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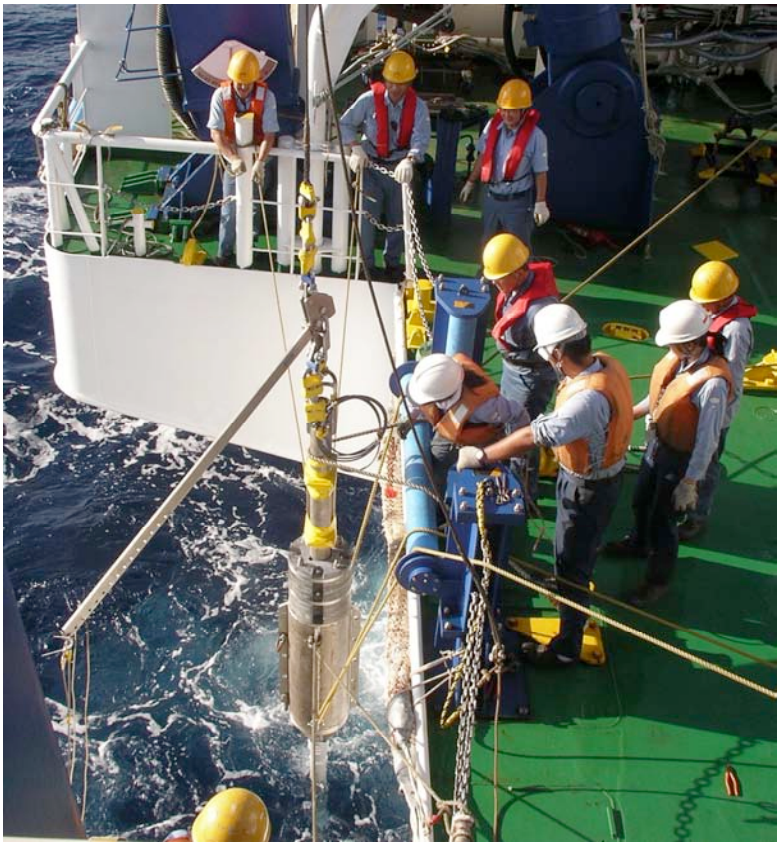
Onboard Preliminary Report of KR05-15 cruise of R/V Kairei

West Caroline Basin

28 October 2005 (Guam) – 8 November 2005 (Guam)



Contents

1. Purpose of the KR05-15 cruise

This cruise is to implement the proposal No. S05-03 for the JAMSTEC deep-sea research, “Paleoclimatic and Orbital Modulation of the Earth's Magnetic Field: Site survey for IODP proposal 612”

Recently, paleomagnetists have argued a possibility of orbital modulation of the geomagnetic field: presence or absence of the Milankovitch orbital frequencies in geomagnetic paleointensity records. This is fundamentally important for the geomagnetism because it suggests a possibility that part of energy for the geodynamo may come from outside the Earth's core. The main criticism to the orbital modulation hypothesis is that it might be an artifact induced by magnetic property changes of sediments, which is controlled by lithological changes caused by paleoclimatic changes. To solve this problem, it is necessary to compare paleomagnetic records from sediments of various lithologies. We plan to examine effect of carbonate contents in sediments to geomagnetic paleointensity estimation. We have chosen the West Caroline Basin (WCB) for this purpose because it is known that sediments in this area can yield exceptionally excellent paleomagnetic records, which is based on results from piston cores taken previously in WCB at depths close to the carbonate compensation depth (CCD). One of the purposes of this cruise is to take cores from various depths shallower than the CCD, and evaluate the effect of carbonate content changes on geomagnetic paleointensity estimation. The sediment cores taken will be used also for geochemical and micropaleontological analyses in order to assign ages for the sediments and to understand sedimentary environment.

Another objective of this cruise is to conduct a site survey for the IODP (Integrated Ocean Drilling Program) proposal 612-Full2. This proposal aims to clarify long-term secular variations of the geomagnetic field in both intensity and direction during the last 10 m.y. with special emphasis on testing the hypothesis of the orbital modulation of the geomagnetic field. One of the high priority sites of this proposal is in the West Caroline Basin partly because high quality paleomagnetic data during the last 2 to 3 m.y. were previously obtained using sediment cores from this area. But all previous coring sites were close to CCD. SSEP (Science Steering and Evaluation Panel) of IODP requested to find appropriate sites with water depths enough shallower than CCD, because sediments from such sites can be dated by oxygen isotope and can be used for paleoceanography as well as paleomagnetism.

2. Summary of the KR05-15 cruise

2.1 Vessel

R/V Kairei owned by Japan Agency for Marine-Earth Science and Technology

Overall length: 105 m

Gross tonnage: 4,628 tons

2.2 Dates

Left Guam on 28 October, 2005

Arrived at Guam on 8 November, 2005

2.3 Survey Area

The West Caroline Basin, within the rectangular in Figure 2.3-1.

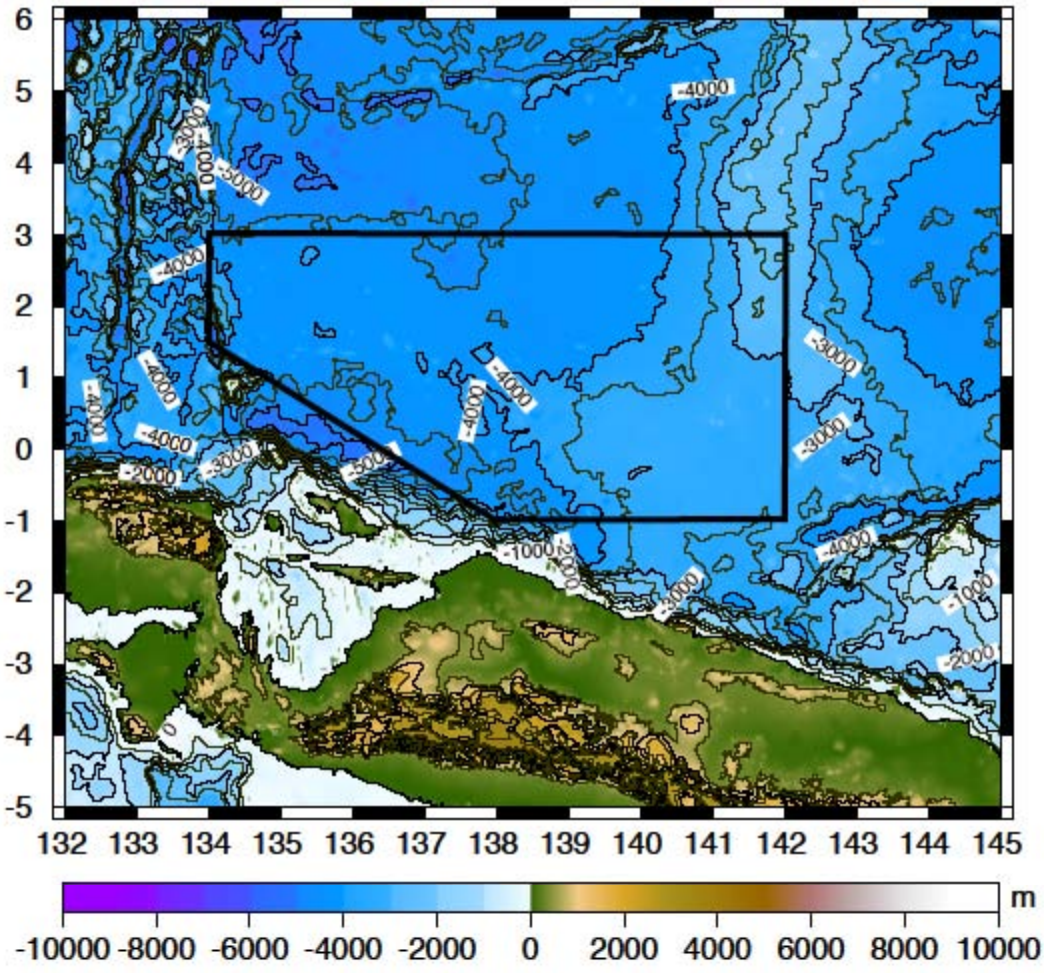


Figure 2.3-1 Survey area of KR05-15 cruise in the West Caroline Basin.

2.4 Ship log

Date	Time	Observation
10.28	14:00	Leave Guam
10.29		Transit to survey area (southeastern part)
10.30	11:00	Deploy proton magnetometer
	11:20	Deploy XBT
	12:55	Start topographic and magnetic survey
10.31	13:55	End topographic and magnetic survey
	15:35	Retrieve proton magnetometer
	15:55	Deploy GI-gun and hydrophone
	17:17	Start single-channel seismic reflection (SCS) survey line
11.1	8:27	End SCS line
	8:37	Retieve GI-gun and hydrophone
	8:41	Deploy XBT
	9:16	Start piston coring (PC-01)
	12:10	End piston coring
	14:38	Start topographic survey line
	15:50	End topographic survey line
	16:21	Deploy GI gun and hydrophone
	16:57	Start SCS line
11.2	6:54	End SCS line
	7:04	Retrieve GI-gun and hydrophone
	8:30	Start piston coring (PC-02)
	11:35	End piston coring
	11:46	Deploy proton magnetometer
	12:01	Figure-8 turn (Calibration of three-component magnetometer)
	12:38	Start topographic and magnetic survey line
	15:16	End topographic and magnetic survey line
	15:28	Retrieve proton magnetometer
	15:36	Deploy GI-gun and hydrophone
	16:19	Start SCS line
11.3	6:09	End SCS line
	7:03	Retieve GI-gun and hydrophone
	8:35	Start piston coring (PC-03)
	11:43	End piston coring
	11:53	Deploy proton magnetometer

		Transit to the western part of the survey area Topographic and magnetic survey
11.4	12:55	Retrieve proton magnetometer
	13:17	Deploy GI-gun and hydrophone
	13:52	Start SCS line
11.5	6:19	End SCS line
	7:07	Retrieve GI-gun and hydrophone
	8:08	Start piston coring (PC-04)
	11:30	End piston coring
	11:40	Deploy proton magnetometer
	12:15	Figure-8 turn (Calibration of three-component magnetometer)
	13:10	Start topographic and magnetic survey line
	16:00	End topographic and magnetic survey line Transit to Guam
	20:48	Figure-8 turn (Calibration of three-component magnetometer) End observation
11.6	6:15	Retrieve proton magnetometer
11.7		Transit to Guam
11.8	9:00	Arrive at Guam

2.5 Participants

(1) Scientific team

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2/O	Naoto Kimura
3/O	Hiroyuki Kato
C/E	Hiroyoshi Kikkawa
2/E	Takashi Ota
3/E	Takafumi Tominaga
C/Op	Tokinori Nasu
2/Op	Katsutoshi Kitamura
3/Op	Hiroki Ishiwata
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Able Seaman	Osamu Tokunaga
Able Seaman	Hideo Isobe
Able Seaman	Masanori Ohata
Able Seaman	Yutaka Sato
Able Seaman	Yoshiaki Matsuo
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Oiler	Tsuneo Harimoto
Oiler	Junji Mori
Oiler	Hiroshi Yamamoto
Oiler	Sakoh Tanaka
C/S	Takeshi Miyauchi
Cook	Sueto Sasaki
Cook	Hideo Fukumura
Cook	Hiroyuki Yoshizawa
Cook	Hiroaki Yaoita

3. Site survey

During the KR05-15 cruise, two small areas in the West Caroline Basin were surveyed: the southeastern part and the western part.

First, seafloor topographic mapping and sub-bottom acoustic reflection profiling were conducted in order to find appropriate sites for piston coring using a SeaBeam 2112 multi-narrow-beam echo-sounder with 4 kHz sub-bottom profiler, which is equipped with R/V Kairei. Sub-bottom profiling was not carried out during nighttime from 20:00 to 06:00. XBT measurements for sound velocity correction were conducted twice.

Next, a single-channel seismic reflection survey was conducted in the vicinity of each coring site to investigate sedimentary structure and thickness of sediments above the oceanic crust. Two lines of 20 to 30 miles each were occupied, which run north-south and east-west directions. Coring sites are at or near the cross points of the two lines. Ship's speed was 4 knots in general. Detailed description of observation conditions and preliminary results are presented in the section 3.2.

Gravity and magnetic measurements were also carried out along topographic survey lines. A shipboard gravity meter (Bodenseewerk KSS311) was used, and relative gravity values were connected to absolute gravity at the Gaum port. Magnetic measurements were performed by a proton magnetometer (Kawasaki PRT010) and a shipboard three-component magnetometer system (Tierra Technica SFG1214). To evaluate induced and permanent magnetization of the ship, "figure-8 turn" was conducted three times. The proton magnetometer was not towed during single-channel seismic reflection profiling.

3.1 Topography and sub-bottom profiles

Figures 3.1-1 and 3.1-2 show bathymetric maps of the southeastern and western parts of the West Caroline Basin. An enlarged bathymetric map and a sub-bottom profile around each coring site were displayed in Figures 3.1-3 through 3.1-6.

From sub-bottom profiles, it is recognized that the survey areas are covered with well-stratified thick sedimentary layers except for small seamounts. A characteristic feature of the survey areas is the gently undulating seafloor. Relative height is on the order of 10m. From sub-bottom profiles, it is revealed that the undulation is caused by occurrence of numerous faulted blocks. The both survey areas are on a bulge of the subducting Caroline Plate along the New Guinea Trench, and hence they are estimated to be normal faults induced by a bend of the plate.

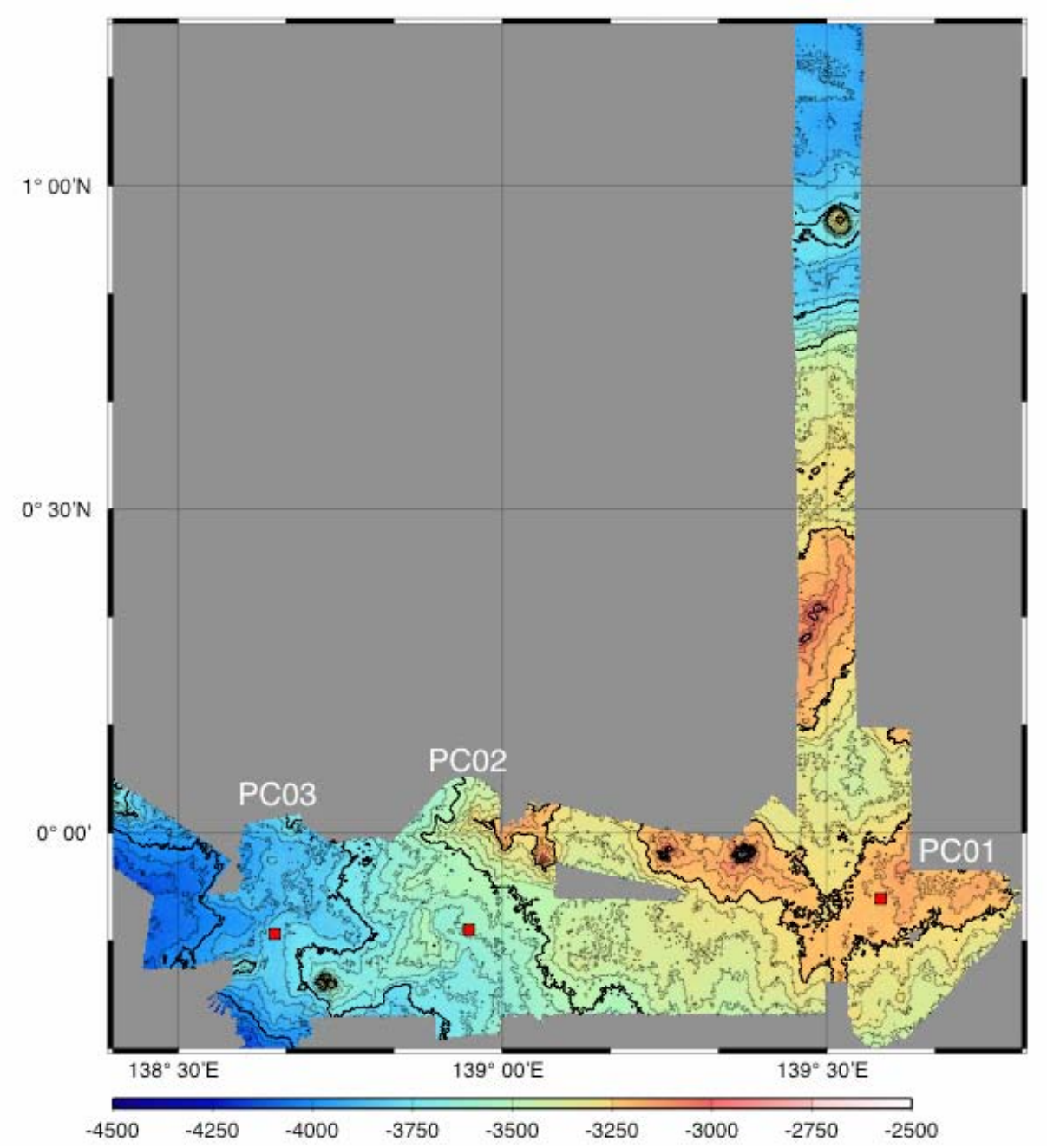


Figure 3.1-1 Topographic map of the southeastern survey area in the West Caroline Basin.

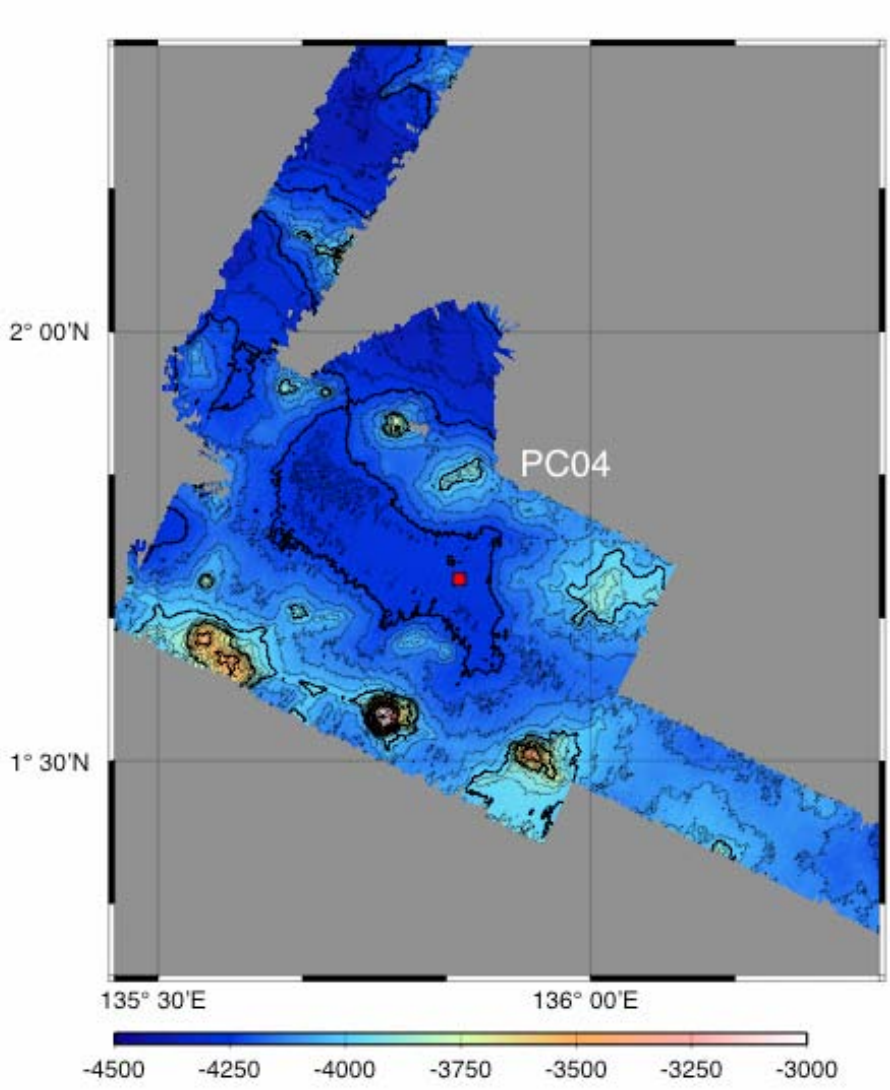


Figure 3.1-2 Topographic map of the western survey area in the West Caroline Basin.

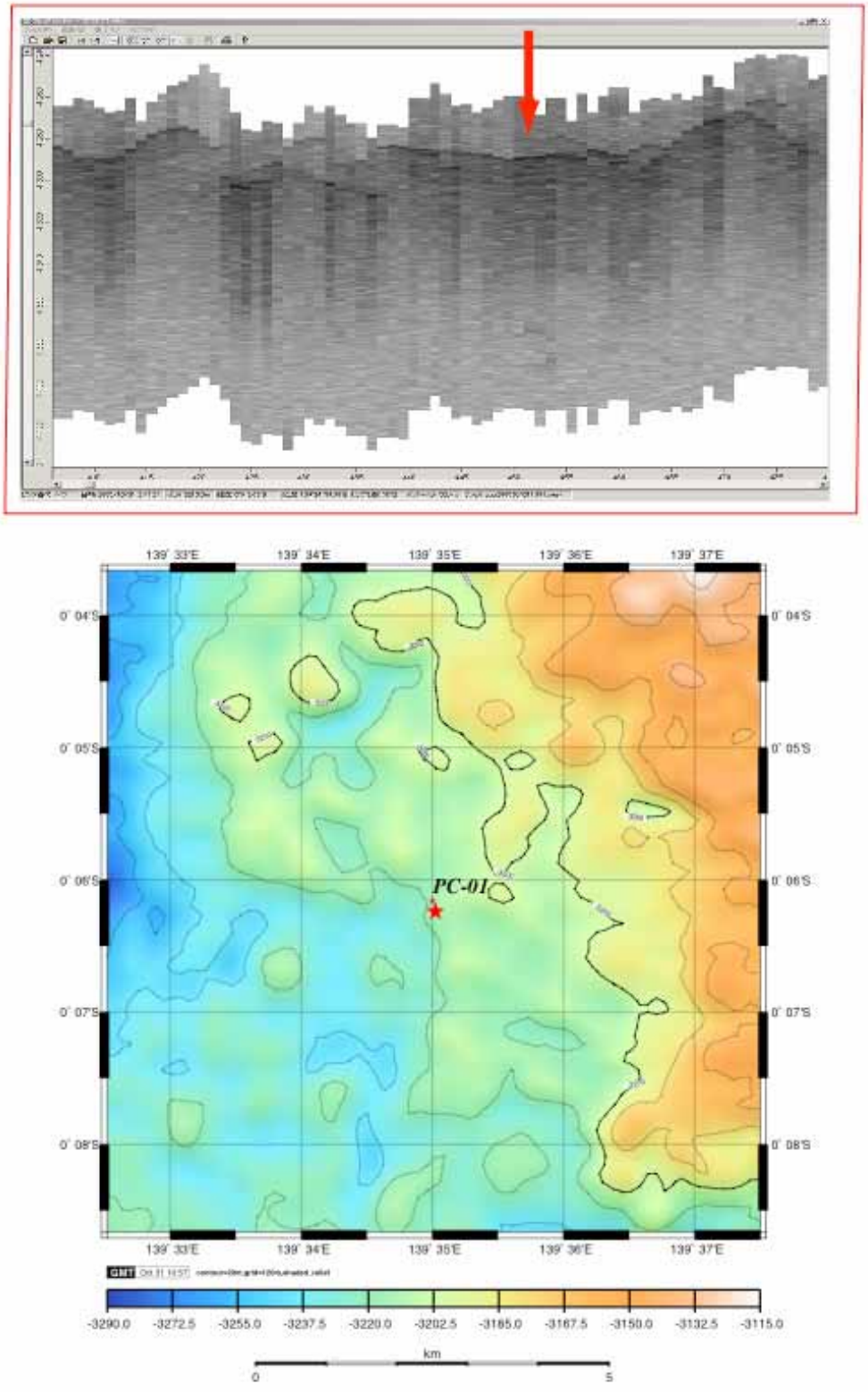


Figure 3.1-3 Topographic map and sub-bottom profile around the site PC-01.

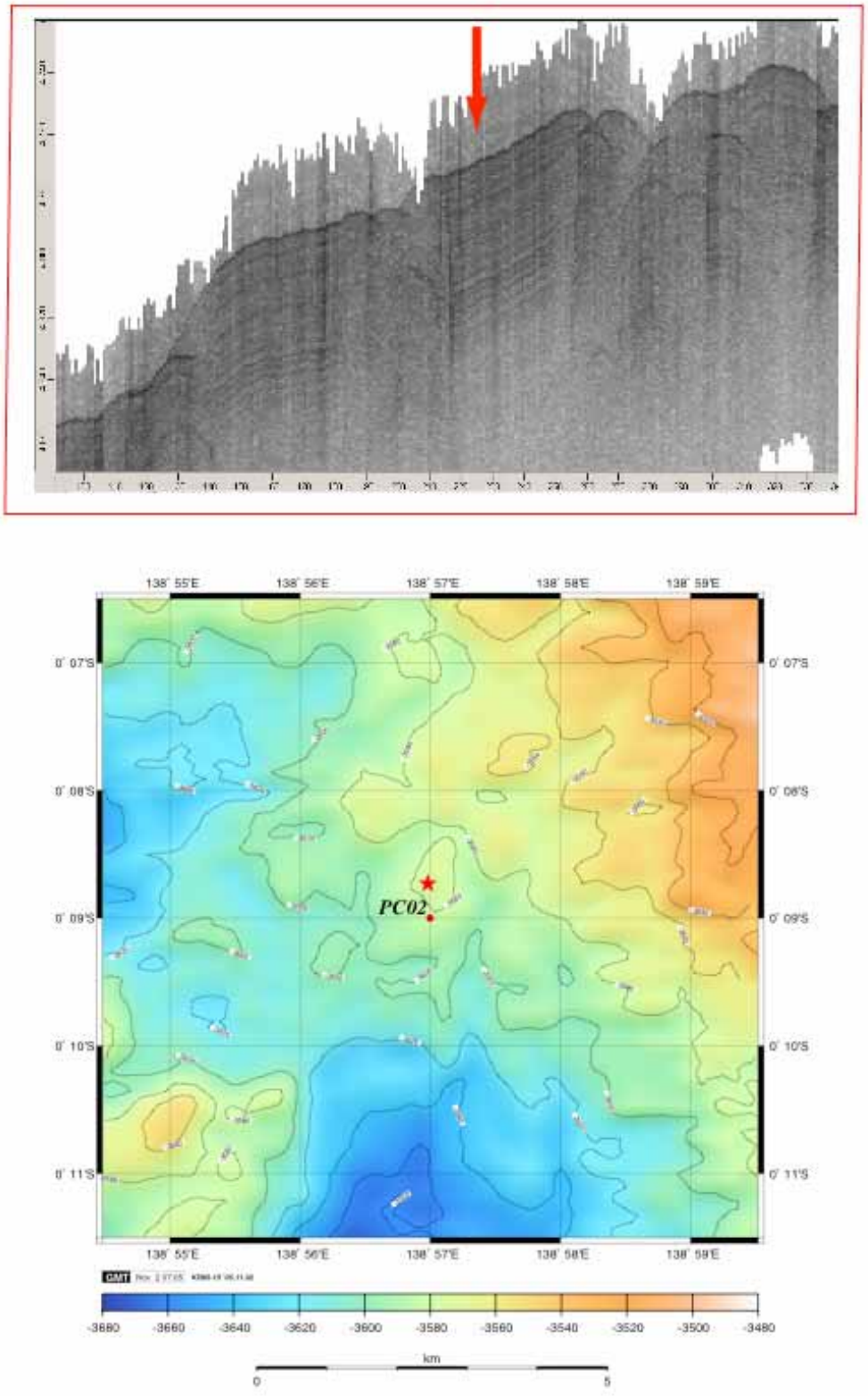


Figure 3.1-4 Topographic map and sub-bottom profile around the site PC-02.

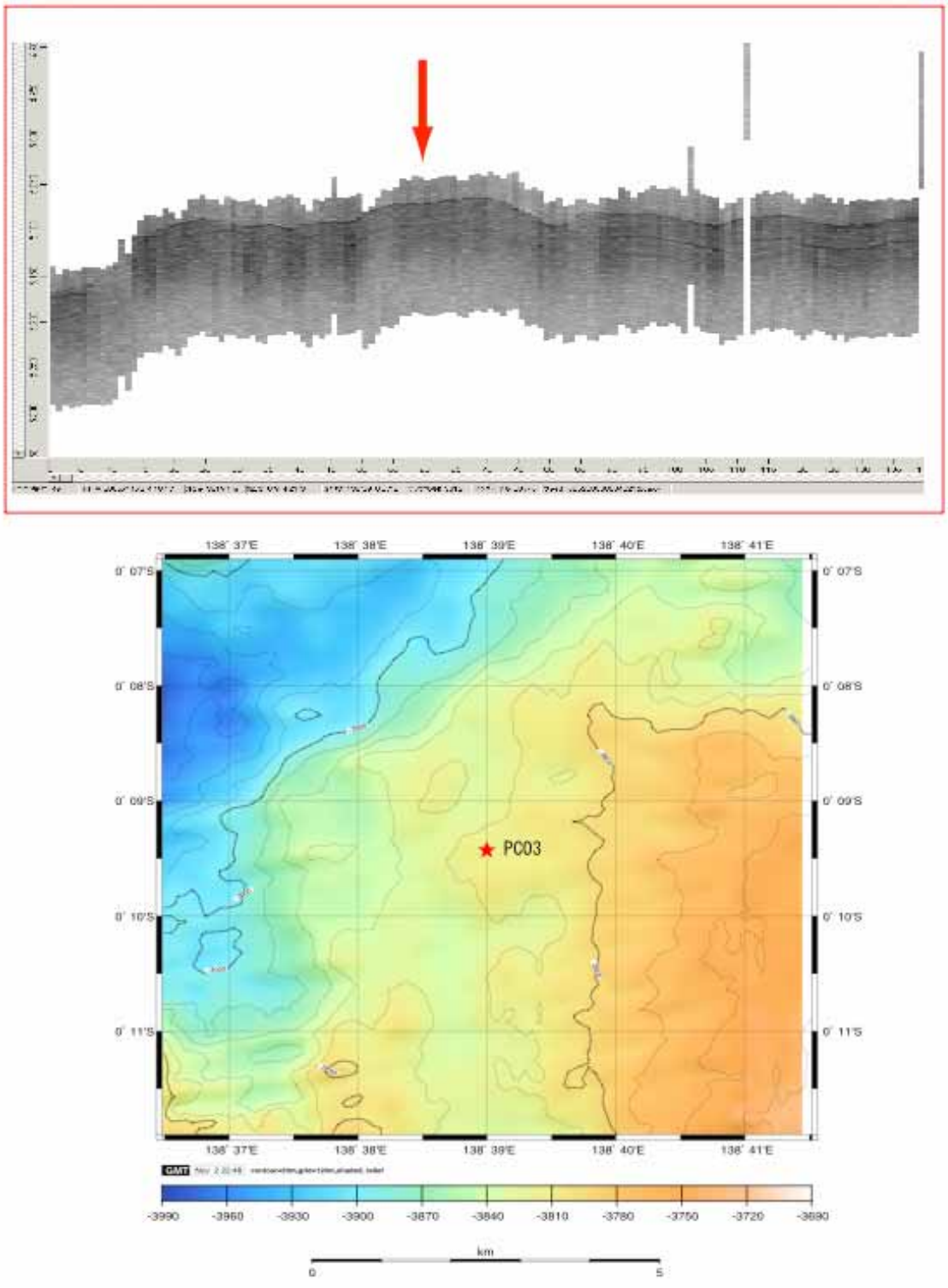


Figure 3.1-5 Topographic map and sub-bottom profile around the site PC-03.

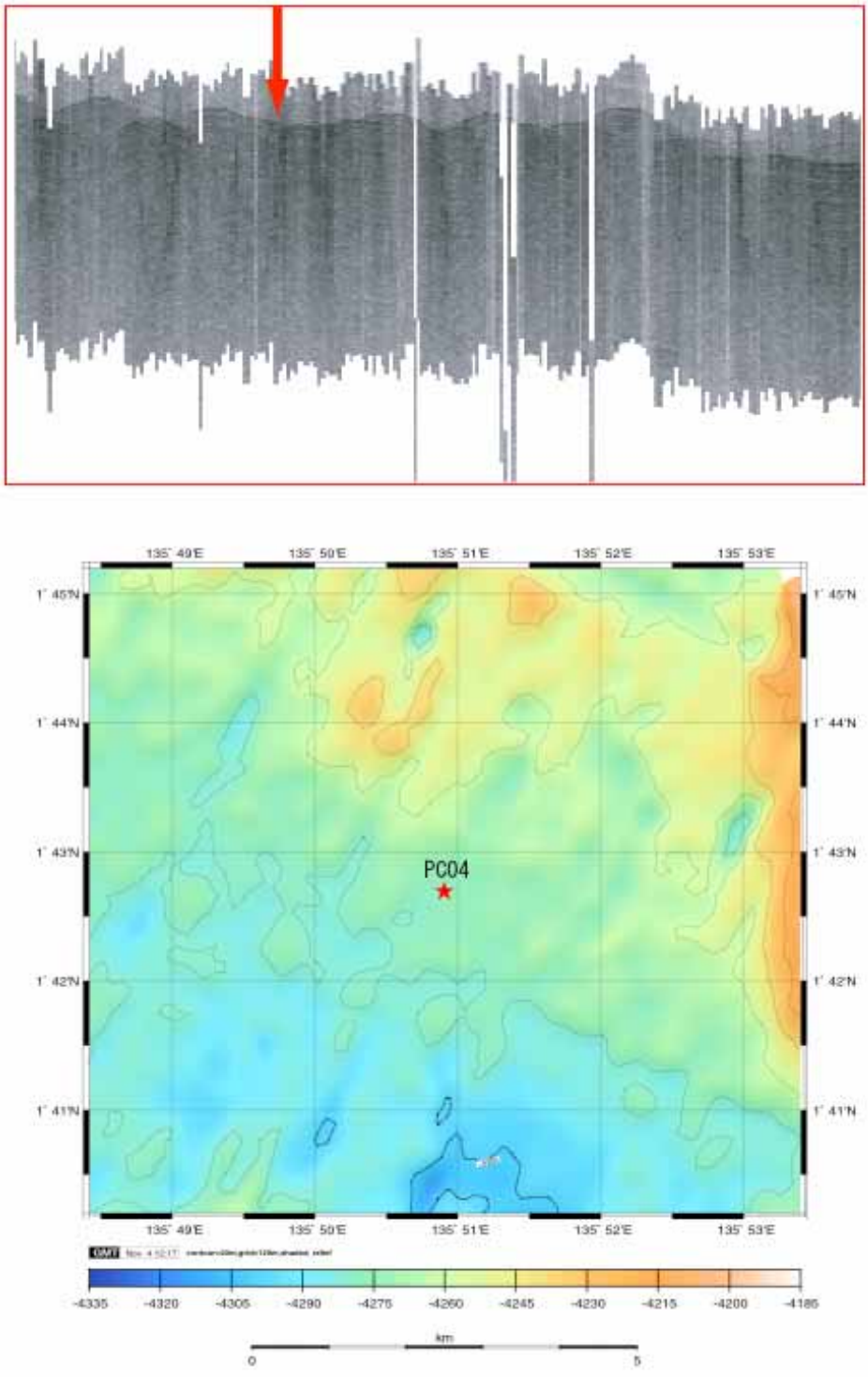


Figure 3.1-6 Topographic map and sub-bottom profile around the site PC-04.

3.2 Single-channel seismic reflection survey

The equipment and specification of the single channel seismic survey are as follows.

Streamer

Manufacturer	S.I.G
Active section length	65m
Hydrophone Interval	1m
Type of Hydrophone	S.I.G.16.48.65
Hydrophone output	-90 dB re 1V/μbar,±1dB
Frequency	flat from 10Hz to 1000Hz
Depth sensor	Yes
Preamplifier	39dB
Lead in cable	135m
Receiver depth	3-5m

Source

Manufacturer	Sercel
Type of airgun	GI-150
Volume	210cu.in. ([G]105+[I]105)
Air pressure	2000psi
Source depth	4.0m
Depth sensor	Yes (Off line sensor)
Gun Controller	GI-01

Air Compressor

Manufacturer	Leobersdorfer Maschinenfabrik AG Wien
Type of machine	LMF 24/150-E60(VC 2214 w15)
Air supply Capacity	$24m^3$/min.

Recording System

Manufacturer	IXEA
Type of system	Delph Seismic/Delph Seismic+Plus
Monitor	EPC The model GSP-1086 Printer
Recording format	SEG-Y
Recording length	7.5sec
Sample rate	1msec
High cut	Anti-aliasing filtering (>2KHz)
Lowcut	None
Recording media	HD

Navigation

DGPS system	Starfix

Shot Point Geometry

Time mode shooting	8sec interval

Geodetic Parameter

Spheroid	WGS84
Semi-major Axis	6,378,160m
Inverse Flattening	298.25
Projection	U.T.M
Zone	Zone 54 S (southeast area)/ Zone 53 N (northwest area)

Figure 3.2-1 shows the geometry of the seismic source, receiver, and vessel. Figure 3.2-2 displays the location of survey lines, and seismic reflection profiles are presented in Figures 3-2.3 through 3-2.6. The profiles are after applying a band-pass filter (ranging from 10 to 250 Hz with a flat band between 30 and 200 Hz) to static-shifted seismic reflection data.

All four sites show similar seismic characteristics. Acoustic basements, which correspond to oceanic crusts of Oligocene age, are covered with thick transparent sedimentary layers. Some reflectors are recognized in the middle to lower part of the sedimentary layer. At the sites of PC01 and PC02, the thickness of the sediments is about 0.7 sec. in two-way travel times (700m when a sound velocity of 2.0 km/sec. is assumed for the sediments). It is about 0.9 sec. at the site PC03, and 0.5 sec. at the site PC04. The numerous faults observed on the topography and sub-bottom profiles can also be recognized on the seismic reflection profiles.

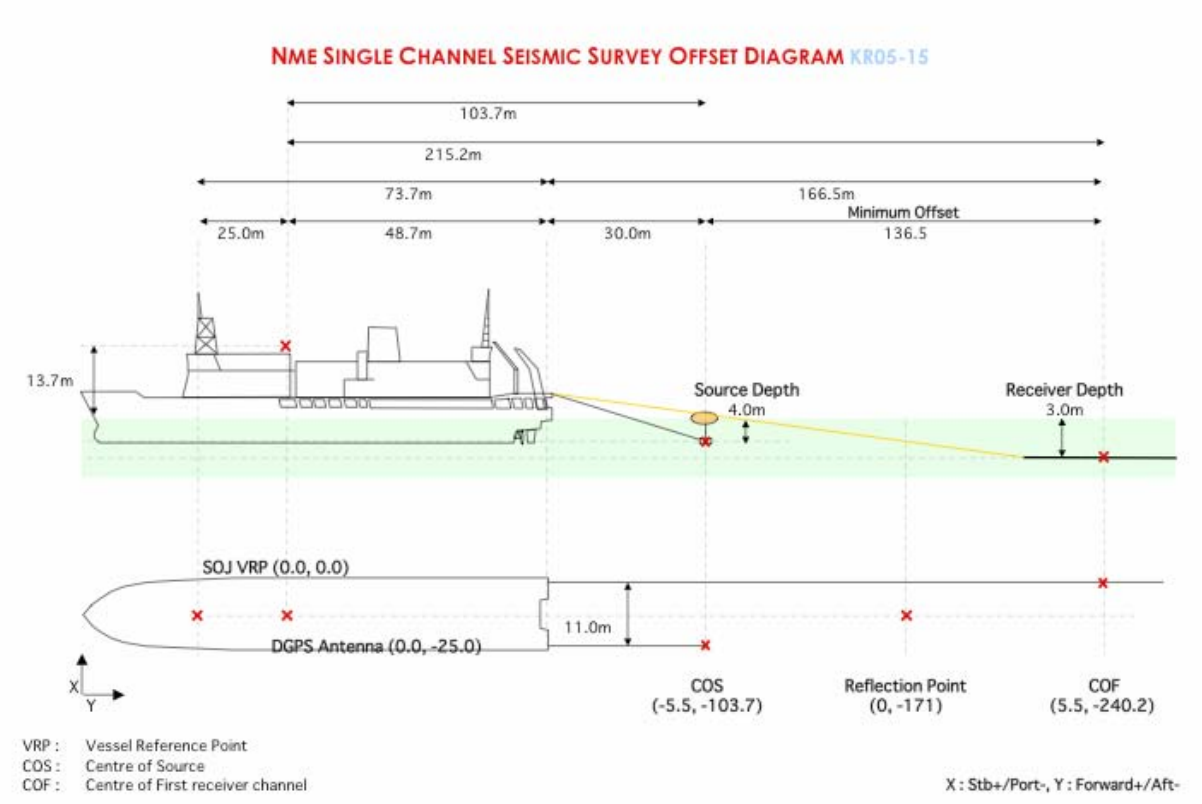


Figure 3.2-1 Geometry of single-channel seismic reflection observation in KR05-15 cruise.

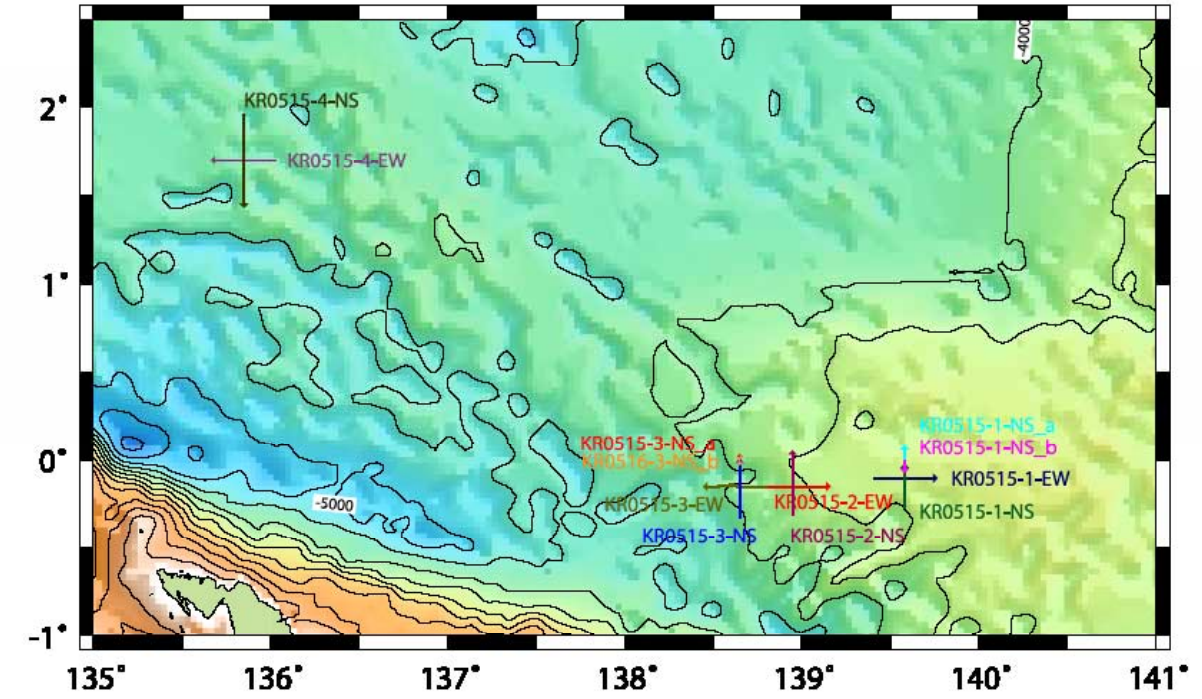


Figure 3.2-2 Location of single-channel seismic survey lines.

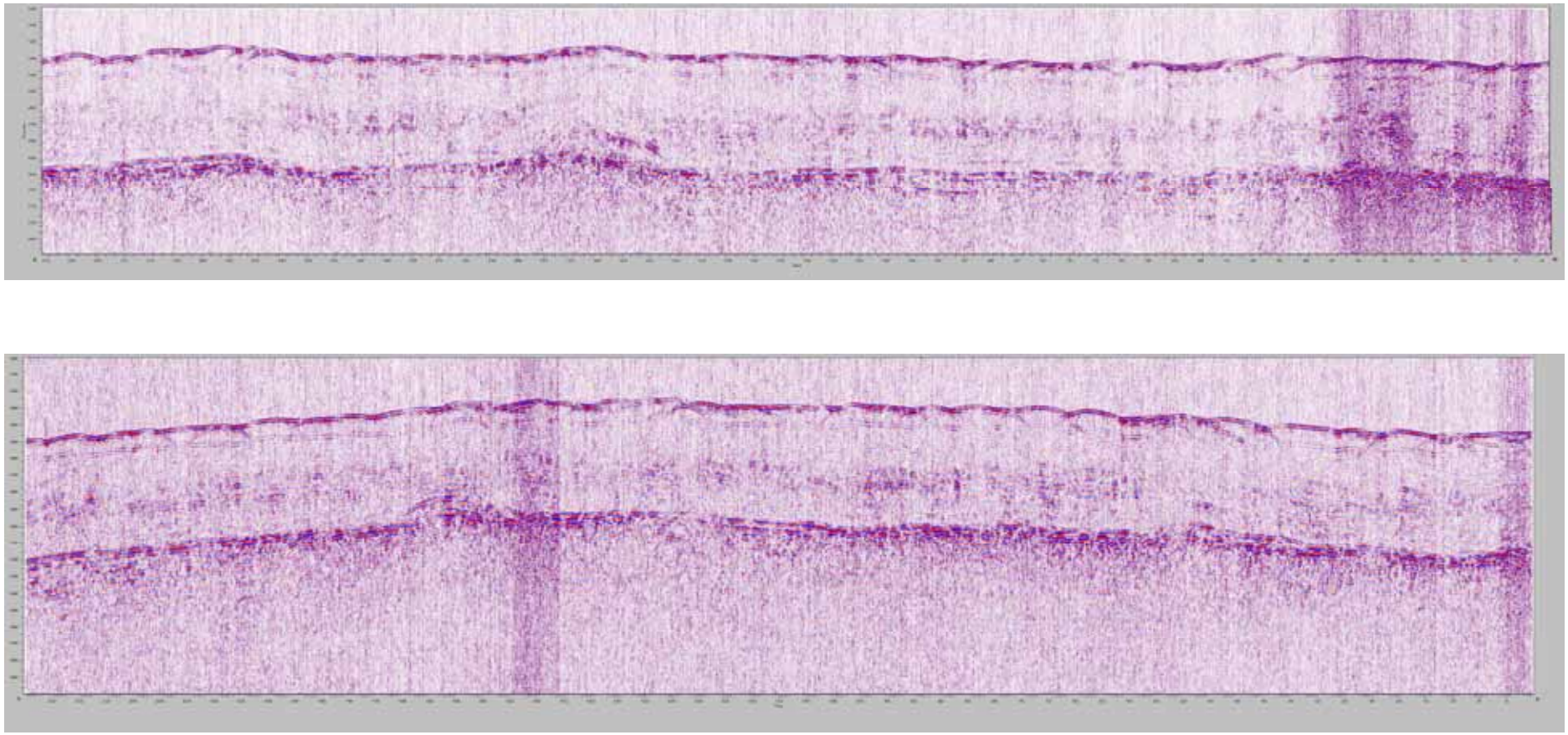


Figure 3-2.3 Seismic reflection profiles at site PC01. Upper panel: EW line (KR0515-1-EW), lower panel: NS line (KR0515-1-NS).

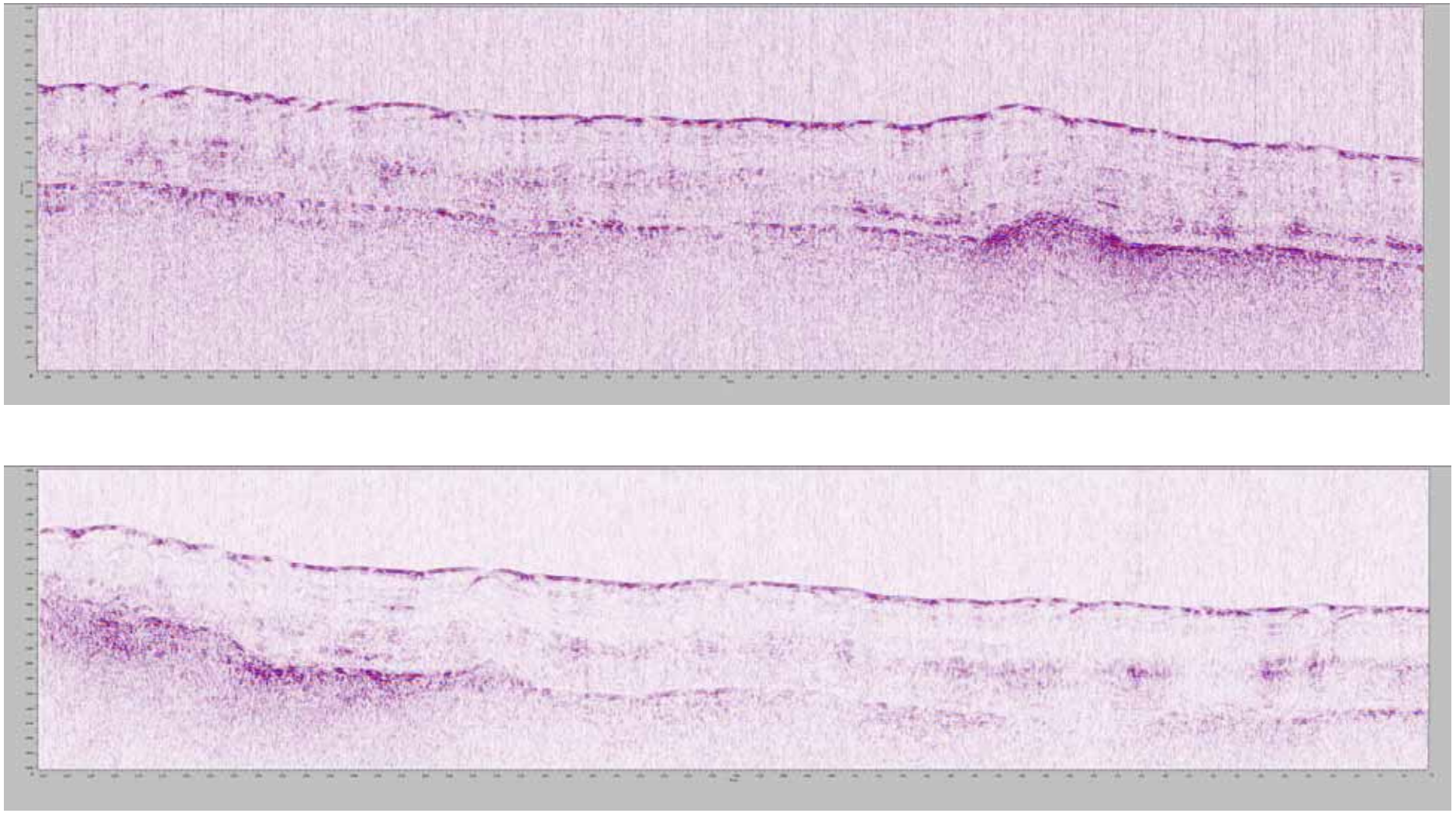


Figure 3-2.4 Seismic reflection profiles at site PC02. Upper panel: EW line (KR0515-2-EW), lower panel: NS line (KR0515-2-NS).

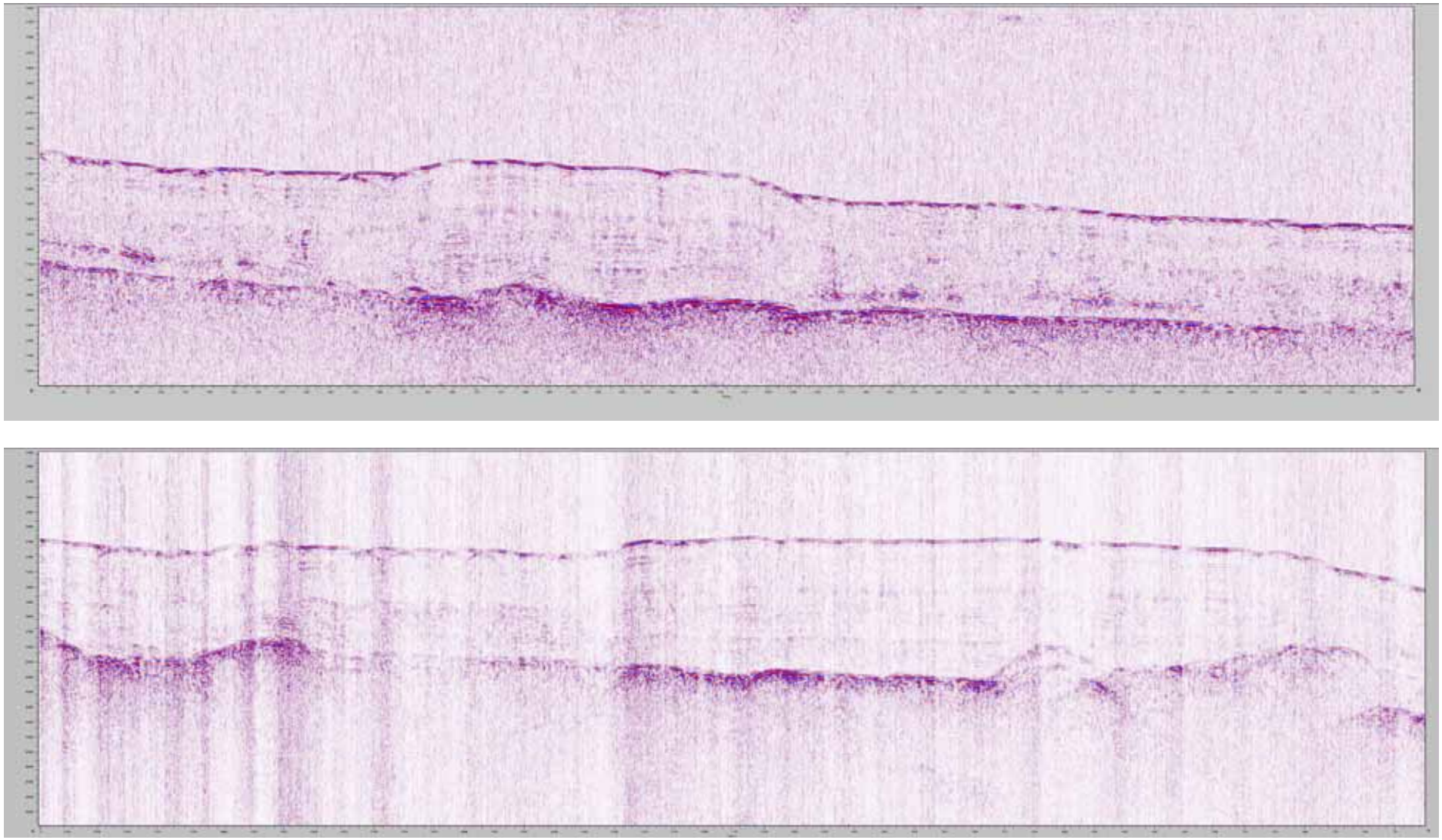


Figure 3-2.5 Seismic reflection profiles at site PC03. Upper panel: EW line (KR0515-3-EW), lower panel: NS line (KR0515-3-NS).

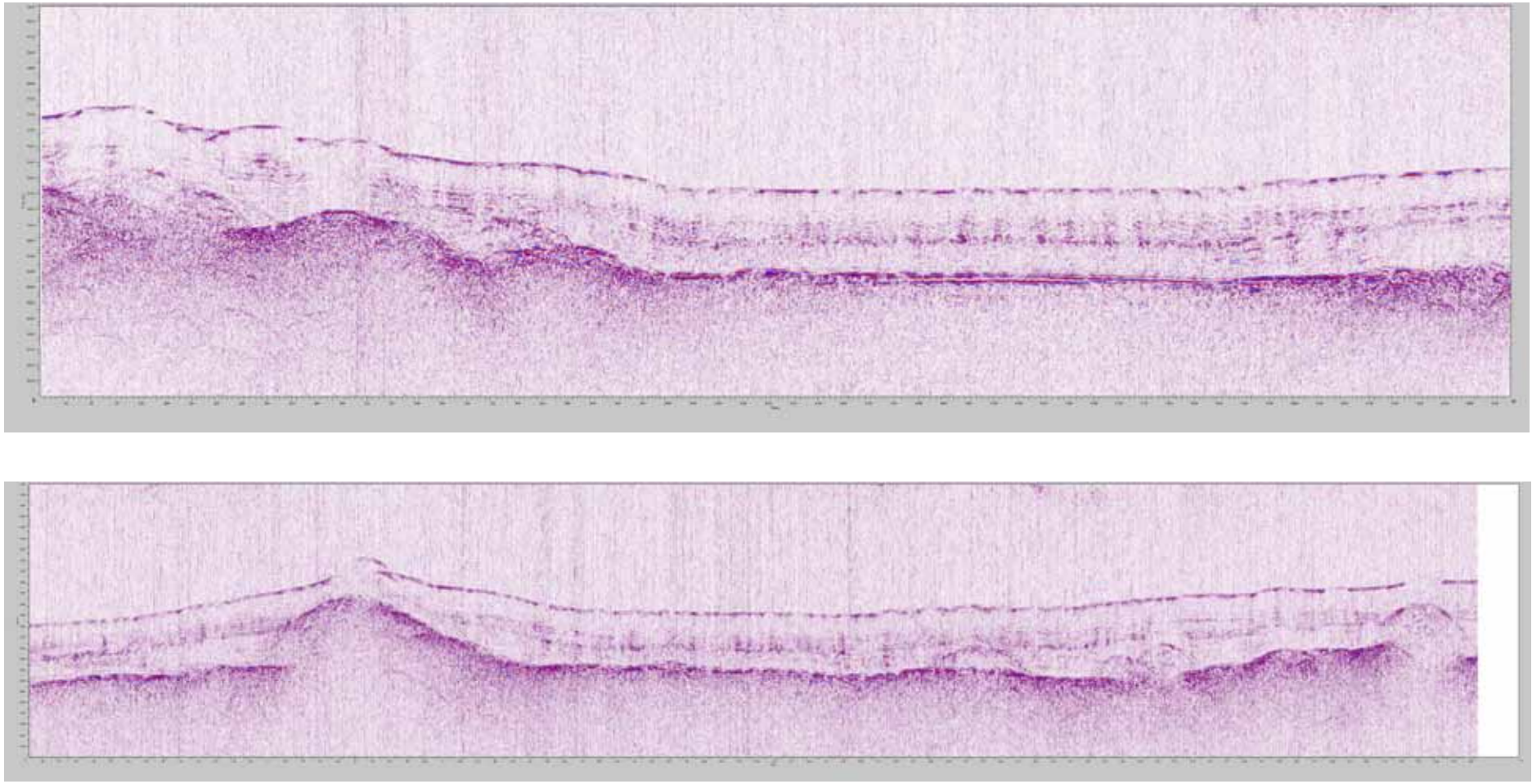


Figure 3-2.6 Seismic reflection profiles at site PC04. Upper panel: EW line (KR0515-4-EW), lower panel: NS line (KR0515-4-NS).

4. Piston coring

4.1 Summary

Piston coring was conducted at four sites. PC01, PC02 and PC03 belong to the southeasten survey area, and PC04 belongs to the western survey area. In the southeastern survey area, the coring sites were determined so as to take sediments from various depths above CCD. The site PC04 in the western survey area is close to the site WCB-1 of IODP proposal 612-Full2. The coring was successful, and high-quality long sediment cores were recovered. The result of the coring is summarized in Table 4-1.1

Table 4-1.1 Summary of piston coring.

Core No.	Date and Time	Latitude	Longitude	Depth (m)	Core length (m)*	Lithology
PC01	2005.11.1 10:55:30	0°06.135'S	139°34.969'E	3,226	12.48	Hemipelagic clay
PC02	2005.11.2 10:10:55	0°08.987'S	138°56.969'E	3,583	16.96	Hemipelagic clay
PC03	2005.11.3 10:17:50	0°09.391'S	138°38.956'E	3,811	17.25	Hemipelagic clay
PC04	2005.11.5 9:54:10	1°42.709'N	135°50.866'E	4,277	19.44	Hemipelagic clay

*excluded flow-in

4.2 Coring method and sample handling

A piston corer system used in this cruise consists of a long aluminum barrel with or without polycarbonate liner tube. The outline of the piston corer system is shown in Figure 4-2.1. The total weight of the system is approximately 1.5 ton. The length of the core barrel was 15m for PC01, and 20m for others. We used an Ewing-type pilot corer for a trigger. For PC01, we used inner liners (Inner type): polycarbonate liner tubes of 5 m long and 74mm inside diameter. For others, we didn't use inner liners (Outer type). A compass with an inclinometer was attached above the weight of the corer to examine performance of the corer.

When we started lowering the piston corer system, a speed of wire out was set to be 20 m/min., and then gradually increased to the maximum of 60 m/min. The piston corer was stopped at a depth about 100 m above the sea floor for about 5 minutes to reduce any pendulum motion of the system. After the system was stabilized, wire was paid out at a speed of 20 m/min., and we carefully watched a tension meter. When the piston corer touches the bottom, wire tension abruptly decreases by the loss of the piston corer weight. After the corer hit the bottom, three more meters of wire were paid out. Then, rewinding of the wire was started at a dead slow speed (10 m/min.), until the tension gauge indicated that the corer was lifted off the bottom. After leaving the bottom, wire was wound in at the maximum speed.

For PC01, the inner tubes of the piston corer filled with sediments were cut into 1m long for each section using a handy cutter. The sections were longitudinally split into a working and an archive halves using a splitting devise and a fishing line. For PC02, 03, and 04, the aluminum barrels were cut into 1m long each using a band saw. The sediments of each section were detruded on a half vinyl chloride tube by a detrusion device. And then, the sediments were longitudinally split into a working and an archive halves.

On board, we carried out visual core description (on the working half), taking photographs (archive half), color reflectance measurement (archive half), and sub-sampling using plastic cubes of 7 cm^3 each (working half). The samples were taken successively along two rows: one for paleomagnetism and another for isotope measurements.

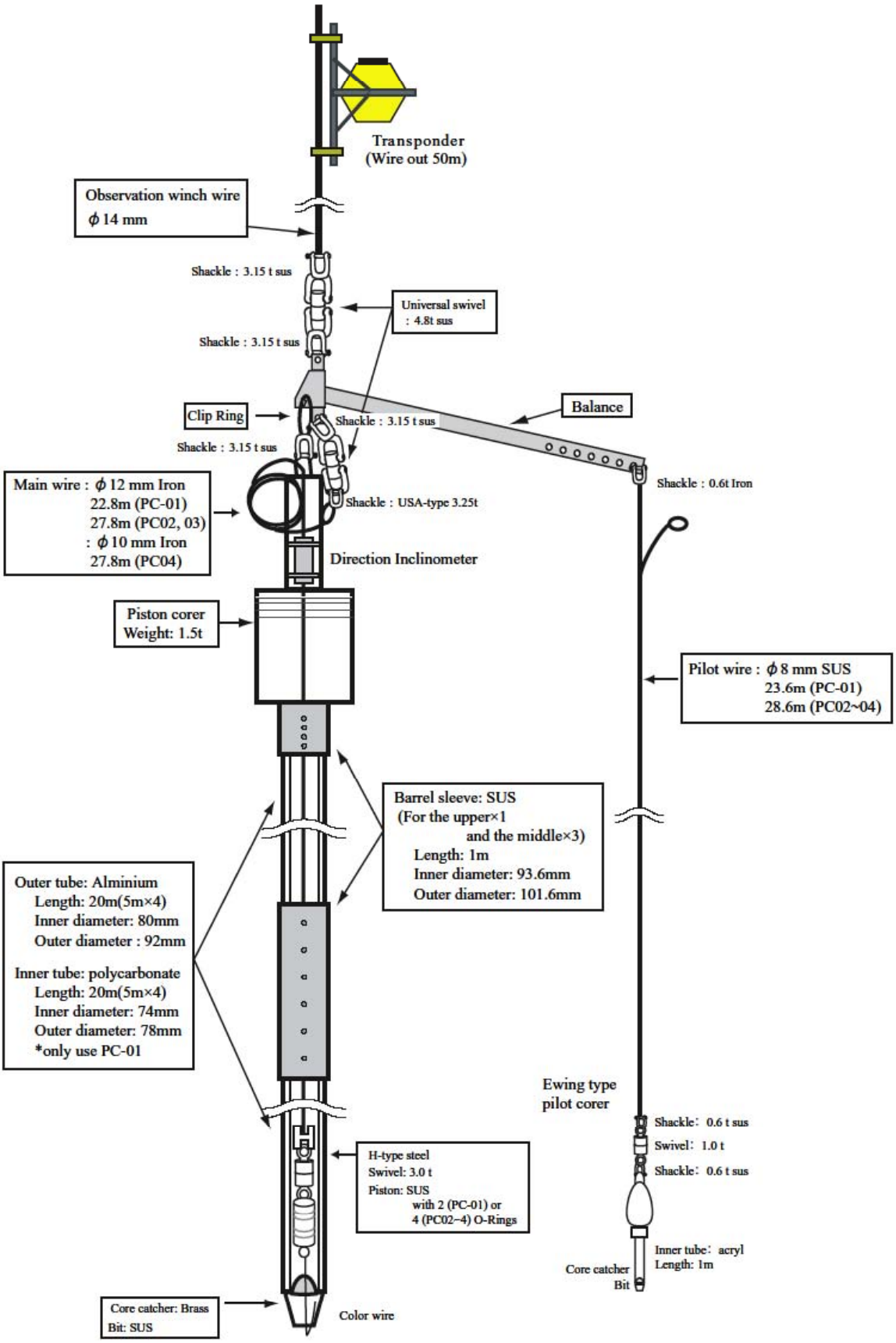


Figure 4-2.1 Diagram of piston corer system.

4.3 Visual core description and photograph

Visual core descriptions of the four sediment cores are presented in Appendix. Photographs of the cores are shown in Figures 4.3-1 through 4.3-4. The following is a brief summary of the description of each core.

Core PC01 consists of moderate to dark yellowish brown oxic clay (top 35 cm) and greenish gray hemipelagic clay with a large amount of visible foraminifera (below 35 cm). The sediments of the core PC1 are mottled and bioturbated, especially in the deeper part of the core. A large number of dusky green lithified layers and unclear dark gray layers occur throughout the core.

Core PC02 is composed of moderate yellowish brown or dark grayish orange oxide clay (top 42 cm) and greenish gray to dark greenish gray hemipelagic clay with a relatively large amount of visible foraminifera (below 42 cm). The sediments of the core PC2 are mottled and bioturbated relatively heavier than the core PC01. A large number of dusky green lithified layers and unclear dark gray layers occur throughout the core. A pumice occurs at 89 cm of the section 13, which is probably drifted pumice.

Core PC03 consists of moderate to dark yellowish brown oxide clay (top 60.5 cm) and hemipelagic clay with an amount of visible foraminifera (below 60.5 cm). The color of hemipelagic clay is generally changed from dark greenish gray to greenish gray with depth of the core. The sediments of the core PC03 are frequently mottled and bioturbated throughout the core. A large number of dusky green lithified layers and unclear dark gray layers occur throughout the core.

Core PC4 consists of moderate to dark yellowish brown clay with minor amount of foraminifera (top 51 cm) and dark greenish gray hemipelagic clay (below 51 cm). A thin fine-grain sand layer with normal grading occurs at 1357 cm of the core. The sediments of the core PC4 are frequently mottled and bioturbated throughout the core. A large number of dusky green lithified layers and unclear dark gray layers occur throughout the core.

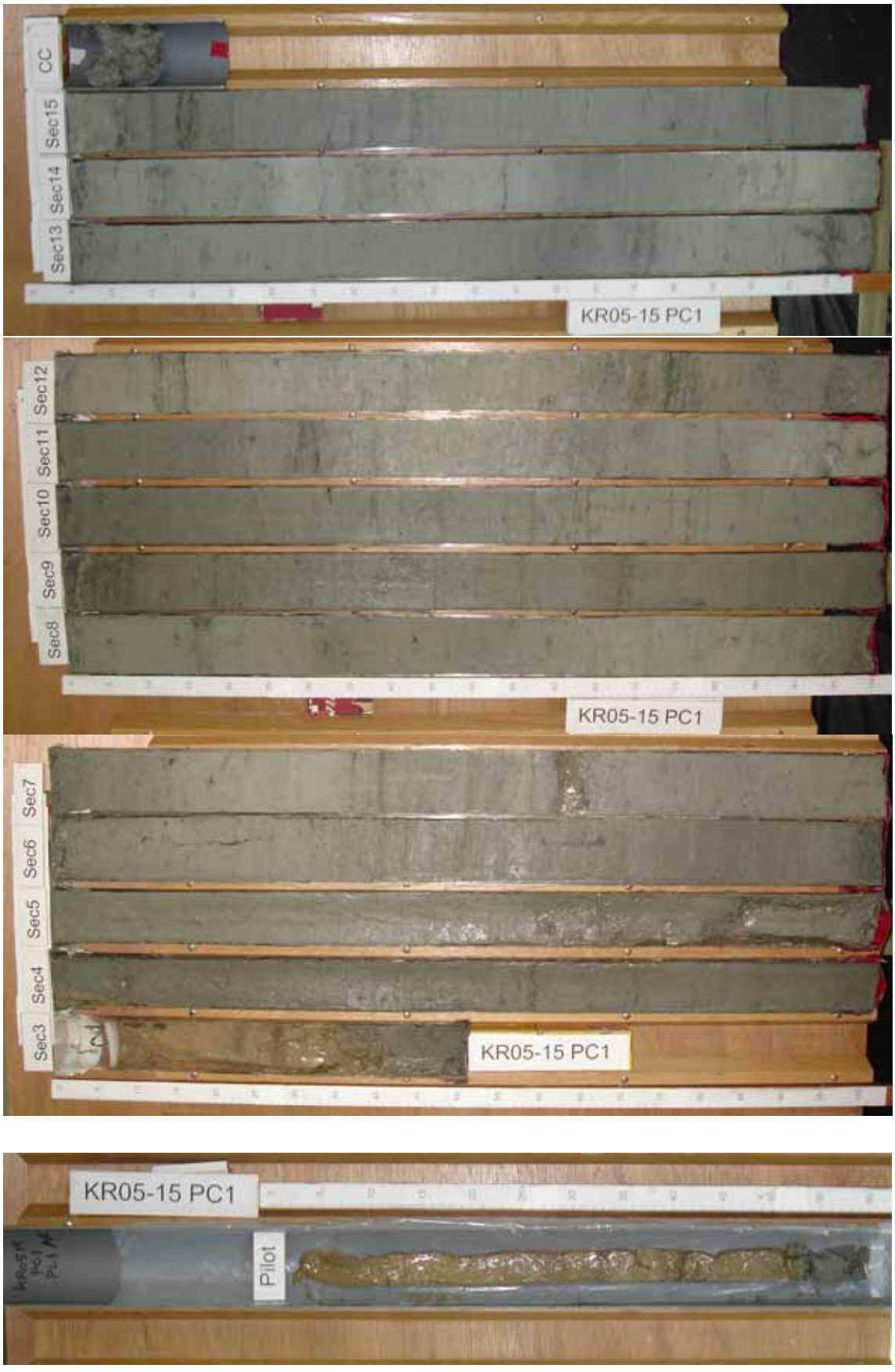


Figure 4-3.1 Photograph of core PC01.

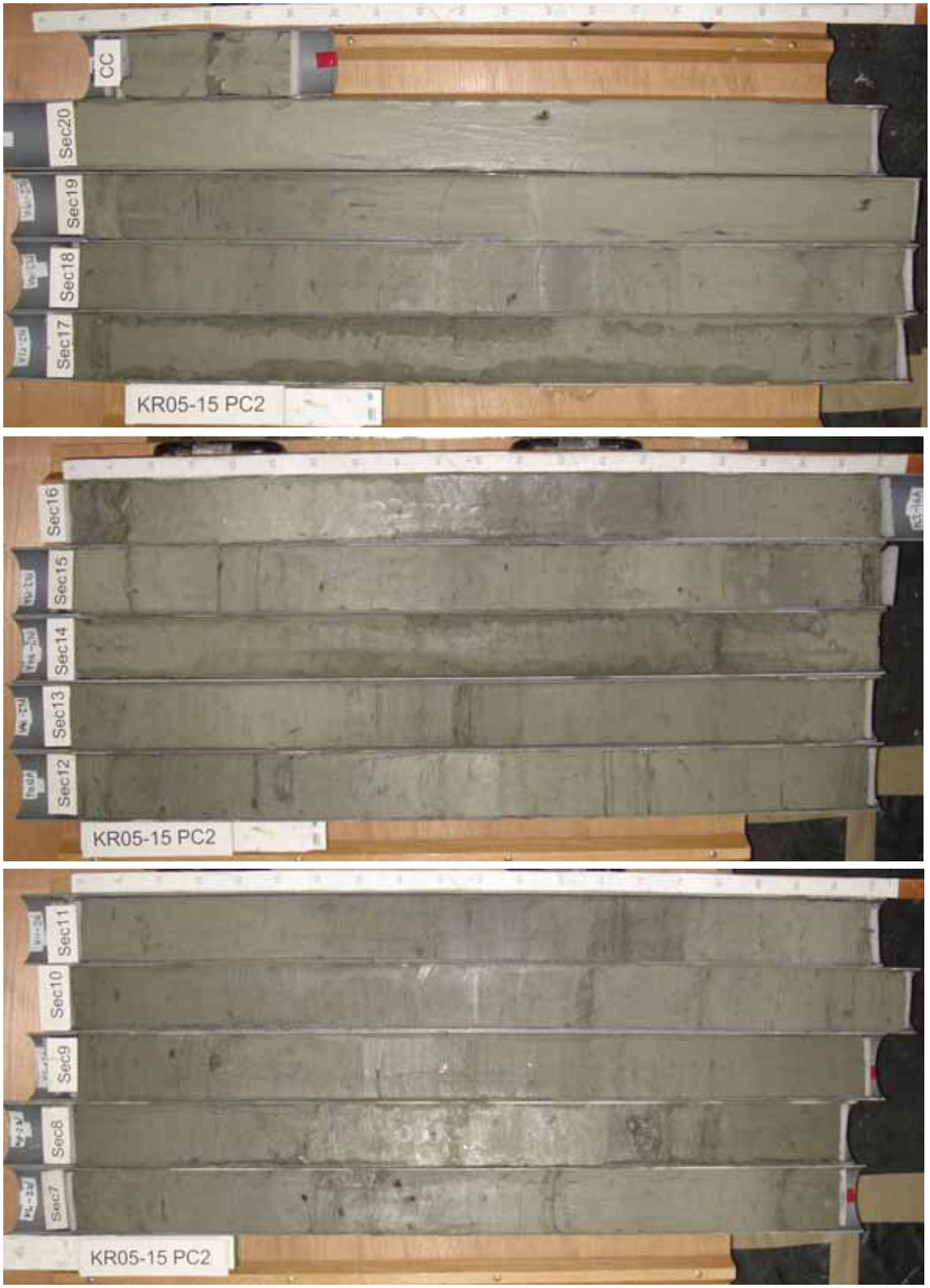


Figure 4-3.2 Photograph of core PC02 (section 7 to 20, and cc.).

Figure 4-3.2 (continued) Photograph of core PC02 (section 2 to 6, and PL02).

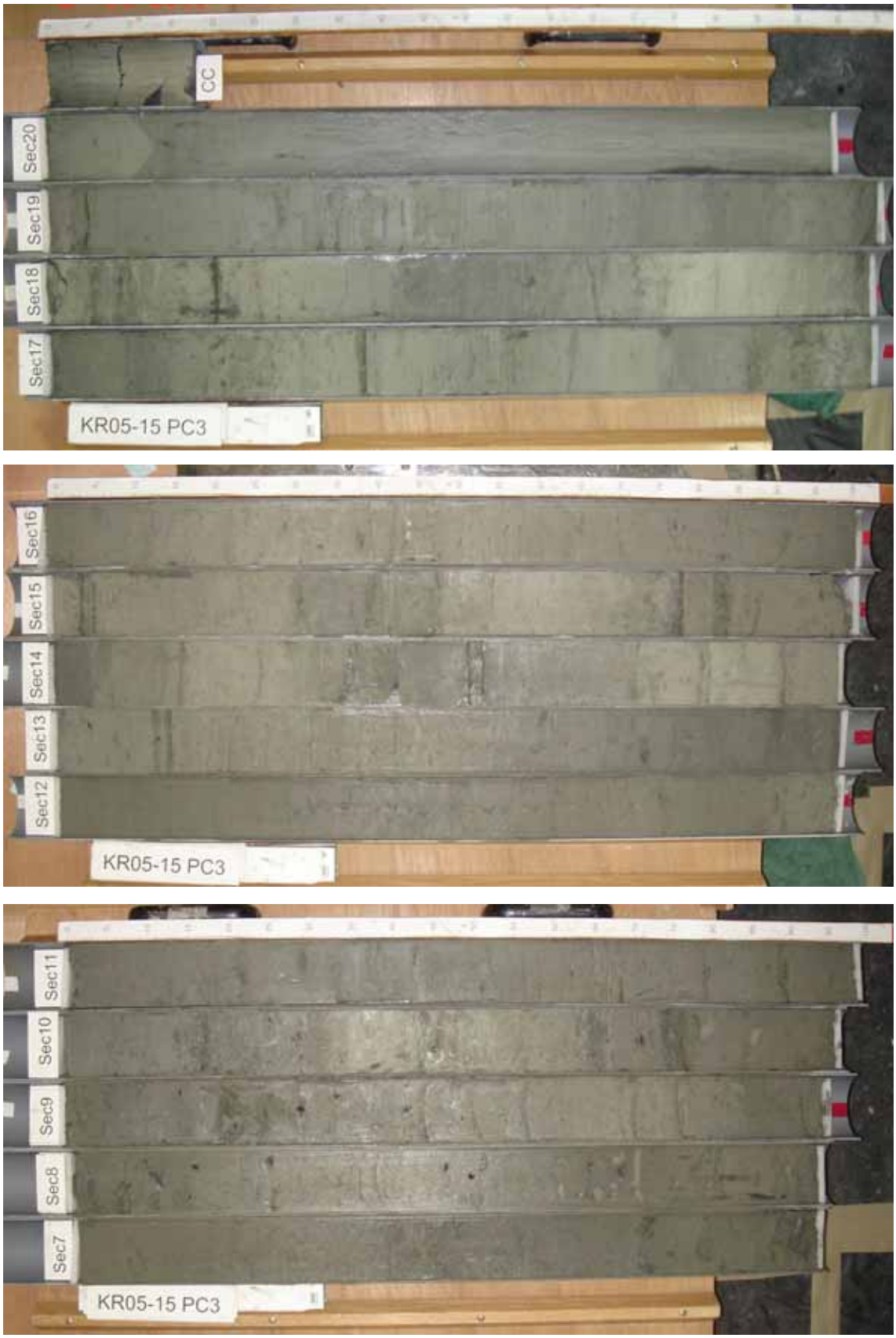


Figure 4-3.3 Photograph of core PC03 (section 7 to 20, and cc.).

Figure 4-3.3 (continued) Photograph of core PC03 (section 2 to 6, and PL03).

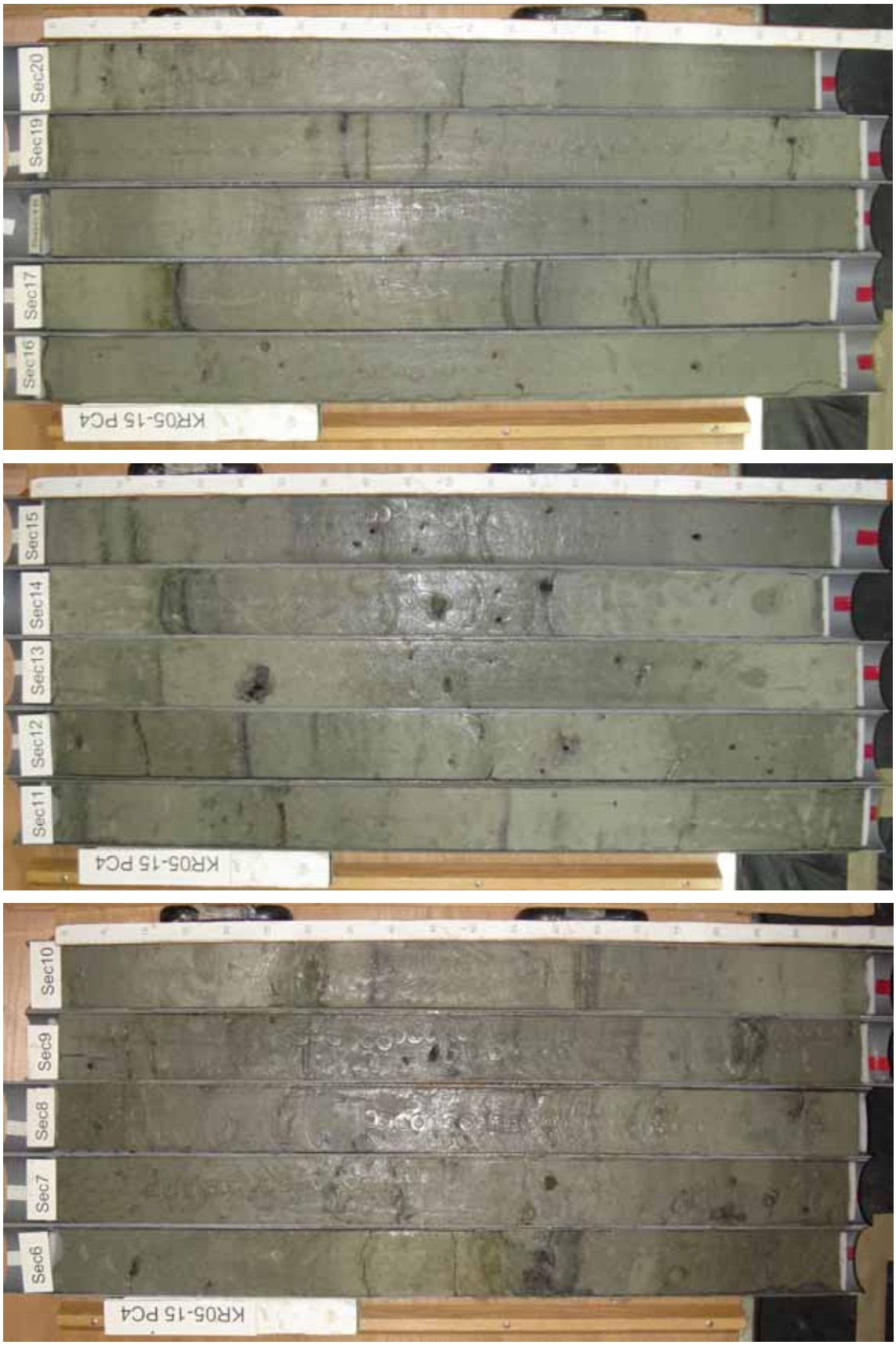


Figure 4-3.4 Photograph of core PC04 (section 6 to 20).

Figure 4-3.4 (continued) Photograph of core PC04 (section 1 to 5, cc., and PL04).

4.4 Color reflectance

Color reflectance was measured using the Minolta Photospectrometer CM-2002. The split surface of archive halves was measured on every 2 cm through crystal clear polyethylene wrap. The color reflectance data are displayed as color parameters L*, a*, and b* (L*: black and white, a*: red and green, b*: yellow and blue). The results are presented in Figures 4.4-1 through 4.4-8.

For all cores, the several tens of centimeters from the top are generally characterized by high a* and b*. The L* values fluctuate throughout the cores. The variation patterns in L*, a*, and b* between PL01 and PC01, PL02 and PC02, PL04 and PC04 show consistency, which suggests the good recovery of surface sediments by the piston corer.

The plots of PL03 show a duplicated pattern (0-50 cm and 50-62 cm) (Figure 4.4-6). This suggests that pilot core PL03 hit the bottom twice. On the other hand, the variation pattern of PC03 is similar to that of other cores. It is hence considered that PC03 was normally recovered.

The variation pattern of L* is quite similar among the cores from the southeastern survey area (PC01, PC02, and PC03), and these cores can be correlated by L*. For example, tentative visual inspection suggests that 11.5m of PC01, 15m of PC02, and 16.5m of PC03 can be correlated with each other. The pattern of PC04 is somewhat different from others, but seems to be still correlative. The low of L* at 13.5m of PC04 may correspond to the above mentioned horizons of other cores.

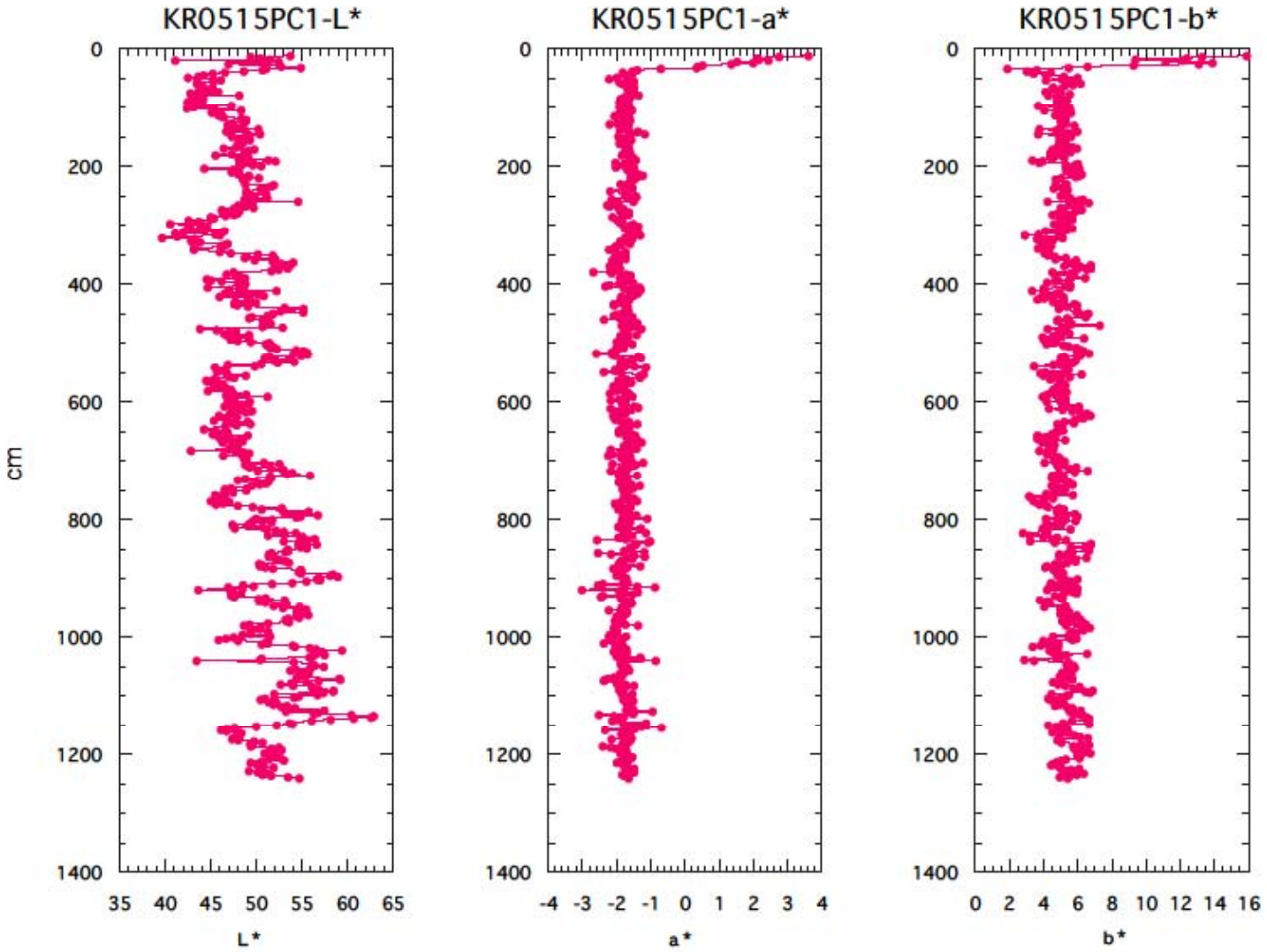


Figure 4.4-1 Color reflectance (L*, a*, b*) of KR0515-PC01.

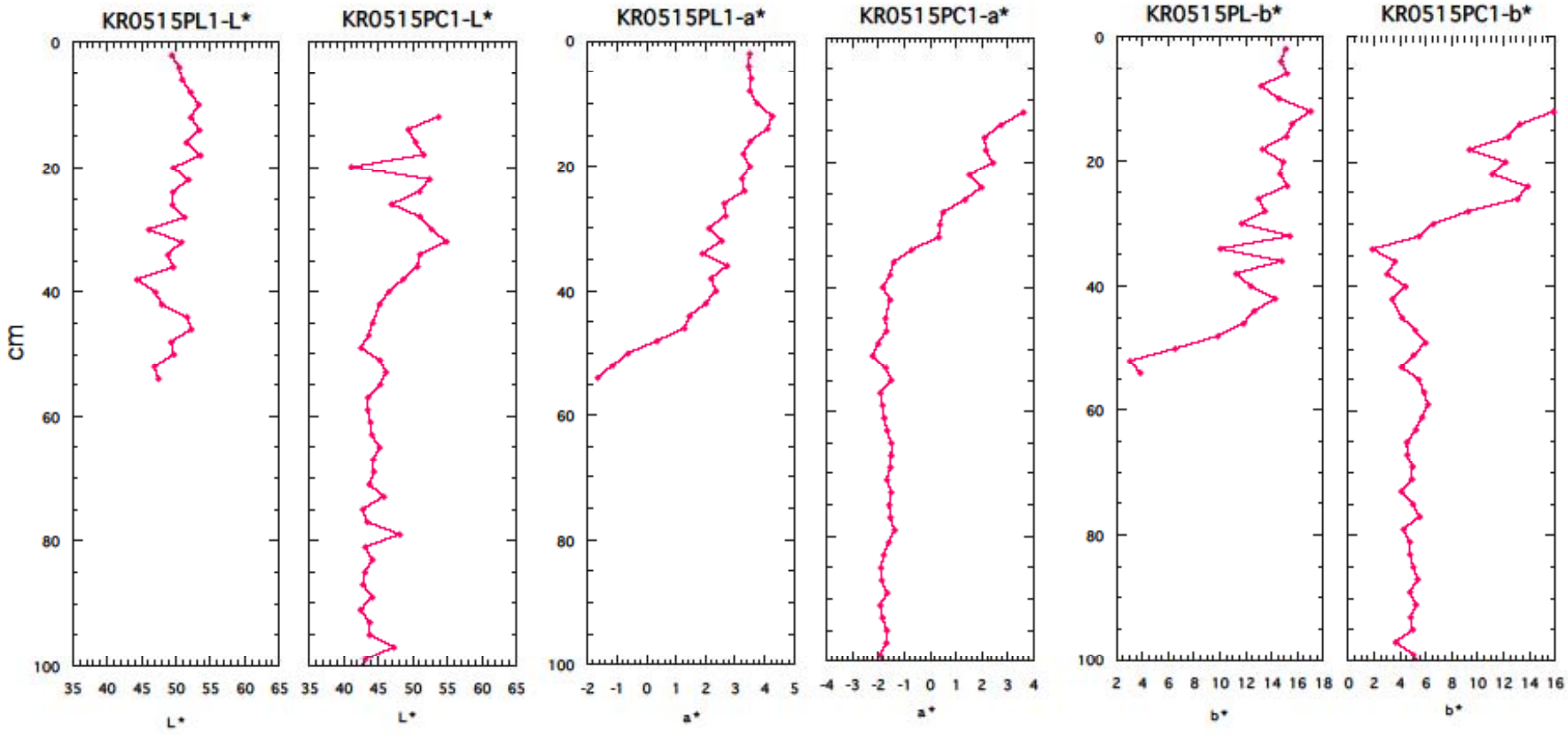


Figure 4.4-2 Comparison of color reflectance (L*, a*, b*) of pilot core PL01 and the uppermost part of piston core PC01.

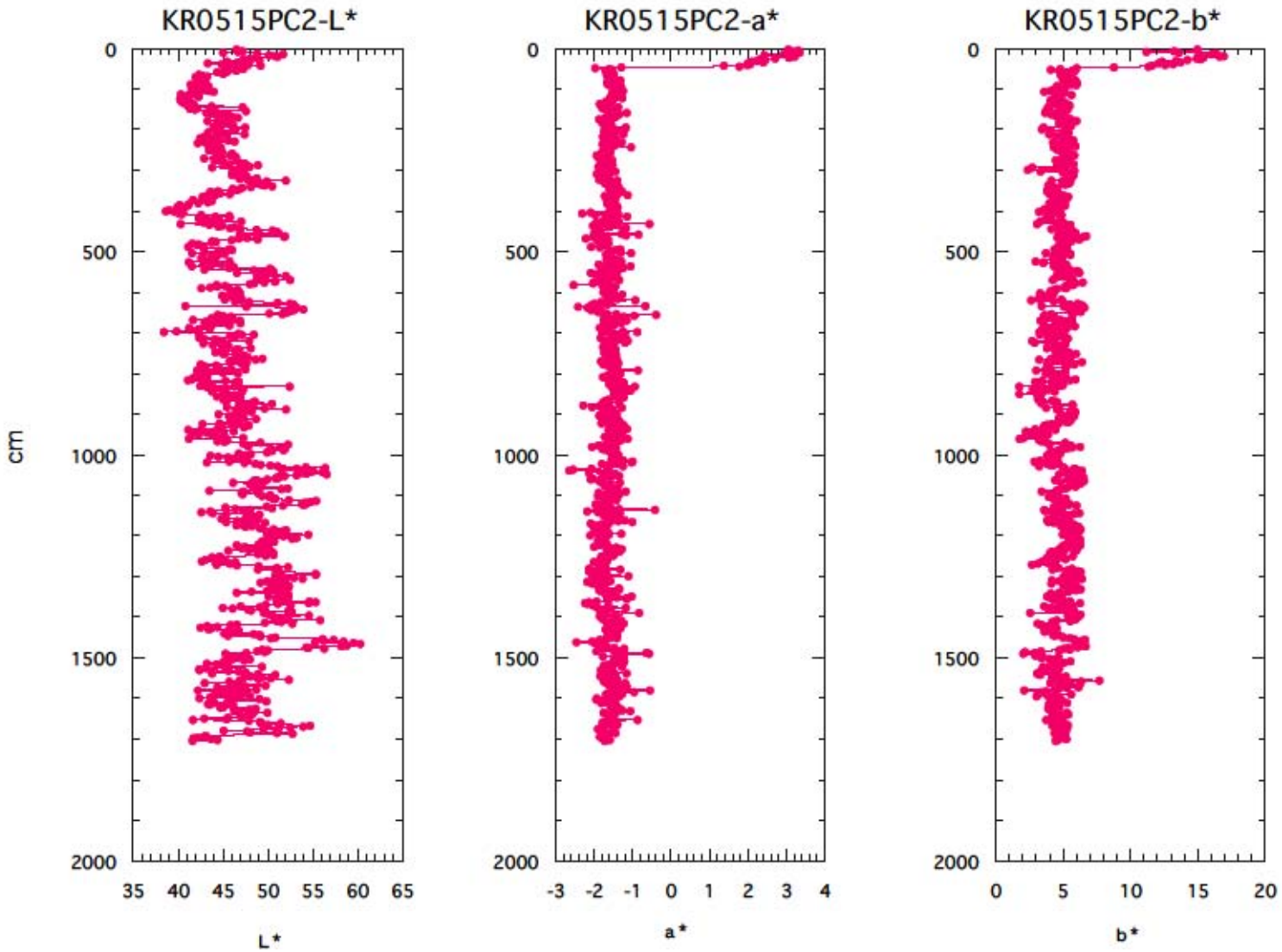


Figure 4.4-3 Color reflectance (L*, a*, b*) of KR0515-PC02.

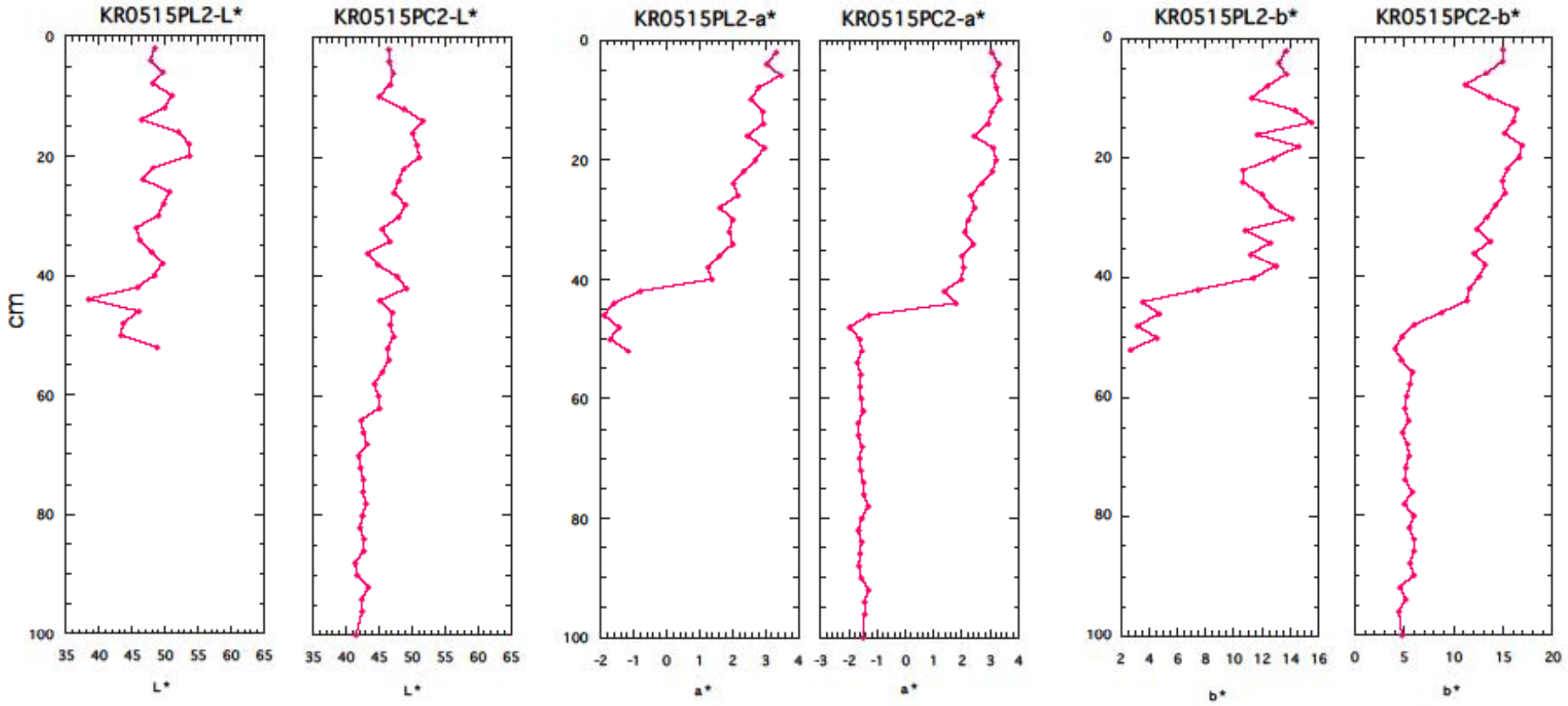


Figure 4.4-4 Comparison of color reflectance (L*, a*, b*) of pilot core PL02 and the uppermost part of piston core PC02.

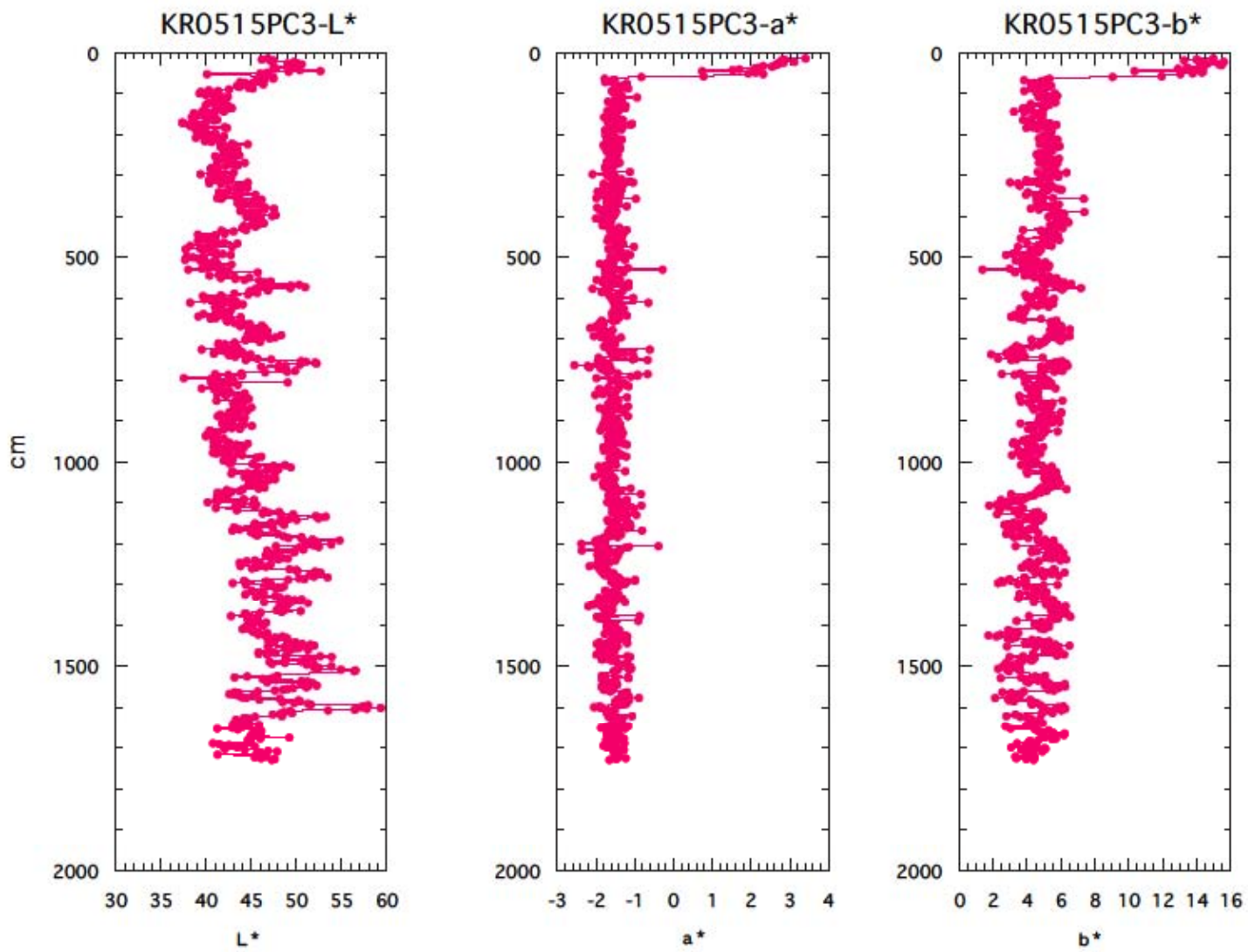


Figure 4.4-5 Color reflectance (L*, a*, b*) of KR0515-PC03.

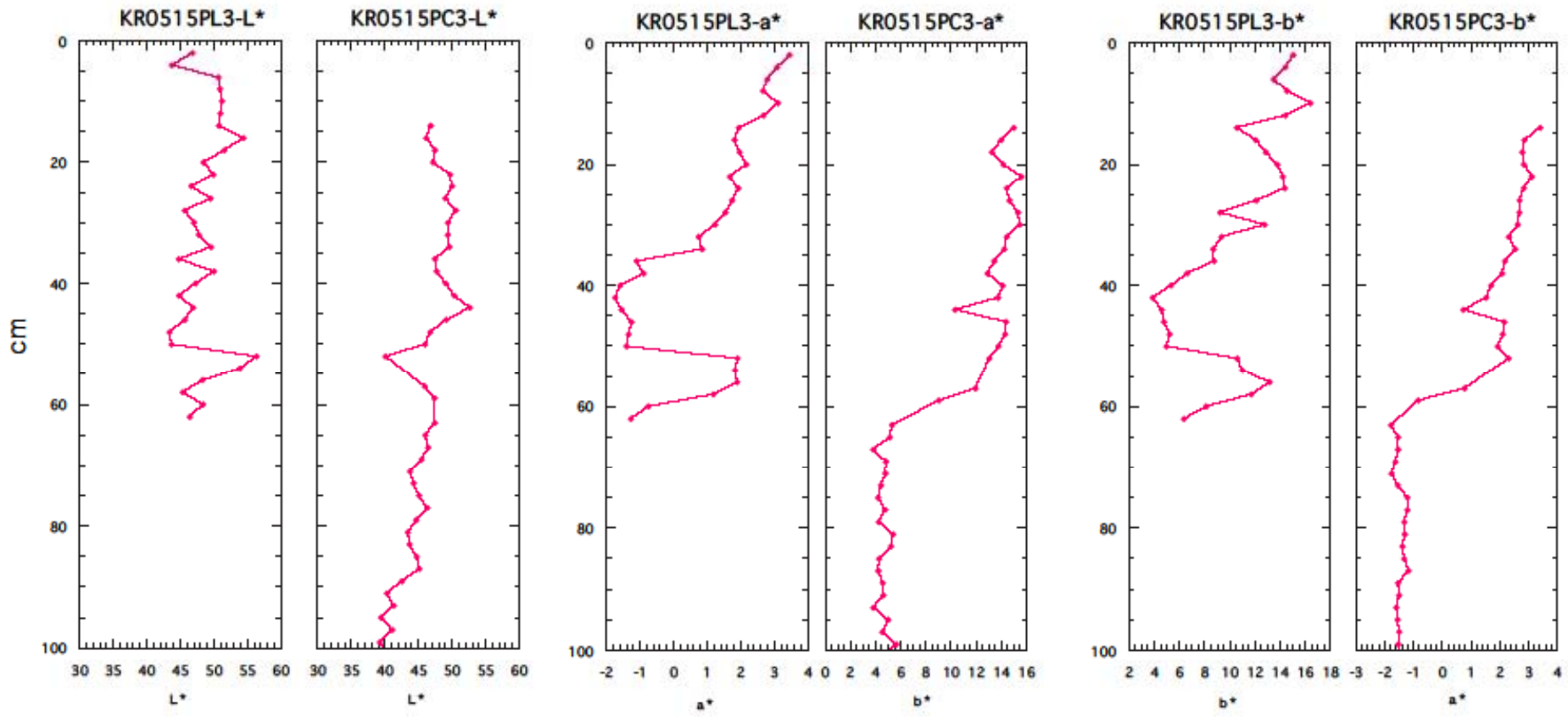


Figure 4.4-6 Comparison of color reflectance (L*, a*, b*) of pilot core PL03 and the uppermost part of piston core PC03.

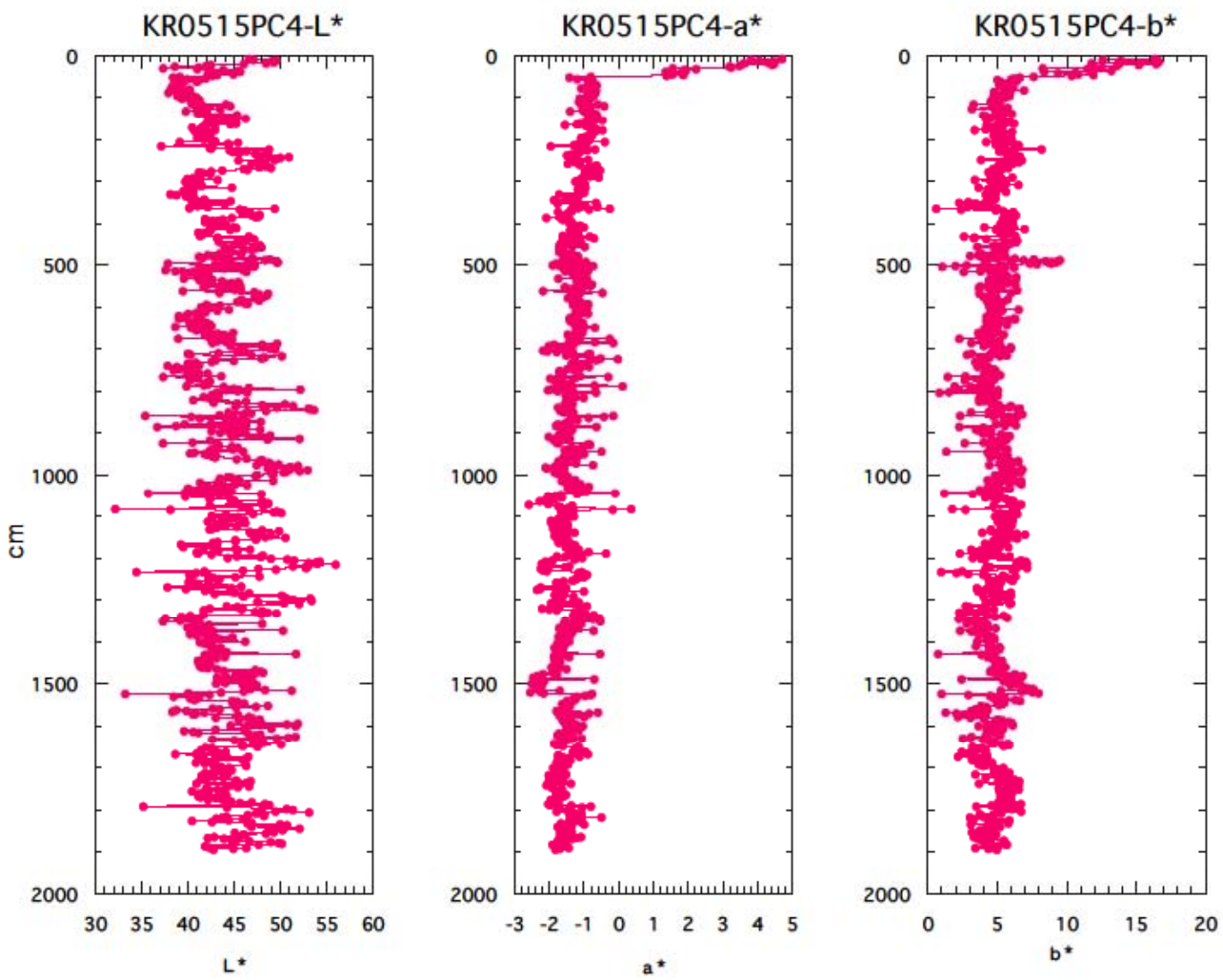


Figure 4.4-7 Color reflectance (L*, a*, b*) of KR0515-PC04.

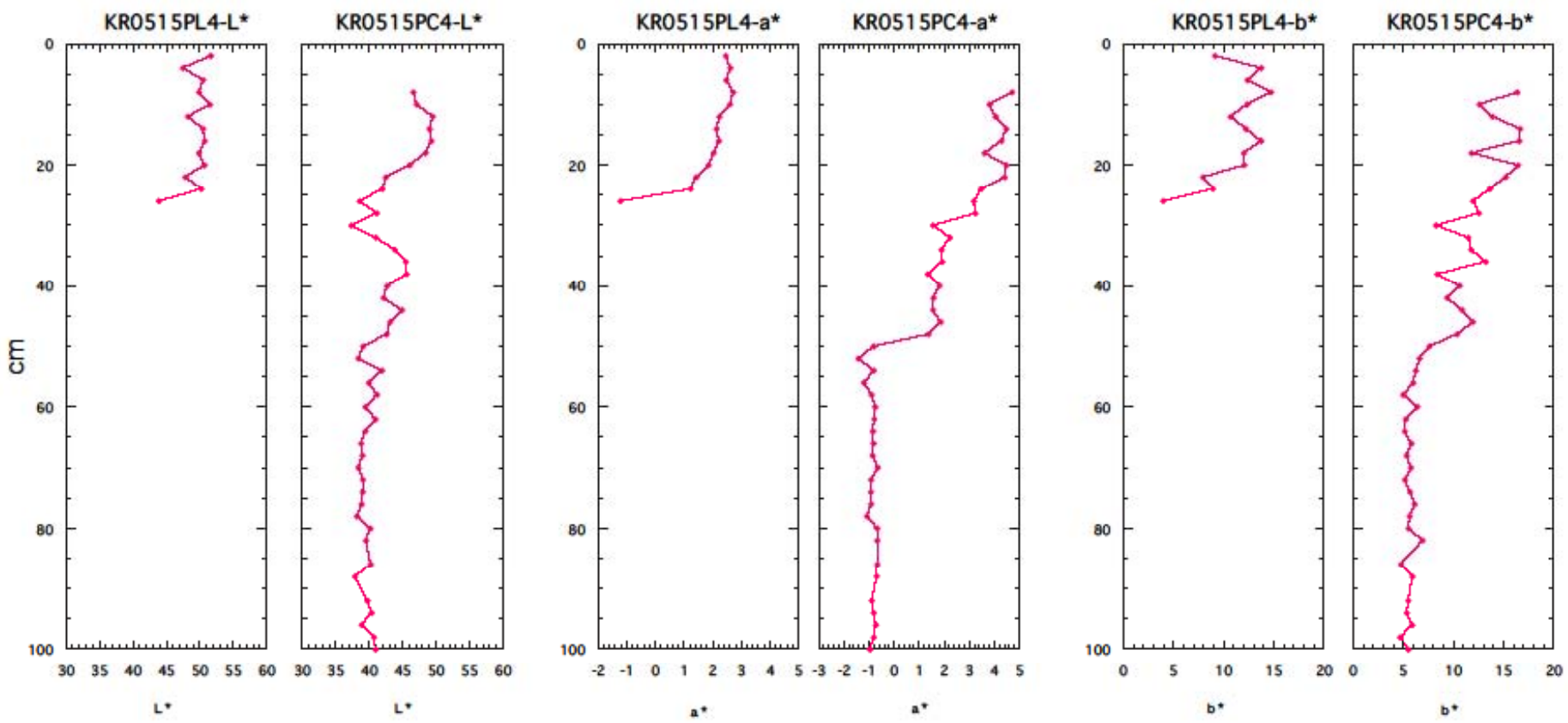


Figure 4.4-8 Comparison of color reflectance (L*, a*, b*) of pilot core PL04 and the uppermost part of piston core PC04.

4.5 Future studies

Paleomagnetic and rock-magnetic measurements of the sediment cores will be carried out at the Geological Survey of Japan, JAMSTEC, and Kochi University in cooperation with LIPI (Indonesian Institute of Sciences). Oxygen isotope measurement will be conducted at the Geological Survey of Japan. These data and site survey data (topography, sub-bottom profiles, and single-channel seismic profiles) will be utilized to revise the IODP proposal 612-Full2. Also the results will be published in international journals.

☆ Gravel

Ⓢ Sand spot or patch

Ⓑ Scoria spot

Ⓐ Pumice or ash spot

Py Pyrite nodule

● Black spot

Greenish band or spot

Wood fragment

Shell fragment

* Sponge spicules

? Brown gelly material

≀ Mottled

Burrow

Fining upward

LLLLLL Partially lithified

PPPPPP Porous layer

HHHHH Hard layer

Soupy

Disturbed

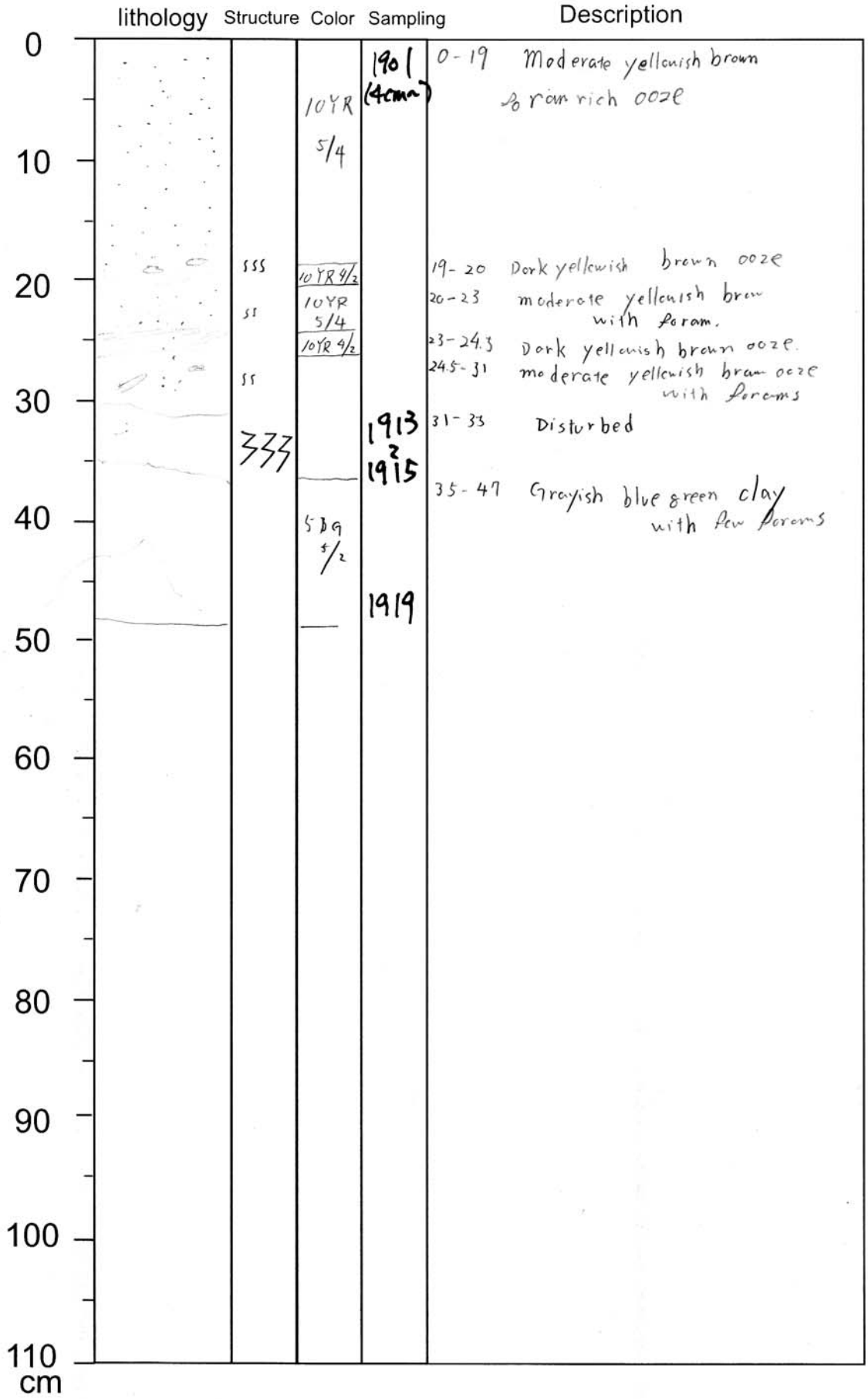
V Volcanic ash

KR05-15

CORE: PC1 Sec. 3

Date: 11/1 2005

by: Riyanuma.



total length 47 cm

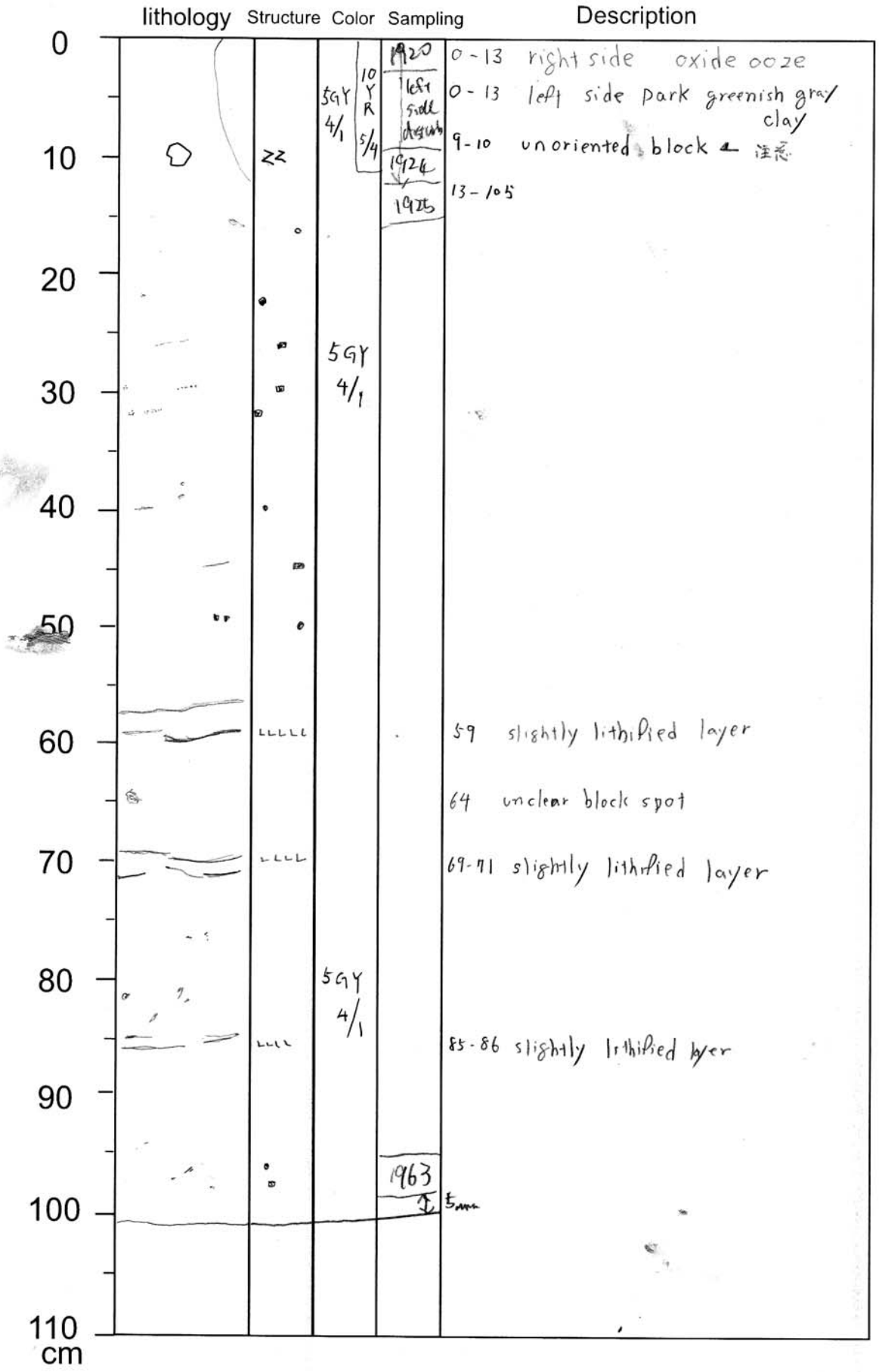
section length 47 cm

KR05-15

CORE: Pc1 sec. 4

Date: 11/1 2005

by: Suganuma.



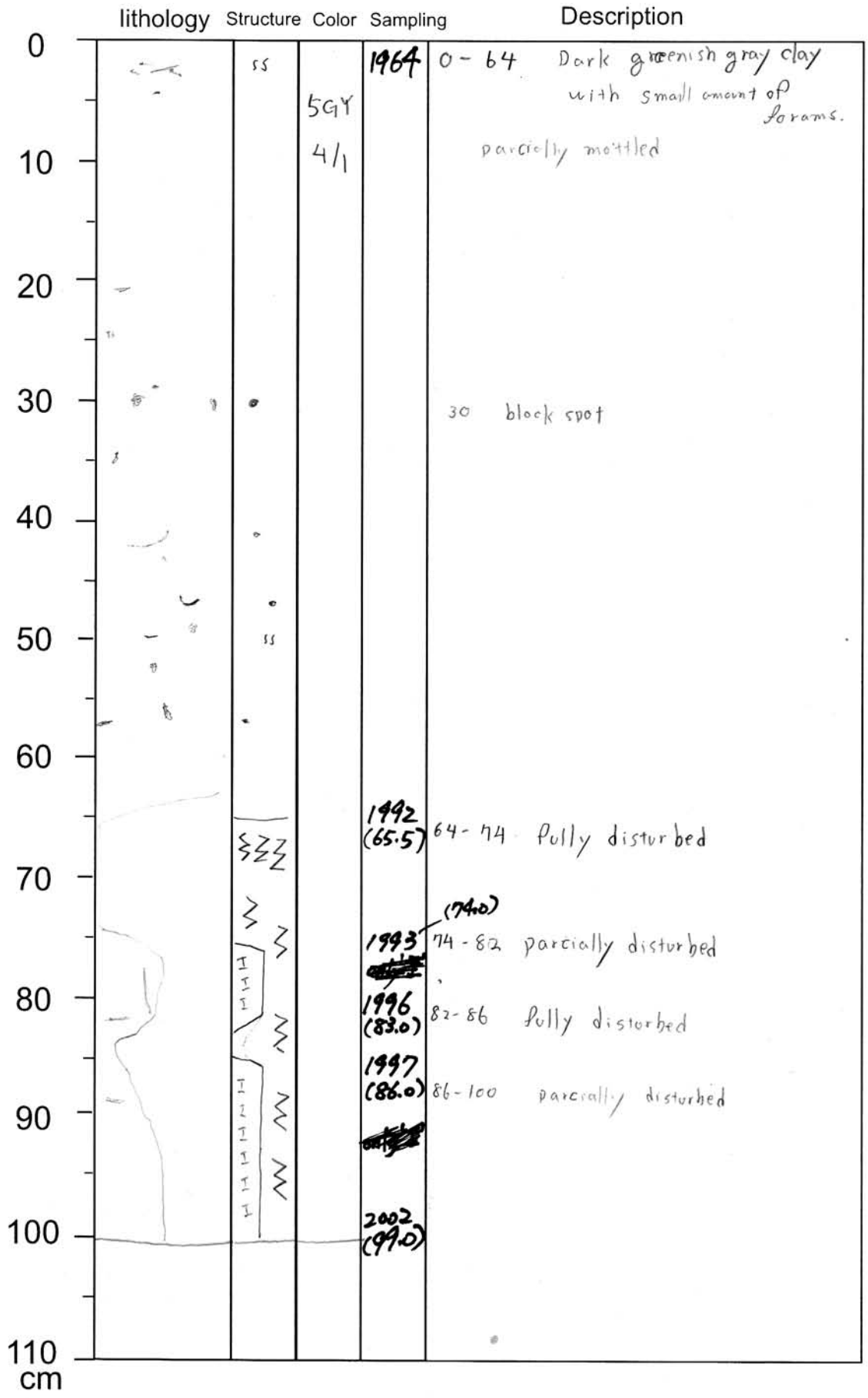
total length _____ section length 100.5 cm

KR05-15

CORE: Pc1 sec. 5

Date: 11/1 2005

by: Suganuma



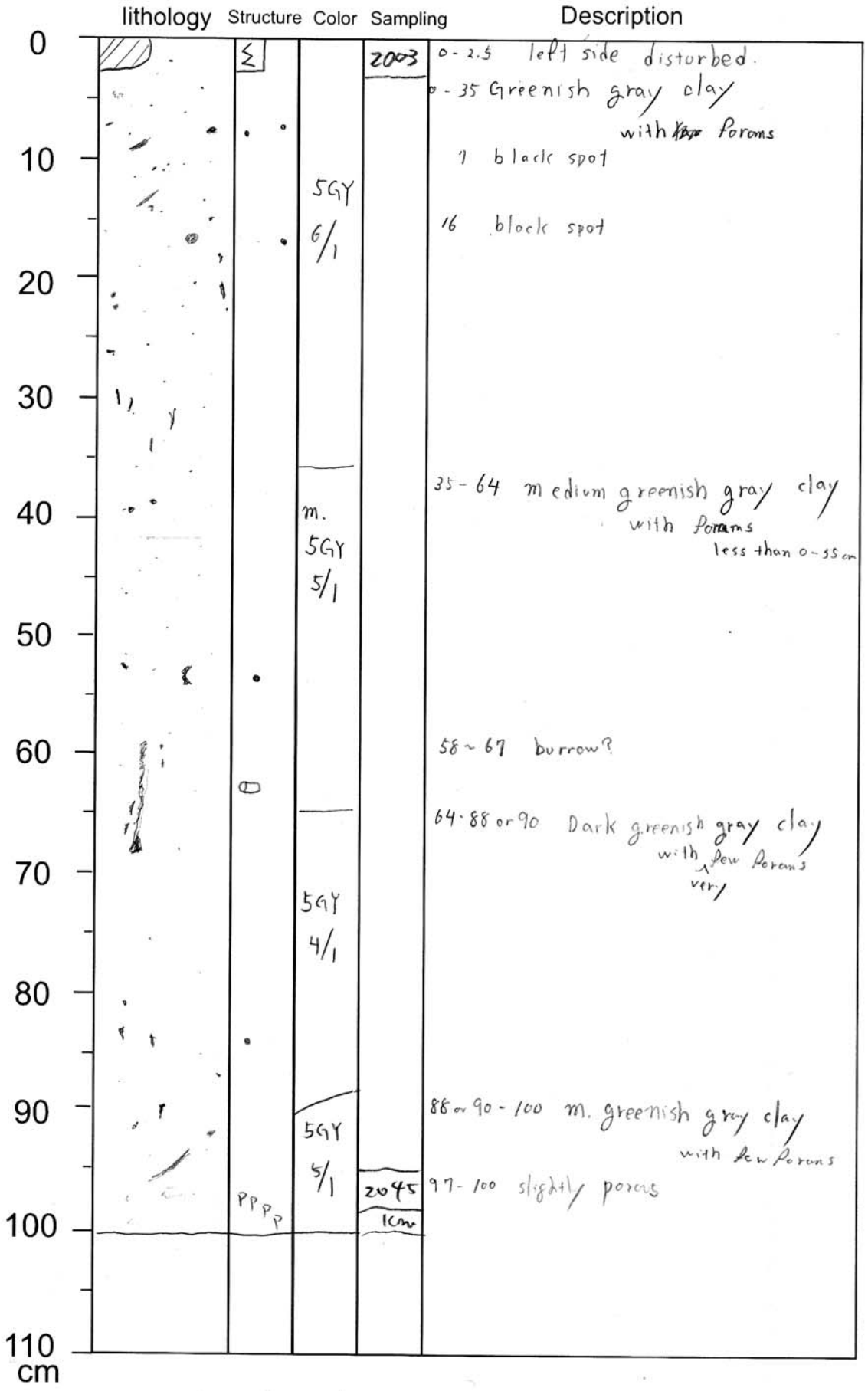
total length _____ section length 100.0

KR05-15

CORE: PC1 sec. 6

Date: 11/1 2005

by: Sugawara



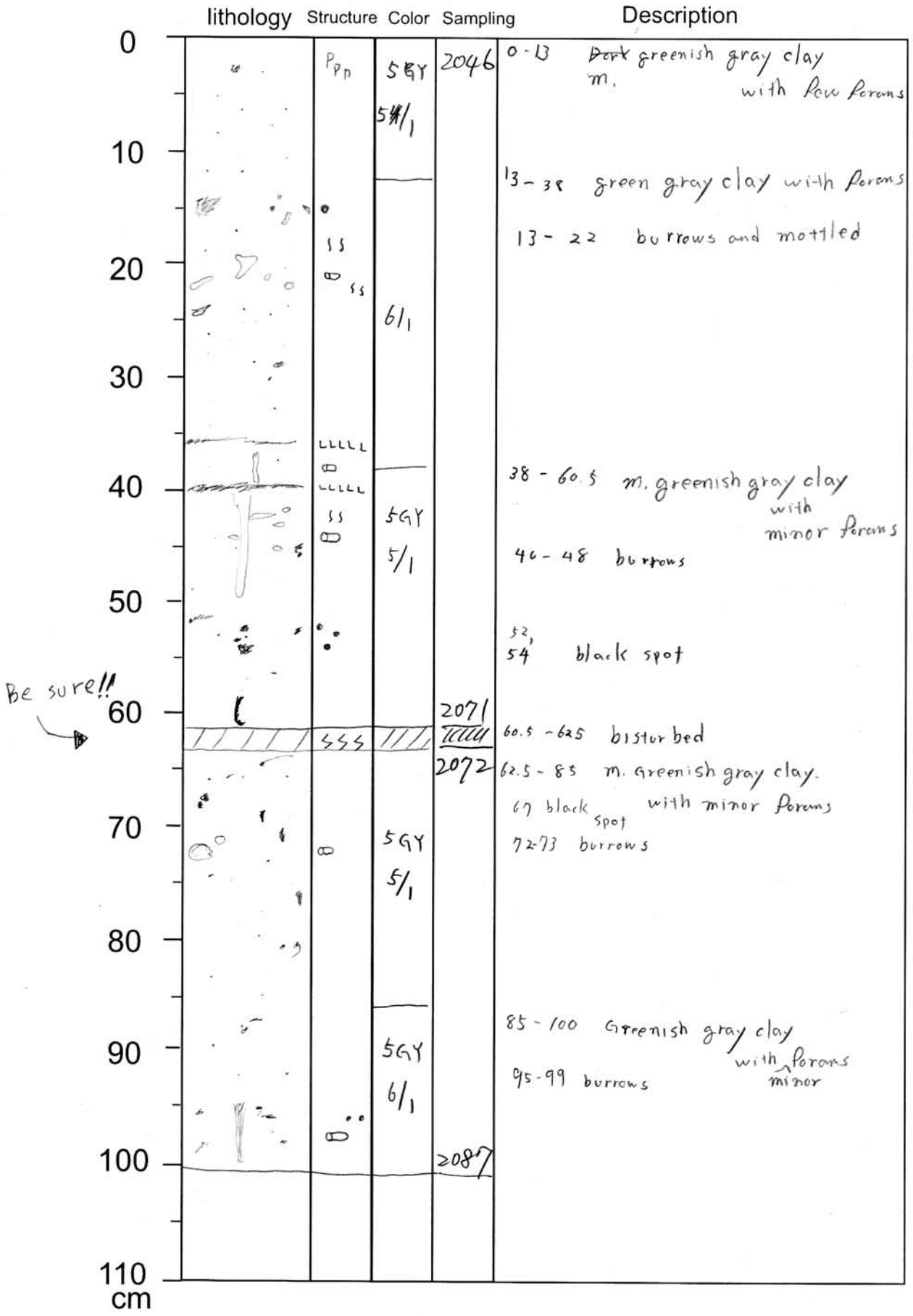
total length _____ section length 100

KR05-15

CORE: Pc1 sec 7

Date: 11/1 2005

by: Suganuma



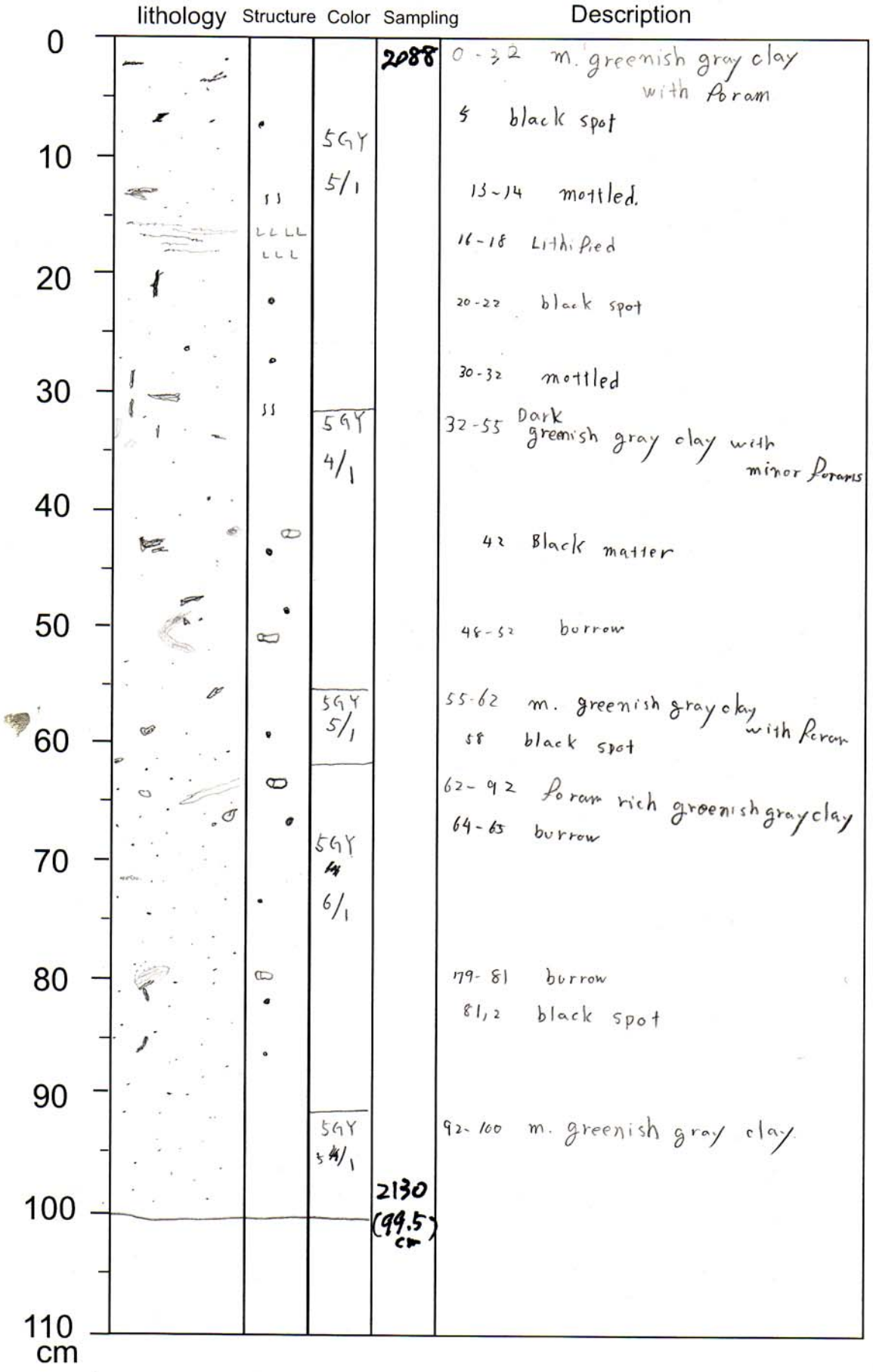
total length _____ section length 100.

KR05-15

CORE: PC1 sec. 8

Date: 11/1 2005

by: Suganuma



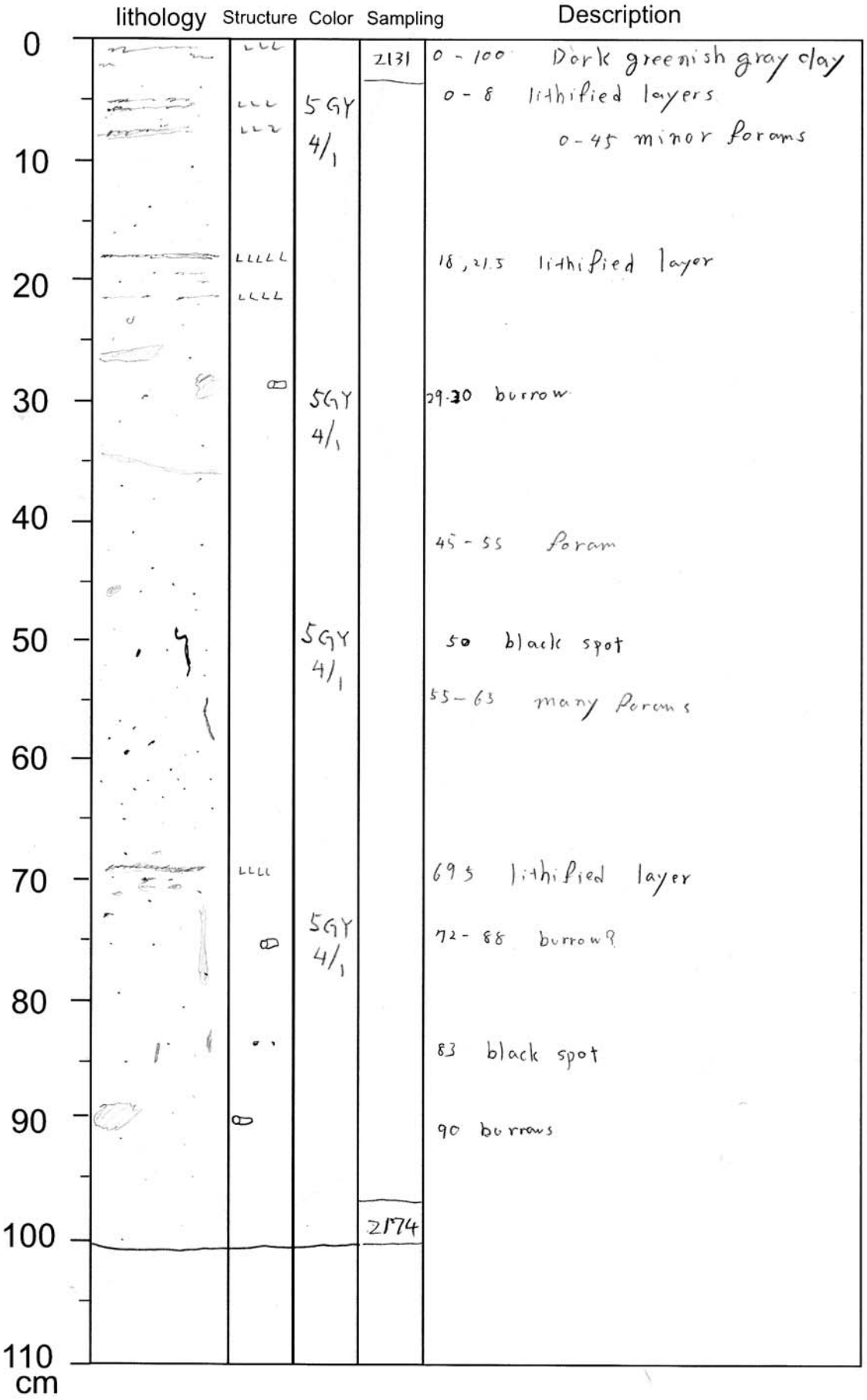
total length _____ section length 100.

KR05-15

CORE: Pc1 sec. 9

Date: 11/1 2005

by: Suganuma.



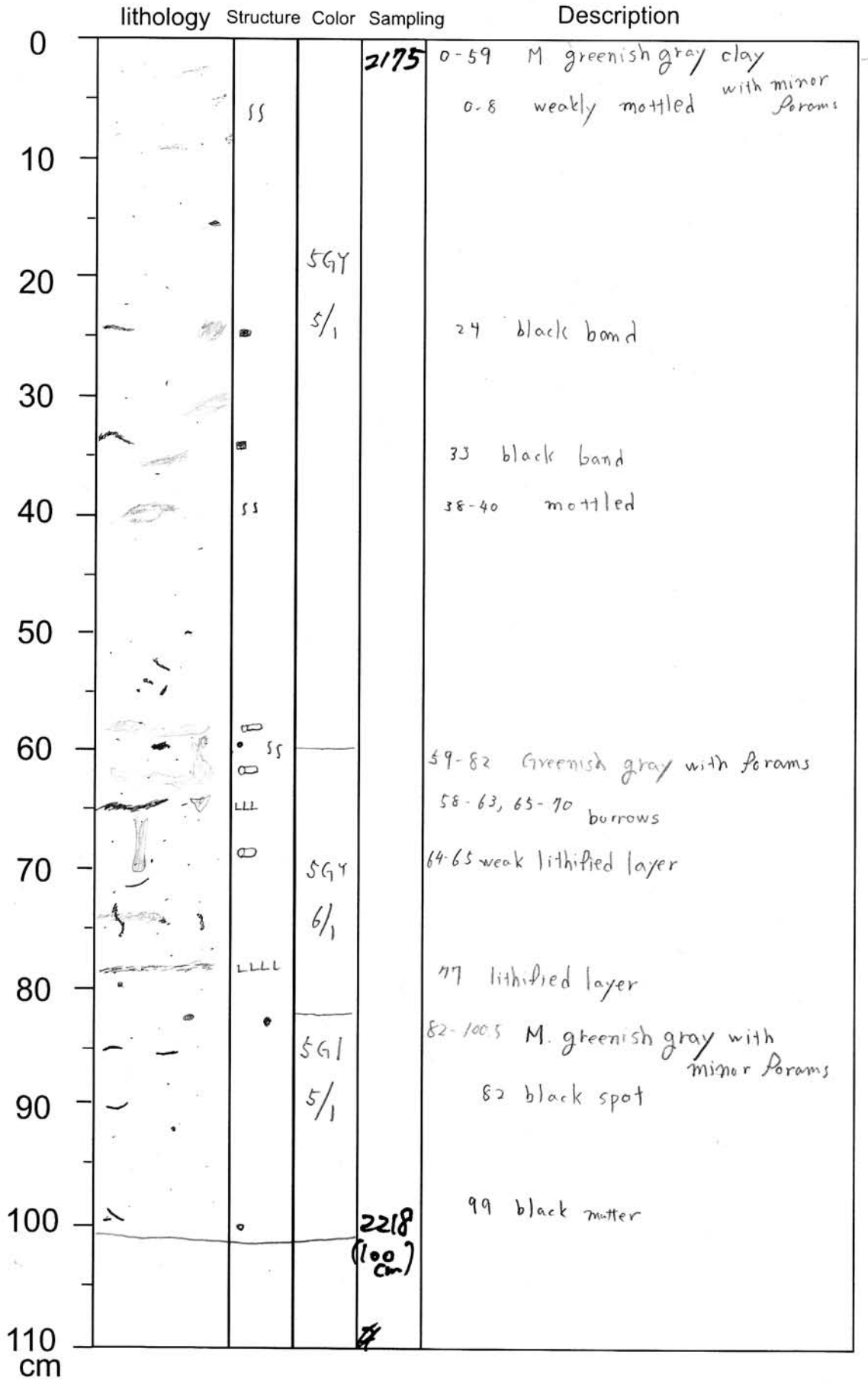
total length _____ section length 100

KR05-15

CORE: PC1 sec. 10

Date: 11/2 2005

by: Suganuma



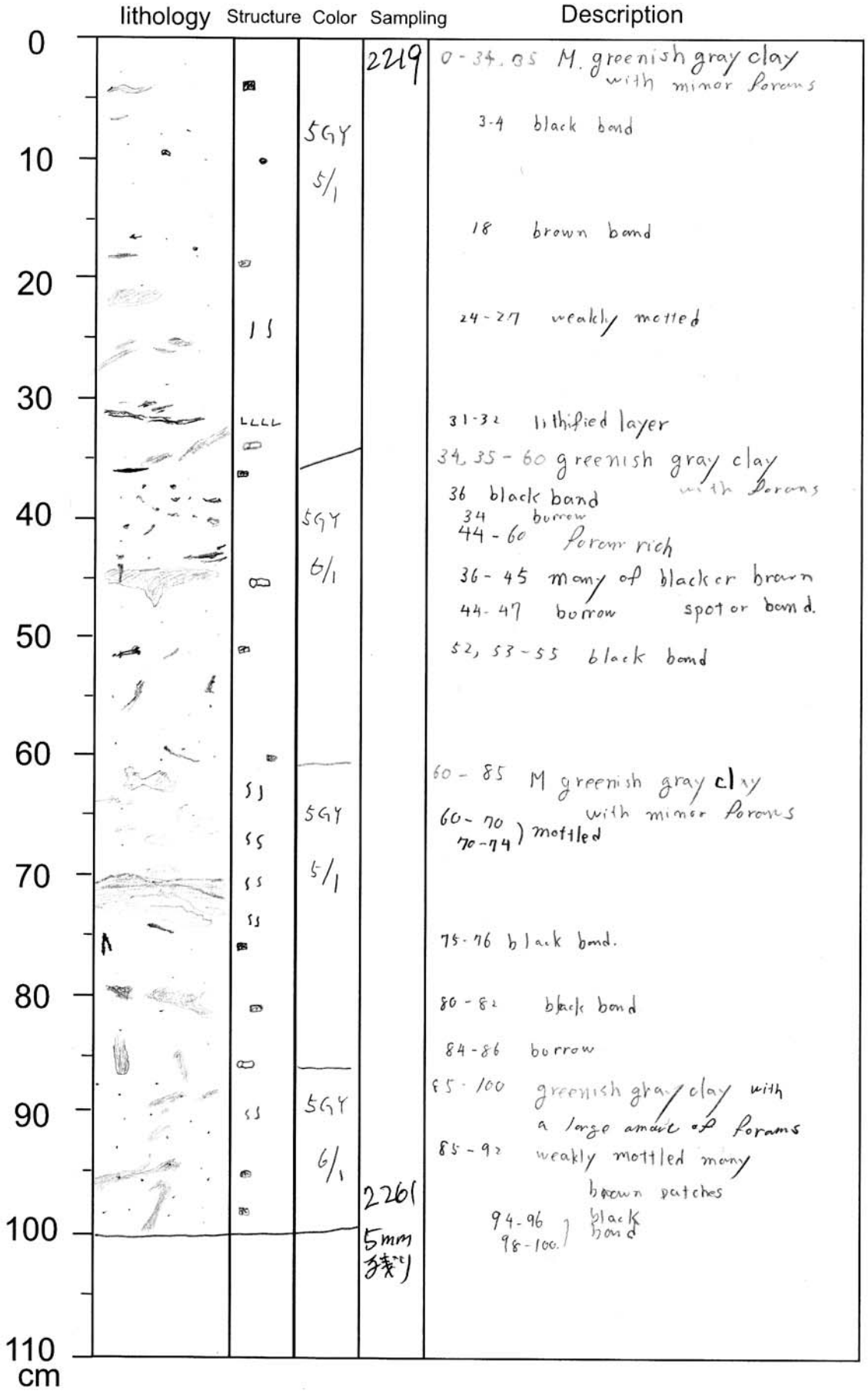
total length _____ section length 100 5

KR05-15

CORE: PC sec 11

Date: 11/2 2005

by: Suganuma



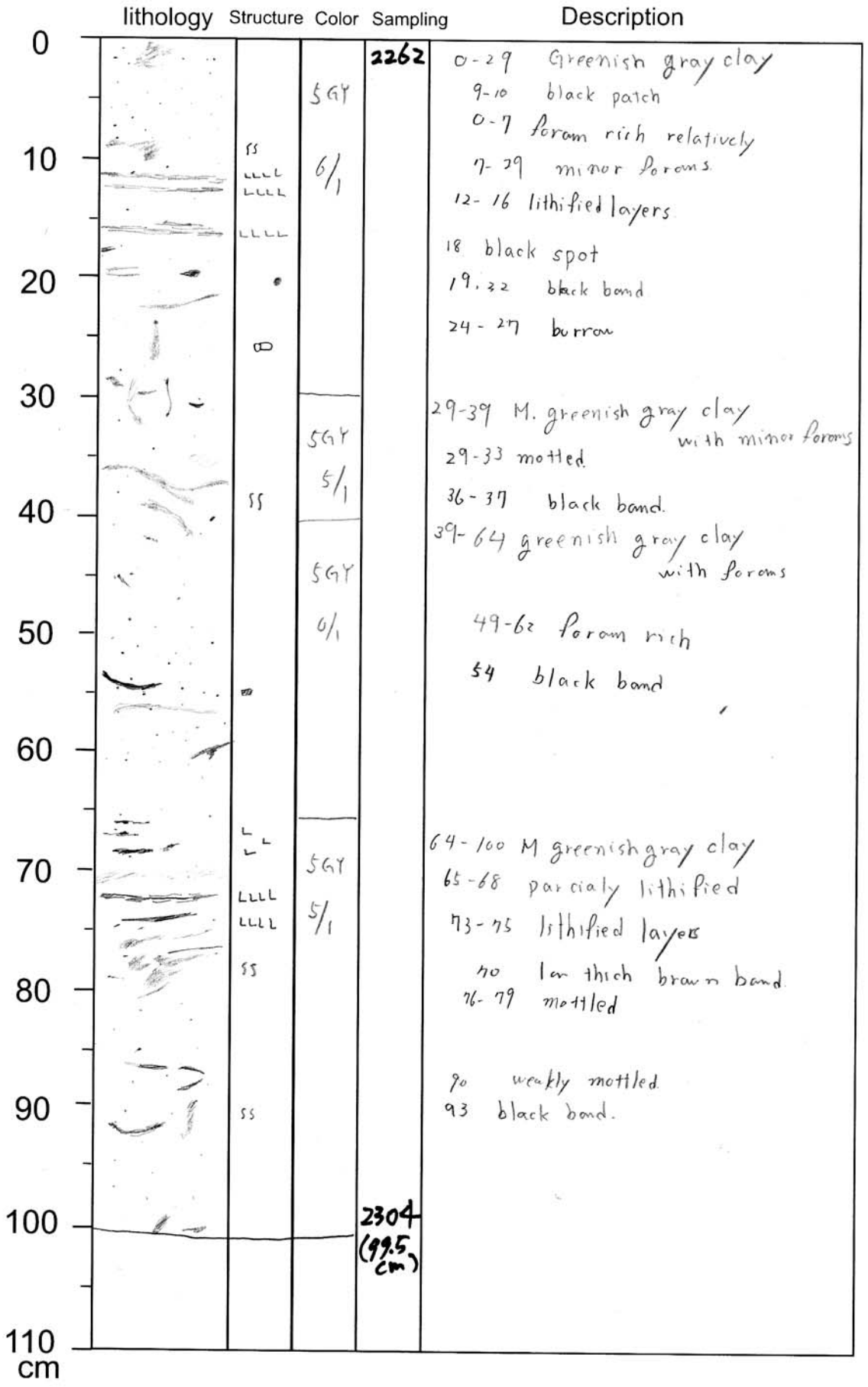
total length _____ section length 100

KR05-15

CORE: PC1 Sec. 12

Date: 11/2 2005

by: Suganuma



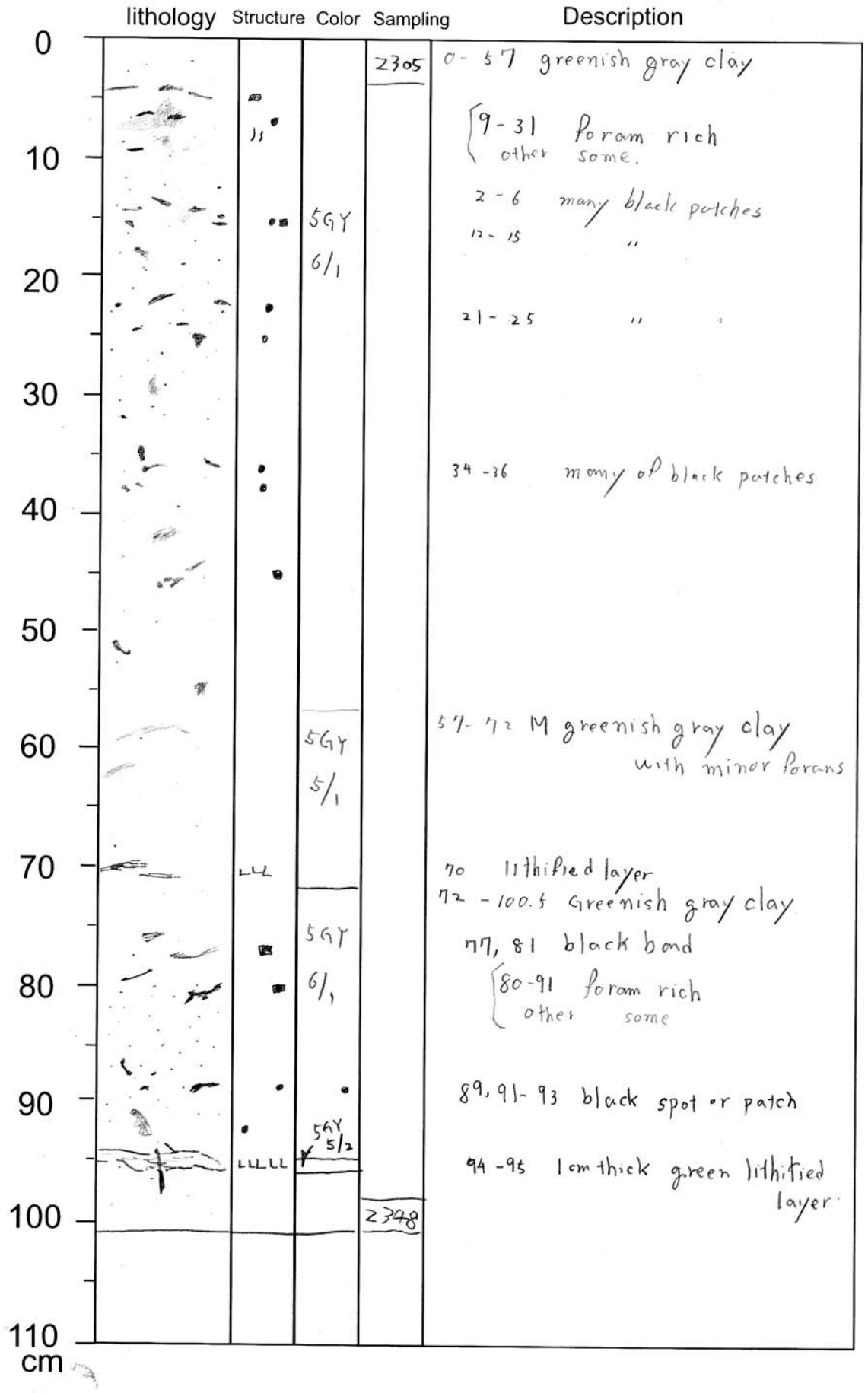
total length _____ section length 100

KR05-15

CORE: Pc1 sec. 13

Date: 11/2 2005

by: Suganuma



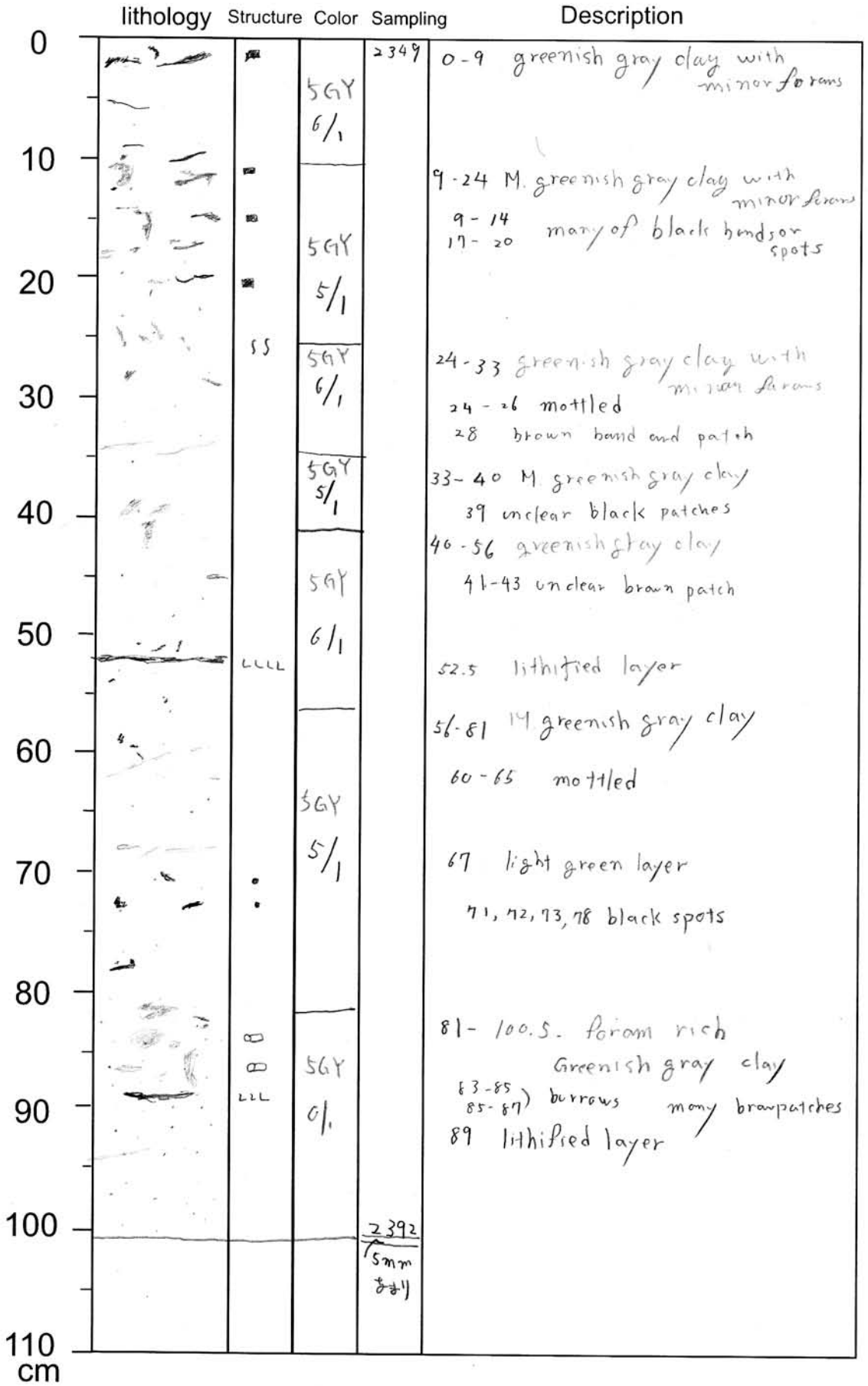
total length _____ section length 100.5

KR05-15

CORE: Pc 1 sec. 14

Date: 11/2 2005

by: Suganuma



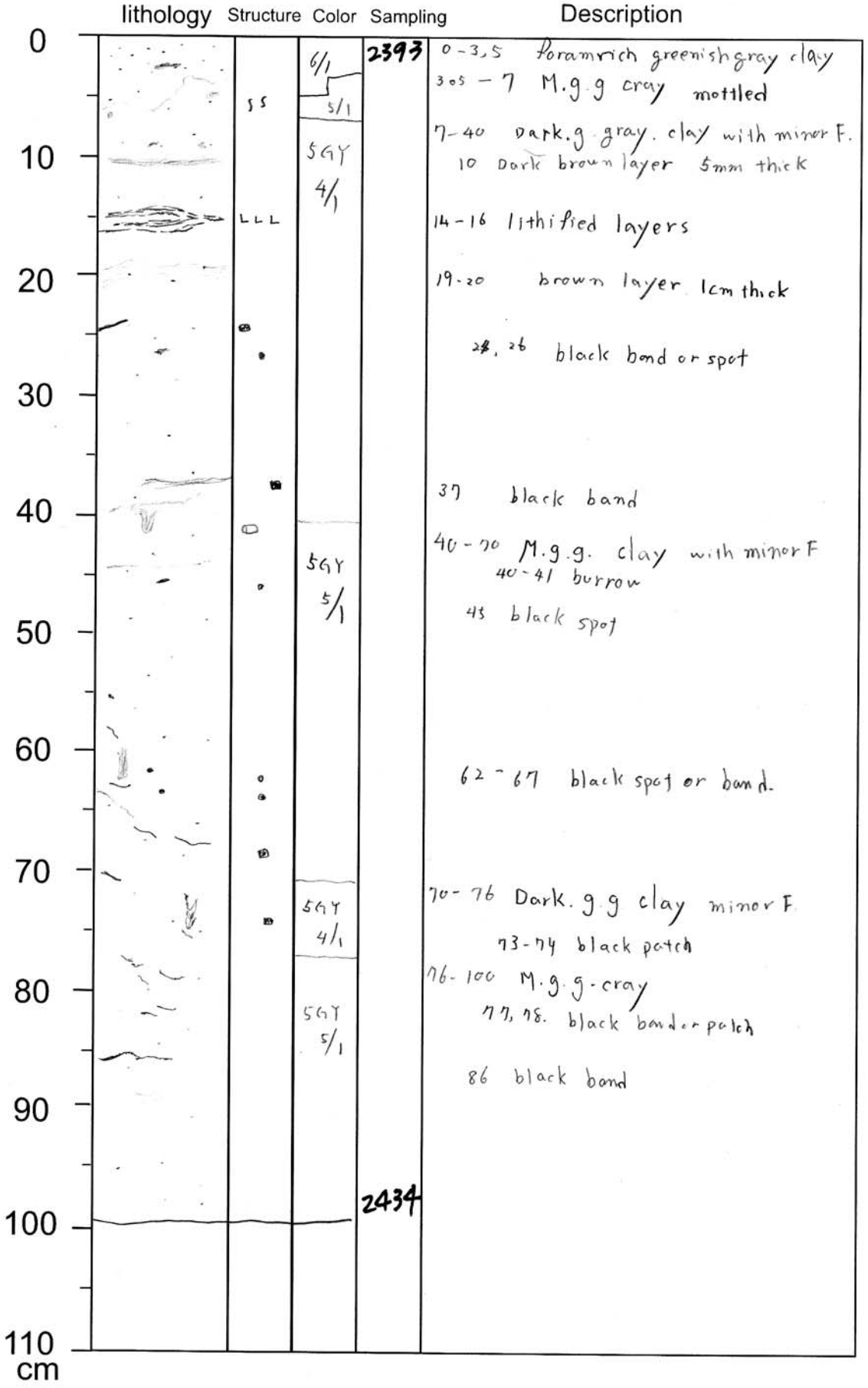
total length _____ section length 100 5 cm

KR05-15

CORE: P C | Sec. 15

Date: 11/2 2005

by: Suganuma



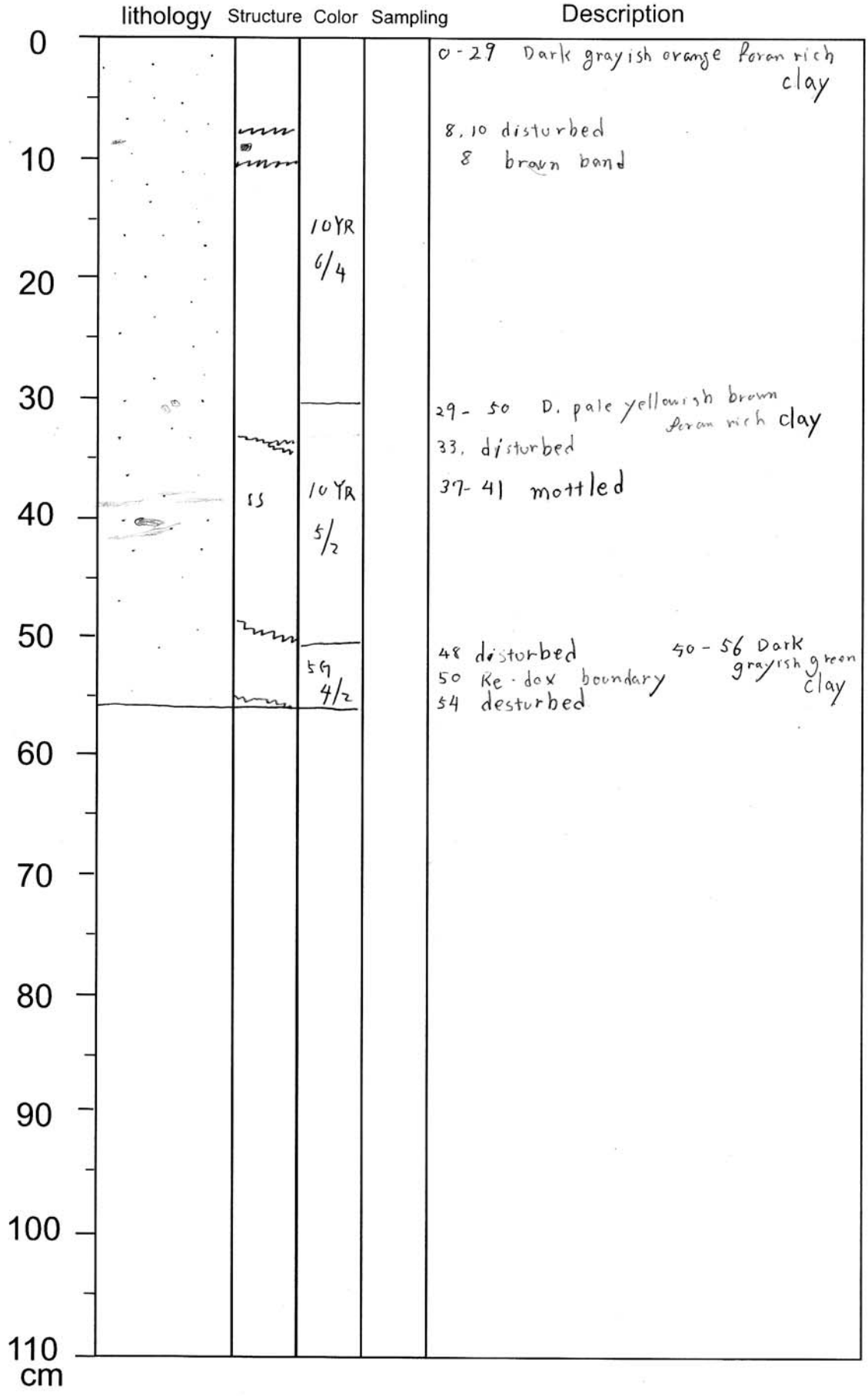
total length _____ section length 99 cm.

KR05-15

CORE: PC1 pilot

Date: 11/2

by: Suganuma



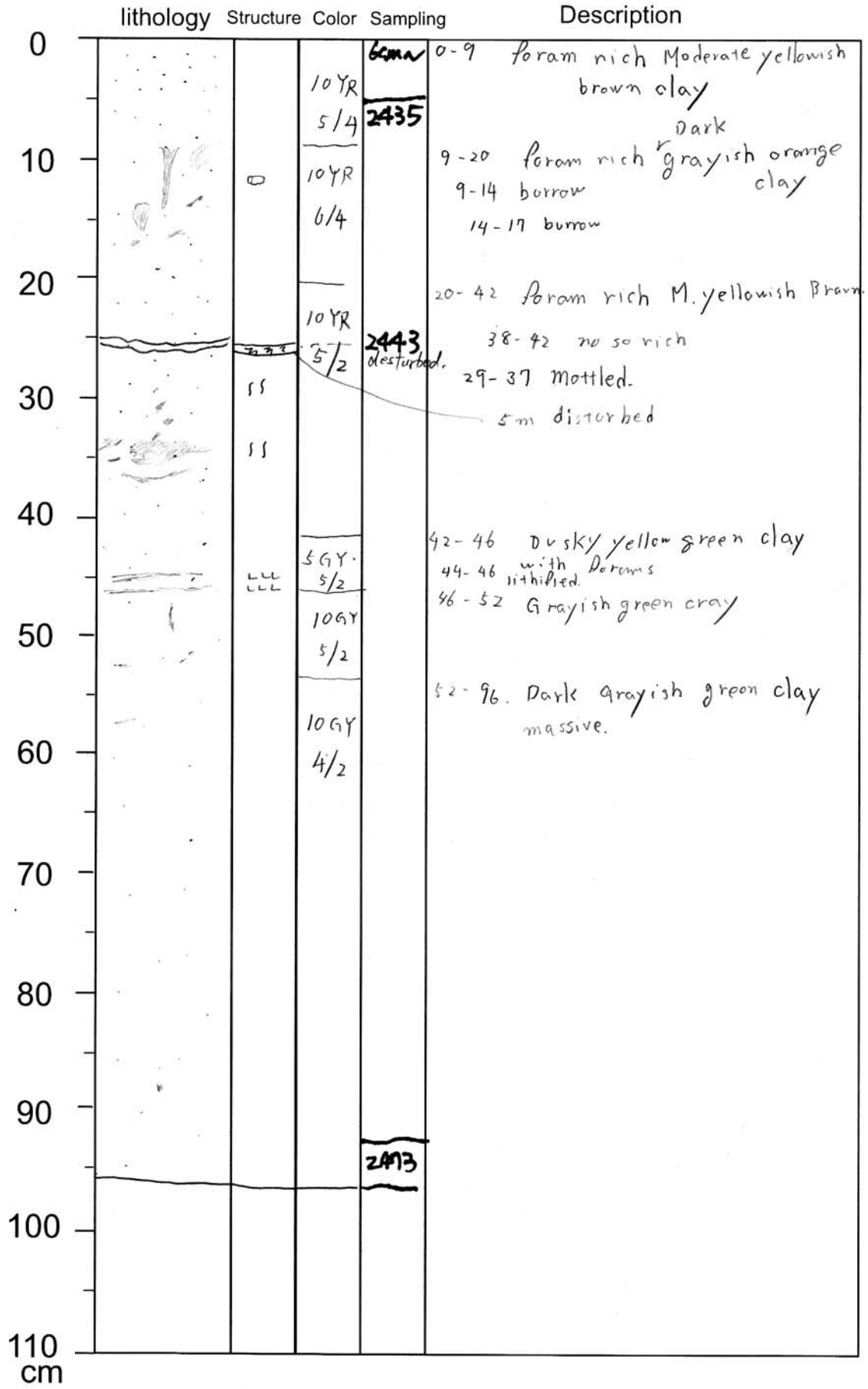
total length _____ section length 56

KR05-15

CORE: pc2 sec. 2

Date: 11/2 2005

by: Sagawa



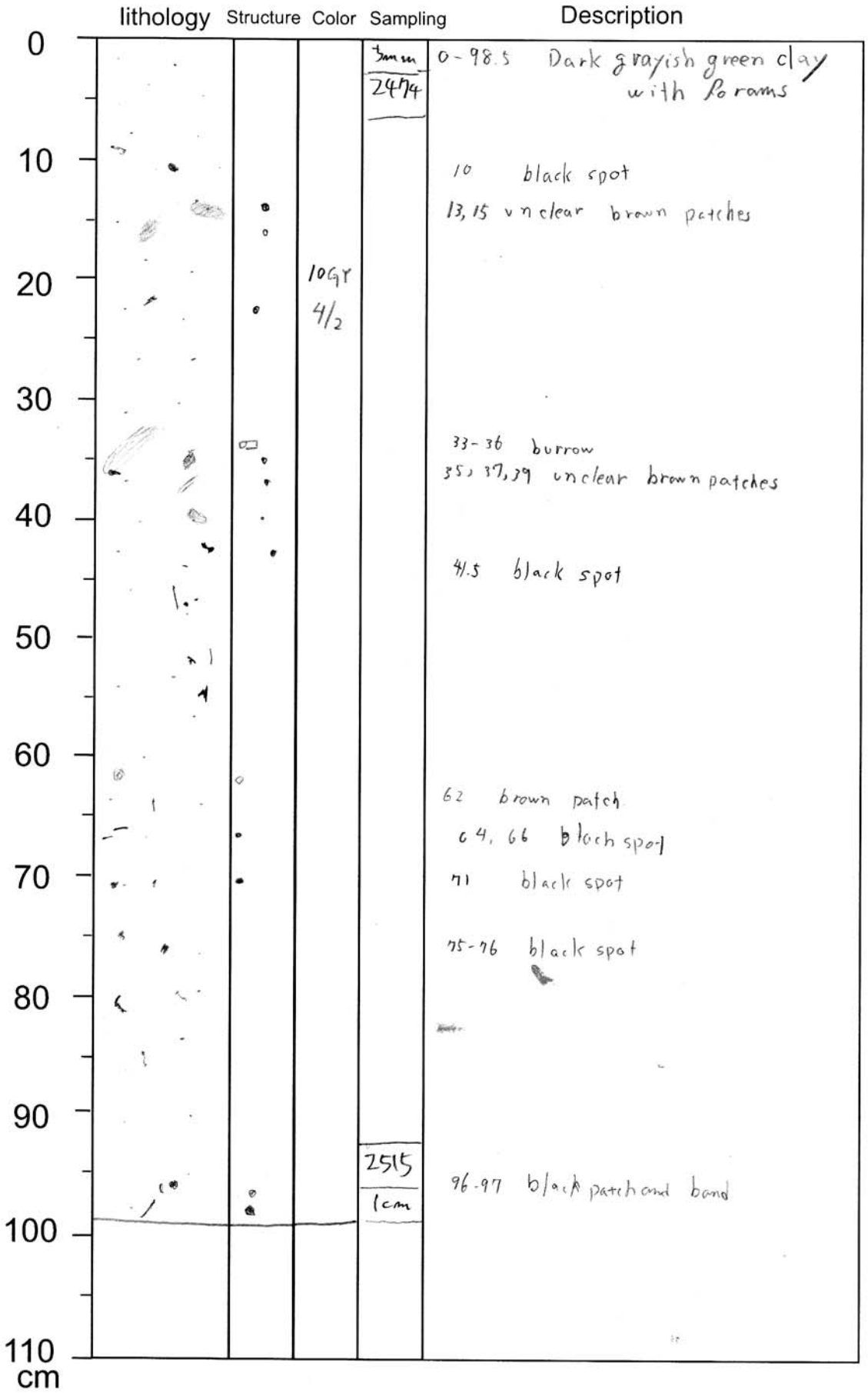
total length _____ section length 96 cm

KR05-15

CORE: PC2 sec.3

Date: 11/2 2005

by: Sugazuma.



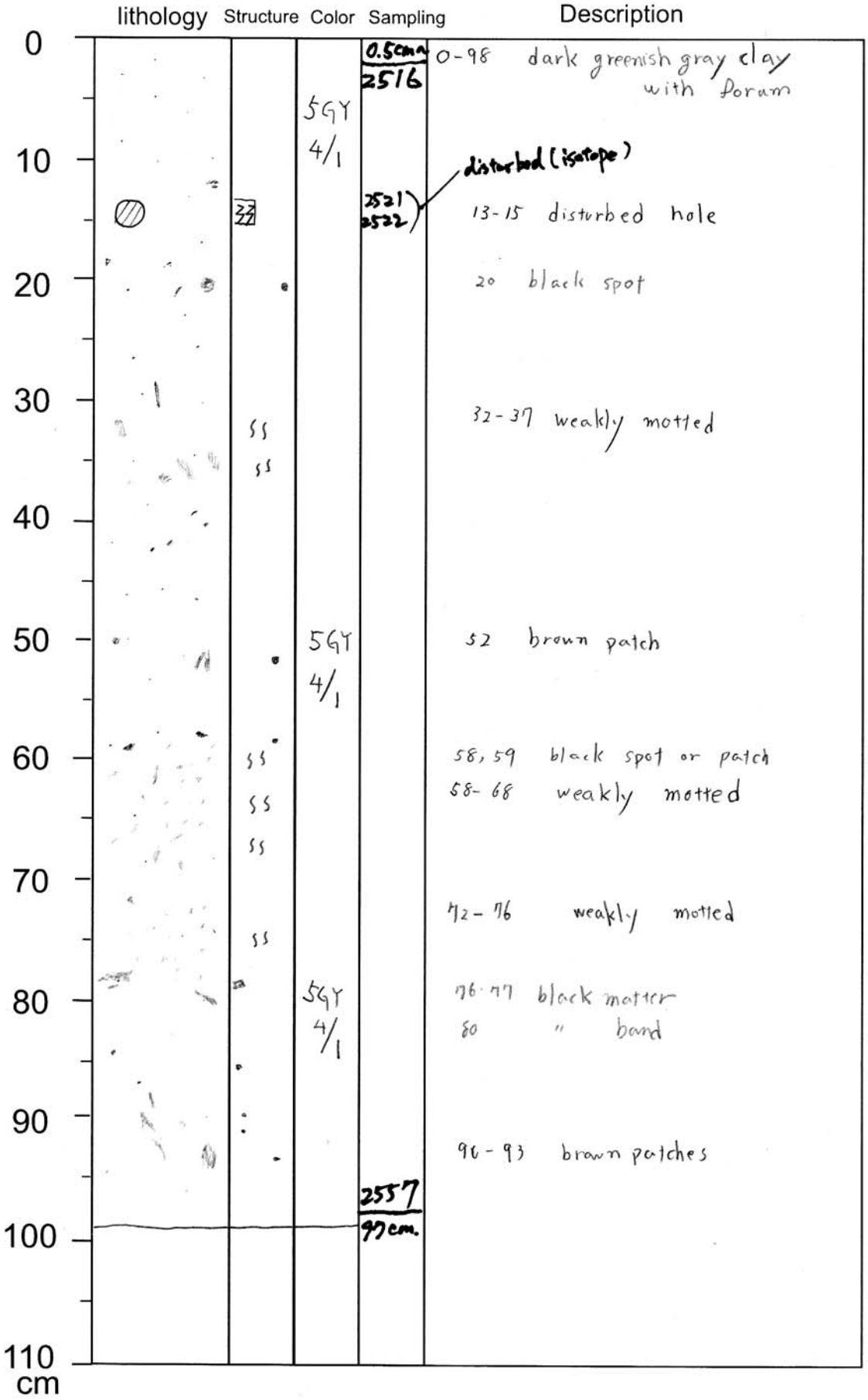
total length _____ section length 98.5

KR05-15

CORE: PC2 sec 4

Date: 11/3 2005

by: Suga



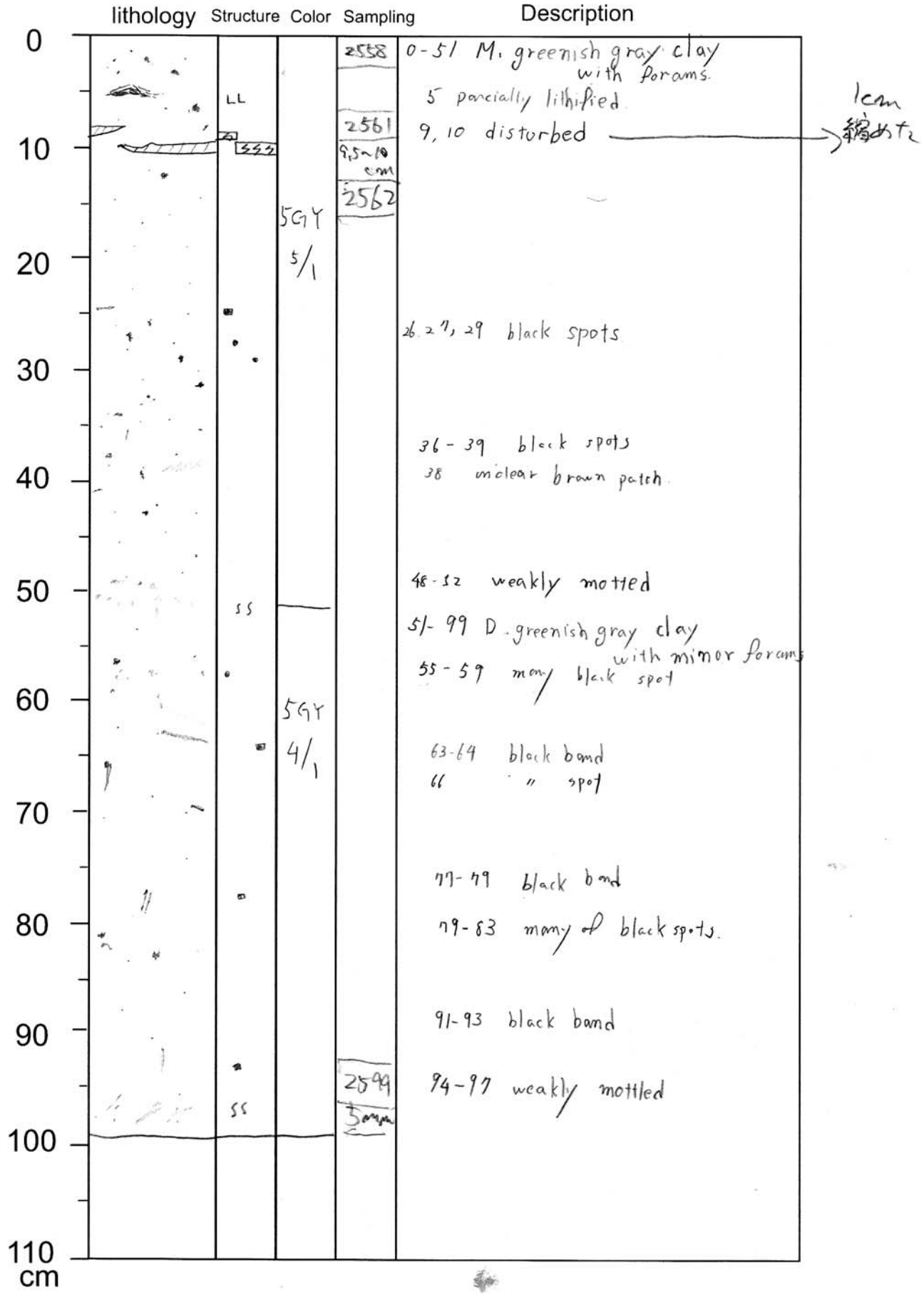
total length _____ section length 98

KR05-15

CORE: PC2 sec 5

Date: 11/13 2005

by: Susanuma



total length _____ section length ~~99~~ 98cm

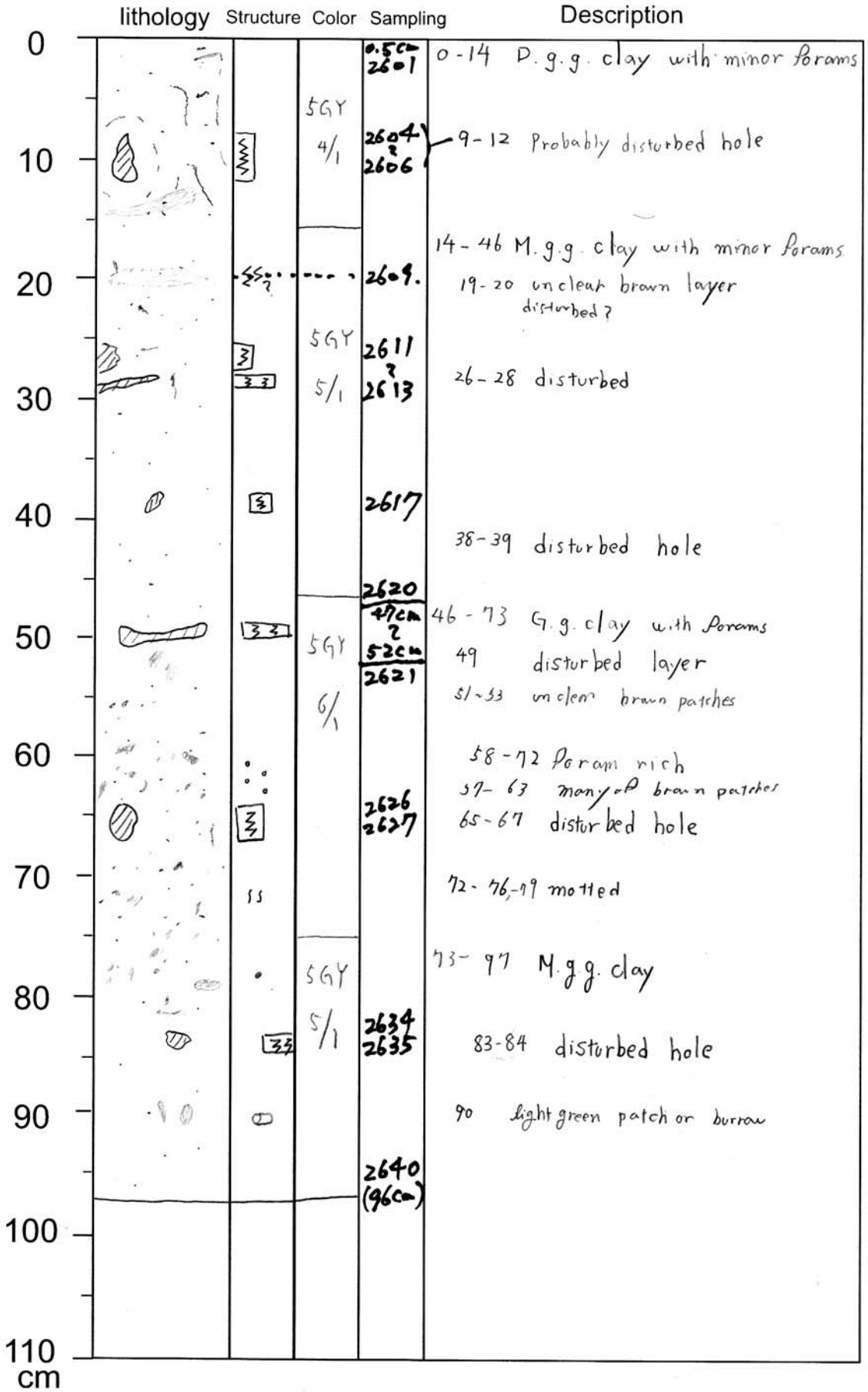
KR05-15

CORE: PC2 sec. 6

Date: 11/3 2005

by: Suganuma

* Sample No. 2600 とばした.



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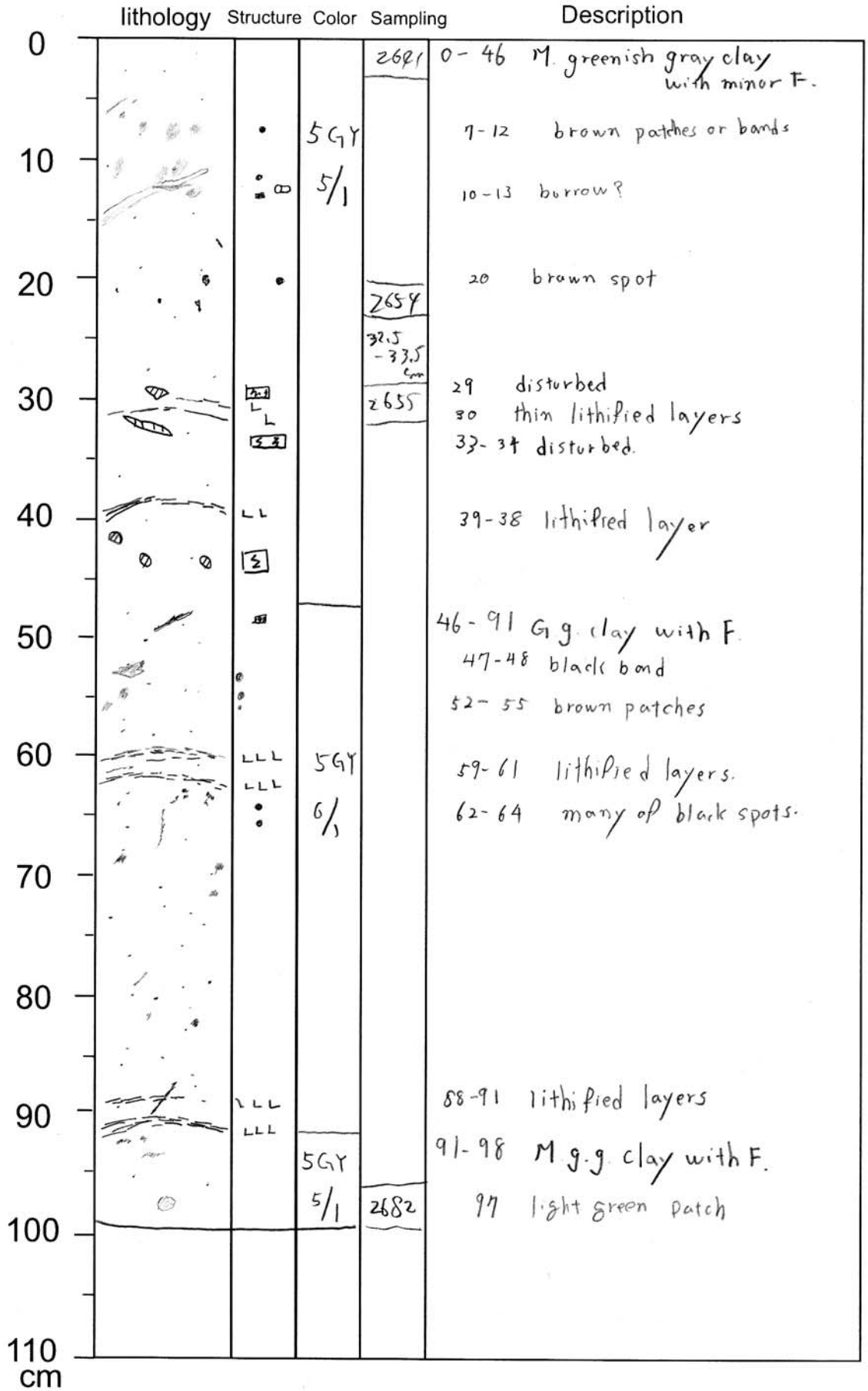
KR05-15

CORE: PC2 sec. 7

Date: 11/3 2005

by: Suganuma



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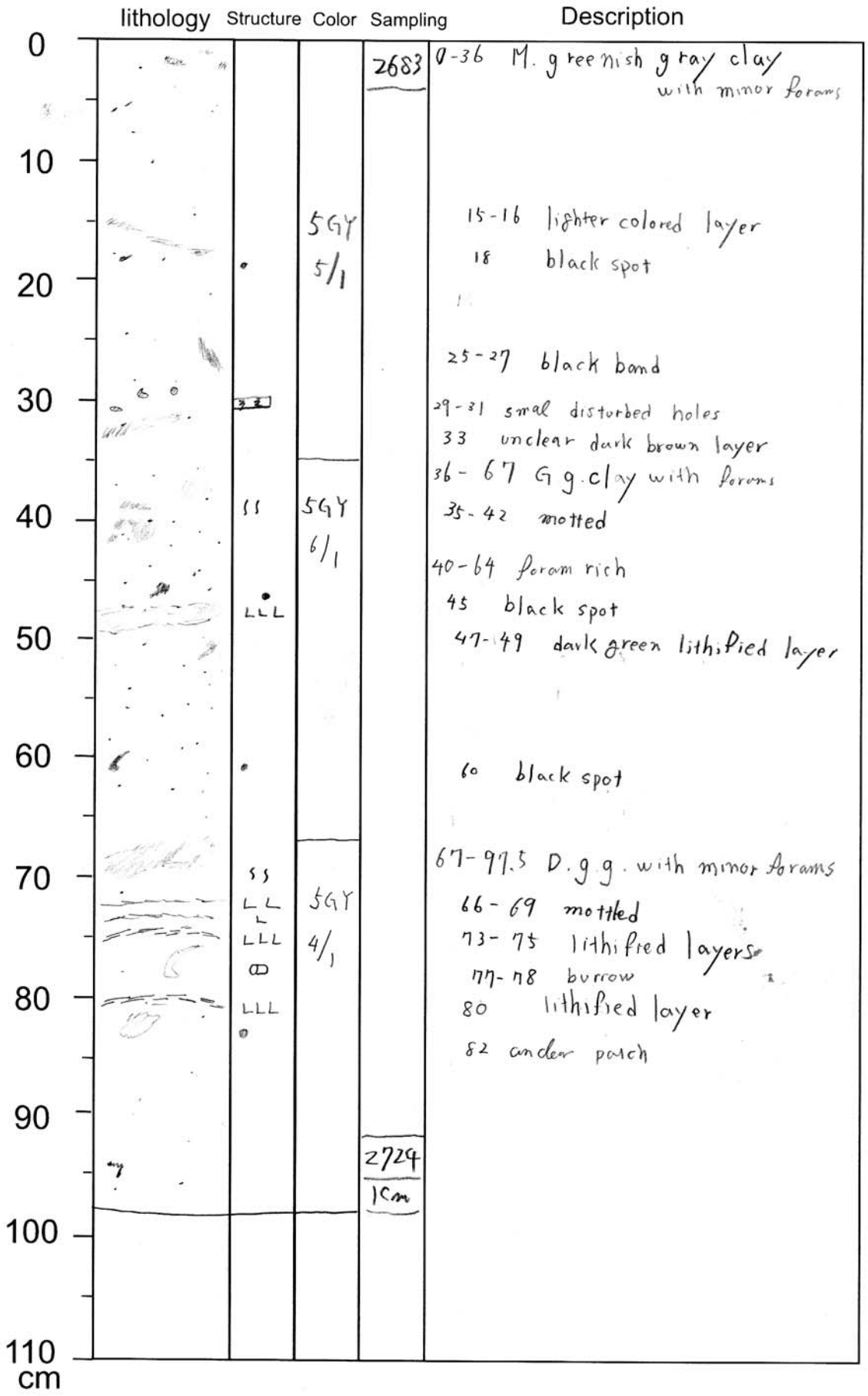
KR05-15

CORE: PC2 sec. 8

Date: 11/3 2005

by: Suganuma



total length

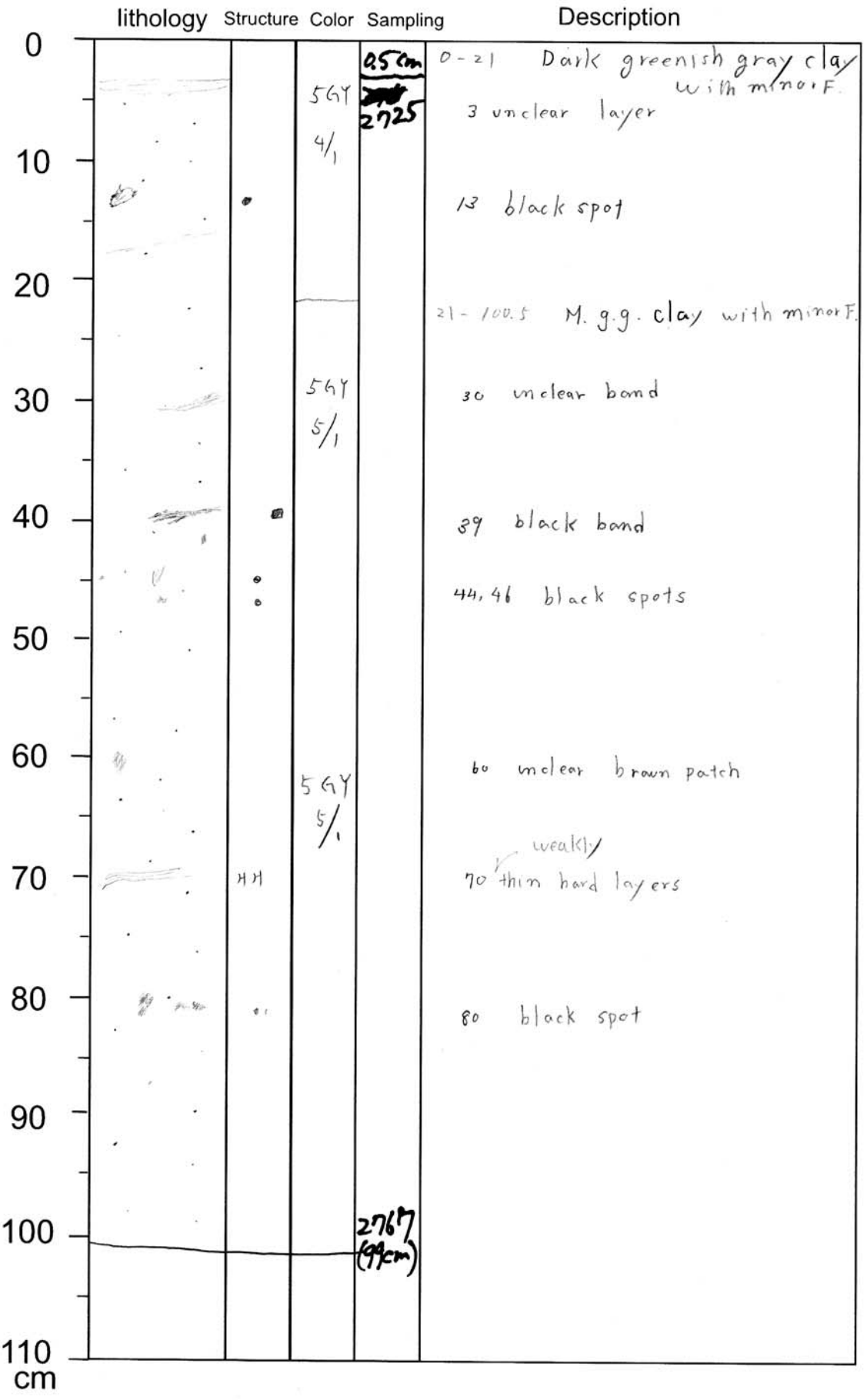
section length 97.5

KR05-15

CORE: PC2 sec.9

Date: 11/3 2005

by: Siganuma



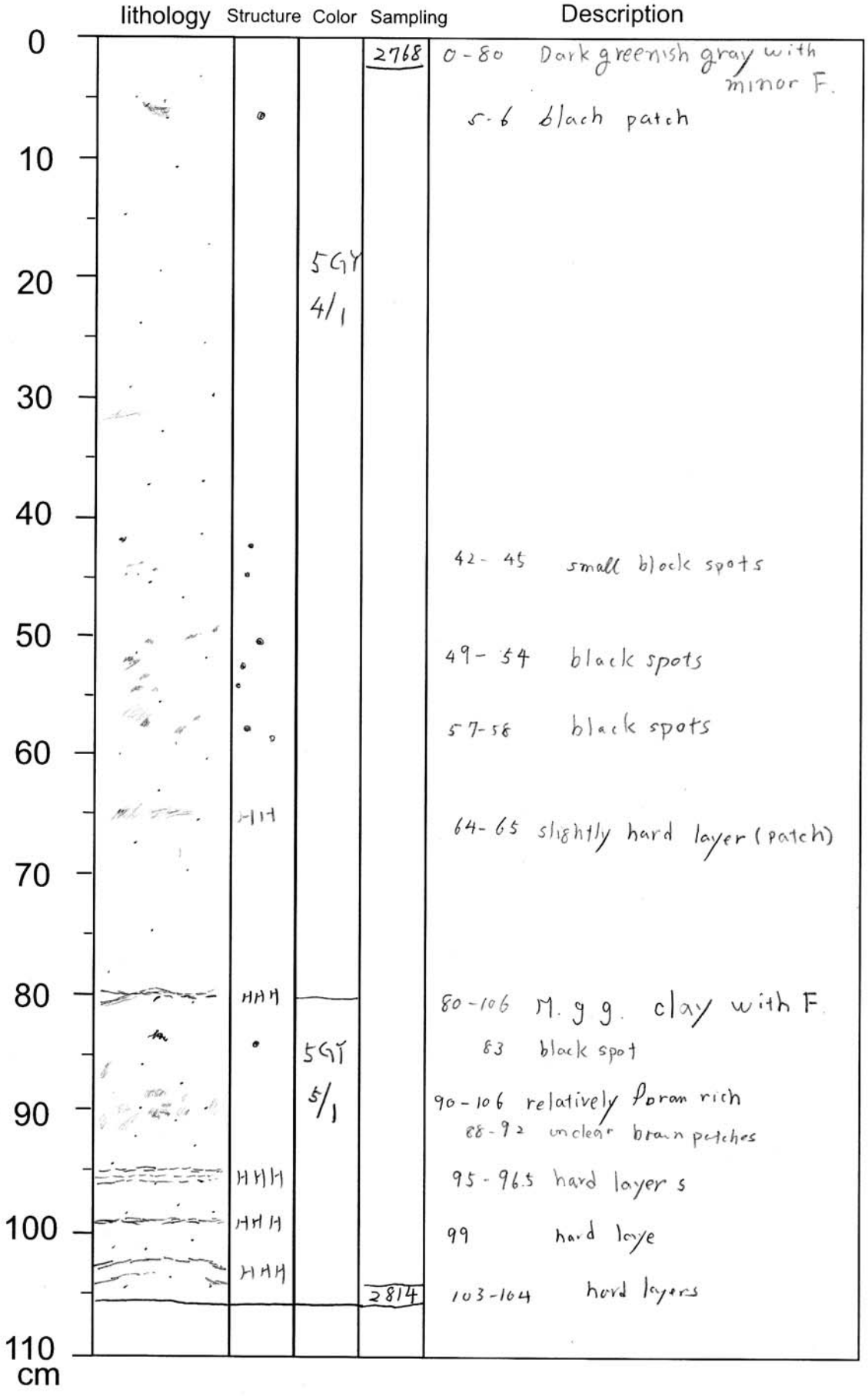
total length _____ section length 100.5

KR05-15

CORE: PC2 sec.10

Date: 11/3 2005

by: Suganuma



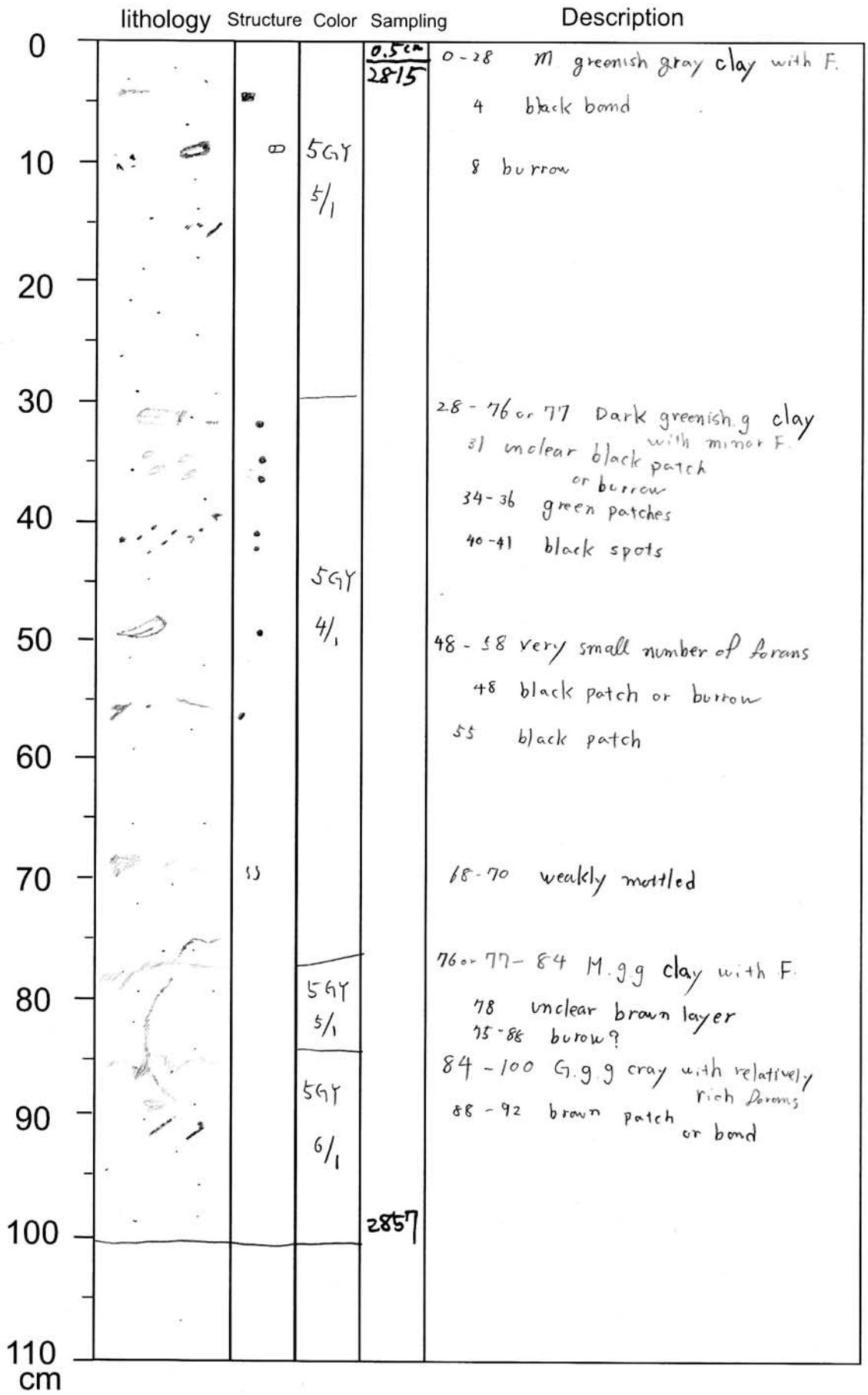
total length _____ section length 106 cm

KR05-15

CORE: PC2 sec. 11

Date: 11/3, 2005

by: Suganuma



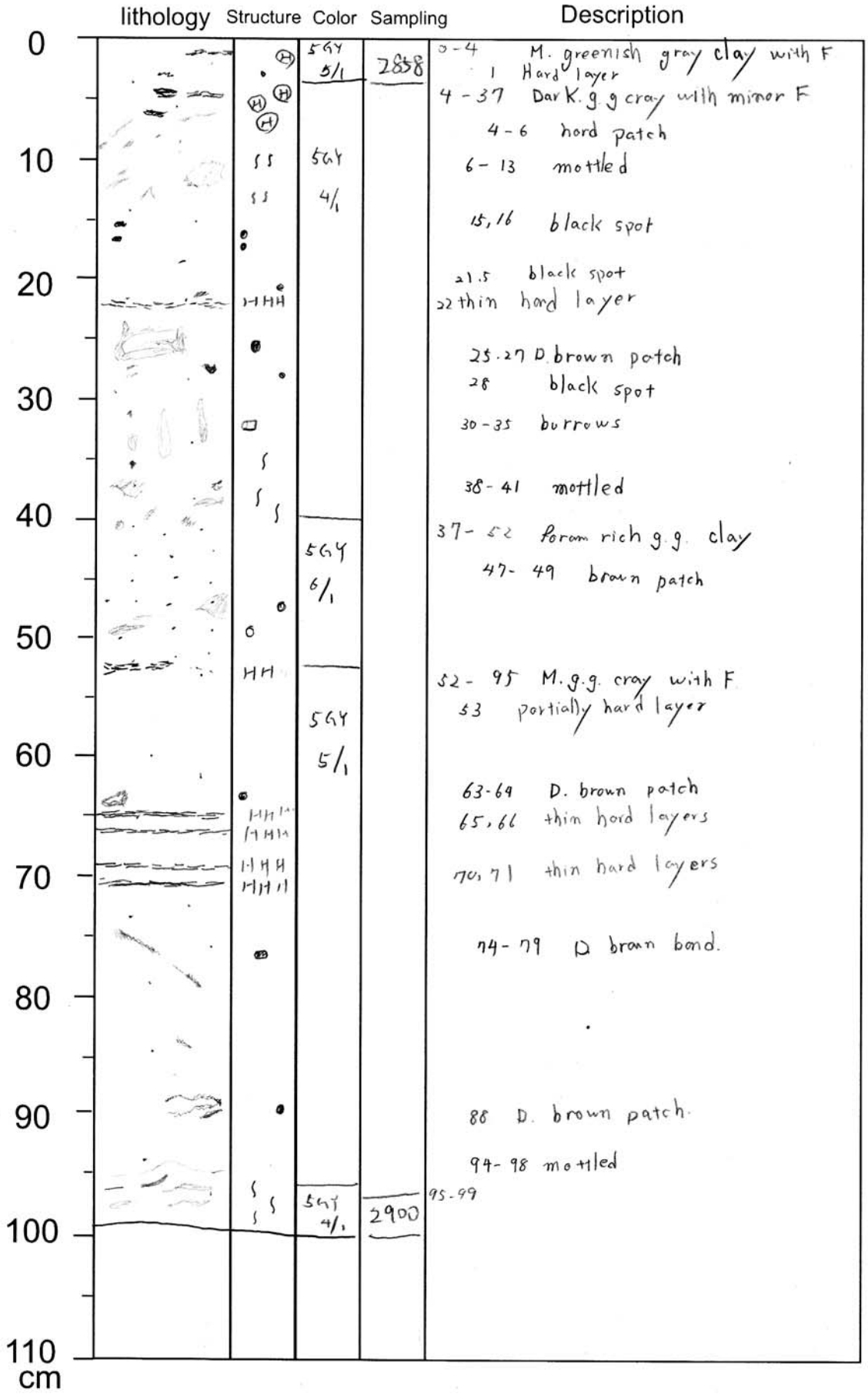
total length _____ section length 100

KR05-15

CORE: PC2 sec. 12

Date: # 11/3 2005

by: Suganuma



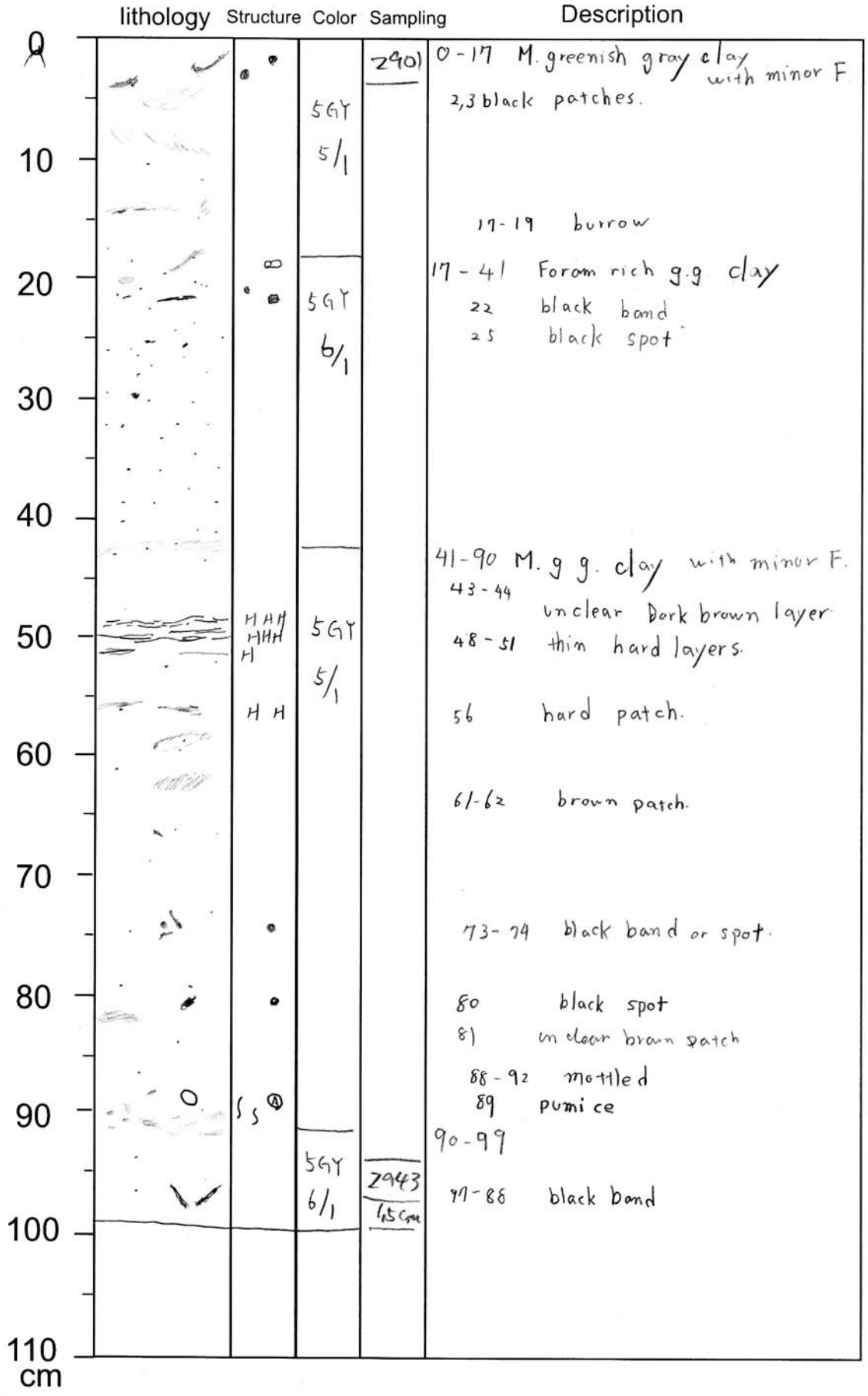
total length _____ section length 99

KR05-15

CORE: P c2 sec. 13

Date: 11/3 2005

by: Suganuma.



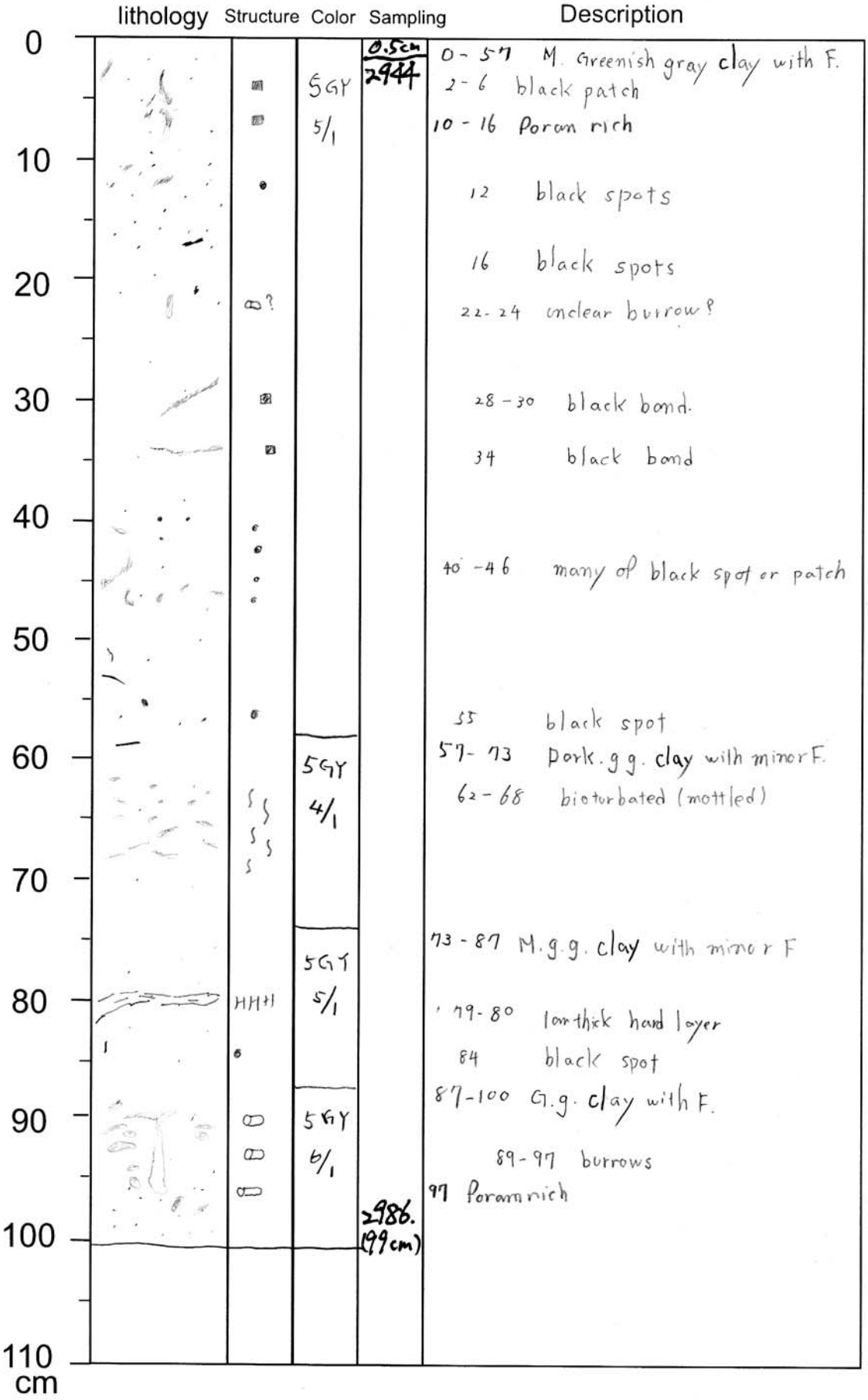
total length _____ section length 99

KR05-15

CORE: Pc 2 sec 14

Date: 11/3 2005

by: Soganuma



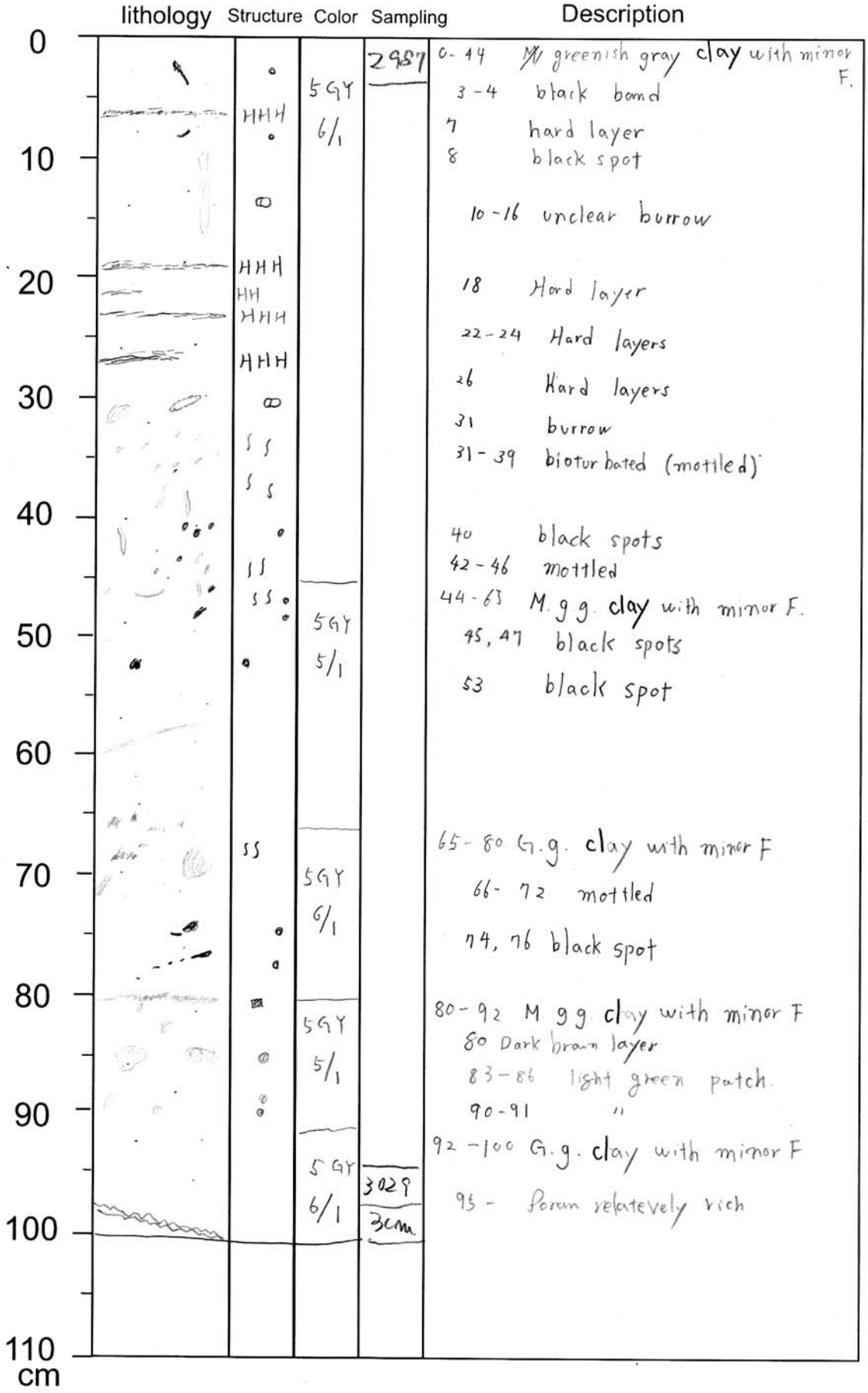
total length _____ section length 100

KR05-15

CORE: PC2 sec. 15

Date: 11/2, 2005

by: Suganuma



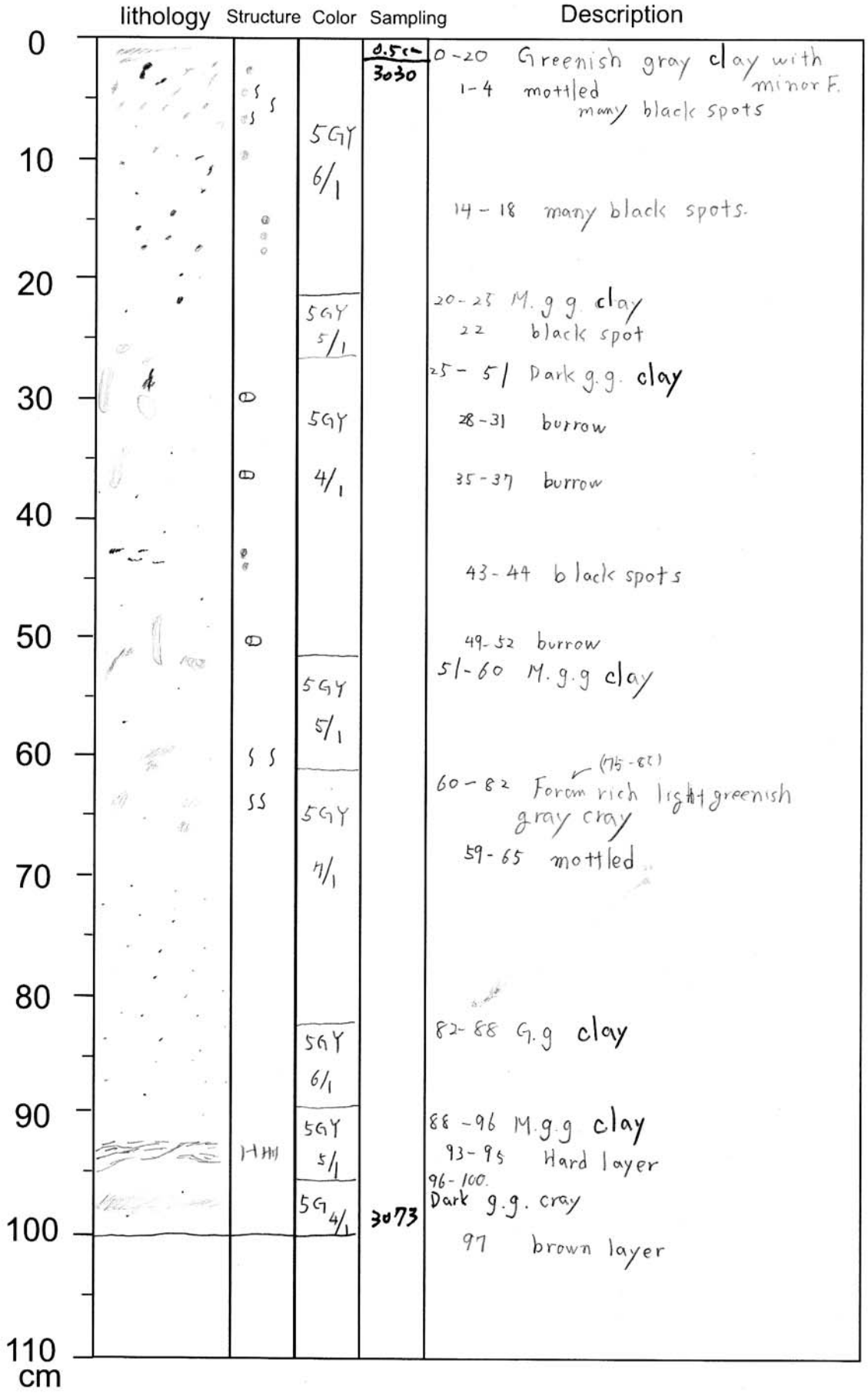
total length _____ section length 100 cm

KR05-15

CORE: PC2 sec. 16

Date: 11/3 2005

by: Suganuma.



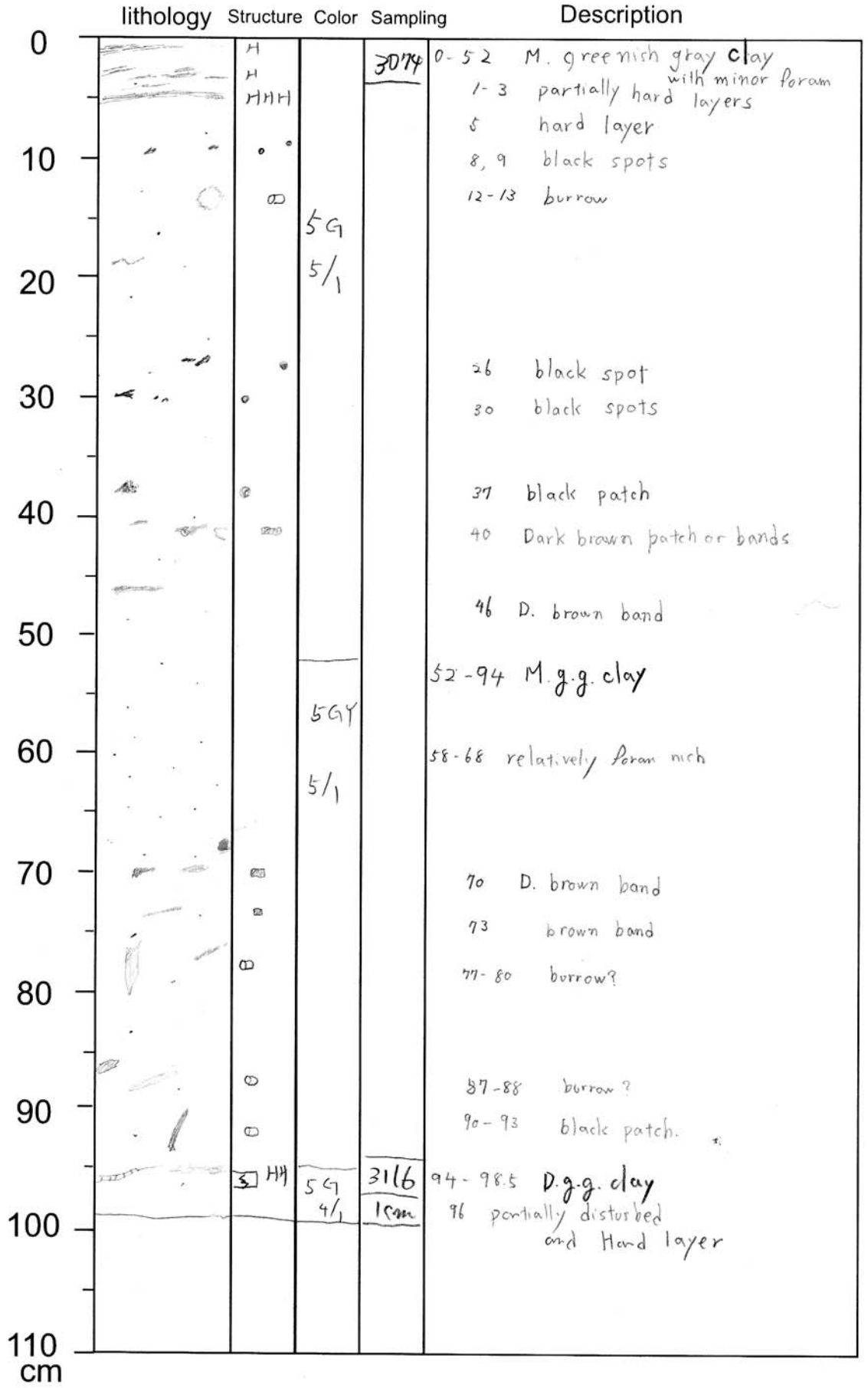
total length _____ section length 100

KR05-15

CORE: P C 2 sec 17

Date: 11/4 2005

by: Suganuma



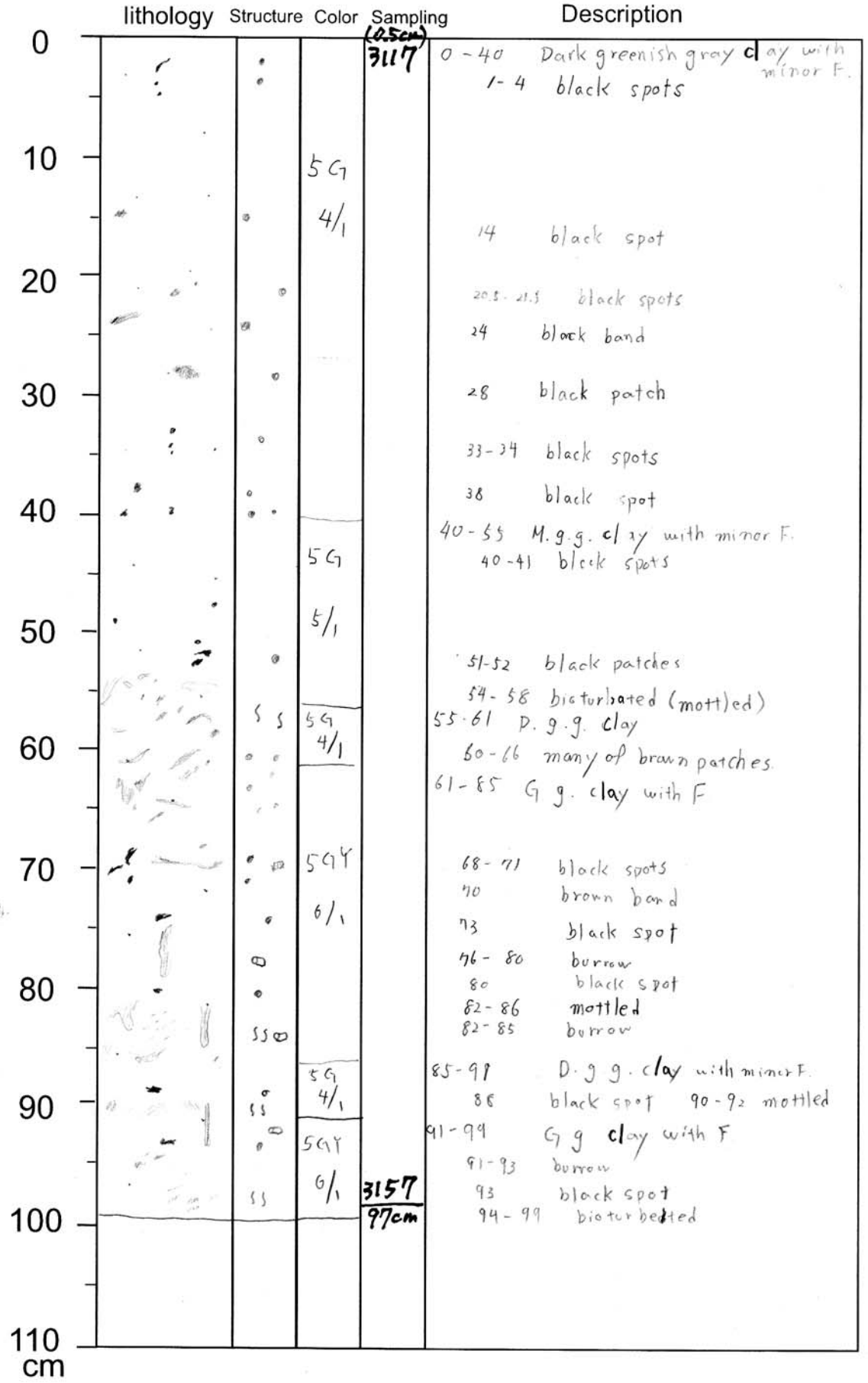
total length _____ section length 98.5

KR05-15

CORE: PC2 sec. 18

Date: 11/4 2005

by: Suganuma



Description

0 - 40 Dark greenish gray clay with minor F.
1 - 4 black spots
14 black spot
20.5 - 21.5 black spots
24 black band
28 black patch
33 - 34 black spots
38 black spot
40 - 55 M. g. g. clay with minor F.
40 - 41 black spots
51 - 52 black patches
54 - 58 bioturbated (mottled)
55 - 61 D. g. g. clay
60 - 66 many of brown patches
61 - 85 G g. clay with F
68 - 71 black spots
70 brown band
73 black spot
76 - 80 burrow
80 black spot
82 - 86 mottled
82 - 85 burrow
85 - 99 D. g g. clay with minor F.
86 black spot 90 - 92 mottled
91 - 99 G g clay with F
91 - 93 burrow
93 black spot
94 - 99 bioturbetted

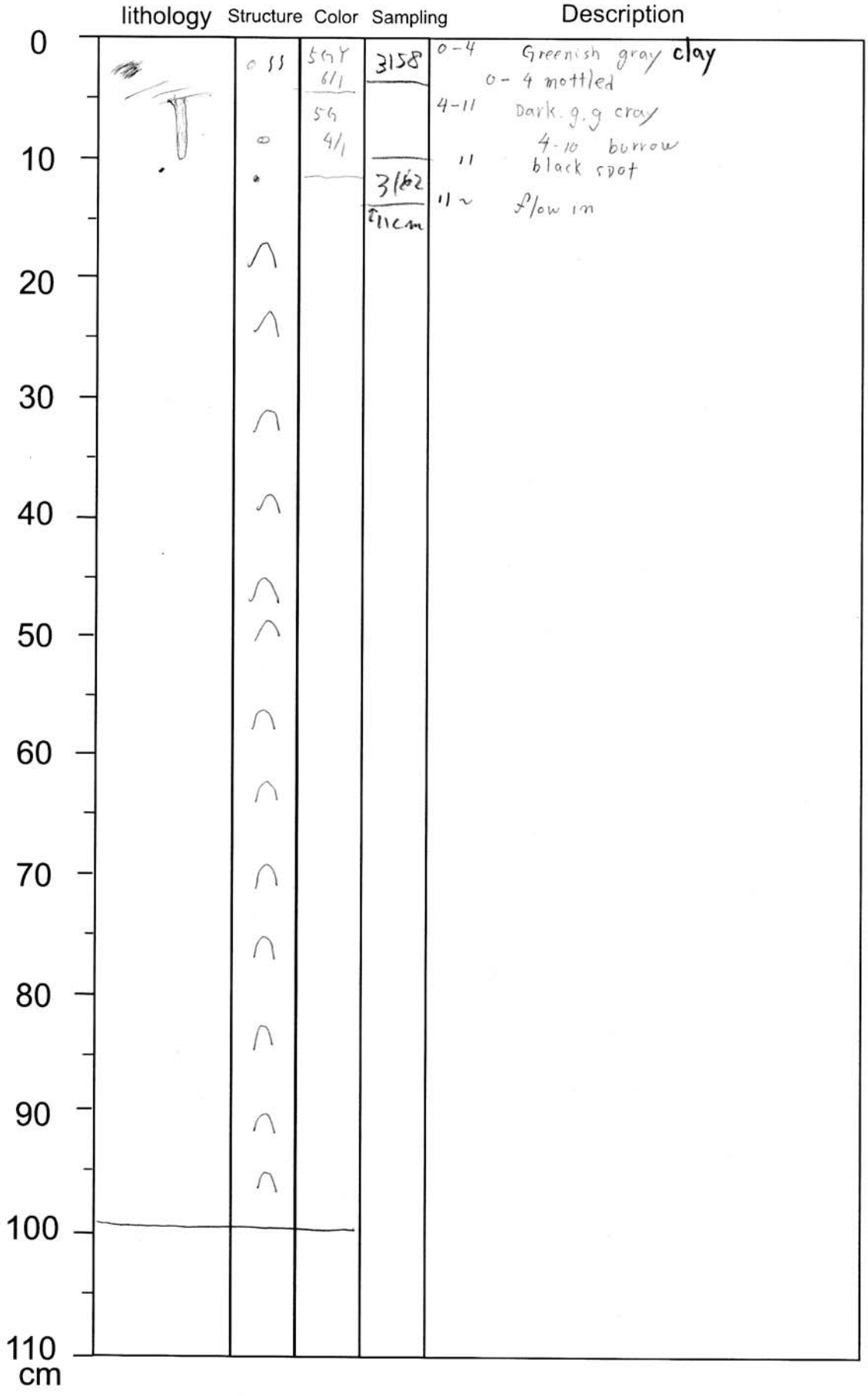
total length _____ section length 99

KR05-15

CORE: PC1 sec. 19

Date: 11/4 2005

by: Soganuma



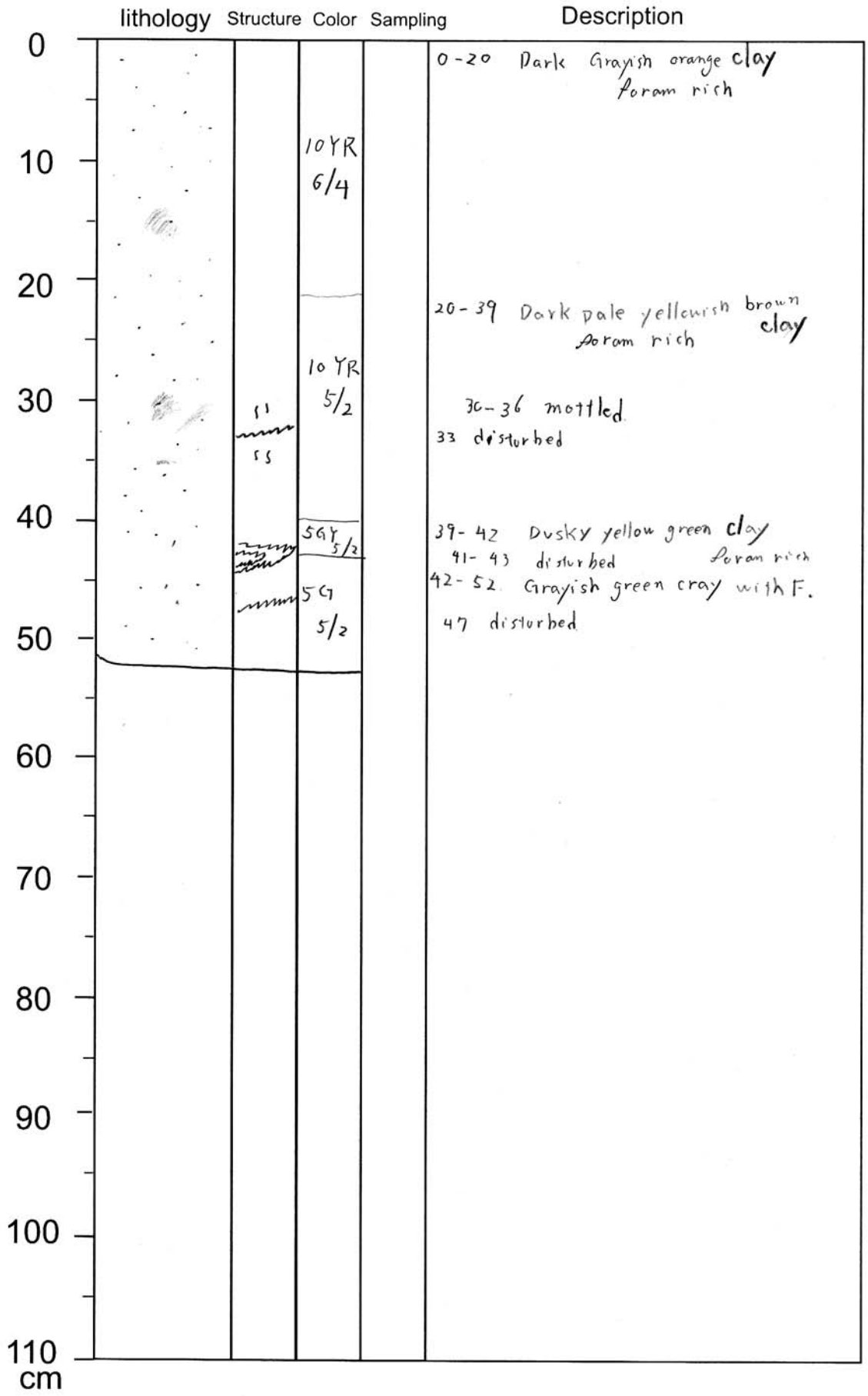
total length _____ section length 98.5

KR05-15

CORE: pc2 pilot

Date: 11/2 2005

by: Suganuma



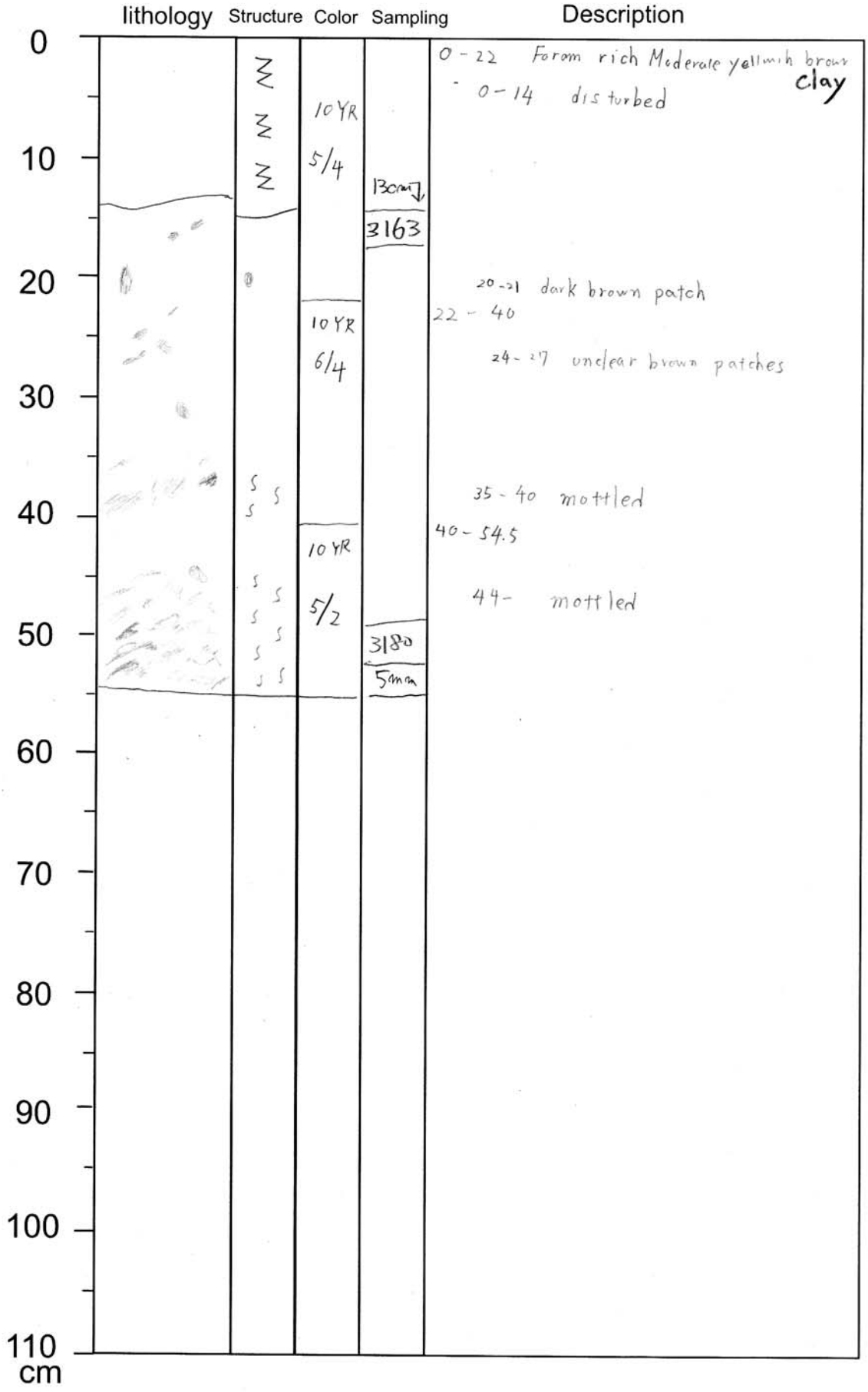
total length _____ section length 52

KR05-15

CORE: PC 3 sec. 2

Date: 11/4 2005

by: Sugawuma.



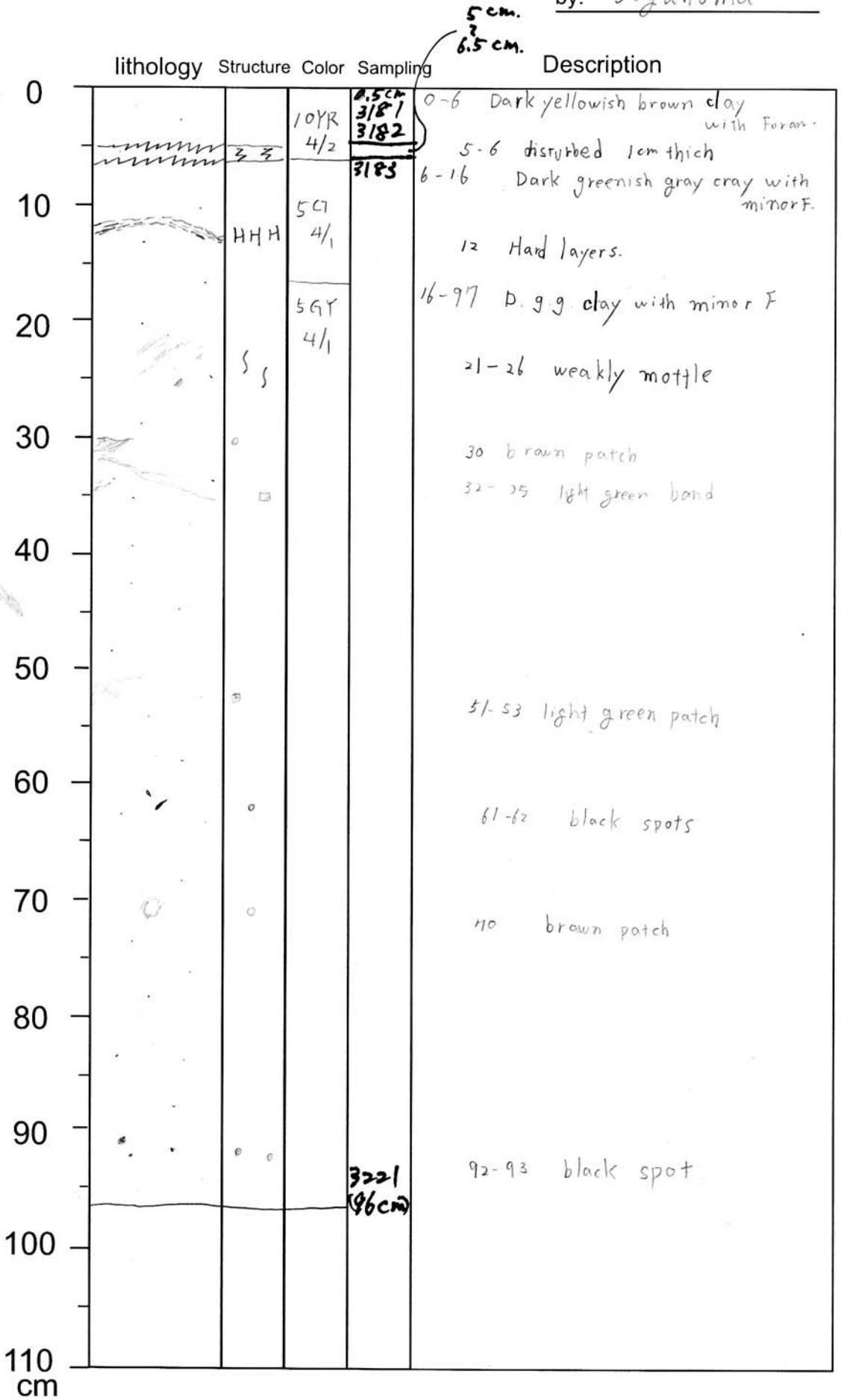
total length _____ section length 54.5

KR05-15

CORE: PC3 sec. 3

Date: 11/4 2003

by: Suganuma



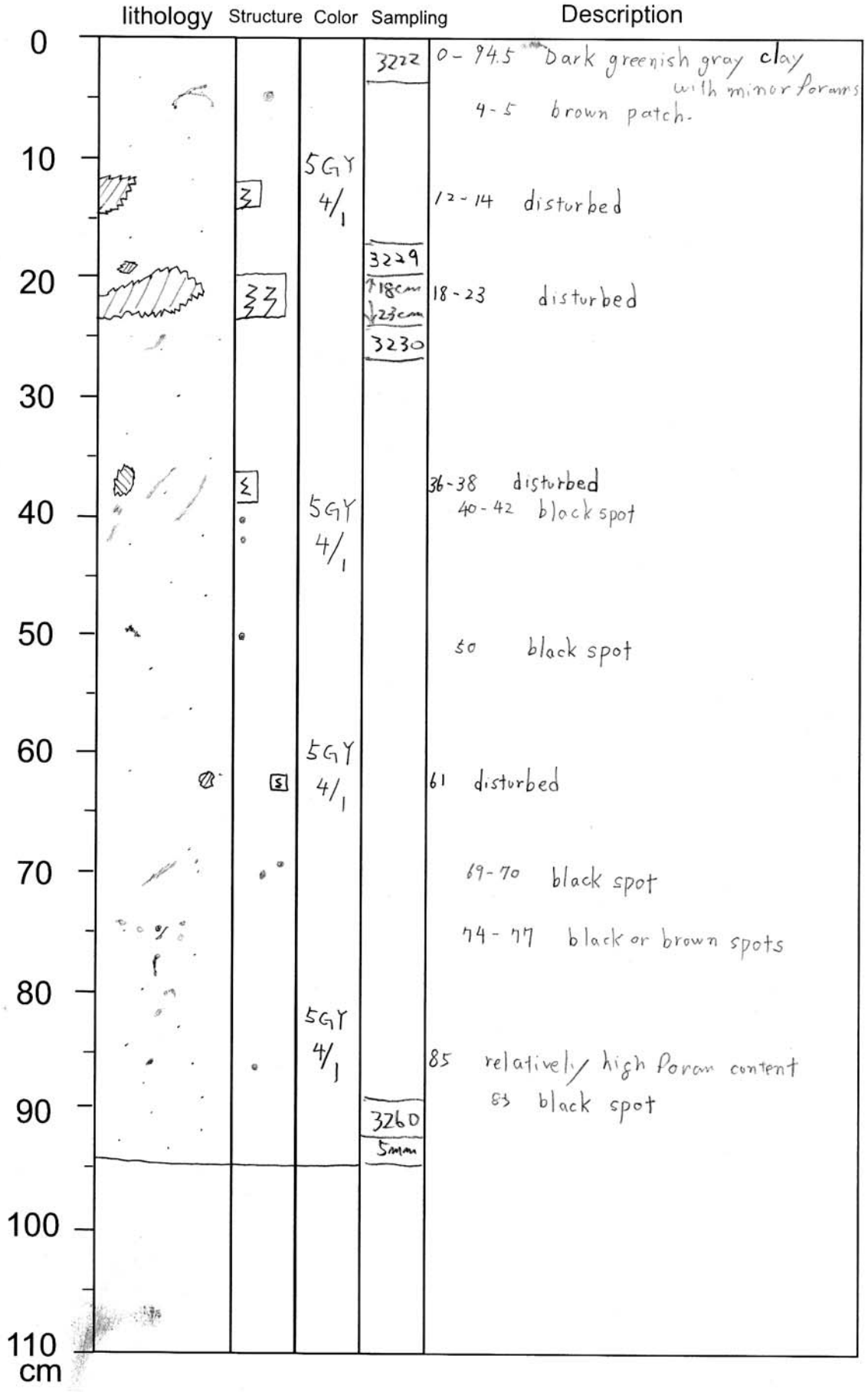
total length _____ section length 97

KR05-15

CORE: pc3 sec.4

Date: 11/4 2005

by: Suganum.



total length

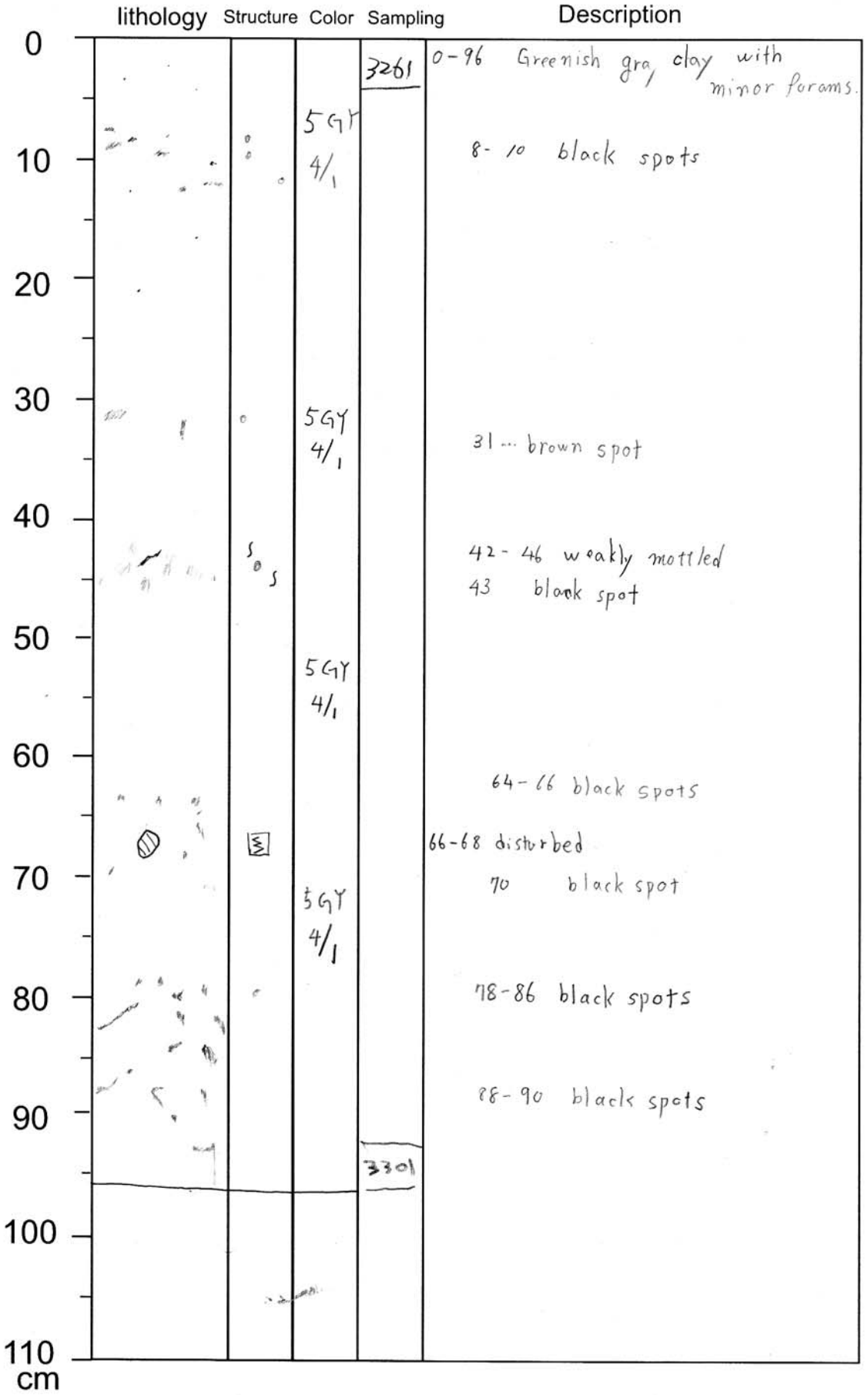
section length 94.5

KR05-15

CORE: pc3 sec. 5

Date: 11/4 2005

by: Suganuma



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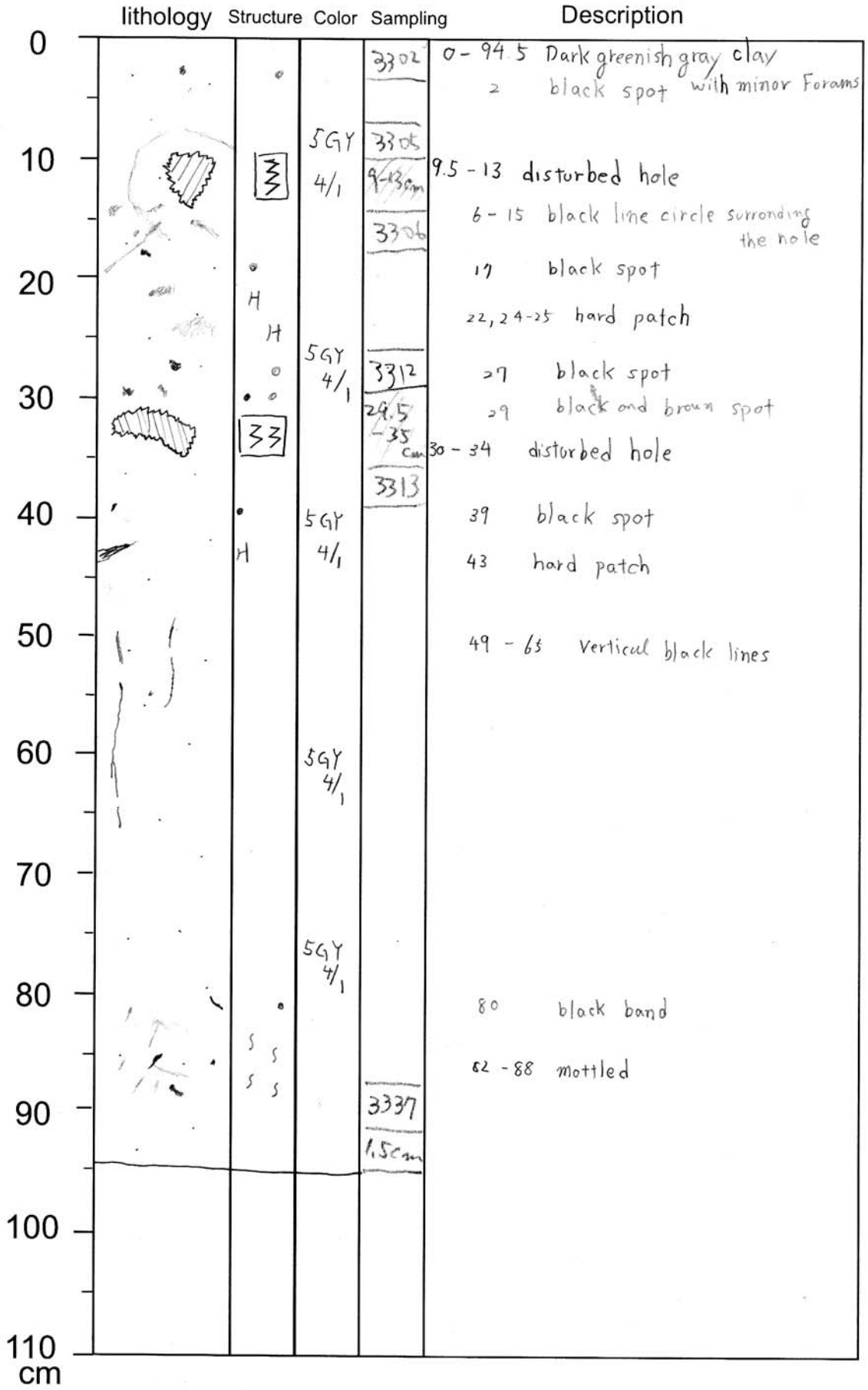
KR05-15

CORE: pc3 sec. 6

Date: 11/4 2005

by: Suganuma



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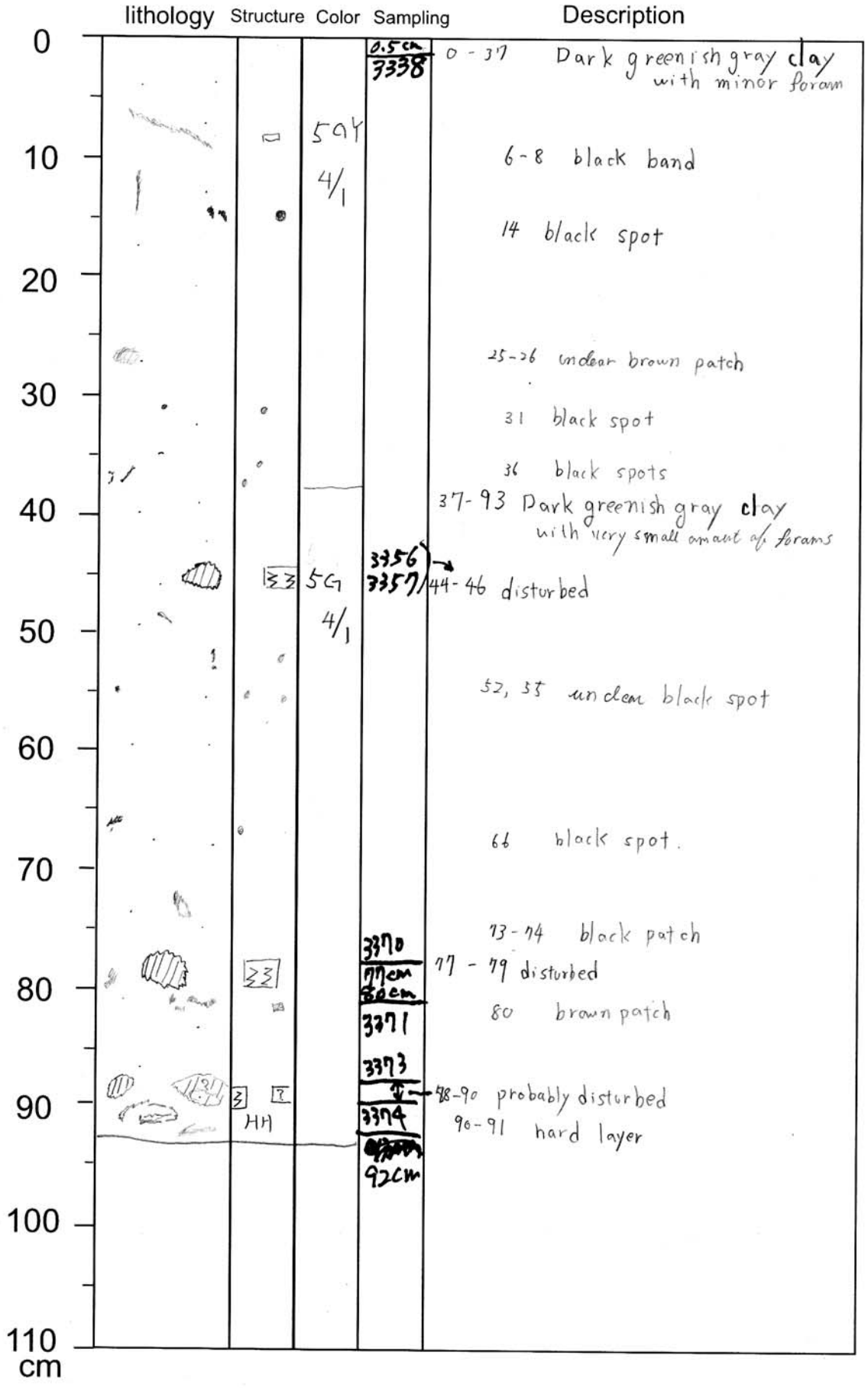
KR05-15

CORE: P c 3 sec 7.

Date: 11/4 2005

by: Suganuma



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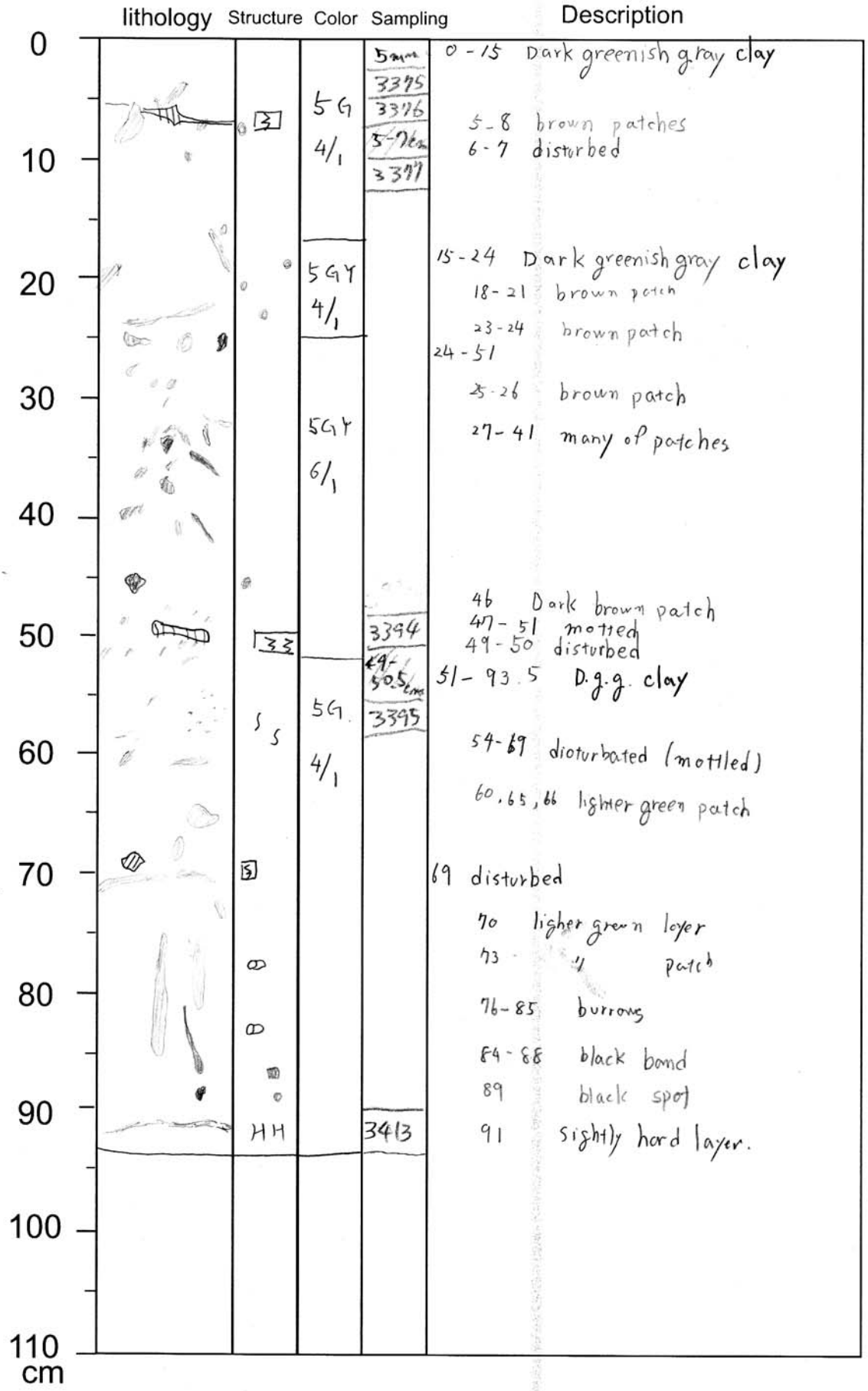
KR05-15

CORE: PC3. sec 8

Date: 11/4 2005

by: Suganuma



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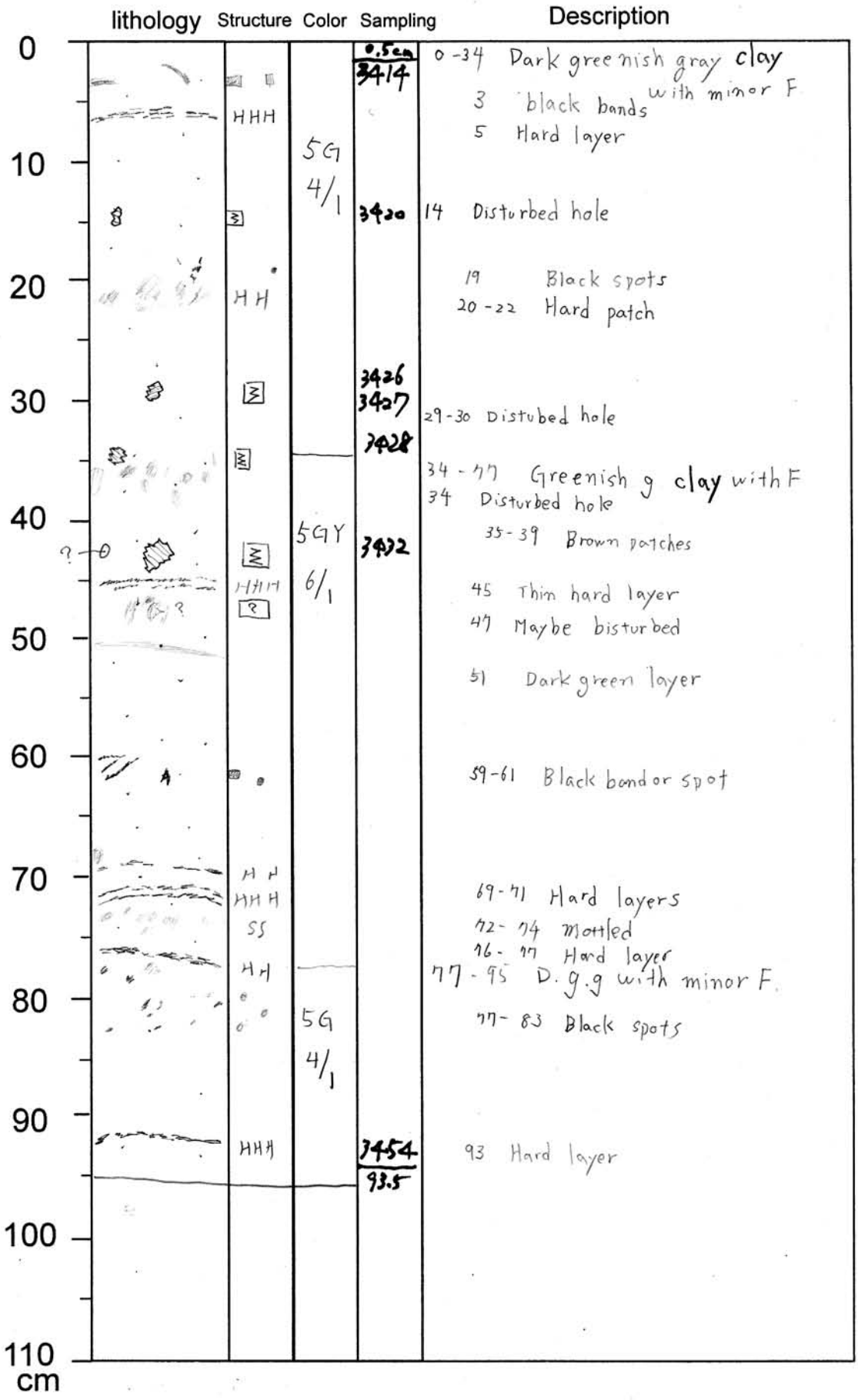
MR05-03

CORE: PC3 Sec. 9

Date: 11/4 2005

by: Suganuma



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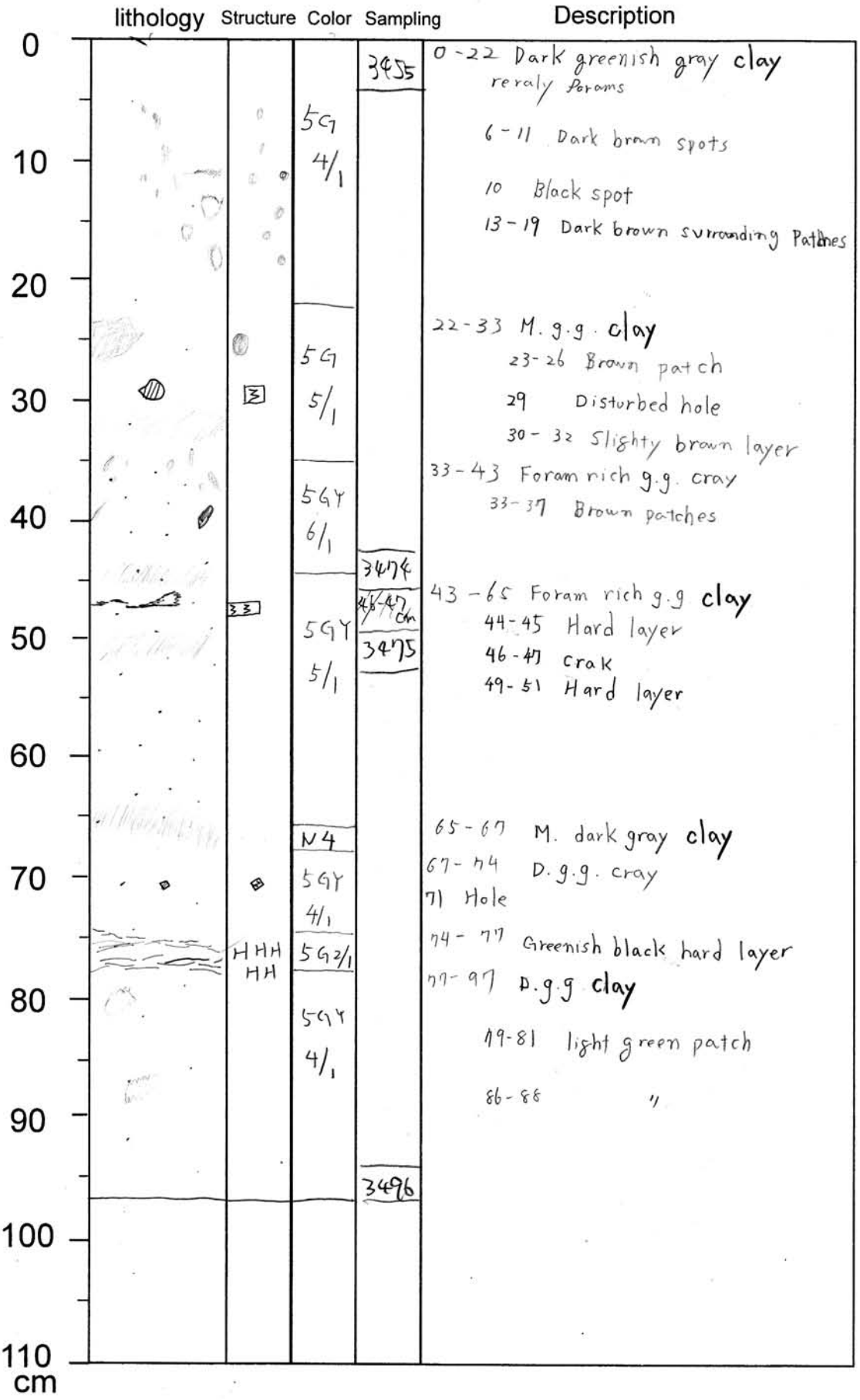
MR05-03

CORE: PC3 sec. 10

Date: 11/4 2005

by: Suganuma



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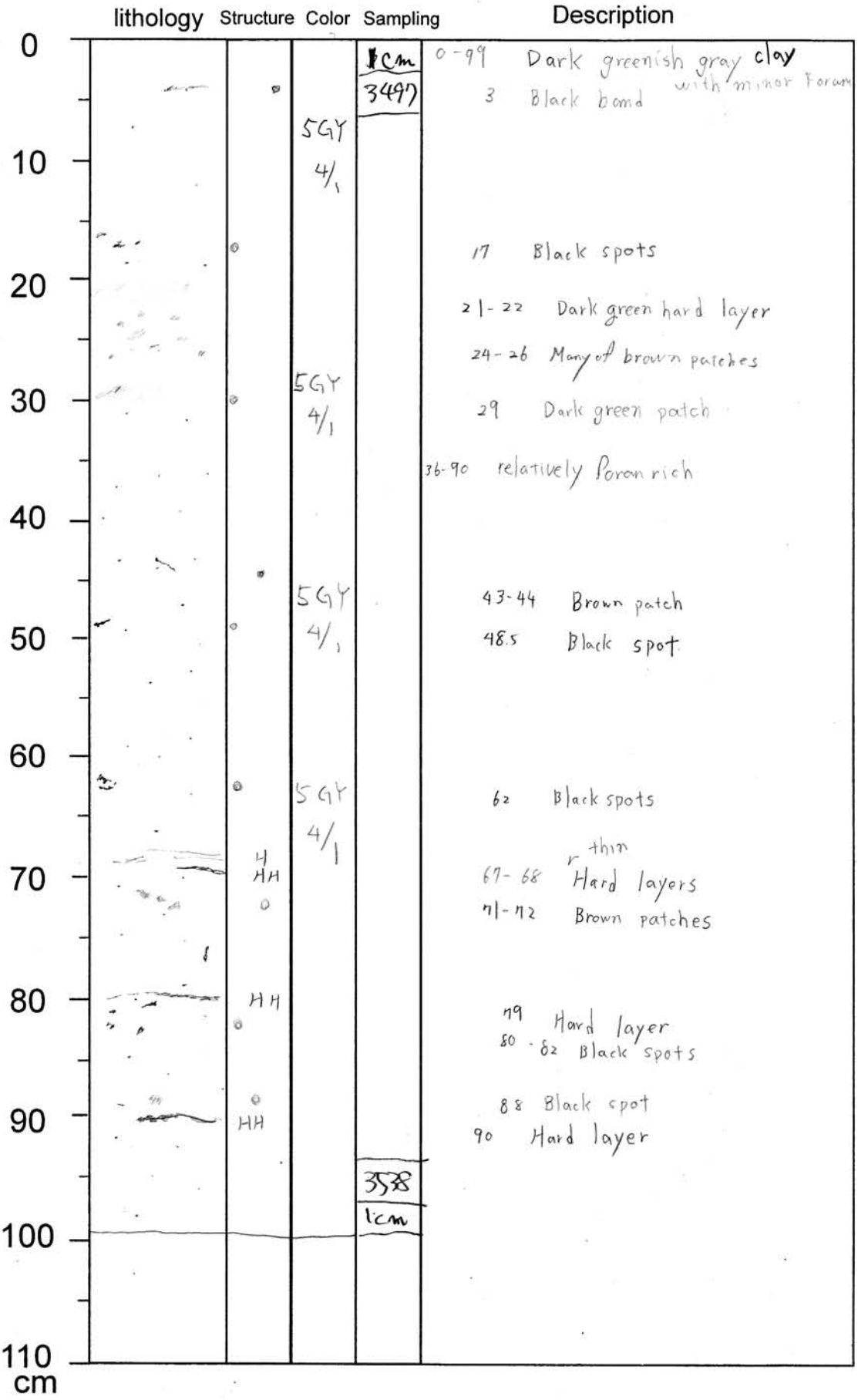
MR05-03

CORE: Pc 3 sec. 11

Date: 11/5 2005

by: Suganuma



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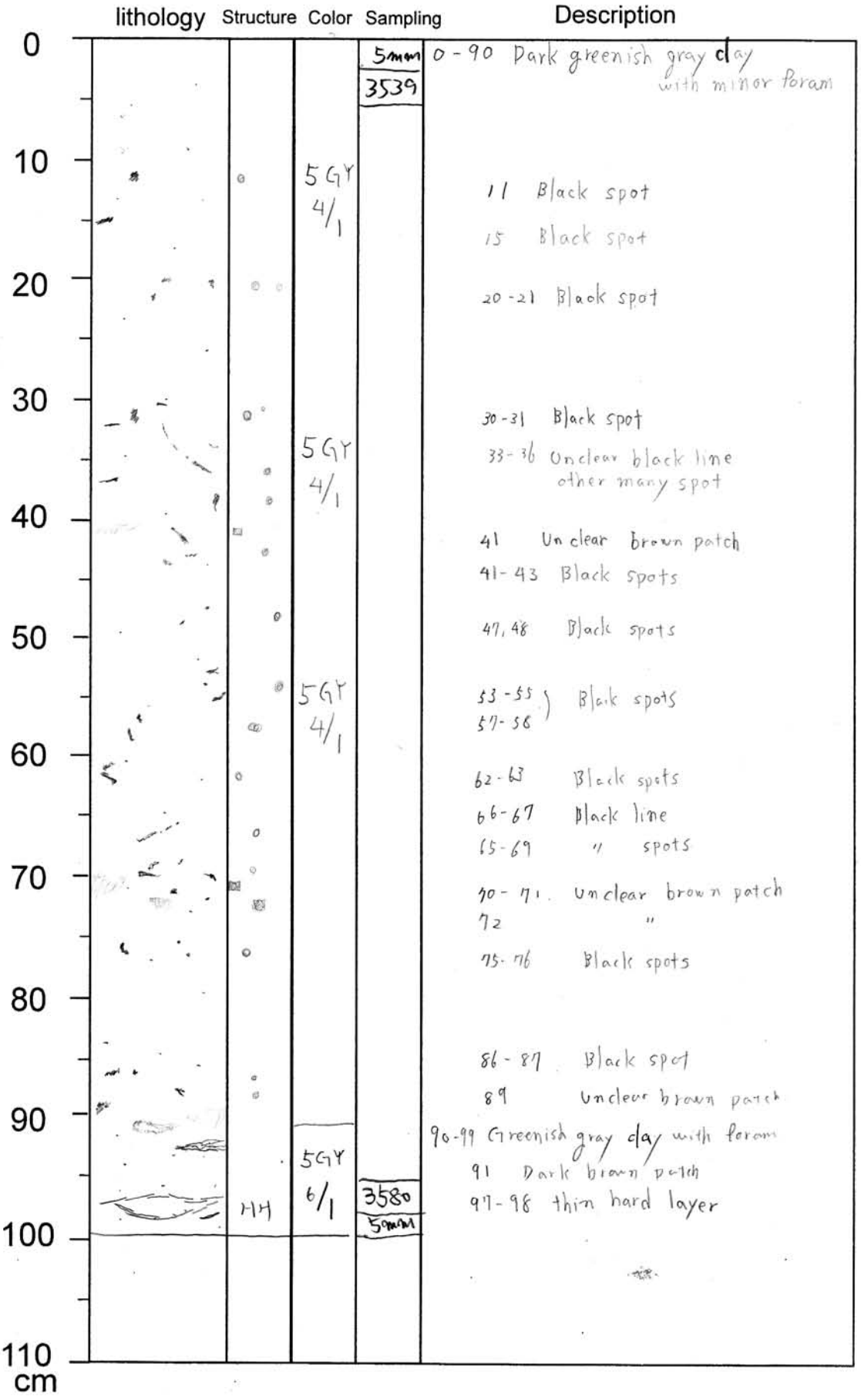
MR05-03

CORE: PC3 sec 12

Date: 2005 11/5

by: Suganuma



total length

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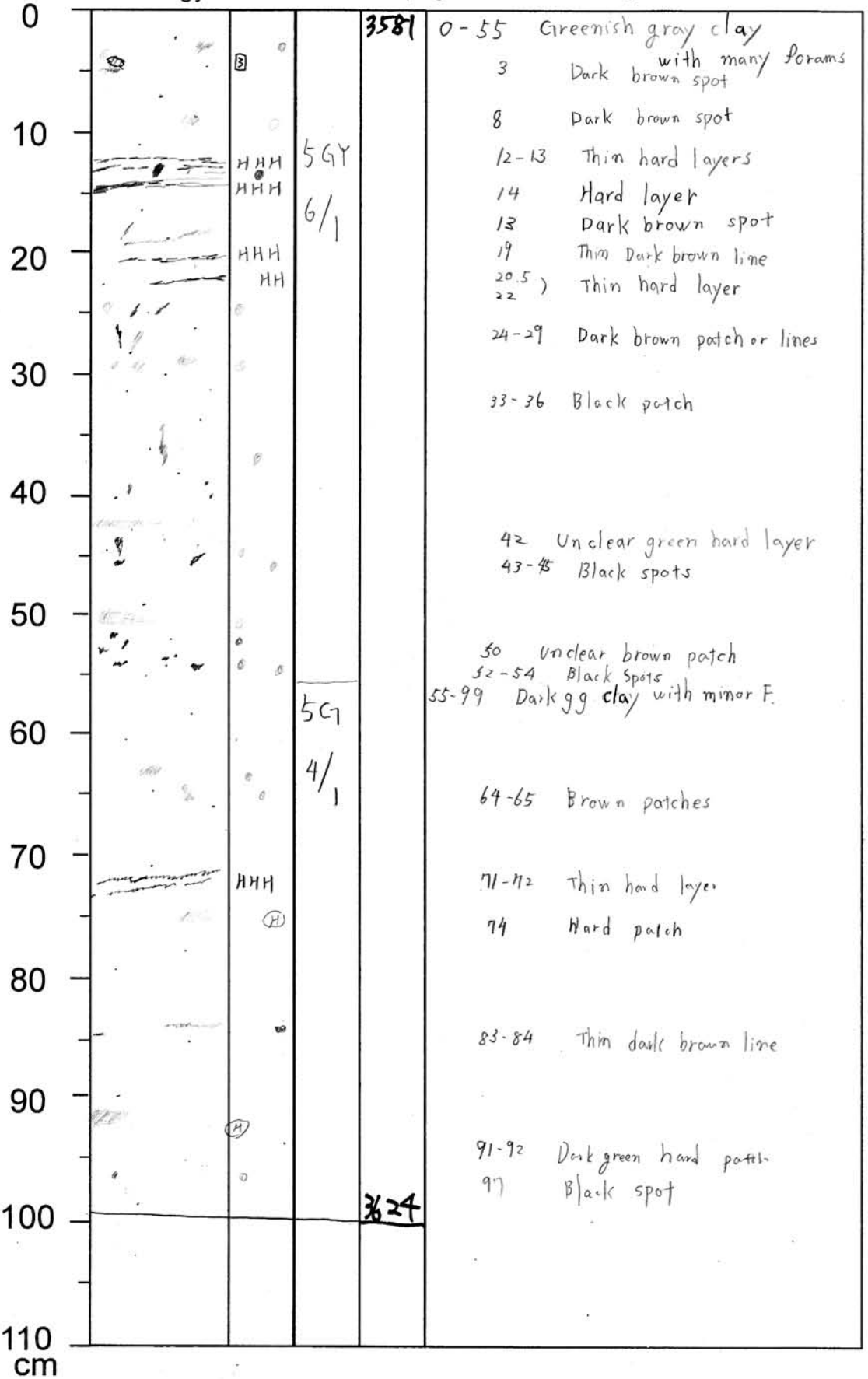
MR05-03

CORE: pc 3 sec.13

Date: 11/5 2005

by: Suganuma



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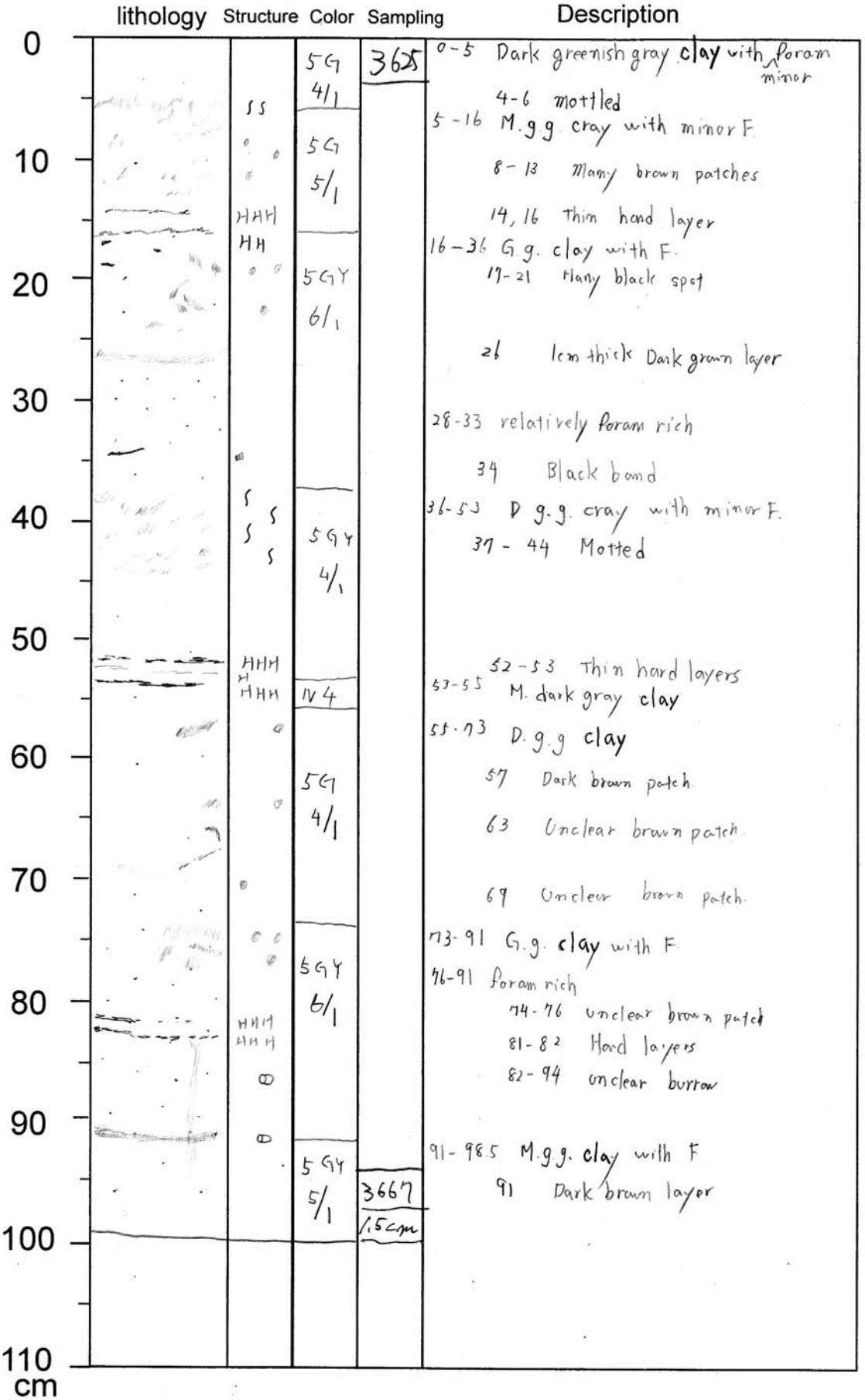
section length 99

MR05-03

CORE: Pc 3 sec 14

Date: 11/5 2005

by: Suganuma



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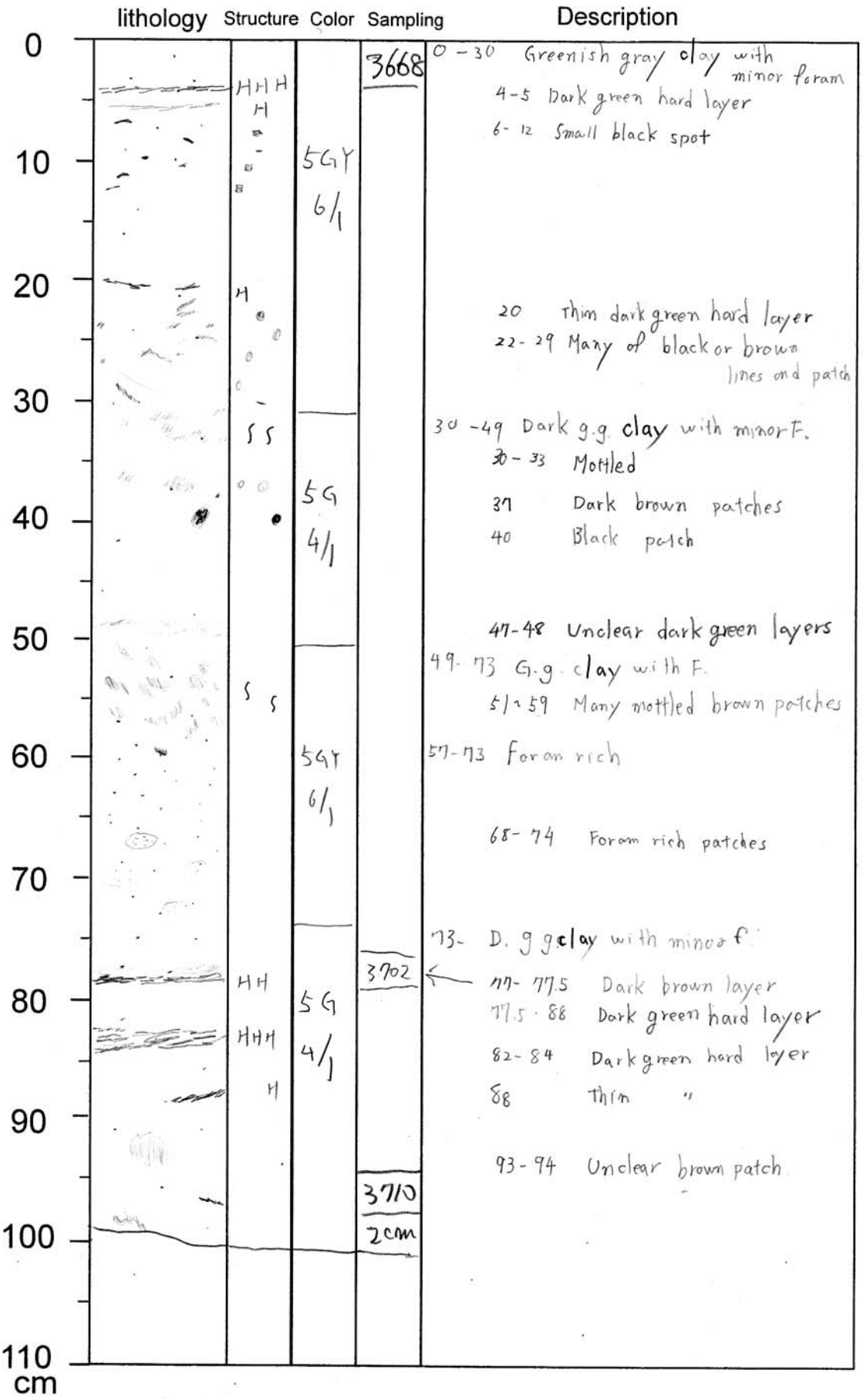
MR05-03

CORE: pc3 sec. 15

Date: 11/5 2005

by: Suganuma



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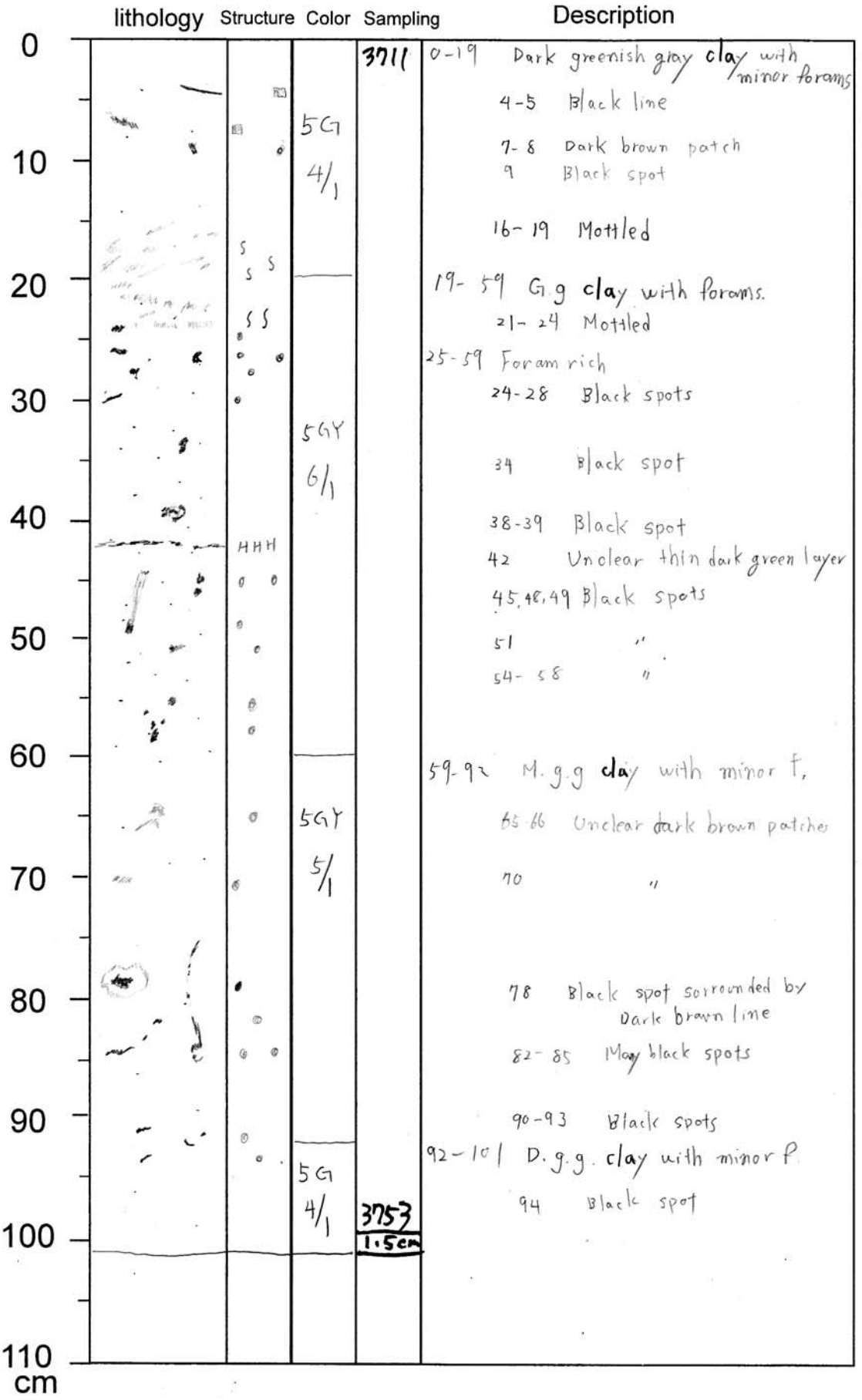
MR05-03

CORE: PC3 sec. 1&2

Date: 11/5 2005

by: Suganuma



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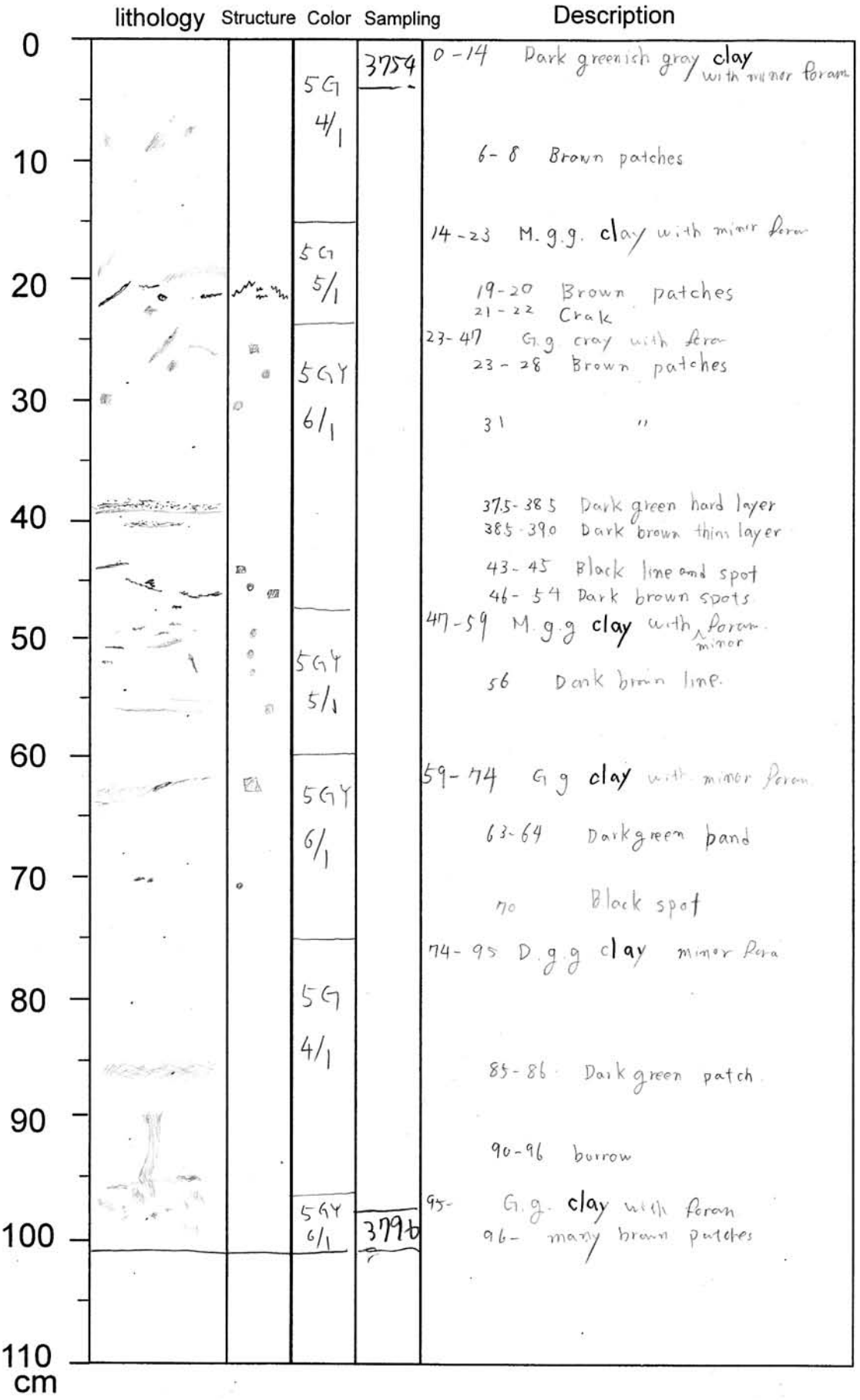
MR05-03

CORE: Pc 3 17

Date: 11/4 2005

by: Suganuma



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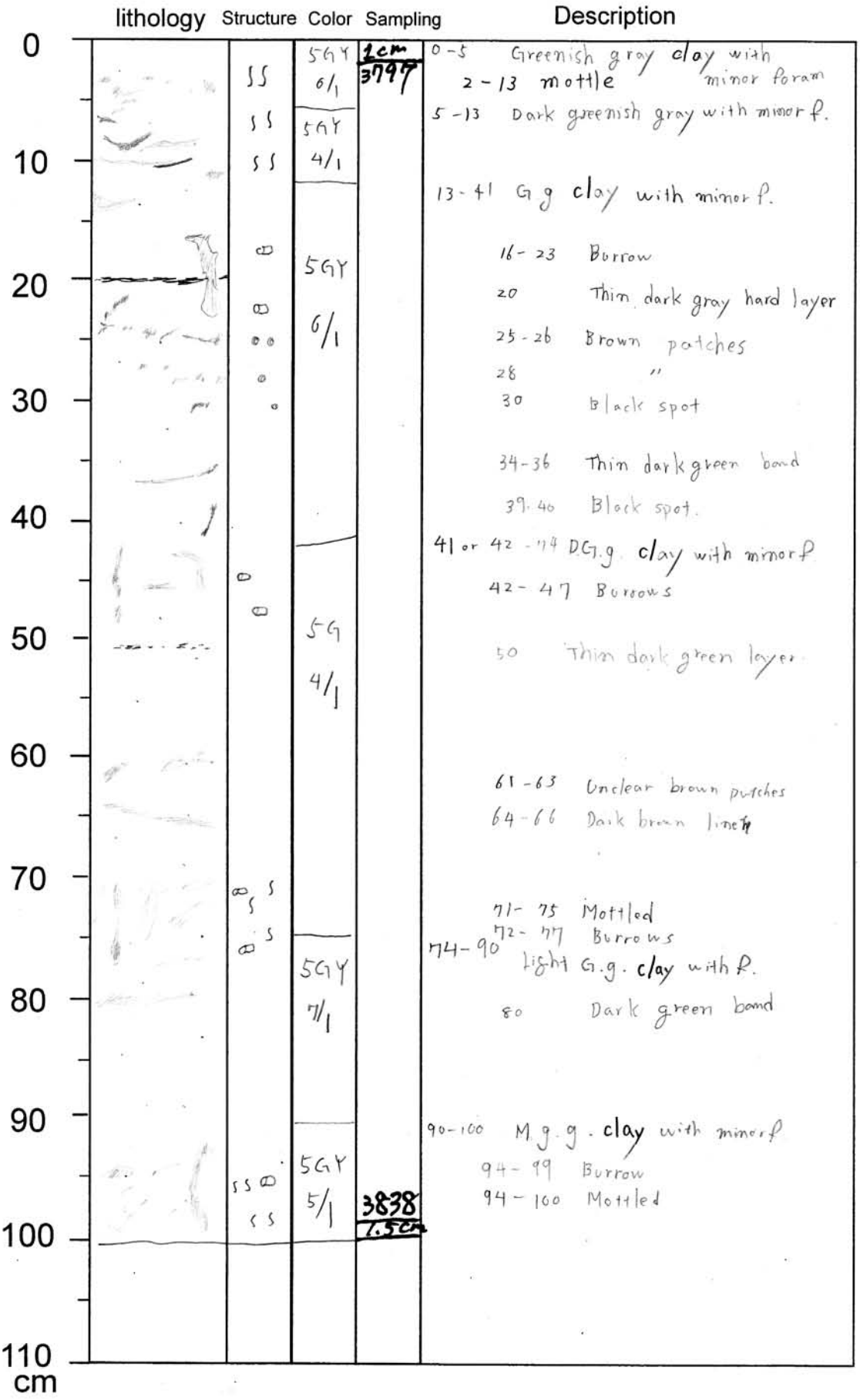
section length 101

MR05-03

CORE: Pc 3 sec 18

Date: 11/5 2005

by: Suganuma



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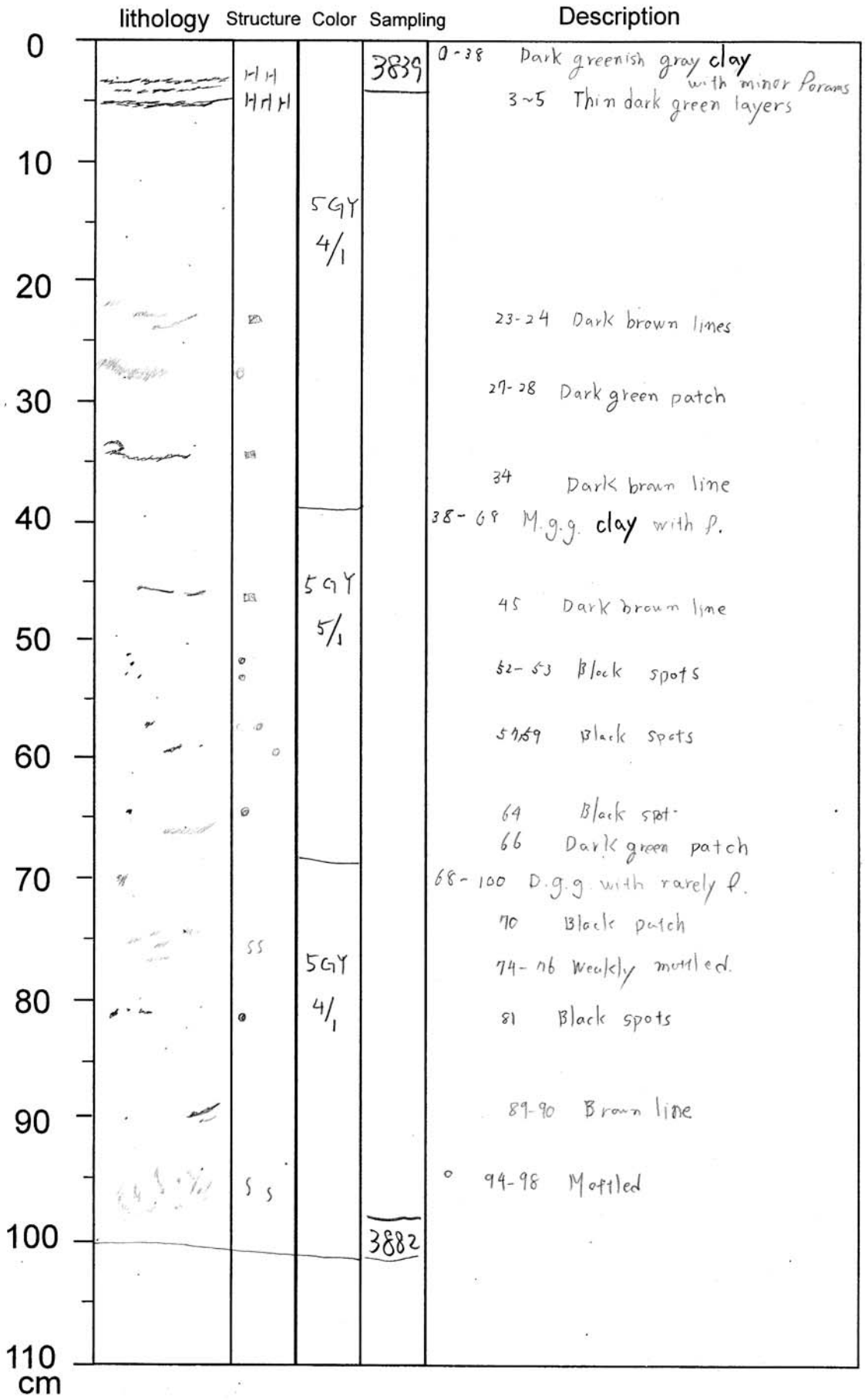
MR05-03

CORE: PC3 sec. 19

Date: 11/4 2005

by: Suganuma



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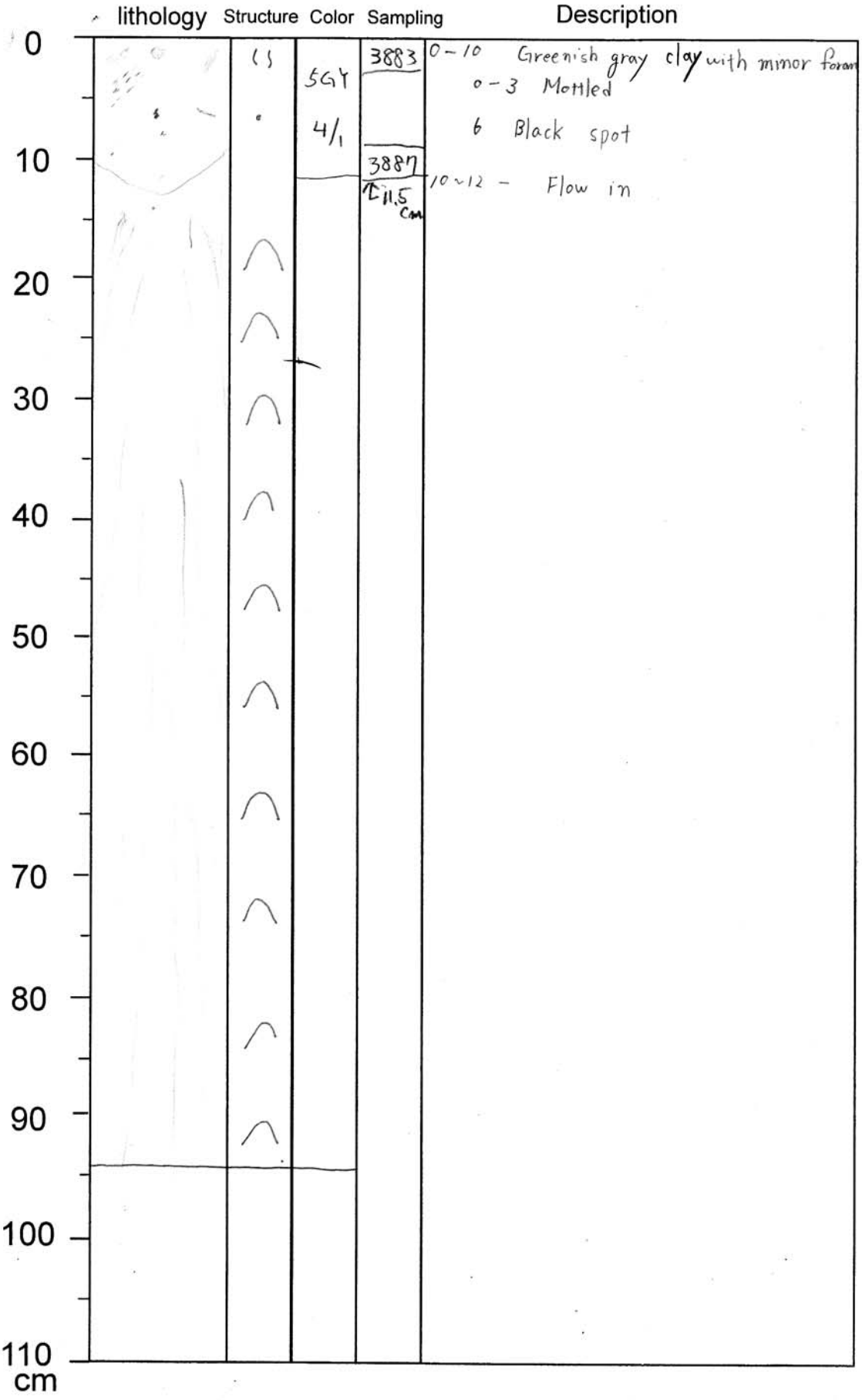
MR05-03

CORE: Pc3 sec 20

Date: 11/5 2005

by: Suganuma



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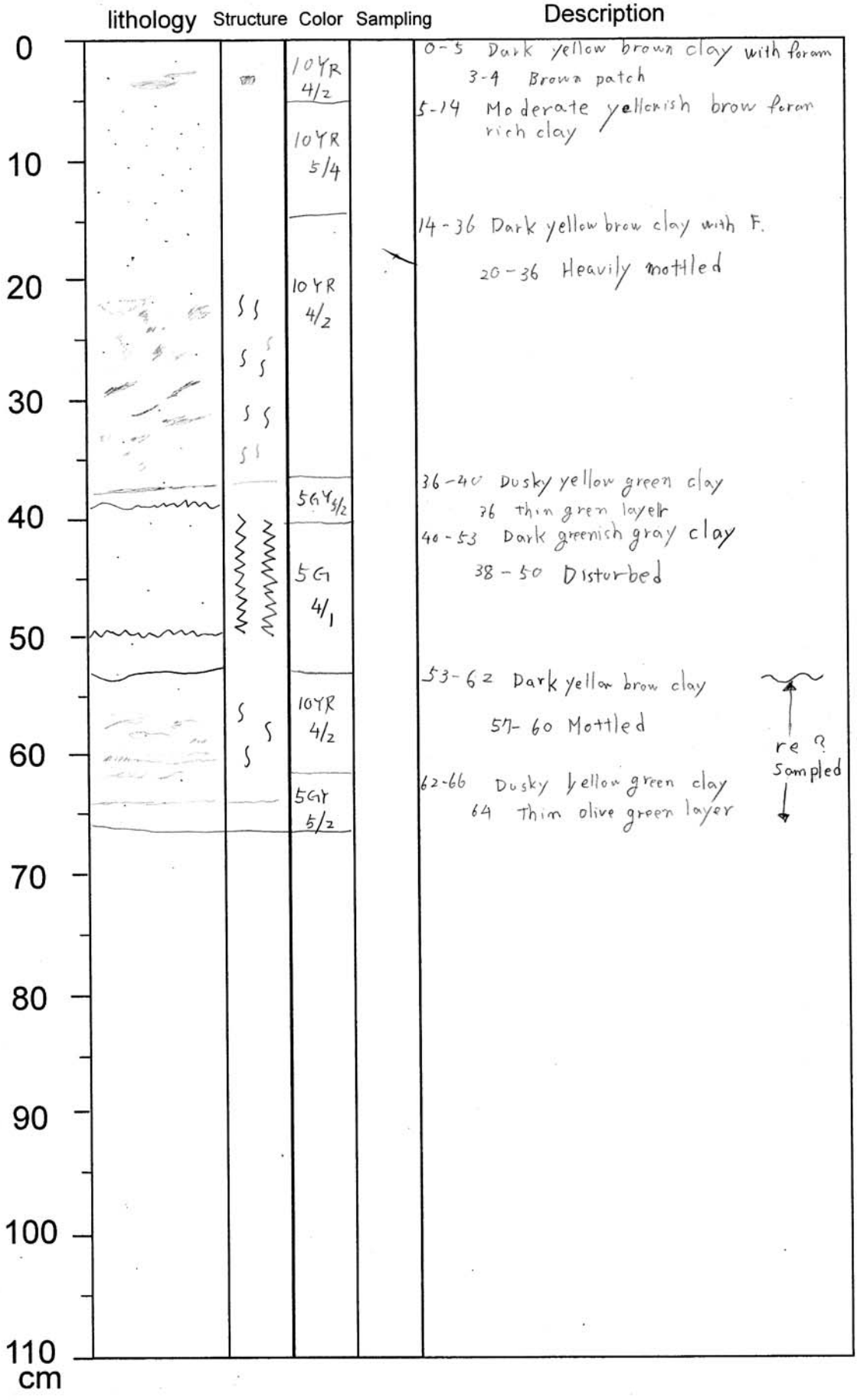
MR05-03

CORE: PL-03

Date: 11/7 2005

by: Suganuma



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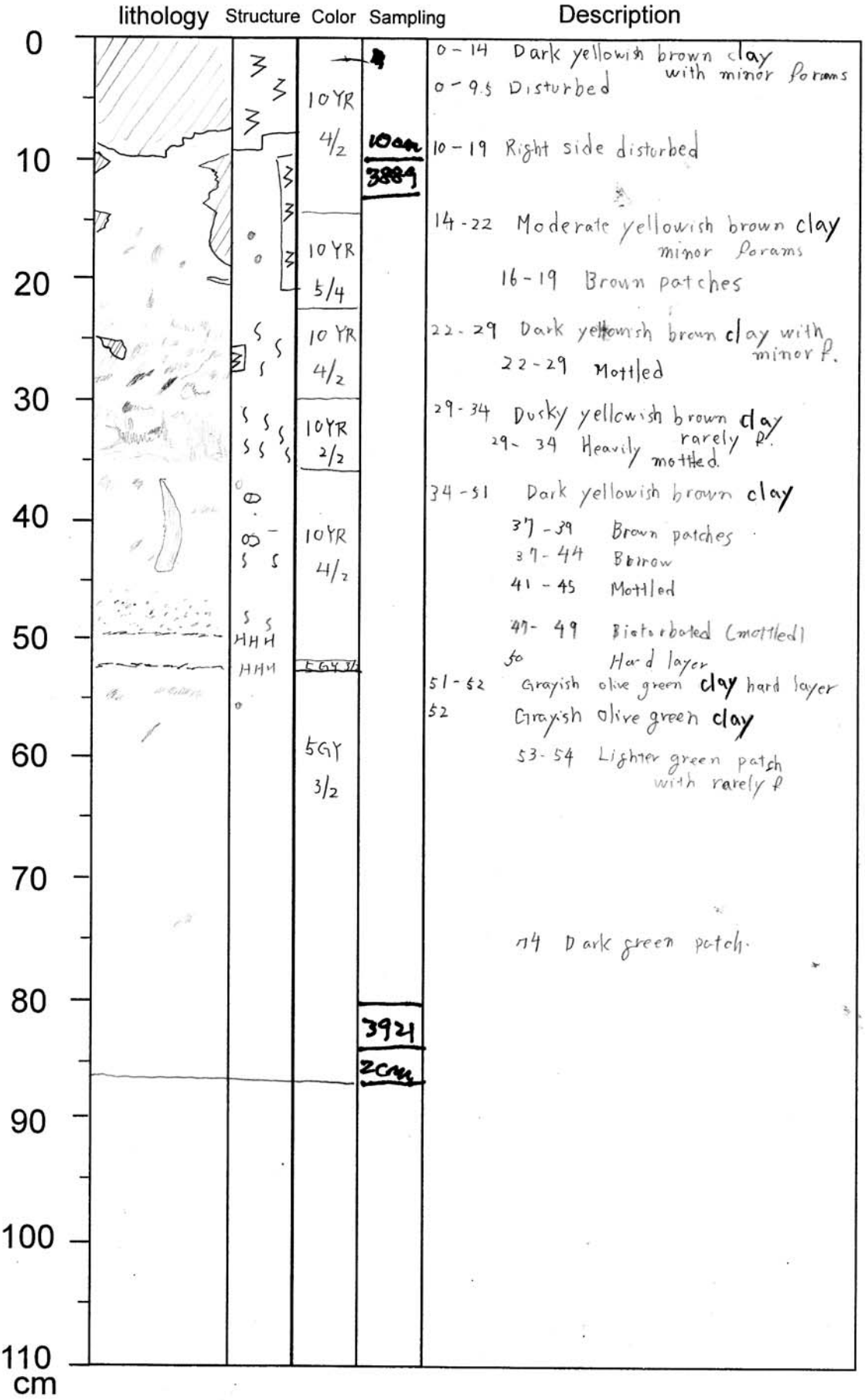
MR05-03

CORE: PC 4 sec. 1

Date: 11/5 2005

by: Suganuma



total length

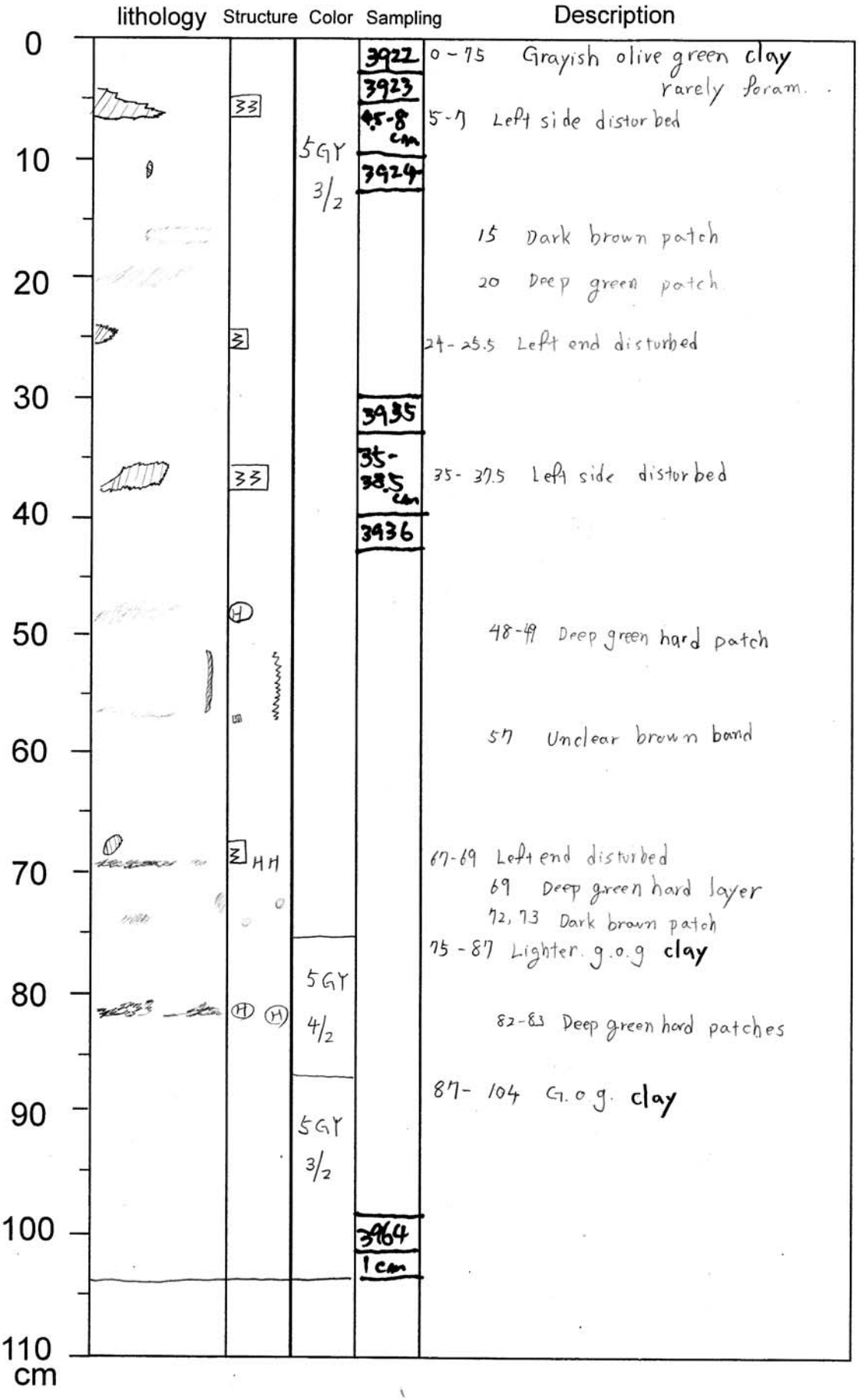
section length 86.5

MR05-03

CORE: P C 4 sec. 2

Date: 11/4 2005

by: Suganuma



total length

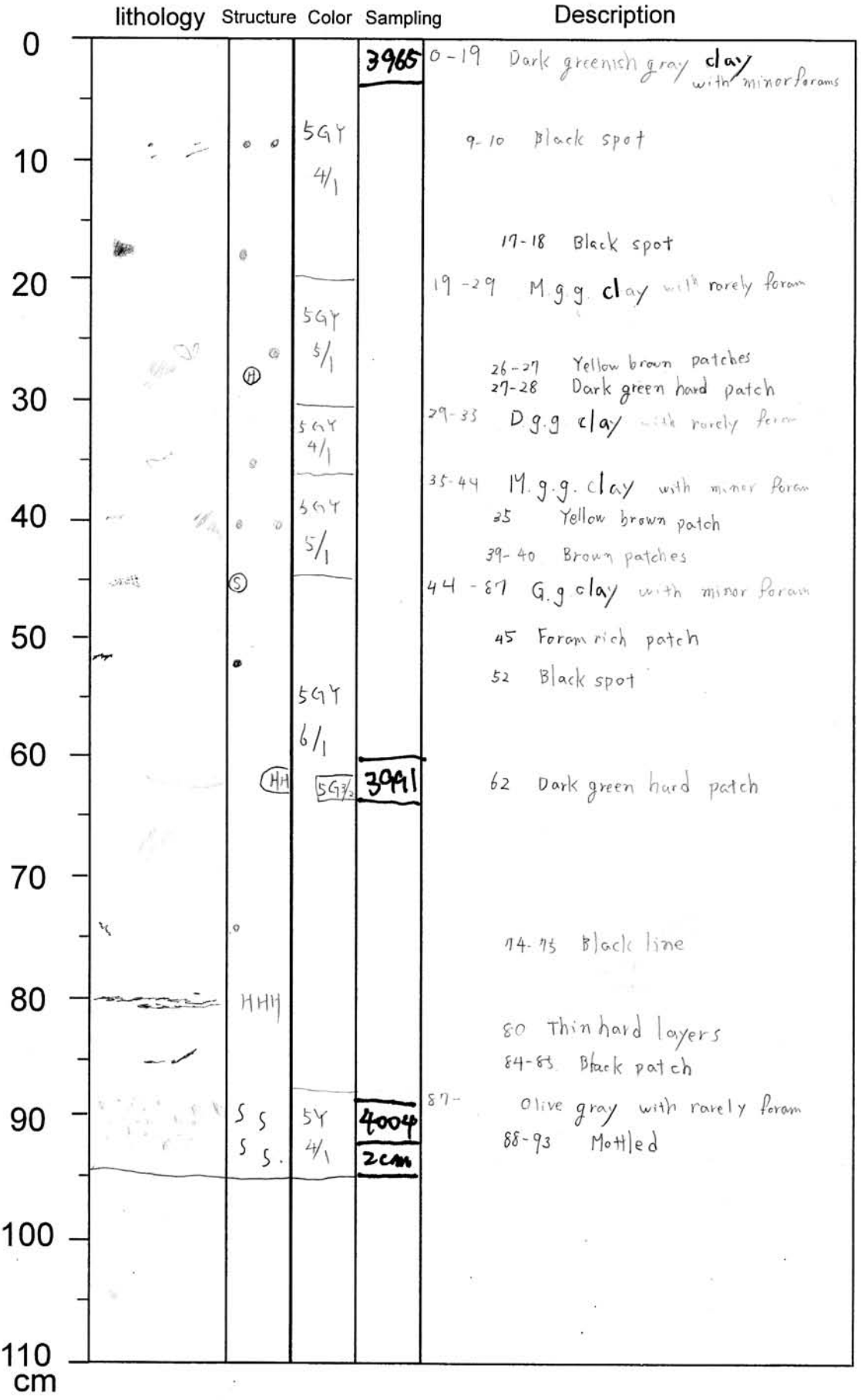
section length 104

MR05-03

CORE: PC 4 sec. 3

Date: 11/6 2005

by: Suganuma



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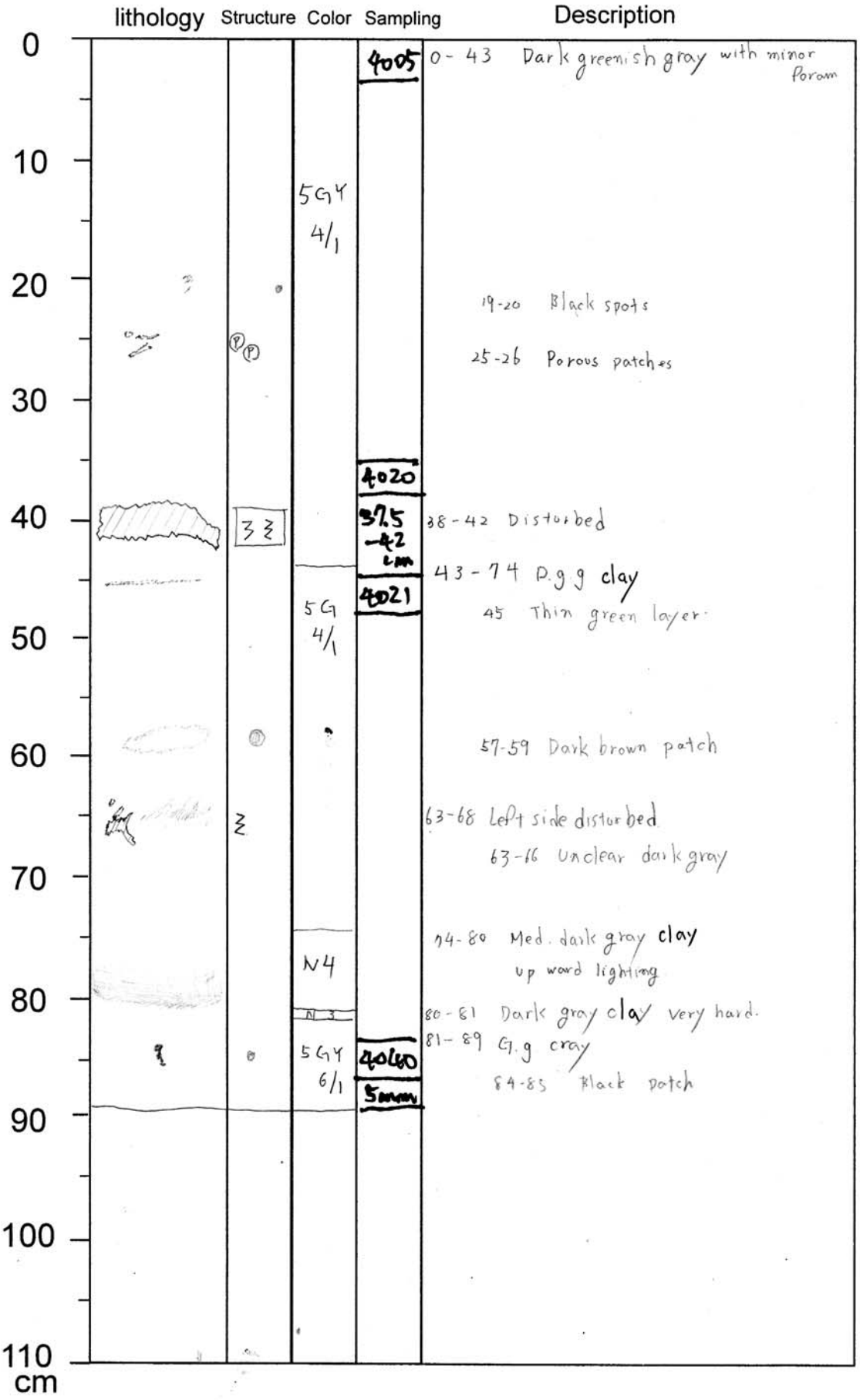
MR05-03

CORE: PC4 sec.4

Date: 11/6 2005

by: Suganuma



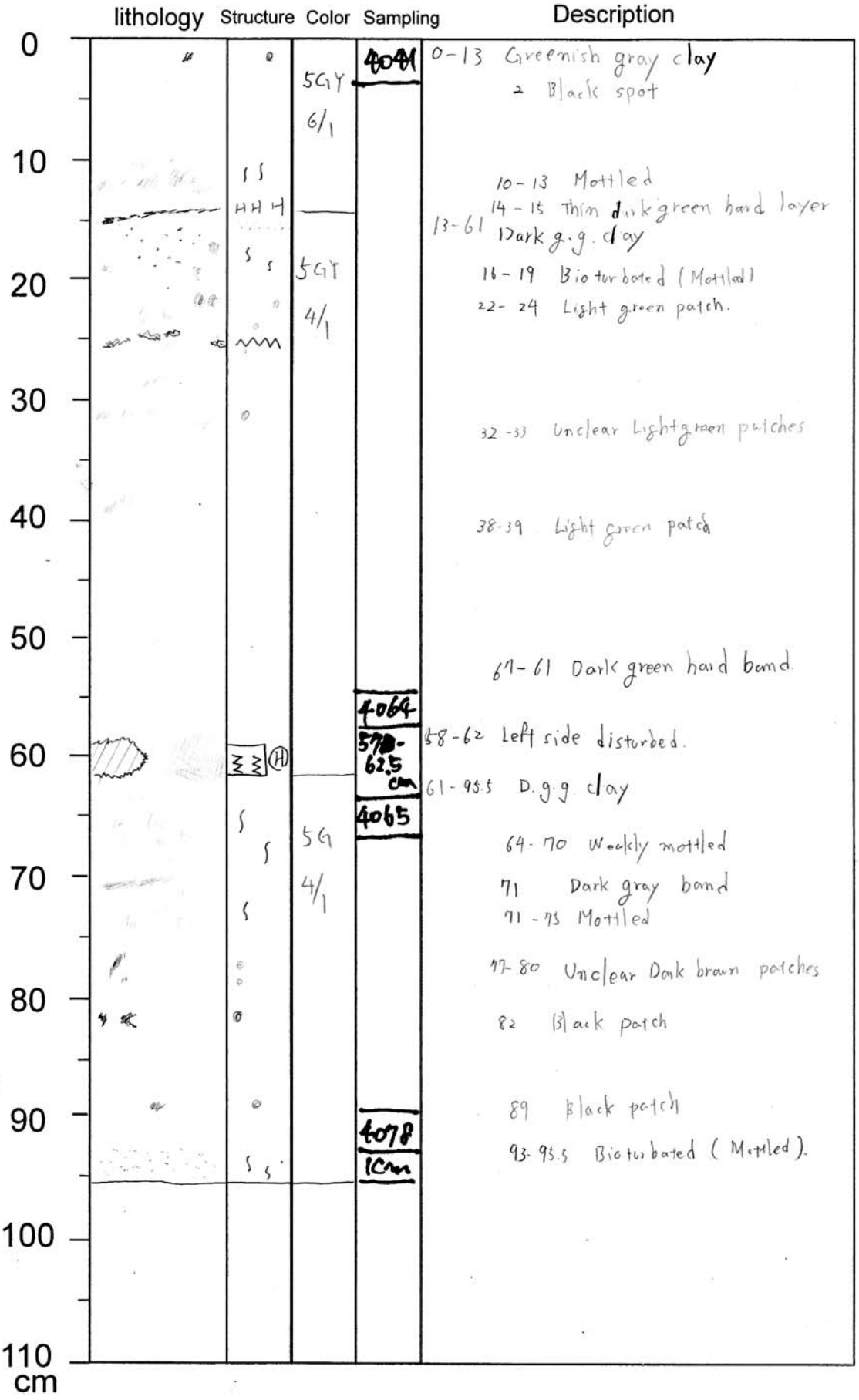
total length _____ section length 89

MR05-03

CORE: PC 4. sec. 5

Date: 11/5 2005

by: Suganuma.



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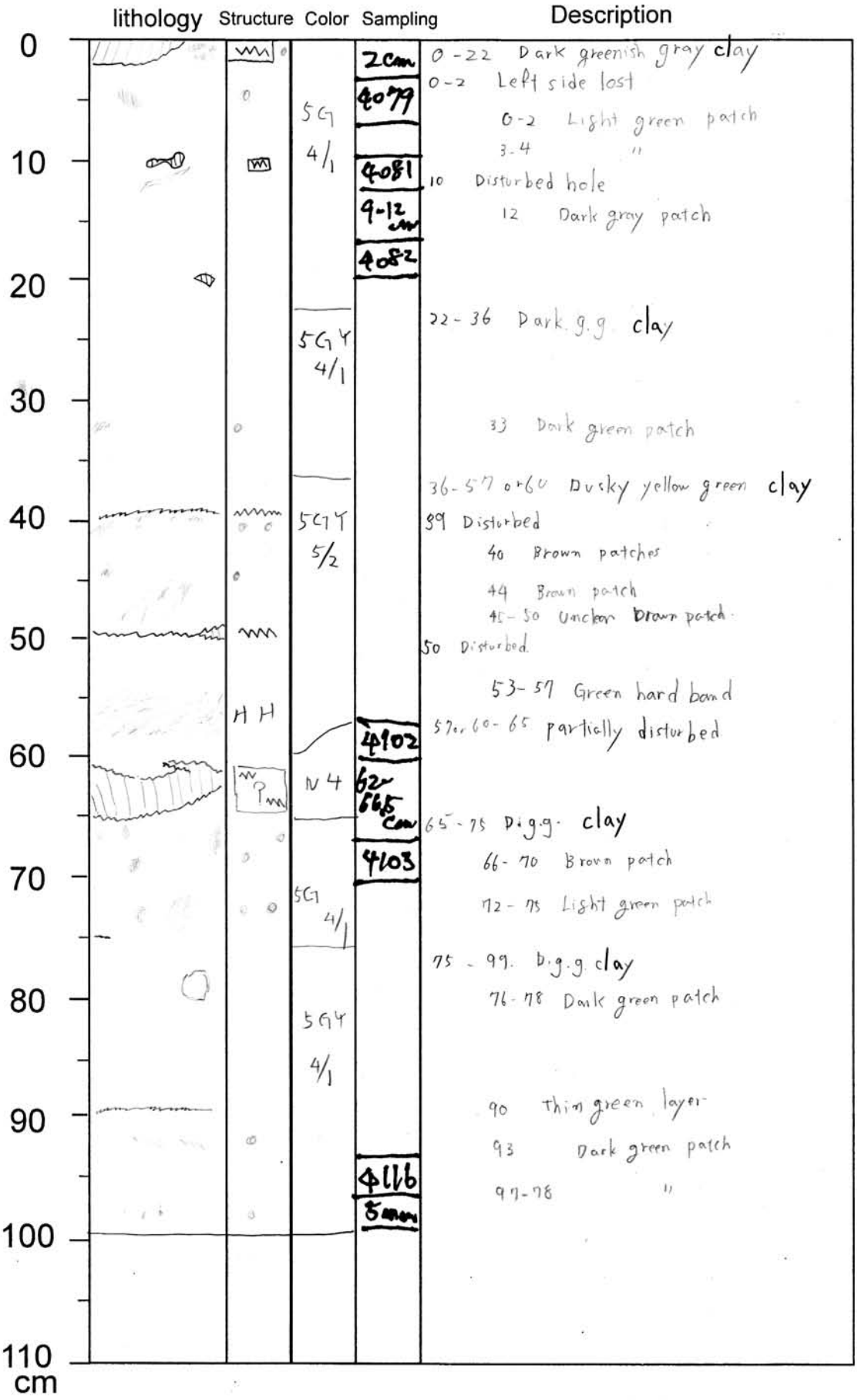
MR05-03

CORE: PC4 sec. 6

Date: 11/6 2005

by: Suganuma



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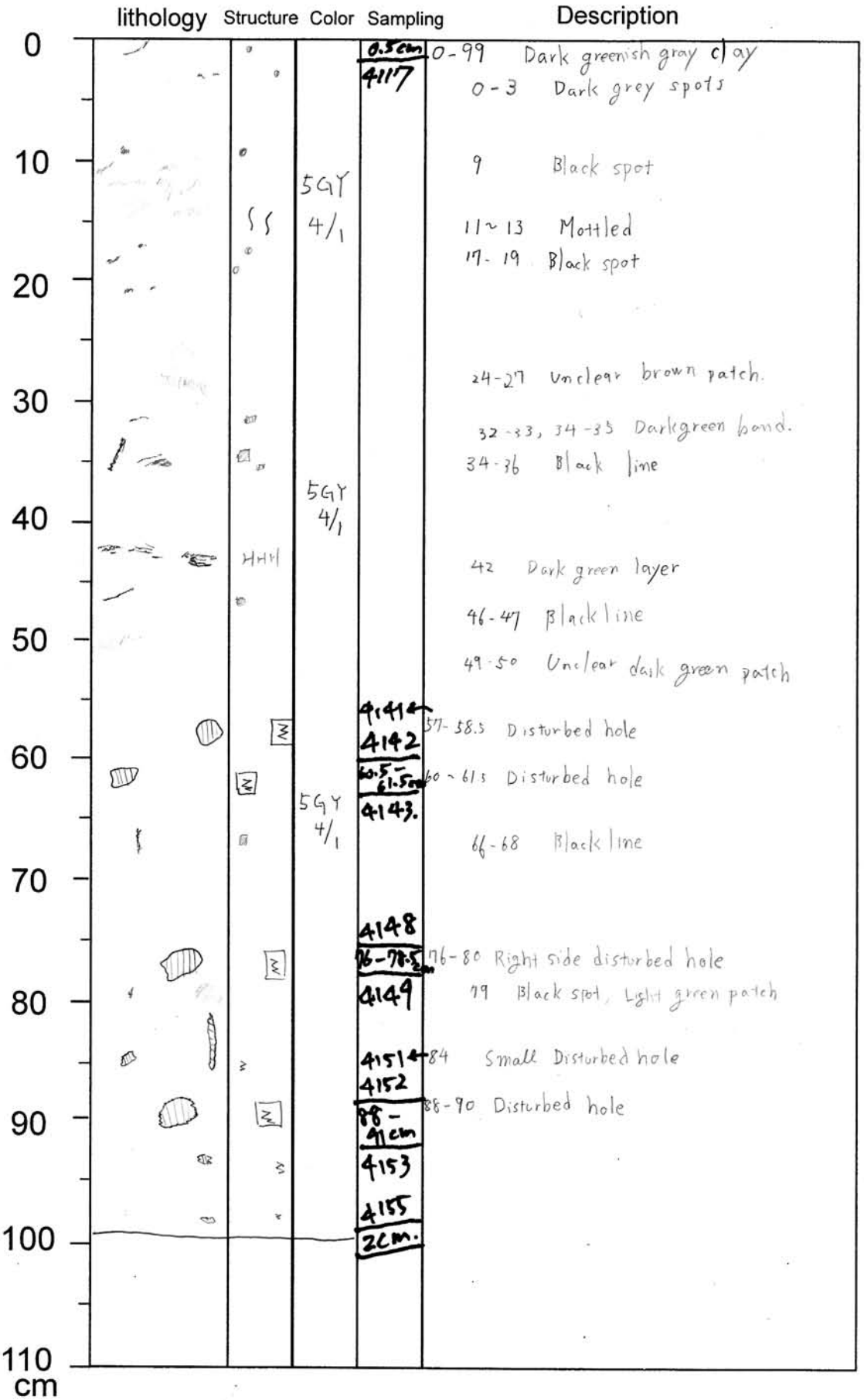
MR05-03

CORE: PC4 sec7

Date: 11/5

by: Suganuma



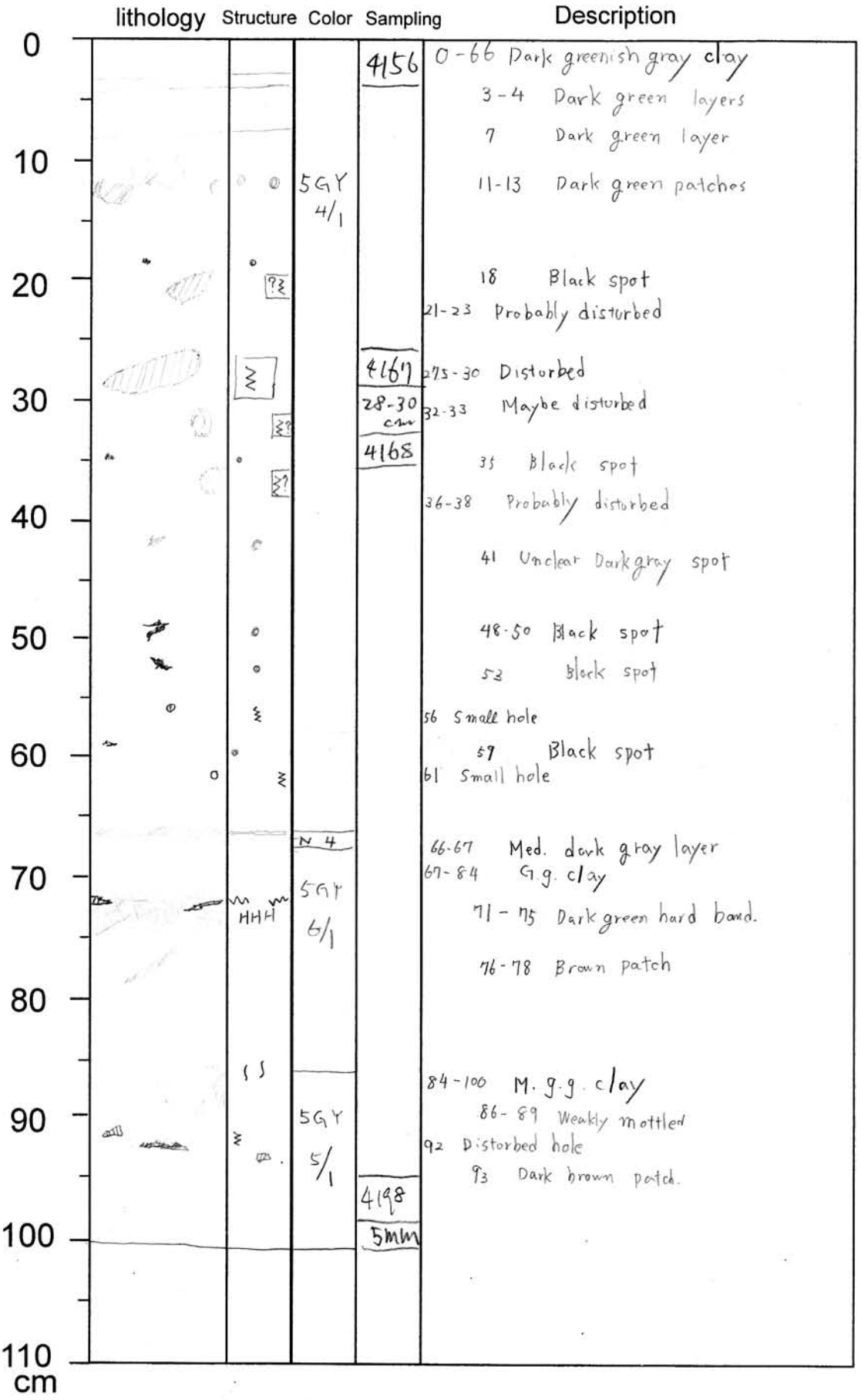
total length _____ section length 99

MR05-03

CORE: PC4 sec. 8

Date: 11/5 2005

by: Suganuma



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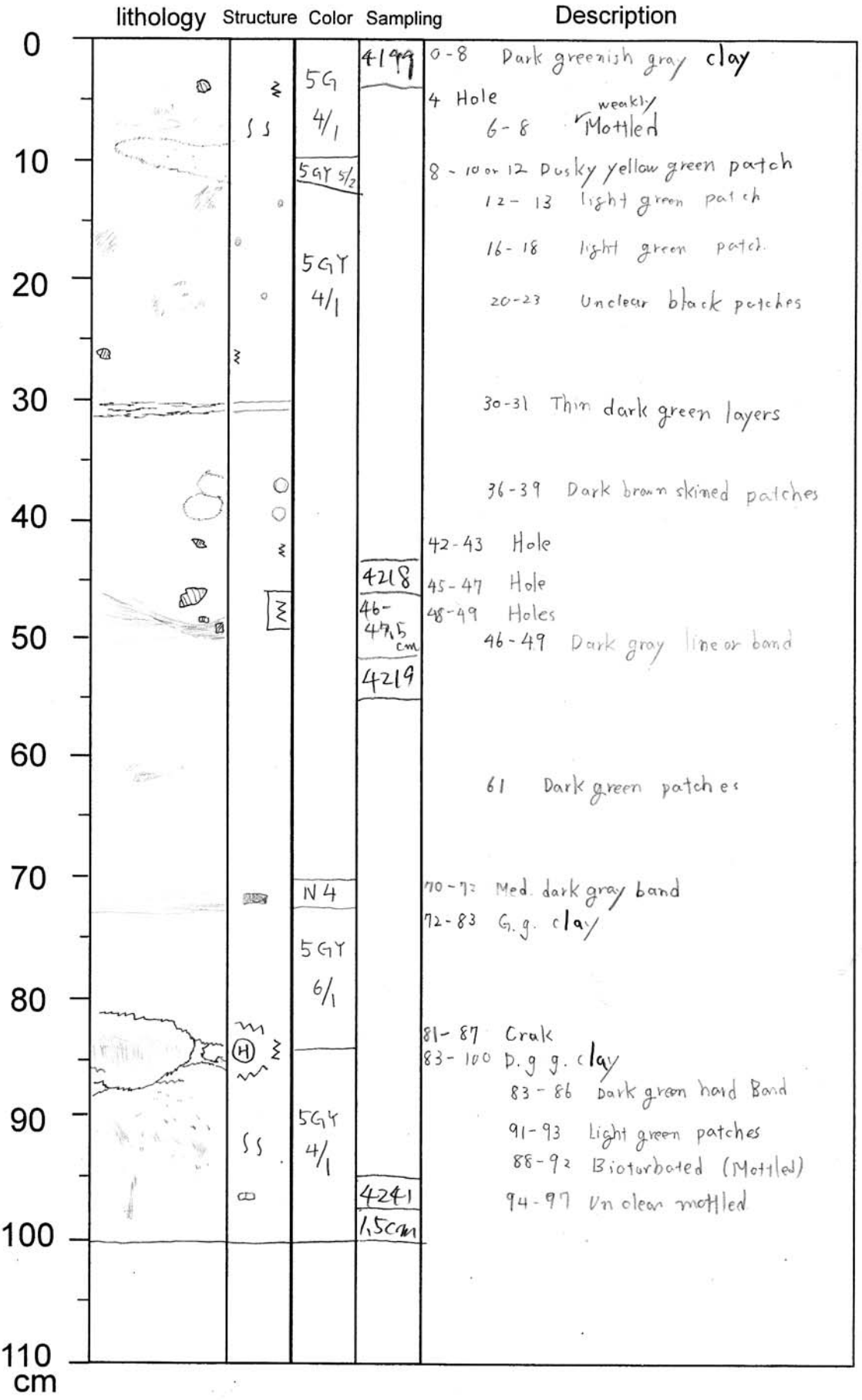
MR05-03

CORE: PC 4 sec 9

Date: 11/6 2005

by: Soganuma



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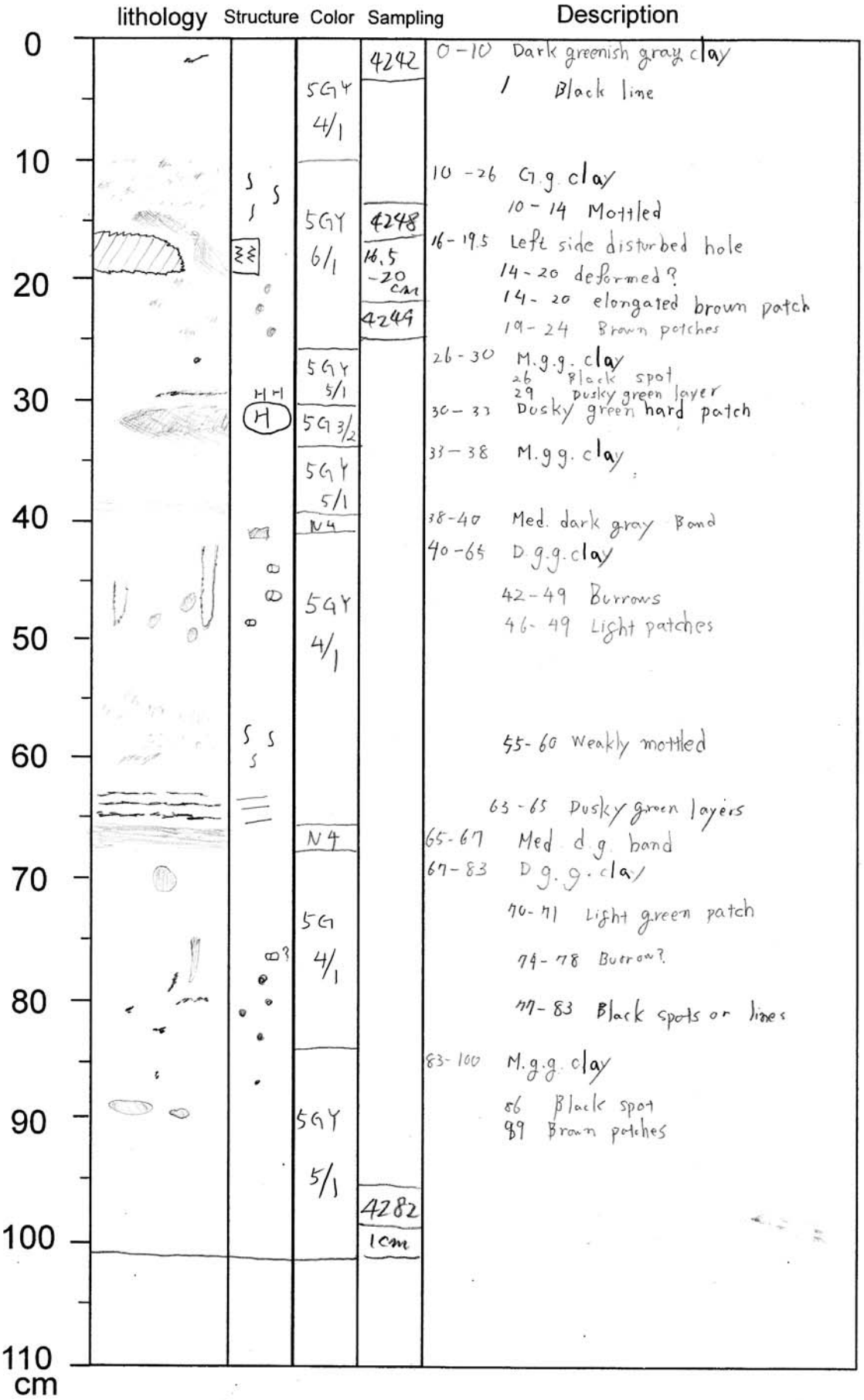
MR05-03

CORE: PC4 Sec 10

Date: 11/5 2005

by: Suganuma



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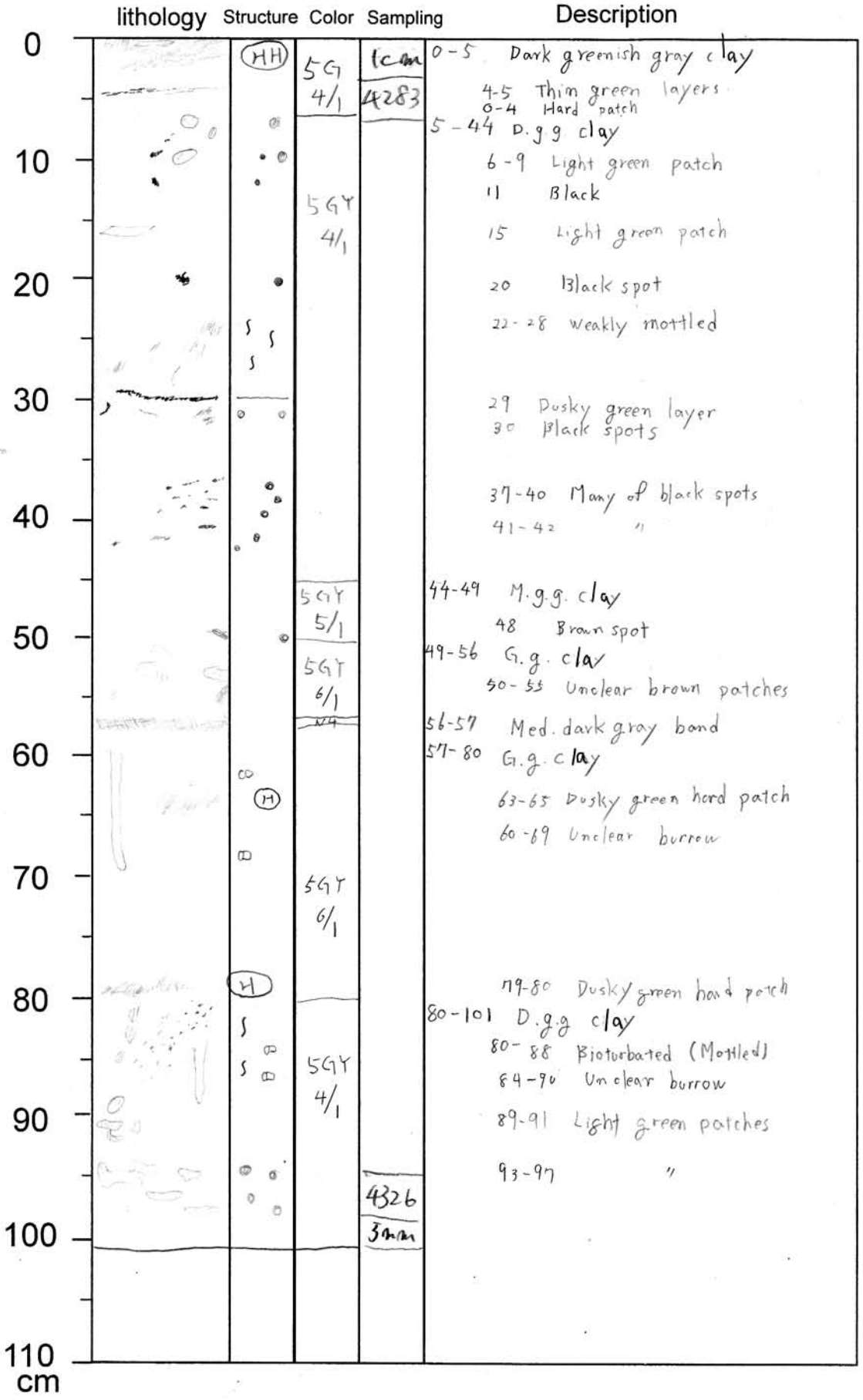
MR05-03

CORE: PC4 sec 11

Date: 11/6 2005

by: Suganuma



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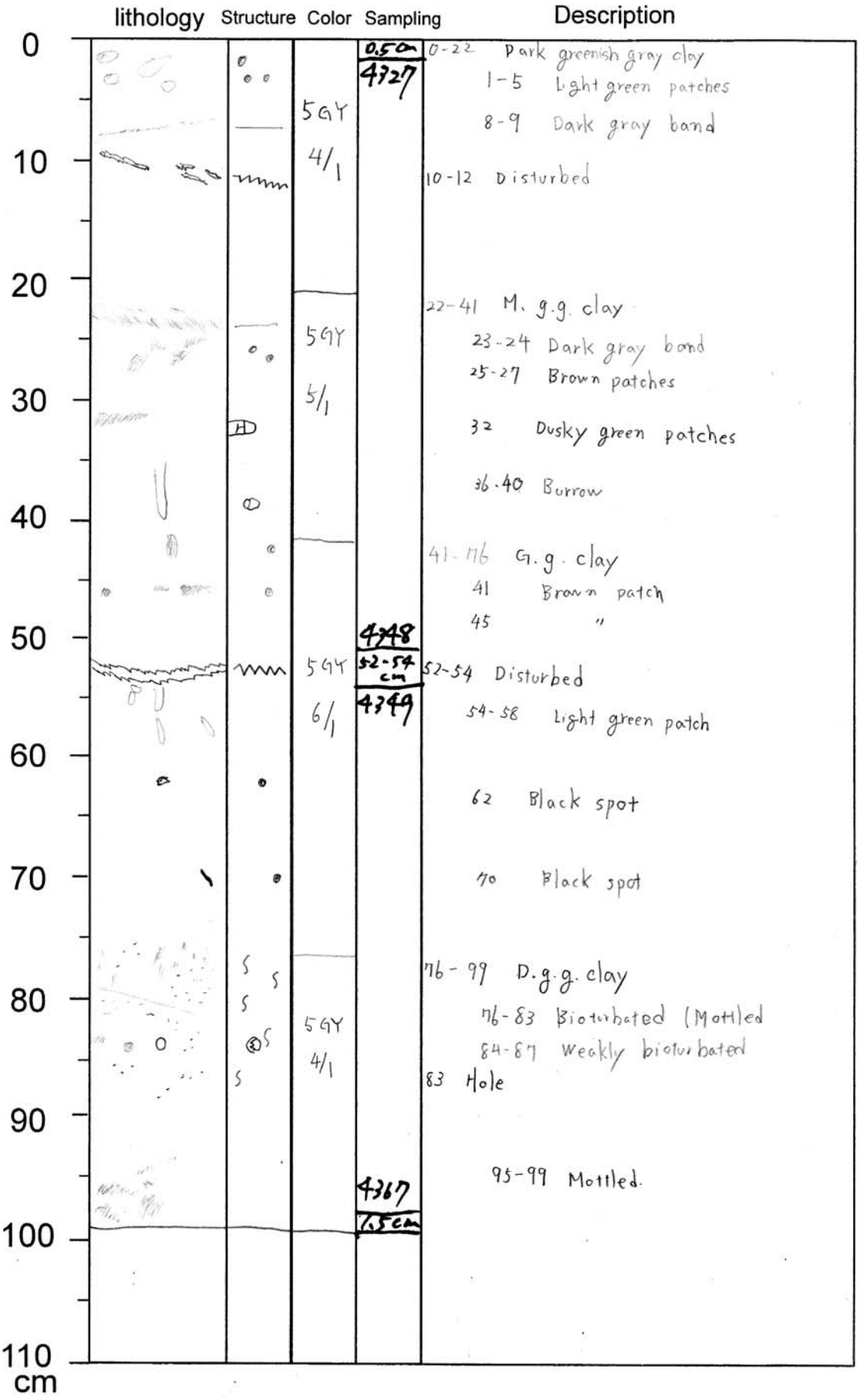
MR05-03

CORE: PC4 Sec 12.

Date: 11/5 2005

by: Suganuma



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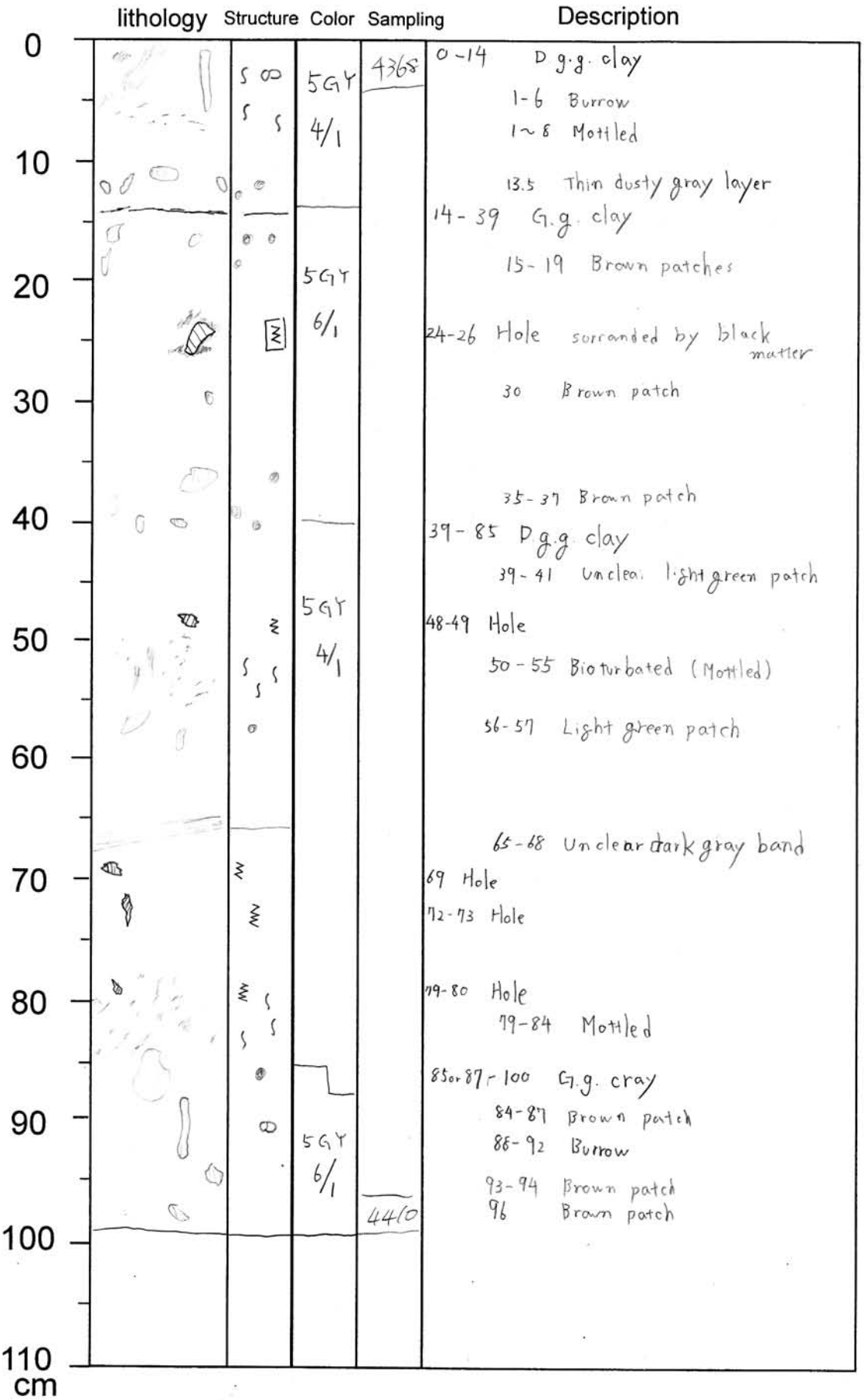
MR05-03

CORE: Pc 4 sec. 13

Date: 11/16 2005

by: Suganuma



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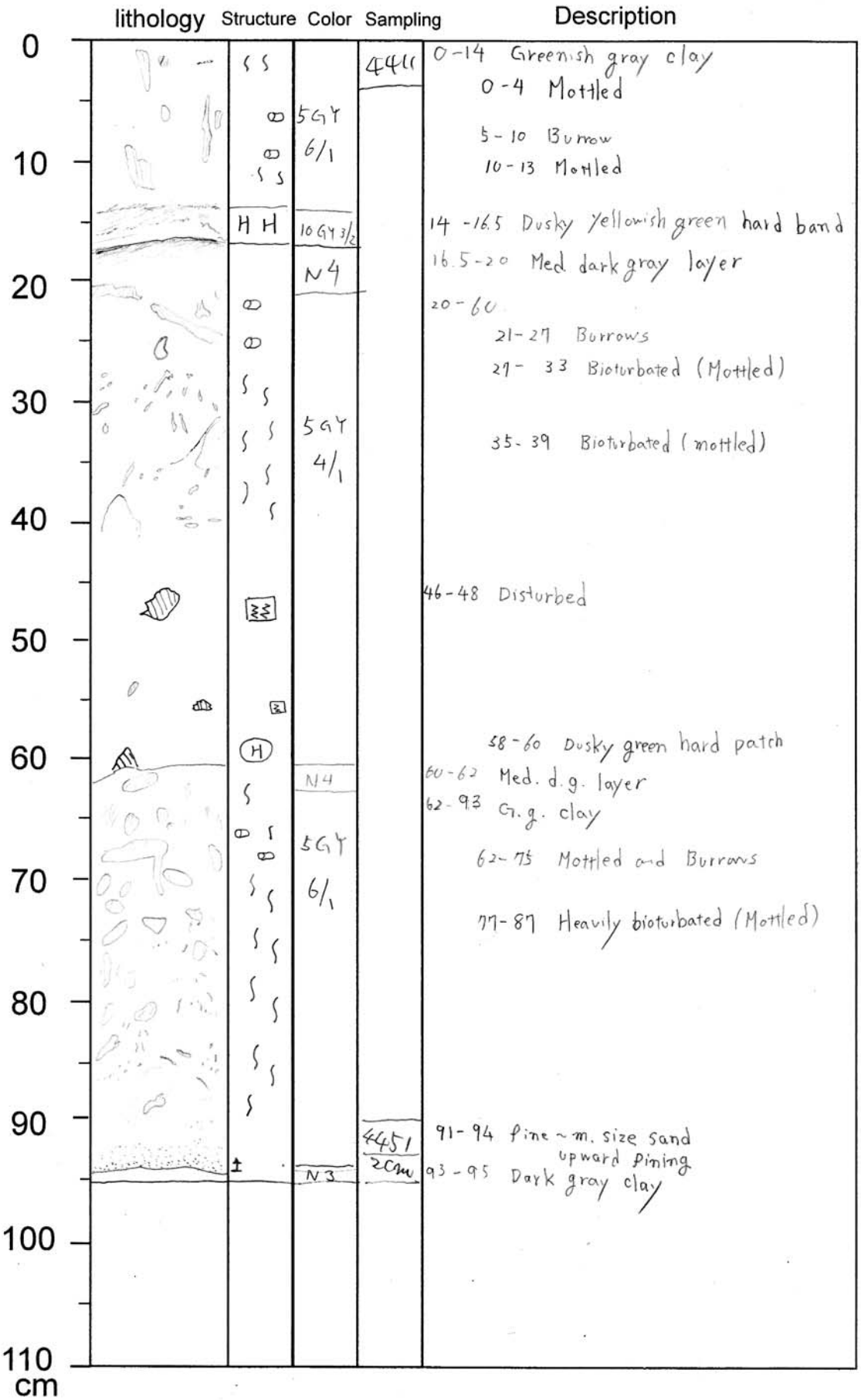
MR05-03

CORE: PC 4 sec. 14

Date: 11/6 2005

by: Sugemura



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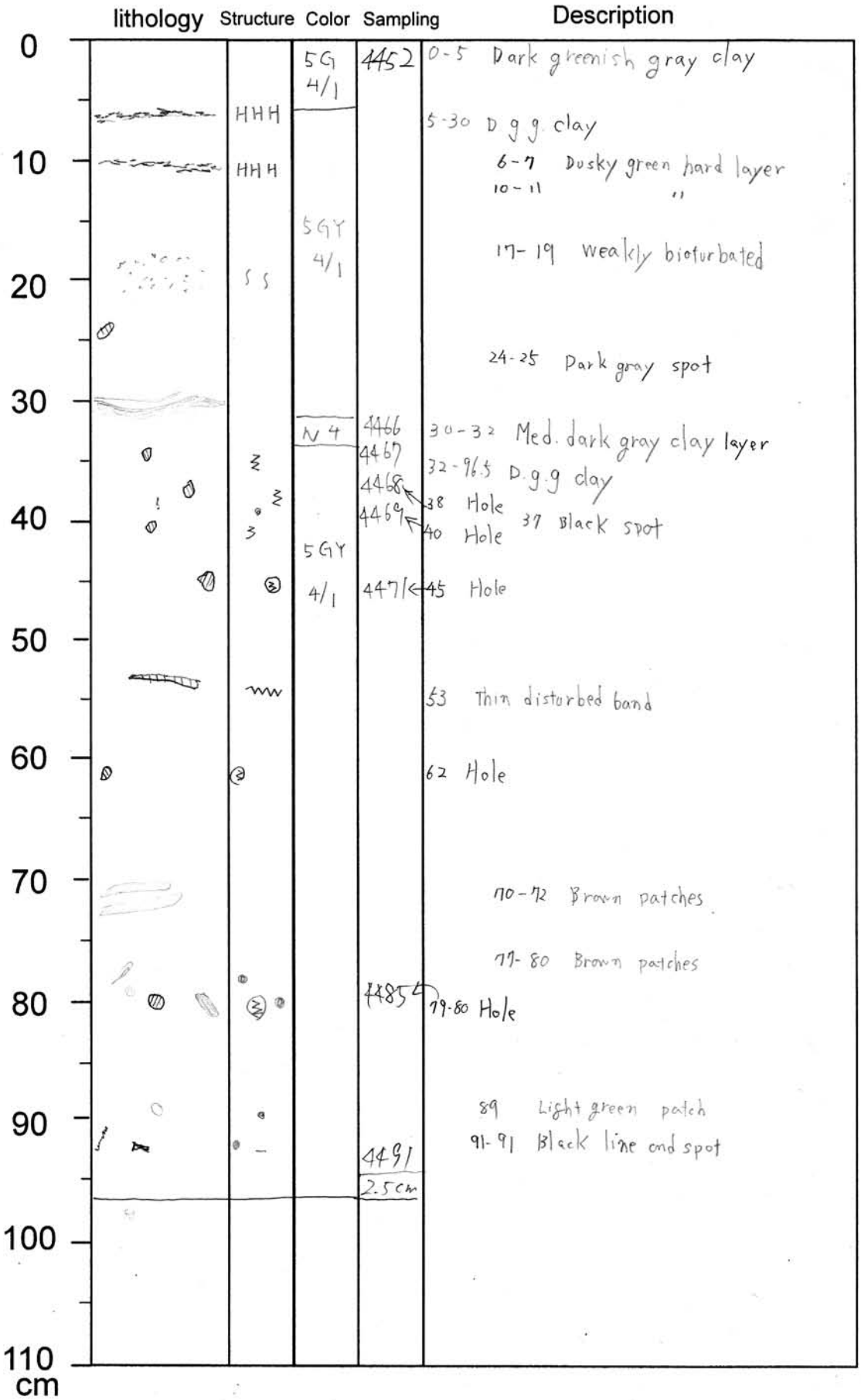
MR05-03

CORE: PC4 sec. 13

Date: 11/6 2005

by: Suganuma.



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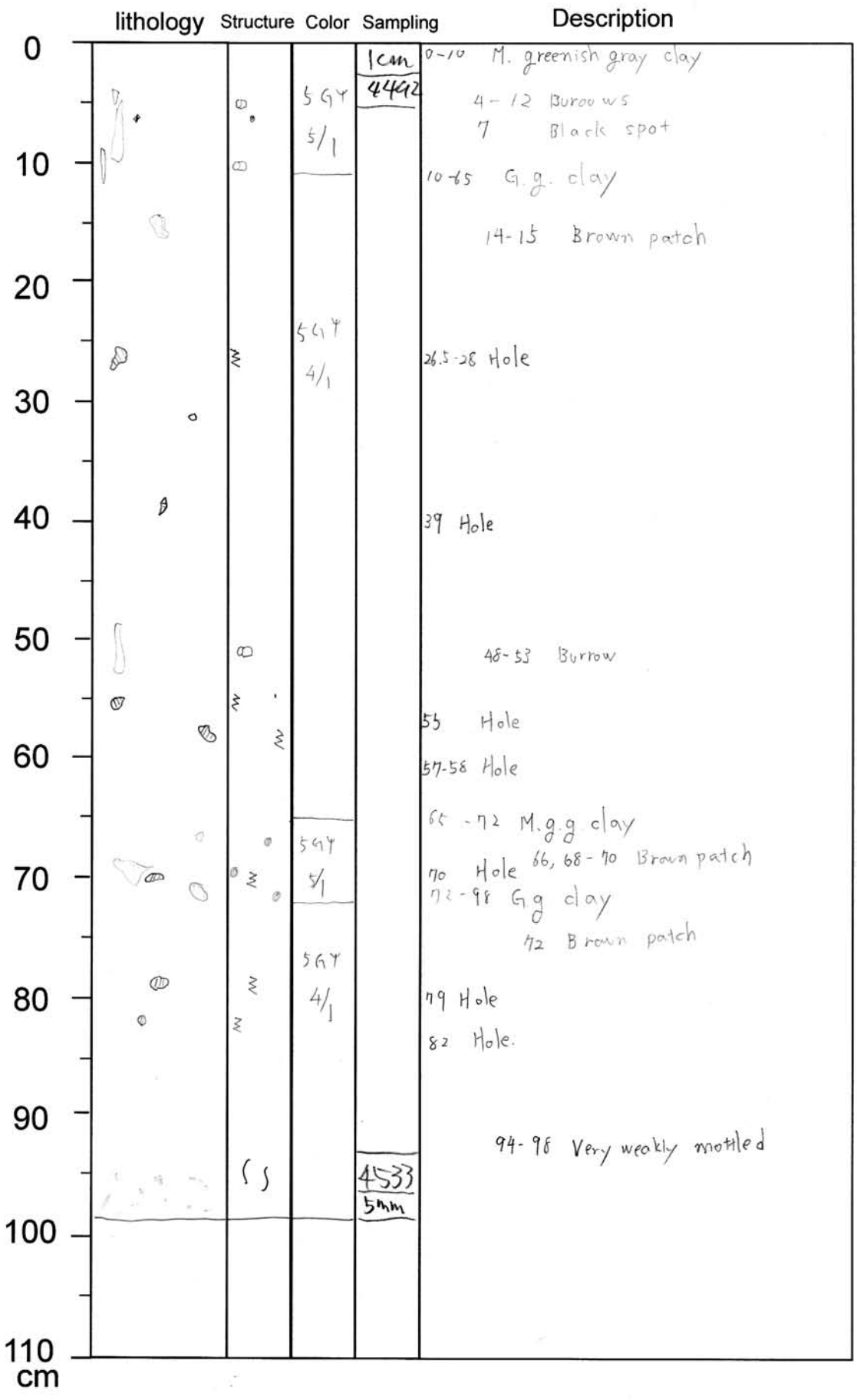
MR05-03

CORE: Pc 4 sec. 1b

Date: 11/7 2005

by: Suganuma



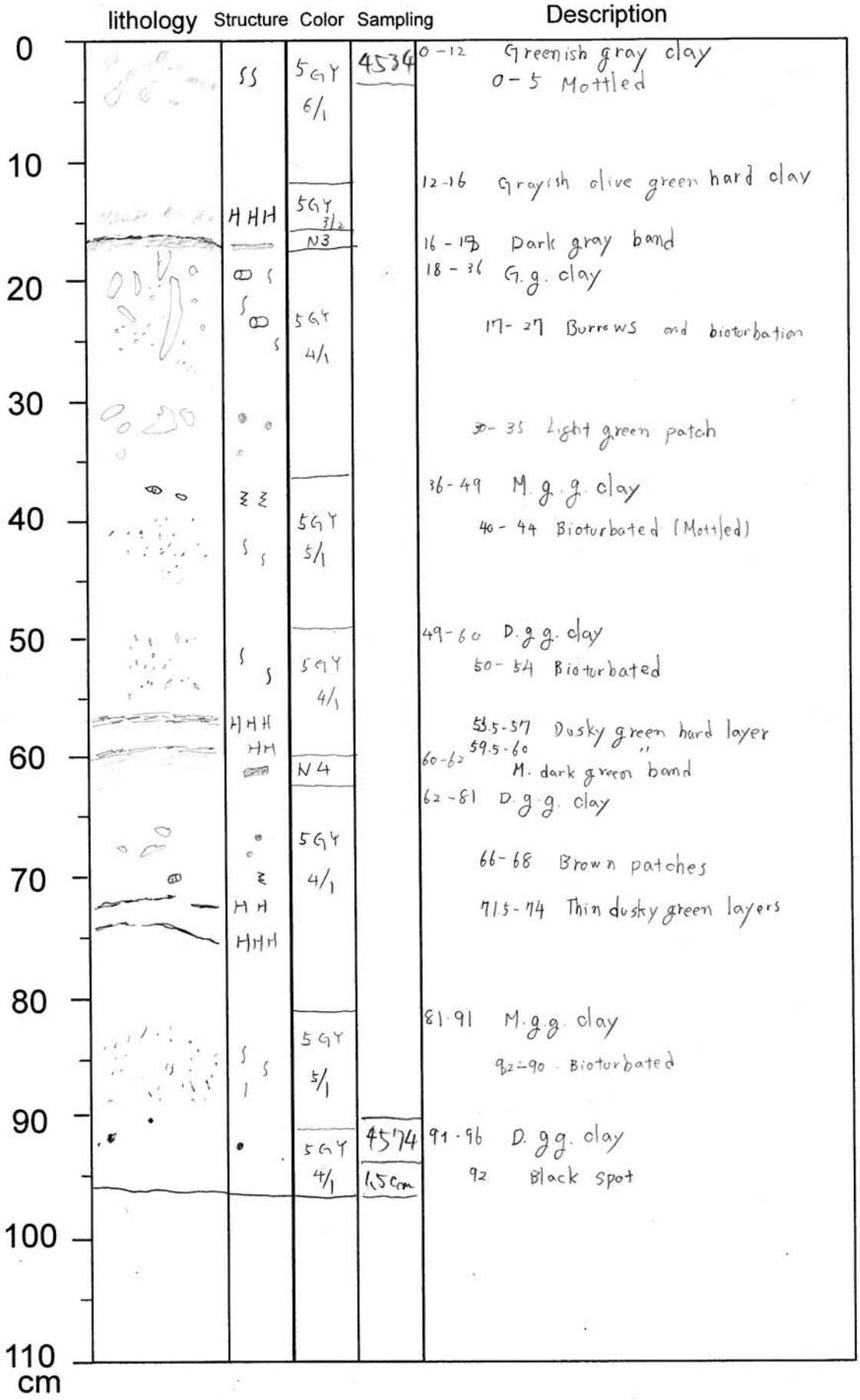
total length _____ section length 98

MR05-03

CORE: PC4 sec 17

Date: 11/7 2005

by: Suganuma



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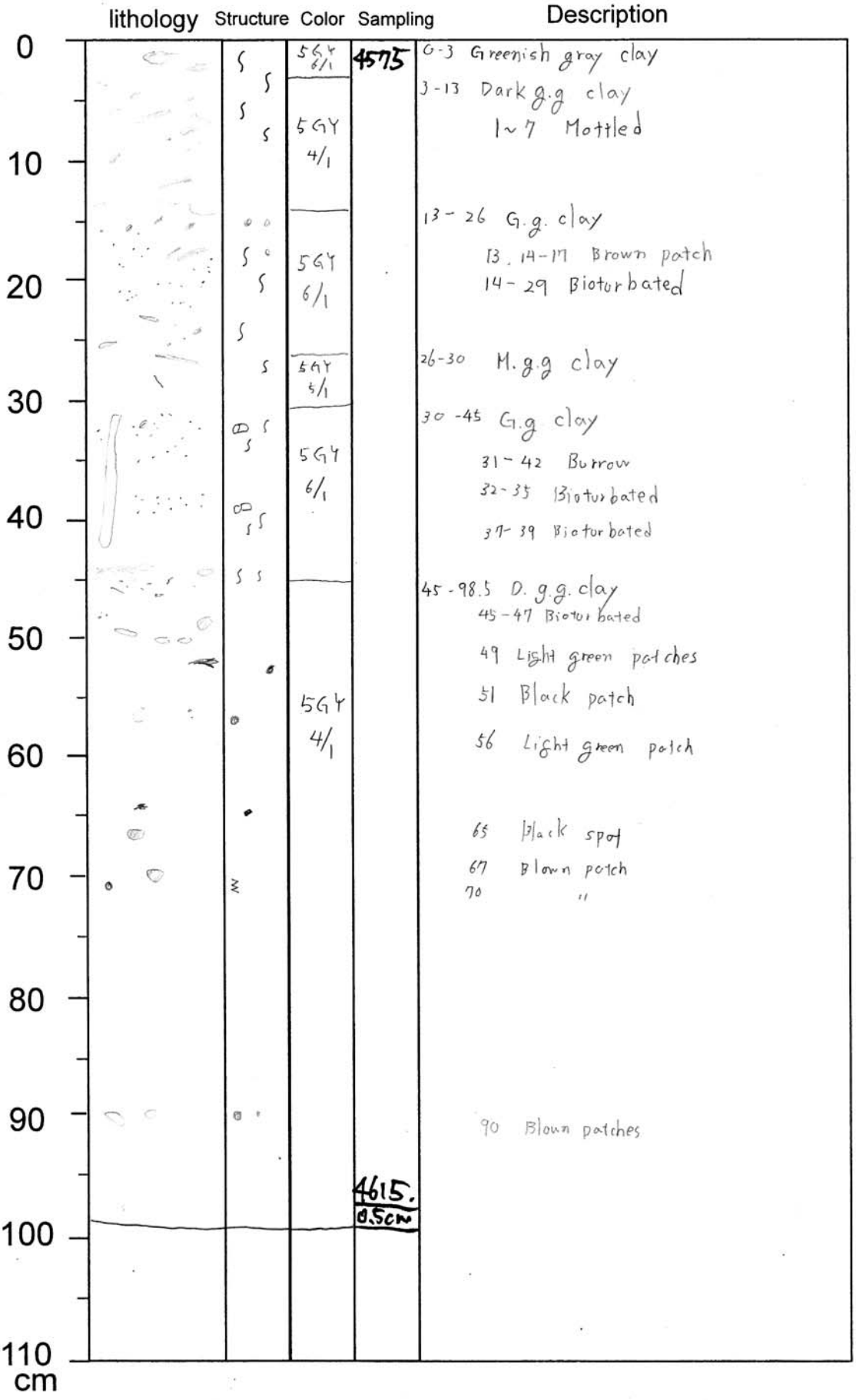
section length 96

MR05-03

CORE: Pc 4 18 w

Date: 11/7 2005

by: Suganuma



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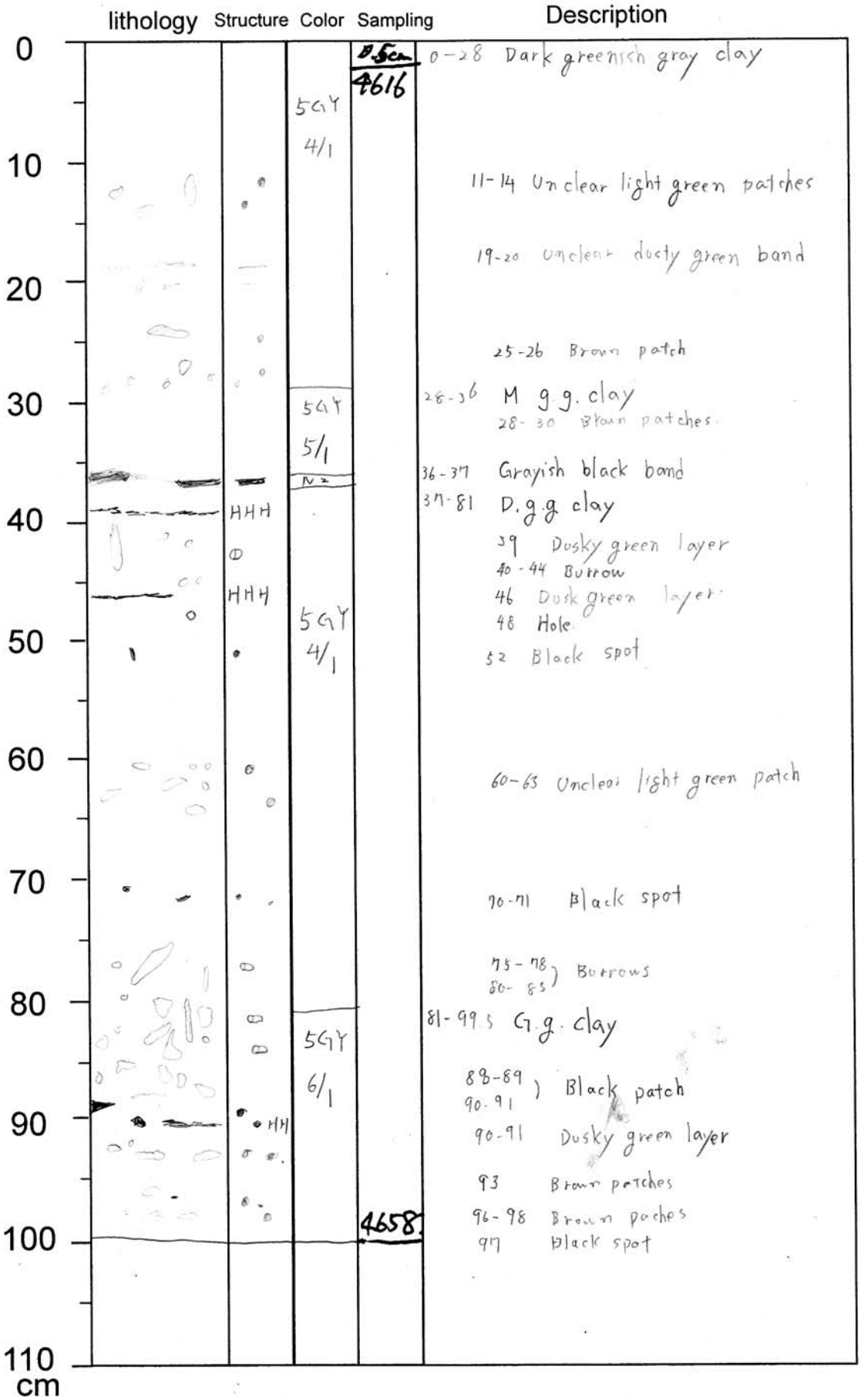
MR05-03

CORE: pc4 19w

Date: 11/17 2005

by: Suganuma



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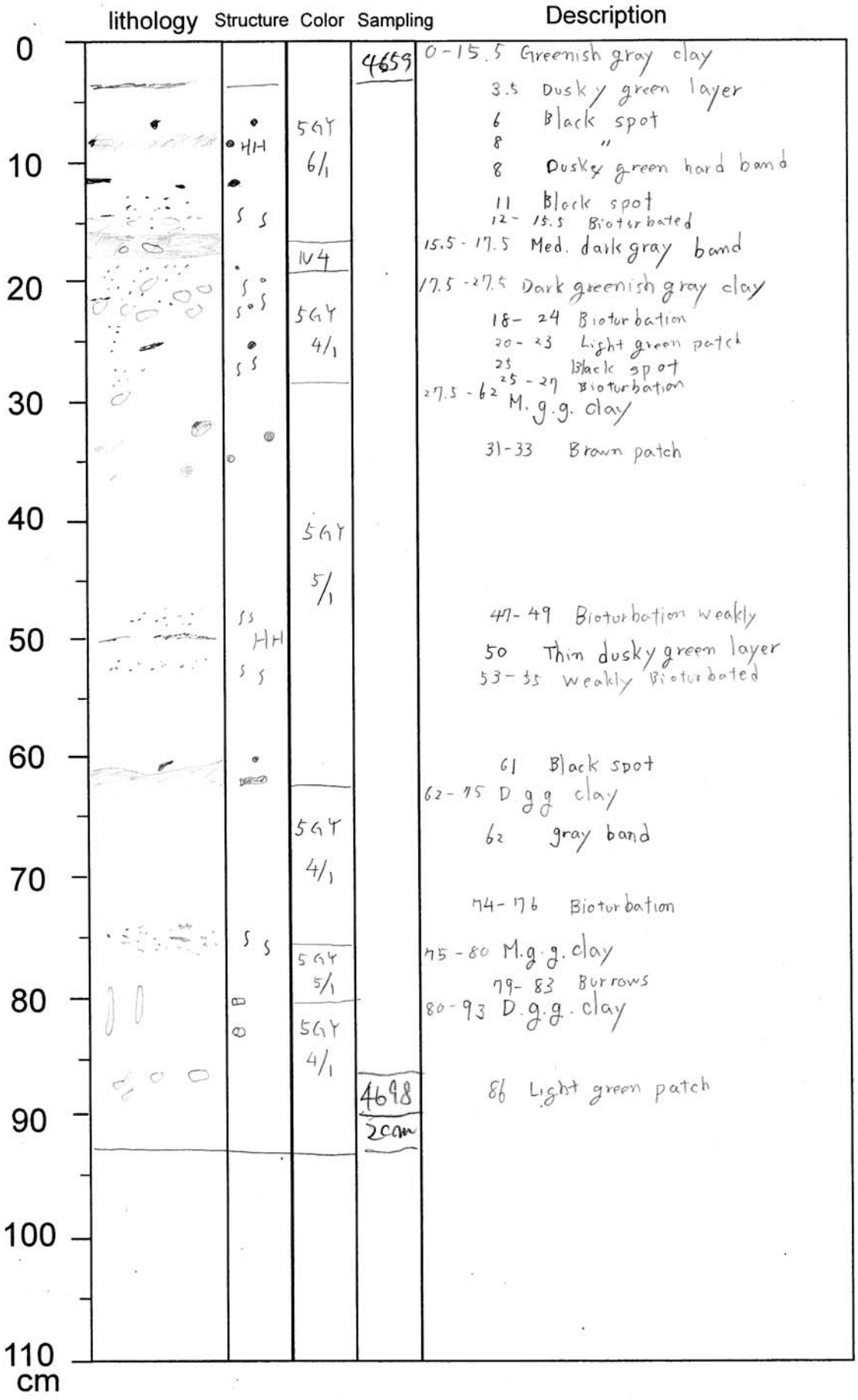
MR05-03

CORE: PC4 sec. 20

Date: 11/7 2005

by: Suganuma



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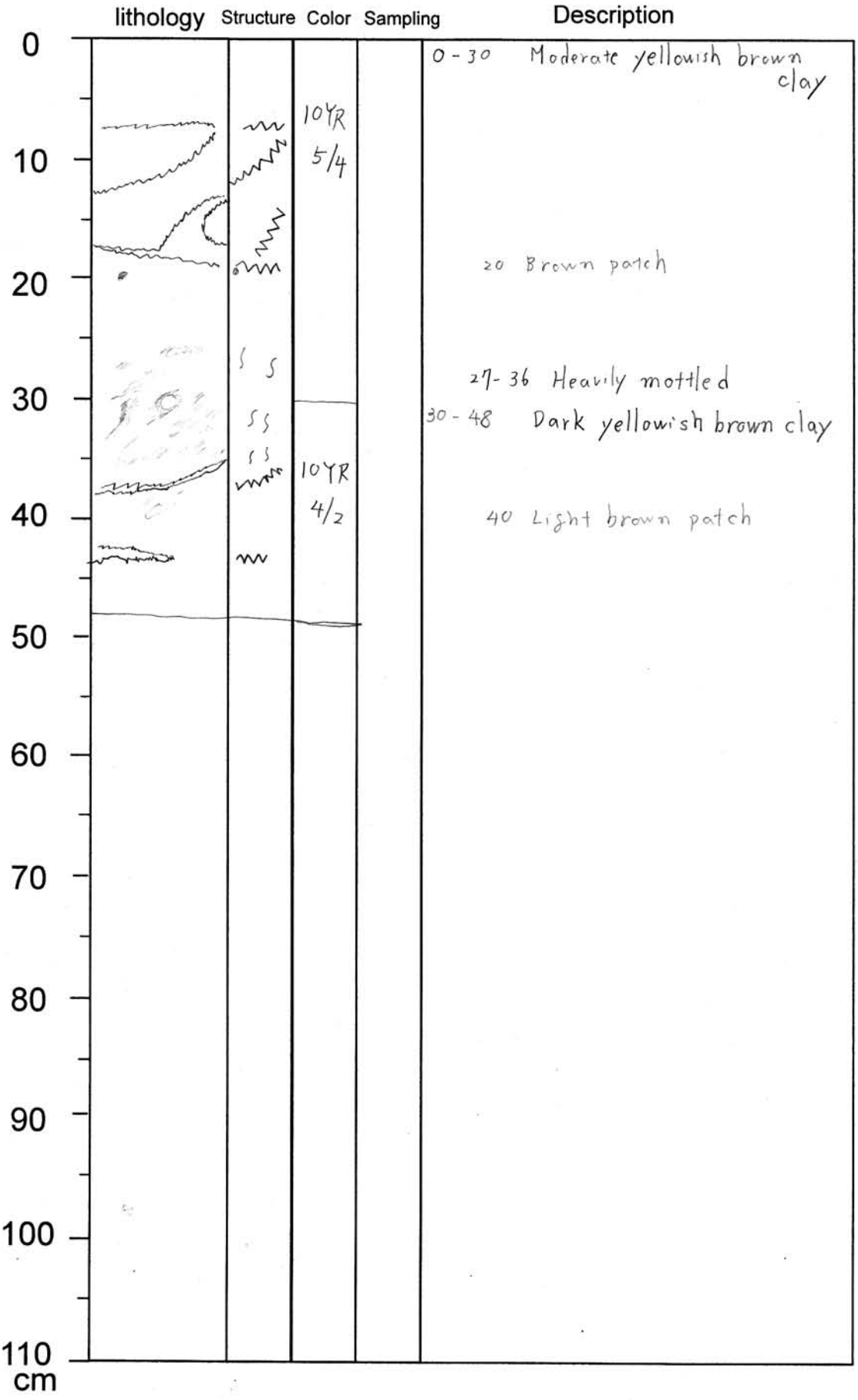
MR05-03

CORE: PL-4W

Date: 11/7 2005

by: Suganuma



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section length 48