L.R # 71/ 12

Date: 09-07-2012

CLIENT: The JICA Study Team
PROJECT: Preparatory Survey (II) on Karachi Circular Railway Revival Project in Karachi.

GRAIN SIZE ANALYSIS (PER CENT FINER BY WEIGHT)

SIEVE ANALYSIS

HYDROMETER (Dia in mm)

S.NO.	BORING NO.	SAMPLE	DEPTH (m)	3"	1.5"	3/4"	3/8"	#4	#8	#16	#30	#50	#100	#200	0.05	0.01	0.002	0.001
				75 mm	38 mm	19 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.600 mm	0.300 mm	0.150 mm	0.075 mm	0.05 mm	0.010 mm	0.002 mm	0.001 mm
1	BH-45	UDS-1	2.50 - 3.0				100	87	84	81	77	74	56	48				
2	BH-48	UDS-1	4.30 - 4.80				100	96	91	86	84	82	77	75	62	54	47	28
3	BH-50	UDS-1	4.50 - 4.95							100	99	98	94	92	85	72	64	30
4	BH-51	UDS-2	6.50 - 6.95							100	98	98	85	77	54	37	22	8
5	BH-52	UDS-1	4.0 - 4.30					100	97	95	93	93	59	42				
6	BH-53	UDS-1	3.0 - 3.47					100	99	98	96	95	89	75	65	54	47	22
7	BH-54	UDS-1	3.5 - 3.95					100	97	92	88	86	78	60	56	44	38	18
8	BH-55-A	UDS-1	2.60 - 2.91					100	99	96	94	93	82	76	65	56	48	24
9	BH-56	UDS-1	6.50 - 6.95						100	98	95	93	80	73	64	55	42	26
10	BH-57	UDS-1	5.45 - 5.95							100	99	99	96	92	64	52	32	9
11	BH-58	UDS-1	5.5 - 5.80								100	99	97	96	88	76	64	30
12	BH-59	UDS-1	6.5 - 6.95					100	97	89	84	80	57	31				
13	BH-60	UDS-1	5.5 - 5.75				100	97	91	82	74	69	59	53	50	42	39	20
14	BH-61	UDS-1	5.5 - 5.91				100	93	89	84	81	79	73	68	60	59	49	25
15	BH-62	UDS-1	4.0 - 5.0						100	99	99	98	96	93	73	66	52	28
16	BH-63	UDS-1									100	99	96	94	87	74	62	30
17	BH-64	UDS-1	3.0 - 3.35	100	75	67	62	49	44	41	39	38	35	31				
18	BH-66	UDS-1	5.30 - 5.65				100	93	93	92	92	91	89	87	82	75	68	31
19	BH-88	UDS-1	3.50 - 4.0								100	99	98	98	73	60	54	23

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ATTERBERG LIMITS

S. NO.	BORING NO.	SAMPLE	DEPTH (m)	LIQUID LIMIT	PLASTICITY INDEX	Specific Gravity of Soil	Natural Water content (%)
1	BH-45	UDS-1	2.50 - 3.0	21	8	2.658	9.47
2	BH-48	UDS-1	4.30 - 4.80	34	12	2.711	16.87
3	BH-50	UDS-1	4.50 - 4.95	37	14	2.687	28.15
4	BH-51	UDS-1	6.50 - 6.95	Non-Plastic		2.704	19.17
5	BH-52	UDS-1	4.0 - 4.30	Non-Plastic		2.679	17.16
6	BH-53	UDS-1	3.0 - 3.47	42	16	2.813	27.15
7	BH-54	UDS-1	3.5 - 3.95	27	12	2.765	12.94
8	BH-55-A	UDS-1	2.60 - 2.91	34	11	2.713	30.2
9	BH-56	UDS-1	6.50 - 6.95	32	13	2.688	25.8
10	BH-57	UDS-1	5.45 - 5.95	Non-Plastic		2.513	20.38
11	BH-58	UDS-1	5.5 - 5.80	36	14	2.781	9.46
12	BH-59	UDS-1	6.5 - 6.95	Non-Plastic		2.781	14.58
13	BH-60	UDS-1	5.5 - 5.75	32	13	2.781	15.55
14	BH-61	UDS-1	5.5 - 5.91	35	16	2.895	26.87
15	BH-62	UDS-1	4.0 - 5.0	42	16	3.153	18.25
16	BH-63	UDS-1		36	14	2.845	17.63
17	BH-64	UDS-1	3.0 - 3.35	35	19	2.700	23.89
18	BH-66	UDS-1	5.30 - 5.65	46	22	2.619	17.95
19	BH-88	UDS-1	3.50 - 4.0	34	10	2.714	28.92

4. Detailed Boring Survey Result

Drilling Survey from 0 km to 4.0 km (KCR BH-1 to BH-9)

KCR Borehole #			BH#1	BH#2	BH#3	BH#4	BH#5	BH#6	BH#7	BH#8	BH#9
Layer #	Breif Description	Elevation of Borehole, El. 'm'	+15.53	+13.86	+14.83	+16.39	+17.66	+18.57	+22.32	+25.81	+26.76
I	BACK FILLED MATERIAL	Extent of Layer, El. 'm'	-	-	-	-	-	-	-	-	-
		Thickness 'm'	-	-	-	-	-	-	-	-	-
		SPT 'N' Value	-	-	-	-	-	-	-	-	-
II	SAND 1 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	+13.53	+10.86	+8.83	+12.39	+13.26	+14.57	+20.32	-	-
		Thickness 'm'	2.0	3.0	6.0	4.0	4.4	4.0	2.0	-	-
		SPT 'N' Value	9	10 & 13	11-32	7-11	9-22	10-26	8	-	-
III	CLAY 1 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-	-	+4.33	+10.39	-	-	-	-	-
		Thickness 'm'	-	-	4.5	2.0	-	-	-	-	-
		SPT 'N' Value	-	-	32 & 54	18 & 24	-	-	-	-	-
IV	SAND 2 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	+8.03	+3.86	-0.67	+9.39	-	-	+19.82	+23.21	+24.26
		Thickness 'm'	5.5	7.0	5.0	1	-	-	0.5	2.6	2.5
		SPT 'N' Value	34-R	32-71	54-R	77	-	-	31	54 & 68	43 & 63
V	CLAY 2 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	+5.53	+2.06	-	+7.89	-	-	-	-	-
		Thickness 'm'	2.5	1.8	-	1.5	-	-	-	-	-
		SPT 'N' Value	72 & 75	75 & 98	-	73 &54	-	-	-	-	-
VI	LIMESTONE 1	Extent of Layer, El. 'm'	-	-	-	-	+11.06	-	-	+21.91	+22.76
		Thickness 'm'	-	-	-	-	2.2	-	-	1.3	1.5
		SPT 'N' Value	-	-	-	-	58 & 72	-	-	R	R
VII	MUDSTONE 1 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-4.47	-0.64	-	+6.89	-	-	-	+16.01	+16.76
		Thickness 'm'	10.0	2.7	-	1.0	-	-	-	5.9	6.0
		SPT 'N' Value	75-R	R	-	R	-	-	-	R	R
VIII	SANDSTONE 1	Extent of Layer, El. 'm'	-	-6.14	-1.67	-3.61	+7.06	+7.27	+7.32	-	-
		Thickness 'm'	-	5.5	1.0	10.5	4.0	7.3	12.5	-	-
		SPT 'N' Value	-	R	R	R	66-R	69-R	74-R	-	-
IX	LIMESTONE 2	Extent of Layer, El. 'm'	-	-	-3.07	-	-	-	-	13.01	+12.96
		Thickness 'm'	-	-	1.4	-	-	-	-	3.0	3.8
		SPT 'N' Value	-	-	R	-	-	-	-	R	R
X	MUDSTONE 2 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	-	-5.17	-	+4.86	+3.57	-	+10.81	+11.76
		Thickness 'm'	-	-	2.1	-	2.2	3.7	-	2.2	1.2
		SPT 'N' Value	-	-	R	-	R	R	-	-	R
XI	SANDSTONE 2	Extent of Layer, El. 'm'	-	-	-	-	-2.34	-	-	-	-
		Thickness 'm'	-	-	-	-	7.2	-	-	-	-
		SPT 'N' Value	-	-	-	-	R	-	-	-	-

Source: JICA Study Team

Drilling Survey from 4.0 km to 8.0 km (KCR BH-10 to BH-16)

KCR Borehole #			BH#10	BH#11	BH#12	BH#13	BH#14	BH#15	BH#16
Layer #	Breif Description	Elevation of Borehole, El. 'm'	+29.46	+32.6	+33.52	+35.8	+38.02	+35.40	+32.75
I	BACK FILLED MATERIAL	Extent of Layer, El. 'm'	-	+31.6	-	+35.0	-	+34.4	-
		Thickness 'm'	-	1.0	-	0.8	-	1.0	-
		SPT 'N' Value	-	-	-	-	-	-	-
II	SAND 1 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	+28.56	-	+31.62	-	-	-	+29.85
		Thickness 'm'	0.9	-	1.9	-	-	-	2.9
		SPT 'N' Value	-	-	4	-	-	-	7&13
III	CLAY 1 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-	-	-	-	-	+31.4	-
		Thickness 'm'	-	-	-	-	-	3.0	-
		SPT 'N' Value	-	-	-	-	-	3-25	-
IV	SAND 2 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	-	-	-	-	+35.42	-	+29.15
		Thickness 'm'	-	-	-	-	2.6	-	0.7
		SPT 'N' Value	-	-	-	-	48 & 52	-	39
V	CLAY 2 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-	-	-	-	-	+28.5	-
		Thickness 'm'	-	-	-	-	-	2.9	-
		SPT 'N' Value	-	-	-	-	-	37 - 45	-
VI	LIMESTONE 1	Extent of Layer, El. 'm'	+24.86	+26.2	+30.22	+34.4	+28.02	+23.9	-
		Thickness 'm'	3.7	5.4	1.4	0.6	7.4	4.6	-
		SPT 'N' Value	R	-	R	-	R	R	-
VII	MUDSTONE 1 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	+23.76	+23.6	-	+27.1	+26.32	+22.6	-
		Thickness 'm'	1.1	2.6	-	7.3	1.7	1.3	-
		SPT 'N' Value	-	-	-	R	-	-	-
VIII	SANDSTONE 1	Extent of Layer, El. 'm'	-	+20.6	+28.82	+25.8	-	-	+25.45
		Thickness 'm'	-	3.0	1.4	1.3	-	-	3.7
		SPT 'N' Value	-	-	-	-	-	-	-
IX	LIMESTONE 2	Extent of Layer, El. 'm'	+14.46	-	-	-	+25.05	+20.4	-
		Thickness 'm'	7.7	-	-	-	1.3	2.2	-
		SPT 'N' Value	-	-	-	-	-	-	-
X	MUDSTONE 2 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	+17.6	+19.22	+20.8	+23.02	-	+17.75
		Thickness 'm'	-	3.0	9.6	5.0	2.0	-	7.7
		SPT 'N' Value	-	-	-	-	-	-	-
XI	SANDSTONE 2	Extent of Layer, El. 'm'	-	-	+18.52	-	-	-	-
		Thickness 'm'	-	-	0.7	-	-	-	-
		SPT 'N' Value	-	-	-	-	-	-	-

Source: JICA Study Team

Drilling Survey from 8.0km to 12.0km (KCR BH-17 to KCR BH-25)

KCR Borehole #			BH#17	BH#18	BH#19	BH#20	BH#21	BH#22	BH#23	BH#24	BH#25
Layer #	Breif Description	Elevation of Borehole, El. 'm'	+31.2	+29.32	+27.48	+26.14	+24.07	+15.6	+19.33	+22.01	+20.41
I	GARBAGE/ SOLID WASTE	Extent of Layer, El. 'm'	-	-	-	-	-	-	-	-	+17.91
		Thickness 'm'	-	-	-	-	-	-	-	-	2.5
		SPT 'N' Value	-	-	-	-	-	-	-	-	12
II	BACK FILLED MATERIAL	Extent of Layer, El. 'm'	+29.6	+28.32	-	-	+22.07	-	-	+20.51	-
		Thickness 'm'	1.6	1.0	-	-	2.0	-	-	1.5	-
		SPT 'N' Value	4	-	-	-	12	-	-	R	-
III	SAND 1 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	+28.5	+26.62	-	+24.64	+18.07	+6.6	+16.33	-	+14.41
		Thickness 'm'	1.1	1.7	-	1.5	4.0	9.0	3	-	3.5
		SPT 'N' Value	14	4 & 21	-	18	7 -13	4 - 45	23 & 10	-	4 - R
IV	CLAY 1 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	27.5	+25.32	+24.48	-	-	-	-	+19.01	+1.41
		Thickness 'm'	1	1.3	3.0	-	-	-	-	1.5	3
		SPT 'N' Value	19	15	13 & 18	-	-	-	-	24	47 -R
V	SAND 2 (Silty SAND/ Clayey SAND/ Gravely SAND)	Extent of Layer, El. 'm'	-	-	-	+22.94	+17.07	+4.6	+9.33	+11.01	+5.41
		Thickness 'm'	-	-	-	1.7	1.0	2.0	7	8	6
		SPT 'N' Value	-	-	-	37 - R	48	R	47 - R	91 - R	45 - R
VI	CLAY 2 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-	-	+23.48	-	-	-	-	-	-
		Thickness 'm'	-	-	1.0	-	-	-	-	-	-
		SPT 'N' Value	-	-	42	-	-	-	-	-	-
VII	SAND 3 (Sandy GRAVELS/ Gravely SAND)	Extent of Layer, El. 'm'	-	-	-	-	-	-	-	+7.01	-
		Thickness 'm'	-	-	-	-	-	-	-	4	-
		SPT 'N' Value	-	-	-	-	-	-	-	-	-
VIII	MUDSTONE 1 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	+24.2	+14.72	+22.48	-	+13.07	-	-	-	-
		Thickness 'm'	3.3	10.6	1.0	-	4.0	-	-	-	-
		SPT 'N' Value	50 - R	79 - R	49	-	R	-	-	-	-
IX	CONGLOMERATE 1	Extent of Layer, El. 'm'	-	-	-	-	-	-	+4.63	-	+3.61
		Thickness 'm'	-	-	-	-	-	-	4.7	-	1.8
		SPT 'N' Value	-	-	-	-	-	-	R	-	R
X	LIMESTONE 1	Extent of Layer, El. 'm'	+20.7	-	-	-	-	-	-	-	-
		Thickness 'm'	3.5	-	-	-	-	-	-	-	-
		SPT 'N' Value	R	-	-	-	-	-	-	-	-
XI	SANDSTONE 1	Extent of Layer, El. 'm'	-	+14.32	+12.48	+17.84	+9.07	-	+4.33	+5.31	-
		Thickness 'm'	-	0.4	10.0	5.1	4.0	-	0.3	1.7	-
		SPT 'N' Value	-	-	-	R	-	-	-	-	-
XII	MUDSTONE 2 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	+16.2	-	-	+17.14	-	+0.6	-	+3.01	+2.41
		Thickness 'm'	4.5	-	-	0.7	-	4.0	-	2.3	1.2
		SPT 'N' Value	-	-	-	-	-	-	-	-	R
XIII	SANDSTONE 2	Extent of Layer, El. 'm'	-	-	-	+12.14	-	-	-	-	-
		Thickness 'm'	-	-	-	5.0	-	-	-	-	-
		SPT 'N' Value	-	-	-	-	-	-	-	-	-
XIV	LIMESTONE 2	Extent of Layer, El. 'm'	-	-	-	+11.14	-	-	-	-	-
		Thickness 'm'	-	-	-	1.0	-	-	-	-	-
		SPT 'N' Value	-	-	-	-	-	-	-	-	-
XV	GRAVELS/ CONGLOMERATE 2	Extent of Layer, El. 'm'	-	-	-	-	-	-	-	+2.01	+0.41
		Thickness 'm'	-	-	-	-	-	-	-	1.0	2
		SPT 'N' Value	-	-	-	-	-	-	-	-	R

Source: JICA Study Team

Drilling Survey from 12.0km to 16.0km (KCR BH-26 to KCR BH-33)

KCR Borehole #			BH#26	BH#27	BH#28	BH#29	BH#30	BH#31	BH#32	BH#33
Layer #	Breif Description	Elevation of Borehole, El. 'm'	+20.40	+21.90	+21.43	+22.51	+22.45	+25.51	26.28	+25.32
I	BACK FILLED MATERIAL	Extent of Layer, El. 'm'	+20.0	+21.4	+20.43	+19.51	+20.45	+24.51	+25.68	-
		Thickness 'm'	0.4	0.5	1	3	2	1	0.6	-
		SPT 'N' Value	-	-	-	35 & 42	10	-	-	-
II	SAND 1 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	+15.4	+14.9	+18.43	+15.51	+13.45	+16.51	+25.28	+17.32
		Thickness 'm'	4.6	6.5	2	4	7	8	0.4	8
		SPT 'N' Value	18 - R	12 - R	4 & 16	60-R	36 - R	16 - R	-	40 - R
III	CLAY 1 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	+12.4	+12.9	+16.43	-	+5.05	+15.51	-	+15.32
		Thickness 'm'	3	2	2	-	8.4	1	-	2
		SPT 'N' Value	70 - R	31	18 & 22	-	32 - R	R	-	43 - R
IV	SAND 2 (Silty SAND/ Clayey SAND/ Gravely SAND)	Extent of Layer, El. 'm'	-	+10.9	+14.43	+13.51	+2.45	+9.51	+17.28	+9.32
		Thickness 'm'	-	2	2	2	2.6	6	8	6
		SPT 'N' Value	-	R	15 & 49	R	32 - R	54 - R	31 - R	R
V	CLAY 2 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	+11.4	+8.4	+11.63	+3.51	-	-	+16.28	+8.35
		Thickness 'm'	1	2.5	2.8	10	-	-	1	1
		SPT 'N' Value	R	R	49 & 58	R	-	-	R	R
VI	SAND 3 (Sandy GRAVELS/ Gravely SAND)	Extent of Layer, El. 'm'	-	-	+8.83	+2.51	-	-	-	+6.52
		Thickness 'm'	-	-	2.8	1.0	-	-	-	1.8
		SPT 'N' Value	-	-	82 - R	-	-	-	-	-
VII	MUDSTONE 1 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	-	-	-	-	+7.51	+6.28	-
		Thickness 'm'	-	-	-	-	-	2	10	-
		SPT 'N' Value	-	-	-	-	-	R	R	-
VIII	CONGLOMERATE 1	Extent of Layer, El. 'm'	+10.4	-	-	-	-	-	-	-
		Thickness 'm'	1	-	-	-	-	-	-	-
		SPT 'N' Value	R	-	-	-	-	-	-	-
IX	LIMESTONE 1	Extent of Layer, El. 'm'	-	-	-	-	-	-	-	-
		Thickness 'm'	-	-	-	-	-	-	-	-
		SPT 'N' Value	-	-	-	-	-	-	-	-
X	SANDSTONE 1	Extent of Layer, El. 'm'	+6.5	+6.9	+3.93	-	-	+5.51	-	+5.62
		Thickness 'm'	3.9	1.5	4.9	-	-	2	-	0.9
		SPT 'N' Value	R	R	R	-	-	R	-	-
XI	MUDSTONE 2 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	+3.5	-	-	-	-	-	-	+5.32
		Thickness 'm'	3	-	-	-	-	-	-	0.3
		SPT 'N' Value	-	-	-	-	-	-	-	-
XII	SANDSTONE 2	Extent of Layer, El. 'm'	-	-	-	-	-	-	-	-
		Thickness 'm'	-	-	-	-	-	-	-	-
		SPT 'N' Value	-	-	-	-	-	-	-	-
XIII	LIMESTONE 2	Extent of Layer, El. 'm'	+2.4	-	-	-	-	-	-	-
		Thickness 'm'	1.1	-	-	-	-	-	-	-
		SPT 'N' Value	-	-	-	-	-	-	-	-
XIV	GRAVELS/ CONGLOMERATE 2	Extent of Layer, El. 'm'	+0.4	+1.9	+1.43	-	-	-	-	-
		Thickness 'm'	2	5	2.5	-	-	-	-	-
		SPT 'N' Value	-	-	-	-	-	-	-	-

Source: JICA Study Team

Drilling Survey from 16.0km to 20.0km (KCR BH-34 to KCR BH-40)

KCR Borehole #			BH#34	BH#35	BH#36	BH#37	BH#38	BH#39	BH#40
Layer #	Breif Description	Elevation of Borehole, El. 'm'	+24.37	+23.62	+23.12	+20.76	+19.48	+18.27	+15.34
I	BACK FILLED MATERIAL	Extent of Layer, El. 'm'	-	+21.62	+20.62	+19.76	+18.48	+16.27	-
		Thickness 'm'	-	2	2.5	1	1	2	-
		SPT 'N' Value	-	11	21	-	-	49	-
II	SAND 1 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	+22.37	-	+20.12	-	-	-	-
		Thickness 'm'	2	-	0.5	-	-	-	-
		SPT 'N' Value	25	-	7	-	-	-	-
III	CLAY 1 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-	-	-	+16.76	-	-	+10.34
		Thickness 'm'	-	-	-	3	-	-	5
		SPT 'N' Value	-	-	-	12-14	-	-	6 - 28
IV	SAND 2 (Silty SAND/ Clayey SAND/ Sandy SILT) Gravely SAND	Extent of Layer, El. 'm'	+10.37	+9.12	+13.12	+2.76	+11.48	+5.27	+1.34
		Thickness 'm'	12	12.5	7.0	14	7	11	9
		SPT 'N' Value	44 - R	65 - R	30- R	62-R	56 - R	40 - R	R
V	CLAY 2 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	+7.37	-	-	+0.76	-	+0.27	-4.66
		Thickness 'm'	3	-	-	2	-	5	6
		SPT 'N' Value	R	-	-	-	-	R	-
VI	SAND 3/ GRAVELS/ CONGLOMERATE	Extent of Layer, El. 'm'	+4.37	+3.62	-	-	+3.48	-1.73	-
		Thickness 'm'	3	5.5	-	-	8	2	-
		SPT 'N' Value	-	R	-	-	R	-	-
VII	MUDSTONE 1 (SILTSTONE/ SHALE/ CLAYSTONE)	Extent of Layer, El. 'm'	-	-	+3.12	-	-	-	-
		Thickness 'm'	-	-	10	-	-	-	-
		SPT 'N' Value	-	-	-	-	-	-	-
VIII	SANDSTONE 1	Extent of Layer, El. 'm'	-	-	-	-	-0.52	-	-
		Thickness 'm'	-	-	-	-	4	-	-
		SPT 'N' Value	-	-	-	-	-	-	-

Source: JICA Study Team

Drilling Survey from 20.0km to 24.0km (KCR BH-41 to KCR BH-49)

KCR Borehole #			BH#41	BH#42	BH#43	BH#44	BH#45	BH#46	BH#47	BH#48	BH#49
Layer #	Breif Description	Elevation of Borehole, El. 'm'	+14.36	+12.14	+10.45	+9.29	+8.77	+6.84	+5.80	+5.90	+6.71
I	BACK FILLED MATERIAL	Extent of Layer, El. 'm'	+13.36	+11.14	+9.45	-	+7.77	+5.84	-	+2.4	-
		Thickness 'm'	1	1	1	-	1	1	-	3.5	-
		SPT 'N' Value	-	-	-	-	-	-	-	12 - 21	-
II	SAND 1 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	+10.36	-	-	+7.29	-	-	+2.8	-	+1.71
		Thickness 'm'	3	-	-	2	-	-	3	-	5
		SPT 'N' Value	8 - 11	-	-	9	-	-	18 & 19	-	14 - 16
III	CLAY 1 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	+9.36	-	-	+4.29	+4.77	+4.84	-	-	+0.71
		Thickness 'm'	1	-	-	2.0	3	1	-	-	1
		SPT 'N' Value	17	-	-	12 & 13	4 - 19	17	-	-	31
IV	SAND 2 (Silty SAND/ Clayey SAND/ Sandy SILT) Gravely SAND	Extent of Layer, El. 'm'	-0.44	+1.14	-	-	-	+2.84	-	-	-0.29
		Thickness 'm'	9.8	10	-	-	-	2	-	-	1
		SPT 'N' Value	75 - R	R	-	-	-	16 & 19	-	-	54
V	CLAY 2 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-	-	+5.45	-	+3.77	+1.84	+0.8	-1.1	-1.29
		Thickness 'm'	-	-	4	-	1	1	2	3.5	1
		SPT 'N' Value	-	-	22 - 39	-	42	R	42 - 76	54 - 97	58
VI	SAND 3/ GRAVELS/ CONGLOMERATE	Extent of Layer, El. 'm'	-5.64	-4.36	-	-	-		-0.2	-	-
		Thickness 'm'	5.2	5.5	-	-	-		1	-	-
		SPT 'N' Value	-	-	-	-	-		76	-	-
VII	MUDSTONE 1 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	-7.86	-5.25	-10.71	-11.23	+1.24	-14.2	-10.1	-6.29
		Thickness 'm'	-	3.5	10.7	16.0	15	0.6	14	9	5
		SPT 'N' Value	-	-	R	-	77-R	-	R	R	R
VIII	SANDSTONE 1	Extent of Layer, El. 'm'	-	-	-7.55	-	-	-13.16	-	-11.8	-6.99
		Thickness 'm'	-	-	2.3	-	-	14.4	-	1.7	0.7
		SPT 'N' Value	-	-	-	-	-	-	-	-	-
IX	MUDSTONE 2 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	-	-8.55	-	-	-	-	-19.1	-23.29
		Thickness 'm'	-	-	1	-	-	-	-	7.3	16.3
		SPT 'N' Value	-	-	-	-	-	-	-	-	-
X	SANDSTONE 2	Extent of Layer, El. 'm'	-	-	-9.55	-	-	-	-	-21.1	-
		Thickness 'm'	-	-	1	-	-	-	-	2.0	-
		SPT 'N' Value	-	-	-	-	-	-	-	-	-
XI	MUDSTONE 3 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	-	-	-	-	-	-	-24.1	-
		Thickness 'm'	-	-	-	-	-	-	-	3.0	-
		SPT 'N' Value	-	-	-	-	-	-	-	-	-

Source: JICA Study Team

Drilling Survey from 25.0km to 28.0km (KCR BH-50 to KCR BH-57)

KCR Borehole #			BH#50	BH#51	BH#52	BH#53	BH#54	BH#55	BH#56	BH#57
Layer #	Breif Description	Elevation of Borehole, El. 'm'	+2.05	+3.55	+3.74	+2.89	+2.74	+2.33	+3.36	+1.85
I	BACK FILLED MATERIAL	Extent of Layer, El. 'm'	-0.95	+0.55	+0.74	0.89	0.74	-0.17	0.96	+0.85
		Thickness 'm'	3	3	3	2	2	2.5	2.4	1
		SPT 'N' Value	4 & 6	4 & 5	4 & 5	4	22	18 & 23	19 & 26	-
II	SAND 1 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	-	-2.45	-	-0.11	-	-	-	-3.15
		Thickness 'm'	-	3	-	1	-	-	-	4
		SPT 'N' Value	-	17 - 21	-	4	-	-	-	5 - 10
III	CLAY 1 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-2.95	-3.25	-1.96	-1.11	-2.86	-3.67	-0.64	-6.15
		Thickness 'm'	2	0.8	2.7	1	3.6	3.5	1.6	3
		SPT 'N' Value	7 & 10	39	4 - 29	9	4 - 21	3 - 5	13	6 - 14
IV	SAND 2 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	-8.75	-8.45	-4.26	-9.11	-4.76	-	-4.64	-16.15
		Thickness 'm'	5.8	5.2	2.3	8	1.9	-	4	10
		SPT 'N' Value	25 - 80	34 - 88	25 & 24	20 - R	42 - R	-	12 - 21	35 - 92
V	CLAY 2 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-9.95	-9.45	-5.26	-13.11	-7.26	-5.67	-	-20.15
		Thickness 'm'	1.2	1	1	4	2.5	2	-	4
		SPT 'N' Value	85	87	26	71- 90	57 - 58	51 - R	-	49 - 60
VI	SAND 3 (Silty SAND/ Clayey SAND/ Gravely SAND)	Extent of Layer, El. 'm'	-10.95	-14.45	-9.26	-17.11	-8.96	-13.17	-8.64	-24.15
		Thickness 'm'	1	5	4	4	1.7	7.5	4	4
		SPT 'N' Value	90	65 - R	87 - R	89 - R	82 - 100	R	48 - R	60 - 62
VII	CLAY 3 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-	-	-13.26	-	-15.26	-17.67	-12.64	-
		Thickness 'm'	-	-	4	-	6.3	4.5	4	-
		SPT 'N' Value	-	-	85 - R	-	41 - R	74 & R	80 - 86	-
VIII	SAND 4 (Clayey SAND/ Gravely SAND)	Extent of Layer, El. 'm'	-				-17.26	-20.47	-21.64	-
		Thickness 'm'	-				2	2.8	9	-
		SPT 'N' Value	-				-	82 - R	56 -R	-
IX	CONGLOMERATE1 /SANDY GRAVELS	Extent of Layer, El. 'm'	-		-15.66	-20.51	-18.96		-22.64	-
		Thickness 'm'	-		2.4	3.4	1.7		1	-
		SPT 'N' Value	-		R	-	-		56 -R	-
X	SANDSTONE 1	Extent of Layer, El. 'm'	-27.95	-	-16.76	-22.11	-21.26	-	-25.84	-
		Thickness 'm'	17.0	-	1.1	1.6	2.3	-	3.2	-
		SPT 'N' Value	-	-	R	-	-	-	R	-
XI	CONGLOMERATE2	Extent of Layer, El. 'm'	-	-21.45	-26.26	-	-24.66	-27.67	-	-28.15
		Thickness 'm'	-	7	9.5	-	3.4	7.2	-	4
		SPT 'N' Value	-	R	-	-	-	-	-	-
XII	MUDSTONE 1 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	+20.25	-26.45	-	-27.11	-27.26	-	-26.64	-
		Thickness 'm'	0.8	5	-	5	2.6	-	0.8	-
		SPT 'N' Value	-	-	-	-	-	-	-	-

Source: JICA Study Team

Drilling Survey from 28.0km to 32.0km (KCR BH-58 to KCR BH-64)

KCR Borehole #			BH#58	BH#59	BH#60	BH#61	BH#62	BH#63	BH#64
Layer #	Breif Description	Elevation of Borehole, El. 'm'	+3.51	+3.55	+2.75	+2.8	+3.74	+3.45	+3.74
I	GARBAGE/ SOLID WASTE	Extent of Layer, El. 'm'	-	-	-	-	-	-	+0.24
		Thickness 'm'	-	-	-	-	-	-	3.5
		SPT 'N' Value	-	-	-	-	-	-	9 & 6
II	BACK FILLED MATERIAL	Extent of Layer, El. 'm'	+0.51	+0.55	-0.05	-0.2	+1.24	+1.45	-
		Thickness 'm'	3	3	2.8	3	2.5	2	-
		SPT 'N' Value	23 & 37	3 - 9	20 & 29	30 & 27	3 & 4	23	-
III	SAND 1 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	-	-1.15	-	-	-	-	-
		Thickness 'm'	-	1.7	-	-	-	-	-
		SPT 'N' Value	-	12 & 16	-	-	-	-	-
iV	CLAY 1 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-2.49	-	-	-1.2	-1.26	0.45	-
		Thickness 'm'	3	-	-	1	2.5	1	-
		SPT 'N' Value	5 - 18	-	-	28	7 & 11	30	-
V	SAND 2 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	-7.49	-3.45	-9.25	-2.2	-12.26	-1.55	-2.26
		Thickness 'm'	5	2.3	9.2	1	11	2	2.5
		SPT 'N' Value	22 - 45	36 & 45	23-R	40	35 - R	38 & 85	R
VI	CLAY 2 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-10.49	-7.45	-12.25	-6.0	-14.26	-	-3.16
		Thickness 'm'	3	4	3	3.8	2	-	0.9
		SPT 'N' Value	32 - 45	46 - 57	-	64 - 67	R	-	47
VII	SAND 3 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	-13.49	-10.95	-24.25	-18.2	-16.26	-5.95	-
		Thickness 'm'	3	3.5	12	12.2	2	4.4	-
		SPT 'N' Value	86 -R	55 - 68	51 - R	R	-	R	-
VIII	CLAY 3 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-16.49	-11.95	-	-	-	-	-
		Thickness 'm'	3	1.0	-	-	-	-	-
		SPT 'N' Value	39 - R	79	-	-	-	-	-
IX	SANDSTONE 1	Extent of Layer, El. 'm'	-	-21.45	-	-	-26.26	-9.05	-
		Thickness 'm'	-	9.5	-	-	10	3.1	-
		SPT 'N' Value	-	50 - R	-	-	-	-	-
X	MUDSTONE 1 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-20.19	-	-	-21.0	-	-26.55	-9.26
		Thickness 'm'	3.7	-	-	2.8	-	17.5	6.1
		SPT 'N' Value	43 - R	-	-	-	-	-	74 - R
XI	SANDSTONE 2	Extent of Layer, El. 'm'	-21.49	-	-	-22.2	-	-	-26.26
		Thickness 'm'	1.3	-	-	1.2	-	-	17
		SPT 'N' Value	R	-	-	-	-	-	-
XII	CONGLOMERATE1	Extent of Layer, El. 'm'	-26.49	-26.45	-27.25	-27.2	-	-	-
		Thickness 'm'	5	5	3	5	-	-	-
		SPT 'N' Value	-	R	R	-	-	-	-

Source: JICA Study Team

Drilling Survey from 32.0km to 36.0km (KCR BH-65 to KCR BH-72)

KCR Borehole #			BH#65	BH#66	BH#67	BH#68	BH#69	BH#70	BH#71	BH#72
Layer #	Breif Description	Elevation of Borehole, El. 'm'	+3.49	+5.15	+7.17	+9.84	+14.82	+12.77	+12.39	+7.42
I	GARBAGE/ SOLID WASTE	Extent of Layer, El. 'm'	-	-	-	-	-	-	-	+4.42
		Thickness 'm'	-	-	-	-	-	-	-	3
		SPT 'N' Value	-	-	-	-	-	-	-	4 & 10
II	BACK FILLED MATERIAL	Extent of Layer, El. 'm'	-	+3.15	-	-	+11.42	+10.77	10.39	-
		Thickness 'm'	-	2	-	-	3.4	2	2	-
		SPT 'N' Value	-	12	-	-	R	10	4	-
III	SAND 1 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	-	-	-	+6.84	-	-	+9.39	+3.42
		Thickness 'm'	-	-	-	3	-	-	1	1
		SPT 'N' Value	-	-	-	16 & 19	-	-	7	21
IV	CLAY 1 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-	-	+3.17	+3.84	-	-	-	-
		Thickness 'm'	-	-	4	3	-	-	-	-
		SPT 'N' Value	-	-	20 - 29	26 & 27	-	-	-	-
V	SAND 2 (Silty SAND/ Clayey SAND/ Sandy SILT) GRAVELS	Extent of Layer, El. 'm'	+1.49	-	-0.43	-	-	-	+8.39	-
		Thickness 'm'	2.0	-	3.6	-	-	-	1	-
		SPT 'N' Value	R	-	R	-	-	-	67	-
VI	CLAY 2 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-	-2.85	-	-	-	-	-	+2.22
		Thickness 'm'	-	6	-	-	-	-	-	1.2
		SPT 'N' Value	-	32 - R	-	-	-	-	-	42 - R
VII	LIMESTONE 1	Extent of Layer, El. 'm'	-	-	-	-	+10.32	-	-	-
		Thickness 'm'	-	-	-	-	1.1	-	-	-
		SPT 'N' Value	-	-	-	-	-	-	-	-
VIII	MUDSTONE 1 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	-	-	0.54	+6.72	-	+6.59	-0.88
		Thickness 'm'	-	-	-	3.3	3.6	-	1.8	3.1
		SPT 'N' Value	-	-	-	-	R	-	42	-
IX	SANDSTONE 1	Extent of Layer, El. 'm'	-	-3.35	-2.63	-0.46	-	2.47	+5.89	-
		Thickness 'm'	-	0.5	2.2	1	-	8.3	0.7	-
		SPT 'N' Value	-	R	-	-	-	R	-	-
X	CONGLOMERATE	Extent of Layer, El. 'm'	+0.49	-	-3.63	-	-	-	-	-
		Thickness 'm'	1	-	1	-	-	-	-	-
		SPT 'N' Value	-	-	-	-	-	-	-	-
XI	LIMESTONE 2	Extent of Layer, El. 'm'	-	-	-	-	+5.72	+1.77	+2.49	-2.08
		Thickness 'm'	-	-	-	-	1	0.7	3.4	1.2.
		SPT 'N' Value	-	-	-	-	-	-	-	-
XII	MUDSTONE 2 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	-24.85	-	-13.76	+1.02	-	-0.61	-7.58
		Thickness 'm'	-	21.5	-	13.3	4.7	-	3.1	5.5
		SPT 'N' Value	-	R	-	-	-	-	-	-
XIII	LIMESTONE 2	Extent of Layer, El. 'm'	-	-	-	-16.76	-2.08	-	-2.61	-
		Thickness 'm'	-	-	-	3	3.1	-	2	-
		SPT 'N' Value	-	-	-	-	-	-	-	-
XIV	SANDSTONE 2	Extent of Layer, El. 'm'	-2.91	-	-21.73	-	-5.18	-1.13	-	-
		Thickness 'm'	3.4	-	18.1	-	3.1	2.9	-	-
		SPT 'N' Value	-	-	-	-	-	-	-	-
XV	MUDSTONE 3 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-26.51	-	-	-17.76	-	-2.23	-	-
		Thickness 'm'	23.6	-	-	1	-	1.1	-	-
		SPT 'N' Value		-	-	-	-	-	-	-
XVI	LIMESTONE 3	Extent of Layer, El. 'm'	-	-	-22.83	-20.16	-	-	-	-
		Thickness 'm'	-	-	1.1	2.4	-	-	-	-
		SPT 'N' Value	-	-	-	-	-	-	-	-

Source: JICA Study Team

Drilling Survey from 36.0km to 40.0km (KCR BH-73 to KCR BH-81)

KCR Borehole #			BH#73	BH#74	BH#75	BH#76	BH#77	BH#78	BH#79	BH#80	BH#81
Layer #	Breif Description	Elevation of Borehole, El. 'm'	+8.27	+7.45	+7.14	+6.53	+8.52	+9.58	+12.55	+15.87	+12.90
I	GARBAGE/ SOLID WASTE	Extent of Layer, El. 'm'	+6.27	+5.45	-	-	-	-	-	-	-
		Thickness 'm'	2	2	-	-	-	-	-	-	-
		SPT 'N' Value	4	6	-	-	-	-	-	-	-
II	BACK FILLED MATERIAL	Extent of Layer, El. 'm'	-	-	-	-	+6.52	-	-	-	-
		Thickness 'm'	-	-	-	-	2	-	-	-	-
		SPT 'N' Value	-	-	-	-	9	-	-	-	-
III	SAND 1 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	-	+3.45	+6.14	+1.03	-	-	+9.55	-	9.7
		Thickness 'm'	-	2	1	5.5	-	-	3.0	-	3.2
		SPT 'N' Value	-	9 &10	-	4 - 8	-	-	5 - 17	-	3 & 5
IV	CLAY 1 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	+4.77	-	-	-	-	-	-	-	-
		Thickness 'm'	1.5	-	-	-	-	-	-	-	-
		SPT 'N' Value	5 & 13	-	-	-	-	-	-	-	-
V	SAND 2 (Silty SAND/ Clayey SAND/ Sandy SILT) GRAVELS	Extent of Layer, El. 'm'	-	-	-	-	+5.52	+6.38	+9.05	+13.07	-
		Thickness 'm'	-	-	-	-	1	3.2	0.5	2.8	-
		SPT 'N' Value	-	-	-	-	R	R	R	55 & 53	-
VI	MUDSTONE 1 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-11.73	-6.35	+5.74	-	+2.12	-	-	-	-
		Thickness 'm'	16.5	9.8	0.4	-	3.4	-	-	-	-
		SPT 'N' Value	70 - R	R	R	-	-	-	-	-	-
VII	SANDSTONE 1	Extent of Layer, El. 'm'	-	-	-	+0.33	+1.52	-	+4.55	+8.87	-
		Thickness 'm'	-	-	-	0.7	0.6	-	4.5	4.2	-
		SPT 'N' Value	-	-	-	-	-	-	R	-	-
VIII	LIMESTONE 1	Extent of Layer, El. 'm'	-	-	5.24	-1.97	-	+4.38	+4.05	+5.87	8.8
		Thickness 'm'	-	-	0.5	2.3	-	2	0.5	3	0.9
		SPT 'N' Value	-	-	-	-	-	-	-	-	R
IX	SANDSTONE 2	Extent of Layer, El. 'm'	-	-8.05	1.64	-	-	+3.38	-	-	+2.3
		Thickness 'm'	-	1.7	3.6	-	-	1	-	-	6.5
		SPT 'N' Value	-	-	31 - R	-	-	-	-	-	-
X	MUDSTONE 2 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	-12.55	-10.96	-13.47	-9.88	-10.42	+1.05	+4.37	-
		Thickness 'm'	-	4.5	12.6	11.5	11.4	13.8	3	1.5	-
		SPT 'N' Value	-	-	-	-	-	-	-	-	-
XI	LIMESTONE 2	Extent of Layer, El. 'm'	-	-	-11.86	-	-11.48	-	-1.95	-0.03	-3.0
		Thickness 'm'	-	-	0.9	-	1.6	-	3	4.4	5.3
		SPT 'N' Value	-	-	-	-	-	-	-	-	-
XII	MUDSTONE 3 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	-	-12.86	-	-	-	-7.45	-4.13	-7.1
		Thickness 'm'	-	-	1	-	-	-	5.5	4.1	4.1
		SPT 'N' Value	-	-	-		-	-	-	-	-

Source: JICA Study Team

Drilling Survey from 40.0km to 43.0km (KCR BH-82 to KCR BH-86)

KCR Borehole #			BH#82	BH#83	BH#84	BH#85	BH#86
Layer #	Breif Description	Elevation of Borehole, El. 'm'	+15.72	+14.0	+15.03	+14.57	+15.35
I	BACK FILLED MATERIAL	Extent of Layer, El. 'm'	+12.42	-	-	+12.67	+14.55
		Thickness 'm'	3.3	-	-	1.9	0.8
		SPT 'N' Value	20 & 25	-	-	2	-
II	SAND 1 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	-	+13.0	+11.53	-	+10.35
		Thickness 'm'	-	1	3.5	-	4.2
		SPT 'N' Value	-	13 & 20	14 - 22	-	46 - 16
III	CLAY 1 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-	+11.3	+10.53	+10.87	-
		Thickness 'm'	-	1.7	1.0	1.8	-
		SPT 'N' Value	-	13 & 20	17	8 & 56	-
IV	MUDSTONE 1 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	+5.76	-	-	+8.87	-
		Thickness 'm'	6.7	-	-	2	-
		SPT 'N' Value	-	-	-	-	-
V	LIMESTONE 1	Extent of Layer, El. 'm'	-	+10.3	+8.03	+7.07	-
		Thickness 'm'	-	1	2.5	1.8	-
		SPT 'N' Value	-	-	-	-	-
VI	MUDSTONE 2 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	-6.0	-0.17	+2.17	-4.65
		Thickness 'm'	-	16.3	8.2	4.9	15
		SPT 'N' Value	-	-	-	-	-
VII	LIMESTONE 2	Extent of Layer, El. 'm'	-	-	-2.67	+0.67	-
		Thickness 'm'	-	-	2.5	1.5	-
		SPT 'N' Value	-	-	-	-	-
VIII	MUDSTONE 3 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	-	-3.27	-5.43	-
		Thickness 'm'	-	-	0.6	6.1	-
		SPT 'N' Value	-	-	-	-	-
IX	SANDSTONE 1	Extent of Layer, El. 'm'	-4.28	-	-4.97	-	-
		Thickness 'm'	10.0	-	1.7	-	-
		SPT 'N' Value	-	-	-	-	-

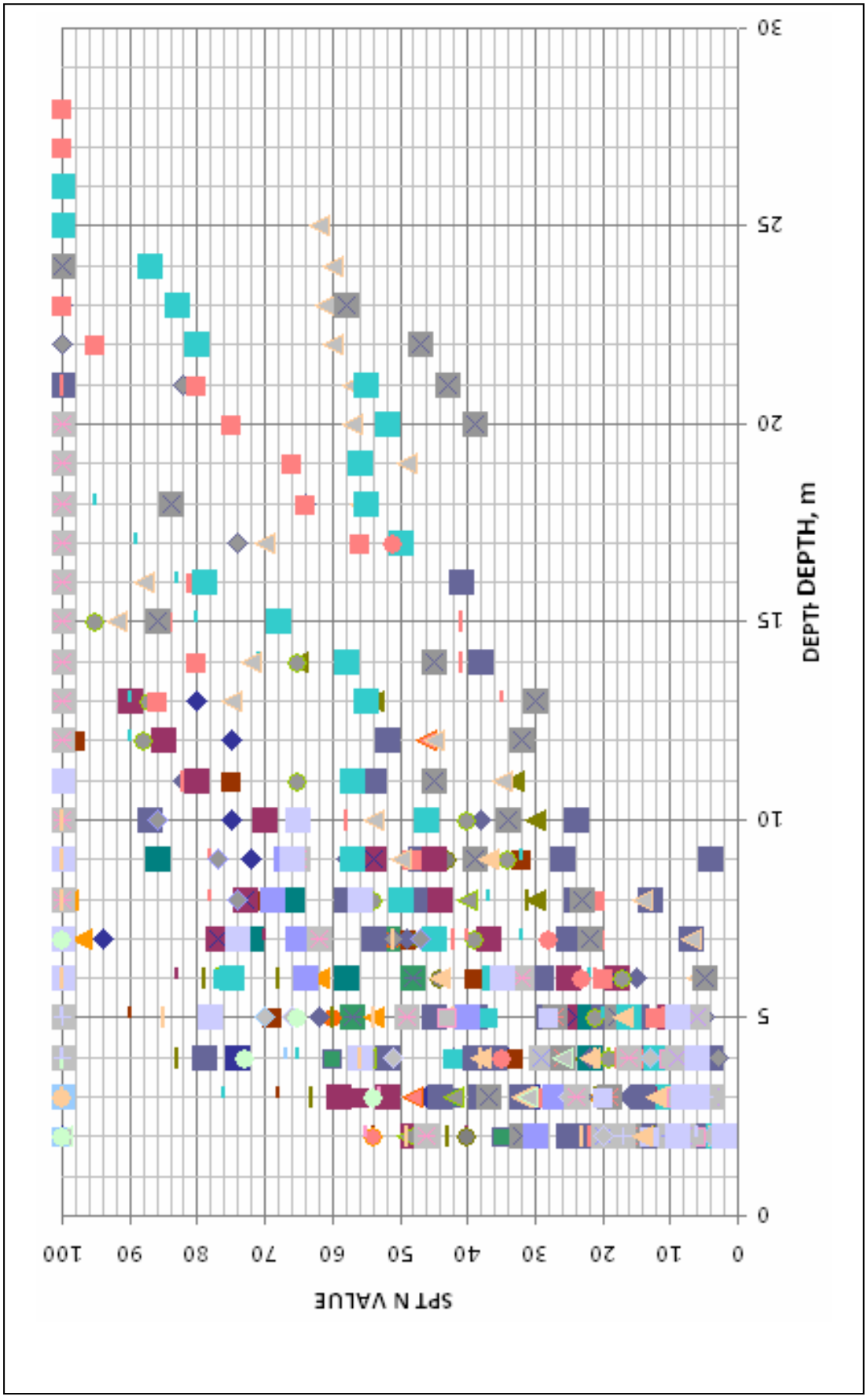
Source: JICA Study Team

Drilling Survey Borehole BH-87, 88, 89 & 90

KCR Borehole #			BH#87	BH#88	BH#89	BH#90
Layer #	Breif Description	Elevation of Borehole, El. 'm'	+42.52	+2.62	+12.68	+23.50
I	BACK FILLED MATERIAL	Extent of Layer, El. 'm'	+41.52	-0.38	-	+22.5
		Thickness 'm'	1	3.0	-	1
		SPT 'N' Value	-	9 & 6	-	-
II	SAND 1 (Silty SAND/ Clayey SAND/ Sandy SILT)	Extent of Layer, El. 'm'	-	-1.38	+10.68	-
		Thickness 'm'	-	1	2	-
		SPT 'N' Value	-	6	6	-
III	CLAY 1 (Silty CLAY/ Sandy CLAY/ Clayey SILT)	Extent of Layer, El. 'm'	-	-2.18	+10.08	-
		Thickness 'm'	-	0.8	0.6	-
		SPT 'N' Value	-	9	9	-
IV	SAND 2 (Silty SAND/ Clayey SAND/ Sandy SILT) GR	Extent of Layer, El. 'm'	+37.92	-7.38	-	+8.5
		Thickness 'm'	3.6	5.2	-	14
		SPT 'N' Value	54 - R	35 - 65	-	49 - R
V	SANDSTONE 1	Extent of Layer, El. 'm'	-	-8.38	+2.68	-
		Thickness 'm'	-	1	7.4	-
		SPT 'N' Value	-	-	-	-
VI	LIMESTONE 1	Extent of Layer, El. 'm'	+37.02	-9.08	-	-
		Thickness 'm'	0.9	0.7	-	-
		SPT 'N' Value	-	-	-	-
VII	MUDSTONE 1 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	-	-	+0.68	-
		Thickness 'm'	-	-	2	-
		SPT 'N' Value	-	-	-	-
VIII	SANDSTONE 2	Extent of Layer, El. 'm'	+33.52	-13.38	-2.32	-
		Thickness 'm'	3.5	4.3	3	-
		SPT 'N' Value	-	-	-	-
IX	MUDSTONE 2 (SILTSTONE/ SHALE/ MUDSTONE/ CLAY STONE)	Extent of Layer, El. 'm'	+32.52	-27.38	-	-
		Thickness 'm'	1	14	-	-
		SPT 'N' Value	+	-	-	-
X	SANDSTONE 3	Extent of Layer, El. 'm'	+27.52	-	-	-
		Thickness 'm'	5	-	-	-
		SPT 'N' Value	-	-	-	-

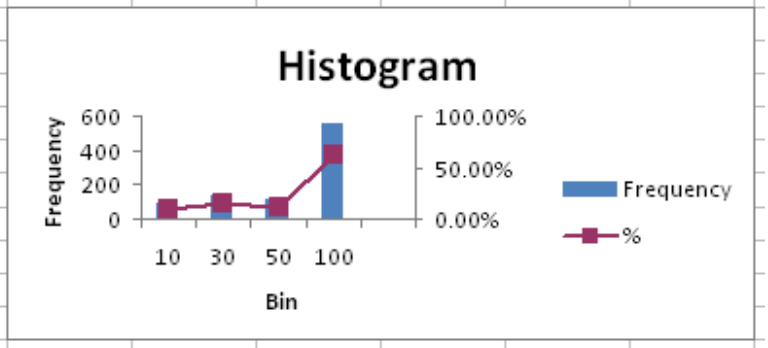
Source: JICA Study Team

SPT Data



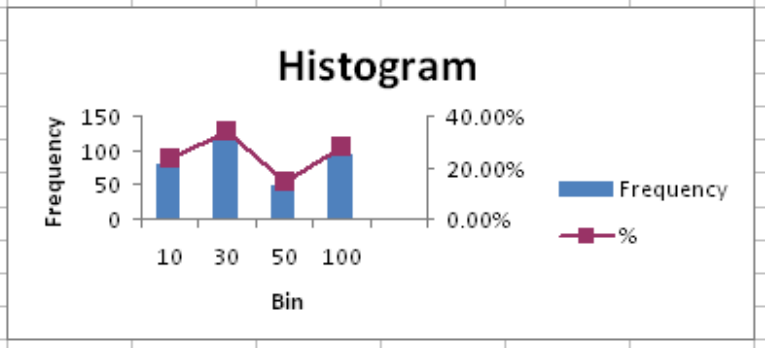
ALL DATA

SPT N	Freq	%
10	85	9.59%
30	137	15.46%
50	108	12.19%
100	556	62.75%
TOTAL	886	



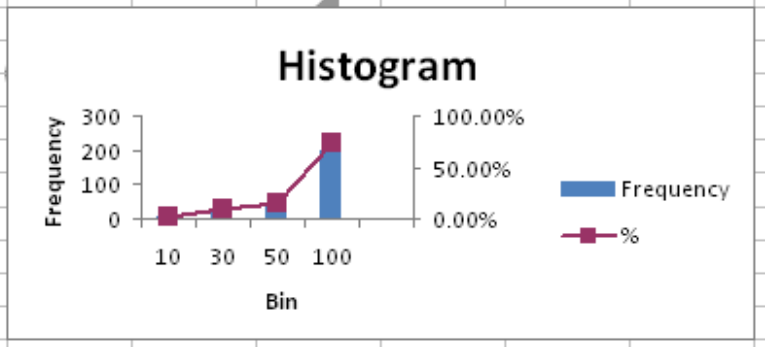
0-5m

SPT N	Freq	%
10	79	23.65%
30	113	33.83%
50	48	14.37%
100	94	28.14%
TOTAL	334	



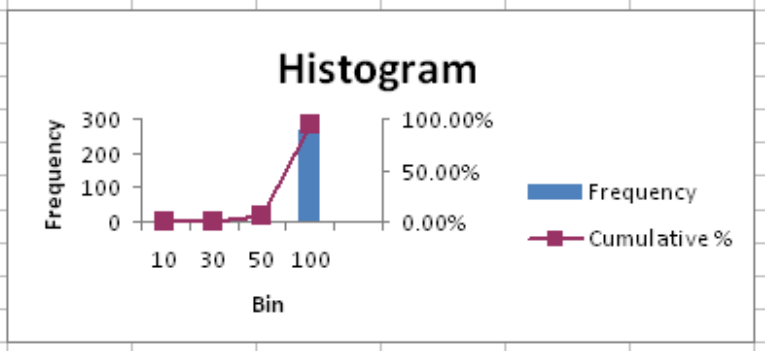
5-10m

SPT N	Freq	%
10	6	2.23%
30	23	8.55%
50	43	15.99%
100	197	73.23%
TOTAL	269	



10-30m

SPT N	Freq	%
10	0	0.00%
30	1	0.35%
50	17	6.01%
100	265	93.64%
TOTAL	283	

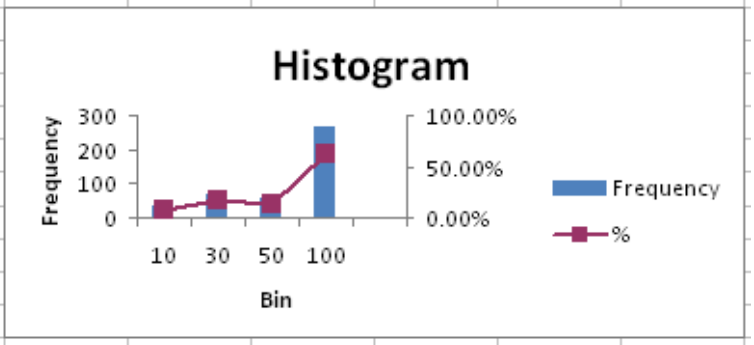


Source: JICA Study Team

Histogram for SPT DATA for ALL

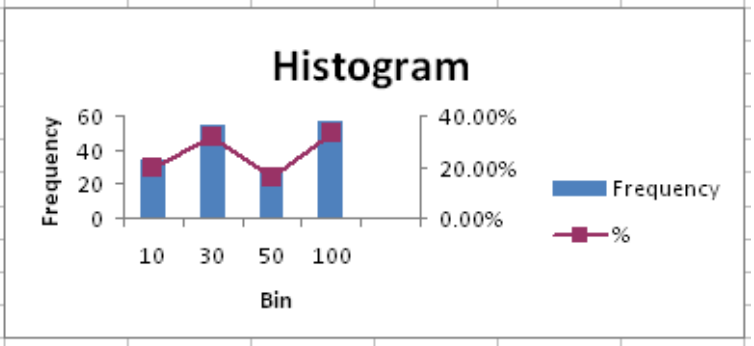
ALL DATA

SPT N	Freq	%
10	36	8.33%
30	70	16.20%
50	58	13.43%
100	268	62.04%
TOTAL	432	



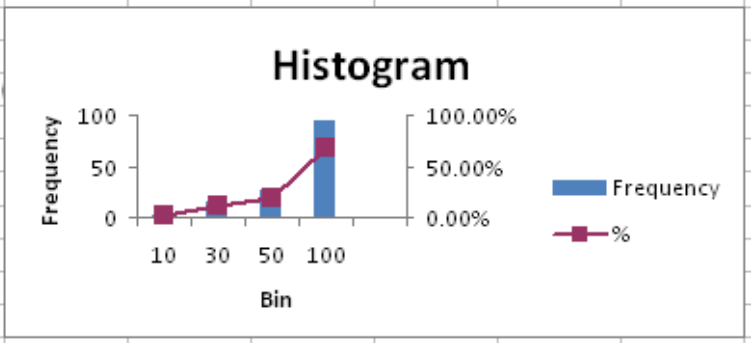
0-5m

SPT N	Freq	%
10	34	19.77%
30	54	31.40%
50	27	15.70%
100	57	33.14%
TOTAL	172	



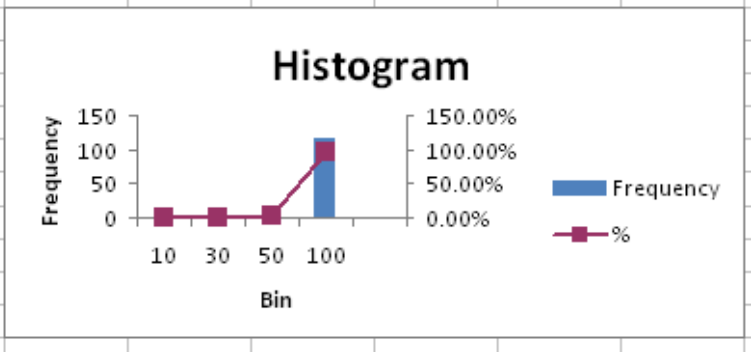
5-10m

SPT N	Freq	%
10	2	1.43%
30	16	11.43%
50	27	19.29%
100	95	67.86%
TOTAL	140	



10-30m

SPT N	Freq	%
10	0	0.00%
30	0	0.00%
50	4	3.33%
100	116	96.67%
TOTAL	120	

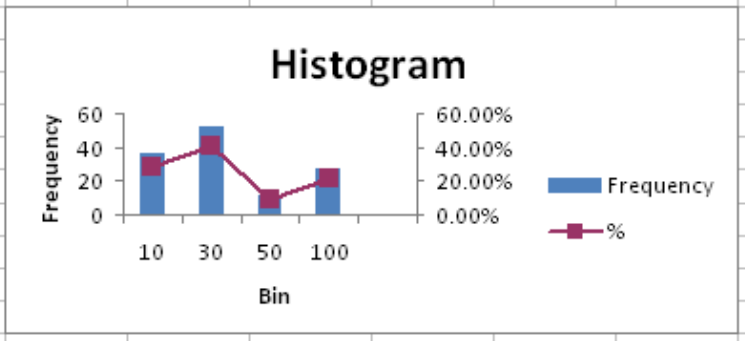


Source: JICA Study Team

Histogram for SPT DATA for ALL SAND

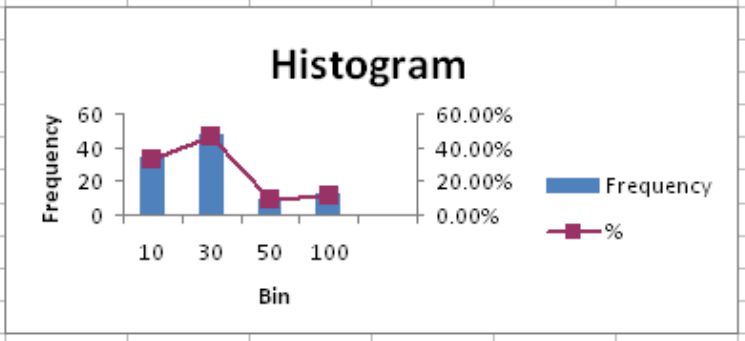
ALL DATA

SPT N	Freq	%
10	36	28.57%
30	52	41.27%
50	11	8.73%
100	27	21.43%
TOTAL	126	



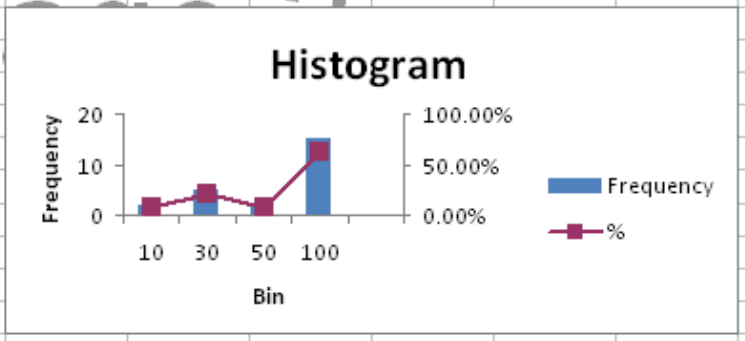
0-5m

SPT N	Freq	%
10	34	33.33%
30	47	46.08%
50	9	8.82%
100	12	11.76%
TOTAL	102	



5-10m

SPT N	Freq	%
10	2	8.33%
30	5	20.83%
50	2	8.33%
100	15	62.50%
TOTAL	24	



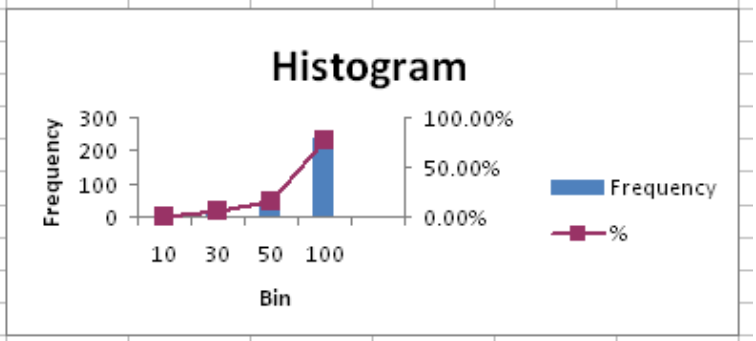
10-30m

NOT APPLICABLE

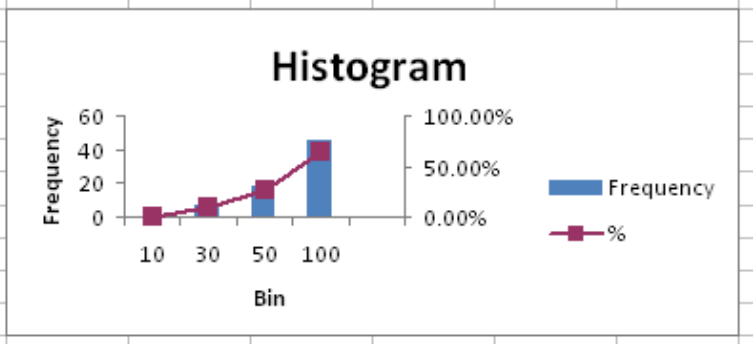
Source: JICA Study Team

Histogram for SPT DATA for SAND-1

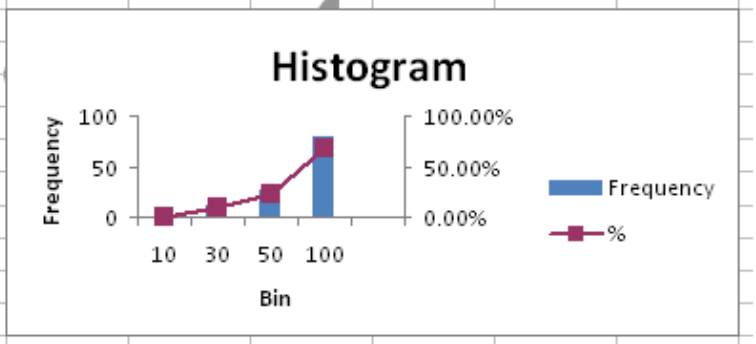
		ALL DATA
SPT N	Freq	%
10	0	0.00%
30	18	5.96%
50	49	16.23%
100	235	77.81%
TOTAL	302	



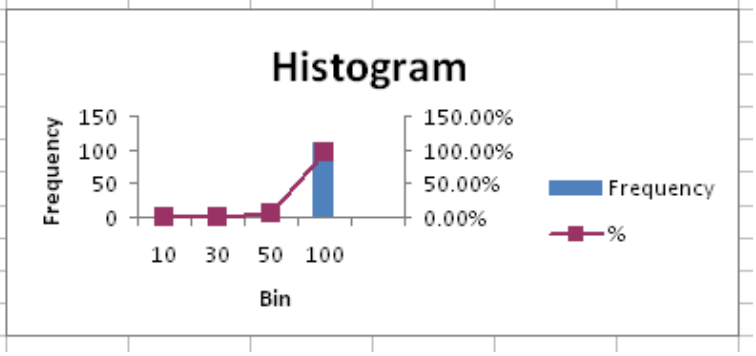
		0-5m
SPT N	Freq	%
10	0	0.00%
30	7	10.00%
50	18	25.71%
100	45	64.29%
TOTAL	70	



		5-10m
SPT N	Freq	%
10	0	0.00%
30	11	9.40%
50	26	22.22%
100	80	68.38%
TOTAL	117	



		10-30m
SPT N	Freq	%
10	0	0.00%
30	0	0.00%
50	5	4.35%
100	110	95.65%
TOTAL	115	

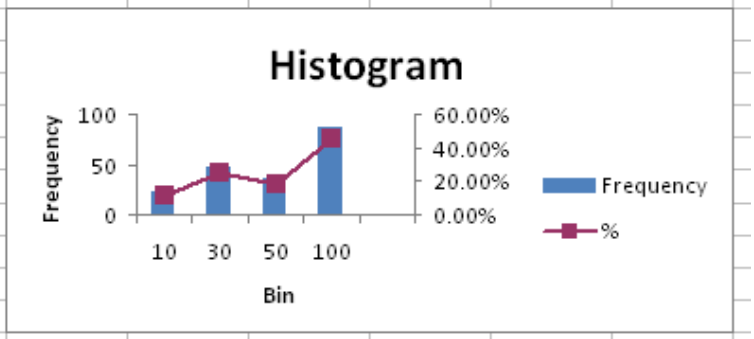


Source: JICA Study Team

Histogram for SPT DATA for SAND-2,3 & 4

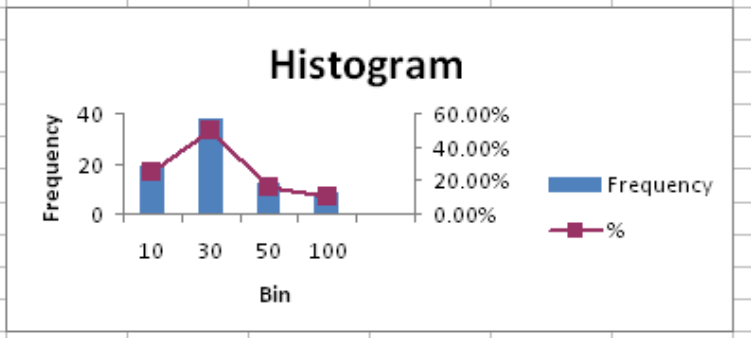
ALL DATA

SPT N	Freq	%
10	23	11.86%
30	48	24.74%
50	36	18.56%
100	87	44.85%
TOTAL	194	



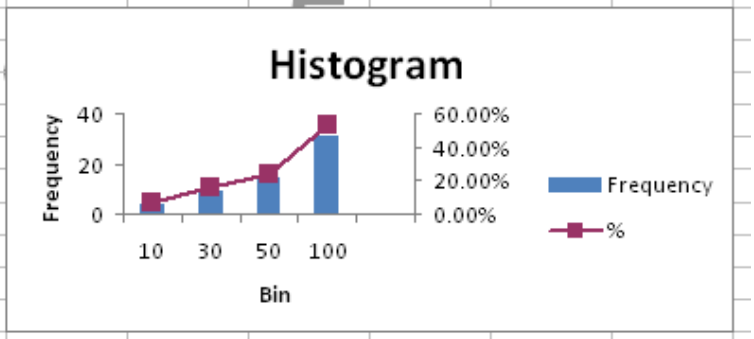
0-5m

SPT N	Freq	%
10	19	24.68%
30	38	49.35%
50	12	15.58%
100	8	10.39%
TOTAL	77	



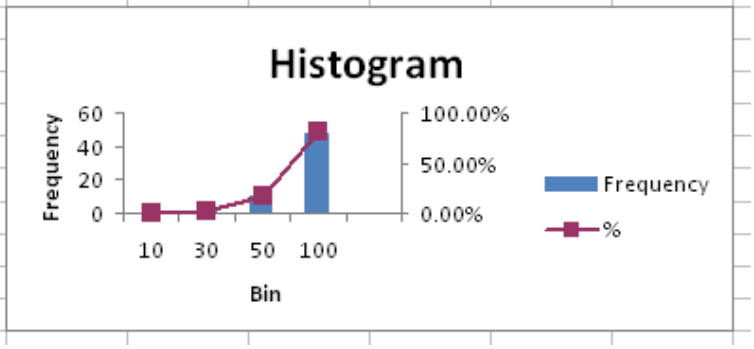
5-10m

SPT N	Freq	%
10	4	6.90%
30	9	15.52%
50	14	24.14%
100	31	53.45%
TOTAL	58	



10-30m

SPT N	Freq	%
10	0	0.00%
30	1	1.69%
50	10	16.95%
100	48	81.36%
TOTAL	59	



Source: JICA Study Team

Histogram for SPT DATA for CLAY

Detailed description of Consistency of Subsoil:

The consistency of various subsoil layers has been discussed for various sections of KCR route as follows;

1) Section-1 from 0 km to 8.0km (KCR BH-1 to KCR BH-16)

Total of 16 boreholes were drilled along KCR route, from 0.0 Km to 8.0 Km. A total of Sixty Eight (68) SPTs were performed in Alluvial / Delluvial (clay and Sand) deposits.
The SPT 'N' Value in top SAND Deposits (designated as SAND-1) is ranges between7 to 26 (with exception of SPT 'N' value 4 in KCR/BH#12 and 32 in KCR/BH#3) indicates that the consistency of this layer is generally loose to medium dense. This layer extends up to minimum 1.0m and maximum 5.0m depth.
In Boreholes KCR/BH# 3 & 4, the SAND-1 is underlain by Clay layer (designated as CLAY-1) with SPT 'N' Value varying 13 to 39 (with exception of SPT 'N' value of 3 in KCR/BH#15 and 54 in KCR/BH#3),which shows that the consistency of this layer is generally stiff to hard. This layer extends up to minimum 3.0m and maximum 10.0m depth.
The CLAY-1 and SAND-1 is underlain by SAND-2. The SPT 'N' Value in SAND-2 layer ranges between 32 to Refusal, which shows that the consistency of this layer is generally dense to very dense. This layer extends up to minimum 2.0m and maximum 15.0m depth.
In Boreholes KCR/BH#1, 2, 4 & 15 underlying the SAND-2, layer is CLAY layer (designated as CLAY-2). The SPT 'N' Value in CLAY-2 ranges between 37 to 98, which shows that the consistency of this layer is hard to very hard. This layer extends upto minimum 6.0m and maximum 11.0m depth.

2) Section-2 from 8.0 km to 16.0km (KCR BH-17 to KCR BH-33)

Total of 17 boreholes were drilled along KCR route, from 8.0 Km to 16.0 Km. A total of one hundred & fifty nine (159) SPTs were performed in Alluvial / Delluvial (Clay and Sand) deposits.
In boreholes KCR/ BH#18, 21, 24, 28, 29, 30, 31 & 32, Fill material comprising of Sand with Gravels encountered upto 1-2m depth, whereas, in KCR/BH#17 & 25, garbage material encountered upto 1.6 & 2.5m depth.
The SPT results in top Alluvial SAND Deposits (designated as SAND-1) shows that the consistency of this layer is generally medium dense to dense and very dense with very loose to loose at places. The SPT 'N' values are ranges between 4 to Refusal in this layer. This layer extends upto maximum 9.0m depth.
The SAND-1 is underlain by Clay layer (Classified as CLAY 1) with SPT 'N' Values are between 13 to 24 in KCR/ BH#17, 18, 19, 24 & 28, which shows that the consistency of this layer in these locations is stiff to very stiff. Whereas, SPT 'N' Values are between 31 to Refusal in KCR/ BH#25, 26, 27, 30, 31 & 33, which shows that the consistency of this layer at these locations is hard to very hard. This layer extends upto minimum 3.0m and maximum 17.0m depth.
The CLAY-1 and SAND-1 was underlain by SAND-2. The SPT 'N' Value in SAND-2 is generally between 31 to Refusal, which shows that the consistency of this layer is dense to very dense. This layer extends up to minimum 3.2m and maximum 20.0m depth.
In Boreholes KCR/BH#19, 26, 27, 28, 29, 32 & 33, underlying SAND-2, there is CLAY layer (designated as CLAY-2). The SPT 'N' Value in CLAY-2 ranges between 42 to Refusal, which shows that the consistency of this layer is hard to very hard. This layer extends up to minimum 4.0m and maximum 19.0m depth.
In Boreholes KCR/BH#24, 28, 29 & 33, underlying CLAY-2, there is Gravely SAND layer (designated as SAND-3). The SPT 'N' Value in SAND-3 is Refusal, which shows that the consistency of this layer is very dense. This layer extends upto minimum 7.0m and maximum 20.0m depth.
Beneath CLAY-2/ SAND-3, Rock formation was encountered. SPT was performed in weak Rocks which resulted in "Refusal".

3) Section-3 from 16 km to 24.0km (KCR BH-34 to KCR BH-49)

Total of 16 boreholes were drilled, along KCR route, from 16.0 Km to 24.0 Km, in which, One hundred & thirteen (113) SPTs were performed in Alluvial / Delluvial (Clay and Sand) deposits.
In Boreholes KCR/ BH#35 to 39, 41 to 43, 45, 46 & 48, Fill material comprising of Sand with Gravels encountered up to 1.0-3.5m depth.
The top Alluvial SAND Deposit (designated as SAND-1) is encountered in KCR/ BH#34, 36, 41, 44, 47 & 49 with SPT 'N' Values between 7 to 25, which shows that the consistency of this layer is loose to medium dense. This layer extends up to maximum 5.0m depth.
The top Alluvial Clay layer (designated as CLAY-1) is encountered in KCR/ BH#37, 40, 41, 44, 45, 46 & 49. The SPT results show that the consistency of this layer in these locations is generally stiff to hard with soft to firm at places. The SPT 'N' Values ranges between 4 to 31. This layer extends up to minimum 1.0m and maximum 5.0m depth.
The CLAY-1 and SAND-1 were underlain by SAND-2 in KCR/ BH#34 to 42, 46 & 49. The SPT 'N' Value in SAND-2 is between 30 to Refusal, which shows that the consistency of this layer is dense to very dense. This layer extends up to minimum 7.0m and maximum 14.8m depth.
In Boreholes KCR/BH#34, 37, 39, 40, 43, & 45 to 49, underlying top CLAY/ SAND and SAND-2, there is / Diluvial CLAY layer (designated as CLAY-2). The SPT 'N' Value in CLAY-2 is ranges between 22 to Refusal, which shows that the consistency of this layer is very stiff to very hard. This layer extends upto minimum 5.0m and maximum 20.0m depth.
Underlying CLAY-2/ SAND-2, another layer of SAND with Gravels (designated as SAND-3) encountered in KCR/BH# 34, 35, 38, 39 & 47. The SPT 'N' Value in SAND-3 is Refusal, which shows that the consistency of this layer is very dense. This layer extends up to minimum 6.0m and maximum 20.0m depth
Beneath Alluvial / Diluvial SAND & CLAY, Rock formation encountered. SPT was performed in weak Rocks which resulted in N value of Refusal.

4) Section-4 from 24 km to 32.0km (KCR BH-50 to KCR BH-64)

Total of 15 boreholes were drilled, along KCR route, from 24.0 Km to 32.0 Km, in which, Two hundred & forty one (241) SPTs were performed in Alluvial / Delluvial (Clay and Sand) deposits.
In Boreholes KCR/BH#50 to 63, Fill material comprising of Sand with Gravels encountered from existing ground level and extending up to 1.0-3.0m depth. In Borehole KCR/BH#64, garbage material encountered up to 3.5m depth.
The top Alluvial SAND Deposit (designated as SAND-1) is encountered in KCR/ BH#51, 53, 57, 59 & 60 with SPT 'N' Values between 4 to 17, which shows that the consistency of this layer is very loose to medium dense. This layer extends up to maximum 6.7m depth.
The top Alluvial Clay layer (designated as CLAY-1) is encountered in KCR/ BH#50 to 58 and 61 to 63. The consistency of CLAY-1 is generally stiff to hard with soft to firm at places. The SPT 'N' Values are ranges between 4 to 39. This layer extends upto minimum 3.0m and maximum 8.0m depth.
The CLAY-1 and SAND-1 were underlain by SAND-2 in KCR/ BH#50 to 54, & 56 to 64. The SPT 'N' Value in SAND-2 is between 12 to Refusal, which shows that the consistency of this layer is medium dense to very dense. This layer extends up to minimum 5.0m and maximum 18.0m depth.
Underlying SAND-2, 2nd layer of CLAY (designated as CLAY-2) encountered in KCR/BH#50 to 55, & 57 to 62 and 64. The SPT 'N' Value in CLAY-2 ranges between 26 to Refusal, which shows that the consistency of this layer is very stiff to very hard. This layer extends up to minimum 7.0m and maximum 18.0m depth.
Underlying CLAY-2, another layer of SAND (designated as SAND-3) encountered in KCR/BH# 50 to 63. The SPT 'N' Value in SAND-3 is Refusal, which shows that the consistency of this layer is very dense. This layer extends upto minimum 9.0m and maximum 27.0m depth.
Underlying SAND-3, another layer of CLAY (designated as CLAY 3) encountered in KCR/BH# 52, 55, 56, 58 & 59. The SPT 'N' Value in CLAY-3 is 39 to Refusal, which shows that the consistency of this layer is hard to very hard. This layer extends up to minimum 15.0m and maximum 20.0m depth.
Whereas, in borehole KCR/BH#54, 55, 56 & 61 a layer of SAND with Gravel (designated as SAND-4) encountered with SPT 'N' values of Refusal. This layer extends up to minimum 20.0 and

30.0m depth Beneath Alluvial SAND & CLAY, Rock formation encountered. SPT was performed in weak Rocks which resulted in 'N' value of Refusal.

5) Section-5 from 32 km to 40.0km (KCR BH-65 to KCR BH-81)

Total of 17 boreholes were drilled, along KCR route, from 32.0 Km to 40.0 Km, in which, forty nine (49) SPTs were performed in Alluvial / Delluvial (Clay and Sand) deposits.
In boreholes KCR/ BH#66, 69, 70, 71 & 77, Fill material comprising of Sand with Gravels encountered from existing ground level extending up to 2.0-3.4m depth, whereas, in borehole KCR/BH#72 to 74, garbage material encountered up to 2.0 to 3.0m depth.
The top Alluvial SAND Deposit (designated as SAND-1) is encountered in KCR/ BH#68, 71, 72, 74, 75, 76, 79 & 81 with SPT 'N' Values between 3 to 19, which shows that the consistency of this layer is very loose to medium dense. This layer extends up to maximum 5.5m depth.
The top Alluvial Clay layer (designated as CLAY-1) is encountered in KCR/ BH#67, 68, & 73 with SPT 'N' Values between 5 to 27, which shows that the consistency of this layer, at these locations, is firm to hard. This layer extends up to 4.0m and 6.0m depth.
& The CLAY-1 and SAND-1 were underlain by SAND-2 in KCR/ BH#65, 67, 71, 77, 78, 79 & 80. The SPT 'N' Value in SAND-2 is Refusal, which shows that the consistency of this layer is very dense. This layer extends up to minimum 2.0m and maximum 7.6m depth.
Whereas, in boreholes KCR/BH#66 & 72, a CLAY layer is encountered (designated as CLAY-2) with SPT 'N' Values ranging between 32 to Refusal, which shows that the consistency of this layer is hard to very hard. This layer extends upto 5.2 & 8.0m depth.
Beneath Alluvial SAND & CLAY, Rock formation encountered. SPT was performed in weak Rocks which resulted in N value of Refusal.

6) Section-6 from 40 km to 43.0km (KCR BH-82 to KCR BH-86)

Total of 5 boreholes were drilled from 40.0 Km to 43.0 Km, in which, fourteen (14) SPTs were performed in Alluvial / Delluvial (Clay and Sand) deposits.
In borehole KCR/ BH#82, 85 & 86, Fill material comprises of Sand with Gravels encountered from existing ground level and extends up to 0.8–3.3m depth.
The Top Alluvial SAND Deposits (Classified as SAND 1) is encountered in KCR/ BH#83, 84 & 86 with SPT 'N' Values ranges between 12 to 49, which shows that the consistency of this layer up to that level is medium dense to dense. This layer extends up to maximum 5.0m depth.
The Top Alluvial Clay layer (Classified as CLAY 1) is encountered in KCR/ BH#83, 84 & 85 with SPT 'N' Values between 8 to 20, which shows that the consistency of this layer in these locations is stiff to very stiff. This layer extends up to minimum 2.7m and maximum 4.5m depth.
Beneath Alluvial SAND & CLAY, Rock formation encountered. SPT was performed in , weak Rocks measured as Refusal.

7) Electrical Sub stations (KCR BH- 87, 88, 89 & 90)

Four boreholes were drilled for Electrical Sub Stations at different locations along KCR route, in which, twenty four (24) SPTs were performed in Alluvial / Delluvial (Clay and Sand) deposits. The results of SPT are discussed in following:

a. KCR BH- 87 (Depot Hill to University)

In borehole KCR/ BH#87, Fill material comprises of Sand with Gravels encountered from existing ground level and extends upto 1.0m depth.
The Top Alluvial SAND Deposits (designated as SAND 2) is encountered up to 3.4m depth with SPT 'N' Values ranges between 54 to Refusal, which shows that the consistency of this layer up to that level is very dense.
Beneath Alluvial SAND Rock formation encountered. SPT was performed in weak Rocks measured as Refusal.

b. KCR BH- 88 (Baldia to Lyari)

In borehole KCR/ BH#88, Fill material comprises of Sand, Silt and Clay encountered from existing ground level and extends up to 3.0m depth.
The Top Alluvial Sand Deposits (designated as SAND-1) is encountered upto 4.0m depth with SPT 'N' Value 6, which shows that the consistency of this layer is loose.
The SAND-1 is underlain by Clay layer (designated as CLAY-1) with SPT 'N' Value 9 encountered up to 4.8m depth.
The CLAY-1 is underlain by SAND-2 with SPT 'N' values ranges between 35 to 65, which shows that the consistency of this layer is dense to very dense. This layer extends up to 10.0m depth
Beneath Alluvial SAND Rock formation encountered. SPT was performed in weak Rocks measured as Refusal.

c. KCR BH- 89 (Departure Yard to Karsaz Halt)

In borehole KCR/ BH#89, the Top Alluvial Sand Deposits (designated as SAND-1) is encountered up to 2.0m depth with SPT 'N' Value 6, which shows that the consistency of this layer is loose.
The SAND-1 is underlain by Clay layer (designated as CLAY-1) with SPT 'N' Value 9 encountered up to 2.6m depth.
Beneath Alluvial SAND Rock formation encountered. SPT was performed in weak Rocks measured as Refusal.

d. KCR BH- 90 (North Nazimabad to Orangi)

In borehole KCR/ BH#90, Fill material comprises of Sand with Gravels encountered from existing ground level and extends up to 1.0m depth.
The Top Alluvial SAND Deposits (designated as SAND 2) is encountered up to 15.0m depth with SPT 'N' Values ranges between 49 to Refusal, which shows that the consistency of this layer up to that level is very dense.

5. Water Level Monitoring Result

Table 1 Water Level Monitoring Data (BH-1 to BH-30)

BoreHole #	Elev. of Borehole (m)	Data-1 (May 04, 2012)			Data-2 (May 31, 2012)			Data-3 (Jun 15, 2012)			Data-4 (Jul 04, 2012)			Data-5 (July 16, 2012)			Data-6 (Aug 01, 2012)			Data-7 (Aug 16, 2012)			Data-8 (Sep 01, 2012)			Data-9 (Sep 19, 2012)			Average Water Level From GL (m)	Elevation of Water Level (m)
		Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time	Tide Level	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)		
KCR/BH-01	15.53	15:15	1.00	2.93	1257	1.50	4.89	10.30	2.20	4.94	1518	1.50	5.19	1740	1.80	5.28	1425	1.40	4.89	800	2.10	4.94	1140	2.90	6.10	1029	2.50	5.01	4.91	10.62
KCR/BH-02	13.86	14:50	1.00	3.84	1830	2.40	4.35	1040	2.20	4.52	1512	1.70	4.77	1735	1.80	4.97	1445	1.40	4.75	830	2.30	4.94	1150	2.80	4.40				4.59	9.27
KCR/BH-03	14.83	13:40	1.30	5.27	1810	2.20	5.75	1057	2.10	5.91	1506	1.70	6.09	1730	1.80	6.00	1455	1.10	5.94	900	2.50	6.10	1155	2.80	6.50	1039	2.50	3.34	5.66	9.17
KCR/BH-04	16.39	13:49	1.10	3.35	1750	2.20	4.06	1105	2.10	4.07	1559	1.20	4.14	1726	1.80	4.04	1505	1.10	3.69	920	2.70	3.72	1215	2.80	3.86	1044	2.50	3.86	3.87	12.52
KCR/BH-05	17.66	13:28	1.30	3.27	1735	2.00	3.70	1113	2.10	3.83	1552	1.20	3.85	1722	1.80	3.90	1517	1.00	3.85	945	2.70	2.80	1225	2.60	2.00	1052	2.70	1.90	3.23	14.43
KCR/BH-06	18.57	13:20	1.30	2.01	1720	2.00	2.41	1120	2.00	2.61	1547	1.20	2.81	1718	1.80	2.94	1525	1.00	2.64	1015	2.80	1.83	1230	2.60	2.09	1057	2.70	2.16	2.39	16.18
KCR/BH-07	22.32	13:10	1.50	1.16	1705	1.70	1.62	1130	2.00	1.76	1542	1.50	2.23	1715	1.70	2.08	1545	1.00	1.79	1035	2.80	1.83	1240	2.60	2.53	1105	2.70	2.58	1.95	20.37
KCR/BH-08	25.81	12:53	1.50	1.12	1630	1.50	1.44	1140	2.00	1.58	1528	1.50	2.63	1703	1.70	1.68	1555	0.90	1.93	1055	2.80	2.53	1250	2.30	1.74	1120	2.90	1.68	1.81	24.00
KCR/BH-09	26.76	12:43	1.70	0.27	1640	1.50	0.75	1150	1.80	0.93	1531	1.50	1.22	1706	1.70	1.49	1602	0.90	1.39	1115	2.80	0.54	1010	1.80	1.66	1125	2.90	1.29	1.06	25.70
KCR/BH-10	29.46	12:53	1.50	0.24	1455	1.00	0.79	1200	1.80	0.87	1537	1.50	0.87	1712	1.70	1.07	1612	0.90	0.97	1135	2.70	1.77	1020	1.80	0.78	1130	2.90	0.73	0.90	28.56
KCR/BH-11	32.60	12:48	1.50	0	1600	2.30	0.00	1208	1.80	0.00	1535	1.80	0.00	1650	1.70	0.00	1620	1.00	0.00	1145	2.70	0.00	1110	2.90	0.00	1135	3.00	0.00	0.00	32.60
KCR/BH-12	33.52	12:40	1.70	0.82	1545	1.10	-0.46	1215	1.80	-0.46	1530	1.50	-0.46	1628	1.60	-0.46	1630	1.00	-0.46	1215	2.50	-0.46	1250	1.50	-0.46	1140	2.90	-0.46	-0.32	33.84
KCR/BH-13	35.80	12:30	1.70	0	1538	2.10	0.00	1240	1.70	0.00	1525	1.80	0.00	1631	1.40	0.00	1635	1.00	0.00	1230	2.30	0.00	1300	2.70	0.00	1200	2.90	0.00	0.00	35.80
KCR/BH-14	38.02	12:20	1.70	0.8	1532	1.10	0.90	1245	1.70	0.75	1520	1.50	0.80	1635	1.60	0.95	1640	1.00	1.00	1245	2.30	0.95	1350	1.50	0.95				0.88	37.14
KCR/BH-15	35.40	12:00	1.90	0.02	1455	1.00	0.05	1250	1.60	0.23	1459	1.70	0.14	1603	1.50	0.05	1010	3.10	0.10	115	1.00	-0.05	1405	1.20	0.65	1245	3.00	0.70	0.21	35.19
KCR/BH-16	32.75	11:35	2.20	0.83	1440	1.10	1.55	1255	1.60	1.37	1455	1.70	2.25	1558	1.50	1.40	1025	3.10	1.30	844	2.30	1.37	1415	1.20	1.41	1300	2.90	1.17	1.41	31.34
KCR/BH-17	31.20	11:10	2.40	0.89	1419	1.10	0.32	1302	1.60	1.40	1302	2.70	1.47	1552	1.50	1.42	1030	3.10	1.52	905	2.50	1.27	1430	1.20	1.37	1305	2.90	1.26	1.21	29.99
KCR/BH-18	29.32	1039	2.60	0.2	1408	1.10	0.65	1306	1.60	0.45	1448	1.70	0.50	1545	1.50	0.55	1036	3.10	0.50	910	2.50	0.65	1435	1.20	0.60				0.50	28.82
KCR/BH-19	27.48	1025	2.60	0.4	1355	1.10	0.65	1316	1.60	0.70	1440	2.00	0.65	1542	1.50	0.65	1050	3.00	0.85	930	2.70	0.55	1445	1.00	0.55				0.63	26.86
KCR/BH-20	26.14	-	-	-	1335	1.30	2.46	1416	1.70	2.11	1435	2.00	2.53	1535	1.50	2.71	1100	3.00	3.11	941	2.70	2.21	1458	1.00	2.42	1325	2.70	2.51	2.51	23.63
KCR/BH-21	24.07	-	-	-	1315	1.50	7.52	1421	1.70	7.89	1430	2.00	7.77	1528	1.50	7.72	1115	3.00	7.62	949	2.80	7.57	1500	1.00	7.00				7.68	16.39
KCR/BH-22	15.60	-	-	-	1215	1.90	7.11	1436	1.70	5.92	1419	2.00	5.95	1523	1.50	5.85	1130	2.80	5.70	1010	2.80	6.96	1510	1.00	6.20	1355	2.40	6.26	6.24	9.36
KCR/BH-23	19.33	-	-	-	1223	1.70	10.85	1445	1.70	10.90	1405	2.20	11.15	1518	1.50	11.17	1145	2.80	10.90	1015	2.80	11.17	1520	0.70	11.32	1400	2.40	11.42	11.11	8.22
KCR/BH-24	22.01	-	-	-	1210	1.90	16.00	1455	1.70	16.09	1413	2.20	15.22	1510	1.50	15.64	1150	2.60	15.54	1025	2.80	16.99	1526	0.70	17.29	1410	2.40	17.36	16.30	5.71
KCR/BH-25	20.41	-	-	-	1210	1.90	12.10	1505	1.70	12.00	1400	2.20	11.12	1500	1.50	12.25	1200	2.60	12.07	1035	2.80	12.84	1540	0.70	12.57	1420	2.10	12.34	12.17	8.24
KCR/BH-26	20.40	-	-	-	1205	1.90	8.25	1512	1.70	8.10	1355	2.20	7.95	1455	1.50	9.80	1210	2.60	9.75	1050	2.80	9.80	1550	0.70	9.10				8.94	11.46
KCR/BH-27	21.90	-	-	-	1150	1.90	9.15	1521	1.80	8.12	1345	2.50	9.45	1450	1.50	9.75	1220	2.40	9.70	1105	2.80	9.65	1555	0.60	10.06	1445	2.10	10.24	9.52	12.39
KCR/BH-28	21.43	-	-	-	1135	2.20	4.88	1530	1.80	4.63	1339	2.50	4.93	1444	1.60	5.13	1229	2.40	4.63	1115	2.80	4.73	1602	0.60	5.00				4.82	16.61
KCR/BH-29	22.51	-	-	-	-	-	-	1555	1.90	6.82	1334	2.50	6.55	1430	1.60	6.90	1236	2.40	6.80	1123	2.70	6.60	1620	0.60	8.90				6.73	15.78
KCR/BH-30	23.90	-	-	-	1120	2.20	8.25	1605	1.90	8.48	1329	2.50	7.45	1430	1.60	7.35	1240	2.40	7.31	1139	2.70	7.43	1640	0.40	7.90				7.71	16.19

Source: JICA Study Team

Table 2 Water Level Monitoring Data (BH-31 to BH-60)

BoreHole #	Elev. of Borehole (m)	Data-1 (May 04, 2012)			Data-2 (May 31, 2012)			Data-3 (Jun 15, 2012)			Data-4 (Jul 04, 2012)			Data-5 (July 16, 2012)			Data-6 (Aug 01, 2012)			Data-7 (Aug 16, 2012)			Data-8 (Sep 01 , 2012)			Data-9 (Sep 19, 2012)			Average Water Level From GL (m)	Elevation of Water Level (m)
		Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time	Tide Level	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)		
KCR/BH-31	25.51	-	-	-	1110	2.40	9.11	1610	1.90	9.28	1325	2.50	9.36	1425	1.60	9.83	1300	2.10	9.79	1150	2.50	9.66	1650	0.40	10.28	1510	2.10	9.43	9.59	15.92
KCR/BH-32	26.28	-	-	-	-	-	-	1620	2.00	9.75	1310	2.70	10.20	1420	1.60	10.50	1310	2.10	10.48	1210	2.50	10.46	1700	0.40	10.65	1515	2.10	10.55	10.37	15.91
KCR/BH-33	25.32	-	-	-	-	-	-	1635	2.00	18.45	1315	2.70	18.31	1415	1.60	17.91	1325	1.90	17.71	1220	2.30	18.01	1705	2.10	18.00				18.08	7.24
KCR/BH-34	24.37	-	-	-	-	-	-	1650	2.10	18.63	1300	2.70	17.59	1400	1.60	17.84	1335	1.90	17.82	115	1.00	18.70	1710	1.00	18.83	1536	1.80	18.90	18.33	6.04
KCR/BH-35	23.62	-	-	-	-	-	-	1715	2.10	19.65	1230	3.00	18.66	1312	1.90	18.50	1345	1.90	18.35	125	0.80	18.59	1740	1.00	19.00				18.75	4.87
KCR/BH-36	23.12	-	-	-	-	-	-	1730	2.20	10.93	1215	3.20	12.89	1300	1.90	13.19	1350	1.60	13.14	1225	2.30	12.94	1755	1.30	12.61	1615	1.40	12.61	12.62	10.50
KCR/BH-37	20.76	-	-	-	-	-	-	-	-	-	1150	3.20	13.33	1245	2.10	13.53	1400	1.60	13.73	1210	2.50	13.56	1500	1.30	18.43	1630	1.10	18.18	15.13	5.63
KCR/BH-38	19.48	-	-	-	-	-	-	-	-	-	1132	3.30	17.89	1234	2.10	18.19	1410	1.60	18.89	1155	2.50	19.06	1510	1.50	19.06	1640	1.10	17.81	18.48	1.00
KCR/BH-39	18.27	-	-	-	-	-	-	-	-	-	1126	3.30	17.84	1224	2.10	17.88	1416	1.40	18.39	1143	2.70	18.76	1530	1.50	18.44	1650	0.80	18.39	18.28	-0.01
KCR/BH-40	15.34	-	-	-	-	-	-	-	-	-	1110	3.30	17.52	1213	2.20	16.94	1425	1.40	17.00	1135	2.70	18.07	1542	1.80	17.97	1700	0.80	17.77	17.55	-2.21
KCR/BH-41	14.36	-	-	-	-	-	-	-	-	-	-	-	-	1136	2.40	16.86	1435	1.40	16.11	1105	2.80	15.66	1550	1.80	15.61	1618	1.40	15.46	15.94	-1.58
KCR/BH-42	12.14	-	-	-	-	-	-	-	-	-	1105	3.30	17.01	1112	2.50	11.73	1445	1.40	12.11	1050	2.80	11.53	1600	1.80	18.11	1609	1.40	17.31	14.63	-2.49
KCR/BH-43	10.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1456	1.10	6.68	1035	2.80	6.53	1610	2.00	6.76	1606	1.40	6.58	6.64	3.81
KCR/BH-44	9.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1510	1.10	3.07	1019	2.80	3.42	1620	2.00	3.52	1600	1.40	3.52	3.38	5.91
KCR/BH-45	8.77	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1520	1.00	1.65	1005	2.80	1.22	1630	2.00	1.39	1555	1.40	1.28	1.39	7.39
KCR/BH-46	6.84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1530	1.00	1.95	955	2.80	2.12	1645	2.30	2.16	1545	1.80	2.01	2.06	4.78
KCR/BH-47	5.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1545	1.00	0.69	945	2.70	0.77	1650	2.50	0.97	1528	1.80	0.87	0.83	4.98
KCR/BH-48	5.90	-	-	-	-	-	-	-	-	-	-	-	-	1400	1.80	1.56	1130	3.10	1.60	930	2.60	1.52	1700	2.50	1.50				1.56	4.34
KCR/BH-49	6.71	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1150	3.00	3.67	940	2.60	3.74	1710	2.50	3.91	1510	2.10	3.82	3.79	2.93
KCR/BH-50	2.05	-	-	-	-	-	-	-	-	-	-	-	-	1520	1.50	0.61	1200	3.00	0.61	1235	2.50	0.81	1250	2.70	0.85				0.68	1.37
KCR/BH-51	3.55	-	-	-	-	-	-	-	-	-	-	-	-	1510	1.50	2.84	1210	3.00	3.07	1225	2.50	2.92	1245	2.80	2.94	1438	2.40	2.85	2.92	0.63
KCR/BH-52	3.74	-	-	-	-	-	-	-	-	-	-	-	-	1500	1.50	4.67	1220	2.70	4.54	1215	2.70	4.57	1235	2.80	4.84	1430	2.40	4.51	4.63	-0.89
KCR/BH-53	2.89	-	-	-	-	-	-	-	-	-	-	-	-	1445	1.70	3.62	1229	2.70	3.66	1210	2.70	3.69	1225	2.80	3.91	1420	2.40	3.83	3.74	-0.85
KCR/BH-54	2.74	-	-	-	-	-	-	-	-	-	1430	2.30	3.79	1440	1.70	3.45	1236	2.70	3.50	1155	2.70	3.00	1223	2.80	3.00				3.44	-0.70
KCR/BH-55	2.33	-	-	-	-	-	-	-	-	-	1340	2.80	3.54	1420	1.70	2.64	1240	2.70	3.14	1140	2.90	3.06	1216	2.80	3.30	1410	2.70	3.19	3.15	-0.82
KCR/BH-56	3.36	-	-	-	-	-	-	-	-	-	1336	2.80	2.34	1410	1.80	2.60	1300	2.40	2.71	1130	2.90	2.69	1210	2.90	2.66	1405	2.70	2.51	2.59	0.78
KCR/BH-57	3.00	-	-	-	-	-	-	-	-	-	1315	3.10	0.93	1340	2.00	1.88	1310	2.40	1.98	1120	2.90	1.86	1205	2.00	1.90	1355	2.70	1.80	1.73	1.28
KCR/BH-58	3.51	-	-	-	-	-	-	-	-	-	1306	3.10	4.16	1325	2.00	4.31	1325	2.20	4.21	1110	3.00	4.16	1200	2.90	4.51	1350	2.70	4.37	4.29	-0.78
KCR/BH-59	3.55	-	-	-	-	-	-	-	-	-	1300	3.10	4.03	1315	2.10	3.90	1335	2.20	3.91	1100	3.00	4.28	1130	2.00	4.29	1342	2.80	4.26	4.11	-0.56
KCR/BH-60	2.75	-	-	-	-	-	-	-	-	-	1245	3.10	4.68	1308	2.10	4.53	1345	2.20	4.23	955	2.80	4.68	1148	2.90	4.41	1335	2.80	4.32	4.48	-1.73

Source: JICA Study Team

Table 3 Water Level Monitoring Data (BH-61 to BH-90)

BoreHole #	Elev. of Borehole (m)	Data-1 (May 04, 2012)			Data-2 (May 31, 2012)			Data-3 (Jun 15, 2012)			Data-4 (Jul 04, 2012)			Data-5 (July 16, 2012)			Data-6 (Aug 01, 2012)			Data-7 (Aug 16, 2012)			Data-8 (Sep 01, 2012)			Data-9 (Sep 19, 2012)			Average Water Level From GL (m)	Elevation of Water Level (m)
		Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time	Tide Level	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)	Time hrs	Tide Level (CD KPT), m	Water Level From GL (m)		
KCR/BH-61	2.80	-	-	-	-	-	-	1510	1.50	3.85	1238	3.20	4.94	1305	2.10	4.96	1400	1.90	4.86	930	2.60	4.78	1142	2.80	4.36	1329	2.80	4.48	4.60	-1.80
KCR/BH-62	3.74	-	-	-	-	-	-	1520	1.50	4.78	1232	3.20	4.78	1259	2.10	3.79	1417	1.60	3.96	945	2.60	3.98	1135	2.80	4.00				4.26	-0.52
KCR/BH-63	3.45	-	-	-	-	-	-	1540	1.50	3.01	1224	3.20	2.83	1250	2.10	2.95	1430	1.60	3.13	105	1.30	2.92	1127	2.80	3.17	1318	2.80	3.11	3.02	0.43
KCR/BH-64	3.74	-	-	-	-	-	-	1555	1.50	2.94	1217	3.20	3.04	1245	2.30	3.00	1435	1.60	3.04	1255	2.30	3.01	1120	2.80	3.28	1310	2.90	3.09	3.06	0.68
KCR/BH-65	3.49	-	-	-	-	-	-	1610	1.50	2.52	1210	3.30	1.57	1240	2.30	1.62	1450	1.30	1.42	1240	2.50	1.52	1110	2.70	1.36				1.73	1.76
KCR/BH-66	5.15	-	-	-	-	-	-	1615	1.50	2.56	1152	3.30	2.46	1235	2.30	2.56	1459	1.30	2.31	1230	2.50	2.43	1105	2.70	2.33	1240	2.80	2.10	2.39	2.76
KCR/BH-67	7.17	-	-	-	1516	1.10	1.79	1625	1.60	1.92	1145	3.20	2.07	1220	2.30	2.05	1510	1.30	2.60	1215	2.70	2.10	1055	2.70	1.60	1235	2.80	0.92	1.88	5.29
KCR/BH-68	9.84		-		1520	2.00	-0.28	1632	1.60	1.72	1142	3.20	1.82	1215	2.50	1.92	1525	1.10	2.02	1206	2.70	1.87	1050	2.70	1.92	1230	2.80	1.84	1.60	8.24
KCR/BH-69	14.82	-	-	-	1553	1.20	4.49	1640	1.60	4.57	1130	3.20	4.57	1208	2.50	4.75	1530	1.10	4.57	1153	2.70	4.68	1041	2.50	4.79	1220	2.80	4.17	4.57	10.25
KCR/BH-70	12.77	-	-	-	1605	1.20	2.93	1650	1.60	3.03	1120	3.20	3.21	1205	2.50	3.33	1546	0.90	3.21	1135	2.90	3.28	1035	2.50	3.31	1215	2.70	3.03	3.17	9.60
KCR/BH-71	12.39	-	-	-	1615	1.20	2.10	-	-	-	1112	3.10	1.95	1155	2.50	2.19	1555	0.90	2.00	1115	3.00	1.91	1025	2.50	2.30	1205	2.70	2.13	2.08	10.31
KCR/BH-72	7.42	-	-	-	1645	1.50	1.90	1710	1.60	2.00	1058	3.10	2.17	1149	2.50	2.28	1605	0.90	2.80	1105	3.00	2.30	1018	2.50	2.30				2.24	5.18
KCR/BH-73	8.27	-	-	-	1700	1.70	2.16	1715	1.60	2.30	1048	3.10	2.34	1142	2.60	2.36	1615	0.90	2.19	1025	2.90	2.03	1010	2.30	2.00				2.23	6.04
KCR/BH-74	7.45	-	-	-	1705	1.70	1.88	1720	1.80	1.13	1043	2.80	0.88	1135	2.60	0.98	1625	0.80	1.02	1040	2.90	0.98	1005	2.30	1.00				1.15	6.31
KCR/BH-75	7.14	-	-	-	1710	1.70	2.61	1727	1.80	2.61	1039	2.80	1.66	1128	2.60	2.86	1632	0.80	2.31	1025	2.90	2.79	1000	2.80	3.86	1140	2.60	3.46	2.77	4.37
KCR/BH-76	6.53	-	-	-	1715	1.70	3.40	1735	1.80	3.30	1031	2.80	3.77	1117	2.60	3.45	1645	0.80	3.40	1015	2.80	3.55	620	0.90	3.75	1130	2.60	3.55	3.52	3.01
KCR/BH-77	8.52	-	-	-	1750	2.20	4.04	1744	1.80	2.74	1021	2.80	5.44	1110	2.70	4.74	1655	0.70	4.84	1005	2.80	4.79	615	0.60	5.20	1120	2.60	4.79	4.57	3.95
KCR/BH-78	9.58	-	-	-	1430	1.10	1.46	1135	2.50	1.16	1730	1.10	1.26	1849	2.20	1.41	1708	0.70	1.31	940	2.60	1.46	1120	2.90	1.60				1.34	8.24
KCR/BH-79	12.55	-	-	-	1420	1.10	2.41	11.45	2.50	2.48	1715	1.00	2.60	1833	1.90	2.76	1720	0.80	3.06	1105	3.00	3.07	605	0.60	3.43	1100	2.40	3.01	2.85	9.70
KCR/BH-80	15.87	1635	1.50	3.68	1415	1.10	4.25	1125	2.50	4.37	1620	1.10	4.45	1823	2.10	4.52	1735	0.80	4.05	1045	2.90	4.55	600	0.60	4.70	1055	2.40	4.60	4.35	11.52
KCR/BH-81	12.90	1620	1.50	0.43	1405	1.10	0.95	1115	2.60	0.90	1554	1.20	0.90	1818	2.10	0.94	1745	0.80	0.95	1025	2.90	1.00	555	0.60	0.63	1050	2.40	0.40	0.79	12.11
KCR/BH-82	15.72	1610	1.20	0.72	1400	1.10	1.95	1106	2.60	2.01	1544	1.50	1.92	1807	1.90	2.10	1755	0.90	2.05	1000	2.80	2.10	540	0.50	2.13	1034	2.20	1.80	1.86	13.86
KCR/BH-83	14.00	1600	1.20	0.66	1355	1.10	1.15	10.55	2.60	0.85	1538	1.50	0.40	1803	1.90	0.47	1810	0.90	0.48	940	2.60	1.28	533	0.50	1.26	1025	2.20	0.90	0.83	13.17
KCR/BH-84	15.03	1548	1.20	0.15	1345	1.30	0.61	1045	2.70	0.53	1534	1.50	0.51	1858	2.20	0.51	1819	1.20	0.61	920	2.60	0.54	545	0.50	0.67	1015	1.90	0.51	0.52	14.51
KCR/BH-85	14.57	1540	1.10	0.51	1338	1.30	4.36	1035	2.70	1.48	1530	1.50	1.46	1750	1.90	1.56	1825	1.20	1.66	915	2.40	1.51	419	0.40	1.81	1010	1.90	1.61	1.77	12.80
KCR/BH-86	15.35	1530	1.10	0.83	1315	1.50	3.03	1030	2.70	2.91	1525	1.50	3.26	1745	1.80	3.28	1830	1.20	3.66	850	2.20	3.18	510	0.30	3.20				2.88	12.47
KCR/BH-87	42.52	-		-	1615	1.20	3.39	1227	1.70	0.04	1510	1.70	4.49	1622	1.60	4.54	1842	1.20	4.74	125	1.10	4.77	145	1.50	4.54	1215	3.00	4.49	3.88	38.65
KCR/BH-88	2.62	-		-	-	-	-	-	-	-	-	-	-	-	-	-	1856	1.40	1.63	1255	1.30	1.62	1255	2.50	1.63	1500	2.10	1.58	1.62	1.01
KCR/BH-89	12.68	1520	1.10	0.59	1408	1.10	0.92	1113	2.60	0.93	1549	1.20	0.96	1812	1.90	2.17	1905	1.40	1.17	1015	2.80	1.16	550	0.60	1.25	1044	2.20	1.17	1.15	11.53
KCR/BH-90	23.50	-		-	-	-	-	1710	2.10	14.13	1245	3.00	13.06	1405	1.60	12.96	1910	1.40	12.76	1255	1.30	14.11	420	0.90	14.56	1600	1.00	14.31	13.70	9.80

Source: JICA Study Team

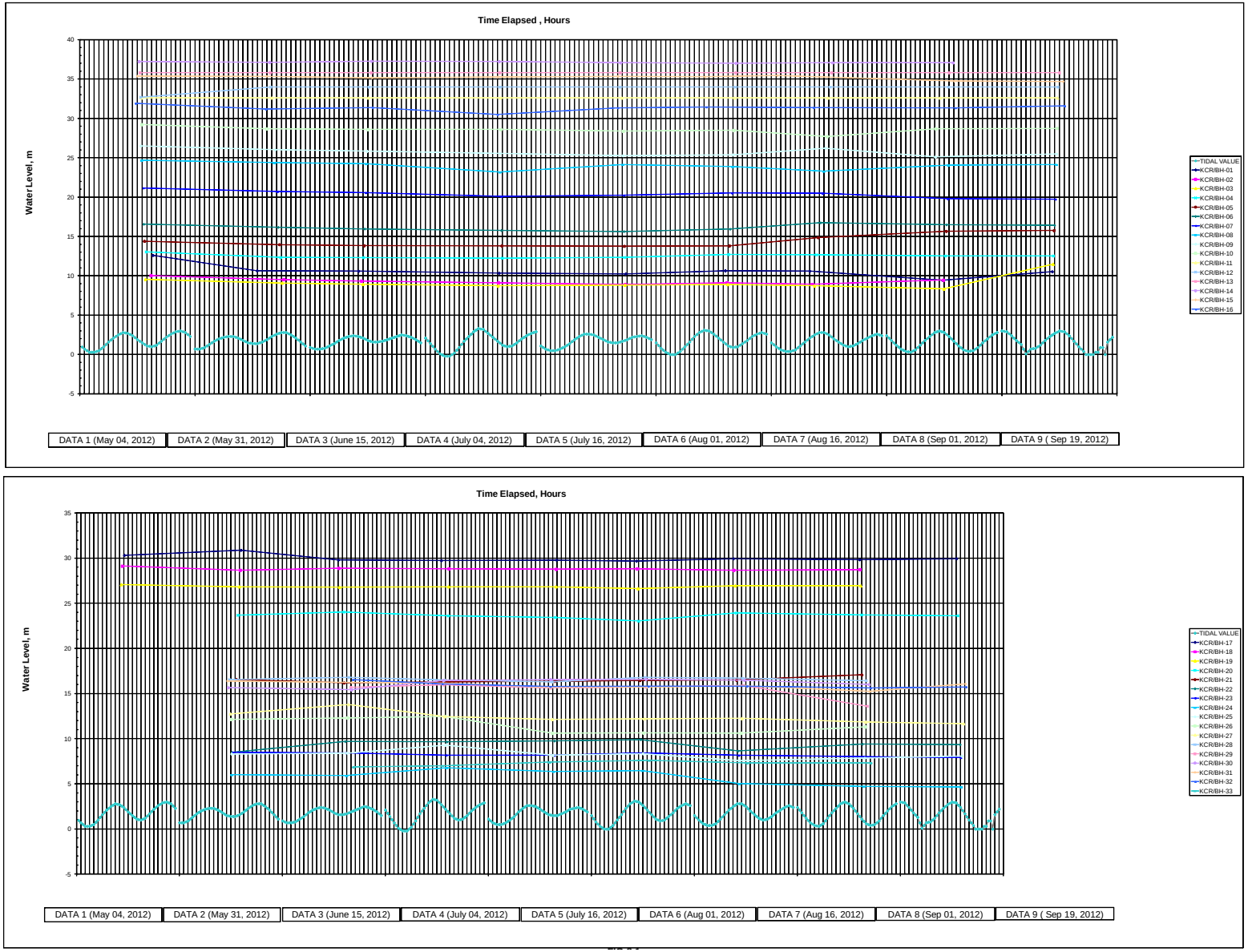


Figure 1 Water Level Monitoring Data (BH-1 to BH-33)

Source: JICA Study Team

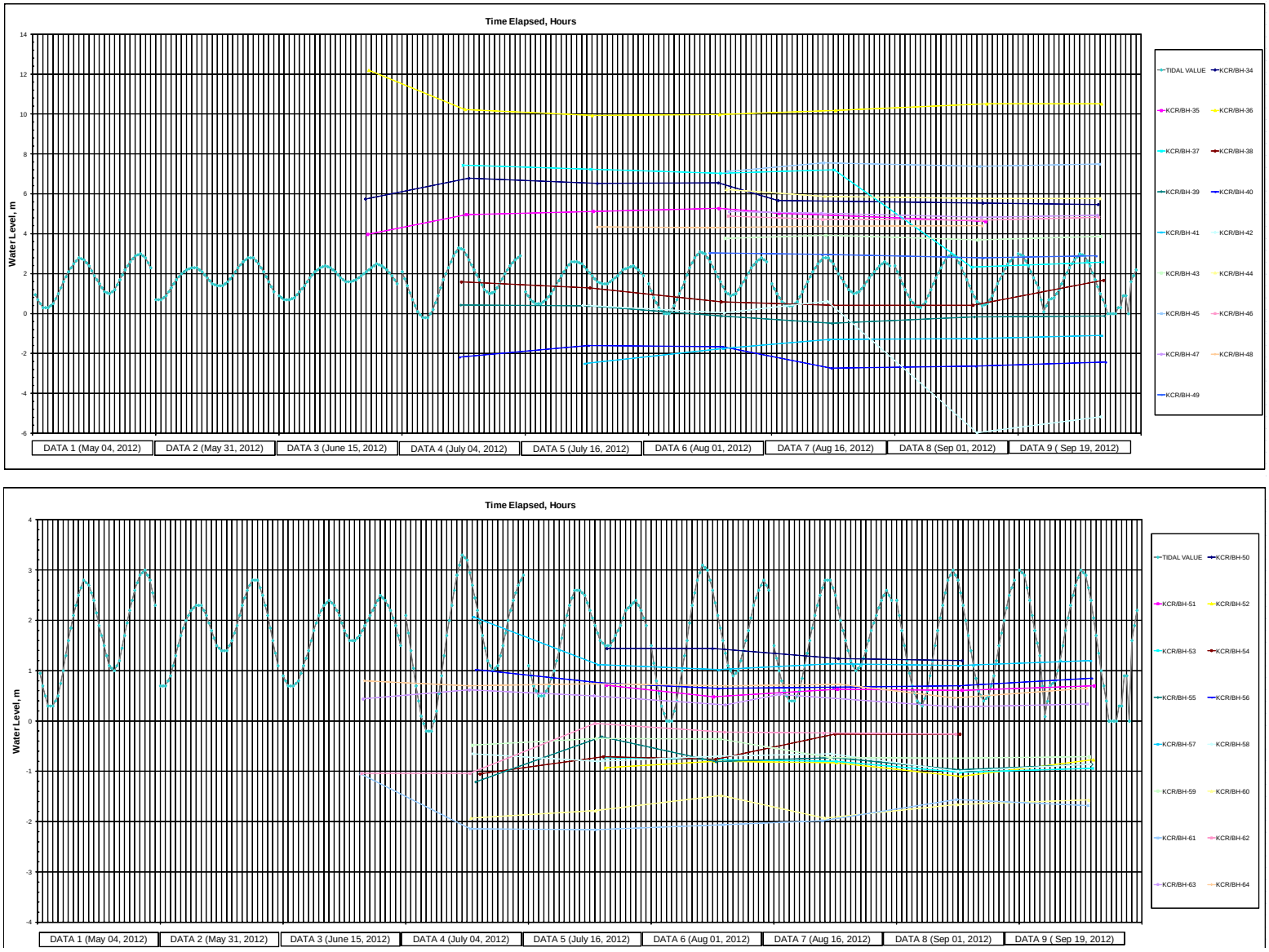


Figure 2 Water Level Monitoring Data (BH-34 to BH-64)

Source: JICA Study Team

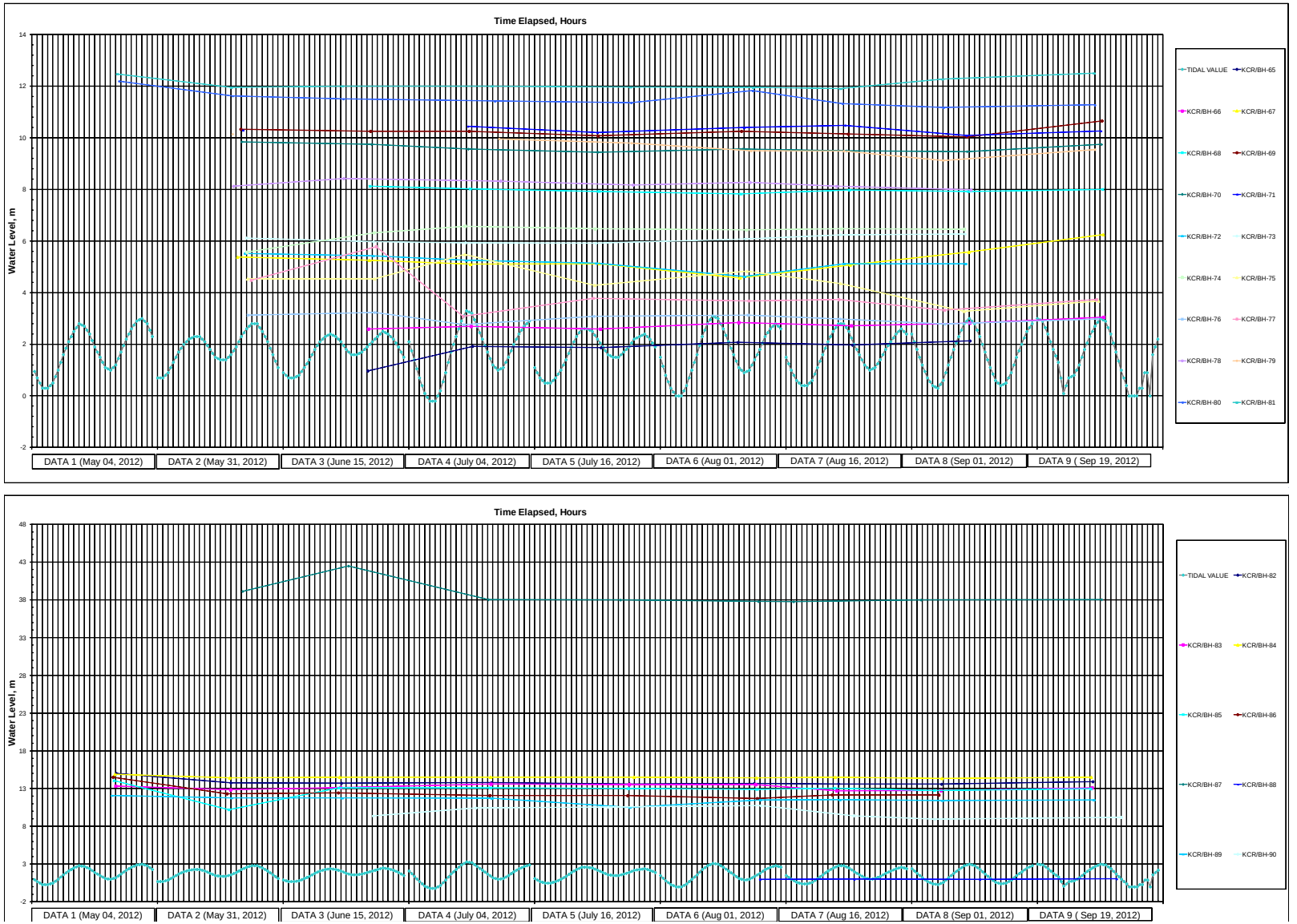


Figure 3 Water Level Monitoring Data (BH-65 to BH-90)

Source: JICA Study Team

Results of Permeability Tests and Comments

Permeability tests were performed, in Boreholes KCR/BH-12, KCR/BH-13 & KCR/BH-14, by variable head permeability method in accordance with BS-5930. The tests were conducted at 10m and 15m depth in each borehole.

BS-5930 gives following formula for variable head permeability test:

$$k = \left\{\frac{A}{F}(t_2 - t_1)\right\}\left\{\log_e\left(\frac{H_0}{H_t}\right)\right\}$$

Also k = A/FT

where

k = the permeability of soil

H_o = the variable head measured at time t_1 after commencement of test

H_t = the variable head measured at time t_2 after commencement of test

A = cross sectional area of borehole casing

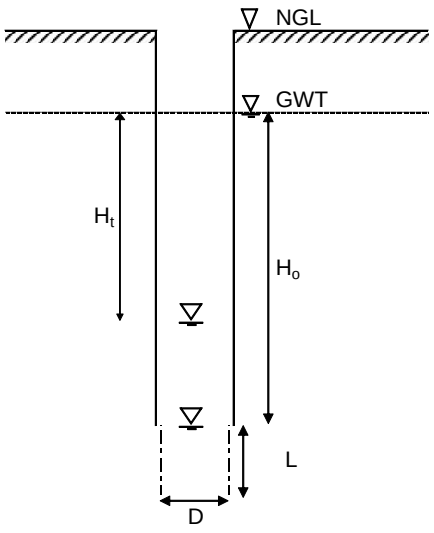
F = intake factor

T = basic Time factor (determined by plotting Time versus (Ht/Ho)

$$\frac{2\pi L}{\log_e\left\{\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D^2}\right)}\right\}}$$

Where L= uncased length of borehole

D= diameter of the borehole



(1) Permeability in KCR/BH-12

Rising Head tests was performed in Boreholes KCR/BH-12 at 10m & 15m depths.

The strata tested comprised of Grayish red to brown, highly fractured, very poor, highly weathered, medium hard, Sandy SHALE. Study of test results in Table 5 shows that the coefficient of permeability is of the order of 1.5x10-6 m/sec.

The strata tested comprised of Brownish Grey, fractured, poor, slightly weathered, jointed, friable SANDSTONE. Study of test results in Table 6 shows that the coefficient of permeability is of the order of 4.7x10-6 m/sec.

(2) Permeability in KCR/BH-13

Rising Head tests were performed in Boreholes KCR/BH-13 at 10m & 15m depths. The location of boring KCR/BH-13 was at under water.

The strata tested comprised of Grayish brown, highly fractured, very poor, highly weathered, closely

jointed, fine grained, friable SANDSTONE. Study of test results in Table 7 shows that the coefficient of permeability is of the order of $1.3x10^{-5}$ m/sec.
The strata tested comprised of Grayish brown, highly fractured, very poor, moderately weathered, closely jointed, friable Sandy SILTSTONE. Study of test results in Table 8 shows that the coefficient of permeability is of the order of $1.0x10^{-5}$ m/sec.

(3) Permeability in KCR/BH-14

Rising Head permeability test was performed in Borehole KCR/BH-14 at 10.0m depth. But the results show insignificant values. Therefore, Falling Head test has been performed and the data of Falling Head is only included in the report.
The strata tested comprised of Yellow, highly fractured, very poor, closely jointed, medium hard to hard, limonitic Sandy LIMESTONE. Study of test results in Table 9 shows that the coefficient of permeability is of the order of $3.8x10^{-6}$ m/sec.

(4) Artesian Pressure in KCR/BH-11, 12 & 13

During drilling and testing of KCR/BH#11, 12 & 13, Artesian Pressure has been observed. The detail is in the Table 4.

Table 4 Artesian Pressure in KCR/ BH# 11, 12 & 13

Borehole No.	Depth of Borehole (m)	Artesian pressure at level (m)	Elevation (m)	Soil/ Rock Description
KCR/BH#11	15.0	7.5	+25.1	LIMESTONE
KCR/BH#12	15.0	3.3	+30.22	Friable SANDSTONE
KCR/BH#13	15.0	8.8	+27.0	Friable SANDSTONE & Sandy SHALE

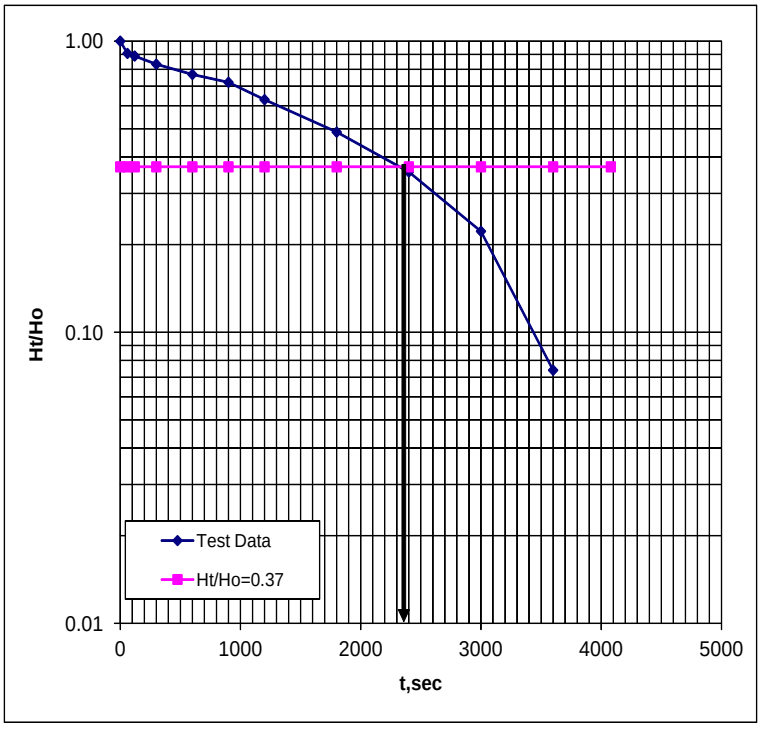
Source: JICA Study Team

It shows that at 7.5m depth in KCR/BH#11, at 3.3 m depth in KCR/BH#12 and at 8.8m depth in KCR/BH#13, there is artesian pressure in the underlying Siltstone / Sandstone / Shale deposit.

Table 5 Permeability Test at 10m depth in BH-12: Rising Head

Project : Preparatory Survey (II) on Karachi Circular Railway Revival Project In Karachi		Client : The Jica Study Team	
Contractor :Consolidated Engineering Services (Pvt) Ltd.			Date : 29-04-2012
Site Location:	Depot Hill to University	Strata:	Sandy Shale
Borehole No.=	KCR/BH#12	L (m) =	1
Depth of Hole (m) =	10.0 m (10.4.0m form top of casing)	D (m) =	0.1
Depth of casing (m) =	9.0 m (9.40m from top of casing)	A(m2) =	7.85E-03
GWT (m) =	0	F =	2.0956

Elapsed time		HW from top (m)	Ht (m)	Ho (m)	Ht/Ho		K (m/sec)
(min)	sec						
0	0	5.40	5.400	5.400	1.00	0.37	
1	60	4.90	4.900	5.400	0.91	0.37	1.26E-06
2	120	4.80	4.800	5.400	0.89	0.37	1.27E-06
5	300	4.50	4.500	5.400	0.83	0.37	1.32E-06
10	600	4.15	4.150	5.400	0.77	0.37	1.16E-06
15	900	3.90	3.900	5.400	0.72	0.37	1.03E-06
20	1200	3.40	3.400	5.400	0.63	0.37	1.20E-06
30	1800	2.63	2.630	5.400	0.49	0.37	1.34E-06
40	2400	1.92	1.920	5.400	0.36	0.37	1.49E-06
50	3000	1.20	1.200	5.400	0.22	0.37	1.78E-06
60	3600	0.40	0.400	5.400	0.07	0.37	2.63E-06
68	4080	0.00	0.000	5.400	0.00	0.37	
						Avg.	1.50E-06

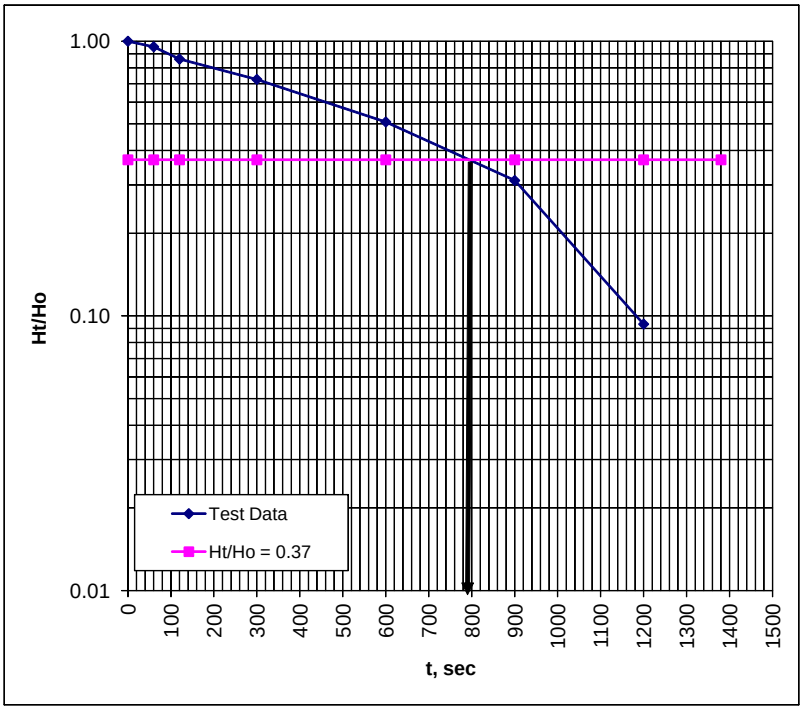


Permeability from graph	
BH dia (m)	0.1
Time T (sec)	2350
F	2.0956
Area A (m2)	7.85E-03
Permeability, k (m/s)	A/FT
Permeability, k (m/s)	1.59E-06

Source: JICA Study Team

Table 6 Permeability Test at 15m depth in BH-12: Rising Head

Project : Preparatory Survey (II) on Karachi Circular Railway Revival Project In Karachi					Client : The Jica Study Team		
Contractor :Consolidated Engineering Services (Pvt) Ltd.						Date : 01-05-2012	
Site Location:	Depot Hill to University			Strata:		Sandstone	
Borehole No.=	KCR/BH#12			L (m) =		1	
Depth of Hole (m) =	15.0 m			D (m) =		0.1	
Depth of casing (m) =	14.0 m			A(m2) =		7.85E-03	
GWT (m) =	0			F =		2.0956	
Elapsed time		HW from top (m)	Ht (m)	Ho (m)	Ht/Ho		K (m/sec)
(min)	sec						
0	0	9.64	9.640	9.640	1.00	0.37	
1	60	9.20	9.200	9.640	0.95	0.37	2.71E-07
2	120	8.30	8.300	9.640	0.86	0.37	3.35E-06
5	300	7.00	7.000	9.640	0.73	0.37	3.47E-06
10	600	4.90	4.900	9.640	0.51	0.37	3.96E-06
15	900	3.00	3.000	9.640	0.31	0.37	4.68E-06
20	1200	0.90	0.900	9.640	0.09	0.37	7.27E-06
23	1380	0.00	0.000	9.640	0.00	0.37	
						Avg.	4.85E-06

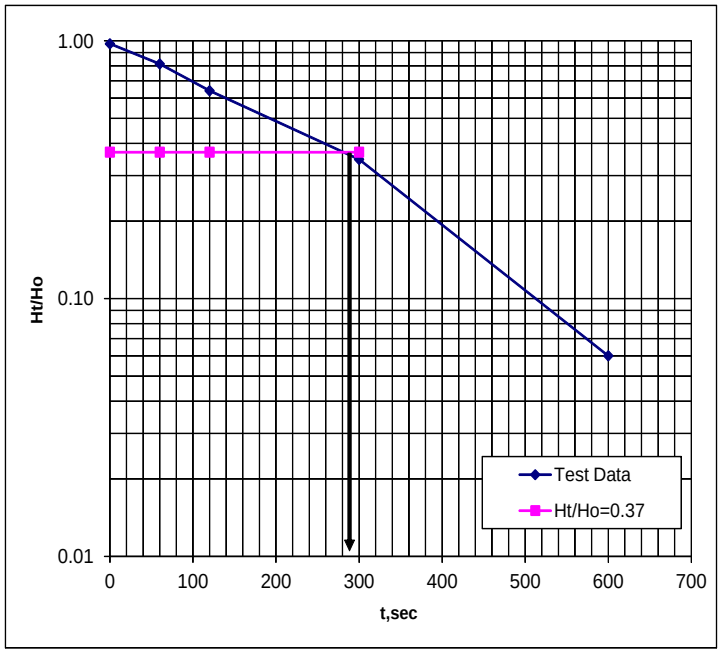


Permeability from graph	
BH dia (m)	0.1
Time (sec)	795
F	2.0956
Area (m2)	7.854E-03
Permeability, k (m/s)	A/FT
Permeability, k (m/s)	4.71E-06

Source: JICA Study Team

Table 7 Permeability Test at 10m depth in BH-13: Rising Head

Project : Preparatory Survey (II) on Karachi Circular Railway Revival Project In Karachi					Client : The Jica Study Team		
Contractor :Consolidated Engineering Services (Pvt) Ltd.					Date : 18-05-2012		
Site Location:		Depot Hill to University		Strata:		Sandstone	
Borehole No.=		KCR/BH#13		L (m) =		1	
Depth of Hole (m) =		10.0m (13.0m from top of casing)		D (m) =		0.1	
Depth of casing (m) =		9.0m (12.0 m from top of casing)		A(m2) =		7.85E-03	
GWT (m) =		0.2		F =		2.0956	
Note: Due to Artetion Pressure, casing top was 3.0m above bed level							
Elapsed time		HW from top (m)	Ht (m)	Ho (m)	Ht/Ho		K (m/sec)
(min)	sec						
0	0	7.50	7.300	7.500	0.97	0.37	
1	60	6.30	6.100	7.500	0.81	0.37	1.29E-05
2	120	5.00	4.800	7.500	0.64	0.37	1.39E-05
5	300	2.80	2.600	7.500	0.35	0.37	1.32E-05
10	600	0.65	0.450	7.500	0.06	0.37	1.76E-05
15	900	0.20	0.000	7.500	0.00	0.37	
						Avg	1.34E-05

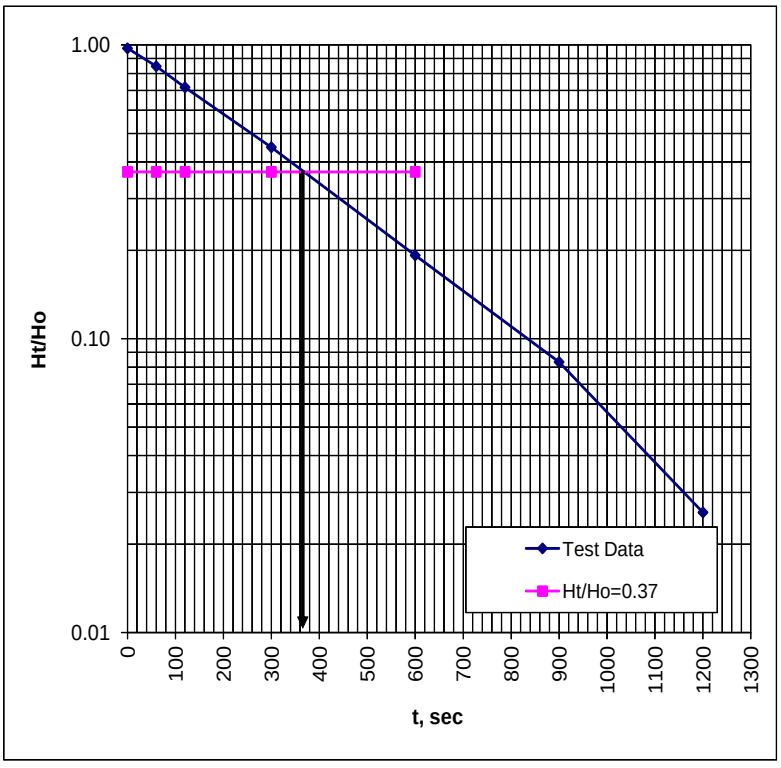


Permeability from graph	
BH dia (m)	0.1
Time (sec)	282
F	2.0956
Area (m2)	7.85E-03
Permeability, k (m/s)	A/FT
Permeability, k (m/s)	1.33E-05

Source: JICA Study Team

Table 8 Permeability Test at 15m depth in BH-13: Rising Head

Project : Preparatory Survey (II) on Karachi Circular Railway Revival Project In Karachi					Client : The Jica Study Team		
Contractor :Consolidated Engineering Services (Pvt) Ltd.						Date : 20-05-2012	
Site Location:	Depot Hill to University			Strata:		Siltstone	
Borehole No.=	KCR/BH#13			L (m) =		1	
Depth of Hole (m) =	15.0 m (18.0m from top of casing)			D (m) =		0.1	
Depth of casing (m) =	14.0 m (17.0m from top of casing)			A(m2) =		7.85E-03	
GWT (m) =	0.2			F =		2.0956	
Note: Due to Artetion Pressure, casing top was 3.0m above bed level							
Elapsed time		HW from top (m)	Ht (m)	Ho (m)	Ht/Ho		K (m/sec)
(min)	sec						
0	0	7.80	7.600	7.800	0.97	0.37	
1	60	6.80	6.600	7.800	0.85	0.37	1.04E-05
2	120	5.80	5.600	7.800	0.72	0.37	1.03E-05
5	300	3.70	3.500	7.800	0.45	0.37	1.00E-05
10	600	1.70	1.500	7.800	0.19	0.37	1.03E-05
15	900	0.85	0.650	7.800	0.08	0.37	1.03E-05
20	1200	0.40	0.200	7.800	0.03	0.37	1.14E-05
22	1320	0.20	0.000	7.800	0.00	0.37	
						Avg.	1.03E-05



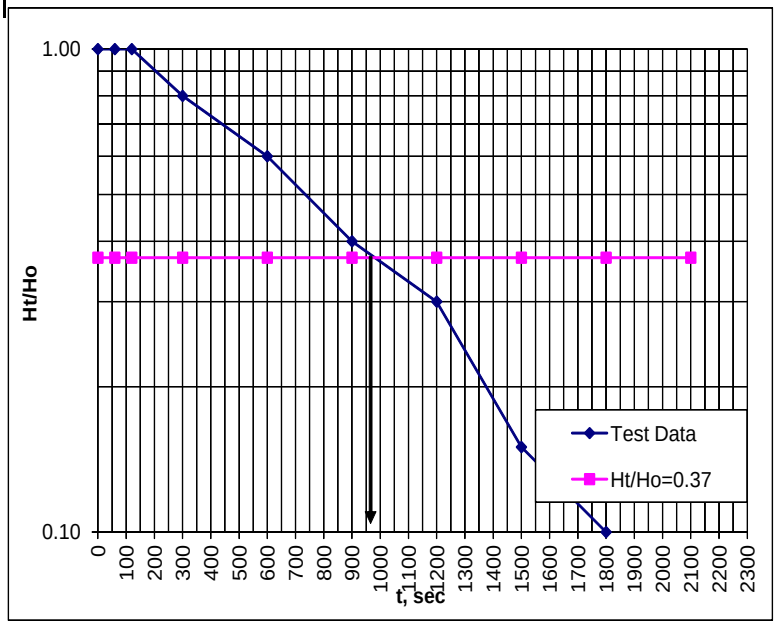
Permeability from graph	
BH dia (m)	0.1
Time (sec)	365
F	2.0956
Area (m2)	7.85E-03
Permeability, k (m/s)	
Permeability, k (m/s)	1.03E-05

Source: JICA Study Team

Table 9 Permeability Test at 10m depth in BH-14: Falling Head

Project : Preparatory Survey (II) on Karachi Circular Railway Revival Project In Karachi		Client : The Jica Study Team	
Contractor :Consolidated Engineering Services (Pvt) Ltd.			Date : 23-04-2012
Site Location:	Depot Hill to University	Strata:	Sandy Limestone
Borehole No.=	KCR/BH#14	L (m) =	1
Depth of Hole (m) =	10.0 m	D (m) =	0.1
Depth of casing (m) =	9.0 m	A(m2) =	7.9E-03
GWT (m) =	0.02	F =	2.096

Elapsed time		HW from top (m)	Ht (m)	Ho (m)	Ht/Ho		K (m/sec)
(min)	sec						
0	0	0.000	0.020	0.020	1.0000	0.37	
1	60	0.000	0.020	0.020	1.0000	0.37	
2	120	0.000	0.020	0.020	1.0000	0.37	
5	300	0.004	0.016	0.020	0.8000	0.37	2.8E-06
10	600	0.008	0.012	0.020	0.6000	0.37	3.2E-06
15	900	0.012	0.008	0.020	0.4000	0.37	3.8E-06
20	1200	0.014	0.006	0.020	0.3000	0.37	3.8E-06
25	1500	0.017	0.003	0.020	0.1500	0.37	4.7E-06
30	1800	0.018	0.002	0.020	0.1000	0.37	4.8E-06
35	2100	0.020	0.000	0.020	0.0000	0.37	
						Avg.	3.8E-06

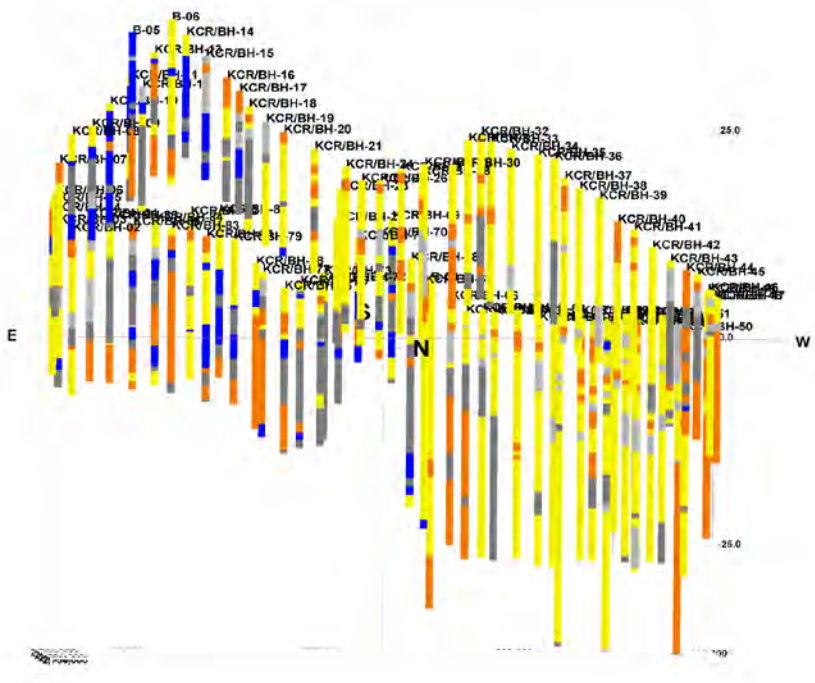


Permeability from graph	
BH dia (m)	0.1
Time T (sec)	970
F	2.095636452
Area A (m2)	7.85398E-03
Permeability, k (m/s)	A/FT
Permeability, k (m/s)	3.9E-06

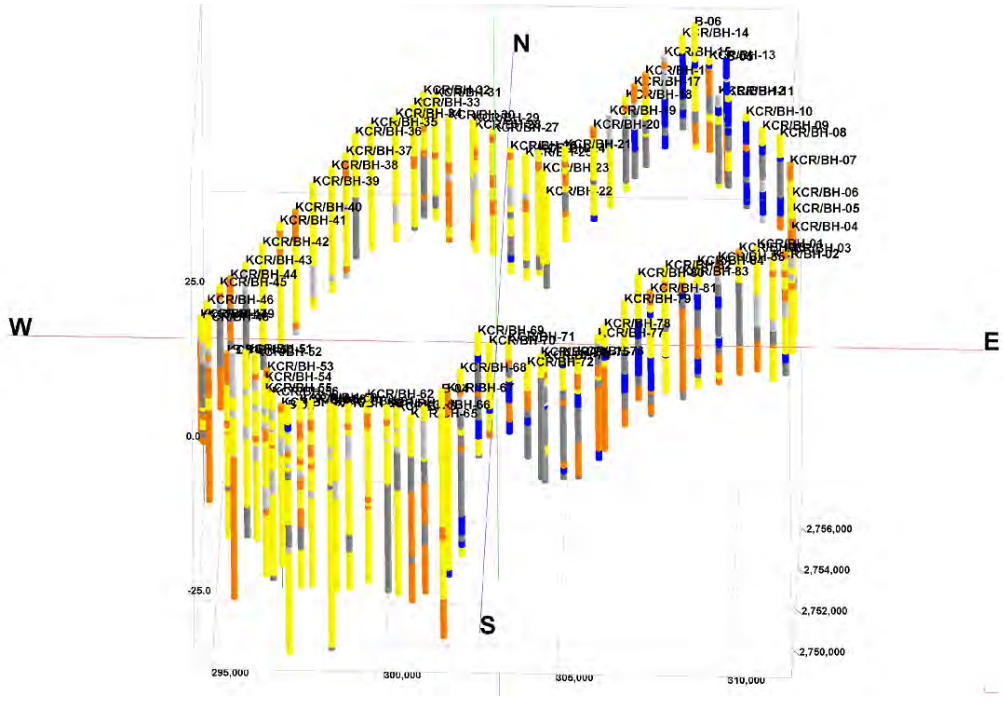
Source: JICA Study Team

6. 3D Geological Cross Section

A simplified graphic representation of the succession of rocks in a particular are, shown in the form of a column with the oldest rocks at the bottom. Each rock unit is distinguished by and appropriate lithologic symbol.

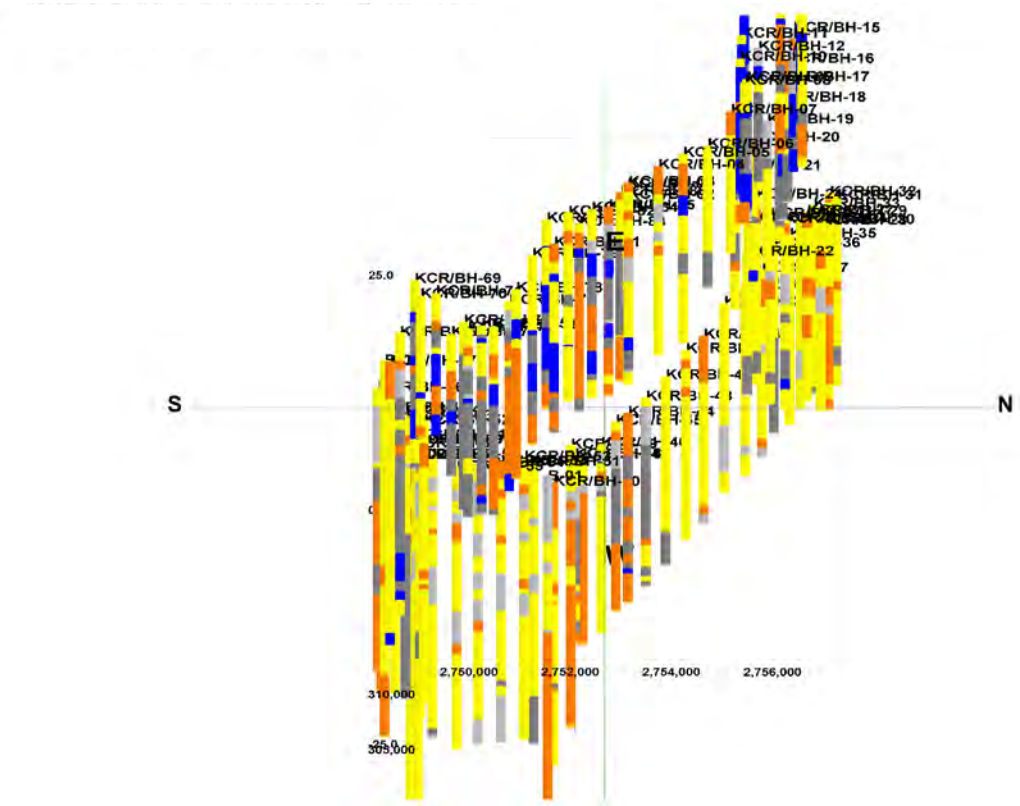


North View of Lithological Columnar



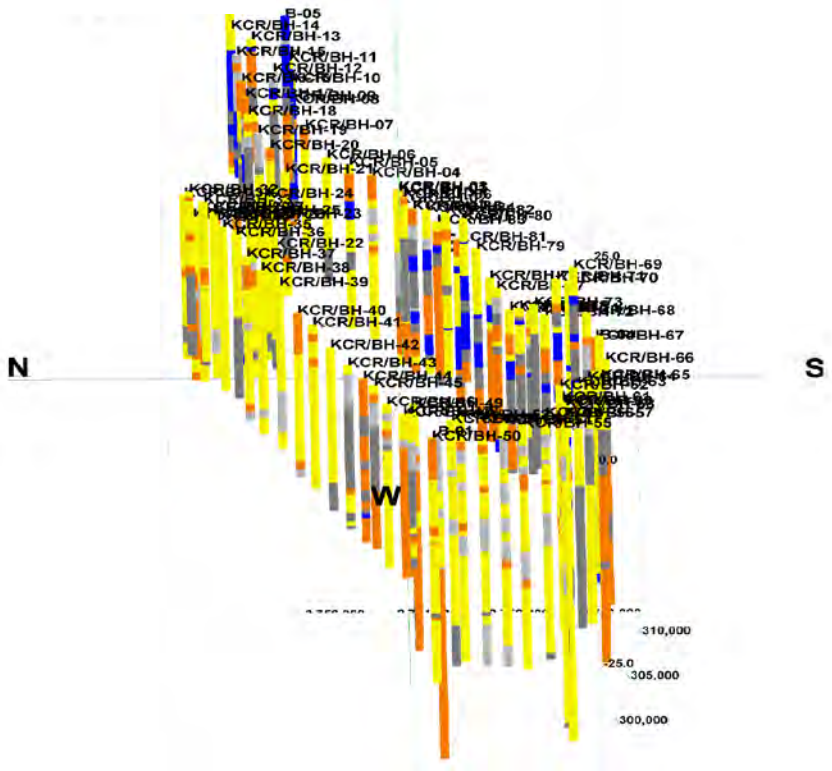
Source: JICA Study Team

South View of Lithological Columnar



Source: JICA Study Team

East View of Lithological Columnar

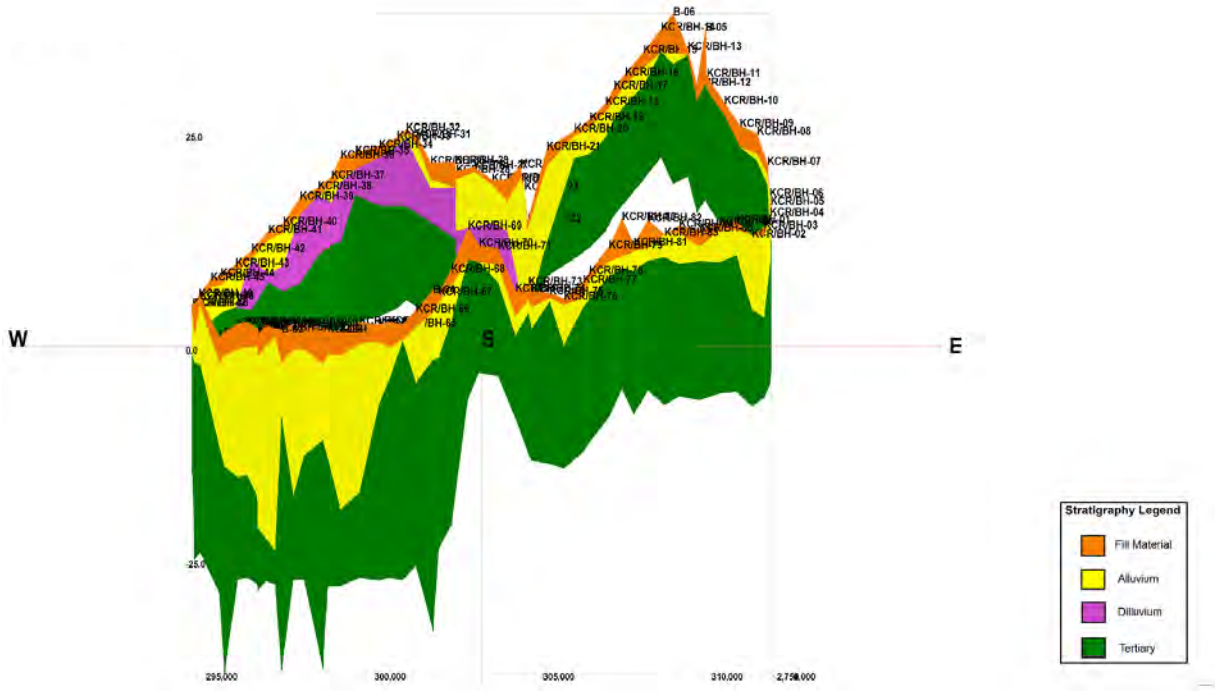


Source: JICA Study Team

West View of Lithological Columnar

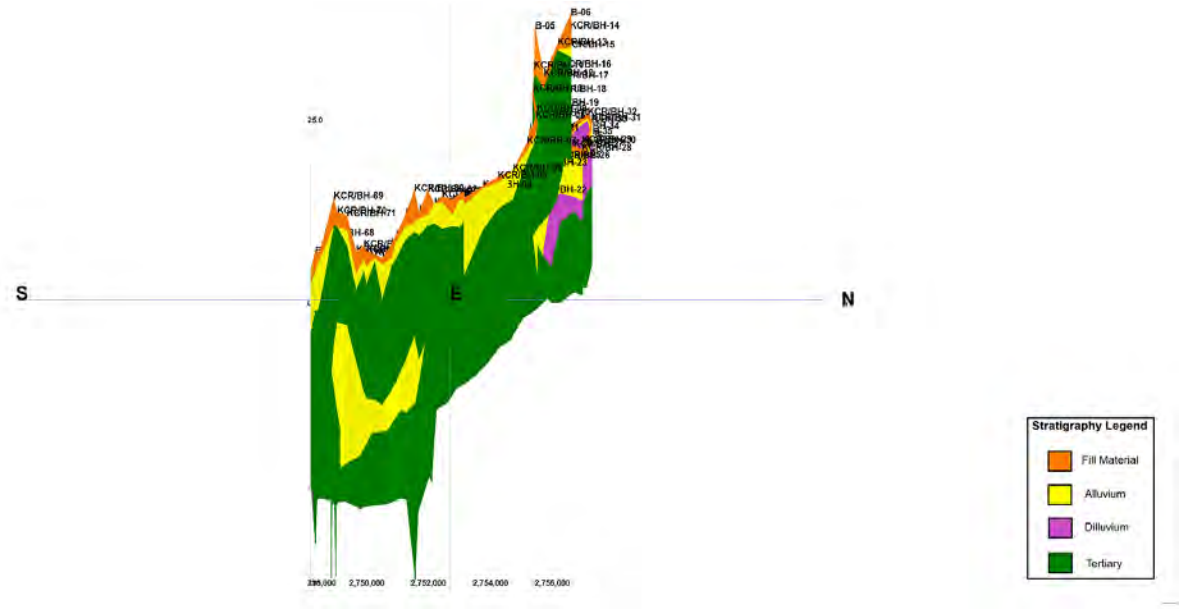
Stratigraphical 3D Fence Diagram

It is designed to show the thicknesses and stratigraphic relationships of lithostratigraphic units. The units and their boundaries are related to the Subdivisions of geographic time. Stratigraphical 3D fence diagrams are presented here:



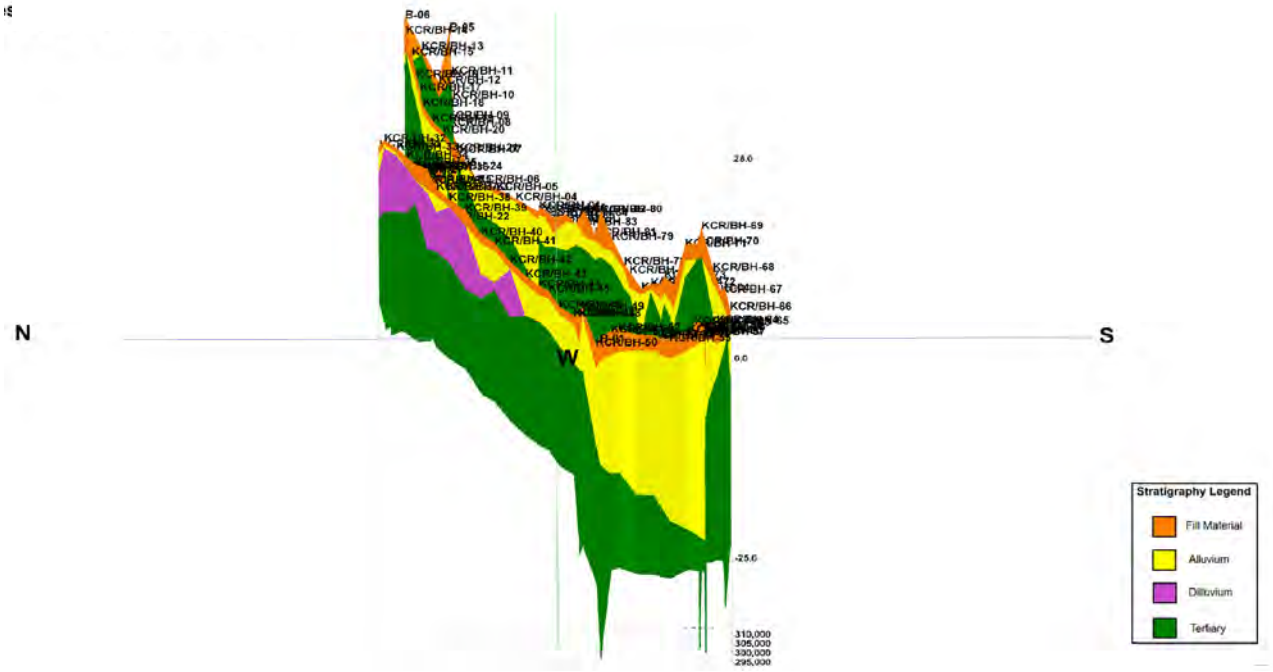
Source: JICA Study Team

South View of Fence Diagram



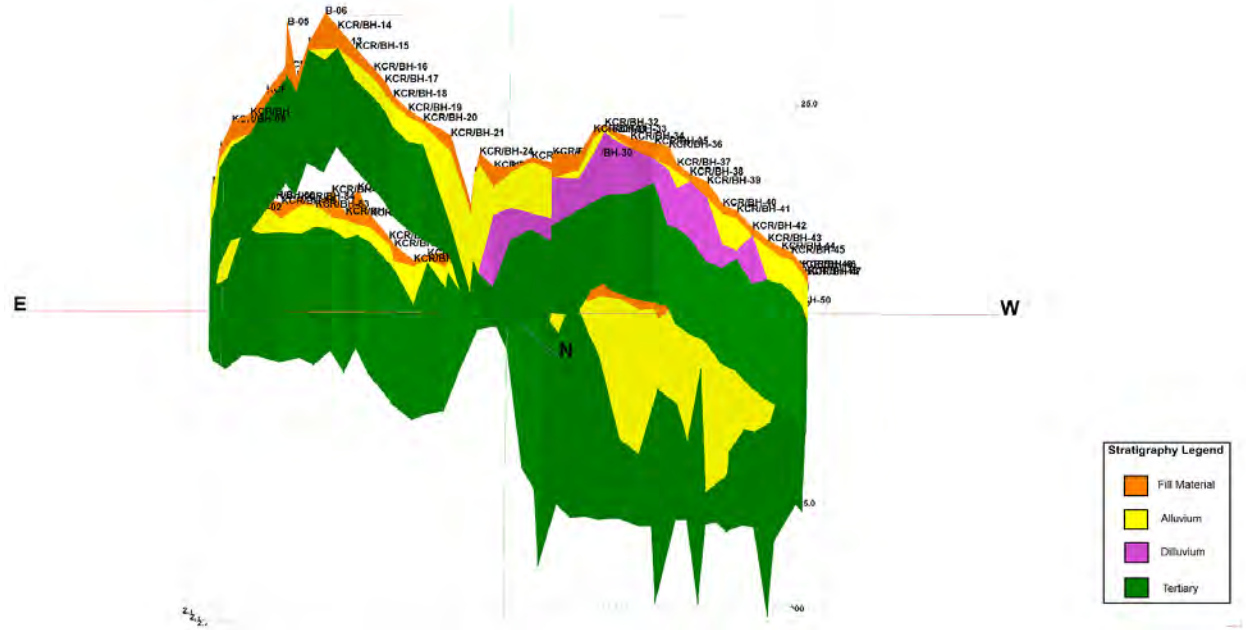
Source: JICA Study Team

East View of 3D Fence Diagram



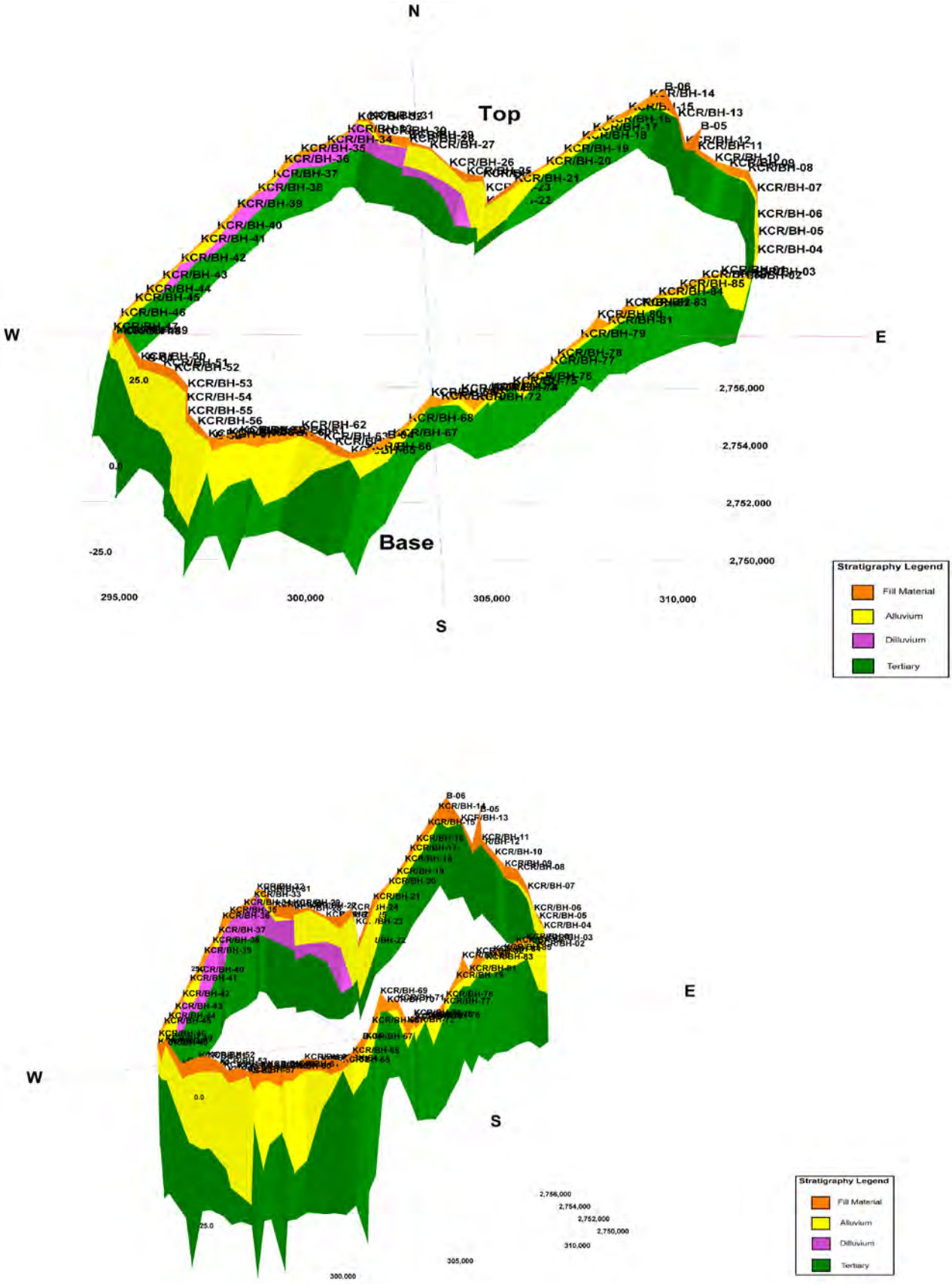
Source: JICA Study Team

West View of 3D Fence Diagram



Source: JICA Study Team

North View of 3D Fence Diagram



Source: JICA Study Team

The View of 3D Fence Diagram

7. Photographs of Core Samples

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:1	Depth:0.0 To 20.0m	Date: 13-04-12 to 16-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:2	Depth:0.0 To 20.0m	Date: 09-04-12 to 11-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:3	Depth:0.0 To 20.0m	Date: 09-04-12 to 12-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:4	Depth:0.0 To 20.0m	Date: 13-04-12 to 15-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:5	Depth:0.0 To 20.0m	Date: 17-04-12 to 19-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:6	Depth:0.0 To 15.0m	Date: 19-04-12 to 21-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:7	Depth:0.0 To 15.0m	Date: 16-04-12 to 18-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:8	Depth:0.0 To 15.0m	Date: 13-04-12 to 15-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:9	Depth:0.0 To 15.0m	Date: 11-04-12 to 14-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:10	Depth:0.0 To 15.0m	Date: 16-04-12 to 19-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:11	Depth:0.0 To 15.0m	Date: 06-05-12 to 8-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:12	Depth:0.0 To 15.0m	Date: 27-04-12 to 01-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:13	Depth:0.0 To 15.0m	Date: 15-05-12 to 19-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH# :14	Depth:0.0 To 15.0m	Date: 20-04-12 to 24-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:15	Depth:0.0 To 15.0m	Date: 23-04-12 to 24-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:16	Depth:0.0 To 15.0m	Date: 25-04-12 to 29-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:17	Depth:0.0 To 15.0m	Date: 25-04-12 to 27-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:18	Depth:0.0 To 15.0m	Date: 27-04-12 to 29-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:19	Depth:0.0 To 15.0m	Date: 30-04-12 to 1-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:20	Depth:0.0 To 15.0m	Date: 1-05-12 to 6-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH# :21	Depth:0.0 To 15.0m	Date: 2-05-12 to 5-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:22	Depth:0.0 To 15.0m	Date: 04-05-12 to 08-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH # :23	Depth:0.0 To 15.0m	Date: 07-05-12 to 10-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH# :24	Depth:0.0 To 20.0m	Date: 6-05-12 to 8-05-12

JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:25	Depth:0.0 To 20.0m	Date: 09-05-12 to 12-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:26	Depth:0.0 To 20.0m	Date: 10-05-12 to 14-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH # :27	Depth:0.0 To 20.0m	Date: 15-05-12 to 18-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH# :28	Depth:0.0 To 20.0m	Date: 19-05-12 to 22-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH # :29	Depth:0.0 To 20.0m	Date: 06-06-12 to 08-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:30	Depth:0.0 To 15.0m	Date: 26-05-12 to 28-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH # :31	Depth:0.0 To 20.0m	Date: 26-05-12 to 28-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:32	Depth:0.0 To 20.0m	Date: 29-05-12 to 31-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH # :33	Depth:0.0 To 20.0m	Date: 29-05-12 to 31-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH# :34	Depth:0.0 To 20.0m	Date: 03-06-12 to 05-06-12

JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:35	Depth:0.0 To 20.0m	Date: 10-06-12 to 13-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:36	Depth:0.0 To 20.0m	Date: 11-06-12 to 14-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:37	Depth:0.0 To 20.0m	Date: 22-06-12 to 25-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:38	Depth:0.0 To 20.0m	Date: 14-06-12 to 16-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH # :39	Depth:0.0 To 20.0m	Date: 16-06-12 to 19-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:40	Depth:0.0 To 20.0m	Date: 28-06-12 to 30-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:41	Depth:0.0 To 20.0m	Date: 02-07-12 to 07-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:42	Depth:0.0 To 20.0m	Date: 17-06-12 to 21-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:43	Depth:0.0 To 20.0m	Date: 26-07-12 to 29-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:44	Depth:0.0 To 20.0m	Date: 26-07-12 to 28-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:45	Depth:0.0 To 20.0m	Date: 23-07-12 to 24-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:46	Depth:0.0 To 20.0m	Date: 22-07-12 to 24-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:47	Depth:0.0 To 20.0m	Date: 23-07-12 to 25-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:48	Depth:0.0 To 30.0m	Date: 13-07-12 to 16-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:49	Depth:0.0 To 30.0m	Date: 17-07-12 to 21-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:50	Depth:0.0 To 30.0m	Date: 13-07-12 to 17-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:51	Depth:0.0 To 30.0m	Date: 1-07-12 to 5-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:52	Depth:0.0 To 30.0m	Date: 30-06-12 to 5-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:53	Depth:0.0 To 30.0m	Date: 27-06-12 to 30-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:54	Depth:0.0 To 30.0m	Date: 26-06-12 to 29-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:55	Depth:0.0 To 30.0m	Date: 06-07-12 to 11-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH# :56	Depth:0.0 To 30.0m	Date: 07-07-12 to11-07-12

JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH# :57	Depth:0.0 To 30.0m	Date: 21-06-12 to 24-06-12

JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:58	Depth:0.0 To 30.0m	Date: 21-06-12 to 24-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:59	Depth:0.0 To 30.0m	Date: 17-06-12 to 19-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH# :60	Depth:0.0 To 30.0m	Date: 16-06-12 to19-06-12

JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH # :61	Depth:0.0 To 30.0m	Date: 13-06-12 to15-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:62	Depth:0.0 To 30.0m	Date: 13-06-12 to 16-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH # :63	Depth:0.0 To 30.0m	Date: 09-06-12 to12-06-12

JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:64	Depth:0.0 To 30.0m	Date: 9-06-12 to 11-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:65	Depth:0.0 To 30.0m	Date: 05-06-12 to 7-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:66	Depth:0.0 To 30.0m	Date: 3-06-12 to 7-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:67	Depth:0.0 To 30.0m	Date: 25-05-12 to 30-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:68	Depth:0.0 To 30.0m	Date: 31-05-12 to 3-06-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:69	Depth:0.0 To 15.0m	Date: 20-05-12 to 23-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH# :70	Depth:0.0 To 15.0m	Date: 20-05-12 to 21-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH# :71	Depth:0.0 To 15.0m	Date: 23-05-12 to 24-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:72	Depth:0.0 To 15.0m	Date: 16-05-12 to 18-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:73	Depth:0.0 To 20.0m	Date: 15-05-12 to 18-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:74	Depth:0.0 To 20.0m	Date: 12-05-12 to 15-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH# :75	Depth:0.0 To 20.0m	Date: 11-05-12 to 14-05-12

JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:76	Depth:0.0 To 20.0m	Date: 07-05-12 to 10-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:77	Depth:0.0 To 20.0m	Date: 07-05-12 to 10-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:78	Depth:0.0 To 20.0m	Date: 4-05-12 to 6-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:79	Depth:0.0 To 20.0m	Date: 4-05-12 to 6-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:80	Depth:0.0 To 20.0m	Date: 01-05-12 to 03-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH # :81	Depth:0.0 To 20.0m	Date: 29-04-12 to 2-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:82	Depth:0.0 To 20.0m	Date: 26-04-12 to 29-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:83	Depth:0.0 To 20.0m	Date: 24-04-12 to 26-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:84	Depth:0.0 To 20.0m	Date: 21-04-12 to 23-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:85	Depth:0.0 To 20.0m	Date: 21-04-12 to 25-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:86	Depth:0.0 To 20.0m	Date: 17-04-12 to 20-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:87	Depth:0.0 To 15.0m	Date: 23-05-12 to 25-05-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:88	Depth:0.0 To 30.0m	Date: 18-07-12 to 21-07-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:89	Depth:0.0 To 15.0m	Date: 27-04-12 to 28-04-12
		JICA Study Team

Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		
KCR/BH#:90	Depth:0.0 To 15.0m	Date: 07-06-12 to 10-06-12
		JICA Study Team