4 DSR – Russian Plain Sites

4.1 Introduction

Five sites were sampled on the Russian Steppe, in three separate areas (Figure 4.1): Biriuchya Balka 2, Biriuchya Balka 1a, Kalitvenka 1, Kalitvenka 1v, and Kostenki 14 (Markina Gora). All were open sites and all contained some deposits thought to be loessic in origin. Relief in the vicinity of all sites was of the order 50 m, in contrast to the more mountainous sites in the Gubs and Sochi Regions. The Biriuchya Balka and Kalitvenka sites were situated on the shoulders of small valleys/broad ravines, of the order 1 km or less in breadth, which connect to larger river valleys. Kostenki 14 was located at the base of such a ravine. In total, 120 luminescence and related samples, 131 tephra, magnetic and sedimentary samples, and 19 pollen samples were taken from the five sites, on the 20-28th July 2004 (Table 4.1 and Table 4.2).

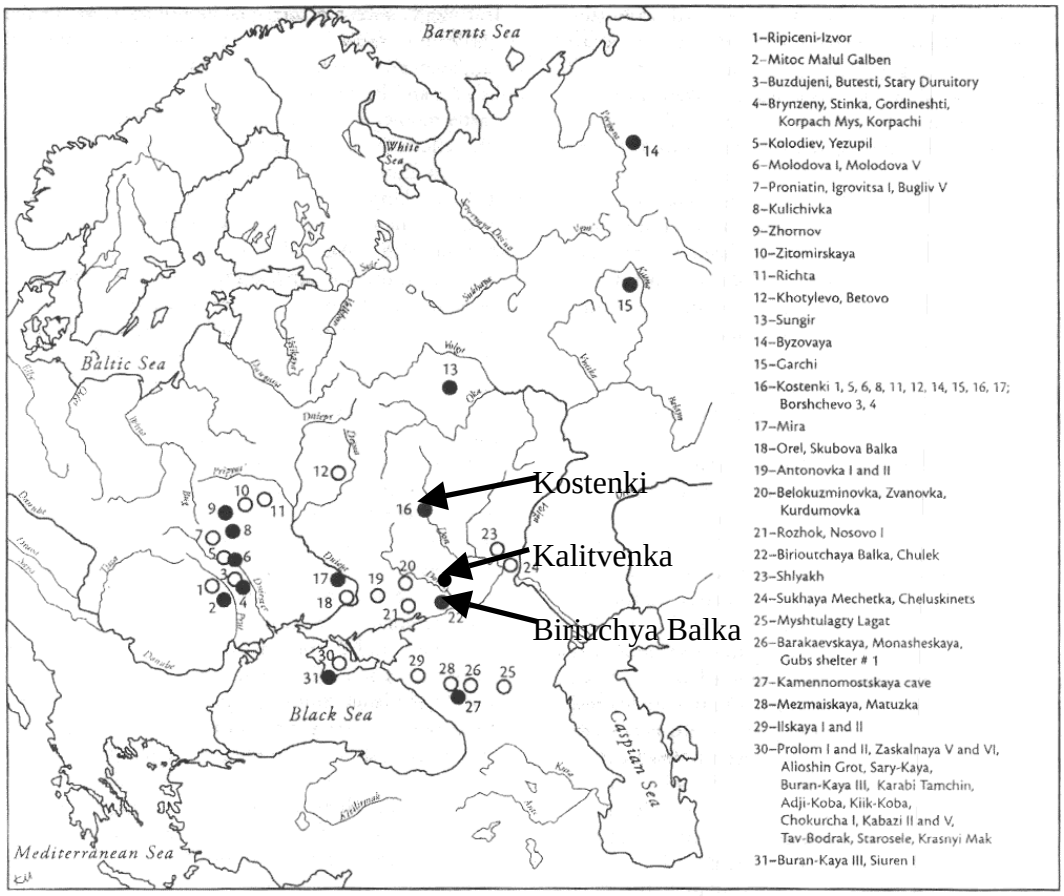


Figure 4.1. Location of the Russian Steppe sites, with locations of other Middle and Upper Palaeolithic sites (Adapted from Chabai *et al*., 2004)

Site	Section	Context	Sample		Field gamma spectrometry	
			Number	Type	Measurement	Dose rate (mGy/a)
Biriuchya Balka 2	East	Profiling	EFD4L123-53	Small Tubes ~1 g	-	-
Biriuchya Balka 2	East	Layer 3	EFD4L154	Tube ~1 kg	EFD4G049	0.78 ± 0.04
Biriuchya Balka 2	East	Layer 5	EFD4L155	Tube ~1 kg	EFD4G050	0.79 ± 0.04
Biriuchya Balka 2	East	Layer 6	EFD4L156	Tube ~1 kg	EFD4G051	0.84 ± 0.04
Biriuchya Balka 2	East	Layer 7	EFD4L157	Tube ~1 kg	EFD4G052	0.84 ± 0.05
Biriuchya Balka 2	East	Layer 8	EFD4L158	Tube ~1 kg	EFD4G053	0.87 ± 0.04
Biriuchya Balka 2	East, sondage	Layer 9	EFD4L159	Tube ~1 kg	EFD4G054	0.80 ± 0.04
Biriuchya Balka 2	East, sondage	Layer 10 Upper	EFD4L160	Tube ~1 kg	EFD4G055	0.76 ± 0.04
Biriuchya Balka 2	East, sondage	Layer 10 Lower	EFD4L161	Tube ~1 kg	EFD4G056	0.66 ± 0.03
Biriuchya Balka 2	East, sondage	Layer 8/9?	EFD4L162	Tube ~1 kg	EFD4G057	0.84 ± 0.04
Biriuchya Balka 2	South	Modern Topsoil	EFD4L163	Bag ~ 100 g	-	-
Biriuchya Balka 1a	South, sondage	Profiling, L 5,6,7	EFD4L164-73	Small Tubes ~1 g	-	-
Biriuchya Balka 1a	South, sondage	Layer 6 above 7	EFD4L174	Tube ~1 kg	EFD4G059	0.74 ± 0.04
Biriuchya Balka 1a	South, sondage	Layer 6 below 7	EFD4L175	Tube ~1 kg	EFD4G060	0.71 ± 0.04
Biriuchya Balka 1a	South, sondage	Layer 6, sand lens	EFD4L176	Tin ~ 1 kg	EFD4G061	0.62 ± 0.03
Kalitvenka 1		Profiling	EFD4L177-201	Small Bags ~1 g	-	-
Kalitvenka 1		Layer 10	EFD4L202	Tube ~1 kg	EFD4G063	0.28 ± 0.01
Kalitvenka 1		Layer 11	EFD4L203	Tube ~1 kg	EFD4G064	0.20 ± 0.01
Kalitvenka 1		Layer 12 Upper	EFD4L204	Tube ~1 kg	EFD4G065	0.13 ± 0.01
Kalitvenka 1		Layer 12 Lower	EFD4L205	Tube ~1 kg	EFD4G066	0.07 ± 0.01
Kalitvenka 1v		Layer 3	EFD4L206	Tube ~1 kg	EFD4G067	0.25 ± 0.01
Kalitvenka 1v		Layer 4	EFD4L207	Tube ~1 kg	EFD4G068	0.14 ± 0.01
Kostenki 14	South	Profiling	EFD4L208-217	Small Tubes ~1 g	-	-
Kostenki 14	South	“Layer 3”	EFD4L218	Tube ~1 kg	EFD4G070	0.42 ± 0.02
Kostenki 14	South	“Layer 3”	EFD4L219	Tube ~1 kg	EFD4G070	0.42 ± 0.02
Kostenki 14	South	“Layer 7”	EFD4L220	Tube ~1 kg	EFD4G071	0.41 ± 0.02
Kostenki 14	East	Profiling	EFD4L221-240	Small Tubes ~1 g	-	-
Kostenki 14	East	“Layer 9”	EFD4L241	Tube ~1 kg	EFD4G072	0.58 ± 0.03
Kostenki 14	East	“Layer 11”	EFD4L242	Tube ~1 kg	EFD4G073	0.45 ± 0.02

Table 4.1. Luminescence and related samples taken, and measurements made at sites in the Russian Steppe.

Site	Section	Context	Sample			Associated Sample(s)
			Number	Depth	Type	
Biriuchya Balka 2	East, square 1	Layer 5	EFD4T154-163	765-815 cm	T/M/S	-
Biriuchya Balka 2	East, square 1	Layer 6	EFD4T164-171	815-855 cm	T/M/S	-
Biriuchya Balka 2	East, square 1	Layer 7	EFD4T172-191	855-956 cm	T/M/S	-
Biriuchya Balka 2	East, square 1	Layer 8	EFD4T192-198	956-990 cm	T/M/S	-
Biriuchya Balka 2	East, square 1	Layer 9	EFD4T199-200	990-1000 cm	T/M/S	-
Biriuchya Balka 2	East, Square III, sondage	Layer 7	EFD4T201	1000-1017 cm	T/M/S	-
Biriuchya Balka 2	East, Square III, sondage	Layer 8	EFD4T202-203	1017-1043 cm	T/M/S	-
Biriuchya Balka 2	East, Square III, sondage	Layer 9	EFD4T204-209	1043-1090 cm	T/M/S	-
Biriuchya Balka 2	East, Square III, sondage	Layer 10	EFD4T210-227	1090-1180 cm	T/M/S	-
Biriuchya Balka 2	East, Square III, sondage	Stones in Layer 10	EFD4T228	1180-1193 cm	T/M/S	-
Biriuchya Balka 2	East, Square III, sondage	Below stones in Layer 10	EFD4T229-230	1193-1210 cm	T/M/S	-
Biriuchya Balka 2	East, square 1	Layer 3	EFD4P231	475 cm	Pollen	EFD4L154
Biriuchya Balka 2	East, square 1	Layer 5	EFD4P232	761 cm	Pollen	EFD4L155
Biriuchya Balka 2	East, square 1	Layer 6	EFD4P233	835 cm	Pollen	EFD4L156
Biriuchya Balka 2	East, square 1	Layer 7	EFD4P234	911 cm	Pollen	EFD4L157
Biriuchya Balka 2	East, square 1	Layer 8	EFD4P235	973 cm	Pollen	EFD4L158
Biriuchya Balka 2	East, Square III, sondage	Layer 9	EFD4P236	-	Pollen	EFD4L159
Biriuchya Balka 2	East, Square III, sondage	Layer 10 Upper	EFD4P237	-	Pollen	EFD4L160
Biriuchya Balka 2	East, Square III, sondage	Layer 10 Lower	EFD4P238	-	Pollen	EFD4L161
Biriuchya Balka 2	East, Square III, sondage	Layer 8/9	EFD4P239	-	Pollen	EFD4L162
Biriuchya Balka 2	East, Square III, sondage	Layer 8/9	EFD4X240	1019-1032 cm	Soil	-
Biriuchya Balka 1a	South, sondage	Layer 6 Upper	EFD4P241	961 cm	Pollen	EFD4L174
Biriuchya Balka 1a	South, sondage	Layer 6 Lower	EFD4P242	1039 cm	Pollen	EFD4L175
Biriuchya Balka 1a	South, sondage	Layer 6 Upper	EFD4T243-250	900-985 cm	T/M/S	-
Biriuchya Balka 1a	South, sondage	Layer 6 Lower	EFD4T251-256	1000-1060 cm	T/M/S	-
Kalitvenka 1		Layer 2	EFD4S257	46-56 cm	T/M/S	-
Kalitvenka 1		Layer 3	EFD4S258-260	56-86 cm	T/M/S	-

Kalitvenka 1		Layer 4	EFD4S261	86-98 cm	T/M/S	-
Kalitvenka 1		Layer 5	EFD4S262-264	98-127 cm	T/M/S	-
Kalitvenka 1		Layer 7	EFD4S265-266	127-150 cm	T/M/S	-
Kalitvenka 1		Layer 8	EFD4S267-268	150-164 cm	T/M/S	-
Kalitvenka 1		Layer 10	EFD4S269-270	164-178 cm	T/M/S	-
Kalitvenka 1		Layer 11	EFD4S271-272	178-202 cm	T/M/S	-
Kalitvenka 1		Layer 12 Upper	EFD4S273-274	202-225 cm	T/M/S	-
Kalitvenka 1		Layer 10	EFD4P275	-	Pollen	EFD4L202
Kalitvenka 1		Layer 11	EFD4P276	-	Pollen	EFD4L203
Kalitvenka 1v		Layer 3	EFD4P277	-	Pollen	EFD4L206
Kalitvenka 1v		Layer 4	EFD4P278	-	Pollen	EFD4L207
Kostenki 14	South, Square Y73	“White colluvium”	EFD4T280-281	0-20 cm	T/M/S	-
Kostenki 14	South, Square Y73	“Light brown colluvium”	EFD4T282-283	20-42 cm	T/M/S	-
Kostenki 14	South, Square Y73	“Spring activity”	EFD4T284	42-52 cm	T/M/S	-
Kostenki 14	South, Square Y73	“Dark brown palaeosol”	EFD4T285	52-61 cm	T/M/S	-
Kostenki 14	East, Square L75	“Dark brown palaeosol”	EFD4T286	-24 to -18 cm	T/M/S	-
Kostenki 14	East, Square L75	“Colluvium”	EFD4T287-290	-18 to +42 cm	T/M/S	-
Kostenki 14	East, Square L75	Layer IVB (1?)	EFD4T291	42-47 cm	T/M/S	-
Kostenki 14	East, Square L75	“Alluvium”	EFD4T292-296	47-126 cm	T/M/S	-
Kostenki 14	East, Square L75	Layer IVB (2? = hh)	EFD4T297	126-130 cm	T/M/S	-
Kostenki 14	East, Square L75	“Chalky alluvium”	EFD4T298	130-140 cm	T/M/S	-
Kostenki 14	East, Square L75	“Sandy alluvium”	EFD4T299-301	140-188 cm	T/M/S	-
Kostenki 14	South, Square Y73	“White colluvium”	EFD4P302	15 cm	Pollen	EFD4L219
Kostenki 14	South, Square Y73	“Colluvium”	EFD4P303	72 cm	Pollen	EFD4L220
Kostenki 14	East, Square L75	“Alluvium”	EFD4P304	87 cm	Pollen	EFD4L241
Kostenki 14	East, Square L75	“Sandy alluvium”	EFD4P305	164 cm	Pollen	EFD4L242

Table 4.2. Tephra, magnetic susceptibility, sedimentary, pollen and general samples made at sites in the Russian Steppe. Note that sample depths for the Kostenki 14 (East, Square L75) samples have been adjusted by minus 24 cm to conform to the luminescence sample depths.

The natures and histories of the sites were assessed prior to sampling. Reviews of the sites and sediments can be found in Section 4.5 to this report, and tabulated notes from these found in Appendix 4.1. A general description of the samples, and tabulated information relating to each luminescence sample is presented in Appendix 4.2. *In situ* measurements of environmental gamma dose rate were made at the locations of all dating samples. A general description of the measurements, and tabulated information relating to each measurement is presented in Appendix 4.3.

Of the 120 luminescence related samples, 23 were full luminescence dating samples in steel tubes or tins, with associated *in situ* dose rate measurements made using a field gamma spectrometer (Table 4.1). Nine such samples were taken from Biriuchya Balka 2 (Figure 4.2, Figure 4.3, Figure 4.4, Figure 4.5), which had a deep sequence of loessic deposits containing evidence for climatic fluctuations, and both Upper and Middle Palaeolithic layers (Section 4.5). The boundary between Upper and Middle Palaeolithic at this site is not well defined: the excavator having recently revised his interpretations based on a small number of ^{14}C dates, implying that the archaeological assemblage is not diagnostic. A palaeomagnetic excursion has also been identified in this sequence (Section 4.5.2), but was assigned an age based primarily on where it fitted into the ^{14}C chronology. Three samples were taken from low in the sequence of the associated site Biriuchya Balka 1a (Figure 4.6, Figure 4.7). The two sites were linked stratigraphically, primarily through the presence of a rubble layer low in the stratigraphic sequence of the section. Dating would be able to test this. However, because the lower part of the Biriuchya Balka 2 sequence was subject to water logging while that at Biriuchya Balka 1a was not, dates from Biriuchya Balka 1a may prove to be more reliable for the basal deposits at Biriuchya Balka as a whole, especially since a clean sand lens was sampled from this section.

Four full luminescence samples were taken at Kalitvenka 1 (Figure 4.8, Figure 4.9). This site contained many layers, and the stratigraphic sequence evinced a complex geomorphological history, although archaeological interest was focussed around one layer of uncertain date. Two samples were also taken at Kalitvenka 1v (Figure 4.10, Figure 4.11), which contains a layer of the quartzite nodules used in the manufacture of tools at Kalitvenka 1. The local drift geology of the Kalitvenka sites is quartzose: all sedimentary layers contain significant amounts of quartzose sand (often likely to have been reworked sub-aerially), and the archaeological assemblage is predominantly quartzite. However, loessic material is also present, as are

archaeological tools of flint, although the assemblage as a whole is so undiagnostic as to be of virtually any age, and difficult to correlate with other assemblages (this is also the case at Biriuchya Balka, though the problem is less severe). Present chronological interpretations seem to be based on geological inference, and sometimes appear to confuse the geological age of the source (drift) deposits with that of the geomorphological actions that produced the observed sequence. The presence of both wind blown quartzose sand and loessic material at these sites, makes them very appealing from the point of view of establishing OSL dating protocols for different types of minerals, though of course this would not address bleaching issues in less open sites… All other sites in the present study have very little sandy material against which to compare fine grain dating results, let alone material that is believed to be (sub)-aeolian in origin.

Four full luminescence-dating samples were taken from Kostenki 14 (Markina Gora) (Figure 4.12, Figure 4.13). This is one of a large number of sites in the same area, containing a complex but well-defined (archaeologically) and well constrained (chronologically), sequence of Upper Palaeolithic deposits. To date no Middle Palaeolithic levels have been confirmed at Kostenki. The sediments are silty/loessic, but deformed, and in most cases show signs of post-depositional colluviation. They also often contain chalk clasts derived from the local bedrock, from which luminescent grains may have weathered (cf. the sites of the Gubs Gorge and Sochi regions). However, Kostenki was included because it would both provide good chronological control and permit insight into the chronology of the Middle to Upper Palaeolithic transition. The upper two luminescence samples (South Section) are associated with a relatively thick layer of volcanic tephra that is dated (by ^{14}C) to *c*.32 uncal ka BP (or 38.3 ka based on Ar-Ar), and a palaeosol with a palaeomagnetic excursion (Kargapolovo = Laschamp [?]) is thought to date to *c*.40-42 (or *c*.44-46) ka. The lower two OSL samples (East Section) are associated with IRSL samples previously dated by Steve Forman. The upper sample from the present study was taken adjacent to one of Forman's that produced an age of 44-46 ka (^{14}C dates from approximately the same level suggest an age of *c*.36-37 uncal ka BP), while the lower sample constrains the upper age of a layer that yielded IRSL ages of 34 and 45 ka (UIC-749 & -748, Sinitsyn, 2003b).

In addition to the full luminescence dating samples, 99 small samples were taken in zip lock bags or small tubes (Table 4.1). These were designed to provide

profiles of more limited luminescence information up and down the sampled sections (Figure 4.3, Figure 4.6, Figure 4.8, Figure 4.10). These may be used to indicate changes in luminescence behaviour and hence source material down section, and for the better quality samples change in stored dose with depth can be used to help assess the datability of the sequence. The best quality profiling samples (generally small tubes in soft sediment) might be used to measure approximate dates in their own right.

One modern surface sample was also taken at Biriuchya Balka 2, in a black bag (Table 4.1). A bulk modern sample was not taken at Kalitvenka, but the uppermost profiling sample was taken from the topsoil layer present prior to the deposition of spoil from excavations at the site. At Kostenki a representative sample could not be obtained due to disturbance of the uppermost layers by recent agricultural and archaeological activity on and around the site.

A total of 131 samples were taken for combined volcanic tephra, magnetic susceptibility and sedimentary analysis (see samples marked T/M/S in Table 4.2). These came from prepared continuous vertical cleaned profiles at Biriuchya Balka 2 and 1a, Kalitvenka 1 and Kostenki 14. A total of 77 samples came from a 445 cm long vertical section at Biriuchya Balka 2, 14 came from a 160 cm long sequence at Biriuchya Balka 1a, 18 samples from a 179 cm section at Kalitvenka 1, and 22 from two profiles (61 and 212 cm in length) at Kostenki 14. All these samples are for analysis in Cambridge University. One general purpose sample (designated with the EFD4X prefix in Table 4.2) was taken for soil thin section analysis.

Pollen samples were taken at all but two points where full luminescence dating samples were removed, the purpose of this sampling being to permit the optically stimulated luminescence measurements to be firmly tied in with existing palynological data by means of the correlation of pollen compositions. Altogether 19 pollen samples came from the 5 sites in the Russian Steppe, with the sediment being removed from the immediate surroundings of the steel tubes, i.e. in the vicinity of where the gamma dosimetry readings had been made.

Within this project no AMS samples were taken from any of the sites on the Russian Steppe. This is because at Biriuchya Balka and at Kostenki 14 it was felt that an adequate ^{14}C chronology already existed, whilst at Kalitvenka (where no such framework existed) an absence of appropriate materials precluded sampling.

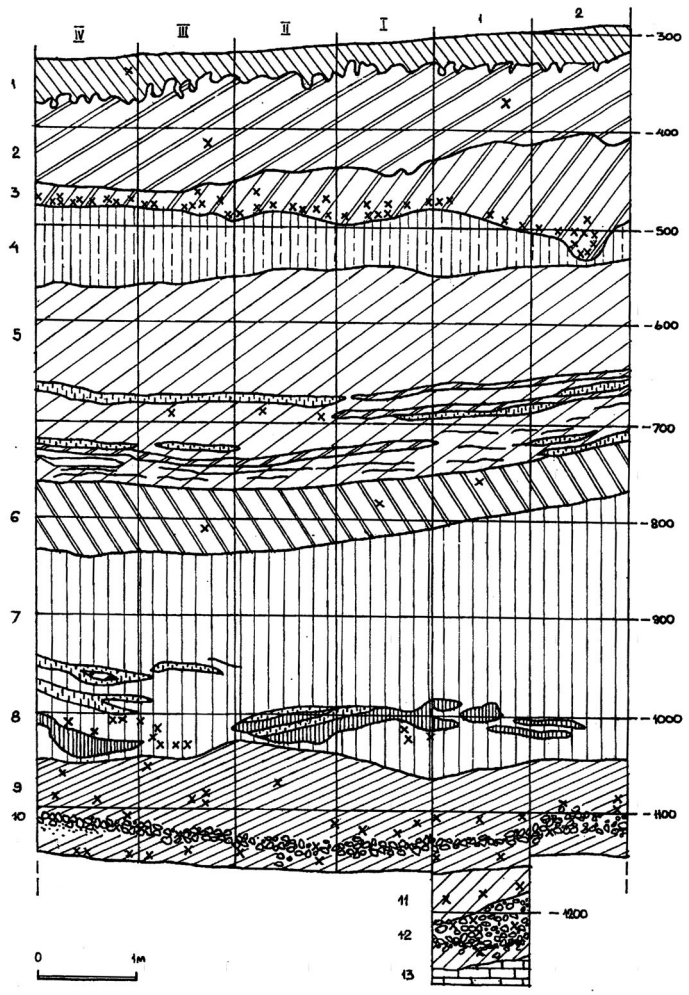


Figure 4.2. Biriuchya Balka 2 section, after Matiukhin (1998)

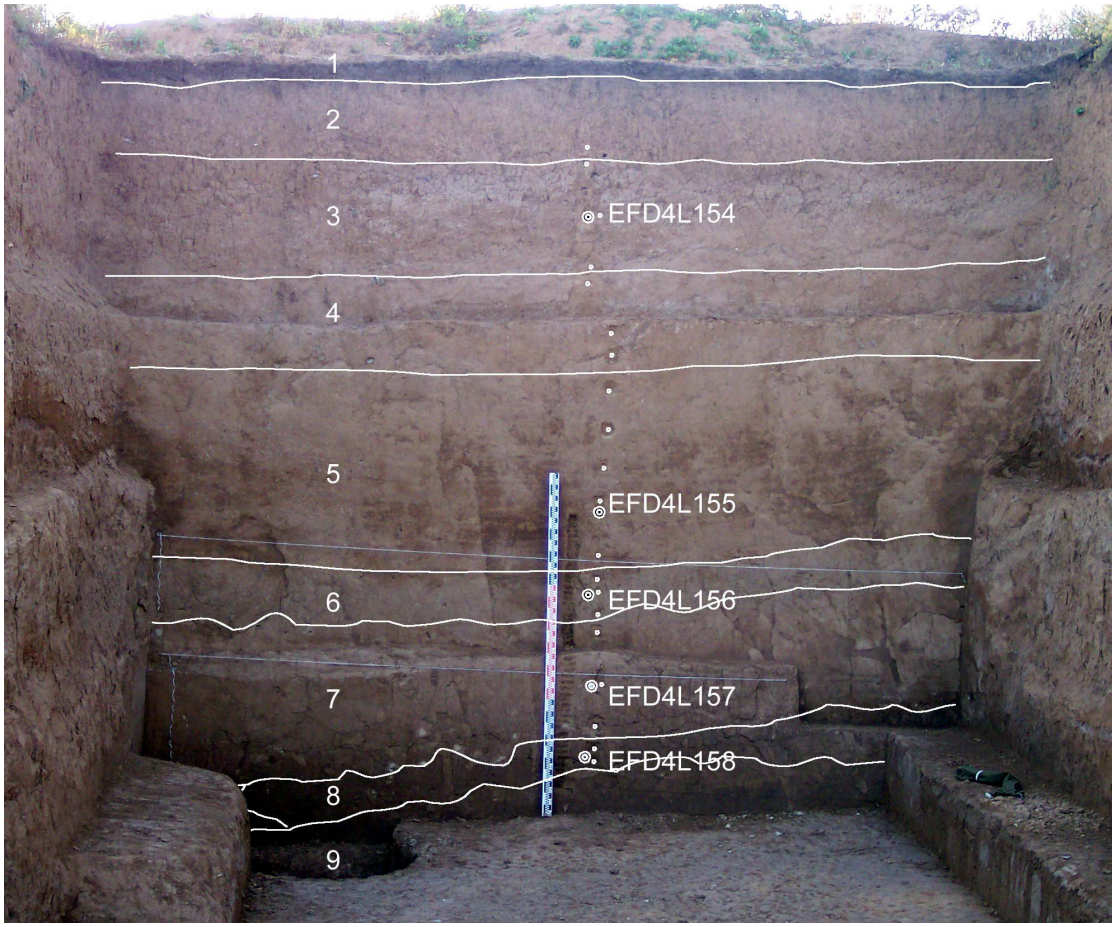


Figure 4.3. Biriuchya Balka 2 main section. Luminescence sampling positions are shown as concentric circles, representing the diameters of the luminescence sampling tube and of the field gamma spectrometer probe. Small circles mark the locations from which small tube samples were taken for luminescence profiling.

Figure 4.4. Biriuchya Balka 2 sondage. Luminescence sampling positions are shown as concentric circles, representing the diameters of the luminescence sampling tube and of the field gamma spectrometer probe. Small circles mark the locations from which small tube samples were taken for luminescence profiling.

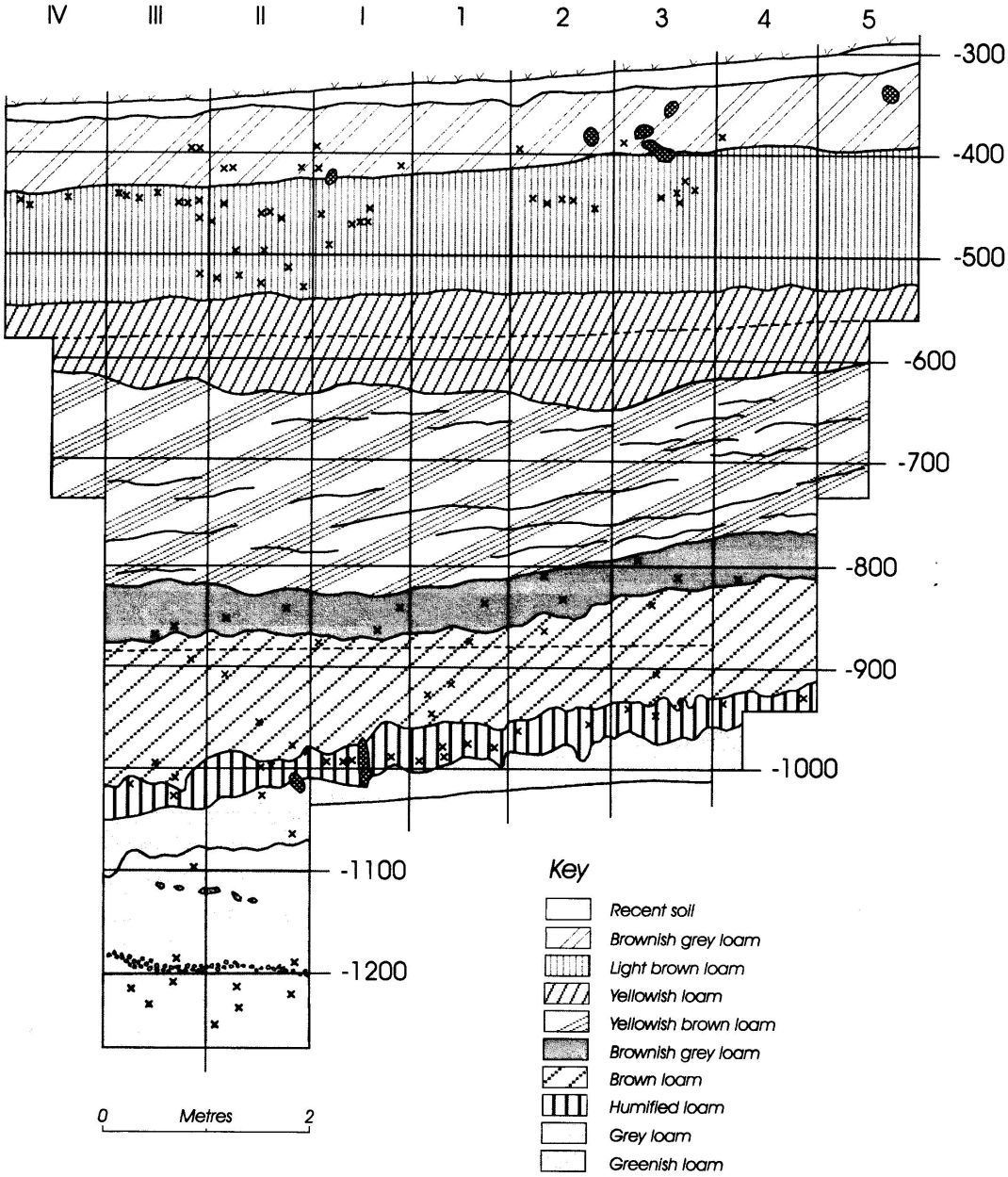


Figure 4.5. Biriuchya Balka 2 section as recorded by Matiukhin in 2004

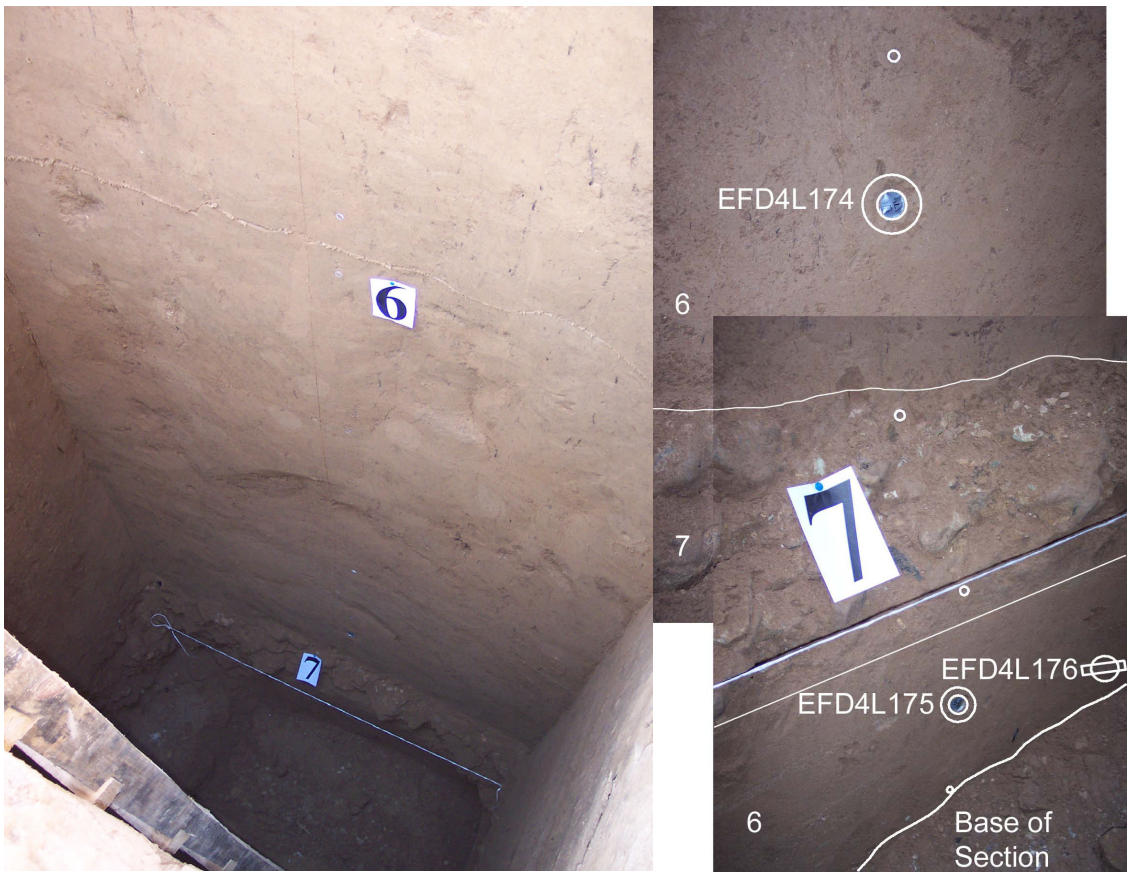


Figure 4.6. Biriuchya Balka 1a. Luminescence sampling positions are shown as circles or rectangles, representing the diameters of the sampling tubes or the sizes of the tins. Larger overlain circles indicate the diameter of the field gamma spectrometer probe. “o” mark the locations from which small tubes of intact sediment were extracted for luminescence profiling.

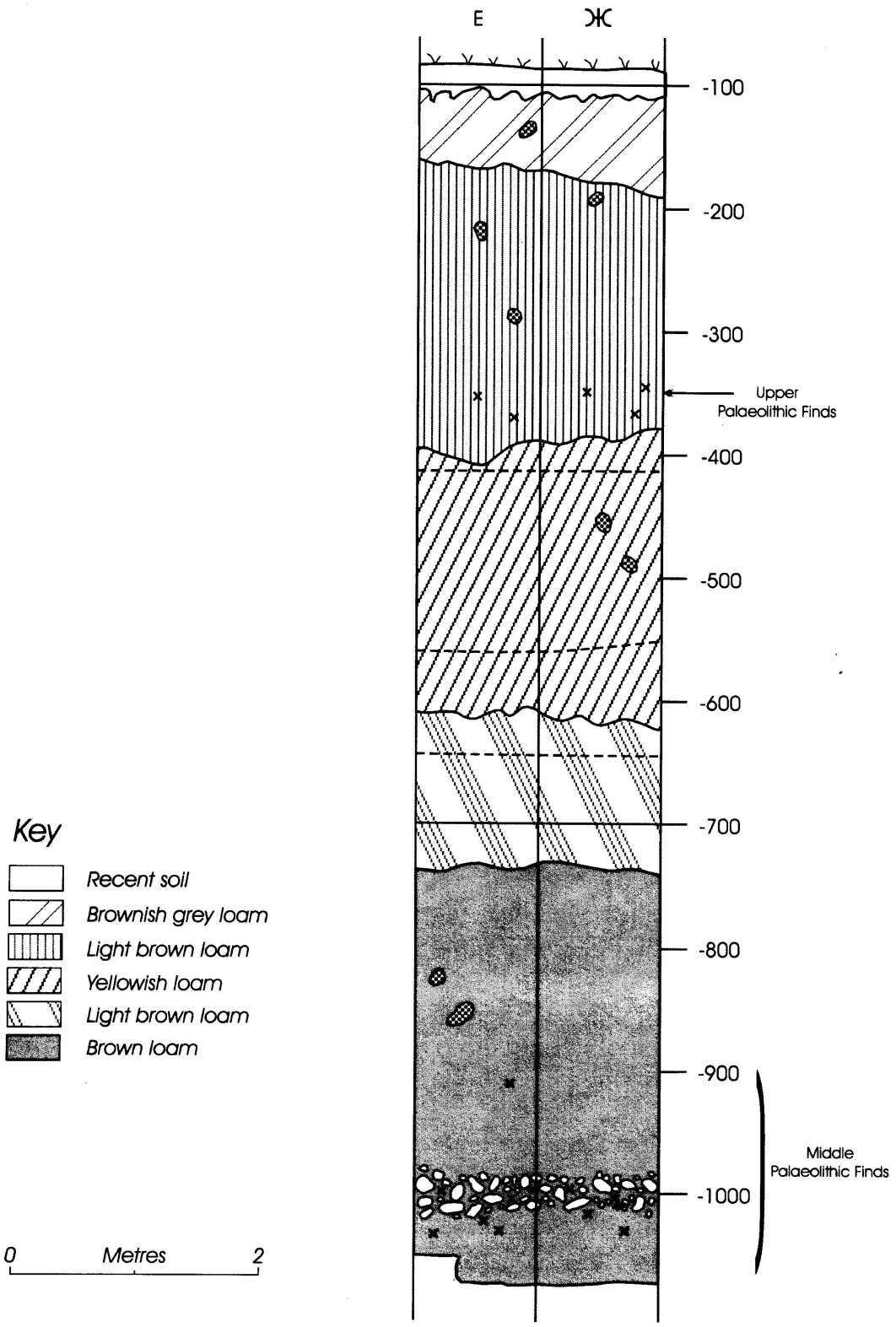


Figure 4.7. Biriuchya Balka 1a section as recorded by Matiukhin in 2004

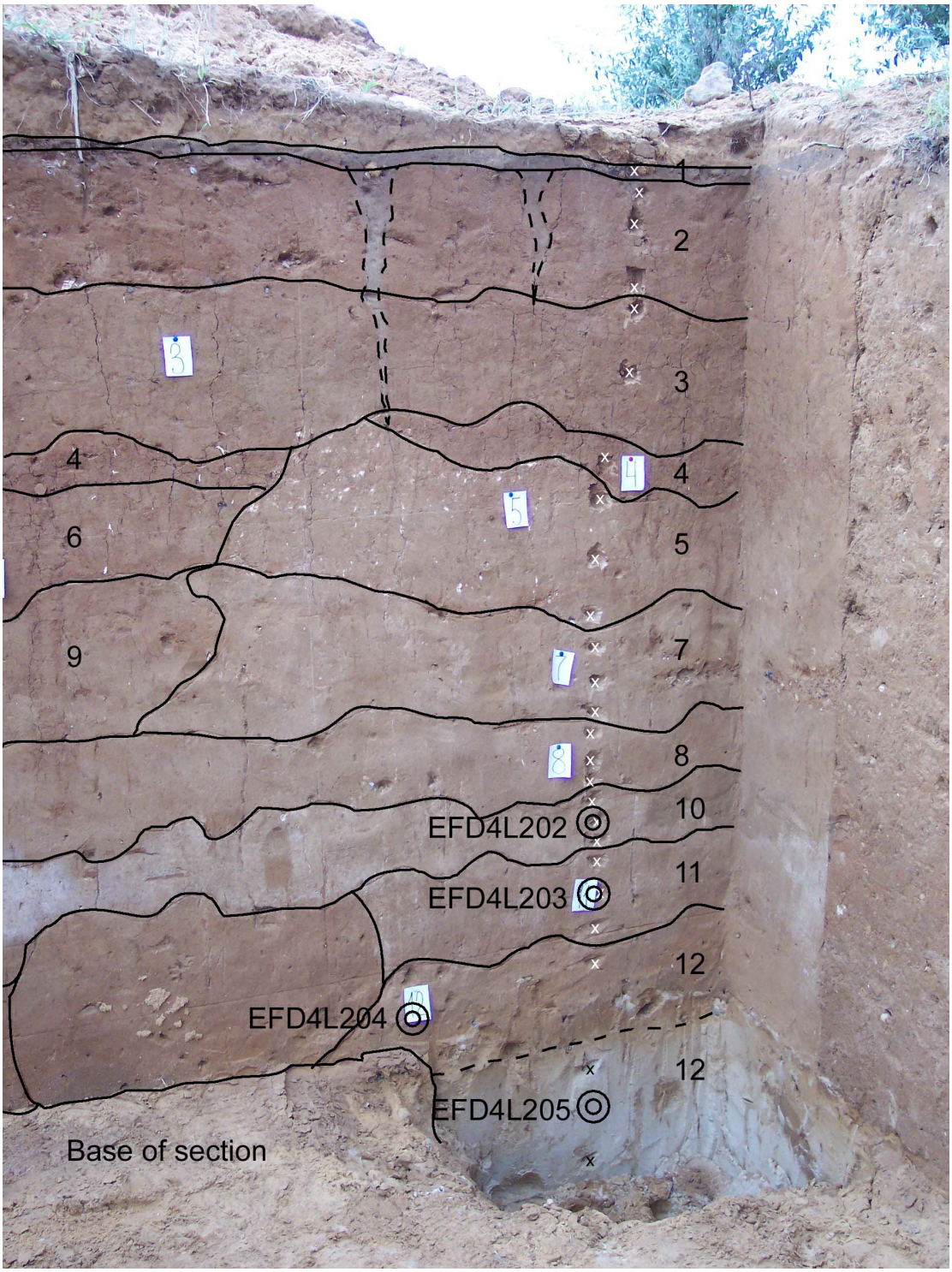


Figure 4.8. Kalitvenka 1. Luminescence sampling positions are shown as concentric circles, representing the diameters of the luminescence sampling tube and of the field gamma spectrometer probe. “x”s mark the locations from which small bag samples were excavated for luminescence profiling.

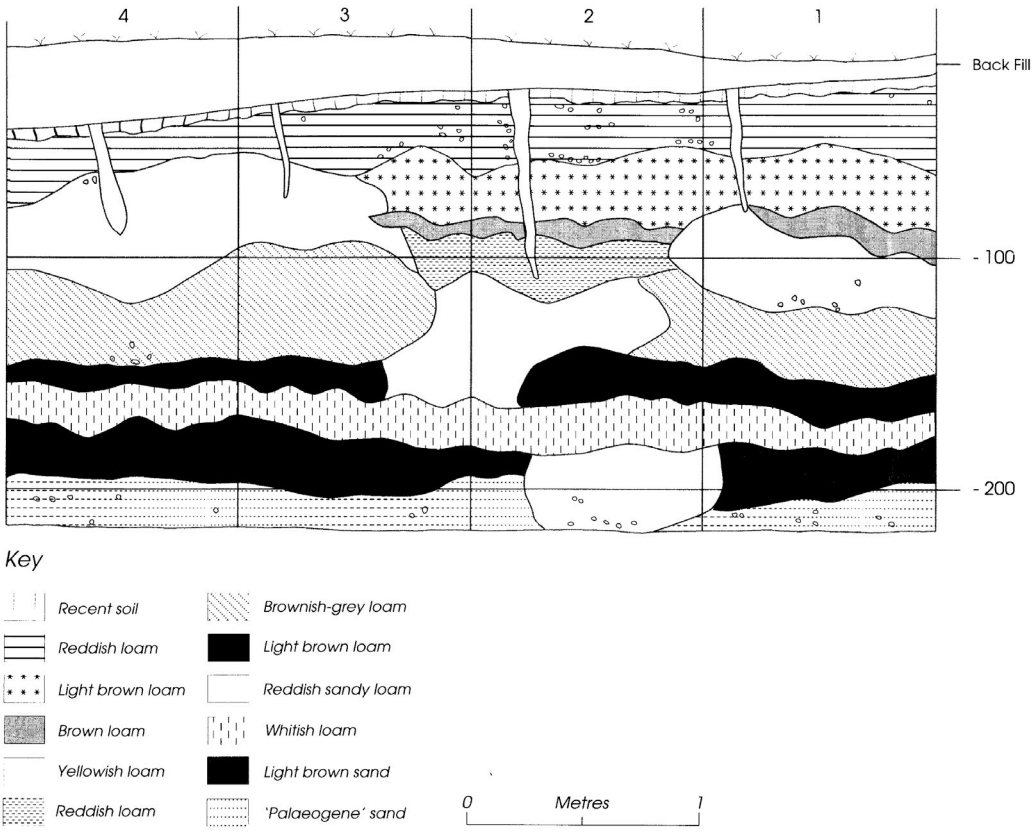


Figure 4.9. Kalitvenka 1 section as recorded by Matiukhin in 2004

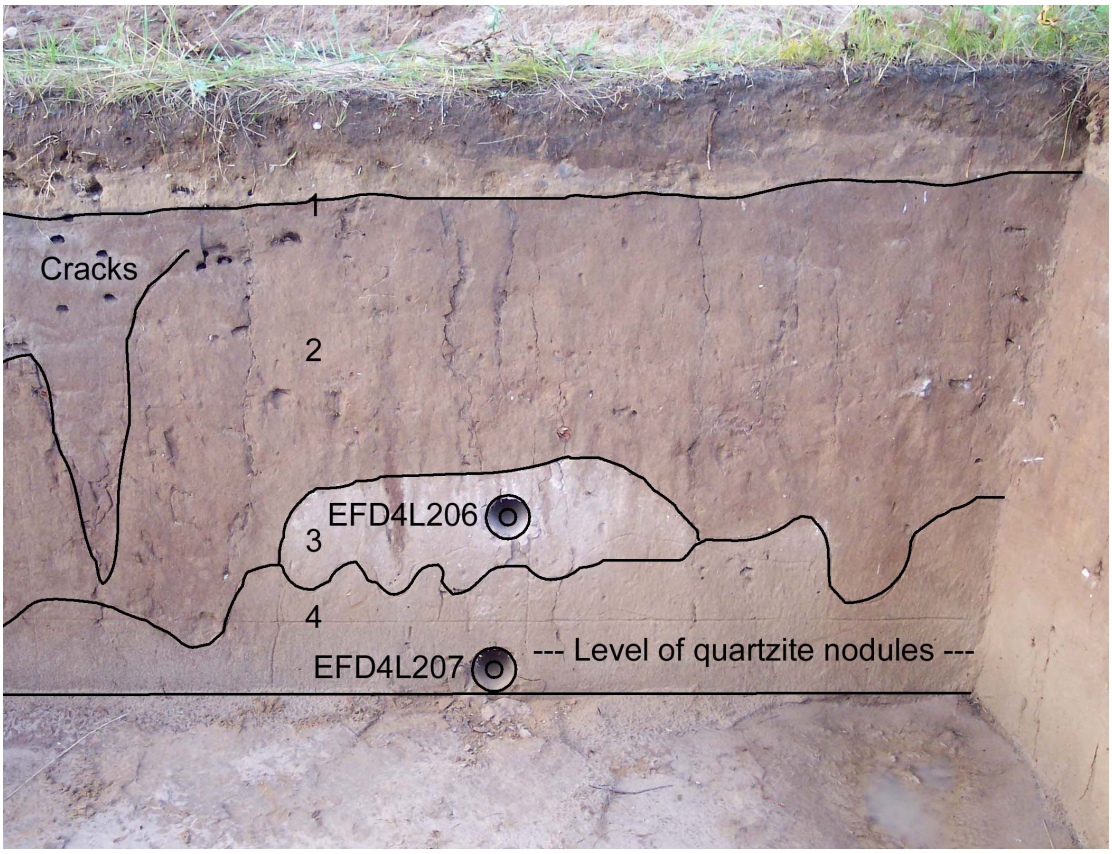


Figure 4.10. Kalitvenka 1v. Luminescence sampling positions are shown as concentric circles, representing the diameters of the luminescence sampling tube and of the field gamma spectrometer probe. Small circles mark the locations from which small tube samples were taken for luminescence profiling.

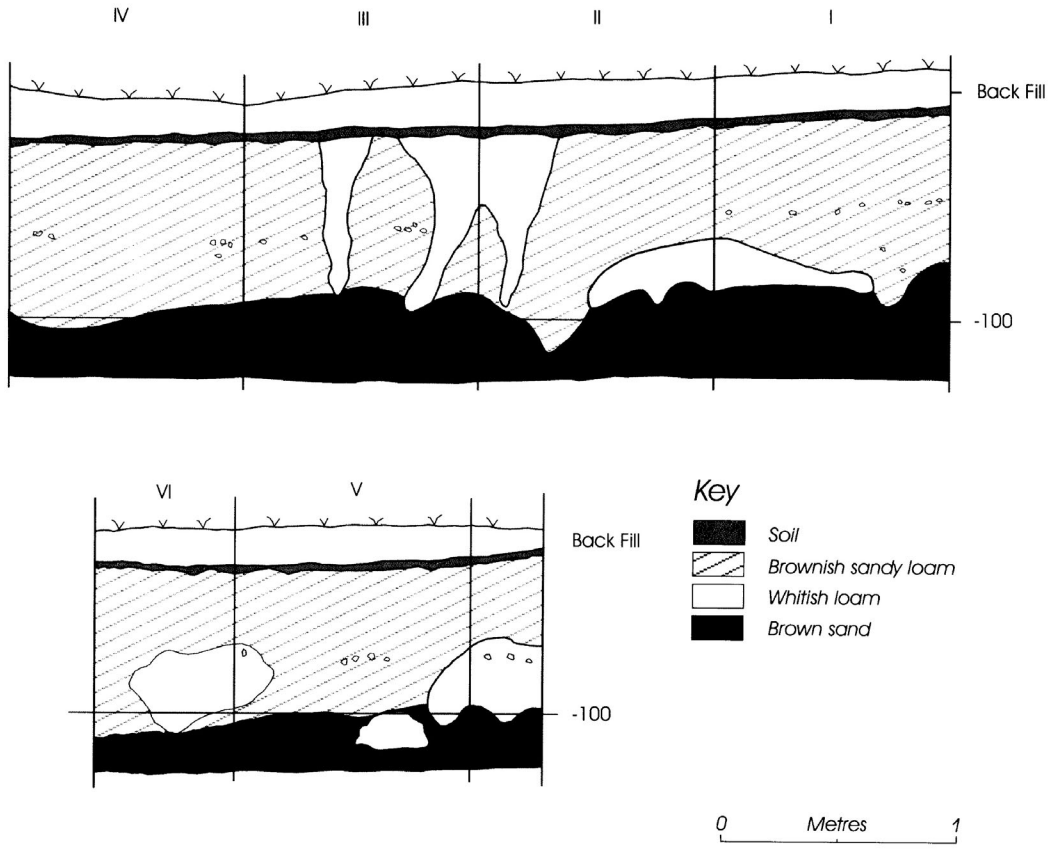


Figure 4.11. Kalitvenka 1v section as recorded by Matiukhin in 2004

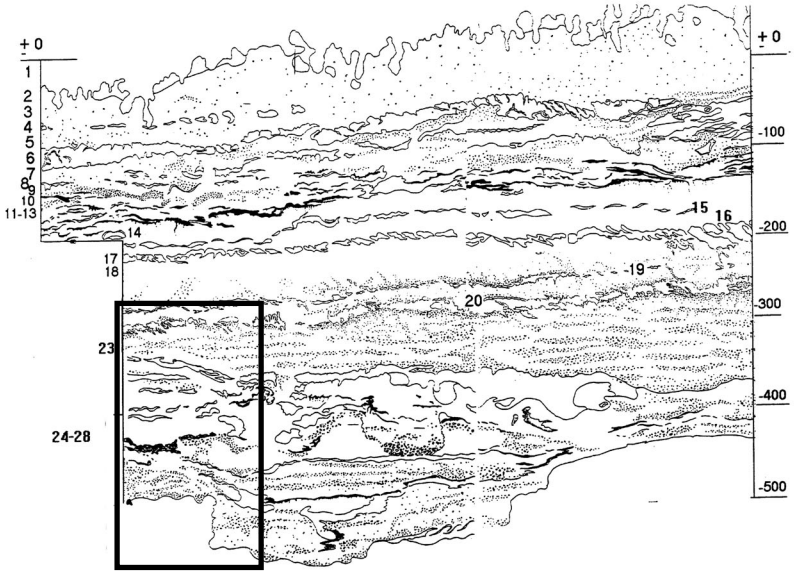


Рис.7. Костенки 14 (Маркина гора). 2002. Раскоп К ...С - 70-77. Разрез восточной стенки по линии 76 -77.
1 -28 - номера стратиграфических слоев.

Figure 4.12. Kostenki 14 (Markina Gora). **a**. South section, **b**. East section. Approximate locations of sections sampled in the present study are shown.

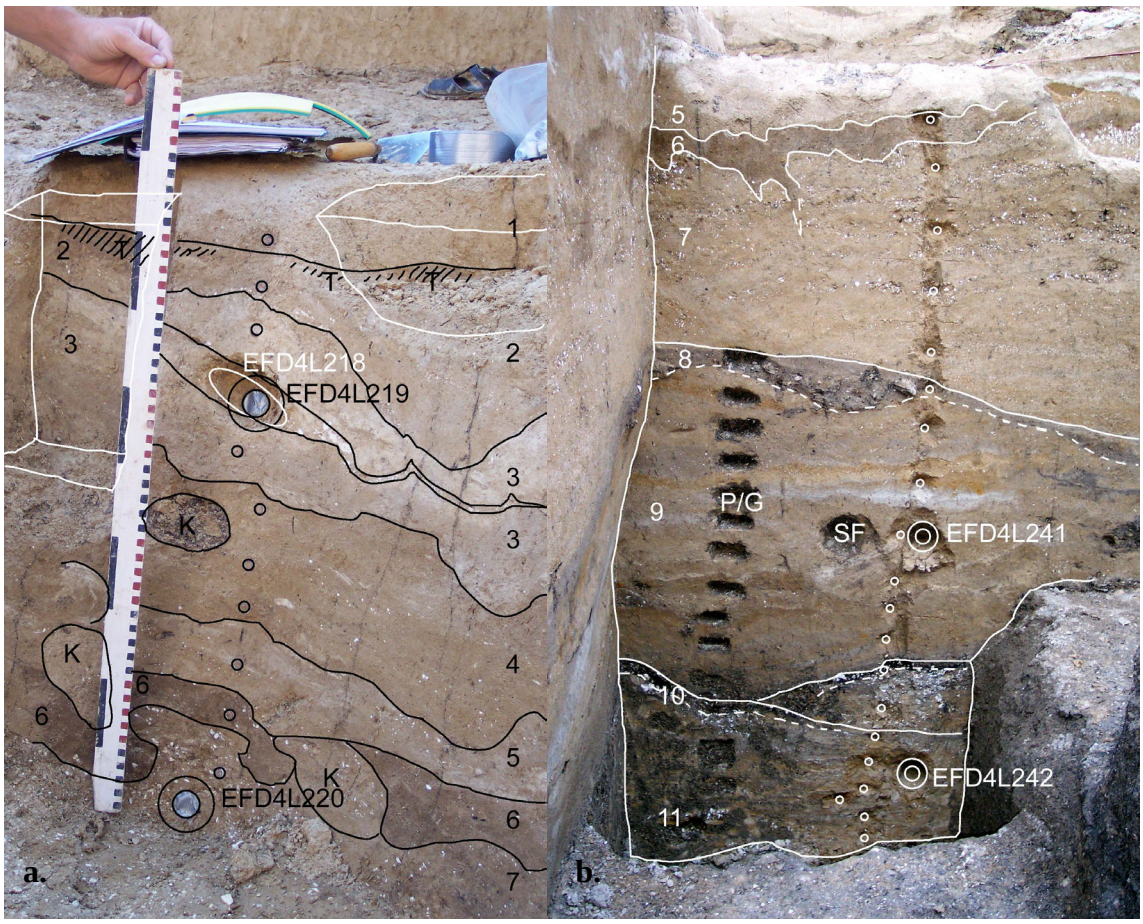


Figure 4.13. Kostenki 14 (Markina Gora). **a**. South section, **b**. East section. Luminescence sampling positions are shown as concentric circles, representing the diameters of the luminescence sampling tube and of the field gamma spectrometer probe. Small circles mark the locations from which small tube samples were taken for luminescence profiling. The oval labelled EFD4L218 represents the location from which material was excavated for a bagged sample.

4.2 Luminescence samples

Luminescence dating samples were generally taken in stainless steel tubes (l = 15 cm, ∅ = 3 cm) (Appendix 4.2). The ends of these tubes were taped to retain the sample material and water following very brief light exposure. In softer/less stony sediments, steel kubiena style tins (12.5 x 3 x 4 cm) were sometimes used. These were particularly advantageous for sampling thin or discontinuous layers, since there was greater assurance that the sample did not cut into other layers. After extraction the tins' lids were used to scrape off the outer layers (of light exposed material) as they were placed. These were taped on to seal the samples.

The tubes/tins were then labelled and sealed in labelled zip-lock bags, with additional loose sediment for gamma spectrometry measurements in the laboratory. This sediment was collected from a 6 cm ∅ hole made around the sampling position using a larger steel "over tube". The resultant hole facilitated placement of a 2" NaI probe for field gamma dose rate measurements (Section 4.3, Appendix 4.3). The zip-lock bags were packed in groups of two or three in labelled and sealed black bags. Other samples are described individually in the text, but were all ultimately packed in labelled and sealed black bags before being packed in a larger black bag containing all samples from the site and/or region.

4.3 Gamma Spectrometry

In situ determinations of gamma dose rate were made by field gamma spectrometry at the point of sampling for all "full" luminescence dating samples (Appendix 4.3). The measurements were conducted using a Rainbow multichannel analyser with a 2" x 2" NaI probe. Gamma emissions were measured in the approximate range 10 – 3072 keV in 1024 channels, such that all emissions from 40K, and the U and Th decay series could be observed. These account for the vast majority of gamma radiation present in a "natural" environment. In situ "infinite medium" gamma dose rates were calculated from counts integrated above energies of 450 keV, above 1350 keV, and from the empirically corrected total energy integral. The proportion of total counts above 450 keV, and above 1350 keV, will be similar for 40K, and the U and Th decay series when they are in secular equilibrium. Thus, in a

mixed field conversion from counts to dose rate can be made directly by integrating above these energies, with little effect from variations in the relative concentrations of 40K, and the U and Th decay series. In the present study conversion was made using factors measured for another but similar instrument, which have been adopted as standard in the SUERC laboratory for 2” x 2” detector dimensions.

The field gamma spectrometry measurements were made for 10 minutes (600 s) each, which yielded counts >450 keV of between 2098 (EFD4G066, Kalitvenka, Layer 12 Lower) and 25484 (EFD4G053, Biriuchya Balka 2, Layer 8). In situ gamma dose rates were calculated by hand following field measurements, using integrated counts above Channel 150, and assuming that the instrument gain setting was correct: i.e. It had not varied since the instrument was last set such that the 40K peak (1461 keV) was at Channel 487, and channel width was thus ~3 keV. Recorded spectra were later processed using proprietary software (“Rainbow 3”), which included energy recalibration to the location of the gamma emission from 40K observed in each spectrum.

For measurement, the NaI probe was generally placed in a 6 cm diameter hole cut around each sampling point using a larger “overtube”. It was not generally possible to drive the tube into the sections the “ideal” distance of 30 cm, which would ensure that no more than ~1% of the detected gamma field would come from outside the sampled section. However, hole depth and the approximate geometry of the sediments around the measurement points was assessed and recorded. It was ensured that hole depth was sufficient for the large majority (>~90%) of the detected gamma field to come from sediments in the immediate vicinity of the luminescence sampling point. The relatively enclosed nature of the sections being sampled ensured that the remainder of the field would be close to an average for the section, such that averaging effects of no more than ~3% might be expected. Since this is less than other expected sources of uncertainty, no attempt was made to correct for it. Other sources of uncertainty in the dose rates include: the accuracy of the dose rate conversion factors, instrument reproducibility (over and above counting statistics), variations in the water content during burial, and U-Series disequilibrium effects. The instrument related factors are currently being assessed, and the sample-related factors will be assessed in the laboratory. The dose rates quoted in this report should thus be regarded as preliminary, but are likely to be correct within uncertainties of ~5%.

4.4 Tephra, Magnetic Susceptibility, Sedimentary and Pollen Samples

4.4.1 Tephra, Magnetic Susceptibility and Sedimentary Samples

The samples taken for tephra, magnetic susceptibility and sedimentary analysis consisted of loose sediment scraped with a knife from a cleaned prepared vertical section and placed into zip-locked polythene bags. Sampling was contiguous and normally covered 5 cm of sedimentary accumulation although this had to be adjusted on occasion to take account of layer boundaries in order to avoid mixing material from separate units. During sampling the larger clasts were generally excluded in favour of fine-grained sediment, since the latter was deemed more suitable for the intended analyses.

4.4.2 Pollen samples

Within this project sampling for pollen was, in general, limited since most of the sites had already been palynologically studied and it was felt that there was little need, or resource, to duplicate the earlier findings. However, because the sections we were sampling were commonly not those that had been palynologically studied, it was deemed advantageous to take new samples in order to permit correlation of the OSL determinations with the proxy environmental and climate pollen data. With this in mind individual zip-locked polythene bags of sediment were recovered from around the locations where the OSL steel tube samples were sited.

4.5 Pre sampling site reviews (by Allsworth-Jones, with some post sampling revised stratigraphies by Housley)

4.5.1 Biriuchya Balka

The initial information which we had available concerning this group of sites was contained in A.E. Matiukhin's article in *L'Anthropologie* (1998), and the first summary was written on that basis. This database was supplemented and modified thanks to information received in the field in 2004. In the first place, two new sections at Biriuchya Balka 2 and 1a were prepared and drawn by Matiukhin, and the samples taken were recorded by reference to these new sections. Secondly, he gave us details of 6 new AMS dates for the sites, and the text of a manuscript by Guskova and Iosifidi in which their reasons for detecting the Kargapolovo excursion at Biriuchya Balka 2 were explained (see below). In addition, we have now received copies of some more recent articles by Matiukhin (2002, 2003, 2004 a and b) which add significantly to the published information about these sites. The communication which he gave to the Kostenki conference in 2004 mentioned the radiocarbon dates and their context. The section of Biriuchya Balka 2 which he published in 2002 (in ed. Sinitsyn *et al*., Figure 2, p. 85) indicated the position of the archaeological horizons in relation to the identified geological layers. [The only confusing point here being that archaeological horizon 3a is placed in geological layer 5 rather than 3, though elsewhere it is said or implied that it is in layer 3 above archaeological horizon 3]. The revised account below takes account of all this information as far as possible.

Biriuchya Balka (Konstantinov region, Rostov district, near the village of Kremenskoi) is a ravine on the left (east) bank of the Severskii Donets River, along which until recently a stream did flow. 8 sites have been investigated over a distance of about 2.5 km on the left (south) side of this ravine (*L'Anthropologie* 1998 Fig. 2: (Figure 4.14) the numbering of the sites on the map does not correspond to the numbers used by the excavator A.E. Matiukhin, thus for example map numbered site 6 = excavated site 2). In general, the deposits are said to consist of marl overlain by loamy layers 6-13 m thick. The first site was discovered in 1976 by N. D. Praslov, the remainder have been investigated by Matiukhin in 1987-1993 and 1997. The principal site, and that which has been reported in most detail, is Biriuchya 2 (*L'Anthropologie* 1998 Fig. 3) (Figure 4.15). The geology of this section, and also

Biriuchya 2b (5 on the map), has been studied by S. V. Khrutskii (Voronezh State University of Agronomy), but details of his study are not currently available. The palynology of the upper part of the section has also been studied by G. M. Levkovskaya (St Petersburg Institute of Archaeology). She identified 9 palynological horizons, but again her report is not currently available; the summary of her work given by Matiukhin is not complete, and the correlation with his layers is not entirely clear.

4.5.1.1 Biriuchya Balka 2 Stratigraphy

The site has been excavated over an area of 70 square metres. The stratigraphic succession in the eastern section as described by Matiukhin (1998) was as follows. His layer numbering has been observed. The total thickness of deposits was about 9.5 metres. In terms of the measurements written at the side of the section, it extended from 300 to 1250 cm, which implies that zero is situated at a point somewhere higher up. In his account published in 1998, there were said to be 5 Upper Palaeolithic levels and 5 Middle Palaeolithic levels, but this has since been revised (see below). The radiocarbon dates and information about the archaeological levels subsequently published by Matiukhin is included in this description.

(1) Present day soil. Neolithic. Archaeological level 1.

(2) Light brown loam (suglinok). Upper Palaeolithic level 2. The Upper Palaeolithic level contains a few animal bones but no traces of hearths. There are some burnt flints. Some also have traces of polishing (due to natural factors). Pollen predominantly NAP, indicative of steppe conditions.

(3) Brownish loam, irregular lower boundary, implied solifluction. Industry is described as Upper Palaeolithic, one of the richest horizons, 10-15 cm thick. As already mentioned, the levels here should be 3a and 3. Some artefacts are patinated on one side only, some pseudo-retouch. Pollen said to indicate two phases, moving from predominantly AP (same species as in layer 6, plus birch) to predominantly NAP, grasses and shrubs. There are two AMS dates with indicated depths, one on charcoal of 26630 ± 230 uncal BP (Beta-183588) from a depth of 444 cm associated

with archaeological horizon 3a, and one on bone of 31560 ± 200 uncal BP (Beta-183589) from a depth of 540 cm associated with archaeological horizon 3. There is also mention of a third AMS date on bone from layer 3 of 26390 ± 200 uncal BP (Beta-177776), though no detailed provenance is recorded (Matiukhin 2004b).

(4) Yellowish loam.

(5) Yellowish loam. Industry is Upper Palaeolithic, possibly with two subdivisions [as already mentioned, these were referred to as levels 3 a and b in 2002]. No indication concerning what the lenses in this layer might represent. Pollen predominantly NAP.

(6) Brownish grey loam. Archaeological level 3v. In 1998, this was said to be Upper Palaeolithic, one of the richest horizons, and the first at this particular site. Artefacts show some signs of rolling, with pseudo-retouch. Nonetheless, Matiukhin states that (in general) there has been no significant movement of artefacts at Biriuchya Balka, and that this has been demonstrated by refitting. Fossil soil, slightly displaced, was said to equate with the Bryansk interstadial (27-30 ka BP), although it is not clear whether this identification would now be maintained in view of the radiocarbon dates and the reclassification which the industry has undergone. Pollen is predominantly AP, with deciduous species, including elm, alder, and hazel. In 2002, Matiukhin listed 7177 artefacts from level 3v (2002, Table 3.5) of which 44 were tools, but he stated that “the cultural appurtenance of this industry remains unclear in view of the absence of diagnostic forms, in particular complete bifacial projectile points” (2002, 97). In 2004, he was prepared to list it as a Mousterian level with a question mark (2004b, 112).

(7) Brown loam. Archaeological levels 4’ and 4. Both Middle Palaeolithic. There is an AMS date (Beta-183590) on bone of 40750 ± 970 uncal BP at a depth of 860 cm from zero, which (in terms of the depths written at the side of the section) should correspond to the top of this layer and is said to be associated with level 4’. The archaeological levels contain some animal bone fragments (almost entirely bison) and traces of hearths.

(8) Very thin lenses of humic clay, within (7), said to represent a partially displaced fossil soil. A supposedly 'too young' ^{14}C date on bone of 30330 ± 360 uncal BP (Beta-183591) has come from a depth of 1050 cm in this layer.

(9) and (11) Marshy alluvial deposits, with intercalated limestone rubble horizons (10) and (12). Three Middle Palaeolithic levels were identified in layers 9, 10, and 11, labelled 5, 5b, and 5v. In layer 10, Middle Palaeolithic level 5b is 70-80 cm thick, and contains some traces of hearths. The artefacts here and in the level beneath are slightly worn. Both contain some Levallois flakes. There is a palaeomagnetic reading at a depth of 1190 cm from zero, which (in terms of the depths written at the side of the section) corresponds to layer 11 (Middle Palaeolithic level 5v). The reading corresponds to Kargapolovo and is estimated at 46 ka BP (see report by Guskova and Iosifidi, below).

(13) Marl (weathered limestone) bedrock.

4.5.1.2 Revised Biriuchya Balka 2 stratigraphy based on 2004 excavations

See the new section from 2004 (Figure 4.16). Layers (1) to (7) and (9) remain as before, including layer (6) which is thought to represent a fossil soil horizon. Layer (8) is much more substantial. Rather than being lenses of a partially displaced fossil soil it is now thought to be an *insitu* fossil soil. The new layer (10) takes in what were previously layers 10, 11 and 12. The line of rubble in the new section is thought to equate with the previous layer 12, hence upper 10 (2004) equates with layers 10 and 11 (*L'Anthropologie*) whilst lower 10 (2004) has no direct comparable deposit in the previously published section. The situation can be summarised as follows:

L'Anthropologie article	**2004 section**
1: Present day soil. Arch horizon 1	1: Present day soil
2: Light brown loam, Upper Palaeolithic horizon 2	2: Brownish-grey loam, Upper Palaeolithic horizon 2
3: Brown loam, rich Upper Palaeolithic horizons 3a and 3	3: Light brown loam, rich Upper Palaeolithic horizons 3a and 3
4: Yellowish loam	4: Yellowish loam
5: Yellowish loam, Upper Palaeolithic – possibly two divisions	5: Yellowish brown loam colluvium
6: Brownish grey loam, fossil soil, Upper Palaeolithic horizon 3v	6: Brownish grey loam, fossil soil, Middle Palaeolithic (?) horizon 3v

7: Brown loam, two Middle Palaeolithic horizons, 4' and 4	7: Brown loam, two Middle Palaeolithic horizons towards base
8: Very thin humic clay lenses	8: Humified loam soil, Middle Palaeolithic horizon
9: Alluvium, Middle Palaeolithic horizon 5	9: Grey alluvium, Middle Palaeolithic horizon
10: Rubble, Middle Palaeolithic horizon 5b	10 Upper: Greenish alluvium with Middle Palaeolithic tools
11: Alluvium, Middle Palaeolithic horizon 5v	
12: Limestone Rubble	Limestone Rubble lens in layer 10
	10 Lower: Greenish alluvium with Middle Palaeolithic tools
13: Marl (weathered limestone) bedrock	Not observed

4.5.1.3 Biriuchya Balka 1a

Mapped site 3. In 1998, no detailed description of stratigraphy. Section 10 metres thick. Upper deposits similar to Biriuchya 2 in general. Five Upper Palaeolithic levels in layers 5, 6, and 8. Some traces of pseudo-retouch. Not much fauna, but there is mention of a bison mandible at one point. No marshy alluvial unit at the base. But there is a yellow and brown clayey soil with a marl crust covering Middle Palaeolithic artefacts. These constitute two levels in two layers. Level 4 (layer 16) is *insitu*. Level 5 (layer 18) has been displaced in limestone rubble.

4.5.1.4 Revised Biriuchya Balka 1a stratigraphy based on 2004 excavations

See the section drawing from 2004 (Figure 4.17). The description of the sequence, following indications by Matiukhin, is as follows.

(1) Recent soil
(2) Brownish grey loam
(3) Light brown loam, Upper Palaeolithic horizon with a supposedly 'too old' AMS date on bone of 36000 ± 280 uncal BP (Beta-183587) at a depth of 376 cm.
(4) Yellowish loam, sterile layer
(5) Light brown loam, sterile layer
(6) Brown loam, below 900 cm a few Middle Palaeolithic stone tools are encountered.
(7) Limestone rubble layer, within layer 6, with large nodules of black flint. Matiukhin thinks that this correlates with the upper rubble layer at Biriuchya

Balka 2 (layer 10 in *L'Anthropologie* article). Associated with a small collection of fresh non-weathered Middle Palaeolithic stone tools.

Some more details were given of the archaeological succession by Matiukhin (2004b). There were said to be six Upper Palaeolithic horizons and three Middle Palaeolithic. Upper Palaeolithic layers 3 and 3a respectively contained more than 10,000 and more than 15,000 artefacts, though the proportion of tools as at Biriuchya Balka 2 was small. Matiukhin stated that he no longer linked the Upper Palaeolithic at these sites with the Streletskaya culture (as at Kostenki) but considered them to be part of a more general (probably convergent) phenomenon.

4.5.1.5 Biriuchya Balka 1b

Mapped site 2. No detailed description of stratigraphy, said to be similar to 1a. 16 square metres excavated. Upper Palaeolithic level situated in layer 7, 2.8 metres from the surface, at the top of a brownish clayey fossil soil. Traces of hearths. Many burnt flints.

4.5.1.6 Biriuchya Balka 1v

Mapped site 1. Excavated to 7 metres depth without reaching bedrock (*L'Anthropologie* 1998, section at Figure 4.17). 18 square metres excavated. Section shows seven layers, no detailed description, said to be similar to the preceding. Layer 6 is a fossil soil, equated with Bryansk. The lower boundary is uneven; sand, gravel, and pebbles indicate some displacement. Layer 7 is a brown loam, containing Upper Palaeolithic artefacts. Since this level is below the fossil soil, it is considered to be older than the earliest Upper Palaeolithic in layer 6 (?) at Biriuchya Balka 2, and therefore the oldest at this group of sites as a whole. Some of the tools are patinated on one side only, and there is some polishing (due to natural causes) and some pseudo-retouch. There are many burnt flints.

4.5.1.7 Other sites

Site 1 (mapped 4) was the one excavated by Praslov in 1976. Three sparse Upper Palaeolithic levels were found. Site 2a (mapped 7) has one Upper Palaeolithic and one Middle Palaeolithic level. Site 2b (mapped 5) has a 13 metre thick profile,

with 8 archaeological levels, 6 Upper Palaeolithic and 2 Middle Palaeolithic. This is the second profile that has been studied by S. V. Khrutskii. Site 3 (mapped 8; the only one not in the side of the ravine) was excavated by means of three test pits, in an endeavour to find the source of the raw material used at the sites. One Upper Palaeolithic and one Middle Palaeolithic level.

4.5.1.8 General characterisation of the sites

All of the localities are regarded as workshop rather than habitation sites, despite the fact that the local flint is of rather poor quality. Finished tools account for only 1% of the inventory. In so far as cultural affinities can be discerned, the presence of triangular shaped points originally suggested a comparison between the Upper Palaeolithic assemblages and the Streletskaya culture. This was first suggested by Matiukhin for Biriuchya Balka sites 2 and 1v at least, although he left the question open for sites 1a and 1b, and, as mentioned above, he has now become more sceptical about this anyway. No specific comparisons are made with regard to the Middle Palaeolithic, although the presence of the Levallois technique is noteworthy.

4.5.1.9 Comments

From the archaeological point of view, it is important that we have superposition of Upper and Middle Palaeolithic at these sites (Biriuchya Balka 2, 1a, 2a, 2b, and 3). This is not so common in the Russian plain. At Kostenki for example there is no Middle Palaeolithic, and the majority of the cave sites we are dealing with in the Caucasus and the Crimea contain only Middle Palaeolithic deposits. It is a weakness, as the excavator says, that so little has yet been done at these sites from a geological or palaeoenvironmental point of view. It is obviously important that we should try to get a date for the basal deposits with Middle Palaeolithic levels, but a date for the initial Upper Palaeolithic would also be useful. The supposed Bryansk fossil soil seems to be a significant stratigraphic marker at two sites (Biriuchya Balka 2 and 1v) at least, and the earliest Upper Palaeolithic here marks a *terminus ante quem* for our study.

First version 12 June 2004; final revision 26 August 2005.

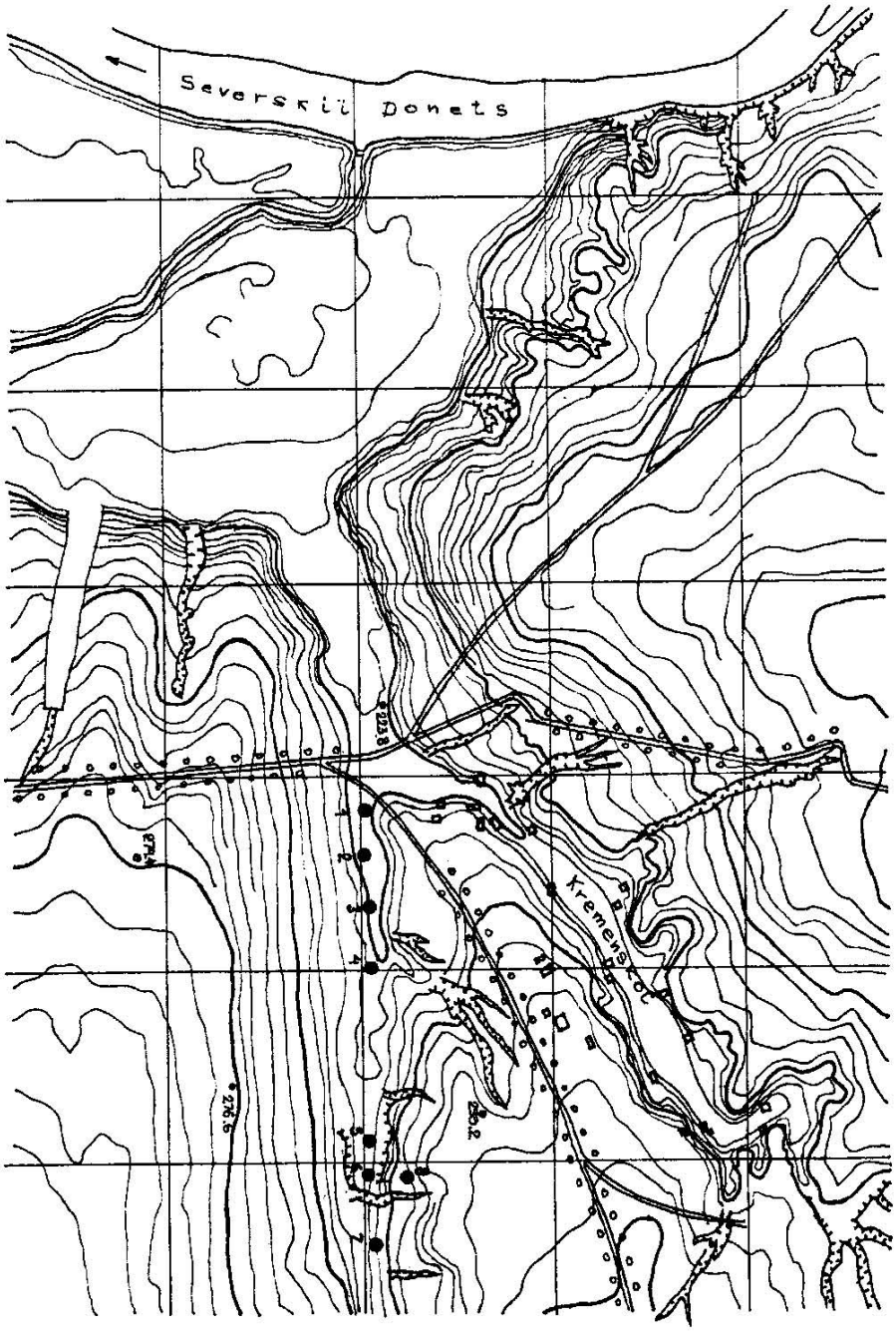
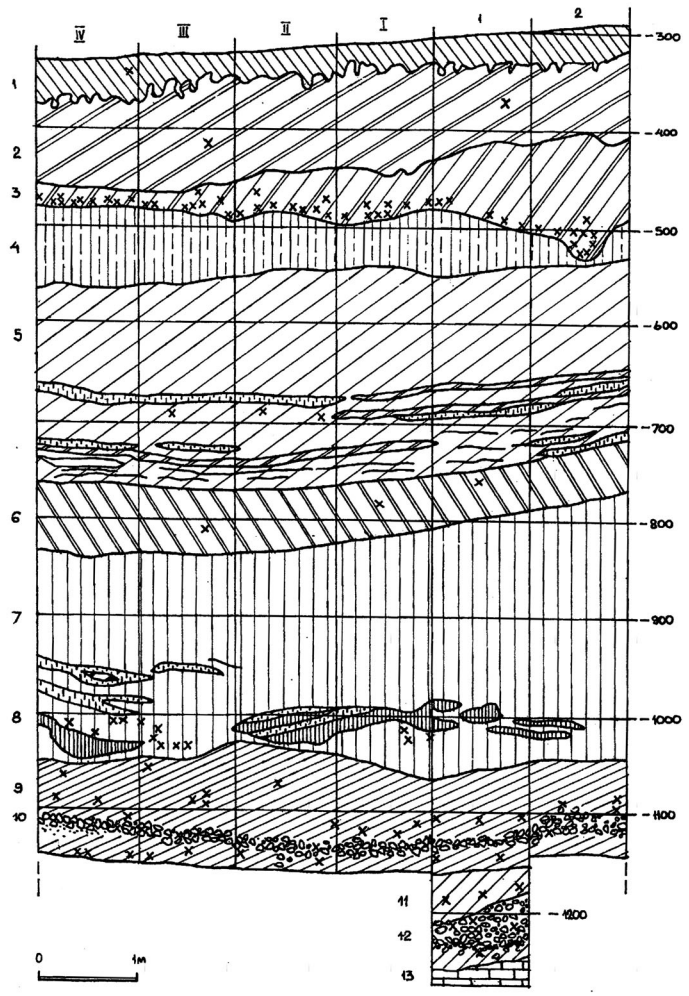


Fig. 2. — Position topographique des sites dans le ravin de Birioutchya. 1 : Birioutchya 1v ; 2 : Birioutchya 1b ; 3 : Birioutchya 1a ; 4 : Birioutchya 1 ; 5 : Birioutchya 2b ; 6 : Birioutchya 2 ; 7 : Birioutchya 2a ; 8 : Birioutchya 3.

Fig. 2. — *Topographic location of the sites. 1: Birioutchya Iv; 2: Birioutchya 1b; 3: Birioutchya 1a; 4: Birioutchya 1; 5: Birioutchya 2b; 6: Birioutchya 2; 7: Birioutchya 2a; 8: Birioutchya 3.*

Figure 4.14. Map showing the location of the various sites within Biriuchya Balka, after Matiukhin (1998, page 469, Fig. 2)



. — Birioutchya 2. La stratigraphie des dépôts (voir la description de la coupe dans le texte).

. — *Birioutchya 2. Stratigraphy of deposits (see description of the cross-section in the text).*

Figure 4.15. Biriuchya Balka 2 section, after Matiukhin (1998, page 471, Fig. 3)

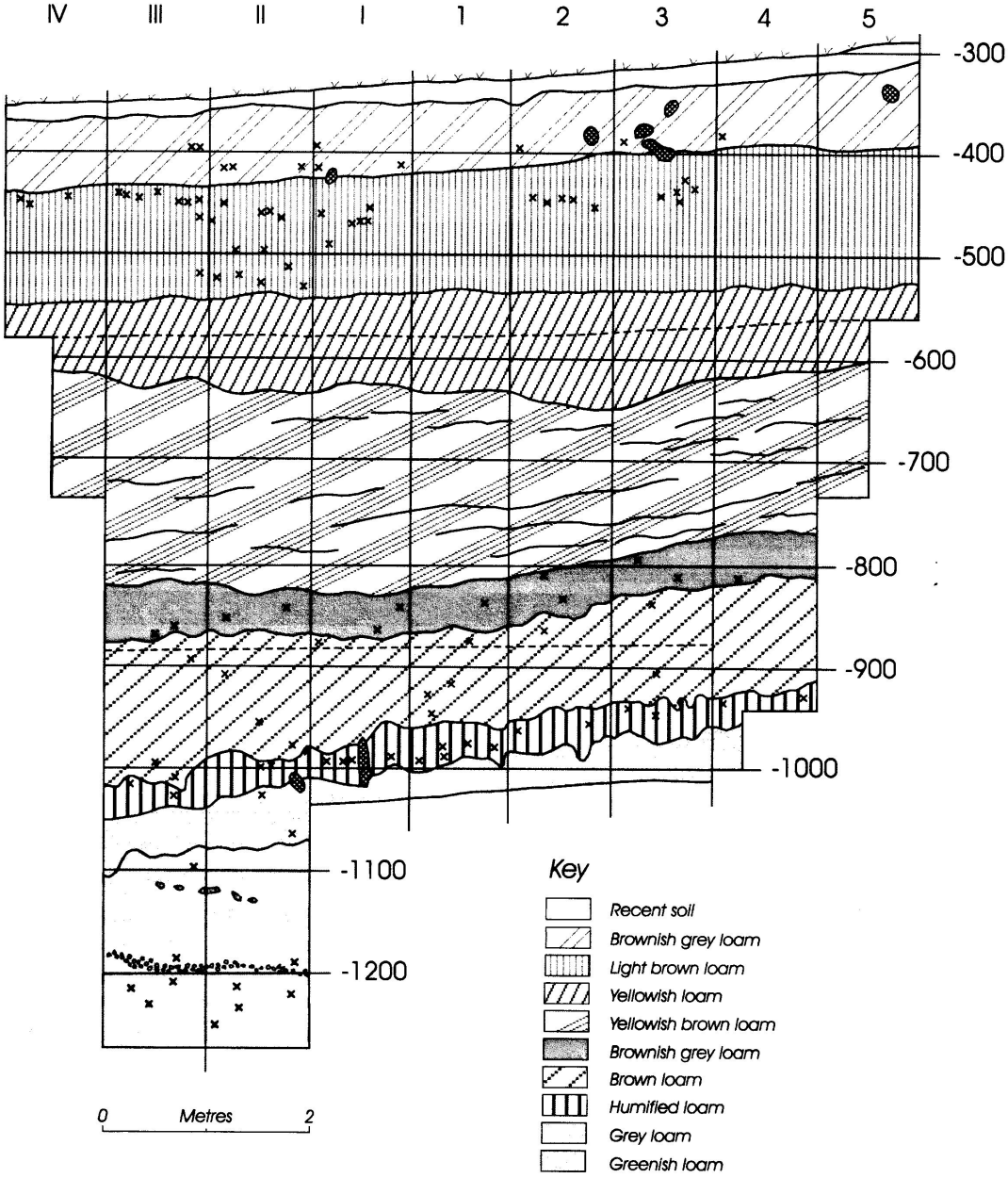


Figure 4.16. Biriuchya Balka 2 section as recorded by Matiukhin in 2004

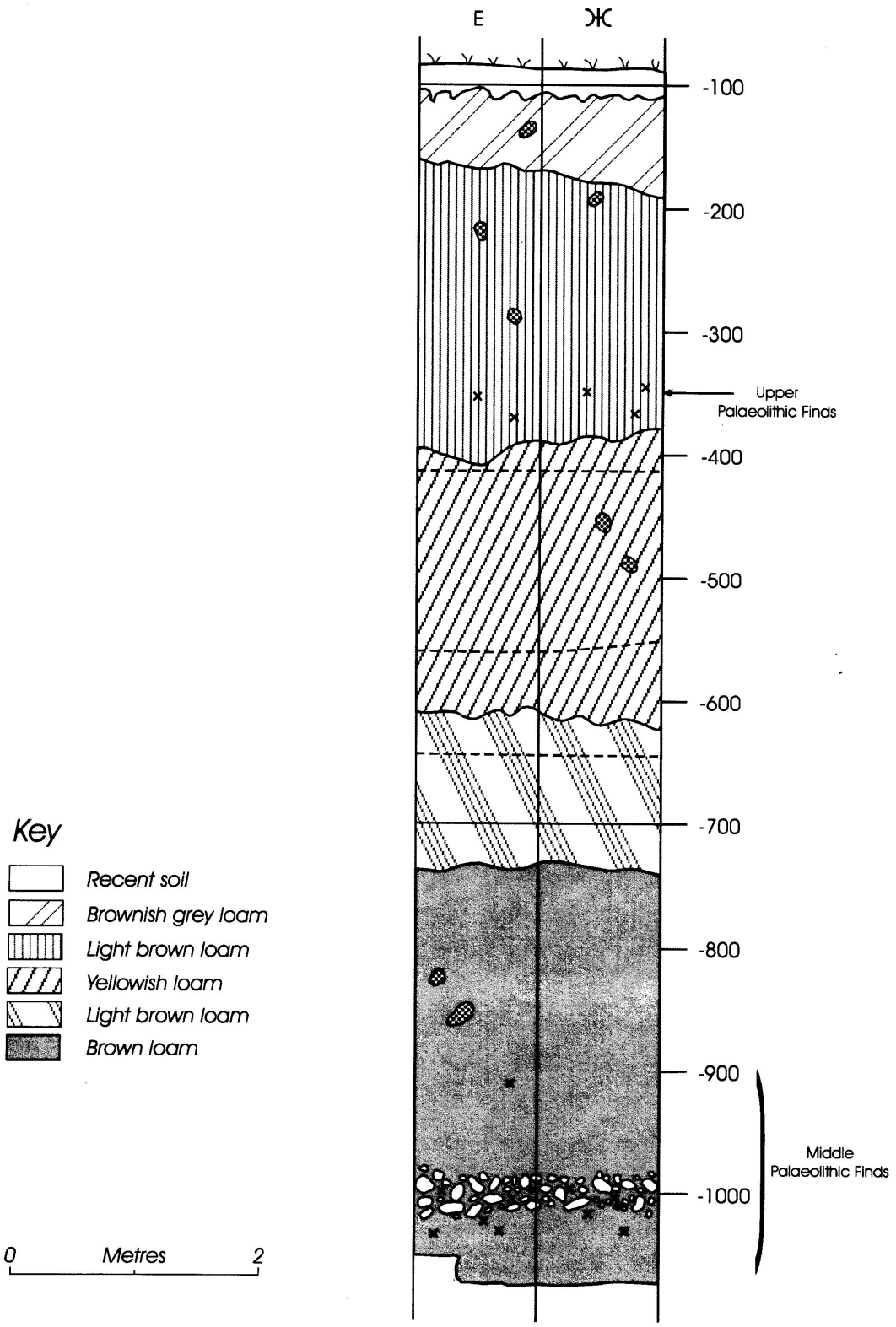


Figure 4.17. Biriuchya Balka 1a section as recorded by Matiukhin in 2004

4.5.2 Palaeomagnetic investigations at Biriuchya Balka 2 (2003)

Manuscript 2004

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A.G. Iosifidi (All-Russian Oil Industry Scientific Research and Geological Investigation Institute St Petersburg)

4.5.2.1 Summary

104 samples were taken in 2003 from the northern section at BB2 at depths from 925 to 1205 cm (a 280 cm column). All except 5 samples were taken in glass ampoules. Five (nos. 98, 100, 101, 103, and 104) were taken in aluminium containers, but the results from these samples were not considered satisfactory. The primary measurements carried out were as follows.

1. changes in magnetic susceptibility [K, x 10^{-3} SI units]
2. natural remanent magnetism [J_n, mAm/m]
3. declination [D, °]
4. inclination [I, °]

From the top down, values for the first two measurements were as follows.

Samples	K	J_n	Layer
1-22	0.4	15	reddish brown loam
23-83	0.5	20	brownish grey loam
84-104	0.2	5	greenish alluvium

A decrease in magnetic susceptibility is therefore observed at the base of the section. This may be linked, either with a change in the amount and type of ferromagnetic minerals present, or with a decrease in the intensity of the geomagnetic field.

The results for D and I provided the following commentary. For samples 1-91, D varied within a range of 40° [-10° to +30°]. Sample 91 is at a depth of 1150 cm,

hence samples 92 and 93 (the object of special attention) will have been immediately below that. The values for I likewise varied within a range of 20° [20-40°]. Below sample 91, however, there was an increase in the range to 50° [10-60°]. In this part of the section, there was also a clear decrease in the values for J_n (see above), but not much change in D, except for sample 93. This sample was also found to be different in terms of magnetic viscosity.

A stereogram was provided for J_n, in which samples 92 and 93 occupied clearly deviant positions. The average values for D=11.1° and for I=+31.8°. 'These values do not agree with the average values for a stationary field of a central axial dipole at the place where the samples were taken', i.e., 47.5° N latitude and 41.0° E longitude at BB2, 'which would correspond to D=0° and J_n=65°'.

Palaeomagnetic characteristics for all the samples were presented in Table 1. The results for samples 92 and 93 were as follows.

Sample	K	J_n	D	I
92	0.26	8.5	87.3	42.3
93	0.19	5.0	207.8	58.3

It is considered that samples 92 and 93 show a possible excursion. In Table 2 the coordinates of the virtual geomagnetic poles for these samples were given as follows.

Sample	N latitude °	E longitude °
92	19.5	115.7
93	0.0	19.7

All the other measurements given fall within the limits: N latitude 43.0-63.9°, longitude 143.7-240.9°.

The concluding argument is that, since the age of the section exceeds 30,000 years, the changes noted in D and I may be linked to the Kargapolovo excursion, the beginning of which is put at 40-42,000 years and its duration at 2000 years (G.N. Petrova, T.B. Nechaeva, G.A. Pospelova, 1992, *Kharakternye izmeneniya*

geomagnitnogo polya v proshlom). Usually excursions take place against a background of reduced geomagnetic field intensity. In the section there has been observed a marked change in the magnitude of natural remanant magnetism J_n (x 3.5) and in magnetic susceptibility K (x 2). This does not allow us to demonstrate conclusively that there was an excursion (particularly in view of the problems with the aluminium containers) but the existence of such an excursion is probable. More careful work should be carried out on this part of the section in future (*and it is intended that this will be done now, in 2004*).

Coordinates were calculated for the virtual geomagnetic poles for 20 samples (see above) including the section with the supposed excursion (samples 85-104). The position and succession of these virtual poles at BB2 was shown at Figure 4, with which was compared Figure 5, the same for the section at Yangiyul' in Uzbekistan, where the Kargapolovo excursion was found (G.A. Pospelova, G.N. Petrova, Z.V. Sharonova, 1998, Geomagnitnoe pole vo vremya i posle ekskursov, zapisannykh v rasreze Yangiyul', *Fizika Zemli*, pp. 65-79). The two Figures are similar, which suggests that we do also have the Kargapolovo excursion at BB2, but further work is needed to confirm this, using glass ampoules only.

[Translation based on notes made in the field at Kremenskoi, 3 August 2004]

4.5.3 Kalitvenka

A short account of Kalitvenka 1 was published by A.E. Matiukhin in 1987 (KSIA, 189) and this, together with a brief e-mail about the site as well as Kalitvenka 1v and 1a, was the information we had available prior to the field work in 2004. Further information was received from Matiukhin during the field work, and subsequently we were also able to consult his later articles on the Kalitvenka sites (Matiukhin, 2003, 2004 AEAE 1).

4.5.3.1 Kalitvenka 1

This site was discovered by L.Ya. Krizhevskaya in 1973, on the right (southward facing) bank of the Malaya Peschanaya ravine where the river Kalitvenka enters the Severskii Donets (Kamenskii region, Rostov district). It is on the second terrace, 15 metres above the floodplain. In 1979-81 and again in 1984 three

excavations were carried out over a total area of 114 square metres, and several test pits were also put down. In his account published in 1987, Matiukhin divided the deposits into an upper and a lower unit (or 'packet') with a number of differentcomponents. He distinguished 13 'lithological horizons' but these apparently coincide with the levels in which he dug. The first 6 levels were arbitrarily defined, the lower 7 are said to have followed the natural layers.

(1) Upper unit

Loams (suglinki) 1-3.5 metres thick. Levels 2-6 are said to be displaced, such artefacts as are present being linked with detrital material contained within the loams. Level 1 is said to be *insitu*, and to have produced 10 cores and 200 flakes.

(2) Lower unit

Loams, greyish sandy loams (supesi) and sands 0.7-3 metres thick, equivalent to levels 7-9, above basal whitish sands, presumably equivalent (though it is not said so) to levels 10-13. The total depth of deposits is said to be 2-6.5 metres. In the e-mail message, the basal sands are said to be of Palaeogene age. They are in places greenish or orange coloured and they contain detrital material in the form of small pebbles, rounded gravel, and quartzite boulders. There were some artefacts in level 7, but the bulk of them were found in levels 8 and 9, either on the surface of the basal whitish sands or in the deposits immediately overlying them.

In his account published in 1987, Matiukhin stated that level 8 contained a total of 700 artefacts and level 9 2100. A detailed description, however, was given of fewer pieces than this. Both levels together were said to have produced 93 cores, 831 blanks (mostly flakes with a few blades), and 27 tools (n=951). The basic raw material employed was quartzite, occurring naturally in boulders of variable quality, and there was some use of flint. The site was classified as a workshop because of the large number of cores and flakes relative to finished tools, the presence of unfinished tools, and the proximity of the site to raw material outcrops. There was some use of the Levallois technique, some Levallois or disc cores (KSIA Fig. 1.7), some bifacial and Middle Palaeolithic type tools. Matiukhin at first was unspecific in his

classification of the site, but he did compare it to Derkul, a Mousterian site discovered by Efimenko, and in the e-mail message it was said to be Upper Mousterian, although there is no independent dating evidence to support this. In his account published in 1983, Matiukhin gives slightly different totals for the artefacts found at the site: 663 in layer 8 (with 14 tools) and 2326 in layer 9 (with 37 tools). In his opinion, the fact that bifacial tools were made does not signify that this was a Micoquian site and he continues to refer to it in general as Mousterian.

In the test pits, some artefacts were found in the Upper unit, associated with detrital material in coarse grained sand, and at pits 16 and 18 some concentrations of finds were discovered on the surface. South west of the main excavated area, a depression in the basal whitish sand was discovered filled with artefacts of the same type as elsewhere, and this is referred to as 'locus 2'. There were 73 cores, 90 flakes, 71 dechets de travail, and 14 'macrotools' (n=248). In addition, some surface collections were made, including 31 cores and 33 tools, and these too were said to be of the same type as those found *insitu*.

4.5.3.2 Revised Kalitvenka 1 stratigraphy based on 2004 section

The 2004 section (south wall) revealed the following sequence of deposits (see section drawing, Figure 4.18). The delineation of the layers and their description follows indications given by A.E. Matiukhin, who also drew the section.

(0) Backfill from 1984 excavations
(1) Recent soil
(2) Reddish loam containing pebbles
(3) Light brown loam channel, discontinuous – deposit is altogether absent on eastern side of section
(4) Brown loam lenses – only present in the centre and western end of the section
(5) Yellowish sandy loam with calcareous inclusions. Separated by (3), (4) and (6)
(6) Reddish sandy loam – channel fill
(7) Brownish grey sandy loam, separated by channel fill (9)
(8) Light brown sandy loam, again separated by channel fill (9)
(9) Reddish sandy loam – channel fill

(10) Whitish loam deposit – widely encountered in the Kalitvenka area. The geological view has been expressed that this deposit is mid Weichselian (50-55 ka BP) in age but this is no more than an estimation
(11) Light brown colluvial sand
(12) Reddish, grading to white, Palaeogene sand. From this layer came about 98% of the Mousterian stone tools

It should be noted that the numbered levels here evidently do not correspond exactly to the system earlier used by Matiukhin, when he distinguished 13 'lithological horizons', with archaeological occurrences, as described above.

4.5.3.3 Kalitvenka 1v

Kalitvenka 1v is 200 metres north of Kalitvenka 1. It is situated directly on a quartzite outcrop. Outcrops of this kind also occur 100 metres from the main site at Kalitvenka 1. According to Matiukhin (2003) the basal sands with artefacts in places come out onto the surface, whereas elsewhere they are covered by sandy loams and loams up to 7 metres thick. At that time, he distinguished two levels of finds: (1) in whitish loam, and (2) in yellowish basal sand. Since the finds are so clearly associated with the quartzite outcrop, the site is referred to as a quarry-workshop.

During the fieldwork in 2004 we learnt that Kalitvenka 1v had been excavated in 1984 and 1985 and that the excavations uncovered many large nodules of quartzite in the basal sands. Located further upslope than Kalitvenka 1, the basal sands at Kalitvenka 1v had not been covered by as great a thickness of colluvial loams as at the other site, hence the sequence was shallower. Examining the 2004 section revealed a complicated situation in which the upper part of the sequence had been disturbed by what looked to be tree roots and drying cracks. The sequence of deposits in the section (northern wall) was as follows (Figure 4.19). The delineation of the layers and their description follows indications provided by A.E. Matiukhin, who also drew the section.

(1) Recent soil
(2) Brownish sandy loam
(3) Whitish loam – discontinuous lenses

(4) Brown sand

Matiukhin's view was that layer (3) at Kalitvenka 1v correlates with layer (10) at Kalitvenka 1. In appearance it is more like layer (5) but this is because of the presence of calcareous precipitates in both layers, which more than likely, formed once deposition had taken place. If so, the presence of such features is not significant, and the correlation is most likely correct.

4.5.3.4 Other sites

A number of other sites are briefly mentioned. Kalitvenka 1a is quite distant from the raw material sources (about 400-500 metres). According to Matiukhin (2003) many finds were in a recent soil level but others were in a whitish loam horizon. There were no finds in the basal sands, but Matiukhin suggested that the artefacts could in fact have been derived from there. The depth of finds was no more than 1.5 metres from the surface. Altogether there were >16,000 artefacts, but Matiukhin stated that many of them were redeposited. There is mention of broken bifacially worked points such as those found at Kalitvenka 1 (KSIA Fig. 1.5). Other sites mentioned are 1b, 2, and 10, but we have no further information about them.

4.5.3.5 Comments

On the assumption that this is a Middle Palaeolithic site concentration, then obviously it is an important addition to the open air sites which we have available for study. There do not seem to be any fossil soils represented here, the nature of the sands, sandy loams, and loams will have to be investigated, and the dating of these sites is wide open.

First version 16 June 2004; final revision 26 August 2005.

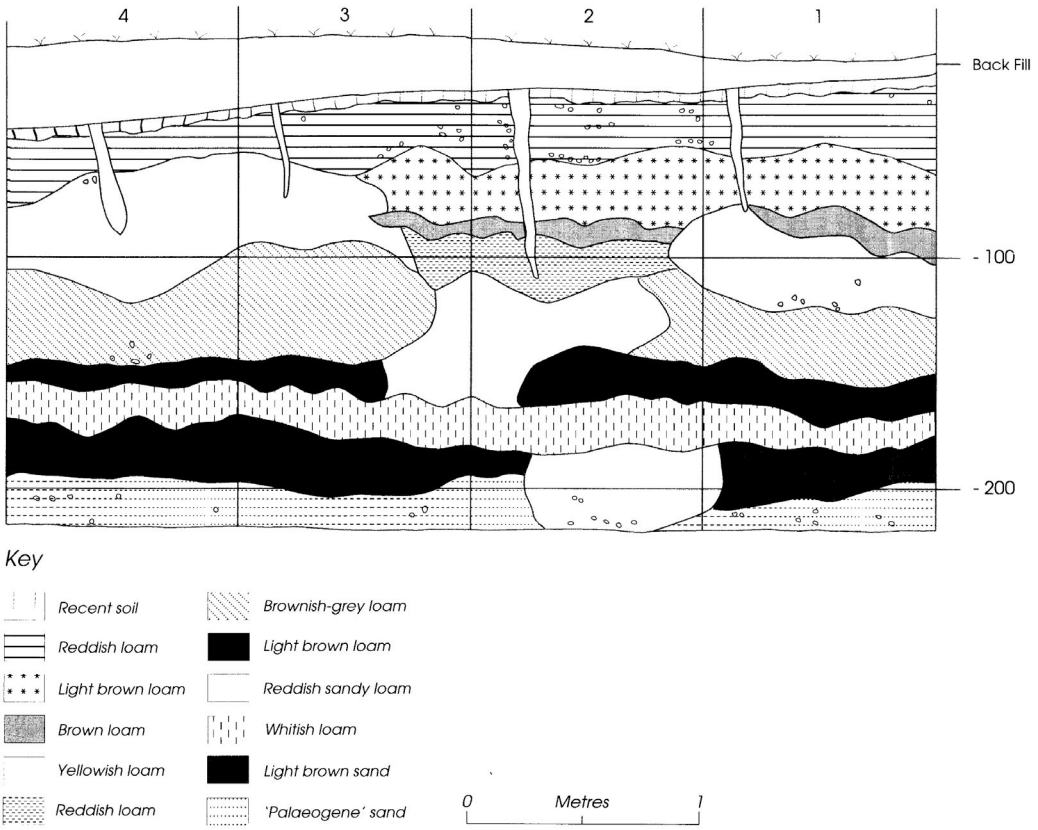

Figure 4.18. Kalitvenka 1 section as recorded by Matiukhin in 2004

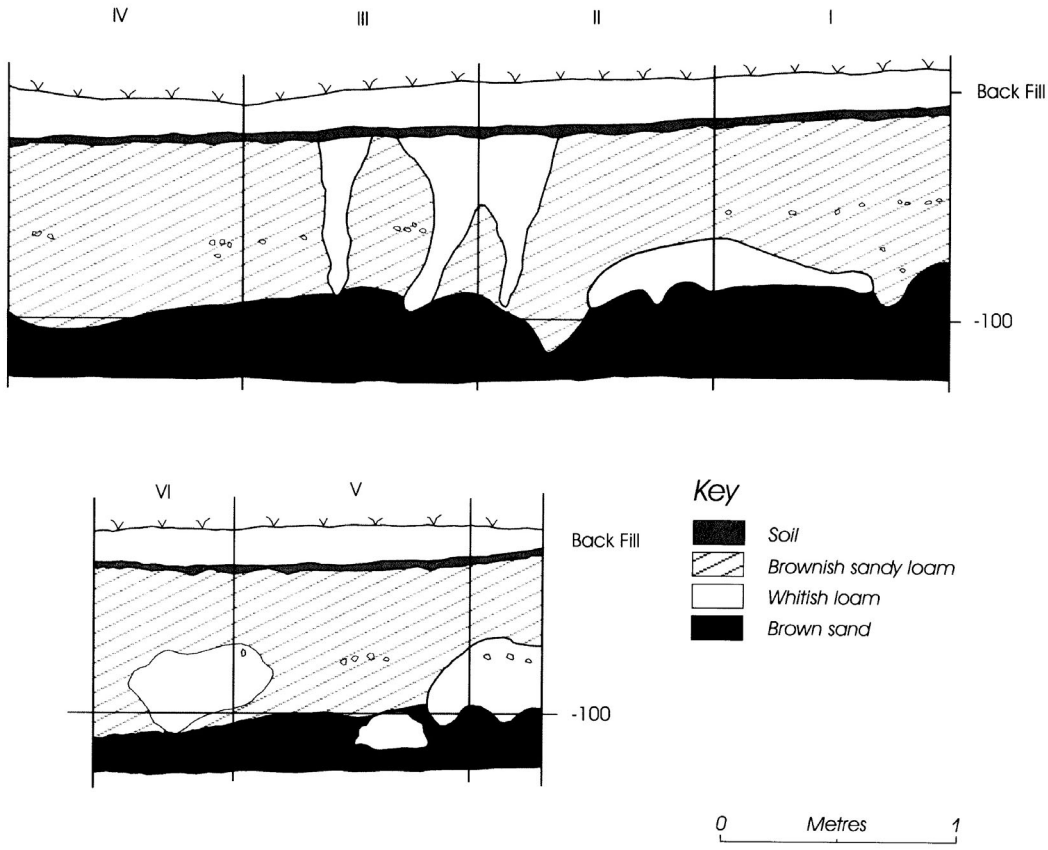

Figure 4.19. Kalitvenka 1v section as recorded by Matiukhin in 2004

4.5.4 Kostenki 14 (Markina Gora)

The Kostenki area has long been the focus of archaeological investigation. In 2004 we were solely focused on the four cultural layers that had been discovered below the chronological marker represented by the volcanic ash (Sinitsyn 2001). A A. Sinitsyn guided our investigations in the field, described the stratigraphy, and suggesting two suitable locations for the taking of samples. The samples were initially taken from the south section (square Y73) through a set of colluvial deposits. This was the same point that David Pyle had sampled in a previous year. Sampling in 2004 extended from the horizon containing the volcanic ash vertically down the stratigraphic column to the layer that is termed the “hs” (horizon in soil). At this point we transferred to the east section (square L75) where sampling resumed from the top of the “hs” soil horizon through layer IVb to the “hh” (horizon with hearths). It is important to note that the OSL datum in the east section was 24 cm different from the datum used by the T/M/S and P samples; 24 cm has been added to the T/M/S and P samples to make them equivalent in depth to the OSL samples.

A full summary will be provided at a later date for Kostenki 14.

Appendix 4.1 Pre-sampling site assessment forms (by Burbidge and Allsworth-Jones)

Site	Biriuchya Balka				
General Description					
Open site on the Russian Steppe, actually several sites close to each other. Biriuchya Balka 2 is the best known.					
Geographic Description					
Ravine on the east bank of the Severskii Donets river. Now dry, but used to contain a stream.					
Latitude	47° 48.37'N	**Longitude**	41°07.85'E	**Altitude**	*c*.50 m a.s.l.
Bedrock Geology					
Report by Krutskii is not available yet. Limestone (weathered – Marl)					
Archaeology & Quaternary Stratigraphy:					
Excavation History					
N.D. Praslov, 1976 – Discovery and excavation of 1 site. A. Matiukhin 1987-93 & 1997 – Excavation of remainder.					
Periods/cultures represented					
Upper and Middle Palaeolithic, plus younger					
Main activities represented					
Flint workshop – Upper Pal, but questionable. Middle Pal – Not entirely clear, but may be interpreted as a workshop.					
Common artefact types	e.g. Flint, quartzite, hearths/occupation, faunal, human etc.				
Flint – local source. "Burnt flint" in many layers. No hearths in Upper Pal, traces of hearths in layer 7 Middle Pal.					
Faunal remains					
Little faunal.					
Sedimentation types	e.g. Aeolian, fluvial, colluvial, anthropogenic, loessic, sandy				
Base = "marshy alluvial" in site 2 In general colluvial: artefact assemblages indicate only small scale movement?, but signs of larger scale reworking Probably derived from loess-like material.					
Approx. depth of stratigraphy	Site 2: 9.5 m Site 2b: 13 m				
Approx. No. contexts / stratigraphic units	Site 2: 13 units including bedrock				

Expected age range	50 ka – 5 ka
Existing chronological control e.g. Typology, Anthropology, Faunal, ^{14}C etc	
Typology: Upper Pal very difficult – workshop means only ~1% finished tools. Middle Pal OK – Levallois etc Geological: Bryansk soil correlates with other sites. 1 x AMS ^{14}C at the top of Layer 7 = 40 ka 1 x Palaeomagnetic excursion in Layer 11 = Kargapolovo = 46 ka Pollen analysis in Upper Palaeolithic levels at site 2: Layer 6 (“Bryansk soil”) has deciduous arboreal pollen, above this pollen is non-arboreal	
Artefacts/contexts of particular note	
Biriuchya Balka 2, Layer 6: “Bryansk soil” – should correlate with other sites Biriuchya Balka 2, Layer 8: another soil Many burnt flints at sites 1b and 1v, but may not be Middle Palaeolithic	
Archaeological questions to be addressed	
Superposition of Upper and Middle Palaeolithic at sites 1a, 2, 2a, 2b, 5. What does the Upper Palaeolithic assemblage really represent? We can’t solve this. Hypothesis: Middle Palaeolithic “Streletskaya culture” at BB leads to Upper Palaeolithic at Kalitvenka on basis of typology. (Note CIB 11/11/04: Is this the wrong way around? – No Upper Pal at Kalitvenka!) (Note RAH 19/12/04: Kalitvenka should really have been Kostenki?)	
Chronological questions to be addressed	
Superposition: constrain transition of Middle – Upper Palaeolithic Five levels claimed – Lowest Middle Pal is alluvial and reworked, but 2 m depth so can be used to define Middle Pal chronology. We need to know/ it depends on what exactly are layers 9, 10, and 11 – would we be dating alluviation?	
Regional connections	
Hypothesis: Middle Palaeolithic “Streletskaya culture” at BB leads to Upper Palaeolithic at Kalitvenka on basis of typology. “Bryansk soil” plus pollen record – regional changes. Links to Kostenki archaeologically according to Matiukhin. (Upper Pal – Bryansk again – chronological links help with archaeological links)	
Importance of the site archaeologically	
Superposition of Upper and Middle Palaeolithic. Open air site(s) – one of a limited number that we are looking at in the Russian Steppe Very different from the Caucasus sites, and further north	
Importance of the site in terms of the regional chronology	
Superposition Bryansk Pollen Possible archaeological connections	
Datability of the site	
Relatively stone free	

Colluvial? / Alluvial? Loessic Relatively good overall		
Contexts on which to focus for sampling		
Layer 6 – “Bryansk soil” – has pollen analysis Layer 8 – fossil soil (Potential for sampling through the Middle Pal and early Upper Pal – Layers 12 – 6.		
Completed By	**Checked By**	**Date**
CIB		

Site	Kalitvenka				
General Description					
Near Biriuchya Balka, but exact location not known yet					
Geographic Description					
"Right" bank of ravine adjacent to Severskii Donets. Second terrace (15 m) above floodplain					
Latitude	48° 18.84'N	**Longitude**	40° 33.51'E	**Altitude**	c.28-31 m a.s.l.
Bedrock Geology					
"Whitish sands" of Palaeogene age? – Quartz? Quartzite veins (in Limestone? – not known) What do archaeologists mean by quartzite?					
Archaeology & Quaternary Stratigraphy:					
Excavation History					
Discovered in 1973 by A. Matiukhin, report from 1987					
Periods/cultures represented					
Middle Pal "Mousterian / Upper Mousterian", Levallois. No Upper Pal.					
Main activities represented					
Quartzite workshop Site 1v = quarry rather than workshop					
Common artefact types	e.g. Flint, quartzite, hearths/occupation, faunal, human etc.				
Quartzite Flint – no layers given					
Faunal remains					
No. No Palynological or Geological information found					
Sedimentation types	e.g. Aeolian, fluvial, colluvial, anthropogenic, loessic, sandy				
"Sands" Upper – loams – colluvial – whole moved, but surface level OK? Lower – sandy – not known					
Approx. depth of stratigraphy	2 m – 6.5 m in different sites				
Approx. No. contexts / stratigraphic units	3 Major units: Layers 1-6 = upper Layers 7-9 = lower Layers 10-13 = basal sands				
Expected age range	Palaeogene(?) & colluvium? Oldest archaeology = Mid Pal				
Existing chronological control e.g. Typology, Anthropology, Faunal, ^{14}C etc					
Typological only					
Artefacts/contexts of particular note					
Tool scatters – Surface of basal sands, 2100 tools But: lots of tools in depression					
Archaeological questions to be addressed					
Is it really late/upper Mousterian typologically? – Then we can test the chronology. Quartzite outcrop. Tools throughout stratigraphy: Middle Pal - ? – Excavator says it's all similar					

Upper Pal - ? – and more recent - ? Distribution of tools implies wider age range		
Chronological questions to be addressed		
Constrain age of top of basal sands – reworked by wind…? Date colluviation in upper levels?? For testing the Middle Pal only theory, we don't want colluviation, just aeolian deposition – discrete marker event – natural.		
Regional connections		
Compared with Derkul – Mousterian. Typological nature of tools. Other sites excavated since. What is the connection to BB, if any? Similar contexts for these sites – link the sites.		
Importance of the site archaeologically		
Comparisons with BB Open air. Middle Pal??? See BB Archaeology needs assessing in the field – IS IT WORTH SAMPLING FROM???		
Importance of the site in terms of the regional chronology		
BB, "Streletskaya" etc, Kostenki		
Datability of the site		
Sand = good. Relative to other sites = very good. Question marks mean take samples to test archaeological hypotheses. Date one sample to test if worth going further. E.g. if one date from lower layers in Neolithic, then STOP!		
Contexts on which to focus for sampling		
Upper basal sands and layer above – to constrain oldest tools. BUT: Need to assess the integrity of the contexts and their descriptions. BUT: Very deep with similar tools in different layers and, BUT: <u>Beware of archaeological significance</u>		
Completed By	**Checked By**	**Date**
CIB		

No pre sampling site assessment form was completed for Kostenki.

Appendix 4.2 Luminescence sample forms

Site Code: **Site Name:** Biriuchya Balka 2	**Date** 20/7/04	**Context No** Whole section: Profile samples	**Luminescence Sample No** EFD4L123 – 153
Description of sampling location:		**Sketch of surrounding area**	
Small tube samples down section from context 2 (lower) – above this was inaccessible. Dog leg at layer 8. Samples from upper, mid, and lower of each context, except layers 5 and 10, which have 5 and 6 tubes respectively. (10 = 3 either side of rubble layer)		EFD4L123 Layer 2L EFD4L124 Layer 3U EFD4L125 Layer 3M EFD4L126 depth Layer 3L EFD4L127 coord Layer 4U EFD4L128 595 Layer 4M EFD4L129 619 Layer 4L EFD4L130 649 Layer 5a EFD4L131 686 Layer 5b EFD4L132 718 Layer 5c EFD4L133 752 Layer 5d EFD4L134 800 Layer 5e EFD4L135 820 Layer 6U EFD4L136 833 Layer 6M EFD4L137 852 Layer 6L EFD4L138 868 Layer 7U EFD4L139 909 Layer 7M EFD4L140 945 Layer 7L EFD4L141 963 Layer 8U EFD4L142 975 Layer 8M EFD4L143 1026 Layer 8M dog-leg EFD4L144 1036 Layer8L EFD4L145 1046 Layer9U EFD4L146 1059 Layer9M EFD4L147 1080 Layer9L EFD4L148 1093 Layer10a EFD4L149 1135 Layer10b EFD4L150 1173 Layer10c EFD4L151 1212 Layer10d EFD4L152 1225 Layer10e EFD4L153 1237 Layer10f	
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	-	-	-

Details:

Any dosimetry to be based on tube samples from the same section.

Description of Sample:

1 cm diameter x 2 cm length tubes. Black insulting tape around tubes upon excavation, labelled with duct tape and black bagged together. Samples from upper section had short light exposures of the sediment at the ends of the tubes.

Nature of Dating Problem:

Examine progression through entire sequence, look for steps relative to / between luminescence samples. Test colluvial bleaching in layer 5.

Completed By	**Checked By**	**Date**
CIB		20/7/04

Site Code: **Site Name:** Biriuchya Balka 2	**Date** 20/7/04	**Context No** 3	**Luminescence Sample No** EFD4L154
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from middle part of layer 3: Light reddish brown, silty: Loessic. Compact thick layer in centre of layer 3, which appears to contain 4 layers of different compactness at this point. Burrow containing loose darker soil 23-30 cm above. 140 cm below surface 50 cm below boundary Layer 2 – Layer 3 50 cm above boundary Layer 3 – Layer 4 Layer 3 seals Layer 4, sealed by Layer 2 – uneven boundary. Layer 2 has calcareous precipitate throughout.			
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G049	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time Hole Depth = 23 cm Est. Solid Angle = 4π Gamma dose rate = 0.78 ± 0.04			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Date from Layer 3, to compare / tie in with ^{14}C dates (26 and 31 ka?) from this layer. Layer 3 is rich in Upper Palaeolithic flints etc. Do layers 4, 5, and 6 represent 9 ka of accumulation? – See EFD4L157			

Completed By	**Checked By**	**Date**
CIB		20/7/04

Site Code: **Site Name:** Biriuchya Balka 2	**Date** 20/7/04	**Context No** 5	**Luminescence Sample No** EFD4L155
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from the lower third of layer 5: Reddish brown loessic, harder at top – may just represent moisture variations. Colluvial layer with layers of darker and lighter material within – but only slight colour variations – no obvious changes in texture associated – relatively homogeneous sediments, no stones. 39 cm above 800 cm datum 50 cm above boundary Layer 5 – Layer 6 Depth Coordinate = 761 cm (surface = 326)			
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G050	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time Hole Depth = 22 cm Est. Solid Angle = 4π Gamma dose rate = 0.79 ± 0.04			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Terminus post quem for Middle Palaeolithic layers below. Colluvial climate implications. Combined with profiling samples, should indicate efficiency of colluvial bleaching. Should post date sample from Layer 6, and predate that from Layer 3			

Completed By	**Checked By**	**Date**
CIB		20/7/04

Site Code: **Site Name:** Biriuchya Balka 2	**Date** 20/7/04	**Context No** 6	**Luminescence Sample No** EFD4L156
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from the middle of layer 6: “Soil” layer, red-brown, silty, limited signs of calcite precipitation. Stratigraphy relatively homogeneous, no stone, all are loessic in character. Sealed by layer 5: loessic colluvium Seals layer 7: Loessic, some signs of colluviation and calcite precipitation. Wavy boundary. 35 cm below 800 cm datum 24 cm below boundary Layer 5 – Layer 6 22 cm above boundary Layer 6 – Layer 7 16 cm right of tephra sampling column Depth Coordinate = 835 cm (surface = 326)			
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G051	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time Hole Depth = 20 cm Est. Solid Angle = 4π Gamma dose rate = 0.84 ± 0.04			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Layer 6 = Uppermost Middle Pal (following reinterpretation by Matiukhin on the basis of a new ^{14}C date from Layer 3). This means that the boundary between Layers 5 and 6 may be the Upper-Middle Pal boundary. However, ^{14}C dates of 40ka and 21ka from upper Layer 7 indicate that Layer 6 could lie anywhere in the Late Middle – Early Upper Pal – this implies the archaeology isn’t diagnostic Soil layer indicates ground surface stable for some time (= bleaching of OSL by bioturbation?), and a (warmer?) wetter climate. Should post date sample from Layer 7, and predate that from Layer 5			

Completed By	**Checked By**	**Date**
CIB		20/7/04

Site Code: **Site Name:** Biriuchya Balka 2	**Date** 21/7/04	**Context No** 7	**Luminescence Sample No** EFD4L157
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from the middle of layer 7: Loessic, Middle Pal, but possible colluviation effects. Stratigraphy relatively homogeneous loessic, except "Loess dolls" – whitish, clayey calcite nodules up to ~10 cm across – visible in lower part of Layer 7 and Upper part of Layer 8 across the section. Sealed by Layer 6: loessic "soil", wavy boundary. Seals Layer 8: another loessic "soil", via a highly uneven boundary which was not easy to determine in many places. 111 cm below 800 cm datum 53 cm below boundary Layer 6 – Layer 7 45 cm above boundary Layer 7 – Layer 8 28 cm below step in section 110 cm above base of section (not sondage) 38 cm above loess doll Depth Coordinate = 911 cm (surface = 326)			
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G052	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time Hole Depth = 20 cm Est. Solid Angle = 4π Gamma dose rate = 0.84 ± 0.05			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
^{14}C dates of 40ka and 21ka from upper Layer 7 indicate probably Late Middle but possibly Early Upper Pal – this implies the archaeology isn't diagnostic: will it become so with a proper chronology? Calcite nodules at base indicate a wetter climate (?), but they form below the ground surface – are these associated with soil formation, i.e. is Layer 6 basically soil development in what was Upper Layer 7? Should post date sample from Layer 7, and predate that from Layer 5			
Completed By	**Checked By**	**Date**	
CIB		21/7/04	

Site Code: **Site Name:** Biriuchya Balka 2	**Date** 21/7/04	**Context No** 8	**Luminescence Sample No** EFD4L158
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from the middle of layer 8: Loessic "soil" layer, Middle Pal. Stratigraphy still relatively homogeneous loessic in texture, but has some complex patterns of colour variation: whitish sub-vertical streaks (of calcite precipitates?), and lenses of slightly different colours across the base of Layer 8/upper Layer 9. Some discontinuity of colour on LHS of section (see EFD4L162). Plus "Loess dolls" – whitish, clayey calcite nodules up to ~10 cm across – visible in lower part of Layer 7 and Upper part of Layer 8 across the section. Also "lenses" of flints evident Sealed by Layer 7: loessic colluvial? Via uneven/indistinct boundary. Seals Layer 9: by clearer in places, but apparently complex boundary – looking at sediment colours.		173 cm below 800 cm datum 15 cm below boundary Layer 7 – Layer 8 11 or 20 cm above boundary Layer 8 – Layer 9, depending on whether different coloured lens is considered part of 8 or 9 50 cm above base of section (not sondage) 3 cm above lens of flints Depth Coordinate = 973 cm (surface = 326)	
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G053	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time Hole Depth = 20 cm Est. Solid Angle = 4π Gamma dose rate = 0.87 ± 0.04			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Late Middle Pal. ^{14}C of 40 and 21 in Layer 7, palaeomagnetic excursion at 46ka in Layer 10. Do Layers 7,8,9,10 represent 6ka of deposition? Soil layer indicates ground surface stable for some time (= bleaching of OSL by bioturbation?), and a (warmer?) wetter climate. Should post date sample from Layer 9, and predate that from Layer 7, and may also post date sample from "Layer 8" taken across the section above the sondage – still in the same layer according to Matiukhin, but changes in colour indicate that situation may be more complex.			

Completed By	**Checked By**	**Date**
CIB		21/7/04

Site Code: **Site Name:** Biriuchya Balka 2	**Date** 21/7/04	**Context No** 9	**Luminescence Sample No** EFD4L159
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from the middle of layer 9 above sondage: Loessic but damper than above and "cakey" with slight mottling – small nodules? Whitish ~ 1cm diameter unlike those at layer7/8 boundary: Water table fluctuations? – water from a "spring" rather than simply a "water table" thing? Sealed by Layer 8: apparently complex, lenticular boundary Seals Layer 10		59 cm below 1000 cm datum 15 cm below boundary Layer 8 – Layer 9 25 cm above boundary Layer 9 – Layer 10 74 cm right from LHS of section (and sondage) 143 cm above present water table (in sondage) 0 cm above 37 cm step in section at top of sondage Depth Coordinate = 1059 cm (surface = 326)	
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G054	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time Hole Depth = 23 cm Est. Solid Angle = 4π Gamma dose rate = 0.80 ± 0.04 Lower dose rate than layer 8 - damper			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Middle Pal artefacts present. Late Middle Pal. ^{14}C of 40 ka and 21 ka in Layer 7, palaeomagnetic excursion at 46ka in Layer 10. Do Layers 7,8,9,10 represent 6ka of deposition? Should post date sample from Layer 10, and predate that from Layer 8			

Completed By	**Checked By**	**Date**
CIB		21/7/04

Site Code: **Site Name:** Biriuchya Balka 2	**Date** 21/7/04	**Context No** 10 Upper	**Luminescence Sample No** EFD4L160
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from upper part of layer 10: In sondage, above rubble layer. Layer 10 is loessic but damper than above with "cakey" calcareous precipitates – small ~1 cm diameter. As layer 9, unlike 7/8 – water table fluctuations? Ashy lenses were evident as smudges – grass fires? Natural? Sandier than above: sandstone in rubble, and CHUNKS OF DEGRADING SANDSTONE FOUND IN GAMMA SAMPLE. Rubble layer mainly limestone, but also sandstone Sealed by Layer 9 Seals rubble in mid-Layer 10		40 cm below 1100 cm datum 52 cm below boundary Layer 9 – Layer 10 44 cm above rubble layer 72 cm right from LHS of section (sondage) ~ 65 cm above water in sondage at time of sampling, but water table would presumably have been higher. Depth Coordinate = 1140 cm (surface = 326)	
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G055	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time Hole Depth = 19 cm Est. Solid Angle = 4π Gamma dose rate = 0.76 ± 0.04 Lower dose rate than layer 9 – damper and sandier			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Late Middle Pal. ^{14}C of 40 ka and 21 ka in Layer 7, palaeomagnetic excursion at 46ka in Layer 10 around level of rubble. Do layers 7,8,9,10 represent 6ka of deposition? Occasional Middle Pal artefacts Supposedly alluvial context (rubble containing degrading sandstone) – implies different depositional context to other layers, but "marshy" signs may relate to post-depositional proximity to water table, since basic texture is loessic like the layers above. Should post date sample from Layer 10 Lower, and predate that from Layer 9			

Completed By	**Checked By**	**Date**
CIB		21/7/04

Site Code: **Site Name:** Biriuchya Balka 2	**Date** 21/7/04	**Context No** 10 Lower	**Luminescence Sample No** EFD4L161
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from lower part of layer 10: In sondage, between two rubble layers. Very damp: below present water table. Upper part is similar in texture to Layer 10 above the upper rubble layer, but it becomes sandier lower down, closer to the second rubble layer. Bone and unworked flint observed at base of upper rubble layer, and in lower Layer 10. Rubble layer mainly limestone, but also sandstone Sealed by Rubble mid -Layer 10 Seals Rubble and bedrock?		124 cm below 1100 cm datum 20 cm below upper rubble layer 13 cm above lower rubble layer 75 cm right from LHS of section (sondage) ~ 5 cm below present water table ~ 10 cm above water in sondage at time of sampling Depth Coordinate = 1224 cm (surface = 326)	
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G056	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time Hole Depth = 20 cm Est. Solid Angle = 4π Gamma dose rate = 0.66 ± 0.03 Gamma dose rate lower again than samples above: water removed from pit, sample near saturation. ~80% of DR in Layer 7, so 20% difference from water content, or also because more sandy?			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Palaeomagnetic excursion at 46ka around level of upper rubble in Layer 10. Oldest deposit at site – test age range Should predate sample from Layer 10 Upper			

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Site Code: **Site Name:** Biriuchya Balka 2	**Date** 21/7/04	**Context No** 8 above sondage	**Luminescence Sample No** EFD4L162
Description of sampling location:		**Sketch of surrounding area**	
Second tube sample from layer 8 as defined by Matiukhin, this one at the LHS of the section, above the sondage: Appears darker than layer 8 in the centre of the section, a potential line of division is located ~ 30 cm to the right of the sampling point. More like Layer 9 below, but also a chunk of degrading sandstone was found – more like layer 10!. Flint found on boundary between Layers 7 and 8 directly above the sampling point. Sealed by Layer 7 and the rest of Layer 8 Seals Layer 9, but may actually be part of 9 rather than 8.		35 cm below 1000 cm datum 15 cm below Matiukhin's boundary Layer 7 – Layer 8 9 cm above Matiukhin's boundary Layer 8 – Layer 9 25 cm above step in section at top of sondage 75 cm right from LHS of section (and sondage) Depth Coordinate = 1035 cm (surface = 326)	
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G057	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = 22 cm
Est. Solid Angle = 4π
Gamma dose rate = 0.84 ± 0.04
Bang in between other measurement from Layer 8, and that from Layer 9 below. Both within errors.

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Late Middle Pal. ^{14}C of 40 and 21 in Layer 7, palaeomagnetic excursion at 46ka in Layer 10. Do Layers 7,8,9,10 represent 6ka of deposition?
Layer 8 below the main sampling column is "disrupted" – evidence for cracking, roots etc? Complicated. Matiukhin wants doubled up sampling, but this location actually appears different to the rest of layer 8, and may provide a more reliable date for a different context. But note sandstone.
Should predate sample from layer 7, and other from layer 8.
Should post date sample from layer 9, but may be a later part of 9 itself.

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Site Code: **Site Name:** Biriuchya Balka 2	**Date** 21/7/04	**Context No** Modern Topsoil	**Luminescence Sample No** EFD4L163
Description of sampling location:		**Sketch of surrounding area**	
Black bag sample from surface (A Horizon) at top of section. Taken from sidewall of cut, where no spoil was observed on top of the 'a' Horizon. Vegetation removed, and ~ 1 cm depth bits of topsoil were trowelled into a bag and sealed.			
		Photo No:	
Gamma Dosimetry	**Reading** -	**Assoc. Sample** -	**Ref No** -
Details:			
-			
Description of Sample:			
Black bag containing ~ 100 g trowelled from top 1 cm, after vegetation removal.			
Nature of Dating Problem:			
Assess bleaching of material accumulating naturally on the steppe. Present soil summarised as Neolithic by PAJ based on Matiukhin's report.			

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Site Code: **Site Name:** Biriuchya Balka 1a	**Date** 22/7/04	**Context No** Profile Samples: Layers 5, 6, and 7	**Luminescence Sample No** EFD4L164 – 73
Description of sampling location:		**Sketch of surrounding area**	
Small tube samples down lowest step at Biriuchya Balka 1a. To provide context for Luminescence samples and identify discontinuities. Layers 5 and 6 are loessic, less compact than at BB2. 5 appears more porous – from drying line. Lower part of Layer 6 contains context 7: Rubble with artefacts in and around in 6 too. Only the odd artefact higher in the section.		EFD4L164 640 Layer 5a EFD4L165 718 Layer 5b EFD4L166 736 Layer 6a EFD4L167 804 Layer 6b EFD4L168 850 Layer 6c EFD4L169 903 Layer 6d EFD4L170 943 Layer 6e EFD4L171 988 Layer 6f (top rubble) EFD4L172 1014 Layer 6g (base of rubble) EFD4L173 1061 Layer 6h	
		Photo No:	
Gamma Dosimetry	**Reading** -	**Assoc. Sample** -	**Ref No** -
Details:			
Any dosimetry to be based on tube samples from the same section.			
Description of Sample:			
1 cm diameter x 2 cm length tubes. Black insulting tape around tubes upon excavation, labelled with duct tape and black bagged together. Soft loessic material sampled in a deep hole: Good quality small dating samples..			
Nature of Dating Problem:			
Examine progression through entire sequence, look for steps relative to / between luminescence samples.			
Completed By	**Checked By**	**Date**	
CIB		22/7/04	

Site Code: **Site Name:** Biriuchya Balka 1a	**Date** 22/7/04	**Context No** 6 above rubble	**Luminescence Sample No** EFD4L174
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from layer 6 above rubble layer: Loessic, but less compact than at BB2 – damper, not dried and hardened. Seals rubble layer 7: Limestone, degraded sandstone, flint. Depth coordinate 961 cm 30 cm above stones at top of Layer 7 (EFD4L171) 89 cm left of RHS of section/pit 7 cm right of vertical line in section			
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G059	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time Hole Depth = 17 cm Est. Solid Angle = 4π Gamma dose rate = 0.74 ± 0.04 Taken from deep pit relatively recently excavated, so in situ WC may have some relevance here.			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Rubble layer 7 contains flint nodules plus artefacts and bones apparently un-reworked: occupation surface. Rubble linked by Matiukhin to upper rubble layer in BB2? Noted on site that link was to rubble layer in published section that was not observed by us… Constrain occupation and link to BB2 section			
Completed By	**Checked By**	**Date**	
CIB		22/7/04	

Site Code: **Site Name:** Biriuchya Balka 1a	**Date** 22/7/04	**Context No** 6 below rubble	**Luminescence Sample No** EFD4L175
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from layer 6 below rubble layer: Loessic, but less compact than at BB2 – damper, not dried and hardened. Matrix of layer 6 below rubble is equal to 6 above, except that sandy lenses were observed within it, sloping down towards the right of the section. Seals rubble layer 7: Limestone, degraded sandstone, flint. Depth coordinate 1039 cm 27 cm below stones at bottom of Layer 7 (EFD4L172) 28 cm above base of section 73 cm left of RHS of section/pit			
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G060	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time Hole Depth = 18 cm Est. Solid Angle = 4π Gamma dose rate = 0.71 ± 0.04 Taken from deep pit relatively recently excavated, so in situ WC may have some relevance here.			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Rubble layer 7 contains flint nodules plus artefacts and bones apparently un-reworked: occupation surface. Rubble linked by Matiukhin to upper rubble layer in BB2? Noted on site that link was to rubble layer in published section that was not observed by us… Constrain occupation and link to BB2 section			
Completed By	**Checked By**	**Date**	
CIB		22/7/04	

Site Code: **Site Name:** Biriuchya Balka 1a	**Date** 22/7/04	**Context No** Sand lens in layer 6 below rubble	**Luminescence Sample No** EFD4L176
Description of sampling location:		**Sketch of surrounding area**	
Tin sample from quartzose? Sand lens in layer 6 below rubble layer: Yellow-brown sand. Appears to be well sorted size-wise, but a mixture of minerals including heavy minerals. Sand lens slopes down towards the right of the section at ~ 30 degrees. Lens is 2.5 – 4 cm thick in region of sampling, thinning up: Upper tail extends into sampling location of EFD4L175. Seals layer 6, sealed by layer 6.		Depth coordinate (centre of tin) 1056 cm 30 cm below stones at bottom of Layer 7 at this point 10 cm above base of section 20 cm left of RHS of section/pit	
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G061	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time Hole Depth = ? cm Est. Solid Angle = 4π Gamma dose rate = 0.62 ± 0.03 Dose rate lower than others from BB1a – close to EFD4L175 and no evidence of water table (wetness, precipitates etc as in BB2), so water content should be similar: Just sandier. Taken from deep pit relatively recently excavated, so in situ WC may have some relevance here.			
Description of Sample:			
12 cm × 4 cm × 3 cm stainless steel tin in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Rubble layer 7 contains flint nodules plus artefacts and bones apparently un-reworked: occupation surface. Rubble linked by Matiukhin to upper rubble layer in BB2? Noted on site that link was to rubble layer in published section that was not observed by us… Constrain occupation and link to BB2 section Sand lens in layer 6 lower to provide quartz comparison with EFD4L175. Sand is alluvial or colluvial? – Slope indicates not alluvial. Reasonably clean, but bleaching mechanism uncertain.			
Completed By	**Checked By**	**Date**	
CIB		22/7/04	

Site Code: **Site Name:** Kalitvenka 1	**Date** 23/7/04	**Context No** Whole section: Profile samples	**Luminescence Sample No** EFD4L177 – 201
Description of sampling location:		**Sketch of surrounding area**	
Small zip lock bag samples taken down whole of RHS of section. Sediments = sandy loams, sand silt loams, and sands. Must be some clay as the surface of the section was very compact – small sampling tubes could not be used. To provide context for Luminescence samples and identify discontinuities. Particularly upper part where full luminescence samples not taken.		EFD4L177 28 Layer 1 EFD4L178 34 Layer 2U EFD4L179 40 Layer 2M EFD4L180 54 Layer 2L EFD4L181 58 Layer 3U EFD4L182 72 Layer 3M EFD4L183 92 Layer 4 (labelled 3L) EFD4L184 100 Layer 5U (labelled 4) EFD4L185 112 Layer 5M EFD4L186 125 Layer 5L EFD4L187 132 Layer 7U EFD4L188 140 Layer 7M EFD4L189 147 Layer 7L EFD4L190 152 Layer 8U EFD4L191 158 Layer 8M EFD4L192 162 Layer 8L EFD4L193 167 Layer 10U EFD4L194 173 Layer 10M EFD4L195 177 Layer 10L EFD4L196 182 Layer 11U EFD4L197 190 Layer 11M EFD4L198 197 Layer 11L EFD4L199 207 Layer 12U EFD4L200 235 Layer 12M EFD4L201 260 Layer 12L	
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	-	-	-

Details:

Any dosimetry to be based on tube samples from the same section.

Description of Sample:

Small zip lock bags (~1 g), sampled under space blanket. Material trowelled into ZLB after surface of section had been cleaned. ZLB put directly into black bag. However: difficult to make light tight, so quality is variable. Lower in section likely to be better.

Nature of Dating Problem:

Look for steps in chronology / links between main luminescence samples. Examine palaeoclimate/stratigraphic sequence not possible using main samples. Break at 4-5 in particular.
Test OSL on coarse (quartz?) versus fines

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Site Code: **Site Name:** Kalitvenka 1	**Date** 23/7/04	**Context No** 10	**Luminescence Sample No** EFD4L202
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from layer 10: Whitish sand / sandy loam found in many sites around the area. However, evidence for burrows and mixing from darker soils above and below. Seals Layer 11: Sandy loam similar to Layer 8. Sealed by Layers 8 and 9: Compact reddish sandy silt loam, probably colluvial. Depth from surface 175 cm 7 cm below boundary Layer 8 - Layer 10 6 cm above boundary Layer 10 - Layer 11 38 cm left of RHS of section			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G063	ZLB for lab γ	-

Details:

Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time
Hole Depth = 17 cm
Est. Solid Angle = 4π
Gamma dose rate = 0.28 ± 0.01
Much lower dose rates than at BB reflect quartzose drift geology

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Layer 10 has been identified around the area and associated with the period 40 ka – 55 ka by geological / sedimentary comparisons. Test this. Should be in situ (wind blown) as opposed to colluvial etc.
Test OSL on coarse (quartz?) versus fines

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Site Code: **Site Name:** Kalitvenka 1	**Date** 23/7/04	**Context No** 11	**Luminescence Sample No** EFD4L203
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from layer 11: Compact reddish sandy silt loam, loessic, probably colluvial. Contains some evidence for burrows. Seals Layer 12, including channel/pit fill: Sand containing majority (~98%) of artefacts from site. Upper 12 is reddish brown silty sand. Sealed by Layer 10: whitish sand. Depth from surface 192 cm 10 cm below boundary Layer 10 - Layer 11 10 cm above boundary Layer 11 - Layer 12 39 cm left of RHS of section			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G064	ZLB for lab γ	-

Details:

Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time
Hole Depth = 29 cm above hole, but collapse of material left only ~ 10 cm hole depth on the lower side.
Est. Solid Angle = 4π
Gamma dose rate = 0.20 ± 0.01
Much lower dose rates than at BB reflect quartzose drift geology

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Constrain Layers 10 and 12. Layer 10 has been identified around the area and associated with the period 40 ka – 55 ka by geological / sedimentary comparisons. Test this. Layer 12 contains most of the archaeology.
Test OSL on coarse (quartz?) versus fines

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Site Code: **Site Name:** Kalitvenka 1	**Date** 23/7/04	**Context No** 12 Upper	**Luminescence Sample No** EFD4L204
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from middle of Layer 12 Upper: Reddish-brown silty sand. Similar colour to sandy loams above it. Sufficiently sandy to be loose in texture – tube can be pushed in by hand. Section collapse in line of other samples meant that this one was taken further to the left. Seals Layer 12 Lower: Cleaner whitish sand. Sealed by Layer 11: Colluvial? Sandy silt loam. Depth from surface 217 cm 17 cm below boundary Layer 11 - Layer 12 9 cm above base of section (left of sondage) 77 cm left of RHS of section			
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G065	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time Hole Depth = 25 cm Est. Solid Angle = 4π Gamma dose rate = 0.13 ± 0.01 Much lower dose rates than at BB reflect quartzose drift geology			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Layer 12 is a sand called “Palaeogene” by the geologist, but contains 98% of the artefacts from the site. Layer 12 Upper has been subject to soil formation processes if not colluviation – should provide a date for archaeological activity at Kalitvenka. Test OSL on coarse (quartz?) versus fines			
Completed By	**Checked By**	**Date**	
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Site Code: **Site Name:** Kalitvenka 1	**Date** 23/7/04	**Context No** 12 Lower	**Luminescence Sample No** EFD4L205
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from middle of Layer 12 Lower: Cleanish white quartzose sand. A few pebbles and root lines. Loose in texture – tube pushed in by hand. Base of exposed sequence, in sondage. At very bottom of sondage, sand is becoming yellower. Sealed by Layer 11 via Layer 12 Upper: Reddish brown sand/silty sand. Depth from surface 245 cm. 20-30 cm below transition Layer 12 Upper - Layer 12 Lower (transition diffuse). 30 cm above base of sondage 36 cm left of RHS of section			
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G066	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time Hole Depth = 23 cm, but only 5 cm depth immediately above probe due to collapse. Beneath probe was composed of material replaced after collapse. Est. Solid Angle = 4π Gamma dose rate = 0.07 ± 0.01 Very loose sandy material – low dose rate and very little ^{40}K implies clean quartz(ite) sand.			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Layer 12 is a sand called “Palaeogene” by the geologist, but contains 98% of the artefacts from the site. Reworking, saltation etc: good dates? Lower Layer 12 is cleaner sand, unlike soils above.			

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Site Code: **Site Name:** Kalitvenka 1v	**Date** 23/7/04	**Context No** 3	**Luminescence Sample No** EFD4L206
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from middle of Layer 3: Remnant lens of compact sandy silt loam with calcite nodules. Matiukhin makes link to Layer 10 at Kalitvenka 1. Seals Layer 4: basal sand from which quartzite nodules were recovered and worked in antiquity. Sealed by Layer 2: Reddish brown sandy silt (loessic, colluvial?). Depth from surface ? cm 9 cm below boundary Layer 2 - Layer 3. 7 cm above boundary Layer 3 - Layer 4. 24 cm above datum 101 cm left of RHS of section			
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G067	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time Hole Depth = 18 cm Est. Solid Angle = 4π Gamma dose rate = 0.25 ± 0.01 Dose rate similar to Layer 10 at Kalitvenka 1.			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Link to Layer 10 at Kalitvenka 1: link sites in group, link source and working area? Constrain age of resource usage in combo with sample from Layer 4			

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Site Code: **Site Name:** Kalitvenka 1v	**Date** 23/7/04	**Context No** 4	**Luminescence Sample No** EFD4L207
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from Layer 4: Basal sand from which quartzite nodules were recovered and worked in antiquity. Red – brown sand similar to Layer 12 Upper at Kalitvenka 1. Sealed by Layer 2: Reddish brown sandy silt (loessic, colluvial?) and Layer 3: Remnant sandy silt loam with calcite nodules. Depth from surface ? cm 25 cm below boundary Layer 3 - Layer 4. 12 cm below datum 8 cm above base of section 104 cm left of RHS of section			
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G068	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time Hole Depth = 21 cm Est. Solid Angle = 4π Gamma dose rate = 0.14 ± 0.01 Dose rate within errors of Layer 12 upper at Kalitvenka 1			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Link to Layer 12 at Kalitvenka 1: link sites in group, link source and working area? Constrain age of resource usage in combo with sample from Layer 4			

Completed By	**Checked By**	**Date**
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Site Code: **Site Name:** Kostenki 14	**Date** 28/7/04	**Context No** South Section: Profile Samples	**Luminescence Sample No** EFD4L208 – 17
Description of sampling location:		**Sketch of surrounding area**	
10 Small tube samples down section through tephra (in Layer 2) and palaeosol with excursion at base (Layer 6). Generally silt/silty clay of different colours. Tephra fine but gritty (in Layer 2). Intermittent lens of coarse material including chalk and sand (Mid layer 3, sampled for full luminescence dating). Layer 5 contains "spring action" calcareous precipitates. Layer 7 contains chalk/ calc nodules ~ 1cm diameter.		EFD4L208 -5.5 "Layer 1" EFD4L209 1 "Layer 2" EFD4L210 7 "Layer 3U" EFD4L211 24 "Layer 3L" EFD4L212 30.5 "Layer 4U" EFD4L213 38 "Layer 4M" EFD4L214 44 "Layer 4L" EFD4L215 52 "Layer 5" EFD4L216 59 "Layer 6" EFD4L217 67 "Layer 7" Depths are below the 0 point of Rupert's sampling column. Profiling samples taken ~ 87 cm to the left of Rupert's Layer No's allocated for these samples only – no convenient numbering system covering site	
		Photo No:	
Gamma Dosimetry	**Reading** -	**Assoc. Sample** -	**Ref No** -
Details:			
Any dosimetry to be based on tube samples from the same section.			
Description of Sample:			
1 cm diameter x 2 cm length tubes. Black insulting tape around tubes upon excavation, labelled with duct tape and black bagged together. Plugs of material left at ends of tubes: remove and within are good quality small dating samples.			
Nature of Dating Problem:			
Provide context and look for discontinuities between tephra and palaeosol. Tephra = ? ka Palaeomagnetic excursion at base of Palaeosol = ? ka.			

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Site Code: **Site Name:** Kostenki 14	**Date** 28/7/04	**Context No** South section: "Layer 3"	**Luminescence Sample No** EFD4L218
Description of sampling location:		**Sketch of surrounding area**	
Bag sample from lens of coarse material mid- "Layer 3": between tephra and palaeosol. - Layer No's allocated for these samples only – no convenient numbering system covering site Lens includes chalky lumps (< 3 cm) and sandy material. Undulating nature of lens and other layer boundaries indicates post depositional soft sediment deformation. Sealed by "Layer 3" Upper: Light greyish-brown silty clay immediately below "Layer 2": as "Layer 3" but interleaved with tephra. Seals "Layer 3" Lower: Slightly darker grey clayey silt.		15 cm below 0 point of Rupert's sampling column 54 cm left from line of Rupert's sampling column 15 cm right from location of previous column sample (David Pyle?) 13 cm below tephra visible directly above 11 cm above boundary "Layer 3" – "Layer 4" 32 cm below large step in the section. 61 cm above another large step.	
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G070	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time Hole Depth = 21 cm Est. Solid Angle = 4π Gamma dose rate = 0.42 ± 0.02 Depth from ground surface ~ 4 m, opposite wall of pit ~ 20 m away. Section drying, in situ WC not expected to be representative.			
Description of Sample:			
Black bag of loose sediment excavated from lens under space blanket, sealed and second bagged. Total mass as sampled ~ 0.5 kg.			
Nature of Dating Problem:			
Check performance of OSL against Tephra (38-41 ka) and Palaeosol magnetic excursion (40-42 or 44-46 ka). Extract coarse grains (quartz, feldspar?) after sieving out calcareous lumps, for comparison with fine grain results from EFD4L219 - OSL cross comparison. Should post date EFD4L220 and should equal EFD4L219.			

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Site Code: **Site Name:** Kostenki 14	**Date** 28/7/04	**Context No** South section: "Layer 3"	**Luminescence Sample No** EFD4L219
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from behind bag sample from lens of coarse material mid- "Layer 3": between tephra and palaeosol. - Layer No's allocated for these samples only – no convenient numbering system covering site Lens includes chalky lumps (< 3 cm) and sandy material. Undulating nature of lens and other layer boundaries indicates post depositional soft sediment deformation. Sealed by "Layer 3" Upper: Light greyish-brown silty clay immediately below "Layer 2": as "Layer 3" but interleaved with tephra. Seals "Layer 3" Lower: Slightly darker grey clayey silt.		15 cm below 0 point of Rupert's sampling column 54 cm left from line of Rupert's sampling column 15 cm right from location of previous column sample (David Pyle?) 13 cm below tephra visible directly above 11 cm above boundary "Layer 3" – "Layer 4" 32 cm below large step in the section. 61 cm above another large step.	
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G070	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time Hole Depth = 21 cm Est. Solid Angle = 4π Gamma dose rate = 0.42 ± 0.02 Depth from ground surface ~ 4 m, opposite wall of pit ~ 20 m away. Section drying, in situ WC not expected to be representative.			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Check performance of OSL against Tephra (38-41 ka) and Palaeosol magnetic excursion (40-42 or 44-46 ka). Extract fine grains (+ coarse?), for comparison with coarse grain (quartz, feldspar?) results from EFD4L218 – OSL cross comparison. Should post date EFD4L220 and should equal EFD4L218.			

Completed By	**Checked By**	**Date**
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Site Code: **Site Name:** Kostenki 14	**Date** 28/7/04	**Context No** South section: “Layer 7”	**Luminescence Sample No** EFD4L220
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from “Layer 7” below palaeosol “Layer 6” - Layer No’s allocated for these samples only – no convenient numbering system covering site “Layer 7” is light grey-brown clayey silt with chalk clasts <1 cm = top of series of “alluvial” deposits visible more fully in the East Section. This is thicker than the wavy and sometimes discontinuous palaeosol. Undulating nature of layer boundaries indicates post depositional soft sediment deformation. Sealed by “Layer 6”: Palaeosol. Darker grey-Brown silty clay loam, some chalk. Seals further “alluvial” deposits.		72 cm below 0 point of Rupert’s sampling column 47 cm left from line of Rupert’s sampling column 13 cm below tephra 11 cm below boundary “Layer 6” – “Layer 7” directly above, but boundary undulates, so sample was taken approximately level with bottom of soil. 7 cm above large step in the section.	
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G071	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time Hole Depth = 22 cm Est. Solid Angle = 4π Gamma dose rate = 0.41 ± 0.02 Depth from ground surface ~ 4 m, opposite wall of pit ~ 20 m away. Section drying, in situ WC not expected to be representative.			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Check performance of OSL against Tephra (38-41 ka) and Palaeosol magnetic excursion (40-42 or 44-46 ka) – constrain upper age of magnetic excursion at base of palaeosol. Should pre date EFD4L218 and 219. Should post date EFD4L241			

Completed By	**Checked By**	**Date**
CIB		28/7/04

Site Code: **Site Name:** Kostenki 14	**Date** 28/7/04	**Context No** East Section: Profile Samples	**Luminescence Sample No** EFD4L221 – 40
Description of sampling location:		**Sketch of surrounding area**	
20 Small tube samples down East Section, from the palaeosol containing the magnetic reversal, down to basal clay (apparently), through 2/3 cultural layers: The lower ("Layer 10") being the oldest on site, the upper ("Layer 8") being interpreted as redeposited older material. Depths are below datum (planning line running across upper part of section). Profiling samples follow Rupert's Layer No's allocated for these samples only – no convenient numbering system covering site		EFD4L221 -22 "Layer 6" EFD4L222 -12 "Layer 7a" EFD4L223 5 "Layer 7b" EFD4L224 20 "Layer 7c" EFD4L225 35 "Layer 7d" EFD4L226 44 "Layer 8" EFD4L227 55 "Layer 9a" EFD4L228 70 "Layer 9b" EFD4L229 86 "Layer 9c" EFD4L230 101 "Layer 9d" EFD4L231 109 "Layer 9e" EFD4L232 118 "Layer 9f" EFD4L233 127 "Layer 10a" EFD4L234 134 "Layer 10b" EFD4L235 141 "Layer 10c" EFD4L236 151 "Layer 10d" EFD4L237 160 "Layer 11a" EFD4L238 175 "Layer 11b" (sand) EFD4L239 179 "Layer 11c" EFD4L240 186 "Layer 11d"	
		Photo No:	
Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	-	-	-
Details:			
Any dosimetry to be based on tube samples from the same section.			
Description of Sample:			
1 cm diameter x 2 cm length tubes. Black insulting tape around tubes upon excavation, labelled with duct tape and black bagged together. Plugs of material left at ends of tubes: remove and within are good quality small dating samples.			
Nature of Dating Problem:			
Put EFD4L241 and 242 in context and link to profile on South Section via Palaeosol with magnetic excursion at base. Examine process of accumulation in the sequences of thin layers / lenses from which the Luminescence samples were taken. Is upper horizon redeposited?			

Completed By	**Checked By**	**Date**
CIB		28/7/04

Site Code: **Site Name:** Kostenki 14	**Date** 28/7/04	**Context No** East Section: "Layer 9"	**Luminescence Sample No** EFD4L241
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from "Layer 9" level with sample of Steve Forman: Grey-Brown silt/silty clay layer within "Layer 9", ~ 15 cm thick. Layer No's allocated for these samples only – no convenient numbering system covering site "Layer 9" consists of many sub-horizontal layers, thickness from ~15 cm to ~1 cm. All thought to be colluvial, silt/silty clay, differentiated on the basis of colour. Sealed by "Layer 8": Cultural layer interpreted as redeposited while frozen (lumps of permafrost). Seals "Layer 10": Very dark red-brown silty clay, lowermost cultural horizon associated with "hearths layer" elsewhere on site.		87 cm below datum 83 cm right from LHS of section, above sondage 22 cm right from sampling point of Steve Forman	
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G072	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time Hole Depth = 22 cm Est. Solid Angle = 4π Gamma dose rate = 0.58 ± 0.03 Depth from ground surface ~ 5 m, opposite wall of pit ~ 15 m away. Deep, still damp, only re-excavated recently, so *in-situ* WC may have some relevance.			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Tie in results with IRSL of Steve Forman (44-46 ka), and provide upper constraint for "cultural layer" containing red ochre similar to "hearth's layer", with IRSL of 34 and 45 ka. (!) (UIC-749 & -748) (Sinitsyn, 2003b) Should pre date EFD4L220. Should post date EFD4L242			

Completed By	**Checked By**	**Date**
CIB		28/7/04

Site Code: **Site Name:** Kostenki 14	**Date** 28/7/04	**Context No** East Section: “Layer 11”	**Luminescence Sample No** EFD4L242
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from “Layer 11”: “Alluvial?” layer below lower cultural layer. Layer No’s allocated for these samples only – no convenient numbering system covering site “Layer 11” consists of sandy silt / clayey silt lenses. Thin, complex interleaving, but not VERY different from each other, except lower down, where some sand lenses were observed (one sampled using profiling tube: EFD4L238). Some chalk clasts <1 cm, more above sampling position, less below. Sealed by “Layer 10”: Very dark red-brown silty clay, lowermost cultural horizon associated with “hearths layer” elsewhere on site. Seals whitish clay – at base of deposits, or backfill from previous excavation?		164 cm below datum 85 cm right from LHS of section, in sondage 16 cm left from RHS of sondage 36 cm below upper dark part of Layer 10, 28 cm below very chalky bit below dark cultural material. Tail of other line of deposition (part of Layer 10) is closer.	
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G073	ZLB for lab γ	-

Details:

Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time
Hole Depth = 21 cm
Est. Solid Angle = 4π
Gamma dose rate = 0.45 ± 0.02
Deep, still damp, only re-excavated recently, so in-situ WC may have some relevance.
Lower dose rate than EFD4L241 may reflect water content

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Provide lower constraint for “cultural layer” containing red ochre similar to “hearth’s layer”, with IRSL of 34 and 45 ka. – Oldest at Kostenki?
Should pre date EFD4L241.

Completed By	**Checked By**	**Date**
CIB		28/7/04

Appendix 4.3 Field gamma spectrometry forms

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G047.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kreminskoe	**Measurement Date**	19/07/04
Context	Biriuchya Balka Accommodation	**Spectrum No.**	1

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	481 (1443 keV)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		15194	15625	2963	
Count Rate (cps)		25.3	26.04	4.93	
Dose Rate (mGy/a)		0.49	0.51	0.53	0.55
Error			0.026	0.027	0.027
Mean Dose Rate (mGy/a)			0.53		

Location and geometry
Test measurement in box adjacent to stone wall in room.

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.53 ± 0.02

TL Samples
-

Date	20/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G048.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 2	**Measurement Date**	20/07/04
Context	Base of section, RHS	**Spectrum No.**	2

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	497 (1510 keV)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		21207	21243	4193	
Count Rate (cps)		35.3	35.4	6.99	
Dose Rate (mGy/a)		0.69	0.69	0.74	0.74
Error			0.036	0.037	0.037
Mean Dose Rate (mGy/a)			0.72		

Location and geometry
Test measurement at base of section – not in hole
Geometry: 3.5 – 3.8 π at surface of section,
Hole depth = 0 cm

Estimated solid angle (π Rad.)	3.5 – 3.8 π	**4π Gamma dose rate (mGy/a)**	0.76 (if 3.8 π) – 0.82 (if 3.5 π)

TL Samples
-

Date	20/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G049.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 2	**Measurement Date**	20/07/04
Context	Layer 3 (Mid)	**Spectrum No.**	3

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	505 (1485 keV)		
Ch. Width (eV)		3	2.90		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		23043	22711	4519	
Count Rate (cps)		38.4	37.9	7.53	
Dose Rate (mGy/a)		0.75	0.74	0.80	0.80
Error			0.04	0.04	0.04
Mean Dose Rate (mGy/a)			0.78		

Location and geometry
~ 5 m from LHS of section (N)
~ 6 m from RHS of section (S)
~ 5 m above base of section (not sondage)
and see TL sample sheet
Geometry: ~ 3.5 π at surface of section,
Hole depth = 23 cm
Gamma dose rate = 0.78 mGy/a implies gamma + beta ~ 2.34 mGy/a to coarse grains of quartz. Higher than may other sites, but loess would/could be around 4 mGy/a? or is that only to fine grains?

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.78 ± 0.04

TL Samples
EFD4L154

Date	20/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G050.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 2	**Measurement Date**	20/07/04
Context	Layer 5 (Lower)	**Spectrum No.**	4

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	495 (1433 keV)		
Ch. Width (eV)		3	2.95		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		22850	22897	4633	
Count Rate (cps)		30.1	38.1	7.72	
Dose Rate (mGy/a)		0.74	0.74	0.82	0.81
Error			0.04	0.04	0.04
Mean Dose Rate (mGy/a)			0.79		

Location and geometry
~ 5 m from LHS of section (N)
~ 6 m from RHS of section (S)
~ 3 m below top of section
~ 3.5 m above base of section (not sondage)
and see TL sample sheet
Geometry: ~ 3.6 π at surface of section,
Hole depth = 22 cm

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.79 ± 0.04

TL Samples
EFD4L155

Date	20/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G051.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 2	**Measurement Date**	20/07/04
Context	Layer 6	**Spectrum No.**	5

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	481 (1420 keV)		
Ch. Width (eV)		3	3.04		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		23626	24228	4939	
Count Rate (cps)		39.4	40.4	8.23	
Dose Rate (mGy/a)		0.77	0.79	0.88	0.86
Error			0.04	0.04	0.04
Mean Dose Rate (mGy/a)			0.84		

Location and geometry
~ 5 m from LHS of section (N)
~ 6 m from RHS of section (S)
~ 4 m below top of section
~ 2 m above base of section (not sondage)
and see TL sample sheet
Geometry: ~ 3.7 π at surface of section,
Hole depth = 20 cm
Note: Although still within errors of the average, the >450 keV dose rate appears consistently lower >1350keV. This is expected to result from a different balance of U, Th and K to that assumed in the definition of the conversion factors.
Spectra display relatively large amounts of high energy emissions, indicating high U and Th decay series concentrations relative to K.

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.84 ± 0.04

TL Samples
EFD4L156

Date	20/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G052.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 2	**Measurement Date**	21/07/04
Context	Layer 7	**Spectrum No.**	1

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	486 (1458 keV)		
Ch. Width (eV)		3	3.00		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		23942	24425	4888	
Count Rate (cps)		39.9	40.7	8.14	
Dose Rate (mGy/a)		0.78	0.79	0.87	0.86
Error			0.04	0.04	0.04
Mean Dose Rate (mGy/a)			0.84		

Location and geometry
~ 5 m from LHS of section (N)
~ 6 m from RHS of section (S)
28 cm below step in section
110 cm above base of section (not sondage)
and see TL sample sheet
Geometry: ~ 3.8 π at surface of section,
Hole depth = 20 cm

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.84 ± 0.05

TL Samples
EFD4L157

Date	21/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G053.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 2	**Measurement Date**	21/07/04
Context	Layer 8	**Spectrum No.**	2

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	500 (1500 keV)		
Ch. Width (eV)		3	2.92		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		25553	25484	5027	
Count Rate (cps)		42.6	42.5	8.4	
Dose Rate (mGy/a)		0.83	0.83	0.89	0.89
Error			0.04	0.04	0.04
Mean Dose Rate (mGy/a)			0.87		

Location and geometry
~ 5 m from LHS of section (N)
~ 6 m from RHS of section (S)
90 cm below step in section
50 cm above base of section (not sondage)
and see TL sample sheet
Geometry: ~ 3.8 π at surface of section,
Hole depth = 20 cm

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.87 ± 0.04

TL Samples
EFD4L158

Date	21/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G054.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 2	**Measurement Date**	21/07/04
Context	Layer 9	**Spectrum No.**	3

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	501 (1464 keV)		
Ch. Width (eV)		3	2.92		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		23897	23664	4557	
Count Rate (cps)		39.8	39.4	7.60	
Dose Rate (mGy/a)		0.78	0.77	0.81	0.83
Error			0.04	0.04	0.04
Mean Dose Rate (mGy/a)			0.80		

Location and geometry
~ 74 cm from LHS of section (N)
0 cm above 37 cm step at top of sondage, ~5 cm below base of main section elsewhere and see TL sample sheet
Geometry: ~ 3.9 π at surface of section,
Hole depth = 23 cm
Gamma dose rate lower than G053: Higher water content? – appears damper

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.80 ± 0.04

TL Samples
EFD4L159

Date	21/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G055.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 2	**Measurement Date**	21/07/04
Context	Layer 10	**Spectrum No.**	4

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	500 (1459 keV)		
Ch. Width (eV)		3	2.92		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		22483	22368	4394	
Count Rate (cps)		37.5	37.3	7.32	
Dose Rate (mGy/a)		0.73	0.73	0.78	0.78
Error			0.04	0.04	0.04
Mean Dose Rate (mGy/a)			0.76		

Location and geometry
~ 70 cm from LHS of section (N)
74 cm below top of sondage
65 cm above water in sondage at time of sampling, but this would have presumably been higher
and see TL sample sheet
Geometry: ~ 4 π at surface of section,
Hole depth = 19 cm
Gamma dose rate lower again than samples above: Location clearly damper, but contains sandstone too…?

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.76 ± 0.04

TL Samples
EFD4L160

Date	21/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G056.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 2	**Measurement Date**	21/07/04
Context	Layer 10, below stones	**Spectrum No.**	6

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487			
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		19885	19664	3745	
Count Rate (cps)		33.1	32.74	6.24	
Dose Rate (mGy/a)		0.64	0.64	0.66	0.69
Error			0.03	0.03	0.03
Mean Dose Rate (mGy/a)			0.66		

Location and geometry
~ 70 cm from LHS of section (N)
20 cm below layer of stones, which was also approximately the present water table
13 cm above other layer of stones
30 cm above water in sondage at time of sampling
and see TL sample sheet
Geometry: ~ 4 π at surface of section,
Hole depth = 20 cm
Gamma dose rate lower again than samples above: water removed from pit, sample near saturation. ~80% of DR in Layer 7, so 20% difference from water content, or also because more sandy?

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.66 ± 0.03

TL Samples
EFD4L161

Date	21/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G057.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 2	**Measurement Date**	21/07/04
Context	Layer 8 (above sondage)	**Spectrum No.**	5

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	502 (1468 keV)		
Ch. Width (eV)		3	2.97		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		24815	24583	4796	
Count Rate (cps)		41.4	40.97	7.99	
Dose Rate (mGy/a)		0.81	0.80	0.85	0.87
Error			0.04	0.04	0.04
Mean Dose Rate (mGy/a)			0.84		

Location and geometry
~ ? cm from LHS of section (N)
25 cm above 37 cm step at top of sondage which lay ~5 cm below base of main section elsewhere
and see TL sample sheet
Geometry: ~ 3.9 π at surface of section,
Hole depth = 22 cm

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.84 ± 0.04

TL Samples
EFD4L162

Date	21/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G058.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 1a	**Measurement Date**	22/07/04
Context	Surface	**Spectrum No.**	1

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	496 (1488 keV)		
Ch. Width (eV)		3	2.95		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		14721	14741	2243	
Count Rate (cps)		24.5	24.6	3.74	
Dose Rate (mGy/a)		0.48	0.48	0.40	0.49
Error			0.02	0.02	0.02
Mean Dose Rate (mGy/a)			0.40 = soil , 0.08 = ^{137}Cs*		

Location and geometry
Ground surface 10 m S from top of section
Geometry: 2 π,
Hole depth = 0 cm

* ^{137}Cs component probably slightly larger bearing in mind natural spectra yield slightly higher >1350 keV DR values here.

Estimated solid angle (π Rad.)	2π	**4π Gamma dose rate (mGy/a)**	0.80 ± 0.04 Soil 0.16 ± 0.04 ^{137}Cs

TL Samples
-

Date	22/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G059.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 1a	**Measurement Date**	22/07/04
Context	Layer 6 (above stony layer)	**Spectrum No.**	2

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	490 (1444 keV)		
Ch. Width (eV)		3	2.98		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		21668	21966	4127	
Count Rate (cps)		36.1	36.6	7.11	
Dose Rate (mGy/a)		0.70	0.71	0.76	0.76
Error			0.04	0.04	0.04
Mean Dose Rate (mGy/a)			0.74		

Location and geometry
92 cm from RHS of section
104 cm above base of pit
28 cm above stony layer
and see TL sample sheet
Geometry: ~ 4 π at surface of section,
Hole depth = 17 cm

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.74 ± 0.04

TL Samples
EFD4L174

Date	22/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G060.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 1a	**Measurement Date**	22/07/04
Context	Layer 6 (below stony layer)	**Spectrum No.**	3

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	491 (1464 keV)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		20369	20527	4135	
Count Rate (cps)		33.9	34.2	6.89	
Dose Rate (mGy/a)		0.66	0.67	0.73	0.72
Error			0.03	0.03	0.03
Mean Dose Rate (mGy/a)			0.71		

Location and geometry
73 cm from RHS of section
28 cm above base of pit
27 cm below stony layer
and see TL sample sheet
Geometry: ~ 4 π at surface of section,
Hole depth = 18 cm

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.71 ± 0.04

TL Samples
EFD4L175

Date	22/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G061.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Biriuchya Balka 1a	**Measurement Date**	22/07/04
Context	Layer 6 (sand lens)	**Spectrum No.**	4

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	498 (1482 keV)		
Ch. Width (eV)		3	2.94		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		18478	18392	3555	
Count Rate (cps)		30.8	30.7	5.93	
Dose Rate (mGy/a)		0.60	0.60	0.63	0.64
Error			0.03	0.03	0.03
Mean Dose Rate (mGy/a)			0.62		

Location and geometry

and see TL sample sheet
Geometry: ~ 4 π at surface of section,
Hole depth = ? cm

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.62 ± 0.03

TL Samples
EFD4L176

Date	22/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G062.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kalitvenka 1	**Measurement Date**	23/07/04
Context	Surface	**Spectrum No.**	1

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	477 (1431 keV)		
Ch. Width (eV)		3	3.06		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		8595	8962	1169	
Count Rate (cps)		14.3	14.9	1.95	
Dose Rate (mGy/a)		0.28	0.29	0.21	0.28
Error			0.015	0.011	0.014
Mean Dose Rate (mGy/a)			0.21 = soil , 0.08 = ^{137}Cs		

Location and geometry
Ground surface 10 m from top of section
Geometry: 2 π,
Hole depth = 0 cm

The A horizon is very thin in the section.
^{137}Cs peak evident
Only a small ^{40}K peak is evident

Estimated solid angle (π Rad.)	2π	**4π Gamma dose rate (mGy/a)**	0.42 ± 0.04 Soil 0.16 ± 0.04 ^{137}Cs

TL Samples
-

Date	23/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G063.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kalitvenka 1	**Measurement Date**	23/07/04
Context	Layer 10	**Spectrum No.**	3

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	488 (1464 keV)		
Ch. Width (eV)		3	2.996		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		8161	8285	1616	
Count Rate (cps)		13.60	13.81	2.70	
Dose Rate (mGy/a)		0.26	0.27	0.29	0.29
Error			0.014	0.015	0.014
Mean Dose Rate (mGy/a)			0.28		

Location and geometry

36 cm from RHS of section
60 cm from base of section (not sondage, which had been refilled with its original material at the time of measurement)
and see TL sample sheet
Geometry: ~ 3 π at surface of section,
Hole depth = 17 cm

Much lower dose rates than at BB reflect quartzose drift geology

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.28 ± 0.01

TL Samples
EFD4L202

Date	23/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G064.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kalitvenka 1	**Measurement Date**	23/07/04
Context	Layer 11	**Spectrum No.**	5

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	473 (1440 keV)		
Ch. Width (eV)		3	3.09		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5684	5495	1183	
Count Rate (cps)		9.47	9.91	1.97	
Dose Rate (mGy/a)		0.185	0.19	0.21	0.21
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.20		

Location and geometry

~ 36 cm from RHS of section
and see TL sample sheet
Geometry: ~ 3 π at surface of section,
Hole depth = 29 cm above hole, but collapse of material left only ~ 10 cm hole depth on the lower side. The probe therefore lay at an angle, but should have been isolated from material outside its immediate surroundings.

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.20 ± 0.01

TL Samples
EFD4L203

Date	23/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G065.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kalitvenka 1	**Measurement Date**	23/07/04
Context	Layer 12 (upper)	**Spectrum No.**	4

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	Very small ^{40}K peak, but 480 (1438 keV)		
Ch. Width (eV)		3	3.05		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		3512	3624	765	
Count Rate (cps)		5.85	6.04	1.28	
Dose Rate (mGy/a)		0.11	0.12	0.14	0.13
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.13		

Location and geometry

18 cm below boundary with Layer 11
and see TL sample sheet
Geometry: ~ 3 π at surface of section,
Hole depth = 25 cm.

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.13 ± 0.01

TL Samples
EFD4L204

Date	23/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G066.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kalitvenka 1	**Measurement Date**	23/07/04
Context	Layer 12 (lower)	**Spectrum No.**	2

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	No ^{40}K peak visible, but located in 485		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		2012	2098	404	
Count Rate (cps)		3.35	3.50	0.67	
Dose Rate (mGy/a)		0.065	0.068	0.072	0.075
Error			0.004	0.005	0.004
Mean Dose Rate (mGy/a)			0.072		

Location and geometry

36 cm from LHS of sondage
30 cm from base of sondage
245 cm depth
and see TL sample sheet
Geometry: ~ 3.5 π at surface of section,
Hole depth = 23 cm, but only 5 cm depth immediately above probe due to collapse.
Beneath probe was composed of material replaced after collapse.
Very loose sandy material – low dose rate and very little ^{40}K implies clean quartz(ite) sand.

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.07 ± 0.01

TL Samples
EFD4L205

Date	23/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G067.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kalitvenka 1v	**Measurement Date**	23/07/04
Context	Layer 3	**Spectrum No.**	6

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	477 (1474 keV)		
Ch. Width (eV)		3	3.06		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		6973	7263	1439	
Count Rate (cps)		11.6	12.1	2.4	
Dose Rate (mGy/a)		0.23	0.24	0.26	0.25
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.25		

Location and geometry

and see TL sample sheet
Geometry: ~ 3.2 π at surface of section,
Hole depth = 18 cm

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.25 ± 0.01

TL Samples
EFD4L206

Date	23/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G068.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kalitvenka 1v	**Measurement Date**	23/07/04
Context	Layer 4	**Spectrum No.**	7

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	481 (1474 keV)		
Ch. Width (eV)		3	3.04		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		3745	3849	789	
Count Rate (cps)		6.24	6.42	1.32	
Dose Rate (mGy/a)		0.12	0.13	0.14	0.14
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.14		

Location and geometry

and see TL sample sheet
Geometry: ~ 3.2 π at surface of section,
Hole depth = 21 cm

Dose rate within errors of Layer 12 upper at Kalitvenka 1

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.14 ± 0.01

TL Samples
EFD4L207

Date	23/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G069.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kostenki	**Measurement Date**	26/07/04
Context	Ground surface outside accommodation	**Spectrum No.**	1

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	480 (1440 keV)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5722	5935	822	
Count Rate (cps)		9.54	9.89	1.37	
Dose Rate (mGy/a)		0.186	0.19	0.15	0.19
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.15 = soil , 0.04 = ^{137}Cs		

Location and geometry
Ground surface outside accommodation under fruit trees
^{137}Cs peak prominent
^{40}K peak small but sufficient

Geometry: 2 π,
Hole depth = 0 cm

Estimated solid angle (π Rad.)	2π	**4π Gamma dose rate (mGy/a)**	0.30 ± 0.02 Soil 0.08 ± 0.02 ^{137}Cs

TL Samples
-

Date	26/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G070.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kostenki 14	**Measurement Date**	28/07/04
Context	Between Tephra and Palaeosol	**Spectrum No.**	2

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	486 (1480 keV)		
Ch. Width (eV)		3	3.001		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		12111	12344	2460	
Count Rate (cps)		20.19	20.6	4.1	
Dose Rate (mGy/a)		0.39	0.40	0.44	0.43
Error			0.02	0.02	0.02
Mean Dose Rate (mGy/a)			0.42		

Location and geometry

Depth from ground surface ~ 4 m, opposite wall of pit ~ 20 m away.
32 cm below large step.
~ 60 cm above another large step.
and see TL sample sheet
Geometry: ~ 3.5 π at surface of section,
Hole depth = 21 cm

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.42 ± 0.02

TL Samples
EFD4L219

Date	28/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G071.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kostenki 14	**Measurement Date**	28/07/04
Context	Below Palaeosol	**Spectrum No.**	3

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	496 (1462 keV)		
Ch. Width (eV)		3	2.95		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		11974	11994	2339	
Count Rate (cps)		19.96	19.99	3.89	
Dose Rate (mGy/a)		0.39	0.39	0.42	0.42
Error			0.02	0.02	0.02
Mean Dose Rate (mGy/a)			0.41		

Location and geometry

Depth from ground surface ~ 4 m, opposite wall of pit ~ 20 m away.
85 cm below large step.
~ 5 cm above another large step.
and see TL sample sheet
Geometry: ~ 3.8 π at surface of section,
Hole depth = 22 cm

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.41 ± 0.02

TL Samples
EFD4L220

Date	28/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G072.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kostenki 14	**Measurement Date**	28/07/04
Context	Colluvial layer next to Steve Forman’s sample	**Spectrum No.**	4

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	493 (1453 keV)		
Ch. Width (eV)		3	2.97		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		16686	16825	3332	
Count Rate (cps)		27.8	28.04	5.55	
Dose Rate (mGy/a)		0.54	0.55	0.59	0.59
Error			0.03	0.03	0.03
Mean Dose Rate (mGy/a)			0.58		

Location and geometry

Depth from ground surface ~ 5 m, opposite wall of pit ~ 15 m away.
108 cm below large step.
80 cm right from LHS of sub section, above sondage
~ 30 cm from another large step.
and see TL sample sheet
Geometry: ~ 3.8 π at surface of section,
Hole depth = 22 cm

Damp and deep enough for *in situ* water content to mean something?

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.58 ± 0.03

TL Samples
EFD4L241

Date	28/07/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G073.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kostenki 14	**Measurement Date**	28/07/04
Context	“Alluvial” layers below lowest cultivated layer	**Spectrum No.**	5

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	493 (1462 keV)		
Ch. Width (eV)		3	2.97		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		13175	13288	2544	
Count Rate (cps)		21.9	22.1	4.24	
Dose Rate (mGy/a)		0.43	0.43	0.45	0.46
Error			0.02	0.02	0.02
Mean Dose Rate (mGy/a)			0.45		

Location and geometry

Depth from ground surface ~ 5 m, opposite wall of main pit ~ 15 m away.
23 cm above bottom of sondage
85 cm right from LHS of sondage, 16 cm left from RHS of sondage
and see TL sample sheet
Geometry: ~ 3.9 π at surface of section,
Hole depth = 21 cm

Damp and deep enough for *in situ* water content to mean something?

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.45 ± 0.02

TL Samples
EFD4L242

Date	28/07/04
Completed By	CIB
Checked By	