



Geological Survey Branch  
Assessment Report Indexing System



[ARIS11A]

ARIS Summary Report

Regional Geologist, Kamloops

Date Approved: 1999.04.30

Off Confidential: 1999.09.23

ASSESSMENT REPORT: 25842

Mining Division(s): Similkameen

Property Name: Cash

Location:	NAD 27	Latitude: 49 34 01	Longitude: 120 30 00	UTM:	10	5493267	680769
	NAD 83	Latitude: 49 34 00	Longitude: 120 30 04	UTM:	10	5493453	680684
	NTS:	092H09W					

Camp:

Claim(s): Cash 1-6

Operator(s): Canica Mineral Development Corp.  
Author(s): Hopper, Douglas H.

Report Year: 1999

No. of Pages: 26 Pages

Commodities Searched For: Volcanic Ash

General Work Categories: GEOC

Work Done: Geochemical  
~~SAM~~ Sampling/assaying (2 sample(s);)  
Elements Analyzed For : Multielement

Keywords: Volcanic ash, Zeolites

Statement Nos.: 3124810, 3126756, 3132287

MINFILE Nos.:

Related Reports: 24239

## ASSESSMENT REPORT

Geochemical testing of the zeolitized volcanic ash Cash 1-6, Claims, Map 92H058, for the betterment of the above rock by chemical leaching and crushing to various sizes, absorption and cation exchange capacity.

Mining Division, Similkameen

Map 92H058

North Latitude 49°-34'  
West Longitude 120° 30'  
Summers Creek, Area B.C.

Written by:

Douglas H. Hopper

For:

Douglas H. Hopper

Also included:

Zeolite Treatment Study

By:

Peter Tse, A.Sc.T.  
Process Research Associates Ltd.  
9145 Shaughnessy Street  
Vancouver BC V6P 6R9

February 8, 1999

GEOLOGICAL SURVEY BRANCH  
ASSESSMENT REPORT

25,842

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*PAGE 7* Road And Location Of Cash 1-6 Claims

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Zeolite Treatment Study by Peter Tse, Process Research *PAGE A, PAGES 1A-5A-10A*

*PAGE 7A* Certificate of Analysis PL 98K1258

*PAGE 8A* Certificate of Analysis PL 98I0951

*PAGE 9A* Certificate of Analysis PL 98G0760

*PAGE 10A* Certificate of Analysis PL 98H0882

*PAGE 11A* Certificate of Analysis PL 98L1358

*PAGE 9* Geochemical Analysis Certificates:  
July 20, 1998 #9802805  
November 18, 1998 #9802805R

*PAGE 10* Cash Claims Expenses

*PAGE 11* Statement of Qualifications for Douglas H. Hopper

### Location and access

The Cash claims are centered along the Summers Creek Road at a point of about 5 km north of its intersection with Highway 5 (road from Princeton to Merrit) and some 12 km due north of the town of Princeton. There are several other roads leading off the Summers Creek Road to the east and west. One other road from the separation leads to the southeast corner of Cash #3, in a northerly direction. It may prove to be good road to avoid Summers Creek for any work done.

The claims consist of 6 two-post claims, located along the Summers Creek Road and Summers Creek itself.

Claim Name	Record Number	Expiry Date
Cash 1	332276	November 2, 1999
Cash 2	332277	November 2, 1999
Cash 3	332278	November 2, 2000
Cash 4	332279	November 2, 2000
Cash 5	359687	October 11, 2000
Cash 6	359688	October 11, 1999

All the above claim posts are made from local trees, squared and cut off, with the correct claim tags.

The Cash claims 1-6 are owned by Nick Wychopin 30% and Douglas Hopper 70%. We each have private ownership papers between us.

The claims are located on Map 92H508. The north latitude is 49°-34' and the west longitude is 120° 30'. The intersection of these two coordinates is almost in the centre of Cash #3.

### Work done

A sample of volcanic rock taken from a slide area, west side of the road, 100 meters north of the #2 post of Cash 5 and 6 claims.

The material is an altered red volcanic with 5.74% iron, 48.34% SiO<sub>2</sub>, 3.24% Al, from the assays of 9802805, dated July 20, 1998.

This same sample was assayed again for the complete sample analysis. The sample assayed 48.34% SiO<sub>2</sub> versus Al<sub>2</sub>O<sub>3</sub>. The following calculations were done to find out the molecular ratio of SiO<sub>2</sub> versus Al<sub>2</sub>O<sub>3</sub>. See assay sheet 9802805R, November 18, 1998 assays for:

**SiO<sub>2</sub>.**

$$28 + (16)_2 = 28 + 32 = 60 \text{ molecular weight}$$

$$\frac{48.34 \text{ units of SiO}_2}{60 \text{ molecular weight SiO}_2} = 0.80 \text{ MOL SiO}_2$$

**Al<sub>2</sub>O<sub>3</sub>**

$$(26.98)_2 + (16)_3 = 53.96 + 48 = 101.96 \text{ molecular weight}$$

$$\frac{18.98 \text{ units of Al}_2\text{O}_3}{101.96 \text{ molecular weight Al}_2\text{O}_3} = 0.18 \text{ MOL Al}_2\text{O}_3$$

The SiO<sub>2</sub> gives a molecular assay value of 0.80 MOL and the molecular assay value of 0.18 MOL

$$\frac{\text{SiO}_2 = 0.80 \text{ MOL}}{\text{Al}_2\text{O}_3 = 0.18} = 4.44 \text{ MOL ratio}$$

This MOL ratio of the red volcanic rock of 4.44 MOL ratio agrees with the following:

<b>Zeolite</b>	<b>Si/Al Range</b>
Clinoptilolite	2.7 - 5.3
Heulandite	2.7 - 5.3

These two minerals occur together with clinoptilolite high potassium and heulandite with lower calcium, sodium and potassium levels.

<b>Zeolite</b>	<b>Si/Al Range</b>
Perrierite	3.2 - 6.2
Mordenite	4.4 - 5.5

However, these assays of 9802805R, assay sheet for the red volcanic rock with the SiO<sub>2</sub> 48.34% and Al<sub>2</sub>O<sub>3</sub> 18.98% assays is the total of these elements in the rock. Other minerals such as feldspar, mica and free quartz blebs will use up some of the assay values of the SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub>. To achieve actual mineral values of the rock, some thin section work must be done on some rock samples, that is, X-ray diffraction.

Additional assaying may be done to find out the actual cation exchange values of the rock to prove it is of zeolitic value.

## **Zeolitized volcanic ash economic potential**

Tan coloured rock: because the source is so large and it has been found out that this material is very good for fertilizer, with its time release for elements (high silica content). Golf courses, chicken feed, cat litter, fine grind for cow feed, are some of the most important uses. The cost per ton is between \$140 to \$145 Canadian per ton.

### **Purpose**

This chemical assaying and sampling has been done to see if the correct molarity could be achieved by acid leaching to arrive at a correct ionic exchange rate. A comparable assay was done and it was found out that the original material, the tan coloured coarse grained rock had an ionic exchange of 32.6 before the acid leach. The end point was 39.7 after the leaching. These numbers 32.6 and 39.7 are described as CEC value (MEQ/100GM).

A sample of the zeolitized volcanic ash was placed in an acid solution for a period of time to open the porosity (molecular) by removing some of the silica and the aluminum thus improving its catalytic and cation exchange qualities.

By acid leaching the sample with a molecular high  $\text{SiO}_2 / \text{Al}_2\text{O}_3$  ratio of 7.6 to a lower molecular ratio of 6.7.

This is described also in the report from Process Research Associates Ltd.

See the report "Properties of Natural Zeolites" pp. 353-370 by D.E.W. Vaughan, with special attention to p. 359 clinoptilolite and p. 363 mordenite.

See United States Patent Office Patent #3,374,182, dated March 29, 1968, Caustic Treated Zeolites, by Arthur Young. Our chemical procedures were adapted from this patent invention.

### **Deposit size**

The deposit of zeolitized volcanic ash can be seen on either side of the road, cliffs on the east, outcrops lower on the west (or Summers Creek). This extends, in a relative flat lying formation from the #1 posts of Cash 1 and 2 to the final posts of Cash 3 and 4, continuing on the Cash #6. Most of Cash #5 is covered by the rusty red volcanic rock. Some finer grained layers can be seen, stratified in the deposit with some iron staining.

Mr. Peter Read describes the deposit as a sandstone, containing a vitric crystal (biotite, feldspar, quartz) component which increases northward, along Summers Creek. The sandstone passes gradationally into a water-lain tuff and in the north into a tuff. Hewlandite-clinoptilolite water lain tuff.

Peter Read open file 1987-19 reference map of 92H7, 92H8, 92H9 and 92H10.

This zeolitization is a result of the component of sandstone, probably as the alteration product of the contained feldspar.

### **Research**

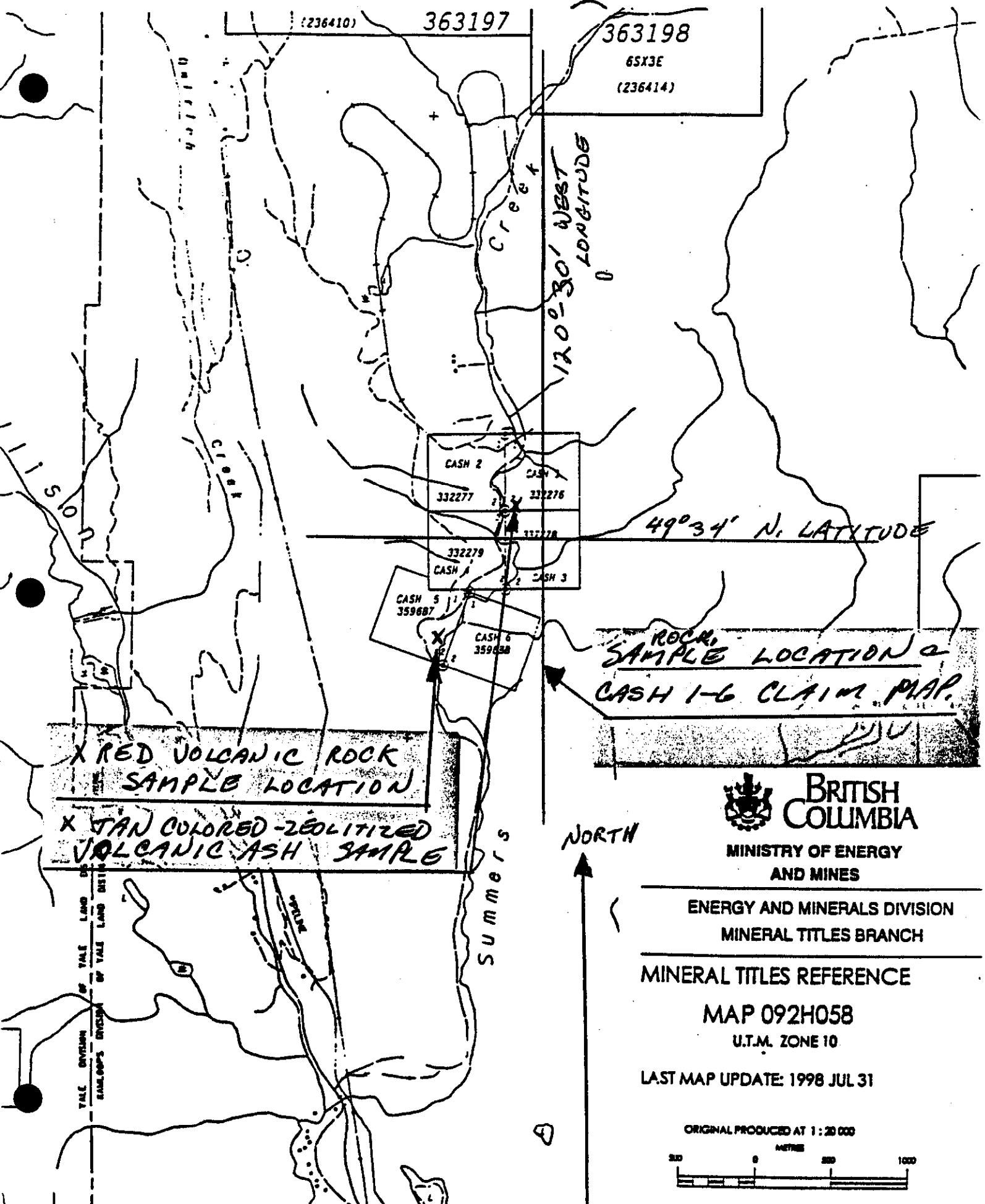
Honorable mention must go to the Vancouver City Library and to the people who work there, who helped in finding books and information on the work that has been done here and to the people whose work went into the production of these books and papers.

It is hopeful for the future to achieve the results needed by further chemical testing and assaying to make the molecular sieves.

### **Previous work**

The Princeton area has been known for its deposits of copper, placer gold and coal. Potentially economic deposits of zeolite were recognized and described by Read (1986), Sunday Creek Snow Patch Ash, Asp Creek Ash, Summers Creek Sandstone, Tailings Ash and Bromley Vale. The mapping also shows five occurrences of zeolite within the Cash claim group.

These claims were initially prospected by D. Hopper who observed and sampled several of the zeolite occurrences.



(236410)

363197

363198

6SX3E

(236414)

CASH 2

332277

332276

332279

CASH 1

CASH 3

CASH 5

359687

X

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

49°34' N. LATITUDE

120°30' WEST LONGITUDE

ROCK SAMPLE LOCATION & CASH 1-6 CLAIM MAP.

X RED VOLCANIC ROCK SAMPLE LOCATION

X TAN COLORED-ZEOLITIZED VOLCANIC ASH SAMPLE



BRITISH COLUMBIA

MINISTRY OF ENERGY AND MINES

ENERGY AND MINERALS DIVISION MINERAL TITLES BRANCH

MINERAL TITLES REFERENCE

MAP 092H058

U.T.M. ZONE 10

LAST MAP UPDATE: 1998 JUL 31

ORIGINAL PRODUCED AT 1:20 000

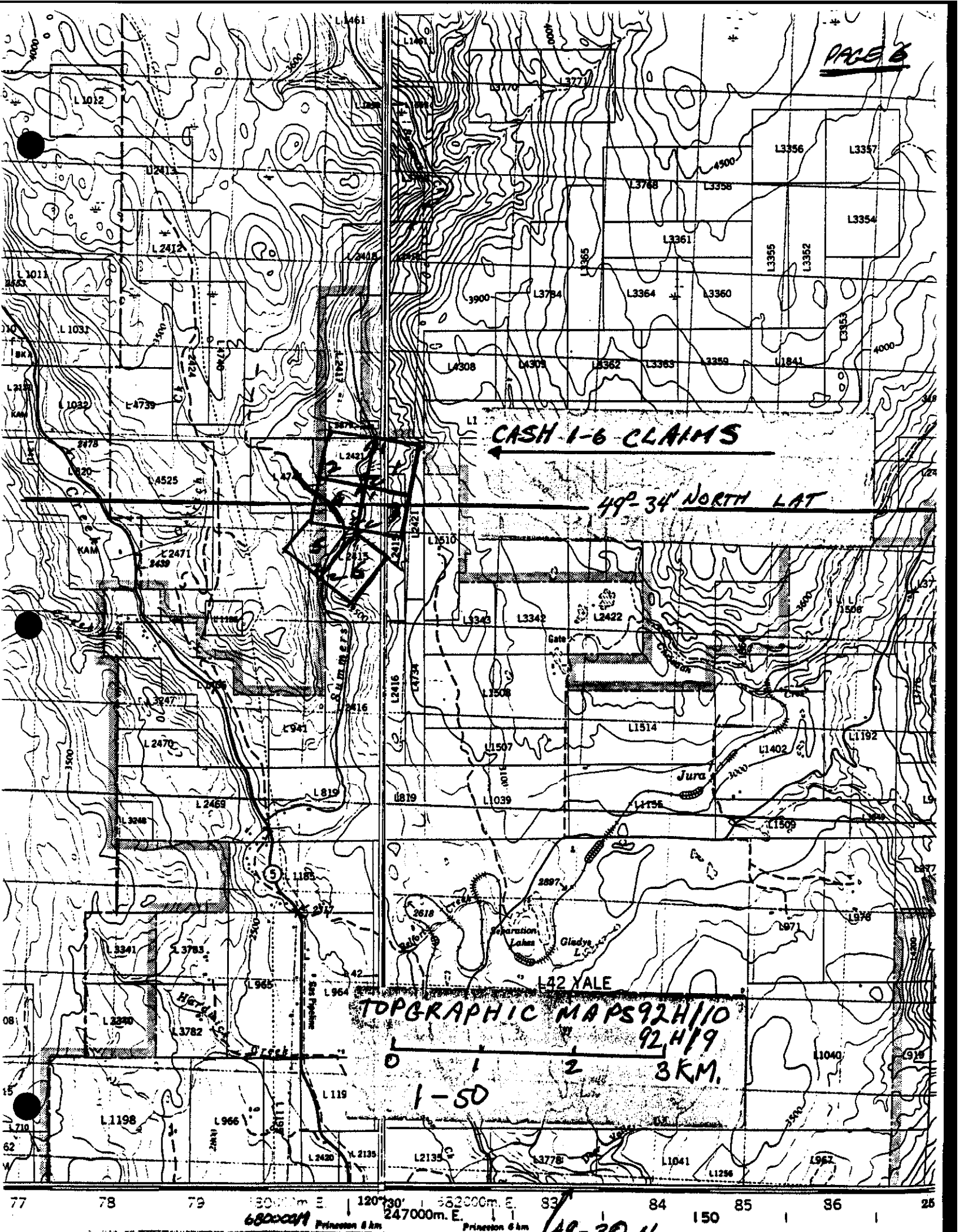


ADMINISTRATIVE AREAS

TALE DIVISION OF TALE LAND DISTRICT

SUMMERS

NORTH



CASH 1-6 CLAIMS

49° 34' NORTH LAT

TOPGRAPHIC MAPS 92H/10  
92H/19  
3 KM.

1-50

122°  
52°

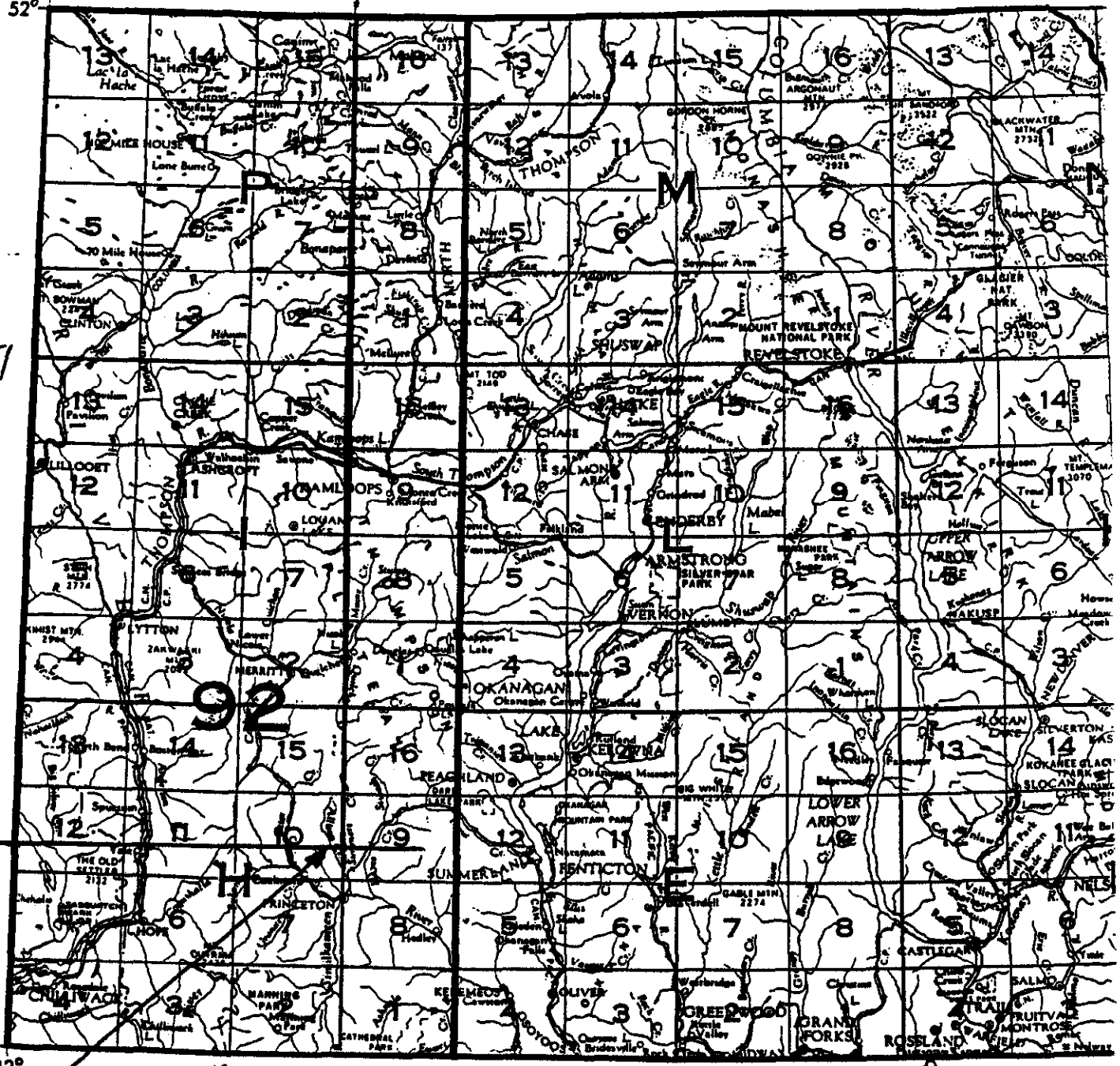
120-30  
WEST

57

50

49°-34'  
NORTH

49°



121

120

119

118

SCALE

SCALE

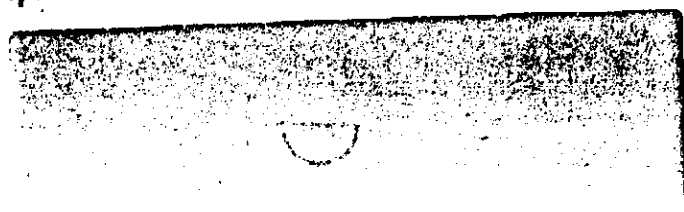
CASH 1-6 CLAIMS



AT INTERSECTION OF



49°-34' NORTH AND 120°-34' WEST LONGITUDE  
LATITUDE





PAGE A

# **ZEOLITE TREATMENT STUDY**

**Prepared for:** Canica Mineral Development Inc.

**Attention:** Mr. Doug Hopper

**Prepared by:** **PROCESS RESEARCH ASSOCIATES LTD**  
9145 Shaughnessy Street  
Vancouver, BC  
V6P 6R9

**PRA Project No.:** 98-030

  
\_\_\_\_\_  
Peter Tse, A.Sc.T.  
Senior Metallurgist

Date: February 8, 1999

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**CASH CLAIM 1-6 ZEOLITE TREATMENT STUDY****PAGE 1 A****1.0 A TECHNICAL SUMMARY**

A sample from Cash Claim 1-6, described as zeolite material by Mr. Doug Hopper, was investigated for its physical property as a marketable product to the oil industrial or for the other applications.

The head characterization of the as received material was analyzed. The SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> molar ratio was calculated to be 7.57 and the cation exchange capacity (CEC) was determined to be 32.6 me/100 grams. The whole rock analysis results are tabulated in the table below and the ICP analysis results are in the Appendix.

Symbol	%
Al <sub>2</sub> O <sub>3</sub>	15.03
BaO	0.23
CaO	2.54
Fe <sub>2</sub> O <sub>3</sub>	1.80
K <sub>2</sub> O	4.67
MgO	0.71
MnO	0.02
Na <sub>2</sub> O	3.24
P <sub>2</sub> O <sub>5</sub>	0.03
SiO <sub>2</sub>	67.1
TiO <sub>2</sub>	0.30
LOI	3.92
Total	99.6

One acid and three caustic leach tests were conducted on the material at different leaching conditions, attempting to decrease the SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> molar ratio to less than 6.

The initial two tests results show that 0.22% and 0.28% of the aluminum was leached from the solids by acid (HCl) and caustic (NaOH), respectively, after 2 hours continuous contact with the lixiviants. The sample particle size of -4+8 mesh screen fraction was used for the testing. The SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> molar ratio of the solids from the caustic leach was increased to 8.6.

At a particle size of 100% -10 mesh, a caustic leach of the sample at ambient temperature of 18 °C, for 6 hours, the aluminum content in the leach solids was reduced to 1.44%. The decrease of aluminum content in the leach solids implies that the SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> molar ratio might possibly increased.

CASH CLAIM 1-6 ZEOLITE TREATMENT STUDYPAGE 2 A

An other caustic leach test result show that the  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio decreased from the untreated sample of 7.6 to 6.6, after the sample was crushed to 80% passing 150 mesh, leached at 18 °C for 168 hours. The CEC was increased marginally from 32.6 to 39.7 me/100 grams.

Based on the scoping test results, the caustic leach to decrease the  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio is depending on the particle size and leaching time.

The preliminary tests result indicate that caustic leaching to reduce the  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio to less than 6 can be achieved. Optimization of the leaching conditions can be further improved.

**CASH CLAIM 1-6 ZEOLITE TREATMENT STUDY***PAGE 3 A***2.0 EXPERIMENTAL PROCEDURES****2.1 Acid Leach Test**

The sample was crushed and screened to obtain -4+8 mesh fraction. The screen fraction was repulped in a plastic bottle to 30% solids with 1M HCl solution. The bottle was placed on a roll case, the slurry was continuous mixing for 2 hours at an ambient temperature (18 °C). At the end of the test, the slurry was filtered and the solids were washed with three hot displacement water. The solids were air dried. The dried solids were weighed and submitted to IPL laboratory for ICP analysis.

**2.2 Caustic Leach Test**

The sample was crushed and screened to obtain -4+8 mesh fraction. The screen fraction was repulped in a plastic bottle to 30% solids with NaOH solution. The bottle was placed on a roll case; the slurry was continuous mixing for 2 hours at an ambient temperature (18 °C). At the end of the test, the slurry was filtered and the solids were washed with three hot displacement water washes. The solids were air dried. The dried solids were weighed and submitted to IPL laboratory for ICP and whole rock analysis. Pacific Soil Analysis Inc analyzed the cation exchange capacity of the test products. Two other tests were conducted with the similar procedure at the particle size of 100% -10 mesh and 80% -150 mesh. The slurry was mixed with an overhead agitator for the specified time period.

**3.0 RESULTS AND DISCUSSIONS**

**CASH CLAIM 1-6 ZEOLITE TREATMENT STUDY**

PAGE 4 A

**3.1 Head Assays**

One kg of sample was received on July 20, 1998. The sample was crushed to  $\frac{1}{4}$  inch particle size. A representative sub-sample was riffled and pulverized for head analysis. The  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$  content in the sample were 67.07 and 15.03%, respectively. The  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio was calculated to be 7.57 and the cation exchange capacity (CEC) was determined to be 32.6 me/100 grams. The whole rock analysis results and the ICP analysis results are presented in the Appendix.

**3.2 Acid Leach Test**

A test L2 was conducted with 300 grams of  $-4+8$  mesh screen fraction, slurried with 1M HCl solution to 30% solids. The sample was leached at ambient temperature of  $18^\circ\text{C}$  for 2 hours. The ICP results show that the aluminum content in the acid leach residue was reduced to 1.42% from 1.63% of the head sample. As the aluminum content of the solids decreased, the  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio might possibly increased. This is yet to be determined by analyzing the residue for whole rock.

**3.3 Caustic Leach Test**

Three tests were conducted with 300 grams at different crushed size. The sample was slurried with 6M NaOH to 30% solids and leached at ambient temperature of  $18^\circ\text{C}$  for specific time periods.

Test L1 was performed on  $-4+8$  mesh screen fraction for 2 hours. The ICP result on the leach residue indicates 0.22% of the aluminum was removed from the solids, 1.35% of the aluminum was remained with the residue. As expected, the  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio of the solids was increased from 7.57 to 8.6.

A head sample was further crushed to 100%  $-10$  mesh and subjected 6 hours caustic leaching (test L3). The aluminum content in the solids after leaching was analyzed to be 1.44%. Again, a whole rock analysis result is required to determine the  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio.

Based on the Caustic Treated Zeolites information of Patent 3,374,182, test L4 was conducted with sample pulverized to 80%  $-150$  using 6M NaOH to pH 10.5 for 168 hours. The result shows that the  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio of the solids was improved from 7.57 to 6.66. The cation exchange capacity was analyzed at 39.7 me/100 grams.

CASH CLAIM 1-6 ZEOLITE TREATMENT STUDY

PAGE 5 A

**4.0 CONCLUSIONS AND RECOMMENDATION**

The preliminary test results indicate that the material from Cash Claim 1-6 can be treated with caustic to improve the  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio to below the marketable value of 6. Optimization of particle size, reagents addition, temperature, etc. can be benefit to the economic of the process for producing the marketable product.

**APPENDEIX**

*PAGE 6 A*

**Certificates of Analysis**



## CERTIFICATE OF ANALYSIS

IPL 98K1258

Process Research Associates Ltd

PAGE 7A  
 2036 Columbia Street  
 Vancouver, B.C.  
 Canada V5Y 3E1  
 Phone (604) 879-7878  
 Fax (604) 879-7898

Project: 98-030

Out: Dec 07, 1998  
 In : Nov 26, 1998

Page 1 of 1  
 [125816:32:17:89120798]

1 Samples 1=Pulp

Symbol	Unit	98-030	Pulp HEAD	Limit Low	Limit High
Al2O3	%	15.03		0.01	100.00
BaO	%	0.23		0.01	100.00
CaO	%	2.54		0.01	100.00
Fe2O3	%	1.80		0.01	100.00
K2O	%	4.67		0.01	100.00
MgO	%	0.71		0.01	100.00
MnO	%	0.02		0.01	100.00
Na2O	%	3.24		0.01	100.00
P2O5	%	0.03		0.01	100.00
SiO2	%	67.07		0.01	100.00
TiO2	%	0.30		0.01	100.00
LOI	%	3.92		0.01	100.00
Total	%	99.56		0.01	105.00

—No Test Ins=Insufficient Sample Del=Delay Max=No Estimate Rec=ReCheck m=x1000 %=Estimate % NS=No Sample

BC Certified Assayer: David Chiu



**CERTIFICATE OF ANALYSIS**  
**IPL 98I0951**

PAGE 8A

2036 Columbia Street  
Vancouver, B.C.  
Canada V5Y 3E1  
Phone (604) 879-7878  
Fax (604) 879-7898

Process Research Associates Ltd

Project: 98-029

Out: Sep 15, 1998  
In : Sep 09, 1998

Page 1 of 1  
[095115:22:08:89091598]

1 Samples 1-Pulp

Symbol	Unit	Pulp Li	Limit Low	Limit High
Al2O3	%	13.31	0.01	100.00
BaO	%	0.26	0.01	100.00
CaO	%	3.06	0.01	100.00
Fe2O3	%	1.61	0.01	100.00
K2O	%	4.17	0.01	100.00
MgO	%	0.68	0.01	100.00
MnO	%	0.05	0.01	100.00
Na2O	%	3.97	0.01	100.00
P2O5	%	0.03	0.01	100.00
SiO2	%	67.46	0.01	100.00
TiO2	%	0.32	0.01	100.00
LOI	%	4.77	0.01	100.00
Total	%	99.69	0.01	105.00

—No Test Ins=Insufficient Sample Del=Delay Max=No Estimate Rec=ReCheck m=x1000 %=Estimate% NS=No Sample

BC Certified Assayer: David Chiu



# CERTIFICATE OF ANALYSIS

## IPL 98G0760

PAGE 9A

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Process Research Associates Ltd

Project: 98-029

Out: Jul 31, 1998  
In: Jul 30, 1998

Page 1 of 1  
[076013:58:56:89073198]

3 Samples

3=Pulp

Symbol	Unit	Pulp L1	Pulp L2	Pulp Head	Limit Low	Limit High
Al	ppm	13472.	14069.	16290.	100.	50000.
Sb	ppm	<5.	<5.	<5.	5.	1000.
As	ppm	19.	20.	24.	5.	10000.
Ba	ppm	436.	423.	486.	2.	10000.
Bi	ppm	<2.	<2.	<2.	2.	10000.
Cd	ppm	<0.1	<0.1	<0.1	0.1	100.0
Ca	ppm	5575.	4174.	6261.	100.	100000.
Cr	ppm	55.	125.	60.	1.	10000.
Co	ppm	2.	2.	2.	1.	10000.
Cu	ppm	9.	4.	4.	1.	20000.
Fe	ppm	7501.	8078.	7896.	100.	50000.
La	ppm	25.	26.	27.	2.	10000.
Pb	ppm	16.	5.	20.	2.	20000.
Mg	ppm	3229.	3089.	3610.	100.	100000.
Mn	ppm	110.	95.	130.	1.	10000.
Hg	ppm	<3.	<3.	<3.	3.	10000.
Mo	ppm	1.	<1.	<1.	1.	1000.
Ni	ppm	4.	5.	4.	1.	10000.
P	ppm	358.	<100.	374.	100.	50000.
K	ppm	7618.	7891.	9506.	100.	100000.
Sc	ppm	1.	<1.	1.	1.	10000.
Ag	ppm	<0.1	<0.1	<0.1	0.1	100.0
Na	ppm	9345.	613.	933.	100.	50000.
Sr	ppm	341.	301.	386.	1.	10000.
Tl	ppm	<10.	<10.	<10.	10.	1000.
Ti	ppm	578.	714.	638.	100.	10000.
W	ppm	<5.	<5.	<5.	5.	1000.
V	ppm	17.	17.	18.	2.	10000.
Zn	ppm	32.	30.	36.	1.	20000.
Zr	ppm	9.	10.	11.	1.	10000.

—No Test Ins=Insufficient Sample Del=Delay Max=No Estimate Rec=ReCheck m=x1000 %=Estimate% NS=No Sample

BC Certified Assayer: David Chiu



# CERTIFICATE OF ANALYSIS

## IPL 98H0882

PAGE 10A

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**Process Research Associates Ltd**

INTERNATIONAL PLASMA LABORATORY LTD.

Project: 98-030

Out: Aug 27, 1998  
In : Aug 25, 1998

Page 1 of 1  
[088216:12:33:89082798]

1 Samples

1-Pulp

Symbol	Unit	Pulp L-3 Residue	Limit Low	Limit High
Al	ppm	14439.	100.	50000.
Sb	ppm	<5.	5.	1000.
As	ppm	31.	5.	10000.
Ba	ppm	503.	2.	10000.
Bi	ppm	<2.	2.	10000.
Cd	ppm	0.5	0.1	100.0
Ca	ppm	6501.	100.	100000.
Cr	ppm	102.	1.	10000.
Co	ppm	4.	1.	10000.
Cu	ppm	16.	1.	20000.
Fe	ppm	11433.	100.	50000.
La	ppm	30.	2.	10000.
Pb	ppm	16.	2.	20000.
Mg	ppm	3949.	100.	100000.
Mn	ppm	160.	1.	10000.
Hg	ppm	<3.	3.	10000.
Mo	ppm	1.	1.	1000.
Ni	ppm	7.	1.	10000.
P	ppm	357.	100.	50000.
K	ppm	7385.	100.	100000.
Sc	ppm	2.	1.	10000.
Ag	ppm	<0.1	0.1	100.0
Na	ppm	6161.	100.	50000.
Sr	ppm	380.	1.	10000.
Tl	ppm	<10.	10.	1000.
Ti	ppm	743.	100.	10000.
W	ppm	<5.	5.	1000.
V	ppm	20.	2.	10000.
Zn	ppm	47.	1.	20000.
Zr	ppm	14.	1.	10000.

—No Test Ins=Insufficient Sample Del=Delay Max=No Estimate Rec=ReCheck m=x1000 %=Estimate% NS=No Sample

BC Certified Assayer: David Chiu



# CERTIFICATE OF ANALYSIS

## IPL 98L1358

PAGE 11A

2036 Columbia Street  
Vancouver, B.C.  
Canada V5Y 3E1  
Phone (604) 879-7878  
Fax (604) 879-7898

**Process Research Associates Ltd**

Project: 98-030

Out: Jan 06, 1999  
In : Dec 31, 1998

**1 Samples**      1=Pulp

Page 1 of 1  
[135815:44:32:99010699]

Symbol	Unit	Pulp		Limit Low	Limit High
		L - 4	RESIDUE		
Al2O3	%		16.38	0.01	100.00
BaO	%		0.26	0.01	100.00
CaO	%		2.82	0.01	100.00
Fe2O3	%		1.92	0.01	100.00
K2O	%		4.85	0.01	100.00
MgO	%		0.81	0.01	100.00
MnO	%		0.03	0.01	100.00
Na2O	%		3.45	0.01	100.00
P2O5	%		0.06	0.01	100.00
SiO2	%		54.29	0.01	100.00
TiO2	%		0.34	0.01	100.00
LOI	%		4.27	0.01	100.00
Total	%		99.48	0.01	105.00

—No Test    Ins=Insufficient Sample    Del=Delay    Max=No Estimate    Rec=ReCheck    m=x1000    %=Estimate %    NS=No Sample

BC Certified Assayer: David Chiu



GEOCHEMICAL ANALYSIS CERTIFICATE

Hopper, Doug File # 9802805  
 203 - 828 W. Hastings St., Vancouver BC V6C 4C8 submitted by: Doug Hopper

SAMPLE#	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W	SiO2
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	%	ppm	%	%	%	ppm	%
CASH CLAIMS	2	216	<3	71	<.3	22	24	823	5.74	<2	<8	<2	<2	71	.6	<3	<3	172	1.33	.136	7	42	2.16	89	.23	<3	3.24	.08	.10	<2	48.34

ICP - .500 GRAM SAMPLE IS DIGESTED WITH 3ML 2-2-2 HCL-HNO3-H2O AT 95 DEG. C FOR ONE HOUR AND IS DILUTED TO 10 ML WITH WATER.  
 THIS LEACH IS PARTIAL FOR MN FE SR CA P LA CR MG BA TI B W AND MASSIVE SULFIDE AND LIMITED FOR NA K AND AL.  
 SiO2 BY FUSION, ANALYSIS BY WHOLE ROCK ICP.  
 ASSAY RECOMMENDED FOR ROCK AND CORE SAMPLES IF CU PB ZN AS > 1%, AG > 30 PPM & AU > 1000 PPB  
 - SAMPLE TYPE: ROCK

DATE RECEIVED: JUL 13 1998 DATE REPORT MAILED: *July 20/98* SIGNED BY: *C. Long* D. TOYE, C. LEONG, J. WANG; CERTIFIED B.C. ASSAYERS



WHOLE ROCK ICP ANALYSIS

Hopper, Doug File # 9802805R  
 203 - 828 W. Hastings St., Vancouver BC V6C 4C8

SAMPLE#	SiO2	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO	Cr2O3	Ba	Ni	Sr	Zr	Y	Nb	Sc	LOI	C/TOT	S/TOT	SUM
	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	%	%
CASH CLAIMS	48.34	18.98	10.72	4.10	5.25	3.85	1.28	1.17	.34	.14	.020	420	<20	665	63	15	<10	34	5.6	.01	.10	99.93

.200 GRAM SAMPLES ARE FUSED WITH 1.5 GRAM OF LiBO2 AND ARE DISSOLVED IN 100 MLS 5% HNO3. OTHER METALS ARE SUM AS OXIDES.  
 TOTAL C & S BY LECO (NOT INCLUDED IN THE SUM).  
 - SAMPLE TYPE: ROCK PULP

DATE RECEIVED: JUL 15 1998 DATE REPORT MAILED: *Nov 18/98* SIGNED BY: *[Signature]* D. TOYE, C. LEONG, J. WANG; CERTIFIED B.C. ASSAYERS

**Cash Claims Expenses 1998-1999**

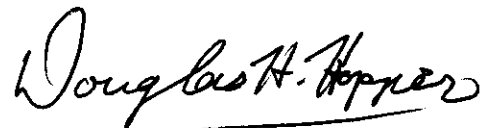
July 13, 1998	Assaying File #9802805 Cash Claims	\$ 28.73
July 17, 1998	Assaying for Si-Al Test/Process Laboratory	100.00
August 8, 1998	Assaying for Si-Al Ratio Test	100.00
July 15, 1998	D. Hopper to Process Laboratory – 2 day	200.00
July 10, 1998	Nick Wychopin from Princeton – went to the Cash Claims and one assistant for samples	400.00
July 10, 1998	Truck rental	75.00
September 16, 1998	Assaying, Process Lab	<u>300.00</u>
		1,203.73
November 5, 1998	University of B.C. for patent process	13.00
November 12, 1998	Fax to Process Lab	4.56
November 18, 1998	Assaying 9802805R	9.10
December 17, 1998	Process Laboratory	300.00
January 19, 1999	Process Laboratory	100.00
February 18, 1999	Report writing, research	600.00
February 9, 1999	Fax	15.96
February 11, 1999	Typing	<u>50.00</u>
		1,092.62
Total July 13 to September 16, 1998		<u>1,203.73</u>
Total Part 1 and Part 2		<u>\$ 2,296.35</u>

**STATEMENT OF QUALIFICATIONS FOR DOUGLAS H. HOPPER**

1. I attended the Haileybury School of Mining during the years 1962 to 1966 studying Mining Technology.
2. Since the year 1964 I have worked with Hudson Bay Exploration, Kennecot Exploration, Sumitome Exploration and a number of other exploration companies as a field geologist, underground geologist, Diamond Drill supervision and other related duties concerning mining.

February 8, 1999

Douglas H. Hopper

Handwritten signature of Douglas H. Hopper in cursive script, underlined.