reliability of this analysis is limited by the low number of attitudes taken and the assumption that folds are cylindrical, it does give an indication of general features (see diagrams). The bedding analysis suggests that the mapped area is a large fold trending 334° Az, plunging 20° to the northwest. The joint analysis shows that fracturing is random although there is a slight majority of planes striking to the northeast and all planar dips are greater than 45°. Dikes strike mostly to the northeast and dip from vertical to 26° both northwest and southeast.

DESCRIPTIONS OF ROCKS

Sulphide Mineralization

Sulphides are present to some degree in all the rocks of Windfall Canyon except argillite and some of the lime chert. Except for nine mineralized fractures (1 cm. to .6 meters wide) where massive iron sulphides weather to a powdery gossan, all sulphides occur as finely disseminated specks in the rock. These specks range in size from microscopic to blebs .5 cm. across, most too small for positive field identification. The specks are splendent silver, many times magnetic, suggesting pyrrhotite. In barren cherts, sulphide specks concentrate along minute (< .1 cm.) greenish seams. Crystalline calcite is associated with the gossan filled fractures and here pyrite and minor chalcopyrite show. On the whole, pyrrhotite is the most abundant sulphide; pyrite and its low temperature dimorph marcasite, second; chalcopyrite, in minor amounts, third. No other sulphide minerals were noted.

DESCRIPTIONS OF ROCKS (continued)

Silica

High silica content is characteristic of the canyon rock. Only argillite and sparsely distributed boulders and sheets of limestone remain unsilicified. The breccia, matrix, and fragmental material are highly siliceous; cryptocrystalline cherts of both marine and clastic origin are abundant; quartzite is abundant; and the igneous rocks are genetically high in silica content.

Chert

Two genetic distinctions of chert are made: 1) of clastic origin, 2) of marine (limestone) origin. The clastic chert occurs in the upper part of the canyon (above 5600 feet) where it is randomly intercalated with breccia. Here it is aphanitic, ranging in color from light to dark grey - the darker rock having a slight sugary texture under the hand lens. Frequently there are finely disseminated flakes of biotite present and the darker, coarser chert often has a reddish tinge. One area at the 5100 foot level is believed to have been a fine volcanic ash that was loosely deposited then silicified (fine-grained silicified tuff). The clastic chert shows little if any sulphide mineralization.

Below the 5600 foot level all chert is believed to be a genetic derivation of limestone (except at the 5100 foot level). This rock is aphanitic, ranging in color from light to dark grey. The light grey variety commonly has a greenish tinge and faint greenish bands; the dark variety shows a reddish tinge. These color variations may indicate development of the lime-silicate minerals diopside, epidote, and garnet, but the texture is too massive to determine this in the field. This chert is defined as distinct from the clastic because of its green banding and the presence of finely disseminated sulphide specks. The chert weathers light to dark grey and brown of varying shades. The rock breaks easily into angular hand-size pieces.

DESCRIPTIONS OF ROCKS (continued)

Quartzite

Quartzite occurs above the 5500 foot level and below the 5100 foot level. It is colored through all shades of grey - the darker containing impurities of biotite (small flakes < .1 cm.) and some feldspar. Quartzite is always associated with chert - the two grade imperceptibly into one another - and is more densely packed with sulphide specks. Pure quartzite always contains more sulphides than the hybrid cherty-quartzite which always contains more than pure chert. The texture is a fine granular intergrowth of allotriomorphic quartz sand. It appears quite glassy in the light colored specimens, more granular in the darker, impure specimens. Quartzite weathers dark brown but lightens up in some spots and becomes grey as it zones into chert.

Breccia

Breccia outcrops above the 5600 foot level and becomes the dominant rock type above 5800 feet. The matrix, comprising approximately 50% of the rock, is mostly siliceous, but some parts are a similar appearing calcium carbonate. Fragments are angular to varying degrees and range in size from .5 cm. to one meter across. The smaller fragments are generally hard, aphanitic pieces of rock and light in color, although dark grey and green ones are sparsely mixed in. Characteristic of this breccia are large boulders of grey limestone which expand in some areas to massive sheets two meters thick. Where they expand, the whitish-grey matrix appears to have been squeezed through the limestone like a soft putty. The weathered rock is distinctly pockmarked indicating either weak fragmental material, causing it to disintegrate, or a weak matrix, causing the fragments to fall out of a less supportive shell.

Limestone

The only unaltered limestone in Windfall Canyon appears as cobbles, boulders, and sheets in the breccia. There is crystalline calcite associated with the mineralized veins and some faces of rock where a grey, powdery

DESCRIPTIONS OF ROCKS (continued)

Limestone (continued)

carbonate has precipitated, but these are in minor amounts and are not genetically related to the earlier sedimentation responsible for the cobbles, boulders, and sheets. This limestone is light grey on both weathered and fresh surfaces but the weathered surface commonly shows small (.5 cm.) rows of weathered ridges and troughs. Thin (.1 cm. wide), white, bleached seams with fine crystals of calcite cut the rock in random directions but show a tendency to follow these ridge-trough zones. The limestone is generally fine grained; one fresh surface, though, near 36795, showed a poorly sorted, impure calcarenite. The limestone is devoid of sulphides.

Argillite

Argillite outcrops in an interlayered sequence with chert between 5400 and 5600 feet. It is dark, soft (relative to the chert), and aphanitic, and grades imperceptibly into the adjacent chert layers which are lighter with greenish bands. The beds are 5 cm. thick, unmineralized, and show clearly on the weathered outcrop face.

Diorite and Lamprophyre

Four outcrops of diorite occur between 5000 and 5400 feet; two isolated ones outcrop above 5400 feet. Attitudes of these intrusions are difficult to ascertain because contacts are well hidden under a weathered surface. However, one large intrusion, which appears to strike east-west, cuts across the Nick of Time Fraction and outcrops to the west in the Red Mountain claim, and to the east in the Morning claim. The other outcrops indicate a northeast strike but are difficult to connect into a structural pattern.

The diorite is a fine-grained (<.1 cm.) hypidiomorphic rock with well defined dark green crystals of pyroxene in a dark grey, hypocrystalline matrix. In hand specimen it is a distinctive grey-green color with a

DESCRIPTIONS OF ROCKS (continued)

Diorite and Lamprophyre (continued)

reddish tinge on the freshly cleaved surface. All diorite samples show good sulphide mineralization - the finely disseminated specks - and are very dense. The outcrops weather to a deep red-brown color where mineralization is exceptionally strong, or to a grey-brown where it is less so.

In two locations the grain size diminishes to a black aphanitic mass. This rock has been called lamprophyre but because of its traceable continuity with the diorite, it is probably the fine grained equivalent.

Keratophyre

Two intrusions of keratophyre were found. One, near Sample 36785, strikes 274° Az, dips 79° south; the other is concordant with a bedded chert striking 30° Az, dipping 39° northwest. The fresh surface of this rock is a light grey-green aphanitic matrix with white and clear feldspar grains ($<$.2 cm.) and blebs ($<$.5 cm.) of medium to dark green chlorite. Finely disseminated sulphide specks show throughout - similar to and in the same amount as in the diorite. The weathered surface is indistinguishable from the chert that borders it on either side.

Hornblende Porphyry

Northeast along the wall from Setter's Cabin at the 5600 foot level is a 26° Az striking, 26° southeast dipping hornblende porphyry approximately ten feet thick. The matrix looks like a grey quartzite but has abundant small (.1 cm.), clear feldspar crystals that show fine striations. Approximately 20% of the rock is composed of long, medium to dark green hornblende crystals. The rock looks similar to the diorite but is lighter (less mafic) and contains the hornblende phenocrysts. Sulphide mineralization is slight; the weathered surface is the same as the adjacent chert.

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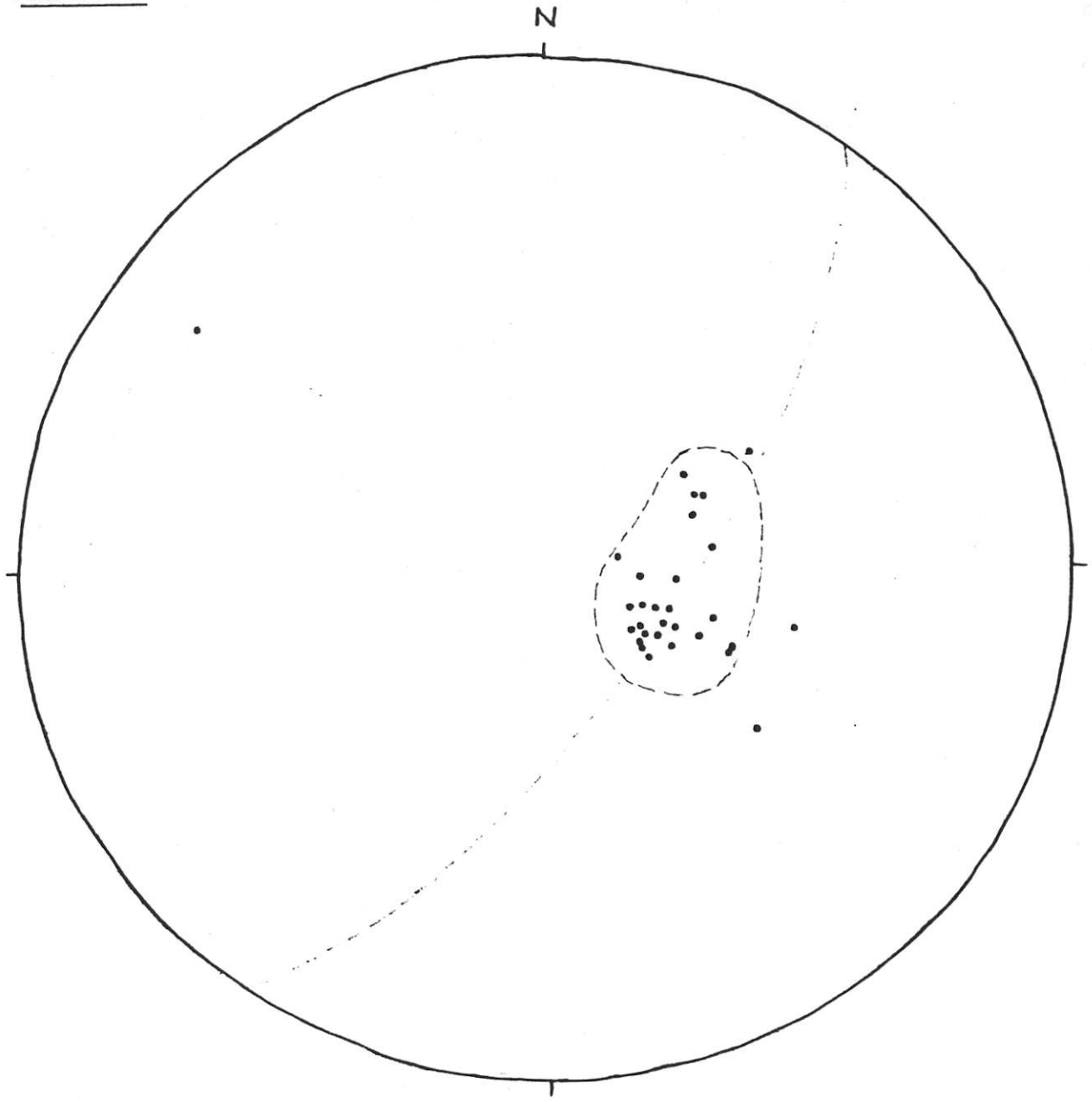
BEDDING



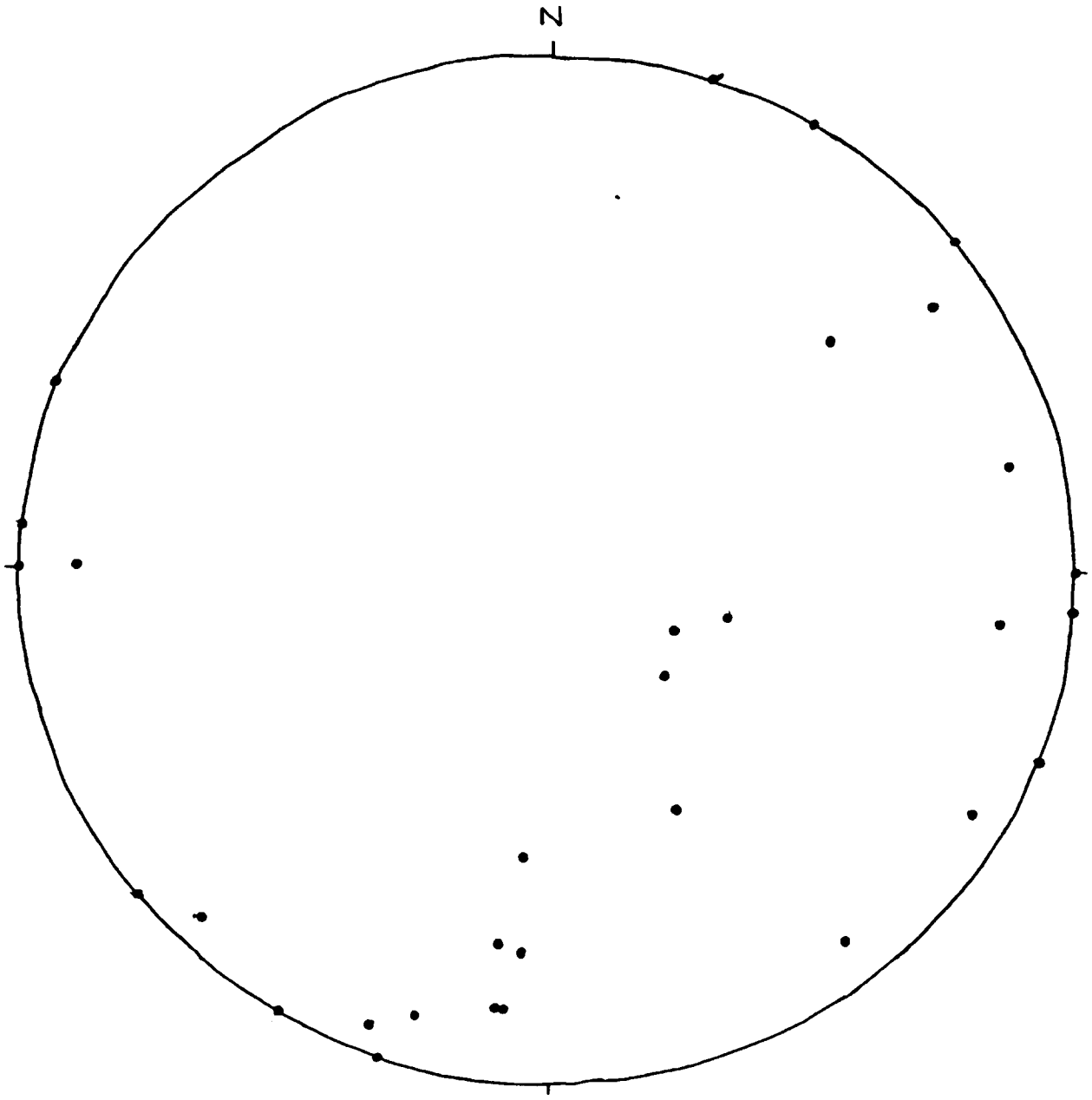
Pi Diagram showing poles of bedding planes. 76% of the 29 bedding planes measured strike NE, dip NW. 24% strike NNW, dip WSW. All dips are less than 45%. The pole of the girdle shown plunges 20° NW. The axis of the cylindrical fold defined by this girdle strikes 334°, plunges 20°.

DATA FOR PI DIAGRAMS

BEDDING

	STRIKES (AZ)	DIPS
1.	210° = 39°	42° NW
2.	194° = 14°	40° NW
3.	4°	14° NW
4.	25°	20° NW
5.	25°	31° NW
6.	18°	20° NW
7.	24°	14° NW
8.	335°	27° SW
9.	40°	19° NW
10.	340°	24° SW
11.	333°	26° SW
12.	35°	16° NW
13.	325°	26° SW
14.	330°	37° SW
15.	25°	26° NW
16.	25°	31° NW
17.	32°	23° NW
18.	31°	20° NW
19.	32°	17° NW
20.	25°	22° NW
21.	38°	19° NW
22.	17°	27° NW
23.	42°	21° NW
24.	20°	18° NW
25.	20°	16° NW
26.	34°	18° NW
27.	352°	26° SW
28.	5°	20° NW
29.	350°	11° SW

JOINTS



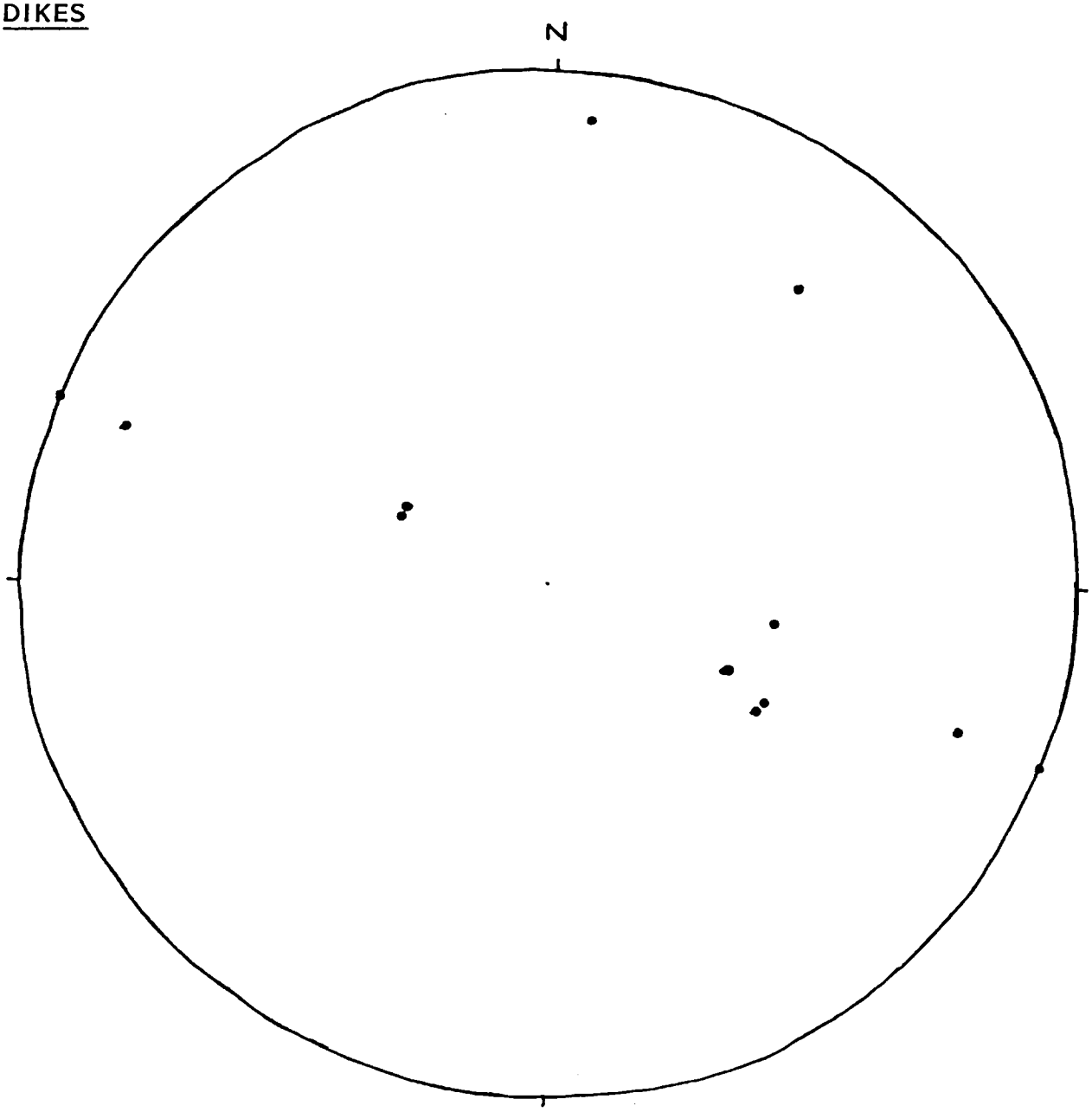
Pi Diagram showing poles of joint planes. 88% of dips are greater than 45°; 24% are vertical. 56% of the joints strike NW; 36% strike NE; 8% strike N. No girdle is attempted.

DATA FOR PI DIAGRAMS

JOINTS (INCLUDING VEIN-FILLED)

	∝ (AZ)	S
1.	195° = 15°	29° NW
2.	313°	83° NE
3.	276°	63° NE
4.	61°	44° NW
5.	221° = 41°	25° NW
6.	285°	80° NE
7.	273°	47° N
8.	0°	90°
9.	320°	90°
10.	320°	59° SW
11.	21°	90°
12.	347°	79° SW
13.	325°	78° SW
14.	51°	83° NW
15.	30°	83° NW
16.	0°	78° E
17.	95° = 275°	75° NE
18.	120° = 300°	90°
19.	92° = 272°	64° NE
20.	92° = 272°	64° NE
21.	288°	90°
22.	187° = 7°	76° NW
23.	5°	90°
24.	25°	22° NW
25.	110° = 290°	84° NE

DIKES



Pi Diagram showing poles of dike planes. All planes strike E of N. 54% of dips are greater than 45°. Axis of dike intrusion strikes 23°.

DATA FOR PI DIAGRAMS

DIKES (IGNEOUS CONTACTS)

	∝(AZ)	S
1.	274°	79° SW
2.	309°	63° SW
3.	25°	31° NW
4.	26°	26° SE
5.	21°	90°
6.	20°	75° SE
7.	25°	26° SE
8.	200° = 20°	72° NW
9.	30°	39° NW
10.	30°	39° NW
11.	10°	36° NW
12.	120° = 300°	64° NE
13.	120° = 300°	90°