MAR 19980013: CORKSCREW MOUNTAIN

Received date: Jul 24, 1998

Public release date: Jul 25, 1999

19980013.

CONTINENTAL LIME LTD.

1997 EXPLORATION NEAR CORKSCREW AND IDLEWILDE MOUNTAINS

WEST-CENTRAL ALBERTA

Metallic and Industrial Minerals Permit
9396020019

Geographic Coordinates

51°58' N to 52°07' N
115°15' W to 115°31' W

NTS Sheets 82 O/13, O/14, 83 B/3, and B/4

1998 06 29

by

D.I. Pană, Ph.D.

J.R. Dahrouge, B.Sc., P.Geol.

Halferdahl & Associates
(a division of Dahrouge Geological Consulting Ltd.)
18, 10509 - 81 Avenue
Edmonton, Alberta
T6E 1X7

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF APPENDICES

1. SUMMARY

At Corkscrew and Idlewilde mountains and within metallic and industrial minerals permit 9396020019, the Upper Devonian to Lower Carboniferous Banff Formation and the Lower Carboniferous Rundle Assemblage were examined for high-calcium limestone. Between August 28 and September 4, 1997, Paleozoic limestone units were measured and examined at 10 locations and 73 samples were collected and analyzed for whole rock constituents and LOI. A total sample length of 203½ m was collected from a total of about 346 m normal thickness of strata examined.

At three sections more than 135 m of the Banff Formation were examined and 19 samples collected from about 50 m normal thickness of strata. For these samples, concentrations of CaO range from 24.12 to 54.86%, with up to 14.11% MgO, and up to 31.88% SiO_2.

At seven sections more than 150 m of the lower Rundle Assemblage were examined and 52 samples collected from about 200 m normal thickness of strata. Concentrations of CaO vary from 41.45 to 55.42%, with up to 11.56% MgO, and up to 2.31% SiO_2.

At one section, two samples were collected from about 1½ m stratigraphic thickness of the Mount Head Formation of the uppermost Rundle Assemblage. Concentrations of CaO vary from 49.00 to 50.35%, with up to 5.07% MgO, and up to 1.31% SiO_2.

Carbonate units examined within the Banff and Mount Head formations are of little economic interest for high-calcium limestone, as they exhibit low concentrations of CaO, and elevated concentrations of MgO, SiO_2, or both. High-calcium limestone units are present locally within the lower Rundle Assemblage, however thickness and constituent concentrations exhibit variability.

2. INTRODUCTION

Between August 28 and September 4, 1997, Halferdahl & Associates Ltd. on behalf of Continental Lime Ltd. conducted exploration for high-calcium limestone within west-central Alberta. This assessment report describes the exploration conducted within metallic and industrial minerals permit 9396020019 which encompasses parts of Idlewilde and Corkscrew mountains of the Alberta Foothills. This report contains analytical data from 73 samples collected in 1997, as well as geologic observations made while collecting these samples and an interpretation of the results.

3. GEOGRAPHIC SETTING AND ACCESS

Metallic and industrial minerals permit 9396020019 west of Caroline, Alberta, encompasses the southern part of Baseline Ridge southeast to the Limeco Quarry on Corkscrew Mountain, and west to Idlewilde Mountain, Rocky Creek, and Cutoff Creek. The quarry of Limeco Products Ltd. is at the southeast end of Corkscrew Mountain. Access is from Innisfail on Alberta Highway 2, 70 km westerly on Highway 54, and continuing another 34 km westerly on secondary road 591 and the Forestry Trunk Road (Fig. 3.1). The Forestry Trunk Road continues to the northwest along the southwest side of Corkscrew Mountain. Near the north end of Corkscrew Mountain a spur of the Forestry Trunk Road continues west along Clearwater River and Cutoff Creek past Idlewilde Mountain.

The northern parts of Corkscrew Mountain are about 13 km south of the CNR spur line at the Husky Oil Ram River gas plant near Baseline Ridge. Access to the southwestern part of Corkscrew Mountain is from the Forestry Trunk Road which is along its southwestern flank (Fig. 7.1). Access to the central portions of Idlewilde Mountain is by a cut line suitable for all terrain vehicles leading southwesterly from the Forestry Trunk Road. Bush roads and cut lines south of Cutoff Creek provide access to those parts of MAIM Permit 9396020019 south of Clearwater River.

The area is part of the Eastern-Slope Montane Forest Ecological Region, and lies within the Clearwater District of the Alberta Forestry Reserve. In the subalpine zone vegetation consists of stunted subalpine fir and Englemann spruce and above the timber line, of alpine foliage. Vegetation in areas of rugged limestone outcroppings is generally sparse. Below timberline, vegetation consists of dense stands of aspen, lodgepole pine, white spruce, and less frequent stands of Douglas fir. Areas of lowest relief along the Clearwater River are covered with dense stands of black spruce and thick undergrowth, with local muskegs and swamps.

4. PROPERTY, EXPLORATION, AND EXPENDITURES

4.1 METALLIC AND INDUSTRIAL MINERALS PERMIT 9396020019

In 1996, Continental Lime Ltd. acquired metallic and industrial minerals (MAIM) permit 9396020019 to cover Paleozoic limestones on and near Corkscrew Mountain, Alberta (Fig 4.1). The original area of MAIM permit 9396020019 totalled 8,816 hectares (Table 4.1). Based on the exploration described herein this has been reduced to 4,368 hectares (Fig. 4.1).

TABLE 4.1 INFORMATION ON METALLIC AND INDUSTRIAL MINERALS PERMIT 9396020019 OF CONTINENTAL LIME LTD.

Comm. Date	Expiry Date*	Land Description (Tp-RW5)	Size (Ha)
Permit Area (Fig. 4.1)			
Feb. 29, 1996	March 1, 1998	35-9W5 (Sections: 5W, L2; 6SE; 7S, NW, L9, L10; 18SW) 35-10W5 (Sections: 1N; 2NE; 11; 12; 13; 14; 15; 16; 17; 18; 22; 23; 27; 34) 35-11W5 (Sections: 2; 3; 10; 11; 12; 13; 14; 15; 22; 23; 24W; 26W; 27; 28E; 33SE; 34) 36-10W5 (Sections: 3; 4; 9; 10SW; 16S, NW; 17NE; 19NE; 20; 21SW; 29SE)	8,816
Reduced Permit Area (Fig. 4.1)			
Feb. 29, 1996	March 1, 1998	35-9W5 (Sections: 5W, L2; 6SE; 7S, NW, L9, L10; 18SW) 35-10W5 (Sections: 1N; 2NE; 11; 12; 13; 14; 15, L1, L8, L9, L16; 23) 35-11W5 (Sections: 2; 3; 10; 11S, L12, L13; 12S, L13, L14; 13SW, L12, L13; 14E, L9; L11, L13, L14; 15W, SE, L9, L10, L15; 22SW, L2, L7, L12 to 16; 23W, SE, L10, L15; 26SW, L12; 27S, L9 to L12; 28, L1, L7, L8)	4,368

* Assessment report deadline extended by 30 days (Hudson, 1998).

4.2 1997 EXPLORATION

Between August 28 and September 4, 1997 those parts of Corkscrew and Idlewilde mountains within MAIM Permit 9396020019 were examined by Halferdahl & Associates Ltd. on behalf of Continental Lime Ltd. for high-calcium limestone. Limestone outcrops were examined, sampled, or both at 10 locations (Table 4.2). A total of 73 samples representing about 203 m of strata were collected from more than 346 m of strata examined.

TABLE 4.2 LOCATIONS SAMPLED

Section Number*	Location	UTM°		Number of Samples	Stratigraphic Thickness Examined (m)	Sampled Length (m)
		Easting (m)	Northing (m)			
	Mount Head Formation					
1	South-Central Part of Baseline Ridge	610557	5773865	2	1½	1½
	Turner Valley Formation					
10	West Flank of Corkscrew Mountain	615500	5760700	-	10	-
	Pekisko/Shunda Formation(s)					
3	Southwestern Flank of Idlewilde Mountain	603670	5765260	7	29½	19
4	Southwestern Flank of Idlewilde Mountain	603670	5765260	3	25	8½
6	East Limb of Idlewilde Mountain Anticline	606410	5761840	4	15¼	12¾
7	West Flank of Corkscrew Mountain	614580	5761704	4	8	7
8	West Flank of Corkscrew Mountain	614580	5761704	5	7¼	6
9	West Flank of Corkscrew Mountain	615040	5761120	11	33¼	24¼
10	West Flank of Corkscrew Mountain	615500	5760700	18	81	74
			TOTALS	52	199	151½
	Banff Formation					
2	Southwestern Flank of Idlewilde Mountain on Clearwater River	603050E	5764750	6	38	14
5	Cliffs Adjacent to Road on Southwest Bank of Clearwater River	603670E	5765260	12	95½	36
9	West Flank of Corkscrew Mountain	615040E	5761120	1	2	½
			TOTALS	19	135½	50½

* Shown on Fig. 7.1
° Location approximate, UTM grid is NAD 83

4.3 EXPLORATION EXPENDITURES

Exploration expenditures, not including G.S.T. totalled $32,211.85 (Appendix 1) and are allocated to Maim Permit 9396020019 as follows:

Assessment Period	Expiry Date	Required Expenditures*	Assigned Expenditures*
Years 1 and 2	1998-01-17	$21,840	$21,840
Years 3 and 4	2000-01-17	$43,680	$10,372
		Total:	$32,212

* Based on the reduced permit area of Section 4.1

5. PREVIOUS INVESTIGATIONS

Exploration for high-calcium limestone in the Foothills and Front Ranges of the Rocky Mountains in Alberta began prior to 1886 when Loders Lime opened the first quarry at Kananaskis (Matthews, 1956). Near Kananaskis, Loders Lime and its successor companies, Steel Brothers Canada Ltd. and Continental Lime Ltd., have quarried high-calcium limestone and produced lime for more than 100 years.

The areas of the Foothills and Front Ranges of the Rocky Mountains in west-central Alberta examined in 1997, were previously mapped according to NTS map sheets by the following officers of the Geological Survey of Canada:

NTS Map Sheet	Reference
82 O/14 W½ (Limestone Mountain)	Ollerenshaw (1968)
82 O/14 E½ (Marble Mountain)	Ollerenshaw (1965)
83 B/3 W½ (Tay River)	Henderson (1944); (1945a)
83 B/4 E½ (Fall Creek)	Henderson (1945b); (1946)

Between 1988 and 1990 Halferdahl & Associates Ltd. investigated several sites in West-Central Alberta including the quarry now held by Limeco Products Ltd. on the southern flank of Corkscrew Mountain (Halferdahl and Gorham, 1990). Samples from the Carboniferous Banff Formation exposed at the quarry were found to be too impure for the manufacture of lime, whilst Holter (1990) and Hamilton (1993) reported concentrations of up to 54½ % CaO for samples of limestone from the lower Rundle Assemblage. In 1986, Erdmer (*cf.* Holter, 1994) estimated extractable reserves of at least 1 Mt from a limestone layer at least 45 m thick.

6. REGIONAL GEOLOGY

In west-central Alberta, Paleozoic limestones are known to occur within the Middle Cambrian Eldon Formation, Upper Devonian Palliser Formation, Upper Devonian to Lower Carboniferous Banff Assemblage and Lower Carboniferous Rundle Assemblage (Table 6.1). The Palliser Formation at both Exshaw and Cadomin supplies limestone for the manufacture of cement.

Only the regional lithostratigraphic relationships of the Palliser Formation and the Banff and Rundle assemblages are discussed herein, while detailed lithostratigraphy of sections from these units and within MAIM Permit 9396020019 are provided in Appendix 2 and discussed in Section 7. Detailed accounts of the regional stratigraphy are available in Stott and Aitken (1993), Mossop and Shetsen (1994), Halbertsma (1994), and Richards et al. (1994).

6.1 STRATIGRAPHY

6.1.1 Palliser Formation

In west-central Alberta, the Lower to Middle Famennian Palliser Formation consists mainly of outer shelf and basinal carbonates of the Sassenach Basin (Halbertsma, 1994). The Palliser Formation is divisible into the Morro and overlying Costigan members, which are separated by an unconformity. The Morro Member comprises a lithologic suite dominated by carbonates with significant lateral facies variations. The Costigan Member consists of open-marine fossiliferous limestones and shales, with local evaporitic sedimentation. Within the Foothills and Front Ranges of Alberta, limestones of the Palliser Formation vary from about 180 m to 270 m in thickness (Holter, 1976).

The Palliser Formation is overlain by shales of the Exhaw Formation, and siliciclastics and carbonates of the Banff Formation.

6.1.2 Banff Assemblage

In west-central Alberta, the Exshaw, Banff and Yohin formations comprise the Banff Assemblage (Richards et al., 1994). The Upper Famennian to Lowermost Tournaisian Exshaw Formation is dominated by fine-grained siliciclastics deposited in an euxinic to shallow-neritic environment. In general, the Exshaw Formation is unconformably overlain by the Lower to Upper Tournaisian Banff Formation, which is a heterogeneous association of carbonates and fine-grained siliciclastics deposited on poorly differentiated carbonate platforms. In the Rocky Mountains, the upper part of the sequence contains limestone interbeds up to 10 m thick which are increasingly dolomitic to the east (Ollerenshaw, 1968). The uppermost Banff Formation grades laterally westward, into the Rundle Assemblage (Richards et al., 1994).

6.1.3 Rundle Assemblage

The Lower Carboniferous Rundle Assemblage extends from MacKenzie Mountains in the Arctic, south through the Peace River Embayment to southeastern British Columbia. In west-central Alberta, it comprises shallow-marine platform and ramp carbonates which prograded westward over deeper water shales and carbonates of the Banff Assemblage. The lower Rundle Assemblage is subdivided into the transgressive carbonate Pekisko Formation, and two regressive successions of restricted-marine carbonates and subordinate anhydrite assigned to the Shunda and Turner Valley formations (Richards et al., 1994). In southern Alberta the Pekisko grades laterally into the uppermost Banff Formation. The Turner Valley Formation extends from east-central British Columbia to southwest Alberta. According to Richards et al. (1994), the Turner Valley Formation thickens to the southwest and for most of its length is 50 m to 120 m thick. The type section near Turner Valley is 152 m thick and divisible into four beds.

Earlier work by Douglas (1958), and MacQueen and Bamber (1968) indicate that the eastern peritidal sequences of the uppermost Pekisko, Shunda and lower Turner Valley grade south and southwestward into the more open-marine sequence of the Livingstone Formation (Table 6.1).

The upper Rundle Assemblage includes the transgressive Mount Head Formation.

6.2 STRUCTURE

The main structural elements within the region include, from southwest to northeast, the McConnell Thrust, Burnt Timber Thrust and Fallentimber Thrust. Displacements on these faults are interpreted to be tens of kilometres to the northeast. The Fallentimber Thrust, apparent only in the Tay River basin, splays southeastward within the Clearwater River basin as a series of moderate to minor thrusts at the surface (Fig. 6.1). The McConnell and Burnt Timber thrust-sheets form southwest-dipping homoclines; the Fallentimber thrust-sheet is divided into three structural units which are, from southwest to northeast: the Limestone Mountain anticlinorium, the Bread Creek synclinorium and the Marble Mountain anticlinorium, respectively. Fold axes within these structures are arranged *en echelon* and the fold profiles vary from symmetrical to asymmetrical, and overturned.

TABLE 6.1 GENERALIZED PALEOZOIC STRATIGRAPHY OF FOOTHILLS AND FRONT RANGES, WEST-CENTRAL ALBERTA*

System or Subsystem	Stratigraphic Unit: Assemblage / Group	Formation (S)	Formation (N)
Lower Carboniferous		Etherington	
Lower Carboniferous	Rundle Assemblage	Mount Head	
Lower Carboniferous	Rundle Assemblage	Livingstone [1]	Turner Valley
Lower Carboniferous	Rundle Assemblage	Livingstone [1]	Shunda
Lower Carboniferous	Rundle Assemblage		Pekisko
Lower Carboniferous	Banff Assemblage	Banff	
Lower Carboniferous	Banff Assemblage	Exshaw	
Upper Devonian		Palliser [1]	
Upper Devonian		Alexo	
Upper Devonian	Fairholme Group°	Southesk	Mount Hawk
Upper Devonian	Fairholme Group°	Cairn	
Cambrian		Pika	
Cambrian		Eldon	
Cambrian		Stephen	
Cambrian		Cathedral	

*Compiled from MacKenzie (1969), Richards et al., 1994, Switzer et al., 1994., and Holter, 1994.
° Fairholme Group of MacKenzie (1969) is partly equivalent to the Woodbend Group of Switzer et al., 1994.
[1] Current limestone production (*from* Holter, 1994)

7. PERMIT GEOLOGY

7.1 STRATIGRAPHY

Within MAIM Permit 9396020019, the Devonian Palliser Formation is about 210 m thick and is more dolomitic and recessive than elsewhere in western Alberta (Ollerenshaw, 1968). Carboniferous strata are represented by the marine Exshaw and Banff formations, the Rundle Assemblage, and the Etherington Formation (Ollerenshaw, 1968).

The Exshaw Formation is inferred from a 4 m covered interval between the Palliser and Banff formations north of Limestone Mountain (Ollerenshaw, 1968). The Banff Formation with a thickness of approximately 246 m is represented by thin-bedded, argillaceous and silty limestone, black chert layers, and crinoidal limestone and dolomite. Within the dolomites, mud-cracks occur indicating local shallow-water deposition. Along Clearwater River and at Corkscrew Mountain thin interbeds of crinoidal limestone are observed within the uppermost few metres of the Banff Formation (Appendix 2). Within the Limestone Mountain map-area Ollerenshaw (1968) divided the Rundle Assemblage into the Pekisko, Shunda, Turner Valley, Mount Head, and Etherington formations.

Within MAIM Permit 9396020019, the Pekisko Formation is a 60 to 67 m thick sequence of light-grey weathering crinoidal limestone, brown dolomite, and calcarenite. The Shunda Formation is a 52 to 70 m thick sequence of recessive dolomite, dolomite breccia, limestone, and minor shaly dolomite. It is overlain by 33 to 82 m of light-grey crinoidal limestone and dolomitic limestone of the Turner Valley Formation. The uppermost part of the Rundle Assemblage consists of 40 to 142 m of dolomite, dolomitic limestone, minor chert, sandstone, and limestone assigned to the Mount Head Formation. The Etherington Formation is thin or absent within the permit.

7.2 STRUCTURE

Within MAIM Permit 9396020019 Paleozoic limestone units are exposed within two anticlinoriums while an intervening synclinorium exposes mostly Upper Cretaceous units. From southwest to northeast these are the northwest trending Limestone Mountain anticlinorium, Bread Creek synclinorium, and Marble Mountain anticlinorium (Fig. 7.1). The Limestone Mountain anticlinorium consists of a composite sequence of *en echelon* folds and thrust faults. Paleozoic and Mesozoic rocks are exposed by the Idlewilde Mountain Anticline, Limestone Mountain Syncline, and Limestone Mountain Anticline. At Limestone Mountain, the Limestone Mountain Anticline is overturned with the dip of bedding almost flat at the crest and about 35° along the western limb (Fig. 7.2).

East of the Pineneedle Creek thrust, the Bread Creek synclinorium exposes Upper Cretaceous strata of the Alberta Group.

To the east, Paleozoic strata are exposed along the Marble Mountain anticlinorium which consists, from southwest to northeast, of Corkscrew Mountain anticline, Corkscrew Mountain syncline, and Marble Mountain anticline (Ollerenshaw, 1968; Fig. 7.3). At Corkscrew Mountain the Carboniferous Banff Formation is intermittently exposed along the axis of the Corkscrew Mountain anticline, while the Rundle Assemblage forms prominent dipslopes along the southwestern limb with dips of 10° to 40° and along the northeastern limb with dips of 25° to 85°. The southwest limb of the anticline is cut by the southwesterly dipping Corkscrew Mountain Thrust and the east limb by an east-dipping backthrust.

To the southwest, between Limestone Mountain Anticline and Idlewilde Mountain Anticline is the southwest dipping Limestone Mountain Thrust. Near Limestone Creek, Idlewilde Mountain Anticline is approximately symmetrical with its southwest limb cut by the Limestone Mountain Thrust. In the divide between Clearwater River and Limestone Creek, dipslopes are present on both the northeast and southwest flanks of Simon Ridge, while on the southwest flank of Idlewilde Mountain, bedding is oblique to topography (sampled sections 2 to 4; Fig. 7.1).

8. SAMPLING AND ANALYSES

8.1 SAMPLING

Some 73 samples of limestone were collected between August 28 and September 4, 1997 (Appendix 2) by chipping outcrops perpendicular to bedding. Where bedding could not be identified, chips were taken in directions appropriate to topography with stratigraphic thickness deduced from other measurements where possible. Samples were collected from the locations and stratigraphic units listed in Table 4.2. The 73 samples represent a stratigraphic thickness of about 203 m and were collected from an investigated stratigraphic thickness that exceeds 346 m.

8.2 ANALYTICAL PROCEDURES

Samples were analyzed by the Quality Assurance Laboratory of Continental Lime Inc. Salt Lake City, Utah by Standard ICP techniques. Analytical data are in Appendix 3A, and a description of the analytical procedure is in Appendix 3C. Eight check samples were analysed by Acme Analytical Laboratories Ltd. (Appendix 3B) according to inductively coupled plasma (ICP) techniques. This analytical technique when used to analyse limestone samples typically gives satisfactory results, but the Acme determinations of CaO and LOI in some samples required adjustment (Section 8.4). For ICP analyses the samples were crushed, ground, and pulverized, with 0.2 g of sample fused with 1.2 g of $LiBO_2$, and dissolved in 100 ml 5 % HNO_3. Acme was requested to determine LOI at a temperature higher than 1000°C or to ignite the sample for 2 h.

8.3 STATISTICAL EXAMINATION OF ANALYSES BY ANALYTICAL LABORATORIES

Appropriate tests for comparing analyses of individual samples reported by Acme Analytical Laboratories Ltd. and Quality Assurance Laboratory of Continental Lime Inc. are: the test of differences (Snedecor, 1957), the sign test (Mendenhall et al., 1990), and the test of confidence intervals (Koch and Link, 1970). For the test of differences and the test of confidence intervals, determinations for each constituent in each sample by the two laboratories are paired; their differences comprise the sample data. For the sign test, each constituent determination in each sample by the laboratories is paired with the sign of the difference comprising the sample data.

Results of statistical tests are in Appendix 4 and summarized in Table 8.1. Comparison of the 1997 analyses by Acme and Continental by the various tests show no significant differences for SiO_2. Differences and confidence intervals for MgO are significant at a probability level of 10%, while signs are significant at all probability levels examined. Differences and confidence intevals for CaO, adjusted CaO, LOI and adjusted LOI are significant at all levels, while signs are significant at a probability level of about 33%.

These results indicate a more conservative estimate of CaO by Acme and more conservative estimates of MgO and LOI by Continental. Although differences, confidence intervals, and sign tests are statistically significant for some constituents, the absolute amounts of the differences are considered small enough that the results from the various laboratories are acceptable.

8.4 ADJUSTMENTS TO REPORTED ANALYSES

Although none of the analyses of CaO by Acme exceeds 56%, previous experience (Pană and Dahrouge, 1998) shows that Acme analyses can exceed 56% CaO, the maximum possible CaO content for pure $CaCO_3$ and some of the LOI values may appear low. Low LOI determinations probably arise from the fact that the decomposition temperature of $CaCO_3$ is about 894°C, not much below the usual ignition temperature of 1000°C which may not be reached by all the limestone samples in the furnace, if the temperature calibration of the furnace is not accurate or if temperature gradients in the furnace are significant.

Chemical analyses of limestone can be checked by subtracting the carbon dioxide equivalent to CaO plus that equivalent to MgO (total carbon dioxide equivalents are indicated CO_2 EQ) from the determined LOI (Appendix 5). If P_2O_5 has been determined, the percentage of CaO to use in this calculation is the determined CaO minus 1.31693 P_2O_5. LOI should exceed CO_2 EQ by a small amount to allow for moisture, oxidation of any pyrite, and other factors. Of the nine analyses completed by Acme, LOI minus CO_2 EQ is positive in eight.

TABLE 8.1: SUMMARY OF STATISTICAL TESTS FOR SAMPLES ANALYSED BY ACME ANALYTICAL LABORATORIES LTD. AND CONTINENTAL LIME INC.

For the sign test α is the level of significance associated with the rejection region (Appendix 4).

Ho: Constituent $\text{Determination}_{CONT}$ - Constituent $\text{Determination}_{ACME} = 0$

Constituent	Statistic	Test of Differences				Test of Confidence Intervals						Sign Test							Difference		n
		t	$t_{\alpha=0.100}$	$t_{\alpha=0.050}$	$t_{\alpha=0.025}$	$t_{\alpha=0.100}$		$t_{\alpha=0.050}$		$t_{\alpha=0.025}$		M	RRα1		RRα2		RRα3		Range	μ	
						μL	μU	μL	μU	μL	μU		L	U	L	U	L	U			
CaO	t	3.574	1.860	2.306	2.752	0.15	0.05	0.11	0.50	0.07	0.54	8	2	7	1	8	0	9	-0.15 to 0.70	0.30	9
	Ho	-	Reject	Reject	Reject	Reject		Reject		Reject			Reject		Reject		Accept				
Adjusted CaO	t	3.262	1.860	2.306	2.752	0.12	0.43	0.08	0.05	0.04	0.50	8	2	7	1	8	0	9	-0.15 to 0.70	0.27	9
	Ho	-	Reject	Reject	Reject	Reject		Reject		Reject			Reject		Reject		Accept				
MgO	t	-2.195	1.860	2.306	2.752	-0.14	-0.01	-0.02	0.00	-0.17	0.02	0	2	7	1	8	0	9	-0.30 to 0.00	-0.08	9
	Ho	-	Reject	Accept	Accept	Reject		Accept		Accept			Reject		Reject		Reject				
SiO_2	t	-1.636	1.860	2.306	2.752	-2.47	0.16	-2.79	0.47	-3.10	0.79	4	2	7	1	8	0	9	-6.46 to 0.03	-1.16	9
	Ho	-	Accept	Accept	Accept	Accept		Accept		Accept			Accept		Accept		Accept				
LOI	t	-4.638	1.860	2.306	2.752	-0.73	-0.31	-0.78	-0.26	-0.83	-0.21	1	2	7	1	8	0	9	-0.93 to 0.17	-0.52	9
	Ho	-	Reject	Reject	Reject	Reject		Reject		Reject			Reject		Reject		Accept				
Adjusted LOI	t	-4.651	1.860	2.306	2.752	-0.73	-0.31	-0.78	-0.26	-0.83	-0.21	1	2	7	1	8	0	9	-0.93 to 0.17	-0.52	9
	Ho	-	Reject	Reject	Reject	Reject		Reject		Reject			Reject		Reject		Accept				

Adjustments to determined values of CaO and LOI for the nine Acme analyses and 73 Continental analyses in 1997, have been calculated by two methods: LOI-based and impurity - based (Appendix 5). The LOI-based method involves lowering the determined CaO in analyses with high CaO determinations and concomitantly raising the determined LOI so that with the adjusted values of CaO and LOI, LOI minus CO_2 EQ equals 0.2. The equations for LOI-based adjustments follow:

$$CaO_F = \frac{99.8 - 0.21522\ CaO - 2.09175\ MgO - SiO_2 - R_2O_3 - \mathit{others} + 0.983\ P_2O_5}{1.56956}$$

$$LOI_F = \tfrac{1}{2}\,(100.20 - 0.21522\ CaO + 0.09175\ MgO - SiO_2 - R_2O_5 - \mathit{others} - 0.983\ P_2O_5)$$

where the subscript $_F$ refers to the adjusted or calculated percentage (final) of CaO or LOI;
R_2O_3 is the sum of $Al_2O_3 + Fe_2O_3 + TiO_2 + P_2O_5 + MnO + Cr_2O_3$ as determined; with any determination less than the detection limit set at half the detection limit; and
others is the sum of the rest of the constituents as determined in the analytical reports not already appearing in the equations, with any determination less than the detection limit set at half the detection limit.

The impurity-based method involves subtracting the sum of all the determined impurities from 100.00 %, assigning the remainder to $CaCO_3$, and calculating adjusted values for CaO and LOI based on this remainder. The equations for impurity-based adjustments follow:

$$CaO_F = \frac{99.80 - 2.09175\ MgO - SiO_2 - R_2O_3 - \mathit{others} + 0.983\ P_2O_5}{1.78478}$$

$$LOI_F = \frac{100.2548 + 0.39115\ MgO - 1.2526\ P_2O_5 - SiO_2 - R_2O_3 - \mathit{others}}{2.2742}$$

where the subscript $_F$, R_2O_3, and *others* have the same meanings as for the previous two equations.

Review of the Acme analyses and Continental analyses adjusted to obtain preferred values for CaO and LOI (Codes 4 and 5 of Appendix 5) indicates that the CaO and LOI values adjusted by either method are very close, the CaO values adjusted by the LOI method being equal to or less than those adjusted by the impurity-based method. The adjusted analyses are summarized in Appendix 6.

9. CONCLUSIONS

High-calcium limestone units are present locally within the lower Rundle Assemblage. Several outcrops contain more than 55% CaO, but thickness and constituent concentrations exhibit variability. At Idlewilde Mountain concentrations of CaO range from 45.92 to 55.42%, with MgO and SiO_2 between 0.33 to 8.50% and 0.08 to 2.31%, respectively. At Corkscrew Mountain, four sections measured and sampled show CaO concentrations between 35.70 to 55.36% with MgO and SiO_2 between 0.44 to 16.21% and 0.10 to 1.97%, respectively.

Carbonate units examined within the Banff and Mount Head formations are of little economic interest for high-calcium limestone, as they exhibit low concentrations of CaO, and elevated concentrations of MgO, SiO_2, or both. Nineteen samples of grey to buff-grey, thin-bedded, silty limestone were collected from the Banff Formation. They yielded CaO concentrations between 24.12 to 54.86% with MgO and SiO_2 ranging from 0.48 to 14.11% and 0.63 to 31.88%, respectively. Two samples from the Mount Head Formation in the central part of Baseline Ridge contain 49.00 and 50.35% CaO, with up to 5.07% MgO, and 1.31% SiO_2.

10. REFERENCES

Douglas, R.J.W. (1958) Mount Head map-area, Alberta; Geol. Surv. Can. Mem. 291.

Halbertsma, H.L., (1994) Devonian Wabamun Group of the Western Canada Sedimentary Basin, *in* Geological Atlas of the Western Canada Sedimentary Basin, G. D. Mossop and I. Shetsen (comps.); Can. Soc. Petr. Geol. and Alberta Res. Coun., p. 221-250.

Halferdahl, L.B., and Gorham, J.G. (1990) Exploration for high-calcium limestone in west-central Alberta and geological investigations at Gap Quarry near Exshaw, Alberta; unpublished rept. for Continental Lime Ltd., Halferdahl and Associates Ltd., Edmonton, 24 p., 25 fig., 11 appendices.

Hamilton, W.N. (1993) Mineral resource availability for pulp and paper chemicals in Alberta; Alta. Geol. Surv., Alta. Res. Coun. Cont. No. 2150., p. 28 - 38.

Henderson, J.F. (1944) Tay River map-area, Alberta; Geol. Surv. Can. Paper 44-26.

______________ (1945a) Tay River; Geol. Surv. Can. Map 840A.

______________ (1945b) Fall Creek map-area, Alberta; Geol. Surv. Can. Paper 45-19.

______________ (1946) Fall Creek; Geol. Surv. Can. Map 883A.

Holter, M.E. (1976) Limestone resources of Alberta; Alta. Res. Coun. Econ. Geol. Rept. 4.

__________ (1990) An evaluation of Alberta limestones for use as paper filler materials; Alta. Geol. Surv., Alta. Res. Coun. Open File Rept. 1990-11., 63 p., 30 figs., 3 appendices.

__________ (1994) A review of Alberta limestone production, marketing, distribution and future development possibilities; Alta. Geol. Surv., Alta. Res. Coun. Open File Rept. 1994-15, 85 p., 47 figs.

Hudson (1998) Assessment Reporting Extension, Fax Message to Continental Lime Ltd., on April 7, 1998, 1p.

Koch G.S. Jr., and Link, R.F. (1970) Statistical Analysis of Geological Data; John Wiley & Sons, Inc., New York, 375 p.

Matthews, J.G. (1956) The non-metallic mineral resources of the Cochrane-Canmore area, Alberta; Alta. Soc. Petrol. Geol. Guide Book, Sixth Ann. Field Conf., p. 39-43.

MacKenzie, W.S. (1969) Stratigraphy of the Devonian Southesk Cairn carbonate complex and associated strata, eastern Jasper National Park, Alberta; Geol. Surv. Can. Bull. 184.

MacQueen, R.W., and Bamber, E.W. (1968) Stratigraphy and facies relationships of the Upper Mississippian Mount Head Formation, Rocky Mountains and Foothills, southwestern Alberta; Bull. Can. Petr. Geol., v. 16, p. 225-287.

Mendenhall, W., Wackerly, D., and Scheaffer, R. (1990) Mathematical statistics with applications, 4th ed.; PWS-Kent Publishing Company, Boston, 818 p.

Mossop, G.D. and Shetsen, I. (1994) Geological Atlas of the Western Canada Sedimentary Basin, G.D. Mossop and I. Shetsen (comps.); Can. Soc. Petr. Geol. and Alberta Res. Coun.

Ollerenshaw, N. C. (1965) Burnt Timber Creek: Geol. Surv. Can., Map 11-1965 (with marginal notes)

Ollerenshaw, N. C. (1968) Preliminary account of the geology of Limestone Mountain map-area, southern Foothills, Alberta; Geol. Surv. Can. Paper 68-24.

Pană, D., and Dahrouge, J., (1998) Core Logging and Evaluation of Reserves of Limestone at the Nordegg Quarry; unpublished rept. for Continental Lime Ltd., Halferdahl and Associates Ltd., Edmonton, 13 p., 6 App., 5 Fig., 5 Tables.

Richards, B. C., Barclay, J. E., Bryan, D., Hartling, A., Henderson, C. M., Hinds, R. C. (1994) Carboniferous strata of the Western Canada Sedimentary Basin *in* Geological Atlas of the Western Canada Sedimentary Basin, G. D. Mossop and I. Shetsen (comps.); Can. Soc. Petr. Geol. and Alberta Res. Coun., p. 221-250.

Snedecor, G. W. (1957) Statistical Methods; Iowa State College Press, Ames, Iowa, 534 p.

Stott, D. F. and Aitken, J. D. (1993) Sedimentary Cover of the Craton in Canada, D.F. Stott and J. D. Aitken (ed.); Geol. Surv. Can. Geology of Canada, no. 5., pp. 202 - 271.

Switzer, S. B., Holland, W. G., Christie, S. D., Graf, G. C., Hedinger, A. S., McAuley, R. J., Wierezbicki, R. A. and Packard, J. J., (1994) Devonian Woodbend-Winterburn Strata of the Western Canadian Sedimentary Basin, *in* Geological Atlas of the Western Canada Sedimentary Basin, G. D. Mossop and I. Shetsen (comps.); Can. Soc. Petr. Geol. and Alberta Res. Coun., p. 165-202.

11. QUALIFICATIONS

D. I. Pană obtained a Diploma of Geological and Geophysical Engineer from the University of Bucharest in 1980 (equivalent to a M.Sc. in North America) and a Ph.D. in Structural Geology and Petrology at the University of Alberta, Edmonton in 1998. He has more than 15 years of experience in mineral exploration and regional mapping, including several years as a senior research geologist with the Geological Survey of Romania. He is a member of the Geological Society of America.

The work described in the report was under the supervision J.R. Dahrouge who obtained degrees in geology and computing science from the University of Alberta, Edmonton in 1988 and 1994, respectively. He has nine years of experience in mining exploration. He is a member of the Canadian Institute of Mining and Metallurgy and is registered as P. Geol. in the Association of Professional Engineers, Geologists, and Geophysicists of Alberta.

Neither D.I. Pană or J.R. Dahrouge hold any direct or indirect interest in metallic and industrial minerals permit 9396020019, which is the subject of this report. The authors grant Alberta Energy the right to reproduce this report in whole or in part.

[redacted]

Dinu Pană, Ph.D.,

PROFESSIONAL GEOLOGIST OF ALBERTA
J.R. DAHROUGE

J.R. Dahrouge, B.Sc., P.Geol.

Edmonton, Alberta
1998 06 29

CONTINENTAL LIME LTD.

HALFERDAHL & ASSOCIATES
(a division of Dahrouge Geological Consulting Ltd.)

Fig. 4.1 Metallic and Industrial Minerals Permit 9396020019

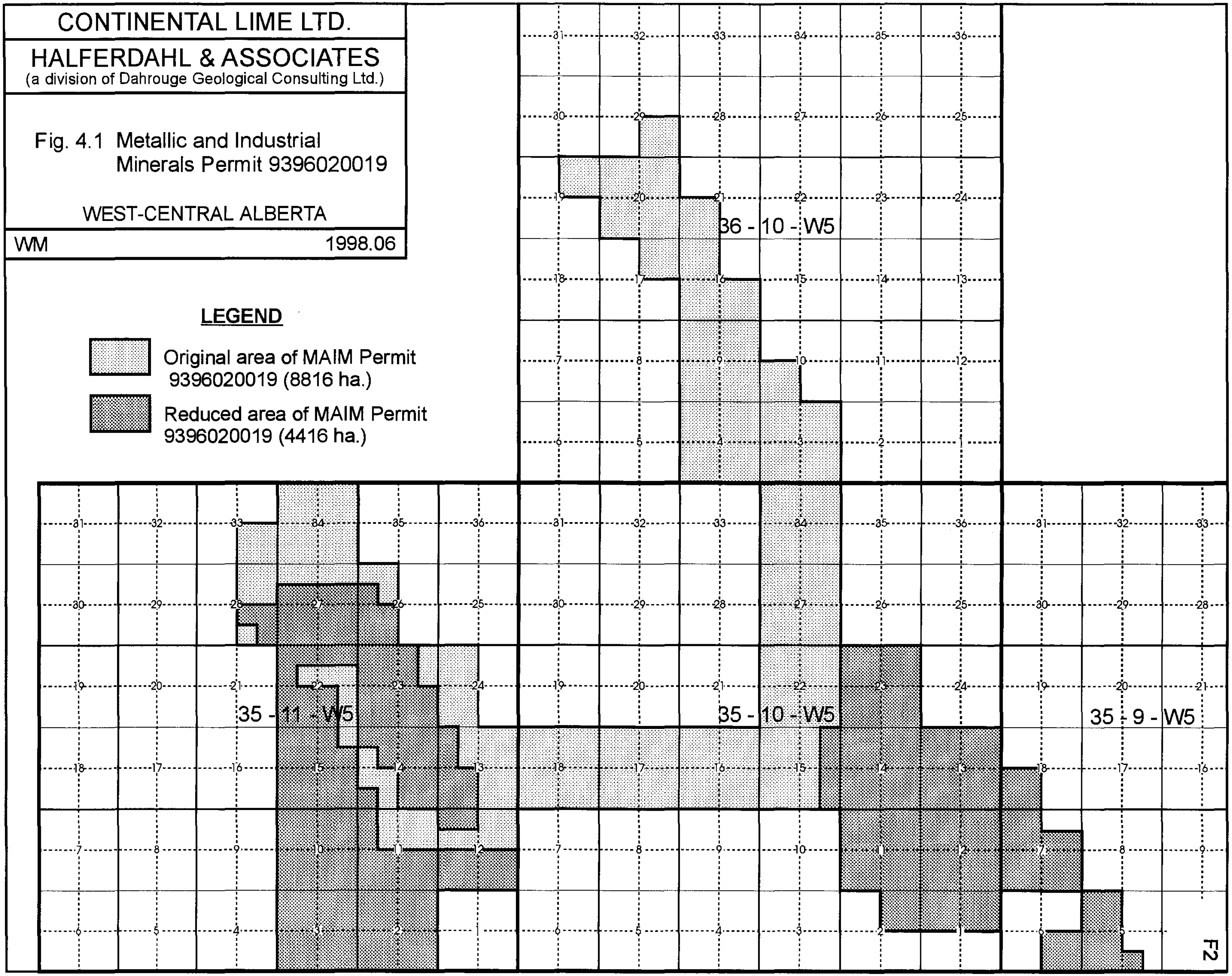
WEST-CENTRAL ALBERTA

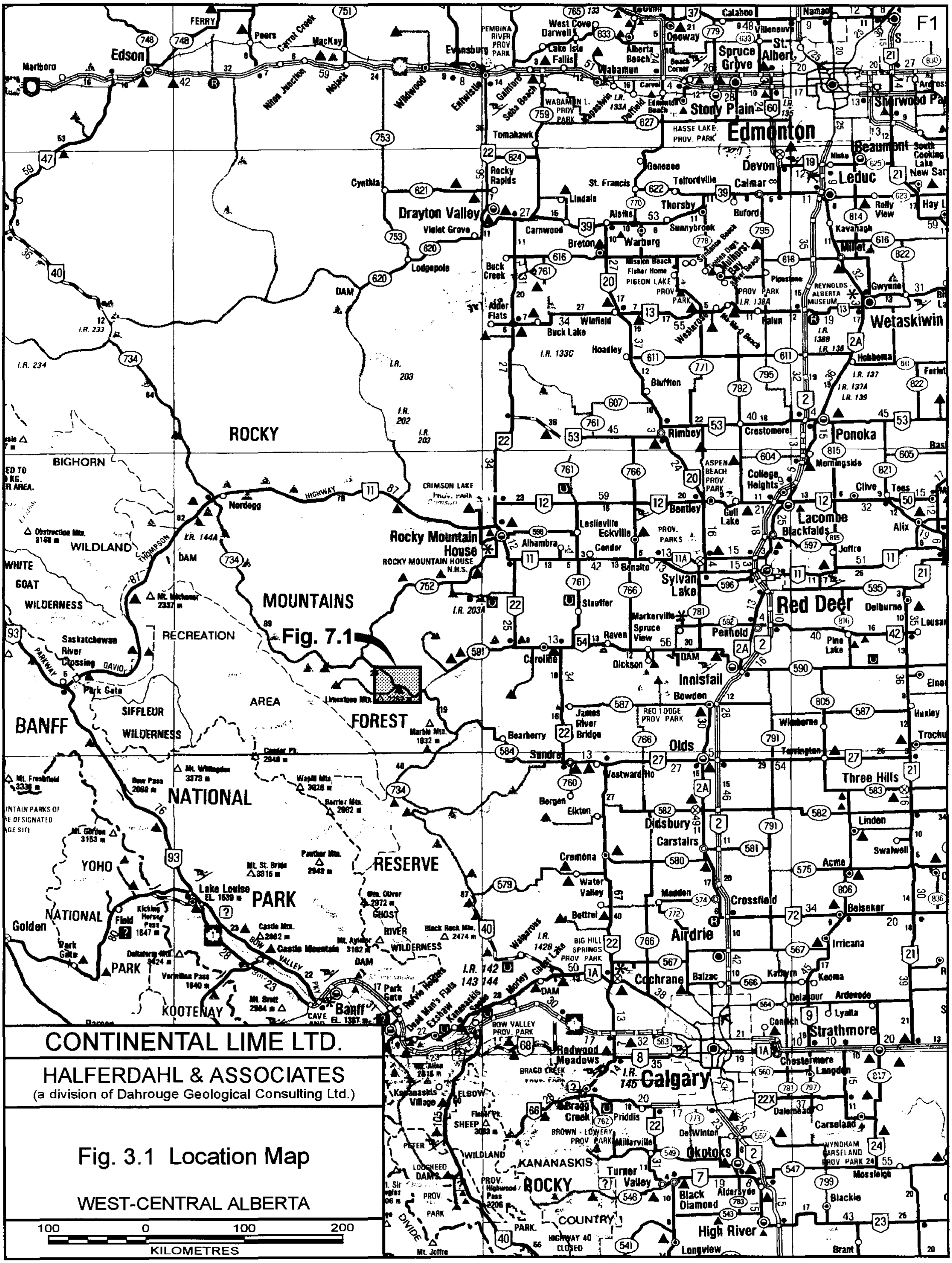
WM 1998.06

LEGEND

Original area of MAIM Permit 9396020019 (8816 ha.)

Reduced area of MAIM Permit 9396020019 (4416 ha.)





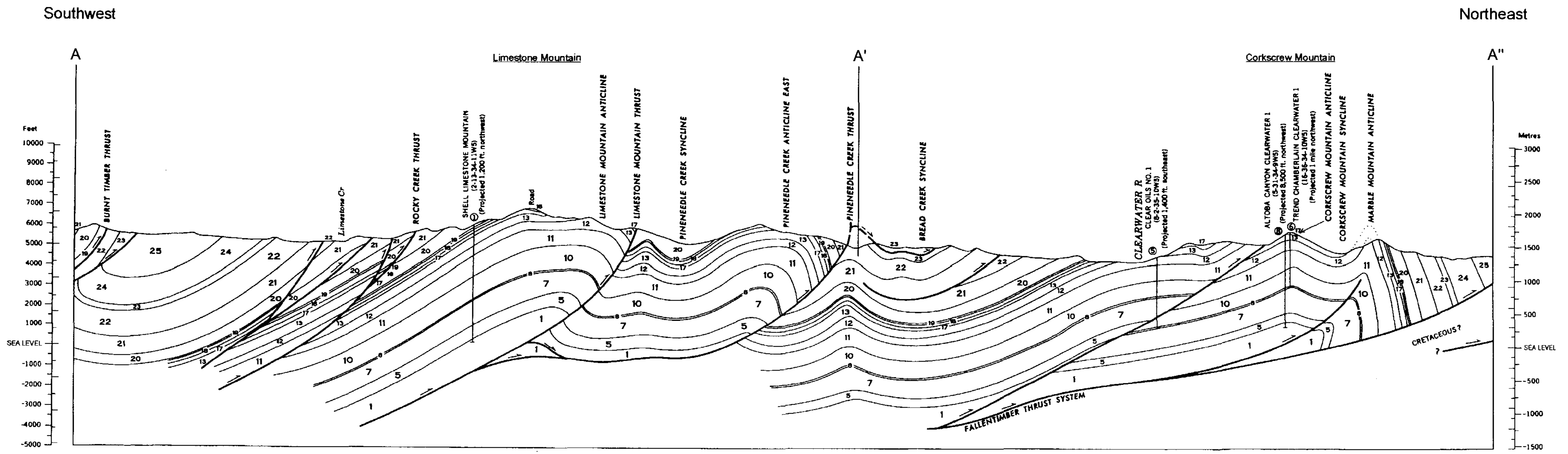
CONTINENTAL LIME LTD.

HALFERDAHL & ASSOCIATES
(a division of Dahrouge Geological Consulting Ltd.)

Fig. 3.1 Location Map

WEST-CENTRAL ALBERTA

100 0 100 200
KILOMETRES



LEGEND

MESOZOIC

UPPER CRETACEOUS
- 25 Brazeau Formation

ALBERTA GROUP
- 24 Wapiabi Formation
- 23 Cardium Formation
- 22 Blackstone Formation

LOWER CRETACEOUS
BLAIRMORE GROUP
- 21 Beaver Mines Formation
- 20 Lower Blairmore Group

LOWER CRETACEOUS AND JURASSIC
- 19 Kootenay Formation

JURASSIC
FERNIE GROUP
- 18 Upper Members
- 17 Nordegg Member

TRIASSIC
- 16 Sulphur Mountain Formation

PALEOZOIC

PENNSYLVANIAN AND (?) PERMIAN
- 15 Rocky Mountain Quartzite

CARBONIFEROUS
RUNDLE GROUP
- 14 Etherington Formation (above McConnell thrust only)
- 13 Turner Valley and Mount Head Formations
- 12 Pekisko and Shunda Formations
- 11 Banff Formation

DEVONIAN
- 10 Palliser Formation
- 9 Alexo Formation (above McConnell thrust only)
- 8 Sassenach Formation (below McConnell thrust)

FAIRHOLME GROUP
- 7 Mount Hawk Formation
- 6 Southesk Formation
- 5 Cairn Formation

CAMBRIAN
UPPER CAMBRIAN
- 4 Lynx Formation

MIDDLE CAMBRIAN
- 3 Arctomys Formation
- 2 Pika Formation
- 1 Cambrian (undivided)

NOTES

1) See Fig. 7.1 for location of section.
2) Geology after Ollerenshaw (1964).

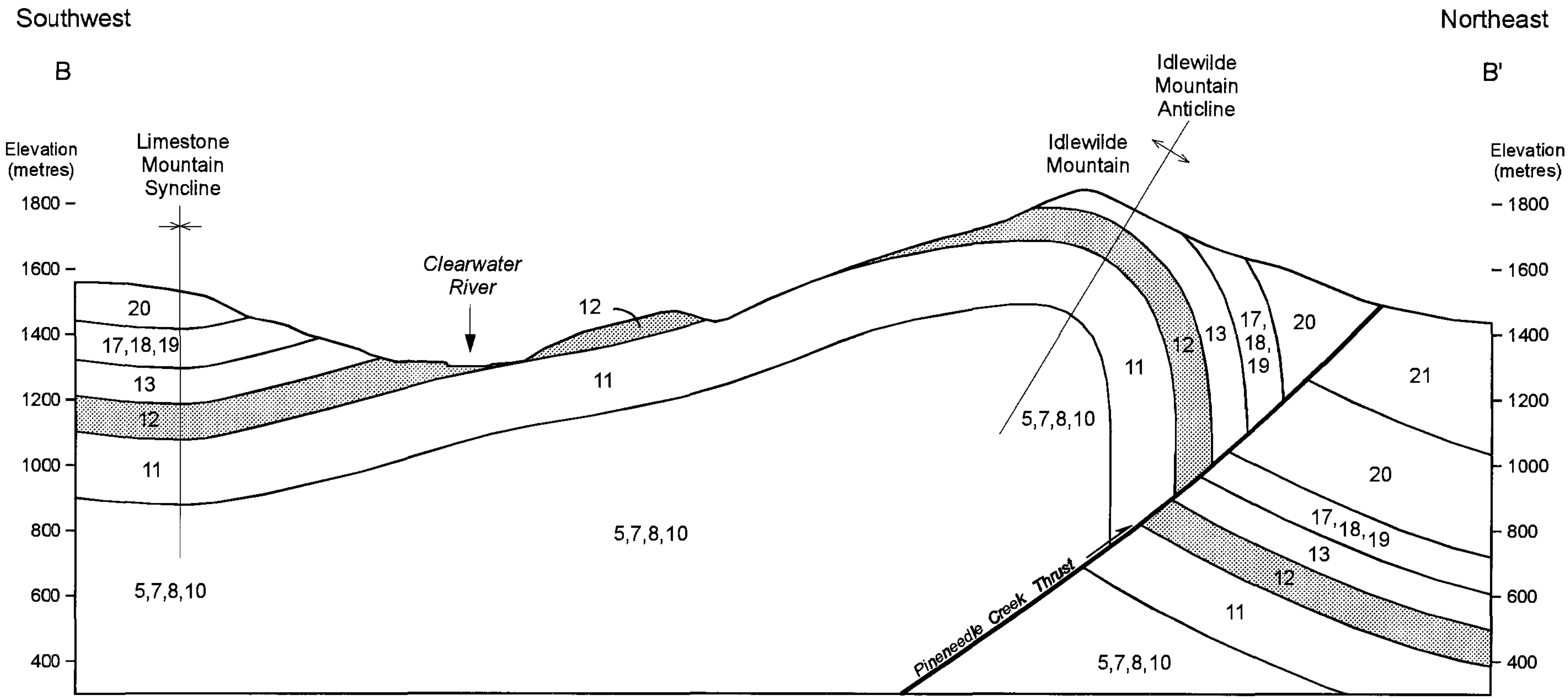
CONTINENTAL LIME LTD.

HALFERDAHL & ASSOCIATES
(a division of Dahrouge Geological Consulting Ltd.)

Fig. 6.1 Schematic Cross-Section through Limestone and Corkscrew Mountains

WEST-CENTRAL ALBERTA

WM 1998.06



LEGEND

MESOZOIC

LOWER CRETACEOUS
BLAIRMORE GROUP
- 21 Beaver Mines Formation
- 20 Lower Blairmore Group

LOWER CRETACEOUS AND JURASSIC
- 19 Kootenay Formation

JURASSIC
FERNIE GROUP
- 18 Upper Members
- 17 Nordegg Member

PALEOZOIC

CARBONIFEROUS
RUNDLE GROUP
- 13 Turner Valley and Mount Head Formations
- 12 Pekisko and Shunda Formations
- 11 Banff Formation

DEVONIAN
- 10 Palliser Formation
- 8 Sassenach Formation (below McConnell thrust)

FAIRHOLME GROUP
- 7 Mount Hawk Formation
- 5 Cairn Formation

NOTES

1) See Fig. 7.1 for location of section.
2) Geology modified after Henderson (1943, 1944).

CONTINENTAL LIME LTD.

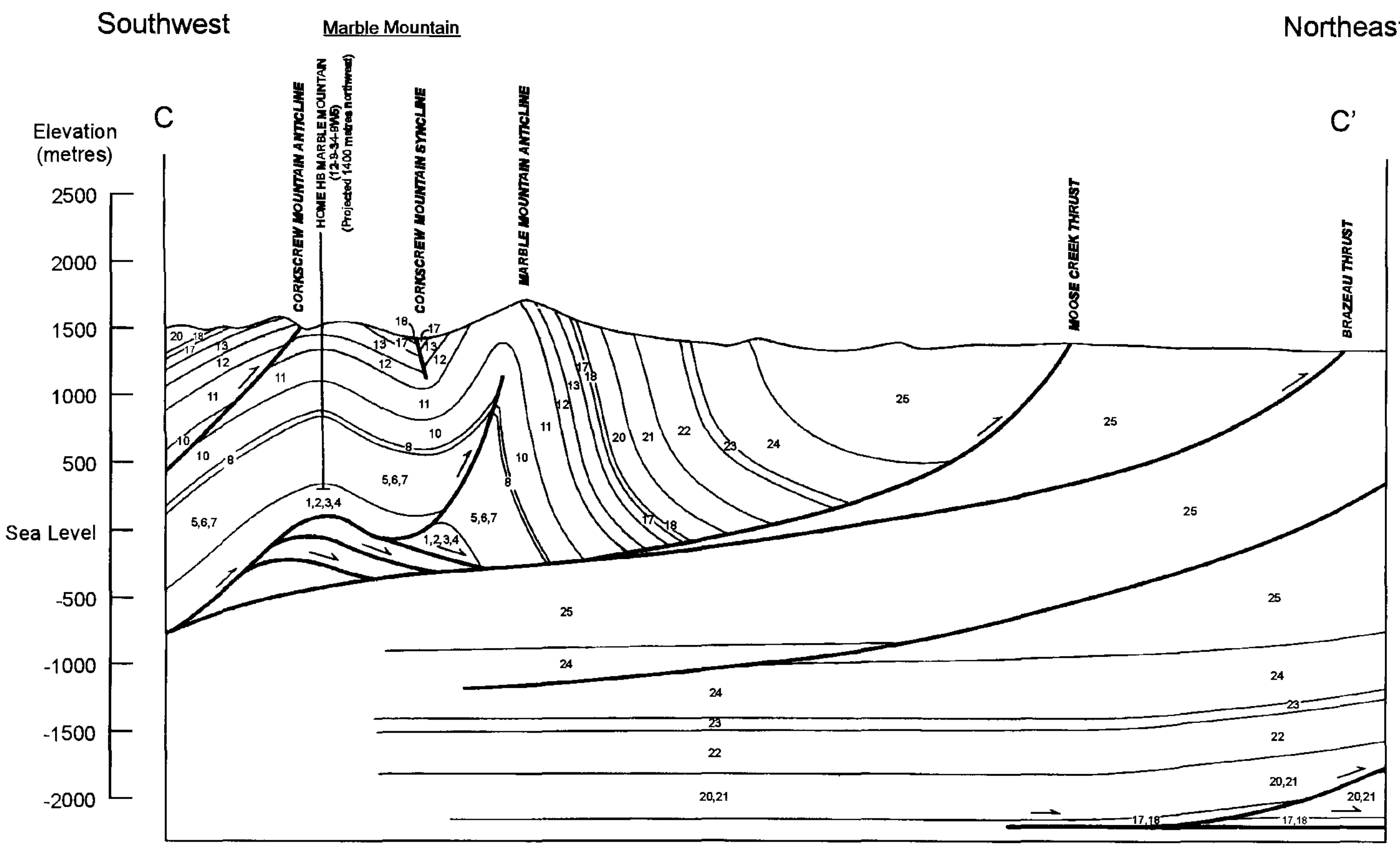
HALFERDAHL & ASSOCIATES
(a division of Dahrouge Geological Consulting Ltd.)

Fig. 7.2 Cross-Section through Idlewilde Mountain

WEST-CENTRAL ALBERTA

WM 1998.06

F4



LEGEND

MESOZOIC

UPPER CRETACEOUS

25	Brazeau Formation

ALBERTA GROUP

24	Wapiabi Formation
23	Cardium Formation
22	Blackstone Formation

LOWER CRETACEOUS
BLAIRMORE GROUP

21	Beaver Mines Formation
20	Lower Blairmore Group

LOWER CRETACEOUS AND JURASSIC

19	Kootenay Formation

JURASSIC
FERNIE GROUP

18	Upper Members
17	Nordegg Member

TRIASSIC

16	Sulphur Mountain Formation

PALEOZOIC

PENNSYLVANIAN AND (?) PERMIAN

15	Rocky Mountain Quartzite

CARBONIFEROUS
RUNDLE GROUP

14	Etherington Formation (above McConnell thrust only)
13	Turner Valley and Mount Head Formations
12	Pekisko and Shunda Formations
11	Banff Formation

DEVONIAN

10	Palliser Formation
9	Alexo Formation (above McConnell thrust only)
8	Sassenach Formation (below McConnell thrust)

FAIRHOLME GROUP

7	Mount Hawk Formation
6	Southesk Formation
5	Cairn Formation

CAMBRIAN
UPPER CAMBRIAN

4	Lynx Formation

MIDDLE CAMBRIAN

3	Arctomys Formation
2	Pika Formation
1	Cambrian (undivided)

NOTES

1) Section is 8500 m southeast along Marble Mountain from section A'-A" (Fig. 6.1).
2) Geology after Ollerenshaw (1965).

CONTINENTAL LIME LTD.

HALFERDAHL & ASSOCIATES
(a division of Dahrouge Geological Consulting Ltd.)

Fig. 7.3 Cross-Section through Marble Mountain

WEST-CENTRAL ALBERTA

WM 1998.06

APPENDIX 1: STATEMENT OF EXPENDITURES FOR METALLIC AND INDUSTRIAL MINERALS PERMIT 9396020019

	Description	Rate ($)	Time	Amount ($)	G.S.T. ($)	Total ($)
	1997 EXPLORATION					
Geological Consulting						
[redacted]	Preparing for field exploration	$ 550.00	0.50	$ 275.00	$ 19.25	$ 294.25
	Preparing for field exploration, geologic mapping, and sampling	$ 400.00	9.50	$ 3,800.00	$ 266.00	$ 4,066.00
[redacted]	"	$ 320.00	10.00	$ 3,200.00	$ 224.00	$ 3,424.00
	Data review, organizing, and reporting	$ 400.00	16.00	$ 6,400.00	$ 448.00	$ 6,848.00
	Data review and reporting	$ 400.00	4.86	$ 1,944.00	$ 136.08	$ 2,080.08
	Drafting and data compilation	$ 350.00	32.07	$ 11,224.50	$ 785.72	$ 12,010.22
Expenses						
- analyses	- Acme (8 samples)	-	-	$ 140.00	$ 9.80	$ 149.80
	- Continental (73 samples)	-	-	$ 1,204.50	-	$ 1,204.50
- expenses related to field work	- accommodations, meals, and other	-	-	$ 729.94	$ ~~130.78~~ 51.10	$ ~~860.72~~ 781.04
	- quad/trailer rental and fuel	-	-	$ 805.00	$ 56.35	$ 861.35
	- freight on samples	-	-	$ 85.00	$ -	$ 85.00
	- truck rental and fuel	-	-	$ 570.50	$ 39.94	$ 610.44
- expenses related to office work	- toll and fax charges	-	-	$ 50.00	$ 3.50	$ 53.50
	- aerial photos			$ 165.00	$ 11.55	$ 176.55
	- digital elevation data			$ 760.00	$ 53.20	$ 813.20
	- report reproduction, map plotting			$ 370.38	$ 25.93	$ 396.31
- plus 10% of expenses				$ 488.03	$ 34.16	$ 522.19
	TOTAL 1997 EXPENDITURES:			$ 32,211.85	$ 2,244.25	$ ~~34,456.10~~
						34,376.46

I, Jody R. Dahrouge, hereby certify that the costs outlined above were expended for the assessment of metallic and industrial minerals permit 9396020019.

PROFESSIONAL GEOLOGIST OF ALBERTA J.R. DAHROUGE

Jody R. Dahrouge, B.Sc., Sp.C., P.Geol.

APPENDIX 2: DESCRIPTIONS AND COMPOSITIONS OF CHIP SAMPLES

Stratigraphic thicknesses are based on measured attitudes of bedding as listed below with appropriate interpolations. UTM coordinates listed are NAD83. Samples are listed in order from stratigraphic top to bottom. They consist of chips collected at approximately 30 cm stratigraphic intervals. Units are abbreviated as follows: Banff - Banff Formation; Pek - Pekisko Formation; Sh - Shunda Formation; Pek-Sh - Pekisko and Shunda Formations undivided; TV - Turner Valley Formation; Mt. Head - Mount Head Formation.

Sample	Strat. Thick. (m)	Unit	Description	CaO (%)	MgO (%)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	$SrCO_3$ ppm	MnO ppm	P_2O_5 ppm
1: South-Central part of Baseline Ridge, near UTM 610557E, 5773865N											
12278	~1¼	Mt. Head(?)	Limy Mudstone, buff to buff-grey weathered with buff laminations, very dark grey fresh, micritic, beds 5 to 25 cm, attitude of beds 150°/24°SW	50.35	4.26	0.72	0.13	0.23	456	76	<70
12279	~¾	Mt. Head(?)	Limy Mudstone, medium-grey weathered, medium- to dark-grey fresh, micritic, beds 10 to 50 cm thick, attitude of beds 160°/20°W	49.00	5.07	1.31	0.29	0.15	409	78	<70
2: Southwestern Flank of Idlewilde Mountain on Clearwater River, near UTM 603050E, 5764750N											
-	~14	Banff	Limestone, buff brown weathered, very-dark grey fresh, micritic, gritty texture, beds up to ¾ m separated by shaly beds up to 1 m thick, very fossiliferous	-	-	-	-	-	-	-	-
12285	2¾	Banff	Limestone, buff brown weathered, dark- to very-dark grey fresh, micritic, beds up to 5 cm, few interbeds of fine- to medium-grained calcarenite to 5 cm	50.47	2.20	4.00	0.49	0.27	805	109	218
12284	1¼	Banff	Calcarenite, medium grey fresh, grains up to 1 mm, beds 5 to 15 cm, crinoids, attitude of beds 174°/22°W	54.36	0.62	1.25	0.08	0.15	532	148	99
12283	4¾	Banff	Calcarenite, medium grey weathered, medium- to dark-grey fresh, well sorted, grains up to 2 mm, beds 5 to 15 cm, well cemented, no fossils observed, attitude of beds 10°/23°W	54.33	0.67	1.00	0.14	0.16	580	154	544
12282	1	Banff	Calcarenite, very-light-grey fresh, grains up to 2 mm, crinoids, beds 5 to 15 cm separated by thin interbeds of argillaceous material	54.86	0.48	0.63	0.08	0.10	394	266	832
12281	1¼	Banff	Limy Mudstone, buff weathered, dark- to very-dark-grey fresh, micritic, gritty texture, beds 2 to 15 cm, few calcareous interbeds up to 5 cm, attitude of beds 14°/9°W	39.37	3.92	15.70	1.05	1.36	431	473	249
-	10	Banff	covered	-	-	-	-	-	-	-	-
12280	3	Banff	Limy Mudstone, buff-brown weathered, medium- to very-dark-grey fresh, micritic, gritty texture, beds 5 to 10 cm, up to 20% chert layers to 3 cm, attitude of beds 140°/18°SW	24.12	4.08	31.88	1.53	5.36	636	905	553

APPENDIX 2: CONTINUED

Sample	Strat. Thick. (m)	Unit	Description	CaO (%)	MgO (%)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	$SrCO_3$ ppm	MnO ppm	P_2O_5 ppm
3: Southwest Flank of Idlewilde Mountain, near UTM 603670E, 5765260N											
12286	4½	Pek-Sh	Calcarenite, medium-grey weathered, light-grey fresh, grains up to 3 mm, beds 5 to 50 cm, buff material along fractures, abundant crinoid osicle fragments and other fossil debris, vugs to ¾ cm wide filled with secondary calcite, attitude of beds 143°/23°SW	51.17	3.70	0.65	0.11	0.04	368	21	107
12287	4	Pek-Sh	Calcarenite, light-grey weathered, light-grey fresh, grains 1 to 3 mm, beds 20 to 60 cm, abundant crinoids and other fossil debris, bivalves to ½ cm, attitude of beds 12°/30°W	53.15	2.07	0.53	0.08	0.03	392	18	222
-	<2	Pek-Sh	Covered	-	-	-	-	-	-	-	-
12288	1½	Pek-Sh	Calcarenite, medium-grey weathered, light-grey to light-greyish brown fresh, grains up to 3 mm, beds generally 10 cm thick with one ¾ m thick bed, rare solitary coral, scattered crinoid fragments and fossil debris, attitude of beds 155°/28°SW, 146°/28°SW	52.53	2.46	0.38	0.05	0.03	316	24	<70
12289	½	Pek-Sh	Limy Mudstone, medium-grey to medium-greyish-brown weathered, medium- to dark-grey fresh, micritic, well-cemented, rare crinoid oscicle, massive	45.92	8.12	0.66	0.10	0.06	242	36	387
12290	5	Pek-Sh	Calcarenite, light-grey fresh, grains 1 to 3 mm, beds ½ to 2 m, abundant crinoids, bivalves, and other fossils, attitude of beds 149°/29°SW	55.15	0.52	0.24	0.05	0.02	367	21	373
12291	2¾	Pek-Sh	Calcarenite, medium- to dark-grey weathered, light-grey fresh, grains up to 2 mm, beds 5 to 20 cm, abundant crinoids, attitude of beds 155°/27°SW	55.27	0.44	0.21	0.05	0.02	366	22	<70
-	8½	Pek-Sh	Covered	-	-	-	-	-	-	-	-
12292	¾	Pek-Sh	Limestone, medium- to dark-grey fresh, micritic, massive, vuggy, no fossils	53.40	0.71	2.31	0.34	0.23	496	68	<70
-		Banff	Dolomite and Dolomitic Calcarenite, rocks and boulders in road surface	-	-	-	-	-	-	-	-

APPENDIX 2: CONTINUED

Sample	Strat. Thick. (m)	Unit	Description	CaO (%)	MgO (%)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	$SrCO_3$ ppm	MnO ppm	P_2O_5 ppm
4: Southwest Flank of Idlewilde Mountain, near UTM 604584E, 5765422N											
12293	1½	Pek-Sh	Calcarenite, dark-grey weathered, medium- to dark-grey fresh, grains up to 2 mm, beds 5 to 20 cm, massive, crinoids, few horn corals near top, rare anhydrite-filled vugs less than 2 mm in size, attitude of beds 174°/10°E	54.39	0.87	0.94	0.05	0.02	424	16	<70
-	6½	Pek-Sh	Covered	-	-	-	-	-	-	-	-
12294	1½	Pek-Sh	Calcarenite, as above, beds 5 to 25 cm, buff stain on weathered surfaces	49.31	5.23	0.77	0.09	0.04	413	21	367
-	10	Pek-Sh	Covered	-	-	-	-	-	-	-	-
12295	5½	Pek-Sh	Calcarenite, light-grey fresh, grains up to 3 mm, beds ½ to 2 m, crumbly, crinoids, attitude of beds 143°/14°NE	54.84	0.75	0.32	0.05	0.03	364	21	<70
5: Cliffs Adjacent to Road on Southwest Bank of Clearwater River, near UTM 604400E, 5762340N											
-	~25	Banff (?)	Limestone, micritic, few interbeds of calcareous Siltstone, strongly jointed, numerous calcite stringers and veins, fractured, few fault planes, attitude of faults 147°/39°SW	-	-	-	-	-	-	-	-
12307	4½	Banff (?)	Limestone, buff- to brownish-grey weathered, dark-brownish-grey fresh, gritty, shaly, recessive, attitude of beds 140°/29°SW	35.48	13.62	5.01	0.52	0.30	387	48	269
-	1½	Banff (?)	Covered	-	-	-	-	-	-	-	-
12306	3	Banff (?)	Limestone, grey weathered, very-dark-grey fresh, micritic, beds less than 10 cm, recessive	42.64	5.27	12.46	0.08	0.20	366	30	410
-	1½	Banff (?)	Covered	-	-	-	-	-	-	-	-
12305	6	Banff (?)	Wackestone to Mudstone, medium- to light-brownish-grey, scattered crinoid and fossil fragments, calcite crystals to 2 mm in micritic groundmass, massive to thick-bedded, well-jointed	43.01	10.18	1.48	0.16	0.05	306	24	413
12304	3	Banff (?)	Wackestone, grey weathered, light-brownish-grey fresh, grains up to 2 mm, generally massive, crinoid oscicles and fragments	48.89	5.49	0.89	0.10	0.04	351	21	181
12303	3½	Banff (?)	Wackestone, massive, medium-dark-grey weathered, medium-grey fresh, coarse-grained; lower 2½ m is Dolomitic Limestone, massive, fine-grained with large vugs lined with clear calcite crystals, yellow staining, attitude of beds 140°/30°SW	38.69	14.11	1.01	0.15	0.08	208	35	<70

APPENDIX 2: CONTINUED

Sample	Strat. Thick. (m)	Unit	Description	CaO (%)	MgO (%)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	$SrCO_3$ ppm	MnO ppm	P_2O_5 ppm
5: Continued											
12302	¾	Banff (?)	Limestone, light-grey weathered, light-brownish-grey fresh, grains less than 1 mm, poorly cemented, porous and vuggy with secondary calcite lining vugs, recessive, beds up to 30 cm; unit grades upward into resistant, well-cemented, micritic limestone	38.71	14.10	1.01	0.14	0.06	205	38	<70
-	4	Banff (?)	Covered	-	-	-	-	-	-	-	-
12301	4½	Banff (?)	Calcarenite, medium-grey fresh, coarse-grained up to 3 mm, thick-bedded to massive, crinoids, 1-m thin-bedded, vuggy interval 2 m up from base	52.06	2.81	0.83	0.11	0.05	326	30	<70
12300	2	Banff (?)	Limestone, buff-grey weathered, light-grey fresh, cryptocrystalline to micritic, few partly vuggy intervals with brownish weathered material, beds up to 10 cm, rare interbed of crinoidal Calcarenite to 5 cm thick	45.42	8.50	0.77	0.11	0.09	219	47	285
12299	2½	Banff (?)	Calcarenite, light-grey to greyish-buff weathered, light-grey fresh, grains 1 to 2 mm, massive with a few interbeds of light-grey micritic limestone to 5 cm thick, crinoid oscicles throughout	51.78	2.89	0.86	0.20	0.11	319	40	205
12298	3	Banff (?)	Limestone, buff-grey weathered, light-grey fresh, cryptocrystalline to micritic, partly vuggy, beds 5 to 50 cm, one chalky recessive bed 25 cm thick, attitude of beds 137°/30°SW	50.41	0.56	6.87	0.80	0.50	608	104	<70
-	14½	Banff (?)	Limestone, inaccessible cliff, black fresh, micritic	-	-	-	-	-	-	-	-
12297	2	Banff (?)	Limestone, light-grey with patches of black on weathered surface, black fresh, micritic, beds 10 to 50 cm, attitude of beds 154°/30°SW	30.28	12.62	11.65	1.69	1.09	298	179	177
-	6½	Banff (?)	mostly covered, Limestone, black fresh, micritic	-	-	-	-	-	-	-	-
12296	1¼	Banff (?)	Limy Mudstone, buff-brown weathered, very-dark-grey fresh, micritic, beds 3 to 25 cm, rare chert lens up to 1½ cm	47.37	2.77	7.80	0.47	0.53	1112	114	212
-	4	Banff (?)	mostly covered, Shale, thin-bedded where exposed	-	-	-	-	-	-	-	-
-	2½	Banff (?)	Limestone, medium-brown-grey fresh and weathered, fine-grained, beds 2 to 15 cm, attitude of beds 152°/25°SW	-	-	-	-	-	-	-	-

APPENDIX 2: CONTINUED

Sample	Strat. Thick. (m)	Unit	Description	CaO (%)	MgO (%)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	$SrCO_3$ ppm	MnO ppm	P_2O_5 ppm
6: East Limb of Idlewilde Mountain Anticline 140 m North of Clearwater River, near UTM 606410E, 5761840N											
12312	2½	Pek	Calcarenite, light-grey weathered, light-brown-grey fresh, grains 1 to 3 mm, locally sucrosic, crumbly, abundant joints, attitude of joints 77°/20°N, attitude of beds 151°/85°NE				(not analyzed)				
12311	4¾	Pek	Calcarenite, light-grey weathered, light-grey fresh, beds 10 cm to massive, grains 1 to 4 mm, strongly jointed, sucrosic, crumbly, crinoid fragments	55.42	0.37	0.14	0.03	0.06	365	24	<70
12310	1¾	Pek	Calcarenite, light-grey weathered, light-grey fresh, beds 10 cm to massive, grains up to 3 mm, strongly jointed, partly sucrosic, crumbly	54.45	0.33	0.08	0.03	0.03	322	42	216
12309	2¼	Pek	Calcarenite, light-grey weathered, light-grey fresh, massive, grains 2 to 3 mm, highly fractured, crumbly	54.97	0.40	0.11	0.03	0.06	336	31	105
12308	4	Pek	Calcarenite, light-grey to white weathered, light-brown-grey fresh, massive, grains 2 to 3 mm, crumbly, attitude of beds 154°/75°NE	54.41	0.46	0.17	0.03	0.04	456	20	<70
7: West Flank of Corkscrew Mountain, near UTM 614580E, 5761704N											
12313	2½	Pek-Sh	Calcarenite, brown to buff-grey weathered, brownish-grey fresh, beds ¼ to 1 m, grains 1 to 3 mm, secondary calcite crystals to 3 mm, attitude of beds 159°/33°W	50.80	3.30	0.85	0.05	0.06	375	25	173
12314	1	Pek-Sh	Limy Mudstone, grey weathered, grey to brownish-grey fresh, micritic to fine-grained with few grains to 1 mm, beds up to ½ m	46.96	6.31	0.96	0.11	0.06	332	29	236
12315	1½	Pek-Sh	Limy Mudstone, grey weathered, grey to brownish-grey fresh, micritic, thick-bedded, cleavage sub-parallel to bedding giving fractured appearance, attitude of beds 153°/27°SW	46.90	7.19	0.84	0.11	0.06	315	25	183
12316	2	Pek-Sh	Calcarenite, brownish-grey weathered, light-grey fresh, beds 2 cm to ½ m, grains 1 to 3 mm, partly sucrosic, few crinoid oscicle fragments, attitude of beds 157°/33°W	53.73	1.28	0.48	0.06	0.05	457	19	<70
-	1	Pek-Sh	Calcarenite, massive, underlain by 30 to 40 cm recessive interval, thin-bedded	-	-	-	-	-	-	-	-

APPENDIX 2: CONTINUED

Sample	Strat. Thick. (m)	Unit	Description	CaO (%)	MgO (%)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	$SrCO_3$ ppm	MnO ppm	P_2O_5 ppm
8: West Flank of Corkscrew Mountain, near UTM 614780E, 5761340N											
12321	1	Pek-Sh	Calcarenite, brown weathered, medium-grey fresh, beds 10 cm to ½ m, grains to 3 mm, few crinoid oscicle fragments	53.28	1.30	0.40	0.05	0.04	421	19	<70
12320	1½	Pek-Sh	Calcarenite, medium- to light-grey weathered, medium-grey fresh, beds 30 to 50 cm, grains 1 to 3 mm, crinoids, vugs to 10 cm in lower 30 cm of sample, attitude of beds 166°/36°W	52.88	2.29	0.53	0.06	0.04	421	19	294
12319	1¼	Pek-Sh	Wackestone, medium-grey, fine-grained, grading downward into fine-grained Calcarenite, beds ~ 30 cm, vuggy	43.57	9.25	0.78	0.13	0.11	240	31	207
12318	1½	Pek-Sh	Calcarenite, brownish-buff weathered, light-grey to creamy-grey fresh, beds ~10 cm, grains to 2 mm in micritic matrix, vuggy	41.72	11.10	1.25	0.13	0.11	214	38	181
-	~1¼	Pek-Sh	Limy Dolomite and Dolomitic Mudstone	-	-	-	-	-	-	-	-
12317	¾	Pek-Sh	Limy Mudstone, buff weathered, medium-brownish-grey fresh, grains to 1 mm in micritic matrix, beds ~ ½ m, attitude of beds 165°/34°W	41.45	11.55	0.82	0.13	0.11	229	36	<70
9: West Flank of Corkscrew Mountain, near UTM 615040E, 5761120N											
12322	2	Pek-Sh	Wackestone, buff- to buff-grey weathered, medium-grey fresh, grains to 2 mm in micritic matrix, crinoid oscicle fragments, attitude of beds 164°/18°W	49.01	5.45	0.73	0.07	0.054	358.6	26.56	475.6
12323	¼	Pek-Sh	Limy Mudstone, grey- to brownish-grey fresh, micritic	45.78	7.57	0.62	0.12	0.075	366.7	27.86	607.7
12324	3½	Pek-Sh	Calcarenite to Wackestone, medium-grey weathered, medium-grey fresh, grains to 3 mm in micritic matrix, beds 30 cm to 1 m, crinoid fragments	53.62	1.57	0.56	0.07	0.041	392.6	18.9	147.5
12325	3	Pek-Sh	Calcarenite, grey weathered, light-grey fresh, grains 1 to 3 mm, massive, crinoids	53.85	1.43	0.34	0.05	0.063	383	22.26	73.06
-	1	Pek-Sh	Covered	-	-	-	-	-	-	-	-
12326	1½	Pek-Sh	Wackestone, medium-grey weathered, medium-grey fresh, grains 1 to 3 mm in micritic matrix, beds up to 30 cm, crinoid fragments	51.40	3.55	0.38	0.06	0.09	326	23	<70
-	¾	Pek-Sh	Dolomite, light-tan-grey fresh, fine-grained, vuggy	-	-	-	-	-	-	-	-
-	6	Pek-Sh	Covered	-	-	-	-	-	-	-	-
12327	¾	Pek-Sh	Wackestone, grey weathered, creamy-grey fresh, grains to 2 mm in micritic matrix	45.03	8.40	0.62	0.08	0.09	213	42	210

APPENDIX 2: CONTINUED

Sample	Strat. Thick. (m)	Unit	Description	CaO (%)	MgO (%)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	$SrCO_3$ ppm	MnO ppm	P_2O_5 ppm
9: Continued											
12328	3¾	Pek-Sh	Calcarenite, brownish-grey weathered, light- to medium-grey fresh, grains <1 to 3 mm, fining upward, massive, crinoid fragments	54.42	1.07	0.31	0.05	0.06	354	24	<70
12329	3	Pek-Sh	Wackestone, light-grey fresh, grains 1 to 3 mm in medium-grey mud matrix, beds 1 to 2 m thick, crinoid fragments	55.19	0.47	0.25	0.05	0.05	376	24	<70
12330	3	Pek-Sh	Wackestone, medium- to light-grey weathered, light-grey fresh, grains 1 to 3 mm in mud matrix, beds 30 to 60 cm, crinoid and bivalve fragments	54.58	1.01	0.25	0.06	0.04	358	29	<70
12331	1¾	Pek-Sh	Calcarenite, brownish-grey weathered, light-grey fresh, grains micritic to 1 mm, coarsening upward, beds ¼ to ½ m, attitude of beds 140°/25°SW	54.17	1.37	0.24	0.06	0.08	356	36	<70
-	1½	Pek-Sh	Covered	-	-	-	-	-	-	-	-
12332	1½	Pek-Sh	Calcarenite, brownish-grey weathered, light-grey fresh, grains < 1 mm to micritic, beds ~¼ m, partly sucrosic	55.24	0.46	0.18	0.04	0.09	387	41	193
-	1½	Banff	Covered	-	-	-	-	-	-	-	-
12333	½	Banff	Limestone, brownish-grey weathered, medium- to dark-grey fresh, micritic, platy beds, gritty texture	36.30	12.19	5.10	1.08	0.91	291	128	399
10: West Flank of Corkscrew Mountain, near UTM 615500E, 5760700N											
-	8	TV	Limy Dolomite, medium- to dark-greyish brown, micritic, thin-bedded, vuggy layers up to ½ m thick, numerous laminar beds, and dark-grey Mudstone beds up to ¾ m	-	-	-	-	-	-	-	-
-	2	TV	Fault Gouge, dark-grey mud and breccia in upper 1 m; very crumbly, fractured blocks in lower 1½ m	-	-	-	-	-	-	-	-
12334	2	Pek - Sh	Limy Mudstone, medium- to dark-grey weathered, brownish-grey to very-dark-grey fresh, micritic, abundant calcite-filled vugs to 4 mm and bitumen-stained layers near top, beds 10 to 30 cm, attitude of beds 118°/14°SW	54.06	1.02	0.85	0.07	0.05	824	21	<70
12335	1	Pek - Sh	Limy Mudstone, as above, rare stylolite, fault surface with attitude 144°/20°SW at base of sample - may repeat 2½ m of section here	54.34	0.59	0.45	0.05	0.03	499	19	108
12336	1½	Pek - Sh	Limy Mudstone, as above, minor calcite, attitude of beds 108°/12°S	54.31	0.93	0.79	0.11	0.07	442	22	188
12337	1	Pek - Sh	Limy Mudstone, as above	51.97	2.94	0.77	0.09	0.10	472	22	139

APPENDIX 2: CONTINUED

Sample	Strat. Thick. (m)	Unit	Description	CaO (%)	MgO (%)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	$SrCO_3$ ppm	MnO ppm	P_2O_5 ppm
10: Continued											
-	1	Pek - Sh	Dolomite, buff-weathered	-	-	-	-	-	-	-	-
12338	2½	Pek - Sh	Limy Mudstone, medium- to dark-grey weathered, medium- to very-dark-grey fresh, micritic, beds 30 to 80 cm, attitude of beds 128°/10°SW	41.02	10.90	1.97	0.28	0.11	351	42	81
-	¼	Pek - Sh	Dolomite, brown weathered, light-buff fresh	-	-	-	-	-	-	-	-
-	7	Pek - Sh	Limy Mudstone, dark-grey weathered, dark-grey to black fresh, micritic, beds 10 to 30 cm, attitude of beds near base 102°/19°S	-	-	-	-	-	-	-	-
-	1½	Pek - Sh	Limy Mudstone and Shale, dark-grey weathered, dark-grey to black fresh, micritic, laminated beds, flourite crystals, calcite veins	-	-	-	-	-	-	-	-
-	4	Pek - Sh	Limy Mudstone, dark-grey weathered, very-dark-grey to black fresh, micritic, few 5 cm wide zones of mud and fault gouge	-	-	-	-	-	-	-	-
-	4	Pek - Sh	Dolomitic Mudstone, dark-grey weathered, very-dark-grey to black fresh, micritic, vuggy in lower ½ m, platy, fractured and faulted, sharp upper contact with attitude 120°/20°SW	-	-	-	-	-	-	-	-
12339	1½	Pek - Sh	Limy Mudstone, brownish-grey weathered, medium-grey fresh, micritic, generally massive with few interbeds to 5 cm of crinoidal Wackestone, layer ½ m thick with vugs to 2 cm in size, attitude of reverse fault within interval 113°/39°	47.88	6.14	1.29	0.13	0.08	408	26	137
-	1½	Pek - Sh	Dolomite, buff weathered, creamy-grey fresh, fine-grained, thin bedded	-	-	-	-	-	-	-	-
12340	1	Pek - Sh	Wackestone, dark-grey weathered, medium-dark-grey fresh, grains to 2 mm, crinoids	49.75	4.57	0.93	0.07	0.14	385	25	<70
-	4	Pek - Sh	Interbedded Dolomite and Limy Mudstone, fine-grained, thin-bedded, highly jointed, numerous slip planes sub-parallel to bedding, possible thickening of strata in this interval	-	-	-	-	-	-	-	-
12341	1¼	Pek - Sh	Wackestone to Limy Mudstone, brownish-grey weathered, light- to medium-grey fresh, fining upward, beds 5 to 30 cm	48.14	6.02	1.09	0.10	0.09	377	25	362
12342	1¾	Pek - Sh	Wackestone, medium- to dark-grey weathered, medium-grey fresh, grains to 2 mm in micritic matrix, ½ m bed of medium-grey Micrite at base	52.62	1.55	1.03	0.07	0.05	429	18	283
-	½	Pek - Sh	Dolomite, buff-grey fresh, fine-grained	-	-	-	-	-	-	-	-

APPENDIX 2: CONTINUED

Sample	Strat. Thick. (m)	Unit	Description	CaO (%)	MgO (%)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	$SrCO_3$ ppm	MnO ppm	P_2O_5 ppm
10: Continued											
12343	3½	Pek - Sh	Wackestone, brownish-grey weathered, light-grey fresh, grains to 2 mm in micritic matrix, beds generally 30 cm, coarse white calcite-filling vugs to 3 cm in ½ m layer 1 m up from base, attitude of beds 109°/19°S	53.63	1.61	0.45	0.06	0.07	412	23	160
12344	1½	Pek - Sh	Dolomitic Wackestone, buff-grey weathered, creamy- to brownish-grey fresh, grains to 3 mm in micritic matrix, recessive, beds generally less than 15 cm; basal bed ½ m	38.57	14.02	0.56	0.10	0.09	185	40	96
-	1¼	Pek - Sh	Dolomite, buff-grey fresh, fine-grained	-	-	-	-	-	-	-	-
12345	1¾	Pek - Sh	Limy Dolomite and Micritic Limestone, medium- to light-grey fresh	35.70	16.21	1.57	0.33	0.13	364	43	<70
12346	4¼	Pek - Sh	Wackestone, brownish-grey weathered, light-grey fresh, grains to 3 mm, fining upward, massive, attitude of beds 110°/25°S	50.53	4.27	0.55	0.06	0.05	309	29	165
12347	3½	Pek	Calcarenitic Packstone, medium-dark-grey weathered, light-grey fresh, grains 1 to 3 mm, crinoids, massive	55.19	0.47	0.23	0.05	0.09	375	46	<70
12348	4¾	Pek	Calcarenite, grey weathered, light-grey fresh, grains 1 to 3 mm, well-cemented, crinoids, beds ½ m to massive, attitude of beds 109°/17°S	55.34	0.40	0.09	0.03	0.11	370	42	191
12349	2	Pek	Wackestone to Micrite, dark-grey weathered, light-grey fresh, grains 1 to 3 mm, crinoids, beds ½ m to massive, attitude of beds 113°/18°S	55.32	0.51	0.08	0.03	0.02	346	24	<70
12350	1	Pek	Wackestone, grey weathered, light- to medium-grey fresh, grains 1 to 3 mm, abundant crinoid debris, beds ~30 cm	54.62	0.44	0.10	0.04	0.03	404	19	123
12351	3	Pek	Wackestone, grey weathered, medium-grey fresh, grains 1 to 3 mm in light-grey matrix, beds 10 cm to ¾ m	55.36	0.43	0.11	0.03	0.06	487	21	<70
-	5½	Banff	Covered	-	-	-	-	-	-	-	-
-	½	Banff	Limy Mudstone, black, micritic	-	-	-	-	-	-	-	-
-	4	Banff	Limy Dolomite, dark-grey, micritic, beds ¼ to ½ m	-	-	-	-	-	-	-	-

APPENDIX 3A: ANALYTICAL REPORTS FOR ICP ANALYSES FROM THE QUALITY ASSURANCE LABORATORY OF CONTINENTAL LIME INC.*

Sample	% LOI	% CaCO3	% MgCO3	% Fe2O3	% Al2O3	ppm SrCO3	ppm MnO	% SiO2	ppm BaO	ppm K2O	ppm Na2O	ppm P2O5	ppm TiO2	% Total
12278	43.98	89.86	8.91	0.228	0.131	456	76	0.72	30	561	131	<70	67	99.98
12279	43.87	87.45	10.61	0.154	0.289	409	78	1.31	12	657	130	<70	80	99.95
12280	22.87	43.04	8.53	5.362	1.527	636	905	31.88	82	8820	1748	553	1661	91.78
12281	35.41	70.26	8.19	1.358	1.054	431	473	15.70	98	5172	1426	249	1080	97.46
12282	43.63	97.91	1.00	0.104	0.077	394	266	0.63	8	260	113	832	38	99.91
12283	43.53	96.97	1.41	0.163	0.142	580	154	1.00	15	709	170	544	73	99.90
12284	43.52	97.02	1.30	0.146	0.078	532	148	1.25	10	298	143	99	40	99.92
12285	41.85	90.08	4.60	0.266	0.493	805	109	4.00	17	2805	301	218	304	99.90
12286	43.89	91.32	7.73	0.042	0.106	368	21	0.65	7	473	154	107	46	99.97
12287	43.94	94.86	4.32	0.027	0.075	392	18	0.53	12	303	147	222	28	99.92
12288	43.88	93.75	5.14	0.034	0.053	316	24	0.38	6	176	126	<70	18	99.42
12289	44.71	81.95	16.99	0.063	0.097	242	36	0.66	6	494	166	387	44	99.90
12290	43.69	98.43	1.09	0.017	0.045	367	21	0.24	6	136	101	373	14	99.92
12291	43.74	98.65	0.91	0.019	0.047	366	22	0.21	7	144	120	<70	12	99.91
12292	42.74	95.30	1.49	0.227	0.335	496	68	2.31	14	1848	155	<70	184	99.93
12293	43.53	97.07	1.81	0.024	0.051	424	16	0.94	7	177	134	<70	23	99.97
12294	44.18	88.01	10.94	0.039	0.089	413	21	0.77	8	430	155	367	36	99.99
12295	43.53	97.87	1.57	0.034	0.049	364	21	0.32	4	161	138	<70	16	99.92
12296	40.00	84.54	5.80	0.529	0.467	1112	114	7.80	47	2709	147	212	247	99.59
12297	38.22	54.05	26.40	1.091	1.694	298	179	11.65	53	10212	312	177	1038	96.12
12298	40.05	89.97	1.18	0.498	0.804	608	104	6.87	62	5090	155	<70	556	99.97
12299	43.73	92.41	6.04	0.106	0.195	319	40	0.86	9	901	135	205	116	99.78
12300	44.21	81.07	17.78	0.087	0.105	219	47	0.77	12	529	160	285	50	99.94
12301	43.87	92.92	5.88	0.051	0.113	326	30	0.83	13	265	137	<70	27	99.88
12302	45.21	69.08	29.50	0.063	0.140	205	38	1.01	12	724	165	<70	66	99.91
12303	45.15	69.05	29.52	0.078	0.147	208	35	1.01	21	843	178	<70	77	99.95
12304	43.95	87.26	11.49	0.039	0.096	351	21	0.89	6	465	155	181	39	99.90
12305	44.56	76.77	21.30	0.052	0.155	306	24	1.48	8	885	185	413	78	99.95
12306	38.61	76.10	11.02	0.197	0.082	366	30	12.46	11	374	166	410	36	99.99
12307	43.16	63.33	28.49	0.296	0.525	387	48	5.01	51	2955	179	269	298	98.07
12308	43.52	97.12	0.95	0.040	0.035	456	20	0.17	13	118	100	<70	24	98.38
12309	43.35	98.11	0.84	0.063	0.032	336	31	0.11	16	72	92	105	15	99.21
12310	43.16	97.18	0.68	0.028	0.027	322	42	0.08	12	68	89	216	149	98.10
12311	43.17	98.91	0.78	0.058	0.033	365	24	0.14	12	97	105	<70	21	99.99
12313	44.11	90.67	6.91	0.057	0.051	375	25	0.85	13	190	189	173	59	98.65

* As received by modem

APPENDIX 3A: CONTINUED

Sample	%	%	%	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%
	LOI	CaCO3	MgCO3	Fe2O3	Al2O3	SrCO3	MnO	SiO2	BaO	K2O	Na2O	P2O5	TiO2	Total
12314	44.00	83.82	13.20	0.061	0.114	332	29	0.96	13	532	152	236	199	98.31
12315	44.38	83.71	15.04	0.057	0.106	315	25	0.84	22	507	169	183	246	99.90
12316	43.47	95.89	2.68	0.046	0.064	457	19	0.48	14	257	140	<70	39	99.25
12317	44.96	73.98	24.17	0.109	0.130	229	36	0.82	16	554	199	<70	95	99.30
12318	44.71	74.45	23.23	0.105	0.135	214	38	1.25	20	625	201	181	107	99.31
12319	44.68	77.77	19.34	0.106	0.129	240	31	0.78	15	583	205	207	82	98.26
12320	44.08	94.37	4.79	0.036	0.058	421	19	0.53	16	233	164	294	43	99.91
12321	44.28	95.10	2.71	0.039	0.054	421	19	0.40	18	209	182	<70	28	98.40
12322	44.43	87.47	11.39	0.054	0.070	359	27	0.73	14	286	181	476	60	99.86
12323	44.29	81.71	15.83	0.075	0.115	367	28	0.62	19	538	159	608	80	98.53
12324	43.94	95.70	3.29	0.041	0.070	393	19	0.56	13	293	165	147	48	99.77
12325	44.09	96.11	2.98	0.063	0.054	383	22	0.34	14	206	176	73	30	99.64
12326	44.75	91.73	7.42	0.091	0.064	326	23	0.38	18	262	192	<70	35	99.77
12327	44.70	80.36	17.58	0.091	0.082	213	42	0.62	15	355	181	210	68	98.84
12328	43.77	97.13	2.23	0.063	0.045	354	24	0.31	13	158	167	<70	21	99.85
12329	43.72	98.51	0.99	0.053	0.048	376	24	0.25	16	175	165	<70	34	99.92
12330	43.65	97.41	2.12	0.042	0.056	358	29	0.25	13	212	167	<70	47	99.95
12331	43.57	96.67	2.87	0.079	0.060	356	36	0.24	14	212	154	<70	26	99.98
12332	43.47	98.59	0.95	0.094	0.039	387	41	0.18	18	126	134	193	26	99.95
12333	42.20	64.78	25.51	0.907	1.078	291	128	5.10	29	5461	294	399	440	98.08
12334	43.56	96.48	2.14	0.055	0.071	824	21	0.85	48	357	130	<70	62	99.72
12335	43.46	96.99	1.24	0.032	0.052	499	19	0.45	28	240	119	108	201	98.88
12336	43.47	96.93	1.95	0.072	0.108	442	22	0.79	23	522	123	188	61	99.99
12337	43.77	92.75	6.15	0.102	0.085	472	22	0.77	21	389	119	139	45	99.98
12338	44.19	73.21	22.81	0.109	0.282	351	42	1.97	17	1409	218	81	205	98.61
12339	44.17	85.46	12.84	0.083	0.133	408	26	1.29	28	703	145	137	77	99.96
12340	43.74	88.80	9.56	0.138	0.068	385	25	0.93	24	231	169	<70	50	99.59
12341	44.16	85.91	12.59	0.086	0.104	377	25	1.09	19	440	134	362	55	99.92
12342	43.71	93.92	3.23	0.051	0.070	429	18	1.03	17	305	162	283	62	98.43
12343	43.93	95.71	3.37	0.067	0.059	412	23	0.45	15	228	170	160	30	99.77
12344	45.36	68.84	29.34	0.088	0.102	185	40	0.56	18	409	182	96	58	99.02
12345	45.15	63.71	33.91	0.128	0.326	364	43	1.57	23	1705	280	<70	155	99.90
12346	43.85	90.18	8.94	0.050	0.063	309	29	0.55	24	260	181	165	229	99.90
12347	43.69	98.50	0.99	0.086	0.049	375	46	0.23	11	147	160	<70	21	99.92
12348	43.96	98.78	0.83	0.109	0.034	370	42	0.09	18	85	155	191	14	99.93
12349	43.44	98.73	1.07	0.025	0.029	346	24	0.08	25	70	130	<70	31	99.99
12350	43.87	97.49	0.93	0.033	0.040	404	19	0.10	10	105	146	123	42	98.68
12351	44.12	98.81	0.91	0.064	0.029	487	21	0.11	19	79	160	<70	16	99.99

APPENDIX 3B: ANALYTICAL REPORT FOR CHECK ANALYSES BY WHOLE ROCK ICP FROM ACME ANALYTICAL LABORATORIES LTD.

ACME ANALYTICAL LABORATORIES LTD. 852 E. HASTINGS ST. VANCOUVER BC V6A 1R6 PHONE(640)253-3158 FAX(604)253-1716

WHOLE ROCK ICP ANALYSIS

Halferdahl & Associates Ltd. PROJECT LOT 2 File # 9800586

18 - 10509 - 81st Ave, Edmonton AB T6E 1X7 Submitted by: L.B. Halferdahl

SAMPLE#	SiO2 %	Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	Cr2O3 %	Ba ppm	Ni ppm	Sr ppm	Zr ppm	Y ppm	Nb ppm	Sc ppm	LOI %	C/TOT %	S/TOT %	SUM %
12280	38.34	2.62	6.12	4.18	24.27	.31	.99	.20	.04	.11	.023	116	28	370	67	<10	<10	<10	22.7	6.56	.08	99.97
12281	16.97	1.59	1.49	3.93	38.67	.27	.59	.14	.06	.05	.007	129	<20	247	73	11	<10	<10	36.2	9.88	.03	100.02
12291	.18	.07	<.04	.44	55.05	.06	.05	.02	.01	<.01	.002	5	<20	208	138	<10	<10	<10	44.1	12.46	.03	100.03
12297	13.67	2.06	1.03	12.81	30.26	.11	1.06	.11	.05	.02	.009	65	<20	174	43	<10	<10	<10	38.8	10.57	.16	100.03
12307	5.73	.59	.38	13.92	35.18	.09	.30	.04	.07	.01	.004	39	<20	202	18	<10	<10	<10	43.7	12.30	.07	100.05
12311	.13	.05	.05	.39	55.11	.06	.05	<.01	.01	<.01	.006	7	<20	209	21	<10	<10	<10	44.1	11.95	.03	99.99
12348	.06	.06	.04	.41	54.99	.07	.04	<.01	.01	<.01	.005	6	<20	186	<10	<10	<10	<10	44.3	12.14	<.01	100.02
RE 12348	.11	.06	.04	.42	54.84	.06	.05	.01	<.01	<.01	.004	7	<20	187	<10	<10	<10	<10	44.4	11.95	<.01	100.03
12349	.06	.04	.05	.53	54.85	.07	.05	.01	.03	<.01	.002	5	<20	173	<10	<10	<10	<10	44.3	12.41	<.01	100.02

.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: PULP Samples beginning 'RE' are Reruns and 'RRE' are Reject Reruns.

DATE RECEIVED: FEB 24 1998 **DATE REPORT MAILED:** Mar 5/98 **SIGNED BY.** [redacted]. TOYE, C.LEONG, J. WANG; CERTIFIED B.C. ASSAYERS

 Data ___ FA ___

APPENDIX 3C: ANALYTICAL PROCEDURE IN THE QUALITY ASSURANCE LABORATORY OF CONTINENTAL LIME LTD.

Fusions Method For ICP Analysis

Lithium metaborate, which melts at 845°C, is used for sample dissolution. Lithium metaborate is well suited for attacking and dissolving acidic oxides. The procedure for fusion with lithium metaborate is as follows:

1. Weigh a 0.5 g sample of powdered rock pulverized to minus 100 mesh, into a graphite crucible of approximately 30 ml capacity. Graphite crucibles must be manufactured from high-purity graphite, and they have a limited lifetime.

2. Add anhydrous lithium metaborate to the crucible and mix the contents well. The ratio of flux to sample should be 4:1. If resistant minerals such as zircon are present, a larger ratio must be used for a successful attack.

3. Fuse the mixture in a muffle furnace at 900°C for 15 minutes. Remove the crucible and swirl the contents. Replace the crucible in the muffle furnace for an additional 15 minutes at 900°C.

4. Remove the crucible from the muffle furnace and allow the fusion to cool to room temperature. Leave any graphite dust in the crucible. Immerse the crucible in a solution of 165 ml of concentrated nitric acid. An internal standard, cobalt, is added at this point. The solids will dissolve in 1-2 hrs.

The following analytical lines are used for ICP analysis:

P	213.618	Ti	334.941
Si	251.611	Al	396.152
Mn	257.610	Sr	407.771
Fe	259.940	Ba	455.403
Mg	280.270	Na	589.592
Ca	317.933	K	766.491

APPENDIX 4: TWO-TAILED STUDENTS *t*-TEST FOR DIFFERENCES, SIGN TEST, AND TEST OF CONFIDENCE INTERVALS FOR CONSTITUENT DETERMINATIONS OF SAMPLES COLLECTED FROM METALLIC AND INDUSTRIAL MINERALS PERMIT 9396020019

Notes: **CONT:** Analysis by the Quality Assurance laboratory of Continental Lime Inc.
ACME: Analysis by Acme Analytical Laboratories Ltd.

Adjusted CaO: Adjusted CaO analyses (Appendix 5).

DEV: deviation (**d = D-dx**)
DIFF: difference (D = Constituent Determination$_{Lab1}$ - Constituent Determination$_{Lab2}$)
SD: squared deviation (**d^2**)

n: number of samples
d.o.f: degrees of freedom [n-1]
d_x: mean of differences in constituent
t_α: two-tailed

TWO-TAILED STUDENTS *t*-TEST OF DIFFERENCES (Snedecor, 1957)

For the test of differences determinations of the same sample from two laboratories are paired and their differences comprise the sample data for which the following hypothesis may be tested:

Ho: Constituent Determination$_{LAB1}$ - Constituent Determination$_{LAB2}$ = 0

Ha: Constituent Determination$_{LAB1}$ - Constituent Determination$_{LAB2}$ $\neq$ 0

The measured variation in the population of sample differences is given by

S_D2: variance of differences in constituent [**Σd^2 / d.o.f.**]

S_D: standard deviation of differences in constituent [**$(S_D2)^{1/2}$**]

and measured variation in sample differences is given by

S_d2: sample variance of differences in constituent [**S_D2 / n**]

S_d: sample standard deviation of differences in constituent [**$(S_d2)^{1/2}$**]

The students *t*-Test is used to test the hypothesis regarding sample differences.

t: test statistic [**$(d_x - \mu / s_d)$**]

TWO-TAILED SIGN TEST (Mendenhall et al., 1990)

For the sign test the determinations of the same sample from two laboratories are paired and the sign of the differences comprise the sample data, with **M** equal to the number of positive differences. The hypothesis that both samples are derived from the same probability distribution with the same position is tested against the alternative that the distributions differ in position. Under the null hypothesis the probability that the sign of the differences is + or - is ½, and

APPENDIX 4: CONTINUED

M: number of positive differences

Ho: P(Constituent Determination$_{LAB1}$ > Constituent Determination$_{LAB2}$) = ½
Ha: P(Constituent Determination$_{LAB1}$ > Constituent Determination$_{LAB2}$) ≠ ½

If both samples are derived from the same probability distribution then **M** will be binomially distributed with **p** = ½ and the level of significance α associated with the rejection region is determined by

y: number of samples required to raise α to the required level of significance
p(x): binomial probability **[(n! / ((n-x)!(x)!)) $0.5^x 0.5^{n-x}$]**
α: two-tailed level of significance **[p(0) + ... + p(0+y) + p(n-y) + ... + p(n)]**
RR: rejection region **[(0 ≤ M ≤ y, n-y ≤ M ≤ n)]**

TWO-TAILED STUDENTS *t*-TEST OF CONFIDENCE INTERVALS (Koch and Link, 1970)

For the test of confidence intervals the determinations of the same sample from two laboratories are paired and their differences comprise the sample data for which the following hypothesis may be tested:

Ho: Constituent Determination$_{LAB1}$ - Constituent Determination$_{LAB2}$ = 0

Ha: Constituent Determination$_{LAB1}$ - Constituent Determination$_{LAB2}$ ≠ 0

If confidence intervals constructed about the mean difference exclude 0 then the null hypothesis is rejected.

Σ w: sum of observations
$\Sigma\, w_{DIFFERENCE}$: difference of the sum of observations [$\Sigma\, w_{LAB1} - \Sigma\, w_{LAB2}$]
$(\Sigma\, w_{DIFFERENCE})^2$: squared difference of the sum of observations [$(\Sigma\, w_{LAB1} - \Sigma\, w_{LAB1})^2$]
$(\Sigma\, w_{DIFFERENCE})^2$ / n: mean squared difference
SS: sum of squared deviations from the sample mean
s^2: sample variance **[SS / d.o.f]**
s: sample standard deviation **[$(s^2)^{½}$ or $SS^{½}$]**
$s / n^{½}$: standard deviation of sample means
$t(s / n^{½})$: test statistic at α level of significance **[(s / n½) • (t_α)]**
μ_L: lower confidence limit **[$d_x - t(s / n^{½})$]**
μ_U: upper confidence limit **[$d_x + t(s / n^{½})$]**

APPENDIX 4: CONTINUED

CaO [CONTINENTAL - ACME]

Sample	CaO (%) CONT	ACME		Test of Differences and Confidence Intervals DIFF (D)	DEV (d)		SD (d^2)		Sign Test Sign of DIFF
12280	24.12	24.27		-0.15	-0.46		0.21		-
12281	39.37	38.67		0.70	0.39		0.15		+
12291	55.27	55.05		0.22	-0.08		0.01		+
12297	30.28	30.26		0.02	-0.28		0.08		+
12307	35.48	35.18		0.30	0.00		0.00		+
12311	55.42	55.11		0.31	0.01		0.00		+
12348	55.35	54.99		0.36	0.05		0.00		+
RE 12348	55.35	54.84		0.51	0.20		0.04		+
12349	55.32	54.85		0.47	0.16		0.03		+
Total (Σ w)	405.95	403.22	ΣW_{DIFF} =	2.73	0.00	SS =	0.52	M =	8
Mean (μ)	45.11	44.80	d_x =	0.30		S_D^2 =	0.07		
n =	9		d.o.f =	8					

TEST OF DIFFERENCES

S_D =	0.25	t =	3.574	tα = 0.100 =	1.860	Reject Ho:
S_{d2} =	0.01			tα = 0.050 =	2.306	Reject Ho:
S_d =	0.08			tα = 0.025 =	2.752	Reject Ho:

SIGN TEST

α = p(0)+...+p(2)+p(7)+...+p(9)	RR = (0 ... 2,7 ... 9)	α = 0.328	Reject Ho:
α = p(0)+p(1)+p(8)+p(9)	RR = (0, 1, 8, 9)	α = 0.141	Reject Ho:
α = p(0)+p(9)	RR = (0, 9)	α = 0.035	Accept Ho:

TEST OF CONFIDENCE INTERVALS

$(\Sigma W_{DIFF})^2$ =	7.48	$(\Sigma W_{DIFF})^2 / n$ =	0.83	SS =	0.52
s^2 = SS/d.o.f =	0.07	$s = (s^2)^{½}$ =	0.25	$s / n^{½}$ =	0.08

$t(s/n^{½})\alpha$ = 0.100 =	0.158	μL =	0.146	μU =	0.462	Reject Ho:
$t(s/n^{½})\alpha$ = 0.050 =	0.196	μL =	0.108	μU =	0.500	Reject Ho:
$t(s/n^{½})\alpha$ = 0.025 =	0.234	μL =	0.070	μU =	0.538	Reject Ho:

Differences

Range of differences:	Max =	0.70	Min =	-0.15
μ of differences:	μ =	0.30		

APPENDIX 4: CONTINUED

Adjusted CaO [CONTINENTAL - $ACME_{ADJUSTED}$]

Sample	Adjusted CaO (%) CONT	ACME		Test of Differences and Confidence Intervals DIFF (D)	DEV (d)		SD (d^2)		Sign Test Sign of DIFF
12280	24.12	24.27		-0.15	-0.43		0.18		-
12281	39.37	38.67		0.70	0.42		0.18		+
12291	55.21	55.05		0.16	-0.11		0.01		+
12297	30.28	30.26		0.02	-0.25		0.06		+
12307	35.48	35.18		0.30	0.03		0.00		+
12311	55.31	55.11		0.20	-0.07		0.01		+
12348	55.35	54.91		0.44	0.16		0.03		+
RE 12348	55.35	54.91		0.44	0.16		0.03		+
12349	55.20	54.85		0.35	0.08		0.01		+
Total (Σ w)	405.66	403.21	ΣW_{DIFF} =	2.45	0.00	SS =	0.50	M =	8
Mean (μ)	45.07	44.80	d_x =	0.27		$S_D{}^2$ =	0.06		
n =	9		d.o.f =	8					

TEST OF DIFFERENCES

S_D =	0.25	t =	3.262	$t\alpha$ = 0.100 =	1.860	**Reject Ho:**
S_{d2} =	0.01			$t\alpha$ = 0.050 =	2.306	**Reject Ho:**
S_d =	0.08			$t\alpha$ = 0.025 =	2.752	**Reject Ho:**

SIGN TEST

α = p(0)+...+p(2)+p(7)+...+p(9)	RR = (0 ... 2,7 ... 9)	α =	0.328	**Reject Ho:**
α = p(0)+p(1)+p(8)+p(9)	RR = (0, 1, 8, 9)	α =	0.141	**Reject Ho:**
α = p(0)+p(9)	RR = (0, 9)	α =	0.035	**Accept Ho:**

TEST OF CONFIDENCE INTERVALS

$(\Sigma W_{DIFF})^2$ =	6.02	$(\Sigma W_{DIFF})^2 / n$ =	0.67	SS =	0.50
s^2 = SS/d.o.f =	0.06	$s = (s^2)^{½}$ =	0.25	$s / n^{½}$ =	0.08

$t(s/n^{½})\alpha$ = 0.100 =	0.155	μL =	0.117	μU =	0.428	**Reject Ho:**
$t(s/n^{½})\alpha$ = 0.050 =	0.193	μL =	0.080	μU =	0.465	**Reject Ho:**
$t(s/n^{½})\alpha$ = 0.025 =	0.230	μL =	0.043	μU =	0.502	**Reject Ho:**

Differences

Range of differences:	Max =	0.70	Min =	-0.15
μ of differences:	μ =	0.27		

APPENDIX 4: CONTINUED

MgO [CONTINENTAL - ACME]

Sample	MgO (%) CONT	MgO (%) ACME		Test of Differences and Confidence Intervals DIFF (D)	DEV (d)		SD (d^2)		Sign Test Sign of DIFF
12280	4.08	4.18		-0.10	-0.03		0.00		-
12281	3.92	3.93		-0.01	0.06		0.00		-
12291	0.44	0.44		0.00	0.07		0.00		-
12297	12.62	12.81		-0.19	-0.11		0.01		-
12307	13.62	13.92		-0.30	-0.22		0.05		-
12311	0.37	0.39		-0.02	0.06		0.00		-
12348	0.40	0.41		-0.01	0.06		0.00		-
RE 12348	0.40	0.42		-0.02	0.05		0.00		-
12349	0.51	0.53		-0.02	0.06		0.00		-
Total (Σ w)	36.35	37.03	ΣW_{DIFF} =	-0.68	0.00	SS =	0.09	M =	0
Mean (μ)	4.04	4.11	d_x =	-0.08		S_D^2 =	0.01		
n =	9		d.o.f =	8					

TEST OF DIFFERENCES

S_D = 0.10	t =	-2.195	$t\alpha$ = 0.100 =	1.860	Reject Ho:
S_{d^2} = 0.00			$t\alpha$ = 0.050 =	2.306	Accept Ho:
S_d = 0.03			$t\alpha$ = 0.025 =	2.752	Accept Ho:

SIGN TEST

α = p(0)+...+p(2)+p(7)+...+p(9)	RR = (0 ... 2,7 ... 9)	α = 0.328	Reject Ho:
α = p(0)+p(1)+p(8)+p(9)	RR = (0, 1, 8, 9)	α = 0.141	Reject Ho:
α = p(0)+p(9)	RR = (0, 9)	α = 0.035	Reject Ho:

TEST OF CONFIDENCE INTERVALS

$(\Sigma W_{DIFF})^2$ =	0.46	$(\Sigma W_{DIFF})^2 / n$ =	0.05	SS =	0.09
s^2 = SS/d.o.f =	0.01	$s = (s^2)^{1/2}$ =	0.10	$s / n^{1/2}$ =	0.03

$t(s/n^{1/2})\alpha$ = 0.100 =	0.064	μL =	-0.140	μU =	-0.012	Reject Ho:
$t(s/n^{1/2})\alpha$ = 0.050 =	0.079	μL =	-0.155	μU =	0.004	Accept Ho:
$t(s/n^{1/2})\alpha$ = 0.025 =	0.095	μL =	-0.170	μU =	0.019	Accept Ho:

Differences

Range of differences: Max = 0.00 Min = -0.30

μ of differences: μ = -0.08

APPENDIX 4: CONTINUED

SiO_2 [CONTINENTAL - ACME]

Sample	SiO_2 (%) CONT	ACME		Test of Differences and Confidence Intervals DIFF (D)	DEV (d)		SD (d^2)		Sign Test Sign of DIFF
12280	31.88	38.34		-6.46	-5.30		28.14		-
12281	15.7	16.97		-1.27	-0.11		0.01		-
12291	0.21	0.18		0.03	1.19		1.41		+
12297	11.65	13.67		-2.02	-0.86		0.75		-
12307	5.01	5.73		-0.72	0.44		0.19		-
12311	0.14	0.13		0.01	1.17		1.36		+
12348	0.09	0.06		0.03	1.19		1.41		+
RE 12348	0.09	0.11		-0.02	1.14		1.29		-
12349	0.08	0.06		0.02	1.18		1.38		±
Total (Σ w)	64.85	75.25	ΣW_{DIFF} =	-10.40	0.00	SS =	35.93	M =	4
Mean (μ)	7.21	8.36	d_x =	-1.16		S_D^2 =	4.49		
n =	9		d.o.f =	8					

TEST OF DIFFERENCES

S_D =	2.12	t =	-1.636	tα = 0.100 =	1.860	Accept Ho:
S_d2 =	0.50			tα = 0.050 =	2.306	Accept Ho:
S_d =	0.71			tα = 0.025 =	2.752	Accept Ho:

SIGN TEST

α = p(0)+...+p(2)+p(7)+...+p(9)	RR = (0 ... 2,7 ... 9)	α =	0.328	Accept Ho:
α = p(0)+p(1)+p(8)+p(9)	RR = (0, 1, 8, 9)	α =	0.141	Accept Ho:
α = p(0)+p(9)	RR = (0, 9)	α =	0.035	Accept Ho:

TEST OF CONFIDENCE INTERVALS

$(\Sigma W_{DIFF})^2$ =	108.16	$(\Sigma W_{DIFF})^2 / n$ =	12.02	SS =	35.93
s^2 = SS/d.o.f =	4.49	$s = (s^2)^{½}$ =	2.12	$s / n^{½}$ =	0.71

$t(s/n^{½})\alpha$ = 0.100 =	1.314	μL =	-2.469	μU =	0.158	Accept Ho:
$t(s/n^{½})\alpha$ = 0.050 =	1.629	μL =	-2.785	μU =	0.473	Accept Ho:
$t(s/n^{½})\alpha$ = 0.025 =	1.944	μL =	-3.099	μU =	0.788	Accept Ho:

Differences

Range of differences:	Max =	0.03	Min =	-6.46
μ of differences:	μ =	-1.16		

APPENDIX 4: CONTINUED

LOI [CONTINENTAL - ACME]

Sample	LOI (%) CONT	LOI (%) ACME		Test of Differences and Confidence Intervals DIFF (D)	DEV (d)		SD (d^2)		Sign Test: Sign of DIFF
12280	22.87	22.70		0.17	0.69		0.47		+
12281	35.41	36.20		-0.79	-0.27		0.07		-
12291	43.74	44.10		-0.36	0.16		0.03		-
12297	38.22	38.80		-0.58	-0.06		0.00		-
12307	43.16	43.70		-0.54	-0.02		0.00		-
12311	43.17	44.10		-0.93	-0.41		0.17		-
12348	43.96	44.30		-0.34	0.18		0.03		-
RE 12348	43.96	44.40		-0.44	0.08		0.01		-
12349	43.44	44.30		-0.86	-0.34		0.12		-
Total (Σ w)	357.93	362.60	ΣW_{DIFF} =	-4.67	0.00	SS =	0.90	M =	1
Mean (μ)	39.77	40.29	d_x =	-0.52		S_D^2 =	0.11		
n =	9		d.o.f =	8					

TEST OF DIFFERENCES

S_D =	0.34	t =	-4.638	tα = 0.100 =	1.860	Reject Ho:
S_{d2} =	0.01			tα = 0.050 =	2.306	Reject Ho:
S_d =	0.11			tα = 0.025 =	2.752	Reject Ho:

SIGN TEST

α = p(0)+...+p(2)+p(7)+...+p(9)	RR = (0 ... 2,7 ... 9)	α =	0.328	Reject Ho:
α = p(0)+p(1)+p(8)+p(9)	RR = (0, 1, 8, 9)	α =	0.141	Reject Ho:
α = p(0)+p(9)	RR = (0, 9)	α =	0.035	Accept Ho:

TEST OF CONFIDENCE INTERVALS

$(\Sigma W_{DIFF})^2$ =	21.81	$(\Sigma W_{DIFF})^2 / n$ =	2.42	SS =	0.90
s^2 = SS/d.o.f =	0.11	$s = (s^2)^{½}$ =	0.34	$s / n^{½}$ =	0.11

$t(s/n^{½})\alpha$ = 0.100 =	0.208	μL =	-0.727	μU =	-0.311	Reject Ho:
$t(s/n^{½})\alpha$ = 0.050 =	0.258	μL =	-0.777	μU =	-0.261	Reject Ho:
$t(s/n^{½})\alpha$ = 0.025 =	0.308	μL =	-0.827	μU =	-0.211	Reject Ho:

Differences

Range of differences: Max = 0.17 Min = -0.93

μ of differences: μ = -0.52

APPENDIX 4: CONTINUED

LOI [CONTINENTAL - $ACME_{ADJUSTED}$]

Sample	LOI (%) CONT	LOI (%) ACME	Test of Differences and Confidence Intervals DIFF (D)	DEV (d)	SD (d^2)	Sign Test Sign of DIFF
12280	22.87	22.70	0.17	0.69	0.47	+
12281	35.41	36.20	-0.79	-0.27	0.07	-
12291	43.74	44.10	-0.36	0.16	0.03	-
12297	38.22	38.80	-0.58	-0.06	0.00	-
12307	43.16	43.70	-0.54	-0.02	0.00	-
12311	43.17	44.10	-0.93	-0.41	0.17	-
12348	43.96	44.35	-0.39	0.13	0.02	-
RE 12348	43.96	44.35	-0.39	0.13	0.02	-
12349	43.44	44.30	-0.86	-0.34	0.12	-
Total (Σ w)	357.93	362.60	ΣW_{DIFF} = -4.67	0.00	SS = 0.90	M = 1
Mean (μ)	39.77	40.29	d_x = -0.52		S_D^2 = 0.11	
n =	9		d.o.f = 8			

TEST OF DIFFERENCES

S_D =	0.33	t = -4.651	tα = 0.100 =	1.860	Reject Ho:
S_d2 =	0.01		tα = 0.050 =	2.306	Reject Ho:
S_d =	0.11		tα = 0.025 =	2.752	Reject Ho:

SIGN TEST

α = p(0)+...+p(2)+p(7)+...+p(9)	RR = (0 ... 2,7 ... 9)	α =	0.328	Reject Ho:
α = p(0)+p(1)+p(8)+p(9)	RR = (0, 1, 8, 9)	α =	0.141	Reject Ho:
α = p(0)+p(9)	RR = (0, 9)	α =	0.035	Accept Ho:

TEST OF CONFIDENCE INTERVALS

$(\Sigma W_{DIFF})^2$ =	21.81	$(\Sigma W_{DIFF})^2 / n$ =	2.42	SS =	0.90
s^2 = SS/d.o.f =	0.11	$s = (s^2)^{1/2}$ =	0.33	$s / n^{1/2}$ =	0.11

$t(s/n^{1/2})\alpha$ = 0.100 = 0.207	μL = -0.726	μU = -0.311	Reject Ho:
$t(s/n^{1/2})\alpha$ = 0.050 = 0.257	μL = -0.776	μU = -0.262	Reject Ho:
$t(s/n^{1/2})\alpha$ = 0.025 = 0.307	μL = -0.826	μU = -0.212	Reject Ho:

Differences

Range of differences: Max = 0.17 Min = -0.93

μ of differences: μ = -0.52

APPENDIX 5: DETERMINED, ADJUSTED, AND PREFERED ANALYSES FOR CaO AND LOI

Det'd - determined; adjustments: LOI - LOI based, Imp - impurity based; Pref. - preferred

Code			
1	LOI - CO_2 EQ > 0.00	CaO(Pref) = CaO(Det'd)	LOI(Pref) = LOI(Det'd)
2	LOI - CO_2EQ < 0.00 and CaO(Det'd) < 52.50	CaO(Pref) = CaO(Det'd)	LOI(Pref) = LOI(Det'd)
3	LOI - CO_2EQ < 0.00 and CaO(Det'd) < CaO(LOI)	CaO(Pref) = CaO(Det'd)	LOI(Pref) = LOI(Det'd)
4	For repeat analyses (RE) the preferred values for that sample are means of the CaO (Pref) and the LOI (Pref) values		
5	LOI - CO_2EQ < 0.00 and CaO(LOI) < CaO(Imp)	CaO(Pref) = CaO(LOI)	LOI(Pref) = LOI(Det'd)*

Criteria for codes are applied to each sample in the order listed.

CONTINENTAL ANALYSES

Sample	LOI-CO_2EQ	Code	CaO Det'd	CaO LOI	CaO Imp	CaO Pref.	LOI Det'd	LOI LOI	LOI Imp	LOI Pref.	SUM Det'd	SUM LOI+Ox.	SUM Adjusted
12278	-0.19	2	50.35	50.24	50.25	50.35	43.98	44.28	44.29	43.98	99.98	99.78	99.98
12279	-0.13	2	49.00	48.91	48.92	49.00	43.87	44.12	44.13	43.87	99.95	99.81	99.95
12280	-0.47	2	24.12	29.27	28.65	24.12	22.87	27.57	27.08	22.87	91.78	91.08	91.78
12281	0.25	1	39.37	40.88	40.70	39.37	35.41	36.54	36.39	35.41	97.46	97.54	97.46
12282	0.13	1	54.86	54.85	54.85	54.86	43.63	43.68	43.68	43.63	99.91	99.95	99.91
12283	0.19	1	54.33	54.31	54.31	54.33	43.53	43.50	43.50	43.53	99.90	100.03	99.90
12284	0.17	1	54.36	54.30	54.31	54.36	43.52	43.48	43.49	43.52	99.92	100.07	99.92
12285	-0.16	2	50.47	50.44	50.44	50.47	41.85	42.16	42.17	41.85	99.90	99.68	99.90
12286	-0.30	2	51.17	51.07	51.08	51.17	43.89	44.31	44.32	43.89	99.97	99.64	99.97
12287	-0.02	5	53.15	53.09	53.10	53.09	43.94	44.10	44.10	43.94	99.92	99.87	99.86
12288	-0.03	3	52.53	52.77	52.74	52.53	43.88	44.29	44.27	43.88	99.42	99.38	99.42
12289	-0.16	2	45.92	45.88	45.89	45.92	44.71	45.04	45.04	44.71	99.90	99.68	99.90
12290	-0.13	5	55.15	55.10	55.11	55.10	43.69	43.97	43.98	43.69	99.92	99.74	99.87
12291	-0.12	5	55.27	55.21	55.22	55.21	43.74	44.00	44.01	43.74	99.91	99.77	99.85
12292	0.05	1	53.40	53.32	53.33	53.40	42.74	42.82	42.82	42.74	99.93	99.97	99.93
12293	-0.11	5	54.39	54.29	54.30	54.29	43.53	43.74	43.75	43.53	99.97	99.85	99.87
12294	-0.20	2	49.31	49.22	49.23	49.31	44.18	44.50	44.51	44.18	99.99	99.74	99.99
12295	-0.33	5	54.84	54.77	54.78	54.77	43.53	44.00	44.01	43.53	99.92	99.57	99.85
12296	-0.21	2	47.37	47.53	47.51	47.37	40.00	40.51	40.49	40.00	99.59	99.35	99.59
12297	0.69	1	30.28	32.65	32.36	30.28	38.22	39.58	39.36	38.22	96.12	96.75	96.12
12298	-0.14	2	50.41	50.31	50.32	50.41	40.05	40.29	40.30	40.05	99.97	99.82	99.97
12299	-0.05	2	51.78	51.81	51.80	51.78	43.73	43.99	43.99	43.73	99.78	99.71	99.78
12300	-0.69	2	45.42	45.35	45.36	45.42	44.21	45.05	45.05	44.21	99.94	99.20	99.94
12301	-0.06	2	52.06	52.02	52.03	52.06	43.87	44.09	44.10	43.87	99.88	99.80	99.88
12302	-0.56	2	38.71	38.63	38.64	38.71	45.21	45.91	45.92	45.21	99.91	99.33	99.91
12303	-0.62	2	38.69	38.60	38.61	38.69	45.15	45.90	45.91	45.15	99.95	99.30	99.95
12304	-0.41	2	48.89	48.85	48.85	48.89	43.95	44.51	44.52	43.95	99.90	99.46	99.90
12305	-0.28	2	43.01	42.95	42.96	43.01	44.56	44.98	44.99	44.56	99.95	99.61	99.95
12306	-0.57	2	42.64	42.54	42.56	42.64	38.61	39.30	39.31	38.61	99.99	99.37	99.99
12307	0.46	1	35.48	36.61	36.47	35.48	43.16	43.77	43.67	43.16	98.07	98.49	98.07
12308	0.31	1	54.42	55.32	55.21	54.42	43.52	44.11	44.02	43.52	98.38	98.69	98.38
12309	-0.23	3	54.97	55.35	55.31	54.97	43.35	44.07	44.03	43.35	99.21	98.98	99.21
12310	0.09	1	54.45	55.56	55.43	54.45	43.16	44.14	44.03	43.16	98.10	98.14	98.10
12311	-0.74	5	55.42	55.31	55.32	55.31	43.17	44.01	44.02	43.17	99.99	99.24	99.88
12313	0.64	1	50.80	51.56	51.47	50.80	44.11	44.25	44.18	44.11	98.65	99.25	98.65
12314	0.27	1	46.96	47.94	47.82	46.96	44.00	44.69	44.60	44.00	98.31	98.53	98.31
12315	-0.27	2	46.90	46.86	46.86	46.90	44.38	44.80	44.81	44.38	99.90	99.60	99.90
12316	-0.10	3	53.73	54.08	54.04	53.73	43.47	44.04	44.01	43.47	99.25	99.14	99.25
12317	-0.19	2	41.45	41.76	41.72	41.45	44.96	45.58	45.56	44.96	99.30	99.12	99.30
12318	-0.14	2	41.71	42.04	42.00	41.71	44.71	45.30	45.27	44.71	99.31	99.13	99.31
12319	0.40	1	43.57	44.57	44.45	43.57	44.68	45.25	45.16	44.68	98.26	98.62	98.26
12320	0.10	1	52.88	52.84	52.84	52.88	44.08	44.14	44.14	44.08	99.91	99.96	99.91

* LOI (Pref) = LOI (Det'd) has been chosen for these analyses because differences in the LOI determinations from both labs are considered small enough as to not be significant.

APPENDIX 5: CONTINUED

Sample	LOI-CO_2EQ	Code	CaO				LOI				SUM		
			Det'd	LOI	Imp	Pref.	Det'd	LOI	Imp	Pref.	Det'd	LOI+Ox.	Adjusted
12321	1.04	1	53.28	54.19	54.08	53.28	44.28	44.14	44.05	44.28	98.40	99.41	98.40
12322	0.06	1	49.01	49.01	49.01	49.01	44.43	44.56	44.56	44.43	99.86	99.85	99.86
12323	0.15	1	45.78	46.64	46.53	45.78	44.29	45.00	44.92	44.29	98.53	98.60	98.53
12324	0.15	1	53.62	53.66	53.65	53.62	43.94	44.01	44.01	43.94	99.77	99.88	99.77
12325	0.27	1	53.85	53.97	53.95	53.85	44.09	44.10	44.09	44.09	99.64	99.88	99.64
12326	0.54	1	51.40	51.42	51.42	51.40	44.75	44.42	44.42	44.75	99.77	100.29	99.77
12327	0.21	1	45.03	45.65	45.58	45.03	44.70	45.18	45.12	44.70	98.84	99.01	98.84
12328	-0.11	5	54.42	54.39	54.40	54.39	43.77	44.05	44.05	43.77	99.85	99.73	99.82
12329	-0.12	5	55.20	55.12	55.13	55.12	43.72	43.97	43.98	43.72	99.92	99.79	99.84
12330	-0.30	5	54.58	54.48	54.49	54.48	43.65	44.06	44.07	43.65	99.95	99.65	99.85
12331	-0.44	5	54.16	54.04	54.06	54.04	43.57	44.11	44.12	43.57	99.98	99.54	99.86
12332	-0.37	5	55.24	55.17	55.17	55.17	43.47	43.97	43.98	43.47	99.95	99.54	99.88
12333	0.44	1	36.30	37.42	37.29	36.30	42.20	42.84	42.74	42.20	98.08	98.44	98.08
12334	0.00	1	54.06	54.11	54.10	54.06	43.56	43.78	43.77	43.56	99.72	99.73	99.72
12335	0.16	1	54.34	54.94	54.87	54.34	43.46	43.95	43.90	43.46	98.88	99.02	98.88
12336	-0.16	5	54.31	54.21	54.22	54.21	43.47	43.74	43.75	43.47	99.99	99.79	99.89
12337	-0.22	2	51.97	51.87	51.88	51.97	43.77	44.10	44.11	43.77	99.98	99.73	99.98
12338	0.09	1	41.02	41.79	41.69	41.02	44.19	44.89	44.82	44.19	98.61	98.68	98.61
12339	-0.11	2	47.88	47.80	47.81	47.88	44.17	44.40	44.41	44.17	99.96	99.82	99.96
12340	-0.30	2	49.75	49.90	49.88	49.75	43.74	44.35	44.33	43.74	99.59	99.26	99.59
12341	-0.16	2	48.14	48.09	48.09	48.14	44.16	44.47	44.48	44.16	99.92	99.71	99.92
12342	0.74	1	52.62	53.52	53.41	52.62	43.71	43.86	43.78	43.71	98.43	99.13	98.43
12343	0.09	1	53.63	53.67	53.66	53.63	43.93	44.06	44.06	43.93	99.77	99.82	99.77
12344	-0.22	2	38.57	39.07	39.01	38.57	45.36	46.17	46.12	45.36	99.02	98.78	99.02
12345	-0.57	2	35.70	35.64	35.64	35.70	45.15	45.86	45.87	45.15	99.90	99.30	99.90
12346	-0.46	2	50.53	50.48	50.48	50.53	43.85	44.46	44.47	43.85	99.90	99.41	99.90
12347	-0.15	5	55.19	55.11	55.12	55.11	43.69	43.96	43.97	43.69	99.92	99.77	99.84
12348	0.10	1	55.35	55.28	55.29	55.35	43.96	44.00	44.01	43.96	99.93	100.00	99.93
12349	-0.54	5	55.32	55.20	55.21	55.20	43.44	44.07	44.09	43.44	99.99	99.45	99.87
12350	0.52	1	54.62	55.35	55.27	54.62	43.87	44.11	44.05	43.87	98.68	99.17	98.68
12351	0.19	1	55.36	55.24	55.26	55.36	44.12	44.03	44.04	44.12	99.99	100.17	99.99

ACME ANALYSES

Sample	LOI-CO_2EQ	Code	CaO				LOI				SUM		
			Det'd	LOI	Imp	Pref.	Det'd	LOI	Imp	Pref.	Det'd	LOI+Ox.	Adjusted
12280	-0.87	2	24.27	23.63	23.71	24.27	22.70	23.27	23.33	22.70	99.97	99.63	99.97
12281	1.62	1	38.67	39.57	39.46	38.67	36.20	35.49	35.40	36.20	100.02	99.73	100.02
12291	0.43	1	55.05	55.18	55.16	55.05	44.10	43.97	43.96	44.10	100.03	99.97	100.03
12297	1.12	1	30.26	31.48	31.33	30.26	38.80	38.84	38.72	38.80	100.03	98.90	100.03
12307	0.97	1	35.18	35.64	35.59	35.18	43.70	43.30	43.26	43.70	100.05	99.95	100.05
12311	0.43	1	55.11	55.27	55.25	55.11	44.10	43.99	43.98	44.10	99.99	99.93	99.99
12348	0.71	4	54.99	55.31	55.27	54.91	44.30	44.04	44.01	44.35	100.02	99.94	100.03
RE 12348	0.91	4	54.84	55.28	55.22	54.91	44.40	44.03	43.99	44.35	100.03	99.96	100.03
123439	0.71	1	54.85	55.16	55.12	54.85	44.30	44.04	44.01	44.30	100.02	99.95	100.02

APPENDIX 6: DETERMINED AND PREFERRED CONCENTRATIONS OF CHEMICAL CONSTITUENTS

All values are as determined except for CaO, LOI, and SUM which have been adjusted, where required, to the preferred values in Appendix 5.

At each location samples are listed in order from stratigraphic top to bottom with covered or other unsampled intervals omitted. See Appendix 2 for sample descriptions.

Abbreviations: Mt. Head - Mount Head Formation; Pk-Sh - Pekisko-Shunda formations, undivided; Pek - Pekisko Formation; Banff - Banff Formation.

Sample	Strat. Thick. (m)	Formation	CaO %	MgO %	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	Na_2O ppm	K_2O ppm	TiO_2 ppm	P_2O_5 ppm	MnO ppm	Cr_2O_3 ppm	BaO ppm	SrO ppm	Others* ppm	LOI %	LOI-CO_2EQ	SUM %
1 - South-Central Part of Baseline Ridge, near UTM 610557E, 5773865N																			
12278	~1¼	Mt. Head(?)	50.35	4.26	0.72	0.131	0.228	131	561	67	<70	76	-	30	319	-	43.98	-0.19	99.98
12279	~¾	Mt. Head(?)	49.00	5.07	1.31	0.289	0.154	130	657	80	<70	78	-	12	286	-	43.87	-0.13	99.95
2 - Southwestern Flank of Idlewilde Mountain on Clearwater River, near UTM 603050E, 5764750N																			
12285	2¾	Banff	50.47	2.20	4.00	0.493	0.266	301.00	2805	304	218	109	-	17	564	-	41.85	-0.16	99.90
12284	1¼	Banff	54.36	0.62	1.25	0.078	0.146	143	298	40	99	148	-	10	372	-	43.52	0.17	99.92
12283	4¾	Banff	54.33	0.67	1.00	0.142	0.163	170	709	73	544	154	-	15	406	-	43.53	0.19	99.90
12282	1	Banff	54.86	0.48	0.63	0.077	0.104	113	260	38	832	266	-	8	276	-	43.63	0.13	99.91
12281	1¼	Banff	39.37	3.92	15.70	1.054	1.358	1426	5172	1080	249	473	0.007	98	302	104	35.41	0.25	97.46
12280	3	Banff	24.12	4.08	31.88	1.527	5.362	1748	8820	1661	553	905	0.023	82	445	110	22.87	-0.47	91.78
3 - Southwestern Flank of Idlewilde Mountain, near UTM 603670E, 5765260N																			
12286	4½	Pek-Sh	51.17	3.70	0.65	0.106	0.042	154	473	46	107	21	-	7	258	-	43.89	-0.30	99.97
12287	4	Pek-Sh	53.15	2.07	0.53	0.075	0.027	147	303	28	222	18	-	12	274	-	43.94	-0.02	99.86
12288	1½	Pek-Sh	52.53	2.46	0.38	0.053	0.034	126	176	18	<70	24	-	6	221	-	43.88	-0.03	99.42
12289	½	Pek-Sh	45.92	8.12	0.66	0.097	0.063	166	494	44	387	36	-	6	169	-	44.71	-0.16	99.90
12290	5	Pek-Sh	55.15	0.52	0.24	0.045	0.017	101	136	14	373	21	-	6	257	-	43.69	-0.13	99.87
12291	2¾	Pek-Sh	55.21	0.44	0.21	0.050	0.020	120	144	12	35	22	0.002	7	256	163	43.74	-0.12	99.85
12292	¾	Pek-Sh	53.40	0.71	2.31	0.335	0.227	155	1848	184	<70	68	-	14	347	-	42.74	0.05	99.93
4 - Southwest Flank of Idlewilde Mountain, near UTM 604584E, 5765422N																			
12293	1½	Pek-Sh	54.29	0.87	0.94	0.051	0.024	134	177	23	<70	16	-	7	297	-	43.53	-0.11	99.87
12294	1½	Pek-Sh	49.31	5.23	0.77	0.089	0.039	155	430	36	367	21	-	8	289	-	44.18	-0.20	99.99
12295	5½	Pek-Sh	54.77	0.75	0.32	0.049	0.034	138	161	16	<70	21	-	4	255	-	43.53	-0.33	99.85

*Sum of Nb, Ni, Sc, Y, and Zr (Appendix 3B).

APPENDIX 6: CONTINUED

Sample	Formation	Strat. Thick. (m)	CaO %	MgO %	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	Na_2O ppm	K_2O ppm	TiO_2 ppm	P_2O_5 ppm	MnO ppm	Cr_2O_3 ppm	BaO ppm	SrO ppm	Others* ppm	LOI %	LOI-CO_2EQ	SUM %
5 - Cliffs Adjacent to Road on Southwest Bank of Clearwater River, near UTM 604400E, 5762340N																			
12307	4½	Banff (?)	35.48	13.62	5.01	0.525	0.296	179	2955	298	269	48	0.004	51	271	43	43.16	0.46	98.07
12306	3	Banff (?)	42.64	5.27	12.46	0.082	0.197	166	374	36	410	30	-	11	256	-	38.61	-0.57	99.99
12305	6	Banff (?)	43.01	10.18	1.48	0.155	0.052	185	885	78	413	24	-	8	214	-	44.56	-0.28	99.95
12304	3	Banff (?)	48.89	5.49	0.89	0.096	0.039	155	465	39	181	21	-	6	246	-	43.95	-0.41	99.90
12303	3½	Banff (?)	38.69	14.11	1.01	0.147	0.078	178	843	77	<70	35	-	21	146	-	45.15	-0.62	99.95
12302	¾	Banff (?)	38.71	14.10	1.01	0.140	0.063	165	724	66	<70	38	-	12	144	-	45.21	-0.56	99.91
12301	4½	Banff (?)	52.06	2.81	0.83	0.113	0.051	137	265	27	<70	30	-	13	228	-	43.87	-0.06	99.88
12300	2	Banff (?)	45.42	8.50	0.77	0.105	0.087	160	529	50	285	47	-	12	153	-	44.21	-0.69	99.94
12299	2½	Banff (?)	51.78	2.89	0.86	0.195	0.106	135	901	116	205	40	-	9	223	-	43.73	-0.05	99.78
12298	3	Banff (?)	50.41	0.56	6.87	0.804	0.498	155	5090	556	<70	104	-	62	426	-	40.05	-0.14	99.97
12297	2	Banff (?)	30.28	12.62	11.65	1.694	1.091	312	10212	1038	177	179	0.009	53	209	68	38.22	0.69	96.12
12296	1¼	Banff (?)	47.37	2.77	7.80	0.467	0.529	147	2709	247	212	114	-	47	778	-	40.00	-0.21	99.59
6 - East Limb of Idlewilde Mountain Anticline 140 m North of Clearwater River, near UTM 606410E, 5761840N																			
12311	4¾	Pek	55.42	0.37	0.14	0.033	0.058	105	97	21	<70	24	0.006	12	256	46	43.17	-0.74	99.88
12310	1¾	Pek	54.45	0.33	0.08	0.027	0.028	89	68	149	216	42	-	12	225	-	43.16	0.09	98.10
12309	2¼	Pek	54.97	0.40	0.11	0.032	0.063	92	72	15	105	31	-	16	235	-	43.35	-0.23	99.21
12308	4	Pek	54.42	0.45	0.17	0.035	0.040	100	118	24	<70	20	-	13	319	-	43.52	0.31	98.38
7 - West Flank of Corkscrew Mountain, near UTM 614580E, 5761704N																			
12313	2½	Pek-Sh	50.80	3.30	0.85	0.051	0.057	189	190	59	173	25	-	13	263	-	44.11	0.64	98.65
12314	1	Pek-Sh	46.96	6.31	0.96	0.114	0.061	152	532	199	236	29	-	13	232	-	44.00	0.27	98.31
12315	1½	Pek-Sh	46.90	7.19	0.84	0.106	0.057	169	507	246	183	25	-	22	221	-	44.38	-0.27	99.90
12316	2	Pek-Sh	53.73	1.28	0.48	0.064	0.046	140	257	39	<70	19	-	14	320	-	43.47	-0.10	99.25

*Sum of Nb, Ni, Sc, Y, and Zr (Appendix 3B).

APPENDIX 6: CONTINUED

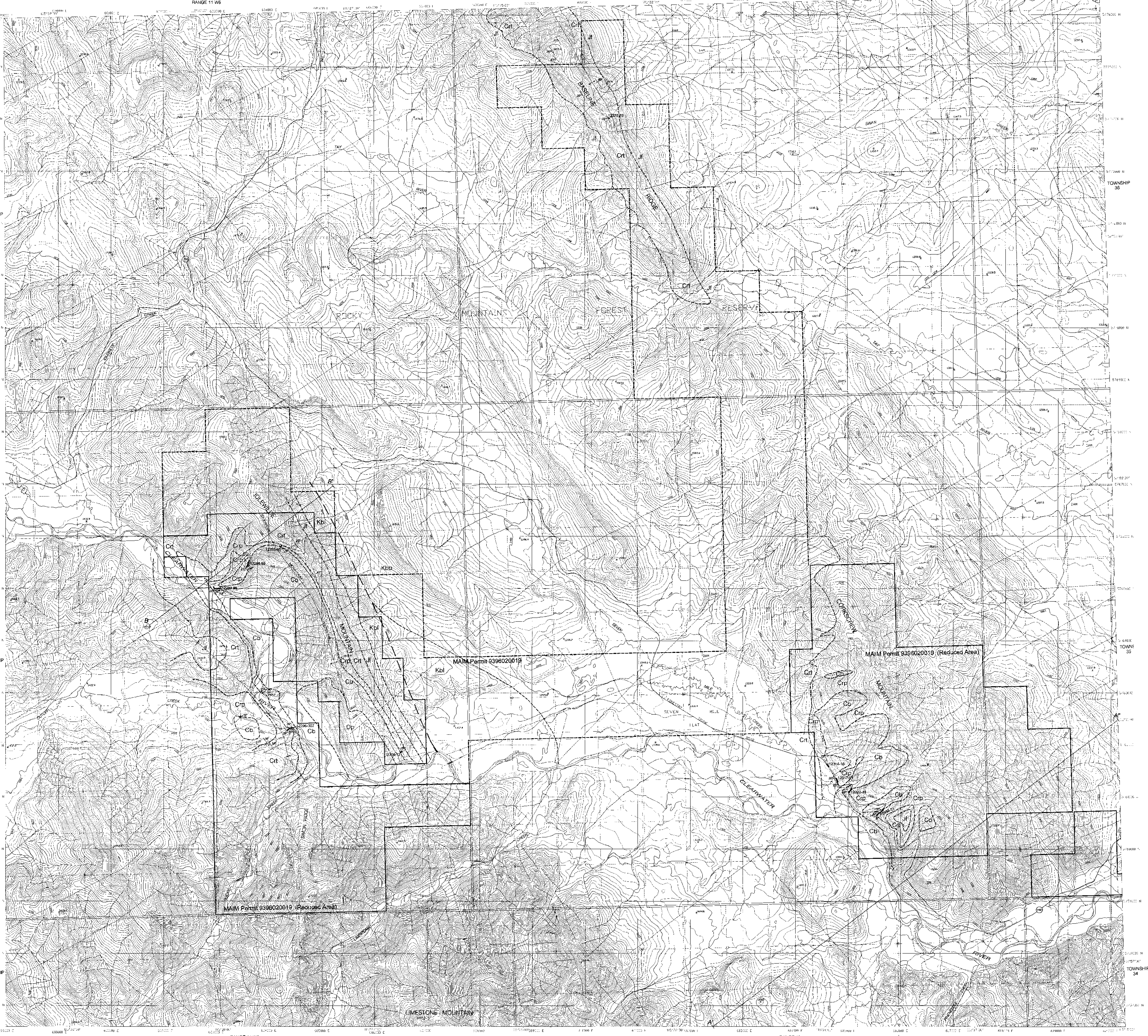
Sample	Formation	Strat. Thick. (m)	CaO %	MgO %	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	Na_2O ppm	K_2O ppm	TiO_2 ppm	P_2O_5 ppm	MnO ppm	Cr_2O_3 ppm	BaO ppm	SrO ppm	Others* ppm	LOI %	LOI-CO_2EQ	SUM %
8 - West Flank of Corkscrew Mountain, near UTM 614780E, 5761340N																			
12321	1	Pek-Sh	53.28	1.30	0.40	0.054	0.039	182	209	28	<70	19	-	18	295	-	44.28	1.04	98.40
12320	1½	Pek-Sh	52.88	2.29	0.53	0.058	0.036	164	233	43	294	19	-	16	295	-	44.08	0.10	99.91
12319	1¼	Pek-Sh	43.57	9.25	0.78	0.129	0.106	205	583	82	207	31	-	15	168	-	44.68	0.4	98.26
12318	1½	Pek-Sh	41.71	11.11	1.25	0.135	0.105	201	625	107	181	38	-	20	150	-	44.71	-0.14	99.31
12317	¾	Pek-Sh	41.45	11.56	0.82	0.13	0.109	199	554	95	<70	36	-	16	160	-	44.96	-0.19	99.30
9 - West Flank of Corkscrew Mountain, near UTM 615040E, 5761120N																			
12322	2	Pek-Sh	49.01	5.45	0.73	0.070	0.054	181	286	60	476	27	-	14	251	-	44.43	0.06	99.86
12323	¼	Pek-Sh	45.78	7.57	0.62	0.115	0.075	159	538	80	608	28	-	19	257	-	44.29	0.15	98.53
12324	3½	Pek-Sh	53.62	1.57	0.56	0.070	0.041	165	293	48	147	19	-	13	275	-	43.94	0.15	99.77
12325	3	Pek-Sh	53.85	1.42	0.34	0.054	0.063	176	206	30	73	22	-	14	268	-	44.09	0.27	99.64
12326	1½	Pek-Sh	51.40	3.55	0.38	0.064	0.091	192	262	35	<70	23	-	18	228	-	44.75	0.54	99.77
12327	¾	Pek-Sh	45.03	8.40	0.62	0.082	0.091	181	355	68	210	42	-	15	149	-	44.70	0.21	98.84
12328	3¾	Pek-Sh	54.39	1.07	0.31	0.045	0.063	167	158	21	<70	24	-	13	248	-	43.77	-0.11	99.82
12329	3	Pek-Sh	55.12	0.47	0.25	0.048	0.053	165	175	34	<70	24	-	16	263	-	43.72	-0.12	99.84
12330	3	Pek-Sh	54.48	1.01	0.25	0.056	0.042	167	212	47	<70	29	-	13	251	-	43.65	-0.30	99.85
12331	1¾	Pek-Sh	54.04	1.37	0.24	0.060	0.079	154	212	26	<70	36	-	14	249	-	43.57	-0.44	99.86
12332	1½	Pek-Sh	55.17	0.45	0.18	0.039	0.094	134	126	26	193	41	-	18	271	-	43.47	-0.37	99.88
12333	½	Banff	36.30	12.20	5.10	1.078	0.907	294	5461	440	399	128	-	29	204	-	42.20	0.44	98.08

*Sum of Nb, Ni, Sc, Y, and Zr (Appendix 3B).

APPENDIX 6: CONTINUED

Sample	Formation	Strat. Thick. (m)	CaO %	MgO %	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	Na_2O ppm	K_2O ppm	TiO_2 ppm	P_2O_5 ppm	MnO ppm	Cr_2O_3 ppm	BaO ppm	SrO ppm	Others* ppm	LOI %	LOI-CO_2EQ	SUM %
10 - West Flank of Corkscrew Mountain, near UTM 615500E, 5760700N																			
12334	2	Pek - Sh	54.06	1.02	0.85	0.071	0.055	130	357	62	<70	21	-	48	577	-	43.56	0	99.72
12335	1	Pek - Sh	54.34	0.59	0.45	0.052	0.032	119	240	201	108	19	-	28	349	-	43.46	0.16	98.88
12336	1½	Pek - Sh	54.21	0.93	0.79	0.108	0.072	123	522	61	188	22	-	23	309	-	43.47	-0.16	99.89
12337	1	Pek - Sh	51.97	2.94	0.77	0.085	0.102	119	389	45	139	22	-	21	330	-	43.77	-0.22	99.98
12338	2½	Pek - Sh	41.02	10.91	1.97	0.282	0.109	218	1409	205	81	42	-	17	246	-	44.19	0.09	98.61
12339	1½	Pek - Sh	47.88	6.14	1.29	0.133	0.083	145	703	77	137	26	-	28	286	-	44.17	-0.11	99.96
12340	1	Pek - Sh	49.75	4.57	0.93	0.068	0.138	169	231	50	<70	25	-	24	270	-	43.74	-0.30	99.59
12341	1¼	Pek - Sh	48.14	6.02	1.09	0.104	0.086	134	440	55	362	25	-	19	264	-	44.16	-0.16	99.92
12342	1¾	Pek - Sh	52.62	1.54	1.03	0.070	0.051	162	305	62	283	18	-	17	300	-	43.71	0.74	98.43
12343	3½	Pek - Sh	53.63	1.61	0.45	0.059	0.067	170	228	30	160	23	-	15	288	-	43.93	0.09	99.77
12344	1½	Pek - Sh	38.57	14.03	0.56	0.102	0.088	182	409	58	96	40	-	18	130	-	45.36	-0.22	99.02
12345	1¾	Pek - Sh	35.70	16.21	1.57	0.326	0.128	280	1705	155	<70	43	-	23	255	-	45.15	-0.57	99.90
12346	4¼	Pek - Sh	50.53	4.27	0.55	0.063	0.050	181	260	229	165	29	-	24	216	-	43.85	-0.46	99.90
12347	3½	Pek	55.11	0.47	0.23	0.049	0.086	160	147	21	<70	46	-	11	263	-	43.69	-0.15	99.84
12348	4¾	Pek	55.35	0.40	0.09	0.034	0.109	155	85	14	191	42	0.0045	18	259	30	43.96	0.10	99.93
12349	2	Pek	55.20	0.51	0.08	0.029	0.025	130	70	31	<70	24	0.0020	25	242	30	43.44	-0.54	99.87
12350	1	Pek	54.62	0.44	0.10	0.040	0.033	146	105	42	123	19	-	10	283	-	43.87	0.52	98.68
12351	3	Pek	55.36	0.44	0.11	0.029	0.064	160	79	16	<70	21	-	19	341	-	44.12	0.19	99.99

*Sum of Nb, Ni, Sc, Y, and Zr (Appendix 3B).



LEGEND AND SYMBOLS

LOWER CRETACEOUS
BLAIRMORE GROUP

Kbb	Beaver Mines Formation: fine- to coarse-grained, greenish-grey sandstone, siltstone and rubbly mudstone; minor grey and black shale; local conglomerate and pebbly sandstone
Kbl	Lower Blairmore Group: siltstone and sandstone; grey and black shale; minor coal seams and limestone; includes conglomerate, pebbly sandstone and sandstone of the Cadomin Formation at the base

JURASSIC AND LOWER CRETACEOUS

Jk	Kootenay Formation: grey to black shale and sandstone

FERNIE GROUP

Jf	Undivided: grey to black shale; sandstone, and carbonates

CARBONIFEROUS
RUNDLE GROUP

Crmh	Mount Head Formation: finely crystalline dolomite, finely to coarsely crystalline limestone, shale
Crt	Turner Valley Formation: dense and porous dolomite, argillaceous dolomite, limestone
Crp	Pekisko and Shunda formations: finely to coarsely crystalline calcarenite, fine-grained dolomite, thin-bedded, silty dolomite, cherty and dolomitic limestone, shale, anhydrite
Cb	Banff Formation: argillaceous and cherty limestone, fissile and calcareous shale

DEVONIAN

Dp	Palliser Formation: massive mottled limestone and dolomite, porous and vuggy dolomite, argillaceous limestone

Geological boundary
Bedding (inclined, vertical, overturned, horizontal) 30 75
Fault (approximate)
Synclinal axis (arrow indicates plunge)
Anticlinal axis (arrow indicates plunge)
Sample section with sample numbers 97-4 9755-57
Isolated sample with sample number 11551
Location of cross-section B B'
Elevation contour (interval: 10 m) 1450
Secondary highway with number 752
Trail or cut line
MAIM Permit boundary (reduced area)
MAIM Permit boundary (original area)

NOTES

1) Map compiled from 1 : 20 000 scale digital base maps 82O/13NE, 14NW, 83B/3SW, and 4SE supplied by Spatial Data Warehouse Ltd., Calgary, Alberta.
2) Geology modified after Henderson (1943, 1944), and Ollerenshaw (1964, 1965).
3) UTM grid is based on North American Datum, 1983 (NAD83). UTM grid zone: 11U.
4) To accompany Continental Lime Ltd. assessment report dated 1998 06 29.

REVISIONS	
BY	DATE

CONTINENTAL LIME LTD.

HALFERDAHL & ASSOCIATES
(a division of Dahrouge Geological Consulting Ltd.)

Fig. 7.1
Geology and Sample Locations

WEST-CENTRAL ALBERTA

0 1 2 km
Scale

W.M. 1998.06