MAP NO.: 115 I 3	**ASSESSMENT REPORT** X **PROSPECTUS** **CONFIDENTIAL** **OPEN FILE** X	**DOCUMENT NO:** **MINING DISTRICT:** **TYPE OF WORK:**	092153 WHITEHORSE GEOLOGICAL, GEOPHYSICAL, GEOCHEMICAL

REPORT FILED UNDER:	Aurchem Resources Ltd.		
DATE PERFORMED:	May 23 - August 16, 1986	**DATE FILED:**	March 30, 1988
LOCATION: **LAT.:**	62°05'N	**AREA:**	Discovery Creek
LONG.:	137°11'W	**VALUE $:**	
CLAIM NAME & NO.:	RAS 1- 5 YA93138-141 LCCS 1- 3 YA95014-016 WEDGE 5-10 YA8217-176 WEDGE 15 YA82181		
WORK DONE BY:	Marck Langdon		
WORK DONE FOR:	Aurchem Resources Ltd.		

DATE TO GOOD STANDING:

REMARKS: ~~#81~~ 56 GOULTER (EIP REPORT)
In 1987, property geology was revised based on diamond drillholes, petrographic studies, air photo interprelation and geophysical surveys, and preliminary cyanide leach studies were also done. In 1988, 15 NQ/HQ holes were drilled totalling 1219.2 m. The best gold values were associated with second phase veins which contain up to 17.1 g/t Au and 2742.8 g/t Ag.

GEOLOGICAL, GEOPHYSICAL, GEOCHEMICAL AND GENERAL EXPLORATION INCLUDING TRENCHING WAS CARRIED OUT ON WEDGE #5, WEDGE #6, WEDGE #7, WEDGE #8, WEDGE #9, WEDGE #10, WEDGE #15, RAS1, RAS2, RAS3, RAS4, LGCS1, LGCS2, LGCS3 and MSL, Claim Sheet 115 I/3, 62° 05N, 137° 11'W, May 23rd, 1986 to August 16th, 1986.

A U R C H E M R E S O U R C E S L T D.

PROCHEM LTD.

Mark Langdon, Geologist,

August 10th, 1986

092153

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List of Claims and Tag Numbers

RAS 1	YA 93138	)	
RAS 2	YA 93139	)	Owned by R. Schneider,
RAS 3	YA 93140	)	Acton, Ontario
RAS 4	YA 93141	)	
LGCS 1	YA 95014	)	Owned by L. Schneider, Calgary, Alberta
LGCS 2	YA 95015	)	Owned by L. Schneider,
LGCS 3	YA 95016	)	~~Acton, Ontario~~
Wedge 5	YA 82171	)	
Wedge 6	YA 82172	)	
Wedge 7	YA 82173	)	Owned by G. Dickson,
Wedge 8	YA 82174	)	Whitehorse, Yukon
Wedge 9	YA 82175	)	
Wedge 10	YA 82176	)	
Wedge 15	YA 82181	)	

MSL — to be issued - owned by R. Schneider, Acton, Ontario.

The location of these claims, along with our holdings of leases, are shown on Map #1 at the back of this report.

INTRODUCTION

The Claims and accompanying Leases were explored for Au/Ag mineralization during the summer of 1986 in the the months of May, June, and July.

A base line and grid was established and geological, local geochemical, and EM-16 geophysical surveys were carried out.

Based on results of the geophysics and limited geochemical surveys, a series of trenches and/or pits were dug with a D8-ripper to investigate the favourable responses.

An accurate record was kept on a daily basis to assess what work was done on claims and on the leases, and I believe that our figures contained in this report contain an accurate adjustment of our costs as so to pertain only to that work done on the claims.

REGIONAL GEOLOGY

The claims are located within the eastern half of the Coastal Crystalline Belt, which trends northwesterly across Southwest Yukon. This belt can generally be said to contain lithologies of acidic to intermediate intrusive bodies of post-Triassic age intruding into sedimentary, volcanic and minor intrusive lithologies of late Paleozoic age.

LOCATION AND ACCESS

The claims are located in the valley of Discovery Creek, a tributary of Nansen Creek. Access is from Carmacks west on the Mount Nansen Road. Our claims are approximately 10 km by road past the Mount Nansen Mine Site, or 70 km west of Carmacks.

GENERAL GEOLOGY

Outcrops on the property are rare (1%), and are usually exposed as weathered regolith of large frost-heaved blocks.

The bulk of the property is non-glaciated and overburden consists of relatively in-situ weathered material derived from the underlying bedrock. The depth varies from one to seventy-five feet before some competent bedrock is observed.

Overburden near Discovery Creek is of a glacial-fluvial origin of up to 80 feet thickness. The glacial-fluvial overburden extends up both valley walls to approximately 100-150 ft. above the present creek/water surface.

GENERAL GEOLOGY (continued)

Paleo-creek beds of possible glacial age or earlier are also found down the slopes of the valley walls heading into Discovery Creek.

Topographic relief is in the order of 1000 ft. with slopes of 15-40%. The high elevation combined with the latitude gives a scrub-bush vegetation, with rare growth-stunted trees.

Permafrost was found immediately under the thin moss and organic layers (approx. 6 inches) on both the north and south facing slopes. Past estimation is that the permafrost goes down to about 150 feet.

GEOLOGY - See Map #2

Lithologies

(a) Metavolcanics and Metasediments (Yukon Group) - No outcrops were observed of this unit on our property, but it is believed that a small amount of this lithology may be found on the extreme western edge of our property on the hill south of Discovery Creek. This "Yukon Group" lithology is the oldest rock in the area being Precambrian to Cambrian in age. The volcanics and sediments show a strong metamorphic grade in comparison to all the other lithologies and appear as quartz-hornblende/quartz-biotite gneisses, and amphibolitic phases, (also minor quartzites).

(b) Mount Nansen Group - This group of Jurassic age is composed of andesitic to basaltic flows, and derived volcanoclastics with minor sub-intrusive dioritic plugs.

Our claim group contains this group on the western 25% of our block with a diorite plug being found, to date, only on the south side of Discovery Creek.

(c) Intrusives - Large intrusive bodies of Cretaceous (95 million years) age were then intruded. Our property shows these as granodiorites with a few local variations near contacts and vein structures. The granodiorite in the northeast corner of our claim block has been silicified with a high influx of quartz.

(d) Rhyolitic sub-intrusives - A late stage of the above granodiorites produced rhyolite as sub-intrusive sills and dykes. No extrusive explosive rhyolites have yet been seen. The rhyolites vary in composition and character from fine grained siliceous varieties to qtz-feldspar porphyritic varieties. The qtz-tournaline plugs which somewhat surround our property may be related to the rhyolites (d) or the intrusives (c), as upper level roof pendants or as a separate intermediate or later phase of the two.

The rhyolites have been found in trenching to intrude the diorite of the Mount Nansen Group. It is my belief that the rhyolites occurred both before and during the epithermal event caused by the intrusives. Therefore, some rhyolites will be weakly mineralized and some show a strong hydrothermal alteration. Also, the epithermal vein structures appear to be related to faulted or weak zones (contacts) which would also structurally control rhyolitic intrusions and dykes. Therefore, a spatial relationship may show up between the mineralized veins and rhyolites because of genetically structural reasons.

Vein Lithologies and Characteristics

Our areas of mineralization we have termed our "vein zones" which comprise a great many variable types of veins within a certain zone or width. Individual veins vary slightly in width and composition along strike, but are highly variable with depth. A few of the vein types are :

(a) BLUE MUD - near surface this shows up as a white "mush" composed of clays, quartz, minor sulphides and other alteration products. With depth the vein turns royal blue to baby blue in colour depending on the sulphide content which ranges up to 50%. Also quartz/sulphide veinlets (<4 inches) become common with depth in the more sulphide rich dark blue mud. This unit to a depth of 50 ft. has gone from the white "mush" to a "plastersine-like" substance with quartz/sulphide clasts increasing in abundance. One panned sample of this showed 10 visible flakes of gold, but we have been unable to reproduce this with four other panned samples. A number of the "blue mud" veins occur in our vein zone which vary from inches to 20 ft. in width. Although nearly all the other vein types in our zone show carbonate, the blue mud does not except that some competent calcite veins (with sulphides) up to 10 inches wide have been found within the vein.

We believe at this time, that the blue mud vein(s) are a kaolinized (clay) vein zone representative of being higher up in an epithermal system (discussed later).

(b) Light Blue Quartz/Calcite Vein - this material varies from 1 inch to 15 feet in width and is highly variable along strike and with depth. Mineralization is erratic, but values are increasing with depth as silica content increases and carbonate decreases.

(c) Quartz/Sulphide Veins with variable amounts of Carbonate - these veins first appear as stringers within a zone of rusty weathering up to 60 feet wide. With depth the stringers increase in width. In all cases the greatest increase in width has been on the upper surface or edge of the dipping veins. In our trenches, the upper edge veins have increased up to 3.5 feet in width.

The material here also increases in silica content with depth and decreases in carbonate. Mineralization gives up to 30% sulphides. Rare galena/sphalerite veins are also found although galena is found also as blebs throughout.

(d) Mineralized Granodiorite - These units are highly variable in appearance from different degrees of alteration. Generally, an increase in silica content, a loss of ferromagnesiums and an increase in sulphides of differing degrees is found. Some shearing occurs at times.

Mineralization occurs up to 10% as disseminations, as sulphide stringers and as fracture cleavage coatings.

When alteration becomes very intense, the rock grades into (c) above, (total replacement?).

(e) Galena Veins - veins of galena/quartz/sulphides up to 6 inches wide are found randomly throughout. Some of these have the same strike and dip as the vein system and some are perpendicular to the main veins.

(f) Other - numerous other variations of the above vein types are found throughout. Brecciation is common with some zones showing many stages of re-brecciation. Some of the brecciation is caused by faulting but the majority appears to be of a hydrothermal origin.

Vein Characteristics and Faulting

Our major work to date has concentrated on one vein system on our claim group. Another vein system occurs on the west side of the property at the diorite/andesite contact. A trench on this system on its southern extention off our property shows a quartz vein of a couple of meters in width. Another vein system may lie to the east of our main area of interest also.

Major NNW trenching faults (Weber, Heustis, and Brown McDade) occurred pre/syn. vein emplacement. These faults appear to be the major controlling factors of vein emplacement. In our zone the veins appear to occur dominantly to the west of the fault zones. Many east-west trending faults post-date the major faults and the vein zones causing eastwest offsets. In our area the east-west faults are shown to be "dominantly" up-thrusts and down faults (dip-slip faults) rather than lateral displacement, (minor lateral faulting). Lateral displacement is then found on the surface due mainly to the dip of the veins when dip-slip faulted.

There are many small east-west faults on our property, but two of these play the major role on our vein structure. One of these occurs in Discovery Creek, where the south side has been down-faulted possibly 100 ft. or more. The other occurs just north of our 4H trench with the north side being downfaulted 100ft. or more. The result is in block between these two faults that has been dropped. Geologically in this zone (trenches 8S, 2S, W8, 3S, 11S) we have found the vein structures indicating that they are higher up in the epithermal model. Abundant carbonate, clay alteration (kaolinite), less silica content, very erratic mineralization, sphalerite, galena, the Ag/Au ratio, malachite, realgar, etc. all support this theory.

Our Courtland trench on the north side of Discovery Creek shows a very siliceous vein rock with very little carbonate possibly indicating the vein at a greater depth or within the siliceous cap.

Our trench 4H to the south of the downfaulted block also shows a much greater silica content.

The EM-16 data in interpretation shows the top of the main conductor to be at about a 150 feet of depth to the north of Discovery Creek and south of the other fault while the downfaulted block indicates a depth of 250-300 feet to the top of the conductor. Although this approach is highly interpretive, the data shows a definite strong support for the downfaulted block theory.

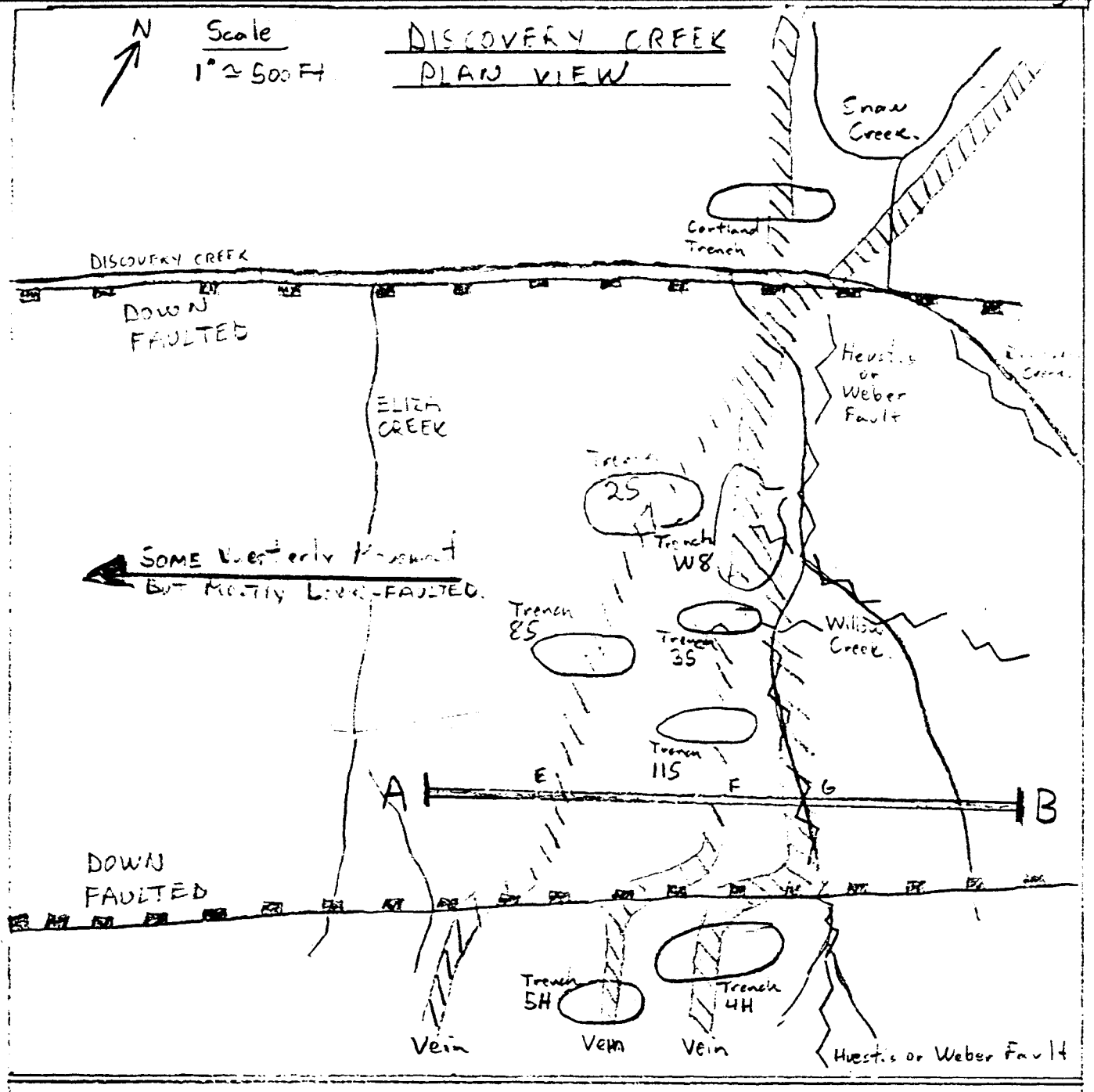
The veins themselves are very continuous along strike with little variation in composition or width. The greatest change takes place with depth as widths vary 75% and composition changes drastically in less than 10 ft. of depth.

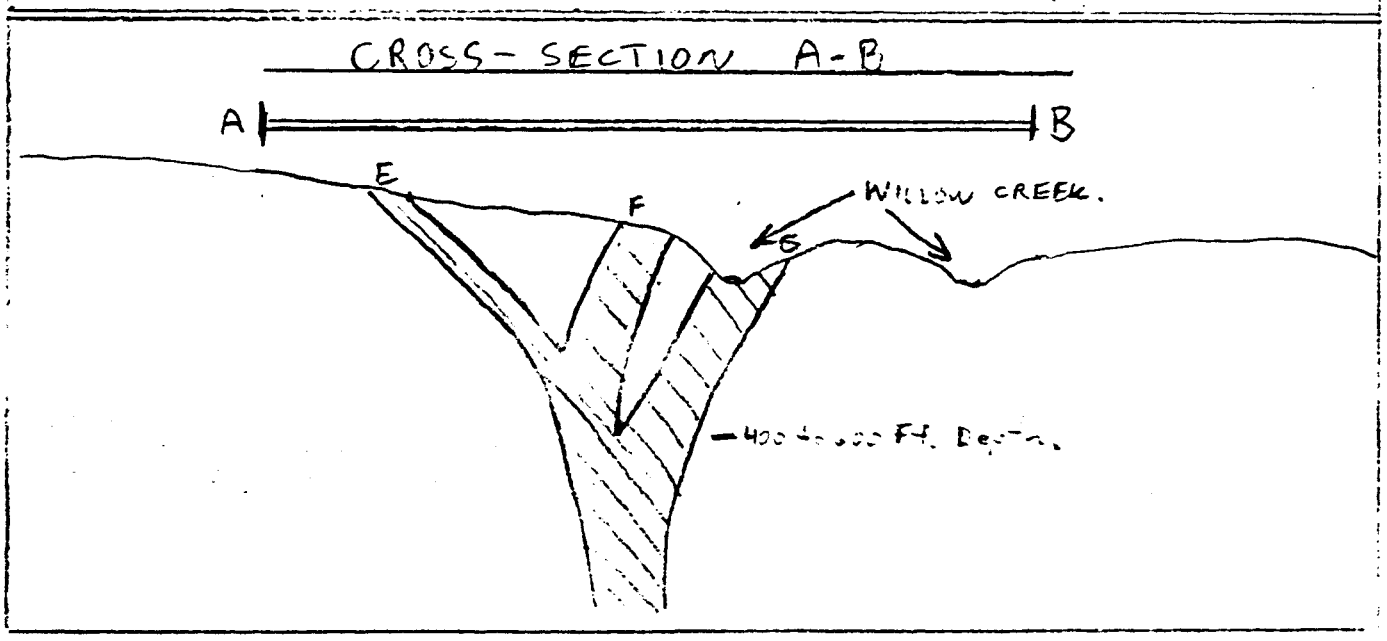
The schematic diagram on the next page shows our main vein system and its general characteristics. Strike and dips were obtained in the trenches to show the cross-sectional view.

The veins on surface appears to split and branch, but this is primarily due to branching in a vertical sense.

Mineralization

Assay values have been sub-economic with erratic higher values of silver and gold. We believe that we are quite high up in the epithermal system, and should expect as much. Silver values tend to increase with galena content. Gold values have shown (from the metallic assay procedure) that about 30% of our gold may be in the form of free gold. Metallurgical testing and panning have supported this. Further metallurgical testing is needed and will be carried out this winter. Arsenic and antimony values tend to show a direct relationship to the silver and gold values, but further work on this is required.


N
Scale
1" ≈ 500 Ft
DISCOVERY CREEK
PLAN VIEW
Snow Creek.
Courtland Trench
DISCOVERY CREEK
DOWN FAULTED
Hewitt or Weber Fault
ELIZA CREEK
Trench 25
Trench W8
SOME Westerly Movement
BUT MOSTLY LEFT-FAULTED.
Trench 85
Trench 35
Willow Creek.
Trench 115
A
E
F
G
B
DOWN FAULTED
Trench 5H
Trench 4H
Vein
Vein
Vein
Hewitt or Weber Fault


CROSS-SECTION A-B
A
B
E
F
G
WILLOW CREEK.
400 to 500 Ft. Depth.

Geology V.S. Mineralization

A very important factor determining the vein width has been the type of host rock. On our claims the granodiorite has shown to be by far the best host. In the granodiorite the vein materials replace and alter to increase their width. Pervasive alteration and partial to total replacement of granodiorite by solutions is very common. This results in wide mineralized zones of many variations and gradations. In many cases, vein material can be seen to have relic granodiorite textures. Much of the granodiorite between individual veins in a "vein zone" is very altered and nearly always has small anomalous gold values from secdonary alteration (seritization, kaolination, carbonitization, silicification, chloritization, minor phyllic alteration).

When the veins cut the diorite which is a much harder lithology, the veins become relatively thin (< 10 ft.). The solutions appear to be fault or fracture infillings, and the walls are relatively impermeable. Wall rock alteration is much less pronounced and is limited to less than 10 ft. where gold values are low. Alteration in the wall rock is more of a brecciation with small mineralized veinlets infilling some fractures.

Our western vein system appears to be at the diorite-andesite contact. The andesite is also very siliceous and hard so we expect similar type veins here as we found within the diorite. No trenching has been done on the vein system to date.

Grid

A picketed base line (chained) was set up at a bearing of 330°. Discovery Creek was used as a zero point for distances north and south from this station. Topofil lines were made to the east and west of the base line (60° and 240°) at 100 ft. separations with 50 ft. flagged stations. (See Map #3)

A small grid had been set up in 1985, but most of this was redone as these were carried out with pace and compass with no base line. The primary results were encouraging and indicated better control was needed for more advanced work.

Geophysics

An EM-16 V.L.F. survey was conducted over the grid using Seattle, Washington as the transmitter. The in-phase/out-of-phase data was plotted and can be seen on Map #4 with our interpretation.

The V.L.F. will respond to conductive bodies (i.e. sulphides) that have a N-S vector component for the Seattle, Washington signal. Our exploration is for precious metals which alone will not produce an anomaly. Therefore, although we have pursued the stronger anomalies, the weaker conductors may be significant, but lack the sulphides to show a strong conductor.

Cuttler Maine transmission was attempted for an E-W conductor vector, but the transmission was too weak and gave about a 50% error rate. Therefore, this was discontinued.

The V.L.F. anomalies have shown, from trenching, to produce extraordinary accuracy of vein location down to within 5 ft. The problem in this area is that we have "vein zones" of 100-200 Ft. width consisting of a great number of individual veins. Each vein sets up its own magnetic field creating multi-anomaly additions across the strike so interpretation of the anomaly's size is very difficult. In most cases, we found a vein of <15 ft. of width on the anomaly, but larger veins to the east that were sometimes 150 ft. away. This obscured using models to determine the dip of the veins.

Some highly interpretive data such as the depth to the top of the conductor was calculated from the V.L.F. data and can be seen on Map #5. Basically, we found that in the centre section (the dropped block area) the depth was about 250 ft. while to the north and south of this area the depth was 150 ft.

Geochemical Data

Over a number of more promising V.L.F. conductors, soil geochemical samples were taken of the B horizon. In most cases these soils were assayed for Au, Ag, Zn, Pb, As. Map #6 shows the results of these surveys.

A soil survey over the entire grid would be very beneficial to our programme but due to the permafrost nature of the ground, this is very slow and difficult work.

The soils were taken with a heavy pick to break the frozen soil and ice. The best methodology is to do a line by clearing the moss and organic layers off a 2 ft. diameter circle leaving these to thaw for a few days before taking the samples. This would be the best method for doing a more extensive soil programme to get consistent, good samples.

Assay Results & Procedures

The soils as stated above, were geochemically assayed usually for Au, Ag, Pb, Zn, As. (sometimes just for Au, Ag) Rock samples were assayed by a "metallic" procedure because of the free gold content that was found to be contained in the veins. In this procedure a 250 gram sample is pulverized and meshed at -150. The free gold when pulverized smears so will not go through the -150 mesh. Therefore, a gold/silver assay is run on all the +150 mesh material and a 30 gram sample of the -150 mesh material. The results are weight averaged to give the final assay result. The -150 mesh sample was then geochemically assayed for Zn, Pb, and As and in some cases Sb.

Rock samples were usually in the 10 lb. range taken over anumber of feet. This whole sample was crushed to 10 mesh and a 300 gram sample was riffled off for assay use. The rest of the sample was shipped to our office for use in metallurgical work to be done during the winter of 1986/1987. This work will be contained in a later assessment report.

Assay results are shown on individual trench maps and are listed in Appendix I.

REPORT ON TRENCHES

General Procedure

Once a V.L.F. anomaly and coincident soil geochem anomaly was established, the best sites for trenches were formed. Detailed soil geochems were then taken at 10 or 25 feet spacings over the trench area. Once the trench was completed soil geochem profiles were also conducted at this spacing at a 15 foot depth and usually on the floor of the trench (depending on the amount of competent rock exposed on the trench floor).

The trenches were then geologically mapped and sampled. Sampling usually consisted of chip samples over footages of bedrock with geochem samples taken where overburden or disintergrated rock still persisted.

The EM-16 (V.L.F.) was re-run at 25 ft. spacings over the trenches to tie in to the geology and assay results.

In some cases, some rock assays were taken at different depths as the trenching continued. Individual maps with assays and V.L.F. data were then formed for each trench.

Below is a brief description of each of the trenches. A trench location map is shown on page 7.

(1) Trench 8S - See Map #8

This vein structure is found within the diorite. It has a strike and dip of 340°/45E. The vein material here is of two kinds; (1) a siliceous and carbonate rich breccia (multi-stage brecciation and recrystallation) carrying 10% sulphides; (2) thin (<10") bands of massive pyritic sulphides.

The vein width varied with depth changing from 3 to 11 ft. With alteration halos the zone zone was about 25 ft. wide.

The diorite near the vein was mangesite rich and at times contained abundant magnetite.

To the east of the vein a fine grained rhyolite intrusion is found (at least 26 ft. wide) that contained minor sulphides and low anomalous gold values.

2) Trench 2S - See Map #9

This trench is on the same structure as trench 8S, but here, is at the granodiorite/diorite contact.

The strike and dip of the veins was 350°/60° E and of the contact 330°/80° E.

This trench was not dug to a great enough depth and most samples are of disintergrated bedrock (overburden).

Small veins and pods of mineralization occur at the diorite contact, but the bulk of the veins showing were within the granodiorite.

Two or three veins of "blue mud" (see earlier) were found and one vein of a rusty sulphide mixture was found. The latter vein was found to "pod" going from 1 ft. to about 15-20 ft. wide. Numerous pods of this type were found within the argillized granodiorite.

(3) Trench W8 - See Map #10

The vein zone here is quite large (150-200 ft. wide) and is within granodiorite. The vein(s) have a strike and dip of 330°/75-80°W.

This trench is our largest and deepest, being about 400ft. long, 100ft. wide and about 40ft. deep at its centre.

The main trench is shown on Map #10 but an extension was dug to the northwest for about 175ft. This extension did not reach bedrock in this area. An important feature seen here was a paleo-stream bed of semi-rounded fragments of diorite/granodiorite/quartz/minor clasts of other lithologies that had extensive coatings of mangesite/ilmenite. Cross-bedding was common giving a flow direction to the north. The paleo bed showed to be at least 4 ft. thick and open to depth. Visible gold flakes can be panned out of this unit (varies from none to 50 flakes).

The Wedge 8 trench has been dug at the intersection of two vein branches. The northwest half of the trench represents the veins also found in trenches 3S, 11S and 5H. The southeast half of the trench represents the veins which run up Willow Creek and are found at the 4H trench.

A mixture of many types of veins can be found in the W8 trench.

(4) Trench 3S - See Map #11

This trench is the southern extension of the western half of trench W8.

The strike and dip of the veins in 335°/75°W. The veins here basically are of two types; (1) a six foot wide blue mud vein; (2) a 30 foot wide vein of small sulphide/quartz veins.

(5) Trench 11S - See Map #12

This trench is an extension to the south of the same "vein zone" as in trench 3S. The strike and dips are the same but the veins have widened to 10ft. for the blue mud and 50-60 feet for the quartz/sulphide vein.

(6) Trench 5H - See Map #13

This trench was only dug to a 2 foot depth. Numerous diorite float was encountered so the trench ws abandoned due to the host rock type. Soil geochems were taken across the 125' long trench surface, and we are presently awaiting the results.

(7) Trench 4H - See Map #14

This trench is the southerly extension of the east half of trench W8.

On the western edge is the diorite/granodiorite contact. From the contact a number of veins occur for about 60 feet to the east, then a 100 foot section of granodiorite, and then another "vein zone" for about another 150 feet.

The strike of the veins here vary (see map) but the dip was fairly consistent at 80°W.

(8) Courtland Trench - See Map #15

This trench is the northern extension of the western half of trench W8. Time restraints did not permit this trench to be dug to the required depth. Two or three veins were encountered. The most significant being a light blue-grey quartz vein, with about 3% sulphides, and a 10 foot width. The material appeared only partly oxidized. Note: others have previously stated that material on south facing slopes is oxidized to a 150ft. depth.

CONCLUSIONS AND RECOMMENDATIONS

Although most assay results show a sub-economic grade, the large widths of "vein zones" of anomalous precious metal values is very signficant. It was found in all trenches that the deeper we dug the better the assay results. This along with geological studies of where we are located vertically in epithermal system models, all indicate a very promising economic potential at depth.

Therefore, it is highly recommended that further work should be done on the project.

Further trenching at this time would not be cost effective for the information it would bring. The western VLF anomaly on the diorite/andesite contact is worthy of investigation, but the steep topography here inhibits cost-effective trenching.

It is therefore recommended that further work should be in the form of diamond drill holes of a HQ or NQ size. Drill sites should be formed when all our information and data has returned and has been fully evaluated.

Mark Langdon
Geological Projects Manager,
AURCHEM RESOURCES LTD.

Bibliography

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Models of Precious Metal Epithermal Deposits.

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Mount Nansen Gold-Silver Deposit (1971) F. Bianconi

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A Canadian Cordilleran Model for Epithermal Gold-Silver Deposits (1986) Andrejs Panteleyer.

Bostock (1936) Carmacks District, Yukon, Geological Survey, Canada. Mem.169.

FOOT-NOTE FOR EXPENDITURES

An accurate record was kept of the work done on claims or leases. The following gives the percentage of total work that was done on the claims versus the leases. From this the expenditures on the following pages have been adjusted to contain only that work that was done on the claim groups.

Assays —— 60% on claims

Personnel ——— 75% on claims

D8-Cat Ripper Rental —— 75%

Mark Langdon

LIST OF EXPENDITURES

(a) Personnel Expenditures

Mark Langdon,	Geological Project Manager, 511 Hayward Crescent, Milton, Ontario. Field Work; Geologic Mapping and Sampling, EM-16 survey, geochemical surveys, supervision. 56 Days AT $150/DAY - $8,400 x 75%	$ 6,300.00
	Compiling Data and Report and Map Forming, organization 45 DAYS AT $150/DAY - $6,750 x 75%	5,062.50
Mike Anderson,	Contract Geologist, St. Catherines, Ontario. Field & Office Work; $600/week for 12.4 weeks - $7,460.72 x 75%	5,595.54
Lee Schneider,	Geological Assistant, Calgary, Alberta. Field Work; EM-16, soil sampling, Claim Staking and line cutt. 9 Days at $100/day - $900 x 75%	675.00
Rob Schneider,	Geological Assistant, Acton, Ontario. Field Work; EM-16, geochemical sampling, drafting, grid formation, general. 32 Days at $450/week - $2,057.14 x 75%...	1,542.86
	Ofice Work; rock sorting, map drafting, compilation. 2 weeks at $321/week - $642.00 x 75%	481.50
John Schneider,	President, Aurchem Resources, Chem. Eng., Metallurgist. Field; trenching, compilation, supervision, sampling. 20 days at $250/day - $2,500 x 75%	1,875.00
	Office; Data Manipulation and Compilation. 15 days at $200/day - $3,000 x 75%	2,250.00
Secretarial Office Costs - $500 x 75%		375.00
(A) Total Personnel Expenditures		$24,157.40

List of Expenditures (continued)

(b) Rental Costs

1 Trailer at $400/month for 2-1/2 months Hidden Valley Outfitters Ltd., Carmacks, Yukon	$ 1,000.00
1 D8-Cat with Ripper $130/hour for 400.5 hours Hidden Valley Outfitters Ltd., Carmacks, Yukon $52,065.02 x 75%	39,048.77
1 Surburban at $1,650/month plus mileage for 2.5 months Norcan Lesing, Whitehorse, Yukon	4,384.18
1 Bronco for 5 days Tilden TruckRental, Whitehorse, Yukon	507.60
1 EM-16 VLF for 13 weeks at $145/week Geonics Ltd., Mississauga, Ontario	1,885.00
(B) Total Rental Expenditures	$46,825.55

(c) Miscellaneous Expenses

Groceries, Meals, Hotels, Propane, Gas for 2.5 months for staff	$ 6,260.50

(d) Material & Equipment Transport Costs

Field Equipment from Toronto to Whitehorse Air Canada Cargo - May 22, 1986	$ 104.34
Rock Samples for Metallurgical Testing from Whitehorse to Toronto; Yukon Freight Lines Ltd.	669.79
From Carmacks to Toronto; Yukon Freight Lines Ltd.	600.00
(D) Total of material and equipment transport costs	$ 1,374.13

(e) Cost of Flights to Yukon

Cost of all flights by staff to get to and from the Yukon	$ 9,497.02

(f) Assay Expenditures

All assays prepared in Whitehorse and sent to Ottawa lab for analysis.
Bondar-Clegg & Co. Ltd., Whitehosre, Yukon.

List of Expenditures (continued)

Geochemical Analysis of Soils :	
114 samples for Au, Ag at $9.40 each	$ 1,071.60
18 samples for Au, Ag, Pb, Zn, As, Sb at $19.90 each	358.20
47 samples for Au, Ag, Pb, Zn, As at $15.15 each	712.05
Assays of Rocks :	
3 samples for metallic Au, Ag, at $26.75 each	80.25
30 samples for metallic Au, Ag, Pb, Zn, Sb at $33.50 each	1,005.00
152 samples for metallic Au, Ag, As, Zn, Pb at $32.50 each	4,940.00
5 samples for Au, Ag, at $15.25 each	76.25
(F) Total - assay expenditures	$ 8,243.35
CLAIMS TOTAL x 60%	$ 4,946.01

(g) Equipment and Supplies Bought

Stationary, flagging, sample bags, hammers, tents, claim posts, pickets, back-packs, compasses, etc.	$ 2,090.74

SUMMARY OF EXPENDITURES

(a) Personnel Expenditures	$24,157.40
(b) Rental Costs.....	46,825.55
(c) Miscellaneous Expenses	6,260.50
(d) Material and Equipment Transport Costs ...	1,374.13
(e) Costs of Flights to Yukon	9,497.02
(f) Assay Expenditures	4,946.01
(g) Equipment and Supplies Bought	2,090.74
GRAND TOTAL	$95,151.35

For all expenditures receipts are available on request.

Mark Langdon
Geological Projects Manager
AURCHEM RESOURCES LTD.

August 7th, 1986

APPENDIX I

LIST OF ROCK AND SOIL

ASSAYS FOR 1986

BONDAR-CLEGG

Certificate of Analysis

Report: 416-2689

Date: August 6, 1986

Client: Prochem

Submitted by: BCC Whitehorse

Samples:	Oz/ton Au +150	Oz/ton Ag +150	grams weight +150	Oz/ton Au -150	Oz/ton Ag -150	grams weight -150	Oz/ton Au weighted average	Oz/ton Ag weighted average
U4R 86-001	0.004	0.05	12.10	0.006	0.18	173.7	0.006	0.17
U4R 86-002	0.013	0.46	6.95	0.013	0.35	185.6	0.013	0.35
U4R 86-003	0.041	0.35	10.83	0.025	0.35	171.6	0.026	0.32
U4R 86-004	0.005	0.07	13.17	0.004	0.11	141.4	0.004	0.11
U4R 86-005	«0.001	«0.01	12.90	«0.001	0.01	136.9	«0.001	0.01
H486L-151	«0.001	«0.01	10.59	0.002	0.06	179.4	0.002	0.06
11S86-153	0.002	0.06	11.88	0.002	0.06	189.9	0.002	0.06
11S86-154	0.072	0.52	9.93	0.041	0.99	221.6	0.042	0.97
11S86-157	0.049	1.40	13.16	0.090	4.03	244.9	0.088	3.90
11S86-160	0.003	0.30	12.73	0.007	0.28	118.5	0.007	0.28
11S86-165	0.004	0.24	13.17	0.006	0.25	131.6	0.006	0.25
11S86-167	0.001	«0.01	12.69	«0.001	«0.01	92.3	«0.001	«0.01

R. Boulton

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5420 Canotek Rd.,
Ottawa, Ontario,
Canada K1J 8X5
Phone: (613) 749-2220
Telex: 053-3233

BONDAR-CLEGG

Certificate of Analysis

Report: 416-2431

Date: August 5, 1986

Client: Prochem Ltd.

Submitted by: M. Langdon

SAMPLES:	Oz/ton Au +150	Oz/ton Ag +150	grams weight +150	Oz/ton Au -150	Oz/ton Ag -150	grams weight -150	Oz/ton Au weighted average	Oz/ton Ag weigh average
3586-L75	0.372	0.78	12.00	0.036	3.72	245	0.052	3.58
F3686-001	0.076	0.55	17.38	0.038	0.44	235	0.041	0.45
F3686-002	1.117	0.44	3.29	0.169	7.38	220	0.183	7.28
R2R86-018	0.004	0.03	10.24	0.004	0.09	212	0.004	0.09
R2R86-019	«0.001	0.06	9.79	«0.001	«0.01	252	«0.001	«0.01
R2R86-020	0.001	0.03	14.93	0.001	«0.01	187	0.001	«0.01
R2R86-021	0.002	0.02	12.03	«0.001	«0.01	216	«0.001	«0.01
R2R86-024	0.002	0.05	12.35	«0.001	«0.01	185	«0.01	«0.01
R2R86-056	0.002	0.11	13.63	0.002	0.09	106	0.002	0.09
W886-L60	0.019	0.20	13.40	0.016	«0.01	116	0.016	0.02
W886-L61	0.055	0.46	17.11	0.063	1.75	140	0.062	1.61
W886-L62	0.012	0.13	6.54	0.007	0.19	130	0.007	0.19
W886-L63	0.940	0.62	18.46	0.108	3.08	191	0.181	2.84
W886-L64	0.212	1.60	6.20	0.054	8.76	203	0.059	8.53
W886-L65	0.010	0.74	9.45	0.012	4.35	96	0.012	4.03
W886-L66	0.065	0.65	17.93	0.047	2.05	225	0.048	1.95
W886-L68	0.025	0.37	2.34	0.017	0.37	166	0.017	0.37
W886-L69	0.090	0.70	1.25	0.071	0.13	172	0.071	0.13
W886-L70	0.021	0.64	4.05	0.067	0.35	90	0.067	0.36
W886-L71	0.005	0.13	13.55	0.002	0.20	160	0.002	0.20

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BONDAR-CLEGG

Certificate of Analysis

Report: 516-2124

Date: August 5, 1986

Client: Prochem

Submitted by: J. Schneider

SAMPLES:	ppm Au +150	ppm Ag +150	grams weight +150	ppm Au -150	ppm Ag -150	grams weight -150	ppm Au weighted average	ppm Ag weighted average
TW 8R-L1	4.78	48.6	6.17	1.55	330.1	257.4	1.63	323.5
W 8S86-1	«0.01	0.5	19.35	0.03	2.7	179.4	0.03	2.5

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BONDAR-CLEGG

Certificate of Analysis

Report: 416-2431

Date: August 5, 1986

Client: Prochem Ltd.

Submitted by: M. Langdon

SAMPLES:	Oz/ton Au +150	Oz/ton Ag +150	grams weight +150	Oz/ton Au -150	Oz/ton Ag -150	grams weight -150	Oz/ton Au weighted average	Oz/ton Ag weighted average
W886-L72	0.002	0.12	12.27	0.004	0.05	129	0.004	0.05
W886-L73	1.040	0.43	13.46	0.049	0.27	155	0.128	0.28
~~W886-L74~~	~~0.092~~	~~2.04~~	~~18.19~~	~~0.058~~	~~0.95~~	~~170~~	~~0.061~~	~~1.06~~

C. Boulton

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BONDAR-CLEGG

Certificate of Analysis

rt: 416-2742

Date: August 6, 1986

nt: Prochem

Submitted by: BCC Whitehorse

les:	Oz/ton Au +150	Oz/ton Ag +150	grams weight +150	Oz/ton Au -150	Oz/ton Ag -150	grams weight -150	Oz/ton Au weighted average	Oz/ton Ag weighted average
-001	0.002	«0.01	9.00	0.003	0.06	139.3	0.003	0.06
-002	«0.001	«0.01	12.95	«0.001	«0.01	103.2	«0.001	«0.01
-015	0.002	0.03	11.42	0.002	0.10	122.8	0.002	0.10
-016	«0.001	«0.01	8.73	«0.001	«0.01	116.3	«0.001	«0.01
-017	«0.001	«0.01	8.99	«0.001	0.11	129.3	«0.001	0.11
-018	«0.001	«0.01	12.37	0.001	0.04	146.0	0.001	0.04
-019	«0.001	«0.01	11.30	«0.001	«0.01	147.0	«0.001	«0.01
-020	0.064	0.74	13.74	0.065	1.21	186.4	0.065	1.18
-021	«0.001	«0.01	9.50	«0.001	«0.01	78.4	«0.001	«0.01
6-004	0.004	«0.01	9.35	0.005	0.05	124.1	0.005	0.05
6-011	0.009	«0.01	3.40	0.003	0.07	186.3	0.003	0.07
6-	«0.001	«0.01	6.21	0.009	0.43	176.4	0.009	0.42
-024	0.005	0.29	9.11	0.005	0.80	140.2	0.005	0.77
-025	«0.001	«0.01	7.63	«0.001	0.12	95.4	«0.001	0.12
-026	«0.001	«0.01	11.28	«0.001	0.09	117.0	«0.001	0.09
-028	0.001	«0.01	11.52	0.015	0.26	121.1	0.014	0.24
-036	0.014	0.03	11.33	0.001	0.07	122.5	0.002	0.07
-037	0.015	«0.01	8.65	0.005	0.09	162.7	0.006	0.09
-038	0.036	0.05	5.41	0.006	0.22	165.7	0.007	0.22
-039	0.002	«0.01	9.11	0.008	0.10	152.9	0.008	0.10

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BONDAR-CLEGG

Geochemical Lab Report

REPORT: 016-2690

PROJECT: 9 PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Zn PPM	Ag PPM	Pb PPM	As PPM	Sb PPM	Au PPB	TestWt gm
060S 050W		56	1.4	31	31	<1	10	10.00
060S 040W		78	1.7	27	28	<1	20	10.00
100S 055W		48	0.6	22	6	2	10	10.00
100S 040W		76	0.8	19	13	5	15	10.00
100S 035W		94	0.8	14	4	<1	26	10.00
000I 080W		66	0.4	23	31	<1	10	10.00
000I 075W		64	0.6	19	15	<1	15	10.00
000I 070W		168	0.6	106	19	<1	<5	10.00
000I 065W		460	3.8	1335	584	6	125	10.00
000I 060W		200	0.7	108	48	1	15	10.00
000I 055W		196	0.4	54	20	<1	20	10.00
000I 050W		98	0.1	42	2	2	5	10.00
000I 045W		110	0.7	66	61	<1	5	10.00
000I 040W		156	1.2	75	45	3	15	10.00
000I 035W		260	0.6	249	88	1	20	10.00
000I 030W		140	1.0	94	54	1	165	10.00
000I 025W		104	0.6	47	31	3	40	10.00
000I 020W		66	0.4	26	13	<1	15	10.00
U4S86001			1.8				140	10.00
U4S86002			0.4				10	10.00
U4S86003			0.3				<5	10.00
U4S86004			0.2				25	10.00
U4S86005			3.5				65	10.00
U4S86006			0.2				10	10.00
U4S86007			6.0				1320	10.00
11S86-152			0.7				10	10.00
11S86-153			8.3				275	10.00
11S86-156			10.2				215	7.50
11S86-158			9.1				565	10.00
11S86-159			4.5				580	10.00
11S86-161			1.0				20	10.00
11S86-162			6.8				335	8.00
11S86-163			2.1				50	10.00
11S86-164			1.8				65	10.00
11S86-166			3.1				130	10.00
11S86-168			15.2				800	10.00

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BONDAR-CLEGG

Geochemical Lab Report

REPORT: 016-2621

PROJECT: B PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Ag PPM	Au PPB
[illegible]36018		0.2	[illegible]
0605-035W		0.6	190
0605-045W		1.3	15
0605-055W		2.9	20
0605-060W		0.5	10
1005-045W		0.8	10
1005-050W		0.3	10
1005-060W		0.4	15

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Certificate of Analysis

REPORT: 416-2184

PROJECT: None

SAMPLE NUMBER	ELEMENT UNITS	Au ppm	Ag ppm	Weight grams	Au ppm	Ag ppm	Weight grams
		+150	+150	+150	-150	-150	-150
R2R-86-005		0.06	12.3	3.25	0.03	1.4	240
R2R-86-007		«0.01	1.1	3.94	0.03	«0.3	240
R2R-86-008		«0.01	1.5	6.69	0.03	3.7	255
R2R-86-014		«0.01	0.7	14.14	0.02	1.4	230
R2R-86-016		0.05	2.3	13.27	0.08	0.3	230
R2R-86-017		0.08	2.0	10.12	0.09	1.0	215
R2R-86-022		0.02	3.8	13.17	0.14	0.3	225
R2R-86-023		«0.01	«0.8	11.97	0.02	0.3	230
R2R-86-025		0.04	«1.2	8.31	0.28	7.5	235
R2R-86-035		«0.01	«0.8	12.11	0.05	«0.3	280
R2R-86-036		«0.01	1.4	14.73	0.01	2.1	250
R2R-86-037		«0.01	«1.0	10.47	0.03	0.7	250
R2R-86-038		0.04	2.7	14.55	0.08	4.1	265
R2R-86-039		0.38	0.6	16.93	0.08	2.1	215
R2R-86-041		«0.01	«0.9	10.72	0.02	0.3	230
R2R-86-042		«0.01	«0.6	15.65	0.03	«0.3	270
R2R-86-047		0.35	«0.9	11.00	0.44	1.4	290
R2R-86-049		«0.01	2.4	8.21	0.02	2.1	250
R2R-86-050		0.05	«1.7	5.83	0.18	5.8	235
R2R-86-051		0.01	1.1	9.18	«0.01	0.7	250
R2R-86-057		79.64	151.2	4.96	8.49	84.0	265
R2R-86-058		0.13	«2.5	3.97	0.04	«0.3	245

SAMPLE NUMBER	ELEMENT UNITS	Au ppm weighted average	Ag ppm weighted average	SAMPLE NUMBER	ELEMENT UNITS	Au ppm weighted average	Ag ppm weighted average
~~R2R-86-005~~		~~0.03~~	~~1.5~~	~~R2R-86-037~~		~~0.03~~	~~0.7~~
R2R-86-007		0.03	«0.3	R2R-86-038		0.08	4.0
R2R-86-008		0.03	3.7	R2R-86-039		0.10	2.0
R2R-86-014		0.02	1.4	R2R-86-041		0.02	0.3
R2R-86-016		0.08	0.4	R2R-86-042		0.03	«0.3
R2R-86-017		0.09	1.0	R2R-86-047		0.44	1.4
R2R-86-022		0.14	0.5	R2R-86-049		0.02	2.1
R2R-86-023		0.02	0.3	R2R-86-050		0.18	5.8
R2R-86-025		0.27	7.5	R2R-86-051		«0.01	0.7
R2R-86-035		0.05	«0.3	R2R-86-057		9.80	85.2
R2R-86-036		0.01	2.1	R2R-86-058		0.04	«0.3

NOTE: « means less than

J. Bradley

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BONDAR-CLEGG

Geochemical Lab Report

Wedge 8

REPORT: 016-2184

PROJECT: NONE

SAMPLE NUMBER	ELEMENT UNITS	Zn PPM	Pb PPM	As PPM
46-129-R2R86-005		560	31	72
46-129-R2R86-007		300	40	37
46-129-R2R86-008		123	13	29
46-129-R2R86-014		62	22	17
46-129-R2R86-016		76	24	34
46-129-R2R86-017		98	32	64
46-129-R2R86-022		178	104	112
46-129-R2R86-023		285	17	65
46-129-R2R86-025		230	275	1216 ✓
46-129-R2R86-035		40	13	9
46-129-R2R86-036		45	20	15
46-129-R2R86-037		90	32	68
46-129-R2R86-038		240	120	266
46-129-R2R86-039		315	110	85
46-129-R2R86-041		95	15	62
46-129-R2R86-042		116	88	40
46-129-R2R86-047		190	200	>2000 ✓
46-129-R2R86-049		198	95	90
46-129-R2R86-050		1750	1150	1016
46-129-R2R86-051		255	95	408
46-129-R2R86-057		3000	1200	>2000 ✓
46-129-R2R86-058		83	28	71

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BONDAR-CLEGG

Certificate of Analysis

eport: 416-2349

Date: July 10,1986

rochem

amples:	g +150 weight	ppm +150 Au	ppm +150 Ag	g -150 wt	ppm -150 Au	ppm -150 Ag
2R86066	8.05	«0.01	1.2	244.13	2.4	«0.01
2R86067	16.83	0.08	«0.3	207.39	«0.3	0.08
2R86068	17.86	0.12	3.9	201.01	0.7	0.12
2R86069	8.15	0.04	«0.3	207.41	7.9	0.04
2R86070	16.72	0.01	«0.3	214.71	«0.3	«0.01
2R86071	11.70	0.01	2.6	195.05	«0.3	0.01

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BONDAR-CLEGG

Certificate of Analysis

Wedge 8

ort: 416-2349

Date: July 10,1986

chem

ples:	g +150 weight	ppm +150 Au	ppm +150 Ag	g -150 wt	ppm -150 Ag	ppm -150 Au
86001	1.31	8.55	190.0	230.19	87.4	0.43
86002	8.79	«0.01	4.6	249.36	«0.3	0.02
86003	2.60	0.01	250.5	202.91	25.0	0.21
86004	10.10	0.03	13.9	121.27	3.8	0.07
86006	15.74	«0.01	8.3	215.71	3.4	«0.01
86009	12.33	«0.01	2.4	196.81	0.7	«0.01
86010	8.23	«0.01	6.1	214.93	14.7	0.02
86011	8.75	0.42	2.3	202.18	3.1	0.23
86012	7.96	«0.01	8.8	229.59	1.4	0.06
86013	5.38	«0.01	18.6	227.55	0.3	0.03
86015	11.98	0.30	«0.3	240.17	1.4	0.02
86[illegible]	11.40	«0.01	11.4	264.99	5.1	0.24
860[illegible]	12.90	0.94	8.5	230.61	3.4	0.02
86028	12.63	«0.01	0.8	206.94	1.4	0.01
86029	14.03	0.01	9.3	247.28	3.4	0.23
86030	7.13	0.06	88.4	181.82	20.6	0.22
86031	6.52	0.03	16.9	215.44	4.5	0.02
86033	4.14	«0.01	«0.3	214.35	2.1	0.02
86034	13.87	0.04	«0.3	158.94	«0.3	«0.01
86040	13.56	0.02	1.5	157.48	1.4	«0.01
86043	0.24	12.71	583.3	212.65	2.4	0.08
86044	12.34	0.09	8.9	211.46	3.4	0.02
86045	9.29	0.03	«0.3	213.54	1.0	«0.01
86046	15.43	0.14	«0.3	149.45	5.5	0.25
86048	8.73	0.10	«0.3	184.66	1.4	0.06
86052	3.86	0.06	2.6	204.49	4.8	0.08
86053	7.23	0.03	«0.3	184.53	3.8	0.03
86054	6.25	0.04	«0.3	228.30	2.4	0.01
86055	12.49	0.02	4.0	205.01	1.0	0.02
86060	13.40	0.03	2.2	205.01	1.0	0.02
86061	15.98	0.02	1.9	194.58	1.0	0.03
86062	13.02	0.02	4.6	219.36	0.7	0.02
86063	12.56	0.03	6.4	212.64	«0.3	«0.01
86[illegible]	0.09	«0.01	17.6	237.80	0.3	0.01
86065	17.66	«0.01	1.7	202.63	3.1	«0.01

this should be confirmed

N-Wong

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Telex: 053-3233

BONDAR-CLEGG

Certificate of Analysis

Wedge 4

port: 416-2349

Date: July 10,1986

ochem

mples:*	weighted average value g Tot.Wt.	ppm Au	ppm Ag
86066	252.18	«0.01	2.3
86067	224.22	0.08	«0.3
86068	218.87	0.12	1.0
86069	215.56	0.04	7.6
86070	231.43	0.01	«0.3
86071	206.75	0.01	«0.3

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Telex: 053-4455

BONDAR-CLEGG

Geochemical Lab Report

REPORT: 016-2430

PROJECT: 7 PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Ag PPM	Au PPB	Au x Ag
F3S-86001		4.5	160	
F3S-86002		7.1	140	
F3S-86003		6.2	105	
F3S-86004		5.9	690	
F3S-86005		26.5	2790	.09
F3S-86006		13.8	1140	.038
F3S-86007		9.5	390	
F3S-86008		0.3	30	
F3S-86009		0.5	20	
F3S-86010		53.5	2990	.10
F3S-86011		47.5	3790	.126
F3S-86012		16.6	315	
F3S-86013		<0.1	5	
F3S-86014		6.1	370	
F3S-86015		>100.0	>20000	>66
F3S-86016		18.5	740	
F3S-86017		1.4	60	
PSPC-1		0.6	2630	
PSPC-2		1.3	7575	.25
PSPC-3		0.1	2270	
PSPC-4		0.4	50	
W8PC-L67		>100.0	3890	.13
080N-025E		0.9	<5	
080N-030E		0.1	15	
080N-035E		1.3	50	
080N-040E		2.2	50	
080N-045E		1.8	165	
080N-050E		0.2	45	
120N-105E		1.1	40	
120N-110E		0.7	25	
120N-115E		0.6	30	
120N-120E		0.7	50	
140N-050E		0.2	40	
140N-055E		<0.1	30	
140N-060E		<0.1	25	
140N-065E		0.5	40	
140N-070E		<0.1	25	
140N-075E		<0.1	40	

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Certificate of Analysis

Report: 416-2431

Wedge 8

Date: July 17, 1986

Client: Prochem

Submitted by: M. Langdon

SAMPLES:	Oz/ton Au +150	Oz/ton Ag +150	grams weight +150	Oz/ton Au -150	Oz/ton Ag -150	grams weight -150	Oz/ton Au weighted average	Oz/ton Ag weighted average
3586-L75	0.372	0.78	12.00	0.036	3.72	245	0.052	3.58
F3686-001	0.076	0.55	17.38	0.038	0.44	235	0.041	0.45
F3686-002	1.117	0.44	3.29	0.169	7.38	220	0.183	7.28
R2R86-018	0.004	0.03	10.24	0.004	0.09	212	0.004	0.09
R2R86-019	«0.001	0.06	9.79	«0.001	«0.01	252	«0.001	«0.01
R2R86-021	0.002	0.02	12.03	«0.001	«0.01	216	«0.001	«0.01
R2R86-024	0.002	0.05	12.35	«0.001	«0.01	185	«0.01	«0.01
R2R86-056	0.002	0.11	13.63	0.002	0.09	106	0.002	0.09
W886-L60	0.019	0.20	13.40	0.016	«0.01	116	0.016	0.02
W886-L61	0.055	0.46	17.11	0.063	1.75	140	0.062	1.61
W886-L62	0.012	0.13	6.54	0.007	0.19	130	0.007	0.19
W886-L63	0.940	0.62	18.46	0.108	3.08	191	0.181	2.84
W886-L64	0.212	1.60	6.20	0.054	8.76	203	0.059	8.53
W886-L65	0.010	0.74	9.45	0.012	4.35	96	0.012	4.03
W886-L66	0.065	0.65	17.93	0.047	2.05	225	0.048	1.95
W886-L68	0.025	0.37	2.34	0.017	0.37	166	0.017	0.37
W886-L69	0.090	0.70	1.25	0.071	0.13	172	0.071	0.13
W886-L70	0.071	0.64	4.05	0.067	0.35	90	0.067	.36
W886-L71	0.005	0.13	13.55	0.002	0.20	160	0.002	0.20
W886-L72	0.002	0.12	12.27	0.004	0.05	129	0.004	0.05

Cont'd on next page

T. Hawkins

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BONDAR-CLEGG

Certificate of Analysis

Wedge 8

Report: 416-2431

Date: July 17, 1986

Client: Prochem

Submitted by: M. Langdon

SAMPLES:	Oz/ton Au +150	Oz/ton Ag +150	grams weight +150	Oz/ton Au -150	Oz/ton Ag -150	grams weight -150	Oz/ton Au weighted average	Oz/ton Ag weighted average
W886-L73	1.040	0.43	13.46	0.049	0.27	155	0.128	0.28
W886-L74	0.092	2.04	18.19	0.058	0.95	170	0.061	1.06

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BONDAR-CLEGG

Geochemical Lab Report

REPORT: 016-2431 | PROJECT: 7 | PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Zn PPM	Pb PPM	Sb PPM	
[illegible]-L75		16000	8640	147	*
F3[illegible]86-001		9600	4740	90	
F3[illegible]86-002		3700	>20000	274	*
R2R86-018		330	637	12	
R2R86-019		160	118	2	
R2R86-020		200	144	2	
R2R86-021		130	37	<1	
R2R86-024		290	340	11	
R2R86-056		300	779	8	
W886-L60		2500	1680	31	
W886-L61		10000	11960	133	*
W886-L62		140	254	94	
W886-L63		560	7180	92	*
W886-L64		6000	9280	205	*
W886-L65		5600	>20000	145	
W886-L66		7600	5990	95	
W886-L68		560	1340	105	
W886-L69		1450	1210	70	*
W886-L70		230	476	54	*
W886-L71		310	56	1	
W886-L72		65	37	10	
W886-L73		590	849	86	*
W886-L74		340	1200	64	*

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Geochemical
Lab Report

REPORT: 116-2431 | PROJECT: 7 | PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	As PPM
3586-L75		>2000
F3586-001		>2000
F3586-002		>2000
R2R86-018		856
R2R86-019		101
R2R86-020		134
R2R86-021		45
R2R86-024		96
R2R86-056		608
W886-L60		>2000
W886-L61		>2000
W886-L62		396
W886-L63		>2000
W886-L64		>2000
W886-L65		758
W886-L66		>2000
W886-L68		616
W886-L69		>2000
W886-L70		>2000
W886-L71		171
W886-L72		103
W886-L73		>2000
W886-L74		>2000

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BONDAR-CLEGG

Certificate of Analysis

Report: 416-2620

Date: July 31, 1986

Client: Prochem

Submitted by: BCC Whitehorse

Samples:	oz/ton Au +150	oz/ton Ag +150	grams weight +150	oz/ton Au -150	oz/ton Ag -150	grams weight -150	oz/ton Au wt.ave.	oz/ton Ag wt.ave.
R2R86-82	0.005	«0.01	7.56	0.002	0.01	142.5	0.002	0.01
R2R86-83	0.002	0.05	6.24	0.004	0.01	123.0	0.004	0.01
R2R86-84	«0.001	0.02	6.24	0.004	0.01	145.8	0.006	0.20
R2R86-85	0.033	0.21	9.69	0.035	0.71	216.6	0.035	0.69
R2R86-86	0.307	0.57	9.74	0.057	0.46	191.8	0.069	0.47
R2R86-87	0.002	0.21	9.85	«0.001	0.01	203.3	«0.001	«0.01
R2R86-88	0.003	«0.01	4.83	«0.001	0.36	202.4	«0.001	0.35
R2R86-89	0.893	0.41	6.37	0.056	«0.01	234.9	0.078	0.01
R2R86-90	0.026	0.56	9.36	0.006	0.29	204.7	0.007	0.30
R2R86-91	0.001	0.08	7.22	0.003	0.52	164.9	0.003	0.50
R2R86-100	0.014	«0.01	6.18	0.003	0.21	178.9	0.003	0.20
R2R86-101	0.003	0.05	7.46	«0.001	«0.01	163.2	«0.001	«0.01
R2R86-102	0.009	0.41	6.36	0.005	0.02	205.9	0.005	0.03
R2R86-103	0.446	0.57	7.62	0.052	0.37	154.7	0.070	0.38
R2R86-104	0.030	0.81	7.89	0.032	0.13	239.0	0.032	0.86
R2R86-105	0.009	0.84	5.93	0.002	0.09	188.2	0.002	0.11
R2R86-106	0.015	0.23	10.25	0.009	0.08	218.4	0.009	0.09
R2R86-107	0.004	0.15	5.91	0.004	0.09	211.2	0.004	0.09
R2R86-108	0.046	0.81	5.40	0.053	0.38	83.7	0.053	0.41
R2R86-109	0.002	0.32	8.21	«0.001	«0.01	189.8	«0.001	0.01
R2R86-110	0.002	0.07	8.56	«0.001	«0.01	138.3	«0.001	«0.01
R2R86-112	0.014	0.31	6.58	0.005	«0.01	221.3	0.005	«0.01
R2R86-113	0.012	0.11	5.50	0.004	«0.01	211.3	0.004	«0.01
R2R86-114	0.005	0.07	4.41	0.004	«0.01	173.8	0.004	«0.01
R2R86-115	0.058	0.62	3.27	0.038	«0.01	213.2	0.038	«0.01
W886-L80	0.080	2.26	1.29	0.036	0.32	223.8	0.036	0.33
W886-L92	0.008	0.58	6.04	0.009	0.21	212.5	0.008	0.22
W886-L76	0.015	0.20	8.62	0.017	«0.01	198.1	0.017	«0.01
W886-L77	0.043	0.99	3.25	0.037	1.59	197.2	0.037	1.58
W886-L78	0.012	0.31	8.40	0.003	«0.01	238.2	0.003	0.01
W886-L79	0.005	«0.01	6.41	0.003	«0.01	246.0	0.003	«0.01
W886-L81	0.124	0.32	7.41	0.080	0.78	227.9	0.081	0.77
W886-A001	0.009	0.64	2.72	0.004	0.06	144.2	0.004	0.06
W886-L150	0.027	«0.01	5.49	0.009	0.28	219.8	0.009	0.28

Chief Chemist

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Geochemical Lab Report

REPORT: 016-2620 | PROJECT: 8 | PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Zn PPM	Pb PPM	As PPM
R2R8682		800	356	73
R2R8683		340	184	352
R2R8684		196	235	1256
R2R8685		2500	2700	>2000
R2R8686		10000	1660	>2000
R2R8687		380	186	306
R2R8688		220	46	61
R2R8689		1250	617	>2000
R2R8690		184	134	312
R2R8691		350	779	884
R2R86100		390	132	177
R2R86101		128	37	181
R2R86102		94	105	1552
R2R86103		1600	371	>2000
R2R86104		11600	10700	>2000
R2R86105		520	586	768
R2R86106		520	974	>2000
R2R86107		270	287	556
R2R86108		98	162	>2000
R2R86109		68	36	115
R2R86110		60	45	40
R2R86112		124	76	145
R2R86113		96	171	102
R2R86114		60	28	75
R2R86115		60	137	>2000
3586-L80		1250	1760	>2000
3586-L92		580	302	>2000
W886-L76		52	54	264
W886-L77		5200	341	338
W886-L78		112	138	>2000
W886-L79		74	29	776
W886-L81		10400	1570	>2000
W886-A001		104	78	416
11586-L150		5600	1810	688

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Geochemical
Lab Report

EPORT: 016-2124

PROJECT: NONE PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Zn PPM	Pb PPM	As PPM	Sb PPM	
3 46-122-MERV-1		625	>370	989	29	
5 46-122-T11R86-1		90	20	8	3	
6 46-122-TWBR-L1		20000	20000	>2000	549	Dreikanter.
8 46-122-TWBR-19		325	400	1104	121	
9 46-122-T8[illegible]R86-18		10150	5500	>2000	134	Rock Sample.
1 46-122-W8R86-1		150	1375	>2000	53	
2 46-122-W8S86-1		650	105	520	12	

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Certificate of Analysis

Report: 416-2124

June 26, 1986

Client: Prochem Ltd.

Submitted by: M. Langdon

	ppm Au	ppm Ag
1	0.16	3.01
2	0.01	0.66
3	1.51	333.16
4	1.14	18.90
5	0.58	21.08
6	0.59	17.41
7	0.03	«0.01

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Certificate of Analysis

Report: 416-2124

July 2, 1986

Client: Prochem Ltd.

Submitted by: M. Langdon

Rock Samples:	ppm Au +150	ppm Ag +150	grams weight +150	ppm Au -150	ppm Ag -150	grams weight -150	ppm Au weight average	ppm Ag weight average
46-122-MERV-1 LBH	0.15	8.2	3.66	0.16	3.1	220	0.16	3.1
46-122-T11R86-1 HS	0.04	«1.6	6.28	0.01	0.7	210	0.01	0.7
46-122-TW8R-L1 BBH	4.17	49.4	3.44	1.47	337.0	255	1.51	333.2
~~46-122-TW8R-19 Pebble~~	~~2.88~~	~~12.4~~	~~8.09~~	~~1.08~~	~~19.2~~	~~225~~	~~1.14~~	~~18.9~~
46-122-T8SR86-18 BS	1.80	9.0	7.77	0.54	21.6	245	0.58	21.1
46-122-W8R86-4 Fine	0.44	5.5	9.06	0.60	17.8	220	0.59	17.4
46-122-W8S86-1 Granodiorite	0.04	«1.3	7.79	0.03	«0.3	210	0.03	«0.3

P. Bamber

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BONDAR-CLEGG

Geochemical Lab Report

REPORT: 016-2689 | PROJECT: 9 | PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Zn PPM	Pb PPM	As PPM
35 ~~H~~R86001		1400	1760	1800
35 ~~H~~R86002		210	844	824
35 ~~H~~R86003		960	845	>2000
35 ~~H~~R86004		240	93	166
35 ~~H~~R86005		112	39	47
42 ~~H~~86L151		98	97	480
11S86-153		310	169	131
11S86-154		6000	2490	>2000
11S86-157		230	3185	>2000
11S86-160		2500	1885	560
11S86-165		740	806	1000
11S86-167		310	80	174

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BONDAR-CLEGG

Certificate of Analysis

eport: 516-2124 Wedge B

July 3, 1986

lient: Prochem

Submitted by: J. Schneider

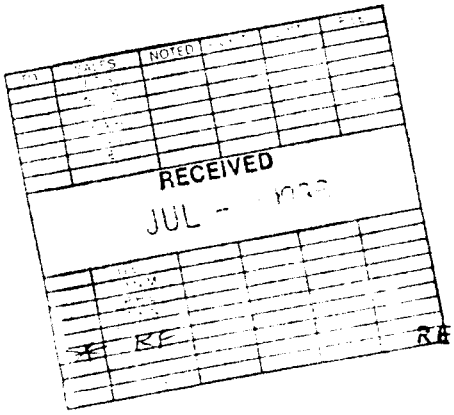
amples: W8	ppm Au +150	ppm Ag +150	grams weight +150	ppm Au -150	ppm Ag -150	grams weight -150	ppm Au weighted average	ppm Ag weighted average
W 8R-L1	4.78	48.6	6.17	1.55	330.1	257.4	1.63	323.5
BS86-1	«0.01	0.5	19.35	0.03	2.7	179.4	0.03	2.5

Repeats ? on Misc samples.

C. Taylor

CERTIFICATE OF ANALYSIS

TO: PROCHEM LIMITED
ATTN: KEN FAIR
8032 TORBRAM ROAD
BRAMPTON, ONTARIO
L6T 3T2



CUSTOMER NO. 615

DATE SUBMITTED
27-MAY-86

REPORT 28148

REF. FILE 23608-J3

2 PULPS

WERE ANALYSED AS FOLLOWS:

	METHOD	DETECTION LIMIT
AU OZ/TON	FA	0.001
B PPM	DCP	10.000
F PPM	WET	20.000
S %	XRF	0.010
CL PPM	XRF	50.000
MN PPM	DCP	2.000
FE %	XRF	0.010
NI PPM	DCP	1.000
CU PPM	DCP	0.500
ZN PPM	DCP	0.500
AS %	XRF	0.010
SE PPM	GFAA	0.100
AG OZ/TON	FA	0.100
SN PPM	XRF	2.000
TE PPM	GFAA	0.100
BA PPM	XRF	10.000
W PPM	XRF	3.000
HG PPB	WET	5.000
PB PPM	DCP	2.000

X-RAY ASSAY LABORATORIES LIMITED

DATE 24-JUN-86

CERTIFIED BY .....

SAMPLE	AU OZ/TON	B PPM	F PPM	S %	CL PPM
YVM-100 HD-1	0.034	<10	210	3.69	<50
YVM-100 HD-3	0.039	<10	190	3.61	<50

SAMPLE	AS %	SE PPM	AG OZ/TON	SN PPM	TE PPM
YVM-100 HD-1	1.48	0.2	TRACE	<2	<0.1
YVM-100 HD-3	1.57	0.4	0.41	<2	<0.1

1

X-RAY ASSAY LABORATORIES LIMITED

1885 LESLIE STREET, DON MILLS, ONTARIO M3B 3J4

PHONE 416-445-5755 TELEX 06-986947

CERTIFICATE OF ANALYSIS

TO: PROCHEM LIMITED
ATTN: KEN FAIR
8032 TORBRAM ROAD
BRAMPTON, ONTARIO
L6T 3T2

CUSTOMER NO. 615

DATE SUBMITTED
29-MAY-86

REPORT 28120

REF. FILE 23638-A1

1 PULP

WAS ANALYSED AS FOLLOWS:

	METHOD	DETECTION LIMIT
AU PPB	NA ✓	5.000
S %	WET	0.010
MN PPM	DCP	2.000
FE %	NA ✓	0.020
CU PPM	DCP	0.500
ZN PPM	NA ✓	50.000
AS PPM	NA ✓	2.000
AG PPM	DCP	0.500
WEIGHT GM	NA ✓	0.010

DATE 20-JUN-86

RECEIVED
JUN 2 1986
KF

X-RAY ASSAY LABORATORIES LIMITED

CERTIFIED BY .....

SAMPLE	AU PPB	S %	MN PPM	FE %	CU PPM
YVM-100-1-M1	260	1.13	NSS	59.4	NSS

NSS - NOT SUFFICIENT SAMPLE

SAMPLE	ZN PPM	AS PPM	AG PPM	WEIGHT GM
YVM-100-1-M1	710	3900	NSS	0.39

NSS - NOT SUFFICIENT SAMPLE

X-RAY ASSAY LABORATORIES LIMITED

1885 LESLIE STREET, DON MILLS, ONTARIO M3B 3J4

PHONE 416-445-5755 TELEX 06-986947

CERTIFICATE OF ANALYSIS

TO: PROCHEM LIMITED
ATTN: KEN FAIR
8032 TORBRAM ROAD
BRAMPTON, ONTARIO
L6T 3T2

CUSTOMER NO. 615

DATE SUBMITTED
2-JUN-86

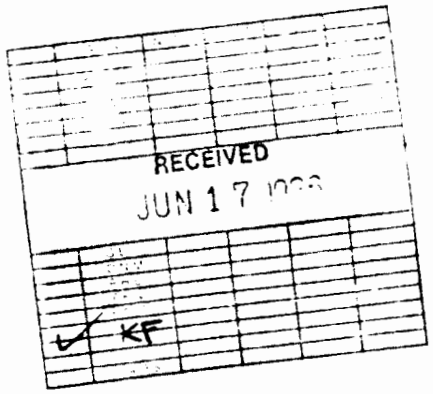
REPORT 28003

REF. FILE 23662-N3

3 C.PULPS

WERE ANALYSED AS FOLLOWS:

	METHOD	DETECTION LIMIT
AU OZ/TON	FA	0.001
S %	XRF	0.010
FE %	XRF	0.010
CU PPM	DCP	0.500
ZN PPM	DCP	0.500
AS %	XRF	0.010
AG OZ/TON	FA	0.100
PB PPM	DCP	2.000



X-RAY ASSAY LABORATORIES LIMITE

DATE 10-JUN-86

CERTIFIED BY .....

SAMPLE	AU OZ/TON	S %	FE %	CU PPM	
YVM-100/5C1	0.110	16.7	14.7	710.	x2
YVM-100/5C3	0.026	3.21	4.00	770.	x 2
YVM-100/5T	0.007	0.80	3.30	390.	x 1

SAMPLE	ZN PPM	AS %	AG OZ/TON	PB PPM	
YVM-100/5C1	>4000.	5.50	1.93	>4000	x2
YVM-100/5C3	>4000.	1.58	0.44	>4000	x2
YVM-100/5T	1100.	0.39	TRACE	1900	x1

> - CONCENTRATION TOO HIGH FOR TREATMENT BY GEOCHEMICAL METHOD

SAMPLE	BA PPM	W PPM	HG PPB	PB PPM
YVM-100 HD-1	80	3	140	>4000
YVM-100 HD-3	120	<3	120	>4000

> - CONCENTRATION TOO HIGH FOR TREATMENT BY GEOCHEMICAL METHOD

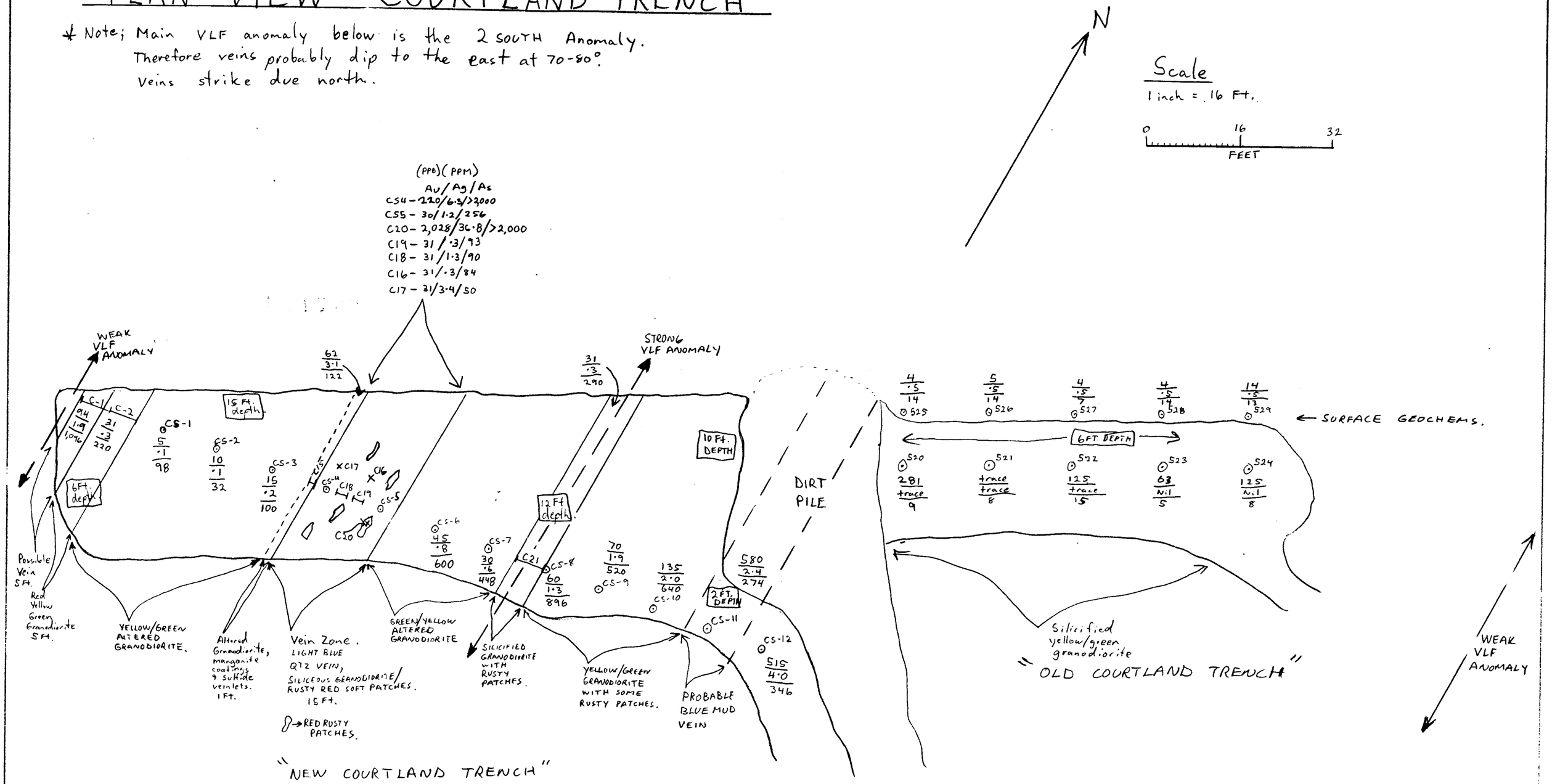
SAMPLE	MN PPM	FE %	NI PPM	CU PPM	ZN PPM
YVM-100 HD-1	>4000	5.92	4	230.	>4000.
YVM-100 HD-3	>4000	5.95	3	230.	>4000.

> - CONCENTRATION TOO HIGH FOR TREATMENT BY GEOCHEMICAL METHOD

SAMPLE	AS %	SE PPM	AG OZ/TON	SN PPM	TE PPM
YVM-100 HD-1	1.48	0.2	TRACE	<2	<0.1
YVM-100 HD-3	1.57	0.4	0.41	<2	<0.1

PLAN VIEW - COURTLAND TRENCH

* Note; Main VLF anomaly below is the 2 SOUTH Anomaly.
Therefore veins probably dip to the east at 70-80°.
Veins strike due north.



AURCHEM RESOURCES LTD.	
DISCOVERY CREEK CLAIMS	YUKON 115 I/3
OCT. 9, 1986.	BY M. LANGDON.

Discovery Creek Testwork Flowchart

Aurchem Resources Ltd.

By Hydrochem Development Limited

092153

VEIN MATERIAL 41.4 kg ESTIMATE ASSAY.

GRIND /36 BM WITTICK

64kg LOST

STORE 9.1kg.

GRAVITY-HOSE CONC.

WET MESH

GRAVITY TWO

710UC

425UC

300UC

212UC

150UC

BINOCULARSCOPE

Polish Section GC86-3

ASSAY GC86-3 .01471 kg

MIXER 30.34 73% Sol'd. BW

TAILS 30.34 kg.

GRAVITY-ONE SEPARATION 35 kg.

CONC.

ASSAY FF86-2 .170 kg

Flotation Feed #1 21.24kg 33% sol'd. bw

FEED

Flotation #1 PH = 10.5 21.07kg

CONC.

Ag/Pb/Zn/Sb Concentrate 3.58 kg

<65 MESH WEIGHT UNKNOWN

GRAVITY TWO TAILS 4.645 kgrams

rift.

ASSAY G86T-1 .02164 kg

GRAVITY-TWO TAILS 4.6239 kg.

ASSAY CF186-7 .02694 kg.

rift.

Cleaner Flotation #1 Concentrate .6567 kg.

CONC.

Cleaner Flotation #1 PH = 11.6

TAILS

Store CF186-7 .62976kg

Cleaner Flotation #1 TAILS 2.92 kg

rift.

ASSAY CF186-6 .0807 kg

2.84 kg

TAILS

ASSAY F286-5 .1125 kg

Slurry cut

Flotation #2 17.49kg PH = 7.5

3.45kg AU/PY/ASSY CONC.

TAILS

Flotation #3 14.04 kg

CONC

Store F3C86-10 .7283 kg

ASSAY F3C86-10 .04752 kg

TAILS 13.31kg

Slurry cut

ASSAY FT86-4 .20851 kg

Cyanide Leach 13.1 kg.

ASSAY FT86-4 (cyanide residue) .065 kg.

ASSAY FT86-4 Filtrate

LEACH TAILS Discarded

MIXER 63985 kg

FEED

Flotation #4 6.3985 kg.

CONC.

Au/Pyrite Concentrate 3.939 kg

rift.

Polish Section FCP86-8 .0111 kg

rift.

ASSAY FCP86-8 .07608 kg

STORE FCP86-8 3.8518 kg

Au/Arsenopyrite Concentrate 2.4595 kg.

rift

Polish Section FTA86-9 .0019 kg

rift

ASSAY FTA86-9 .0398 kg

Store FTA86-9 2.4178 kg.

NOV. 20, 1986.

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092152

Metallurgical Testwork

Material

A) Gravity and Flotation Work

Vein rock samples were gathered to form, a larger compiled sample for the metallurgical testing. Known and estimated assays were used to form a probable base for a head assay.

Rock #	Weight (lbs.)	Au (ppb)	Ag (ppm)	Au (lb. ppb)	Ag (lb. ppm)
FIR86-7A	11	5010	40	55,110	440
FIR86-9A	8.5	5260	12	43,395	99
W886-L57	17.5	9800	85.2	171,500	1,491
W886-L73	2.5	3840	8.4	9,600	21
W886-L63	5.5	5230	85.2	28,765	469
TW886-L1	10.25	1500	333	15,375	3,413
Total	55			323,745	5,933

A total of 36 lbs. of vein rock material was added to the above sample. Assays for this were estimated at Au .08 oz/t and Ag 2.0 oz/ton.

The feed material of 91 lbs. should assay as follows:

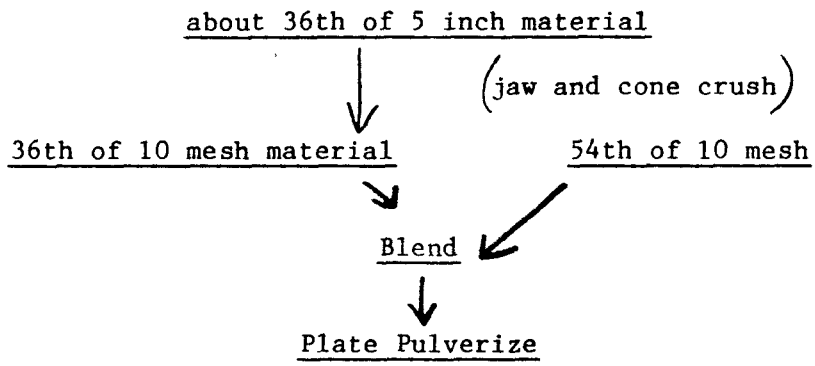
Au = .14 oz/ton
Ag = 2.7 oz/ton
Cu = .1%
Zn = .5%
Pb = 2.0%
Sulphides = 15-20% by volume (20-40% by weight)

B) Cyanide Heap Leach Sample

A 9 lb. sample of 10 mesh material was gathered from the above known assay samples to give: Au = .15 oz/ton, Ag = 2.8 oz/ton.

Material Preparation

The 91 lb. sample was sent to Witteck Development Inc. and prepared by plate pulverizing as follows:



There appeared to be some loss of material during processing and/or transport as when the material returned it weighed 77 lbs.

Material Sent	-	Material Returned	=	Material Lost
(91 lbs.)		(77 lbs.)		(14 lbs.)

Gravity Testwork

Goal

A) To separate the heavy mineral fraction and thus any large size "free gold" particles. Past work to date had indicated a free gold (+150 mesh) of 5-40% of total gold.

B) To access the heavy mineral fraction through the use of the binocularscope and to prepare a sample for polished section microscope work.

Set-up - Gravity-One

The gravity-one set-up is shown on "sketch II" in Appendix I.

The feed material of 77 lbs. formed a heavy mineral concentrate of 4,623.9 grams or 10.2 lbs.

Notes and observations on the gravity-one separation are in Appendix I.

The gravity-one concentrate was used as feed for the gravity-two process in the small column.

Gravity-Two Preparation

In order for the small column to function efficiently, the feed material must be of a common size. For this reason the 4,623.9 gram feed sample was wet meshed at:

Mesh	Size
#20	(850µC)
#24	(710µC)
#35	(425µC)
#48	(300µC)
#65	(212µC)

Each mesh size fraction was then individually run through the column. A description of the heavy concentrate of each size fraction is given in Appendix II.

The concentrates of the mesh sizes were then added together with the "hose" concentrate to give a 14.7 gram sample for total assay. (GC86-3)

The remainder of the gravity-one concentrate (or gravity-two tails) was dried and a rifted sample of 21.64 grams was taken for assay. (G86T-1)

The remaining 4,623.9 grams was added to the flotation feed.

A "selected grain" fraction was compiled during the binocularscope study of the "gravity-two" concentrate to produce a polished section for metallic mineral identification and possible gold association. See Appendix III under "Polished Section 1" for a description of selected minerals or grains.

Flotation

Goal

A number of flotations were done to gain a relative idea of concentrates that could be produced to determine their possible value. For example, are the zinc/lead/antimony contents sufficient or workable to make their presence important? and/or how much of the gold is directly related to the silver fraction? The flotations separated the material into basic fractions with the aim being to see which fractions or associations carried what amounts of gold. This would also give an idea of the refractory nature of the gold.

Flotation General

Table I shows the flotation procedure tests # 1 and #2, the reagents used, the pH maintained, etc., for flotations. Actual flotation notes are shown in Appendix VI. The general procedure followed was very close to one used on

General Procedure - Flotation #1 and #2

Table 1

Total Reagents	Preparation	Flotation #1 Conditioning & Flotation (A)	Flotation (B)	Flotation (C)	Flotation #2 Conditioning	Flotation (D)	Flotation (E)	Flotation (F)	Total Reagents
(lb/ton) amount									
Ca(OH) (pure)		(2.0) 22 gr							22 grams
H SO4 (10% b.w.)					(2.0) 211 ml				211 ml
CuSO4 .5H O (pure)		(.2) 2.2 gr			(.5) 5.5 gr				7.7 grams
Na Isobutyl (10%) (Xanthate)		(.04) 4.2 ml	(.04) 4.2 ml	(.04) 4.2 ml		(0.5) 5.25 ml	(.05) 5.25 ml	(0.5) 5.25 ml	28.35 ml
Aerofloat 25 (1%)								(.024) 26.5 gr	26.5 grams
MIBC (1%)		(.015) 16.6 ml	(.015) 16.6 ml						33.2 ml
TIME (minutes)	20 minutes	60 8		22	7	8	8	23	
pH	8.0	10.5 10.4		10.4	7.4	7.06	7.3	7.5	

Huestis and Webber material by Britton Research Limited in 1967 (submitted by Mount Nansen Mines Ltd.). We used their basic approach with some variations based on their results and your goals.

Flotation Reagents for #1 and #2

Calculations of the amounts of reagents used in the flotations #1 and #2 are contained in Appendix V.

These flotations basically separated the feed into three fractions:

1) A Ag/Pb/Zn/Sb concentrate fraction.
2) A gold - Fe - As sulphide/gange material tails
3) Tails

The feed material was taken as a cut of a mixture of the gravity-one and gravity-two tails (G86T-1) to make a slurry of 33% by weight.

A sample of the Flotation #1 feed material was taken for assay, (FF86-2) weighing 170 grams.

The procedure and calculations to form the Flotation #1 feed are shown in Appendix IV. The results show that 48.74 lbs. of dry solids were used for the flotation #1 material. The remaining 20.26 lbs was stored for possible future use. A 112.6 gram sample (F286-5) was taken from the flotation #2 concentrate for assay.

Flotation #3

Using the tails of Flotation-Two, a further "scavenger" flotation #3 was done. This flotation basically added sodium sulphide (Na_2S) to "coat" oxidized surfaces on the sulphides to give them greater floating capabilities. Through binocularscope work it was seen that a small percentage (<10%) of the sulphides had oxidized surfaces to some extent.

After flotation #3, a sample of the tails (FT86-4) of 208.51 grams was taken for assay. The remaining tails were used as feed material for the cyanide leach.

The concentrate formed in flotation #3 was 728.3 grams in weight and a sample was rifted for assay.

Cleaner Flotation #1

The Ag, Pb, Zn, Sb concentrate from Flotation #1 was used as the feed. The goal here was to re-float our concentrate at a higher Ph to "clean up" and make a richer concentrate. The pH was maintained between 11.6 and 11.9.

The resultant tails (CF186-6) and concentrate (CF186-7) were both assayed. The concentrate assay sample was rifted off and the remainder stored. The tails sample had a slurry cut taken and the remainder of CF186-6 was mixed with the Flotation 2 concentrate as feed for Flotation #4.

The data and comments of the Cleaner Flotation can been seen in Appendix VIII.

Flotation #4

This flotation was a basic separation of pyrite into the concentrate and arsenopyrite into the tails. It is believed that with the addition of potassium permanganate, the surfaces of the realgar and arsenopyrite are oxidized or coated with MnO . This causes them to be depressed (hyrophyllic) while the pyrite floats (hydrophobic).

The basic aim of this float was to see which direction the gold followed; the pyrite or the arsenopyrite fractions.

Notes and calculations on Flotation #4 are shown in Appendix VIV.

Cyanidation - Flotation #3 Tails

A further "scavenging" of the flotation tails for gold was carried out using a cyanide leach method. (See Kwasi Donyina for details.)

The cyanide/feed slurry was agitated for about 48 hours and then a sample of the solution and tails were taken. The total weight of the solids used were calculated from the pulp density and gave 10.12 kg. The tails assay sample FT86-4 (cyanide residue) weighed 65 grams. The bottle of solution was labeled FT86-4 (filtrate).

Experimental Procedure

Cyanide leaching was performed in a 24' x 12" x 12" tank for 48 hours. The pH of the slurry was adjusted to 10-11 with calcium hydroxide. Cyanide level was maintained at approximately 2 lb/t of solution.

6th Flotation; Yukon Vein Material (-100 Mesh)

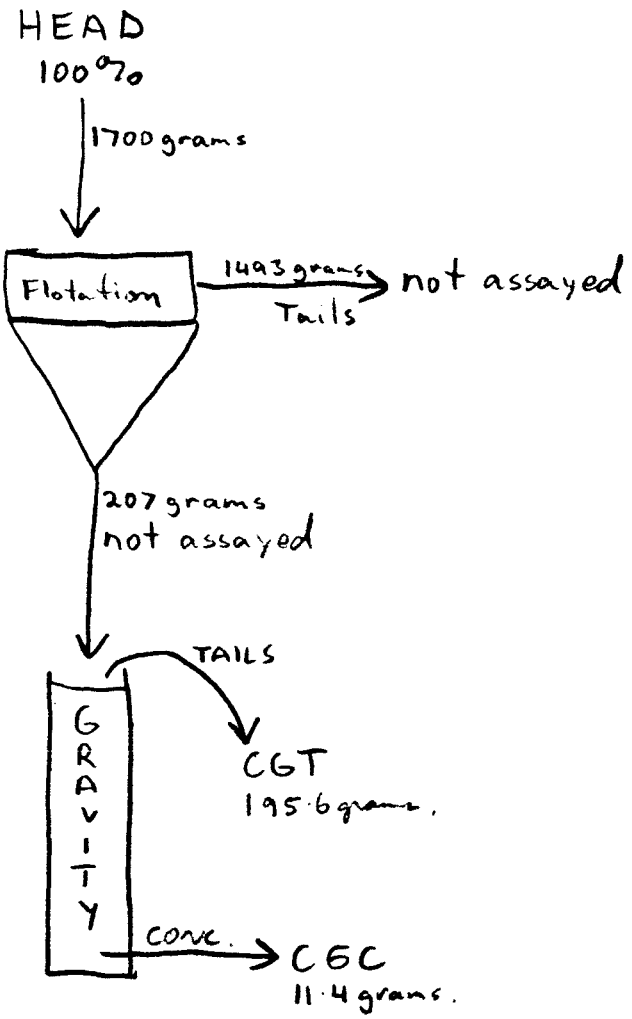
General

This flotation was done on the 1985 vein material and not the feed material used in the previous tests.

Goal

This was an attempt to isolate the carbon constituent by floating it into a concentrate. The flowchart is seen on the next page. No reagents were added in the flotation.

A gravity concentration was then done on the flotation concentrate to see which way the carbon would go.



6th Flotation Flow-Chart

-1985 vein feed used

Results - Cyanide Leach Test #1

1. Cyanidation of Tails

Flotation tailings FT86-4 were cyanided for 48 hours. Gold extraction varied between 70 and 75% and silver 60-70%. Sodium cyanide consumption was 7.9 lb/ton of dry solids and calcium hydroxide 0.89 lb/ton of dry solids.

(a) Into Cyanidation:

10, 120 grams of tails at 0.033 oz/ton Au and .7oz/ton Ag.
Au units = 333.96
Ag units = 7084

(b) Out of Cyanidation
10, 120 grams of 48 hr residue at .010 oz/ton Au and .28 oz/ton Ag.
Au units = 101.20
Ag units = 2833.6

42, 250 ml of 48 hr filtrate at .007 oz/ton Au and .15 oz/ton Ag.

Therefore total units out are;
Au = 396.95
Ag = 9365.5

(c) Recoveries

Au

% Au extraction: $\frac{295.75}{396.95} \times 100 = 74.5\%$

or $\frac{1 - .010}{.033} \times 100 = 69.7\%$

- Gold extraction of 70 - 75%

% silver extraction: $\frac{6531.9}{9365.1} \times 100 = 69.7\%$

or $\frac{(1 - .28)}{(\ .70\ )} \times 100 = 60\%$

- Silver extraction of 60 - 70%

(d) Reagent Consumption

NaCN: $\frac{40 \times 2000}{10120} = 7.9$ lb/ton dry solids

$Ca(OH)_2$: $\frac{4.52 \times 2000}{10120} = .89$ lb/ton dry solids

Discussion

The fairly high extraction for Au and Ag is very encouraging and reagent consumption is not bad. A test using CIP cyanidation on the original feed material before flotation should be carried out in view of these results.

For comparison's sake a similar test on ore from the McLaughlin Mine gave initial results of 5 - 80% recovery depending on the variety of ore. This was improved to 90% by adding sulphuric acid followed by high temperature/high pressure oxidation in autoclaves.

A crude conclusion from our testwork as a whole is that it is possible that in our test sample about 45% of the gold may occur as individual small grains or as electrum possibly associated with the galena fraction. A similar association was found at the McLaughlin Mine as gold occurred with Ag - Sb sulphosalts.

2) Gravity-One Results

(a) Concentrate - 4.645 kg assayed .28 oz/ton Au and 6 oz/ton Ag.
- This contained 35% of the gold in 13.7% of the total sample by weight.

The assays stated are from the gravity-one concentrate after the concentrate of gravity-two was removed. If we put the gravity-two concentrate back in we get;

Au - .304 oz/ton
Ag = 6.08 oz/ton
Ag/Au = 20.1

Discussion See Gravity-Two discussion

3) Gravity-Two Results

(a) Concentrate - this gravitational test was basically to get a "super-concentrate" for polish section and binocularscope studies of the heavy mineral fraction. This gave a .01471 kg concentrate assaying;

Au $\simeq$ 7.74 oz/ton
Ag = 31.02 oz/ton
(3% of total Au and .3% of total Ag)

Discussion

The results show that for this particular sample, a saleable product was not produced using a gravitational method. Only 3% of the total gold content was recovered in the gravity-two concentrate although 35% of the gold was in the feed or gravity-one concentrate.

An explanation for the results can be seen in the binocularscope study of the individual concentrates of the mesh fractions. Visible gold was found in the 100 - 400 micron size with the bulk being 250 microns or less. When the wet meshing was done for the gravity-two work, any particles of 212 microns or less were discarded into the tails of gravity-two. If we assume that all the gold in gravity-one concentrate was free gold, it means that we wet meshed 29% of the total gold back into the tails, the particles being all less than 212 microns.

For comparison, in the McLaughlin Mine, gold was found to be very fine grained and disseminated usually as electron averaging 20 microns in size.

Further evidence was seen in the 1985 material testwork (6th flotation) that showed the bulk of the gold in the 150 micron size fraction. This was the finest fraction used in that testwork.

Overall the work shows that it is possible that the rock sample may contain a very high content of free gold but as very fine particles. This accompanied by the relatively high content of larger sized sulphide material make a gravity separation of these fine gold particles almost impossible as they would float out in the tails before many of the sulphides.

4) Flotation #1 Results

Individual assays and distribution percents can be seen on the results chart.

The attempt here to form a Ag-Pb-Zn-Sb concentrate with no As was quite successful. While the concentrate contained 16.8% by weight of the total sample, it contained 77% of the silver, 53% of the Pb and 63% of the zinc. The antimony did not go into the concentrate which may indicate some oxidation of the Sb minerals. The unexpected surprise in this test was that 46% of the total gold also went into the concentrate indicating a possible high free gold content that is not associated with the arsenic as originally believed. The Pb and Zn recoveries were fair but could be improved. The pH used in this flotation of 10.5 is very close to the borderline for galena to float and is a little better, but not by much for sphalerite. By lowering the pH we would probably float much more of the Pb and Zn but would also risk the possibility of floating more of the As.

5) Cleaner Flotation #1 Results

A cleaning flotation of the concentrate from Flotation #1 was done in order to determine how good a concentrate could be formed and its possible commercial value if any. The flotation was both a success and a failure.

It was a failure in respect to the recovered percentage of the total amount of the minerals. This was probably due to two main reasons:

TEST & PRODUCT	Wt %	Assays Au oz/t	Assays Ag oz/t	Assays Pb %	Assays Zn %	Assays As %	Assays S6 %	Assays Cu %	Assays Total C %	Assays C (NOCO3) %	Distribution Au	Distribution Ag	Distribution Pb	Distribution Zn	Distribution As	Distribution Sb	Individual Distribution % Au	Ag	Pb	Zn	As	Sb	Wt. %
GRAVITY																							
Head Gravity	100	.109	4.16														100	100					100
Gravity-One Tails	86.66	.086	3.9														64.8	80.8					86.66
Gravity-Two Tails	13.3	.264	5.92														32.2	18.9					13.3
Gravity-Two Concentrate	.043	7.74	31.02														3.0	.3					.043
Gravity-One Concentrate	13.7	.28	6.00														35.2	19.2					
Head	100	.109	4.16								100.0	100.0					100	100					
Gravity Concentrate	.043	7.74	31.02								3.0	.3					3.0	.3					
Flotation #1 Feed	99.96	.125	4.34	3.04	1.17	1.98	.06		5.1	3.52	97.0	99.7	100	100	100	100	100	100	100	100	100	100	100
Flotation #1 Concentrate	16.8	.337	19.84	9.63	4.39	1.53	.13				44.1	76.8	53.4	63.2	13.0	36.5	45.5	77.0	53.4	63.2	13.0	36.5	16.8
Flotation #1 Tails	82.8	.082	1.17	1.72	.52	2.09	.05				52.4	22.1	46.6	36.6	86.9	68.6	54.0	22.2	46.6	36.6	86.9	68.6	82.8
Cleaner Flotation Feed	16.8	.337	19.84	9.63	4.39	1.53	.13				44.1	76.8	53.4	63.2	13.0	36.5	100	100	100	100	100	100	100
Cleaner Flotation #1 Tails	13.7	.242	13.95	7.60	2.12	1.73	.07				25.8	44.1	34.4	24.9	12.0	16.0	58.5	57.4	64.4	39.4	92.3	43.8	
Cleaner Flotation #1 Concentrate	3.1	.762	46.09	18.68	14.52	.67	.39	1.09			*18.3	32.7	12.3	38.4	1.0	20.1	41.5	42.6	23.0	60.8	7.7	55.1	18.5
Flotation #2 Feed	82.3	.082	1.17	1.72	.52	2.09	.050				52.4	22.1	46.6	36.6	86.9	68.6	100	100	100	100	100	100	100
Flotation #2 Concentrate	16.2	.310	6.88	3.80	2.44	5.82	.070				39.1	25.6	20.3	33.9	47.7	19.0	74.6	115.8	43.6	92.6	54.9	27.7	19.7
Flotation #2 Tails	66.1	.026	.85	1.21	.05	1.17	.045				13.31	12.9	26.3	2.8	39.1	49.6	25.4	58.4	56.4	7.7	45.0	72.3	80.3
Flotation #4 Feed	30.1	.266	8.79	4.90	2.16	4.40	.07				62.2	60.8	48.6	55.6	66.9	35.1	100	100	100	100	100	100	100
Flotation #4 Concentrate	18.5	.225	9.04	6.16	2.48	3.10	.07				*32.4	38.5	37.6	39.3	12.2	21.6	52.1	63.3	77.4	70.7	43.5	61.5	61.5
Flotation #4 Tails	11.6	.324	5.82	2.88	1.64	6.48	.07				*29.1	15.5	11.0	16.2	37.8	13.5	46.8	25.5	22.5	29.1	56.5	38.5	38.5
Flotation #3 Feed	66.1	.109	.85	1.21	.05	1.17	.045				55.9	12.9	26.3	2.8	39.1	49.6	100	100	100	100	100	100	100
Flotation #3 Concentrate	3.5	1.50	3.53	2.76	.32	3.62	.06				*39.9	2.8	3.1	0.9	6.3	3.4	71.4	21.7	11.8	32.1	16.1	6.9	5.3
Flotation #3 Tails	62.6	.033	.7	1.13	.04	1.04	.044		3.10	.27	16.1	10.1	23.3	2.1	32.9	46.0	28.8	78.3	88.6	75.0	84.1	92.7	
Total Recovered	21.7										122.7	89.8	64.0	94.8	57.3	58.6							
Cyanide Feed	62.6	.033	.7	1.13	.04	1.04	.044	3.10	3.10	.27	16.1	10.1	NaCn Consumption = 7.9 lb/t dry solids				100	100					62.6
Cyanide Residue	62.6	.010	.28								4.8	4.0	Ca(OH)2 Consumption = .89 lb/t dry solids				29.8	39.6					62.6
Cyanide Filtrate		.25ppm	9.3ppm														70-75	60-70%					

Note: A line under the assay indicates calculated assay

1) The flotation was not carried out long enough and only recovered 18.5% by weight of its feed material.

2) Once again their was a problem with the pH used as discussed in Flotation #1. In this cleaner flotation the pH was increased from the 10.5 used previously to a range of 11.6 -11.9. The reason for this increase in pH was to clean the concentrate of As by depressing it, but it also put Pb below the floatable range and Zn as a borderline case. This showed up as only 23% of the Pb and 61% of the Zn went into the concentrate. The Au showed only 42% recovery from the feed which may indicate that some of the gold (possibly free gold) is caught up in the galena and/or sphalerite.

To produce a concentrate as we have done, at the recoveries shown, it can be "crudely" estimated that it's value would be in the range of $30 - $35 per ton of ore at present day prices. Further Pb - Zn separations may also have to be done. From a ton of ore of similar grade we would get a 62 lb. concentrate at;

Au -- .762 oz/ton
Ag -- 46 oz/ton
Pb -- 18.5%
Zn -- 14.5%

With further tests, it can be calculated that the concentrate could be improved to getting a concentrate of 94 lbs at;

Au -- .78 oz/ton
Ag -- 66 oz/ton
Pb -- 32%
Zn -- 15%

Obviously if future geological work indicates the probability of an ore body, further flotation tests should be done.

6) Flotation #2 Results

The aim to produce a Au/pyrite/arsenopyrite concentrate met with mixed success. From the feed material it can be seen that a good percentage of the Au, Ag and Zn went into the concentrate but Pb, As and Sb showed poor recoveries. We ended up with a tails that contained, from the total feed, 13% of the gold and silver, 26% of the lead, 39% of the arsenic and 50% of the antinony. It was postulated that the poor recoveries were caused by the ore material being partially oxidized as seen in the binocularscope study, thus causing the sulphides to become depressed. During the testwork it could be seen that the tails contained a large amount of sulphides so Flotation #3 was set up to investigate this further.

7) Flotation #3 Results

This flotation was in effect a further "scavenging" of the material in an attempt to float the possibly oxidized metallics into a concentrate.

The results show that 71% of the gold was recovered in 5.3% by weight of the feed. The 1.5 oz/ton Au was the highest concentrate value of gold obtained in the flotations. All of the other constituents of Ag, Pb, Zn, As and Sb gave very poor recoveries. This indicates the possibility of the following:

1) The Au definitely did not follow the As or any of the other minerals in this flotation. The gold may be associated with pyrite but Fe was not assayed. The gold could also occur as free gold that had oxide (or possibly manganese oxide) coatings so that it did not float in earlier flotations.

In possible future flotation tests, it may be a better approach to add the Na_2S to the initial flotation (flotation #1). This may prove to give a much higher gold recovery in our initial Ag-Pb-Zn (Au) concentrate.

8) Flotation #4 Results

This flotation was aimed at separating the material into a pyrite rich concentrate and an arsenopyrite rich tails to determine which group the gold followed.

The results show inconclusive evidence. Although the tails/concentrate did assay As as 6.5%/3.1%, the difference in weight gave only 56.5% of total As of the feed in the tails. The gold assays of tails/concentrate were .324/.225 (oz/ton) which appears to make gold follow the As trend. Contrary to this the tails contained only 46.8% of the gold from the feed while it contained 56.5% of the As.

Petrographic Study

The petrographic study was sub-contracted out to Brent McInnes of McMaster University. The report can be seen in Appendix XI.

From the gravity sample (GC86-3) no gold was seen although a free gold particle was put in the sample. It is believed that the gold "ball" was smeared and broken during polished slide preparation and may have gotten smeared onto the polisher. From personal conversation with Mr. McInnes he stated that there was a lot of very fine particles of what he though may be gold but were too small for positive identification.

Some of the gangue minerals listed in the rough notes were quartz and/or other silicates, plagioclase feldspars, zircon, and barite. Most of these contained small inclusions of pyrite, galena and/or magnetic. One other gangue mineral which I though was present from the binocularscope study was flourite with chlorite and magnetite inclusions. Mr. McInnes identified this as a possible silicate or feldspar with magnetite inclusions. (Note: polished sections cannot properly identify transparent or translucent minerals such as flourite, quartz, feldsparr, etc.)

The two other slides of the flotation #4 pyrite concentrate and arsenopyrite tails also showed no gold although their assays indicate .225 and .324 oz/ton Au respectfully. This could be for a number of reasons such as (a) the gold was too fine to be seen, (b) the polished section fractions contained no gold or (c) the gold is as free gold particles which did not get on the polished slides.

A comparison of the point counting method for estimating the percentages of minerals and the assays show the following: (Note: assay in brackets)

(a) FCP86-8
pyrite = 84%
arsenopyrite = 3.9% (As = 3.1%)
galena = 4.5% [(pb = 6.16%) -- 8% galena]
sphalerite = 6.9% [(Zn = 2.5%) -- 5% sphalerite]
Chalcoprite = .4%
Other = .3%

(b) FCP86-9
pyrite = 57%
arsenopyrite = 28.1% (As = 1.04%)
galena = 3.5% [(Pb = 1.13%) -- 1.5% galena]
sphalerite = 4.1% [(Zn = .04%) -- .08% sphalerite]
chalcopyrite = .5%
other = 6.9%

The methods show a great difference in the results. This may be to; (a) unrepresentative samples in either the assay or polish section samples (b) in the point counting method only the larger particles are counted. The groundmass may have a preferred type of mineral changing the percentages. (c) in the point counting method many of the particles were found to be a mixture of minerals so the clast was counted as the dominant mineral present.

One major observation from the polished section report is that supergene activity was seen in the slides. Other companies working in the Mount Nansen area have found that this supergene zone may go 200-300 feet in depth and in this zone cyanidation tests show an improved recovery rate for gold varying from 60 - 90%.

Cyanide Leach Test #2 - Results

Based on the positive results from he first cyanide leach test on the flotation tails, a second test was set up using the original feed material.

Into Cyanidation

	Au	Ag
1293 grams of ore at .105 oz/ton Au	135.81	5807.4

Out of Cyanidation

31.4 g of 45 hr. carbon at 3.48 oz/ton Au	109.06	
40.9 oz/ton Ag		1281.8
31.04 g 115 hr. carbon at 0.12 oz/ton Au	3.72	
4.05 oz/ton Ag		127.7
30 g of 210 hr. at .089 oz/ton Au	2.67	
10.1 oz/ton Ag		303.0
1293.4 g of 210 hr. residue at .055 oz/ton Au	71.14	
2.43 oz/ton Ag		3143.0
TOTAL	186.59	4853.5

Gold Extraction

(a) 48 hours $\frac{109.06}{186.59} \times 100 = 58.4\%$

(b) 115 hours $\frac{112.78}{186.59} \times 100 = 60.4\%$

(c) 210 hours $\frac{115.45}{186.59} \times 100 = 61.9\%$

Silver Extraction

(a) 48 hours $\frac{1281.8}{4853.5} \times 100 = 26.4\%$

(b) 115 hours $\frac{1407.5}{4853.5} \times 100 = 29.0\%$

(c) 210 hours $\frac{1710.5}{4853.5} \times 100 = 35.2\%$

Discussion

Gold extraction was fairly good at 61.9% which still indicates that 50% of the gold may be as fine free gold particles. The 40% Au not recovered may be

refractory gold that went into the arsenopyrite/pyrite concentrate of flotation #2.

The silver recovery at 35% was poor. Our flotation #1 concentrate extracted 77% of the silver with very little arsenic. The silver is believed to be associated mainly with the galena. The poor silver recovery in the cyanidation may be the result of lack of oxygen due to O_2 competition by the cyanide consumers. A pre-oxidation of the feed may bring the silver recovery up (possibly to 70%) so; further testwork is needed.

The graph on the next page shows the cyanide ~~and lime~~ consumption of the test. Consumption ~~of both~~ is quite high. A pre-oxidation of the feed would probably also lower this consumption.

6th Flotation Results

In other reports on the Mount Nansen area, it has been suggested that the gold may be associated with the carbon in the veins. Assays on Aurchem's vein material have shown organic carbon values (carbonate not included) of up to 3%. The purpose of this flotation was to see; (a) if carbon could be concentrated; (b) if the gold followed the carbon; and (c) to see how carbon reacts to a gravity test.

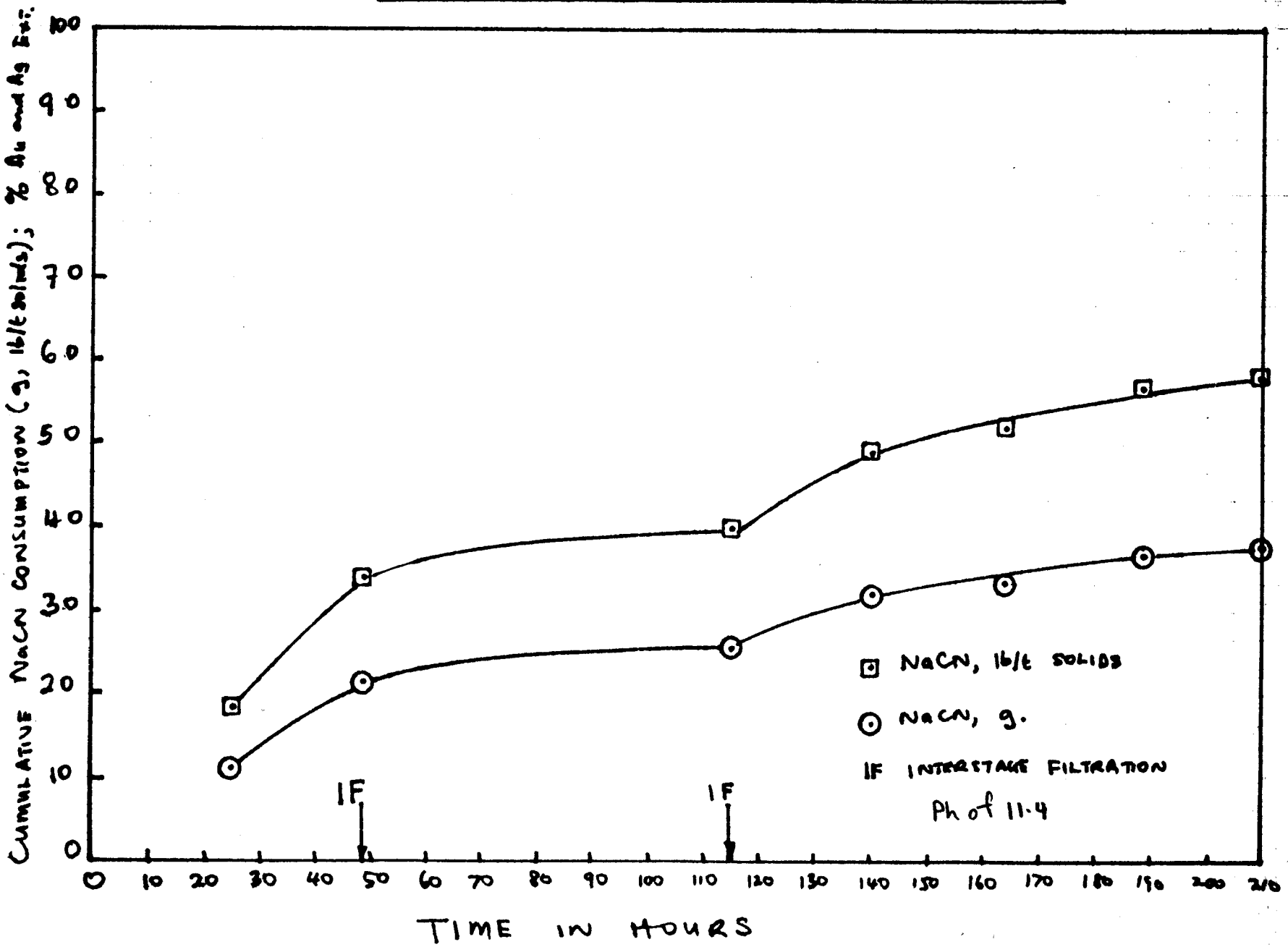
The results chart shows that the organic carbon did go into the concentrate but that the gold did not follow. This shows that the gold is not directly tied to the carbon but the presence of organic carbon may still indicate the presence of gold.

The gravity test shows a slight concentration of organic carbon in the concentrate but again not in proportion to the gold content.

The results show on the next page inconclusive evidence but generally indicate that for recovery processes, the gold-carbon relationship may not be important. The carbon content may show up as a factor in the cyanide leach tests as the carbon may grab gold and silver out of solution.

DEC 22, 1986

YUKON 2: GOLD AND SILVER EXTRACTION, CYANIDE CONSUMPTION AS FUNCTION OF TIME.



6th Flotation Results

Assay

Sample #	Weight (gr)	Au oz/ton	Total C %	CO %	C %	Ag oz/ton
6-CGC	11.4	.140	5.58	25.3	.52	5.36
6-CGT	195.6	.026	7.45	35.9	.27	2.38
HEAD	54.7	-----	7.47	36.8	.11	----

Head sample assays Au -- .037 oz/ton
Ag -- .31 oz/ton

Stream	Weight (gr)	% b.w.	Au oz/t	Total C %	CO %	C %	Ag oz/t	Au %	Total C %	CO %	C %	Ag %
Head	1700	100	.037	7.47	36.8	.11	.31	100	100	100	100	100
6-Flot Ft-Tails	149.0	87.8	.037	7.49	37.0	.09		87.8	88	71.8	67.9	0.0
6-Flot FC Conc.	207.0	12.8	.032	7.35	35.3	.29	2.54	10.5	12	11.7	32.1	100
6-CGC	11.4	0.67	.140	5.58	25.3	.52	5.36	2.5	.5	.5	3.1	11.6
6-CGT	195.6	11.5	.026	7.45	35.9	.27	2.38	8.0	11.5	11.2	28.2	88.5

From the Gravity Test

The 6th flotation put 32.1% of the total C in the concentrate. This used as feed for the gravity test gave 90.35% of C in the concentrate and 9.65% C in the tails.

Appendix I

Notes and Observations on Gravity-One (Large Column)

The feed slurry was agitated and pumped the into column via value 3 when the column was full of water and agitator was on slow speed. The very fines floated off as tails during the material filling process.

Phase 1

In this case the water feed was varied and the agitator motor speed was kept constant at 62.

(a) Water rate (slow = 1.4 1/min or .16 ft/min in column
- Water entered via valves 3 and 2 (not on full).
- Only the very fines were coming off as quartz and calcite (no sulphides).

(b) Water rate (fast) = 4.7 1/min
- Water entered via valves 1 and 2 (not at full water pressure).
- Material coming off contained 2% sulphides mostly as sulphides within quartz (still fine material).

(c) Water rate (full) = 82.5 1/min.
- Water entered at full pressure via valves 1, 2 and 3.
- Coarser material coming off with 8% sulphides.

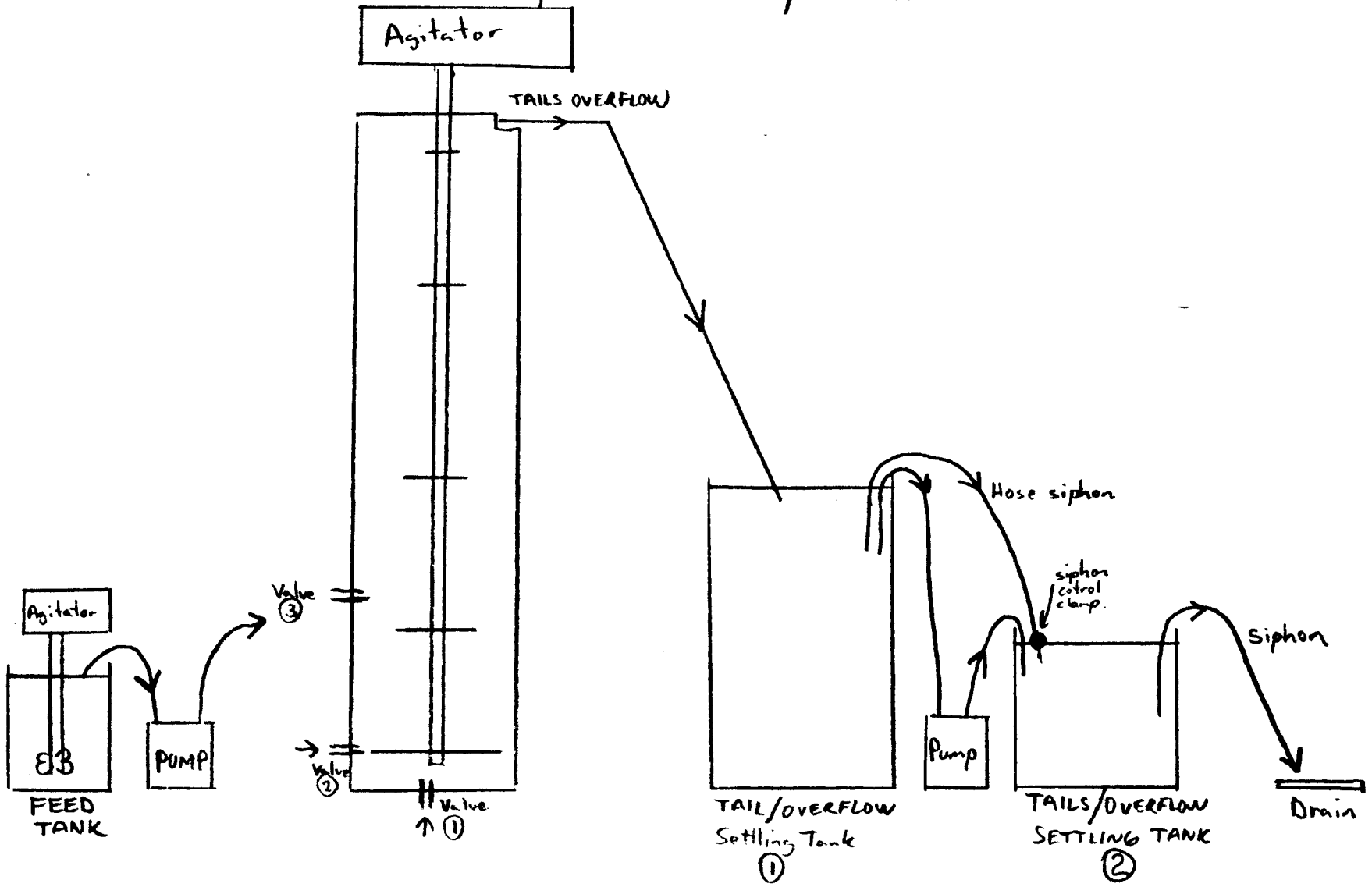
Phase 2

In this case the water rate was kept constant and the agitator motor speed was varied. (Water rate at 82.5 1/min through valves 1, 2 and 3 at full water pressure.)

Agitator Motor Speed	Float Lithology		Particle Size	
	Sulphides	Qtz/Calcite	Sulphides	Qtz/Calcite
22	2%	98%	350-400UC	450UC
42	8%	92%	400UC	500UC
45	10%	90%	350UC	600UC
54	20%	80%	400UC	450UC

Note: Sulphides were mostly as quartz with sulphide particles and not solid sulphides.

Sketch II - Gravity-One Setup



Important

An important observation from the process is that during pumping of the feed into the tank a very good gravity separation or pseudo-panning of the feed was made by the pump and hose. The pulsing pump feed through the elevated hose produced a concentrate in the hose of the coarsest material which contained the bulk of the visible gold. This should be remembered during future tests.

About 30% of our "hose" sample was lost before we realized its significance and presence.

Other Notes

During flotation the sulphides were concentrated in the lower parts of the column increasing in percentage and size down the tank. The "gange" (qtz/calcite) material showed a decrease in size up the column and also a greater degree of roundness.

During high agitation and full 3 valve water rate the coarse sulphides on the bottom of the column showed a "dancing sulphide" fraction. At lower water rates this fraction settled to the bottom

Appendix II

Description of Gravity-Two and Hose Sample Concentrates

- Total of all samples combine to form sample GC86-3

Screen Mesh	Size (UC)	% Sulphides	% qtz/calcite	Composition Sulphides	Visible Gold	Other Comments
65 mesh	212-300	98%	2%	60% galena 20% marcasite 10% pyrite 8% Aspy. <1% pyrrhotite	6	<2% brassy coatings or oxidized surfaces
48 mesh	300-425	97%	3%	50% galena 23% marcasite 15% pyrite 10% Aspy <1% pyrrhotite	1	3% have oxidized coatings. 2% of marcasite have brassy-yellow coatings.
35 mesh	425-710	97%	3%	50% galena 25% marcasite 15% pyrite 7% Aspy	none seen	small oxidized stains on 40% of Fe sulphides 1-2% brassy-yellow marcasite.
24 mesh	710-850	75%	25% galena & pyrite in qtz clast.	8% galena 20% marcasite 40% pyrite 3% Aspy *4% Sphalerite	none seen	50% of Fe sulphides have minor oxidized patches. No brassy-yellow marcasite.
20 mesh	>850	11%	89% 60% qtz. 20% sil. calcite 8% flourite 1% other	2% (galena & sphalerite & Aspy) 6% pyrite 2% pyrrhotite 1% malachite (tuberous)	none seen	flourite has pyrrhotite and/or magnetite in it.
Hose Conc.	Largest size	>99%	1%	45% galena 22% marcasite 18% pyrite 10% Aspy 5% pyrrhotite	6-15 (100-400 UC size)	50% of Fe sulphides gave oxidized patches. 25% of marcasite have brassy-yellow surfaces

Note: In all above cases the galena was the finer fraction.

Appendix III - Polished Sections

1) Selected Particles for Polished Section #1

a) From hose sample
- 3 samples of rusty coated pyrrhotite, magnetic, black and rusty coatings, silvery white inside, irregular shapes, 1 tubular, tarnishes to a deep blue colour, form small round balls also, 1 large sample 3/4 cm across.

b) From hose sample
- possibly a silver alloy, 1 good cleavage, silvery colour with minor oxide coating, brittle, platy cleavage.

c) From hose sample
- a steel grey metallic, no oxides, dull lustre, possible arsenopyrite, two samples.

d) From hose sample
- 2 samples chalcopyrite, brassy yellow colour.

e) From hose sample
- 2 samples, tetrahedrons, silver grey colour, 1 good cleavage and two poor, marcasite or arsenopyrite.

f) From hose sample
- 2 samples, pyritic agglomerations, dull pyritic colour.

g) From hose sample
- 2 samples of cubic galena.

h) From hose sample
- 2 samples, silvery-white colour, choncoidal fracture, probably marcasite.

i) From hose sample
- 2 samples, quartz with pyrite and galena within.

j) From hose sample
- 2 sample, quartz with pyrite agglomeration with a platy sheared surface.

k) From hose sample
- 1 sample, native gold, ball shaped.

l) From the 850 UC sample
- 3 samples, mixture of quartz and sulphides.

m) From the 850 UC sample
- 2 samples, cloudy white/green material not metallic, magnetic probably flourite with chlorite and magnetite (or pyrrhotite), minor sulphides within.

n) From the 850 UC sample
- 1 sample, purplish/pink mineral with minor disseminaqted sulphides within, rhodachrosite??

o) From the 850 UC sample
- 1 sample, possibly a piece of organic carbon, could be a piece of rubber hose, gas bubbles thoughout, black colour, spongy appearance, elastic and very soft, bounces back to shape.

p) From the 850 UC sample
- 1 sample, silvery white or tin white colour, magnetic strained appearance of curved cleavage, possibly strained pyrrhoitite.

r) From the 710 UC sample
1 sample, sphalerite with quartz and calcite, black-red colour.

s) From the 710 UC sample
- 1 sample, purplish/pink sphalerite with quartz.

t) From out of flotation air hose
- 1 sample, platy wire metallic, possible shaving of foreign material from a lathe, brassy coating, silvery white and/or transparent under brassy coating, magnetic, malleable, can be bent and squashed, unknown.

2) A 1.9 gram sample of FTA86-9 (Flotation #4 tails) was sent.

3) A 11.1 gram sample of FCP86-8 (Flotation #4 concentrate) was sent.

Appendix IV

Flotation #1 Feed - Pulp Density

The flotation was conducted in a 24' x 12" x 12" tank. Two samples from the holding tank were taken to determine the % solids by weight in order to be able to determine the amount of the slurry needed to form a 33% by weight slurry in the flotation tank.

(1) -124 ml of slurry
mass (wet) = 233.6 grams
mass (dry) = 170.6 grams
233.6 - 170.6 = 63 grams water.

$$\text{wt \% of } \frac{\text{solids}}{\text{slurry}} = \frac{170.6 \text{ grams}}{233.6 \text{ grams}} = 73\% \text{ by weight}$$

(2) -480 ml of slurry
mass (wet) = 932.9 grams
mass (dry) = 682.5 grams
932.9 - 682.5 = 250.4 grams of water

$$\text{wt \% of } \frac{\text{solids}}{\text{slurry}} = \frac{682.5 \text{ grams}}{932.9 \text{ grams}} = 73\% \text{ by weight}$$

Need dry gravity of solids;

a) Gravity-One Tails = 66.8 lbs _ 30 kg.
b) Gravity-Two Tails = 4.65 kg.
c) Density of galena = 7.6
d) Density of pyrite/arsenopyrite/qtz = 5.3
e) Observed material is 50% galena by volume.

$$\text{\% galena by weight in Gravity-Two Tails} = \frac{\%(e)C7.6}{\%(e)C7.6 + (1 - \%)\ C\ 5.3} = \frac{.5(7.6)}{.5(7.6) + 5(5.3)} = 59\%$$

Gravity of Gravity-Two Tails = % (galena) (7.6) + % (other) 5.3 = 59(7.9) + 41 (5.3) = 6.6

- assume gravity of Gravity-One tails = 2.7

$$\text{Dry Gravity of Mixture (Flot'n Feed)} = \left(\frac{30}{30+4.7}\right)(2.7) + \left(\frac{4.7}{30+4.7}\right)(6.6) = 3.2$$

- Calculation of Pulp Density at a dry density of 3.2 and a slurry of 73% solids by wei

$$C\text{slurry} = \frac{C\ dry}{\frac{\text{wt solids}}{\text{wt slurry}} + (1 - \frac{\text{wt solids}}{\text{wt slurry}})\ C\ dry} = \frac{3.2}{.73 + (1-.73)\ 3.2} = 2.0$$

* a check of Cslurry using the Marcey Density Scale gave 2.05
Slurry Gravity = Specific Gravity x density of water

= 2.0 x 62.4
= 125.3 lbs/ft

- Calculations of volume of slurry in holding tank;

Vol = πr^2 x height
= 3.14 x $(18")^2$ x 5.125 = 5213.97 cubic inches
- 5213.97 - 12^3 = .75 ft^3

wt of slurry = density x vol
= 125.3 x .75
= 94.56 lbs.

wt of dry solids in slurry = 94.56 x 73%
= 69 lbs.

- Calculation of Slurry to add to Flotation Tank to get 33% solids by weight.

Flotation tank = 24" x 12" x 12" (fill up to 22")

need (22" x 12" x 12") - 12^3 = 1.83 cu. ft. of material at 33% b.w.
Cd = 3.2 (preciously calculated)

$$Cslurry = \frac{Cd}{\% + (1-\%)Cd} = \frac{3.2}{.33 + .67\ (3.2)} = 1.29$$

wt of slurry = (sp. gr. x vol.) vol
= (1.29 x 62.4) 1.83 = 147.7 lbs

to get the weight of the dry solids to be added, we have;

$$\frac{\text{wt. dry solids}}{\text{wt. of slurry}} = 33\%$$

wt of dry solids needed in flotation tank = .33 x 147.7 = 48.74 lbs

must add; $\frac{\text{weight of solids needed}}{\% \text{ by weight of solids}}$ = 66.7 lbs of slurry

available at 73% C = 2.05 -- 127.9 lbs/cu ft.

66.7 lbs of slurry = $\frac{\text{wt of solids needed}}{\text{slurry gravity}}$

$$= \frac{66.7 \text{ lbs}}{125.3 \text{ lbs cu ft}} = .53 \text{ cu ft of slurry}$$

Vol = .53 cu ft -- = .53 x 28.3 1/ft = 14.7 1

14.7 litres of slurry were put into the flotation tank and topped up to 22 inches in height with water.

Appendix V

Calculations of Reagents for Flotations #1 and #2

All reagents were used at the same concentrations as in the "Britton Research Limited" report.

(a) H_2SO_4 (10% by weight)
- used at 2.0 lbs/ton = 2 -2000 = .001 (no units)

grams of reagent = .001 x 22.128 grams
= 22.13 grams

- but reagent (H_2SO_4) is at 10% by weight.

wt of acid sol'n $= \frac{22.13 \text{ grams}}{0.1} = 221$ grams of prepared acid

$C = \frac{1.84 \text{ (pure)}}{.1 + (.a)\ 1.84} = 1.0478$ kg/l

Vol acid $= \frac{\text{mass of acid}}{\text{density of acid}} = \frac{.221}{1.0478} = .211$ l or 211 ml

(b) Lime Ca(OH) (pure)
- used at 2.0 lbs/ton
same as in (a) = 22.13 grams

Note; the lime was added as needed to maintain the required pH of each flotation.

(c) CuSO4 $.5H_2O$ (pure)
- used at .2 lbs/ton and .1bs/ton
- as in above -- 22.13 grams for 2.0 lb/ton
.21bs/ton - 22.13 - 10 = 2.213 grams pure $CuSO_4.5H_2O$.
- for .5 lbs/ton;
2.213 grams x $\frac{.5}{.2}$ = 5.53 grams

(d) Na Isobutyl (10% by weight)
- used at .04 lbs/ton and .05 lbs/ton.
.04 lbs/ton = .04 - 2000 = 2 x 10^{-5} (no units)
wt needed = (2 x 10^{-5}) x 22,128 = .44 grams
- assume C = 1.05 kg/l
- solution is 10% by weight
Vol needed $= \frac{\text{Mass}}{\text{Density}} = \frac{.44}{1.05 \times 10^{-3}} = 4.2$ ml
for 0.5 lbs/ton;
$\frac{.04}{4.2} = \frac{.05}{x}$ x = 5.25 ml

(e) MIBC (1%)
- used at .015 lbs/ton
.015 lbs/ton = .015 - 2000 = 7.5×10^{-6} (no units)
wt of = reagent (7.5×10^{-6}) 22, 128 = .166 grams of 100%
But the solids are at 10%, not 100%
We need 100 times the amount or 16.6 grams solution at 1%

(f) Aerofloat 25 (1%)
- need .025 lbs/ton
- assume C = 1 kg/1
.024 lbs/ton - .024 - 2000 = 1.2×10^{-5} (no units)
Grams of reagent needed = $1.2 \times 10^{-5} \times 22{,}128$ = .2655 grams at 100%
But our reagent is at 1%, not 100%
Grams of reagent needed = 100 x .2655 = 26.55 grams at 1%

wt of solids = 48.74 lbs
Pulp Density = 33%
Tank = 12" x 12" x 24"
Settings; Agitator Motor - 100
Air - 25 gf%

$Ca(OH)_2$ = pure
H_2SO_4 = 10% b.w.
$CuSO_4 .5H_2O$ = pure
Na Isobutyl = 10% b.w.
Aerofloat = 1% b.w.
M.I.B.C. = 1% b.w.

Time	RPM	PH	% Air	Comments	Ca(OH)	H_2SO_4	$CuSO_4.5H_2O$	Na Isobutyl	Aerofloat 25	MIBC
(FI)										
10:40	80	7.9	5	Agitating Solution						
11:30	100	8.0	25							
11.31	100	8.0	25							3 ml
										3 ml
				- realgar coming off in float						3 ml 16.6 ml
										3 ml
										3 ml
11:32										1.6 ml
(FIA)										
11:39	100	10.4	25	- add lime for pH of 10.4 (froth thickened was added).	13.2					
11:42		10.7		- added lime	2.8					
11:45				- added $CuSO_4 .5H_2O$			2.26			
11:47		10.6		- added Ca(OH)	2.5					
11:48		10.5		- froth loaded				4.2		
(FIB)										
11:53		10.5		- overflow looks like galena	1.5			4.2		16.6
11:55	100		25	- good overflow						
(FIC)										
12:00		9.9		- added xanthate which				4.2		
12:05		10.2		- added 1500 ml water						
12:09				- added 1500 ml water						
12:10		10.06								
12:12		10.47		- added lime increased frothing	1.7 gr.					
12:17		10.43		- lime thickened froth	1.0 gr.					
(F2)		9.2								
12:22		8.8		- add acid		211 ml	5.59 gr			
12:24				- add 1200 ml of water						
12:26		7.6					5.5 gr			
12:28		7.2		- add acid for lower pH		50 ml				

Time	RPM	PH	% Air	Comments	Ca(OH)	H2SO4	CuSO4.5H2O	NaIsobuityl	Aerofloat 25	MIBC
(F2D)										
12:29		7.1					31 ml	5.25 ml		
12:30		7.06					31 ml	5.25 ml		
12:32				- froth overflowing						
(F2E)										
12:37	100	7.45	25	- added 1500 ml water				5.25 ml		
12:38		7.1		- added acid		35 ml				
(F2F)										
12:45		7.43		- added 750 ml water - much smaller bubbles				5.25 ml	26.66 ml	
12:50		7.58		- added 1900 ml water						
12:58		7.64	20	- added 750 ml water - slurry turning very light coloured						
12:59				- stopped flotation						
TOTAL REAGENTS USED				9,100 ml water	22.7 gr	327ml	13.35 gr	28.35 ml	26.55 ml	33.2 ml

Flotation # 3

Tank = 12" x 12" x 24"
Agitator Motor = 100
Air = 25 gf %
Feed = tails of Flotation #2

N Isobutyl (10% b.w.)
MIBC (1% b.w.)
Na_2S (60% b.w.) -- mixed 10 grams in 335 ml water
$Ca(OH)_2$ (pure)

Time	RPM	PH	% Air	Comments	Ca(OH)2	Na2S	Na Isobutyl	M.I.B.C.
1:08	100	7.71	25					
1:10		9.06		Added Na_2S	2.5 grams	200 ml		
1:13		9.9		Added Na_2S		135 ml		
1:14				Added other reagents			1 ml	1 ml
1:16							3 ml	3 ml
1:18		9.4						
1:21		9.35		Added 200 ml water				
1:29				Added 200 ml water				
1:35		9:15		Stopped Flotation				
TOTAL REAGENTS USED				4000 ml water	2.5 grams	335 ml or 10 grams of 60% b.w.	4 ml	4 ml

Note: Remaining slurry was 22" in height

Tank = 12" x 12" x 24" lbs
Agitator Motor = 75
Air = 25 gf %

$Ca(OH)_2$ = pure
Feed - Flotation #1 concentrate (Ag, Pb, Zn, Sb)
pH = 11.6 to 11.9

Time	RPM	PH	% Air	Comments	Lime ($Ca(OH)_2$)	
4:03	75	9.04	25	Thin froth		
4:06	75	11.6	25		1.4 grams	
4:10		11.9			1.3 grams	realgar and stibnite were seen in the Cleaner Flotation
4:17	75	11.76	7.5	Thick Froth		tails under the binocularscope
4:22				Overflow started		
4:24	75	11:68	10			
4:28	75	11:58	6			
4:31		11:46				
4:32		11.8			.9 grams	
4:39		11.6		Overflow stopped		
TOTAL REAGENTS USED				Water continually supplied from tap.	3.6 grams	

Calculation of Weight of Cleaner Flotation Tails

From the tails a slurry cut was taken for assay sample CF186-6. From this cut the total weight the total weight of the tails can be calculated. The tails were then mixed with the Flotation #2 concentrate to be used as feed for Flotation #4.

Knowns;

- slurry cut weighed 302.4 grams wet
- dry weight of cut = 80.7 grams
- volume of cut = 225 ml
- 1 litre = .03531 cu. ft.
- volume of slurry holding tank = 11 3/4" diameter x 1" depth.

Volume of slurry = depth x ¶r
= 1" x 3.14 $(5.875)^2$
= 108.4 cu inches or .061 cu ft

Total volume of slurry = .061 cu ft + 5 litres + 2000 ml
= .061 + .1765 + .071
= .309 cu ft -- .309 - .03531 = 8.75 1

$$C_{\text{of slurry}} = \frac{C_{dry}}{\frac{\text{wt solids}}{\text{wt slurry}} + \left(1 - \frac{\text{wt solids}}{\text{wt slurry}}\right) C_{dry}}$$

$$= \frac{4}{.267 + (1 - .267)\ 4} = 1.25 \text{ kg/l}$$

Mass of slurry = Density x Volume
= 1.25 x 8.75
= 10.94 kg

$$\text{Wt of dry solids} = \text{wt of slurry} \times \frac{\text{wt of solids sample}}{\text{wt of slurry sample}}$$

$$= 10.94 \times \frac{80.7}{302.4} = 2.92 \text{ kg}$$

- Cleaner Flotation Tails are 2.92 kg in weight
  2920 - 80.7 = 2.84 kg added to flotation #4 slurry

Appendix VIV

Flotation #4 Calculations and Data

To form a slurry for this flotation the estimated weight of the dry solids for the feed was required. The feed is coming from (a) Flotation #2 concentrate (b) Cleaner Flotation #1 tails.

From Appendix VIII we can get that (b) = 2.84kg dry solids.
Need weight of (a)

Known;

Volume of Flotation #2 concentrate holding tank = 4.75" x 11.75 dia.
slurry sample = 312.8 grams wet
slurry sample = 112.6 grams dry
assumed C dry = 4

Volume of slurry (a) = ¶R x depth
= 3.14 x 5.875 x 4.75
= 513.925 cu inches
= .2974 cu ft -- - .03531 = 8.42 liters

$$\text{C kg/l (of slurry)} = \frac{\text{C dry}}{\frac{\text{wt solids}}{\text{wt slurry}} + \left(1 - \frac{\text{wt solids}}{\text{wt slurry}}\right) \text{C dry}}$$

$$= \frac{4}{\frac{112.6}{312.8} + \left(1 - \frac{112.6}{312.8}\right) 4} = 1.37 \text{ kg/l}$$

Mass of slurry = Density x Volume
= 1.37 x 8.42
= 4.15 kg

$$\text{Mass of solids} = \text{Mass of slurry} \times \frac{\text{wt of solids}}{\text{wt of slurry}}$$

Total solids = solids (a) + solids (b)
= 2.84 + 1.5
= 4.64 kg

This total weight of solids was needed in order to determine the amount of the reagents needed for the flotation #4.

*Note: In calculating the total solids weight before the flotation, a mathematical error was made which gave the total solids a weight of 7.07 kg rather than the 4.64 kg shown above. The reagents for the test were calculated using the 7.07 kg. After flotation #4 was completed, the tails and concentrate (see later) were dried and weighed so the true weight is known after the fact. The true weight is 6.399 kg. Therefore the 7.07 kg weight was the better value to be used in the calculations for of the reagents. A 10% oversupply of reagents was therefore used.

Calculation of Reagents (Using 7.07 kg as wt of solids)

Pot. Permanganate = .36 grams/kg of solids (added dry)
Zanthate = .24 grams/kg of solids (mixed H_2O)
Dowthroth = .34 grams/kg of solids (mixed in H_2O)

Pot. Permanganate = 2.55 grams
Zanthate = 1.69 grams
Dowthroth = 2.40 grams

Flotation #4 Procedure

- the pH was kept at 8.0
- the agitator motor was set at 2500 rpm
- the slurry was 1" below lip of column

(a) agitated for 4 minutes
(b) air rated for 135 minutes (had problems of reagents of flotation #1 and #2 causing a flotation during this air rating period.)
(c) added 2.55 grams of kMn04 and waited 49 minutes.
(d) added 1.69 grams of Na Isobutyl (Xanthate) and 2.4 grams of Dowfroth and floated for 30 minutes.

Both the concentrate and tails were dried, weighed, and assay samples were rifted. Also a sample of each was sent for a polished section study.

	Total Weight	Assay wt	Polished Sect. wt
Aspy (tails) FTA86-9	2459.5 grams	39.8 grams	1.9 grams
Py (concentrate) FCP86-8	3939.0 grams	79.08 grams	11.1 grams

Appendix X

Assay Samples

GC86-3
- 14.71 grams
- total assay
- assay for Au, Ag, Pb
- small column gravity-two concentrate

G86T-1
- 21.64 grams
- rifted sample from gravity-one concentrate after gravity-two concentrate was removed (i.e. gravity-two tails)

FF86-2
- 170 gram (dry)
- sample of flotation #1 feed
- sample taken from agitated slurry

FT86-4
- 208.51 grams
- tails of flotation #3 (Cyanide Feed)
- sample cut from agitated slurry

CF186-6
- 80.7 grams dry
- tails of cleaner flotation of flotation #1 concentrate
- sample cut from agitated slurry

CF186-7
- 26.94 grams dry
- concentrate of cleaner flotation of flotation #1 concentrate

F286-5
- 112.6 grams dry
- sample of Flotation #2 concentrate
- sample cut from agitated slurry
- used as feed for Py/Aspy separation

FTA86-9
- arsenopytite tails of flotation #4
- 39.8 grams
- rift off dried sample

FCP86-8
- pyrite concentrate of flotation #4
- 76.08 grams
- rift off dried sample

FT86-4 (Cyanide residue)
- 65 grams
- tails from cyanide leach

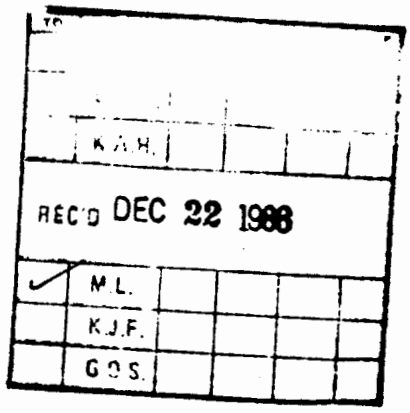
FT86-4
- bottle of solution
- taken from cyanide leach solution

F3C86-10
- 47.52 grams
- flotation #3 Concentrate
- rifted from dried solids

Appendix XI

PETROGRAPHIC STUDY OF PROCHEM SAMPLES

FCP 86-8, FTA 86-9 AND GC 86-3



December 18, 1986
Prepared by:
Brent McInnes

PURPOSE

The purpose of this study was to:

A) identify particles of free gold and associated minerals in order to establish the best gold recovery method
B) identify the metallic minerals and their relative percentages to assess the pyrite/arsenopyrite separation process
C) observe mineral intergrowths and textures in order to constrain the environment of precious metal deposition

METHOD

Samples FTA 86-9, FCP 86-8 and GC 86-3 were mounted on a glass slide and polished on one side to enable observation by reflected light microscopy. Two sections were made of FTA 86-9 and FCP 86-8 each to insure maximum sample use, and one of GC 86-3.

Modal percentage analysis was conducted using a grid system point counting scheme. Five hundred grains were counted on each slide, for a total of one thousand grains per sample. Statistically, this method has a probable error of less than 5%, and is quite effective in accurately estimating modal percentages of minerals.

During the point counting, notes were made and pictures taken of interesting mineral textures. Gold was carefully searched for at medium power (200X) and at high power (500X). It is possible to distinguish gold grains as small as 10 microns when in contact with another mineral and 25 microns when it occurs as singular grains. No gold grains were detected in any of the samples studied.

RESULTS

The following are the results of the point counting:

FCP 86-8 (Pyrite Concentrate)

	PYRITE	ARSENOPYRITE	GALENA	SPHALERITE	CPY	OTHER
FCP-8A	422	20	21	34	2	1
FCP-8B	418	19	24	35	2	2
TOTAL(%)	84.0	3.9	4.5	6.9	.4	.3

FTA 86-9 (Arsenopyrite Concentrate)

	PYRITE	ARSENOPYRITE	GALENA	SPHALERITE	CPY	OTHER
FTA-9A	275	143	17	16	3	46
FTA-9B	295	138	18	25	2	23
TOTAL(%)	57.0	28.1	3.5	4.1	.5	6.9

Marcasite was included with the pyrite during the point counting, however the modal abundance of marcasite does not exceed 1% in either sample. The category "OTHER" refers to non-metallic minerals, generally quartz and quartz-silicate (gangue) intergrowths, and Fe-oxides.

A total of 29 grains are present in GC 86-3. They are as follows:

GALENA	5
PYRITE	11
ARSENOPYRITE	4
GANGUE	6
SPHALERITE	1
FE-OXIDE	1
MAGNETITE	1

Rough notes made during identification are provided for your reference.

TEXTURES

Some of the common textures that occur in the samples have been photographed and appear in the following pages.

Pyrite and arsenopyrite are common constituents of all the samples. These minerals often appear fractured, some of which probably occurred during sample preparation, but other evidence such as subgraining and replacement along fractures suggest that some of the deformation may have been the result of faulting during ore emplacement. Pyrite and arsenopyrite are often intergrown and therefore obtaining pure separates of these minerals may be difficult (see photos 6, 7 and 8). Pyrite commonly contains inclusions of other minerals (see 1 & 2), generally galena, pyrrhotite and chalcopyrite, suggesting that all constituents were being precipitated simultaneously from solution.

Sphalerite occurs in both samples, often associated with galena or chalcopyrite. Internal reflections in sphalerite are reddish-brown (see 5), indicative of a Fe-rich variety commonly known as blackjack sphalerite. Some sphalerites have tiny blebs of chalcopyrite within them, a texture known as chalcopyrite disease. This phenomenon is an unmixing caused by the mineral separation of chalcopyrite from sphalerite at a lower temperature

high temperature Cu-Fe-Zn sulphide precursor precipitated at (see 3 &4).

Marcasite (see 5) often appears disaggregated and is preferentially replaced by Fe-oxides along parallel cleavage planes. Chalcopyrite also replaces marcasite.

The presence of amorphous Fe-oxides (goethite) and replacement rims of chalcocite and covellite auggist that the samples have been partially exposed to surface waters and are from a supergene zone of alteration.

All minerals were observed intergrown with each other, therefore they probably represent a coeval suite, with no late stage depositional event.

CONCLUSIONS

1. No particles of free gold were observed during the study. This is not uncommon and has frustrated many researchers working on precious metal systems. An alternative route to identify the presence of gold would be to retry the technique used in this study on a larger heavy mineral concentrate, or to use a scanning electron microscope equipped with an energy dispersive unit.

2. The pyrite separate FCP 86-8 contained 84% pyrite and 4% arsenopyrite. The arsenopyrite separate FTA 86-9 contained 57% pyrite and 28% arsenopyrite. As pyrite and arsenopyrite are commonly intergrown a relatively "pure" separate may not be possible unless the samples are crushed to a finer grain size.

3. Mineralogically, the deposit contains a mineral suite similar to many of the known gold deposits in the Dawson Range. Deformation textures are common, and are probably the result of tectonic disturbance during the mineralization event.

Photo 1. Large grain of pyrite (P) containing inclusions of brownish pyrrhotite (Po) and yellow chalcopyrite. Smaller grain below shows galena remobilized into fractures within pyrite. Field of view is approx. 1 mm wide.

Photo 2. Large grain consisting of pyrite, galena and sphalerite. Note inclusions of galena and sphalerite within pyrite suggesting coeval precipitation. The two lower flanking grains are galena. Field of view = .8 mm wide.

Photo 3. Sphalerite (S) and galena (G) intergrowth with small blebs of chalcopyrite within sphalerite. This texture is referred to as chalcopyrite disease. Small gray minerals within sphalerite are Fe-oxides. Field of view = .5mm wide.

Photo 4. Two grains of sphalerite, one with chalcopyrite disease, the other massive. Galena at top. Field of view = 1 mm.

Photo 5. Two grains of marcasite (M) with other grains of arsenopyrite (A), pyrite (P) and sphalerite (S). Marcasite has well developed parallel cleavage where surface water has penetrated and reacted to form amorphous Fe-oxides. Chalcopyrite has replaced the right hand marcasite grain before oxidation. Grain of sphalerite shows reddish-brown internal reflections indicating Fe- rich composition. Field of view = .8 mm wide.

PHOTOS 6-9 ARE FROM GCA 86-3

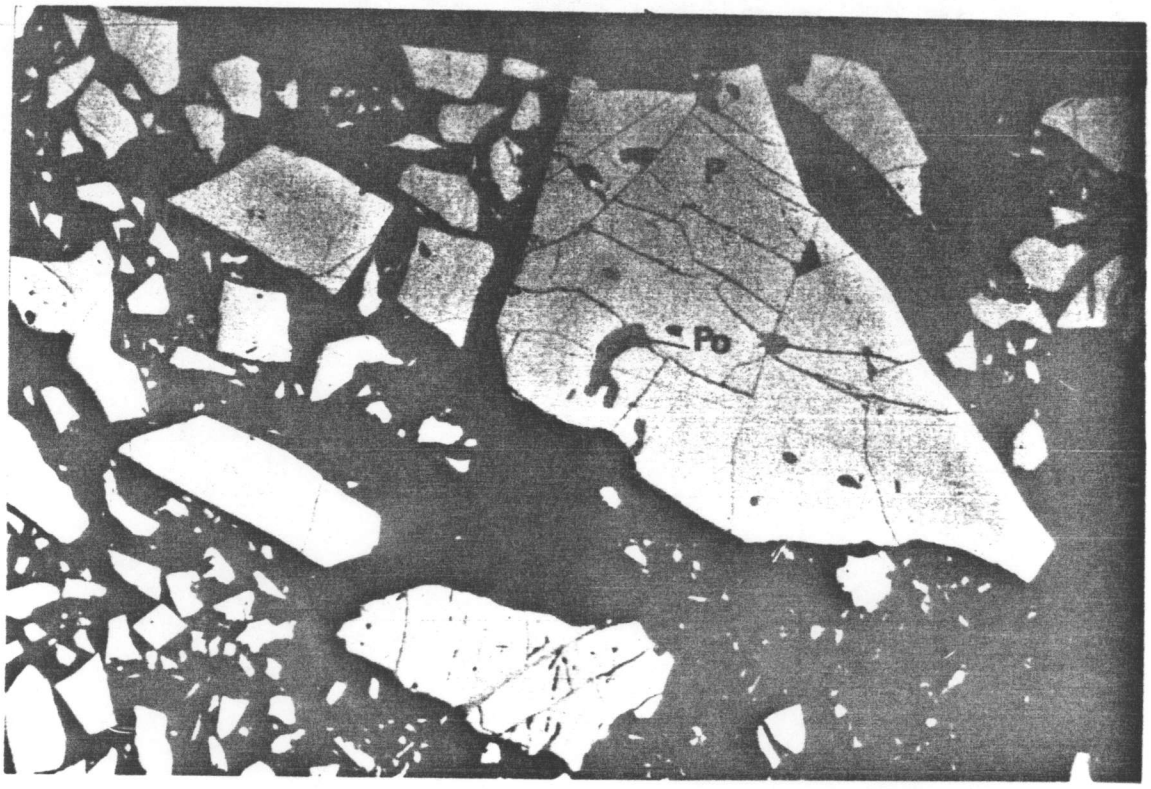
Photo 6. Fine grained aspy mass with occasional grain of yellow pyrite. Grain is 0.7 mm long.

Photo 7. Arsenopyrite - pyrite intergrowth. The three grains are 1.2 mm by 0.7 mm long.

Photo 8. Aggregate of arsenopyrite, pyrite and quartz showing well developed crystal faces indicative of growth in free space. Grain to left consists of silicate minerals intergrown with magnetite (M). Dimensions of grain are .8 mm X .6 mm.

Photo 9. A very fine grained assemblage of pyrite with about 10 % arsenopyrite. Grain dimensions = 1.5 mm X .8 mm, ave. gn. size =

1



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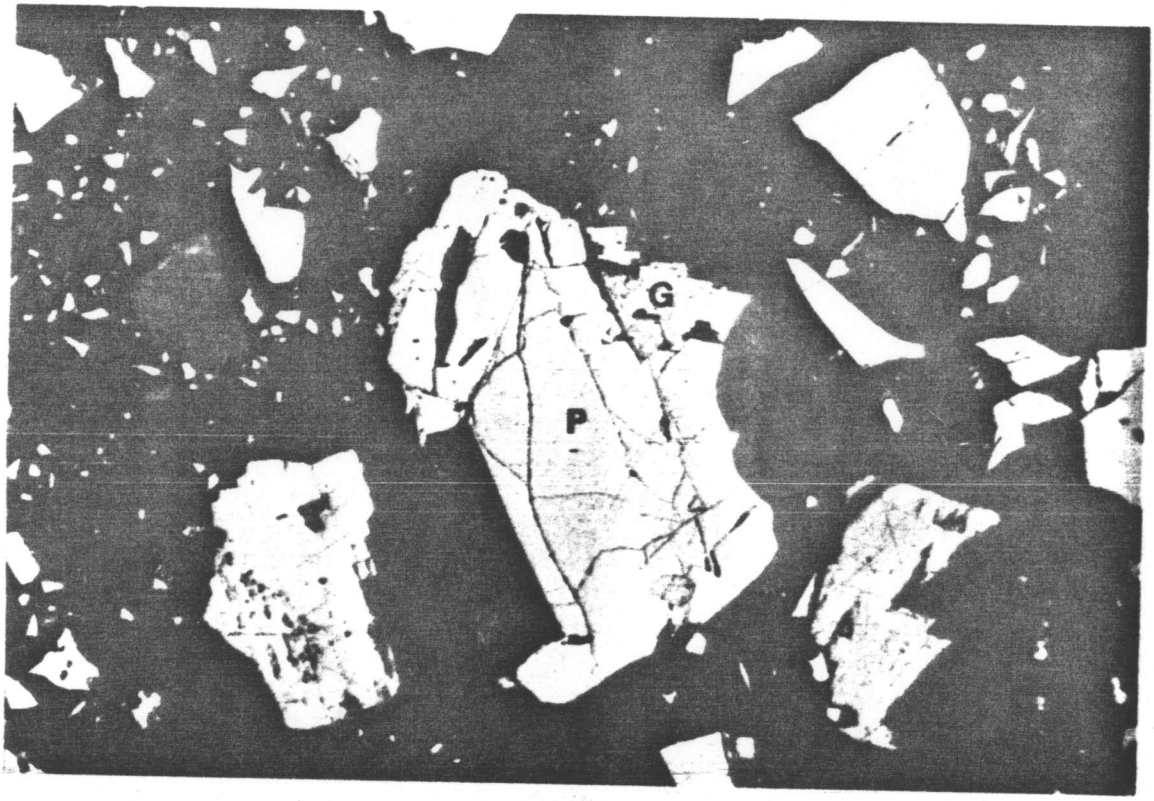

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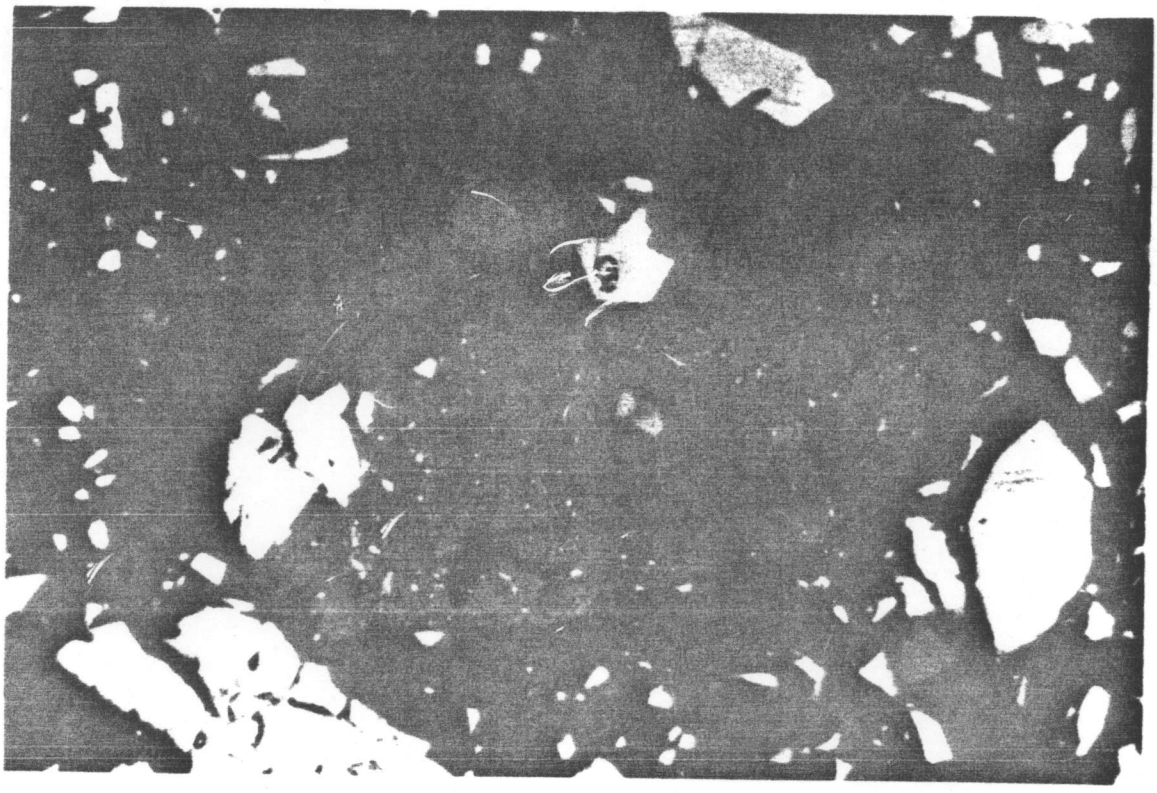

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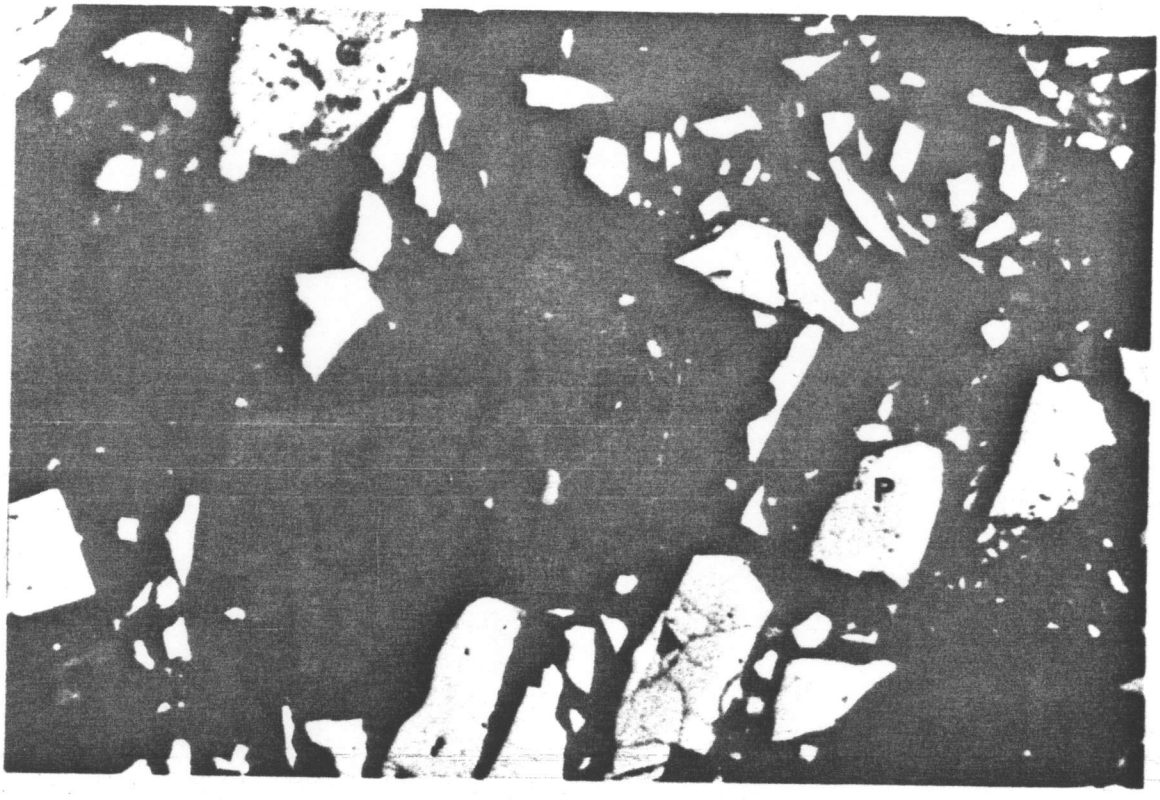

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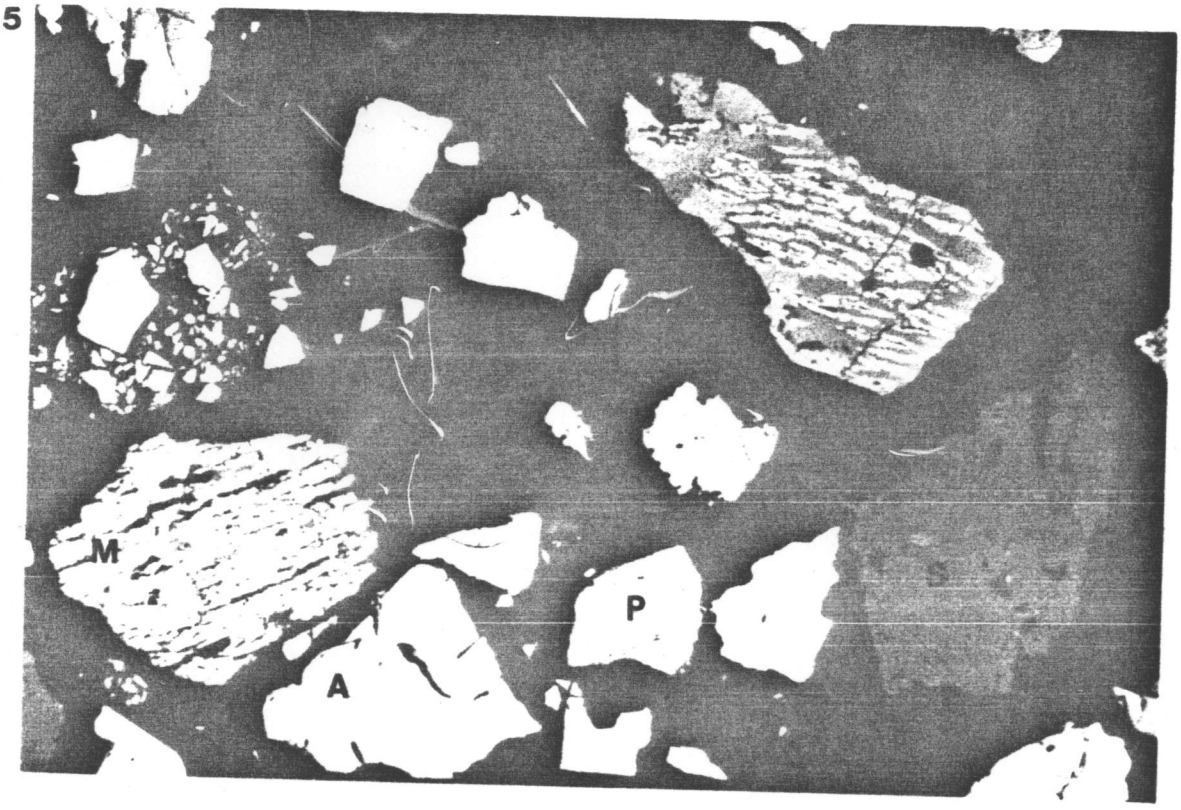

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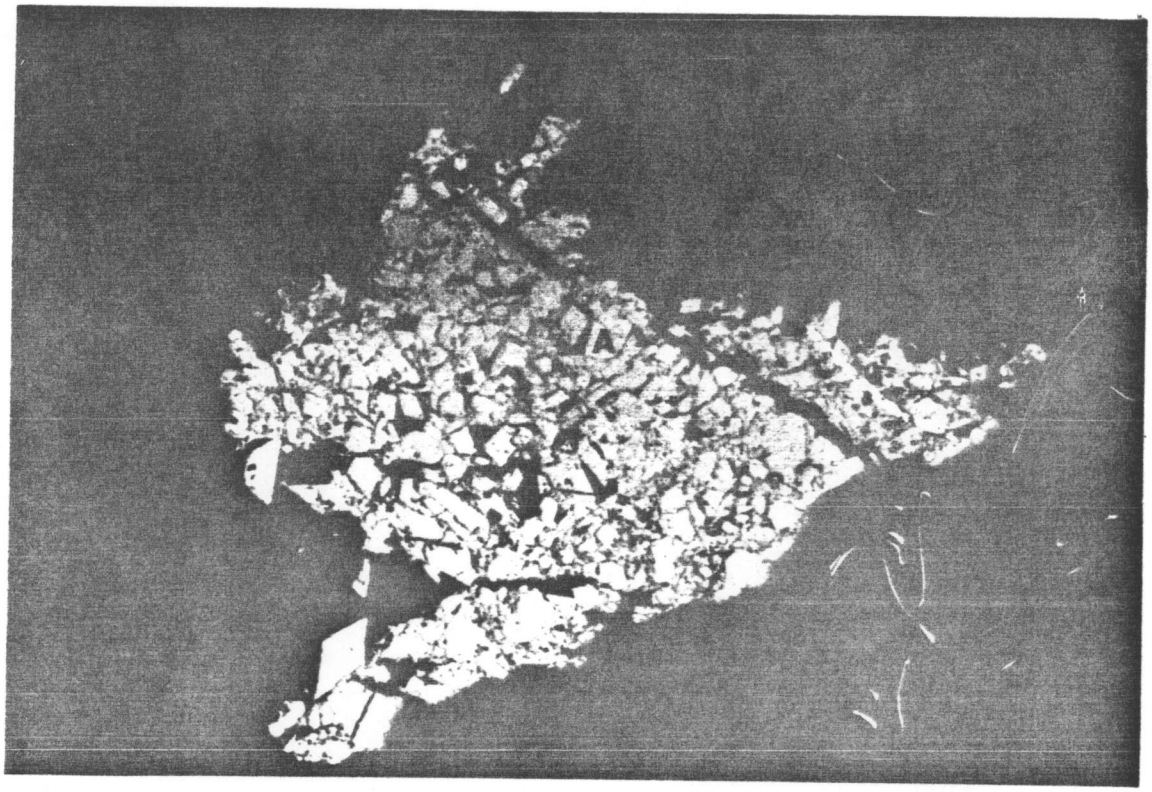

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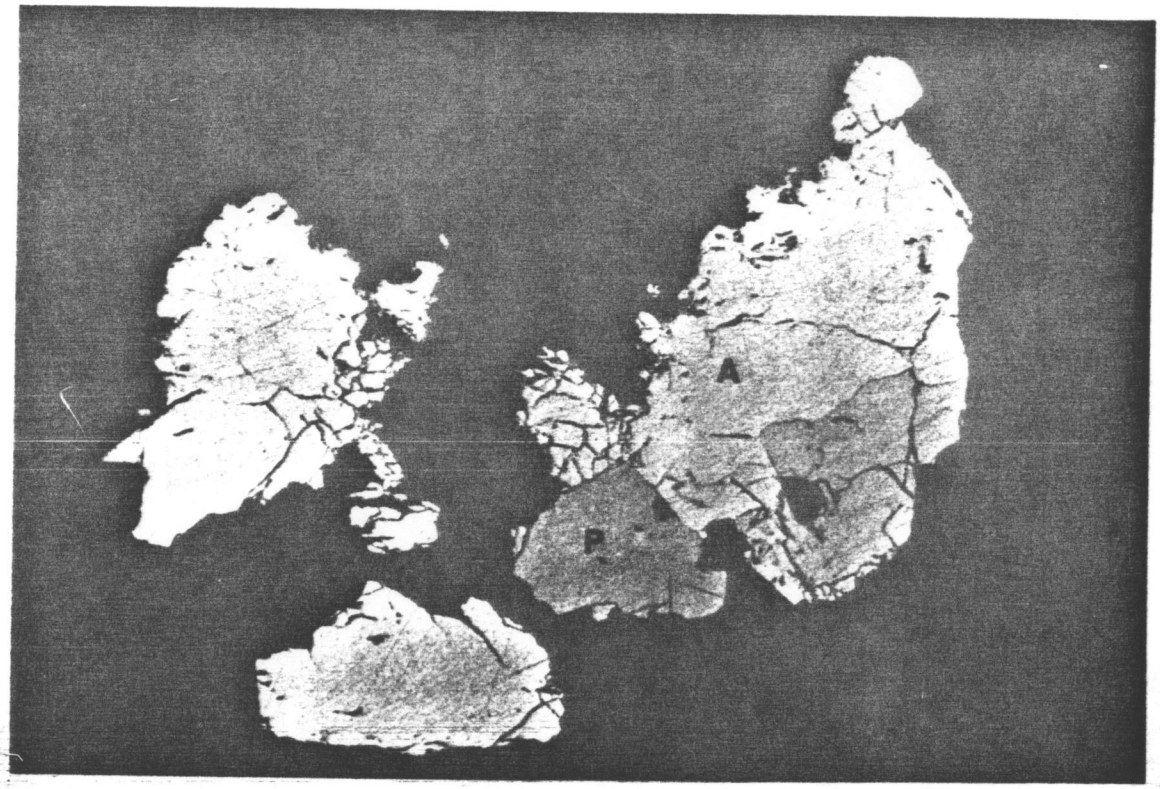

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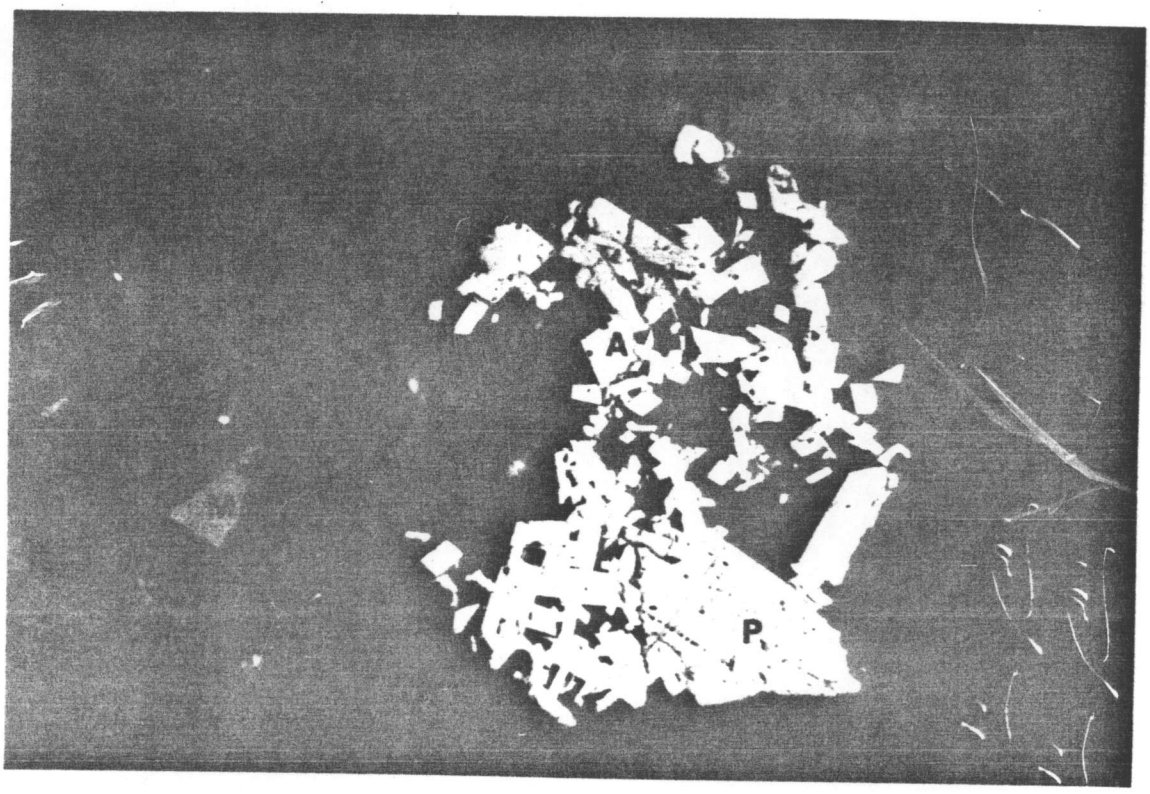

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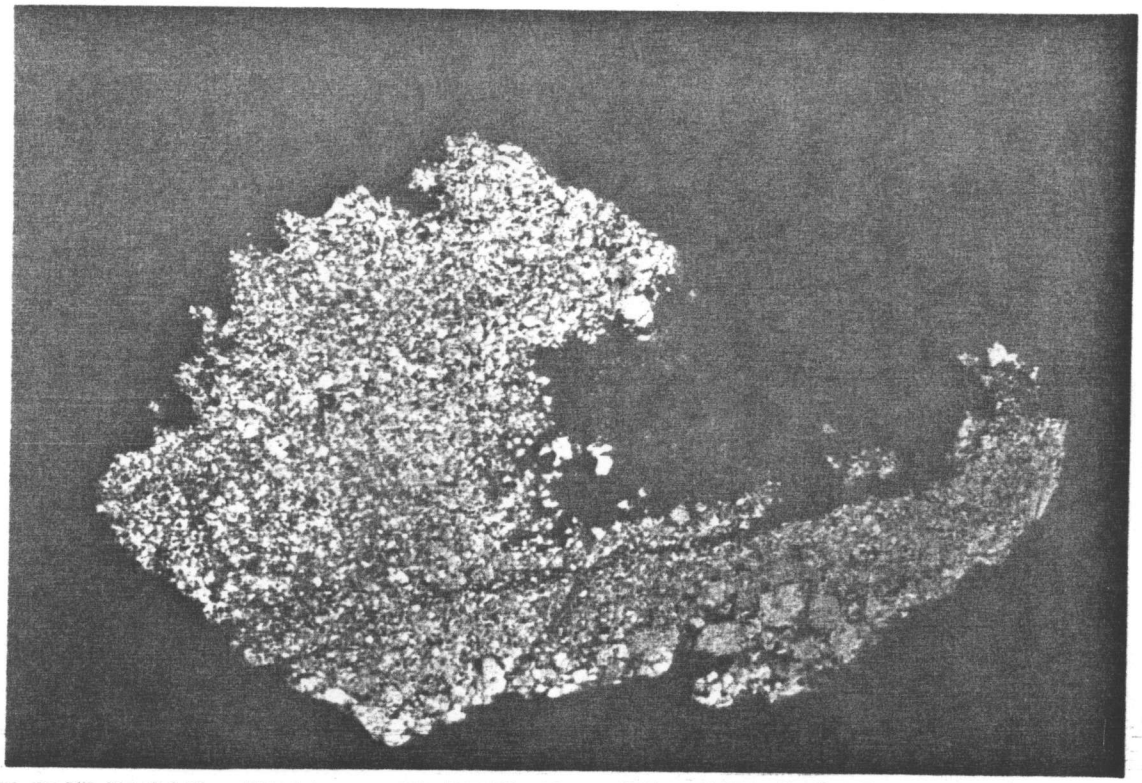
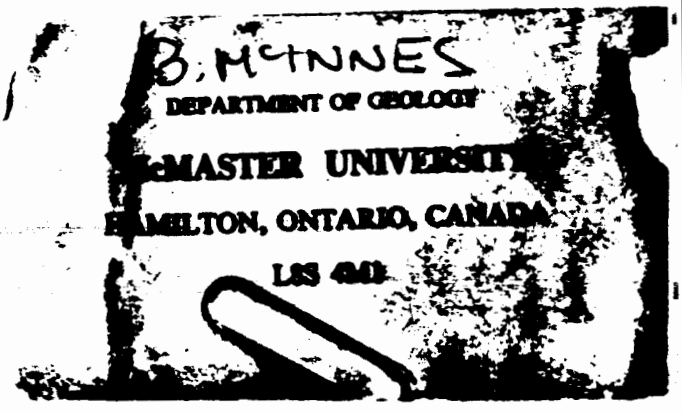


The following is a breakdown of costs incurred during preparation of this report. Cost per hour is $20.00.

Mineral Identification		2
Point Counting		7
Photography		1.5
Report preparation		3.5
TOTAL		14.0 hours
Labour costs	14 X $20 =	$280.00
Photo processing		$ 10.64
TOTAL COST		$290.64

Brian McInnes

Dec 18, 1986



APPENDIX XII - ASSAYS

REPORT: 416-5306 | PROJECT: Y86 | PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Au O/T	Ag O/T	Pb PCT	Zn PCT	As PCT	Sb PCT	Cu PCT	C tot. PCT	C fix. PCT
GC 86-3		7.740	31.02							
C 86T-1		0.264	5.92							
FF 86-2		0.125	4.34	3.04	1.17	1.98	0.06		5.10	3.52
F2 86-7		0.319	6.88	3.80	2.44	5.82	0.07			
CF 186-7		0.762	46.09	29.09	14.52	0.67	0.39	1.09		
CF 186-6		0.242	13.96	7.73	2.12	1.73	0.07			
FTA 86-9		0.324	5.82	2.88	1.64	6.48	0.07			
FC? 86-8		0.225	9.04	6.16	2.48	3.10	0.07			
FT 86-4		0.033	0.70						3.10	0.27
FT 86-4 CYANIDE		0.010	0.28							
V 86-1		0.248	16.02							

Chief Chemist

REPORT# 418-5306

PROJECT: Y86 PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Au O/T	Ag O/T	Pb PCT	Zn PCT	As PCT	Sb PCT	Cu PCT	C tot. PCT	C fix. PCT
GC 86-3		7.740	31.02							
C 86T-1		0.264	5.92							
FF 86-2		0.125	4.34	3.04	1.17	1.98	0.06		5.10	3.52
F2 86-7		0.310	6.88	3.80	2.44	5.82	0.07			
CF 186-7		0.762	46.09	29.09	14.52	0.67	0.39	1.09		
CF 186-6		0.242	13.96	7.73	2.12	1.73	0.07			
FTA 86-9		0.324	5.82	2.88	1.64	6.48	0.07			
FCP 86-8		0.225	9.04	6.16	2.48	3.10	0.07			
FT 86-4		0.033	0.70						3.10	0.27
FT 86-4 CYANIDE		0.010	0.28							
V 86-1		0.248	16.02							

Chief Chemist

SAMPLE	AG OZ/TON	SB %	PB %
F3C 86-10	3.53	0.06	2.76

ARAL

08-DEC-86 REPORT 30334 REF.FILE 26049-J1 PAGE 1 OF 2

SAMPLE	AU OZ/TON	ZN %	AS %
F3C 86-10	1.500	0.32	3.62

BONDAR-CLEGG

Certificate of Analysis

REPORT: 414-5307

PROJECT: TR6 PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Au PPM	Ag PPM	
ET 86-4 FILTRATE		6.05	9.3	by fusion act.
		.38	5.3	Nitric Acid Only
		.25		aquaregia solution (Ag not possible.)

Used 0.25 ppm Au & 5.3 ppm Ag for calculation as the gave better metal balance.

Chief Chemist

Rd.
K1J 8X5
(613) 749-2220
053-3233

BONDAR-CLEGG

Certificate of Analysis

REPORT: 416-5367

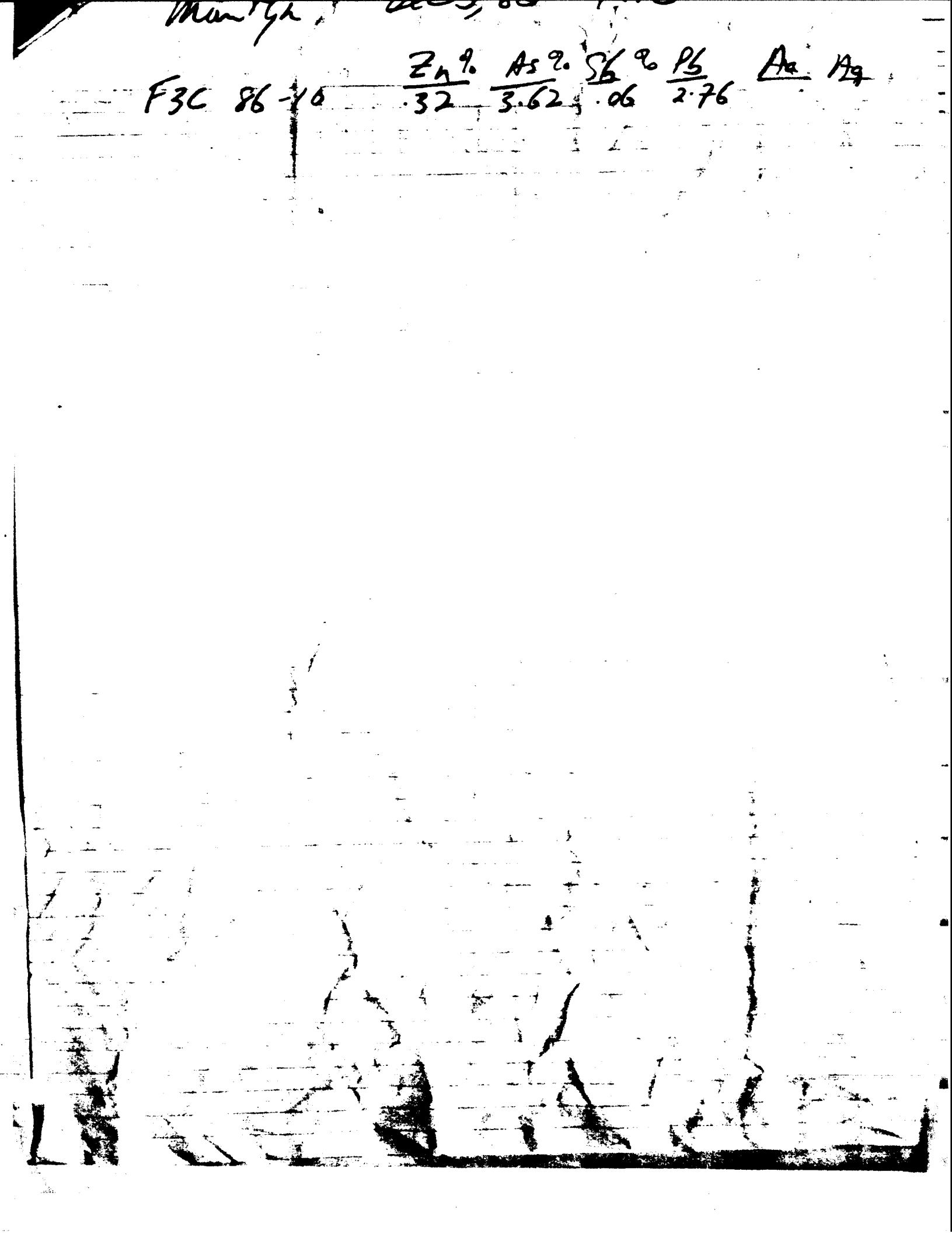
PROJECT: TBR

PAGE: 1

SAMPLE NUMBER	ELEMENT UNITS	Au PPB	Ag PPM
ET 86-4 FILTRATE		0.25	5.3

Chief Chemist

	Zn %	As %	Sb %	Pb	Au	Ag
F3C 86-10	.32	3.62	.06	2.76		



8032 TORBRAM RD, BRAMPTON, ONT.

Carrier ____
☐ ppd. ☐ col. ____
WB# ____

The samples of 4 listed below are to be analyzed by: ☐ GEOCHEMICAL METHODS : ☑ ASSESSMENT ASSAY METHODS

for the elements circled and/or as indicated in the listing. Report to: 1 ☑ Head office, 2 ☐ Field office, 3 ☐ Other (please specify) ____

PROJECT# ____

Invoice to 1, 2 or 3. Unused materials: ☐ return to 1, 2 or 3, ☐ store at cost ____ days, ☐ discard after 90 days.

P.O.# ____

AUTHORIZED BY: [signature] DATE: DEC. 15, 1986

SERVICE AGREEMENT# ____

Cu Pb Zn Ag Cd Ni Co Fe Mn Mo Au As Sb B U Th Sn W S F Ba Pt Pd Whole Rock Analysis-(Si Al Ca Mg Na K Fe Mn Cr Ti P Sr Rb Zr LOI) 30 El

SAMPLE NUMBER	Au	Ag
YUKON 2 - ~~HEAD~~	✓	✓
VEIN - C28b - 1	✓	✓
YUKON 2 - 48 HR CARBON	✓	✓
YUKON 2 - 115 HR CARBON	✓	✓

Au & Ag by Fire Assay
48 HR RUSH

SAMPLE NUMBER	Au	Ag	
	0.11	4.41	4.485 = 4.49
	.10	4.56	
	0.105		
	3.48	40.90	
	0.12	4.05	

Due 17th PM

8032 TORBRAM RD. BRAMPTON, ONT.

The samples of 4 listed below are to be analyzed by: ☐ GEOCHEMICAL METHODS
: ☑ ASSESSMENT ASSAY METHODS

for the elements circled and/or as indicated in the listing. Report to: 1 ☑ Head office, 2 ☐ Field office, 3 ☐ Other (please specify)

Invoice to 1, 2 or 3. Unused materials: ☐ return to 1, 2 or 3, ☐ store at cost ____ days, ☐ discard after 90 days.

AUTHORIZED BY [signature] DATE DEC 22, 1986

Carrier ____
☐ ppd. ☐ col. ____
WB# ____
PROJECT# ____
P.O.# ____
SERVICE AGREEMENT# ____

Cu Pb Zn Ag Cd Ni Co Fe Mn Mo Au As Sb B U Th SnW S F Ba Pt Pd Whole Rock Analysis-(Si Al Ca Mg Na K Fe Mn Cr Ti P Sr Rb Zr LOI) 30 Ele

SAMPLE NUMBER	Au	Ag	SAMPLE NUMBER	Au	Ag
YUKON 2 - FILTRATE	✓	✓		N.L	NIL
YUKON 2 - RESIDUE	✓	✓		.061	2.32
YUKON 2 - V2 - RESIDUE	✓	✓		.049	2.53
YUKON 2 - FIN. ST. CARBON	✓	✓		.089	10.1

0.055 2.43

Jan 0, 87

Au by Fire Assay

Normal Delivery.

SAMPLE	AU OZ/TON	AG OZ/TON
VEIN-C286-1	0.100	4.56
YUKON2-HEAD	0.110	4.41
YUKON2-48C	3.480	40.90
YUKON2-115C	0.120	4.05

SAMPLE		AU OZ/TON	AG OZ/TON
YUKON-2-	FILTRATE	NIL	NIL
YUKON-2-	RES.	0.061	2.32
YUKON-2-	V2-RES.	0.049	2.53
YUKON-2-	FIN.ST.CAR.	0.089	10.10

RESULTS TABLE

TEST & PRODUCT	Wt %	Assays Au oz/t	Ag oz/t	Pb %	Zn %	As %	S6 %	Cu %	Total C %	C (NOCO3) %	Distribution Au	Ag	Pb	Zn	As	Sb	Individual Distribution % Au	Ag	Pb	Zn	As	Sb	Wt. %
GRAVITY																							
Head Gravity	100	.109	4.16														100	100					100
Gravity-One Tails	86.66	.086	3.9														64.8	80.8					86.66
Gravity-Two Tails	13.3	.264	5.92														32.2	18.9					13.3
Gravity-Two Concentrate	.043	7.74	31.02														3.0	.3					.043
Gravity-One Concentrate	13.7	.28	6.00														35.2	19.2					
Head	100	.109	4.16								100.0	100.0					100	100					
Gravity Concentrate	.043	7.74	31.02								3.0	.3					3.0	.3					
Flotation #1 Feed	99.96	.125	4.34	3.04	1.17	1.98	.06		5.1	3.52	97.0	99.7	100	100	100	100	100	100	100	100	100	100	100
Flotation #1 Concentrate	16.8	.337	19.84	9.63	4.39	1.53	.13				44.1	76.8	53.4	63.2	13.0	36.5	45.5	77.0	53.4	63.2	13.0	36.5	16.8
Flotation #1 Tails	82.8	.082	1.17	1.72	.52	2.09	.05				52.4	22.1	46.6	36.6	86.9	68.6	54.0	22.2	46.6	36.6	86.9	68.6	82.8
Cleaner Flotation Feed	16.8	.337	19.84	9.63	4.39	1.53	.13				44.1	76.8	53.4	63.2	13.0	36.5	100	100	100	100	100	100	100
Cleaner Flotation #1 Tails	13.7	.242	13.95	7.60	2.12	1.73	.07				25.8	44.1	34.4	24.9	12.0	16.0	58.5	57.4	64.4	39.4	92.3	43.8	
Cleaner Flotation #1 Concentrate	3.1	.762	46.09	18.68	14.52	.67	.39	1.09			*18.3	32.7	12.3	38.4	1.0	20.1	41.5	42.6	23.0	60.8	7.7	55.1	18.5
Flotation #2 Feed	82.3	.082	1.17	1.72	.52	2.09	.050				52.4	22.1	46.6	36.6	86.9	68.6	100	100	100	100	100	100	100
Flotation #2 Concentrate	16.2	.310	6.88	3.80	2.44	5.82	.070				39.1	25.6	20.3	33.9	47.7	19.0	74.6	115.8	43.6	92.6	54.9	27.7	19.7
Flotation #2 Tails	66.1	.026	.85	1.21	.05	1.17	.045				13.31	12.9	26.3	2.8	39.1	49.6	25.4	58.4	56.4	7.7	45.0	72.3	80.3
Flotation #4 Feed	30.1	.266	8.79	4.90	2.16	4.40	.07				62.2	60.8	48.6	55.6	66.9	35.1	100	100	100	100	100	100	100
Flotation #4 Concentrate	18.5	.225	9.04	6.16	2.48	3.10	.07				*32.4	38.5	37.6	39.3	12.2	21.6	52.1	63.3	77.4	70.7	43.5	61.5	61.5
Flotation #4 Tails	11.6	.324	5.82	2.88	1.64	6.48	.07				*29.1	15.5	11.0	16.2	37.8	13.5	46.8	25.5	22.5	29.1	56.5	38.5	38.5
Flotation #3 Feed	66.1	.109	.85	1.21	.05	1.17	.045				55.9	12.9	26.3	2.8	39.1	49.6	100	100	100	100	100	100	100
Flotation #3 Concentrate	3.5	1.50	3.53	2.76	.32	3.62	.06				*39.9	2.8	3.1	0.9	6.3	3.4	71.4	21.7	11.8	32.1	16.1	6.9	5.3
Flotation #3 Tails	62.6	.033	.7	1.13	.04	1.04	.044		3.10	.27	16.1	10.1	23.3	2.1	32.9	46.0	28.8	78.3	88.6	75.0	84.1	92.7	
Total Recovered	21.7										122.7	89.8	64.0	94.8	57.3	58.6							
Cyanide Feed	62.6	.033	.7	1.13	.04	1.04	.044	3.10	3.10	.27	16.1	10.1	NaCn Consumption = 7.9 lb/t dry solids				100	100					62.6
Cyanide Residue	62.6	.010	.28								4.8	4.0	Ca(OH)2 Consumption = .89 lb/t dry solids				29.8	39.6					62.6
Cyanide Filtrate		.25ppm	9.3ppm														70-75	60-70%					

Note: A line under the assay indicates calculated assay

ML

COPY

AURCHEM

EXPLORATIONS
AURCHEM ~~RESOURCES~~ LTD.
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TWX 9102405259

VIA COURIER

November 2, 1987

Vancouver Petrographics Ltd.
P. O. Box 39
8887 Nash Street
Fort Langley, B.C.
V0X 1J0

092153

Attn: Mr. James Vinnell

Enclosed are a set of instructions with sample and geology descriptions for laboratory studies of polished thin sections. I had phoned you on October 29, 1987, to discuss the sending of these samples to you.

We would like you to proceed on these samples at "regular" handling using the 26 x 46 mm polished thin section size. We would like photomicrographs of each slide also.

If you have any questions at all regarding these samples, please feel free to call.

Yours truly,

AURCHEM EXPLORATIONS LTD.

Mark Langdon

Mark Langdon
Manager - Geological Projects

ML/joc

Enclosure

Polished Thin Sections - Aurchem Explorations Ltd.

I will attempt to give you a general geology of the sample's source and other details relevant for your proper identification and description of the polished thin sections.

General

The general setting is one of epithermal silver/gold/lead/zinc veins from our property in the Yukon.

The samples can be divided into three basic categories due to their purpose;

1) A set of samples basically for rock type analysis hoping to confirm the intrusive source of extrusive samples.

2) A set of samples of various alteration assemblages through one rock type caused by the epthermal system. I have logged our drill core using these alteration assemblages and am now looking for confirmation of these assemblages. We use these assemblages as an exploration tool so we would like to feel confident in our initial assessment.

3) A set of samples of various vein materials. We are working on a present theory of the differing veins having different paleo-elevations with some telescoped veins. If the thin sections also suggest this may be true by their mineral suites, it will help us to form new drill targets. The metallic minerals in the veins can also be quite diverse so the identification of them will help us considerably.

General Geology

The samples are taken from four basic litholgies through which the veins run.

a) Grandiorite

- a hornblende rich grey to orange coloured granodiorite.
- derived from the Cretaceous juring widespread granite/ granodiorite/ monzonite intrusive activity.
- epithermal alteration of our property of this lithology is quite intense and widespread.

b) Dacite to Ryolite Dykes & Sills (generally rhyodacite)

- highly variable in composition
- epithermal alteration varies from none to highly altered
- can be fined grained and siliceous or prophyritic
- generally believed to be the extrusive component of the granodiorite (Cretaceous and or later)

. . ./2

c) Quartz Diorite

- Jurassic age
- sub-intrusive Horblende Quartz Diorite
- very siliceous

d) Andesitic to Basaltic Extrusive Flows

- generally believed to be the extrusive phase of the quartz diorite.

Veins

Work to date and work done on other properties nearby suggest two phases of epithermal veining. An early stage with low Au and Ag values and a later stage of high Au and Ag values. This may have contributed to the highly compositionally erratic nature (including assays) of the veins as the later solutions enriched earlier veins as well as forming new veins.

1) Samples for rock type analysis

Sample #	Au (oz/ton)	Ag (oz/ton)	Pb (ppm)	Zn (ppm)	As (ppm)
D12-87-13	<.001	.01	17	131	54
D8-87-205	<.001	.01	34	203	21
D8-87-114	<.001	.01	35	140	20
D9A-87-43	<.001	.02	33	275	96
D4-87-264	<.001	.00	27	77	25
D1A-87-163	.002	.02	37	13	7
D8-87-144	<.001	.04	103	171	86
85-87-6	.001	.02	39	374	--

Note: Assays are from 1-5 ft. drill core sections

D4-87-264

- quartz diorite (typical sample)
- sample for basic composition of this lithology
- located about 20 feet from granodrite contact

D-8-87-114

- quartz diorite near contact with andesitic/basaltic extrusives
- possibly from the cap of the diorite intrusive
- general lithographic description is wanted

. . . /3

D8-87-205

- calcareous intermediate/basaltic volcanic flow
- located 100 feet from D8-87-114 diorite
- other than basic mineral lithology we are trying to find out if this lithology does appear to be the extrusive of the diorite by a similar mineral suite.

D8-87-144

- possibly a bleached diorite
- at the diorite/int. volcanic flow contact we get an alternating or intermixing zone. Within this zone we get a series of white "bleached" veins that sometimes have a qtz/galena/sphalerite vein (<6 cm)in the centre. We would like to find out if (1) what the original rock type of the bleached zone was (2) if the alteration is probably from an epithermal source or if it is from a primary source of the intrusive (diorite)/extrusive (volcanic) contact metamorphism. (3) Many epithermal papers say that bleached zones on the surface that show advanced argillic (sulphate) assemblage alteration are a good sign for vein enlargement at depth. Therefore, we want to know which alteration assemblage this "bleaching" falls into. At the back of this description of samples is a description of the five alteration assemblages that we have attempted to place our grandiorite alterations in. If you could place this "bleached" zone in one of the categories it may be of great use to us in our future drilling.

The next four samples are all from the general rock type of rhyodacite. The rhyodacite group intruded up the diorite/granodiroite contact and then spread out from there as dykes down fault structures.

D12-87-13

- calcareous rhyodacite? (from within the granodiorite)
- is the granodiorite a probable source?
- epithermal alteration?

D1A-87-163

- probable rhyodacite (from withing the granodorite)
- is this a rhyodacite or a silicified and altered granodiorite?

D9A-87-43

- rusty altered rhyolite? (from within the granodiorite)
- alteration?
- possible source?

. . . /4

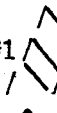
85-6

- this is a trench sample of a "feldspar-quartz-porphyritic rhyolite bordering a vein within the diorite.
- is this from the same source as the other rhyolites and rhyodacites
- would it possibly have come in before or after or during vein emplacement (alteration?)

2) Samples for alteration assemblages

All the following samples were originally granodiorite. As mentioned earlier, a paper at the back shows the five alteration assemblages that we attempted to classify our granodiorite into. I have sent at least one sample for each of our alteration assemblages. If possible I would like a confirmation of our alteration assemblage groups or changes that you would suggest. Assemblages #5 through #1 occur on both sides of our veins although some veins only show alterations #5 though to #3. Alterations are more intense (larger) on the hanging wall.

Eg. #5 #4 #3 #2 #1 #1 #2 #3 #4 #5



vuggy qtz/sulphide/sulfosalt vein

Eg. #5 #4 #3 #2 #3 #4 #5

cherty qtz/sulphide vein

We would also like to see the changes in metallic minerals that occurs through the assemblages.

Sample #	Au (oz/ton)	Ag (oz/ton)	Pb (ppm)	Zn (ppm)	As (ppm)
D12-87-34	.080	.01	25	100	30
D12-87-79	<.001	.06	32	214	10
D12-87-94	.001	.03	76	308	105
D1A-87-62	.043	.01	17	69	20
D4-87-226	.003	.11	609	463	896
D12-87-104	.006	.34	797	195	412

Note: samples part of a 5 foot core assay

. . . /5

D12-87-34

- potassium silicate assemblage (5)

D12-87-79

- propylitic assemblage (4)

D12-87-94

- argillic assemblage (3)

D1A-87-62

- argillic assemblage (3)

D4-87-226

- phyllic/sericitic assemblage (2)

D12-87-104

- advanced argillis (sulphate) assemblage (1)
- this sample surrounds vein sampled D12-87-106, D12-87-111, and D12-87-112
- the black/grey colouration showed up in fresh core as a ruby red/magenta purple colour.

3) Samples of vein material

What we would like to get from these samples is:

1) Metallic and gangue mineral identification.
2) Any evidence of later enrichment (stockwork veinlets) from a secondary source.
3) Possible order of crystallization of sulphides (this is often not possible in epithermal veins due to pulsating solutions).
4) Any possible clues to precious metal association (there is free gold and silver in the veins and testwork has shown some to be associated with lead, but the bulk associated with arsenopyrite. A test three years ago by Lakefield said the gold was associated with pyrrhotite; but I find that hard to believe because of the lack of pyrrhotite in our veins.

5) Any possible comments you may have on the relative distance from the paleosurface of the various veins (i.e. increasing temperature and pressure of the formation).

Sample #	Au (oz/ton)	Ag (oz/ton)	Pb (ppm)	Zn (ppm)	As (ppm)
D8-87-145	.026	.62	7,520	16,050	>2,000
D12-87-106	.019	1.35	5,700	185	1,112
D12-87-111	.250	14.02	9,610	14,300	>2,000
D12-87-112	.080	19.56	12,180	>20,000	>2,000
D4-87-76	.103	.26	303	276	936
D3A-87-114	.005	.19	108	162	242
D9C-87-13	.052	.26	315	323	72,000

These samples are taken from 4 different veins where we feel vein 1 is closest to the source and veins 2, 3 and 4 get progressively farther away from the source or closer to the paleosurface.

Vein 1 - we believe to be a "telescoped" vein from depth (within granodiorite).

(a) D12-87-106

- oxidized vuggy quartz/hematite/manganese oxides/other vein from within the advanced argillic (sulphate) alteration zone
- sample D12-87-104 surrounds this vein
- fresh this sample was a purple/red/magenta colour

(b) D12-87-111

- same vein as above
- from the centre of the vein
- very black "sooty" vein material

(c) D12-87-112

- same vein as above
- the bulk of the vein is this material
- vuggy quartz sulphide/sulphosalt? vein
- possible gangue minerals of quartz, adularia, alunite, etc.

.../7

Vein 2 - within granodiorite

(a) D4-87-76

- brecciated quartz/sulphide (minor carbonate)
- possible stockwork within hydrofractured vein from secondary epithermal
- found within sericite/phyllic alteration assemblage
- vein is fairly oxidized

Vein 3 - within granodiorite

(a) D3A-87-114

- similar style of vein as vein 2
- associated with sericitic alteration
- appears to have a more cherty quartz

(b) D9C-87-13

- probably the same vein as above but about 1 km away
- cherty quartz/carbonate/silicified carbonate vein
- dark grey cherty quartz -- quartz/pyrite/arsenopyrite mixture?

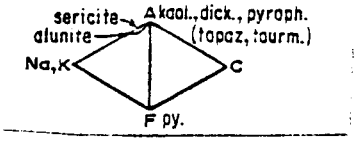
Vein 4 - at diorite/int. volcanic contact

(a) D8-87-145

- quartz/galena/sphalerite/pyrite vein
- found within "bleached" lithology as in sample D8-87-144
- epithermal vein?
- differences of this type of vein to other veins (possible implications of distance from source relative to other veins

Epithermal Alteration Types

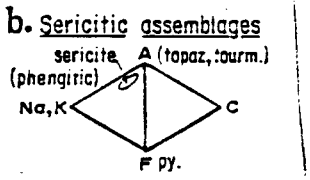
(1) Advanced Argillic (Sulphate) Assemblages



- all feldspars converted to dickite, kaolinite, pyrophyllite, diaspore, alunite or other aluminum rich phases
- majorly composed of quartz, alunite, pyrophyllite, kaolinite-dickite opal, K-mica, no carbonate present, minor sericite-illite-montmorillonite
- usually exhibits an intense oxidation halo
- rare sulphides (usually oxidized)
- commonly referred to as bleaching
- forms a halo around and above individual ore shoots within and above the precious metal horizon
- low pH alteration (sulphate or sulphuric acid solutions by water mixing with oxidized H_2S)

(Aurchem rocks; white mud vein around and above the smoky-vuggy quartz-sulphide-sulphosalt vein).

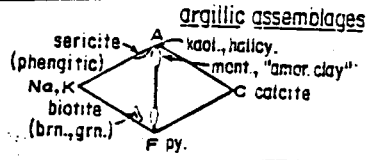
(2) Phyllic/Sericitic Assemblages



- both potassium feldspar and plagioclase is converted to sericite
- minor kaolinite may be present
- major minerals are quartz, sericite and pyrite with minor carbonate

(Aurchem rocks; blue mud veins).

(3) Argillic Assemblages



- presence of important amounts of kaolinite, montmorillonite or amorphous clay principally replacing plagioclase

- sericite may accompany clays

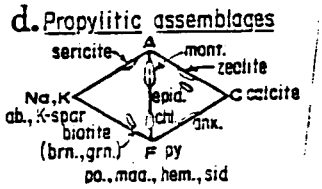
- potassium feldspar unaltered or argillized

- appreciable leaching of calcium, sodium and magnesium

- major minerals are quartz, kaolinite, chlorite and montmorillonite

(Aurchem rocks; granodiorite altered to baby blue/green granodiorite with optional brown coloured kaolinite).

(4) Propylitic Assemblages



- major minerals of albitized plagioclase (Na rich), chlorite, epidote at depth, carbonate, montorillonite, pyrite, illite

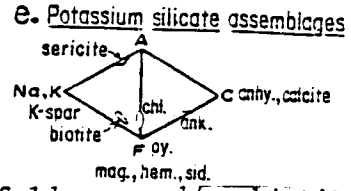
- presence of epidote and/or chlorite and lack of appreciable cation metasomatism or leaching of alkalies or alkaline earths

- H_2O, CO_2 and sulphur may be added

- commonly occurs as large halos around the veins to a greater amount in the hanging wall

- often this alteration is pre-ore

(5) Potassium Silicate Assemblages



- potassium feldspar and/or biotite formed as an alteration of plagioclase or mafic minerals

(Aurchem rocks; competant and usually siliceous granodiorite showing pink feldspars).

Overlapping alterations on the above

(1) Silicification

- silicification and/or silica flooding appears to be found overlapping any or all of the Argillic, Propylitic and Potassium Silicate Assemblages. It appears most dominant in the Potassium Silicate Assemblage.

- if silicification has occurred Aurchem has classified as:

(a) silightly silicified
(b) silicified
(c) highly silicified

(2) Carbonatization

- the only assemblage that the carbonate is not found within is the Advanced Argillic (Sulphate) Assemblage. In many cases the carbonate appears to be a late stage "overprint" also showing to be more abundant near fault zones.

- Carbonate alteration (enrichment) can appear as:

(1) pervasive carbonate
(2) as distinct "vein bedded" veins
(3) as "stockwork like" veinlets

Note: both types (2) and (3) can occur as either carbonate (calcite) veins or as quartz-carbonate veins.

(3) Oxidation

- strong oxidation of the Fe minerals can occur in all but the Advanced Argillic Assemblage (here the irons have all been leached from the material)

- oxidation is rare in the Phyllic/Sericitic Assemblage

Vancouver Petrographics Ltd.

JAMES VINNELL, Manager
JOHN G. PAYNE, Ph. D. Geologist

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PHONE (604) 888-1323

Report for: **Mark Langdon,**
Aurchem Explorations Ltd.,
16 - 266 Rutherford Road S.,
BRAMPTON, Ontario, L6V 2X8

Invoice 6944
November 1987

Samples: D-1A-87- 62, 163
D-3A-87- 114
D-4 -87- 76, 226, 264
D-8 -87- 114, 144, 145, 205
D-9A-87- 43
D-9C-87- 13
D-12-87- 13, 34, 79, 94, 104, 106, 111, 112, 85-6

Summary:

1. Samples for rock type identification

D4-87-264: porphyritic diorite with phenocrysts of plagioclase and minor ones of clinopyroxene and biotite, and very minor ones of orthopyroxene; strong fractionation indicated by presence of groundmass quartz and K-feldspar.

D8-87-114 quartz-bearing diorite, early formed plagioclase and clinopyroxene, later biotite, hornblende, and magnetite, and interstitial quartz, K-feldspar, and chlorite. Clinopyroxene is altered strongly to amphibole or chlorite-calcite; biotite is replaced by chlorite and plagioclase is replaced slightly by sericite.

D8-87-205 porphyritic andesite; plagioclase phenocrysts altered slightly to sericite-epidote; hornblende phenocrysts altered completely to chlorite-calcite. Somewhat similar to diorite samples, but lacks pyroxene, which would be expected in phenocrysts from same magmatic source as diorites.

D8-87-144 quartz diorite (argillic alteration); plagioclase replaced by kaolinite-carbonate; hornblende is replaced by quartz-ankerite; magnetite is replaced by hematite; biotite is fresh to replaced completely by chlorite.

D12-87-13 porphyritic andesite (phyllic alteration); plagioclase altered to sericite-(quartz); hornblende replaced by chlorite-calcite-sericite.

D1A-87-163 leucocratic quartz diorite (phyllic alteration); plagioclase altered moderately to strongly to sericite-calcite; biotite replaced by muscovite/sericite-quartz

D9A-87-43 andesite (phyllic-carbonate alteration); plagioclase replaced by kaolinite-calcite; mafic minerals destroyed

85-6 leucocratic quartz diorite (argillic-carbonate alteration); plagioclase replaced by kaolinite-calcite; biotite replaced by chlorite-calcite-muscovite; hornblende replaced by quartz/plagioclase-carbonate-limonite-(tremolite)

2. Samples for Alteration Assemblages

D12-87-34 porphyritic granodiorite (weak propylitic alteration); plagioclase altered slightly to sericite-calcite; hornblende slightly altered to chlorite-actinolite; biotite altered completely to chlorite-(epidote); magnetite altered slightly to hematite

D12-87-79 porphyritic granodiorite (propylitic alteration); plagioclase altered slightly to sericite-(calcite); biotite altered completely to chlorite-epidote; hornblende altered completely to carbonate-(opaque-chlorite); magnetite is altered strongly to hematite

D12-87-94 porphyritic granodiorite (argillic alteration); plagioclase replaced by kaolinite-(sericite-carbonate); biotite is replaced completely by chlorite-(Ti-oxide-limonite); hornblende is replaced completely by tremolite and/or carbonate-opaque-limonite.

D1a_87-62 granodiorite (phyllic alteration); plagioclase is replaced completely by sericite-carbonate with patches of kaolinite; biotite is altered completely to chlorite-ankerite/calcite; hornblende is altered completely to quartz/plagioclase or chlorite-ankerite

D4-87-226 granodiorite (phyllic-carbonate alteration; original texture largely destroyed); secondary sericite-carbonate after feldspars; hornblende replaced completely by quartz/plagioclase-pyrite

D12-87-104 granodiorite (advanced argillic alteration[?]); feldspars replaced completely by sericite; hornblende replaced completely by quartz-(sericite-Ti-oxide); pyrite replaced completely by hematite

3. Samples of Vein Material

Vein 1

D12-87-106 quartz-sericite-pyrite-pyrrhotite/marcasite/hematite-galena vein in altered rock

D12-87-111 galena-pyrite-quartz-sphalerite-chalcopyrite-arsenopyrite vein; minor silver-bearing mineral included in galena; trace of electrum in pyrite; galena partly replaced by cerusite, pyrrhotite replaced by pyrite, chalcopyrite locally replaced by covellite.

D12-87-112 quartz-pyrite vein cut by late vein of galena- sphalerite-(arsenopyrite-chalcopyrite); minor argentite in pyrite; galena partly replaced by cerusite secondary covellite associated with cerusite.

Vein 2

D4-87-76 brecciated quartz-pyrite vein, trace pyrrhotite, chalcopyrite, galena, argentite as inclusions in pyrite; minor sphalerite, tetrahedrite interstitial to pyrite

Vein 3

D3A-87-114 altered granodiorite replaced by quartz-pyrite-(arsenopyrite); late veins and replacement patches of carbonate-quartz-tetrahedrite-chalcopyrite

D9C-87-13 silicified rock replaced by pyrite-arsenopyrite-sphalerite-(chalcopyrite); rock is brecciated and healed by quartz-carbonate veins; pyrite contains minor inclusions of galena and lesser chalcopyrite and pyrrhotite

Vein 4

D8-87-145 altered quartz diorite cut by vein of sphalerite-calcite-arsenopyrite-galena-(chalcopyrite); texture much different from other veins, especially extremely fine grained arsenopyrite intimately intergrown with galena and to a lesser extent with sphalerite. Textures suggest lower temperature than other veins.

General Comments:

1. The host rocks show a moderately wide variation in compositions and textures, suggesting that more than one magmatic source is present. This is suggested by the strong differences between the diorite samples and the leucocratic quartz diorite samples.

2. The andesites appear to be more likely related to the leucocratic quartz diorite than to the strongly fractionated diorite.

3. Assay values for altered samples probably represent background values, because, for example, no sphalerite was seen in any of the samples with assays up to 374 ppm.

4. Some of the samples show at least two ages of vein formation, which in some samples were separated by a period of brecciation.

5. Late alteration of sulfides produced cerusite from galena, and covellite from remobilized copper produced from alteration of chalcopyrite. Iron and iron-copper sulfides are locally replaced by hematite, especially in the zone of advanced argillic alteration, where only those grains enclosed in quartz escaped alteration.

6. In most samples, sulfides of one stage of vein formation appear to have crystallized together. Where more than one set of veins are contain sulfides, pyrite and to a lesser extent, arsenopyrite are abundant in early formed veins, whereas base-metal sulfides are more common in later veins.

7. Precious metals were seen in samples D12-87-111 and D12-87-112. Argentite, electrum, and an unknown silver-bearing(?) mineral (possibly pyrargyrite) form minor inclusions in pyrite grains. Tetrahedrite is present in samples D4-87-76 and D3A-87-114. It is probable that a large amount of the silver occurs in the crystal structure of galena.

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Photographs

Representative photographs were taken to illustrate textures. All except Photo S are about 100X magnification (length of photo represents 1.2 mm in thin section). Photo S is magnified about 135X. Numbers on photographs refer to corresponding numbers on the film negative and on the reverse of the photograph.

Abbreviations used on the photographs are as follows

plag	plagioclase	ct	calcite
Q	quartz	py	pyrite
K-f	K-feldspar	cpy	chalcopyrite
Bio	biotite	gl	galena
Hb	hornblende	marc	marcasite
cpx	clinopyroxene	apy	arsenopyrite
chl	chlorite	cer	cerusite
ap	apatite	po	pyrrhotite
zr	zircon	tet	tetrahedrite
mt	magnetite		

Photo	Sample	Description
S	D4-87-264	corroded clinopyroxene, partly surrounded by biotite; zoned plagioclase, minor interstitial quartz. Crossed nicols.
1	D4-87-264	same as Photo S, lower magnification.
2	D8-87-114	hornblende, biotite (altered to pseudomorphic chlorite- Ti-oxide), opaque magnetite and ilmenite, plagioclase, minor interstitial quartz. Plane light.
3	D8-87-205	plagioclase phenocryst, hornblende phenocrysts (altered to chlorite), groundmass dominated by lathy plagioclase with much less chlorite and disseminated magnetite. Plane light.
4	D8-87-144	plagioclase altered to kaolinite with veinlets of ankerite, biotite altered to chlorite-Ti-oxide-limonite, interstitial quartz. Plane light.
5	D12-87-13	plagioclase phenocryst altered to sericite, groundmass dominated by plagioclase altered to sericite-calcite, minor chlorite, apatite, interstitial patch of quartz. Plane light.
6	D1A-87-163	plagioclase strongly altered to sericite, quartz (white and black), veinlet of calcite. Crossed nicols.
7	D9A-87-43	lathy plagioclase in a groundmass of anhedral plagioclase, calcite, quartz, and hematite (after pyrite). Plane light.

8	85-6	plagioclase altered to kaolinite, interstitial quartz, mafic grains altered to limonite-rich patches. Crossed nicols.
9	D12-87-34	plagioclase (light grey) and hornblende (orange), with interstitial quartz (white, grey, black) and K-feldspar (dark grey). Crossed nicols.
10	D12-87-79	plagioclase, biotite (altered to chlorite), magnetite (altered to hematite), with interstitial K-feldspar and quartz. Plane light.
11	D12-87-94	plagioclase (altered to kaolinite, minor sericite, limonite). biotite (altered to chlorite, minor Ti-oxide, limonite), interstitial K-feldspar and quartz. Zircon grain in biotite. Plane light.
12	D1A-87-62	plagioclase (altered to sericite-carbonate, minor kaolinite), hornblende (altered to quartz/plagioclase, carbonate, Ti-oxide), interstitial quartz. Crossed nicols.
13	D4-87-226	plagioclase (altered to sericite), quartz laced with calcite veinlets. Original texture largely destroyed. Crossed nicols.
14	D12-87-104	plagioclase (altered to sericite), hornblende (altered to quartz-sericite- Ti-oxide), patches of quartz, pyrite (opaque) altered to hematite.minor zircon. Crossed nicols.
15	D12-87-106	fragments of pyrite, galena corroded and replaced by cerusite, marcasite/hematite after pyrrhotite. Reflected light.
16	D12-87-111	fractured arsenopyrite enclosed in galena (altered on borders to cerusite). Reflected light.
17	D12-87-111	galena replaced concentrically by cerusite; sphalerite surrounded by pyrite/pyrrhotite. Reflected light.
18	D12-87-112	pyrite on border of vein; late vein of galena (altered partly to cerusite), sphalerite (dark grey patch), arsenopyrite, quartz (black), and minor covellite (dark grey enclosed in light grey galena near left side of photo). Reflected light.
19	D4-87-76	brecciated pyrite, surrounded by quartz. Reflected light.

20	D3A-87-114	tetrahedrite with inclusions of pyrite and of chalcopyrite, chalcopyrite grains included in quartz (dark grey). Reflected light.
21	D3A-87-114	veinlets of quartz-tetrahedrite-chalcopyrite-pyrite in sericite-carbonate altered rock. Much of the chalcopyrite is rimmed by tetrahedrite. Reflected light.
22	D9C-87-13	sphalerite with blebs of chalcopyrite surrounded by carbonate. Reflected light.
23	D9C-87-13	pyrite with inclusions of chalcopyrite, sphalerite, and galena; arsenopyrite on border of pyrite patch, with minor inclusions of galena. Reflected light.
24	D4-87-76	very fine grained carbonate vein with minor, extremely fine grained pyrite fragments; coarser earlier vein of quartz-pyrite, with minor interstitial galena. Reflected light.
25	D8-87-145	subhedral to euhedral, tiny arsenopyrite grains with interstitial galena, surrounded by sphalerite with only minor arsenopyrite inclusions. Reflected light.

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D4-87-264 Porphyritic Diorite

↑ BIOTITE, PLAGIOCLASE & CLINOPYROXENE

The rock contains phenocrysts of plagioclase, pyroxene, and biotite in a very fine grained groundmass dominated by plagioclase with lesser quartz, biotite, hornblende, and magnetite. Strong fractionation is indicated by plagioclase zonation and the presence of phenocrysts of pyroxene and interstitial quartz-(K-feldspar). The rock is cut by a few veinlets of calcite-(pyrrhotite)

phenocrysts	
plagioclase	20-25%
clinopyroxene	2- 3
orthopyroxene	0.3
biotite	3- 4
groundmass	
plagioclase	55-60
quartz	3- 4
biotite	4- 5
hornblende	1- 2
magnetite	1- 2
ilmenite	0.2
K-feldspar	minor
apatite	minor
veinlets	
calcite-(pyrrhotite)	0.1

Plagioclase forms ragged phenocrysts and a few clusters of phenocrysts averaging 0.5-1.7 mm in size. Many are strongly concentrically zoned gradationally towards more sodic rims. Some are altered slightly to extremely fine grained secondary plagioclase and epidote spots.

Clinopyroxene forms anhedral, pale green, equant to prismatic grains averaging 0.3-0.8 mm in size. A few clusters of clinopyroxene grains are up to 1.2 mm long. It commonly is partly rimmed by or replaced by secondary hornblende and/or biotite. Some grains are replaced by extremely fine grained secondary amphibole and moderately abundant opaque (magnetite?). A few patches up to 1.5 mm in size of extremely finely intergrown hornblende and biotite probably are secondary after original pyroxene. A few clinopyroxene grains are altered completely to a dense, extremely fine grained aggregate of an unknown, brownish-grey, semiopaque mineral.

Orthopyroxene forms a few subhedral to anhedral, equant to slightly prismatic grains averaging 0.2-0.5 mm in size. They are distinguished from clinopyroxene by parallel extinction and pleochroism from pale green to pink.

Biotite forms subhedral phenocrysts(?) up to 0.5 mm in size. These grade in texture into ragged interstitial grains and aggregates, and into irregular rims on clinopyroxene grains and intergrowths with hornblende.

In the groundmass, plagioclase forms anhedral equant to prismatic, moderately interlocking grains averaging 0.05-0.15 mm in size. Quartz forms interstitial patches up to 0.5 mm in size, generally skeletal between abundant plagioclase grains, and locally more continuous with less abundant plagioclase inclusions. Associated with quartz is minor K-feldspar. The latter was not identified in thin section, but its presence is inferred from the pale yellow stain on the offcut block.

Biotite and hornblende occur as irregular interstitial grains averaging Ø.Ø3-Ø.1 mm in grain size

Apatite forms scattered subhedral to euhedral, short prismatic grains averaging Ø.Ø7-Ø.Ø8 mm in length, and a few anhedral grains up to Ø.2 mm across.

Magnetite forms anhedral grains and clusters of grains averaging Ø.Ø3-Ø.5 mm in grain size. A few patches up to Ø.7 mm in size consist of coarse aggregates of magnetite and ilmenite. Some magnetite grains are surrounded by thick rims of biotite. Magnetite also occurs as disseminated, extremely fine grains in clusters of biotite-hornblende intergrowths. and in a few grains of clinopyroxene, mainly along borders of grains.

The rock is cut by a few veinlets from Ø.Ø1-Ø.Ø5 mm wide of extremely fine grained calcite with scattered patches up to Ø.1 mm long of pyrrhotite/pyrite.

D8-87-114 Quartz-bearing Hornblende-Biotite Diorite

The rock is a medium to fine grained quartz-bearing diorite, with early-formed plagioclase and clinopyroxene, later biotite, hornblende, and magnetite, and interstitial quartz and minor K-feldspar and chlorite. Clinopyroxene is replaced strongly by secondary amphibole and/or chlorite and calcite. Biotite is replaced almost completely by chlorite and plagioclase is replaced slightly by sericite.

plagioclase	60-65%	
hornblende	15-20	
clinopyroxene	7- 8	
quartz	4- 5	
biotite	4- 5	
magnetite	0.7	
K-feldspar	0.3	
chlorite	0.3	
ilmenite	0.2	(+/-hematite)
calcite	minor	
pyrite	trace	
chalcopyrite	trace	

Plagioclase forms subhedral, prismatic grains averaging 0.5-1.2 mm in size. Grains are compositionally zoned, especially near their margins, towards more-sodic rims. Alteration is slight to disseminated, extremely fine grained flakes of sericite.

Clinopyroxene forms pale green, anhedral, prismatic grains up to 1 mm in size. These are overgrown and partly replaced by medium to light green to brownish green hornblende. In some aggregates, magnetite is concentrated in hornblende surrounding clinopyroxene. Some clinopyroxene grains are altered to extremely fine grained tremolite(?) associated with moderately abundant patches of extremely fine to very fine grained magnetite. One mafic patch contains abundant calcite in very irregular intergrowths with hornblende; calcite appears to mainly replace clinopyroxene.

Hornblende forms anhedral to subhedral prismatic grains up to 1.5 mm long overgrown on clinopyroxene, and others intergrown with and partly interstitial to plagioclase.

Biotite forms grains up to 2 mm long, in part interstitial to plagioclase. It also occurs in irregular aggregates up to 2.5 mm across with hornblende. Almost all biotite grains are altered completely to pale to light green, pseudomorphic chlorite and minor Ti-oxide, with a few grains also containing moderately abundant patches of epidote. A few grains of biotite are fresh, with pleochroism from light to medium-dark brown.

Quartz occurs in irregular, interstitial patches from 0.05-0.5 mm in average size. A few of these patches also contain anhedral grains up to 0.2 mm across of K-feldspar.

Magnetite forms anhedral grains averaging 0.03-0.1 mm in size, with a few up to 0.25 mm across. Commonly it is concentrated in clusters of grains in mafic minerals. Ilmenite occurs in a few patches with or without magnetite, as grains from 0.1-0.4 mm in size. Some ilmenite grains contain patches of extremely fine grained intergrowths of ilmenite-hematite.

Chlorite forms a few interstitial aggregates from Ø.Ø5-Ø.15 mm in average size in part associated with quartz. These grains are free of Ti-oxide inclusions and do not appear to be pseudomorphic after biotite. Some patches show radiating textures.

Apatite forms prismatic grains up to Ø.15 mm in length and equant, anhedral to subhedral grains up to Ø.1 mm in size.

Calcite forms a very few equant grains from Ø.Ø3-Ø.Ø5 mm in size associated with plagioclase..

Pyrite forms a few anhedral grains up to Ø.1 mm in size, in part associated with interstitial chlorite.

Chalcopyrite forms a few clusters of grains averaging Ø.Ø1-Ø.Ø3 mm in size in biotite and in hornblende.

D8-87-205 Porphyritic Andesite

The rock contains phenocrysts of plagioclase and hornblende in a groundmass dominated by plagioclase with lesser chlorite and moderately abundant accessory magnetite. Hornblende is altered completely to chlorite-calcite-(semiopaque). Chlorite-(calcite) forms patches in the groundmass interstitial to plagioclase. Calcite forms replacement patches in the groundmass.

phenocrysts	
plagioclase	12-15%
hornblende	7- 8
groundmass	
plagioclase	60-65 (+ up to 3% K-feldspar?)
chlorite	7- 8
magnetite	1- 1.5
calcite	4- 5
quartz	minor
epidote	minor

Plagioclase forms subhedral prismatic phenocrysts from 0.5-1.5 mm in length. These are altered slightly to extremely fine grained, disseminated flakes of sericite and patches of epidote.

Hornblende forms anhedral to subhedral, equant grains averaging 0.2-0.7 mm in size, and a few prismatic phenocrysts up to 2.5 mm long. It is altered completely to intimate intergrowths of chlorite and calcite, which in some grains are oriented parallel to the c-axis of the original hornblende grain. Associated with these minerals is moderately abundant, dusty to extremely fine grained semiopaque. Some phenocrysts are altered completely to chlorite with or without minor calcite and free of semiopaque; except for the well developed crystal outlines of the original hornblende grain, these are texturally similar to irregular interstitial patches of chlorite-(calcite). Some phenocrysts are altered completely to irregular aggregates of calcite, commonly with moderately abundant disseminated, dusty semiopaque (Ti-oxide?).

Groundmass plagioclase ranges from prismatic grains averaging 0.1-0.15 mm in length to anhedral, interstitial grains averaging 0.05 mm in size. The light yellow color in the stained offcut block suggests that the groundmass contains interstitial K-feldspar. This mineral was not identified in thin section.

Chlorite occurs in interstitial patches from 0.05-1 mm in size. The larger patches commonly contain a few anhedral, equant grains of calcite up to 0.1 mm across.

In the groundmass are irregular replacement patches up to 2 mm across of strongly interlocking, very fine grained calcite. Locally calcite forms coarser grained replacement patches of equant grains from 0.2-0.5 mm in size. These commonly are surrounded by extremely fine grained aggregates of calcite.

Magnetite forms disseminated, anhedral to subhedral, equant grains averaging 0.01-0.03 mm in size. and much fewer equant grains from 0.05-0.1 mm in size. Some of the latter are altered slightly to patches of extremely fine grained hematite.

Quartz forms scattered interstitial grains averaging 0.02 mm in size.

Epidote forms scattered patches averaging 0.02-0.03 mm in size.

D8-87-144 Hornblende-Biotite Quartz Diorite (Argillic Alteration)

The rock is a medium to fine grained quartz diorite dominated by plagioclase with lesser hornblende, quartz and biotite. Plagioclase is altered completely to kaolinite. Hornblende is altered completely to quartz-carbonate-semiopaque. Biotite is partly altered to chlorite-carbonate- Ti-oxide. Magnetite is replaced by hematite, and ilmenite is replaced by leucoxene. The alteration assemblage is argillic.

plagioclase	60-65%
quartz	10-12
hornblende	12-15
biotite	8-10
magnetite	0.5
Ti-oxide	0.2
pyrite	0.1
apatite	minor
chalcopyrite	trace

Plagioclase forms anhedral to subhedral grains from 0.5-12 mm in size. It is altered completely to extremely fine grained (0.005-0.01 mm) kaolinite with minor wispy veinlets of and patches of extremely fine grained carbonate, and scattered flakes of sericite.

Hornblende forms equant, anhedral grains averaging 0.3-0.7 mm in size. It is altered completely to extremely fine to very fine grained aggregates of quartz(?), with minor to very abundant, extremely fine grained ankerite. In a few grains, relic amphibole cleavage is preserved by seams of ankerite.

Biotite forms ragged flakes averaging 0.3-1 mm in size. It is variably altered, with some grains relatively fresh with pleochroism from light to dark brown or reddish brown, and other grains altered moderately to completely to pseudomorphic chlorite with wispy patches and lenses of Ti-oxide, and extremely fine grained patches and streaks of calcite.

Quartz forms grains with skeletal to irregular outlines, commonly interstitial to subhedral to euhedral plagioclase. Grains average 0.3-0.8 with a few up to 1.7 mm across.

Magnetite forms equant grains averaging 0.03-0.1 mm in size. It is replaced completely by strongly interlocking aggregates of very fine grained hematite.

Pyrite forms disseminated, anhedral to locally subhedral grains from 0.05-0.15 mm in size.

Chalcopyrite forms a few patches up to 0.07 mm across with pyrite, a very few equant grains up to 0.03 mm in size in quartz, and one elongate grain 0.04 mm long along biotite cleavage plane in biotite.

Ti-oxide (leucoxene) forms irregular patches up to 0.4 mm in size associated with biotite; it probably is secondary after ilmenite.

Apatite forms equant grains averaging 0.02-0.04 mm in size, and a very few acicular grains up to 0.2 mm long.

D12-87-13 Slightly Porphyritic Andesite

The rock contains minor phenocrysts of plagioclase and hornblende(?) in a moderately foliated groundmass dominated by lathy plagioclase.

phenocrysts	
plagioclase	4- 5%
hornblende	3- 4
apatite	minor
groundmass	
plagioclase	80-85
calcite	3- 4
magnetite/hematite	0.5
patches	
quartz-calcite	4- 5
chalcopyrite	trace

Plagioclase forms subhedral to euhedral prismatic to equant phenocrysts up to 1.2 mm in size. It is altered completely to extremely fine to very fine grained aggregates of sericite and minor patches of quartz.

Hornblende forms subhedral prismatic phenocrysts and a few clusters of phenocrysts up to 1.7 mm across, averaging 0.5-1 mm in grain size. A few elongate prismatic phenocrysts are up to 3.5 mm in length, averaging 0.5-1 mm long. Alteration is complete to very fine grained chlorite with intergrowths of very fine grained calcite and extremely fine grained sericite. Some aggregates contain moderately abundant magnetite or apatite intergrown with chlorite and calcite.

Apatite forms one euhedral prismatic phenocryst 0.4 mm long.

The groundmass is dominated by moderately oriented, lathy to prismatic plagioclase grains averaging 0.1-0.15 mm in length. These are altered moderately to extremely fine grained sericite and calcite. Calcite also forms irregular replacement patches up to 0.3 mm in size. Foliation in lathy plagioclase commonly is warped or contorted around phenocrysts.

Magnetite forms disseminated, equant grains averaging 0.01-0.02 mm in size. It is altered moderately to hematite.

Apatite forms anhedral to euhedral equant grains up to 0.15 mm across and a few elongate prismatic grains up to 0.22 mm long.

Quartz forms interstitial grains averaging 0.03-0.05 mm in size. It also occurs in very fine grained interstitial patches up to 1 mm in size. Some of the patches contain fine grains of calcite intergrown coarsely with quartz.

Chalcopyrite forms a patch 0.03 mm across in secondary quartz.

D1A-87-163 Altered Leucocratic Quartz Diorite

The rock is a fine to medium grained, leucocratic quartz diorite in which biotite is altered completely to muscovite- Ti-oxide, and plagioclase is altered moderately to strongly to sericite and calcite.

plagioclase	55-60%
quartz	40-45
biotite	1
Ti-oxide	0.2
veinlets	
quartz-calcite	trace

Plagioclase forms mainly anhedral, equant grains averaging 0.3-1 mm in size. Alteration is moderate to locally strong to extremely fine grained sericite and irregular, very fine grained patches of calcite. Dusty semiopaque inclusions are very common is some grains. A few patches consist of very fine grained aggregates of quartz/plagioclase intergrown with sericite and calcite; these may be secondary after original hornblende.

Quartz forms anhedral grains up to 1.5 mm in size, mainly interstitial to plagioclase, and commonly containing several inclusions of plagioclase. Locally quartz was recrystallized to extremely fine to very fine grained aggregates along incipient shear zones.

Biotite forms ragged flakes form 0.2-1 mm in average size. It is replaced by pseudomorphic muscovite/sericite and minor to moderately abundant Ti-oxide. In a few grains, muscovite is replaced by quartz, leaving only Ti-oxide as an indication of the original mineral and texture.

Ti-oxide also forms a few patches up to 0.7 mm in size of extremely fine, semiopaque grains (probably leucoxene).

Apatite forms anhedral, equant grains averaging 0.02-0.04 mm in size, commonly associated with biotite.

The rock is cut by a few wispy veinlets up to 0.02 mm in width of calcite-quartz.

D9A-87-43 Altered Andesite (Phyllic-Carbonate Alteration)

The rock is dominated by fine to locally medium grained, lathy plagioclase with interstitial plagioclase, calcite, quartz, hematite, and pyrite. Plagioclase is altered completely to kaolinite and calcite. Replacement patches or amygdules up to 2 mm across are dominated by calcite with lesser ankerite and limonite.

plagioclase	75-80%
carbonate	7- 8
quartz	3- 4
hematite	0.5
pyrite	0.1
Ti-oxide	minor
carbonate patches	5- 7
limonite	2- 3

Plagioclase forms lathy prismatic grains averaging 0.2-0.4 mm in length, and anhedral, equant, interstitial grains up to 0.07 mm in size. A few patches up to 0.5 mm across may represent plagioclase phenocrysts. All are altered to extremely fine grained (0.005-0.01 mm) aggregates of equant flakes of kaolinite, with minor to moderately abundant patches of calcite. Some plagioclase grains contain moderately abundant dusty semiopaque of unknown composition.

One equant plagioclase or hornblende phenocryst 1.5 mm in size is replaced in the core by a patch of extremely fine grained kaolinite surrounded by very fine grained calcite and quartz. Outwards from this is an extremely fine grained aggregate of quartz, kaolinite, and calcite.

Groundmass minerals interstitial to plagioclase laths include very fine grained (0.03-0.08 mm) quartz, extremely fine to very fine grained patches of carbonate, and abundant disseminated, equant hematite grains averaging 0.01-0.02 mm in size, with scattered grains of hematite up to 0.1 mm across. Associated with carbonate, and in part replacing carbonate are moderately abundant patches of limonite.

The rock contains patches up to 2 mm in size of submosaic aggregates of fine grained calcite with minor grains of quartz, mainly near or along borders of the patches. Some patches contain zones of higher-relief, commonly subhedral carbonate associated with moderately abundant limonite; these may be ankerite. A few patches are dominated by very fine grained, anhedral aggregates of ankerite (0.03-0.07 mm grain size), with abundant limonite, mainly along grain borders.

Pyrite forms disseminated subhedral to euhedral, equant grains averaging 0.01-0.02 mm in size.

Ti-oxide forms disseminated grains averaging 0.01-0.02 mm in size.

A few wispy veinlets up to 0.015 mm wide consist of calcite.

85-6 Leucocratic Quartz Diorite (Argillic-Carbonate Alteration)

The sample is a leucocratic quartz diorite which is moderately similar to sample DlA-87-163. Quartz is interstitial to plagioclase. Mafic minerals are altered completely to chlorite, carbonate, limonite, and Ti-oxide. The rock contains replacement patches and veinlets of calcite.

plagioclase	60-65%
quartz	20-25
biotite	2- 3
hornblende	2- 3
carbonate	5- 7
apatite	minor
hematite	0.3
pyrite	trace
limonite	0.5
veinlets	
carbonate-(limonite)	2- 3%

Plagioclase forms anhedral to subhedral grains from 0..3-1.2 mm in size. It is altered completely to extremely fine grained kaolinite and patches and veinlets of calcite.

Quartz forms irregular, commonly skeletal grains up to 1 mm in size interstitial to plagioclase. The texture suggests rapid cooling in a hypabyssal environment.

Biotite forms ragged flakes up to 1 mm in size. They are altered completely to extremely fine grained pseudomorphic chlorite with locally abundant calcite and lesser muscovite and quartz. Original texture is outlined by extremely fine grained disseminated Ti-oxide.

Hornblende (?) forms equant grains averaging 0.3-0.7 mm in size. It is altered completely to extremely fine grained aggregates of quartz/plagioclase with moderately abundant, extremely fine grained carbonate, limonite, and Ti-oxide. One prismatic grain up to 1 mm long contains a core of subparallel tremolite grains surrounded partly by carbonate-limonite.

Calcite and ankerite-limonite form irregular replacement patches and veinlets; some of these are partly replaced by limonite. Pyrite forms a few patches up to 0.15 mm in size in one large vein, which is up to 0.2 mm wide.

Limonite also forms dusty replacements in kaolinite, giving the latter a pale to light yellow color.

Hematite forms subhedral to euhedral grains and clusters of grains averaging 0.07-0.12 mm in size. These probably are secondary after magnetite. Internally, many of these consist of extremely fine grained intergrowths.

Ti-oxide forms scattered patches up to 0.08 mm in size, commonly associated with hematite.

Pyrite forms a few equant grains and patches up to 0.2 mm in size; many have irregular outlines.

Apatite forms scattered clusters of acicular grains up to 0.12 mm in length, mainly associated with quartz.

D12-87-34 Porphyritic Hornblende-(Biotite) Granodiorite
(Weak Propylitic Alteration)

The rock is a medium to locally coarse grained granodiorite with moderately abundant hornblende and lesser biotite. Biotite is altered completely to chlorite-(epidote).

plagioclase	50-55%
quartz	17-20
hornblende	10-12
K-feldspar	8-10
biotite	7- 8
magnetite	1- 2
calcite	minor
sphene	trace
zircon	trace
pyrite	minor
calcite veinlets	minor

Plagioclase forms anhedral grains averaging 0.7-1.5 mm in size with moderately abundant phenocrysts up to 4 mm long. Many grains are compositionally zoned, with oscillatory zones in the cores of andesine composition (An_{40-48}) grading outwards towards more-sodic rims. Alteration is slight to extremely fine grained sericite flakes and calcite patches.

Quartz forms anhedral grains up to 2 mm across intergrown with plagioclase, and finer, commonly subrounded grains averaging 0.1-0.2 mm in size intergrown with K-feldspar interstitial to plagioclase.

Hornblende forms anhedral grains up to 2.5 mm in size. Pleochroism is from light to medium green. Grains locally are slightly altered to chlorite and secondary amphibole.

Biotite forms anhedral to subhedral, equant flakes up to 1.5 mm in size and a few clusters up to 2 mm across of flakes up to 1 mm in size. Some clusters consist of intimate intergrowths of biotite and plagioclase, with lesser magnetite and hornblende. Biotite is altered completely to pseudomorphs of chlorite with minor to moderately abundant patches of epidote.

K-feldspar forms interstitial grains from 0.5-2 mm in size, mainly intergrown with quartz. K-feldspar typically has abundant dusty, semiopaque to opaque inclusions.

Magnetite forms equant grains averaging 0.07-0.2 mm in size with a few up to 1 mm across. Some are slightly altered thir margins to very fine grains and aggregates of hematite.

Pyrite forms scattered anhedral grains up to 0.07 mm in size in quartz; one patch of quartz contains moderately abundant grains of this type. A very few subrounded pyrite grains up to 0.02 mm in size are included in magnetite.

Calcite forms a few patches up to 0.2 mm in size, in part probably after hornblende.

Zircon forms a few equant, subhedral grains up to 0.12 mm in size.

Sphene forms a very few anhedral to subhedral grains up to 0.15 mm in size.

Chlorite forms a few subradiating, interstitial patches up to 0.1 mm in size associated with quartz.

Calcite forms a few veinlets up to 0.02 mm in width.

D12-87-79 Porphyritic Granodiorite (Propylitic Alteration)

The rock is a medium to very coarse grained granodiorite with phenocrysts of plagioclase and hornblende and interstitial quartz, K-feldspar, and biotite.

plagioclase	50-55%	Ti-oxide	minor
quartz	20-25	chlorite	minor
K-feldspar	8-10	apatite	trace
biotite	7- 8	zircon	trace
hornblende	7- 8	pyrite	minor
magnetite	0.5	chalcopyrite	trace
veins			
calcite-(chlorite)	1		

Plagioclase forms a few phenocrysts up to several mm across, and finer grains averaging 1-1.5 mm across. Some show slight to moderate compositional zoning. Alteration is slight to moderate to disseminated flakes, patches, and veinlets of sericite and much less abundant patches of calcite.

Quartz forms anhedral interstitial grains and patches up to 2 mm in size.

K-feldspar forms anhedral, interstitial grains up to 1 mm in size. Dusty semiopaque-opaque inclusions are common.

Biotite forms ragged flakes up to 2 mm in size. Most grains are altered completely to pseudomorphic chlorite and moderately abundant, extremely fine grained epidote, with a few lenses of carbonate parallel to cleavage. A few grains are partly altered to chlorite; they contain cores of biotite which is pleochroic from straw to medium brown.

Hornblende(?) forms anhedral grains from 0,5-1 mm in average size. It is altered completely to extremely fine grained aggregates of carbonate with lesser opaque and chlorite.

Magnetite forms anhedral grains and clusters of grains averaging 0.05-0.15 mm in size, commonly associated with biotite It is strongly altered to very fine grained, moderately interlocking aggregates of hematite.

Ti-oxide (leucoxene) forms scattered patches up to 0.2 mm in size of extremely fine grained aggregates, commonly associated with magnetite.

Chlorite forms a few interstitial, subradiating patches up to 0.25 mm in size.

Apatite forms scattered anhedral to subhedral, stubby prismatic grains up to 0.1 mm in size.

Zircon forms a very few anhedral prismatic to equant grains up to 0.08 mm long.

Pyrite forms scattered anhedral to locally euhedral grains up to 0.07 mm in size, and a few discontinuous veinlets up to 0.01 mm wide in fractures in large quartz grains.

Chalcopyrite forms a few clusters of grains up to 0.2 mm in size. They are replaced along grain borders by thin to moderately thick rims of hematite.

The rock is cut by a vein up to 0.2 mm wide of very fine grained calcite-(ankerite-limonite-chlorite). Near this vein are abundant wispy veinlets and replacement patches of carbonate in plagioclase.

D12-87-94 Porphyritic Granodiorite (Argillic Alteration)

The rock contains moderately abundant very coarse grained phenocrysts of plagioclase in a medium grained groundmass of plagioclase-quartz- K-feldspar-hornblende-biotite. Plagioclase is replaced by kaolinite-(sericite), hornblende is replaced by carbonate-tremolite-chlorite-(kaolinite), and biotite is replaced by chlorite-(Ti-oxide).

plagioclase	50-55%	pyrite	minor
quartz	20-25	apatite	minor
K-feldspar	10-12	zircon	trace
biotite	7- 8	chalcopyrite	trace
hornblende	5- 7		
Ti-oxide	0.2		
veinlets			
calcite	minor		

Plagioclase forms anhedral to subhedral prismatic grains up to 2.5 mm in size. It is altered completely to extremely fine grained (0.005 mm) kaolinite with much less abundant flakes of sericite and patches and seams of carbonate and limonite.

Quartz forms anhedral grains and patches from 0.3-1 mm in grain size.

K-feldspar forms anhedral grains from 0.5-1.5 mm in average size. It contain moderately abundant dusty opaque/semiopaque inclusions and is slightly altered to extremely fine grained sericite.

Biotite forms flakes up to 2 mm in size. It is replaced completely by pseudomorphs or relatively unoriented aggregates of extremely fine grained chlorite with moderately abundant Ti-oxide and limonite.

Hornblende forms anhedral to subhedral prismatic grains up to 1 mm in size. It is altered completely to very fine grained, feathery aggregates of tremolite and/or carbonate, opaque, and limonite. A few grains are replaced by very fine grained quartz, extremely fine grained kaolinite, and much less, extremely fine grained carbonate-limonite.

Apatite forms scattered subhedral prismatic grains up to 0.4 mm in length.

Ti-oxide forms patches up to 0.2 mm in size of extremely fine grained aggregates.

Zircon forms scattered subhedral to euhedral grains up to 0.2 mm in length.

Pyrite forms scattered to locally abundant, anhedral grains and aggregates from 0.03-0.1 mm in average size. Locally it is concentrated in quartz.

Chalcopyrite forms a very few grains up to 0.1 mm in size. Most grains are in quartz and are unaltered. A few grains are altered strongly to hematite, which shows concentric alteration rings about a tiny core of chalcopyrite.

The rock is cut by a discontinuous veinlet up to 0.15 mm in width of very fine grained calcite.

D1A-87-62 Biotite Granodiorite (Phyllic Alteration)

The rock contains scattered plagioclase phenocrysts in a fine to medium grained groundmass dominated by altered feldspar and quartz, with much less biotite (replaced by chlorite-carbonate- Ti-oxide). Feldspars are altered completely to extremely fine grained aggregates of sericite-carbonate with patches of kaolinite. Veins are dominated by calcite with much less quartz. Minor veinlets are of sericite-pyrite.

feldspar	55-60%	(dominated by plagioclase)	
quartz	30-35		
biotite	3- 4		
hornblende	2- 3	veins and veinlets	
hematite	0.5	1) calcite-quartz	1- 2%
Ti-oxide	0.1	2) calcite	1- 2
apatite	minor	3) sericite-pyrite 0.2	
zircon	trace		

Plagioclase forms anhedral grains from 0.7-1.5 mm in size, with a few phenocrysts up to 4 mm across. Plagioclase is altered completely to extremely fine grained aggregates of sericite-carbonate or much less commonly to patches of extremely fine grained kaolinite. Kaolinite patches commonly are surrounded by aggregates of sericite-carbonate. Original K-feldspar was altered completely to the same assemblages, and cannot be distinguished from plagioclase.

Quartz forms anhedral grains from 0.3-1.5 mm in average size.

Biotite forms flakes from 0.5-1 mm in average size. It is altered completely to very fine grained aggregates of chlorite with moderately abundant lenses of ankerite and lesser calcite, and minor Ti-oxide.

Hornblende forms anhedral grains up to 1.2 mm in size. It is altered completely to extremely fine to very fine grained aggregates of quartz/plagioclase(?) or chlorite-ankerite with minor to moderately abundant carbonate and Ti-oxide.

Biotite and hornblende are concentrated in a few clusters up to 3 mm across with lesser Ti-oxide (after ilmenite) patches from 0.1-0.2 mm in size..

Hematite forms anhedral patches up to 0.1 mm in size.

Ti-oxide forms anhedral grains up to 0.1 mm in size, and clusters up to 0.2 mm in size of extremely fine grained aggregates, probably after ilmenite.

Zircon forms subhedral to euhedral prismatic grains up to 0.22 mm in length.

Pyrite forms anhedral grains from 0.05-0.4 mm in size.

Apatite forms anhedral ti euhedral grains up to 0.1 mm in size associated with hornblende and biotite.

The rock is cut by a diffuse vein up to 0.2 mm wide of extremely fine grained chlorite with much less carbonate and with one pyrite grain up to 0.25 mm across.

A few discontinuous wispy veinlets consist of extremely fine grained sericite with scattered grains of pyrite from 0.05-0.25 mm in length.

One discontinuous vein up to 0.5 mm wide is dominated by fine grained calcite with lesser quartz. It is cut by one of a set of very fine grained calcite veinlets up to 0.06 mm wide.

D4-87-226 Granodiorite (Phyllic-Carbonate Alteration)
[Original Texture Largely Destroyed]

The sample is very crumbly, and partly leached. It contains patches of sericite after feldspars, and much less abundant patches of original(?) quartz, intensely laced by calcite veinlets. Pyrite forms disseminated patches and is concentrated in irregular seams.

feldspars	55-60%
quartz	25-30
hornblende	4- 5
Ti-oxide	minor
zircon	trace
calcite	5- 7
pyrite	3- 4%
galena	trace
marcasite	minor

Original textures of feldspars and mafic minerals are almost completely destroyed. These minerals, dominated by plagioclase, are replaced by extremely fine grained aggregates of sericite, with locally abundant dusty opaque, and locally abundant patches and veinlets of calcite.

Quartz occurs in patches up to a few mm across as fine to medium grained aggregates. Probably much of the quartz is original. Quartz is laced by abundant calcite veinlets and veins averaging 0.03-0.07 mm in width. Calcite also forms irregular replacement patches associated in origin with the veins.

Several anhedral grains of hornblende up to 1.2 mm in length were recognized from their alteration assemblage and nature of inclusions. Alteration is complete to very fine grained aggregates of plagioclase/quartz, with moderately abundant extremely fine to very fine disseminated pyrite grains. Some hornblende grains contain a few anhedral inclusions of apatite up to 0.05 mm in size. Apatite also forms scattered anhedral prismatic grains up to 0.1 mm in size.

Ti-oxide forms a few patches up to 0.12 mm in size, mainly associated with sulfides.

Zircon forms subhedral prismatic grains up to 0.07 mm long and anhedral grains up to 0.1 mm long.

Pyrite forms disseminated, subhedral to euhedral equant grains averaging 0.02-0.05 mm in size, with a few patches up to 0.4mm across.

Galena forms one anhedral patch 0.08 mm across in quartz.

Marcasite forms wispy, discontinuous veinlets up to 0.01 mm in width and a few patches up to 0.25 mm across. It is extremely fine grained (0.002 mm).

D12-87-104 Granodiorite (Phyllic Alteration)

The rock is a medium to coarse grained granodiorite which was strongly altered. Plagioclase and K-feldspar were replaced by sericite, hornblende was replaced by quartz-(sericite), biotite was replaced by muscovite-(Ti-oxide), and pyrite was replaced by hematite.

feldspar	50-55%	
quartz	30-35	
hornblende	7- 8	
biotite	1- 2	
Ti-oxide	0.1	
zircon	trace	
pyrite	4- 5	(strongly altered to hematite)
marcasite	trace	
chalcopyrite	trace	

Plagioclase (and lesser K-feldspar) are altered completely to extremely fine grained to locally very fine grained aggregates of sericite. A few patches show subhedral to euhedral outlines against quartz, but generally original textures are not recognizable. Some grains also contain abundant subhedral to euhedral grains of pyrite (altered to hematite) averaging 0.02-0.05 mm in size. Surrounding many of the hematite patches, sericite is stained light to medium orange by limonite.

Quartz forms anhedral grains from 0.3-2 mm in size. It is recrystallized slightly along wispy seams to very fine grained aggregates.

Hornblende forms anhedral grains up to 1 mm in size and a few subhedral prismatic grains up to 2 mm long. These are replaced completely by very fine grained, moderately interlocking aggregates of quartz with minor to moderately abundant sericite and minor Ti-oxide.

Clusters of biotite grains up to 2 mm in size are altered to very fine grained sericite intergrown with moderately abundant Ti-oxide and lesser hematite (after pyrite). One wispy biotite grain 0.8 mm across and another 0.3 mm across are replaced by pseudomorphic muscovite with minor Ti-oxide in lenses along cleavage.

Ti-oxide forms scattered anhedral, equant grains from 0.05-0.15 mm in size.

Zircon forms a subhedral prismatic grain 0.1 mm in length.

Pyrite forms clusters of subhedral to euhedral cubic grains averaging 0.05-0.1 mm in size. Most are altered completely to hematite. A few in quartz are fresh. Hematite also forms scattered anhedral grains and clusters up to 1.5 mm in size.

Chalcopyrite forms a very few grains up to 0.02 mm in size enclosed in quartz grains.

Marcasite forms a very few, extremely fine grained clusters up to 0.03 mm in size.

D12-87-106 Quartz-Sericite-Pyrite-Pyrrhotite/Marcasite-Galena Altered Rock and Vein

Note: The sample is very crumbly, and was examined in two pellets, on of larger fragments and one of smaller fragments.

The rock contains quartz and sericite in a variety of secondary textures, with disseminated patches of sulfides dominated by pyrite and by pyrrhotite altered progressively to marcasite and then to hematite. Minor galena is partly corroded and altered to secondary Pb-minerals and hematite.

quartz	50-55%	pyrrhotite/marcasite	2- 3%
sericite	30-35	hematite	3- 4
Ti-oxide	minor	galena	0.3
pyrite	5- 7%		

Quartz occurs in three main modes. It forms a few patches of extremely fine grained (0.01-0.03 mm), moderately interlocking, cherty aggregates. Most commonly it occurs with minor to abundant sericite in very fine grained (0.02-0.05 mm) aggregates. In a few of these, sericite is oriented giving the rock a weak foliation. A third type of occurrence of quartz is as fine grains 0.2-0.5 mm in size with textures typical of vein quartz, including locally slightly radiating prismatic grains. Textures are somewhat gradational between types, especially the first two. Dusty opaque inclusions are common in some patches of very fine grained quartz-(sericite).

Sericite forms extremely fine grained patches alone or associated with quartz as described above. Borders between the two types are moderately gradational. Limonite locally forms bright yellow stains in sericite patches.

Ti-oxide forms patches up to 0.05 mm across, and a few discontinuous seams up to 0.4 mm long and 0.03 mm wide. Locally it is concentrated in patches of very abundant, extremely fine, disseminated grains in fine grained quartz.

Pyrite forms subhedral to euhedral grains averaging 0.1-0.5 mm in size. Some grains are strongly corroded, and have very irregular outlines within subhedral to euhedral casts. Cubic casts averaging 0.02-0.05 mm across are common in some sericite-(quartz) aggregates. A very few pyrite grains contain inclusions up to 0.02 mm in size of galena, and up to 0.15 mm in sized of pyrrhotite with or without chalcopyrite and galena.

Galena forms slightly to moderately corroded grains up to 0.5 mm in size. Corroded grains have an extremely fine texture produced during replacement of galena by secondary Pb-minerals, which appear to have been leached from the section. Some grains are partly replaced in patches along their borders by extremely fine grained, red-brown hematite.

Pyrrhotite forms patches up to 0.5 mm in size. It is altered strongly to completely to extremely fine grained marcasite showing secondary replacement textures. Marcasite commonly is altered moderately to strongly to hematite.

Hematite forms extremely fine grained, secondary patches up to 1.5 mm in size; textures suggest that these are strongly altered pyrrhotite/marcasite.

Mn-oxide forms dense patches and abundant veinlets and disseminations in some patches of very fine to fine grained quartz (gradational between type 2 and type 3 quartz).

D12-87-111 Galena-Pyrite-Quartz-Sphalerite-Chalcopyrite-Arsenopyrite Vein

The rock is a fine to coarse grained sulfide-quartz vein dominated by galena with lesser pyrite and quartz,and much less sphalerite, chalcopyrite, pyrrhotite, and arsenopyrite. Galena is variably altered to cerusite. Pyrrhotite is altered to pyrite.

quartz	10-12%
sericite	minor
pyrite	20-25
galena	40-45
cerusite	7- 8
sphalerite	4- 5
chalcopyrite	4- 5
arsenopyrite	1
pyrrhotite	minor
covellite	0.2
calcite	0.1
electrum	trace

Quartz forms patches up to 2 mm across of fine to very fine grained aggregates, locally with minor interstitial patches of extremely fine grained sericite. A few patches of quartz contain moderately abundant, subhedral to euhedral grains of pyrite averaging 0.1-0.3 mm in size.

Pyrite forms anhedral grains averaging 0.1-0.2 mm in size, with a few up to 1.5 mm across. Some are moderately corroded. A few large grains contain numerous tiny inclusions of galena and lesser ones of pyrrhotite and chalcopyrite. Some pyrite patches consist of very fine to fine grained aggregates, with minor interstitial quartz. Some patches up to 1.5 mm in size consist of aggregates of fine grained sphalerite surrounded by very fine grained patches of pyrite. This pyrite has slightly lower reflectivity than pyrite grains away from sphalerite. It may be secondary after pyrrhotite.

Galena forms fragments up to 1.5 mm in size. Some grains are relatively fresh. Others are fresh with a rim of extremely fine grained galena replaced by cerusite. Many galena grains are strongly replaced by extremely fine grained cerusite. Some patches of cerusite show a well developed concentric structure. Some galena grains contain wispy veinlets and disseminated patches of chalcopyrite and an unknown, silver-bearing(?) mineral averaging 0.005-0.01 mm in size. The latter is bluish grey in color, and appears to have reddish internal reflection.

Sphalerite forms grains up to 0.7 mm in size. It commonly contains trains and irregular exsolution blebs of chalcopyrite and less commonly of pyrrhotite. Some patches up to 1.5 mm across consist of intergrowths of fine grained sphalerite surrounded by very fine grained aggregates of pyrrhotite/pyrite.

Chalcopyrite forms anhedral patches averaging 0.1-0.5 mm in size, with a few from 1 to 1.7 mm across. Some patches are surrounded by wispy rims of corroded galena. Along the border of the largest patch are moderately abundant anhedral pyrite grains from 0.1-0.3 mm in size.

Covellite forms extremely fine grained patches up to Ø.Ø6 mm across enclosed by galena. In a few patches covellite is surrounded by and intimately intergrown with extremely fine grained chalcopyrite and minor bornite(?).

Arsenopyrite forms anhedral grains up to Ø.5 mm in size enclosed in galena. These are moderately fractured and slightly corroded along fractures. One is altered along fractures to an intergrowth of light grey and brown minerals of unknown composition.

Electrum (light yellow) forms one equant, subrounded grain Ø.ØØ3 mm in size in a pyrite grain, and an adjacent grains Ø.ØØ1 mm across.

Calcite forms one veinlike zone up to Ø.3 mm wide in cerusite. Associated with calcite are patches of galena up to Ø.1 mm in size. some of which surround extremely fine grained patches of covellite-chalcopyrite up to Ø.Ø5 mm in size.

Locally, pyrrhotite forms veinlets up to Ø.Ø3 mm wide in pyrite.

D12-87-112 **Quartz-Pyrite Vein cut by late vein of Galena-Sphalerite-(Arsenopyrite)**

The vein contains a broad core dominated by quartz bordered by zones dominated by pyrite-quartz.

host rock	
quartz	25-30%
sericite	3- 4
zircon	trace
Ti-oxide	trace
veins	
1) quartz	35-40
pyrite	17-20
other sulfides	minor
2) galena	5- 7
sphalerite	2- 3
arsenopyrite	0.1
chalcopyrite	minor
covellite	trace

The sample contains irregular patches of quartz-sericite altered host rock. These consist of aggregates of very fine grained quartz with irregular patches up to 1 mm in size of extremely fine grained sericite to very fine grained muscovite. Zircon forms one subhedral equant grain 0.12 mm across. Ti-oxide forms clusters of a few subhedral grains from 0.03-0.07 mm in average size.

The altered rock is gradational to and partly replaced by coarser grained, commonly subhedral quartz, which shows textures more typical of vein quartz. Locally, coarse grained quartz is slightly recrystallized to extremely fine to very fine grained aggregates. In places, euhedral quartz grains are surrounded by altered rock.

Pyrite forms anhedral to euhedral grains from 0.5-1.5 mm in average size. Several contain abundant inclusions from 0.01-0.05 mm in size of galena and lesser ones of sphalerite, chalcopyrite, and pyrrhotite. One pyrite grain contains a very few inclusions of argentite from 0.02- 0.05 mm in size, in part associated with galena. A few large patches of pyrite consist of very fine to fine grained aggregates of equant, anhedral to subhedral grains with minor interstitial quartz. Scattered pyrite grains in quartz are subhedral to euhedral in outline. Many pyrite grains are slightly corroded along their borders.

A major crosscutting vein up to 1.5 mm wide at one end of the section and a few much smaller veinlets along the border of the section are dominated by galena with lesser sphalerite and much less arsenopyrite.

Galena forms subhedral patches up to Ø.35 mm in size which were unaffected by alteration. Much galena is replaced moderately to strongly extremely fine grained cerusite. Locally, cerusite forms patches up to Ø.6 mm in size. Galena forms a few patches up to Ø.3 mm in size interstitial to euhedrally terminated quartz grains. These patches are replaced strongly by hematite with wispy dendritic to irregular patches of covellite.

Sphalerite forms anhedral grains up to Ø.8 mm in size. Some smaller grains contain minor exsolution blebs and trains of chalcopyrite.

Arsenopyrite forms subhedral, in part corroded grains from Ø.1-Ø.2 mm in size, mainly enclosed by galena.

Chalcopyrite forms scattered interstitial grains up to Ø.Ø3 mm in size in the galena-sphalerite vein.

Covellite forms a few patches up to Ø.1 mm in size surrounded by galena.

D4-87-76 **Brecciated Quartz-Pyrite Vein; Late Carbonate Veins and Patches**

The rock is a replacement to fracture filling vein of quartz-pyrite, which was brecciated, and the fragments cemented and partly replaced by calcite veinlets and patches, some of which contain abundant angular fragments of pyrite.

calcite	40-45%
quartz	30-35
sericite	0.5
pyrite	20-25
galena	minor
chalcopyrite	trace
tetrahedrite(?)	trace
hematite	0.5

Quartz forms aggregates ranging widely in grain size. Very fine grained patches commonly have strongly interlocking grains borders and irregular outlines. Some of these contain minor to locally moderately abundant sericite as concentrations of disseminated flakes in quartz and a few patches up to 0.1 mm in size of unoriented flakes. In places, sericite-quartz intergrowths form thin interstitial selvages between coarser grained quartz. Textures suggest that quartz-sericite aggregates represent strongly altered and silicified host rock. Coarser grained patches of quartz averaging 0.2-1 mm in grain size have textures suggestive of veins.

Calcite occurs in patches and veins, mainly of very fine grain size. Extremely fine grained concentrations of angular pyrite fragments are common in some veins. One large veinlike zone of calcite-pyrite has a border zone of extremely fine grained calcite containing abundant angular fragments of pyrite, and a core of very fine to fine grained calcite, relatively free of pyrite. Late calcite veinlets up to 0.2 mm wide cut fractured pyrite grains and quartz.

Pyrite forms subhedral to euhedral grains averaging 0.1-0.5 mm in size. Some are fractured moderately to strongly, and in several patches of these, quartz fills narrow, wispy fractures. One grain contains a few inclusions up to 0.02 mm in size of pyrrhotite-chalcopyrite, and another contains a few inclusions up to 0.03 mm in size of galena with lesser argentite. One strongly brecciated veinlike zone of pyrite up to 0.2 mm wide is replaced moderately to strongly by hematite.

Galena and much less tetrahedrite form interstitial patches up to 0.15 mm in size in pyrite-rich clusters. Tetrahedrite forms a few irregular patches up to 0.1 mm in size. It is moderately hard, with low reflectivity and brownish grey color against galena.

One patch 0.03 mm across in quartz contains a grain of chalcopyrite adjacent to a slightly smaller grain of galena. Both minerals are slightly corroded.

D3A-87-114 Altered Granodiorite replaced by Quartz-Pyrite; cut by late veins and replacement patches of Carbonate-Quartz-Tetrahedrite-Chalcopyrite

The rock is a medium to coarse grained granodiorite which was strongly altered to quartz-sericite-muscovite, and replaced by quartz-pyrite-(arsenopyrite). Late veins and patches consist of carbonate (ankerite and calcite), quartz, with patches of tetrahedrite-chalcopyrite-(pyrite).

sericite	30-35		
quartz	40-45%		
biotite	3- 4		
Ti-oxide	0.5		
pyrite	12-15		
arsenopyrite	0.1		
carbonate	5- 7	pyrrhotite	trace
tetrahedrite	1.5-2	covellite	trace
chalcopyrite	1		

Sericite (after plagioclase and probably much less K-feldspar) forms extremely fine grained to locally very fine grained aggregates in patches up to 2 mm in size. Original feldspar outlines are almost completely destroyed. Sericite patches grade into aggregates of sericite and very fine grained quartz.

Quartz mainly occurs as medium to coarse, anhedral grains intergrown coarsely with sericite and sericite/quartz patches. Locally it forms extremely fine grained, cherty patches and lenses, in part along thin fractures between medium grained pyrite grains, and elsewhere cutting patches of sericite.

Biotite forms ragged, strongly corroded flakes up to 1.7 mm in size. It is altered completely to pseudomorphic muscovite with irregular patches of extremely fine grained Ti-oxide.

Ti-oxide forms clusters from 0.05-0.25 mm in size intergrown with quartz and sericite. In places, Ti-oxide appears to have been a nucleus for replacement by pyrite, and some pyrite grains contain abundant inclusions of Ti-oxide. Minor Ti-oxide grains up to 0.08 mm in size occur in carbonate.

Zircon forms a very few subhedral prismatic grains up to 0.1 mm in length.

Pyrite forms clusters of anhedral to euhedral grains ranging from 0.03-1.5 mm in size. One grain contains two inclusions, 0.1 mm and 0.03 mm long, respectively, composed of slightly intergrown chalcopyrite and pyrrhotite.

Arsenopyrite forms a few grains 0.05-0.2 mm in size on the border of a cluster of pyrite. One arsenopyrite grain is rimmed by a zone up to 0.01 mm in width containing minor extremely fine grained covellite. Arsenopyrite also forms a very few subhedral grains up to 0.1 mm in size enclosed in pyrite.

Carbonate forms irregular replacement patches, mainly associated with the carbonate-bearing vein. The moderately high relief of much of the carbonate suggests that it is ankerite. One discontinuous vein up to 3 mm long consists of medium to coarse grained calcite partly rimmed by very fine grained quartz, whose grains commonly are in subparallel orientation perpendicular to the wall of the vein.

The rock is cut by a diffuse branching veinlike zone up to 1 mm wide containing subhedral to euhedral quartz, with interstitial patches of carbonate, tetrahedrite, and chalcopyrite, with minor pyrite.

Tetrahedrite forms anhedral patches up to 1 mm across, commonly associated with lesser chalcopyrite. Some of the patches contain inclusions of fine grained pyrite and extremely fine grained chalcopyrite. Nearby in quartz are grains of chalcopyrite up to Ø.2 mm across. Chalcopyrite forms patches up to Ø.7 mm long mm across intergrown with lesser very fine grained tetrahedrite. Many chalcopyrite grains are partly surrounded by thin rims of tetrahedrite. A few patches of chalcopyrite contain inclusions of very fine grained pyrite.

D9C-87-13 Silicified Rock replaced by Pyrite-Arsenopyrite, and cut by Quartz and Carbonate Veins

The original rock was strongly altered to the assemblage quartz-pyrite-arsenopyrite-sericite. It was brecciated and healed by veins dominated by calcite and quartz.

quartz	50-55%
sericite	1- 2
Ti-oxide	0.2
apatite	0.1
carbonate	20-25
pyrite	15-17
arsenopyrite	3- 4
sphalerite	0.3
galena	0.1
chalcopyrite	trace

The rock contains patches up to a few mm across of extremely fine to very fine grained, moderately interlocking quartz, with minor to moderately abundant disseminated euhedral to subhedral grains of arsenopyrite and/or pyrite averaging 0.01-0.03 mm in size. Sericite is concentrated in patches up to 0.5 mm in size, which may be relics from original feldspar grains. Ti-oxide and apatite commonly are concentrated together; textures suggest that they were inclusions in original hornblende grains which have since been altered completely to quartz. Ti-oxide forms subhedral stubby prismatic grains averaging 0.05-0.07 mm in size. and local anhedral patches up to 0.25 mm in size. Apatite forms anhedral grains up to 0.05 mm across. It is concentrated in a few clusters of very irregular grains up to 0.2 mm in size, associated with the large Ti-oxide patches. Calcite forms irregular, very fine grained patches replacing the host rock.

The rock was brecciated, and fragments healed by irregular veins of calcite and quartz. Calcite ranges from very fine to very coarse grained. Quartz commonly forms subparallel aggregates oriented perpendicular to vein walls. In cores of veins, quartz forms euhedral prismatic grains surrounded by interstitial calcite. Some very fine grained calcite aggregates were slightly strained and recrystallized from coarser grained aggregates.

Pyrite forms anhedral grains up to 2 mm in size. Some grains contain abundant tiny inclusions of one or more of galena and lesser chalcopyrite and sphalerite. Pyrite is variably brecciated, with most grains cut only by coarse fractures, and a few intensely granulated.

Arsenopyrite forms abundant disseminated subhedral, rhombic grains averaging 0.02-0.05 mm in size in the very fine grained altered host rock. It also forms subhedral to euhedral cubic grains from 0.1-1 mm in size associated with pyrite and possibly partly pseudomorphic after pyrite.

Sphalerite occurs in one main patch up to 1 mm across, in which it is intergrown finely with calcite. Sphalerite is mainly red-brown in color, with minor orange colored patches. It contains moderately abundant exsolution blebs of chalcopyrite averaging 0.002-0.003 mm in size.

Galena forms a few anhedral, equant inclusions in pyrite up to 0.6 mm in size. More commonly it forms moderately abundant inclusions averaging 0.01-0.03 mm in size with a few elongate ones up to 0.2 mm in length.

Chalcopyrite forms minor grains up to 0.05 mm in size in fractures and inclusions in pyrite, and forms a very few grains up to 0.05 mm in size along borders of sphalerite.

Late fracture-filling calcite veinlets cut the rock; these vary in thickness from 0.02-0.2 mm along the length of a vein. Some calcite grains are strongly strained. Some of these contain minor pyrite grains up to 0.4 mm in size.

D8-87-145 Altered Quartz Diorite cut by Sphalerite-Galena-Arsenopyrite-Calcite-Quartz Vein

The sample is a medium grained diorite which was altered to a phyllic assemblage, and cut by a vein up to 1 cm wide dominated by sphalerite with lesser calcite, arsenopyrite, galena and quartz.

rock			
plagioclase	30-35%	arsenopyrite	0.1%
quartz	8-10	Ti-oxide	0.1
biotite	4- 5	apatite	minor
hornblende	2- 3	zircon	trace
pyrite	3 -4		
vein			
sphalerite	20-25		
arsenopyrite	7- 8		
galena	3- 4		
calcite	10-12		
quartz	2- 3		
chalcopyrite	trace		

Plagioclase forms subhedral prismatic grains averaging 0.2-0.8 mm in size. It is altered completely to extremely fine grained sericite

Quartz forms interstitial grains averaging 0.05-0.3 mm in size.

Biotite forms ragged flakes up to 1.5 mm in size. It is replaced completely by pseudomorphic muscovite with abundant extremely fine grained Ti-oxide oriented in cleavage planes of mica.

Hornblende forms a few phenocrysts up to 2 mm across. It is altered completely to very fine grained quartz with interstitial to porphyroblastic sericite and moderately abundant dusty Ti-oxide. Disseminated cubic pyrite is common in hornblende.

Pyrite occurs in clusters up to 1 mm in size and as disseminated grains averaging 0.03-0.07 mm in grain size. Most grains are subhedral to euhedral cubes. Nearer the vein, some patches up to 1 mm across consist of dense intimate intergrowths of very fine grained pyrite and arsenopyrite. Arsenopyrite also forms a few disseminated patches of a few to several subhedral to euhedral grains averaging 0.02-0.05 mm in size.cleavage planes .

Ti-oxide (after ilmenite) forms extremely fine grained patches up to 0.3 mm in size.

Apatite forms scattered subhedral to euhedral prismatic grains averaging 0.07-0.12 mm in length.

Zircon forms subhedral equant to prismatic grains up to 0.07 mm in size.

Near the main vein are patches of very fine grained quartz with lesser sphalerite and carbonate, and a few disseminated patches of arsenopyrite.

Bordering the vein is a discontinuous halo averaging 0.03-0.05 mm in size composed of extremely fine grained arsenopyrite with lesser pyrite.

vein

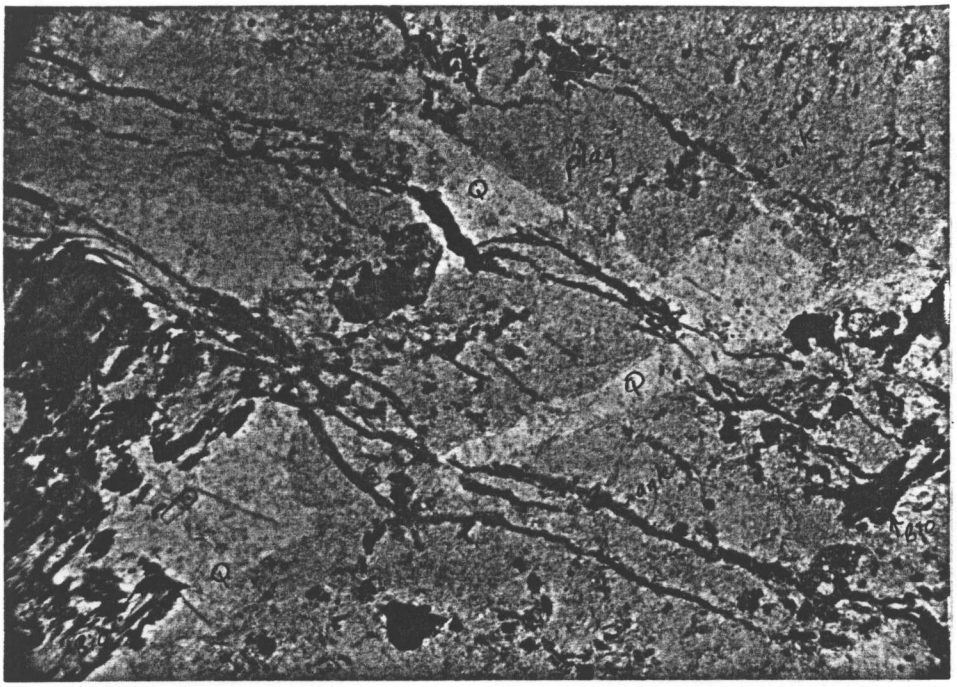
Sphalerite forms anhedral grains up to 2 mm in size. It commonly is color zoned, with medium to dark orange cores grading outwards towards light to pale orange rims. Sphalerite locally contains exsolution blebs of chalcopyrite averaging Ø.ØØ2 mm in size.

Arsenopyrite forms clusters of subhedral to anhedral rhombic to irregular grains averaging Ø.Ø2-Ø.Ø4 mm in size. These grade outwards into disseminated subhedral to euhedral grains of similar habit with interstitial patches of galena, and less commonly of one of sphalerite, quartz, carbonate, and sericite. In some patches, early formed arsenopyrite and pyrite are fractured, with fractures filled by galena.In a few patches, elongate euhedral arsenopyrite grains are up to Ø.3 mm in length.

Galena forms anhedral patches up to Ø.5 mm in size, locally coarsely intergrown with sphalerite, and is common interstitial to arsenopyrite.

Pyrite forms scattered subhedral to euhedral grains averaging Ø.Ø5-Ø.1 mm in size enclosed in other sulfides.

Calcite and lesser quartz form very fine grained to locally fine grained patches interstitial to sulfide aggregates, and locally containing abundant inclusions of arsenopyrite. Near the border of the vein sulfides are much less abundant. Here the vein is dominated by very fine grained calcite with lesser patches of extremely fine to very fine grained quartz, disseminated patches of sulfides, and minor sericite.Sericite forms patches up to Ø.8 mm in size, and may be secondary after original plagioclase.



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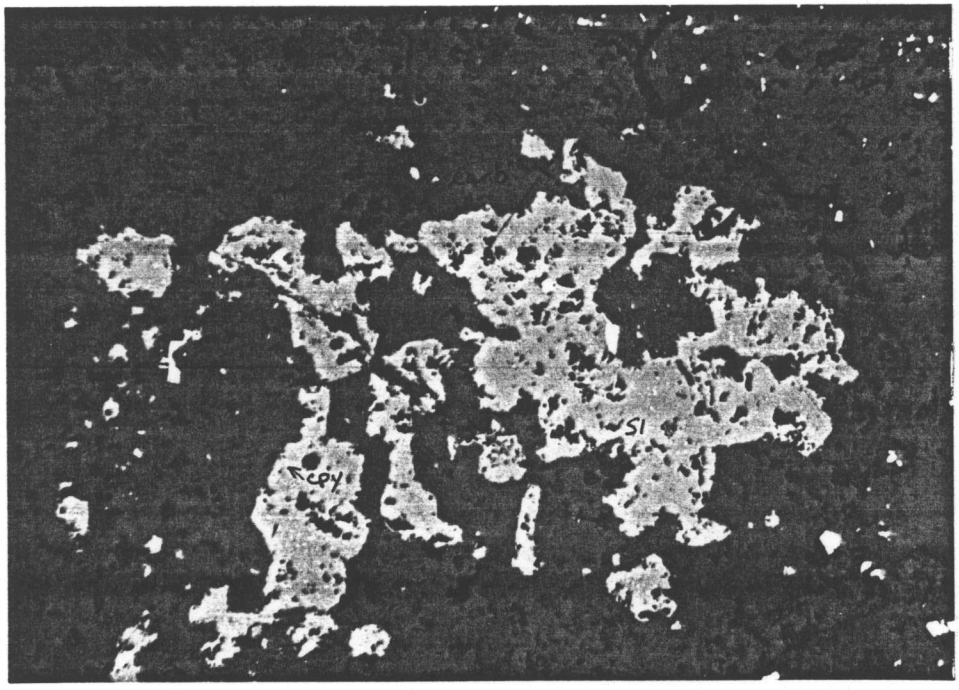

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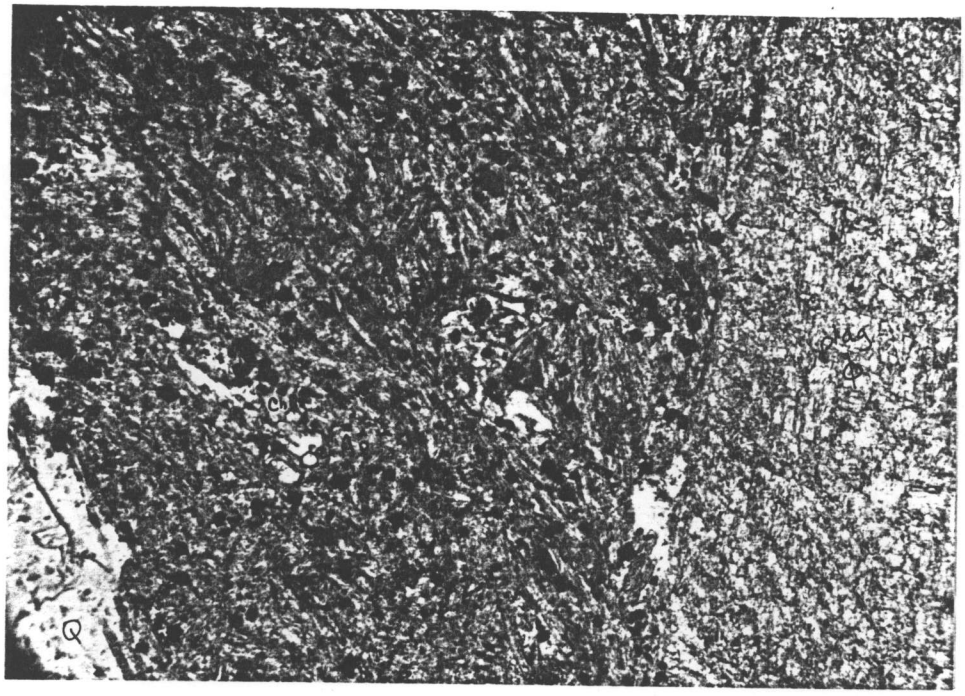

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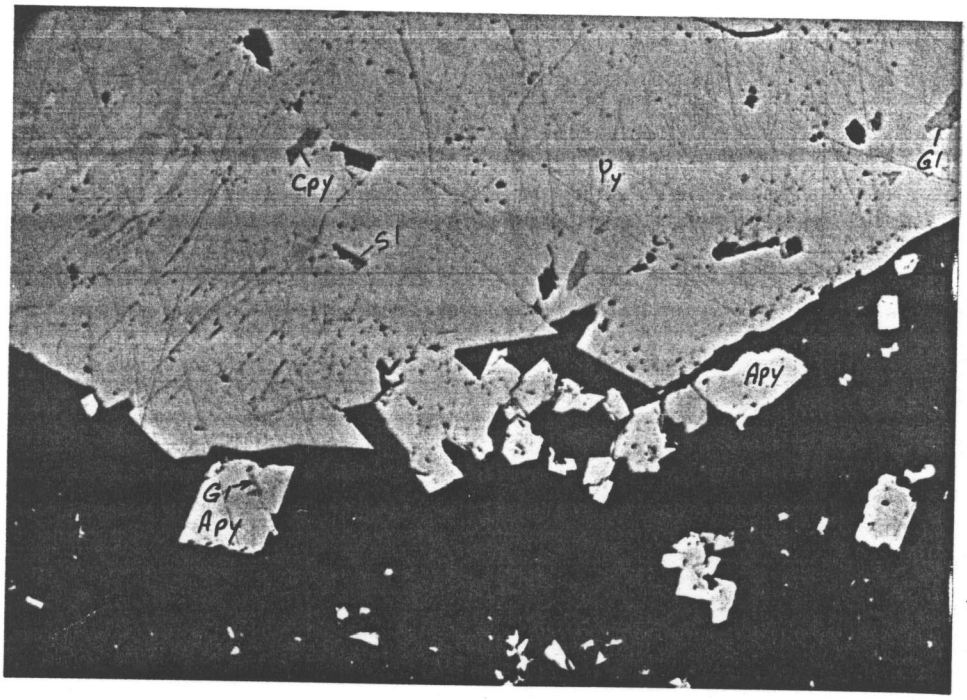

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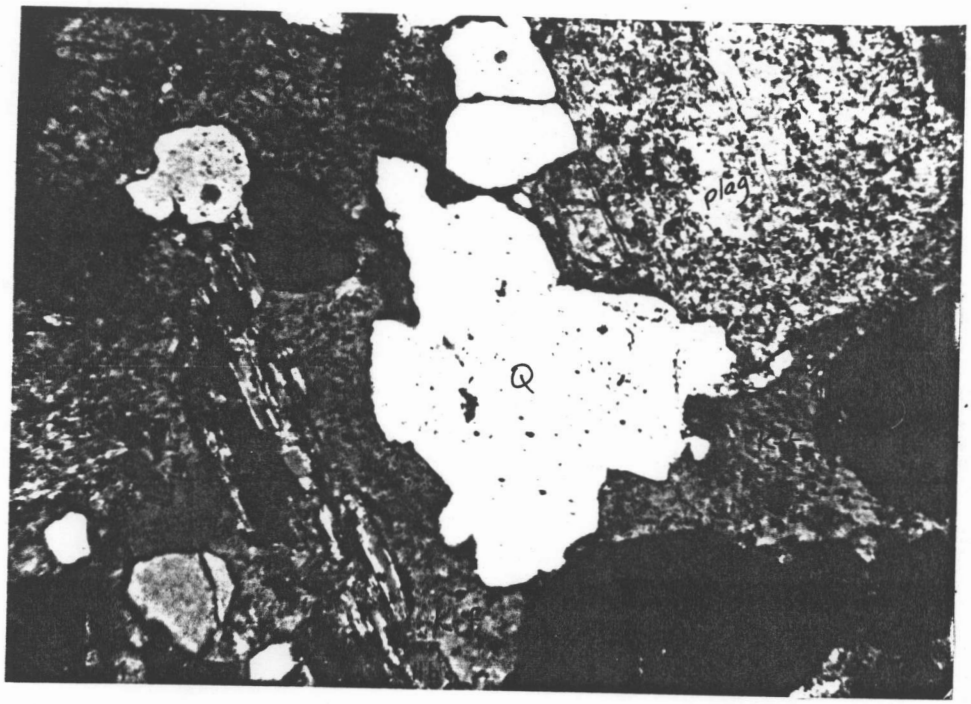

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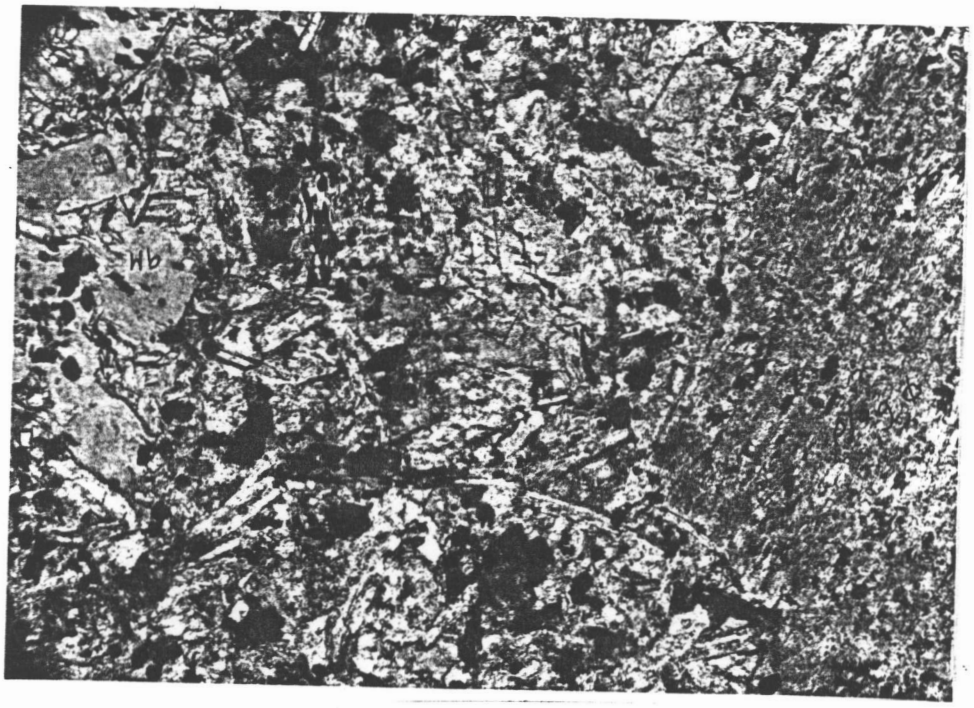

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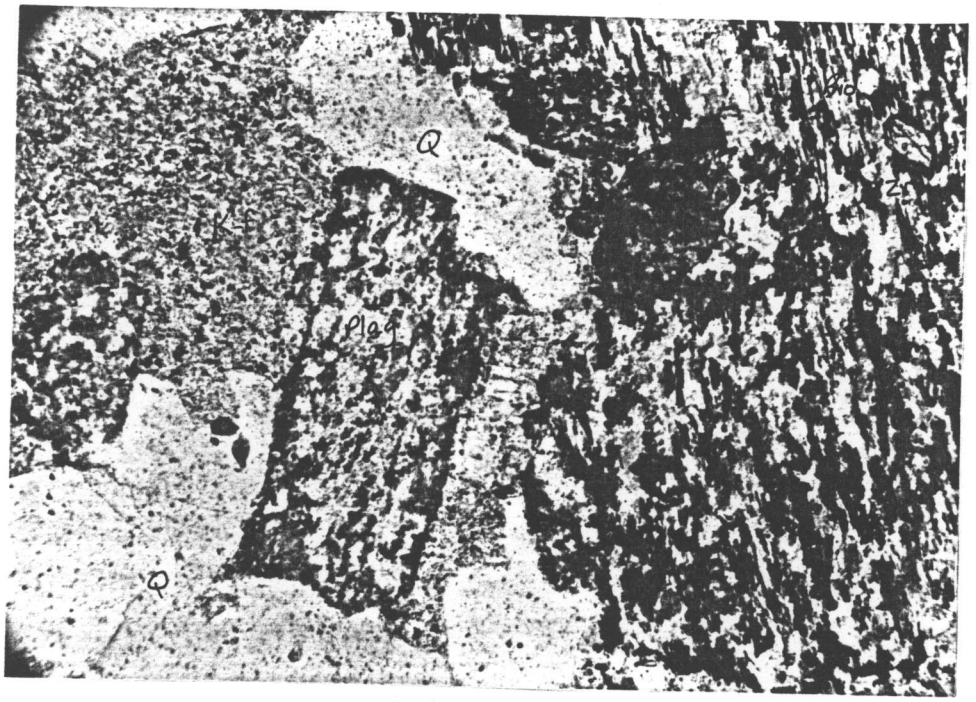

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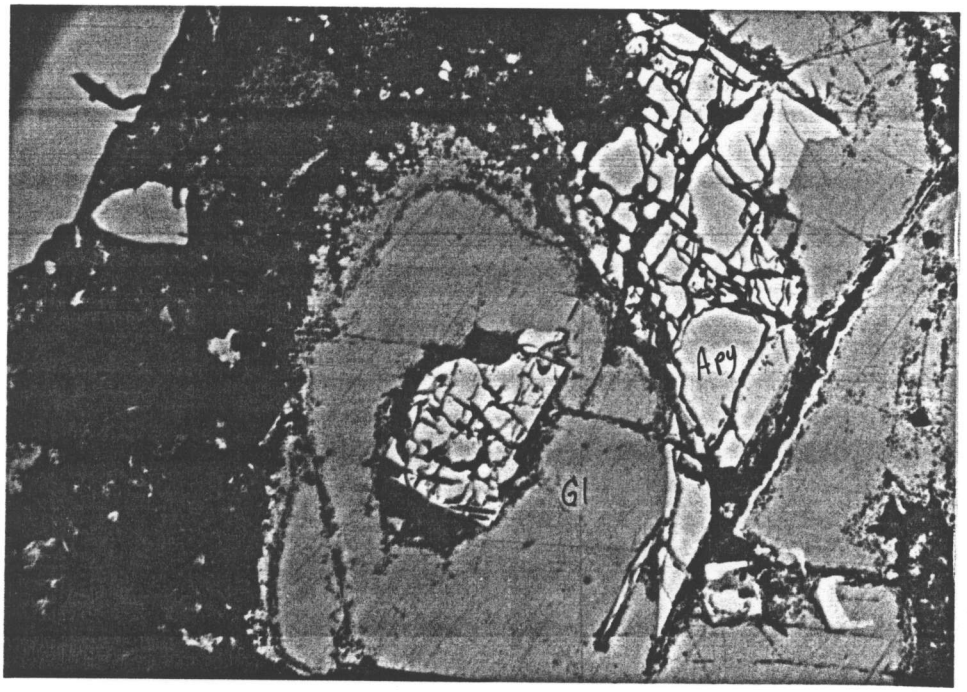

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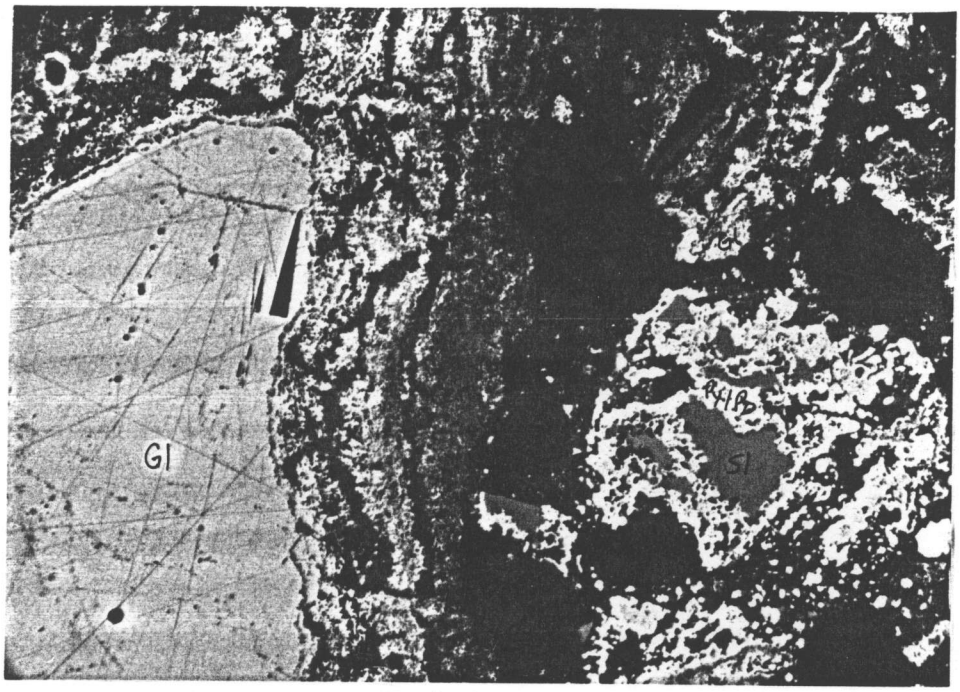

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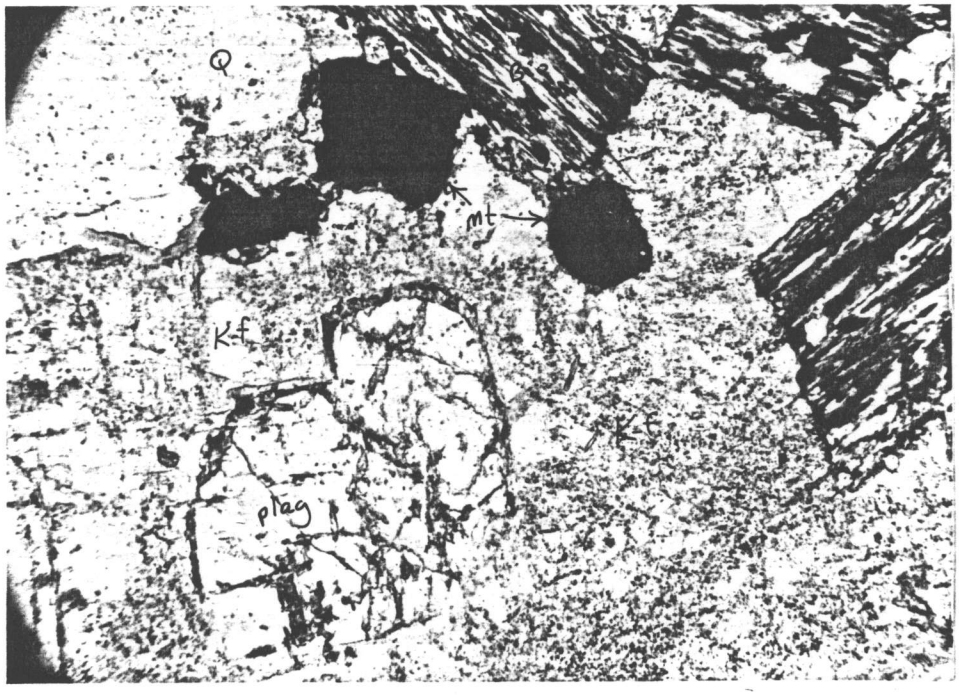

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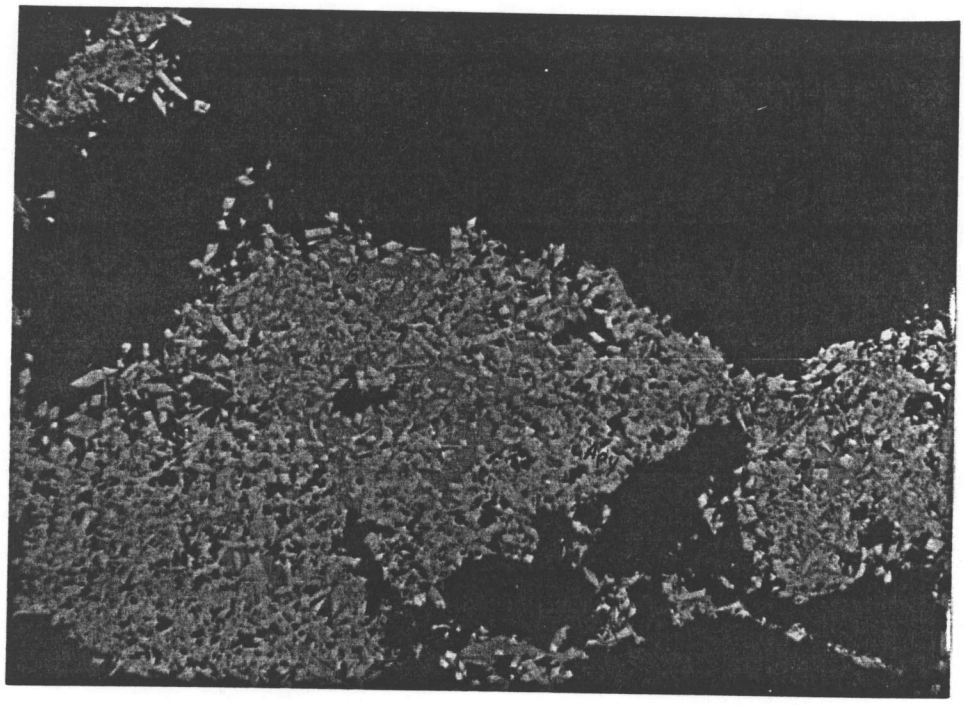

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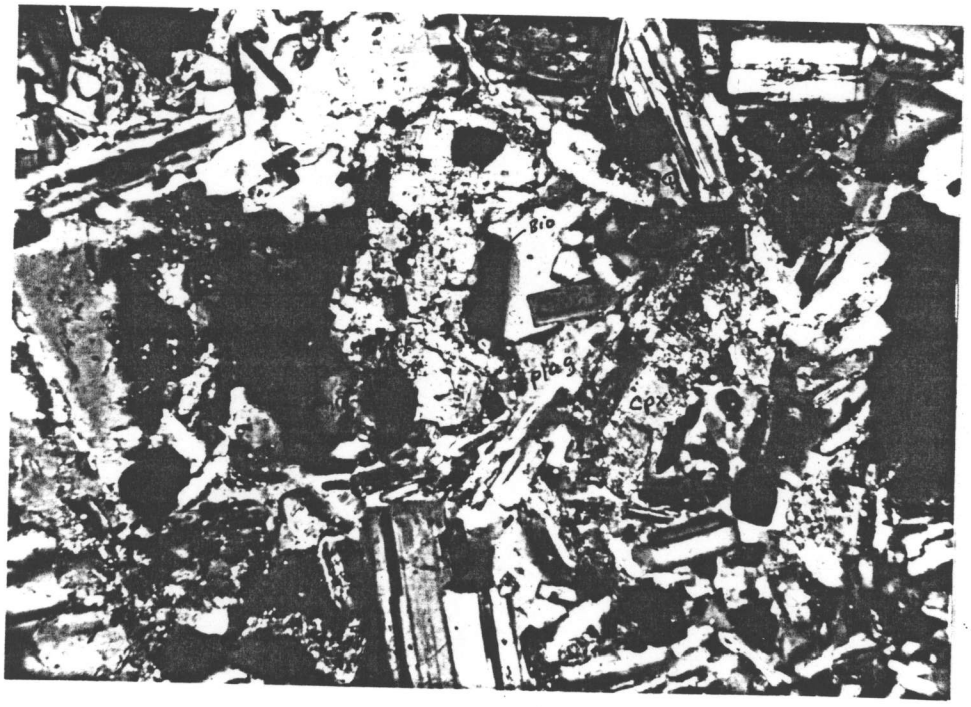

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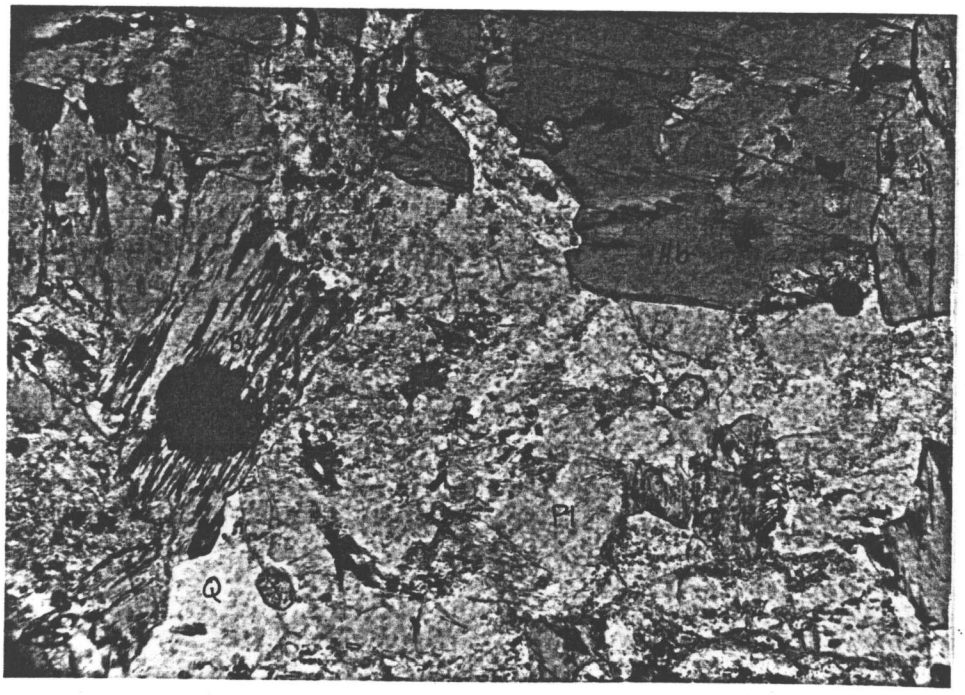

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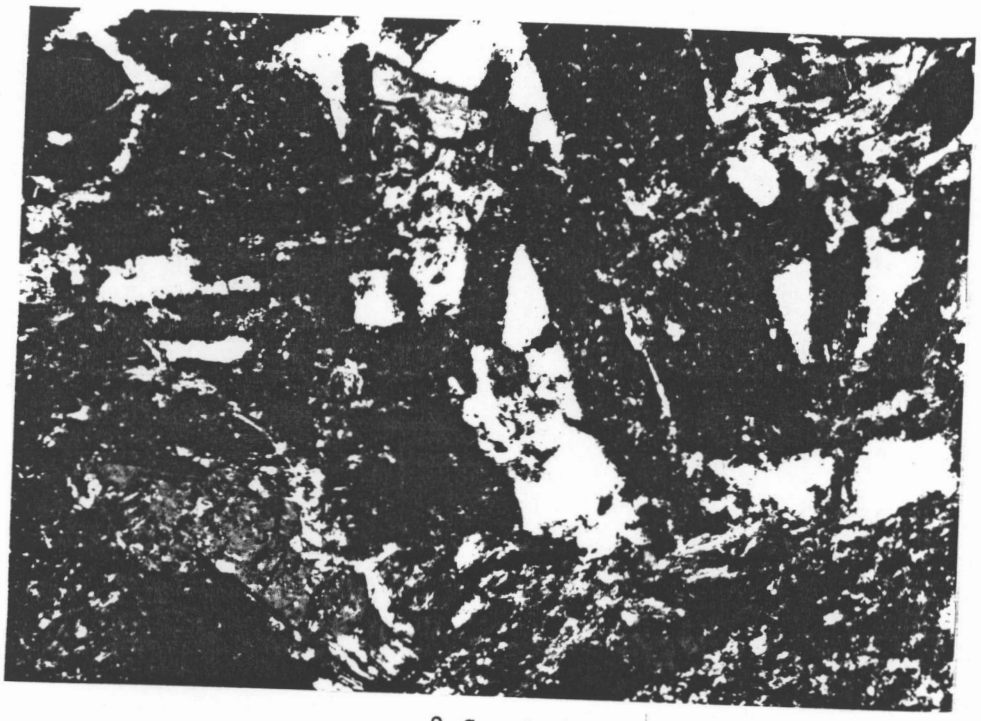

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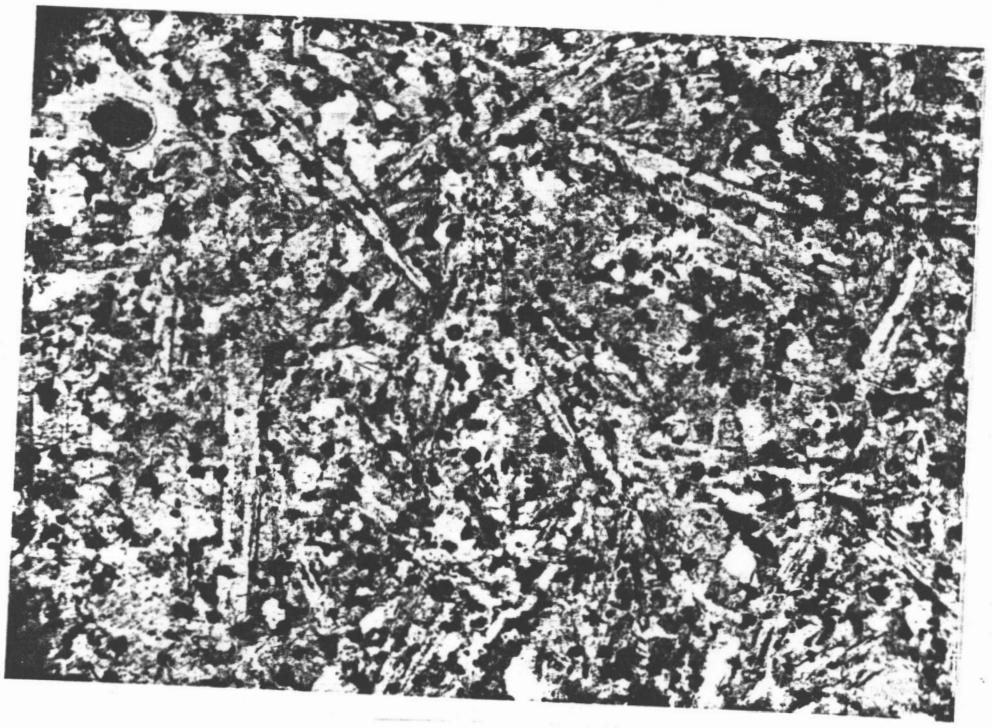

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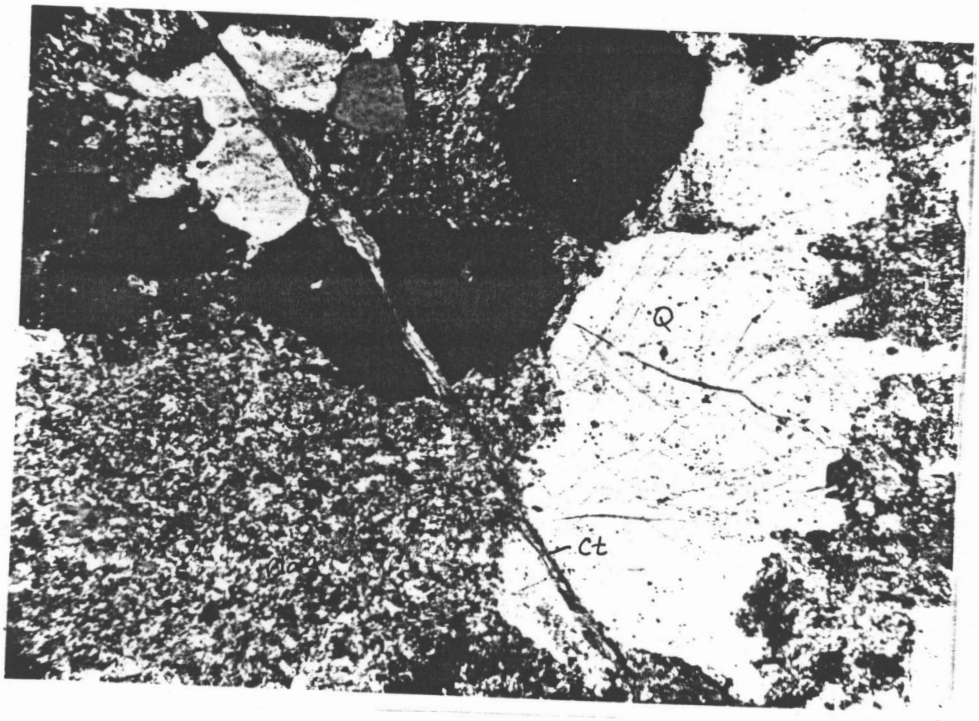

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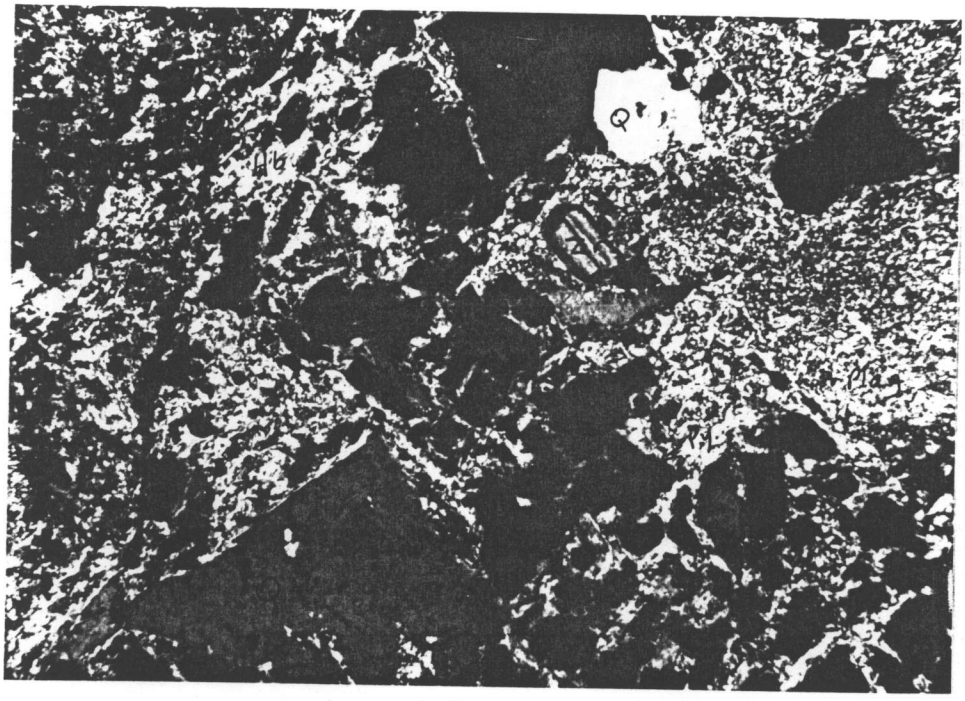

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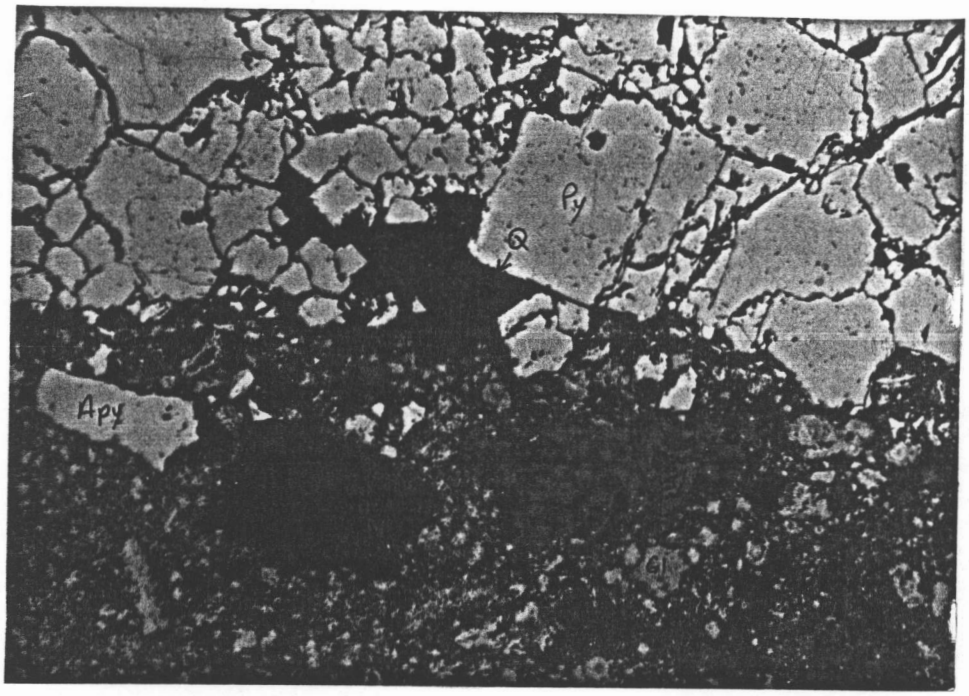

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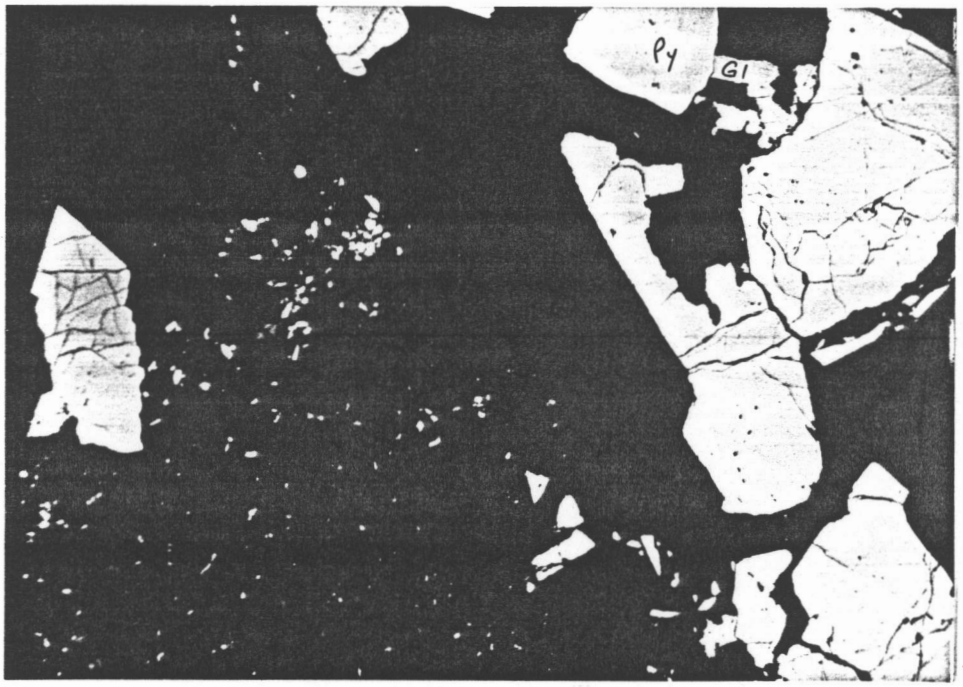

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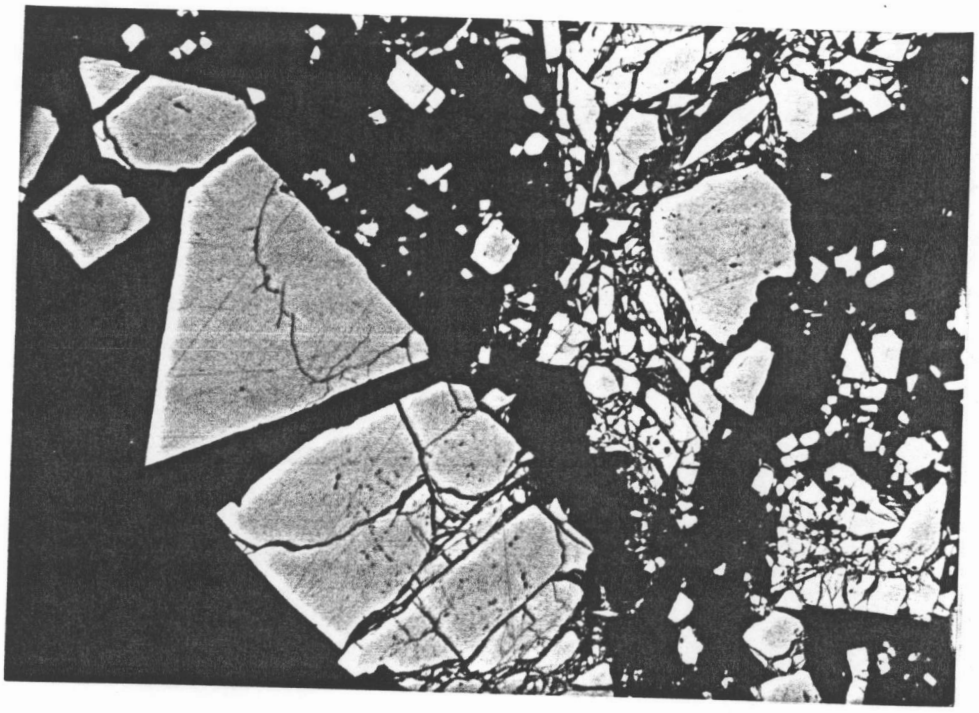

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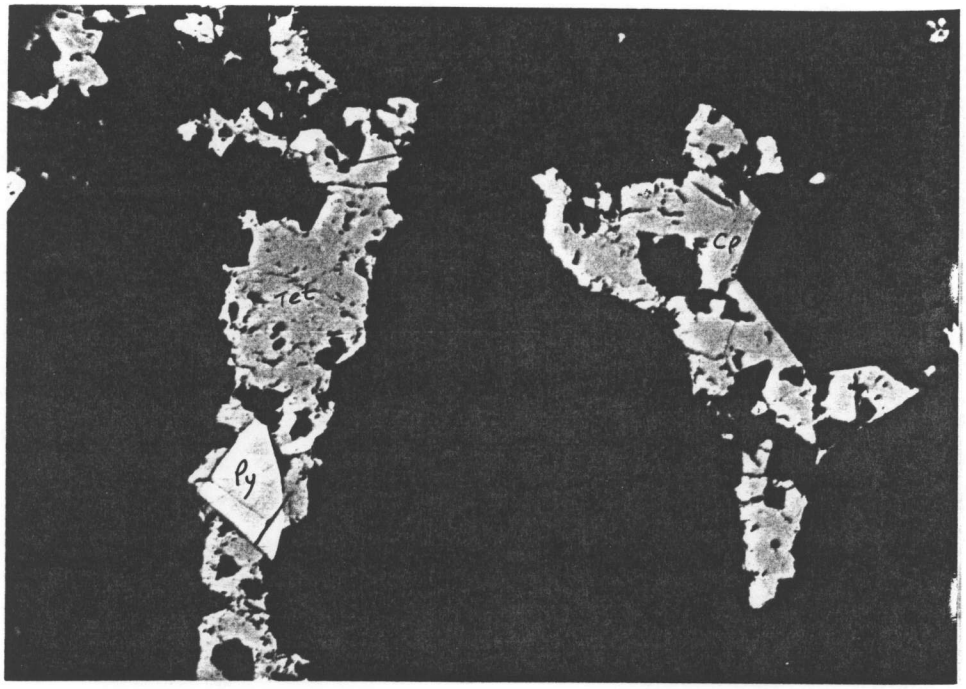

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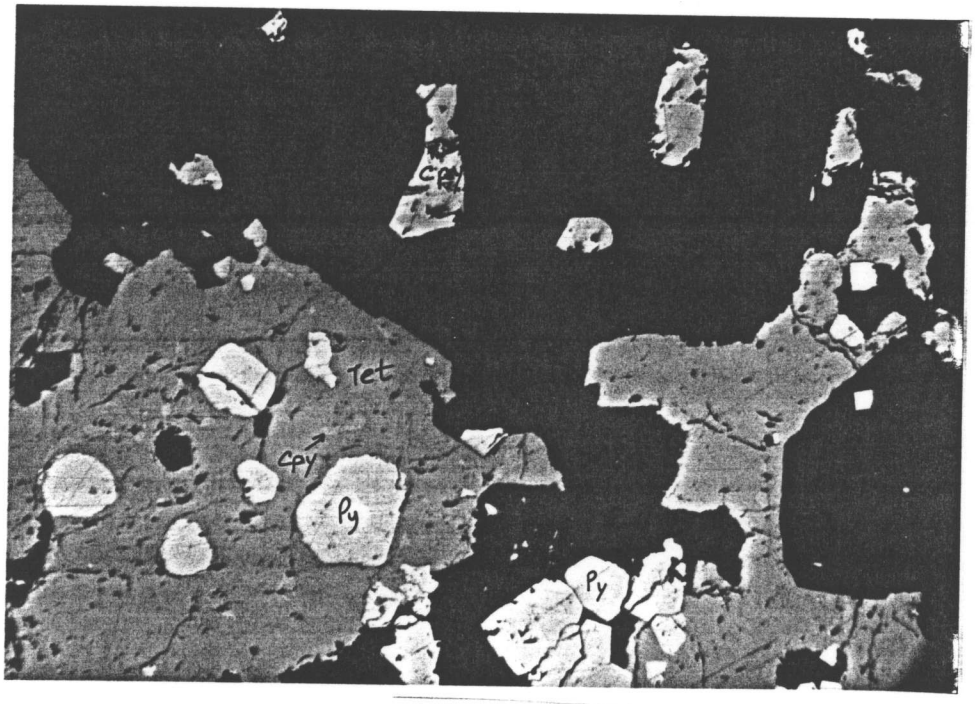

D3A-87-114

1987 - Aurchem Exploration Ltd.

Carried our on Wedge 5, Wedge 6, Wedge 7
Wedge 8, Wedge 9, Wedge 10, Wedge 15, Ras 1
Ras 2, Ras 3, Ras 4, LGCS 1, LGCS 3, MSL
Claim sheet 115 I/3, 62°05'N; 137°10'W

092153

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January 14, 1988

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Introduction

This report compliments Aurchem Exploration Ltd.'s assessment report dated September 15, 1987. Only data, maps, etc., that are not included in the earlier assessment report are discussed here. The drilling results, regional geology, location and access, general geology, etc., are discussed in the assessment report.

In September, 1987, further work was carried out on our claim group after our summer drill program. This comprised "fill in" geochemical soil sampling and a test magnetometer survey. This was done over what we believe to be our most favourable geological zone for gold/silver veins.

Geology Map

Based on drilling data, microscope work, etc., revisions were made on our earlier geology map. Aerial-photo interpretation gave most of the fault locations as shown. Three basic sets of faults are evident. We believe that our property has had at least two and possibly three epithermal mineralization periods. The faulting that has taken place appears to be very important to forming preferred sites for vein formation for the later precious metal rich epithermals. The magnetometer map (discussed later) clearly shows the major N-S fault just west of Willow Creek which coincides with a large vein structure. On the Yukon Government's geology map (1987), this fault is shown. This vein/fault structure appears to be one of the earlier epithermal veins with some enrichment from later episodes. The government map shows this fault as a major contact of different lithologies. Our work shows that other faulting has caused the lithological contact not to follow this fault. It is our present theory that where the contact has moved to the west of the fault, the block of ground bounded by the lithologic contact to the west and the major N-S fault to the east holds the most promising area for higher grade epithermal veins.

On a more general note, the regional geology indicates that our property has been moved to the east accompanied by significant uplift and collapse. Our property indicates that as we cross faults we change significantly the depth to paleosurface and thus our geochem values change accordingly.

Is a quite possible that the major N-S fault is really the same fault that follows Nansen Creek to the west of us. To the south this fault may move farther to the east and follow Back Creek. This would indicate that Mount Nansen Mines to the south of us is also in a similar situation.

A recent field trip to Omni Resources Mnt. Skukum property shows their veins and geology to be very similar to ours. They also have the associated "rhyolite" dykes with their veins. Their dykes are visibly indistinguishable from ours. Our polished thin section work indicates that these "rhyolite" dykes are actually quite variable in character and are more andesitic in composition than visually indicate. These dykes appear to have intruded during and before the lastest epithermal period and are probably a major controlling factor in vein formation.

EM-16 (VLF)

The VLF data was re-interpreted as shown on the maps. So far, everywhere the VLF has indicated a vein we have found one. The problem seems to lie in the fact that the later higher grade veins do not show up with the VLF or are masked by the strong response to the earlier veins. The earlier veins have much larger sericite (clays) halos and hanging walls accompanied by sulphides producing the strong response. The later veins have advanced argillic alteration with lower sulphide levels producing poor conductors.

Magnetometer (MP-2)

A small test survey proved to be highly successful so we will be conducting a survey covering the entire property next summer.

The magnetometer clearly shows the major N-S fault just west of Willow Creek. It also clearly shows where the rhyolite (andesite) dykes and sills are with very high readings. The diorite/granodiorite contact is also shown but is obscured by the rhyolite dykes and the changing dip of the contact (from east to west dip). The magnetometer data also shows clear changes across some of the faults on the property giving us clues to the nature of the movements. Veins show up poorly with the magnetometer, but give subtle "lows" over all veins types. We are hoping that closer spaced readings may enable us to trace the late veins along strike for drilling purposes.

Geochemical Maps

Contoured soil geochemical maps were produced from our September, 1987, work. These all show strong geochemical trends corresponding with our VLF and magnetometer data. Some strong trends have also shown on the maps where no VLF conductor is found but a magnetometer low is shown. We believe these are possibly late phase veins.

The geochem values are largely obscured by cross faults. At larger cross faults we get higher values at vein intersections. These values may be more a result of preferred soil enrichment due to the fault rather than indicating stronger veins at the fault intersections. Our drilling to date shows that these sites are risky as the veins are broken and moved all over the area as blocks. Greater surface slumping also appears to be normal near these faults. The geochems, when compared to all the other maps, also show a strong indication of different fault bounded blocks having different paleo-elevations. We hope that this data may help us in chosing depths to drill at in different areas.

It is interesting to note that our two best drill intersections (DDH-87-12 and DDH-87-4) have very poor to non-existent geochemical amomalies associated. Following these veins on strike shows some very high geochem anomalies which will be tested next summer.

Microscopic work

Accompanying this report is our polished then section report. The thin sections were basically done to explore different types of veins (different epithermal episodes?) and to confirm our interpretation of the alteration halos.

Process studies

A report in Appendix I shows some cyanide leach test studies that were done last spring to get a general preliminary idea of the refractory nature of the material. Generally the material used showed it not to be all that refractory. These studies are being put on hold until more drilling is done and the problem of different epithermal veins is more clearly understood. Different veins may all show different metallogenic characteristics.

Future work

A diamond drill program of 4000 ft. is presently planned for next year to drill new targets and follow-up on vein intersections in 1987 drill holes.

A magnetometer survey over the entire property will also be conducted along with some geochemical soil sampling over geophysical targets. No drilling is planned on our Eliza Creek Zone or on the north half of our property until more preliminary work is done to better locate targets.

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Appendix I

Yukon Vein Material Metallurgical testwork
Cyanide Leach test #4

Purpose

Cyanide leach test #3 showed that at the end of 117 hours of cyanidation that recovery of the precious metals was continuing but at a very slow rate. Extraction ended with gold at 70% and silver at 51%. Grain size analysis shows the feed to be;

Mesh Size	Wt. % Passing
+150	57.7
+200	19.6
+270	10.3
+325	.6

It seemed obvious that a finer grain size would yeild higher precious metal recoveries. The economics of the cost of grinding versus recovery in a mill is a very important number. If we assume the recoveries of test #3 are for a coarse grain size, then test #4 will be for the finest grain size. The optimal economic condition of a mill would lie somewhere in-between these two results. (This also assumes that recovery of a fine grind would be about the same if we used initial feed material and not reground coarse tails).

Therefore, the basic purpose of test #4 in conjunction with test #3 is to gain a relative idea of recoveries at a coarse grind to a very fine grind.

Procedure

1) Use CN87-3-Residue as the feed material.

2) Check the 02 level at the initial outset to see if a pre-oxidation is necessary. Monitor 02 level throughout test.

3) Add 3 lbs/ton $Pb(NO_3)_2$ at initial start-up.

4) Add and maintain 1.0 grams/litre (2lbs/ton) excess CN-. Monitor every hour for 8 hours and then every 2 hours thereafter.

5) The CIP test will be run at; 24 hours
48 hours
120 hours

Carbon removal will be after each run. The filtrate solution will not be changed. The solid residue will be analyzed after the final interval.

Oxidation Levels (02 ppm)

The 02 levels shown on the next page show that for test #4 no pre-oxidation was necessary. The initial 02 level before the pre-oxidation (i.e. before test #3 shows to be 2.8 ppm. The pre-oxidation brought this up to about 9.5 ppm. The grinding between tests #3 and #4 shows a drop to 7.8 ppm 02 at the outset but this 02 level should be satisfactory for the cyanide leach test #4.

Cyanidation III

Into Cyanidation

	Au	Ag
1244 grams of ore at .105 oz/ton Au	130.62	
4.49 oz/ton Ag		5585.6

Out of Cyanidation

28.28 grams of 24 hr carbon at 3.1 oz/ton Au	87.7	
5.54 oz/ton Ag		156.7
28.24 grams of 48 hr carbon at 1.83 oz/ton Au	51.7	
44.5 oz/ton		1256.7
26.86 grams of 117 hr carbon at .47 oz/ton Au	12.6	
12.2 oz/ton Ag		327.7
Sub-Total at	152.0	1741.1
Residue at 1244.1 grams at .052 oz/ton Au		
1.35 oz/ton Ag		1679.5
Total out	216.7	3420.0

Gold Extraction

(a) (24 hours)
$\frac{87.7}{216.7} \times 100 = 40.5\%$

(b) (48 hours)
$\frac{139.4}{216.7} \times 100 = 64.3\%$

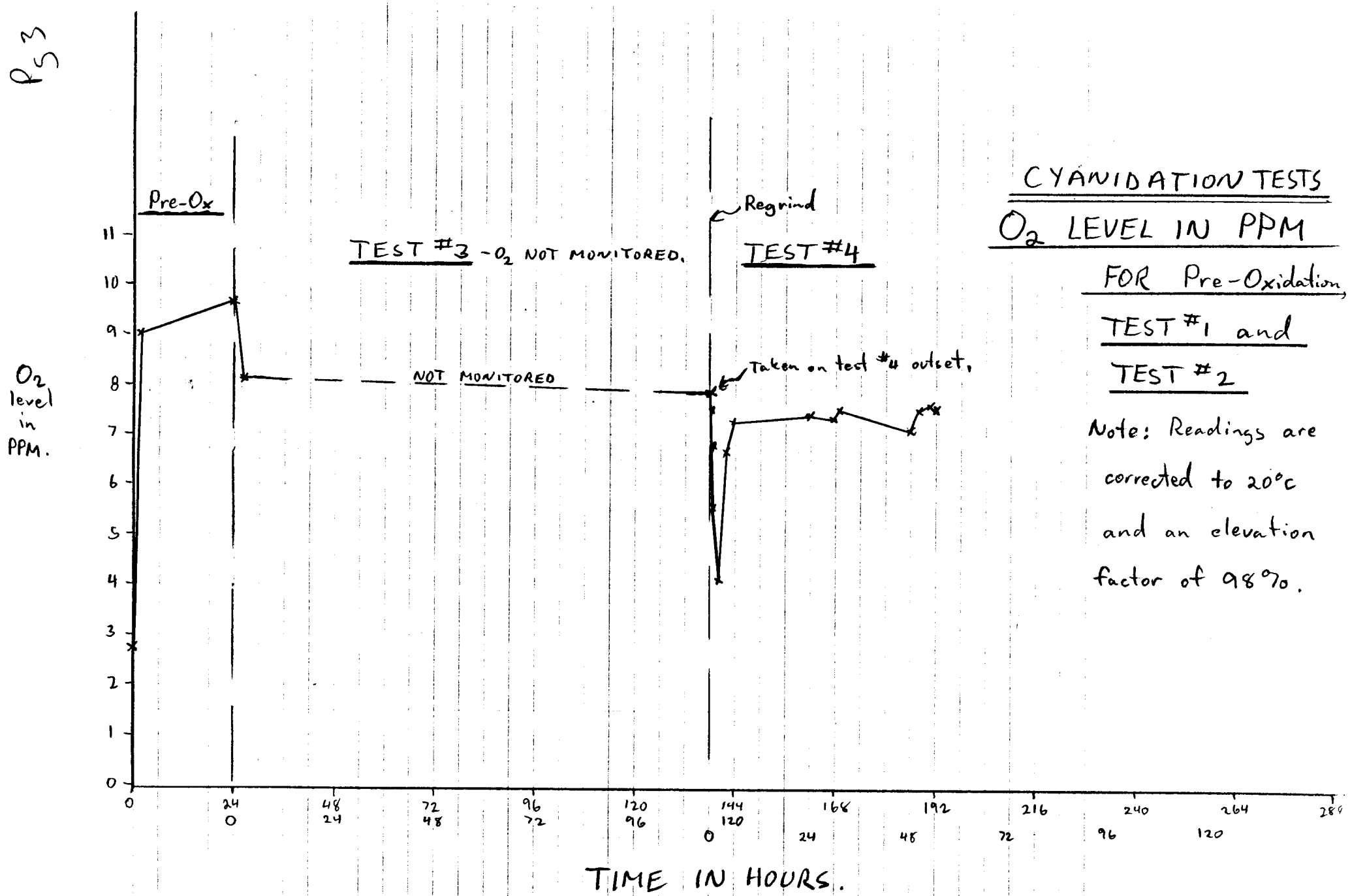
(c) (117 hours)
$\frac{152.0}{216.7} \times 100 = 70.1\%$

Ag Extraction

(a) (24 hours)
$\frac{156.7}{3420.6} \times 100 = 4.6\%$

(b) (48 hours)
$\frac{1413.4}{3420.6} \times 100 = 41.3\%$

(c) (117 hours)
$\frac{1741.1}{3420.6} \times 100 = 50.9\%$



CYANIDATION TESTS
O_2 LEVEL IN PPM
FOR Pre-Oxidation,
TEST #1 and
TEST #2
Note: Readings are corrected to 20°c and an elevation factor of 98%.
Pre-Ox
TEST #3 - O_2 NOT MONITORED.
Regrind
TEST #4
NOT MONITORED
Taken on test #4 outset.
O_2 level in PPM.
0
1
2
3
4
5
6
7
8
9
10
11
0
24
48
72
96
120
144
168
192
216
240
264
288
0
24
48
72
96
120
0
24
48
72
96
120
TIME IN HOURS.

Cyanidation III

Results

Into Cyanidation

	Au	Ag
1244 grams of ore at .105 oz/ton Au 4.49 oz/ton Ag	130.62	5585.6

Out of Cyanidation

28.28 grams of 24 hr carbon at 3.1 oz/ton Au 5.54 oz/ton Ag	87.7	156.7
28.24 grams of 48 hr carbon at 1.83 oz/ton Au 44.5 oz/ton Ag	51.7	1256.7
26.86 grams of 117 hr carbon at .47 oz/ton Au 12.2 oz/ton Ag	12.6	327.7
Sub-Total at	152.0	1741.1
Residue at 1244.1 grams at .052 oz/ton Au 1.35 oz/ton Ag	64.7	1679.5
Total out	216.7	3420.0

Gold Extraction

(a) (24 hours)

$\frac{87.7}{216.7} \times 100 = 40.5\%$

(b) (48 hours)

$\frac{139.4}{216.7} \times 100 = 64.3\%$

(c) (117 hours)

$\frac{152.0}{216.7} \times 100 = 70.1\%$

Ag Extraction

(a) (24 hours)

$\frac{156.7}{3420.6} \times 100 = 4.6\%$

(b) (48 hours)

$\frac{1413.4}{3420.6} \times 100 = 41.3\%$

(c) (117 hours)

$\frac{1741.1}{3420.6} \times 100 = 50.9\%$

Cyanidation IV

Into Cyanidation

	Au	Ag
1119.25 grams of ore at .052 oz/ton Au	58.22	
1.35 oz/ton Ag		1511.0

Out of Cyanidation

31.68 grams of 24 hr carbon at .12 oz/ton Au	3.8	
20.78 oz/ton Ag		658.3
30.12 grams of 48 hr carbon at .14 oz/ton Au	4.2	
4.32 oz/ton		132.7
29.61 grams of 120 hr carbon at.059 oz/ton Au	1.8	
4.48 oz/ton Ag		132.7
Sub-Total at	9.8	921.1
1090.50 grams of Residue at .052 oz/ton Au	54.5	
1.50 oz/ton Ag		1635.8
Total out	64.3	2556.9

Gold Extraction

(a) (24 hours)
$\frac{3.8}{64.3} \times 100 = 5.9\%$

(b) (48 hours)
$\frac{8.0}{64.3} \times 100 = 12.4\%$

(c) (117 hours)
$\frac{9.8}{64.3} \times 100 = 15.2\%$

Silver Extraction

(a) (24 hours)
$\frac{658.3}{2556.9} \times 100 = 25.4\%$

(b) (48 hours)
$\frac{788.4}{2556.9} \times 100 = 30.8\%$

(c) (117 hours)
$\frac{921.1}{2556.9} \times 100 = 36.0\%$

Combined Cyanidation Test #3 and #4

	Time (hours)	Extraction % Au	Ag
Test #3 at 24 hours	24	40.5%	4.6%
Test #3 at 48 hours	48	64.3%	41.3%
Test #3 at 117 hours	117	70.1%	50.9%
- Grinding to 100% -325 mesh.			
Test #4 at 117 + 24 = 141 hours Au extraction = (5.9% x 29.9%) + 70.1% Ag extraction = (25.8% x 49.1%) + 50.9%	141	71.9%	63.6%
Test #4 at 117 = 48 = 165 hours Au extraction = (12.4% x 29.9%) = 70.1% Ag extraction = (30.8% x 49.1%) = 50.9%	165	73.8%	66.0%
Test #4 at 117 = 120 = 237 hours Au extraction = (15.2% x 29.9%) = 70.1% Ag extraction = (36.0% x 49.1%) = 50.9%	237	74.6%	68.6%

Discussion

1) Cyanide Consumption

For details on the grinding I refer you to the separate write-up. The grinding lowered our 02 level slightly (i.e. greater surface area of fresh sulphides) which is probably the indirect cause of the slight increase in cyanide consumption. Test #3 consumed 3.1 #/ton while test #4 consumed 5.7 #/ton. Neither figures contain the inital 2 #/ton of cyanide. The 02 level at the start of test #3 was 9.7 ppm compared to 7.8 ppm at the start of test #4.

2) Lime Consumption

The lime consumption curve for all tests #1, #2, #3 and #4 are all almost identical but a small increase was noted in test #4.

Test #2 = 7.6 #/ton (210 hours)
Test #3 Pre-oxidation = 8.2 #/ton (24 hours)
Test #3 = 6.8 #/ton (117 hours) (no initial amount - pre-oxidation)
Test #4 = 12.5 #/ton (120 hours)
(10.5 #/ton in 120 hours without pre-oxidation lime)

The increase is possibly due to the grinding which creates a greater surface area of exposed particles of solids, thus a greater effect of the pH.

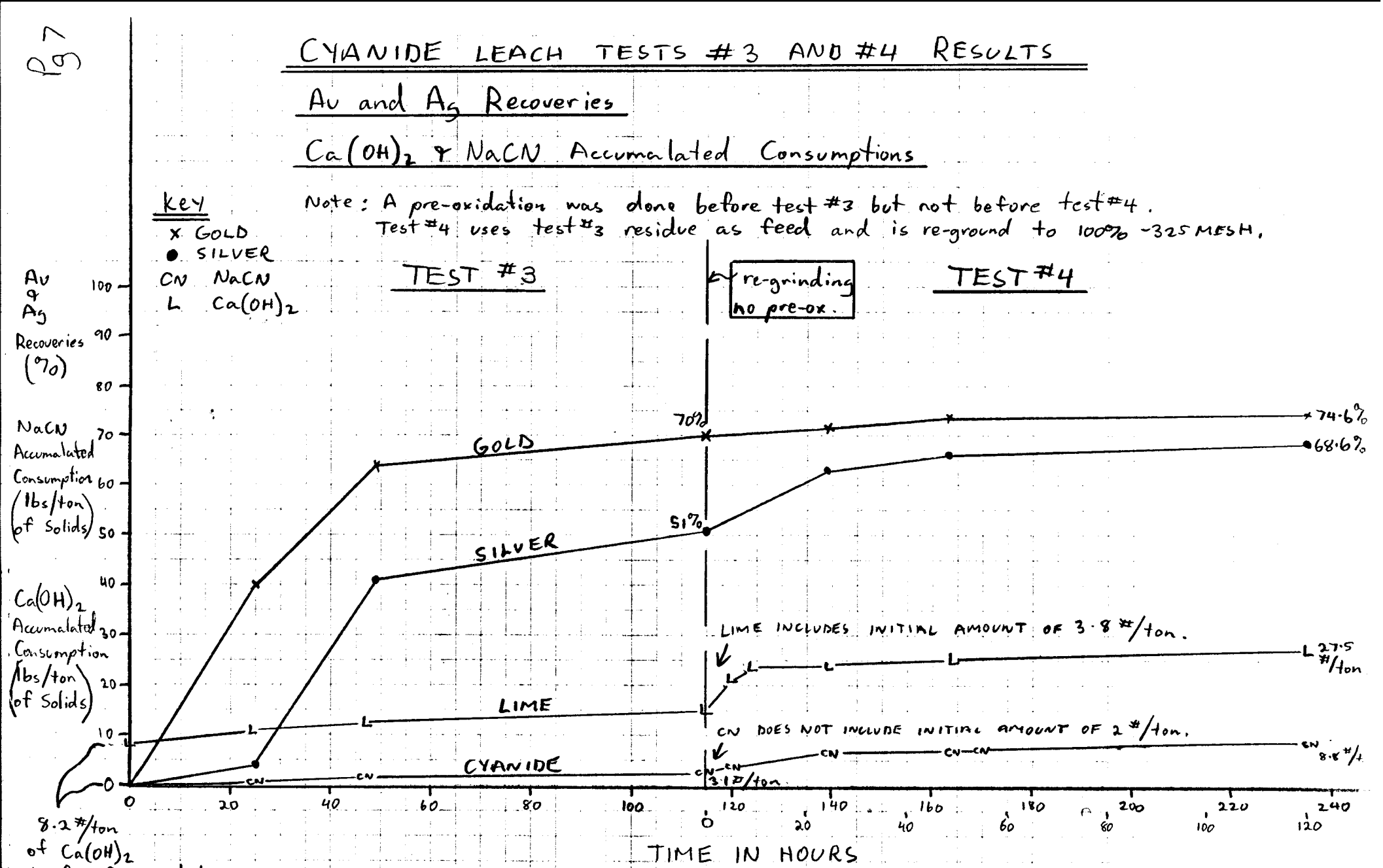
CYANIDE LEACH TESTS #3 AND #4 RESULTS

Au and Ag Recoveries

$Ca(OH)_2$ & NaCN Accumalated Consumptions

Key
- x GOLD
- ● SILVER
- CN NaCN
- L $Ca(OH)_2$

Note: A pre-oxidation was done before test #3 but not before test #4. Test #4 uses test #3 residue as feed and is re-ground to 100% -325 MESH.



3) Gold and Silver Recoveries

Regrinding had the greatest effect on the silver recovery versus gold. Grinding caused the gold to go from a 70% recovery to 74.6% (4.6% increase). The silver meanwhile went from a 51% recovery to 68.6% (17.6% increase). The silver may have been trapped within coarse galema crystals so the grinding gave the exposure and the initial steep rise in recovery. The gold recovery is possibly from the same source (i.e. silver is electrums with low amounts of golds).

A major problem found in calculating the gold and silver recoveries is seen as finding the true head grade of the feed. The free gold and silver in our material causes wild fluctuations in the assays. Visual confirmation of native silver (or electrum) found in the +325 mesh material in the fine grinding confirms this to be a persistant problem. For an example, the residue assays of Au and Ag in test #4 are both higher than the residue assays of test #3 which was the feed for test #4. If we use the assay results in test #4 to calculate the head grade (Au = .057 oz/ton, Ag = 2.28 oz/ton) and substitute these numbers in for test #3 residue, the recoveries change somewhat. They are:

	Au Recovery	Ag Recovery
Test #3 at 24 hours:	39.3%	3.4%
Test #3 at 48 hours:	62.2%	30.8%
Test #3 at 117 hours:	68.2%	38.0%
Regrinding		
Test #4 at 141 hours:	70.1%	54. %
Test #4 at 165 hours:	72.1%	57.1%
Test #4 at 237 hours:	73.0%	60.3%

Overall recoveries show a slight drop for gold (1.6%) but a large drop for silver (8.3%). This possibly reflects the native silver containing minor amounts of gold (electrum).

Summary

Regrinding of the ore to 100% -325 mesh gave a 5% increase in gold recovery to 74% and about a 20% increase in silver recovery to 65%. The increases may be due to either; (1) grinding liberated the silver (electrum) from within coarse galena. (2) Large native silver (electrum) that was too large to dissolve in test #3 were broken-up somewhat by the grinding and so were dissolved (completely?) in test #4. (3) combination of (1) and (2).

Discussion

Gravity separation of the free gold and silver particles before cyanide leaching would be the optimal method to prevent the problems that free gold and silver cause in the leaching. Earlier work by us has shown this to be

difficult with our ore because the bulk (90%) of the free gold and silver in fine grained (-150 mesh) which the galena and pyrite sulphides are fairly coarse grined (see 1986 gravity testwork). (Cyanamid, 1955), that in the presence of stibnite, orpiment and/or realgar, that gold recoveries for a 48 hour leach can improve dramatically by lowering the pH of the solution to 10 (we used 11.5). I feel though, that lowering th pH increases the rate of recovery and not the overall recovery. At a certain number of hours of leaching, whether 200 or 500 hours, all pH recovery curves will level off a the same % recovery. If our material has reached (or very near) it's maximum level of recovery, further leaching at any pH will not enhance the total recovery. An interesting observation to follow makes it possible that this is true for our present test material. Our cyanide leach test #1 was conducted on the tails of a series of flotations which produced (a) a lead-zinc-gold-silver concentrate (b) a pyrite-gold scavenger concentrate. Therefore, the cyanide leach feed (flotation tails) was fairly stripped of sulphide material. Even though the recoveries of gold were 70-75% and for silver at 60-70%. These values match very well with our recoveries in cyanide leach tests #3 and #4 using the original ore as feed where gold recovery was 74% and silver 68%. It would seem possible that the refractory component of the ore in 25% for gold and 30% for silver.

Of interest to note is the final assays of the residues for comparison.

Test #	Au oz/ton		Ag oz/ton	
Test #1	.010	ratio = .2	.23	ratio = .19
Test #4	.050		1.50	

Ag/Au ratio = 30:1 for both.

If we have indeed reached the optimal recovery possible in test #4 then the test #1 assays show that a large part of this refractory gold and silver (80% for Au and 87% for Ag) will be found in the flotation concentrates.

Possible Future Work

A number of differing routes could be taken to further our confidence and knowledge of our materal.

1) A further cyanide leach of the test #4 residue at a pH of 10 could be done to verify that the remaining gold and silver is refractory.

2) A new cyanide leach test on fresh feed material could be done at a pH of 10 (with pre-oxidation) to achieve a faster rate of recovery. This could be done with or without further grinding.

3) A gravity or flotation test could be done on cyanide test #4 residue to

see what sort of concentrate can be formed with the refractory material. Due to the small size of the sample (1090.5 grams) the gravity separation would be the easiest approach. The concentrate may also show (binnoccularscope) if native silver is still present.

4) A combination of (1) and (3).

5) Do cyanide leach tests on the flotation concentrates (1986 work) to see into which concentrates the refractory material went to.

6) Conduct a heap leach test.

Our presently planned field work for 1987 consists of a drill program. Metallurgical studies of cyanidation and probably flotations are envisioned on the core samples. The refractory nature of the rocks may be highly variable with depth and with different veins and locations. A number of cyanide leach tests may well be needed if the drill results prove positive. For this reason #(2) from above may be the best test for us to do to use for future testwork in order to get a basic cyanide test procedure for next fall's samples.

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Certificate of Analysis

HYDROCHEM DEVELOPMENTS
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	G.V.W.				
	K.A.H.				

REC'D MAR 30 1987

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REPORT: 417-1150 (COMPLETE)

REFERENCE INFO:

CLIENT: HYDROCHEM DEVELOPMENTS
PROJECT: 302

SUBMITTED BY: M. LANGDON
DATE PRINTED: 25-MAR-87

ORDER		ELEMENT	NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Au	Gold -Assay	4	0.001 O/T		
2	Ag	Silver -Assay	4	0.01 O/T		

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
OTHER	4	-200	4	PULVERIZING	4

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REPORT: 417-1150

PROJECT: 302 PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Au O/T	Ag O/T
CN87-4-1		0.120	20.78
CN87-4-2		0.140	4.32
CN87-4-3		0.059	4.40
CN87-4-4		0.050	1.50

Chief Chemist

Yukon Vein Material Metallurgical Testwork Cyanide Leach Test #5

Purpose

For the results of test #4 it was decided that another cyanide leach of the tails would be done. (i.e. test #5). In test #5 the pH would be kept as low as possible (target of 10.0). A pre-oxidation of the material would also be done prior to this final leach.

Pre-Oxidation

For the pre-oxidation the pH was kept at 9.5 to 10.0 with the addition of lime. The air was pumped at 5.5 1/min. (i.e. 40 on the Matheson Air Rate Meter). The material was aerated for 19 hours while monitoring the temperature, 02 (ppm) level and the pH. Deaeration tasts were conducted initially and at the end of the pre-oxidation.

Pre-Oxidation Results

The next two pages show the results of the pre-oxidation as compared to the oxidation in test #3. Both the monitored 02 (ppm) level during cyanidation plot and the deaeration tests show that no pre-oxidation of the material was required.

Cyanidation Test #5 - Results

Out of Cyanidation	Units Au	Ag
80.43 g of 30 hour carbon at .016 oz/ton Au	1.29	
2.6 oz/ton Ag		208.8
10.72 g of very fine carbon at .134 oz/ton Au	1.44	
2.24 oz/ton Ag		24.0
Residue of 945.1 g at .040 oz/ton Au	37.80	
2.22 oz/ton Ag		2098.1
Total out	40.53	2,330.9

Gold Extraction

(a) (30 hours)

$$\frac{1.29 \times 100}{40.53} = 3.2\%$$

(b) (30 hours with carbon slimes)

$$\frac{(1.29 + 1.44) \times 100}{40.53}$$

Silver Extraction

(a) (30 HOURS)

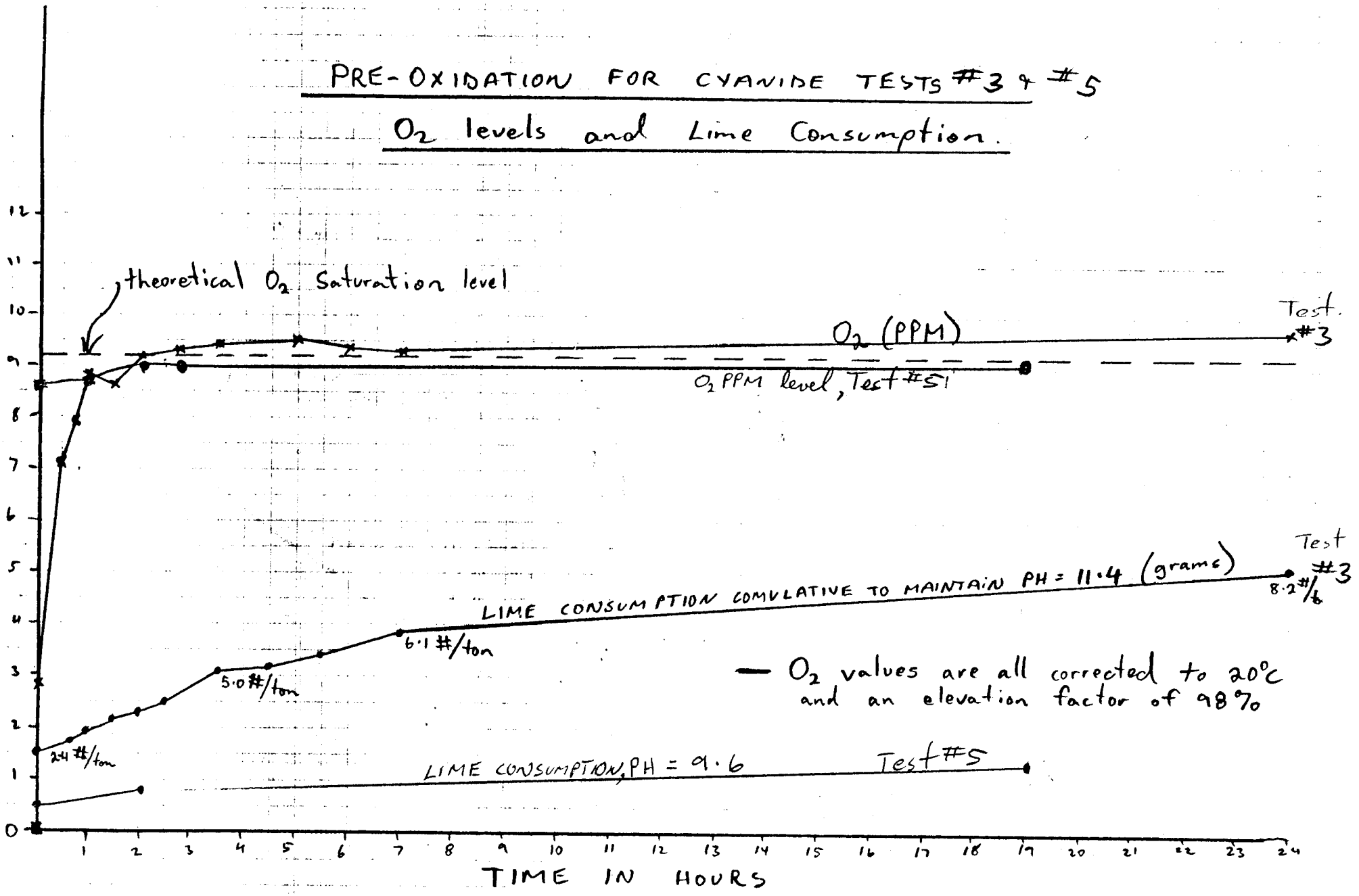
$$\frac{208.8 \times 100}{2330.9} = 9.0\%$$

(b) (with carbon slimes)

$$\frac{(24 + 208.8) \times 100}{2330.9} \times 100 = 10.0\%$$

PRE-OXIDATION FOR CYANIDE TESTS #3 & #5

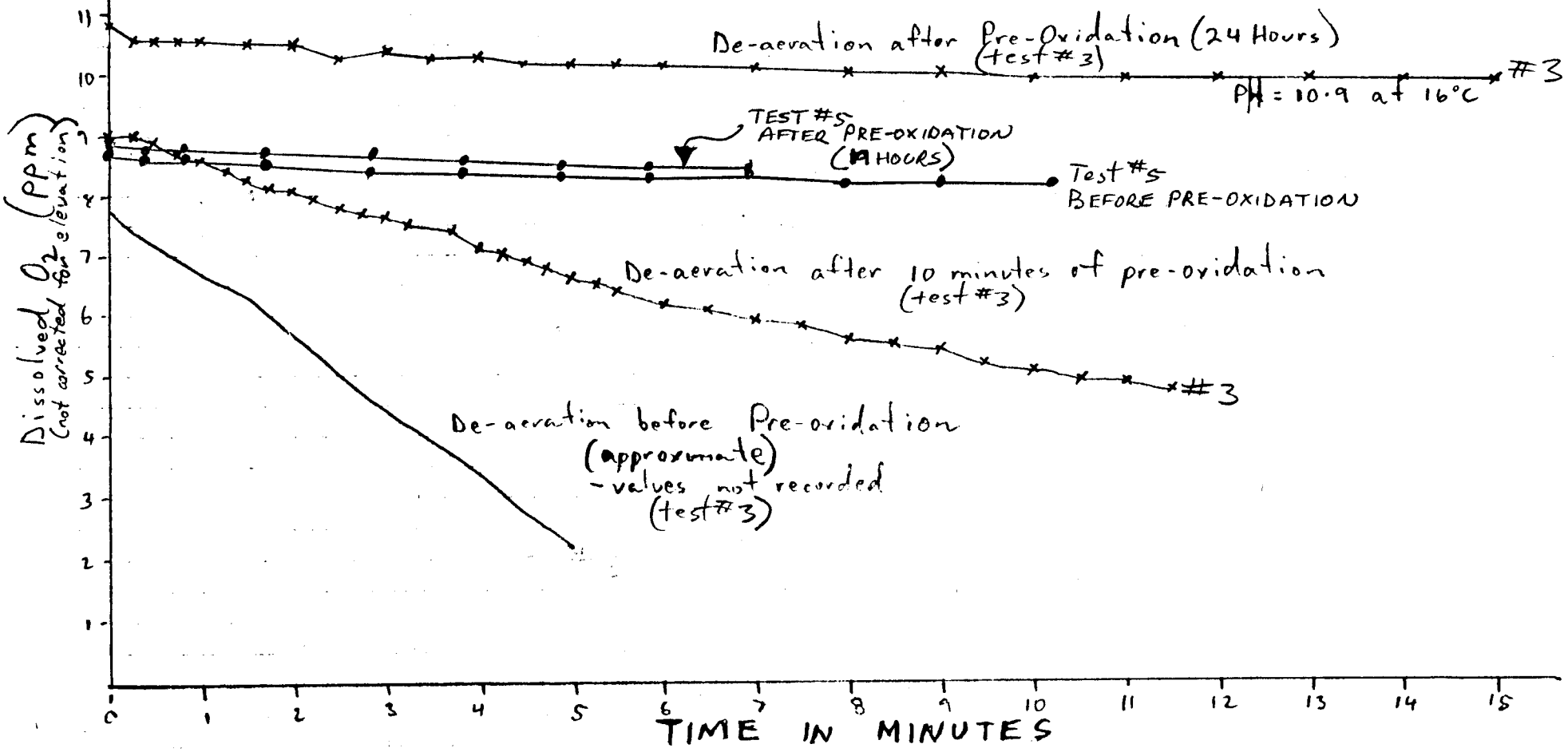
O_2 levels and Lime Consumption.



De-aeration Tests – Pre-oxidation Cyanide Test #3

- no aeration or agitation

9 TEST #5



Test #5 Results corrected for 20°C and a .98% elevation correction.

Cummulative Results with test #3, #4 and #5

(a) Test #5 at 237 + 30 = 267 hours total cyanidation.
Au extration = (3.2% x 25.4) + 74.6% = 75.4% recovery.
Ag extraction = (9.0% x 31.4) + 68.6% + 71.4% recovery.

(b) Test #5 at 267 hours with carbon slimes.
Au extraction = (6.7% x 25.4) + 74.6% = 76.3% recovery.
Ag extraction = (10.0% x 31.4) + 68.6% = 71.7% recovery.

Discussion

Lime consumption was basically nil for the cyanide test #5. Our aim for a pH of 10 was not achieved as the pH averaged about 10.4 even with the addition of acid to keep the pH down below 11.0.

Gold and silver recoveries were poor. From the initial feed used in test #3, the recoveries were;

Au from 74.6% at the end of test #4 to 75.4% (8% recovery).
Ag from 68.6% at the end of test 4 to 71.4% (2.8% recovery).

Commulative Recovery	Test #3	to Test #4	to Test #5
Au Recovery	70.1%	74.6%	75.4%
Ag Recovery	50.9%	68.6%	71.4%

A couple of small side tests were done during test #5.

1) It was noted that from tests #3, #4, and #5, the carbon was gradually being mechanically broken and a black slime was forming on the surface of the slurry during cyanidation. It is possible that this black slime was carrying some of the Au and Ag that we have been unable to recover. During test #5, some of this slime was scooped off with a spoon and assayed (sample CN87-5-TC). The 10.72 g sample was cut with silica to 30 g. Being scooped off the slurry, it is obvious that most of the 10.72 g is really slurry and not just the fine carbon slimes. Even so, the sample assayed .134 oz/ton Au and 2.24 oz/ton Ag. Therefore, this fine carbon is carrying some of the gold and silver and possibly carries a significant amount. Although some of this material would also be lost in a plant, it may mean that our non-refractory Au and Ag might be 5-10% higher than our recoveries show.

2) A second 'side test" was done to follow-up the first test. It was noted that some mechanically broken carbon was not very fine, but would still go through the screen (20 mesh) that was used to recover it. Therefore, after screening out the carbon from the residue, we did another screening using a 100 mesh screen. Our sample had been ground to 98% -325 mesh so no residue would be caught in the 100 mesh screen. We recovered .33 grams of +100/-20

mesh carbon. This was mixed with 35.87 g of regular carbon to see if the assay would increase with the addition of the finer carbon. The gold assay was the same, but the silver assay was significantly higher. Below shows the "back" calculated assay values for the .33 grams carbon. Being such a small sample though, this has a large multiplying effect on the calculated assay if even a small assay error was done on the actual assays.

		Au units	Ag units
.33 grams of +100/-20 mesh carbon (calculated Assays)	.016 oz/ton Au	.005	
	182.5 oz/ton Ag		60.23
35.87 grams of +20 mesh carbon at	.016 oz/ton Au	.574	
	2.60 oz/ton Ag		93.26
36.2 grams of combined carbon	.016 oz/ton Au	.579	
	4.24 ox/ton Ag		153.49

This small sized carbon would have been from carbon in both tests #4 and #5. small carbon from test #3 would have been ground in the tower mill in the re-grinding between tests #3 and #4.

Although the .33 gram assay of 182.5 oz/ton Ag is probably wrong, it does show that a significant amount may be found to increase our overall recoveries and reduce our percent of possible refractory precious metals. As noted, a small assay error would change the calculated assays dramatically. For example, if we use .017 oz/ton Au instead of .016 oz/ton Au for Au for the 36.2 gram sample, the back-calculated value for Au in the .33 gram sample would change from .016 to .125 oz/ton Au.

If we include the 182.5 oz/ton assay in the overall recovery we would increase the recovery from 71.7% to 72.4% of Ag.

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REPORT: 417-1916 (COMPLETE)

REFERENCE INFO:

CLIENT: AURCHEM RESOURCES
PROJECT: CN87-5

SUBMITTED BY: M.LANGDON
DATE PRINTED: 15-MAY-87

ORDER	ELEMENT		NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Au	Gold -Assay	5	0.001 O/T		
2	Ag	Silver -Assay	5	0.01 O/T		

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
ASSORTED	5	-200	5	PULVERIZING	2

REMARKS: ASSORTED SAMPLES ARE :3 PULPS
2 CARBON

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Certificate of Analysis

REPORT: 417-1916 | PROJECT: CN87-5 | PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Au O/T	Ag O/T
CN87-5-TC		0.048	0.80
CN87-5-R2		0.048	2.46
CN87-5-R1		0.016	1.98
CN87-C100		0.016	4.24
CN87-5-C		0.016	2.60

$\frac{33}{10.72} = 2.8$ times value.

residue samples average =

	Au	Ag
	.134	2.24

carbon after leach.

	Au	Ag
Head for CN87-4 =	.05	1.5

Chief Chemist

Cyanide Leach Tests #3, #4, and #5 - Discussion

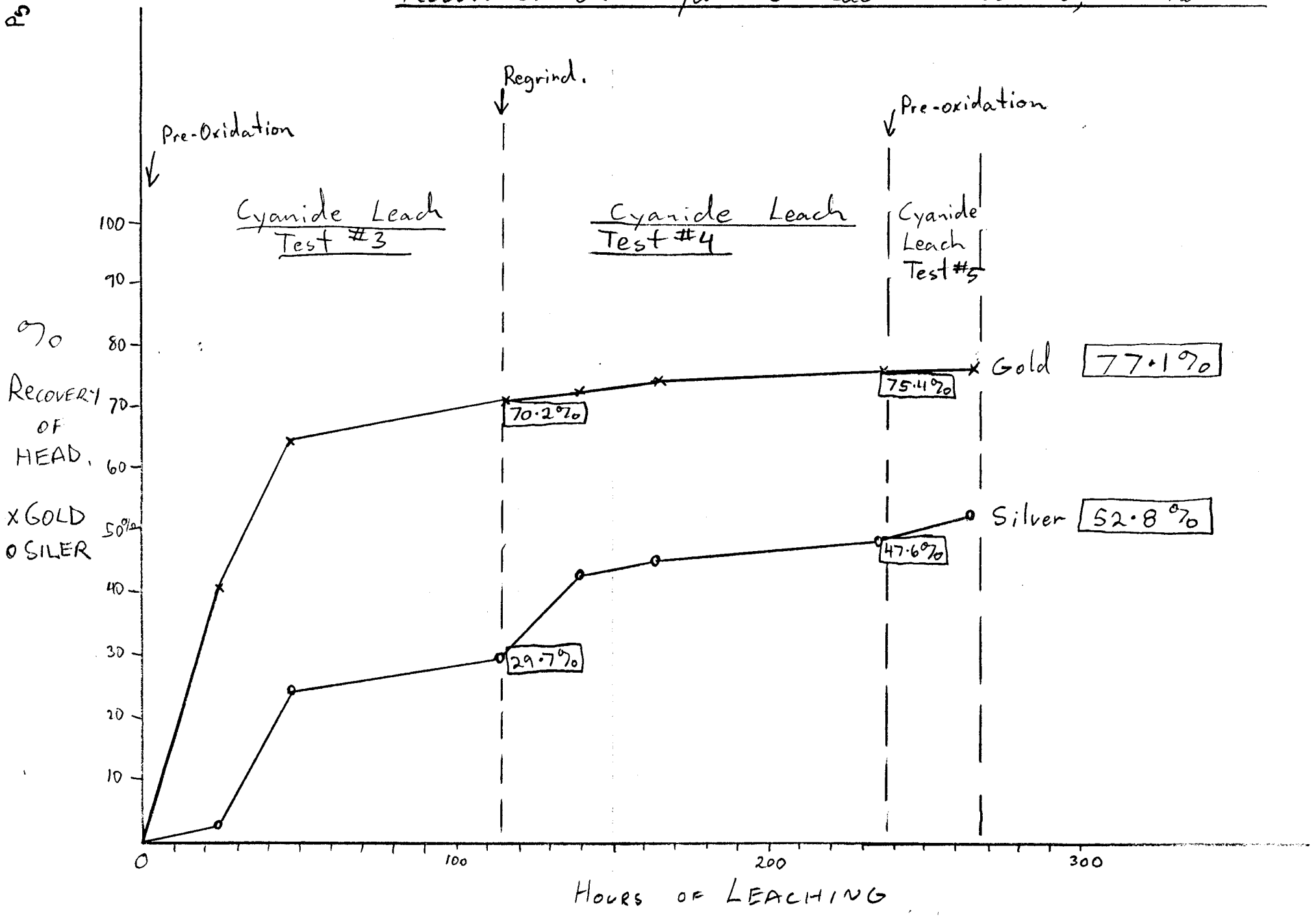
On all three tests a major problem has been balancing the values from reported assays. The culprit making this difficult has been native gold and silver, with native silver causing the worst problem. Small amounts of gold in the native silver could account for the gold balances.

From all the flotations and cyanide leach tests that were done in 1986, a back calculated head assay for the feed was .125 to .174 oz/ton Au and 4.34 oz/ton Ag. If we back-calculate our head assays from test #3, #4 and #5 we get .174 oz/ton Au and 4.71 oz/ton Ag. The charts on the following pages uses these values as the head assays and re-calculates all the recoveries for the three cyanide leach tests. The calculated "head" for test #5 is used as the residue assay for test #4 and the calculated head for test #4 is used as the residue assays for test #3. The result is a much more balanced chart with more credible assays. The resulting head assay also fits very close to what our previous tests show it to be (values stated above). The native silver (seen under the binoccularscope) was giving us residue assays higher than the head assys for both test #4 and #5.

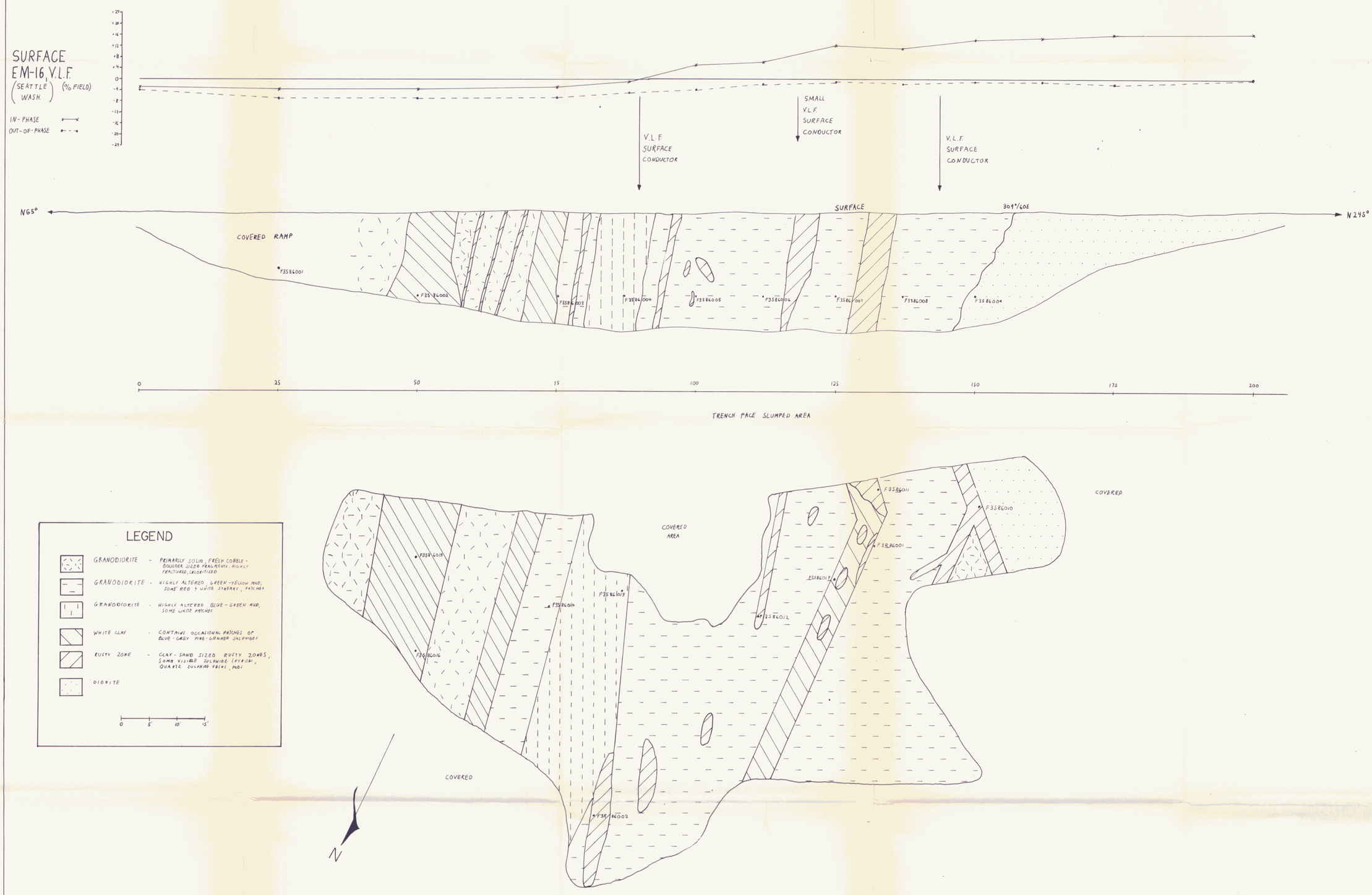
Samples	Assays (calculated)	Units		Total Recovery (%)	
		Au	Ag	Au	Ag
Cyanide leach Test #3					
Head 124.4 grams at	(.174) oz/ton Au	216.57			
	(4.71) oz/ton Ag		5862.80		
Out of Cyanidation					
28.28 grams of 24 hr carbon	3.1 oz/ton Au	87.7		40.5%	
	5.54 oz/ton Ag		156.7		2.7%
28.24 grams of 48 hr carbon	1.83 oz/ton Au	51.7		64.4%	
	44.5 oz/ton Ag		1256.7		24.1%
26.86 grams of 117 hr carbon	.47 oz/ton Au	12.6		70.2%	
			327.7		29.7%
Residue - 1244.1 grams	(.0519 oz/ton Au)	64.57			
	(3.313 oz/ton Ag)		4121.7		
"Fine Grinding"					
Cyanide Leach Test #4					
Head - 1090.5 grams	(.0519 oz/ton Au)	56.60			
	(3.313 oz/ton Ag)		3612.8		
Out of Cyanidation					
31.68 grams of 24 hr carbon	.12 oz/ton Au	3.8		72.2%	
	20.78 oz/ton Ag		658.3		42.5%
30.12 grams of 48 hr carbon	.14 oz/ton Au	4.2		74.4%	
			130.1		45.0%
29.61 grams of 120 hr carbon	.059 oz/ton Au	1.8		75.4%	
			132.7		47.6%
Residue 1090.5 grams	(.0429 oz/ton Au)	46.78			
	(3.313 oz/ton Ag)		2691.35		
Cyanide Leach Test #5					
Head 945.1 grams	.0429 oz/ton Au	40.54			
	3.313 oz/ton Ag		2332.3		
Out of Cyanidation					
80.43 grams of 30 hr carbon	.016 oz/ton Au	1.29		76.2%	
	2.6 oz/ton Ag		208.8		52.3%
10.72 grams of carbon slimes	.134 oz/ton Au	1.44		77.1%	
	2.24 oz/ton Ag		24.0		52.8%
Residue 945.1 grams	.040 oz/ton Au				
	2.22 oz/ton Ag				

P5-8

Recoveries of Cyanide Leach Tests #3, #4 and #5

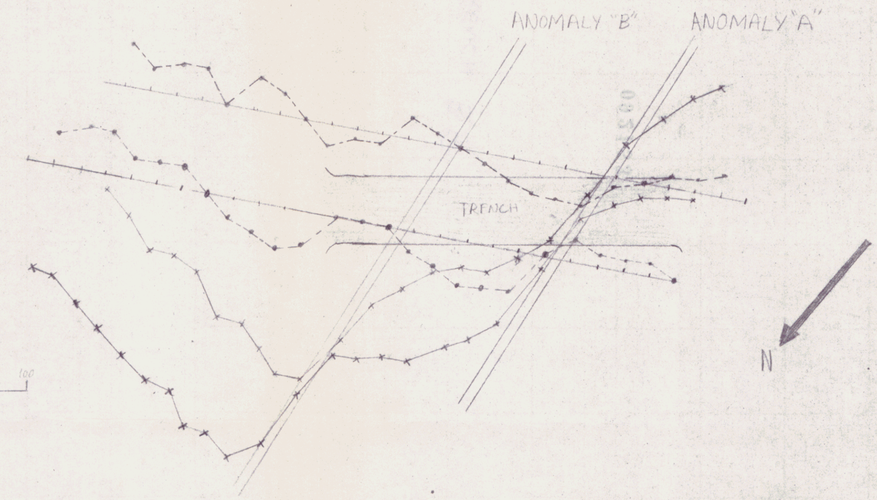


CROSS SECTION & PLAN VIEW OF TRENCH F3 (MACK CLAIM)(2 SOUTH) - VLF PROFILE, SAMPLE LOCATIONS AND GEOLOGY OF THE DISCOVERY CREEK PROJECT - YUKON TERRITORIES

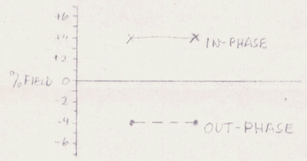


749

PLAN VIEW – EM-16 OVER TRENCH 3 SOUTH



LEGEND – VLF



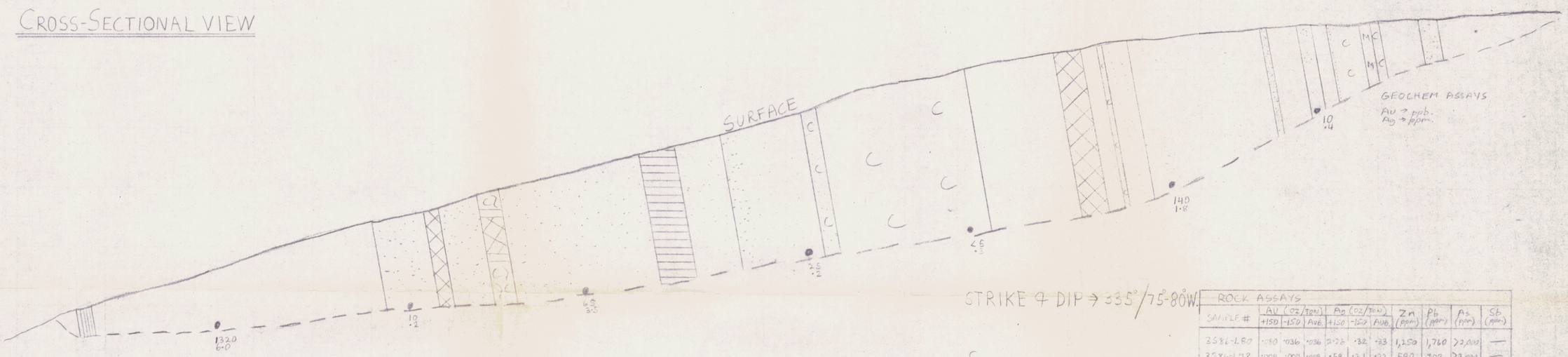
SCALE

1 INCH = 50 FT.

0 50 100

FEET

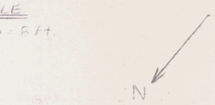
CROSS-SECTIONAL VIEW



STRIKE & DIP → 335°/75-80W.

SCALE

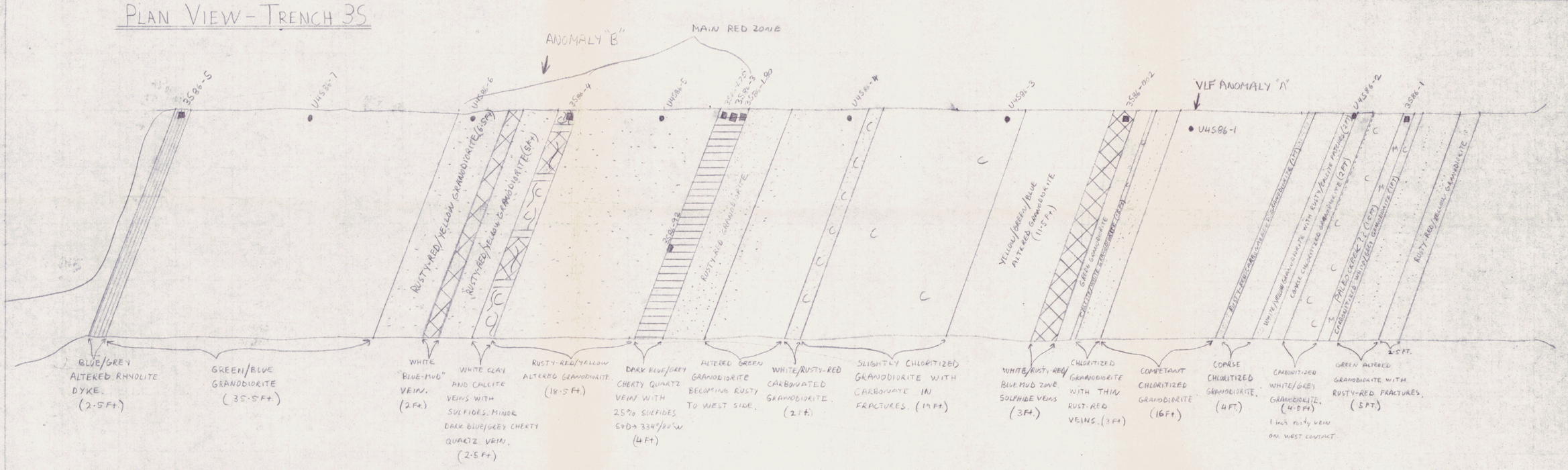
1 inch = 8 Ft.



ROCK ASSAYS

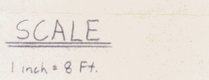
SAMPLE #	Au (oz/ton) +150	Au (oz/ton) -150	Au (oz/ton) Ave.	Ag (oz/ton) +150	Ag (oz/ton) -150	Ag (oz/ton) Ave.	Zn (ppm)	Pb (ppm)	As (ppm)	Sb (ppm)
3586-L80	·080	·036	·036	2·28	·32	·33	1,150	1,760	>2,000	—
3586-L92	·008	·009	·008	·58	·21	·22	580	302	>2,000	—
3586-1	·044	·006	·006	·05	·18	·17	1,400	1,760	1,800	—
3586-2	·013	·013	·013	·46	·35	·35	210	844	824	—
3586-3	·041	·025	·026	·38	·35	·32	960	845	>2,000	—
3586-4	·005	·004	·004	·07	·11	·11	240	93	166	—
3586-5	·001	·001	·001	·01	·01	·01	112	39	47	—
3586-L75	·872	·026	·052	·78	3·72	3·58	9,600	4,740	72,000	90

PLAN VIEW – TRENCH 3S



SCALE

1 inch = 8 Ft.



AURCHEM RESOURCES LTD.	
TRENCH 3 SOUTH 75-0	
NTS: 115I/3	DATE: SEPT. 18, 1986.
PROVINCE: YUKON	AREA: DISCOVERY CREEK
DATA BY: M. ANDERSON	DRAWN BY: M. LANGDON

DISCOVERY CREEK PROJECT – YUKON

base line

mag. decl'n 33·5 west

L24+00N.
L22+00N.
L20+00N.
L18+00N.
L16+00N.
L14+00N.
L12+00N.
L10+00N.
L8+00N.
L6+00N.
L4+07N.
L1+90N.
L0+00
L1+96S.
L4+16S.
L6+50S.
L8+60S.
L10+06S.
L12+38S.
L14+33S.
L16+70S.
L18+67S.
L19+67S.
L20+67S.
L22+51S.
L24+11S.
L27+16S.
L29+16S.
L30+50S.
L31+50S.
L32+85S.
L34+10S.
L35+70S.

DDH-8 N340°/-45° 150 Ft.

POSSIBLE HOLE

DDH-9 N340°/-45° 450-730 Ft.

DDH-1 N255°/-60° 350 Ft.

DDH-2 N255°/-45° 750 Ft.

DDH-7 N75°/-60° 500-700 Ft.

DDH-5 N360°/-45° 330 Ft.

DDH-6 N90°/-45° 200 Ft.

DDH-4 N60°/-55° 550 Ft.

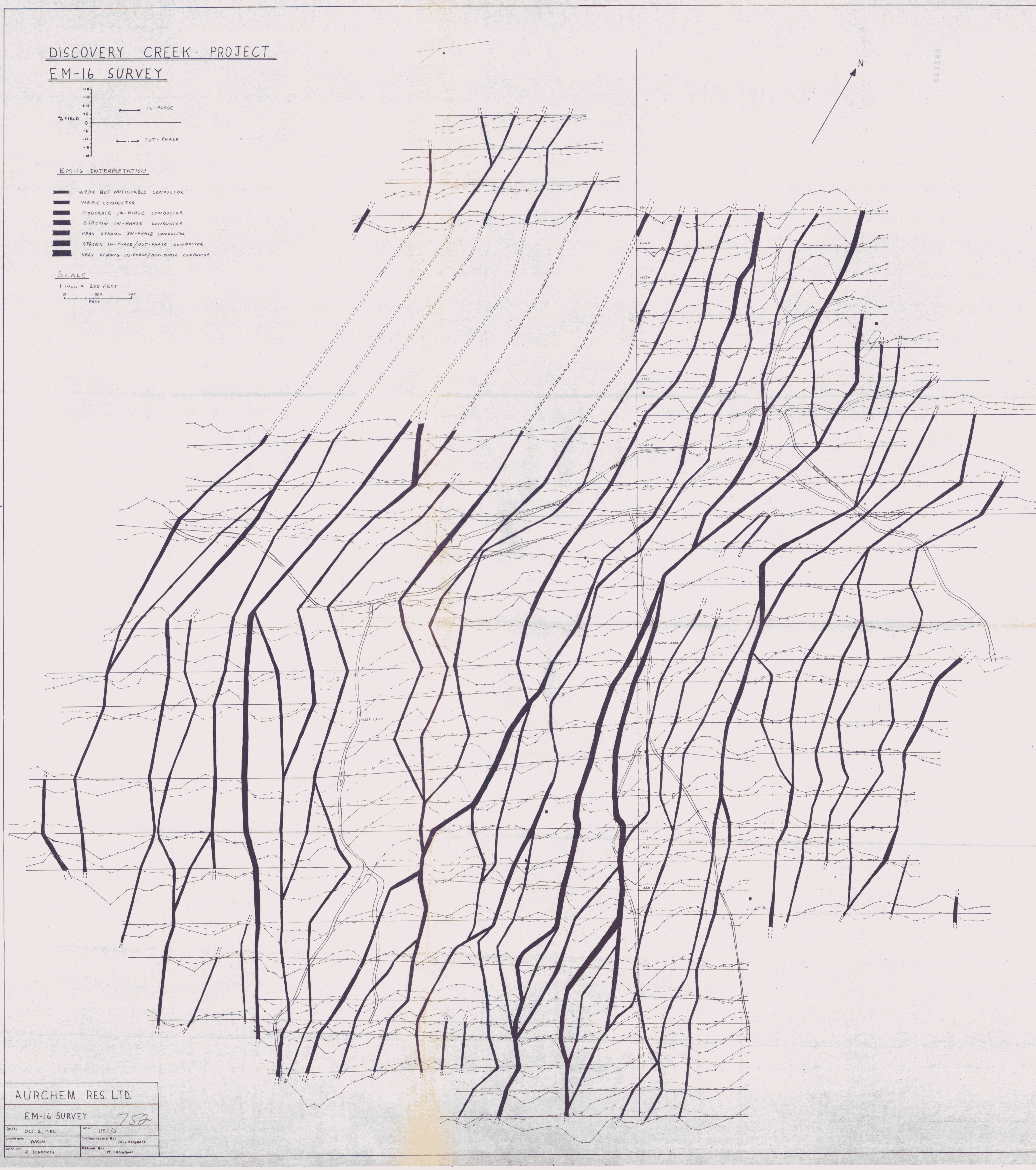
DDH-3 N240°/-45° 335 Ft.

Scale

0 200 400 600 FEET

1 INCH = 200 FEET

AURCHEM RES. LTD. 751	
DIAMOND DRILL HOLES - PROPOSED 1987	
NTS. 115I/3	REGION MNT. NANSEN
PROV. YUKON	DATE DEC. 10, 1986.
DATA BY M. LANGDON	DRAWN BY M. LANGDON


DISCOVERY CREEK PROJECT
EM-16 SURVEY
% FIELD
+18
+15
+12
+6
0
-6
-12
-15
-18
IN-PHASE
OUT-PHASE
EM-16 INTERPRETATION
WEAK BUT NOTICEABLE CONDUCTOR
WEAK CONDUCTOR
MODERATE IN-PHASE CONDUCTOR
STRONG IN-PHASE CONDUCTOR
VERY STRONG IN-PHASE CONDUCTOR
STRONG IN-PHASE/OUT-PHASE CONDUCTOR
VERY STRONG IN-PHASE/OUT-PHASE CONDUCTOR
SCALE
1 INCH = 200 FEET
0
200
400
FEET
N
083123
1800N
1600N
1400N
1000N
800N
SHAW CREEK
DISCOVERY CREEK
ROAD
ELIZA CREEK
WILLOW CREEK
2716 S
AURCHEM RES. LTD.
EM-16 SURVEY
752
DATE: OCT. 2, 1986.
NTS: 115I/3
LOCATION: YUKON
INTERPRETATE BY: M. LANGDON
DATA BY: R. SCHNEIDER
DRAWN BY: M. LANGDON

DISCOVERY CREEK PROJECT – YUKON

base line

Zone of silicification from Rhyolite contact

mag. decl'n 33·5 west

L24+00N. L22+00N. L20+00N. L18+00N. L16+00N. L14+00N. L12+00N. L10+00N. L8+00N. L6+00N. L4+07N. L1+90N. L0+00 L1+96S. L4+16S. L6+50S. L8+60S. L10+06S. L12+38S. L14+33S. L16+70S. L18+67S. L19+67S. L20+67S. L22+51S. L24+11S. L27+16S. L29+16S. L30+50S. L31+50S. L32+85S. L34+10S. L35+70S.

LEGEND

4 Rhyolite/Rhyodacite/Dacite; Cretaceous, extrusive and usual late phase of 3.

3 Granodiorite; Cretaceous (95M.Y.), some sub-intrusive phases, silicified zones.

2 Volcanics; Jurassic; andesitic and basaltic flows and their volcanoclastic derivatives; Extrusive of 1.

1 Quartz Diorite/Diorite; Jurassic.

Fault.

Geological Contact.

Note; Geology based on trenching and rare outcrops extrapolated by aerial-photo interpretation.

753

Scale

0 200 400 600 FEET

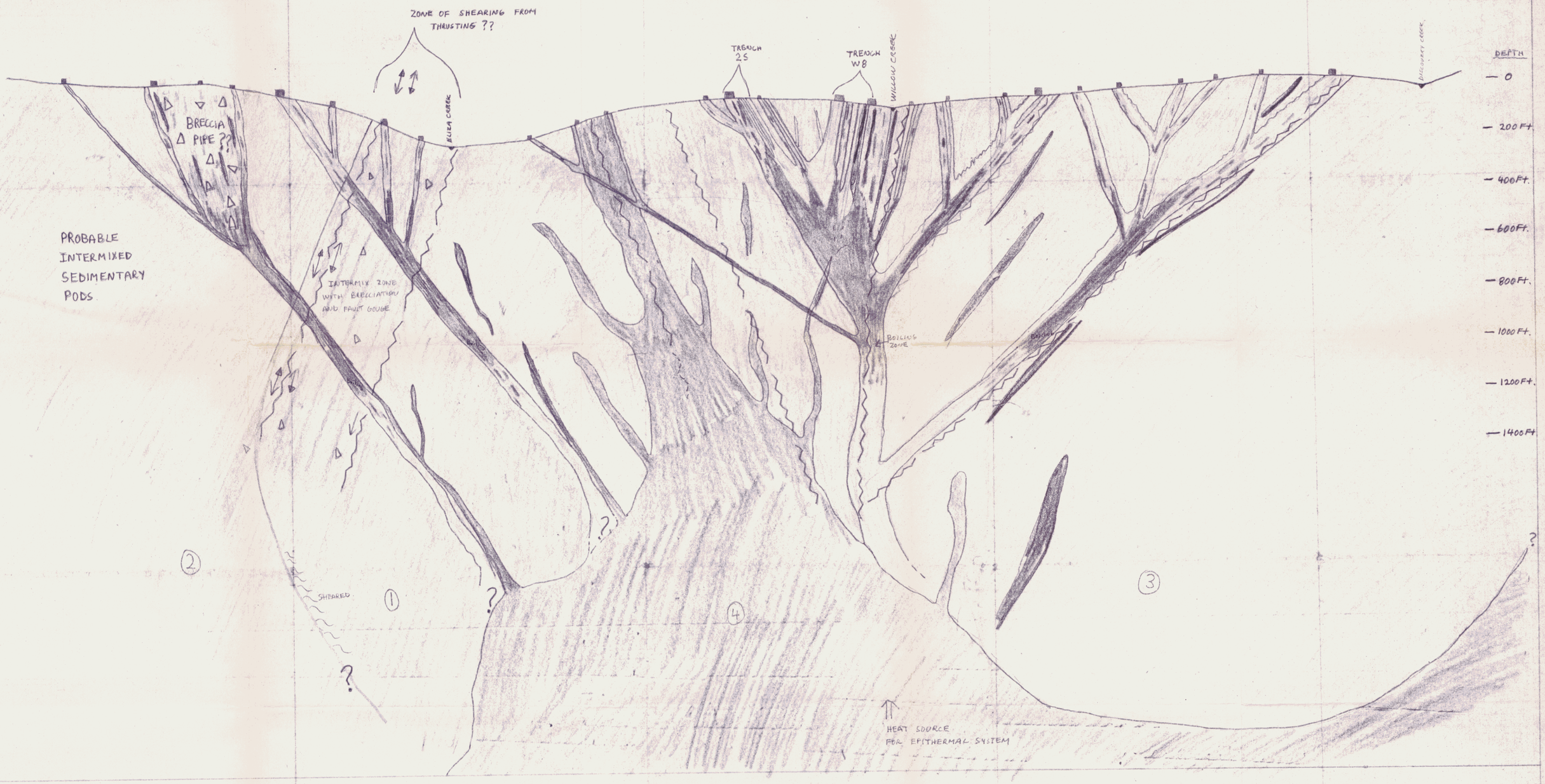
1 INCH = 200 FEET

AURCHEM RES. LTD.

GEOLOGY

NTS. 115 I/3	REGION WHITEHORSE
PROV. YUKON	DATE SEPT. 15, 1986
DATA BY M. LANGDON	DRAWN BY M. LANGDON

SCHEMATIC CROSS-SECTION ON LI+96 SOUTH (N60°)



AURCHEM RES. LTD.

[redacted]

DATE: OCT 2, 1986.	NTS. 115 I/3
LOCATION: DISCOVERY CK. YUKON	DRAWN BY: M. LANGDON
ON LINE LI+96S.	VIEW CUT AT N60°

GEOLOGY

OLDEST
- 2 INT. & BASALTIC FLOWS, MINOR INTERMIXED SEDIMENTS.
- 1 DIORITE (INTRUSIVE OF ABOVE)

YOUNGEST
- 3 GRANODIORITE
- 4 RHYOLITE (EXTRUSIVE OF ABOVE)

VEIN GEOLOGY

- BLUE MUD - HANGING WALL CLAY ALTERATION ZONES - HIGHLY VARIABLE MINERALIZATION.
- LOW GRADE MINERALIZED VEIN MATERIAL, qtz/calcite VEIN:.
- HIGH GRADE MINERALIZED VEINS. BOILING ZONE → MASSIVE SULPHIDES.

EM-16 GEOPHYSICS

■ → WEAK
↓ ↓
■ → VERY STRONG

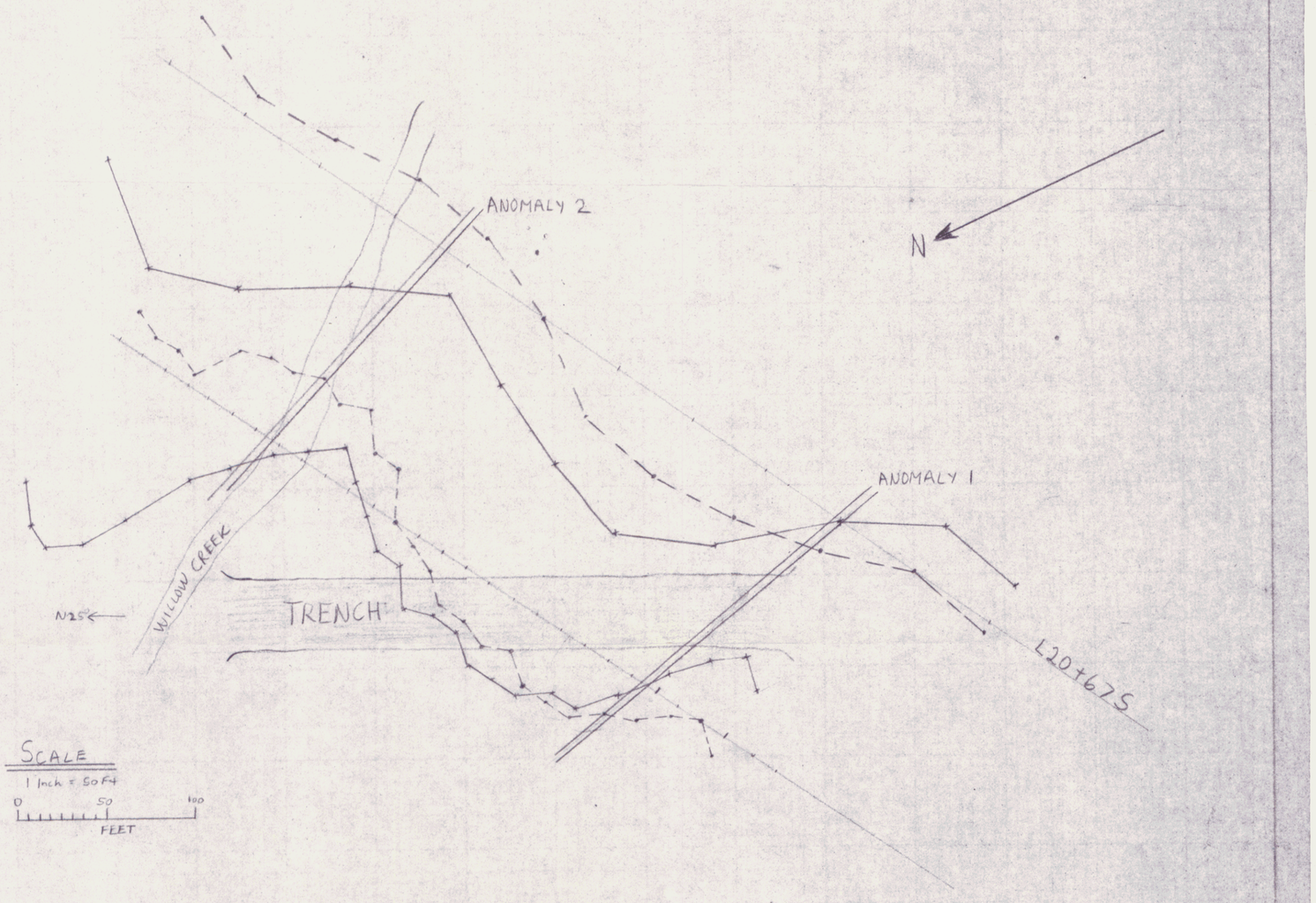
SCALE

1 inch = 200 Ft.

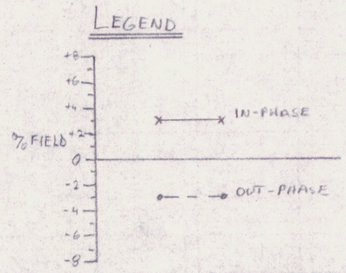
0 200 400
FEET.

754

EM-16 PROFILE AT TRENCH 11 SOUTH



LEGEND



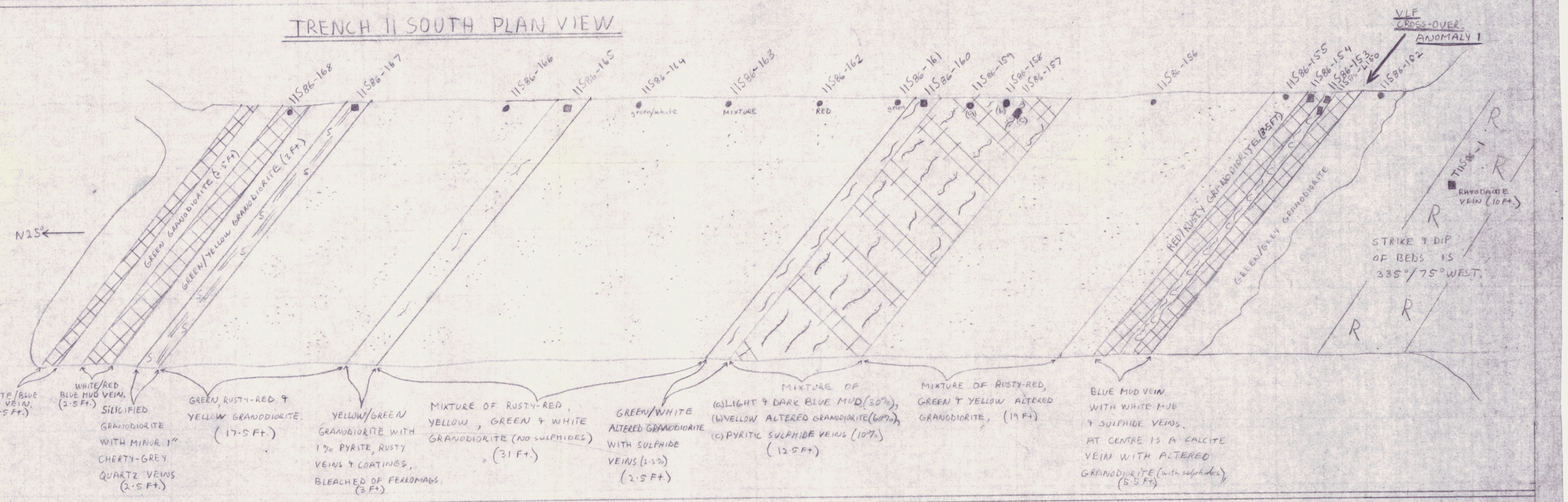
SCALE

1 Inch = 50 Ft

0 50 100

FEET

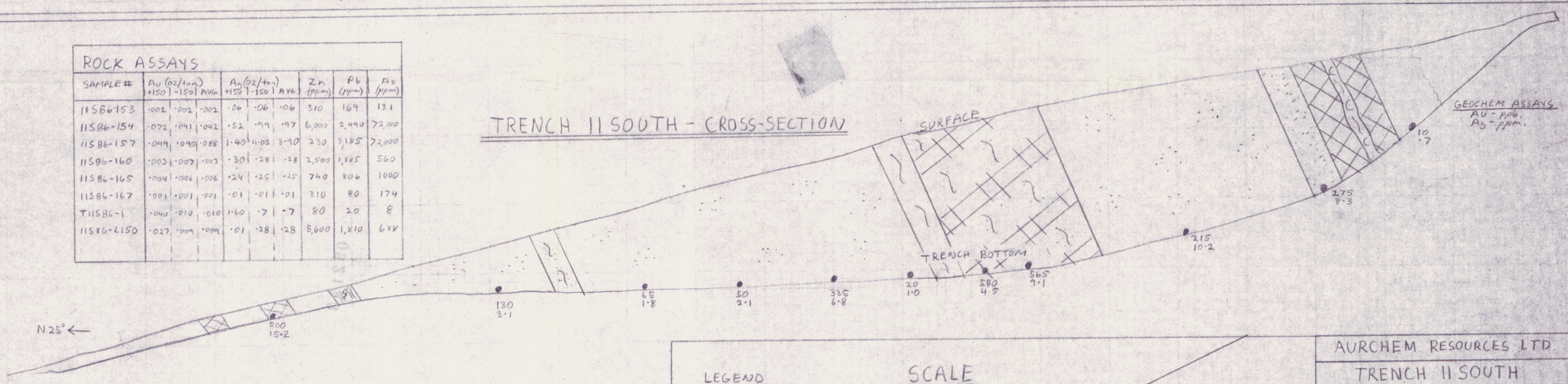
TRENCH 11 SOUTH PLAN VIEW



ROCK ASSAYS

SAMPLE #	Au (oz/ton) +150	-150	AVG	Ag (oz/ton) +150	-150	AVG	Zn (ppm)	Pb (ppm)	As (ppm)
11SB6153	.002	.002	.002	.06	.06	.06	310	169	131
11586-154	.072	.041	.042	.52	.99	.97	6,000	2,490	>2,000
11586-157	.049	.090	.088	1.40	4.03	3.90	230	3,185	>2,000
11586-160	.003	.007	.007	.30	.28	.28	2,500	1,885	560
11586-165	.004	.006	.006	.24	.25	.25	740	806	1000
11586-167	.001	.001	.001	.01	.01	.01	310	80	174
TII586-1	.040	.010	.010	1.60	.7	.7	80	20	8
11586-L150	.027	.009	.009	.01	.28	.28	5,600	1,810	688

TRENCH 11 SOUTH - CROSS-SECTION



LEGEND

- GEOCHEM SAMPLE
- ROCK SAMPLE

SCALE

1 inch = 8 Feet.

0 8 16

FEET

N

755

AURCHEM RESOURCES LTD.	
TRENCH 11 SOUTH	
DATE, SEPT. 17, 1986	NTS 115I/3
PROJECT, DISCOVERY CK.	PROV., YUKON
DATA BY; M. LANGDON	DRAWN BY; M. LANGDON

LGCS 1

MYRTLE

WEDGE 6

RICCO

COURTLAND

LAURA

ACCESS ROAD

WEDGE 5

W10
W15
W9

CAMP

DISCOVERY CREEK

W6
W5
W7
W8

→ TO TRIGGERS

5L106

5L90

IDA MAY

LGCS 3

WEDGE 10

MACK

WILLOW CREEK

WEDGE8

3L90

ELIZA CREEK

W7
W8
RAS 3

4L90

WEDGE 7

W10
W15
RAS1
RAS2

3L106

RAS 2

MSL

6L106

4L105

WEDGE 15

RAS 3

RAS 1

5L105

8L102

3L102

RAS 1+RAS 2

SUNSET

HAZEL
ANNE

RAS 4

KEY

— Boundry of Surveyed Claims
--- Boundry of Staked Claims
■ Found Post
□ Post (approx. position)

SCALE 1" = 200'

0 200 400 600

N

AURCHEM
RESOURCES LTD.

CLAIM MAP

DISCOVERY CREEK CLAIMS

DATE; SEPT. 17, 1986

DRAWN BY; R. Schneider

00123

756

DISCOVERY CREEK PROJECT – YUKON

base line

mag. decl'n 33·5 west

L24+00N
L22+00N
L20+00N
L18+00N
L16+00N
L14+00N
L12+00N
L10+00N
L8+00N.
L6+00N.
L4+07N.
L1+90N.
L0+00
L1+96S.
L4+16S.
L6+50S.
L8+60S.
L10+06S.
L12+38S.
L14+33S.
L16+70S.
L18+67S.
L19+67S.
L20+67S.
L. 14+15
L24+11S.
L27+16S.
L29+16S.
L30+50S.
L31+50S.
L32+85S.
L34+10S.
L35+70S.

LEGEND

As - (ppm)

< 5	501 - 600
5 - 25	601 - 700
26 - 50	701 - 800
51 - 100	801 - 900
101 - 200	901 - 1000
201 - 300	1000 - 1500
301 - 400	1,500 - 2,000
401 - 500	> 2,000

KEY - Ag (ppm)

.1-.2	5.1-7.5	71-80
.3-.4	7.6-10	81-90
.5-.6	10-20	91-100
.7-.8	21-30	> 100
.9-1.0	31-40	
1.1-1.5	41-50	
1.6-2.0	51-60	
2.1-5.0	61-70	

KEY - Au (ppb)

< 5	66-75	500-1000
5-15	76-85	1000-1500
16-25	86-99	1500-2,000
26-35	100-200	> 2,000
36-45	200-500	
46-55		
56-65		

Scale

0 200 400 600 FEET

1 INCH = 200 FEET

757

AURCHEM RES. LTD.

GOLD – SURFACE GEOCH.

NTS 115 I/3	REGION WHITE HORSE
PROV YUKON	DATE SEPT. 12, 1988
DATA BY L. Schneider & Schneider H. Anderson	DRAWN BY [illegible]

DISCOVERY CREEK PROJECT – YUKON

base line

mag. decl'n 33·5 west

L24+00N.
L22+00N.
L20+00N.
L18+00N.
L16+00N.
L14+00N.
L12+00N.
L10+00N.
L8+00N.
L6+00N.
L4+07N.
L1+90N.
L0+00
L1+96S.
L4+16S.
L6+50S.
L8+60S.
L10+06S.
L12+38S.
L14+33S.
L16+70S.
L18+67S.
L19+67S.
L20+67S.
L22+51S.
L24+11S.
L27+16S.
L29+16S.
L30+50S.
L31+50S.
L32+85S.
L34+10S.
L35+70S.

W5

Courtland

2 South

Wedge 8

3 South

8 South

11 South

Trench 4H

Trench 5H

Scale

0 200 400 600
FEET

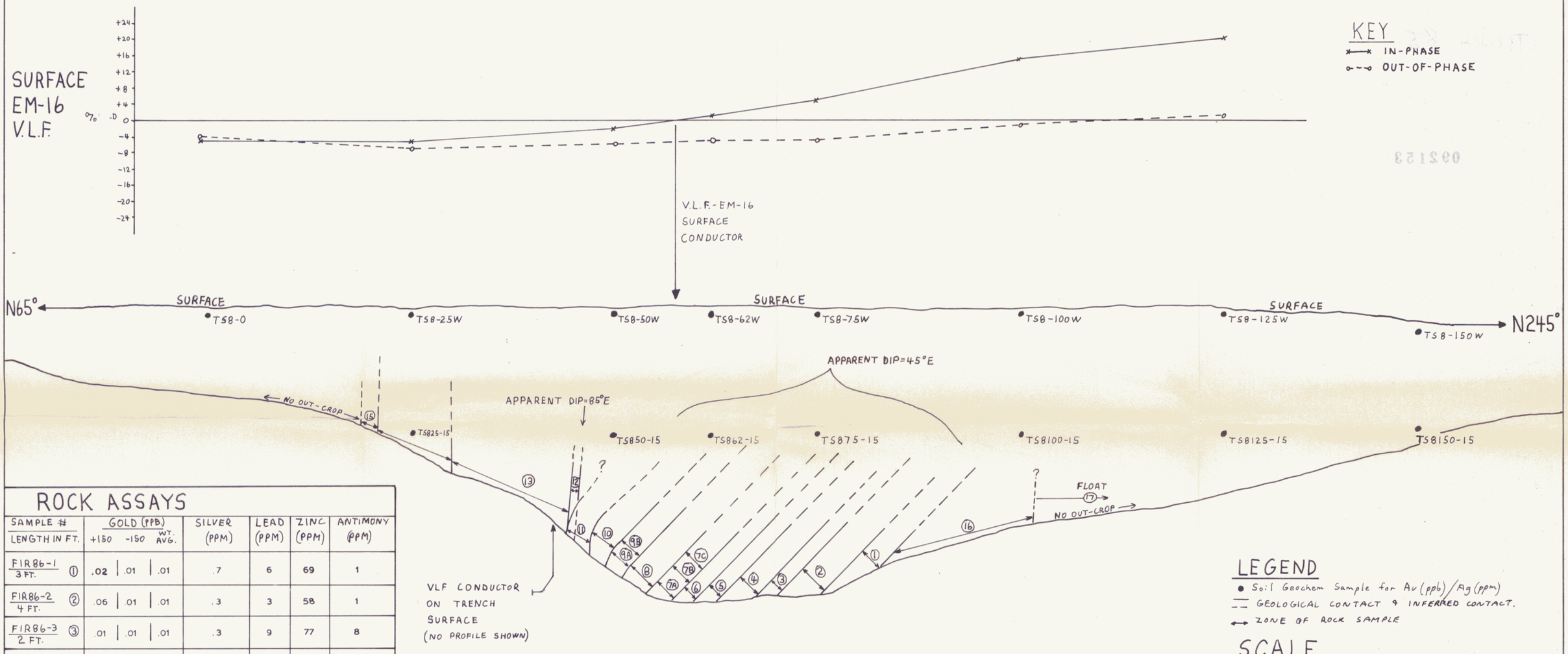
1 INCH = 200 FEET

758

AURCHEM RES. LTD.	
TRENCH LOCATION MAP	
NTS. 115 I/3	REGION DISCOVERY CREEK
PROV. YUKON	DATE OCT. 8, 1986.
DATA BY M. LANGDON	DRAWN BY M. LANGDON

CROSS-SECTION PROFILE OF TRENCH 8S.—V.L.F, SOILS & GEOLOGY

DISCOVERY CREEK PROJECT—YUKON TERRITORY



ROCK ASSAYS

SAMPLE # / LENGTH IN FT.		GOLD (PPB) +150	GOLD (PPB) -150	GOLD (PPB) WT. AVG.	SILVER (PPM)	LEAD (PPM)	ZINC (PPM)	ANTIMONY (PPM)
FIR86-1 / 3 FT.	①	.02	.01	.01	.7	6	69	1
FIR86-2 / 4 FT.	②	.06	.01	.01	.3	3	58	1
FIR86-3 / 2 FT.	③	.01	.01	.01	.3	9	77	8
FIR86-4 / 3 FT.	④	.09	.03	.03	.3	15	109	7
FIR86-5 / 2 FT.	⑤	.02	.11	.11	1.4	13	115	3
FIR86-6 / 2 FT.	⑥	.05	.03	03	.7	39	374	16
FIR86-7A / 3 FT.	⑦A	4.74	5.02	5.01	40.0	11,760	6980	173
FIR86-7B / 3 FT.	⑦B	1.09	.87	.88	15.3	3,180	1,648	56
FIR86-7C / 3 FT.	⑦C	94.4	2.45	2.74	19.2	3,500	1,860	65
FIR86-8 / 4 FT.	⑧	.37	.49	.49	3.9	955	2,018	25
FIR86-9A / 3 FT.	⑨A	9.67	5.14	5.26	12.0	1,665	2,850	133
FIR86-9B / 3 FT.	⑨B	.31	.68	.66	11.5	683	2,066	56
FIR86-10 / 3 FT.	⑩	.11	.40	.40	12.0	2,840	2,040	28
FIR86-11 / 3 FT.	⑪	.05	.08	.08	5.5	606	1,568	21
FIR86-12 / 1 FT.	⑫	9.95	1.63	1.86	30.0	6,720	1,220	51
FIR86-13 / 16 FT.	⑬	.02	.02	.02	3.1	39	291	1
FIR86-14 / 10 FT.	⑭	.06	.07	.07	3.4	72	579	26
FIR86-15 / 2 FT.	⑮	.01	.01	.01	1.7	6	323	10
FIR86-16 / 10 FT.	⑯	.01	.03	.02	1.6	15	114	1

GEOLOGY-GENERAL

17 UNALTERED DIORITE; <3% magnetite, no sulphides visible.

16 FRACTURED DIORITE; <10% magnetite, no sulphides visible.

1 METADIORITE; highly shattered, minor qtz/carb. coatings on fractures, 15-20% magnetite, 3-5% pyrite, minor rusty qtz. patches.

2 RUSTY METADIORITE; same as 1 but very oxidized.

3 BLEACHED DIORITE?; altered to clays, creamy-red/yellow colour, minor pyrite & mag. (<2%), 1cm wide blood-red cross-cutting veins.

4 BLEACHED DIORITE & VEIN; same as 3 but the middle 1ft. is a blood-red coloured rusty-weathered vein (calcite + pyrite + mag.).

5 BLEACHED DIORITE & VEIN; same as 4 but has 2 or 4 rusty veins, highly altered, slightly sheared in places.

6 RHYOLITE; medium to coarse grained, greyish-blue colour, calcite and qtz, ≃5% sulphides, very homogenious.

7 VEIN MATERIAL; highly irregular qtz/carb vein with sulphides (15%), massive sulphide pods & veinlets, very rusty altered material, the width of the vein down strike highly variable as well as the component content, overall about 30% sulphides.

8 METADIORITE WITH VEINLETS; fine grained metadiorite with minor sulphides that have veinlets and pods of qtz/carb/sulphide material as in 7.

9 BLACK METADIORITE WITH VEINLETS; same as 8 but diorite is black coloured from mag./ilmenite/manganese coatings, colour rusty black-red.

10 MIXTURE; light green fine grained rhyolite/fine grained diorite/thin qtz-carb-sulphide veinlets → all shattered and intermixed, <5% sulphides.

11 BLACK METADIORITE WITH VEINLETS; same as 10 but no rhyolite fragments.

12 RUSTY WEATHERED VEIN; highly oxidized rusty coloured vein of unknown lithology, possibly vein material (7) + diorite.

13 DIORITE; relatively fresh unaltered diorite, blocky fracture, <1% disseminated pyrite & pyrrhotite, minor qtz/pyrite fracture planes.

14 RHYOLITE; light grey-green fine grained rhyolite, siliceous, minor carb. veins, fracture veinlets with sulphides plus finely diss. sulphides (<3%)

15 PORPHYRITIC RHYOLITE; reddish-green rhyolite with blue-green subeuhedral porphyritic plagioclases, 1-2% very fine black sulphides.

NOTE; LITHOLOGIES 1 THROUGH 12 REPRESENT A GENERALLY HIGHLY RUSTY-COLOURED OXIDIZED ZONE.

LEGEND

- ● Soil Geochem Sample for Au (ppb)/Ag (ppm)
- — — GEOLOGICAL CONTACT & INFERRED CONTACT.
- ⟷ ZONE OF ROCK SAMPLE

SCALE

1" = 8 FT.

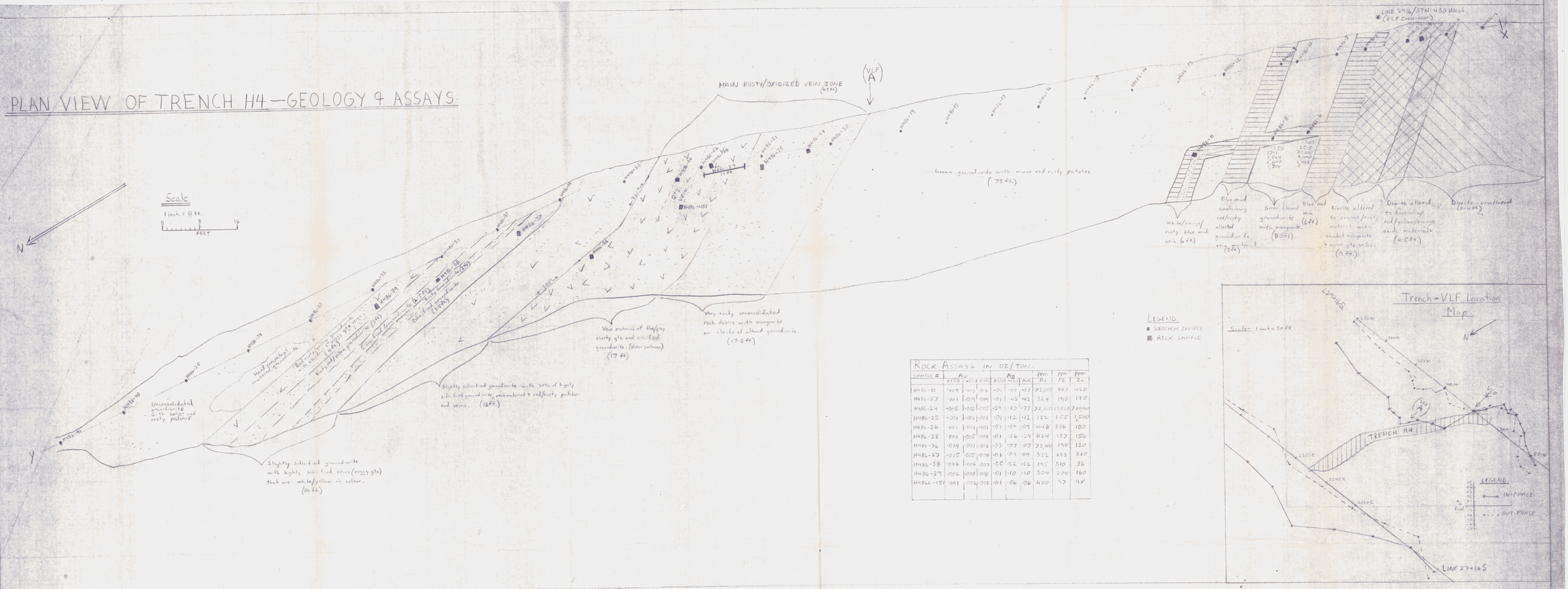
0 8 16 24 FEET.

PROCHEM | AURCHEM

DATE; JUNE 11, 1986. N.T.S.; 115-1/3
DRAWN BY; M. LANGDON REGION; MOUNT NANSEN
DATA; M. LANGDON, L. SCHNEIDER, M. ANDERSON.

759

PLAN VIEW OF TRENCH H4 — GEOLOGY & ASSAYS



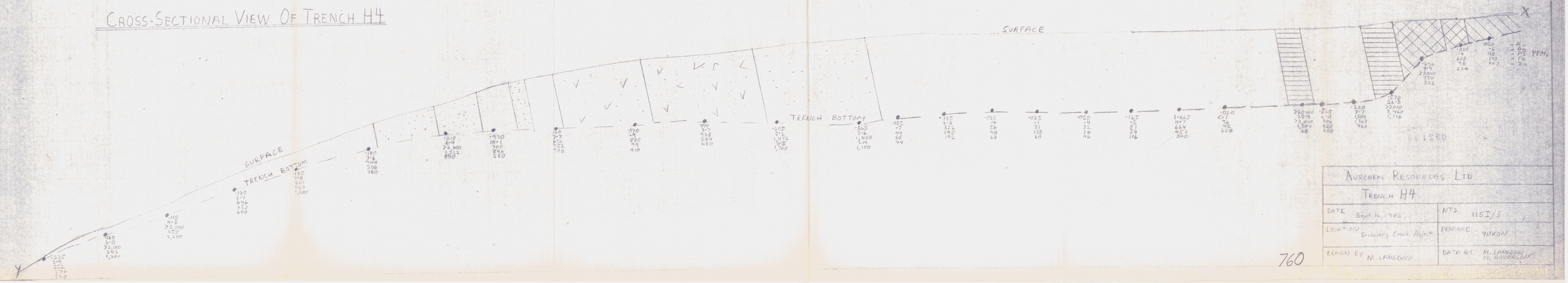
ROCK ASSAYS IN OZ/TON.

SAMPLE #	Au			Ag			Ppm As	Ppm Pb	Ppm Zn
	+150ft	-150ft	AVG.	+150ft	-150ft	AVG.			
H486-11	.009	.005	.03	.01	.07	.07	22,000	387	420
H486-27	.001	.014	.014	.01	1.43	1.42	324	190	180
H486-24	.005	.005	.005	.29	1.80	1.77	22,000	13,210	22,000
H486-25	.001	.001	.001	.01	1.12	1.12	122	525	1,500
H486-26	.001	.001	.001	.01	.09	.09	448	886	100
H486-28	.001	.015	.014	.01	.26	.24	424	137	156
H486-36	.014	.001	.012	.03	.07	.07	22,000	190	120
H486-37	.015	.005	.026	.01	.09	.09	322	233	380
H486-38	.026	.004	.023	.05	.22	.22	195	510	36
H486-39	.002	.008	.008	.01	.10	.10	504	204	160
H486-151	.001	.002	.002	.01	.06	.06	480	97	98

LEGEND
- GEOCHEM SAMPLE
- ROCK SAMPLE

Trench - VLF Location Map

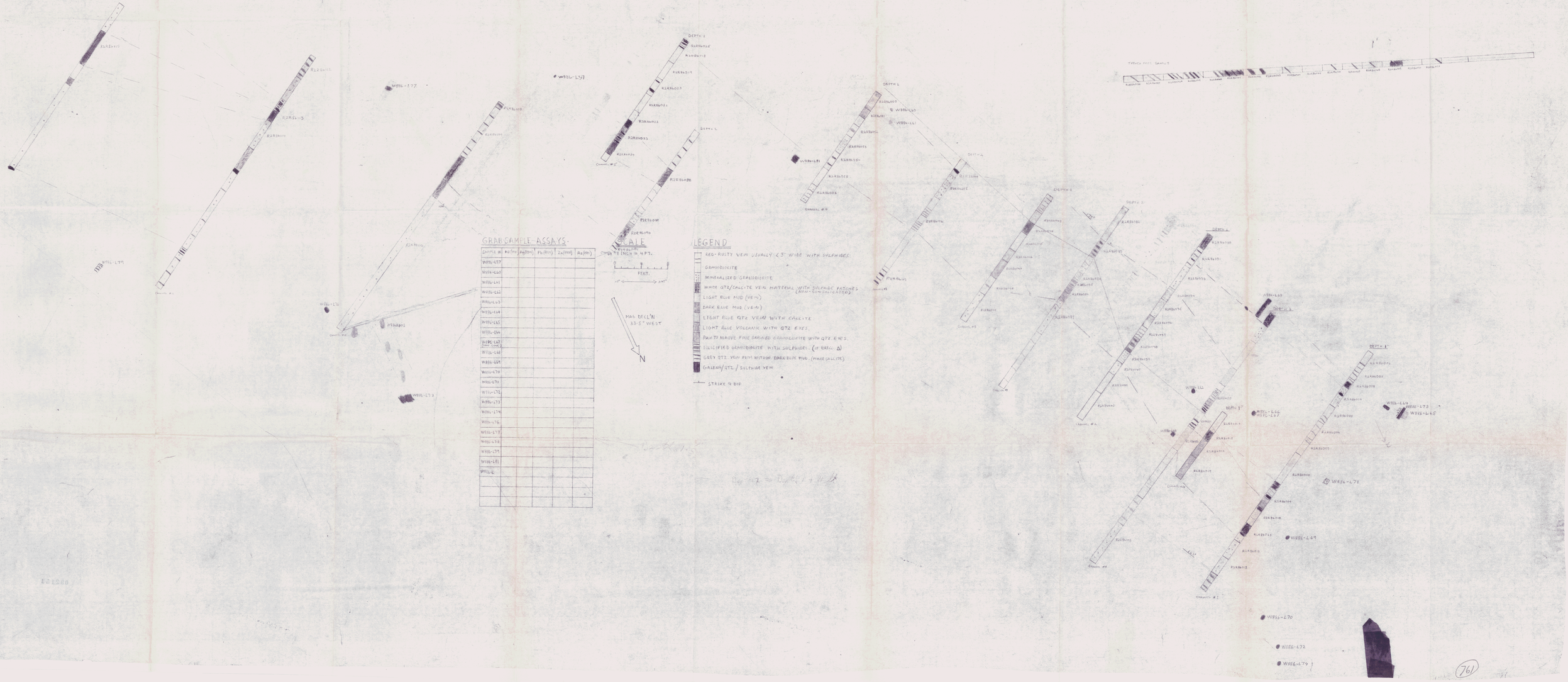
CROSS-SECTIONAL VIEW OF TRENCH H4



AURCHEM RESOURCES LTD	
TRENCH H4	
DATE Sept. 16, 1986	NTS 115I/3
LOCATION Discovery Creek Project	PROVINCE YUKON
DRAWN BY M. LANGDON	DATA BY M. LANGDON, M. HARBALUK

760

W8 TRENCH – PLAN VIEW
GEOLOGY, SAMPLE LOCATION & ASSAYS



GRAB SAMPLE ASSAYS.

SAMPLE #	Au (ppm)	Ag (ppm)	Pb (ppm)	Zn (ppm)	As (ppm)
W886-L57					
W886-L60					
W886-L61					
W886-L62					
W886-L63					
W886-L64					
W886-L65					
W886-L66					
W886-L67 (MAX CONC)					
W886-L68					
W886-L69					
W886-L70					
W886-L71					
W886-L72					
W886-L73					
W886-L74					
W886-L76					
W886-L77					
W886-L78					
W886-L79					
W886-L81					
W886-L					

761

LGCS 1

LGCS 1

LGCS 1
LGCS 2

MYRTLE

WEDGE 6

RICCO

COURTLAND

LGCS 2
LGCS 3

LAURA

ACCESS ROAD

WEDGE 5

W10
W15
W9

CAMP

DISCOVERY CREEK

W6
W5
W7
W8

→ TO TRIGGERS

5L106

5L90

W15
W16

IDA MAY

MACK

WILLOW CREEK

WEDGE 10

WEDGE8

3L90

ELIZA CREEK

W10
W15
RAS1
RAS2

W7
W8
RAS3

4L90

WEDGE 7

3L106

RAS 2

6L106

MSL

4L105

WEDGE 15

RAS 3

RAS 1

5L105

8L102

3L102

RAS 1+RAS 2

SUNSET

HAZEL
ANNE

RAS 4

KEY

— Boundry of Surveyed Claims
--- Boundry of Staked Claims
■ Found Post
□ Post (approx. position)

SCALE 1" = 200'

0 200' 400' 600'

N

AURCHEM
RESOURCES LTD.

CLAIM MAP

DISCOVERY CREEK CLAIMS

DATE; SEPT. 17, 1986

DRAWN BY; R. Schneider

092153

762.

DISCOVERY CREEK PROJECT – YUKON

base line

mag. decl'n 33·5 west

L24+00N
L22+00N
L20+00N
L18+00N
L16+00N
L14+00N
L12+00N
L10+00N
L8+00N
L6+00N
L4+07N
L1+90N
L0+00
L1+96S 6N
L4+16S 4N
L6+50S
L8+60S
L10+06S 22S
L12+38S
L14+33S
L16+70S
L18+67S 1S
L19+67S
L20+67S
L22+51S
L24+11S 15N
L27+16S
L29+16S
L30+50S
L31+50S
L32+85S
L34+10S
L35+70S
L30+50S
L31+50S
L39+85S

KEY

IN-PHASE

OUT-OF-PHASE

IN-PHASE AND OUT-OF-PHASE ANOMALY

IN-PHASE ANOMALY

- VERY STRONG
- STRONG
- MODERATELY STRONG
- INTERMEDIATE
- INTERMEDIATE TO WEAK
- WEAK
- VERY WEAK
- X – POSSIBLE

092153

Scale

0 200 400 600 FEET

1 INCH = 200 FEET

763

AURCHEM EXPL. LTD.

EM-16 CUTTLER DATA

NTS. 115I/3	REGION MNT. NANSEN
PROV. YUKON	DATE NOV. 1987.
DATA BY M. LANGDON	DRAWN BY M. LANGDON

DISCOVERY CREEK PROJECT — YUKON

base line

mag. decl'n 33·5 west

N

L24+00N
L22+00N
L20+00N
L18+00N
L16+00N
L14+00N
L12+00N
L10+00N
L8+00N
L6+00N
L4+07N
L1+90N
L0+00
L1+76S
L4+16S
L6+30S
L8+60S
L10+06S
L11+00S
L12+38S
L14+33S
L15+50S
L16+70S
L18+67S
L19+67S
L20+67S
L22+51S
L24+11S
L27+16S
L29+16S
L30+50S
L31+50S
L32+85S
L34+10S
L35+70S

KEY

Contours
·45 ppm.
·90 ppm.
1·50 ppm.
2·00 ppm
3·00 ppm.

< ·45 ppm.
·45 to ·90 ppm.
·90 to 1·50 ppm.
1·50 to 2·00 ppm.
2·00 to 3·00 ppm.
> 3·00 ppm.

092153

Scale

0 200 400 600 FEET

1 INCH = 200 FEET

764

AURCHEM EXPL. LTD.

SILVER — SURFACE GEOCHEMS.

NTS 115 I/3	REGION MNT. MANSE
PROV YUKON	DATE OCT. 15, 19
DATA BY M. LANGDON	DRAWN BY M. LANGDO

DISCOVERY CREEK PROJECT – YUKON

base line

mag. decl'n 33·5 west

L24+00N
L22+00N
L20+00N
L18+00N
L16+00N
L14+00N
L12+00N
L10+00N
L8+00N
L6+00N
L4+07N
L1+90N
L0+00
L1+96S
L4+16S
L6+50S
L8+60S
L10+00S
L11+00S
L12+38S
L14+33S
L15+58S
L16+70S
L18+67S
L19+67S
L20+67S
L22+51S
L24+11S
L27+16S
L29+16S
L30+50S
L31+50S
L32+85S
L34+10S
L35+70S

LEGEND

CONTOUR INTERVALS

4·5 PPB.	< 4·5 ppb.
10 PPB.	4·5 - 10 ppb.
20 PPB	10 - 20 ppb.
40 PPB	20 - 40 ppb.
100 PPB	40 - 100 ppb.
	> 100 ppb.

Scale

0 200 400 600 FEET

1 INCH = 200 FEET

765

092153

AURCHEM EXPL. LTD.

GOLD – SURFACE GEOCHEM.

NTS 115 I/3	REGION MNT. HANSEN
PROV YUKON	DATE OCT. 1987
DATA BY M. LANGDON	DRAWN BY M. LANGDON

DISCOVERY CREEK PROJECT – YUKON

base line

mag. decl'n 33·5 west

L24+00N
L22+00N
L20+00N
L18+00N
L16+00N
L14+00N
L12+00N
L10+00N
L8+00N
L6+00N
L4+07N
L1+90N
L0+00
L1+96S
L4+14S
L6+50S
L8+50S
L10+06S
L12+38S
L14+33S
L16+70S
L18+67S
L19+67S
L20+67S
L22+51S
L24+11S
L27+16S
L29+16S
L30+50S
L31+50S
L32+85S
L34+10S
L35+70S

QUARTZ DIORITE ?

QUARTZ DIORITE

INT. VOLCANICS

SEDIMENTS

GRANODIORITE

MAJOR

GRANITE

DACITE ?

MAJOR

092153

CONTACT

Scale

0 200 400 600 FEET

1 INCH = 200 FEET

766

AURCHEM EXPL. LTD.	
GEOLOGY	
NTS. 115 I/3	REGION MNT. NANSEN
PROV. YUKON	DATE
DATA BY M. LANGDON	DRAWN BY M. LANGDON

DISCOVERY CREEK PROJECT – YUKON

base line

mag. decl'n 33·5 west

L24+00N
L22+00N
L20+00N
L18+00N
L16+00N
L14+00N
L12+00N
L10+00N
L8+00N
L6+00N
L4+07N
L1+90N
L0+00
L1+96S
L4+16S
L6+50S
L8+60S
L10+06S
L11+00S
L12+38S
L14+33S
L15+50S
L16+70S
L18+67S
L19+67S
L20+67S
L22+51S
L24+11S
L27+16S
L29+16S
L30+50S
L31+50S
L32+85S
L34+10S
L35+70S

KEY

CONTOURS

57,100 STATION VALUES
57,200 REPRESENT VALUE
57,300 MINUS 57,000.
57,400
57,500 ALL VALUES
57,600 WERE CORRECTED
57,700 TO 57,800 FOR
57,800 DAILY AND HOURLY
57,900 FLUCUATIONS.
58,000
58,100
58,200
58,300
58,400

092153

(gammas)

- 57,000 to 57,200
- 57,200 to 57,400
- 57,400 to 57,600
- 57,600 to 57,800
- 57,800 to 58,000
- 58,000 to 58,200
- 58,200 + 58,400
- > 58,400

AURCHEM EXPL. LTD.

MAGNETOMETER DATA

NTS. 115 I/3	REGION MNT. NANSEN
PROV. YUKON	DATE NOV. 1987
DATA BY M. LANGDON	DRAWN BY M. LANGDON

Scale

0 200 400 600 FEET

1 INCH = 200 FEET

767

DISCOVERY CREEK PROJECT – YUKON

base line

mag. decl'n 33·5 west

N

L24+00N
L22+00N
L20+00N
L18+00N
L16+00N
L14+00N
L12+00N
L10+00N
L8+00N
L6+00N
L4+07N
L1+90N
L0+00
L1+96S
L4+16S
L6+50S
L8+60S
L10+06S
L11+00S
L12+38S
L14+33S
L15+60S
L16+70S
L18+67S
L19+67S
L20+67S
L22+51S
L24+11S
L27+16S
L29+16S
L30+50S
L31+50S
L32+85S
L34+10S
L35+70S

KEY

Contours;
15 ppm
30 ppm
60 ppm
120 ppm
240 ppm

⊠ – No Zn Assay on High Pb/Ag assay.

092153

< 15 ppm.
15 - 30 ppm.
30 - 60 ppm.
60 - 120 ppm.
120 - 240 ppm.
> 240 ppm.

AURCHEM EXPL. LTD.

ZINC - SURFACE GEOCHEMS.

NTS 115 I/3	REGION MNT. NANSEN
PROV YUKON	DATE OCT. 1987
DATA BY M. LANGDON	DRAWN BY M. LANGDON

Scale

0 200 400 600 FEET

1 INCH = 200 FEET

768

DISCOVERY CREEK PROJECT – YUKON

base line

mag. decl'n 33·5 west

L24+00N
L22+00N
L20+00N
L18+00N
L16+00N
L14+00N
L12+00N
L10+00N
L8+00N
L6+00N
L4+07N.
L1+90N.
L0+00
L1+96S
L4+16S
L6+50S
L8+75S
L10+06S
L11+00S.
L12+38S
L14+33S
L15+50S
L16+70S
L18+67S.
L19+67S.
L20+67S.
L22+51S.
L24+11S.
L27+16S
L29+16S
L30+50S
L31+50S.
L32+85S.
L34+10S
L35+70S.

CONTOURS

·2 (no units)
·4
·6
·8
1·0

☒ No Pb or Zn assays but high Au + Ag assays.

092153.

KEY

	< ·2
	·2 – ·4
	·4 – ·6
	·6 – ·8
	·8 – 1·0
	> 1·0

AURCHEM EXPL. LTD.

LEAD/ZINC RATIO – SOIL GEOCHEMS

NTS. 115I/3	REGION MAT. HANSEN
PROV. YUKON	DATE NOV. 1987
DATA BY M. LANGDON	DRAWN BY M. LANGDON

Scale

0 200 400 600 FEET

1 INCH = 200 FEET

769

DISCOVERY CREEK PROJECT – YUKON

base line

mag. decl'n 33·5 west

L 0+00

L 2+00S

L 4+00S

L 6+00S

L 8+00S

L 10+00S

L 11+00S.

L 12+00S

L 13+00S

L 14+00S

L 15+00S.

L 16+00S

L 17+00S

L 18+00S

L 19+00S

L 20+00S

L 22+00S.

L 24+00S

L 27+00S

L 29+00S

L 30+00S

L 31+00S

L 32+00S

L 34+00S

L 35+00S

KEY

CONTOURS (ppm)

10
25
50
100
200

< 10 ppm.
10 - 25 ppm
25 - 50 ppm
50 - 100 ppm
100 - 200 ppm
> 200 ppm

092153

AURCHEM EXPL. LTD.

ARSENIC – SURFACE GEOCHEMS

NTS 115 I/3	REGION MAT. HANSEN
PROV. YUKON	DATE NOV. 11, 1987
DATA BY M. LANGDON	DRAWN BY M. LANGDON

Scale

0 200 400 600 FEET

1 INCH = 200 FEET

770

DISCOVERY CREEK PROJECT – YUKON

base line

mag. decl'n 33·5 west

L24+00N
L22+00N
L20+00N
L18+00N
L16+00N
L14+00N
L12+00N
L10+00N
L8+00N
L6+00N
L4+07N
L1+90N
L0+00
L1+96S
L4+16S
L6+50S
L8+60S
L10+06S
L12+78S
L14+33S
L16+70S
L18+67S
L19+67S
L20+67S
L22+51S
L24+11S
L27+16S
L29+16S
L30+50S
L31+50S
L32+85S
L34+10S
L35+70S

KEY

IN-PHASE AND OUT-OF-PHASE CONDUCTOR
IN-PHASE CONDUCTOR ONLY

- VERY STRONG
- STRONG
- MODERATELY STRONG
- INTERMEDIATE
- INTERMEDIATE TO WEAK
- WEAK
- VERY WEAK
- POSSIBLE

092153

Scale

0 200 400 600 FEET

1 INCH = 200 FEET

771

AURCHEM EXPL. LTD.

EM-16 ANOMALIES

NTS. 115 I/3	REGION MNT. NANSEN
PROV. YUKON	DATE NOV. 1987.
DATA BY M. LANGDON	DRAWN BY M. LANGDON

DISCOVERY CREEK PROJECT – YUKON

base line

mag. decl'n 33.5 west

L24+00N
L23+00N
25+00N
L18+00N
L16+00N
L14+00N
L12+00N
L10+00N
L8+00N
L4+07N
L11+90N
L0+00
L1+96S
L4+16S
L6+50S
L8+60S
L10+04S
L11+00S.
L12+38S
L14+33S
L15+50S.
L16+70S
L18+67S
L19+67S
L20+67S
L22+51S.
L24+11S
L26+65
L29+63
L30+50S
L31+50S
L32+85S
L34+10S
L35+70S

KEY

CONTOURS
5 ppm.
15 ppm
30 ppm.
60 ppm
120 ppm

⊠ LEAD ASSAY MISSING FROM HIGH AU Y/OR Ag SAMPLE.

'092153

- < 5 ppm.
- 5 – 15 ppm
- 15 – 30 ppm
- 30 – 60 ppm
- 60 – 120 ppm
- > 120 ppm

Scale

0 200 400 600 FEET

1 INCH = 200 FEET

772

AURCHEM EXPL. LTD.

LEAD - SURFACE GEOCHEMS.

NTS 115 I/3	REGION MNT. NIMISEN
PROV. YUKON	DATE OCT. 1987.
DATA BY M. LANGDON	DRAWN BY M. LANGDON

EM-16 V.L.F. PROFILE FROM TRENCH WEDGE 8 TO TRENCH 11 SOUTH — DISCOVERY CREEK PROJECT, YUKON TERRITORIES