



42D16SW8229 63.4422 SEELEY LAKE

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GEOLOGICAL REPORT

ON

HEMLO WEST (PIC RIVER) PROPERTY
THUNDER BAY MINING DISTRICT, ONTARIO

for

TEESHIN RESOURCES LTD.

by

LESLIE KAYE, GEOLOGIST

July, 1984.



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Back Pocket

GEOLOGICAL MAP: SCALE 1 inch to 200 feet
DRILL LOGS: D.D.H. T 84-1, T 84-2, T 84-3,
T 84-4, T 84-5.

1.0 INTRODUCTION

The present report describes the geology of a group of eight contiguous mining claims, known as the Hemlo West (Pic River) property, located approximately ten miles northeast of Marathon, northwestern Ontario. The geological survey was carried out by the writer for Teeshin Resources Ltd. The field work was performed during the period May 13 to May 24, 1984. A cut grid, with wing lines at 400 feet spacing provided the control for the mapping.

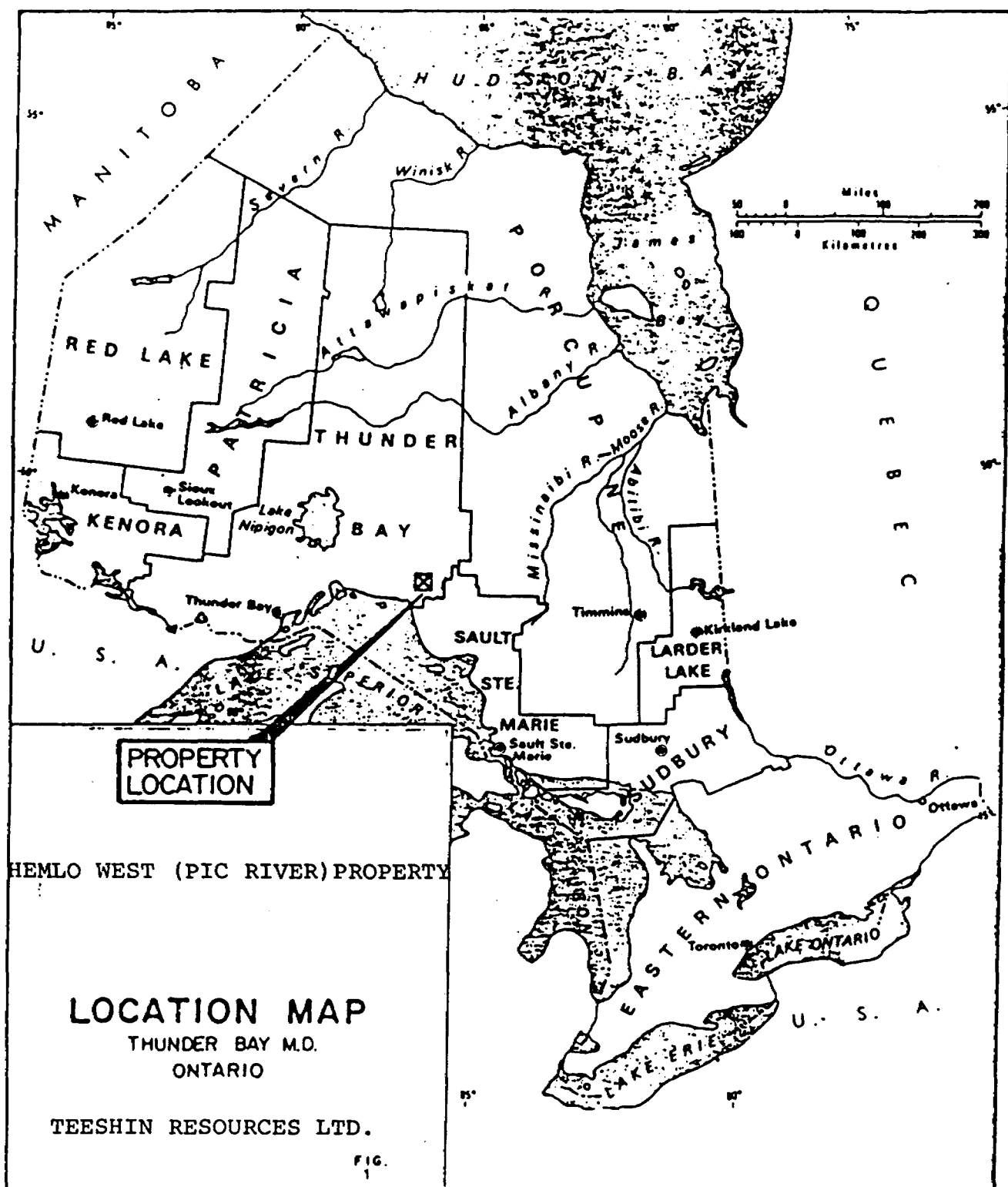
Magnetometer and V.L.F. ground geophysical surveys on the property were carried out in May, 1984.

In June 1984 a diamond drill programme consisting of 1,165 feet of drilling was carried out under direction of the writer. Examination of the drill core has supplied additional geological information which has been incorporated into the present report.

2.0 LIST OF CLAIMS

The property consists of eight contiguous mining claims on the Thunder Bay Mining Division, northwest Ontario, identified by the following record numbers:

TB 469422	TB 469426
TB 469423	TB 469439
TB 469424	TB 469440
TB 469425	TB 656714



3.0 LOCATION AND ACCESS

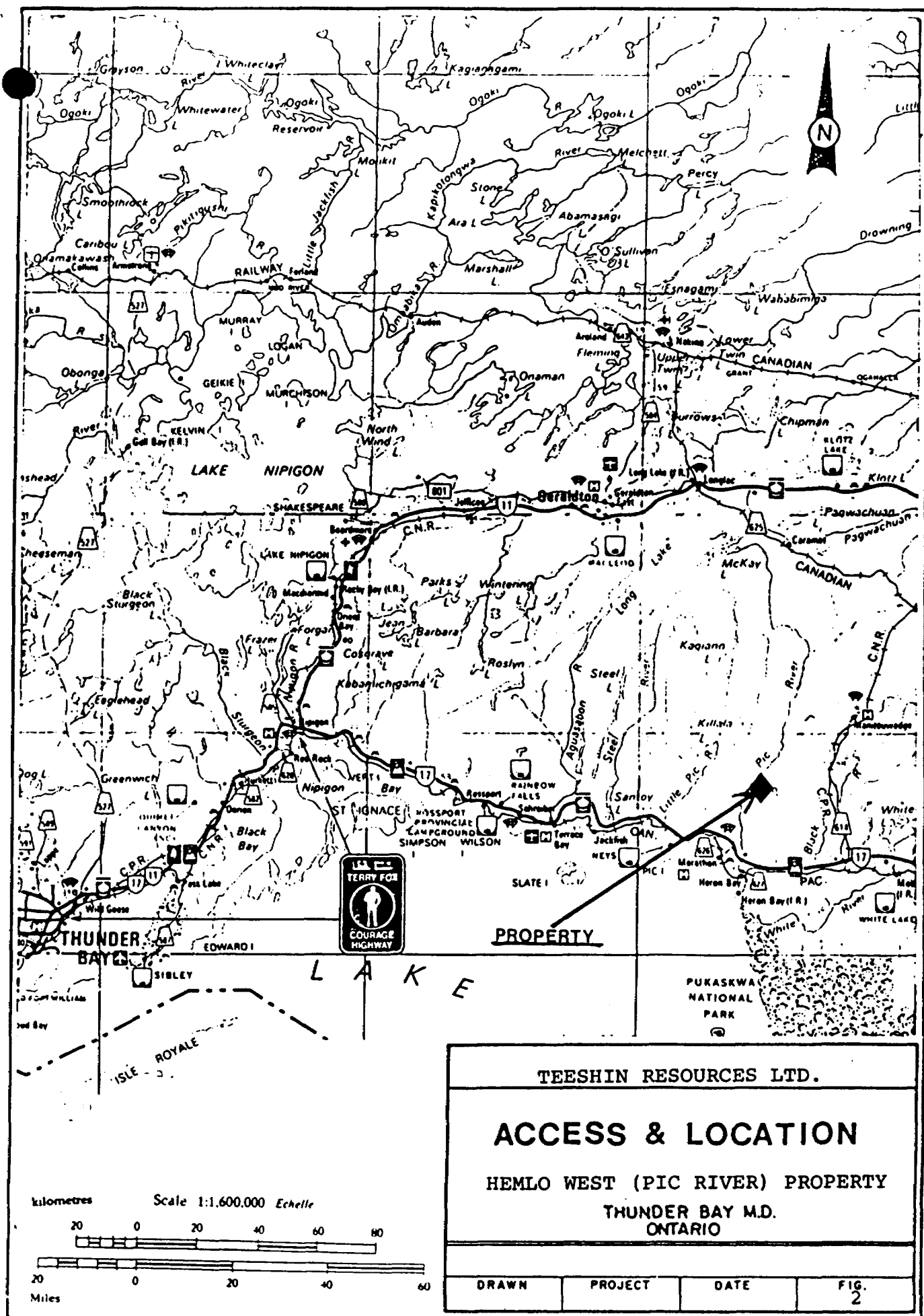
The Hemlo West (Pic River) property is located in the Seeley Lake area (M. 1861) in the Thunder Bay Mining Division, northwest Ontario (see inset, Geological Map, back pocket). The centre of the property is located about 1.5 miles east of Pic River at Mile 18, and north of Goodchild Creek. (figs. 2 and 3)

The property is readily accessible by helicopter from Marathon airport (6 miles S.W.) on the Trans-Canada Highway. A gravel pit at Mile 16 and three miles S.W. of the property, was used for the helicopter-supported mobilization and demobilization of drilling and camp gear.

A trail, starting from the east bank of Pic River, opposite the landing at Mile 16, leads for about three miles to the property. Canoe access to the property via Goodchild Creek is possible, although a 15-chain portage would be necessary at rapids and falls about one half mile upstream from its entry into Pic River.

4.0 PHYSIOGRAPHY

The area of the property is fairly rugged for north-western Ontario, with a relief of about 650 feet. The topography is largely controlled by the nature of the bed-rock geology. The major topographic features, prominent



4.0 PHYSIOGRAPHY Cont'd

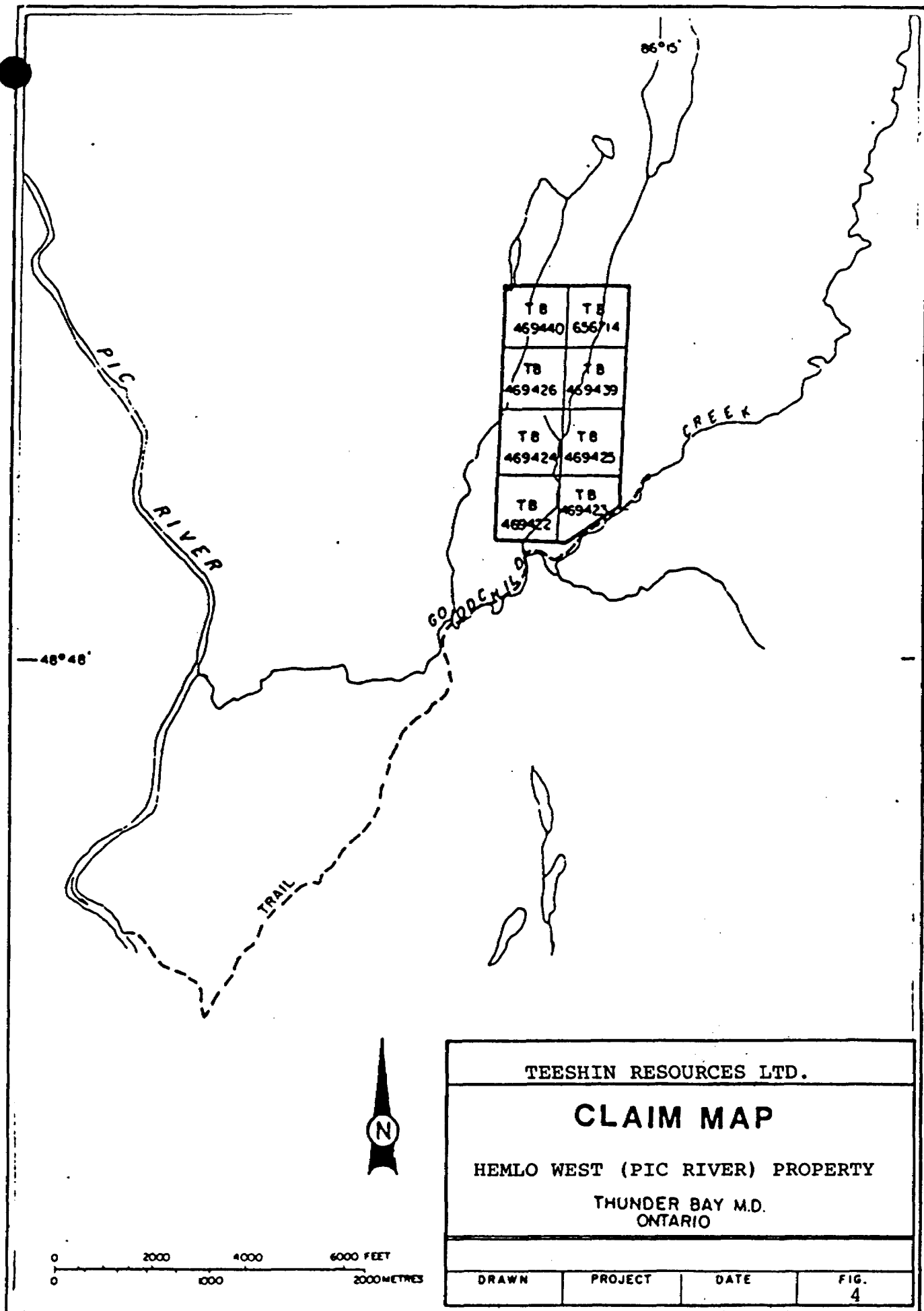
ridges and steeply incised valleys, tend to follow the general bedrock foliation trend of N 10° E.

Areas underlain by tough, resistant rhyolitic volcanics, though moderately rugged, are hummocky and cliff faces are relatively smooth and rounded. Stretches of relatively flatter ground are commonly associated with underlying black mudstone sediments.

Approximately bisecting the property is a deeply incised, glacial-scoured valley that cuts through basalt metavolcanics and features step-like subvertical to vertical cliff faces on its western side. Many minor valleys ridges and cliffs follow the trends cross-faults and contact zones in its underlying bedrock.

The main drainage is fed into a stream that occupies the main central valley and flows south into Goodchild Creek at the south boundary of the property. In the northwest part of the property, a narrow beaver-pond valley leads into a narrow creek that flows south-southwest and leaves the property about the centre of the west boundary. The southern half of the property is relatively less rugged and local drainage is affected by thick clay cover.

The property is thickly forested with stands of spruce, poplar, birch and aspen. Dense growths of alders are common in the flatter areas.



5.0 PREVIOUS EXPLORATION

Although the writer is aware of reports of earlier prospecting activity on the property, no evidence of this was encountered during the present survey. A prospector, Mr. Barney Jensen of Thunder Bay, is reported to have taken a sample from a trench on the property that yielded an assay of 0.4 oz gold per ton. Unfortunately, the writer was not able to locate this trench. Of the numerous gossanous zones and rusty outcrops encountered by the writer none showed evidence of earlier prospecting, except for the resampling by Caulfield (1983) of an old trench cut in 1938 and described in his report.

A cut line grid on the neighbouring claims (Homestake) on the west extends on to the property and there is a Homestake North-South tie line several hundred feet east of the property boundary. A Homestake drill hole, drilled in the winter of 1983 is located about 100 feet west of the west boundary of the property, approximately on line 28+00 N.

Kerr Addison Mines carried out a drill programme in 1971 on the four claim group adjoining to the north of the property. Some of the holes tested a drag-fold structure located about 300 feet north of the property boundary on a bearing in line with the property's present baseline of N 10° E.

5.0 PREVIOUS EXPLORATION Cont'd

A recent (1983) grid which was cut on the neighbouring Gowganda claims to the north, extends into the property. Induced polarization survey (Ontario Ministry of Natural Resources, assessment file No. 2-5981) similarly extends into the property coincidentally with the property grid lines 51 + 50 N and 47 + 50 N. The results of the IP survey are available to the public through the assessment files at the Ontario Ministry of Natural Resources.

Shell Canada Ltd. carried out a regional airborne magnetic and electromagnetic survey in 1975 (O.M.N.R. Assessment file No. 2 2011).

6.0 GEOLOGY OF THE PROPERTY

6.1 GENERAL GEOLOGY SUMMARY

The consolidated rocks underlying the area of the property comprises mainly mafic metavolcanic flows, felsic pyroclastics and associated volcanic exhalative chert and sulphide formation components, and pelitic sediments of Early Precambrian (Archean) age.

The volcanic-sedimentary pile was early intruded by minor high-level lamprophyre and feldspar porphyry dikes. Later, Keweenawan, diabase dikes represent a final phase of igneous activity.

6.1 GENERAL GEOLOGY SUMMARY Cont'd

The rocks have been affected by a moderate grade of metamorphism and exhibit characteristics of the upper greenschist to almandine-amphibolite facies range.

Recent and post-glacial clays form an extensive cover over a large part of the property.

6.2 TABLE OF ROCK - UNITS

PRECAMBRIAN
PROTEROZOIC (KEWEENAWAN)

- | | | |
|---|----|-------------------------|
| 7 | 7a | Diabase (dikes) |
| | 7b | Leucogabbro (dike-plug) |

ARCHEAN
INTRUSIVES

- | | | |
|---|----|-------------------------------------|
| 6 | 6a | Lamprophyre |
| 5 | 5a | Feldspar porphyry (dikes and sills) |

MAFIC METAVOLCANICS
EXTRUSIVES

- | | | |
|---|----|--|
| 4 | 4a | Amphibolitic basalt, amphibotite |
| | 4b | Basalt |
| | 4c | Chloritic basalt and derived chlorite schist |
| | 4e | Mafic tuff |

FELSIC METAVOLCANICS
EXTRUSIVES

- | | | |
|---|----|-------------------------------------|
| 3 | 3a | Rhyolite flows and high level sills |
| | 3b | Rhyolitic lapilli-tuff |
| | 3c | Rhyolitic tuff, silty tuff. |
| | 3d | Dacitic lapilli-tuff |
| | 3e | Dacitic tuff |

VOLCANIC EXHALATIVES

- | | | |
|---|----|---|
| 2 | 2a | Sulphide-chert formation (pyrrhotite, pyrite) |
| | 2b | Chert, silicic tuffaceous chert |

METASEDIMENTS

- | | | |
|---|----|---|
| 1 | 1a | Mudstone, black carbonaceous |
| | 1b | Mudstone and interbedded tuffaceous siltstone |
| | 1c | Cherty mudstone |

6.3 DESCRIPTION OF ROCK UNITS

METASEDIMENTS - UNIT 1

1a Mudstone (argillite)

Dense to very fine grained, black to dark grey, carbonaceous and locally highly graphitic. Thin-bedded and finely laminated to thick bedded. Bedding commonly emphasized by colour banding. Small-scale sedimentary structures such as flame structures, soft-sediment load deformation, scour and fill, frequently encountered in the field. Variously fissile, brittle and uniform.

1b Mudstone and interbedded tuffaceous siltstone.

This is a hybrid rock-unit describing black to dark grey mudstone variously intermixed and interlaminated with water-lain or re-worked volcanogenic, pyroclastic material, mainly very fine grained to fine grained, light to medium grey rhyolitic and dacitic tuff. Interbed contacts vary from sharp to gradational.

1c Cherty mudstone

Commonly encountered in outcrop as thick-bedded, dense, tough, highly silicified or chertified rock.

VOLCANIC EXHALATIVES - UNIT 2

2a Sulphide-Chert formation

Massive, thick to thin-banded or bedded, very fine to fine grained pyrrhotite and pyrite, with included or

6.3 DESCRIPTION OF ROCK UNITS Cont'd

interbedded whitish grey to light grey chert. May grade to chert with heavy (up to 50 percent) banded, disseminated and nodular pyrrhotite and pyrite. Drill intersections of sulphide-chert formation indicate thicknesses of 43 feet (D.D.H. T 84-1), 7 feet (D.D.H. T 84-3), 5 feet (D.D.H. T 84-4), and a combined thickness of 24 feet in two sulphide-chert formations (D.D.H. T 84-5) (see drill logs, back pocket, for detailed description).

2b Chert, silicic cherty tuff.

This unit includes whitish to dark grey chert and hybrid chert and silicic tuffaceous material. May also grade into or include unit 1c.

FELSIC METAVOLCANICS - UNIT 3

3a Rhyolite flows and high-level sills

Aphanitic to very fine grained. Locally porphyritic with feldspar phenocrysts. Waxey texture common. Pale grey light grey-buff or buff-grey or greenish grey. Commonly massive, uniform, tough rocks.

3b Rhyolitic lapilli-tuff

Light to dark grey or buff grey. Commonly contains close-packed angular to sub-rounded aphanitic rhyolite or fine grained tuff clasts up to 40mm size. May occur intercalated or gradational with dacitic lapilli-tuff and tuff units, mainly in the northwestern part of the property.

6.3 DESCRIPTION OF ROCK UNITS Cont'd

3c Rhyolitic tuff, silty tuff

Massive to thin-bedded. Light to medium grey or buff-grey. Very fine grained to medium grained. Highly silicic, tough rock. The unit includes reworked or waterlain silicic tuffaceous material which may exhibit a silty texture. It also hosts the sulphide-chert formations (rock-unit 2a) and may have gradational affinities with silicic cherty tuff and chert (rock-unit 2b).

3d Dacitic lapilli-tuff

Medium to dark grey or grey-green. Moderately silicic, but relatively high biotite-chlorite-amphibole content is indicative of an intermediate composition. Matrix/lapilli ratio is commonly greater than 50 percent.

3e Dacitic tuff

Massive to thin-bedded fine to medium grained, light to medium grey-green or greenish grey. Intermediate composition estimated on basis of relatively high biotite-chlorite-amphibole content.

MAFIC METAVOLCANICS - UNIT 4

4a Amphibolitic basalt, amphibolite

Dark green, fine to medium grained, massive, weakly foliated.

4b Basalt

Dark green, uniform, very fine grained, locally

6.3 DESCRIPTION OF ROCK UNITS Cont'd

silicified or moderately chloritic, weakly to moderately schistose.

- 4c Chloritic basalt and derived chlorite schist.
Designates highly chloritic and strongly schistose basalt, and derived chlorite schist developed on shear and fault zones.
- 4d Mafic tuff.
Fine to medium grained, dark grey-green or green.
High biotite content. Of minor, local occurrence.
- 5a Feldspar porphyry: dikes and sills.
Light buff-cream; euhedral, zone K - feldspar crystals up to 1cm size, set in fine grained matrix.
Of relative minor occurrence (constitutes less than one per cent of property rocks), mainly in north-striking dike swarms. Individual dikes may be up to 40 feet thick.
- 6a Lamprophyre: dikes.
Dark grey to dark greenish brown, medium grained, equigranular. Mainly intersected in drilling (see DDH Logs T 84-1, T 84-2). Biotite content commonly up to 20 per cent.

6.3 DESCRIPTION OF ROCK UNITS Cont'd

7a Diabase: dikes

Dark grey, medium to coarse grained. Of minor occurrence; less than one per cent of property rocks. Commonly in loose, north-striking swarm, with individual dikes up to 60 feet in thickness.

7b Lencogabbro: dike-plug.

Occurs in outcrop as small elongated stock-like intrusive body in the northwest part of the property about grid location 40 + OON, 14 + OOW. Intersected by DDH T 84-3. Medium grey-green, medium to coarse grained, equigranular with subophitic texture. Feldspathic content (plagioclase) 30 to 40 per cent. Strongly magnetic. Evidentially, compositionally related to, and spatially associated with diabase (rock unit 7a).

6.4 STRUCTURAL GEOLOGY: REGIONAL

The rocks underlying the property occupy part of the east limb of a major anticlinal fold structure that plunges to the northeast (Milne, 1967 a). The property straddles the main contact zone between regionally distributed mafic and felsic metavolcanics.

6.5 STRUCTURAL GEOLOGY: PROPERTY

The dominant bedding and layering foliation trend on the property is N 10° E, following the main contact zone described above (Chapter 7.1), with dips generally 70° to the east. However, there are local variations in strike and dip, due to small-scale folds which are probably parasitic on the larger, regional anticlinal fold structure.

One of the larger small-scale folds, encountered in a beaver swamp near the drill camp site at grid location 41 + 00 N, 9 + 00 E, exhibits a fairly open inclined fold-style with dips of 60° and 80°, respectively, on north and south limbs. The fold plunges NE at 45°. It is probable that this is characteristic of other larger folds that may exist on the property.

Schistosity, mainly developed in the mafic metavolcanics, i.e. the basalt and amphibolite flow rocks, follows generally the N 10° E trend. A fracture cleavage is more commonly

6.5 STRUCTURAL GEOLOGY: PROPERTY Cont'd

developed in the silicic pyroclastic and cherty rock-units. Slatey cleavage, wide-spread and poorly developed in the mudstones, occurs at low to high angles oblique to bedding.

A system of closely spaced, steeply dipping faults strikes northeast through the property and marked by strong zones of shearing, brecciation and faulting. Left-handed, strike-slip displacement of up to 500 feet on individual faults is indicated from the mapping. The existence of at least two strong northwest-striking faults is similarly inferred.

Strike-faults may exist within the property, although evidence for this is conjectural. The intensely brecciated and fractured zones of faulting intersected by D.D.H. T 84-2 may have been caused by a north-trending, strike-fault movement.

6.6 DISTRIBUTION OF ROCK UNITS

Volumetrically, mafic metavolcanics (basalt and amphibolite) comprise about 50 percent of the rocks and occupy most of the eastern half of the property.

Felsic metavolcanics, mainly acidic and rhyolitic tuffs (25 percent) broadly flank a black mudstone unit, up to 1,000 feet thick, in the north west-central part, and else-

6.6 DISTRIBUTION OF ROCK UNITS Cont'd

where, in the eastern half of the property are complexly interrelated and intermixed with mudstone, argillite units. In the opinion of the writer, volcanism and pelitic sedimentation were contemporaneous, and water lain tuffaceous material is an important component of much of the mudstone rock-unit and vice versa.

Local volcanic exhalative activity produced considerable chertification and sulphide-chert formations encountered in outcrop and intersected by drill holes. One such sulphide-chert formation, intersected by D.D.H. T 84-3 and D.D.H. T 84-5 may be traced for over 600 feet in the northwest part of the property. Another sulphide-chert formation, up to 40 feet thick, intersected by D.D.H. T 84-1 and seen in outcrop, may probably be traced for at least 400 feet.

A complex system of northeast and northwest striking faults has resulted in considerable offsets and displacements of the rock-units, best explained by examination of the accompanying geological map (back pocket).

Several rhyolite and rhyolite tuff units located within basalt in the eastern half of the property, apparently spatially remote from the main felsic belt, may represent separate, minor mafic-felsic volcanic cycles, or may be the result of fault displacement. Possibly, too, their location may have been the result of in-folding.

6.6 DISTRIBUTION OF ROCK UNITS Cont'd

Folding on a small scale is certainly known to affect the rocks. No doubt, large-scale folds exist to further complicate the distribution picture, but precise identification and location of such folds would require further mapping and stratigraphic and structural analysis.

6.7 SULPHIDE MINERALIZATION

Massive, banded and heavy concentrations of disseminated pyrrhotite and pyrite of the sulphite-chert formations (rock-unit 2a) are described elsewhere in the present report and also in detail in the drill logs (back pocket).

Disseminated pyrrhotite and pyrite mineralization is widespread in sparse to fair amounts throughout most of the property.

In the basalts, the most significant sulphide mineralization encountered in outcrop occurs as fine and coarse disseminations of up to five percent pyrrhotite and pyrite in the northeast part of the property, particularly along line 47 + 50 N, east of the baseline.

D.D.H. T 84-2, collared at 47 + 50 N, 2 + 00 E, intersected heavy (up to 30 percent) pyrrhotite and pyrite associated with strongly silicified fault breccia and fracture zones (see drill log, T 84-2 back pocket).

6.7 SULPHIDE MINERALIZATION Cont'd

Pyrrhotite and pyrite are common occurrences in fault shear and fracture zones, often marked in felsic rocks by bleached, rusty outcrops.

Pyrite is fairly ubiquitous, in concentrations of one to two percent, as fine disseminated cube pyrite, and as blebs, seams and smears along bedding, cleavage and fracture planes.

Only trace amounts of chalcopyrite and sphalerite were encountered in outcrop and by diamond drill intersections.

7.0 DIAMOND DRILLING

A total of 1,165 feet of drilling in five holes was carried out on the property in June, 1984. Details of the drilling are as follows:

<u>Hole No.</u>	<u>Collar location</u>	<u>Azm</u>	<u>Dip</u>	<u>Length(ft)</u>
T 84-1	25+50N 0+80E	300°	-45°	353
T 84-2	47+50N 2+00E	290°	-50°	249
T 84-3	40+00N 13+85W	310°	-50°	157
T 84-4	47+65N 4+30W	300°	-50°	273
T 84-5	44+00N 14+20W	290°	-50°	133

D.D.H. T 84-1

Objective: To test rusty sulphide zone exposed on cliff face and on strike with pyrrhotite chert outcrop located

7.0 DIAMOND DRILLING Cont'd

at 24 + 00 N, 1 + 00 E. Also to intersect a probable mineralization fault zone indicated by heavy limonite gossan at 26 + 00 N and 0 + 50 W, and weak V.L.F. conductor and weak magnetic anomaly.

Results: D.D.H. T 84-1 intersected 43 feet of massive and disseminated pyrrhotite in sulphide-chert formation. No significant mineralized fault zones were intersected.

D.D.H. T 84-2

Objective: To test coincident I.P. and strong ground magnetic anomalies in basalt flow rocks.

Results: D.D.H. T 84-2 intersected throughout most of its 249 foot length, heavy pyrrhotite and pyrite in strongly silicified and quartz-injected fault breccia and fracture zones.

D.D.H. T 84-3

Objective: To test strong V.L.F. conductor and strongly magnetic anomaly at contact between rhyolitic tuffs and black mudstone sediments. The magnetic anomaly is in part due to the influence of magnetism from the nearby leucogabbro intrusion.

Results: D.D.H. T 84-3 intersected 7 feet of massive and

7.0 DIAMOND DRILLING Cont'd

and heavy disseminated pyrrhotite in a sulphide-chert formation.

D.D.H. T 84-4

Objective: To test strong V.L.F. and magnetic conductors in rhyolitic tuffs, tuff-sediments and black mudstone. Also, probable northeast-striking fault zones.

Results: Intersected fair to moderately pyrrhotitized and pyritized sections in mainly rhyolite tuff with interbedded black mudstone units; including a five foot section of sulphide-chert formation.

D.D.H. T 84-5

Objective: To test a very strong V.L.F. conductor and for extension, 400 feet north, of sulphide-chert formation intersected by D.D.H. T 84-3.

Results: D.D.H. T 84-5 intersected 23 feet of massive and disseminated pyrite and pyrrhotite in two sulphide-chert formations.

ASSAY RESULTS

86 split core samples representing 428 feet of drill

7.0 DIAMOND DRILLING Cont'd

core intersections were analysed by fire assay by Assayers (Ontario) Ltd. for gold and silver. Of these, drill core sulphide-chert formations in D.D.H. T 84-1 and D.D.H. T 84-3 was also analysed for copper and zinc. The highest gold assays returned were 0.008 ozs per ton across 6 feet, from moderately silicified, sheared and brecciated mudstone, from section 333.6 to 339.6 feet in D.D.H. T 84-1; and 0.011 ozs. per ton, across 5 feet, in mafic tuff and graphitic mudstone with minor quartz veining, from section 348.0 to 353.0 feet, also in T 84-1.

The highest copper and zinc assays from the sulphide-chert formations are 0.18 and 0.075 percent, respectively, with silver values ranging up to 0.14 ozs. per ton.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The assemblage of volcanic and sedimentary rocks underlying the property are, generally, considered to be potentially favourable hosts for base- and precious metals. The existence of volcanic-exhalitives (sulphide-chert formations) on the property is significant. Where intersected by drilling the sulphide-chert formation show relatively high "background" values of silver, copper and zinc.

Encouraging drill intersections yielding the highest

8.0 CONCLUSIONS AND RECOMMENDATIONS Cont'd

gold values are from black mudstone at the bottom of D.D.H. T 84-1, namely 0.008 and 0.011 oz per ton, along respective lengths of 5.0 feet and 6.0 feet.

Further drilling on the property would be justified to test:

(i) the down-dip and strike-extensions of chert-sulphide formations for economic silver-copper-zinc mineralization.

(ii) the mudstone and associated sediments for possible economic gold mineralization.

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ONTARIO DEPARTMENT OF MINES

1972: Manitonwadge - Wawa sheet, Algoma, Sudbury, and Thunder Bay Districts. Ontario Department of Mines Map No. 2220. Scale 1 inch: 4 miles.

Caulfield, D.A., and Ikana, Charles K.

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CERTIFICATE

I, Leslie Kaye, of Box 165, 238 Davenport Road, Toronto, Ontario, certify that:

- 1) I graduated in 1959 with a B.A. (Geology) degree from Carleton University and subsequently did two years of post-graduate studies at the University of Ottawa.
- 2) I am a Fellow of the Geological Association of Canada.
- 3) Since graduation I have continuously practiced my profession as a geologist mainly in Canada, but also in Africa and Central and South America.
- 4) I have a sound background of exploration and mining experience in N.W. Ontario having worked as a mine geologist in the Red Lake, Timmins and Larder Lake gold mining camps. From 1974 to 1977 I was employed by Noranda Exploration Company as District Geologist for N.W. Ontario, based in Thunder Bay.
- 5) I have several published geological reports and maps of geological surveys I have carried out for the Ontario Department of Mines (now O.G.S.).
- 6) I hold no interest directly or indirectly in the West Hemlo (Pic River) Property of Teeshin Resources Ltd.



Leslie Kaye.

Toronto, Ontario, Canada
July 26, 1984

