AN ASSESSMENT OF QUATERNARY STRATIGRAPHY AND THE APPLICABILITY OF REVERSE CIRCULATION TO MINERAL EXPLORATION IN HOLMES - BURT - EBY TOWNSHIP AREA

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1.0 INTRODUCTION

Terrain Analysis and Mapping Service Ltd. was engaged by Billiton Canada to make available Dr. V.N. Rampton to provide (1) on site assistance with a reverse circulation overburden drilling program, (2) advice regarding further reverse circulation drilling and sampling as an aid to mineral exploration, and (3) provide a regional assessment of the Quaternary stratigraphy and history.

In order to fulfill the above requirements the following activities were completed: (1) collation and review of pertinent reports and maps; (2) purchase and review of high level air photos (scale of approximately 1:50,000); (3) logging and sample collection of reverse circulation drill holes at localities as chosen by Billiton personnel; (4) inspection of landforms and exposures of Quaternary materials throughout the area and; (5) production of a final report describing the Quaternary materials and landforms, and assessing the applicability of the reverse circulation drilling to mineral exploration in the area.

2.0 QUATERNARY LANDFORMS AND DEPOSITS

2.1 General

A map of the Quaternary deposits of the area has been recently produced by the OGS (Baker 1980). Our field work would suggest that this document adequately portrays the Quaternary map-units at a scale of 1:50,000 and describes the Quaternary materials (Figure 1) and history. A drift thickness map, similarily produced by the OGS (Baker 1982), has limited use in that minimal drill-hole log control was available in the area of concern (Figure 2).

2.2 Quaternary Geology

The area may have been affected by ice flowing in an east-southeasterly direction prior to ice crossing it in a south-southeasterly direction (Boissonneau 1966). This was confirmed at locality A on Figure 1 where striations indicating an indicated flow direction toward an azmuth of 168 postdate striations with an azimuth of 118 . During glaciation a stoney sandy till was deposited - generally this till shows a lodgement and ablation facies. Sandy lodgement till is exposed at locality B on Figure 1 and stoney lodgement till at locality C. Lodgement till was recognized in a number of drill holes.

During deglaciation a number of glaciofluvial deposits, both ice-contact and outwash, were emplaced. Most notably, are the coarse cobbly and bouldery gravels exposed in the ice-contact complex near drill hole I and encountered in the base of drill hole I, and the stratified pebbly gravels and sands in the outwash delta south of Burt Lake.

Immediately upon deglaciation much of the area was inundated by a glacial lake. Baker (1980) notes that strand lines are present to near 1150 feet a.s.l., although significant thicknesses of lacustrine deposits are confined to below 1050 feet a.s.l. Lacustrine processes have resulted in the upper part of most tills on hills and ridges being winnowed of their fines and pockets of sand, such as near drill hole II, being deposited throughout the area. In lower areas varved clays accumulated . Generally these clays are less than 50 feet thick (Hughes 1965), but at drill hole VII over 175 feet were penetrated. These clays are exposed at the surface only in areas, such as that near drill hole IV, where fine sandy lacustrine material (deposited in either a subaqueous or subaerial environment in a shoaling lake) did not cover them. In much of the Englehart River valley, the clay is covered by these sands, which were deposited from glacial meltwater streams issuing from a stagnating glacier located to the northwest of the area. In many places the sands contain beds of silt and clay. Accumulation of between 25 and 190 feet of these sands (cf. drill holes VI, VII, IX, X) in the Englehart River valley has masked most relief on the bedrock surface there.

Sand dunes formation and stream incission followed further fall in lake levels. During this phase, the Englehart River seems to have incissed itself at least 62 feet below its present flood plain level as abundant organic detritus and shelly material indicative of flood plain environment were present in drill hole VII on the Englehart River flood plain. An alternate explanation for these materials is that they are interglacial or interstadial deposits and that the sand and clay below them date from an early glaciation. Assuming that the upper 60 feet of material under the Englehart River flood plain and low terraces is alluvium, it implies a drastic change in the flow regime following the initial phase of incission.

In areas of poor drainage, organic materials have begun accumulating during the postglacial. Bogs have developed in areas of thick organic accumulation.

2.3 Stratigraphy and Bedrock Relief

The bedrock surface in the area of concern is generally rolling; defining hills and ridges with gentle to moderate slopes. This is especially true on the upland to the northeast and southwest of the Englehart River valley.

The bedrock surface under the sandy plain occupying the Englehart River valley falls off and is generally over 100 feet below the surface of this plain, which lies 1000 to 1050 feet a.s.l. (cf. Figures 2 and 3). Some rugged relief is present on this bedrock surface as can be witnessed by the steep-sided bedrock hill that rises above the sandy plain at location D on Figure 1.

A deep trench running parallel to the Englehart River is also present within the broad valley (cf. Figure 3). The absolute base level of this trench is not known, although it must lie well below 500 feet elevation. The course of this trench will not necessarily lie directly under the entrenched Englehart River, although the distribution of outcrop and drift thickness data (Figures 1 and 2) would suggest very near coincidence of these two features.

Whether the base of the bedrock trench penetrates the Huronian at drill hole VII and to the south of the drill hole is open to question given the available data. The coarse fractions of the basal tills at drill holes IX and X were extremely rich in Huronian clasts and deficient in Archean clasts. This would suggest the absence of an Archean window to the north. However drill hole VII lies well to the east of drill holes IX and X, and a window of drill hole VII would not be detectable at drill holes IX and X. To investigate what underlies the bedrock trench near hole VII through glacial dispersion would require examination of clast lithologies in the till in northeastern Gross Township along the western edge of the incissed Englehart River valley (cf. Figure 1).

2.4 Drift Thicknesses

Drift thicknesses on areas noted as 'thin, much bedrock exposure' on Figure 2 are rarely covered by more than 10 feet of drift and bedrock outcrop is common. In areas noted as 'extensive, but discontinuous' bedrock also outcrops, but enough drift is present to smooth the topography. However, ground observations suggest that drift thicknesses of 5 to 15 feet are common, and that the drift may only thicken significantly in depressions. The drift is generally less than 100 feet thick even in depressions within the uplands where the drift has been noted as 'thick' on Figure 2.

Bedrock is infrequently exposed within the Englehart River valley. Drift thicknesses within the valley likely are generally between 100 and 200 feet (cf. Figures 2 and 3). Within the deep bedrock trench underlying the Englehart River valley, bedrock is more than 425 feet below the surface.

3.0 REVERSE CIRCULATION AND MINERAL EXPLORATION - BURT PROJECT AREA

3.1 Applicability

Reverse circulation drilling and till sampling would appear to be a most applicable exploration tool in areas where the drift is more than 20 feet thick, but less than 200 feet thick. This encompasses most of the Englehart River valley and areas of thick drift in depressions within the surrounding uplands.

In the uplands of eastern Burt Township and western Holmes Township, shoveled excuvation (via backhoe or Hyhoe) would probably allow more economic collection of basal till for analysis. Sites could be chosen 'down-glacier' from narrow depressions to investigate the possibility of mineralization within the depressions.

Overburden drilling of the deep bedrock trench underlying the Englehart River valley would require great expense to intercept the bedrock surface and would seem impractical unless a very definate target was identified.

3.2 Miscellaneous Considerations

As noted during the field operation, identification of clay, silt, sand, bouldery gravel and bedrock is relatively easy, although bouldery gravel and bedrock may be confused if composed of similar lithologies (drilling progress is generally more rapid in the gravels). Problems do exist in differentiating sandy till and pebbly or gravelly sands. If moderate amounts of water are being used during the drilling, the till can be identified by noting sandy clods on the screens. However, in some cases where much water is used this is impossible to note. In these cases, one can only note the general texture of the material and relate it to the regional stratigraphy. In situations of uncertainty where one appears to be penetrating various units, it is best to collect separate samples from all units, even if the intervals sampled are less than 5 feet thick - this equires numerous sample pails (one cannot have too many for this situation). The textured lithologic and geochemical signatures of different units may become apparent when examined within an areal context.

The first 6 inches of any drive should not be sampled. Often it contains material from above that have been washed down the hole during washing of the hole. Material obtained during washing of the hole should not be mixed with materia obtained during drilling under any circumstances. This is particularly important when sampling till under gravel or bedrock under till or gravel as analysis from uncontaminated samples of till and bedrock are the most easiest results to interpret in mineral exploration through overburden drilling.

Respectively submitted,

V.N. Rampton, Ph.D., P.Eng.

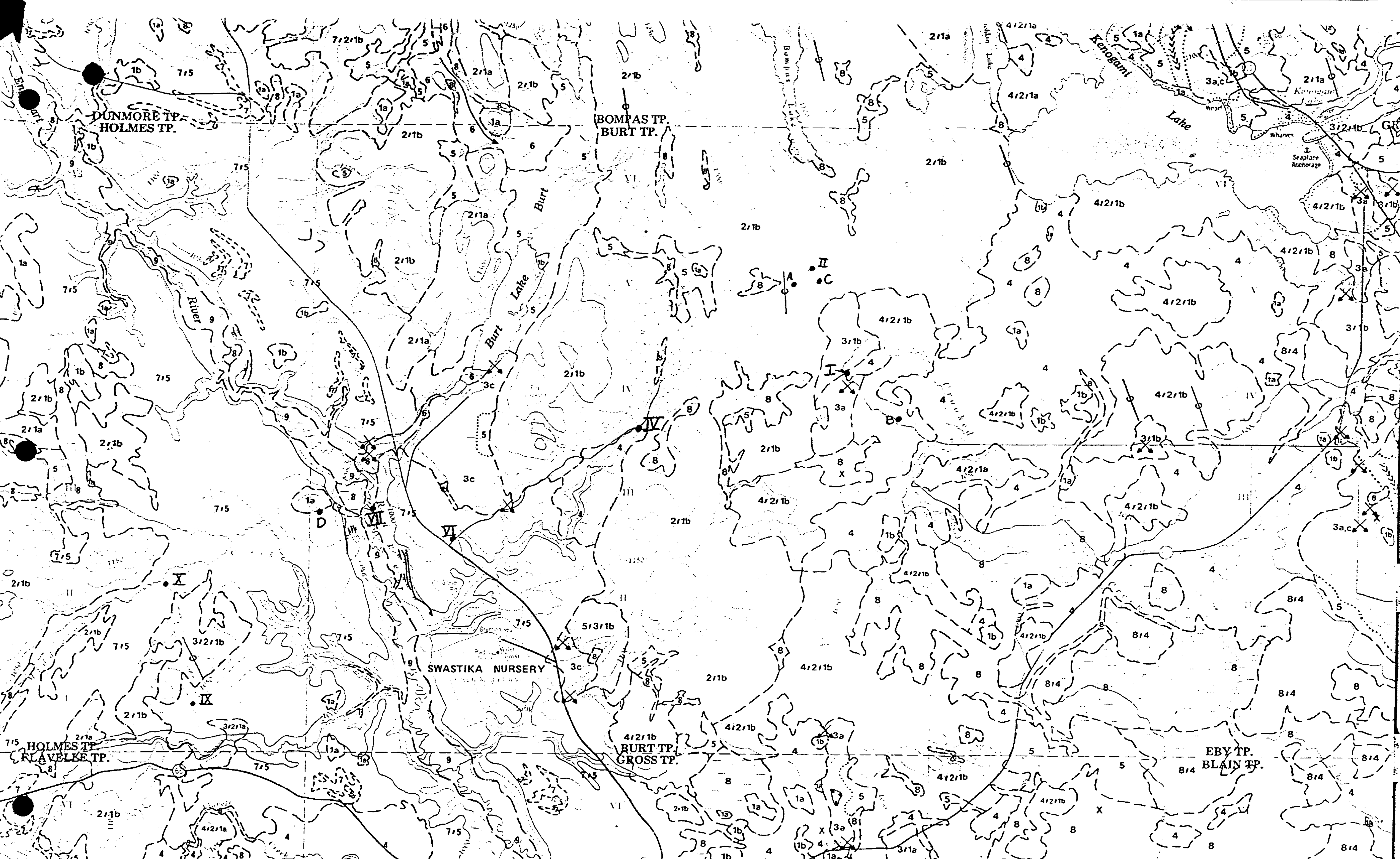
REFERENCES

Baker, C.L. 1980: Quaternary geology of the Kirkland Lake area, District of Timiskaming; Ontario Geological Survey, Preliminary Map P.2382.

Baker, C.L. 1982: Drift thickness of the Kirkland Lake area, Timiskaming District; Ontario Geological Survey, Preliminary Map P.2479.

Boissoneau, A.N. 1966: Glacial history of northeastern Ontario, 1. The Cochrane-Hearst area; Canadian Journal of Earth Sciences, v.3, p.559-578.

Hughes, O.L. 1965: Surficial geology of part of the Cochrane District, Ontario, Canada; in International studies on the Quaternary; Wright, H.E. and Frey, D.G., editors, Geological Society of America, Special Paper 84, p.535-565.

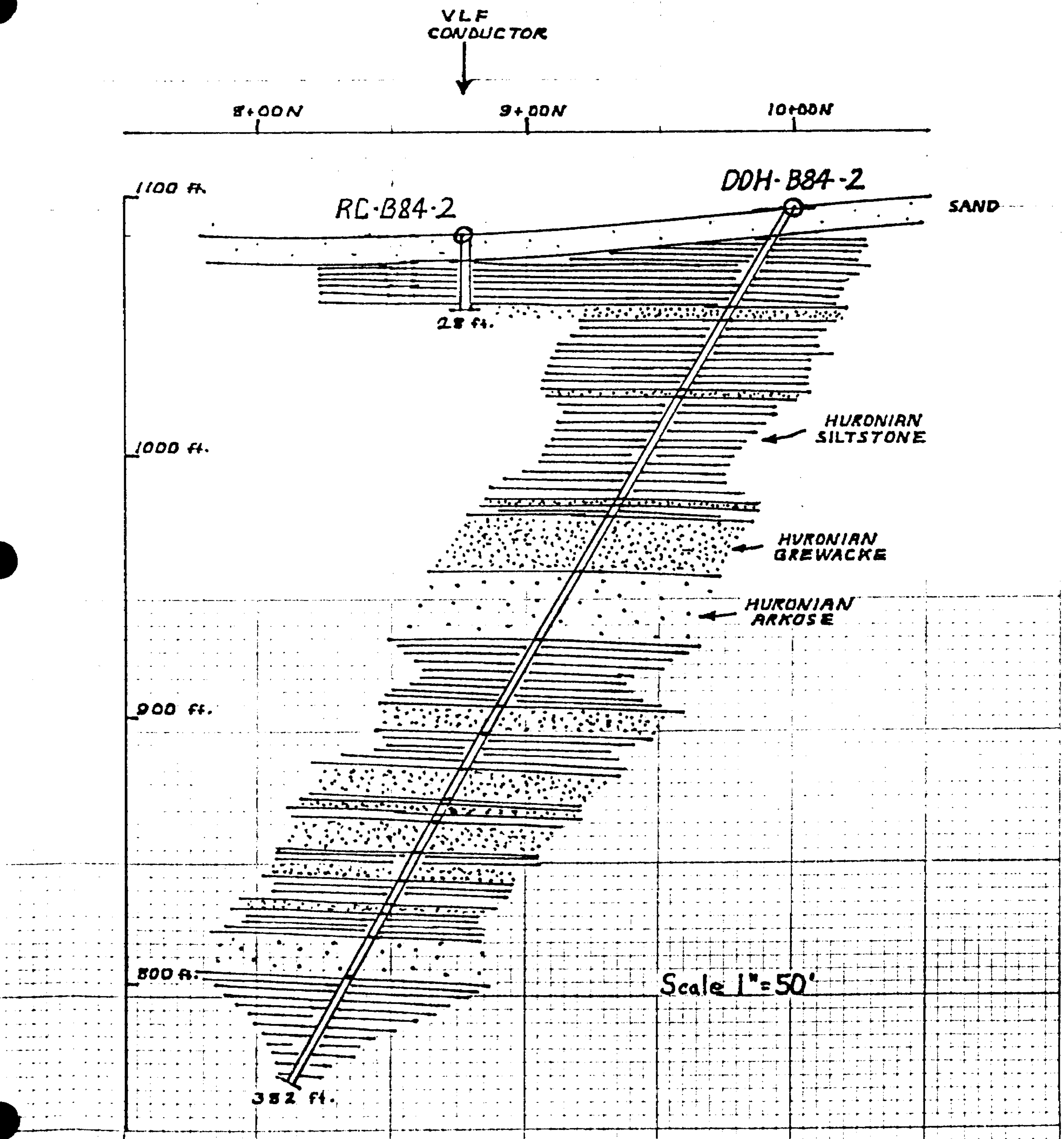


EXPLANATION:

1. Bedrock
2. Till
3. Glaciofluvial Deposits
4. Clayey Lacustrine Deposits
5. Sandy Lacustrine Deposits
6. Fluvial Deposits
7. Eolian Deposits
8. Organic Deposits
9. Alluvial Deposits

● A Locations
● I Drill Holes

FIGURE 1
from Baker (1980)



SECTION 2 : Geological Cross Section, RC-B84-2 and DDH-B84-2

#63.4595

42A01SW0057 63.4595 HOLMES

900

OM84-6-C-18

30/06/87

THIS SUBMITTAL CONSISTED OF VARIOUS REPORTS, SOME OF WHICH HAVE BEEN CULLED FROM THIS FILE. THE CULLED MATERIAL HAD BEEN PREVIOUSLY SUBMITTED UNDER THE FOLLOWING RECORD SERIES. (THE DOCUMENTS CAN BE VIEWED IN THESE SERIES):

COMPARISONS:		TORONTO FILE:
1. Report #927-85-01 on the BURT PROJECT Billiton Canada Ltd. Robertson, D Feb., 1985		#2.9440
2. Diamond drill logs for holes:	B84-7 B84-7A B84-9 B84-10 B84-6 B84-4 B84-1	#2.9440
3. Diamond drill logs for holes:	B84-1 B84-2 (2)	Burt Twp. D.D.#10

NON-COMPARISONS:

1. Report: An Assessment of Quaternary Stratigraphy and Circulation to Mineral Exploration in Holmes-Burt-Eby Townships Area.

   for: Billiton Canada Ltd.
   by: Terrain Analysis and Mapping Services Ltd.
   Rampton, V.N.
   October 1984 — #63.4595

2. Geological Cross Section, RC-B84-2 and DDH-B84-2 (sec. 2) — #63.4595

3. Burt project-List of claims (table 1) — #63.4595

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February 7, 1985

Mr. F.W. Pooley
OMEP Administrator
Mining Taxation and OMEP Office
Room 4649, Whitney Block
99 Wellesley Street West
Toronto, Ontario
M7A 1W3

Re: Certificate of Designation No. OM84-6-C-18

Dear Mr. Pooley:

In compliance with the OMEP Act, Billiton Canada Ltd., is submitting its technical report (in duplicate).

A completed FORM 2 - Application for Grant or Certificate of Entitlement to Tax Credit and an audited financial statement will be provided by March, 1985.

Yours truly,

BILLITON CANADA LTD.

John W. Perston

JWP:mam
Enclosure
cc: BCET/3

TABLE I

BURT PROJECT - LIST OF CLAIMS

Claim Numbers from	Claim Numbers to	No. of Claims	Township	Date Recorded	Assessment Rep. Due Before
L749270	L749305	36	Burt	Sept. 9, 1983	Sept. 19
L749318	L749337	20	Burt	Sept. 9, 1983	Sept. 19
L735638	L735644	7	Burt	Sept. 16, 1983	Sept. 26
L749831	L749868	38	Burt	Sept. 16, 1983	Sept. 26
L749881	L749890	10	Burt	Sept. 16, 1983	Sept. 26
L750001	L750015	15	Burt	Sept. 16, 1983	Sept. 26
L724827	L724830	4	Burt	Sept. 27, 1983	Oct. 7
L735645	L735648	4	Burt	Sept. 27, 1983	Oct. 7
L749891	L749892	2	Burt	Nov. 8, 1983	Nov. 18
L753423	L753438	16	Holmes	Nov. 9, 1983	Nov. 19
L753443	L753462	20	Holmes	Nov. 9, 1983	Nov. 19
L779878	L779894	17	Burt	Nov. 9, 1983	Nov. 19
L779898	L779906	9	Burt	Nov. 9, 1983	Nov. 19
L755159	L755205	46	Burt	May 8, 1984	May 18
L755205	L755208	4	Eby	May 8, 1984	May 18
	TOTAL	248			