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Bentonite Exploration in the Battle River Area, Rosalind, Alberta

Dec. 27, 2000

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On behalf of Alberta Bentonite Corporation

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Summary

The Rosalind area, located 40 km southeast of the city of Camrose in central Alberta, was the focus of bentonite exploration during 2000. The Rosalind area has previously been a bentonite producer with earlier production estimated at over 400,000 tons. The Quarry 37 area, south of the Battle River, was the source of much of the previous production. A compilation of this area was undertaken by the author as part of a study to investigate the bentonite potential. The results of the compilation suggest that mainly gray bentonite remains in abundance in the Quarry 37 area. Additional areas investigated include Sections 6, and 18 of Township 43, Range 17, West 4th Meridian. At Section 6 green bentonite is found dipping shallowly southeasterly under glacial drift. A resource of approximately 175,000 metric tons has been located here. Additional exploration in this area has revealed a resource of green bentonite which totals greater than 300,000 metric tons. Additional auger work is recomended.

1.0 Introduction

1.1 Introduction

Alberta has long been known as a source of bentonite with production from the Drumheller area as early as the 1920's. Primarily past bentonite production in Alberta has been from the Upper Cretaceous, Horseshoe Canyon Formation, a belt of sedimentary rocks extending from southern Alberta to Grand Prairie in northwestern Alberta. By far the greatest bentonite production in Alberta has been from the Rosalind area, which is located southeast of Camrose. Bentonite production from the Rosalind deposits is estimated at over 400,000 tons and was mined by MI Fluids Ltd. and its predecessor companies Dresser Minerals and Magnet Cove Barite from 1960 through 1992.

The Rosalind deposit was discovered by J. S. Carter of Calgary, Alberta, who recognized bentonite outcropping along both sides of the Battle River, approximately 9 miles south of the town of Rosalind. Upon discovery of the deposit in 1957, drill hole testing continued to 1960. No further drilling is recorded after 1960. Mining activity principally from the Quarry 37 area began in the early 1960's and continued to 1992. Tonnage's mined in the later years under MI Fluids is thought to be less than 12,000 tons /year (MI fluids company records).

The author and Ben Christensen of Edmonton first visited the Rosalind plant site and principle quarry (Quarry 37) on March 17, 2000. Limited sampling was done on stockpiles adjacent the plant site at Rosalind and 4 samples were taken from outcrop and stockpiles from the Quarry 37 area. Drill logs and plan maps were obtained from the main office next to the Rosalind plant. This report is based on maps and available drill logs from Dresser Minerals files and fieldwork from May through December of 2000. Exploration auger drilling was concentrated in primarily Sections 18, 19, 20 and 6 of Township 43, Range 17 and Section 12, Township 43, Range 18, all west of the 4th Meridian.

An estimated 409,000 tons of bentonite have been produced from the Rosalind deposits with an estimated 2,065,000 tons remaining (pers. comm., Stan Cordingly). In the course of compiling information for this report, individuals contacted include former geologist with Dresser minerals John Carter and former president of MI Fluids Ihor Mazuryk, both of Calgary and former manager of operations Bernie Sturek, who presently lives in the village of Rosalind.

This report essentially is concerned with bentonite exploration and exploration mainly in the Battle River area south of the village of Rosalind. Another aspect here which is generally overlooked is the potential for humalite or humic acid which is considered to be a soil additive and potentially an asset during stripping operations.

1.1 Terms and definitions

Bentonite has been defined as a clay consisting primarily of the smectite group of variably swelling minerals, regardless of origin or occurrence .The smectite group of minerals includes montmorillonite and beidellite as end members. Bentonite has been referred to as Wyoming bentonite as the original deposits were from Benton, Wyoming (Rath, 1986). It is thought to be formed as the result of alteration of volcanic ash and/or volcanic tuff. It consists of three layer platelets (alumina-silica-alumina) stacked to form a matrix, which when in contact with water forms polar bonds and induces swelling. This property of swelling in montmorillonite clays makes it extremely useful in oil and gas drilling as a drilling mud, in supporting formation walls in drilling and allowing for cuttings to exit the hole. Heat (in excess of 1500° C for montmorillonite clay) will collapse the platelet structure and create a product which will not swell or reabsorb water.

Yield in association with bentonites is an evaluation done on raw clays to determine the commercial applicability for drilling fluids. It is defined as the number of 42-gallon barrels of fluid with an apparent viscosity of 15-centipoise produced by a ton of clay. A number above 90 is an acceptable number for raw sodium bentonite. Other bentonite clay falling in the range 75-90 range can be upgraded with polymer and/or soda ash to create an acceptable bentonite for the oil and gas industry as a drilling mud (personal communication, Cheryl Stark, API).

Swelling is the percentage volume increment exhibited by 2.5 grams of bentonite in 100 ml of water calculated to 100 grams.

Percentage moisture is the moisture determined at point of manufacture using method in API Specification 13A, sections 4.8 and 4.9.

Percentage fines are generally reported by dry sieve analysis as percentage through 200 mesh size. Analyses performed in this report by Loring Laboratories, Calgary (**appendix II**) show percentage fines determinations using a wet sieving method.

1.3 Uses, properties and markets

Bentonite has numerous uses and generally constitutes a small, but significant part of the final product in which it is an ingredient. Andrews (1992) reports that the three most common uses for the swelling variety of bentonite include well drilling, foundry molding and pelletizing. Bentonite constitutes about 5 % of the weight in well-drilling fluids, up to 10% in foundry molding and about 0.5-0.8% in iron-ore pelletizing (Andrews, 1992).

Andrews (1992) suggests that the single most important feature of bentonite is their colloidal property. The breakdown of aluminum silicates in the alteration to montmorillonite clay results in the formation of colloidal silica and colloidal compounds of aluminum. The fine particles ranging in size between 1 and 100 mm, are most striking

in sodium bentonites. Mixed with water, dormant electrochemical energy in the crystal lattice of the swelling smectite-group minerals is activated, imparting dilatancy (swelling capacity), viscosity (resistance to flow), thixotropy (gelling strength), and other colloidal properties to the mixture (Andrews, 1992).

Amcol International a major bentonite producer in Wyoming lists metalcasting with 47% of their sales and cat liter at 35%. The popularity of scoopable cat litter is a growing market. Additional Wyoming production has applications within agriculture (pelletization agent for animal feed); chemicals (as gelling, binding, thickening, plasticizing and emulsifying agents for pharmaceuticals, cosmetics, and household products) http://www.amcol.com/corp/products.htm.

Estimated bentonite production in Canada in 1998 was 20,000 tons with production from Saskatchewan and Quebec, while production in the state of Wyoming alone was over 200,000 tons.

2.0 Location

The Rosalind bentonite workings lie from 7 to 15 km south of the town of Rosalind. The principal workings were in a pit termed Quarry 37, which is south of the Battle River in Section 31 of Township 42, Range 17, west of the 4th Meridian. Additional workings lie to the north of the Quarry 37 pit, in Section 7 of Township 43, Range 17 and north of the Battle River in Section 19 of Township 43, Range 17. An all weather gravel road, a continuation of secondary Highway 854, connects the above areas to the village of Rosalind which was the plant site for Dresser Minerals bentonite operations.

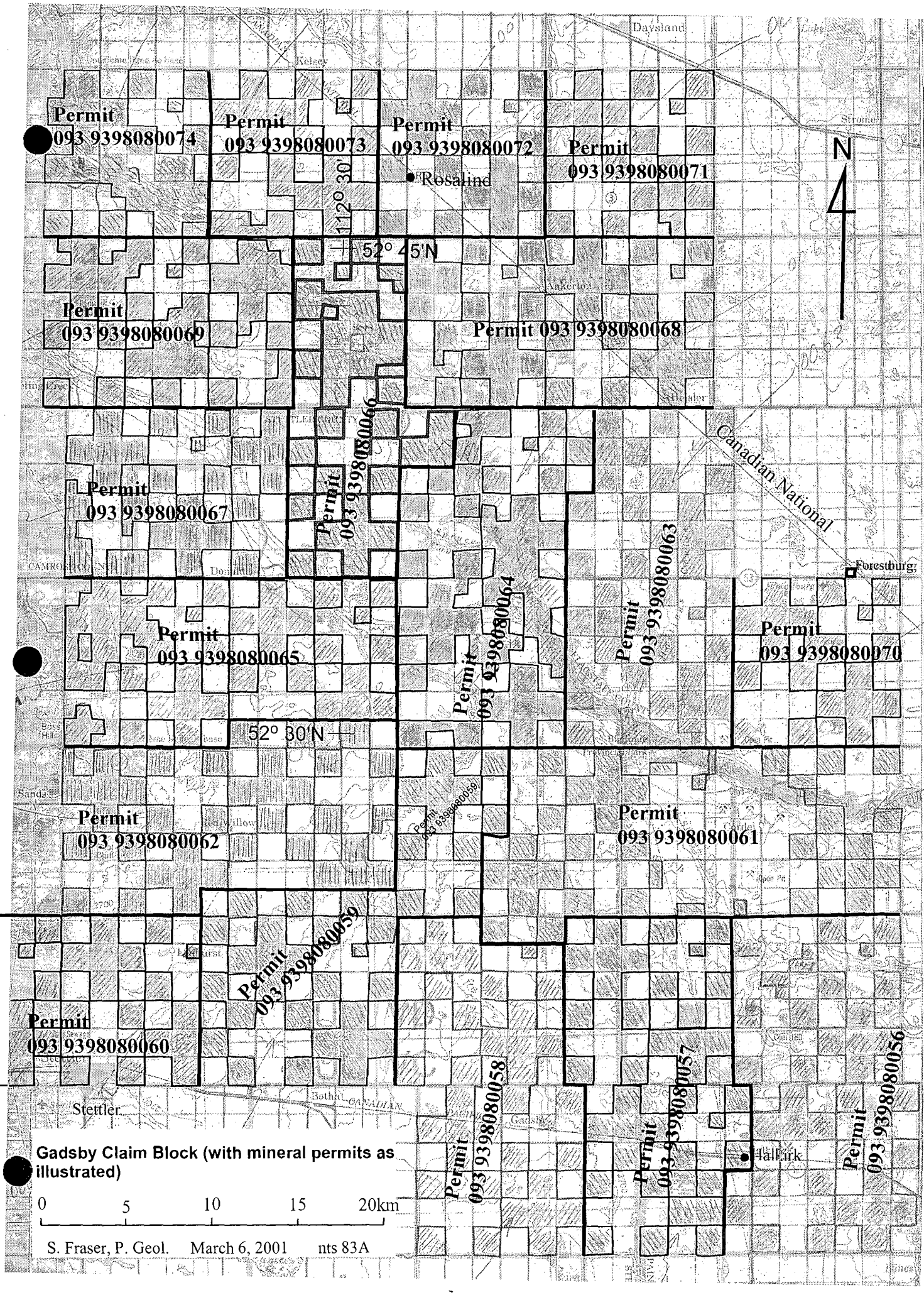
The Rosalind plant site is at the south end of the village of Rosalind, and lies along a spur of the CNR. Rosalind is approximately 35 km by road from the town of Camrose, Alberta (**Figure 1**).

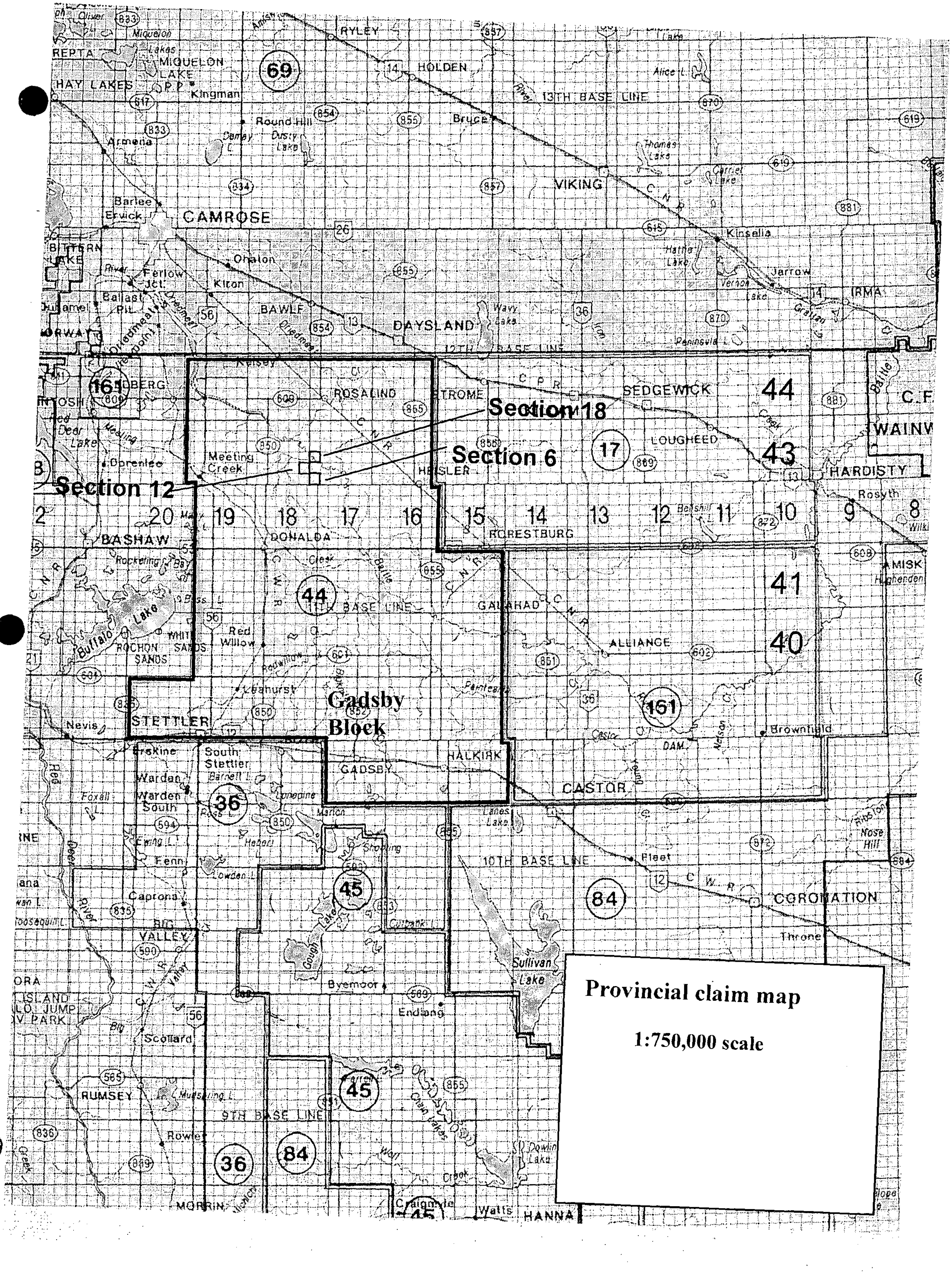
3.0 Mineral leases and land position

Stan Cordingly of MI Drilling Fluids stated that MI Fluids sold the Rosalind plant and all mineral rights to bentonite (stockpiles) in 1992 to Nelson Miller, of Global Aggregates, who resides in Cypress, Alberta.

Fording Coal is the registered owner of several bentonite mineral leases in the Battle River area. Leases held by Fording Coal in the Battle River area include;

Section	Quarter	Township	Range	Meridian	Acres	Hectares
19	all	43	17	W 4th		
7	all	43	17			
31	north half of section	42	17			
5	Southwest ¼	43	17			


Permit 093 9398080074
Permit 093 9398080073
Permit 093 9398080072
Permit 093 9398080071
Rosalind
112° 30'
52° 45'N
Permit 093 9398080069
Permit 093 9398080068
Permit 093 9398080066
Permit 093 9398080067
Canadian National
Forestburg
Permit 093 9398080063
Permit 093 9398080064
Permit 093 9398080065
Permit 093 9398080070
52° 30'N
Permit 093 9398080062
Permit 093 9398080061
Permit 093 9398080059
Permit 093 9398080060
Permit 093 9398080058
Permit 093 9398080057
Permit 093 9398080056
Stettler
Hallark
N
Gadsby Claim Block (with mineral permits as illustrated)
0 5 10 15 20km
S. Fraser, P. Geol. March 6, 2001 nts 83A



Provincial claim map

1:750,000 scale

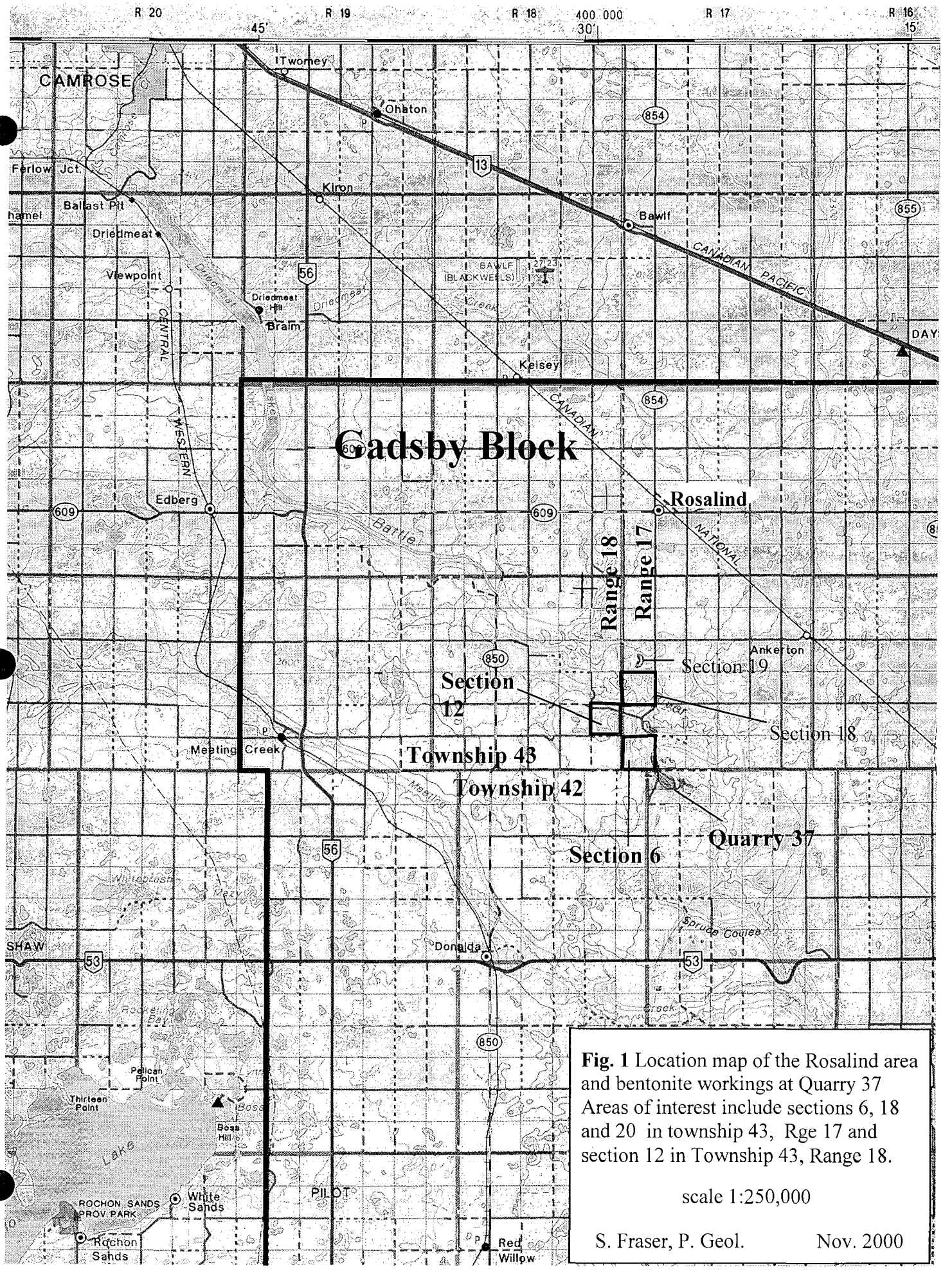


Fig. 1 Location map of the Rosalind area and bentonite workings at Quarry 37 Areas of interest include sections 6, 18 and 20 in township 43, Rge 17 and section 12 in Township 43, Range 18.

scale 1:250,000

S. Fraser, P. Geol. Nov. 2000

Present mineral claims (Crown granted claims) in the Battle River area south of the village of Rosalind are held jointly by Ben Christensen and Bill Kizan of Edmonton and comprise the Gadsby Block which is shown in **Figure 2**. This block contains in excess of 300,000 hectares and was optioned to Columbia Yukon Resources in 1998 for its diamond potential. The Gadsby Block was returned to Christensen and Kizan on September 7th, 2000 and assessment figures as well as a capsulated report from the Columbia Yukon work are noted in **Appendix IV**.

The following metallic and industrial mineral permit numbers refer to the Gadby Block (**Figure 2**) and the transfer of those permits to Kizan and Christensen.

Metallic and Industrial Mineral Permits

093 9398080056
093 9398080057
093 9398080058
093 9398080059
093 9398080060
093 9398080061
093 9398080062
093 9398080063
093 9398080064
093 9398080065
093 9398080066
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093 9398080068
093 9398080069
093 9398080070
093 9398080071
093 9398080072
093 9398080073
093 9398080074

A legal description of relevant claim areas to be applied for assessment credit is listed in **Appendix V**.

4.0 Geology

Bentonite in Alberta is common in Cretaceous and Tertiary formation rocks, but significant deposits have only been discovered within Upper Cretaceous rocks. **Figure 3** illustrates bentonite occurrences in Alberta and shows the Rosalind deposits lying within the Upper Cretaceous, Horseshoe Canyon formation, a belt of sedimentary rocks consisting of mainly marine shales and lesser sandstone. Ross (1964) reports that beds of Edmonton Formation bentonite have been found up to 30 feet thick, while at Rosalind thicknesses up to 11 feet are reported. The bentonite beds are in bentonitic shale and grade laterally into bentonitic shale and clay. Local concentrations of volcanic ash are

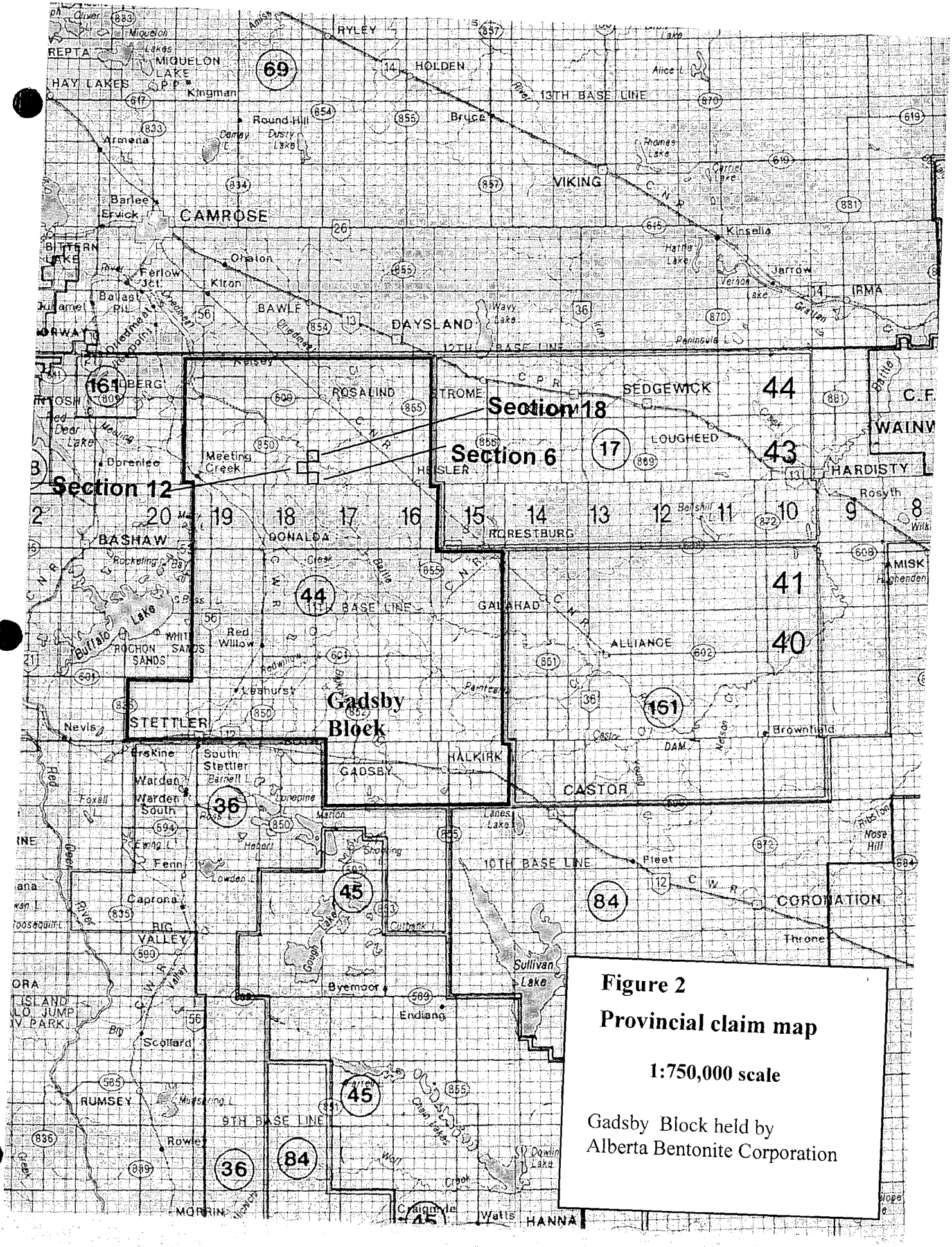


Figure 2

Provincial claim map

1:750,000 scale

Gadsby Block held by
Alberta Bentonite Corporation

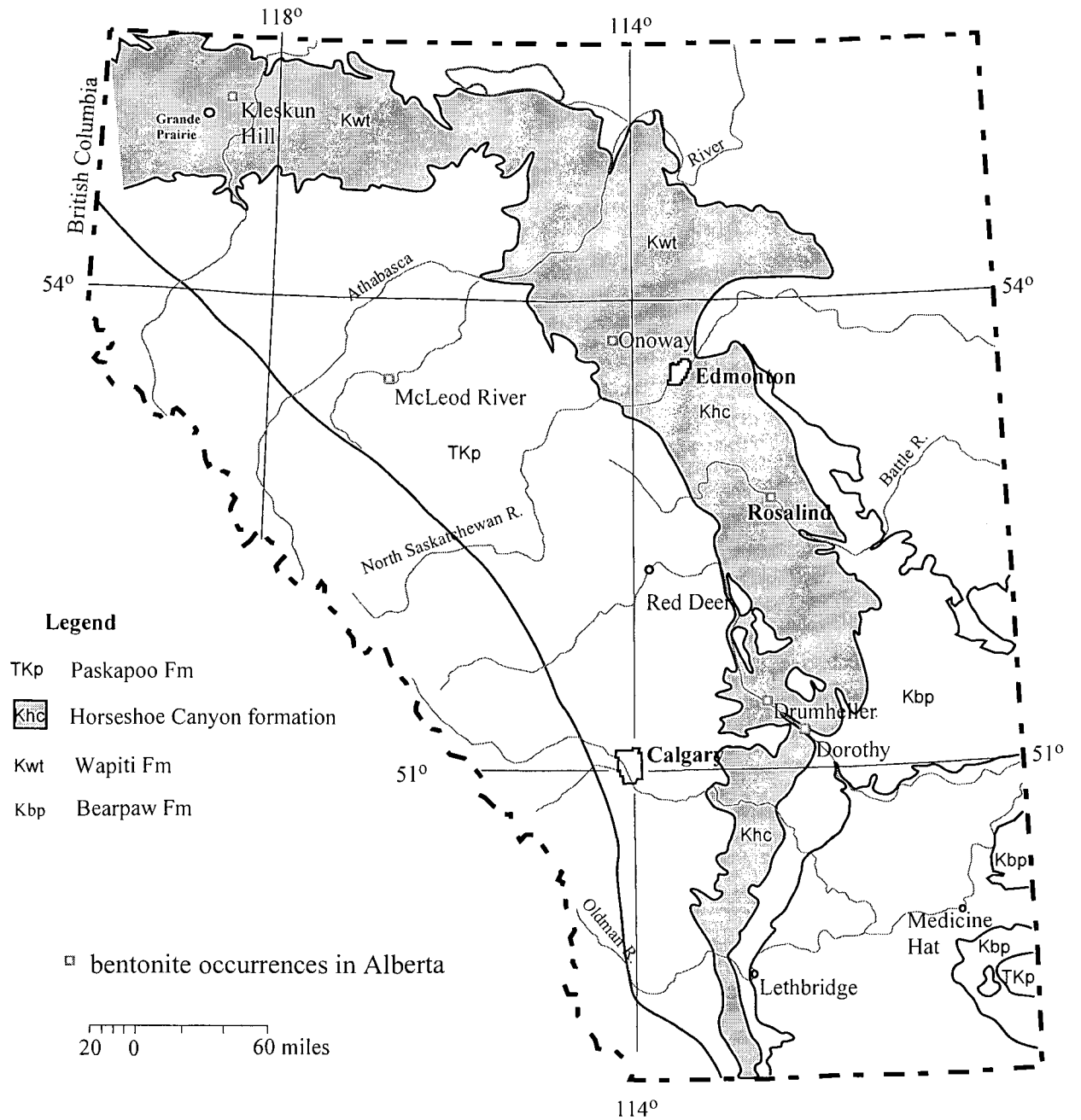


Figure 3 Alberta Bentonite occurrences (modified from Scafe, 1975)

reported in Ross, (1964) and are depicted in drawings by Carter within the Rosalind deposits (Dresser Minerals files).

Stratigraphically Scafe (1975) reports 4 stratigraphic horizons of bentonitic layering in the Battle River area. Bentonite located in sections 19 and 6 are thought to be the same horizon, while the bentonite in the Quarry 37 area is stratigraphically higher.

At Rosalind, mine production came primarily from Quarry 37, which is located in the north half of Section 31, Township 42, range 17, and west of the 4th Meridian, south of the Battle River (**Figure 4**). Ross (1964) reports that the deposit has been outlined for a width of 500 feet and for a distance of 3,600 feet along the valley. Magcobar Mining Company, predecessor to Dresser Minerals estimated a reserve of 1 million tons based on a thickness of 8.5 to 10.5 feet. Ross (1964) reports that the bentonite is overlain by up to 25 feet of overburden, and underlain by black carbonaceous shale. Ross (1964) further reports that an additional bentonite zone, about half a mile to the north contains about 300,000 tons of bentonite and in section 19, Township 43, Range. 17 a 5 foot bed may contain more than a million tons of bentonite.

5.0 Year 2000 Investigation

The author and Ben Christensen of Edmonton initially visited the Rosalind plant site and Quarry 37 area on March 17th, 2000. Just west of the plant site which is located at the south end of the village of Rosalind, are three stockpiles of bentonite, estimated at 25000 tons . The main office contains drill logs of holes completed in the period 1957 through 1960 and plan maps were located which illustrate drill hole locations as well as areas mined.

One sample was taken from each of the three stockpiles at the plant site for bentonite analyses. In addition to the bentonite stockpiles, south of the plant a stockpile of lignite (potentially a source of humic acid) is estimated at approximately 25,000 tons.

A swelling test (Ross, 1964) was performed on samples collected from the Rosalind area and limited x-ray diffraction work were both performed at the University of Alberta.

5.1 Quarry 37 area

Former Dresser Minerals plan maps and drill log information was used to prepare a compilation plan map as well as cross sections highlighting areas with potential bentonite resources south of the Quarry 37 workings.

In the southwest area of Quarry 37, 3 samples were taken from 2 stockpiles of bentonite and a 4th sample from outcrop of mainly volcanic ash. The location of the three samples taken from bentonite stockpiles are shown on **Figures 4 and 5**.

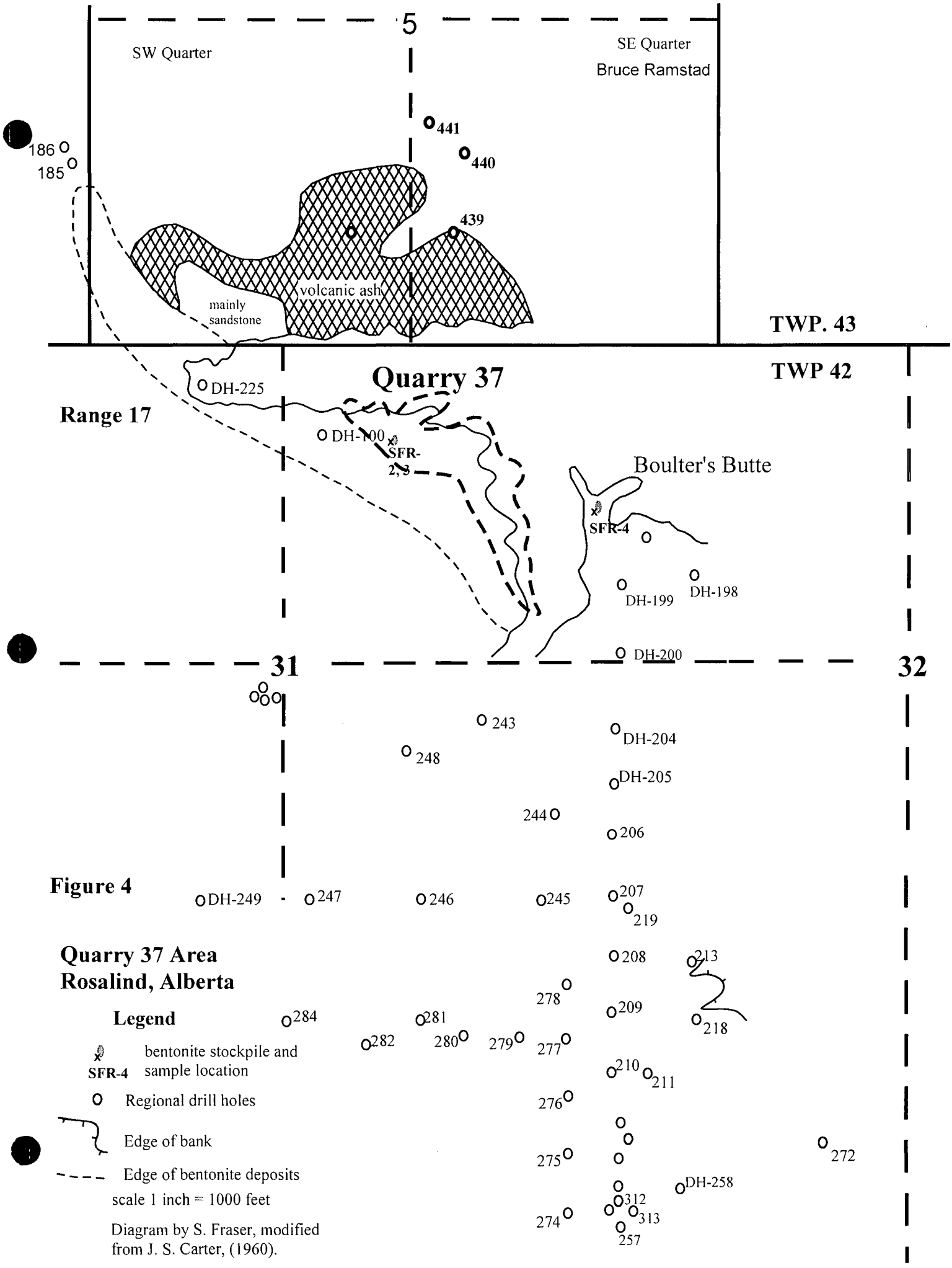


Figure 4

Quarry 37 Area
Rosalind, Alberta

One day was spent examining outcrop exposures southeast of the Quarry 37 area, within drainage areas south of Boulter's Butte. [Boulter's Butte is an area mined for bentonite, just east of the Quarry 37 area.] Four samples were collected, but were not analyzed. A compilation map prepared from Dresser Minerals plans and drill logs from the Quarry 37 area is shown as **Figure 5**, in the pocket of this report. In addition, from available drill logs, north-south cross sections **(Figure 6)** were produced by the author.

5.2 Section 6, Township 43, Range 17 area

This area received the greatest attention by the author in 2000 and was evaluated by the use of auger holes. Geological profiles were prepared. A geological map of Section 6 (**Figure 7**) as well as cross sections (**Figure 8**) are found in the pocket of this report. A total of 49 auger holes (**2.5 inch diameter holes**) were drilled to various depths to penetrate bentonite horizons in Section 6, of Township 43, Range 17, W4th Meridian. One meter sample lengths were collected for analysis. Samples splits were obtained by using a Jones sample splitter, with one half of the material retained in Edmonton and the remainder shipped to Loring Laboratories, Calgary for analysis. Sample checks were run by submitting some of the sample splits for reanalysis. A table with drill logs and geology as well as bentonite analysis from Loring Labs is located in **Appendix I**. In addition lignite samples with up to 1 meter thickness were collected for their humic acid potential. No lignite samples were submitted for analyses.

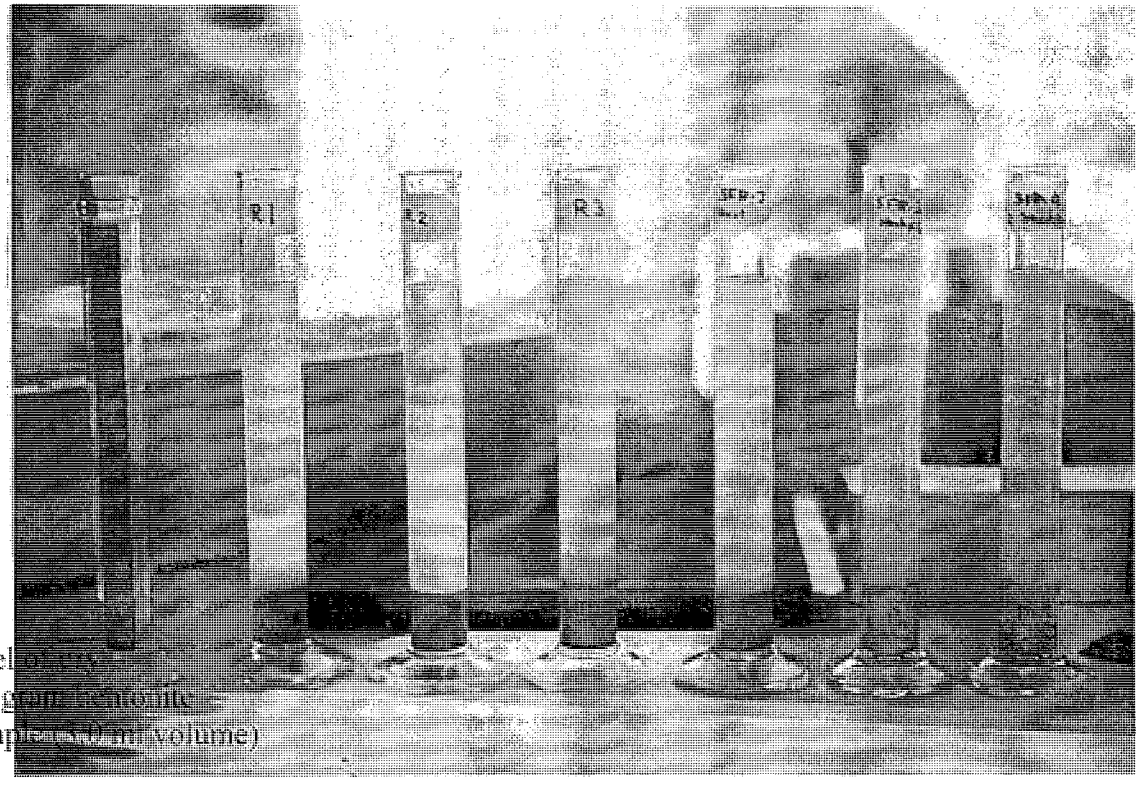
5.3 Other areas

In addition to section 6, sections 18 and 20 in Township 43, Range 17 and section 12 in Township 43, Range 18 were investigated in 2000. Drill hole logs are listed in **Appendix I** and available bentonite analyses, from Loring Labs, Calgary are illustrated in **Appendix II**.

Regionally bentonite samples were also collected in the Halkirk area, but no samples were submitted for analyses. Approximately 9 km north of Halkirk, yellowish colored bentonite up to 0.5m thickness was found in outcrop.

6.0 Results 2000 fieldwork

A simple swelling test (Ross, 1964) was performed on samples collected from the Rosalind area. At the University of Alberta the 6 samples were pulverized and 2 grams were weighed from each sample. 0.1 gram aliquots (totaling 2 grams) were then placed in a 100ml graduated cylinder filled with 100 ml of distilled water and allowed to stand for several hours. **Plate 1** illustrates the comparison between the volume of the dry sample weighing 2 grams (on the left of the photo) and the 6 Rosalind samples showing 5 to 6 times the dry volume, after being immersed in water.



level
2.0
sam

Plate 1 swell test on Rosalind bentonite samples. Samples immersed in 100 ml distilled water attain volume up to18 ml.

Limited x-ray diffraction analysis work was done at the U. of A. on selected samples collected from Rosalind. An x-ray diffraction scan from sample R1 from the stockpile adjacent the plant at Rosalind is shown in **Plate 2**. This scanning technique is not quantitative, but illustrates primary minerals including here beidellite which is part of the smectite group of swelling minerals and is part of a solid solution series with beidellite and montmorillonite $(XAl_2[(Al,Si)_4O_{10}](OH)_2.nH_2O$ and $X(Al,Mg)(Si_4O_{10})(OH)_2.nH_2O$ respectively, where X refers to the exchangeable cations mainly Na and Ca (Blackburn and Dennen, 1988).

Analytical results from Activation Labs, Ancaster, Ontario indicate that the 6 stockpile samples taken (three from the plant stockpiles and three from two stockpiles from the Quarry 37 area) contain principally sodium bentonite, a swelling bentonite. A comparison between the stockpile samples and a sample of Wyoming bentonite is shown in Table 1 below.

6.1 Quarry 37 Area

Dresser Minerals drill log data (**Figure 6**) suggest that a gray bentonite termed Autobond, (pers. comm., J.S. Carter) shallows to the southwest with increasing silt and sand content south of the green bentonite layer boundary, southwest of Quarry 37. Drill logs further indicate a carbonaceous shale underlies the bentonite horizon. The carbonaceous shale appears to be a distinct marker horizon.

Outcrop sampling from north of the Quarry 37 area reveals volcanic ash, which is consistent with field mapping reported by J. S. Carter (company geology reports). Reserve estimates for areas within the Quarry 37 area southwest, Boulter's Butte, and area west of Quarry 37, Blocks A, B, and C are shown in **Figure 5**.

The compilation plan map **Figure 5** further illustrates an east-west to southeasterly trend of the boundary of green to gray bentonite. This boundary is consistent with thickness variation in overburden, where gray bentonite is generally found under deeper cover.

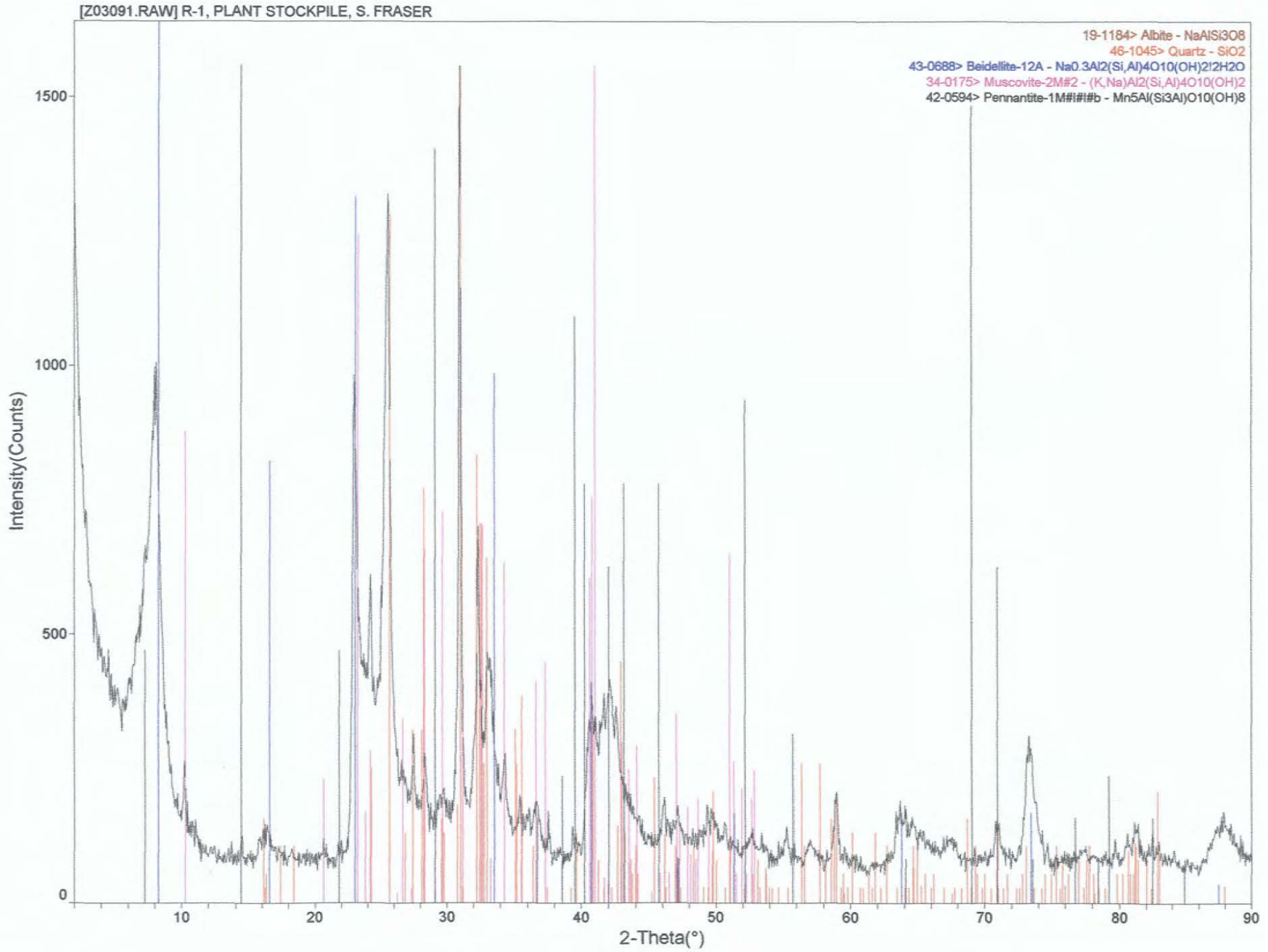

[Z03091.RAW] R-1, PLANT STOCKPILE, S. FRASER
19-1184> Albite - NaAlSi3O8
46-1045> Quartz - SiO2
43-0688> Beidellite-12A - Na0.3Al2(Si,Al)4O10(OH)2!2H2O
34-0175> Muscovite-2M#2 - (K,Na)Al2(Si,Al)4O10(OH)2
42-0594> Pennantite-1M#i#i#b - Mn5Al(Si3Al)O10(OH)8
Intensity(Counts)
0
500
1000
1500
10
20
30
40
50
60
70
80
90
2-Theta(°)

Table 1 Chemical analyses of Rosalind bentonites

The table below lists major oxide analyses for selected bentonite samples from stockpiled bentonite at Rosalind and compares the Rosalind samples with a typical swelling bentonite from Colony, Wyoming. Values, reported in weight percent, were analyzed at Activation Labs, Ancaster, Ontario. Wyoming results are taken from Andrews, (1992).

Sample #	**R1**	**R2**	**R3**	**SFR-2**	**SFR-3**	**SFR-4**	**Colony, Wyoming (swelling bentonite)**
SiO_2	64.27	70.06	70.76	70.96	69.18	71.86	**59.72**
Al_2O_3	15.16	13.92	13.50	13.63	13.41	13.74	**18.22**
Fe_2O_3	2.78	2.05	2.27	1.89	2.23	2.46	**4.15**
FeO	0.88	1.25	0.36	1.05	1.13	0.35	-
MnO	0.049	0.055	0.032	0.032	0.053	0.044	-
MgO	1.86	1.39	1.43	1.36	1.36	1.47	**2.08**
CaO	2.38	2.24	1.48	1.48	1.71	1.70	**1.46**
Na_2O	1.69	1.52	1.27	1.49	1.44	1.33	**2.70**
K_2O	0.69	0.53	0.47	0.46	0.50	0.53	**0.54**
TiO_2	0.377	0.231	0.215	0.239	0.229	0.238	-
P_2O_5	0.10	0.07	0.06	0.07	0.07	0.06	NA
Li_2O	NA	NA	NA	NA	NA	NA	**0.14**
SO_3	NA	NA	NA	NA	NA	NA	**0.59**
LOI	8.33	6.69	7.76	6.01	7.12	6.51	NA
LOI2	8.43	6.83	7.80	6.13	7.25	6.55	NA
H_2O^-	4.16	2.13	4.32	1.90	2.83	2.73	**5.87**
H_2O^+	4.28	2.86	4.21	2.97	3.27	4.01	**5.55**
Total	**98.66**	**100.14**	**99.65**	**98.78**	**98.56**	**100.33**	**101.02**
Total2	**98.56**	**100.00**	**99.61**	**98.66**	**98.43**	**100.29**	
Ba (ppm)	945	918	659	745	609	865	
Sr (ppm)	274	216	170	203	197	183	
Y (ppm)	26	19	17	15	18	18	
Sc (ppm)	6	4	4	4	4	4	
Zr (ppm)	173	113	109	118	112	114	
Be (ppm)	1	1	1	1	1	1	
V (ppm)	41	24	22	23	25	27	

Samples R1-3 were collected from stockpiles adjacent the former Dresser Minerals plant at the south end of the village of Rosalind. Samples SFR-2 and 3 are taken from a stockpile of gray bentonite at the Quarry 37 site, while SFR-4 is taken from a stockpile of green bentonite at Boulter's Butte, just east of the Quarry 37 area. The attached figure of the Quarry 37 area shows sample locations. The Quarry 37 Area is located just south of the Battle River, approximately 15 km south of Rosalind, along secondary road 854.

6.2 Section 6 Area

Results from the 2000 fieldwork from Section 6, Township 43, Range 17, W4th M show consistency in bentonite thickness and grade. Bentonite layering up to 3.0 meters thickness generally consists of a green to olive green bentonite section. Overlying the bentonite is a feldspathic sandstone (in part bentonitic) and a distinctively hard brown shale underlying the bentonite. The brown shale is impenetrable by hand auger and may be in part silicified, resulting from the process of alteration of volcanic ash to bentonite. The sharp contact (and siliceous nature) of the competent, brown shale with the overlying bentonite layer is consistent with observations by Grim and Güven (1978) in Wyoming bentonite deposits. Occasionally overlying feldspathic sandstone in section 6 is a layer of lignite, referred to as tannathin in Dresser Minerals drill log reports. The lignite has a thickness of up to one meter and is exposed in outcrop on the east side of Vikse Creek just east of drill hole ABC-32. Generally the green bentonite in Section 6 is overlain by glacial till and from the plan map (**Figure 7** and Section CC') part of the bentonite resource has been eroded in a glacial erosion channel.

Bentonite mineralization located in Section 6 appears to have a significant dip to the south (**Figure 8**). The bentonite in the northwest quarter of Section 6 outcrops at the base of the hillside west of Vikse Creek [sample location ABC-17] seen in **Plate 3,** but which is not shown in **Figure 7**. South from this location the bentonite dips south and underlies Quaternary deposits of glacial till which consists of silty to variably sandy till. In part glaciation has eroded the bentonite along glacial erosion channels in the area which generally follow along more recent drainages. **Figure 9** is a plan map showing auger holes in the area as well as the glacial erosion channel west of Vikse Creek in the northwest quarter of section 6. Green bentonite has been located north of hole ABC-42, while gray bentonite has been found in drilling south of ABC-42 and hole ABC-41. Researchers including Rath (1986) have suggested that the color of the bentonite (green versus gray) is a function of depth and here in the northwest quarter of Section 6 gray bentonite appears to be the predominant type of bentonite below 10 meters depth (**Figure 8**).

6.3 Other Areas

Additional bentonite sampling was done in Sections 12, Township 43, Range 18 **Figure 10** and Section 18, Township 43, Range 17, W4th M **Figure 11**. The stratigraphy observed in these areas is consistent with that of Section 19 and the bentonite sampled is thought by the author to be the same horizon.

There is presently insufficient drill information in these additional sections to comment on their geological potential.

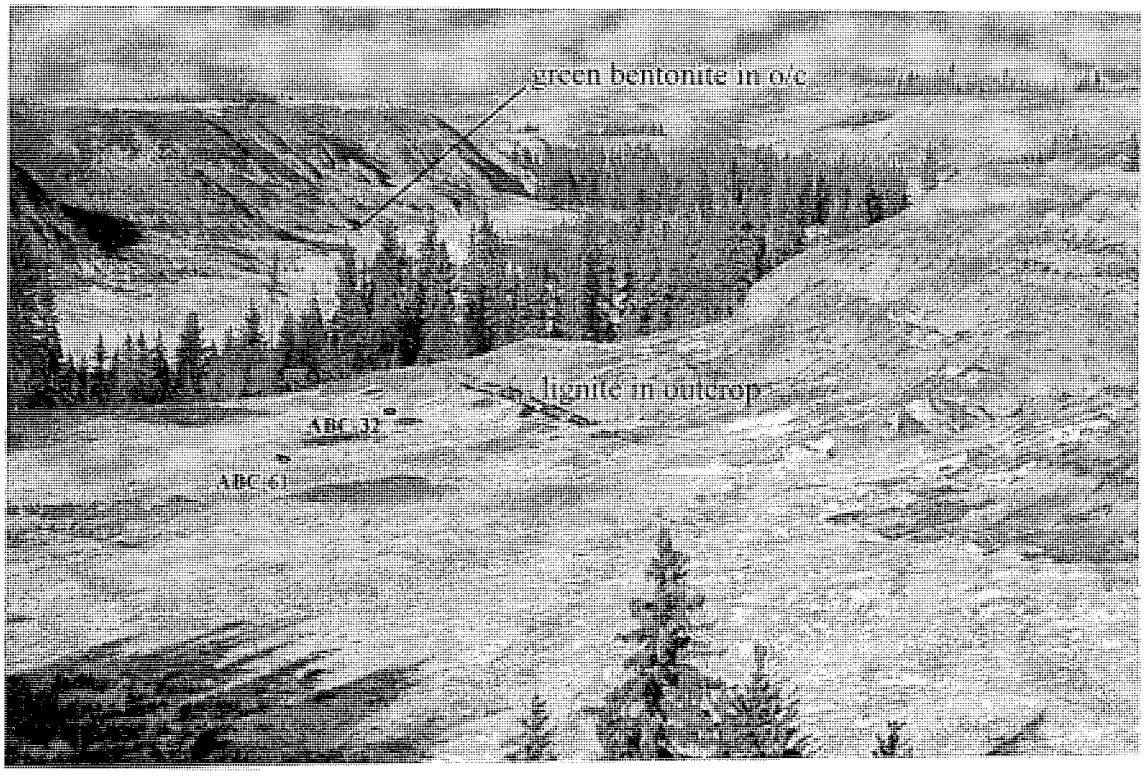


Plate 3 Area east of Vikse Creek in Section 6 with lignite exposure just east of auger hole ABC-32 and on the west side of Vikse Creek, the location of green bentonite (sample # ABC-17) in outcrop. Also visible in photo are slide debris, related to bentonitic shales within embankment walls. Photo looking north.

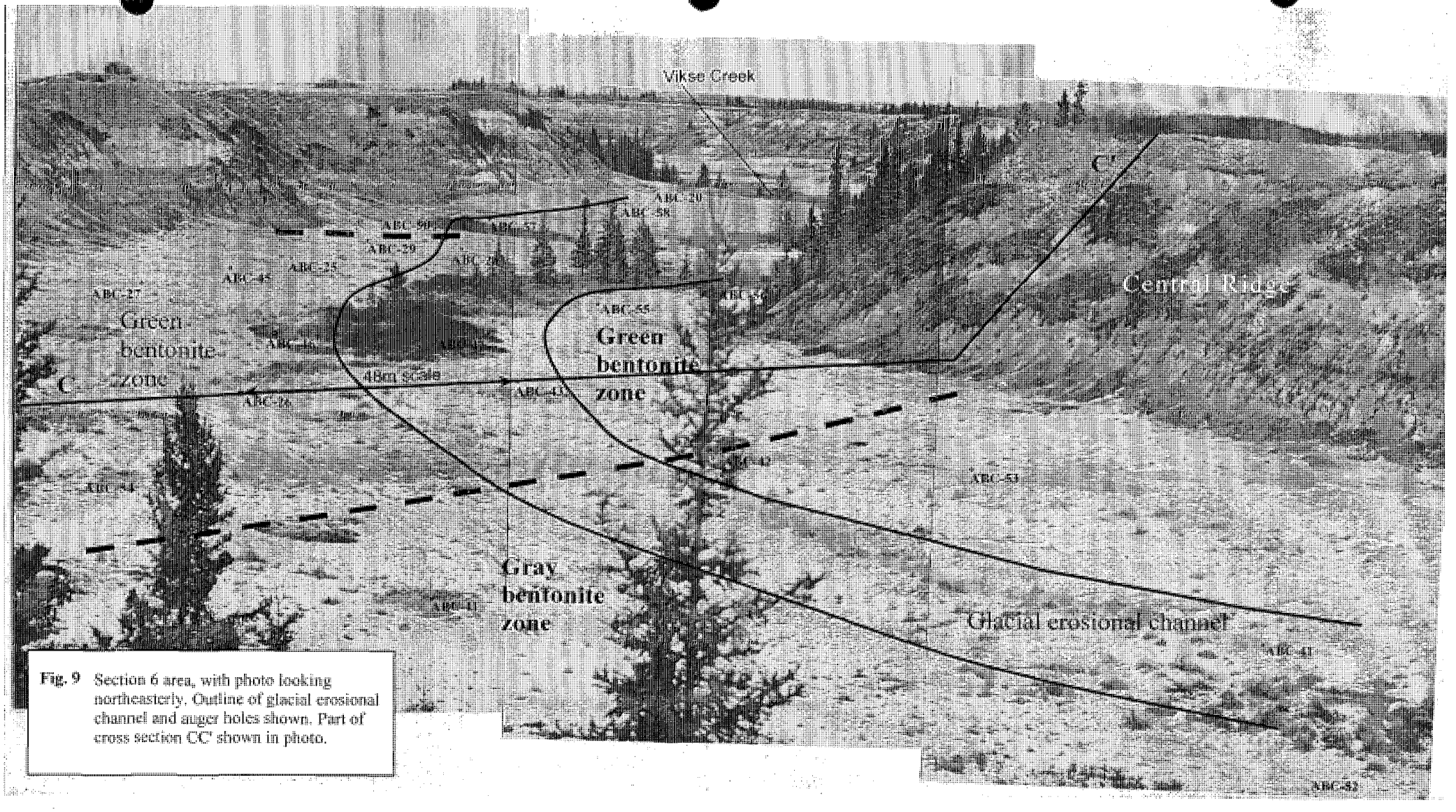
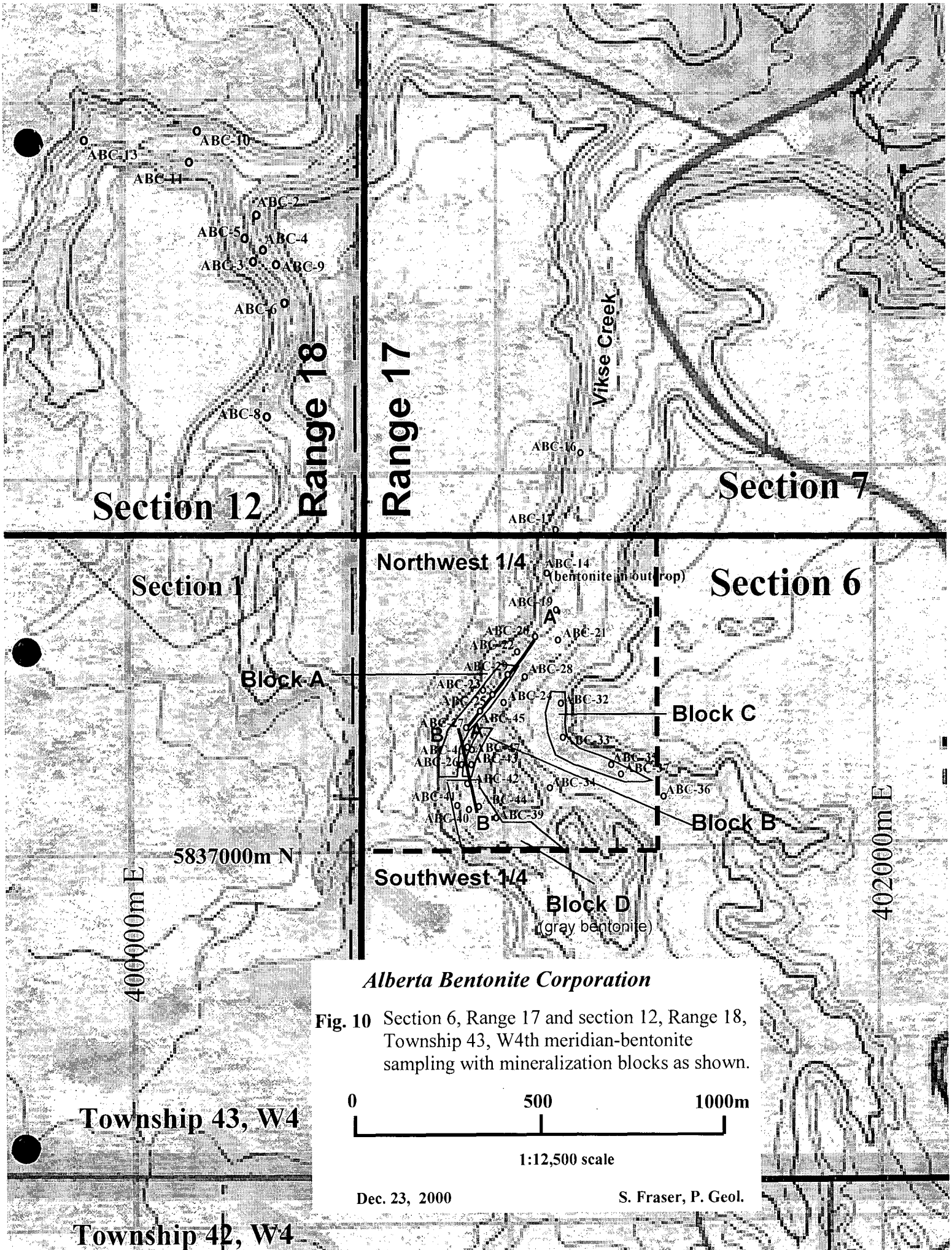


Fig. 9 Section 6 area, with photo looking northeasterly. Outline of glacial erosional channel and auger holes shown. Part of cross section CC' shown in photo.



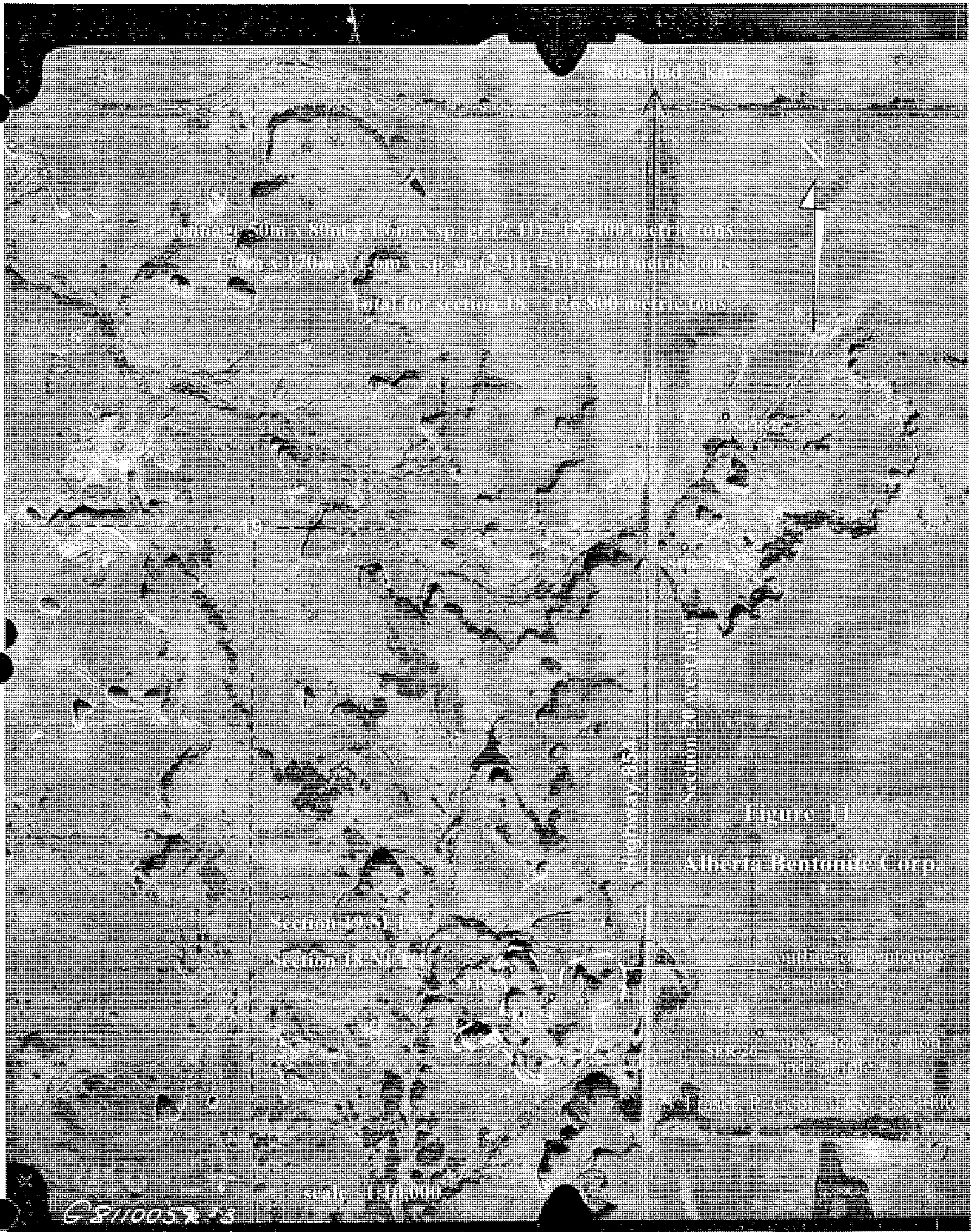
Alberta Bentonite Corporation

Fig. 10 Section 6, Range 17 and section 12, Range 18, Township 43, W4th meridian-bentonite sampling with mineralization blocks as shown.

0 500 1000m

1:12,500 scale

Dec. 23, 2000 S. Fraser, P. Geol.



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7.0 Estimated Reserve potential

7.1 Quarry 37 area

From Dresser Minerals drill logs and plan maps, a reserve of 720,000 tons is calculated for the southwest area of the Quarry 37 area. Dresser Minerals maps suggest an average bentonite thickness of seven feet and yield of 59.7. Boulter's Butte an area just east of Quarry 37 has a smaller tonnage estimated at <100,000 tons, but increased bentonite thickness (8 feet) and grade 84.9. Block C located to the west of Quarry 37 and lying within section 6 of Township 43 is estimated to contain 300,000 tons with an average thickness of 5 feet and a yield of 56.8 barrels per ton of clay.

7.2 Section 6 area

Based on auger hole information to date, an estimated 175,300 metric tons of green bentonite is outlined in 3 blocks A, B, and C in **Figure 7**. [A specific gravity value of 2.41 is used in the calculations]. Additional auger drilling is required to firm up these numbers and from Section CC' the western edge of Block C is unclear with regard to the eastern extent of glacial erosion. Section CC' suggests that drill hole ABC-63 may not have penetrated deep enough to reach the bentonite horizon projected in the section. More drilling is required in this area.

7.3 Section 12 area, Range 18

Insufficient drilling has been done on Section 12 to predict tonnage, but olive green bentonite has been located and further work is warranted. Sample locations are outlined in **Figure 10.**

7.4 Sections 18 and 20 area, Range 17

On the north side of the Battle River, in the northeast quarter of Section 18, Township 43, Range 17 limited auger drilling has located green bentonite. Based on outcrop exposure in the area and drill holes SFR-26 and 54, an approximate resource of 126,000 metric tons of green bentonite has been calculated (**Figure 11**).

Limited drilling, 2 holes only, on section 20 east of section 19 suggests that bentonite mineralization may be thinning easterly in this area, but additional drilling is required.

8.0 Conclusions

8.0 Introduction

A combined estimated resource of 301,000 metric tons of green bentonite is inferred from the northwest quarter of sections 6 and the northeast quarter of section 18, Township 43, Range 17, west of the 4th Meridian. In addition resources of gray bentonite (not calculated) occur south of the green bentonite block in Section 6.

It is estimated that there is sufficient stockpiled bentonite adjacent the Rosalind plant to last 4-5 years in terms of production and the proximity of a gas well within 300 meters of the plant site is a ready source of fuel. In addition the CNR has a spur line adjacent to the plant for ready transportation of bulk shipments.

8.1 Quarry 37 Area

The low yield (< 60) in gray bentonite, referred to as Autobond, (per. Comm., J. S. Carter and Bernie Sturek) shown in Blocks A and C, south of the Quarry 37 area suggest that bentonite production may not be feasible for use as an oil well drilling fluid, but other modern uses may be appropriate for the bentonite. Research into uses for gray bentonite is to be conducted.

8.2 Section 6 Area

A resource of approximately 175,000 metric tons of green to olive green bentonite has been outlined in the northwest quarter of section 6, Township 43, Range 17, W4th meridian. Resource estimates of gray bentonite in section 6, south of hole ABC-42, indicated as Block D in **Figure 10,** have not been calculated.

Resource potential for green bentonite has not been determined further east in the northeast quarter of section 6 due to a lack of drilling.

8.3 Other Areas

Bentonite mineralization has been located in Section 12, Township 43, Range 18, but insufficient drilling has been done to assess resource potential.

A resource calculation of approximately 126,000 metric tons is inferred for Section 18, Township 43, Range 18 on limited drill hole data.

Minimal work in the Gadsby block north of Halkirk has located bentonite layering, but no samples as yet have been submitted for analyses.

9.0 Recommendations

The Quarry 37 area is thought to contain significant reserves of bentonite, but primarily gray bentonite, which is probably of poor quality yield for the oil and gas industry as a drilling mud.

The northwest quarter of section 6, Township 43, Range 17 represents a significant area with green to olive green bentonite and potential for additional resources. Further drilling is warranted in the northeast quarter of section 6 and the lateral extent of the glacial erosion channels in the northwest quarter of section 6 needs to be determined more precisely.

Additional auger drilling is to be carried out in section 12, Township 43, Range 18 which is favorably positioned along a northwesterly trend with Section 6. While drilling to date in Section 12 has located green bentonite in generally steep ravines, additional exploration is to be concentrated further south in more wide open coolies.

Additional exploration drilling is also recommended for Section 18, Township 43, to prove up resource potential.

10.0 Costs

A detailed list of assessment costs is outlined in **Appendix III**.

Assessment costs relating to bentonite exploration for Alberta Bentonite Corporation total	**25,981.47.**
Columbia Yukon Resources assessment charges for diamond exploration program total	**18,947.88**
Total assessment charges to be assigned to the Gadsby Block include	**$44,929.35**

11.0 Statement of Qualifications

I, Stuart Campbell Fraser of [redacted] Edmonton, Alberta, Canada, T5M 1P6, phone number 780-454-0379 do hereby certify that:

I am a registered professional geologist with the Association of Professional Engineers, Geologists and Geophysicists of Alberta, member number M47638.

I am a graduate of Dalhousie University, Halifax, Nova Scotia with a B. Sc. in geology, 1973 and a M. Sc. in geology from the University of Alberta, 1996.

I have been practicing my profession as a geologist since 1973, excluding the period to complete a Master's program at the University of Alberta. I am also a member of the Canadian Institute of Mining and Metallurgy.

I am the author of this report on the bentonite exploration potential of the Battle River area south of Rosalind, having supervised field activities and constructing geological plans and sections for the report.

I hold a 20 percent interest in the affairs of Alberta Bentonite Corporation.

Dated at Edmonton, this 27th day of December, 2000.

Stuart C. Fraser

12.0 References

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Loring Labs analytical results for Rosalind bentonite samples
Section 12, Township 43, Range 18
Aug. 22, 2000

Sample #	Date	Section	UTM co-ordinates Nad 27 Northing	Easting	description	thickness (m)	yield b/ton	% passing 200 mesh*	% moisture	pH
ABC-1	Aug. 22	Sect. 12 NE1/4			**0-0.95 bentonite** 0.4-0.6 oxidized bentonite 0.85 olive green bentonite 0.95 hit bentonitic shale					
ABC-1A					bentonite exposed in o/c slide on east side of valley					
ABC-2		Sect. 12	**5838697**	**400353**						
ABC-2A*		SE1/4			**0-1.05 green bentonite**	**1.05**	**NA**			
ABC-2B					**1.05-1.98 mainly brown bentonite** 1.98 hit bentonitic shale	**0.93**	**NA**			
ABC-3		Sect 12 SE1/4	**5838555**	**4000294**	0-2.42 glacial drift 2.42-3.70 gray bentonite					
ABC-4		Sect 12 SE1/4	**5838596**	**400356**	0-0.4 glacial till 0.4-0.62 feldspathic ss					
ABC-4A					**0.62-1.98 pale green bentonite (high yield)**	**1.36**	**72**	**1.42**	**1.42**	**8.81**
ABC-4B	Aug. 23				**1.98-2.43 brown (oxidized) bentonite** 2.43-3.15 gray bentonite (becoming more moist)	**0.45**	**65**	**1.76**	**1.76**	**8.74**
ABC-5		Sect 12 SE1/4	**5838656**	**400304**	0-2.14 glacial drift **2.14-2.76 green to brown bentonite** 2.76-2.80 bentonitic shale (soft, oxidized)	**0.62**	**68**	**1.26**	**1.26**	**8.62**

Sample #	Date	Section	Northing	Easting	description	thickness (m)	yield b/ton	% passing 200 mesh*	% moisture	pH
ABC-6		Sect 12 SE1/4	**5838468**	**400417**	0-0.5 topsoil 0.5-4.6 glacial tills 0.5-0.96 dark brown clay rich till w/coal frags 0.96-4.6 sandy rich, light br colored till 4.6-4.65 bentonitic shale					
ABC-7		Sect 12 SE1/4			0.4 m abandoned in sandstone					
ABC-8		Sect 12 SE1/4	**5838177**	**400365**	0-3.7m sandy till 2.55 very moist till 2.65 hit water table					
ABC-9		Sect 12 SE1/4	**5838555**	**400389**	0-2.25 greenish brown sandy till 2.25-4.28 brownish clay-rich till					
ABC-10	Aug. 25	Sect 12 NE1/4	**5838914**	**400200**	0-0.3 glacial till 0.3-1.12 feldspathic sandstone					
ABC-10A					**1.12-1.46 gray bentonite** 1.46-1.70 gritty clay		**NA**			
ABC-10B					**1.70-3.05 gray bentonite** 3.05 hit bentonitic shale		**NA**			
ABC-11		Sect 12 NE1/4	**5838842**	**400184**	0-0.8 fluvial sand 0.8-1.37 dk brown, clay rich till 1.37-1.50 more sandy rich till 1.50-1.85 clay rich till 1.85-4.0m dk br clay with coal frags					
ABC-12		Sect 12 SE1/4			0-2.8m clay rich dk br till					

Sample #	Date	Section	Northing	Easting	description	thickness (m)	yield b/ton	% passing 200 mesh*	% moisture	pH
ABC-13	Aug. 29	Sect 12 NE1/4	**5838893**	**399864**	0.43-1.20 br-green bentonite; hit water table at 1.1m		**NA**			

* wet sieve analysis

Appendix I Loring Labs analytical results for Rosalind bentonite samples
Section 6, Township 43, Range 17, W4th M.
Dec. 23, 2000.

Sample #	Date	Section	UTM co-ordinates Nad 27 Northing	Easting	description	thickness (m)	yield barrels/ton	% passing* 200 mesh	% moisture	pH
ABC-14	Sept. 1	Sect. 6 NW1/4	5837710	401146	**ABC_41A 0-1.05 green bentonite**	**1.05**	**48**	**3.85**	**15.51**	**9.7**
					ABC-14B 1.05-1.9m green bentonite	**0.85**	**73**	**1.08**	**13.77**	**9.04**
ABC-15	Sept. 1	Sect. 7 SW1/4			0-1.17 olive green bentonite hit shale at 1.17m					
ABC-16		Sect. 7 SW1/4	5838042	401214	0-0.86m brown, oxidized bentonite	**0.86**	**67**	**1.48**	**12.6**	**8.98**
ABC-17		Sect. 6 NW1/4	5837831	401143	**0-0.7m olive green bentonite; in outcrop**	**0.7**	**77**	**2.45**	**13.44**	**9.17**
ABC-18		Sect. 6	same location as ABC-14; check sample							
ABC-19	Sept. 6	Sect. 6 NW1/4	**5837627**	**401132**	0-4.4m glacial till with green bentonite at 3.55m; bentonitic soil 4.2-4.4m 4.4m bedrock (?)					
ABC-20		Sect. 6 NW1/4	**5837564**	**401076**	0-1.7m glacial till 1.7-2.1m feldspathic sandstone					
					ABC-20A 2.1-3.1m green bentonite	**1.0**		**NA**		
					ABC-20B 3.1-4.1m green bentonite	**1.0**		**NA**		
					ABC-20C 4.1-4.63 green bentonite	**0.5**		**NA**		
					4.63 hit silica chips (?) in bentonite					
ABC-21		Sect. 6 NW1/4	**5837548**	**401097**	0-5.1m glacial till till sample collected for diamond indicator mineral analysis					
ABC-22		Sect. 6 NW1/4	**5837528**	**401036**	0-4.7m glacial till					

Sample #	Date	Section	Northing	Easting	description	thickness (m)	yield barrels/ton	% passing* 200 mesh	% moisture	pH
ABC-23	Sept 12	Sect. 6 NW1/4	**5837385**	**400912**	0-1.32 glacial till					
					1.32-1.72 lignite		**NA**			
					1.72-2.08 brown (bentonitic) shale					
					2.08-2.1 feldspathic sandstone					
					2.1-2.68 bentonitic shale					
					2.68-3.42 feldspathic ss					
					3.42-3.58 brown bentonitic shale					
					could not penetrate deeper; 3.58m EOH					
ABC-24	Sept. 14	Sect. 6 NW1/4	**5837366**	**400953**	0-5.1m glacial till					
					0-4.01 light brown silty till					
					4.01-5.1 more sandy till; becoming very moist at 5.1m					
					hole deepened; sandy till to 6.0m					
					6.0-6.2m more clay rich					
					water table at 6.0m					
ABC-25	Sept. 12	Sect. 6 NW1/4	**5837376**	**400934**	0-4.31m glacial till					
					ABC-25A 4.31-5.2 olive green bentonite	**0.89**	**66**	**3.45**	**26.71**	**8.31**
					ABC-25B 5.2-6.1m olive green bentonite	**0.9**	**82**	**1.76**	**27.39**	**8.32**
ABC-26	Sept. 12	Sect. 6 NW1/4	**5837226**	**400876**	0-5.2m glacial till					
					6.55-9.93 green bentonite					
					ABC-26A 6.55-7.7m	**1.15**	**65**	**3.16**	**28.79**	**8.32**
	hole deepened Oct. 17				**ABC-26B 7.7-9.1m**	**1.4**	**65**	**2.65**	**33.02**	**8.32**
					ABC-26C 9.1-9.93m	**0.83**	**76**	**2.28**	**30.24**	**8.31**
					9.93-9.95 brown shale; could not penetrate deeper.					
ABC-27	Sept. 12	Sect. 6 NW1/4	**5837328**	**400899**	0-5.5m glacial till					
					ABC-27A 5.5--6.2m	**0.7**	**55**	**1.88**	**17.37**	**8.56**
					ABC- 27B 6.2-7.15m	**0.95**	**71**	**2.15**	**30.34**	**8.52**
					7.15-7.2m cream to light green colored silty bentonite; **still in bentonite**					

Sample #	Date	Section	Northing	Easting	description	thickness (m)	yield barrels/ton	% passing* 200 mesh	% moisture	pH
ABC-28	Sept. 16	Sect. 6 NW1/4	**5837403**	**400973**	0-5.9m glacial till 0-4.1 silty till 4.1-5.1 more sandy rich till becomes moist at 5.1m becomes very moist at 5.8m water table at 5.85m 5.9-6.1m lignite 6.1m could not penetrate deeper.					
ABC-29	Sept. 16	Sect. 6 NW1/4	**5837413**	**400954**	0-3.45m glacial till 3.45-3.95m green bentonite					
					ABC-29A 3.95-5.10 green bentonite	**1.15**	**68**	**2.59**	**20.94**	**8.58**
					ABC-29B 5.10-5.7m green bentonite	**0.6**	**76**	**1.76**	**21.02**	**8.50**
					5.7 hit bentonitic shale; EOH					
ABC-30	Sept. 19	Sect. 6 NW1/4			0-6.2m glacial till 0-3.0m light brown silty till 3.3-3.75m more sandy till 3.75-5.2m dark brown clay 5.2-5.9m sandy rich till, very moist 5.9-6.2m clay; water table at 6.1m					
ABC-31	Sept. 19	Sect. 6 NW1/4			0-1.33m glacial till hit rocks at 1.33m; abandon hole location 51m southwest of hole 27 on a bearing of 209 degrees.					
ABC-32	Sept. 19	Sect. 6 NW1/4	**5837434**	**401124**	0-0.2m glacial till 0.2-0.7m feldspathic ss 0.7-0.95 gray clay					
					ABC-32 0.95-2.05m green bentonite	**1.1**	**68**	**2.34**	**24.09**	**8.55**

Sample #	Date	Section	Northing	Easting	description	thickness (m)	yield barrels/ton	% passing* 200 mesh	% moisture	pH
ABC-33	Sept. 19	Sect. 6 NW1/4	**5837301**	**401151**	0-1.25m glacial till 1.25-1.70m bentonitic shale 1.7-2.4 dark brown clay **hit lignite at 2.4m and perched water table; stop drilling.** **green bentonite layer projected to be 2.4m below lignite.**					
ABC-34	Oct. 11	Sect. 6 NW1/4	**5837167**	**401115**	0-3.65 glacial till **3.65-4.54 lignite** 4.54-4.81 bentonitic shale 4.81-6.0 feldspathic ss 6.0-6.15 silty bentonite		**NA**			
ABC-35		Sect. 6 NW1/4	**5837209**	**401279**	0-3.94 glacial till 3.94-4.1 feldspathic ss					
ABC-36	Oct. 13	Sect. 6 NE1/4	**5837136**	**401424**	0-8.4m glacial till 0-5.1 silty till 5.1-5.68 more clay rich till w/5.68-5.8 lignite 5.68-6.9 intermixed feldspathic ss, coal frags and silty till					
ABC-37	Oct. 13	Sect. 6 NW1/4	**5837193**	**401308**	0-5.1m glacial till 0-4.5m silty till 4.5-5.1 more clay rich till **5.1- 5.76 lignite** 5.76-5.9 brown shale 5.9-7.1 feldspathic ss 7.1-7.4m brown shale		**NA**			
ABC-38	Oct. 13	Sect. 6 NE1/4			hole started east of hole ABC-36, but aborted quickly in glacial till at <3m.					
ABC-39	Oct. 18				hole started southeast of ABC-40; hit bedrock at only 2.3m, considerably above bentonite target					

Sample #	Date	Section	Northing	Easting	description	thickness (m)	yield barrels/ton	% passing* 200 mesh	% moisture	pH
ABC-40	Oct. 18	Sect. 6 NW1/4	**5837120**	**400894**	0-9.34m glacial till 0-8.0m variably silty to sandy till; 8.0-9.34m mainly rusty ironstone fragments in moist sandy till.					
ABC-41	Oct.18	Sect. 6 NW1/4	**5837140**	**400863**	0-6.2m glacial till **6.2-7.0m lignite (with minor clay inter-mixed)** 7.0-7.38 brown shale 7.38-7.65m feldspathic ss 7.65-9.0m bentonitic shale with intermixed ss **ABC-41** 9.0-10.0m gray bentonite 10.0-11.0m gray bentonite; stopped in bentonite.	**1.0**	**NA** **45** **NA**	**3.39**	**23.79**	**8.78**
ABC-42		Sect. 6 NW1/4	**5837181**	**400901**	0-7.9 glacial till 7.9-8.95 feldspathic ss intermixed with shale **ABC-42A** 8.95-10.03 light green bentonite **ABC-42B** 10.03-11.1 gray bentonite	**1.08** **1.07**	**64** **51**	**2.88** **3.15**	**29.02** **22.52**	**8.38** **8.69**
ABC-43	Oct. 23	Sect. 6 NW1/4	**5837230**	**400905**	0-9.8m glacial till **9.8-9.9m greenish brown bentonite** 9.9-10.25m bentonitic shale		**NA**			
	hole located 27.5m east from ABC-26									
ABC-44	Oct. 23	Sect. 6 NW1/4	**5837114**	**400935**	0-8.0m glacial till 8.0-8.95 mainly feldspathic sandstone; may include minor volcanic ash 8.95m could not penetrate deeper with auger.					
ABC-45		Sect. 6 NW1/4			0-4.5m glacial till **4.5-7.55 green to brown bentonite** 7.55 hit bentonitic shale		**NA**			

Sample #	Date	Section	Northing	Easting	description	thickness (m)	yield barrels/ton	% passing* 200 mesh	% moisture	pH
ABC-46	Oct. 26	Sect. 6 NW1/4	**5837271**	**400895**	0-4.8m glacial till 4.8-5.17 silty bentonite **5.17-7.65 olive green bentonite** 7.65-7.80 very moist, sandy		**NA**			
ABC-47	Oct. 26	Sect. 6 NW1/4	**5837266**	**400918**	0-7.1m glacial till 0-5.2 variably silty to sandy till 5.2-5.3m ironstone frags predominent 5.3-7.1 sandy till; very moist **7.1-7.4m poor quality bentonite; contains coal fragments which is probable part of glacial till**		**NA**			
ABC-48		Sect. 6 NW1/4			hole drilled to only 3m depth in till; stopped in rock cobbles.					
ABC-49	Oct. 28	Sect. 6 NW1/4	**5837362**	**400970**	0-6.2m 4.8m becoming very moist hole located 14.7m east of hole ABC-24					
ABC-50	Oct. 28 Oct. 31	Sect. 6 NW1/4 deepened hole			0-2.98m glacial till 2.98-3.5m green bentonitic shale 3.5-5.0m brown bentonitic shale					
ABC-51	Nov. 2	Sect. 6 NW1/4	**5837099**	**400882**	0-5.3m glacial till 5.2-5.8m silty bentonite 5.8-6.15m green bentonite (bedrock ?)					
ABC-52	Nov. 4	Sect. 6 NW1/4	**5837083**	**400880**	0-5.6m glacial till (4.5-5.2m brown clay) 5.6-6.2m feldspathic ss					
ABC-53		Sect. 6 NW1/4	**5837173**	**400914**	0-4.0m glacial till 4.0-5.8m bentonitic shale 6.1-6.38m lignite; could not penetrate 6.38m		**NA**			

Sample #	Date	Section	Northing	Easting	description	thickness (m)	yield barrels/ton	% passing* 200 mesh	% moisture	pH
ABC-54	Nov. 10	Sect. 6 NW1/4	**5837182**	**400860**	0-6.3m glacial till **6.3-7.0m lignite** 7.0-7.2m bentonitic shale 7.2m could not penetrate deeper, rods binding		**NA**			
ABC-55	Nov. 11	Sect. 6 NW1/4			0-2.55m glacial till 2.55-2.95m lignite 2.95-3.6m bentonitic shale 3.6-4.2m sandstone 4.2-5.4m ss & bentonitic sh. **ABC-55A** 5.4-6.4 **ABC-55B** 6.4-7.14m 7.14m bentonitic shale, EOH.	**1.0** **0.74**	**66** **84**	**3.49** **1.48**	**26.56** **25.96**	**8.36** **8.43**
ABC-56	Nov. 11	Sect. 6 NW1/4			0-4.1m glacial till; hit minor water. 5.1m water table (?) 5.1-6.8m very wet; poor quality bentonite (?) at 6.8m bentonite contains a large (5cm) chunk of coal; **in situ (?)**		**NA**			
	location 35.5m east of ABC-49									
ABC-57		Sect. 6 NW1/4			0-6.2m glacial till minor moisture at 6.0m	location 46.2m north of ABC-50				
ABC-58		Sect. 6 NW1/4			0-5.6m glacial till becomes moist at 5.5m	21.8m on a bearing of 125 degrees from ABC-22				
ABC-59		Sect. 6 NW1/4			0-5.33m glacial till					
ABC-60		Sect. 6 NW1/4			0-7.1m glacial till	32.35m on a bearing of @289 degrees from ABC-27				
ABC-61	Nov. 18	Sect. 6 NW1/4			0-1.27m glacial till 1.27-1.30m feldspathic ss; could not penetrate deeper in bedrock	48.6m north of ABC-59 on bearing of 016 deg.				

Sample #	Date	Section	Northing	Easting	description	thickness (m)	yield barrels/ton	% passing* 200 mesh	% moisture	pH
ABC-62		Sect. 6 NW1/4			0-4.8m glacial till 0-3.6m silty and in part clay rich till 3.6-4.8m sandy till; becoming moist at at 4.6m. 4.8-5.7m intermixed ss and bentonitic sh.					
					ABC-62A 5.7-6.5m green bentonite	**0.8**	**74**	**2.35**	**38.12**	**8.41**
					ABC-62B 6.5-7.5 green bentonite	**1.0**	**65**	**2.45**	**33.89**	**8.40**
					ABC-62C 7.5-8.4m green bentonite	**0.9**	**88**	**1.23**	**34.2**	**8.40**
					8.4-8.45 bentonitic shale					
ABC-63	Nov. 20	Sect. 6 NW1/4			0-7.15m glacial till 0-4.5m silty till 4.5-5.2m sandy till, becoming moist at 5.0m 5.2-5.5 more clay rich (brown) till 5.5-7.15m generally sandy till water table at 6.25m.					
ABC-64		Sect. 6 NW1/4			0-6.9m glacial till 6.9-7.15m feldspathic ss 7.15-7.9m poor quality gray bentonite to bentonitic shale					
					ABC-64A 7.9-9.0m green bentonite	**1.1**	**64**	**3.65**	**33.5**	**8.46**
					ABC-64B 9.0-10.0m green bentonite	**1.0**	**69**	**4.1**	**32.35**	**8.50**
					ABC-64C 10.0-10.55m greenish brown bentonite	**0.55**	**74**	**1.28**	**29.29**	**8.50**
ABC-65	Nov. 28	Sect. 6 NW1/4 296 deg. bearing to ABC-64			0-3.5m glacial till 3.5-4.65m feldspathic ss 4.65-6.0m bentonitic shale;to be deepened later.					
ABC-66	Dec 2 Dec. 6				0-4.2m glacial till deepened to 6.0m in glacial till.					

* **% passing 200 mesh in wet sieve analysis**

Appendix 1
Loring Labs analytical results for Rosalind bentonite samples
Sections 18 & 20 , Township 43, Range 17, W4th M
August 5, 2000

Sample #	Date	Section	Northing	Easting	description	thickness (m)	yield barrels/ton	% passing 200 mesh	% moisture	pH
SFR-38	May 26	Sect. 20 NW1/4			0-1.85m glacial drift 1.85-2.17m feldspathic sandstone 2.17-2.80m highly oxidized, br-gr bentonite 2.80m bentonitic shale; EOH	**0.63**	**47**	**2.59**		
SFR-39	May 26	Sect. 20 NW1/4			0-3.45m glacial till 3.45m bentonitic shale; no samples collected					
SFR-52	June 20	Sect. 18			0-0.5m glacial till					
SFR-52A		SE1/4			0.5-1.0m gray bentonite	**0.5**	**55**	**6.55**		
SFR-52B					1.0-2.0m green bentonite	**1.0**	**52**	**2.01**		
SFR-52C		sample just north of Battle R.			2.0-3.1m green bentonite 3.1m hit bentonitic shale	**1.1**	**63**	**0.78**		
SFR-53	June 20	Sect. 18			0-2.9m glacial till; hit water table at 2.2m					
SFR-53A		SE1/4			2.9-3.9m gray bentonite	**1.0**	**41**	**12.75**		
SFR-53B					3.9-4.75m gray-green bentonite	**0.85**	**50**	**2.68**		
SFR-54	June 22	Sect. 18	**5841350**	**401984**	0-2.2m glacial drift					
SFR-54A		NE1/4			2.2-2.7m tan colored, oxidized bentonite	**0.5**	**46**	**6.5**		
SFR-54B					2.7-3.7m green bentonite	**1.0**	**65**	**1**		
SFR-54C					3.7-4.35m green bentonite	**0.65**	**80**	**0.45**		
SFR-55	June 22	Sect. 18 NE1/4	**5841656**	**401870**	lignite sample		**NA**			

Loring Laboratories Ltd.

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TO: STUART FRASER
10705 - 139 Street
Edmonton, Alberta
T5M 1P6

FILE: 43057

DATE: June21, 2000

BENTONITE ANALYSIS

Sample No.	% 200 Mesh	% Solids	B/T Yield	Apparent Viscosity	FANN 600	FANN 300	Plastic Viscosity	Yield Point	pH	% Moisture
SFR - 25	0.68	7.0	87	18.5	37	22	15	7	8.75	26.77
		8.0	94	37.5	75	46	29	17		
SFR - 26A	0.65	8.0	60	8.5	17	7	10	<1	8.71	23.83
		10.0	51	12.5	25	15	10	5		
SFR - 26B	0.59	8.0	82	24	48	29	19	10	8.71	28.85
		10.0	70	10	20	12	8	4		
SFR - 31A	1.39	8.0	75	19	38	22	16	6	8.73	32.75
		9.0	68	20.5	41	24	17	7		
SFR - 31B	1.48	7.0	75	11	22	12	10	2	8.69	29.74
		8.0	88	30.5	61	37	24	13		

Certified by: [redacted]

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FILE: 43058

DATE: June26, 2000

BENTONITE ANALYSIS

Sample No.	% 200 Mesh	% Solids	B/T Yield	Apparent Viscosity	FANN 600	FANN 300	Plastic Viscosity	Yield Point	pH	% Moisture
SFR - 29	5.50	8.0	36	2	4	3	1	2	8.35	20.18
		10.0	31	25	5	3	2	1		
SFR - 38	2.59	8.0	47	4	8	4	4	0	8.63	20.73
		10.0	45	6	12	6	6	0		
SFR - 40	0.54	8.0	75	20.5	41	24	17	7	8.67	29.30
		10.0	85	66.5	133	85	48	37		
SFR - 41	1.21	8.0	83	25	50	30	20	20	8.96	29.10
		10.0	130	120	240	172	68	104		
SFR - 42	1.52	8.0	67	13.5	27	15	12	3	8.77	31.34
		10.0	87	59.5	119	78	41	37		
SFR - 35A	2.90	8.0	53	6	12	7	5	2	8.84	25.51
		10.0	67	13	26	15	11	4		
SFR - 35B	0.51	8.0	67	11.5	23	12	11	1	9.01	32.50
		10.0	81	48.5	97	61	36	25		
SFR - 35C	0.33	8.0	80	21.5	43	25	18	7	9.11	31.26
		10.0	150	136	272	200	72	128		
SFR - 37A	3.23	8.0	51	5.5	11	6	5	1	9.03	25.58
		10.0	54	12.5	25	15	10	5		
SFR - 37B	1.04	8.0	68	13.5	27	15	12	3	8.94	34.81
		10.0	82	47.5	95	60	35	25		
SFR - 37C	1.47	8.0	77	20	40	24	16	8	8.94	33.62
		10.0	102	97.5	195	136	59	75		

Certified by: [redacted]

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Edmonton, Alberta
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FILE: 43120

DATE: July 25, 2000

BENTONITE ANALYSIS

Sample No.	% 200 Mesh	% Solids	B/T Yield	Apparent Viscosity	FANN 600	FANN 300	Plastic Viscosity	Yield Point	pH	% Moisture
SFR - 48	0.58	8.0	72	15.5	31	18	13	5	8.38	15.65
		10.0	85	68	136	94	42	52		
SFR - 49A	4.76	8.0	51	6	12	7	5	2	8.42	16.65
		10.0	55	14	28	16	12	4		
SFR - 50	2.26	8.0	74	16.5	33	19	14	5	9.20	18.51
		10.0	84	67	134	90	44	46		
SFR - 52A	6.55	8.0	55	7.5	15	9	6	3	8.40	26.56
		10.0	70	15	30	17	13	4		
SFR - 52B	2.01	8.0	52	6.5	11	6	5	1	8.42	23.40
		10.0	69	13.5	27	15	12	3		
SFR - 52C	0.78	8.0	63	11	22	13	9	4	8.34	21.80
		10.0	75	41	82	52	30	22		
SFR - 53A	12.75	8.0	41	3	6	3	2	1	8.40	15.04
		10.0	39	5	10	5	5	0		
SFR - 53B	2.68	8.0	50	5.5	11	6	5	1	8.64	17.77
		10.0	53	13.5	27	15	12	3		
SFR - 54A	6.50	8.0	46	4.5	9	5	4	1	8.75	10.47
		10.0	44	7.5	15	8	7	1		
SFR - 54B	1.00	8.0	65	12	24	13	11	2	8.71	23.17
		10.0	80	44	88	50	38	12		
SFR - 54C	0.45	8.0	80	22.5	45	27	18	9	8.62	19.99
		10.0	103	97	194	136	58	78		

Certified by: [redacted]

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Edmonton, Alberta
T5M 1P6

FILE: 43375

DATE: October 12, 2000

BENTONITE ANALYSIS

Sample No.	% 200 Mesh	% Solids	B/T Yield	Apparent Viscosity	FANN 600	FANN 300	Plastic Viscosity	Yield Point	pH	% Moisture
ABC - 4A	1.42	8.0	72	15.5	31	18	13	5	8.81	15.24
		10.0	95	37.5	75	48	27	22		
ABC - 4B	1.76	8.0	65	13.5	27	15	12	3	8.74	14.40
		10.0	70	31.5	63	38	25	13		
ABC - 5	1.26	8.0	68	14	28	17	11	6	8.62	13.21
		10.0	68	27.5	55	35	20	15		
ABC -14A	3.85	8.0	48	4.5	9	3	6	1	9.70	15.51
		10.0	46	8	16	9	7	2		
ABC -14B	1.08	8.0	73	16	32	18	14	4	9.04	13.77
		10.0	80	50	100	63	37	26		
ABC - 16	1.48	8.0	67	12.5	25	13	12	1	8.98	12.60
		10.0	73	35	70	42	28	14		
ABC - 17	2.45	8.0	77	19.5	39	22	17	5	9.17	13.44
		10.0	88	66	132	87	45	42		
ABC - 5	2.68	8.0	50	5.5	11	6	5	1	8.64	17.77
		10.0	53	13.5	27	15	12	3		

Certified by: [redacted]

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Edmonton, Alberta
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FILE: 43508

DATE: December 22, 2000

BENTONITE ANALYSIS

Sample No.	% 200 Mesh	% Solids	B/T Yield	Apparent Viscosity	FANN 600	FANN 300	Plastic Viscosity	Yield Point	pH	% Moisture
25A	3.45	8.0	66	13.5	27	15	12	3	8.31	26.71
		10.0	74	37.5	75	46	29	17		
25B	1.76	8.0	82	25	50	31	19	12	8.32	27.39
		10.0	85	52.5	105	69	36	33		
26A	3.16	8.0	65	12.5	25	15	10	5	8.32	28.79
		10.0	72	31	62	38	24	14		
26B	2.65	8.0	65	12.5	25	14	11	3	8.32	33.02
		10.0	70	29	58	35	23	12		
26C	2.28	8.0	76	21	42	24	18	6	8.31	30.24
		10.0	90	62.5	125	83	42	41		
27A	1.88	8.0	55	7.5	15	8	7	1	8.56	17.37
		10.0	56	14	28	15	13	2		
27B	2.15	8.0	71	17.5	35	20	15	5	8.52	30.34
		10.0	80	45	90	57	33	24		

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10705 - 139 Street
Edmonton, Alberta
T5M 1P6

FILE: 43508

DATE: December 22, 2000

BENTONITE ANALYSIS

Sample No.	% 200 Mesh	% Solids	B/T Yield	Apparent Viscosity	FANN 600	FANN 300	Plastic Viscosity	Yield Point	pH	% Moisture
29A	2.59	8.0	68	14	28	16	12	4	8.58	20.94
		10.0	77	40.5	81	50	31	19		
29B	1.76	8.0	76	21.5	43	26	17	9	8.50	21.02
		10.0	90	65	130	86	44	42		
32	2.34	8.0	68	14	28	16	12	4	8.55	24.09
		10.0	75	39	78	49	29	20		
41	3.39	8.0	45	5	10	5	5	0	8.78	23.79
		10.0	42	6.5	13	8	5	3		
42A	2.88	8.0	64	11	22	12	10	2	8.38	29.02
		10.0	66	26	52	31	21	10		
42B	3.15	8.0	51	5.5	11	6	5	1	8.69	22.52
		10.0	49	9.5	19	10	9	1		
55A	3.49	8.0	66	13.5	27	15	12	3	8.36	26.56
		10.0	80	45.5	71	43	28	15		
55B	1.48	8.0	84	24	48	28	20	8	8.43	25.96
		10.0	92	71	142	94	48	46		

Certified by: [redacted]

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TO: STUART FRASER
10705 - 139 Street
Edmonton, Alberta
T5M 1P6

FILE: 43532

DATE: December 22, 2000

BENTONITE ANALYSIS

Sample No.	% 200 Mesh	% Solids	B/T Yield	Apparent Viscosity	FANN 600	FANN 300	Plastic Viscosity	Yield Point	pH	% Moisture
[redacted]	2.35	8.0	74	16.5	33	19	14	5	8.41	38.12
		10.0	83	48	96	60	36	24		
62B	2.45	8.0	65	12.5	25	14	11	3	8.40	33.89
		10.0	72	35	70	42	28	14		
62C	1.23	8.0	88	29.5	59	36	23	13	8.40	34.20
		10.0	106	103.5	207	142	65	77		
64A	3.65	8.0	64	11.5	23	13	10	3	8.48	33.50
		10.0	70	29.5	59	34	25	9		
64B	4.10	8.0	69	15	30	17	13	4	8.50	32.35
		10.0	78	42.5	85	52	33	19		
64C	1.28	8.0	74	16.5	33	19	14	5	8.50	29.29
		10.0	84	50.5	101	64	37	27		

Certified by: [redacted]

A PRELIMINARY ANALYSIS
DIAMOND POTENTIAL
THE GADSBY PROPERTY, ALBERTA
FOR
COLUMBIA YUKON RESOURCES LIMITED

A PRELIMINARY ANALYSIS OF THE DIAMOND POTENTIAL OF THE GADSBY PROPERTY, ALBERTA FOR COLUMBIA YUKON RESOURCES LIMITED

Executive Summary

The Gadsby property of Columbia Yukon Resources covers approximately 300,000 hectares located some 90 kilometres southeast of Edmonton, Alberta. The mineral holdings were recently acquired as a grass roots diamond exploration project in a region that is currently very active, inspired by the discovery of diamondiferous kimberlites in the Peace River region of northern Alberta.

The Gadsby project is considered to be prospective on the basis of three key parameters:

- The area has diamond indicator mineral anomalies on a regional scale.
- It is located in a tectonostratigraphic domain that may be conducive to the emplacement of diamondiferous diatremes.
- It has a temporal range of exposed stratigraphic units that would enable such potential host rocks to sub-crop.

These combined features indicate that the CYR property is a prime area for investigation by airborne magnetics as a first step toward identifying kimberlites. Additional work will be required following this survey.

Diamond indicator mineral anomalies: Two indicator mineral anomalies have been reported in a group of five widely spaced till samples taken within or directly adjacent to the Gadsby property (figure 1). However, due to the complexities of the glacial history of Alberta, provenance of such indicator minerals is uncertain. In general terms the Gadsby area has been affected by an early southeasterly advance from the Rocky Mountains between 0.7 and 2.5 million years ago, followed by the major Laurentide continental glaciation from the northeast beginning about 120,000 years before the present. As a result a typical dispersion train would be spread to the southeast from its bedrock source by the Rocky Mountain advance and would subsequently be smeared to the southwest during the Laurentide event. Thus any of the several

indicator mineral anomalies located to the south or southwest of the property could be of interest with respect to the Gadsby property.

Tectonostratigraphic domain: Areas underlain by thick PreCambrian Basement are generally regarded as having the best potential for the development of diamondiferous diatremes. The Gadsby area is characterized by a regional residual Bouger gravity low that is typical of an area underlain by great thicknesses of such basement (figure 2). Investigations based on geologcal data from oil/gas drill holes and regional geophysical trends and patterns show that two basement domains, the Lacombe Domain (uncertain origin) and the Hearne Domain (Archean: 2.6-2.8 Ga), underlie the Paleozoic formations in the Gadsby area. Structural dislocations such as might follow the tectonic boundary between the two domains could provide loci for the emplacement of diatreme material.

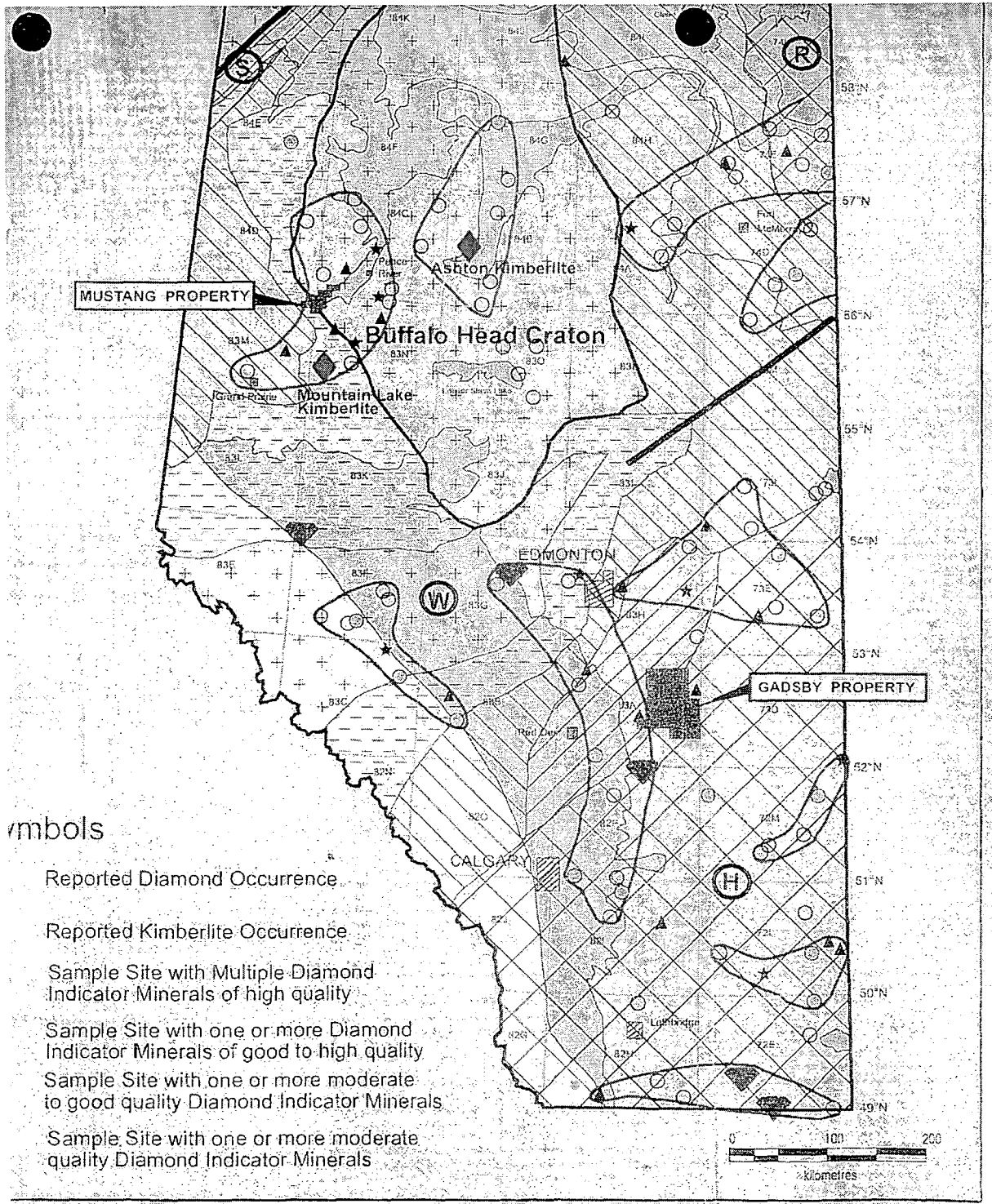
Temporal range: Worldwide kimberlites and lamproites have been emplaced throughout geological time, ranging in age from Quaternary to Proterozoic. Within this framework several periods emerge as being unusually productive in terms of diamond prospectivity. The Upper Cretaceous to Middle Jurassic (age range 66 – 170 Ma) is known to be one of these periods of emplacement of diamondiferous kimberlitic/lamproitic bodies in many areas of the world. Several of the famous South African diamond mines, as well as advanced prospects at Lac de Gras, Northwest Territories (74 Ma), the recent Ashton diamond discovery northeast of Peace River, Alberta (93 Ma), and the Mountain Lake kimberlite southwest of Peace River lie within this temporal range.

The Gadsby property has subcropping Upper Cretaceous sedimentary units of the Bearpaw Formation (late Campanian) and the Horseshoe Canyon Formation (Mastrichtian) that together span a time period from approximately 66 to 77 Ma (figure 3). The later formation is known to contain a few bentonite horizons that are thought to represent tuff horizons associated with subaerial volcanic activity, possibly in some instances related to the emplacement of kimberlite bodies. On the basis of the foregoing temporal observations the near surface lithologic units at the Gadsby property could contain kimberlite or related bodies associated with the Lac de Gras, Mountain Lake, or any subsequent emplacement episodes.

General Conclusions: It is concluded that the Gadsby property of Columbia Yukon Resources Limited is a conceptually sound grass roots diamond exploration prospect in a region that is experiencing substantial current activity in this regard. The property has not previously been tested by state of the art techniques to identify kimberlite or related igneous bodies. Consequently a modern exploration program designed to develop the diamond potential of this property is considered to be fully justified. It is proposed to initiate work in this regard with a compilation of existing regional geological and geophysical data, followed by a High Resolution Airborne Magnetic (HRAM) survey over the property. The aeromagnetic database would be used to identify potential kimberlite targets for subsequent testing.

A first phase budget of C$350,000 would allow for completion of the initial compilation, and the HRAM survey, with allowance for selective ground follow-up of potential target areas and drill testing of a few potential targets. It is anticipated that a second round of work will likely be required to complete the routine testing for the presence of all potential diamondiferous bodies. Details of the first phase budget are presented in the attached table.

A provisional unallocated additional amount of C$500,000 will probably be required to complete the ground follow-up and drill testing of the overall property for a grand total of C$850,000. Substantial additional expenditures would be required in the event that kimberlite / lamproite bodies are encountered.



ymbols

- Reported Diamond Occurrence
- Reported Kimberlite Occurrence
- Sample Site with Multiple Diamond Indicator Minerals of high quality
- Sample Site with one or more Diamond Indicator Minerals of good to high quality
- Sample Site with one or more moderate to good quality Diamond Indicator Minerals
- Sample Site with one or more moderate quality Diamond Indicator Minerals

- Devonian
- Precambrian
- Disturbed Belt
- Kimberlite Indicator Trends
- Major Tectonic / Shear Zone

Basement Domain

Origin Uncertain

- Lacombe Domain

2.0 - 1.8 Ga Magmatic Arcs

2.4 - 2.0 Ga Magnetic Lows

2.4 - 2.0 Ga Accreted Terranes

- (H) Hottah
- (B) Buffalo Head
- (W) Wabamun

Archean 2.6-2.8 Ga

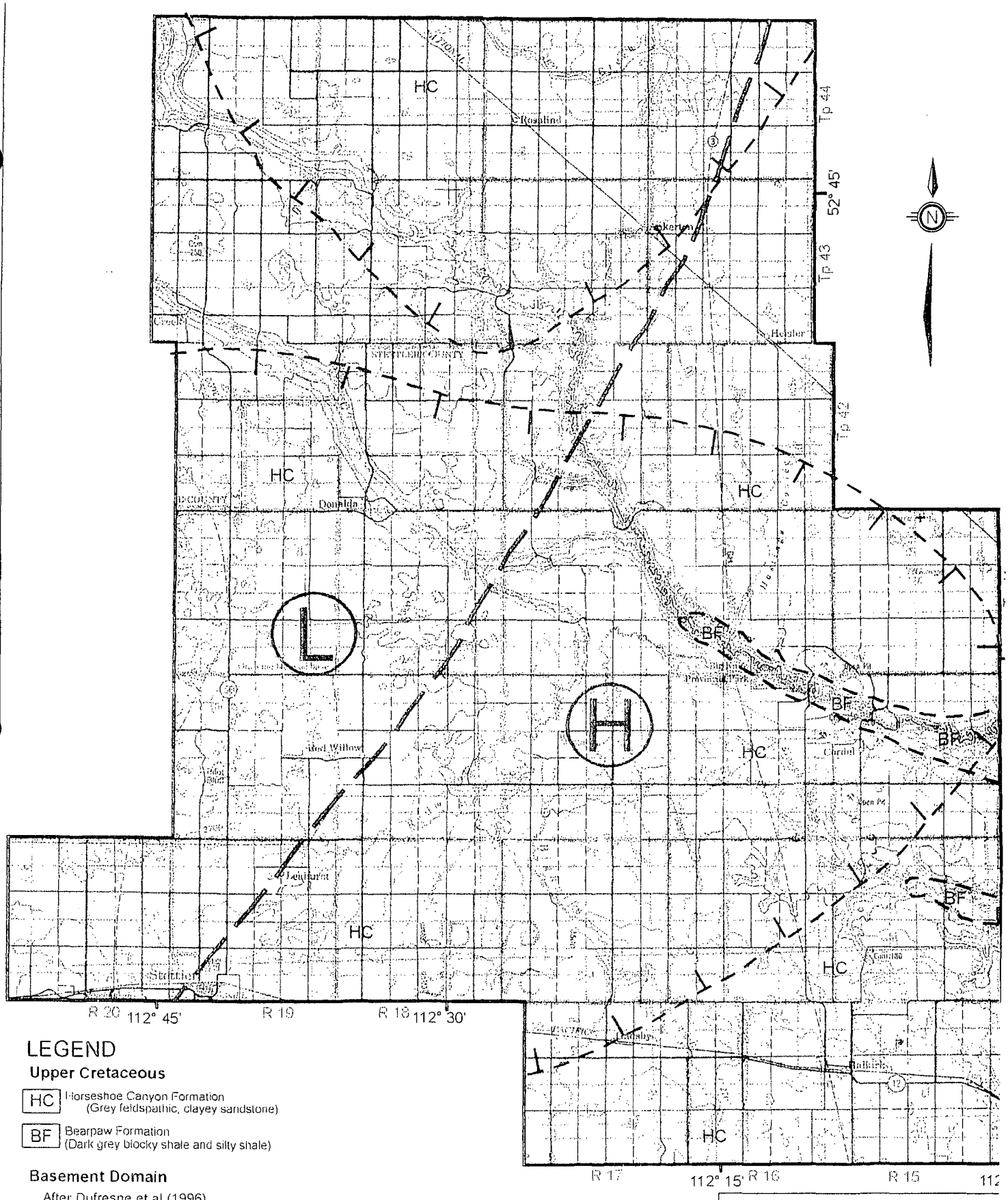
- (S) Slave
- (R) Rae
- (H) Hearne

COLUMBIA YUKON RESOURCES INC.

ALBERTA, CANADA GEOLOGICAL MAP

MAP REF. NO. 1815-001	DRAFTED BY: M.B.
SCALE: AS SHOWN	DRAWN: MPH TORONTO
FIGURE: 1	DATE: APRIL 1998

MPH CONSULTING LIMITED — *International Exploration & Mining Consultants*



LEGEND

Upper Cretaceous

- HC — Horseshoe Canyon Formation (Grey feldspathic, clayey sandstone)
- BF — Bearpaw Formation (Dark grey blocky shale and silty shale)

Basement Domain

After Dufresne et al (1996)

Lacombe Domain (Origin Uncertain) — L

Hearne Domain (Archean: 2.6 -2.8 Ga) — H

After MPH (1998)

Residual Bouguer Gravity Low

0 5 10 15

kilometres

Topography after NTS sheet 83A

COLUMBIA YUKON RESOURCES IN

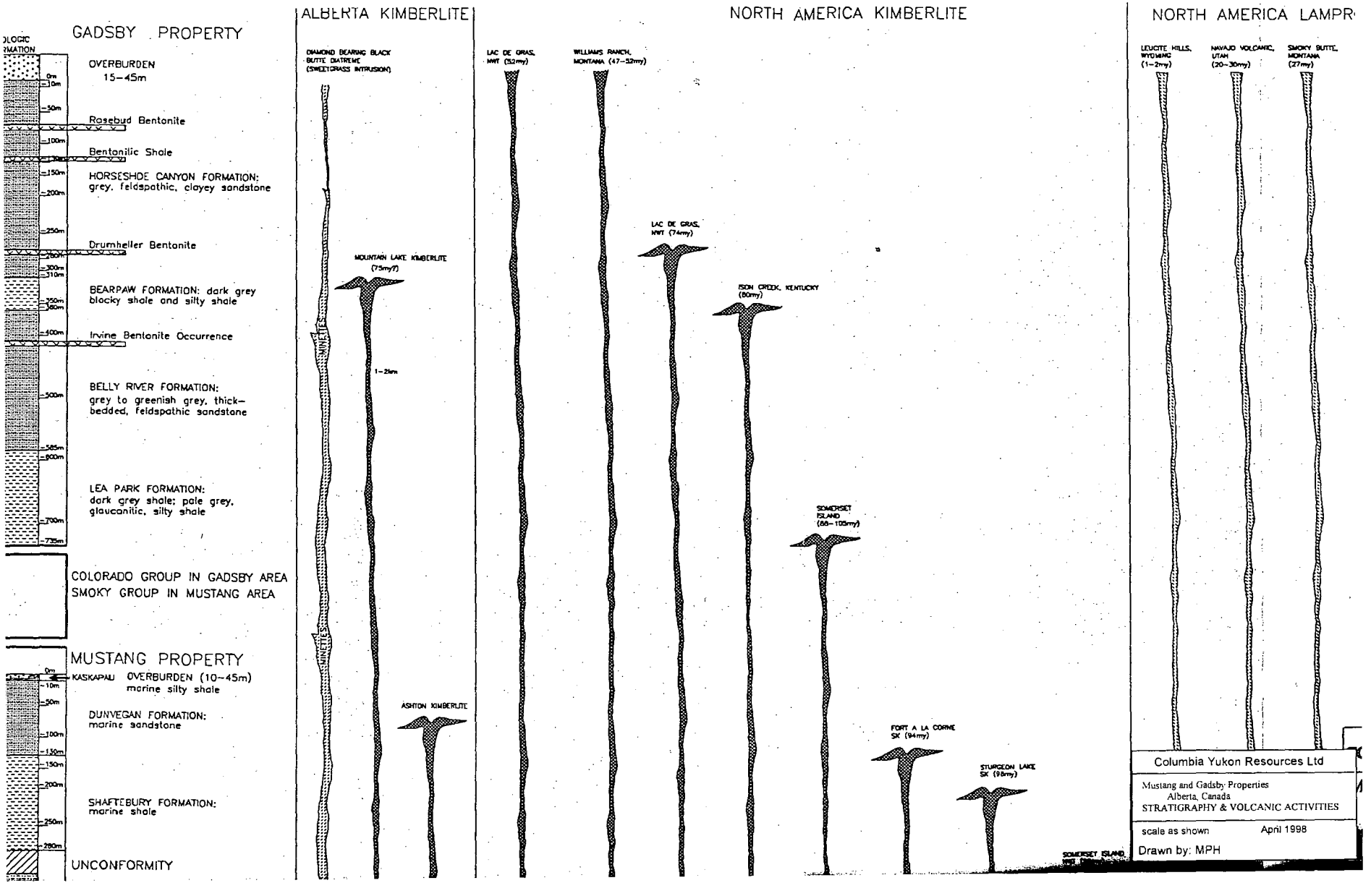
GADSBY PROPERTY

ALBERTA, CANADA

GEOLOGY

MAP REF. NO.: 1815-002	DRAFTED BY: M.B.
SCALE: AS SHOWN	DRAWN: MPH TORONT
FIGURE: 2	DATE: APRIL 1998

MPH CONSULTING LIMITED — International Exploration Mining Consultants


GADSBY PROPERTY
OVERBURDEN
15–45m
Rosebud Bentonite
Bentonilic Shale
HORSESHOE CANYON FORMATION:
grey, feldspathic, clayey sandstone
Drumheller Bentonite
BEARPAW FORMATION: dark grey
blocky shale and silty shale
Irvine Bentonite Occurrence
BELLY RIVER FORMATION:
grey to greenish grey, thick-
bedded, feldspathic sandstone
LEA PARK FORMATION:
dark grey shale; pale grey,
glauconitic, silty shale
COLORADO GROUP IN GADSBY AREA
SMOKY GROUP IN MUSTANG AREA
MUSTANG PROPERTY
KASKAPAU OVERBURDEN (10–45m)
marine silty shale
DUNVEGAN FORMATION:
marine sandstone
SHAFTEBURY FORMATION:
marine shale
UNCONFORMITY
ALBERTA KIMBERLITE
DIAMOND BEARING BLACK
BUTTE DIATREME
(SWEETGRASS INTRUSION)
MOUNTAIN LAKE KIMBERLITE
(75my?)
1–2km
MINETTES
MINETTES
ASHTON KIMBERLITE
NORTH AMERICA KIMBERLITE
LAC DE GRAS,
NWT (52my)
WILLIAMS RANCH,
MONTANA (47–52my)
LAC DE GRAS,
NWT (74my)
ISON CREEK, KENTUCKY
(80my)
SOMERSET
ISLAND
(68–105my)
FORT A LA CORNE
SK (94my)
STURGEON LAKE
SK (98my)
SOMERSET ISLAND
NORTH AMERICA LAMPR
LEUCITE HILLS,
WYOMING
(1–2my)
NAVAJO VOLCANIC,
UTAH
(20–30my)
SMOKY BUTTE,
MONTANA
(27my)
Columbia Yukon Resources Ltd
Mustang and Gadsby Properties
Alberta, Canada
STRATIGRAPHY & VOLCANIC ACTIVITIES
scale as shown
April 1998
Drawn by: MPH

GADSBY DIAMOND PROJECT, ALBERTA, C-1815

PHASE 1 PROGRAM BUDGET (Part A - Airborne geophysics, Target development, Limited follow-up & Drilling)

Forecast Issue Date -April 3, 1998

		DETAILS			SUMMARY		
		BUDGET	ACTUAL	*FORECAST*	BUDGET	ACTUAL	*FORECAST*
Mob./Demob.					$ 5,000	$ -	*$ 5,000*
	Air	$ 5,000	$ -	*$ 5,000*			
Staffing					29,000	4,500	*29,000*
	Supv. & Consulting	7,500	1,000	*7,500*			
	Proj. Geologist	6,000	2,500	*6,000*			
	Proj. Geophysicist	6,000	500	*6,000*			
	Field Technician	6,000	0	*6,000*			
	Field Labour	2,000	0	*2,000*			
	Data Processing/CAD	1,500	500	*1,500*			
Support Costs					17,000	500	*17,000*
	Food & Accom.	3,000	0	*3,000*			
	Field Supplies & Equip.	1,000	0	*1,000*			
	Map/Drawing Charges	1,500	500	*1,500*			
	Exploration Permits	1,000	0	*1,000*			
	Travel	2,500	0	*2,500*			
	Communications	500	0	*500*			
	Freight	750	0	*750*			
	Equipment Rental	1,500	0	*1,500*			
	Vehicle Rental (4x4 pick-up)	4,500	0	*4,500*			
	Fuel & Maintenance	750	0	*750*			
Landowner Consent Agreements					11,000	0	11,000
	Fees & Expenses	8,000	0	*8,000*			
	Payments to Landowners	3,000	0	*3,000*			
Diamond Drilling *					45,000	0	45,000
	Mob / Demob	10,000	0	*10,000*			
	Contract Costs (7 days @ $5000)	35,000	0	*35,000*			
Geophysics *					194,000	0	*194,000*
	Airborne magnetic survey	188,000	0	*188,000*			
	Purchase magnetic & gravity data	3,000	0	*3,000*			
	Equipment rental ground follow-up	3,000	0	*3,000*			
Interim Report Costs (Lump Sum)		2500	0	*2500*	2,500	0	*2,500*
Administration (10%)		30,350	500	*30,350*	30,350	500	30,350
		Sub-Total			333,850	5,500	*333,850*
Contingency @ 5%					16,693	0	*16,693*
		Sub-Total			**350,543**	**5,500**	***350,543***
Add GST @ 7%					24,538	385	*24,538*
		TOTAL			**$ 375,080**	**$ 5,885**	***$ 375,080***

* *The budgeted amounts allow for only limited selective target definition and diamond drilling. Additional funding will likely be required to complete testing of all airborne magnetic target areas.*

Appendix V

Legal Description of significant claim areas to have assessment applied Dec/2000.

Section 6
Legal Description Meridian 4, Range 17, Township 43, Section 6, Quarter NW
Area: 65.2 hectares (161.11 acres)
Municipality: County of Camrose No. 22

Legal description Meridian 4, Range 17, Township, Section 6, Quarter NE
Area: 64.7 hectares (160 acres)
Municipality: County of Camrose No. 22

Legal Description Meridian 4, Range 17, Township 43, Section 6, Quarter SW
Area: 72.8 hectares (180 acres)
Municipality: County of Camrose No. 22

Legal Description Meridian 4, Range 17, Township 43, Section 6, Quarter SE
Area: 71.6 hectares (177 acres)
Municipality: County of Camrose No. 22

Section 12
Legal Description Meridian 4, Range 18, Township 43, Section 12, Quarter SW
Area: 65.2 hectares (161 acres); excepting 0.813 hectares(2.01 acres) for road, as shown on road plan 6270MC
Municipality: County of Camrose No. 22

Legal Description
First All that portion of the North East quarter of Section Twelve (12) Township 43, Range 18, West of the 4th Meridian which lies south of the southerly limits of the road as shown on road plan 6270MC, containing 144.61 acres.
Excepting thereout: plan 9122266 - road, 0.206 hectares (0.51 acres).

SecondMeridian 4, range 18, Township 43, Section 12, Quarter SE
Area: 65.2 hectares (161 acres)
County of Camrose No. 22

Section 18
Legal Description The North east quarter of Section 18, Township 43, Range 17, W4th Meridian containing 64.7 hectares (160 acres)
Excepting thereout: 0.405 hectares (1 acre) as shown on road plan 4894MC
Municipality of Camrose No. 22.

Section 18 continued

Legal Description Meridian 4, Range 17, Township 43, Section 18

All that portion of the North west quarter which lies to the north and east of the left bank of the Battle River as shown on a plan of survey of the said Township dated 20 January 1909 containing 61.024 hectares (150.80 acres) more or less.

Municipality of Camrose No. 22.

DH-440 NS

DH-240 10-8-67

DH-239 8-9-67

DH-238 11-12-58

DH-178 8-8-74

DH-176 11-8-59

DH-177 8-6-92

DH-179 12-4-48

SHALY & SILTY BEDS

DH-236 11-9-68

DH-237 NS

DH-105 14-3-45

DH-104 NS

DH-103 NS

DH-102 12-9-71

DH-99 13-8-58

DH-439 7-6-65

DH-98 14-6-60

ASHY BENTONITE

DH-812 10-6-62

DH-811 13-7-65

DH-810 15-7-85

DH-93 25-2-55

DH-95 19-6-42

DH-96 13-9-46

DH-97 16-7-50

DH-86 10-10-54

DH-809 13-5-60

DH-87 14-7-50

DH-88 11-7-50

Edge of bank

DH-92 23-5-52

DH-94 NS

SANDSTONE

DH-82 NS

DH-83 19-4-47

DH-84 17-10-50

DH-85 16-11-55

DH-182 19-9-50

road

bentonite

middle of bed

SW1/4 SECTION 5

SE1/4 SECTION 5

TWP 43

TWP 42

DH-78 20-8-58

DH-79 20-8-55

DH-80 19-8-54

DH-802 18-5-66

power line

NW1/4 SECTION 31

NE1/4

LSD 15 SECTION 31

LSD 16 SECTION 31

DH-808 19-8-63

DH-76 23-5-56

DH-807 16-7-65

DH-801 19-7-62

500 ft to quarry road

DH-793 22-6-65

DH-791 17-9-65

DH-794 11-10-65

DH-790 23-9-58

DH-813 21-10-65

DH-796 5-7-76

DH-223 NS

DH-233 NS

MINED OUT

DH-229 NS

DH-699 8-8-68

DH-698 13-8-61

DH-703 15-7-63

DH-700 13-8-65

DH-695 21-8-60

DH-696 30-6-62

DH-693 26-8-60

DH-961 12-9-61

DH-692 22-9-62

DH-690 21-9-61

DH-689 20-8-60

DH-64 22-9-60

SFR-3

SFR-2

Edge of bank

DH-232 NS

DH-70 34-7-54

DH-69 34-6-58

DH-68 36-7-58

500

DH-67 31-8-58

DH-66 31-9-58

DH-65 25-9-60

1000

DH-688 20-9-64

MINED OUT

2000

2500

3000 Feet Baseline

DH-01 22-10-59

DH-100 33-8-59

DH-02 27-9-64

DH-475 37-6-56

DH-03 30-7-47

DH-04 33-7-63

DH-477 28-7-foundary

DH-27 20-8-54

DH-35 23-8-57

DH-34 20-8-52

DH-192 37-6-62

DH-05 34-6-48

DH-26 22-7-55

DH-06 34-6-57

DH-25 28-5-59

DH-39 22-8-57

DH-24 29-8-60

DH-07 excessive sand & silt

DH-23 28-8-61

DH-08

DH-22 29-6-60

DH-09

DH-14 32-1-60

DH-10

DH-11

DH-12

DH-13

Section 790E

Section 1287E

Section 1970E

Block A
720,000 tons with ave. thickness of 7feet and yield of 59.7

DH-40 22-7-60

DH-41 20-8-57

DH-682 21-7-67

MINED OUT

DH-15 24-4-47

DH-16 25-4-50

DH-17 27-5-47

DH-18 26-7-48

DH-19 27-7-61

DH-44 30-1-71

DH-43 30-1-90

DH-42 26-7-65

DH-675 24-7-64

DH-45 >12% sand

DH-46 30-1-69

DH-47 27-6-59

DH-48 24-7-66

Section 2595E

DH-478 29-6-62

DH-49 32-5-59

DH-50 30-5-60

DH-51 34-4-62

DH-202 12-11-78

DH-201 8-11-77

DH-71 11-10-86

DH-601 16-9-76

DH-72 16-8-86

DH-101 18-10-89

DH-610 21-8-83

SRR-4

DH-73 18-8-86

DH-609 21-8-73

DH-203 18-8-84

DH-196 26-6-88

DH-195 NS

DH-197 31-6-64

DH-74 27-5-67

Block B, Boulter's Butte
100,000 tons, 8' ave. thickness and yield of 84.9

DH-193 NS

Fig. 5

BENTONITE QUARRY Q37
ROSALIND ALBERTA

Drawing compiled from Dresser Minerals plan maps

LEGEND

DH-01 22-10-59 Top of bentonite layer - thickness in feet - yield

Bentonite boundary

Edge of bank

Bentonite contact

Fence

scale
1 INCH = 100 FEET

100 50 0 100 200 300 feet

Drawing by: S. Fraser P. Geol. April 6, 2000

FIG. 7 **Section 6 - Auger hole location map and bentonite resources, Rosalind area, Alberta.**

Legend

ABC-64 — auger drill hole
7.9-2.65-69 — Depth of bentonite (m)-thickness (m)-yield (barrels/ton)

C — C' cross section

embankment, ridge

fence line, approximate quarter section boundary

glacial erosional channel

25 10 0 25 50 100m

scale 1:1000

S. Fraser, P. Geol. December 2000

N

Block A
81,100 metric tons

Block B
25,600 metric tons

Block C
68,700 metric tons

Western slope (embankment)

Zone of Green bentonite

Vikse Creek

Beaver pond

Glacial erosional channel

Central ridge

Eastern slope

probable southern limit of green bentonite

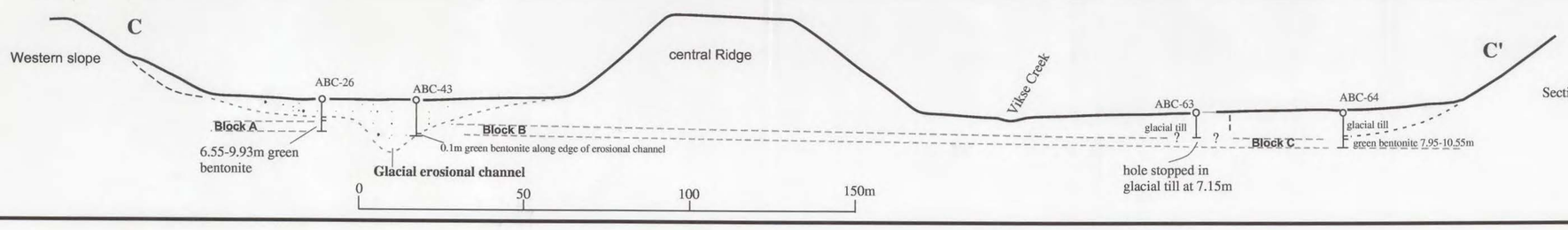
ABC-20
ABC-22
ABC-58
ABC-57
ABC-50
ABC-32 0.95-1.1-68
ABC-29 3.85-1.75-72
ABC-28
ABC-23
ABC-25 4.31-1.79-74
ABC-61
ABC-24
ABC-49
ABC-45
ABC-56
ABC-27 5.5-1.65-63
ABC-48
ABC-59
ABC-60
ABC-55
ABC-30
ABC-33
ABC-46 5.17-1.48-NA
ABC-47 7.1-0.3-NA
ABC-62 5.7-2.7-76
ABC-63
ABC-43 9.8-0.1-NA
ABC-26 6.55-3.38-69
ABC-64 7.9-2.65-69
ABC-65
ABC-35
ABC-54
ABC-42
ABC-55 5.4-1.74-75
ABC-66
ABC-37
ABC-34
ABC-41 9.0-1.0-45 (only 1 of 2m analyzed)
ABC-40
ABC-44
ABC-36
ABC-52

A — A'
B — B'
C — C'

Section 6, northeast quarter, Township 43, Range 17, W4th M.

Section 6, northwest quarter, Township 43, Range 17, W4th M.

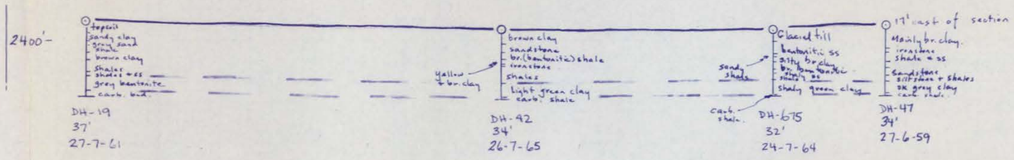
Section 6, southwest quarter, Township 43, Range 17, W4th M.



Section looking NNW ; bearing at 085 degrees

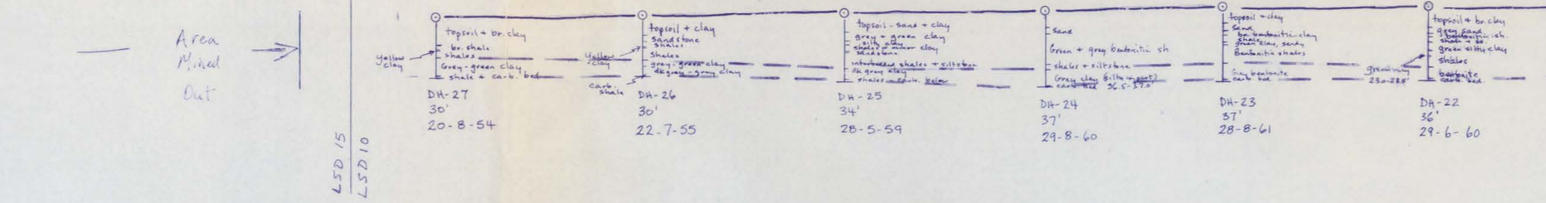
LSD 16 / LSD 9

SECTION 2595E

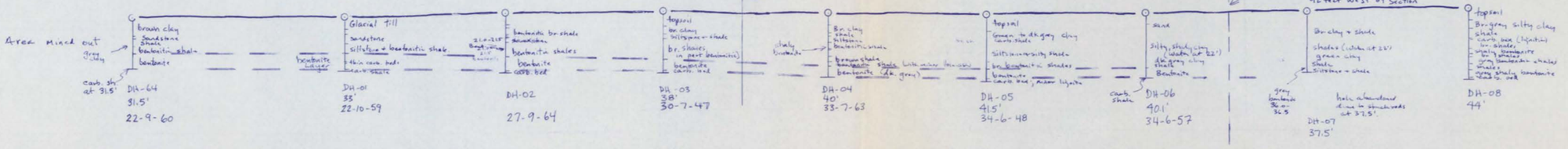


SECTION 1970E

Area Mined Out

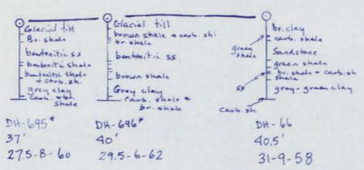


LSD 15 / LSD 10

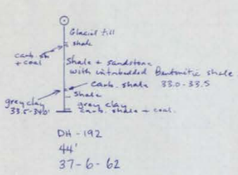


SECTION 1287E

LSD 15 / LSD 10



* collar elevations not recorded in Drill logs



SECTION 790E

Fig. 6

Quarry 37 Area, Rosalind

Drill hole sections

Scale

50 25 0 50 100 feet

Drawing by S. Fraser P. Geol. April 6, 2000