REPORT

ON

SAMPLING AND ANALYSIS

OF

SILICA DEPOSITS, CAMPANIA ISLAND

(CAMPANIA CLAIM)
RECORD NO. 19244

SKEENA MINING DIVISION

NTS 103H/3W
53 00'N, 129 20'W

Owner: FALCONBRIDGE LIMITED

Operator: FALCONBRIDGE LIMITED

F.R. HASSARD

JUNE 1988

SUMMARY

On June 24, 1987 the Campania silica deposit was examined and sampled by the writer, P.M. Manojlovic, and J.D. Fournier. The objective of the property visit was to collect further quartz samples to provide data on quality of the quartz occurrences with a view to future marketability. Five chip samples over 25.8 m were taken from the "A" zone, and two grab samples of beach sand were collected from lakeshores 2.8 and 4.0 km ENE of zone "A". Samples, whose weight averaged 3 - 4 kg, were shipped to Indusmin Industrial Centre, Markham, Ontario for chemical and mineralogical analysis.

Results suggest that samples of quartz from Campania Island are not suitable for producing high purity quartz, but may be acceptable for glass manufacture or decorative purposes.

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INTRODUCTION

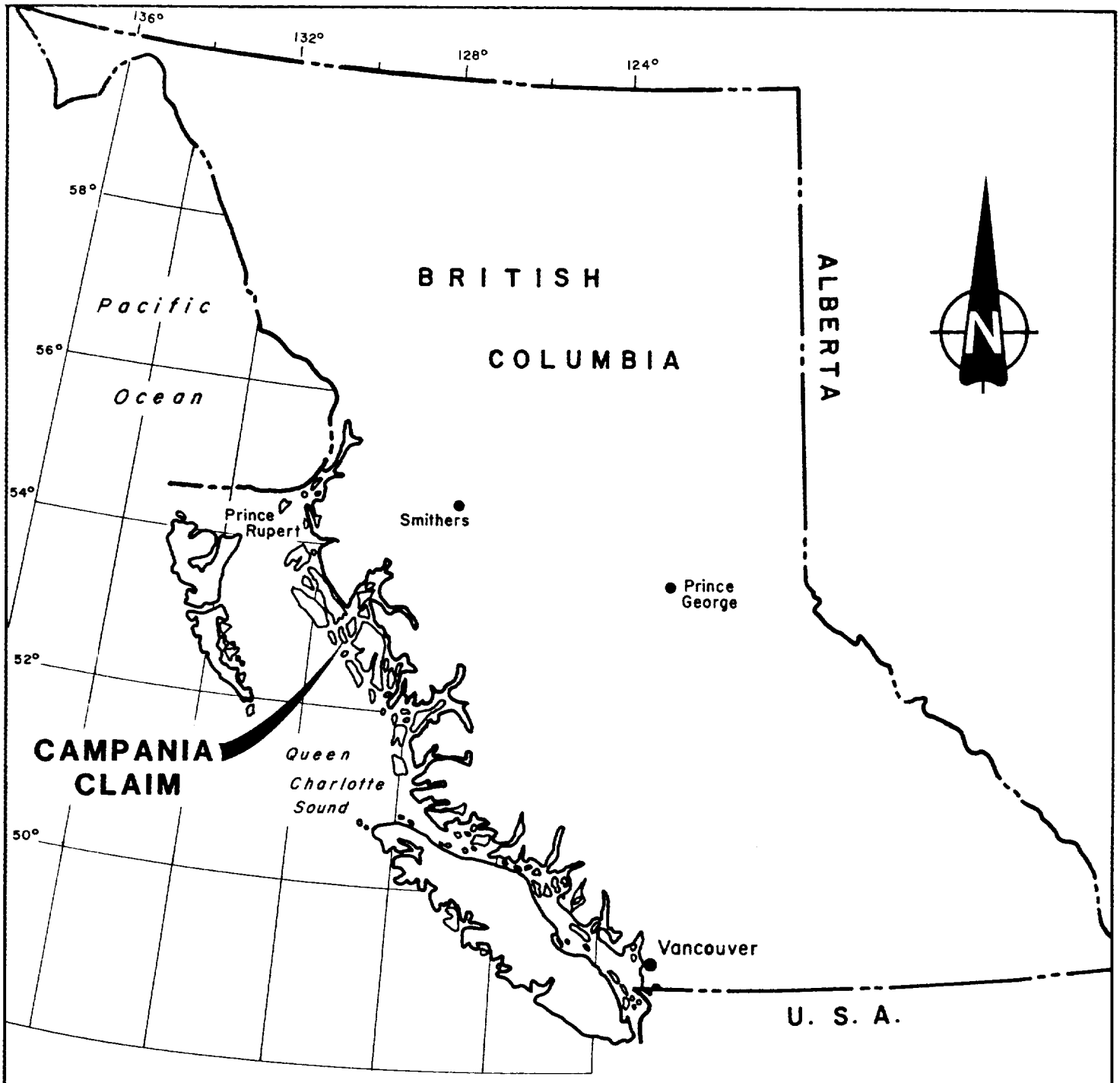
The silica deposits on Campania Island were examined and sampled by F.R. Hassard P.Eng., P.M.Manojlovic MSc., and J.D. Fournier BSc. on behalf of Falconbridge Limited on July 24, 1987. The purpose of the property visit was to sample quartz exposures and silica beach sands for qualitative tests of commercial viability. This report provides a brief historical background, description of quartz exposures, and details regarding the sampling completed in 1987. A Lab Report by Indusmin Limited on chemical and mineralogical analyses, and beneficiation tests carried out on samples is found in Appendix 1.

LOCATION AND ACCESS

Campania Island is located on the west coast of British Columbia, 645 km north of Vancouver, and 160 km south of Prince Rupert (Figure 1). The island is approximately 6.5 km wide and 24 km long. The Queen Charlotte Islands are located across Hecate Strait, 160 km to the west. Access to Campania Island is via boat or aircraft.

HISTORY

The Campania mineral claim (Rec. No. 19244) has been held by Falconbridge Limited since 1960, and covers massive quartz showings. In the past Deposit "A" has been mapped, trenched (one small trench near the north end of the large outcrop), and tested with one 10 m vertical hole (Figure 4).



FALCONBRIDGE LIMITED

CAMPANIA CLAIM

INDEX MAP

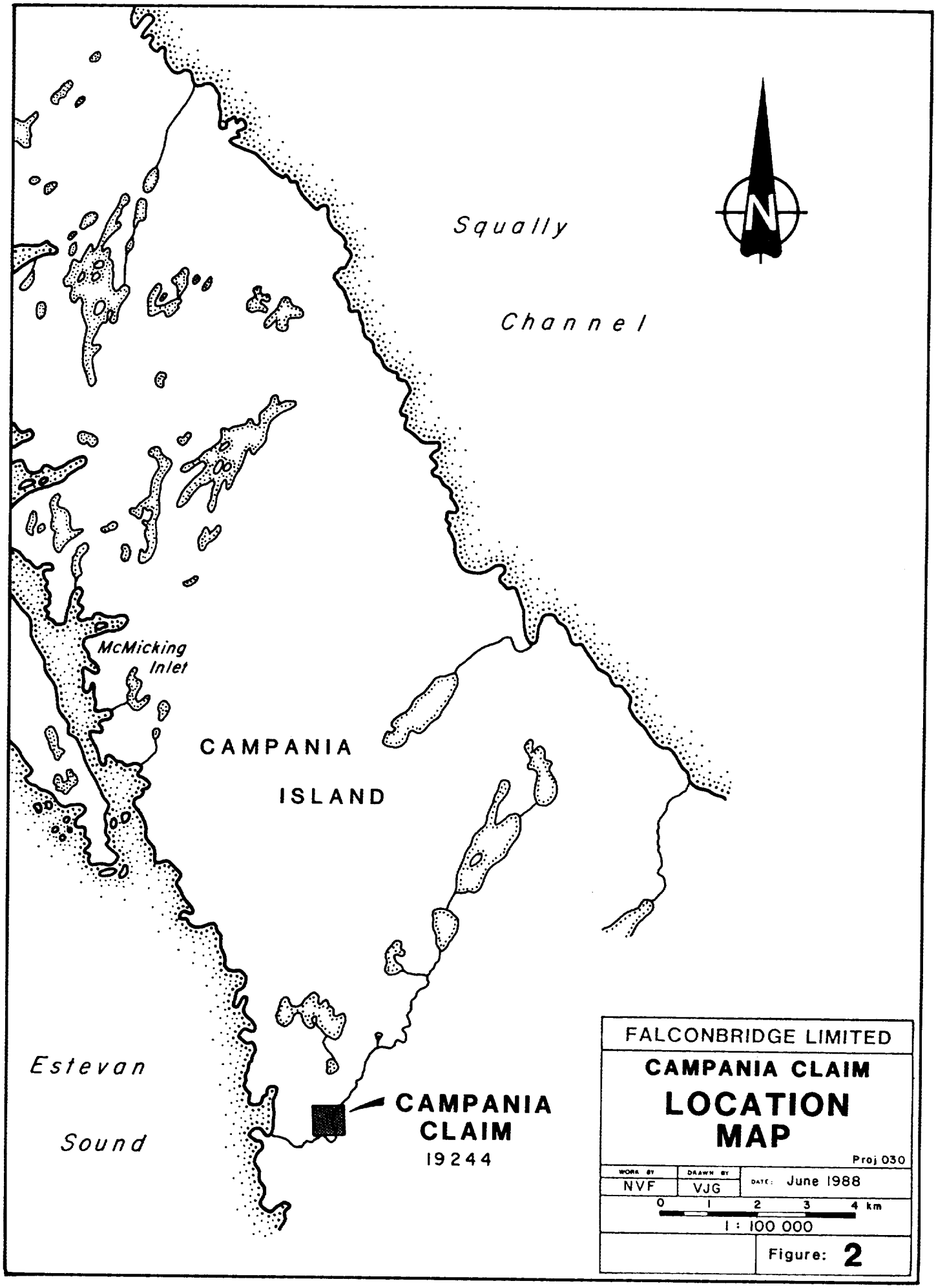
PROJ. 030

WORK BY	DRAWN BY	DATE.
NVF	VJG	June 1988

0 100 200 300 km

SCALE in kilometres 1 : 7,500,000

Figure: 1



FALCONBRIDGE LIMITED

CAMPANIA CLAIM

LOCATION MAP

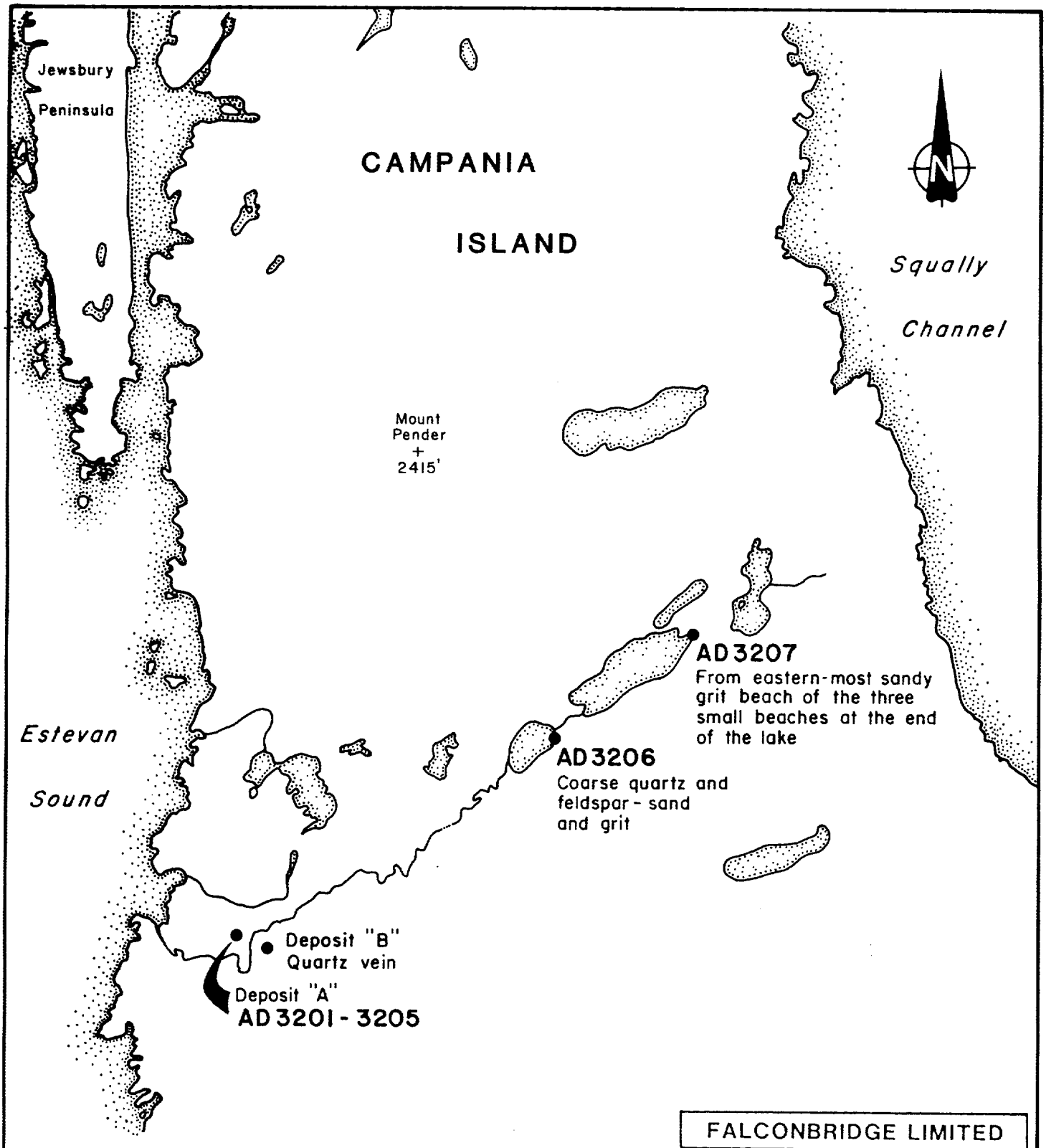
Proj 030

WORK BY	DRAWN BY	DATE: June 1988
NVF	VJG	

0 1 2 3 4 km

1 : 100 000

Figure: **2**



From report by E.J. Stephen (April 1963)

FALCONBRIDGE LIMITED

CAMPANIA CLAIM

QUARTZ DEPOSITS

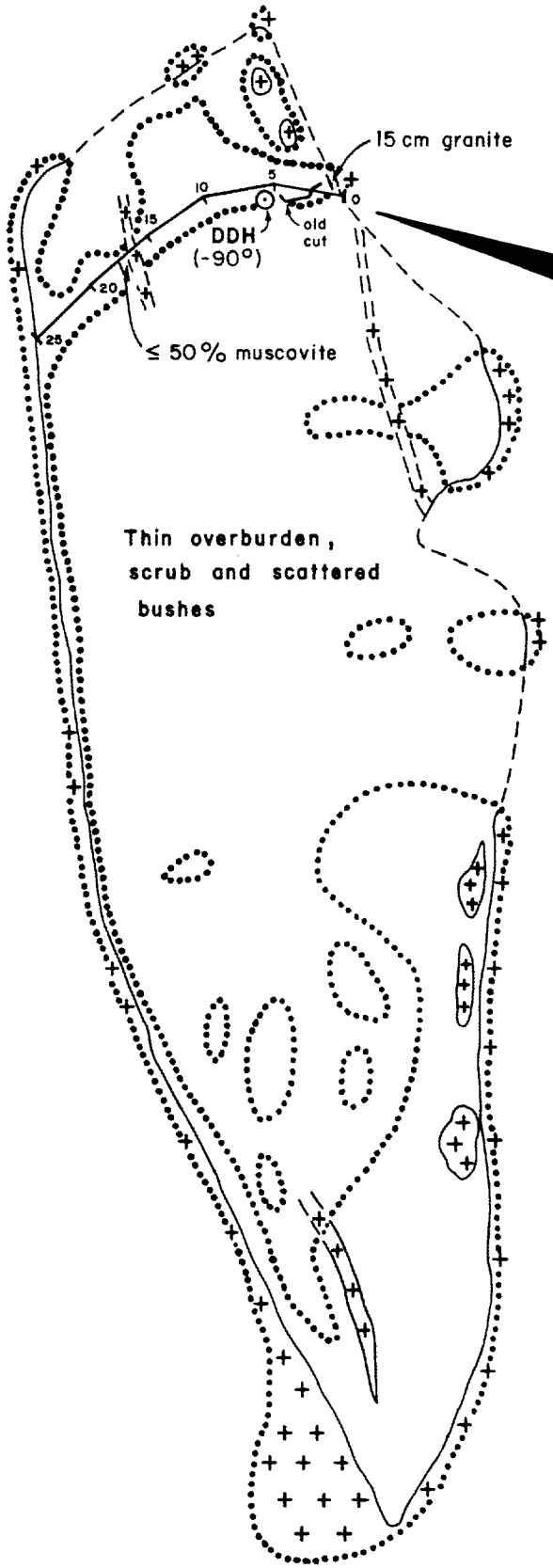
Proj 030

WORK BY	DRAWN BY	DATE: June 1988
NVF	VJG	

0 0.5 1 mile

1.5" ≃ 1 mile

Figure: **3**



Sample No.	From	To	Length (metres)
AD 3201	0.0	5.0	5.0
AD 3202	0.5	10.0	5.0
AD 3203	10.0	15.0	5.0
AD 3204	15.0	20.0	5.0
AD 3205	20.0	25.8	5.8

LEGEND

- Outcrop
- Quartz
- \+ Granite

Geology after A.A. Allen (1963)

FALCONBRIDGE LIMITED

CAMPANIA ISLAND

"A" DEPOSIT QUARTZ POD SAMPLES-1987

PROJ. 030

WORK BY	DRAWN BY	DATE. June 1988
NVF	VJG	

0 1 2 3 4 m

SCALE IN METRES 1 : 480 , 1" = 40'

Figure: **4**

SILICA DEPOSITS

Campania Island is underlain by the Coast Range Intrusive Complex, locally composed of granite. One important, and two minor quartz showings occur approximately 800 m from the west coast, 9.5 km from the south end of the island. An unnamed creek makes a hairpin bend to the south at the location of the quartz outcrops (Figure 2).

The "A" deposit, the largest quartz outcrop, is dome shaped, with its long axis striking 10 degrees west of north. The outcrop is 104 m long and up to 30 m wide, and rises 17 m above the lowest exposure at the north end. Approximately 50% of it is covered by a thin veneer of overburden. Best exposures are on the north end and southeast half, although nearly all of the west contact, and 60% of the east contact is exposed. Both contacts appear to dip from 70 to 90 degrees. At the north and south ends the quartz body narrows to a point.

The quartz is white and translucent to opaque. No apparent variation was observed throughout the exposed part of the deposit. Numerous fracture and strain lines in various directions were noted. Visually only minor impurities were observed which consisted of a band of muscovite and weak disseminations of mica. Inclusions of granite occur throughout the quartz, and appear to be most numerous near the southeast end of the outcrop.

Several small irregular quartz outcrops occur 65 m west of the main exposure, and three additional outcrops of quartz lie 150 m to the east. All are small and contain intermixed granite.

Silica beach sand occurrs on the east shore of two lakes which lie 2.5 and 4.0 km east of the main quartz showing (Figure 2).

SAMPLE PROCEDURE

Five chip samples were collected ove a total length of 25.8 m. Samples were obtained by using a hammer and chisel. Roughly uniform chips were taken along a painted line, each sample weighed approximately 3-4 kg. Sample number and length are shown on Figure 3. Samples were sent to Indusmin Technical Centre, 2651 John St. Markham Ontario for analysis.

Sample Data

Sample No.	From	To	Length	Azimuth	Description
AD 3201	0.0	5.0	5.0m	100	0.0 - 0.2m quartz 0.2 - 0.35m granite 0.35 - 5.0m quartz
AD 3202	5.0	10.0	5.0m	080	quartz
AD 3203	10.0	15.0	5.0m	055	quartz
AD 3204	15.0	20.0	5.0m	050	15.8 - 16.6m granite
AD 3205	20.0	25.8	5.8m	045	quartz
AD3206	Grab sample of beach sand 2.8 km ENE of Zone "A"				
AD3207	Grab sample of beach sand 4.0 km ENE of Zone "A"				

RESULTS AND CONCLUSIONS

Chemical analysis of samples from the "A" deposit suggest that the quartz cannot be used to produce High Purity Quartz because Al_2O_3, associated alkalies and TiO_2 are too high.
Two types of quartz are developed in Zone "A"

1) massive
2) granular (groundmass type)

1) The massive quartz is white and usually clear. Minor amounts of muscovite, kaolin, and local hematite noticeable as a light red stain are the only contaminants visible in the quartz. However detailed microscopic examination shows that this quartz also contains inclusions of muscovite, zircon, apatite, and perhaps othe minerals, as well as numerous bubbles.

2) The granular quartz appears impure since it is often stained by iron oxide and algae. It has a fine grained aggregated appearance. It is referred to as "groundmass" type because it usually fills spaces between coarse, massive quartz in pegmatites. This type of quartz contains considerably higher percentages of mineral impurities, which are usually trapped between the quartz grains or found in inclusions.

The mineral inclusions, some of wich were identified as zircon,rutile,apatite, pyroxene, sericite, and feldspars were found primarily in the fine grained "groundmass" type of aggregated quartz, which forms up to 30% of the total quartz.

The two samples of beach sand, as well, are too high in impurities to be acceptable. The quartz from both localities may be suitable for glassmaking or decorative purposes. Refer to Appendix 1 for details of analytical procedures and results.

REFERENCES

A.R. Allen P.Eng. - Report on the Campania Island Silica Deposits for the Canadian Western Syndicate. April 1963

STATEMENT OF COSTS

LABOUR		
F.R. Hassard	1 day @ $250/day	$ 250.00
P.M.Manojlovic	1 day @ $125/day	$ 125.00
J.D. Fournier	1 day @ $ 95/day	$ 95.00
HELICOPTER		
Okanagan Helicopters 1.5 hrs @ $500/hr		$ 750.00
ANALYTICAL		
Indusmin Technical Labs. Mineralogical,Analytical testing		
Bench work 31 hr @ $26/hr.		$ 806.00
Chemical & Mineralogical Analysis 54 hr. @ $26/hr.		$1,404.00
Report Prep.	14 hr. @ $30/hr.	$ 420.00
REPORT		
Data compilation, writing, drafting		$ 350.00
	TOTAL EXPENDITURES	$4,200.00

STATEMENT OF QUALIFICATIONS

I, Franklin R. Hassard, of Noranda, Quebec, do hereby certify that:

I am a Senior Exploration Geologist with Falconbridge Limited at #8 Rue Doyon, C.P. 1056, Rouyn-Noranda, P.Q., J9X 5C8

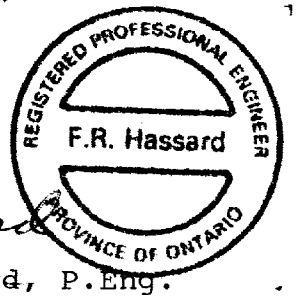
I am a graduate of the University of British Columbia with a B.A.Sc. degree in Geological Engineering (1970).

I have practised my profession for over 17 years.

I am a member of the Association of Professional Engineers of Ontario and a Fellow of the Geological Association of Canada.

Work described in this report was carried out under my supervision by competent personnel listed in Appendix II.

Dated this 20 day of June, 1988 at Noranda, Quebec.



F. R. Hassard

Franklin R. Hassard, P.Eng.

APPENDIX I

ANALYTICAL RESULTS

indusmin limited

OFFICE MEMORANDUM

To: L. Heymann / E. Yates

Date: March 9, 1988

From: G. Gerritse

Location: W.O. 2104
chg. 05 320 780

Re: Compania Island Quartz Samples

Five samples of "quartz chips" were received for evaluation for high purity silica along with two samples of "beach sand" for evaluation as a glass sand.

These samples were taken on Compania Island by Frank Hassard of Falconbridge at the request of Dale MacGregor.

The samples were identified as follows:

Lab# 7708	Compania "A" 0-5 m	(AD3201)	Quartz chips
Lab# 7709	Compania "A" 5-10 m	(AD3202)	Quartz chips
Lab# 7710	Compania "A" 10-15 m	(AD3203)	Quartz chips
Lab# 7711	Compania "A" 15-20 m	(AD3204)	Quartz chips
Lab# 7712	Compania "A" 20-25.8m	(AD3205)	Quartz chips
Lab# 7713	Compania Sand #1	(AD3206)	
Lab# 7714	Compania Sand #2	(AD3207)	

A - Compania Island Quartz Chips Results

Based on the chemical analysis of the leached composites after flotation and high intensity magnetic separation, (see Table 4) it is obvious that this quartz cannot be upgraded to High Purity Quartz.

Al_2O_3 and associated alkalies plus TiO_2 are too high.

A cursory mineralogical examination of the leached composite products shows the presence of numerous mineral inclusions and bubbles in the quartz grains. The mineral inclusions, some of which were identified as zircon, rutile, apatite, pyroxene-augite, sericite-mica and feldspars were found especially in the fine-grained "groundmass type" of aggregated quartz, which forms upto approximately 30% of the total quartz material.

Beneficiation

Each sample was jaw and rolls crushed to produce a -30 mesh product which was then sampled. The -140 mesh fraction was then removed to produce a -30+140 mesh product. Both products were then subjected to LIMS to remove abraded iron which was followed by chemical analysis.

Table 1

Recoveries

	-30+140 mesh	-140 mesh
Lab# 7708	93.6 %	6.4 %
7709	87.9	12.1
7710	89.8	10.2
7711	87.1	12.9
7712	86.8	13.2

Table 2

Chemical Analysis

		Fe_2O_3	Al_2O_3	Na_2O	K_2O	CaO	MgO
L#7708	-30 M	0.040	0.39	0.028	0.127	32	74
	-30+140 M	0.035	0.32	0.011	0.112	12	73
L#7709	-30 M	45	440	56	92	15	6
	-30+140 M	35	370	43	75	9	5
L#7710	-30 M	32	300	36	45	13	2
	-30+140 M	18	290	34	41	12	2
L#7711	-30 M	0.146	1.84	0.46	0.29	0.15	0.030
	-30+140 M	0.127	1.78	0.44	0.28	0.14	0.029
L#7712	-30 M	54	540	76	91	27	8
	-30+140 M	52	540	80	104	29	8

NOTE: Whole numbers = ppm; fraction numbers = %

In order to reduce the number of samples which would be subjected to further beneficiation, composites were prepared by combining samples 7708 and 7709 to produce composite #1 and then 7710-7712 to produce #2.

Proximity to each other and mineralogy were the basis of these two composite make-ups and not the chemical composition which flotation would take care of.

Beneficiation of the two composites consisted of crushing the -30+50 mesh fractions to -50 mesh and removing the -140 mesh fines to produce -50+140 mesh LIMS products for flotation.

The two composites were then subjected to mica, garnet and feldspar flotation as per procedures in Spruce Pine.

The quartz concentrates were then subjected to HIMS (one pass) prior to leaching as per tests performed on the Spruce Pine High Purity Quartz.

Table 3

Recoveries

Crushing - Sizing	Comp. #1 (7708-7709)	Comp. #2 (7710-7712)
-30+50 M	1.3 %	1.4 %
-50+140 M	73.8	74.9
-140 M (plus dust)	24.9	23.7
Flotaion	**Stage Rec. (losses)**	**Stage Rec. (losses)**
Mica	(1.0)	(2.4)
Garnet	(2.2)	(2.4)
Feldspar	(1.5)	(2.1)
Quartz	90.8	85.7
Scrubbing and residual losses	(6.2)	(7.4)
Total Recovery	60.8 %	56.4 %

Table 4

Chemical Analysis

Leached Flotation Products

	Comp. #1		Comp. #2	
	Oxide	Element	Oxide	Element
Fe_2O_3	0.8 PPM	0.6 PPM	0.8 PPM	0.6 PPM
Al_2O_3	130.0	69.0	138.0	73.0
Na_2O	14.0	10.0	14.0	10.0
K_2O	13.0	11.0	16.0	13.0
CaO	1.2	0.9	1.5	1.1
MgO	0.1	<0.1	0.1	<0.1
Li_2O	2.8	1.3	3.0	1.4
TiO_2	6.0	3.6	7.0	4.2

Note: Composite samples -50+140 Mesh which had been subjected to only HIMS and leaching (no flotation) gave virtually the same results as above.

Mineralogical Analyses

The Compania Island Quartz chip samples are represented predominantly by a candle-white massive-vein type of quartz, originating in a muscovite-gneiss body.

The microscopical examination of the five samples L#7708-12 showed that the quartz is developed in two forms: 1. massive and 2. granular (a"groundmass" type of quartz).

1. The massive, candle-white quartz usually appears very clear. Minor amounts of muscovite, kaolinized feldspar and locally occuring hematite, noticeable as a light reddish stain are the only contaminating minerals visible on the quartz chips. However, detailed microscopical examination showed that this quartz also contains inclusions of muscovite, zircon, apatite and perhaps other minerals as well as numerous bubbles.

2. The granular quartz looks impure since it is often stained by iron oxides and algae. It has fine-grained aggregated nature. (Each grain of this type of quartz in -30+140 mesh product is composed of several small grains of quartz more or less tightly attached). This quartz is called the "groundmass" type, because it usually fills the space between the coarse massive quartz in pegmatites; in the vein quartz, it fills small veinlets and fractures. This type of quartz contains considerably higher amounts of mineral impurities, which are usually trapped in between the quartz grains or found in the form of inclusions.

The "groundmass", granular quartz represents approximately 30% of the total quartz in the samples L#7710 to 12. Sample L#7708 and 7709 contained approx. 20% of this type of quartz. Mineral contaminants found associated with this granular quartz were mainly heavy kaolinized feldspars (microcline and plagioclase), muscovite and zircon. Rutile, apatite and pyroxene-augite were present as inclusions within the quartz grains. Bubbles and gass-liquid inclusions were found in great abundance in this type of quartz.

B - Compania Island Sand Results

Both samples after HIMS contained 50 -55% quartz with Fe_2O_3 values well above the 0.1% mark.

Flotation, as per the Spruce Pine method, yielded quartz concentrates containing approx. 0.06% Fe_2O_3 and 20-25% Feldspar. The feldspar content (Al_2O_3, Na_2O, K_2O and CaO) could have been lowered somewhat by crushing to -40 mesh or even -50 mesh prior to flotation since a large portion of the feldspar in the quartz concentrates was unliberated. Weathering of the feldspar is also suspected to have made flotation less effective.

Lowering the feldspar content in the quartz concentrates would almost certainly lower the Fe_2O_3 values.

The plus 10 mesh fractions were excluded since they contained only about 35% quartz but about 65% feldspar.

Beneficiation

Both samples, Compania Sand No.1 and No.2, were screened to remove the +10 mesh fractions. The amount of +10 mesh sand in each was 1.2% and 10.3% respectively.

Sieve analysis of the two samples (-10 mesh) are as follows.

Table 1

Sieve Analysis

	Compania No. 1		Compania No. 2	
U.S. Sieve No.	Wt.%	Cum. Wt.%	Wt.%	Cum. Wt.%
-10+16	7.2	7.2	17.7	17.7
-16+20	14.6	21.8	15.7	33.4
-20+30	24.5	46.3	18.7	52.1
-30+40	22.7	69.0	20.8	72.9
-40+50	21.3	90.3	21.1	94.0
-50+140	9.6	99.9	5.9	99.9
-140	0.1		0.1	

Both samples of -10 mesh Compania Sand were then subjected to magnetic separation at approx. 1.5 TPH feed rate to produce -10 mesh HIMS products (2 HIMS passes).

This was followed by the removal of the -10+30 mesh fractions which were ground to -30 mesh. The -200 mesh fractions were then removed as was the abraded iron.

The resultant -30+200 mesh fractions were then recombined with the original -30 mesh material.

The -10 mesh and -30+200 mesh 2nd HIMS products were then subjected to chemical analysis.

Based on the chemical analysis and cursory mineralogical analysis it was obvious that both samples were too high in Fe_2O_3 and feldspar, so were subjected to flotation in an effort to upgrade to a glass grade sand.

Flotation tests were as per Spruce Pine flotation methods.

Table 2

Recoveries (Percent)

	Compania No. 1		Compania No. 2	
Sizing / Mag. Sep.	Stage Recov.	Total Recov.	Stage Recov.	Total Recov.
+10 M	1.1	---	10.3	---
-10 M	98.9	98.9	89.7	89.7
-10 M LIMS Mags.	0.2	---	0.2	---
-10 M Non-Mags.	99.8	98.7	99.8	89.5
-10 M HIMS Mags.	5.3	---	6.1	---
-10 M Non-Mags.	94.7	93.5	93.9	84.1
-200 M	6.3	---	8.5	---
-30+200 M	93.7	87.6	91.5	76.9
Flotation				
Mica	1.0	---	1.8	---
Garnet	1.8	---	2.1	---
Feldspar	17.3	---	7.7	---
Scavenger	9.0	---	20.0	---
Quartz conc.	64.0	56.1	58.9	45.3
Scrubbing and residual losses	17.4	---	23.7	----

Table 3

Chemical Analysis

Compania Sand No. 1 (L#7713)

	Fe_2O_3	Al_2O_3	Na_2O	K_2O	CaO	MgO	Calc. %Qtz
-10 M 2nd HIMS Prod.	0.136	11.3	3.44	1.84	1.50	0.030	53.0
-30+200 M 2nd HIMS Prod.	0.120	11.2	3.49	1.85	1.49	0.031	52.0
Feldspar conc.	0.118	21.1	6.28	4.68	2.74	0.024	5.5
Scavenger	0.141	20.3	6.80	2.67	3.07	0.027	11.0
Quartz conc.	0.059	5.8	1.96	0.88	0.85	0.015	74.0

Companis Sand No. 2 (L#7714)

-10 M 2nd HIMS Prod.	0.187	11.0	3.33	1.94	1.47	0.041	53.0
-30+200 M 2nd HIMS Prod.	0.154	10.7	3.20	1.87	1.42	0.033	55.0
Feldspar conc.	0.121	21.4	5.57	6.15	2.25	0.024	5.0
Scavenger	0.158	21.0	6.78	3.22	2.98	0.031	9.0
Quartz conc.	0.055	4.32	1.40	0.69	0.62	0.013	81.0

Mineralogical Analyses

The Compania Sand samples #1(L#7713) and #2(L#7714) look very similar to each other (sample #2 is somewhat coarser), therefore both will be described as one sample.

The -30+200 mesh fractions of both untreated samples were examined microscopically with the following results.

The Compania sand is composed of approximately equal amounts of angular glassy quartz and chalky-white heavily kaolinized feldspar, plus accessory minerals. The major accessory minerals found in the sand were biotite, muscovite, rutile, zircon, tourmaline and pyroxene.

Majority of the quartz grains appear glassy cleat, but commonly contain mineral inclusions of biotite, muscovite, needle-like rutile sagenite and fine inclusions of hematite. Quartz in both samples is poorly liberated from feldspar, especially in the +40 mesh fractions.

Examination of the quartz flotation HIMS products (-30+200 M) showed that 26% and 19% of residual feldspar is present in the quartz concentrates of samples #1 and #2, respectively. The major portion of the residual feldspar remaining in the quartz concentrates after flotation is present as unliberated grains intermixed with quartz. The "liberated" feldspar grains in the quartz concentrate seem to be almost entirely altered into kaolinite, therefore their response to the flotation process would be limited.

G. Gerritse

c.c.: File

APPENDIX II

PERSONNEL

Personnel	Title	Date on Property
FALCONBRIDGE LIMITED		
F.R. Hassard	Sr. Expl. Geol	July 24, 1987
P.M. Manojlovic	Geol/ Crew Chief	July 24, 1987
J.D. Fournier	Geologist	July 24, 1987
OKANAGAN HELICOPTERS		
G. Thomsen	Pilot	July 24, 1987