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COMINCO LTD.

EXPLORATION DIVISION

WESTERN DISTRICT

GEOLOGICAL REPORT

ECHO GROUP of 1, 2, 3 and 4 CLAIMS

82K/1W

Golden Mining Division

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 6413

Work performed by:

I.D. McCartney

Reported by:

G.L. Webber

Cominco Ltd.
Kootenay Exploration
2450 Cranbrook Street
Cranbrook, B.C.

Under the supervision of:

D.W. Heddle, P. Eng.

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WESTERN DISTRICT

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GENERAL STATEMENT

This report details the results of geological mapping on the Echo Group of four claims (28 units), during the period from June 15th to September 15th, 1977.

Expenditures incurred in carrying out the geological work amounted to $9,000.

It is requested that $8,400 be applied to claims 1, 2, 3 and 4 of the Echo Group.

An Affidavit on Application to Record Work is being submitted with this report.

INTRODUCTION

General

Geological mapping was undertaken to evaluate the economic potential of the Echo claim area and to determine the geological setting of lead, zinc mineralization in Precambrian sediments of the Aldridge Formation.

Geological work was done during the period from July 15th to September 15th, 1977, under the supervision of D.W. Heddle (U.B.C. 1949), Cominco Assistant Manager Exploration and registered B.C. Professional Engineer. Field mapping was conducted largely by Ian McCartney (Queens University, 1977) Cominco Exploration Geologist. Field assistance was provided by J.L. Livingstone (student, U.B.C.). Special technical assistance was provided by Cominco Geologist, E.A.U. Parviainen (University of Helsinki, B.Sc. 1963; M.Sc 1968;PhD from the University of Western Ontario, 1973).

Mapping results were plotted on a Cronaflex 1:10,000 (C.I. 10m) orthophoto base map, prepared for Cominco Ltd. by McElhanney Engineering Ltd. of Vancouver, B.C. Outcrops and altitudes were plotted directly on the base map. Geological interpretations are based on the results of surface mapping but our knowledge was supplemented by regional mapping in the Skookumchuck, Findlay and Doctor Creeks drainages. This provided a better perspective of the goelogy and structure within the claim boundaries.

Location and Access

The claim area lies on the headwaters of Doctor Creek, 24 miles NNW of Kimberley, B.C., Lat: 50°02'; Long: 116°12'. Access was provided by helicopter from Cranbrook, B.C., and 12 miles of good gravel road from Highway 95 to the confluence of Doctor Creek, thence 7 miles of 4 x 4 road to within 2 miles of the Echo Claim Group.

GEOLOGY

Bedrock formations in the claim area consist of Precambrian clastic sediments and Moyie intrusives. Stratigraphic units in the map area are (a) Lower Aldridge, (b) Middle Aldridge and (3) conglomerate or fragmental rock.

Aldridge Formation

The Aldridge Formation was first defined by Schofield (1915), and was later used by Rice (1937) for the same group of rocks. Cominco Exploration geologists sub-divided the Aldridge into Lower, Middle and Upper Aldridge. This division has been followed by Leech (1957), Reesor (1959), and in subsequent work by Cominco geologists. There is very close agreement among all of these workers as to the nature of the formation, so that its character may be regarded as being definite and distinctive.

Lower Aldridge

The Lower Aldridge is characterized by a rusty weathering surface. It consists of alternate bands of siltstone (or fine quartzite) and laminated argillite. Usually the fine siltstone bands are massive or graded, often with intervals of laminated fine grain quartzite and occasional turbidites.

The upper 600m of the Lower Aldridge is characterized by <200m layers of sediments between massive sills of Moyie intrusives.

Lower Aldridge sediments are moderately folded and faulted. Fold limbs are often steeply dipping to overturned. Bands of sediments are commonly pinched or dialated due to the competence difference between sills. Prominent shear faults lie within the bands of sediments and may juxtapose different parts of Lower Aldridge stratigraphy or produce repeats. These deformation effects have been considered in attempting to gain stratigraphic control in the claim area. Correlation between different bands of sediments is further complicated by diorite sills that cut up or down tens of meters of stratigraphy, and are observed to be gently crosscutting up to 150m.

Lower Aldridge stratigraphy is dissected into a number of fault blocks, all displaced relative to each other. Thus no long continuous sections can be mapped and it is difficult to define the relative position of the sedimentary bands or the thickness of the major sills.

Middle Aldridge

The Middle Aldridge is typified by sections of dominantly turbidite quartz greywackes alternating with sections of laminated argillite and siltstone. Turbidite beds range up to 0.8m thick, are often graded and commonly show flame structures, minor slump features, load casts and current laminations.

Middle/Lower Aldridge Contact

There is a broad transition zone between the Middle and Lower Aldridge. In this zone the style of sedimentation changes from dominantly thin-bedded and laminated, fine pelitic sediments in the Lower Aldridge to rapdily deposited coarse-grained turbidite sediments in the Middle Aldridge. This is a slight simplification as components resembling typical Middle Aldridge occur in Lower Aldridge and material resembling typical Lower Aldridge occur in the Middle Aldridge. Nevertheless, this change is the style of sedimentation and has been the primary criterion used in distinguishing Lower and Middle Aldridge contact. A conglomerate unit occurs within the transition zone, and has been arbitrarily choosen as being on the Lower/Middle Contact.

Conglomerate

The conglomerate unit is composed of unsorted, angular to rounded fragments of argillite, siltstone, and quartzite, suspended in an argillaceous matrix. Maximum fragment size is approximately .20m and all smaller sizes are present.

No consistent variation in fragment size or type has yet been recognized either laterally or vertically within the conglomerate, however future, more detailed studies should be carried out to test for subtle variations which might give clues as to transport direction and source area.

Bedding has not been observed, however, it may be obscured by foliation development in some areas.

Pyrrhotite fragments are fairly common, but no Pb or Zn-bearing fragments were observed. A boulder size fragment containing 1% Zn is documented in the same conglomerate, approximately 600m southwest of the map area.

The conglomerate occurs whenever the Lower/Middle Aldridge contact is exposed, throughout the map area. A zone of thin-bedded, Fe-sulphide rich argillite approximately 3-4m thick occurs in the conglomerate hangingwall.

The following conglomerate thickness estimates indicate that the conglomerate thicken to the northeast.

Orthophoto Co-ord.		Estimated Conglomerate Thickness	Comments
555,050 E	5,538,950N	2-3 m	
553,450 E	5,539,300N	3-4 m	well exposed
555,800 E	5,539,600N	4-5 m	well exposed
556,400 E	5,539,695N	7-10m	well exposed
556,100 E	5,540,700N	indeterminate, probably >10m	conglomerate folded and hangingwall, possibly eroded.

Moyie Intrusives

Sills and dykes referred to as the Moyie intrusives occur throughout the map area and are most abundant in the Middle and Lower divisions of the Aldridge Formation. They consist essentially of meta-diorite or meta-quartz diorite and altered equivalents and intermediate types between these and the sediments they intrude. Certain sills contain much fine biotite and quartz and lack diorite-like distributions of light and dark minerals.

STRUCTURE

There is a contrast in intensity of deformation between the Lower and Middle Aldridge sediments in the map area. Lower Aldridge strata (characterized by thin veneers of sediment between massive competent sills) contain abundant major folds. Such folds are tight to isoclinal, with limbs commonly steeply dipping to vertical. Middle Aldridge strata (characterized by uniform sequences of argillite, siltstone and quartzites) contain very open, much larger, major folds of the same orientation as those in Lower Aldridge with only occasional, small tight folds observed.

Faulting is also more highly developed in the Lower Aldridge, and appears to be especially concentrated in a zone just below the Middle/Lower contact.

Because the Lower and Middle Aldridge rock packages differ so greatly in structural homogeniety, such contrasting response to a major deformation is predictable. Strain in the Lower Aldridge would occur dominently in the thin peletic sedimentary bands sandwiched between diorite intrusives. Tight to isoclinal folding, strong foliation, and shear faulting would develop as a result. Strain would be equally distributed throughout the rock body and larger, more open folds would result. The model, based on structural inhomogeniety, could account for the two areas of contrasting deformation intensity between Lower/Middle Aldridge.

Two phases of deformation are indicated by minor structures in the more gently and evenly deformed Middle Aldridge sediments. The first, major phase, during which all observed major folds formed, produced a prominent cleavage in quartzites and a pervasive foliation in argillites. Cleavage refracts considerably in graded beds and changes orientation abruptly across lithology changes. Cleavage planes have average NW to N strike and steep westerly to vertical dips. Lineations and fold axis trend N to NW and ;oung 15-35^{o} N. These first phase folds are similar in style and orientation to those described by Reesor (1973) as being the dominant structural features of the Purcell Anticlinorium, formed during Jurassic orogeny.

Second phase deformation is relatively weak and features crenulation or small kink folding, which are only locally developed. Crenulation cleavage is occasionally developed in these rocks. Second phase fold axis trend WNW and plunge 20-35^{o}. Crenulation cleavages were measured striking 120^{o} and steeply dipping.

The genesis of second phase structures is uncertain. Although data is limited, these structures do not appear to be parallel to, or spatially related to the exposed Cretaceous intrusive contacts. Further work could be designed to determine if these structures are parallel to or spatially related to exposed Cretaceous intrusive contacts. If related to Cretaceous intrusives, these structures may indicate the presence of near surface unexposed intrusive cupolas.

Most well-defined faults in the map sheet appear to be related to major phase 1 folds. Such faults occur dominantly in Lower Aldridge stratigraphy and are approximately parallel to first phase fold planes. They are N to NW trending, steeply to moderately west dipping, normal faults with west side down. A well defined zone os such faulting displaces the Middle/Lower Aldridge contact near orthophoto co-ordinate 5,540,000N; 556,000E.

MINERALIZATION AND ALTERATION

All mineralization and alteration noted with the possible exceptions of sulphide conglomerate fragments and horizon of granophyric alteration, occurs in crosscutting faults or fractures. No "chert" type tourmalinized sediments were observed.

Chlorite-Tourmaline-Quartz (±galena) veins

Medium-coarse grained, crosscutting quartz-tourmaline-chlorite veins occasionally with minor Fe-sulphide and galena are common throughout Lower and Middle Aldridge stratigraphy, and have many orientations. They are especailly concentrated in the vicinity of diorite sills and on the ridge west of Doctor Basin. These veins are usually small and appear to be genetically related to diorite intrusions. Best assay result was 4.6% Pb and 1 oz. Ag for a selected sample from a narrow vein occurring in the saddle north of Pico Basin. All veins observed are too small to be of interest.

Pb/Zn in Carbonate Healed Breccia

A zone of chloritized breccia healed by siderite dolomite and calcite occur in two places; 1) in central Pico Basin and, 2) where a topographic linear cuts a sediment-diorite contact in South Basin. In both locations the structure strikes 355^{o} and dips steeply. The two similar structures are now offset, possibly due to faulting.

WO_3 in Pegmatite Quartz Veins

Showings that occur in Pico Basin, are in fault controlled muscovite, tourmaline, actinolite and calcite veins. Best mineralization occurs where veins cut diorite, but better grade scheelite has also been observed in narrower veins in sediments.

The best scheelite seen, occurs in a quartz vein 710 ft. long and averaging 6.5' width which was evaluated by Cominco in 1958. The calculated average grade was .13% WO_3 and concluded that the scheelite distribution was too erratic to be of further economic interest. Later trenches have exposed more veins, both sedimentary and diorite hosted; and all of lower apparent grade than the one described above. Minor sphalerite, galena also occurs in one of these veins. Uneconomic scheelite veins also occur in diorite, on the west side of Echo Lake Basin, co-ord. 5,541,000N; 557,000E.

Cu in Diorite

Chalcopyrite-pyrrhotite quartz veins are common within and bordering diorite intrusion in Lower Aldridge strata. They are small, widely spaced, and economically insignificant.

Report by: G.L. Webber
G.L. Webber,
Geologist.

Endorsed by: D.W. Heddle
D.W. Heddle, P.Eng.
Assistant Manager

Approved for Release by:
G. Harden, Manager
Exploration,
Western District

Distribution
Mining Recorder (2)
Vancouver (1)
Cranbrook (1)

EXHIBIT "A"

Statement of Expenditures

ECHO GROUP (28 units)

Geological mapping

As a result of this geological mapping program, the following expenditures were incurred by Cominco Ltd.

Salaries

E.A.U. Parviainen (Supervision) 4 days @ $150/day . .	$ 600.00
I.D. McCartney (Geologist) 30 days @ $85/day.	2550.00
J.L. Livingstone (Geol. Assistant) 30 days @ $60/day.	1800.00
G.L. Webber (Report) 3 days @ $100/day.	300.00
C.E. Gravelle (Cook) 17 days @ $40/day.	680.00

Transportation

Helicopter 4.9 hrs @ $360.	1771.00
One 4 x 4 half-ton - 1 month - $500/month	500.00

Domicile

One month	636.00
TOTAL EXPENDITURES	$8837.00

SIGNED: G.L. WEBBER

This is Exhibit "A" to the Statutory Declaration of G.L. Webber declared before me this 26 day of September, 1977.

A Commissioner for taking Affidavits for British Columbia

IN THE MATTER OF THE

B.C. MINERAL ACT

AND

IN THE MATTER OF A GEOLOGICAL PROGRAMME

CARRIED OUT ON THE ECHO MINERAL CLAIMS

in the Golden Mining Division of the
Province of British Columbia

More Particularly N.T.S. 82K/1W

A F F I D A V I T

I, G.L. WEBBER, of the City of Kimberley in the Province of British Columbia, make Oath and say:

1. That I am employed as a Geologist by Cominco Ltd. and as such, have a personal knowledge of the facts to which I hereinafter depose;

2. That annexed hereto and marked as Exhibit "A" to this my Affidavit is a true copy of expenditures incurred on a geological mapping program, on the Echo Group of mineral claims.

3. That the said expenditures were incurred between the 15th day of June, 1977 to the 15th day of September, 1977, for the purpose of mineral exploration on the above noted claims.

Sworn Before Me at Cranbrook)
in the Province of British Columbia, this)
26th day of September, 1977.)

G.L. Webber
G.L. WEBBER

A Commissioner for taking Affidavits in the Province of British Columbia.

COMINCO LTD.

EXPLORATION DIVISION

WESTERN DISTRICT

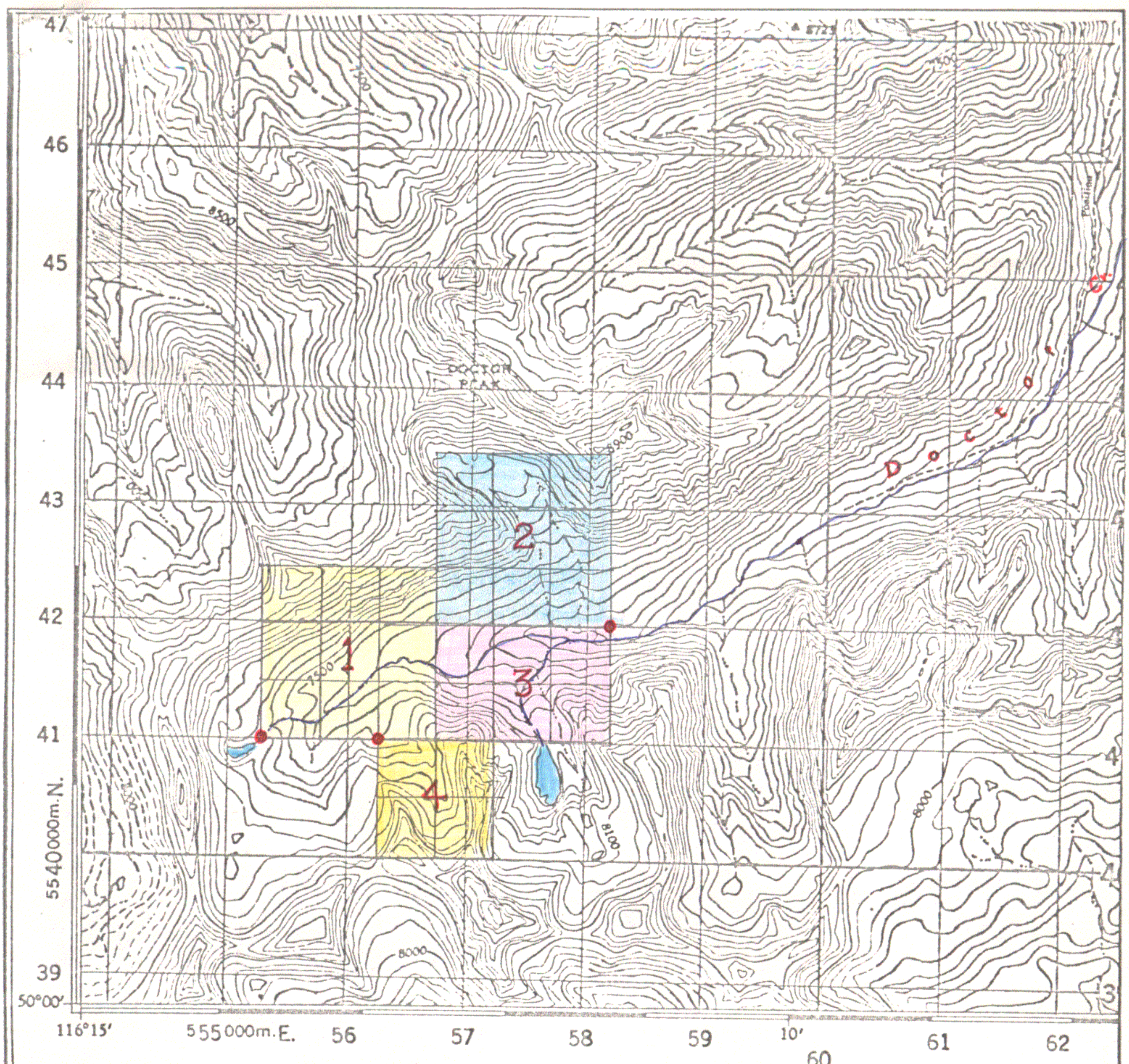
STATEMENT OF QUALIFICATIONS

G.L. WEBBER has been involved in various types of mineral exploration work for Cominco Ltd. over the last twenty-five years.

I consider him well qualified to carry out the reporting on all phases of geological exploration work.

D.W. Heddle

D.W. HEDDLE
P. Eng.
Assistant Manager, Exploration
Western District.



ECHO CLAIMS	RECORD NOS.	DATE RECORDED	NO. UNITS
No. 1	99	Sept. 29, 1976	9
No. 2	100	Sept. 29, 1976	9
No. 3	149	July 26, 1976	6
No. 4	150	July 26, 1976	4

N

Cominco

Drawn by: G.L.W.		Traced by:	
Revised by	Date	Revised by	Date

ECHO GROUP

CLAIMS 1, 2, 3, and 4

82K/1E

Scale: 1: 50,000 | Date: Sept 1977 | Plate: 2

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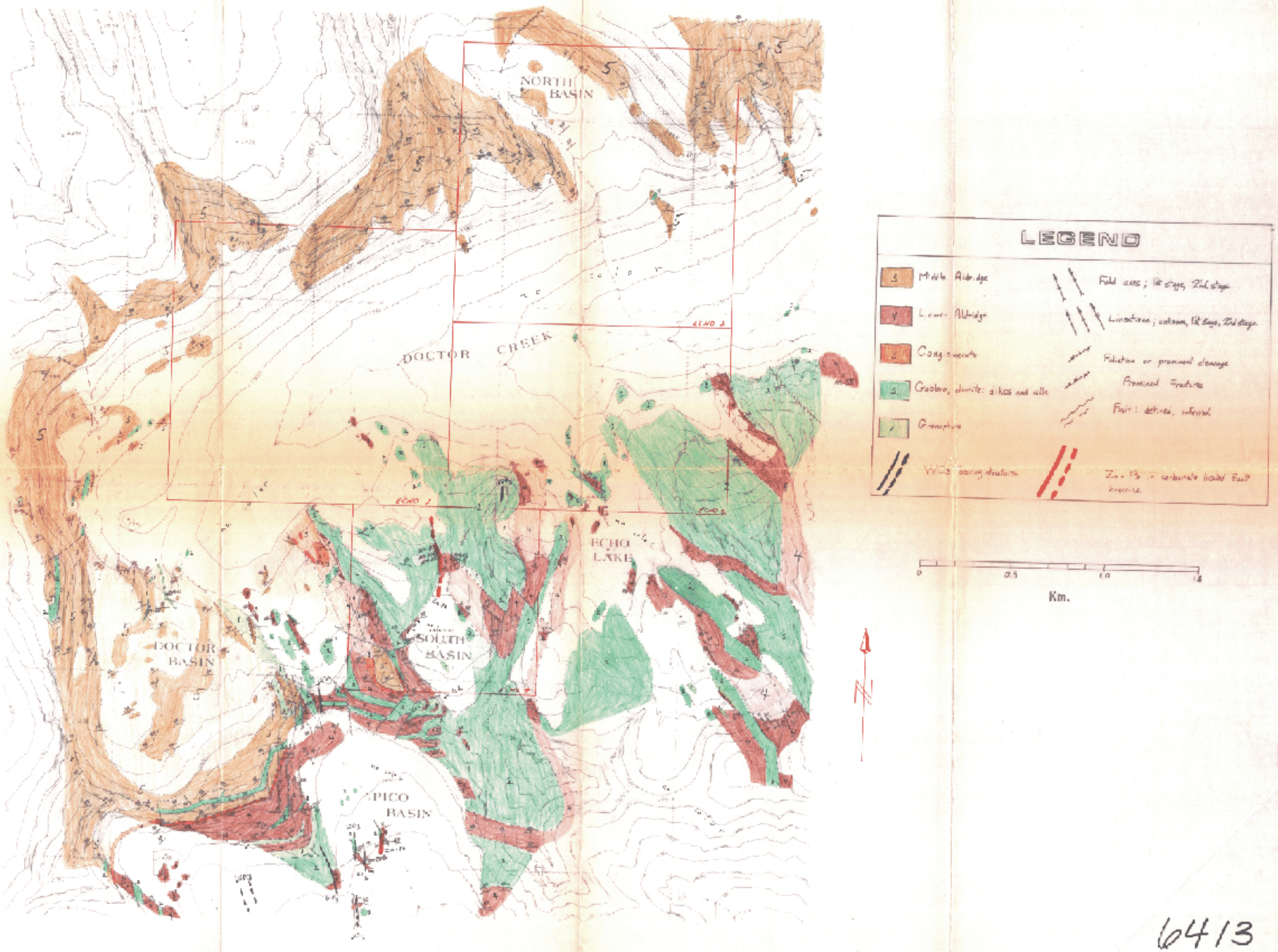
210-0610



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GEOLOGY

Drawn by L.U.M.

ECHO GROUP

82F/1 W

Date 16 AUG. 19

Sheet 1