PART 1

FINAL REPORT

ON THE 1976 EXPLORATION PROGRAM

AT HOWARDS PASS YUKON - NORTHWEST TERRITORIES

CANEX PLACER LIMITED
EXPLORATION DIVISION

FINAL REPORT

ON THE 1976 EXPLORATION PROGRAM

AT HOWARDS PASS YUKON - NORTHWEST TERRITORIES

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HOWARDS PASS
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I. INTRODUCTION

Preface

This report consists of three sections. The first summarizes the objectives, results and conclusions of the 1976 program, the second covers the activities of the 1976 season in greater detail and the last section outlines the objectives and proposals for the 1977 season. The main body of the report is summarized as much as possible. Back-up detailed data such as reports or cost data are contained in the Appendix. The section dealing with 1977 proposals will include only those proposals agreed upon during the Management Meeting held in October 1976. The original 1977 proposals as presented by Canex Placer Limited, prior to modification because of budgetary limitations, are included within the Appendix.

Proposals for future work on the ANNIV and OP areas are also in the Appendix.

1) Summary & Conclusions

The general objectives for 1976 were to carry out a program that would increase the tonnage of drill-indicated mineralization and to locate higher grade mineralization on both the XY and the Anniv areas. Concurrently, efforts were to be directed to improving our geological and metallurgical knowledge of the deposit. In addition, work would continue toward the acquisition of the governmental permits required for the construction of the proposed access road originating just beyond the eastern end of Harrison Pass on the Nahanni Range Road.

The program achieved most of these objectives. The drilling program was considerably expanded during the season from an original objective of 21,000 feet to an actual footage of 31,173 feet drilled. This was accomplished through better than expected operating efficiency, and a

$150,000 increase in budget. The encouraging results obtained from the XY area were the main impetus for increasing the drill footage. Commencing with drill hole 49 (Plate HP-111-2)and then later by hole 53, it became apparent that a higher than average grade zone was being developed in the area northwest of line 105. Unfortunately this zone will be too deep for open pit mining, but the grades indicated were adequate to support underground mining if a sufficient tonnage can be proven. By the end of the season, holes 66 and 80 extended the area of high grade, and also suggested an increase in grade downdip to the north. Using an 8% combined lead and zinc cut-off, grades ranging from 13% combined to 46% combined are indicated by 15 holes throughout the area, the only exception being 3 holes on line 115 which indicated material in the 7 to 8% combined range. Grades indicated from the most northerly holes -- 66, 76 and 80 --- were 24.01%, 17.34%, and 46.10% combined lead zinc respectively, over intersection thickness of 20 feet, 25 feet and 55 feet respectively.

Using the data from 15 holes in the Central Zone from line 85+00 to line 130+00, drill indicated reserves are approximately 11,000,000 tons grading 6.7% Pb, 13.2% Zn, assuming an 8% Pb+Zn cut-off and a minimum thickness of 10 feet. It must be stressed that this potential reserve calculation is based on holes spaced approximately 500 feet apart, and while the zone is responding very well to drill development much more detailed investigation is required before these potential tonnages can be considered firmly established.

The Anniv drilling program succeeded in confirming the existence of continuous mineralization throughout the area previously tested by trenching and four short diamond drill holes. Grades were consistent with 65% of the samples falling in the range of 4.0% to 9.5% combined lead and zinc, and 25% of the samples having an average grade between 9.5% and 21.8%. This work also indicated that additional potential exists to the northwest, the southeast and downdip to the southwest. With

present operating and capital cost data, the Anniv zone appears to be too low grade to be economic in the initial production years. However testing of the extensions should be considered as soon as the necessary funds are available.

Investigation of the Don and OP groups was continued by geological mapping, prospecting, and geophysics. Four new showings were located, two are on the OP group and two are on the northwest end of the Don group adjacent to the Anniv area. These showings suggest that additional potential exists throughout the Don and OP claim blocks, and that further work should be carried out in these areas as soon as funds are available.

Two holes, 428 feet and 392 feet respectively, were drilled near the original showing of the OP group. This is the same general area that was tested with a short, unsuccessful hole in 1975. Results from the two holes drilled this season partially resolve the stratigraphic problems experienced here. The footwall beds were located by Hole OP2. OP3 was stepped out 500 feet to the southwest and intersected the hanging wall Flaggy Mudstone. However, due to drilling difficulties, this hole could not be extended beyond the Flaggy Mudstone. Additional drilling will be necessary to test for the existence of the Active Zone in this area.

Mineralization from the XY Central Zone has been divided into five categories for metallurgical testing purposes. These categories are based on their content of the metal-rich whitish grey Pb-Zn mudstone and range from 42.4% Pb/Zn combined for Category 1, to less than 7% Pb/Zn combined for Category 5. Metallurgical testwork on Categories 1 and 4 is complete with respect to bulk concentrate production. Work is in progress on Categories 2 and 3. In general, better recovery results are obtained with the higher grade material.

Results on Category 1 ranged from 99% recovery for a 50% combined bulk concentrate, to 54% recovery for a 70% combined bulk concentrate. The optimum condition would probably be in the order of 95% recovery for a 60% combined bulk concentrate. Category 4, which averaged 11% combined lead and zinc, had results ranging from 79% recovery for a 40% combined bulk concentrate to 71% recovery for a 50% combined bulk concentrate.

An interesting aspect is that current separate-concentrate research is producing encouraging results in the Category 2 sample. Insufficient work has been done to confirm present results, but the improvement over earlier results is significant. If separate concentrates can be produced, marketing of concentrate is greatly simplified. The maximum metal saleable annually could be increased, thereby enhancing the economics of the operation.

Bench scale metallurgical testing continued using samples taken from 1976 drill core. Results from flotation test work suggest that producing saleable separate concentrates of Pb and Zn may be difficult, but still warrants further effort. Better results were obtained by producing a bulk concentrate, but much improvement is required with respect to both concentrate grade and recovery, if the concentrate is to be treated by conventional smelter methods.

Preliminary roast-leach testwork suggests that this approach may have potential. More work will be conducted along these lines when sufficient concentrate is available.

A composite prepared for sink-float testing is being investigated by the Coleraine laboratory of U.S. Steel. Results obtained so far are preliminary, but suggest that more work on this process is warranted.

Prior to commencing construction on the access road from Tungsten, N.W.T., it is necessary to obtain government approval in the form of a Land Use Permit. Liaison with the various government agencies continued throughout the year to further this end. An environmental impact study was completed in August and submitted immediately to the Land Use Department. This resulted in a permit being granted for the last 10 mile section, but approval for the remaining 40 miles is still in abeyance. Meetings with the appropriate government agencies were held in February in an attempt to resolve the remaining problems.

In summary, the conclusions to be drawn from this summers work are:

(i) Drilling in the Central Zone of the XY area indicates that this zone might contain sufficient tonnage of high grade mineralization to provide the "plum" necessary for an early payback of development and construction capital costs. Most of this material would be recovered by underground mining methods. Relatively little mineralization has been indicated to date that would be amenable to mining by open pit methods, but a small open-pit potential exists and should be investigated as soon as practical.

Drill indicated reserves are 27,000,000 tons at 3.4% Pb, 6.6% Zn using a 4% combined lead and zinc cut-off, or 11,000,000 tons at 6.7% Pb, 13.1% Zn using an 8% combined lead and zinc cut-off. In addition to the area mentioned above, potential still exists over a large area of the XY Property.

(ii) The Anniv area that is amenable to open pit mining is too low grade to be mined in the early production period assuming present metal prices and operating costs. Drill indicated reserves are approximately 7,800,000 tons at 2.17% Pb, 6.57% Zn using a 4% combined lead and zinc cut-off, or approximately 3,400,000 tons at 3.07% Pb, 9.56% Zn using an 8% combined lead and zinc cut-off.

Good potential still exists in the Anniv area, and future programs should be directed to testing the areas outlined under the Anniv Proposal Section of the report.

iii) Several new showings were located along the claim group outside the known Anniv and XY showings. This suggests that much work will be required in the future to completely evaluate the entire property. Programs should be continually directed to this end as funds permit.

iv) Compared to earlier studies, bench flotation tests yielded improved metallurgical results, but more work remains to be done to bring recovery and concentrate grade up to desirable levels. Investigation of hydrometallurgical processes suggests that these processes may be applicable to Howards Pass mineralization. Also, Howards Pass concentrate may be amenable to the Imperial Smelting process. Recent encouragement in the production of separate concentrates is a positive development.

v) Obtaining the necessary governmental approval for constructing the proposed access road from Cantung to Howards Pass has not progressed as rapidly as expected. It is felt that approval will be granted eventually, but it may not be until April or May of 1977.

2) Location & Access

The Howards Pass area (Fig. 1) (Lat. $62^{o}27'$N., Long $129^{o}12'$W) is situated along the Yukon Territory - Northwest Territories border approximately 50 miles northwest of Cantung (Tungsten). The extreme south end of the XY group and a small area on the north edge of the Anniv group are in the Northwest Territories, otherwise the property is located in Yukon Territory.

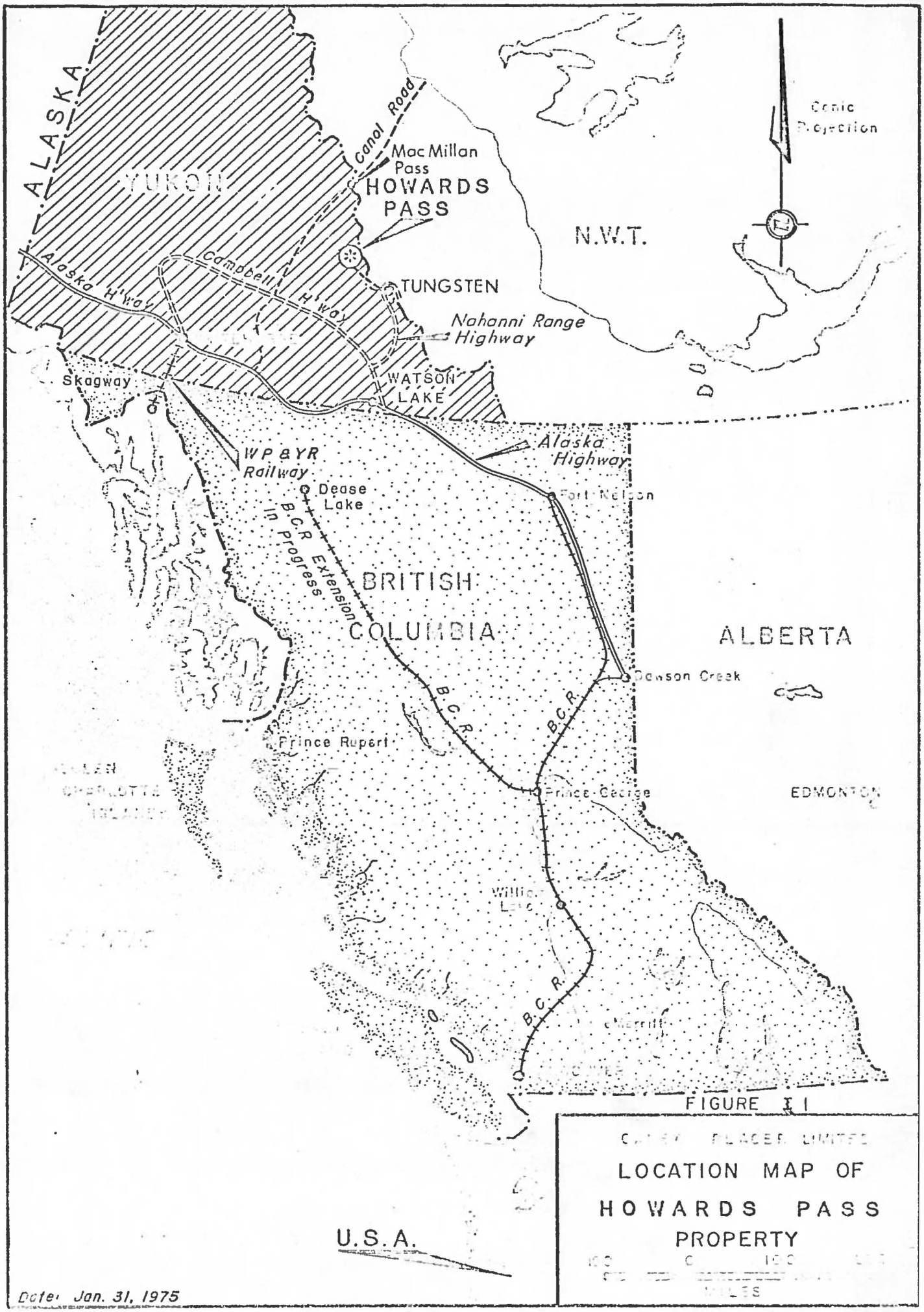


FIGURE II

CASSIAR PLACER LIMITED

LOCATION MAP OF HOWARDS PASS PROPERTY

Date: Jan. 31, 1975

Present access is primarily by air. Ground transport from the Cantung Road is limited to tracked vehicles for the relatively short period when the ground is frozen and snow levels are low. Figure 2.

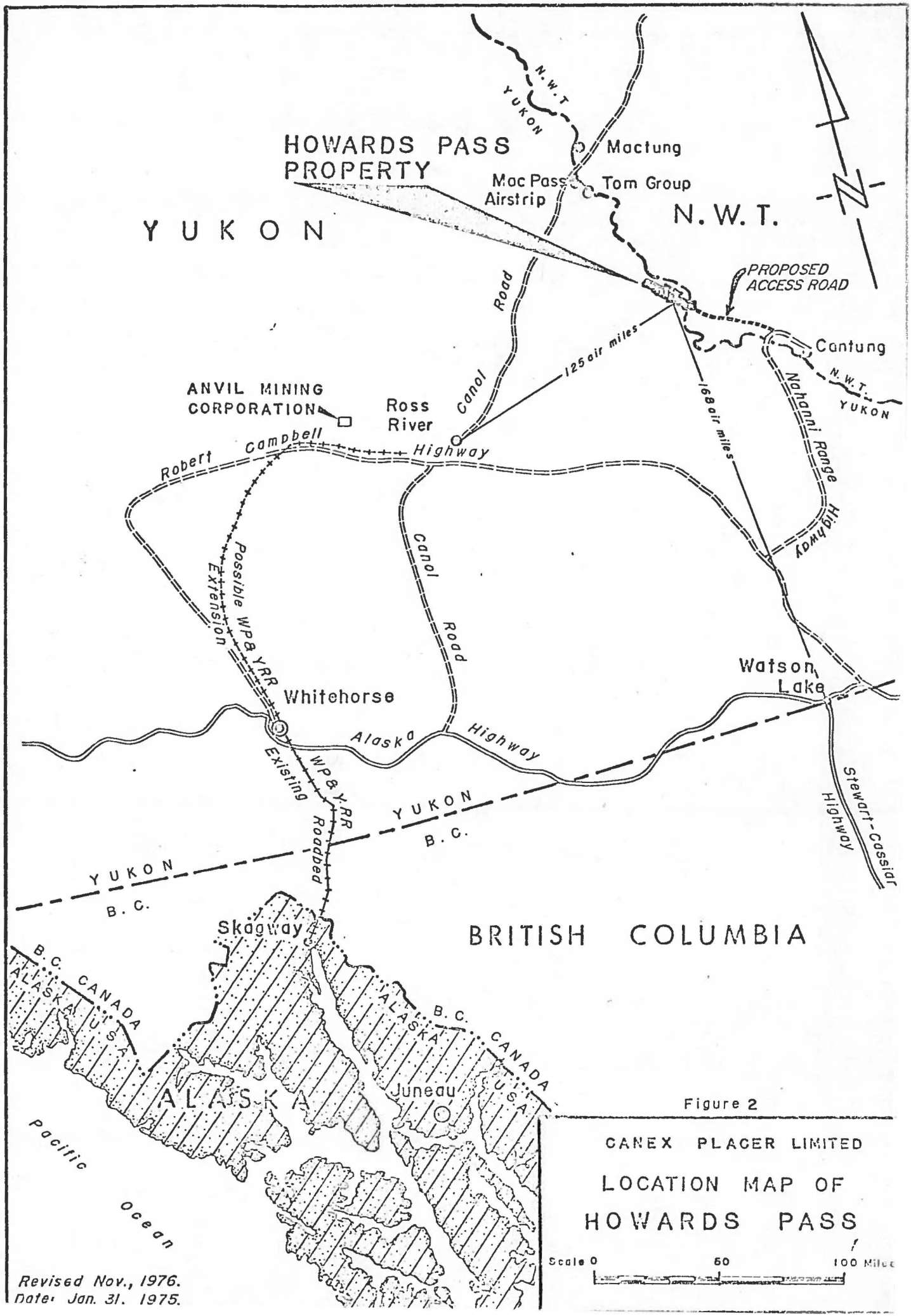
Air transport was used for movement of all personnel and supplies in the 1976 season. Heavy freight was flown from the Cantung airstrip in April to the 1,800 foot strip at Howards Pass with a Twin Pioneer and Single Otters. Anniv freight was flown by ski-equipped Single Otters to a snow strip located on the Anniv Summit.

Personnel and regular supplies were air lifted to Howards Pass, from Watson Lake, a distance of 168 miles. This was accomplished primarily with a Twin Islander operated by B.C. - Yukon Air Service.

Winter transportation has been limited so far to ski-equipped Beavers and Otters. Larger aircraft on skis have not been used because they have not been available from local carriers. Should a large scale winter flying program be necessary, it might be worthwhile to ferry in a larger aircraft for that specific purposes.

The Anniv area is now accessible in summer by either helicopter or by wheelequipped Otters. A 1,300 foot strip was roughed out in late 1976 to accommodate the Otters or other aircraft with equivalent characteristics.

Access by land from Cantung to Howards Pass would be advantageous for movement of heavy equipment and supplies when the project reaches the stage where underground testwork is required. The groundwork for this road is presently being prepared through contact with the appropriate Federal Government Departments that would ultimately approve and possibly aid in financing and construction of this "resource road" link. Construction of this access road is scheduled to start in June 1977.


HOWARDS PASS PROPERTY
YUKON
N.W.T.
N.W.T.
YUKON
Mactung
Mac Pass Airstrip
Tom Group
PROPOSED ACCESS ROAD
Road
Canol
125 air miles
168 air miles
Cantung
N.W.T.
YUKON
Nahanni Range
Highway
ANVIL MINING CORPORATION
Ross River
Robert Campbell Highway
Possible WP&YRR Extension
Canol Road
Whitehorse
Watson Lake
Alaska Highway
Existing WP&YRR Roadbed
YUKON
B.C.
YUKON
B.C.
Stewart-Cassiar Highway
Skagway
BRITISH COLUMBIA
B.C.
CANADA
ALASKA
U.S.A.
ALASKA
B.C.
CANADA
ALASKA
U.S.A.
Juneau
Pacific Ocean
Revised Nov., 1976.
Date: Jan. 31. 1975.
Figure 2
CANEX PLACER LIMITED
LOCATION MAP OF
HOWARDS PASS
Scale 0
50
100 Miles

3) Topography & Climate

The topography of the area is quite variable ranging from broad glaciated valleys to sharp peaks. Elevations on the property range from 3,600 feet near the Pelly River to 6,514 feet on the Yara Peak, with most of the area above the 4,700 foot tree-line. Major valleys are U-shaped and are densely vegetated with thick grass, brush and stunted timber. Peaks are barren and alpine in nature. Much of the area studied in detail consists of gently rolling hills with sparse outcrops.

Climate in the area is typical for this portion of the Yukon and Northwest Territories - cool summers and cold winters. The field season runs mid-June to late September in an average year, deep snow being the limiting factor for starting earlier, and cold temperatures being the deterrent to operating later. Summers are cool with temperatures ranging from $10^{o}C$ to $30^{o}C$ June through September with moderate shower activity frequent in the afternoons.

Snow levels in the spring are generally in the 6-8 foot range, but where drifted, can be up to 12 feet deep. Thawing usually starts by May, and by the end of June, most of the property is bare. Temperatures averaged $-12^{o}C$ from October to May during the only winter when temperatures were recorded. The January average during this period was $-29^{o}C$ with a low of $-35^{o}C$.

4) History

Following the discovery of vanadium in the shales near Flat Lake, N.W.T. by Canex in 1968, a broad scale geochemical resonnaissance program was carried out to the north in areas underlain by black shales.

In 1971, it was decided to expand this reconnaissance to cover a 300 mile long belt extending from south of the Toad River Lodge on the Alaska Highway to Macmillan Pass on the Canol Road. During the course of this work, a more detailed investigation was aimed at the anomalous areas indicated by earlier work. The program was carried out using the company Hughes 500 helicopter, operating out of Lower Liard, Watson Lake, the Iso Tungsten camp and the Flat Lake camp. About 2,500 square miles underlain largely by Ordovician to Mississipian black shales were investigated. This geologic environment was considered comparable to the Flat Lake vanadium discovery area and it also was thought that it had a potential for sedimentary base metal deposits. The results of the program indicated an outstanding anomaly in the vicinity of Howards Pass.

Detailed stream sampling and prospecting was carried out in the area of geochemically anomalous drainages in 1972 in order to determine the cause of the anomalies. Routine chip samples were taken of any interesting rocks and analyzed in the base camp with an X-ray fluorescence mineral analyzer for Pb-Zn. The textures and colours of the few mineralized float samples gave the first basis from which mineralized float and outcrop could be recognized, since very little sulphide could be seen in the weathered rock. This discovery of a long, intermittent belt of mineralized float with a few mineralized outcrops in the belt, confirmed the probable strata-bound nature of the source of the original geochemical anomalies. Hand and bulldozer trenching was carried out to evaluate the grade and widths of the mineralization. Soil sampling was carried out in areas of grass and moss cover to determine possible extensions. At the time, some prospecting was carried out to check the northwest extension of the favourable horizon.

Exploration during 1973 consisted of 15,400 feet of diamond drilling and 24 cat trenches in the XY claim area. Regional 1" to 1,000' mapping in the Howards Pass area was done. At the end of the 1973 field season the mineralized horizon had been intersected by some drill holes but the relationship of stratigraphy, structure and mineralization was not understood.

In 1974, exploration activities included 5,162 feet of diamond drilling, and 15 cat trenches on the XY claims, and 12 trenches on the Anniv claims. 1" to 400' scale mapping was completed on the XY claims and trench mapping completed on the Anniv claims. Based on this information the present sedimentation base model was developed for the XY, ANNIV and OP claims as was a structural model for the XY claims. These concepts set the scene for the 1975 section drilling to check grade, continuity and structure in the XY sub-basin and grade and continuity in the Anniv sub-basin.

The 1975 program included 12,334 feet of drilling on the XY, 833 feet of drilling on the Anniv and OP claims, mapping on the XY, Don and Anniv claims, geochemical surveying on the Don claims, prospecting in various areas of the total claim group, and trenching on the XY claims. Additional work included improvements on the airstrip, improvements on the Don Creek road and the location of a proposed road from the XY claims to the Anniv claims, along the Don claims. At the end of the field season the main camp was moved from the Northwest to the Yukon Territories.

The Howards Pass property consisted of 693 claims as of December 31st, 1976.

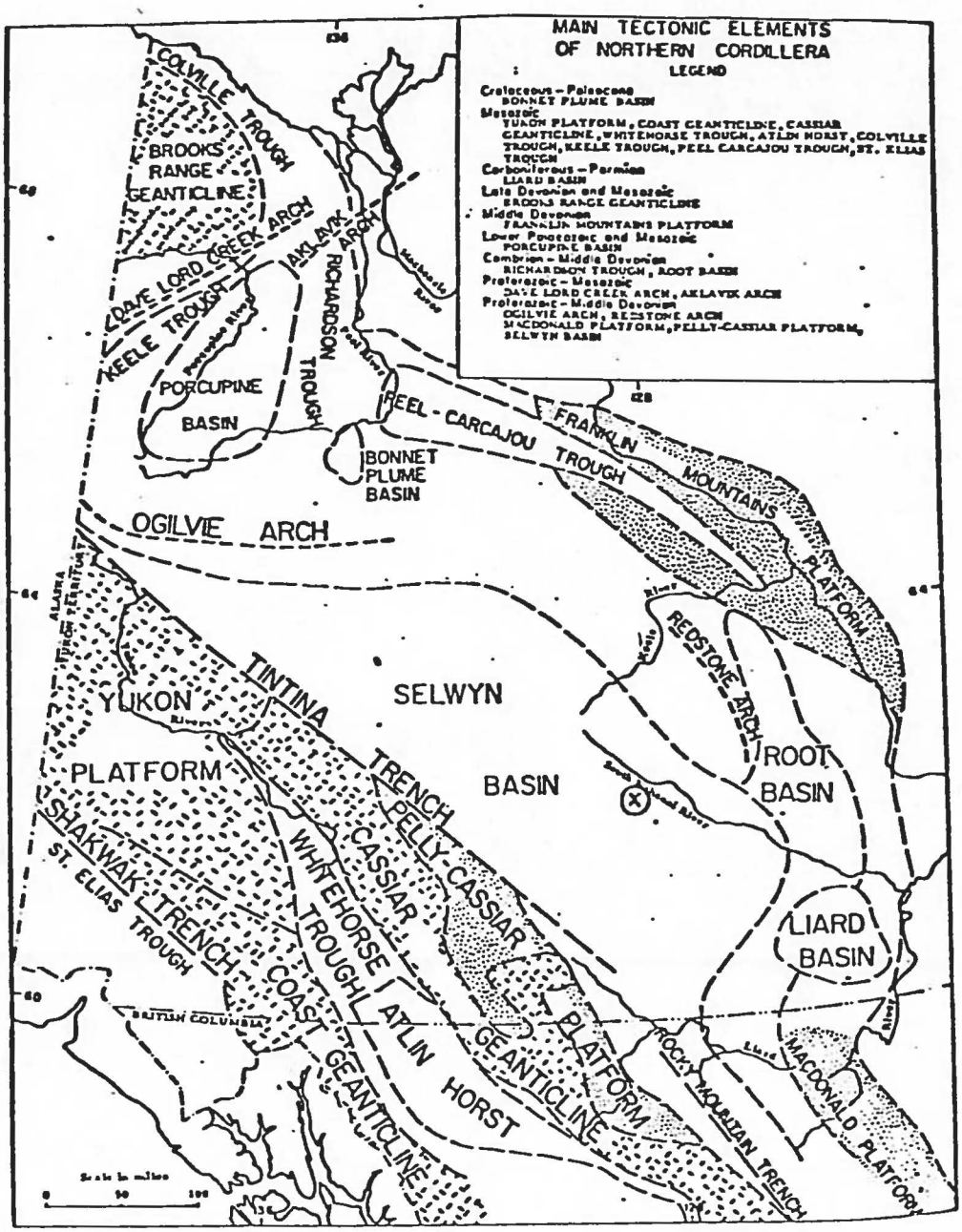
II. GEOLOGY

1) Introduction

Since 1973, when drilling commenced at Howards Pass, geologic investigations have tried to evaluate the Pb/Zn mineralization in an attempt to find more and higher grade concentrations. Central to this work has been the development of a geologic model for the Pb/Zn mineralization which emphasizes the concept of "Ore Petrology" (Stanton 1972). The model fits present geologic information and has been a direct aid in finding higher grade areas of Pb/Zn mineralization and in discovering new areas of Pb/Zn occurrences. Briefly stated the Howards Pass geologic model proposes that Pb and Zn rich fluids, originating from compacting carbonaceous muds, were expelled onto the Silurian sea floor and subsequently moved to the base of the paleoslope and were there trapped in sump areas or sub-basins; three examples of which are the XY, Anniv and OP sub-basins. Slow euxinic deposition of the Howards Pass Formation was followed by turbidite deposition. Subsequent tectonic activity has deformed rocks in the Howards Pass area into variously folded strata cut by longitudinal and cross-faults which have displaced the Pb/Zn mineralization.

In the present section the geology of the Pb/Zn mineralization is reviewed and related to the general geology. It is hoped that this will allow for a better appreciation of the model for Pb/Zn mineralization at Howards Pass and therefore the potential of the area.

The Howards Pass Pb/Zn deposit occurs in Lower Paleozoic Carbonaceous pelites of the Selwyn Basin (Figure HP-1) which is bounded on the southwest by the Tintina Trench and to the northeast by the Paleozoic stable platform. (Gabrielse, 1967). The stratigraphic section preserved within the Selwyn Basin ranges from Cambrian to Mississippian in age and is subsequently intruded by Cretaceous stocks. These units have been mapped in the Nahanni



Figure· HP-1

Main tectonic elements of Northern Cordillera. (Gabrielse 1967).
Location of Howard's Pass marked by X.

region by the G.S.C. (Green et. al. 1967,& Table HP-1). The stratigraphic section in the Howards Pass area spans Hadrynian to Upper Devonian time and can be correlated with the more generalized mapping of the G.S.C. in the region. A detail stratigraphic column for the Howards Pass area is presented in Plate HP-I.

TABLE HP-1

Generalized Table of Formations for the Nahanni Map Sheet

Age	Unit(s)	General Description
K	19	Cretaceous intrusives - ranging from monzonite to granodiorite and quartz latite porphyry.
Ord - Dev.	10, 18	Carbonaceous pelites.
Є - Dev.	8, 9, 11, 12, 13 14, 15, 16, 17	Limestones and dolostones with minor terrigenous material
Є - Ord.	7	Limestone and dolostones with minor terrigenous rocks, unit 7-b shows wavy bedding.
PЄ - Є	4, 5, 6	Calcareous terrigenous sediments to silty carbonates
PЄ	1, 2, 3	PЄ clastic rocks with minor carbonate.

2) Stratigraphy

The general geologic evolution of the Howards Pass area consists of a deepening basin from Hadrynian to Mississippian time. Shallow water, Lower Paleozoic sedimentary rocks unconformably overlie Precambrian phyllites and clastic sedimentary rocks. Cambrian siltstones and massive limestones form the base of the section on the property. Up section, tabular limestones grade into the carbonaceous mudstones of the Howards Pass Formation. One member of this formation, the Active Zone, is a cyclical sequence of laminated mudstones, limestones and chert and contains all of the significant Pb/Zn mineralization found to date. Overlying the Howards Pass Formation is the light coloured Flaggy Mudstone, a regional marker which suggests a continued deepwater depositional environment. Locally on the XY claim block, Fetid Limestone containing abundant trace fossils overlies the Flaggy Mudstone. These formations are in turn overlain by a sequence of siliceous mudstones of the Backside Siliceous Mudstone which marks a change in the depositional pattern in the area, and may also mark a mid-Devonian regional unconformity. The Iron Creek Formation, a sequence of thin bedded mudstone to siltstone turbidites containing a barite horizon of regional extent overlies the Backside Siliceous Mudstone. The top of the section in the area consists of two brown weathering flyshoid units; the Yara Peak Formation, a sequence of turbidite mudstones to sandstones, and the Chert Pebble Conglomerate. The major stratigraphic units at Howards Pass are correlatable with regional units mapped by the G.S.C. (Figure HP-2).

The detailed stratigraphic section at Howards Pass has been divided into lithologic formations, with scant fossil data supporting this division. Detailed stratigraphic nomenclature for Howards Pass is presented in Plate HP-I.

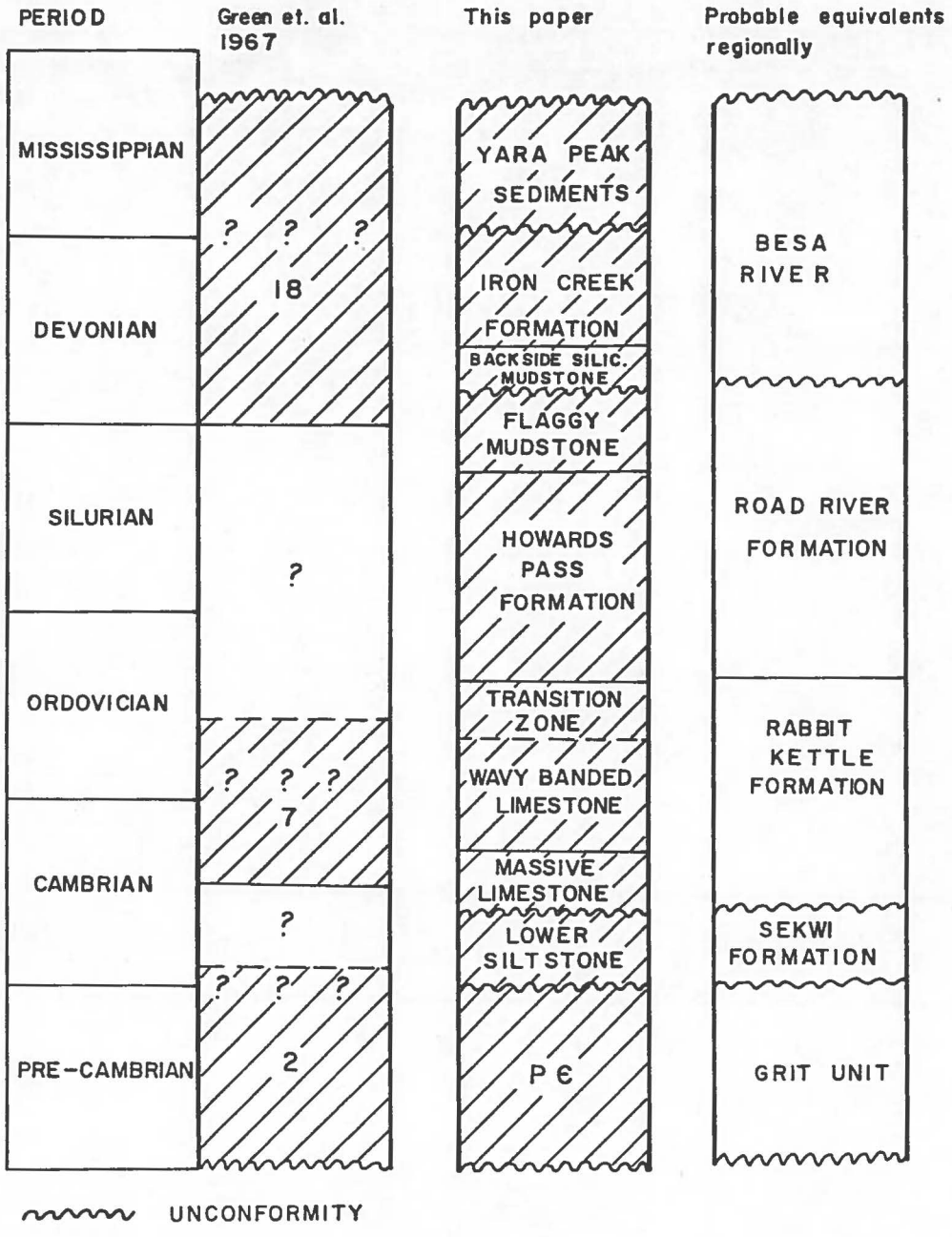


Figure HP - 2 Regional correlation of Formations in the Howards Pass Area.

Grit Unit

Rocks of Pre-Cambrian age are exposed to the southwest of Howards Pass (Plate HP-II). These consists of phyllites, siltstones, mudstones and minor limestones. Sedimentary structures such as cross-beds, mudcracks, and flat pebble conglomerate all indicate shallow water deposition, and are thought to be equivalent to the Hadrynian Grit Unit (Gabrielse et. al. 1973).

Lower Siltstone Formation

The Lower Siltstone Formation consists of a sequence of orange weathering dolomitic siltstones to sandstones exposed 3 to 5 miles southeast of the XY camp (Plate HP-II). The stratigraphic position of the unit suggests that it may correlate with the Lower Cambrian Sekwi Formation to the northeast. Low angle cross-beds and a far west location relative to the intertidal deposited Sekwi Unit, indicate that the rocks represent deposition in a deltaic environment suggesting that basinal subsidence began during the Lower Cambrian.

Massive Limestone Formation

The Massive Limestone Formation consists of grey silicified micritic limestones. The rocks are present to the northeast of the XY claim block (Plate HP-II). Biomicrite lenses which occur locally in the lower part of the unit represent clasts of not too distant reefs shed into the continually deepening basin.

Wavy Banded Limestone Formation

Wavy Banded Limestone is the name given to a regionally significant limestone unit, characteristically showing chain-link structure. The lower member of the formation consists of intercalated light and dark tabular micrite which shows a general thinning of beds up section.

STRATIGRAPHIC COLUMN OF THE HOWARDS PASS FORMATION

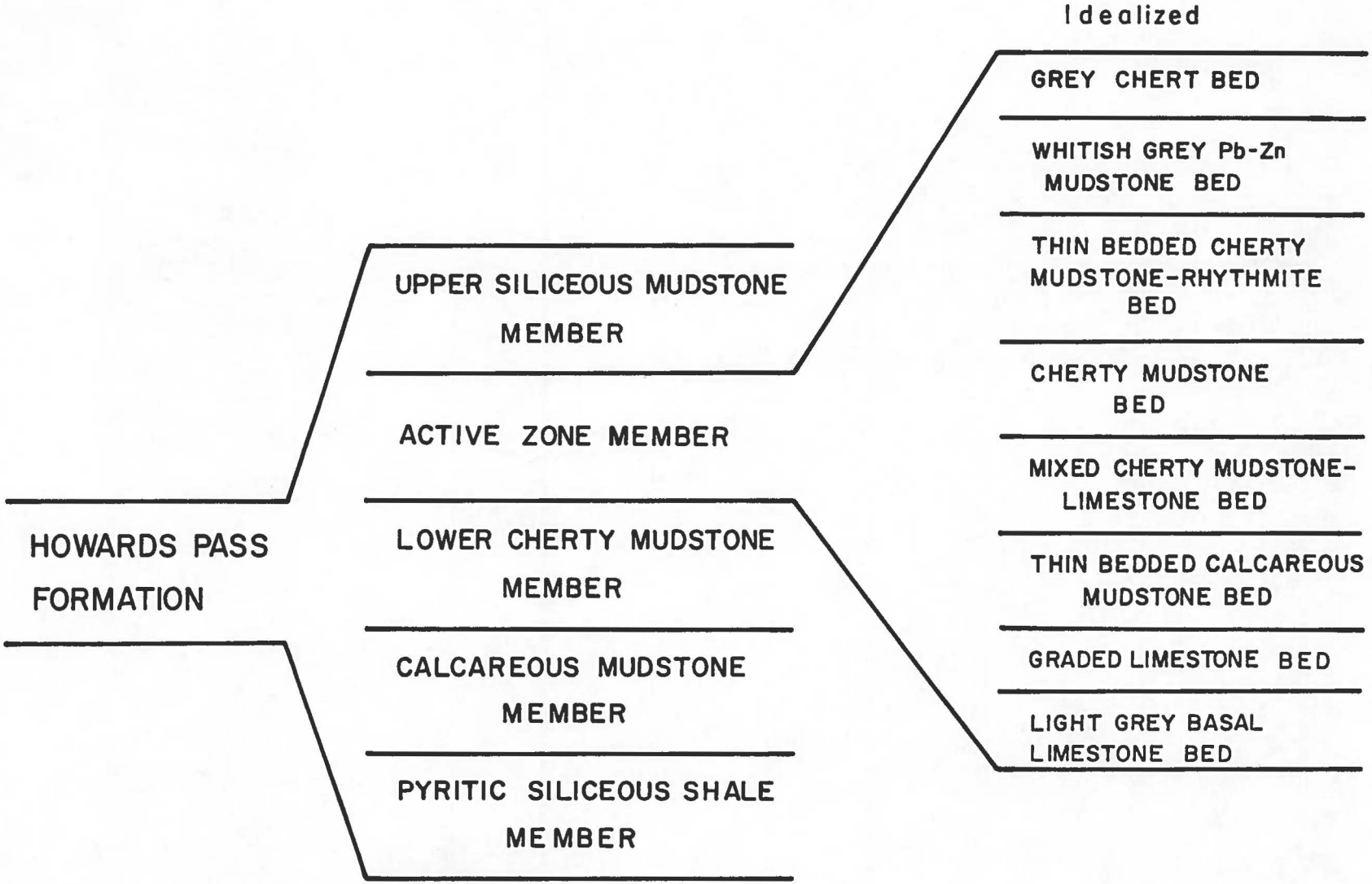


Figure HP - 3

The upper member consists of intercalated light and dark micrite with dark micrite showing a gradual increase in argillaceous material up section. A wavy bedding is associated with the more argillaceous beds at the top of the member. Although the origin of this feature is diagenetic it is of regional proportions and as such represents a characteristic of the formation. The Formation is correlated with the Rabbit Kettle Formation as defined by Gabrielse and others (1973). The tabular nature of the beds suggest a deep water environment, with the lower, more thickly bedded member representing a proximal tabular limestone and the upper member a distal tabular limestone (Hofman, 1974), suggesting a continual deepening of the basin.

Transition Zone

Continuing up section an increase in terrigenous influx is reflected in the Transition Zone in which alternating laminations of mudstone and calcareous mudstone grade upward into the Howards Pass Formation, with a gradual increase in carbon content.

Howards Pass Formation

The Howards Pass Formation consists of a sequence of carbonaceous mudstones which contain all of the known significant Howards Pass type Pb-Zn mineralization. For this reason this formation is divided into members. The mineralized member, the Active Zone is further divided into beds. Figure HP-3 summarizes stratigraphic nomenclature and stratigraphic relationships of the Howards Pass Formation.

Pyritic Siliceous Shale Member

The Pyritic Siliceous Shale member is the lowest extensive carbonaceous rock in the section and is approximately 5 to 20 feet thick, and is the only unit in the section which shows a fissile nature. Other characteristics include pyrite pods up to 1 inch across and quartz pseudo-beds (diagenetic veins which follow bedding and appear to have formed before diagenetic folding).

Calcareous Mudstone

The Calcareous Mudstone member consists of calcareous carbonaceous mudstone and is 20 to 150 feet thick. The calcite occurs as interstitial grains in the mudstone so that field identification of the unit is by reaction with HCl. The mudstone is massive with the occassional "feathery" calcite bed which consists of concentrations of calcite blebs (0.5 to 1 mm across) which follow bedding but are elongate, parallel to cleavage. The bedding - cleavage relationship also produces "poker chip" breakage of the rock making core identification possible even without acid.

Lower Cherty Mudstone Member

The Lower Cherty Mudstone Member is monontonous highly carbonaceous siliceous mudstone occurring up to 200 feet thick in the XY claims and is more than 100 feet thick in the Anniv area; the unit is characterized by its extreme monotony and lack of definitive bedding. Quartz pseudo-beds, described earlier, are abundant. There are minor differences between the unit at the XY claims and in some areas on the Anniv claims in that two drill holes (A-1 and A-2) in the Anniv claims showed the member to contain limestone ballstones and thin grey laminations, both features typical of the Upper Siliceous Mudstone member of the Howards Pass Formation and not usually found in the Lower Cherty Mudstone. This anomalous stratigraphic situation in the Anniv area should be checked eventually by drilling a hole to the Transition Zone to verify this as Lower Cherty Mudstone.

Active Zone Member

The Active Zone Member contains all significant Pb/Zn mineralization found in the Howards Pass claim block. To date the Pb/Zn mineralized Active Zone has been found to occur in three main areas; the XY, Anniv and

OP. These are thought to represent sub-basins which trapped base metal brines (Figure HP-4). Nine beds have been recognized in the member (Figure HP-3) although within any drill intersection the beds may be repeated 5 or more times (Figure HP-5). Based on detailed logging of core an ideal sequence has been developed (Figure HP-3 and Plate HP-I). The reoccurrence of part or all of this sequence indicates cyclical sedimentation was responsible for deposition of the Active Zone. Thickness of the zone varies tremendously, ranging from 0 to over 250 feet and is related to sub-basins or sumps in the large "shale basin" developed during the Lower Silurian. Lead-zinc mineralization is related to specific beds in the zone (Plate HP-I) and thus detailed knowledge of the Active Zone beds is of economic importance. The following details of the zone are described in ascending order of an idealized cycle (Plate HP-I).

Garbage Rock

The Garbage Rock (a descriptive name referring to the rubbly nature of the unit in some drill core) occurs only at the base of the Active Zone and is not part of the cyclical Active Zone. The unit consists of highly disrupted beds of mudstone and appears to be a slump fault indicating that the Active Zone has been moved by slumping, although in many instances only a 1 foot rubble zone is present. The presence of Garbage Rock in some drill holes where the rest of the Active Zone is missing (e.g., DDH-43, XY area) in parts of the XY sub-basin suggests that the parts of Active Zone may have been transported over tens of feet to the southwest in the XY area.

Graded Limestone

The Graded Limestone consists of thin limestone beds with carbonaceous tops, producing a graded appearance. Except for the carbonaceous matter this unit is similar to the Light Grey Basal Limestone into which it grades. This unit appears similar on both the XY and Anniv claim blocks.

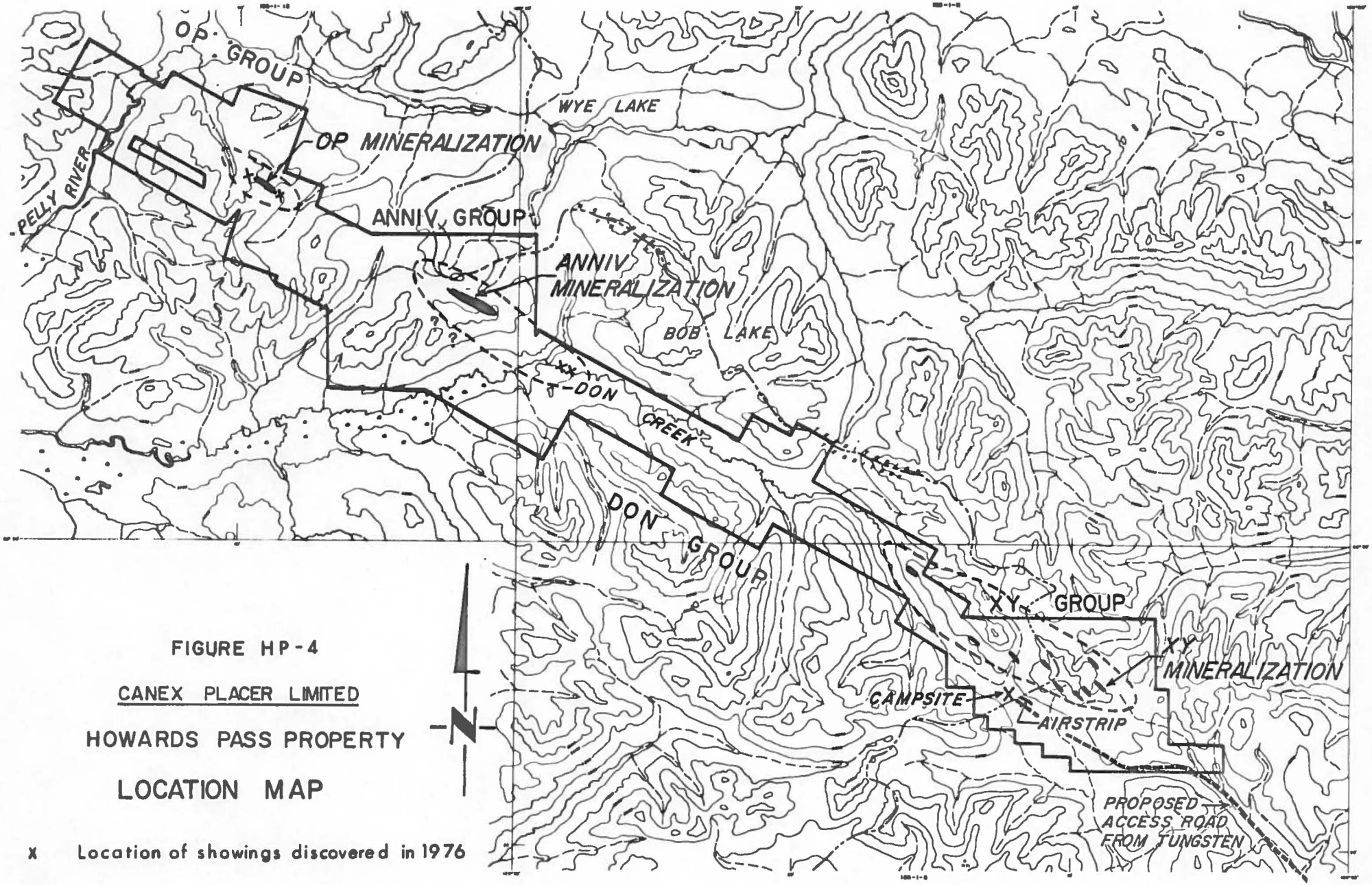


FIGURE HP-4

CANEX PLACER LIMITED

HOWARDS PASS PROPERTY

LOCATION MAP

x Location of showings discovered in 1976

---- Approximate outline of sub-basins

Showing area

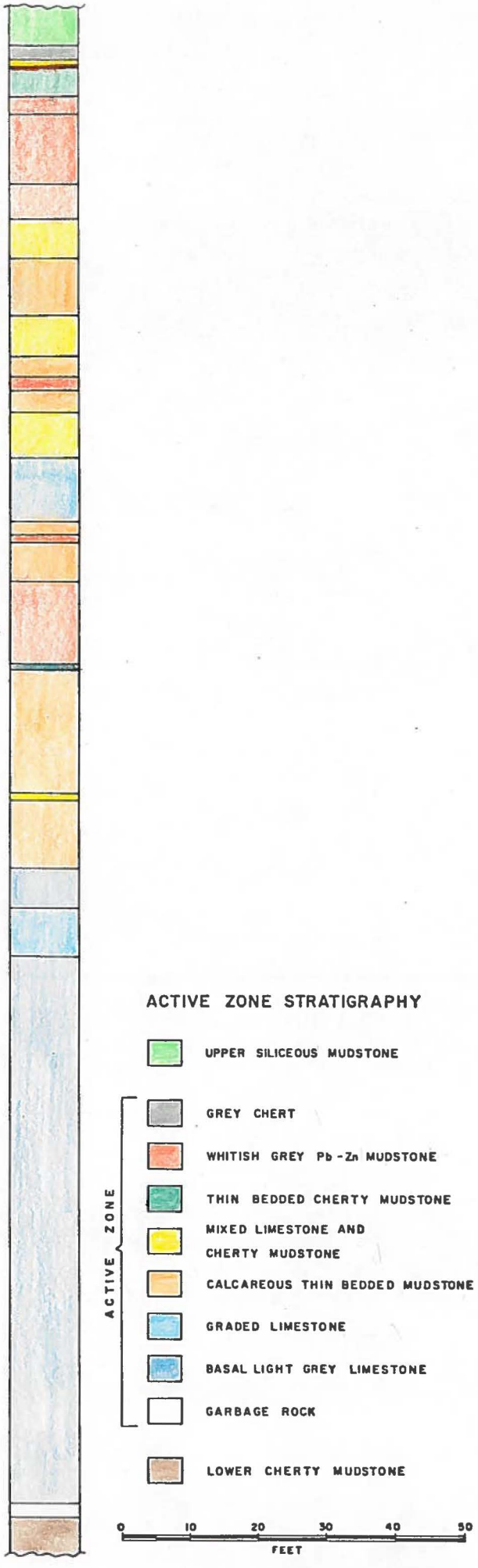


Fig. HP-5

Log of DDH 36, showing the heterogeneous nature of the Active Zone.

Thin Bedded Calcareous Mudstone

The Thin Bedded Calcareous Mudstone is a laminated carbonaceous mudstone containing 5 to 30% calcite as disseminated grains. Slump and diagenetic folds are open to closed and in some instance spiral structures are present. Framboidal pyrite rich laminations are common. These may be intercalated with sphalerite and galena rich mudstone laminae. Pb and Zn grades within the unit range from 1%-6%. Higher grades associated with this unit are attributed to the presence of Whitish Grey Pb/Zn Mudstone laminations (described below). The Thin Bedded Calcareous Mudstone is abundant at both the XY and Anniv claims, but laminations are more evident in the XY area, where the unit is similar in appearance to the Thin Bedded Cherty Mudstone. In the Anniv area the laminations are less evident and may appear similar to the Cherty Mudstone bed in a few cases.

Light Grey Basal Limestone

The Light Grey Basal Limestone is typically found as the bottom or first bed of an ideal cycle of the Active Zone (the Garbage Rock occurs only at the base of the Active Zone). The bed is 0.25 to over 5 feet thick, consisting of laminated argillaceous limestone. In the XY area the bed is more abundant and thicker in the basal cycles of the Active Zone, while in the Anniv area the bed is present in equal abundance throughout the Active Zone except at the very base of the Active Zone where it is characteristic and up to 5 feet thick, and is an excellent marker horizon.

Mixed Cherty Mudstone and Limestone

The Mixed Cherty Mudstone and Limestone bed of the Active Zone member consists of a mixture of cherty mudstone identical to the Lower Cherty Mudstone Member and limestone identical to the Light Grey Basal Limestone Bed of the Active Zone. Contacts between the mudstone and limestone are typically cleavage planes although the occasional depositional contacts are present. No bedded sulphides have been noted in this unit; low grade (below cutoff at 4% Pb+Zn) values are associated with this bed, which is usually 1-5 feet thick stratigraphically.

Cherty Mudstone

The Cherty Mudstone bed consists of siliceous carbonaceous mudstone very similar to the Lower Cherty Mudstone except that pseudo-beds are relatively more abundant and a weak bedding is evident in some cases (especially in the XY area).

Thin Bedded Cherty Mudstone

The Thin Bedded Cherty Mudstone consists of intercalated laminations of mudstone, pyritic mudstone, sphalerite-galena rich mudstone and limestone. Some of the limestone beds have been diagenetically separated and altered into limestone clasts. Structures, such as spiral structures indicate slumping of the unit. The unit usually contains between 5 and 15% Pb+Zn and as such is present in intermediate to higher grade areas. Thickness for the unit ranges from less than 0.5 feet to 10 feet; and therefore is included in ore reserve calculations using both 4 and 8% cutoff grades.

The Thin Bedded Cherty Mudstone constitutes 10-20% (estimate) of the Active Zone in the XY area while in the Anniv area less than 5% of the Active Zone is classified as Thin Bedded Cherty Mudstone.

Rhythmite Bed

Rhythmites occur at the same stratigraphic position as the Thin Bedded Cherty Mudstone bed in an idealized Active Zone cycle and may therefore be a lateral equivalent. The Rhythmites consist of alternating mudstone and sphalerite-galena-rich mudstone laminations with some framboidal pyrite. The lack of abundant structures indicative of slumping cannot at present be explained but may be related to the high silica content of the bed. There is a great difference in the relative abundance of Rhythmites to other beds in the Active Zone between the XY and Anniv drill areas. In the XY drill area Rhythmites average about 2-5% of the Active Zone ranging in thickness from less than 0.5 to 2 feet. In the Anniv area Rhythmites constitute over

20% of the Active Zone and thicknesses up to 30 feet are present. This fact appears to explain why the Pb/Zn mineralization appears more homogeneous in the Anniv areas. The average grade of the Rhythmites range from 5 to 17% Pb+Zn, and the predominance of this unit containing Pb+Zn above 4% cutoff grade in the Anniv area is in contrast to the mixture of different beds containing over 4% Pb+Zn in the XY drill area.

Whitish Grey Pb/Zn Mudstone

The Whitish Grey Pb/Zn Mudstone contains the highest grade Pb/Zn of any bed in the Active Zone.

The unit consists of laminated quartz-sphalerite-galena mudstone, with minor pyrite and with carbon defining bedding. The unit shows abundant compaction features and some slump structures. Grades for Pb+Zn in the Whitish Grey Pb-Zn mudstone range from 8 to 50%, with an average of about 20-30%. Thickness for the unit ranges from less than 0.5 feet to 35 feet with the thickest drill intersections to date being in the Central Zone of the XY area. It may be stated concerning grade and its relationship to the presence of the Whitish Grey Pb-Zn Mudstone that any drill hole with an intersection of 20% combined Pb+Zn contains this unit within the interval. The present information indicates that the Whitish Grey Pb-Zn Mudstone is more abundant in the XY area than the Anniv, although the graditional nature of this unit and the Rhythmites makes a percentage estimate difficult.

Grey Chert

The Grey Chert typically occurs at the top of the Active Zone cycle, and appears more abundant near the top of the Active Zone taken as a unit. The unit consists of laminated medium grey chert containing up to 96% SiO_2. This unit contains no significant Pb-Zn mineralization.

Upper Siliceous Mudstone Member

The Upper Siliceous Mudstone member of the Howards Pass Formation is a laminated carbonaceous mudstone. At present the member may be divided into three beds. These are the Transition, Middle and Upper Beds.

The Transition bed shows features typical of both the Active Zone and the Middle bed of the Upper Siliceous Mudstone. Features similar to those found in the Active Zone are Medium Grey chert beds (only slightly more carbonaceous than that of the Grey Chert Bed of the Active Zone) and limestone clasts (i.e., relic bedding is evident). The bed also shows features of the Middle Bed (described in detail below) such as limestone ballstones with both radiating and banded structure and laminated carbonaceous and siliceous mudstone. The Transition Bed may be used to anticipate the Active Zone by 20 to 50 feet.

The Middle Bed of the Upper Siliceous Mudstone is distinctive and has previously been described as the Upper Siliceous Mudstone Member (Howards Pass, Final Report 1975). A characteristic of the bed is the presence of abundant limestone ballstones, 0.2 to 3 feet across, typically spherical to ellipsoidal in shape. Radiating and banded structures are typical as is a strong fetid odor given off upon breaking. Also characteristic are intercalated carbonaceous and lighter coloured siliceous laminations.

The Upper Bed consists of monotonous, weakly laminated carbonaceous mudstone, similar in appearance to carbonaceous interbeds of the Flaggy Mudstone Formation and slightly similar to the Lower Cherty Mudstone. Within the Upper Bed a one to five foot thick graptolite horizon has been noted throughout the Howards Pass claim block. All three beds have been identified in drill core in both the XY and Anniv drill area, ranging in aggregate thickness from 20 to over 200 feet, with an average between 170-200 feet.

Flaggy Mudstone Formation

The Flaggy Mudstone Formation overlies the Howards Pass Formation and is considered a regional marker horizon due to its low carbon content and regional homogeneity. Within the XY and Anniv drill areas the Formation contains three major rock types; Flaggy Mudstone, Carbonaceous Mudstone, and calcilutite. Flaggy Mudstone constitutes 70-90% of the Formation and consists of quartz-illite-pyrite beds with intercalated carbon rich laminations. Most of these are discontinuous due to syneresal separation and subsequent rotation by compaction and related upward moving compaction waters. Animal burrows are common; these are parallel to bedding indicating a continued deep water environment of deposition. Although the average visually estimated carbonaceous matter content is 5-10% the variation is great and may be over 50%. This lateral variation has not been studied in detail but may effect electrical conductivity of the formation along strike.

At the top of some of the carbonaceous beds there is a laminated sequence consisting of intercalated micrite, calcilulite, and carbonaceous calcilutite. Minor Pb-Zn mineralization is present in the laminated calcilutite (for example 5 feet of 6% Pb+Zn in DDH-53 and 5 feet of 2% (estimate) in DDH-A-20) although the thinness of the bed (less than 7') makes it uneconomic at present. A study is continuing on this unit.

Fetid Limestone Formation

The Fetid Limestone Formation is a discontinuous unit consisting of massive carbonaceous limestone with large animal burrows (up to 1/2" across). The unit is best exposed near Yara Peak in the XY claim group where it is up to 50 feet thick. The discontinuous nature of the unit and the similarity of the rock type with diagenetic limestone ballstones found in the Flaggy Mudstone Formation may eventually lead to inclusion of the Fetid Limestone in the lower Formation.

Backside Siliceous Mudstone Formation

The Backside Siliceous Mudstone is a dark-grey-weathering, siliceous, carbonaceous mudstone unit which overlies the Flaggy Mudstone and/or the Fetid Limestone Formations. The unit consists of distinctly bedded cherts in the lower portions and less siliceous bedded mudstones in the upper portions. The thickness of the formation ranges from 200 to 600 feet. The unit is present throughout the Howards Pass area. Flute marks and chevron tool marks indicate that this was the first unit to be deposited by obvious turbidity currents.

Iron Creek Formation

The Iron Creek Formation consists of silver weathering carbonaceous clastics (not to be confused with "black clastics" used by the Geological Survey of Canada for all formations overlying the Road River Formation, Blusson 1976) and load casts, tool marks and abundant graded beds indicate deposition by turbidity currents. The formation is 600 to 900 feet thick, within the Howards Pass area, but varies in thickness and rock type regionally - for example, the formation is predominately chert northeast of the OP claims. A barite horizon of regional significance occurs in the upper portion of the Iron Creek Formation, here termed the Selwyn Mountains Barite Horizon to differentiate it from the MacMillan Pass Barite Horizon, which occurs above the Chert Pebble Conglomerate. The Selwyn Mountian Barite Horizon is discontinuous regionally with local thickening of the bedded barite suggesting deposition in small sumps on the basin floor. Examples are the GHMS, Little Nahanni barite showing and numerous barite showings in the XY, Anniv, OP and Don claim blocks. The NOR claims, to the southeast of the XY claims, contain minor visible lead, while in some of the above barite showings a local positive Zn test (a field chemical technique) suggests a possible Pb-Zn potential at this horizon.

Yara Peak Formation

The Yara Peak Formation consists of brown weathering clastics which may unconformably overly the other formations. The low carbon and high oxidized iron contents produce the characteristic brown weathering. The unit contains mudstones, slates, siltstones, and greywackes. Graded beds are ubiquitous, and partial Bouma cycles are common indicating that the unit is a flysch sequence. In the Yara Peak area greywacke clastic dikes and slaty cleavage indicate a high hydrostatic pressure existed in the sediments during the Middle Devonian orogenic event. The unit regionally caps most mountain tops indicating only open folds deform the rocks.

Chert Pebble Conglomerate

The Chert Pebble Conglomerate occurs to the south of the Don, Anniv and OP claim blocks (Plate HP-II and Plate HP-III). This sequence of chert clast breccias to conglomerates with intercalated sandstone, siltstone, and minor mudstones is transgressive on all units. For example, between the Anniv and OP Pb-Zn showings it directly overlies Wavy Banded Limestone with no evidence of faulting (Plate HP-III).

The unit is regionally extensive having been noted as far north as MacMillan Pass. Average clast size decreases to the east indicating a western source area. The thickness of the individual beds (up to 100 feet) suggests deposition by fluxio-turbidites or mass flows and an associated high tectonic activity during deposition. The unit marks the top of the section in the Nahanni region and is of Devonian to Mississippian age, marking the last remaining evolutionary evidence in the region until the late Cretaceous intrusive activity.

The Chert Pebble conglomerate is the youngest stratigraphic unit in the Howards Pass area, while to the north at MacMillan Pass the Tom Pb-Zn-Ag-Ba horizon lies directly above the chert pebble conglomerate (Blusson per. com. 1975).

3) Sedimentation

The ore bearing assemblage of the Howards Pass area is part of the sedimentary regime of the Selwyn Basin. Shallow water shelf deposition during the Hadrynian was followed by a deepening basin beginning with deltaic sedimentation during the Lower Cambrian and deep water basinal limestones during the Upper Cambrian. During the Upper Cambrian definition of the Selwyn Basin began. This basin had four main phases:

- First, deep water tabular limestone deposition which defined the proto-Selwyn Basin (i.e., Wavy Banded Limestone).

- Second, deposition of a "classical basin" termed here the Lower Selwyn Basin in which the Howards Pass Pb-Zn mineralization was deposited.

- Third, deep water, regional, rapidly deposited mudstone was subsequently deposited by geostrophic currents, producing the Flaggy Mudstone Formation.

- Finally, the upper Selwyn Basin rocks are the result of turbidite deposition from the west, covering all lower sequences.

The later three phases of the basin are most pertinent to ore deposition and exploration in the area. The east half of the Lower Selwyn Basin during the Ordovician-Silurian was a "typical basin" (Plate HP-IV) consisting of limestone reefs to the east of Howards Pass, a carbonaceous slope containing allocthenous reef debris, the base of the slope being at Howards Pass, and a basinal chert to the west (Plate HP-V). This basin received terriginous material from the east (Plate HP-V). The thickening of the Howards Pass Formation suggests deposition at the change in slope. Along the length of the trough at the base of the slope, sump sub-basins produced areas of further environmental isolation. It was in these that the Active Zone was developed.

The cyclical nature of the Active Zone may be the result of sub-basin evolution related to sulphide producing bacteria and collection of Pb-Zn rich brines advecting from the Howards Pass Formation.

The third stage of basin development, deposition of the Flaggy Mudstone, is not very well understood. It appears at present that the reefs marked the eastward extent of the formation, and as such the Flaggy Mudstone may mark the time interval between earlier sedimentation from the east and later sedimentation from the west.

The fourth stage of development of the Selwyn Basin was rapid turbidite deposition with a source area to the west. This concept is based on regional pebble size variation in the Chert Pebble Conglomerate.

4) Lead-Zinc Mineralization

The lead-zinc mineralization at Howards Pass may be divided into six phase assemblages. The definition of these phase-assemblages is based on texture although there is a related mineralogical variation. These phases are not, by definition sedimentary-lithologic units, but may be related to specific beds within the Active Zone. The phases are summarized here but the reader is referred to the Howards Pass Final Report 1975.

Phase I: Phase I consists of bedded sulphides defined by alternating mudstone, framboidal pyrite rich mudstone and sphalerite rich mudstone laminations. Deformation is minimal so that the laminations are undisturbed to slightly folded. Examples of this type of mineralization are found in the Thin Bedded Cherty Mudstone, the Thin Bedded Calcareous Mudstone, and Rhythmites. Grades associated with this phase range from 2% to 9% Pb+Zn although the Rhythmites may contain up to 17% Pb+Zn.

Phase II: Phase II consists of bedded sulphides similar to Phase I except for (1) more intense folding and (2) more sulphide mobilization. This type of mineralization is found in the Thin Bedded Cherty Mudstone and Thin Bedded Calcareous Mudstone. Pb+Zn grades associated with this phase are 3 to 12% with a Zn/Pb ratio of 3:1.

Phase III: Phase III consists of bedded mineralization similar to phases I and II except that isoclinal and flow folds are abundant. Sulphide remobilization is commonly associated with folding. In many cases micro-folding is extreme with laminations showing textures indicative of fluid flow. Pb+Zn grades associated with Phase III range from 3 to 16%. Traces of chalcopyrite have been noted in Phase III. This phase is limited to the Thin Bedded Cherty Mudstone and the Thin Bedded Calcareous Mudstone.

Phase I, II and III appear to be related. Phase I, a synsedimentary bedded sulphide may be the precursor to folded Phase II and if folding is more intense, Phase III. Phases I through III show a progressive increase in the importance of sulphide remobilization. There is also a progressive increase in grade, which may be due to initially higher grades in Phases II and III (more sulphides would produce gravitational instability hence, more probability for slumping). Metallurgically these three phases represent a carbon-high pyrite, somewhat low grade Pb-Zn mineralization at Howards Pass.

Phase IV: Phase IV may be subdivided into two occurrences termed IVa and IVb. Phase IVa consists of disseminated sphalerite and galena although bedding still shows an obvious control. In this phase complex sphalerite-galena intergrowths are common. Phase IVb consists of coarse sphalerite (grains up to 100 u across) and galena. Within compaction faults (i.e., dewatering cleavage) Phase IV ranges from 8 to 52% combined Pb+Zn with low iron and low carbon content. This phase occurs only in the Whitish Grey Pb/Zn mudstone.

Phase V: Phase V consists of massive sphalerite and galena with only minor pyrite which is massive to cubic. Grades range from 25 to 52% Pb+Zn. This phase occurs at the base of the Whitish Grey Pb+Zn Mudstone and appears to represent slumped Pb-Zn mineralization of Phase IV.

Phases IV and V represent the highest grade Pb/Zn mineralization at Howards Pass, occurring within the Whitish Grey Pb/Zn Mudstone and as such are distinct from Phases I, and III. Genetically, Phases IV and V are distinct from Phase I, II and III. The former are the result of basinal brine deposition while the latter appear to have originated during early diagenesis.

Phase VI: Phase VI produced isolated sphalerite-galena-pyrite pods which at present are economically insignificant. The pods are less than 0.5 to 1 inch across and are typically found overlying the Active Zone, apparently the result of late stage Zn & Pb. This is confirmed by the face that the sphalerite and galena are usually found partially replacing pyrite.

All significant Pb-Zn mineralization is confined to the Active Zone, except for Phase VI which may occur within 15' of that member. Phases I, II and III are bedded and the result of early diagenesis, Phases IV and V are the result of brine deposition and mobilization and were originally syngenetic.

5) Structure

The structural history of the Howards Pass area is complex. Up to five major tectonic events have occured regionally with evidence for four events locally. In this section emphasis is placed on local structure and its effects on Pb/Zn mineralization.

Hadrynian folding and related metamorphism affected the Grit Unit in the Selwyn Mountains. This deformation appears to have produced the regional trend in the Selwyn Mountains and Backbone ranges, and appears to have controlled sedimentation throughout the Paleozoic in these regions. In the Howards Pass area this is expressed as reactivated faults trending approximately 300^{o} identified locally in the field and traceable as lineaments on aerial photographs. The lack of significant alteration associated with these faults indicates that the faults controlled sedimentation but did not act as vents for significant material additions (i.e., volcanism).

Slumping and Compaction

Slumping has an important effect on the Active Zone. Micro-folding and associated sulphide mobilization are related to slumping of laminations and beds within the Active Zone. It is also probable that slumping of parts of the Active Zone occurred during its deposition; if so this would explain areas where the Active Zone is missing within the sub-basin areas. Examples are DDH-44 and 43 (Line 95 NW) in the XY area and DDH-A-7 (line 777, +00NW) in the Anniv area. The present location of this transported Active Zone is unknown, but the apparent asymmetry of the XY sub-basin may be partially a result of this large scale slumping.

Compaction features are abundant in the Active Zone, especially in the Whitish Grey Pb-Zn Mudstone. Most typical are the growth faults containing massive sphalerite and galena. Movement of galena and sphalerite was in the order of centimetres, but a general coarsening of the sulphides is evident.

Folds

Folds are apparent throughout the Howards Pass area. Large scale open folds with wavelengths of over 5,000 feet are evident regionally (Plate HP-II), with the syncline in the XY area being an example (Plate HP III). Minor folds with wavelengths in the order of 200 to 500 feet

are present in both the XY and Anniv area, and are most evident in the Howards Pass Formation. All scales are related with axial planes striking 300^{o} and appear to have been caused by a mid-Devonian tectonic event.

Cleavage

Fracture cleavage pervades the Howards Pass area, strikes 300^{o} and appears related to the regional folding. In the Yara Peak Formation high fluid content caused this deformation to be expressed as a local slaty cleavage.

Faults

Faults are evident regionally and locally in the Howards Pass area, and greatly complicate geological interpretation. It is extremely important to decipher their direction and distance of movement since they have radically displaced Pb-Zn mineralization. Interpretation of drill hole data aids in the solution but is restricted to the relatively small area drilled.

Longitudinal faults occur throughout the area. For example, a major fault along the southern side of Don Valley brings Wavy Banded Limestone and Yara Peak Formation into contact, with a 60 foot wide gouge zone evident (Plate HP-III). This is the only fault proposed to date on the Howards Pass claim block that is visible at surface. Other longitudinal faults appear to be present in both the XY and Anniv areas (Plate HP-III; and related sections). Two major longitudinal faults are proposed for the XY area, one passing through a saddle south of Yara Peak and continuing parallel to the north of the reference line (Plate HP-III) to the head waters of Don Creek, the other fault bounding the southern edge of the XY sub-basin in the Central Zone. A multitude of smaller scale longitudinal faults are probably present also, but more detail drilling is necessary to deliniate

these. In the Anniv claim area the only major longitudinal fault proposed occurs in the Iron Creek Formation and is expressed as a line of iron seeps (Line 792 +00 Plate HP-III). The lack of recognition of significant longitudinal faults in the Anniv area may be the result of cover more than actual structural complexity. Longitudinal faults present in the OP area occur northeast of the three showings found there. These faults are based on attitudinal disparities between the Howards Pass Formation and the Wavy Banded Limestone and the apparent lack of Transition Zone.

Longitudinal faults appear to have moved the Pb-Zn mineralization significantly although deduction of the extent and detail of these movements must await further drilling. The longitudinal faults appear related to the folding in the area.

Cross Faults

Cross faults are inferred throughout the Howards Pass area mostly by apparent offset of beds and longitudinal faults, indicating that at least some of the cross-faults post date other structures in the area. In the XY area cross-faults appear to have broken the area into structural blocks. These are expressed at the surface as southwest-northeast trending creeks (Plate HP-III). Smaller and much more abundant cross faults are inferred from drilling (See Plate HP-III, and longitudinal sections). Cross faults are also apparent in the Anniv area, the major ones defining Anniv Creek near camp and in Don Valley where Anniv Creek enters Don Creek (Plate HP-III). Cross faults are also evident along Don Valley between the XY and Anniv claim blocks, based on apparent Formation displacement (for example, Cross Creek). Little is known about these faults, due to poor exposure in the valleys where they would intersect the land surface.

Thrust Faults

Thrust faults are important regionally, but in the Howards Pass claim group only one has been recognized. It lies in the XY west zone (Plate HP-III).

6) 1976 Geologic - Prospecting Program

The Howards Pass geologic-prospecting program was 5-fold in nature:

1) Core logging was completed to evaluate drill holes for both assays and geologic information (see sections on drilling).

2) Mapping was completed over all the original Howards Pass claims on a 1"=400' scale in an attempt to evaluate the overall Pb/Zn potential of the area.

3) Reconnaissance geological mapping at a scale of 1"=1/2 mile was done to evaluate the available surface data on the 300 square miles surrounding Howards Pass.

4) A geologic traverse was made across the eastern Selwyn Basin to evaluate the regional Pb/Zn potential and to put the Howards Pass Pb/Zn mineralization into a tectonic context.

5) Prospecting was completed in areas of no or little outcrop where geologic potential for Pb and Zn mineralization seemed high.

The results of this program have been incorporated in the Geologic Overview presented earlier in this report. The most important result of this years geology-prospecting program was the discovery of new Pb/Zn showings.

Two new showings were found in the OP area with a strike length of 5,000 feet between them (Plate HP-III-9). Previous to the discovery of these new showings only a few pieces of float found in 1973 indicated significant Pb-Zn mineralization in the OP claim block.

Two new showings were discovered in Don Creek and when interpreted in light of geological mapping indicate that the Anniv Pb-Zn mineralization may be relatively continuous over 16,000 feet along strike, as opposed to 4,000 feet indicated by 1974-75 work.

The mapping photographs (1"=1/2 mile) indicated a linear trend of Howards Pass Formation occurring northeast of the Howards Pass claim group. This trend occurs as a combination syncline and graben. Although no Pb-Zn mineralization has been found to date this trend may contain minor Pb and Zn.

Numerous barite showings were also identified during the aerial mapping. These correlate with the Selwyn Mountains Barite Horizon and may have a potential for Pb-Zn mineralization similar to that found by Serem on the NOR claims.

Regional geotraverses made across the eastern side of the Selwyn Basin confirmed the hypothesis presented in the 1975 Howards Pass Report, that the Howards Pass mineralization is restricted to the base of the slope. This concept will aid in future exploration in the area.

In summary, the geological prospecting completed in 1976 adds substantially to our knowledge of Howards Pass, and provides guides to exploration both short and long term.

The model developed for Howards Pass is new and is based on the premise of Ore Petrology, which simply stated considers the Pb-Zn as just a part of the rock, and as such the origin of the Pb-Zn mineralization is part and parcel of the origin and evolution of the Selwyn Basin. Regional mapping demonstrated the presence of a reef-slope-basin complex during the early Paleozoic, with the Howards Pass Pb-Zn mineralization apparently restricted to the base of the slope (Plate HP-V). In the Howards Pass area

the three main areas of Pb-Zn mineralization co-incide with thickening of the Howards Pass Formation and occurrence of the Active Zone. This is intrepreted as indicating that the mineralization was deposited in sumps or sub-basins occurring along the base of the slope of the Selwyn Basin.

The presence of limestone grading upward into more Pb-Zn rich and SiO_2 rich material in an idealized cycle of the Active Zone indicates a cycle of bacterial sulphide generation followed by base metal influx. Regional geochemical data indicates that the Howards Pass Formation is regionally a metal rich shale which may have acted as a source rock, providing metallifereous brines regionally which were collected in the sump (i.e., sub-basins) areas at the base of the slope. These were subsequently fixed during sedimentation and diagenesis. The cyclical nature of the Active Zone would therefore be a result of repetition of the cycle sulphide generation-metal migration metal fixation, in response to sub-basin evolution.

7) 1977 Geological Program

The 1977 geological program is limited by budgetary restrictions. If additional funds become available the program should be expanded as proposed. Two major items are the objectives of the 1977 program. First, detailed geologic information is needed in the area of the Central and West Zones of the XY area, and secondly it is necessary to finish certain areas of the Howards Pass area prior to embarking on the anticipated 1978 underground information gathering in the XY area. To these ends the following program is proposed:

1) In the XY area a detailed geologic base map should be compiled. This would include a detailed airphoto study to define structure, and detailed surface mapping. This work will aid in interpreting drill hole information this year and serve as a base for correlation with underground mapping next year.

2) Geologic mapping (1"=400') should be continued to the east of the XY area for about two miles. This is needed to check for mineralization to the east of the Nose Zone in the XY area and to tie the XY geology to any Pb-Zn mineralization reported to have been discovered by Cominco Limited to the east of the XY claim block.

Detailed prospecting should be conducted in two areas at Howards Pass. The area southeast of the XY area should be prospected and would be co-ordinated in the geological mapping in the area. Prospecting should also cover the linear trend (a combination syncline-fault) containing the Howards Pass Formation which occurs northeast of the XY, Don, Anniv and OP claim groups (Plate HP-II).

8) Long Range Geologic Program

The long term geological prospecting program is 3-fold in nature. All three objectives were presented at the October 1976 Management Meeting for Howards Pass; but due to budgetary restrictions have not been proposed for the 1977 program in the present report. These are presented in order of decreasing priority as seen at the present time.

1) Howards Pass Claim Block Drilling -

Reconnaissance drilling should be completed on the Howards Pass Claim block in areas not covered by XY, Anniv or OP drilling programs. This would include drill holes in Don Creek Valley between the XY and Anniv claims and in the areas of the original (1972) OP east and OP west claims (Figure HP-VI). The purpose of this drilling is to test for the presence of Active Zone rocks in these areas.

2) Mapping completed in 1976 has demonstrated the presence of reef-slope basin environments in the area. The Howards Pass type Pb-Zn mineralization appears to be limited to the base of the slope (i.e., the Pb-Zn corridor, Plate HP-V).

The trace of the slope base should be examined by reconnaissance mapping (1"=1/2 mile). The south eastern half (to Flat Lakes) should have the highest priority since the Howards Pass Access road will improve logistics this coming year. The north western half (to the Itsi Mountains) should also be completed since other mining companies have been observed in this area.

3) Eventually, a more thorough study than the 1"=1/2 mile mapping completed this year should be made of the Selwyn Mountains Barite Horizon. At present the economic potential is unknown, but the presence of Pb mineralization in the horizon at the NOR claims and the large barite tonnage potential of Noranda's ORO barite deposit warrants a detailed geological investigation of barite showings in the area.

III. 1976 PROGRAM

1) XY Area

During the June to September field season 37 diamond drill holes totalling 20,479 feet, were completed in the XY area of Howards Pass. The drilling results led to minor revisions of the 1975 geology map, extended the mineralized zone and indicated the presence of a higher grade zone. The soil sampling grid over the Brodell Zone was extended to the west, and an EM survey was conducted over the Central Zone. Four permanent buildings were added to the camp, the kitchen was extended, a temporary camp water supply was established, and airstrip and property road drainage was improved. The "X" claims were surveyed by Underhill & Underhill, as well as the "Don", "R" and "Anniv" claims to the west. The manpower complement averaged 30 men/month.

Diamond drilling did not delineate any large open-pit potential. The results of relatively closed spaced drilling in the Central area indicated that a high grade zone lies down dip to the north east beneath the mountain. Wide spaced drill holes to the west on the southern margin of the basin did not intersect mineralization until the Brodell Zone was reached. Results of drilling in the Nose Zone were inconclusive.

Table XY-1 - Cost Summary
1976 Exploration Program, XY Area

Administration	$20,408.58	Metallurgy	$29,341.33
Joint Venture O/H	67,762.74	Environmental Assessment	26,599.20
Camp Operation	141,152.22	Property Expense	38,124.61
Communications	2,964.39	Property Roads	2,267.61
Computer	0.00	Sampling & Assaying	7,344.16
Consulting	0.00	Surface Prospecting	157.50
Drilling	418,179.34	Trenching	0.00
Engineering Services	3,074.32	Underground	377.09
Equipment Maintenance	28,460.67	Business Promotion	11.22
Geochemistry	637.32	Education & Conventions	172.20
Geology & Research	54,108.95	Telephone & Teletype	2,582.72
Geophysics	7,314.88	Transportation	116,107.85
Main Access Road	20,847.65	Total:	$987,996.55

Diamond Drilling

The 1976 diamond drilling program in the XY area had two main objectives:

1) Determine if there was potential for open pit mining, and

2) Extend the area of mineralization.

From the results of previous drilling it appeared that the most probable area in which to develop open pit potential was in the Central Zone, between Sections 80 NW, and 120 NW. Consequently the majority of the holes were in this area, resulting in extending the known mineralized zone to Section 150 NW, and in the discovery of a high grade zone (Figure 6) between Sections 115 NW and 135 NW.

No material amenable to open pit mining has yet been delineated; the combination of the mineralized horizon dipping about 30^{o} to the north and the ground surface rising at 35^{o} in the same direction indicates that underground extraction will be required in the Central Zone.

Four holes were drilled in the West Zone - none intersected the Active Zone. One of the two holes sited to intersect the Brodell Zone did encounter mineralization. Of the five holes drilled in the Nose Zone, two intersected mineralization (75 and 78), one was collared in the footwall (77), one passed from hanging wall to footwall without finding the Active Zone (79), and the last (84),encountered a fault zone where the Active Zone was expected.

TABLE XY-II

Summary of Diamond Drilling, XY Area, 1976

Zone	DDH	Location	Depth	Mineralization
Nose	75	20 NW, 480' N	257	11.2/5'
	77	20 NW, 980' N	160	No, FW
	78	20 NW, 1480' N	162	8.2/15'
	79	20 NW, 2010' N	757	No, AZ
	84	40 NW, 10'5	583	No, Fault
Central	48	145 NW, 1000's	302	7.1/75'
	49	110 NW, 790's	507	12.8/55', 5.5/15'
	50	110 NW, 1245's	373	No, AZ
	51	95 NW, 805's	337	No, Fault
	52	110 NW, 1815's	202	No, FW
	53	120 NW, 480's	574	13.6/65'
	54	95 NW,180' N	247	No, FW
	55	95 NW, 410' N	318	No, FW
	56	85 NW, 240' N	156	11.7/45'
	57	120 NW, 1260's	474	5.1/40'
	58	105 NW, 325's	435	8.3/115'
	59	120 NW, 1755's	179	No, FW
	60	105 NW, 200' N	194	No, FW
	61	105 NW, 715's	422	5.9/50'
	62	130 NW, 1255's	444	8.7/55'
	63	130 NW, 810's	758	8.2/45'
	66	120 NW, 290's	877	7.5/20', 24.9/55'
	69	140 NW, 820's	791	6.3/15', 8.2/20', 13.4/30
	70	115 NW, 790's	496	8.2/15'
	72	115 NW, 1280's	322	No, A.Z. w/o min.
	73	125 NW, 790's	677	10.5/50'
	74	150 NW, 790's	610	19.7/5'
	76	120 NW, 270'N	1367	17.3/20'
	80	130 NW, 285's	1258	25.2/60'
	82	150 NW, 515's	957	7.0/25'
	83	140 NW, 275's	931	No, HW
West	64	172 NW, 960's	179	No, FW
	65	188 NW, 250's	771	No AZ
	67	223 NW, 365's	974	No, HW
	81	171 NW, 420's	1046	No AZ
Brodell	68	250 NW, 155's	1033	No, HW
	71	250 NW, 415'N	349	7.5/10'

Notes:

1) All holes collared at -90°
2) 11.2/5' = combined Pb+Zn/intersection, 4% combined cut-off
3) HW=hole stayed in hanging wall
   FW=hole collared in footwall
4) Hole collars measured north or south of Reference Line

Geology

Improved knowledge of the subsurface geology after diamond drilling resulted in some changes to the geologic map of the XY area (Geology maps 1 - 4). No trenching was done, and few new drill access roads encountered bedrock. One change was made in the stratigraphic column - the Cherty Mudstone member of 1975 was subdivided into the Active Zone and the Lower Cherty Mudstone member. This revision clarifies presentation and interpretation.

The row of holes drilled on Section 20 NW in the Nose Zone reveal a broad anticlinal fold, with the north limb down faulted. The absence of the Active Zone in DDH-79 indicates either no deposition or tectonic thinning parallel to bedding. This anticlinal fold can be traced westward from Section 0 NW with the Lower Cherty Mudstone member thickening to the west. Superimposed on the broad fold are two or more parallel folds which appear as domes on the plan view, Geology Map 1. The Active Zone appears to be relatively close to the surface in the Nose Zone, and it may be possible to develop an open pit, or pits, in this area (Figure 1).

Drilling results in the Central Zone (Geology Maps 2 and 3) indicate a number of longitudinal faults not previously defined by surface mapping. A study of topography and aerial photographic linears shows these faults to continue from section to section. In particular, it now appears that the Active Zone/mineralization is faulted down and not folded down in the area east of Section 110 NW and north of the Reference Line.

West of Section 110 NW the Active Zone plunges to the northwest and dips steeply northeast, under the mountain. The net result is that it is infeasible to test this area of the down-dip extensions of the zone from surface. This is particularly annoying because the tenor of the mineralization has been found to be increasing down dip (Figure 6).

In the West Zone (Geology Map 3), the southwestern edge of the basin appears to be a wide fault zone which horsetails to the southeast. No mineralization was intersected by the four holes drilled in the West Zone.

Two holes were drilled to intersect the Brodell Zone (Geology Map 4). The first intersected some 1,000 feet of Flaggy Mudstone; the second was drilled 500 feet northeast and was in steeply dipping Active Zone from the surface.

The holes drilled at the west end of the XY sub-basin indicate a syncline with steeply dipping limbs, the axial plane striking northwesterly.

Mineral Inventory of Central Zone (Sections 85NW-130 NW)

This information gives only a rough estimate of grade and tons and must not be construed as an ore reserve or mining reserve.

The criteria used in calculating mineral inventory were:

(1) 8% combined Pb/Zn cutoff
(2) Mineralized interval no less than 10 feet
(3) "Waste" intervals of less than 20 feet included in mineral calculation

For the 8% of combined Pb-Zn mineralization, it was also assumed that mineralization was continuous between drill holes, and area of influence extended half way to the next section. Using these criteria it can be calculated that between Sections 85 NW - 130 NW, there are 11,000,000 tons at 19.84% combined Pb-Zn.

When using these criteria for a cutoff of 4% combined Pb-Zn and using a planimeter to calculate the thickness along section, it can be calculated that there are 27,000,000 tons at a combined grade of 10.0% Pb-Zn.

The accompanying plan, Figure 11, shows the area of influence for each drill hole and areas which lack information, and need more drill information.

Geophysics

A detailed report of the geophysical program undertaken at Howards Pass in 1976 appears as an appendix to this report. A summary pertinent to the XY area is as follows.

Geophysical exploration in the past on the Howards Pass claims has consisted of a gravity survey which failed to define any clear targets. During the 1976 program two electrical surveying techniques were tried, the Crone Shootback Em system and VLF-EM. It was anticipated that these techniques, separately or combined, would provide data that could be correlated with lithologic and structural features. The initial results of the orientation survey conducted over selected areas of the XY property were not encouraging. Because it was felt that the geology in the XY area may have been too complex for an orientation survey, both techniques were tried at the Anniv. There it was possible to correlate the results with lithology with acceptable confidence. Additional lines were surveyed over the XY area using the correlations defined at the Anniv; the interpretation which then resulted was in accordance with the geologic picture developed by surface mapping. These surveyed areas are shown on Figure 9.

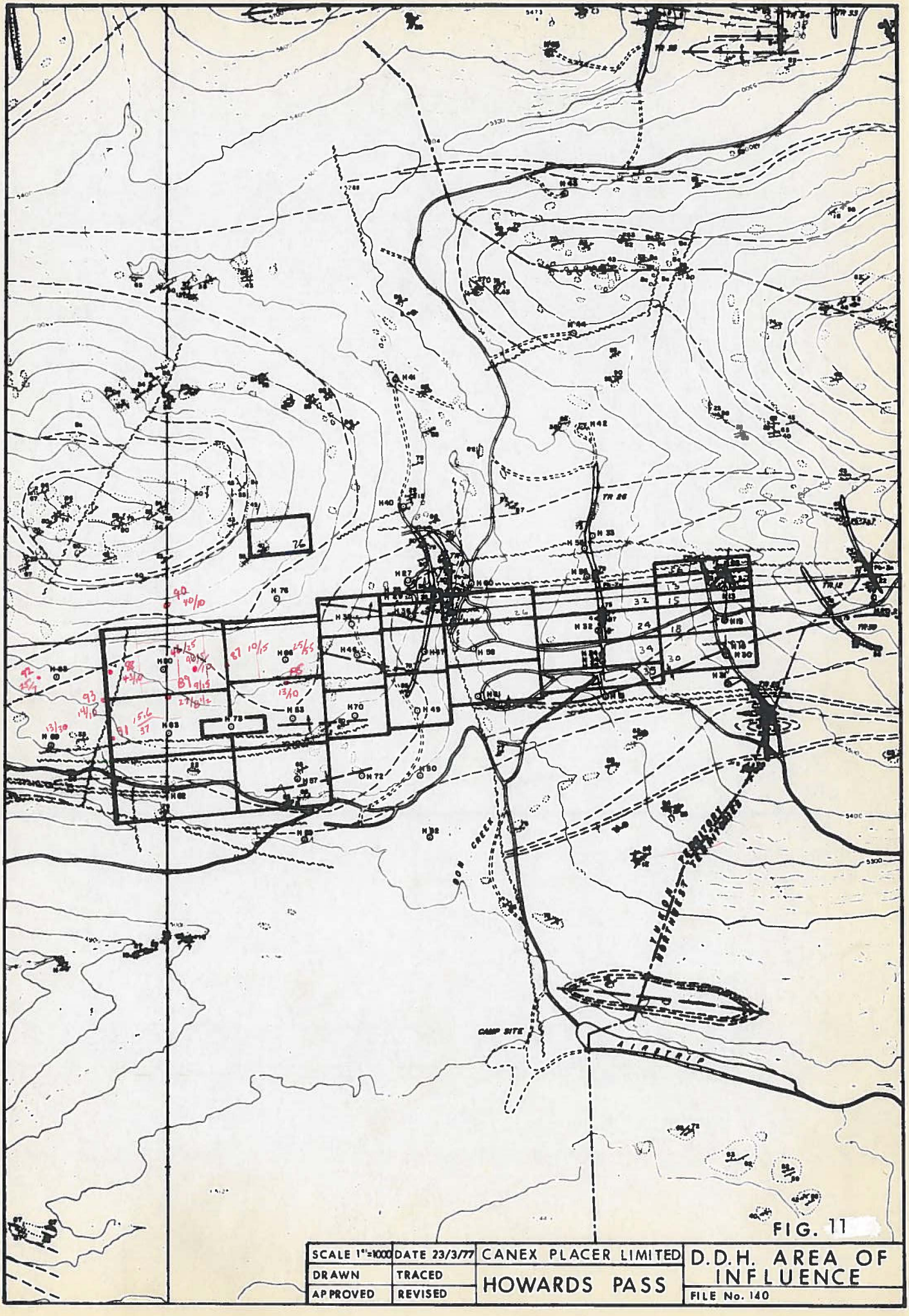


FIG. 11

SCALE 1"=1000	DATE 23/3/77	CANEX PLACER LIMITED	D.D.H. AREA OF INFLUENCE
DRAWN	TRACED	HOWARDS PASS	FILE No. 140
APPROVED	REVISED		

Geochemistry

A soil survey of limited extent was conducted over the western edge of the XY basin to determine the extension of the Brodell Zone. Seventy-one samples were collected on five lines, and analyzed for Zn, Pb and Cd. The results indicate that the Brodell Zone continues to the west from the discovery area, and a diamond drill hole (DDH-71) sited after interpretation of this data (Figures 7 and 8) intersected mineralization.

The results obtained from the samples collected in 1976 do not correlate well with the previous results. The presence of permafrost in much of the area sampled in 1976 is thought to be the major contributing factor to this disparity.

Camp, Equipment & Other Services

The XY camp was capable of accommodating 40 people, eighteen of whom were in permanent buildings. The dining hall could seat 33 at one sitting. Four permanent buildings were constructed during 1976, as follows:

Type	Size		Accommodation
Bunkhouse	28' x 16'	-	10 in three rooms (drillers)
Bunkhouse	32' x 16'	-	7 in 2 rooms, plus office
First Aid	10' x 12'	-	1 plus extra bed
Shop	40' x 24'	-	2 vehicles plus warehouse

The first three buildings were of frame construction; the shop was prefabricated in Vancouver. These buildings, plus the dry, the old office (prefabricated), the kitchen-dining hall and the core logging building (prefab.) were wired for 110 V. The core splitting building was wired for 110 V/220 V to accommodate the jaw crusher. The diamond drillers found that the wooden bunkhouse was much preferable to the framed tents as it was cooler and darker during the day when the night shift was sleeping.

Water for the camp was obtained from a surface seep about 75 feet higher than camp and 800 feet south. The supply was barely adequate for 35 men. Drainage at the northwest end of the airstrip was improved by installation of a temporary 8 inch culvert, and straightening and levelling of this end of the strip was begun. The access road between camp and the drilling area was re-aligned and a culvert installed.

Vehicles in use during the season were:

Vehicle	Availability	Major Problems
D-6	99%	Fuel injector pump replaced
Nodwell FN-60	25%	Right front idler; final drive; tracks; subframe components
Bombardier	25%	Overheating; subframe components
Jeep	80%	Brakes; front wheel hubs
skidoo	6 hrs.	Cylinder and piston
Hiller 12E	95%	Electrical

The Nodwell and Bombardier gave good service while there was snow on the ground (April to June); problems developed when they were used by inexperienced operators on bare roads, in mud or off-road. The Nodwell was running again by the end of the season, but the subframe assembly needs rebuilding. The Bombardier is in the shop, partly assembled. When problems arose with the other tracked vehicles, a sloop was constructed for the D-6 to supply the drills with fuel, rods and mud.

The Hiller 12E helicopter, dry leased for the season, flew about 680 hours from April to October. The usage was high due to:

a) moving surveyors for two months
b) supplying Anniv camp from XY camp, and
c) moving drillers to remote sites.

Communications between the camps and Watson Lake were excellent on the camp frequency for the season, but it was next to impossible to call long distance on the CNT channels from the middle of July. A daily schedule was maintained with the expediter in Watson Lake. This service was found to be indispensable.

All freight, groceries, fuel, etc., were hauled from either Watson Lake or Tungsten by B.C. - Yukon Air Services. Loads were arranged, consolidated and delivered to the airstrip by the expediter. Very good continuous service was obtained from B.C. - Yukon Air Services who had one or more of the Twin Islander, and two single Otters available during the season.

Eleven people were employed by Canex at the XY camp. Six of these were permanent employees; the remainder were hired for first aid, core splitter, mechanic, pilot and bullcook. Of the eleven, three left and were replaced. One left for health reasons and two others left for better paying jobs late in the season.

2) Anniv Area

The main program of the 1976 Anniv area field season was diamond drilling to test for extensions of the shallow zone of Pb-Zn mineralization encountered during the 1976 drilling. The average thickness of these intersections is 50 feet, and the distance along strike between these is 4,500 feet. Mineralization has also been intersected on the Don claims, 9,000 feet east along strike from the eastern most intersection on the Anniv claims. Therefore, there is mineral potential for a strike length of 13,500 feet and the structure is still open along strike in both directions. The maximum distance across strike between holes that intersected Pb-Zn mineralization is 1,250 feet and the limit has not been defined to the south across strike, i.e., down-dip.

The 1972 and 1973 geochemical soil sample grid was extended downhill to the east of drill holes A32 and A33 (Section 747 + 00).

The survey program carried out by Underhill and Underhill included the Anniv claims, the R claims, the Anniv drill holes and the trenches in the Anniv area.

An 18 man camp was constructed and during the field season the complement averaged 16 men.

Drilling

The objective of the 1976 drilling program was to test for the extension of the favourable mineralization indicated by the 1975 drilling results. Previous work had indicated shallow mineralization and therefore an open pit potential. The test drilling was conducted on a grid pattern, with lines 500 feet apart and with holes 250 feet apart on the lines.

N.Q. wireline diamond drilling using two Longyear 38 drills commenced on June 20th, 1976, and by September 18th, 1976, thirty holes totalling 10,693 feet were completed. The drill hole location data are presented in Table A-2, page 58. The maximum distance along strike between holes is 6,000 feet and the maximum distance across strike is 1,500 feet on the Anniv claims.

The stratigraphic sequence and rock types in the Anniv area are essentially the same as in the XY area as compared in the geological overview section of this report. All the mineralization intersected to date is strata-bound and strataform similar to the XY area. Most of the drill holes were collared in or below the Flaggy Mudstone member, intersected the Upper Siliceous Mudstone member, the Active Zone, and were completed in the Lower Cherty Mudstone member of the Howards Pass Formation.

Ground Conditions, Hole Deflections, Costs

In general, ground conditions in the Anniv area are not as good as those in the XY area. Drilling shows the rock to be more broken. The average depth of casing in the drill holes is 26 feet, with the minimum being no casing and the maximum being 104 feet. The casing requirement was found to be greater in the eastern part of the drilled area.

Drill hole deflection, similar to that encountered in the XY area, continued to be a problem. Deflection is probably the result of a combination of the following factors:

- The folded nature of the units,
- Interbeds of various thickness, and hardness,
- and possibly as a result of too much bit pressure being applied.

Drilling costs including fuel, site preparation, moves and assaying were $24.30 per foot. Although there were a number of mechanical delays, the overall performance of the contractor, E. Caron Diamond Drilling and his personnel, was satisfactory.

Mineral Inventory

The drill indicated mineral inventory was calculated from plan maps using a planimeter and modified polygonal system around each drill hole. The drill holes are all located more or less on the 500' grid lines with the holes spaced about 250' apart on the lines. Therefore, a polygon with sides spaced one half the distance between adjacent holes was used in the calculations of the surface area of influence. In the event that the distances to the adjacent holes were greater or less than the above distances, the sides were adjusted to the smaller distance. The largest surface area of influence resulting from this procedure was 126,471 square feet, or approximately 500 feet across strike by 255 feet along strike.

The outline of the polygons is shown on Plate III at a scale of 1 inch to 400 feet. The adjusted surface areas were then multiplied by the assay interval footages above the various cutoff grades and summed to ascertain the volume of rock influenced by each drill hole. The volume was then divided by a tonnage factor of 11.5 cubic feet per ton to convert the volume to tons. The planimetered surface areas were used in conjunction with a computer to preform the arithmetic to determine the weighted tonnage, average grades of lead, zinc and lead plus zinc, and the number of tons for each half percent cutoff from 3.00% to 10.00% lead plus zinc. A summary of the mineral inventory thus calculated and the lead-zinc ratios are presented in Table A-1, of this page.

TABLE A-1

Summary of Anniv Drill Indicated Mineral Inventory

Zn%+Pb% Cut-off	Zn%	Pb%	Zn+Pb%	Tons x 10^3	Zn:Pb Ratio	Pb:Zn Ratio
3.00	5.92	1.94	7.86	9416	3.05:1	.328:1
3.50	6.20	2.03	8.23	8721	3.05:1	.327:1
4.00	6.57	2.17	8.64	7846	3.03:1	.330:1
4.50	6.99	2.30	9.29	7007	3.04:1	.329:1
5.00	7.30	2.41	9.71	6432	3.03:1	.330:1
5.50	7.60	2.49	10.09	5926	3.05:1	.328:1
6.00	8.20	2.70	10.90	4963	3.04:1	.329:1
6.50	8.36	2.76	11.12	4802	3.03:1	.330:1
7.00	8.75	2.85	11.60	4341	3.07:1	.326:1
7.50	9.02	2.93	11.95	4028	3.08:1	.325:1
8.00	9.56	3.07	12.63	3491	3.11:1	.321:1
8.50	10.06	3.22	13.28	3057	3.12:1	.320:1
9.00	10.69	3.38	14.07	2627	3.16:1	.316:1
9.50	11.27	3.51	14.78	2321	3.21:1	.311:1
10.00	11.82	3.69	15.51	2049	3.20:1	.312:1

A smoothed profile of lead + zinc values for each hole shows the width and intervals applicable at each of the cutoff grades. Using the smoothed profile plot it is possible to estimate what grades and tons may be mineable using various mining widths. It appears that if the same mining constraint placed on the XY mineral inventory were to be placed on the Anniv mineral inventory, i.e., 10 feet above cutoff grade or 20 feet below cutoff grade, the majority of the Anniv drill indicated mineral inventory, as reported in Table A-1, would be included.

The maximum depth to the base of the mineralization in the area drilled is approximately 800 feet, and the average depth is approximately 350 feet. The average strip ratio is therefore approximately 6 to 1, not taking into account the necessary slope on the walls of a pit.

Geologic or Potential Reserves

On the Anniv claims, the maximum distance along strike between holes that intersected Pb-Zn mineralization is 4,500 feet. The extension of mineralization is still open along strike. The maximum distance across strike between holes that intersected Pb-Zn mineralization is 1,250 feet. This distance is not limited to the south across strike nor to depth, but it is limited on the north by the footwall rocks. The potential mineral inventory in Area A (Plate III) is 15.2×10^6 tons, assuming:

a) that the Pb-Zn mineralization is continuous between mineralized holes as it appears to be,
b) that the mineralization maintains an average 50 foot thickness, &
c) that a 4% Pb-Zn cutoff is used.

Assuming the Pb-Zn mineralization is continuous between mineralized holes as it appears to be, and maintains the 50 foot average mineralized intersection, the potential mineral inventory in area A (Plate III) is 15.2×10^6 tons, above 4.00% Pb+Zn cutoff.

The Area A potential was calculated as follows using the planimetered surface of 5.4×10^6 square feet as marked on Plate III.

$$\frac{5.4 \times 10^6 \text{ square feet} \times 50 \text{ feet thick}}{11.5 \text{ cubic feet per ton}} = 23 \times 10^6 \text{ tons}$$

Within this area there is now a drill indicated mineral inventory of 7.8×10^6 tons so that the remaining Area A potential above a 4.00% combined Pb + Zn cutoff is 15.2×10^6 tons.

The Area B potential for depths of less than 1,000 feet to the base of mineralization is 27×10^6 tons. The 1,000 foot depth limit was chosen so that all the potential mineralization is above a drift started in the Don Creek Valley. This area is outlined on Plate 3 and has a planimetered surface area of 1.14×10^7 square feet. The Area B potential was calculated as follows:

$$\frac{1.14 \times 10^7 \text{ square feet} \times 50 \text{ feet thick}}{11.5 \text{ cubic feet per ton}} = 50 \times 10^6 \text{ tons}$$

Therefore, Area B potential is 50×10^6 tons less the drill indicated mineral inventory of 7.8×10^6 tons, less the Area A potential of 15.2×10^6 tons = 27×10^6 tons. Further potential exists in the area between DDH A31 (Section 752 + 00 NW) and DDH A34 (Section approximately 662 + 00 NW).

An assay - feet plot for Pb + Zn, Pb and Zn shows a high in the area of DDH A1 and DDH A2 and indicates a trend at 120^o in the direction of drill holes A31, A33, A34.

The drill indicated inventory is 7.8 million tons grading 8.74% lead + zinc at a cutoff of 4% or 2 million tons at 15.51% lead + zinc at a cutoff of 10% lead + zinc. The Area A potential is an additional 15.2×10^6 tons and the Area B potential is an additional 27×10^6 tons.

The extent of the mineralization has not been limited to the east, west or south and further potential exists especially in the area between drill hole A31, Section 752 + 00 NW and drill hole A34, approximately on Section 662 + 00 NW. The assay-feet trend of better grade mineralization appears to point in this direction.

Computer

The following Anniv area data was transferred to computer cards with the appropriate footage intervals: hole location, elevation of collar, depth of hole, angle of hole, assays, core recovery, rock types and faults. This was done to test the feasibility of using the computer to handle the Howards Pass drill hole information. The computer could be used to: determine the statistical distribution at various cut-offs, with and without considering core recoveries; calculate and interpolate isocore and isopack plan maps; plot cross-sections and logitudinal sections complete with stratigraphic units, assay information in tables and/or graphically and with faults; test the adaptability of a Placer Development Limited open pit prophyry program to the Howards Pass data; and calculate, plot and interpolate grade trends.

Normal statistics and log statistics were done on 5 foot intervals and 20 foot composite intervals to determine a distribution of grades at various cutoffs. The information was printed out in the form of tables and also histograms. The distribution of grades appears to be closer to a bell curve using a log normal distribution, than to a normal distribution, and there appears to be at least three populations in the log distribution with no sharp delineation between the populations.

The 20' lead, zinc and lead + zinc composites were then benched to each of 4,900, 4,905, 4,910, 4,915 foot datums to determine if a preliminary open pit program could be run for the Anniv data. The histogram plots of the benched data indicate the 4,900' level gives the best grouping of the higher grade values. It was then decided that the available computer program for an open pit in a porphyry environment, would require considerable modification to adapt it to the Howards Pass mineralization.

Structure

The following is a cross-section by cross-section discussion of the general structure and stratigraphy in the Anniv area, starting with the eastern-most section and working to the west. Assay information for each mineralized intersection in each drill hole is plotted on the cross-sections in the following manner, at a 4.00% lead + zinc cutoff:

Lead%, Zinc%, Lead + Zinc%
Sum of intersection thicknesses in feet.

The average amplitude of anticlinal or synclinal fold pairs in the Anniv area appears to be 750 feet. The Anniv and XY reference lines are parallel and have an azimuth of 300°T. The Anniv reference line lies 4,098 feet northerly from the XY reference line. The Anniv area cross-section numbers are in the same series as the XY area cross-section numbers and the origin is the same.

The simplified nature of the structure as presented on Section 662 + 00 NW, reflects a lack of information and outcrop in the area of drill hole A34 in Don Valley.

Section 742 + 00 NW shows the possible depth of the Active Zone as extrapolated from the next section to the west. The casing was left in DDH A33 with a view to continuing that hole until it intersects the Active Zone.

On Section 752 + 00 NW drill hole A31 intersected the Active Zone and sufficient data has been acquired from previous drill holes on this section to draw a reasonably reliable cross section. It is possible that the rock interpreted from surface mapping as the Lower Cherty Mudstone in the area of the reference line,may in fact be the Upper Siliceous Mudstone and therefore a drill hole in this area may encounter the Active Zone.

On Section 767 + 00 NW the fault between holes A-18 and A-20 is interpreted from geophysics and its true dip is unknown. The Lower Cherty Mudstone in the area of the reference line is interpolated from the next section to the west.

On Section 772 + 00 NW the Lower Cherty Mudstone from 400 S to 1,000 N was interpreted during the field season as an up-faulted block. However, it is possible that DDH A 11 and DDH A 16 encountered the upper part of a thickened Upper Siliceous Mudstone member and the anomalous stratigraphy in DDH A 12 is similar to that encountered in drill hole A-7, therefore a hole will be proposed to test these assumptions.

Section 777 + 00 NW presents the most detailed information to date on the Anniv area. The absence of the Active Zone in drill hole A-7 may be explained by (1), two faults, one on either side of the drill hole or (2), the member shown as Lower Cherty Mudstone being in fact Upper Siliceous Mudstone and the hole did not extend deeply enough or (3), the Active Zone feathered out on a sub-basin high and there was no deposition of the Active Zone in this area or (4), the Active Zone was deposited in this area and later slumped or (5), the mineralizing fluids migrated down slope. Of these possibilities, the last three are thought to be the more probable and may also explain the higher grades encountered in drill holes A 1 and A 2. Faulting conditions caused drill hole A-8 to be abandoned and drill hole A 10, beside it, was caused to 100 feet to avoid this difficulty.

On Section 782 + 00 NW it is thought that the problem in drilling DDH A-15 was caused by the same fault which was encountered in DDH A-8 and DDH A-10 on Section 777. It therefore appears that Anniv Creek occupies the surface trace of this fault. Southerly along the section a fault has been interpreted from geophysics between DDH A-24 and DDH A-21. The fault between drill hole A-24 and A-21 is interpreted from surface geophysics and its dip is unknown.

Drill hole A24 is interpreted as having encountered the top of an isoclinal anticline. The angle between the core axis and the bedding was 55^{o} throughout the hole. If the hole had remained vertical from the collar it is assumed that it would have intersected the Active Zone at a depth of approximately 800-900 feet. It is also possible that drill hole A24 and drill nole A9 reflect a roll-off or deepening of the basin similar to that encountered in the XY area and discussed in the Geological Overview section.

The interpretation of Section 787 + 00 NW is similar to a possible interpretation mentioned in Section 752 + 00 NW.

The interpretation of Section 797 + 00 NW is based on one drill hole and limited surface outcrop information and is therefore very tentative.

Drill hole A25 on Section 802 + 00 NW may have deviated to the south and therefore the thickness of Flaggy Mudstone as shown on this section may be too great.

The average apparent dip on the cross sections appears to be $10\text{-}15^{o}$ to the southwest and the apparent plunge between the section is in the range of $10\text{-}15^{o}$ to the northwest. However, this may represent a combination of both block faulting and plunge. Mineralization appears to be thicker in the eastern section of the drilled area.

Surface Geology

Some minor relocation of outcrop locations as a result of better survey information and changes of the rock type based on the drill hole data resulted in refinement of the surface map in the drilled area.

Two trenches were dug in the Anniv area during the summer. Trench 13, near the camp, located the contact between the Upper Siliceous Mudstone and the Flaggy Mudstone. Trench 14 was dug in the Wavy Banded Limestone on the Parr claims in the Northwest Territories for assessment purposes.

A 200 scale contoured surface map has been prepared following the 1976 aerial photographic survey (Plate A-1). This 200 scale plan map matches the 200 scale cross sections. A 1,000 scale map(Plate HP-2-6, 7, 8)reduced from 1 inch to 400 foot scale shows the location of DDH A-34 as well as all the information shown on Plate A-1.

Refinement of the surface outcrop locations when combined with the drilling and geophysics has produced a reliable surface map, especially in the drilled area. Due to limited outcrops and information outside the drilled area, locations of the geologic contacts should be considered tentative.

Geophysics

A complete geophysical report by R. Rivera is in Appendix 2. The objective of the geophysical survey was to determine if there was a geophysical method that would provide reliable information on faults and rock types in the Howards Pass area. Shootback EM and VLF surveys were completed on 20 lines totalling 10.5 line miles between DDH A34 (Section 662 + 00 NW) on the east and DDH A25 (Section 802 + 00 NW) on the west.

The geophysical data shows a good correlation with the diamond drill hole information and surface outcrops and is expected to provide reasonably reliable information in the areas that have no outcrops.

Geochemistry

The objective of the geochemical soil sampling survey was to extend the 1972 and 1973 grids, which contain anomalous values, downhill to the east. The geochemical trend was trenched in 1974 and drill hole A-31 intersected mineralization in the area of the anomalous geochemical results (Plates A-2-Pb, A-2-Zn and A-2-Cd).

The 1976 soil geochemical anomalies for lead were not definitive and the zinc anomalies reflect dispersion due to benches, swamps and downhill migration on the east facing slope. The 1972, 1973 and 1976 Anniv geochemical soils results have been replotted, using the Underhill and Underhill surveyed claim lines map so that the soil survey, the geophysical survey, and the geological maps can be overlaid.

Although the extended grid does contain anomalous values it is felt that these anomalies may be explained by swamps and downhill dispersion, rather than reflecting mineralization below surface.

Camp, Equipment & Other Services

An 18 man camp was required to accommodate drillers, Canex employees, and claim surveyors. A 20' x 32' prefab kitchen was erected and has seating capacity for sixteen, a propane fridge, stove and hot water heater and a propane refrigerator which is used as a freezer. Running water is gravity fed. A prefabricated insulated building 16' x 16' was used as a dry and a 12' x 16' core shed was built on site. Six tents 12' x 16' were put on cribbed plywood floors. Four of these tents were for accommodation only, one was for food storage and the cooks accommodation, and the other was used as an office and for storage.

A D5 Caterpillar tractor with a winch was obtained on a lease purchase and walked from the Cantung Road to the Anniv Camp in February, 1976. The tractor was used in conjunction with a wooden stone boat for drill moves, making drill roads and moving fuel and equipment in the Anniv area. The availability of the D5 caterpillar was 100%, however, the wooden sloop was worn out by the first part of August.

A battery operated Traegar SSB radio provided communication between camps and with the outside. A small gasoline operated alternator provided power to charge the radio batteries.

Of the two drills in use during the summer, one was flown to the XY camp and skidded to the Anniv using the tractor and one was flown from Cantung to the winter airstrip at the Anniv camp. A short airstrip 1,300 feet long was built in the fall of 1976, but as yet no plane has landed on it.

TABLE A-3

ANNIV TRENCHES

No.	Picket Location	Lat.(N)	Dep.(E)	Elev.
1	East End	58781	27384	4735
2	North End	60152	25849	4650
3	East End	60264	25634	4667
3A	North End	60425	25416	4680
4	North End	60720	24435	4714
5	North End	60803	24143	4739
6	North End	60770	24261	4731
7	North End	60808	24120	4734
8	North End	60725	23961	4754
9	North End	60571	24478	4730
10	North End	58928	27314	4722
11	North End	58804	27843	4723
12	South End	58499	28322	4717
13	North End	58955	26705	4712

HOLE No.	SEC. No.	COORDINATES NORTH	EAST	COLLAR ELEV.	DEPTH	BEARING	DIP	STARTED	COMPLETE
DDH A19	782+00	60383	24765	4733.5	0	----	-90	20/7/76	
					545	----			26/7/76
A20	767+00	58998	25704	4734.1	0	----	-90	23/7/76	
					543.5	----			27/7/76
A21	782+00	60161	24695	4764.6	0	----	-90	26/7/76	
					552.5	----			2/8/76
A22	772+00	59412	25398	4776.5	0	----	-90	27/7/76	
					599	----			2/8/76
A23	787+00	60405	24277	4752	0	----	-90	2/8/76	
					602	----			2/7/76
A24	782+00	59955	24560	4805.6	0	----	-90	2/8/76	
					315^T	193	-74		
					575^T	202	-55		
					787^T	184	-49		
					1007^T	195	-38		
					1012				13/8/76
A25	802+00	60997	22832	4875.4	0	----	-90	8/8/76	
					602	----			12/8/76
A26	797+00	60958	23384	4818	0	----	-90	12/8/76	
					461	----			15/8/76
A27	752+00	≈58064	≈27120	≈4770	0	----	-90	14/8/76	
					200	----			16/8/76
A28	752+00	≈58540	≈27312	≈4745	0	----	-90	16/8/76	
					150	----			19/8/76
A29	752+00	≈58542	≈27317	≈4745	0	030	-60	19/8/76	
					63	030			21/8/76
A30	752+00	≈58627	≈27364	≈4740	0	----	-90	21/8/76	
					177.5	----			27/8/76
A31	752+00	≈58630	≈27365	≈4740	0	030	-60	28/8/76	
					377	030			1/9/76
A32	742+00	≈58332	≈28313	≈4715	0	----	-90	1/9/76	
					207^T	300	-89		6/9/76
A33	742+00	≈58336	≈28315	≈4715	0	030	-60	6/9/76	
					152				9/9/76
A34	662+00	≈53100	≈35235	≈3800	0	----	-90	6/9/76	
					373^T	----	-90		18/9/76
					T= Topari dip test				
	ANNIV AREA V-140 HOWARDS PASS, DDH CO-ORDINATES					TABLE #A-2			

HOLE No.	SEC. No.	COORDINATES NORTH	COORDINATES EAST	COLLAR ELEV.			DIP	STARTED	COMPLETE
DDH A1	777+00	60404	25329	4690.3	0	---	-90	18/8/75	
					242	---			20/8/75
A2	777+00	60210	25397	4697.2	0	---	-90	20/8/75	
					237.5	---			23/8/75
A3	787+00	60532	24504	4730.7	0	---	-90	23/8/75	
					159	---			31/8/75
A4	792+00	60647	24038	4747.8	0	---	-90	31/8/75	
					129	---			2/9/75
A5	777+00	60511	25479	4668.8	0	---	-90	20/6/76	
					208	---			22/6/76
A6	777+00	60095	25233	4721.6	0	---	-90	23/6/76	
					327	---			26/6/76
A7	777+00	59902	25103	4764.2	0	---	-90	26/6/76	
					380	---			2/7/76
A8	777+00	60736	25614	4631.4	0	---	-90	28/6/76	
					159	---			3/7/76
A9	777+00	59674	24991	4811.3	0	---	-90	2/7/76	
					600^{T}	171.5	-76		
					800^{T}	200	-73		
					814^{T}	---			13/7/76
A10	777+00	60740	25604	4630	0	---	-90	3/7/76	
					254	---			6/7/76
A11	772+00	60047	25824	4670.5	0	---	-90	7/7/76	
					129	---			9/7/76
A12	772+00	59838	25664	4694.7	0	---	-90	9/7/76	
					365	---			9/7/76
A13	772+00	59587	25521	4751	0	---	-90	13/7/76	
					406	---			16/7/76
A14	782+00	60609	24893	4705	0	---	-90	14/7/76	
					188	---			16/7/76
A15	782+00	60764	25061	4678	0	---	-90	16/7/76	
					323	---			20/7/76
A16	772+00	60447	26062	4594.7	0	---	-90	16/7/76	
					203	---			18/7/76
A17	767+00	59371	25953	4680	0	---	-90	18/7/76	
					124	---			19/7/76
A18	767+00	59181	25855	4712.4	0	---	-90	19/7/76	
					341.5	---			23/7/76

3) OP AREA

During 1976 two new showings were located and two diamond drill holes were completed. Mapping was done at 1 inch to 400 feet on contoured air-photos.

Drilling

The 1976 OP drilling program was carried out to test the mineralized showings at depth, to gain stratigraphic and structural information in areas of poor outcrop, and for assessment work.

Diamond drilling commenced on August 17th and was completed on September 6th. Mobilization, demobilization and support was by helicopter. Diamond drill hole OP-2 appears to have been collared in the Lower Cherty Mudstone or footwall and no Pb-Zn mineralization was intersected in its 428 foot length. DDH OP-3 was collared in the Flaggy Mudstone unit or hanging wall and was abandoned at 392 feet in this unit due to drilling problems.

The correlation between the drilled rock units and the mapped rock units suggests that further work is needed in this area. Drill hole OP 1 appears to be collared in Lower Cherty Mudstone, however, the unit mapped in the area is Upper Siliceous Mudstone. Drill hole OP 2 appears to have been collared in Lower Cherty Mudstone as well, however, the unit in this area is mapped as Flaggy Mudstone. Drill Hole OP-3 was collared in Flaggy Mudstone and the unit is mapped as the Flaggy Mudstone.

The OP area drill cross-section appears to indicate that the units dip steeply to the south - southwest.

Although there are three mineralized outcrops in the OP area, no Pb-Zn mineralization was intersected in the drill holes, which indicates a need for further work in the OP area. Some suggestions for such work are discussed in the 1977 OP recommendations and proposals section of this report and additional comments are included in the OP area proposal to the October 1976 Joint Management Meeting.

Drilling Costs

Drilling costs including fuel and contractors bills were $25.64 per foot. Helicopter costs related to drilling, mobilization, support and de-mobilization were $18.90 per foot drilled on the OP; giving a total of $44.54 per foot drilled. Using the total cost of the OP program, divided by the total number of feet drilled yields a cost of $54.48 per foot drilled.

Surface Geology

The previous OP surface mapping was done on a scale of 1 inch 1,000 feet on airphotos. The 1976 surface mapping was done on contoured airphotos on a scale of 1 inch to 400 feet, and later reduced to the present 1 inch to 1,000 feet (Plate HP-III-9). As a result of mapping, prospecting and geophysics two new showings 5,000' apart along strike were located in the area that was drilled. In general, the surface mapping shows good correlation with the geophysical data, soils anomalies and the diamond drilling, however, there is a correlation problem between the diamond drill hole rock units and the units mapped in outcrop.

Geologic mapping shows that the OP area is similar to the Anniv area since both are located on the northern sides of a basin or sub-basins within the main basin. The geochemical soil anomalies are not as pronounced as the anomalies on the Anniv area but they do show definite favourable trends. The geophysical survey anomalies are similar to those encountered on the Anniv property and delineate the Wavy Banded Limestone, the Howards Pass Formation,

the Flaggy Mudstone, and the Iron Creek Formation and show a good correlation with the geology as mapped and a reasonable correlation with the geology as interpreted from the drill core. Therefore, the expected potential for mineralization in the OP area may be the same as that of the Anniv area.

Geophysics

A complete geophysical report by R. Rivera is included in the Appendix.

The geophysical survey of the Anniv area demonstrated that it was possible for shoot-back EM and VLF to give reliable information on rock types and faults in the Howards Pass Area. A similar survey of 4.3 line miles on 11 lines of shoot-back EM and VLF was completed on the OP claims. The resulting data show a reasonable correlation with drill hole information and surface outcrops and are therefore expected to provide a reasonably reliable geologic picture and to be very useful especially in areas of little or no outcrop.

Geochemistry

No additional geochemical soil samples were taken on the OP claims during 1976. The 1973 OP Center and OP West geochemical grids do not adjoin and there is a gap of approximately 2,500 feet between the grids in a creek valley. This gap is along the trend of the anomalies between the two grids. In a broad sense geochemistry shows a reasonable correlation with geophysics, surface mapping, and diamond drill hole information. However, when the geochemical maps are overlaid on the surface geology or geophysics or diamond drill hole location maps the correlation is not good and the apparent traces of the Active Zone vary by as much as 200-800 feet. This correlation discrepancy may be due in part to the approximated or idealized plot of the claim line locations along which the geochemical soil samples were taken. All the mineralized showings located to date on the OP claims have a nearby soils geochemical expression.

Road Building

One and one tenth miles of access road from the Anniv area to the OP area were completed during 1976, and a further 4.5 miles are required to complete the connection between the two areas.

4) Metallurgy

Mineralization from the XY Central Zone has been divided into five categories for metallurgical testing purposes. These categories are based on their content of the metal-rich whitish grey mudstone and range from 42.2% combined for Category 1, to less than 7% combined for Category 5. Testwork on Categories 1 and 4 is complete with respect to bulk concentrate production. Work is in progress in Categories 2 and 3. In general, better results are obtained with the higher grade material.

Results on Category 1 ranged from 99.0% recovery for a 50% combined bulk concentrate, to 54.0% recovery for a 70% combined bulk concentrate. The optimum condition would probably be in the order of 95.0% recovery for a 60% combined bulk concentrate. Category 4, which averaged 11.0% combined lead and zinc, had results ranging from 79.0% recovery for a 40.0% combined bulk concentrate to 71% recovery for a 50% combined bulk concentrate.

An interesting aspect is that current separate concentrate research is producing encouraging results in the Category 2 sample. Insufficient work has been done to confirm present results, but the improvement over earlier results is significant. If separate concentrates can be produced, marketing of concentrate is greatly simplified. The maximum metal saleable annually could be increased, thereby enhancing the economics of the operation.

5) Surveying

The Howards Pass Property consists of claims in both the Yukon and the N.W.T. Most of the N.W.T. claims were surveyed in 1973, while the claims surveyed in 1976 were in the Yukon.

The legal survey undertaken by Underhill & Underhill surveyed and cut out claim boundaries, marked the claim corners with iron pins, and staked and recorded any resulting fractions. The survey report has been submitted to the Surveyor General for approval and on receipt of this approval, clear title to the claims will be established together with the prerequisites for converting the claims to leasehold.

Underhill & Underhill employed a maximum crew of 12 men in the period 14 June 1976 to 16 August 1976 and covered 273 claims and 7 fractions in the "X", "Don", "R", and "Anniv" claim groups.

The total cost of the survey was $196,786.74; with a breakdown of the charges as follows:

(1)	Underhill & Underhill	- Direct Billing	$120,541.74
		- Late Billing	25,000.00
(2)	Helicopter Costs	- Hiller 12-E (160.8 x $125)	20,000.00
		- 206B (26.5 x $370)	9,805.00
(3)	Camp Costs	- 667 Man Days @ $20.00	13,340.00
(4)	Mobilization		4,000.00
(5)	Capitalization		4,000.00
		TOTAL:	$196,786.74
		Average Cost per Claim	$ 702.81

The Howards Pass Property has a total of 693 claims and fractions. Of these 409 have now been put under legal survey status leaving 284 still to be surveyed (Figure HP-3).

Diamond drill holes A1 to A26 inclusive and trenches 1 to 13 were surveyed by Underhill & Underhill, and diamond drill holes A27 to A33 inclusive were located using chain and brunton compass. The approximate location of diamond drill hole A34 was determined using a contoured air photograph. As a result of the Underhill & Underhill survey, the diamond drill hole and trench locations were shifted and adjacent outcrop locations which were previously tied to the drill hole and trench locations by a stadia survey were adjusted. The diamond drill hole locations are given in Table A-2, and the trench locations are given in Table A-3.

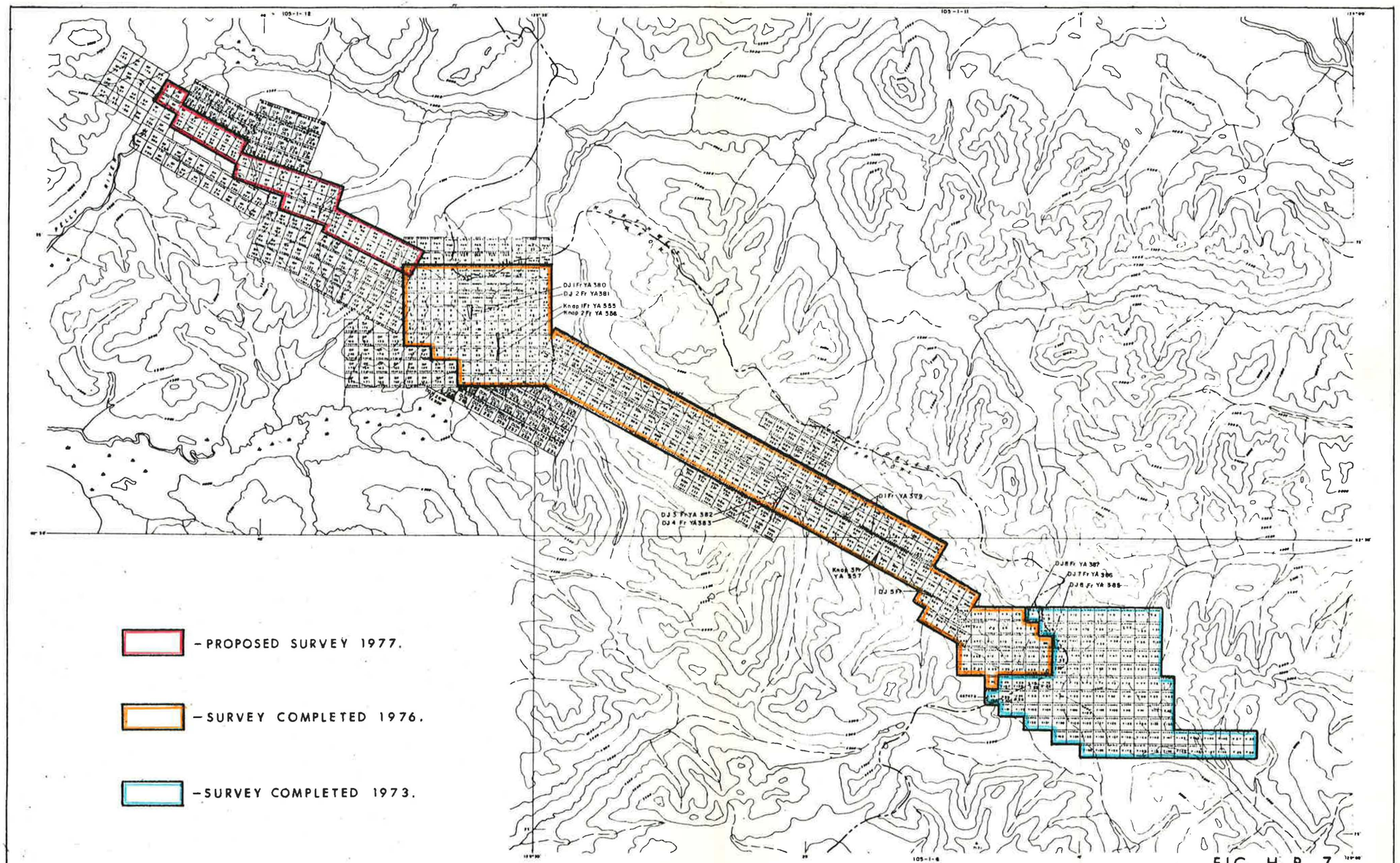


FIG. H. P. 7

DRAWN: J. L.	SCALE	CANEX PLACER LIMITED	CLAIM MAP
	DATE: OCT. 1972.	HOWARDS PASS AREA	
REVISED: JUNE, 1976. - JAN., 1977.			FILE NO. 140

6) Access Road

Preliminary planning and environment studies required by government departments as a pre-requisite to applying for permits and authorization were done in the first half of 1976. Approximately $55,000 was spent on fees and services provided by independent consultants.

An environment overview report and geotechnical study of the route of the road was forwarded to Indian & Northern Affairs, Yellowknife in August together with applications for land use permits for the road. In September applications for water authorizations required for tributary stream crossings were forwarded to the Northwest Territory Water Board and in October application for cost assistance from the Federal Government for a $500,000 contribution in 1977 for construction of the road was forwarded to Indian & Northern Affairs, Ottawa. In the same month, at the request of the N.W.T. Game Department, Canex, under protest, commissioned a survey of game migration routes in the area of the access road. This survey was partially completed by the end of October.

By year end, preliminary engineering studies of the approved routes, had been completed. Five major tributaries of the Little Nahanni River which will require bridges were surveyed. A Land Use Permit and water authorization for stream crossings for the 10 mile of road construction at the Howards Pass end was received in late October but the plan for that construction had to be abandoned because of the onset of winter.

As part of the Howards Pass 1977 budget, $1,325,000 was estimated and submitted to management for the construction of the initial access road.

7) Geophysics

General

Field geophysical work consisting of 2-frequency shootback electro-magnetic surveys, VLF electromagnetic surveys and trial magnetic and gamma ray surveys were done between July 20 and August 25 at the Howards Pass property. The work was executed by a two man crew consisting of Floyd Faulkner and R.A. Rivera.

The shootback electromagnetic survey was used in such a way as to try to determine the location of narrow highly conductive zones (faults) and to obtain a continuous measure of the apparent resistivity of the top 100 feet of the ground.

Objective for obtaining this latter information was to map the distribution of sedimentary rock units by means of patterns of resistivity found to be characteristic of these units by orientation surveys. The VLF electomagnetic work was designed to verify the presence of narrow highly conductive zones interpreted from the shootback data and to locate other thin conductive zones too weak to be sensed by the shootback survey. The gamma ray and magnetic traverses were experimental, designed only to check for any unexpected response from either mineralization or known faults.

Results and Tentative Conclusions

The resistivities encountered on the Howards Pass Property are extremely low which explains the unusually complex behaviour of the electro-magnetic results. It has been possible (by tedious measurement of both tilt angle and field strength at two frequencies at stations spaced either 50 or 100 feet apart along the traverse) to obtain a reliable measurement of the apparent resistivity of the ground. Although it was not immediately evident,

due to a very poor choice of orientation test lines in a very complicated area, resistivity patterns have been found to yield important information on the distribution of various sedimentary units.

The first indication that this approach could successfully perform a geological mapping service was obtained only after several traverses 500 feet apart were run over the relatively simple Anniv geology. The presence of good line to line correlation of the E-M results was the key to this realization.

It is now apparent that the following electrical - stratigraphic correspondence is present:

Sedimentary Unit	Characteristic Resistivity OHM-Meters	Other Characteristics
Iron Creek Formation	Over 30	Sometimes less than 30
Backside Siliceous Unit	2 - 7	Contains a strong electrical response from a cherty sub-unit.
Flaggy Mudstone Unit	7 - 30	Can be more conductive in places.
Howards Pass Formation	1/2 - 7	Usually quite uniform
Wavy Banded Limestone	More than 50	Includes transition zone

Needless to say, where exposures are poor the ability to routinely map the distribution of these various units is a very valuable aid to exploration. It should be noted however, that where disruptions in the line to line correlation of profiles occur it will not in general be possible to form an unambiguous interpretation of the unit's distribution. A few outcrops of identifiable material in key areas will be of crucial importance in determining the correct picture in these cases.

Because of the low resistivities characteristic in this area the depth of penetration of the VLF method is severely limited. Within the Howards Pass Formation, for example, this depth is less than 25 feet. Clearly, if the target faults are not well expressed by near surface shearing, they will not cause a significant VLF anomaly. As is common with the VLF method, very many anomalies have been recorded. Since many of these do not register a response in the Shootback E-M survey we might expect that some important new information is present in the VLF data.

The ground magnetic results indicate that no useful response is present in the vicinity of the mineralization. The gamma ray results, while successfully indicating the limestone-shale contact, are not considered definitive in measuring useful variations within the shale units.

Coverage

The following table and Figure 1 indicate the areas covered by the various geophysical surveys:

Area	# of Lines	Total Mileage	Survey Type	Comments
Central Zone of the XY Area	15	9.2	Shootback E-M & VLF	Lines 500' apart
	2	1.6	Mag	
	2	1.7	Gamma Ray	
Anniv Claims	20	10.5	Shootback E-M & VLF	Lines 500' apart Line 85E not done with VLF
OP Claims	11	4.3	Shootback E-M & VLF	Lines 500' apart
Brodell Zone	3	1.0	Shootback E-M	Lines 1000' apart
Don Valley Recon.	2	1.9	Shootback E-M	Random Lines
Nose Zone of XY Area	7	1.8	Shootback E-M	Random Lines

The Total Mileages for the Job are as Follows:

Shootback E-M	28.7 miles
VLF E-M	22.4 miles
Magnetics	1.6 miles
Gamma Ray	1.7 miles

Production Rates

The breakdown of the daily activities is as follows:

Operating Days	25 1/2
Bad Weather Days	2
No Helicopter or Camp Change Days	2 3/4
Days Doing Other Type Work	1 3/4
Mobilization - Demobilization Days	5
TOTAL FINAL DAYS	37

Roughly speaking the production rate for combination shootback E-M and VLF surveys was 1.1 miles/operating day and 0.8 miles/TOTAL FIELD DAY. At $300 per crew day not including field transportation costs, the cost per mile for this type of survey is quite high.

Presentation of Results

The results of the 1976 geophysical surveys are presented on four 1:4,800 scale plan maps showing traverse lines, drill holes, control, drainages, property lines, geology interpreted from the electromagnetic results, the actual conductor positions and other pertinent information. These maps have been assigned numbers as follows:

Plate No.	Grids Shown
XY - 1	XY Center and Brodell Zone
XY - 2	XY Nose Zone
A - 4	Anniv and Anniv Cr - Don Cr Areas
OP - 1	OP showing area

A comprehensive geophysical report describing methods and results in detail and including the complete set of geophysical profiles and geologic sections on the lines forms a separate report (Appendix 2).

8) Economic Evaluation

An economic evaluation of the Howards Pass property is a prerequisite to future planning. With the data available at the present time, it is possible to produce only a preliminary evaluation. This has been done by using data from current mining operations on other properties for operating costs, plus preliminary marketing research. These studies are all continuing and by the fall of 1977, better data will be available to upgrade the evaluation. However, in the interim the following evaluation is presented:

Mineral Reserves

For this evaluation, only the Central Zone of the XY area is considered. As previously mentioned in this report, the hole spacing is too wide to allow accurate reserve calculations. However, there has been sufficient consistency in results to suggest that continuity does exist between holes. There have also been a sufficient number of high grade intersections to suggest that a "high grade plum" exists which could provide higher than average grade for the initial 5 years of production.

"Drill indicated" reserves, as calculated by D. Huston based on an 8% combined lead zinc cutoff, are 11,000,000 tons averaging 6.7% Pb, 13.1% Zn. Assuming 30% waste dilution, the "mining reserve" would be 14,300,000 tons averaging 5.1% Pb, 10.1% Zn. Within this mining reserve there are blocks totalling 4,900,000 tons averaging 24.1% combined, lead and zinc, suggesting that it may be feasible to mine only in the high grade zone in the first five years. If this is done, a diluted grade over the five year interval could be in the order of 22% to 25% combined lead, zinc.

It should be emphasized that insufficient tonnage is indicated by present drilling to support a viable operation, and that the following evaluations are intended only to show what results might be possible under various parameters. However, it is expected that the 1977 drill program will be successful in expanding and confirming sufficient reserves to support a high grade operation in the early years of production.

To demonstrate the economics of the deposit, production grades of 22% and 25% combined lead zinc have been chosen. While these grades have been arbitrarily selected to illustrate the various cases, they are within the realm of possibility based on present drill hole data.

Marketing

A preliminary review of the marketability of bulk Pb-Zn concentrates by Placer Marketing suggests that roughly 200,000 tons can be sold annually. This is equivalent to about 100,000 tons of lead and zinc metal. If no other markets can be found, and assuming Canex Placer does not treat the concentrate, it is apparent that the scale of operation will be limited by the volume of bulk concentrate that can be sold.

For this evaluation three cases have been considered to show the effect of varying the amount of metal that can be marketed. These are 100,000 tons, 150,000 tons and 200,000 tons of Pb and Zn annually. The following table shows the scale of operation for the various operating conditions noted:

Tons Metal Marketable	% Recovery	Daily Mill Throughput @ 25% Comb.	Daily Mill Throughput @ 22% Comb.
100,000	90	1,400	1,550
100,000	80	1,550	1,750
150,000	90	2,050	2,300
150,000	85	2,150	2,500
150,000	80	2,300	2,600
200,000	85	2,900	3,300

Operating Costs

Operating costs have been developed for operations ranging from 1,400 tons per day to 3,300 tons per day. The detailed calculations are included in the Appendix. The summary is as follows:

~~Cost~~ Tons Per Day	Cost Per Ton	
1,400	$20.55	Total property cost does not include concentrate freight, income taxes, royalties or head office expenses.
1,500	20.35	
1,750	19.45	
2,050	18.50	
2,150	18.10	
2,300	17.80	
2,500	17.70	
2,600	17.40	
2,900	17.10	
3,300	16.50	

Concentrate Grade & Metal Recovery

Preliminary data available from the metallurgical research currently underway, suggests that for mill heads in the 22 to 25% range, the following results may be feasible:

85% recovery with 50% combined bulk concentrate

or

80% recovery with 55% combined bulk concentrate

Other recovery values were used to indicate the sensitivity of cash flows to changes in recovery with present data. It is apparent that increasing concentrate grade has a greater effect on cash flows than increasing recovery.

Concentrate Value

Values shown are based on smelter contract data for bulk concentrate, and metal prices provided by Placer Marketing (See Appendix).

Concentrate Value @ 55% Combined Pb Plus Zn

Pb (21.1%)				
Pay 85% (min. 60# d'd'n)	442#	362 359	359 @ $0.38	$136
Zn (33.9%)				
Pay 80% (min. 140# d'd'n)	678	538 542	538# @ $0.40	215
Total Concentrate Value per ton (SDT)				$351
Less Treatment @ $162/DMT or $147/SDT				-147
Net Smelter Return				$204

Concentrate Value @ 50% Combined Pb and Zn

Pb (19.2%)				
Pay 85% (min. 60# ded'n)	384#	326 324	324 x $0.38	$123
Zn (30.8%)				
Pay 80% (min. 140# ded'n)	616#	493 476	476 x $0.40	190
				$313
Treatment $162/DMT or $147/SDT				-147
Net Smelter Return				$166

Cash Flow Estimates

Based on the foregoing data, the following tables of cash flows for various marketing, and operating conditions are presented:

100,000 Tons Metal Marketable Annually

	Head Grade Combined Metal	Daily Throughput	Annual Throughput	Recovery %	Conc. Grade	Oper. Cost /ton	Annual Cash Flow
1.	25%	1,400	445,000	90	50	20.55	14,600,000
2.	25%	1,550	500,000	80	50	20.35	13,600,000
3.	22%	1,550	500,000	90	50	20.35	13,625,000
4.	22%	1,750	570,000	80	50	19.45	12,710,000

150,000 Tons Metal Marketable Annually

	Head Grade Combined Metal	Daily Throughput	Recovery %	Bulk Conc. Grade	Oper. Cost /ton	Annual Cash Flow
5.	25%	2,050	90	50	18.50	23,375,000
6.	25%	2,150	85	50	18.10	22,940,000
7.	25%	2,300	80	55	17.80	29,500,000
8.	22%	2,300	90	50	17.80	22,350,000
9.	22%	2,500	85	50	17.70	21,540,000
10.	22%	2,600	80	55	17.40	28,079,000

200,000 Tons Metal Marketable Annually

	Head Grade Combined Metal	Daily Throughput	Recovery %	Bulk Conc. Grade	Oper. Cost /ton	Annual Cash Flow
11.	25%	2,900	85	50	17.10	31,500,000
12.	22%	3,300	85	50	16.50	29,940,000

A rough rule of thumb for the annual cash flow required to provide a 5 year payback at 12% is that cash flow should be no lower than 28% of the capital investment. Using this rough factor the above cases would support the following capital investments:

Case	Daily Throughput	Recovery	Conc. Grade	Annual Cash Flow (000's)	(000's) Max. Capital Cost
1	1,400	90	50	14,600	52,100
2	1,550	80	50	13,600	48,600
3	1,550	90	50	13,625	48,600
4	1,750	80	50	12,710	45,400
5	2,050	90	50	23,375	83,500
6	2,150	85	50	22,940	81,900
7	2,300	80	55	29,500	105,300
8	2,300	90	50	22,350	79,800
9	2,500	85	50	21,540	76,900
10	2,600	80	55	28,079	100,200
11	2,900	85	50	31,500	112,500
12	3,300	85	50	29,940	106,900

IV. 1977 PROPOSED PROGRAM

1. Introduction

This section of the report will deal only with the program approved at the joint Canex Placer - U.S. Steel meeting held in October 1976. Programs proposed, but not approved due to budget limitations, are contained within the Appendices.

The preliminary budget approved has been opportioned as follows:

XY Property	$1,100,000
Metallurgy	125,000
Survey	50,000
Road	1,325,000
General Exploration	100,000
	$2,700,000
Metallurgical Contingency	300,000
	$3,000,000

The unallocated contingency of $300,000 is available if required for pilot plant work or advanced research. The main objective of the 1977 program will be to confirm the existence of, and to extend, the high grade mineralization indicated in 1976 by drilling in the Central Zone of the XY Area. As noted in the economic evaluation, increased reserves are required before production will be feasible. To accomplish this objective, fill-in holes will be drilled within the Central Zone, and deep holes will be drilled to the north and north-west in an attempt to extend the presently indicated mineralization. In addition, several short holes will be drilled east of Don Creek from Lines 95 to 105, to confirm the grade of possible open-pittable mineralization.

As well as adding to Central Zone geological information, the 1977 drilling will provide samples for bench scale metallurgical testing. This metallurgical research will continue on several fronts. The main emphasis will be placed on improving flotation of both a bulk concentrate and separate lead and zinc concentrates. Roasting and hydrometallurgical studies will be done on larger samples of flotation concentrate. These tests may extend from 4 to 8 months and include the use of the Coleraine roasting equipment. Approximately 100 pounds of concentrate will be obtained from the treatment of a 1974 bulk sample and will be available for the work.

Further follow-up will also be done on sink-float processes, should encouragement be received from the preliminary work currently underway. Further investigation of those smelter processes considered most amenable to either bulk or separate concentrates will be continued. By year end it is expected that sufficient metallurgical data will be available to commence an initial concentrator flow-sheet design. It is possible that pilot plant testwork may be feasible near the end of the season. In that event, a bulk surface sample from the current drilling in the order of 75 to 100 tons may be required.

The current schedule for the 48 mile access road from Cantung, assuming the necessary land use permits are obtained, is to commence construction in early June, with completion in mid-October. Eight northern contractors are currently interested in bidding this work.

Surveying of the location lines of 50 OP claims will be completed this year. The main reason for this work is to ensure that post locations are on legal record before weather, slides, animals, etc., disturb them to the point where their validity may be questioned.

Little work is planned for the Don, Anniv and OP Groups this season. Activities will be limited to follow-up geology in areas of interest so that the 1978 program - if required - can be prepared this fall.

Engineering data will continue to be gathered and reviewed so that economic evaluations can be prepared with greater confidence in the fall of 1977. Data on possible hydro sites will be collected to evaluate the feasibility of locally produced electricity. Water sources for mill processes and domestic purposes will also be investigated. Possible plant and concentrator rates, townsite locations, and transportation routes, will also be examined to provide preliminary data.

The following sections on the 1977 Proposed Program have been prepared by the various members of the Howards Pass team. These proposals are based on the broad outlines established during the Joint Management Committee meeting, held in October 1976. As noted earlier, programs proposed but not approved, are included within the Appendices.

2) XY Area - 1977 Program

Diamond Drilling

Drilling during 1976, and previous years, has indicated that the best potential for developing a Pb/Zn orebody, using a cut-off grade of 8% Pb+Zn, lies in the Central Zone of the XY mineralized area. The most recent interpretation of data from the Nose Area indicates it may contain a substantial tonnage of shallower, lower grade material. Results from drilling the West Zone in 1976 were inconclusive, but grade appears to increase to the northwest from the Central Zone. Therefore, it is recommended that diamond drilling during 1977 be concentrated in the Central Zone, with the three scout holes to the west. If possible, a number of short holes should be drilled in the Nose Zone. The locations of the proposed holes are listed in Table XY3. If faulting is apparent near the proposed collar location of a hole, the collar will be moved.

The Central Zone has been given the highest priority because of the high tenor and the thickness of the mineralization, together with the apparent down-dip increase in both of these characteristics. To test this extension will require a number of holes, each in excess of 1,000 feet in depth. A number of alternatives have been considered to keep these holes straight, including bigger drills, increased expertise, and pre-collaring the holes. Pre-collaring, drilling 600 to 800 feet initially with rotary, percussion or down-the-hole-hammer equipment without recovering core, seems the most feasible with present access problems and equipment. The three holes proposed for the West Zone, as a continuation of the Central Zone drilling, will also be deep. It would be advantageous to pre-collar these holes too.

By comparison holes proposed for the Nose Zone will be shallow, as the present structural interpretation indicates that the Active Zone is near surface. It is possible that many of the holes will be even shallower than indicated.

TABLE XY-3

Locations of Proposed 1977 Drill Holes, XY Area

Section	Location	Depth
115 NW	500 N	1,200
120 NW	250 N (#76)	1,500
125 NW	250 N	1,500
	250 S	1,200
	1,250 S	300
130 NW	250 N	1,700
135 NW	250 N	1,800
	250 S	1,500
	800 S	700
	1,250 S	400
140 NW	250 N	1,400
	250 S	1,400
	500 S	1,100
145 NW	250 S	1,000
150 NW	0	1,500
155 NW	500 S	1,000
160 NW	250 S	1,000
170 NW	0	1,500
		21,700

Caron Diamond Drilling presently has three Longyear 38 drills on the XY property, two powered by Ford diesels and the third by a Detroit diesel ("Jimmy"). The Jimmy is the most powerful, and will have to be used for the deepest holes unless a heavier drill is moved in. It is strongly recommended that a Wesdrill 60, of which Caron presently has one, be moved in for the holes in excess of 1,400 feet. The Jimmy would then be used for holes between 1,000 and 1,400 feet in depth. A Ford could be used on the shallow holes. It is expected that Caron will unitize at least one of the drills presently on the property so that moving time between holes could be markedly lessened.

A down-the-hole-hammer (DHH) appears to be the most applicable technique for pre-collaring holes. A hammer of this type mounts on the drill rod in place of the diamond bit, and requires compressed air to operate. Penetration rates observed in the field of a DHH mounted on a Wesdrill 60 varied from 15 feet/hr. in hard rock (silicified) to 60 feet/hr. in unsilicified andesitic basalt. In the drillers experience he had encountered very little hole deviation with vertical holes in a variety of rocks to depths of 1,600 feet.

Surface Geology

It became evident during the 1976 field season that faulting has increased the difficulty of interpreting the geology west of section 100 NW. Many of the holes drilled in the area in 1976, located on a predetermined grid, encountered difficulties or deviated because they were collared on or adjacent to major faults. It is also anticipated that the underground exploration program proposed for 1977 will commence in 1978. The zone to be tested lies between Sections 115 NW and 130 NW where a number of faults have been partly delineated. The extent and intensity of these faults must be determined before driving underground openings.

The major thrust of geological study in the XY area during the 1977 season will therefore be to delineate these faults and fault zones, using aerial photographs, detailed surface mapping and drill hole information. Trenches will be excavated if required. It is anticipated that the results of this study will lead to a more coherent geologic picture, decrease drill hole deviation and drilling problems, and guide the location of the underground openings.

Geophysics

A limited program of shootback and VLF E-M surveys is recommended for the XY area in 1977. The suggested program is to extend the 1976 coverage west from Section 150 NW to Section 180 NW. The results of this survey are expected to map the Iron Creek Formation,the Howards Pass Formation and the Wavy Banded Limestone, and more precisely locate the fault zone detected during the 1976 drilling program. This is shown as area 1 on Figure 10.

Geochemistry

Many of the soil samples collected from the Brodell Zone in 1976 were not satisfactory, due to the presence of frost at the surface at the time the sampling was done. It is proposed that the Brodell Zone be resampled, in part, and the grid extended on strike of the present anomaly, during 1977. Claim posts and location lines, established during the legal survey of 1976, would be used for control. This sampling would be undertaken as late in the season as possible, to allow the surface soil to thaw as much as possible.

Surveying

All mineral claim legal surveys have been completed in the XY area. There is enough property surveying to be done, however, to occupy a surveyor and assistant for the 1977 field season. No on-property surveying of drill holes, roads, trenches, etc., was done in 1975 and only drill holes in 1976. The surveys begun in 1974 must be updated, particularly drill hole locations. The collars of drill holes are easily lost by being covered during drill moves and sloughing; each hole collar will be surveyed as soon as it is completed.

Camp Operations

Experience during 1976 has indicated the desirability of a number of modifications or changes to the Howards Pass camp operating procedures and structures.

The kitchen facility will be improved in 1977 by revising the storage capability and moving the food preparation area out of the traffic path. An additional bunkhouse is planned to accommodate contractor and Canex personnel formerly housed in tents. Waste water disposal will be modified to be more hygenic, and the dry-washroom facility upgraded.

The camp roads and the airstrip will be improved with "gravel" and installation of additional culverts. The addition of two power wagons will increase mobility and save wear and tear on the tracked service vehicles. The main drill access roads will be upgraded by the addition of "gravel" to facilitate moving men and supplies to the drills by power wagon. Wheeled transportation is expected to be appreciably faster than the tracked equipment used in the past, and its use will decrease helicopter costs.

Communications between camps and to Watson Lake were generally satisfactory during 1976. Improvements are planned, however, between the XY camp and the drills through installation of field telephones, and between camp and the helicopter, by common radio frequencies. Revised aerials or aerial orientations will be tried to further upgrade communications on both the local and CNT frequencies.

A Bell 206-B Jet Ranger with pilot will be leased from Frontier Helicopters, Watson Lake, for the 1977 field season. The main advantages are increased speed and carrying capacity, and much reduced down time because Frontier has broad back-up support. Canex will have first call on this helicopter while it is based at Howards Pass.

The increased speed and carrying capacity for personnel is required because of the proposed legal survey of 50 OP claims. An analysis of expected costs indicates that it will be cheaper to base the survey crew at the XY camp than to open the Anniv camp for a short period, even though the helicopter trip distance will be greater from the XY camp.

3) Anniv Area

The 1977 geological program is limited to budgetary restrictions. A long term program proposal is included in the Appendix for future reference and to provide continuity in the Anniv area in the event of personnel shifts. The long term program proposal includes drilling, surface geology, geophysics, geochemistry, surveying and camp equipment and other services. Also included in the Appendix is a minimum program proposal, with a cost comparison between expediting the minimum program from the XY camp, or opening the Anniv camp to carry out the minimum proposed program.

A copy of the 1977 proposal that was presented to the Joint Management Meeting between U.S. Steel and Canex Placer, in October 1976, is presented in the Appendix.

4) OP Area

The proposed program during 1977 field season on the OP claims includes a limited amount of trenching, fill-in geochemical soil sampling and a corridor claims survey.

A copy of the 1977 program proposal as presented to the Joint Management Meeting between U.S. Steel and Canex Placer in October 1976 is included in the Appendix. Due to budgetary constraints the drilling portion of the proposal will not be carried out during 1977. It is suggested that the above mentioned drilling proposal be considered as a proposal for future work when further drilling is carried out in the OP area.

a) Drilling

It is expected that no drilling will be carried out in the OP area during 1977 due to budget restrictions.

b) Surface Geology

It is suggested that the majority of the outcrops in the drilled area on the OP claims have been located, mapped, and interpreted to their reasonable limits. There are, however, some discrepancies between the mapped units and the units logged in the drill core, and an attempt to resolve these discrepancies should be made.

It is recommended that the Anniv - OP cat track be completed and a trench or trenches be dug in the area of the 1975/76 drill holes (OP Center geochemical soils survey grid area) in an attempt to locate mineralization and to resolve the discrepancies between the units as logged in the drill core and as mapped on surface. This trench information will hopefully enable future holes to be collared in locations that will result in mineralized intersections. It is further recommended that the two new showings on the OP claims (OP Center geochem grid area) be trenched, if feasible, following completion of the first proposed trench.

Cost Estimates

The following costs are based on:

(1) Starting the trenching in mid-August which will give the ground sufficient time to thaw so that the trench can be dug using a D5 caterpillar tractor without a ripper.

(2) Co-ordinating the use of the Bell 206B helicopter with the geochemical soils survey and possibly any trips required by the claim surveyor.

Cat Track 4.5 Miles - Anniv Area to OP Area

Cat Operator Time, 1 day x $75 plus 56%	$117
Helicopter Time, 2 hours x $300 per hour	600
Cat Fuel, 4 gallons per hour x 10 hours x $2.10 per gallon	84
TOTAL:	$801

Trench #3 (Geological Section 1000 + 00 NW or Geophysics line 105W)

Cat Operator Time, 4 days x $75 + 56%	$468
Helicopter time 6 hours x $300 per hour	1800
Cat Fuel, 4 gallons per hour x 40 hours x $2.10 per gallon	336
TOTAL:	$2604
Total Cost for Cat Track and Trench #3	$3405

If the two new showings on the OP claims center grid area are trenched then the additional costs are estimated to be:

Trench #4 - Nippy Showing Trench or Western Showing

Cat Operator time 2 days x $75 + 56%	$234
Helicopter time 3 hours x $300 per hour	900
Cat fuel, 4 gallons per hr. x 20 hrs. x $2.10 gallon	168
TOTAL:	$1302

Trench #5 - Eastern Showing Trench

Same totals as for the Nippy Showing Trench, total	$1302
Total for trenching the two new showings	2604
Total for Cat Track and all Three Trenches, approximately:	$6000

c) Geophysics

Due to budgetary restraints no geophysical work will be carried out on the OP showings during 1977. A copy of the recommended 1977 geophysical program at Howards Pass by R.A. Rivera is included in the Appendix, and points 3 and 5 of this recommendation are for the OP area.

d) Geochemistry

It is proposed that the two claim gaps between the 1973 OP Center and OP West soils geochemical survey for Pb and Zn be filled in during the 1977 field season. The fill in lines should be on a 500 foot by 50 foot grid that continues to the west from the 1973 OP Center geochemical soils grid.

This survey will cover 2.2 line miles of sampling as follows:

Line	Claim Boundary	From	To or	To
4500 W	OP11, 12-OP13, 14	Completed	1973	
5000 W		0+00	8+00S	
5500 W		8+00S	1+00N	
6000 W		8+00S	18+00N)	Wavy Banded Limestone
6500 W	OP15, 16-OP13, 14	8+00S	20+00N)	
7000 W		8+00S	22+00N)	

OPC Total Line Miles = 2.2

It is further proposed that the 1973 OP west soils geochemical survey for Pb and Zn be continued to 1500 North or to the Wavy Banded Limestone to ensure coverage of the Howards Pass Formation as presently interpreted from surface mapping. This survey will cover 0.63 line miles of sampling as follows:

Line	Claim Boundary	From	To or:	To
3000 W	OP25, 26-OP23,24		Completed	1973
2500 W		11+50N	1700N	
2000 W		7N, 9N, 11N, 12+00N	15+00N	
1500 W	OP23, 24-OP21, 22	4N, 10+50N	15+00N	
1000 W		8+50N	15+00N	Wavy Banded
500 W		5+00N	15+00N	Limestone
00 W	OP21, 22	3+50N	15+00N	

OP Total Line Miles = 0.63

The total proposed geochemical survey will not exceed 2.83 line miles or 300 samples. It is suggested that the samples be taken with a hand auger, rather than a mattock due to the heavy buck brush that will likely be encountered in the creek bottom. It is also suggested that the sampling program not be initiated until August, to allow the ground to thaw and until after the claim line survey is completed which will permit use of the cut lines as a base line for sampling grid.

5) Survey Proposal 1977

With the restriction in budget, the only surveying proposal for 1977 would be a location line survey of the original OP claims. This means that the claims will not be taken to lease, but the posts will be accurately located which will reduce cost at such times that they are taken to lease.

The estimated costs for surveying the 50 claims in 1977 would be:

Underhill & Underhill direct costs approximately (50 x $275)	$13,750
Camp costs 3 men x 15 days = 45 men days 45 x $20	900
Helicopter costs 20 x $305	6,100
TOTAL:	$20,750

Costs per Claim $415.00

6) 1977 Planning for the Access Road

Subject to receiving the required permits and authorizations it is planned to commence construction of the access road in June 1977, with completion of the clearing, construction of the subgrade, and installation of bridges and culverts by October 15th, 1977. Surface gravelling of the road will be done in 1978.

In May, detailed engineering of the road, installation of the centre-line of the route; drill-testing of suspected permafrost areas and bridge sites will be done.

Tendors to construct the road will be solicited from a selected group of contractors classified as "Northern Contractors." Five of these contractors had examined the road site by the end of 1976 and had indicated their intention to submit beds.

In so far as possible within budget limitations the design and location of the access road will be planned to permit upgrading to the standards of resource development road at a later date. The road contractor will be required to develop ditching and water-control facilities to ensure minimum maintenance during winter and periods of high surface runoff.

The access road, as planned, will be a single land 12 foot road with turnouts at regular intervals. Five timber-trestle bridges are planned for major tributary stream crossings and thirty minor tributary streams will be crossed using culvert designed to transfer the estimated high water runoff.

The study of game migration routes, commenced in October 1976 will be completed as soon as suitable flying conditions occur for aerial observations.

7) Economic Evaluation - 1977 Proposal

Data accumulation will continue throughout 1977 so that a more reliable estimate of the economic viability of the Howards Pass area can be prepared. Additional drilling will provide better data for calculating reserves. Metallurgical work will continue, using existing samples, and samples to be collected this season. By year end it is anticipated that recommendations can be made on the types of processes best suited for this deposit. Firmer estimates of concentrator operating costs, recoveries and concentrate grades should also be available by this time. Cost data from other operations in the Yukon will continue to be reviewed. Marketing research will also be more current by the end of the year. Expected capital cost data will be reviewed and updated. With better data for these various areas, it will be possible to evaluate the feasibility of the alternatives such as scale of operation and whether or not a smelter is justified.

More information will be gathered on energy alternatives. This will involve on-site evaluation of nearby high-head hydro sites, and further discussions with Northern Canada Power Commission with regard to their supplying standby diesel generation.

Review of existing and proposed transportation alternatives will continue. Liason with the appropriate government agencies, other potential mine operations and possible transportation companies will be maintained. When this data has been collected and analyzed, it will then be possible to put together a more comprehensive economic evaluation of the Howards Pass property.

8) Advance Planning

As noted in the foregoing section in Economic Evaluation, a number of areas require more data accumulation so that reliable capital and operating cost estimates can be made. Therefore in 1977, in addition to the drilling and metallurgical work to be carried out, the following areas should be subjected to preliminary investigation - with provision for more intensive studies in 1978.

1. Metallurgical treatment methods
2. Marketing - concentrate or metal?
3. Scale of operations
4. Capital cost estimates
5. Government liason
6. Power sources
7. Transportation links and methods
8. Environmental studies leading to operating permits
9. Plant site location
10. Town site location
11. Royalty and taxation

For some of these items, 1977 will be a year of continuing studies. For others, 1977 will be the year that investigations are initiated. Some of these initial studies will be very superficial, serving only to familiarize ourselves with the generalities of the various problems.

Others are sufficiently crucial that substantial studies should get underway as soon as possible. Power sources and marketing are two examples. One point is readily apparent, fairly substantial work will be required in 1978 on all of the areas listed and substantial funds will be necessary to accomplish this work.

The table below indicates a possible schedule for development of the first stage of the Howards Pass Property, assuming that 1977 drilling confirms and expands the reserves indicated by 1976 work.

	1977	1978	1979	1980	1981	1982
Surface Exploration & Related Work	----	----	----			
Access Road Construction	----					
Underground Exploration & Testing		----	----			
Metallurgical Research	----	----	----			
Power, Market, Transport, Environment, Tax & Economic Studies		----	----			
Construction & Development				----	----	
Production						----

HOWARDS PASS

APPENDIX

Appendix

Appendix

PLACER DEVELOPMENT LIMITED

METALLURGICAL RESEARCH CENTRE

HOWARDS PASS PROPERTY

YUKON

REPORT NO. 3

Metallurgical Testing of Selected Drill Cores

PREPARED BY: B. D. Lam

B. D. Lam

REVIEWED AND APPROVED BY: B. Wilson

B. Wilson

DATE: 16 July 76

TABLE OF CONTENTS

BDL/res
July 14, 1976

SECTION 1 - INTRODUCTION

1.1 Location

Howards Pass Property, Yukon.

1.2 Objectives

To produce lead-zinc concentrates of marketable grade.

1.3 Scope of Work

Laboratory bench flotation testing.

1.4 Sample Description

Selected drill cores from the X Y and Anniv zones were combined to produce a composite for metallurgical testing. The 54 samples, from diamond drill holes A1, A2, 30, 32, 35, 36, 39, 40, 41, and 45, had an average assay of 2.63% Pb, 7.31% Zn, 3.48% Fe, and 3.0 ppm Ag.

BDL/res
July 14, 1976

SECTION 2 - SUMMARY

1. Head Assay: 2.63% Pb, 7.31% Zn, 3.48% Fe, and 3.0 ppm Ag.

2. Specific Gravity of Ore: 2.77

3. Work Index of Ore: 17.42

4. In the flotation of separate lead and zinc concentrates, satisfactory grades and recoveries of lead and zinc were not possible despite regrinding and cyanide additions. The best results were obtained in Test 76-4A with a lead concentrate grading 33.8% Pb at 60.9% recovery and a zinc concentrate grading 47.5% Zn at 46.5% recovery.

5. The results of the bulk flotation (Test 76-2) indicate three possibilities:

    1. A bulk concentrate grading 58.80% (Pb + Zn) at 52.60% (Pb + Zn) recovery.

    2. A bulk concentrate grading 48.82% (Pb + Zn) at 73.06% (Pb + Zn) recovery.

    3. A bulk concentrate grading 36.66% (Pb + Zn) at 80.63% (Pb + Zn) recovery.

BDL/res
July 14, 1976

SECTION 3 - DETAILS OF TESTWORK

3.1 Grinding Conditions

1.	Stainless Steel Rod Mill:	8 x 16"
2.	Stainless Steel Rods (24):	35 kg.
3.	Mill Speed:	69 rpm
4.	Pulp Density:	67% solids

3.2 Regrind Conditions

1.	Stainless Steel Rod Mill:	8 x 16"
2.	Stainless Steel Rods (12):	17.5 kg.
3.	Mill Speed:	69 rpm

3.3 Reagents

SYMBOL IN REPORT	CHEMICAL OR BRAND NAME	POINTS OF ADDITION
D-250	Dowfroth 250	Carbon rougher.
NaCN	Sodium Cyanide	Carbon Conditioner, Lead Regrind.
CaO	Lime	Zinc Rougher, Zinc Cleaner.
$CuSO_4$	Copper Sulphate	Zinc Rougher, Zinc Regrind.
PEX	Potassium Ethyl Xanthate	Lead Rougher, Lead Cleaner, Zinc Rougher, Zinc Cleaners.

BDL/res
July 14, 1976

SECTION 3 - DETAILS OF TESTWORK

3.4 Differential Flotation (Test 76-1)

2000 gram batches of ore were ground at 67% solids to 80% passing 200 mesh.

The pulp was then conditioned with 0.9 lb/t Dowfroth 250. The carbon was floated with stage additions of frother. The carbon rougher concentrate was conditioned for one minute with 0.2 lb/t sodium cyanide and given one stage of cleaning.

The carbon rougher tailing and cleaner tailing were combined and conditioned with 0.2 lb/t potassium ethyl xanthate. A lead rougher concentrate was floated in three stages followed by a 5 minute regrind with 0.2 lb/t sodium cyanide added. Three timed lead cleaner concentrates were then floated.

The lead rougher tailing and cleaner tailing were combined and conditioned with 1.5 lb/t lime, 2.0 lb/t copper sulphate, and 2.0 lb/t ethyl xanthate. A zinc rougher concentrate was floated in 4 stages with 0.5 lb/t ethyl xanthate per stage.

The zinc rougher concentrate was reground for 10 minutes and given two stages of cleaning. Three timed concentrates were floated in the second cleaner stage.

In Test 76-4A, the cyanide was increased from 0.2 lb/t to 0.5 lb/t in the conditioner and regrind.

3.5 Bulk Pb-Zn Flotation (Test 76-2)

A 2000 gram batch of ore was ground to 80% passing 200 mesh.

The carbon was first floated with Dowfroth 250 and given one stage of cleaning. The combined rougher and cleaner tailings were conditioned with 2.0 lb/t copper sulphate and 0.5 lb/t ethyl xanthate.

A bulk rougher concentrate was then floated in three stages with 0.5 lb/t ethyl xanthate added to the last two stages.

The rougher concentrate was reground with 0.5 lb/t copper sulphate added. The pulp was then given two stages of cleaning. The first cleaner concentrate was conditioned with 2.0 lb/t lime and 0.2 lb/t PEX. In the second cleaner stage, four timed concentrates were floated.

SECTION 3 - DETAILS OF TESTWORK

3.5 Bulk Pb-Zn Flotation (Test 76-2) (Continued)

A tabulation of the progressive grade and cumulative recovery of the flotation products in Test 76-2 are shown below in Table 1 and also in Figure 1. The products are listed in decreasing order of Pb+Zn grade.

TABLE 1 Progressive Grade and Cumulative Recovery (%)
Test 76-2

PRODUCT	% WT.	PROGRESSIVE GRADE			CUMULATIVE RECOVERY (%)		
		Pb	Zn	Pb+Zn	Pb	Zn	Pb+Zn
Bulk Conc. #1	9.44	13.90	44.9	58.80	46.43	54.86	52.60
Bulk Conc. #2	6.35	12.41	36.41	48.82	69.35	74.42	73.06
Bulk Conc. #3	7.42	9.41	27.25	36.66	77.25	81.87	80.63
Carbon Conc.	8.91	7.62	21.69	29.31	86.64	90.17	89.23
Bulk Conc. #4	5.38	6.70	18.91	25.61	88.93	91.76	91.00
Cl. Tlg. #2	2.10	6.41	17.95	24.36	89.75	91.99	91.39
Cl. Tlg. #1	9.64	5.33	14.62	19.95	92.82	93.16	93.07
R. Tlg.	50.76	2.83	7.73	10.56	100.00	100.00	100 00

3.6 Bulk - Differential Flotation (Test 76-3)

In Test 76-3 the carbon was first removed, then a bulk concentrate was produced.

The bulk concentrate was reground with 0.2 lb/t sodium cyanide. The pulp was then thickened to about 40% solids and conditioned with 0.2 lb/t NaCN and 0.2 lb/t PEX.

Three timed lead concentrates were floated.

The lead cleaner tailing was conditioned with 0.5 lb/t $CuSO_4$ and given two stages of cleaning.

The first cleaner concentrate was conditioned with 0.2 lb/t lime (pH 11.6) and 0.3 lb/t PEX. Three timed zinc concentrates were then floated.

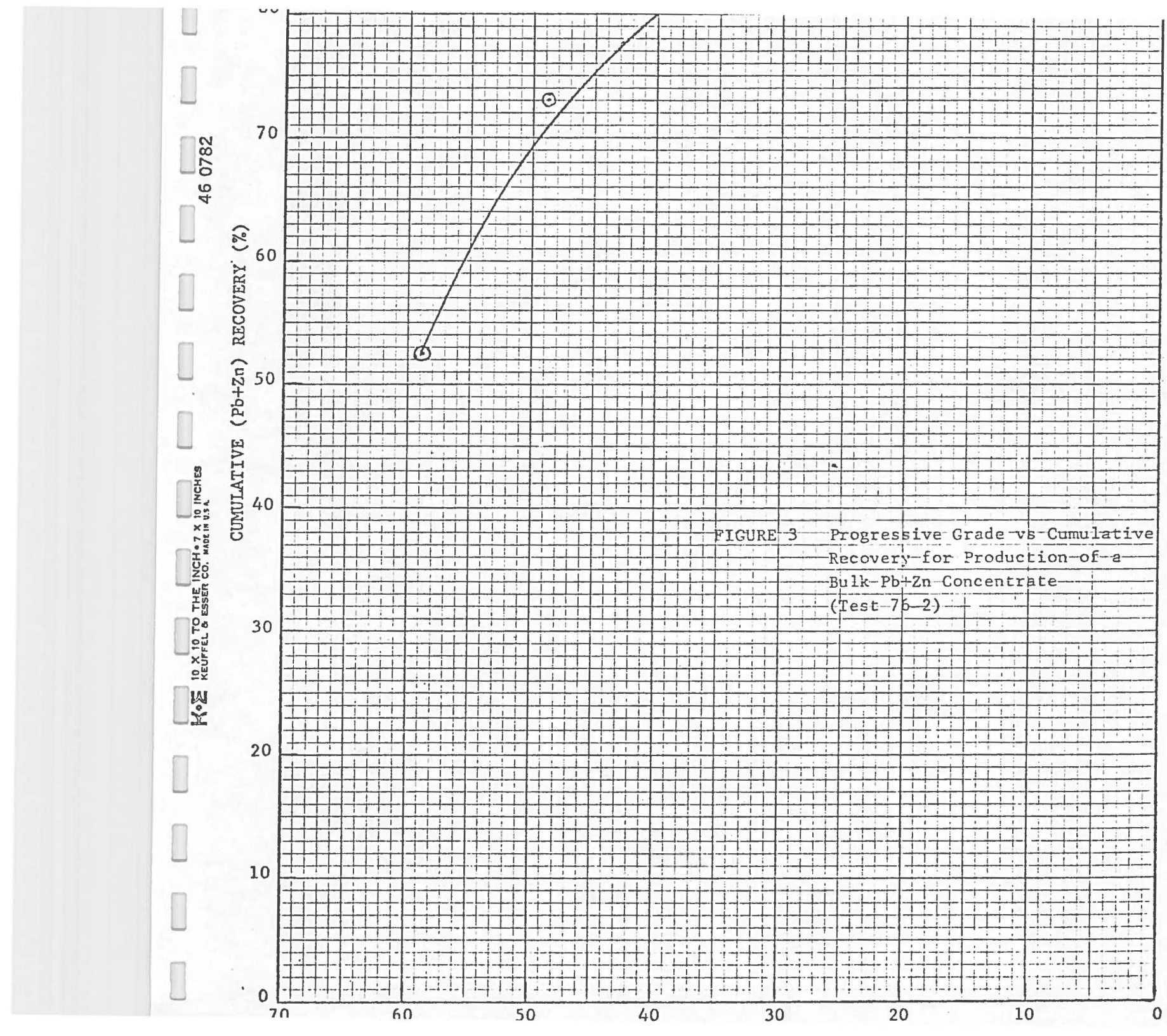


FIGURE 3 Progressive Grade vs Cumulative Recovery for Production of a Bulk Pb+Zn Concentrate (Test 76-2)

$$Wi = \frac{0.964\ (T)}{\left(\sqrt{\frac{10}{P}} - \sqrt{\frac{10}{F}}\right)}$$

Where: T = Grind time in minutes

P = 80% passing product size in microns

F = 80% passing feed size in microns

GRIND TIME (Mins)	FEED SIZE (80% Passing, Microns)	PRODUCT SIZE (80% Passing, Microns)	Wi
9	2300	200	17.40
12	2300	130	17.30
15	2300	94	17.57

MEAN = 17.42

BDL/res
July 14, 1976

A P P E N D I X 1

Flotation Reports

and

Flowsheets

BDL/res
July 14, 1976

PLACER RESEARCH LABORATORY

FLOTATION REPORT

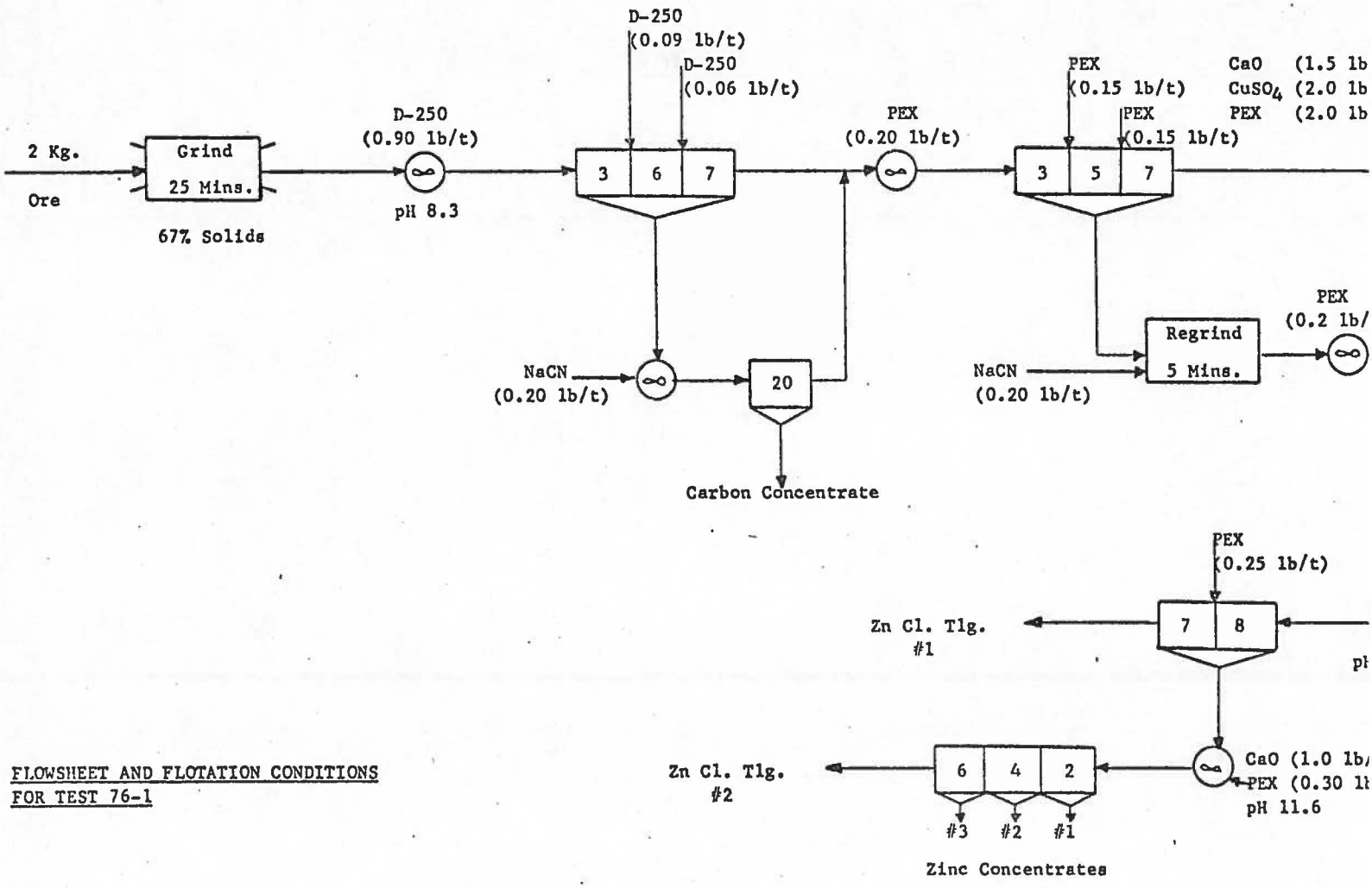
	TIME MINS.	80% PASSING	% SOLIDS	pH	RE
GRIND					
CONDITION					
					SEE FLOWSHEET

TITLE HOWARDS PASS

DATE: 14 May 76

SAMPLE NO. X Y & Anniv TEST NO. 76-1

METALLURGICAL BALANCE			ASSAYS					UNITS					
PRODUCTS	GMS	% WT	% Pb	% Zn	% Fe	ppm Ag	%	Pb	Zn	Fe	Ag		Pb
Carbon Conc.	152.1	7.62	2.99	6.64	6.08	6.0		22.78	50.60	46.33	45.72		8.29
Pb Conc. #1	118.2	5.92	29.7	13.8	4.35	14.0		175.82	81.70	25.75	82.88		64.00
Pb Conc. #2	95.7	4.79	2.83	11.5	6.47	7.0		13.56	55.09	30.99	33.53		4.94
Pb Conc. #3	25.3	1.27	2.19	7.68	5.06	4.5		2.78	9.75	6.43	5.72		1.01
Zn Conc. #1	112.3	5.62	2.08	47.8	2.92	7.0		11.69	268.64	16.41	39.34		4.26
Zn Conc. #2	129.8	6.50	1.82	25.1	5.42	6.5		11.83	163.15	35.23	42.25		4.31
Zn Conc. #3	118.1	5.91	1.15	6.96	6.49	6.0		6.80	41.13	38.36	35.46		2.48
Zn Cl. Tlg. #1	213.9	10.71	0.62	1.06	2.69	4.0		6.64	11.35	28.81	42.84		2.42
Zn Cl. Tlg. #2	136.4	6.83	0.78	2.28	8.97	4.5		5.33	15.57	61.27	30.74		1.94
R. Tlg.	895.1	44.83	0.39	0.96	1.57	1.5		17.48	43.04	70.38	67.25		6.35
Calc. Head	1996.9	100.00	2.75	7.40	3.60	4.3		274.71	740.02	359.96	425.73		100.00
Assay Head			2.63	7.31	3.48	3.0							



FLOWSHEET AND FLOTATION CONDITIONS
FOR TEST 76-1

BDL/res
July 14, 1976

PLACER RESEARCH LABORATORY

FLOTATION REPORT

	TIME MINS.	80% PASSING	% SOLIDS	pH	REA	
GRIND						
CONDITION						
					SEE FLOWSHEET	

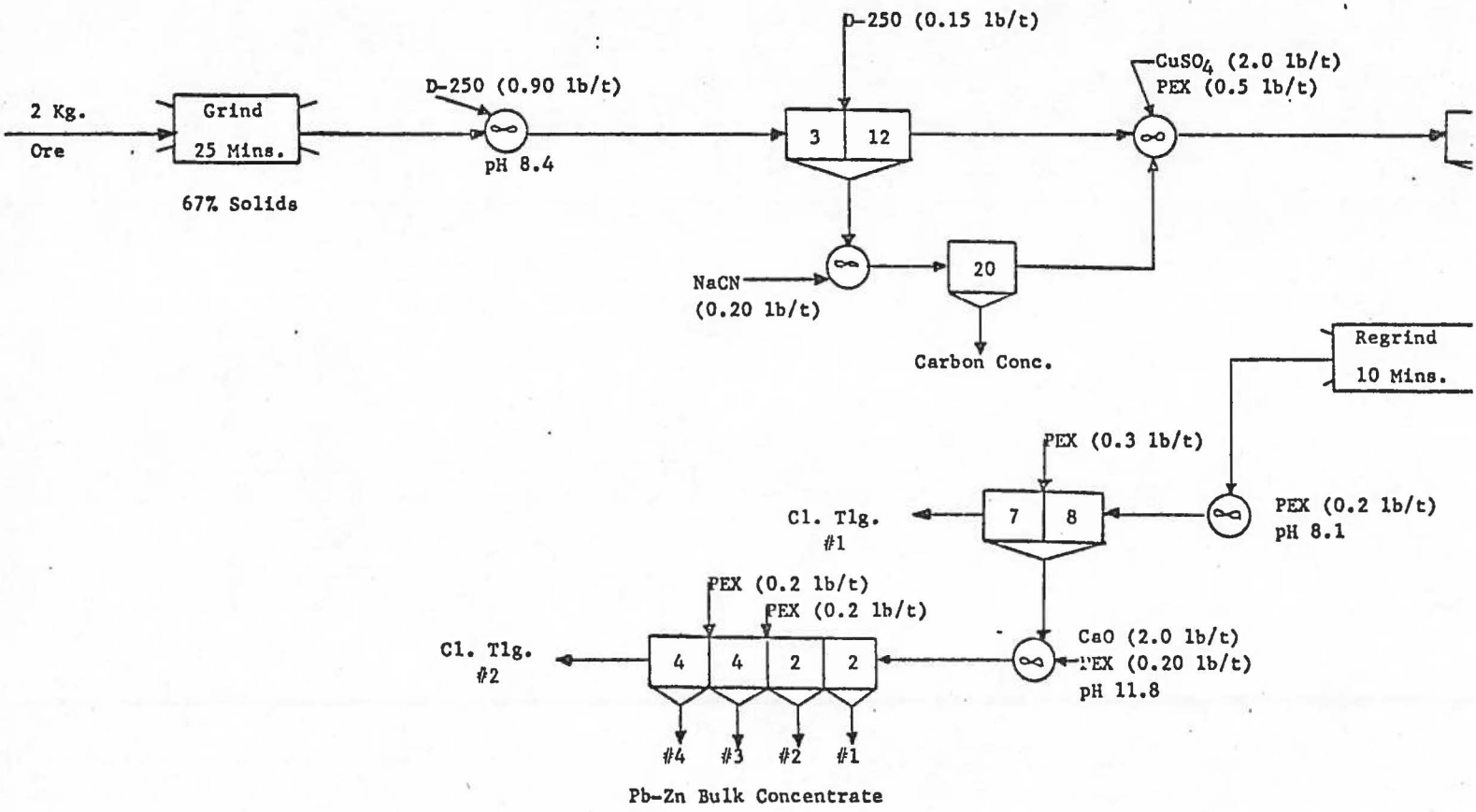
TITLE HOWARDS PASS

DATE: 19 May 76

SAMPLE NO. X Y & Anniv TEST NO. 76-2

Bulk Pb-Zn Conc.

METALLURGICAL BALANCE			ASSAYS					UNITS						
PRODUCTS	GMS	% WT	% Pb	% Zn	% Pb+Zn	% Fe	ppm Ag	Pb	Zn	Pb+Zn	Fe	Ag	Pb	Zr
Carbon Conc.	181.2	8.91	2.98	7.20	10.18	5.81	5.5	26.55	64.15	90.70	51.77	49.01	9.39	8.
Bulk Conc. #1	192.0	9.44	13.9	44.9	58.80	2.25	5.5	131.22	423.86	555.08	21.24	51.92	46.43	54.
Bulk Conc. #2	129.1	6.35	10.2	23.8	34.00	4.84	8.5	64.77	151.13	215.90	30.73	53.98	22.92	19.
Bulk Conc. #3	150.9	7.42	3.01	7.76	10.77	10.8	5.0	22.33	57.58	79.91	80.14	37.10	7.90	7.
Bulk Conc. #4	109.5	5.38	1.20	2.28	3.48	9.67	3.5	6.46	12.27	18.73	52.02	18.83	2.29	1.
Cl. Tlg. #2	42.7	2.10	1.10	0.84	1.94	3.62	2.5	2.31	1.76	4.07	7.60	5.25	0.82	0
Cl. Tlg. #1	196.2	9.64	0.90	0.94	1.84	2.99	2.5	8.68	9.06	17.74	28.82	24.10	3.07	1
R. Tlg.	1033.0	50.76	0.40	1.04	1.44	1.58	2.5	20.30	52.79	73.09	80.20	126.90	7.18	6
Calc. Head	2034.6	100.00	2.83	7.73	10.55	3.52	3.7	282.62	772.60	1055.22	352.52	367.09	100.00	100
Assay Head			2.63	7.31		3.48	3.0							



FLOWSHEET AND FLOTATION CONDITIONS
FOR TEST 76-2

BDL/res
July 14, 1976

PLACER RESEARCH LABORATORY

FLOTATION REPORT

TITLE HOWARDS PASS

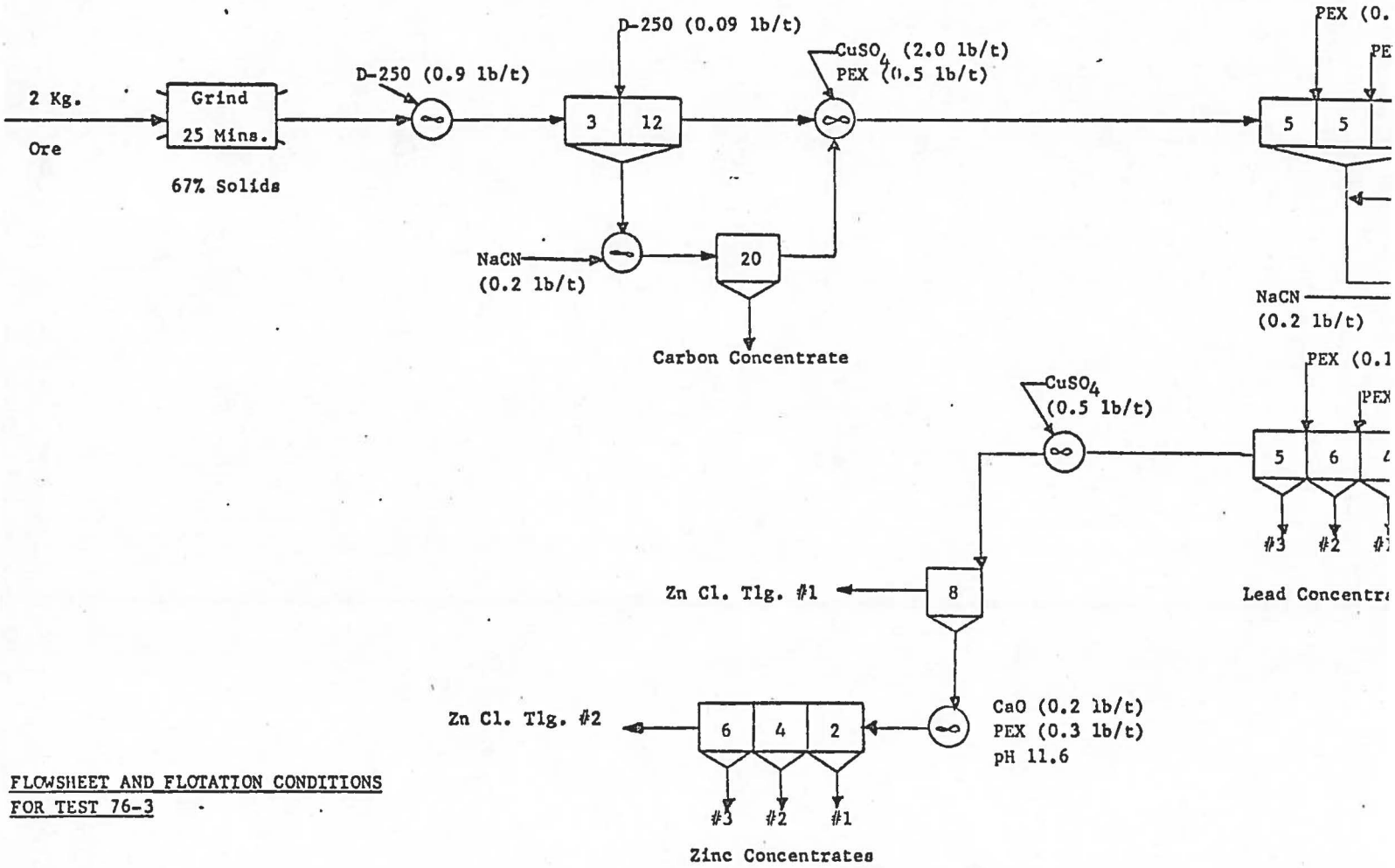
DATE: 25 May 76

SAMPLE NO. TEST NO. 76-3

Bulk Flot. with Differential Pb-Zn Flotation.

	TIME MINS.	80% PASSING	% SOLIDS	pH	RE	
GRIND						
CONDITION						
					SEE FLOWSI	

METALLURGICAL BALANCE			ASSAYS					UNITS						
PRODUCTS	GMS	% WT	% Pb	% Zn	% Fe	ppm Ag	%	Pb	Zn	Fe	Ag		Pb	Z
Carbon Conc.	181.3	9.10	3.04	7.04	6.00	5.5		27.66	64.06	54.60	50.05		10.08	8
Pb Conc. #1	178.0	8.94	16.65	33.2	3.18	8.0		148.85	296.81	28.43	71.52		54.26	3
Pb Conc. #2	150.4	7.55	6.08	27.0	5.10	8.5		45.90	203.85	38.51	64.18		16.73	2
Pb Conc. #3	136.9	6.87	2.08	12.8	6.63	8.5		14.29	87.94	45.55	58.40		5.21	1
Zn Conc. #1	45.0	2.26	1.06	7.4	6.64	6.0		2.40	16.72	15.01	13.56		0.87	
Zn Conc. #2	51.1	2.57	0.98	5.44	6.94	5.0		2.52	13.98	17.84	12.85		0.92	
Zn Conc. #3	72.7	3.65	1.14	5.60	9.94	5.5		4.16	20.44	36.28	20.08		1.52	
Zn Cl. Tlg. #1	151.0	7.58	0.89	2.64	6.04	3.5		6.75	20.01	45.78	26.53		2.46	
Zn Cl. Tlg. #2	10.0	0.50	0.77	0.47	1.92	3.5		0.39	0.24	0.96	1.75		0.14	
R. Tlg.	1015.1	50.98	0.42	1.00	1.59	2.0		21.41	50.98	81.06	101.96		7.81	
Calc. Head	1991.5	100.00	2.74	7.75	3.64	4.2		274.33	775.03	364.02	420.88		100.00	10
Assay Head			2.63	7.31	3.48	3.0								



FLOWSHEET AND FLOTATION CONDITIONS
FOR TEST 76-3

BDL/res
July 14, 1976

PLACER RESEARCH LABORATORY

FLOTATION REPORT

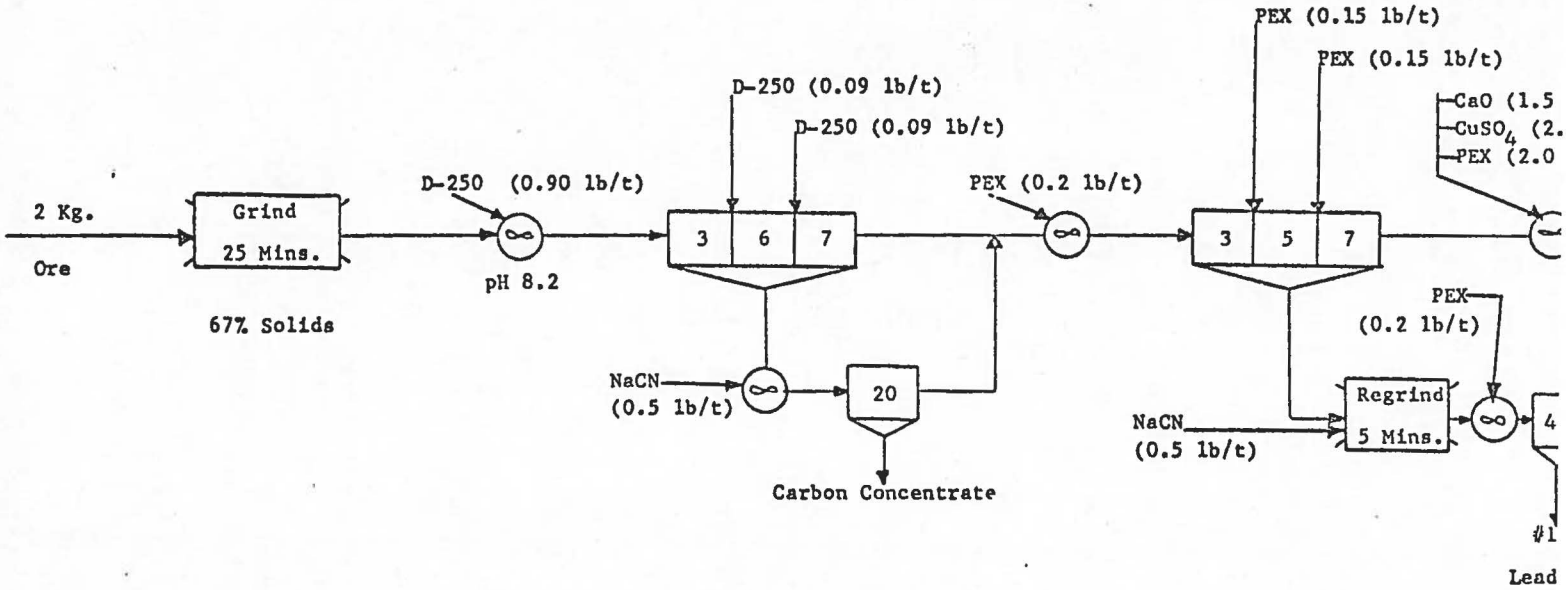
	TIME MINS.	80% PASSING	% SOLIDS	pH	REA	
GRIND						
CONDITION						
					SEE FLOWSHEET	

TITLE HOWARDS PASS

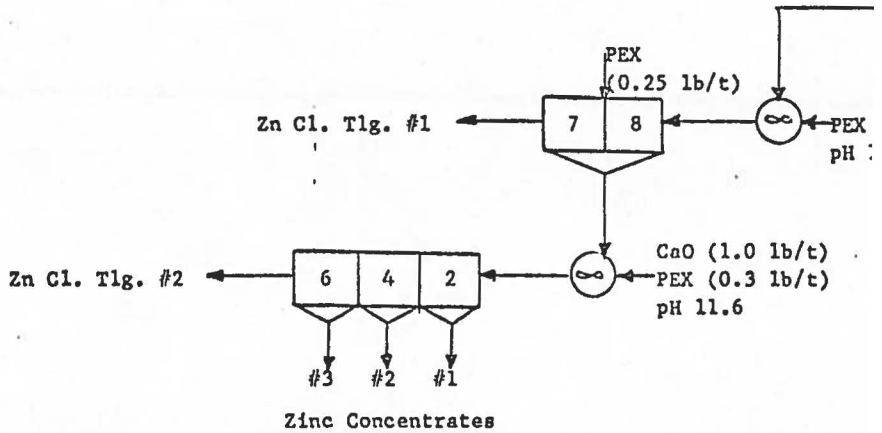
DATE: 27 May 76

SAMPLE NO. X Y & Anniv TEST NO. 76-4A

METALLURGICAL BALANCE			ASSAYS					UNITS						
PRODUCTS	GMS	% WT	% Pb	% Zn	% Fe	ppm Ag	%	Pb	Zn	Fe	Ag		Pb	
Carbon Conc.	189.1	9.50	2.80	7.12	5.57	7.0		26.60	67.64	52.92	66.50		9.66	
Pb Conc. #1	98.7	4.96	33.8	20.8	2.79	8.5		167.65	103.17	13.84	42.16		60.91	1
Pb Conc. #2	74.0	3.72	5.04	14.8	5.26	7.0		18.75	55.06	19.57	26.04		6.81	
Pb Conc. #3	58.2	2.92	1.92	2.84	5.86	5.5		5.61	8.29	17.11	16.06		2.04	
Zn Conc. #1	150.2	7.54	2.00	47.5	3.38	4.0		15.08	358.15	25.49	30.16		5.48	4
Zn Conc. #2	110.2	5.53	1.56	17.2	6.60	5.5		8.63	95.12	36.50	30.42		3.13	1
Zn Conc. #3	56.5	2.84	1.04	5.20	7.16	4.0		2.95	14.77	20.33	11.36		1.07	
Zn Cl. Tlg. #1	181.2	9.10	0.70	1.16	4.08	2.5		6.37	10.56	37.13	22.75		2.31	
Zn Cl. Tlg. #2	92.7	4.66	0.85	2.36	10.83	4.5		3.96	11.00	50.47	20.97		1.44	
R. Tlg.	980.4	49.23	0.40	0.94	1.51	3.0		19.69	46.28	74.34	147.69		7.15	
Calc. Head	1991.2	100.00	2.75	7.70	3.48	4.1		275.29	770.04	347.70	414.11		100.00	1(
Assay Head			2.63	7.31	3.48	3.0								



FLOWSHEET AND FLOTATION CONDITIONS
FOR TEST 76-4A



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July 14, 1976

A P P E N D I X 2

Screen Analysis

BDL/res
July 14, 1976

REMARKS: Head Screen: 6 to 28

Size μ	Wt. Grams	% Weight	% Cumu.	% Cumu. Passing					
+ 6 3360	18.6	5.79	5.79	94.21					
- 6 + 8 2380	42.0	13.06	18.85	81.15					
- 8 + 10 1680	32.3	10.05	28.90	71.10					
- 10 + 14 1190	66.0	20.53	49.43	50.57					
- 14 + 20 841	33.3	10.36	59.79	40.21					
- 20 + 28 595	24.0	7.47	67.26	32.74					
- 28 + 35 420									
- 35 + 48 297									
- 48 + 65 210									
- 65 +100 149									
-100 +150 105									
-150 +200 74									
-200 +270 53									
-270 +325 44									
- 28 SAND 10.7	105.3	32.74	100.00	-					
- 28 SLIME 94.6									
TOTALS	321.5	100.00	-	80% passing 2300 μ					

REMARKS: 48 to 200

Size μ	Wt. Grams	% Weight	% Cumu.	% Cumu. Passing					
+ 6 3360									
- 6 + 8 2380									
- 8 + 10 1680									
- 10 + 14 1190									
- 14 + 20 841									
- 20 + 28 595									
- 28 + 35 420									
- 35 + 48 300	6.8	3.10	3.10	96.90					
- 48 + 65 212	28.3	12.90	16.00	84.00					
- 65 +100 150	39.9	18.19	34.19	65.81					
-100 +150 106	24.1	10.98	45.17	54.83					
-150 +200 75	19.7	8.98	54.15	45.85					
-200 +270 53									
-270+325 44									
- 200 SAND 9.5	100.6	45.85	100.00	-					
- 200 SLIME 91.1									
TOTALS	219.4	100.00	-	80% passing 200 μ					

SAMPLE WEIGHT: _____

REMARKS: 48 to 200

Size μ	Wt. Grams	% Weight	% Cumu.	% Cumu. Passing					
+ 6 3360									
- 6 + 8 2380									
- 8 + 10 1680									
- 10 + 14 1190									
- 14 + 20 841									
- 20 + 28 595									
- 28 + 35 420									
- 35 + 48 300	0.2	0.08	0.08	99.92					
- 48 + 65 212	5.4	2.03	2.11	97.89					
- 65 +100 150	32.7	12.31	14.42	85.58					
-100 +150 106	41.7	15.70	30.72	69.88					
-150 +200 75	36.5	13.74	43.86	56.14					
-200 +270 53									
-270+325 44									
- 200 SAND 12.7	149.1	56.14	100.00	-					
- 200 SLIME 136.4									
TOTALS	265.6	100.00	-	80% passing 130 μ					

SAMPLE WEIGHT: _____

REMARKS: 65 to 325

Size	μ	Wt. Grams	% Weight	% Cumu.	% Cumu. Passing					
+ 6	3360									
- 6 + 8	2380									
- 8 + 10	1680									
- 10 + 14	1190									
- 14 + 20	841									
- 20 + 28	595									
- 28 + 35	420									
- 35 + 48	297									
- 48 + 65	212	0.6	0.22	0.22	99.78					
- 65 +100	150	8.7	3.15	3.37	96.63					
-100 +150	106	27.9	10.12	13.49	86.51					
-150 +200	75	44.8	16.24	29.73	70.27					
-200 +270	53	30.6	11.09	40.82	59.18					
-270 +325	45	19.2	6.96	47.78	52.22					
-325 SAND	6.5	144.0	52.22	100.00	-					
-325 SLIME	137.5									
TOTALS		275.8	100.00	-	80% passing 94 μ					

HOWARDS PASS PROPERTY

YUKON

REPORT NO. 4

Preliminary Leach Tests on
Howards Pass Ores.

PREPARED BY: J. A. King

REVIEWED AND
APPROVED BY: B. Wilson

DATE: 1st October.

JAK/res
September 30, 1976

Preliminary leach tests to evaluate acid consumption and zinc solubility.

1.3 Scope of Work

Laboratory bench testing.

1.4 Sample Description

Selected drill cores from the X Y and Anniv zones were combined to produce a composite for metallurgical testing. The 54 samples, from diamond drill holes A1, A2, 30, 32, 35, 36, 39, 40, 41, and 45, had an average assay of 2.63% Pb, 7.31% Zn, 3.48% Fe, and 3.0 ppm Ag.

JAK/res
September 30, 1976

Natural Ore: 440 lb H_2SO_4/ton natural ore

Calcined Ore: 250 to 300 lb H_2SO_4/ton calcined ore
or 240 to 290 lb H_2SO_4/ton natural ore

2. Zinc Solubility

90% of the zinc in the ore was selectively leached from the lead and ore waste by roasting finely ground ore at 700°C and bottle leaching the calcine with 10% H_2SO_4 for 16 hours.

Lead solubilization was negligible; the pregnant solution contained 6 ppm lead.

Some iron was solubilized during the H_2SO_4 leach; the pregnant solution contained 1 to 2 gpl Fe, the higher value resulting from a leach with higher acid concentration.

Roasting at temperatures above or below 700°C resulted in lower zinc solubilities in the subsequent leaching step.

Sulphur evolved during roasting was equivalent to 2.4% of the weight of the natural ore.

JAK/res
September 30, 1976

1000 g of natural ore was ground in the laboratory rod mill at 50% solids for 20 minutes (75% passing 200 mesh). Water and acid were added to the ground pulp to provide 2500 mls of leach solution containing 10% H_2SO_4 by volume.

The 1000 g of ground ore was bottle leached with the 2500 mls of leach solution for 16 hours at room temperature.

At the end of the leach, the leach pulp was filtered and the clear pregnant solution assayed for Zn, Pb, Fe and residual H_2SO_4. The leach residue was washed thoroughly by repulping and washing with distilled water before drying and assaying for Zn and Pb.

Leach Solution Contained		6.3 ppm Pb
		2.87 gpl Zn
		2.01 gpl Fe
	and	241 g of residual H_2SO_4
Leach Residue Contained		6.54% Zn
		2.40% Pb
		Wt: 999 g
Initial H_2SO_4 Addition		250 mls x 1.84 S.G.
		= 460 g H_2SO_4
Residual H_2SO_4		= 241 g H_2SO_4
Acid Consumption		= 219 g H_2SO_4
		or 438 lb H_2SO_4/ton of natural ore.

JAK/res
September 30, 1976

Zn in Pregnant Leach Solution = 2.5 x 2.87 gpl Zn
= 7.18 g Zn

$$\text{Zinc Leach Recovery} = \frac{7.18}{(7.18 + 65.33)} \times 100$$

= 9.9% Zn Recovery

$$\text{Backcalculated Zn Ore Grade} = \frac{7.18 + 65.33}{1000} \times 100$$

= 7.25% Zn

(vs 7.31% Zn assayed head).

Note that lead solubility was negligible, the lead content of the pregnant solution being 6.3 ppm Pb.

3.2 Roast-Leach Tests to Evaluate Zinc Solubility

H_2SO_4 leach tests on natural ore indicated high acid consumption with expected minimal zinc dissolution. Leach tests were therefore run on roasted ore samples to determine whether zinc dissolution could be improved and whether SO_2 evolved during roasting would neutralize the limestone in the ore thereby reducing acid leach consumptions.

3.2.1 Effect of Roast Temperature

500 g batches of -6 mesh ore were each roasted in the laboratory muffle furnace at temperatures of 500°, 600°, 700°, 800° and 900°C. Each batch was roasted for 2 hours duration with rabbling every 20 minutes.

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September 30, 1976

ROAST TEMPERATURE °C	CALCINE WT (g)	LEACH RESIDUE WT (g)	RESIDUE ASSAYS (%)		% ZINC DISSOLUTION*
			Pb	Zn	
500	487.5	482.2	2.95	6.48	13.7
600	476.8	460.5	2.98	5.28	32.6
700	478.0	442.0	2.90	2.24	72.1
800	468.0	436.5	2.80	2.64	67.6
900	469.0	449.0	2.61	3.04	61.8

* Zn dissolution based on a zinc head assay of 7.31%.

The results indicate that a roast temperature of 700°C will maximize the solubility of zinc from the calcine.

3.2.2 Effect of Acid Concentration

Two further roast-leach tests were run using:

a) natural ore ground to 54% -200 mesh
b) a roast temperature of 700°C
c) acid leach concentrations of 25% and 10% H_2SO_4 by volume.

2000 g of ore was ground in the laboratory rod mill at 50% solids for 15 minutes (54% -200 mesh). The ground pulp was filtered and the solids dried.

JAK/res
September 30, 1976

Size	Wt %	Cum Wt %	Wt % Passing
+100 mesh	14.4	14.4	85.6
-100 +200	31.5	45.9	54.1
-200 +325	13.0	58.9	41.1
-325	41.1	100.0	-
Total	100.0	-	-

Two 500 g lots were riffled from the dried solids and each lot roasted at 700°C for 2 hours with rabbling every 20 minutes.

The two batches of calcine were combined, weighed and mixed thoroughly. Weight loss during roasting was 2.8%. Two 400 g lots of calcine were riffled out for leach tests, using two different acid concentrations but with the net weight of acid used in each test being the same.

TEST A 400 g calcine plus 400 mls 25% H_2SO_4 by volume.

TEST B 400 g calcine plus 1000 mls 10% H_2SO_4 by volume.

The two leach tests were run for 16 hours each. 600 mls of water were added to the Test A pulp at the end of the leach to bring the volume of pregnant solution to 1000 mls for both Tests A and B.

The pulps were filtered and the filtrate assayed for Pb, Zn, Fe and residual H_2SO_4. The leach residues were washed thoroughly by repulping twice, dried, weighed, and assayed for Pb, Zn, Fe and S. Samples of natural ore and roasted calcine were also assayed for Pb, Zn, Fe and S to provide checks for backcalculated assay figures and to provide a measure of sulphur losses during roasting and leaching.

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September 30, 1976

PRODUCT	WT/VOL.	ASSAY				DISTRIBUTION (%)		
		Zn	Pb	Fe	S	Zn	Pb	Fe
Pregnant Solution	1000 mls	29.1 gpl	5.8 ppm	0.96 gpl	-	89.6	0.06	6.8
Leach Residue	378.5 g	0.89 %	2.47 %	3.74 %	5.63 %	10.4	99.94	93.2
Leach Feed (Calcine)	400 g	8.12 %	2.34 %	3.78 %	-	100.0	100.00	100.0
Leach Feed (Assayed)		7.72 %	2.69 %	3.55 %	5.13 %			

Sulphur loss on Roasting

	WT %	ASSAY (%)				UNITS			
		Zn	Pb	Fe	S	Zn	Pb	Fe	S
Natural Ore	100.0	7.70	2.76	3.51	7.41	770	276	351	741
Calcine	97.2	7.72	2.69	3.55	5.13	750	261	345	499

Sulphur loss on roasting expressed as a weight percent of the natural ore

$$= \frac{741 - 499}{100} = 2.4\%$$

JAK/res
September 30, 1976

of Fe/Zn hydroxide precipitation as the titration end-point.

TEST A Acid Consumption = 245 lb H_2SO_4/ton calcine
or 231 lb H_2SO_4/ton natural ore.

TEST B Acid Consumption = 299 lb H_2SO_4/ton calcine
or 291 lb H_2SO_4/ton natural ore.

TEST A

PRODUCT	WT/VOL.	ASSAY				DISTRIBUTION (%)		
		Zn	Pb	Fe	S	Zn	Pb	Fe
Pregnant Solution	1000 mls	29.0 gpl	5.8 ppm	1.76 gpl	-	90.9	0.06	12.3
Leach Residue	354.8 g	0.82 %	2.76 %	3.55 %	6.10 %	9.1	99.94	87.7
Leach Feed (Calcine)	400 g	7.98 %	2.45 %	3.59 %	-	100.0	100.00	100.0
Leach Feed (Assayed)		7.72 %	2.69 %	3.55 %	5.13 %			

JAK/res
September 30, 1976

acid (10 to 25% by volume H_2SO_4).

ii) iron solubilized from the calcine appears to increase with increasing acid concentration.

iii) acid consumption is less when leaching roasted ore compared to unroasted ore.

iv) sulphur evolved during roasting is equivalent to 2.4% of the weight of the natural ore.

JAK/res
September 30, 1976

Lead	38 cents U.S.
Zinc	40 cents U.S.
Silver	$5.60 U.S.

B. In Europe ISF smelter capacities in place, are as follows:

Metallgesellschaft	80,000 MT annually
AMMI	80,000 MT annually
Penarroya	100,000 MT annually
Avonmouth	80,000 MT annually
ISF (Yugoslavia)	80,000 MT annually

- For a total combined capacity of 700,000 MT of bulk concentrate annually.

All of these smelters operate partially on straight lead or zinc concentrates which are blended before being fed to the smelter.

In addition there is capacity in Japan for 250,000 MT bulk concentrate (Sumiko and Hachinohe smelters) where perhaps 75,000 MT of bulk concentrate could be delivered.

In total, selling up to 200,000 of bulk concentrate to the above smelters may be possible.

C. Typical smelter terms for bulk concentrate have changed and in 1977 dollars might be:

- Pay for 60% of cadmium after deducting 0.2 units, at European Price.

Penalties would probably apply to arsenic at $2 per DMT for each 0.1% by which content exceeds 0.2%.

Treatment charge would be about $150/DMT plus $3.00 for each 1¢ increase in the price of zinc over 36¢ per lb.

C.II Typical lead smelter terms might be as follows:

- Pay for 95% of silver content (minimum deduction 3-5 oz) at Handy and Harman price.

- Pay for 95% of gold (minimum deduction 0.05 oz) at London spot price.

Treatment charges may be $120/DMT at 20¢/lb. price plus $3.00 each 1¢ increase in the price.

C.III Zinc concentrate terms might be:

- Pay for 85% of zinc (minimum deduction 8 units) at published producer prices.

- Pay for 95% of silver over 5 oz/DMT at Handy and Harman prices.

- Treatment charges may be $150/DMT at 36¢/lb. plus $3/DMT for each 1¢ increase in price.

The capacity for the world market to absorb lead and zinc metal is large. If the decision were made to produce metal we could deliver say 150,000 MT of both lead and zinc.

Underground Mining Cost

Various approximate mining costs for Howards Pass were determined after reviewing data for relevant operations from Craigmont Mines and Whitehorse Copper. Craigmont uses the relatively high cost sub-level caving method, and has difficult ground conditions. Its location in the southern interior of B.C. gives the advantage of an established labour pool and low cost transportation of supplies. Craigmont's production rate of 5,300 tons per day is substantially higher than the rates examined in this evaluation. Therefore, to adjust for this difference an analysis was done and Craigmonts costs adjusted for various mining rates.

To obtain a comparison with a northern underground mine, the mining costs for Whitehorse Copper Mines were analyzed. This is a 2,500 ton per day longhole operation with decline and shaft access. Ground conditions are generally good. Costs from this operation will reflect higher northern transportation and labour costs, however, these costs are still lower than they would be if this operation was located at Howards Pass.

Craigmont and Whitehorse Copper costs are not directly applicable to an operation at Howards Pass. However, they can be used with appropriate contingency factors to indicate a possible range of costs. The comparison of present mining costs, and estimated costs adjusted for the 1,600 ton per day case are following:

These estimated costs have taken into consideration the longer haulage distance, the smaller townsite and other related facilites.

MINING COST ADJUSTMENT - CRAIGMONT & WHITEHORSE COPPER

(for comparison purposes)

		12 Mos. Nov.75 5200 TPD (160,000 TPM)		2 Mos. Dec.76 3800 TPD (110,000 TPM)	
Total Cost per Ton Mined	4.15	$664,000		5.80	($638,000)
Fixed Costs	1.66	(266,000)	40%	2.51	(274,000) 43%
Variable Costs	$2.49	(398,000)		$3.29*	(364,000)

At 1600 TPD or 50,000 TPM:

Variable	2.50 x 50,000	$125,000
Fixed		266,000
		$391,000
Total:	$7.82/ton**	

* Production levels abnormally low in Nov. & Dec. due to ore pass problems. This has adversely affected costs.

** Note: that 'fixed costs' for a 50,000 TPM operation should be lower than a 160,000 TPM operation, so this is an inflated figure. This figure would represent a reasonable expectation of cost if Craigmont operated @1600 TPD with no change in supervision levels, or power requirements, hoisting, ventilation and track and pipe crews, maintenance crews, etc.

With the scale of operations reduced to 1600 TPD, it is conceivable that 'fixed costs' could be reduced to $200,000/month.

Secondary Breaking	.10
Ground Support. Assume $8/bolt, 3' space, 5 bolts/stope foot	.80
Crusher	.15
Conveying	.10
*Supervision, Eng. $4,000/month	.65
*Mine Servicing	.65
	$6.70
+20% Contingency	$8.00

Mining Costs (Based on Howards Pass Estimates)

	500,000TPY	666,000TPY	705,000TPY	750,000TPY
Variable Costs ($5.40)	2,700,000	3,600,000	3,800,000	4,050,000
'Fixed' Cost	960,000	1,000,000	1,050,000	1,100,000
TOTAL COST	3,660,000	4,600,000	4,850,000	5,150,000
Adjusted Cost per ton	$7.32/ton	$6.91/ton	$6.88/ton	$6.87/ton
with 10% contingency	8.00	7.55	7.52	7.51

Manpower Levels

	Mine	Mill	Plant	Geology	Engin.	Admin.	Misc.	Total
1400	75	21	19	3	3	13	3	137
1450	79	"	"	"	"	"	"	141
1550	81	"	"	"	"	"	"	143
2050	95	"	"	"	4	14	5	153
2150	100	"	22	"	"	"	"	161
2300	104	"	"	"	"	"	"	168
2900	128	"	24	"	"	"	6	195

- 11% interest
- operating cost $300,000 annually
- 7 month operation hydro
- capital cost 3 sites @700,000 - 2,100,000

30 miles @$75,000/mile	2,250,000
With 20% contingency	870,000
	$5,220,000
Capital recovery over 10 yrs.	900,000 annually

Operating cost	$300,000	
Capital recovery	900,000	
Contingency	200,000	
Annual Cost (Hydro)	1,400,000	$1,400,000
Annual Cost (Diesel) $0.08x7 .2mill KWH		600,000
		$2,000,000

With Capital Recovery: Cost per KWH = $0.066
Cost per ton = $4.00

With Capital Recovery: Cost per KWH = $0.036
Cost per ton = $2.20

Anvil Townsite Data (1,000's of KWH's consumption)

J (1975)	F	M	A	M	J	J	A	S	O	N	D
828	772	640	729	578	523	573	525	631	660	787	1000

TOTAL KWH's 8,246,000

Approx. 430 employees

" 20,000 KWH/emp/year

With electric heating (rough estimate only) 14,000,000 KWH

Approx. 33,000 KWH/employ/year

Average per month 1,166,000 KWH

Peak @ 1,750,000 or 1.5 times average

Power Consumption	Annual Tonnage Mine & Mill	KWH/Year	Plant	Town Site	Peak/Mo	Total
1400 TPD	445,000	18.0 million	0.5	4.6	(0.6)	23.1
1450	470,000	19.0	0.5	4.6	(0.6)	24.1
1550	500,000	20.0	0.5	4.7	(0.6)	25.2
2050	666,000	26.6	0.7	5.0	(0.63)	32.2
2150	705,000	28.2	0.7	5.3	(0.66)	34.2
2300	750,000	30.0	0.7	5.6	(0.7)	36.3
2900	942,000	37.7	0.8	6.4	(0.8)	44.9

Hydro Production

May to Oct: Can provide total consumption = 0.4 total annual consumption

Nov. to April: Can provide 30% of total = 0.18 total annual consumptio

750,000	36	3.0	4.2	4.5	21.0
942,000	45	3.7	5.1	$5 million	26.1

Operating Cost & Capital Recovery

000's Cap.	000's Rec.	000's Op. Cost	000's Contingency	000's Total	$/KWH	Diesel Standby Make up KWH	Diesel Standby 000's Cost @0.08¢	Hydro+ Diesel	Cost Per Ton
3.0	540	250	150	940	0.07	9.7 mill	776	1716	3.85
3.0	540	250	150	940	0.07	10.1	808	1748	3.70
5.5	630	275	175	1080	0.07	9.5	760	1840	3.70
4.0	720	275	175	1170	0.06	13.4	1072	2242	3.40
4.0	720	275	175	1170	0.06	14.3	1144	2314	3.30
4.5	810	300	200	1310	0.06	15.0	1200	2510	3.35
5.0	900	300	200	1400	0.05	18.9	1512	2912	3.10

COST SUMMARY (500,000 tpy)

	Including Capital Recovery for Hydro	Excluding Hydro Capital Recovery
Mining	$8.00	$8.00
Milling	4.50	4.50
Power	4.00	2.20
Plant Service	0.60	0.60
Administration	1.60	1.60
Townsites	0.65	0.65
Prop. Taxes, Road	1.00	1.00
	$20.35	$18.55

Power)	3.70	3.60	3.40	3.30	3.30	3.20	3.10
Plant)							
Admin,)							
Townsite }	Fixed 2,075,000						
Prop. Taxes, Road)							
	$20.35	$19.44/t.	$18.50	$18.10	$17.80	$17.70/t.	$17.10

Operating Costs at Various Tonnages @25% Combined Heads

100,000 tons metal annually	
recovery	
445,000 tpy 90% 1,400 tpd	$20.55
470,000 tpy 85% 1,450 tpd	
500,000 tpy 80% 1,550 tpd	20.35
150,000 tons metal annually	
666,000 tpy 90% 2,050 tpd	$18.50
705,000 tpy 85% 2,150 tpd	18.10
750,000 tpy 80% 2,300 tpd	17.80
200,000 tons metal annually	
890,000 tpy 90% 2,750 tpd	$17.10
942,000 tpy 85% 2,900 tpd	
1,000,000 tpy 80% 3,100 tpd	16.70

Total Concentrate Value per ton (SDT)	$351
Less Treatment @ $162/DMT or $147/SDT	-147
	$204

Concentrate Value @ 50% Combined Pb and Zn

Pb (19.2%)				
Pay 85% (min. 60# ded'n)	384#	326 324	324 x $0.38 =	$123
Zn (30.8%)				
Pay 80% (min. 140# ded'n)	616#	493 476	476 x $0.40 =	190
				$313
Treatment $162/DMT or $147/SDT				-147
Net Smelter Return				$166

Cash Flow Estimate

Annual Throughput	500,000
%Pb	9.6
%Zn	15.4
Content Pb (Tons)	48,000
Content Zn (Tons)	77,000
Recoverable @ 80%(Pb)	38,400
Recoverable @ 80%(Zn)	61,600
Tons bulk concentrate @50% (19.2, 30.8)	200,000

	$313
Treatment $162/DMT or $147/SDT	-147
	$166

Net Smelter Return per pound 16.6¢

Net Smelter return 200,000 tons @$166	$33,200,000
Operating Cost @ 500,000 tons @$20.35	-10,175,000
Conc. Freight (37+10) 200,000 tons @$147	- 9,400,000
Cash Flow Before Taxes, Head Office Expenses	$13,625,000

Mill Feed: 9.6% Pb 15.4% Zn

Tonnage Throughput @ 85% recovery:	470,000 tpy
90% recovery:	445,000 tpy
Concentrate Production:	200,000 tpy @ 50% combined metal
	182,000 tpy @ 55% combined metal

85% Recovery (470,000 tpy mill throughput)

Net Smelter Return	$33,200,000
Operating Cost @$20.30	- 9,500,000
	$23,700,000
Concentrate Freight	-9,400,000
Cash Flow before taxes, head office expense	$14,300,000

90% Recovery (445,000 tpy mill throughput)

Net Smelter Return	$33,200,000
Operating Cost @$20.55	- 9,200,000
Conc. Freight	- 9,400,000
	$14,600,000

@ 85% Recovery (470,000 tpy mill throughput)	
Net Smeltrr Return: 182,000 x $204	$37,128,000
Operating Cost: 470,000 x $20.30	-9,541,000
Conc. Frt. 182,000 x $47	-8,554,000
Cash Flow before taxes, lo expense	$19,033,000
@ 90% Recovery (445,000 tpy mill throughput)	
NSR 182,000 X $204	$37,128,000
Operating Cost 445,000 x $20.55	-9,145,000
Conc. Frt. 182,000 x $47	-8,554,000
	$19,429,000

Cash Flow Estimate

Maximum marketable metal: 150,000 tons

Heads: 25% combined

Conc. value @ 55% - $204/ton

@ 50% - $166/ton

@ 80% Recovery 55% Con. Grade	
Mill Production: 750,000 tpy 2300 tpd	
Tons Conc: 273,000	
NSR = 273,000 x 204 =	$55,700,000
Operating Cost = 750,000 x 17.80 =	-13,350,000
Conc. Frt. = 273,000 x 47 =	-12,850,000
	$22,940,000

200,000 Tons Metal Marketable

@ 85% Recovery; 50% con. Grade

NSR - 400,000 tons @ $166	$66,400,000
Oper. Cost - 942,000 @$17.10 =	-66,100,000
Conc. Frt - 400,000 @$47 =	-18,800,000
	$31,500,000

150,000 ton metal marketable

@ 90% recovery 50% con. grade

Conc. 300,000 tons @ $166	$49,800,000
Oper. Cost 666,000 tons @$18.50	-12,325,000
Conc. Frt. 300,000 @$47	-47,100,000
	$23,375,000

Cash Flow Estimate @ 15.2% Combined

150,000 tons Metal Marketable

@ 80% Recovery; 50% con. Grade

Throughput: 1,235,000 tpy, 3800 tpd

Conc, Value: 300,000 x $166 =	$49,800,000
Oper. Cost: 1,235,000 x $16.50 =	-20,380,000
Conc. Frt: 300,000 x $47 =	-14,100,000
	$15,320,000

in the Anniv area.

a) Drilling

The objectives of future work should be to test for the extensions of mineralization along strike to the east and west and to the south at depth. The main thrust of the extension drilling should be to follow the trends of better grade and to attempt to locate higher grade mineralization.

The proposals for future work are arranged in two groups, with the first group being a minimum program proposal and the second group being related to a more extensive drill program. Table I is a list of proposed drill holes arranged in the suggested sequence of future drilling. The more extensive drilling proposal is estimated to take 12 months with 1 drill.

(1) Minimum Drilling Proposal

A minimum drilling program of two holes (Holes #2 and #3 in Table 1) totalling approximately 1,200 feet would be a preliminary test of the continuity of mineralization between DDH A31 (Section 752+00) and DDH A34 (Section 662+00 NW) in Don Valley. These locations are also on the projections of the trend of the better grade mineralization.

(2) Proposal for the more Extensive Drilling Program

The objective of this drilling is to test for extensions of the mineralization encountered in 1975 and 1976. Table 1 gives the estimated range of depths for each hole listed in the recommended sequence of drilling and the costs based on the 1976 Anniv figure of $53.50 per foot (Breakdown 4). Past performance suggests approximately 2,600 feet of drilling per month per drill can be expected.

for each DDH. This data was plotted and contoured using the computer.

Category B

Drilling in this category is laid out to test the continuity and grade of the mineralization to the south-east downhill between DDH A31 (Section 752+00 NW) and DDH A34 (Section ≃ 662+00 NW). The two minimum program holes are included in this category B drilling.

Category C

The holes in this category are to test for Pb/Zn mineralization south of the 1976 drilling grid and less than 1,000 feet deep. In the event of a mining operation all Pb/Zn mineralization that is less than 1,000 feet deep would be above a drive collared in Don Creek.

Category D

These holes are proposed to check the possibility of two mineralized zones as a result of a repeated depositional sequence or as a result of thrust faulting. The tabulated hole depths are based on completing the holes in the Transition Zone of the Wavy Banded Limestone. All the holes in this category will be the continuation of holes in other categories.

Category E

The holes in this category are intended to fill in more information in the favourable areas between the 1976 drill holes.

Category F

Category F drilling is to test the "A11, A12, A16 fault block" area for the possibility that it was downfaulted and the Pb/Zn mineralization is at depth rather than the 1976 field assumption that the "Block" was upfaulted and the Pb/Zn was eroded.

the West (i.e., towards the OP area) of the 1976 Anniv drilling.

Costs

i) Minimum Drilling Proposal

Assuming a helicopter is based at the XY camp, it appears to be less expensive to expedite a 1,200 foot minimum drilling program from there than to open up the Anniv camp for 4 to 5 weeks for this possible drilling program, the OP corridor claims survey, and the possible OP trenching.

Summary of Cost Estimates

	Based at XY Camp	Based at Anniv Camp
Drilling (Breakdown 1)	29,160	29,160
Helicopter (Breakdown 2)	16,000	
Helicopter (Breakdown 3)		16,160
Cook (Breakdown 3)	0	4,680
Camp Asst. (Breakdown 3)	0	1,246
Extra Fuel (Breakdown 3)	0	200
	45,160	51,446
OP Claim Survey,Wages		
OP Trenching (OP 77 Proposal)	3,405	3,405
TOTAL COST:	48,565	54,851

The average depth costs are 23% higher than the minimum depth costs and 16% lower than the maximum depth costs, on average for all the proposed holes from #1 through #41.

1	742+00	(A33)-60°/250S	B	325	325	325				
2	712+	1000S	B	450	550	500	775	775	825	441,238
3	712+	2500S	B	600	750	675	1375	1525	1500	80,250
4	742+	1500S	A+D	1000	1200	1000	2375	2725	2500	133,750
5	752+	1100S	C	700	950	825	3075	3675	3325	177,888
6	772+	1250S	C	700	1500	1100	3775	5175	4425	236,738
7	802+	1250S	C+D	600	1100	850	4375	6275	5275	282,213
8	822+	750S	H	550	750	650	4925	7025	5925	316,988
9	852+	1250S	H	550	650	600	5475	7675	6525	349,088
10	852+	2000S	H	775	1425	1100	6250	9100	7625	407,938
11	742+	750S	A	800	800	800	7050	9900	8425	450,738
12	742+	2500S	A	1000	1150	1075	8050	11050	9500	508,250
13	732+	1000S	B	600	700	650	8650	11750	10150	543,025
14	722+	1000S	B	450	550	500	9100	12300	10650	568,438
15	702+	1000S	B	400	500	450	4500	12800	11100	593,850
16	692+	1000S	B	325	425	375	9825	13225	11475	613,913
17	682+	1000S	B	250	350	300	10075	13575	11775	629,963
18	662+	1750S	B	400	800	600	10475	14375	12375	662,063
19	662+	1000S	B	800	1500	1150	11275	15875	13525	723,588
20	672+	1000S	B	800	1600	1200	12075	17475	14725	787,788
21	682+	2500S	B	500	500	500	12575	17975	15225	814,538
22	722+	00S(BC)	B	200	250	225	12775	18225	15450	826,575
23	742+	3500S	A	1000	1850	1425	13775	20075	16875	902,813
24	752+	2000S	A	600	1400	1000	14375	21475	17875	956,313
25	757+	500S	E	500	700	600	14875	22175	18475	988,413
26	762+	1250S	C	700	1100	900	15575	23275	19375	1,036,563
27	782+	1500S	C	1100	1300	1200	16675	24575	20575	1,100,763
28	792+	1250S	C	500	800	650	17175	25375	21225	1,135,538
29	812+	1250S	C	900	1100	1000	18075	26475	22225	1,189,038
30	832+	1000S	H	550	750	650	18625	27225	22875	1,223,813
31	842+	1000S	H	600	700	650	19225	27925	23525	1,258,588
32	862+	1750S	H	600	750	675	19825	28675	24200	1,294,700
33	872+	2000S	H	600	750	675	20425	29425	24875	1,330,813
34	852+	2750S	H	1100	2100	1600	21525	31525	26475	1,416,413
35	812+	3000S	G	1500	2500	2000	23025	34025	28475	1,523,413
36	807+	00(BC)	E	300	450	375	23325	34475	28850	1,543,475
37	797+	00(BC)	E			300	23625	34775	29150	1,559,525
38	787+	250N	E,D	300	500	400	23925	35275	29550	1,580,925
39	767+	500N	F	400	600	500	24325	35875	30050	1,607,675
40	757+	00(BC)	E,D			500	24825	36375	30050	1,634,425
41	767+	3000S	G	1200	2050	1625	26025	38425	32175	1,721,363
							10 Drill months	15 Drill months	12 Drill months	

TABLE #1

	Total Charges	$/ft. Drilled
Drill Charges (118)	$259,279.91	$22.36
Assay	4,495.15	.42
Site Prep. ($8,413.87 x 60%)	5,048.32	.47
Fuel (1 gal./2 ft) $2.10 gallon	11,228.18	1.05
TOTAL:	280,051.56	$24.30

Breakdown #1

	Total Charges	$/ft. Drilled
All Costs (362) Anniv	$646,564.06	$60.46
Less Surv. C. Oper.	3,250,00	0.30
Less Main Acc. Road	13,253.14	1.24
Less Environ. Cost	20,307.21	1.90
Less Prop. Exp.	36,736.47	3.44
= Drill Camp Costs	$599,433.74	$53.58

Breakdown #4

- 1 Geol. and Cat. SK. AM (Drill) XY-Anniv-XY 15 min/trip for 1/2 x 20 days x $300/hour	750
- 2 Surv. & 1 Geol. & 1 Cat AM (OP) XY-OP-OP-XY 25 min/trip for 10 days x $300/hour	$1250
- 4 Survey PM XY-Anniv Sling-OP-XY 25 min/trip for 30 days x $400 per hour	3750
- 2 Surv. & 2 Drill PM XY-OP-Anniv-XY 25 min/trip for 20 days x $300/hour	2500
- 1 Geol & 1 Cat SK PM (Drill XY-Anniv Sling-Anniv-XY 20 min/trip for 1/2 x 20 dyas x $300/hour	1000
- 2 Surv. & 1 Geol. & Cat PM (OP) XY-OP Sling-OP-OP-XY 25 min/trip for 10 days x $300/hour	1250
HELICOPTER COSTS	$16000

The above includes 50 possible XY-Anniv/OP Sling trips

- Require 10 x 2 bbl sling trips to Anniv
- Require 7 x 1000 lb mud sling trips to Anniv
- Require 3 x 2 bbl sling trips to OP
- Require 1 x 75 core box sling trips to Anniv

∴ Require 21 XY and Anniv/OP sling trips

TOTAL XY BASED COST COMPARISON $16000

Breakdown #2

-	2 Surv. + Geol. Anniv Cp. -OP-OP-XY 10 d. x 20 min/trip x $300/hour	1000
-	Camp set up and down & drill repair XY-A-XY 7 d. x 15 men/trip x $300/hour	525
-	PM Ferry XY-OP 30 d. x 15 min/trip x $300/hour	2250
-	3 Surv. P. OP-Anniv-OP 20 d. x 12 min/trip x $300/hour	1200
-	3 Surv. OP-Anniv- Cp. 20 d x 6 min/trip x $300/hour	600
-	2 + 2 Drill Anniv Cp. - Anniv Drill-Anniv Cp 20 d x 10 min/trip x $30/hour	1000
-	4 Surv. OP-OP-Anniv Cp. 10¢ x 10 min/trip x $300/hour	500
-	2 Surv. + Geol + 1 Cat Anniv Cp -OP-OP-Anniv Cp. 10d x 18 min/trip x $300/hour	900
-	4 Ferry XY-OP will be sling fuel 4 d x 88 min/trip x $300/hr.	160
-	Camp set-up-knock-down-drill repair YX-A-XY 7 d x 15 min/trip x $300/hour	525
-	Ferry Anniv Camp - XY 30 d x 10 min/trip x $300/hour	1500
	Helicopter Costs	$16,160

The above includes 66 possible XY-Anniv/OP Sling trips

- Require 21 XY-Anniv/OP trips for fuel, mud, core boxes for dilling and Cat
- Require 20 XY-Anniv trips for food, tents, propane, assuming no previous fixed-wing haul.

b) Surface Geology

No future surface mapping is proposed at this time since the area was saturation mapped by J.M. Morganti in 1975, using stadia control for location.

There may have to be some re-interpretation of the outcrop rock types when related to core recovered from subsequent drilling.

c) Geophysics

i) Objectives

The objectives of future geophysics should be to fill in rock type and structural data obtained by using shoot-back EM and VLF in areas that are not ameanable to soils geochemistry and are nearly 100% covered.

ii) Proposals

It is proposed that the shoot-back EM and VLF geophysical survey be completed prior to the start of drilling since the geophysical results will refine the sub-crop data and possibly dictate a change in hole locations.

It is suggested that the Geophysical survey be given priority to diamond drilling in the event of fund restrictions limiting the program. The following proposals are taken from R.A. Rivera's outline of 1977 recommendations for geophysics at Howards Pass, June 18, 197$\not{b}$, points 2 and 4.

"2) Extend the Anniv grid eastward from line 45W to 1,000 feet east of reconnaissance line A, in Don Valley, using a 1,000 foot line spacing. This will give geological control to what promises to be a very important area. The Active Zone is known to be present here and the beds appear to undulate gently over a very large area. If ore is found it is very likely to be shallow enough for open pit mining. About 18 line miles would be involved in this survey."

2) Extend Anniv grid eastward from Line 45W (Section 732+00) to ≈ line 667 + 00 18 line miles shootback EM + VLF cost.

18 miles at $18,000 for 30 miles - $10,800

4) Extend Anniv grid westward

1.5 line miles shootback EM and VLF Cost.

1.5 miles at $18,000 for 30 miles = $900

Total Geophysics $11,700

It is recommended that the geophysics survey be completed prior to drilling.

d) Geochemistry

No future geochemical soils surveys are proposed in the Anniv area.

The 1976 geochemical soils survey carried out between section 742 + 00 NW and Section 722 + 00 NW did show some anomalous results, but these anomalies can be explained either by swampy conditions and/or down slope dispersion especially for Zn.

e) Surveying

The Anniv claims have all been surveyed as have some of the R claims in the Anniv area. Some R, Don and OP claims along the southern boundary of the Anniv area may require surveying at some future date.

(1) test for the continuation of mineralization along strike between DDH A31, Section 752 (00) and DDH A34 in Don Valley, approximately Section 666 (00);

(2) to fill in the open areas in the 1976 drilled grid;

(3) to test for mineralization to a depth of approximately 1,000 in the area south of the 1976 drilled grid (Table 3, proposed hole locations and 1" = 400' scale map of proposed hole locations.)

The programme will require 2 or 3 diamond drills that will drill a total of 17,500 feet and is estimated to cost $875,000.

Category #1

This drilling is designed to test for the continuation of mineralization along strike between DDH A31, Section 752 (00) and DDH A34, in the Don Valley Section 666 (00) approximately. The soils geochemistry and the geophysics indicate that the Howards Pass Formation which contains the Active Zone and the Pb-Zn mineralization probably continues along strike between DDH A31 and DDH A34.

The estimated footage is 6,300 feet in 13 holes on 6 lines 1,000 feet apart with 2 holes 500 feet apart per line.

Category #2

The drilling in this category is designed to test those areas that appear geologically favourable within 1976 Anniv drilled area that were not drilled during 1976. The geophysics has helped refine the geologic picture within the 1976 drill grid area.

The geophysics and geology in this area indicate that the stratigraphy is favourable and that all the holes will be collared well above the Howards Pass Formation.

Since these holes will be collared high in the section it may be advisable to drill the top of the hole using rotary or down the hole hammer methods to increase production and minimize hole deviation.

The total estimated footage is 6,600 feet in 7 holes spaced 1,000 feet apart on 7 lines on a longitudinal section line 1,250 feet south of the Anniv reference line south of the 1976 drilling between Sections 752 (00) and 812 (00).

692+00	500S	600		
	1000S	600		
702+00	500S	600		
	1000S	600		
712+00	500S	600		
	1000S	600		
722+00	250S	600		
	750S	600		
732+00	250S	600		
	500N	600		
742+00	225S	300	Complete A33	
		6300	Feet	6300 feet

Category 2 Drilling

742+00	250N	400		
	750S	400		
752+00	000	400		
	250N	400		
757+00	000	400		
	500S	400		
762+00	---	---		
767+00	---	---		
772+00	---	---		
777+00	---	---		
782+00	---	---		
787+00	250N	400		
792+00	000	500		
797+00	000	600		
802+00	000	700		
		4600	Feet	4600 feet

Category 3 Drilling

752+00	1050S	1000		
762+00	1250S	1000		
772+00	1250S	1000		
782+00	1250S	1000		
792+00	1250S	800		
802+00	1250S	800		
812+00	1250S	1000		
		6600	Feet	6600 Feet
		TOTAL FEET		17500 Feet

delineate the mineralization and to gain more information about the geology and structure of the area between the two mineralized outcrops. It is proposed that 4 holes be drilled in the area of the OP claims (No's 7, 8, 9, 10, 11 and 12) which is in the area of the 1975 and 1976 drilling. It is suggested that two 50 foot holes be drilled on each of the section lines that lay 1,000 feet east and west of Section 1000 + 00 that was drilled in 1976.

It is further recommended that about 2 miles of soils geochemistry be carried out to fill in the area that was not previously soil sampled. This program will consist of 2,000 feet of drilling and 2 line miles of soils geochemistry at an estimated cost of $120,000.

metallurgical work;

(2) check diamond drill results with respect to grade and continuity;

(3) obtain detailed structural information not readily available by diamond drilling;

(4) obtain data on ground conditions so that various mining methods may be designed and evaluated;

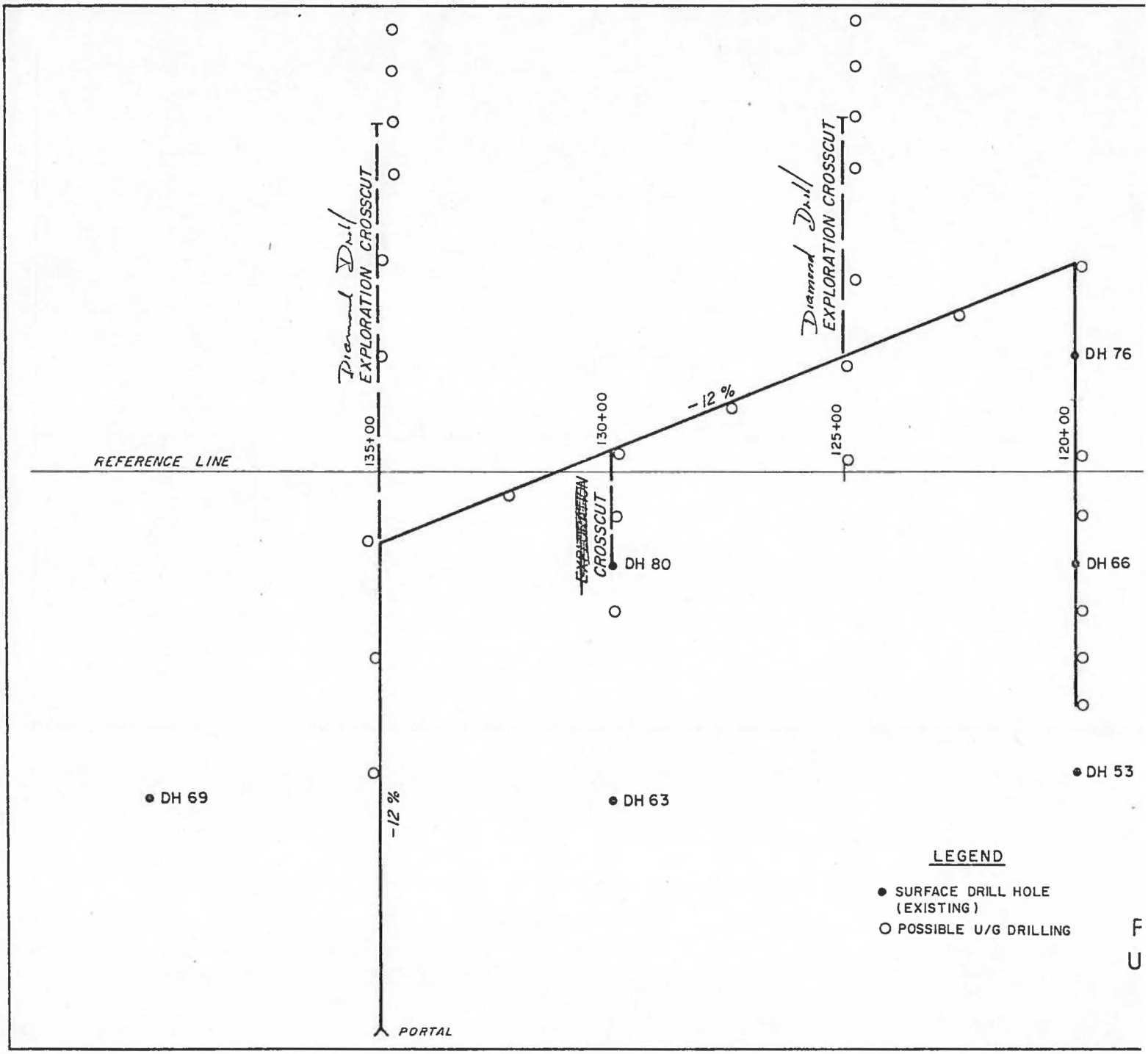
(5) obtain data on dilution to be expected for various mining methods;

(6) provide access for drilling areas of deep mineralization which cannot feasibly be drilled on a close pattern from surface.

The preliminary proposal is to drive a 14 foot by 14 foot decline at -12% for approximately 3,500 feet (See Figure). Crosscuts are proposed to provide access for underground diamond drilling as shown. Cut-outs for mucking and diamond drilling would be provided at suitable intervals throughout the length of the drift.

The principal objectives of the underground program require the drift to be in mineralization for some distance. This distance would be dependent on information gained in the next 12 months, but would probably be in the range of 300 to 500 feet. This length should provide sufficient data to prepare an adequate bulk sample and to evaluate mining conditions. Additional crosscutting of mineralization may be required after the initial openings have been established, if more data on ground conditions is needed. Because of the stratigraphic and topographic configuration in the area to be tested, it will be necessary to collar the drift in the Upper Siliceous Mudstone member, which is in the hanging wall. The hanging wall of the mineralized horizon would not be reached until the drift had been driven about 3,000 feet. The two exploration crosscuts which are designed to provide access for drilling the anticipated downdip extension of the high grade area, would be in the Flaggy Mudstone and Iron Creek Formation. A total of about 16,000

of $3,500,o00 to $4,000,000. This includes the cost of rockwork, setting up bulk sampling plant, and diamond drilling. Further refinements will be made to these estimates in the 1977 season.


Diamond Drill
EXPLORATION CROSSCUT
Diamond Drill
EXPLORATION CROSSCUT
135+00
130+00
125+00
120+00
REFERENCE LINE
-12 %
-12 %
DH 76
DH 80
DH 66
DH 53
DH 69
DH 63
PORTAL
LEGEND
SURFACE DRILL HOLE (EXISTING)
POSSIBLE U/G DRILLING