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Ministry of Energy, Mines & Petroleum Resources
Mining & Minerals Division
BC Geological Survey

Assessment Report
Title Page and Summary

TYPE OF REPORT [type of survey(s)]: STUDIES OF HYDROTHERMAL ALTERATION, AND SOIL MOLYBDENUM ANOMALIES, AND SEDIMENT SAMPLING

TOTAL COST: $35,872.23

AUTHOR(S): JOHN OSTLER; M.Sc., P.Geo.

SIGNATURE(S): John Ostler

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S):

YEAR OF WORK: 2016

STATEMENT OF WORK - CASH PAYMENTS EVENT NUMBER(S)/DATE(S): EVENT 5618570

PROPERTY NAME: MANTLE

CLAIM NAME(S) (on which the work was done): MANTLE 1 (1040280), MANTLE 2 (1040285), MANTLE 3 (1042507), MANTLE 4 (1042508)

COMMODITIES SOUGHT: COPPER, MOLYBDENUM, SILVER, GOLD

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN: 103 I 103, 103 I 709

MINING DIVISION: SKEENA

NTS/BCGS: N.T.S: 103 I/1 + [illegible] BC: 103I 019 + 020

LATITUDE: 54 ° 8 ' 14 " LONGITUDE: 128 ° 12 ' 6 " (at centre of work)

OWNER(S):
1) JOHN DAVID OSTLER (FMC 120383)
2)

MAILING ADDRESS:
1015 CLYDE AVENUE
WEST VANCOUVER BC V7T 1E3

OPERATOR(S) [who paid for the work]:
1) JOHN OSTLER
2)

MAILING ADDRESS:
1015 CLYDE AVENUE
WEST VANCOUVER BC V7T 1E3

PROPERTY GEOLOGY KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralization, size and attitude):
STOCKWORK AND DISSEMINATED COPPER AND MOLYBDENUM MINERALIZATION IN EOCENE-AGE SODA GRANITE (QUARTZ MONZONITE) AND QUARTZ-FELDSPAR PORPHYRY

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS: GSC MEM. 329, GSC MAPS 1136A, 1385A; BCGS PAPER 2009-1; AR, 775, 818, 819, 1000, 7928, 12868, 14011, 15104

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TYPE OF WORK IN THIS REPORT	EXTENT OF WORK (IN METRIC UNITS)	ON WHICH CLAIMS	PROJECT COSTS APPORTIONED (incl. support)
GEOLOGICAL (scale, area)	34.8 ha at 1:10,000	MANTLE 1 (1040280)	
Ground, mapping	ALTERATION MAPPING + INTERP.	MANTLE 2 (1040285) MANTLE 3 (1042507)	
~~Photo interpretation~~	OF SOIL-MOLYBDENUM ANOMALIES	MANTLE 4 (1042508)	$28848.93
GEOPHYSICAL (line-kilometres)			
Ground			
Magnetic			
Electromagnetic			
Induced Polarization			
Radiometric			
Seismic			
Other			
Airborne			
GEOCHEMICAL (number of samples analysed for...)			
Soil			
Silt	5 PAN CONCENTRATES: ICP ME-MS61L	MANTLE 1 (1040280) MANTLE 2 (1040285)	
Rock	ANALIZED FOR 45 ELEMENTS	MANTLE 4 (1042508)	$4804.15
Other			
DRILLING (total metres; number of holes, size)			
Core			
Non-core			
RELATED TECHNICAL			
Sampling/assaying			
Petrographic			
Mineralographic			
Metallurgic			
PROSPECTING (scale, area)			
PREPARATORY / PHYSICAL			
Line/grid (kilometres)			
Topographic/Photogrammetric (scale, area)			
Legal surveys (scale, area)	CUT HELICOPTER ACCESS		
* Road, local access (kilometres)/trail	PAD 0.1 ha	MANTLE 2 (1040285)	2219.15
Trench (metres)			
Underground dev. (metres)			
Other			
		TOTAL COST:	$35872.23

CASSIAR EAST YUKON EXPEDITING LTD.

STUDIES OF HYDROTHERMAL ALTERATION AND SOIL-MOLYBDENUM ANOMALIES, AND SEDIMENT SAMPLING ON THE MANTLE PROPERTY

Map-staked Claims

Claim Name	Area	Claim Number
MANTLE 1	**360.05 ha. (889.32 A.)**	**1040280**
MANTLE 2	**303.08 ha. (748.61 A.)**	**1040285**
MANTLE 3	**170.49 ha. (421.11 A.)**	**1042507**
MANTLE 4	**151.64 ha. (374.55 A.)**	**1042508**
Total Area	**985.26 ha. (2,433.59 A.)**	

UNDERLINE denotes claims worked on

Owner:

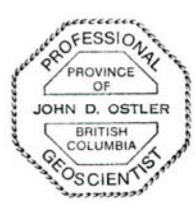
John David Ostler
1015 Clyde Avenue
West Vancouver,
British Columbia
V7T 1E3

Location:
Skeena Mining Division
N.T.S.: 103 I/1 B.C.: 103I 019, 020
54° 8' 14"N., 128° 12' 6" W.
U.T.M.: 5,999,097 N., 552,156 E.

By:

John Ostler; M.Sc., P.Geo., Consulting Geologist

September 15, 2016



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continued

STUDIES OF HYDROTHERMAL ALTERATION AND SOIL-MOLYBDENUM ANOMALIES, AND SEDIMENT SAMPLING ON THE MANTLE PROPERTY

SUMMARY

The Mantle property covers a lower part of the western slope of the upper Kitimat River valley. The property is located in the Kitimat Range of the Coast Mountains in northwestern British Columbia.

The property area comprises 4 map-staked claims covering 985.26 hectares (2,433.59 acres), in the Skeena Mining Division, in the Regional District of Kitimat-Stikine, and in the Coast Land District Range 5. The Mantle property is owned by John David Ostler, the author of this report. It is on N.T.S. map sheet 103 I/1 and on B.C. map sheets 103I 019 and 020.

No part of the Mantle property covers private land or aboriginal homelands. The closest reserve to the property is the No. 5 Iugwees (Minette Bay) Indian Reserve which is located in Haisla territory about 22.9 km (14.42 mi) west-southwest of the of the western boundary of the MANTLE 3 (1042507) claim. The No.5 Reserve is about 4.4 km (2.7 mi) east of the Town of Kitimat. The property is located in area designated as Tsimshian territory. There is no plant or equipment, inventory, mine or mill structure of any value on these claims.

Elevations on the western part of the Mantle property range from 1,385 m (4,544 ft) on the ridge in the southwestern part of the MANTLE 3 (1042507) claim at the western margin of the property to 375 m (1,230 ft) on the Kitimat River flood plane at the eastern boundary of the MANTLE 2 (1040285) claim at the eastern boundary of the property area.

The claims are bounded to the east by Kitimat River. Adequate fresh water for a mining operation could be drawn from that and other local rivers.

The northwestern margin of the Mantle property is above tree line. Lower slopes on the property are covered with a dense forest of cedar, spruce, fir, and hemlock. Much of the forest near Kitimat River has been clear-cut recently. Although here is sufficient timber suitable for underground mining on the property, the exploration target there is a porphyry molybdenum and copper deposit that would be mined from an open pit. Thus, the availability of mining timber has little relevance on the Mantle property.

The property is remote from any power transmission lines. During development, power would have to be generated on site, or a transmission line would have to be built for about 38 km (23.2 mi) along the Upper Kitimat River forest service road.

Terrain in most of the property area is rugged. The slopes in much of the western part of the property are covered with scree and abundant rock outcrop. However, soil profiles in most of the property area are sufficiently mature to conduct total metal ion (traditional) soil surveys. Mobile metal ion soil surveys could be successful on higher slopes near the northwestern margin of the property. Total metal ion soil surveys have been used successfully in the property area during previous exploration programs.

The Terrace-Kitimat area experiences cold wet winters and cool, moderately dry summers. Winter snow falls in the property area by November and stays on the ground until April in open areas, and until July on shady northerly facing slopes at high elevations.

The Upper Kitimat River forest service road is currently used to access logging on the northern and eastern slopes of the upper Kitimat River valley. That road diverges eastward from B.C. Highway 37 south of Lakelse 28.3 km (17.26 mi) south of the junction of B.C. highways 16 and 37 at Terrace. There is a large log landing just up-river from the Hunter Creek bridge at Km 28.5 (Mi 17.4) on the Upper Kitimat River forest service road that could be used as a staging area for slinging into the Mantle property. Lamp Creek, located on the MANTLE 1 (1040280) claim, is directly across the valley from Km 37 (Mi 22.6) on the Upper Kitimat River forest service road.

There is a road that extends up the southern and eastern sides of the upper Kitimat valley that diverges from the Upper Kitimat River forest service road at Km 8 (Mi 4.9). The bridge across the river to the southern and eastern sides is still being used. Although, the roadbed beyond it is generally in good condition, it is disused and overgrown. The crossings of Gossan, Lamp, and Mantle creeks in the eastern part of the property are spanned by concrete and steel bridges that are still quite serviceable. Log bridges and culverts that spanned

minor crossings have been pulled out. A Bell 206 helicopter from Quantum Helicopters Ltd. was used to transport crew and equipment to the property directly from Terrace.

During the current (2016) program, an area of 0.1 ha (0.25 acres) was brushed out across a log yard located 100 m (328 ft) south of the Lamp Creek bridge to serve as a landing and camp area. A total of 5.8 km (3.54 mi) of traverse was conducted, mostly over difficult terrain. Assuming that results of exploration along traverse lines were relevant for 30 m (98.4 ft) on either side of a traverse line, alteration and the provenance of soil-molybdenum anomalies were investigated over a total area of 34.8 ha (86 acres). Five pan-concentrate samples were taken from Gossan, Lamp, Mantle, and South creeks.

Potassic alteration in quartz-feldspar porphyry at Gossan Creek is related to north-south trending, sub-vertical shears. In the porphyry matrix, potassic alteration occurs mostly as re-crystallization and overgrowth of potassium feldspar. Red-brown biotite and magnetite crystallization is less abundant. Early mafic and ‘A’-type quartz-potassium feldspar veins are most common in the areas of the shears. These veins have indistinct (plastic) margins that indicate that they were emplaced in a high temperature environment with temperatures varying from about 450 to 600°C. Veins in the porphyry have sparse, very fine-grained (<1 mm) pyrite, chalcopyrite, and molybdenite mineralization.

At Lamp Creek, potassium feldspar overgrowths of plagioclase occur in the matrices of both andesite and soda granite (quartz monzonite). Overgrowths are abundant also at Mantle Creek where only soda granite is exposed. Early mafic veins and ‘A’-type veins with indistinct margins are scarse. The most common veins present are narrow quartz-potassium feldspar veins with distinct (brittle) margins (‘B’-type veins). Also late pyritic veins with distinct (brittle) margins (‘D’-type veins) are present. These veins indicate that potassic alterations at Lamp and Mantle creeks was emplaced in a moderately hot environment with temperatures ranging from 350 to 450°C.

No copper or molybdenum mineralization was observed at Lamp Creek. At Mantle Creek, mineralization comprising mostly molybdenite occurred both in the margins of quartz-potassium feldspar veins and in the soda granite matrix. There, very fine-grained molybdenite was accompanied with sparse pyrite and chalcopyrite mineralization.

Potassic alteration appears to have developed in soda granite at Lamp and Mantle creeks under a cooler more brittle regime than it has in quartz-feldspar porphyry at Gossan Creek. It is deduced that potassic alteration formed after the soda granite had cooled sufficiently to support brittle deformation and while the quartz-feldspar porphyry was still sufficiently hot to be ductile. This indicates that the soda granite predates the quartz-feldspar porphyry and that the porphyry is most intimately related to potassic alteration and mineralization.

All of the rocks examined in Gossan, Lamp, and Mantle creeks have undergone potassic alteration. Thus, the core potassic alteration zone of the Mantle hydrothermal system exists as a single zone that extends for a north-south distance of at least 2.9 km (1.8 mi) from Gossan Creek to Mantle Creek. Its total extent remains unknown. The vertical extent of potassic alteration and mineralization is at least from 440 to 550 m (1,444 to 1,804 ft) as exposed in Mantle and Gossan creeks.

The rocks of Gossan, Lamp, and Mantle creeks have all been subjected to retrograde propylitic alteration after the development of potassic alteration had ceased. The propylitic alteration is best developed in Telkwa Formation andesite and hornfels where iron, magnesium, and calcium-bearing minerals are most common. Propylitic alteration is mostly visible as narrow epidote-biotite-hematite-chlorite-quartz-carbonate veins and smears on fractures. Commonly, propylitic alteration occupies the same general north-south fracture sets as the preceding potassic alteration. In the quartz-feldspar porphyry and soda granite (quartz monzonite) early mafic and pyritic veins are partly or completely altered to red hematite or orange-brown limonite.

The 1965-1966 AMAX soil surveys revealed that alteration and mineralization in both Gossan and Mantle creeks were associated with extensive soil-molybdenum anomalies in which concentrations exceeded 50 parts per million (ppm) molybdenum. Those anomalies were located in the following areas: atop the mineralized and altered bluffs south of Gossan Creek, down the slope toward Kitimat River east of the bluffs, on the hillside north of the mineralized and altered stockwork zones on Mantle Creek, and in an annex along the western slope of the Kitimat River valley southeast of Mantle Creek.

The main Gossan Creek soil-molybdenum anomaly is located directly atop altered and mineralized quartz-feldspar porphyry that forms the bluffs. It is deemed to have developed in place from weathering of underlying mineralized material.

Three smaller soil-molybdenum anomalies occur on the main slope of the Kitimat valley directly east of the main Gossan Creek anomaly in an area probably underlain by Telkwa Formation (Hazelton Group) meta-andesite. The slope comprises a series of steep sections and north-south trending benches. Soil-molybdenum anomalies on the benches are deemed to have been enriched by illuviation (concentration) of molybdenum-bearing soil material at the bases of the steep slope sections. They are presumed to be not entirely related to underlying mineralization.

The main Mantle Creek soil-molybdenum anomaly is located on the slope north of the creek. Gash Creek, a gossanous rock chimney of soda granite (quartz monzonite), cuts through the western part of the anomaly. East of Gash Creek, the anomaly is underlain by small sub-crops of altered, gossanous soda granite. The main Mantle Creek soil-molybdenum anomaly is deemed to have developed in place from weathering of underlying mineralized material.

The area of greater than 50 ppm molybdenum in soils crosses Mantle Creek and extends as a linear southeasterly trending annex along the main western slope of the Kitimat valley. That annex was not investigated during the current (2016) exploration program and its provenance remains unknown.

Analytical results of the 2016 pan concentrate samples formed two discernable populations. The one with higher copper and molybdenum concentrations was from Gossan and Mantle creeks which have exposed mineral showings. The population with lower copper and molybdenum concentrations was from Lamp and South creeks which have no recorded surface mineral showings.

The best results are from sample MC-15-PC which was taken from beneath the Gossan Creek bridge. It contains 287 ppm copper and 36.3 ppm molybdenum. Those concentrations are generally analogous with anomalous results from the 1965-1966 AMAX total metal ion soil survey around Gossan Creek.

Although soil anomalies with similar anomalous thresholds and mineralized showings occur in both Gossan and Mantle creeks, the copper and molybdenum concentrations in pan concentrates from Mantle Creek are only about two thirds of what they are in the Gossan Creek pan concentrate. This difference can be explained by a difference in the rates of erosion and material transport through the two creek profiles. Gossan Creek is floored by sediment throughout its whole length while the central part of Mantle Creek is floored by bare rock. The author opines that erosion and sediment transport, including the mineralized heavy mineral fraction, is sufficiently rapid in Mantle Creek to significantly depress pan concentrate results.

Sample MC-9-PC was taken at South Creek near the southeastern corner of the current Mantle property in an area that may be near the southern margin of the Mantle potassic alteration zone as may be reflected by the decline in soil-molybdenum concentrations in that area. That pan concentrate contains 40.8 ppm copper and 4 ppm molybdenum. Those concentrations are only slightly elevated above those from a typical soil sample taken from an unmineralized soil.

The area adjacent to Lamp Creek hosts potassic alteration but no known copper or molybdenum showings. Pan concentrations of copper and molybdenum from the Lamp Creek sample are only slightly higher than those of the sample from South Creek and much lower than those of the samples taken from Gossan and Mantle creeks.

These results demonstrate that pan concentrate surveys are useful in identifying mineralized drainages in the regime of high rainfall and rapid erosion that is present in the Kitimat area of northwestern British Columbia.

It is recommended that a helicopter-borne magnetic and radiometric survey be flown over the Mantle property to explore the areal extent of the potassic alteration zone and to identify details within it that could be used to discern the shapes and locations of any plumes or channels of potassic alteration and mineralization that could be present. Any significant anomalies identified by the helicopter-borne magnetic and radiometric survey should be investigated on the ground by a geologist with an assistant. The estimated cost of the recommended work program is $116,934.

STUDIES OF HYDROTHERMAL ALTERATION AND SOIL-MOLYBDENUM ANOMALIES, AND SEDIMENT SAMPLING ON THE MANTLE PROPERTY

1.0 INTRODUCTION

1.1 Duration and Management of the Current (2016) Work Program

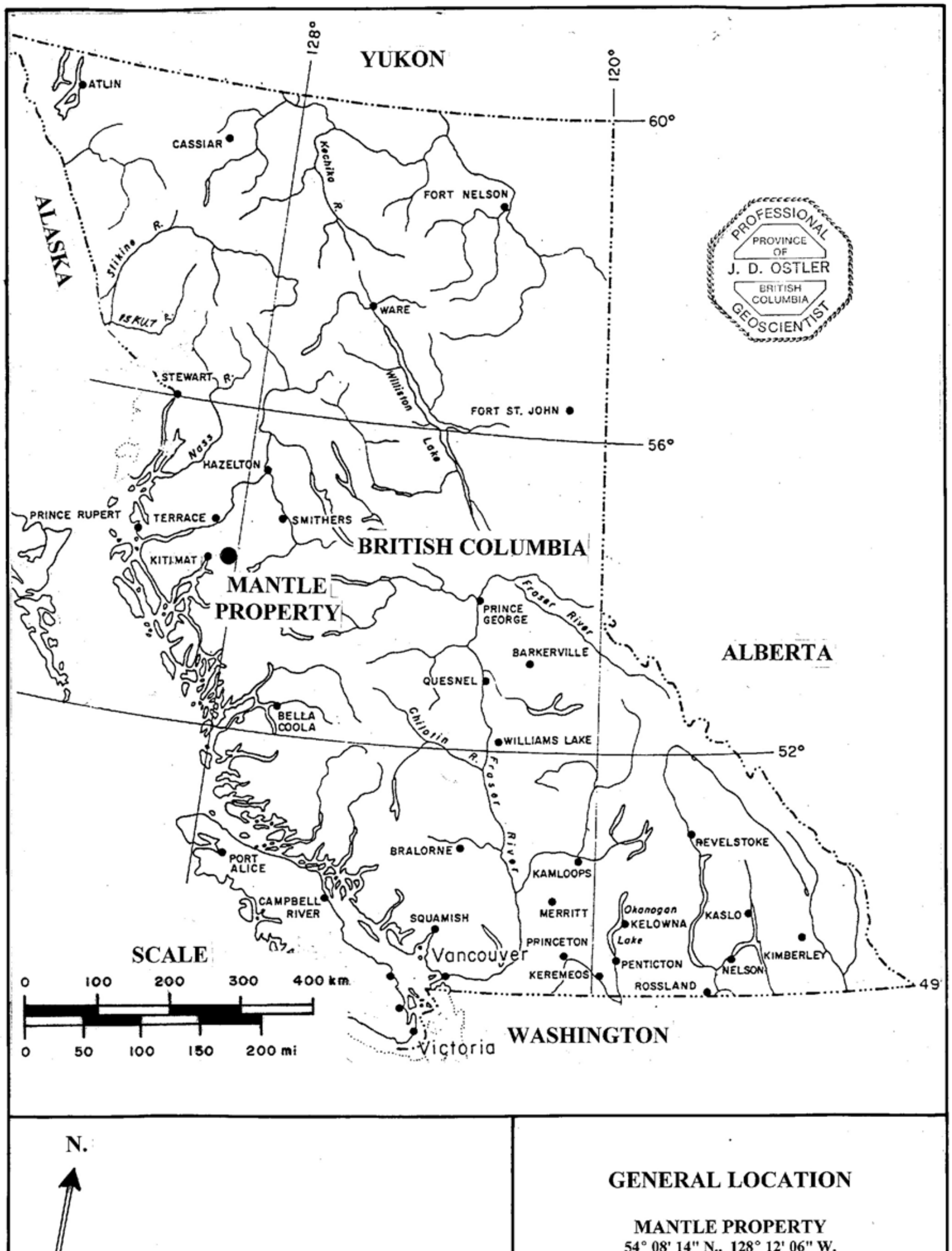
The property owner, John Ostler; M.Sc., P.Geo. conducted the current (2016) exploration program and produced this report through his company, Cassiar East Yukon Expediting Ltd., of West Vancouver, British Columbia. For details and costs of the current exploration program, see sections 5.1 to 5.3 of this report. The current work program was conducted on and about the property during the following days:

July 26 to 27 and August 6 to 7, 2016	transport from Vancouver to Terrace, return
July 28, 2016:	road and slinging access investigation
July 29, 2016:	chain-saw clearing of a helicopter landing site and camp area, camp mobilization
July 30 to August 5, 2016:	geological field work and sampling on the Mantle property
March 3 to September 15, 2016	research and production of this assessment report (intermittent)

A total of 51 person-days X 8 = 408 person-hours were spent on all of the claims of the Mantle property (Figure 4B, Table 6).

1.2 Property Description and Location

The Mantle property covers a lower part of the western slope of the upper Kitimat River valley. The property is located at the eastern margin of the Kitimat Range of the Coast Mountains in northwestern British Columbia on N.T.S. map sheets 103 I/1, and on B.C. map sheets 103I 019 and 020 (Figures 1 and 3).



CASSIAR EAST YUKON EXP. LTD.

Figure 1

GENERAL LOCATION

MANTLE PROPERTY
54° 08' 14" N., 128° 12' 06" W.
U.T.M.: 5,999,097 N., 552,156 E.
N.T.S.: 103 I/1, B.C.: 103I 019+020 SKEENA M.D., B.C.
JOHN OSTLER; M.Sc, P.Geo. SEPTEMBER, 2016

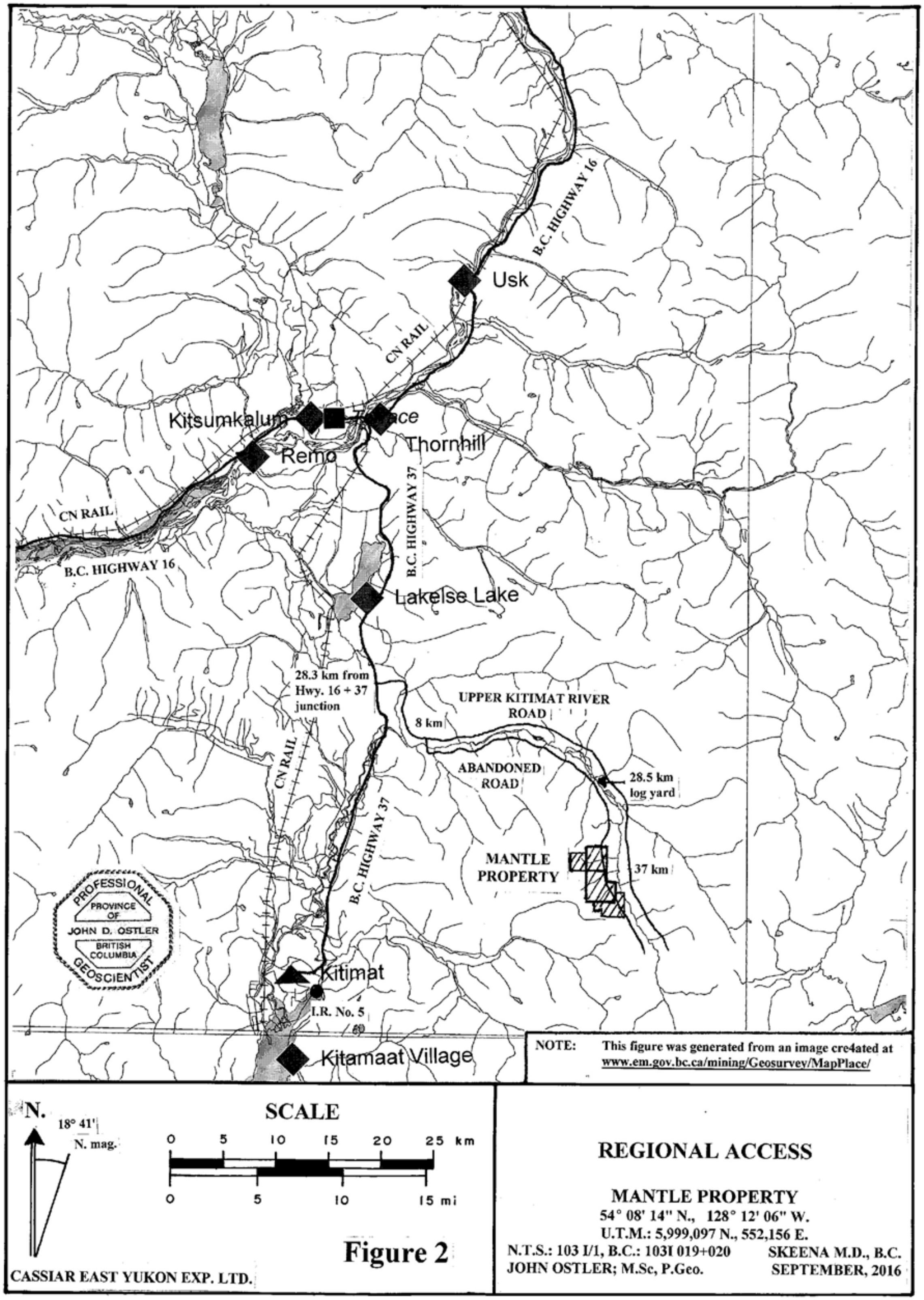
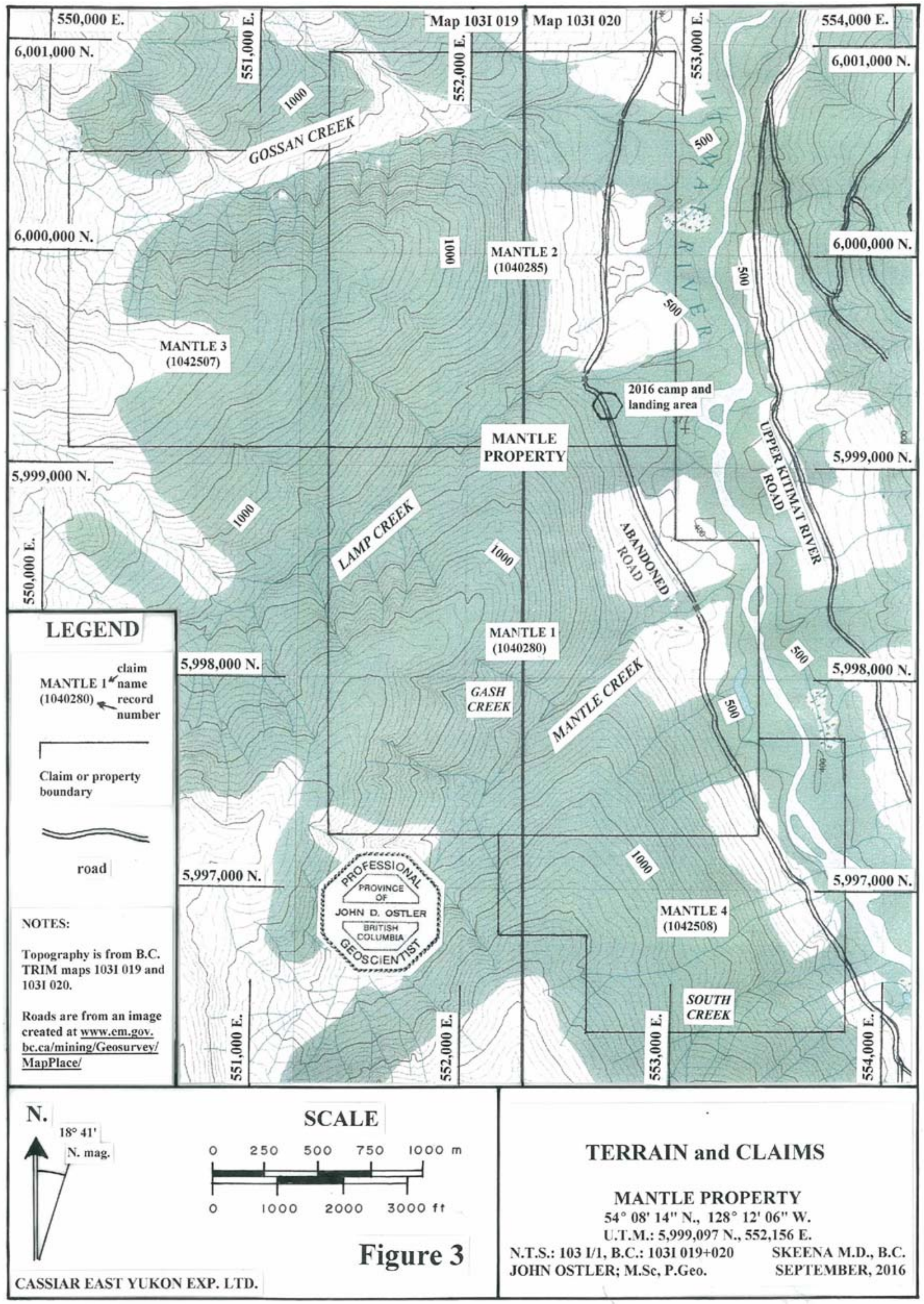

B.C. HIGHWAY 16
Usk
CN RAIL
Kitsumkalum
Thornhill
Remo
CN RAIL
B.C. HIGHWAY 16
B.C. HIGHWAY 37
Lakelse Lake
28.3 km from
Hwy. 16 + 37
junction
UPPER KITIMAT RIVER
ROAD
8 km
ABANDONED
ROAD
28.5 km
log yard
CN RAIL
B.C. HIGHWAY 37
MANTLE
PROPERTY
37 km
PROFESSIONAL
PROVINCE OF
JOHN D. OSTLER
BRITISH COLUMBIA
GEOSCIENTIST
Kitimat
I.R. No. 5
Kitamaat Village
NOTE: This figure was generated from an image cre4ated at www.em.gov.bc.ca/mining/Geosurvey/MapPlace/
N.
18° 41'
N. mag.
SCALE
0 5 10 15 20 25 km
0 5 10 15 mi
CASSIAR EAST YUKON EXP. LTD.
REGIONAL ACCESS
MANTLE PROPERTY
54° 08' 14" N., 128° 12' 06" W.
U.T.M.: 5,999,097 N., 552,156 E.
N.T.S.: 103 I/1, B.C.: 103I 019+020
SKEENA M.D., B.C.
JOHN OSTLER; M.Sc, P.Geo.
SEPTEMBER, 2016

Figure 2



550,000 E.
551,000 E.
552,000 E.
553,000 E.
554,000 E.
Map 103I 019
Map 103I 020
6,001,000 N.
6,000,000 N.
5,999,000 N.
5,998,000 N.
5,997,000 N.
GOSSAN CREEK
MANTLE 2
(1040285)
MANTLE 3
(1042507)
2016 camp and
landing area
MANTLE
PROPERTY
UPPER KITIMAT RIVER
ROAD
ABANDONED
ROAD
LAMP CREEK
MANTLE 1
(1040280)
GASH
CREEK
MANTLE CREEK
MANTLE 4
(1042508)
SOUTH
CREEK
1000
500
LEGEND
MANTLE 1 claim name
(1040280) record number
Claim or property boundary
road
NOTES:
Topography is from B.C. TRIM maps 103I 019 and 103I 020.
Roads are from an image created at www.em.gov.bc.ca/mining/Geosurvey/MapPlace/
PROFESSIONAL
PROVINCE OF
JOHN D. OSTLER
BRITISH COLUMBIA
GEOSCIENTIST
N.
18° 41'
N. mag.
SCALE
0 250 500 750 1000 m
0 1000 2000 3000 ft
CASSIAR EAST YUKON EXP. LTD.
TERRAIN and CLAIMS
MANTLE PROPERTY
54° 08' 14" N., 128° 12' 06" W.
U.T.M.: 5,999,097 N., 552,156 E.
N.T.S.: 103 I/1, B.C.: 103I 019+020
SKEENA M.D., B.C.
JOHN OSTLER; M.Sc, P.Geo.
SEPTEMBER, 2016

Figure 3

The property area comprises 4 map-staked claims covering 985.26 hectares (2,433.59 acres) in the Skeena Mining Division, in the Regional District of Kitimat-Stikine, and in the Coast Land District Range 5. Claim tenures are as follow:

Table 1
Map-staked Claims

Claim Name	Record Number	Area: hectares (Acres)	Record Date	Expiry Date	Owner
MANTLE 1	1040280	360.05 (889.32)	December 1, 2015	June 19, 2022	John D. Ostler
MANTLE 2	1040285	303.08 (748.61)	December 1, 2015	June 19, 2022	
MANTLE 3	1042507	170,49 (421.11)	March 2, 2016	June 19, 2022	
MANTLE 4	1042508	151.64 (374.55)	March 2, 2016	June 19, 2022	
		985.26 (2,433.59)			

On September 15, 2016, sufficient work was filed (event 5618570) to extend the expiry dates of the claims to those reported in the preceding table.

The locations of the property center and significant exploration areas within the property area are as follow (Figures 4A and 4B, 7, 11, and 12):

Table 2
Locations of Significant Areas on the Mantle Property

Center of Entity	U.T.M. Co-ordinates	Longitude and Latitude	Claim Location
property center	5,999,097 N. 552,156 E.	54° 08' 14" N. 128° 12' 06" W.	MANTLE 1+2 (1040280 +1040285)
<u>Centre of the Mantle Creek soil-molybdenum anomaly</u>	5,997,850 N., 552,400 E.	54° 07' 34" N. 128° 11' 53" W.	MANTLE 1 (1040280)
Southeastern extension of the Mantle Creek soil-molybdenum anomaly	5,997,200 N. 533,200 E.	54° 07' 13" N. 128° 11' 10" W.	MANTLE 4 (1042508)
<u>Centre of the Mantle Creek molybdenum stockworks MINFILE 103I 109</u>	5,997,850 N., 552,400 E.	54° 07' 29" N. 128° 12' 06" W.	MANTLE 1 (1040280)
<u>Centre of the Gossan Creek soil-molybdenum anomaly</u>	6,000,480 N., 551,475 E.	54° 08' 59" N. 128° 12' 43" W.	MANTLE 2 (1040285)
<u>Centre of the Gossan Creek molybdenum stockworks MINFILE 103I 103</u>	6,000,468 N. 551,598 E.	54° 08' 59" N. 128° 12' 36" W.	MANTLE 2 (1040285)

NOTE: <u>UNDERLINE</u> denotes locations that were confirmed by the writer during the current 2016 exploration program.

Although the boundaries of the Mantle property have not been surveyed and their exact positions have not been defined on the ground, those positions have been defined precisely on the provincial mineral tenure grid. Consequently, there is no legal uncertainty regarding the location and the area covered by the Mantle claims.

There is no private land or aboriginal homeland on the property. The closest reserve to the property is the No. 5 Iugwees (Minette Bay) Indian Reserve which is located in Haisla territory about 22.9 km (14.42 mi) west-southwest of the of the western boundary of the MANTLE 3 (1042507) claim. The No. 5 Reserve is about 4.4 km (2.7 mi) east of the Town of Kitimat (Figure 2). The property is located in area designated as Tsimshian territory.

There is no plant or equipment, inventory, mine or mill structure of any value on these claims.

1.3 Accessibility, Climate, Local Resources, Infrastructure, and Physiography

Elevations on the western part of the Mantle property range from 1,385 m (4,544 ft) on the ridge in the southwestern part of the MANTLE 3 (1042507) claim at the western margin of the property to 375 m (1,230 ft) on the Kitimat River flood plane at the eastern boundary of the MANTLE 2 (1040285) claim at the eastern boundary of the property area.

The claims are bounded to the east by Kitimat River. Adequate fresh water for a mining operation could be drawn from that and other local water courses.

The northwestern margin of the Mantle property is above tree line. Most of the property is covered with a dense, first-growth forest of cedar, spruce, fir, and hemlock. Much of the forest on lower slopes near Kitimat River has been clear-cut recently. Although here is sufficient timber suitable for underground mining on the property, the exploration target there is a porphyry molybdenum and copper deposit that would be mined from an open pit. Thus, the availability of mining timber has little relevance on the Mantle property.

The property is remote from any power transmission lines. During development, power would have to be generated on site or a transmission line would have to be built for about 38 km (23.2 mi) along the Upper Kitimat River forest service road.

Terrain in most of the property area is quite rugged and post-glacial weathering has produced steep V-shaped valley profiles. The valley profile of Mantle Creek is developing so rapidly that the creek floor is covered with bare rock that is flushed clean each year during the winter rains. Gash Creek, a tributary of Mantle Creek on its northern side is believed by the author to have been so-named because it is clear of soil and vegetation. The creek is a rock chimney that extends for 340 m (1,115.5 ft) up from Mantle Creek to the top of the ridge. Although steep, the forested slopes host little rock outcrop, and soil profiles in most of the property area are sufficiently mature to conduct total metal ion (traditional) soil surveys. The author opines that mobile metal ion soil surveys could be successful in the property area. Total metal ion soil surveys have been used successfully in the property area during previous exploration programs (Figures 7 and 8).

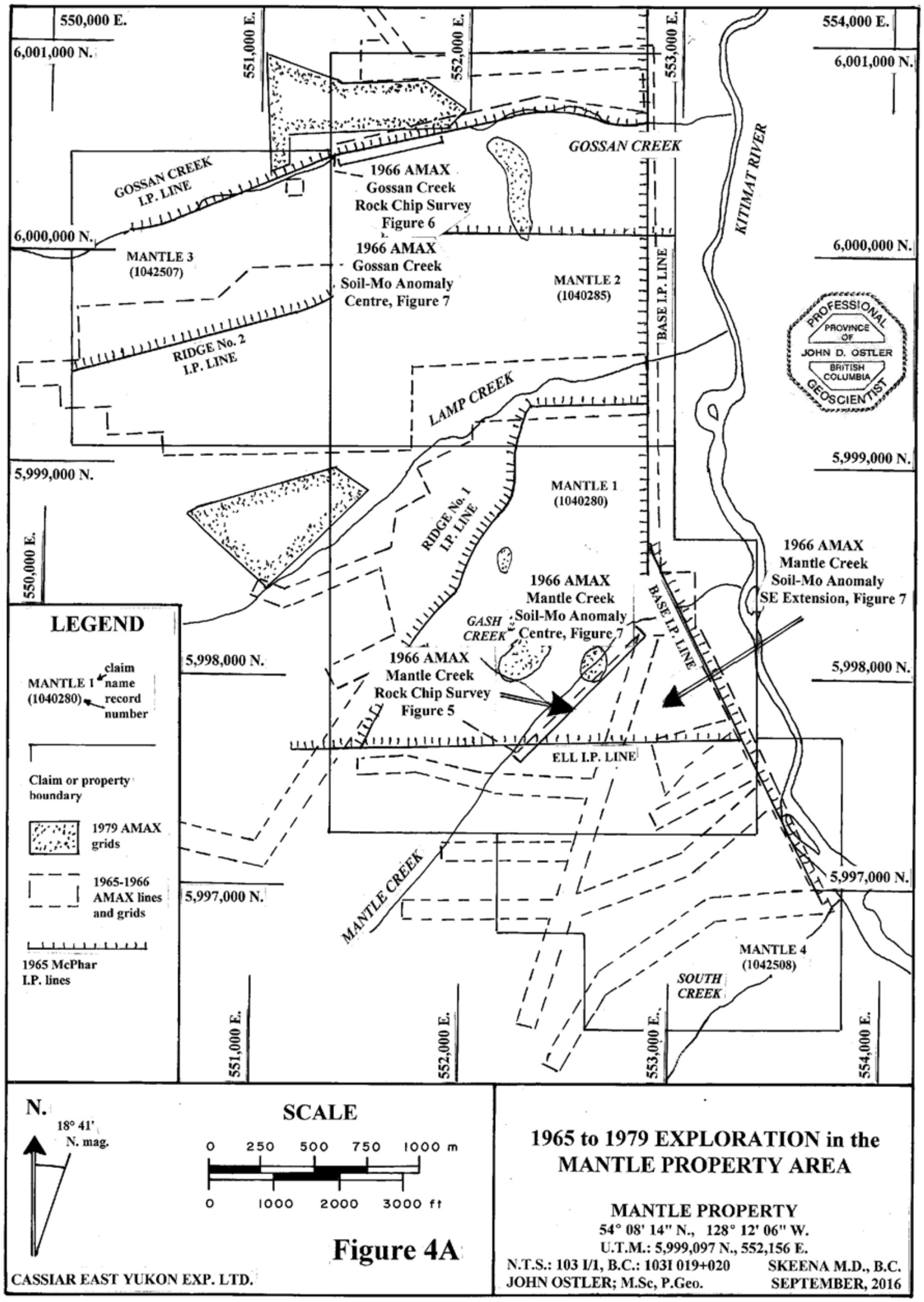
The Terrace-Kitimat area experiences cold wet winters and cool, moderately dry summers. Winter snow falls in the property area by November and stays on the ground until April in open areas, and until July on shady northerly facing slopes at high elevations.

The Upper Kitimat River forest service road is currently used to access logging on the northern and eastern slopes of the upper Kitimat River valley. That road diverges eastward from B.C. Highway 37 south of Lakelse 28.3 km (17.26 mi) south of the junction of B.C. highways 16 and 37 at Terrace. There is a large log landing just up-river from the Hunter Creek bridge at Km 28.5 (Mi 17.4) on the Upper Kitimat River forest service road that could be used as a staging area for slinging into the Mantle property. Lamp Creek, located on the MANTLE 1 (1040280) claim, is directly across the valley from Km 37 (Mi 22.6) on the Upper Kitimat River forest service road.

There is a road that extends up the southern and eastern sides of the upper Kitimat valley that diverges from the Upper Kitimat River forest service road at Km 8 (Mi 4.9). The bridge across the river to the southern and eastern sides is still being used. Although, the roadbed beyond it is generally in good condition, it is disused and overgrown. The crossings of Gossan, Lamp, and Mantle creeks in the eastern part of the property are spanned by concrete and steel bridges that are still serviceable. Log bridges and culverts that spanned minor crossings have been pulled out.

During the current (2016) program, a log yard just south of Lamp Creek was cut out to serve as a landing and camp area. A Bell 206 helicopter from Quantum Helicopters Ltd. was used to transport crew and equipment to the property directly from Terrace. The first trip in from brought crew and saws onto the landing. Once a landing pad was cut out, equipment was brought in on a second trip. The first trip out was a freight flight and the second was used to transport crew. There were a total of four trips each lasting 0.7 hours for a total of 2.8 hours of helicopter time.

By road, the valley slope across from the property is about 56 km (34.2 mi) from the town of Kitimat and about 65.3 km (39.8 mi) from the City of Terrace (Figure 2). Kitimat hosts basic services sufficient to support a small surface exploration program. However, Kitimat is an ocean port from which concentrate can be shipped by barge to the orient. Terrace, located at the junction of B.C. highways 16 and 37 has services necessary to support a mining operation. The city has a regional airport with scheduled jet service to other parts of North America. Also, it is located on Canadian National Railways's main line westward to the port of Prince Rupert and eastward to Prince George.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5,998,000 N.
5,997,000 N.
GOSSAN CREEK
KITIMAT RIVER
GOSSAN CREEK I.P. LINE
1966 AMAX Gossan Creek Rock Chip Survey Figure 6
1966 AMAX Gossan Creek Soil-Mo Anomaly Centre, Figure 7
MANTLE 3 (1042507)
MANTLE 2 (1040285)
BASE I.P. LINE
RIDGE No. 2 I.P. LINE
LAMP CREEK
PROFESSIONAL GEOSCIENTIST PROVINCE OF BRITISH COLUMBIA JOHN D. OSTLER
MANTLE 1 (1040280)
RIDGE No. 1 I.P. LINE
1966 AMAX Mantle Creek Soil-Mo Anomaly SE Extension, Figure 7
1966 AMAX Mantle Creek Soil-Mo Anomaly Centre, Figure 7
GASH CREEK
1966 AMAX Mantle Creek Rock Chip Survey Figure 5
ELL I.P. LINE
MANTLE CREEK
MANTLE 4 (1042508)
SOUTH CREEK
LEGEND
MANTLE 1 (1040280) claim name record number
Claim or property boundary
1979 AMAX grids
1965-1966 AMAX lines and grids
1965 McPhar I.P. lines
N.
18° 41' N. mag.
SCALE
0 250 500 750 1000 m
0 1000 2000 3000 ft
Figure 4A
CASSIAR EAST YUKON EXP. LTD.
1965 to 1979 EXPLORATION in the MANTLE PROPERTY AREA
MANTLE PROPERTY
54° 08' 14" N., 128° 12' 06" W.
U.T.M.: 5,999,097 N., 552,156 E.
N.T.S.: 103 I/1, B.C.: 103I 019+020
SKEENA M.D., B.C.
JOHN OSTLER; M.Sc, P.Geo.
SEPTEMBER, 2016

Sample Mo (ppm)
MC-8-PC 20.3
MC-9-PC 4.00
MC-12-PC 26.7
MC-14-PC 5.55
MC-15-PC 36.3

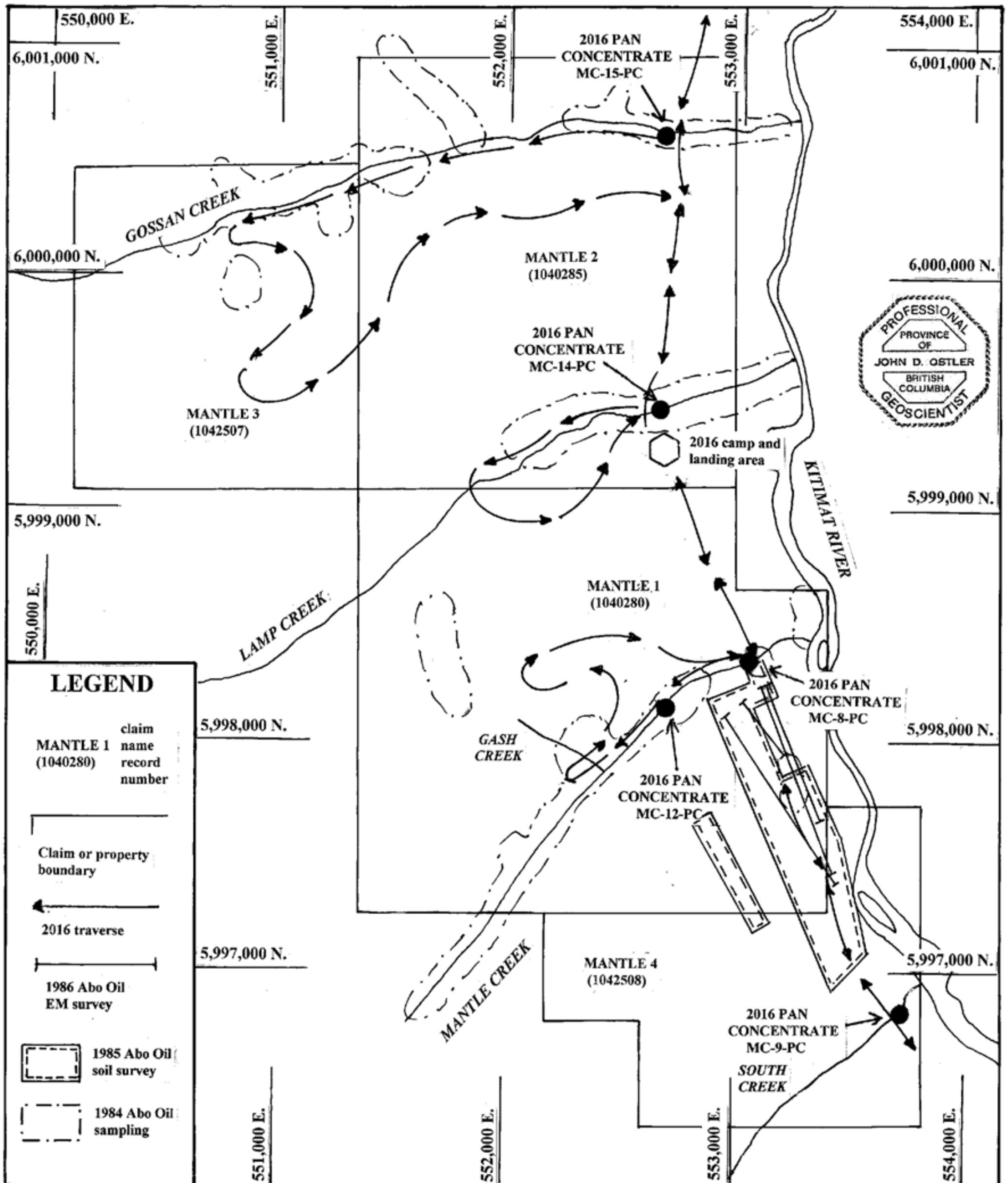


Figure 4B

CASSIAR EAST YUKON EXP. LTD.

1984 to 2016 EXPLORATION in the MANTLE PROPERTY AREA

MANTLE PROPERTY
54° 08' 14" N., 128° 12' 06" W.
U.T.M.: 5,999,097 N., 552,156 E.
N.T.S.: 103 I/1, B.C.: 103I 019+020 SKEENA M.D., B.C.
JOHN OSTLER; M.Sc, P.Geo. SEPTEMBER, 2016

2.0 HISTORY

2.1 Chronology of Ownership and Exploration of Claims in the Mantle Property Area

1965 A large gossan was discovered on the cliffs south of Gossan Creek by John Schindler, a geologist working for Southwest Potash Corporation. The gossan was found during a low-level reconnaissance helicopter flight as part of an regional exploration program. The subsequent 1965 Southwest Potash (AMAX) exploration program was described by A.C. Gambardella and P.W. Richardson (1967) as follows:

> Staking ... began in June, 1965. Additional claims were staked and some of the earlier claims were re-staked in August and September.
>
> Beginning in June, preliminary prospecting was done in the more remote areas of the property and along the three main creeks named Gossan, Lamp, and Mantle. Geological assessment of the property began in September when S.J. Carryer and R.H. McMillan mapped Mantle and Gossan creeks and the claim location lines in the central area of the property. Some ... stream ... and soil sampling were done concurrently with geological mapping.
>
> An induced polarization survey ... was done by McPhar Geophysics (appendix in Bell, 1965) along location lines and accessible sections of the creeks (Figure 4A). (A frequency-domain unit was used. Station intervals were 91.44 to 182.88 m (300 to 600 ft) with an 'a' spacing of n=1 to 3.) The survey totaled 3.5 line miles (5.64 line kilometres). No anomalies were found indicating that there is ... (little) ... pyrite associated with the molybdenite mineralization (Bell, 1965).
>
> A total of 61 ft (98.2 m) of bedrock was tested by chip and channel sampling to establish the background of molybdenum in both mineralized and unmineralized areas.
>
> ... Soil samples were collected at 300 foot (91.44-m) intervals along the location lines and the I.P. survey lines. Water and silt samples were collected in the drainage systems of Gossan, Lamp, and Mantle creeks and from several creeks flowing into the east side of Kitimat River. The stream sediment and water sampling confirmed the wide distribution of molybdenum mineralization, but sufficient work to limit the areas of interest was not completed. The sample density was insufficient to outline specific anomalous areas.
>
> The combination of molybdenum-bearing float of altered quartz-veined acidic rock, scattered positive soil sampling results, and the highly anomalous molybdenum-bearing waters flowing into Gossan and Mantle creeks was sufficiently encouraging to justify an extensive program ... in 1966.
>
> Gambardella, A.C. and Richardson, P.W.; 1967: pp. 8-9.

1966 AMAX's (Southwest Potash's) Kitimat River property changed shape and size during the 1965-1966 exploration program. By August, 1966 the property was comprised of 131 457.2 m^2 2-post claims (Gambardella and Richardson, 1967). The author estimates that the property covered about 2,738 hectares (6,763 acres) and included all of the current Mantle property area.

1966 Continued

The 1966 AMAX exploration program was described by Gambardella and Richardson (1967) as follows:

The objectives of the 1966 program were (1) to establish the extent and grade of molybdenite mineralization, (ii) to supplement and refine the geological data obtained during the 1965 program, (iii) to prospect for other areas of molybdenite mineralization, and (iv) to outline possible drill targets.

The work consisted of line cutting, plane table mapping, geological mapping, and rock chip sampling. (The crew comprised from 7 to 10 men). Field work was started on May 27 and ended on October 8th ...

... Plane table mapping was done along the base line between the mouths of Gossan and Mantle creeks and was extended up the above creeks to the areas of molybdenite mineralization. The plane table stations served as primary control for the geological mapping and for the rock chip sampling along the creek valleys. Where plane table mapping was not possible, control stations were established along Mantle and Gossan creeks by the tape and compass method.

In the heavily timbered hillsides between the creeks, accurate compass and chain lines were established at 400 foot (121.92 m) , and pickets were placed at intervals of 200 horizontal feet (60.96 m) along each line. The slopes covered by the grid average 45° and some sections are between 55° and 60°. Establishing these lines, was therefore, labourious and costly, but (I) the presence of highly anomalous Mo values in the water of springs along the base of the slope and (ii) the inaccuracy introduced by the simple compass and pace method along the very steep slopes justified the costs incurred in establishing the grid. A total of 27 line miles (43.47 line km) was completed.

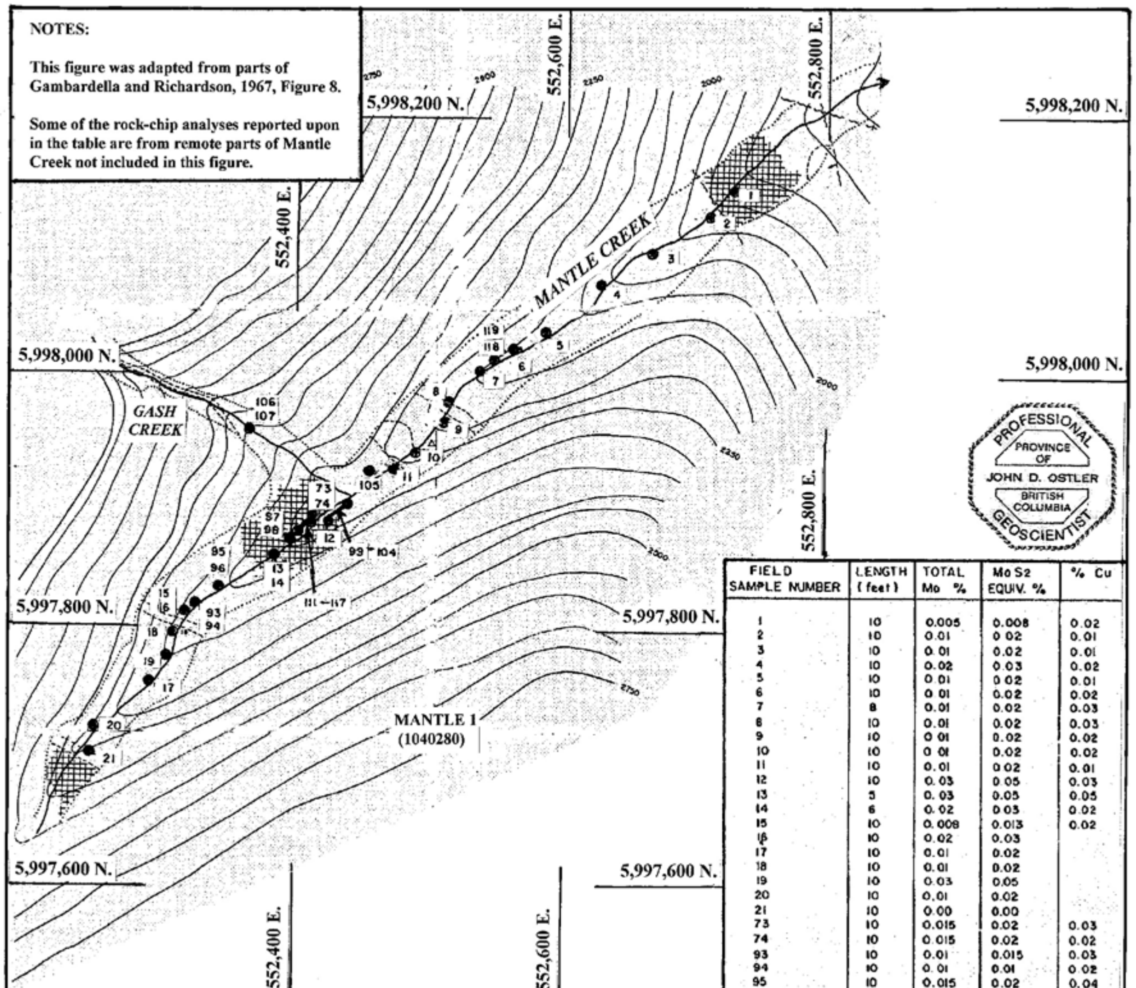
The grid was used as control for geological mapping and for the geochemical soil survey.

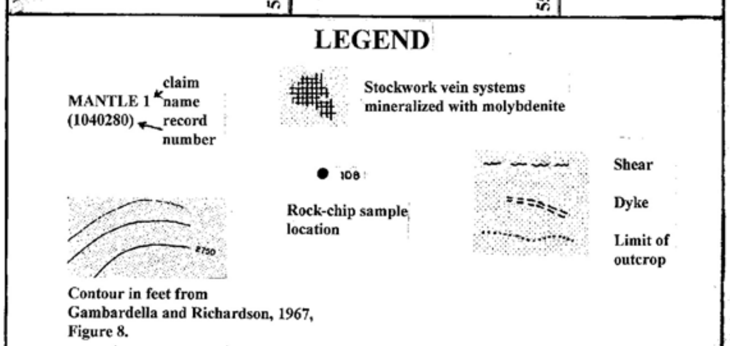
Geological mapping was carried out in both Mantle and Gossan creeks on a scale of 1" = 100' (1:1,200) (Figures 5 and 6). The area between the creeks was mapped at a scale of 1" = 200' (1:2,400) using the grid lines as control. The rest of the property was mapped in a reconnaissance fashion with the aid of a 1" = 500' (1:6,000-scale) contour map, aerial photos, and altimeter (Figure 11). In areas of no rock exposures, the underlying rock types were mapped by examining the rock rubble in geochemical sample holes.

Geochemical samples were collected along the grid lines at 200' (60.96-m) intervals. The area tested in this fashion is approximately two and one half square miles (6.48 km^2). Reconnaissance geochemical sampling was done in the remainder of the property and in areas adjacent to the claim group (Figure 4A). (Soil samples were analyzed in camp using the stannous chloride - thiocyanate method (appendix in Gambardella, A.C. and Richardson, P.W.; 1966)

Rock chip sampling was done to test the grade of molybdenite mineralization in Mantle and Gossan creeks (Figures 5 and 6). The samples, each weighing approximately 10 pounds (4.55 kg), were taken at 10 foot (3.28-m) lengths, spaced at about 100 foot (32.81-m intervals. A total of 1088 linear feet (331.6 m) were collected. Of these, 771 were sent for assay to Coast Eldridge in Vancouver and 317 to the AMAX Exploration geochemical laboratory in Smithers.

Gambardella, A.C. and Richardson, P.W.; 1967: pp. 9-12.





FIELD SAMPLE NUMBER	LENGTH (feet)	TOTAL Mo %	MoS2 EQUIV. %	% Cu
1	10	0.005	0.008	0.02
2	10	0.01	0.02	0.01
3	10	0.01	0.02	0.01
4	10	0.02	0.03	0.02
5	10	0.01	0.02	0.01
6	10	0.01	0.02	0.02
7	8	0.01	0.02	0.03
8	10	0.01	0.02	0.03
9	10	0.01	0.02	0.02
10	10	0.01	0.02	0.02
11	10	0.01	0.02	0.01
12	10	0.03	0.05	0.03
13	5	0.03	0.05	0.05
14	6	0.02	0.03	0.02
15	10	0.008	0.013	0.02
16	10	0.02	0.03	
17	10	0.01	0.02	
18	10	0.01	0.02	
19	10	0.03	0.05	
20	10	0.01	0.02	
21	10	0.00	0.00	
73	10	0.015	0.02	0.03
74	10	0.015	0.02	0.02
93	10	0.01	0.015	0.03
94	10	0.01	0.01	0.02
95	10	0.015	0.02	0.04
96	10	0.02	0.025	0.02
97	10	0.01	0.02	0.03
98	5	0.01	0.01	0.03
99	10	0.01	0.01	0.03
100	10	0.015	0.02	0.03
101	10	0.02	0.025	0.03
102	10	0.02	0.02	0.02
103	10	0.02	0.03	0.03
104	5	0.02	0.25	0.02
105	8	0.02	0.02	0.02
106	10	0.05	0.08	0.05
107	5	0.03	0.035	0.05
108	Grab Sample	0.34	0.56	0.03
110	5	0.005	0.001	0.02
111	10	0.02	0.02	0.03
112	10	0.02	0.03	0.03
113	10	0.025	0.03	0.04
114	10	0.025	0.04	0.03
115	10	0.015	0.02	0.03
116	10	0.02	0.03	0.03
117	10	0.025	0.03	0.03
118	5	0.015	0.02	0.03
119	5	0.02	0.025	0.02

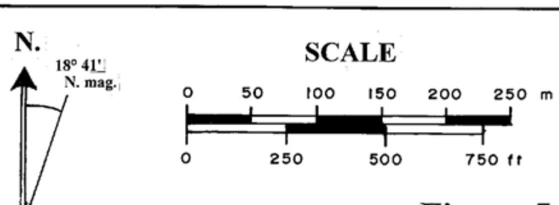


Figure 5

CASSIAR EAST YUKON EXP. LTD.

1966 AMAX ROCK CHIP SURVEY in MANTLE CREEK

MANTLE PROPERTY
54° 08' 14" N., 128° 12' 06" W.
U.T.M.: 5,999,097 N., 552,156 E.
N.T.S.: 103 I/1, B.C.: 103I 019+020 SKEENA M.D., B.C.
JOHN OSTLER; M.Sc, P.Geo. SEPTEMBER, 2016

FIELD SAMPLE NUMBER	LENGTH (feet)	TOTAL Mo %	Mo S2 EQUIV %	% Cu
31	10	0.00	0.00	
32	12	0.01	0.02	
33	10	0.00	0.00	
34	15	0.00	0.00	
35	10	0.00	0.00	
36	10	0.01	0.02	
37	10	0.01	0.02	
38	10	0.01	0.02	
39	10	0.02	0.03	
40	10	0.00	0.00	
41	10	0.02	0.03	
42	10	0.01	0.02	
45	10	0.01	0.02	
46	10	0.01	0.01	
47	10	0.01	0.02	
48	10	0.01	0.02	
49	10	0.01	0.01	
50	10	0.11	0.18	
51	10	0.01	0.01	
52	10	0.005	0.01	
79	10	0.01	0.01	0.03
80	6	0.015	0.02	0.12
81	12	0.01	0.01	0.07
82	7	0.005	0.01	0.03
83	10	0.015	0.01	0.04
84	10	0.01	0.01	0.03
85	10	0.015	0.02	0.03
86	10	0.015	0.02	0.03
87	10	0.01	0.01	0.02
88	10	0.015	0.02	0.02
89	10	0.015	0.02	0.02
90	12	0.02	0.02	0.03
91	12	0.005	0.01	0.02
92	5	0.005	0.01	0.04

LEGEND

MANTLE 1 ← claim name
(1040280) ← record number

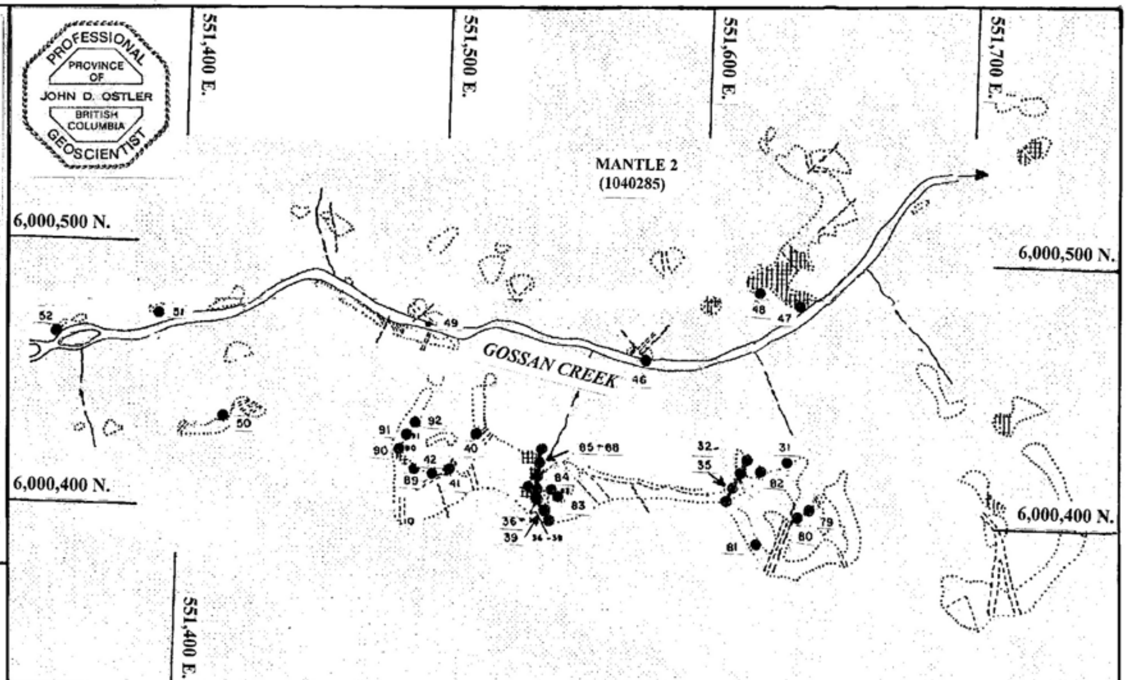
● 38 Rock-chip sample location

Stockwork vein systems mineralized with molybdenite

Shear

Dyke

Limit of outcrop



NOTES:

This figure was adapted from parts of Gambardella and Richardson, 1967, Figure 8.

Some of the rock-chip analyses reported upon in the table are from remote parts of Gossan Creek not included in this figure.

N. 18° 41' N. mag.

SCALE

0 25 50 75 100 m

0 100 200 300 ft

Figure 6

CASSIAR EAST YUKON EXP. LTD.

1966 AMAX ROCK CHIP SURVEY in GOSSAN CREEK

MANTLE PROPERTY

54° 08' 14" N., 128° 12' 06" W.
U.T.M.: 5,999,097 N., 552,156 E.
N.T.S.: 103 I/1, B.C.: 103I 019+020 SKEENA M.D., B.C.
JOHN OSTLER; M.Sc, P.Geo. SEPTEMBER, 2016

1966 Continued

The rock-chip sampling program that was commenced in 1965 was expanded in 1966. The most prospective areas on Gossan and Mantle creeks were sampled (Figures 5 and 6). That program was described in detail as follows:

Surface sampling in the form of continuous chip samples was conducted in Mantle and Gossan creeks. (*A continuous chip sample constitutes a line of "continuous chips 1 to 3 inches (2.54 to 7.62 cm) apart, taken along a line (generally 10 feet (3.05 m) in length) and using a hammer and moil.*) A total of 119 samples (1088 linear feet or 331.6 m) were collected. All samples were assayed for total Mo, and some of the samples were assayed for Cu and MoS_2 ... (Figures 5 and 6). Samples were generally taken in 10 foot (3.05-m) sections, with the sample interval varying according to the available rock exposure and accessibility. The average weight of each sample was approximately 15 lbs (6.82 kg).

Areas of visible mineralization and/or deep weathering, were drilled to a depth of 2 to 4 feet (0.61 to 0.91 m) ... and blasted open ... samples were collected on the fresh surfaces.

The weighted average of all samples in Mantle Creek is 0.025% MoS_2 (0.017% Mo) and 0.026% Cu. (That) ... from the mineralized zone in Gossan Creek is 0.019% MoS_2 (0.010% Mo) and 0.029% Cu ...

Assay results of several samples collected from the same site before and after blasting were essentially the same, indicating that mechanical or chemical leaching of MoS_2 and Cu is negligible.

With regard to the low grade of assays obtained, it must be pointed out that large portions of the mineralized areas, especially in Gossan Creek could not be sampled because of the rugged topography.

Gambardella, A.C. and Richardson, P.W.; 1967: pp. 35-36.

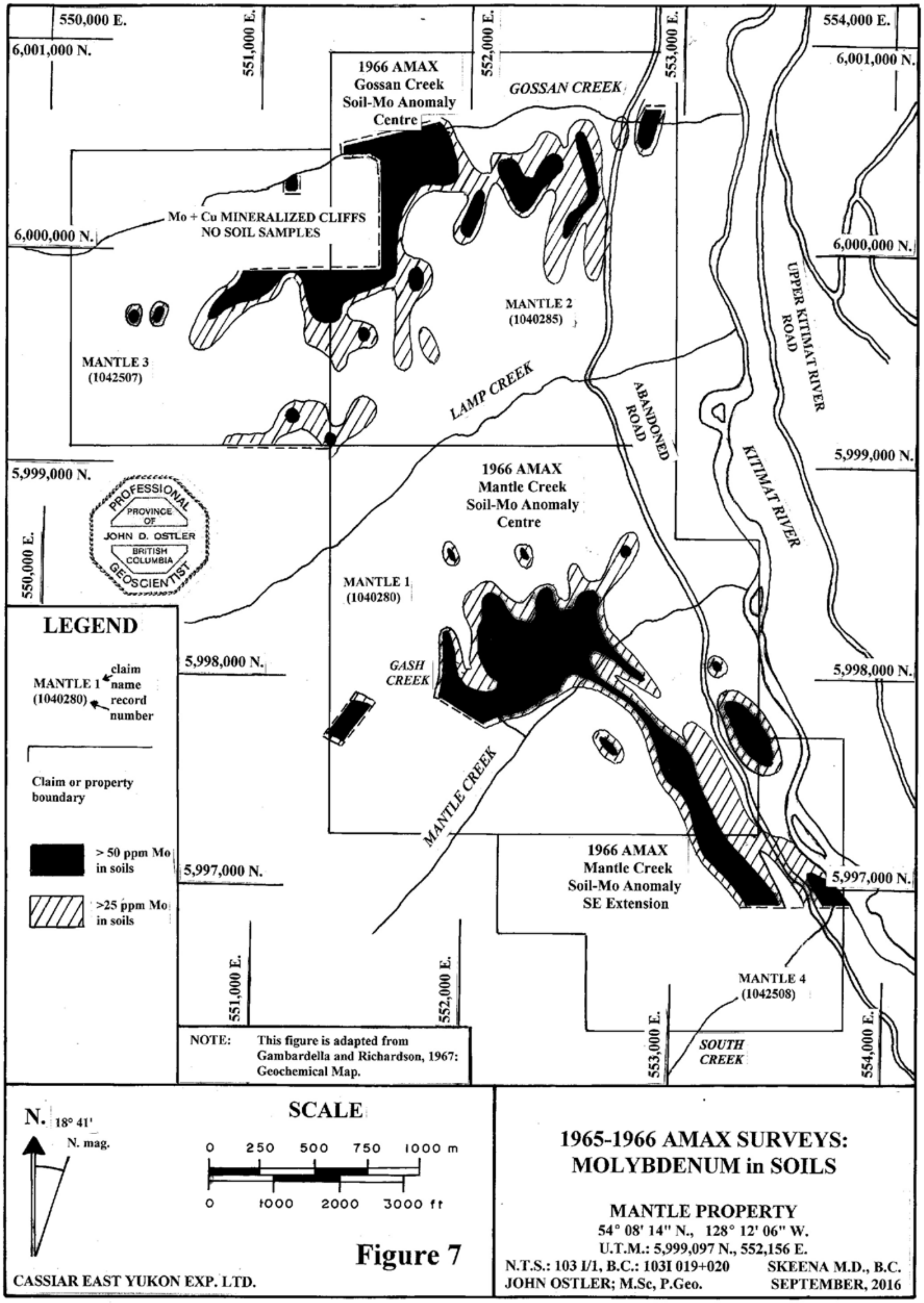
The 1965-1966 Southwest Potash (AMAX) geochemical surveys were described in detail as follows:

A total of 1005 geochemical soil, silt, water, and rock chip samples were collected on the property ... Most of the soil samples were collected at 200' (60.96-m) intervals along grid lines spaced at 400' (121.92-m) intervals. Silt and water sampling was primarily to test the drainage from inaccessible areas around the fringes of the grid and as a reconnaissance tool in areas adjacent to the property. Rock chip samples were taken to determine the background Mo and Cu content of the various rock types in the map area ...

Two anomalous areas were outlined (Figure 7) ... One occurs on the ridge between Gossan and Lamp creeks. It extends over an area of 7,000 by 2,000 feet (2,133.6 X 609.6 m). Mo values range from 0 to 500 ppm and Cu from 0 to 120 ppm. The second anomaly occurs on the south facing slope of Mantle Creek and extends southward across the creek, for a distance of 1500' (457.2 m). The anomaly is roughly elliptical in shape and 4,500 by 4,000 feet (1,371.6 X1,219.2 m) in area. Mo values range from 6 to 500 ppm and Cu from 0 to 140 ppm.

Silt values for the entire property range from 0 to 160 ppm Mo and from 0 to 320 ppm Cu. Water values range from 0 to 700 ppm Mo. THM (total heavy mineral) values in soils range from 0 to 25 ppm.

Gambardella, A.C. and Richardson, P.W.; 1967: pp. 37 and 39.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5,998,000 N.
5,997,000 N.
1966 AMAX
Gossan Creek
Soil-Mo Anomaly
Centre
GOSSAN CREEK
Mo + Cu MINERALIZED CLIFFS
NO SOIL SAMPLES
MANTLE 2
(1040285)
MANTLE 3
(1042507)
LAMP CREEK
ABANDONED
ROAD
UPPER KITIMAT RIVER
ROAD
KITIMAT RIVER
1966 AMAX
Mantle Creek
Soil-Mo Anomaly
Centre
PROFESSIONAL
PROVINCE
OF
JOHN D. OSTLER
BRITISH
COLUMBIA
GEOSCIENTIST
MANTLE 1
(1040280)
GASH
CREEK
MANTLE CREEK
1966 AMAX
Mantle Creek
Soil-Mo Anomaly
SE Extension
MANTLE 4
(1042508)
SOUTH
CREEK
LEGEND
MANTLE 1 claim name
(1040280) record number
Claim or property boundary
> 50 ppm Mo in soils
>25 ppm Mo in soils
NOTE: This figure is adapted from Gambardella and Richardson, 1967: Geochemical Map.
N.
18° 41'
N. mag.
SCALE
0 250 500 750 1000 m
0 1000 2000 3000 ft
Figure 7
CASSIAR EAST YUKON EXP. LTD.
1965-1966 AMAX SURVEYS:
MOLYBDENUM in SOILS
MANTLE PROPERTY
54° 08' 14" N., 128° 12' 06" W.
U.T.M.: 5,999,097 N., 552,156 E.
N.T.S.: 103 I/1, B.C.: 103I 019+020
SKEENA M.D., B.C.
JOHN OSTLER; M.Sc, P.Geo.
SEPTEMBER, 2016

1966 Continued

The average copper molybdenum ratio in the 1965-1966 survey area was 3.3:1. That of the soils was 0.9:1 (pH of 5.0) and that of the silts was 2.5:1 (pH of 7.0). It was determined that at low pH like that of the average soil, molybdenum formed stable molybdates and copper did not form stable compounds and was partly lost (Gambardella and Richardson, 1967).

Gambardella and Richardson (1967) reported that sufficient work was done on the AMAX Kitimat River property to keep the claims in good standing for from three to five years.

1967 to 1978

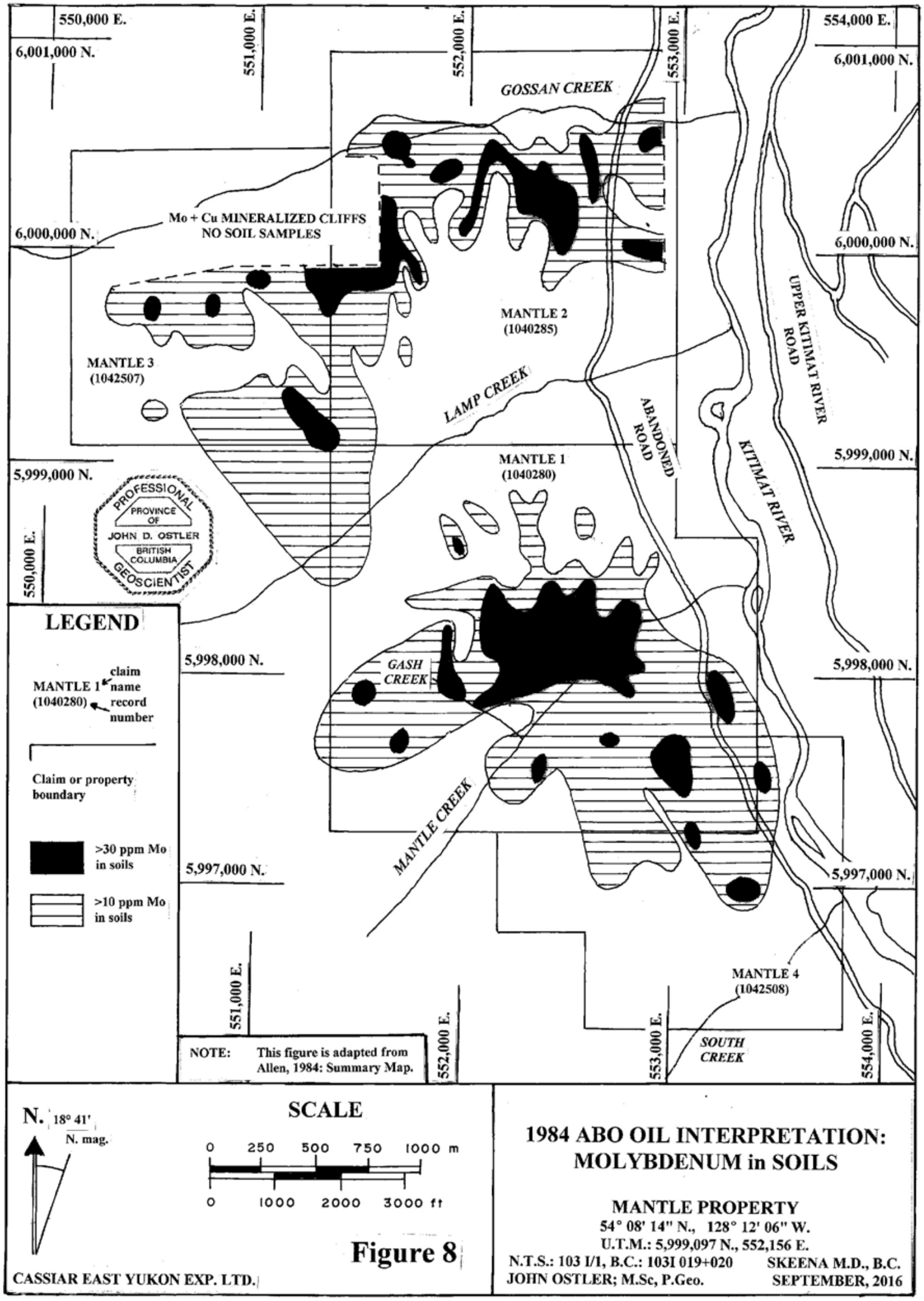
The author in unaware of any work conducted in the current Mantle property area from 1967 to 1978.

1979 On March 27 and 28, 1979 AMAX of Canada Ltd. staked the Mat 1 and 2 (1235 and 1236) claims. Those two modified grid claims comprised a total of 40 units that covered 1,000 ha (2,470 acres) in an area that covered most of the current Mantle property.

A 3-man crew was on the property from August 23 to 27 and from October 27 to 30, 1979 conducting soil and rock-chip surveys. Work was done over two small grids. One north of the Gossan Creek molybdenite stockwork zone near the northeastern corner of the current MANTLE 2 (1040285) claim; the other was northwest of Lamp Creek near the common corner of the MANTLE 1 to 3 (1040280, 1040285, and 1042507) claims (Figure 4A). Rock chips were collected from the noses of slopes between Gossan and Lamp creeks and between Lamp and Mantle creeks (Figure 4A). A total of 134 soil samples were taken at locations spaced at 50-m (164-ft) intervals along lines spaced 100 m (328.1 ft) apart (Allen and Fleming, 1979). 26 rock-chip samples were taken. All samples were assayed for nine elements including copper and molybdenum.

D.G. Allen and D.B. Fleming (1979) described the results of the 1979 AMAX soil surveys as follows:

> Mo and Cu soil anomalies (>4 ppm Mo., >100 ppm Cu) were outlined in each of the sampled areas (Figure 4A). Mo values ranged from 1-350 ppm with a frequency curve peaking at 0-10 ppm. Cu values ranged from 0-1940 ppm with a modal value between 20 and 40 ppm.
>
> Adjacent to Gossan Creek, a 250 X 100 m (820.2 X 328.1 ft) Cu anomaly is coincidental with the southern lobe of a larger Mo anomaly. Conversely, one and a half km (0.92 mi) to the south adjacent to Lamp Creek, The Mo and Cu anomalies are generally non-coincidental.
>
> South of the anomalous zone in Gossan Creek, are large precipitous cliffs exposing significant molybdenite and chalcopyrite (?) mineralization. Soil geochemistry has therefore, possibly defined the northerly extension of the mineralization.
>
> The isolated Mo and Cu anomalies in Lamp Creek are interesting due to the fact that mineralization is not apparent anywhere along Lamp Creek. The anomalies are closed off on all sides and do not appear to meet with a previously determined open anomalous area extending down from the northeast (Figures 4A and 7).
>
> A greater percentage of soil samples were found to be anomalous in Mo than in Cu (68% vs. 45%). Assays taken from chip sampling in 1966, however, repeatedly indicated high copper concentration over Mo. The chemical nature of the soil is thought to mobilize Mo more than Cu.
>
> Allen, D.G. and Flemming, D.B.; 1979: pp 4-5.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553,000 E.
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6,001,000 N.
6,000,000 N.
5,999,000 N.
5,998,000 N.
5,997,000 N.
GOSSAN CREEK
Mo + Cu MINERALIZED CLIFFS
NO SOIL SAMPLES
MANTLE 2
(1040285)
MANTLE 3
(1042507)
LAMP CREEK
MANTLE 1
(1040280)
ABANDONED ROAD
KITIMAT RIVER
UPPER KITIMAT RIVER ROAD
PROFESSIONAL
PROVINCE OF
JOHN D. OSTLER
BRITISH COLUMBIA
GEOSCIENTIST
LEGEND
MANTLE 1
(1040280)
claim name
record number
Claim or property boundary
>30 ppm Mo in soils
>10 ppm Mo in soils
GASH CREEK
MANTLE CREEK
MANTLE 4
(1042508)
SOUTH CREEK
NOTE: This figure is adapted from Allen, 1984: Summary Map.
N.
18° 41'
N. mag.
SCALE
0 250 500 750 1000 m
0 1000 2000 3000 ft
Figure 8
CASSIAR EAST YUKON EXP. LTD.
1984 ABO OIL INTERPRETATION:
MOLYBDENUM in SOILS
MANTLE PROPERTY
54° 08' 14" N., 128° 12' 06" W.
U.T.M.: 5,999,097 N., 552,156 E.
N.T.S.: 103 I/1, B.C.: 103I 019+020
SKEENA M.D., B.C.
JOHN OSTLER; M.Sc, P.Geo.
SEPTEMBER, 2016

1980 to 1983

One year worth of assessment credit was applied to the Mat 1 and 2 (1235 and 1236) claims. The author assumes that those claims lapsed in 1980. The author knows of no work that was conducted in the current Mantle property area from 1980 to 1983.

1984 In June, 1984, the MAT 1 and 2 (3098 and 3099) claims were staked for ABO Oil Corporation. The 1984 MAT property was the same size as the 1979 AMAX Mat property comprising 40 units covering 1,000 ha (2,470 acres). The 1979 and 1984 properties were in the same location. Probably, the 1979 posts and lines were re-used.

ABO Oil contracted with A&M Exploration Ltd. of Vancouver, B.C. (D.G. Allen's exploration services company) to conduct exploration on the MAT property. Prospecting and geochemical sampling was conducted by a 3-man crew from June 16 to 20, 1984. The foci of the 1984 work were to confirm AMAX's 1966 work and to investigate the precious metal potential of the property area.

A total of 123 soil, silt, and rock-chip samples were taken in the lower parts of Gossan, Lamp, and Mantle creeks (Figure 4B). D.G. Allen (1984) reported upon the results of the 1984 ABO oil exploration program as follows:

> Molybdenum and copper values range up to 2400 ppm and 2440 ppm respectively. This data confirms results obtained from previous sampling. A number of zinc geochemical anomalies (150 to 418 ppm Zn) were obtained on the north slopes of Mantle Creek. Lead values are low and are not considered to be in the anomalous range. All gold values are 10 ppb. A few anomalous silver values (up to 3.8 ppm Ag) were obtained in Gossan Creek.
>
> Allen, D.G.; 1984: pp. 9-10.

D.G. Allen (1984) concluded that the area probably could not host a precious-metal deposit. On his interpretation map, Allen re-outlined both the Gossan Creek and Mantle Creek soil-molybdenum anomalies (Figure 8). The 1984 soil-sampling was too restricted both in number and in area (Figure 4B) to justify re-outlining those anomalies on its own. The author opines that the soil-molybdenum anomalies on Allen's map were mostly due to a re-interpretation of the previous 1965 to 1979 AMAX soil data.

1985 On June 16 and 17, 1985 D.G. Allen and D. Sorenson took 145 soil samples along 6 contour lines in the area of the southeastern extension of the Mantle Creek soil molybdenum anomaly (Allen, 1985) (Figure 4B). Work was done in an area in the southeastern part of the current MANTLE 1 (1040280) claim and in the adjacent northeastern part of the current MANTLE 4 (1042508) claim. Results confirmed those of the 1966 AMAX soil survey in that area (Figure 7).

1986 ABO Oil Corporation contracted with A&M Exploration Ltd. to conduct a horizontal loop electromagnetic survey on the MAT property (MacQuarrie and Allen, 1986). The work was sub-contracted to Shangri-La Mineral Exploration Consultants and was done from June 21 to 22, 1986.

The electromagnetic survey and its results were described as follows:

> A Scintrex Genie SE-88 horizontal loop electromagnetic survey was carried out ... (over the 1985 ABO Oil grid area (Figure 4B)) ... in order to test the previously located soil geochemical anomaly ...

A total of 2.8 line kilometres (1.7 line-mi) of surveying was completed on four flagged lines. A loop separation of 50 metres (164 ft), a frequency pair of 112/3037, and a 12.5 metre (41-ft) station separation were used for all observations ...

No conductors were detected by the survey. This indicates that the soil geochemical anomalies are not related to massive sulphide type or massive sulphide stringer type conductors, and therefore are probably related to quartz stringer mineralization as seen elsewhere on the claims.

MacQuarrie, D.R. and Allen, D.G.; 1986: pp. 4-5.

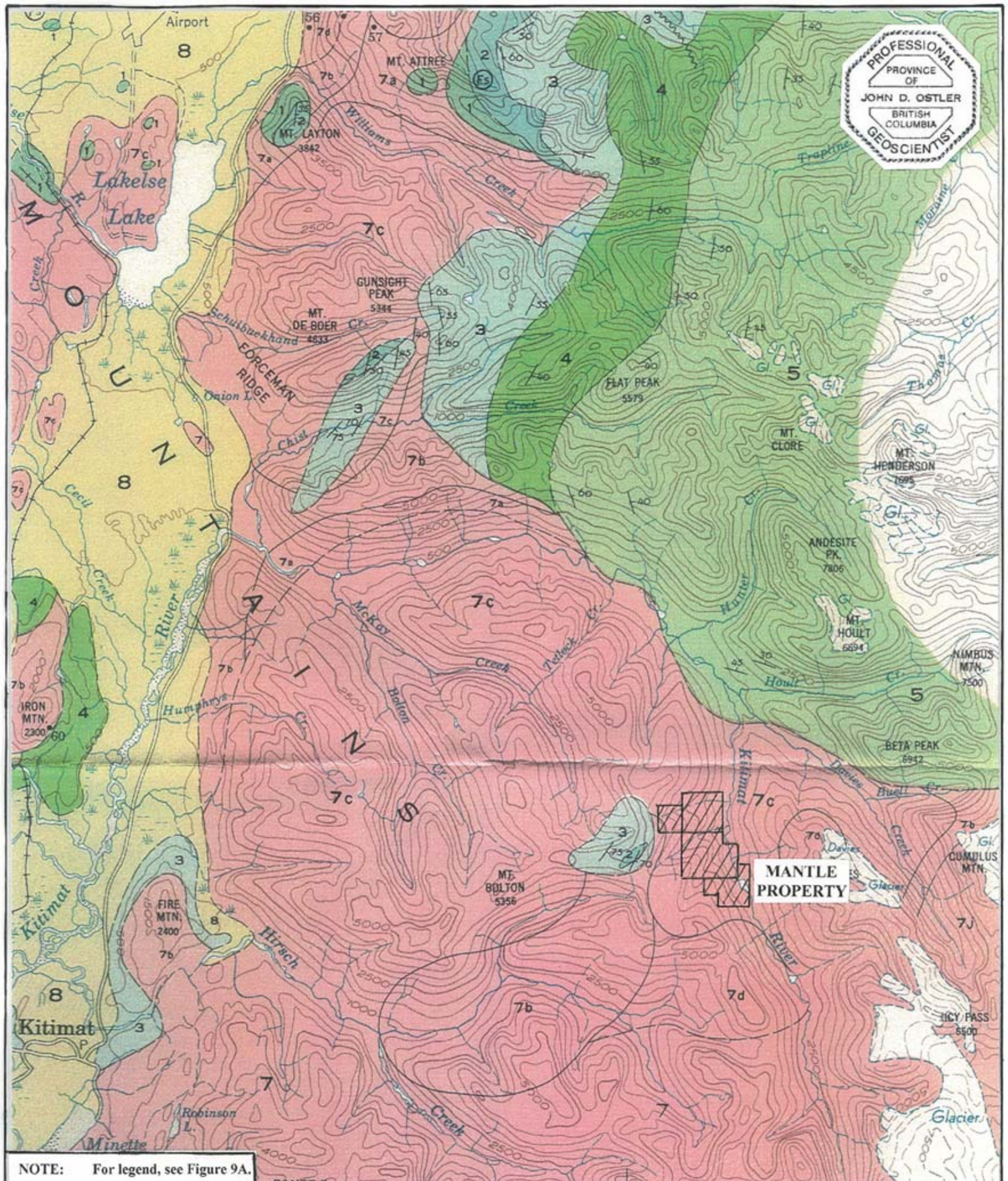
1987 to 2015

Although the current Mantle property area was staked several times, no exploration work in the property area from this period is known to the author.

2015 On December 1, 2015 the current Mantle property area was abandoned by the claim holder and the author map-staked the MANTLE 1 and 2 (1040280 and 1040285) claims to cover the Gossan and Mantle creek soil molybdenum anomalies and stockwork zones (Figures 3 and 4A).

2016 On March 2, 2016, the author map-staked the MANTLE 3 and 4 (1042507 and 1042508) claims to include the mineralized cliffs south of Gossan Creek and the southeastern extension of the Mantle Creek soil molybdenum anomaly. That staking brought the Mantle property to its current configuration and size of 985.26 ha (2,433.59 acres) (Table 1).

The current (2016) exploration program was conducted by the author and an assistant. Work on the ground was done from July 29 to August 5, 2016. The work focused on hydrothermal alteration related to copper and molybdenum mineralization around Gossan, Lamp, and Mantle creeks, and investigation of the provenance of the 1965-1966 AMAX soil-molybdenum anomalies near Gossan and Mantle creeks. Five pan concentrate samples were taken from sediments in Gossan, Lamp, Mantle, and South creeks. Details of that exploration are reported upon herein.



N.

18° 41' N. mag.

SCALE

0 2 4 6 8 10 km

0 1 2 3 4 5 mi

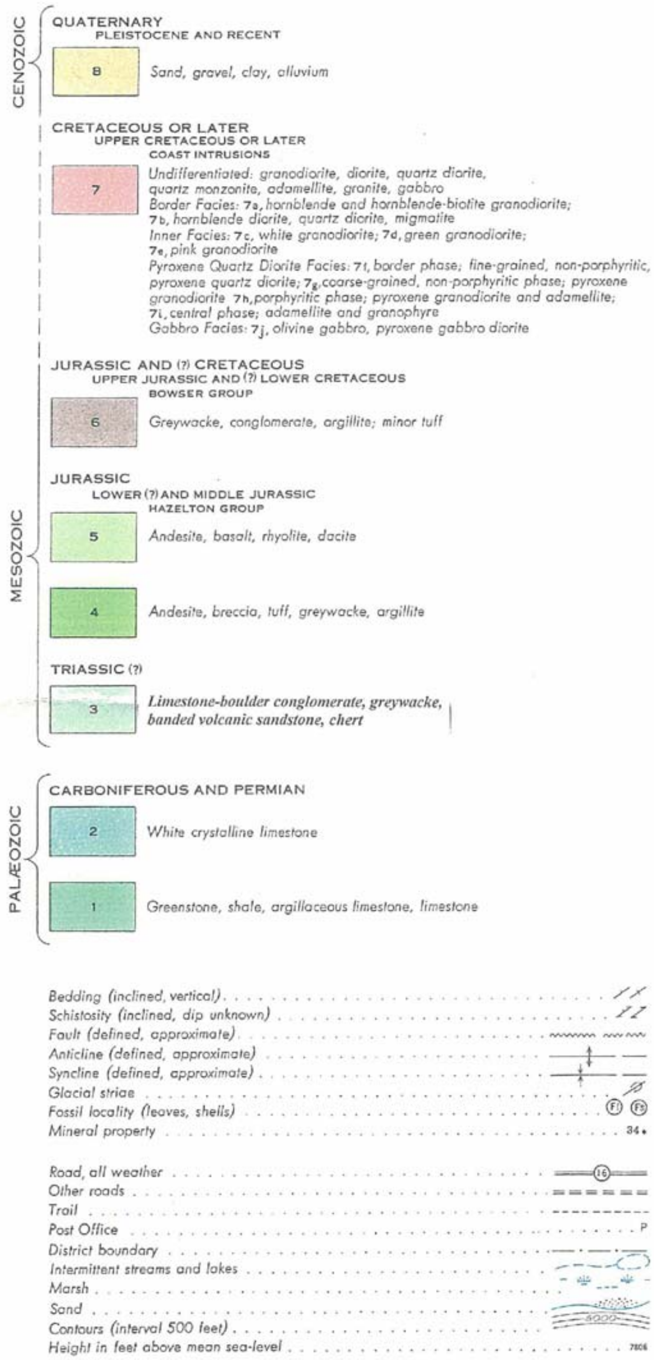
Figure 9

CASSIAR EAST YUKON EXP. LTD.

REGIONAL GEOLOGY
from G.S.C. MAP 1136A

MANTLE PROPERTY
54° 08' 14" N., 128° 12' 06" W.
U.T.M.: 5,999,097 N., 552,156 E.
N.T.S.: 103 I/1, B.C.: 103I 019+020 SKEENA M.D., B.C.
JOHN OSTLER; M.Sc, P.Geo. SEPTEMBER, 2016

Figure 9A
Legend to Figure 9



3.0 GEOLOGICAL SETTING AND CURRENT (2016) WORK

3.1 Regional Geology

The most definitive regional mapping conducted in the upper Kitimat River area was by S. Duffell and J.G. Souther (1964) of the Geological Survey of Canada (Figure 9).

Duffell and Souther's summary of the geology of the Terrace area was as follows:

GENERAL GEOLOGY

> The geology of the Terrace map-area may be briefly stated as that of a part of the eastern contact of the Coast Range batholith, and the flanking metamorphosed sedimentary and volcanic rocks that range in age from late Palaeozoic to early Cretaceous. The stratigraphy of the thick sequence (15,000 to 20,000 feet or 4,572 to 6,096 m) of metamorphosed volcanic and sedimentary rocks is imperfectly known. Correlations of sections from one area to another, or even from one place to another in a small area, cannot be made with certainty. Fossil evidence obtained proves the existence of rocks of Permian, Triassic, Jurassic, and Cretaceous? Age, but their boundaries are difficult to establish...
>
> Fossiliferous Palaeozoic limestone and associated greenstones occur as small pendants in the batholithic rocks or as narrow lenses along the flanks of eastward-extending tongues of the batholith. Limestone boulder conglomerate, greywacke, and chert believed to be of Triassic age rest unconformably above the Palaeozoic rocks without marked angular discordance. Lying above the Triassic rocks in conformable succession is a series of volcanic and minor sedimentary rocks referable to Middle Jurassic strata of the Hazelton Group. These rocks may be divided into a lower division of coarse andesitic breccia, green andesite, and intercalated greywacke and argillite; and an upper division of red, green, and purple, porphyritic and amygdaloidal andesitic flows with minor basalt, rhyolite, and dacite. This upper division is lithologically similar to volcanic rocks lying conformably above Middle Jurassic sedimentary strata in the Whitesail Lake map-area to the southwest ... Lying above the Middle Jurassic volcanic rocks with marked angular discordance is a series of marine and continental sedimentary rocks of Upper Jurassic age that may include some Lower Cretaceous strata and is referable to the Bowser Group. Marine beds near the bottom of this group yielded ammonites, pelecypods, and brachiopods of Upper Jurassic age. Greywacke and argillaceous beds higher in the group yielded perfectly preserved plant remains mainly of Jurassic age but possibly including some of Cretaceous age.
>
> The structure is dominated by the Coast Intrusions, which occupy most of the western and southwestern parts of the area and intrude all the sedimentary and volcanic formations described above. The main contact of the intrusions trends northwesterly across the area in an extremely irregular manner. Great apophyses extend northeastward nearly to the eastern boundary of the area. The intruded strata generally dip to the northeast, away from the main contact; local structures although often complex, tend to conform with the local configuration of the intrusive bodies.
>
> Granodiorite and adamellite (quartz-hornblende-mica diorite) are dominant rocks of the main batholith. Apophyses and stocks are generally more basic and consist mainly of quartz diorite, diorite, gabbro, and minor syenite. True granite is a minor component of both.

> Dykes are abundant in the area and cut both bedded and batholithic rocks. They vary in composition and include such rock types as granite, diorite, aplite, lamprophyre, basalt, and porphyritic variations; pegmatites are conspicuous by their absence. Commonly dykes have exercised structural control on the localization of mineral deposits.
>
> Regional metamorphism is of the lowest grade. Chlorite, muscovite, and minor epidote are present as secondary minerals in volcanic and sedimentary rocks but, with the exception of rocks near igneous contacts and faults, the texture and mineral composition of the original rocks have not been greatly altered. Contact metamorphism on the other hand has been extremely varied. Commonly rocks adjacent to the batholith are of the albite-epidote-amphibolite facies. Some rocks may show no megascopic alteration, whereas others fall within the highest grades of contact and dynamic metamorphism. Crystalline schists and gneisses of the latter type are more commonly developed along contacts with the main batholith than along contacts with the apophyses and stocks.
>
> Deuteric alteration of the granitic rocks, with the development of sericite, actinolite, and epidote, is almost universal throughout the area.
>
> Duffell, S. And Souther J.G.; 1964: pp. 12-14.

The 1965-1966 Southwest Potash/AMAX regional program included regional mapping of the upper Kitimat River area (Figure 10). Mineralization in the current Mantle property area was found to be hosted by grey soda granite (quartz monzonite) and leucocratic altered granite. Those granitic rocks were determined to post-date the main granodioritic intrusion exposed south of upper Kitimat River.

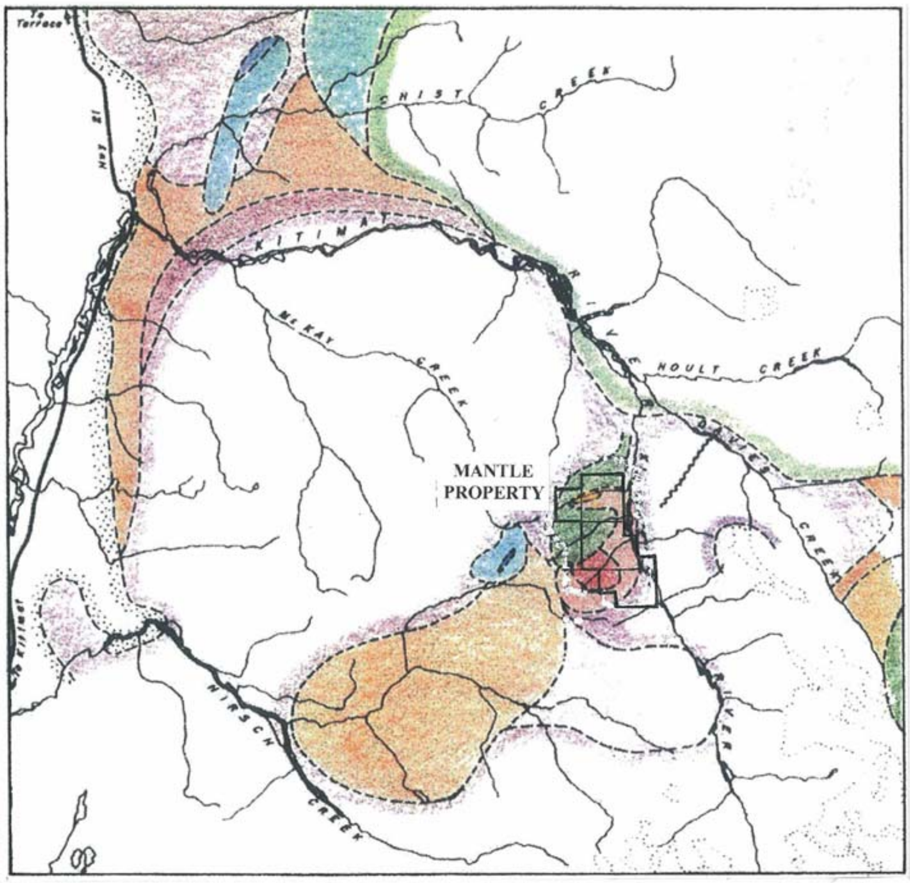
Subsequently, the work of Duffel and Souther (1963) was included in a regional compilation by Hutchison et al. (1979), on Geological Survey of Canada Map 1385A. In that 1: 1,000,000-scale compilation, the whole Mantle property area fit easily into a 5 X 5 mm square. No new mapping was done in the property area.

From 2005 to 2008, J. Nelson et al. conducted regional mapping in the Terrace-Kitimat area (Nelson, J. et al., 2008 and 2009). Mapping extended southward to the upper Kitimat River area during the last year of the program. However, the focus of that mapping was on Late Palaeozoic-age volcanic rocks exposed northwest of the town of Kitimat. No work was done near the current Mantle property.

Nelson et al. (2009) noted that the main intrusion in the upper Kitimat River area was related to the Williams Creek pluton. They assigned an age of Eocene or younger to the Williams Creek pluton because of its lack of penetrative cleavages. This is consistent with Miocene to Pliocene age determinations in the granodiorite in the Mackay Creek area about 10 km (6 mi) west of the current Mantle property area.

Table 3
Table of Geological Events and Lithological Units in the Mantle Property Area

Time	Formation or Event
Recent 0.01-0 m.y.	**Valley rejuvenation**: Down cutting of stream gullies through till, development of soil profiles.
Pleistocene 1.6-0.01 my.	**Glacial erosion and deposition:** Removal of Tertiary-age regolith, deposition of till and related sediments at lower elevations, smoothing of the Tertiary-age land surface.
Eocene to Pliocene 56.5-1.6 m.y.	**Erosion, and unroofing of the rocks, incision of the land surface:**
Eocene to Oligocene 56.5-23.8 my.	**Tensional faulting:** Deposition of the Endako Group flood basalt on the erosional surface regional erosion east to the map area. Emplacement of post-mineralization dioritic to quartz monzonitic dykes in the map area.
Eocene 56.5-33.7 m.y.	**Emplacement of the Williams Creek, Carpenter Creek, and Newton plutons:** granite, granodiorite and diorite. **Emplacement of the Kitimat River quartz-feldspar porphyry, soda granite and leucocratic altered granite.** **MINERALIZATION; Emplacement of Mo and Cu in aplitic stockworks, veins and disseminations on the Mantle property (MINFILE No. 103I 103 and 109)**
Late Cretaceous to Palaeocene 75-57 m.y.	**Larimide Orogeny:** mild folding faulting and erosion. **Emplacement of the foliated Kitsumkalum pluton** (58 m.y.) Foliated garnet-bearing granite.
Late Jurassic to Middle Cretaceous 144-88 m.y.	**Columbian Orogeny:** **Emplacement of the Coast Intrusions, thrusting and transcurrent faulting, deformation of Cache Creek rocks in a northeastward dipping subduction zone, accretion of Nicola Group rocks to North America:** **MINERALIZATION:** **Development of polymetallic Au-Ag-Cu-Pb-Zn veins near Terrace. E.g. St. Paul and Society Girl veins (MINFILE No. 103I 098 and 184).**
Late Jurassic to Early Cretaceous 163-131 m.y.	**Deposition of the Bowser Group sediments** in shallow marine and continental environments.
Middle Jurassic 167-163 m.y.	**Nassian Orogeny:** Re-emergence of the Stikine Arch, deepening of flanking basins regional deformation and metamorphism, overriding of Cache Creek Terrane rocks onto Quesnel Terrane Rocks to the east and Stikine Terrane (Telkwa Formation - Hazelton Group) rocks to the west along thrust faults **Development of an erosional surface on Telkwa Formation (Hazelton Group) rocks**
Early to Middle Jurassic 208-167 m.y.	**Deposition of the Telkwa Formation (Hazelton Group) volcanic and associated sedimentary rocks**. Triassic-age sedimentation was conformably succeeded by the Telkwa Formation (Hazelton Group) volcanics and sediments in the Terrace area. **Emplacement of the Kleanza pluton granodiorite.**
Early Jurassic East of the Map-area 200-188 m.y.	**Inklinian Orogeny east of the Terrace area:** Deformation producing the Stikine Arch, intrusion of granitic bodies, rapid unroofing and deposition of basal conglomerates on an erosional surface along the flanks of the arch.
Triassic 245-208 m.y.	Deposition of limestone, greywacke and banded volcanic sandstone above a basal limestone boulder conglomerate.
Late Permian to Early Triassic 256-241 m.y.	**Mild orogenic event in southern British Columbia:** Deformation, low-grade metamorphism, plutonism, uplift and erosion. **Development of an erosional surface on Palaeozoic strata**
Early Permian 300-272 m.y.	**Deposition of the Zyometz Group:** Mount Attree volcanics (285 m.y.) and marine sediments overlain by limestone. Small hypabissial intrusions are associated with the Mount Attree volcanics. **MINERALIZATION: Massive sulphide occurrences in the Mount Attree volcanics north of Kitimat and east of Terrace (Nelson, 2009)**
Carboniferous 355-300 m.y. m.y. = million years	**Deposition of white crystalline limestone in a miogeosyncline.** These rocks were deposited in an environment similar to that of the Kaslo and Milford Groups which record the in-filling of the Cordilleran miogeosyncline in eastern British Columbia **MINERALIZATION: Polymetallic Pb, Zn, Cu, Ag, Au veins similar to those in the Lardeau area of eastern British Columbia. Eg. Lead King south of Mount Thornhill (MINFILE No. 1103I 177)**.



PROFESSIONAL
PROVINCE OF
JOHN D. OSTLER
BRITISH COLUMBIA
GEOSCIENTIST

NOTES: This figure is adapted from Gambardella and Richardson; 1966: Figure 2.

For legend, see Figure 10A.

N.
18° 41'
N. mag.

SCALE

0 2 4 6 8 10 km

0 1 2 3 4 5 mi

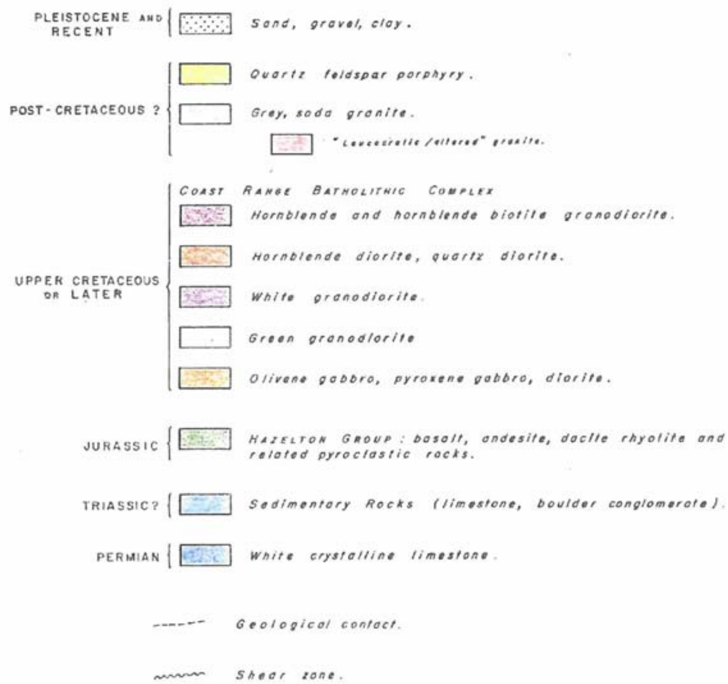
Figure 10

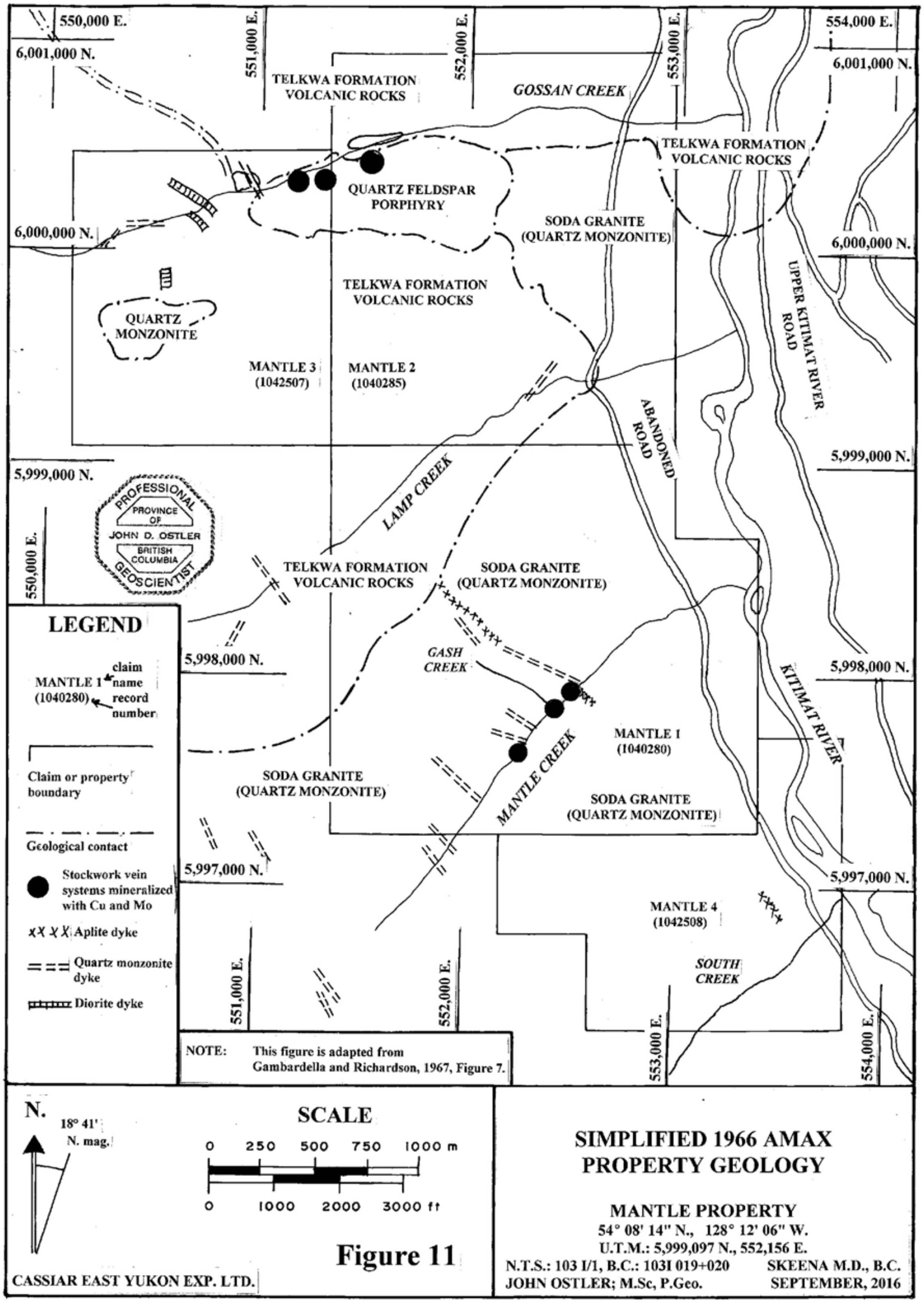
CASSIAR EAST YUKON EXP. LTD.

1965 SOUTHWEST POTASH (AMAX)
REGIONAL GEOLOGY

MANTLE PROPERTY
54° 08' 14" N., 128° 12' 06" W.
U.T.M.: 5,999,097 N., 552,156 E.
N.T.S.: 103 I/1, B.C.: 103I 019+020 SKEENA M.D., B.C.
JOHN OSTLER; M.Sc, P.Geo. SEPTEMBER, 2016

Figure 10A
Legend to Figure 10




550,000 E.
551,000 E.
552,000 E.
553,000 E.
554,000 E.
6,001,000 N.
6,000,000 N.
5,999,000 N.
5,998,000 N.
5,997,000 N.
TELKWA FORMATION VOLCANIC ROCKS
GOSSAN CREEK
QUARTZ FELDSPAR PORPHYRY
SODA GRANITE (QUARTZ MONZONITE)
QUARTZ MONZONITE
MANTLE 3 (1042507)
MANTLE 2 (1040285)
MANTLE 1 (1040280)
MANTLE 4 (1042508)
UPPER KITIMAT RIVER ROAD
ABANDONED ROAD
LAMP CREEK
GASH CREEK
MANTLE CREEK
SOUTH CREEK
KITIMAT RIVER
PROFESSIONAL GEOSCIENTIST PROVINCE OF BRITISH COLUMBIA JOHN D. OSTLER
LEGEND
MANTLE 1 (1040280) claim name record number
Claim or property boundary
Geological contact
Stockwork vein systems mineralized with Cu and Mo
Aplite dyke
Quartz monzonite dyke
Diorite dyke
NOTE: This figure is adapted from Gambardella and Richardson, 1967, Figure 7.
N.
18° 41' N. mag.
SCALE
0 250 500 750 1000 m
0 1000 2000 3000 ft
Figure 11
CASSIAR EAST YUKON EXP. LTD.
SIMPLIFIED 1966 AMAX PROPERTY GEOLOGY
MANTLE PROPERTY
54° 08' 14" N., 128° 12' 06" W.
U.T.M.: 5,999,097 N., 552,156 E.
N.T.S.: 103 I/1, B.C.: 103I 019+020
SKEENA M.D., B.C.
JOHN OSTLER; M.Sc, P.Geo.
SEPTEMBER, 2016

3.2 Property Geology

3.2.1 Stratigraphy

The only significant previous study of the geology of the Mantle property area was conducted during 1965 and 1966 by AMAX (Figure 11). The results of that work were recorded by A.C. Gambardella and P.W. Richardson (1967) as follows:

Hazelton Group (now Telkwa Formation)

A roof pendant composed of medium to dark green, massive, undifferentiated volcanic rocks of the Hazelton Group ... is the oldest rock type in the property ... The rock is uniformly fine-grained and composed of feldspar, quartz, biotite, and hornblende. The grade of metamorphism is relatively low, and the main alteration products are epidote and chlorite. Along the contact with the granitic quartz-feldspar porphyry the volcanic rocks are finely brecciated and granitized.

Molybdenite mineralization is generally absent except near the contact with the granitic quartz-feldspar porphyry in Gossan Creek (on the current MANTLE 2 (1040285) claim) where sporadic MoS_2-bearing quartz veins were noted.

Intrusive Rocks

General Statement

The intrusive rocks underlying the property show considerable variation in texture and composition, and differ significantly from the rocks of the surrounding batholith. Two main intrusive facies, soda granite and granitic quartz-feldspar porphyry; two pre-mineral dykes, aplite and foliated feldspar; and a variety of post-mineral dykes ranging in composition from diorite to quartz-monzonite have been mapped on the property ...

Molybdenite mineralization is located largely in the soda granite and the granitic quartz-feldspar porphyry ... A tentative age sequence with respect to MoS_2 mineralization is (as follows):

Table 4
Table of Formations adapted from Gambardella and Richardson (1967)

Eocene to Oligocene 56.5-23.8 m.y.	Intermediate dykes Quartz-monzonite dykes Diorite dykes	Youngest
Eocene 56.5-33.7 m.y. m.y. = million years	Molybdenum mineralization Aplitic dykes Granitic quartz-feldspar porphyry Foliated feldspar-porphyry dykes Soda granite White biotite granodiorite	 Oldest

White Biotite Granodiorite

The white biotite granodiorite crops out on a ridge on the extreme northwestern margin of the property (west of the current Mantle property), and is the most abundant rock type in areas adjacent to the property. The rock has a uniform medium-grained texture and is composed of white feldspar (70%), quartz (15-20%), biotite (5-10%), and hornblende (2%).

In thin section, euhedral crystals of plagioclase exhibit strong to moderate normal zoning and range in composition from An_{20} to An_{36}. Potash feldspar (perthitic in part) constitutes 10% of the rock and occurs as anhedral, poikilitic grains interstitial to plagioclase. Strained quartz is interstitial to both feldspars and appears to be replacing them. Unaltered flakes of brown biotite and hornblende laths are the mafic constituents. Accessory amounts of sphene, magnetite and apatite are present.

With the exception of a slight sericitization of plagioclase cores, the rock is relatively free of alteration products.

Soda Granite (Quartz monzonite)

This rock constitutes the main intrusive body on the property. It underlies most of the eastern and south-central portions of the property (Figure 11). The colour varies from light pink to light grey and the texture from medium-grained hypidiomorphic granular to sub-porphyritic. The latter texture occurs only along the ridge tops, indicating the current level of erosion is close to the original intrusive surface level. Irrespective of texture and colour, the composition is essentially 50-60% plagioclase, 15-20% K-feldspar, 15-20% quartz, and 2-5% biotite.

Microscopic examination of a representative specimen from Mantle Creek gave the following results:

> Plagioclase - euhedral to subhedral grains, with weak to moderate normal zoning and generally poor twinning. The composition varies from An_8 to An_{12}. The cores exhibit strong to moderate alteration to sericite and minor biotite.
>
> K feldspar - occurs as coarse anhedral grains of string perthite, interstitial to plagioclase. Also as rims around plagioclase. Frequently the perthite is closely associated with quartz, suggesting a simultaneous crystallization of the two minerals either as a late cotectic crystallization or as hydrothermal replacement.
>
> Quartz - anhedral grains, with undulatory extinction.
>
> Biotite - brown, medium-sized flakes, occurring singly or in clusters, slightly altered to chlorite.
>
> Opaque Minerals - finely disseminated dust of iron oxides and minor amounts of euhedral pyrite.

A partial chemical analysis of one sample of soda granite gave the following results: SiO_2, 71.7%; K_2O, 3.0%; Na_2O, 4.48%; and CaO, 0.825%.

Foliated Feldspar Porphyry Dyke

A dark grey, foliated feldspar porphyry crops out intermittently along a narrow zone on the northern slope of Gossan Creek between elevations of 2,000 and 2,500 feet (609.6 and 762 m) (near the northern boundaries of the current MANTLE 2 and 3 (1040285 and 1042507) claims). The texture is porphyritic with phenocrysts of subhedral feldspar and rounded quartz “eyes” set in a dark grey, aphanitic matrix. The pronounced foliation results from the planar orientation of biotite laths. Fracturing is generally weak except in areas of shearing.

Along its northern margin the feldspar porphyry exhibits a chilled contact against the Hazelton (Telkwa) volcanics. The southern contact is, for the most part, covered by alluvium ... The feldspar porphyry is a dyke, 20 to 50 feet (6.6 to 15.2 m) wide, intruded parallel to the course of Gossan Creek. Molybdenite mineralization is generally absent ...

In thin section, the plagioclase phenocrysts show a pronounced oscillatory extinction, and a compositional range of An_{30} to An_{40}. They constitute 20% of the rock. Alkali feldspar (perthite) occurs as anhedral phenocrysts (less than 10%) and as fine grained graphic intergrowths with quartz in the groundmass. Quartz phenocrysts make up 10% of the rock. They have slightly resorbed borders and wavy extinction due to straining. Biotite which constitutes approximately 12% of the rock is the only mafic present. Accessory amounts of magnetite, pyrite, apatite, and zircon are the remaining constituents.

Alteration of plagioclase to sericite and biotite to chlorite is widespread but generally weak.

<u>Granitic quartz-feldspar porphyry</u>

A body of pink, granitic rock outcrops as a steep cliff on the south slope of Gossan Creek, between elevations of 2,000 and 3,500 feet (609.6 and 1,066.8 m) (on the current MANTLE 2 and 3 (1040285 and 1042507) claims). The geometric configuration, especially with regard to its southern extension, remains largely undetermined because only the lower portion on the cliff is accessible. The ridge overlooking the cliff contains little or no outcrop. The texture of the rock varies from medium-grained sub-porphyritic to fine-grained porphyritic. Two facies have been recognized: a porphyritic muscovite border facies, and a sub-porphyritic biotite facies.

The porphyritic facies occurs at or near the contact with older volcanic rocks and in dykes and apophyses. Megascopically the rock is composed of pink to buff subhedral feldspar phenocrysts (30%) and rounded quartz “eyes” (10-15%), set in a fine grained groundmass of quartz and feldspar. Muscovite in euhedral flakes (2%) is the only mafic constituent and is diagnostic of this facies.

In thin section, the feldspar phenocrysts consist of 20% sodic plagioclase (An_8 to An_{10}) and 10% perthite. The plagioclase crystals generally show corroded edges and some are badly shattered and altered. The perthite occurs as subhedral phenocrysts and as reaction rims around plagioclase, suggestive of a replacement origin. Quartz “eyes” (10-15%) are clear, with resorbed crystal edges and wavy extinctions. Some are distinctly ovoid in shape and have a crude alignment. Muscovite occurs as euhedral, inclusion-free flakes, and it appears to be of primary origin. Alteration of plagioclase to sericite is widespread and locally very intense. The groundmass is composed of a microcrystalline aggregate of quartz and feldspar (mostly alkali).

The sub-porphyritic biotite facies grades imperceptibly into the muscovite facies as the contact with the volcanic rocks is approached. The texture is medium-grained and weakly porphyritic. The primary mineral constituents are: quartz (25%), feldspar (65%), and biotite (2%).

In thin section, the feldspars are composed of sodic plagioclase (An_8 to An_{12}), perthite and orthoclase. The plagioclase crystals occur as subhedral, cloudy grains with albite twinning. Perthite is largely interstitial and closely associated with quartz, forming coarse-grained, graphic intergrowths, suggestive of a late cotectic crystallization of the two minerals. Biotite occurs as individual flakes with ragged edges, partly altered to chlorite and as unaltered, fine-grained aggregates of apparently secondary origin.

... A partial chemical analysis of one sample of the sub-porphyritic facies indicated that the rock is compositionally equivalent to leucogranite ... : SiO_2, 74.2%; K_2O, 6.0%; Na_2O, 3.08%; and CaO, 0.250%.

Aplite Dykes

Several aplite dykes ranging in width from 10 inches (25.4 cm) to 20 feet (6.1 m) have been mapped throughout the property. Most of them occur in Gossan Creek (on the current MANTLE 2 and 3 (1040285 and 1042507) claims) (Figure 11), either within or peripheral to the granitic quartz-feldspar porphyry. They are typically pink in colour, with a fine-grained sugary texture and composed of pink feldspar, quartz, and accessory amounts of euhedral pyrite crystals. Occasional molybdenite-bearing quartz veinlets indicate that they are of pre-molybdenum mineralization age. The close spacial relationship and the mineralogical similarity with the granitic quartz-feldspar porphyry strongly suggests that the aplite dykes are genetically related to the porphyry.

Diorite Dykes

Two diorite dykes, both approximately 40 feet (12.2 m) wide, occur near the heads of both Gossan and Mantle creeks ... The colour is dark green and the texture is medium-grained hypidomorphic granular. They are composed of 60% light grey feldspar, 35% mafics (hornblende, biotite, minor pyroxene), 5% quartz and accessory amounts of magnetite and pyrite. The massive, unfractured nature of the dykes and the lack of molybdenite mineralization indicate that they are post molybdenite mineralization in age.

Quartz-monzonite Dykes

Quartz-monzonite dykes ranging in width from 5 to 30 feet (1.5 to 9.1 m) are widely distributed throughout the property, but are especially abundant along the western margin of the map area. The dykes generally exhibit a well developed porphyritic texture, and they vary in colour from light grey to medium grey. They are composed of phenocrysts on white to buff feldspar (10-15% of the rock) and quartz (5% of the rock) set in a fine-grained matrix of feldspar, quartz, and biotite.

Intermediate Dykes

Intermediate dykes of andesitic composition ranging in width from 1 to 5 feet (0.3 to 1.5 m) occur throughout the property. These dykes are light to medium green in colour, aphanitic, and generally unfractured. They cut all other rock types on the property, and clearly represent the last stage of igneous activity in the area.

Gambardella, A.C. and Richardson, P.W.; 1967: pp. 15-23.

The author's investigation up Gossan and Lamp creeks revealed that the Telkwa-Formation (Hazelton-Group) rocks were pillowed andesites that were in part porphyritic. Sparse amygdules in pillow rinds indicated that the pillows were deposited in deep water.

No definitive geochronological work has been conducted on the rocks in the Mantle property area. Gambardella and Richardson (1967) mapped the volcanic rocks exposed in Lamp Creek as part of the Hazelton Group (Telkwa Formation). They have not been investigated in detail during any government mapping program known to the author.

Duffel and Souther (1964) mapped the intrusive rocks in the property area as Late Cretaceous or younger (Figure 9). Hutchinson et al. (1979) mapped them as Early Tertiary in age. Nelson (2009) determined from their lack of regional structures that they were of Eocene age and related to the Williams Creek pluton (Table 3).

The local igneous history as deciphered by A.C. Gambardella and P.W. Richardson (1967) was as follows:

Igneous History

General Statement

From a study of textural and mineralogical variations, contact features, and spatial relationships, some generalizations can be drawn concerning (I) the genetic relationships between the intrusive rock types, (ii) their mode of emplacement, (iii) the sequence of chronological events.

Sequence of Events

White biotite granodiorite is the oldest rock type in the area. It is the most common and uniform member of the inner facies of the Coast Range Batholithic Complex, and is probably of Late Mesozoic or Early Cenozoic age (Figure 10) (Tables 3 and 4).

The relationship between the white biotite granodiorite and the soda granite can not be determined by direct geological evidence, since contacts between the two rock types are not exposed within the property. The soda granite may represent a contemporaneous, more acid phase of the white biotite granodiorite, or more likely, a later and separate intrusive phase. The latter hypothesis is favoured by the writer on the basis of the similarity on composition and close spatial relationship that exist between the soda granite and the granitic quartz-feldspar porphyry, which is definitely younger than the biotite granodiorite. The similarity in composition is shown by a partial chemical analysis of the two rocks ... and the composition of plagioclases in the An_8 to An_{12} range for both rocks. The similarity in composition and close spatial relationship to the younger rock type suggests that the soda granite is more closely related in time to the intrusion of the granitic quartz-feldspar porphyry than to that of the biotite granodiorite and is therefore younger than the biotite granodiorite.

The position of the foliated feldspar porphyry in the sequence of events is not established. The rock is of pre-mineralization age and older than the granitic quartz-feldspar porphyry, since it is intruded by the latter. Compositionally it is more closely related to the white biotite granodiorite and probably represents a late phase of the granodiorite.

The intrusion of the granitic quartz-feldspar porphyry and related aplitic dykes and apophyses represents the last intrusive event in the property prior to molybdenite mineralization.

Mineralization (pyrite, molybdenite, chalcopyrite) occurred after the emplacement of the quartz feldspar porphyry and is probably genetically related to the porphyry. This is suggested by the comparatively high Mo content in dykes and apophyses related to the granitic quartz-feldspar porphyry relative to the Mo content of the older igneous rocks which they intrude.

Field evidence indicates that most of the faults and shears in the area were active after molybdenite mineralization. However, the rough correspondence of mineralized quartz veins with a main structural trend of shears and faults in the area suggests that the zones of weakness existed prior to the mineralization.

Hydrothermal alteration, chiefly feldspathization and silicification, became active in the area in conjunction with sulphide mineralization. Carbonate and hematite alteration remained active mainly along shear zones up to the intrusion of post-mineralization dykes.

The intrusion of post-mineralization dykes represents the last igneous event in the area. The dykes include diorite, quartz monzonite, and dykes of intermediate composition. They appear to be completely unrelated to the pre-mineralization rocks on the property and are probably of regional extent.

Significance of Contact Features

Geological contacts between the white biotite granodiorite and the Hazelton (Telkwa Formation) rocks were mapped on the north-west corner of the property. The contacts are sharp, with no appreciable granitization or brecciation of the volcanic rocks. Wall rock alteration is of low grade, with epidote being the only visible alteration product in the volcanics. The granodiorite does not exhibit any textural or mineralogical variations as the contact is approached.

The relatively low grade of metamorphism in the volcanic rocks, the lack of textural variations in the granodiorite, and the sharpness of the contacts indicate that at the time of emplacement the granodiorite magma had completely crystallized and was relatively free of fluids and volitiles.

The nature of the contacts between the granitic quartz-feldspar porphyry and the Hazelton (Telkwa Formation) volcanics suggests that the conditions under which the granitic magma was intruded were considerably different from those of the regional biotite granodiorite and therefore the two intrusives represent distinct and separate phases in the igneous history of the area. At all observed contacts between the porphyry and the volcanic rocks the latter are finely brecciated and granitized and the quartz feldspar porphyry exhibits a wide range of textural variations. The abundance of quartz veining and the presence of muscovite along the border facies is characteristic of a magma rich in fluids and volitiles. These observations suggest that the granitic quartz-feldspar porphyry was intruded in a semi-liquid state and probably at shallow depth.

Gambardella, A.C. and Richardson, P.W.; 1967: pp. 32-35.

During the author's 2016 alteration study, the 1966 AMAX mapping was found to have been quite accurate.

3.2.2 Structure and Metamorphism

The Telkwa Formation pillowed andesites forming the roof pendant exposed in Gossan and Lamp creeks are of Early Jurassic age and were folded during subsequent orogenies. However, folding within that roof pendant has no bearing on the development of porphyry-style mineralization in nearby intrusive rocks. Probably for that reason that folding was not studied during the 1965-1966 AMAX mapping of the property area (Gambardella and Richardson, 1967). For that reason it was not studied in detail during the current (2016) exploration program.

Intrusive rocks in the area are of Eocene or younger age and post-date the most recent orogeny that deformed the area. Consequently, the significant structural features in the property area are fractures, faults, stockwork zones, and dykes; and not folds.

The only previous structural mapping in the Mantle property area was conducted by AMAX in 1965 and 1966. The results of that structural mapping were reported upon by A.C. Gambardella and P.W. Richardson (1967) as follows:

Structure

Faults and Shears

... Three shear directions have been recognized in the map area: (1) N30° - 40°W (320 to 330°), dipping steeply to the southwest, (2) north (000°) and (3) N38°E (038°), both with vertical dips. The first set, N30° - 40°W (320 to 330°), is the predominant structure and is reflected by topographic linears which extend beyond the limits of the property. Most of the post-mineral dykes are intruded along this set.

All of the shears are characterized by zones of intense alteration and fracturing varying in width from a few inches (cm) to 15 feet (4.6 m). These zones weather easily by comparison with the adjacent rocks , leaving deep incised gullies along the slopes of Mantle and Gossan creeks ....

Quartz Vein Stockworks

Quartz vein stockworks occur in Mantle and Gossan creeks where they are associated with sulphide mineralization. The stockworks are best-developed in the granitic quartz-feldspar porphyry in Gossan Creek where they have been noted in areas 2,000 feet (609.6 m) apart, averaging 8 veins per square foot (86 veins/m^2).

Three separate stockworks 100 to 150 feet (30.5 to 45.7 m) wide occur over a distance of 2,000 feet (609.6 m) in Mantle Creek. The intensity of veining ranges from 4 to 8 veins per square foot (43 to 86 veins/m^2).

Joints and Fractures

Fracturing is an important structural feature in the property because it has been largely responsible for the location of most of the molybdenite mineralization in quartz veins and as smears on fracture planes.

Results of Stereonet Plots

... The predominant attitudes of plotted structural features are listed below under their respective headings in order of decreasing concentrations:

Table 5
Predominant Attitudes of Plotted Structural Features adapted from Gambardella and Richardson (1967)

Structure	Orientation	Predominance
Joints and fractures	N42°W, dipping 74°SW (138°/74°) N50°E, dipping 80°NW (230°/80°) North, dipping 80°W (180°/80°)	most common scarcest
Shears, faults and dykes	N40°W, dipping 80°SW (140°/80°) N38°E, dipping vertically (038°/90°) N4°W to N10E, dipping vertically (356° to 010°/90°)	most common scarcest
Mineralized quartz veins and fractures	N4°E, dipping vertically (004°/90°) N40°W, dipping 60°SW (140°/60°) N38°W, dipping 55°NW (322°/55°)	most common scarcest

The above data show that the predominant attitude of joints and fractures is N42°W, dipping 74°SW (138°/74°). This coincides well with the predominant orientation of shears, faults, and dykes (N40°W, dipping 80°SW (140°/80°)). The theory proposed is that most of the shearing occurred along per-existing joint planes. These planes probably represent large tension fractures developed within the Coast Range Intrusive Complex as a result of cooling. These fractures were later intruded by swarms of post-mineralization dykes. The extension of dykes, shears and faults beyond the limits of the property suggests that the above orientation is of regional rather than local nature.

The preferred orientation of mineralized quartz veins and fractures is N4°E with a vertical dip (004°/90°). This attitude agrees with a secondary but well-defined attitude of joints and fractures (North, dipping 80°W (180°/80°)). Two other orientations of mineralized quartz veins and fractures (Table 5) have the same strike as the two major orientations of faults, shears, and dykes ... but less steep dips. The dip variations may be attributed to local rotation of pre-existing fractures by the intrusive processes associated with mineralization. In general, it can be said that mineralization is structurally controlled, and that the controlling structure coincides roughly with the predominant structural features of the area, which are probably of regional extent.

Gambardella, A.C. and Richardson, P.W.; 1967: pp. 24-27.

The author found the preceding results of the AMAX structural study to be quite accurate.

Gambardella and Richardson (1967) mentioned little about pre-tertiary-age regional metamorphism in the Telkwa Formation meta-volcanic rocks in the current Mantle property area. The author observed that those rocks have undergone upper greenschist to lower amphibolite grade regional metamorphism that is between the biotite and garnet isograds. That regional metamorphism has been overprinted by contact metamorphism and hornfelsing near contacts with the soda granite (quartz monzonite) and the quartz-feldspar porphyry. In Gossan Creek the contact between the quartz-feldspar porphyry is close to vertical. Thus, it can be assumed that the width of the contact metamorphic zone as viewed along the creek is close to its true thickness. Visible hornfelsing decreases from pervasive and intense at the intrusive contact to negligible about 400 m (1,312 ft) east of it (Figure 12).

During previous mapping east of Terrace, the author found that intrusive contacts at the sides of magma chambers were distinct and sub-vertical. At the roofs of the chambers, contacts were complex and gradational due to hydraulic fracturing and roof rock falling into the chamber (Ostler, 2008). The situation is similar on the current Mantle property where the sub-vertical, distinct intrusive contact between side of the quartz-feldspar porphyry is less complex than the sub-horizontal intrusive contact between top of the soda granite (quartz monzonite) and andesite at Lamp Creek.

3.3 Alteration and Mineralization on the Mantle Property

3.3.1 Alteration

Alteration was scrupulously recorded but little sense was made of its distribution during the 1965-1966 AMAX exploration program. A.C. Gambardella and P.W. Richardson (1967) reported that the grade of regional metamorphism is relatively low, and the main regional metamorphic minerals were epidote and chlorite. Their work on hydrothermal alteration was consistent with the era of that work, which pre-dated much of our understanding of alteration systems and distributions in hydrothermal systems. Their summary of hydrothermal alteration was as follows:

> <u>Alteration</u>
>
> The effects of hydrothermal alteration are present throughout the map area. A variety of alteration types, which include silicification, feldspathization, sericitization, chloritization, hematitization, carbonitization, and epidotization have been noted in addition to sulphidization (pyrite, molybdenite, chalcopyrite) ...
>
> All of the alteration types, with the exception on epidotization, occur within the mineralized zones. Silicification and feldspathization and to a lesser extent sericitization are the alteration types most consistently associated with molybdenite mineralization.
>
> For the most part the alteration is structurally controlled and occurs along shear zones, faults, and fractures. Because of the scarcity of rock exposures, the zonal distribution of alteration types could not be firmly established beyond the following general observations.
>
> 1. Increase of silicification, largely as quartz fracture filling and to a lesser extent as pervasive silicification, in the mineralized zones in Mantle and Gossan Creeks.

2. Feldspathization, manifest as a pink colouration of the rock is restricted almost exclusively to areas of visible sulphide mineralization in both Mantle and Gossan creeks. In the latter the feldspathiztion is generally pervasive, whereas in Mantle Creek it occurs exclusively along tight fractures.

3. Sericitization is best developed in areas of sulphide mineralization. However, it also occurs throughout the property and is generally very intense along all shears and fault zones. Carbonitization, Hemititization, chloritization, and epidotization occur in varying degrees throughout the map area and are unrelated to sulphide mineralization. Carbonitization, mainly as calcite and to a lesser extent as siderite, and hemititization generally occur together along shear zones. Epidotization occurs as fracture fillings in the volcanic rocks and chloritization occurs in varying degrees in all rock types as an alteration product of the mafic constituents.

Gambardella, A.C. and Richardson, P.W.; 1967: pp. 30-31.

Now, we would refer to the occurrence of silica, orthoclase and sericite near the mineralized zones as a potassic alteration zone. Carbonate, hematite and epidote in fractures remote from mineralization currently would be deemed to be an outer propylitic zone. Gambardella and Richardson's record of the occurrence of hematite after magnetite indicated that there was what we would now term as retrograde encroachment of the propylitic zone on previous potassic alteration. This is indicated by the following quote:

> Hydrothermal alteration, chiefly feldspathization and silicification, became active in the area in conjunction with sulphide mineralization. Carbonate and hematite alteration remained active mainly along shear zones up to the intrusion of post-mineralization dykes.

Gambardella, A.C. and Richardson, P.W.; 1967: p. 34.

The results of the author's current (2016) investigation of alteration in Gossan, Lamp, and Mantle creeks are summarized as follows:

Potassic alteration in quartz-feldspar porphyry at Gossan Creek is related to north-south trending, sub-vertical shears. In the porphyry matrix, potassic alteration occurs mostly as re-crystallization and overgrowth of potassium feldspar. Red-brown biotite and magnetite crystallization is less abundant. Early mafic and 'A'-type quartz-potassium feldspar veins are most common in the areas of the shears. These veins have indistinct (plastic) margins that indicate that they were emplaced in a high temperature environment with temperatures varying from about 450 to 600°C.

At Lamp Creek, potassium feldspar overgrowths of plagioclase occur in the matrices of both andesite and soda granite (quartz monzonite). Overgrowths are abundant also at Mantle Creek where only soda granite is exposed. There, early mafic veins and 'A'-type veins with indistinct margins are scarse. The most common veins present are narrow quartz-potassium feldspar veins with distinct (brittle) margins ('B'-type veins). Also late pyritic veins with distinct (brittle) margins ('D'-type veins) are present. These veins indicate that potassic alterations at Lamp and Mantle creeks was emplaced in a moderately hot environment with temperatures ranging from 350 to 450°C.

Potassic alteration appears to have developed in soda granite at Lamp and Mantle creeks under a cooler more brittle regime than it has in quartz-feldspar porphyry at Gossan Creek. It is deduced that potassic alteration formed after the soda granite had cooled sufficiently to support brittle deformation and while the quartz-feldspar porphyry was still sufficiently hot to be ductile. This indicates that the soda granite predates the quartz-feldspar porphyry and that the porphyry is most intimately related to potassic alteration and mineralization.

All of the rocks examined in Gossan, Lamp, and Mantle creeks have undergone potassic alteration. Thus, the core potassic alteration zone of the Mantle hydrothermal system exists as a single zone that extends for a north-south distance of at least 2.9 km (1.8 mi) from Gossan Creek to Mantle Creek. Its total extent remains unknown. The vertical extent of potassic alteration and mineralization is at least from 440 to 550 m (1,444 to 1,804 ft) as exposed in Mantle and Gossan creeks (Figure 12).

The rocks of Gossan, Lamp, and Mantle creeks have all been subjected to retrograde propylitic alteration after the development of potassic alteration had ceased. The propylitic alteration is best developed in Telkwa Formation andesite and hornfels where iron, magnesium, and calcium-bearing minerals are most common. Propylitic alteration is mostly visible as narrow epidote-biotite-hematite-chlorite-quartz-carbonate veins and smears on fractures. Commonly, propylitic alteration occupies the same general north-south fracture sets as the preceding potassic alteration. In the quartz-feldspar porphyry and soda granite (quartz monzonite) early mafic and pyritic veins are partly or completely altered to red hematite or orange-brown limonite.

For more details of the current (2016) study of alteration on the Mantle property, see section 5.2.1 of this report.

3.3.2 Mineralization

There are two British Columbia MINFILE mineral occurrences in the Mantle property area: MINFILE No. 103I 103 and No. 103I 109 which describe the mineralized quartz vein stockworks exposed on Gossan and Mantle creeks respectively. The published locations of both of these MINFILE occurrences are accurate (Table 2) (Figures 4A, 11, and 12).

Molybdenum was the focus of interest during the 1965-6 AMAX exploration program. Although copper-bearing minerals were present in most of the significant mineral showings, it seems to have been considered of minor importance. Mineralization in the current Mantle property area was described by A.C. Gambardella and P.W. Richardson (1967) as follows:

> Sulphide Mineralization
>
> General Statement
>
> The following sulphides in order of decreasing abundance have been observed: Pyrite, molybdenite, chalcopyrite. All three minerals occur mainly in narrow quartz veins and to a minor extent along dry fractures and as fine disseminations.
>
> Pyrite is generally present in amounts of less than 1% but is very widespread. It occurs either alone or in association with molybdenite and chalcopyrite in quartz veins, and is present in accessory amounts in most igneous rocks.
>
> Chalcopyrite has been observed in quartz veins, commonly associated with molybdenite and pyrite.
>
> Molybdenum Mineralization
>
> Distribution
>
> Known molybdenum mineralization is exposed in Gossan and Mantle creeks, two of the three major creeks draining the property. In Gossan Creek, low grade MoS_2 is exposed over a horizontal distance of 2,500 feet (762 m) and through a vertical distance of 1,500 feet (457.2 m). Surface mapping and geochemical sampling indicate that the northern boundary of the zone is defined by Gossan Creek. However, its east-west and southern extensions remain undefined because of the continuous overburden in those areas (Figures 4, 6, 7, and 11).
>
> In Mantle Creek, molybdenite is exposed discontinuously over a horizontal distance of 2,000 feet (609.6 m) along the narrow creek bed and through a height of 1,000 feet (304.8 m). The molybdenum mineralization is open in both directions at right angles to the creek (Figures 4, 5, 7, 11, and 12).

Mode of Occurrence

Molybdenum mineralization occurs as the sulphide MoS_2. No molybdenum oxides were recognized on the property. The molybdenite is characteristically fine-grained and occurs as sporadic disseminations along the margins of quartz veins, and to a minor extent on dry fracture surfaces, and as fine disseminations.

Quartz-veins and Quartz-vein Stockworks

In both mineralized areas, molybdenite-bearing quartz-veins range from less than 1/16" to 1/4" (1.6 mm to 6.4 mm). MoS_2 is restricted almost entirely to the margins of the veins.

In Gossan Creek, three weakly mineralized stockworks, ranging in width from 50 to 150 feet (15.2 to 45.7 m) were defined (Figures 6, 11, and 12). The stockworks are all contained within the granitic quartz-feldspar porphyry. The vein intensity ranges from 6 to 12 veins per square foot (70.6 to 141.2 veins /m^2), but generally less than 50% of the veins are mineralized. Single, widely spaced quartz-MoS_2 veins occur in the intervening areas . In both stockwork and single veins, the distribution of MoS_2 along the strike is erratic, and frequently, MoS_2-bearing veins become barren within a few inches (cm). Occasional randomly oriented quartz-MoS_2 veins were noted in the volcanic rocks and in the grey feldspar porphyry where they come in contact with the quartz-feldspar porphyry.

In Mantle Creek, three areas of quartz-vein stockwork were outlined (Figures 5, 11, and 12). Their dimensions vary from 100 to 150 feet (30.5 to 45.7 m), and they all occur in soda granite (quartz monzonite). The vein intensity ranges from 4 to 12 veins per square foot (47.1 to 141.2 veins /m^2). As in Gossan Creek, less than 50% of the veins are mineralized and each vein shows erratic MoS_2 content. The areas between the stockworks are characterized by barren stretches of up to 50 feet (15.2 m) with occasional single MoS_2-bearing quartz veins.

Dry Fractures

Molybdenite occurring as smears on dry fractures in relatively rare and of minor importance in both mineralized zones. Upon close inspection, many of the dry fractures reveal a thin coating of quartz. It is therefore, likely that many, if not all of the so-called dry fractures are really fine molybdenite-bearing quartz veins.

Disseminations

Disseminated MoS_2 is generally absent in both mineralized zones. In Gossan Creek, finely disseminated MoS_2 was noted at one locality in the granitic quartz-feldspar porphyry, and in Mantle Creek, coarsely disseminated MoS_2 was found along a three inch (7.6 cm) wide zone of intensely K-feldspathized soda granite (quartz monzonite). A fragment of float of similar K-feldspathized rock that assayed 0.33% MoS_2. The source of this float was traced to an inaccessible cliff at the head of Gash Creek, a southerly flowing tributary of Mantle Creek.

Gambardella, A.C. and Richardson, P.W.; 1967: pp. 27-30.

During the author's current (2016) investigation, Gambardella and Richardson's (1967) description of copper and molybdenum mineralization to be quite accurate. At Gossan Creek, potassic 'A'-type veins in the quartz-feldspar porphyry have sparse, very fine-grained (<1 mm) pyrite, chalcopyrite, and molybdenite mineralization. Mineralization seems to be most common adjacent to north-south trending shears.

No copper or molybdenum mineralization was observed at Lamp Creek. At Mantle Creek, mineralization comprising mostly molybdenite occurred both in the margins of quartz-potassium feldspar ('B'-type) veins and in the soda granite matrix. There, very fine-grained molybdenite was accompanied with sparse pyrite and chalcopyrite mineralization. More molybdenite mineralization was observed at Mantle Creek than it was at Gossan Creek.

4.0 DEPOSIT TYPE SOUGHT ON THE MANTLE PROPERTY

4.1 Calc-alkalic Porphyry Copper-molybdenum Deposit

The mineral exploration target on the Mantle property is a "classic" calc-alkalic porphyry copper and molybdenum deposit.

Such deposits were described by Andre Panteleyev (1995) as follows:

Porphyry Cu +/- Mo +/- Au L04

IDENTIFICATION

SYNONYM: Calcalkaline porphyry Cu, Cu-Mo, Cu-Au.

COMMODITIES (*BYPRODUCTS*): Cu Mo and Au are generally present but quantities range from insufficient for economic recovery to major ore constituents. *Minor Ag in most deposits; rare recovery of Re from Island Copper mine.*

EXAMPLES (British Columbia (MINFILE #) - *Canada/ International*):

- Volcanic type deposits (Cu + Au +/- Mo) - Fish Lake (092O 041), Kemess (094E 021, 094), Hushamu EXPO, (092L 240), Red Dog (092L 200), Poison Mountain (092O 046), Bell (093M 001), Morrison (093M 007), Island Copper (092OL 158); Dos Pobres (USA); Far Southeast (Lepanto/Mankayan), Dizon, Guianaong, Taysan and Santo Thomas II (Philippines), Frieda River and Panguna (Papua New Guinea).

- Classic deposits (Cu+Cu+/-Au - Brenda (092HNE 047), Berg (093E 046), Huckleberry (093E 037), Schaft Creek (104G 015); *Casino (Yukon, Canada), Inspiration, Morenci, Ray Sierrita-Experanza, Twin Buttes, Kalamazoo and Santa Rita (Arizona, USA), Bingham (Utah, USA), El Salvador, (Chile), Bajo de Alumbrera (Argentina).*

- Plutonic deposits Cu+/-Mo - Highland Valley Copper (092ISE 001, 011, 012, 045), Gibralter (093B 012, 007), Catface (092F 120); *Chuquicamata, La Escondida and Quebreda Blanca (Chile).*

GEOLOGICAL CHARACTERISTICS

CAPSULE DESCRIPTION:

Stockworks of quartz veinlets, quartz veins, closely spaced fractures and breccias containing pyrite and chalcopyrite with lesser molybdenite, bornite and magnetite occur in large zones of economically bulk-mineable mineralization in or adjoining porphyritic intrusions and related breccia bodies. Disseminated sulphide minerals are present, generally in subordinate amounts. The mineralization is spatially, temporally and genetically associated with hydrothermal alteration of the hostrock intrusions and wallrocks.

TECTONIC SETTINGS:

In orogenic belts at convergent plate boundaries, commonly linked to subduction-related magmatism. Also in association with emplacement of high-level stocks during extensional tectonism related to strike-slip faulting and back-arc spreading following continent margin accretion.

DEPOSITIONAL ENVIRONMENT / GEOLOGICAL SETTING:

High-level (epizonal) stock emplacement levels in volcano-plutonic arcs, commonly oceanic volcanic island and continent-margin arcs. Virtually any type of country rock can be mineralized, but commonly the high-level stocks and related dykes intrude their coeval and cogenetic volcanic piles.

AGE OF MINERALIZATION:

Two main periods in the Canadian Cordillera: the Triassic/Jurassic (210-180 Ma) and Cretaceous/Tertiary (85-45 Ma). Elsewhere deposits are mainly Tertiary, but range from Archean to Quaternary.

HOST / ASSOCIATED ROCK TYPES:

Intrusions range from coarse-grained phaneritic to porphyritic stocks, batholiths and dyke swarms; rarely pegmatitic. Compositions range from calcalkaline quartz diorite to granodiorite and quartz monzonite. Commonly there is multiple emplacement of successive intrusive phases and a wide variety of breccias. Alkalic porphyry Cu-Au deposits are associated with syenitic and other calcalkalic rocks and are considered to be a distinct deposit type.

DEPOSIT FORM:

Large zones of hydrothermally altered rock contain quartz veins and stockworks, sulphide-bearing veinlets; fractures and lesser disseminations in areas up to 10 km^2 (3.72 mi^2) in size, commonly coincident wholly or in part with hydrothermal or intrusion breccias and dyke swarms. Deposit boundaries are determined by economic factors that outline ore zones within larger areas of low-grade, concentrically zoned mineralization. Cordilleran deposits are commonly sub-divided according to their morphology into three classes - classic, volcanic, and plutonic ...:

- Volcanic type deposits (e.g. Island Copper) are associated with multiple intrusions in subvolcanic settings of small stocks, sills, dikes and diverse types of intrusive breccias. Reconstruction of volcanic landforms, structures, vent-proximal extrusive deposits and subvolcanic intrusive centers is possible in many cases, or can be inferred. Mineralization at depths of 1 km (0.61 mi) or less, is mainly associated with breccia development or as lithologically controlled preferential replacement in hostrocks with high primary permeability. Propylitic alteration is widespread and generally flanks early, centrally located potassic alteration; the latter is commonly well-mineralized. Younger mineralized phyllic alteration commonly overprints the early mineralization. Barren advanced argillic alteration is rarely present as a late, high-level hydrothermal carapace.

- Classic deposits (e.g Berg) are stock related with multiple emplacements at shallow depth (1 to 2 km, 0.6 to 1.2 mi) of generally equant, cylindrical porphyritic intrusions. Numerous dykes and breccias of pre, intra, and post-mineralization age modify stock geometry. Orebodies occur along margins and adjacent intrusions as annular ore shells. Lateral outward zoning of alteration and sulphide minerals forming a weakly mineralized potassic/propylitic core is usual. Surrounding ore zones with potassic (commonly biotite-rich) or phyllic alteration contain molybdenite +/- chalcopyrite, then chalcopyrite and a generally widespread propylitic, barren aureole or 'halo'.

- Plutonic deposits (e.g. the Highland Valley deposits) are found in large plutonic to batholithic intrusions immobilized at relatively deep levels, say 2 to 4 km (1.2 to 2.4 mi). Related dikes and intrusive breccia bodies can be emplaced at shallower levels. Host rocks are phaneritic coarse-grained to porphyritic. The intrusions can display internal compositional differences as a result of differentiation with gradational to sharp boundaries between different phases of magma emplacement. Local swarms of dikes, many with associated breccias, and fault zones are sites of mineralization. Orebodies around silicified alteration zones tend to occur as diffuse vein stockworks carrying chalcopyrite, bornite and minor pyrite in intensely fractured rocks but, overall, sulphide minerals are sparse. Much of the early potassic and phyllic alteration in central parts of orebodies is restricted to the margins of mineralized fractures as selvages. Later phyllic argillic alteration forms envelopes on the veins and fractures and is more pervasive and widespread. Propylitic alteration is widespread but unobtrusive and is indicated by the presence of rare pyrite with chloritized mafic minerals, saussuritized plagioclase and small amounts of epidote.

TEXTURE / STRUCTURE:

Quartz, quartz-sulphide and sulphide veinlets and stockworks; sulphide grains in fractures and fracture selvages. Minor disseminated sulphides commonly replacing primary mafic minerals. Quartz phenocrysts can be partly resorbed and overgrown by silica.

ORE MINERALOGY (Principal and *subordinate*):

Pyrite is the predominant sulphide mineral; in some deposits the Fe oxide minerals magnetite, and rarely hematite, are abundant. Ore minerals are chalcopyrite; molybdenite, lesser bornite and rare (primary) chalcocite. Subordinate minerals are *tetrahedrite/tennanite, enargite and minor gold, electrum and arsenopyrite.* In many deposits late veins commonly contain galena and sphalerite in a gangue of quartz, calcite and barite.

GANGUE MINERALOGY (Principal and *subordinate*):

Gangue minerals in mineralized veins are mainly quartz with lesser *biotite, sericite, K-feldspar, magnetite, chlorite, calcite, epidote, anhydrite and tourmaline.* Many of these veins are also pervasive alteration products of primary igneous mineral grains.

ALTERATION MINERALOGY:

Quartz, sericite, biotite, K-feldspar, albite, anhydrite/gypsum, magnetite, actinolite, chlorite, epidote, calcite, clay minerals, tourmaline. Early formed alteration can be overprinted by younger assemblages. Central and early formed potassic zones (K-feldspar and biotite) commonly coincide with ore. This alteration can be flanked in volcanic hostrocks by biotite-rich rocks that grade outward into propylitic rocks. The biotite is a fine-grained 'shreddy' looking secondary mineral that is commonly referred to as an early developed biotite (EDB) or a "biotite hornfels". These older alteration assemblages in cupriferous zones can be partially to completely overprinted by later biotite and K-feldspar and the phyllic (quartz-sericite-pyrite) alteration, less commonly argillic, and rarely, in the uppermost parts of some ore deposits, advanced argillic alteration (Kaolinite-pyrophyllite).

WEATHERING:

Secondary (supergene) zones carry chalcocite, covellite and other Cu^$_2$S minerals (digenite, djurleite, etc.), chrysocolla, native copper, and copper oxide, carbonate and sulphate minerals. Oxidized and leached zones at surface are marked by ferruginous 'cappings' with supergene clay minerals, limonite (goethite, hematite and jarosite) and residual quartz.

ORE CONTROLS:

Igneous contacts, both internal between intrusive phases and external with wallrocks; cupolas and the uppermost, bifurcating parts of stocks, dike swarms. Breccias, mainly early formed intrusive and hydrothermal types. Zones of most intensely developed fracturing give rise to ore-grade vein stockworks, notably where there are coincident or intersecting multiple mineralized fracture sets.

ASSOCIATED DEPOSIT TYPES:

Skarn Cu (K01), porphyry Au (K02), epithermal Au-Ag in low sulphidation type (H05) or epithermal Cu-Au-Ag as high-sulphidation type enargite-bearing veins (L01), replacements and stockworks; auriferous and polymetallic base metal quartz and quartz-carbonate veins (I01, I05), Au-Ag and base metal sulphide mantos and replacements in carbonate and non-carbonate rocks (M01, M04), placer Au (C01, C02).

COMMENTS:

Subdivision of porphyry copper deposits can be made on the basis of metal content, mainly ratios between Cu, Mo, and Au. This is a purely arbitrary, economically based criterion, an artifact of mainly metal prices and metallurgy. There are a few differences in the style of mineralization between deposits although morphology of calcalkaline deposits does provide a basis for subdivision into three distinct subtypes - the 'volcanic, classic, and plutonic' types. A fundamental contrast can be made on the compositional differences between calcalkaline quartz-bearing porphyry copper deposits and the alkalic (silica undersaturated) class ...

EXPLORATION GUIDES

GEOCHEMICAL SIGNATURE:

Calcalkalic systems can be zoned with a cupriferous (+/-Mo) ore having a 'barren', low-grade pyritic core and surrounded by a pyritic halo with peripheral base and precious-metal bearing veins. Central zones with Cu commonly have coincident Mo, Au and Ag with possibly Bi, W, B and Sr. Peripheral enrichment in Pb, Zn, V, Sb, As, Se, Te, Co, Ba, Rb and possibly Hg is documented. Overall the deposits are large-scale repositories of sulphur, mainly in the form of metal sulphides, chiefly pyrite.

GEOPHYSICAL SIGNATURE:

Ore zones, particularly those with higher Au content, can be associated with magnetite-rich rocks and are indicated by magnetic surveys. Alternatively the more intensely hydrothermally altered rocks, particularly those with quartz-pyrite-sericite (phyllic) alteration produce magnetic and resistivity lows. Pyritic halos surrounding cupriferous rocks respond well to induced polarization (I.P.) Surveys but in sulphide-poor systems the ore itself provides the only significant I.P. response.

OTHER EXPLORATION GUIDES:

Porphyry deposits are marked by large-scale, zoned metal and alteration assemblages. Ore zones can form within certain intrusive phases and breccias or stockworks are present as vertical 'shells' or mineralized cupolas around particular intrusive bodies. Weathering can produce a pronounced vertical zonation with an oxidized, limonitic leached zone at surface (leached capping), an underlying zone with copper enrichment (supergene zone with secondary copper minerals) and at depth a zone of primary mineralization (the hypogene zone).

ECONOMIC FACTORS

TYPICAL GRADE AND TONNAGE:

Worldwide according to Cox and Singer (1988) based on their subdivision of 55 deposits into subtypes according to metal ratios, typical porphyry Cu deposits contain (median values):

Porphyry Cu-Au:	160 Mt with 0.55% Cu, 0.003% Mo, 0.38 gm/mt Au and 1.7 gm/mt Ag.
Porphyry Cu-Au-Mo:	390 Mt with 0.48% Cu, 0.015% Mo, 0.15 gm/mt Au, and 1.6 gm/mt Ag.
Porphyry Cu-Mo:	500 Mt with 0.41% Cu, 0.016% Mo, 0.012 gm/mt Au, and 1.22 gm/mt Ag.

A similar subdivision by Cox (1986) using a larger data base results in:

Porphyry Cu:	140 Mt with 0.54% Cu, <0.002% Mo, <0.02 gm/mt Au and <1 gm/mt Ag.
Porphyry Cu-Au:	100 Mt with 0.5% Cu, ,0.002% Mo, 0.38 gm/mt Au and 1 gm/mt Ag. (This includes deposits from the British Columbia alkalic porphyry class)
Porphyry Cu-Mo:	500 Mt with 0.42% Cu, 0.016% Mo, 0.012 gm/mt Au and 1.2 gm/mt Ag.

British Columbia porphyry Cu+/-Mo+/-Au deposits range from <50 to >900 Mt with commonly 0.2 to 0.5% Cu, <0.1 to 0.6 gm/mt Au, and 1 to3 gm/mt Ag. Mo contents are variable from negligible to 0.04% Mo. Median values for 40 B.C. deposits with reported reserves are: 115 Mt with 0.37% Cu, ^0.01% Mo, 0.3 gm/mt Au and 1.3 gm/mt Ag.

ECONOMIC LIMITATIONS:

Mine production in British Columbia is from primary (Hypogene) ores. Rare exceptions are Afton mine where native copper was recovered from an oxide zone, and Gibralter and Bell mines where incipient supergene enrichment has provided some economic benefits.

IMPORTANCE:

Porphyry deposits contain the largest reserves of Cu, significant Mo resources and close to 50% of the Au reserves in British Columbia.

Panteleyev, Andre
in:
Lefebure, D.V. and Ray, G.E. ed.; 1995, pp. 87-91.

5.0 EXPLORATION

5.1 Procedures and Parameters of the Current (2016) Exploration Program

An area of 0.1 ha (0.25 acres) was brushed out across a log yard located 100 m (328 ft) south of the Lamp Creek bridge. The clearing provided room for helicopter landing and camp.

Total traverse length during the current (2016) exploration program was 5.8 km (3.54 mi), mostly over difficult terrain. Assuming that results of exploration along traverse lines were relevant for 30 m (98.4 ft) on either side of a traverse line, alteration and the provenance of soil-molybdenum anomalies were investigated over a total area of 34.8 ha (86 acres).

Locations were established in most areas by use of a Garmin 62 GPS unit. Insufficient satellite visibility required locations to be established by traditional altimeter and triangulation techniques in the old growth forest south of Gossan Creek. The area was not mapped; that had already been done quite well by AMAX geologists during the 1960s (Gambardella and Richardson, 1966 and 1967). The focus of the current (2016) exploration program was to investigate alteration in a 21st century context and to discern the provenance of the large soil-molybdenum anomalies in the current Mantle property area. However, established field mapping techniques were used during the investigation.

Topography was taken from BC Trim map 103I 019 (Figures 3 and 12). Parts of that map were blown up and used as field base maps. Some of the maps and diagrams from previous assessment reports, mostly from Gambardella and Richardson (1966 and 1967), were re-scaled and used in this report (Figures 5 to 12). Originally, some AMAX maps were drafted on powdered linen and were rendered poorly in the BC Department of Mines microfiche system. Some maps and diagrams had to be re-drafted in whole or in part to improve clarity (Figures 5 to 8, and 11).

Two pan concentrate samples were taken from Mantle Creek. One sample was taken from each of Gossan, Lamp, and South creeks. The lee sides of large boulders in a creek bed were preferred locations. Collection was facilitated by unusually dry, August weather and low water levels. One standard metal gold pan was filled with about 3 kg (6.6 lb) of material using a stainless steel trowel. Samples were panned down to dark, heavy mineral silt fractions which weighed less than 5 gm (< 0.175 oz). The heavy mineral fractions were packaged in plastic bags and delivered to ALS Canada Ltd. for ICP analysis (method: ME-MS61L). For sample locations see Figures 4B and 12. Details of procedure and results of analysis and assay comprise Appendix ‘A’.

Figures for this report were produced using traditional drafting and various computer techniques. Soil-molybdenum data from the 1965-1966 AMAX exploration program were contoured by the author (Figure 7).

5.2 Results and Interpretation of the Current (2016) Exploration Program

The results of the 1965-1966 AMAX exploration programs were found to be quite accurate.

5.2.1 Alteration

During the current (2016) exploration program alteration was investigated at Gossan, Lamp, and

Mantle creeks (Figure 12).

Potassic Alteration

Telkwa-Formation (Hazelton-Group) andesites exposed in both Gossan and Lamp creeks have pervasive potassium overgrowths on plagioclase phenocrysts and fine-grained potassium feldspar and brown biotite growth in the andesitic matrix. Overgrowths are present in hornfelsed areas but tend to be somewhat less visible.

At Gossan Creek, narrow, early mafic ptigmatic veins containing red-brown biotite and quartz-orthoclase veins with indistinct (plastic) margins increase in abundance as the intrusive contact between the andesite and quartz-feldspar porphyry is approached. Narrow quartz-potassium feldspar veins with indistinct margins also increase in abundance toward the intrusive contact. These are commonly referred to as ‘A’ type veins. Some of these veins have very fine-grained pyrite, chalcopyrite, and molybdenite crystals at their margins. Generally, early mafic and ‘A’-type veins with indistinct (plastic) margins are thought to have been developed in hot environments with temperatures varying from about 450 to 600°C.

Potassic alteration in quartz-feldspar porphyry at Gossan Creek is related to north-south trending, sub-vertical shears that significantly re-crystallize feldspar phenocrysts and rotate those of quartz. In the porphyry matrix, potassic alteration occurs mostly as re-crystallization and overgrowth of potassium feldspar. Red-brown biotite and magnetite crystallization is less abundant. Early mafic and ‘A’-type quartz-potassium feldspar veins are most common in the areas of the shears. Like in the andesite, these veins have indistinct (plastic) margins that indicate that they were emplaced in a high temperature environment. Veins in the porphyry have sparse, very fine-grained (<1 mm) pyrite, chalcopyrite, and molybdenite mineralization.

At Lamp Creek, potassium feldspar overgrowths of plagioclase occur in the matrices of both andesite and soda granite (quartz monzonite). Overgrowths are abundant also at Mantle Creek where only soda granite is exposed. Early mafic veins and ‘A’-type veins with indistinct margins are scarse. The most common veins present are narrow quartz-potassium feldspar veins with distinct (brittle) margins. These are normally referred to as ‘B’-type veins. Also late pyritic veins with distinct (brittle) margins, normally referred to as ‘D’-type veins are present. These veins indicate that potassic alterations at Lamp and Mantle creeks was emplaced in a moderately hot environment with temperatures ranging from 350 to 450°C.

No copper or molybdenum mineralization was observed at Lamp Creek. At Mantle Creek, mineralization comprising mostly molybdenite occurred both in the margins of quartz-potassium feldspar veins and in the soda granite matrix. There, very fine-grained molybdenite was accompanied with sparse pyrite and chalcopyrite mineralization. Mineralization was most common in the stockwork zones at Mantle Creek (Figure 12).

Potassic alteration appears to have developed in soda granite at Lamp and Mantle creeks under a cooler more brittle regime than it has in quartz-feldspar porphyry at Gossan Creek. It is deduced that potassic alteration formed after the soda granite had cooled sufficiently to support brittle deformation and while the quartz-feldspar porphyry was still sufficiently hot to be ductile. This indicates that the soda granite predates the quartz-feldspar porphyry and that the porphyry is most intimately related to potassic alteration and mineralization.

All of the rocks examined in Gossan, Lamp, and Mantle creeks have undergone potassic alteration. Thus, the core potassic alteration zone of the Mantle hydrothermal system exists as a single zone that extends for a north-south distance of at least 2.9 km (1.8 mi) from Gossan Creek to Mantle Creek. Its total extent remains unknown.

Potassic alteration and mineralization at Gossan Creek extends from the creek level at about 550 m (1,804 ft) a.s.l. up to about 1,100 m (3,609 ft) a.s.l. directly beneath the soil-molybdenum anomaly atop the bluffs south of the creek (Figure 12). At Mantle Creek, gossanous soda granite and an in-place soil-molybdenum anomaly indicate that potassic alteration and mineralization extend from the creek level at 560 m (1,837 ft) up to about 1,000 m (3,281 ft) at the source of Gash Creek. Thus, the vertical extent of potassic alteration and mineralization is from 440 to 550 m (1,444 to 1,804 ft) as exposed in Mantle and Gossan creeks.

Retrograde Propylitic Alteration

The rocks of Gossan, Lamp, and Mantle creeks have all been subjected to retrograde propylitic alteration after the development of potassic alteration had ceased.

The propylitic alteration is best developed in Telkwa Formation andesite and hornfels where iron, magnesium, and calcium-bearing minerals are most common. Propylitic alteration is mostly visible as narrow epidote-biotite-hematite-chlorite-quartz-carbonate veins and smears on fractures. Commonly, propylitic alteration occupies the same general north-south fracture sets as the preceding potassic alteration. In the quartz-feldspar porphyry and soda granite (quartz monzonite) early mafic and pyritic veins are partly or completely altered to red hematite or orange-brown limonite.

5.2.2 Soil-molybdenum Anomalies

The 1965-1966 AMAX soil surveys revealed that alteration and mineralization in both Gossan and Mantle creeks were associated with extensive soil-molybdenum anomalies in which concentrations exceeded 50 parts per million (ppm) molybdenum (Figures 4A and 7). Those anomalies were located in the following areas: atop the mineralized and altered bluffs south of Gossan Creek, down the slope toward Kitimat River east of the bluffs, on the hillside north of the mineralized and altered stockwork zones on Mantle Creek, and in an annex along the western slope of the Kitimat River valley southeast of Mantle Creek (Figures 7 and 12).

A.C. Gambardella and P.W. Richardson (1966 and 1967) did not discern the provenance of those soil anomalies and until the current (2016) exploration program, no one has returned to do so.

The author scaled the bluffs south of Gossan Creek and found that alteration and sparse mineralization extended from near the creek level up to the crests of the bluffs. The main Gossan Creek soil-molybdenum anomaly is located directly atop altered and mineralized quartz-feldspar porphyry that forms the bluffs. It is deemed to have developed in place from weathering of underlying mineralized material (Figure 12).

Three smaller soil-molybdenum anomalies occur on the main slope of the Kitimat valley directly east of the main Gossan Creek anomaly. That slope is covered with large widely spaced first-growth trees growing on a thick carpet of moss. Brush, mostly mountain hemlock and blueberry bushes, occurs only on the central and lower parts of the slope. Although there is no rock outcrop on that slope, it can be deduced from the AMAX geological maps (Figure 10) that the area is underlain by Telkwa Formation (Hazelton Group) meta-andesite. The slope comprises a series of steep sections and north-south trending benches. Soil-molybdenum anomalies occupy the benches. Those anomalies are deemed to have been enriched by illuviation (concentration) of molybdenum-bearing soil material at the bases of the steep slope sections (Figure 12). They are presumed to be not entirely related to underlying mineralization.

The main Mantle Creek soil-molybdenum anomaly is located on the slope north of the creek. Gash Creek, a gossanous rock chimney of soda granite (quartz monzonite), cuts through the western part of the anomaly that hosts greater than 50 ppm molybdenum in soils. The author traversed part of the slope east of Gash Creek and found that the anomaly was underlain by small sub-crops of altered, gossanous soda granite. The main Mantle Creek soil-molybdenum anomaly is deemed to have developed in place from weathering of underlying mineralized material (Figure 12).

The area of greater than 50 ppm molybdenum in soils crosses Mantle Creek and extends as a linear southeasterly trending annex along the main western slope of the Kitimat valley (Figure 12). That annex was not investigated during the current (2016) exploration program and its provenance remains unknown.

5.2.3 Pan Concentrates

Analytical results of the 2016 pan concentrate samples formed two discernable populations. The one with higher copper and molybdenum concentrations was from Gossan and Mantle creeks which have exposed mineral showings. The population with lower copper and molybdenum concentrations was from Lamp and South creeks which have no recorded surface mineral showings (Figure 12).

The best results are from sample MC-15-PC which was taken from beneath the Gossan Creek bridge. It contains 287 ppm copper and 36.3 ppm molybdenum. Those concentrations are generally analogous with anomalous results from the 1965-1966 AMAX total metal ion soil survey around Gossan Creek (Figures 7 and 12).

Two pan concentrate samples were taken at Mantle Creek. MC-8-PC was taken from the dry cut-off channel at the Mantle Creek bridge. MC-12-PC was taken about 350 m (1,148 ft) up-stream from the bridge and about 100 m (328 ft) down-stream from the most easterly mineralized stockwork zone in the currently active creek channel. Concentrations of copper and molybdenum in sample MC-12-PC are 144 ppm copper and 26.7 ppm molybdenum. Concentrations of copper and molybdenum decline to 133 ppm copper and 20.3 ppm molybdenum in sample MC-8-PC, taken 350 m (1,148 ft) down-stream at the bridge (Figure 12).

Although soil anomalies with similar anomalous thresholds and mineralized showings occur in both Gossan and Mantle creeks, the copper and molybdenum concentrations in pan concentrates from Mantle Creek are only about two thirds of what they are in the Gossan Creek pan concentrate (Figure 12). This difference can be explained by a difference in the rates of erosion and material transport through the two creek profiles. Gossan Creek is floored by sediment throughout its whole length while the central part of Mantle Creek is floored by bare rock. The author opines that erosion and sediment transport, including the mineralized heavy mineral fraction, is sufficiently rapid in Mantle Creek to significantly depress pan concentrate results.

Sample MC-9-PC was taken at South Creek near the southeastern corner of the current Mantle property in an area that may be near the southern margin of the Mantle potassic alteration zone as may be reflected by the decline in soil-molybdenum concentrations in that area (Figures 7 and 12). That pan concentrate contain 40.8 ppm copper and 4 ppm molybdenum. Those concentrations are only slightly elevated above those from a typical soil sample taken from an unmineralized soil.

The area adjacent to Lamp Creek hosts potassic alteration but no known copper or molybdenum showings. Sample MC-14-PC, taken from the active creek bed near the Lamp Creek bridge, contains 69.6 ppm copper and 5.55 ppm molybdenum. Those concentrations are only slightly higher than those of the sample from South Creek and much lower than those of the samples taken from Gossan and Mantle creeks.

These results demonstrate that pan concentrate surveys are useful in identifying mineralized drainages in the regime of high rainfall and rapid erosion that is present in the Kitimat area of northwestern British Columbia.

Complete analytical results of the 2016 pan concentrate samples comprise Appendix 'A' of this report.

5.3 Duration, Area, Location, Management, and Value of the Current (2016) Exploration Program

The current (2016) work program was conducted on and about the property during the following days:

July 26 to 27 and August 6 to 7, 2016	transport from Vancouver to Terrace, return
July 28, 2016:	road and slinging access investigation
July 29, 2016:	chain-saw clearing of a helicopter landing site and camp area, camp mobilization
July 30 to August 5, 2016:	geological field work and sampling on the Mantle property
March 3 to September 15, 2016	research and production of this assessment report (intermittent)

Table 6
Duration of the 2016 Work

Name	Geoloical survey + sampling	Site clearing + camp mob.	Weather + expediting	Crew Tspt.+ access survey	Data Comp. + Reporting	Totals
John Ostler; M.Sc., P.Geo. West Vancouver, B.C.	5.50	1.50	2.00	5.00	25.00	38.00
David Nunuk, B.Sc. North Vancouver, B.C.	5.50	1.50	1.00	5.00	0.00	13.00
Total person-days	11.00	3.00	3.00	10.00	25.00	51.00

A total of 51 person-days X 8 = 408 person-hours spent on the current (2016) exploration program.

The current (2016) exploration program was conducted on all of the claims of the Mantle property.

Table 7
Contractors for the 2016 Work

Contractor	Activities
Cassiar East Yukon Expediting Ltd. 1015 Clyde Avenue West Vancouver, British Columbia V7T 1E3 (604) 926-8454	geological field work data analysis, reporting
Quantum Helicopters Ltd. RR 4, Site 16, Comp 2 Terrace, British Columbia V8G 4V2 (250) 615-0168	helicopter transport
ALS Canada Ltd. 2103 Dollarton Highway North Vancouver, British Colombia V7H 0A7 (604) 984-0221	analysis and assay
Arcprint Imaging (Digital Canada Corp.) Unit B-4455 Alaska Street Burnaby, British Columbia V5C 5T3 (877) 893-0029	diagram scanning and cropping
Terracad Geoscience Services Ltd. 880-409 Granville Street Vancouver, British Columbia V6C 1T2 (604) 689-5923	colouring of Figure 12
Western Technical Supply Company Limited 845 West 15th Street North Vancouver, British Columbia V7P 1M5 (604) 986-2391	photocopy, map scaling and scanning

Table 8
Value of the 2016 Work

Item		
Wages: John Ostler; M.Sc., P.Geo., research, data compilation, and reporting 25 days @ $600/day . . . . John Ostler; M.Sc., P.Geo., field work, 13.0 days @ $600/day . David Nunuk, B.Sc.; 13 days field work @ $320/day	$15,000.00 $ 7,800.00 $ 4,160.00 $26,960.00	$26,960.00
Transport: 1 1-ton pick-up truck; 13 days @ $160/day . . . . Diesel . . . . Bell206 helicopter; 2.8 hrs @ $1,024.60 inc. fuel, airport fees, etc. (Highland Helicopters)	$ 2,080.00 $ 427.30 $ 2,868.88 $ 5,376.18	$ 5,376.18
Camp and Crew Costs: 1 2-man fly camp inc. chain saws: 0.5 month @ $900/month. . Camp food and meals in transit (NOTE: $325.14 is G.S.T. exempt) . . . . Hotel, Terrace and Quesnel . . . . Field Supplies inc. propane	$ 450.00 $ 905.67 $ 668.97 $ 142.19 $ 2,166.83	$ 2,166.83
Communications: Satellite phone rental inc. air time (Deakin Industries) . . . . Long distance phone	$ 247.05 $ 15.32 $ 262.37	$ 262.37
Assay and Analysis: 5 ICP analyses of pan concentrates (ALS Canada Ltd).	$ 365.85	$ 365.85
Office Expenses Scale changes and map copy . . . . Diagram and map scans . . . . Computer colouring of map	$ 433.03 $ 67.97 $ 150.00 $ 651.00	$ 651.00
Value of Current (2016) Work		**$35,872.23**
G.S.T. on $ 35,547.09.		$ 1,777.35
Total Value of the Current (2016) Work Program		**$37649.58**

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Potassic alteration in quartz-feldspar porphyry at Gossan Creek is related to north-south trending, sub-vertical shears. In the porphyry matrix, potassic alteration occurs mostly as re-crystallization and overgrowth of potassium feldspar. Red-brown biotite and magnetite crystallization is less abundant. Early mafic and 'A'-type quartz-potassium feldspar veins are most common in the areas of the shears. These veins have indistinct (plastic) margins that indicate that they were emplaced in a high temperature environment with temperatures varying from about 450 to 600°C. Veins in the porphyry have sparse, very fine-grained (<1 mm) pyrite, chalcopyrite, and molybdenite mineralization.

At Lamp Creek, potassium feldspar overgrowths of plagioclase occur in the matrices of both andesite and soda granite (quartz monzonite). Overgrowths are abundant also at Mantle Creek where only soda granite is exposed. There, early mafic veins and 'A'-type veins with indistinct margins are scarse. The most common veins present are narrow quartz-potassium feldspar veins with distinct (brittle) margins ('B'-type veins). Also late pyritic veins with distinct (brittle) margins ('D'-type veins) are present. These veins indicate that potassic alterations at Lamp and Mantle creeks was emplaced in a moderately hot environment with temperatures ranging from 350 to 450°C.

No copper or molybdenum mineralization was observed at Lamp Creek. At Mantle Creek, mineralization comprising mostly molybdenite occurred both in the margins of quartz-potassium feldspar veins and in the soda granite matrix. There, very fine-grained molybdenite was accompanied with sparse pyrite and chalcopyrite mineralization.

Potassic alteration appears to have developed in soda granite at Lamp and Mantle creeks under a cooler more brittle regime than it has in quartz-feldspar porphyry at Gossan Creek. It is deduced that potassic alteration formed after the soda granite had cooled sufficiently to support brittle deformation and while the quartz-feldspar porphyry was still sufficiently hot to be ductile. This indicates that the soda granite predates the quartz-feldspar porphyry and that the porphyry is most intimately related to potassic alteration and mineralization.

All of the rocks examined in Gossan, Lamp, and Mantle creeks have undergone potassic alteration. Thus, the core potassic alteration zone of the Mantle hydrothermal system exists as a single zone that extends for a north-south distance of at least 2.9 km (1.8 mi) from Gossan Creek to Mantle Creek. Its total extent remains unknown. The vertical extent of potassic alteration and mineralization is at least from 440 to 550 m (1,444 to 1,804 ft) as exposed in Mantle and Gossan creeks.

The rocks of Gossan, Lamp, and Mantle creeks have all been subjected to retrograde propylitic alteration after the development of potassic alteration had ceased. The propylitic alteration is best developed in Telkwa Formation andesite and hornfels where iron, magnesium, and calcium-bearing minerals are most common. Propylitic alteration is mostly visible as narrow epidote-biotite-hematite-chlorite-quartz-carbonate veins and smears on fractures. Commonly, propylitic alteration occupies the same general north-south fracture sets as the preceding potassic alteration. In the quartz-feldspar porphyry and soda granite (quartz monzonite) early mafic and pyritic veins are partly or completely altered to red hematite or orange-brown limonite.

The 1965-1966 AMAX soil surveys revealed that alteration and mineralization in both Gossan and Mantle creeks were associated with extensive soil-molybdenum anomalies in which concentrations exceeded 50 parts per million (ppm) molybdenum. Those anomalies were located in the following areas: atop the mineralized and altered bluffs south of Gossan Creek, down the slope toward Kitimat River east of the bluffs, on the hillside north of the mineralized and altered stockwork zones on Mantle Creek, and in an annex along the western slope of the Kitimat River valley southeast of Mantle Creek.

The main Gossan Creek soil-molybdenum anomaly is located directly atop altered and mineralized quartz-feldspar porphyry that forms the bluffs. It is deemed to have developed in place from weathering of underlying mineralized material.

Three smaller soil-molybdenum anomalies occur on the main slope of the Kitimat valley directly east of the main Gossan Creek anomaly in an area probably underlain by Telkwa Formation (Hazelton Group) meta-andesite. The slope comprises a series of steep sections and north-south trending benches. Soil-molybdenum anomalies on the benches are deemed to have been enriched by illuviation (concentration) of molybdenum-bearing soil material at the bases of the steep slope sections. They are presumed to be not entirely related to underlying mineralization.

The main Mantle Creek soil-molybdenum anomaly is located on the slope north of the creek. Gash Creek, a gossanous rock chimney of soda granite (quartz monzonite), cuts through the western part of the anomaly. East of Gash Creek, the anomaly is underlain by small sub-crops of altered, gossanous soda granite. The main Mantle Creek soil-molybdenum anomaly is deemed to have developed in place from weathering of underlying mineralized material.

The area of greater than 50 ppm molybdenum in soils crosses Mantle Creek and extends as a linear southeasterly trending annex along the main western slope of the Kitimat valley. That annex was not investigated during the current (2016) exploration program and its provenance remains unknown.

Analytical results of the 2016 pan concentrate samples formed two discernable populations. The one with higher copper and molybdenum concentrations was from Gossan and Mantle creeks which have exposed mineral showings. The population with lower copper and molybdenum concentrations was from Lamp and South creeks which have no recorded surface mineral showings.

The best results are from sample MC-15-PC which was taken from beneath the Gossan Creek bridge. It containes 287 ppm copper and 36.3 ppm molybdenum. Those concentrations are generally analogous with anomalous results from the 1965-1966 AMAX total metal ion soil survey around Gossan Creek

Although soil anomalies with similar anomalous thresholds and mineralized showings occur in both Gossan and Mantle creeks, the copper and molybdenum concentrations in pan concentrates from Mantle Creek are only about two thirds of what they are in the Gossan Creek pan concentrate. This difference can be explained by a difference in the rates of erosion and material transport through the two creek profiles. Gossan Creek is floored by sediment throughout its whole length while the central part of Mantle Creek is floored by bare rock. The author opines that erosion and sediment transport, including the mineralized heavy mineral fraction, is sufficiently rapid in Mantle Creek to significantly depress pan concentrate results.

Sample MC-9-PC was taken at South Creek near the southeastern corner of the current Mantle property in an area that may be near the southern margin of the Mantle potassic alteration zone as may be reflected by the decline in soil-molybdenum concentrations in that area. That pan concentrate contains 40.8 ppm copper and 4 ppm molybdenum. Those concentrations are only slightly elevated above those from a typical soil sample taken from an unmineralized soil.

The area adjacent to Lamp Creek hosts potassic alteration but no known copper or molybdenum showings. Pan concentrations of copper and molybdenum from the Lamp Creek sample are only slightly higher than those of the sample from South Creek and much lower than those of the samples taken from Gossan and Mantle creeks.

These results demonstrate that pan concentrate surveys are useful in identifying mineralized drainages in the regime of high rainfall and rapid erosion that is present in the Kitimat area of northwestern British Columbia.

6.2 Recommendations

It is recommended that a helicopter-borne magnetic and radiometric survey be flown over the Mantle property to explore the areal extent of the potassic alteration zone and to identify details within it that could be used to discern the shapes and locations of any plumes or channels of potassic alteration and mineralization that could be present.

The mineralizing structures in the Mantle property area trend north-south, so it would be most prudent to fly lines east-west. It is proposed that 101 4.2 km (2.56-mi) long lines be flown at 50-m (164-ft) intervals along U.T.M. lines from 5,996,200 N. to 6,001,200 N. The lines should be flown from 549,800 E. to 554,000 E. This will result in a total of 424.2 km of surveyed line. A total of 5-km (3.05-mi) long north-south tie lines will be required also. The resulting grid will comprise a total of 469.2 km (286.2 mi) of line.

Any significant anomalies identified by the helicopter-borne magnetic and radiometric survey should be investigated on the ground by a geologist with an assistant.

The estimated cost of the recommended exploration program is as follows:

Table 9
Estimated Cost of the Recommended Work

Item		
Helicopter-borne Magnetic and Radiometric Survey: 469.2 km of survey and tie line @ $120/km . . . . Fuel positioning . . . . Mobilization, calibration and report fee	 $61,304 $ 2,000 $ 3,000 $66,304	 $66,304
Geological Survey:: 1 geologist and 1 assistant, 2 weeks field work . . . . Data processing and reporting for assessment credit..	 $ 30,000 $ 10,000 $ 40,000	 $40,000
Contingency: 10% of previous items	 $ 10,630	 $10,630
Estimated Cost of Proposed Work		$116,934

John Ostler: M.Sc., P.Geo.,
Consulting Geologist
West Vancouver, British Columbia,
September 15, 2016

7.0 REFERENCES

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APPENDIX ‘A’

Methods and Results

of Assay and Analysis

ALS Minerals

ALS Canada Ltd.

2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: +1 (604) 984 0221 Fax: +1 (604) 984 0218
www.alsglobal.com

To: CASSIAR EAST YUKON EXPEDITING LTD.
1015 CLYDE AVENUE
WEST VANCOUVER BC V7T 1E3

Finalized Date: 8-SEP-2016
This copy reported on 9-SEP-2016
Account: DYQ

CERTIFICATE VA16134082

This report is for 5 Pan Con samples submitted to our lab in Vancouver, BC, Canada on 12-AUG-2016.

The following have access to data associated with this certificate:

JOHN OSTLER		

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI-21	Received Sample Weight
LOG-22	Sample login - Rcd w/o BarCode
PUL-51	Pulverize Pan Concentrate

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
ME-MS61L	Super Trace Lowest DL 4A by ICP-MS	ICP-MS

To: CASSIAR EAST YUKON EXPEDITING LTD.
ATTN: ALS MINERALS

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

***** See Appendix Page for comments regarding this certificate *****

Signature:
Colin Ramshaw, Vancouver Laboratory Manager

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CERTIFICATE OF ANALYSIS VA16134082

Sample Description	Method Analyte Units LOR	WEI-21 Recvd Wt. kg 0.02	ME-MS61L Ag ppm 0.002	ME-MS61L Al % 0.01	ME-MS61L As ppm 0.05	ME-MS61L Ba ppm 1	ME-MS61L Be ppm 0.02	ME-MS61L Bi ppm 0.005	ME-MS61L Ca % 0.01	ME-MS61L Cd ppm 0.005	ME-MS61L Ce ppm 0.01	ME-MS61L Co ppm 0.005	ME-MS61L Cr ppm 0.3	ME-MS61L Cs ppm 0.01	ME-MS61L Cu ppm 0.02	ME-MS61L Fe % 0.002
MC-8-PC		<0.02	0.430	3.12	3.40	364	0.85	44.7	1.91	0.199	355	48.9	274	0.39	133.0	30.6
MC-9-PC		<0.02	0.159	3.54	2.68	830	0.76	0.874	2.64	0.163	345	39.2	243	0.22	40.8	32.0
MC-12-PC		<0.02	0.625	2.55	3.44	132	0.74	47.3	1.57	0.620	366	72.0	330	0.33	144.0	34.5
MC-14-PC		<0.02	0.241	1.82	3.83	182	0.32	27.0	1.43	0.259	76.2	47.9	313	0.54	69.6	>50
MC-15-PC		<0.02	1.225	1.44	2.40	168	0.40	27.7	1.66	0.238	91.1	67.8	741	0.38	278	>50

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Sample Description	Method Analyte Units LOR	ME-MS61L Ga ppm 0.05	ME-MS61L Ge ppm 0.05	ME-MS61L Hf ppm 0.004	ME-MS61L In ppm 0.005	ME-MS61L K % 0.01	ME-MS61L La ppm 0.005	ME-MS61L Li ppm 0.2	ME-MS61L Mg % 0.01	ME-MS61L Mn ppm 0.2	ME-MS61L Mo ppm 0.02	ME-MS61L Na % 0.001	ME-MS61L Nb ppm 0.005	ME-MS61L Ni ppm 0.08	ME-MS61L P % 0.001	ME-MS61L Pb ppm 0.01
MC-8-PC		19.50	0.73	1.735	0.099	0.55	166.0	3.6	0.65	3430	20.3	0.979	65.6	40.7	0.179	17.05
MC-9-PC		22.7	0.78	1.955	0.079	0.45	167.5	3.0	1.03	2510	4.00	1.015	45.3	42.8	0.142	10.50
MC-12-PC		19.10	0.83	2.11	0.076	0.44	163.0	2.6	0.46	3390	26.7	0.751	59.6	50.4	0.156	16.50
MC-14-PC		25.6	0.79	0.574	0.041	0.17	35.3	2.7	0.42	3100	5.55	0.335	17.25	49.9	0.087	6.26
MC-15-PC		21.3	0.91	0.881	0.055	0.17	44.2	2.5	0.46	2400	36.3	0.223	24.3	107.5	0.093	7.95

***** See Appendix Page for comments regarding this certificate *****

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www.alsglobal.com

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1015 CLYDE AVENUE
WEST VANCOUVER BC V7T 1E3

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Account: DYQ

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Sample Description	Method Analyte Units LOR	ME-MS61L Rb ppm 0.02	ME-MS61L Re ppm 0.002	ME-MS61L S % 0.01	ME-MS61L Sb ppm 0.02	ME-MS61L Sc ppm 0.01	ME-MS61L Se ppm 0.2	ME-MS61L Sn ppm 0.02	ME-MS61L Sr ppm 0.02	ME-MS61L Ta ppm 0.01	ME-MS61L Te ppm 0.04	ME-MS61L Th ppm 0.004	ME-MS61L Ti % 0.001	ME-MS61L Tl ppm 0.004	ME-MS61L U ppm 0.01	ME-MS61L V ppm 0.1
MC-8-PC		14.80	0.002	2.25	0.57	18.85	1.3	5.12	237	3.88	0.92	15.60	1.855	0.077	4.44	412
MC-9-PC		9.89	<0.002	0.51	0.24	19.00	0.3	4.99	256	3.07	0.26	23.8	2.09	0.055	6.34	641
MC-12-PC		12.00	0.003	3.42	0.60	17.45	2.2	4.81	170.5	3.50	0.33	19.75	1.755	0.058	10.05	445
MC-14-PC		5.12	0.004	0.34	0.32	12.55	0.4	1.86	113.5	0.97	1.73	3.04	1.565	0.039	1.32	1620
MC-15-PC		5.52	0.007	1.19	0.46	13.60	0.7	2.99	109.5	1.47	2.62	5.21	2.05	0.051	2.80	1590

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WEST VANCOUVER BC V7T 1E3

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Sample Description	Method Analyte Units LOR	ME-MS61L W ppm 0.008	ME-MS61L Y ppm 0.01	ME-MS61L Zn ppm 0.2	ME-MS61L Zr ppm 0.1
MC-8-PC		169.0	74.9	158.0	42.3
MC-9-PC		70.9	72.0	157.0	37.8
MC-12-PC		360	75.0	176.5	49.1
MC-14-PC		350	34.1	195.0	15.4
MC-15-PC		650	44.5	209	20.2

***** See Appendix Page for comments regarding this certificate *****

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CERTIFICATE OF ANALYSIS VA16134082

CERTIFICATE COMMENTS

LABORATORY ADDRESSES

Processed at ALS Vancouver located at 2103 Dollarton Hwy, North Vancouver, BC, Canada.

Applies to Method:	LOG-22	ME-MS61L	PUL-51	WEI-21

PUL-51 *- Pulverize Pan Concentrate*
High grade pan concentrate ring pulverization of entire sample to better than 85% passing minus 75 micron
A crushed sample split is ground using a ring mill pulverizer style grinding mill (LM2). All samples are pulverized to at least 85% of the ground material passing through a 75 micron screen.

ME-MS61L: Lowest Detection Limit Super Trace Multi-Element Analysis by Four-Acid Digestion and ICP-MS/ICP-AES

Sample Decomposition:

HNO_3-$HClO_4$-HF acid digestion, HCl leach (GEO-4A01)

Analytical Method:

Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES)
Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

The ME-MS61L Super Trace method combines a four-acid digestion with ICP-MS instrumentation utilizing collision/reaction cell technologies to provide the lowest detection limits available. This super trace method has been optimized for long-term robust ICP-MS signal stability, in particular for samples with high Ca content.

This method is ideal for exploration in soils or sediments, and not appropriate for mineralized samples.

A prepared sample (nominal weight 0.25g) is digested with 1.5mL concentrated nitric and perchloric acids, followed by concentrated hydrofluoric acid. The mixture is heated at 185°C until incipient dryness, leached with 50% hydrochloric acid and diluted to volume with weak HCl.

The final solution is then analyzed by ICP-MS and ICP-AES, with results corrected for spectral inter-element interferences.

NOTE: Four-acid digestions are able to dissolve most minerals. However, depending on the sample matrix, not all elements are quantitatively determined. For example, digestion may not be complete for some minerals, including but not limited to magnetite, zircon, garnet, cassiterite, rutile and barite. Potassium may bias low due to the formation of the insoluble perchlorate, which may not be completely decomposed during the leaching process. Tungsten occurring in scheelite behaves similarly to potassium with insoluble tungstate formation. Low recoveries of Al and Ca may occur if their insoluble fluorides are not completely decomposed during the leaching process.

Add On Packages Available

See following pages for details.

- Rare Earths by ICP-MS (MS61L-REE)
- Lead Isotopes by ICP-MS (MS61L-PbIS)
- Si, Zr and Ti by pXRF (pXRF-34)

List of 48 Reportable Elements:

Analyte	Symbol	Units	Lower Limit	Upper Limit
Silver	Ag	ppm	0.002	100
Aluminum	Al	%	0.01	25
Arsenic	As	ppm	0.05	10000
Barium	Ba	ppm	1	10000
Beryllium	Be	ppm	0.02	1000
Bismuth	Bi	ppm	0.005	10000
Calcium	Ca	%	0.01	25
Cadmium	Cd	ppm	0.005	1000
Cerium	Ce	ppm	0.01	500
Cobalt	Co	ppm	0.005	10000
Chromium	Cr	ppm	0.3	10000
Cesium	Cs	ppm	0.01	500
Copper	Cu	ppm	0.02	10000
Iron	Fe	%	0.002	50
Gallium	Ga	ppm	0.01	10000
Germanium	Ge	ppm	0.01	500
Hafnium	Hf	ppm	0.004	500
Indium	In	ppm	0.005	500
Potassium	K	%	0.01	10
Lanthanum	La	ppm	0.005	10000
Lithium	Li	ppm	0.2	10000
Magnesium	Mg	%	0.01	25
Manganese	Mn	ppm	0.2	50000
Molybdenum	Mo	ppm	0.02	10000
Sodium	Na	%	0.001	10
Niobium	Nb	ppm	0.005	500
Nickel	Ni	ppm	0.08	10000
Phosphorus	P	%	0.001	1
Lead	Pb	ppm	0.01	10000
Rubidium	Rb	ppm	0.02	10000
Rhenium	Re	ppm	0.002	50
Sulphur	S	%	0.01	10
Antimony	Sb	ppm	0.02	10000
Scandium	Sc	ppm	0.01	10000
Selenium	Se	ppm	0.2	1000
Tin	Sn	ppm	0.02	500
Strontium	Sr	ppm	0.02	10000
Tantalum	Ta	ppm	0.01	500
Tellurium	Te	ppm	0.04	500
Thorium	Th	ppm	0.004	10000
Titanium	Ti	%	0.001	10
Thallium	Tl	ppm	0.004	10000
Uranium	U	ppm	0.01	10000
Vanadium	V	ppm	0.1	10000
Tungsten	W	ppm	0.008	10000
Yttrium	Y	ppm	0.01	500
Zinc	Zn	ppm	0.2	10000
Zirconium	Zr	ppm	0.1	500

Add-on packages available with ME-MS61L

Rare Earth Element Add-On: MS61L-REE

The full suite of rare earth elements may be added to the method on request. Ce and La are reported in the standard package.

NOTE: Many REE-bearing minerals are not fully dissolved in four-acid digestion.

List of 12 Reportable Rare Earth Elements and Concentrations:

Analyte	Symbol	Units	Lower Limit	Upper Limit
Dysprosium	Dy	ppm	0.005	1000
Erbium	Er	ppm	0.004	1000
Europium	Eu	ppm	0.004	1000
Gadolinium	Gd	ppm	0.005	1000
Holmium	Ho	ppm	0.002	1000
Lutetium	Lu	ppm	0.002	1000
Praseodymium	Pr	ppm	0.004	1000
Neodymium	Nd	ppm	0.005	1000
Samarium	Sm	ppm	0.004	1000
Terbium	Tb	ppm	0.002	1000
Thulium	Tm	ppm	0.002	1000
Ytterbium	Yb	ppm	0.004	1000

Pb Isotope Add-On: MS61L-PbIS

Pb isotope concentrations may also be added on request. Pb isotopes are mass bias corrected; no correction for ^{204}Hg interference on ^{204}Pb is performed.

List of 4 Reportable Lead Isotope Concentrations:

Analyte	Symbol	Units	Lower Limit	Upper Limit
Lead 204	^{204}Pb	ppm	0.01	10000
Lead 206	^{206}Pb	ppm	0.01	10000
Lead 207	^{207}Pb	ppm	0.01	10000
Lead 208	^{208}Pb	ppm	0.01	10000

Si and Zr Add-On: pXRF-34

For lithogeochemical applications, Silicon and Zirconium may be obtained as a cost-effective add-on package using portable XRF analysis on sample pulps.

List of Elements & Concentrations:

Analyte	Symbol	Units	Lower Limit	Upper Limit
Silicon	Si	%	0.05	47
Zirconium	Zr	ppm	1	10000
Titanium	Ti	%	0.1	60

APPENDIX 'B'

CERTIFICATE OF QUALIFICATION

I, John Ostler, of 1015 Clyde Avenue in the City of West Vancouver, Province of British Columbia do hereby certify:

That I am a consulting geologist with business address at 1015 Clyde Avenue, West Vancouver, British Columbia;

That I am a graduate of the University of Guelph in Ontario where I obtained my Bachelor of Arts degree in Geography (Geomorphology) and Geology in 1973, and that I am a graduate of Carleton University of Ottawa, Ontario where I obtained my Master of Science degree in Geology in 1977;

That I am registered as a Professional Geoscientist with the Association of Professional Engineers and Geoscientists of British Columbia;

That I have been engaged in the study and practice of the geological profession for over 40 years;

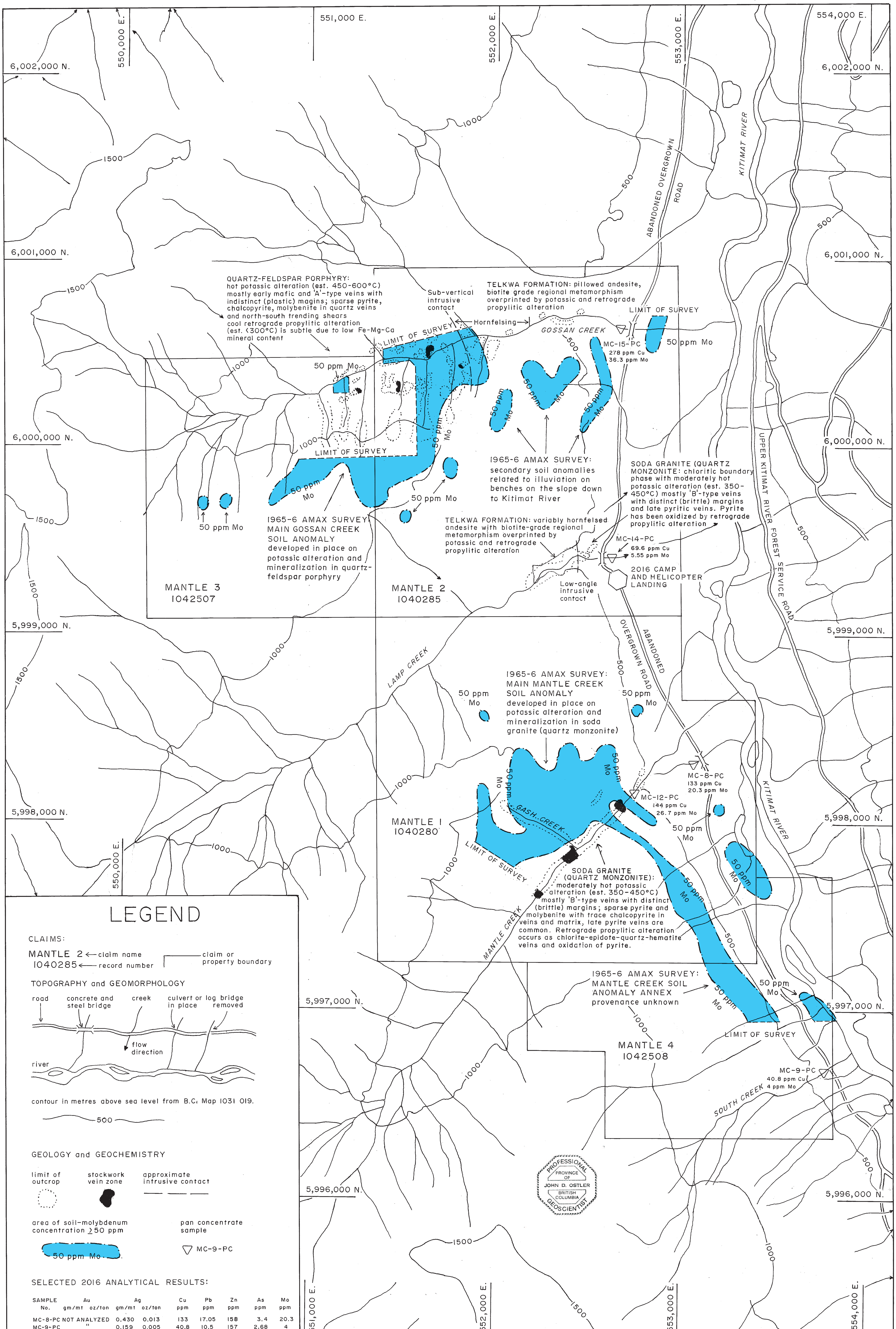
That this report is based on data in the literature and on exploration conducted by me in the Mantle property area from July 29 to August 5, 2016.;

That I own 100% of the Mantle property;

That I am the sole author of this report and all sources of information not based on my personal knowledge of the Mantle property area are referenced in a standard format. In my opinion, the record of previous exploration on the Mantle property areas is reasonably accurate and correct.

John Ostler; M.Sc., P.Geo.
Consulting Geologist

West Vancouver, British Columbia
September 15, 2016



LEGEND

CLAIMS:

MANTLE 2 ← claim name
1040285 ← record number

claim or property boundary

TOPOGRAPHY and GEOMORPHOLOGY

road, concrete and steel bridge, creek, culvert or log bridge in place, removed

flow direction

river

contour in metres above sea level from B.C. Map 103I 019.

500

GEOLOGY and GEOCHEMISTRY

limit of outcrop

stockwork vein zone

approximate intrusive contact

area of soil-molybdenum concentration ≥50 ppm

50 ppm Mo

pan concentrate sample

MC-9-PC

SELECTED 2016 ANALYTICAL RESULTS:

SAMPLE No.	Au gm/mt	Au oz/ton	Ag gm/mt	Ag oz/ton	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm
MC-8-PC	NOT ANALYZED		0.430	0.013	133	17.05	158	3.4	20.3
MC-9-PC	"		0.159	0.005	40.8	10.5	157	2.68	4
MC-12-PC	"		0.625	0.018	144	16.5	176.5	3.44	26.7
MC-14-PC	"		0.241	0.007	69.6	6.26	195	3.83	5.55
MC-15-PC	"		1.225	0.036	278	7.95	209	2.4	36.3

NOTES:

For complete analytical results, see Appendix 'A'.

N.
18°41'
N. mag.

SCALE

0 200 400 600 800 1000 m

0 500 1000 1500 2000 2500 3000 ft

Figure 12

CASSIAR EAST YUKON EXPEDITING LTD.

2016 EXPLORATION

MANTLE PROPERTY

54° 08' 14" N., 128° 12' 06" W.

U.T.M.: 5,999,097 N., 552,156 E.

N.T.S.: 103 I/1 B.C.: 103I 019+020 SKEENA M.D., B.C.

JOHN OSTLER; M.Sc., P.Geo. SEPTEMBER, 2016