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BULLETIN 507

GROUND ICE VOLUMES DETERMINED FROM SHALLOW CORES FROM WESTERN FOSHEIM PENINSULA, ELLESMERE ISLAND, NORTHWEST TERRITORIES

D.A. Hodgson and F.M. Nixon



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Cover illustration

Coring the original (abandoned) Eureka airstrip with
a JKS 300 drill. The pond follows the top of a partly
thawed ice wedge. 19 July, 1974.

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GROUND ICE VOLUMES DETERMINED FROM SHALLOW CORES FROM WESTERN FOSHEIM PENINSULA, ELLESMERE ISLAND, NORTHWEST TERRITORIES

Abstract

A mean ice content of 53 per cent was estimated for 152 boreholes drilled to depths of 1 to 8 m on Fosheim Peninsula. Visual estimates were supplemented with a few laboratory measurements. Cores were obtained from raised marine sediments, weathered clastic rock, till, and peat. The majority of boreholes were in clay- to sand-sized Holocene marine-deltaic deposits (64 per cent ice); one third of these boreholes were in frost-fissure troughs (84 per cent ice). Frost fissures occupy 25 per cent by volume of the upper 2 m of marine fines. Polygon centres were underlain by 47 per cent ice, which included some massive ice lying between marine veneer and shale. For weathered rock (38 per cent ice), the finer material was generally more icy than the coarse, except for some clay shale showing no visible ice. No difference was observed in ice content of rock above and below marine limit. Sites disturbed by compaction or scraping were depressed by thaw of ice-wedge tops and other segregated ice. Generally, if the frost table was lowered, then liquefaction of fine grained sediments would occur.

Résumé

Dans la péninsule Fosheim, le forage de 152 trous jusqu'à des profondeurs de un à huit mètres a permis d'estimer à 53 % la teneur moyenne en glace du sous-sol. Les estimations visuelles ont été complétées par quelques mesures en laboratoire. Des carottes ont été prélevées dans des sédiments marins de dépôts soulevés, des roches clastiques météorisées, du till et de la tourbe. La majorité des trous ont été forés dans des sédiments de milieux marins-deltaïques de l'Holocène, qui montrent une granulométrie s'échelonnant de la classe des argiles à celle des sables (64 % de glace); le tiers de ces trous ont été implantés dans des fentes de gélicontraction (84 %). Ces fentes occupent 25 % du volume des deux mètres supérieurs des sédiments marins à grain fin. Sous le centre des polygones, les sédiments contenaient 47 % de glace, dont une partie est constituée de glace massive formée au contact d'un placage de sédiments marins et d'un shale. Dans la roche météorisée (38 % de glace), les matériaux fins contenaient généralement plus de glace que les matériaux grossiers, à l'exception de certains shales argileux qui étaient dépourvus de glace visible. Aucune différence dans la teneur en glace n'a été observée dans les roches situées de part et d'autre de la limite marine. Les sites ayant été dérangés soit par une compaction des dépôts, soit par des travaux de décapage, montraient un affaissement créé par la fusion du sommet des coins de glace et d'autres formes de glace de ségrégation. En général, si le plafond du pergélisol est abaissé, il se produit une liquéfaction des sédiments à grain fin.

SUMMARY

Shallow drilling to determine stratigraphy in support of Quaternary mapping and terrain performance studies was undertaken in 1972, 1973, and 1974 on Fosheim Peninsula, central Ellesmere Island. The material of greatest interest in the cores was ground ice. Materials around Eureka weather station and at industry well sites active at that time were known to contain some large ice bodies; we wished to examine interactions between ice and ground disturbed by human activity. Recent climate change studies centred at Hot Weather Creek on western Fosheim Peninsula have revived interest in the previously unpublished borehole logs. Hence this data has been recompiled on a computerized database and subjected to some simple analyses.

SOMMAIRE

En complément des travaux de cartographie des sédiments quaternaires et des études de terrain entreprises en 1972, 1973 et 1974 dans la péninsule Fosheim, dans le centre de l'île d'Ellesmere, des forages à faible profondeur ont été effectués pour établir la stratigraphie. Le matériau du plus grand intérêt contenu dans les carottes était la glace de sol. Il était établi que les matériaux présents autour de la station météorologique d'Eureka et aux sites où étaient exploités des puits par l'industrie à cette époque contenaient quelques grands amas de glace; le but poursuivi par le présent projet était d'étudier les interactions entre la glace et les sols dérangés par des activités anthropiques. Les études récentes sur le changement climatique centrées sur le ruisseau Hot Weather dans la partie ouest de la péninsule Fosheim ont ravivé l'intérêt pour les diagraphies de puits non publiées. Aussi ces données ont-elles été recompilées dans une base de données informatisée et soumises à certaines analyses peu complexes.

Surficial material over much of the Fosheim Peninsula is poorly to well consolidated clastic rock, commonly disaggregated by weathering into a range of grain sizes. Younger unconsolidated deposits include Late Tertiary fluvial sand and gravel, Quaternary silty to bouldery till, Holocene silt- and sand-sized raised marine and deltaic deposits below 150 m elevation, fluvial sediments, and small areas of thin peat. Pore ice and segregated ice are a significant component of surficial materials. Permafrost is present below a depth of 10-100 cm, depending on the porosity of materials and the nature of vegetation (if any).

Cores were extracted to a maximum depth of 2.5 m using hand-held drills. Mounted drills produced a few long cores to a maximum depth of 8 m. Cores were described in the field, and some icy sediments were sampled for later determination of water content, grain size, and soil plasticity. Other sources of ground ice data investigated included excavated banks, shallow refraction seismic profiling, and industry shothole logs. Sub-surface and laboratory data recently were entered in a borehole database (ESELog/ESEBase) to provide multi-parameter logs.

The sites of more than half the 152 holes bored were in thick, fine grained marine or deltaic deposits, or in a marine veneer over shale or siltstone; these are the dominant materials adjacent to Eureka weather station and to the well sites chosen for investigation. Fewer cores were taken from the other main types of surficial material. Most holes were below the 145-150 m Holocene marine limit. For 60 per cent of the cases, it was possible to determine whether the sites were over frost-fissure troughs or polygon centres.

From measurements and visual estimates, the mean ice content of all cores was calculated to be 53 per cent. Most holes were less than 1.5 m deep; however, deeper holes had similar ice contents. The ice content was 84 per cent under polygon troughs (up to 6 m wide), compared to 47 per cent under polygon centres. Marine-deltaic sediments averaged 64 per cent ice; this value may be skewed by the numerous ice-wedge investigations carried out in this material; nevertheless, massive non-wedge ice was encountered. In weathered rock, ice content declined overall with increasing grain size; however, some clay shale contained no visible ice. No significant difference was noted for rock above and below marine limit. Ice observations recorded in industry seismic shothole logs for this area were judged too unreliable to use.

Les matériaux de surface s'étendant à la majeure partie de la péninsule Fosheim sont des roches clastiques faiblement à bien consolidées, généralement fragmentées par altération météorique en sédiments de différentes classes granulométriques. Les dépôts non consolidés plus récents incluent : des sables et des graviers fluviaux du Tertiaire tardif; du till silteux à blocailleux du Quaternaire; des dépôts silteux et sableux formés dans des milieux deltaïques et marins à l'Holocène, qui ont été soulevés par la suite et qui se situent aujourd'hui à des altitudes de moins de 150 m; des sédiments fluviaux; et des étendues limitées de tourbe mince. La glace interstitielle et la glace de ségrégation constituent une portion significative des matériaux de surface. Le pergélisol est présent à partir de 10 à 100 cm de profondeur, selon la porosité des matériaux et la nature de la végétation (s'il y en existe).

Des carottes ont été extraites jusqu'à une profondeur maximale de 2,5 m au moyen d'une foreuse manuelle. Des foreuses montées sur un support ont permis d'extraire quelques longues carottes jusqu'à une profondeur maximale de 8 m. Les carottes ont été décrites sur le terrain et des échantillons de sédiments contenant de la glace ont été prélevés afin de réaliser des déterminations de la teneur en eau, de la granulométrie et de la plasticité du sol. Parmi les autres sources de données sur la glace de sol qui ont été étudiées, mentionnons des bancs d'excavation, des profils de sismique-réfraction de faible profondeur et des descriptions (diagraphies) des matériaux extraits des trous effectués pour la réalisation de levés sismiques par l'industrie. Les données recueillies dans la subsurface et en laboratoire ont été stockées, il y a peu de temps, dans une base de données sur les sondages (ESELog/ESEBase) afin de produire des diagraphies multiparamétriques.

Les sites de plus de la moitié des 152 trous forés étaient situés dans d'épais dépôts à grain fin de milieux marins ou deltaïques ou dans un placage de sédiments marins surmontant une unité de shale ou de siltstone; ces matériaux sont ceux qui dominent près de la station météorologique d'Eureka et des puits choisis pour l'analyse. Un nombre moins élevé de carottes ont été prélevées dans les autres principaux types de matériaux de surface. La plupart des trous ont été forés sous la limite marine soulevée de l'Holocène, qui se situe à une altitude de 145-150 m. Dans 60 % des cas, il a été possible de déterminer si les sites étaient situés à l'aplomb de fentes de gélicontraction ou sous le centre de polygones.

À partir de mesures et d'estimations visuelles, la teneur moyenne en glace de toutes les carottes a été évaluée à 53 %. La plupart des trous n'ont pas dépassé 1,5 m de profondeur; cependant, les trous plus profonds ont révélé des teneurs en glace semblables. Ces teneurs s'élevaient à 84 % à l'aplomb des fentes de gélicontraction délimitant des polygones (dont la largeur pouvait atteindre 6 m), comparative-ment à 47 % sous le centre des polygones. Les sédiments de milieux marins-deltaïques contenaient 64 % de glace en moyenne; cette valeur peut être biaisée du fait qu'un grand nombre d'analyses des coins de glace ont été menées dans ces matériaux; néanmoins, de la glace massive a été observée ailleurs que dans des coins de glace. Dans la roche météorisée, la teneur en glace diminuait globalement en proportion de l'augmentation de la dimension du grain de celle-ci; cependant, certains shales argileux ne contenaient aucune glace visible. Aucune différence marquée n'a été notée dans la teneur en glace des roches situées de part et d'autre de la limite marine. Dans cette région, les observations sur la glace notées dans les journaux de sondage des trous effectués par l'industrie pour la réalisation de levés sismiques ont été jugées trop peu fiables pour être utilisées.

Subsurface materials were examined at several sites disturbed by compaction or scraping. The first Eureka airstrip (now abandoned), harrowed between 1947 and 1951, is depressed 10-60 cm below surrounding areas. The underlying marine veneer over fine grained rock contains massive ice wedges; tabular ice was present locally between the veneer and shale. Vegetation removal was probably an early factor in encouraging thaw, with drainage disruption a continuing factor. The present strip suffered similar disturbance of ice wedges until sufficiently built up with coarse material.

In general, too few sites were cored to permit correlation of ground ice data with site parameters such as surficial materials, slope/drainage, or position relative to marine limit. Bias in site selection resulted in more than half the holes being bored in raised marine sediments. Here, ice wedges occupy 25 per cent by volume of the upper 2 m. Massive tabular ice occurs in places, but certainly not everywhere. In the event of climate warming and depression of the frost table, marine sediments will be particularly prone to liquefaction.

INTRODUCTION

Studies of Quaternary deposits (surficial materials), including mapping, were undertaken on central Ellesmere Island (Fig. 1) in 1972-74, and 1978 (Hodgson, 1973b, 1974; Hodgson and Edlund, 1975). Reconnaissance investigations had been carried out in the same area by J.G Fyles (in Jenness, 1962). To assist stratigraphic studies, 152 shallow holes were bored on western Fosheim Peninsula, initially using hand-held corers transported by all-terrain tricycles, a method pioneered on Melville Island (Barnett and Forbes, 1973), and subsequently by larger drills transported by helicopter (Veillette, 1975). Drill sites are shown in Figures 2 and 3, and core logs are reproduced in Appendix 1. Ground ice was the material of greatest interest in cores and is the focus of this report. Quantities of pore ice or segregated ice generally could not be determined from surveys of the land surface, though indicators of wedge ice and massive ice included ubiquitous polygonal frost cracks and scattered concentrations of retrogressive thaw slumps. Palsas are rare on Fosheim Peninsula; pingos have not been observed.

Interest in ground ice was stimulated by related studies of terrain performance and disturbance associated with oil and gas exploration (Hodgson, 1973a). From the late 1960s to the mid 1970s the petroleum industry actively explored the western Fosheim Peninsula, resulting in the most intensive land use yet experienced in the eastern Queen Elizabeth Islands. By 1972, drilling had revealed oil-bearing formations at

Des matériaux de surface dérangés par une compaction ou des travaux de décapage ont été examinés en plusieurs endroits. La première piste d'atterrissage (maintenant abandonnée) à Eureka, aménagée entre 1947 et 1951, s'est affaissée de 10 à 60 cm par rapport aux secteurs environnants. Le placage de sédiments marins sus-jacent à une roche à grain fin sur lequel a été construite la piste contient des coins de glace massive; de la glace tabulaire était présente par endroits entre le placage de sédiments marins et le shale sous-jacent. L'élimination de la végétation a probablement été un facteur précoce de dégel, et la modification de l'écoulement, un facteur continu. La piste actuelle a subi un dérangement semblable par des coins de glace jusqu'à ce qu'elle soit enchaussée de matériaux grossiers en quantités suffisantes.

En général, on peut dire que trop peu de sites ont fait l'objet de carottages pour que puissent être corrélées les données sur la glace de sol aux paramètres des sites comme la nature des matériaux de surface, la pente et le drainage ou la position du site par rapport à la limite marine. Un biais dans le choix des sites a fait en sorte que plus de la moitié des trous ont été forés dans des sédiments marins soulevés. Là, les coins de glace occupent 25 % du volume des 2 m supérieurs des dépôts. De la glace tabulaire massive est présente par endroits, mais certainement pas partout. Si le climat devait se réchauffer et que le plafond du pergélisol devait s'abaisser, les sédiments marins seraient particulièrement sujets à une liquéfaction.

Romulus well site (Fig. 2), leading to a proposal for a pipeline to a marine terminal on southeastern Ellesmere Island (Oilweek, 1972). This provided the initial impetus for surficial mapping. As it turned out, there was insufficient oil to exploit, nor were gas reserves found on the scale of those in the central Queen Elizabeth Islands. Longer term though less extensive land use has occurred around the Eureka weather station. The long-abandoned first airstrip of the station is of particular interest; detailed coring was carried out in this area.

Information on ground ice was incorporated in extended legends accompanying surficial geology and vegetation maps of Hodgson and Edlund (1977), but no other analysis of core records was published. The cores were not collected systematically from representative Quaternary units because mapping was concurrent with drilling; therefore, statistical manipulation did not appear appropriate. Since the original work was done, a new interest in ground ice has developed as a result of climate change studies centred around Hot Weather Creek (Edlund et al., 1989). Any rise in mean air temperature during the seasonal thaw period would lower the permafrost table, thawing any excess ice, and lead to thaw settlement, slope instability, as well as changes in the surface water balance. Hence the borehole data have been subjected to some simple manipulation and been recompiled and renumbered chronologically (Appendix 1) The results form the nucleus of this report and complement several recent studies of massive ice on western Fosheim Peninsula (Pollard, 1991; Barry, 1992; Robinson, 1994).

PHYSIOGRAPHY AND SURFICIAL MATERIALS

The Fosheim Peninsula, together with lowlands of eastern Axel Heiberg Island, is intermontane, surrounded to the west, north, and east by massifs exceeding 1000 m elevation (Fig. 1). Western Fosheim Peninsula is bounded by deep straits and sounds, except to the southeast, where the Sawtooth Mountains rise to 1000 m elevation (Fig. 2). Uplands within the western peninsula locally exceed 500 m. The underlying folded and faulted Mesozoic and Tertiary sediments, mostly sandstone, siltstone, and shale, range from well-consolidated to unconsolidated (Thorsteinsson, 1971a, b; Trettin 1991). Basic sills and dykes, massive in places, intrude these sediments. Bedrock structure is widely visible on the sparsely vegetated land surface; nevertheless, exposed rock has commonly been highly fractured during weathering, and even disaggregated in the case of the poorly consolidated rock underlying most lowlands.

The nature of the last glaciation of central Ellesmere Island is a fractious issue (Hodgson, 1985; England et al., 1991). Geomorphological evidence suggests either that western Fosheim Peninsula remained ice free during the Late Wisconsin, except for local glaciation of upland (Bell, 1992), or that any ice sheet present was cold based. In either case, interglacial or interstadial permafrost conditions would have been preserved through the last glacial cycle. The occurrence of a marine inundation in the latest Pleistocene/early Holocene is not contentious (Hodgson, 1985; Hodgson et al., 1991; Bell, 1992). It is well documented that sea level lay 145-150 m above present sea level (a.s.l.) at about 9000 radiocarbon years B.P., after which it fell at the exponential rate common in the Arctic (Fig. 4). However, the period for which the highstand was maintained is in dispute (England, 1992). After a marine transgression, pre-existing permafrost thins from the top and bottom, though complete thawing under an Arctic sea could take several tens of thousands of years (Taylor, 1991). With shoreline regression, surface layers freeze when exposed to subaerial temperatures.

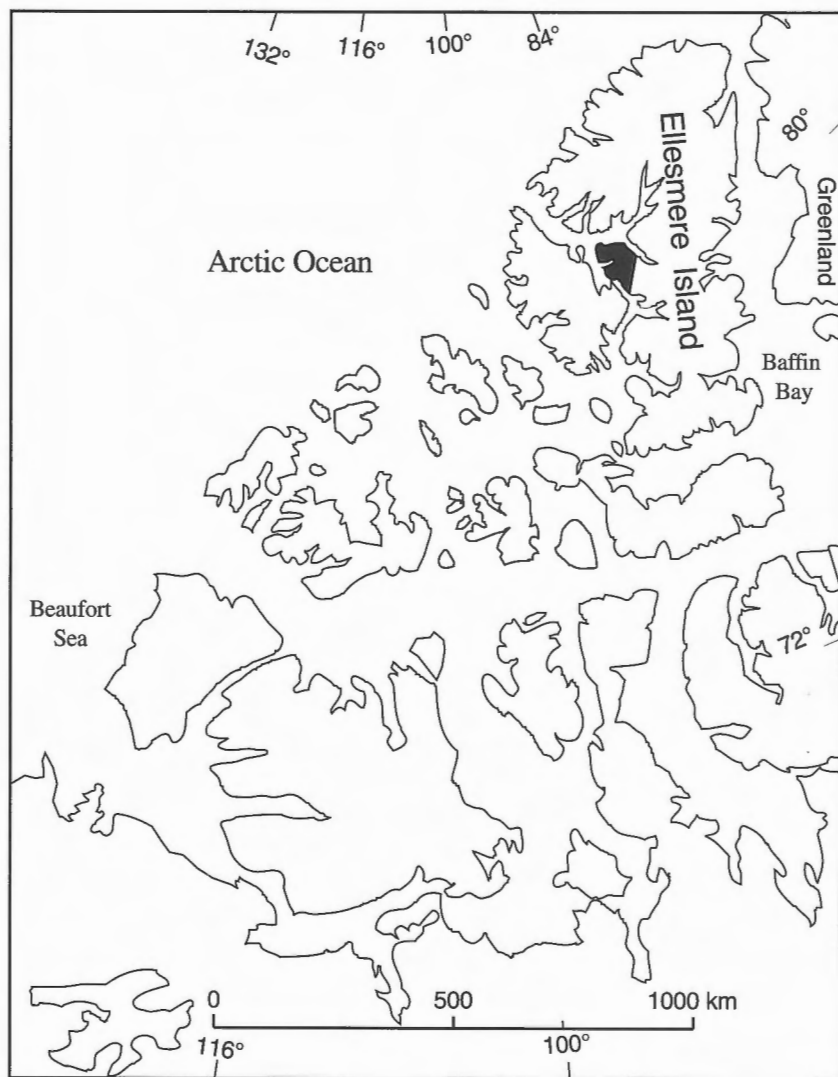


Figure 1.

Location of western Fosheim Peninsula within the Canadian Arctic Archipelago.

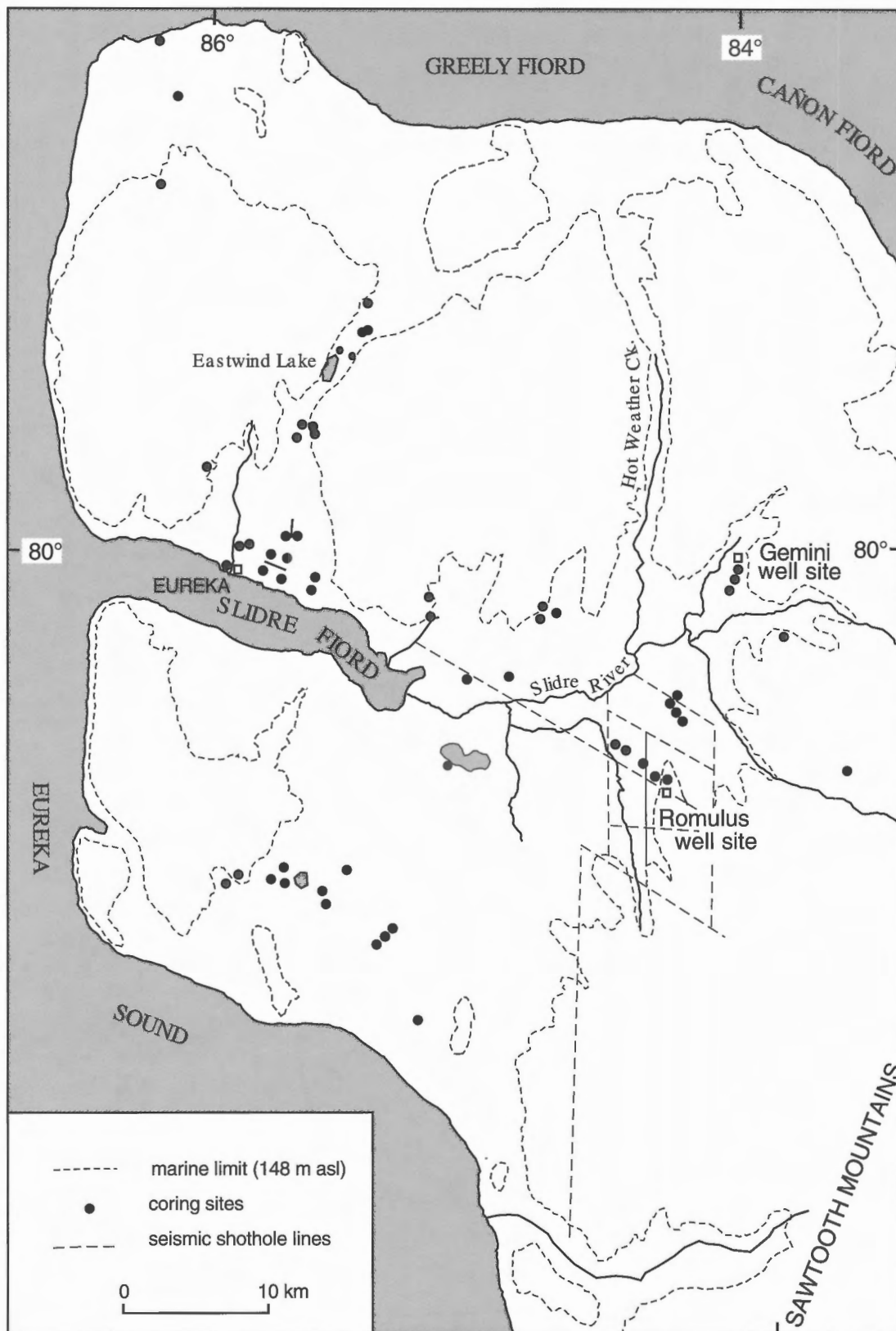


Figure 2. Western Fosheim Peninsula showing marine limit, coring sites, and location of selected seismic lines.

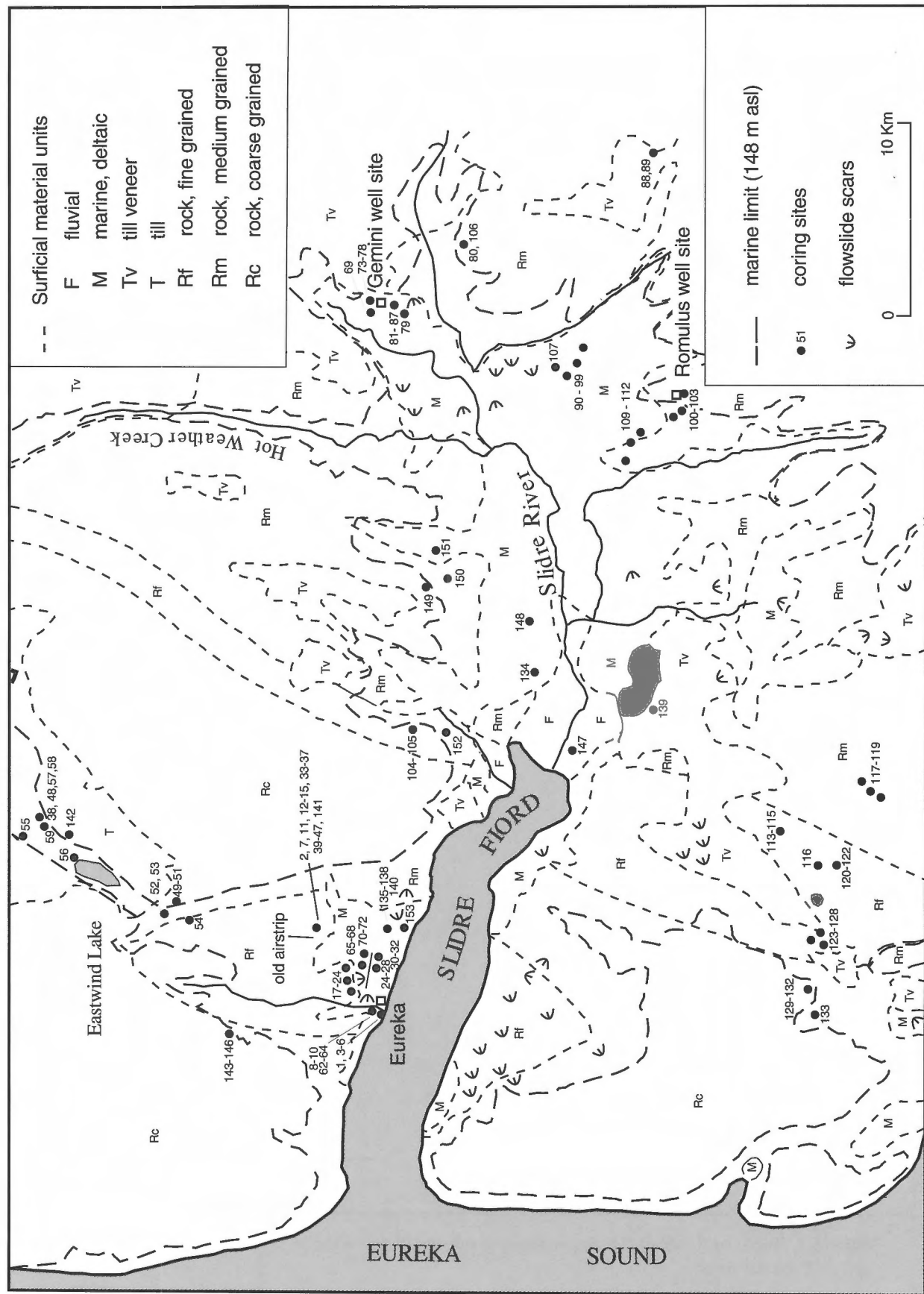


Figure 3. Area around Slidre Fjord showing coring sites, surficial materials.

Bedrock over 25 per cent of the western part of the peninsula is masked by unconsolidated deposits from a range of Late Tertiary and Quaternary events (Fig. 3). These deposits are attributed to the following processes:

1. Late Tertiary fluvial deposition of sands and gravels left formerly extensive, massive deposits, which are preserved in high terraces 250-350 m above sea level (Fyles, 1989; Hodgson et al., 1991).
2. Quaternary glaciations resulted in deposition of silty-clay matrix till to bouldery gravel till.
3. Marine inundation during the latest Pleistocene and/or early Holocene left nearshore and deltaic silty clay to fine sand especially in the lower basin of the Slidre River and around Slidre Fiord.
4. Holocene fluvial processes deposited sediments dominantly composed of the coarser fraction of source deposits.
5. Slope processes with rates ranging from rapid (active-layer failures) to slow (creep and solifluction) generally left deposits similar in composition to subjacent bedrock or Quaternary materials. Colluvium therefore is rarely mapped as a separate unit.
6. Thin deposits of muck and peat are scattered over lowlands.

FIELD METHODS

Coring and logging

Coring equipment used is listed in Table 1. A description and performance evaluation of each type is provided by Veillette and Nixon (1980). Hand-held corers were moved by foot, all-terrain tricycle and helicopter, and frame-mounted drills by helicopter. Drilling took place in June, July, and August, after snowmelt. Cores were extruded from core barrels and described on site.

Descriptive conventions and subsequent analyses differed between 1972-73 and 1974. In 1972-73, soils were described by typical names, ice structure by common stratigraphic terms, and ice quantity as a percentage of the core. Observations were later converted to the unified soil classification system (Bureau of Reclamation, 1968) and the National Research Council system of permafrost description (Pihlainen and Johnston, 1963). To check visual descriptions, measured lengths of some cores were sealed in cans or plastic tubs and returned to the field camp to determine water content (by thawing sample, decanting any excess water, oven-drying residue, and comparing weights). Some of these samples were analyzed for sand/silt/clay size or given complete grain size analyses in the Geological Survey of Canada sedimentology laboratory. Soil plasticity of a few samples was determined in the laboratory from Atterberg limit tests. In 1974, the complete cores were described on site, using

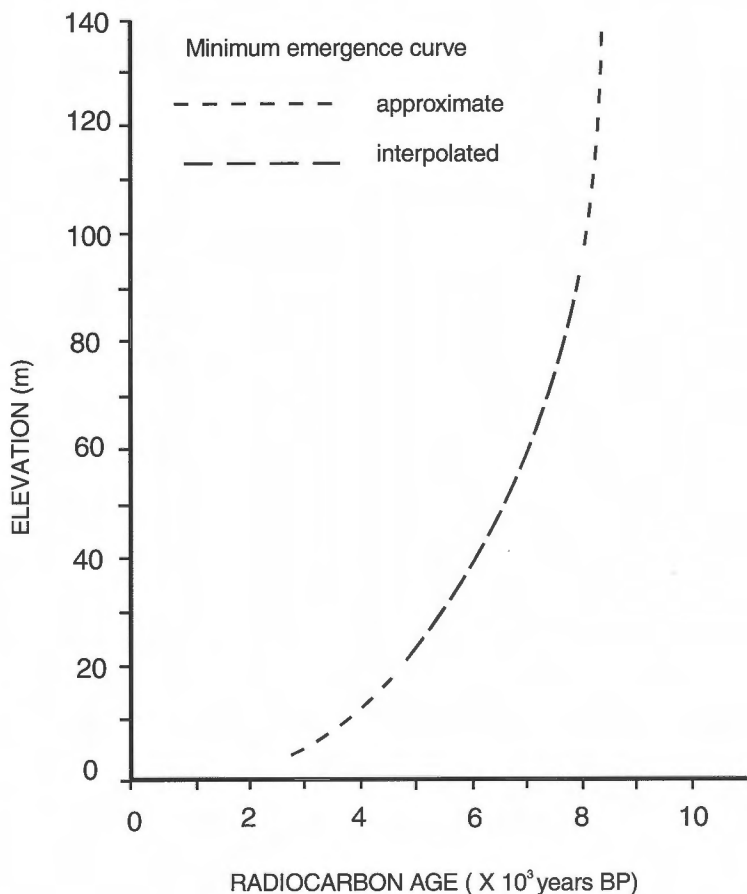


Figure 4.

Age-elevation data describing emergence of western Fosheim Peninsula (modified from Figure 3, Hodgson et al., 1991).

Table 1. Types of coring equipment used, range of penetration below surface, and numbers of cores logged.

Core barrel	Drilling machine	Depth cored (cm)	Holes 1972	----- 1973	logged 1974
CRREL	Haynes flexible drive (hand held)	130-180	2		
CRREL	General Equipment 51 (hand held)	30-240		109	1
CRREL	GW-15 Winkie (mounted drill)	310		1	
CRREL	JKS 300 (mounted drill)	160-690			14
BX diamond	GW-15 Winkie (mounted drill)	70-800		25	
TOTAL (per year)			2	135	15
TOTAL (1972-1974)		152			

unified soil symbols and typical names, and ice was described using National Research Council nomenclature. Water content and soil plasticity of samples were measured in the Geological Survey of Canada sedimentology laboratory.

Other sources of ground ice data

Artificial cuts

A stream bank 10 m high, with poorly exposed till, was excavated and cleaned using snowmelt stream water propelled through a Wajax fire pump (log 16; logs are presented in Appendix 2, unless otherwise noted). A completely artificial section was inspected in the 3.5 m high wall of a sump excavated for a future well site (log 139).

Shallow seismic survey

Refraction seismic profiling using a hammer source was carried out in 1974 at the sites of cores 140, 141, 143, 145, and 147-153 (Gagne and Hunter, 1975).

Industry seismic shothole logs

Many kilometres of seismic reflection profiles were run on western Fosheim Peninsula. Shothole logs for several hundred holes drilled to depths of 12 to 25 m across and to the south of the Slidre River were made available by Panarctic Oils Limited (Fig. 2). Descriptions are crude because they were made from cuttings ejected by air drills, but nonetheless many logs indicate that drillers observed visible (i.e. excess) ice in cuttings. A detailed study of shothole sampling on Banks Island is described by Tucker (1975) and Gauthier (1978).

Table 2. Distribution of cores by surficial material units.

No. of holes	% of total	surficial material
63	41	Holocene marine and deltaic silty clay to fine sand
26	17	Holocene marine veneer (fines) over shale and siltstone
19	12	weathered poorly consolidated or unconsolidated sandstone or siltstone
18	12	weathered shale or siltstone
10	6	weathered consolidated sandstone
9	6	till (stony silt or fine sand)
5	3	all or partly peat
3		fluvial deposits
1		beach material

CORE LOGS

Subsurface and laboratory data were entered in the borehole database ESELog/ESEBase, Version 4.0 (ESE Software Limited, 1991), which is geographically referenced and produces graphic or tabular output. Multiparameter logs were produced by this application (Fig. 5; Appendix 1). Data used in results and conclusions were taken from both the database and field notes. For example, the depth to the top of permafrost was estimated using the thickness of the seasonal thaw layer at the date of boring compared to the date of probable maximum thaw, together with an estimate of the porosity of material.

SITE SELECTION

The primary aim of coring was to examine ice content of (1) the main groups of surficial materials around Eureka, concentrating on materials known or suspected to contain large quantities of excess ice, and (2) disturbed areas (man-induced disturbance and naturally occurring slope failures).

Selection of surficial materials

Boreholes were distributed in a number of surficial material units (Fig. 6, Table 2). The greatest number of holes were bored in the unconsolidated and commonly fine grained raised marine deposits because they are widespread and relatively easily cored (Fig. 3). Segregated ice was known to occur in them, and slope failures revealing icy sediments are common around Slidre Fiord and in the lower Slidre River basin. Several holes were drilled in till near Eastwind Lake to accommodate thermistor cables prepared and monitored by M.W. Smith, Carleton University, Ottawa.

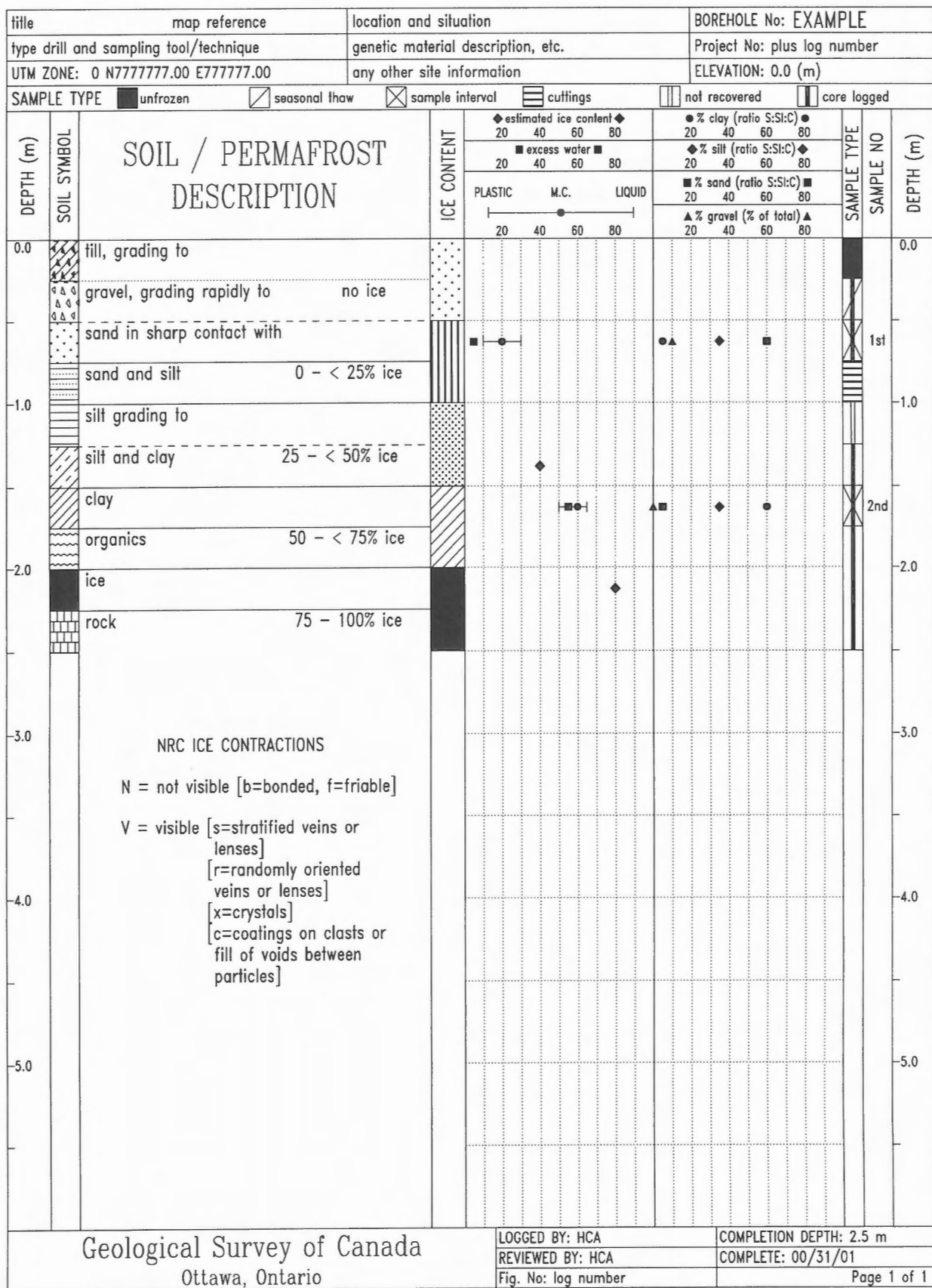


Figure 5. Example of a borehole log.

Selection of disturbed sites

Twenty-seven holes were bored in man-disturbed ground: twelve on the old Eureka airstrip; eight around the present strip; seven at the Panarctic Oils Gemini well site (Fig. 2, 3). Six more holes were adjacent to natural retrogressive thaw flowslides where massive ice was exposed.

Other site factors

An attempt was made to discriminate between frost-fissure troughs and the centres of the polygons that they form, both within units of similar material and in disturbed areas. It was predicted that many frost fissures would be underlain by ice wedges, whereas polygon centres might better indicate the presence or absence of ground ice resulting from other factors. Thirty-eight holes were bored in frost-fissure troughs

and fifty in polygon centres. Five holes were in fields of raised rim/depressed centre polygons where the usual order of relief was inverted.

Most holes (130 = 84 per cent) were bored in deposits below the 145-150 m asl Holocene marine limit (Fig. 7). This followed the abundance of fine grained and unconsolidated material in the lowlands and marine deposits. Abundant sites (38 per cent) at 100-124 m asl include the many holes drilled at the abandoned Eureka airstrip, which lies on a plateau 114 m asl, and the holes drilled at the Gemini well site at about 120 m.

RESULTS

Mean ice content

Mean ice content in all cores was 53 per cent (Fig. 8). The frequency distribution of ice content shows peaks at 90-100 per cent, 50 per cent (a common value for estimates) and 0-10 per cent (Fig. 9a). Most holes were shallower than 1.5 m. To test whether ice content changed significantly below this depth, values above 1.5 m were compared with total ice content for the 33 holes bored to 3 m or more. The mean ice content of the upper segments was 48 per cent, versus 49 per cent for the entire core. Correlation was generally good (Fig. 9b), suggesting that in this environment ice content remained constant throughout the depth investigated.

Top of permafrost

The active layer and the immediately underlying permafrost represented the most sensitive zone with respect to man-induced disturbance; any excess ice may be thawed and supersaturate the sediment. Within 1 m of the ground surface, the mean ice content was 49 per cent, slightly lower than the mean for all cores (Fig. 9c). Nevertheless, strata containing more than 50 per cent visible ice were identified in the upper

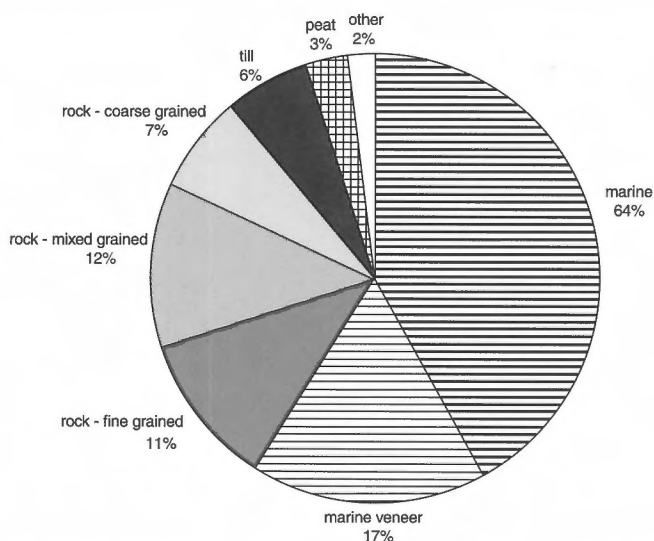


Figure 6. Proportion of cores from each surficial material unit.

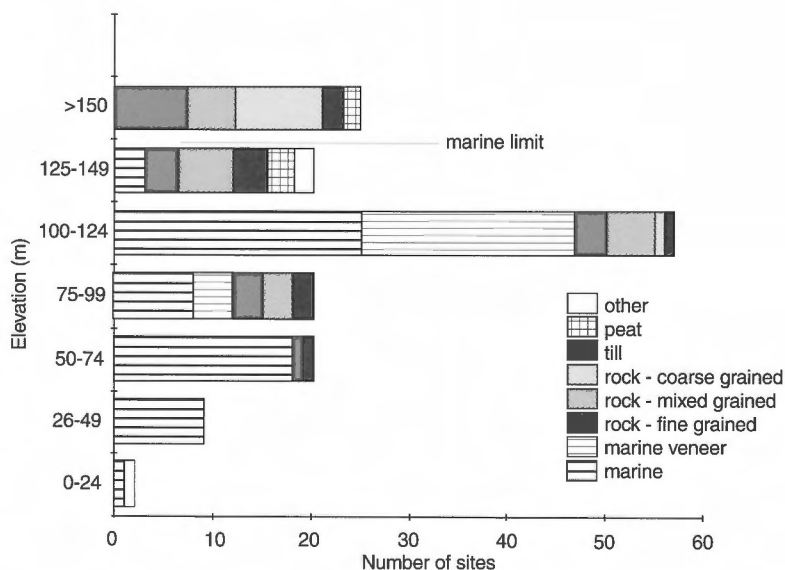


Figure 7.

Site elevations and surficial materials.

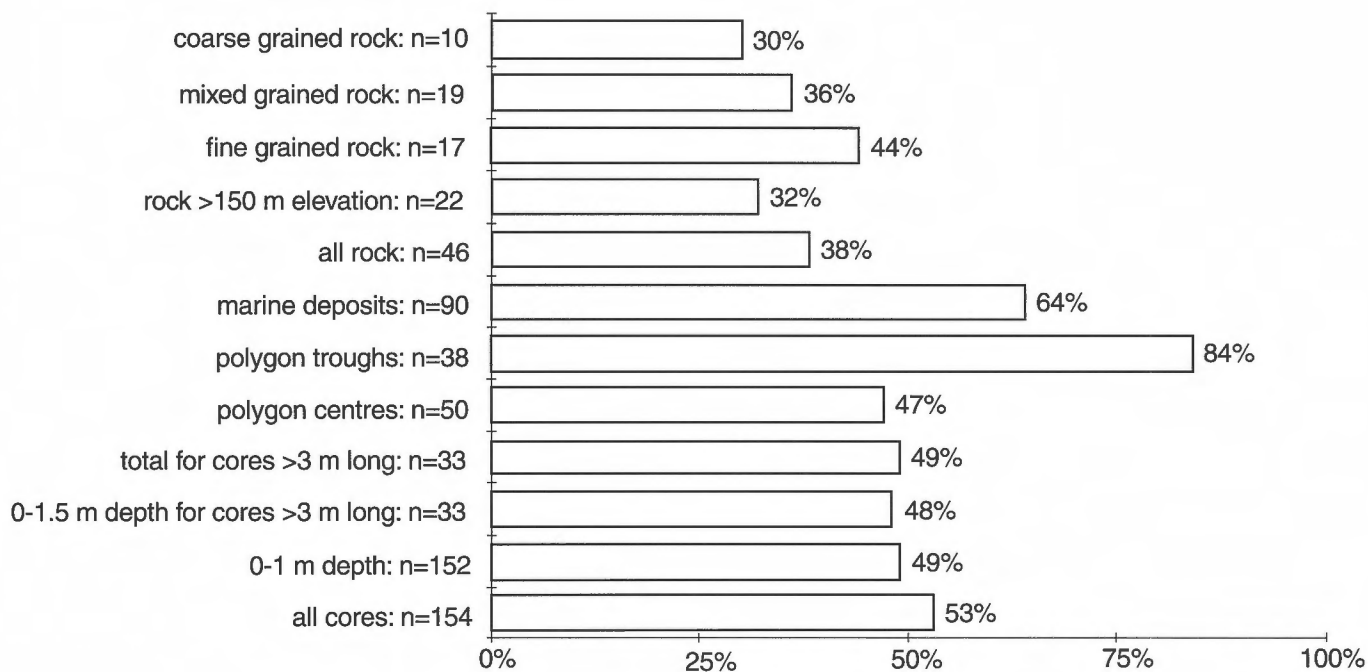


Figure 8. Per cent mean ice content of cores.

Figure 9. Ice content of selected groups of cores.

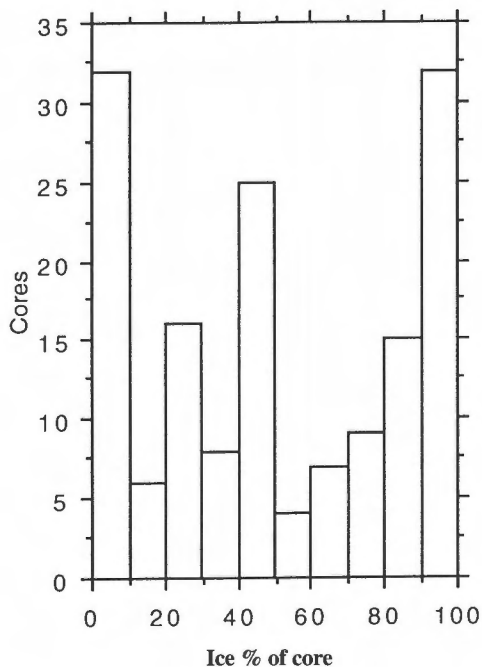


Figure 9a. Ice content of all cores. Mean 53 per cent.

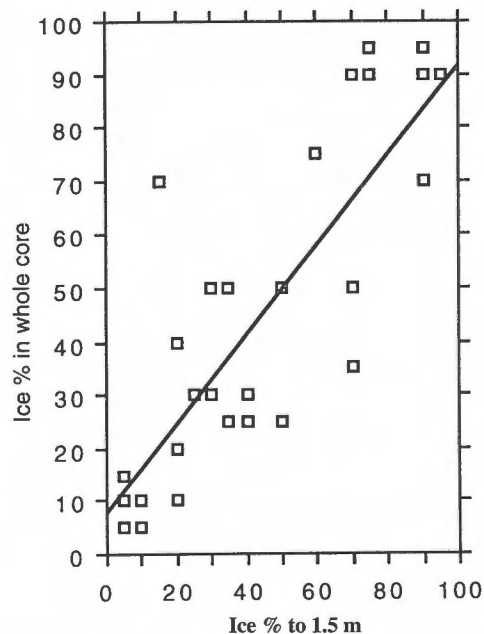


Figure 9b. For holes >3 m deep: ice to 1.5 m depth correlated with ice in whole core. $r_2=0.704$.

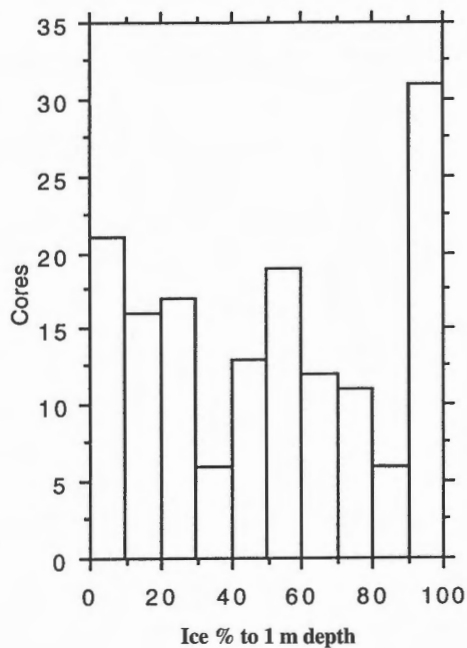


Figure 9c. Ice content to 1 m depth. Mean 49 per cent.

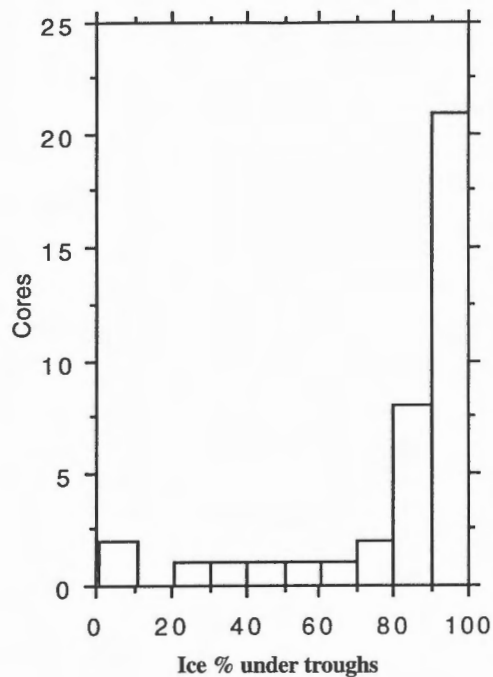


Figure 9d. Ice content under frost-fissure troughs. Mean 84 per cent.

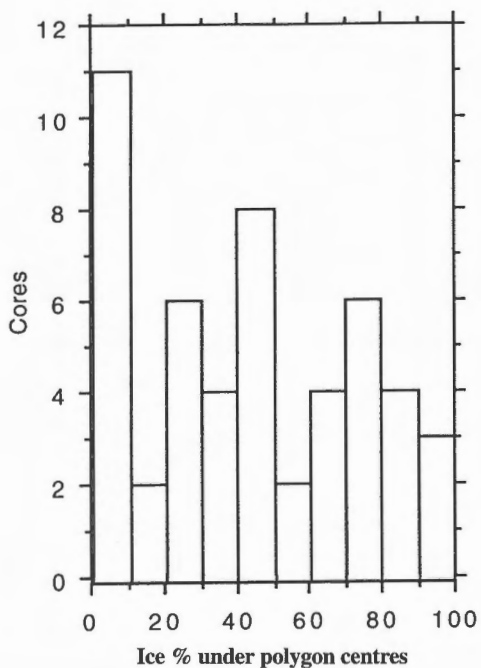


Figure 9e. Ice content under frost-fissure polygon centres. Mean 47 per cent.

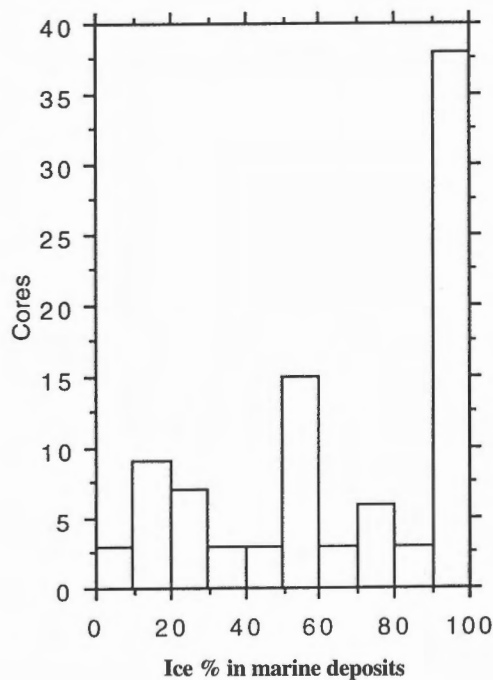


Figure 9f. Ice content in marine-deltaic deposits. Mean 64 per cent.

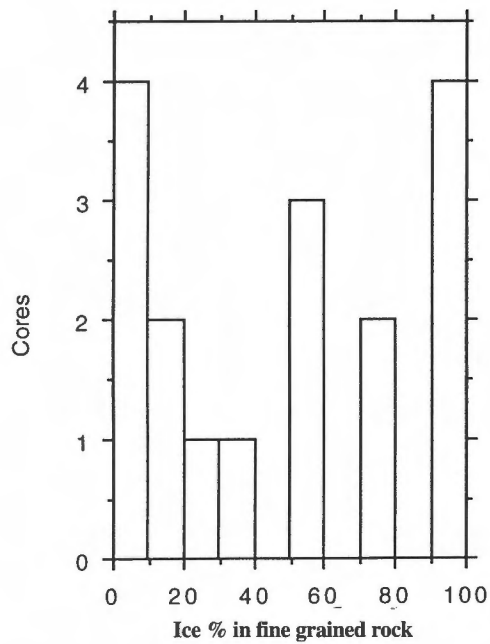


Figure 9g. Ice content in fine grained rock. Mean 44 per cent.

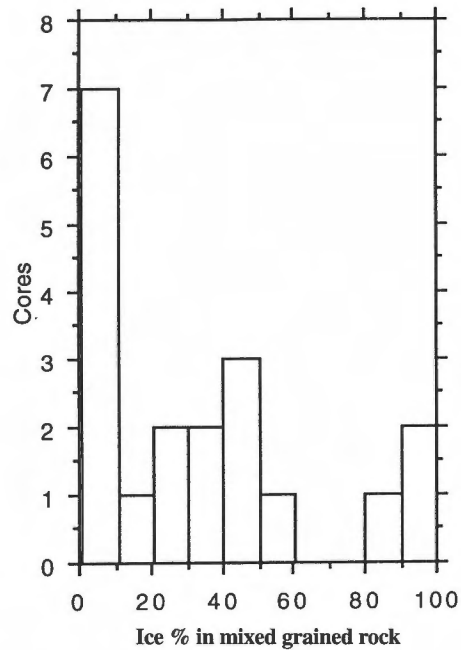


Figure 9h. Ice content in mixed grained rock. Mean 36 per cent.

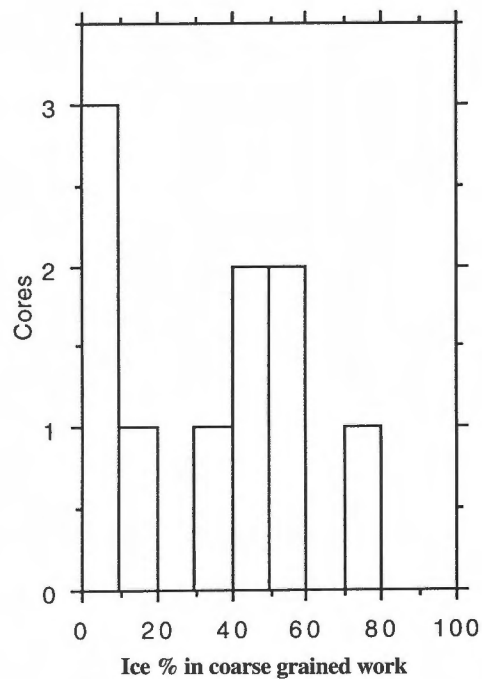


Figure 9i. Ice content in coarse grained rock. Mean 30 per cent.

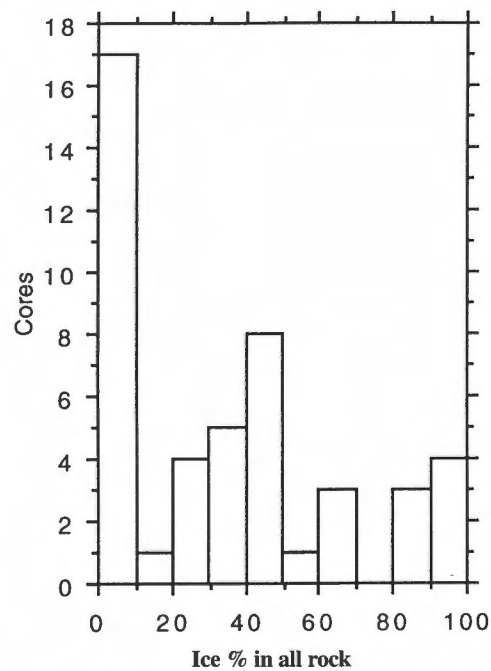


Figure 9j. Ice content of all rock. Mean 38 per cent.

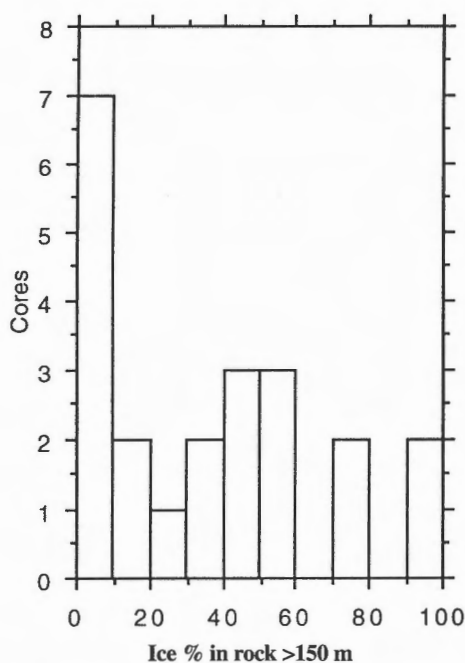


Figure 9k. Ice content of rock above marine limit. Mean 32 per cent.

1 m of 60 per cent of all cover, and strata or lenses of ice ≥ 10 cm thick were present in the upper 1 m of at least 30 per cent of the cores.

Ice wedges

Most holes bored in frost-fissure troughs (and the few raised polygon rims) penetrated ice. Hence the mean ice content under troughs is 84 per cent (Fig. 9d) compared to 47 per cent under polygon centres, where one third of the cores had less than 25 per cent ice (Fig. 9e). Troughs up to 6 m wide were investigated, and the top of an ice wedge was generally found over the full width of the depression at a depth of 10-90 cm below ground surface. The maximum depth to which a wedge was cored was 7 m (core log 25).

Ice structure

Ice was commonly observed to have a gradational contact with adjacent materials; e.g. a reticulate pattern of ice in sediments, or clasts of sediment in ice. Horizontal stratification was widespread, and icy cores commonly broke into disks during coring. Vertically elongated gas bubbles were recorded in massive ice in a number of cores, including cores from holes bored down frost fissures, presumably in wedge ice, from holes under polygon centres (non-wedge ice), and from several holes under peat deposits.

Variations in ice content between surficial material units

Marine-deltaic deposits

Marine and deltaic sediments on western Fosheim Peninsula are unconsolidated, finely laminated to massive, and range from clay- to sand-sized. The mean ice content is 64 per cent, well above the 53 per cent mean for all materials (note that 58 per cent of all holes were bored in marine sediment). The ice content may be skewed because most ice-wedge investigations were carried out in marine sediment, hence the large number of holes in the highest decile (Fig. 9f). Massive non-wedge ice was found in the vicinity of retrogressive thaw flowslides near Gemini well-site (e.g. logs 73, 74, 85-87). Ice bodies also were found in areas without surface indicators (e.g. in centres of polygons on level areas). For example, ice at least 4 m thick was encountered in core 151, and ≥ 2 m of ice showed in a number of holes on and around the old Eureka airstrip, sandwiched between a veneer of clayey silt and unconsolidated clay shale.

Till

Mean ice content in cores from stony clay fill to gravelly sand till varied from 5 per cent to 50 per cent, but were higher in a frost fissure (log 48) and under a wet site (logs 57 and 58).

Fine grained rock

The uppermost strata of shale and siltstone in lowland areas has generally disaggregated to clay and silt with some consolidated beds. The ice content per hole varied widely (Fig. 9g), with a mean of 44 per cent. Some holes showed no visible ice after reaching unconsolidated shale (e.g. log 29). High ice content was found not only under frost-fissure troughs, but under slopes and wet sites (logs 123, 124), and in disaggregated rock close to a large retrogressive thaw flow-slide (log 108).

Mixed grained rock

Poorly consolidated sandstone and siltstone had a mean ice content of 36 per cent (Fig. 9h). Segregated ice was not observed on the same scale as in fine grained deposits.

Coarse grained rock

The ten holes in consolidated sandstone and siltstone had a mean ice content of 30 per cent (Fig. 9i). All holes had 50 per cent or less ice, except for one hole that penetrated 3.5 m of ice in a frost fissure (log 143). Nevertheless, segregated non-wedge ice bodies were observed in sandstone (e.g. logs 51 and 52).

Other materials

The several holes drilled through thin peaty deposits entered ice bodies (e.g. logs 59 and 88). One hole through peat penetrated 1 m of ice overlying shale (log 127). Holes in beach gravel (log 61) and in active floodplain sand (log 147) encountered little visible ice.

Marine overlap

A comparison between ice content of materials above and below marine limit was made using holes bored in rock (mostly poorly consolidated or unconsolidated). Rock was selected because it was the dominant material at the 25 drill sites above 150 m altitude (Fig. 7). No significant difference in ice content was apparent between the 21 rock cores from above the marine limit and all 45 rock cores (Fig. 9j, k). Only two holes were bored below 25 m elevation, which, as Figure 4 shows, is where the shoreline lay at about 5000 B.P.

Shallow seismic survey

Hammer seismic profiling near a number of the 1974 coring sites was reported by Gagne and Hunter (1975). Results (their Figure 2) show little difference in seismic velocities between coarse- and fine-grained materials, or high ice content versus low. Velocities of about 3000 m/s were achieved at a depth of 4 m.

Industry seismic shothole logs

The distribution of observed ice (recorded in drillers' logs) compared to surficial materials and bedrock, as well as our own drill logs, makes us suspect that ice was present at many sites but not noted (admittedly, our holes were only 10-20 per cent of the depth of the shotholes). Conversely, at other sites the presence of ice may have been exaggerated. For example, no ice was recorded along a line south of the Gemini well site that crossed marine sediments subject to flowslides, whereas farther south, above the marine limit and on bedrock, ice was recorded in every hole. We conclude that a trained observer is necessary for accurate recording (c.f. Tucker, 1975). Ice was commonly recorded together with clay or shale, and less frequently with sand, coal, and sandstone. There are a number of records of ice and hard sandstone.

DISTURBED SITES

Abandoned Eureka airstrip

Description

This strip was first prepared in 1947 and abandoned in 1951 due largely to unsuitable orientation to prevailing winds (Gajda, unpub. Rep., 1949; Sim, 1957). It can be distinguished from adjacent undisturbed terrain on airphotos and from the air by the wide frost-fissure troughs and different vegetation cover (see below). The site lies on level sandy

clayey silt marine sediments thinly (1-2 m?) covering poorly consolidated clayey shale, 5 km northeast of Eureka weather station (Fig. 3).

Construction of the approximately 1200 m by 45 m (4000 feet by 150 feet) strip and access road started in June 1947, using a harrow, scraper, and roller to remove boulders and cobbles, smooth the surface, and attempt to compact the seasonal thaw layer (unpublished Eureka Weather Station journal). The strip was too wet and soft to be used until after freeze-up, as was generally the case in subsequent summers. In the second summer the constructors acknowledged that probably it had been a mistake to remove vegetation. By 1950, in its last year of use, a polygonal network of wide depressions up to 25 cm deep indented the previously graded surface (Fig. 10).

We bored a number of holes on and off the strip, both over polygon troughs or cracks and in polygon centres (Fig. 3, 11a). Three profiles across the strip were surveyed using a Zeiss NI2 level (Fig. 11b).

Results

The surface of the strip was found to be depressed 10 to 60 cm below adjacent undisturbed terrain (Fig. 11b). Frost fissure troughs were given prominence in summer by pools of standing water, and by their size – up to 9 m wide by 60 cm deep. Off the strip, troughs were a maximum 1.5 m wide by 20 cm deep, but were commonly much smaller, sometimes just a crack.

Much ice was found everywhere. In polygon centres, pure or silty ice was encountered 50 to 150 cm below ground surface; in the two deep holes, these ice bodies were 3 m thick, extending down to shale (e.g. log 37). As expected, ice was entered 1 m or less below ground surface under fissures and troughs; the one deep hole through a fissure penetrated 4.5 m of ice underlain by shale (log 39).

We conclude that compaction and scraping lowered the ground surface, depressing the frost table into previously frozen (icy?) sediments. At the same time, drainage was impeded. In 1960, Beschel (1961) found more vegetation on parts of the disturbed site than on adjacent areas. He suggested this could be due to the fact that (1) excessive salts commonly concentrated in surface layers of silt by evaporation were scraped from the strip making it a more suitable habitat; (2) excess water was released from upper permafrost during the initial thickening of the seasonal thaw layer, and; (3) compaction changed the capillary structure of the soil. We found that, compared to adjacent areas, the main difference in vegetation is the concentration of sedges in and around pools in troughs.

Present Eureka airstrip

Description

The site of the present strip was first prepared in 1951. Like the old strip, it is underlain by sandy clayey silt marine sediments, though they are much thicker. The alignment

Figure 10a.

Old Eureka airstrip at time of abandonment, 1951. (GSC 1995-228A)



Figure 10b. Access road to old Eureka airstrip, 1951. (GSC 1995-228B)



Figure 10c. Access road to old Eureka airstrip, 1972. (GSC 1995-228C)

generally follows a ridge top, which provides better drainage than the plateau to the north; however, during the 1950s, this strip suffered the same thaw problems as the earlier one (Gadbois, unpub. rep., 1951; Sim, 1957; c.f. French, 1975). The strip is now built up sufficiently with material coarser than silt to permit drainage and maintain stability except in the warmest weather (Edlund, 1989). A number of holes were bored on and adjacent to deeply scraped slopes flanking both sides of the centre of the strip (Fig. 3).

Results

Massive ice was encountered under frost-fissure polygon cracks and troughs, but not elsewhere.

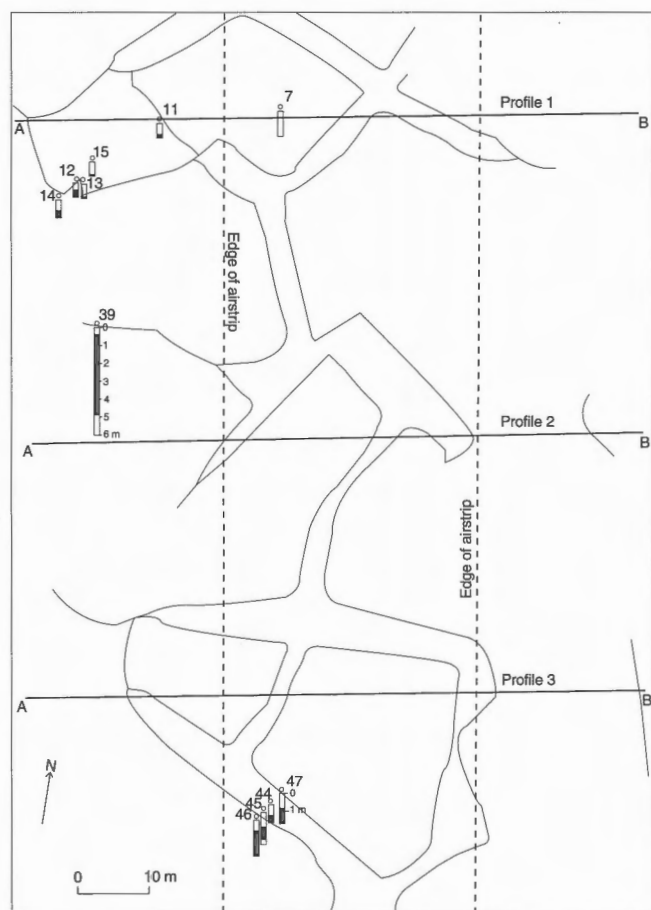


Figure 11a. Plan of south end of old Eureka airstrip (graded 1947, abandoned 1951), showing outline of ice wedge cracks and troughs, extent of graded area, coring sites, and length of core composed of >90 per cent ice (black), and location of profiles shown in Figure 11b. Surveyed 1973.

Panarctic Oils Gemini well site

Description

The well site is on silt and sand marine-deltaic sediments, locally thick, elsewhere feathering out over poorly consolidated bedrock at the marine limit (Fig. 3). In March 1973, while the well was being drilled, waste fluids from a snow-dammed sump seeped into an adjacent stream, resulting in a rare conviction under the Territorial Lands Act (Calgary Herald, 1973). Borings were carried out after the sump break, as part of an investigation of the retrogressive thaw flowslides that scallop the edge of a plateau to the south of the well site.

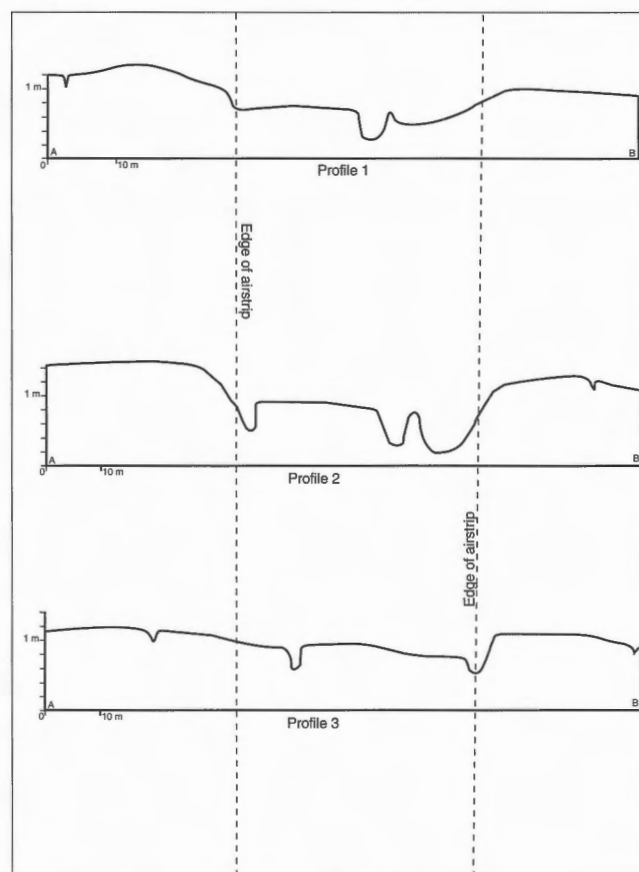


Figure 11b. Profiles across old Eureka airstrip (1973 survey).

Results

Massive ice was found immediately below the frost table in the centre of some frost-fissure polygons adjacent to the well head and sump (e.g. logs 73, 74). Thaw of ground ice may have contributed to the sump failure. Massive ice was also encountered adjacent to a flowslide (logs 84-87), but not everywhere in the vicinity (log 79).

DISCUSSION

Bias was present in selecting drill sites, thus statistical manipulation of the data can be misleading. For example, of the eight surficial material units cored, only marine deposits and fine- and medium-grained rock were sampled more than ten times. Gravel, stony diamicton and consolidated rock were rarely cored. Most holes were drilled on level or very gently inclined terrain, to avoid the mix of materials and variability in drainage that commonly occur on steeper slopes. Few sites were above the marine limit and few were at elevations close to sea level. Many holes (25 per cent) were bored intentionally in or adjacent to frost fissures and troughs, which are normally underlain by ice wedges. Fortunately, the land surface occupied by wedge troughs may be about 25 per cent of the total area. This is the ratio on the abandoned Eureka airstrip, where wedge outlines are easily traced due to thaw of the tops; however, similar outlining of wedges was not carried out elsewhere.

This study and that of Robinson (1994) showed by drilling that some massive ice bodies are present under 1-2 m of sediment. Pollard (1991) observed that massive ice in natural exposures was covered by 3-7 m or more of sediment. Either much ice is too deep to be reached by shallow drilling (which, in our case, was mainly on flat-lying ground) or ice is buried more deeply on slopes, where multiple failures have occurred (see Pollard, 1991, Fig. 3b). Much of this ice is in raised silty clay marine sediments. In an area of such deposits, scarred by flowsides, about 100 m above sea level, 3 km east of the junction of Hot Weather Creek and Slide River, Robinson (1994) outlined from Bouger gravity anomalies a body of ice up to 17 m thick. Marine shells from this area are early Holocene (Bell, 1992). However 7 km to the southwest, no ice bodies were observed in hundreds of metres of freshly undercut banks of the Slide River, exposing fine grained marine-deltaic sediments up to 36 m thick and dated as middle Holocene (Hodgson et al., 1991). Massive ice other than wedge ice was uncommon in non marine deposits; segregated ice content was particularly low in clayey unconsolidated bedrock or weak shale and in medium grained sand or coarser materials.

It is possible that if massive ice exists above 150 m asl, it could be buried glacier ice (c.f. Vincent, 1983; Lorrain and Demeur, 1985). Ice in sediments below the marine limit is clearly epigenetic. A wide swath of unfrozen marine or marine-washed sediments was exposed to subaerial temperatures incrementally through the Holocene. Under these conditions, segregated ice may well have aggraded in the manner described by Pollard (1991), except that some massive ice

clearly is not underlain by coarse grained sediments with hydraulic conductivities higher than fine grained materials overlying the ice.

The mean ice content of 53 per cent in all cores, and 49 per cent in the permafrost zone within 1 m of the ground surface, indicates considerable potential for thawing and liquefaction at the base of the active layer of much of lowland western Fosheim Peninsula, if more heat than present is gained at the ground surface. Where vegetation and/or albedo have been reduced following disturbance by compaction or scraping, near-surface segregated ice has generally thawed and the ground surface has lowered, with the effect being greatest over ice-wedge troughs where snowmelt water collects. Why the tops of many ice wedges have thawed naturally has not been explained.

ACKNOWLEDGMENTS

D. Martin Barnett provided the initial encouragement to investigate ground ice by coring. Much advice was given by others during field work, especially J.J. Veillette and S.A. Edlund. Excellent field assistance was provided by R.J. Richardson in 1972; R.E. Allan, D. Feldbruegge, S. Hotzel, and L.R. Stevenson in 1973; B.G. Green, A.C. Liard and R. Young in 1974. The Atmospheric Environment Service of Environment Canada permitted access to the unpublished Eureka weather station journal in 1973. The field logs were painstakingly transcribed into an orderly body by Theresa Grasby.

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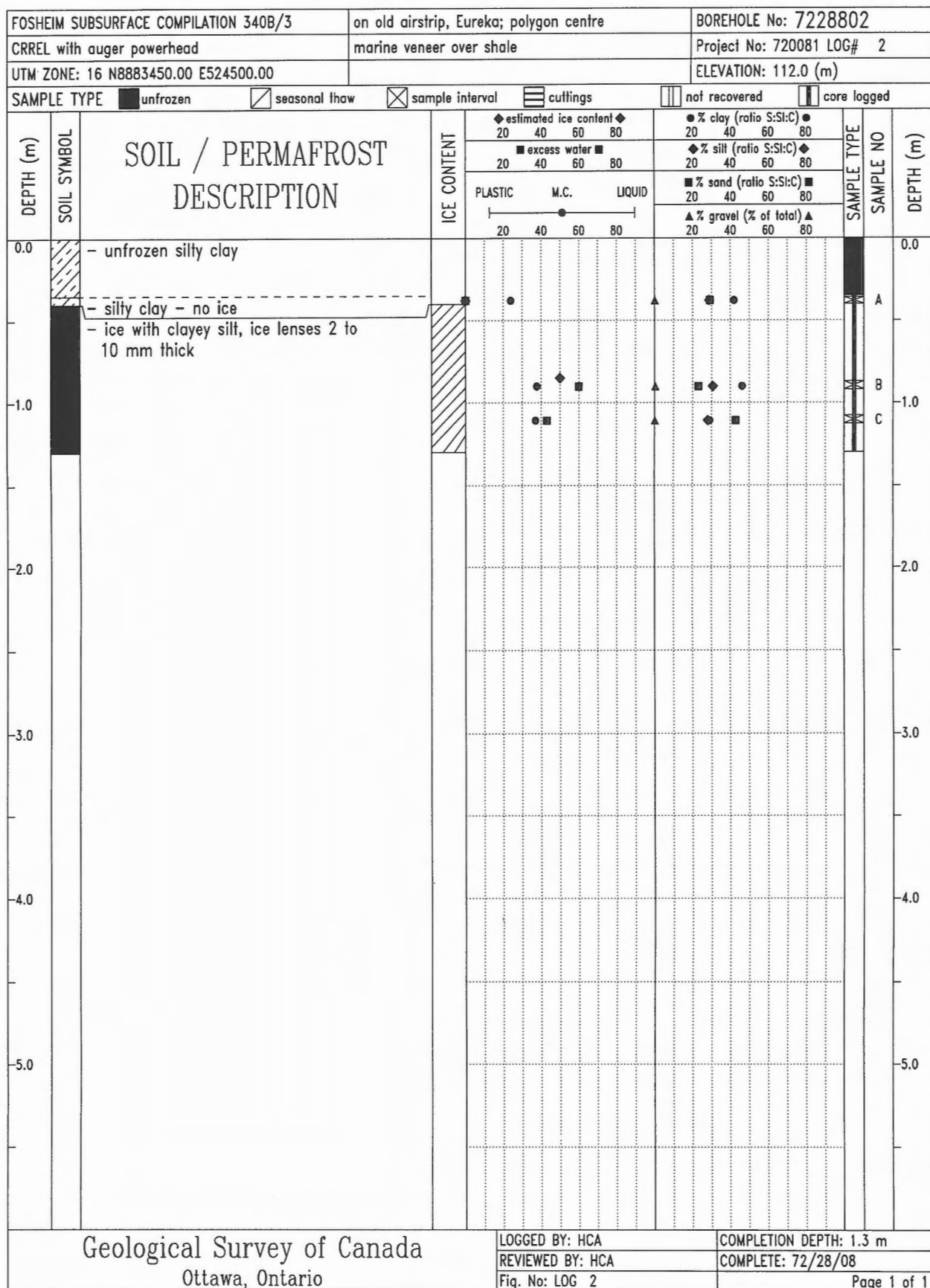
CORE LOGS

1-154

FOSHEIM SUBSURFACE COMPILATION 340B/3		west side of Station Creek		BOREHOLE No: 7228801	
CRREL with auger powerhead		marine - deltaic material		Project No: 720081 LOG# 1	
UTM ZONE: 16 N8881200.00 E520580.00				ELEVATION: 30.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT				ICE CONTENT				SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				◆ estimated ice content ◆ ● % clay (ratio S:Si:C) ● 20 40 60 80 20 40 60 80				■ excess water ■ ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 20 40 60 80						
				PLASTIC M.C. LIQUID 20 40 60 80				■ % sand (ratio S:Si:C) ■ ▲ % gravel (% of total) ▲ 20 40 60 80 20 40 60 80						
0.0	▨	- unfrozen clay/silt - clay/silt, ice lenses 1-10 mm thick following thin sand partings	▨											0.0
-1.0				■	●			■	◆	●		B		-1.0
-2.0				■	●			■	◆	●		F		-2.0
-3.0														-3.0
-4.0														-4.0
-5.0														-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.8 m
		REVIEWED BY: HCA	COMPLETE: 72/28/08
		Fig. No: LOG 1	Page 1 of 1



FOSHEIM SUBSURFACE COMPILATION 49G/15		west side of Station Creek, on rise from		BOREHOLE No: 7305601				
CRREL with auger powerhead		delta surface, marine deltaic		Project No: 720081 LOG# 3				
UTM ZONE: 16 N8881200.00 E520580.00				ELEVATION: 30.0 (m)				
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID ----- 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen silt/clay, blocky fragments of silt to clay - silt/clay seasonal thaw zone, crumbled, no core - silt/clay, random ice vein orientation, veins 0 to 3 mm thick, estimated 10% ice						0.0
-1.0								-1.0
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA		COMPLETION DEPTH: 1.0 m		
				REVIEWED BY: HCA		COMPLETE: 73/05/06		
				Fig. No: LOG 3		Page 1 of 1		

FOSHEIM SUBSURFACE COMPILATION 49G/15		Station Creek		BOREHOLE No: 7307601					
CRREL with auger powerhead		marine deltaic		Project No: 720081 LOG# 4					
UTM ZONE: 16 N8881200.00 E520580.00				ELEVATION: 30.0 (m)					
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged									
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)	
				PLASTIC	M.C.				
0.0		- unfrozen silt/clay, blocky, crumbly - silt/clay seasonal thaw zone, crumbly, blocky, some ice crystals <5% - silt/clay, minor sand, thin ice veins 1-2 mm thick, 5-10% ice - pure ice (95%), one or two bands of clay/sand about 1 cm thick, more soil towards base of hole		♦ estimated ice content ♦ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80				0.0	
1.0									1.0
2.0									2.0
3.0									3.0
4.0									4.0
5.0									5.0

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LOGGED BY: HCA
REVIEWED BY: HCA
Fig. No: LOG 4

COMPLETION DEPTH: 1.2 m
COMPLETE: 73/07/06

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FOSHEIM SUBSURFACE COMPILATION 49G/15		Station Creek		BOREHOLE No: 7307602	
CRREL with auger powerhead		marine deltaic		Project No: 720081 LOG# 5	
UTM ZONE: 16 N8881200.00 E520580.00				ELEVATION: 30.0 (m)	
SAMPLE TYPE ☒ unfrozen		☒ seasonal thaw		☒ sample interval	
		☐ cuttings		☐ not recovered	
				☐ core logged	

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 — excess water — 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0	▨	- unfrozen blocky fines - fines, seasonal thaw zone, blocky, some ice crystals, 1% - fines with reticulate ice veins about 1 to 2 mm across, 5-10% ice - ice with fines, sand, occasional pebble to 0.5 cm, >50% ice	▨	◆		▨		0.0
1.0	▨		▨	◆		▨		1.0
2.0	▨		▨			▨		2.0
3.0	▨		▨			▨		3.0
4.0	▨		▨			▨		4.0
5.0	▨		▨			▨		5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.2 m
		REVIEWED BY: HCA	COMPLETE: 73/07/06
		Fig. No: LOG 5	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/15		Station Creek		BOREHOLE No: 7307603				
CRREL with auger powerhead		marine deltaic		Project No: 720081 LOG# 6				
UTM ZONE: 16 N8881200.00 E520580.00				ELEVATION: 30.0 (m)				
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC M.C. LIQUID ----- ----- 20 40 60 80				
0.0		- unfrozen fines						0.0
		- fines, 5-10% ice						
-1.0		- ice, 100%						-1.0
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

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LOGGED BY: HCA	COMPLETION DEPTH: 0.9 m
REVIEWED BY: HCA	COMPLETE: 73/07/06
Fig. No: LOG 6	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		old airstrip, Eureka, polygon centre		BOREHOLE No: 7311601				
CRREL with auger powerhead		marine veneer over shale		Project No: 720081 LOG# 7				
UTM ZONE: 16 N8883450.00 E524500.00				ELEVATION: 113.0 (m)				
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0	[diagonal lines]	- clay/silt mainly clay, damp to top - clay/silt/sand from frost table, occasional stones to 5 mm, no ice, not completely bonded, (i.e. little ice in voids) to base of seasonal thaw? - clay/silt/sand with stones to 5 mm, equal parts mixed, no stratification, horizontal ice veins about 1-2 mm thick every 0.5 mm, 10-15% ice - clay/silt/sand, fewer stones?, ice vein 2-5 mm thick at 1 cm intervals, mainly horizontal, 15-25% visible ice - ice with soil, mainly silt, 1 cm ice lenses, 50% or greater - clay/silt/sand as above - ice/silt/clay with sandstone granules to 2 mm and ice to 50%?	[diagonal lines]					0.0
1.0	[diagonal lines]		[diagonal lines]			[diagonal lines]	A	1.0
	[diagonal lines]		[diagonal lines]			[diagonal lines]	B	
	[diagonal lines]		[diagonal lines]			[diagonal lines]	C	
	[diagonal lines]		[diagonal lines]			[diagonal lines]	D	
2.0	[diagonal lines]		[diagonal lines]			[diagonal lines]		2.0
3.0	[diagonal lines]		[diagonal lines]			[diagonal lines]		3.0
4.0	[diagonal lines]		[diagonal lines]			[diagonal lines]		4.0
5.0	[diagonal lines]		[diagonal lines]			[diagonal lines]		5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 7		COMPLETION DEPTH: 1.4 m COMPLETE: 73/11/06 Page 1 of 1		

FOSHEIM SUBSURFACE COMPILATION 49G/15		Station Creek		BOREHOLE No: 73166101	
CRREL with auger powerhead		marine deltaic		Project No: 720081 LOG# 8	
UTM ZONE: 16 N8881300.00 E520610.00				ELEVATION: 30.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				estimated ice content	excess water			
0.0		- unfrozen medium sand to 25 cm						0.0
		- medium sand, seasonal thaw zone, no visible ice						
		- sand with a few layers of fines <15%, <5% ice						
-1.0		- sand with ice in vertical veins, ice content 25-30%						-1.0
		- 100% ice						
		- ice with a few sand pockets, sand layer at 1.05 m, ice 70%						
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.1 m
		REVIEWED BY: HCA	COMPLETE: 73/16/06
		Fig. No: LOG 8	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/15		Station Creek		BOREHOLE No: 73166102	
CRREL with auger powerhead		marine deltaic		Project No: 720081 LOG# 9	
UTM ZONE: 16 N8881300.00 E520610.00				ELEVATION: 30.0 (m)	
SAMPLE TYPE ☐ unfrozen ☒ seasonal thaw		☒ sample interval ☐ cuttings		☐ not recovered ☐ core logged	

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen silt and fine sand - silt/sand, seasonal thaw zone, - no visible ice - fines with some sand lenses (thin) 1-2 mm, small bits of wood, seasonal thaw zone? - sand interbedded with fines, approx. 0.44 to 0.45 m, ice lenses 1-2 mm thick, 10% ice - massive ice with very little sand or clay, >95 % ice - sand balls in ice, sand 30-40%					0.0
1.0							1.0
2.0							2.0
3.0							3.0
4.0							4.0
5.0							5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 0.7 m
		REVIEWED BY: HCA	COMPLETE: 73/16/06
		Fig. No: LOG 9	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/15		Station Creek		BOREHOLE No: 73166103	
CRREL with auger powerhead		marine deltaic		Project No: 720081 LOG# 10	
UTM ZONE: 16 N8881300.00 E520610.00				ELEVATION: 30.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80

Geological Survey of Canada
Ottawa, Ontario

LOGGED BY: HCA	COMPLETION DEPTH: 0.9 m
REVIEWED BY: HCA	COMPLETE: 73/16/06
Fig. No: LOG 10	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		polygon trough, off old airstrip, Eureka		BOREHOLE No: 7318601					
CRREL with auger powerhead		marine veneer / shale		Project No: 720081 LOG# 11					
UTM ZONE: 16 N8883450.00 E524500.00				ELEVATION: 113.0 (m)					
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged									
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC M.C. LIQUID			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				◆ estimated ice content ◆ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80					
0.0		- unfrozen silt/clay - silt/clay, crumbly, some visible interstitial ice, seasonally thawed - silt/clay and ice interbedded, 2-4 mm thick beds, 60% ice - ice 100%						A	0.0
1.0									1.0
2.0									2.0
3.0									3.0
4.0									4.0
5.0									5.0

Geological Survey of Canada
Ottawa, Ontario

LOGGED BY: HCA COMPLETION DEPTH: 0.8 m
REVIEWED BY: HCA COMPLETE: 73/18/06
Fig. No: LOG 11 Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		polygon trough off old airstrip, Eureka		BOREHOLE No: 7318602	
CRREL with auger powerhead		marine veneer / shale		Project No: 720081 LOG# 12	
UTM ZONE: 16 N8883450.00 E524500.00				ELEVATION: 113.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID ----- 20 40 60 80	● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0	▨	- unfrozen silt/clay - silt/clay? 1.5-2.5 cm vertical ice vein, 10% ice - ice - >50% - pure ice	▨	♦				0.0
-1.0								-1.0
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 0.7 m
		REVIEWED BY: HCA	COMPLETE: 73/18/06
		Fig. No: LOG 12	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		polygon trough, off old airstrip, Eureka		BOREHOLE No: 7318603	
CRREL with auger powerhead		marine veneer / shale		Project No: 720081 LOG# 13	
UTM ZONE: 16 N8883450.00 E524500.00				ELEVATION: 113.0 (m)	
SAMPLE TYPE ☒ unfrozen		☒ seasonal thaw		☒ sample interval	
		☐ cuttings		☐ not recovered	
				☐ core logged	

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen silt/clay				0.0	
		- silt/clay, stones to 0.5 cm, seasonal thaw zone					
		- interbedded ice, clay and silt beds, 0.2-0.4 cm thick, ice content >15%?					
		- pure ice, sand wedge 1 cm wide, 99% ice					
-1.0						-1.0	
-2.0						-2.0	
-3.0						-3.0	
-4.0						-4.0	
-5.0						-5.0	

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 0.7 m
		REVIEWED BY: HCA	COMPLETE: 73/18/06
		Fig. No: LOG 13	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/4		polygon trough, off old airstrip, Eureka		BOREHOLE No: 73196102				
CRREL with auger powerhead		marine veneer / shale		Project No: 720081 LOG# 14				
UTM ZONE: 16 N8883450.00 E524500.00				ELEVATION: 113.0 (m)				
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC	M.C.			
0.0		- started in ice wedge crack - ice, silt and clay with detritus, vertical ice veins 2-4 cm thick contain leaves at 20 cm, wood fragments and thin ice lenses (1 mm thick) within silt at approximately 60 cm depth - 100% ice						0.0
1.0								1.0
2.0								2.0
3.0								3.0
4.0								4.0
5.0								5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA		COMPLETION DEPTH: 0.9 m		Page 1 of 1
				REVIEWED BY: HCA		COMPLETE: 73/19/06		
				Fig. No: LOG 14				

FOSHEIM SUBSURFACE COMPILATION 340B/3		polygon trough, off old airstrip, Eureka		BOREHOLE No: 73196103						
CRREL with auger powerhead		marine veneer / shale		Project No: 720081 LOG# 15						
UTM ZONE: 16 N8883450.00 E524500.00				ELEVATION: 113.0 (m)						
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged										
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Sl:C) ● 20 40 60 80 ◆ % silt (ratio S:Sl:C) ◆ 20 40 60 80 ■ % sand (ratio S:Sl:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80				SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen silt/clay - silt/clay, 2 thin vertical ice viens, 1-2 mm thick - silt/clay, ice lenses from 2-8 mm thick, thickest near base - solid ice							0.0	
1.0									1.0	
2.0									2.0	
3.0									3.0	
4.0									4.0	
5.0									5.0	
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA		COMPLETION DEPTH: 0.8 m				
				REVIEWED BY: HCA		COMPLETE: 73/19/06				
				Fig. No: LOG 15		Page 1 of 1				

FOSHEIM SUBSURFACE COMPILATION 340B/4		Iceberg Point		BOREHOLE No: 73226101	
natural exposure, washed clean		natural exposure, washed		Project No: 720081 LOG# 16	
UTM ZONE: 16 N8905450.00 E515250.00		till		ELEVATION: 200.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ exposure ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC		M.C.		LIQUID		SAMPLE TYPE		SAMPLE NO	DEPTH (m)
				20	40	60	80	20	40	60	80		
0.0		- unfrozen stratified light brown fine sand and silt (70%), dark grey silt and clay and very few stones (30%) - interbedded sand and fines, with ice lenses 1 mm thick, 15 cm gravel band with high ice content, otherwise very little ice to 3 m depth											0.0
1.0													1.0
2.0													2.0
3.0		- sand and silt with lots of stones (20%) and high ice content (60%) - interbedded fine sand silt and clay (50%) medium sand (25%) and gravel (25%) ice content about 50% throughout to 7 m 3.3-3.5 m - ice lens, sand and gravel											3.0
4.0													4.0
5.0		- horizontal bands of silt and clay - interbedded sand and silt as above											5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 10.0 m
		REVIEWED BY: HCA	COMPLETE: 73/22/06
		Fig. No: LOG 16	Page 1 of 2

FOSHEIM SUBSURFACE COMPILATION 340B/4		Iceberg Point		BOREHOLE No: 73226101	
natural exposure, washed clean		natural exposure, washed		Project No: 720081 LOG# 16	
UTM ZONE: 16 N8905450.00 E515250.00		till		ELEVATION: 200.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ exposure ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 PLASTIC M.C. LIQUID ■ % sand (ratio S:Si:C) ■ 20 40 60 80 — % gravel (% of total) — 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
6.0	▨	- fine sand, fines, and coal fragments	◆				6.0
7.0	▨	- fines with sand (15%) and stones (15%), 5-10% ice content	◆				7.0
8.0	▨	- no stratification, till-like, with small ice lenses 1-2 mm thick	◆				8.0
9.0	▨		◆				9.0
10.0	▨		◆				10.0
11.0	▨		◆				11.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 16	COMPLETION DEPTH: 10.0 m COMPLETE: 73/22/06
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FOSHEIM SUBSURFACE COMPILATION 340B/3		polygon centre on plateau north of		BOREHOLE No: 73246101				
CRREL with auger powerhead		airstrip at Eureka		Project No: 720081 LOG# 17				
UTM ZONE: 16 N8882300.00 E522020.00		marine veneer / shale		ELEVATION: 94.0 (m)				
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 ● % clay (ratio S:Sl:C) ● 20 40 60 80 ◆ % silt (ratio S:Sl:C) ◆ 20 40 60 80 ■ % sand (ratio S:Sl:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC M.C. LIQUID ----- ----- ----- 20 40 60 80				
0.0		- mostly fines, very little sand, unfrozen						0.0
		- fines as above, seasonal thaw zone						
		- ice lenses 3-4 mm thick in fines, 70% ice content						
		- high ice content (70-90%) with inclusions and occasional layers of fine material, grades into higher ice contents near bottom						
-1.0		- stratified fines and sand with ice lenses 1 mm thick, <5% ice						-1.0
		- poorly stratified sand (15%) and fines (85%), ice <1%						
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

Geological Survey of Canada
Ottawa, Ontario

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Fig. No: LOG 17

COMPLETION DEPTH: 1.4 m
COMPLETE: 73/24/06
Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		polygon trough on plateau north of		BOREHOLE No: 73246102	
CRREL with auger powerhead		airstrip at Eureka		Project No: 720081 LOG# 18	
UTM ZONE: 16 N8882300.00 E522020.00		marine veneer / shale		ELEVATION: 94.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen fines with little sand - fines with few sand inclusions, ice lenses 1 mm thick, ice content <1% - 100% ice						0.0	
1.0								1.0	
2.0								2.0	
3.0								3.0	
4.0								4.0	
5.0								5.0	

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 0.6 m
		REVIEWED BY: HCA	COMPLETE: 73/24/06
		Fig. No: LOG 18	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		polygon trough centre, plateau north of		BOREHOLE No: 73027101	
CRREL with auger powerhead		Eureka airstrip		Project No: 720081 LOG# 19	
UTM ZONE: 16 N8882300.00 E522020.00		marine veneer / shale		ELEVATION: 94.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				◆ estimated ice content ◆ ● % clay (ratio S:Si:C) ● ■ excess water ■ ◆ % silt (ratio S:Si:C) ◆ PLASTIC M.C. LIQUID ■ % sand (ratio S:Si:C) ■ ▲ % gravel (% of total) ▲				
0.0		- unfrozen silt/clay with minor sand						0.0
		- silt/clay, seasonal thaw zone, minor sand, little visible ice, <2%						
		- ice with inclusions of fines, ice 60%						
		- >95% ice with minor inclusions of sand						
-1.0								-1.0
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.5 m
		REVIEWED BY: HCA	COMPLETE: 73/02/07
		Fig. No: LOG 19	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		plateau north of Eureka airstrip,		BOREHOLE No: 73027102						
CRREL with auger powerhead		polygon trough 1 m from 73027101 (toward		Project No: 720081 LOG# 20						
UTM ZONE: 16 N8882300.00 E522020.00		edge of trough) in marine veneer / shale		ELEVATION: 94.0 (m)						
SAMPLE TYPE ☐ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged										
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	☒ estimated ice content ☐ 20 40 60 80		☐ % clay (ratio S:Si:C) ☐ 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				☐ excess water ☐ 20 40 60 80		☐ % silt (ratio S:Si:C) ☐ 20 40 60 80				
				PLASTIC M.C. LIQUID 20 40 60 80		☐ % sand (ratio S:Si:C) ☐ 20 40 60 80				
						☐ % gravel (% of total) ☐ 20 40 60 80				
0.0		- silt and clay 80%, rest sand, thawed								0.0
		- mostly fines, little sand, seasonally thawed zone								
		- fines and ice lenses (3-10 mm thick)								
		little visible ice, <5%								
		- ice, 100%								
-1.0										-1.0
-2.0										-2.0
-3.0										-3.0
-4.0										-4.0
-5.0										-5.0

Geological Survey of Canada		LOGGED BY: HCA	COMPLETION DEPTH: 1.2 m
Ottawa, Ontario		REVIEWED BY: HCA	COMPLETE: 73/02/07
		Fig. No: LOG 20	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		plateau north of Eureka airstrip, in a		BOREHOLE No: 73027103	
CRREL with auger powerhead		polygon trough 2 m from 73027101 (toward		Project No: 720081 LOG# 21	
UTM ZONE: 16 N8882300.00 E522020.00		edge of trough), shale		ELEVATION: 94.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen, 85% silt, 15% fine sand					0.0
		- silt/clay, <5% ice					
		- ice lenses (1-2 mm thick) in fines, approximately 50% ice					
		- 95% ice, 5% fines					
-1.0							-1.0
-2.0							-2.0
-3.0							-3.0
-4.0							-4.0
-5.0							-5.0

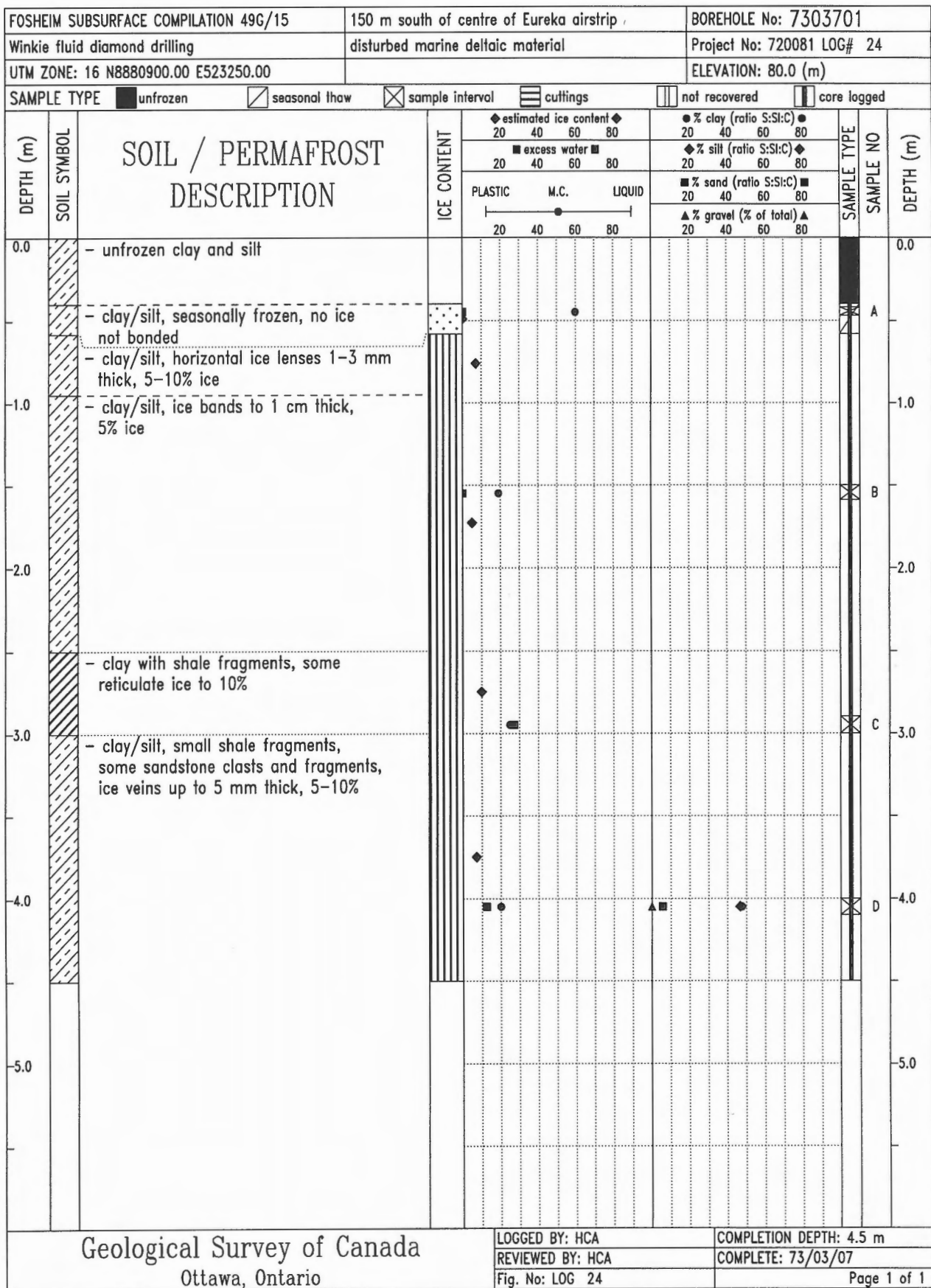
Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.1 m
		REVIEWED BY: HCA	COMPLETE: 73/02/07
		Fig. No: LOG 21	Page 1 of 1

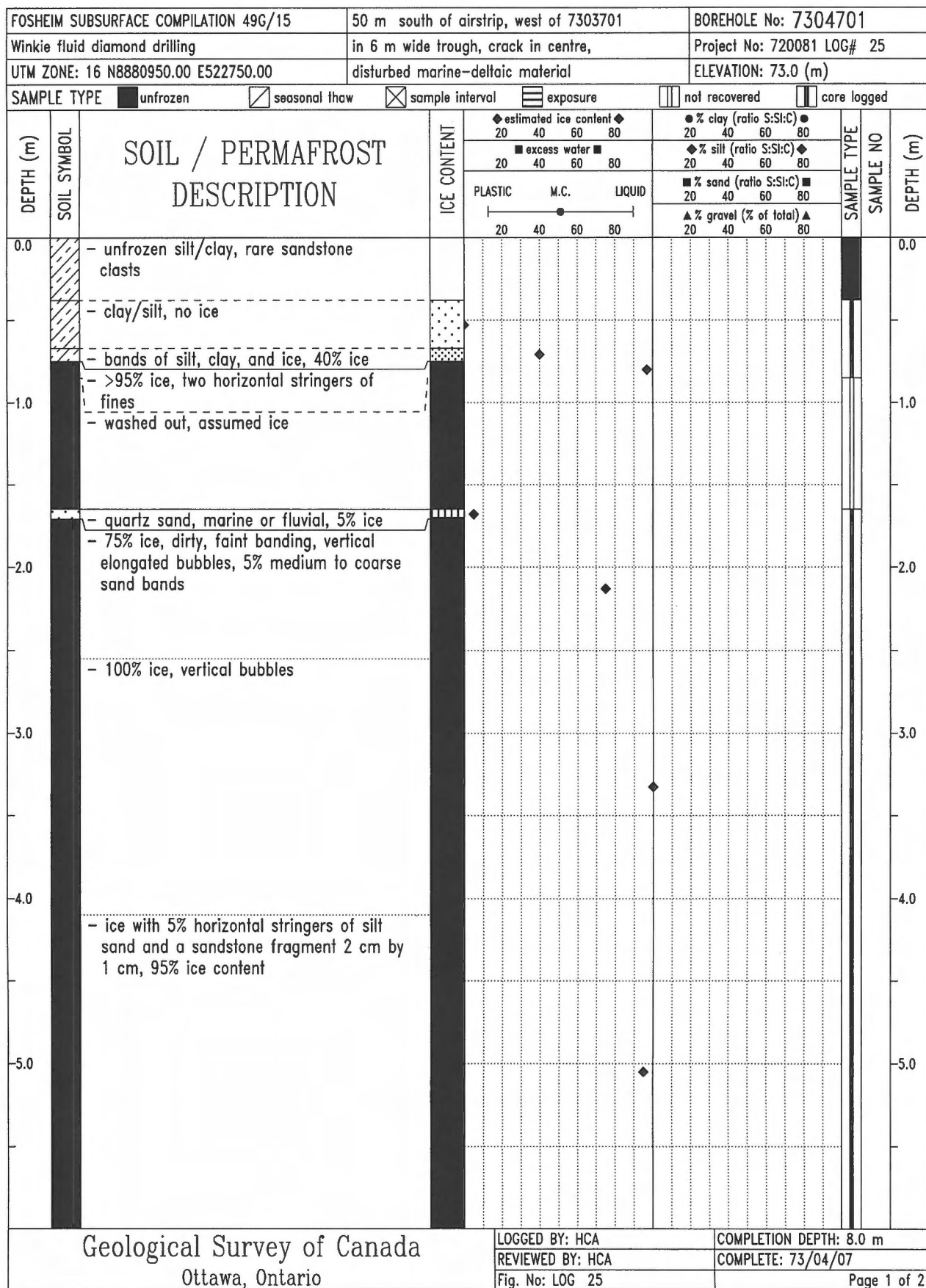
FOSHEIM SUBSURFACE COMPILATION 340B/3		plateau north of Eureka airstrip		BOREHOLE No: 73027104				
CRREL with auger powerhead		polygon trough edge		Project No: 720081 LOG# 22				
UTM ZONE: 16 N8882300.00 E522020.00		fine grained rock (shale)		ELEVATION: 94.0 (m)				
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	☒ estimated ice content ☒ 20 40 60 80 ☒ excess water ☒ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	☒ % clay (ratio S:Si:C) ☒ 20 40 60 80 ☒ % silt (ratio S:Si:C) ☒ 20 40 60 80 ☒ % sand (ratio S:Si:C) ☒ 20 40 60 80 ☒ % gravel (% of total) ☒ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen silt and clay 90%, fine sand 10%						0.0
		- silt/clay?, seasonal thaw zone						
		- silt/clay?, large vertical ice lense (2 cm wide), small horizontal ice lenses (<1 mm)						
1.0		- silt/clay, large horizontal ice lenses 1 cm maximum width, 25% ice						1.0
		- high ice content 60%, inclusions of fines						
		- dipping shaly bedrock, ice lenses 5 mm thick, some layers of lighter coloured material, very fine grained, poorly consolidated, 5-10% ice content						
2.0								2.0
3.0								3.0
4.0								4.0
5.0								5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 22		COMPLETION DEPTH: 1.5 m COMPLETE: 73/02/07 Page 1 of 1		

FOSHEIM SUBSURFACE COMPILATION 340B/3		plateau north of Eureka airstrip		BOREHOLE No: 73027105				
CRREL with auger powerhead		on edge of "Fossil Creek" valley		Project No: 720081 LOG# 23				
UTM ZONE: 16 N8882050.00 E521500.00		fine grained rock (shale)		ELEVATION: 65.0 (m)				
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC M.C. LIQUID ----- 20 40 60 80				
0.0		- clayey shale, no visible ice						0.0
1.0								1.0
2.0								2.0
3.0								3.0
4.0								4.0
5.0								5.0

Geological Survey of Canada
Ottawa, Ontario

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REVIEWED BY: HCA	COMPLETE: 73/02/07
Fig. No: LOG 23	Page 1 of 1





FOSHEIM SUBSURFACE COMPILATION 49G/15		50 m south of airstrip, west of 7303701		BOREHOLE No: 7304701	
Winkie fluid diamond drilling		in 6 m wide trough, crack in centre,		Project No: 720081 LOG# 25	
UTM ZONE: 16 N8880950.00 E522750.00		disturbed marine-deltaic material		ELEVATION: 73.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ exposure ☐ not recovered ☐ core logged					

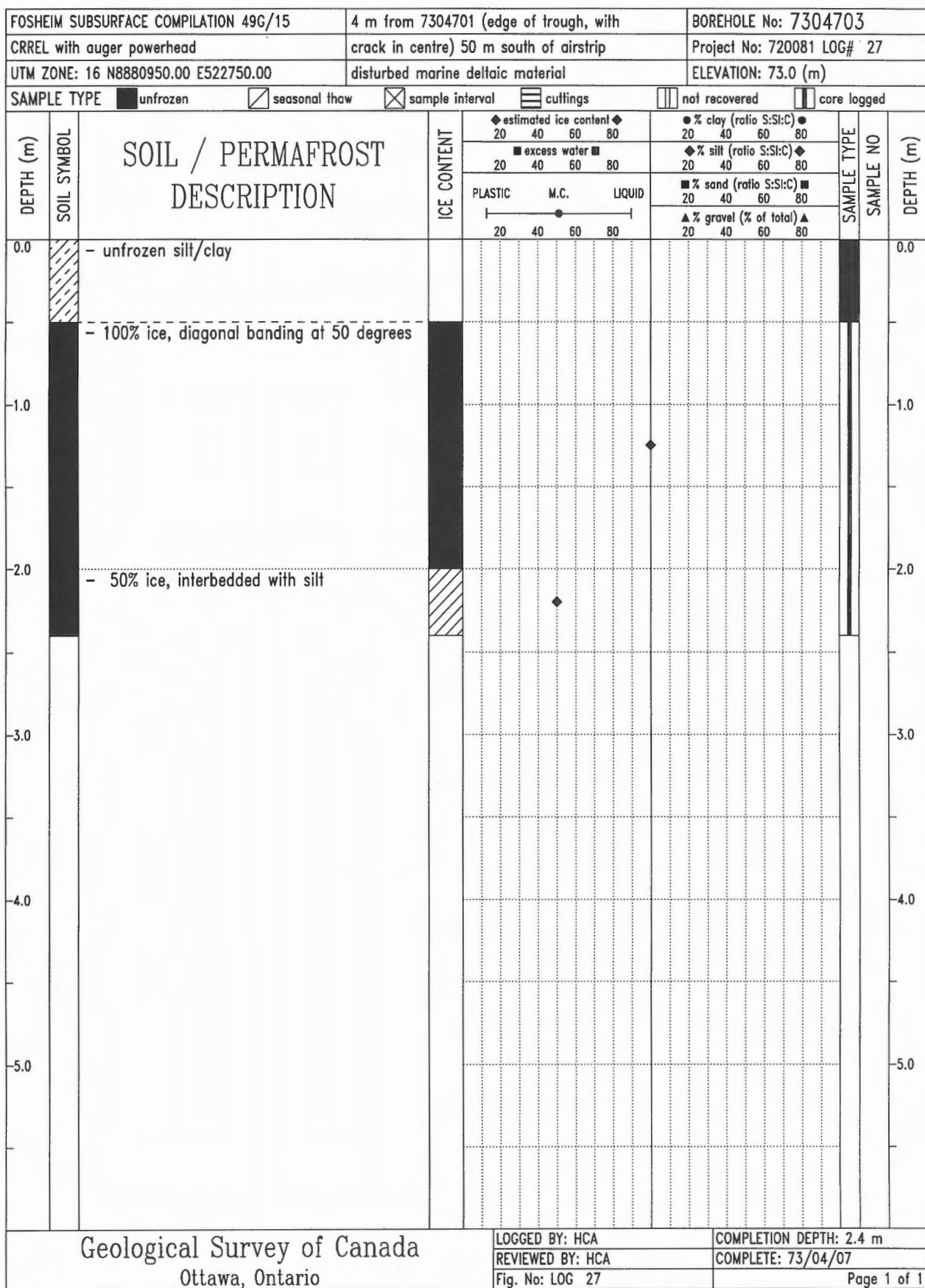
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ ● % clay (ratio S:Si:C) ● 20 40 60 80 20 40 60 80 ■ excess water ■ ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 20 40 60 80 ■ % sand (ratio S:Si:C) ■ ▲ % gravel (% of total) ▲ 20 40 60 80 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
6.0		- ice 90%, bands of fine sand/sandy silt				6.0	
7.0						7.0	
8.0		- sand/silt and ice lenses, 5% ice				8.0	
9.0						9.0	
10.0						10.0	
11.0						11.0	

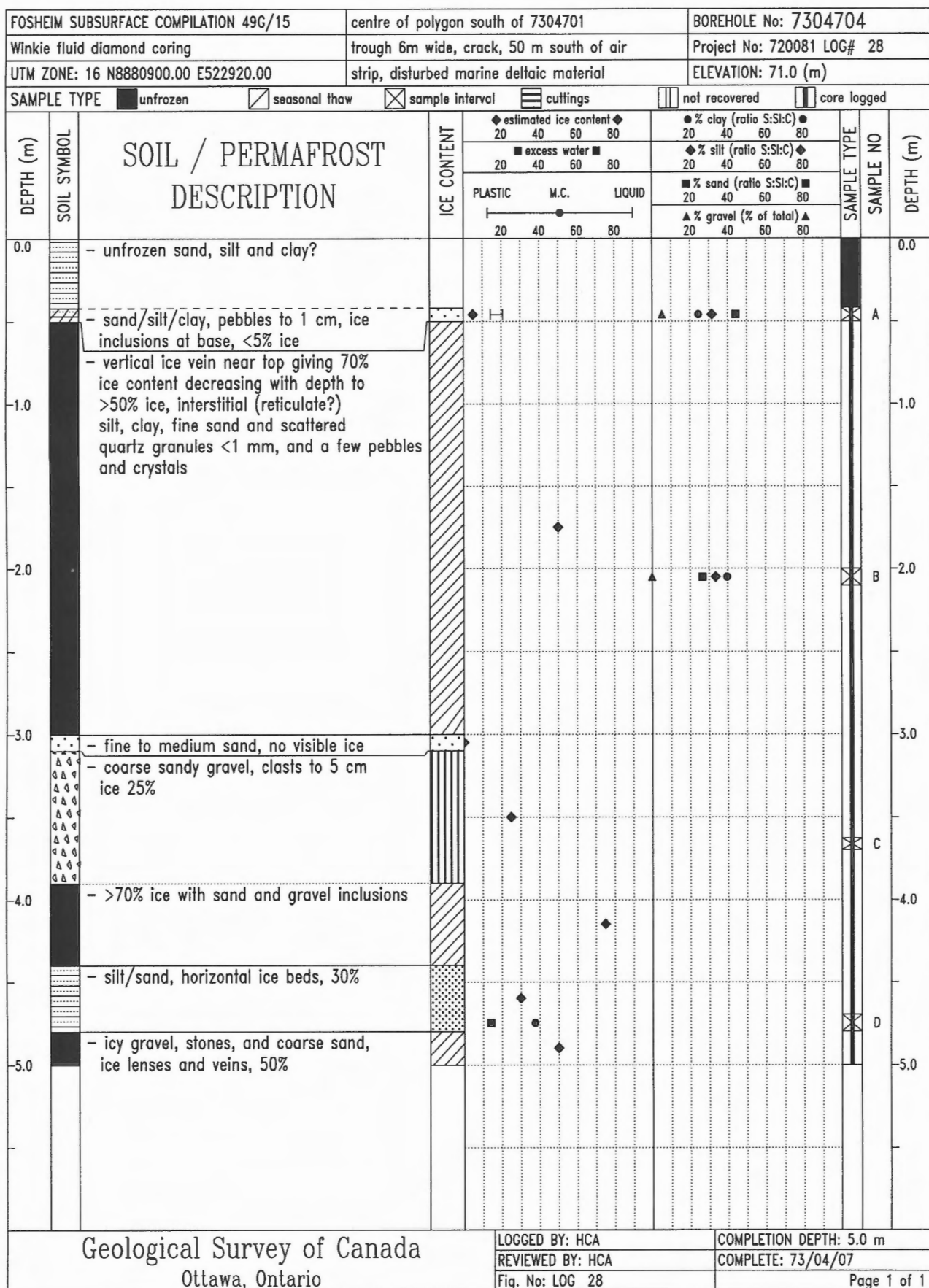
Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 8.0 m
		REVIEWED BY: HCA	COMPLETE: 73/04/07
		Fig. No: LOG 25	Page 2 of 2

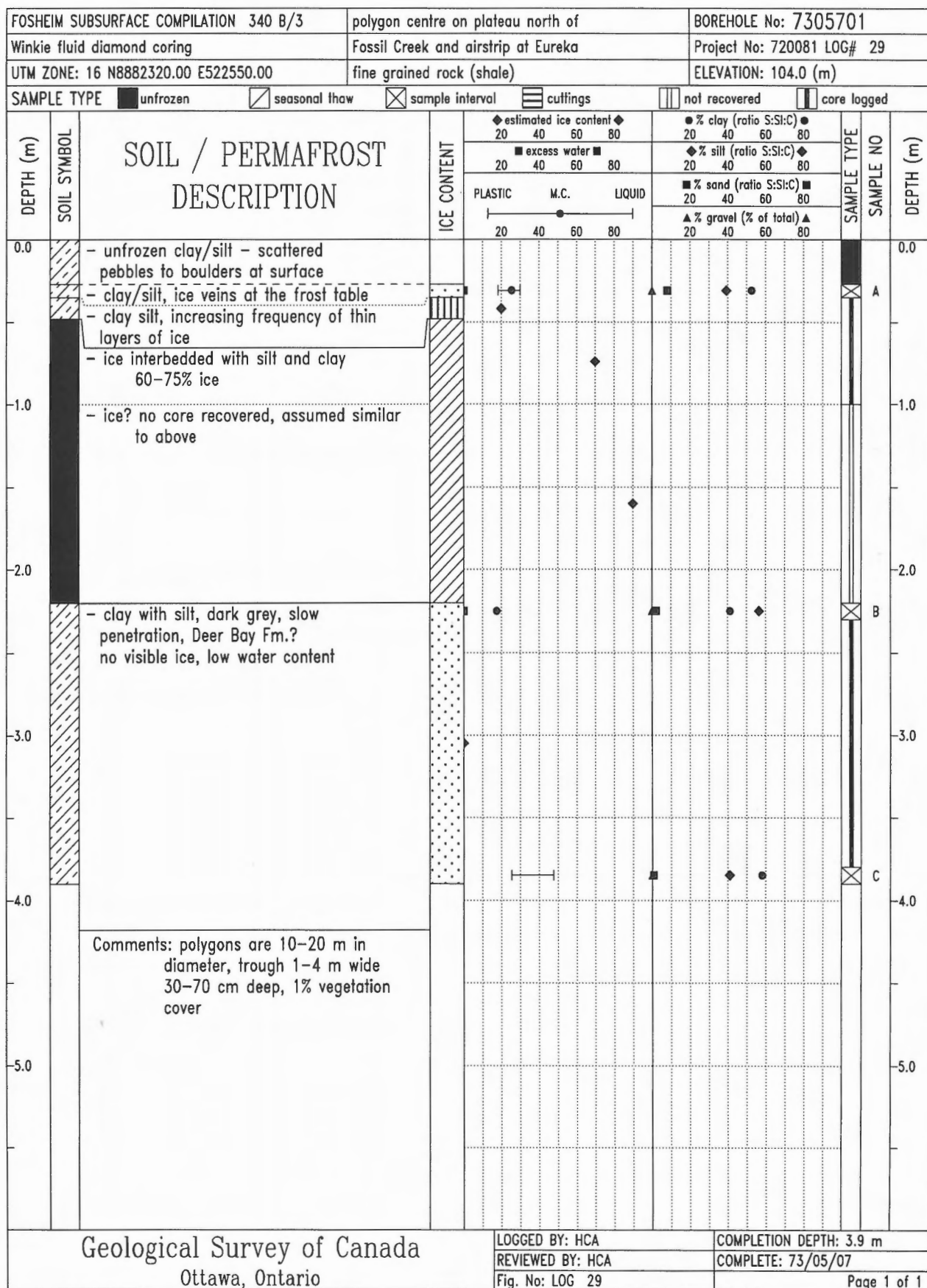
FOSHEIM SUBSURFACE COMPILATION 49G/15		near 7304701, 50 m south of airstrip in		BOREHOLE No: 7304702	
CRREL with auger powerhead		6 m wide trough, crack in centre,		Project No: 720081 LOG# 26	
UTM ZONE: 16 N8880950.00 E522750.00		disturbed marine deltaic material		ELEVATION: 73.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

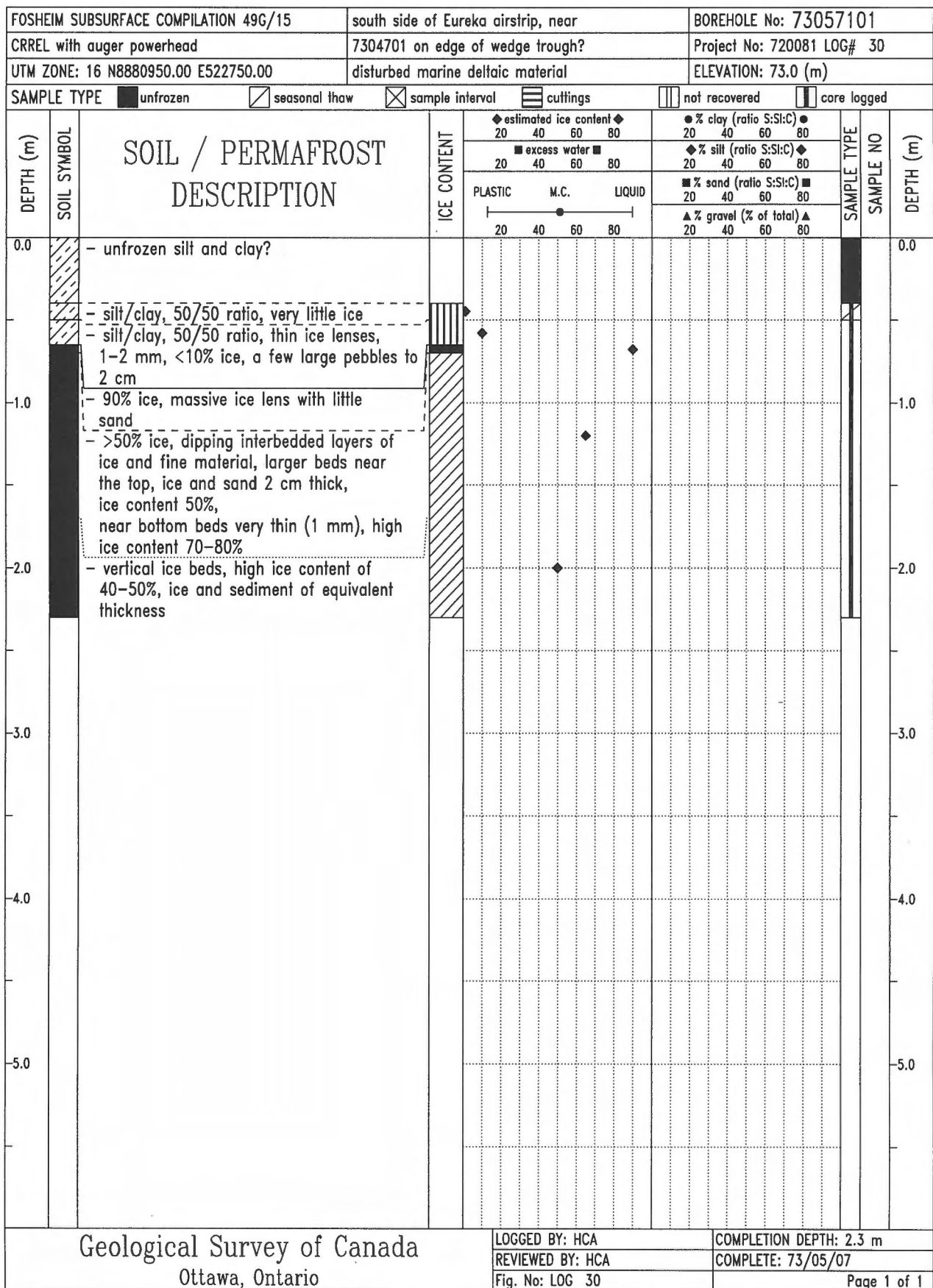
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID ----- ----- 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen silt and clay					0.0
		- silt/clay, minor sand, a few sandstone clasts, no visible ice					
		- silt/clay with thin ice lenses 1 to 2 mm 10% ice					
-1.0		- silt/clay, wide ice bands, 1-5 mm, 40% ice					-1.0
		- pure ice, diagonal banding at 60 degrees					
-2.0							-2.0
-3.0							-3.0
-4.0							-4.0
-5.0							-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.0 m
		REVIEWED BY: HCA	COMPLETE: 73/04/07
		Fig. No: LOG 26	Page 1 of 1







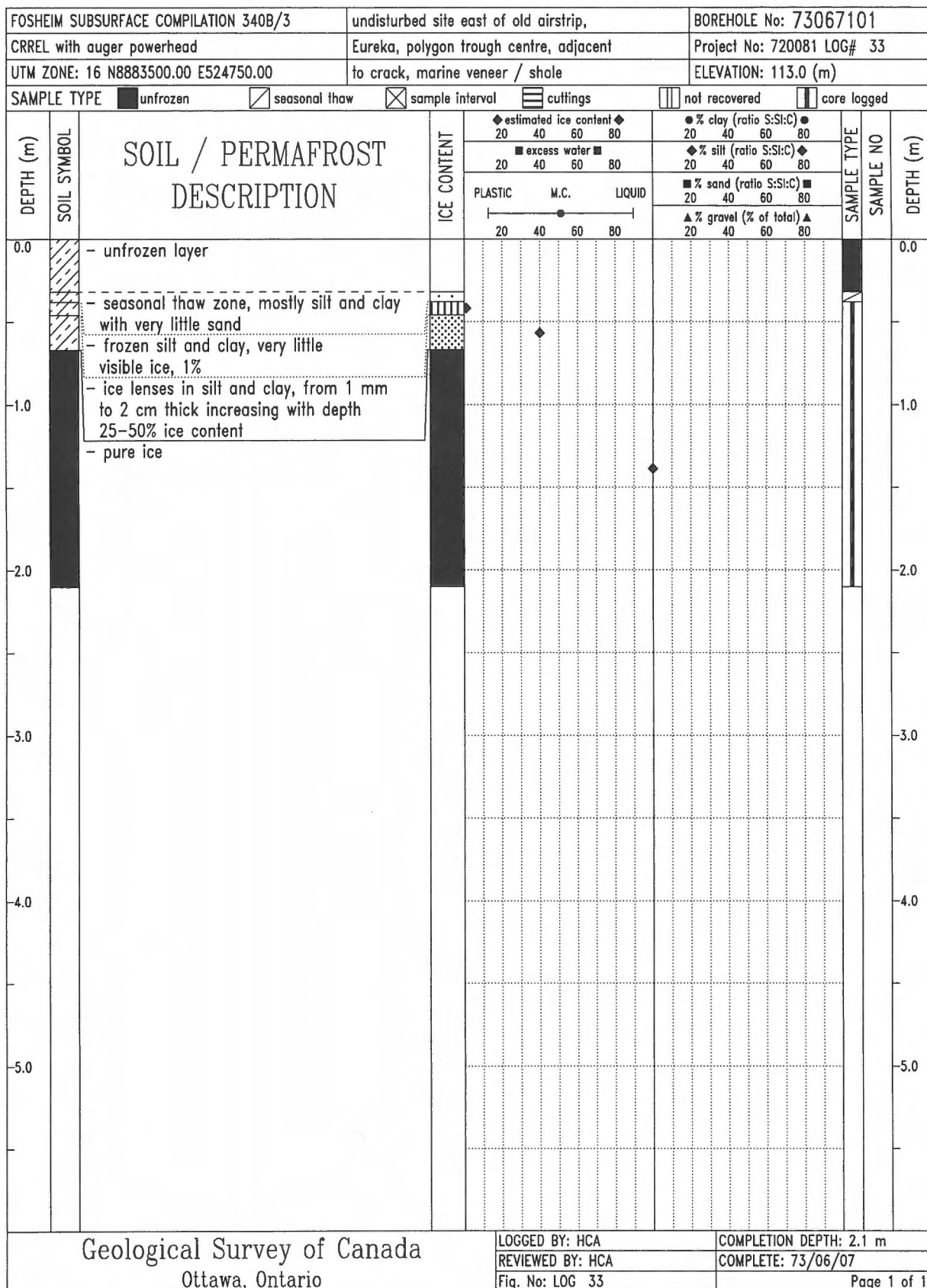


FOSHEIM SUBSURFACE COMPILATION 49G/15		south side of Eureka airstrip, edge of		BOREHOLE No: 73057102	
CRREL with auger powerhead		trough near 7304701		Project No: 720081 LOG# 31	
TM ZONE: 16 N8880950.00 E522750.00		disturbed marine deltaic material		ELEVATION: 73.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 PLASTIC M.C. LIQUID ----- 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- thawed, dry, granular chunks of silt, clay and some fine sand					0.0
		- not recovered, missing contact					
		- sand/silt, stratified reddish-brown medium to fine sand with dark grey fine sand and silt, stones, and one coarse sand layer, no visible ice					
-1.0		- thick ice lenses, some fines, ice content 85-90%					-1.0
		- silt and clay with ice crystals ice content 40%					
		- stratified reddish-brown medium sand with dark grey fine sand and silt no visible ice					
-2.0							-2.0
-3.0							-3.0
-4.0							-4.0
-5.0							-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.3 m
		REVIEWED BY: HCA	COMPLETE: 73/05/07
		Fig. No: LOG 31	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/15		south side of Eureka airstrip near		BOREHOLE No: 73057103								
CRREL with auger powerhead		7304701		Project No: 720081 LOG# 32								
TM ZONE: 16 N8880950.00 E522750.00		disturbed marine deltaic material		ELEVATION: 73.0 (m)								
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged												
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC		M.C.		LIQUID		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20	40	60	80	20	40			
0.0		- thawed, dry, granular chunks of silt and clay, some fine sand and stones - layered brown medium sand and silt, development of thin ice lenses (1-2 mm), - high ice content (80%), minor silt and clay - icy silt and clay, ice inclusions, with some vertical orientation, 50% ice										0.0
1.0												1.0
2.0												2.0
3.0												3.0
4.0												4.0
5.0												5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA		COMPLETION DEPTH: 1.5 m				Page 1 of 1		
				REVIEWED BY: HCA		COMPLETE: 73/05/07						
				Fig. No: LOG 32								



FOSHEIM SUBSURFACE COMPILATION 340B/3		undisturbed site east of old airstrip,		BOREHOLE No: 73067102	
CRREL with auger powerhead		polygon trough centre, 1.5 m across		Project No: 720081 LOG# 34	
UTM ZONE: 16 N8883500.00 E524750.00		crack from 73067101, marine veneer/shale		ELEVATION: 113.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- predominantly silt, some fine sand and clay, unfrozen - seasonal thaw zone, predominantly silt - silt/clay, little visible ice, <5%, a few small disintegrated pebbles - thin ice lenses 1-2 mm thick, silt and clay layers between are 0.5-1 cm thick - ice lens 2 cm thick at depth of 65 cm, >50% ice content - >99% ice, with some very minor sand inclusions	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80			0.0
1.0						1.0
2.0						2.0
3.0						3.0
4.0						4.0
5.0						5.0

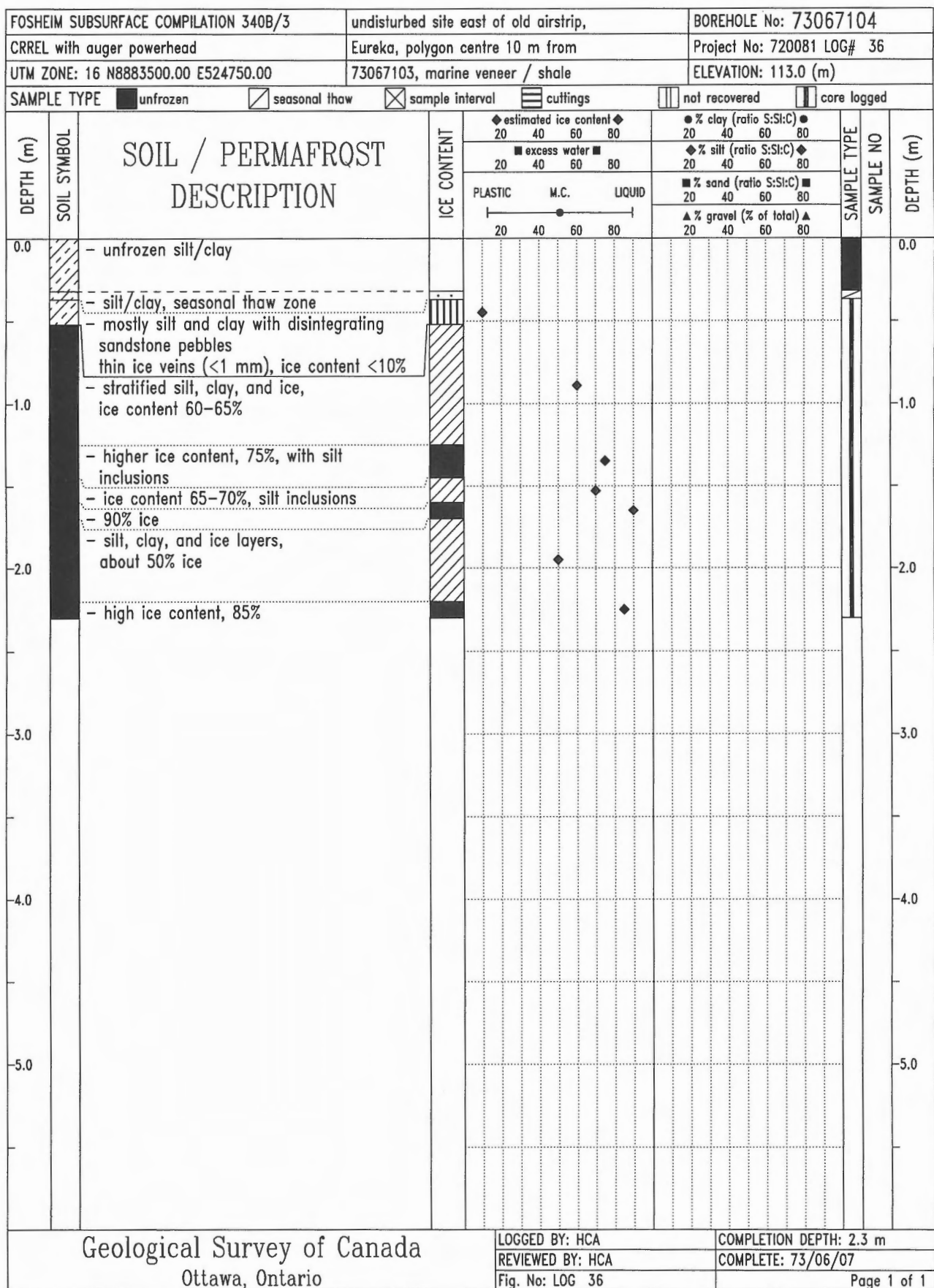
Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 34	COMPLETION DEPTH: 2.4 m COMPLETE: 73/06/07
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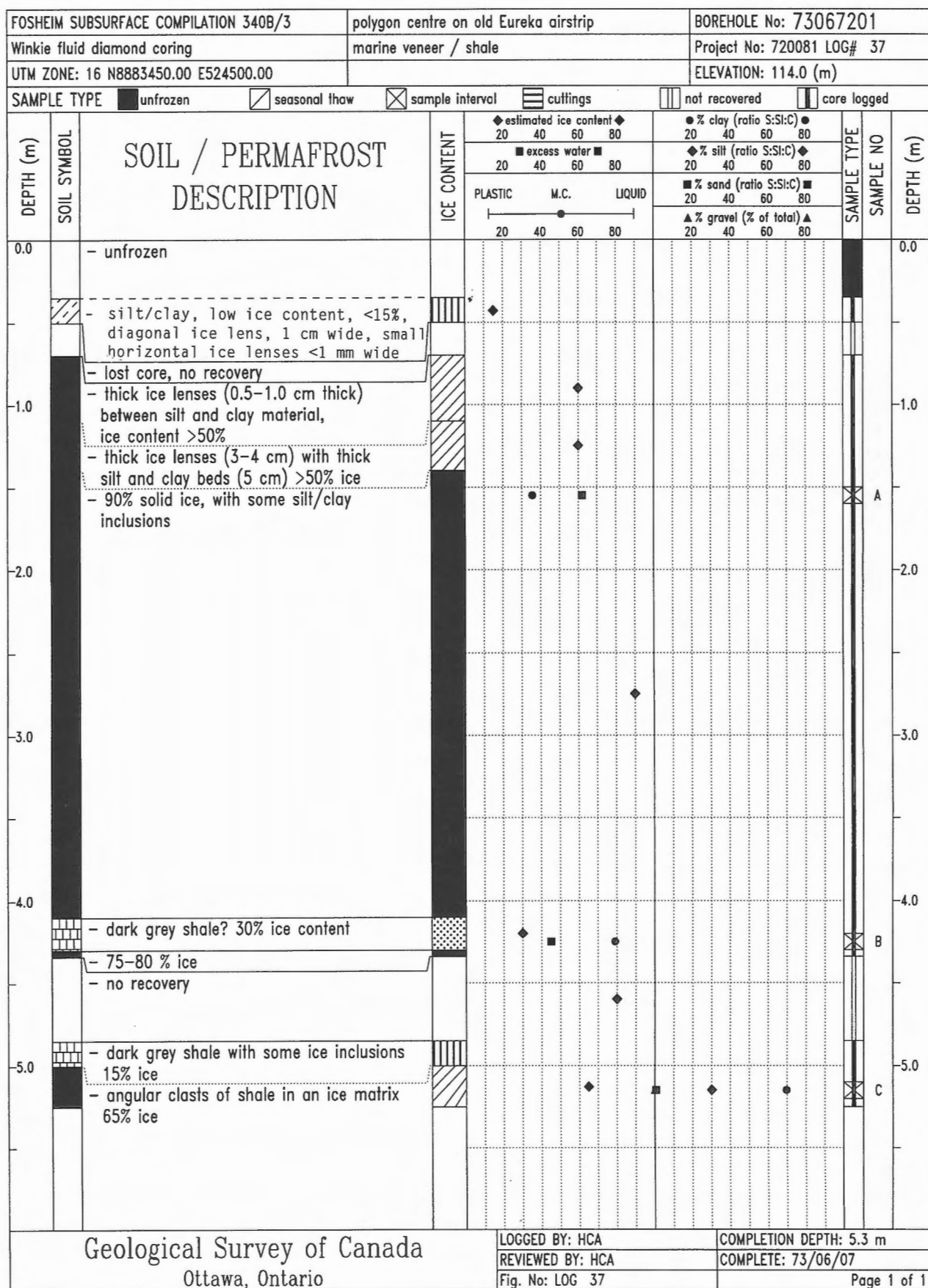
Page 1 of 1

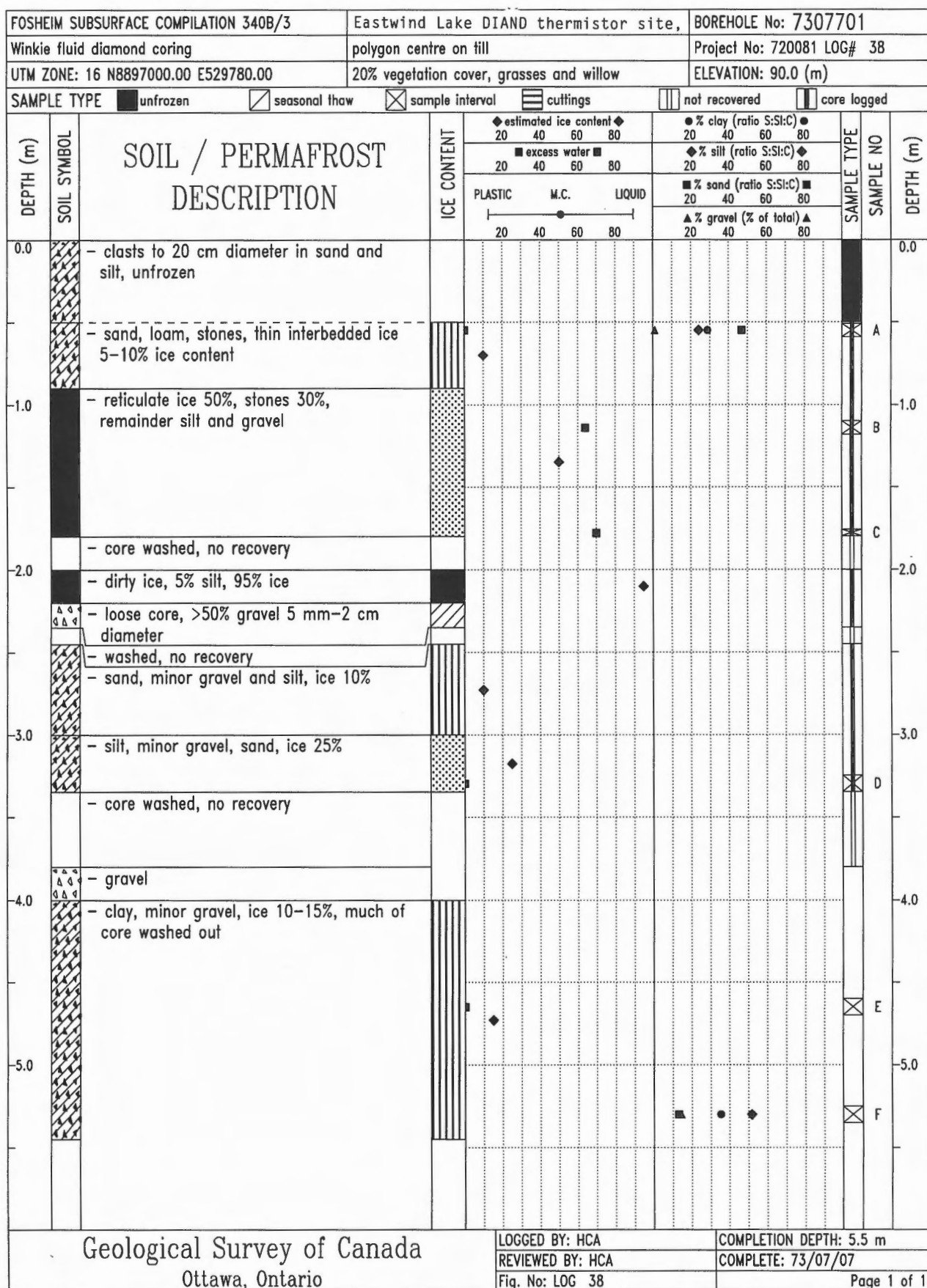
FOSHEIM SUBSURFACE COMPILATION 340B/3		undisturbed site east of old airstrip,		BOREHOLE No: 73067103	
CRREL with auger powerheda		Eureka, edge of polygon trough, 2 m from		Project No: 720081 LOG# 35	
UTM ZONE: 16 N8883500.00 E524750.00		73067102, marine veneer / shale		ELEVATION: 113.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80	PLASTIC M.C. LIQUID 20 40 60 80	● % clay (ratio S:St:C) ● 20 40 60 80 ◆ % silt (ratio S:St:C) ◆ 20 40 60 80 ■ % sand (ratio S:St:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80			
0.0		- thawed silt and clay?							0.0
		- silt/clay, small ice lenses (2-3 mm) 5-10% ice							
-1.0		- large ice lenses up to 3 cm, silt and clay lenses 1 cm thick maximum, 50% ice content							
-2.0		- 100% ice							
-3.0									
-4.0									
-5.0									

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 2.0 m
		REVIEWED BY: HCA	COMPLETE: 73/06/07
		Fig. No: LOG 35	Page 1 of 1







FOSHEIM SUBSURFACE COMPILATION 340B/3		undisturbed site east of old airstrip		BOREHOLE No: 73087101	
CRREL with auger powerhead		Eureka, polygon centre adjacent 73067104		Project No: 720081 LOG# 40	
UTM ZONE: 16 N8883500.00 E524750.00		marine veneer / shale		ELEVATION: 114.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0	▨	- predominantly silt, some fine sand 10% few stones, thawed - silt, seasonal thaw zone - silt and fine sand with small ice lenses 1-2 mm thick, ice content 15% - ice lenses with silt, fine sand lenses 3-5 mm thick, ice content varies vertically from 40-70%	▨				0.0
1.0	▨		♦				1.0
2.0	▨						2.0
3.0	▨						3.0
4.0	▨						4.0
5.0	▨						5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.9 m
		REVIEWED BY: HCA	COMPLETE: 73/08/07
		Fig. No: LOG 40	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		undisturbed site east of old airstrip		BOREHOLE No: 73087102	
CRREL with auger powerhead		Eureka, polygon trough margin		Project No: 720081 LOG# 41	
UTM ZONE: 16 N8883500.00 E524750.00		marine veneer / shale		ELEVATION: 114.0 (m)	
SAMPLE TYPE ☒ unfrozen		☒ seasonal thaw		☒ sample interval	
		☐ cuttings		☐ not recovered	
				☐ core logged	

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			ICE CONTENT			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC	M.C.	LIQUID	estimated ice content	excess water	% clay (ratio S:Si:C)			
0.0		- thawed silt, fine sand no stones										0.0
		- ice lens from 30 to 32 cm, silt and fine sand with thin ice veins (1-2 mm), ice content 5-10%										
		- ice lens from 55 to 57 cm, silt and fine sand with thick ice lenses (4 mm), ice content 40%										
-1.0		- silt and fine sand as inclusions in ice matrix, some thicker ice lenses (2 cm) and some silt and sand layers, ice content 80%										-1.0
-2.0												-2.0
-3.0												-3.0
-4.0												-4.0
-5.0												-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 41	COMPLETION DEPTH: 1.9 m COMPLETE: 73/08/07 Page 1 of 1
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FOSHEIM SUBSURFACE COMPILATION 340B/3		undisturbed site east of old airstrip,		BOREHOLE No: 73087103	
CRREL with auger powerhead		Eureka, polygon trough centre		Project No: 720081 LOG# 42	
UTM ZONE: 16 N8883500.00 E524750.00		marine veneer / shale		ELEVATION: 114.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ ● % clay (ratio S:Si:C) ● 20 40 60 80 20 40 60 80 ■ excess water ■ ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 20 40 60 80 ■ % sand (ratio S:Si:C) ■ ▲ % gravel (% of total) ▲ 20 40 60 80 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen silt/fine sand				0.0	
		- silt/fine sand, seasonal thaw zone					
		- silt/fine sand, roots, thin ice lenses					
		- 2 mm maximum, one ice lens 2 cm thick, ice content increases with depth from 10% to 35%					
1.0		- pure ice				1.0	
2.0						2.0	
3.0						3.0	
4.0						4.0	
5.0						5.0	

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 42	COMPLETION DEPTH: 1.6 m COMPLETE: 73/08/07
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FOSHEIM SUBSURFACE COMPILATION 340B/3		on old Eureka airstrip		BOREHOLE No: 73097101	
CRREL with auger power head		polygon trough margin		Project No: 720081 LOG # 45	
UTM ZONE: 16 N8883450.00 E524500.00		marine veneer / shale		ELEVATION: 114.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

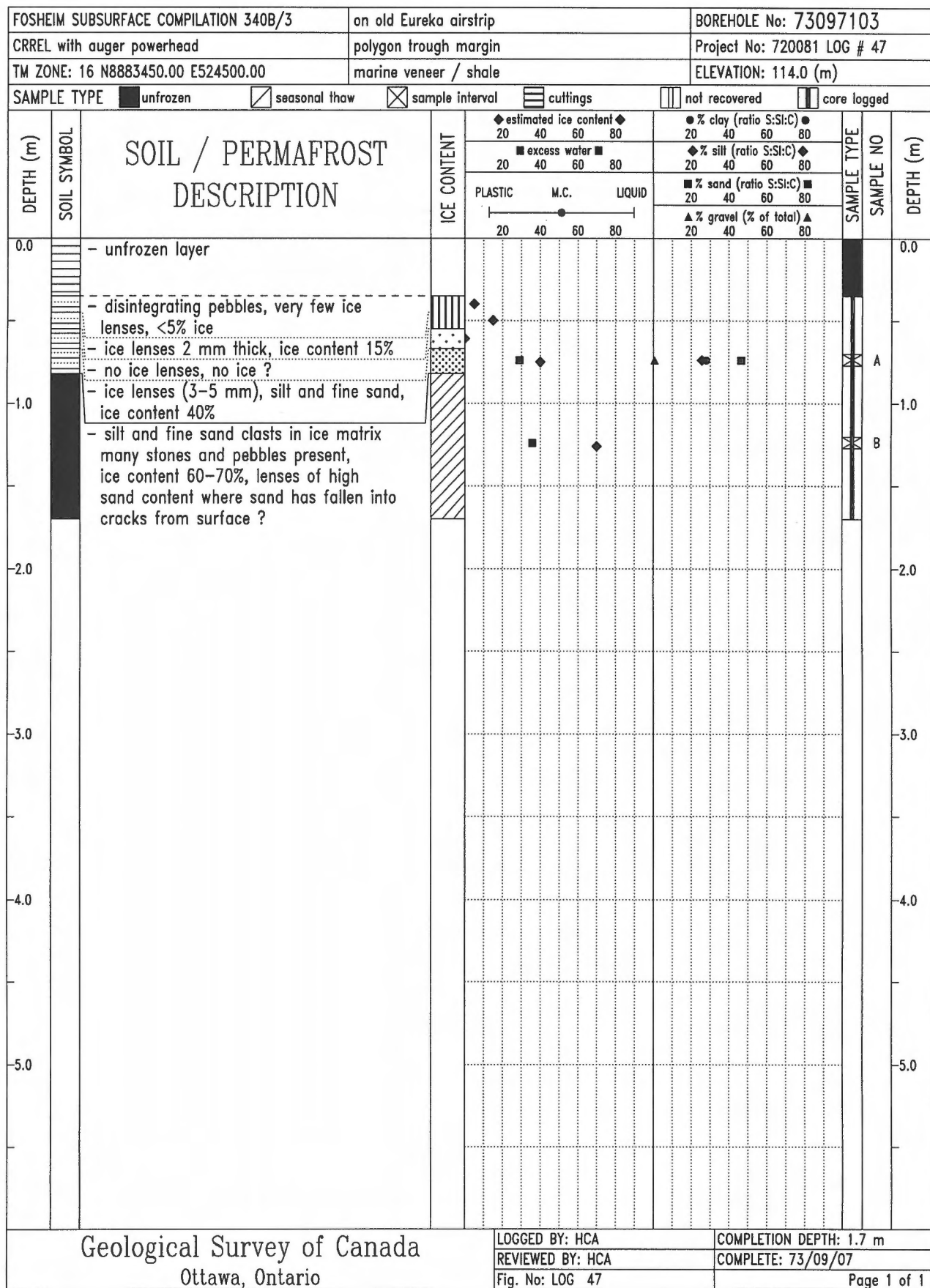
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT				SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				◆ estimated ice content ◆	● % clay (ratio S:Si:C) ●	■ excess water ■	◆ % silt (ratio S:Si:C) ◆			
				20 40 60 80	20 40 60 80	20 40 60 80	20 40 60 80			
				PLASTIC	M.C.	LIQUID	▲ % sand (ratio S:Si:C) ▲			
0.0		- predominantly silt, 80%, some clay and fine sand, unfrozen - seasonal thaw zone - silt with some ice lenses that increase in size from <1 mm at top to 10 mm at the bottom, ice content 20% - pure ice								0.0
1.0										1.0
2.0		- predominantly silt with slightly dipping ice beds 2 mm thick, ice content 15% Comments : appears to be on the extreme edge of an ice wedge								2.0
3.0										3.0
4.0										4.0
5.0										5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.8 m
		REVIEWED BY: HCA	COMPLETE: 73/09/07
		Fig. No: LOG 45	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		on old Eureka airstrip		BOREHOLE No: 73097102	
CRREL with auger powerhead		polygon trough margin		Project No: 720081 LOG # 46	
TM ZONE: 16 N8883450.00 E524500.00		marine veneer / shale		ELEVATION: 114.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC	M.C.	LIQUID	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- predominantly silt, unfrozen							0.0
		- silt and fine sand (70:30), disintegrating pebbles, thin ice lenses, 1 mm thick, ice content <5%							
		- thicker ice lenses (5 mm), layers of silt and fine sand with some disintegrating pebbles, ice content 50%							
-1.0									-1.0
-2.0									-2.0
-3.0									-3.0
-4.0									-4.0
-5.0									-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 2.0 m
		REVIEWED BY: HCA	COMPLETE: 73/09/07
		Fig. No: LOG 46	Page 1 of 1



FOSHEIM SUBSURFACE COMPILATION 340B/3		Eastwind L., polygon trough, 1.5 m wide		BOREHOLE No: 7310701	
fluid diamond coring		25 cm deep, 2-10 cm crack, 10 cm deep in		Project No: 720081 LOG # 48	
UTM ZONE: 16 N8897000.00 E529780.00		till with 100% cover of moss and willow		ELEVATION: 85.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen, 15% stones up to 20 cm diameter				0.0	
		- silt-clay with granules, interbedded with ice, 5-15%					
-1.0		- 99% ice, vertical bubble trains rare vertically oriented inclusions, minor silt/clay, difficult drilling, some coarse sand at depth 3.2 m (15%), some horizontal banding below 3.3 m					
-2.0							
-3.0							
-4.0		- 100% ice, diagonal banding at 70 to 80 degrees					
-5.0		- horizontal 1-2 mm bands of sand in >90% ice					
		- vertical bubbles, some horizontal bands					

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 48	COMPLETION DEPTH: 6.0 m COMPLETE: 73/10/07
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FOSHEIM SUBSURFACE COMPILATION 340B/3		south of Eastwind Lake on sandstone		BOREHOLE No: 73107101				
CRREL with auger powerhead				Project No: 720081 LOG # 49				
UTM ZONE: 16 N8890510.00 E526450.00				ELEVATION: 190.0 (m)				
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20 40 60 80	20 40 60 80			
				☒ estimated ice content ☐ ☐ excess water ☐ PLASTIC M.C. LIQUID 20 40 60 80	☐ % clay (ratio S:St:C) ☐ ☐ % silt (ratio S:St:C) ☐ ☐ % sand (ratio S:St:C) ☐ ☐ % gravel (% of total) ☐			
0.0		- thawed gravel in silty sand matrix, gravel 30%, sand 50%, silt 20%						0.0
		- gravel in silt and fine sand						
		- gravel in sandy silt, with small ice lenses 1-2 mm, ice content <5%						
-1.0								-1.0
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA		COMPLETION DEPTH: 0.7 m		
				REVIEWED BY: HCA		COMPLETE: 73/10/07		
				Fig. No: LOG 49		Page 1 of 1		

FOSHEIM SUBSURFACE COMPILATION 340B/3		south of Eastwind Lake		BOREHOLE No: 73107102	
CRREL with auger powerhead		sandstone		Project No: 720081 LOG # 50	
UTM ZONE: 16 N8890500.00 E526300.00				ELEVATION: 172.0 (m)	
SAMPLE TYPE ☒ unfrozen		☒ seasonal thaw		☒ sample interval	
		☐ cuttings		☐ not recovered	
				☐ core logged	

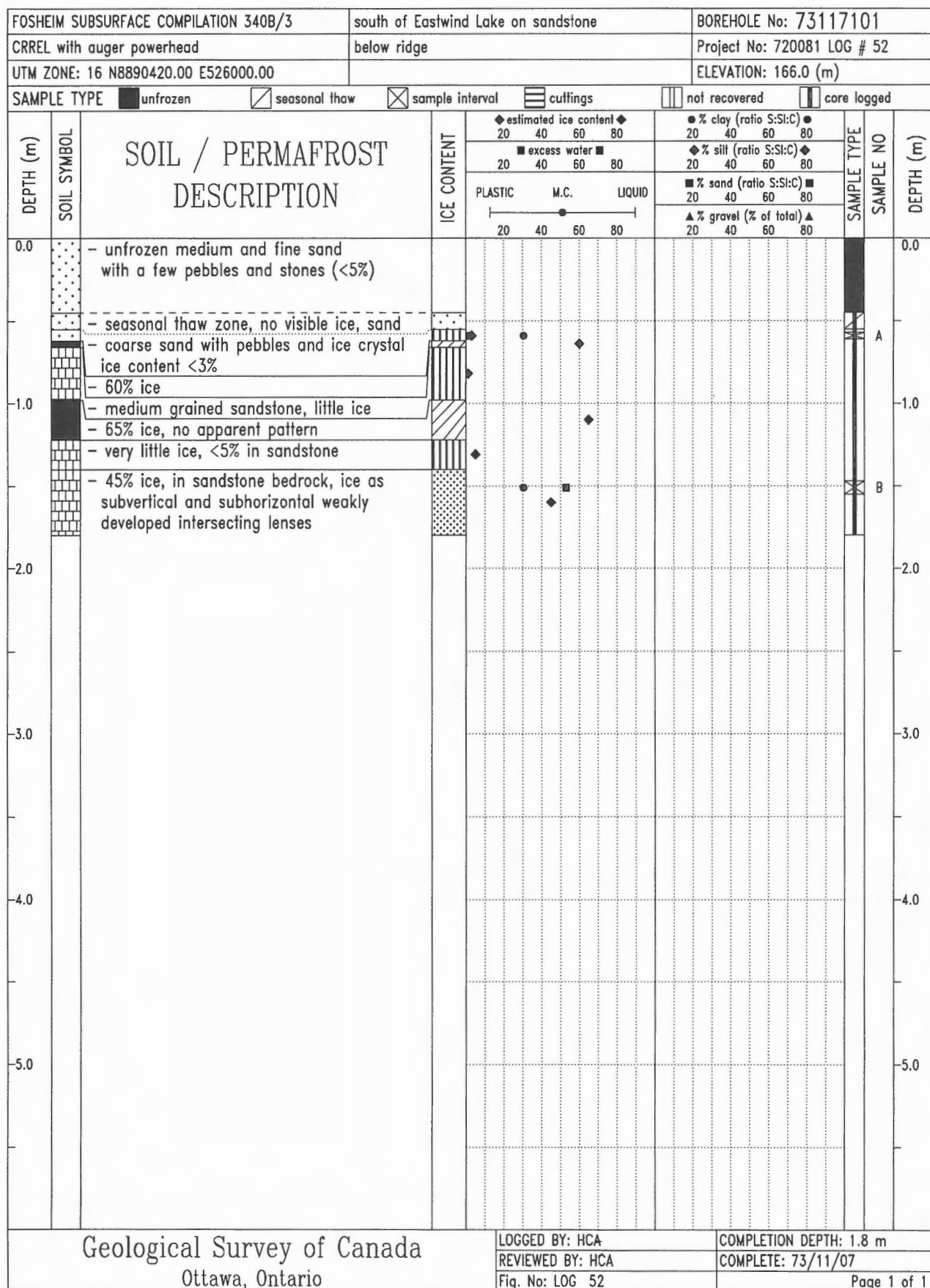
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC		M.C.		LIQUID		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20	40	20	40	20	40			
0.0		- unfrozen, mostly light brown fine sand, no stones or gravel										0.0
		- fine sand with thin ice lenses 1-2 mm thick, ice content <5%										
		- layer of high ice content, 50%										
		- dark grey/brown silty material, low ice content <5%										
-1.0		- grey silty material with ice lenses 3-4 mm thick, ice content 35%, some reddish-brown peat on side of core										-1.0
		- high ice content, 80%										
-2.0												-2.0
-3.0												-3.0
-4.0												-4.0
-5.0												-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.8 m
		REVIEWED BY: HCA	COMPLETE: 73/10/07
		Fig. No: LOG 50	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		south of Eastwind Lake on sandstone		BOREHOLE No: 73107103	
CRREL with auger powerhead				Project No: 720081 LOG # 51	
UTM ZONE: 16 N8890450.00 E526200.00				ELEVATION: 168.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- thawed light grey fine sand and silt, 10 cm diagonal gravelly layer					0.0
		- thinly bedded fine sand and silt, grey					
		- white to reddish-brown sandstone, no ice					
-1.0		- 60% ice content, ice matrix with white sandstone clasts		◆ 60	■ 60		
-2.0							-2.0
-3.0							-3.0
-4.0							-4.0
-5.0							-5.0

Geological Survey of Canada Ottawa, Ontario	LOGGED BY: HCA	COMPLETION DEPTH: 1.0 m
	REVIEWED BY: HCA	COMPLETE: 73/10/07
	Fig. No: LOG 51	Page 1 of 1



FOSHEIM SUBSURFACE COMPILATION 340B/3		south of Eastwind Lake		BOREHOLE No: 73117102	
CRREL with auger powerhead		below ridge on black shale		Project No: 720081 LOG # 53	
UTM ZONE: 16 N8890420.00 E526000.00				ELEVATION: 166.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80				SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC M.C. LIQUID 20 40 60 80						
0.0	■	- unfrozen black shale						0.0		
	-	- no visible ice in shale	●							
	-	- thin ice lenses <1 mm, ice content <1%	■							
-1.0								-1.0		
-2.0								-2.0		
-3.0								-3.0		
-4.0								-4.0		
-5.0								-5.0		

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.0 m
		REVIEWED BY: HCA	COMPLETE: 73/11/07
		Fig. No: LOG 53	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		south of Eastwind Lake on slope to		BOREHOLE No: 73117103								
CRREL with auger powerhead		Blacktop Creek		Project No: 720081 LOG # 54								
UTM ZONE: 16 N8890300.00 E525500.00		fine grained bedrock (shale)		ELEVATION: 145.0 (m)								
SAMPLE TYPE ☐ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged												
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC		M.C.		LIQUID		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20	40	60	80	20	40			
0.0		- thawed fine sand and silt, no stones										0.0
		- fine sand and silt, visible ice <2%										
		- layered silt, sand, and clay, sand is light brown and red, clay is dark grey, probably bedrock, little ice, <2%										
-1.0												-1.0
-2.0												-2.0
-3.0												-3.0
-4.0												-4.0
-5.0												-5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA		COMPLETION DEPTH: 1.3 m				Page 1 of 1		
				REVIEWED BY: HCA		COMPLETE: 73/11/07						
				Fig. No: LOG 54								

FOSHEIM SUBSURFACE COMPILATION		Eastwind Lake, 3 m behind shallow		BOREHOLE No: 7312701	
CRREL with auger powerhead		flowslide		Project No: 720081 LOG # 55	
TM ZONE: 16 N8899020.00 E530000.00		fluvial material over till?		ELEVATION: 140.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC M.C. LIQUID		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				☒ estimated ice content 20 40 60 80	☒ excess water 20 40 60 80			
0.0		- thawed fine sand with trace of laminations and crossbedding						0.0
		- layers of fine sand with ice lenses (1-2 mm) of relatively high ice content (10-40%) interbedded with sand of low ice content (0-5%)						
-1.0								-1.0
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.4 m
		REVIEWED BY: HCA	COMPLETE: 73/12/07
		Fig. No: LOG 55	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		Eastwind Lake		BOREHOLE No: 7312702								
CRREL with auger powerhead		till ?		Project No: 720081 LOG # 56								
TM ZONE: 16 N8895700.00 E527900.00				ELEVATION: 145.0 (m)								
SAMPLE TYPE ☐ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged												
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	estimated ice content			% clay (ratio S:Sl:C)			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20	40	60	80	20	40			
				excess water			% silt (ratio S:Sl:C)					
				20			20					
				40			40					
				60			60					
				80			80					
				PLASTIC			M.C.					
				20			20					
				40			40					
				60			60					
				80			80					
				LIQUID			% sand (ratio S:Sl:C)					
				20			20					
				40			40					
				60			60					
				80			80					
							% gravel (% of total)					
				20			20					
				40			40					
				60			60					
				80			80					
0.0		- thawed silt, clay, <10% subangular stones, till										0.0
		- as above but frozen										
		- similar material, ice interbedded, 1-3 mm thick, 40% ice content										
		- same material with sandstone granules occasional ice lenses 1-5 mm thick 10% ice content										
-1.0												-1.0
-2.0												-2.0
-3.0												-3.0
-4.0												-4.0
-5.0												-5.0

Geological Survey of Canada
Ottawa, Ontario

LOGGED BY: HCA	COMPLETION DEPTH: 0.7 m
REVIEWED BY: HCA	COMPLETE: 73/12/07
Fig. No: LOG 56	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		3 km northeast of Eastwind Lake,		BOREHOLE No: 73127101			
CRREL with auger powerhead		wet site, till		Project No: 720081 LOG # 57			
TM ZONE: 16 N8897000.00 E529780.00				ELEVATION: 135.0 (m)			
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged							
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION		ICE CONTENT	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen sand 70%, gravel 20%, fines 10% sandy till - thin ice lenses <2 mm, ice content <10% in sand 80%, fines 20%, thicker ice lenses with depth - high ice content 70%, clast of fine material and sand		♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80		0.0
1.0							
2.0							2.0
3.0							3.0
4.0							4.0
5.0							5.0

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LOGGED BY: HCA
REVIEWED BY: HCA
Fig. No: LOG 57

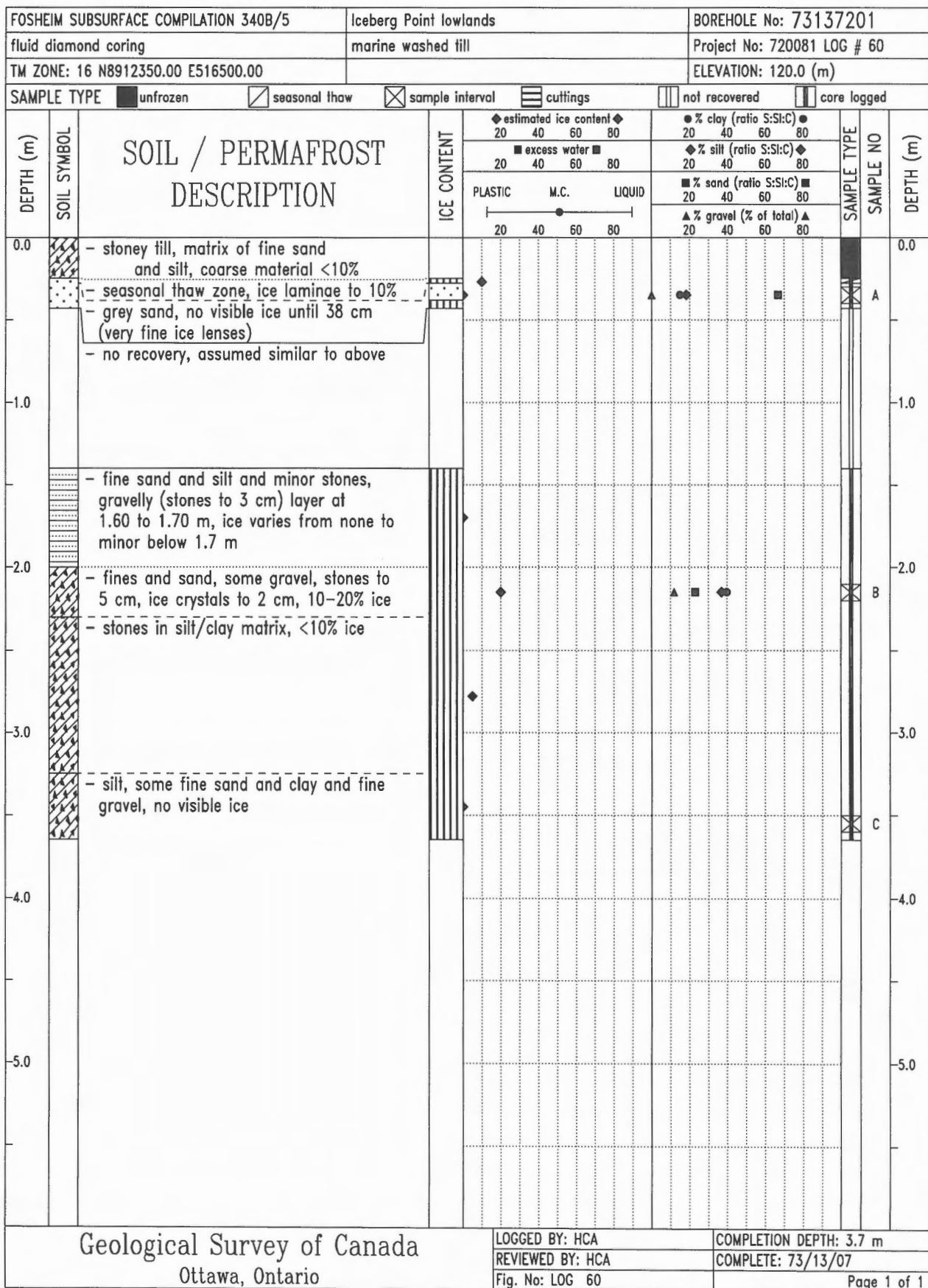
COMPLETION DEPTH: 1.1 m
COMPLETE: 73/12/07
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FOSHEIM SUBSURFACE COMPILATION 340B/3		3 km northeast of Eastwind Lake,		BOREHOLE No: 73127102								
fluid diamond coring		adjacent to #73127101, till		Project No: 720081 LOG # 58								
TM ZONE: 16 N8897000.00 E529780.00				ELEVATION: 135.0 (m)								
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged												
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC		M.C.		LIQUID		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20	40	60	80	20	40			
0.0		- thawed till?										0.0
-1.0		- 70% ice; remainder clasts consisting of fines increasing with depth, both sand and gravel decreasing 10% gravel, 60% sand, and 30% fines,										-1.0
-2.0		- no recovery										-2.0
		- coarse sand and stones, ice content 40% layer of stones at 2.30 m										
-3.0		- predominantly grey clay, no stones ice veins 3 mm thick, ice content 10% occurring as intersecting vertical and horizontal veins										-3.0
-4.0												-4.0
-5.0												-5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA		COMPLETION DEPTH: 3.2 m						
				REVIEWED BY: HCA		COMPLETE: 73/12/07						
				Fig. No: LOG 58								Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		Eastwind Lake, wet site		BOREHOLE No: 73127103	
fluid diamond coring		peat over till		Project No: 720081 LOG # 59	
TM ZONE: 16 N8897000.00 E529490.00				ELEVATION: 135.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0	~ ~ ~	- thawed organics					0.0
	- - -	- frozen organics					
	■	- pure ice with vertical bubble trains, wedge ice					
-1.0							-1.0
-2.0							-2.0
-3.0		- predominantly ice with clasts of clay ice content 80%					-3.0
		- pure ice					
-4.0							-4.0
-5.0							-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 3.0 m
		REVIEWED BY: HCA	COMPLETE: 73/12/07
		Fig. No: LOG 59	Page 1 of 1



FOSHEIM SUBSURFACE COMPILATION 340B/5		3 km east of Iceberg Point		BOREHOLE No: 7314701				
fluid diamond coring		marine beaches		Project No: 720081 LOG # 61				
TM ZONE: 16 N8916750.00 E514850.00				ELEVATION: 25.0 (m)				
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0	●●●●●	- thawed stony sand and gravel layers						0.0
1.0	▲▲▲▲▲	- partial recovery, gravel with <5% interstitial ice - gravel, mainly >1 cm, fines and ice washed out, 5% ice?	♦			X	A	1.0
2.0	▲▲▲▲▲		♦					2.0
3.0								3.0
4.0								4.0
5.0								5.0

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LOGGED BY: HCA
REVIEWED BY: HCA
Fig. No: LOG 61

COMPLETION DEPTH: 1.9 m
COMPLETE: 73/14/07
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FOSHEIM SUBSURFACE COMPILATION 49G/15		west of Station Creek, 0.5 km north of		BOREHOLE No: 7315701	
CRREL with auger powerhead		delta, marine-deltaic material		Project No: 720081 LOG # 62	
TM ZONE: 16 N8881600.00 E520510.00				ELEVATION: 55.0 (m)	
SAMPLE TYPE ☐ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

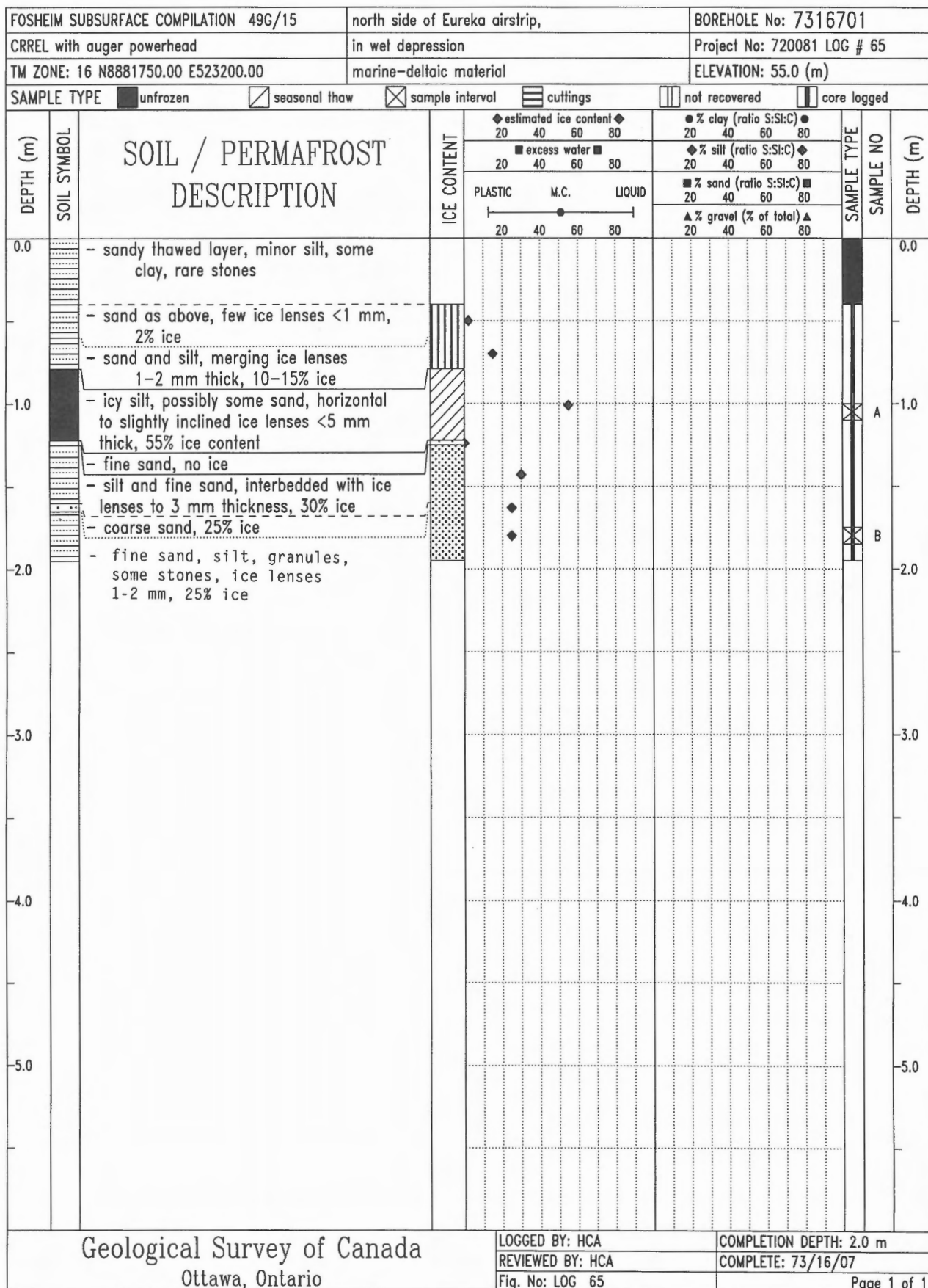
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC	M.C.	LIQUID			
0.0		- thawed silt and clay							0.0
0.5		- clay/silt, some sand, granules of sand-stone, ice lenses <1 mm, <2% ice							0.5
1.0		- clay/silt, some sand, thin ice lenses from <1 mm to 3 mm thick, content increasing from 5 to 10%							1.0
1.5		- clay/silt, ice lenses and veins in reticulate pattern, 20% ice							1.5
2.0		- silt/clay, some sand, lamination horizontal to 20 degrees, <5% ice							2.0
3.0									3.0
4.0									4.0
5.0									5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 62	COMPLETION DEPTH: 1.8 m COMPLETE: 73/15/07
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FOSHEIM SUBSURFACE COMPILATION 49G/15		west of Station Creek, 0.5 km north of		BOREHOLE No: 7315702				
CRREL with auger powerhead		delta, marine-deltaic material		Project No: 720081 LOG # 63				
TM ZONE: 16 N8881600.00 E520510.00				ELEVATION: 55.0 (m)				
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC M.C. LIQUID		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20 40 60 80 20 40 60 80				
				20 40 60 80 20 40 60 80				
0.0		- thawed silt/clay						0.0
		- silt/clay with thin ice lenses from <5% at top to 10% ice content after 40 cm						
		- silt/clay, ice lenses 1-10 mm, 40% ice						
-1.0		- mainly ice, 10% reticulate silt-clay veins as inclusions						-1.0
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA		COMPLETION DEPTH: 1.2 m		
				REVIEWED BY: HCA		COMPLETE: 73/15/07		
				Fig. No: LOG 63				
						Page 1 of 1		

FOSHEIM SUBSURFACE COMPILATION 49G/15		west of Station Creek, 0.5 km north of		BOREHOLE No: 7315703				
CRREL with auger powerhead		delta, junction of three polygon troughs		Project No: 720081 LOG # 64				
TM ZONE: 16 N8881600.00 E520510.00		marine-deltaic material		ELEVATION: 55.0 (m)				
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- thawed silt/clay						0.0
		- silt/clay seasonal thaw zone						
		- 100% ice, vertical bubbles and cracks						
1.0								1.0
2.0								2.0
3.0								3.0
4.0								4.0
5.0								5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 0.5 m
		REVIEWED BY: HCA	COMPLETE: 73/15/07
		Fig. No: LOG 64	Page 1 of 1



FOSHEIM SUBSURFACE COMPILATION 49G/15		north side of Eureka airstrip,		BOREHOLE No: 7316702	
CRREL with auger powerhead		on divide, drier than 7316701		Project No: 720081 LOG # 66	
TM ZONE: 16 N8881750.00 E523200.00		marine - deltaic		ELEVATION: 55.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC		M.C.		LIQUID		SAMPLE TYPE		SAMPLE NO	DEPTH (m)
				20	40	60	80	20	40	60	80		
0.0		- thawed silt some clay, fine sand dry, blocky											0.0
		- silt/clay with interbedded ice, 1-2 mm, 15% ice content											
		- clay with ice veins and lenses, <10% ice											
-1.0		- silt/clay, fine sand, few buff-orange granules, ice lenses and veins, <5% ice											-1.0
		- silt/clay, ice lenses to 5 mm, 25% ice											
-2.0													-2.0
-3.0													-3.0
-4.0													-4.0
-5.0													-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.9 m
		REVIEWED BY: HCA	COMPLETE: 73/16/07
		Fig. No: LOG 66	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/15		north side of Eureka airstrip,		BOREHOLE No: 7316703	
CRREL with auger powerhead		dry site		Project No: 720081 LOG # 67	
TM ZONE: 16 N8881750.00 E523200.00		marine-deltaic material		ELEVATION: 55.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			ICE CONTENT			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				estimated ice content	excess water	PLASTIC	M.C.	LIQUID	% clay (ratio S:Si:C)			
0.0		- thawed silt/clay										0.0
		- silt and clay with occasional granules <2% ice content										
		- silt/clay, reticulate ice veins to 5 mm, 15-20% ice content										
-1.0												-1.0
-2.0												-2.0
-3.0												-3.0
-4.0												-4.0
-5.0												-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.8 m
		REVIEWED BY: HCA	COMPLETE: 73/16/07
		Fig. No: LOG 67	Page 1 of 1

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FOSHEIM SUBSURFACE COMPILATION 49G/16		Gemini well, undisturbed site,		BOREHOLE No: 7317701	
fluid diamond coring		polygon centre		Project No: 720081 LOG # 69	
TM ZONE: 1° N8881850.00 E556800.00		marine - deltaic		ELEVATION: 123.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			ICE CONTENT			SAMPLE TYPE	SAMPLE NO	DEPTH (m)		
				◆ estimated ice content ◆	■ excess water ■	PLASTIC	M.C.	LIQUID	● % clay (ratio S:Si:C) ●				◆ % silt (ratio S:Si:C) ◆	■ % sand (ratio S:Si:C) ■
				20 40 60 80	20 40 60 80	20 40 60 80	20 40 60 80	20 40 60 80	20 40 60 80				20 40 60 80	
				20 40 60 80	20 40 60 80	20 40 60 80	20 40 60 80	20 40 60 80	20 40 60 80				20 40 60 80	
0.0		- thawed clayey silt									A	0.0		
		- clayey silt with ice lenses <1 mm, <5%									B			
		- 100% ice, horizontally oriented bubbles near top									C			
-1.0												-1.0		
-2.0												-2.0		
-3.0												-3.0		
-4.0												-4.0		
-5.0												-5.0		
		(continued drilling in ice to about 6 m detailed logging to about 1 m)												

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 6.0 m
		REVIEWED BY: HCA	COMPLETE: 73/17/07
		Fig. No: LOG 69	Page 1 of 1

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FOSHEIM SUBSURFACE COMPILATION 49G/15		north side of Eureka airstrip		BOREHOLE No: 73177102	
CRREL with auger powerhead		polygon trough, centre crack		Project No: 720081 LOG # 71	
TM ZONE: 16 N8881750.00 E523200.00		marine-deltaic material		ELEVATION: 55.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				☒ estimated ice content 20 40 60 80	☐ excess water 20 40 60 80	☐ % clay (ratio S:Sl:C) 20 40 60 80			
0.0		- thawed fine to medium sand - some ice crystals but low ice content, <2%, seasonally thawed - ice lenses increase in thickness with depth (1-3 mm), low ice content of <7% in fine material - pure ice wedge ice		PLASTIC M.C. LIQUID 20 40 60 80	☐ % silt (ratio S:Sl:C) 20 40 60 80	☐ % sand (ratio S:Sl:C) 20 40 60 80			0.0
1.0									1.0
2.0									2.0
3.0									3.0
4.0									4.0
5.0									5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.7 m
		REVIEWED BY: HCA	COMPLETE: 73/17/07
		Fig. No: LOG 71	Page 1 of 1

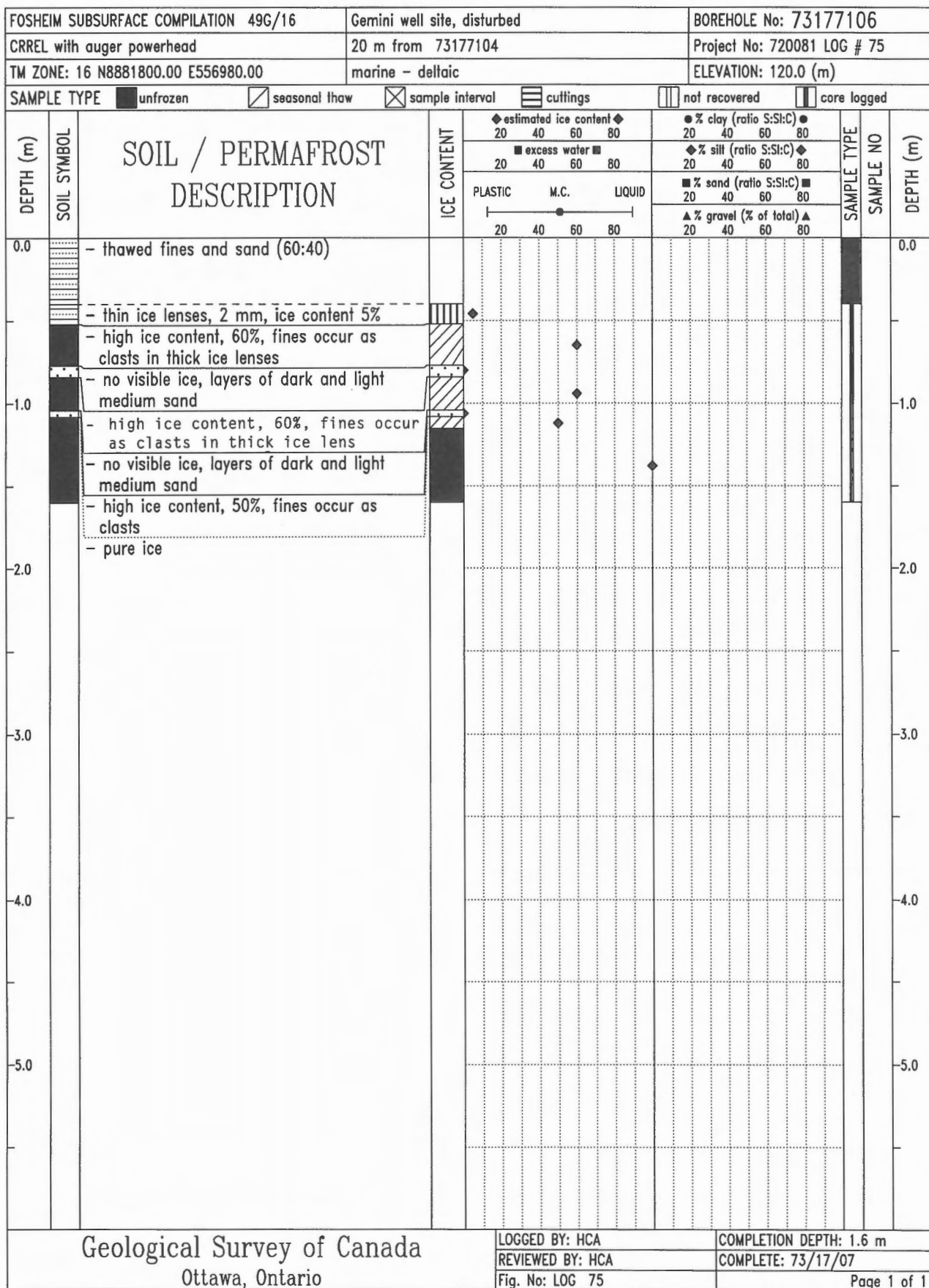
FOSHEIM SUBSURFACE COMPILATION 49G/15		north side of Eureka airstrip		BOREHOLE No: 73177103				
CRREL with auger powerhead		50 cm from crack in polygon trough		Project No: 720081 LOG # 72				
TM ZONE: 16 N8881750.00 E523200.00				ELEVATION: 55.0 (m)				
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC	M.C. LIQUID			
0.0		- thawed, dry, fine to medium sand some silt (10%) - seasonal thaw zone - fine sand and silt, little visible ice - fines with ice lenses 2-3 mm wide, ice content 15% - predominantly sand with several pebbles, larger ice lenses (3-4 mm), ice content <5% - 40-50% ice, ice occurs as lenses 1 cm wide on average between layers of fines and sand - <5% ice content, ice lenses 2-5 mm, predominantly sand with few thin layers of fines		♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80	● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80			0.0
1.0								1.0
2.0								2.0
3.0								3.0
4.0								4.0
5.0								5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 72		COMPLETION DEPTH: 1.7 m COMPLETE: 73/17/07 Page 1 of 1		

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FOSHEIM SUBSURFACE COMPILATION 49G/16		Gemini well site, disturbed		BOREHOLE No: 73177105	
CRREL with auger powerhead		4 m from 73177104		Project No: 720081 LOG # 74	
TM ZONE: 16 N8881800.00 E556980.00		marine - deltaic		ELEVATION: 120.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ ● % clay (ratio S:Si:C) ● 20 40 60 80 20 40 60 80 ■ excess water ■ ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 20 40 60 80 ■ % sand (ratio S:Si:C) ■ ▲ % gravel (% of total) ▲ 20 40 60 80 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen, predominantly fines, increasingly wet to frost table				0.0	
	-----	- pure ice					
-1.0	■■■■■					-1.0	
-2.0						-2.0	
-3.0						-3.0	
-4.0						-4.0	
-5.0						-5.0	

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.0 m
		REVIEWED BY: HCA	COMPLETE: 73/17/07
		Fig. No: LOG 74	Page 1 of 1



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FOSHEIM SUBSURFACE COMPILATION 49G/16		Gemini well site, on airstrip		BOREHOLE No: 73177108	
CRREL with auger powerhead		(disturbed?)		Project No: 720081 LOG # 77	
TM ZONE: 16 N8882200.00 E556800.00		marine - deltaic		ELEVATION: 119.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

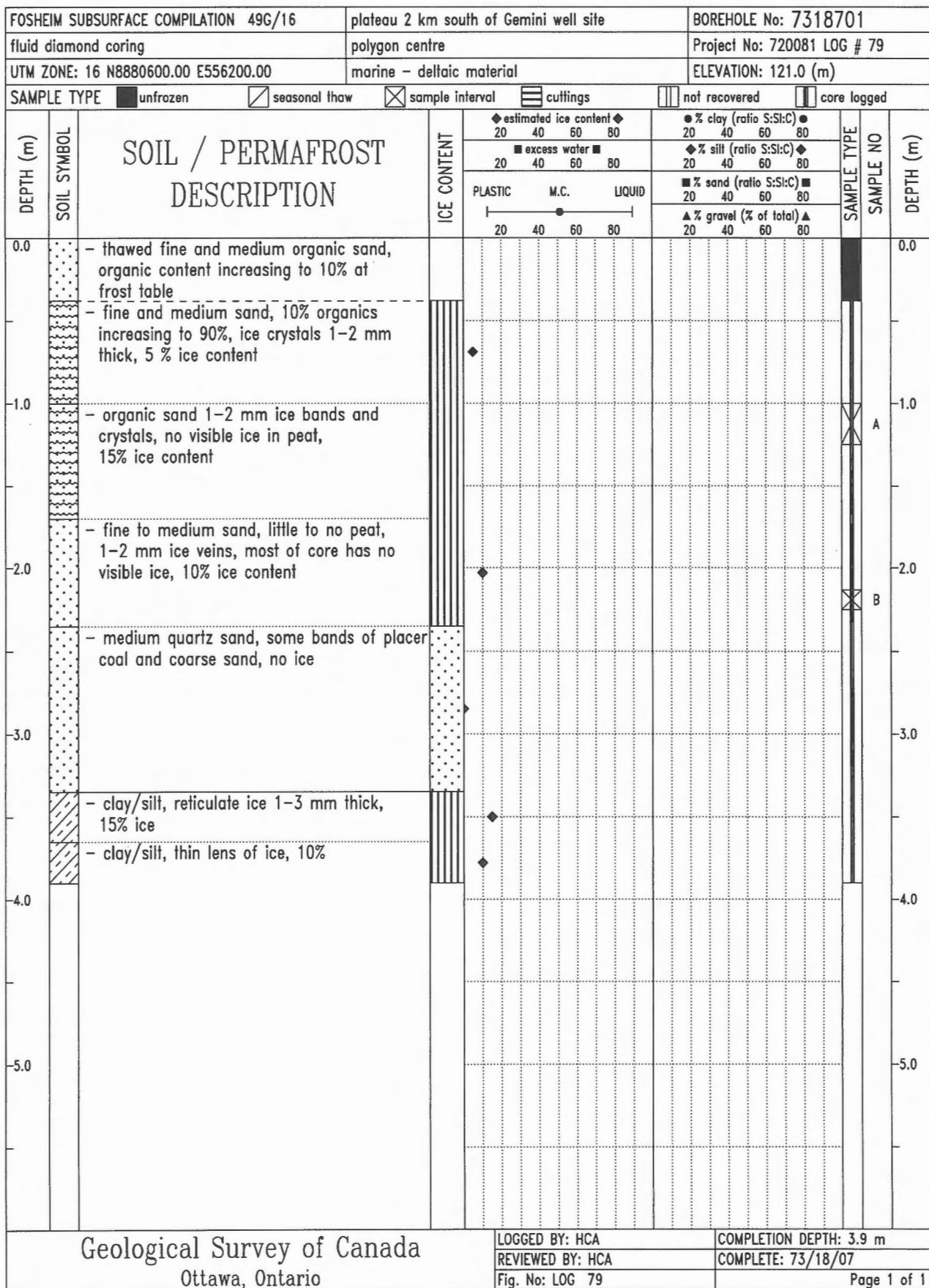
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC M.C. LIQUID		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20 40 60 80	20 40 60 80			
0.0		- thawed medium and fine sand 80%, silt 20% - sand with little ice, 10% - sand and silt interbedded with ice lenses 3-5 mm thick, ice content 50% - low ice content <2% - ice content, 30%, occurs as ice lenses in fine sand - high ice content, 50-70%, fine sand occurs as clasts in ice matrix						0.0
1.0								1.0
2.0								2.0
3.0								3.0
4.0								4.0
5.0								5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.6 m
		REVIEWED BY: HCA	COMPLETE: 73/17/07
		Fig. No: LOG 77	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/16		Gemini well site, in crack developing		BOREHOLE No: 73177109	
CRREL with auger powerhead		on disturbed airstrip		Project No: 720081 LOG # 78	
TM ZONE: 16 N8882200.00 E556800.00		marine - deltaic		ELEVATION: 119.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			ICE CONTENT			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC	M.C.	LIQUID	estimated ice content	excess water	% clay (ratio S:Si:C)			
0.0		- thawed, dry, powdery fine sand										0.0
		- sand with no visible ice, between 5 cm thick layers with thin ice lenses 1-2 mm thick, ice content 15%										
		- pure ice										
-1.0												-1.0
-2.0												-2.0
-3.0												-3.0
-4.0												-4.0
-5.0												-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 0.7 m
		REVIEWED BY: HCA	COMPLETE: 73/17/07
		Fig. No: LOG 78	Page 1 of 1



FOSHEIM SUBSURFACE COMPILATION 49H/13		poorly consolidated rock		BOREHOLE No: 7318702				
fluid diamond coring		polygon centre		Project No: 720081 LOG # 80				
UTM ZONE: 17 N8876850.00 E442450.00		sandstone		ELEVATION: 170.0 (m)				
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				☒ estimated ice content ☒ 20 40 60 80 ☒ excess water ☒ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	☒ % clay (ratio S:Sl:C) ☒ 20 40 60 80 ☒ % silt (ratio S:Sl:C) ☒ 20 40 60 80 ☒ % sand (ratio S:Sl:C) ☒ 20 40 60 80 ☒ % gravel (% of total) ☒ 20 40 60 80			
0.0		- thawed sand, some silt and stones at surface						0.0
		- fine to medium sand, no ice						
		- fine sand, interbedded ice 1-3 mm thick 20% ice content						
-1.0		- no recovery						-1.0
		- sandstone boulder? no ice						
-2.0		- sand, flecks of interstitial ice, ice lenses 1 mm, 5% ice content						-2.0
		- clear ice, few bubbles						
		- sandstone or boulder, no ice						
		- partial recovery, sandstone?						
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

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LOGGED BY: HCA
REVIEWED BY: HCA
Fig. No: LOG 80

COMPLETION DEPTH: 3.4 m
COMPLETE: 73/18/07
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FOSHEIM SUBSURFACE COMPILATION 49G/16		Gemini well site		BOREHOLE No: 73187101	
CRREL with auger powerhead		slope to lake		Project No: 720081 LOG # 81	
UTM ZONE: 16 N8882100.00 E556500.00		marine - deltaic material		ELEVATION: 119.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- thawed fine sand and silt (50:50)						0.0
		- little visible ice, <1% in sand and silt seasonal thaw zone?						
		- horizontal ice lenses ranging from 1 mm to 5 mm interbedded with sand and silt, ice content 5%						
-1.0		- high ice content with mineral material occurring as clasts in ice matrix, ice content 65%						-1.0
		- silt and fine sand, 10% ice						
		- high ice content with mineral material occurring in clasts, ice content 65-70%						
		- lenses of ice 1 cm wide on average, interspersed with silt and fine sand, ice content 40-50%						
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.8 m
		REVIEWED BY: HCA	COMPLETE: 73/18/07
		Fig. No: LOG 81	Page 1 of 1

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FOSHEIM SUBSURFACE COMPILATION 49G/16		plateau south of Gemini well site,		BOREHOLE No: 73187104	
CRREL with auger powerhead		polygon trough adjacent to 7318701		Project No: 720081 LOG # 84	
UTM ZONE: 16 N8880700.00 E556050.00		marine - deltaic		ELEVATION: 110.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ ● % clay (ratio S:Si:C) ● 20 40 60 80 20 40 60 80 ■ excess water ■ ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 20 40 60 80 ■ % sand (ratio S:Si:C) ■ ▲ % gravel (% of total) ▲ 20 40 60 80 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- thawed medium to fine sand				0.0		
		- medium sand, very little ice <1%						
		- coarse sand, small ice lenses 1-2 mm thick, ice content 1-2%						
		- ice wedge, 100% ice						
-1.0						-1.0		
-2.0						-2.0		
-3.0						-3.0		
-4.0						-4.0		
-5.0						-5.0		

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 84	COMPLETION DEPTH: 2.0 m COMPLETE: 73/18/07
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FOSHEIM SUBSURFACE COMPILATION 49G/16		south of Gemini well site		BOREHOLE No: 73187106	
CRREL with auger powerhead		hill slope above flowslide		Project No: 720081 LOG # 86	
UTM ZONE: 16 N8880200.00 E556000.00		marine - deltaic		ELEVATION: 110.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- thawed sand					0.0
		- sand with little visible ice					
-1.0		- high ice content 40-50%, mineral material occurs as sand clasts in ice matrix		◆			-1.0
		- coarse sand, no visible ice					
-2.0		- pure ice					-2.0
				◆			
-3.0							-3.0
-4.0							-4.0
-5.0							-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 86	COMPLETION DEPTH: 1.8 m COMPLETE: 73/18/07 Page 1 of 1
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FOSHEIM SUBSURFACE COMPILATION 49G/16		south of Gemini well site,		BOREHOLE No: 73187107	
CRREL with auger powerhead		flanking the active flowslide		Project No: 720081 LOG # 87	
UTM ZONE: 16 N8880200.00 E556000.00		marine - deltaic		ELEVATION: 110.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- thawed sand					0.0
0.5		- medium sand with few small ice lenses 1mm thick, ice content <1%					0.5
1.0		- same material, thicker ice lenses to 3 mm, ice content 10%					1.0
1.5		- little visible ice in medium sand					1.5
2.0		- pure ice					2.0
2.5							2.5
3.0							3.0
3.5							3.5
4.0							4.0
4.5							4.5
5.0							5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 2.0 m
		REVIEWED BY: HCA	COMPLETE: 73/18/07
		Fig. No: LOG 87	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49H/13		probable palsas		BOREHOLE No: 7319701	
CRREL with auger powerhead		wet site		Project No: 720081 LOG # 88	
UTM ZONE: 17 N8866950.00 E446250.00		peat		ELEVATION: 300.0 (m)	
SAMPLE TYPE ☒ unfrozen		☐ seasonal thaw		☒ sample interval	
		☐ cuttings		☐ not recovered	
				☐ core logged	

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			SOIL COMPOSITION			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				estimated ice content	excess water	PLASTIC M.C. LIQUID	% clay (ratio S:Si:C)	% silt (ratio S:Si:C)	% sand (ratio S:Si:C)			
0.0		- thawed peat										0.0
		- frozen peat, no ice										
		- 50% peat as clasts and bands in 50% ice, vertical bubbles in ice										
		- ice of variable hardness, ice with vertical streams of bubbles is hard, horizontal bands are softer, pure ice										
-1.0												-1.0
-2.0												-2.0
-3.0												-3.0
-4.0												-4.0
-5.0												-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.9 m
		REVIEWED BY: HCA	COMPLETE: 73/19/07
		Fig. No: LOG 88	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49H/13		near 7319701		BOREHOLE No: 7319702	
CRREL with auger powerhead		wet site		Project No: 720081 LOG # 89	
UTM ZONE: 17 N8866950.00 E446250.00		peat over glaciofluvial material		ELEVATION: 169.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT				SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				estimated ice content		% clay (ratio S:Si:C)				
				excess water		% silt (ratio S:Si:C)				
				PLASTIC	M.C.	LIQUID	% sand (ratio S:Si:C)			
0.0		- thawed peat								0.0
		- frozen peat, no ice								
		- medium grey sand, no ice								
		- ice lenses in peat, 10-20% ice								
		- sand with minor peat, ice not estimated but high moisture content suggests visible ice								
-1.0										-1.0
-2.0										-2.0
-3.0										-3.0
-4.0										-4.0
-5.0										-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 0.9 m
		REVIEWED BY: HCA	COMPLETE: 73/19/07
		Fig. No: LOG 89	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/16		BOREHOLE No: 7319703	
CRREL with auger powerhead		Project No: 720081 LOG # 90	
UTM ZONE: 16 N8872200.00 E552850.00		ELEVATION: 104.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged			

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0	[diagonal lines]	- thawed silt with some clay, slightly damp - mainly silt, possibly 10% clay and fine sand, interbedded ice to 2 mm thick 20% ice content - contorted black organic deposit with occasional twigs to 3 mm diameter makes up 75%, fine sand = 10%, ice lenses are deformed, but not to same degree as peat 15% ice content - ice has vertical bubble trains, but with horizontal variations of opacity, 80% ice with inclusions of silt and clay, 2-6 mm in diameter - silt and clay with irregular lenses and veins of ice, 10% ice content - ice with clasts as above	[vertical lines]				0.0
1.0							1.0
2.0							2.0
3.0							3.0
4.0							4.0
5.0							5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 90	COMPLETION DEPTH: 1.8 m COMPLETE: 73/19/07 Page 1 of 1
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FOSHEIM SUBSURFACE COMPILATION 49G/16		adjacent to 7319703		BOREHOLE No: 7319704	
CRREL with auger powerhead		polygon centre		Project No: 720081 LOG # 91	
UTM ZONE: 16 N8872200.00 E552850.00		marine - deltaic material		ELEVATION: 104.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0	▨	- thawed silt and clay					0.0
	▨	- silt/clay, thin interbedded ice <1 mm thick, 5-10% ice content, one lens 1 cm thick	▨	♦			
	▨	- ice with vertical bubbles, silt and clay inclusions <5%	▨	♦			
1.0							1.0
2.0							2.0
3.0							3.0
4.0							4.0
5.0							5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 0.8 m
		REVIEWED BY: HCA	COMPLETE: 73/19/07
		Fig. No: LOG 91	Page 1 of 1

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FOSHEIM SUBSURFACE COMPILATION 49G/16		BOREHOLE No: 7319706	
CRREL with auger powerhead		polygon centre on 1 degree slope	
UTM ZONE: 16 N8871760.00 E553350.00		Project No: 720081 LOG # 93	
marine - deltaic		ELEVATION: 105.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged			

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0	[diagonal lines]	- unfrozen blocky, crumbly clay/silt, damp in lower 20 cm - clay/silt with uniform, almost rectilinear hairline fracture, occasional ice crystals, rare thin veins towards base <1% ice - clay/silt with veins and lenses of ice, reticulate, 1-5 mm thick, ice 15% - ice 80%, inclusions and dykes of clay and silt - clay/silt, thin interbedded ice 0.5-1 mm thick, occasionally to 5 mm, occurrence of small orange sandstone fragments, ice content 20%	[vertical lines]				0.0
1.0					[diagonal lines]	A	1.0
2.0							2.0
3.0							3.0
4.0							4.0
5.0							5.0

Geological Survey of Canada Ottawa, Ontario	LOGGED BY: HCA	COMPLETION DEPTH: 1.6 m
	REVIEWED BY: HCA	COMPLETE: 73/19/07
	Fig. No: LOG 93	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/16		BOREHOLE No: 7319707	
CRREL with auger powerhead		Project No: 720081 LOG # 94	
UTM ZONE: 16 N8871400.00 E553750.00		ELEVATION: 105.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged			

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen fine sand, damp				0.0	
		- fine sand, no bedding apparent, flecks of organic material and sandstone, rare visible ice veins <1%, wet on exposure to air					
-1.0		- ice takes up half of core, remainder sand, horizontal banding of different opacities in ice				-1.0	
		- sand as above					
-2.0						-2.0	
-3.0						-3.0	
-4.0						-4.0	
-5.0						-5.0	

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.6 m
		REVIEWED BY: HCA	COMPLETE: 73/19/07
		Fig. No: LOG 94	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/16		low centre raised rim polygons, 5 degree		BOREHOLE No: 7319708				
CRREL with auger powerhead		slope, edge of 5 m wide ice wedge ridge		Project No: 720081 LOG # 95				
UTM ZONE: 16 N8871400.00 E553750.00		marine - deltaic material		ELEVATION: 105.0 (m)				
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen fine sand						0.0
		- fine sand, no bedding apparent, flecks of organic material and sandstone, <1% ice						
		- pure ice splitting into discs						
-1.0								-1.0
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

Geological Survey of Canada
Ottawa, Ontario

LOGGED BY: HCA	COMPLETION DEPTH: 0.7 m
REVIEWED BY: HCA	COMPLETE: 73/19/07
Fig. No: LOG 95	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/16		low centre, raised rim polygons,		BOREHOLE No: 7319709	
CRREL with auger powerhead		5 degree slope, centre of 5 m wide ice		Project No: 720081 LOG # 96	
UTM ZONE: 16 N8871400.00 E553750.00		wedge ridge, marine - deltaic material		ELEVATION: 105.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				☒ estimated ice content 20 40 60 80	☐ excess water 20 40 60 80	PLASTIC M.C. LIQUID 20 40 60 80			
0.0	...	- unfrozen fine sand - pure ice splits into discs							0.0
1.0									1.0
2.0									2.0
3.0									3.0
4.0									4.0
5.0									5.0

Geological Survey of Canada Ottawa, Ontario	LOGGED BY: HCA	COMPLETION DEPTH: 0.3 m
	REVIEWED BY: HCA	COMPLETE: 73/19/07
	Fig. No: LOG 96	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/16		upslope from 7319707		BOREHOLE No: 7319710	
CRREL with auger powerhead		high centre polygons, polygon centre		Project No: 720081 LOG # 97	
UTM ZONE: 16 N8871400.00 E553750.00		marine - deltaic material		ELEVATION: 105.0 (m)	
SAMPLE TYPE ☒ unfrozen		☐ seasonal thaw		☒ sample interval	
		☐ cuttings		☐ not recovered	
				☐ core logged	

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			ICE CONTENT			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				estimated ice content	excess water	PLASTIC	M.C.	LIQUID	% clay (ratio S:Si:C)			
0.0	•••••	- unfrozen fine sand										0.0
	- - - - -	- fine sand and flecks of organic material and sandstone, no visible ice										
	- - - - -	- fine sand and anastomosing lenses and veins of ice, 15-20%										
-1.0	•••••	- fine sand and flecks of organics, occasional visible ice in small crystals and thin veins, <5%										-1.0
-2.0												-2.0
-3.0												-3.0
-4.0												-4.0
-5.0												-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 97	COMPLETION DEPTH: 1.7 m COMPLETE: 73/19/07 Page 1 of 1
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FOSHEIM SUBSURFACE COMPILATION 49G/16		upslope from 7319707		BOREHOLE No: 7319711	
CRREL with auger powerhead		high centre polygons, ice wedge trough		Project No: 720081 LOG # 98	
UTM ZONE: 16 N8871400.00 E553750.00		marine - deltaic material		ELEVATION: 105.0 (m)	
SAMPLE TYPE ☒ unfrozen		☒ seasonal thaw		☒ sample interval	
		☒ cuttings		☐ not recovered	
				☐ core logged	

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	estimated ice content		% clay (ratio S:Si:C)		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20	40	20	40			
0.0		- unfrozen fine sand								0.0
		- fine sand and flecks of organics, interbedded thin ice (1 mm) increasing downward from 0 to 20%								
		- pure ice								
1.0										1.0
2.0										2.0
3.0										3.0
4.0										4.0
5.0										5.0

Geological Survey of Canada		LOGGED BY: HCA	COMPLETION DEPTH: 0.8 m
Ottawa, Ontario		REVIEWED BY: HCA	COMPLETE: 73/19/07
		Fig. No: LOG 98	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/16		crest of slope,		BOREHOLE No: 7320701	
CRREL with auger powerhead		polygon centre		Project No: 720081 LOG # 99	
UTM ZONE: 16 N8871400.00 E553750.00		marine - deltaic		ELEVATION: 105.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

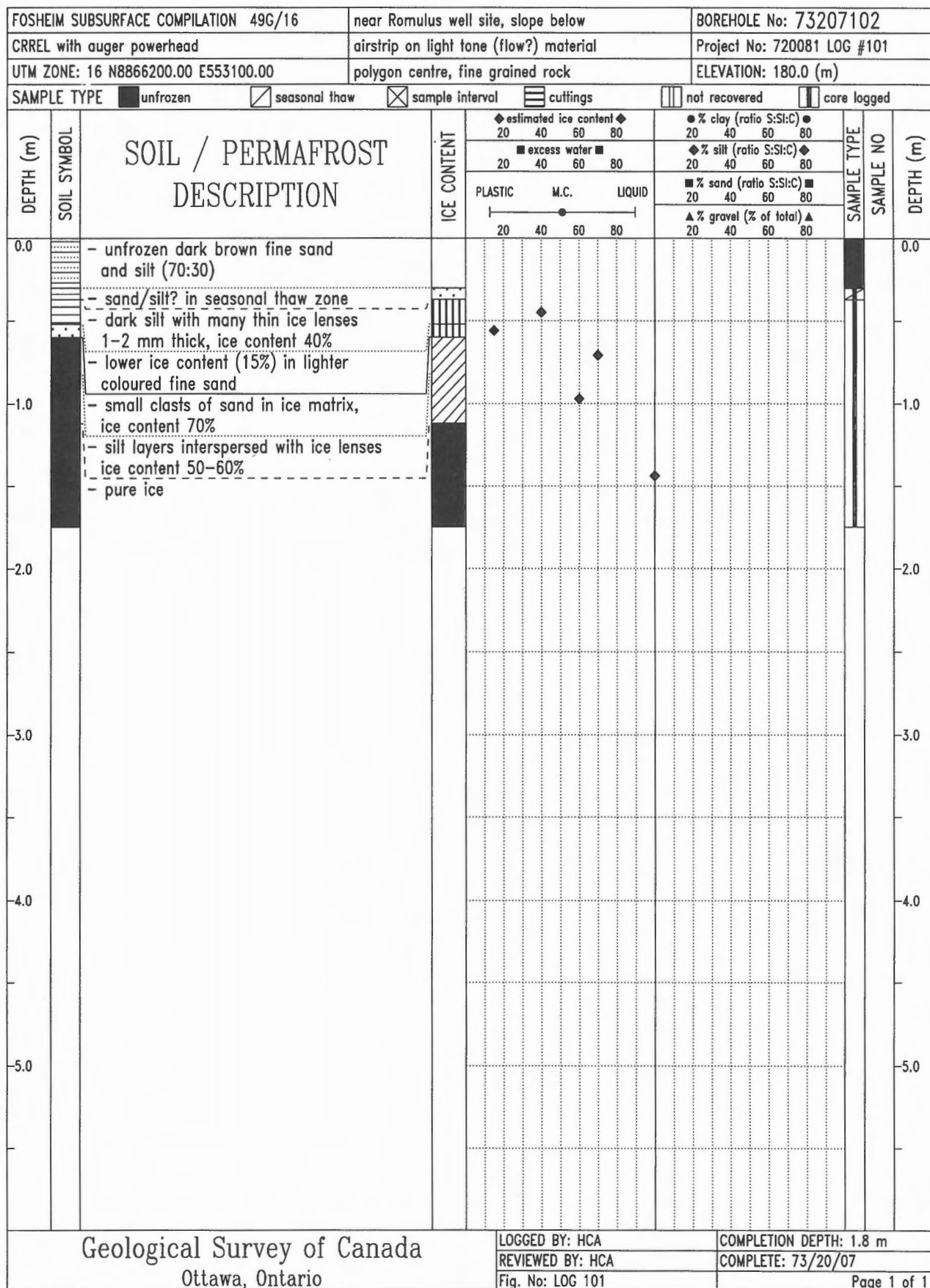
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC M.C. LIQUID		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20 40 60 80	20 40 60 80			
0.0		- unfrozen silt/clay						0.0
		- silt/clay with thin ice lenses, <5% ice						
		- silt/clay? ice lenses and veins 1 mm to 2 cm thick, 40% ice						
-1.0		- silt/clay? ice lenses and veins, thin to 4 mm, 10-15% ice						-1.0
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.8 m
		REVIEWED BY: HCA	COMPLETE: 73/20/07
		Fig. No: LOG 99	Page 1 of 1

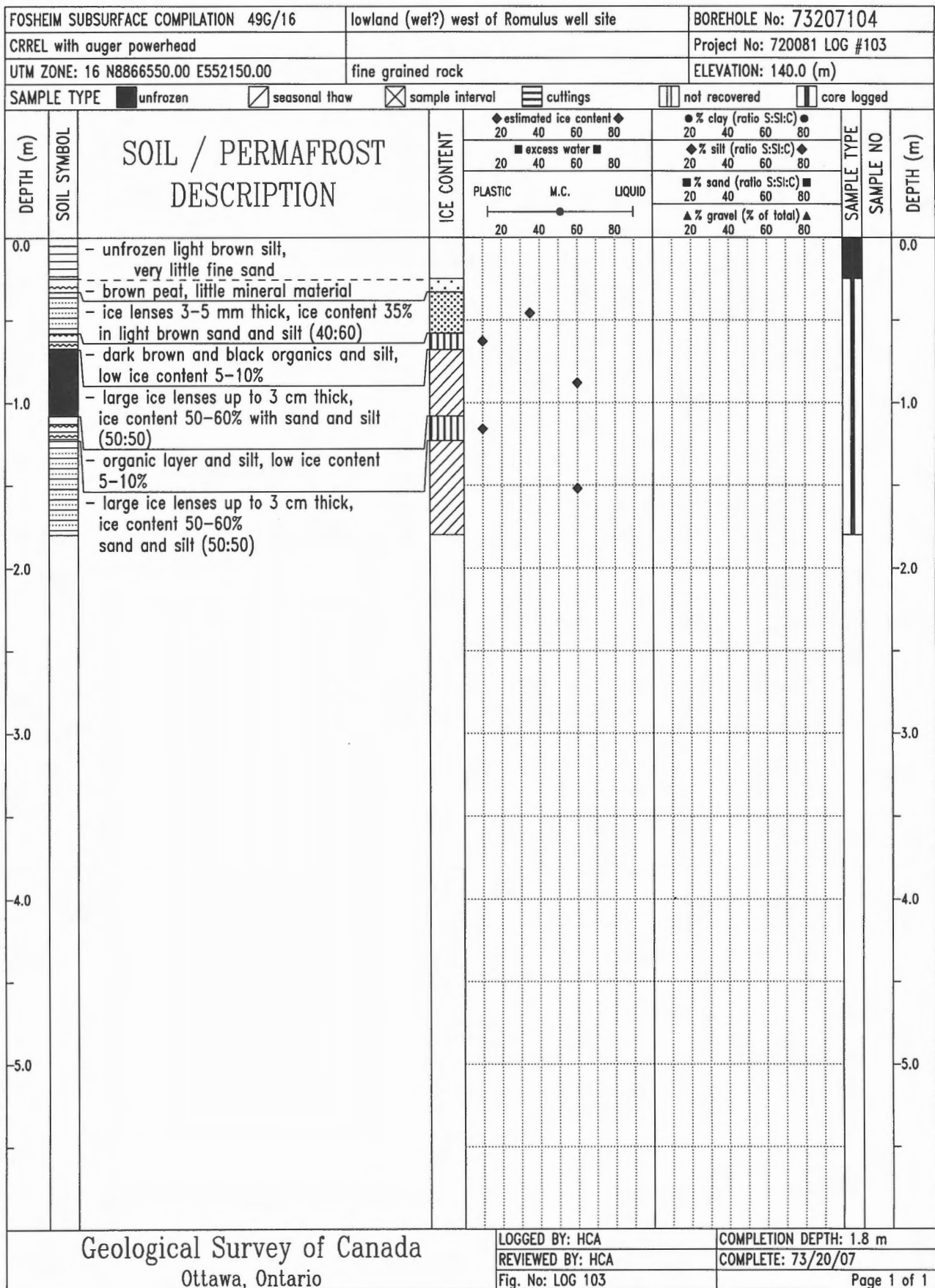
FOSHEIM SUBSURFACE COMPILATION 49G/16		near Romulus well site, slope below		BOREHOLE No: 73207101	
CRREL with auger powerhead		airstrip on light tone (flow?) material		Project No: 720081 LOG #100	
UTM ZONE: 16 N8866200.00 E553270.00		poorly consolidated rock		ELEVATION: 180.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	- ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80				SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				- unfrozen wet silt and fine sand (50/50), under a dry, hard surface - black silty organic layer with a few small lenses of brown sand, no ice - green silty bedrock?, ice occurs as sharp angular lenses, ice content 15-20% - greenish-grey silt and fine sand, bedrock?, no visible ice, very dry	◆ ▲ ■ ● ◆ ◆	A B				

Geological Survey of Canada		LOGGED BY: HCA	COMPLETION DEPTH: 1.2 m
Ottawa, Ontario		REVIEWED BY: HCA	COMPLETE: 73/20/07
		Fig. No: LOG 100	Page 1 of 1



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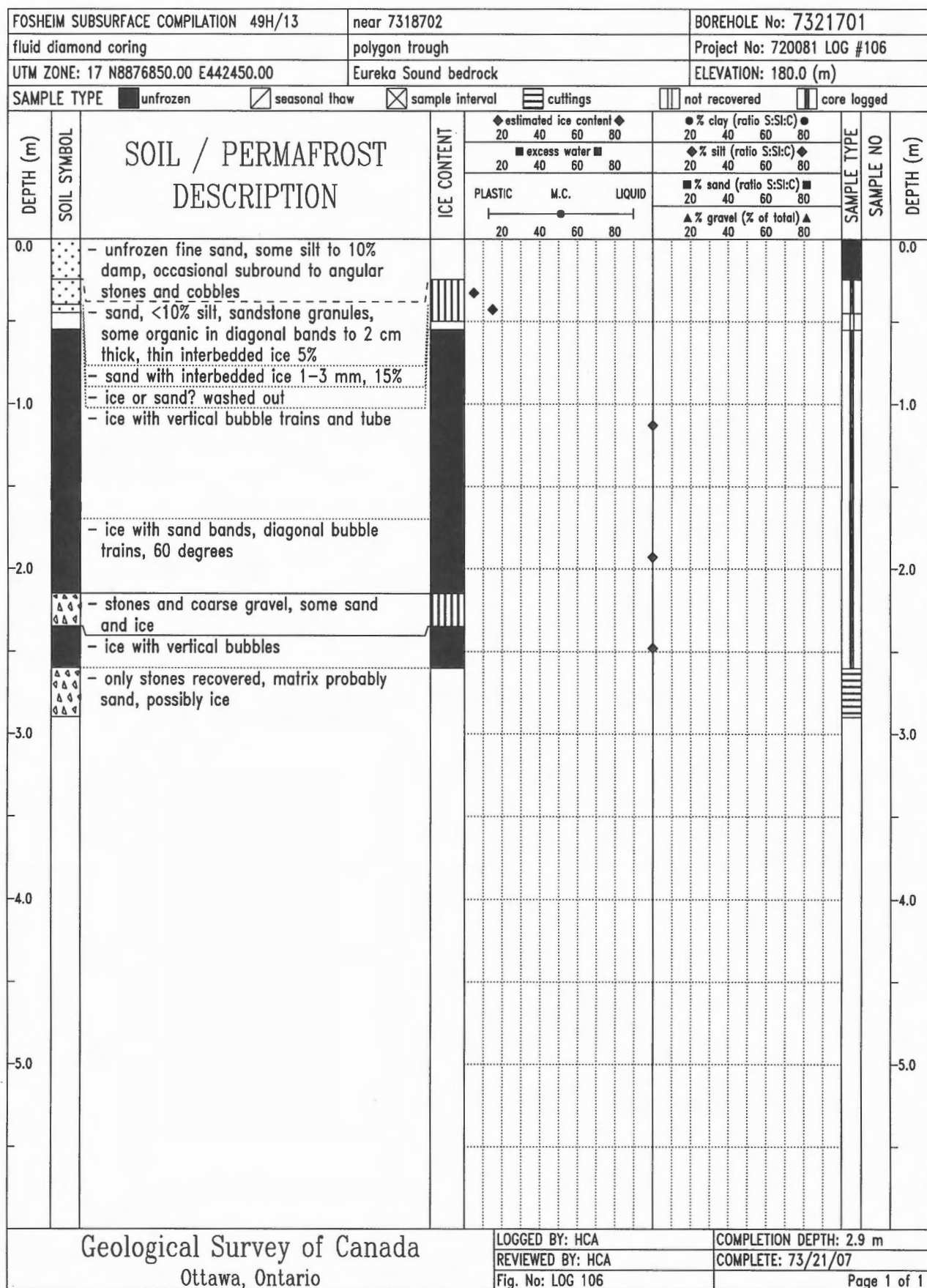
FOSHEIM SUBSURFACE COMPILATION 49G/15		southeast corner Blacktop ridge west of		BOREHOLE No: 73207301	
CRREL with auger powerhead		Remus Creek, indistinct, 40 m polygons,		Project No: 720081 LOG #104	
UTM ZONE: 16 N8879050.00 E535000.00		polygon centre, Christopher shale		ELEVATION: 172.0 (m)	
SAMPLE TYPE ☒ unfrozen		☒ seasonal thaw		☒ sample interval	
		☐ cuttings		☐ not recovered	
				☐ core logged	

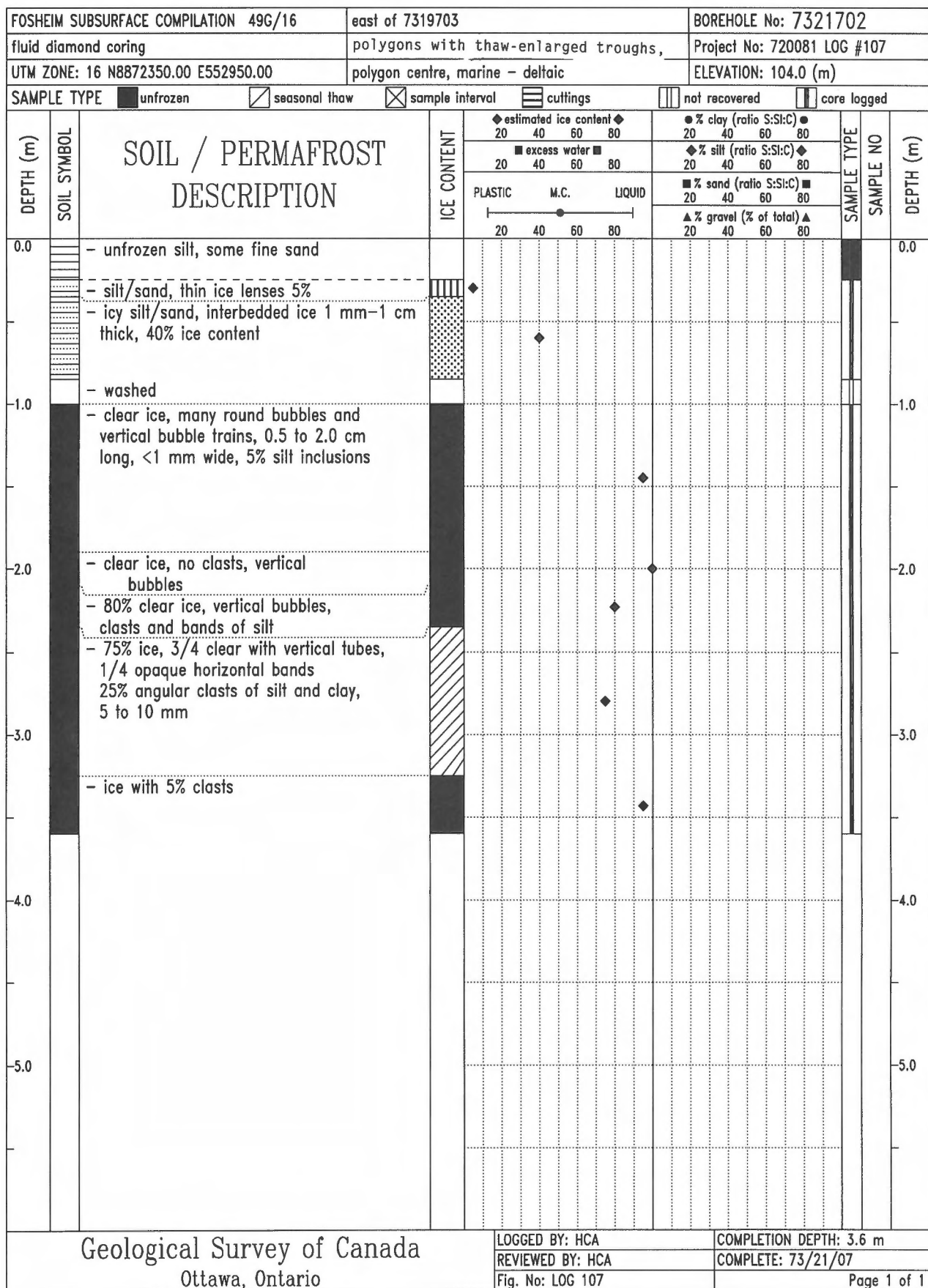
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0	/	- unfrozen black to dark brown silty clay, spherical structure near surface - raised ice veins at top of frost table, clay and silt with visible ice in horizontal veins, 15-20% - icy clay with small red clasts, visible ice in horizontal and vertical veins, >50% content, both clear and bubbly - almost all ice with clay inclusions - 50-70% visible ice, clasts of clay and mudstone - almost all ice with clay inclusions - 50-70% visible ice, clasts of clay and mudstone - almost all ice with clay inclusions	◆ estimated ice content ◆ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	/		0.0	
1.0	/		◆ estimated ice content ◆ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	/		1.0	
2.0	/		◆ estimated ice content ◆ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	/		2.0	
3.0	/		◆ estimated ice content ◆ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	/		3.0	
4.0	/		◆ estimated ice content ◆ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	/		4.0	
5.0	/		◆ estimated ice content ◆ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	/		5.0	

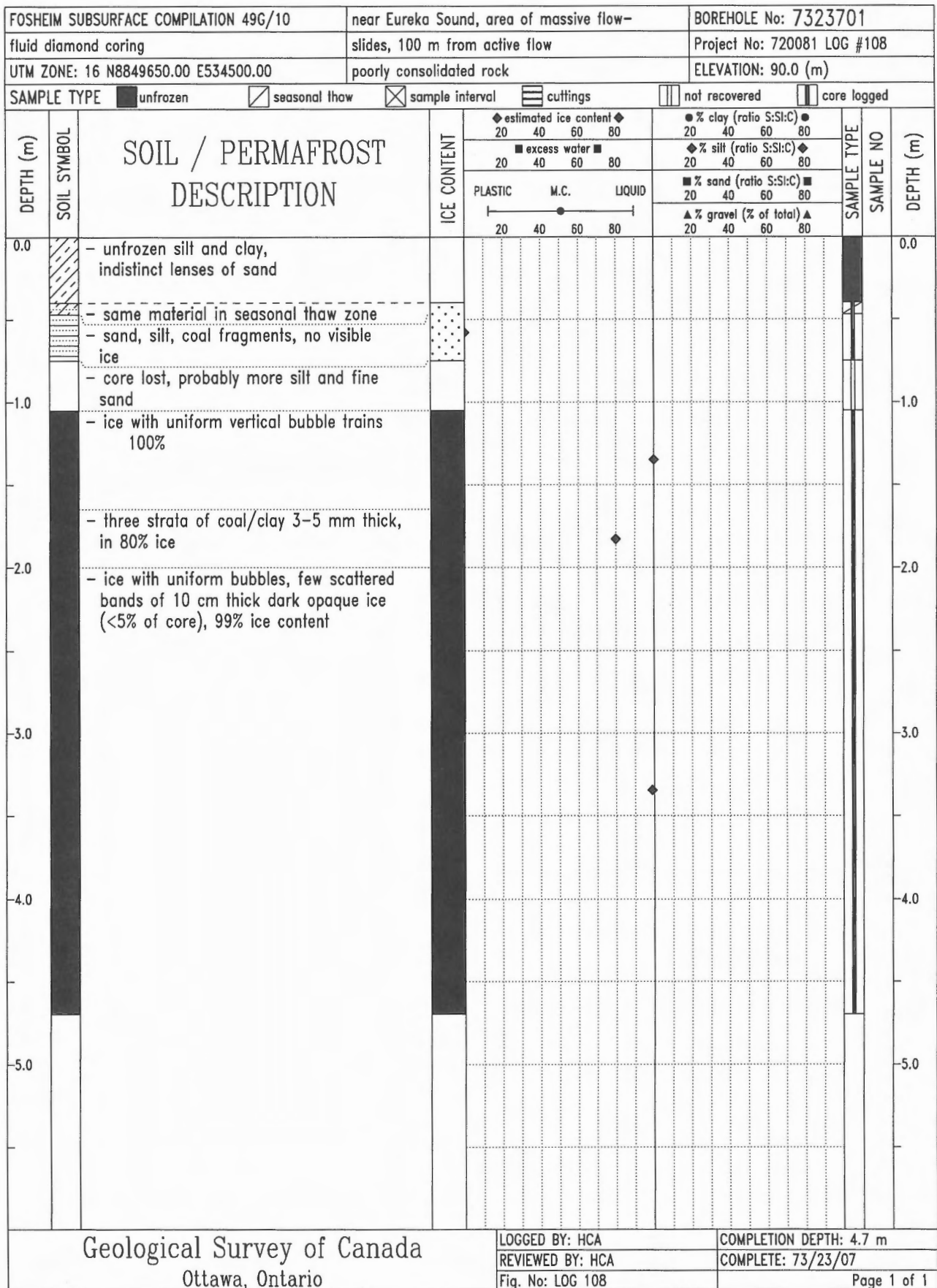
Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 104	COMPLETION DEPTH: 1.4 m COMPLETE: 73/20/07
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FOSHEIM SUBSURFACE COMPILATION 49G/15		southeast corner Blacktop Ridge west of		BOREHOLE No: 73207302	
CRREL with auger powerhead		Remus Creek, 10 m polygon centre		Project No: 720081 LOG #105	
UTM ZONE: 16 N8879050.00 E535250.00		Christopher shale bedrock		ELEVATION: 150.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80			
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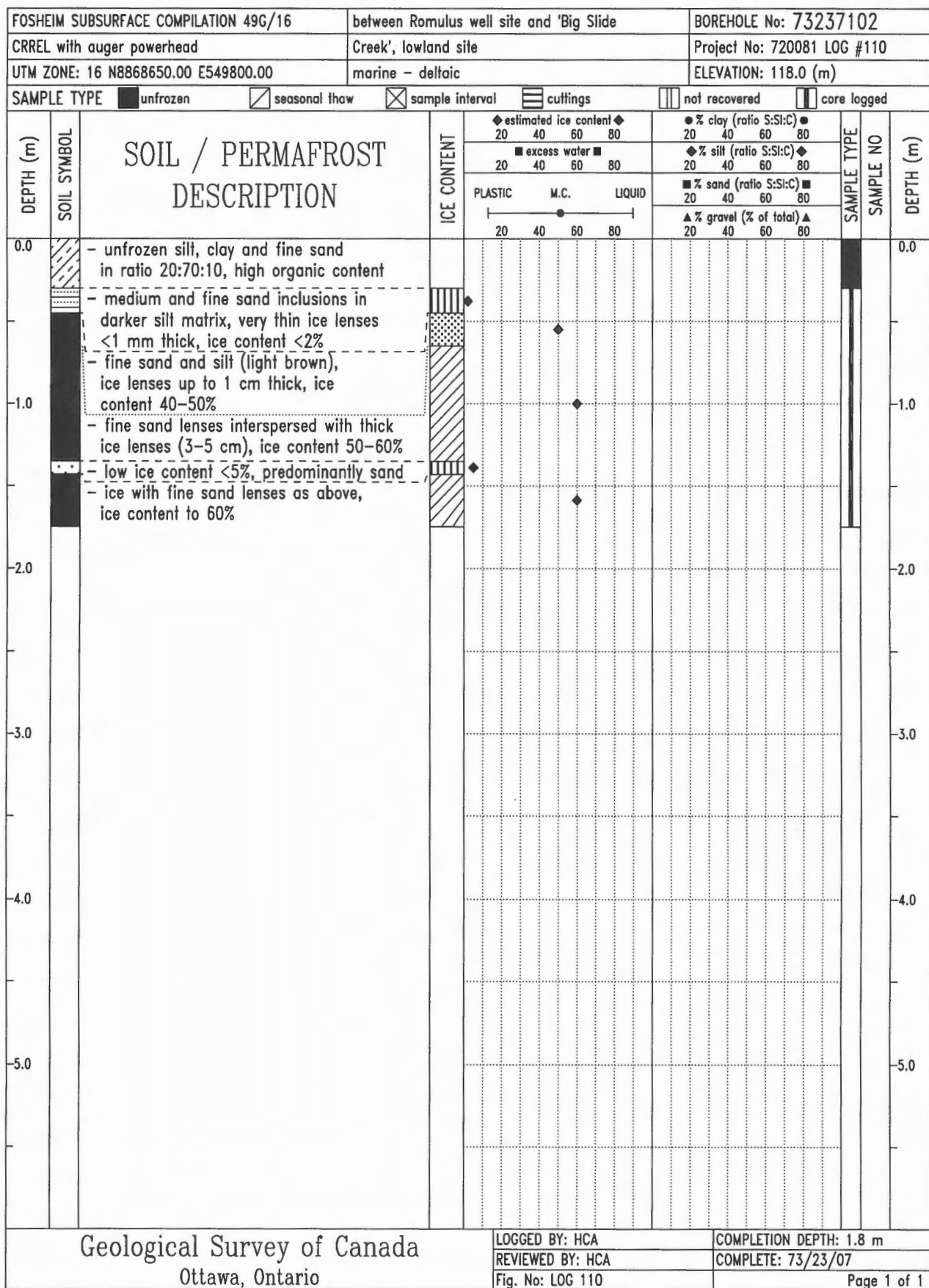




FOSHEIM SUBSURFACE COMPILATION 49G/16		between Romulus well site and Big Slide		BOREHOLE No: 73237101	
CRREL with auger powerhead		Creek, lowland site		Project No: 720081 LOG #109	
UTM ZONE: 16 N8868150.00 E550150.00		marine - deltaic		ELEVATION: 125.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				◆ estimated ice content ◆ ● % clay (ratio S:Si:C) ● 20 40 60 80 20 40 60 80	■ excess water ■ ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 20 40 60 80			
				PLASTIC M.C. LIQUID 20 40 60 80 20 40 60 80				
				■ % sand (ratio S:Si:C) ■ ▲ % gravel (% of total) ▲ 20 40 60 80 20 40 60 80				
0.0		- reddish-brown fine sand and silt (60:40)						0.0
		- reddish-brown fine sand and silt with thin ice lenses to 2 mm thick, ice content 5-10%						
		- clasts and a few lenses of grey fines in ice, high ice content 50-70%						
-1.0		- reddish-brown fine sand with ice lenses 3 mm thick, ice content 15%						-1.0
		- reddish-brown fine sand with irregular streaks of dark red coarser material running through it, low ice content 5%						
		- material similar to above but higher ice content, 20%						
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.6 m
		REVIEWED BY: HCA	COMPLETE: 73/23/07
		Fig. No: LOG 109	Page 1 of 1



FOSHEIM SUBSURFACE COMPILATION 49G/16		between Romulus well site and 'Big Slide		BOREHOLE No: 73237103	
CRREL with auger powerhead		Creek', polygon trough on Eureka Sound		Project No: 720081 LOG #111	
UTM ZONE: 16 N8868800.00 E549000.00		Formation, poorly consolidated rock		ELEVATION: 131.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC	M.C.	LIQUID	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen silt and fine sand, very high in organics (20%) - as above, no visible ice - ice lenses 1-4 mm thick, ice content 10-15%, predominantly sand - pure ice							0.0
1.0									1.0
2.0									2.0
3.0									3.0
4.0									4.0
5.0									5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 111	COMPLETION DEPTH: 1.0 m COMPLETE: 73/23/07 Page 1 of 1
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FOSHEIM SUBSURFACE COMPILATION 49G/16		between Romulus well site and 'Big Slide	BOREHOLE No: 73237104	
CRREL with auger powerhead		Creek', polygon centre on Eureka Sound	Project No: 720081 LOG #112	
UTM ZONE: 16 N8868900.00 E549000.00		Formation, poorly consolidated rock	ELEVATION: 131.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged				

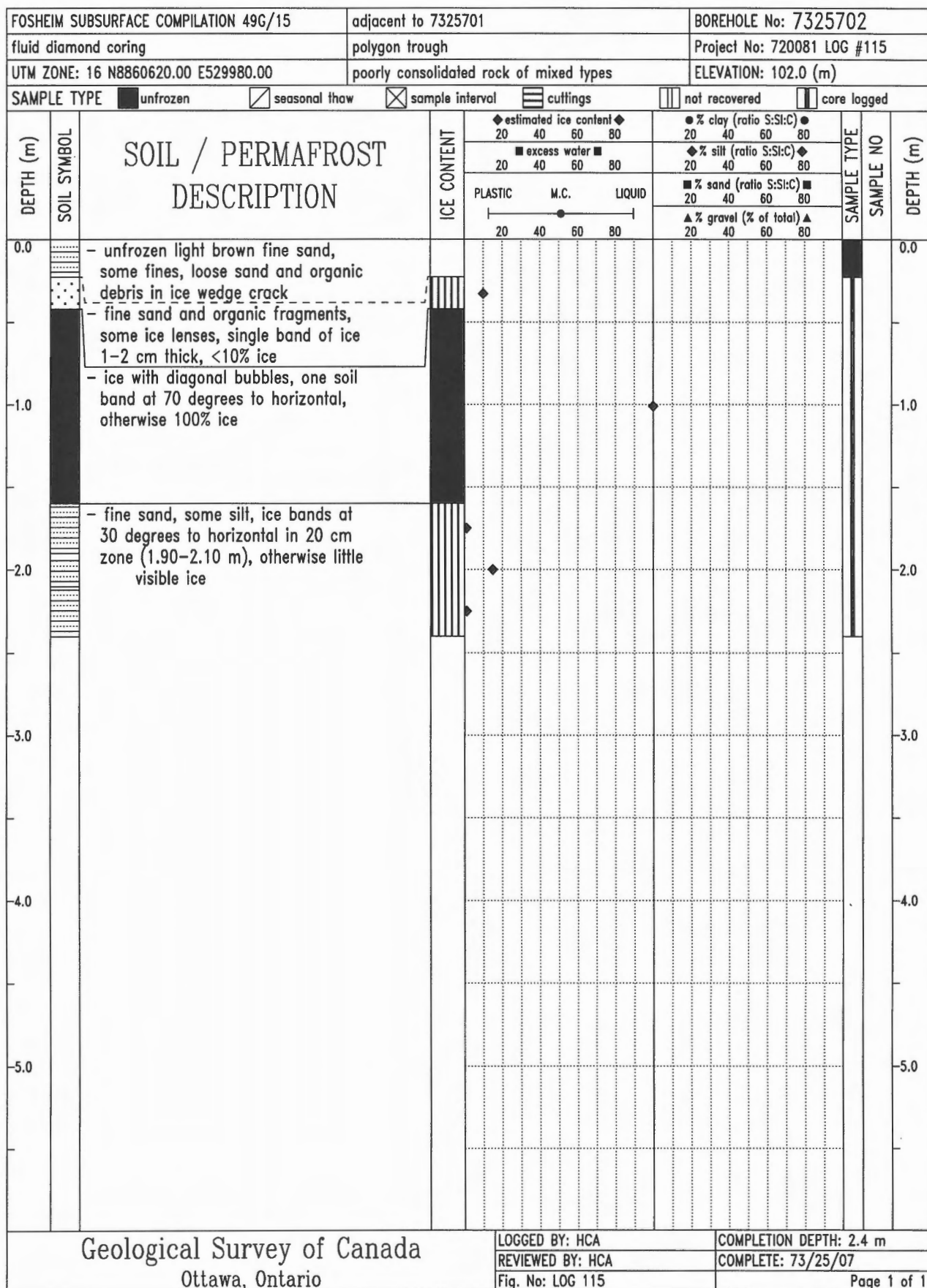
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT				SAMPLE TYPE	SAMPLE NO	DEPTH (m)	
				estimated ice content	excess water	PLASTIC	M.C.				LIQUID
0.0		- unfrozen, unconsolidated shaly surface grading into unconsolidated sandstone, high content of coalified wood - shaly coal layer with no visible ice - coarse sandstone with pebbles, no visible ice - banded light and dark sandstone with many pebbles, a few areas with some ice showing, <5% - pure ice bed									0.0
-1.0											-1.0
-2.0		- layers of indurated sandstone interbedded with dark shaly coal-like material, no visible ice - coarse grained sandstone with clasts of ice and a few ice lenses, ice content 10%									-2.0
-3.0											-3.0
-4.0											-4.0
-5.0											-5.0

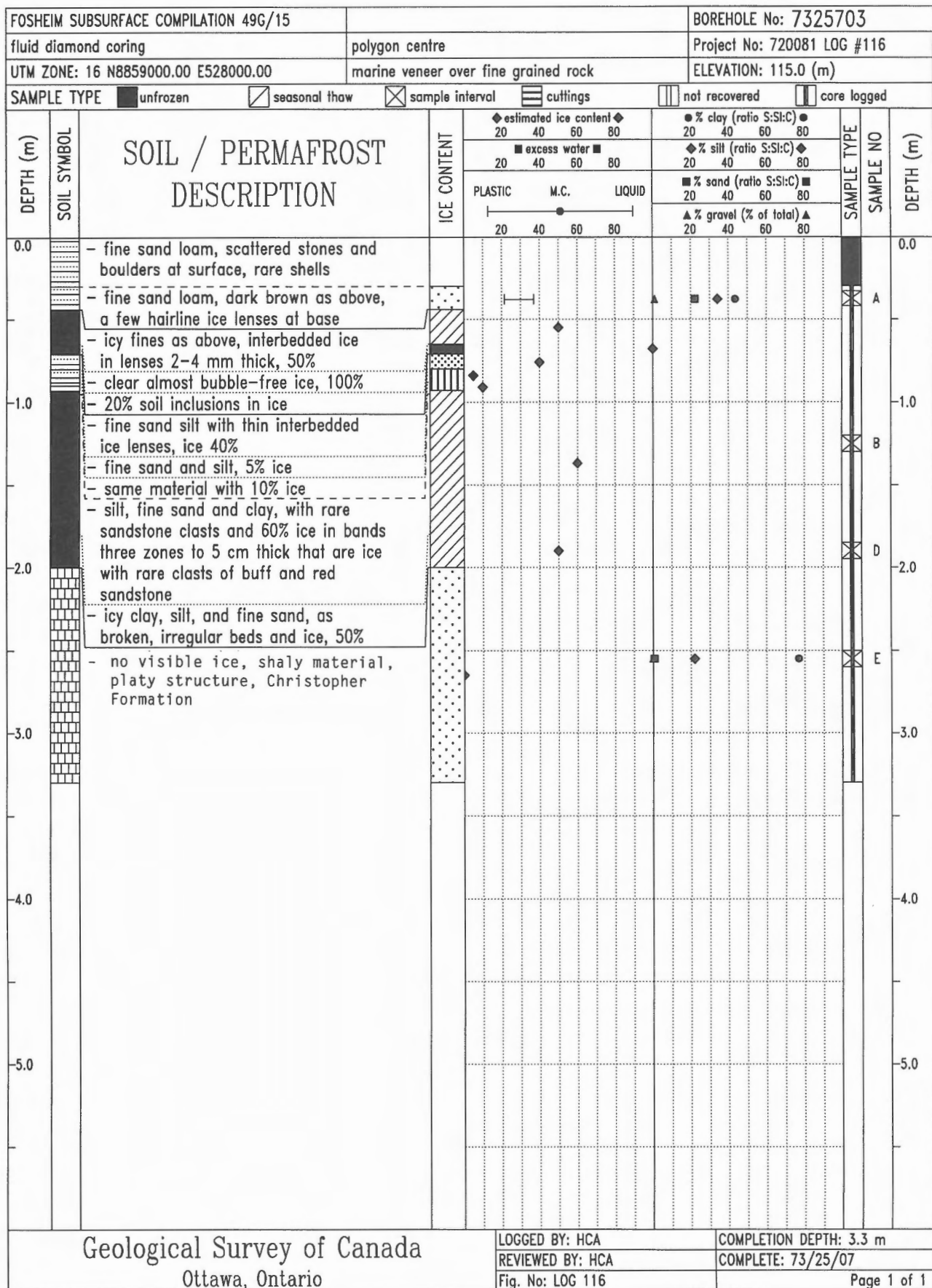
Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.8 m
		REVIEWED BY: HCA	COMPLETE: 73/23/07
		Fig. No: LOG 112	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/15		BOREHOLE No: 7325701	
fluid diamond coring		polygon centre	
UTM ZONE: 16 N8860620.00 E529980.00		Project No: 720081 LOG #114	
poorly consolidated rock of mixed types		ELEVATION: 102.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged			

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 ● % clay (ratio S:St:C) ● 20 40 60 80 ◆ % silt (ratio S:St:C) ◆ 20 40 60 80 ■ % sand (ratio S:St:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen fine sand, light brown, some rootlets				0.0	
		- as above, no rootlets, few horizontal ice bands, <5% ice					
-1.0		- sand, colour change from light brown to blue-grey, slightly mottled, thin ice lenses, 10% ice				-1.0	
		- blue-grey fine sand, some silt, reticulate ice mainly vertical veins to 3 mm thick, 25% ice					
-2.0		- fine to medium sand, horizontal ice laminae 1-2 mm, 25% ice				-2.0	
		- grey fine to medium sand, ice laminae and reticulate veins, 25% ice, one 5 cm thick bed of plant debris					
-3.0		- uniform light grey-blue sand, bonded, no visible ice				-3.0	
		- uniform dark blue-grey fine sand and silt, no visible ice					
-4.0						-4.0	
-5.0						-5.0	

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	REVIEWED BY: HCA	COMPLETE: 73/25/07
	Fig. No: LOG 114	Page 1 of 1





FOSHEIM SUBSURFACE COMPILATION 49G/15		area of very weak to no frost wedge		BOREHOLE No: 73257101						
CRREL with auger powerhead		polygon development		Project No: 720081 LOG #117						
UTM ZONE: 16 N8855670.00 E531900.00		poorly consolidated rock of mixed types		ELEVATION: 95.0 (m)						
SAMPLE TYPE		☒ unfrozen	☒ seasonal thaw	☒ sample interval	☒ cuttings	☒ not recovered	☒ core logged			
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION		ICE CONTENT	estimated ice content 20 40 60 80 excess water 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80		% clay (ratio S:Si:C) 20 40 60 80 % silt (ratio S:Si:C) 20 40 60 80 % sand (ratio S:Si:C) 20 40 60 80 % gravel (% of total) 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen greyish-brown fine sand and silt, minor sandstone pebbles on surface								0.0
1.0		- silt and clay 70%, fine sand 30%, few thin ice lenses <1 mm, ice <1% - fine sand and silt with ice lenses 1-2 mm thick, ice content 5-10% - large clasts of silt and clay in ice matrix, ice content 40% - fine sand 30%, silt and clay 70%, ice occurs as inclusions throughout mineral matrix, ice content 30% - light brown fine sand and silt, very little ice								1.0
2.0		- grey silt and clay, a few layers with fine sand, low ice content <2%								2.0
3.0										3.0
4.0										4.0
5.0										5.0

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 Fig. No: LOG 117

COMPLETION DEPTH: 1.8 m
 COMPLETE: 73/25/07

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FOSHEIM SUBSURFACE COMPILATION 49G/15		downslope from 73257101		BOREHOLE No: 73257102	
CRREL with auger powerhead		weak to no ice wedge polygon development		Project No: 720081 LOG #118	
UTM ZONE: 16 N8855870.00 E531990.00		poorly consolidated rock of mixed types		ELEVATION: 93.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				◆ estimated ice content ◆ ● % clay (ratio S:Si:C) ● 20 40 60 80 20 40 60 80 ■ excess water ■ ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 20 40 60 80 PLASTIC M.C. LIQUID ■ % sand (ratio S:Si:C) ■ 20 40 60 80 20 40 60 80 ▲ % gravel (% of total) ▲ ▲ % gravel (% of total) ▲ 20 40 60 80 20 40 60 80				
0.0		- unfrozen brown medium sand						0.0
0.5		- brown medium sand with layers of fine black sand, ice occurs only in thin lenses in black layers						
1.0		- dark grey fine material with 40-60% ice content, ice occurring as inclusions, no definite lenses						1.0
1.8		- very coarse sand with little visible ice, <5%						
2.0								2.0
3.0								3.0
4.0								4.0
5.0								5.0

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FOSHEIM SUBSURFACE COMPILATION 49G/15		flow material on slope, polygon centre		BOREHOLE No: 73257104	
CRREL with auger powerhead		possibly closer to wedge		Project No: 720081 LOG #120	
UTM ZONE: 16 N8858100.00 E528220.00		poorly consolidated rock of mixed types		ELEVATION: 120.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC	M.C.	LIQUID	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen fine sand and silt (50:50) with a few pebbles, boulder-strewn surface - fine sand and silt (50:50) with a few pebbles, no visible ice - fine sand and silt with ice lenses 2-3 mm thick, ice content 15% - pure ice							0.0
1.0									1.0
2.0		(possible that the bottom of the ice is at 175 cm but unable to recover any mineral core)							2.0
3.0									3.0
4.0									4.0
5.0									5.0

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		REVIEWED BY: HCA	COMPLETE: 73/25/07
		Fig. No: LOG 120	Page 1 of 1

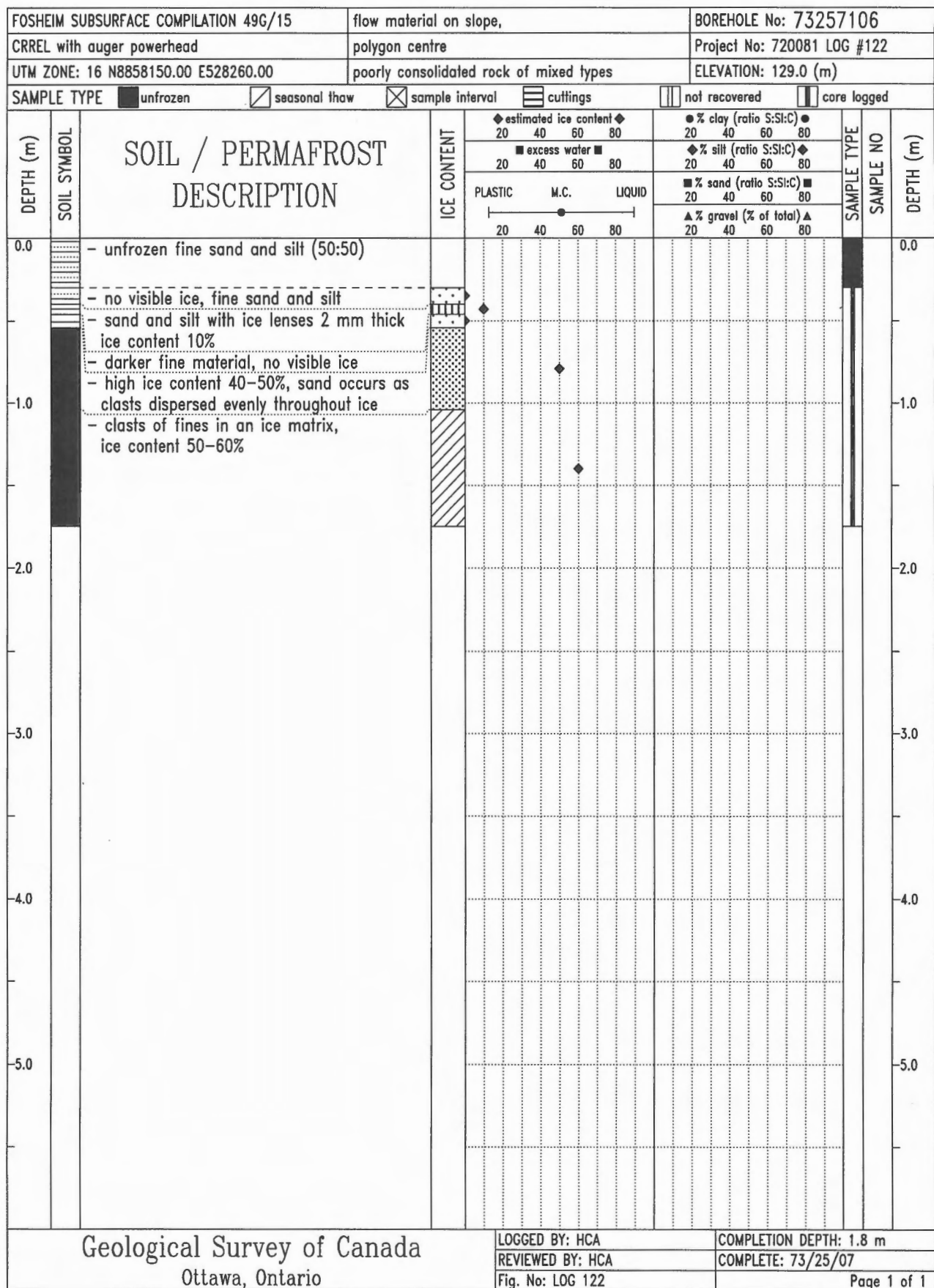
FOSHEIM SUBSURFACE COMPILATION 49G/15		flow material on slope, near 73257104		BOREHOLE No: 73257105				
CRREL with auger powerhead		polygon centre		Project No: 720081 LOG #121				
UTM ZONE: 16 N8858100.00 E528220.00		poorly consolidated rock of mixed types		ELEVATION: 120.0 (m)				
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC M.C. LIQUID ----- ----- ----- 20 40 60 80				
0.0		- unfrozen brown medium and fine sand						0.0
		- dark brown medium sand, no visible ice						
		- alternating bands of light medium sand and dark sand possibly finer, some ice along the contacts but minor <2%						
1.0		- light brown sandstone with very little ice, some small crystals make up <1%						1.0
2.0								2.0
3.0								3.0
4.0								4.0
5.0								5.0

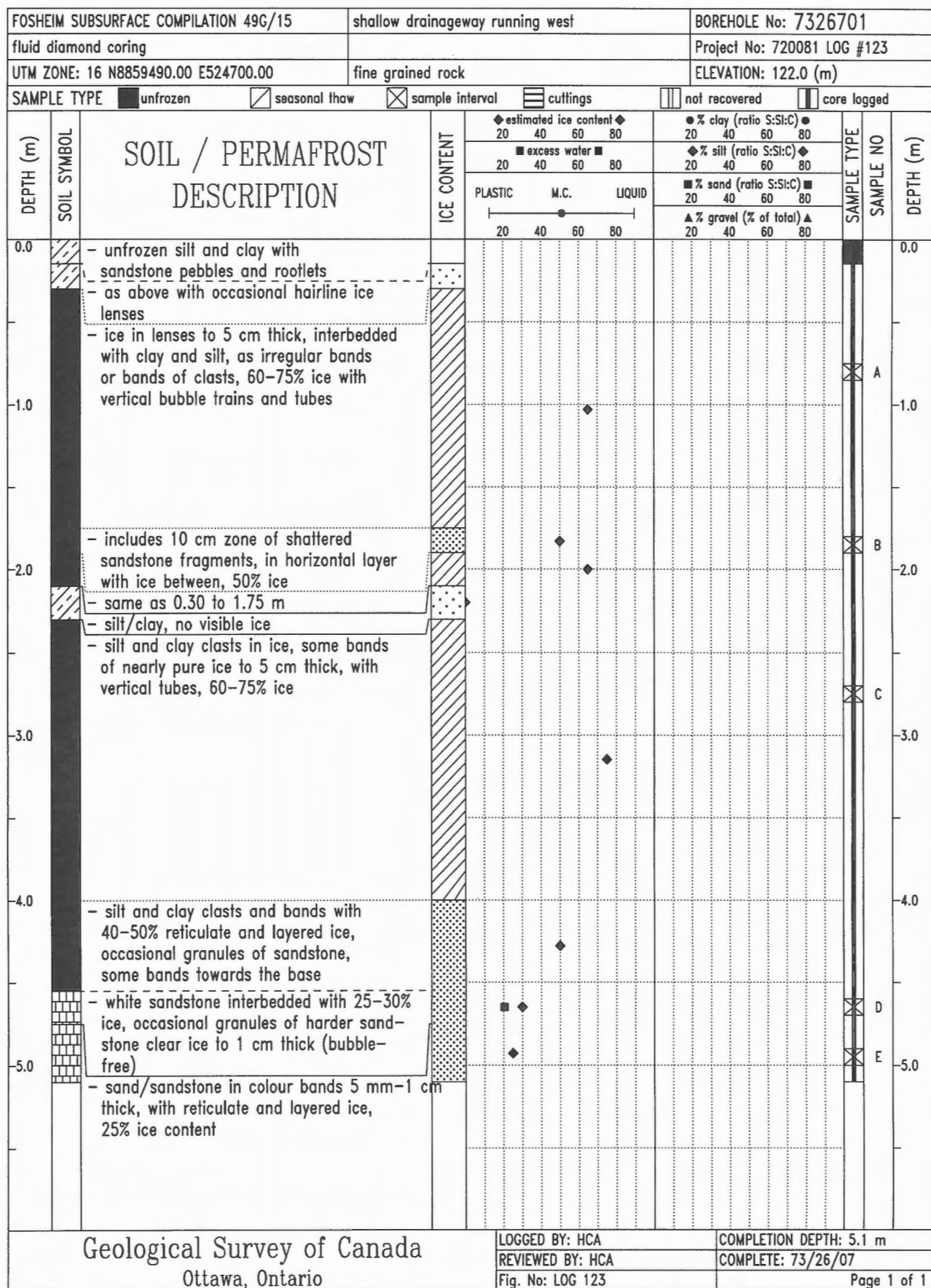
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Fig. No: LOG 121

COMPLETION DEPTH: 1.6 m
COMPLETE: 73/25/07

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FOSHEIM SUBSURFACE COMPILATION 49G/15		north of 7326701 on divide between		BOREHOLE No: 7326702	
fluid diamond coring		depressions, polygon centre		Project No: 720081 LOG #124	
UTM ZONE: 16 N8859670.00 E524750.00		fine grained rock		ELEVATION: 122.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID ----- ----- 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0	▨	- unfrozen silt, some clay, and fine sand, scattered sandstone granules and pebbles					0.0
	▨	- icy silt, some clay and sand as above, 50% ice in 2-5 mm beds	▨	♦			
	▨	- 75% ice, a few bubbles and vertical tubes, silt in reticulate veins and clasts	▨	♦			
-1.0							-1.0
				♦			
-2.0	▤	- fine grained bedrock?, no visible ice	▤				-2.0
-3.0							-3.0
-4.0							-4.0
-5.0							-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 2.4 m
		REVIEWED BY: HCA	COMPLETE: 73/26/07
		Fig. No: LOG 124	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/15		ice wedge trough		BOREHOLE No: 7326703				
CRREL with auger powerhead				Project No: 720081 LOG #125				
UTM ZONE: 16 N8859320.00 E524900.00		poorly consolidated rock of mixed types		ELEVATION: 129.0 (m)				
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC M.C. LIQUID 20 40 60 80				
0.0		- unfrozen black fine to medium sand						0.0
		- white sandstone, some black layers, hairline ice lenses, otherwise no visible ice, little interstitial ice						
1.0								1.0
2.0								2.0
3.0								3.0
4.0								4.0
5.0								5.0

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Fig. No: LOG 125

COMPLETION DEPTH: 0.7 m
COMPLETE: 73/26/07
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FOSHEIM SUBSURFACE COMPILATION 49G/15		wet site; low centre polygons capped by		BOREHOLE No: 73267101	
CRREL with auger powerhead		peat (on ice wedge ridge?)		Project No: 720081 LOG #126	
UTM ZONE: 16 N8859250.00 E525120.00				ELEVATION: 125.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen black and brown peat - frozen peat - fine grained loam and peat - icy silty sand occurring as clasts in matrix, ice content 40-50%						0.0
1.0		- 70% ice content, mineral material is sandy						1.0
2.0								2.0
3.0								3.0
4.0								4.0
5.0								5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 126	COMPLETION DEPTH: 1.6 m COMPLETE: 73/26/07
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FOSHEIM SUBSURFACE COMPILATION 49G/15		low centre polygons, wet site		BOREHOLE No: 73267102	
CRREL with auger powerhead		polygon centre adjacent to 73267101		Project No: 720081 LOG #127	
UTM ZONE: 16 N8859200.00 E525100.00		peat over fine grained rock		ELEVATION: 125.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			ICE CONTENT			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC M.C. LIQUID			PLASTIC M.C. LIQUID					
				20 40 60 80			20 40 60 80					
				20 40 60 80			20 40 60 80					
0.0		- unfrozen brown peat										0.0
1.0		- ice lenses on frost table over black silty material with ice content about 20%, ice occurs as vertical veins - alternating layers of ice (15-20 cm) and black silty material with ice content about 5-10%, 55% ice overall									A	1.0
2.0		- black shale bedrock?, <2% ice content									B	2.0
3.0												3.0
4.0												4.0
5.0												5.0

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		REVIEWED BY: HCA	COMPLETE: 73/26/07
		Fig. No: LOG 127	Page 1 of 1

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FOSHEIM SUBSURFACE COMPILATION 49G/15		Jurassic bedrock?		BOREHOLE No: 73267104				
CRREL with auger powerhead		polygon centre		Project No: 720081 LOG #129				
UTM ZONE: 16 N8859260.00 E522200.00		rock of mixed lithology		ELEVATION: 185.0 (m)				
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0	•••••	- unfrozen sand and gravel (80:20)						0.0
	/ / / / /	- dark grey silt and clay with pebbles, unfrozen						
	- - - - -	- silt clay and fine sand with thin ice lenses (2 mm thick), ice content 5-10%						
-1.0	•••••	- fine sand and silt with variable ice occurrence and content ranging from 20-60%	•••••					-1.0
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 129		COMPLETION DEPTH: 1.8 m COMPLETE: 73/26/07		Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/15		Jurassic bedrock?		BOREHOLE No: 73267105			
CRREL with auger powerhead				Project No: 720081 LOG #130			
UTM ZONE: 16 N8859260.00 E522150.00		rock of mixed lithology		ELEVATION: 185.0 (m)			
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged							
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION		ICE CONTENT	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				◆ estimated ice content ◆ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ■ excess water ■ 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80			
0.0	A.G. 1 A.G. 2	- sand and gravel capping surface - unfrozen light grey silt					0.0
	-----	- silt, no visible ice					
	-----	- grey silt with ice lenses 1-2 mm thick, ice content 5-10%					
1.0	-----	- silt and clay, visible ice <1%					1.0
	-----	- silt with streaks of fine sand visible ice <1%					
2.0							2.0
3.0							3.0
4.0							4.0
5.0							5.0

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Fig. No: LOG 130	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/15		Jurassic bedrock		BOREHOLE No: 73277101			
CRREL with auger powerhead		polygon centre		Project No: 720081 LOG #131			
UTM ZONE: 16 N8859260.00 E522350.00		rock of mixed lithology		ELEVATION: 185.0 (m)			
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged							
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80		● % clay (ratio S:St:C) ● 20 40 60 80 ◆ % silt (ratio S:St:C) ◆ 20 40 60 80 ■ % sand (ratio S:St:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	

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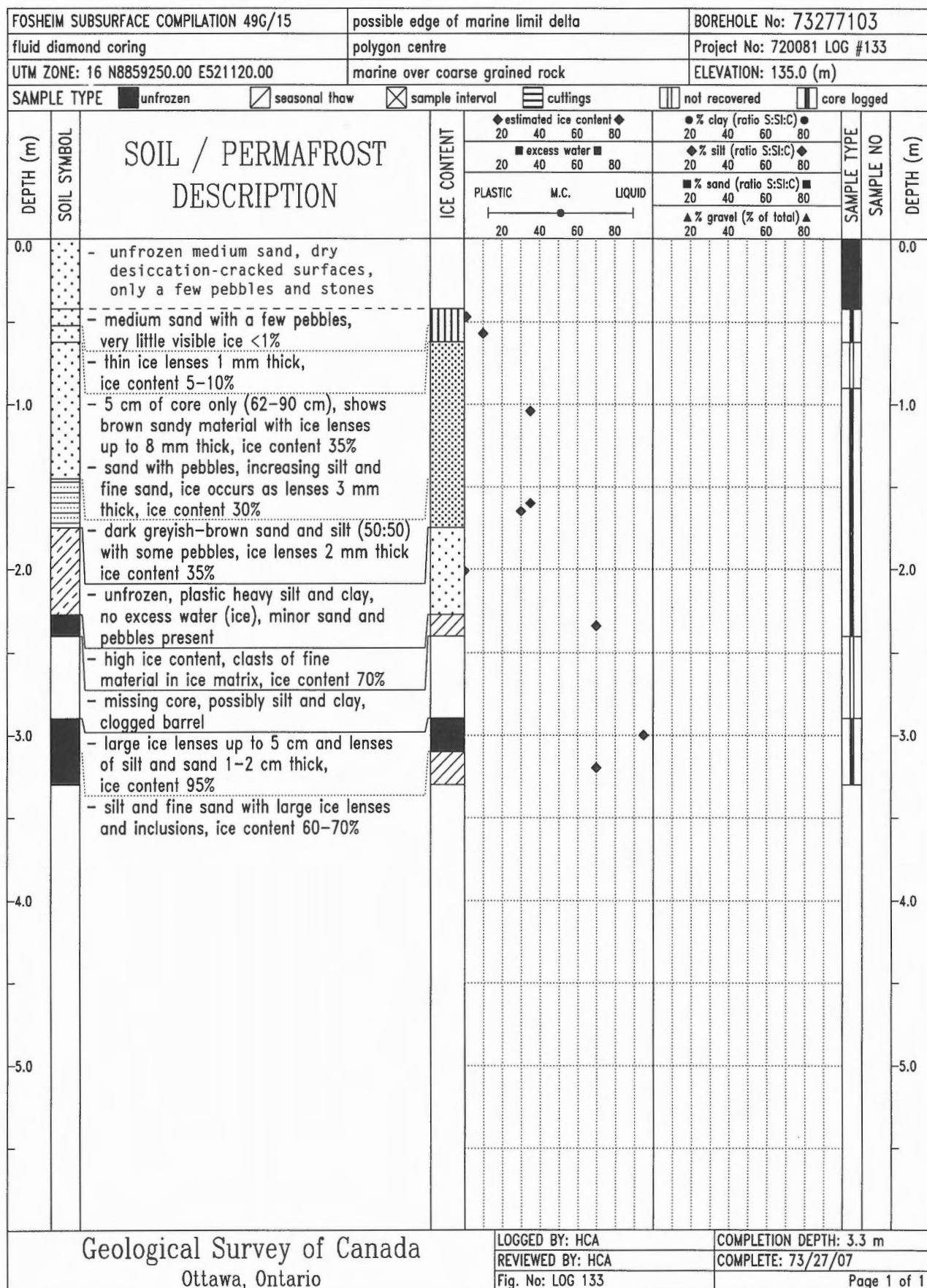
LOGGED BY: HCA
REVIEWED BY: HCA
Fig. No: LOG 131

COMPLETION DEPTH: 1.3 m
COMPLETE: 73/27/07
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FOSHEIM SUBSURFACE COMPILATION 49G/15		downslope from 73277101		BOREHOLE No: 73277102	
CRREL with auger powerhead		5 degree slope,		Project No: 720081 LOG #132	
UTM ZONE: 16 N8859260.00 E522450.00		rock of mixed lithology		ELEVATION: 185.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80 PLASTIC 20 40 60 80 M.C. 20 40 60 80 LIQUID 20 40 60 80			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen brown medium sand, no stones						0.0	
		- brown sandy material with some pebbles, no visible ice							
		- black shaly material with small clasts of sand, ice occurs as inclusions, ice content 25%							
-1.0		- inclusions of sand in linear orientation some black shale, ice content 25%, sand lens from 140 to 142 cm						-1.0	
-2.0								-2.0	
-3.0								-3.0	
-4.0								-4.0	
-5.0								-5.0	

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.7 m
		REVIEWED BY: HCA	COMPLETE: 73/27/07
		Fig. No: LOG 132	Page 1 of 1



FOSHEIM SUBSURFACE COMPILATION 49G/15		east of head of Slidre Fjord,		BOREHOLE No: 73287101	
CRREL coring with Winkie diamond drill		behind large flowslide		Project No: 720081 LOG #134	
UTM ZONE: 16 N8873650.00 E537700.00		marine - deltaic		ELEVATION: 65.0 (m)	
SAMPLE TYPE ☒ unfrozen		☐ seasonal thaw		☒ sample interval	
		☐ cuttings		☐ not recovered	
				☐ core logged	

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				estimated ice content	excess water	% clay (ratio S:Si:C)	% silt (ratio S:Si:C)			
0.0		- unfrozen sand and gravel at top over beds of heavy mineral sand, silt (70:30) and some pebbles, fluvial origin								0.0
1.0		- medium and coarse sand with a lot of coal fragments, ice and sand interbedded ice lenses 3 cm thick, fluvial bedding of light grey-brown and black sand, visible ice total <5%								1.0
2.0		- light brown fine sand with small lenses and inclusions of ice, ice 10-15%								2.0
3.0		- stratified dark and light grey sand, no visible ice								3.0
		- sand with small ice lenses 1 mm thick, ice content 10%								
		- grey fine sand and silt, diagonal ice lenses 2-3 mm thick, ice content 15-20%								
		- interbedded silt and fine sand, ice occurs as lenses associated with silt-sand interfaces, ice content 15-20%								
4.0										4.0
5.0										5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 3.1 m
		REVIEWED BY: HCA	COMPLETE: 73/28/07
		Fig. No: LOG 134	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/15		access road to old Eureka airstrip		BOREHOLE No: 73148101						
CRREL with auger powerhead		1 m off road		Project No: 720081 LOG #135						
UTM ZONE: 16 N8881200.00 E523910.00		marine - deltaic		ELEVATION: 82.0 (m)						
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged										
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	estimated ice content		% clay (ratio S:Si:C)		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20	40	20	40			
				☒ excess water ☐ PLASTIC M.C. LIQUID ☐		☒ % silt (ratio S:Si:C) ☐				
				☐ 20 ☐ 40 ☐ 60 ☐ 80		☐ 20 ☐ 40 ☐ 60 ☐ 80				
				☐ 20 ☐ 40 ☐ 60 ☐ 80		☐ 20 ☐ 40 ☐ 60 ☐ 80				
				☐ 20 ☐ 40 ☐ 60 ☐ 80		☐ 20 ☐ 40 ☐ 60 ☐ 80				
0.0		- unfrozen very dry fine sand and silt (40:60) with occasional stone								0.0
		- clasts of silt and fine sand in ice matrix, ice content 85%								
		- silt and fine sand, as angular lenses and clasts, 25-35% ice content								
1.0		- ice lenses with clasts of silt and fine sand, ice content 40%								1.0
		- silt and fine sand, ice content 10%								
2.0		- long rectangular clasts of silt and fine sand in ice matrix, ice content 55-60%								2.0
3.0										3.0
4.0										4.0
5.0										5.0

Geological Survey of Canada
Ottawa, Ontario

LOGGED BY: HCA	COMPLETION DEPTH: 2.1 m
REVIEWED BY: HCA	COMPLETE: 73/14/08
Fig. No: LOG 135	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 49G/15		on access road to old Eureka airstrip,		BOREHOLE No: 73148102	
CRREL with auger powerhead		on depressed old road bed 1 m lower		Project No: 720081 LOG #136	
UTM ZONE: 16 N8881200.00 E523910.00		than 73148101, marine - deltaic		ELEVATION: 81.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			ICE CONTENT			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				estimated ice content	excess water	PLASTIC	M.C.	LIQUID	% clay (ratio S:Si:C)			
0.0		- desiccated surface over unfrozen, damp fine sand and silt										0.0
		- clasts of silt in ice matrix, ice content 65%										
		- ice bed, ice content 90%										
-1.0		- silt with some thick ice lenses (1-2 cm) ice content 5-10%										-1.0
		- ice with clasts of silt, ice content 95%										
		- silt with some ice lenses 3-4 mm thick, ice content 2-5%										
-2.0												-2.0
-3.0												-3.0
-4.0												-4.0
-5.0												-5.0

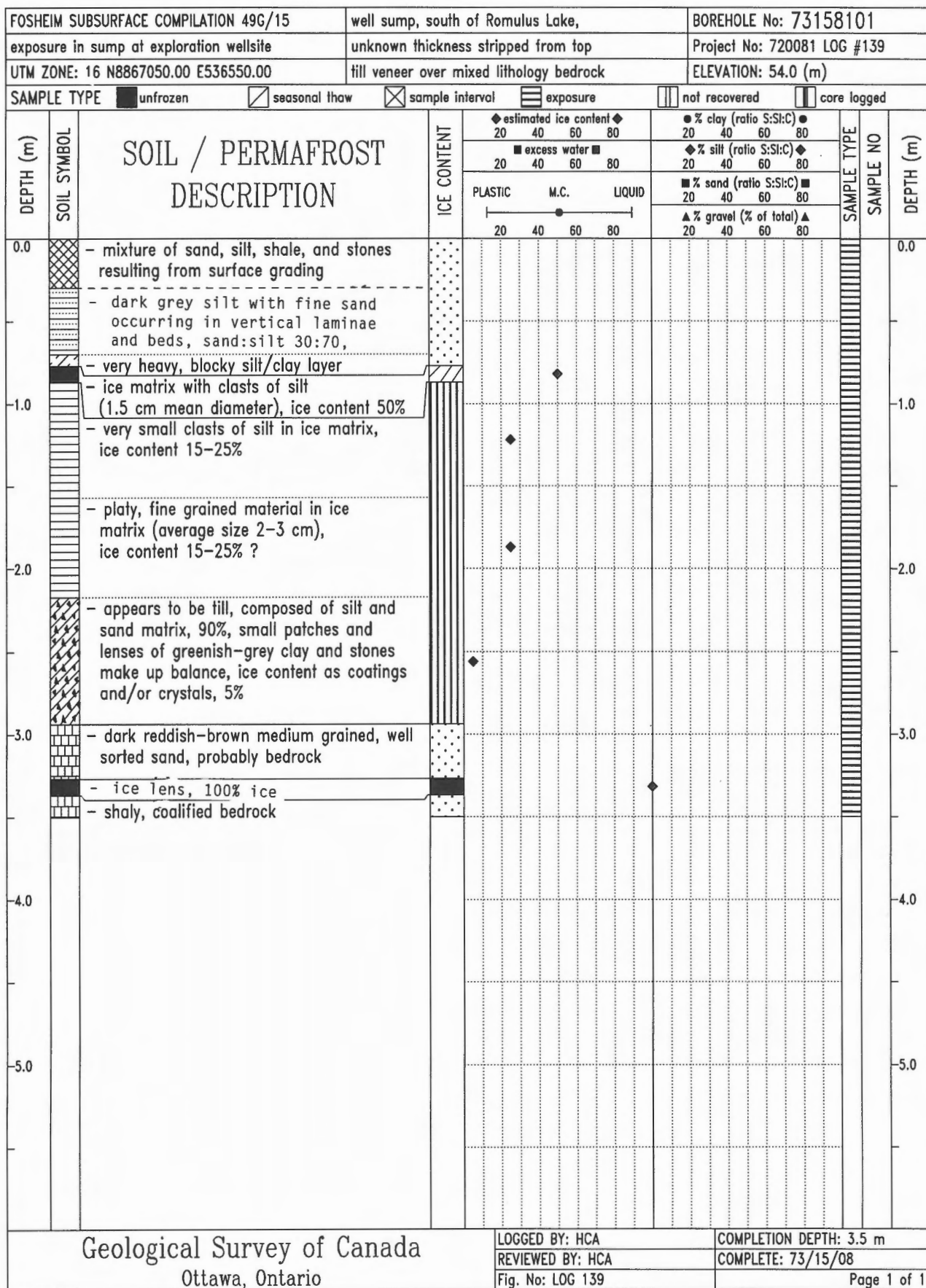
Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 136	COMPLETION DEPTH: 1.8 m COMPLETE: 73/14/08
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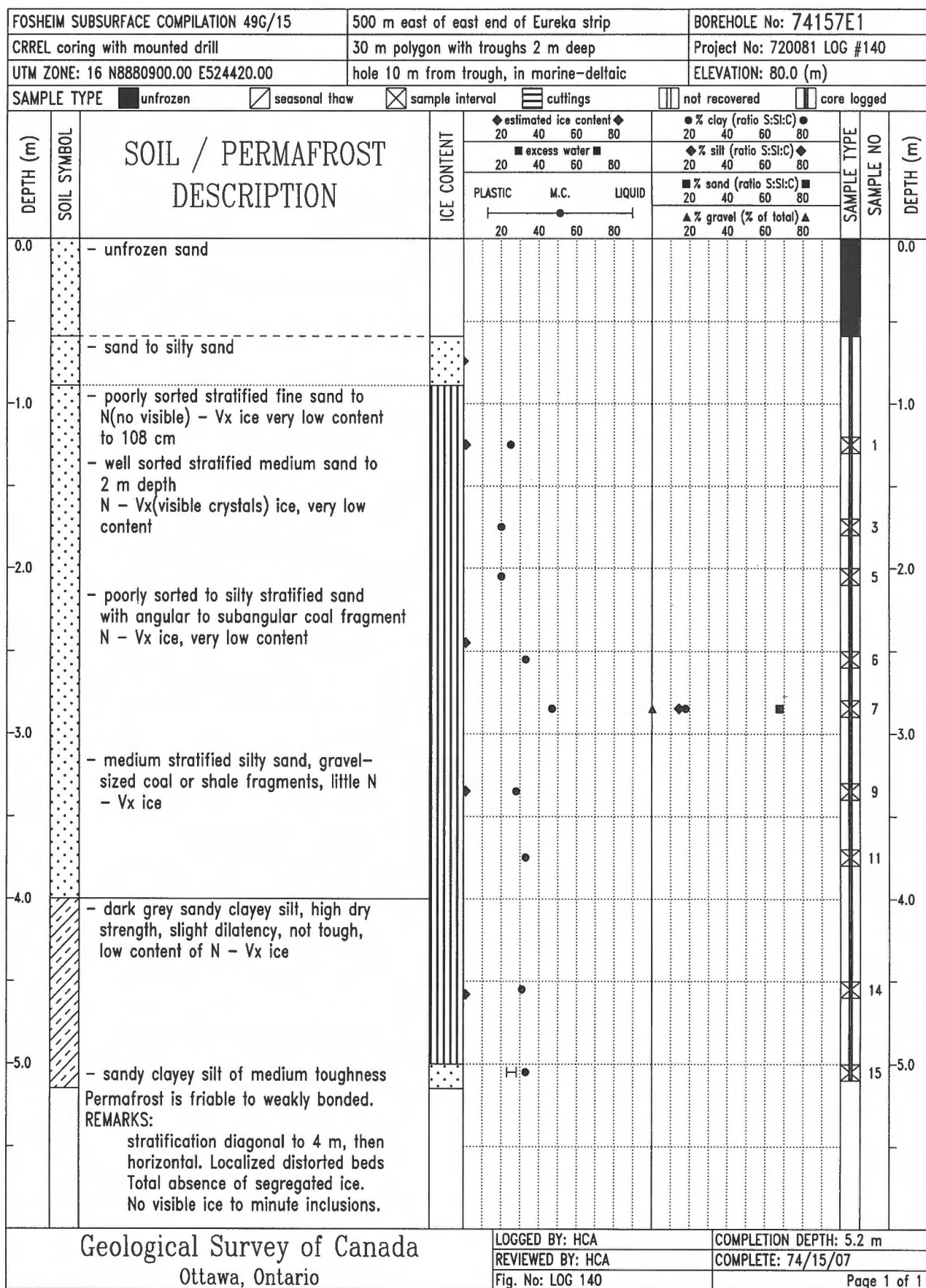
FOSHEIM SUBSURFACE COMPILATION 49G/15		on access road to old Eureka airstrip,		BOREHOLE No: 73148103				
CRREL with auger powerhead		in disturbed depression on roadbed		Project No: 720081 LOG #137				
UTM ZONE: 16 N8881200.00 E523910.00		marine - deltaic material		ELEVATION: 81.0 (m)				
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged								
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				☒ estimated ice content ☒ 20 40 60 80 ☒ excess water ☒ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	☒ % clay (ratio S:Si:C) ☒ 20 40 60 80 ☒ % silt (ratio S:Si:C) ☒ 20 40 60 80 ☒ % sand (ratio S:Si:C) ☒ 20 40 60 80 ☒ % gravel (% of total) ☒ 20 40 60 80			
0.0		- unfrozen moist silt with a little fine sand						0.0
-1.0		- nearly pure ice with some thin vertical veins of sand and a few sand inclusions, ice content 95-99%						-1.0
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA		COMPLETION DEPTH: 1.4 m		
				REVIEWED BY: HCA		COMPLETE: 73/14/08		
				Fig. No: LOG 137		Page 1 of 1		

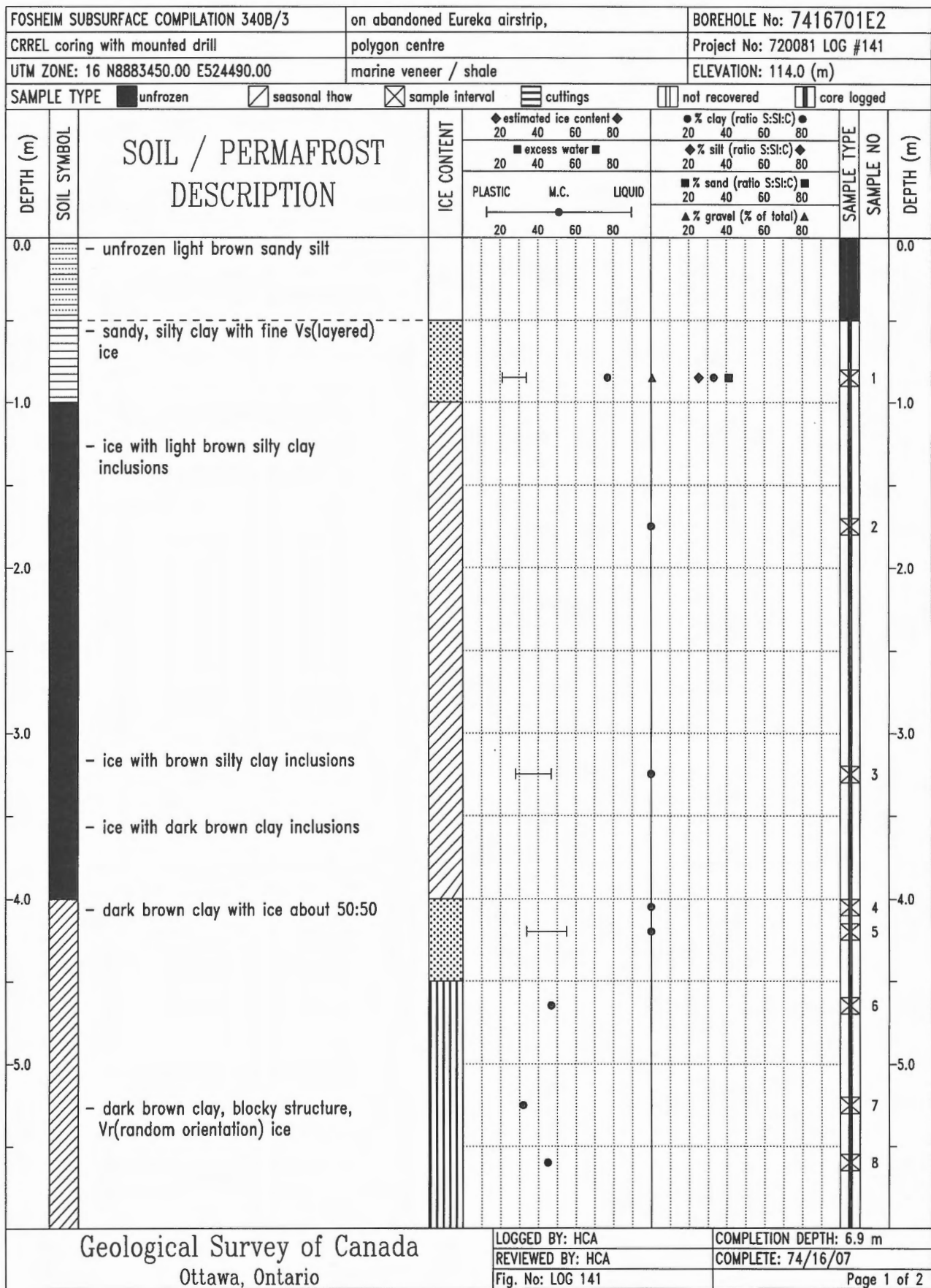
FOSHEIM SUBSURFACE COMPILATION 49G/15		access road to old Eureda airstrip,		BOREHOLE No: 73148104	
CRREL with auger powerhead		just off shoulder opposite 73148101		Project No: 720081 LOG #138	
UTM ZONE: 16 N8881200.00 E523910.00		marine - deltaic		ELEVATION: 82.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	♦ estimated ice content ♦ 20 40 60 80 ■ excess water ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	● % clay (ratio S:Si:C) ● 20 40 60 80 ♦ % silt (ratio S:Si:C) ♦ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
0.0		- unfrozen, top 10 cm is dry and friable, rest is moist silt, dark grey						0.0
		- silt occurring as clasts in ice matrix, ice content 75-80%						
-1.0		- silt with ice clasts, ice content 10%						-1.0
		- ice with silt clasts, ice content 60-65%						
		- silt with ice clasts and a few thicker ice lenses 2-3 cm up to 10 cm thick, within ice lenses, silt occurs as very angular clasts, ice content varies from 15-30%						
-2.0								-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA REVIEWED BY: HCA Fig. No: LOG 138	COMPLETION DEPTH: 1.8 m COMPLETE: 73/14/08
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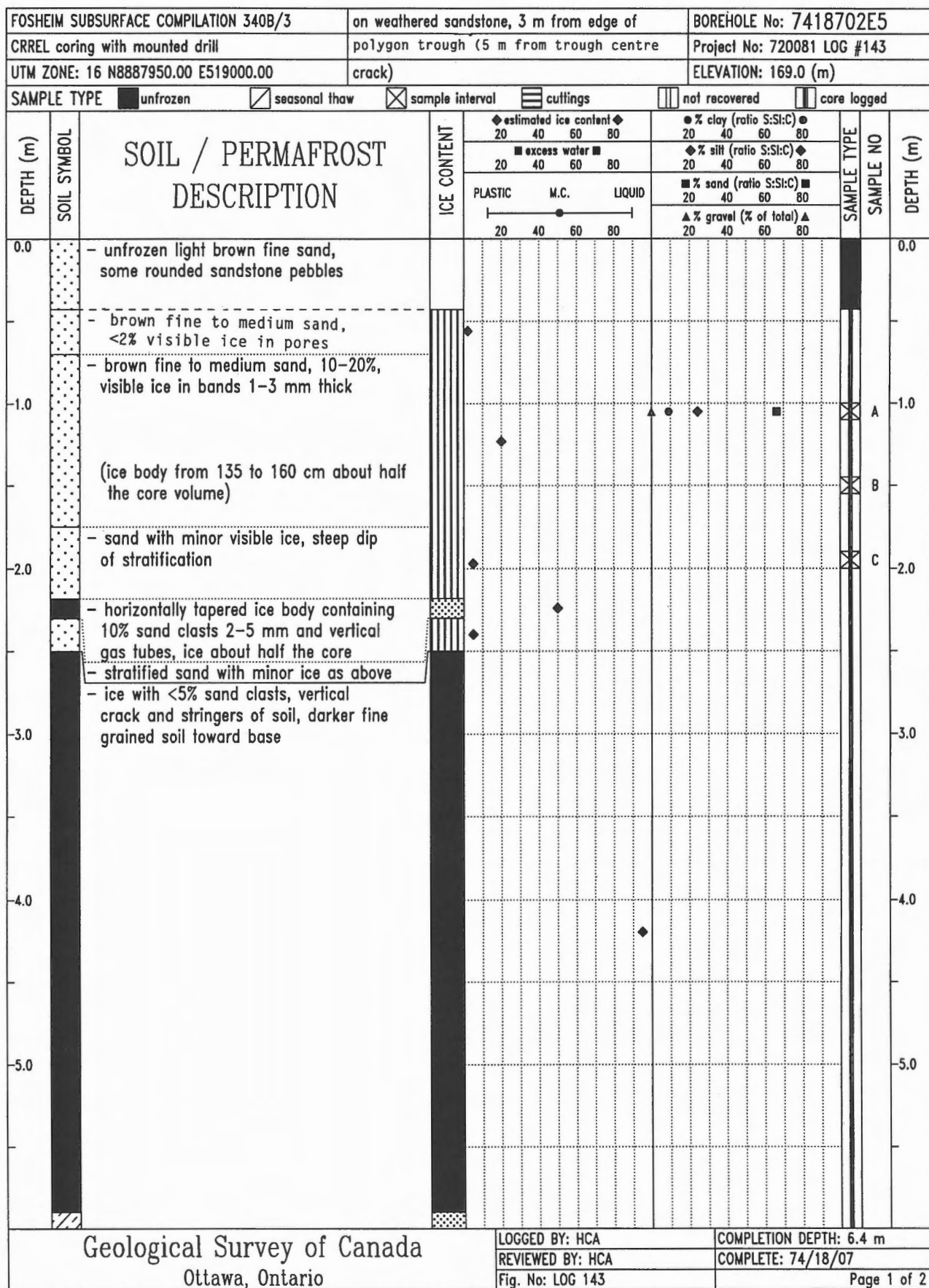


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FOSHEIM SUBSURFACE COMPILATION 340B/3		Eastwind Lake		BOREHOLE No: 7418701E4	
CRREL coring & auger with mounted drill				Project No: 720081 LOG #142	
UTM ZONE: 16 N8887950.00 E529300.00		till		ELEVATION: 160.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	◆ estimated ice content ◆ 20 40 60 80 ■ excess water ■ 20 40 60 80 ● % clay (ratio S:Si:C) ● 20 40 60 80 ◆ % silt (ratio S:Si:C) ◆ 20 40 60 80 ■ % sand (ratio S:Si:C) ■ 20 40 60 80 ▲ % gravel (% of total) ▲ 20 40 60 80				SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC M.C. LIQUID 20 40 60 80						
0.0		- unfrozen silt, clay, and 10-20% stones						0.0		
		- silt, sand, and clay with 10-20% pebbles mostly sandstone, 10% Vs ice								
-1.0								-1.0		
		- fines and >50% ice								
-2.0		- boulder						-2.0		
-3.0								-3.0		
-4.0								-4.0		
-5.0								-5.0		

Geological Survey of Canada Ottawa, Ontario	LOGGED BY: HCA	COMPLETION DEPTH: 2.0 m
	REVIEWED BY: HCA	COMPLETE: 74/18/07
	Fig. No: LOG 142	Page 1 of 1



FOSHEIM SUBSURFACE COMPILATION 340B/3		on weathered sandstone, 3 m from edge of		BOREHOLE No: 7418702E5								
CRREL coring with mounted drill		polygon trough (5 m from trough centre		Project No: 720081 LOG #143								
UTM ZONE: 16 N8887950.00 E519000.00		crack)		ELEVATION: 169.0 (m)								
SAMPLE TYPE ☐ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged												
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC		M.C.		LIQUID		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20	40	60	80	20	40			
6.0		- dark silt to clay, Vr ice to 40%										6.0
7.0												7.0
8.0												8.0
9.0												9.0
10.0												10.0
11.0												11.0

Geological Survey of Canada
Ottawa, Ontario

LOGGED BY: HCA	COMPLETION DEPTH: 6.4 m
REVIEWED BY: HCA	COMPLETE: 74/18/07
Fig. No: LOG 143	Page 2 of 2

FOSHEIM SUBSURFACE COMPILATION 340B/3		site on weathered sandstone,		BOREHOLE No: 7419701								
CRREL with auger powerhead		in polygon trough adjacent to 7419702E6		Project No: 720081 LOG #144								
UTM ZONE: 16 N8887950.00 E519000.00				ELEVATION: 169.0 (m)								
SAMPLE TYPE ☐ unfrozen ☒ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged												
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	PLASTIC		M.C.		LIQUID		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20	40	60	80	20	40			
0.0		- fine to medium sand, unfrozen										0.0
		- fine to medium sand, seasonal thaw zone										
		- fine sand and clasts of ice to 1 mm										
		10% ice content										
		- sand and ice, 40% ice content										
-1.0												-1.0
-2.0												-2.0
-3.0												-3.0
-4.0												-4.0
-5.0												-5.0
Geological Survey of Canada Ottawa, Ontario				LOGGED BY: HCA		COMPLETION DEPTH: 1.5 m						
				REVIEWED BY: HCA		COMPLETE: 74/19/07						
				Fig. No: LOG 144								Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		100 m east of 7418702E5, 15 m east of		BOREHOLE No: 7419702E6	
CRREL coring with mounted drill		sandstone outcrop		Project No: 720081 LOG #145	
UTM ZONE: 16 N8887950.00 E519300.00		polygon centre		ELEVATION: 169.0 (m)	
SAMPLE TYPE ☐ unfrozen ☒ seasonal thaw ☒ sample interval ☒ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				PLASTIC	LIQUID			
0.0		- unfrozen very fine sand						0.0
		- grey-buff very fine sand (some orange)						
		- as above, thin-bedded ice, 0.5 mm thick						
		- 20% visible ice						
		- Vc(coating)-Vx ice up to 3 mm in sandy silt, 30% ice						
-1.0		- grey fine sand/silt with two or three bands of ice 5 mm thick, some thinner lenses, 5% visible ice.						-1.0
		- sandstone with clasts of ice to 5 mm and occasional 2-5 mm bands of ice, <5% ice content						
-2.0		- stratified sandstone, with ice lenses to 5 mm thick totaling 3 cm in this section, ice on bedding planes dipping 30 degrees						-2.0
-3.0								-3.0
-4.0								-4.0
-5.0								-5.0

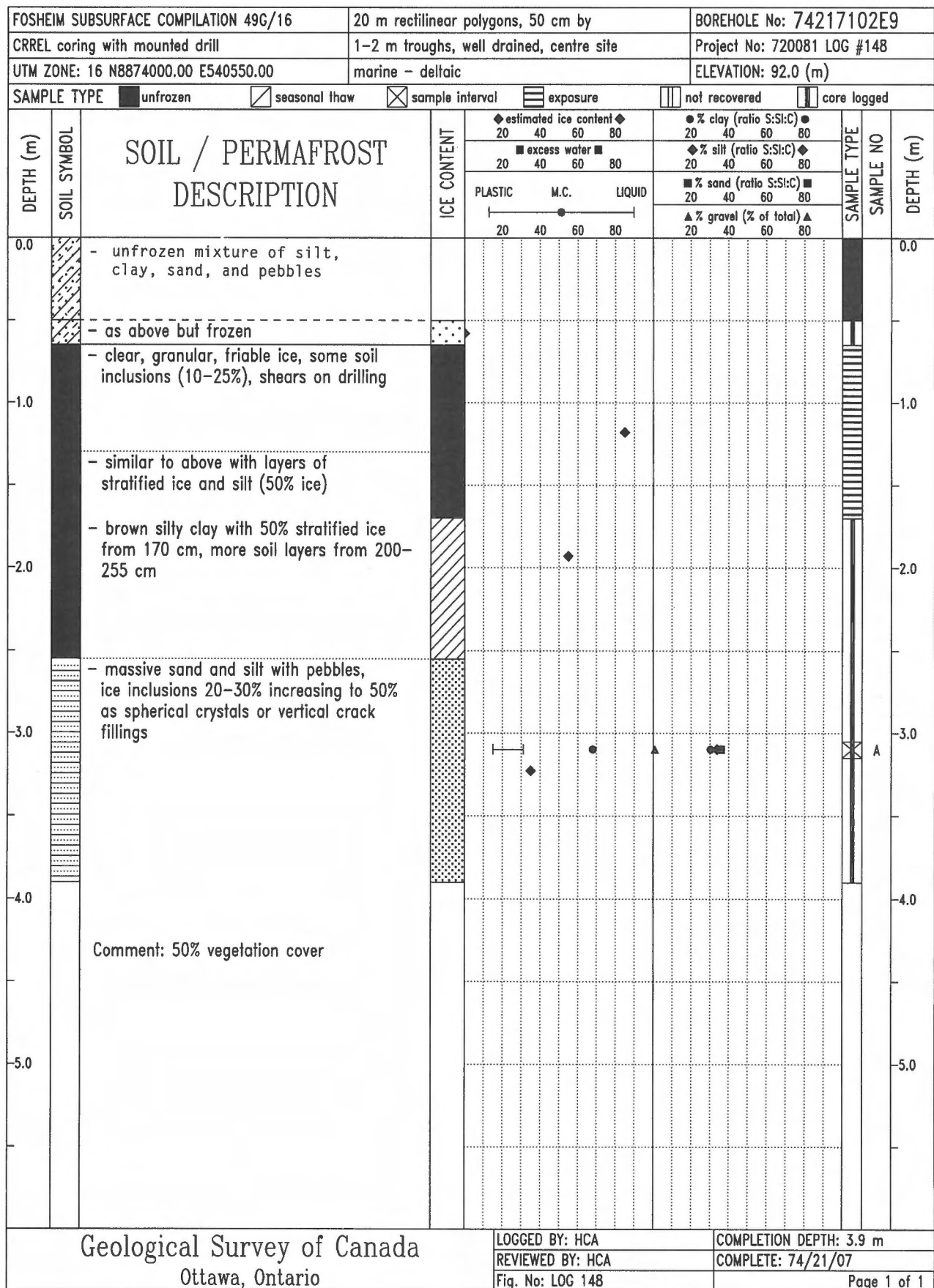
Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 2.9 m
		REVIEWED BY: HCA	COMPLETE: 74/19/07
		Fig. No: LOG 145	Page 1 of 1

FOSHEIM SUBSURFACE COMPILATION 340B/3		5 m north of 7419702E6 along strike of		BOREHOLE No: 7420701E7	
CRREL coring with mounted drill		underlying sandstone, in ice wedge crack		Project No: 720081 LOG #146	
UTM ZONE: 16 N8887950.00 E519300.00				ELEVATION: 169.0 (m)	
SAMPLE TYPE ☒ unfrozen ☐ seasonal thaw ☒ sample interval ☐ cuttings ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	estimated ice content		% clay (ratio S:Sl:C)		% silt (ratio S:Sl:C)	% sand (ratio S:Sl:C)	% gravel (% of total)	SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				20	40	20	40						
0.0		- unfrozen buff very fine sand											0.0
0.5		- sand with no visible ice											
0.8		- thin, horizontal interbedded sand with ice in 0.5-1 mm layers, 30% ice											
1.0		- zone of thick horizontal ice lenses in sand, vertical tubes and other structure within the ice, 50% ice content											
1.5		- vertical stringers or plates of soil in 60% ice, wedge ice?											
1.8		- fractured core, vertical structure in ice but split into horizontal discs											
2.0		- sandstone with some visible ice <0.5 mm 10% ice content											
2.5													
3.0													
3.5													
4.0													
4.5													
5.0													

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 1.6 m
		REVIEWED BY: HCA	COMPLETE: 74/20/07
		Fig. No: LOG 146	Page 1 of 1

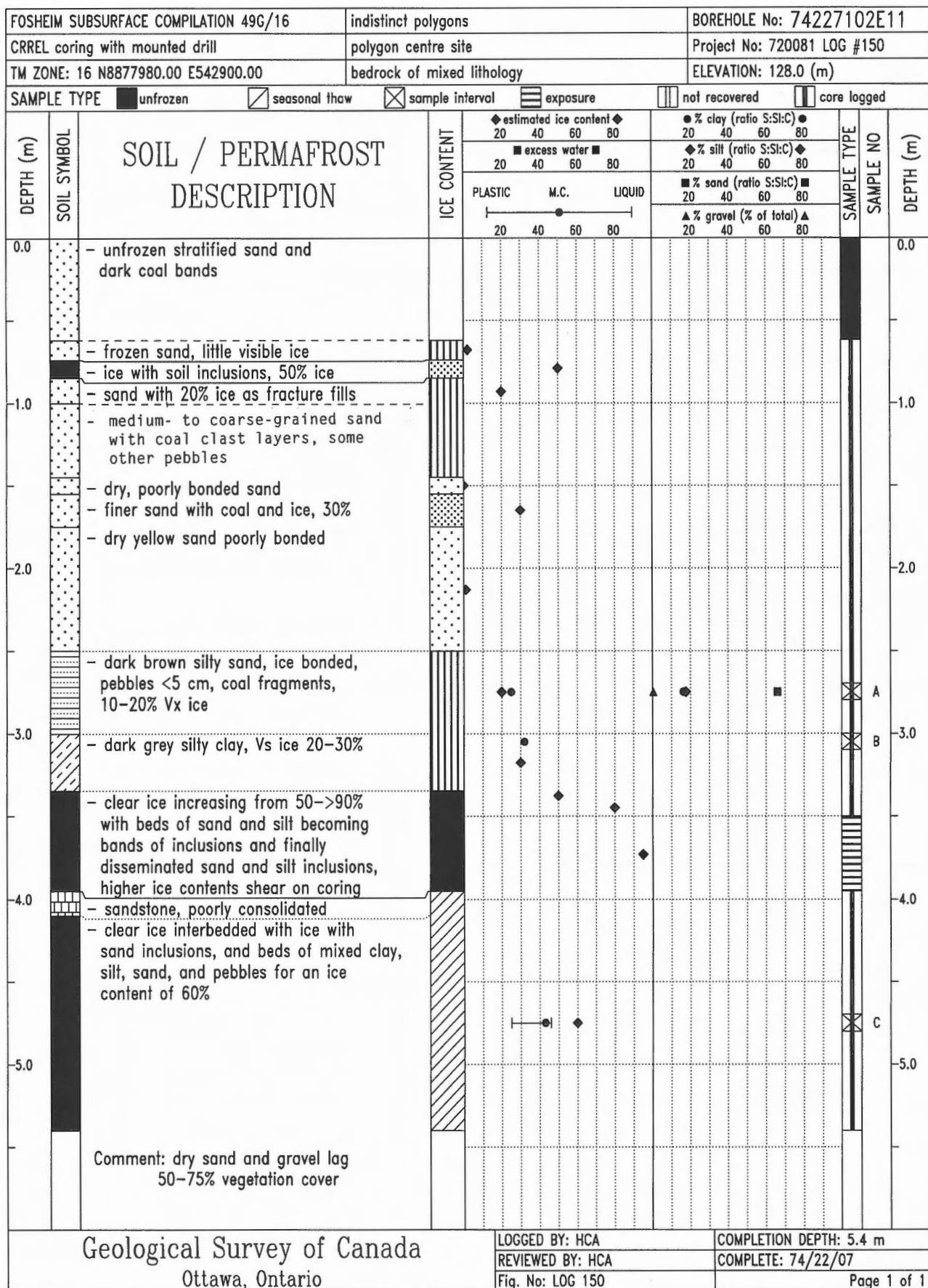
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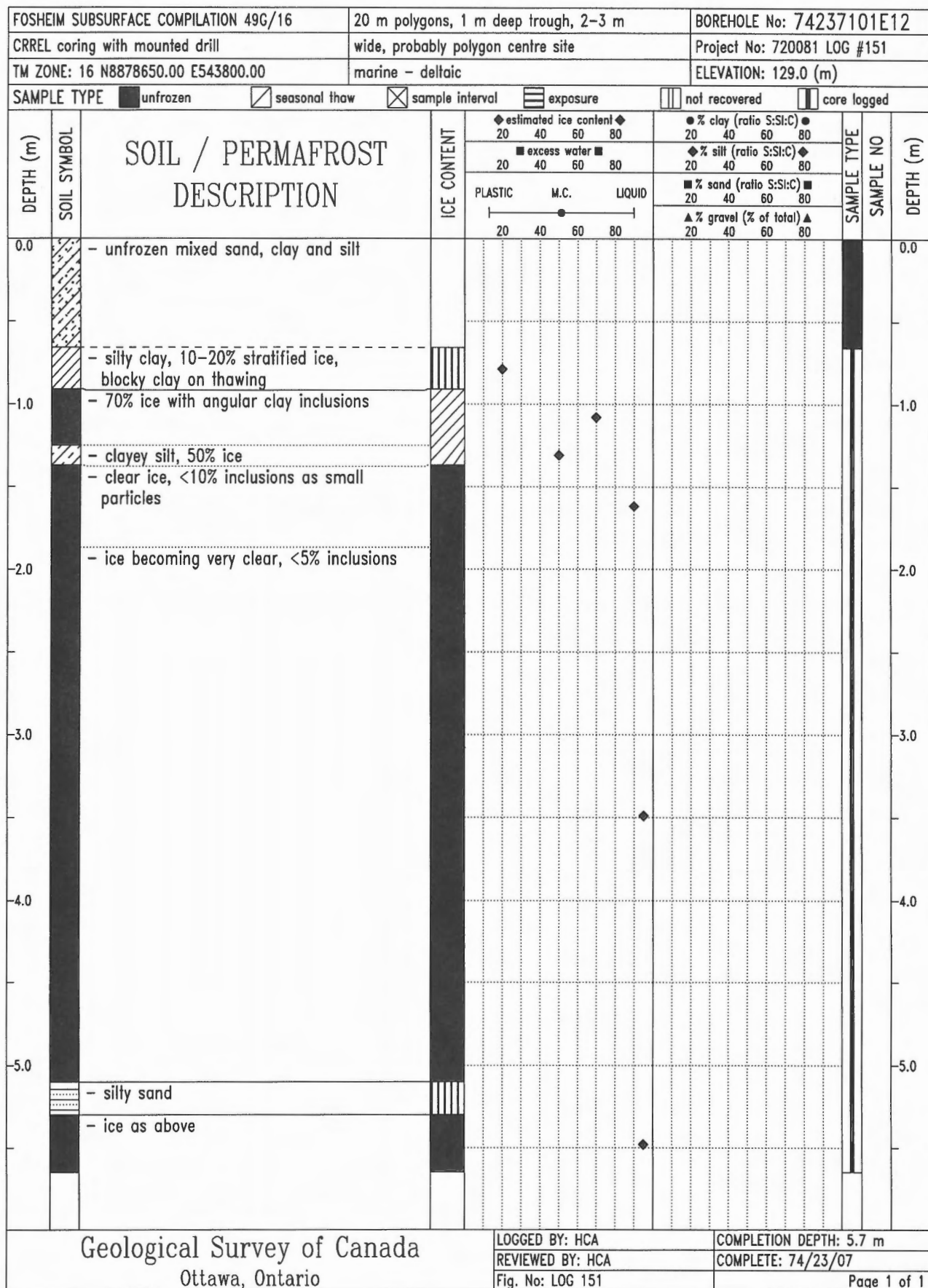


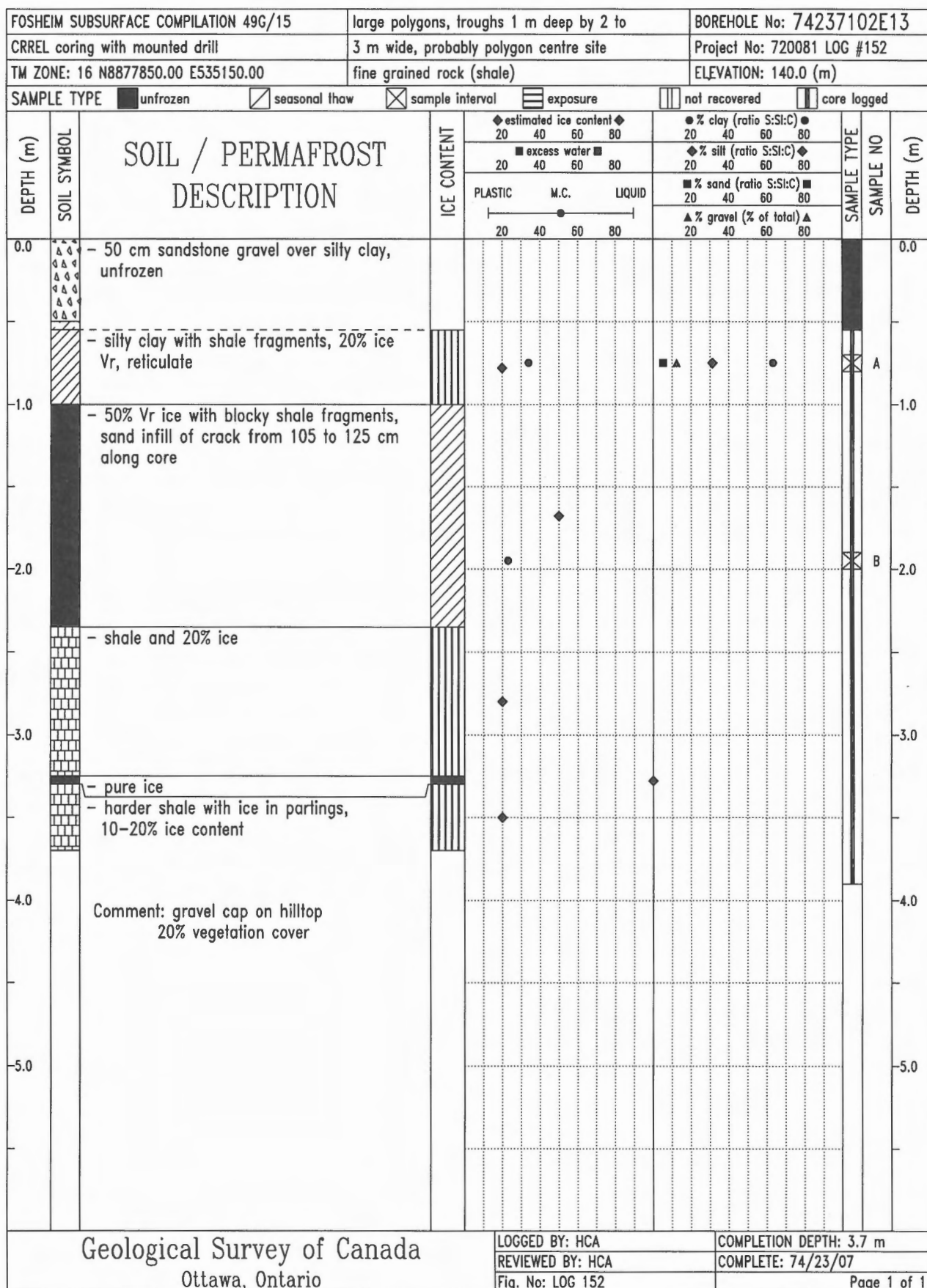
FOSHEIM SUBSURFACE COMPILATION 49G/16		Eureka Sound Formation bedrock spur		BOREHOLE No: 74227101E10	
CRREL coring with mounted drill		poorly developed polygons		Project No: 720081 LOG #149	
UTM ZONE: 16 N8878150.00 E542570.00		bedrock of mixed lithology		ELEVATION: 160.0 (m)	
SAMPLE TYPE ☒ unfrozen		☒ seasonal thaw		☒ sample interval	
		☐ exposure		☐ not recovered	
				☐ core logged	

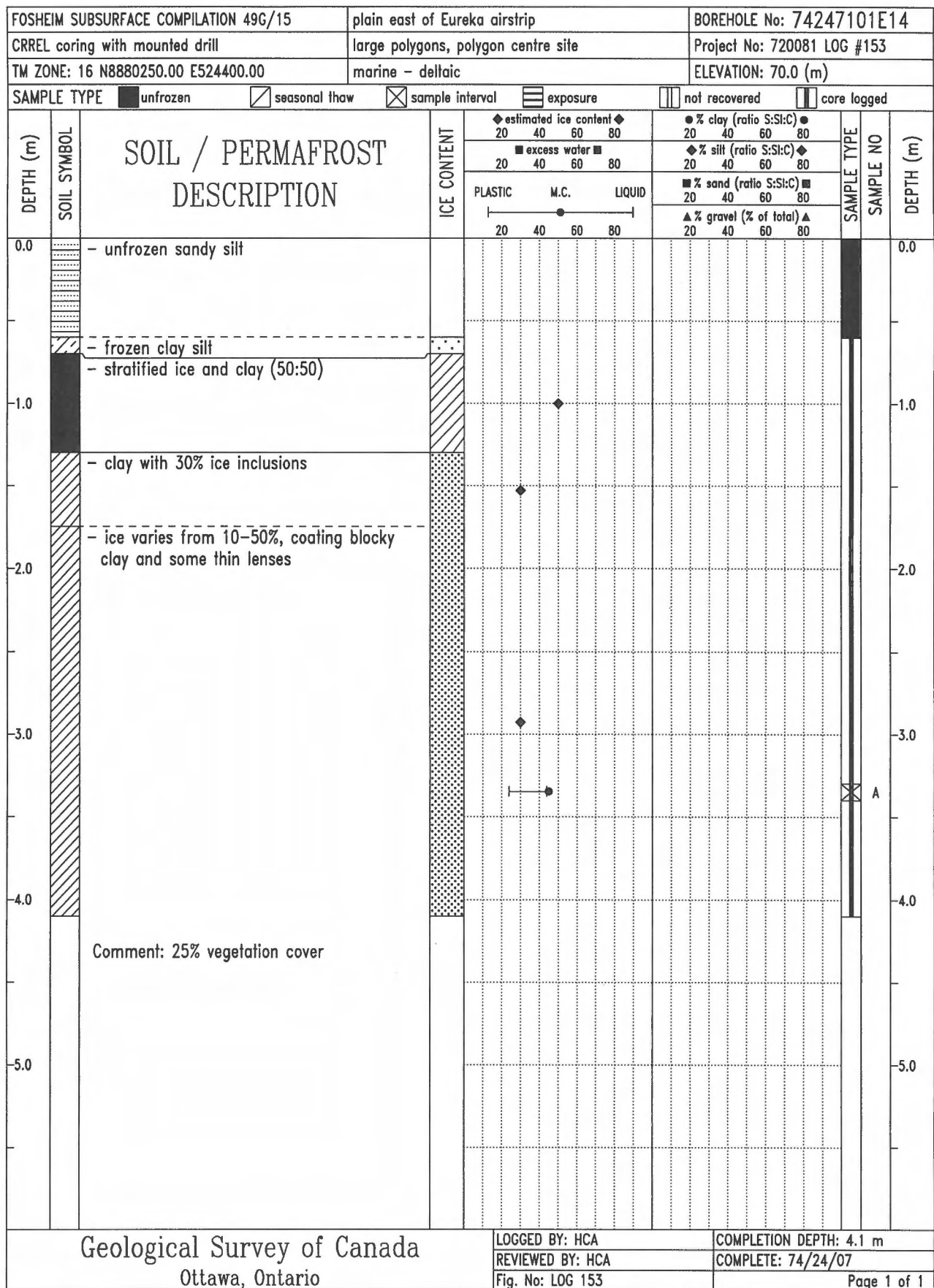
DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT		ICE CONTENT		SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				estimated ice content	excess water	% clay (ratio S:Si:C)	% silt (ratio S:Si:C)			
0.0		- unfrozen silty, sandy clay with pebbles and blocks								0.0
		- clay or weathered shale, 30% ice lenses								
		- dark green shale with oxidized partings, ice in fractures, 20% of core								
-1.0		- ice with shale blocks, >50% ice								-1.0
		- as above, 60% clear ice, may be partly stratabound on bedding planes								
-2.0		- poorly consolidated, jointed sandstone ice in joints 10%								-2.0
-3.0										-3.0
-4.0										-4.0
-5.0										-5.0

Geological Survey of Canada		LOGGED BY: HCA		COMPLETION DEPTH: 3.2 m	
Ottawa, Ontario		REVIEWED BY: HCA		COMPLETE: 74/22/07	
		Fig. No: LOG 149		Page 1 of 1	









FOSHEIM SUBSURFACE COMPILATION 49G/15		plateau west of Eureka airstrip		BOREHOLE No: 74257E15	
CRREL coring with mounted drill				Project No: 720081 LOG #154	
TM ZONE: 16 N8881150.00 E521300.00		marine - deltaic		ELEVATION: 50.0 (m)	
SAMPLE TYPE ☒ unfrozen ☒ seasonal thaw ☒ sample interval ☒ exposure ☐ not recovered ☐ core logged					

DEPTH (m)	SOIL SYMBOL	SOIL / PERMAFROST DESCRIPTION	ICE CONTENT	ICE CONTENT			SAMPLE TYPE	SAMPLE NO	DEPTH (m)
				estimated ice content	% clay (ratio S:St:C)	% silt (ratio S:St:C)			
				excess water	% sand (ratio S:St:C)	% gravel (% of total)			
				PLASTIC	M.C.	LIQUID			
0.0		- sandy silt, olive-grey							0.0
1.0		- no visible ice at 1 m depth - sandy silt, laminated, more fine sand							1.0
2.0		- laminated sandy silt							2.0
3.0		- no detailed log between 3 and 5 m							3.0
5.0		- silt with clay and vein ice at base							5.0

Geological Survey of Canada Ottawa, Ontario		LOGGED BY: HCA	COMPLETION DEPTH: 5.0 m
		REVIEWED BY: HCA	COMPLETE: 74/25/07
		Fig. No: LOG 154	Page 1 of 1

