CARCROSS GEOCHEMICAL PROJECT APPRAISAL

by

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CARCROSS GEOCHEMICAL PROJECT

INTRODUCTION

The geochemical coverage for the Carcross Project includes a large variety of rock units which comprise parts of three main geological regions. These include the St. Elias Range (on the southwest) which is mainly Upper Paleozoic and Mesozoic volcanic and sedimentary rocks and batholithic intrusions. The St. Elias Range has attracted mining companies for its copper potential because of the numerous copper showings throughout the Kluane Ranges and because of a large porphyry copper deposit found in the same geological region in Alaska.

The central unit is the northern and widened extension of the Coast Range Batholith (Coast Crystalline Complex). It is mainly batholithic intrusions of Mesozoic age and includes numerous roof pendants of a variety of sizes and a variety of rock types. The Batholith has been neglected by mining companies because of the scarcity of known ore deposits.

The region lying to the northeast of the Coast Range Batholith has been that most favoured by exploration companies in British Columbia. It is an area largely of Mesozoic volcanic and sedimentary rocks and the locus for numerous important Tertiary rocks and related mineral deposits.

TECHNIQUES

Chemical Techniques

For all samples total Cu, total Zn, and total Mo were determined and plotted on maps. In addition samples from areas anomalous in these three elements were analyzed for Pb, Ag, As, Mn.

As stated in a previous appraisal, the values from X-ray fluorescence for Zn were reliable and these have been plotted where available. X-ray fluorescence values for Cu were fairly reliable and only those values over 150 ppm were repeated using perchloric acid digestion and atomic absorption determination. The X-ray fluorescence values for Pb were somewhat low and these were multiplied by 1.5 to bring them into range with the values obtained with atomic absorption. This adjustment is not as accurate as one would like; but it will suffice for the present appraisal.

About 600 samples were run for Cu, Pb, and Zn by X-ray Laboratories Limited, Toronto. The results from this X-ray fluorescence work were appraised and adjusted as stated above. The remainder of the analyses were done by Vancouver Geochemical Laboratories Ltd. using the following techniques:

Elements	Digestion	Determination
Cu,Zn,Mn,Co,Ni	$HClO_4$	Atomic Absorption
Pb, Ag	HCl: HNO_3 = 4:1	Atomic Absorption

Mo	$HClO_4$	thiocyanate, stannous chloride, isopropyl ether
As	$HClO_4$, HNO_3	modified Gutzeit

Anomaly Appraisal

In appraising a regional geochemical program, many geochemists use statistical analyses to determine background values, threshold values, and contour intervals for their colour legend. In this study some histograms were drawn to aid in the interpretation of the results and to determine a general range of contour values for the legends. In general the legends have been designed so that at least two value ranges (represented by two colours) fall within the background levels for most of the map area. This enables one to, by glancing at the map, detect fairly low magnitude anomalies within a very low background area.

The writer believes that a strictly statistical analyses of regional data is of more academic interest than practical use. The great variety of rock types, based only on regional mapping, would make a statistical study very time-consuming and costly. The fact that much glacial debris from the batholith area lies on the Mesozoic rocks to the northeast would cause great inaccuracies in determining background if the geochemist were to rely strictly on the bedrock geology in outlining boundaries for threshold values, etc. Other very important variables which cannot be easily included in a strictly statistical analyses for background values, threshold values, etc. include climate, altitude, vegetation, and permafrost.

The writer has deliberately omitted specific threshold values in the legends and the report. In a general way one might assume that the first two colours on the legend are within the background values, the third colour is in the range of threshold values, and the remaining three colours (yellow, orange and red) are anomalous values. However instead of using this method of picking out anomalies, the writer has reviewed the anomalous values in view of their magnitude, persistency (downstream or in adjacent creeks), creek size, geological setting, and in some cases composition of silt.

Geochemical Maps

For plotting the values, the "cold extraction" maps drawn by Geophoto Services Inc. were used as a base. A somewhat larger circle was drawn over the small sample points to aid in producing a coloured anomaly map. On some maps, two metals (e.g. Pb, Ag) were plotted with the colour for one metal inside the circle and the colour for the second metal outside the circle. The available analyses for Cu, Mo, Zn, Pb, Ag, As, Ni, Co, and THM are plotted and coloured. The Mn results are listed in the appendix. The THM values are those supplied by Geophoto Services. The geochemical anomalies indicated on the maps are numbered with Arabic numerals. Each number is preceded by the map index number. The merits of the individual anomalies are indicated by

the letters "A", "B", "C", or "D", indicating that the anomalies are outstanding, good, fair, or poor. The rating depends on the magnitude and persistency of the anomaly, but the geological setting has figured very strongly in the appraisal.

The individual anomalies for each sheet are listed and briefly described. Pertinent data or geology are included under individual anomalies or groups of similar anomalies. This will be followed by a summary and conclusions which will synthesize the appraisal and point out the best anomalies.

GEOCHEMICAL ANOMALIES

Sheet 114P-NE

To facilitate appraising the anomalous values of this sheet we will consider first of all the area southwest of the Kelsall Lineament. This is a region of Cache Creek formation (volcanic and some sedimentary rocks) intruded by batholithic bodies. The area of Cache Creek rocks has a relatively high and unusually erratic background for copper values -- a mixture of values ranging from 40 to 130 ppm, with no outstanding persistent anomalies. Therefore, within this region, only samples with extra high copper values or those anomalous in more than one metal are considered.

114P-NE-1: (D+) ✓ Mo Zn

Trapper result ↓ no further work, resampled background

A single creek draining Cache Creek rocks is anomalous in Mo, Zn, THM. Cu is not anomalous. Pb, Ag, As are possibly slightly anomalous.

114P-NE-2: (C⁻) Zn Cu

no further work background

A single creek fed by a glacier and draining batholithic rocks yielded good Zn, THM and low Cu anomalies. There was insufficient sample for Mo, As, Ag analyses. The adjacent creek on the south has a low Zn anomaly.

114P-NE-3: (C⁻) Mo

resampled background no further work

A single creek draining Cache Creek rocks near a batholith contact has a persistent Mo anomaly. There are also slightly anomalous values in Cu, THM, As, Mn, but not in Pb, Ag.

114P-NE-4: (C+) Zn Pb

claims 1969 work +

A small creek draining Cache Creek rocks and contact of batholith has high anomaly in Zn, THM, Pb; low anomaly in Cu, Mo and no anomaly in As. It is in an area of known mineralization and may be covered by mineral claims.

114P-NE-5: (C) Cu

Two small streams at the head of Tina Creek are anomalous in copper. A single sample from the summit area is highly anom-

Cu.

alous in copper; but this is possibly a soil sample. (See follow-up work for anomaly K). The soil sample is anomalous in THM, but not in Zn or Pb. The area is underlain by batholithic rocks and gossan is reported by Geophoto Services Ltd.

false anomaly NFW

Another characteristic feature of the area southwest of the Kelsall Lineament, especially the part east of the Haines Road, is the widespread relatively high Mo values in batholithic rocks. Some acidic batholithic intrusives are unusually high in molybdenum. In places, scattered molybdenite crystals (a late stage magmatic constituent) can account for the widespread anomalous values. This late stage molybdenite can also occur near the contacts in small quartz lenses.

When appraising the high Mo anomalies within the batholith one must take the above phenomenon into account and also regard the fact that the Coast Crystalline intrusives of British Columbia are noted for their lack of porphyry copper and stockwork molybdenite deposits.

However any good anomaly warrants some follow-up work and the better ones will be listed accordingly. Moreover some roof pendant areas could have been missed in the G.S.C. reconnaissance mapping.

114P-NE-6: (C) Cu, Mo

resampled

Staked + work program 69 no anomaly Mo anomaly

Three adjacent streams are somewhat anomalous in Cu; one of these is anomalous in Mo. These streams drain batholithic rocks.

114P-NE-7: (C) Mo, Cu

A large area (5 miles by 3 miles) of batholithic rocks is anomalous in Mo. Yokeak Creek, a fairly large stream, has values 110 ppm and 55 ppm, which would be outstanding for even a small stream. However Mr. Chun, chemist, reports that these two samples had very high organic content. The tributary streams that have been sampled have much lower, but still anomalous, Mo values.

resampled organic or manganese not significant

114P-SE-1: (C)

The anomalous conditions on this stream (50 ppm Mo) could be caused by the same type of mineralization which causes anomaly 114P-NE-7 and therefore the anomaly is mentioned at this point. The anomaly is not persistent downstream. The stream drains batholithic rocks; but a Tertiary (?) stock has been mapped to the west of the stream.

The area northeast of Kelsall Lineament is appraised as a separate geological unit. A band of Mush Lake volcanic rocks, up to four miles wide, extends along the northeast side of the Lineament for 18 miles (Blanchard River to Kelsall Lake). This unit is noted for its widespread copper occurrences -- generally with relatively little pyrite.

The above zone is somewhat anomalous in Cu throughout; but four centres of high values have been picked. Follow-up work should be

done on the best two centres (#9 and #11) and if encouraging results are obtained, then the remaining two centres (#9 and #10) should be investigated.

114P-NE-8: (C^+) Cu, resampling, no cu, but Zn anomaly, staked, no f.w.

114P-NE-9: (B^+) Cu, resampling, background values, n.f.w.

114P-NE-10: (C^+) Cu,

114P-NE-11: (B^-) Kelsal Lake

Sheet 114P-SE

114P-SE-1: (C)

This anomaly has been described under anomaly 114P-NE-7.

Sheet 114P-NW

As mentioned under Sheet 114P-NE the Mush Lake volcanic rocks of the St. Elias Range are noted for their widespread copper occurrences. The same unit occurs on Sheet 114P-NW. Several slightly anomalous centres have been noted, but are regarded as low priority targets (#1, #2, #3).

114P-NW-1: (D) Cu,

Several creeks draining Mush Lake rocks north of Ronge Lake have Cu values about 2 x background with no corresponding Mo, Zn, THM anomalies. resampled background n.f.w.

114P-NW-2: (D) Cu

This anomaly is similar to 114P-NW-1. resampled, background, n.f.w.

114P-NW-3: (C^-) Cu, Mo,

A single creek has a good Mo anomaly and low Cu anomaly; but no Zn or THM. resampled background, n.f.

114P-NW-4: (C) Zn, Mo, THM,

The stream draining Mush Lake formation is anomalous in THM, Zn, Mo but not in Cu, Pb, or As. No adjacent creeks were sampled. false anomaly n.f.w.

114P-NW-5: (D)

A small tributary, draining Cache Creek formation, is anomalous in Mo + Zn but not in Cu, Pb, Ag or As. The anomaly is not persistent downstream.

A similar anomaly (but without Zn) occurs in a stream three miles to the north.

Woodcock, Y.T.-B.C. NW quadrant

CONCLUSIONS

The appraisal herein has been based mainly on the chemical results and their relationship to geological formations. The distribution of known mineral occurrences and any preliminary follow-up work done by Geophoto Services have not been taken into account.

The anomalies have been graded from D (poor) through C (fair), B (good) and A (outstanding) with + and - "shades of merit". The results of the rating of 56 anomalies is tabulated as follows:

Metal	Class and Number of Anomalies									
	A	A^-	B^+	B	B^-	C^+	C	C^-	D^+	D
Cu			1	1	1	5	4	1	2	4
Mo				2	1	1	5	5	1	2
Pb, Ag, Zn As (Au)		1		2	1	3	3	3		5
As (Sb)	1									
Ni							1			

The writer has rated only two anomalies as outstanding (A^-, A); and the high quality of these anomalies may be dependent on the presence of workings. However the B^+, B, B^-, C^+ anomalies and some of the C anomalies warrant investigation.

When reviewing specific metals, one can state that there are no outstanding Cu anomalies. However at least eight anomalies, of varying degrees of merit warrant investigation. These occur in the vicinity of the copper-rich Haines Road region and in the eastern parts of the Coast Range Batholith.

Some outstanding Mo values were obtained. The fact that these are associated with the Batholith (see previous explanation) and the fact that many of the very high values occur in organic-rich silts detract considerably from the merits of the molybdenum anomalies.

Poly-metallic prospects and poly-metallic anomalies are scattered throughout the eastern parts of the survey area. Many of the better ones may be associated with known showings and workings. However some could represent unknown mineralization in the vicinity of showings or claims. Some areas of Eocene volcanics are anomalous in several metals. As mentioned previously, those associated with the Bennett Lake ring dike, are particularly intriguing.

Arsenic anomalies are widespread, and are often associated with poly-metallic mineralization, gold mineralization, or molybdenum deposits. The well-known antimony deposits on Carbon Hill yield good arsenic anomalies.

One area of ultrabasic rocks yielded Ni values up to 4 x background and somewhat anomalous Co values. Inadequate numbers of samples and analyses prevent drawing any conclusions.

114P-NW-6: (C^+)

A large glacial stream, which drains a variety of rock formations, especially Cache Creek volcanics, is anomalous in Cu. If this site is plotted correctly and if the anomalous value can be repeated, then investigation is warranted.

Sheet 114P-SW

The small portion covered has no anomalies.

Sheet 114O-NE

The small portion covered has no anomalies.

Sheet 115A-SE

115A-SE-1: (C^-)

Anomalous Mo values occur in two small streams in the centre of the Batholith. These occur below small lakes, so additional silt sampling should be done in any follow-up work. Cu, Zn, THM are not anomalous.

Sheet 115A-NE

115A-NE-1: (D)

The map sheet is also situated over the central part of the Batholith. Only one anomalous Pb value warrants mention. The other metals (Zn, THM, Cu, Mo) are not anomalous for this sample.

Sheet 115A-NW

The small portion covered has no anomalies.

Sheet 105D-SW

105D-SW-1: (C^-)

A creek which drains the contact area of a batholithic intrusive with Yukon Group rocks is slightly anomalous in Cu, Mo, THM. This creek and the adjacent ones should have more sampling in their upper reaches.

105D-SW-2: (D)

The creeks draining a batholithic area are anomalous in THM and slightly anomalous in Zn.

105D-SW-3: (B^-)

Creeks draining a roof pendant of Yukon Group within the Batholith are anomalous to varying degrees in Ag, Cu, As, Pb, Ag, Zn, and THM.

105D-SW-4: (C)

An area of Skukum volcanics overlying batholithic rocks are drained on the south by creeks slightly anomalous in THM, Zn and Pb, and on the north by one creek slightly anomalous in Pb and Mo.

105D-SW-5: (C^+)

A good Cu anomaly (600 ppm) occurs in one creek which drains Lewis River Group. The sample is also anomalous in THM and slightly anomalous in Pb. However the anomalies are not persistent downstream.

105D-SW-6: (D)

A large area of batholithic rocks has somewhat anomalous values in Cu, THM, but only background values in Mo, Pb, Ag.

105D-SW-7: (B)

Several small creeks draining northward into Watson River are anomalous in a variety of metals. One creek has good anomalous values for Mo, Cu, and low anomalous values for Zn, Pb. An adjacent creek has good anomalous values for Zn, THM, As, and slightly anomalous values for Mo. A third creek two miles to the east is anomalous in Pb, Ag, As. Mn values are in the background range.

The two western creeks drain Mesozoic volcanics, whereas the eastern creek drains an area mapped as batholithic intrusives.

105D-SW-8: (C^-)

A small stream, which drains the contact of the Batholith with Yukon Group rocks, is highly anomalous in THM and Zn, and very slightly anomalous in Pb, and Cu. The anomaly does not persist downstream. The Rose claim group was staked on this anomaly.

105D-SW-9 (B)

Some moderate, but persistent, Cu anomalies occur in two streams. Slightly anomalous Zn and Mo values accompany the Cu values. The streams drain an area of Yukon Group which is intruded on the south by the Batholith and on the north by a Tertiary (?) body.

105D-SW-10: (B)

Two small branches of a stream are anomalous in Mo. Small anomalies in Zn, THM and Pb are also present. The creek drains a Tertiary (?) stock.

105D-SW-11: (C)

Two small streams appear to be draining a relatively low area underlain by Yukon Group. An antimony prospect occurs in

Triassic volcanics ¾-mile to the south.

The stream flowing into Butte Creek is anomalous in THM and Mo. The stream flowing into Wheaton River is slightly anomalous in As and Ag.

105D-SW-12: (A)

This includes the creeks on the northern and eastern flanks of Carbon Hill -- an area noted for its antimony prospects. Probably most of the area is covered by mineral claims.

The area is underlain by batholithic rocks containing roof pendants of Triassic volcanics. An interesting Tertiary (?) stock lies northeast of Carbon Hill.

The antimony deposits are readily detected by As. Slightly anomalous values in Mo and Pb accompany most of the highly anomalous As values.

In addition, some slightly anomalous Pb values occur south of the As anomalies near the summit of Carbon Hill.

The As anomaly is outstanding because of its persistent high values. Many of the anomalous creeks are probably draining some workings.

105D-SW-14: (D^+)

Tallyho Mountain is underlain by Triassic volcanics which are intruded by a small ultrabasic body. Several gold showings occur in the granodiorite and in the Triassic volcanics to the northeast of Tallyho Mountain.

The creeks draining Tallyho Mountain have moderately anomalous Cu; but only background values for Mo, Zn, THM, Pb, Ag and As.

105D-SW-15 (D)

Two small creeks in the centre of the Batholith are anomalous in Mo. There are no accompanying anomalous Zn or Cu values.

105D-SW-16: (D)

An area of Triassic volcanics near the Batholith has a few scattered moderately anomalous values in THM, Zn, and Pb. Values for As, Cu, and Mo are background.

105D-SW-17: (C)

Two creeks draining a batholithic area south of Alligator Lake are anomalous in Mo (Y755 and Y804). The one anomaly is extremely high (275 ppm) and is also anomalously high in Mn (4000 ppm). The sample is largely organic and this detracts considerably from the merits of the anomaly.

105D-SW-18: (C^+)

High THM, Zn, and Pb values occur in one creek draining Mesozoic volcanics and sedimentary formations. Silt samples are very widespread in this area.

105D-SW-19: (C)

A good anomalous Cu value (335 ppm) occurs in a creek which drains a small lake in an area of batholithic rocks and Skukum volcanics. Sample density is not sufficient to draw any conclusions.

West of Bennett Lake, a series of discontinuous Tertiary rhyolite intrusions form part of a ring dike. The enclosed preliminary map and report by M. B. Lambert (Report of Activities, Paper 69-1, Part A, pp 21-23) states that the ring dike is associated with cauldron subsidence in a batholithic area. The rocks surround an area of Eocene (Skukum) acidic pyroclastic and flow rocks.

Except for a small fluorite occurrence at the west end of the ring dike, no directly associated mineralization is known. However this geological structure is centrally situated to the numerous silver-gold occurrences in the southern Yukon. A map showing the spacial relationship was compiled by the writer several years ago. A copy of the map is included in the appendix.

105D-SW-20 (B)

Several creeks draining the central part of the ring complex are highly anomalous in Pb, Ag, As. Values for Zn, THM, Cu, Mo are background. Examination of the silt samples shows a very high organic content for most of the highly anomalous samples. Sample Y649, the most anomalous does not have the very high organic content; but it is yellow in colour and anomalous in manganese (3500 ppm). Additional samples within the western part of the ring complex are also anomalous (e.g. Y669) and are included with this anomaly.

The large organic content of the samples detracts considerably from the merits of the anomaly. However in view of the recent exploration activity south of Smithers, British Columbia, for possible open-pit silver deposits in acidic pyroclastics and in view of the silver-gold metallogenic characteristics of this region, the anomaly warrants investigation.

105D-SW-21 (C^+)

Some moderately to slightly anomalous values for Pb, Ag, As, Zn, Cu and Mo occur in streams which drain a complex area of Yukon Group, Triassic volcanics, batholithic intrusions, Eocene volcanics, and ring-dike rhyolite.

Sheet 105D-NW

105D-NW-1: (C^+)

An outstanding Cu value (1200 ppm) occurs at one sample site. It is not very persistent downstream and does not show up in adjacent creeks. However it is in Triassic volcanics — a suitable host formation for copper deposits.

105D-NW-2: (C+)

A Mo anomaly with good downstream decay pattern occurs in one creek within the Batholith. Somewhat anomalous Cu, Zn, and THM values are also coincident.

105D-NW-3: (C-)

High THM values, accompanied at some sites by moderately anomalous Zn and Pb occur in several streams. Cu, Mo and As are background. The anomalous area (1 mile x 3 miles) is in the Batholith.

Sheet 105D-SE

105D-SE-1: (C)

A small batholithic outlier intrudes Laberge sedimentary rocks. The Laberge Series includes some limestone.

Low copper anomalies occur in streams that drain the northern contact area of the intrusion. One silt is also anomalous in Zn and THM.

The area should be checked for skarn deposits.

105D-SE-2: (C)

An area of Cache Creek volcanics is intruded by an ultrabasic body on the north slope of Jubilee Mountain. Streams draining the ultrabasic have low Cu and THM anomalies. These streams were run for Ni and Co and one sample yielded Ni values of about 4 x background.

105D-SE-3: (D)

A small creek draining Cache Creek sedimentary rocks (limestone, etc.) has good anomalies in THM and Zn and slightly anomalous Pb values. Mo and Cu are background.

Sheet 105D-NE

The small portion covered has no anomalies.

Sheet 104M-NW

104M-NW-1: (B)

Good Mo anomalies occur in creeks that drain an area of gossans in batholithic rocks. These creeks drain north and south from high glacier area. Samples are also anomalous in THM, Pb, As, but not in Zn or Mo.

All creeks and branches should be sampled and the area prospected for stockwork molybdenum and other types of mineralization.

104M-NW-2: (C-)

One sample site is anomalous in Mo, THM, Zn, Pb, but not in

Cu. The anomaly is not persistent downstream, but the creek is probably large.

104M-NW-3: (D)

Two small creeks within the Batholith are anomalous in THM and Zn but not in Cu or Mo.

104M-NW-4: (C^-)

A molybdenum anomaly, persistent downstream, occurs in one creek only within the Batholith. Cu, Zn, THM are not anomalous.

104M-NW-5: (C)

A high Mo anomaly occurs in the Batholith near the White Pass Lineament. The anomaly is not persistent downstream and Zn, THM, Cu are not anomalous.

Sheet 104M-NE

104M-NE-1: (C)

Good Mo anomalies and some fair Cu anomalies occur in branches of a creek that drains the Batholith near a contact with Yukon Group. Zn and THM are background.

104M-NE-2: (D)

This high area of Cache Creek volcanics has several cirque glaciers. Many of the creeks which drain it have small Cu anomalies. THM, Zn, and Mo are background.

104M-NE-3: (A^-)

Highly anomalous values in Zn, THM, Pb, Ag, As and slightly anomalous values in Cu occur in two widely spaced creeks. The creeks probably drain a Coast Range intrusion (batholith) and its surrounding contact area in Laberge sedimentary rocks.

104M-NE-4: (D^+)

An area (2 miles x 3 miles) of Laberge sedimentary rocks has Cu anomalies, none particularly high, but quite consistent. Zn, Mo, THM are only background.

Sheet 104M-SE

104M-SE-1: (B^-)

Fair molybdenum anomalies occur in two creeks draining Yukon Group near the Batholith contact. One sample has a low Cu anomaly.

CONCLUSIONS

The appraisal herein has been based mainly on the chemical results and their relationship to geological formations. The distribution of known mineral occurrences and any preliminary follow-up work done by Geophoto Services have not been taken into account.

The anomalies have been graded from D (poor) through C (fair), B (good) and A (outstanding) with + and - "shades of merit". The results of the rating of 56 anomalies is tabulated as follows:

Metal	Class and Number of Anomalies									
	A	A^-	B^+	B	B^-	C^+	C	C^-	D^+	D
Cu			1	1	1	5	4	1	2	4
Mo				2	1	1	5	5	1	2
Pb, Ag, Zn As (Au)		1		2	1	3	3	3		5
As (Sb)	1									
Ni							1			

The writer has rated only two anomalies as outstanding (A^-, A); and the high quality of these anomalies may be dependent on the presence of workings. However the B^+, B, B^-, C^+ anomalies and some of the C anomalies warrant investigation.

When reviewing specific metals, one can state that there are no outstanding Cu anomalies. However at least eight anomalies, of varying degrees of merit warrant investigation. These occur in the vicinity of the copper-rich Haines Road region and in the eastern parts of the Coast Range Batholith.

Some outstanding Mo values were obtained. The fact that these are associated with the Batholith (see previous explanation) and the fact that many of the very high values occur in organic-rich silts detract considerably from the merits of the molybdenum anomalies.

Poly-metallic prospects and poly-metallic anomalies are scattered throughout the eastern parts of the survey area. Many of the better ones may be associated with known showings and workings. However some could represent unknown mineralization in the vicinity of showings or claims. Some areas of Eocene volcanics are anomalous in several metals. As mentioned previously, those associated with the Bennett Lake ring dike, are particularly intriguing.

Arsenic anomalies are widespread, and are often associated with poly-metallic mineralization, gold mineralization, or molybdenum deposits. The well-known antimony deposits on Carbon Hill yield good arsenic anomalies.

One area of ultrabasic rocks yielded Ni values up to 4 x background and somewhat anomalous Co values. Inadequate numbers of samples and analyses prevent drawing any conclusions.

RECOMMENDATIONS

(1) Most of the "C" to "A" anomalies should be investigated, the order of importance depending on rating and on accessibility. If the results are encouraging then additional silt sampling should be done in suitable areas.

(2) The distribution of known mineral occurrences, the results of the preliminary follow-up work by Geophoto Services, and the prior mineral claim coverage should be appraised in planning the follow-up program.

(3) The air photos and field maps used by the men who collected the silts should be used in the follow-up work to facilitate location of the correct drainages.

J. R. Woodcock

March 19, 1969

11. STUDY OF A TERTIARY CAULDRON SUBSIDENCE COMPLEX, BENNETT LAKE, BRITISH COLUMBIA AND YUKON TERRITORY (104 M/14, 105 D/5)

Project 670011

M. B. Lambert

Detailed mapping, begun in 1967[1], of the Skukum volcanics was completed near the West Arm of Lake Bennett in parts of the Wheaton River (105 D/5) and Homan Lake (104 M/14) map-areas. This is a presumed cauldron subsidence area (Fig. 1) with a history of explosive acidic volcanism and rapid sedimentation that resulted in the accumulation of great thicknesses of tuffs, breccias, ignimbrites and conglomerates.

Granitic and metamorphic rocks completely surround the layered rocks of the Skukum Group in this region. Isolated masses of pre-Mesozoic[2] metamorphic rocks (unit 1) consist of quartz-feldspar schists and gneisses, quartz-biotite schists, quartzites, and gneissic granodiorite. Granitic rocks (unit 2) of the Coast Range Intrusions range from hornblende granodiorite, through biotite quartz monzonite to biotite leucogranite. These rocks are shattered and brecciated in the vicinity of known fault zones, generally around the periphery of the central volcanic rocks, and in breccia pipes. Disruption of these rocks was probably caused by explosive volcanism and by faulting during the initial stages of subsidence of a central cauldron.

The early products of explosive volcanism, which include a variety of light-coloured breccias and tuffs (unit 3), accumulated on an irregular granitic terrain to a maximum thickness of about 1,500 feet. The late products of this eruptive series form a sequence of ignimbrites (unit 4) with a maximum thickness of 2,000 feet.

Tuff and breccia pipes, composite tuff-rhyolite and tuff-dacite dykes, and ignimbritic dykes are considered to be the sources (unit 5) of the pyroclastic rocks. These vents, which are scattered around the periphery and north-central parts of the area, commonly occur along fracture zones or along contacts between granitic and metamorphic rocks. Vent forms vary from pipes with elliptical to completely irregular cross-sections, to steeply dipping dykes. During a period of erosion following the explosive eruptions, a sequence of essentially unsorted granitic boulder conglomerates (unit 7) accumulated to thicknesses as great as 1,000 feet in the southeast corner of the area. In the central parts of the area, the conglomerate beds interfinger with tuff and ignimbrite units. The conglomerates are overlain by coarse-grained sandstones, tuffaceous sandstones and tuffs. A maze of faults occurs throughout the central part of the area. One of the larger faults has a vertical

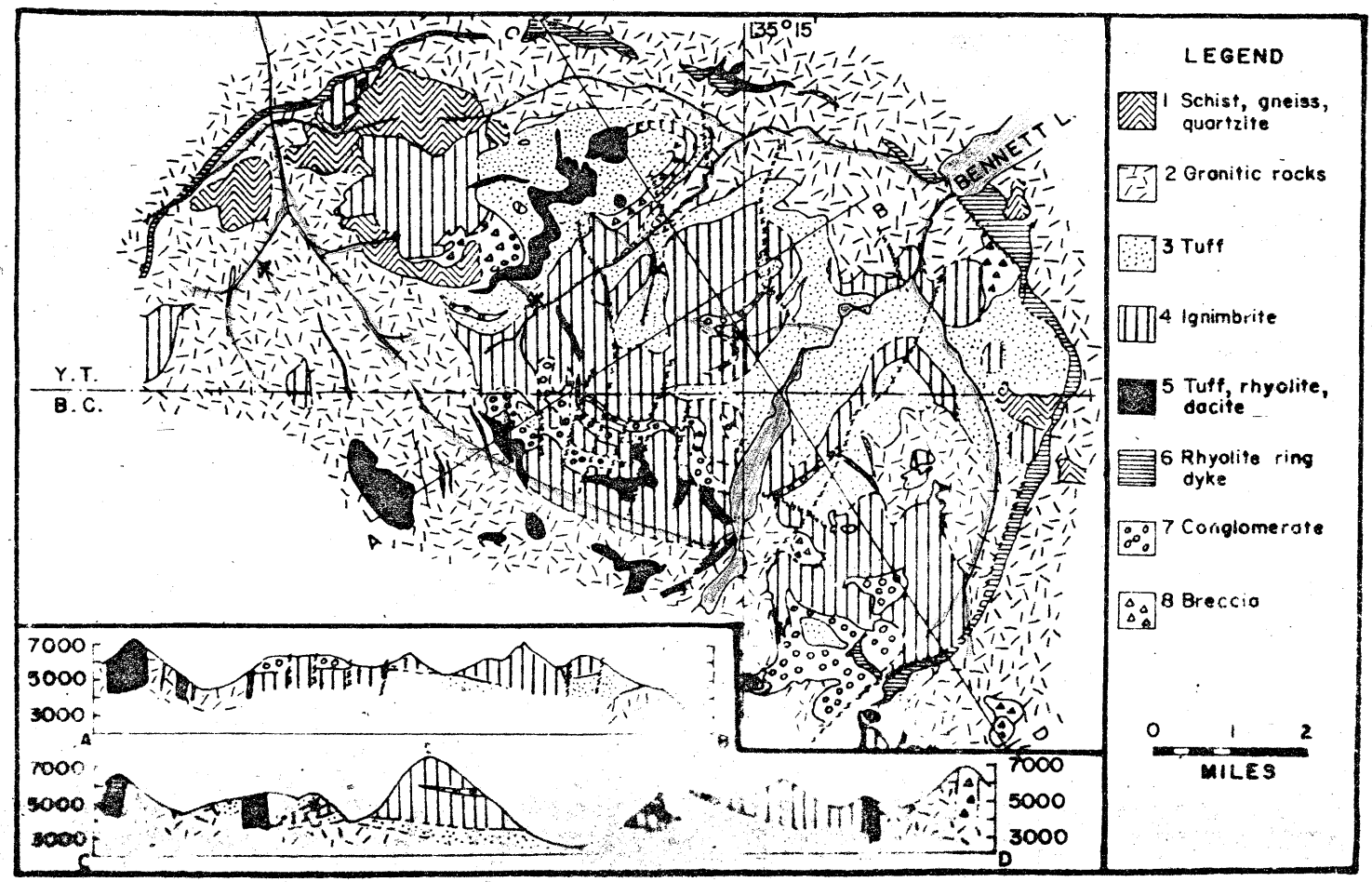

Figure 1. Cauldron subsidence area, Bennett Lake, British Columbia and Yukon Territory.

displacement of 500 feet. Fault relations indicate that the layered rocks suffered disruption and jostling at intervals both during and after deposition.

A final period of faulting along peripheral arcuate fracture systems was accompanied by (1) a second period of explosive volcanism, which resulted in deposition of relatively thin layers of tuff; (2) extrusion of basalt lava flows; and (3) intrusion of a large ring dyke. The vertical to steeply outward dipping, porphyritic rhyolite ring dyke (unit 6) forms a broad, discontinuous arc, about 22 miles long, around the northern and eastern periphery of the area. The dyke pinches and swells and has a maximum thickness of 1,500 feet. The dyke, near its ends, flares out into a maze of smaller dykes, ranging from a few inches to 20 feet wide. Andesitic and basaltic magma intruded the volcanic pile and reached the surface to form very small lava flows. The volume of lava flows is very small (less than one per cent) in relation to the total bulk of pyroclastic rocks.

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[1] Lambert, M. B.: Wheaton River and Homan Lake, Yukon and British Columbia; in Report of Activities May to October 1967, Geol. Surv. Can., Paper 68-1A, p. 32 (1968).

[2] Wheeler, J. O.: Whitehorse map-area, Yukon Territory; Geol. Surv. Can., Mem. 312 (1961).

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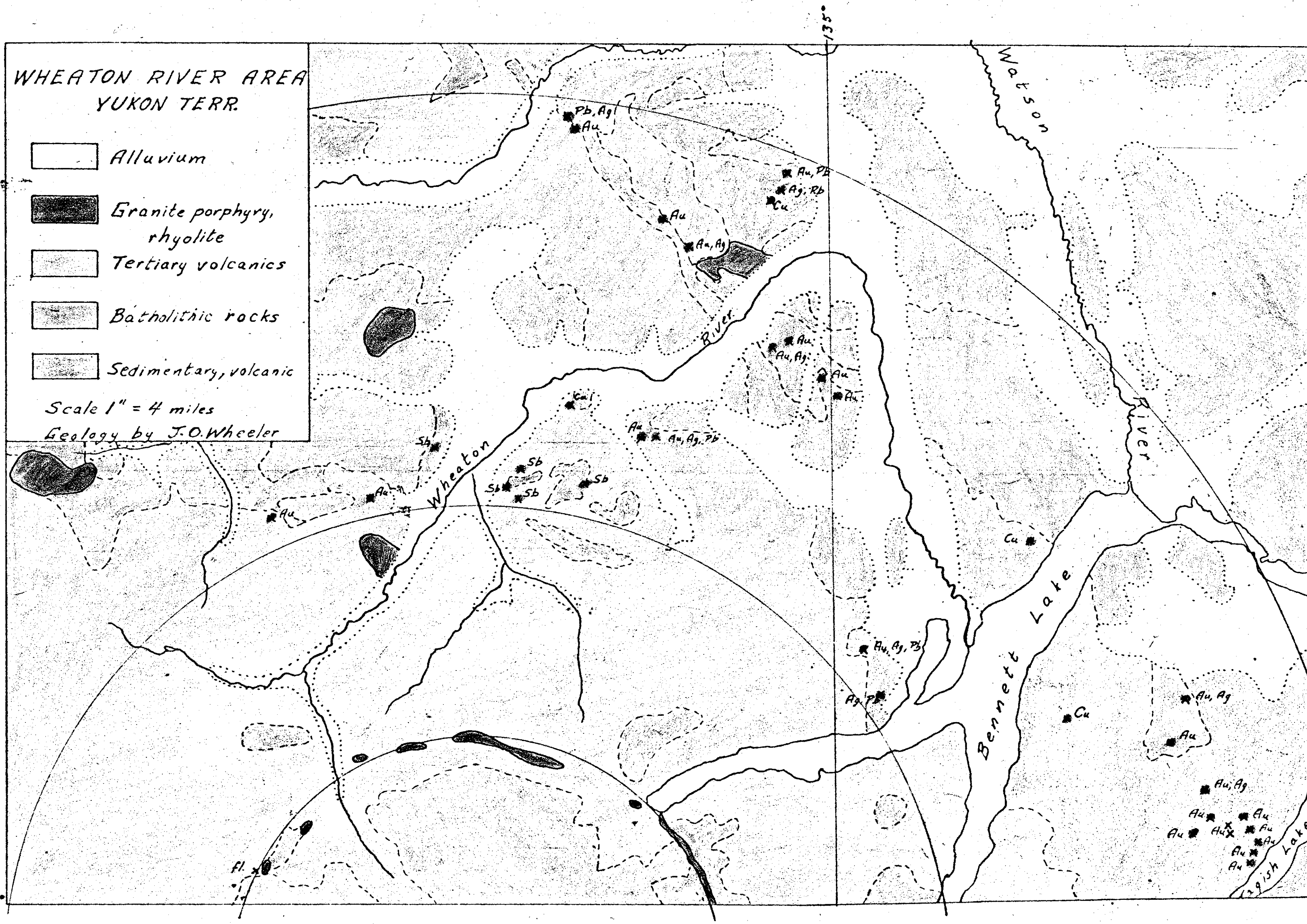
12. LATE PALEOZOIC ROCKS OF THE ATLIN HORST, NORTHWESTERN BRITISH COLUMBIA AND SOUTH-CENTRAL YUKON (104M, N, 105C, D)

Project 660002

J. W. H. Monger

Field investigation of the stratigraphy and structure of late Paleozoic rocks comprising the Atlin Horst[1] was concluded in 1968. Rocks in areas A, B, C (Fig. 1) were studied in detail and those near Angel Lake, Diella Lake, Hurricane Creek and Kedahda Lake (localities A, D, H, K, Fig. 1) were examined briefly. Stratigraphic sections given below (Figs. 1, 2) are composite and result from detailed mapping. Fusulinids used to correlate these sections were tentatively identified in the field on sawn, etched surfaces of hand specimens. Sections D and E, from previous work[2], are included for comparison.

Rapid facies changes characterize the upper Paleozoic sequence in the Atlin Horst. Four northwest-trending 'facies belts', defined by predominant lithologies, are shown in the facies map (Fig. 2).


WHEATON RIVER AREA
YUKON TERR.
Alluvium
Granite porphyry, rhyolite
Tertiary volcanics
Batholithic rocks
Sedimentary, volcanic
Scale 1" = 4 miles
Geology by J.O. Wheeler
Watson
River
Wheaton
River
Bennett Lake
135°
60°

APPENDIX

Manganese Analyses

Sample No.	Mn.	Sample No.	Mn.	Sample No.	Mn.
Y 7	575	Y 344	625	Y 621	625
8	275	350	550	622	750
12	175	352	575	623	4100
270	860	354	750	626	1050
273	760	355	1000	628	700
274	1150	359	820	631	640
275	700	360	440	632	560
276	620	364	540	633	460
277	580	365	780	634	800
278	1400	367	620	635	380
279	760	369	1080	636	380
281	580	370	640	637	480
282	580	371	800	640	500
283	900	414	1400	641	580
284	1000	415	1050	642	860
285	800	416	1600	645	440
286	500	423	700	647	1080
287	700	424	450	648	1040
288	720	425	375	649	3500
289	700	426	1900	650	720
290	1200	428	1350	652	620
292	700	430	850	653	840
293	1200	431	825	655	640
294	1080	432	825	656	1160
319	760	433	500	657	740
323	620	460	750	658	360
331	325	461	900	659	300
332	525	462	900	660	780
333	725	463	900	661	640
334	450	464	1000	662	360
341	450	618	1120	663	720
342	825	619	1000	664	560
Y 343	700	Y 620	900	665	420

Sample No.	Mn.
Y 666	630
667	580
668	800
669	575
670	500
672	700
673	675
674	625
675	450
677	1000
678	420
679	1040
680	680
681	400
683	740
686	640
687	1000
689	580
691	880
692	460
693	1240
694	1080
696	780
697	740
700	520
701	600
726	825
729	1200
737	1520
738	1150
739	1200
742	975
748	475
749	450
750	525
Y 751	880

Sample No.	Mn.
Y 752	800
753	1150
755	4000
779	500
783	850
789	1120
790	90
792	675
817	1350
820	600
822	225
824	750
895	540
896	540
900	280
1400	340
1403	275
1404	463
1405	375
1406	450
1407	425
1410	500
1534	325
1539	1400
1587	210
1588	290
1589	290
1590	250
1591	400
1592	460
1605	420
1626	540
1629	660
1642	380
1742	500
1743	400

Sample No.	Mn.
Y 1746	1000
1776	660
1777	1360
1781	840
1782	540
1784	420
1786	840
Y 1865	370
1866	320
1867	380
1868	175
1972	475
1974	1050
1975	900
1976	800
1977	1150
1978	1050
2074	580
2075	640
2076	560
2077	620
2078	860
2079	290
2080	740
2081	600
2082	640
2083	450
2084	440
2085	440
2086	360
2087	680
2088	1000
2089	600
2090	540
2091	980
2092	420

Sample No.	Mn.
Y 2093	410
2094	470
2095	720
2096	470
2097	300
2098	860
2099	620
2100	500
2101	480
2102	620
2103	620
2104	700
2105	500
2106	460
2107	420
2108	700,
2109	440
2110	660
2111	980
2112	800
2113	360
2114	480
2115	640
2116	460
2117	460
2118	760
2119	480
2120	740
2121	360
2122	260
2123	440
2124	280
2504	490
2506	740
2507	700
2508	660

Sample No.	Mn.
Y 2513	350
2514	1080
2515	900
2535	600
2554	440
2555	460
2556	560
2557	170
2558	500
2560	740
2561	620
2562	540
2564	580
2565	725
2566	460
2567	475
2578	680
2650	375
2651	500
2648	375
2703	375
2706	400
2763	450
2764	950
2900	400
2901	420
2915	300
2919	550
2920	350
2921	240
2922	225
2523	275
2924	550
2926	625
2927	600
2928	175

Sample No.	Mn.
Y 2929	275
2930	800
2933	240
2934	380
2935	440
2936	400
2937	5450
2939	960
2940	440
2942	400
2950	820
3143	220
3144	210
3145	340
3146	220
3147	220
3221	300
3222	680
3223	400
3224	520
3225	650
3226	580
3228	500
3229	300
3452	800
3453	600
3454	460
3455	700
3456	1800
3737	340
3738	420
3739	460
3740	400
3743	200
3744	800
Y 3745	275

Sample No.	Mn.	Sample No.	Mn.	Sample No.	Mn.
Y 3747	300				
3822	1100				
3843	900				
4001	1000				
4002	1350				
4003	925				
4052	200				
4053	400				
4054	580				
4055	280				
4057	230				
4058	480				
4059	580				
4069	460				
4070	440				
4161	1600				
5242	200				
5246	450				
5247	1100				
5626	500				
5627	720				
5628	520				
5657	1120				
5665	480				
5665	250				
5841	310				
5842	660				
5883	760				
5884	980				
5888	860				
5890	520				
Y 9010	225				

114 P NE

COLD EXTRACTION GEOCHEMICAL SAMPLE PLAN
CARCROSS AREA
N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR
ASHLAND OIL & REFINING COMPANY
THE BRITISH AMERICAN OIL COMPANY LTD.
PACIFIC PETROLEUMS LTD.

SCALE
1:63,360 - 1 mile to 1 inch

1968

LEGEND

- ° Y 227 - 13 - 10
- ° Sample location.
- Y 227 — Sample number.
- -13 — Heavy Metal Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using Bloom's Heavy Metal Test.
- -10 — Copper Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using the Holman Copper Test.
- Ⓑ Geochemical anomalies.

INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

114 P NE

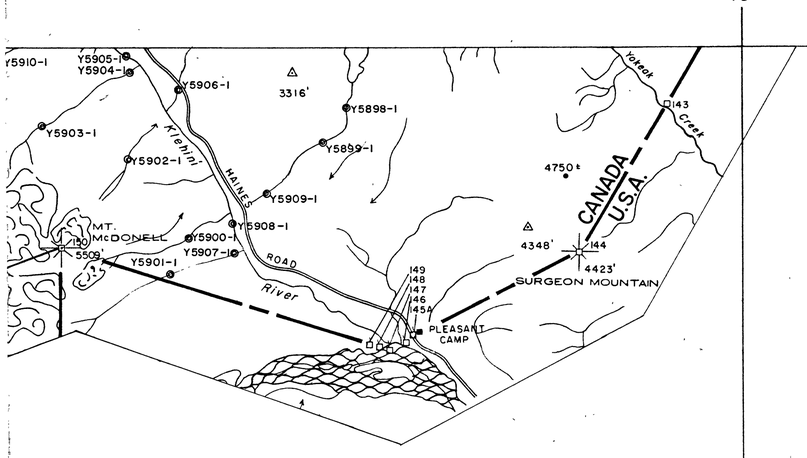
137°00'
45'
30'
60°00'
50'
40'
59°30'
YUKON TERRITORY
BRITISH COLUMBIA
Langton
Talbot
Goldrun Creek
TATSHENSHINI RIVER
HAINES ROAD
Blanchard River
Stanley
Mansfield Creek
MOUNT MANSFIELD
Kwatini
Tatshenshini
Goat or Mot Creek
Blanchard Lake
MOUNT REILLY
MT. KELSALL
KELSALL LAKE
Kelsall River
RAPIDS
GLACIER CAMP
Mule Creek
SCOTTIE MTN.
Rainbow Lakes
MT. PARTON
Parton River
West Nadahini Creek
MOSQUITO FLATS
NADAHINI MTN.
Nadahini Creek
Kusawak Lake
CHILKAT PASS
Stonehouse Creek
SAMUEL GLACIER
Fault Creek
O'CONNOR RIVER
Mineral Lakes
Camp Creek
North Fork
South Fork
THREE GUARDSMEN PASS
Three Guardsmen Lake
THREE GUARDSMEN MOUNTAIN
CAMP
MINERAL MOUNTAIN
KLEHINI RIVER
Inspector Creek
Seltat Creek
Wilson Creek
COPPER BUTTE
RAINY HOLLOW
JARVIS GLACIER
Dick Creek
Tina Creek
Q
P
O
T
L
K

114 P SE

15'

136°00'

59°30'



20'

10'

59°00'

15'

136°00'

COLD EXTRACTION GEOCHEMICAL SAMPLE PLAN

CARCROSS AREA

N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR

ASHLAND OIL & REFINING COMPANY
THE BRITISH AMERICAN OIL COMPANY LTD.
PACIFIC PETROLEUMS LTD.

GEOPROD

SCALE

1:63,360 - 1 mile to 1 inch

5000 3000 1000 0 5000 10,000 FEET

1 1/2 1/4 0 1 2 MILES

1968

LEGEND

° Y 227 - 13 - 10

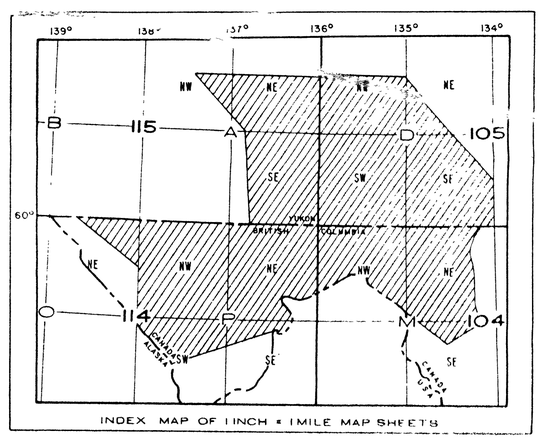
° Sample location.

Y 227 Sample number.

-13 Heavy Metal Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using Bloom's Heavy Metal Test.

-10 Copper Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using the Holman Copper Test.

Ⓑ Geochemical anomalies.



INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

114 P SE

137°00'
45'
30'
15'
59°30'
20'
10'
59°00'

Y6360-1
Y6363-2
Y6361-1
Y6362-1
Y6380-2
Y6379-1
Y6364-1
Y6365-1
Y6373-2
NOLAND
RIVER
Y6374-1
Y6366-1
Y6367-1
Y6368-1
Y6369-2
Y6370-1
Y6371-1
Y6376-1
Y6375-1
Y6377-1
Y6378-1
6250±
8920'
MT.
BIGGAR
BUCKWELL GLACIER
JARVIS GLACIER
6250'
Y5913-1
Y5910-1
Y5905-1
Y5904-1
Y5906-1
3316'
Y5903-1
Y5902-1
Y5898-1
Y5899-1
Klehini
HAINES
Y5909-1
Y5908-1
MT.
McDONELL
5509'
Y5900-1
Y5907-1
Y5901-1
ROAD
River
Yukon
River
143
4750±
CANADA
U.S.A.
4348'
144
4423'
SURGEON MOUNTAIN
149
148
147
146
145
PLEASANT
CAMP

114 P NW

COLD EXTRACTION GEOCHEMICAL SAMPLE PLAN

CARCROSS AREA

N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR

ASHLAND OIL & REFINING COMPANY

THE BRITISH AMERICAN OIL COMPANY LTD.

PACIFIC PETROLEUMS LTD.

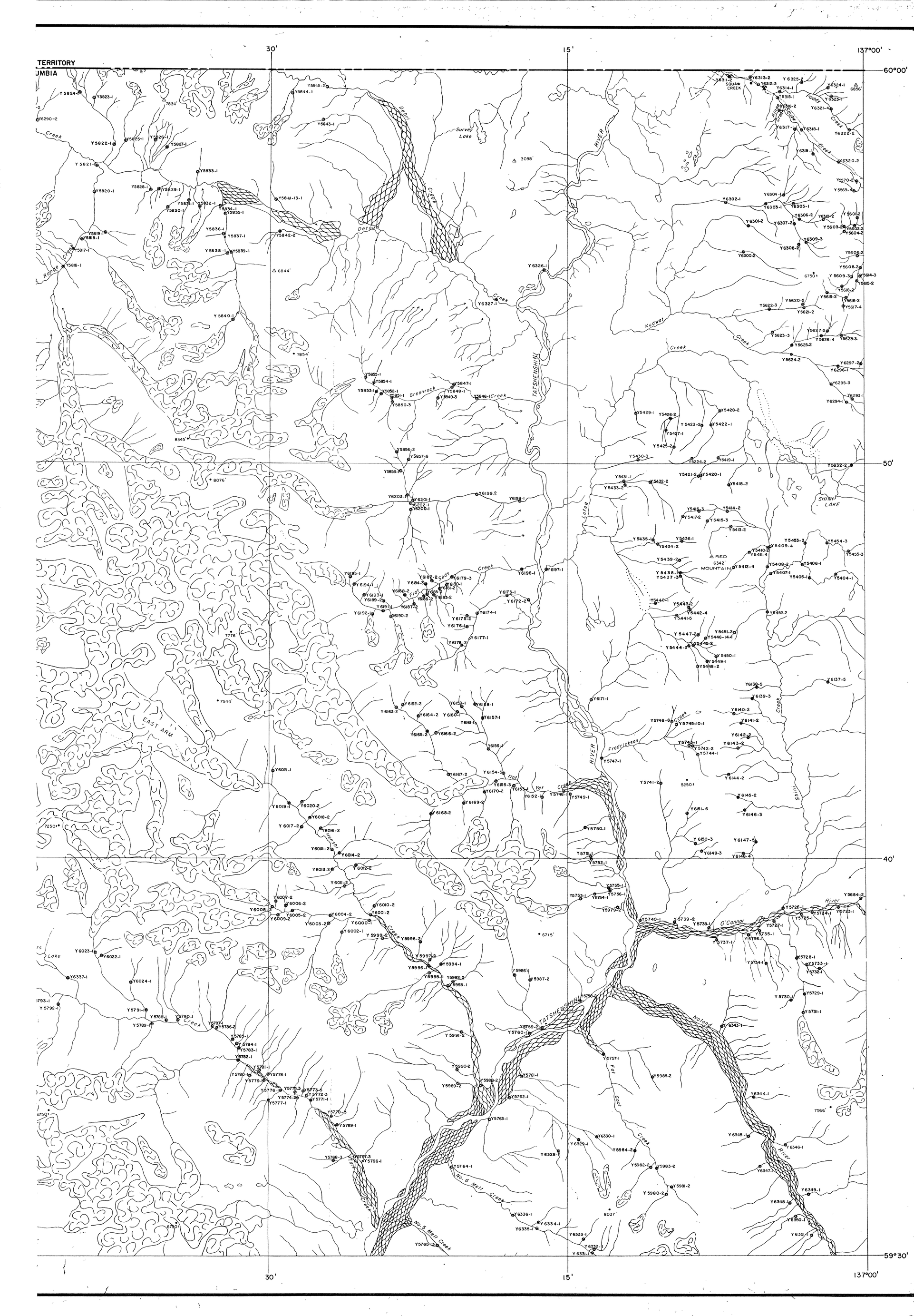
SCALE

1:63,360 - 1 mile to 1 inch

5000 3000 1000 0 5000 10 000 FEET

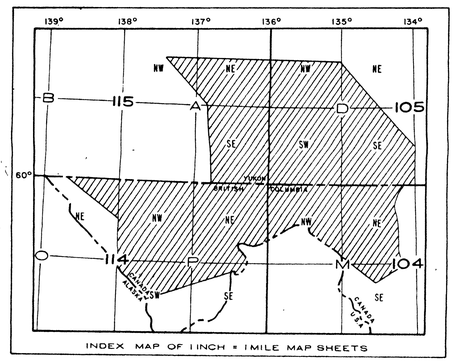
1/2 1/4 0 1 2 MILES

1968



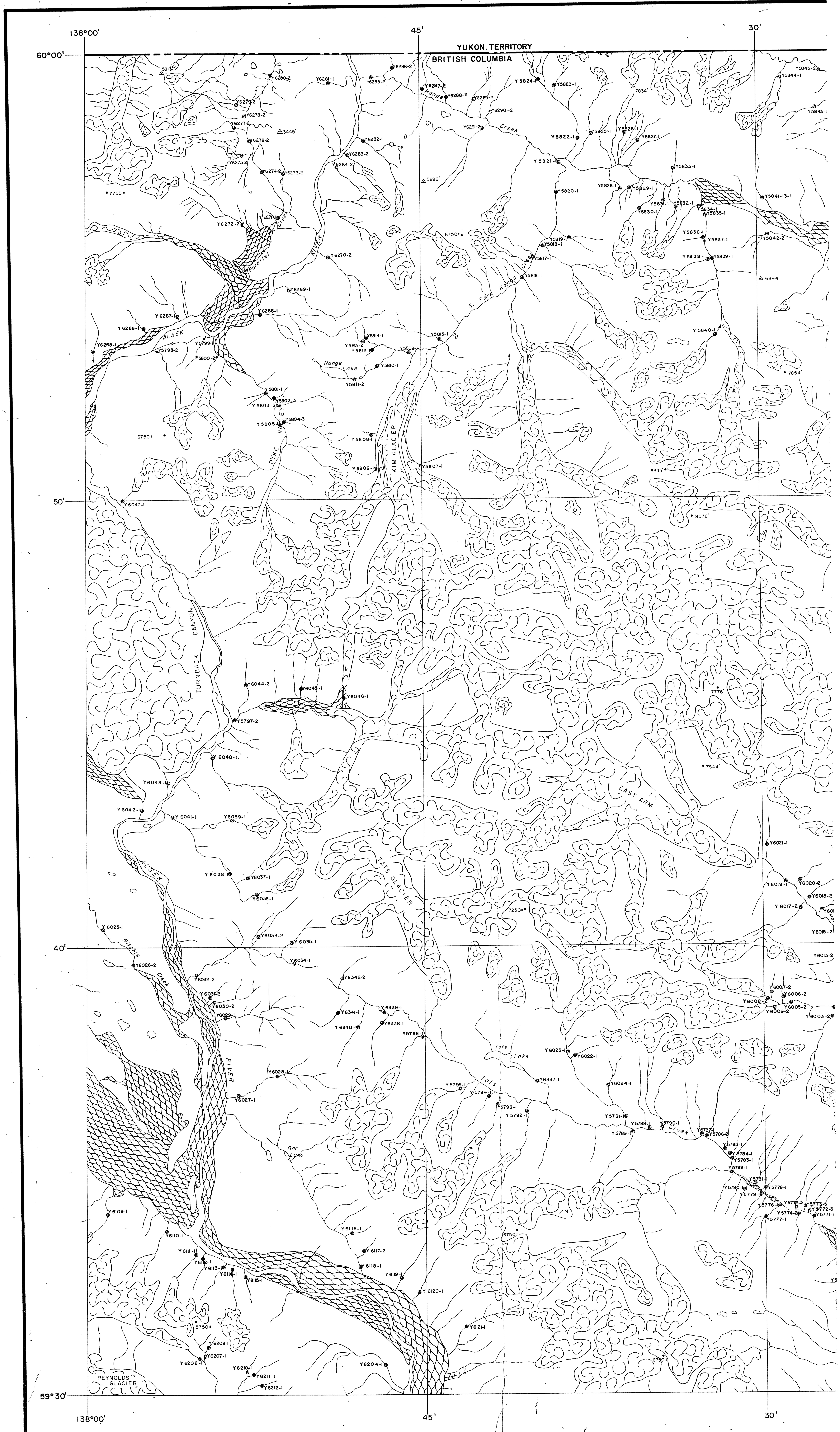
LEGEND

- ° Y 227 - 13 - 10
- ° **Sample location.**
- **Y 227** **Sample number.**
- **-13** **Heavy Metal Test** - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using Bloom's Heavy Metal Test.
- **-10** **Copper Test** - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using the Holman Copper Test.
- Ⓑ **Geochemical anomalies.**



INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

114 P NW


138°00'
45'
30'
60°00'
50'
40'
59°30'
YUKON TERRITORY
BRITISH COLUMBIA
ALSEK
RIVER
Parallel Creek
Range Creek
S. Fork Range Creek
Range Lake
DYKE VALLEY
KIM GLACIER
TURNBACK CANYON
EAST ARM
TATS GLACIER
Tats Lake
Tats Creek
Ritchie Creek
Bar Lake
REYNOLDS GLACIER
5913
3445'
5896'
7834'
7750±
6750±
6844'
7854'
8345'
8076'
7776'
7544'
7250±
5750±
Y6280-2
Y6281-1
Y6285-2
Y6286-2
Y6287-2
Y6288-2
Y6289-2
Y6290-2
Y6291-2
Y6279-2
Y6278-2
Y6277-2
Y6276-2
Y6275-2
Y6274-2
Y6273-2
Y6282-1
Y6283-2
Y6284-2
Y6271-1
Y6272-2
Y6270-2
Y6269-1
Y6268-1
Y6267-1
Y6266-1
Y6265-1
Y5798-2
Y5799-1
Y5800-2
Y5801-1
Y5802-3
Y5803-3
Y5804-3
Y5805-1
Y5806-1
Y5807-1
Y5808-1
Y5809-1
Y5810-1
Y5811-2
Y5812-1
Y5813-2
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Y5797-2
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Y6036-1
Y6025-1
Y6026-2
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Y6035-1
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Y6341-1
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Y5789-1
Y5790-1
Y5787-1
Y5786-2
Y5785-1
Y5784-1
Y5783-1
Y5782-1
Y5781-1
Y5780-1
Y5779-1
Y5778-1
Y5776-1
Y5775-3
Y5774-2
Y5773-5
Y5772-3
Y5771-1
Y5777-1
Y6021-1
Y6019-1
Y6020-2
Y6018-2
Y6017-2
Y6015-2
Y6013-2
Y6007-2
Y6006-2
Y6008-2
Y6005-2
Y6009-2
Y6003-2
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Y6110-1
Y6111-1
Y6112-1
Y6113-1
Y6114-1
Y6115-1
Y6116-1
Y6117-2
Y6118-1
Y6119-1
Y6120-1
Y6121-1
Y6204-1
Y6209-1
Y6207-1
Y6208-1
Y6210-1
Y6211-1
Y6212-1

114 P SW

COLD EXTRACTION GEOCHEMICAL SAMPLE PLAN CARCROSS AREA N.W. BRITISH COLUMBIA & YUKON

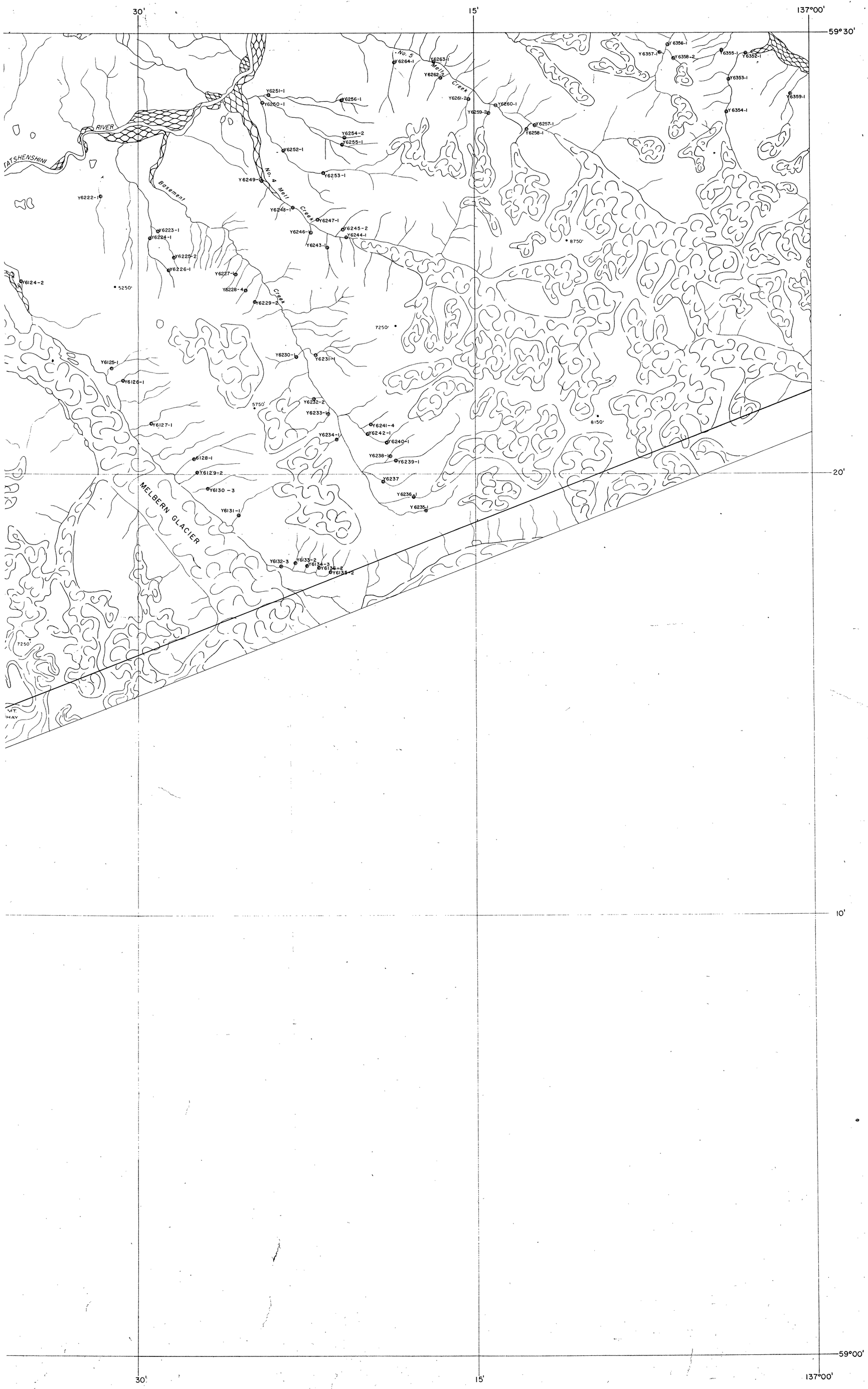
PREPARED FOR
ASHLAND OIL & REFINING COMPANY
THE BRITISH AMERICAN OIL COMPANY LTD.
PACIFIC PETROLEUMS LTD.

GEOPHYSICAL SERVICES INCORPORATED CALGARY ALBERTA CANADA

SCALE
1:63,360 - 1 mile to 1 inch

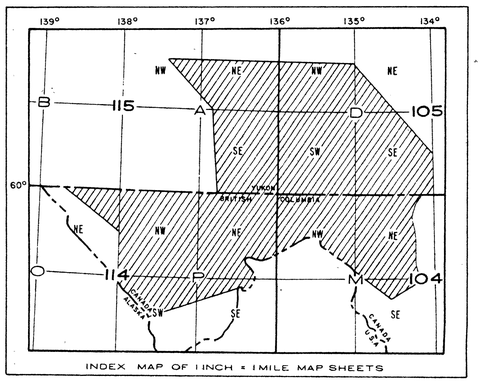
5000 3000 1000 0 5000 10000 FEET
1 1/2 1/4 0 1 MILES

1968



LEGEND

∘ Y 227 - 13 - 10	
∘	Sample location.
Y 227	Sample number.
-13	Heavy Metal Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using Bloom's Heavy Metal Test.
-10	Copper Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using the Holman Copper Test.
Ⓑ	Geochemical anomalies.



INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

114 P SW

138°00'

45'

30'

59°30'

20'

10'

59°00'

138°00'

45'

30'

Y6206-1
Y6205-1
Y6313-2
ALSEK
RIVER
170
169
168
Y6214-2
Y6215-3
Y6216-1
Y6217-1
6250'
Y6218-1
Y6219-1
5750'
Y6220-1
No. 1 Well
Creek
Y6221-1
98' R Creek
Y6122-1
Y6123-1
TATSHENSHINI
RIVER
Y6222-1
Basement
Y6223-1
Y6224-1
Y6225-2
Y6226-1
Y6227-1
Y6228-4
Y6124-2
5250'
Y6125-1
Y6126-1
5750'
Y6127-1
6128-1
Y6129-2
Y6130-3
Y6131-1
MELBERN GLACIER
CANADA
USA
7250'
167
MT
HAY
8870'

114 O NE

COLD EXTRACTION GEOCHEMICAL SAMPLE PLAN

CARCROSS AREA

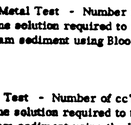
N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR

ASHLAND OIL & REFINING COMPANY

THE BRITISH AMERICAN OIL COMPANY LTD.

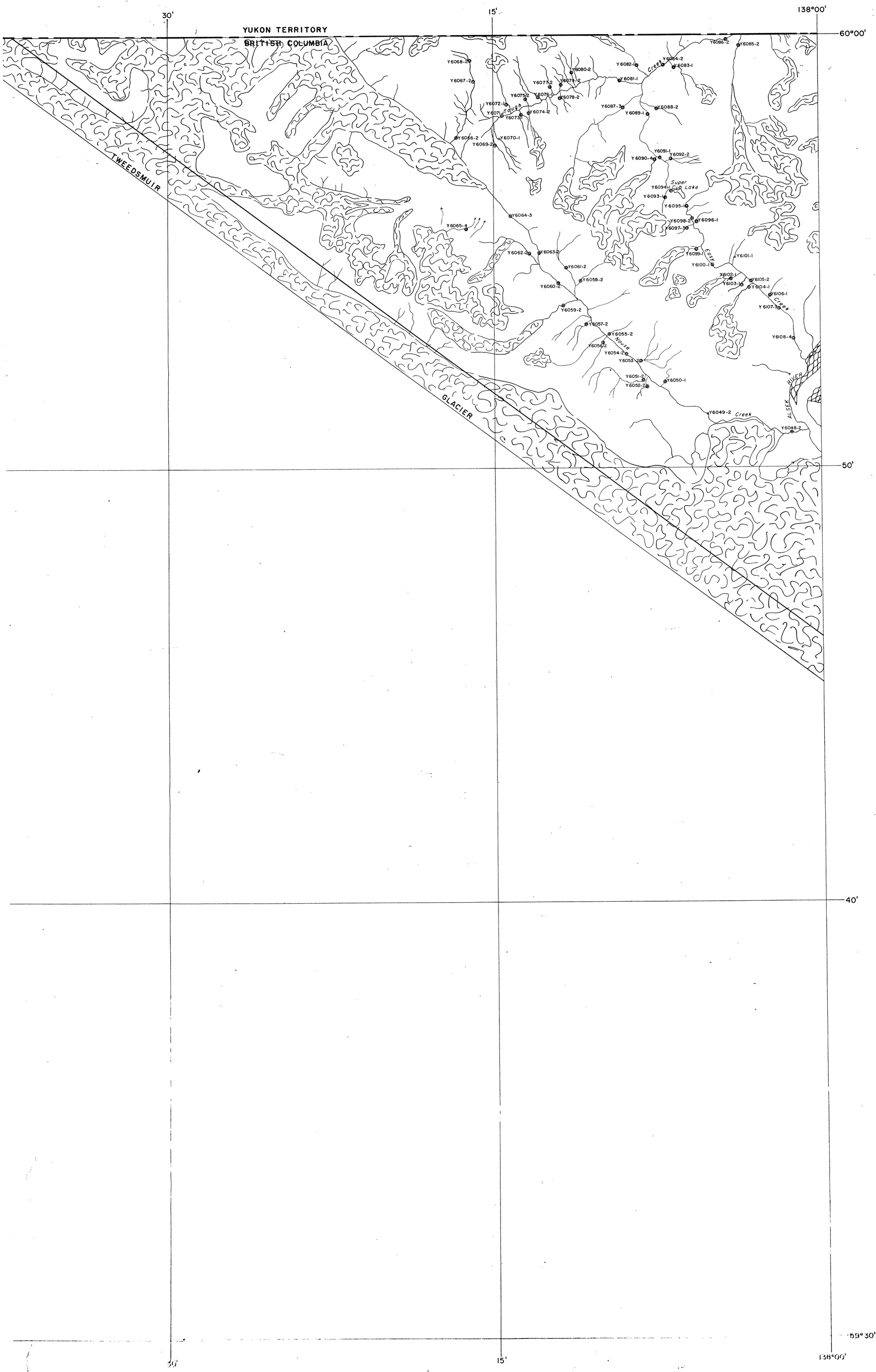
PACIFIC PETROLEUMS LTD.



SCALE

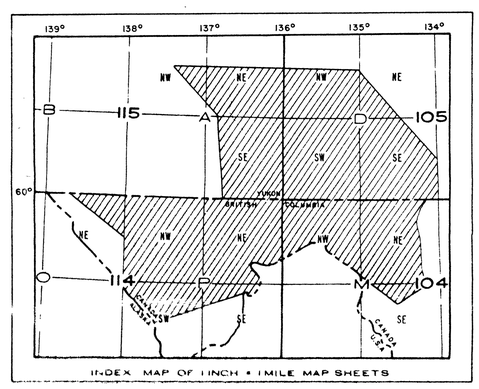
1:63,360 - 1 mile to 1 inch

1968



LEGEND

°	Y 227 - 13 - 10
°	Sample location.
Y 227	Sample number.
-13	Heavy Metal Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using Bloom's Heavy Metal Test.
-10	Copper Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using the Holman Copper Test.
Ⓑ	Geochemical anomalies.



114 O NE

139°00'

45'

30'

60°00'

YUKON TERRI

BRITISH COL

TWEEDSMUIR

50'

40'

59°30'

139°00'

45'

30'

115 A SE

COLD EXTRACTION GEOCHEMICAL SAMPLE PLAN

CARCROSS AREA

N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR
ASHLAND OIL & REFINING COMPANY
THE BRITISH AMERICAN OIL COMPANY LTD.
PACIFIC PETROLEUMS LTD.

SCALE
1:63,360 - 1 mile to 1 inch

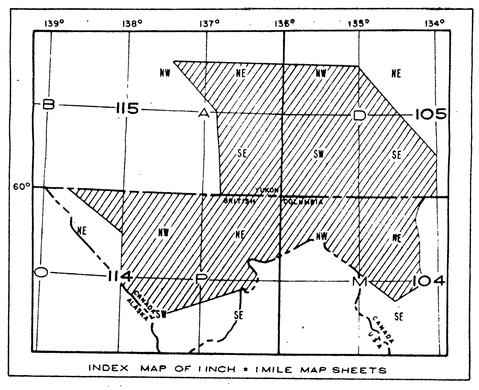
1968

136°30' 15' 136°00' 60°30' 20' 10' 60°00'

CAMP 2
Primrose River
Sandpiper Creek
Lake
Kluhini River
KUSAWA LAKE
ARK MTN.
2200'
7260'
7410'
7085'
8275'
6714'
6624'
MT. NEVIN
Devilhole
Charcoal Creek
Devils Club Creek
Hendon River
Kusawa
YUKON TERRITORY
BRITISH COLUMBIA

LEGEND

- ° Y 227 - 13 - 10 — Sample location.
- Y 227 — Sample number.
- -13 — Heavy Metal Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using Bloom's Heavy Metal Test.
- -10 — Copper Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using the Holman Copper Test.
- (B) — Geochemical anomalies.



INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

115 A SE

137°00'
45'
136°30'
60°30'
20'
10'
60°00'
Frederick Lake
Frederick Creek
Kluhini River
Howard Lake
Takhanne River
Devils Club Creek
Charcoal Cr.
Pass Creek
7205'
7085'
6714'
YUKON TERRITORY
BRITISH COLUMBIA
Y3932-1
Y3934-1
Y3933-1
Y3927-1
Y3929-2
Y3928-1
Y3926-1
Y3914-2
Y3916-1
Y3913-2
Y3912-2
Y3915-1
Y3911-1
Y3909-1
Y3910-1
Y3925-1
Y3924-2
Y3931-1
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Y4334-1
Y4639-2
Y4619-1
Y4616-7
Y4617-3
Y4615-2
Y4638-2
Y4335-1
Y4614-1

115 A NE

COLD EXTRACTION
GEOCHEMICAL SAMPLE PLAN
CARCROSS AREA
N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR
ASHLAND OIL & REFINING COMPANY
THE BRITISH AMERICAN OIL COMPANY LTD.
PACIFIC PETROLEUMS LTD.

SCALE
1:63,360 - 1 mile to 1 inch

5000 3000 1000 0 5000 10,000 FEET
1 1/2 1/4 0 1 2 MILES

1968

136°30' 15' 136°00' 61°00' 50' 40' 60°30'

MT KELVIN △5858
△2775
△5102'
△4295
△6979'
△5949
6049 △
△6073'
△6169
2200'
BM 2501'
BM 2322'
BM 2307'
MP 975
MP 970
MP 965
MP 960
ALASKA HWY
CHAMPAGNE
MENDENHALL LANDING
Mendenhall River
Mendenhall Creek
Jo-Jo Lake
Kusowo Lake
TAKHINI RIVER
Pond
Creek

LEGEND

- ∘ Y 227 - 13 - 10
- ∘ Sample location.
- Y 227 — Sample number.
- -13 — Heavy Metal Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using Bloom's Heavy Metal Test.
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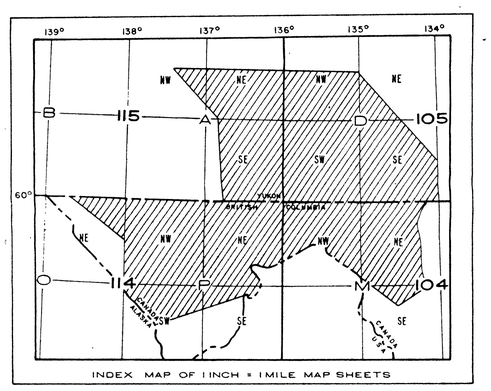

INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

115 A NE

137°00'
45'
136°30'
61°00'
50'
40'
60°30'
ALASKA HWY
MP 985
MP 980
MP 975
Cracker Creek
Dezadeash River
Moose Creek
Dune Creek
Red Squirrel Creek
Sixmile Lake
Asumbo Creek
Undie Creek
Pond River
CHAMPAGNE
BM 2345'
BM 2252
BM 2301'
6310'
MT BRATNOBER
5979
MT KELVIN
5858
6073'
5908'
Y3061-2
Y3060-2
Y3059-2
Y3058-2
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Y2494-2
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Y2449-3
Y2489-2
Y3136-1
Y2503-3
Y2502-3
Y2501-2
Y2499-3
Y2500-2
Y2498-2

115 A NW

COLD EXTRACTION GEOCHEMICAL SAMPLE PLAN

CARCROSS AREA

N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR
ASHLAND OIL & REFINING COMPANY
THE BRITISH AMERICAN OIL COMPANY LTD.
PACIFIC PETROLEUMS LTD.

SCALE
1:63,360 - 1 mile to 1 inch

1968

137°30' 15' 137°00' 61°00' 50' 40' 60°30'

Pine Lake
Alaska Hwy
Dezadeash River
Kathleen River
Taylor Creek
Granite Lake
Granite Creek
6150'

Y3063-2 Y3062-2 Y3071-2 Y3072-2 Y3069-2 Y3070-2 Y3065-2 Y3064-2 Y3067-2 Y3066-2 Y3068-2 Y3081-2 Y3083-2 Y3084-2 Y3080-2 Y3078-2 Y3079-2 Y3344-2 Y3345-2 Y3343-2 Y3074-2 Y3077-2 Y3076-2 Y3075-2 Y3082-2 Y3073-2 Y3046-2 Y3341-2 Y3042-2 Y3336-2 Y3340-2 Y3338-2 Y3339-2 Y3334-2 Y3333-2 Y3337-2 Y3328-2 Y3329-2 Y3330-2 Y3327-2 Y3325-2 Y3326-2

LEGEND

- Y 227 - 13 - 10
- Sample location.
- Y 227 — Sample number.
- -13 — Heavy Metal Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using Bloom's Heavy Metal Test.
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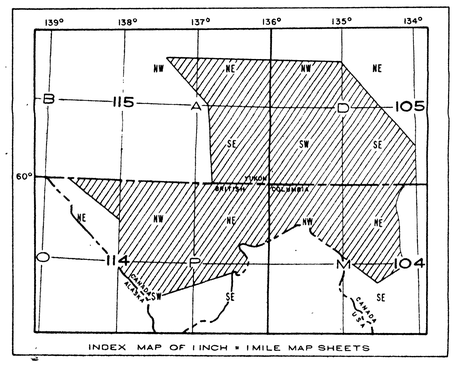

INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

115 A NW

138°00'

45'

137°30'

61°00'

50'

40'

60°30'

138°00'

45'

137°30'

105 D SW

COLD EXTRACTION GEOCHEMICAL SAMPLE PLAN

CARCROSS AREA

N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR
ASHLAND OIL & REFINING COMPANY
THE BRITISH AMERICAN OIL COMPANY LTD.
PACIFIC PETROLEUMS LTD.

GEOMETRIC SERVICES LTD.
CALGARY, ALBERTA, CANADA

SCALE
1:63,360 - 1 mile to 1 inch

5000 3000 1000 0 5000 10000 FEET
1 1/2 1/4 0 1 2 MILES

1968

LEGEND

- ° Y 227 - 13 - 10
- ° Sample location.
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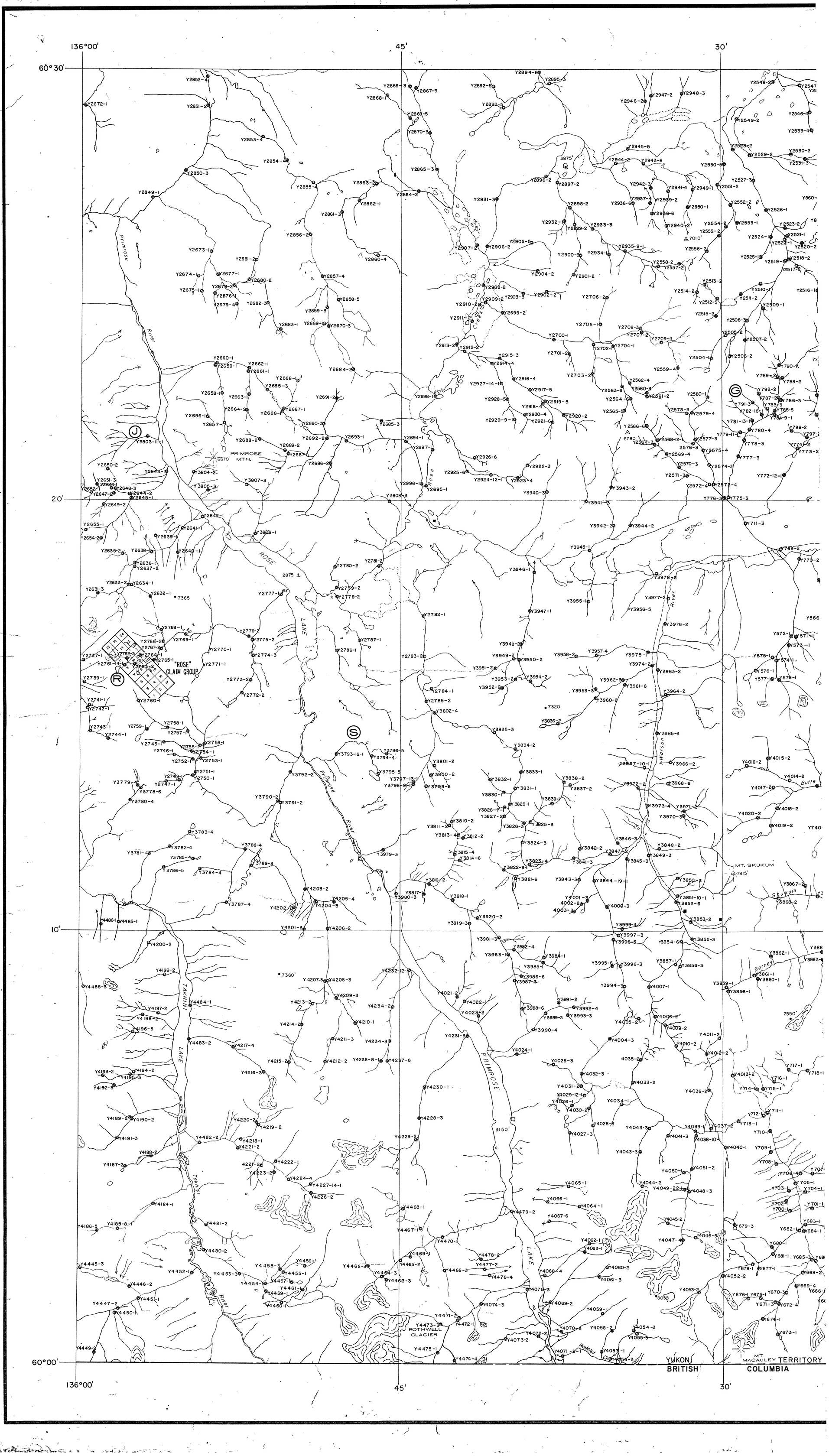
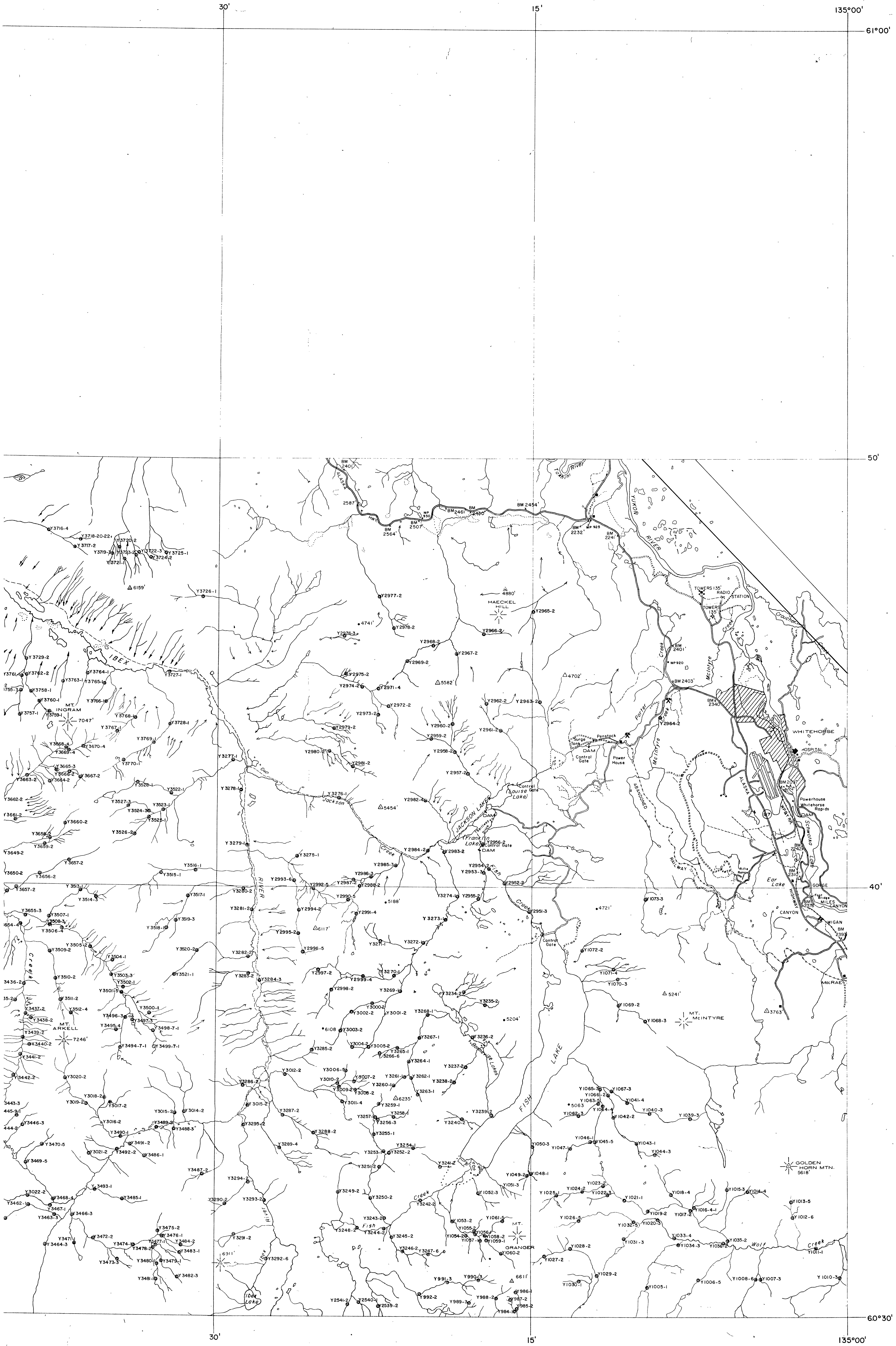
105 D SW


136°00'
45'
30'
60° 30'
20'
10'
60°00'
PRIMROSE MTN.
6670
"ROSE" CLAIM GROUP
ROSE LAKE
ROSE River
Primrose River
Takhini River
TAKHINI LAKE
PRIMROSE LAKE
ROTHWELL GLACIER
MT. SKUKUM
7815'
MT. MACAULEY
YUKON TERRITORY
BRITISH COLUMBIA

105 D NW



COLD EXTRACTION
GEOCHEMICAL SAMPLE PLAN
CARCROSS AREA
N.W. BRITISH COLUMBIA & YUKON

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THE BRITISH AMERICAN OIL COMPANY LTD.
PACIFIC PETROLEUMS LTD.

SCALE
1:63,360 - 1 mile to 1 inch
5000 3000 1000 0 5000 10,000 FEET
1 1/2 1/4 0 1 2 MILES

1968

LEGEND

∘	Y 227 - 13 - 10
∘	Sample location.
Y 227	Sample number.
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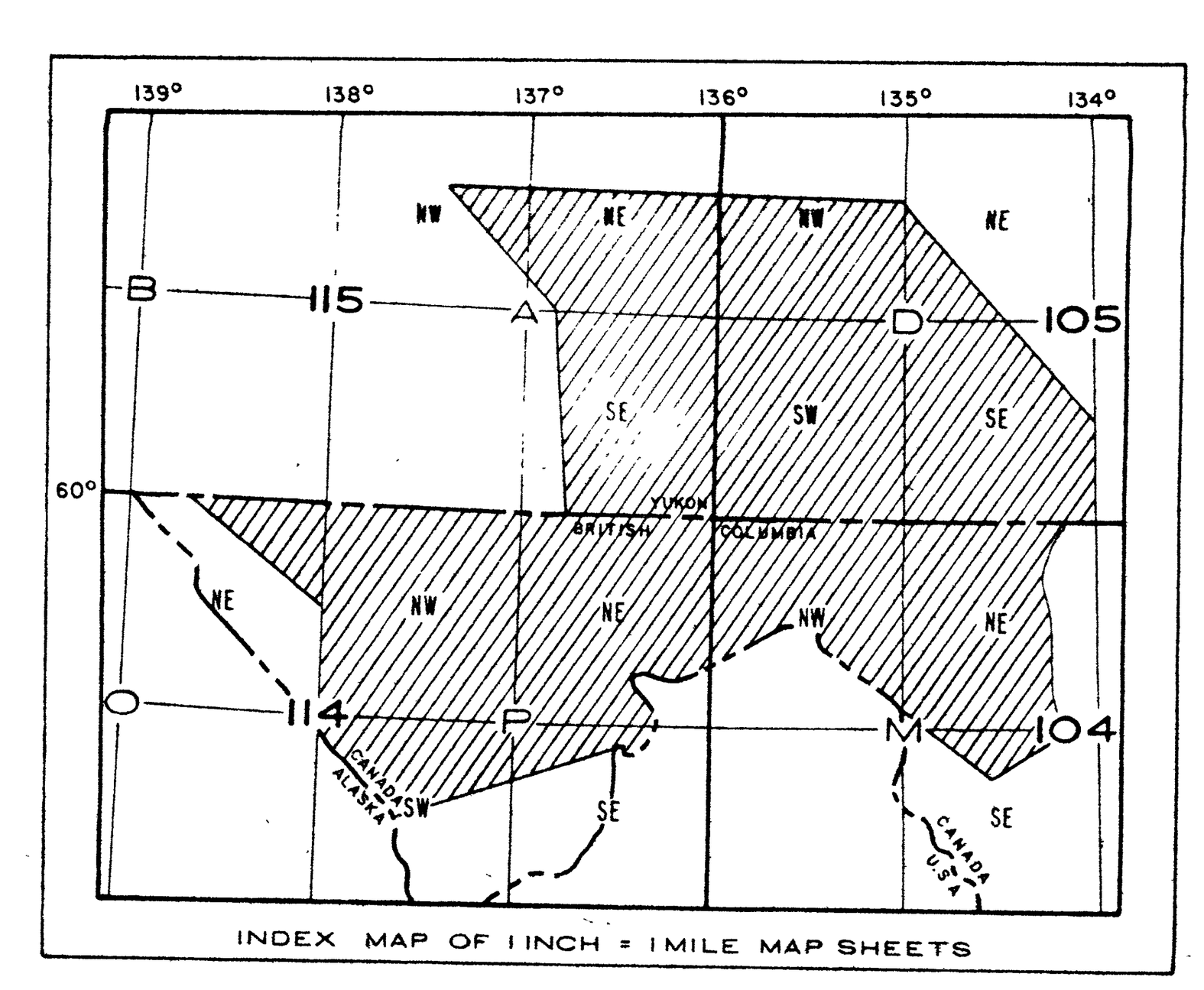
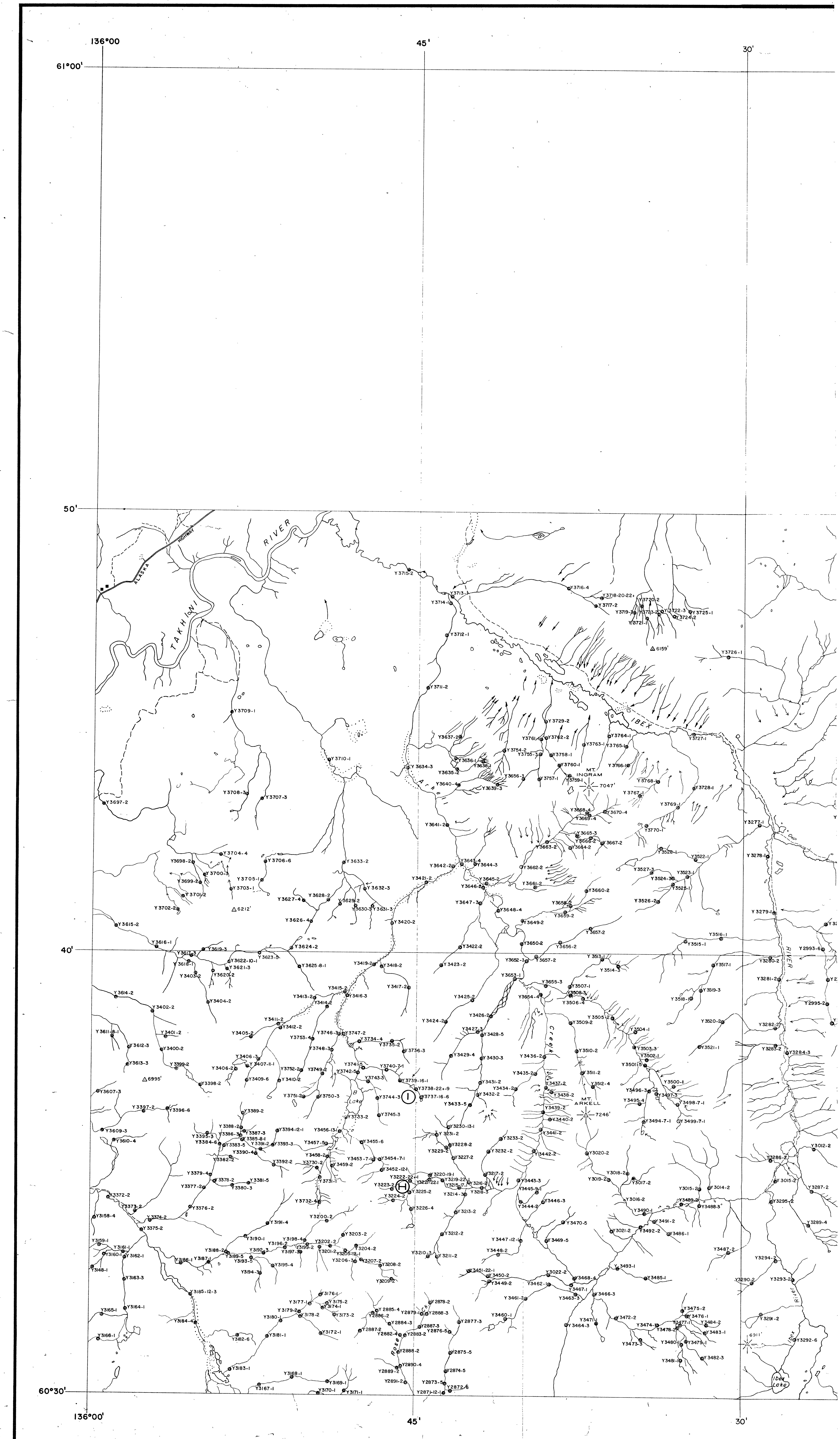


INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

105 D NW



136°00
45'
30'
61°00'
50'
40'
60°30'
136°00'
ALASKA HIGHWAY
TAKHINI RIVER
IBEX
Arkell
Creek
RIVER
Ibex River
Ibex Lake
Rose Ck.
B Lake
MT. INGRAM 7047'
MT. ARKELL 7246'
6159'
6212'
6995'
6911'
Y3715-2
Y3713-1
Y3714-1
Y3716-4
Y3718-20-22+
Y3717-2
Y3720-2
Y3719-3
Y3723-2
Y3721-1
Y3722-3
Y3724-2
Y3725-1
Y3712-1
Y3726-1
Y3711-2
Y3709-1
Y3729-2
Y3637-2
Y3761-1
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Y3502-1
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Y3752-2
Y3410-2
Y3749-2
Y3741-5
Y3742-5
Y3740-7-1
Y3743-3
Y3739-16-1
Y3738-22+-9
Y3737-16-6
Y3744-3
Y3745-3
Y3751-2
Y3750-3
Y3436-2
Y3435-2
Y3431-2
Y3434-2
Y3432-2
Y3433-5
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Y3438-2
Y3439-2
Y3440-2
Y3510-2
Y3511-2
Y3512-4
Y3500-1
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Y3497-3
Y3495-4
Y3498-7-1
Y3494-7-1
Y3499-7-1
Y3607-3
Y3397-2
Y3396-6
Y3389-2
Y3388-2
Y3387-3
Y3395-3
Y3386-3
Y3385-8-1
Y3384-6
Y3383-5
Y3391-2
Y3393-3
Y3394-12-1
Y3390-4
Y3382-2
Y3392-2
Y3609-3
Y3610-4
Y3456-13-1
Y3457-5
Y3458-2
Y3730-2
Y3459-2
Y3733-2
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Y3454-7-1
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Y3230-13-1
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Y3219-22-1
Y3221-22-1
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Y3218-3
Y3217-2
Y3443-3
Y3445-9-1
Y3444-2
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Y3015-2
Y3014-2
Y3016-2
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Y3158-4
Y3374-2
Y3375-2
Y3191-4
Y3200-2
Y3470-5
Y3491-2
Y3492-2
Y3021-2
Y3486-1
Y3289-4
Y3159-1
Y3161-1
Y3160-1
Y3162-1
Y3148-1
Y3190-1
Y3198-4
Y3196-2
Y3202-2
Y3203-2
Y3199-2
Y3197-3
Y3201-2
Y3204-2
Y3205-12-1
Y3206-3
Y3207-2
Y3208-2
Y3209-2
Y3188-2
Y3189-5
Y3192-3
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Y3194-3
Y3186-1
Y3187-1
Y3212-2
Y3210-3
Y3211-2
Y3447-12-1
Y3448-2
Y3469-5
Y3487-2
Y3294-2
Y3163-3
Y3451-22-1
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Y3022-2
Y3462-1
Y3468-4
Y3467-1
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Y3493-1
Y3485-1
Y3290-2
Y3293-2
Y3185-12-3
Y3466-3
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Y3165-1
Y3164-1
Y3184-4
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Y3180-1
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Y2887-3
Y2877-3
Y2887-2
Y2882-4
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Y3477-1
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Y2890-4
Y2889-2
Y2874-5
Y2891-2
Y2873-5
Y2872-6
Y3167-1
Y3170-1
Y3171-1
Y2871-12-1

105D SE

COLD EXTRACTION GEOCHEMICAL SAMPLE PLAN CARCROSS AREA N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR
ASHLAND OIL & REFINING COMPANY
THE BRITISH AMERICAN OIL COMPANY -LTD.
PACIFIC PETROLEUMS LTD.

GEOPRO

SCALE
1:63,360 - 1 mile to 1 inch

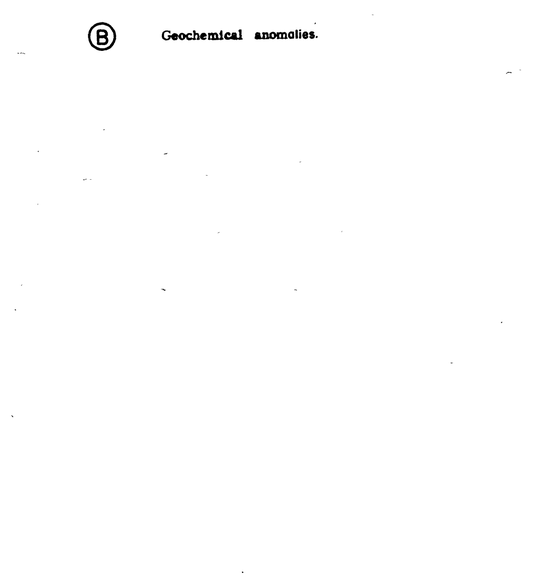
5000 3000 1000 0 5000 10,000 FEET
1 1/2 1/4 0 1 2 MILES

1968

30' 15' 134°00'
60°30'
20'
10'
60°00'

LEGEND

- ∘ Y 227 - 13 - 10
- ∘ Sample location.
- Y 227 Sample number.
- -13 Heavy Metal Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using Bloom's Heavy Metal Test.
- -10 Copper Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using the Holman Copper Test.
- (B) Geochemical anomalies.



INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

105D SE


135°00'
45'
30'
60°30'
20'
10'
60°00'
Cowley Lakes
Dugdale Ck
MOSQUITO HILL 4059'
McConnell Lake
2452±
BM 2501'
BM 2492'
ROBINSON
4187'
5926'
MT. LORNE 6629'
5064'
Bear Creek
River
Watson
BM 2416'
BM 2439'
MINTO HILL 5081'
CARCROSS
MINTO
Lewes Lk.
2422'
DE WEITE
Lewes
Creek
MT. LANSDOWNE 5882'
Kenny
Monkey Creek
Creek
Austins
Tagish
NEEDLE MTN. 5672'
WHITE HILL
LEWIS
WHITE PASS & YUKON RAILROAD
Watson
Annie Lake 2590±
6425'
BM 2354'
LORNE
BM 2338'
ROAD
MT. GILLIAM
Twelve Mile Creek
MP 20
TAGISH
CARCROSS ROAD
PRIVATE ROAD
4817
3340'
BM 2333'
Blue Lake
LANSDOWNE
Spirit Lake
5645
SURPRISE MTN.
Stevens Cr.
Creek
WATSON RIDGE
River
BM 2310'
3032'
CARIBOU MTN.
BM 2602'
CRAG LAKE
WHEATON
PYRAMID MTN.
Wabona
BM 2247'
BM 2382'
CARCROSS ROAD
CAMP I
NARES MTN 5833'
OIL TANKS
AIRFIELD
CARCROSS
NARES LAKE
TEN MILE
WATER TANK
BM 2153'
MT. GRAY 6083'
RIVER
LAKE
TAGISH LAKE
Bove Island
LIME MTN. 5222'
4267'
McDonald Creek
Millhaven Creek
MILLHAVEN BAY
2152'
WATSON
BRUTE MTN.
SUGAR LOAF HILL
Big Thing Creek
PREJEVALSKY POINT
KNOB HILL
WEST ARM
ARM
BASE MTN.
BENNETT
BM 2179'
DUNDALK
Knob Creek
Dundalk Creek
MONTANA MTN. 7233'
Montana Creek
CONRAD (ABAN)
WINDY
Lime Creek
FINGER MTN.
MT. MATHESON
COPPER GULCH
ESCARPMENT MTN.
NORTH CANYON
Pooly Creek
POOLY CANYON
DUNDALK MTN.
DALL PEAK
MT. CONRAD
Ramshorn
Ck.
WHITE MTN.
MT. DEAN
Old Lady Lake
YUKON TERRITO
BRITISH COLUMBI

105D NE

134°00'

30'

15'

61°00'

50'

40'

60°30'

30'

15'

134°00'

COLD EXTRACTION
GEOCHEMICAL SAMPLE PLAN
CARCROSS AREA
N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR
ASHLAND OIL & REFINING COMPANY
THE BRITISH AMERICAN OIL COMPANY LTD.
PACIFIC PETROLEUMS LTD.

SCALE
1:63,360 - 1 mile to 1 inch

5000 3000 1000 0 5000 10,000 FEET
1 1/2 1/4 0 1 2 MILES

1968

LEGEND

- ∘ Y 227 - 13 - 10
- ∘ Sample location.
- Y 227 Sample number.
- -13 Heavy Metal Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using Bloom's Heavy Metal Test.
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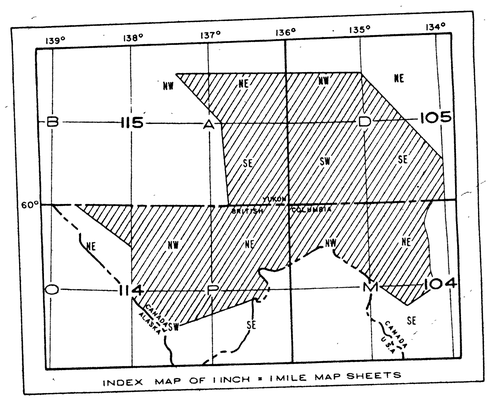
- (B) Geochemical anomalies.



INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

105D NE

135°00'
45'
30'
61°00'
50'
40'
60°30'
135°00'
45'
30'
4658'
CANYON MTN.
4901'
Chadburn Lake
BM 2381'
MACRAE
YUKON
Y1193-2
Creek
BM 2410
MP 905
2406
ALASKA
BM 2446'
BM 2391'
MP 900
HIGHWAY
RIVER
WHITE
PASS
CARCROSS
Wolf
Creek
BM 2502
Y1074-1
3460'
BM 2515'
P.R.
COWLEY
ROAD
Cowley
Creek
Y1051-2
Y1038-3
BM 2465
3878'
Y1192-3
Y1191-1
Y1189-1
Y1190-4
Y1188-3
Y1187-2
Y1194-3
4292'
BM 2334
DAM
BM 2266'
Lower

104 M NW

COLD EXTRACTION GEOCHEMICAL SAMPLE PLAN
CARCROSS AREA
N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR
ASHLAND OIL & REFINING COMPANY
THE BRITISH AMERICAN OIL COMPANY LTD.
PACIFIC PETROLEUMS LTD.

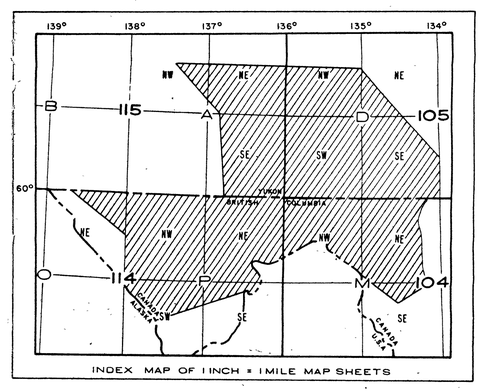
SCALE
1:63,360 - 1 mile to 1 inch

1968

LEGEND

- ○ **Y 227 - 13 - 10**
- ○ **Sample location.**
- **Y 227** — **Sample number.**
- **-13** — **Heavy Metal Test** - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using Bloom's Heavy Metal Test.
- **-10** — **Copper Test** - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using the Holman Copper Test.
- Ⓑ — **Geochemical anomalies.**

Samples Y2117 to Y2131 taken in Alaska.



INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

104 M NW

136°00'

45'

30'

60°00'

50'

40'

59°30'

YUKON TERRITORY

BRITISH COLUMBIA

TAKHINI RIVER

Primrose River

Radelet Creek

Partridge

SILT LAKE

ROTHWELL PEAK 7220'

7360'

MT. FOSTER 7127'

RAYMOND PEAK 6620'

CHILKAT RIVER

CHILKAT GLACIER

BRITISH COLUMBIA ALASKA

123 124 126 127 128

Y4878-1 Y4844-2 Y4845-1 Y4843-1 Y4877-1 Y4846-1 Y4847-1 Y4848-1 Y4842-2 Y4876-2 Y4849-1 Y4851-1 Y4841-1 4840-3 Y4867-1 Y4873-1 Y4875-2 Y4874-1 Y4850-1 Y4852-2 Y4866-1 Y4868-2 Y4871-2 Y4853-3 Y4869-3 Y4870-1 Y4872-2 Y4879-2 Y4807-1 Y4808-2 Y4839-2 Y4865-2 Y4806-2 Y4880-2 Y4864-1 Y4882-1 Y4810-1 Y4805-1 Y4863-1 Y4809-2 Y4838-2 Y4881-2 Y4855-1 Y4804-2 Y4813-2 Y4883-2 Y4856-1 Y4802-2 Y4801-2 Y4803-3 Y4836-2 Y4859-1 Y4857-1 Y4858-1 Y4837-2 Y4799-2 Y4800-2 Y4860-1 Y4854-1 Y4812-2 Y4798-1 Y4815-1 Y4814-3 Y4816-1 Y4817-1 Y4797-4 Y4796-1 Y4818-1 Y4819-1 Y4795-1 Y4835-1 Y4820-2 Y4790-1 Y4791-1 Y4821-2 Y4822-2 Y4861-1 Y4823-1 Y4789-1 Y4834-1 Y4792-1 Y4794-1 Y4824-1 Y4788-4 Y4833-1 Y4825-1 Y4793-1 Y4826-1 Y4827-1 Y4832-1 Y4830-1 Y4787-1 Y4828-1 Y4829-1 Y4831-1 Y4785-1 Y4786-1 Y4780-1 Y4783-1 Y4781-2 Y4784-1 Y4782-1 Y4884-1 Y4885-2 Y4886-2 Y4887-1 Y4889-1 Y4890-1 Y4888-1 Y4902-1 Y4891-1 4901-1 Y4903-1 Y4904-1 Y4893-1 Y4900-3 Y4898-2 Y4899-1 Y4892-1 Y4894-1 Y4896-1 Y4897-1 Y4895-1 Y4905-1 Y4908-2 Y4907-1 Y4906-1 Y4910-1 Y4909-1 Y4911-1 Y4912-1 Y4914-1 Y4913-1 Y4915-1 Y4916-1 Y4917-2

Y1783-1 Y1784-1 Y1785-4 Y1788-2 Y1785-17-1 Y1780-1 Y1782-1 Y1787-2 Y1781-3 Y1777-13-1 Y1778-5 Y1776-4 Y1799-1 Y1775-1 Y1760-1 Y1761-1 Y1759-1 Y1774-6 Y1763-1 Y1762-1 Y1758-1 Y1773-4 Y1772-4 Y1764-1 Y1765-1 Y1771-1 Y1766-1 Y1767-1 Y1756-3 Y1757-1 Y1768-3 Y1755-1 Y1769-1 Y1754-1 Y1770-1 Y1752-1 Y1753-2 Y1751-1 Y1749-1 Y1748-5 Y1747-1 Y1750-1 Y1746-22+-1 Y1745-1 Y1744-9-1 Y1743-1 Y1741-1 Y1742-1 Y1740-1 Y1739-1 Y1738-1 Y1737-1

Y1561-2 Y1560-2 Y1562-3 Y1557-3 Y1559-2 Y1558-4 Y1563-2 Y1556-1 Y1564-1 Y1564-3 Y1553-2 Y1555-2 Y1552-2 Y1565-3 Y1551-1 Y1567-2 Y1566-1 Y1545-1 Y1542-6 Y1543-2 Y1544-5 Y1541-2 Y1540-2 Y1539-15-1 Y1538-17-1 Y1537-7-1 Y1534-6 Y1536-3 Y1535-4 Y1533-3 Y1526-2 Y1524-2

Samples Y2117 to Y213
taken in Alaska.

104M NE

COLD EXTRACTION GEOCHEMICAL SAMPLE PLAN

CARCROSS AREA

N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR
ASHLAND OIL & REFINING COMPANY
THE BRITISH AMERICAN OIL COMPANY LTD.
PACIFIC PETROLEUMS LTD.

SCALE
1:63,360 - 1 mile to 1 inch

5000 3000 1000 0 5000 10,000 FEET
1/2 1/4 0 1 MILES

1968

LEGEND

- ○ Y 227 - 13 - 10
- ○ Sample location.
- Y 227 Sample number.
- -13 Heavy Metal Test - Number of cc's of 0.001% dithizone solution required to titrate 0.1 grams of stream sediment using Bloom's Heavy Metal Test.
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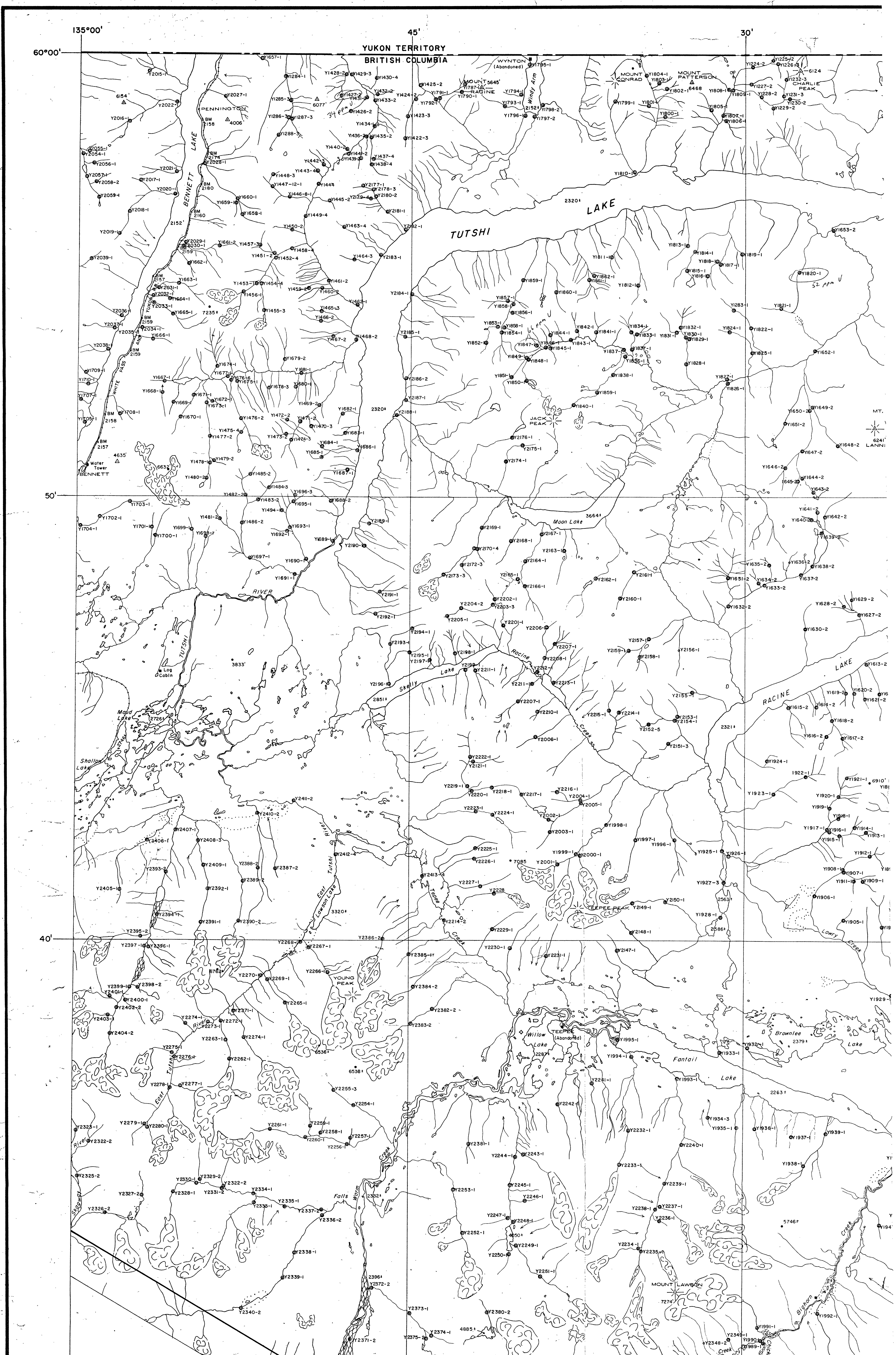
- (B) Geochemical anomalies.

INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

104M NE



135°00'
45'
30'
60°00'
50'
40'
59°30'
YUKON TERRITORY
BRITISH COLUMBIA
WYNTON (Abandoned)
MOUNT RACINE 5645'
Windy Arm
MOUNT CONRAD
MOUNT PATTERSON 6468
CHARLIE PEAK 6124
PENNINGTON
BENNETT LAKE
WHITE PASS AND YUKON RR
Water Tower
BENNETT
TUTSHI LAKE
2320±
JACK PEAK
MT. LANNING 6241'
Moon Lake 3664±
TUTSHI RIVER
Log Cabin
Maud Lake
Shallow Lake
Skelly Lake 2851±
Racine Creek
RACINE LAKE 2321±
East Tutshi River
Lawson Lake
Tepee Creek
TEEPEE PEAK
YOUNG PEAK
TEEPEE (Abandoned)
Willow Lake 2287±
Fantail Lake
Brownlee Lake 2379±
Lowry Creek
Falls
Warm Creek
Skagway River
MOUNT LAWSON 7274'
Bighorn Creek
Chicken Creek
34 ppm U
52 ppm U
66 ppm U

104M SE

COLD EXTRACTION
GEOCHEMICAL SAMPLE PLAN
CARCROSS AREA
N.W. BRITISH COLUMBIA & YUKON

PREPARED FOR
ASHLAND OIL & REFINING COMPANY
THE BRITISH AMERICAN OIL COMPANY LTD.
PACIFIC PETROLEUMS LTD.

SCALE
1:63,360 - 1 mile to 1 inch

5000 3000 1000 0 5000 10,000 FEET
1 1/2 1/4 0 1 2 MILES

1968

LEGEND

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- ∘ Sample location.
- Y 227 — Sample number.
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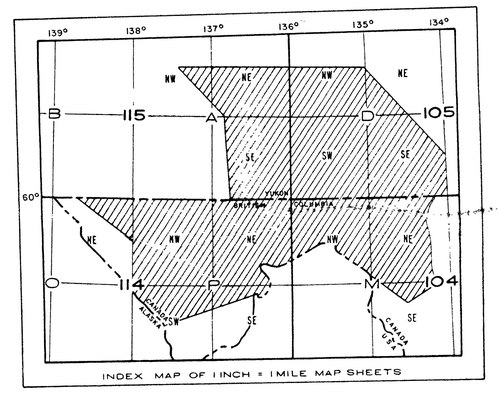

INDEX MAP OF 1 INCH = 1 MILE MAP SHEETS

104M SE

135°00'

45''

30'

59°30'

20'

10'

59°00'

135°00'

45'

30'

Y2368-2
Y2367-2
Y2379-2
Y2366-2
Y2365-2
Y2378-2
Y2344-2
Y2343-1
Y2345-2
Y2347-1
Y2346-1
Creek
Y2352-1
Y2354-1
Y2353-1
Y2362-2
Y2359-2
Bighorn
Y2363-2
Y2361-2
Y2360-1
Y2355-1
Y2356-2
Y2357-2
Y2358-1
Y2364-2
Y1987-1
Y1988-1
Creek
Y1958-1
Y1957-
Y1985-1
Y1984-1
Y1986-1
Y1983-1
Chicken
Y1963-1
Y1962-1
Y1960-1
Y1961-1
WHITE MOOSE MTN.
7200'
Y1981-1
Y1982-1
Y1979-
Y1980-1
BEN-MY-CREE
SWANSON
RIVER