TOODOGGONE RIVER AREA*
(94E)

By T. G. Schroeter, L. J. Diakow, and A. Panteleyev

INTRODUCTION

The writers continued to examine and keep abreast of ongoing mineral exploration in the Toodoggone gold-silver 'camp', located approximately 300 kilometres north of Smithers. In August 1985, British Columbia Ministry of Energy, Mines and Petroleum Resources' *Preliminary Map 61, at a scale of 1:50 000, Geology of the* Toodoggone River Area, NTS 94E by L. A. Diakow, A. Panteleyev, and T. G. Schroeter, was released. The map includes a detailed geological subdivision of the 'Toodoggone Volcanics' (Carter, 1972), age dates obtained by the authors and the Geological Survey of Canada, the location and minerals present for mineral occurrences and prospects (with Mineral Inventory File Number where present), and types of hydrothermal alteration. Major faults (predominantly with a northwesterly trend) are located on the map.

The level of exploration and development activity in the Toodoggone area during 1985 was the highest ever recorded; an estimated $6 million was spent.

ACCESS

Access into the area continued to be by means of fixed-wing aircraft to the Sturdee Airstrip from Smithers (approximately 1.1-hour flight). From Sturdee Airstrip road access exists to the Lawyers property (approximately 26 kilometres) and an additional 4 kilometres was added to access the Silver Pond property (Fig. 24-1). Elsewhere access is by foot or helicopter.

In the spring of 1985 a preliminary agreement was reached by SEREM Inc. and the province of British Columbia to share in the cost of upgrading and extending the Omineca Resource Road from its present terminus at Moosevale Flats to the Sturdee Airstrip, a distance of approximately 71 kilometres. The final decision and plans for this resource access road are contingent on SEREM Inc.'s *submittal of a Stage 1 Report and commitment to a production* decision to the province of British Columbia; this decision is expected some time in early 1986. Such improved access will no doubt enhance and stimulate further exploration and development activity in the Toodoggone area.

REGIONAL GEOLOGY

The regional geology of the Toodoggone area is described in several publications including Barr (1978), Schroeter (1981-1985), Panteleyev (1982-1984), and Diakow (1983-1985). British Columbia Ministry of Energy, Mines and Petroleum Resources' Preliminary Map No. 61 (Geology of the Toodoggone River Area, NTS 94E) incorporates field mapping by Ministry staff (mainly between 1980-1983), data from ministry assessment reports, plus data supplied by various companies.

NEW AGE DATES

Diakow (1984) reported published and new K/Ar age determinations of 204 to 182 Ma from volcanic rocks in Toodoggone River map-area, and Schroeter (1982) reported a single hydrothermal *alunite* date of 190 ± 7 Ma.

New dates for three hydrothermal adularia samples from Lawyers AGB deposit, Golden Lion prospect, and Metsantan prospect are: 180 ± 6, 176 ± 6, and 168 ± 6 Ma, respectively (Table 24-1). A specimen of hornblende basalt from Takla rocks underlying Toodoggone volcanics was determined to be 210 ± 8 Ma. A whole rock sample of volcanic glass from a rhyolite flow was analysed but was not suitable for dating.

The 180 and 176 hydrothermal dates are from relatively pure adularia from vein selvages at the Lawyers and Golden Lion deposits. The Metsantan sample was a mixture of adularia with fine-grained quartz; the indicated 168 Ma age of mineralization might be low due to some loss of argon. The hydrothermal events and related gold-silver mineralization apparently postdate the youngest volcanism in the map-area by two to six, and possibly as much as 14 million years. This is similar to the 2 to 17-million-year interval between volcanism and mineralizing hydrothermal activity reported from southwestern United States Tertiary epithermal deposits.

CLAIM STATUS

The unofficial status of claim holdings within the Toodoggone area to September 1985 is shown on Figure 24-1. Table 24-2 lists current operators, where they are known.

TABLE 24-1
K/Ar AGE DETERMINATIONS FROM ADULARIA AND HORNBLENDE, 1985

SAMPLE NO.	LOCATION UTM COORDINATES		MINERALS	%K	Ar40* $\times 10^{-10}$ mol/g	$\%Ar^{40}$	APPARENT AGE (Ma)
82AP-T107A	609560E	6356420N	Adularia	7.68	25.249	95.0	180 ± 6
LD84-Golden Lion	602550E	6381430N	Adularia	10.38	33.189	97.9	176 ± 6
LD84-Metsantan	601900E	6365270N	Adularia-quartz	8.09	24.666	96.4	168 ± 6
LJD84-Hb (Adoogacho Creek)	591400E	6380750N	Hornblende	0.696	2.696	93.7	210 ± 8

* Radiogenic Ar
Constants: $\lambda^{40}K_{\varepsilon} = 0.581 \times 10^{-10}\ yr^{-1}$ $\lambda^{40}K_{\beta} = 4.96 \times 10^{-10}\ yr^{-1}$; $^{40}K/K = 1.167 \times 10^{-4}$
%K determined by the Analytical Laboratory, British Columbia Ministry of Energy, Mines and Petroleum Resources, Victoria
Ar determination and age calculation by *J. E. Harakal, University of British Columbia*

British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork, 1985, Paper 1986-1.

* This project is a contribution to the Canada/British Columbia Mineral Development Agreement.

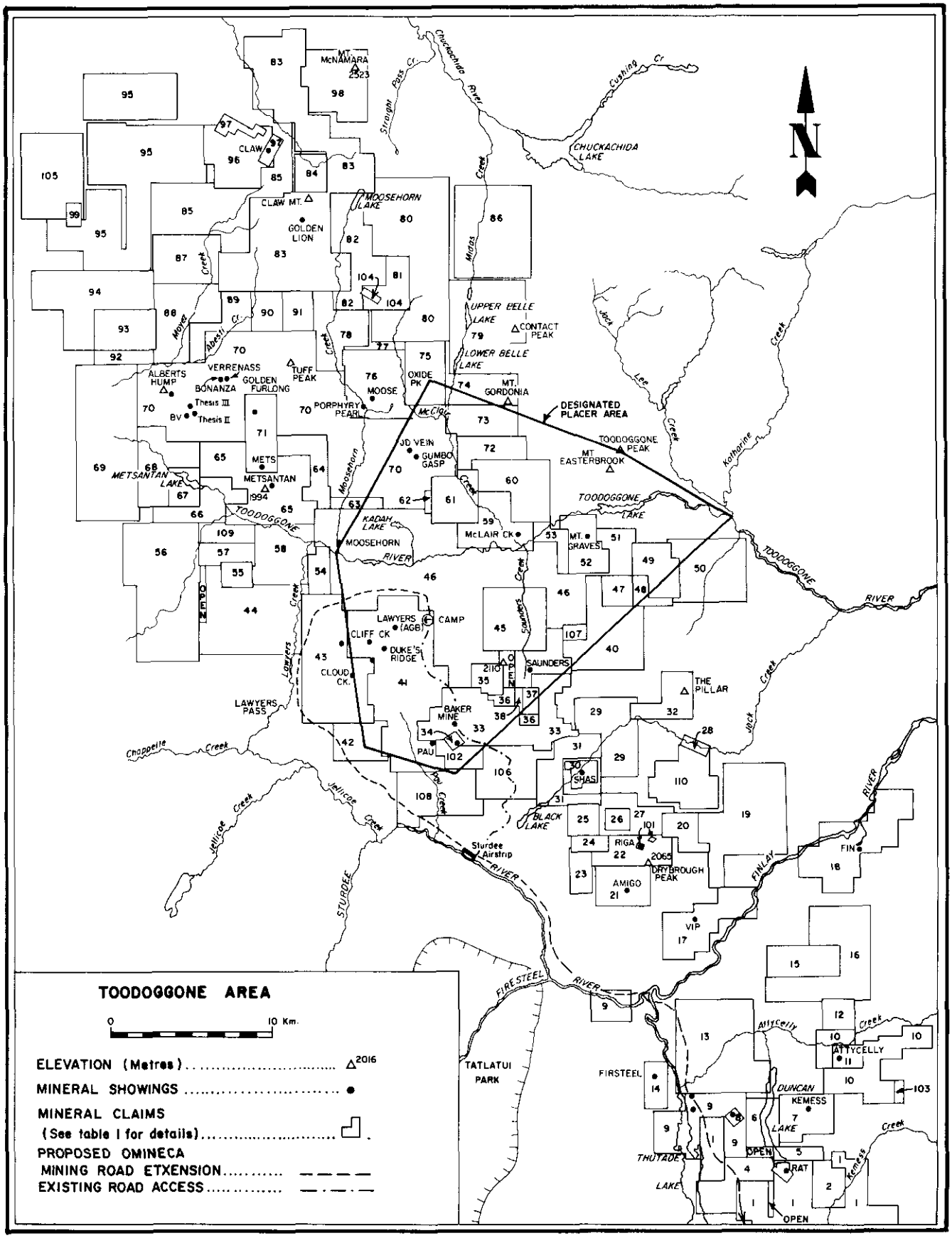

Figure 24-1. Claims in the Toodoggone River area (94E).

TABLE 24-2
TOODOGGONE RIVER AREA MINERAL PROPERTIES

NO.	CLAIMS	MINERAL INVENTORY NUMBER (94E)	OPERATOR
1	RON 1-11	13, 14, 15	Pacific Ridge Res.
2	DU, DU 2	—	Pacific Ridge Res.
3	RAT	25	Cominco
4	TUT 1, 2	—	Univex Mining
5	DU 1, 2	—	Pacific Ridge Res.
6	DUNCAN 1-4	—	Asitka Res.
7	NEW KEMESS 1, 2	21	Kennco
8	CROWN-GRANTED CLAIMS	12	Cominco
9	LAKE 1-5	—	Pacific Ridge Res.
10	KEM 1-9	—	Inca Res.
11	AUDREY WEST, AUDREY EAST	22	ABM Mining Group
12	AWESOME	81	Inca Res.
13	ARK 1-7	—	Ark Energy
14	FIRESTEEL	2	SEREM
15	WRICH 1-3	82	SEREM
16	RICH 1-5	—	Golden Rule Res.
17	GRACE 1-5	48	Asitka Res.
18	FIN 1-9	16	B. Pearson
19	JOCK 4, 6-12	—	Golden Rule Res.
20	GOLDEN RING, GOLDEN RING 2	—	Newmont Expl.
21	STAR, PULL, SUN	58	SEREM
22	PARADISE 3, 4	—	Phillip Res.
23	DALE	—	M. Bell
24	LEGHORN	—	Kidd Creek Mines
25	JERRY	—	Phillip Res.
26	DAWN	—	Newmont Expl.
27	SHASTEX, PARADISE 2	—	Alexim
28	BRENDA 1-8	8	Camine Dev.
29	JK 1-5	39	Golden Rule Res.
30	SHAS, SHA 1-2	50	International Shasta, Newmont
31	SHASTA 3-5, SILVERREEF 3	—	Arctic Red Res.
32	ATLAS, HERCULES	42, 83	SEREM
33	CHAPPELLE	26, 71	Multinational Res.
34	CROWN-GRANTED CLAIMS	27	O. McDonald
35	PEL	—	Multinational Res.
36	XT 1, 3	—	D. Stecyk
37	DAVE PRICE	—	Western Horizons
38	XT 2	—	Golden Rule Res.
39	GOLDEN NEIGHBOUR 1-4	37	Alban Expl., Lacana
40	IAN, ADRIAN, PAUL, OTTO	—	Rhyolite Res.
41	NEW LAWYERS 1-4, LAW 1-3, BREEZE, ROAD 1-3, PERRY 1, 2, MASON 1, 2, GTW 1-3, ATTORNEY 2	66, 67, 74, 72, 73	SEREM
42	ATTORNEY 1, 2	—	Alexim
43	SILVER POND, ASAP, SILVER SUN, SILVER CLOUD 1-3, SILVER CREEK	69, 75	St. Joe
44	PC 1-4, MM 1-4	—	Tanker Oil and Gas
45	SAUNDERS 1-4	40	Golden Rule Res.
46	GWP 1, 10-30, 34, 40, 41, 43, 200	86	Cassidy Res., Western Pacific Energy, Imperial Metals
47	DEBRA LYNN	—	Kelley-Kerr Energy
48	MARKER	28	Kelley-Kerr Energy
49	SAMMY, SUN	89	Newmont Expl.
50	KNIGHT, KEVIN, BISHOP, CASTLE	—	Hi-Tec Res.
51	GRAVY II, IV	—	Hemlo Expl.
52	GRAVES 1, 2	7, 87	Miramar
53	GRAVY I, II, TODD	—	Kelley-Kerr Energy
54	KODAH 1-2	68	SEREM
55	GOLDEN STRANGER, GOLDEN STRANGER 2	76	Western Horizons
56	LASSIE 1-4, LADD 1-4	—	Alexim
57	SB 3, 4	—	S. Young
58	LAINEY 1-4	—	Deep South Pet.
59	MAC III, HYFLY I, II	1	C. Ashworth
60	MAC I, II, IV	—	Hi-Tec Res.
61	BELLE 1, 2, 4	—	Manson Creek Res.
62	*BIG LODE*	—	*Alexim*
63	KEY	—	Duke Minerals
64	LEXIM 1-3, GWP 42	—	Mandusa Res.
65	METSANTAN 1-9	64	Bart Res.
66	SY 2-4	—	A. L. Constantine
67	DISCOVERY 4	—	Black Diamond Res.
68	DISCOVERY 1-3	—	Duke Minerals
69	INDIAN GOLD 1-4, TOODOGGONE 1-4	—	Alexim
70	AL 1-8, BERT, ERNIE, WINKLE, BULL, CHUTE, SURPRISE, GEROME, CALF MOOSE, ANTOINE LOUIS, TOUR, COW MOOSE, STURDEE, JM, JS, KADAH 1-2, BIG BIRD, GAS 1, JR, JB, JD	66, 65, 80, 78, 85, 84, 79, 91, 32	Energex
71	METS 1, 2	—	Manson Creek Res.
72	PEREGRINE, FALCON A	—	C. Ashworth
73	JOANNA III, JOANNA IV	—	International Westward Dev.
74	JOANNA I, II	36	Armour Res.
75	AMETHYST, KIDVIEW	—	Geostar
76	SCREE 1-3, MOOSE 1-3, BULLMOOSE, GAS 2	31	New Ridge Res.
77	*OXIDE I*	—	Alexim
78	HORN 1-5	20	Norman Res.
79	LAKE I-IV, MAGIC I, II	23	Hi-Tec Res.
80	CAT 1-4, MID 1-3, BELL 1-3	59	A. L. Constantine
81	GORD DAVIES, GORDON DAVIES 2	53	Lacana
82	HORN 1-4, AS 1-3	—	Deep South Pet.
83	GUARD, LYNX 1-8, GOLDEN LION 1-11, HUMP 1-2	77, 19	Newmont Expl.
84	SPAR MOUNTAIN	—	C. Kowall
85	PAW, PIKA, CAL 1, YET 1, SUET, GACHO	—	Hi-Tec Res.
86	ORO I, II, URUS I-IV	—	Hi-Tec Res.
87	RANGER 1-4	—	Cusac Industries
88	MOYEZ 1, 2, 4	—	Geostar
89	SPIKE, WOLF I	—	Duke Minerals
90	WOLF II	—	Texpez Oil and Gas
91	WOLF III	—	Skeena Res.
92	CHUCK 1, 2	—	Miramar
93	MOYTAN I, II	—	Yukon Gold Placers
94	ADOOG 1-5, STIK 1-4	—	Delaware Res.
95	GACHO 1-3, WILDCAT 1-3, HEAVY METAL 1-8, SHEEP ROCK 1, 2	54, 62	Alexim
96	*COPPERKING* 1-5 NAMERA IV	—	Western Horizons
97	CLAW	45	Umex
98	WOLVERINE I-IV	—	Hi-Tec Res.
99	DAR	90	Newmont Expl.
100	SILVER REEF	—	Newmont Expl.
101	RN	3	Windarra
102	CASTLE MT. 1	—	Dynamic Oil
103	MESS 4	70	SEREM
104	HAR	53	Kennco Expl.
105	STIK 1-4	—	Delaware Res.
106	BLACK	—	Hi-Tec Res.
107	ARGUS 2 plus?	—	Rhyolite Res.
108	HECKLE, JECKLE, TITAN	—	M. Bell
109	SB 1, 2	—	P. Crook

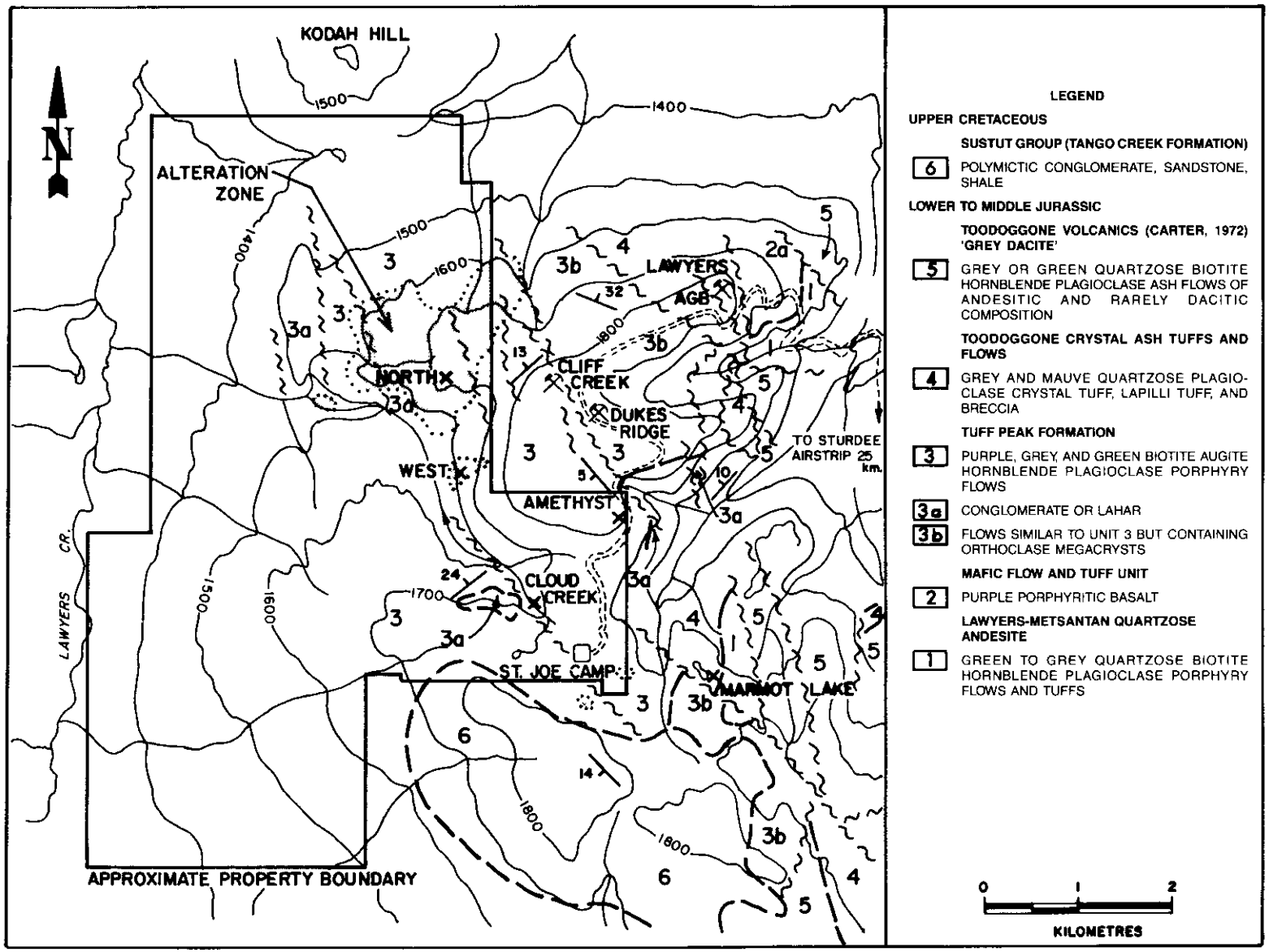

Figure 24-2. Geology of the Silver Pond property and area (based on Preliminary Map 61).

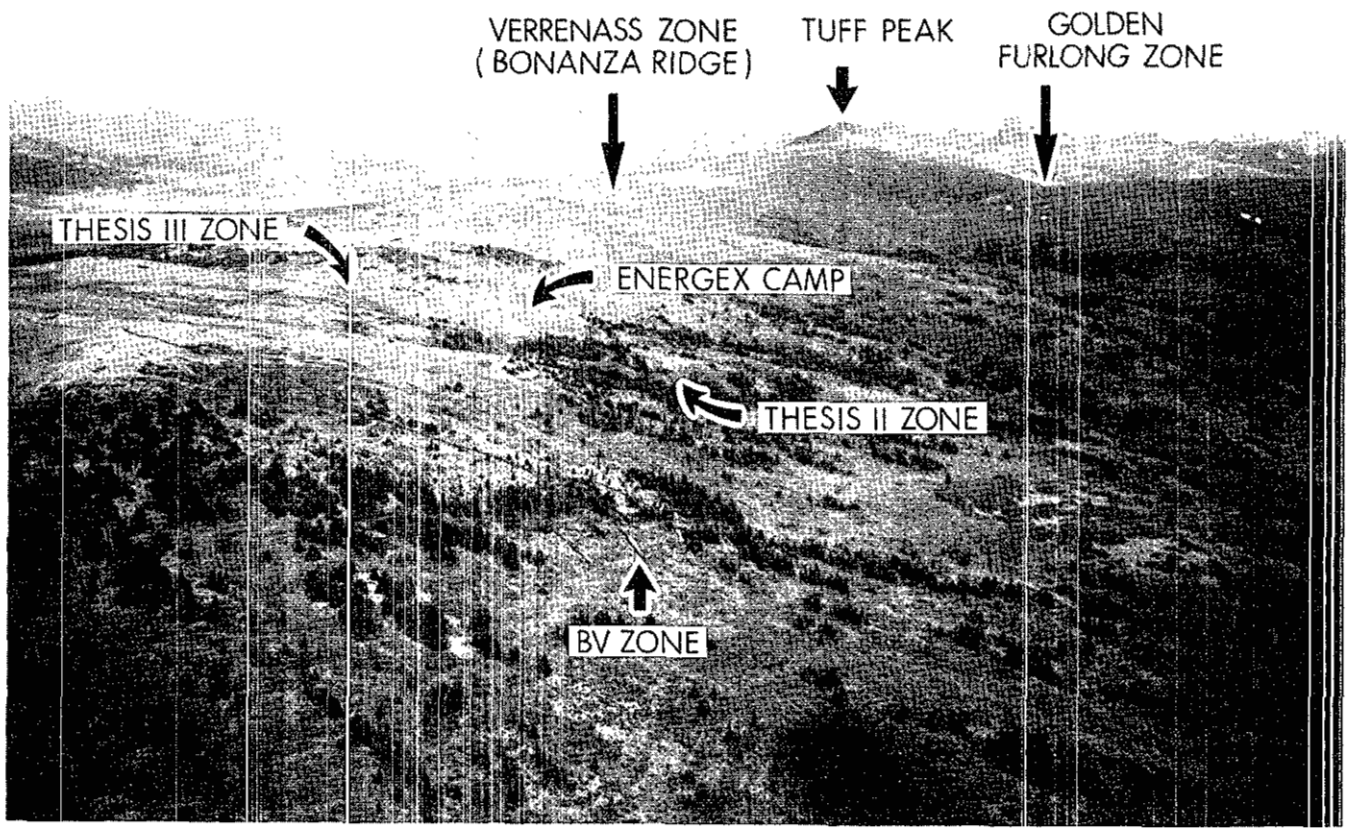

Plate 24-1. Looking northeasterly over A1 property.

PROPERTY UPDATES

Very brief visits were made to several properties within the Toodoggone area and only highlights of ongoing activity are described here.

LAWYERS (MI 94E-66) — SEREM INC.

The largest and most significant progam in the Toodoggone "camp" during 1985 cost an estimated $2.4 million and involved development, environmental studies, and road design. It was carried out by SEREM Inc. on their Lawyers property (*see* Fig. 24-2). Two new adits were completed on the Amethyst gold breccia zone, one from the 1 760-metre level and the other from the 1 800-metre level. Together with the previously completed 1 750-metre level adit consisting of 762 metres of advance and slash, these three adits have enabled the sampling, correlation, and delineation of ore reserves, now estimated at 509 600 tonnes grading 7.2 grams per tonne gold and 260 grams per tonne silver over a vertical range in excess of 150 metres on the Amethyst gold breccia zone. The 1 700 level adit consists of a 250-metre crosscut plus drifts, 50 metres north and 45 metres south. The ore shoot intersected on the 1 700 level was well mineralized with electrum, native gold, and argentite. Slickensiding observed near the 1 700 level portal indicated a strong left lateral movement which appears to be typical in the Toodoggone area. The 1 800 level consists of a 107-metre crosscut plus drifts 60 metres north and 68 metres south. In addition, 178.6 metres of raising was completed, connecting all levels to the surface.

In addition to the development program, SEREM Inc. contracted out environmental studies and an on-site investigation of the proposed extension of the Omineca Resource Road from Moosevale Flats to link up with the Sturdee Airstrip.

PAU CREEK (MI 94E-72) — SEREM INC.

Exploration during 1985 on the Pau Creek showing by SEREM Inc. revealed some significant assays for gold and silver. On the property Takla Group andesites are in structural contact with Permian limestones.

AL — ENERGEX MINERALS LTD.

The Al property, located approximately 40 kilometres north of the Sturdee Airstrip, is owned and operated by Energex Minerals Ltd. It is a very large property, consisting of 565 claim units and fractional claims (*see* Plate 24-1 and Fig. 24-3). During 1985, Energex Minerals Ltd. completed a diamond-drilling program totalling approximately 1 690 metres in 35 short holes as well as surface trenching, geophysics, and prospecting at an estimated cost of nearly $1 million. Three areas of gold mineralization were tested:

(1) **Thesis III (MI 94E-91)** — 17 short HQ holes totalling approximately 969 metres tested a steeply plunging quartz-barite-native gold zone in clay altered (mainly dickite) hornblende-feldspar andesitic tuffs ('Toodoggone volcanics'). The central part of the altered zone was drilled along a strike length of 120 metres, a width ranging from 12 to 22 metres, and a maximum vertical depth of approximately 60 metres. Native gold is primarily associated with replacement barite

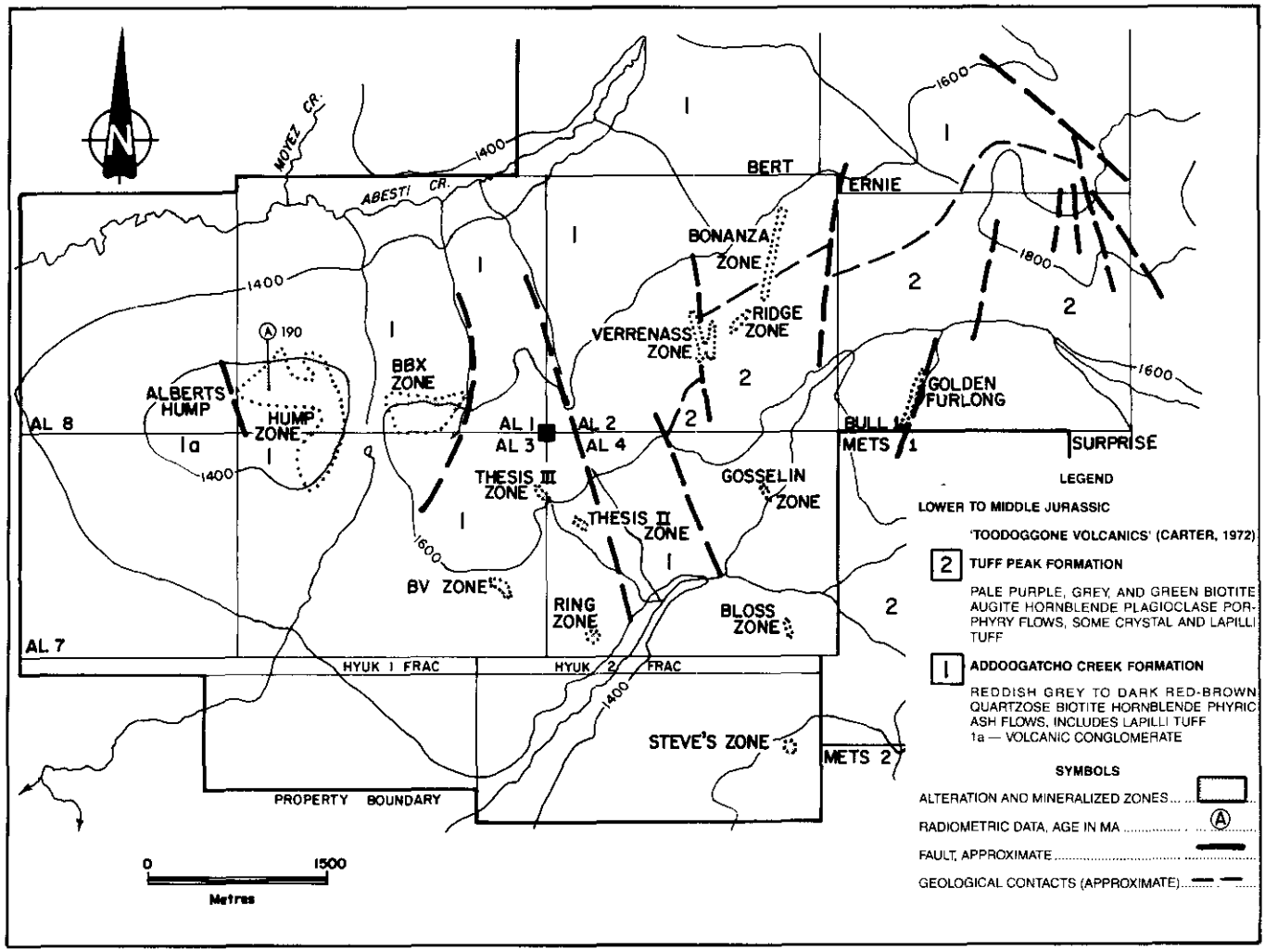

Figure 24-3. Geology of the A1 property.

which averages 2 to 5 per cent. Locally, at depth, pyrite is abundant and trace amounts of native gold were observed. There are trace amounts of chalcopyrite, and galena, and corkite [$PbFe_3(PO_4)(SO_4)(OH)_6$] was identified by X-ray analysis of samples from DDH-85-02 at 61.1 metres. Some spectacular grades related to native gold were intersected in drilling holes like 85-10 and 85-30.

(2) **BV (MI 94E-91)** — 11 short HQ holes totalling approximately 450 metres were drilled along a zone exposed by trenching and drilling for more than 500 metres; alteration widths are up to 15 metres. Native gold is intimately associated with barite-filled fractures within a silicified, pyritic, clay alteration zone. The fractures appear to have a predominant west-northwest trend.

(3) **BONANZA RIDGE (MI 94E-78, 79)** — 7 short HQ holes totalling approximately 271 metres were drilled to test the small, high-grade, structurally complex Verrenass zone, and the Ghost zone, which may have potential for a near-surface bulk mining operation. Both areas are similar to the Thesis III zone. A chemical analysis of typical quartz-barite altered rock from the Verrenass zone yielded the following results: SiO_2, 64.21 per cent; Al_2O_3, 1.53 per cent; Fe_2O_3, 0.19 per cent; MgO, <0.02 per cent; CaO, <0.03 per cent; Na_2O, 0.011 per cent; K_2O, 0.048 per cent; TiO_2, 0.48 per cent; MnO, <0.002 per cent; Ba, 18.5%; S, 4.17%; CO_2, <0.07%; LOI, 2.2%; and H_2O-, 0.11%.

The total is apparently low because barium is present as barite (barium sulphate). The pattern represented here is characteristic of alteration zones on the A1 property, with a gain in silica and barite and net losses of iron, manganese, potassium, sodium, cadmium, and aluminum.

For a more complete description of geology, alteration, and mineralization on the A1 property the reader is referred to Schroeter (1985).

Overall mineralization on the A1 property is suggested to have occurred in a high level, epithermal setting that included local hot spring discharge sites where boiling created porosity in the volcanic rocks and subsequent mineralization. There is a strong structural control involving intersections of small, local northeast-southwest faults with large, regional northwest-southeast faults. An anomalous heat flow regime and possibly some of the fluid component of the system may have been provided by hypabyssal felsic intrusions at depth. Hydrothermal alteration is widespread in structurally favourable zones; locally it is superimposed on diagenetic hematitization.

A thesis study by J. R. Clark underway at McGill University is aimed at defining the environment of formation of the mineralization and alteration.

SILVER POND (MI 94E-69) —
ST. JOE CANADA INC.
IMPERIAL METALS CORP.
CASSIDY RESOURCES LTD.

During 1985 St. Joe Canada Inc. (operator) completed 33 diamond-drill holes totalling approximately 3 000 metres on the Silver Pond property (*see* Fig. 24-2). Four main zones of mineralization were tested:

(1) **Cloud Creek (or Silver Creek)** — two holes were drilled on the old Kennco showing which consists of a northwesterly trending zone of silicification in 'Toodoggone' andesitic tuffs.
(2) **Amethyst zone** — a northwesterly trending silicified zone (minor quartz-amethyst veinlets) on strike with SEREM Inc.'s Cliff Creek breccia zone. The host rock is andesitic crystal tuff, similar to the host rock at the Lawyers AGM zone.
(3) **North zone** — a large pyritic, silicified ± clay (predominantly illite) altered zone with minor quartz veinlets containing trace sphalerite and pyrite.
(4) **West zone** — green andesitic tuff with quartz veinlets carrying minor chalcopyrite and pyrite. Illite is the predominant clay mineral present.

MOOSE (MI 94E-31, 81) —
NEW RIDGE RESOURCES LTD.

During 1985, New Ridge Resources Ltd., under an option agreement with Energex Minerals Ltd., completed approximately 915 metres of diamond drilling in 20 holes (including two on the Porphyry Pearl zone) on the Moose property. The main zone was drill tested along a length of approximately 550 metres in a northwesterly direction. Galena, sphalerite, pyrite, barite, hematite, chlorite, and quartz with minor chalcopyrite and trace amethyst occur as vein-type occurrences in altered hornblende-feldspar crystal and crystal-lapilli tuffs and tuff breccias. Local minor brecciation and shearing are found near the break in slope, which is presumed to be related to a regional fault that extends from McClair Creek northwest up to Mooschorn Creek.

Silver is the main target; the company reports assays of up to 6 600 grams per tonne. Acanthite is suspected but has not yet been verified. Secondary minerals identified include anglesite and cerussite.

METS (NO MI) —
MANSON CREEK RESOURCES LTD.

During 1985, Manson Creek Resources Ltd., under an option agreement with Golden Rule Resources Ltd., completed three short diamond-drill holes on their 'A to E' zone located on the southeastern portion of the claim group. In all, five northerly trending altered zones, which presumably splay off regional northwesterly faults, have been identified. The 'A to E' zone, consisting of a quartz, barite, clay-altered zone with minor native gold and pyrite, has been traced by 10 surface trenches and 3 short diamond-drill holes along a length of 800 metres and over a maximum width of 11 metres. Locally the zone is brecciated and up to 10 metres in width with a quartz porphyry dyke adjacent to the altered zone. Host rocks are 'Toodoggone' andesitic tuffs.

BAKER (MI 94E-26) —
MULTINATIONAL RESOURCES INC.

During 1985, Multinational Resources Inc., under an option agreement with Du Pont of Canada, completed 11 short holes totalling approximately 610 metres; two were on the West Chappelle vein, one on the D vein, two on the C vein, two on the B vein, and four on the main or A vein and its northeastern extension. The program was designed to re-evaluate known vein systems.

The agreement includes options on the existing mill (90-tonne-per-day-capacity) and the 80-man mining camp.

Between 1980 and 1983 Du Pont of Canada mined 79 580 tonnes from A vein that yielded 1 287 676 grams of gold and 25 446 258 grams of silver.

Bulldozer trenching and an induced polarization survey were also carried out.

METSANTAN (MI 94E-64) —
BART RESOURCES LTD.

Bart Resources Ltd., under an option agreement with Lacana Mining Corp., conducted a small surface program which included resampling of the Lacana Mining Corp. trenches. The program basically confirmed Lacana Mining Corp.'s previous results and located several new anomalies. The main mineralized zone has been traced along a length of nearly 550 metres and across widths of up to 18 metres.

MOOSEHORN (MI 94E-86) —
CASSIDY RESOURCES LTD.
E&B MINES LTD.

During 1985, Cassidy Resources Ltd. (as operator), conducted detailed geological and geochemical surveys in preparation for a diamond drill program. An epithermally altered and weakly mineralized zone has been identified on the surface for a length of 2 200 metres and across widths up to 270 metres.

SHAS (MI 94E-50) —
INTERNATIONAL SHASTA RESOURCES LTD.
NEWMONT EXPLORATION OF CANADA LTD.
ARCTIC RED RESOURCES CORP.

Because of a legal tenure dispute, no work was carried out in 1985 on the Shas prospect, located 16 kilometres southeast of the Lawyers property and 10 kilometres southeast of the Baker property. Arctic Red Resources Ltd. has estimated geologic reserves at several million tonnes grading 2.45 grams per tonne gold equivalent within which there is a higher grade section of 498 850 tonnes grading 5.3 grams per tonne gold equivalent (George Cross Newsletter, July 4, 1985). The main zone is the Creek zone which has a strike length of 370 metres and a width ranging from 2 to 23 metres. Mineralization has been outlined to a depth of 100 metres; it is open to depth and to the north.

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