TOODOGGONE RIVER

(94E)

By T.G. Schroeter

INTRODUCTION

The Toodoggone River area is situated approximately 300 kilometres north of Smithers. Access is by aircraft because there are no roads into the area. During the 1981 season, a great variety of aircraft were used for supply and freight services to and from the Sturdee strip; these included a Cessna 180, Cessna 206, Beech-18, Otter, Beaver, Goose, Islander, DC-3, and Hercules. All were routed through Smithers. The strip has a useable length of 620 metres and is equpped with landing lights. Du Pont of Canada Exploration Ltd. maintain the strip and have a traffic controller on duty during daylight hours. The area discussed in this report forms a northwesterly trending belt 80 kilometres in length, 35 kilometres in width, and approximately centred on the Baker mine (Figure 1). The area of economic interest may continue several more kilometres to the west-northwest.

During July and August 1981, the writer commenced geologic field mapping with the aid of an especially contracted topographic base map at scale 1:25 000. The area covered by this base map is shown on Figure 1. Property investigations, ongoing since 1974, were continued. Much of the writer's effort was concentrated in the area bounded by the Finlay River on the southeast and Abesti Creek on the northwest. In addition, Andrejs Panteleyev with the British Columbia Ministry of Energy, Mines and Petroleum Resources and Larry Diakow, a graduate student at the University of Western Ontario, joined the project in August and expanded the area of mapping south of the Finlay River (see Panteleyev, this report) and Mount Graves. A preliminary geological map of the Toodoggone area should be available by the spring of 1983.

During 1979-80, approximately 2 000 mineral claim units were staked in the area. In 1981, approximately 1 300 more units were staked. In addition, after part of the area was opened to placer staking in November 1980, a placer staking rush occurred during the winter of 1980-81 (see Figure 1). The reader is referred to Geological Fieldwork, 1980 (Paper 1981-1) for a description of the history of the camp.

GEOLOGY

Typical epithermal mineralization in the camp is related to a period of Early Jurassic intermediate to acidic volcanism. Mineralization occurs both within Late Triassic alkaline andesitic rocks (Takla Group) and Early Jurassic calc-alkaline volcanic rocks (Hazelton Group). The host

volcanic rocks were deposited in an island arc environment during the transition period from submarine to subaerial volcanism.

The regional geology is covered in Paper 1981-1 and only minor additions are offered here. The Toodoggone volcanic sequence consists of a pile of complexly intercalated and varicoloured subaerial andesitic, dacitic, and trachytic tuffs, ash flow sheets, and minor epiclastic rocks that is 1 000 metres or more in thickness. They are tentatively correlated with very Early Jurassic rocks of the Hazelton Group. K-Ar and Sb-Sr dates obtained from whole rock and mineral samples, including alunite from Alberts Hump (which is believed to be contemporaneous with the major pulse of epithermal mineralization), range between 179 and 190±7 Ma. This relatively old age compared to similar deposits in Nevada, Colorado, and Mexico may be a particularly important factor in the future discovery of similar epithermal deposits in British Columbia (for example, Premier).

It is worth re-stating that the Toodoggone volcanic rocks and intrusions are probably coeval with associated Omineca Intrusions. It is also significant that porphyry deposits associated with the Omineca Intrusions have anomalous gold and silver contents (Paper 1981-1, p. 128). Quartz feldspar porphyry dykes may in fact be feeders to the Toodoggone volcanic sequence.

Regionally, the lower volcanic division consists dominantly of pyroclastic maroon agglomerate and grey to green to maroon andesitic and dacitic tuffs. It is overlain by the middle volcanic division consisting mainly of rhyolites, dacites, and an intermediate to acidic assemblage of orange crystal to lithic tuffs, minor welded tuffs, and quartz feldspar porphyries. A young, upper volcanic-sedimentary division is locally present. In areas, major structural breaks and mineralizing events (for example, Lawyers) coincide with the contact between the lower and middle volcanic divisions.

STRUCTURE

The structural setting was probably the most significant factor in allowing mineralizing solutions and vapours to migrate through the thick volcanic pile in the Toodoggone area. Major fault systems with attendant splays extend tens of kilometres (for example, McClair, Lawyers - Cliff Creek). Some are postulated to be related to volcanic centres, particularly collapsed ones (for example, Kodah, Alberts Hump).

MINERALIZATION

Styles of mineralization are discussed in Paper 1981-1, pages 128 and 129. The precious and base metal epithermal type are the main exploration targets. Preliminary chemical data (Tables 2 and 3) suggest the following:

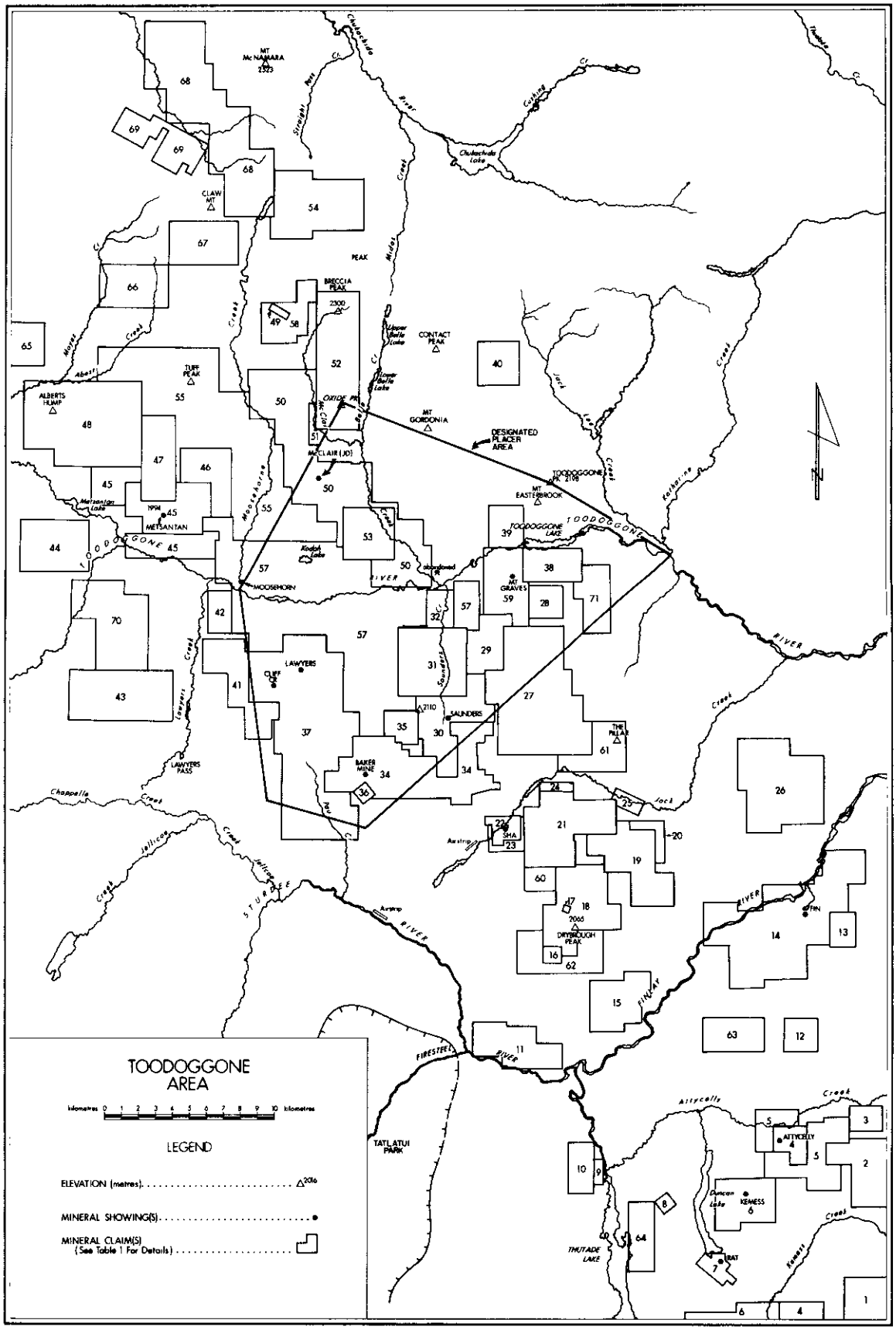

Figure 1. Toodoggone map-area.

TABLE 1. TOODOGGONE RIVER AREA, MINERAL PROPERTIES

No.	Claim Name	MDI 94E	Operator
1	Aura	------	Serem Ltd.
2	Mess 1-4	------	Serem Ltd.
3	Audrey 1-2	------	Inca Res.
4	Audrey East, Audrey West	22	Inca Res.
5	Kem 1-9	------	Inca Res.
6	New Kemess 1-2	21	Kennco
7	Rat	25	Cominco Ltd.
8	Crown-granted claims	12, 13, 14	Cominco Ltd.
9	Atty	------	Taiga Cons.
10	Firesteel	2	Serem Ltd.
11	Fire 1-3	------	Du Pont Expl.
12	Rich	------	Taiga Cons.
13	Mex	57	Cominco Ltd.
14	Fin 1-9, Zip, Gem, Kid	16	B. Pearson
15	Grace 1-4	47, 48, 49	D. MacQuarrie
16	Amigo	58	Cominco Ltd.
17	RN	3, 4, 5	Winderra Mines
18	Aca, Pul, Acapulco, Gotch 1-2	3, 4, 5	Serem Ltd.
19	Jock 1-5	8	Taiga Cons.
20	Gossan 1-2	8	Lacana Mining
21	Jock 1-5	8, 39	Serem Ltd.
22	Shas	50	International Shasta
23	Silver Reef	45, 50	C. Kowall
24	Pitt	------	J. Welshaupt
25	Brenda	------	J. Welshaupt
26	Nub Mountain	63	Serem Ltd.
27	Orange, Argus 1-4, Arg 1-2, OJ 1-4	28, 29, 42	SEREM Ltd.
28	To No. 2	------	Du Pont Expl.
29	GWP 1-9	7	Great Western Pet.
30	Golden Neighbour 1-4, Camp, Camp Fr., Jolly Roger, Artful Dodger	37	Lacana Mining
31	Saunders	40	Taiga Cons.
32	GWP 43	-------	Great Western Pet.
34	Chappelle	26	Du Pont Expl.
35	Pel	26	Du Pont Expl.
36	Crown-granted claims	27	O. McDonald
37	New Lawyers 1-4, Law 1-3, Breeze, Road 1-III, Perry 1-2, Mason 1-2, GTW 1-3, plus fractions	64	SEREM Ltd.
38	Duke 1-2	------	Serem Ltd.
39	To No. 1	------	Du Pont Expl.
40	Mul 1-2	52	Du Pont Expl.
41	Silver Pond, Silver Creek, Silver Peak, Silver Grizzly	17	C. Kowall
42	Kodah	17	Serem Ltd.
43	Lass 1-4	------	Du Pont Expl.
44	Edo 1-4	------	Du Pont Expl.
45	Metsantan 1-9	65	Lacana Mining
46	Ant 1-3	------	Du Pont Expl.
47	Mets 1-2	------	Taiga Cons.
48	Al 1-8	66	Kidd Creek Mines
49	Har	53	Kennco
50	Scree 1-3, Moose 1-3, JM, JD, JB, JR, McClair 1-5, plus fractions	31, 32	Kidd Creek Mines
51	Air 1-2	------	Du Pont Expl.
52	Poo, On, Lou, Oxide	------	Serem Ltd.
53	Belle 1-2	------	Taiga Cons.
54	Moose 1-4	------	S. Young
55	Bert, Ernie, Winkie, Buff, Chute, Surprise, Gerome, Oscar Fr., Wankie Fr., Antoine Louis, Tour Sturdee, Big Bird, Kadah, Shodee	------	Kidd Creek Mines
57	GWP 1-43, Doug's Bear	------	Great Western Pet.
58	Horn 1-3	53	Lacana Mining
59	Graves 1-4	67	Great Western Pet.
60	Itsch	------	SEREM Ltd.
61	Hercules, Atlas	24	SEREM Ltd.
62	Star, Co, Sun	58	SEREM Ltd.
63	Wrich	------	SEREM Ltd.
64	Ron 1-6	13, 14	R. Wong
65	Adoo 1-2	------	C. Kowall, G. Auger
66	Hump 1-2	------	C. Kowall, G. Auger
67	Golden Lion 1-2	------	C. Kowall, G. Auger
68	QBX 1-12	------	Taiga Cons.
69	Claw	46	Umex
70	Xenos 1-4	------	Lacana Mining
71	Sun 1-2	------	C. Kowall, G. Auger

TABLE 2. SELECTED CHEMICAL

Lab. No.	Field No.	Field Description	Location	SiO_2	Al_2O_3	Fe_2O_3 Total
24233	La 80-6-21 m	Upper crystal tuff	Lawyers	60.21	15.27	5.29
24234	La 80-13-21.8 m	Orange crystal tuff without quartz eyes	Lawyers	57.58	14.89	5.29
24235	La 80-13-94 m	Chocolate brown dust tuff	Lawyers	68.02	13.13	3.17
24236	La 80-14-116.5 m	Green footwall crystal tuff	Lawyers	56.06	15.06	6.01
24237	La 80-4-81.7 m	Welded tuff	Lawyers	62.93	14.78	3.34
24238	La 80-4-104.5 m	Footwall orange crystal tuff with quartz eyes	Lawyers	64.86	12.91	5.48
24239	La 80-11-11 m	Upper volcanic sedimentary rocks	Lawyers	72.85	12.00	2.65
24240	K 74-3-48.5 m	Cemented mud zone	Lawyers	58.94	12.65	6.05
24241	La 80-6-105.4 m	Silicified brecciated mineralized zone	Lawyers	80.97	6.21	2.29
24242	La 80-5-113.4 m	Green andesitic dyke	Lawyers	46.03	16.68	9.62
24243	JC 2-80-4	Massive andesite	Northeast of Cliff Creek	59.76	15.39	5.53
24244	JC 6-80-24	Porphyritic andesitic flow	Northwest of Marmot Lake	60.40	14.88	5.70
24245	Met 80-9	Typical orange crystal tuff	Metsantan	56.38	15.65	6.02
24246	AH 80-2	Siliceous volcanic pyroclastic	Alberts Hump	55.58	17.43	0.46
24247	Pil-w-80-1	Orange crystal tuff	Pillar West (Nub Creek)	62.15	15.96	3.99
24248	T 80-6	Purple andesite	Above two ponds, crest between Lawyers and Baker	58.20	15.42	5.62
24249	La 80-7	Purple andesite	Northeast downslope of Lawyers Knob	49.76	17.43	10.36
24250	JC 4-80-4	Purple andesite	Duke's Demise - southeast end	61.03	16.92	5.53
24251	JC 7-80-13	Purple andesite	600 metres west of Marmot Lake	59.42	14.61	5.69
24252	JC 7-80-15	Green to purple crystal tuff	1 250 metres northwest of Marmot Lake	61.79	15.14	5.58
24253	JC 9-80-6	Flow-banded andesite	Kodah Lake	57.77	17.72	5.97

Rock Name*	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Au ppm
Trachyte	5	14	82	0.4	0.029
Trachyte	11	15	71	0.8	<0.02
Trachyte	27	41	167	48.0	0.027
Trachyandesite	8	18	113	4.2	0.022
Trachyte	35	44	118	11.0	0.042
Normal dacite	40	41	214	29.0	0.092
Normal rhyolite	19	13	61	5.3	0.056
Normal andesite	37	30	82	4.4	0.031
------	69	93	233	34.0	3.36
Sub-alkaline mafic phonolite	90	12	133	1.0	<0.02
Normal andesite	17	3	78	<0.4	<0.02
Normal andesite	16	10	77	<0.4	<0.02
Trachyte	19	10	215	<0.4	<0.02
Sub-alkaline trachyte	4	26	100	<0.4	<0.02
Trachyte	7	420	138	<0.4	<0.02
Normal andesite	7	17	77	<0.4	<0.02
Basalt-andesite	33	11	106	<0.4	<0.02
Trachyte	8	9	85	<0.4	<0.02
Normal andesite	15	10	68	<0.4	0.068
Trachyte	16	10	85	0.6	<0.02
Normal andesite	4	19	111	<0.4	<0.02

*B.N. Church's classification.

ANALYSES, TOODOGGONE AREA

MgO	CaO	Na_2O	K_2O	TiO_2	MnO	P_2O_5	CO_2	S	H_2O^-	H_2O^+	$(H_2O)T$	Total
2.18	3.07	3.375	5.602	0.562	0.13	0.22	2.42	<0.008	0.79	1.83	1.04	99.36
1.67	3.24	1.593	8.782	0.550	0.085	<0.08	5.10	0.02	0.55	0.85	0.30	99.10
1.50	0.37	0.191	9.026	0.483	0.075	0.11	2.62	0.04	0.14	1.28	1.14	99.88
2.84	1.94	0.878	9.588	0.520	0.142	<0.08	4.88	0.37	<0.1	1.54	1.44	99.73
1.50	0.76	0.848	9.498	0.532	0.073	0.18	3.59	0.042	0.18	1.7	1.52	99.59
2.00	0.68	0.931	6.616	0.435	0.104	0.15	3.30	0.008	0.44	1.26	0.82	98.29
0.23	1.17	0.987	6.683	0.326	0.092	0.15	0.81	<0.008	0.80	1.04	0.24	98.19
3.17	4.30	0.128	4.293	0.459	0.143	0.13	6.34	0.012	1.33	1.03	-0.30	96.91
1.64	0.51	0.060	2.934	0.156	0.072	<0.08	2.86	0.04	0.15	0.19	0.04	97.74
5.91	2.30	4.533	2.041	1.151	0.257	0.13	7.37	0.014	1.84	3.31	1.47	97.49
2.80	4.30	2.971	3.514	0.617	0.158	0.23	1.39	0.008	1.38	3.00	1.62	98.28
2.66	2.68	3.476	3.523	0.566	0.133	0.23	0.95	0.008	1.88	5.04	3.16	98.36
1.56	2.00	0.210	10.64	0.610	0.274	0.18	4.81	0.016	0.34	0.66	0.32	98.68
<0.08	<0.22	0.335	3.832	0.139	<0.002	0.09	0.18	6.19	0.17	7.13	6.96	91.50
1.32	2.18	3.823	6.266	0.437	0.132	0.18	1.43	<0.008	0.29	0.97	0.68	98.58
1.92	5.34	3.457	3.096	0.579	0.141	0.22	2.57	0.014	0.96	2.38	1.42	97.98
3.93	7.87	3.025	3.688	1.040	0.182	0.30	<0.10	0.012	0.73	1.59	0.86	98.43
1.99	2.85	4.841	3.318	0.518	0.152	0.13	0.99	0.008	0.53	1.83	1.30	99.56
1.33	4.44	4.155	3.367	0.572	0.146	0.23	3.28	<0.008	1.21	1.29	0.08	97.32
2.82	1.56	2.242	6.608	0.561	0.142	0.19	0.70	0.04	0.50	1.94	0.44	97.82
2.19	5.24	3.536	4.039	0.562	0.158	0.15	<0.10	0.008	0.33	1.55	0.22	97.54

Hg	SrO	BaO	As	Sn	Se	Te	W	Th	U
ppb	per cent	per cent	ppm	ppm	ppm	ppm	ppm	ppm	ppm
40	0.02	0.15	18	2.0	8	6	5	8	3
45	0.02	0.18	28	1.8	3	6	5	9	5
47	0.02	0.18	26	<1.0	3	3	14	<7	6
<10	0.02	0.19	24	1.8	5	4	6	<7	7
67	0.02	0.13	30	<1.0	5	4	6	<7	6
37	0.02	0.13	20	1.8	3	6	8	9	<3
45	0.02	0.19	<10	<1.0	<3	6	3	7	6
42	0.07	0.19	23	2.4	5	8	4	<7	5
37	0.01	0.04	23	2.7	<3	5	8	<7	4
42	0.02	0.14	21	5.3	5	6	5	<7	<3
25	0.05	0.19	18	3.7	3	8	<2	11	3
47	0.02	0.19	20	2.2	5	4	<2	8	4
<10	0.01	0.17	14	<1.0	3	4	6	13	5
18	0.08	0.03	21	<1.0	5	<3	2	7	6
29	0.02	0.20	<10	1.2	3	4	2	<7	6
29	0.08	0.21	<10	2.2	5	3	2	9	<3
27	0.16	0.23	<10	3.5	3	9	<2	<7	4
13	0.03	0.16	22	1.5	3	3	<2	<7	4
10	0.02	0.20	18	<1.0	5	7	<2	<7	6
25	0.01	0.20	<10	<1.0	3	4	2	<7	6
35	0.05	0.17	<10	<1.0	3	8	2	<7	9

TABLE 3. GEOCHEMICAL RANGE OF SELECTED HIGH-GRADE SPECIMENS FROM TOODOGGONE EPITHERMAL PROSPECTS
(All values in ppm unless otherwise indicated.)

As	<10 to 30	Ga	<3 to 10	Se	<5 to 272
B	<2	Ge	<5	Sn	<1 to 5.3
Ba	8 to 2 140	Hg	60 to 2 800 ppb	Sr	<2 to 250
Be	<1	La	<10	Te	5 to 45
Bi	<3 to 17	Li	7 to 76	Th	<7 to 16
Cd	<0.2 to 388	Mo*	2 to 91	U	<3 to 5
Co	<1 to 16	Ni	9 to 31	W	<2 to 16
Cr	19 to 52	Pb	24 to 0.835%	Zn	45 to 6%
Cs	<4 to 8	Rb	<5 to 150		
Cu	35 to 0.94%	Sb	<3 to 8		

*Excluding one high-grade sample at Baker mine with 0.23% Mo.

(1) There are three main classes of rocks: varicoloured, andesitic, and dacitic pyroclastic tuffs overlain by trachytic pyroclastic tuffs.

(2) The ratio K_2O/Na_2O increases toward mineralization.

(3) Sulphur values are very low - average <0.04 per cent S.

(4) Trace elements are not enhanced near mineralization (Table 2). However, there is some hope for mercury as a pathfinder element.

(5) The overall Ag:Au ratio is approximately 20:1.

There are three stages of of veining. A pre-ore stage consists of thin bands of amethyst and adularia with very minor amounts of calcite. This was followed by the ore-bearing stage consisting of open space fillings, and post-ore deposition of coarsely crystalline calcite and minor amounts of zeolites.

ALTERATION

Typical lateral and vertical alteration patterns for epithermal deposits exist. There is an outer propylite zone, consisting of chlorite, epidote, calcite, and pyrite that grades inward to an argillic-phyllic zone consisting of sericite, montmorillonite, illite, and silica and finally there is a silicified core zone that is adjacent to the vein system and consists of silica, adularia, and/or albite. Hematite is ubiquitous but appears to be especially abundant in mineralized zones, as does manganese oxide. Locally there are zones of intense kaolinite+silica±alunite±sulphate alteration (for example, Alberts Hump area). Similar zones occur at the upper, low pH regions of other epithermal systems. Native gold, hematite, and minor pyrite have been observed in these silica-rich rocks. When they are mapped on a regional scale, they occupy a crude concentric fracture system and are indicative of a major collapse structure.

Bleaching appears to be more common in the hangingwall; chlorite is more common in the footwall. Epidote, pyrite, and laumontite are abundant in regionally altered zones.

GEOCHEMICAL SIGNATURES

Regional and detailed follow-up silt, soil, and rock geochemical surveys have been key tools in exploring for and delineating mineral deposits. They rank second only to good prospecting. Analyses for gold and silver alone have proven successful but lead, zinc, and copper are also useful. Values of anomalous gold in silts range from 20 ppb to 1 500 ppb, and silver from 3 ppm to 400 ppm. Silification is accompanied by anomalous values in rock geochemistry.

As mentioned earlier, these mineralized systems appear to be relatively free of contaminants such as arsenic and antimony. On a detailed basis, the writer believes that mercury might be a useful pathfinder, especially if the analyses were properly done in the field.

PROPERTIES

BAKER MINE (previously Chappelle)(MDI No. 094E/026)

The Baker gold-silver mine, formerly Chappelle, is currently operating at a rate of 100 tons per day. Published mineable reserves are 100,000 short tons containing 0.92 troy ounce of gold and 18.7 troy ounces of silver per ton. During the fall of 1980, surface cut mining down to about 6 metres was carried out. Since then underground mining has been in progress from the 5500 level and development work has proceeded on the 5400 level.

Seven quartz vein systems, mostly occupying fault zones, have been identified in the area of the mine. The main vein (Vein A) actually consists of two or more subparallel veins that have been traced more than 435 metres, have a width of 10 to 70 metres, and have a vertical depth of at least 150 metres. Individual veins within the system vary from 0.5 metre to greater than 9 metres in width. A variety of quartz vein textures and crosscutting relationships indicate a complex history of mineralization with multiple stages of deposition. Fine-grained acanthite, pyrite, electrum, chalcopyrite, bornite, native gold, sphalerite, galena, chalcocite, covellite, polybasite, and stromeyerite occur in this highly fractured and brecciated quartz system in Takla Group andesite and dacite (see Barr, 1980 for detailed description). Higher grade mineralization is most obviously associated with grey quartz, some of which contains visible acanthite. Alteration minerals include pervasive laumontite, chlorite, pyrite, anhydrite, and silica. It is interesting to note that one sample of high-grade ore assayed 0.23 per cent molybdenum. During 1981, dore bullion with a 95-per-cent precious metal content that contained approximately 950 ounces per ton silver and 50 ounces per ton gold, with minor copper, lead, and zinc, was

shipped directly from the minesite by air to Vancouver. Results from an additional surface diamond-drilling program totalling over 1 500 metres on surrounding quartz vein systems were discouraging.

LAWYERS

The Lawyers gold-silver deposit is located approximately 15 kilometres north of Baker mine and is now connected by a four-wheel-drive access road. To date some 40 surface diamond-drill holes on a three-tier system have been completed and the Amethyst gold breccia zone has been traced over a north-south length of 610 metres, a width of 60 to 75 metres, and a vertical depth of 75 metres. Recently Serem Ltd. completed an underground program consisting of approximately 730 metres of adit, five crosscuts, and minor drifting from the 1750 level approximately 110 metres below the highest surface expression.

This preliminary underground work has outlined mineralization along a length of 200 metres with a maximum width in any single silicified system of 20 metres. Underground drilling is planned for next season.

Fine-grained acanthite, electrum, and native silver, with minor pyrite, chalcopyrite, galena, and sphalerite, occur in a gangue of amethystine to white quartz and adularia with minor amounts of calcite. Secondary minerals include malachite, chalcocite, and cerussite. The structurally controlled, steeply dipping, brecciated, silicified, and mineralized zones are located in a sequence consisting of green quartz-eye footwall andesitic tuff overlain by aphanitic chocolate brown tuff, welded tuff, and orange trachyte. The orange trachyte generally occurs at stratigraphically and topographically high elevations within the Toodoggone area. Younger altered mafic phonolite dykes cut the entire sequence. Specular hematite and manganese oxide are common alteration products. Typical open-spaced epithermal textures occur within the fissure zone. Grades of mineralization are erratic but some assays exceed 20 ounces per ton gold and 700 ounces per ton silver.

The geologic environment at Lawyers in particular has many similarities to epithermal deposits in Nevada, Colorado, and Mexico.

The Cliff Creek breccia zone is located approximately 2 kilometres west of the Amethyst gold breccia zone. It has been traced for several kilometres on surface. Assay results are good and this zone represents an interesting target for drilling. To date only a few holes have been drilled. The geologic setting is identical to that at Lawyers.

JD (McClair) (MDI No. 094E/032)

The Schmitt and Carbonate Breccia showings on the Texasgulf (Kidd Creek Mines Ltd.) JD claim are located on a ridge immediately south of McClair Creek and north of Kodah Lake. Fissure zones of rebrecciated, mineralized rock occur within a sequence of massive, varicoloured green,

grey, brown, and maroon feldspar and hornblende porphyritic andesite, trachyte, and latite tuffs of the middle volcanic division of the Toodoggone volcanic series. Locally, tuffaceous agglomerate and volcanic breccia exist. Attendant alteration zones include kaolinite, gypsum, and pyrite with conspicuous manganese oxide and jaspery hematite. Rounded to subangular fragments of quartz, chert, jasper, and sulphides (including galena, sphalerite, chalcopyrite, and pyrite) occur in a fine-grained matrix of brecciated and silicified tuff. Assays are erratic with some as high as 9.5 ounces per ton gold and several hundred ounces per ton silver. Gangue minerals include amethystine to white quartz, calcite, and minor amounts of barite. To date, only limited surface blasting has been carried out; a much more aggressive program including diamond drilling is planned for next year.

ALBERTS HUMP, GOLDEN FURLONG, RIDGE

The Alberts Hump area includes an area bounded by Alberts Hump - Tuff Peak and the Metsantan prospect. It may be underlain by a collapsed structure (for example, volcanic core) which is now expressed on the surface by a roughly concentric broken ring of massive silica±kaolinite±sulphate-bearing rocks. These may be examples of ancient hot springs indicative of the uppermost part or 'cap' of an epithermal or high-level hydrothermal system. Hematitic fracturing with erratically distributed native gold exists. The host rocks include typical hornblende-feldspar andesitic tuffs of the middle volcanic division of the Toodoggone volcanic series. Significant zones containing alunite (especially Alberts Hump) occur within this area. A K-Ar age date on alunite from Alberts Hump yielded 190±7 Ma. This date for alteration is compatible with other age dates obtained for Toodoggone volcanic rocks in the area. Consequently, these deposits are Early Jurassic, significantly older than most other epithermal deposits. Erratic gold and silver values have been obtained from altered zones but much more detailed work is required to fully understand this area.

METSANTAN

The Metsantan prospect is located on the southeast flank of a mountain immediately east of the abandoned Indian village of Metsantan. During 1980-81 Lacana Mining Corporation identified six zones of mineralization. They have an overall northwesterly trend, having been traced over 1 100 metres in length and 300 metres in width and may have a vertical range of 200 metres. Zones of higher grade mineralization range from 4 to 7 metres in width. Present indications are that higher gold values at surface give way to higher silver values at depth. Base metal mineralization, which includes chalcopyrite, galena, and sphalerite, is associated with orange trachytic tuff and appears to be more abundant at Metsantan than elsewhere in the Toodoggone. Gold and silver values are associated with pyrite, specular hematite, and sericite. The largest zone, the Metsantan gold breccia zone, has been

traced and sampled by hand-dug and blasted trenches along a length of 600 metres and across a width of 120 metres. Diamond drilling is planned for next year. Gangue minerals include amethystine to white quartz, kaolinite, and barite.

MOOSEHORN

The Moosehorn prospect of Great Western Petroleum Corp. is in Moosehorn gulley, approximately 2 kilometres upstream from the junction with the Toodoggone River. Amethystine to white quartz and pyrite occur in two silicified zones that are 450 metres in length and 1 to 5 metres in width. The veins are in typical Toodoggone hornblende-feldspar andesitic tuffs.

OTHER PROSPECTS

Other epithermal prospects in the belt with surface showings include:

(1) Mount Graves - a quartz-amethyst stockwork in Toodoggone and Hazelton volcanic rocks.

(2) Silver Pond - a large altered zone which may represent a leached cap zone.

(3) Mess - a massive barite-galena vein.

(4) Kem (Attycelly) - a galena, sphalerite, and barite 'vein.'

(5) Shas - gold-silver mineralization in a stockwork.

(6) Saunders - a gold anomaly and chalcopyrite, pyrite, sphalerite, and molybdenite in quartz veins in Toodoggone volcanic rocks.

(7) Pillar West - gold-silver mineralization in a silicified zone in Toodoggone volcanic rocks.

PLACER GOLD

Tamarik Ltd. conducted preliminary studies that included shallow blasting and overburden drilling on many placer leases covering the McClair and Toodoggone Rivers. Gold found is very fine. Work is scheduled to continue next year.

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