

SASK. MINING AND DEVELOPMENT CORP.
QUATERNARY GEOLOGY OF THE RIOU LAKE
AREA AND ITS APPLICATION TO
DRIFT PROSPECTING

Project 0043

March 31, 1980

E. A. Christiansen Consulting Ltd.

CONSULTING GEOLOGIST

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March 31, 1980

Saskatchewan Mining and Development Corporation
122 - 3rd Avenue North
Saskatoon, Saskatchewan
S7K 2H6

Attention : Mr. J.S. Kermeen

Dear Mr. Kermeen:

Enclosed is one copy of Report 0043-001 on the "Quaternary Geology of the Riou Lake area and its application to drift prospecting".

I am sending extra copies of the drawing and figures which are difficult to reproduce from the xeroxed figures or blue printed drawing.

If you have any queries, please contact me.

Sincerely yours,

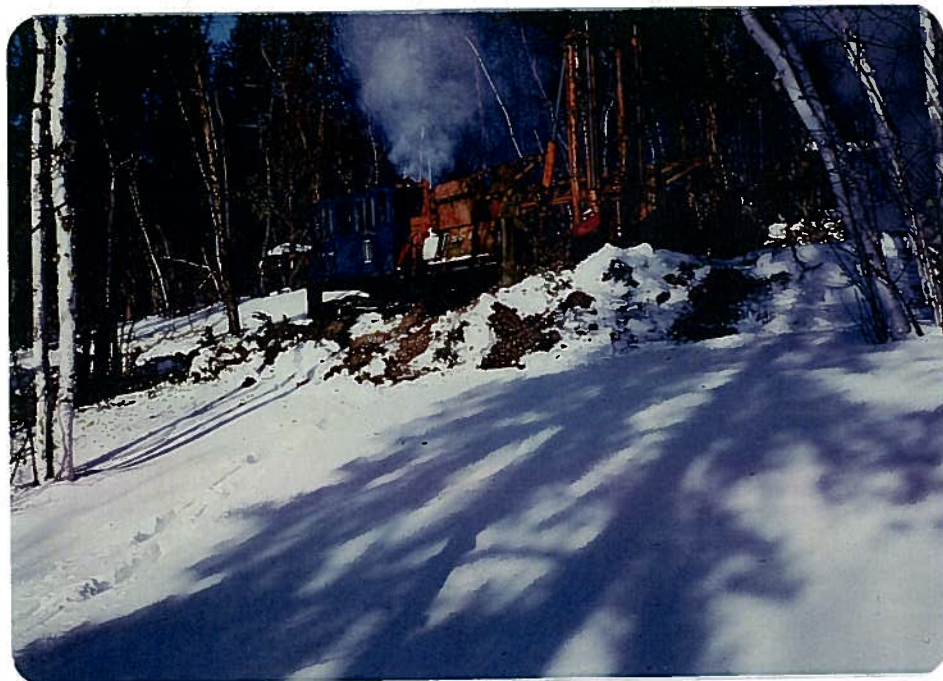
E.A. Christiansen



DRUMLIN LOOKING NORTHWEST FROM CAMP GRAYLING.



SMDC-13 ON TOP OF DRUMLIN LOOKING NORTH ACROSS RIOU LAKE.



AUGERING AT SMDC-14 ON SOUTH SIDE OF DRUMLIN.



LOOKING ESE FROM SMDC-14 ON DRUMLIN TOWARD CAMP GRAYLING.

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1. INTRODUCTION

During a meeting with Mr. J.S. Kermeen, Saskatchewan Mining and Development Corporation (SMDC) on February 20, 1980, E.A. Christiansen Consulting Ltd. was commissioned to:

- (1) examine areal photographs and Saskatchewan Research Council (SRC) information of the Riou Lake area with special emphasis on lineaments,
- (2) spend a few days in the field instructing SMDC geologists on auger-sampling techniques and on sample descriptions and classification, and
- (3) write a brief report on the Quaternary geology of the Riou Lake area.

2. OFFICE STUDY

Information on the surficial geology obtained from SRC and colored photographs of the Riou Lake area were examined. This study indicated the Riou Lake area is a drumlinized till plain covered in part with lacustrine deposits below 300 metres which marks the highest level of Glacial Lake Athabasca. The study also showed the glacier which formed or at least shaped the drumlins flowed from east to west.

A major lineament was observed on aerial photographs extending northwest from the western limit of the northwestern part of Riou Lake (49° 10' N. Lat., 106° 30' W. Long.). These findings were reported verbally to Mr. Kermeen and members of his staff on February 28, 1980.

3. FIELD STUDY

On March 3, 1980, I flew with Mr. Kermeen to Stony Rapids during which the augering program was discussed in considerable detail.

From March 3 to 7, I supervised the augering program, described the samples which were taken prior to my arrival and during my stay, and discussed sampling techniques and the classification and origin of the deposits.

4. STRATIGRAPHY

4.1 Introduction

The Quaternary deposits examined from augerholes SMDC 1-14 in ascending order are: (1) Lodgement Till, (2) Ablation Till, (3) Lacustrine Silts and Clays, (4) Lacustrine Sands and Silts, and (5) Beach Gravel (Drawing 0043-001-01).

4.2 Lodgement Till

The Lodgement Till is at least 57 ft (17 m) thick and probably more than 100 feet (30 m) thick in the drumlin shown in Drawing 0043-001-01. The till is sandy (Table 1), pinkish gray (Appendix 1), and is composed mainly of quartz, feldspar, kaolinite, and illite (Fig. 1).

4.3 Ablation Till

The Ablation Till is composed of 0 to 12 feet (3.7 m) of till, sand, and gravel which is draped over the drumlin (Drawing 0043-001-01). In the inter-drumlin lowland, patches of Ablation Till directly overlie bedrock. Most surficial boulders in the Riou Lake area are probably of ablation origin. The contact between the Lodgement Till and Ablation Till is distinct.

Table 1. Grain Size Analyses *

Augerhole	Deposit	Depth (FT)	Sand (2.0-0.5mm)	Silt (0.5-0.002mm)	Clay (<0.002mm)
SMDC-3	Lacustrine Silts & Clays	2.5-5.0	3.8	66.5	29.7
SMDC-13	Lodgement Till	7.5-10.0	74.5	16.8	8.7
SMDC-13	Lodgement Till	12.5-15.0	74.2	19.4	6.4
SMDC-14	Lodgement Till	32	79.1	16.8	4.1
SMDC-14	Lodgement Till	50	72.1	14.6	13.3
SMDC-14	Lodgement Till	72	70.5	20.9	8.6

* Analyses by pipette method on less than 2.0 mm fraction.

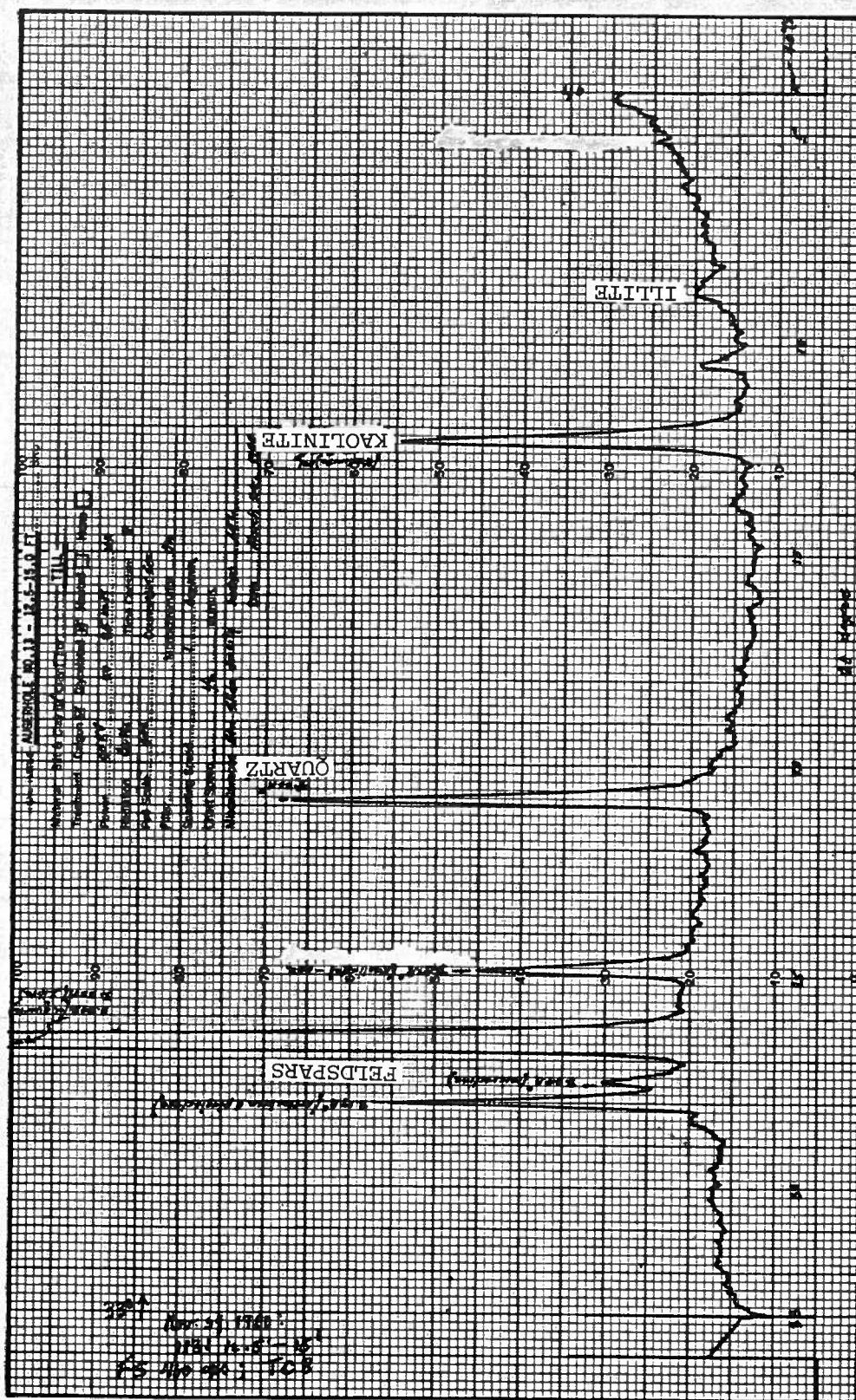


Figure 1. X-ray diffractogram of Lodgement Till.

4.4 Lacustrine Silts and Clays

The Lacustrine Silts and Clays range in thickness from 0 to 10 feet (3 m) in inter-drumlin lowlands. In augerhole SMDC-3, this sediment is composed of 66.5% silt and 29.7% clay (Table 1), and the main minerals are quartz, feldspar, kaolinite, and illite (Fig. 2). The contact between the Ablation Till and the overlying Lacustrine Silts and Clays is gradational.

4.5 Lacustrine Sands and Silts

Lacustrine Sands and Silts were deposited at the south foot of the drumlin in Drawing 0043-001-01, and presumably flank the entire drumlin. These sediments are 12 feet (3.7 m) thick in SMDC-12 (Drawing 0043-001-01). The base of iron oxide staining, which is 5 feet (1.5 m) below the surface, marks the lowest water table since deposition. These sands and silts are thought to have been derived from the erosion of the wave-cut cliffs which surround the drumlin.

4.6 Beach Gravel

The beach terraces on the drumlin in Drawing 0043-001-01 are covered with 0 to 1 m of well rounded gravel which becomes bouldery at the base of the terraces. Drumlins in the area are notched with wave-cut cliffs and terraces below 300 m which was the highest level of Glacial Lake Athabasca. Most of the Beach Gravel in the drumlin shown in Drawing 0043-001-01 was derived from the Ablation Till. The Beach Gravel is believed to be the coarser facies of the finer Lacustrine Sands and Silts formed by regressive offlap as the lake level fell.

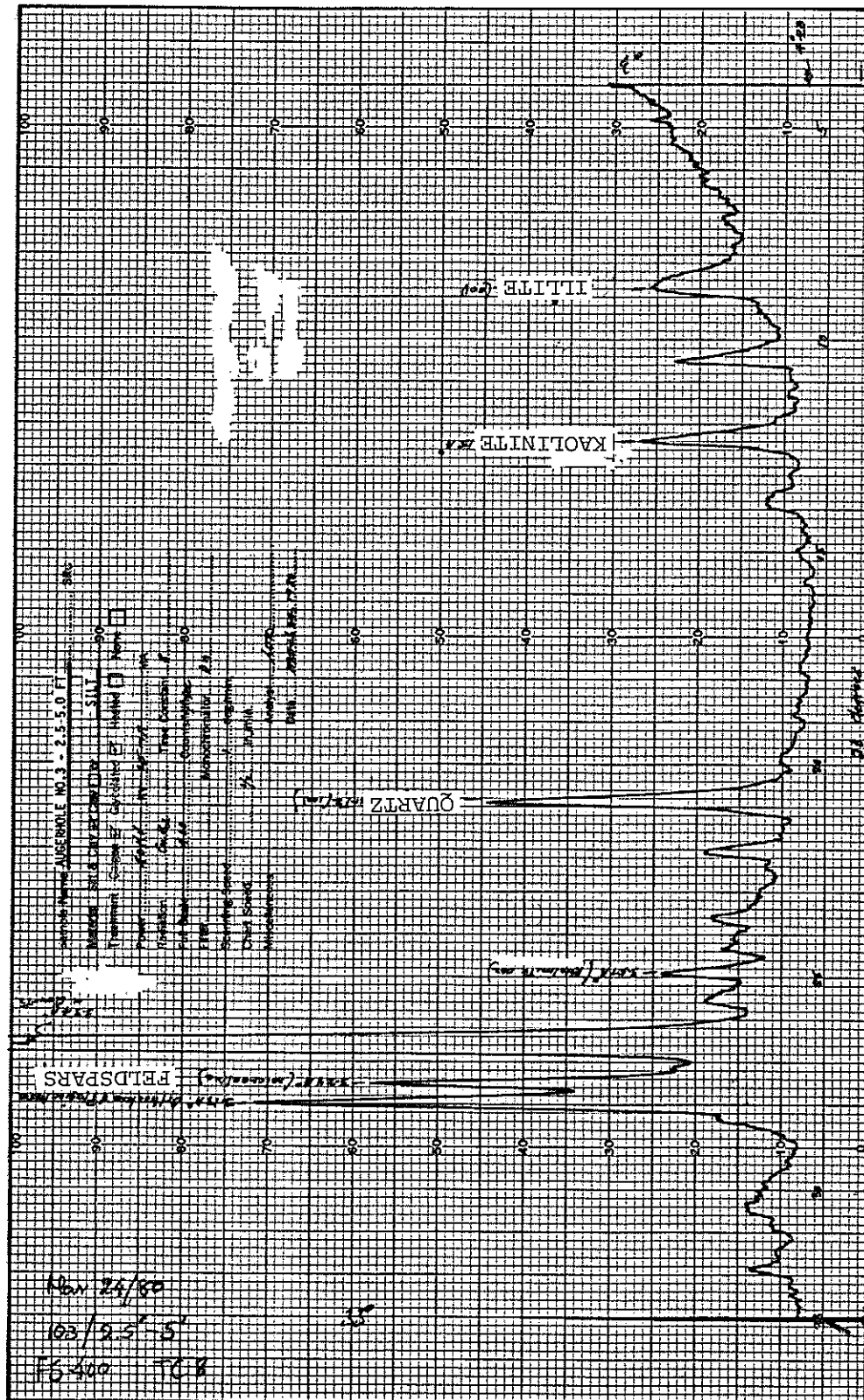


Figure 2. X-ray diffractogram of Lacustrine Silts and clays.

5. HISTORY AND ORIGIN

5.1 Lodgement Till

The absence of Lodgement Till in the inter-drumlin lowland and its great thickness in the drumlin suggest the material was eroded from the lowland and deposited in the drumlin. If this is the case, then the Lodgement Till in the drumlin was presumably obtained from the area between it and the next up-ice drumlin to the east.

5.2 Ablation Till

As the glacier melted the englacial material was released to the top of the glacier to be eventually let down on the Lodgement Till as the glacier disappeared leaving a distinct contact between the two deposits. Ablation Till was draped over the drumlin and was deposited sporadically on the inter-drumlin lowland.

5.3 Lacustrine Silts and Clays

As the ice surface melted below 300 m, Glacial Lake Athabasca inundated the glacier and deposited Lacustrine Silts and Clays on the ice surface. As the ice continued melting, these sediments were mixed with the ablation material released from the glacier which accounts for the gradational contact between these sediments.

5.4 Lacustrine Sands and Silts and Beach Gravel

As the level of Glacial Lake Athabasca lowered, wave-cut cliffs were eroded into the drumlin leaving lag gravels (Beach Gravel) on the wave-cut terraces. The finer-grained sediment from the erosion of these cliffs was transported into deeper parts of the lake and deposited on the piedmont of the drumlin to form the Lacustrine Sands and Silts

unit. When the lake fell to the foot of the drumlin, Beach Gravel was deposited on the previously deposited Lacustrine Sands and Silts to form the regressive offlap sequence of sediments.

6.1 DRIFT PROSPECTING

Both lodgement and ablation tills occur in the Riou Lake area. The lodgement till is believed to be restricted to the drumlins, whereas the ablation till is draped over the drumlin and occurs sporadically, in the inter-drumlin lowland. The Beach Gravel in Drawing 0043-001-01 was derived from Ablation Till. Lacustrine sediments are the only deposit on much of the lowland.

It is important to determine whether the mineralized boulders are from lodgement or ablation till. If they were derived from lodgement till, their source is probably from an area between them and the next up-ice drumlin. If, on the other hand, they were derived from ablation till, the source may be east of the permit area.

If it should be desirable to sample groundwater which has flowed through the lodgement tills in the drumlins, the best place to do so would be the Lacustrine Sands and Silts which flank these features.

APPENDIX 1. LITHOLOGIC LOGS OF SMDC/1-14.

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PAGE 1 OF 1

GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.			
				R10U LAKE 1							
N T S		UTM - ZONE		UTM - EASTING (M)		UTM - NORTHING (M)					
1/4	LSD	S	T	R	M	LATITUDE		N.S			
LONGITUDE		E.W	TYPE OF OBSERVATION			DAY	MO.	YEAR			
			AUGER HOLE			09	03	19 80			
ELEVATION (M)		SOURCE OF ELEVATION				AERIAL PHOTOGRAPH NO.					

Till, sandy and pebbly, v. pale brown

SIGNATURE

Geologic Log

[illegible]

Geologic Log

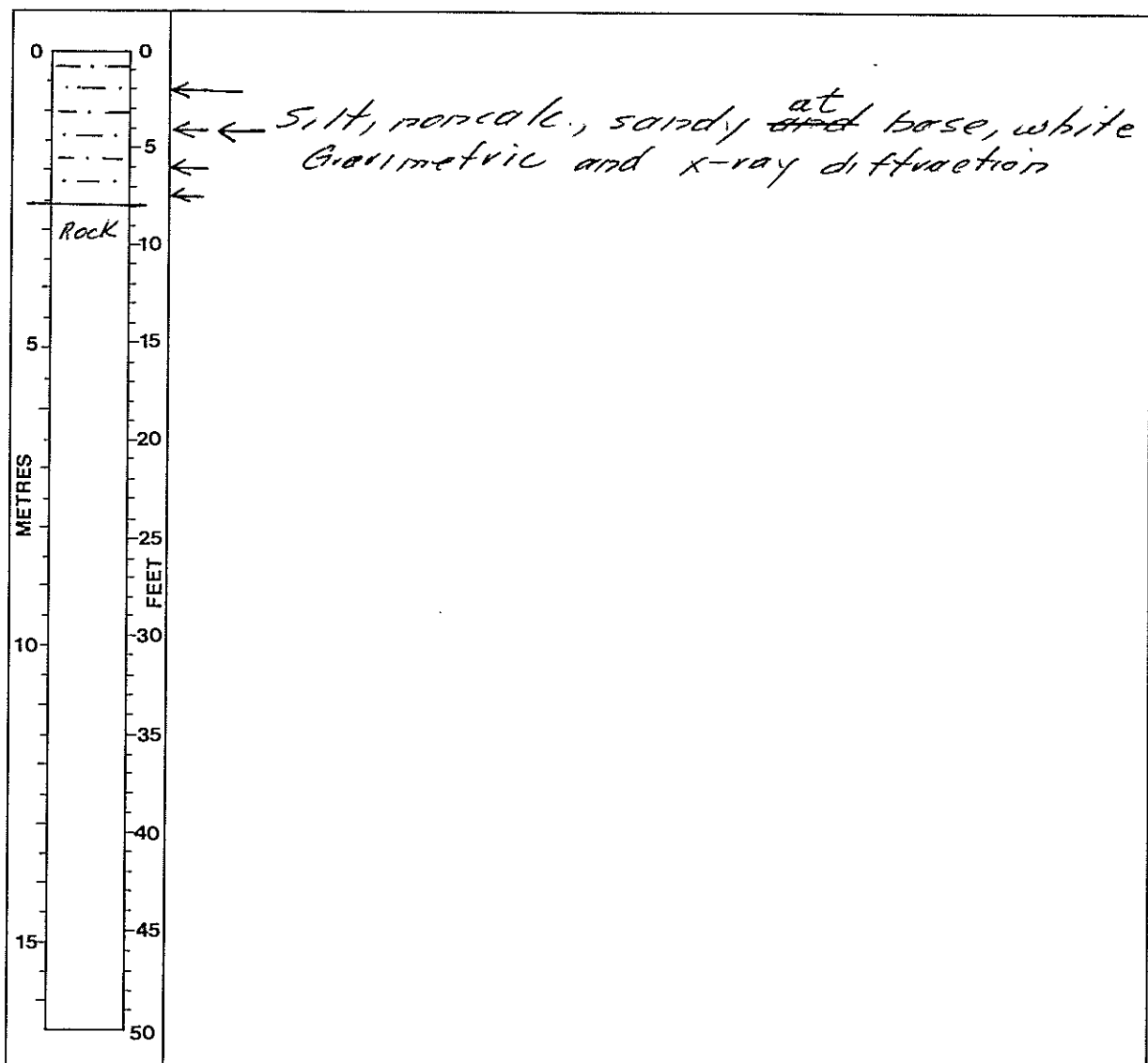
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GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.			
				R104 LAKE 3							
N T S		UTM - ZONE		UTM-EASTING (M)		UTM-NORTHING (M)					
1/4	LSD	S	T	R	M	LATITUDE			N.S		
LONGITUDE		E.W	TYPE OF OBSERVATION			DAY	MO.	YEAR			
			PUGERHOLE			04	03	19 80			
ELEVATION (M)		SOURCE OF ELEVATION			AERIAL PHOTOGRAPH NO.						



SIGNATURE

Geologic Log

[illegible]

Geologic Log

[illegible]

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PAGE 1 OF 1

GEOLOGIST-SITE		NAME OF SITE		PROJECT NO.	
		R100 LAKE 48			
N T S		UTM - ZONE		UTM-EASTING (M)	
LSD		S		T	
M		R		W	
LATITUDE		N.S		E.W	
TYPE OF OBSERVATION		DAY		MO.	
RUGER HOLE		09		03	
YEAR		SOURCE OF ELEVATION		AERIAL PHOTOGRAPH NO.	
1980					
ELEVATION (M)		SOURCE OF ELEVATION		AERIAL PHOTOGRAPH NO.	

METRES

FEET

← Silt, normal, lt gray

← Till, pebbly, sandy, lt gray

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PAGE 1 OF 1

GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.			
				R I O U L A K E S							
N T S		UTM - ZONE		UTM-EASTING (M)		UTM-NORTHING (M)					
1/4	LSD	S	T	R	M	LATITUDE				N,S	
					W						
LONGITUDE		E,W	TYPE OF OBSERVATION			DAY	MO.	YEAR			
			P U G E R H O L E			0 4	0 3	19 8 0			
ELEVATION (M)		SOURCE OF ELEVATION				AERIAL PHOTOGRAPH NO.					

← Till, pebbly, sandy, silty at base,
it. gray

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Geologic Log

[illegible]

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PAGE 1 OF 1

GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.			
				R I O U L A K E 6							
N T S		UTM - ZONE		UTM-EASTING (M)		UTM-NORTHING (M)					
1/4	LSD	S	T	R	M	LATITUDE				N,S	
					W						
LONGITUDE			E,W	TYPE OF OBSERVATION			DAY	MO.	YEAR		
				A U G E R H O L E			04	03	19 80		
ELEVATION (M)		SOURCE OF ELEVATION				AERIAL PHOTOGRAPH NO.					

← silt, noncalc., lt. gray

←

←

← Till, pebbly and sandy becoming more silty toward base, sandier at top

SIGNATURE

Geologic Log

[illegible]

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PAGE 1 OF 1

GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.			
				R100 LAKE 7							
N T S		UTM - ZONE		UTM-EASTING (M)		UTM-NORTHING (M)					
1/4	LSD	S	T	R	M	LATITUDE				N,S	
					W	0° 0' 0"					
LONGITUDE		E,W		TYPE OF OBSERVATION		DAY		MO.		YEAR	
0° 0' 0"				AUGER HOLE		04		03		19 80	
ELEVATION (M)		SOURCE OF ELEVATION				AERIAL PHOTOGRAPH NO.					

METRES

0

5

10

15

20

25

30

35

40

45

50

← silt, noncalc., lt. gray becoming sandy at base

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GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.			
				R I O U L A K E B							
N T S		UTM - ZONE		UTM-EASTING (M)		UTM-NORTHING (M)					
1/4	LSD	S	T	R	M	LATITUDE		N,S			
					W						
LONGITUDE		E,W		TYPE OF OBSERVATION		DAY	MO.	YEAR			
				A U G E R H O L E		0 4	0 3	19 8 0			
ELEVATION (M)		SOURCE OF ELEVATION				AERIAL PHOTOGRAPH NO.					

← Silt, normal, white to H. gray with
 ← some sand and a few pebbles
 at base

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GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.					
				R I O U L A K E 2									
N T S		UTM - ZONE		UTM-EASTING (M)		UTM-NORTHING (M)							
1/4	LSD	S	T	R	M	LATITUDE				N,S			
LONGITUDE		E,W		TYPE OF OBSERVATION				DAY		MO.		YEAR	
				P U G E R H O L E				04		03		19 80	
ELEVATION (M)				SOURCE OF ELEVATION				AERIAL PHOTOGRAPH NO.					

METRES

0

50

← silt, sandy, non calc., pinkish white

SIGNATURE

Geologic Log

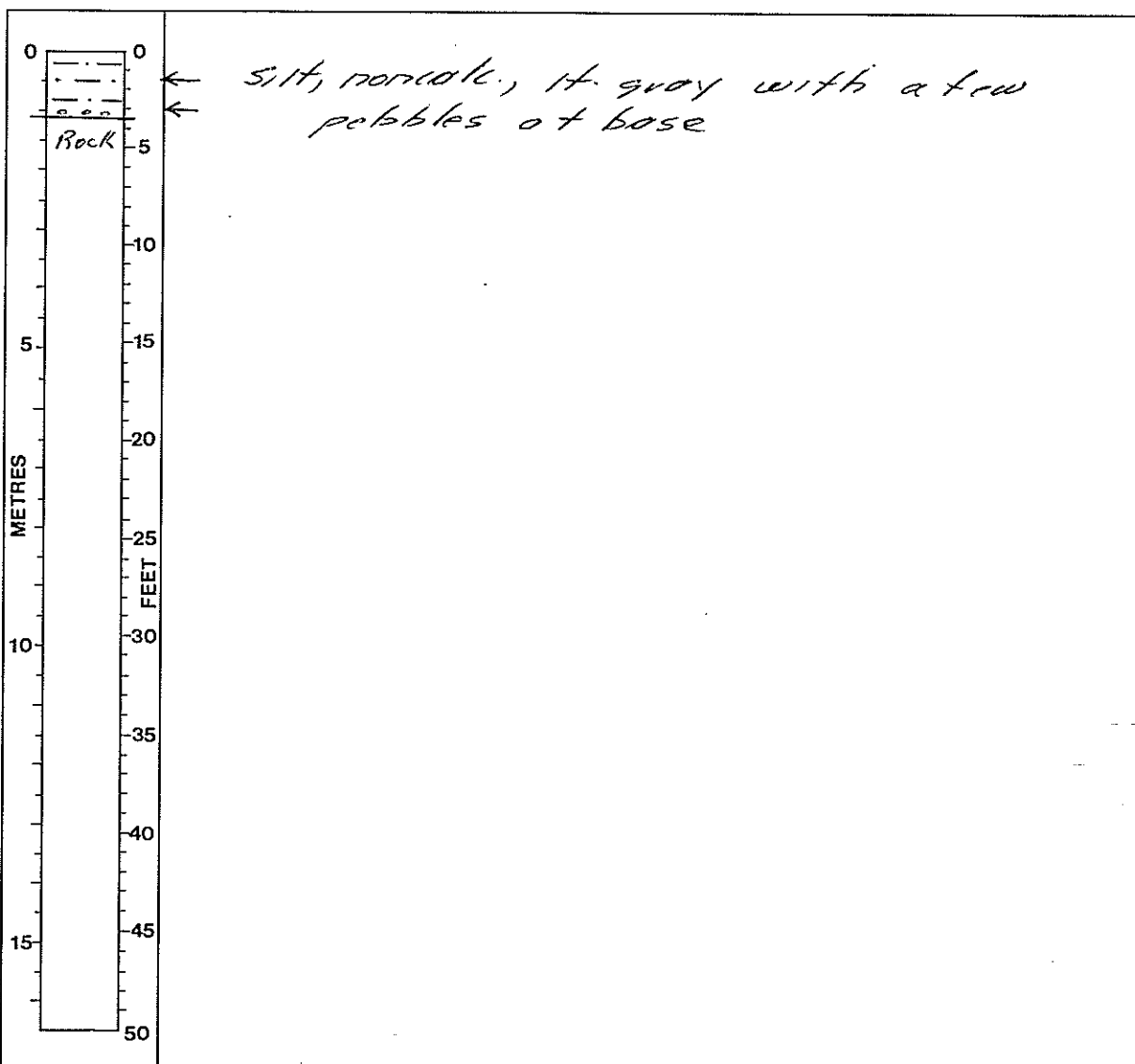
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GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.			
				R I O U L A K E 9							
N T S		UTM - ZONE		UTM-EASTING (M)		UTM-NORTHING (M)					
1/4	LSD	S	T	R	M	LATITUDE				N,S	
LONGITUDE		E,W	TYPE OF OBSERVATION			DAY	MO.	YEAR			
			P U G E R H O L E			04	03	19 80			
ELEVATION (M)		SOURCE OF ELEVATION				AERIAL PHOTOGRAPH NO.					



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PAGE 1 OF

GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.			
				RIOU LAKE 10							
N T S		UTM - ZONE		UTM-EASTING (M)		UTM-NORTHING (M)					
1/4	LSD	S	T	R	M	LATITUDE		N,S			
LONGITUDE		E,W	TYPE OF OBSERVATION			DAY	MO.	YEAR			
			AUGER HOLE			04	03	19 80			
ELEVATION (M)		SOURCE OF ELEVATION				AERIAL PHOTOGRAPH NO.					

Silt, noncalc, lt. gray with sand float

SIGNATURE

Geologic Log

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PAGE 1 OF

GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.			
				R100 LAKE 11							
N T S		UTM - ZONE		UTM-EASTING (M)		UTM-NORTHING (M)					
1/4	LSD	S	T	R	M	LATITUDE		N,S			
LONGITUDE		E,W	TYPE OF OBSERVATION			DAY	MO.	YEAR			
			PUGER HOLE			04	03	19 80			
ELEVATION (M)		SOURCE OF ELEVATION				AERIAL PHOTOGRAPH NO.					

← silt, noncalc., white and it gray,
← sandy at base

SIGNATURE

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PAGE 1 OF

GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.			
				R100 LAKE 12							
N T S		UTM - ZONE		UTM-EASTING (M)		UTM-NORTHING (M)					
1/4	LSD	S	T	R	M	LATITUDE		N,S			
					W						
LONGITUDE		E,W		TYPE OF OBSERVATION		DAY	MO.	YEAR			
				RUGERHOLE		04	03	19 80			
ELEVATION (M)		SOURCE OF ELEVATION				AERIAL PHOTOGRAPH NO.					

METRES

FEET

Gravel, sandy, yellowish brown

— Base of yel. br. staining

Silt, v. fine sandy and sand, v. fine silty, interbedded, lt. gray, laminated, noncalc.

Silt, noncalc., lt. gray with yel. br. staining near base

Till, noncalc., pinkish gray, sandy

Sand, silty, and pebbly or till, sandy and pebbly, lt. gray + pinkish gray

Till, noncalc., lt. gray

Rock

SIGNATURE

Geologic Log

Name: <u>Black-Mac 12</u>		Geology by: <u>etb</u>	Page <u>1</u> of <u>2</u>
<u>Bion Lake AH-12</u>			
Source:		Date: <u>March 9/80</u>	
Sample No.	Description	Depth Feet	
	Gravel, sandy, yel. br. (10YR 5/14, dry), angular (Probably colluvium from drumlin).	0-2.5	
	Sand, v. fine, silty, noncalc., lt. gray (10YR 7/2, dry) with yel. br. staining (10YR 5/16, dry)	2.5-5	
	Silt, v. fine sandy, noncalc., white 10YR 8/2, dry with pink staining (7.5YR 7/4, dry)	5-7.5	
	Sand, fine silty, noncalc., lt. gray (10YR 7/2, dry) or brown (10YR 5/3, wet)	7.5-10	
	Silt, v. fine sandy, noncalc., lt. gray (10YR 7/2, dry) or pale br. (10YR 6/3, dry), laminated	10-12.5	
	Sand, v. fine, silty, with coarse grained laminae, angular, lt. gray (10YR 7/2, dry) or pale brown (10YR 6/3, ^{wet} dry)	12.5-15	
	Silt, lt. gray (10YR 7/2, dry) or brown (10YR 5/3, wet), noncalc. with sand laminae	15-17.5	
	Silt, noncalc., lt. gray (10YR 7/2, dry) or grayish br (10YR 5/2, ^{wet} dry), laminated with yel. br. staining	17.5-20	
	Silt ^{Till} , noncalc., pinkish gray (7.5YR 7/2, dry) or 7.5YR 5/4, wet, sandy	20-22.5	
	Sand, silty, noncalc., lt. gray (10YR 7/1, dry) or grayish brown (10YR 5/2, wet)	22.5-25	
	Sand, silty, pebbly, pinkish gray (7.5Y 7/2, dry) noncalc. could be sandy, pebbly till	25-27.5	



Geologic Log

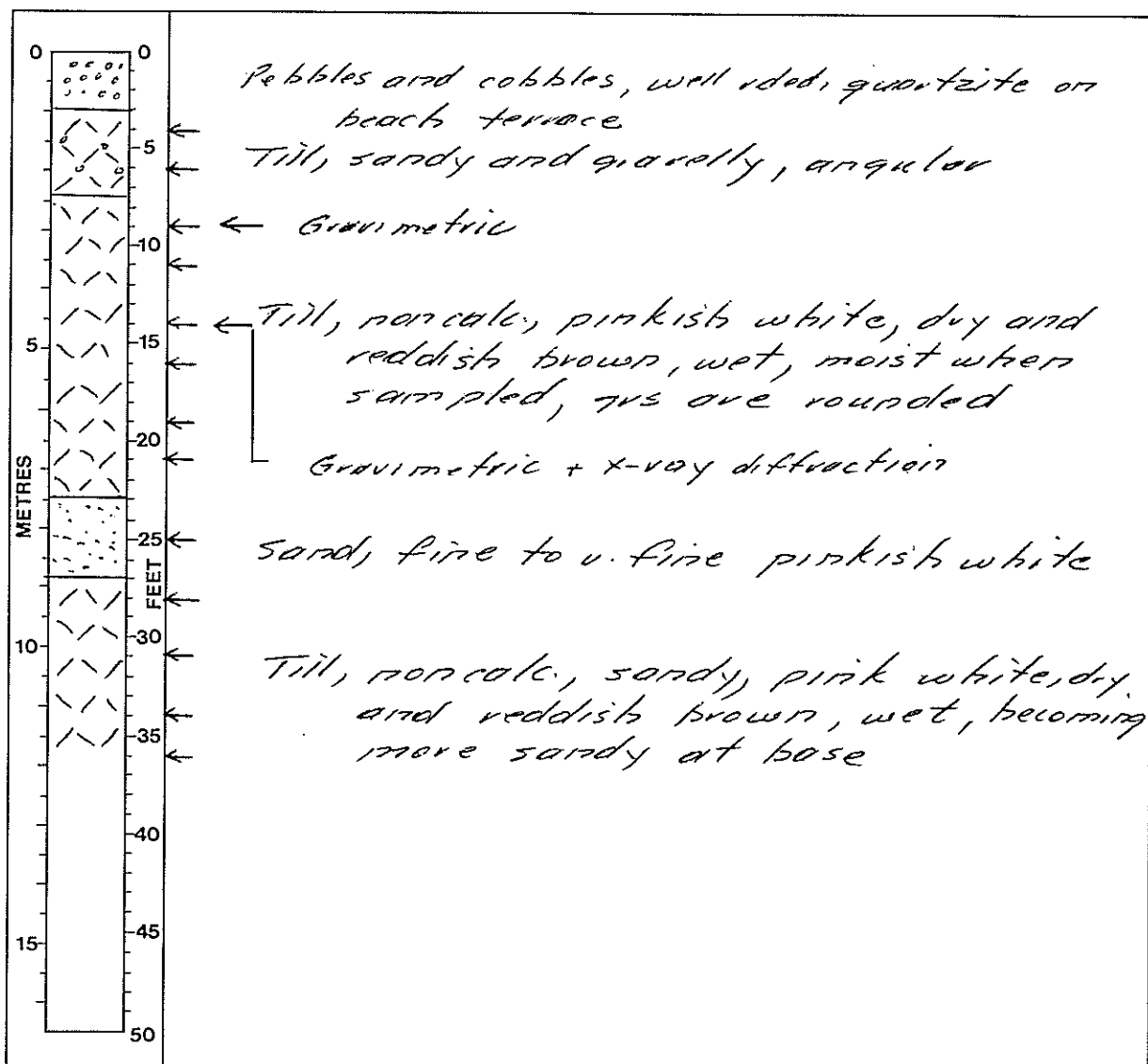
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PAGE 1 OF

GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.				
				B I O K L A K E 13								
N T S		UTM - ZONE		UTM - EASTING (M)		UTM - NORTHING (M)						
1/4	LSD	S	T	R	M	LATITUDE			N, S			
					W							
LONGITUDE		E, W		TYPE OF OBSERVATION			DAY		MO.		YEAR	
				A U G E R H O L E			04		05		19 80	
ELEVATION (M)		SOURCE OF ELEVATION				AERIAL PHOTOGRAPH NO.						



SIGNATURE

Geologic Log

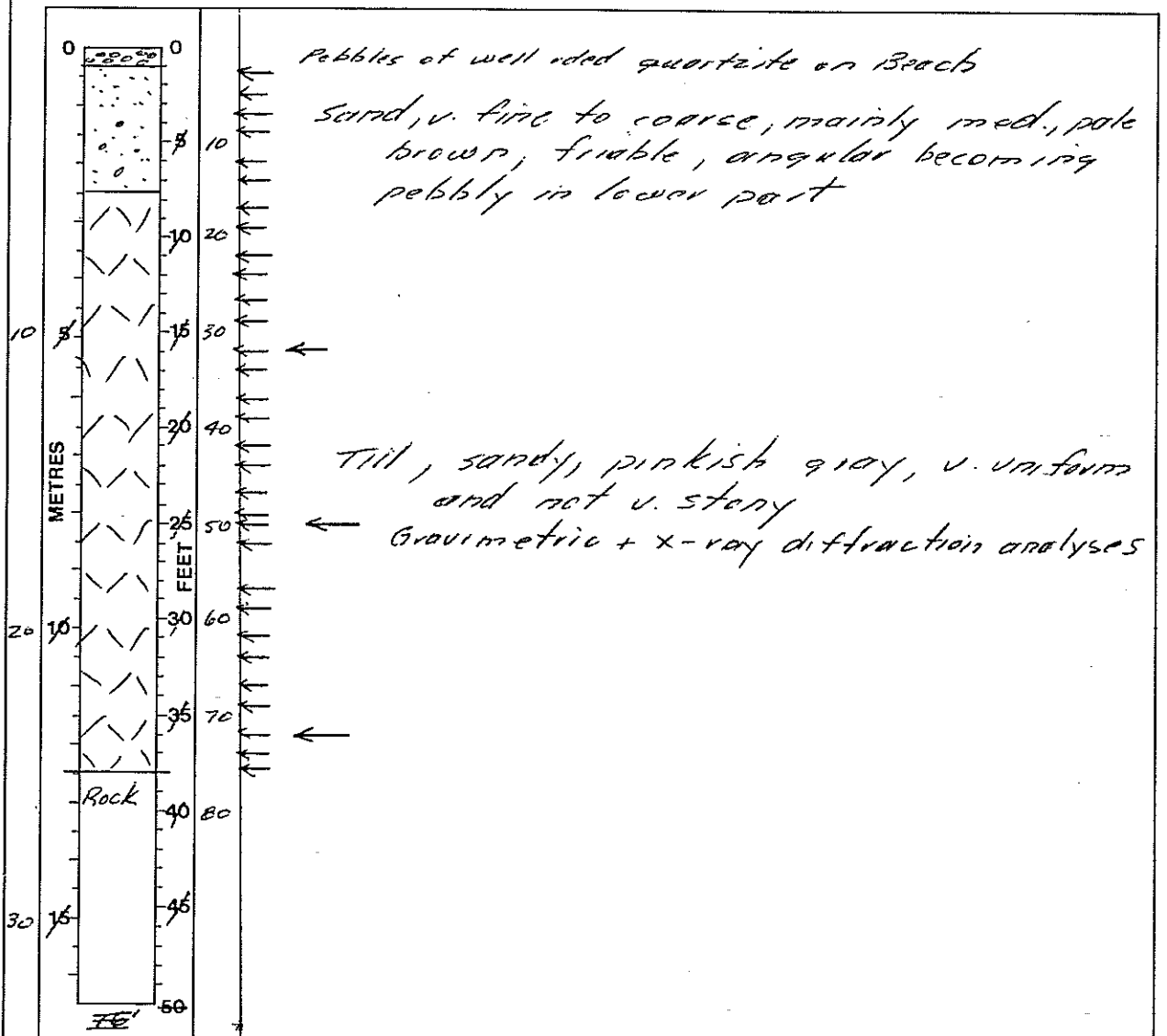
Name:	Black Mac Project Riou Lake AH-13	
Geology by:	EAB	
Date:	March 3 / 80	
Sample No.	Description	Depth
A	Till, noncalc. pinkish gray (5YR 7/2, dry), with angular sand grains, sandy and gravelly	4
B	Till as above but darker (5YR 6/2, dry)	6
C	Till, noncalc., pinkish white (5YR 8/2, dry) or reddish brown (5YR 5/3, wet), less sandy and gravelly than above, forms pieces of sample rather than grains angular rounded	9 + 10
D	Till as above	11 + 13
E	Till as above	14 + 16
F	Till as above	16 + 20
G	Till as above	19 + 23
H	Till as above	21 + 26
I	Sand, fine to v. fine, pinkish white (5YR 8/2, dry)	25
J	Till, noncalc., pinkish white (5YR 8/2, dry) or reddish brown (5YR 5/3, dry), sandy, rounded	28
K	Till as above	31
L	Till as above	34
M	Till, noncalc., pinkish white (5YR 8/2, dry) or H. reddish br. (5YR 6/3, dry), rounded, very sandy	36

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PAGE 1 OF 1

GEOLOGIST-SITE				NAME OF SITE				PROJECT NO.			
				B I O U L A K E 1 4							
N T S		UTM - ZONE		UTM-EASTING (M)		UTM-NORTHING (M)					
1/4	LSD	S	T	R	M	LATITUDE		N.S			
					W						
LONGITUDE		E,W		TYPE OF OBSERVATION				DAY		MO.	
								0 8		0 3	
								19		8 0	
ELEVATION (M)		SOURCE OF ELEVATION				AERIAL PHOTOGRAPH NO.					



EAC
SIGNATURE

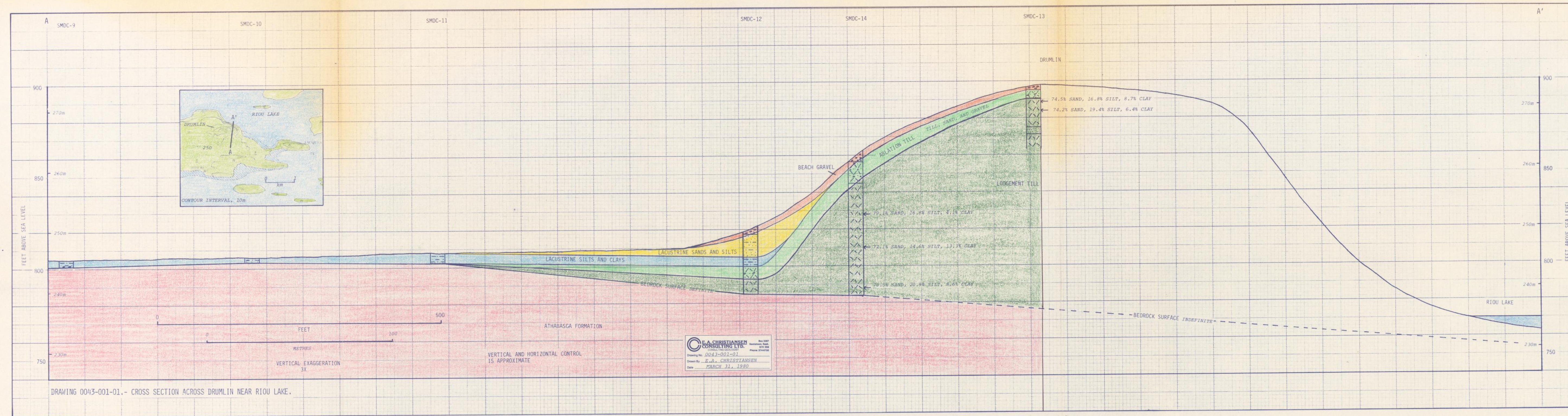
Geologic Log

Name: <u>Black Mac Project</u>		Page <u>1</u> of <u>2</u>
<u>Rieu Lake AH-12</u>		
Source:		Geology by: <u>MEB</u>
		Date: <u>March 5/80</u>

Sample No.	Description	Depth Feet.
	Sand, v. fine to coarse, mostly med., angular, pale brown (10YR 6/3, dry)	3
	Sand, med. to v. coarse, lt. gray to v. pale brown (10YR 7 1/2 - 7/3, dry), angular	5
	Sand, med. to v. coarse with a few pebbles, lt. gray to v. pale br. as above, rdd	7
	Sand, v. fine to coarse with a few v. coarse grs floating, friable, color as above, rdd	9
	Sand as above	12
	Sand as above	14
	Till, sandy, pinkish gray (7.5YR 7/2, dry)	17
	Till, sandy, pinkish gray as above with white patches and reddish yellow staining	19
	Till, sandy, pinkish gray as above	22
	Till, sandy, pinkish gray (7.5YR 7/2, dry)	24
	Till as above	27
	Till as above	29
	Till as above	32
	Till as above	34
	Till as above	37
	Till as above	39
	Till as above	42
	Till as above	44
	Till as above	47
	Till as above	49
	Till as above	50
	Till as above	52
	Till as above	57

Geologic Log

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DRAWING 0043-001-01.- CROSS SECTION ACROSS DRUMLIN NEAR RIOU LAKE.