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February 1, 1977

TO: MR. W.M. SIROLA

FROM: MR. T. TAKEDA

SUBJECT: PRELIMINARY STUDY ON THE SEMI-REGIONAL GEOLOGICAL STRUCTURE OF THE COAL SEAMS - BEARING TANTALUS FORMATION NEAR WALSH CREEK, YUKON TERRITORY

1. SUMMARY

(i) The property includes known coal occurrence at Jumpout Creek on the Coal Exploration Licence No. 58. However, no detailed information is available due to insufficient prospecting in the past by Atlas Exploration.

(ii) The coal seams bearing Tantalus formation with a general northeasterly dip is exposed in two major blocks for a distance of 19 km (12 miles) or more and 0.5 km (1/3 mile) wide in the plan.

(iii) A maximum thickness of 480 m (1,600 feet) is estimated near the eastern contact where a southwestward over-thrusting might have caused intense deformation near the thrust plane.

If the Bostock's information (Geol. Survey of Canada Memoir 217) is correct, the Tantalus formation may thin out towards the west unless preserved by a down-throw fault near the Big Salmon River.

(iv) Two geologic profiles were prepared to illustrate the assumed geological setting of the Tantalus formation on the property.

(v) Exploration camp must be serviced by air, preferably by float equipped aircraft. Landing site must be sought in the Big Salmon River as close as possible to the known coal occurrence.

Stereoscopic study of airphotos covering the licenced area is required for this purpose.

2. PURPOSE OF THE STUDY

To summarize Geological structure on an 8 km x 20 km (4 mile x 12 mile) strip of the Tantalus Formation as a potential source of thermal coal for generating electric power and drying concentrates for the operation of the Grum Deposit.

3. REFERENCE

(i) G.S.C. Memoir 217: Laberge Map-Area, Yukon (1938)
by Bostock, H.S. and Lees, E.J.

(ii) G.S.C. Memoir 352: Geology of Glenlyon Map-Area, Yukon Territory (1967)
by Campbell, R.B.

(iii) G.S.C. Information: Coal in the Yukon (1973)
by Milner and Craig

(iv) G.S.C. Paper 50 - 14: Potential Mineral Resources of Yukon Territory
by Bostock, H.S.

4. COAL EXPLORATION LICENCES

Granted to Kerr Addison Mines Ltd.

No. 58* ..... Lat. $61^{o}52'30"$ - $62^{o}0'0"$N, Long. $134^{o}30'$ - $134^{o}45'$W

No. 59* ..... Lat. $61^{o}52'30"$ - $62^{o}0'0"$N, Long. $134^{o}45'$ - $135^{o}0'$W

No. 60* ..... Lat. $61^{o}45'$ - $61^{o}52'30"$ Long. $134^{o}30'$ - $134^{o}45'$W

* Each licensed area is 13 km (E - W) and 14 km (N - S) (8 miles E - W and 8.5 miles N - S) in size approximately.

5. LOCATION AND ACCESS

The property lies approximately 125 km (80 miles) north of Whitehorse between Little Salmon Lake and Lake Laberge.

The Big Salmon River flows northwesterly through the southwestern part of the property and joined to the meandering Lewes River as the headwater of the Yukon River, at the abandoned trade post of Big Salmon.

An all-weather road of Robert Campbell Highway passes the north shore of the Little Salmon Lake, which is located roughly 32 km (20 miles) north of the property.

Elevation is between 1,800 feet and 4,200 feet above sea level. There is no land access through the swampy areas and an exploration camp must be serviced by air either by helicopter or by float equipped aircraft. In the

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latter case, a landing site should be sought in the Big Salmon River as close as possible to the known coal occurrence in Coal Exploration Licence #58. Reportedly, ice breaks up in the river in early May, but the lakes generally remain frozen until late May. Freeze-up begins in October.

6. GEOLOGY

The property is underlain by the rock units, including Nos. 6,7,16,17?, 18,19,20,21,22 and 23 as per attached Table of Formations.

The oldest formation in the area is fossiliferous limestone (unit 6 and 7) which occurs 6.5 km (4 miles) south of Big Salmon (abandoned trade post).

Mesozoic sediments with minor occurrences of volcanics, conglomerate and coal seams are separated by a possible fault zone, from the NNW - SSE trending metamorphic belt on the northeast side which comprises metamorphic rock units 6 and 7 as well as small stocks of granitic rocks.

Reportedly, volcanism was widespread in the region during and after the Late Palaeozoic and prior to the Late Triassic. Stratigraphic sequence indicating volcanic activities and occurrence of basal conglomerate consisting of volcanics and granitic material suggests an event of episogenic crustal movement during the Mesozoic period.

The Laberge formation of Lower Jurassic and (?) later, represents the sedimentary facies as a result of considerable uplift in the trough. The Tantalus formation is possibly underlain by the Laberge formation with unconformed base contact, and represents a rather terrestrial facies of sediments including coal seams.

By later deformation and faulting, this small coal basin is now exposed over a V-shaped area of 24 km (15 miles) wide (max.) and 80 km (50 miles) long with an opening to the northwest. Major coal occurrence on the property lies at the Walsh Creek on the eastern limb, whereas sporadical coal occurrences at Mason's Landing, Hootalinqua and Claire Creek form the larger western limb.

According to Bostock (Memoir 217) later movement caused an overthrusting of limy unit No. 17 (Lewes River Series) westward over the younger Tantalus formation, near the northeastern edge of the above-mentioned terrestrial coal basin.

There was minor intrusion of small granitic stocks into the Laberge formation of Lower Jurassic and (?) later age (No. 18), but its definite age is unknown.

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Another crustal movement is assumed during the Cretaceous to Early Tertiary age, and introduced extensive uplifting to allow the area for erosion. Re-juveniled basic volcanic activities comprise mainly lava flows and pyroclastics of sub-aerial eruption origin, as well as minor occurrence of acidic porphyry dykes and of terrestrial sediments.

There have been several epochs of glaciation during Tertiary and Quarternary.

7. DETAILED GEOLOGICAL STRUCTURE OF THE TANTALUS FORMATION

In an attempt to assume a geological setting and possible thickness of the coal seams bearing Tantalus formation, two profiles were prepared along Section Lines N20°E - S20°W and N60°E - S60°W respectively across the property. Common datum point is at the intersection of Lat. 61°45'N and Long. 135°W.

The licenced area includes an assumably northeasterly dipping block of Tantalus formation for a distance of 19 km (12 miles) or more, and 0.5 km (1/3 mile) wide in the plan.

If the Bostock's description and mapping are correct, an assumed overthrust bounds the eastern outline of the Tantalus formation on the surface, while the western limit may be defined by the possible unconformity with the underlying Laberge formation although the direct contact is masked by the capping of Tertiary volcanics (Unit No. 22).

Maximum thickness of 480 m (1,600 ft.) is assumed for the Tantalus formation towards the east below the overthrust zone with intense deformation and disturbance near the contact, and the formation may gradually thin out to the west unless there is a fault along the Big Salmon River to preserve the Tantalus formation in the down-throw block.

This geological setting is illustrated in two profiles attached to this memo.

8. DATA TO ACCOMPANY

(i) Index Map

(ii) Excerpt from "Coal in the Yukon"
by Milner and Craig. 1973 pp. 12 - 13

(iii) Table of Formations (Stratigraphic sequence of rock units)
by Campbell, R.B. (G.S.C. Memoir 352) 1967

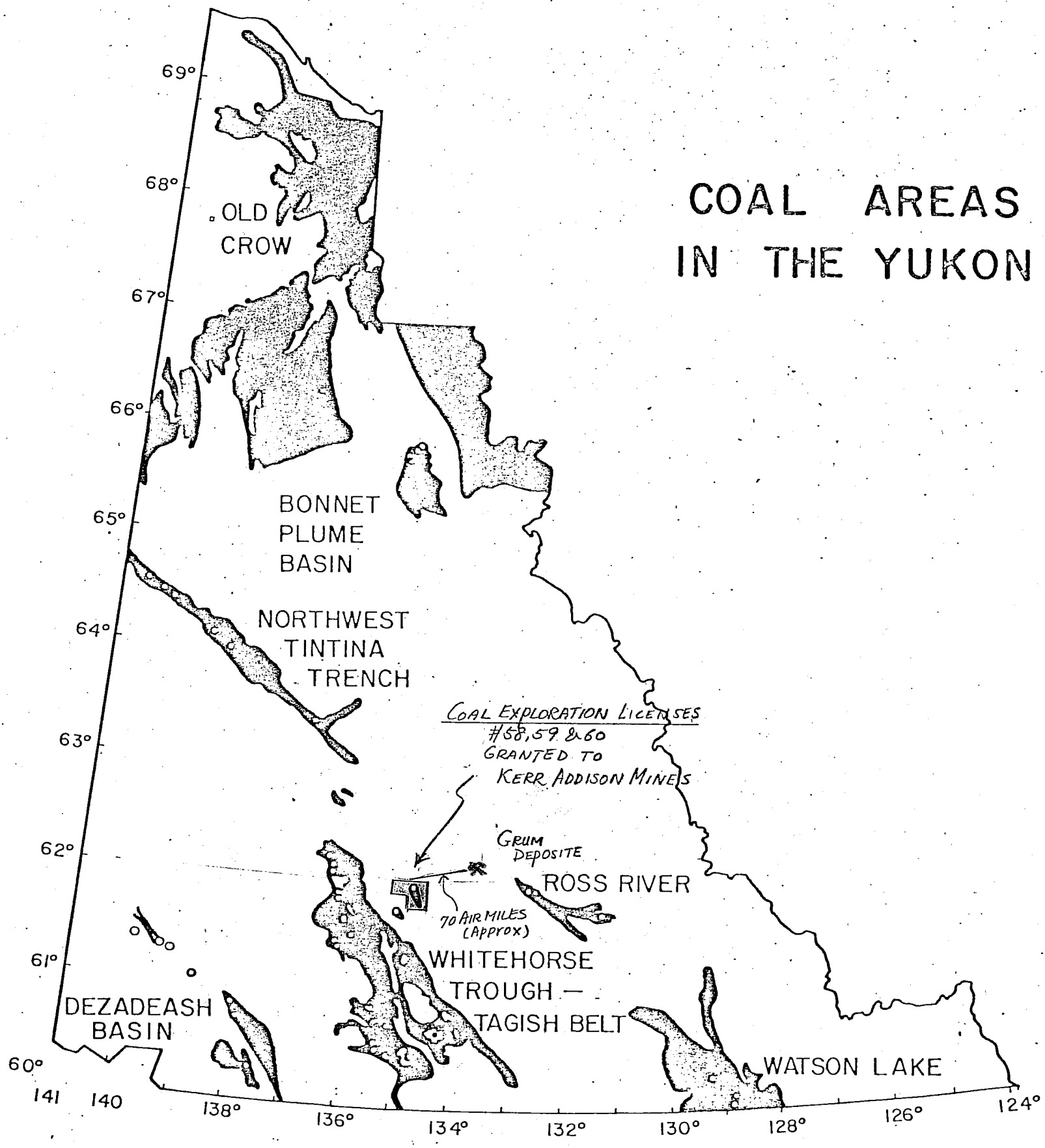
(iv) Geologic Profiles: Horizontal scale 1 inch = 4 miles
Vertical scale 1 inch = 2,000 feet

(a) N20°E - S20°W
(b) N60°E - S60°W

Respectfully submitted

Tats Takeda

TATS TAKEDA


COAL AREAS IN THE YUKON
69°
68°
67°
66°
65°
64°
63°
62°
61°
60°
141
140
138°
136°
134°
132°
130°
128°
126°
124°
OLD CROW
BONNET PLUME BASIN
NORTHWEST TINTINA TRENCH
COAL EXPLORATION LICENSES #58, 59 & 60 GRANTED TO KERR ADDISON MINES
GRUM DEPOSITE
ROSS RIVER
70 AIR MILES (Approx)
WHITEHORSE TROUGH — TAGISH BELT
DEZADEASH BASIN
WATSON LAKE
JANUARY 10, 1977

Excerpt from "Coal in the Yukon"

by Milner and Craig 1973 pp 12 - 13.

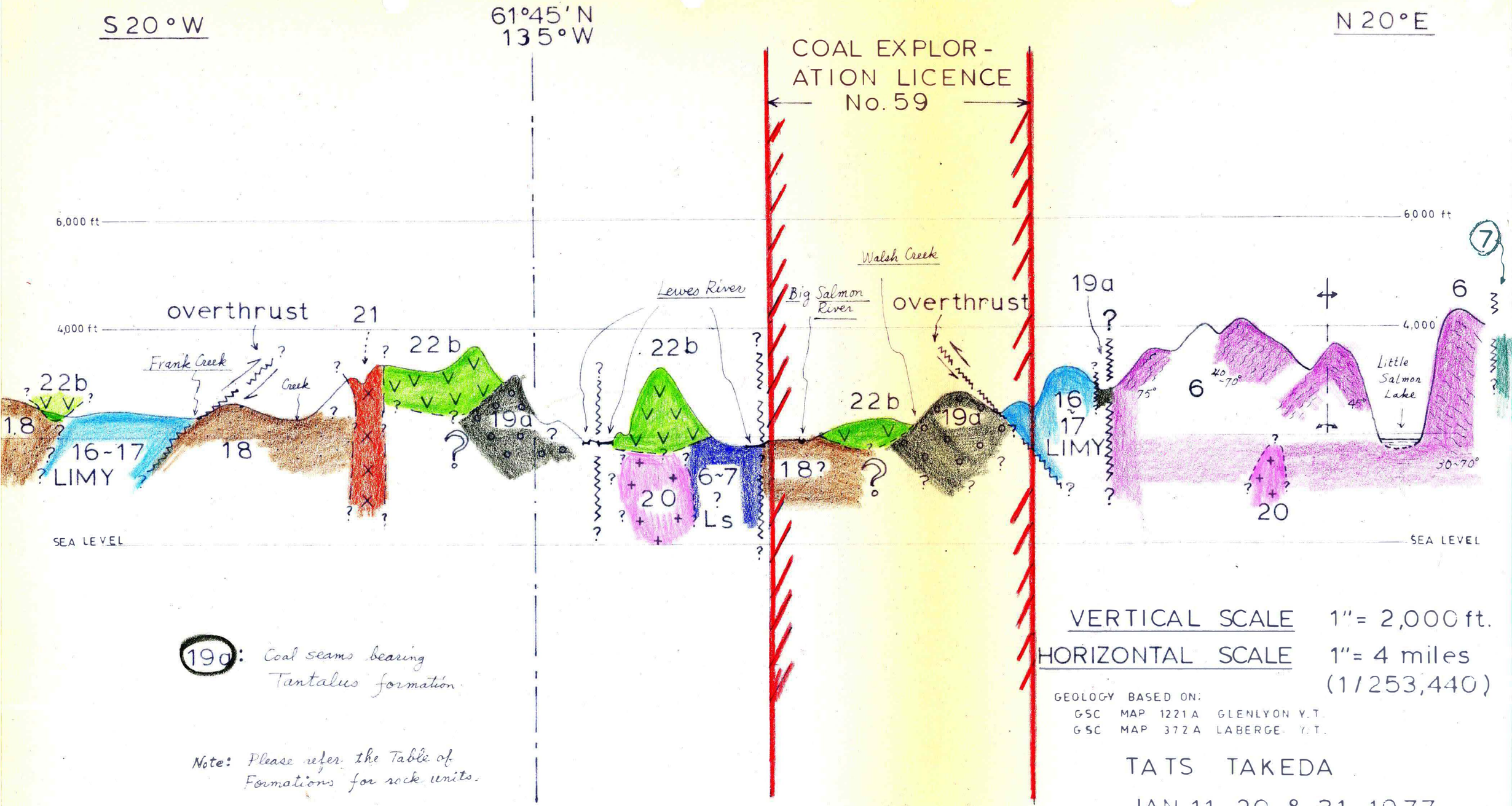
The Big Salmon Area (61°57'N, 134°47'W) has been known for some time as a coal occurrence on Jumpout Creek, a tributary to Walsh Creek. It was recommended by Mackay for drilling as the stratigraphy was favourable and the exposure poor. Work by J.F. George in 1970 for Atlas Exploration has provided very little new information and because of poor exposure and the recessive nature of the coal measures he recommended drilling. Coal was observed in slumped material north of a 100-foot cliff of conglomerate on the south side of Walsh Creek. Coal occurs as stream gravel and in slides and slumps along Jumpout Creek and in outcrop as 2 inch strips in siltstone.

Bostock and Lees (1936) suggest that this is a single coal basin with Tantalus Formation in the order of 1,000 feet and an area 25 miles long and 3 miles wide.

Coal was also reported from the early days at or near Hootalinqua (61°36'N,134°53'W) and Mason's Landing (61°25'N,134°53'W).

Table of Formations

Era	Period or Epoch	Formation or Map-unit	Lithology	Formation or Map-unit	Lithology
		Southwest of Tintina Trench		Northeast of Tintina Trench	
Cenozoic	Pleistocene and Recent	23	Recent stream deposits; gravel, sand and silt: glacial deposits; till, gravel, sand, silt, clay: bog deposits and volcanic ash	23	Recent stream deposits; gravel, sand and silt: glacial deposits; till, gravel, sand, silt, clay: bog deposits and volcanic ash
			Unconformity		Unconformity
	Tertiary	22	Basaltic and trachytic flows and breccia; conglomerate and shale		
			Relation of unit 22 to 21 unknown; unconformable on other units		
		21	Quartz-feldspar porphyry	21	Rhyolite (quartz) porphyry
			Intrusive contact; relation of unit 21 to unit 20 unknown		Intrusive contact; relation of unit 21 to unit 20 unknown
Mesozoic	Jurassic and/or Cretaceous and (?) earlier	20	Granodiorite, quartz monzonite, quartz diorite, syenite, diorite, basic rocks, and gneissic granodiorite	20	Granodiorite, quartz monzonite, and quartz diorite
			Intrusive contact; relations to unit 19 unknown		Intrusive contact; relations to unit 19 unknown
	Upper Jurassic and Lower Cretaceous (?)	Tantalus Group(?) 19a	Chert-pebble and chert-cobble conglomerate and sandstone	Tantalus Group(?) 19b	Conglomerate, shale, and sandstone
			Base not exposed		Base not exposed; possible fault contacts
	Lower Jurassic and (?) later	Laberge Group 18	Arkose, conglomerate, sandstone, siltstone, and argillite		
			Relations uncertain; possibly unconformable on Lewes River group		
	Upper Triassic	Lewes River Group 17	Andesite, basalt, limestone, conglomerate, and greywacke		
			Base not exposed		
	Upper Triassic or (?) earlier	16	Andesitic and basaltic volcanic rocks; minor rhyolite, argillite, and limestone		
			Relations unknown	Anvil Range Group 15	Andesitic and basaltic flows, breccia, and tuff, diorite, slate, phyllite, slaty limestone, chert, and carbonaceous shale
Palaeozoic	Mississippian or later				
		14	Serpentinite		Possible unconformable contact
			Intrusive and/or fault contacts with rocks of unit 7		
	Lower Mississippian or later			Earn Group (10-13) 13	Thin-bedded chert, argillite, quartzite, and minor limestone
					Conformable contact
	Lower Mississippian			Kalzas Formation 12	Limestone; minor argillite and chert
					Conformable contact
	Lower Mississippian and/or earlier			Crystal Peak Formation 11	Chert-pebble and chert-cobble conglomerate and breccia; minor quartzite
					Possible unconformable or disconformable contact
				10	Chert, argillite, quartzite, limestone, and chert conglomerate
					Possible unconformable contact
	Mississippian(?) or earlier	9	Chert-pebble and chert-cobble conglomerate, slate, sandstone, greenstone, tuff, limestone, and hornfels		
			Unconformable contact with units 2 to 5; relation to units 6 and 7 unknown		
		8	Slate, argillite, chert, quartzite, lime-silicate rocks, limestone, greenstone		
			Relations unknown; fault contacts in part		
		6 and 7	Greenstone, greenschist, quartz-sericite and quartz-chlorite schist, quartzite, limestone, amphibolite, quartz-mica schist, argillite, and phyllite		
			Contacts not exposed; fault contacts in part		
	Silurian(?) and Devonian(?)	Askin Group(?) 5	Quartzite, dolomitic quartzite, dolomite, siliceous dolomite, limestone, slate, and argillite		
			Base not exposed; may have conformable contact with unit 4		
	Middle Cambrian(?) and later	Harvey Group (2-4) 4	Slate, phyllite, spotted slate, hornfels, argillite, and limestone		
			Conformable contact		
	Lower Cambrian(?)	3	Limestone, phyllitic limestone, lime-silicate gneiss, phyllite, slate, and skarn		
			Conformable contact		
	Lower Cambrian(?) or earlier(?)	2	Quartzite, quartz-mica schist, marble, amphibolite, lime-silicate gneiss, and skarn		
			Base not exposed		
Pre-cambrian (?)	Proterozoic(?)			1	Red, green, and grey slate; quartzite
					Base not exposed



19a: Coal seams bearing Tantalus formation.

Note: Please refer the Table of Formations for rock units.

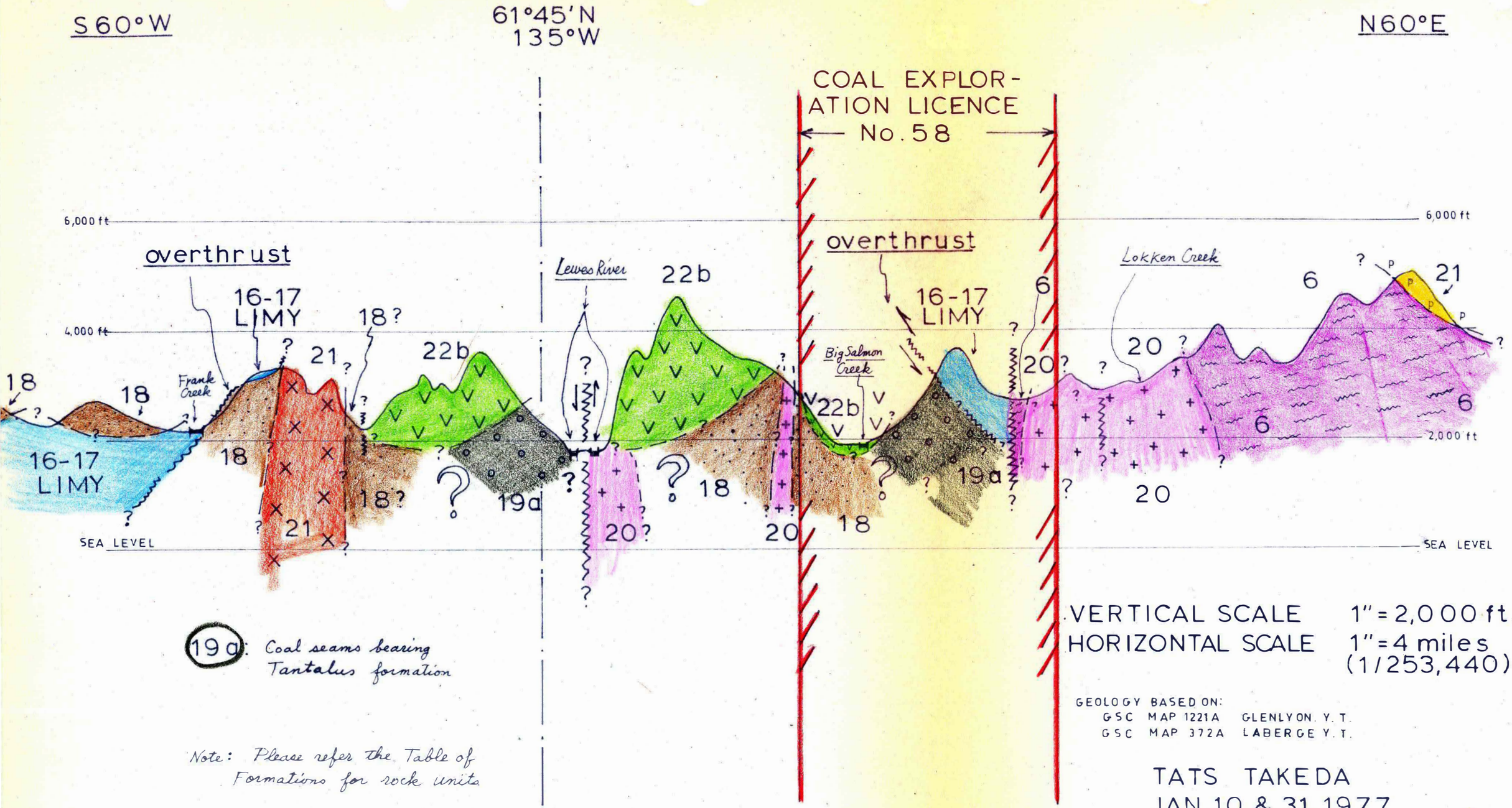
VERTICAL SCALE 1" = 2,000 ft.

HORIZONTAL SCALE 1" = 4 miles (1/253,440)

GEOLOGY BASED ON:
GSC MAP 1221A GLENLYON Y.T.
GSC MAP 372A LABERGE Y.T.

TATS TAKEDA

JAN. 11, 20 & 31, 1977


S60°W
61°45'N
135°W
N60°E
COAL EXPLOR-
ATION LICENCE
No. 58
6,000 ft
4,000 ft
2,000 ft
SEA LEVEL
overthrust
16-17
LIMY
18?
21
22b
Lewes River
Frank Creek
18
19a
20?
20
Big Salmon Creek
Lokken Creek
6
?
P
21
6
19a: Coal seams bearing Tantalus formation
Note: Please refer the Table of Formations for rock units
VERTICAL SCALE 1" = 2,000 ft.
HORIZONTAL SCALE 1" = 4 miles
(1/253,440)
GEOLOGY BASED ON:
GSC MAP 1221A GLENLYON, Y.T.
GSC MAP 372A LABERGE Y.T.
TATS TAKEDA
JAN. 10 & 31, 1977

Geology and topography by W. E. Cockfield (in charge), 1929, 1930; E. J. Lees, 1929, 1930, 1931; and H. S. Bostock, 1934.

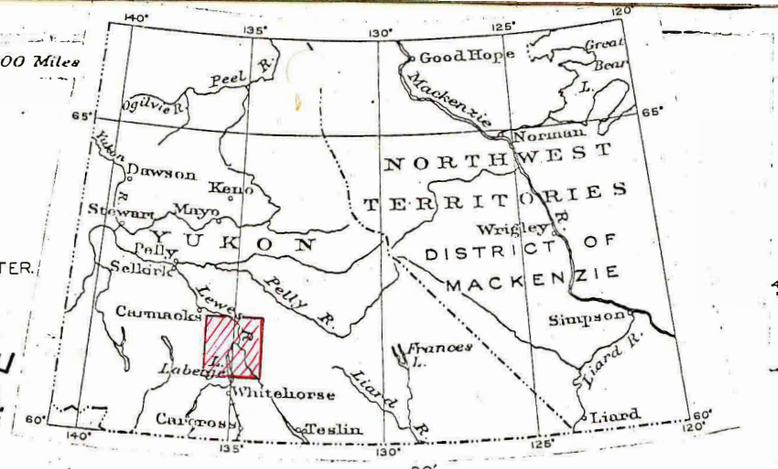
Scale, 1 Inch to 200 Miles

Canada
Department of Mines

HON. T. A. CRERAR, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER.

BUREAU OF ECONOMIC GEOLOGY
GEOLOGICAL SURVEY

Issued 1936



MAP 372A

LABERGE SHEET
YUKON TERRITORY

Scale, 1/253,440 or 1 Inch to 4 Miles

Miles: 4 0 4 8 12

Kilometres: 5 0 5 10 15

Contour interval 500 Feet

SEC. N.20°E

SEC. N.60°E

135°00′ 45′ 30′ 15′ 134°00′ 62°00′

59

GRANTED AREA OF COAL EXPLORATION LICENCE

MESOZOIC

9	HUTSHI GROUP: andesite, basalt; lava, breccia, tuff
8	TANTALUS FORMATION: conglomerate, sandstone, shale, coal seams
JURASSIC	
7	NORDENSKIÖLD FORMATION: dacite, tuff, breccia
6	LABERGE SERIES: conglomerate, greywacke, sandstone, argillite, coal seams
TRIASSIC	
5	LEWES RIVER SERIES: limestone
4	LEWES RIVER SERIES: sandstone, argillite
	Note. Section is limestone top, sandstone, argillite middle, limestone base. In places, several horizons of limestone, sandstone, argillite interbedded
PRECAMBRIAN OR LATER	
1	Quartzite, schists, limestone, gneiss, greenstone