

## DYNAMIC PENETRATION TEST

Customer: NKJI Site: km 5+870 - km 6+060 Location: Zaharna_Fabrika - Gorna Banya	
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### Equipment technical characteristics DPM (DL030 10) (Medium)

Regulation ref.	DIN 4094
Weight of striking mass	30 Kg
Freefall height	0.20 m
Weight of striking system	21 Kg
Diameter of cone tip	35.68 mm
Area of tip base	10 cm <sup>2</sup>
Rod length	1 m
Weight of rods /m	2.9 Kg/m
Depth first rod joint	0.80 m
Tip penetration	0.10 m
Number of blow by tip	N(10)
Correlation coeff.	0.761
Coating/Slurries	Yes
Cone tip angle	60 °

## TEST...DPM 1

Equipment used... DPM (DL030 10) (Medium)  
 Test performed on 2016 r.  
 Test depth 5.00 mt  
 Elevation 612.50 mt  
 No GWT found

Processing type nr. blows: Average

Depth (m)	No. of blows	No. of blows Coating/Slurries	Calculation Chi probe reduction coeff.	Reduced dyn. resistance (Mpa)	Dynamic resistance (Mpa)	Reduced allowable pressure Herminier - Olandesi (KPa)	Allow. pressure Herminier - Olandesi (KPa)
0.10	2	0	0.857	0.56	0.65	28.05	32.75
0.20	3	0	0.855	0.84	0.98	41.98	49.12
0.30	3	0	0.853	0.84	0.98	41.89	49.12
0.40	3	0	0.851	0.84	0.98	41.79	49.12
0.50	4	0	0.849	1.11	1.31	55.60	65.50
0.60	5	0	0.847	1.39	1.64	69.35	81.87
0.70	4	0	0.845	1.11	1.31	55.36	65.50
0.80	8	0	0.843	2.21	2.62	110.48	131.00
0.90	4	0	0.842	1.05	1.24	52.31	62.15
1.00	3	0	0.840	0.78	0.93	39.15	46.62
1.10	5	0	0.838	1.30	1.55	65.11	77.69
1.20	9	0	0.836	2.34	2.80	116.95	139.85
1.30	6	0	0.835	1.56	1.86	77.81	93.23
1.40	4	0	0.833	1.04	1.24	51.77	62.15
1.50	3	0	0.831	0.77	0.93	38.75	46.62
1.60	5	0	0.830	1.29	1.55	64.45	77.69
1.70	6	0	0.828	1.54	1.86	77.19	93.23
1.80	11	0	0.826	2.82	3.42	141.24	170.93
1.90	6	0	0.825	1.46	1.77	73.16	88.70
2.00	6	0	0.823	1.46	1.77	73.02	88.70
2.10	5	0	0.822	1.21	1.48	60.74	73.92
2.20	6	0	0.820	1.45	1.77	72.75	88.70
2.30	4	0	0.819	0.97	1.18	48.41	59.14
2.40	4	0	0.817	0.97	1.18	48.32	59.14
2.50	7	0	0.816	1.69	2.07	84.41	103.49
2.60	7	0	0.814	1.69	2.07	84.26	103.49
2.70	5	0	0.813	1.20	1.48	60.08	73.92
2.80	6	0	0.811	1.44	1.77	71.98	88.70
2.90	7	0	0.810	1.60	1.97	79.95	98.69
3.00	6	0	0.809	1.37	1.69	68.41	84.59
3.10	8	0	0.807	1.82	2.26	91.06	112.79
3.20	10	0	0.806	2.27	2.82	113.64	140.99
3.30	13	0	0.755	2.77	3.67	138.33	183.29
3.40	12	0	0.803	2.72	3.38	135.93	169.19
3.50	12	0	0.802	2.71	3.38	135.71	169.19
3.60	13	0	0.751	2.75	3.67	137.63	183.29
3.70	14	0	0.750	2.96	3.95	147.97	197.39
3.80	13	0	0.748	2.74	3.67	137.17	183.29
3.90	13	0	0.747	2.62	3.50	130.89	175.17
4.00	15	0	0.746	3.02	4.04	150.79	202.12
4.10	16	0	0.745	3.21	4.31	160.59	215.60
4.20	15	0	0.744	3.01	4.04	150.32	202.12
4.30	14	0	0.743	2.80	3.77	140.08	188.65
4.40	15	0	0.741	3.00	4.04	149.86	202.12
4.50	16	0	0.740	3.19	4.31	159.61	215.60
4.60	15	0	0.739	2.99	4.04	149.42	202.12
4.70	15	0	0.738	2.98	4.04	149.20	202.12
4.80	17	0	0.737	3.38	4.58	168.85	229.07
4.90	18	0	0.736	3.42	4.65	170.96	232.26
5.00	20	0	0.735	3.79	5.16	189.69	258.07

Layer depth (m)	NPDM	Rd (Mpa)	Type	Clay Fraction (%)	Unit weight (KN/m <sup>3</sup> )	Saturated unit weight (KN/m <sup>3</sup> )	Effective stress (KPa)	Correlation Coeff. with Nspt	Nspt	Description
3.1	5.32	1.624962	Cohesive	90	16.67	18.34	25.84	0.76	4	Wastes
5	14.53	3.949138	Cohesive	14	19.52	21.48	70.22	0.76	11	Silty to Sandy Clay

## ESTIMATE TEST GEOTECHNICAL PARAMETERS DPM 1

### COHESIVE SOIL S

Undrained cohesion

Description	Nspt	Layer depth (m)	Correlation	Cu (KPa)
Layer (1) Wastes	4	0.00-3.10	Terzaghi-Peck	24.52
Layer (2) Silty to Sandy Clay	11	3.10-5.00	Terzaghi-Peck	72.86

Qc (CPT Cone resistance)

Description	Nspt	Layer depth (m)	Correlation	Qc (Mpa)
Layer (1) Wastes	4	0.00-3.10	Robertson (1983)	0.78
Layer (2) Silty to Sandy Clay	11	3.10-5.00	Robertson (1983)	2.16

Oedometric module

Description	Nspt	Layer depth (m)	Correlation	Eed (Mpa)
Layer (1) Wastes	4	0.00-3.10	Stroud e Butler (1975)	1.80
Layer (2) Silty to Sandy Clay	11	3.10-5.00	Stroud e Butler (1975)	4.95

Young's modulus

Description	Nspt	Layer depth (m)	Correlation	Ey (Mpa)
Layer (1) Wastes	4	0.00-3.10	Apollonia	3.92
Layer (2) Silty to Sandy Clay	11	3.10-5.00	Apollonia	10.79

AGI Classification (Assoc. It. Geolog.)

Description	Nspt	Layer depth (m)	Correlation	Classification
Layer (1) Wastes	4	0.00-3.10	A.G.I. (1977)	POCO CONSISTENTE
Layer (2) Silty to Sandy Clay	11	3.10-5.00	A.G.I. (1977)	CONSISTENTE

Unit weight

Description	Nspt	Layer depth (m)	Correlation	Unit weight (KN/m <sup>3</sup> )
Layer (1) Wastes	4	0.00-3.10	Meyerhof ed altri	16.67
Layer (2) Silty to Sandy Clay	11	3.10-5.00	Meyerhof ed altri	19.52

Saturated unit weight

Description	Nspt	Layer depth (m)	Correlation	Saturated unit weight (KN/m <sup>3</sup> )
Layer (1) Wastes	4	0.00-3.10	Meyerhof et al	18.34
Layer (2) Silty to Sandy Clay	11	3.10-5.00	Meyerhof et al	21.48

Shear wave velocity

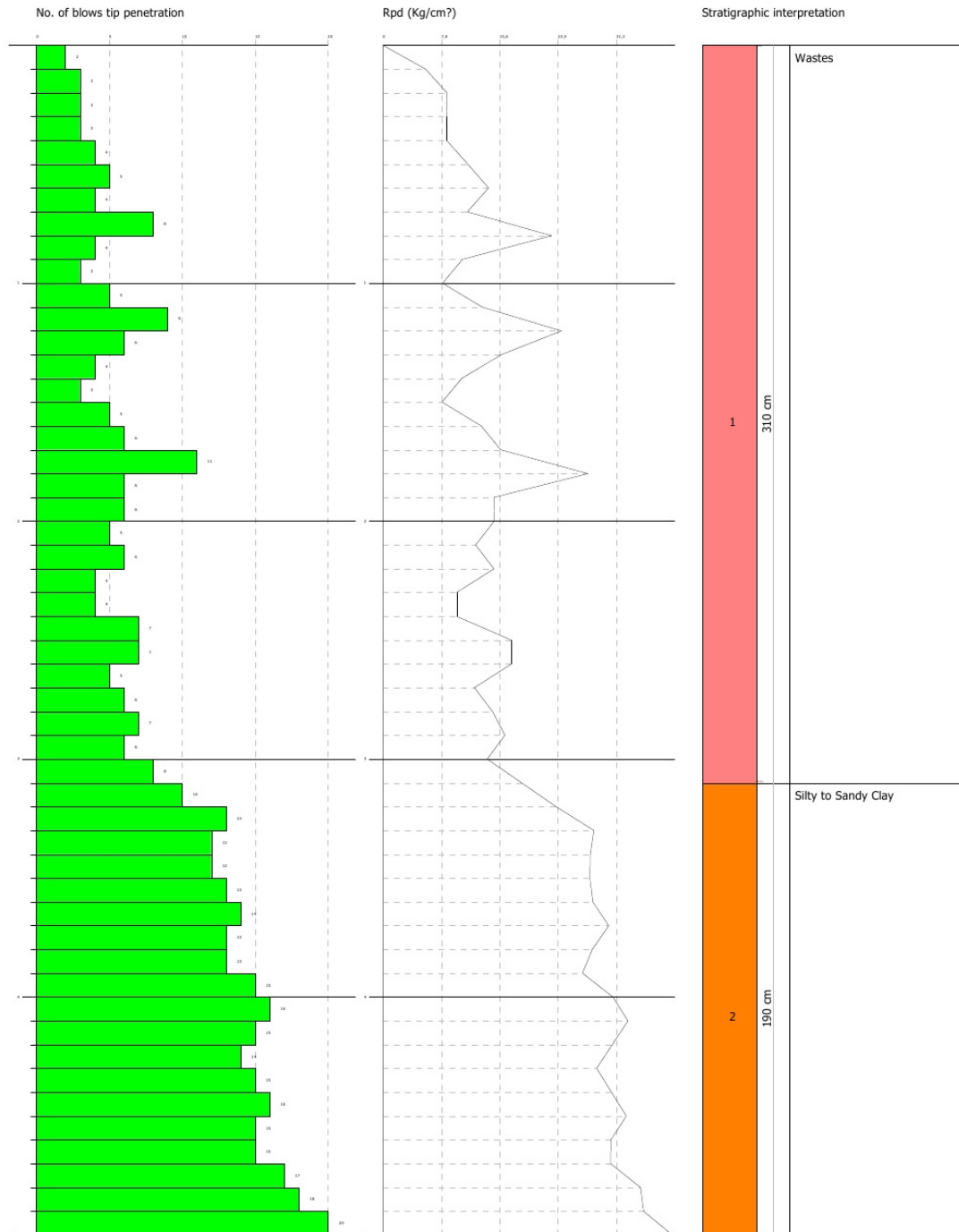
Description	Nspt	Layer depth (m)	Correlation	Shear wave velocity (m/s)
Layer (1) Wastes	4	0.00-3.10	Ohta & Goto (1978) Low plasticity clays and silty clays	94.63
Layer (2) Silty to Sandy Clay	11	3.10-5.00	Ohta & Goto (1978) Low plasticity clays and silty clays	135.68

DYNAMIC PENETRATION TEST DPM 1  
 Equipment used... DPM (DL030 10) (Medium)

Customer: NKJI  
 Site: km 5+870 - km 6+060  
 Location: Zaharna\_Fabrika - Gorna Banya

Date:

Scale 1:23



SIGNATURE 1

SIGNATURE 2

## TEST...DPM 2

Equipment used... DPM (DL030 10) (Medium)  
 Test performed on 01.2017 г.  
 Test depth 4.00 mt  
 Elevation 610.50 mt  
 No GWT found

Processing type nr. blows: Average

Depth (m)	No. of blows	No. of blows Coating/Slurries	Calculation Chi probe reduction coeff.	Reduced dyn. resistance (Mpa)	Dynamic resistance (Mpa)	Reduced allowable pressure Herminier - Olandesi (KPa)	Allow. pressure Herminier - Olandesi (KPa)
0.10	2	0	0.857	0.56	0.65	28.05	32.75
0.20	3	0	0.855	0.84	0.98	41.98	49.12
0.30	4	0	0.853	1.12	1.31	55.85	65.50
0.40	5	0	0.851	1.39	1.64	69.66	81.87
0.50	9	0	0.849	2.50	2.95	125.10	147.37
0.60	4	0	0.847	1.11	1.31	55.48	65.50
0.70	5	0	0.845	1.38	1.64	69.20	81.87
0.80	3	0	0.843	0.83	0.98	41.43	49.12
0.90	5	0	0.842	1.31	1.55	65.38	77.69
1.00	6	0	0.840	1.57	1.86	78.29	93.23
1.10	6	0	0.838	1.56	1.86	78.13	93.23
1.20	8	0	0.836	2.08	2.49	103.96	124.31
1.30	8	0	0.835	2.07	2.49	103.74	124.31
1.40	9	0	0.833	2.33	2.80	116.47	139.85
1.50	8	0	0.831	2.07	2.49	103.33	124.31
1.60	8	0	0.830	2.06	2.49	103.12	124.31
1.70	9	0	0.828	2.32	2.80	115.78	139.85
1.80	9	0	0.826	2.31	2.80	115.56	139.85
1.90	9	0	0.825	2.19	2.66	109.74	133.06
2.00	9	0	0.823	2.19	2.66	109.53	133.06
2.10	10	0	0.822	2.43	2.96	121.47	147.84
2.20	9	0	0.820	2.18	2.66	109.12	133.06
2.30	8	0	0.819	1.94	2.37	96.82	118.27
2.40	9	0	0.817	2.17	2.66	108.73	133.06
2.50	10	0	0.816	2.41	2.96	120.59	147.84
2.60	9	0	0.814	2.17	2.66	108.34	133.06
2.70	8	0	0.813	1.92	2.37	96.13	118.27
2.80	9	0	0.811	2.16	2.66	107.96	133.06
2.90	10	0	0.810	2.28	2.82	114.21	140.99
3.00	9	0	0.809	2.05	2.54	102.61	126.89
3.10	10	0	0.807	2.28	2.82	113.83	140.99
3.20	9	0	0.806	2.05	2.54	102.27	126.89
3.30	9	0	0.805	2.04	2.54	102.11	126.89
3.40	12	0	0.803	2.72	3.38	135.93	169.19
3.50	11	0	0.802	2.49	3.10	124.40	155.09
3.60	13	0	0.751	2.75	3.67	137.63	183.29
3.70	12	0	0.800	2.71	3.38	135.29	169.19
3.80	13	0	0.748	2.74	3.67	137.17	183.29
3.90	14	0	0.747	2.82	3.77	140.96	188.65
4.00	15	0	0.746	3.02	4.04	150.79	202.12

Layer depth (m)	NPDM	Rd (Mpa)	Type	Clay Fraction (%)	Unit weight (KN/m <sup>3</sup> )	Saturated unit weight (KN/m <sup>3</sup> )	Effective stress (KPa)	Correlatio n Coeff. with Nspt	Nspt	Descriptio n
1.1	4.78	1.544547	Cohesive	40	16.48	18.34	9.06	0.76	3.64	Wastes
3.3	8.91	2.645834	Cohesive	90	18.14	18.53	38.08	0.76	6.78	Silty Clay Black
4	12.86	3.573543	Cohesive	90	19.22	21.18	64.76	0.76	9.79	Silty to Sandy Clay

## ESTIMATE TEST GEOTECHNICAL PARAMETERS DPM 2

### COHESIVE SOIL S

Undrained cohesion

Description	Nspt	Layer depth (m)	Correlation	Cu (KPa)
Layer (1) Wastes	3.64	0.00-1.10	Terzaghi-Peck	22.36
Layer (2) Silty Clay Black	6.78	1.10-3.30	Terzaghi-Peck	41.58
Layer (3) Silty to Sandy Clay	9.79	3.30-4.00	Terzaghi-Peck	64.82

Qc (CPT Cone resistance)

Description	Nspt	Layer depth (m)	Correlation	Qc (Mpa)
Layer (1) Wastes	3.64	0.00-1.10	Robertson (1983)	0.71
Layer (2) Silty Clay Black	6.78	1.10-3.30	Robertson (1983)	1.33
Layer (3) Silty to Sandy Clay	9.79	3.30-4.00	Robertson (1983)	1.92

Oedometric module

Description	Nspt	Layer depth (m)	Correlation	Eed (Mpa)
Layer (1) Wastes	3.64	0.00-1.10	Stroud e Butler (1975)	1.64
Layer (2) Silty Clay Black	6.78	1.10-3.30	Stroud e Butler (1975)	3.05
Layer (3) Silty to Sandy Clay	9.79	3.30-4.00	Stroud e Butler (1975)	4.40

Young's modulus

Description	Nspt	Layer depth (m)	Correlation	Ey (Mpa)
Layer (1) Wastes	3.64	0.00-1.10	Apollonia	3.57
Layer (2) Silty Clay Black	6.78	1.10-3.30	Apollonia	6.65
Layer (3) Silty to Sandy Clay	9.79	3.30-4.00	Apollonia	9.60

AGI Classification (Assoc. It. Geolog.)

Description	Nspt	Layer depth (m)	Correlation	Classification
Layer (1) Wastes	3.64	0.00-1.10	A.G.I. (1977)	POCO CONSISTENTE
Layer (2) Silty Clay Black	6.78	1.10-3.30	A.G.I. (1977)	MODERAT. CONSISTENTE
Layer (3) Silty to Sandy Clay	9.79	3.30-4.00	A.G.I. (1977)	CONSISTENTE

Unit weight

Description	Nspt	Layer depth (m)	Correlation	Unit weight (KN/m <sup>3</sup> )
Layer (1) Wastes	3.64	0.00-1.10	Meyerhof ed altri	16.48
Layer (2) Silty Clay Black	6.78	1.10-3.30	Meyerhof ed altri	18.14
Layer (3) Silty to Sandy Clay	9.79	3.30-4.00	Meyerhof ed altri	19.22

## Saturated unit weight

Description	Nspt	Layer depth (m)	Correlation	Saturated unit weight (KN/m <sup>3</sup> )
Layer (1) Wastes	3.64	0.00-1.10	Meyerhof et al	18.34
Layer (2) Silty Clay Black	6.78	1.10-3.30	Meyerhof et al	18.53
Layer (3) Silty to Sandy Clay	9.79	3.30-4.00	Meyerhof et al	21.18

## Shear wave velocity

Description	Nspt	Layer depth (m)	Correlation	Shear wave velocity (m/s)
Layer (1) Wastes	3.64	0.00-1.10	Ohta & Goto (1978) Low plasticity clays and silty clays	76.22
Layer (2) Silty Clay Black	6.78	1.10-3.30	Ohta & Goto (1978) Low plasticity clays and silty clays	110.92
Layer (3) Silty to Sandy Clay	9.79	3.30-4.00	Ohta & Goto (1978) Low plasticity clays and silty clays	130.33

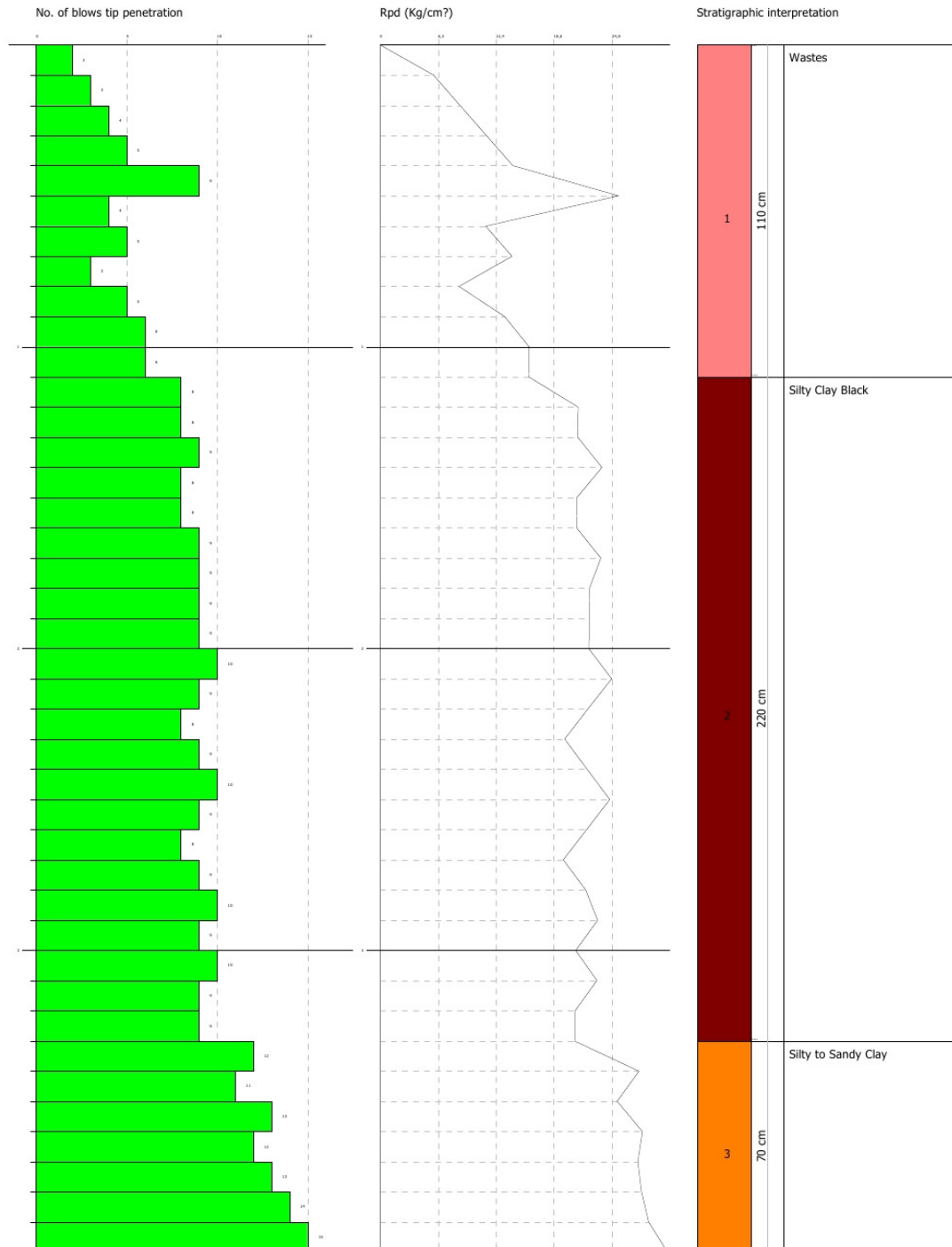


DYNAMIC PENETRATION TEST DPM 2  
 Equipment used... DPM (DL030 10) (Medium)

Customer: NKJI  
 Site: km 5+870 - km 6+060  
 Location: Zaharna\_Fabrika - Gorna Banya

Date:

Scale 1:18



SIGNATURE 1

SIGNATURE 2