Geological Evaluations
of the
Volcanic Zeolite – Pozzolanic Deposits
Tom and Kitty Claims
Manuel Creek Area

Osoyoos Mining Division
British Columbia

Mineral Titles Reference Map M082E022
Lat. 49º 14.6' N, Long. 119º 43.9' W

operator

Wade Hartwell
0864803 BC Ltd.

owners

B.N. Church and F. Niddery

Prepared by
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Victoria, B.C.
July 21st , 2010

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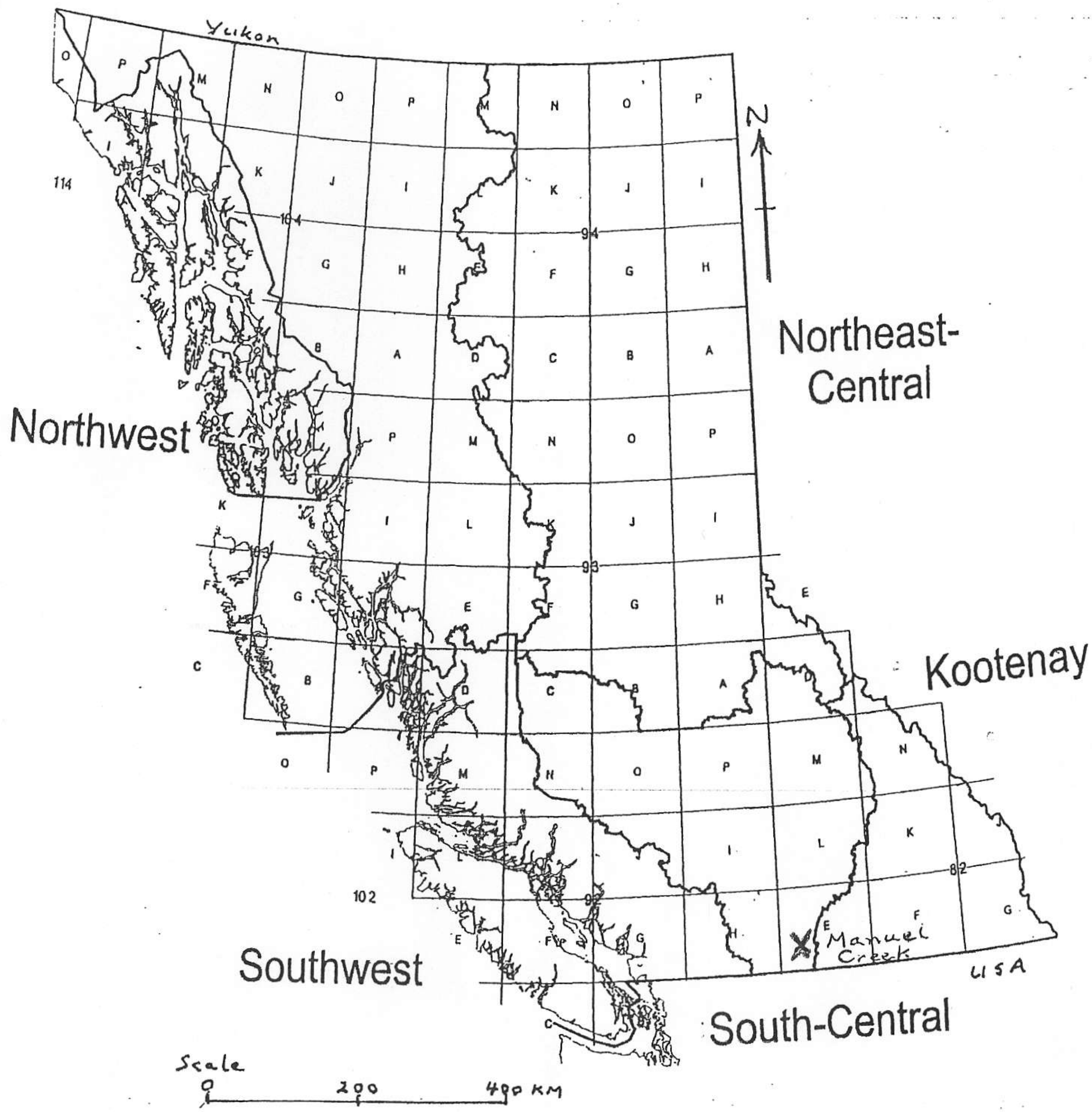


Summary

This is part of a continuing investigation of the industrial mineral potential of the Marron Formation in the western part of the Penticton Tertiary outlier. The current study focuses on the Tom and Kitty claims with a view to further evaluation of the zeolite and pozzolan potential of the Manuel Creek Member (Minfile No. 082ESW258). In particular, the investigation includes the petrology and mineralogy of these rocks by density measurements, X-ray diffraction analysis, SEM imagery and pozzolan capability testing.

Zeolite mineralization occurs in abundance at several localities associated with Eocene dacitic tuff in the Manuel Creek area. The Manuel Creek Member is mid-section in the Marron Formation in the southern part of the Penticton Tertiary outlier. The zeolitic beds in this unit range up to 10 m thick and dip gently easterly. The effective zeolite of interest is a calcium-rich variety of clinoptilolite. Element mobility between the Marron beds, during the period of zeolite emplacement, fits the 'open-system' model of mineralization (Church, 2006).

Analyses show the Manuel Creek dacitic tuff is a significant pozzolan resource. Tests for pozzolanic activity and compressive strength yield values well within the limits of ASTM standards. The potential benefits of using pozzolan as a replacement or partial replacement for Portland cement include product improvement for some specific uses, CO_2 emissions abatement and energy savings.

Introduction

Zeolite minerals are hydrated aluminosilicates of alkaline and alkaline earth elements such as sodium, potassium, magnesium and calcium. They commonly form in nature from the reaction between volcanic ash and alkaline water. The commercial application of zeolite stems from the mineral's capacity for absorption, catalysis and ion exchange. Also, zeolitic rocks find use as an effective component in pozzolanic cement and light weight stone or aggregate in the construction industry.

Manufactured 'synthetic' zeolites are use principally for ion exchange and molecular sieves in purification of gases and liquids albeit at a much higher cost than naturally occurring zeolites. Clinoptilolite and chabazite are two of the most common zeolites used in commercial operations. Generally these minerals may be described as having a cage-like or honeycomb crystal structure. The pores within their structure range in size from 2 to 12 angstroms. The cations within the structure are loosely bound and can be readily exchanged. Therefore these zeolites may be used for ion exchange, chemical sieving and filtering and gas absorption to remove odour, toxins and metals from both air and water. They are commonly used as human and animal waste adsorbents. Also, zeolites are employed for soil amendments and hydroponics, water filtration in fish farms, enhancement to livestock feed and even storage of solar and waste energy (Mumpton, 1999).

In British Columbia zeolite deposits occur in the relatively young felsic volcanic formations of relatively low metamorphic grade. The typical host rocks are the sediments and pyroclastic units and intercalated lavas in a northwest–trending belt, about 150 km wide, extending 800 km from the Republic Mining District of Washington state to the Houston area of the central interior of British Columbia. The Most active zeolite properties in this belt are in the Kamloops (Ranchlands MINFILE 092ISE123) and Princeton areas (Bromley Vale MINFILE 092HSE166).

The Manuel Creek property is located in the central part of the Okanagan-Similkameen Regional District that extends from Osoyoos at the US border, north to Summerland and west to Manning Park. Penticton is the major center - Oliver, Princeton, Keremeos, Cawston and Hedley are other notable communities in the district. The regional economy here is varied and includes agriculture, tourism, light manufacturing, forestry and mining.

This report is an update of previous research on the Manuel Creek area. In particular, several zeolite localities were identified in a 5-km N-S strike-length of Eocene dacitic tuff northeast of Keremeos (Church, 2002a). The study included a geological / geochemical investigation that shows the effective zeolite to be a calcium-rich variety of clinoptilolite, the origin of which fits the 'open-system' model of mineralization (Church, 2006). The current study explores the mineralogy / petrology and the pozzolanic capability of these rocks.

The Property

The property, located 30 km southwest of Penticton, consists of a contiguous block of 10 two-post legacy claims (Table 1) of 25 hectares each, Kitty 1-7 and Tom 1-3, owned respectively by B.N. Church of Victoria, B.C. and F. Niddery of Okanagan Falls, B.C.

These claims were optioned by Wade Hartwell (0864803 BC Ltd.), December 31st, 2009 with a view to acquisition of title pending the results of further exploration and development work. Elizabeth Butler Henderson has assisted in collecting samples and obtaining analyses.

Location and Access

The Tom and Kitty claims are centered 7 km northeast of the town of Keremeos, B.C., in the headwater area of Manuel Creek between 1160 and 1360 m elevation at Lat. 49°14.6' Long. 119°43.9'. The property is connected to Highway 3A at the Twin Lake road junction, 10 km to the north, via the paved White Lake road and a network of gravel powerline service roads (Photos 1 and 2) and old logging trails (Figs. 1, 2 and 3).

Physiography and Climate

The area is characterized by low mountainous terrain that is bounded by the Okanagan valley on the east and the Similkameen and tributary valleys on the west (~400 m elev). The concordant summits of the region, rising to more than 1,300 m elev., are remnants of a once continuous upland surface that comprises the southern extremity of the Thompson Plateau.

The low parts of the region and south-facing slopes are generally open grazing lands with plentiful grasses, sagebrush and cactus. The summits and north-facing slopes include rocky outcrops interspersed with pine, spruce and fir trees of sufficient density to support intermittent logging operations.

Climatic conditions are generally warm and dry during the summer months; freezing conditions may occur anytime from November to April. Total annual precipitation of combined rain and snowfall water equivalent is about 30 cm.

Background

Natural pozzolan is a siliceous or siliceous and aluminous geological resource, which, in a finely divided form, reacts with lime and water, at ordinary temperatures, to form cement (ACI Committee, 2002; Meheta, 1987). The ancient Greeks between 600 and 700 BC used pozzolan for construction purposes and their techniques were later passed on to the Romans (Mumpton, 1999). Glassy volcanic ash or tuff is the principal resource. The glassy nature and/or fine grain size of this material promotes reaction with calcium hydroxide to form interlocking aluminum-rich and calcsilicate mineral phases in the cementation process. Alternative pozzolanic source materials include shale, diatomite and, most important, the cinders or fly ash produced from coal burning.

According to the Canadian Minerals Yearbook annual cement production in British Columbia is approximately 2 million tonnes, most of which is Portland cement. Pozzolanic cement has special benefits but currently has found use mostly as an additive. Wider use is constrained by the limited availability of the resource.

The benefits of using pozzolan as a replacement or partial replacement of Portland cement includes enhanced strength and textural quality of the concrete. For example, the high fines content of pozzolan reduces the permeability of the concrete lining of waterways (flumes) and water reservoirs. Also pozzolan has the advantage that it can be used to reduce the rate of heat produced during the hydration of cement while constructing massive concrete structures such as hydroelectric dams. Excess heat of hydration can cause cracks in concrete leading to leaking and structural failure. In addition, pozzolan is resistant to acid attack and undesirable alkali-aggregate reactions that can cause fissuring, spalling and ablation of the concrete.

There are cost and environmental benefits achievable by replacing a portion of the Portland cement with natural pozzolan. To make Portland cement the key process is the production of lime (CaO) by calcination of limestone ($CaCO_3$) and, by this process, each tonne of limestone yields approximately 0.78 tonnes of carbon dioxide (CO_2) - a major greenhouse gas. The energy consumption is equivalent to about six million British Thermal Units (BTUs).

Natural pozzolan has cementing properties, complementary to Portland cement, that requires no energy consumption for calcination and there is no carbon dioxide byproduct.

Geological Setting

Glassy volcanic rocks and zeolites are commonly preserved in the Tertiary formations owing to the usual low metamorphism of these young rocks. The interior plateau area of British Columbia is underlain by deeply dissected early Tertiary lava, associated pyroclastic rocks and interbedded sedimentary units. These units occur within a northwesterly-trending belt about 150 km wide, extending 800 km from the Republic Mining District in Washington State to the Babine Lake area of central British Columbia. The thickness of these rocks ranges from less than 100 m to more than 1,200 m. The base of the Tertiary succession, where fully developed, is composed of fluvial sandstone and conglomerate. The upper boundary is generally coincident with an upland surface that locally marks an unconformity with Miocene volcanics of the Chilcotin Group.

The Penticton Tertiary outlier, type area of the (Eocene) Penticton Group, covers approximately 430 km^2 between the town of Penticton and Okanagan Falls in the Okanagan Valley and village of Keremeos in the Similkameen Valley (Church, 2002b). The Springbrook Formation, at the base of the group, is a polymictic conglomerate containing clasts derived by stream erosion of a geologically diverse pre-Tertiary metamorphic terrane. In the Manuel Creek area this unit is overlain by the Marron Formation (1,700 m thick) consisting of phonolite, trachyte, andesite, and basalt lava flows, tuff and breccia deposits. Above this sequence, the Marama Formation comprises an array of dacitic lava domes that are scattered across the area. In the east part of the Penticton outlier the White Lake Formation (1000 m thick) is a succession of fluvial, lacustrine, lahar and volcanic breccias developed unconformably on the Marron and Marama Formations. Completing the Penticton Group, the Skaha Formation is a mainly chaotic landslide breccia at the top of the Eocene succession.

Structural control of these rocks is a north-south stress scheme related to the oblique subduction of the Pacific plate under the North American craton. This stress engine was active throughout the Cordillera during the early Tertiary. The result is a complex inter-relationship of shears, tension faults and folds and the simultaneous development of grabens, folding and thrusting. In overall scheme the rocks of the Penticton Tertiary outlier dip easterly towards major gravity faulting in the Okanagan Valley to form a trap-door-like half graben structure. The Manuel Creek area is on the westerly rim of the White Lake basin (Church, 1973).

Figure 2 Claim Map

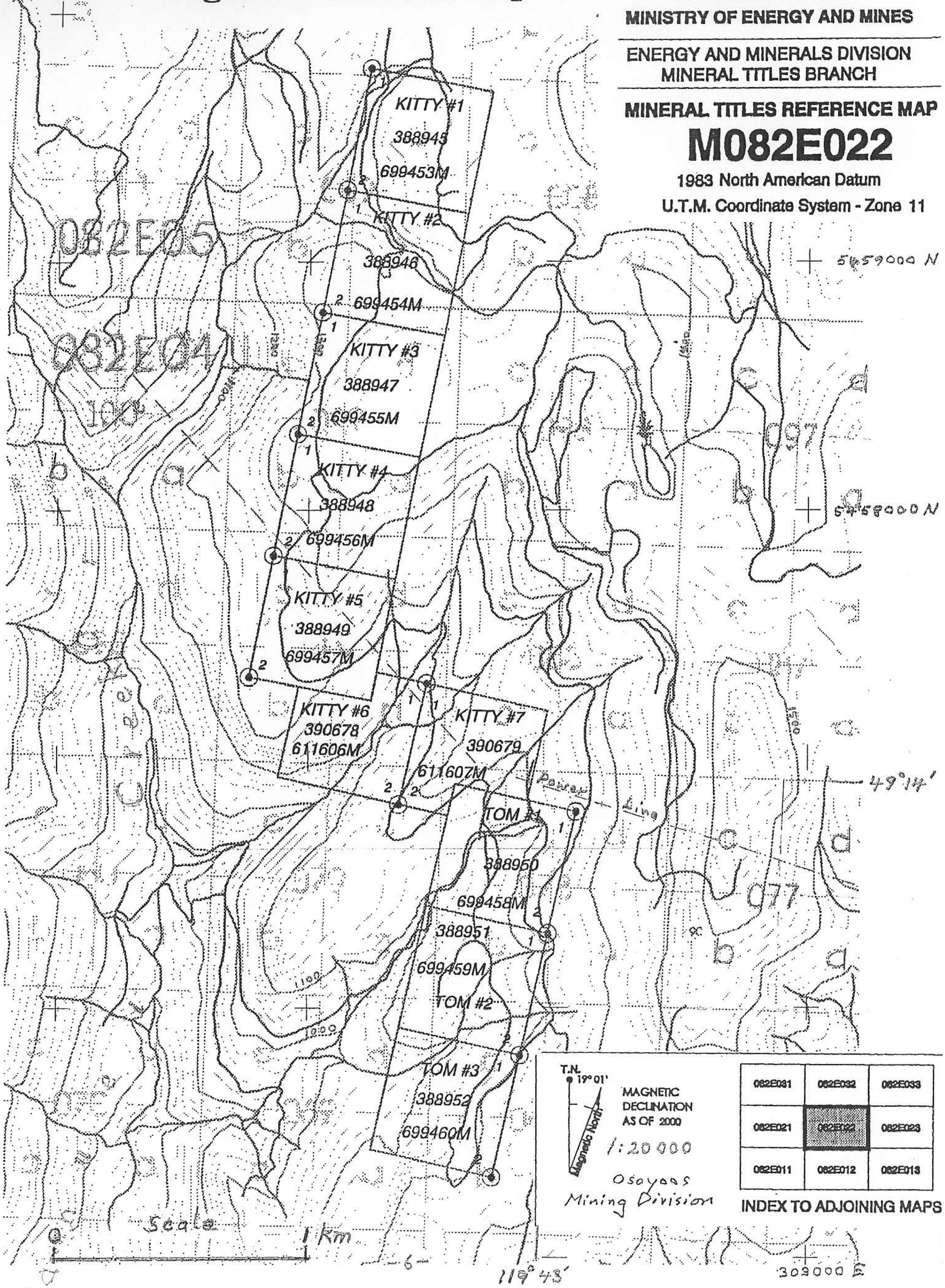


Figure 3 Access to the Map Area

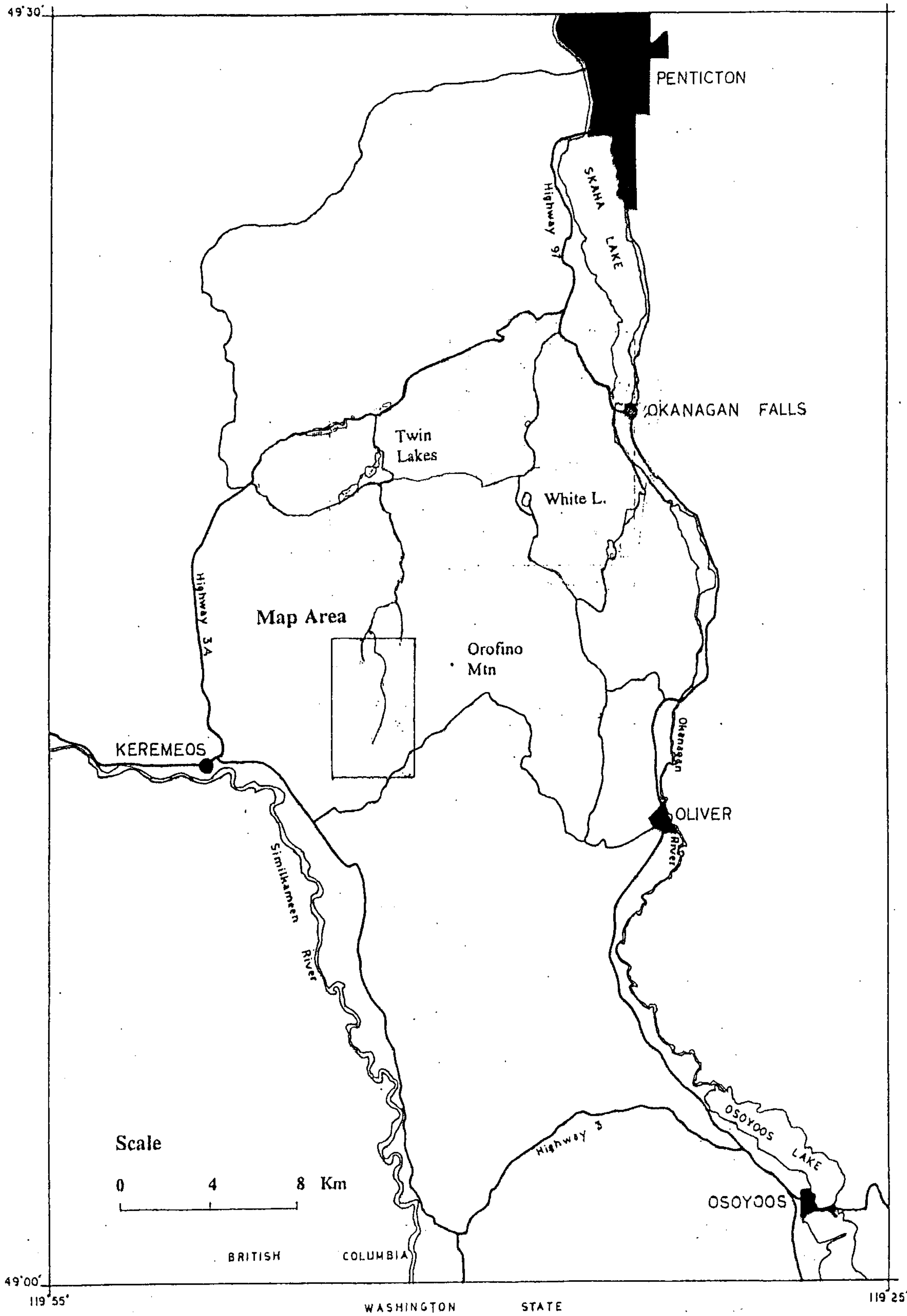


Table 1 Manuel Creek Property

Tenure Number	Claim Name	Map Number	Good To Date	Area	Registered Owner
388945	Kitty1	082E022	2011/Sept/02	25.0	B.N. CHURCH
388946	Kitty2	082E022	2011/Sept/02	25.0	B.N. CHURCH
388947	Kitty3	082E022	2011/Sept/02	25.0	B.N. CHURCH
388948	Kitty4	082E022	2011/Sept/02	25.0	B.N. CHURCH
388949	Kitty5	082E022	2011/Sept/02	25.0	B.N. CHURCH
390678	Kitty6	082E022	2011/Sept/02	25.0	B.N. CHURCH
390679	Kitty7	082E022	2011/Sept/02	25.0	B.N. CHURCH
388950	Tom 1	082E022	2011/Sept/02	25.0	F. NIDDERY
388951	Tom 2	082E022	2011/Sept/02	25.0	F. NIDDERY
388952	Tom 3	082E022	2011/Sept/02	25.0	F. NIDDERY

Work Done

The present study is a follow-up to earlier exploration on the Tom and Kitty claims (Church, 2002 and 2006). The work began as a mapping project to determine the extent of zeolite mineralization and this has evolved to a mineralogical - petrological investigation leading to product testing.

Owing to the fine-grained nature and relative light weight of the zeolitized rocks, it is proposed that a combination of density measurements and X-ray diffraction analyses serves as an adequate guide to resource delineation and evaluation.

For this study 23 rock samples were collected for analyses from nine stations in the periods July 18th to July 23rd, and Oct. 18th to Oct. 20th, 2009. Tuffaceous rocks of the Manuel Creek Member were the target of the sampling at three sites: MAN-10 (5 samples), MAN-36 (6 samples), MAN-78 (6 samples); Appendix B-1, Fig. 4). For comparison, several more sites were added to the sampling beyond the main mineralized horizon. These include the tuffaceous beds (MAN-22 and MAN-28); a sandstone facies (MAN-37), underlying trachyandesite lava (MAN-81) and overlying basalt (MAN-29 and MAN-80).

Density

The 'relative density' (specific gravity) is the mass of a given volume of a material divided by the mass of an equal volume of water at its maximum density (at 4°C). The result is commonly expressed as grams per cubic centimeters (g/c) or simply as the ratio of two masses (a pure number).

The field procedure for measuring relative density simply involves a triple beam balance (capacity 600 grams) and a beaker of water of equivalent volume capacity. The selected rock samples are freshly broken (no moss or weathered surfaces) in the range 20 to 150g. The weight of the sample is measured in grams and then the displaced weight of water in grams is determined while the rock is fully immersed and freely suspended from a thread in the beaker of water. The ratio of these weights is the relative density.

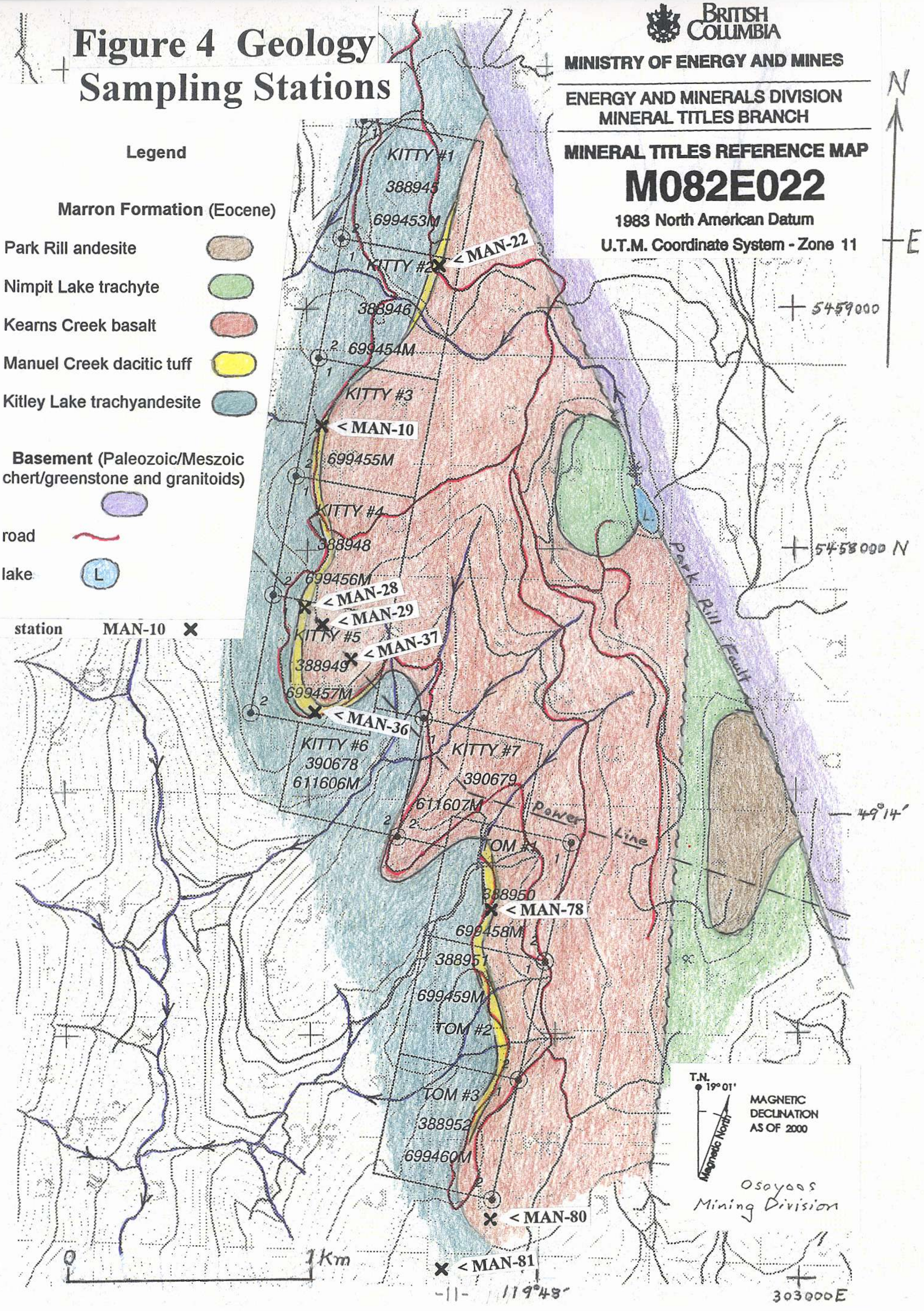
The results for the 23 rock samples are given in Appendix B-1. This shows that the zeolitic tuff of the Manuel Creek Member falls in the density range 1.997 to 2.230, in particular, the samples from sites MAN-10, MAN-36 and MAN-78. Sandstone and siltstone lenses within the tuffaceous beds have a somewhat greater density. The underlying Kitley Lake trachyandesite lava flows the overlying Kearns Creek basalt have significantly greater density than the zeolitized tuff.

For control and comparison, four mineral standards - potassium feldspar, pyrite, quartz and natrolite are measured and tabulated. The density for these samples is essentially the same as quoted in Dana's Textbook of Mineralogy (4th Edition) and Deer et al (1964).

Photo 1 Road Access, Manuel Creek Area

Photo 2 Interbedded Zeolitized Tuffaceous Rocks, MAN-10

Figure 4 Geology Sampling Stations



Mineralogy

The fine-grained nature of the Manuel Creek dacitic tuff and related volcanic rocks precludes traditional determination by optical microscope methods and requires X-ray diffraction (XRD) for mineralogy analyses. For XRD analyses, rock samples are crushed to powder and a small representative portion (~ 1 gram) is mounted on a goniometer within a X-ray source unit. Then the mounted sample is gradually rotated while being bombarded in the X-ray beam to produce a diffraction pattern for a camera or a chart recorder. The record is called a diffractogram. The resulting succession of peaks and peak heights are read and the mineralogy is interpreted by reference to the catalogue of ASTM cards representing the '**d**' spacings of known minerals. The '**d**' values are the typical crystal lattice spacings measured in angstroms for the minerals manifest at characteristic theta angles, **-θ°** being the incident angle of the X-ray beam (**2θ°** is the angle read from the goniometer). The '**d**' spacings and the corresponding **θ°**angles are related by trigonometry according to Bragg's Law $\mathbf{n\lambda = 2d\ Sin\theta°}$ where '**n**' is any integer and '**λ**' is the wavelength of the X-ray beam. In this case **λ** = 1.78899 Angstroms (Co/K-alpha 1).

For this study, five rock samples were submitted for XRD analyses to the Geology Department of the University of Alberta in Edmonton. These are designated CMBC Batch 1, CMBC Batch 2, CMBC Batch 4, CMBC Batch 5 and CMBC Batch 6 collected, respectively, from sites MAN-78, MAN-78, MAN-10, MAN-36 and MAN-78 (Fig. 4). These are the principal sites of zeolitized dacitic tuff in the Manuel Creek area. The '**d**' spacing results for these samples are tabulated in Appendix B-2 and the corresponding diffractograms are shown in Appendix B-3.

The samples, consisting of freshly broken fragments of dacitic tuff, were collect in the field in 10-pound bags and shipped to the University of Alberta for processing and XRD determination.

The XRD results for the five samples show that oligoclase, quartz and clinoptilolite are the main minerals (Appendix B-2). Glass, being isotropic, is not detectable by XRD and accessory minerals <5% (i.e. biotite and amphibole) are generally below detection limit, and, in general, any estimates of mineral abundance by XRD are qualitative. Nevertheless the peak for oligoclase at d (Å) = 3.1793 to 3.1830 is the most intense line on the diffraction charts, indicating prominence of this mineral. Quartz is less abundant and the key lines for this mineral have variable in intensity. The peak for quartz at d (Å) = 3.3408 to 3.3552 is moderately strong except for the Batch 2 and Batch 5, and a secondary peak for quartz at d (Å) = 4.2364 to 4.2572 is particularly weak for both of these samples. For clinoptilolite, there are two important diffraction lines – these are at d (Å) = 3.9614 to 3.9853 and d (Å) = 8.9610 to 9.0688. Peaks are strongest for Batch 1, Batch 2, Batch 4 and Batch 6 indicating significant clinoptilolite, however, Batch 5 has a relatively moderate amount of clinoptilolite. The weak line at d (Å) = 14.6117 to 14.9836 suggests a small amount of clay (montmorillonite) in Batch 2, Batch 4 and Batch 5.

Previous investigations, using cation exchange capacity (CEC), show clinoptilolite levels at 50%, 45% and 70% for samples from MAN-10, MAN-36 and MAN-78, respectively (Church, 2002a). The corresponding level of quartz from the same sites is estimated to be 10% to 25% and for oligoclase, 25% to 35%.

SEM Imagery

The scanning electron microscope is a type of electron microscope that images the sample surface by scanning it with a high-energy beam in a back and forth raster traverse scan pattern. The SEM produces very high-resolution images of the sample, revealing details from less than 1 to 5 mm in size. A wide range of magnification is possible from 10 times (equivalent to a hand lens) to more than 500,000 times, that is about 250 times the magnification of the best light microscope. Due to the very narrow character of the employed electron beam, SEM micrographs have a large depth of field that yields a characteristic three-dimensional appearance useful for understanding detailed surface structures on the sample.

The SEM imagery for Batch 1, 2, 4, 5 and 6 samples is shown on consecutive pages in Appendix B-3. The scale of the imagery in each case is 150 microns (µm) per 4 cm, except for Batch 6, where the scale is 100 microns (µm) per 1 cm. (Batch samples 1, 2 and 6 are from the MAN-78 site on the Tom 1 claim. Batch 4 sample is from site MAN-10 on the Kitty 3 claim and Batch sample 5 is from site MAN-36 on the Kitty 5 claim – see Fig. 4).

The low-magnification imagery for Batch 6 (MAN-78) shows irregular and random crystal and lithic fragments 50 to 100 µm embedded in a uniform fine-grained (shard-rich) matrix. The enlarged image for Batch 1 is a section showing a strong fabric of stacked (010) faces of clinoptilolite and/or cleaved plagioclase; the image for Batch 2 shows a crowded mixture irregular mineral clasts 20 to 100 µm and growth of clinoptilolite plates in a shard-rich matrix.

The imagery for Batch 4 (MAN-10) shows subhedral quartz 100 µm (left side of plate) and smaller quartz grains embedded in a shard-dominated matrix and scaly clinoptilolite replacement.

The imagery for Batch 5 (MAN-36) shows a mass of compacted devitrified shards with clinoptilolite and some well-cleaved feldspar microlites 50 to 150 µm (left side).

Pozzolan Tests

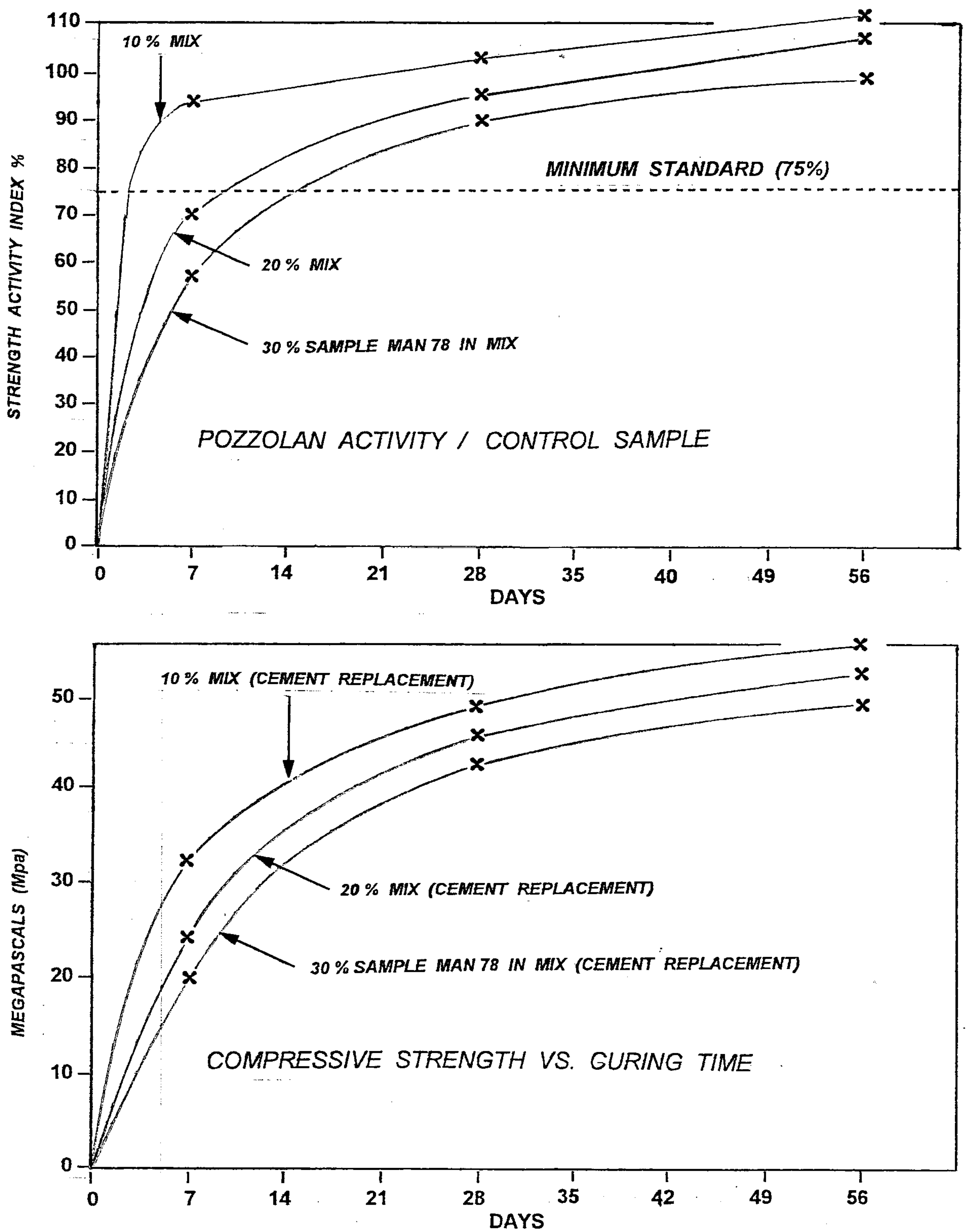
Dacitic tuff from the Manuel Creek Member was submitted to AMEC Earth & Environmental Laboratories in Calgary to determine pozzolanic activity and compressive strength variation with time of curing. The submitted sample, from station MAN-78, was typical fine grained, mottled greenish-grey-beige, zeolitized tuff showing some conchoidal fracturing. The standard tests for natural pozzolan are listed in 'Supplementary Cementing Materials' (CSA, 1998). The results of testing (replacing 10%, 20 % and 30% of Portland cement with these pozzolanic materials) are listed in Appendix B-4 of this report. These results are illustrated in Figure 5 that shows (1) the pozzolanic activity (%) versus days of curing time and (2) compressive strength vs days.

Pozzolanic Activity**:** This is a measure of a sample's cementing properties compared with standard Portland cement. It is well established that pozzolanic materials normally gain strength until completion of the usual 28 day testing period. In the present case, testing the pozzolanic activity of the tuff sample, from 7 to 28 and 56 days shows that all mixtures (at 10, 20 and 30%) exceed the minimum 75% ASTM strength activity standard for curing time interval between 7 and 28 days and beyond. Indeed, the measured pozzolanic activity, using a 30% tuff mixture, is 89.5 % (compared to the control sample) at 28 days; this rises to 99.4 % at 56 days.

Compressive Strength**:** The results for the compressive strength tests for the concrete mixtures are also shown in Fig. 5. The graphs indicate a gain in concrete strength for all pozzolanic mixtures (10, 20 and 30%) at all intervals in the full curing period (7, 28 and 56 days). It is noted that at 7 days the prepared concrete, using the tuff pozzolanic mixtures of 10, 20 and 30 %, acquired the average strength of 35.3 Mpa; this increased to 48.5 Mpa at 28 days and 50.1 Mpa at 56 days.

These results are excellent. The zeolitic pozzolan is essentially equivalent to pure Portland cement up to 30% replacement and should be competitive at this mixture level with fly ash. Also, from this - it is projected that if a slightly higher substitution mixture ratio does not equal the properties of pure Portand cement, the Manuel Creek tuff may still be useful as an effective additive for the purpose of lowering the heat of hydration in the construction of massive concrete structures (such as hydroelectric dams), although the overall curing time/ strength gain may be reduced somewhat.

Figure 5 Pozzolanic Activity and Strength Tests



Conclusions and Recommendations

This project investigates the zeolite and pozzolan potential of dacitic tuff in the Manuel Creek area.

The zeolitic rocks, characterized by densities in the range 1.997 to 2.230, are relatively low (light weight) compared to the 2.568 to 2.753 values obtained for the adjacent volcanic formations. The effective zeolite in these rocks, identified as clinoptilolite (density 2.1-2.2), is confirmed by XRD diffractograms where the ASTM diagnostic lines for clinoptilolite d (Å) = 3.96 and d (Å) = 9.00 are prominent for samples from the three main sampling sites MAN-10 (Lat. 49°14.8', Long. 119°44.0'), MAN-36 (Lat. 49°14.4', Long. 119°44.0'), MAN-78 (Lat. 49°13.7', Long. 119°43.4').

In SEM imagery, microlites (20-150 µm) of quartz (est.10-25%) and oligoclase feldspar (est. 25-35%), and minor biotite and amphibole, are set in a shard- dust rich matrix that is largely replaced by fine-grained (10 µm) scaly clinoptilolite.

Examples of the production and use of zeolite as a gas and water filter and absorbent are provided by Mumpton (1999) and Barker et al (2004). St. Cloud Mining Company, based in Winston, New Mexico (mine reserve resource of 18.3 million tons), is the largest producer of natural zeolites in North America. The company promotes many uses for their zeolite (Appendix B-5). 'AlwaysFreshContainers' are a recent addition to the list of zeolite products available on the market. This is like Tupperware for food storage that 'prolongs the life of fruit and vegetables by eliminating ethylene gas' (a ripening catalyst released as a byproduct during food aging). Also, 'CoolCrisp' is a new fridge freshener product sold by Canadian Tire stores (Product #53-4111-6). According to advertisement, this product, made from zeolite found in volcanic rocks, absorbs odours, ethylene gas and moisture so food stays fresh.

Further analyses suggest that the Manuel Creek dacitic tuff is a significant pozzolan resource. When this rock is mechanically crushed and mixed with Portland cement, the powder reacts, when water is added, to form cementing calcsilicate minerals. Specific tests of this product, for activity and compressive strength, produce values that are well within ASTM standard limits for mixtures containing up to 30% tuff.

For specific concrete design, other physical and compositional testing might be necessary to achieve the best performance and economy of the concrete mix. These include testing for the effect of fineness of grind vs strength gain, determination of optimal water content, optimal slump / flow values, and testing to determine drying and shrinkage properties.

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Appendix A
Statement of Costs

Labour: -	geological engineer, B.N. Church, P.Eng. July 18-23rd, 2009; Oct. 18-20th; 2009 - 9 days @ 500/day	$4,500.00
Accomodation:	$ 5.11.75 + 63.25 + 63.25 (9 days)	638.25
Meals:		489.01
Vehicle costs:	@ $ 0.50/km	450.00
	Fuel	171.16
Ferry costs:	($30.00 + 56.50 + 45.00 + 58.50)	192.00
Specific density analyses:	(27 x $ 20.00)	540.00
X-ray diffraction analyses:	(4 x $100)	400.00
SEM imagery:	(University of Alberta) (4 x $ 200.00)	800.00
Pozzolan Testing:	(AMEC Earth & Environmental Laboratories Ltd.)	300.00
Report preparation:		4,000.00
	Total	$ 12,480.42

Appendix B Analytical Results

Appendix B-1 Relative Density of Samples

Appendix B-1 Relative Density of Samples

Sample	Notes	Location Lat.	Long.	Weight (g)	Volume (ml)	Density (g / ml)
MAN 10	dactic tuff	49^14.8'	119^44.0'	71.1	35.6	1.997
MAN 10	dactic tuff	49^14.8'	119^44.0'	81.8	39.7	2.061
MAN 10	dactic tuff	49^14.8'	119^44.0'	75.8	36.1	2.101
MAN 10	dactic tuff	49^14.8'	119^44.0'	72.7	35.7	2.036
MAN 10	sandstone	49^14.8'	119^44.0'	29.7	12.4	2.395
MAN 22	dactic tuff	49^15.2'	119^43.6'	100.01	43.6	2.294
MAN 28	dactic tuff	49^14.4'	119^44.0'	107.61	49.1	2.191
MAN 29	basalt	49^14.4'	119^43.8'	234.6	85.5	2.744
MAN 36	dactic tuff	49^14.1'	119^44.0'	51.1	22.9	2.231
MAN 36	dactic tuff	49^14.1'	119^44.0'	65.6	29.1	2.262
MAN 36	dactic tuff	49^14.1'	119^44.0'	75.8	33.6	2.256
MAN 36	dactic tuff	49^14.1'	119^44.6'	75.1	38.5	2.242
MAN 36	dactic tuff	49^14.1'	119^44.0'	119.91	54.1	2.216
MAN 36	siltstone	49^14.1'	119^44.0'	55.1	23.4	2.355
MAN 37	sandstone	49^14.2'	119^43.8'	105.31	44.5	2.366
MAN 78	dactic tuff	49^13.7'	119^43.4'	12.2	5.7	2.141
MAN 78	dactic tuff	49^13.7'	119^43.4'	155.11	71.9	2.157
MAN 78	dactic tuff	49^13.7'	119^43.4'	105.71	48.5	2.179
MAN 78	dactic tuff	49^13.7'	119^43.4'	78.1	36.8	2.121
MAN 78	dactic tuff	49^13.7'	119^43.4'	63.4	28.3	2.241
MAN 78	dactic tuff	49^13.7'	119^43.4'	43.7	20.5	2.132
MAN 80	basalt	49^13.1'	119^43.4'	83.7	30.4	2.753
MAN 81	trachyandesite	49^12.8'	119^43.6'	37.5	14.6	2.568
control	Kspar	na	na	80.9	32.1	2.528
control	pyrite	na	na	41.5	8.4	4.941
control	quartz	na	na	161.1	6.2	2.601
control	natrolite	na	na	17.5	7.4	2.241

Appendix B-2 X-Ray Diffraction Analyses

[Z13026.RAW] CLINOPTILOLITE, CDN POWDER, BP	Peak Search Report

SCAN: 2.0/90.0/0.02/2(sec), Co, I(p)=957.0, 07/29/09 03:44p

PEAK: 23(pts)/Parabolic Filter, Threshold=3.0, Cutoff=0.1%, BG=3/1.0, Peak-Top=Summit

NOTE: Intensity = Counts, 2T(0)=0.0(deg), Wavelength to Compute d-Spacing = 1.78899Å (Co/K-alpha1)

#	2-Theta	d(Å)	BG	Height	H%	Area	A%	FWHM
1	10.179	10.0836	46	118	12.8	1528	17.6	0.221
2	11.379	9.0224	30	201	21.8	3596	41.3	0.305
3	12.973	7.9180	28	84	9.1	796	9.1	0.162
4	15.155	6.7832	28	42	4.6	667	7.7	0.267
5	15.461	6.6499	25	39	4.2	734	8.4	0.322
6	19.299	5.3364	19	29	3.1	546	6.3	0.325
7	19.615	5.2512	21	79	8.6	1545	17.7	0.331
8	20.143	5.1151	20	90	9.7	1252	14.4	0.237
9	22.121	4.6627	23	86	9.3	1037	11.9	0.205
10	23.682	4.3592	21	34	3.7	402	4.6	0.200
11	24.258	4.2572	20	52	5.6	620	7.1	0.203
12	25.538	4.0470	20	72	7.8	736	8.5	0.173
13	26.100	3.9614	23	274	29.7	8378	96.3	0.520
14	26.398	3.9175	32	140	15.1	4523	52.0	0.551
15	27.622	3.7471	31	135	14.7	1743	20.0	0.219
16	28.396	3.6469	28	122	13.2	996	11.4	0.139
17	29.080	3.5629	37	41	4.5	303	3.5	0.124
18	29.743	3.4862	30	44	4.8	828	9.5	0.318
19	30.241	3.4292	39	98	10.7	2513	28.9	0.435
20	30.981	3.3481	30	341	37.0	6726	77.3	0.335
21	31.603	3.2849	30	50	5.4	255	2.9	0.087
22	32.321	3.2138	30	355	38.5	4585	52.7	0.219
23	32.642	3.1830	35	922	100.0	8704	100.0	0.160
24	33.182	3.1327	28	136	14.8	1765	20.3	0.220
25	34.431	3.0223	31	63	6.9	1589	18.3	0.426
26	34.860	2.9779	29	118	12.8	3993	45.9	0.576
27	35.375	2.9441	21	88	9.5	2190	25.2	0.425
28	36.662	2.8441	23	31	3.3	154	1.8	0.085
29	37.299	2.7972	26	81	8.8	1110	12.3	0.232
30	38.084	2.7417	23	45	4.9	600	6.9	0.227
31	39.341	2.6573	20	65	7.1	592	6.8	0.155
32	41.263	2.5386	22	85	9.2	1619	18.6	0.325
33	42.676	2.4583	23	28	3.1	991	11.4	0.593
34	43.320	2.4234	23	33	3.6	991	11.4	0.512
35	49.335	2.1432	15	34	3.7	517	5.9	0.261
36	49.841	2.1229	15	52	5.6	1150	13.2	0.378
37	52.548	2.0207	15	21	2.3	576	6.6	0.469
38	52.795	2.0119	15	26	2.8	576	6.6	0.379
39	57.025	1.8739	14	30	3.2	192	2.2	0.109
40	58.840	1.8210	18	43	4.6	722	8.3	0.288
41	59.717	1.7967	20	67	7.3	771	8.9	0.195
42	60.480	1.7761	24	88	9.6	650	7.5	0.125
43	63.629	1.6968	14	22	2.4	366	4.2	0.282

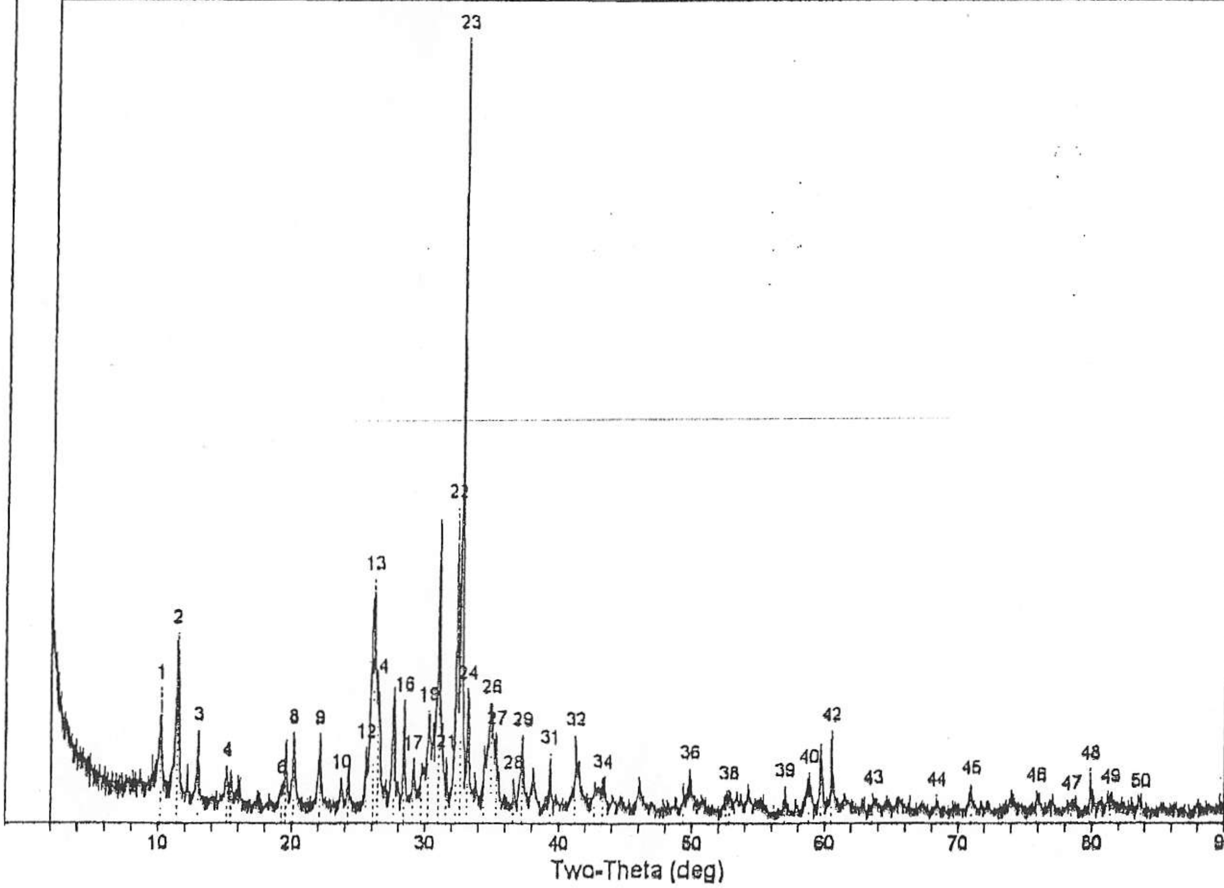
[Z13026.RAW] CLINOPTILOLITE, CDN POWDER, BP	Peak Search Report

SCAN: 2.0/90.0/0.02/2(sec), Co, I(p)=957.0, 07/29/09 03:44p

PEAK: 23(pts)/Parabolic Filter, Threshold=3.0, Cutoff=0.1%, BG=3/1.0, Peak-Top=Summit

NOTE: Intensity = Counts, 2T(0)=0.0(deg), Wavelength to Compute d-Spacing = 1.78899Å (Co/K-alpha1)

#	2-Theta	d(Å)	BG	Height	H%	Area	A%	FWHM
44	68.379	1.5918	13	21	2.3	254	2.9	0.203
45	70.994	1.5405	16	32	3.5	485	5.6	0.255
46	75.883	1.4548	15	24	2.6	314	3.6	0.224
47	78.473	1.4142	12	17	1.8	479	5.5	0.492
48	79.883	1.3933	14	51	5.5	419	4.8	0.140
49	81.415	1.3716	18	19	2.0	319	3.7	0.289
50	83.667	1.3411	13	18	1.9	310	3.6	0.297



Materials Data, Inc.

[XRD-LAB-ESBB10A|xrd lab]<a:\Data> Wednesday, July 29, 2009 04:26p (MDI/JADE9)

[Z13086.RAW] CMBC POWDER (AUG 14/09), BP	Peak Search Report

SCAN: 2.0/90.0/0.02/2(sec), Co, I(p)=736.0, 08/18/09 01:13p

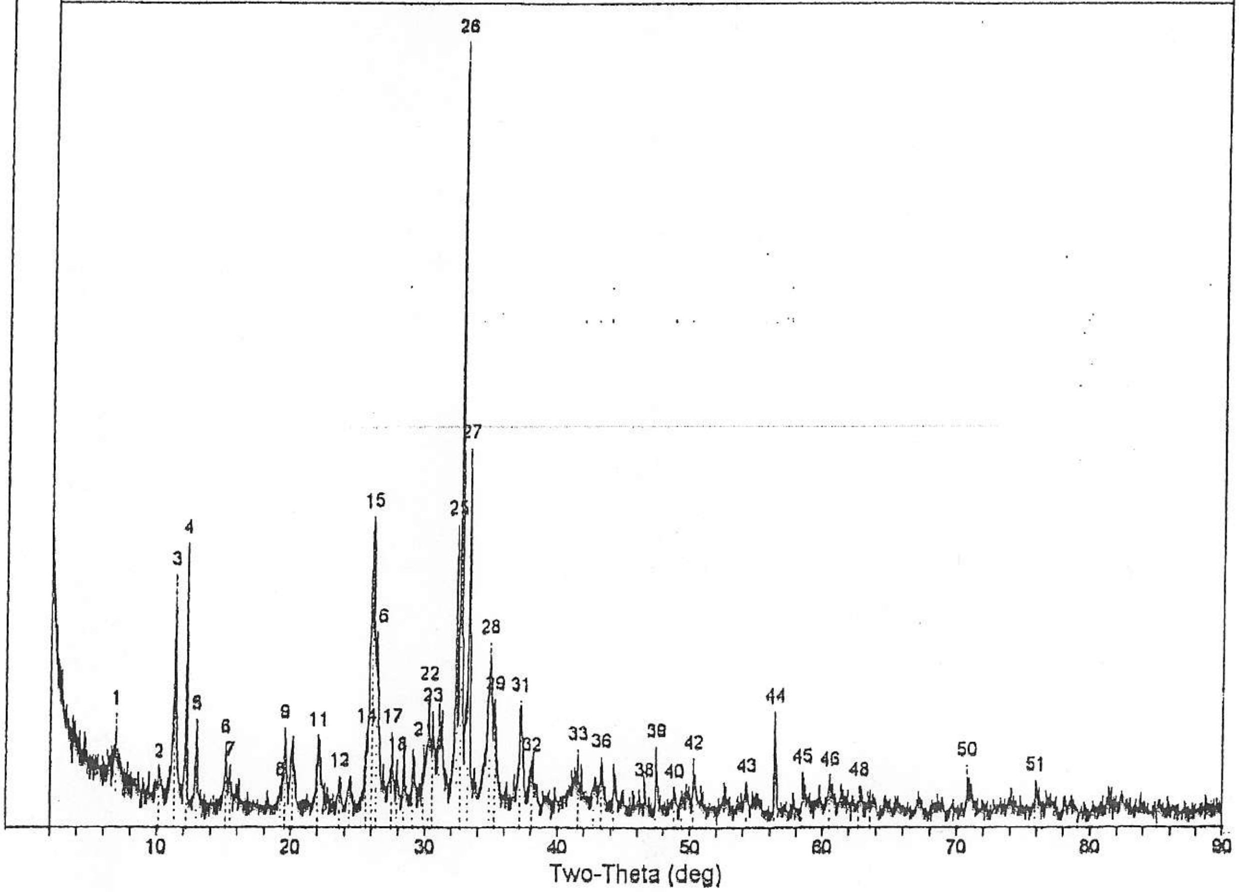
PEAK: 21(pts)/Parabolic Filter, Threshold=3.0, Cutoff=0.1%, BG=3/1.0, Peak-Top=Summit

NOTE: Intensity = Counts, 2T(0)=0.0(deg), Wavelength to Compute d-Spacing = 1.78899Å (Co/K-alpha1)

#	2-Theta	d(Å)	BG	Height	H%	Area	A%	FWHM
1	6.958	14.7408	54	52	7.4	272	3.2	0.089
2	10.178	10.0842	31	25	3.6	412	4.9	0.280
3	11.361	9.0374	28	209	29.8	2525	30.1	0.206
4	12.198	8.4190	30	237	33.8	1253	14.9	0.090
5	12.962	7.9249	23	78	11.2	717	8.5	0.156
6	15.121	6.7983	23	56	8.0	882	10.5	0.267
7	15.476	6.6434	20	38	5.4	945	11.2	0.421
8	19.219	5.3585	17	22	3.2	440	5.2	0.336
9	19.580	5.2605	18	75	10.7	1508	18.0	0.341
10	20.196	5.1018	18	67	9.6	1226	14.6	0.311
11	22.041	4.6793	20	66	9.4	1024	12.2	0.265
12	23.655	4.3641	20	28	4.0	291	3.5	0.175
13	24.379	4.2364	19	28	4.1	455	5.4	0.272
14	25.599	4.0377	19	71	10.2	1474	17.5	0.352
15	26.061	3.9673	21	271	38.7	8400	100.0	0.527
16	26.382	3.9199	32	152	21.6	4367	52.0	0.490
17	27.505	3.7627	29	60	8.6	631	7.5	0.179
18	27.885	3.7124	25	38	5.4	382	4.5	0.172
19	28.419	3.6440	23	59	8.4	409	4.9	0.118
20	29.060	3.5653	22	51	7.2	872	10.4	0.292
21	29.895	3.4680	32	45	6.4	208	2.5	0.079
22	30.279	3.4250	32	97	13.8	2400	28.6	0.421
23	30.559	3.3943	38	71	10.1	1728	20.6	0.415
24	31.020	3.3450	33	83	11.8	1663	19.8	0.341
25	32.337	3.2123	33	252	36.0	2951	35.1	0.199
26	32.658	3.1815	36	700	100.0	6773	80.6	0.164
27	33.281	3.1236	30	325	46.4	3840	45.7	0.201
28	34.881	2.9844	29	145	20.7	4387	52.2	0.514
29	35.298	2.9503	24	96	13.8	2254	26.8	0.397
30	36.715	2.8402	24	26	3.7	313	3.7	0.206
31	37.183	2.8057	26	93	13.2	1519	18.1	0.279
32	38.064	2.7431	27	36	5.1	582	6.9	0.277
33	41.559	2.5213	25	48	6.9	1242	14.8	0.437
34	41.806	2.5071	23	36	5.2	307	3.7	0.144
35	42.738	2.4549	23	25	3.6	478	5.7	0.319
36	43.282	2.4255	22	44	6.3	935	11.1	0.359
37	44.201	2.3775	20	38	5.4	599	7.1	0.267
38	46.572	2.2627	17	22	3.2	274	3.3	0.208
39	47.442	2.2235	16	60	8.5	398	4.7	0.113
40	48.800	2.1653	17	21	2.9	246	2.9	0.204
41	49.393	2.1409	18	18	2.6	346	4.1	0.323
42	50.261	2.1063	21	44	6.3	558	6.6	0.214
43	54.278	1.9610	18	25	3.6	439	5.2	0.295

[Z13086.RAW] CMBC POWDER (AUG 14/09), BP	Peak Search Report
SCAN: 2.0/90.0/0.02/2(sec), Co, I(p)=736.0, 08/18/09 01:13p	
PEAK: 21(pts)/Parabolic Filter, Threshold=3.0, Cutoff=0.1%, BG=3/1.0, Peak-Top=Summit	
NOTE: Intensity = Counts, 2T(0)=0.0(deg), Wavelength to Compute d-Spacing = 1.78899Å (Co/K-alpha1)	

#	2-Theta	d(Å)	BG	Height	H%	Area	A%	FWHM
44	56.378	1.8936	12	97	13.8	929	11.1	0.163
45	58.483	1.8312	15	37	5.3	516	6.1	0.236
46	60.539	1.7745	18	31	4.4	528	6.3	0.290
47	61.403	1.7520	18	22	3.2	319	3.8	0.245
48	62.750	1.7181	19	20	2.8	163	1.9	0.140
49	63.554	1.6986	16	18	2.5	274	3.3	0.264
50	70.780	1.5445	20	38	5.5	144	1.7	0.064
51	75.913	1.4543	18	26	3.8	267	3.2	0.171



Materials Data, Inc.

[XRD-LAB-ESBB10A|xrd lab]<c:\Data> Wednesday, August 19, 2009 01:20p (MDI/JADE9)

[Z13201.RAW] CLINOPTILOLITE ROCK, #4 BATCH-100509, BP	Peak Search Report
SCAN: 2.0/90.0/0.02/0.1(sec), Co, I(p)=476.0, 10/06/09 03:22p	
PEAK: 15(pts)/Parabolic Filter, Threshold=3.0, Cutoff=0.1%, BG=3/1.0, Peak-Top=Summit	
NOTE: Intensity = Counts, 2T(0)=0.0(deg), Wavelength to Compute d-Spacing = 1.78899Å (Co/K-alpha1)	

#	2-Theta	d(Å)	BG	Height	H%	Area	A%	FWHM
1	6.845	14.9836	45	27	6.0	583	8.4	0.349
2	10.239	10.0242	28	44	9.9	435	6.2	0.168
3	11.441	8.9742	26	133	29.7	2174	31.2	0.279
4	12.202	8.4160	23	174	38.9	1099	15.8	0.107
5	12.981	7.9132	19	79	17.7	678	9.7	0.146
6	15.179	6.7728	15	48	10.7	810	11.6	0.288
7	15.499	6.6336	14	40	8.9	887	12.7	0.378
8	17.513	5.8756	16	8	1.9	99	1.4	0.190
9	19.307	5.3342	18	25	5.6	362	5.2	0.248
10	19.674	5.2356	17	69	15.5	1319	18.9	0.324
11	20.142	5.1153	14	72	16.1	1271	18.2	0.300
12	20.377	5.0569	14	31	6.9	755	10.8	0.414
13	22.178	4.6508	13	71	16.0	1213	17.4	0.289
14	22.780	4.5294	13	25	5.7	205	2.9	0.137
15	24.359	4.2398	20	51	11.4	726	10.4	0.243
16	24.559	4.2058	20	45	10.0	726	10.4	0.277
17	25.560	4.0437	17	64	14.4	497	7.1	0.132
18	25.981	3.9793	21	224	50.2	6967	100.0	0.528
19	26.400	3.9172	31	127	28.4	4879	70.0	0.654
20	27.380	3.7795	32	48	10.7	530	7.6	0.189
21	27.999	3.6976	16	38	8.4	468	6.7	0.212
22	28.441	3.6413	16	67	14.9	729	10.5	0.186
23	29.177	3.5513	20	52	11.7	531	7.6	0.173
24	29.912	3.4660	24	40	9.0	255	3.7	0.108
25	30.337	3.4186	24	82	18.4	2178	31.3	0.452
26	30.582	3.3918	25	71	15.8	2039	29.3	0.491
27	31.039	3.3431	25	201	44.9	3609	51.8	0.306
28	31.281	3.3178	25	116	25.9	2819	40.5	0.415
29	31.697	3.2754	25	121	27.0	835	12.0	0.118
30	32.297	3.2161	52	76	17.0	676	9.7	0.151
31	32.659	3.1814	30	446	100.0	5668	81.4	0.216
32	33.355	3.1169	23	106	23.7	1680	24.1	0.270
33	33.777	3.0790	28	21	4.8	197	2.8	0.158
34	34.901	2.9828	26	121	27.0	3749	53.8	0.528
35	35.079	2.9682	27	107	24.0	3749	53.8	0.596
36	35.301	2.9501	22	68	15.2	2667	38.3	0.668
37	37.260	2.8001	25	86	19.2	1295	18.6	0.256
38	38.142	2.7377	26	31	6.8	429	6.2	0.239
39	40.303	2.5964	17	25	5.6	523	7.5	0.357
40	41.522	2.5235	26	29	6.6	621	8.9	0.359
41	42.922	2.4449	21	26	5.9	969	13.9	0.624
42	43.259	2.4267	22	25	5.6	730	10.5	0.501
43	45.240	2.3257	17	23	5.1	162	2.3	0.121

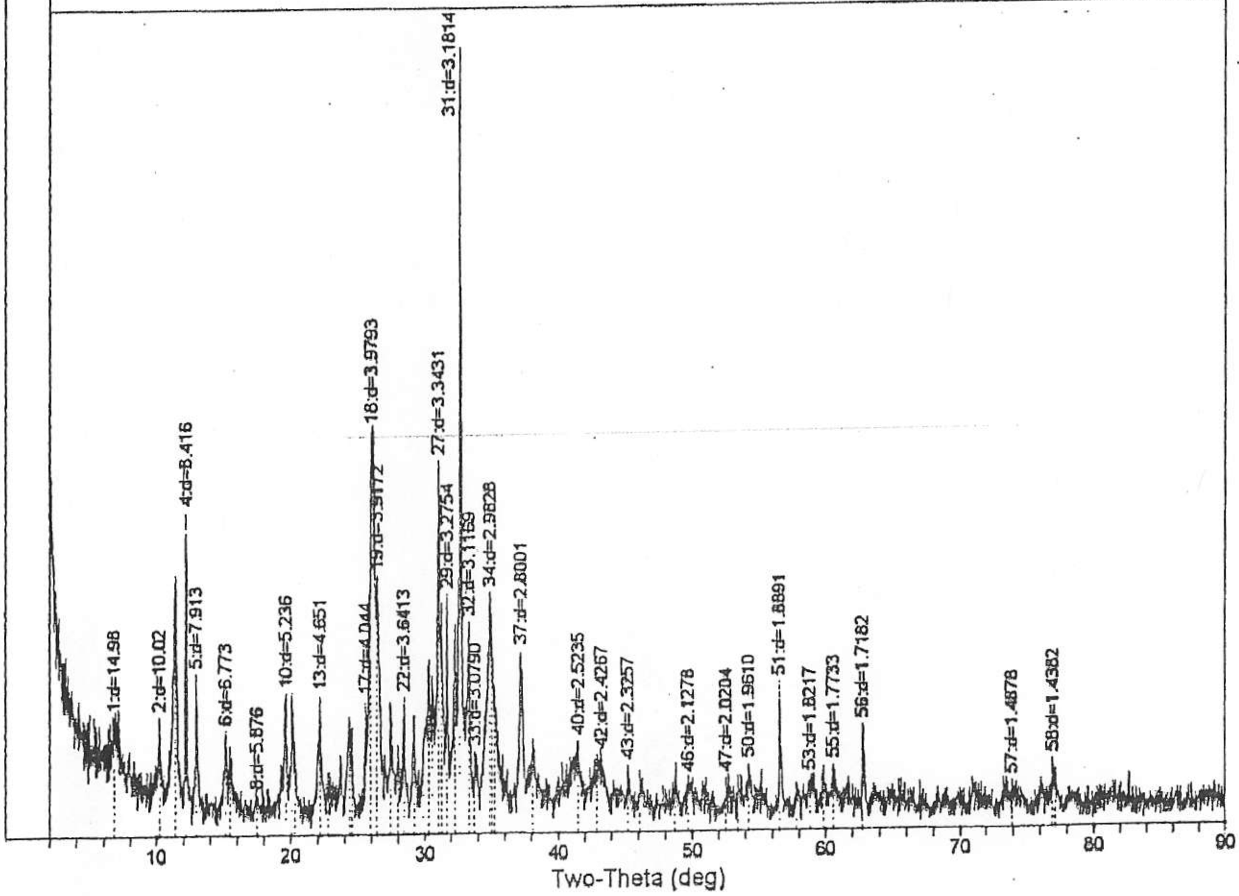
[Z13201.RAW] CLINOPTILOLITE ROCK, #4 BATCH-100509, BP — **Peak Search Report**

SCAN: 2.0/90.0/0.02/0.1(sec), Co, I(p)=476.0, 10/06/09 03:22p

PEAK: 15(pts)/Parabolic Filter, Threshold=3.0, Cutoff=0.1%, BG=3/1.0, Peak-Top=Summit

NOTE: Intensity = Counts, 2T(0)=0.0(deg), Wavelength to Compute d-Spacing = 1.78899Å (Co/K-alpha1)

#	2-Theta	d(Å)	BG	Height	H%	Area	A%	FWHM
44	46.118	2.2838	16	21	4.6	263	3.8	0.204
45	48.730	2.1682	16	12	2.7	194	2.8	0.253
46	49.717	2.1278	17	15	3.3	236	3.4	0.255
47	52.558	2.0204	14	18	4.1	62	0.9	0.058
48	53.454	1.9889	15	18	4.0	152	2.2	0.143
49	53.659	1.9819	15	18	4.1	342	4.9	0.318
50	54.277	1.9610	16	24	5.3	539	7.7	0.389
51	56.525	1.8891	11	79	17.7	771	11.1	0.165
52	57.817	1.8504	14	12	2.8	107	1.5	0.137
53	58.814	1.8217	15	17	3.9	406	5.8	0.371
54	59.856	1.7929	18	20	4.4	129	1.9	0.105
55	60.585	1.7733	18	21	4.7	287	4.1	0.217
56	62.745	1.7182	14	49	10.9	397	5.7	0.139
57	73.916	1.4878	12	16	3.6	645	9.3	0.676
58	76.917	1.4382	14	27	6.0	446	6.4	0.281
59	77.131	1.4349	13	22	4.9	446	6.4	0.348



[Z13259.RAW] CMBC-5, BP	Peak Search Report

SCAN: 2.0/90.0/0.02/0.1(sec), Co, I(p)=634.0, 11/06/09 09:53a

PEAK: 25(pts)/Parabolic Filter, Threshold=3.0, Cutoff=0.1%, BG=3/1.0, Peak-Top=Summit

NOTE: Intensity = Counts, 2T(0)=0.0(deg), Wavelength to Compute d-Spacing = 1.78899Å (Co/K-alpha1)

#	2-Theta	d(Å)	BG	Height	H%	Area	A%	FWHM
1	7.019	14.6117	42	69	10.9	418	6.1	0.267
2	10.160	10.1015	30	79	12.5	556	8.1	0.191
3	11.321	9.0688	28	150	23.7	2031	29.7	0.284
4	12.140	8.4589	23	144	22.7	755	11.1	0.107
5	12.920	7.9501	22	95	15.0	671	9.8	0.156
6	14.182	7.2461	18	35	5.5	154	2.3	0.149
7	15.082	6.8158	19	68	10.7	852	12.5	0.298
8	15.400	6.6761	18	59	9.3	699	10.2	0.290
9	19.542	5.2707	17	83	13.1	1102	16.1	0.285
10	20.083	5.1301	29	75	11.8	492	7.2	0.181
11	22.039	4.6798	17	94	14.8	905	13.2	0.200
12	23.700	4.3559	13	39	6.2	452	6.6	0.301
13	24.365	4.2388	15	38	6.0	246	3.6	0.185
14	25.941	3.9853	18	238	37.5	6833	100.0	0.528
15	26.359	3.9231	27	145	22.9	4064	59.5	0.586
16	27.936	3.7058	23	47	7.4	169	2.5	0.119
17	28.430	3.6426	25	38	6.0	-12	-0.2	0.020
18	29.010	3.5713	25	51	8.0	388	5.7	0.240
19	29.680	3.4925	24	75	11.8	417	6.1	0.139
20	30.201	3.4336	27	106	16.7	1841	26.9	0.398
21	30.544	3.3959	33	129	20.3	1476	21.6	0.262
22	30.924	3.3552	27	107	16.9	1431	20.9	0.304
23	32.283	3.2175	27	99	15.6	1499	21.9	0.354
24	32.603	3.1868	29	634	100.0	6208	90.8	0.175
25	33.197	3.1313	25	183	28.9	1967	28.8	0.212
26	34.821	2.9895	23	130	20.5	3659	53.5	0.584
27	35.222	2.9565	24	96	15.1	2510	36.7	0.592
28	36.621	2.8472	24	76	12.0	195	2.9	0.060
29	37.201	2.8043	26	107	16.9	1085	15.9	0.226
30	38.099	2.7406	18	57	9.0	802	11.7	0.349
31	38.418	2.7187	18	69	10.9	600	8.8	0.200
32	41.419	2.5295	20	53	8.4	802	11.7	0.417
33	42.722	2.4558	19	34	5.4	494	7.2	0.511
34	43.183	2.4308	18	50	7.9	681	10.0	0.338
35	43.985	2.3886	18	80	12.6	551	8.1	0.152
36	44.918	2.3415	19	50	7.9	368	5.4	0.202
37	46.031	2.2878	16	21	3.3	79	1.2	0.243
38	48.713	2.1689	17	34	5.4	48	0.7	0.044
39	49.304	2.1445	18	42	6.6	243	3.6	0.169
40	50.361	2.1023	16	46	7.3	323	4.7	0.183
41	52.702	2.0152	15	37	5.8	445	6.5	0.336
42	52.996	2.0049	15	41	6.5	445	6.5	0.286
43	54.188	1.9640	16	36	5.7	442	6.5	0.385

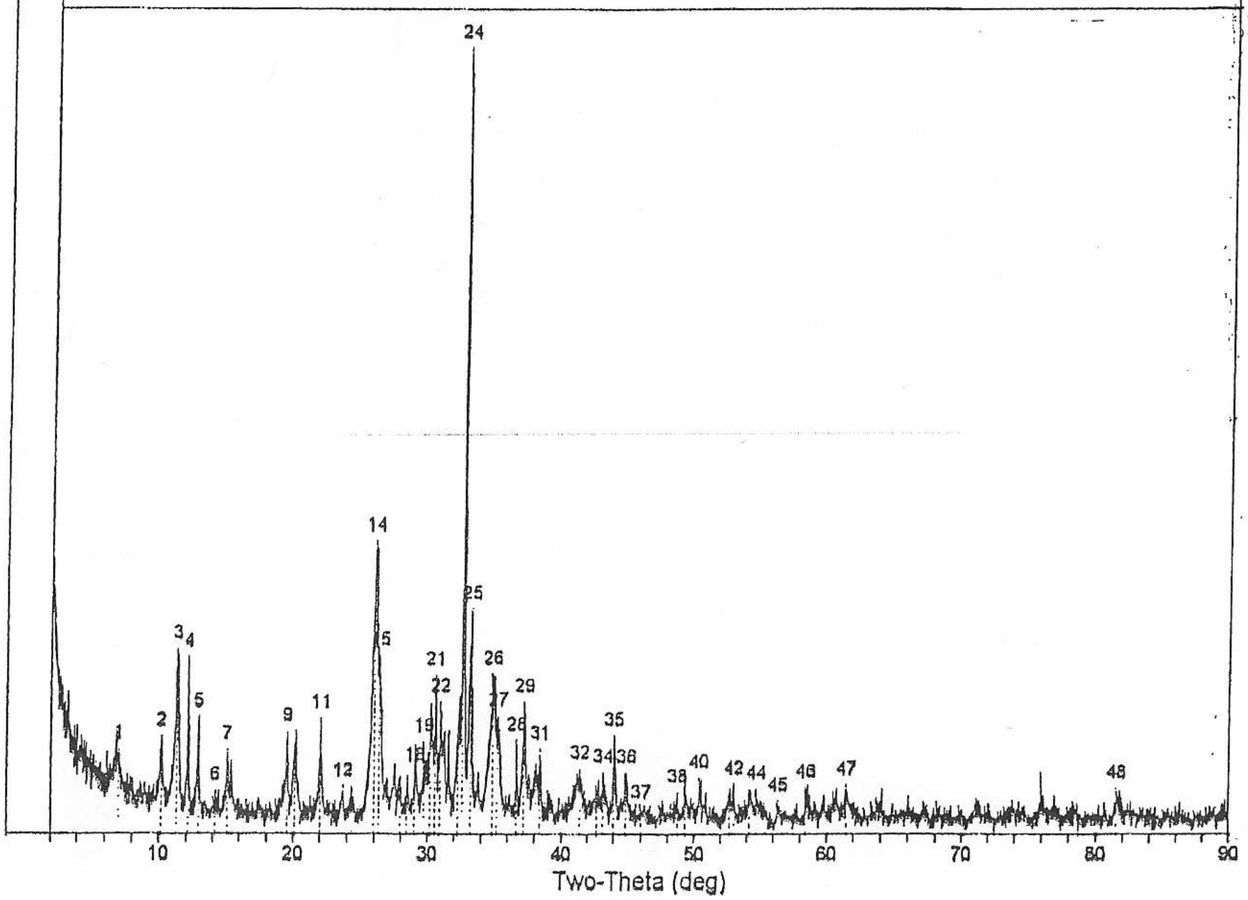
[Z13259.RAW] CMBC-5, BP	Peak Search Report

SCAN: 2.0/90.0/0.02/0.1(sec), Co, I(p)=634.0, 11/06/09 09:53a

PEAK: 25(pts)/Parabolic Filter, Threshold=3.0, Cutoff=0.1%, BG=3/1.0, Peak-Top=Summit

NOTE: Intensity = Counts, 2T(0)=0.0(deg), Wavelength to Compute d-Spacing = 1.78899Å (Co/K-alpha1)

#	2-Theta	d(Å)	BG	Height	H%	Area	A%	FWHM
44	54.704	1.9469	13	37	5.8	757	11.1	0.546
45	56.339	1.8948	9	27	4.3	135	2.0	0.130
46	58.416	1.8331	13	38	6.0	402	5.9	0.276
47	61.447	1.7508	17	40	6.3	354	5.2	0.260
48	81.506	1.3703	12	37	5.8	363	5.3	0.250



[Z13403.RAW] CMBC-6, BP	Peak Search Report

SCAN: 2.0/90.0/0.02/0.1(sec), Co, I(p)=744.0, 12/17/09 12:01p

PEAK: 21(pts)/Parabolic Filter, Threshold=1.0, Cutoff=1.0%, BG=3/1.0, Peak-Top=Summit

NOTE: Intensity = Counts, 2T(0)=0.0(deg), Wavelength to Compute d-Spacing = 1.78899Å (Co/K-alpha1)

#	2-Theta	d(Å)	h	k	l	BG	Height	H%	Area	A%	FWHM	P/N
1	10.279	9.9855				19	37	5.0	2.8	2.1	0.135	1.5
2	11.458	8.9610				18	121	16.3	32.0	23.9	0.265	4.7
3	12.238	8.3917				22	114	15.3	11.7	8.7	0.108	4.3
4	13.039	7.8780				17	57	7.7	5.4	4.0	0.114	2.6
5	15.181	6.7718				12	46	6.2	16.9	12.6	0.416	2.5
6	15.518	6.6255				14	41	5.5	9.4	7.1	0.300	2.1
7	19.659	5.2397				14	57	7.7	15.4	11.5	0.304	2.9
8	20.179	5.1061				19	66	8.9	8.3	6.2	0.150	2.9
9	22.215	4.6431				12	61	8.2	13.8	10.3	0.241	3.1
10	23.767	4.3438				13	26	3.5	2.3	1.7	0.156	1.2
11	24.298	4.2502				14	72	9.7	15.5	11.6	0.228	3.4
12	25.604	4.0369				15	83	11.2	15.1	11.3	0.190	3.7
13	26.042	3.9700				15	167	22.4	113.6	85.0	0.634	5.9
14	26.503	3.9023				25	120	16.1	40.3	30.2	0.362	4.3
15	27.599	3.7501				21	95	12.8	20.2	15.1	0.231	3.8
16	28.442	3.6412				18	55	7.4	4.3	3.2	0.100	2.5
17	29.958	3.4608				19	52	7.0	10.3	7.7	0.266	2.3
18	30.360	3.4161				18	79	10.6	32.0	24.0	0.448	3.4
19	30.606	3.3892				18	70	9.4	25.7	19.2	0.422	3.1
20	31.061	3.3408				18	384	51.6	91.0	68.1	0.211	9.3
21	31.683	3.2768				18	63	8.5	9.6	7.2	0.183	2.8
22	32.401	3.2061				46	187	25.1	34.9	26.1	0.210	5.2
23	32.682	3.1793				17	744	100.0	133.7	100.0	0.156	13.3
24	33.299	3.1220				15	117	15.7	31.2	23.3	0.260	4.7
25	34.542	3.0129				15	50	6.7	6.8	5.1	0.167	2.5
26	35.001	2.9746				17	96	12.9	56.1	41.9	0.600	4.1
27	35.324	2.9482				20	108	14.5	53.4	40.0	0.518	4.2
28	36.665	2.8439				16	27	3.6	2.2	1.7	0.169	1.1
29	37.260	2.8000				18	87	11.7	20.2	15.1	0.247	3.7
30	38.176	2.7353				13	52	7.0	14.5	10.8	0.313	2.7
31	38.518	2.7119				14	25	3.4	6.3	4.7	0.488	1.1
32	41.504	2.5245				13	47	6.3	13.8	10.3	0.342	2.5
33	41.896	2.5019				13	32	4.3	4.2	3.1	0.184	1.7
34	42.780	2.4526				15	44	5.9	14.7	11.0	0.426	2.2
35	43.375	2.4205				16	38	5.1	9.7	7.3	0.368	1.8
36	46.158	2.2819				12	40	5.4	7.0	5.2	0.211	2.2
37	47.253	2.2319				12	33	4.4	3.7	2.8	0.149	1.8
38	48.123	2.1939				10	21	2.8	1.7	1.3	0.131	1.2
39	48.840	2.1636				12	25	3.4	3.4	2.5	0.227	1.3
40	49.857	2.1222				14	33	4.4	8.2	6.1	0.373	1.6
41	50.353	2.1027				15	29	3.9	5.0	3.7	0.301	1.3
42	53.720	1.9798				12	23	3.1	5.5	4.1	0.407	1.2
43	54.353	1.9585				12	27	3.6	4.7	3.5	0.271	1.4
44	54.898	1.9405				11	24	3.2	4.9	3.7	0.318	1.3

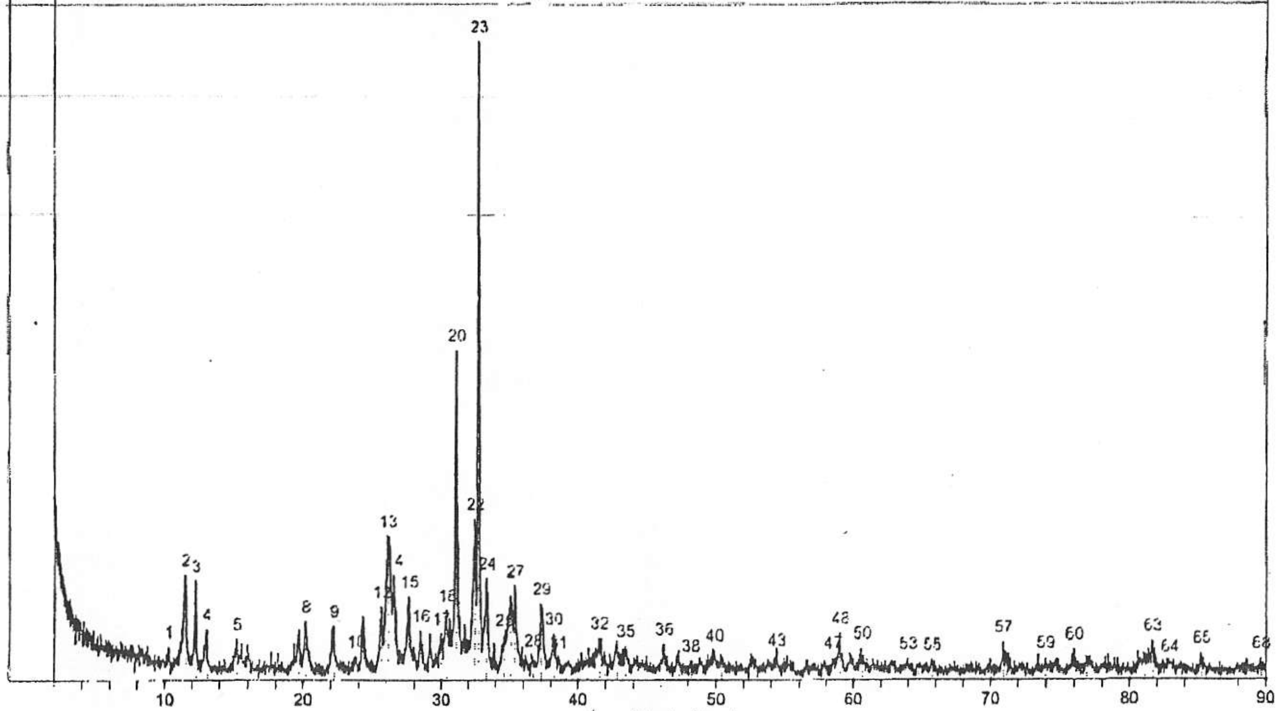
[Z13403.RAW] CMBC-6, BP — Peak Search Report

SCAN: 2.0/90.0/0.02/0.1(sec), Co, I(p)=744.0, 12/17/09 12:01p

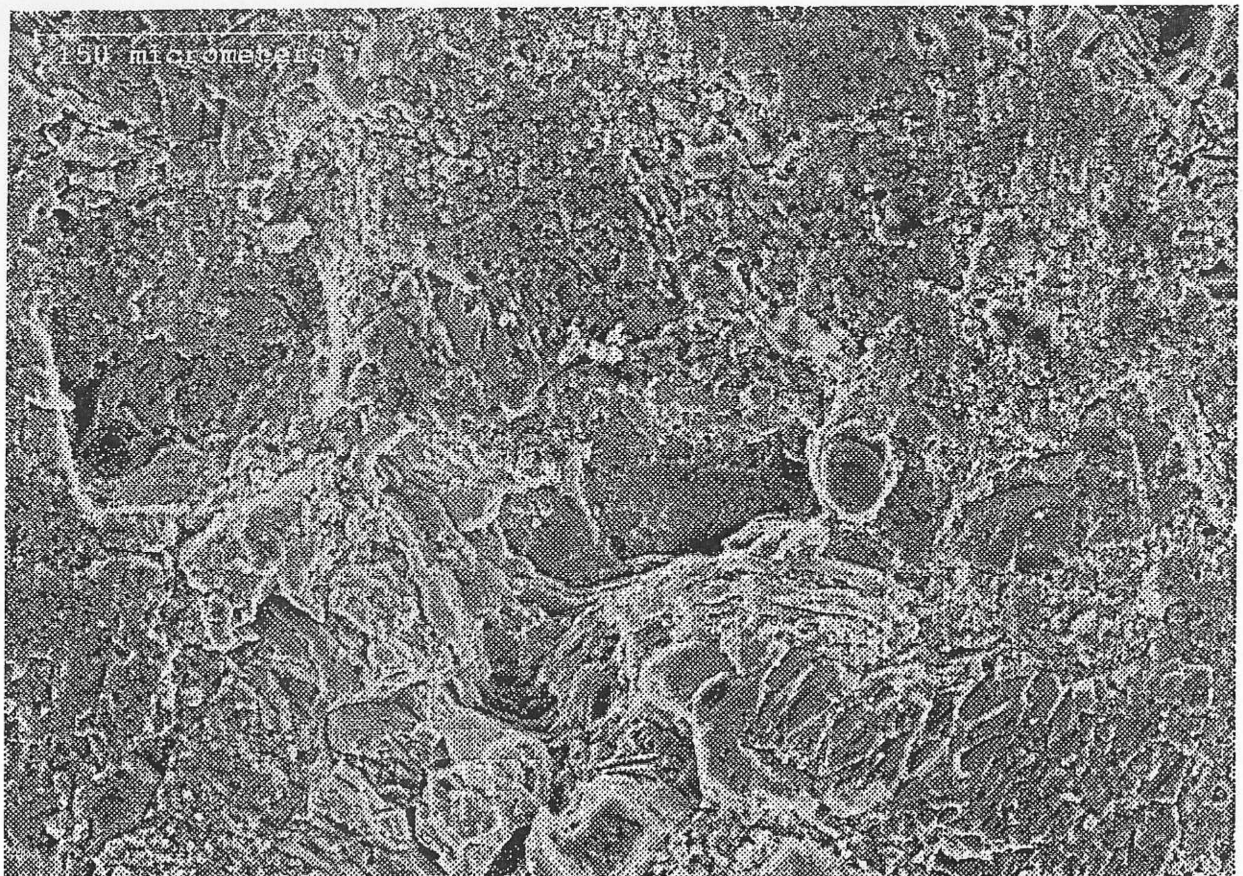
PEAK: 21(pts)/Parabolic Filter, Threshold=1.0, Cutoff=1.0%, BG=3/1.0, Peak-Top=Summit

NOTE: Intensity = Counts, 2T(0)=0.0(deg), Wavelength to Compute d-Spacing = 1.78899Å (Co/K-alpha1)

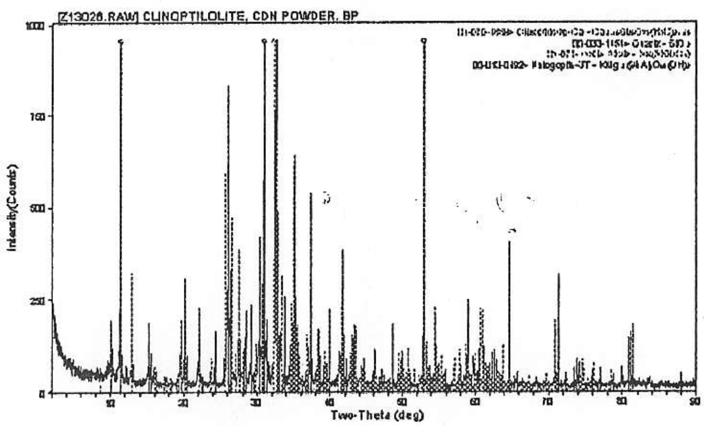
#	2-Theta	d(Å)	h	k	l	BG	Height	H%	Area	A%	FWHM	P/N
45	55.116	1.9334				10	27	3.6	5.2	3.9	0.261	1.6
46	57.795	1.8510				11	21	2.8	1.6	1.2	0.130	1.1
47	58.423	1.8328				11	24	3.2	5.6	4.2	0.367	1.3
48	58.960	1.8176				13	52	7.0	11.2	8.3	0.240	2.7
49	59.740	1.7961				14	30	4.0	2.7	2.0	0.141	1.5
50	60.582	1.7734				13	35	4.7	5.5	4.1	0.213	1.9
51	60.963	1.7634				12	24	3.2	3.1	2.3	0.218	1.2
52	61.417	1.7516				11	23	3.1	3.5	2.6	0.245	1.3
53	63.938	1.6894				11	23	3.1	2.2	1.7	0.162	1.2
54	64.658	1.6726				10	18	2.4	3.4	2.5	0.344	1.0
55	65.698	1.6491				10	22	3.0	3.8	2.8	0.272	1.3
56	69.965	1.5602				9	22	3.0	2.6	1.9	0.171	1.4
57	70.883	1.5426				10	42	5.6	7.6	5.7	0.205	2.4
58	71.103	1.5384				11	32	4.3	5.7	4.2	0.224	1.9
59	73.944	1.4873				12	24	3.2	5.1	3.8	0.348	1.3
60	75.980	1.4532				11	34	4.6	4.7	3.5	0.171	2.0
61	76.861	1.4391				11	26	3.5	5.2	3.9	0.298	1.5
62	81.079	1.3762				10	28	3.8	15.4	11.5	0.745	1.7
63	81.655	1.3682				14	43	5.8	9.9	7.4	0.290	2.2
64	82.898	1.3513				12	19	2.6	4.2	3.2	0.490	0.8
65	85.222	1.3212				9	29	3.9	5.1	3.8	0.214	1.9
66	85.479	1.3180				8	17	2.3	5.3	4.0	0.526	1.0
67	88.544	1.2814				10	22	3.0	2.6	1.9	0.183	1.3
68	89.609	1.2693				12	23	3.1	1.4	1.0	0.102	1.2

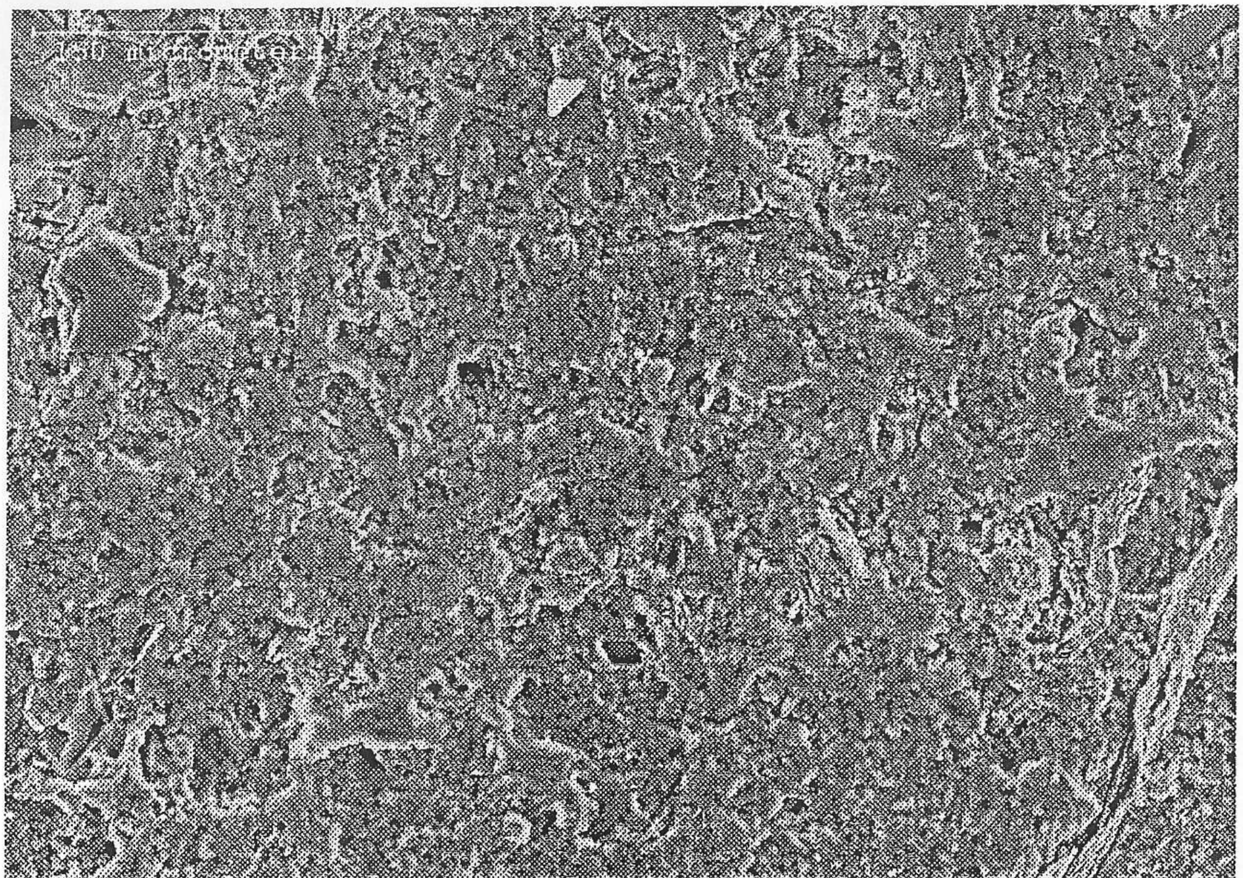


Appendix B-3 SEM Imagery

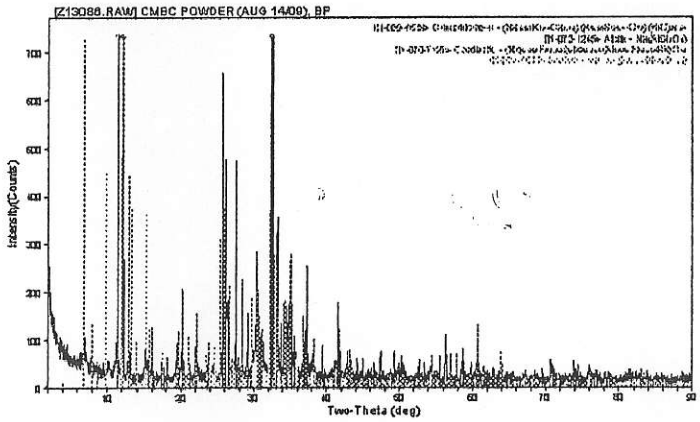


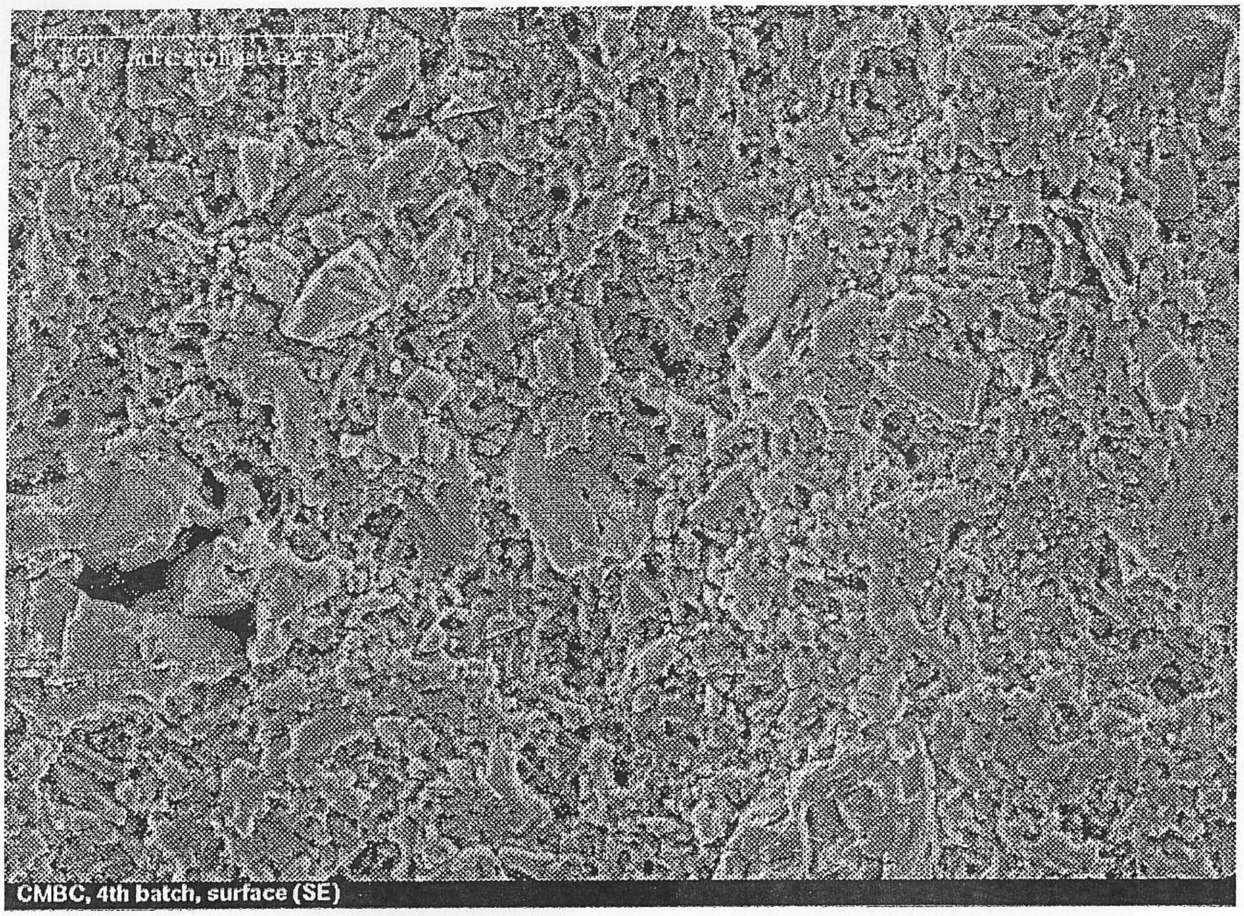
CMBC, 1st batch, surface (SE)



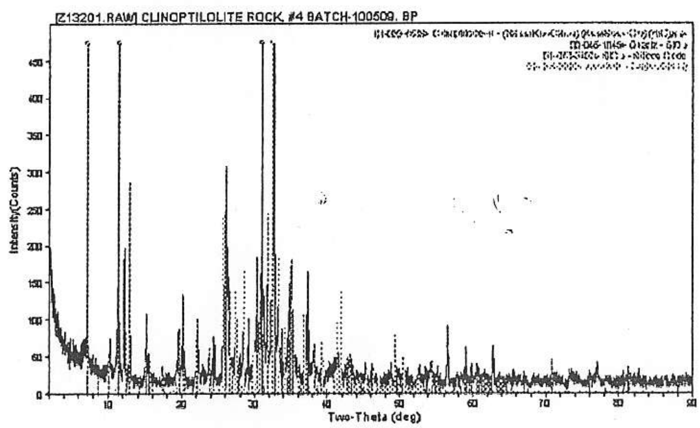


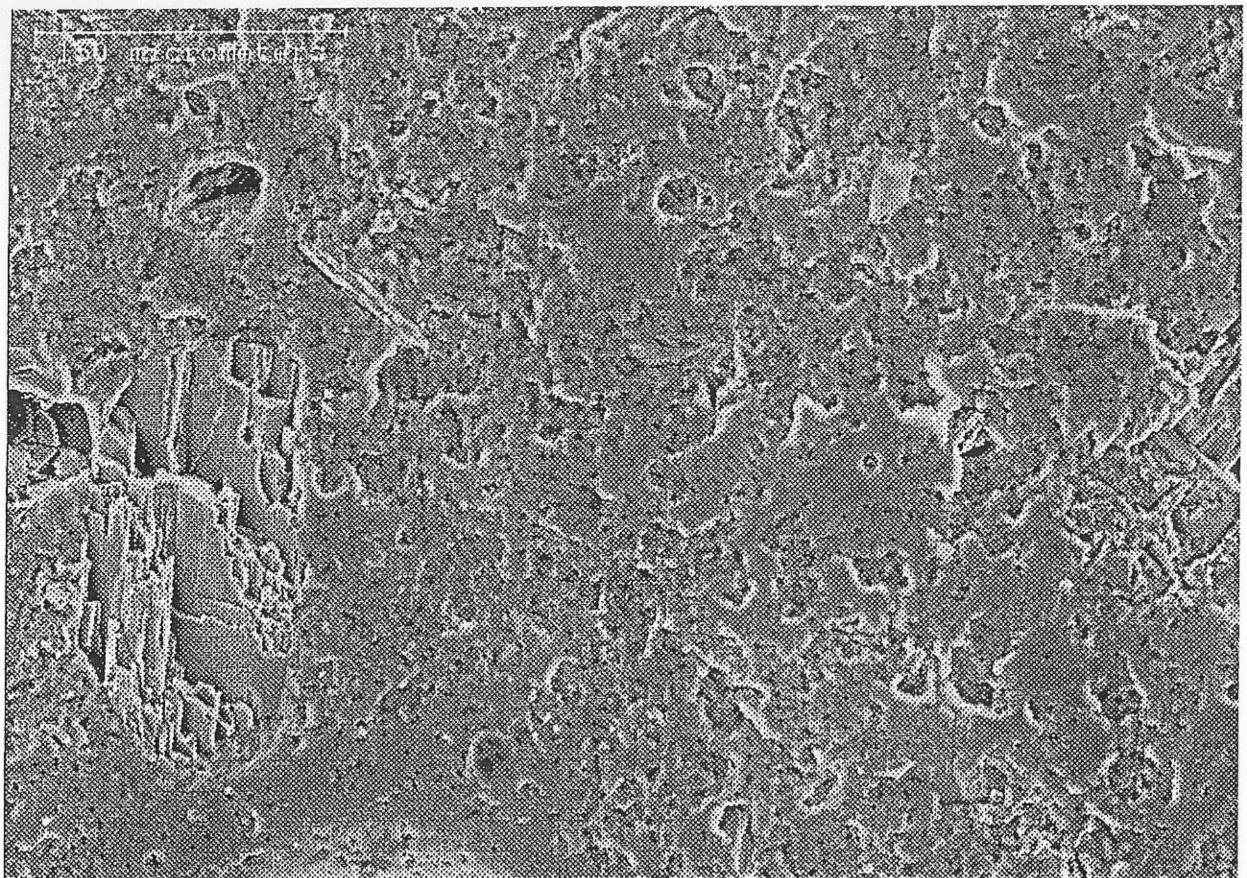
CMBC, 2nd batch, surface (SE)



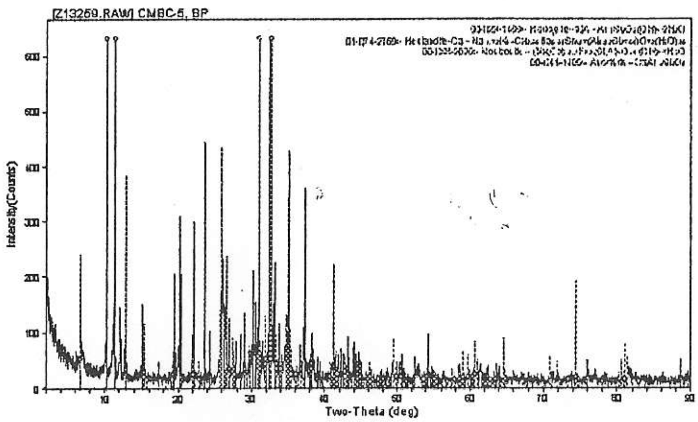


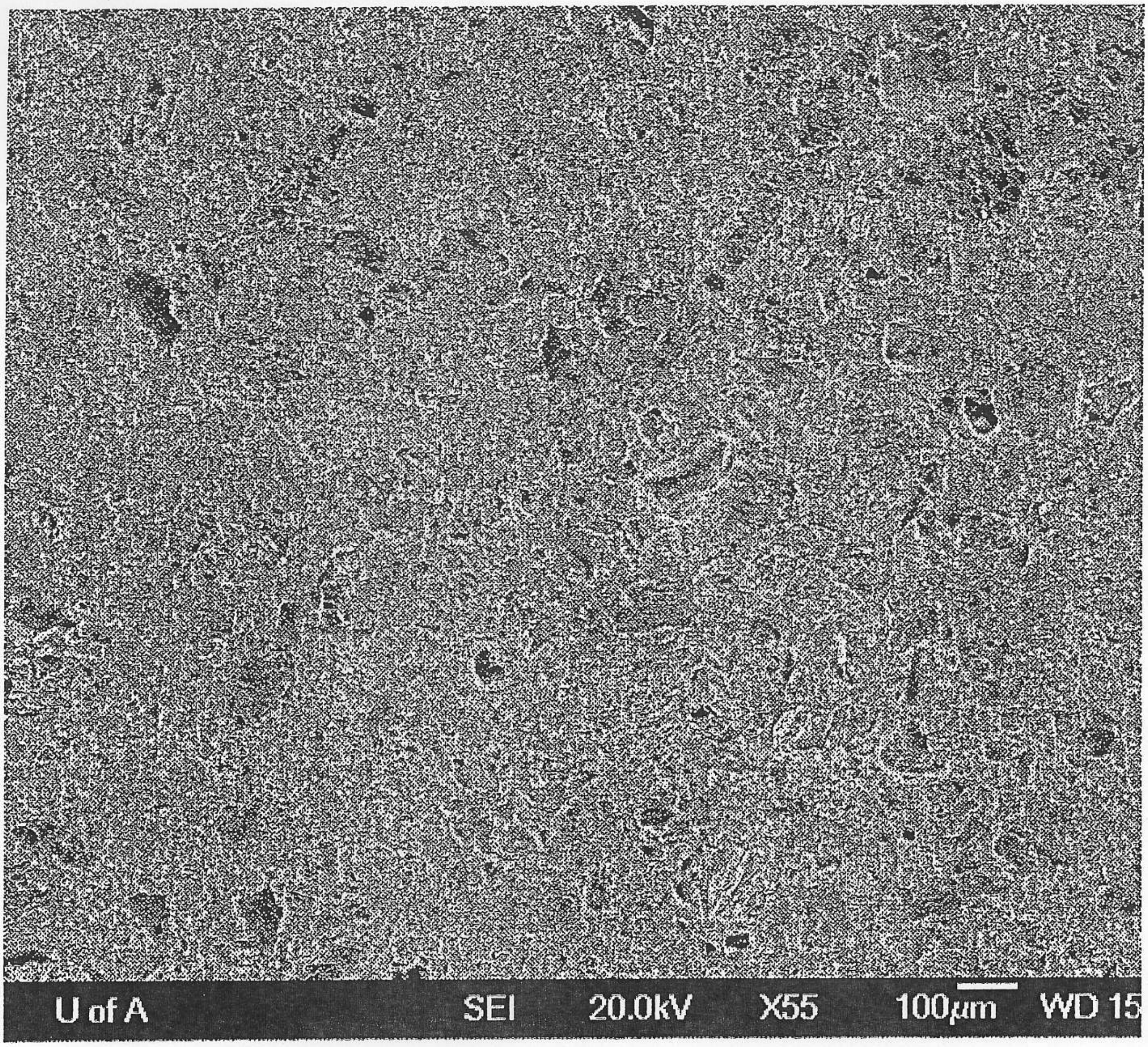
CMBC, 4th batch, surface (SE)

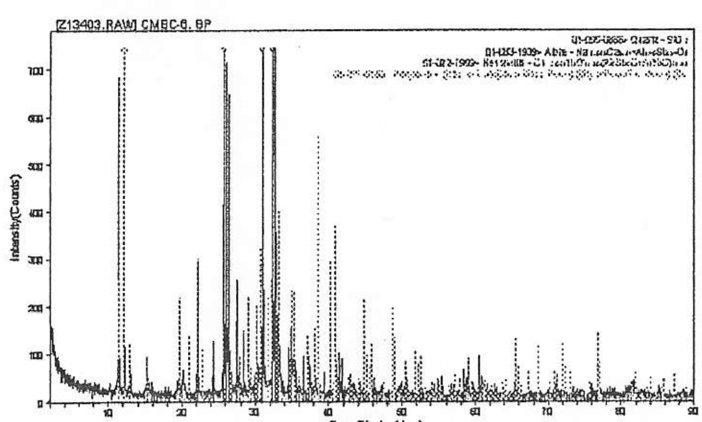




CMBC-5, surface (SE)




U of A
SEI
20.0kV
X55
100μm
WD 15


[Z13403.RAW] CMBC-6. BP
Intensity(Counts)
Two-Theta (deg)
10
20
30
40
50
60
70
80
90

Appendix B-4 Pozzolan Testing

TECHNICAL REPORT

CERTIFIED CONCRETE TESTING LABORATORY
IN ACCORDANCE WITH CSA STD. A283

TO: 0864803 BC Limited
Box 129
Okotoks, AB T2K 5X3

FILE NO: CA17755
DATE: 20 May, 2010
CC: Elizabeth Butler Henderson
Enzo Gardin- CNRC

ATTN: Mr. Wade Hartwell

PROJECT: Pozzolan Sample Testing
SUBJECT: **Strength Activity Index with Portland Cement**

Following is a summary of test results for a sample of Pozzolan, received at our Calgary laboratory for testing March 3rd, 2010.

SAMPLE IDENTIFICATION	TEST NO.	STRENGTH ACTIVITY INDEX – COMP.STR. (MPa) CONTROL MIXTURE			TEST MIXTURE		
		7 Day	28 Day	56 Day	7 Day	28 Day	56 Day
"Zeolite"	A	35.6	48.4	51.0	19.7	43.4	51.5
MAN-78b	B	35.2	49.5	49.9	20.6	43.8	49.1
	C	35.0	47.5	49.3	20.7	43.0	48.8
Compressive Strength Averages:		35.3	48.5	50.1	20.3	43.4	49.8
Strength Activity Index-% of Control:		-	-	-	57.5	89.5	99.4

Notes:

- Tests performed in accordance with the ASTM Standard C311-07 (27).
- Cement Replacement = **30% Pozzolan (Zeolite) in test mix.**
- Reference Standard / ASTM C618-08a (Table 2 – Type N Pozzolan) = 75% (Min.)
- Physical Requirements:
  Water Requirement (% control) = 106.4 (Max.115%)
  Flows (%) = 111 (Control mix) 108.5 (Test mix)

(Final Report)

AMEC Earth & Environmental
a Division of AMEC Americas Limited

, C.E.T.

K.W. (Kent) Gillingwater, C.E.T.
Senior Technical Supervisor
Materials Testing Division

AMEC Earth & Environmental,
A Division of AMEC Americas Limited
1003, 53 Avenue N.E.
Calgary, Alberta
Canada T2E 6X9
Tel +1 (403) 248-4331
Fax +1 (403) 569-0737
www.amec.com

amec

TECHNICAL REPORT
CERTIFIED CONCRETE TESTING LABORATORY
IN ACCORDANCE WITH CSA STD. A283

TO: 0864803 BC Limited
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Okotoks, AB T2K 5X3

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Enzo Gardin- CNRC

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Following is a summary of test results for a sample of Pozzolan, received at our Calgary laboratory for testing March 3rd, 2010

SAMPLE IDENTIFICATION	TEST NO.	STRENGTH ACTIVITY INDEX – COMP.STR. (MPa) CONTROL MIXTURE 7 Day	28 Day	56 Day	TEST MIXTURE 7 Day	28 Day	56 Day
"Zeolite"	A	35.6	48.4	51.0	24.4	45.5	52.4
MAN-78b	B	35.2	49.5	49.9	24.8	45.9	54.1
	C	35.0	47.5	49.3	24.3	46.2	53.3
Compressive Strength Averages:		35.3	48.5	50.1	24.5	45.9	53.3
Strength Activity Index-% of Control:		-	-	-	69.4	94.6	106.4

Notes:

- Tests performed in accordance with the ASTM Standard C311-07 (27).
- Cement Replacement = **20% Pozzolan (Zeolite) in test mix.**
- Reference Standard / ASTM C618-08a (Table 2 – Type N Pozzolan) = 75% (Min.)
- Physical Requirements:
  Water Requirement (% control) = 104.7 (Max.115%)
  Flows (%) = 111 (Control mix) 111.5 (Test mix)

(Final Report)

AMEC Earth & Environmental
a Division of AMEC Americas Limited

K.W. (Kent) Gillingwater, C.E.T.
Senior Technical Supervisor
Materials Testing Division

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amec

TECHNICAL REPORT

CERTIFIED CONCRETE TESTING LABORATORY
IN ACCORDANCE WITH CSA STD. A283

TO: 0864803 BC Limited
Box 129
Okotoks, AB T2K 5X3

FILE NO: CA17755
DATE: 20 May, 2010
CC: Elizabeth Butler Henderson-
Enzo Gardin- CNRC

ATTN: Mr. Wade Hartwell

PROJECT: Pozzolan Sample Testing
SUBJECT: **Strength Activity Index with Portland Cement**

Following is a summary of test results for a sample of Pozzolan, received at our Calgary laboratory for testing March 3rd, 2010.

SAMPLE IDENTIFICATION	TEST NO.	STRENGTH ACTIVITY INDEX – COMP.STR. (MPa) CONTROL MIXTURE 7 Day	CONTROL MIXTURE 28 Day	CONTROL MIXTURE 56 Day	TEST MIXTURE 7 Day	TEST MIXTURE 28 Day	TEST MIXTURE 56 Day
"Zeolite"	A	35.6	48.4	51.0	33.1	50.6	56.1
MAN-78b	B	35.2	49.5	49.9	32.8	49.2	56.0
	C	35.0	47.5	49.3	34.0	49.2	56.2
Compressive Strength Averages:		35.3	48.5	50.1	33.3	49.7	56.0
Strength Activity Index-% of Control:		-	-	-	94.3	102.5	111.8

Notes:

- Tests performed in accordance with the ASTM Standard C311-07 (27).
- Cement Replacement = **10% Pozzolan (Zeolite) in test mix.**
- Reference Standard / ASTM C618-08a (Table 2 – Type N Pozzolan) = 75% (Min.)
- Physical Requirements:
  Water Requirement (% control) = 101.7 (Max.115%)
  Flows (%) = 111 (Control mix) 109 (Test mix)

(Final Report)

AMEC Earth & Environmental
a Division of AMEC Americas Limited

K.W. (Kent) Gillingwater, C.E.T.
Senior Technical Supervisor
Materials Testing Division

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A Division of AMEC Americas Limited
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Calgary, Alberta
Canada T2E 6X9
Tel +1 (403) 248-4331
Fax +1 (403) 569-0737
www.amec.com

Appendix B-5 Examples, Production and Products

St. Cloud Mining Company

P.O. Box 1670 Truth or Consequences, New Mexico 87901

Phone: 505-743-5215 Fax: 505-743-3333 website: www.stcloudmining.com

Email: info@stcloudmining.com

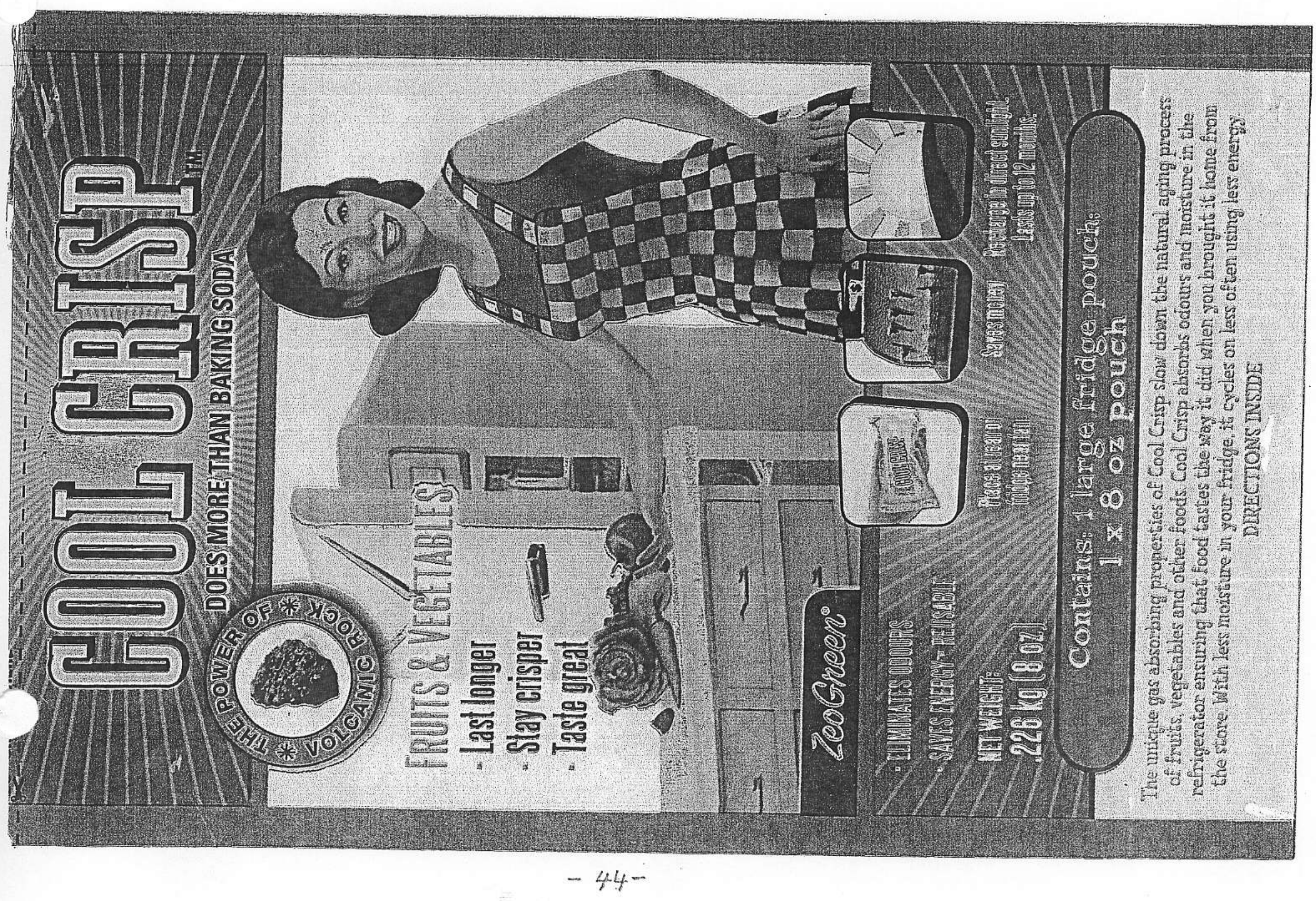
St. Cloud Natural Zeolite (Clinoptilolite)

Product Information Sheet

Natural zeolites are a unique type of microporous volcanic mineral with sieving and cation exchange properties for use in agriculture, environmental and industrial applications. St. Cloud Mining Company is the largest producer of natural zeolite in North America.

- **Uses of St. Cloud Zeolite**

  St. Cloud Zeolite has hundreds of proven uses, and the list continues to grow. St. Cloud Zeolite is a natural mineral produced by all natural means, and is used as an animal feed supplement that has been shown to improve health and reduce the negative effects of animal waste; as an additive to animal stalls and pens to reduce ammonia and other emissions to air and water; as a soil amendment to retain water and plant nutrients in root zones, which conserves both; for a number of other horticultural and agricultural uses, including being the only zeolite endorsed for use in space by NASA; as a water filtration media that removes ammonia, some heavy metals and other constituents; and dozens of other uses.



Appendix C
Statement of Qualifications

I, Barry Neil Church, do hereby certify that:

1. I am a member of the Association of Professional Engineers and Geoscientists of British Columbia (membership number #8172) with offices at 600 Parkridge St., Victoria, B.C.
2. I am a graduate of the University of British Columbia (1967) with a Ph.D. in geology. I have practiced my profession continuously since graduation.
3. I am familiar with the district. This report is based on my personal examination of the property during July and October 2009. I am the author of this report and verify the costs as reported to be true.
4. Florence Niddery (Okanagan Falls, B.C.) and myself, B. Neil Church, are the owners of the property (the Tom and Kitty claims, respectively).

Dated: July 21st, 2010, Victoria, B.C.

Submitted by: Neil Church

B. Neil Church, Ph.D., P.Eng.