

**MINISTRY OF REGIONAL DEVELOPMENT AND INFRASTRUCTURE  
OF GEORGIA  
ROADS DEPARTMENT**



**SAMTREDIA-GRIGOLETI ROAD  
SECTION OF E-60 HIGHWAY**

**PREPARATION OF ENVIRONMENTAL IMPACT ASSESSMENT,  
LAND ACQUISITION, RESETTLEMENT PLAN,  
DETAILED ENGINEERING DESIGNS AND TENDER DOCUMENTS**

**LOT 1. KM 0+000 – KM 11+500**

**FINAL REPORT**

**ANNEX 2  
GEOLOGICAL INVESTIGATION REPORT  
VOLUME I.  
TECHNICAL REPORT AND ANNEXIS**

**PROJECT: GEORGIA EAST WEST HIGHWAY**



**TBILISI, 2013**

## **COMPOSITION OF FINAL REPORT**

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## 1. GENERAL

### 1.1 INTRODUCTION

This technical report includes the results of the works performed by “Geoengineering” Ltd (Contractor) based on the Contract with “Transproject” Ltd, (Customer) dated 28 May 2012. As per agreement, the purpose of the works was to conduct geotechnical investigation in the right of way of Samtredia-Lanchkhuti-Grigoleti motor road and submit to the Customer a relevant technical report. Total length of the investigated road is 57 km.

As long as it is intended to design the road in two stages on its two different segments, the investigation works were conducted on the first stage and this technical report includes geotechnical conditions of Samtredia-Lanchkhuti (kp0+300) segment, while the next stage will include investigation of Lanchkhuti-Grigoleti (kp300-kp570) segment and submitting a relevant technical report to the Customer.

The list of the main field and laboratory testing works performed for engineering-geological/geotechnical surveys on Samtredia--Lanchkhuti segment, together with referenced standards, are given in Table 1.1.

**Table-1.1 Types of the executed works and referenced standard**

#	NAME OF WORK	TESTING STANDARD/ METHOD
1	<b>Field Investigations</b>	
1.1	Standard Penetration Test [SPT]	BS 1377:Part-9
2	<b>Laboratory Testing</b>	
2.1	Definition of Particle Size Distribution	BS 1377:Part-2
2.2	Definition of Natural Moisture Content	
2.3	Density Measurements	
2.4	Definition of Specific Gravity	
2.5	Atterberg Limits	
2.6	Unconfined Compressive Test for Soils	BS 1377:Part-7:1990
2.7	Consolidation	BS 1377:Part-5:1990
2.8	Standard Compaction Test	BS 1377:Part-4:1990
2.9	Soils and Ground Water Chemical Analysis	ГОСТ 4889-72 ГОСТ 4245-72

Boreholes were drilled by dry core drilling method, with YPB-2A-2 and YTB-1-BC self-propelled drilling rigs, without flushing fluid. Boreholes were drilled with 152-92 mm diameter drilling equipment and soil samples were taken using appropriate diameter soil samplers.

Lithological columns or borehole logs, are given in the Annexes. They include the following data:

1. Borehole number and drilling date;
2. Drilling method and type of drilling equipment;
3. Drilling diameter;

4. Geographical coordinates of borehole;
5. Depth ranges and final depth for the soil strata encountered in the boreholes;
6. Soil sampling depth range;
7. Type and depth of test executed in the borehole;
8. Description of soil strata;
9. Soil/Rock lithological designator symbol shown graphically;
10. Ground water table in the borehole (in case of groundwater phenomena);
11. Project Name and Contract Number;
12. Name of person who prepared the borehole log.

The list of the types and scopes of the executed field and laboratory works are given in Table 1.2.

**Table-1.2 Types and scopes of the executed works**

Description	Actual amount
<b>Field Work:</b>	
Drilling test boreholes, with sampling and preparing borehole logs	23 boreholes/683.6m
Conducting SPT tests in the boreholes	150 tests
<b>Laboratory Work</b>	
Particle Size Distribution	45 tests
Atterberg Limits	52 tests
Density (in natural condition)	26 tests
Particle Density	25 tests
Natural Moisture Content	78 tests
Shear test	9 tests
Consolidation	14 tests
Chemical analysis of soils water extract	19 tests
Ground water chemical analysis	12 tests

## 1.2 DESCRIPTION OF INVESTIGATED SITE

### 1.2.1 Geomorphologic Structure of the Area and Relief

Geomorphologically, the part of the territory of Georgia within which the project road will be located from Samtredia to Grigoleti, represents part of the Georgian intermount depression Colchis table land, confined with uplands of triangular mountains on the east, south and north, while on the west it opens toward the Black Sea. At the same time it is the easternmost part of the latitudinal Black Sea geosyncline, which in the past (up to the end of Miocene) was occupied by the sea. Later on, as a result of tectonic processes, the sea retreated while the coastal basin filled with marine and mainland sand-gravel and clayey sediments. The process is still in progress.

In general, direction of Samtredia-Lanchkhuti-Grigoleti motor road is south-western and it is to be located in the southern part of the Colchis table land. The initial part of the road from the beginning to village Japana (from pk0 to pk 134) will be located distanced from the mountain range bottom, first on the planed part of the r. Rioni right alluvial terrace, and then on the planed part of the r. Rioni left alluvial terrace. From vlg. Dafnari to vlg. Supsa (from pk 134 to pk 490) the road will pass along the northern side-hill of the Meskheta mountain range, near the range bottom, on the coastal planed part in the relief of which, in the line adjacent to Meskheta Mountain range, observed are depressions of the rivers flowing down from the northern side-hill of the mountain range and small elevations formed by the debris of the sediments carried out by these rivers. The last segment of the route from village Supsa to village Grigoleti (from pk490 to pk570) will be located on the right terrace of the r. Supsa and follows it up to the sea coast, i. e. vlg. Grigoleti. The height of this terrace at vlg. Supsa is relatively big (4-5 m), while with the approach to the sea, within vlg Grigoleti area it lowers to 2-3 m.

The whole area of the project road, except for small topographic roughnesses of different genesis, represents one whole plain, with its surface being cut down to 1-5 m depth by river beds and races. In their turn, former river beds of the local rivers, among which most noticeable are the former beds of the r. Rioni, also contribute to the local topographic roughness.

The main relief-forming arteries of the hydrographic network within the road right of way are the rivers Rioni, Tskhenistskali and Supsa. The role of their tributaries in formation of the landforms (cutting downs of the river beds, micro-relief forms as a result of sediment accumulation, etc) was always conditioned by their erosion basis, or the state of the main river beds on this or that segment of the valleys.

### 1.2.2 Climate

The climate data of the project road segment from Samtredia to Lanchkhuti is taken from the Georgian Climatological Norm - PN 01.05-08, according to the data from Samtredia and Lanchkhuti meteorological stations. Based on the main properties given in Table 2 of the above mentioned norm, the project road location area is attributed to IIIb sub-district. Climate properties are given in the Tables below.

**Table 1.2.1 Main climate properties of the climate subdistrict**

Climate district	Climate subdistrict	Average temperature in January, °C	Average temperature in July, °C	Relative humidity in July, %
III	IIIb	From +2 to +6	From +22 to +28	50 and more at 13hrs

**Table-1.2.2 Air temperature and humidity**

#	Climate Characteristics	Meteorological Station	By month												Annually
			I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
1	Average Monthly and Yearly Air Temperature, °C	Samtredia	4.7	5.6	8.8	13.0	18.0	21.0	23.2	23.5	20.4	16.2	11.2	7.0	14.4
		Lanchkhuti	4.2	5.2	8.2	12.2	17.2	20.5	23.0	23.1	19.8	15.5	10.8	6.3	13.8
2	Absolute Minimum Air Temperature, °C	Samtredia	-	-	-	-	-	-	-	-	-	-	-	-	-17
		Lanchkhuti	-	-	-	-	-	-	-	-	-	-	-	-	-20
3	Absolute Maximum Air Temperature, °C	Samtredia	-	-	-	-	-	-	-	-	-	-	-	-	41
		Lanchkhuti	-	-	-	-	-	-	-	-	-	-	-	-	39
4	Mean Maximum of the hottest month, °C	Samtredia	-	-	-	-	-	-	-	28.8	-	-	-	-	-
		Lanchkhuti	-	-	-	-	-	-	-	28.1	-	-	-	-	-
5	Range of ambient temperature, °C	Samtredia	9.4	10.1	10.3	9.6	10.3	11.7	12.4	13.0	12.7	11.6	9.9	9.2	-
		Lanchkhuti	7.5	8.7	10.1	11.7	11.6	11.0	9.0	9.4	10.8	11.0	9.5	8.0	-
6	Relative air humidity, %	Samtredia	76	75	73	72	73	75	78	80	81	79	72	72	76
		Lanchkhuti	80	78	77	74	75	76	80	82	83	81	78	77	78

**Table-1.2.3 Amount of precipitation and snow cover**

Meteorological station	Amount of precipitation in a year, mm	Amount of precipitation in 24 hours, mm	Weight of snow cover, KPa	Number of days with snow cover
Samtredia	1461	145	0.50	16
Lanchkhuti	1980	250	0.50	14

**Table-1.2.4 Standard values of wind pressure**

Meteorological station	$W_0$ Once in 5 years, KPa	$W_0$ Once in 15 years, KPa
Samtredia	0.38	0.48
Lanchkhuti	0.60	0.73

**Table-1.2.5 Greatest wind velocity with probability once in 1, 5, 10, 15, 20 years, m/s**

Meteorological station	in 1 year	in 5 years	in 10 years	in 15 years	in 20 years
Samtredia	23	25	26	27	28
Lanchkhuti	27	32	34	35	36

**Table-1.2.6 Frequency of wind directions**

Wind property			Direction								Calm
			N	NE	E	SE	S	SW	W	NW	
Frequency of wind directions (%)	January	Samtredia	0	1	67	7	1	6	17	1	-
		Lanchkhuti	3	29	30	3	8	19	7	1	-
	July	Samtredia	1	1	14	3	2	19	56	4	-
		Lanchkhuti	2	3	5	2	14	40	33	1	-
Wind direction and calm		Samtredia	0	1	45	6	1	11	34	2	35

Wind property		Direction								Calm
		N	NE	E	SE	S	SW	W	NW	
frequency (%) in a year	Lanchkhuti	4	19	17	2	10	28	18	2	46

In Kutaisi and Samtredia, seasonal freezing depth for any soil is 0 cm, which means that soil does not freeze.

### 1.2.3 Geological Structure of the Area

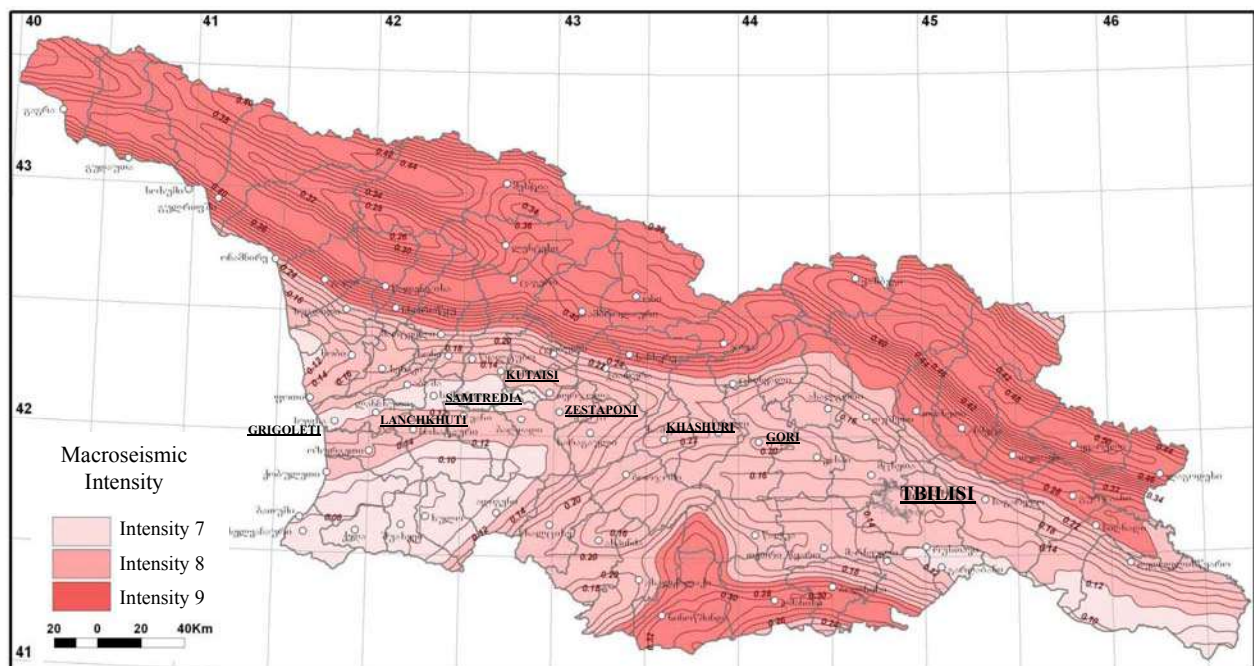
Geological section of the Colchis table land is represented by marine and mainland formations. Marine sediments are represented by a complete stratigraphic sequence (Chaudi-Holocene - Q<sub>I-IV</sub>). In the central part of the Colchis table land, including the neighborhood of the city Poti, total thickness of the Quaternary marine sediments is over 300 m. Here these sediments are mostly represented by alternation of dark gray clays and sands.

The mainland sediments on the area are mainly represented by alluvial sediments. They have accumulated in the flood plains of the rivers Rioni, Tskhenistskali, Supsa, etc., and lithologically are structured by sand/gravel and sand/cobbles soil varieties. On the last stage of the accumulation process, alternation of marine and mainland phases occurred which reflected in the alternation of sediment strata in the coast adjacent line (alluvial, marine sediments and turfs). West of city Senaki, this stage corresponds by age with Holocene, while east of it – to Pleistocene. In the very central part of the Colchis table land (Poti adjacent zone), the thickness of Holocene sediments (A. G. Laliev) reaches 40-50 m and three turf strata are distinguished in it – correspondingly. at 41, 37 and 10 m depth.

The thickness of alluvial formations near city Kutaisi is not more than 4-5 m, near city Samtredia – over 30.0 m, while near city Poti the thickness of alluvial-marine formations is over 300 m.

Distribution of swamp sediments, apparently alternating with alluvial fine sands, is represented by peat-bogs, organic silts and clays.

Based on the normative document currently effective in Georgia – PN 01.01-09 -"Antiseismic Construction", Samtredia-Lanchkhuti segment of the project road is situated in the seismic zone of intensity 7 by MSK64 scale, with the value of maximum horizontal acceleration (nonmetric seismic coefficient – A) 0.12 (see the Seismic Hazard Map below).



**Pic. 1: Seismic Hazard Map indicating maximal horizontal acceleration and intensity**  
**Note: accelerations are given in "g" units.**

## 2. SOIL LABORATORY TESTING RESULTS

Varieties of soils distinguished as a result of field and laboratory testing are described in whole for the entire project road segment. Each soil type has been assigned its unique number, which designates it throughout the whole project road alignment in accordance with its repeatability.

In general, within the project road alignment there are 7 varieties of soils. Among the soils there are silts and clays, as well as subgroups of coarse soils. In turn, among the silts/clays soils 4 varieties of different composition and conditions are distinguished. At river crossings, soils below the river-level are saturated everywhere. In general, within the road alignment, ground-waters reveal at different depths. Water tables are recorded on borehole columns (logs), as well as on the geotechnical section along the route-line.

Varieties of soils represented within the ROW of the project road, provisionally named “Strata”, are described separately below. Geotechnical descriptions of the strata are based on the results of the laboratory analyses conducted on the samples taken from the boreholes. The descriptions also consider data obtained by the in-situ testing and the visual inspection.

**STRATUM-1** – Brown, stiff clay, with occasional gravel inclusions. By origin it is an alluvial soil (aQ). STRATUM-1 has quite large area distribution in the surface part of the project line and has revealed in 15 boreholes. Stratum thickness in various parts varies from 1.0 to 5.1 m. The stratum ranges along the road RoW and in depth are graphically shown on the long sectionS of the project structures (see graphical part of the report). STRATUM-1 distribution by borehole is also given in Table-2.1.

**Table-2.1 Depth ranges in the boreholes and stratum thickness for STRATUM-1**

Consecutive #	Borehole #	Stratum depth range in the borehole , m	Stratum thickness, m.
1	BH-B-1	0.2-3.7	3.5
2	BH-B-2	0.5-2.9	2.4
3	BH-U-2	0.5-2.1	2.1
4	BH-B-4a	0.60-1.90	1.30
		7.00-10.20	3.20
5	BH-B-8	0.6-5.7	5.1
6	BH-B-9	0.3-2.0	1.7
7	BH-B-10	0.6-3.4	2.8
8	BH-11a	0.5-3.1	2.6
9	BH-12	0.6-1.2	0.6
		1.7-5.9	4.2
10	BH-13	0.6-2.3	1.7
11	BH-14	0.4-2.1	1.7
12	BH-15	0.3-2.5	2.2
13	BH-16	0.4-1.8	1.4
14	BH-17	0.5-1.5	1.0
15	BH-18	0.5-1.5	1.0

STRATUM-1 has been investigated by 1 borehole sample. Test results are given in Tables 2.2 and 2.3.



**Table-2.2 STRATUM-1 particle-size distribution**

Consecutive #	Borehole #	Sampling depth interval, m	Fraction composition, %							
			Rounded boulder >200.00mm	Rounded cobbles, 200.00-63.00-mm	RoundedGravel, 63.00-2.00mm	Sand			Silt, 0.063-0.002mm	Clay, <0.002mm
						Coarse 2.00- 0.600mm	Medium 0.600- 0.212mm	Fine, 0.212- 0.063mm		
1	BH-B-1	3.4-3.65				0.6	1.2	11.5	67.6	19.1

**Table-2.3. STRATUM-1 physical properties parameter values**

Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content, W%	Plasticity			Liquidity index, I <sub>L</sub>	Density, g/cm <sup>3</sup>			Porosity, n%	Voids ratio, e	Moisture degree, S <sub>w</sub>
				Liquid limit, W <sub>L</sub> %	Plastic limit, W <sub>p</sub> %	Plasticity index, I <sub>p</sub>		Mineral parts, ρ <sub>s</sub>	Natural, ρ	Dry unit weight, ρ <sub>d</sub>			
1	BH-B-1	1.2-1.4	28	42.1	22	20.1	0.30						
2	BH-B-1	3.4-3.65	25.8	41.7	23.7	18.0	0.12	2.73	1.93	1.53	43.80	0.779	0.904
3	BH-B-2	1.2-1.5	28.9	40.5	21.2	19.3	0.40						
4	BH-B-2	2.3-2.6	30.5	41.6	21.5	20.1	0.45						
5	BH-B-4	1.2-1.5	31.5	37.3	17.6	19.7	0.70	2.72	1.87	1.42	47.71	0.913	0.939
6	BH-B-4a	8.4-8.7	29.3	42.5	22.3	20.2	0.35						
7	BH-B-8	2.2-2.4	29.1	40.5	21.8	18.7	0.39						
8	BH-B-8	4.8-5.0	29.4	40.2	22.2	18.0	0.40						
9	BH-B-10	2.5-2.8	29.6	42	21.9	20.1	0.38						
10	BH-B-12	4.5-4.7	28.6	42.1	22.6	19.5	0.31						
11	BH-B-14	1.8-2.0	28.3	41.5	22.4	19.1	0.31						
12	BH-B-16	1.5-1.7	28.0	40.5	21	19.5	0.36						
13	BH-B-17	1.3-1.5	29.1	40.6	22.1	18.5	0.38						
14	BH-B-18	1.0-1.3	29.5	41.4	21.6	19.8	0.40						

Based on the results of the shear test (see Annex 2.2), internal friction angle of STRATUM-1 is  $\varphi=14.2^{\circ}$ ,  $c=39.6\text{KPa}$ .

In STRATUM-1, Standard Penetration Tests were conducted. The results of the tests are given in Table-2.4.

**Table-2.4. Results of Standard Penetration Test (SPT) conducted in STRATUM-1**

No.	Borehole No.	Penetration depth, m	Penetration interval, cm			N=B+C
			A	B	C	
			0-15	15-30	30-45	
1	BH-B-1	1.00-1.45	1	2	1	3
2	BH-B-1	3.00-3.45	2	1	1	2
3	BH-B-2	2.00-2.45	2	3	2	5
4	BH-B-4	1.00-1.45	1	2	4	6
5	BH-B-8	3.00-3.45	2	2	3	5
6	BH-B-8	5.00-5.45	2	3	2	5
7	BH-B-10	2.00-2.40	1	2	2	4
8	BH-B-18	1.00-1.45	4	5	5	10

Based on the data from the tables:

- According to GOST Standard, STRATUM-1 is stiff clay, with occasional gravel inclusions
- According to **BS** Standard, STRATUM-1 is stiff, slightly moist, intermediate plasticity CLAY, with occasional gravel inclusions.

**STRATUM-2** – Gray-rustish, firm clay, with fine water-containing sand bands and lenses. Genetically this stratum is also alluvial soil (aQ). Stratum-2 is quite wide-spread by area. It revealed in 16 different boreholes, and is found within 0-15 m depth interval. In BH-B-2 and BH-18 boreholes, stratum-2 has revealed at two different ranges. Stratum thickness in different places varies within wide range – from 0.9m to 11.9m. Stratum distribution area along the route and in depth is graphically shown on the longitudinal sections of the project structures (see graphical part of the report). STRATUM-2 distribution by borehole is also given in Table-2.5.

**Table-2.5 Depth ranges in the boreholes and stratum thickness for STRATUM-2**

Consecutive #	Borehole #	Stratum depth range in the borehole , m	Stratum thickness, m.
1	BH-B-1	3.7-5.2	1.5
2	BH-B-2	1.7-4.55	2.85
		4.6-5.5	0.9
3	BH-U-1	0.4-7.5	7.1
4	BH-U-2	2.1-6.8	4.7
5	BH-U-3	0.8-3.0	2.2
6	BH-B-4	0.4-6.5	6.1
7	BH-B-5	0.6-4.1	3.5
8	BH-B-9	2.0-5.0	3.0
9	BH-B-10	0.6-6.0	5.4
10	BH-B-11	2.3-5.4	3.1
11	BH-11a	3.1-4.6	1.5
		7.0-8.2	1.2
12	BH-12	5.9-7.4	1.5
13	BH-13	2.9-14.8	11.9
14	BH-14	2.8-14.2	11.4
15	BH-15	2.5-4.8	2.3
16	BH-17	1.5-13.2	11.7
17	BH-18	1.5-4.1	2.6
		4.8-11.7	6.9

STRATUM-2 has been investigated by 4 borehole samples. Test results are given in Tables 2.6 and 2.7.



**Table-2.6 STRATUM-2 particle-size distribution**

Consecutive #	Borehole #	Sampling depth interval, m	Fraction composition, %							
			Rounded boulder >200.00mm	Rounded cobbles, 200.00-63.00-mm	Rounded Gravel, 63.00-2.00mm	Sand			Silt, 0.063-0.002mm	Clay, <0.002mm
						Coarse 2.00- 0.600mm	Medium 0.600- 0.212mm	Fine, 0.212- 0.063mm		
1	BH-B-2	5.25-5.5	-	-	-	0.4	4.1	12.7	61.0	21.8

**Table-2.7. STRATUM-2 physical properties parameter values**

Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content, W%	Plasticity			Liquidity index, $I_L$	Density, g/cm <sup>3</sup>			Porosity, n%	Voids ratio, e	Moisture degree, $S_z$
				Liquid limit, $W_L$ %	Plastic limit, $W_p$ %	Plasticity index, $I_p$		Mineral parts, $\rho_s$	Natural, $\rho$	Dry unit weight, $\rho_d$			
1	BH-B-2	5.25-5.5	31.9	40.6	21.0	19.6	0.56	2.73	1.89	1.43	47.51	0.905	0.962
2	BH-B-4	3,2-3,5	34.2	40.9	26.7	14.2	0.53	2.71	1.68	1.25	53.81	1.165	0.796
3	BH-B-4	8.5-8.8	32.3	40.1	20.5	19.6	0.60						
4	BH-B-5	3,0-3,35	34.0	41	21.8	19.2	0.64						
5	BH-B-12	6.0-6.4	32.8	39.6	20.9	18.7	0.64						
6	BH-B-13	7.5-7.9	32.5	40.5	21.3	19.2	0.58						
7	BH-B-14	4.0-4.2	34.2	39.5	21.9	17.6	0.70						
8	BH-B-16	11.3-11.6	33.1	39.6	21.1	18.5	0.65						
9	BH-B-17	7.3-7.6	32.6	38.6	20.1	18.5	0.68						

Based on the results of the shear test (see Annex 2.2), internal friction angle of STRATUM-2 is  $\varphi=7.4^0$ ,  $c=8.5$ KPa.

In STRATUM-2, Standard Penetration Tests were conducted. The results of the tests are given in Table-2.8.

**Table-2.8. Results of Standard Penetration Test (SPT) conducted in STRATUM-2**

No.	Borehole No.	Penetration depth, m	Penetration interval, cm			N=B+C
			A	B	C	
			0-15	15-30	30-45	
1	BH-B-2	4.1-4.55	3	2	2	4
2	BH-B-4	3.0-3.45	1	1	1	2
3	BH-B-5	2.0-2.45	1	2	1	3
4	BH-B-9	3.0-3.45	1	3	3	6
5	BH-B-9	4.4-4.95	2	3	4	7
6	BH-B-10	4.0-4.45	1	1	1	2
7	BH-B-11	4.0-4.45	1	1	1	2
8	BH-13	3.5-3.95	3	2	2	4

No.	Borehole No.	Penetration depth, m	Penetration interval, cm			N=B+C
			A	B	C	
			0-15	15-30	30-45	
9	BH-13	6.0-6.45	1	2	2	4
10	BH-13	10.0-10.45	1	1	1	2
11	BH-13	13.0-13.50	1	1 blow/35cm	-	1
12	BH-14	3.0-3.45	1	2	2	3
13	BH-14	7.0-7.48	1	1 blow/33cm	-	1
14	BH-14	11.0-11.45	1	1	1	2
15	BH-15	3.0-3.45	1	2	2	4
16	BH-15	13.0-13.45	1	2	2	4
17	BH-18	3.0-3.45	1	2	1	3
18	BH-18	5.0-5.45	1	1	2	3
19	BH-16	11.0-11.45	1	1	1	2
20	BH-16	13.0-13.45	1	2	2	4
21	BH-17	3.0-3.45	1	2	1	3
22	BH-17	6.0-6.45	1	1	1	2
23	BH-17	8.0-8.45	1	2	2	4
24	BH-17	11.0-11.45	1	1	1	2

Based on the data from the tables:

- According to GOST Standard, STRATUM-2 is firm clay, with fine, water-containing sand bands and lenses.
- According to BS Standard, STRATUM-2 is soft, very moist, intermediate plasticity CLAY, with fine, water-containing sand bands and lenses.

**STRATUM-3** – Gray and dark gray, fine, water-saturated sand, with thin bands of gray firm clays. Genetically, this stratum is also alluvial soil (aQ). STRATUM-3 is one of the most important elements in the lithology of the investigated line. In the surface part of the section it is less spread, but in the depth it is found up to 35 m investigated depth. Its distribution in depth is not of the character of continued, somewhat equal thickness strata; it is characterized by shapeless, random distribution. It has revealed in 23 different boreholes, in most of which it is encountered at different depth intervals between 2 and 4 m, which is indicative of its “scattered” distribution. Stratum thickness in different boreholes varies within wide range – from 0.7 m to 18.5m. Distribution range of the soil stratum along the route and in depth is graphically shown on the long sections of the project structures (See graphical part of the report). STRATUM-3 distribution by borehole is also given in Table-2.9.

**Table-2.9**      *Depth ranges in the boreholes and stratum thickness for STRATUM-3*

Consecutive #	Borehole #	Stratum depth range in the borehole , m	Stratum thickness, m.
1	BH-B-1	5.2-6.6	1.40
2	BH-B-2	2.90-3.70	0.80
		4.35-4.60	0.25
		5.50-6.70	1.20
3	BH-U-1	7.50-14.00	6.50
4	BH-U-2	6.80-12.10	5.30
5	BH-U-3	3.00-8.00	5.00
6	BH-U-4	0.70-10.20	9.50
7	BH-B-3	1.00-4.80	3.80
		12.40-15.9	3.5
		20.70-21.10	0.40

Consecutive #	Borehole #	Stratum depth range in the borehole , m	Stratum thickness, m.
8	BH-B-4	19.20-20.50	1.30
		23.50-26.10	2.60
9	BH-B-4a	1.90-3.20	1.30
10	BH-B-5	4.10-8.70	4.60
		10.80-12.70	1.90
		16.40-20.00	3.60
11	BH-B-7	0.80-5.80	5.00
		6.80-7.50	0.70
		8.00-8.40	0.40
12	BH-B-8	5.70-14.70	9.00
		18.80-30.00	11.20
13	BH-B-9	5.00-11.30	6.30
		19.50-30.00	10.50
14	BH-B-10	6.50-25.00	18.50
		30.00-34.50	4.50
15	BH-B-11	0.30-2.30	2.00
		5.40-13.10	7.70
		15.50-16.60	1.10
		27.20-35.00	7.80
16	BH-B-11a	4.60-7.00	2.40
		8.20-11.60	3.40
		12.40-13.20	0.80
		16.10-21.80	5.70
		26.70-28.00	1.30
17	BH-12	1.20-1.70	0.50
18	BH-13	2.30-2.90	0.60
		14.80-30.00	15.20
19	BH-14	2.10-2.80	0.70
		14.20-30.00	15.80
20	BH-15	4.80-11.80	7.00
		13.70-23.00	9.30
		<del>25.50-30.00</del>	<del>4.50</del>
21	BH-16	1.80-9.30	7.50
		14.20-19.50	5.30
		22.50-30.00	7.50
22	BH-17	13.20-15.10	1.90
		17.50-30.00	12.50
23	BH-18	4.10-4.80	0.70
		11.70-14.10	2.40
		20.20-31.00	10.80

STRATUM-3 has been investigated by 4 borehole samples. Test results are given in Tables 2.10 and 2.11.

**Table-2.10 STRATUM-3 particle-size distribution**

Consecutive #	Borehole #	Sampling depth interval, m	Fraction composition, %						
			Rounded cobbles, 200.00-63.00mm	Rounded Gravel, 63.00-2.00mm	Sand			Silt, 0.063-0.002mm	Clay, <0.002mm
					Coarse 2.00-0.600mm	Medium 0.600-0.212mm	Fine, 0.212-0.063mm		
1	BH-B-1	6.0-6.4			14.8	32.4	41.2	7.1	
2	BH-B-3	2,3-2,5			5.4	44.7	15.1	29.1	5.5
3	BH-B-5	5.2-5.6	0.0	0.0	13.9	31.9	42.2	12.0	
4	BH-B-5	7.2-7.6	0.0	0.0	17.7	30.0	42.5	9.8	
5	BH-B-5	11,0-11,4	0.0	0.8	10.7	60.7	8.4	13.3	6.1
6	BH-B-7	4,0-4,5	0.0	0.0	15.9	33.0	43.3	7.8	
7	BH-B-8	7.4-7.8	0.0	10.0	21.2	38.5	21.8	8.5	
8	BH-B-8	9.0-9.3	0.0	11.2	23.7	35.7	19.7	9.7	
9	BH-B-8	11.1-11.4	0.0	8.2	19.3	43.5	19.7	9.3	
10	BH-B-9	6.5-7.0	0.0	0.2	16.9	29.6	41.2	12.1	
11	BH-B-9	10.0-10.3	0.0	0.0	15.6	32.0	41.7	10.7	
12	BH-B-10	11.4-11.7	0.0	0.0	15.8	31.3	41.3	11.6	
13	BH-B-10	20.0-20.4	0.0	0.0	15.9	31.7	41.3	11.1	
14	BH-B-11	6.0-6.4	0.0	0.0	14.0	34.6	40.6	10.8	
15	BH-B-11	11.3-11.8	0.0	0.2	14.1	34.7	38.4	12.6	
16	BH-B-15	6.0-6.3	0.0	0.0	16.0	32.5	40.6	10.9	
17	BH-B-15	11.0-11.3	0.0	0.0	15.0	34.0	41.8	9.2	
18	BH-B-16	29.7-30	0.0	0.0	9.9	35.3	32.7	22.1	
19	BH-B-16	25.4-26.0	0.0	0.0	14.6	29.1	34.4	21.9	
20	BH-B-17	23.7-24.0	0.0	0.0	13.3	32.1	34.3	20.3	
21	BH-B-18	27.7-28.0	0.0	0.4	14.0	33.9	41.9	9.8	
22	BH-U-4	5.0-5.5	0.0	0.0	13.9	31.9	42.2	12.0	
23	BH-B-4a	2.8-3.0	0.0	0.0	14.5	32.6	42.4	9.5	

**Table-2.11. STRATUM-3 physical properties parameter values**

Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content, W%	Plasticity			Liquidity index, I <sub>L</sub>	Density, g/cm <sup>3</sup>			Porosity, n%	Voids ratio, e	Moisture degree, S <sub>z</sub>
				Liquid limit, W <sub>L</sub> %	Plastic limit, W <sub>p</sub> %	Plasticity index, I <sub>p</sub>		Mineral parts, ρ <sub>s</sub>	Natural, ρ	Dry unit weight, ρ <sub>d</sub>			
1	BH-B-3	2,3-2,5	30.5					2.68	1.65	1.26	52.81	1.119	0.730
2	BH-B-5	11,0-11,4	15.3					2.65	1.62	1.40	47.00	0.887	0.459
3	BH-B-5	19,4-19,8	31.2										
4	BH-B-7	4,0-4,5	21.9										
5	BH-B-8	7.4-7.8	22.1										
6	BH-B-8	9.0-9.3	23.0					2.66	1.66	1.35	49.26	0.971	0.630
7	BH-B-8	12.1-12.4	22.5										
8	BH-B-9	10.0-10.3	24.0					2.65	1.64	1.32	50.09	1.004	0.634

Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content, W%	Plasticity			Liquidity index, I <sub>L</sub>	Density, g/cm <sup>3</sup>			Porosity, n%	Voids ratio, e	Moisture degree, S <sub>z</sub>
				Liquid limit, W <sub>L</sub> %	Plastic limit, W <sub>p</sub> %	Plasticity index, I <sub>p</sub>		Mineral parts, ρ <sub>s</sub>	Natural, ρ	Dry unit weight, ρ <sub>d</sub>			
9	BH-B-10	20.0-20.4	26.8					2.66	1.65	1.30	51.08	1.044	0.683
10	BH-B-11	6.0-6.4	25.1										
11	BH-B-11	11.3-11.8	25.5					2.66	1.67	1.33	49.97	0.999	0.679
12	BH-B-15	6.0-6.3	24.7					2.65	1.64	1.32	50.37	1.015	0.645
13	BH-B-15	11.0-11.3	26.0										
14	BH-B-16	29.7-30	27.2										
15	BH-B-16	25.4-26.0	28.1					2.66	1.67	1.30	50.99	1.040	0.718
16	BH-B-17	23.7-24.0	27.5					2.66	1.64	1.29	51.64	1.068	0.685
17	BH-B-18	27.7-28.0	26.0					2.65	1.65	1.31	50.58	1.024	0.673
18	BH-U-4	5.0-5.4	25.5					2.66	1.63	1.30	51.17	1.048	0.647

In STRATUM-3, Standard Penetration Tests were conducted. The results of the tests are given in Table-2.12.

**Table-2.12. Results of Standard Penetration Test (SPT) conducted in STRATUM-3**

No.	Borehole No.	Penetration depth, m	Penetration interval, cm			N=B+C
			A	B	C	
			0-15	15-30	30-45	
1	BH-B-1	6.00-6.45	2	2	3	5
2	BH-B-2	6.00-6.45	2	3	4	7
3	BH-B-3	1.80-2.25	1	1	2	3
4	BH-B-3	4.30-4.75	3	3	2	5
5	BH-B-5	4.00-4.45	1	1	1	2
6	BH-B-5	6.00-6.45	2	3	3	6
7	BH-B-5	12.00-12.45	1	1	2	3
8	BH-B-7	2.80-3.25	4	6	6	12
9	BH-B-7	7.20-7.65	8	10	9	19
10	BH-B-8	5.00-5.45	2	3	2	5
11	BH-B-8	8.00-8.45	2	4	2	6
12	BH-B-8	10.00-10.45	2	3	3	6
13	BH-B-8	12.00-12.45	7	7	9	16
14	BH-B-8	20.00-20.45	2	4	5	9
15	BH-B-8	23.00-23.45	2	4	4	8
16	BH-B-8	25.00-25.45	3	5	6	11
17	BH-B-8	29.70-30.15	4	4	6	10
18	BH-B-9	6.00-6.45	2	4	4	8
19	BH-B-9	7.50-7.95	3	4	5	9
20	BH-B-9	9.00-9.45	4	6	5	11
21	BH-B-9	25.00-25.45	5	8	12	20
22	BH-B-9	27.00-27.45	4	7	10	17
23	BH-B-10	7.00-7.45	3	3	5	8
24	BH-B-10	9.00-9.45	5	5	5	10
25	BH-B-10	10.00-10.45	4	4	5	9

No.	Borehole No.	Penetration depth, m	Penetration interval, cm			N=B+C
			A	B	C	
			0-15	15-30	30-45	
26	BH-B-10	13.00-13.45	3	5	5	10
27	BH-B-10	16.50-16.95	4	7	6	13
28	BH-B-10	19.00-19.45	5	8	8	16
29	BH-B-10	21.00-21.45	7	8	9	17
30	BH-B-10	24.00-24.45	10	14	16	30
31	BH-B-10	32.00-32.45	6	11	14	25
32	BH-B-11	2.00-2.45	1	2	2	4
33	BH-B-11	6.00-6.45	2	2	3	5
34	BH-B-11	9.00-9.45	1	3	5	8
35	BH-B-11	30.00-30.45	5	7	6	13
36	BH-B-11	32.0-32.45	4	6	8	14
37	BH-B-13	18.00-18.45	1	3	4	7
38	BH-B-13	23.00-23.45	2	6	6	12
39	BH-B-13	30.00-30.45	3	5	6	11
40	BH-B-14	15.00-15.45	1	3	3	6
41	BH-B-14	18.00-18.45	2	3	4	7
42	BH-B-14	23.00-23.45	2	4	4	8
43	BH-B-14	27.00-27.45	2	4	3	7
44	BH-B-14	30.00-30.45	2	4	4	8
45	BH-B-15	5.00-5.45	6	10	12	22
46	BH-B-15	8.00-8.45	7	8	14	22
47	BH-B-15	11.00-11.45	6	9	9	18
48	BH-B-15	16.00-16.45	2	2	3	5
49	BH-B-15	20.00-20.45	2	3	3	6
50	BH-B-15	24.00-24.45	4	5	5	10
51	BH-B-15	27.00-27.45	5	5	7	12
52	BH-B-15	30.0-30.45	5	7	6	13
53	BH-B-16	3.00-3.45	4	7	7	14
54	BH-B-16	5.00-5.45	5	10	11	21
55	BH-B-16	8.00-8.45	4	9	12	21
56	BH-B-16	15.00-15.45	2	2	3	5
57	BH-B-16	18.00-18.45	2	2	2	4
58	BH-B-16	23.00-23.45	1	2	2	4
59	BH-B-16	27.00-27.45	2	2	3	5
60	BH-B-16	30.00-30.45	3	2	3	5
61	BH-B-17	14.00-14.45	2	4	4	8
62	BH-B-17	20.00-20.45	2	3	4	6
63	BH-B-17	23.00-23.45	2	3	4	7
64	BH-B-17	30.00	2	2	2	4
65	BH-B-18	12.0-12.45	2	4	4	8

Based on the data from the tables:

- According to GOST Standard, STRATUM-3 is Gray and dark gray, fine, water-saturated sand, with thin bands of gray firm clays.
- According to BS Standard, STRATUM-3 is loose, water-saturated, fine silty SAND with thin bands of soft, gray clay. Based on the  $N=B+C$  result of many SPT tests performed in the strata (see Table 2.12), in 7 cases it is very loose (value  $N$  is from 2 to 4), in 34 cases it is loose (value  $N$  is from 5 to 10), and in 24 cases it is medium dense (value  $N$  is from 11 to 30)). The sand stratum is in water-saturated state, contains thin bands of soft, gray clay, and also contains small amounts of rounded gravel and small cobbles (2-8%).

**STRATUM-4** – Gray, firm clay. Genetically it is alluvial soil (aQ). It is quite wide-spread and is represented as an irregularly-shaped stratum in the ground mass. Stratum-4 is almost never found on the surface and has revealed within 5-25m depth range. The stratum has been crossed in 19 boreholes, among them in 3 boreholes at 2-3 different ranges. Stratum thickness in different places varies within wide range – from 1.20m to 17m. The stratum distribution range, both along the road alignment and in the depth, is graphically shown on the long section of the project structures (see Graphical Part of the report). Distribution of STRATUM-4 by borehole is also given in Table-2.13.

**Table-2.13**      *Depth ranges in the boreholes and stratum thickness for STRATUM-4*

Consecutive #	Borehole #	Stratum depth range in the borehole , m	Stratum thickness, m.
1	BH-B-1	6.60-15.30	8.70
2	BH-B-2	12.90-15.60	2.70
3	BH-U-2	12.10-15.00	2.90
4	BH-U-3	8.00-16.00	8.00
5	BH-U-4	10.20-18.70	8.50
6	BH-B-3	4.80-12.40	7.60
		15.90-20.70	4.80
7	BH-B-4	6.50-23.50	17.00
8	BH-B-5	12.70-16.40	3.70
		20.00-24.20	4.20
9	BH-B-7	12.10-16.50	4.40
10	BH-B-8	14.70-18.80	4.10
11	BH-B-9	11.30-19.50	8.20
12	BH-B-10	25.00-30.00	5.00
13	BH-B-11	13.10-15.50	2.40
		16.60-24.80	8.20
		25.60-27.20	1.60
14	BH-B-11a	11.60-12.40	0.80
		13.20-16.10	2.90
		21.80-26.70	4.90
		28.00-30.00	2.00
15	BH-12	9.50-30.0	20.5
16	BH-15	23.00-30.00	7.00
17	BH-16	14.80-16.00	1.20
		17.60-22.50	4.90
18	BH-17	15.10-17.50	2.40
		28.40-30.00	1.60
19	BH-18	14.10-23.00	8.90
		27.60-31.00	3.40

STRATUM-4 has been investigated by 10 borehole samples. Test results are given in Tables 2.14 and 2.15.

**Table-2.14 STRATUM-4 particle-size distribution**

Consecutive #	Borehole #	Sampling depth interval, m	Fraction composition, %							
			Rounded boulder >200.00mm	Rounded cobbles, 200.00-63.00-mm	Rounded Gravel, 63.00-2.00mm	Sand			Silt, 0.063-0.002mm	Clay, <0.002mm
						Coarse, 2.00-0.600mm	Medium 0.600-0.212mm	Fine, 0.212-0.063mm		
1	BH-B-1	9.4-9.8				0.3	0.3	0.3	66.7	32.2
2	BH-B-2	14.0-14.3				0.5	2.8	6.4	68.8	21.5
3	BH-B-3	8,5-8,8				0.2	0.6	3.6	68.5	27.1
4	BH-B-3	19,1-19,3				0.2	1.4	1.3	71.5	25.6
5	BH-B-4	10,3-10,5				0.2	0.4	0.2	56.5	42.7
6	BH-B-4	21,0-21,4				0.3	0.3	0.7	63.7	34.8
7	BH-B-4A	6.5-6.8				14.5	32.6	42.4	9.5	

**Table-2.15. STRATUM-4 physical properties parameter values**

Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content, W%	Plasticity			Liquidity index, I <sub>L</sub>	Density, g/cm <sup>3</sup>			Porosity, n%	Voids ratio, e	Moisture degree, S <sub>w</sub>
				Liquid limit, W <sub>L</sub> %	Plastic limit, W <sub>p</sub> %	Plasticity index, I <sub>p</sub>		Mineral parts, ρ <sub>s</sub>	Natural, ρ	Dry unit weight, ρ <sub>d</sub>			
1	BH-B-1	9.4-9.8	37.7	51.4	22.6	28.8	0.52	2.74	1.85	1.34	50.97	1.039	0.994
2	BH-B-2	14.0-14.3	27.8	35.4	19.9	15.5	0.51	2.70	1.97	1.54	42.91	0.752	0.999
3	BH-B-3	8,5-8,8	36.6	43.7	24.7	19.0	0.63	2.73	1.8	1.32	51.73	1.072	0.932
4	BH-B-3	19,1-19,3	36.0	40.7	27.2	13.5	0.65	2.71	1.84	1.35	50.08	1.003	0.973
5	BH-B-4	10,3-10,5	44.3	57.5	30.6	26.9	0.51	2.74					
6	BH-B-4	21,0-21,4	44.2	54.9	29.4	25.5	0.58	2.73	1.78	1.23	54.78	1.212	0.996
7	BH-B-4a	6.5-6.8	33.6	40.4	19.9	20.5	0.67						
8	BH-B-4a	19.5-19.8	34.1	41.6	22	19.6	0.62						
9	BH-B-4a	24.4-25.0	33.5	40.5	19.9	20.6	0.66						
10	BH-B-5	15,2-15,6	36.7	44.0	22.6	21.4	0.66	2.73					
11	BH-B-5	22,3-22,7	35.0										
12	BH-B-8	15.4-15.7	32.8	39.8	20.5	19.3	0.64						
13	BH-B-12	15.7-16.0	34.2	40.2	19	21.2	0.72						
14	BH-B-12	20.3-20.5	32.1	38.5	18.8	19.7	0.68						
15	BH-B-12	27.4-27.7	32.4	40	20.7	19.3	0.61						
16	BH-B-15	23.4-24.0	34.1	40.1	20.1	20.0	0.70						
17	BH-B-16	20.2-20.5	32.7	38.4	19.8	18.6	0.69						
18	BH-B-17	29.7-30.0	36.5	45.1	25.6	19.5	0.56						
19	BH-B-18	18.0-19.0	36.1	46.7	23.7	23.0	0.54						
20	BH-B-18	29.7-30.0	34.3	42.4	22	20.4	0.60						



Based on the results of 5 shear test (see Annex 2.2), internal friction angle of STRATUM-4 is  $\varphi=8.2^{\circ}$ ,  $c=7.7\text{KPa}$ .

In STRATUM-4, Standard Penetration Tests were conducted. The results of the tests are given in Table-2.16.

**Table-2.16. Results of Standard Penetration Test (SPT) conducted in STRATUM-4**

No.	Borehole No.	Penetration depth, m	Penetration interval, cm			N=B+C
			A	B	C	
			0-15	15-30	30-45	
1	BH-B-1	8.0-8.45	1	1	1	2
2	BH-B-1	11.0-11.45	1	2	1	3
3	BH-B-1	14.00-14.45	1	1	2	3
4	BH-B-2	13.70-14.15	3	3	4	7
5	BH-B-3	9.00-9.45	1	2	3	5
6	BH-B-3	12.00-12.45	1	2	2	4
7	BH-B-3	16.50-16.95	2	3	2	5
8	BH-B-4	8.00-8.45	1	1	5	6
9	BH-B-4	12.00-12.45	1	2	2	4
10	BH-B-4	14.00-14.45	1	1	2	3
11	BH-B-4	18.00-18.45	1	1	1	2
12	BH-B-5	15.00-15.45	1	1	1	2
13	BH-B-5	23.00-2.45	5	5	7	12
14	BH-B-7	9.60-10.05	2	4	3	7
15	BH-B-8	17.00-17.45	1	1	1	2
16	BH-B-9	12.00-12.45	2	2	3	5
17	BH-B-9	18.00-18.45	2	2	2	4
18	BH-B-10	27.00-27.45	4	6	8	14
19	BH-B-11	14.00-14.45	1	1	1	2
20	BH-B-11	17.00-17.45	1	2	2	3
21	BH-B-11	20.00-20.45	1	1	1	2
22	BH-B-11	26.00-26.45	1	1	2	3
23	BH-15	24.00-24.45	4	5	5	10
24	BH-16	20.00-20.45	1	1	1	2
25	BH-17	16.00-16.50	1	1 blow/35cm	-	1

Based on the data from the tables:

- According to GOST Standard, STRATUM-4 is firm clay.
- According to BS Standard, STRATUM-4 is soft, intermediate plasticity CLAY.

**STRATUM-5** – Firm, dark gray, silty clay, with organic content and occasional thin turf bands and lenses. It is not widely spread, and within the soil mass is represented as irregularly-shaped lense-like bodies. STRATUM-5 is not found on the surface and has revealed after 5-8m depth. The stratum was crossed in only 4 boreholes and its thickness varies from 1.3m to 6.2m. Stratum distribution range both, along the right of way and in depth is graphically shown on the long sections of the project structures (see Graphical Part of the report). STRATUM-5 distribution range by borehole is also given in Table-2.17.

**Table-2.17 Depth ranges in the boreholes and stratum thicknesses for STRATUM-5**

Consecutive #	Borehole #	Stratum depth range in the borehole , m	Stratum thickness, m.
1	BH-B-2	6.70-12.90	6.20
2	BH-B-7	8.40-12.10	3.70

STRATUM-5 has been investigated by 3 borehole samples. Test results are given in Tables 2.18 and 2.19.

**Table-2.18 STRATUM-5 particle-size distribution**

Consecutive #	Borehole #	Sampling depth interval, m	Fraction composition, %							
			Rounded boulder >200.00mm	Rounded cobbles, 200.00-63.00-mm	Rounded Gravel, 63.00-2.00mm	Sand			Silt, 0.063-0.002mm	Clay, <0.002mm
						Coarse, 2.00-0.600mm	Medium 0.600-0.212mm	Fine, 0.212-0.063mm		
1	BH-B-2	7.3-7.6	-	-	-	1.4	0.4	10.5	83.0	4.7

**Table-2.19. STRATUM-5 physical properties parameter values**

Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content, W%	Plasticity			Liquidity index, I <sub>L</sub>	Density, g/cm <sup>3</sup>			Porosity, n%	Voids ratio, e	Moisture degree, S <sub>w</sub>
				Liquid limit, W <sub>L</sub> %	Plastic limit, W <sub>p</sub> %	Plasticity index, I <sub>p</sub>		Mineral parts, ρ <sub>s</sub>	Natural, ρ	Dry unit weight, ρ <sub>d</sub>			
1	BH-B-2	7.3-7.6	29.3	36.6	21.4	15.2	0.52	2.70	1.80	1.39	48.44	0.940	0.842
2	BH-B-2	10.0-10.3	32.5	35.8	23.3	12.5	0.74	2.70	1.83	1.38	48.85	0.955	0.919
3	BH-B-7	14.4-14.8	33.6	39.7	27.0	12.7	0.52	2.70	1.81	1.35	49.82	0.993	0.914
4	BH-B-12	8.0-8.3	33.1	37.5	23.2	14.3	0.69						

Based on the results of 2 shear test (see Annex 2.2), internal friction angle of STRATUM-5 is  $\varphi=11.4^\circ$ ,  $c=3.8\text{KPa}$ .

In STRATUM-5, Standard Penetration Tests were conducted. The results of the tests are given in Table-2.20.

**Table-2.20. Results of Standard Penetration Test (SPT) conducted in STRATUM-5**

No.	Borehole No.	Penetration depth, m	Penetration interval, cm			N=B+C
			A	B	C	
			0-15	15-30	30-45	
1	BH-B-2	8.0-8.45	3	4	3	7
2	BH-B-2	11.80-12.25	2	2	3	5
3	BH-B-3	14.50-14.95	1	3	2	5

Based on the data from the tables:

- According to GOST Standard, STRATUM-5 is firm, silty clay, with organic content and occasional thin turf bands and lenses.
- According to BS Standard, STRATUM-5 is soft, very moist, intermediate plasticity CLAY with organic content and occasional thin turf bands and lenses.

**STRATUM-6** – water-saturated fine and medium-grained gravelly soil, with gray sand and sandy clay, with up to 10% cobbles inclusions. Stratum-6 has revealed only within the first part of Samtredia-Lanchkhuti project road segment, and it starts with 15-23m length. The gravelly soil stratum is of mid- and upper Quaternary age ( $Q_{II}$  or  $Q_{III}$ ) and genetically it is alluvial soil. Its underlayer has not been crossed by boreholes and it distributes deeper than the investigated depth; therefore, its thickness has not been determined, though this thickness exceeds 16 m. STRATUM-6 has revealed in 9 different boreholes. The stratum distribution range, both along the road alignment and in the depth, is graphically shown on the long section of the project road alignment (see Graphical Part of the report). Distribution of STRATUM-6 by borehole, is also given in Table-2.21.

**Table-2.21** Depth ranges in the boreholes and stratum thicknesses for STRATUM-6

Consecutive #	Borehole #	Stratum depth range in the borehole , m	Stratum thickness, m.
1	BH-B-1	15.30-30.00	14.70
2	BH-B-2	15.60-30.00	14.40
3	BH-U-3	16.00-17.40	1.40
4	BH-U-4	18.70-18.90	0.20
5	BH-B-3	21.10-36.30	15.10
6	BH-B-4	26.10-40.00	13.90
7	BH-B-5	24.20-40.00	15.80
		8.70-10.80	2.10
8	BH-B-7	5.80-6.80	1.00
		16.50-37.00	20.5
9	BH-B-10	34.50-40.00	5.50

STRATUM-6 has been investigated by 13 borehole samples. Test results are given in Tables 2.22 and 2.23.

**Table-2.22** STRATUM-6 particle-size distribution

Consecutive #	Borehole #	Sampling depth interval, m	Fraction composition, %						
			Rounded boulder >200.00mm	Rounded cobbles, 200.00-63.00-mm	Rounded Gravel, 63.00-2.00mm	Sand			Clay, <0.002mm
						Coarse, 2.00-0.600mm	Medium 0.600-0.212mm	Fine, 0.212-0.063mm	
1	BH-B-1	16.7-17.0			51.8	11.0	18.6	15.6	3.0
2	BH-B-1	25.0-25.3			51.4	9.6	17.7	14.2	7.1
3	BH-B-2	18.7-19.0			62.5	6.5	8.0	5.1	16.6
4	BH-B-3	31.0-32.0		10.8	49.6	6.8	10.4	12.7	9.7
5	BH-B-4	27.5-29.0		3.4	55.8	11.0	9.2	6.2	9.4
6	BH-B-5	28.0-30.0			53.2	9.6	14.0	5.0	17.7
7	BH-B-5	39.0-40.0			36.5	11.7	19.3	10.7	20.1
8	BH-B-7	20.0-21.0			51.7	11.9	15.0	6.6	13.4
9	BH-B-7	22.0-22.8			57.8	8.0	15.4	8.9	9.9
10	BH-B-7	25.0-26.0			73.3	7.6	7.0	4.1	7.8
11	BH-B-7	29.0-30.0			76.0	6.9	5.9	4.8	6.4
12	BH-B-7	32.0-33.0			75.9	6.5	7.4	4.0	6.2
13	BH-B-7	36.5-37.0			59.7	6.9	16.8	6.9	9.7

**Table-2.23. STRATUM-6 physical properties parameter values**

Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content, W%	Plasticity			Liquidity index, $I_L$	Density, g/cm <sup>3</sup>			Porosity, n%	Voids ratio, e	Moisture degree, $S_z$
				Liquid limit, $W_L$ %	Plastic limit, $W_p$ %	Plasticity index, $I_p$		Mineral parts, $\rho_s$	Natural, $\rho$	Dry unit weight, $\rho_d$			
1	BH-B-1	16.7-17.0	7.4										
2	BH-B-1	25.0-25.3	8.9										
3	BH-B-2	18.7-19.0	6.7	20.5	14.5	6.0	0.20	2.67	1.90	1.64	38.5	0.626	0.670
4	BH-B-5	28.0-30.0	13.2	19.0	13.8	5.2	-0.12	2.67					
5	BH-B-5	39,0-40,0	14.6	19.6	15.3	4.3	-0.16	2.73	1.77	1.54	43.4	0.768	0.519
6	BH-B-7	20,0-21,0	7.3	20.7	14.1	6.6	-1.03	2.67	1.82	1.70	36.5	0.574	0.339
7	BH-B-7	22,0-22,8	3.2						1.66				
8	BH-B-7	25,0-26,0	2.5	19.9	13.4	6.5	-1.67	2.68	1.84	1.79	33.0	0.493	0.138
9	BH-B-7	29,0-30,0	5.3						1.92				
10	BH-B-7	32,0-33,0	5.0						1.89				
11	BH-B-7	36,5-37,0	4.4						1.72				

In STRATUM-6, Standard Penetration Tests were conducted. The results of the tests are given in Table-2. 24.

**Table-2.24. Results of Standard Penetration Test (SPT) conducted in STRATUM-6**

No.	Borehole No.	Penetration depth, m	Penetration interval, cm			N=B+C
			A	B	C	
			0-15	15-30	30-45	
1	BH-B-1	16.00-16.45	15	19	19	38
2	BH-B-1	18.00-18.45	16	20	22	42
3	BH-B-1	20.00-20.30	18	50/11	-	>50
4	BH-B-1	24.00-24.30	43	50/5	-	>50
5	BH-B-1	28.00-28.30	45	50/10	-	>50
6	BH-B-2	17.00-17.45	27	32	30	62
7	BH-B-2	20.00-20.45	34	50/6	-	>50
8	BH-B-2	24.00-24.45	41	48	50/11	>50
9	BH-B-3	21.3-21.75	39	40	42	82
10	BH-B-3	25.00-25.45	45	50/12	-	>50
11	BH-B-3	28.00-28.45	20	24	26	50
12	BH-B-3	31.00-31.45	30	42	50/3	>50
13	BH-B-3	34.00-34.45	21	22	27	49
14	BH-B-4	27.00-27.45	16	17	19	36
15	BH-B-4	32.00-32.45	22	22	25	47
16	BH-B-4	35.00-35.45	28	37	45	82
17	BH-B-4	38.00-38.45	26	28	31	59
18	BH-B-5	28.00-28.45	25	37	45	82
19	BH-B-5	31.00-31.45	29	32	30	62
20	BH-B-5	35.00-35.45	39	50/10	-	>50
21	BH-B-7	18.00-18.45	24	34	37	71
22	BH-B-7	21.00-21.45	32	50/11	-	>50

No.	Borehole No.	Penetration depth, m	Penetration interval, cm			N=B+C
			A	B	C	
			0-15	15-30	30-45	
23	BH-B-7	24.00-24.45	28	30	34	64
24	BH-B-7	29.4-29.15	38	50/7	-	>50
25	BH-B-7	32.00-32.45	29	30	34	64

Based on the data from the tables:

- According to GOST Standard, STRATUM-6 is fine and medium-grained gravelly soil, with gray sand and sandy clay, with up to 10% cobbles inclusions.
- According to BS Standard, STRATUM-6 is densely structured, very sandy, water-saturated slightly cobbly, sub-rounded and rounded, medium-grained GRAVEL, In 5 cases out of 25 standard penetration tests, and it is dense, while in the other 20 cases it is very dense. Gravel sometimes contains up to 4-11% cobbles.

**STRATUM-7** – blackish-brown clay, averagely mixed with turf, with up to 35% organic content. The stratum has formed within alluvial terraces in local ponding mode (lacustrine-boggy mode). It has a very restricted distribution in the soil mass both in depth and by area. It has revealed in only 2 boreholes, as lense-shaped 0.50-0.80 m thick bands. The stratum distribution range, both along the road alignment and in depth, is graphically shown on the long sections of the project structures (see Graphical Part of the report). Distribution of STRATUM-7 by borehole is also given in Table-2.25.

**Table-2.25** Depth ranges in the boreholes and stratum thickness for STRATUM-7

Consecutive #	Borehole #	Stratum depth range in the borehole, m	Stratum thickness, m.
1	BH-B-10	6.00-6.50	0.50
2	BH-B-11	24.80-25.60	0.80
3	BH-12	7.40-9.50	2.10

STRATUM-7 has been investigated by 2 borehole samples. Test results are given in Table 2.26

**Table-2.26. STRATUM-7 physical properties parameter values**

Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content, W%	Plasticity			Liquidity index, I <sub>L</sub>	Density, g/cm <sup>3</sup>			Porosity, n%	Voids ratio, e	Moisture degree, S <sub>w</sub>	Organic content, %
				Liquid limit, W <sub>L</sub> %	Plastic limit, W <sub>p</sub> %	Plasticity index, I <sub>p</sub>		Mineral parts, ρ <sub>s</sub>	Natural, ρ	Dry unit weight, ρ <sub>d</sub>				
1	BH-B-10	6.00-6.30	76.5	40.1	21.6	18.5								34.6
2	BH-B-11	24.80-25.10	80.2	39.2	21.4	17.8								

Based on the data from the table:

- According to GOST Standard, STRATUM-7 is clay, averagely mixed with turf, with up to 35% organic content.
- According to BS Standard, STRATUM-7 is very organic clay with up to 35% organic content.

Table-2.27. Soils classification based on GOST 25100-82 Standard

Group	Sub-group		Geological Index	Soil Stratum No.	Soil stratum description
Sedimentary Incoherent	Fragmental	Silty and clayey	aQ	1	Brown, stiff clay, with occasional gravel inclusions.
			aQ	2	Gray-rustish, firm clay, with fine water-containing sand bands and lenses.
		Sandy	aQ	3	Gray and dark gray, fine, water-saturated sand, with thin bands of gray firm clays
		Silty and clayey	aQ	4	Gray, firm clay
			aQ	5	Firm, dark gray, silty clay, with organic content and occasional thin turf bands and lenses.
		Coarse	aQ	6	Water-saturated fine and medium-grained gravelly soil, with gray sand and sandy clay, with up to 10% cobbles inclusions.
	Biogenic		chQ	7	Blackish-brown clay averagely mixed with turf, with up to 40% organic content.

Table-2.28. Soils classification based on BS Standard

Group	Sub-group	Geological Index	Soil Stratum No.	Soil stratum description
Fine soil	Alluvial	aQ	1	Stiff, brown, slightly moist, intermediate plasticity CLAY, with occasional gravel inclusions.
		aQ	2	Soft, gray-rustish, very moist, intermediate plasticity CLAY, with fine, water-containing sand bands and lenses
Coarse soil		aQ	3	Loose, water-saturated, fine silty SAND with thin bands of soft, gray clay.
Fine soil		aQ	4	Soft, intermediate plasticity CLAY.
		aQ	5	Soft, very moist, intermediate plasticity CLAY with organic content and occasional thin turf bands and lenses.
Coarse soil		aQ	6	Densely structured, very sandy, water-saturated slightly cobbly, sub-rounded and rounded, medium-grained GRAVEL,
Organogenic	Swampy	chQ	7	Very organic clay

Standard values for physical and mechanical properties of the soils revealed within the project road alignment are given in the summary table below (Table 2.29). Standard values of properties are calculated based on the data given in the description of each stratum above. Moreover, some mechanical parameter values of soil strata (including internal friction angle- $\phi^0$  and cohesion-C for STRATUM-3, modulus of deformation- $E_0$  and modulus of elasticity-E for all strata, as well as design strength- $R_0$ ) are defined in accordance with the physical properties parameter values obtained by laboratory testing, in compliance with relevant standard base.

Table-2.29 Standard values for physical-mechanical parameters of soils

Stratum/Bench No.	Soil Description <u>GOST</u> <u>BS</u>	Density, $\rho$ , g/cm <sup>3</sup>	Voids Ratio (Porosity Coefficient), $e$	Liquidity Index, $I_L$	Internal Friction Angle, $\varphi^\circ$	Specific Cohesion, $c$ , kPa	Deformation Modulus $E_D$ , MPa	Elasticity Modulus $E_{EL}$ , MPa	Design Resistance, $R_0$ MPa	Soil Group (as per SNIP-IV-5)
1	Brown, stiff clay, with occasional gravel inclusions.	1.90	0.846	0.37	14.2	39.6	15.8	60	0.15	8 <sup>2</sup>
	Stiff, brown, slightly moist, intermediate plasticity CLAY, with occasional gravel inclusions.									
2	Gray-rustish, firm clay, with fine water-containing sand bands and lenses.	1.79	1.035	0.62	7.4	8.5	7.0	24	0.05	8 <sup>3</sup>
	Soft, gray-rustish, very moist, intermediate plasticity CLAY, with fine, water-containing sand bands and lenses									
3	Gray and dark gray, fine, water-saturated sand, with thin bands of gray firm clays	1.65	1.02	-	26	2	11.0	80	0.1	27 <sup>3</sup>
	Gray and dark gray, water-saturated, fine silty SAND with thin bands of soft, gray clay.									
4	Gray, firm clay	1.85	1.015	0.61	8.2	7.7	7.0	24	0.05	8 <sup>3</sup>
	Soft, gray, intermediate plasticity CLAY									
5	Dark gray, firm, silty clay, with organic content and occasional thin turf bands and lenses.	1.81	0.962	0.62	11.4	3.8	5.0	28	0.03	33 <sup>3</sup>
	Soft, very moist, intermediate plasticity CLAY with organic content and occasional thin turf bands and lenses									



Stratum/Bench No.	Soil Description <u>GOST</u> <u>BS</u>	Density, $\rho$ , g/cm <sup>3</sup>	Voids Ratio (Porosity Coefficient), $e$	Liquidity Index, $I_L$	Internal Friction Angle, $\varphi^\circ$	Specific Cohesion, $C$ , KPa	Deformation Modulus $E_D$ , MPa	Elasticity Modulus $E_{EL}$ , MPa	Design Resistance, $R_0$ MPa	Soil Group (as per SNIP-IV-5)
6	Water-saturated fine and medium-grained gravelly soil, with gray sand and sandy clay, with up to 10% cobbles inclusions.	1.75	-	-	25	10	40	300	0.4	6 <sup>s</sup>
	Densely structured, very sandy, water-saturated slightly cobbly, sub-rounded and rounded, medium-grained GRAVEL,									
7	Blackish-brown clay averagely mixed with turf, with up to 40% organic content.	1.71	-	-	-	-	-	-	-	8 <sup>s</sup>
	Very organic clay									

\*Note: In Stratum-6, liquidity index ( $I_L$ ) has been defined for clayey fill of gravel.

### **3. GEOTECHNICAL CONDITIONS OF SAMTREDIA-GRIGOLETI PROJECT ROAD SAMTREDIA-LANCHKHUTI SEGMENT (PK0-PK300)**

Below are discussed geotechnical conditions of Samtredia-Lanchkhuti segment of Samtredia – Grigoleti project road. The conditions are discussed as per individual segments, which slightly differ from each other by natural environment. Description of soil strata existing within the segments are not repeated in the description of geotechnical conditions of the road alignment, as long as they are given above, in the summary of soil laboratory testing results (Item 2). Here are given the numbers of only those strata which were revealed within this or that segment of the road alignment.

#### **3.1 Road segment from pk0 to pk54**

##### **3.1.1 Relief conditions and geological structure**

The location of the road segment from pk0+00 to pk54+00, in terms of geomorphology, represents the right accumulative terrace I of the river Rioni. The surface of the terrace is flat and is slightly sloped toward south-west. There are trenches, channels or water temporary stream beds which can be seen at shallow depth only (1-2m). Up to the investigated depth, geologically the terrace is structured with the Quaternary alluvial clayey and gravelly sediments. On this segment of the road, 7 boreholes were drilled (BH-B-1, BH-B-2, BH-U-I, BH-U-II, BH-U-III, BH-U-IV and BH-B-3). All the above described soils strata, except Stratum-7, are present within this segment, though existence of thin lenses of Stratum-7 (i. e. very organic clay) too is not excluded in the soils mass of this road segment. Geotechnical profile of the road segment is given in the Graphical Part of the technical report (see Drawing No. GC-1222-7).

##### **3.1.2 Geodynamic conditions**

By visual observation, on this road segment there are no significant geodynamic (physical-geological) events or processes preventing construction or operation of the road. It is only required to regulate surface waters with consideration of micro-relief conditions. There is possibility of flooding at certain areas during high waters, and this issue is subject of hydrological investigation. Within the road line, in the places investigated by boreholes, sometimes existence of swamped areas is not excluded on the ground surface.

##### **3.1.3 Ground waters**

Within road segment, ground waters have revealed in all boreholes, within depth range from 0.90 to 3.50 m. The most abounding in water are sandy and gravelly strata (Stratum-3 and Stratum-6).

#### **3.2 Road segment from pk54 to pk55 (R. Tskhenistskali crossing)**

##### **3.2.1 Relief conditions and geological structure**

Within road segment from pk54 to pk55, the r. Tskhenistskali bed is crossed, where the bridge will be built. Geomorphologically, this segment too represents the r. Rioni accumulation terrace I, in which the r. Tskhenistskali bed is cut to 5-5.5m depth. Lithologically, up to the investigated depth, within the bridge crossing alluvial clayey and gravelly sediment layers have been revealed, including STRATUM-2, STRATUM-3, STRATUM-4 AND STRATUM-6. On this road segment 2 boreholes were drilled (BH-B-3 and BH-B-4). Firm clay (STRATUM-4) and the gravelly soils stratum located in the road bed (STRATUM-6) are the thickest.

Geotechnical profile of the road segment is given in the Graphical Part of the technical report (see Drawing No. GC-1222-3).

### 3.2.2 Geodynamic conditions

By visual observation, on this segment of the road signs of river erosion activity can be seen. Lateral erosion activity is more visible than deep erosion. Therefore, the bridge design should allow for its protection against river erosion. There is possibility of flooding at some areas adjacent to the bridge during high waters. Proximity of the river Rioni should be also taken into account.

### 3.2.3 Ground waters

Ground waters revealed in both boreholes drilled on the bridge crossing, including the left bank of the river (Borehole #BH-B-3). Ground water table was registered at 3.3m depth, while on the right bank (Borehole #BH-B-4) at 4.1m depth. Below the said depth, soils are all water-containing.

## 3.3 Road segment from pk55 to pk91

### 3.3.1 Relief conditions and geological structure

The location of the road segment from pk55 to pk91, in terms of geomorphology, represents the right accumulative terrace I of the river Rioni. The surface of the terrace is flat and slightly sloped toward south-west. Trenches, channels or water temporary stream beds are only observed in the relief at shallow depth (1-2m). Up to the investigated depth, geologically the terrace is structured with the Quaternary alluvial clayey and gravelly sediments. On this segment of the road, 1 borehole was drilled (BH-B-4a). Within this segment soils Stratum-1, Stratum-3 and Stratum-4 are present. Among them Stratum-1 and Stratum-4 repeat at different depth ranges. Geotechnical profile of the road segment is given in the Graphical Part of the technical report (see Drawing No. GC-1222-7).

### 3.3.2 Geodynamic conditions

By visual observation, there are no significant geodynamic (physical-geological) events or processes which might prevent road construction or operation. Only surface waters need to be regulated taking into account the micro-relief conditions. During considerable rise of water in the rivers Rioni and Tskhenistskali, flooding of certain areas is not excluded, which sometimes happens on this territory in such cases.

### 3.3.3 Ground waters

On this road segment ground water is likely to reveal from 1.5-3m depth. In borehole #BH-B-4a, ground water was registered from 2.3m depth, after which the soils are completely water-containing.

## 3.4 Road segment from pk91 to pk100 (R. Rioni crossing)

### 3.4.1 Relief conditions and geological structure

The location of the road segment from pk91 to pk100, in terms of geomorphology, represents the current river-bed cut down at 6m depth into the right accumulative terrace I of the river Rioni, and cut down to 3-3.5 m depth former river beds. The river bed and former river-beds form a broken profile

along the route. On this segment of the route, within bridge crossing, 2 boreholes were drilled (BH-B-5 and BH-B-7). To the investigated depth (37-40m) within the bridge crossing, lithologically alluvial sediments strata have been revealed, including STRATUM-2, STRATUM-3, STRATUM-4 and STRATUM-6. Lithological column is represented by alternation of sandy and gravelly sediments strata. Among the said strata, STRATUM-3, STRATUM-4 and STRATUM-6 repeat at different depth ranges. In the overall mass, sandy and gravelly soils are more than clayey soils. The lower part of the lithology is completely represented by gravelly soil (STRATUM-6), the investigated depth of which is 16-21 meters and the bedrock of which has not been investigated (that is, it spreads even deeper than the investigated depth).

Geotechnical profile of the road segment is given in the Graphical Part of the technical report (see Drawing # GC-1222-4 and Drawing # GC-1222-7).

### 3.4.2 Geodynamic conditions

By visual observation, on this segment of the road signs of river erosion activity can be seen. Lateral erosion activity is more visible than deep erosion. Therefore, the bridge design, should allow for its protection against river erosion. There is possibility of flooding at some areas adjacent to the bridge during floods.

### 3.4.3 Ground waters

Ground water revealed in both boreholes drilled on the bridge crossing. Among them, on the left bank (Borehole #BH-B-3) ground water table registered at 2.12 (BH-B-5) and 1.35 (BH-B-7) m depth. Below the said depths, soils are completely water-containing.

## 3.5 Road segment from pk100 to pk300

### 3.5.1 Relief conditions and geological structure

The location of the road segment from pk100 to pk300, in terms of geomorphology, also represents accumulative terrace I of the river Rioni. The surface of the terrace is flat, with numerous artificial and natural uneven forms like trenches and mounds. The most significant depressions are those of the bends, artificial canals and other trenches of the existing and former river beds of the Rioni. Among them on the segments of the bends of the Rioni former river bed from pk 116 to pk119 and from pk134 to pk138, bridge crossings will be arranged. From km138 to the end of the segment, i. e. to pk305, the surface of the route is dissected by a thick net of 1-3m deep artificial canals, also by the beds of other artificial trenches and small rivers. In many places of the terrace surface, depressions are observed with pools or vegetation characteristic of swamping. On the segment from pk100 to pk300 of the road 12 boreholes were drilled. Up to the investigated depth (31-40m) alluvial sediments strata have been revealed in the route line, including STRATUM-1, STRATUM-2, STRATUM-3, STRATUM-4, STRATUM-6 and STRATUM-7. Lithology is represented by alternation of clayey, sandy and gravelly sediments. Among the said strata, STRATUM-3 (sand) and STRATUM-4 (firm clay) repeats at different depth intervals, and mostly these two strata represent the majority of the lithology.

Geotechnical profiles of the road segment from pk100- to pk300 and the bridge crossings are given in the Graphical Part of the technical report (see Drawings #GC-1222-5, #GC-1222-6, and #GC-1222-7).

### 3.5.2 Geodynamic conditions

By visual observation, there are no significant geodynamic (physical-geological) events or processes which might prevent road construction or operation. Only surface waters need to be regulated taking

into account the micro-relief conditions. Actions against bank erosion and slightly expressed deep erosion within relatively deep channels and natural small river-beds should be envisaged. At drilling points there were no silty soils found or high-plasticity soils resulting from swamping of the area, though within the depressions or flooded areas on the route surface, sometimes their existence is not excluded. Such soils should be cut off and removed from the roadway embankment arrangement area.

### 3.5.3 Ground waters

In both boreholes drilled on the road segment, ground waters revealed from 0.5-3.60 m depth below the ground surface. Below the established water table, soils are completely water-containing.

## 4. SOILS AND GROUND WATERS CHEMICAL CONTENT AND AGGRESSIVENESS

In order to determine aggressiveness against the concretes of the structural steel, borehole samples of ground waters were chemically analyzed. In accordance with the order, content of sulphates ( $\text{SO}_3^-$ ), chloride ( $\text{Cl}^-$ ), magnesium ( $\text{Mg}^+$ ) and ammonium ( $\text{NH}_4^+$ ), as well as hydrogen ion value (pH), was determined in the ground water. Based on 19 soils analyses and 12 ground waters analyses, the results of which are given in Annex-2.2, there is no sulphate component found, therefore the environment is not sulphate-aggressive. According to chloride content, ground waters are aggressive against concrete reinforcement during its temporary submersion into water, while it is not aggressive during its permanent presence in water (i. e. below the ground water level).

The value of hydrogen ion content (pH) according to the analyzed samples, is within 7, therefore, it can be said that ground waters are neutral in this respect.

Based on the ground waters content, their aggressiveness has been defined in accordance with construction norm 2.03.11-85 (“Corrosion Protection of Building Structures”).

## 5. CONCLUSIONS AND RECOMMENDATIONS

1. In terms of geomorphology, the project road is located in the transition line between Colkhis alluvial plain and the North Kolkheti piedmont upland-undulating zone. It represents the plain of the river Rioni right and left terraces with ravine courses, channels and other unevennesses cut into it at 1-5 m depth;
2. By climate conditions, the region including the project area is attributed to IIb subdistrict, based on the Georgian Climatological Norm (PN 01.05-08);
3. In terms of geological structure, up to the investigated depth, the area is represented by the Quaternary alluvial (aQ) gravelly, sandy, silty and clayey soils among which gravelly soils are represented in the largest quantity (mass) among the above mentioned soils. In depth they are sometimes represented as several strata alternating with each other. Gravelly soils mostly revealed in the lower horizons of the route line lithology. Hard rocks have not been found anywhere with the investigated depth;
4. As a result of the field and laboratory testing, 7 varieties of quaternary (nonrocky) soils (strata) have been revealed within the road alignment. The composition of lithological varieties, their state and properties of the soil were studied using selected samples from the boreholes. The subgrade of the road-bed on the segment from pk0 to pk142 will be stiff and firm clays as well as sands (STRATUM-1, STRATUM-2, and STRATUM-3, while on the segment from pk142 to pk305, with rare exceptions, subgrade of the road-bed will be STRATUM-1, i. e. stiff clay. For design calculations of structures, those parameter values of the soil strata should be used, which are given in Table 2.29;
5. In geodynamic terms, by visual examination, ongoing erosion processes can be seen in the road construction line at the river Rioni tributaries and on the banks of the Rioni river. Currently this erosion is not active, although at certain stages, in case of change in the river hydrological regime, there is a possibility that both deep and lateral erosion processes may activate to some extent. Since the terrace of the Rioni river, within the river-bed adjacent zone is not high, depression of the tributaries riverbeds is not more than 2-3 m, possible flooding at certain areas is not excluded during high water periods. Therefore, it will be necessary to protect the road bed and access to bridge embankments against expected erosion events;
6. In terms of hydrogeology, along the whole route soils are water-containing. Among them, greater water content is in alluvial sandy and gravelly soils (strata 3 and 6). Smaller water content is in the clayey varieties of soils. Ground water level has been registered within 0.5-3.6 m depth range. Below the established ground water table, soils are completely water-containing;
7. For arrangement of the road bed embankments, the 20-50 cm thick soil stratum with organic content should be used which overcovers the described strata on most segments of the project road alignment. It should be cut off and removed from the road bed location. The soils of the embankment having formed at different times and loose soils should be removed from the road-bed location. Before being used in any of the soil embankments, optimal moisture content of its maximum density and necessary technical measures for its compaction should be determined additionally;
8. Based on the soils chemical analyses, soils and ground waters do not show sulphate aggressiveness against concretes. According to hydrogen ion property (pH), the environment is neutral, and according to chlorides content, ground waters are aggressive against concrete reinforcement in case of periodical submersion into water, and it is not aggressive during

permanent presence in water. The value of hydrogen ion content (pH) according to the analyzed samples, is within 7, therefore, it can be said that ground waters are neutral in this respect.

9. Based on the normative document currently effective in Georgia – PN 01.01-09 -”Antiseismic Construction”, Samtredia-Lanchkhuti segment of the project road is situated in the seismic zone of intensity 7 by MSK64 scale, with maximum horizontal acceleration value (nonmetric seismic coefficient – A) 0.12.

## ANNEXES

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<b>START DATE:</b> 02.06.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108	<b>BOREHOLE No. BH-B-1</b>
<b>END DATE:</b> 08.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0279809.0</b> Y(m): <b>4669287.00</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm		
0							Ground surface	
	0.3						Dark brown, firm CLAY with plant roots - TOPSOIL	
1.0		1.2-1.4	U	1	2	1		
2.0							Slightly moist, brown, firm CLAY with rust spots and plant roots (aQ Quaternary System. Alluvial deposits)	
3.0				2	1	1		
3.7		3.4-3.65	U					
4.0							Very moist, grayish-brown with rust spots, soft CLAY with very moist, fine grained, gray sand interlayers and lenses (aQ Quaternary System. Alluvial deposits)	
5.0	5.2							
6.0		6.0-6.4	U	2	2	3	Saturated, dark gray, fine grained SAND with soft, thin clay lenses (aQ Quaternary System. Alluvial deposits)	
6.6								
7.0		7.6-8.0	U	1	1	1		
8.0								
9.0		9.4-9.8	U					
10.0								
11.0				1	2	1	Moist, dark gray, soft CLAY rarely with thin sand lenses (aQ - Quaternary System. Alluvial deposits)	
12.0	12.0							
13.0		13.0-13.4	U					
14.0				1	1	2		
15.0								

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> 3.05	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 02.06.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108	<b>BOREHOLE No. BH-B-1</b>
<b>END DATE:</b> 08.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0279809.0</b> Y(m): <b>4669287.00</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm		
15.0	15.3						Moist, dark gray, soft CLAY rarely with thin sand lenses (aQ - Quarternary System. Alluvial deposits)	
16.0				15	19	19		
17.0		16.7-17.0	D					
18.0				16	20	22		
19.0		19.0-19.25	D					
20.0				18	$\frac{50}{11}$			
21.0								
22.0								
23.0		22.7-23.0	D					
24.0				43	$\frac{50}{5}$		Saturated, dense, rounded GRAVEL with fine grained sand matrix (aQ - Quarternary System. Alluvial deposits)	
25.0		25.0-25.3	D					
26.0								
27.0		26.7-27.0	D					
28.0				45	$\frac{50}{10}$			
29.0								
30.0	30.0							

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> 3.05	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 07.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 112	<b>BOREHOLE No. BH-B-2</b>
<b>END DATE:</b> 10.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> M. Duluzauri	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0279665.0</b> Y(m): <b>4669231.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm		
0							Ground surface	
0.5							Dark brown, firm CLAY with plant roots - TOPSOIL	
1.0		1.2-1.5	U					
2.0		2.3-2.6	U	2	3	2	Slightly moist, brown with rust spots, firm CLAY (aQ - Quarternary System. Alluvial deposits)	
3.0	2.9						Saturated, dark gray, fine grained SAND with thin clay lenses (aQ - Quarternary System. Alluvial deposits)	
3.7							Dark gray, soft CLAY with thin sand lenses (aQ - Quarternary System. Alluvial deposits)	
4.0	4.35			3	2	2		
4.6							Saturated, dark gray, fine grained SAND (aQ - Quarternary System. Alluvial deposits)	
5.0		5.25-5.5	U				Gray, soft CLAY (aQ - Quarternary System. Alluvial deposits )	
6.0				2	3	4	Saturated, gray-brownish, fine grained SAND (aQ - Quarternary System. Alluvial deposits)	
6.7								
7.0		7.3-7.6	U					
8.0				3	4	3		
9.0								
10.0		10.0-10.3	U				Very moist, soft, organic, slightly sandy, intermediately plastic silty CLAY (from 8.70m to 8.78mm peat layer can be observed) aQ - Quarternary System. Alluvial deposits	
11.0								
12.0		12.1-12.2	U	2	2	3		
12.9								
13.0								
14.0		14.0-14.3	U	3	3	4	Gray, soft CLAY (aQ - Quarternary System. Alluvial deposits)	
15.0								

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> 5.16	<b>Logged By:</b> T. Danelia
GeoEngineering Ltd	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 07.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 112	<b>BOREHOLE No. BH-B-2</b>
<b>END DATE:</b> 10.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> M. Duluzauri	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0279665.0</b> Y(m): <b>4669231.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm		
15.0	15.6						Gray, soft CLAY (aQ - Quarternary System. Alluvial deposits)	
16.0								
17.0				27	32	30		
18.0								
19.0	18.7-19.0		D					
20.0				34	$\frac{50}{6}$			
21.0								
22.0								
23.0	23.0						Saturated, dense, rounded GRAVEL with fine grained sand matrix (aQ - Quarternary System. Alluvial deposits)	
24.0				41	48	$\frac{50}{11}$		
25.0								
26.0								
27.0	27.0							
28.0								
29.0								
30.0								

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> 5.16	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 09.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 112	<b>BOREHOLE No. BH-B-3</b>
<b>END DATE:</b> 17.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Bridge crossing over the river Tskhenistskali; the left bank	<b>COORDINATES:</b> X(m): <b>38T 0276429.0</b> Y(m): <b>4667479.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.6	0.6							Slightly moist, brown, soft, silty SAND with plant roots - TOPSOIL	
1.0	1.0							Gray, soft CLAY	
2.0		2.3-2.5	D	1	1	2		Moist up to 3.3 m and saturated at the lower part, gray, fine grained SAND (aQ - Quarternary System. Alluvial deposits)	
3.0									
4.0		4.5-4.7	D	3	3	2		Moist, dark gray, soft, slightly sandy CLAY with organic content, with thin peat interlayers at some places (9.9-1.0m) aQ - Quarternary System. Alluvial deposits	
4.8	4.8	5.1-5.3	U						
5.0									
6.0									
7.0								Moist, dark gray, soft, slightly sandy CLAY with organic content, with thin peat interlayers at some places (9.9-1.0m) aQ - Quarternary System. Alluvial deposits	
8.0		8.5-8.8	U						
9.0				1	2	3			
10.0									
11.0		11.3-11.5	U					Very moist, dark gray, soft, slightly sandy, intermediately plastic silty CLAY with dark gray, thin clay interlayers (aQ - Quarternary System. Alluvial deposits)	
12.0	12.4			1	2	2			
13.0									
14.0									
15.0		14.8-15.0	D	1	3	2			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> Level I - 3.30, Level II - 11.5, Level III - 0.97	<b>Logged By:</b> Sh. Lomidze
GeoEngineering Ltd	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
		Page 1 / 3

<b>START DATE:</b> 09.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 112	<b>BOREHOLE No. BH-B-3</b>
<b>END DATE:</b> 17.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Bridge crossing over the river Tskhenistskali; the left bank	<b>COORDINATES:</b> X(m): <b>38T 0276429.0</b> Y(m): <b>4667479.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0	15.9	17.4-17.6	U	2	3	2		Very moist, dark gray, soft, slightly sandy, intermediately plastic silty CLAY with dark gray, thin clay interlayers (aQ - Quarternary System. Alluvial deposits)	
16.0									
17.0									
18.0	20.7	19.1-19.3	U					Dark gray, soft CLAY - (aQ - Quarternary System. Alluvial deposits)	
19.0									
20.0									
21.0	21.1			38	40	42		Saturated, gray, fine grained SAND (aQ - Quarternary System. Alluvial deposits)	
22.0									
23.0									
24.0				45	50	12		Saturated, dark gray, dense, rounded GRAVEL with fine grained sand matrix and up to 10% cobbles inclusions (aQ - Quarternary System. Alluvial deposits)	
25.0									
26.0									
27.0		27.0-28.5	D	20	24	26			
28.0									
29.0									
30.0									




<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> Level I - 3.30, Level II - 11.5, Level III - 0.97	<b>Logged By:</b> Sh. Lomidze
GeoEngineering Ltd	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 09.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 112	<b>BOREHOLE No. BH-B-3</b>
<b>END DATE:</b> 17.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Bridge crossing over the river Tskhenistskali; the left bank	<b>COORDINATES:</b> X(m): <b>38T 0276429.0</b> Y(m): <b>4667479.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
30.0									
31.0		31.0-32.0	D	30	42	$\frac{50}{3}$			
32.0									
33.0									
34.0				21	22	27			
35.0									
36.0	36.3	35.7-36.0	D						
37.0									
38.0									
39.0									
40.0									
41.0									
42.0									
43.0									
44.0									
45.0									

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> Level I - 3.30, Level II - 11.5, Level III - 0.97	<b>Logged By:</b> Sh. Lomidze
GeoEngineering Ltd	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 12.06.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108	<b>BOREHOLE No. BH-B-4</b>
<b>END DATE:</b> 17.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> M.Duluzauri	<b>LOCATION:</b> Village Marani; close to the edge of the river Tskhenistskali	<b>COORDINATES:</b> <b>X(m): 38T 0276328.0</b> <b>Y(m): 4667445.0</b> <b>Z(m):</b>

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.4								Moist, brown, firm, slightly gravelly CLAY with up to 5% cobbles inclusions and plant roots - TOPSOIL	
1.0		1.2-1.5	U	2	2	4			
2.0	2.5								
3.0				1	1	1			
3.7		3.2-3.6	U					Dark gray, soft CLAY with thin silty sand interlayers and lenses (aQ - Quarternary System. Alluvial deposits)	
4.0									
5.0				4	4	5			
5.4		5.4-5.6	U						
6.0	6.5								
7.0		7.0-7.3	U						
8.0				1	1	5			
9.0									
10.0		10.3-10.5	U						
11.0								Blackish-gray, soft CLAY (aQ - Quarternary System. Alluvial deposits)	
12.0				1	2	2			
13.0									
14.0				1	1	2			
15.0									

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 6.5</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 12.06.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108	<b>BOREHOLE No. BH-B-4</b>
<b>END DATE:</b> 17.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> M. Duluzauri	<b>LOCATION:</b> Village Marani; close to the edge of the river Tskhenistskali	<b>COORDINATES:</b> X(m): <b>38T 0276328.0</b> Y(m): <b>4667445.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0									
16.0									
17.0		17.3-17.6	U					Blackish-gray, soft CLAY (aQ - Quarternary System. Alluvial deposits)	
18.0				1	1	1			
19.0	19.2								
20.0		19.6-20.0	D	1	2	2		Saturated, dark gray, dense, rounded GRAVEL with fine grained sand matrix and up to 10% cobbles inclusions and 10cm thickness peat layer (aQ - Quarternary System. Alluvial deposits)	
21.0	20.5								
22.0		21.0-21.3	U						
23.0								Very moist, dark gray, soft, slightly sandy CLAY with thin sand interlayers and lenses (aQ - Quarternary System. Alluvial deposits)	
24.0	23.5								
25.0				2	2	3		Saturated, dark gray, slightly gravelly (inclusions are up to 10%), SAND of different grain sizes, with thin clay lenses at some places (aQ - Quarternary System. Alluvial deposits)	
26.0	26.1	25.8-26.0	U						
27.0				16	17	19			
28.0		27.0-29.0	D					Saturated, gray, rounded GRAVEL with dark gray sand matrix (aQ - Quarternary System. Alluvial deposits)	
29.0									
30.0				18	23	40			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> 6.5	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 12.06.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108	<b>BOREHOLE No. BH-B-4</b>
<b>END DATE:</b> 17.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> M. Duluzauri	<b>LOCATION:</b> Village Marani; close to the edge of the river Tskhenistskali	<b>COORDINATES:</b> X(m): <b>38T 0276328.0</b> Y(m): <b>4667445.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
30.0									
31.0									
32.0		32.0-32.5	D	22	22	25			
33.0									
34.0									
35.0				28	37	45		Saturated, gray, rounded GRAVEL with dark gray sand matrix (aQ - Quarternary System. Alluvial deposits)	
36.0									
37.0		36.5-37.0	D						
38.0				26	28	31			
39.0									
40.0	40.0	39.5-40.0	D						
41.0									
42.0									
43.0									
44.0									
45.0									

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m :</b> 6.5	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 03.08.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-4a</b>
<b>END DATE:</b> 04.08.2012	<b>LOCATION:</b> Abasha Region, Village The First May	<b>COORDINATES:</b> X(m): <b>38T 0275302.0</b> Y(m): <b>4667004.0</b> Z(m):
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze		

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
1.0	0.6	0.8-1.0	U	4	6	6		Brown, stiff, intermediately plastic CLAY with up to 20% gravel inclusions and plant roots	
2.0	1.9							Brown with rust spots, stiff CLAY	
3.0	3.2	2.3 2.2-2.6	W D					Saturated, dark gray, medium dense, fine grained SAND with thin clay layers and lenses	
4.0		2.8-3.0	D						
5.0				1	2	2	13.1-6.2 17.2-8.1 22.0-12.9	Dark gray, soft CLAY (PP 0.6-0.7-1.0-1.5 kg/cm <sup>2</sup> )	
6.0		5.6-5.9	U						
7.0	7.0	6.5-6.8 7.0-7.4	U U						
8.0				6	6	7		Greenish-gray, firm CLAY (PP 2.8-2.5 kg/cm <sup>2</sup> )	
9.0		8.4-8.7	U						
10.0	10.2								
11.0							17.2-9.3		
12.0		12.0-12.14	U	1	2	1	12.6-6.8 13.9-8.3	Gray, soft CLAY (PP 0.3-0.5 kg/cm <sup>2</sup> )	
13.0									
14.0							12.3-6.2 15.2-7.0		
15.0							16.2-8.2		

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.3</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 03.08.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-4a</b>
<b>END DATE:</b> 04.08.2012	<b>LOCATION:</b> Abasha Region, Village The First May	<b>COORDINATES:</b> X(m): <b>38T 0275302.0</b> Y(m): <b>4667004.0</b> Z(m):
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze		

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0									
16.0									
17.0									
18.0				1	2	2	14.3-6.8		
19.0		18.6-19.0	U						
19.5	19.5	19.5-19.8	U						
20.0									
21.0									
22.0							14.7-8.3		
23.0				1	2	2		Gray, soft CLAY (PP 0.3-0.5 kg/cm <sup>2</sup> )	
24.0									
25.0		24.4-25.0	U				14.1-6.0		
26.0									
27.0									
28.0							13.2-5.0		
29.0									
30.0	30.0	29.4-30.0	U	1	2	2			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.3</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 20.06.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108	<b>BOREHOLE No. BH-B-5</b>
<b>END DATE:</b> 27.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> M.Duluzauri	<b>LOCATION:</b> Abasha, Village The First May, edge of the river Rioni	<b>COORDINATES:</b> <b>X(m): 38T 0273080.0</b> <b>Y(m): 4665840.0</b> <b>Z(m):</b>

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.6								Slightly moist, dark brown, firm CLAY with plant roots - TOPSOIL	
2.0		2.0	U	1	2	1		Gray with rust color, soft CLAY with very moist, fine grained, gray sand layers and lenses (aQ Quaternary System. Alluvial deposits)	
3.0		3.0-3.35	U						
4.1				1	1	1			
5.2		5.2-5.6	U	2	3	3		Saturated, dark gray, fine grained SAND with very thin clay layers and lenses (aQ Quaternary System. Alluvial deposits)	
7.2		7.2-7.6	U						
8.7		8.8-9.0	D	12	18	18		Saturated, gray, rounded GRAVEL with medium grained sand matrix (aQ - Quaternary System. Alluvial deposits)	
10.8		11.0-11.4	D						
12.0				1	1	2		Saturated, blackish-dark gray, fine grained SAND (aQ Quaternary System. Alluvial deposits)	
12.7									
13.0								Dark gray, soft CLAY occasionally with peat lenses (aQ Quaternary System. Alluvial deposits)	
15.0				1	1	1			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.12</b>	<b>Logged By:</b> T. Danelia
GeoEngineering Ltd	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 20.06.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108	<b>BOREHOLE No. BH-B-5</b>
<b>END DATE:</b> 27.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> M. Duluzauri	<b>LOCATION:</b> Abasha, Village The First May, edge of the river Rioni	<b>COORDINATES:</b> X(m): <b>38T 0273080.0</b> Y(m): <b>4665840.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0	16.4	15.2-15.6	D					Dark gray, soft CLAY occasionally with peat lenses (aQ Quaternary System. Alluvial deposits)	
16.0									
17.0									
18.0									
19.0	20.0	19.4-19.8	D					Saturated, dark gray, fine grained SAND with soft, thin clay layers and lenses (aQ Quaternary System. Alluvial deposits)	
20.0				2	2	3			
21.0									
22.0									
23.0	24.2	22.3-22.7	U					Dark gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
24.0				5	5	7			
25.0									
26.0									
27.0	28.0	24.5-25.0	D						
28.0				25	37	45		Saturated, dense, rounded GRAVEL with gray, silty sand matrix (aQ - Quaternary System. Alluvial deposits)	
29.0									
30.0		28.0-30.0	D						

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.12</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 20.06.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108	<b>BOREHOLE No. BH-B-5</b>
<b>END DATE:</b> 27.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> M. Duluzauri	<b>LOCATION:</b> Abasha, Village The First May, edge of the river Rioni	<b>COORDINATES:</b> X(m): <b>38T 0273080.0</b> Y(m): <b>4665840.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
30.0									
31.0				29	32	30			
32.0									
33.0									
34.0									
35.0				39	50 10			Saturated, dense, rounded GRAVEL with gray, silty sand matrix (aQ - Quarternary System. Alluvial deposits)	
36.0									
37.0									
38.0									
39.0									
40.0	40.0	39.0-40.0	D						
41.0									
42.0									
43.0									
44.0									
45.0									

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m : 2.12</b>	<b>Logged By:</b> T. Danelia
GeoEngineering Ltd	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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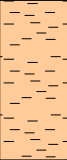

<b>START DATE:</b> 20.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132	<b>BOREHOLE No. BH-B-7</b>
<b>END DATE:</b> 27.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0272524.0</b> Y(m): <b>4665447.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.8								Dark brown, firm CLAY with plant roots - TOPSOIL	
1.0		1.3-1.5	D						
2.0									
3.0				4	6	6		Very moist up to 1.35m and saturated at the lower part, brown, fine and medium grained SAND with up to 5% gravel inclusions (aQ Quarternary System. Alluvial deposits)	
4.0		4.0-4.5	D						
5.0									
5.8				12	22	24			
6.0		5.9-6.8	D					Saturated, gray, rounded GRAVEL with medium grained sand matrix, with some cobbles inclusions (up to 10%) (aQ - Quarternary System. Alluvial deposits)	
6.8				8	10	9			
7.0		7.6-8.0	U					Saturated, gray, medium grained SAND with up to 10% gravel inclusions (aQ Quarternary System. Alluvial deposits)	
7.5									
8.0		9.0-9.3	U					Dark gray, soft CLAY (aQ Quarternary System. Alluvial deposits)	
8.4				2	4	3		Saturated, gray, medium grained SAND with up to 10% some cobbles and gravel inclusions (aQ Quarternary System. Alluvial deposits)	
9.0									
10.0									
11.0		11.4-11.8	U					Very moist, dark gray, soft, slightly sandy, intermediately plastic silty CLAY with organic content, with thin peat layers and lenses (aQ - Quarternary System. Alluvial deposits)	
12.0	12.1								
13.0									
14.0		14.1-14.5	U					Dark gray, soft CLAY (aQ Quarternary System. Alluvial deposits)	
15.0									

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> Level I - 1.35, Level II - 17.3	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 20.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132	<b>BOREHOLE No. BH-B-7</b>
<b>END DATE:</b> 27.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0272524</b> Y(m): <b>4665447</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0								Dark gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
16.0	16.5								
17.0	17.3	17.3-18.0	D						
18.0				24	34	37			
19.0									
20.0		20.0-21.0	D						
21.0				32	50 11				
22.0		22.0-22.8	D						
23.0								Saturated, dense, rounded GRAVEL with up to 10% cobbles inclusions and with dark gray sand matrix (aQ - Quaternary System. Alluvial deposits)	
24.0				28	30	34			
25.0		25.0-26.0	D						
26.0									
27.0									
28.0									
29.0		29.0-30.0	D						
30.0				38	50 7				

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> Level I - 1.35, Level II - 17.3	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 20.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132	<b>BOREHOLE No. BH-B-7</b>
<b>END DATE:</b> 27.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0272524</b> Y(m): <b>4665447</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
30.0									
31.0									
32.0				29	30	34			
33.0		32.0-33.0	D					Saturated, dense, rounded GRAVEL with up to 10% cobbles inclusions and with dark gray sand matrix (aQ - Quarternary System. Alluvial deposits)	
34.0									
35.0									
36.0									
37.0	37.0	36.5-37.0	D						
38.0									
39.0									
40.0									
41.0									
42.0									
43.0									
44.0									
45.0									



<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m :</b> Level I - 1.35, Level II - 17.3	<b>Logged By:</b> T. Danelia
GeoEngineering Ltd	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 05.07.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 113	<b>BOREHOLE No. BH-B-8</b>
<b>END DATE:</b> 10.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Village Japana	<b>COORDINATES:</b> X(m): <b>38T 0270860.0</b> Y(m): <b>4664737.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.6								Slightly moist, dark brown, firm CLAY with plant roots - TOPSOIL	
1.0									
2.0		2.2-2.4	U						
3.0				2	2	3		Slightly moist, brown with rust and grayish spots, firm CLAY with individual large plant roots inclusions (aQ Quaternary System. Alluvial deposits)	
4.0									
5.0		4.8-5.0	U						
5.7		5.0	U						
6.0				2	3	2			
7.0									
8.0		7.4-7.8	U	2	4	2			
9.0									
10.0		9.0-9.3	U						
11.0				2	3	3		Saturated, gray and dark gray SAND with up to 5% fine and medium grained gravel inclusions, and with thin clay layers (aQ Quaternary System. Alluvial deposits)	
12.0									
12.1		12.1-12.4	U	7	7	9			
13.0									
14.0									
14.7									
15.0				1	1	2	12,3-2.1		

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 5.4</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 05.07.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 113	<b>BOREHOLE No. BH-B-8</b>
<b>END DATE:</b> 10.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Village Japana	<b>COORDINATES:</b> X(m): <b>38T 0270860.0</b> Y(m): <b>4664737.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0	18.8	15.4-15.7	U				12.7-2.0	Dark gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
16.0							13.7-3.1		
							13.1-2.7		
17.0				1	1	1	12.3-2.2		
		17.7-18.0	U				14.1-2.3		
18.0									
19.0									
20.0		20.5-20.8	U	2	4	5			
21.0									
22.0									
23.0				2	4	4		Saturated, dark gray, fine and medium grained SAND with up to 10% medium grained gravel inclusions (aQ Quaternary System. Alluvial deposits)	
24.0									
25.0				3	5	6			
26.0									
27.0									
28.0									
29.0									
30.0		29.7-30.0	U	4	4	6			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 5.4</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 04.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-9</b>
<b>END DATE:</b> 07.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0270363.0</b> Y(m): <b>4664619.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.3								Light brown with rust mottles, firm CLAY with plant roots - TOPSOIL	
1.0								Brown, firm CLAY (aQ Quaternary System. Alluvial deposits)	
2.0									
3.0				1	3	3		Gray, soft CLAY with thin, fine grained sand layers (aQ Quaternary System. Alluvial deposits)	
4.0		3.6-4.0	U	2	3	4			
5.0									
6.0		6.0	U	2	4	4			
7.0		6.5-7.0	U	3	4	5		Saturated, gray, slightly gravelly, fine grained SAND with up to 2-3% cobbles inclusions (aQ Quaternary System. Alluvial deposits)	
8.0				4	6	5			
9.0									
10.0		10.0-10.3	U						
11.0									
11.3									
12.0		11.8-12.0	U	2	2	3		Dark gray, soft CLAY rarely with silty sand layers (aQ Quaternary System. Alluvial deposits)	
13.0									
14.0									
15.0		14.7-15.0	U	2	3	3			






<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.0</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 04.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-9</b>
<b>END DATE:</b> 07.07.2012	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0270363.0</b> Y(m): <b>4664619.0</b> Z(m):
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze		

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0									
16.0									
17.0									
18.0		17.6-17.8	U	2	2	2		Dark gray, soft CLAY rarely with silty sand layers (aQ Quaternary System. Alluvial deposits)	
19.0									
19.5									
20.0				4	6	10			
21.0									
22.0									
23.0		23.7-24.0	U	3	7	8			
24.0									
25.0				5	8	12		Saturated, dark gray, slightly gravelly, fine grained SAND with up to 5% cobbles inclusions (aQ Quaternary System. Alluvial deposits)	
26.0									
27.0				4	7	10			
27.0		27.0-27.9	U						
28.0									
29.0									
30.0	30.0								

<b>REMARKS:</b>	<b><u>Borehole Groundwater Observations, m: 2.0</u></b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b><u>Project Name:</u></b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 27.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132	<b>BOREHOLE No. BH-B-10</b>
<b>END DATE:</b> 03.07.2012	<b>LOCATION:</b> Village Japana	<b>COORDINATES:</b> X(m): <b>38T 0269190.0</b> Y(m): <b>4664557.0</b> Z(m):
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze		

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.6								Slightly moist, dark brown CLAY with plant roots - TOPSOIL	
1.0									
2.0		2.5-2.8	U	1	2	2		Brown, firm CLAY with some thin fine grained sand layers and lenses (aQ Quaternary System. Alluvial deposits)	
3.0							6.0-0.5		
3.4									
4.0		4.5-4.8	U	1	1	1	5.0-2.5	Moist, dark gray, soft CLAY with very moist, thin sand layers and lenses (aQ Quaternary System. Alluvial deposits)	
5.0									
6.0	6.0	6.0-6.3	U						
6.5	6.5	6.2-6.5	U					Very organic CLAY (aQ Quaternary System. Alluvial deposits)	
7.0				3	3	5			
8.0									
9.0				5	5	5			
10.0				4	4	5			
11.0								Saturated, dark gray, fine grained SAND with up to 5% fine grained gravel inclusions (aQ Quaternary System. Alluvial deposits)	
12.0		11.4-11.7	U						
13.0				3	5	5			
14.0									
15.0		14.5-14.8	U						

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.0</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 27.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132	<b>BOREHOLE No. BH-B-10</b>
<b>END DATE:</b> 03.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Village Japana	<b>COORDINATES:</b> X(m): <b>38T 0269190.0</b> Y(m): <b>4664557.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0									
16.0				4	7	6			
17.0		17.0-17.4	U						
18.0									
19.0				5	8	8			
20.0		20.0-20.4	U					Saturated, dark gray, fine grained SAND with up to 5% fine grained gravel inclusions (aQ Quaternary System. Alluvial deposits)	
21.0				7	8	9			
22.0									
23.0									
24.0				10	14	16			
25.0	25.0	25.0-25.4	U						
26.0		26.0-26.4	U						
27.0				4	6	8		Dark gray, soft CLAY with organic content (aQ Quaternary System. Alluvial deposits)	
28.0									
29.0									
30.0	30.0			3	6	6			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.0</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 27.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132	<b>BOREHOLE No. BH-B-10</b>
<b>END DATE:</b> 03.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Village Japana	<b>COORDINATES:</b> X(m): <b>38T 0269190.0</b> Y(m): <b>4664557.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
30.0		30.6-31.0	U						
31.0									
32.0		32.0-32.4	U	6	11	14		Saturated, gray, fine grained SAND with up to 10% gravel and cobbles inclusions (aQ Quarternary System. Alluvial deposits)	
33.0									
34.0	34.5								
35.0									
36.0		34.0-38.0	D	15	20	22		Saturated, dense, rounded GRAVEL of different grain sizes, with gray sand matrix (cobbles content is up to 10%) aQ - Quarternary System. Alluvial deposits	
37.0									
38.0									
39.0				12	18	24			
40.0	40.0								
41.0									
42.0									
43.0									
44.0									
45.0									

















<b>REMARKS:</b>	<b><u>Borehole Groundwater Observations, m: 2.0</u></b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b><u>Project Name:</u></b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 28.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 113	<b>BOREHOLE No. BH-B-11</b>
<b>END DATE:</b> 02.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0268947.0</b> Y(m): <b>4664548.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
	0.3							Brown, firm CLAY with plant roots - TOPSOIL	
1.0								Saturated, brownish-gray, fine grained SAND with very thin clay layers and lenses and with up to 5% gravel inclusions (aQ Quaternary System. Alluvial deposits)	
2.0	2.3	1.7-2.0	U	1	2	2	4.0-0.2		
3.0							7.0-3.0		
4.0				1	1	1	8.0-2.3	Brown-grayish, soft CLAY with very thin sand interlayers (aQ Quaternary System. Alluvial deposits)	
5.0		4.4-4.8	U				8.0-3.5		
5.4							8.0-4.1		
6.0		6.0-6.4	U	2	2	3			
7.0									
8.0									
9.0		8.7-9.0	U	1	3	5		Saturated, dark gray, fine grained SAND with very thin clay lenses (aQ Quaternary System. Alluvial deposits)	
10.0									
11.0		11.3-11.8	U						
12.0									
13.0	13.1								
14.0		14.3-14.8	U	1	1	1	9.1-4.2	Dark gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
15.0							8.2-5.4		

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 0.5</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 28.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 113	<b>BOREHOLE No. BH-B-11</b>
<b>END DATE:</b> 02.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0268947.0</b> Y(m): <b>4664548.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0	15.5						18.4-20.0	Dark gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
16.0	16.6						10.4-5.1	Saturated, dark gray, fine grained SAND (aQ Quaternary System. Alluvial deposits)	
17.0	17.2-17.6		U	1	2	1	13.2-6.0		
18.0							8.0-3.3		
19.0							9.1-4.2		
20.0				1	1	1	9.0-5.1		
21.0	20.5-21.0		U					Dark gray, soft CLAY rarely with thin sand interlayers (aQ Quaternary System. Alluvial deposits)	
22.0									
23.0									
24.0	24.1-24.5		U						
25.0	24.8-25.1		U						
26.0	25.6			1	1	2	9.2-3.1	Very organic CLAY (aQ Quaternary System. Alluvial deposits)	
27.0	27.2						9.5-2.0	Dark gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
28.0									
29.0								Saturated, gray, fine grained SAND (aQ Quaternary System. Alluvial deposits)	
30.0	29.5-30.0		D	5	7	6			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 0.5</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 28.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 113	<b>BOREHOLE No. BH-B-11</b>
<b>END DATE:</b> 02.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0268947.0</b> Y(m): <b>4664548.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
30.0									
31.0									
32.0				4	6	8		Saturated, gray, fine grained SAND (aQ Quarternary System. Alluvial deposits)	
33.0									
34.0									
35.0		34.5-35.0	D						
36.0									
37.0									
38.0									
39.0									
40.0									
41.0									
42.0									
43.0									
44.0									
45.0									







<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m : 0.5</b>	<b>Logged By:</b> T. Danelia
GeoEngineering Ltd	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 04.08.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 113	<b>BOREHOLE No.</b> <b>BH-B-11a</b>
<b>END DATE:</b> 05.08.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Lanchkhuti Region, Village Japana	<b>COORDINATES:</b> X(m): <b>38T 0268111.0</b> Y(m): <b>4664599.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.5								Dark brown, firm, intermediately plastic CLAY with plant roots - TOPSOIL	
1.0		1.3-1.5	D	4	6	8		Light brown with rust and gray spots, firm CLAY (aQ Quaternary System. Alluvial deposits)	
2.0									
3.0	3.1								
4.0		4.0-4.4	U				18.3-10.1	Gray, soft CLAY with thin sand layers and lenses (aQ Quaternary System. Alluvial deposits)	
4.6							11.8-5.0		
5.0									
6.0		6.2-6.5	D					Saturated, dark gray SAND with thin clay layers and lenses (aQ Quaternary System. Alluvial deposits)	
7.0	7.0								
8.0	8.2						16.3-9.1	Gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
9.0									
10.0		10.0-10.4	D	2	2	1		Saturated, gray SAND with thin clay layers and lenses (aQ Quaternary System. Alluvial deposits)	
11.0	11.6								
12.0	12.4						15.7-8.1	Gray, soft CLAY with thin sand layers and lenses (aQ Quaternary System. Alluvial deposits)	
13.0	13.2							Saturated, gray SAND with thin clay layers and lenses (aQ Quaternary System. Alluvial deposits)	
14.0		14.1-15.0	U					Gray, soft CLAY with thin sand layers and lenses (aQ Quaternary System. Alluvial deposits)	
15.0							16.2-8.8		

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 4.30</b>	<b>Logged By:</b> T. Danelia
GeoEngineering Ltd	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 04.08.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 113	<b>BOREHOLE No.</b> <b>BH-B-11a</b>
<b>END DATE:</b> 05.08.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Lanchkhuti Region, Village Japana	<b>COORDINATES:</b> X(m): <b>38T 0268111.0</b> Y(m): <b>4664599.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0	16.1	19.0-19.4	D	2	3	2	16.8-7.1	Gray, soft CLAY with thin sand layers and lenses (aQ Quaternary System. Alluvial deposits)	
16.0									
17.0									
18.0	21.8	19.0-19.4	D	2	3	2	14.6-6.9	Saturated, dark gray, fine grained SAND with thin clay layers and lenses (aQ Quaternary System. Alluvial deposits)	
19.0									
20.0									
21.0	26.7	24.2-24.6	U	1	1	2	14.2-7.0	Gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
22.0									
23.0									
24.0	28.0	24.2-24.6	U	1	1	2	12.9-6.3	Saturated, dark gray, fine grained SAND with thin clay layers and lenses (aQ Quaternary System. Alluvial deposits)	
25.0									
26.0									
27.0	29.0	29.5-30.0	U	2	2	4	14.3-6.0	Greenish-gray, soft CLAY with thin sand layers and lenses (aQ Quaternary System. Alluvial deposits)	
28.0									
29.0									
30.0	30.0	29.5-30.0	U	2	2	4			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 4.30</b>	<b>Logged By:</b> T. Danelia
	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
GeoEngineering Ltd		Page 2 / 2

<b>START DATE:</b> 01.08.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-12</b>
<b>END DATE:</b> 03.08.2012	<b>LOCATION:</b> Village Kviani	<b>COORDINATES:</b> X(m): <b>38T 0265560.0</b> Y(m): <b>4664313.0</b> Z(m):
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze		

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
	0.6							Brown, firm CLAY with up to 5-10% gravel inclusions and with plant roots	
1.0	1.2							Dark brown, firm CLAY	
2.0	1.7							Grayish-brown, fine grained SAND with thin clay layers and lenses	
				4	6	6	212-13.1		
							21.0-14.4		
4.0		4.0-4.3	U					Brownish-gray, firm CLAY	
		4.5-4.7	U				21.3-12.3		
5.0							20.2-11.6		
6.0	5.9	6.0-6.4	U	1	2	2	13.3-7.2		
								Brownish-gray, soft CLAY	
7.0		7.2	W				16.2-8.6		
	7.4	7.2-7.6	U				14.1-6.2		
8.0		8.0-8.3	U				12.0-6.7		
							12.8-7.1	Grayish-brown, very organic CLAY	
9.0	9.3						13.1-7.9		
10.0				1	1	2	12.3-6.3		
11.0		11.0-11.4	U				11.1-5.2		
							11.0-6.1		
12.0							11.8-5.9	Dark gray, soft CLAY	
13.0							12.1-5.1		
14.0							13.7-6.2		
15.0									

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 7.2</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 01.08.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-12</b>
<b>END DATE:</b> 03.08.2012	<b>LOCATION:</b> Village Kviani	<b>COORDINATES:</b> X(m): <b>38T 0265560.0</b> Y(m): <b>4664313.0</b> Z(m):
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze		

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0		15.7-16.0	U	2	1	2			
16.0									
17.0									
18.0		18.3-18.7	U						
19.0									
20.0		20.3-20.5	U				12.1-5.0		
21.0									
22.0									
23.0				1	2	2		Dark gray, soft CLAY	
24.0		24.0-24.4	U				13.5-6.3		
25.0									
26.0									
27.0		27.4-27.7	U	1	1	2	14.0-6.0		
28.0									
29.0									
30.0	30.0	29.4-30.0	U	1	2	2	13.5-6.3		

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 7.2</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 28.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-13</b>
<b>END DATE:</b> 29.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Lanchkhuti Region, Village Cholobargi	<b>COORDINATES:</b> X(m): <b>38T 0263452.0</b> Y(m): <b>4664158.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.6								Slightly moist, brown CLAY with fine and medium grained gravel, and with little amount of plant roots - TOPSOIL	
1.0		1.0-1.2	U					Slightly moist, brown with rust spots, firm CLAY (aQ - Quarternary System. Alluvial deposits)	
2.0	2.3								
2.9								Saturated, dark gray, fine grained SAND with thin clay interlayers (aQ Quarternary System. Alluvial deposits)	
3.0		3.2-3.6	U	3	2	2	19.8-12.5		
4.0	4.0						17.1-10.0		
5.0		5.2-5.6	U				16.2-9.3		
6.0				1	2	2	13.4-7.1		
7.0		7.5-7.9	U				18.0-10.3		
8.0							18.2-8.9		
9.0							13.3-6.8		
10.0				1	-	-	14.2-8.0	Dark gray, soft CLAY with some sand layers and lenses; some content and lenses of peat can be seen at 5.8-8.0m interval (aQ - Quarternary System. Alluvial deposits)	
11.0		11.0-11.4	U						
12.0									
13.0				1	1	35			
14.0									
14.8									
15.0									

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.3</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 28.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-13</b>
<b>END DATE:</b> 29.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Lanchkhuti Region, Village Cholobargi	<b>COORDINATES:</b> X(m): <b>38T 0263452.0</b> Y(m): <b>4664158.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0									
16.0									
17.0		17.0-17.4	D						
18.0				1	3	4			
19.0									
20.0									
21.0									
22.0									
23.0				2	6	6		Dark gray, fine grained SAND with thin (from 3 up to 10cm) clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
24.0									
25.0		24.3-25.0	D						
26.0									
27.0									
28.0									
29.0									
30.0	30.0	29.2-30.0	D	3	5	6			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.3</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 26.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-14</b>
<b>END DATE:</b> 28.07.2012	<b>LOCATION:</b> Lanchkhuti Region, Village Cholobargi	<b>COORDINATES:</b> X(m): <b>38T 0262171.0</b> Y(m): <b>4664019.0</b> Z(m):
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze		

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.4								Slightly moist, dark brown, firm CLAY with plant roots - TOPSOIL	
1.0								Slightly moist, grayish-brown with rust spots, firm CLAY (aQ Quarternary System. Alluvial deposits)	
2.0	2.1	1.8-2.0	U						
		2.15	W						
2.8								Saturated, dark gray, fine and medium grained SAND (aQ Quarternary System. Alluvial deposits)	
3.0				1	2	1			
4.0		4.0-4.4	U				13.8-7.5		
							10.7-6.0		
5.0							11.8-5.9		
6.0							11.0-7.1		
							8.0-4.7		
7.0		7.6-8.0	U	1	1	33			
8.0							8.5-4.1		
9.0								Dark gray, soft CLAY with peat and also sand layers and lenses of very little size (aQ Quarternary System. Alluvial deposits)	
							9.2-3.9		
10.0							10.0-4.3		
11.0				1	1	-	7.2-3.9		
							8.4-4.7		
12.0		12.0-12.4	U				9.1-3.9		
13.0							8.3-3.3		
14.0	14.2								
15.0				1	3	3		Dark gray, fine grained SAND with soft clay (5-15cm) layers and lenses (aQ Quarternary System. Alluvial deposits)	

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.1</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 26.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-14</b>
<b>END DATE:</b> 28.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Lanchkhuti Region, Village Cholobargi	<b>COORDINATES:</b> X(m): <b>38T 0262171.0</b> Y(m): <b>4664019.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0									
16.0		16.3-16.7	D						
17.0									
18.0				2	3	4			
19.0									
20.0									
21.0		21.0-21.4	D						
22.0									
23.0				2	4	4		Dark gray, fine grained SAND with soft clay (5-15cm) layers and lenses (aQ Quarternary System. Alluvial deposits)	
24.0									
25.0		25.1-25.5	D						
26.0									
27.0				2	4	3			
28.0									
29.0									
30.0	30.0	29.6-30.0	D	2	4	4			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.1</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 20.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-15</b>
<b>END DATE:</b> 25.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Lanchkhuti Region, Village Nigoiti	<b>COORDINATES:</b> X(m): <b>38T 0260529.0</b> Y(m): <b>4663779.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.3								Slightly moist, grayish-brown, stiff CLAY with plant roots - TOPSOIL	
1.0		1.0-1.2	U					Slightly moist, brown with rust spots, firm CLAY (aQ Quarternary System. Alluvial deposits)	
2.0									
2.5									
3.0				1	2	2	16.2-6.3		
3.6							15.1-8.0	Slightly moist, brown with rust spots, soft CLAY with very moist sand layers and lenses (from 5 up to 10cm)	
4.0		3.6-3.9	U				15.7-7.6	aQ Quarternary System. Alluvial deposits	
4.8							14.9-6.7		
5.0				6	10	12			
6.0		6.0-6.3	D						
7.0									
8.0				7	8	14		Saturated, dark gray, fine and medium grained SAND (aQ Quarternary System. Alluvial deposits)	
9.0		8.7-9.0	D						
10.0									
11.0		11.0-11.3	D	6	9	9			
11.8							13.1-6.3		
12.0							14.7-6.9	Dark gray, soft CLAY with thin sand layers and lenses (aQ Quarternary System. Alluvial deposits)	
13.0				1	2	2	11.7-5.0		
13.7							11.9-4.3		
14.0								Dark gray, fine grained SAND with soft clay layers and lenses (from 5 up to 1.5cm) (aQ Quarternary System. Alluvial deposits)	
15.0									






<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 3.6</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 20.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-15</b>
<b>END DATE:</b> 25.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Lanchkhuti Region, Village Nigoiti	<b>COORDINATES:</b> X(m): <b>38T 0260529.0</b> Y(m): <b>4663779.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0		15.4-15.7	U						
16.0				2	2	3			
17.0									
18.0									
19.0		19.5-19.8	U					Dark gray, fine grained SAND with soft clay layers and lenses (from 5 up to 15cm) (aQ Quarternary System. Alluvial deposits)	
20.0				2	3	3			
21.0									
22.0									
23.0	23.0								
24.0		23.4-24.0	U	4	5	5			
25.0									
26.0									
27.0		26.5-27.0	U	5	5	7		Gray, soft CLAY with peat content (aQ Quarternary System. Alluvial deposits)	
28.0									
29.0		29.3-29.7	U						
30.0	30.0			5	7	6			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 3.6</b>	
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No. GC-1222</b>
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<b>START DATE:</b> 17.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-16</b>
<b>END DATE:</b> 20.07.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze	<b>LOCATION:</b> Lanchkhuti Region, near old stadium	<b>COORDINATES:</b> X(m): <b>38T 0256381.0</b> Y(m): <b>4665197.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
	0.4							Slightly moist, dark brown, firm CLAY with plant roots - TOPSOIL	
1.0		1.4-1.65	U					Slightly moist, light brown with rust spots, firm CLAY (aQ Quarternary System. Alluvial deposits)	
2.0	1.8	1.5-1.7	U						
3.0	2.6			4	7	7			
4.0		4.2-4.5	U						
5.0				5	10	11			
6.0								Saturated, brownish-gray, fine grained SAND (aQ Quarternary System. Alluvial deposits)	
7.0									
8.0		8.0-8.3	U	4	9	12			
9.0									
10.0							17.1-8.7		
11.0		11.3-11.6	U	1	1	1	13.3-6.4		
12.0							9.2-5.7	Dark gray, soft CLAY with very moist, thin sand layers and lenses (aQ Quarternary System. Alluvial deposits)	
13.0							11.8-7.0		
14.0	14.2			1	2	2	13.1-7.5		
15.0	14.8						12.1-6.8		
							13.8-9.1		
				2	2	3		Dark gray, fine grained SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.35</b>	<b>Logged By:</b> T. Danelia
GeoEngineering Ltd	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 17.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-16</b>
<b>END DATE:</b> 20.07.2012	<b>LOCATION:</b> Lanchkhuti Region, near old stadium	<b>COORDINATES:</b> X(m): <b>38T 0256381.0</b> Y(m): <b>4665197.0</b> Z(m):
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze		

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0	16.0	15.5-15.8	U					Dark gray, soft CLAY rarely with fine grained sand layers and lenses (aQ Quarternary System. Alluvial deposits)	
16.0								Dark gray, fine grained SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
17.0	17.6								
18.0		18.2-18.5	U	2	2	2			
19.0									
20.0		20.2-20.5	U	1	1	1	9.4-4.7 11.1-7.3 10.8-6.9	Dark gray, soft CLAY (aQ Quarternary System. Alluvial deposits)	
21.0	22.5								
22.0									
23.0				1	2	2			
24.0									
25.0									
26.0		25.4-26.0	U					Dark gray, fine grained SAND with thin clay layers and lenses, rarely with peat content (aQ Quarternary System. Alluvial deposits)	
27.0				2	2	3			
28.0									
29.0									
30.0		29.7-30.0	U	3	2	3			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 2.35</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 14.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-17</b>
<b>END DATE:</b> 16.07.2012	<b>LOCATION:</b> Lanchkhuti Region, near "Lanchkhuti" stadium	<b>COORDINATES:</b> X(m): <b>38T 0256284.0</b> Y(m): <b>4665212.0</b> Z(m):
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze		

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.5								Slightly moist, dark brown, firm CLAY with plant roots - TOPSOIL	
1.0	1.5	1.0-1.2 1.3-1.5	U U					Moist, light brown with rust spots CLAY (aQ Quarternary System. Alluvial deposits)	
2.0									
3.0				1	2	1	15.1-8.2 11.7-5.9 15.9-8.1 17.9-10.2		
4.0									
5.0		4.7-5.0	U						
6.0				1	1	1	17.2-8.7 16.0-7.9 17.2-10.0		
7.0									
8.0		7.3-7.6	U	1	2	2	19.0-12.1 15.2-8.3	Brownish-gray and gray, soft CLAY with very moist, fine grained, thin sand interlayers, rarely with peat content (aQ Quarternary System. Alluvial deposits)	
9.0									
10.0		10.0-10.4	U				12.3-7.1		
11.0				1	1	1	15.1-6.7		
12.0									
13.0	13.2								
14.0		13.7-14.0	D	2	4	4		Saturated, dark gray, fine grained SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
15.0									














<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 1.5</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 14.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-17</b>
<b>END DATE:</b> 16.07.2012	<b>LOCATION:</b> Lanchkhuti Region, near "Lanchkhuti" stadium	<b>COORDINATES:</b> X(m): <b>38T 0256284.0</b> Y(m): <b>4665212.0</b> Z(m):
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze		

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0	15.1								
16.0				1	50 3.5		17.7-6.8	Dark gray, soft CLAY rarely with fine grained sand layers and lenses (aQ Quarternary System. Alluvial deposits)	
17.0	17.5								
18.0		18.0-18.3	D						
19.0									
20.0				2	3	3			
21.0									
22.0									
23.0				2	3	4		Dark gray, fine grained SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
24.0		23.7-24.0	D						
25.0									
26.0									
27.0									
28.0	28.4								
29.0								Dark gray, soft CLAY rarely with fine grained sand layers and lenses (aQ Quarternary System. Alluvial deposits)	
30.0	30.0	29.7-30.0	D	2	2	2			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 1.5</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 11.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-18</b>
<b>END DATE:</b> 13.07.2012	<b>LOCATION:</b> Lanchkhuti	<b>COORDINATES:</b> X(m): <b>38T 0255215.0</b> Y(m): <b>4665538.0</b> Z(m):
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze		

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type	U-undisturbed	D-disturbed	0-15cm	15-30cm	30-45cm	
0									
	0.5								
1.0		1.0-1.3	U	4	5	5	29.3-17.0	Slightly moist, dark brown, firm CLAY with plant roots - TOPSOIL	
	1.5						27.0-16.8	Moist, light brown with rust spots CLAY (aQ Quarternary System. Alluvial deposits)	
2.0							14.9-8.3		
3.0				1	2	1	9.1-3.7	Brownish-gray, soft CLAY (aQ Quarternary System. Alluvial deposits)	
4.0	4.1	4.0-4.3	U				12.0-5.7		
5.0	4.8			1	1	2		Saturated, dark gray, fine grained SAND (aQ Quarternary System. Alluvial deposits)	
6.0							12.0-7.1		
							8.1-5.2		
7.0		6.7-7.0	U				12.3-6.7		
8.0				1	70			Dark gray, soft CLAY with fine grained, thin sand interlayers with peat content at the upper part (aQ Quarternary System. Alluvial deposits)	
9.0									
10.0									
11.0									
12.0	11.7			1	1	2			
13.0								Dark gray, fine grained SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
14.0	14.1								
15.0									






<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 1.3</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 11.07.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108, 89	<b>BOREHOLE No. BH-B-18</b>
<b>END DATE:</b> 13.07.2012	<b>LOCATION:</b> Lanchkhuti	<b>COORDINATES:</b> X(m): <b>38T 0255215.0</b> Y(m): <b>4665538.0</b> Z(m):
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> GeoEngineering Ltd <b>DRILLER:</b> G. Lomidze		

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0									
16.0									
17.0									
18.0		18.0-19.0	U					Dark gray, soft CLAY with fine grained, thin sand interlayers (aQ Quarternary System. Alluvial deposits)	
19.0									
20.0									
21.0									
22.0		22.4-23.0	U						
23.0	23.0								
24.0									
25.0								Dark gray, fine grained SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
26.0									
27.0		27.7-28.0	U						
28.0	27.6								
29.0								Dark gray, soft CLAY rarely with fine grained sand layers and lenses (aQ Quarternary System. Alluvial deposits)	
30.0									
31.0		29.7-30.0	U	1	2	2			

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m: 1.3</b>	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 10.06.2012	<b>CASING DIAMETER (MM):</b> 146, 127, 108	<b>BOREHOLE No. BH-U-I</b>
<b>END DATE:</b> 10.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> <b>DRILLER:</b> R. Siradze	<b>LOCATION:</b> Samtredia, railway crossing (at Wissol base)	<b>COORDINATES:</b> X(m): <b>38T 0279564.0</b> Y(m): <b>4669178.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.4								Moist, brown, stiff, sandy silty CLAY with plant roots - TOPSOIL	
1.0									
2.0									
3.0		3.2-3.4	U						
4.0								Very moist, gray-rust color, soft CLAY (aQ - Quarternary System. Alluvial deposits)	
5.0		5.1-5.3	U						
6.0									
7.0	7.5								
8.0		7.7-7.9	U						
9.0									
10.0		10.2-10.4	U					Saturated, gray, fine grained SAND with thin clay lenses (aQ - Quarternary System. Alluvial deposits)	
11.0									
12.0									
13.0		12.8-13.0	U						
14.0	14.0								
15.0									

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> 3.05	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 11.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132	<b>BOREHOLE No. BH-U-2</b>
<b>END DATE:</b> 11.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> <b>DRILLER:</b> R.Siradze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0279040.0</b> Y(m): <b>4668963.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
	0.5							Slightly moist, brown, firm CLAY with plant roots - TOPSOIL	
1.0								Slightly moist, brown, firm CLAY (aQ - Quarternary System. Alluvial deposits)	
2.0	2.1								
3.0									
4.0		4.0-4.3	D					Very moist, rust color-gray, soft CLAY with thin sand lenses and layers (aQ - Quarternary System. Alluvial deposits)	
5.0									
6.0									
7.0	6.8								
8.0									
9.0									
10.0		9.5-9.8	D					Saturated, dark gray, fine grained SAND with gray, soft clays layers (aQ - Quarternary System. Alluvial deposits)	
11.0									
12.0	12.1								
13.0									
14.0									
15.0	15.0	14.2-14.5	D					Gray, soft CLAY (aQ - Quarternary System. Alluvial deposits)	







<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> 3.4	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 15.06.2012	<b>CASING DIAMETER (MM):</b> 146, 127	<b>BOREHOLE No. BH-U-3</b>
<b>END DATE:</b> 15.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> <b>DRILLER:</b> R. Siradze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0278292.0</b> Y(m): <b>4668521.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
1.0	0.8							Brown, firm CLAY with plant roots - TOPSOIL	
2.0								Very moist, brownish-gray, soft CLAY with fine grained sand lenses and thin layers (aQ - Quarternary System. Alluvial deposits)	
3.0	3.0								
4.0		3.5-3.8	D					Saturated, dark gray, medium grained SAND with up to 5% well rounded gravel inclusions (aQ - Quarternary System. Alluvial deposits)	
8.0	8.0								
9.0									
10.0									
11.0									
12.0								Dark gray, soft CLAY (aQ - Quarternary System. Alluvial deposits)	
13.0									
14.0									
15.0		14.7-15.0	U						
16.0	16.0								
17.0								Dark gray GRAVEL with sand matrix, with up to 10% cobbles inclusions (aQ - Quarternary System. Alluvial deposits)	
17.4									
18.0									

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> 0.9	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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
<b>START DATE:</b> 16.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 112, 93	<b>BOREHOLE No. BH-U-4</b>
<b>END DATE:</b> 17.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> <b>DRILLER:</b> R. Siradze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0277989.0</b> Y(m): <b>4668366.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
0								Ground surface	
0.5								Moist, brown, firm CLAY - TOPSOIL	
1.0									
2.0		2.0-2.5	D						
3.0									
4.0									
5.0		5.0-5.4	D					Moist up to 1.8m and saturated at the lower part, gray, fine grained SAND with thin (1cm thickness), of the same color, clay interlayers (aQ - Quarternary System. Alluvial deposits)	
6.0									
7.0									
8.0									
9.0									
10.0	10.2								
11.0		11.2-11.6	U						
12.0									
13.0								Dark gray, soft CLAY with peat (of little size) content (aQ - Quarternary System. Alluvial deposits)	
14.0									
15.0		14.7-15.0	U						

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> 1.8	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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<b>START DATE:</b> 16.06.2012	<b>CASING DIAMETER (MM):</b> 151, 132, 112, 93	<b>BOREHOLE No. BH-U-4</b>
<b>END DATE:</b> 17.06.2012		
<b>DRILLING METHOD:</b> ROTARY <b>DRILLING EQUIPMENT:</b> UGB-VS <b>DRILLING CONTRACTOR:</b> <b>DRILLER:</b> R. Siradze	<b>LOCATION:</b> Samtredia-Grigoleti Motor Road	<b>COORDINATES:</b> X(m): <b>38T 0277989.0</b> Y(m): <b>4668366.0</b> Z(m):

Scale, m	Depth, m	Sample/Core Recovery		SPT No. of blows			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
		Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm			
15.0									
16.0								Dark gray, soft CLAY with peat (of little size) content (aQ - Quarternary System. Alluvial deposits)	
17.0		17.3-17.7	U						
18.0	18.1								
19.0	18.9	18.7-18.9	D					Saturated, dark gray, dense, rounded GRAVEL with sand matrix and with up to 10% cobbles inclusions (aQ - Quarternary System. Alluvial deposits)	
20.0									
21.0									
22.0									
23.0									
24.0									
25.0									
26.0									
27.0									
28.0									
29.0									
30.0									

<b>REMARKS:</b>	<b>Borehole Groundwater Observations, m:</b> 1.8	<b>Logged By:</b> T. Danelia
<b>GeoEngineering Ltd</b>	<b>Project Name:</b> Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	<b>Contract No.</b> GC-1222
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**Project: GC-1222 Drilling and Laboratory Works for Engineering-geological investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road**  
**Location: Samtredia, Georgia**

**Ground Composition and Physical-mechanical Properties Characteristics, Laboratory Survey Results Summary Table**

№	BH #	Layer #	Sampling depth, m	Grain Size, mm						Moisture content W%		Plasticity			Liquidity Index, I <sub>L</sub>	Density, g/cm <sup>3</sup>			Porosity, n%	Voids Ratio, e	Saturation Degree, G	Soil discription	
				Sand			Silt % 0.063 - 0.002	Clay % < 0.002	Natural	Matrix	Liquid Limit, W <sub>L</sub>	Plastic Limit, W <sub>p</sub>	Plasticity Index, I <sub>p</sub>	Particle Density, ρ <sub>s</sub>		Density, ρ	Dry Density, ρ <sub>d</sub>						
1	BH-B-1	1	1.2-1.4						28.0		42.1	22.0	20.1	0.30									Slightly moist, brown, stiff, intermediately plastic CLAY
2	BH-B-1	1	3.4-3.65	0.6	1.2	11.5	67.6	19.1	25.8		41.7	23.7	18.0	0.12	2.73	1.93	1.53	0.779	0.904				Slightly moist, brown, stiff, intermediately plastic CLAY
3	BH-B-1	3	6.0-6.4	14.8	32.4	41.2	7.1																Fine grained SAND
4	BH-B-1	4	9.4-9.8	0.3	0.3	0.3	66.7	32.2	37.7		51.4	22.6	28.8	0.52	2.74	1.85	1.34	1.039	0.994				Gray, soft, highly plastic CLAY
5	BH-B-1	6	16.7-17.0			15.6	3.0		7.4														Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content
6	BH-B-1	6	25.0-25.3	9.6	17.7	14.2	7.1		8.9														Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content
7	BH-B-2	1	1.2-1.5						28.9		40.5	21.2	19.3	0.40									Slightly moist, brown, stiff, intermediately plastic CLAY



21	BH-B-4	4	10,3-10,5			0.2	0.4	0.2	56.5	42.7	44.3		57.5	30.6	26.9	0.51	2.74							Gray, soft, highly plastic CLAY
22	BH-B-4	4	21,0-21,3		0.2	0.3	0.3	0.7	63.7	34.8	44.2		54.9	29.4	25.5	0.58	2.73	1.78	1.23	54.8	1.212	0.996		Gray, soft, highly plastic CLAY
23	BH-B-4	6	27.5-29.0	3.4	55.8	11.0	9.2	6.2	9.4	5.0													Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	
24	BH-B-4A	3	2.8-3.0			15.5	32.6	42.4	9.5														Fine grained SAND	
25	BH-B-4A	4	6.5-6.8								33.6		40.4	19.9	20.5	0.67							Gray, soft, intermediately plastic CLAY	
26	BH-B-4A	1	8.4-8.7								29.3		42.5	22.3	20.2	0.35							Slightly moist, brown, stiff, intermediately plastic CLAY	
27	BH-B-4A	4	19.5-19.8								34.1		41.6	22.0	19.6	0.62							Gray, soft, intermediately plastic CLAY	
28	BH-B-4A	4	24.4-25.0								33.5		40.5	19.9	20.6	0.66							Gray, soft, intermediately plastic CLAY	
29	BH-B-5	2	3,0-3,35								34.0		41.0	21.8	19.2	0.64							Gray, soft, intermediately plastic CLAY	
30	BH-B-5	3	5.2-5.6			13.9	31.9	42.2	12.0														Fine grained SAND	
31	BH-B-5	3	7.2-7.6			17.7	30.0	42.5	9.8														Fine grained SAND	
32	BH-B-5	3	11,0-11,4		0.8	10.7	60.7	8.4	13.3	6.1	15.3						2.65	1.62	1.40	47.0	0.887	0.459	Fine grained SAND	
33	BH-B-5	4	15.2-15.6								36.7		44.0	22.6	21.4	0.66	2.73						Soft, intermediately plastic CLAY	



34	BH-B-5	3	19,4-19,8																				Fine grained SAND
35	BH-B-5	4	22,3-22,7																				Soft, intermediately plastic CLAY
36	BH-B-5	6	28,0-30,0		53,2	9,6	14,0	5,0	17,7	0,5	13,2	19,0	13,8	5,2	-0,12								Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content
37	BH-B-5	6	39,0-40,0		51,2	11,7	19,3	10,7	7,0	0,1	14,6												Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content
38	BH-B-7	3	4,0-4,5			15,9	33,0	43,3	7,8	21,9													Fine grained SAND
39	BH-B-7	5	14,4-14,8								33,6	39,7	27,0	12,7	0,52	2,70	1,81	1,35	49,8	0,993	0,914		Soft, intermediately plastic CLAY
40	BH-B-7	6	20,0-21,0		51,7	11,9	15,0	6,6	13,4	1,4	7,3	20,7	14,1	6,6	-1,0								Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content
41	BH-B-7	6	22,0-22,8		57,8	8,0	15,4	8,9	9,9	3,2													Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content
42	BH-B-7	6	25,0-26,0		73,3	7,6	7,0	4,1	7,8	0,2	2,5	19,9	13,4	6,5	-1,7								Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content
43	BH-B-7	6	29,0-30,0		76,0	6,9	5,9	4,8	6,4	5,3							1,92						Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content
44	BH-B-7	6	32,0-33,0		75,9	6,5	7,4	4,0	6,2	5,0							1,89						Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content

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**Project: GC-1222 Drilling and Laboratory Works for Engineering-geological investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road**  
**Location: Georgia**

**Soils Chemical Testing - Laboratory Data**

#	BH/ TP, #	Sampling depth, m	Unit	Aqueous Extract for 100g dry soil				PH	Organic %
				SO <sub>3</sub> <sup>-</sup>	CL <sup>-</sup>	Mg <sup>++</sup>	NH <sub>4</sub> <sup>+</sup>		
1	BH-B-1	3,4-3,65	gr	No	No	0.0170	No	7.00	4.8
2	BH-B-1	9,4-9,8	gr	No	No	0.0036	0.0002	6.70	1.6
3	BH-B-1	16,7-17,0	gr	No	No	0.0158	No	7.26	4.3
4	BH-B-1	25,0-25,3	gr	No	No	0.0122	No	7.15	—
5	BH-B-2	5,25-5,5	gr	No	No	0.0036	0.0004	6.40	1.4
6	BH-B-2	7,3-7,6	gr	No	No	0.0158	No	7.10	6.2
7	BH-B-2	14,0-14,3	gr	No	No	0.0049	0.0004	6.30	—
8	BH-B-3	8,5-8,8	gr	No	No	0.0085	0.0020	7.16	—
9	BH-B-4	10,3-10,5	gr	No	No	0.0085	0.0020	7.10	1.2
10	BH-B-4	19,6-20,0	gr	No	No	0.0097	0.0009	7.12	—
11	BH-B-4	21,0-21,3	gr	No	No	0.0085	0.0008	7.13	—
12	BH-B-7	11,4-11,8	gr	No	No	0.0160	No	7.09	7.3
13	BH-B-9	10,0-10,3	gr	No	No	0.0085	0.0009	7.15	0.5
14	BH-B-10	2,5-2,8	gr	No	No	0.0200	No	7.03	—
15	BH-B-10	6,0-6,3	gr	—	—	—	—	—	34.6
16	BH-B-11	4,4-4,8	gr	No	No	0.0050	No	6.55	—

17	BH-B-16	1.4-1.7	gr	No	No	0.0185	No	7.08	—
18	BH-B-16	8.0-8.3	gr	No	No	0.0125	No	7.11	—
19	BH-B-17	7.3-7.6	gr	No	No	0.0122	0.0004	6.8	1.7

**Project: GC-1222 Drilling and Laboratory Works for Engineering-geological investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road**

**Location: Georgia**

**Results of laboratory study of ground water chemical composition**

#	<u>BH</u> / TP, #	Sampling depth, m	Unit	Content in 1 liter				PH
				SO <sub>3</sub>	CL <sup>-</sup>	Mg <sup>++</sup>	NH <sub>4</sub>	
1	BH-B-1	3.05	mg-l	No	117.30	46.21	0.20	6.87
2	BH-B-2	3.60	mg-l	No	No	36.48	4.00	6.20
3	BH-B-2	5.20	mg-l	No	134.75	29.18	2.00	6.76
4	BH-B-3	8,0-8,5	mg-l	No	141.84	24.32	4.00	6.85
5	BH-B-4	4.10	mg-l	No	106.38	26.75	<0,02	6.25
6	BH-B-5	2.12	mg-l	No	177.30	9.73	0.80	6.27
7	BH-B-7	1.40	mg-l	No	170.21	12.16	0.80	6.43
8	BH-B-9	2.5	mg-l	No	120.51	29.17	2.00	6.70
9	BH-B-11	1.0	mg-l	No	140.81	28.00	4.00	6.25
10	BH-B-14	2.2	mg-l	No	109.17	15.26	0.80	6.40
11	BH-B-16	3.0	mg-l	No	180.2	36.70	<0.02	6.95
12	BH-B-18	2.7	mg-l	No	118.16	41.15	<0.02	6.75

## Particle Size Distribution (Sieving)

Project Name GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		Location		Georgia
			Borehole / Pit. No.		BH-B-1
Soil Description		Slightly moist, brown, stiff, intermediately plastic CLAY	Sample no.		
			Depth		3.4-3.65 m
Test Method		BS 1377, Part 2, 1990, 9.3		Date	5/30/2012
Initial dry mass m <sub>1</sub>		100 g			
BS test sieve		mass retained g		Percentage retained $\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
		actual	corrected m		
>200 mm		0.0		0.00	100.00
125mm		0.0		0.00	100.00
90 mm		0.0		0.00	100.00
75 mm		0.0		0.00	100.00
63 mm		0.0		0.00	100.00
50 mm		0.0		0.00	100.00
37.5 mm		0.0		0.00	100.00
28 mm		0.0		0.00	100.00
20 mm		0.0		0.00	100.00
Passing 20mm m <sub>2</sub>		100.0			
Total (check with m <sub>1</sub> )					
Riffled m <sub>3</sub>		100.0			
Riffled and washed m <sub>4</sub>		–			
Correction factor $\frac{m_2}{m_3}$		1.00			
14 mm		0.0		0.00	100.00
10 mm		0.0		0.00	100.00
6.3 mm		0.0		0.00	100.00
Passing 6.3 mm m <sub>5</sub>		100.0			
Total (check with m <sub>4</sub> )		–			
Riffled m <sub>6</sub>		100.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$		1.00			
5 mm		0.0		0.00	100.00
3.35mm		0.0		0.00	100.00
2.36mm		0.0		0.00	100.00
2 mm		0.0		0.00	100.00
1.18 mm		0.3		0.30	99.70
600 μm		0.3		0.30	99.40
425 μm		0.2		0.20	99.20
300 μm		0.3		0.30	98.90
212 μm		0.7		0.70	98.20
150 μm		1.2		1.20	97.00
63 μ m		10.3		10.30	86.70
Passing 63 μm m <sub>7</sub>		86.7			
Total (check with m <sub>6</sub> )					
Riffled m <sub>8</sub>		30.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$		2.89			
40 μ m		3.5		10.10	76.60
20 μ m		5.7		16.50	60.10
5 μ m		11.4		32.90	27.20
2 μ m		2.8		8.10	19.10
Passing 2 μ m		10.1		19.10	–
Total (check with m <sub>6</sub> )		30.0	m <sub>1</sub>		
			Operator	Checked	Approved
			Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

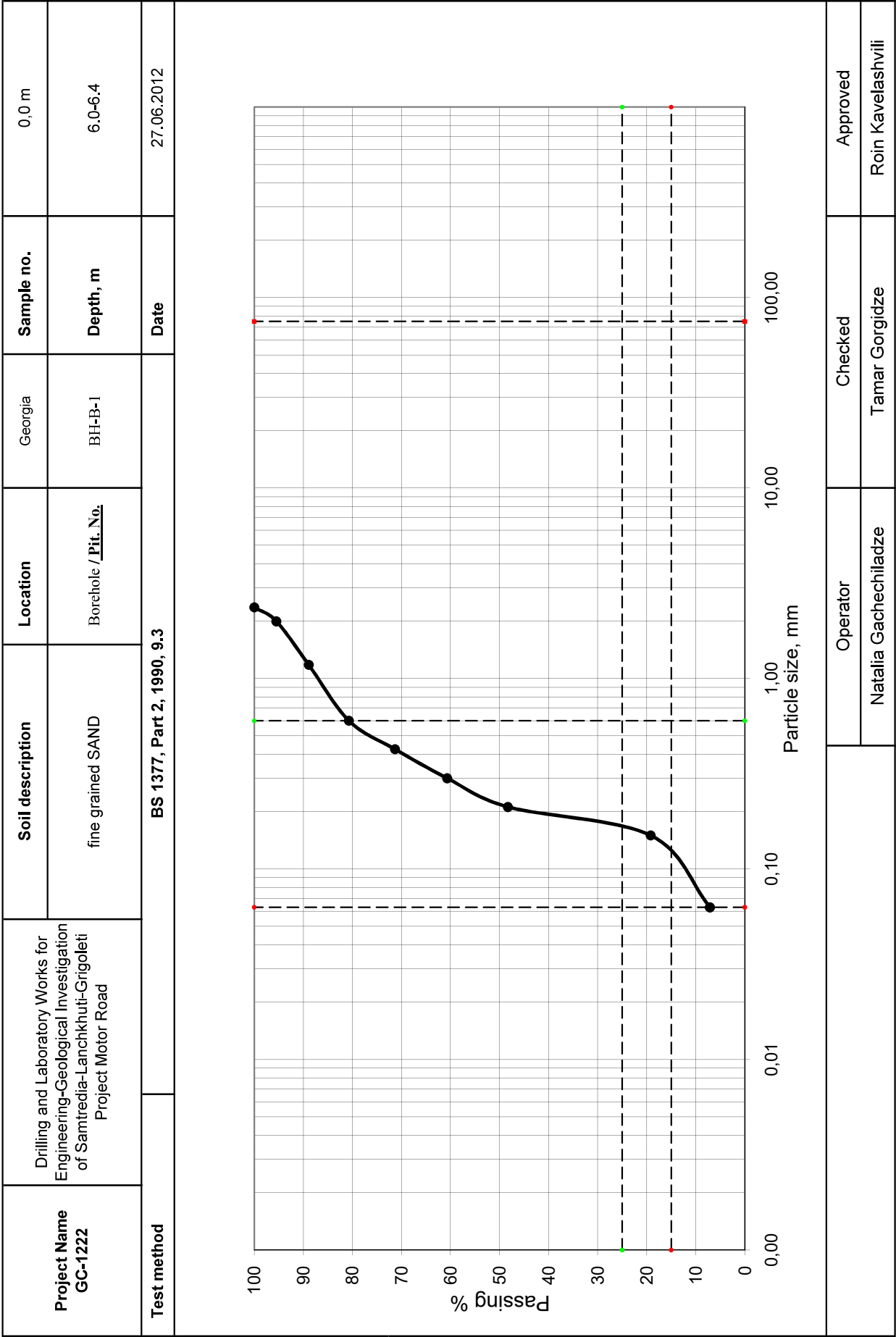




## Particle Size Distribution (Sieving)

<b>Project Name</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-1
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	0
			<b>Depth, m</b>	6.0-6.4
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	27.06.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	22,5		4,50	95,50
1.18 mm	33,0		6,60	88,90
600 $\mu\text{m}$	41,0		8,20	80,70
425 $\mu\text{m}$	47,0		9,40	71,30
300 $\mu\text{m}$	53,0		10,60	60,70
212 $\mu\text{m}$	62,0		12,40	48,30
150 $\mu\text{m}$	145,5		29,10	19,20
63 $\mu\text{m}$	60,5		12,10	7,10
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	35,5		7,10	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

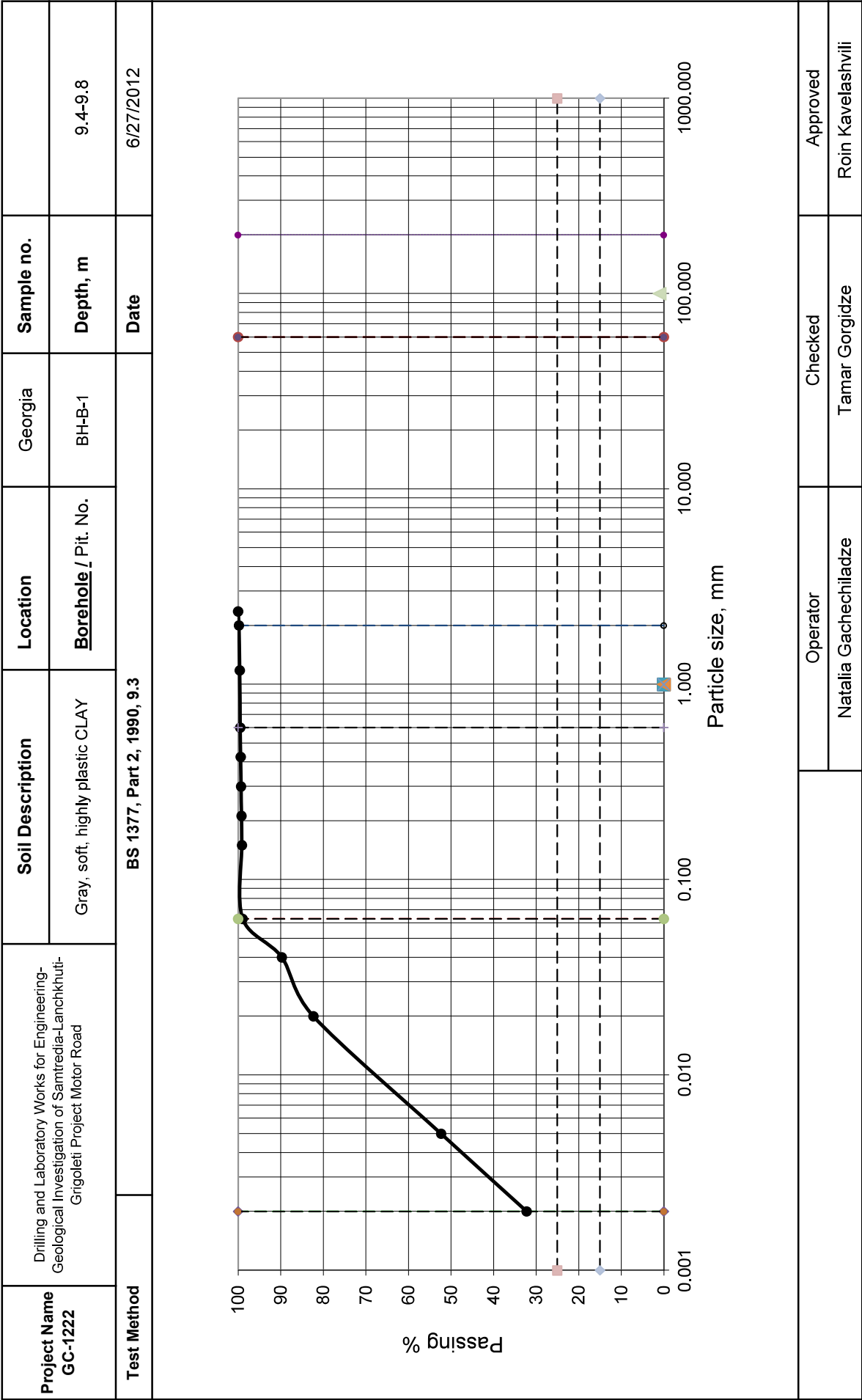
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-1
<b>Soil Description</b>	Gray, soft, highly plastic CLAY		<b>Sample no.</b>	
			<b>Depth</b>	9.4-9.8 m
<b>Test Method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	6/27/2012
Initial dry mass $m_1$	100 g			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected $m$	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0.0		0.00	100.00
125mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	0.0		0.00	100.00
37.5 mm	0.0		0.00	100.00
28 mm	0.0		0.00	100.00
20 mm	0.0		0.00	100.00
Passing 20mm $m_2$	100.0			
Total (check with $m_1$ )				
Riffled $m_3$	100.0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1.00			
14 mm	0.0		0.00	100.00
10 mm	0.0		0.00	100.00
6.3 mm	0.0		0.00	100.00
Passing 6.3 mm $m_5$	100.0			
Total (check with $m_4$ )	–			
Riffled $m_6$	100.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1.00			
5 mm	0.0		0.00	100.00
3.35mm	0.0		0.00	100.00
2.36mm	0.0		0.00	100.00
2 mm	0.2		0.20	99.80
1.18 mm	0.2		0.20	99.60
600 $\mu$ m	0.1		0.10	99.50
425 $\mu$ m	0.1		0.10	99.40
300 $\mu$ m	0.1		0.10	99.30
212 $\mu$ m	0.1		0.10	99.20
150 $\mu$ m	0.1		0.10	99.10
63 $\mu$ m	0.2		0.20	98.90
Passing 63 $\mu$ m $m_7$	98.9			
Total (check with $m_6$ )				
Riffled $m_8$	30.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$	3.30			
40 $\mu$ m	2.8		9.20	89.70
20 $\mu$ m	2.2		7.40	82.30
5 $\mu$ m	9.1		30.00	52.30
2 $\mu$ m	6.1		20.10	32.20
Passing 2 $\mu$ m	12.6		32.20	–
Total (check with $m_6$ )	30.0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)

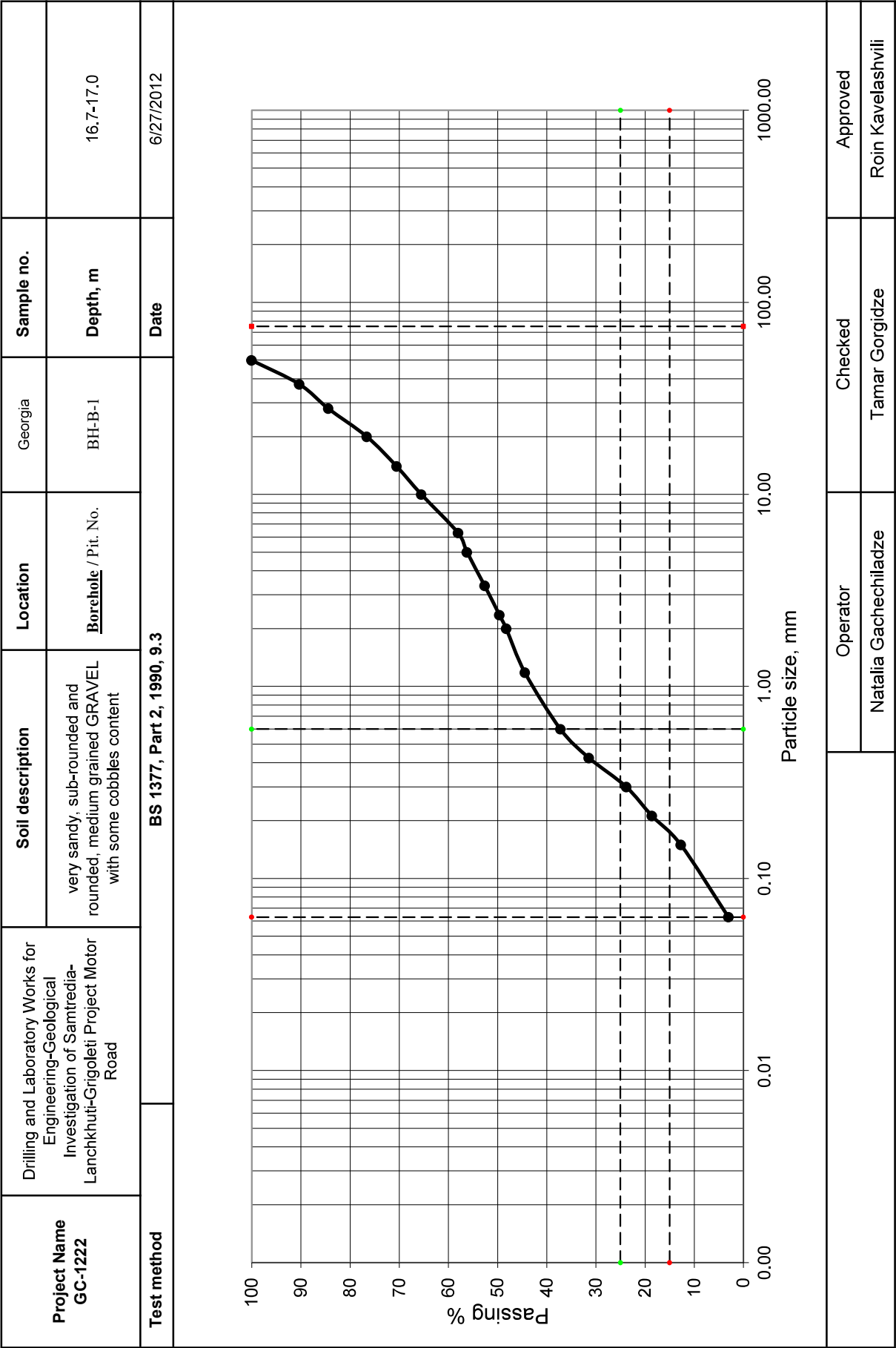


	Operator	Checked	Approved
	Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

## Particle Size Distribution (Sieving)

<b>Project Name</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-1
<b>Soil description</b>	very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	0
			<b>Depth, m</b>	16.7-17.0
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	6/27/2012
Initial dry mass $m_1$	<b>16000 g</b>			
BS test sieve	mass retained g		Percentage retained $\left(\frac{m}{m_1}\right) \cdot 100\%$	Cumulative percentage passing
	actual	corrected m		
>200 mm	0.0		0.00	100.00
200 mm	0.0		0.00	100.00
125 mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	0.0		0.00	100.00
37.5 mm	1552.0		9.70	90.30
28 mm	944.0		5.90	84.40
20 mm	1248.0		7.80	76.60
Passing 20mm $m_2$	12256.0			
Total (check with $m_1$ )				
Riffled $m_3$	12256.0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1.00			
14 mm	976.0		6.10	70.50
10 mm	800.0		5.00	65.50
6.3 mm	1200.0		7.50	58.00
Passing 6.3 mm $m_5$	9280.0			
Total (check with $m_4$ )	–			
Riffled $m_6$	9280.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1.00			
5 mm	288.0		1.80	56.20
3.35mm	576.0		3.60	52.60
2.36mm	480.0		3.00	49.60
2 mm	224.0		1.40	48.20
1.18 mm	608.0		3.80	44.40
600 $\mu\text{m}$	1152.0		7.20	37.20
425 $\mu\text{m}$	928.0		5.80	31.40
300 $\mu\text{m}$	1216.0		7.60	23.80
212 $\mu\text{m}$	832.0		5.20	18.60
150 $\mu\text{m}$	944.0		5.90	12.70
63 $\mu\text{m}$	1552.0		9.70	3.00
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	480.0		3.00	–
Total (check with $m_6$ )	9280.0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)

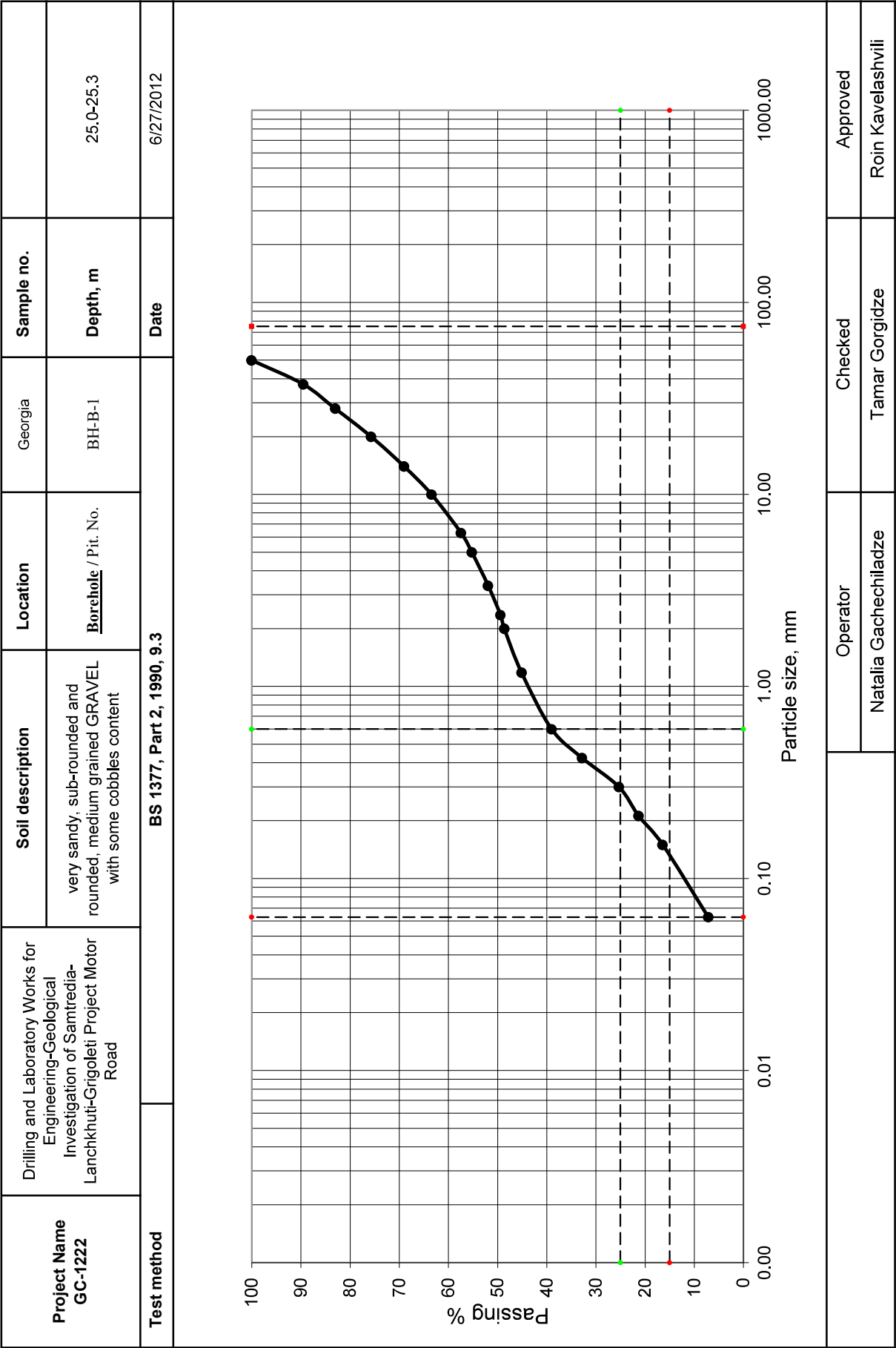


## Particle Size Distribution (Sieving)

<b>Project Name</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-1
<b>Soil description</b>	very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	
			<b>Depth, m</b>	25.0-25.3
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	6/27/2012
Initial dry mass $m_1$	<b>16325 g</b>			
BS test sieve	mass retained g		Percentage retained $\left(\frac{m}{m_1}\right) \cdot 100\%$	Cumulative percentage passing
	actual	corrected m		
>200 mm	0.0		0.00	100.00
200 mm	0.0		0.00	100.00
125 mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	0.0		0.00	100.00
37.5 mm	1714.1		10.50	89.50
28 mm	1061.1		6.50	83.00
20 mm	1191.7		7.30	75.70
Passing 20mm $m_2$	12358.0			
Total (check with $m_1$ )				
Riffled $m_3$	12358.0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1.00			
14 mm	1093.8		6.70	69.00
10 mm	914.2		5.60	63.40
6.3 mm	979.5		6.00	57.40
Passing 6.3 mm $m_5$	9370.6			
Total (check with $m_4$ )	–			
Riffled $m_6$	9370.6			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1.00			
5 mm	359.2		2.20	55.20
3.35mm	538.7		3.30	51.90
2.36mm	408.1		2.50	49.40
2 mm	130.6		0.80	48.60
1.18 mm	571.4		3.50	45.10
600 $\mu\text{m}$	995.8		6.10	39.00
425 $\mu\text{m}$	1012.2		6.20	32.80
300 $\mu\text{m}$	1224.4		7.50	25.30
212 $\mu\text{m}$	653.0		4.00	21.30
150 $\mu\text{m}$	799.9		4.90	16.40
63 $\mu\text{m}$	1518.2		9.30	7.10
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	1159.1		7.10	–
Total (check with $m_6$ )	9370.6	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili



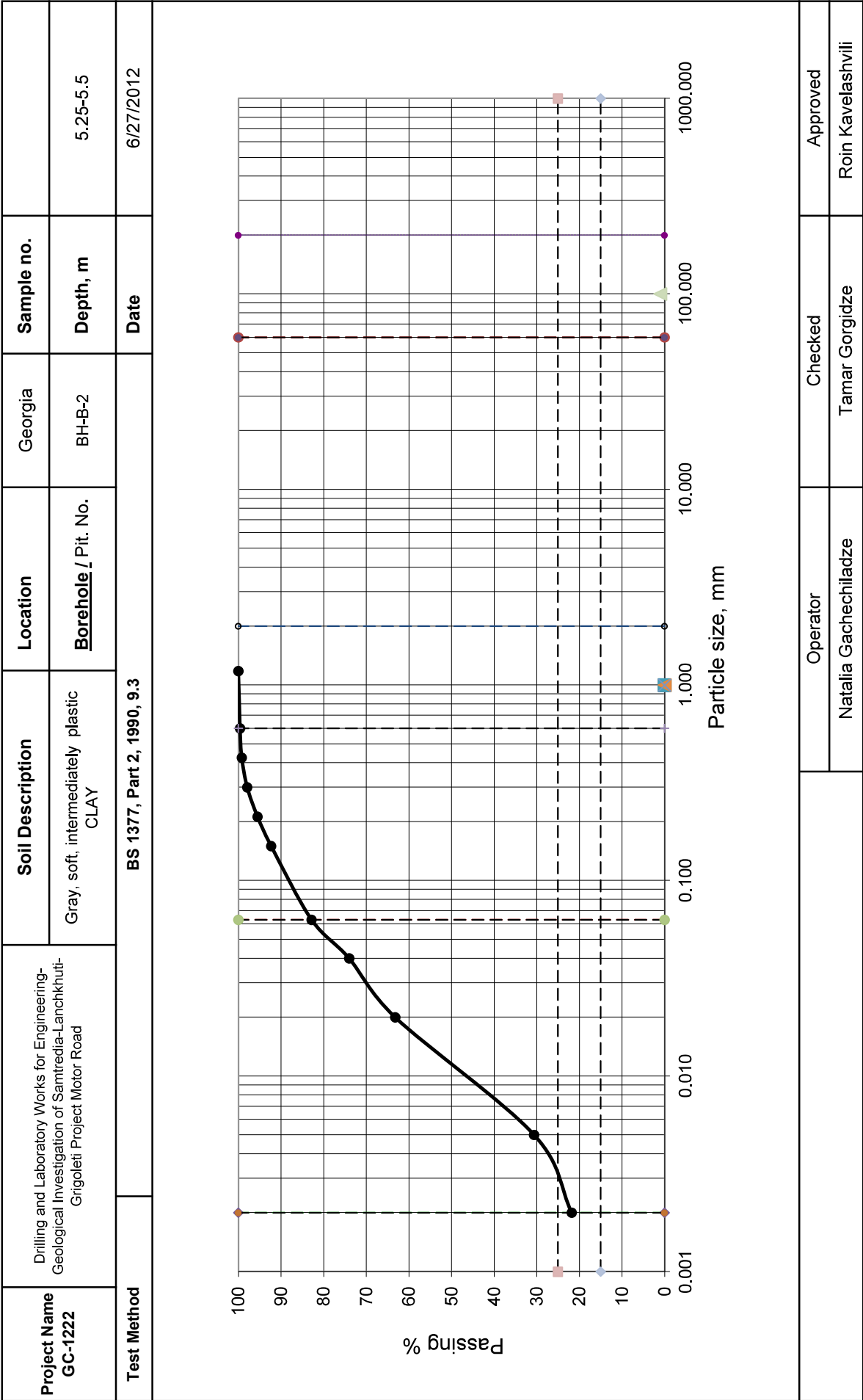
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

Project Name GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		Location		Georgia		
			Borehole / Pit. No.₂		BH-B-2		
Soil Description		Gray, soft, intermediately plastic CLAY		Sample no.			
				Depth		5.25-5.5 m	
Test Method		BS 1377, Part 2, 1990, 9.3		Date		6/27/2012	
Initial dry mass m₁			100 g				
BS test sieve			mass retained g		Percentage retained $\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing	
			actual	corrected m			
>200 mm			0.0		0.00	100.00	
125mm			0.0		0.00	100.00	
90 mm			0.0		0.00	100.00	
75 mm			0.0		0.00	100.00	
63 mm			0.0		0.00	100.00	
50 mm			0.0		0.00	100.00	
37.5 mm			0.0		0.00	100.00	
28 mm			0.0		0.00	100.00	
20 mm			0.0		0.00	100.00	
Passing 20mm m₂			100.0				
Total (check with m₁)							
Riffled m₃			100.0				
Riffled and washed m₄			–				
Correction factor $\frac{m_2}{m_3}$			1.00				
14 mm			0.0		0.00	100.00	
10 mm			0.0		0.00	100.00	
6.3 mm			0.0		0.00	100.00	
Passing 6.3 mm m₅			100.0				
Total (check with m₄)			–				
Riffled m₆			100.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$			1.00				
5 mm			0.0		0.00	100.00	
3.35mm			0.0		0.00	100.00	
2.36mm			0.0		0.00	100.00	
2 mm			0.0		0.00	100.00	
1.18 mm			0.0		0.00	100.00	
600 μm			0.4		0.40	99.60	
425 μm			0.4		0.40	99.20	
300 μm			1.3		1.30	97.90	
212 μm			2.4		2.40	95.50	
150 μm			3.2		3.20	92.30	
63 μ m			9.5		9.50	82.80	
Passing 63 μm m₇			82.8				
Total (check with m₆)							
Riffled m₈			30.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$			2.76				
40 μ m			3.2		8.80	74.00	
20 μ m			3.9		10.80	63.20	
5 μ m			11.8		32.60	30.60	
2 μ m			3.2		8.80	21.80	
Passing 2 μ m			11.1		21.80	–	
Total (check with m₆)			30.0	m₁			
				Operator		Checked	Approved
				Natalia Gachechiladze		Tamar Gorgidze	Roin Kavelashvili

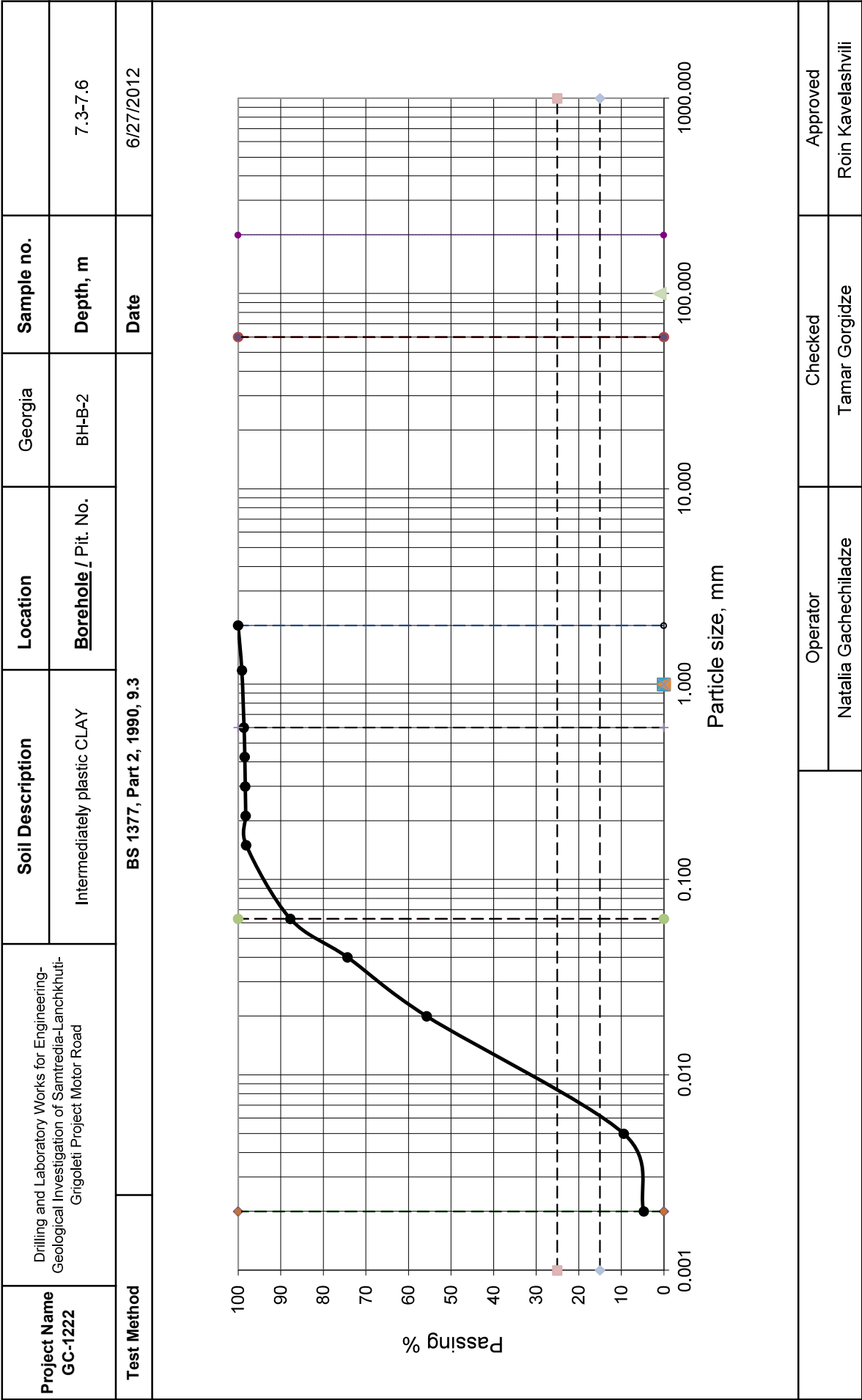
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

Project Name GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		Location		Georgia		
			Borehole / Pit. No.		BH-B-2		
Soil Description		Intermediately plastic CLAY		Sample no.			
				Depth		7.3-7.6 m	
Test Method		BS 1377, Part 2, 1990, 9.3		Date		6/27/2012	
Initial dry mass m <sub>1</sub>			100 g				
BS test sieve			mass retained g		Percentage retained		Cumulative percentage passing
			actual	corrected m	$\left(\frac{m}{m_1}\right).100\%$		
>200 mm			0.0		0.00	100.00	
125mm			0.0		0.00	100.00	
90 mm			0.0		0.00	100.00	
75 mm			0.0		0.00	100.00	
63 mm			0.0		0.00	100.00	
50 mm			0.0		0.00	100.00	
37.5 mm			0.0		0.00	100.00	
28 mm			0.0		0.00	100.00	
20 mm			0.0		0.00	100.00	
Passing 20mm m <sub>2</sub>			100.0				
Total (check with m <sub>1</sub> )							
Riffled m <sub>3</sub>			100.0				
Riffled and washed m <sub>4</sub>			—				
Correction factor $\frac{m_2}{m_3}$			1.00				
14 mm			0.0		0.00	100.00	
10 mm			0.0		0.00	100.00	
6.3 mm			0.0		0.00	100.00	
Passing 6.3 mm m <sub>5</sub>			100.0				
Total (check with m <sub>4</sub> )			—				
Riffled m <sub>6</sub>			100.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$			1.00				
5 mm			0.0		0.00	100.00	
3.35mm			0.0		0.00	100.00	
2.36mm			0.0		0.00	100.00	
2 mm			0.0		0.00	100.00	
1.18 mm			0.9		0.90	99.10	
600 μm			0.5		0.50	98.60	
425 μm			0.2		0.20	98.40	
300 μm			0.1		0.10	98.30	
212 μm			0.1		0.10	98.20	
150 μm			0.1		0.10	98.10	
63 μ m			10.4		10.40	87.70	
Passing 63 μm m <sub>7</sub>			87.7				
Total (check with m <sub>6</sub> )							
Riffled m <sub>8</sub>			30.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$			2.92				
40 μ m			4.6		13.40	74.30	
20 μ m			6.4		18.60	55.70	
5 μ m			15.8		46.30	9.40	
2 μ m			1.6		4.70	4.70	
Passing 2 μ m			6.2		4.70	—	
Total (check with m <sub>6</sub> )			30.0	m <sub>1</sub>			
				Operator		Checked	Approved
				Natalia Gachechiladze		Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

Project Name GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road			Location	Georgia
				Borehole / Pit. No.	BH-B-2
Soil Description		Gray, soft, intermediately plastic CLAY		Sample no.	
				Depth	14.0-14.3 m
Test Method		BS 1377, Part 2, 1990, 9.3		Date	6/27/2012
Initial dry mass m <sub>1</sub>		100 g			
BS test sieve		mass retained g		Percentage retained $\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
		actual	corrected m		
>200 mm		0.0		0.00	100.00
125mm		0.0		0.00	100.00
90 mm		0.0		0.00	100.00
75 mm		0.0		0.00	100.00
63 mm		0.0		0.00	100.00
50 mm		0.0		0.00	100.00
37.5 mm		0.0		0.00	100.00
28 mm		0.0		0.00	100.00
20 mm		0.0		0.00	100.00
Passing 20mm m <sub>2</sub>		100.0			
Total (check with m <sub>1</sub> )					
Riffled m <sub>3</sub>		100.0			
Riffled and washed m <sub>4</sub>		–			
Correction factor $\frac{m_2}{m_3}$		1.00			
14 mm		0.0		0.00	100.00
10 mm		0.0		0.00	100.00
6.3 mm		0.0		0.00	100.00
Passing 6.3 mm m <sub>5</sub>		100.0			
Total (check with m <sub>4</sub> )		–			
Riffled m <sub>6</sub>		100.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$		1.00			
5 mm		0.0		0.00	100.00
3.35mm		0.0		0.00	100.00
2.36mm		0.0		0.00	100.00
2 mm		0.0		0.00	100.00
1.18 mm		0.2		0.20	99.80
600 μm		0.3		0.30	99.50
425 μm		0.6		0.60	98.90
300 μm		1.0		1.00	97.90
212 μm		1.2		1.20	96.70
150 μm		1.2		1.20	95.50
63 μ m		5.2		5.20	90.30
Passing 63 μm m <sub>7</sub>		90.3			
Total (check with m <sub>6</sub> )					
Riffled m <sub>8</sub>		30.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$		3.01			
40 μ m		3.0		9.00	81.30
20 μ m		3.2		9.60	71.70
5 μ m		12.7		38.20	33.50
2 μ m		4.0		12.00	21.50
Passing 2 μ m		10.1		21.50	–
Total (check with m <sub>6</sub> )		30.0	m <sub>1</sub>		
			Operator	Checked	Approved
			Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

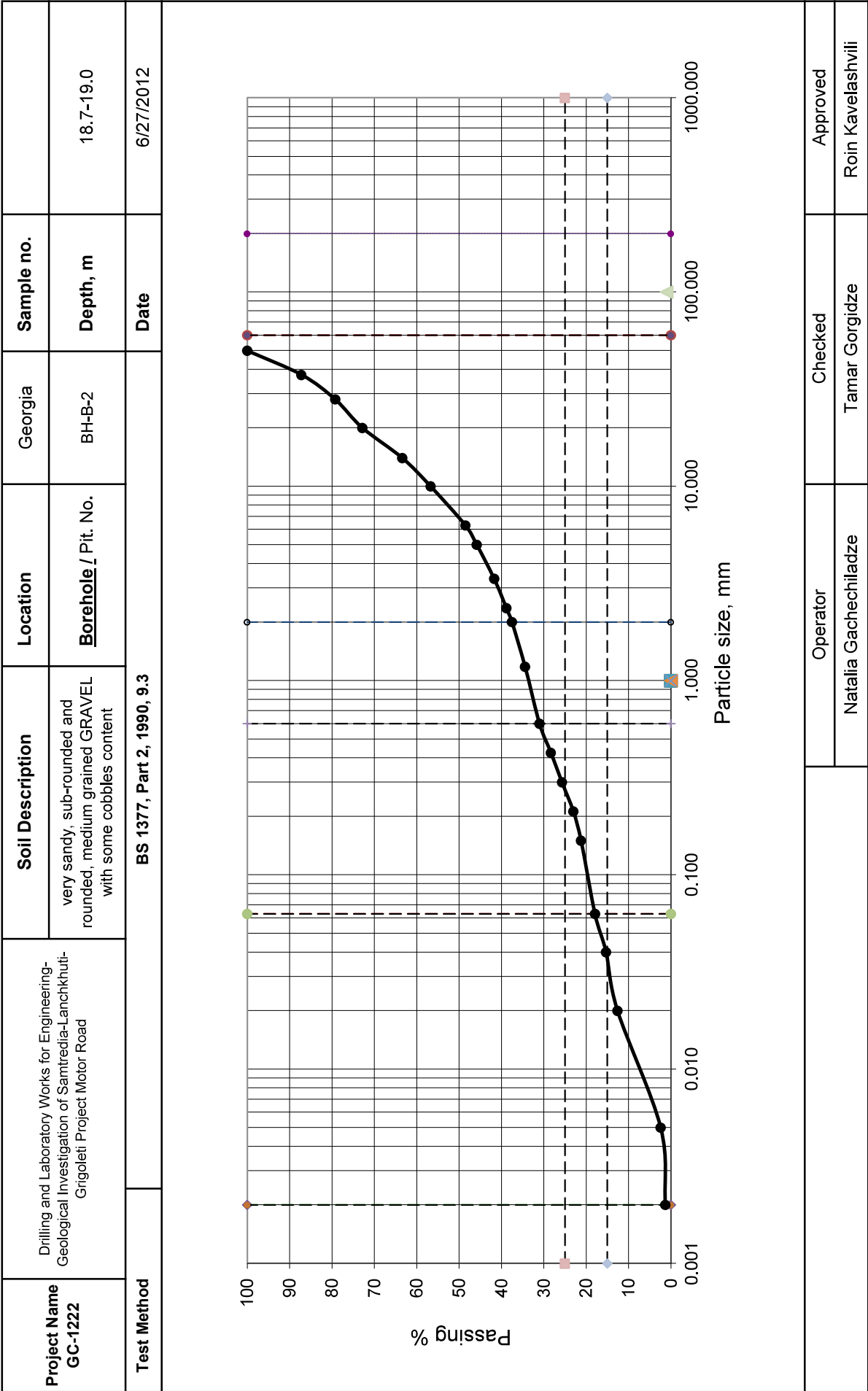


## Particle Size Distribution (Sieving)

<b>Project Name</b> GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No <sub>2</sub>	BH-B-2
<b>Soil Description</b>	very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	
			<b>Depth</b>	18.7-19.0 m
<b>Test Method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	6/27/2012
Initial dry mass m <sub>1</sub>	3340 g			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0.0		0.00	100.00
125mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	0.0		0.00	100.00
37.5 mm	427.5		12.80	87.20
28 mm	267.2		8.00	79.20
20 mm	213.8		6.40	72.80
Passing 20mm m <sub>2</sub>	2431.5			
Total (check with m <sub>1</sub> )				
Riffled m <sub>3</sub>	2431.5			
Riffled and washed m <sub>4</sub>	–			
Correction factor $\frac{m_2}{m_3}$	1.00			
14 mm	314.0		9.40	63.40
10 mm	223.8		6.70	56.70
6.3 mm	273.9		8.20	48.50
Passing 6.3 mm m <sub>5</sub>	1619.9			
Total (check with m <sub>4</sub> )	–			
Riffled m <sub>6</sub>	1619.9			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1.00			
5 mm	90.2		2.70	45.80
3.35mm	136.9		4.10	41.70
2.36mm	96.9		2.90	38.80
2 mm	43.4		1.30	37.50
1.18 mm	103.5		3.10	34.40
600 μm	113.6		3.40	31.00
425 μm	90.2		2.70	28.30
300 μm	86.8		2.60	25.70
212 μm	90.2		2.70	23.00
150 μm	60.1		1.80	21.20
63 μ m	110.2		3.30	17.90
Passing 63 μm m <sub>7</sub>	597.9			
Total (check with m <sub>6</sub> )				
Riffled m <sub>8</sub>	30.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$	19.93			
40 μ m	4.4		2.60	15.30
20 μ m	4.5		2.70	12.60
5 μ m	17.1		10.20	2.40
2 μ m	1.8		1.10	1.30
Passing 2 μ m	6.5		1.30	–
Total (check with m <sub>6</sub> )	30.0	m <sub>1</sub>		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili



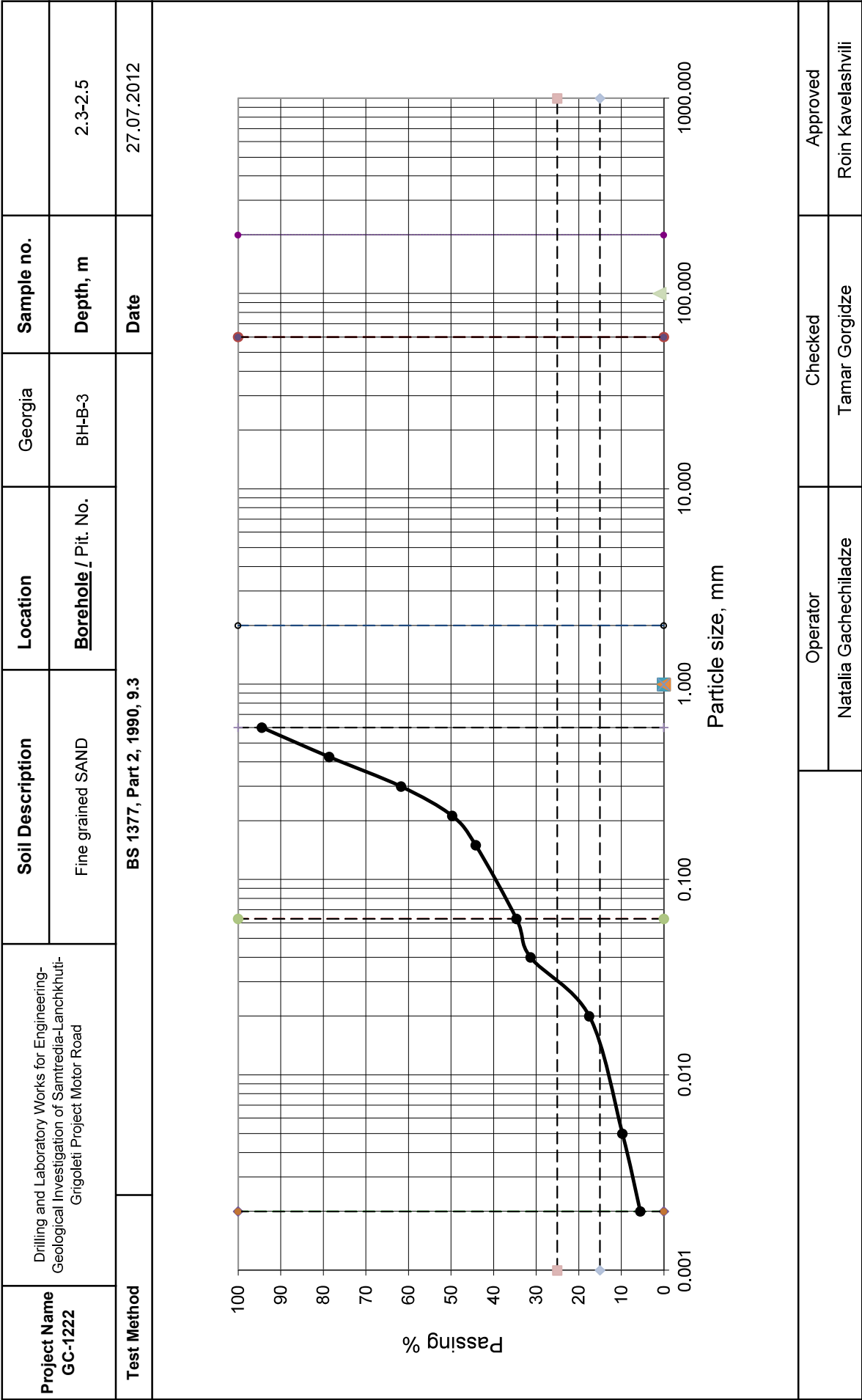
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

Project Name GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		Location		Georgia	
			Borehole / Pit. No.		BH-B-3	
Soil Description		Fine grained SAND		Sample no.		
				Depth		2.3-2.5 m
Test Method		BS 1377, Part 2, 1990, 9.3		Date		27.07.2012
Initial dry mass m <sub>1</sub>		100 g				
BS test sieve		mass retained g		Percentage retained $\left(\frac{m}{m_1}\right) \cdot 100\%$		Cumulative percentage passing
		actual	corrected m			
>200 mm		0.0		0.00	100.00	
125mm		0.0		0.00	100.00	
90 mm		0.0		0.00	100.00	
75 mm		0.0		0.00	100.00	
63 mm		0.0		0.00	100.00	
50 mm		0.0		0.00	100.00	
37.5 mm		0.0		0.00	100.00	
28 mm		0.0		0.00	100.00	
20 mm		0.0		0.00	100.00	
Passing 20mm m <sub>2</sub>		100.0				
Total (check with m <sub>1</sub> )						
Riffled m <sub>3</sub>		100.0				
Riffled and washed m <sub>4</sub>		–				
Correction factor $\frac{m_2}{m_3}$		1.00				
14 mm		0.0		0.00	100.00	
10 mm		0.0		0.00	100.00	
6.3 mm		0.0		0.00	100.00	
Passing 6.3 mm m <sub>5</sub>		100.0				
Total (check with m <sub>4</sub> )		–				
Riffled m <sub>6</sub>		100.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$		1.00				
5 mm		0.0		0.00	100.00	
3.35mm		0.0		0.00	100.00	
2.36mm		0.0		0.00	100.00	
2 mm		0.2		0.20	99.80	
1.18 mm		0.6		0.60	99.20	
600 μm		4.8		4.80	94.40	
425 μm		15.8		15.80	78.60	
300 μm		16.9		16.90	61.70	
212 μm		12.0		12.00	49.70	
150 μm		5.5		5.50	44.20	
63 μ m		9.6		9.60	34.60	
Passing 63 μm m <sub>7</sub>		34.6				
Total (check with m <sub>6</sub> )						
Riffled m <sub>8</sub>		30.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$		1.15				
40 μ m		2.9		3.30	31.30	
20 μ m		12.0		13.80	17.50	
5 μ m		6.8		7.80	9.70	
2 μ m		3.6		4.20	5.50	
Passing 2 μ m		7.6		5.50	–	
Total (check with m <sub>6</sub> )		30.0	m <sub>1</sub>			
			Operator		Checked	
			Natalia Gachechiladze		Tamar Gorgidze	
					Approved	
					Roin Kavelashvili	

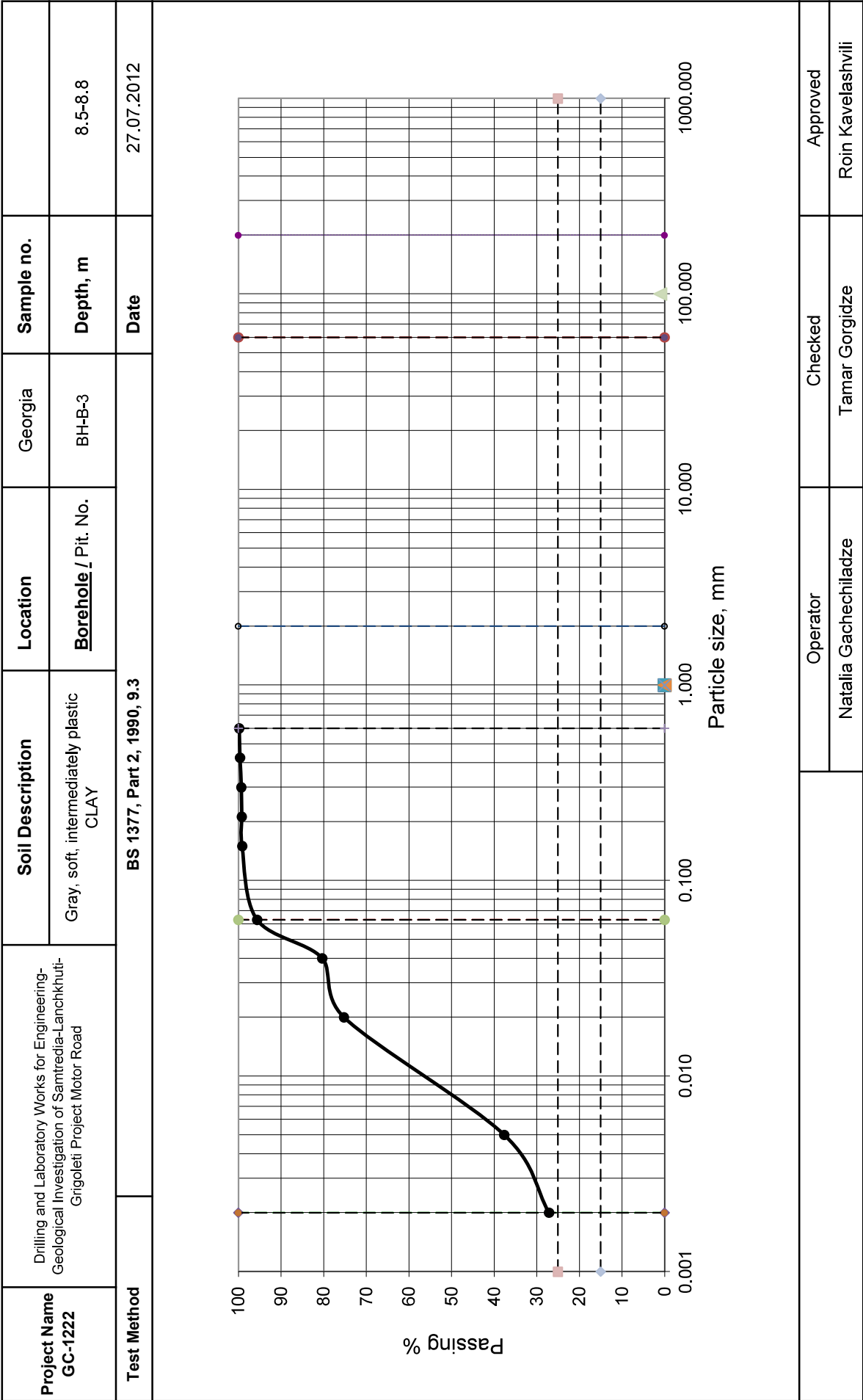
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

Project Name GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		Location		Georgia	
			Borehole / Pit. No.		BH-B-3	
Soil Description		Gray, soft, intermediately plastic CLAY		Sample no.		
				Depth		8.5-8.8 m
Test Method		BS 1377, Part 2, 1990, 9.3		Date		27.07.2012
Initial dry mass m <sub>1</sub>		100 g				
BS test sieve		mass retained g		Percentage retained		Cumulative percentage passing
		actual	corrected m	$\left(\frac{m}{m_1}\right).100\%$		
>200 mm		0.0		0.00	100.00	
125mm		0.0		0.00	100.00	
90 mm		0.0		0.00	100.00	
75 mm		0.0		0.00	100.00	
63 mm		0.0		0.00	100.00	
50 mm		0.0		0.00	100.00	
37.5 mm		0.0		0.00	100.00	
28 mm		0.0		0.00	100.00	
20 mm		0.0		0.00	100.00	
Passing 20mm m <sub>2</sub>		100.0				
Total (check with m <sub>1</sub> )						
Riffled m <sub>3</sub>		100.0				
Riffled and washed m <sub>4</sub>		–				
Correction factor $\frac{m_2}{m_3}$		1.00				
14 mm		0.0		0.00	100.00	
10 mm		0.0		0.00	100.00	
6.3 mm		0.0		0.00	100.00	
Passing 6.3 mm m <sub>5</sub>		100.0				
Total (check with m <sub>4</sub> )		–				
Riffled m <sub>6</sub>		100.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$		1.00				
5 mm		0.0		0.00	100.00	
3.35mm		0.0		0.00	100.00	
2.36mm		0.0		0.00	100.00	
2 mm		0.0		0.00	100.00	
1.18 mm		0.0		0.00	100.00	
600 μm		0.2		0.20	99.80	
425 μm		0.2		0.20	99.60	
300 μm		0.3		0.30	99.30	
212 μm		0.1		0.10	99.20	
150 μm		0.1		0.10	99.10	
63 μ m		3.5		3.50	95.60	
Passing 63 μm m <sub>7</sub>		95.6				
Total (check with m <sub>6</sub> )						
Riffled m <sub>8</sub>		30.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$		3.19				
40 μ m		4.8		15.30	80.30	
20 μ m		1.6		5.10	75.20	
5 μ m		11.8		37.60	37.60	
2 μ m		3.3		10.50	27.10	
Passing 2 μ m		13.3		27.10	–	
Total (check with m <sub>6</sub> )		30.0	m <sub>1</sub>			
			Operator	Checked	Approved	
			Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili	

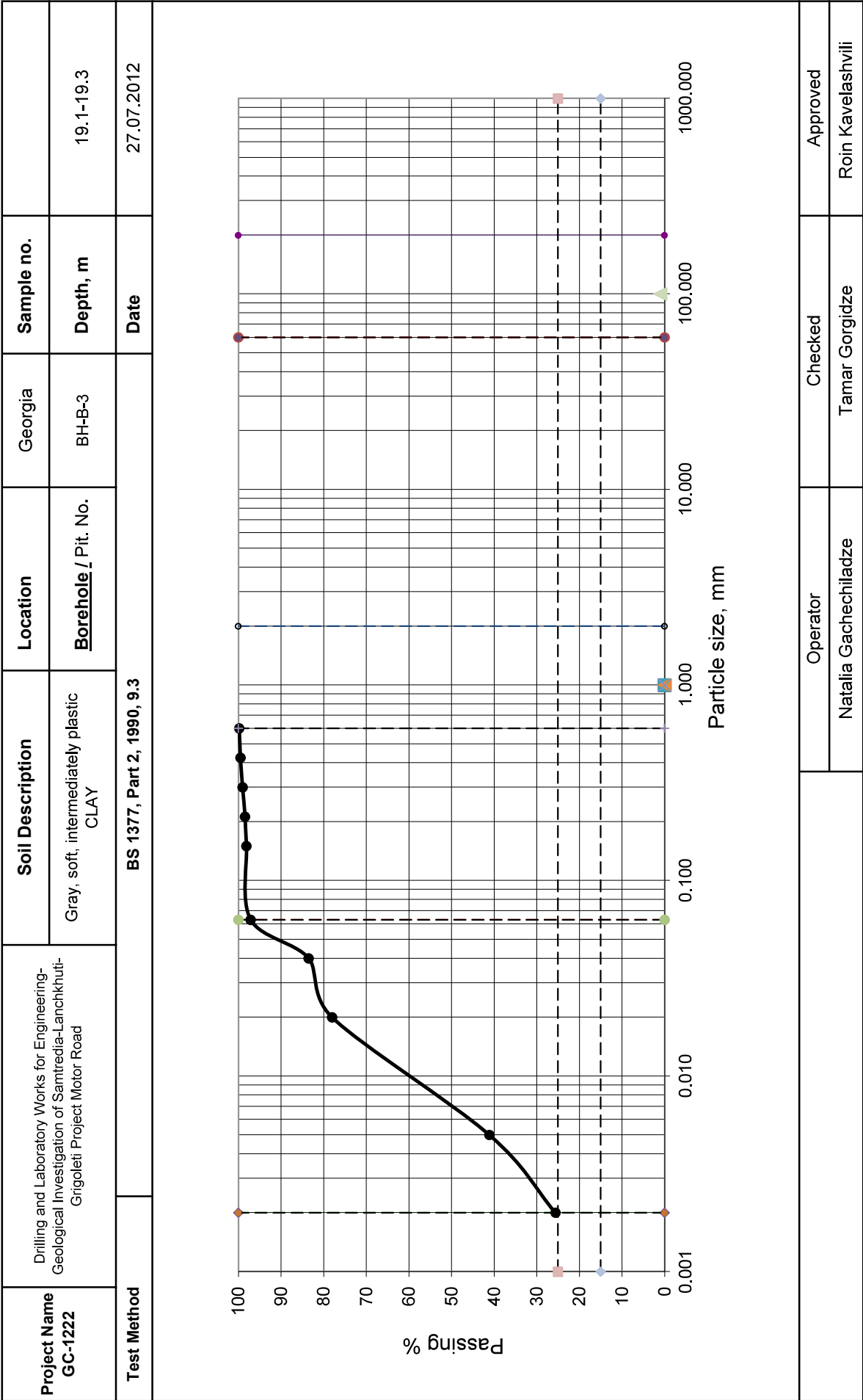
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

Project Name GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road			Location		Georgia	
				Borehole / Pit. No.		BH-B-3	
Soil Description		Gray, soft, intermediately plastic CLAY			Sample no.		
					Depth		19.1-19.3 m
Test Method		BS 1377, Part 2, 1990, 9.3			Date		27.07.2012
Initial dry mass m <sub>1</sub>			100 g				
BS test sieve			mass retained g		Percentage retained		Cumulative percentage passing
			actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$		
>200 mm			0.0		0.00	100.00	
125mm			0.0		0.00	100.00	
90 mm			0.0		0.00	100.00	
75 mm			0.0		0.00	100.00	
63 mm			0.0		0.00	100.00	
50 mm			0.0		0.00	100.00	
37.5 mm			0.0		0.00	100.00	
28 mm			0.0		0.00	100.00	
20 mm			0.0		0.00	100.00	
Passing 20mm m <sub>2</sub>			100.0				
Total (check with m <sub>1</sub> )							
Riffled m <sub>3</sub>			100.0				
Riffled and washed m <sub>4</sub>			–				
Correction factor $\frac{m_2}{m_3}$			1.00				
14 mm			0.0		0.00	100.00	
10 mm			0.0		0.00	100.00	
6.3 mm			0.0		0.00	100.00	
Passing 6.3 mm m <sub>5</sub>			100.0				
Total (check with m <sub>4</sub> )			–				
Riffled m <sub>6</sub>			100.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$			1.00				
5 mm			0.0		0.00	100.00	
3.35mm			0.0		0.00	100.00	
2.36mm			0.0		0.00	100.00	
2 mm			0.0		0.00	100.00	
1.18 mm			0.0		0.00	100.00	
600 μm			0.2		0.20	99.80	
425 μm			0.3		0.30	99.50	
300 μm			0.5		0.50	99.00	
212 μm			0.6		0.60	98.40	
150 μm			0.3		0.30	98.10	
63 μ m			1.0		1.00	97.10	
Passing 63 μm m <sub>7</sub>			97.1				
Total (check with m <sub>6</sub> )							
Riffled m <sub>8</sub>			30.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$			3.24				
40 μ m			4.2		13.60	83.50	
20 μ m			1.7		5.50	78.00	
5 μ m			11.4		36.90	41.10	
2 μ m			4.8		15.50	25.60	
Passing 2 μ m			12.1		25.60	–	
Total (check with m <sub>6</sub> )			30.0	m <sub>1</sub>			
				Operator		Checked	Approved
				Natalia Gachechiladze		Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)

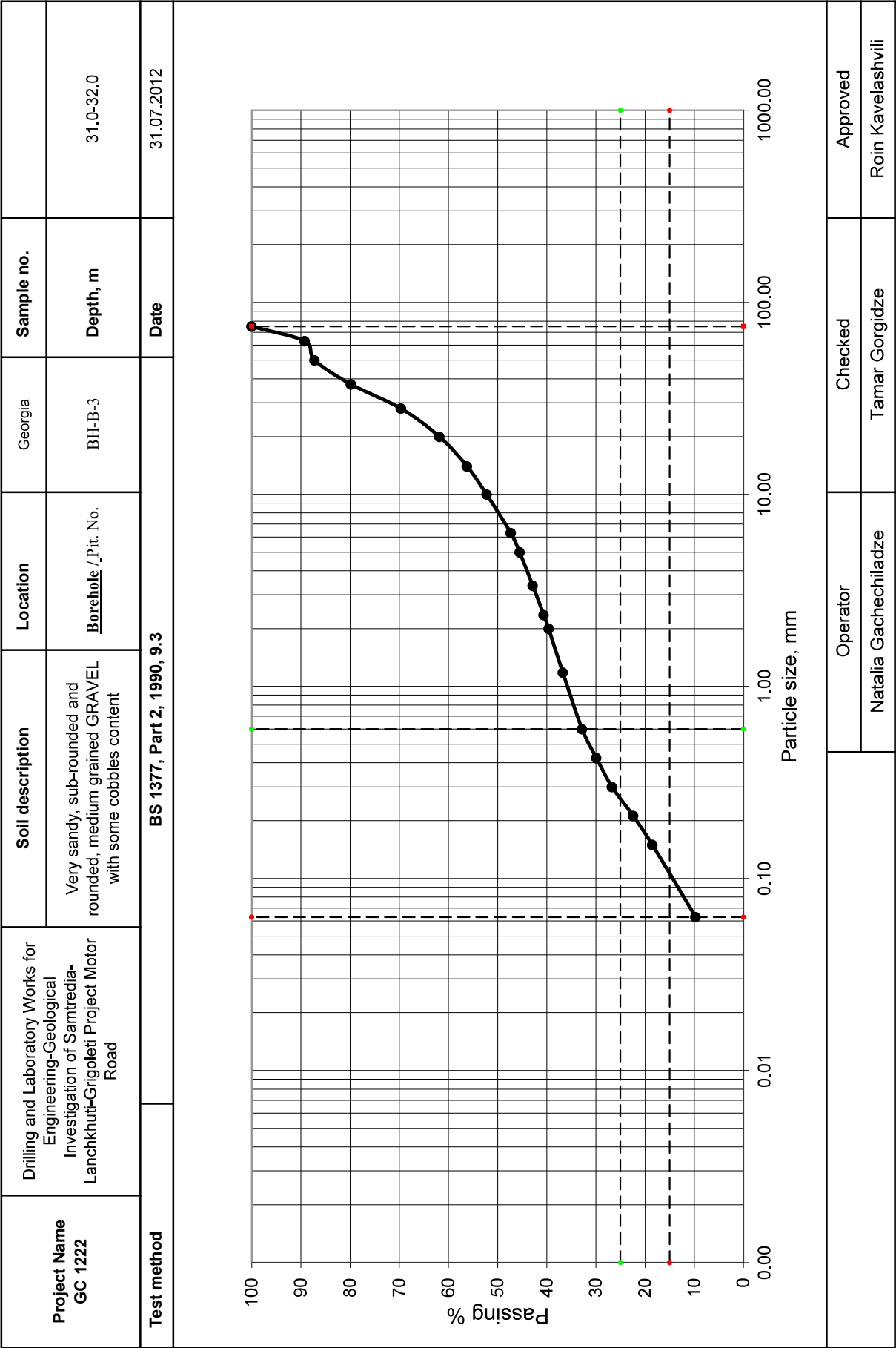


**Particle Size Distribution (Sieving)**

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-3
<b>Soil description</b>	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	
			<b>Depth, m</b>	31.0-32.0
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>14000 g</b>			
BS test sieve	mass retained g		Percentage retained $\left(\frac{m}{m_1}\right) \cdot 100\%$	Cumulative percentage passing
	actual	corrected m		
>200 mm	0.0		0.00	100.00
200 mm	0.0		0.00	100.00
125 mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	1512.0		10.80	89.20
50 mm	280.0		2.00	87.20
37.5 mm	1036.0		7.40	79.80
28 mm	1428.0		10.20	69.60
20 mm	1092.0		7.80	61.80
Passing 20mm $m_2$	8652.0			
Total (check with $m_1$ )				
Riffled $m_3$	2000.0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	4.33			
14 mm	181.2			
10 mm	129.4			
6.3 mm	158.6			
Passing 6.3 mm $m_5$	1530.7			
Total (check with $m_4$ )	–			
Riffled $m_6$	150.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	44.15			
5 mm	5.7			
3.35mm	8.6			
2.36mm	7.0			
2 mm	3.2			
1.18 mm	9.2			
600 $\mu\text{m}$	12.4			
425 $\mu\text{m}$	9.2			
300 $\mu\text{m}$	10.1			
212 $\mu\text{m}$	13.6			
150 $\mu\text{m}$	12.4			
63 $\mu\text{m}$	27.9			
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	30.8		9.70	–
Total (check with $m_6$ )	150.0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili



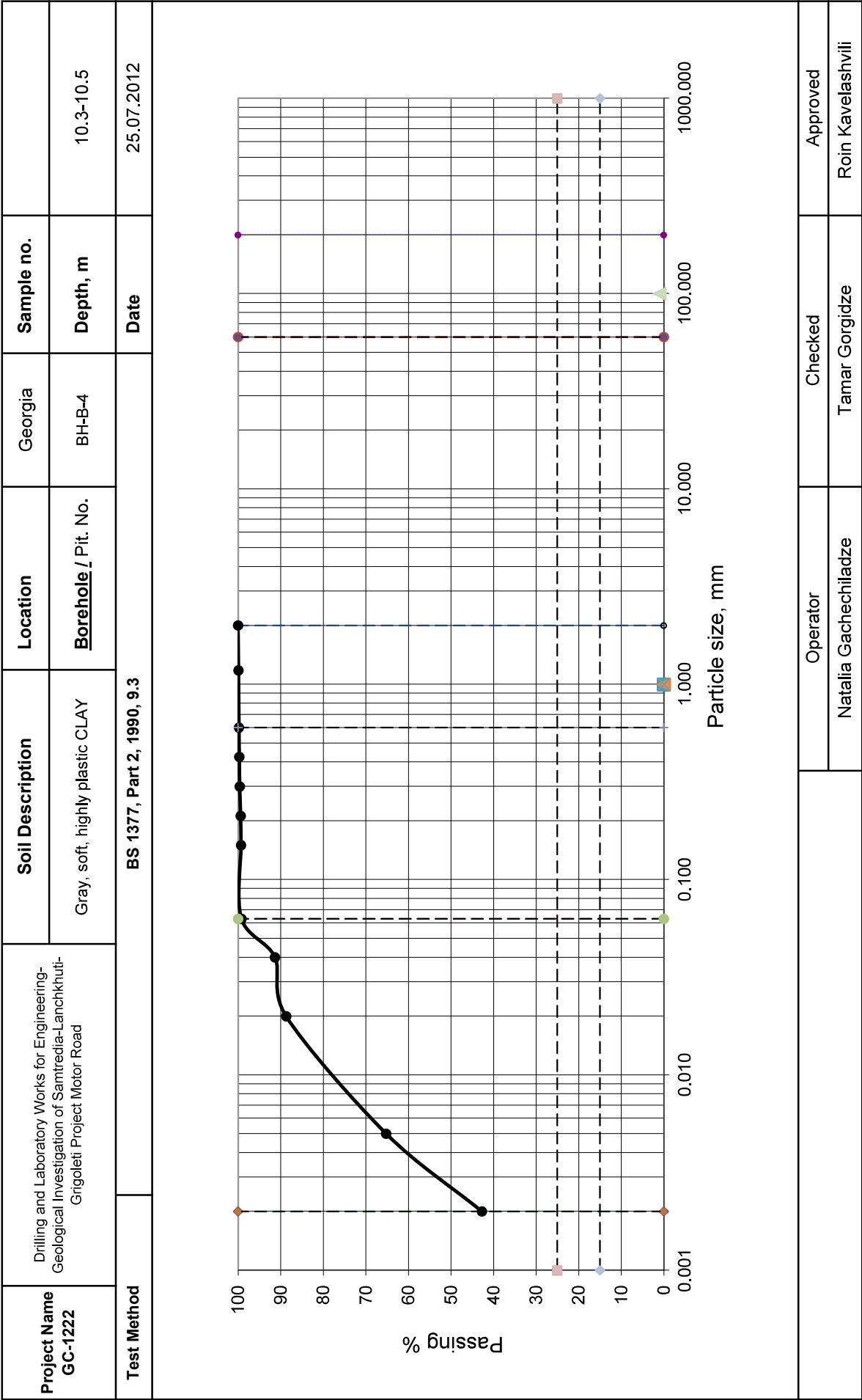
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

Project Name GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		Location		Georgia			
			Borehole / Pit. No.		BH-B-4			
Soil Description		Gray, soft, highly plastic CLAY		Sample no.				
				Depth		10.3-10.5 m		
Test Method		BS 1377, Part 2, 1990, 9.3		Date		25.07.2012		
Initial dry mass m <sub>1</sub>		100 g						
BS test sieve		mass retained g		Percentage retained $\left(\frac{m}{m_1}\right).100\%$		Cumulative percentage passing		
		actual	corrected m					
>200 mm		0.0		0.00	100.00			
125mm		0.0		0.00	100.00			
90 mm		0.0		0.00	100.00			
75 mm		0.0		0.00	100.00			
63 mm		0.0		0.00	100.00			
50 mm		0.0		0.00	100.00			
37.5 mm		0.0		0.00	100.00			
28 mm		0.0		0.00	100.00			
20 mm		0.0		0.00	100.00			
Passing 20mm m <sub>2</sub>		100.0						
Total (check with m <sub>1</sub> )								
Riffled m <sub>3</sub>		100.0						
Riffled and washed m <sub>4</sub>		–						
Correction factor $\frac{m_2}{m_3}$		1.00						
14 mm		0.0		0.00	100.00			
10 mm		0.0		0.00	100.00			
6.3 mm		0.0		0.00	100.00			
Passing 6.3 mm m <sub>5</sub>		100.0						
Total (check with m <sub>4</sub> )		–						
Riffled m <sub>6</sub>		100.0						
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$		1.00						
5 mm		0.0		0.00	100.00			
3.35mm		0.0		0.00	100.00			
2.36mm		0.0		0.00	100.00			
2 mm		0.0		0.00	100.00			
1.18 mm		0.1		0.10	99.90			
600 μm		0.1		0.10	99.80			
425 μm		0.1		0.10	99.70			
300 μm		0.1		0.10	99.60			
212 μm		0.2		0.20	99.40			
150 μm		0.1		0.10	99.30			
63 μ m		0.1		0.10	99.20			
Passing 63 μm m <sub>7</sub>		99.2						
Total (check with m <sub>6</sub> )								
Riffled m <sub>8</sub>		30.0						
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$		3.31						
40 μ m		2.4		7.90	91.30			
20 μ m		0.8		2.60	88.70			
5 μ m		7.1		23.50	65.20			
2 μ m		6.8		22.50	42.70			
Passing 2 μ m		15.3		42.70	–			
Total (check with m <sub>6</sub> )		30.0	m <sub>1</sub>					
			Operator		Checked		Approved	
			Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili	

Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

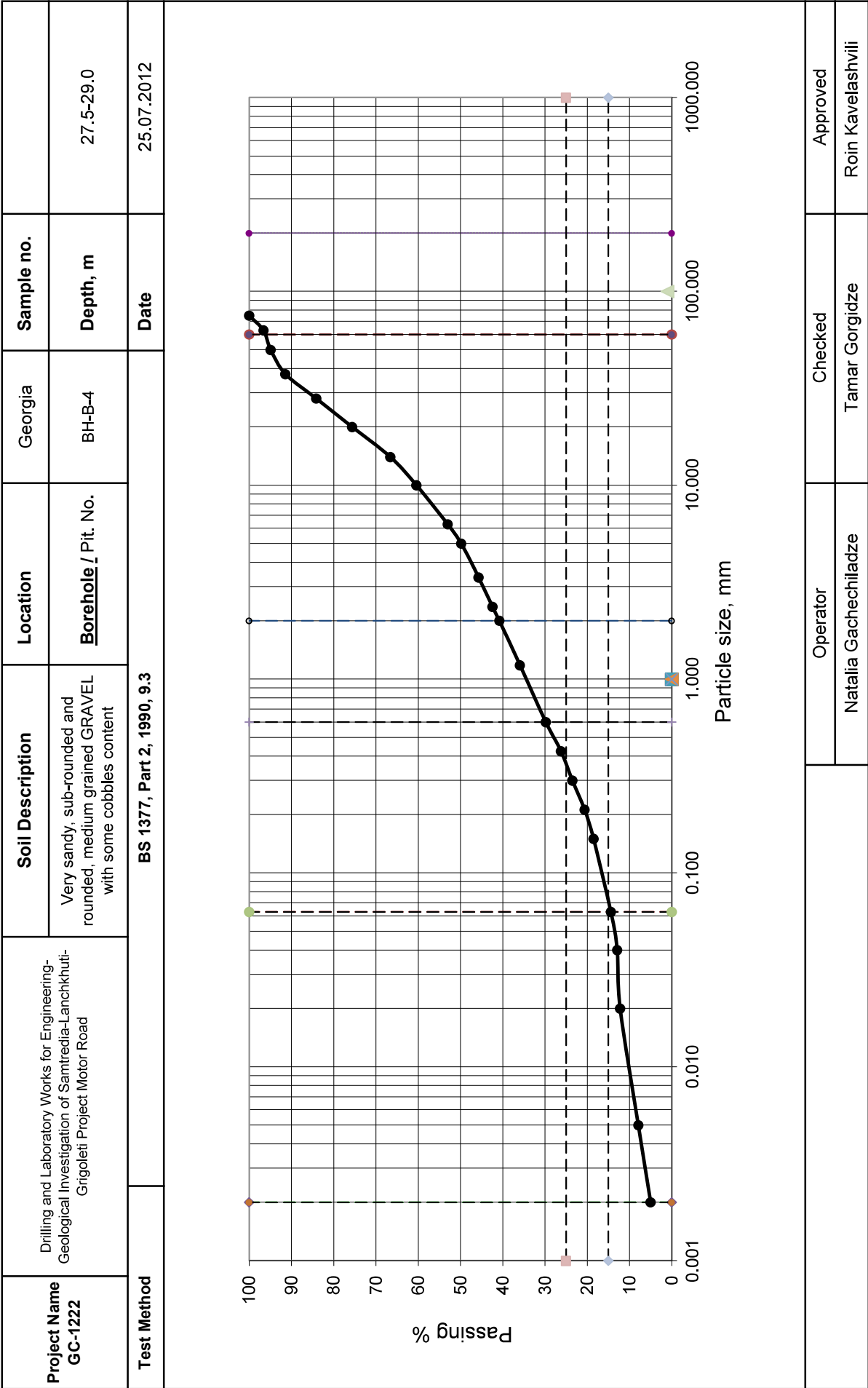
Project Name GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		Location		Georgia	
			Borehole / Pit. No.		BH-B-4	
Soil Description		Gray, soft, highly plastic CLAY		Sample no.		
				Depth		21.0-21.3 m
Test Method		BS 1377, Part 2, 1990, 9.3		Date		25.07.2012
Initial dry mass m <sub>1</sub>		100 g				
BS test sieve		mass retained g		Percentage retained		Cumulative percentage passing
		actual	corrected m	$\left(\frac{m}{m_1}\right).100\%$		
>200 mm		0.0		0.00	100.00	
125mm		0.0		0.00	100.00	
90 mm		0.0		0.00	100.00	
75 mm		0.0		0.00	100.00	
63 mm		0.0		0.00	100.00	
50 mm		0.0		0.00	100.00	
37.5 mm		0.0		0.00	100.00	
28 mm		0.0		0.00	100.00	
20 mm		0.0		0.00	100.00	
Passing 20mm m <sub>2</sub>		100.0				
Total (check with m <sub>1</sub> )						
Riffled m <sub>3</sub>		100.0				
Riffled and washed m <sub>4</sub>		–				
Correction factor $\frac{m_2}{m_3}$		1.00				
14 mm		0.0		0.00	100.00	
10 mm		0.0		0.00	100.00	
6.3 mm		0.0		0.00	100.00	
Passing 6.3 mm m <sub>5</sub>		100.0				
Total (check with m <sub>4</sub> )		–				
Riffled m <sub>6</sub>		100.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$		1.00				
5 mm		0.0		0.00	100.00	
3.35mm		0.0		0.00	100.00	
2.36mm		0.0		0.00	100.00	
2 mm		0.2		0.20	99.80	
1.18 mm		0.2		0.20	99.60	
600 μm		0.1		0.10	99.50	
425 μm		0.1		0.10	99.40	
300 μm		0.1		0.10	99.30	
212 μm		0.1		0.10	99.20	
150 μm		0.1		0.10	99.10	
63 μ m		0.6		0.60	98.50	
Passing 63 μm m <sub>7</sub>		98.5				
Total (check with m <sub>6</sub> )						
Riffled m <sub>8</sub>		30.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$		3.28				
40 μ m		2.5		8.20	90.30	
20 μ m		0.6		2.00	88.30	
5 μ m		10.3		33.80	54.50	
2 μ m		6.0		19.70	34.80	
Passing 2 μ m		13.1		34.80	–	
Total (check with m <sub>6</sub> )		30.0	m <sub>1</sub>			
			Operator		Checked	Approved
			Natalia Gachechiladze		Tamar Gorgidze	Roin Kavelashvili



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No <sub>2</sub>	BH-B-4
<b>Soil Description</b>	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	
			<b>Depth</b>	27.5-29.0 m
<b>Test Method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	25.07.2012
Initial dry mass m <sub>1</sub>	15565 g			
BS test sieve	mass retained g		Percentage retained $\left(\frac{m}{m_1}\right) \cdot 100\%$	Cumulative percentage passing
	actual	corrected m		
>200 mm	0.0		0.00	100.00
125mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	529.2		3.40	96.60
50 mm	264.6		1.70	94.90
37.5 mm	544.8		3.50	91.40
28 mm	1136.2		7.30	84.10
20 mm	1323.0		8.50	75.60
Passing 20mm m <sub>2</sub>	11767.1			
Total (check with m <sub>1</sub> )				
Riffled m <sub>3</sub>	11767.1			
Riffled and washed m <sub>4</sub>	–			
Correction factor $\frac{m_2}{m_3}$	1.00			
14 mm	1400.9		9.00	66.60
10 mm	965.0		6.20	60.40
6.3 mm	1151.8		7.40	53.00
Passing 6.3 mm m <sub>5</sub>	8249.5			
Total (check with m <sub>4</sub> )	–			
Riffled m <sub>6</sub>	8249.5			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1.00			
5 mm	498.1		3.20	49.80
3.35mm	638.2		4.10	45.70
2.36mm	513.6		3.30	42.40
2 mm	249.0		1.60	40.80
1.18 mm	762.7		4.90	35.90
600 μm	949.5		6.10	29.80
425 μm	560.3		3.60	26.20
300 μm	420.3		2.70	23.50
212 μm	451.4		2.90	20.60
150 μm	326.9		2.10	18.50
63 μ m	638.2		4.10	14.40
Passing 63 μm m <sub>7</sub>	2241.4			
Total (check with m <sub>6</sub> )				
Riffled m <sub>8</sub>	30.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$	74.71			
40 μ m	3.1		1.50	12.90
20 μ m	1.5		0.70	12.20
5 μ m	9.0		4.30	7.90
2 μ m	6.0		2.90	5.00
Passing 2 μ m	13.5		5.00	–
Total (check with m <sub>6</sub> )	30.0	m <sub>1</sub>		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)

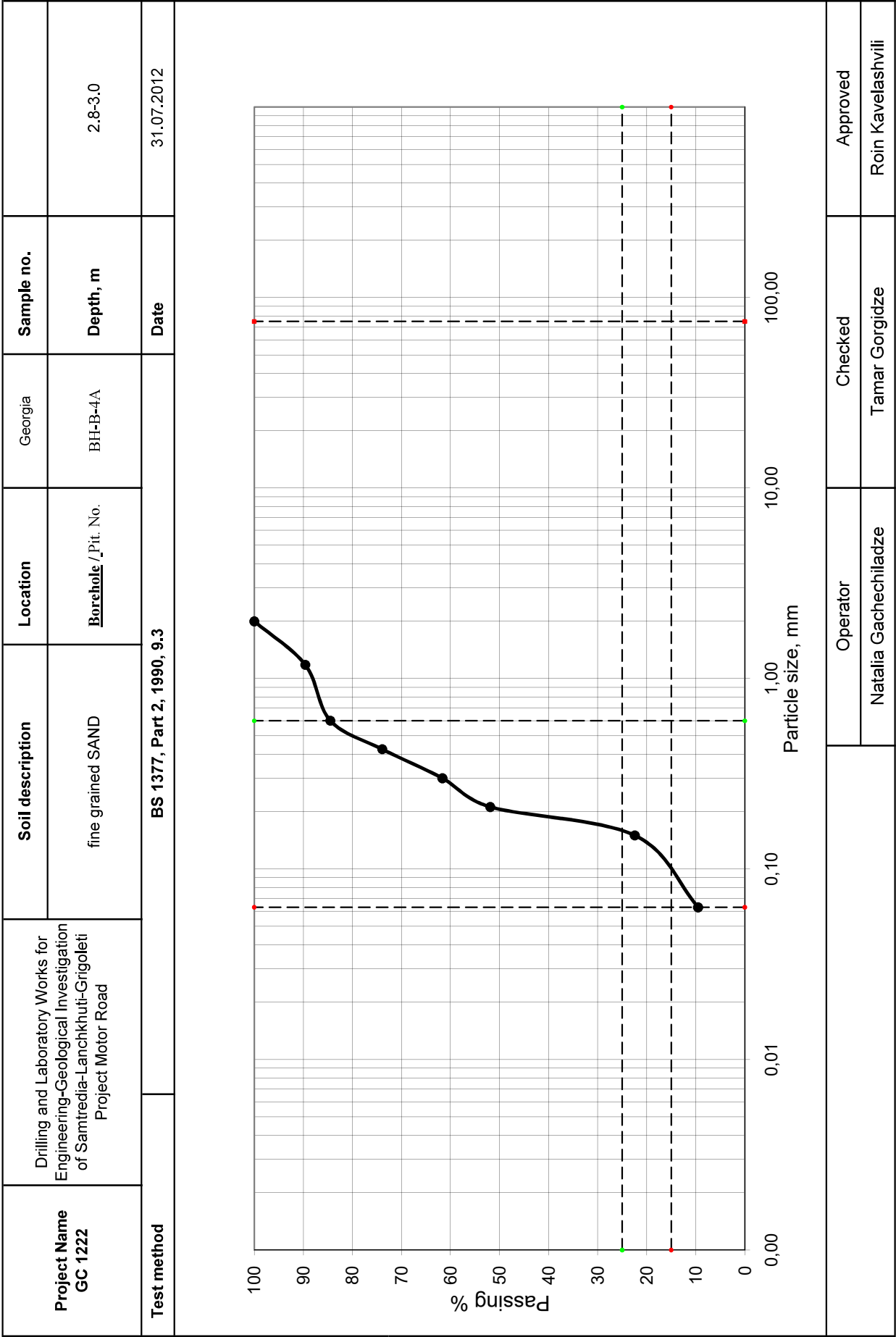


## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-4A
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	2.8-3.0
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>300 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	300,0			
Total (check with $m_1$ )				
Riffled $m_3$	300,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	300,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	300,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	31,2		10,40	89,60
600 $\mu\text{m}$	15,3		5,10	84,50
425 $\mu\text{m}$	31,8		10,60	73,90
300 $\mu\text{m}$	36,9		12,30	61,60
212 $\mu\text{m}$	29,1		9,70	51,90
150 $\mu\text{m}$	88,5		29,50	22,40
63 $\mu\text{m}$	38,7		12,90	9,50
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	28,5		9,50	0,00
Total (check with $m_6$ )	300,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili



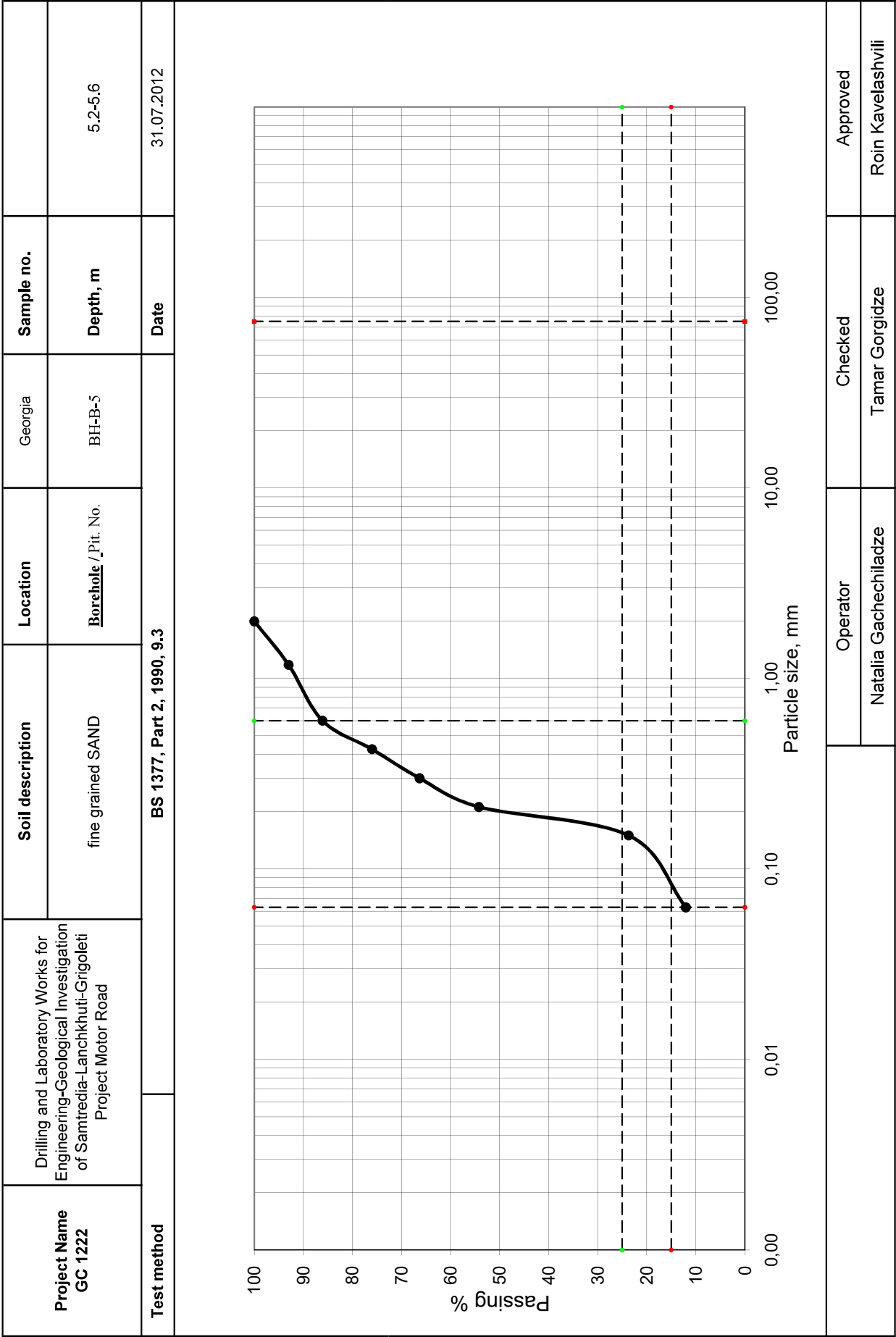
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-5
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	5.2-5.6
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>300 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	300,0			
Total (check with $m_1$ )				
Riffled $m_3$	300,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	300,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	300,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	21,0		7,00	93,00
600 $\mu\text{m}$	20,7		6,90	86,10
425 $\mu\text{m}$	30,3		10,10	76,00
300 $\mu\text{m}$	29,1		9,70	66,30
212 $\mu\text{m}$	36,3		12,10	54,20
150 $\mu\text{m}$	91,5		30,50	23,70
63 $\mu\text{m}$	35,1		11,70	12,00
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	36,0		12,00	–
Total (check with $m_6$ )	300,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

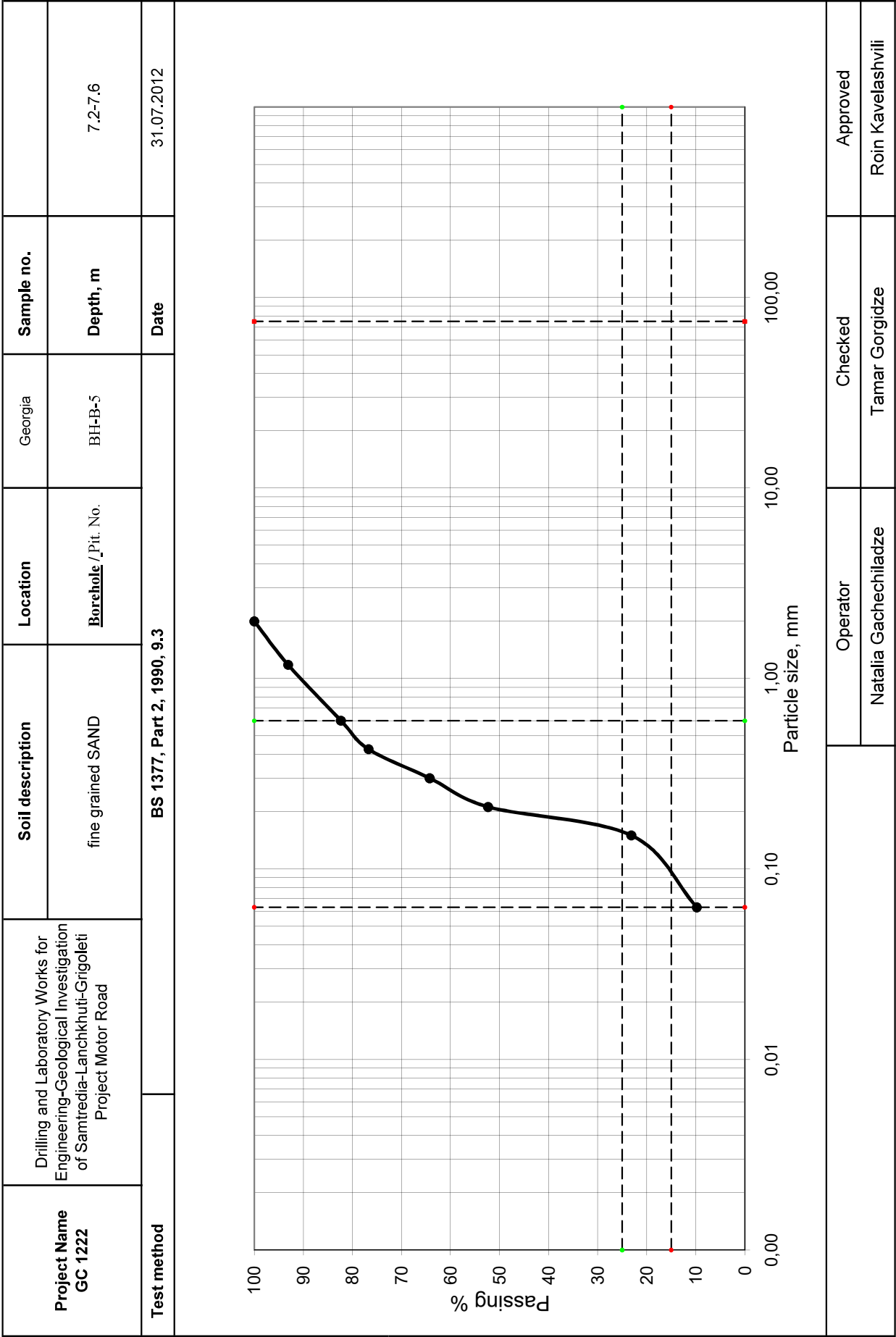
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-5
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	7.2-7.6
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	34,5		6,90	93,10
600 $\mu\text{m}$	54,0		10,80	82,30
425 $\mu\text{m}$	28,0		5,60	76,70
300 $\mu\text{m}$	62,5		12,50	64,20
212 $\mu\text{m}$	59,5		11,90	52,30
150 $\mu\text{m}$	146,0		29,20	23,10
63 $\mu\text{m}$	66,5		13,30	9,80
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	49,0		9,80	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

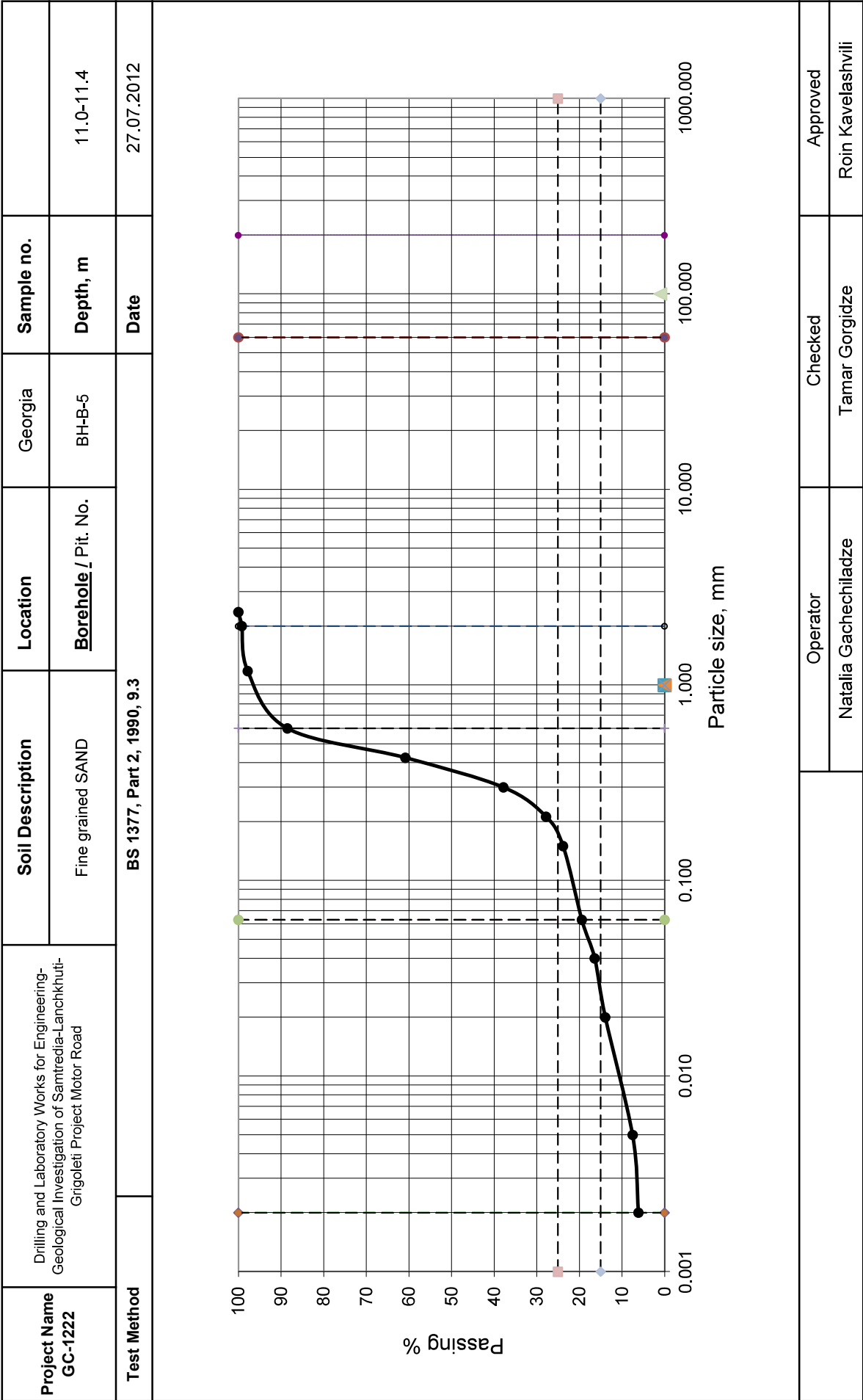
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

Project Name GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road			Location		Georgia	
				Borehole / Pit. No.		BH-B-5	
Soil Description		Fine grained SAND			Sample no.		
					Depth		11.0-11.4 m
Test Method		BS 1377, Part 2, 1990, 9.3			Date		27.07.2012
Initial dry mass m <sub>1</sub>			100 g				
BS test sieve			mass retained g		Percentage retained		Cumulative percentage passing
			actual	corrected m	$\left(\frac{m}{m_1}\right).100\%$		
>200 mm			0.0		0.00	100.00	
125mm			0.0		0.00	100.00	
90 mm			0.0		0.00	100.00	
75 mm			0.0		0.00	100.00	
63 mm			0.0		0.00	100.00	
50 mm			0.0		0.00	100.00	
37.5 mm			0.0		0.00	100.00	
28 mm			0.0		0.00	100.00	
20 mm			0.0		0.00	100.00	
Passing 20mm m <sub>2</sub>			100.0				
Total (check with m <sub>1</sub> )							
Riffled m <sub>3</sub>			100.0				
Riffled and washed m <sub>4</sub>			–				
Correction factor $\frac{m_2}{m_3}$			1.00				
14 mm			0.0		0.00	100.00	
10 mm			0.0		0.00	100.00	
6.3 mm			0.0		0.00	100.00	
Passing 6.3 mm m <sub>5</sub>			100.0				
Total (check with m <sub>4</sub> )			–				
Riffled m <sub>6</sub>			100.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$			1.00				
5 mm			0.0		0.00	100.00	
3.35mm			0.0		0.00	100.00	
2.36mm			0.0		0.00	100.00	
2 mm			0.8		0.80	99.20	
1.18 mm			1.4		1.40	97.80	
600 μm			9.3		9.30	88.50	
425 μm			27.7		27.70	60.80	
300 μm			23.0		23.00	37.80	
212 μm			10.0		10.00	27.80	
150 μm			4.0		4.00	23.80	
63 μ m			4.4		4.40	19.40	
Passing 63 μm m <sub>7</sub>			19.4				
Total (check with m <sub>6</sub> )							
Riffled m <sub>8</sub>			30.0				
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$			0.65				
40 μ m			4.6		3.00	16.40	
20 μ m			3.9		2.50	13.90	
5 μ m			9.9		6.40	7.50	
2 μ m			2.2		1.40	6.10	
Passing 2 μ m			14.1		6.10	–	
Total (check with m <sub>6</sub> )			30.0	m <sub>1</sub>			
				Operator		Checked	
				Natalia Gachechiladze		Tamar Gorgidze	
						Approved	
				Roin Kavelashvili			

Particle Size Distribution (Chart)

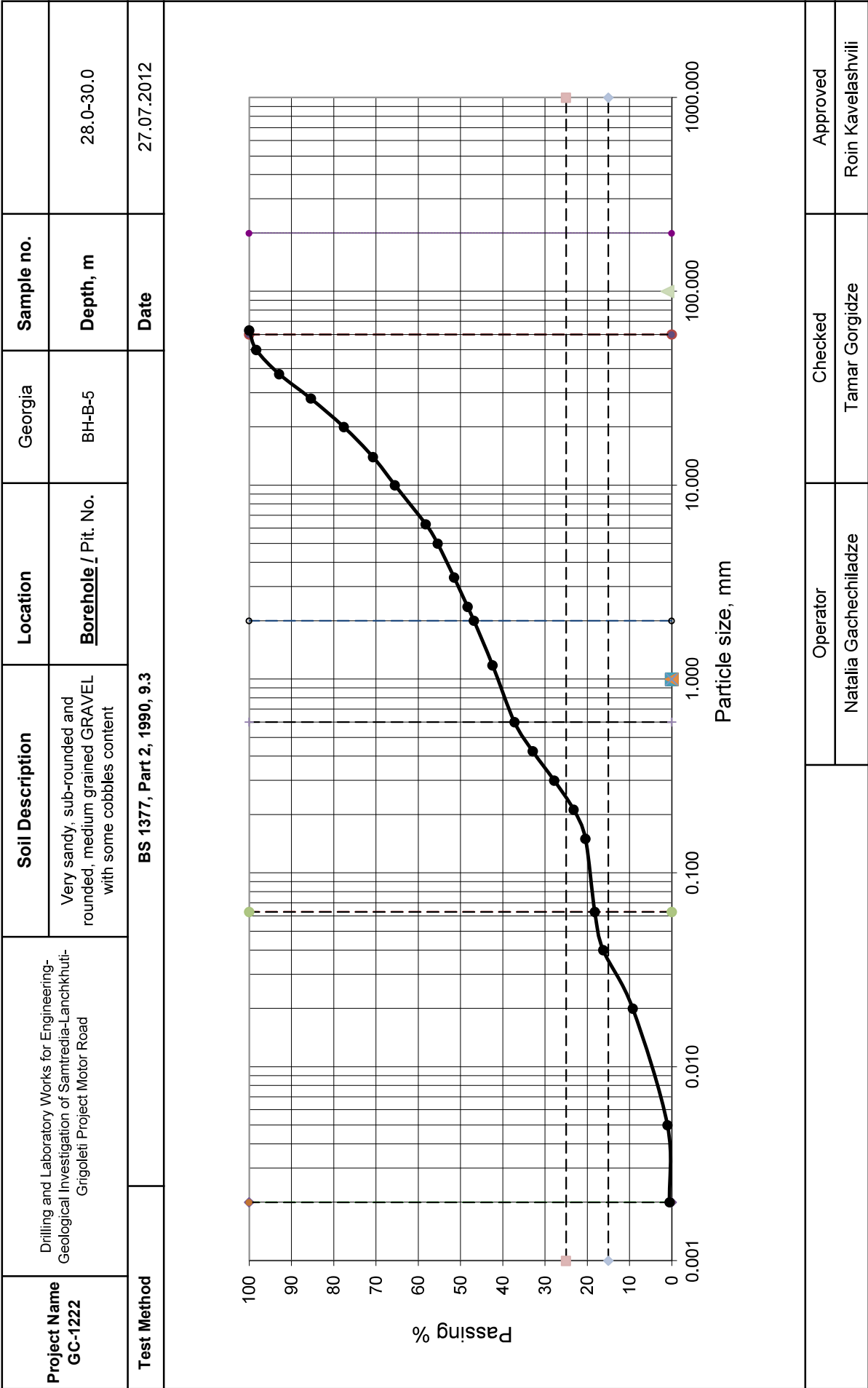


## Particle Size Distribution (Sieving)

<b>Project Name</b> GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No <sub>2</sub>	BH-B-5
<b>Soil Description</b>	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	
			<b>Depth</b>	28.0-30.0 m
<b>Test Method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	27.07.2012
Initial dry mass m <sub>1</sub>	15600 g			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0.0		0.00	100.00
125mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	265.2		1.70	98.30
37.5 mm	842.4		5.40	92.90
28 mm	1170.0		7.50	85.40
20 mm	1216.8		7.80	77.60
Passing 20mm m <sub>2</sub>	12105.6			
Total (check with m <sub>1</sub> )				
Riffled m <sub>3</sub>	12105.6			
Riffled and washed m <sub>4</sub>	–			
Correction factor $\frac{m_2}{m_3}$	1.00			
14 mm	1076.4		6.90	70.70
10 mm	811.2		5.20	65.50
6,3 mm	1138.8		7.30	58.20
Passing 6,3 mm m <sub>5</sub>	9079.2			
Total (check with m <sub>4</sub> )	–			
Riffled m <sub>6</sub>	9079.2			
Correction factor $\frac{m_2 \times m_5}{m_3 \times m_6}$	1.00			
5 mm	436.8		2.80	55.40
3.35mm	608.4		3.90	51.50
2.36mm	499.2		3.20	48.30
2 mm	234.0		1.50	46.80
1.18 mm	686.4		4.40	42.40
600 μm	811.2		5.20	37.20
425 μm	670.8		4.30	32.90
300 μm	795.6		5.10	27.80
212 μm	717.6		4.60	23.20
150 μm	436.8		2.80	20.40
63 μ m	343.2		2.20	18.20
Passing 63 μm m <sub>7</sub>	2839.2			
Total (check with m <sub>6</sub> )				
Riffled m <sub>8</sub>	30.0			
Correction factor $\frac{m_2 \times m_5 \times m_7}{m_3 \times m_6 \times m_8}$	94.64			
40 μ m	3.3		2.00	16.20
20 μ m	11.5		7.00	9.20
5 μ m	13.5		8.20	1.00
2 μ m	0.8		0.50	0.50
Passing 2 μ m	4.1		0.50	–
Total (check with m <sub>6</sub> )	30.0	m <sub>1</sub>		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili



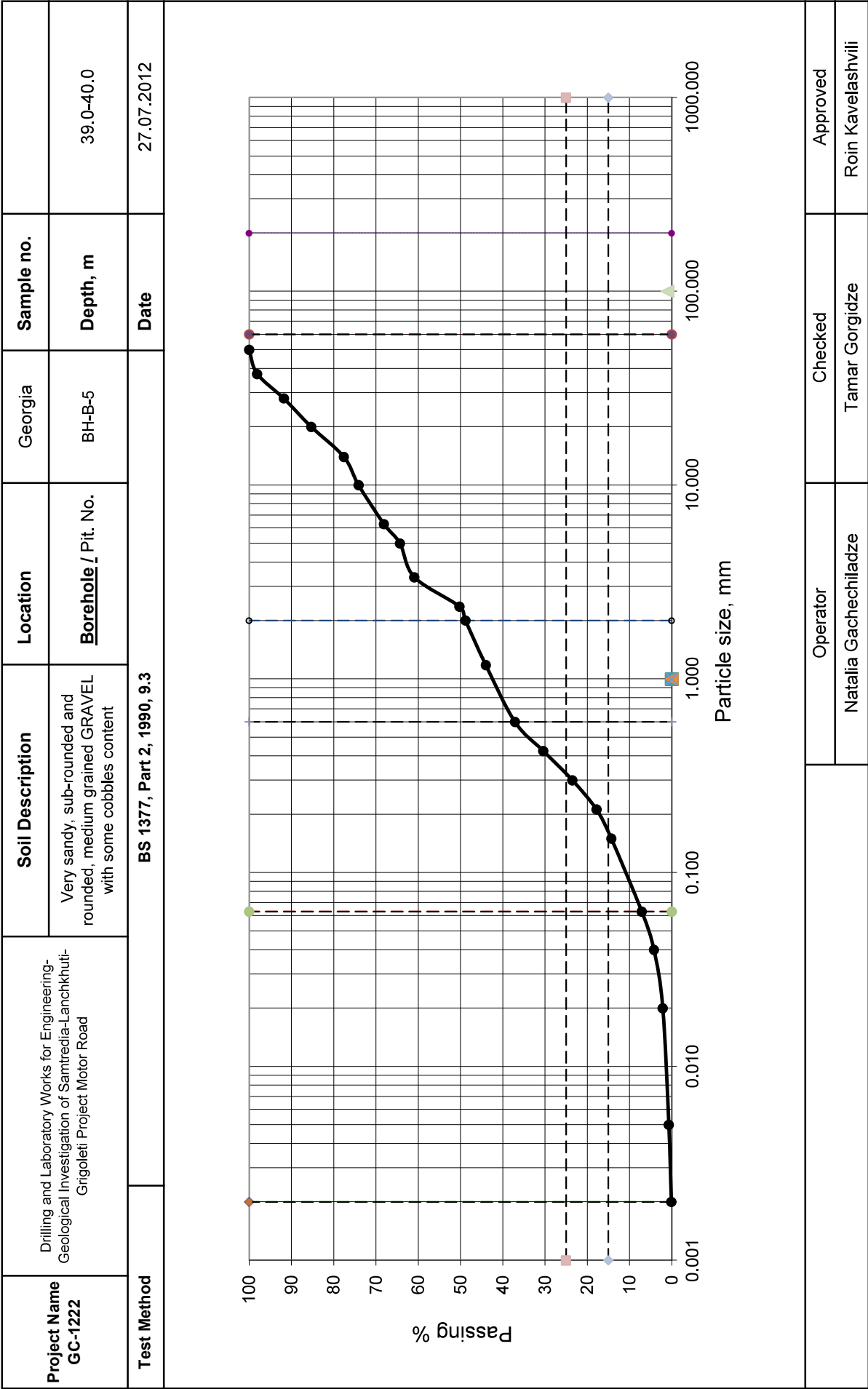
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No <sub>2</sub>	BH-B-5
<b>Soil Description</b>	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	
			<b>Depth</b>	39.0-40.0 m
<b>Test Method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	27.07.2012
Initial dry mass m <sub>1</sub>	7200 g			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0.0		0.00	100.00
125mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	0.0		0.00	100.00
37.5 mm	136.8		1.90	98.10
28 mm	453.6		6.30	91.80
20 mm	468.0		6.50	85.30
Passing 20mm m <sub>2</sub>	6141.6			
Total (check with m <sub>1</sub> )				
Riffled m <sub>3</sub>	6141.6			
Riffled and washed m <sub>4</sub>	–			
Correction factor $\frac{m_2}{m_3}$	1.00			
14 mm	554.4			
10 mm	252.0			
6.3 mm	432.0			
Passing 6.3 mm m <sub>5</sub>	4903.2			
Total (check with m <sub>4</sub> )	–			
Riffled m <sub>6</sub>	4903.2			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1.00			
5 mm	273.6			
3.35mm	244.8			
2.36mm	770.4			
2 mm	100.8			
1.18 mm	345.6			
600 μm	496.8			
425 μm	482.4			
300 μm	496.8			
212 μm	410.4			
150 μm	252.0			
63 μ m	518.4			
Passing 63 μm m <sub>7</sub>	511.2			
Total (check with m <sub>6</sub> )				
Riffled m <sub>8</sub>	30.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$	17.04			
40 μ m	12.3			
20 μ m	8.9			
5 μ m	5.9			
2 μ m	2.5			
Passing 2 μ m	12.7			
Total (check with m <sub>6</sub> )	30.0			
		m <sub>1</sub>		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

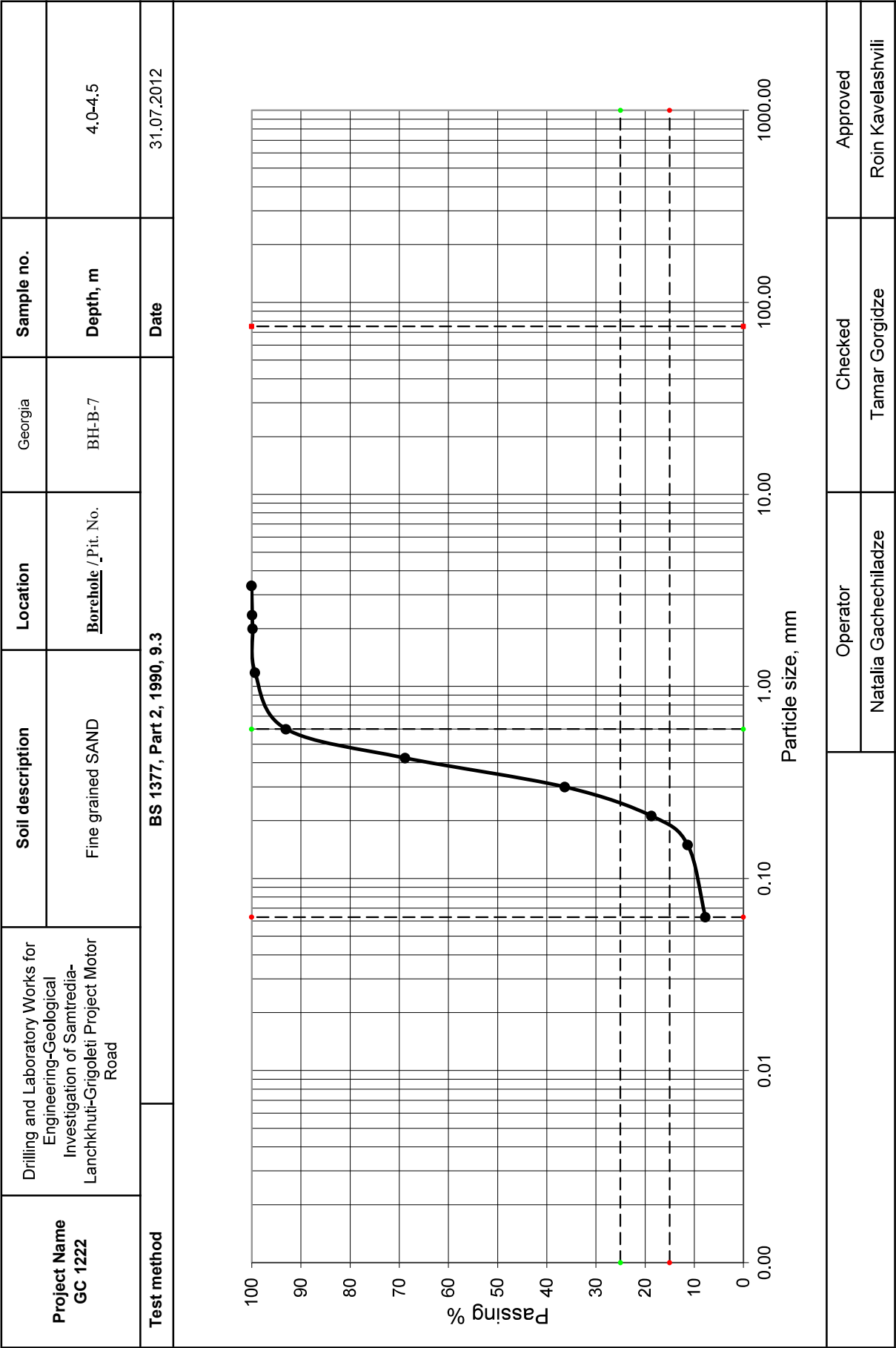
Particle Size Distribution (Chart)



**Particle Size Distribution (Sieving)**

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-7
<b>Soil description</b>	Fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	4.0-4.5
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>100 g</b>			
BS test sieve	mass retained g		Percentage retained $\left(\frac{m}{m_1}\right) \cdot 100\%$	Cumulative percentage passing
	actual	corrected m		
>200 mm	0.0		0.00	100.00
200 mm	0.0		0.00	100.00
125 mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	0.0		0.00	100.00
37.5 mm	0.0		0.00	100.00
28 mm	0.0		0.00	100.00
20 mm	0.0		0.00	100.00
Passing 20mm $m_2$	100.0			
Total (check with $m_1$ )				
Riffled $m_3$	2000.0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	0.05			
14 mm	0.0		0.00	100.00
10 mm	0.0		0.00	100.00
6.3 mm	0.0		0.00	100.00
Passing 6.3 mm $m_5$	2000.0			
Total (check with $m_4$ )	–			
Riffled $m_6$	150.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	0.67			
5 mm	0.0		0.00	100.00
3.35mm	0.0		0.00	100.00
2.36mm	0.2		0.10	99.90
2 mm	0.2		0.10	99.80
1.18 mm	0.8		0.50	99.30
600 $\mu\text{m}$	9.5		6.30	93.00
425 $\mu\text{m}$	36.3		24.20	68.80
300 $\mu\text{m}$	48.8		32.50	36.30
212 $\mu\text{m}$	26.4		17.60	18.70
150 $\mu\text{m}$	11.1		7.40	11.30
63 $\mu\text{m}$	5.4		3.60	7.70
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	11.6		7.70	–
Total (check with $m_6$ )	150.0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

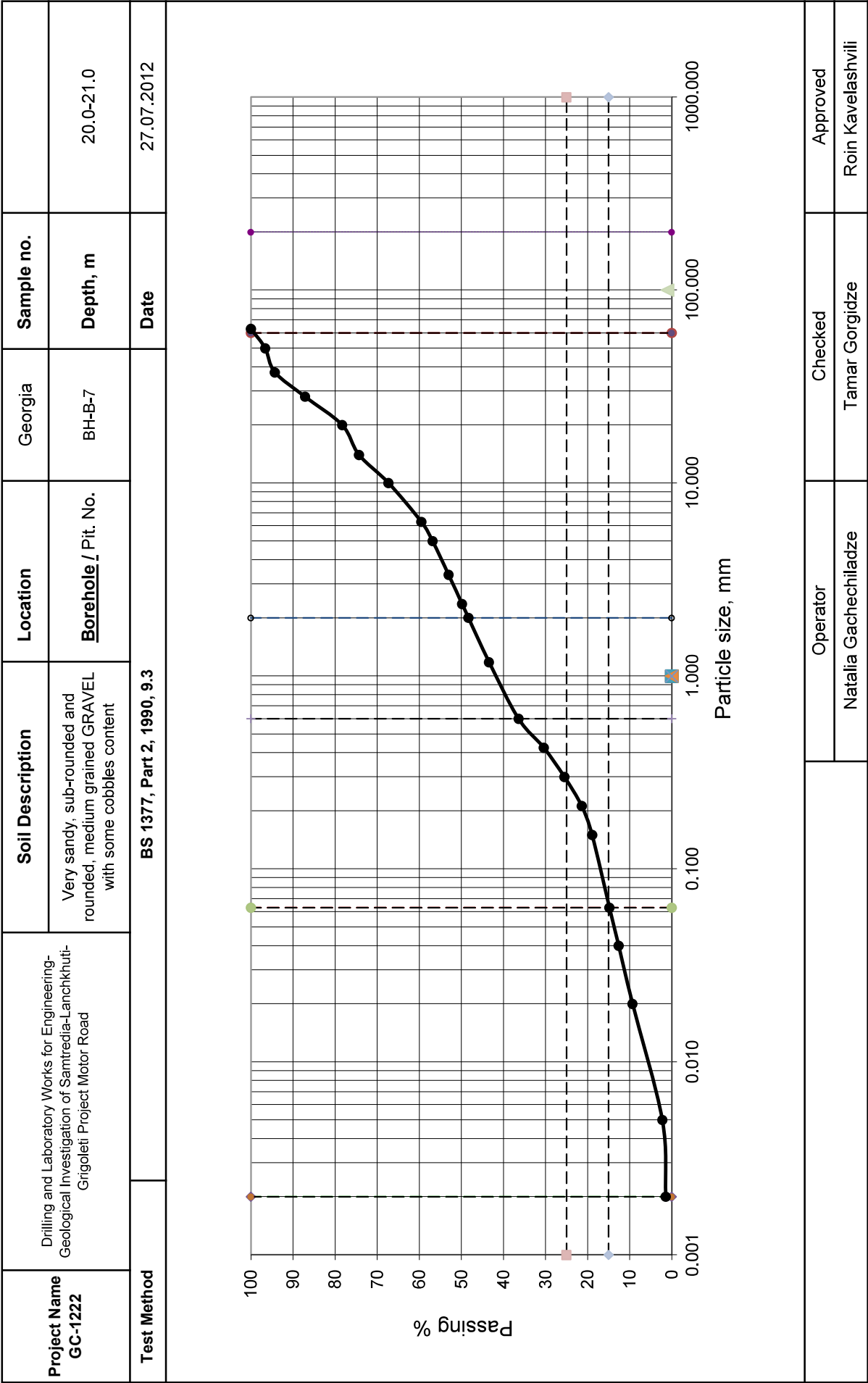
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No <sub>2</sub>	BH-B-7
<b>Soil Description</b>	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	
			<b>Depth</b>	20.0-21.0 m
<b>Test Method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	27.07.2012
Initial dry mass m <sub>1</sub>	10000 g			
BS test sieve	mass retained g		Percentage retained $\left(\frac{m}{m_1}\right) \cdot 100\%$	Cumulative percentage passing
	actual	corrected m		
>200 mm	0.0		0.00	100.00
125mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	340.0		3.40	96.60
37.5 mm	230.0		2.30	94.30
28 mm	720.0		7.20	87.10
20 mm	880.0		8.80	78.30
Passing 20mm m <sub>2</sub>	7830.0			
Total (check with m <sub>1</sub> )				
Riffled m <sub>3</sub>	7830.0			
Riffled and washed m <sub>4</sub>	–			
Correction factor $\frac{m_2}{m_3}$	1.00			
14 mm	400.0		4.00	74.30
10 mm	700.0		7.00	67.30
6.3 mm	780.0		7.80	59.50
Passing 6.3 mm m <sub>5</sub>	5950.0			
Total (check with m <sub>4</sub> )	–			
Riffled m <sub>6</sub>	5950.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1.00			
5 mm	270.0		2.70	56.80
3.35mm	380.0		3.80	53.00
2.36mm	320.0		3.20	49.80
2 mm	150.0		1.50	48.30
1.18 mm	490.0		4.90	43.40
600 μm	700.0		7.00	36.40
425 μm	600.0		6.00	30.40
300 μm	490.0		4.90	25.50
212 μm	410.0		4.10	21.40
150 μm	250.0		2.50	18.90
63 μ m	410.0		4.10	14.80
Passing 63 μm m <sub>7</sub>	1480.0			
Total (check with m <sub>6</sub> )				
Riffled m <sub>8</sub>	30.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$	49.33			
40 μ m	4.5		2.20	12.60
20 μ m	6.7		3.30	9.30
5 μ m	14.4		7.10	2.20
2 μ m	1.6		0.80	1.40
Passing 2 μ m	7.3		1.40	–
Total (check with m <sub>6</sub> )	30.0	m <sub>1</sub>		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)

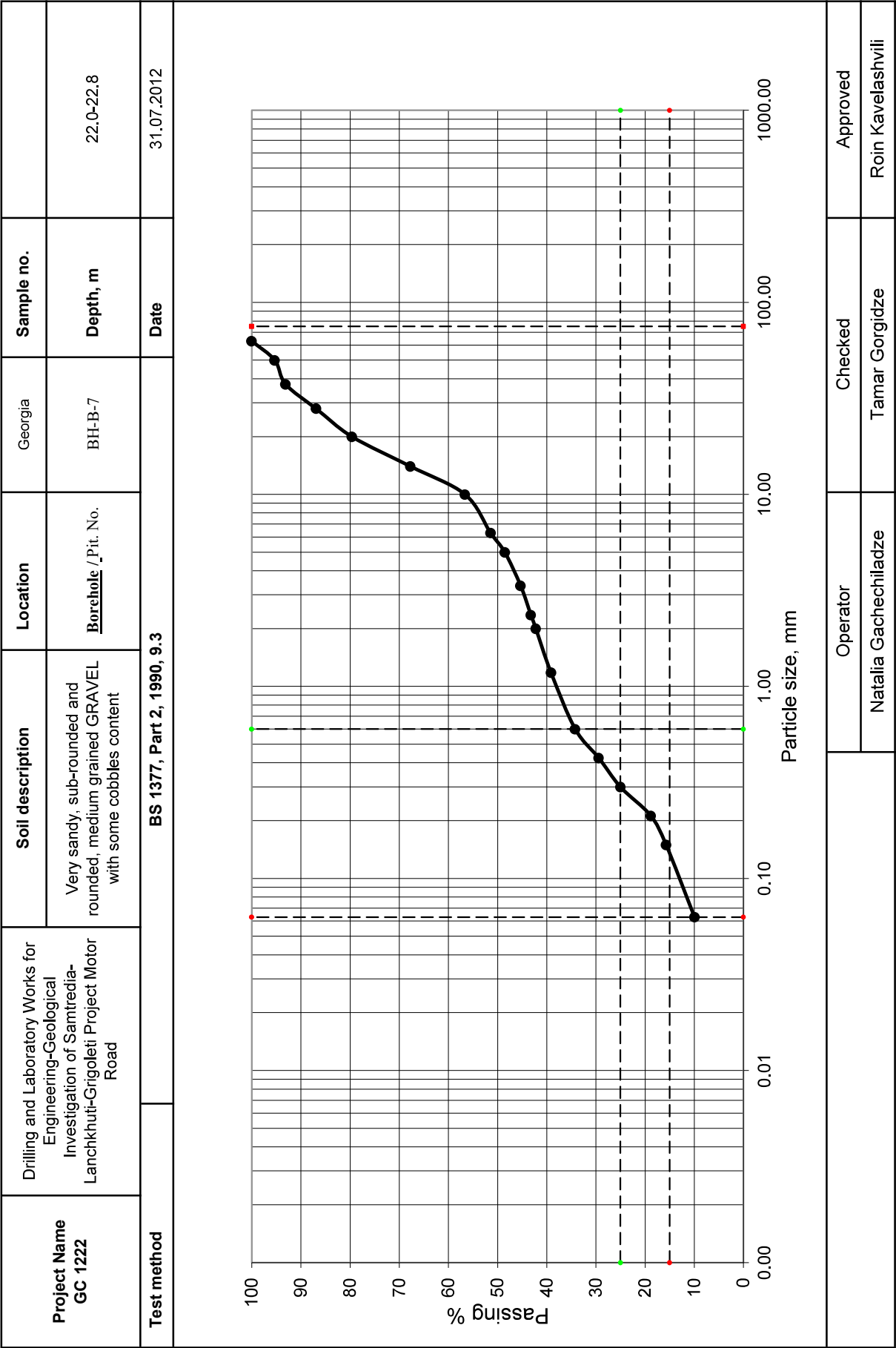


**Particle Size Distribution (Sieving)**

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-7
<b>Soil description</b>	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	
			<b>Depth, m</b>	22.0-22.8
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>12000 g</b>			
BS test sieve	mass retained g		Percentage retained $\left(\frac{m}{m_1}\right) \cdot 100\%$	Cumulative percentage passing
	actual	corrected m		
>200 mm	0.0		0.00	100.00
200 mm	0.0		0.00	100.00
125 mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	564.0		4.70	95.30
37.5 mm	264.0		2.20	93.10
28 mm	744.0		6.20	86.90
20 mm	876.0		7.30	79.60
Passing 20mm $m_2$	9552.0			
Total (check with $m_1$ )				
Riffled $m_3$	2000.0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	4.78			
14 mm	299.0		11.90	67.70
10 mm	278.9		11.10	56.60
6.3 mm	130.7		5.20	51.40
Passing 6.3 mm $m_5$	1291.5			
Total (check with $m_4$ )	–			
Riffled $m_6$	150.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	41.12			
5 mm	8.5		2.90	48.50
3.35mm	9.3		3.20	45.30
2.36mm	6.1		2.10	43.20
2 mm	2.9		1.00	42.20
1.18 mm	9.0		3.10	39.10
600 $\mu\text{m}$	14.3		4.90	34.20
425 $\mu\text{m}$	14.0		4.80	29.40
300 $\mu\text{m}$	12.8		4.40	25.00
212 $\mu\text{m}$	18.1		6.20	18.80
150 $\mu\text{m}$	9.0		3.10	15.70
63 $\mu\text{m}$	16.9		5.80	9.90
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	28.9		9.90	–
Total (check with $m_6$ )	150.0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili



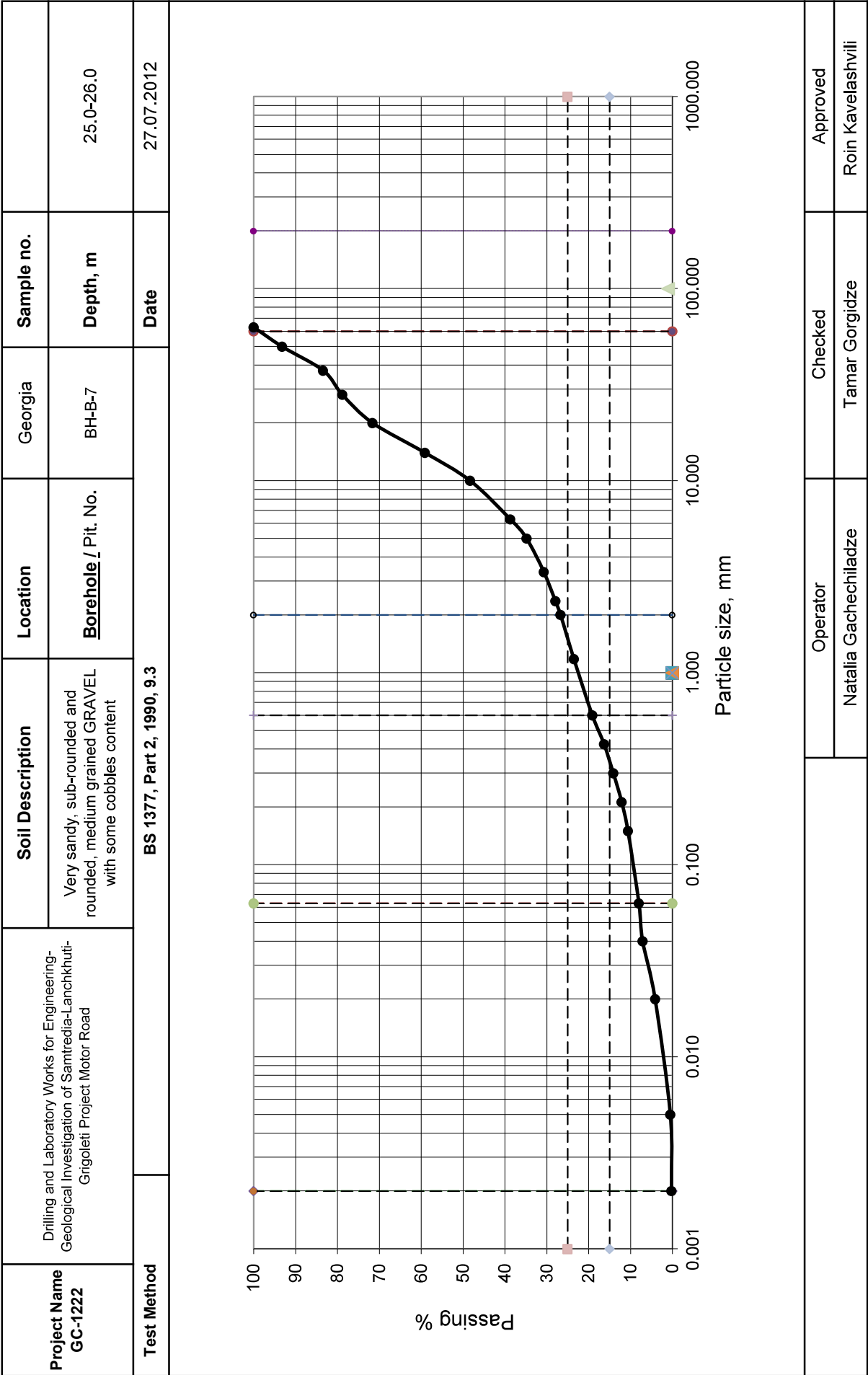
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC-1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No <sub>2</sub>	BH-B-7
<b>Soil Description</b>	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	
			<b>Depth</b>	25.0-26.0 m
<b>Test Method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	27.07.2012
Initial dry mass m <sub>1</sub>	6450 g			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0.0		0.00	100.00
125mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	438.6		6.80	93.20
37.5 mm	632.1		9.80	83.40
28 mm	296.7		4.60	78.80
20 mm	464.4		7.20	71.60
Passing 20mm m <sub>2</sub>	4618.2			
Total (check with m <sub>1</sub> )				
Riffled m <sub>3</sub>	4618.2			
Riffled and washed m <sub>4</sub>	–			
Correction factor $\frac{m_2}{m_3}$	1.00			
14 mm	806.3		12.50	59.10
10 mm	696.6		10.80	48.30
6.3 mm	619.2		9.60	38.70
Passing 6.3 mm m <sub>5</sub>	2496.2			
Total (check with m <sub>4</sub> )	–			
Riffled m <sub>6</sub>	2496.2			
Correction factor $\frac{m_2 \times m_5}{m_3 \times m_6}$	1.00			
5 mm	251.6		3.90	34.80
3.35mm	264.5		4.10	30.70
2.36mm	180.6		2.80	27.90
2 mm	77.4		1.20	26.70
1.18 mm	206.4		3.20	23.50
600 μm	283.8		4.40	19.10
425 μm	180.6		2.80	16.30
300 μm	141.9		2.20	14.10
212 μm	129.0		2.00	12.10
150 μm	96.8		1.50	10.60
63 μm	167.7		2.60	8.00
Passing 63 μm m <sub>7</sub>	516.0			
Total (check with m <sub>6</sub> )				
Riffled m <sub>8</sub>	30.0			
Correction factor $\frac{m_2 \times m_5 \times m_7}{m_3 \times m_6 \times m_8}$	17.20			
40 μm	3.4		0.90	7.10
20 μm	11.3		3.00	4.10
5 μm	13.5		3.60	0.50
2 μm	1.1		0.30	0.20
Passing 2 μm	4.1		0.20	–
Total (check with m <sub>6</sub> )	30.0	m <sub>1</sub>		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

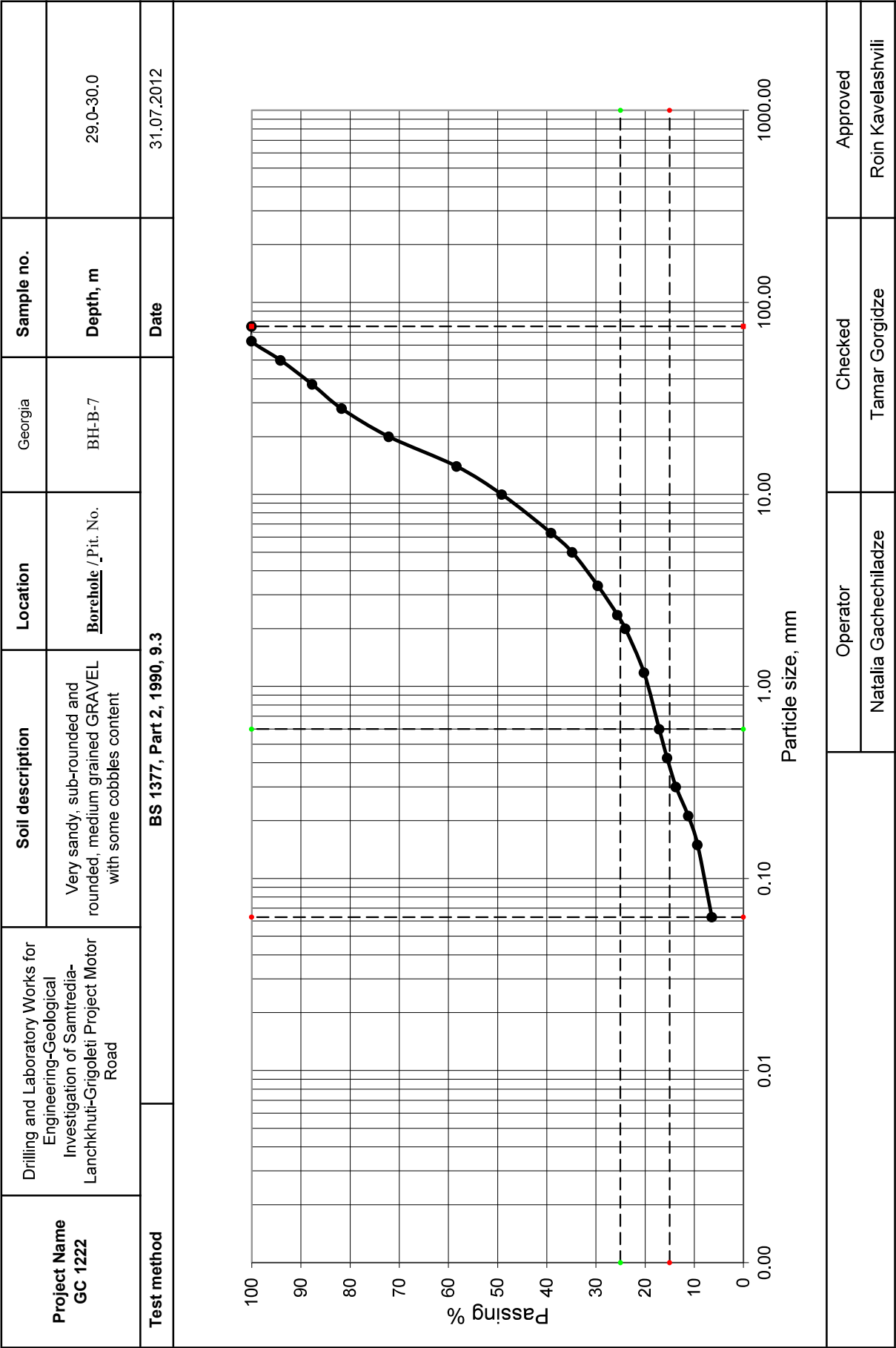
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-7
<b>Soil description</b>	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	
			<b>Depth, m</b>	29.0-30.0
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>11450 g</b>			
BS test sieve	mass retained g		Percentage retained $\left(\frac{m}{m_1}\right) \cdot 100\%$	Cumulative percentage passing
	actual	corrected m		
>200 mm	0.0		0.00	100.00
200 mm	0.0		0.00	100.00
125 mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	675.6		5.90	94.10
37.5 mm	732.8		6.40	87.70
28 mm	687.0		6.00	81.70
20 mm	1099.2		9.60	72.10
Passing 20mm $m_2$	8255.5			
Total (check with $m_1$ )				
Riffled $m_3$	2000.0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	4.13			
14 mm	382.8		13.80	58.30
10 mm	255.2		9.20	49.10
6.3 mm	277.4		10.00	39.10
Passing 6.3 mm $m_5$	1084.6			
Total (check with $m_4$ )	–			
Riffled $m_6$	150.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	29.85			
5 mm	16.5		4.30	34.80
3.35mm	19.9		5.20	29.60
2.36mm	15.3		4.00	25.60
2 mm	6.1		1.60	24.00
1.18 mm	14.6		3.80	20.20
600 $\mu\text{m}$	11.9		3.10	17.10
425 $\mu\text{m}$	6.1		1.60	15.50
300 $\mu\text{m}$	6.9		1.80	13.70
212 $\mu\text{m}$	9.6		2.50	11.20
150 $\mu\text{m}$	7.3		1.90	9.30
63 $\mu\text{m}$	11.1		2.90	6.40
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	24.6		6.40	–
Total (check with $m_6$ )	150.0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

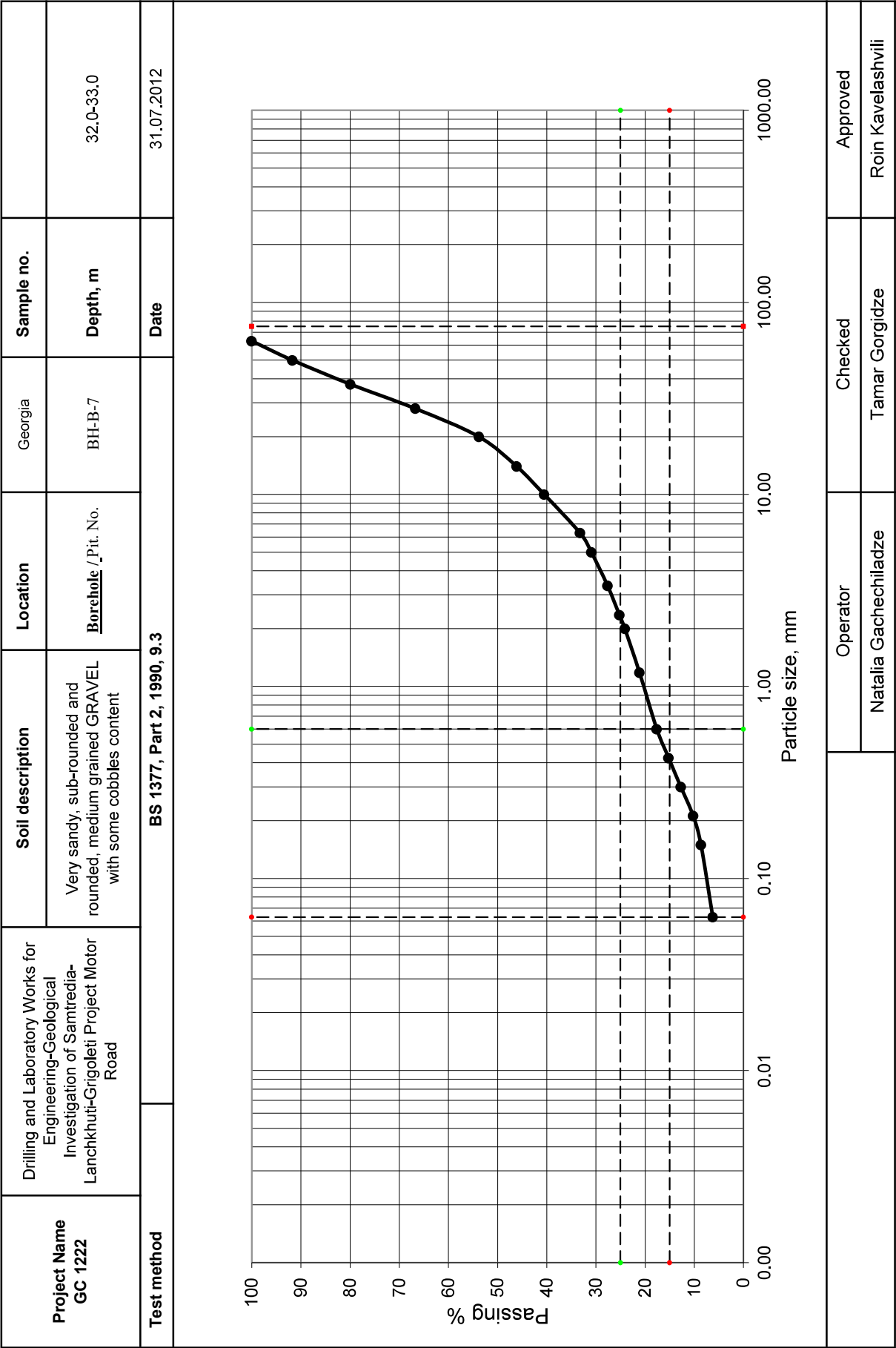
Particle Size Distribution (Chart)



**Particle Size Distribution (Sieving)**

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-7
<b>Soil description</b>	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	
			<b>Depth, m</b>	32.0-33.0
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>10000 g</b>			
BS test sieve	mass retained g		Percentage retained $\left(\frac{m}{m_1}\right) \cdot 100\%$	Cumulative percentage passing
	actual	corrected m		
>200 mm	0.0		0.00	100.00
200 mm	0.0		0.00	100.00
125 mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	830.0		8.30	91.70
37.5 mm	1180.0		11.80	79.90
28 mm	1320.0		13.20	66.70
20 mm	1290.0		12.90	53.80
Passing 20mm $m_2$	5380.0			
Total (check with $m_1$ )				
Riffled $m_3$	2000.0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	2.69			
14 mm	286.2			
10 mm	208.2			
6.3 mm	271.4			
Passing 6.3 mm $m_5$	1234.2			
Total (check with $m_4$ )	–			
Riffled $m_6$	150.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	22.13			
5 mm	10.4			
3.35mm	14.9			
2.36mm	10.8			
2 mm	5.0			
1.18 mm	13.6			
600 $\mu\text{m}$	15.8			
425 $\mu\text{m}$	10.8			
300 $\mu\text{m}$	11.3			
212 $\mu\text{m}$	11.3			
150 $\mu\text{m}$	7.2			
63 $\mu\text{m}$	10.8			
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	28.0			
Total (check with $m_6$ )	150.0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)

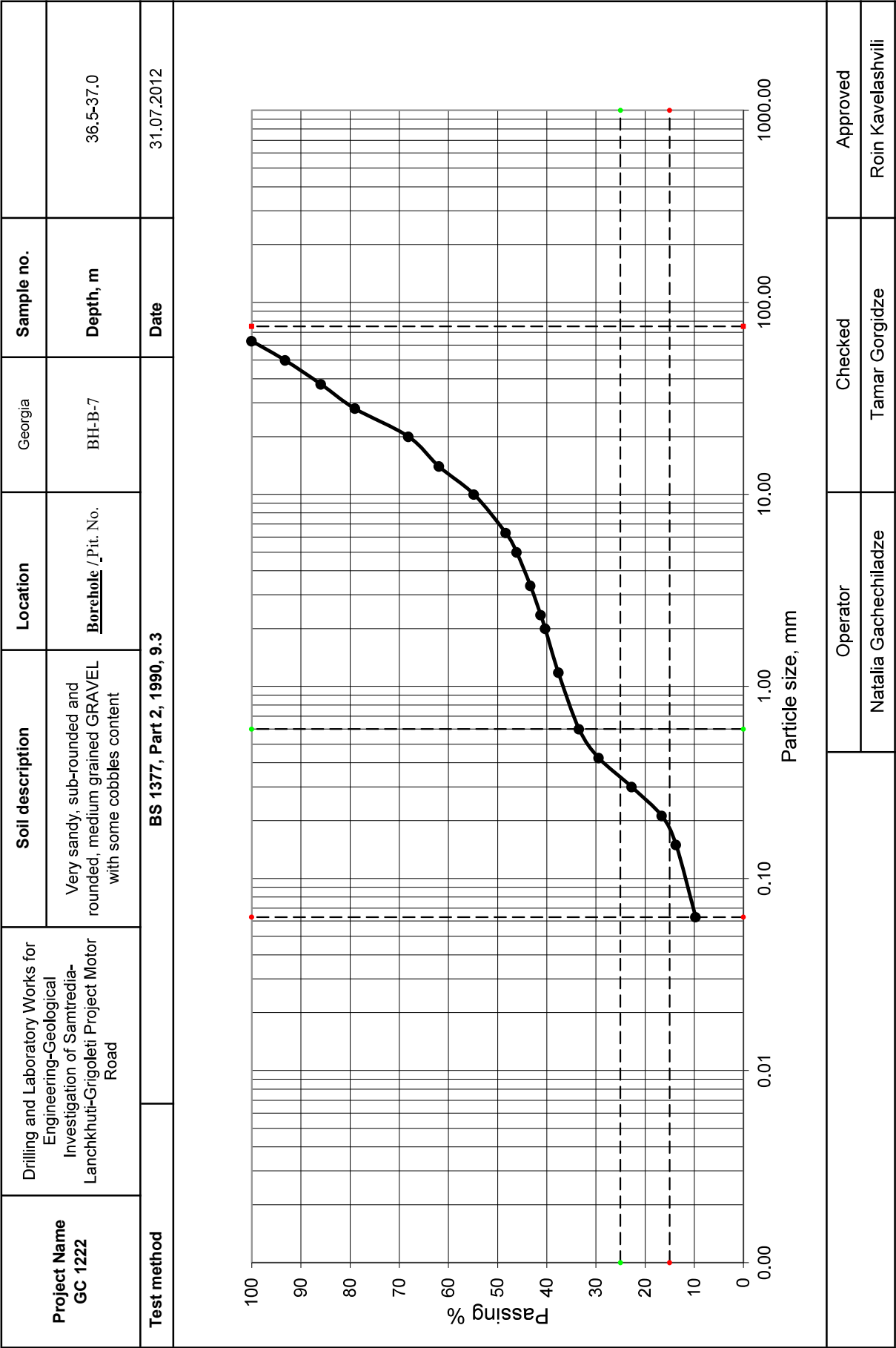


## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-7
<b>Soil description</b>	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Sample no.</b>	
			<b>Depth, m</b>	36.5-37.0
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>10000 g</b>			
BS test sieve	mass retained g		Percentage retained $\left(\frac{m}{m_1}\right) \cdot 100\%$	Cumulative percentage passing
	actual	corrected m		
>200 mm	0.0		0.00	100.00
200 mm	0.0		0.00	100.00
125 mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	680.0		6.80	93.20
37.5 mm	730.0		7.30	85.90
28 mm	690.0		6.90	79.00
20 mm	1090.0		10.90	68.10
Passing 20mm $m_2$	6810.0			
Total (check with $m_1$ )				
Riffled $m_3$	2000.0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	3.41			
14 mm	182.1		6.20	61.90
10 mm	208.5		7.10	54.80
6.3 mm	190.9		6.50	48.30
Passing 6.3 mm $m_5$	1418.5			
Total (check with $m_4$ )	–			
Riffled $m_6$	150.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	32.20			
5 mm	6.8		2.20	46.10
3.35mm	8.7		2.80	43.30
2.36mm	6.5		2.10	41.20
2 mm	2.8		0.90	40.30
1.18 mm	8.4		2.70	37.60
600 $\mu\text{m}$	13.0		4.20	33.40
425 $\mu\text{m}$	12.4		4.00	29.40
300 $\mu\text{m}$	20.8		6.70	22.70
212 $\mu\text{m}$	18.9		6.10	16.60
150 $\mu\text{m}$	9.0		2.90	13.70
63 $\mu\text{m}$	12.4		4.00	9.70
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	30.1		9.70	–
Total (check with $m_6$ )	150.0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili



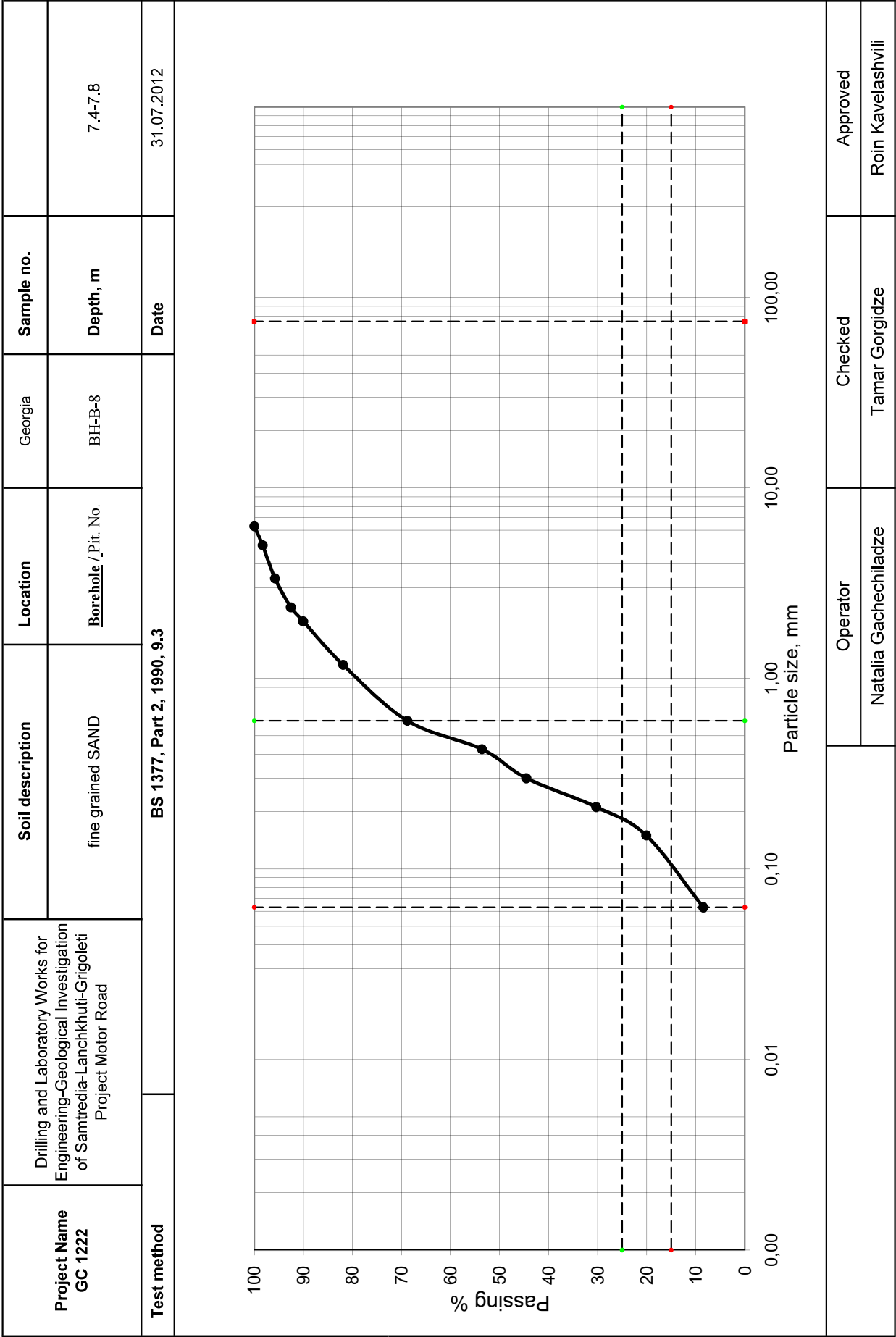
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-8
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	7.4-7.8
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>2000 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	2000,0			
Total (check with $m_1$ )				
Riffled $m_3$	2000,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	2000,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	150,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	13,33			
5 mm	2,6		1,70	98,30
3.35mm	3,8		2,50	95,80
2.36mm	5,0		3,30	92,50
2 mm	3,8		2,50	90,00
1.18 mm	12,2		8,10	81,90
600 $\mu\text{m}$	19,7		13,10	68,80
425 $\mu\text{m}$	22,8		15,20	53,60
300 $\mu\text{m}$	13,7		9,10	44,50
212 $\mu\text{m}$	21,3		14,20	30,30
150 $\mu\text{m}$	15,3		10,20	20,10
63 $\mu\text{m}$	17,4		11,60	8,50
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	12,8		8,50	–
Total (check with $m_6$ )	150,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

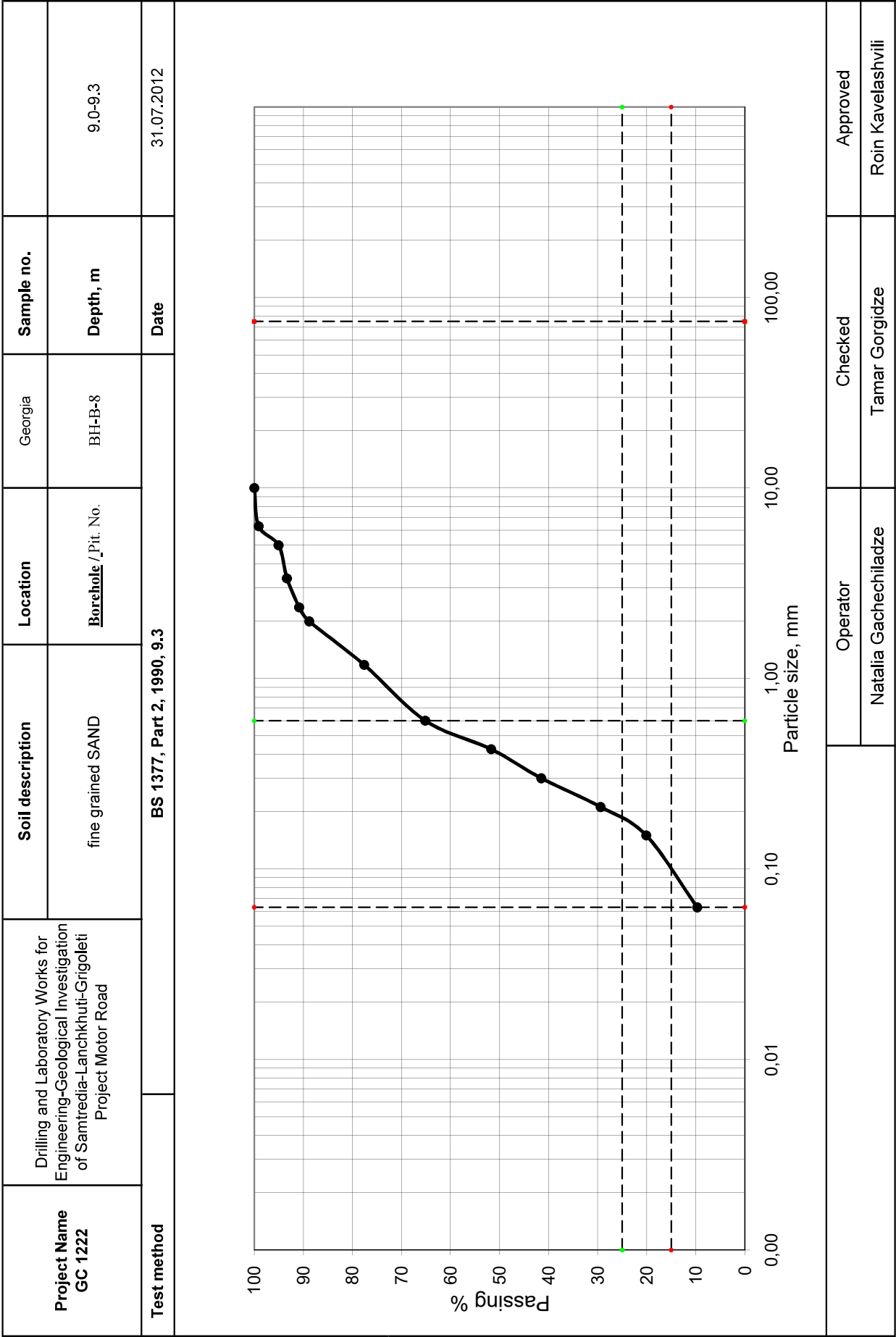
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-8
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	9.0-9.3
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>2000 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	2000,0			
Total (check with $m_1$ )				
Riffled $m_3$	2000,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	18,0		0,90	99,10
Passing 6.3 mm $m_5$	1982,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	150,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	13,21			
5 mm	6,2		4,10	95,00
3.35mm	2,6		1,70	93,30
2.36mm	3,8		2,50	90,80
2 mm	3,0		2,00	88,80
1.18 mm	17,0		11,20	77,60
600 $\mu\text{m}$	18,9		12,50	65,10
425 $\mu\text{m}$	20,3		13,40	51,70
300 $\mu\text{m}$	15,4		10,20	41,50
212 $\mu\text{m}$	18,3		12,10	29,40
150 $\mu\text{m}$	14,1		9,30	20,10
63 $\mu\text{m}$	15,7		10,40	9,70
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	14,7		9,70	–
Total (check with $m_6$ )	150,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

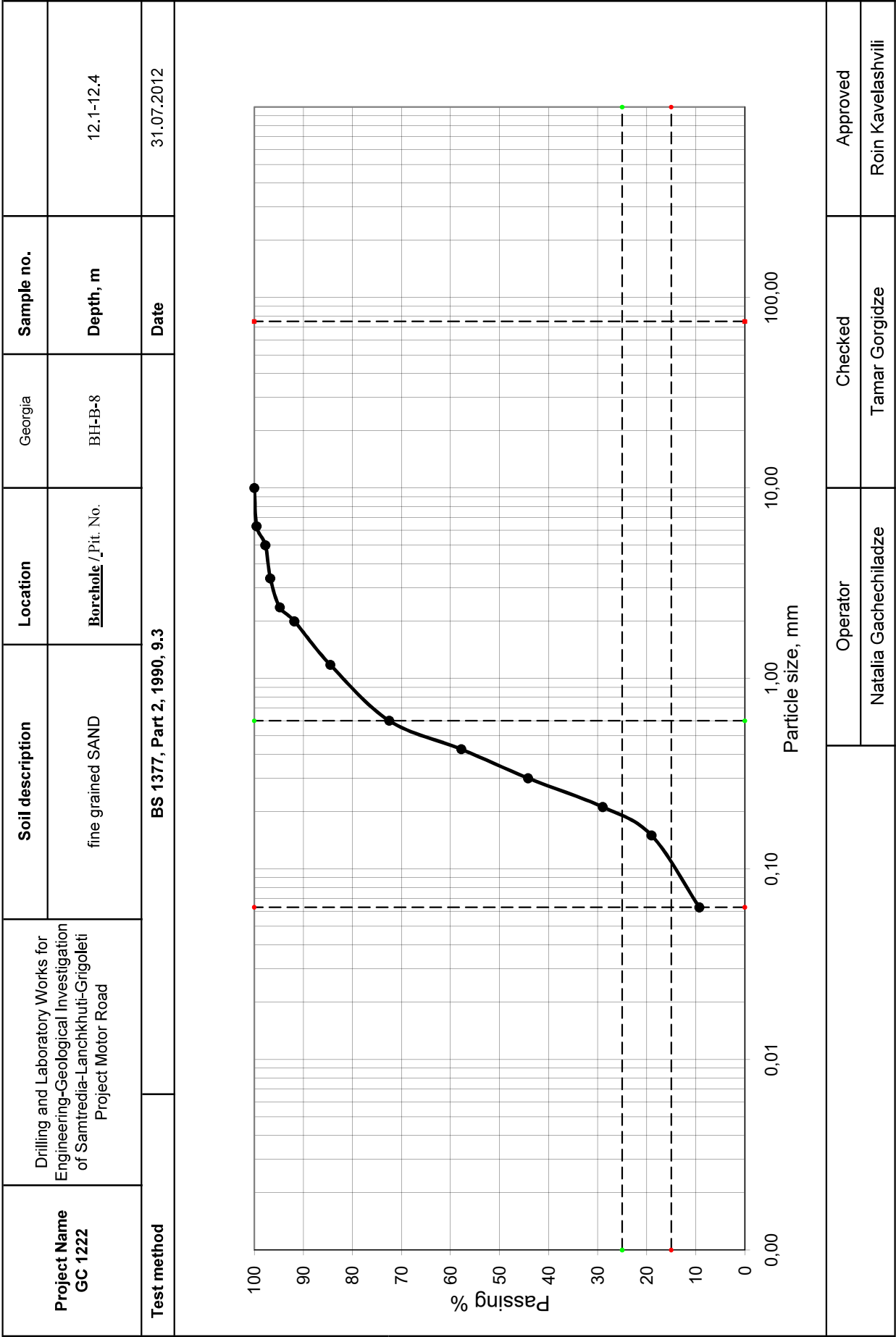
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-8
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	12.1-12.4
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>2000 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	2000,0			
Total (check with $m_1$ )				
Riffled $m_3$	2000,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	10,0		0,50	99,50
Passing 6.3 mm $m_5$	1990,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	150,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	13,27			
5 mm	2,7		1,80	97,70
3.35mm	1,5		1,00	96,70
2.36mm	2,9		1,90	94,80
2 mm	4,5		3,00	91,80
1.18 mm	11,0		7,30	84,50
600 $\mu\text{m}$	18,1		12,00	72,50
425 $\mu\text{m}$	22,2		14,70	57,80
300 $\mu\text{m}$	20,5		13,60	44,20
212 $\mu\text{m}$	22,9		15,20	29,00
150 $\mu\text{m}$	15,1		10,00	19,00
63 $\mu\text{m}$	14,6		9,70	9,30
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	14,0		9,30	–
Total (check with $m_6$ )	150,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)

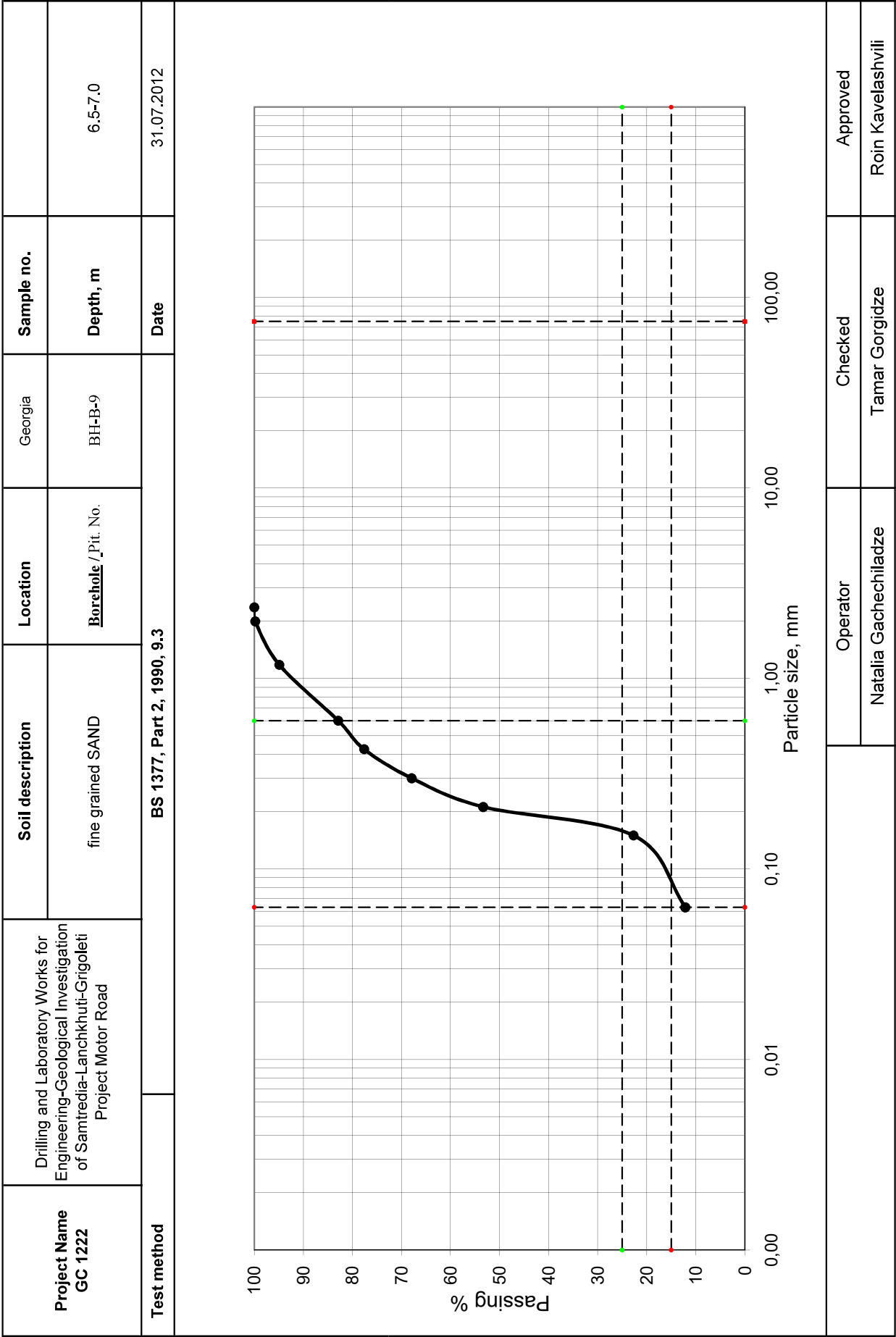


## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-9
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	6.5-7.0
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	1,0		0,20	99,80
1.18 mm	24,5		4,90	94,90
600 $\mu\text{m}$	60,0		12,00	82,90
425 $\mu\text{m}$	26,5		5,30	77,60
300 $\mu\text{m}$	48,5		9,70	67,90
212 $\mu\text{m}$	73,0		14,60	53,30
150 $\mu\text{m}$	153,0		30,60	22,70
63 $\mu\text{m}$	53,0		10,60	12,10
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	60,5		12,10	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili



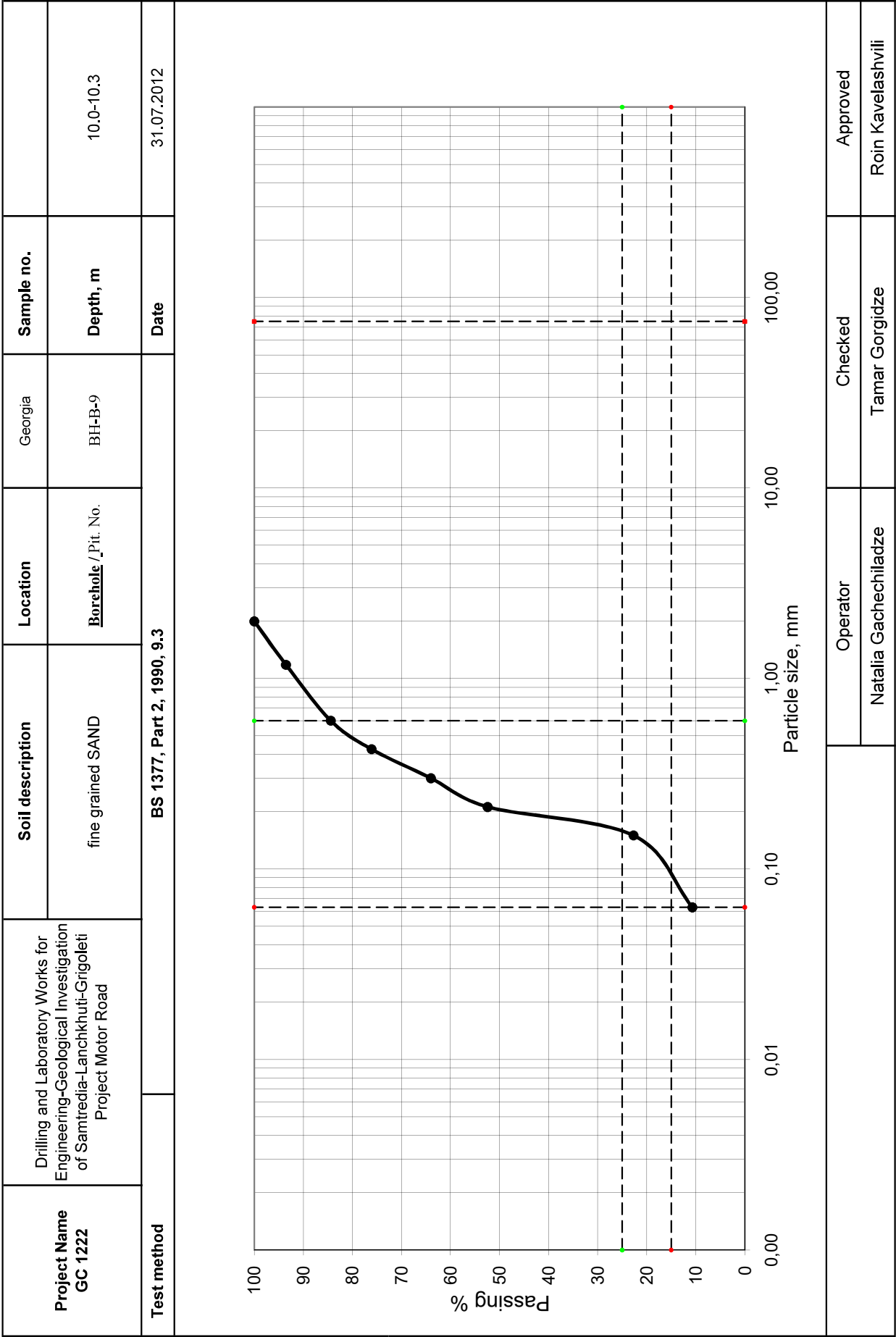
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-9
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	10.0-10.3
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	32,5		6,50	93,50
600 $\mu\text{m}$	45,5		9,10	84,40
425 $\mu\text{m}$	41,5		8,30	76,10
300 $\mu\text{m}$	60,5		12,10	64,00
212 $\mu\text{m}$	58,0		11,60	52,40
150 $\mu\text{m}$	148,5		29,70	22,70
63 $\mu\text{m}$	60,0		12,00	10,70
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	53,5		10,70	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-10
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	11.4-11.7
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	36,0		7,20	92,80
600 $\mu\text{m}$	43,0		8,60	84,20
425 $\mu\text{m}$	45,5		9,10	75,10
300 $\mu\text{m}$	58,5		11,70	63,40
212 $\mu\text{m}$	52,5		10,50	52,90
150 $\mu\text{m}$	152,5		30,50	22,40
63 $\mu\text{m}$	54,0		10,80	11,60
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	58,0		11,60	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

## Particle Size Distribution (Chart)

Project Name GC 1222	Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Soil description	Location	Georgia	Sample no.	11.4-11.7	
		fine grained SAND	<u>Borehole</u> / Pit. No.	BH-B-10	Depth, m		
Test method		BS 1377, Part 2, 1990, 9.3				Date	31.07.2012

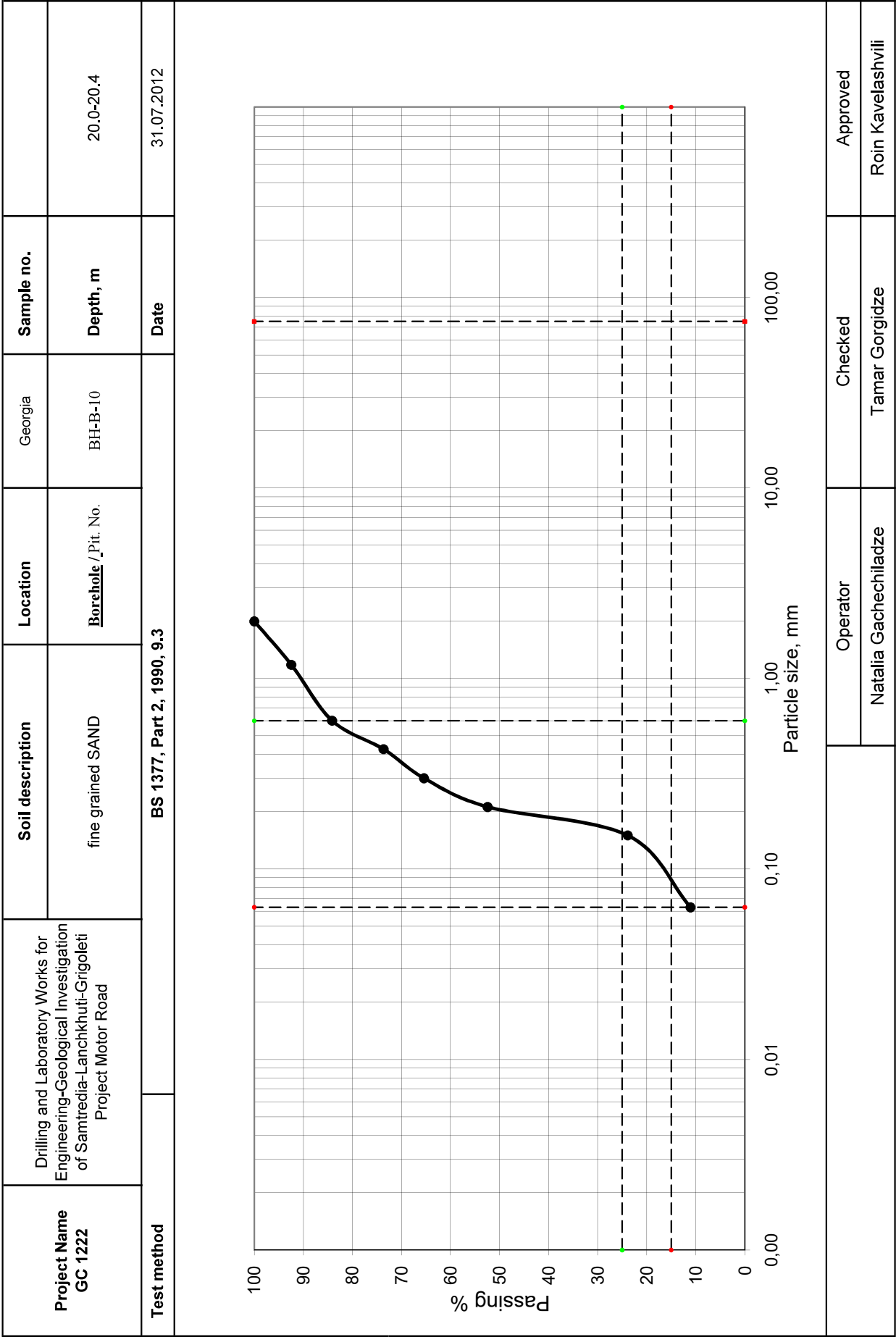
Particle size, mm	Passing %
0,075	100
0,15	95
0,3	85
0,6	75
1,0	65
2,0	55
4,0	45
7,5	35
15,0	25
30,0	10

Operator	Checked	Approved
	Natalia Gachechiladze	

## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-10
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	20.0-20.4
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	38,0		7,60	92,40
600 $\mu\text{m}$	41,5		8,30	84,10
425 $\mu\text{m}$	52,5		10,50	73,60
300 $\mu\text{m}$	41,0		8,20	65,40
212 $\mu\text{m}$	65,0		13,00	52,40
150 $\mu\text{m}$	142,5		28,50	23,90
63 $\mu\text{m}$	64,0		12,80	11,10
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	55,5		11,10	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)

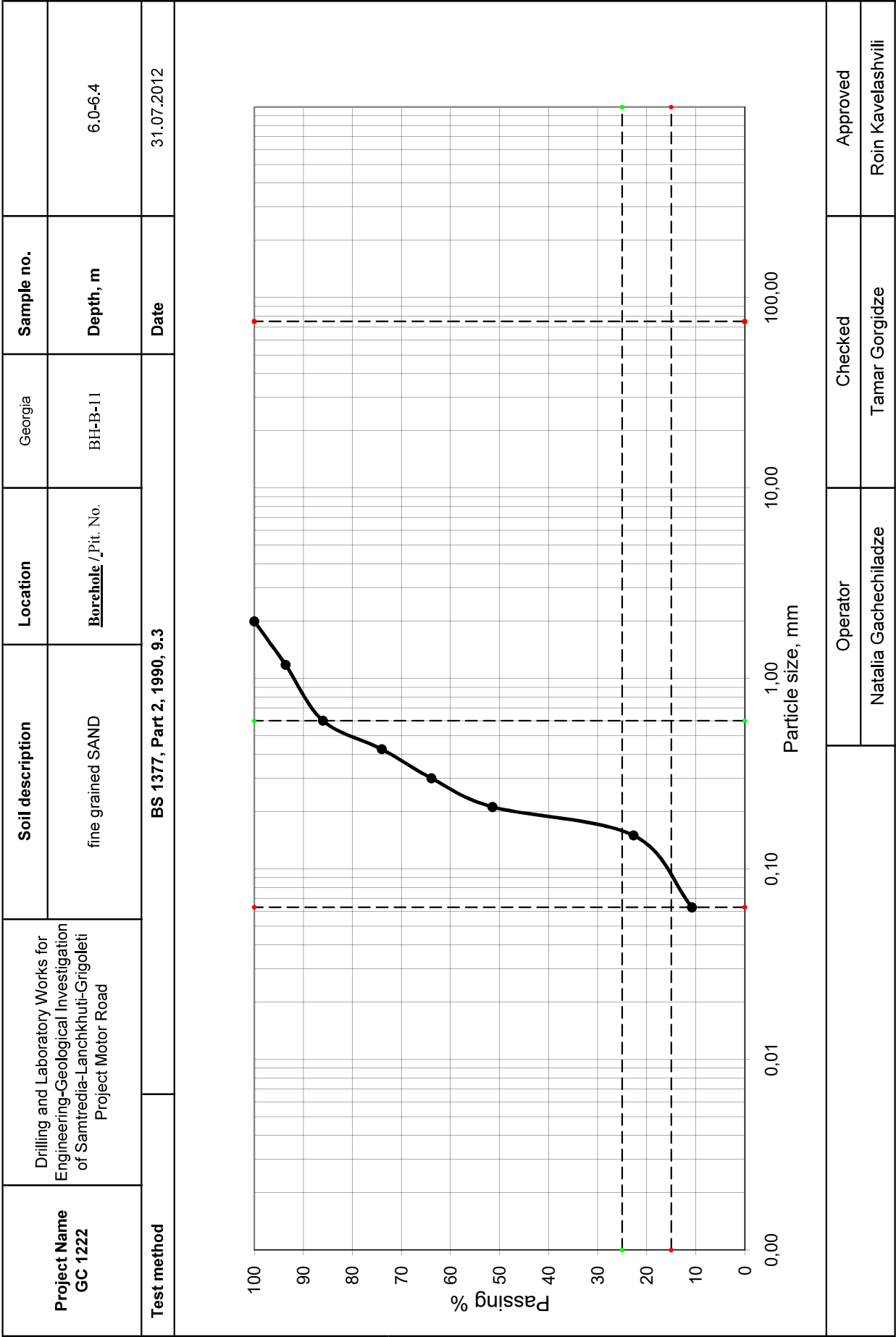


## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-11
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	6.0-6.4
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	32,0		6,40	93,60
600 $\mu\text{m}$	38,0		7,60	86,00
425 $\mu\text{m}$	60,0		12,00	74,00
300 $\mu\text{m}$	50,5		10,10	63,90
212 $\mu\text{m}$	62,5		12,50	51,40
150 $\mu\text{m}$	143,5		28,70	22,70
63 $\mu\text{m}$	59,5		11,90	10,80
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	54,0		10,80	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili



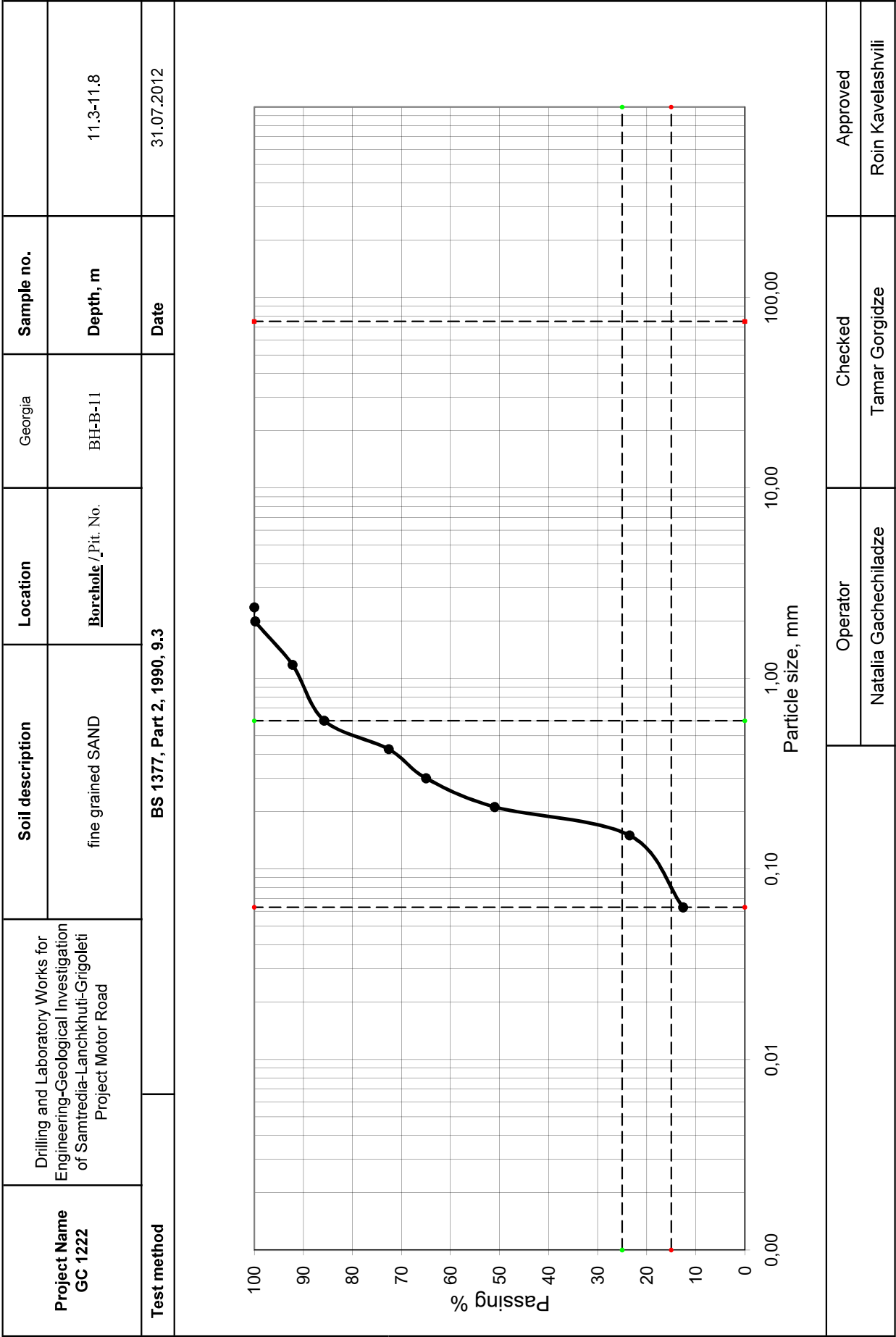
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-11
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	11.3-11.8
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	1,0		0,20	99,80
1.18 mm	38,0		7,60	92,20
600 $\mu\text{m}$	32,5		6,50	85,70
425 $\mu\text{m}$	65,5		13,10	72,60
300 $\mu\text{m}$	38,0		7,60	65,00
212 $\mu\text{m}$	70,0		14,00	51,00
150 $\mu\text{m}$	137,5		27,50	23,50
63 $\mu\text{m}$	54,5		10,90	12,60
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	63,0		12,60	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

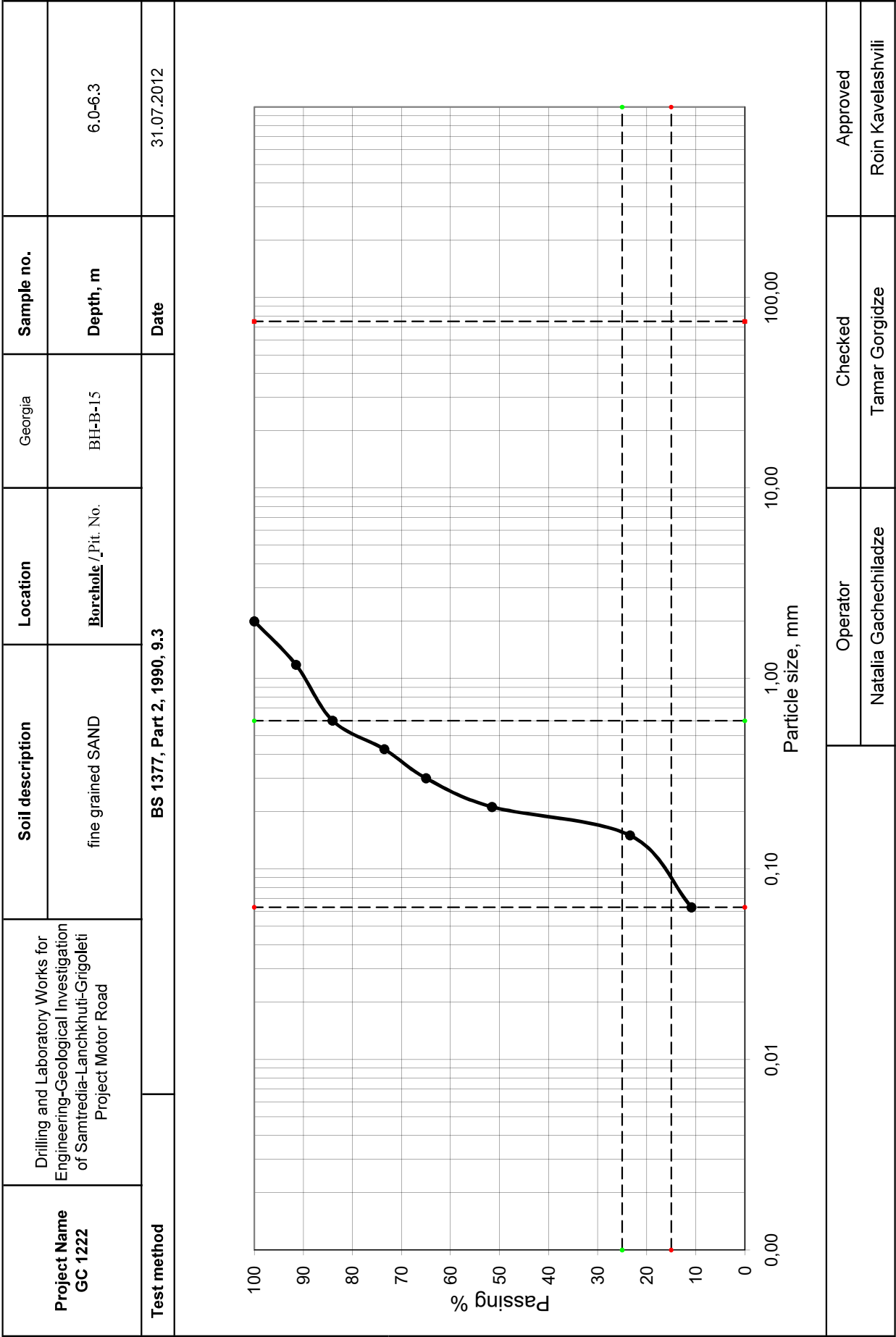
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-15
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	6.0-6.3
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>300 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	300,0			
Total (check with $m_1$ )				
Riffled $m_3$	300,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	300,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	300,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	25,5		8,50	91,50
600 $\mu\text{m}$	22,5		7,50	84,00
425 $\mu\text{m}$	31,5		10,50	73,50
300 $\mu\text{m}$	25,5		8,50	65,00
212 $\mu\text{m}$	40,5		13,50	51,50
150 $\mu\text{m}$	84,3		28,10	23,40
63 $\mu\text{m}$	37,5		12,50	10,90
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	32,7		10,90	–
Total (check with $m_6$ )	300,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

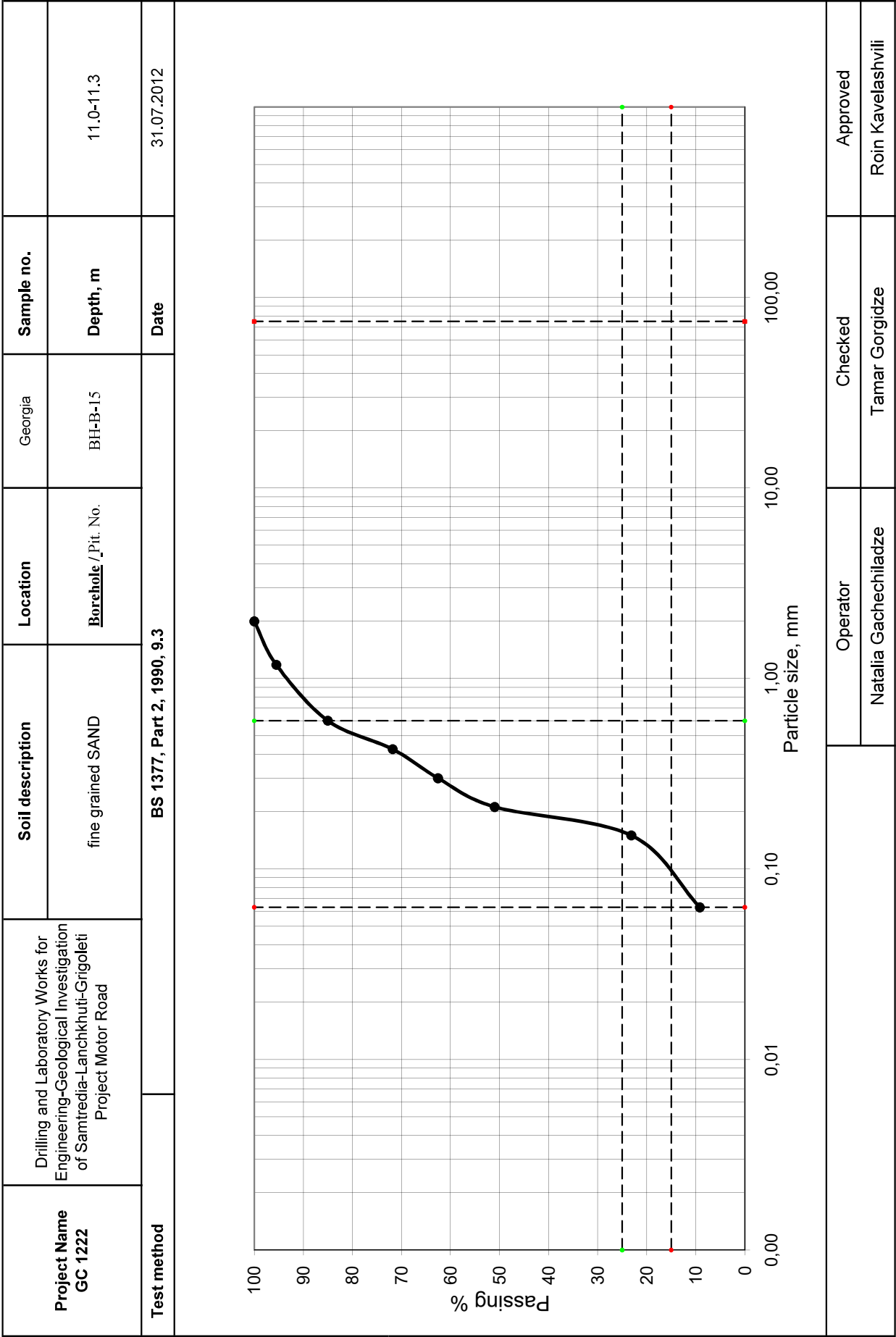
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-15
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	11.0-11.3
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	22,5		4,50	95,50
600 $\mu\text{m}$	52,5		10,50	85,00
425 $\mu\text{m}$	66,0		13,20	71,80
300 $\mu\text{m}$	46,5		9,30	62,50
212 $\mu\text{m}$	57,5		11,50	51,00
150 $\mu\text{m}$	139,5		27,90	23,10
63 $\mu\text{m}$	69,5		13,90	9,20
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	46,0		9,20	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)

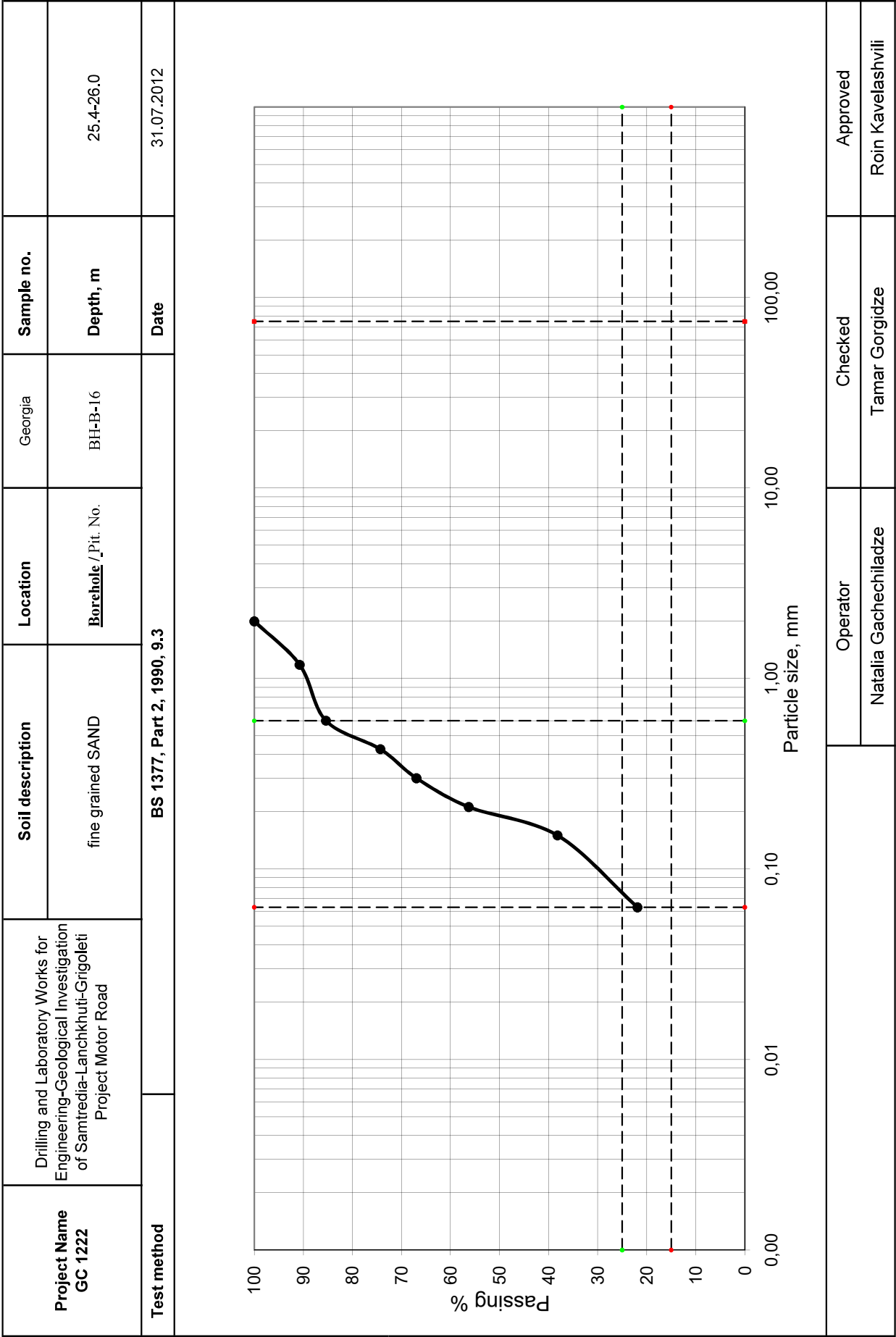


## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-16
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	25.4-26.0
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	46,5		9,30	90,70
600 $\mu\text{m}$	26,5		5,30	85,40
425 $\mu\text{m}$	55,5		11,10	74,30
300 $\mu\text{m}$	37,0		7,40	66,90
212 $\mu\text{m}$	53,0		10,60	56,30
150 $\mu\text{m}$	90,5		18,10	38,20
63 $\mu\text{m}$	81,5		16,30	21,90
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	109,5		21,90	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili



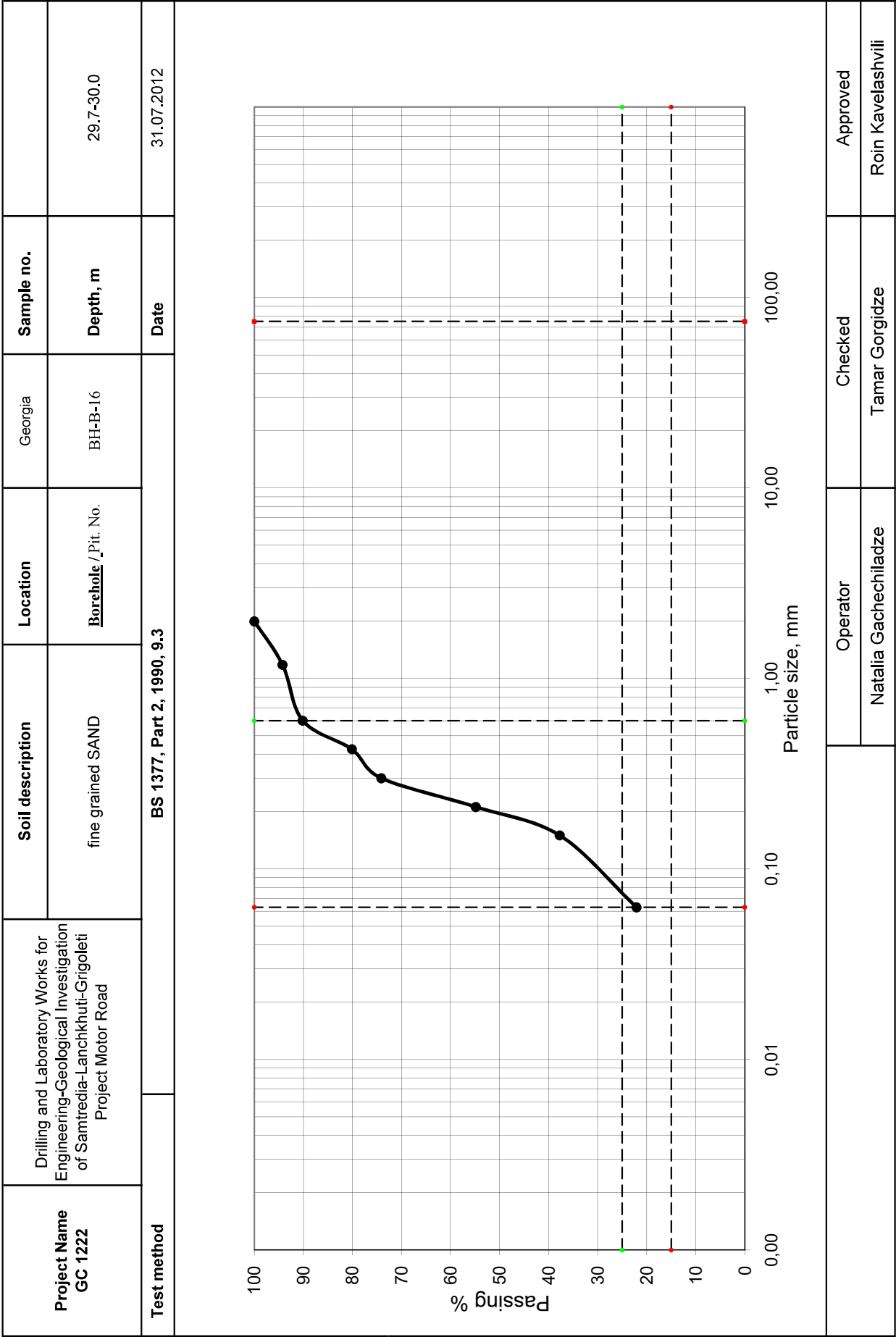
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-16
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	29.7-30.0
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	29,0		5,80	94,20
600 $\mu\text{m}$	20,5		4,10	90,10
425 $\mu\text{m}$	50,0		10,00	80,10
300 $\mu\text{m}$	30,0		6,00	74,10
212 $\mu\text{m}$	96,5		19,30	54,80
150 $\mu\text{m}$	85,5		17,10	37,70
63 $\mu\text{m}$	78,0		15,60	22,10
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	110,5		22,10	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

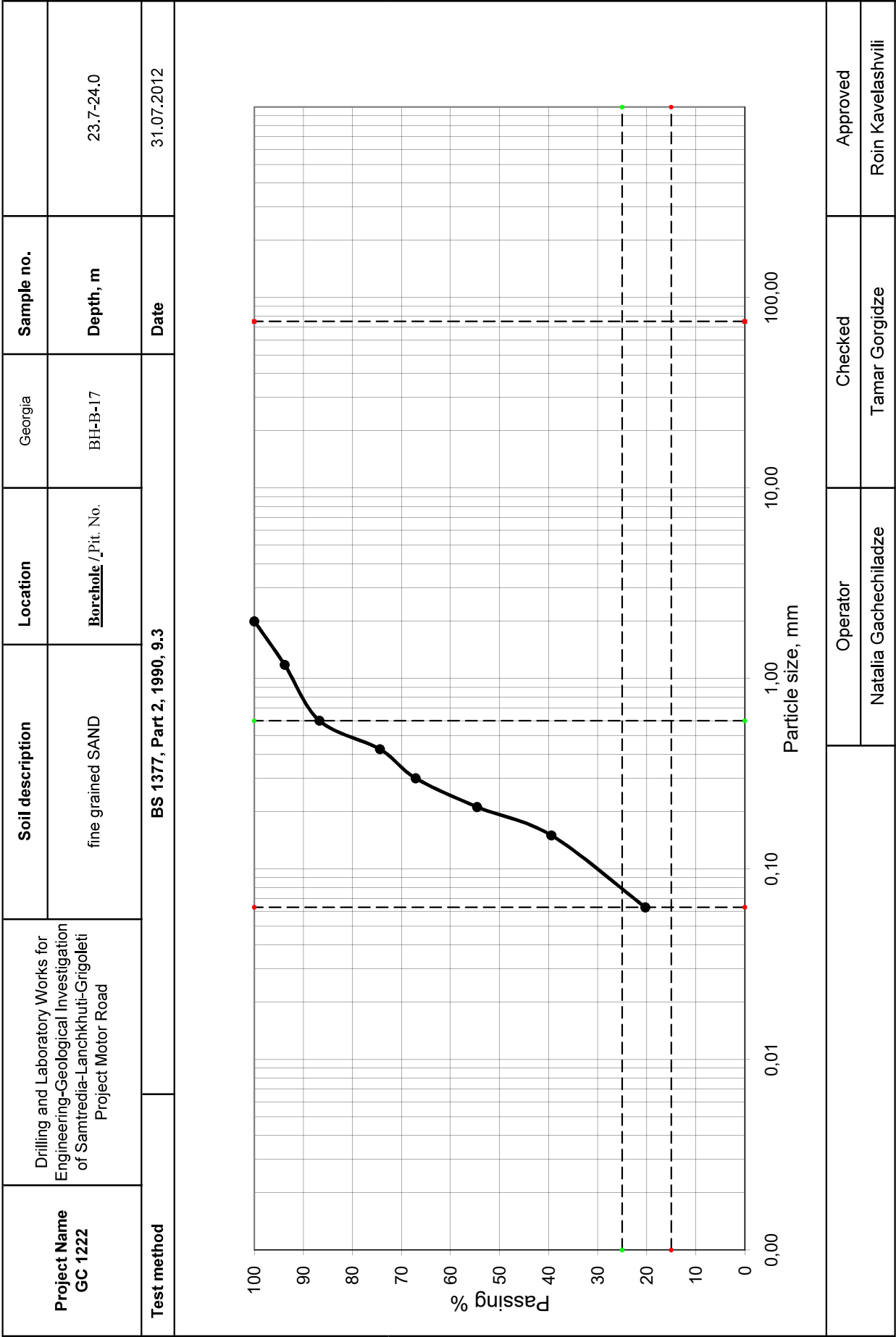
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-17
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	23.7-24.0
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	31,0		6,20	93,80
600 $\mu\text{m}$	35,5		7,10	86,70
425 $\mu\text{m}$	61,5		12,30	74,40
300 $\mu\text{m}$	36,5		7,30	67,10
212 $\mu\text{m}$	62,5		12,50	54,60
150 $\mu\text{m}$	76,0		15,20	39,40
63 $\mu\text{m}$	95,5		19,10	20,30
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	101,5		20,30	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

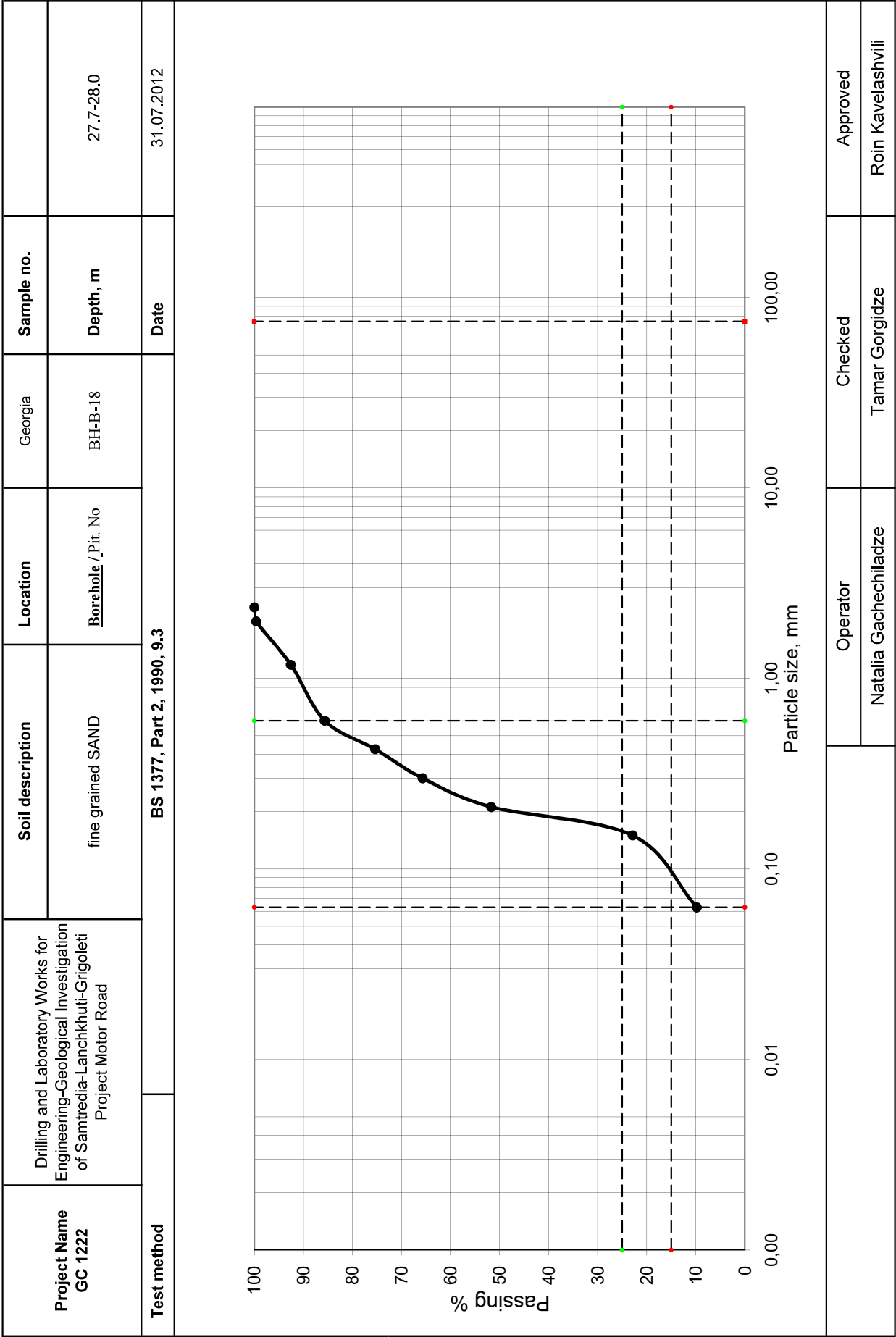
Particle Size Distribution (Chart)



## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-B-18
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	27.7-28.0
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>500 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	500,0			
Total (check with $m_1$ )				
Riffled $m_3$	500,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	500,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	500,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	2,0		0,40	99,60
1.18 mm	35,5		7,10	92,50
600 $\mu\text{m}$	34,5		6,90	85,60
425 $\mu\text{m}$	51,5		10,30	75,30
300 $\mu\text{m}$	48,0		9,60	65,70
212 $\mu\text{m}$	70,0		14,00	51,70
150 $\mu\text{m}$	144,0		28,80	22,90
63 $\mu\text{m}$	65,5		13,10	9,80
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	49,0		9,80	–
Total (check with $m_6$ )	500,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)

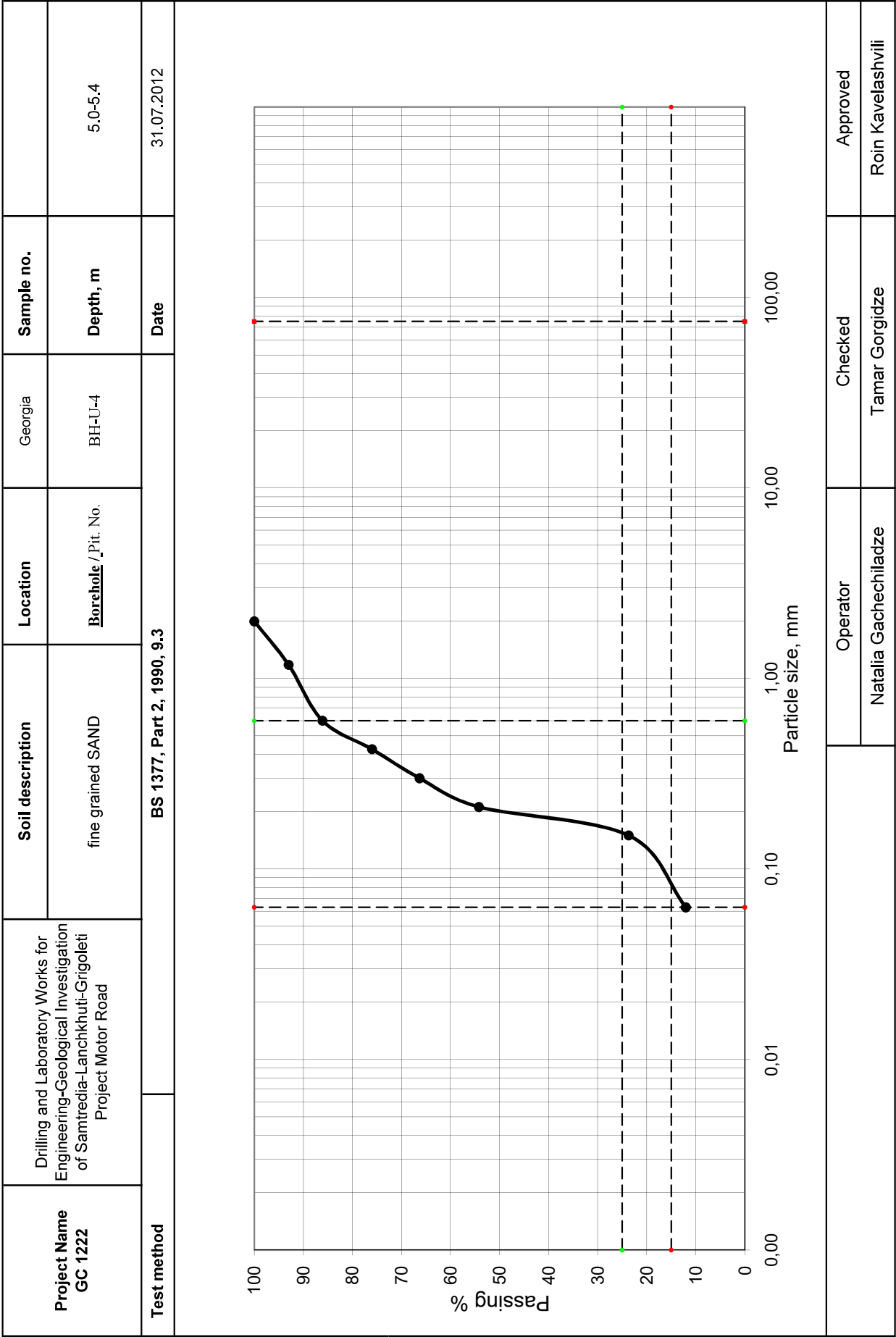


## Particle Size Distribution (Sieving)

<b>Project Name</b> GC 1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		<b>Location</b>	Georgia
			<b>Borehole</b> / Pit. No.	BH-U-4
<b>Soil description</b>	fine grained SAND		<b>Sample no.</b>	
			<b>Depth, m</b>	5.0-5.4
<b>Test method</b>	<b>BS 1377, Part 2, 1990, 9.3</b>		<b>Date</b>	31.07.2012
Initial dry mass $m_1$	<b>300 g</b>			
BS test sieve	mass retained g		Percentage retained	Cumulative percentage passing
	actual	corrected m	$\left(\frac{m}{m_1}\right) \cdot 100\%$	
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm $m_2$	300,0			
Total (check with $m_1$ )				
Riffled $m_3$	300,0			
Riffled and washed $m_4$	–			
Correction factor $\frac{m_2}{m_3}$	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm $m_5$	300,0			
Total (check with $m_4$ )	–			
Riffled $m_6$	300,0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	21,0		7,00	93,00
600 $\mu\text{m}$	20,7		6,90	86,10
425 $\mu\text{m}$	30,3		10,10	76,00
300 $\mu\text{m}$	29,1		9,70	66,30
212 $\mu\text{m}$	36,3		12,10	54,20
150 $\mu\text{m}$	91,5		30,50	23,70
63 $\mu\text{m}$	35,1		11,70	12,00
Passing 63 $\mu\text{m}$ $m_F$ or $m_E$	36,0		12,00	–
Total (check with $m_6$ )	300,0	$m_1$		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili



Particle Size Distribution (Chart)



## PARTICLE SIZE DISTRIBUTION (HYDROMETER SEDIMENTATION)

<b>Project Name:</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	<b>Location</b>	Georgia
		<b>Borehole/Pit no.</b>	BH-B-1
<b>Soil description</b>		<b>Sample no.</b>	
Slightly moist, brown, stiff, intermediately plastic CLAY		<b>Depth</b>	3.4-3.65
<b>Test method</b>	BS 1377 : Part 2 : 1990 : 9.5	<b>Date</b>	28.06.2012
<b>Method of preparation</b>			

### CALIBRATION AND SAMPLE DATA

Hydrometer no.	94
Meniscus correction $C_m$	0
Reading in dispersant $R_o'$	at the upper rim of the meniscus
Calibration equation	$H_r = H + \frac{1}{2} \left( h - \frac{V_h}{900} L \right)$
Dry mass of soil $m$	30.00 g
Particle density measured/assumed $\rho_s$	2.73 Mg/m <sup>3</sup>
Viscosity of water at 25.0 °C $\eta$	0.891 mPa·c

### PRETREATMENT

Pretreated	
Initial dry mass of sample $m_0$	30.00 g
Dry mass after pretreatment $m_p$	— g
Pretreatment loss $m_0 - m_p$	— g
	— %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}} \quad \text{mm}$$

$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d \quad \%$$

Date	Time	Elapsed time t min	Temperature T °C	Reading $R_h'$	$R_h' + C_m = R_h$	Effective depth $H_r$ mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
26.06.2012	10:05	0.5	25.0	18.3	18.3	125.1	0.0628	18.3	96.3
	10:05	1.0	25.0	16.8	16.8	130.5	0.0453	16.8	88.4
	10:07	2.0	25.0	15.0	15.0	137.0	0.0329	15.0	78.9
	10:09	4.0	25.0	13.2	13.2	143.1	0.0237	13.2	69.4
	10:13	8.0	25.0	11.3	11.3	149.6	0.0172	11.3	59.4
	10:35	30.0	25.0	8.2	8.2	160.7	0.0092	8.2	43.1
	12:05	120.0	21.0	6.0	6.0	168.8	0.0049	6.0	31.6
	18:05	480.0	20.0	4.2	4.2	175.5	0.0025	4.2	22.1
	10:05	1440.0	20.0	3.0	3.0	179.9	0.0015	3.0	15.8
				Operator		Checked		Approved	
				Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili	

## PARTICLE SIZE DISTRIBUTION (HYDROMETER SEDIMENTATION)

<b>Project Name:</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	<b>Location</b>	Georgia
		<b><u>Borehole</u></b> /Pit no.	BH-B-1
<b>Soil description</b>		<b>Sample no.</b>	
Gray, soft, highly plastic CLAY		<b>Depth</b>	9.4-9.8
<b>Test method</b>	BS 1377 : Part 2 : 1990 : 9.5	<b>Date</b>	28.06.2012
<b>Method of preparation</b>			

### CALIBRATION AND SAMPLE DATA

Hydrometer no.	94
Meniscus correction $C_m$	0
Reading in dispersant $R_o'$	at the upper rim of the meniscus
Calibration equation	$H_r = H + \frac{1}{2} \left( h - \frac{V_h}{900} L \right)$
Dry mass of soil $m$	30.00 g
Particle density measured/assumed $\rho_s$	2.74 Mg/m <sup>3</sup>
Viscosity of water at 25.0 °C $\eta$	0.891 mPa·c

### PRETREATMENT

Pretreated	
Initial dry mass of sample $m_0$	30.00 g
Dry mass after pretreatment $m_p$	— g
Pretreatment loss $m_0 - m_p$	— g
	— %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}} \quad \text{mm}$$

$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d \quad \%$$

Date	Time	Elapsed time t min	Temperature T °C	Reading $R_h'$	$R_h' + C_m = R_h$	Effective depth $H_r$ mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
26.06.2012	10:10	0.5	25.0	17.5	17.5	128.0	0.0633	17.5	91.9
	10:10	1.0	25.0	17.3	17.3	128.7	0.0449	17.3	90.8
	10:12	2.0	25.0	16.8	16.8	130.5	0.0320	16.8	88.2
	10:14	4.0	25.0	15.9	15.9	133.8	0.0229	15.9	83.5
	10:18	8.0	25.0	15.4	15.4	135.6	0.0163	15.4	80.8
	10:40	30.0	25.0	14.3	14.3	139.4	0.0085	14.3	75.1
	12:10	120.0	21.0	10.1	10.1	153.7	0.0047	10.1	53.0
	18:10	480.0	20.0	6.2	6.2	168.1	0.0025	6.2	32.5
	10:10	1440.0	20.0	3.9	3.9	176.6	0.0015	3.9	20.5
				Operator		Checked		Approved	
				Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili	

## PARTICLE SIZE DISTRIBUTION (HYDROMETER SEDIMENTATION)

<b>Project Name:</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	<b>Location</b>	Georgia
		<b><u>Borehole</u></b> /Pit no.	BH-B-2
<b>Soil description</b>		<b>Sample no.</b>	
Gray, soft, intermediately plastic CLAY		<b>Depth</b>	5.25-5.5
<b>Test method</b>	BS 1377 : Part 2 : 1990 : 9.5	<b>Date</b>	28.06.2012
<b>Method of preparation</b>			

### CALIBRATION AND SAMPLE DATA

Hydrometer no.	94
Meniscus correction $C_m$	0
Reading in dispersant $R_o'$	at the upper rim of the meniscus
Calibration equation	$H_r = H + \frac{1}{2} \left( h - \frac{V_h}{900} L \right)$
Dry mass of soil $m$	30.00 g
Particle density measured/assumed $\rho_s$	2.73 Mg/m <sup>3</sup>
Viscosity of water at 25.0 °C $\eta$	0.891 mPa·c

### PRETREATMENT

Pretreated	
Initial dry mass of sample $m_0$	30.00 g
Dry mass after pretreatment $m_p$	— g
Pretreatment loss $m_0 - m_p$	— g
	— %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}} \quad \text{mm}$$

$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d \quad \%$$

Date	Time	Elapsed time t min	Temperature T °C	Reading $R_h'$	$R_h' + C_m = R_h$	Effective depth $H_r$ mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
26.06.2012	10:20	0.5	25.0	18.5	18.5	124.4	0.0626	18.5	97.3
	10:20	1.0	25.0	17.0	17.0	129.8	0.0452	17.0	89.4
	10:22	2.0	25.0	15.8	15.8	134.1	0.0325	15.8	83.1
	10:24	4.0	25.0	14.5	14.5	138.7	0.0234	14.5	76.3
	10:28	8.0	25.0	12.5	12.5	145.5	0.0169	12.5	65.8
	10:50	30.0	25.0	10.4	10.4	152.6	0.0090	10.4	54.7
	12:20	120.0	21.0	7.0	7.0	165.1	0.0049	7.0	36.8
	18:20	480.0	20.0	5.0	5.0	172.5	0.0025	5.0	26.3
	10:20	1440.0	20.0	4.2	4.2	175.5	0.0015	4.2	22.1
				Operator		Checked		Approved	
				Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili	

## PARTICLE SIZE DISTRIBUTION (HYDROMETER SEDIMENTATION)

<b>Project Name:</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	<b>Location</b>	Georgia
		<b>Borehole</b> /Pit no.	BH-B-2
<b>Soil description</b>		<b>Sample no.</b>	
intermediately plastic CLAY		<b>Depth</b>	5.25-5.5
<b>Test method</b>	BS 1377 : Part 2 : 1990 : 9.5	<b>Date</b>	28.06.2012
<b>Method of preparation</b>			

### CALIBRATION AND SAMPLE DATA

Hydrometer no.	94
Meniscus correction $C_m$	0
Reading in dispersant $R_o'$	at the upper rim of the meniscus
Calibration equation	$H_r = H + \frac{1}{2} \left( h - \frac{V_h}{900} L \right)$
Dry mass of soil $m$	30.00 g
Particle density measured/assumed $\rho_s$	2.70 Mg/m <sup>3</sup>
Viscosity of water at 25.0 °C $\eta$	0.891 mPa·c

### PRETREATMENT

Pretreated	
Initial dry mass of sample $m_0$	30.00 g
Dry mass after pretreatment $m_p$	— g
Pretreatment loss $m_0 - m_p$	— g
	— %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}} \quad \text{mm}$$

$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d \quad \%$$

Date	Time	Elapsed time t min	Temperature T °C	Reading $R_h'$	$R_h' + C_m = R_h$	Effective depth $H_r$ mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
26.06.2012	10:25	0.5	25.0	18.4	18.4	124.8	0.0633	18.4	97.4
	10:25	1.0	25.0	16.0	16.0	133.4	0.0462	16.0	84.7
	10:27	2.0	25.0	15.2	15.2	136.3	0.0331	15.2	80.5
	10:29	4.0	25.0	12.0	12.0	147.2	0.0243	12.0	63.5
	10:33	8.0	25.0	9.0	9.0	157.7	0.0178	9.0	47.6
	10:55	30.0	25.0	5.2	5.2	171.8	0.0096	5.2	27.5
	12:25	120.0	21.0	2.0	2.0	183.6	0.0052	2.0	10.6
	18:25	480.0	20.0	1.0	1.0	187.3	0.0027	1.0	5.3
	10:25	1440.0	20.0	0.5	0.5	189.2	0.0015	0.5	2.6
				Operator		Checked		Approved	
				Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili	

## PARTICLE SIZE DISTRIBUTION (HYDROMETER SEDIMENTATION)

<b>Project Name:</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	<b>Location</b>	Georgia
		<b>Borehole</b> /Pit no.	BH-B-2
<b>Soil description</b>		<b>Sample no.</b>	
Gray, soft, intermediately plastic CLAY		<b>Depth</b>	14.0-14.3
<b>Test method</b>	BS 1377 : Part 2 : 1990 : 9.5	<b>Date</b>	28.06.2012
<b>Method of preparation</b>			

### CALIBRATION AND SAMPLE DATA

Hydrometer no.	94
Meniscus correction $C_m$	0
Reading in dispersant $R_o'$	at the upper rim of the meniscus
Calibration equation	$H_r = H + \frac{1}{2} \left( h - \frac{V_h}{900} L \right)$
Dry mass of soil $m$	30.00 g
Particle density measured/assumed $\rho_s$	2.70 Mg/m <sup>3</sup>
Viscosity of water at 25.0 °C $\eta$	0.891 mPa·c

### PRETREATMENT

Pretreated	
Initial dry mass of sample $m_0$	30.00 g
Dry mass after pretreatment $m_p$	— g
Pretreatment loss $m_0 - m_p$	— g
	— %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}} \quad \text{mm}$$

$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d \quad \%$$

Date	Time	Elapsed time t min	Temperature T °C	Reading $R_h'$	$R_h' + C_m = R_h$	Effective depth $H_r$ mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
26.06.2012	10:00	0.5	25.0	18.5	18.5	124.4	0.0632	18.5	97.9
	10:00	1.0	25.0	17.0	17.0	129.8	0.0456	17.0	90.0
	10:02	2.0	25.0	16.2	16.2	132.7	0.0326	16.2	85.8
	10:04	4.0	25.0	15.0	15.0	137.0	0.0234	15.0	79.4
	10:08	8.0	25.0	13.3	13.3	142.8	0.0169	13.3	70.4
	10:30	30.0	25.0	10.0	10.0	154.0	0.0091	10.0	52.9
	12:00	120.0	21.0	7.0	7.0	165.1	0.0049	7.0	37.1
	18:00	480.0	20.0	4.5	4.5	174.4	0.0026	4.5	23.8
	10:00	1440.0	20.0	2.5	2.5	181.8	0.0015	2.5	13.2
				Operator		Checked		Approved	
				Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili	

## PARTICLE SIZE DISTRIBUTION (HYDROMETER SEDIMENTATION)

<b>Project Name:</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	<b>Location</b>	Georgia
		<b>Borehole</b> /Pit no.	BH-B-2
<b>Soil description</b>		<b>Sample no.</b>	
very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		<b>Depth</b>	18.7-19.0
<b>Test method</b>	BS 1377 : Part 2 : 1990 : 9.5	<b>Date</b>	28.06.2012
<b>Method of preparation</b>			

### CALIBRATION AND SAMPLE DATA

Hydrometer no.	94
Meniscus correction $C_m$	0
Reading in dispersant $R_o'$	at the upper rim of the meniscus
Calibration equation	$H_r = H + \frac{1}{2} \left( h - \frac{V_h}{900} L \right)$
Dry mass of soil $m$	30.00 g
Particle density measured/assumed $\rho_s$	2.67 Mg/m <sup>3</sup>
Viscosity of water at 25.0 °C $\eta$	0.891 mPa·c

### PRETREATMENT

Pretreated	
Initial dry mass of sample $m_0$	30.00 g
Dry mass after pretreatment $m_p$	— g
Pretreatment loss $m_0 - m_p$	— g
	— %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}} \quad \text{mm}$$

$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d \quad \%$$

Date	Time	Elapsed time t min	Temperature T °C	Reading $R_h'$	$R_h' + C_m = R_h$	Effective depth $H_r$ mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
26.06.2012	10:03	0.5	25.0	18.5	18.5	124.4	0.0630	18.5	98.6
	10:03	1.0	25.0	16.0	16.0	133.4	0.0467	16.0	85.3
	10:05	2.0	25.0	14.5	14.5	138.7	0.0336	14.5	77.3
	10:07	4.0	25.0	13.2	13.2	143.1	0.0242	13.2	70.3
	10:11	8.0	25.0	9.5	9.5	155.9	0.0178	9.5	50.6
	10:33	30.0	25.0	4.6	4.6	174.0	0.0097	4.6	24.5
	12:03	120.0	21.0	2.5	2.5	181.8	0.0052	2.5	13.3
	18:03	480.0	20.0	1.4	1.4	185.8	0.0027	1.4	7.5
	10:03	1440.0	20.0	0.8	0.8	188.0	0.0015	0.8	4.3
				Operator		Checked		Approved	
				Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili	

## PARTICLE SIZE DISTRIBUTION (HYDROMETER SEDIMENTATION)

<b>Project Name:</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	<b>Location</b>	Georgia
		<b>Borehole</b> /Pit no.	BH-B-3
<b>Soil description</b>		<b>Sample no.</b>	
fine grained SAND		<b>Depth</b>	2.3-2.5
<b>Test method</b>	BS 1377 : Part 2 : 1990 : 9.5	<b>Date</b>	30.06.2012
<b>Method of preparation</b>			

### CALIBRATION AND SAMPLE DATA

Hydrometer no.	94
Meniscus correction $C_m$	0
Reading in dispersant $R_o'$	at the upper rim of the meniscus
Calibration equation	$H_r = H + \frac{1}{2} \left( h - \frac{V_h}{900} L \right)$
Dry mass of soil $m$	30.00 g
Particle density measured/assumed $\rho_s$	2.68 Mg/m <sup>3</sup>
Viscosity of water at 25.0 °C $\eta$	0.891 mPa·c

### PRETREATMENT

Pretreated	
Initial dry mass of sample $m_0$	30.00 g
Dry mass after pretreatment $m_p$	— g
Pretreatment loss $m_0 - m_p$	— g
	— %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}} \quad \text{mm}$$

$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d \quad \%$$

Date	Time	Elapsed time t min	Temperature T °C	Reading $R_h'$	$R_h' + C_m = R_h$	Effective depth $H_r$ mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
27.06.2012	9:58	0.5	25.0	17.6	17.6	127.6	0.0630	17.6	93.6
	9:58	1.0	25.0	17.0	17.0	129.8	0.0459	17.0	90.4
	10:00	2.0	25.0	13.5	13.5	142.1	0.0340	13.5	71.8
	10:02	4.0	25.0	9.4	9.4	156.2	0.0252	9.4	50.0
	10:06	8.0	25.0	8.0	8.0	161.4	0.0181	8.0	42.5
	10:28	30.0	25.0	6.0	6.0	168.8	0.0096	6.0	31.9
	11:58	120.0	21.0	5.1	5.1	172.1	0.0051	5.1	27.1
	17:58	480.0	20.0	2.8	2.8	180.6	0.0026	2.8	14.9
	9:58	1440.0	20.0	5.0	5.0	172.5	0.0015	5.0	26.6
				Operator		Checked		Approved	
				Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili	



## PARTICLE SIZE DISTRIBUTION (HYDROMETER SEDIMENTATION)

<b>Project Name:</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	<b>Location</b>	Georgia
		<b>Borehole</b> /Pit no.	BH-B-3
<b>Soil description</b>		<b>Sample no.</b>	
Gray, soft, intermediately plastic CLAY		<b>Depth</b>	8.5-8.8
<b>Test method</b>	BS 1377 : Part 2 : 1990 : 9.5	<b>Date</b>	30.06.2012
<b>Method of preparation</b>			

### CALIBRATION AND SAMPLE DATA

Hydrometer no.	94
Meniscus correction $C_m$	0
Reading in dispersant $R_o'$	at the upper rim of the meniscus
Calibration equation	$H_r = H + \frac{1}{2} \left( h - \frac{V_h}{900} L \right)$
Dry mass of soil $m$	30.00 g
Particle density measured/assumed $\rho_s$	2.73 Mg/m <sup>3</sup>
Viscosity of water at 25.0 °C $\eta$	0.891 mPa·c

### PRETREATMENT

Pretreated	
Initial dry mass of sample $m_0$	30.00 g
Dry mass after pretreatment $m_p$	— g
Pretreatment loss $m_0 - m_p$	— g
	— %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}} \quad \text{mm}$$

$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d \quad \%$$

Date	Time	Elapsed time t min	Temperature T °C	Reading $R_h'$	$R_h' + C_m = R_h$	Effective depth $H_r$ mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
27.06.2012	9:58	0.5	25.0	16.5	16.5	131.6	0.0630	16.5	86.8
	9:58	1.0	25.0	16.0	16.0	133.4	0.0458	16.0	84.2
	10:00	2.0	25.0	15.7	15.7	134.5	0.0325	15.7	82.6
	10:02	4.0	25.0	15.0	15.0	137.0	0.0232	15.0	78.9
	10:06	8.0	25.0	13.4	13.4	142.4	0.0167	13.4	70.5
	10:28	30.0	25.0	11.0	11.0	150.6	0.0089	11.0	57.9
	11:58	120.0	21.0	7.5	7.5	163.3	0.0049	7.5	39.5
	17:58	480.0	20.0	5.4	5.4	171.0	0.0025	5.4	28.4
	9:58	1440.0	20.0	3.0	3.0	179.9	0.0015	3.0	15.8
				Operator		Checked		Approved	
				Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili	

## PARTICLE SIZE DISTRIBUTION (HYDROMETER SEDIMENTATION)

<b>Project Name:</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	<b>Location</b>	Georgia
		<b><u>Borehole</u></b> /Pit no.	BH-B-3
<b>Soil description</b>		<b>Sample no.</b>	
Gray, soft, intermediately plastic CLAY		<b>Depth</b>	19.1-19.3
<b>Test method</b>	BS 1377 : Part 2 : 1990 : 9.5	<b>Date</b>	30.06.2012
<b>Method of preparation</b>			

### CALIBRATION AND SAMPLE DATA

Hydrometer no.	94
Meniscus correction $C_m$	0
Reading in dispersant $R_o'$	at the upper rim of the meniscus
Calibration equation	$H_r = H + \frac{1}{2} \left( h - \frac{V_h}{900} L \right)$
Dry mass of soil $m$	30.00 g
Particle density measured/assumed $\rho_s$	2.71 Mg/m <sup>3</sup>
Viscosity of water at 25.0 °C $\eta$	0.891 mPa·c

### PRETREATMENT

Pretreated	
Initial dry mass of sample $m_0$	30.00 g
Dry mass after pretreatment $m_p$	— g
Pretreatment loss $m_0 - m_p$	— g
	— %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}} \quad \text{mm}$$

$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d \quad \%$$

Date	Time	Elapsed time t min	Temperature T °C	Reading $R_h'$	$R_h' + C_m = R_h$	Effective depth $H_r$ mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
27.06.2012	9:52	0.5	25.0	17.0	17.0	129.8	0.0630	17.0	89.8
	9:52	1.0	25.0	16.3	16.3	132.3	0.0459	16.3	86.1
	9:54	2.0	25.0	16.0	16.0	133.4	0.0326	16.0	84.5
	9:56	4.0	25.0	15.2	15.2	136.3	0.0233	15.2	80.3
	10:00	8.0	25.0	13.5	13.5	142.1	0.0168	13.5	71.3
	10:22	30.0	25.0	10.5	10.5	152.3	0.0090	10.5	55.5
	11:52	120.0	21.0	8.0	8.0	161.4	0.0049	8.0	42.3
	17:52	480.0	20.0	5.0	5.0	172.5	0.0025	5.0	26.4
	9:52	1440.0	20.0	3.0	3.0	179.9	0.0015	3.0	15.8
				Operator		Checked		Approved	
				Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili	

## PARTICLE SIZE DISTRIBUTION (HYDROMETER SEDIMENTATION)

<b>Project Name:</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	<b>Location</b>	Georgia
		<b>Borehole</b> /Pit no.	BH-B-4
<b>Soil description</b>		<b>Sample no.</b>	
Gray, soft, highly plastic CLAY		<b>Depth</b>	10.3-10.5
<b>Test method</b>	BS 1377 : Part 2 : 1990 : 9.5	<b>Date</b>	29.06.2012
<b>Method of preparation</b>			

### CALIBRATION AND SAMPLE DATA

Hydrometer no.	94
Meniscus correction $C_m$	0
Reading in dispersant $R_o'$	at the upper rim of the meniscus
Calibration equation	$H_r = H + \frac{1}{2} \left( h - \frac{V_h}{900} L \right)$
Dry mass of soil $m$	30.00 g
Particle density measured/assumed $\rho_s$	2.74 Mg/m <sup>3</sup>
Viscosity of water at 25.0 °C $\eta$	0.891 mPa·c

### PRETREATMENT

Pretreated	
Initial dry mass of sample $m_0$	30.00 g
Dry mass after pretreatment $m_p$	— g
Pretreatment loss $m_0 - m_p$	— g
	— %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}} \quad \text{mm}$$

$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d \quad \%$$

Date	Time	Elapsed time t min	Temperature T °C	Reading $R_h'$	$R_h' + C_m = R_h$	Effective depth $H_r$ mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
27.06.2012	9:50	0.5	25.0	17.8	17.8	126.9	0.0630	17.8	93.4
	9:50	1.0	25.0	17.5	17.5	128.0	0.0448	17.5	91.9
	9:52	2.0	25.0	17.4	17.4	128.4	0.0317	17.4	91.3
	9:54	4.0	25.0	17.0	17.0	129.8	0.0225	17.0	89.2
	9:58	8.0	25.0	16.7	16.7	130.9	0.0160	16.7	87.7
	10:20	30.0	25.0	15.0	15.0	137.0	0.0085	15.0	78.7
	11:50	120.0	21.0	12.5	12.5	145.5	0.0046	12.5	65.6
	17:50	480.0	20.0	8.2	8.2	160.7	0.0024	8.2	43.0
	9:50	1440.0	20.0	4.5	4.5	174.4	0.0015	4.5	23.6
				Operator		Checked		Approved	
				Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili	

## PARTICLE SIZE DISTRIBUTION (HYDROMETER SEDIMENTATION)

<b>Project Name:</b> GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	<b>Location</b>	Georgia
		<b><u>Borehole</u></b> /Pit no.	BH-B-4
<b>Soil description</b>		<b>Sample no.</b>	
Gray, soft, highly plastic CLAY		<b>Depth</b>	21.0-21.3
<b>Test method</b>	BS 1377 : Part 2 : 1990 : 9.5	<b>Date</b>	30.06.2012
<b>Method of preparation</b>			

### CALIBRATION AND SAMPLE DATA

Hydrometer no.	94
Meniscus correction $C_m$	0
Reading in dispersant $R_o'$	at the upper rim of the meniscus
Calibration equation	$H_r = H + \frac{1}{2} \left( h - \frac{V_h}{900} L \right)$
Dry mass of soil $m$	30.00 g
Particle density measured/assumed $\rho_s$	2.73 Mg/m <sup>3</sup>
Viscosity of water at 25.0 °C $\eta$	0.891 mPa·c

### PRETREATMENT

Pretreated	
Initial dry mass of sample $m_0$	30.00 g
Dry mass after pretreatment $m_p$	— g
Pretreatment loss $m_0 - m_p$	— g
	— %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}} \quad \text{mm}$$

$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d \quad \%$$

Date	Time	Elapsed time t min	Temperature T °C	Reading $R_h'$	$R_h' + C_m = R_h$	Effective depth $H_r$ mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
27.06.2012	9:55	0.5	25.0	17.6	17.6	127.6	0.0630	17.6	92.6
	9:55	1.0	25.0	17.4	17.4	128.4	0.0450	17.4	91.5
	9:57	2.0	25.0	17.3	17.3	128.7	0.0318	17.3	91.0
	9:59	4.0	25.0	17.0	17.0	129.8	0.0226	17.0	89.4
	10:03	8.0	25.0	16.2	16.2	132.7	0.0162	16.2	85.2
	10:25	30.0	25.0	14.2	14.2	139.7	0.0086	14.2	74.7
	11:55	120.0	21.0	10.5	10.5	152.3	0.0047	10.5	55.2
	17:55	480.0	20.0	6.7	6.7	166.2	0.0025	6.7	35.2
	9:55	1440.0	20.0	3.5	3.5	178.1	0.0015	3.5	18.4
				Operator		Checked		Approved	
				Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili	