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60. *DATA REPORT:* X-RAY MINERALOGY DATA FROM KERGUELEN PLATEAU, LEG 120, SITE 751[1]

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INTRODUCTION

The purpose of this paper is to present data from a clay mineralogy investigation of the sediments analyzed for ice-rafted debris (IRD) from Hole 751A (see Breza, this volume). This data is significant in that the change in clay mineralogy may provide information about the Neogene evolution of climate and oceanic circulation near the Kerguelen Plateau and adjacent to Prydz Bay, Antarctica.

Site 751 is located in the central part of the Raggatt Basin on the Southern Kerguelen Plateau in 1633.8 m of water (57°43.56′S, 79°48.89′E) (Fig. 1). The plateau is a structural high isolated from any continental input by means of turbidities or nepheloid transport. It is bounded to the northeast by the Australian-Antarctic Basin, to the southwest by the African-Antarctic Basin, and to the northwest by the Crozet Basin. To the south it is separated from Antarctica by the Princess Elizabeth Trough.

Site 751 consists of two lithologic units (Fig. 2). Unit I is composed of 40 m of upper Pleistocene to lower Pliocene diatom ooze with varying amounts of IRD and foraminifers. Unit II consists of 126 m of upper to lower Miocene diatom nannofossil ooze, with nannofossils as the primary sedimentary component.

METHODS

Mineral identification of the <2-μm fraction was performed on 10-cm^3 samples collected from Hole 751A during Ocean Drilling Program (ODP) Leg 120. These samples were routine samples collected at a frequency of 2–3 per section. The qualitative X-ray mineralogy results of this study are summarized in Table 1.

Samples were disaggregated by soaking them in distilled water for 24 hr. They were then dried, weighed, and washed through 250- and a 62-μm sieves using distilled water. The ≥62-μm fraction was retained for clastic material identification as part of an ice-rafted debris study of the Kerguelen Plateau (see Breza, this volume). The <62-μm fraction was leached in 0.2N hydrochloric acid. The excess acid was removed by repeated centrifugation followed by homogenization. The <2-μm size fraction was settled according to Stoke's Law and extracted with a pipette from the deflocculated sample using the standard settling method (Folk, 1980).

The extracts were mounted on petrographic slides using a modification of Pollastro's (1982) filter membrane technique (Holmes, 1989). A 0.45-μm-opening membrane filter was placed on a glass frit mount and placed over a suction flask. The pipetted sample was added to the flask and suction was applied to force the sample onto the filter membrane. The filter membrane was then placed upside down on a petrographic slide, pressure applied, and the filter membrane removed, leaving the extract adhered to the petrographic slide.

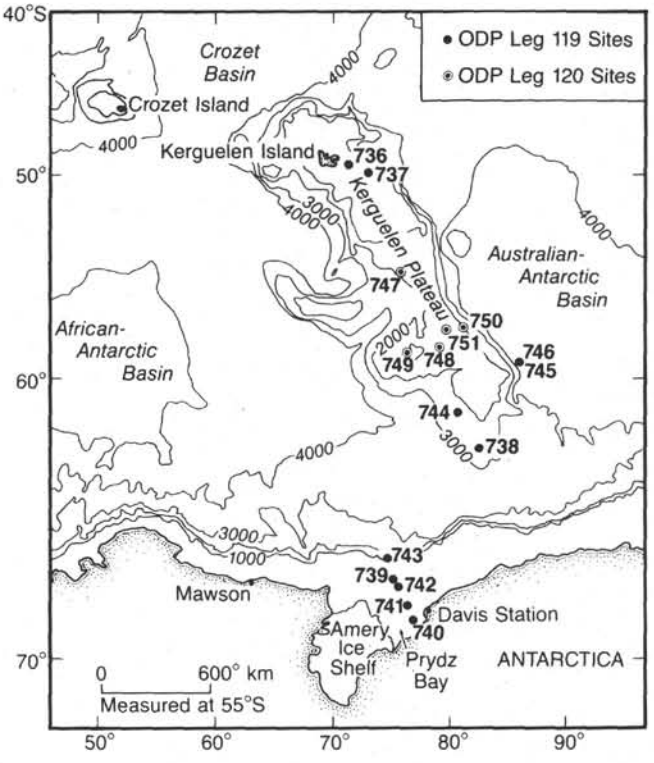

Figure 1. Bathymetric chart of the Kerguelen Plateau showing the Leg 120 site locations. The contour interval is 1000 m.

Two X-ray diffractograms (XRDs) were made of the oriented mounts: (1) an untreated sample X-rayed from 2° to 40° 2θ, and (2) a sample (treated with ethylene glycol for more than 24 hr at room temperature) X-rayed from 2° to 20° 2θ. A Philips diffractometer equipped with cobalt radiation and a receiving slit of 1/4° was used at a scan speed of 1°/min.

The procedures for mineral identification followed those outlined by Brown and Brindley (1980). Smectite was identified from a peak at approximately 15 Å, which shifted to approximately 17 Å upon glycolation. Illite was identified from an approximate 10-Å peak, which did not shift upon glycolation. A 7-Å mineral was also identified; however, no attempt was made to differentiate this mineral between chlorite and kaolinite, which both have 7-Å peaks. The assumption was made that the minerals present when a 7-Å diffraction peak occurred were either chlorite and/or kaolinite. Figure 3 is a representative diffractogram of smectite, illite, and chlorite and/or kaolinite. An amorphous peak was also detected in most diffractograms. This peak is identified by a large diffuse broad silica peak occurring between 20° and 25° 2θ (Fig. 4). The amorphous content largely consist of biogenic silica.

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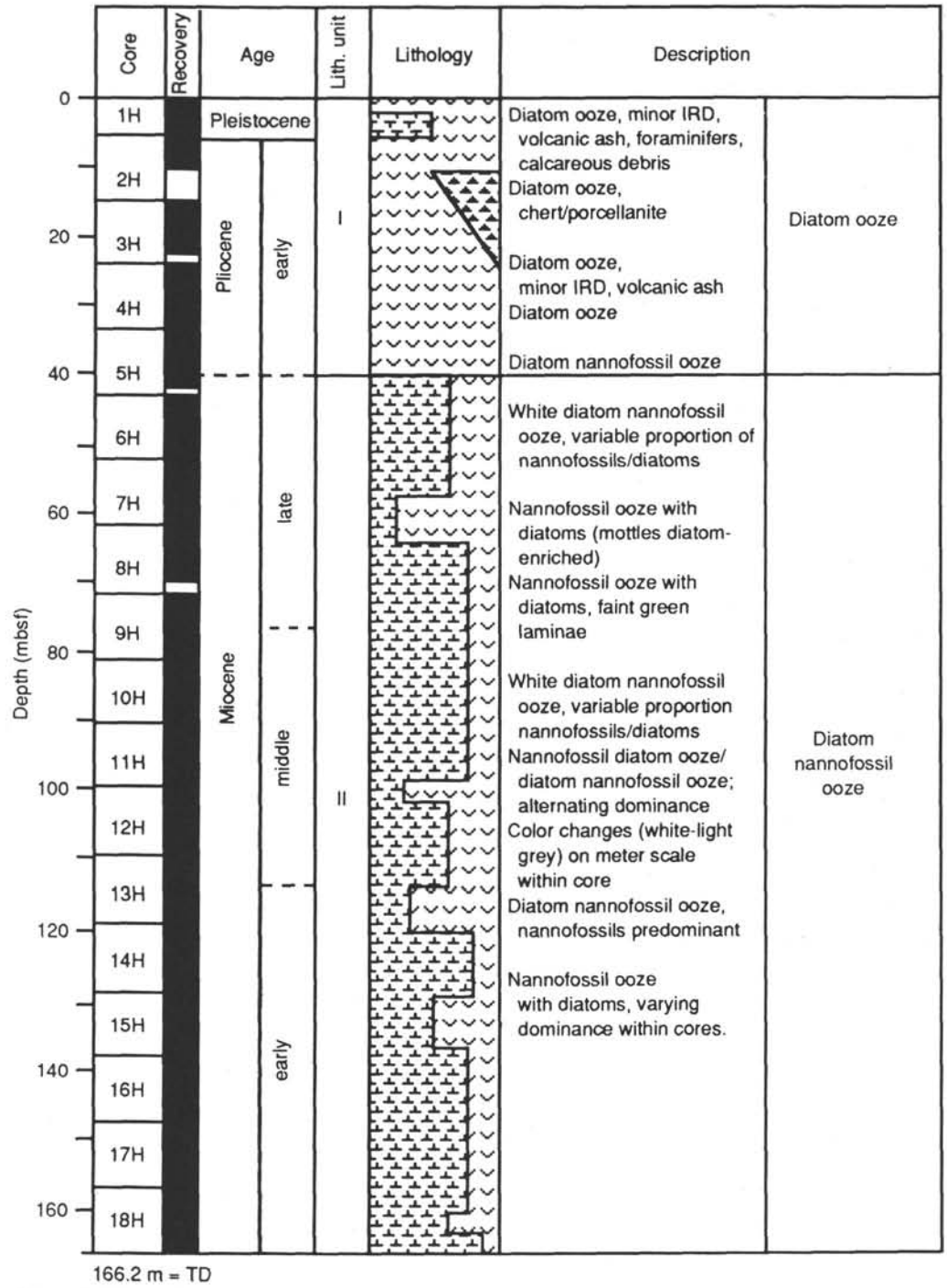

Figure 2. Lithostratigraphy of Site 751, Raggatt Basin, Southern Kerguelen Plateau. Recovered intervals indicated by shading in recovery column. For key to patterns in lithology column, see Schlich, Wise, et al. (1990, "Explanatory Notes" chapter). Figure from Schlich, Wise, et al. (1990). IRD = ice-rafted debris and TD = total depth.

RESULTS

The results of this clay mineralogy study are presented in a qualitative occurrence format in Table 1. However, because of the small amount of <2-μm size material available for X-ray analyses, the concentration of some crystalline minerals may not have been sufficient for the XRD to detect their presence.

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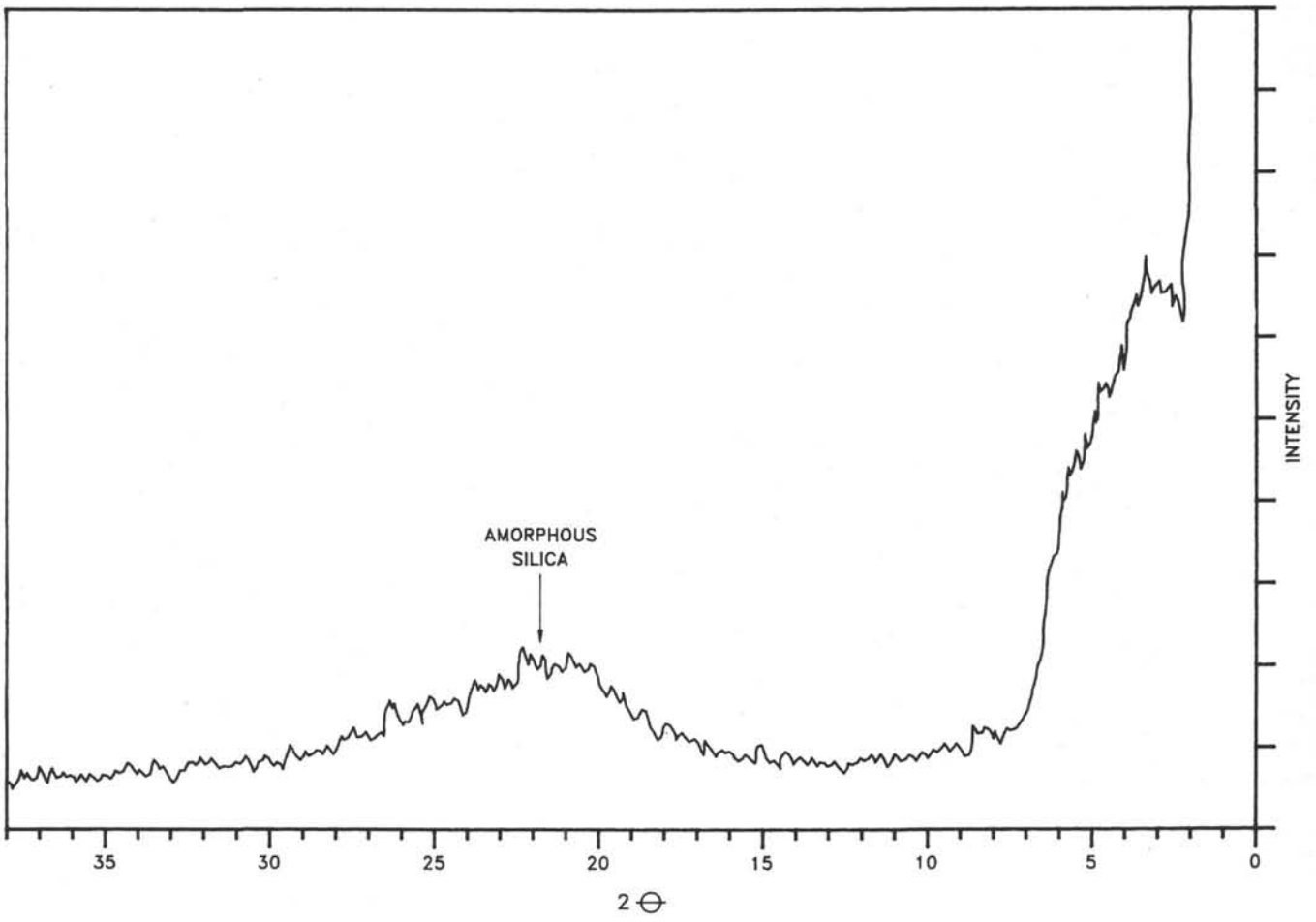

Figure 3. X-ray diffractogram for untreated clay fraction from Sample 120-751A-2H-2, 23–25 cm. S = smectite, I = illite, C/K = chlorite and/or kaolinite. The *x*-axis is °2θ, and the *y*-axis is intensity.

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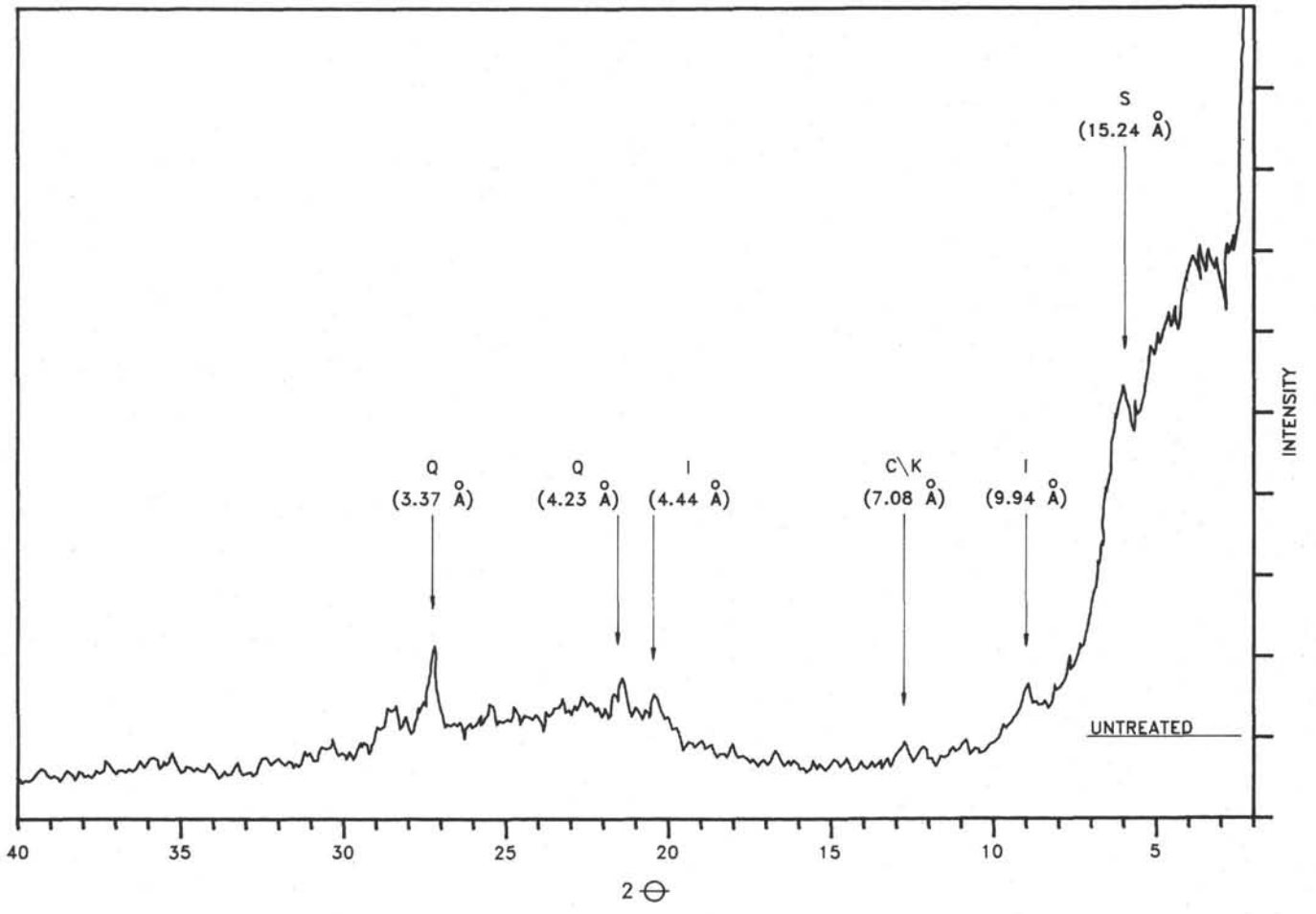

Figure 4. X-ray diffractogram for untreated clay fraction from Sample 120-751A-7H-5, 83–85 cm. The *x*-axis is °2θ, and the *y*-axis is intensity.

Table 1. Results of X-ray diffraction analysis from Hole 751A.

Core, section, interval (cm)	Depth (mbsf)	Smectite	Illite	Chlorite/ kaolinite	Amorphous silica
120-751A-					
1H-1, 23–25	0.23	—	—	—	X
1H-1, 63–65	0.60	X	X	X	—
1H-1, 123–125	1.23	—	X	X	—
1H-2, 23–25	1.73	—	X	X	X
1H-2, 79–81	2.29	—	X	X	—
1H-2, 140–142	2.90	X	X	X	—
1H-3, 97–99	3.97	—	X	X	—
1H-3, 137–139	4.37	X	X	—	X
2H-1, 23–25	4.93	—	X	—	X
2H-1, 63–65	5.33	X	X	—	X
2H-1, 123–125	5.93	X	X	X	X
2H-2, 23–25	6.43	X	X	X	—
2H-2, 63–65	6.83	X	X	X	—
2H-2, 142–145	7.62	X	X	X	X
2H-4, 63–65	9.83	—	—	—	X
3H-1, 63–65	14.83	—	—	—	X
3H-1, 123–125	15.43	—	—	—	X
3H-2, 23–25	15.93	—	—	—	X
3H-2, 83–85	16.53	—	—	—	X
3H-2, 123–125	16.93	—	—	—	X
3H-3, 63–65	17.83	X	X	—	X
3H-3, 123–125	18.43	X	—	—	X
3H-4, 23–25	18.93	X	X	—	X
3H-4, 83–85	19.53	—	—	—	X
3H-4, 103–105	19.73	—	—	—	X
3H-5, 23–25	20.43	X	X	—	X
3H-5, 83–85	21.03	—	—	—	X
3H-5, 142–145	21.62	X	X	—	—
4H-2, 83–85	26.03	—	—	—	—
4H-2, 142–145	26.62	X	X	—	—
4H-3, 63–65	27.33	—	X	—	X
4H-3, 123–125	27.93	X	X	—	X
4H-4, 23–25	28.43	—	X	—	X
4H-4, 83–85	29.03	X	X	—	X
4H-4, 142–144	29.62	X	X	—	X
4H-5, 63–65	30.33	X	X	—	X
4H-5, 142–144	31.12	—	—	—	X
4H-6, 23–25	31.43	—	X	—	X
4H-6, 83–85	32.03	—	—	—	X
4H-6, 142–144	32.62	X	X	—	X
5H-1, 63–65	33.82	—	—	—	X
5H-1, 123–125	34.43	—	X	—	X
5H-2, 23–25	34.93	X	X	—	X
5H-2, 83–85	35.53	X	X	X	X
5H-2, 142–144	36.12	—	X	X	X
5H-3, 63–65	36.83	—	—	—	X
5H-3, 123–125	37.43	—	—	—	X
5H-4, 23–25	37.93	X	X	X	X
5H-4, 83–85	38.53	—	X	—	X
5H-4, 142–144	39.12	—	X	X	X
5H-5, 63–65	39.83	X	X	X	—
5H-5, 123–125	40.43	X	X	X	—
5H-6, 23–25	40.93	—	X	X	—
6H-1, 83–85	43.53	X	X	X	—
6H-1, 142–144	44.12	X	X	X	—
6H-2, 63–65	44.83	X	X	X	—
6H-2, 103–105	45.23	X	—	—	—
6H-3, 23–25	45.93	X	—	—	—
6H-3, 83–85	46.53	—	X	—	—
6H-3, 142–144	47.12	X	X	X	—
6H-4, 63–65	47.83	X	X	—	—
6H-5, 23–25	48.93	—	—	—	—
6H-5, 83–85	49.53	—	—	—	—
6H-5, 142–144	50.12	—	—	—	—
6H-6, 63–65	50.83	X	—	—	—
6H-6, 123–125	51.43	—	—	—	—
6H-7, 23–25	51.93	—	—	—	—
7H-1, 83–85	53.03	—	—	—	—
7H-1, 142–144	53.62	—	—	—	—
7H-2, 63–65	54.33	—	—	—	—
7H-2, 103–105	54.73	—	—	—	—
7H-3, 23–25	55.43	X	X	—	—
7H-4, 63–65	57.33	—	—	—	—
7H-5, 23–25	58.43	—	—	—	X
7H-5, 83–85	59.03	—	—	—	X

Table 1 (continued).

Core, section, interval (cm)	Depth (mbsf)	Smectite	Illite	Chlorite/ kaolinite	Amorphous silica
120-751A- (Cont.)					
8H-3, 83–85	65.53	—	—	—	X
8H-4, 103–105	67.23	—	—	—	X
8H-5, 23–25	67.93	X	—	—	X
8H-5, 83–85	68.53	—	—	—	X
8H-5, 142–144	69.12	—	—	—	X
9H-1, 23–25	71.43	—	—	—	X
10H-1, 83–85	81.53	—	—	—	X
10H-1, 142–144	82.12	—	—	—	X
10H-2, 123–125	83.43	—	—	—	X
10H-3, 23–25	83.93	—	—	—	—
10H-3, 83–85	84.53	—	—	—	X
10H-3, 142–145	85.12	—	—	—	X
10H-4, 63–65	85.83	—	—	—	X
10H-4, 123–125	86.43	—	—	—	X
10H-5, 23–25	86.93	—	—	—	X
10H-5, 83–85	87.53	—	—	—	X
10H-5, 142–144	88.12	—	—	—	X
10H-6, 63–65	88.83	—	—	—	X
10H-6, 123–125	89.43	—	—	—	X
10H-7, 23–25	89.93	—	—	—	X

Notes: X = mineral present in the sample analyzed, — = mineral not present in the sample analyzed.