

## **E. SOIL AND MATERIAL**

**E-1. Actual Quantities Lists**

**Actual Quantities of Soil Investigation Performed**

Borehole Location	Borehole Number	Drilling Depth(m)	Penetration Test (nos.)	Undisturbed Soil Sampling (no.)	Unit Weight (no.)	Moisture Content (nos.)	Specific Gravity (nos.)	Liquid and Plastic Limits (nos.)	Grading Analysis (nos.)	Unconfined Compression Test (no.)	Consolidation Test (no.)
Near Dutluur Pass	BH-1	10.26	8	-	-	-	-	-	-	-	-
Togos River	BH-1	11.20	11	-	-	1	1	-	1	-	-
	BH-2	15.22	15	-	-	-	-	-	-	-	-
	BH-1	12.33	12	-	-	-	-	-	-	-	-
Kherlen River	BH-2	15.31	15	-	-	1	1	-	1	-	-
	BH-3	12.24	12	-	-	1	1	1	1	-	-
	BH-4	3.00	-	1	1	-	-	-	-	1	1
	BH-1	9.35	9	-	-	1	1	-	1	-	-
Urugun Valley	BH-1	19.40	19	-	-	1	1	1	1	-	-
Urt Valley	BH-1	19.40	19	-	-	1	1	1	1	-	-
Murun River	BH-1	15.45	15	-	-	3	3	1	3	-	-
Swamp at Tsenkhermandal	-	-	-	-	-	-	1	1	-	-	-
Total		143.16	135	1	1	9	10	5	9	1	1

# Actual Quantities of Material Tests on Bulk Soil Samples Performed

No.	Sample No.*	Sampling Location		Grading Analysis (nos.)	Specific Gravity (nos.)	Moisture Content (nos.)	Liquid and Plastic Limits (nos.)	Compaction** Test (Series)	Soaked CBR*** (Series)
		N	E						
1	BCD-4	47°41'227	107°52'556	1	1	1	1	1	1
2	BCD-3	47°43'023	107°57'712	1	1	1	1	1	1
3	BCD-2	47°42'803	108°03'387	1	1	1	1	1	1
4	BCD-1	47°41'570	108°10'105	1	1	1	1	1	1
5	BC1A-2	47°39'155	108°17'453	1	1	1	1	1	1
6	BC1A-1A	47°41'534	108°23'349	1	1	1	1	1	1
7	BC1A-1B	47°41'534	108°23'349	1	1	1	1	1	1
8	BC4A-5	47°41'736	108°32'564	1	1	1	1	1	1
9	BC4A-4	47°45'384	108°37'606	1	1	1	1	1	1
10	BC4A-3	47°48'343	108°44'014	1	1	1	1	1	1
11	BC4A-2	47°47'154	108°50'181	1	1	1	1	1	1
12	BC4A-1	47°45'149	108°57'347	1	1	1	1	1	1
13	BC5-1	47°42'484	109°03'335	1	1	1	1	1	1
14	BC6-4	47°38'223	109°09'452	1	1	1	1	1	1
15	BC6-3	47°35'065	109°15'285	1	1	1	1	1	1
16	BC6-2	47°32'793	109°22'787	1	1	1	1	1	1
17	BC6-1	47°28'961	109°29'967	1	1	1	1	1	1
18	BC7-1	47°27'955	109°34'863	1	1	1	1	1	1
19	BC7-2	47°27'244	109°41'328	1	1	1	1	1	1
20	BC8-1	47°25'497	109°51'133	1	1	1	1	1	1
21	BC8-2	47°25'136	109°57'586	1	1	1	1	1	1
22	BC9-3	47°25'306	110°04'905	1	1	1	1	1	1
23	BC9-2	47°24'655	110°12'549	1	1	1	1	1	1
24	BC9-1	47°22'836	110°21'462	1	1	1	1	1	1
25	BC10-1	47°21'778	110°29'827	1	1	1	1	1	1
26	BC10-2	47°19'793	110°37'142	1	1	1	1	1	1
27	BC 4-1	47°45'814	108°51'149	No test was carried out.					
28	BPD-5	47°42'208	107°50'500	1	1	1	1	1	1
29	BPD-4	47°41'533	107°54'975	1	1	1	1	1	1
30	BPD-3	47°42'207	108°00'510	1	1	1	1	1	1
31	BPD-2	47°42'454	108°07'173	1	1	1	1	1	1
32	BPD-1	47°41'286	108°11'803	1	1	1	1	1	1
33	BP1A-2	47°38'712	108°16'600	1	1	1	1	1	1
34	BP1A-1	47°41'023	108°24'347	1	1	1	1	1	1
35	BP3A-1	47°41'907	108°27'102	1	1	1	1	1	1
36	BP4A-5	47°43'005	108°34'922	1	1	1	1	1	1
37	BP4A-4	47°47'229	108°39'724	1	1	1	1	1	1
38	BP4A-3	47°48'458	108°46'637	1	1	1	1	1	1
39	BP4A-2	47°45'287	108°54'323	1	1	1	1	1	1
40	BP5-1	47°44'648	108°59'570	1	1	1	1	1	1
41	Tin mine2	47°43'299	109°03'973	1	1	1	1	1	1
42	Tin mine1	47°40'640	109°07'966	1	1	1	1	1	1
43	BP6-3	47°38'853	109°15'469	1	1	1	1	1	1
44	BP6-2	47°33'955	109°19'720	1	1	1	1	1	1
45	BP6-1	47°32'376	109°23'126	1	1	1	1	1	1
46	BP7-1	47°28'185	109°32'330	1	1	1	1	1	1
47	BP7-2	47°27'193	109°39'934	1	1	1	1	1	1
48	BP7-3	47°26'642	109°44'519	1	1	1	1	1	1
49	BP8-1	47°27'095	109°47'594	1	1	1	1	1	1
50	BP9-3	47°24'313	110°01'365	1	1	1	1	1	1
51	BP9-2	47°24'239	110°14'123	1	1	1	1	1	1
52	BP9-1	47°23'190	110°20'311	1	1	1	1	1	1
53	BP10-2	47°23'083	110°27'021	1	1	1	1	1	1
54	BP10-1	47°21'581	110°36'300	1	1	1	1	1	1
55	BPD-4'	47°41'257	107°54'455	No test was carried out.					
56	BP 1A-1'	47°40'803	108°24'015	No test was carried out.					
57	BP 4-1	47°46'726	108°57'184	No test was carried out.					
Total		57 samples		53	53	53	53	53	53

\* BC: Samples taken along road alignment

\* BP: Samples taken from possible borrow pits

\*\* Modified Proctor test

\*\*\* CBR test at the optimum water content of the modified Proctor test.

Three test specimens were prepared using three different compaction energy, 10, 25 and 56 blows per layer

### Actual Quantities of Aggregate Tests on Rock Samples

No.	Name of Sampling Location	Sampling Location		Production of Aggregate (nos.)	Los Angeles Abrasion Test (nos.)	Soundness* Test (nos.)	Specific Gravity and Absorption** Test (nos.)	Flakyness Index (nos.)	Stripping of Bitumen-Aggregate Mixture (nos.)
		N	E						
1	Quarry at Tumur Ulgi Mt.	47°42'932	108°25'846	1	1	1	2	1	1
2	Stock Pile of Tailing Deposit (Boulder) at Ex-Tsenkhermandal Tin Mine	47°40'640	109°07'966	1	1	1	2	1	1
3	Delger Mt. at Murun	47°23'308	110°23'202	1	1	1	2	1	-
Total				3	3	3	6	3	2

\* Soundness test by sodium sulphate

\*\* One each for two different sizes of aggregate

**Actual Quantities of Sieving Analysis Performed on Sand Samples  
Taken from Possible Sources of Fine Aggregate**

No.	Name of Samples and/or Sampling Location	Sampling Location		Sieving Analysis (nos.)
		N	E	
1	Zoomond Sand Pit	47°47'163	107°28'892	1
2	Kherlen River	47°41'765	108°28'999	1
3*	Ex-Tsenkhermandal Tin Mine	47°43'299	109°03'973	(1)
4	Gold Mine at Tsenkher	47°35'109	109°11'790	1
5	Murun	47°23'252	110°16'188	1
6	Undurkhaan Sand Pit	47°26'633	110°40'159	1
Total				5(6)

\* This sample is same as the bulk soil sample for CBR test, Tin Mine-2.

**Actual Quantities of Cement Stabilization Test Performed**

No.	Name of Samples and/or Sampling Location	Sampling Location		Sieving Analysis (nos.)
		N	E	
1	Zoomond Sand Pit	47°41'765	108°28'999	1
2	Kherlen River	47°24'239	108°14'123	1
Total				2

## E-2. Drilling Logs

FIG DRILLING LOG										Remarks											
Project No. _____		Project <u>The Feasibility Study on</u> <u>Construction of Eastern Ardenal</u> <u>Road in Manigallo</u>				Type of Drilling <u>Dry Coring</u>				D : Dynamic Cone Penetration Test											
Hole Number <u>BH-1 near Outflow Pass</u> <u>N47°42'00" E 107°57'01"</u>		Date <u>01/06/01</u>				Driller <u>Is. Gonsalves</u>															
Water Table _____ m.																					
Scale in m	Elevation in m	Depth in m	Thickness in m	Legend	Type of Soil	Colour	Relative Density or Consistency	General Remarks	Sampling		Dynamic Cone Penetration Test										
									Depth in m	Sample No.	N-Value Blows/30cm	Blows Per Each 15 cm			N - Value 10 20 30 40 50						
1				△	Silty Sand with Gravel			Fill (Rock 10) Max size of rock fragments: 200mm													
2		2.10	2.10	△	Silty Sand with Gravel	Greyish Brown to Grey	Very Dense	Gravel consists of weathered rock fragments of 2 to 4cm in length.													
3				△					3.15 3.38	0-10	30/23	15	35	15/8	50	BLWS/23cm					
4				△					4.15 4.32	0-20	53/48	21	43	10/3	53	BLWS/48cm					
5				△					5.15 5.32	0-30	54/47	24	44	10/2	54	BLWS/47cm					
6				△					6.15 6.32	0-40	55/47	26	45	10/2	55	BLWS/47cm					
7				△					7.15 7.31	0-50	52/46	25	47	5/1	52	BLWS/46cm					
8				△					8.15 8.25	0-60	50/40	31	50/10		50	BLWS/40cm					
9		8.50	7.40	△					9.15 9.32	0-70	56/47	26	46	10/2	56	BLWS/47cm					
10		10.26	0.76	△	Silty Sand and Gravel	Greyish Brown	Very Dense	Consisting of weathered rock fragments.	10.15 10.26	0-80	50/41	33	50/11		50	BLWS/41cm					
11					-END OF DRILLING-																
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Prepared by: \_\_\_\_\_
Checked by: \_\_\_\_\_
Approved by: \_\_\_\_\_

# FIG DRILLING LOG

Project No. \_\_\_\_\_ Project The Feasibility Study on Type of Drilling Dry Coring  
Construction of Eastern Arterial  
Road in Mongolia  
Hole Number BH-1 at Togos River Date 30/05/01 & 31/05/01  
Water Table GL-7.5 m. Driller \_\_\_\_\_

## Remarks

D : Dynamic Cone Penetration Test  
A frozen zone was encountered

Scale in m	Elevation in m	Depth in m	Thickness in m	Legend	Type of Soil	Colour	Relative Density or Consistency	General Remarks	Sampling		Dynamic Cone Penetration Test										
									Depth in m	Sample No.	N-Value Blows/30cm	Blows Per Each 15 cm			N - Value						
												15cm	15cm	15cm		10	20	30	40	50	
1		0.30	0.30		Silty Sand and Gravel	Dark Brown Light Brownish Grey to Greyish Brown	Very Dense	Sand is fine grained. With roots at top. With gravel at bottom.	115 123	D-1	50/8	46	50/8			50	BLWS/8cm				
2					Sand and Gravel			Sand is fine to medium grained. Gravel: Subangular to subrounded $\phi$ max 80mm. $\phi$ prevailing < 25mm. With silt throughout of the layer.	215 220	D-2	50/5	39	50/5			50	BLWS/5cm				
3		3.00	2.70		Sand and Gravel	Brown to Brownish Grey	Very Dense	Sand is fine to coarse grained. Gravel: Subangular to subrounded $\phi$ max 90mm. $\phi$ prevailing < 15mm. Silt content is higher than the above layer.	315 322	D-3	50/7	36	50/7			50	BLWS/7cm				
4		4.50	1.50		Silty Sand and Gravel	Greyish Brown	Very Dense	Sand is fine to coarse grained. Gravel: Subangular to subrounded $\phi$ max 90mm. $\phi$ prevailing < 15mm. Silt content is higher than the above layer.	415 432	D-4	60/17	26	50	10/2		60	BLWS/17cm				
5					Silty Sand and Gravel			Sand is fine to coarse grained. Gravel: Subrounded $\phi$ max 80mm (Trace) $\phi$ prevailing < 20mm.	515 530	D-5	58/17	21	48	10/2		58	BLWS/17cm				
6					Silty Sand and Gravel				615 625	D-6	50/10	34	50/10			50	BLWS/10cm				
7					Silty Sand and Gravel				715 733	D-7	55/18	24	45	10/3		55	BLWS/18cm				
8		7.50	3.00		Silty Clay	Brownish Grey	Very Stiff	Plastic. Moist ~ wet	815 825	D-8	50/8		50/8			50	BLWS/8cm				
9		8.00	0.50		Silty Sand and Gravel	Brownish Grey to Grey	Very Dense	Sand is fine to coarse grained. Gravel: Subrounded $\phi$ max 90mm (Trace) $\phi$ prevailing < 10mm. Very silty throughout of the layer.	915 923	D-9	50/8	32	50/8			50	BLWS/8cm				
10					Silty Sand and Gravel				1015 1022	D-10	50/7	35	50/7			50	BLWS/7cm				
11		11.20	3.20		Silty Sand and Gravel				1115 1120	D-11	50/5	39	50/5			50	BLWS/5cm				
12					-END OF DRILLING-																
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Prepared by: \_\_\_\_\_

Checked by: \_\_\_\_\_

Approved by: \_\_\_\_\_

## FIG DRILLING LOG

Project No.

Project The Feasibility Study on

Type of Drilling Dry Coring

Hole Number BH-2 at Togos River

Road in Monachio

Date 01/06/01

Water Table GL-6.6 m

Driller

Remarks

D : Dynamic Cone Penetration Test

[illegible]

Prepared by:

Checked by:

Approved by:



# FIG DRILLING LOG

Project No. \_\_\_\_\_

Project The Feasibility Study on  
Construction of Eastern Arterial  
Road in Mongolai

Type of Drilling Dry Coring

Hole Number BH-1 of Khelen River

Date 26/05/01 & 27/05/01

Water Table GL-1.0 m.

Driller \_\_\_\_\_

## Remarks

D : Dynamic Cone Penetration Test

Frozen between 2.0 and 2.5m

Scale in m	Elevation in m	Depth in m	Thickness in m	Legend	Type of Soil	Colour	Relative Density or Consistency	General Remarks	Sampling		Dynamic Cone Penetration Test				
									Depth in m	Sample No.	N-Value Blows/30cm	Blows Per Each 15 cm	15cm	15cm	N - Value 10 20 30 40 50
1					Sand with Gravel	Light Brown	Very Dense	Sand is fine to coarse grained. Gravel: subrounded $\phi$ max. 100mm. $\phi$ prevailing < 30mm. Very few silt and clay content throughout of the layer.	1.15	D-18	50/25	8	27	23/10	50 BLOWS/25cm
2									1.40						
3									2.00	D-2	50/5	50/5			
4		3.50	3.50		Sand	Light Brown	Very Dense	Sand is fine to medium grained.	2.05						
5		4.00	0.50		Sand and Gravel	Light Brown	Very Dense	Sand is fine to coarse grained. Subrounded gravel $\phi$ max. 70mm. $\phi$ prevailing < 25mm.	3.15	D-28	50/23	16	32	18/8	50 BLOWS/25cm
6		5.00	1.00		Silty Sand with Gravel	Bluish Grey	Very Dense	Sand is fine grained. Gravel: subrounded $\phi$ max. 40mm. $\phi$ prevailing: 40mm.	3.38						
7		6.50	1.50		Silty Sand with Gravel	Bluish Grey to light Brownish Grey	Very Dense	Sand is fine grained. Very silty throughout of the layer. Gravel: subrounded $\phi$ max. 60mm. $\phi$ prevailing: 20mm. Gravel content is high at 9m and 10m. With sand lenses between 8.5m and 9m.	4.15	D-4	51/20	18	41	19/5	51 BLOWS/20cm
8									4.35						
9									5.15	D-53	50/20	20	39	11/5	50 BLOWS/20cm
10									5.35						
11									6.15	D-6	56/18	24	46	10/3	56 BLOWS/18cm
12		12.33	5.83						6.33						
13									7.15	D-7	50/20	15	54	16/5	50 BLOWS/20cm
14									7.35						
15									8.15	D-8	51/20	18	39	12/5	51 BLOWS/20cm
16									8.35						
17									9.15	D-9	50/12	35	50/12		50 BLOWS/12cm
18									9.27						
19									10.15	D-10	50/11	33	50/11		50 BLOWS/11cm
20									10.26						
21									11.15	D-11	50/13	29	50/13		50 BLOWS/13cm
22									11.28						
23									12.15	D-12	58/18	25	48	10/3	58 BLOWS/18cm
24									12.33						
25															
26															
27															
28															
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30															
31															

Prepared by: \_\_\_\_\_

Checked by: \_\_\_\_\_

Approved by: \_\_\_\_\_

# FIG DRILLING LOG

Project No. \_\_\_\_\_

Project: The Feasibility Study on  
Construction of Eastern Arterial  
Road in Mongolia

Type of Drilling Dry Coring

Hole Number BH-2 at Kherlen River

Date 21/05/01 & 29/05/01

Water Table 2.10 m.

Driller \_\_\_\_\_

## Remarks

D : Dynamic Cone Penetration Test  
Forzen between 2.0m and 2.5m

Scale in m	Elevation in m	Depth in m	Thickness in m	Legend	Type of Soil	Colour	Relative Density or Consistency	General Remarks	Sampling		Dynamic Cone Penetration Test										
									Depth in m	Sample No.	N - Value Blows/30cm	Blows Per Each 15 cm			N - Value						
												15cm	15cm	15cm	10	20	30	40	50		
1					Sand and Gravel	Light Brown	Very Dense	Sand is fine to coarse grained. Gravel: Subrounded max 40mm. Prevailing: 10mm. Very few silt and clay content throughout of the layer.	1.15 1.43	D-18	50/28	6	22	28/13			50	BLOWS/28cm			
2									2.00 2.08	D-2	50/8	50/8									
3									3.15 3.36	D-2	50/21	19	39	11/8			50	BLOWS/21cm			
4									4.15 4.33	D-4	50/16	21	43	7/3			50	BLOWS/16cm			
5		5.50	5.50						5.15 5.32	D-5	56/17	26	48	8/2			56	BLOWS/17cm			
6					Silty Sand and Gravel	Bluish Grey to slightly Brownish and Bluish Grey	Very Dense	Sand is fine grained. Very silty throughout of the layer. Gravel: subrounded max 20mm. Prevailing < 20mm. Gravel Content is low at 6 and 9m.	6.15 6.29	D-6	50/14	30	50/14				50	BLOWS/14cm			
7									7.15 7.27	D-7	50/12	52	50/12				56	BLOWS/12cm			
8									8.15 8.27	D-8	50/12	31	50/12				50	BLOWS/12cm			
9									9.15 9.29	D-9	50/14	30	50/14				50	BLOWS/14cm			
10									10.15 10.32	D-10	56/17	28	46	10/2			56	BLOWS/17cm			
11									11.15 11.32	D-11	50/17	19	36	12/2			50	BLOWS/17cm			
12									12.15 12.37	D-12	50/22	18	29	21/7			50	BLOWS/22cm			
13									13.15 13.33	D-13	50/18	24	42	8/3			50	BLOWS/18cm			
14									14.15 14.35	D-14	50/20	19	39	11/5			50	BLOWS/20cm			
15		15.31	9.81						15.15 15.31	D-15	50/16	23	42	8/1			50	BLOWS/16cm			
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Prepared by: \_\_\_\_\_

Checked by: \_\_\_\_\_

Approved by: \_\_\_\_\_

# FIG DRILLING LOG

Project No. \_\_\_\_\_

Project The Feasibility Study on  
Construction of Eastern Arterial  
Road in Mongolia

Type of Drilling Dry Coring

Hole Number BH-3 at Kherlen River

Date 29/05/01

Water Table GL -0.55 m.

Driller \_\_\_\_\_

## Remarks

D : Dynamic Cone Penetration Test  
UD : Open Drive Sampler  
Frozen between 1.0m and 3.0m

Scale in m	Elevation in m	Depth in m	Thickness in m	Legend	Type of Soil	Colour	Relative Density or Consistency	General Remarks	Sampling	Dynamic Cone Penetration Test										
										Depth in m	Sample No.	N-Value Blows/30cm	Blows Per Each 15 cm			N - Value				
													15cm	15cm	15cm	10	20	30	40	50
1		0.50	0.50		Organic Clayey Silty Clay	Black	Very Soft	With silty. With very fine sand.	0.50 0.50 1.00 1.10	10-1	Recovery = 130 cm									
2					Silty Clay	Dark Grey	(Very Soft)	High moisture content Plastic. With very fine sand throughout of the layer.	2.00 2.08	D-2	50/8 50/8									
3		3.00	2.50		Sand and Gravel	Greyish Brown	Very Dense	Sand is fine to coarse grained. Gravel: subrounded $\phi$ max 50mm $\phi$ prevailing 10mm.	3.15 3.36	D-3	50/21	16	36	14/8	50 BLOWS/21cm					
4		4.00	1.00		Clayey Sand with Gravel	Grey	Very Dense	Gravel: subrounded $\phi$ max 50mm $\phi$ prevailing 20mm.	4.15 4.40	D-4	50/25	21	29	21/10	50 BLOWS/25cm					
5		5.00	1.00		Sand with Gravel	Brown	Very Dense	Sand is fine to coarse grained. Gravel: subrounded $\phi$ max 80mm $\phi$ prevailing 10mm.	5.15 5.32	D-5	50/17	18	43	7/2	50 BLOWS/17cm					
6		6.00	1.00		Silty Sand with Gravel	Bluish Grey	Very Dense	Sand is fine grained. Very silty throughout of the layer. Gravel: subrounded $\phi$ max 30mm $\phi$ prevailing < 10mm.	6.15 6.30	D-6	50/15	28	50/15		50 BLOWS/15cm					
7									7.15 7.31	D-7	51/16	20	46	5/1	51 BLOWS/16cm					
8									8.15 8.31	D-8	53/16	23	48	5/1	53 BLOWS/16cm					
9									9.15 9.33	D-9	51/16	19	41	10/3	51 BLOWS/16cm					
10		10.50	4.50		Sand and Gravel	Light Brownish Grey	Very Dense	Sand is fine to coarse grained. Gravel: subrounded $\phi$ max 90mm $\phi$ prevailing 20mm.	10.15 10.31	D-10	50/16	24	45	5/1	50 BLOWS/16cm					
11		11.50	1.00		Silty Sand and Gravel	Light Brownish Grey	Very Dense	Sand is fine grained. Very silty. Gravel subrounded $\phi$ max 30mm.	11.15 11.29	D-11	50/14	31	50/14		50 BLOWS/14cm					
12		12.24	6.74		Sand and Gravel				12.15 12.24	D-12	50/9	30	50/9		50 BLOWS/9cm					
13					-END OF DRILLING-															
14																				
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Prepared by: \_\_\_\_\_

Checked by: \_\_\_\_\_

Approved by: \_\_\_\_\_

# FIG DRILLING LOG

Project No. \_\_\_\_\_

Project The Feasibility Study on  
Construction of Eastern Arterial  
Road in Mongolia

Type of Drilling Dry Coring

Hole Number BH-4 at Kherlen River

Date 30/05/01

Water Table 0.40 m

Driller \_\_\_\_\_

## Remarks

Frozen between 1.0 and 2.8m

Scale in m	Elevation in m	Depth in m	Thickness in m	Legend	Type of Soil	Colour	Relative Density or Consistency	General Remarks	Sampling		Dynamic Cone Penetration Test									
									Depth in m	Sample No	N-Value Blows/30cm	Blows Per Each 15 cm			N - Value					
												15cm	15cm	15cm	10	20	30	40	50	
1		0.50 0.80	0.50 0.30	 	Silty Sand Sand and Gravel	Dark Grey Grey		With many roots of the first 10cm. With organic fragment. Occasional with gravel. With silt. max 60mm.												
2					Silty Clay	Dark Grey		Occasionally with fine grained Gravel max 30mm. This layer of gravel at 1.5 and 2.0m												
3		2.80	2.00		Sand with Gravel			max 70mm.												
4		3.00	0.20		-END OF DRILLING-															
5																				
6																				
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Prepared by: \_\_\_\_\_

Checked by: \_\_\_\_\_

Approved by: \_\_\_\_\_

# FIG DRILLING LOG

Project No. \_\_\_\_\_

Project The Feasibility Study on  
Construction of Eastern Arterial  
Road in Mongolia

Type of Drilling Dry Coring

Hole Number BH-1 of Tsenshiher River

Date 24/05/01 & 25/05/01

Water Table 0.90 m.

Driller \_\_\_\_\_

## Remarks

D : Dynamic Cone Penetration Test  
Forces between 2.0 and 2.5m

Scale in m	Elevation in m	Depth in m	Thickness in m	Legend	Type of Soil	Colour	Relative Density or Consistency	General Remarks	Sampling		Dynamic Cone Penetration Test																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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Prepared by: \_\_\_\_\_

Checked by: \_\_\_\_\_

Approved by: \_\_\_\_\_

# FIG DRILLING LOG

Project No. \_\_\_\_\_  
 Hole Number 081-1 of Urgan Valley  
 N47°38'66" E109°8'97"  
 Water Table QL-8.0 m

Project The Feasibility Study on  
 Construction of Eastern Arterial  
 Road in Mongolia

Type of Drilling Dry Casing  
 Date 23/05/01  
 Driller \_\_\_\_\_

## Remarks

D : Dynamic Cone Penetration Test  
 A cone with 50.5mm in dia. End 60° of angle of apex is used.  
 Frozen between 2.0 and 2.5m  
 Final casing depth is 13m

Scale in m	Elevation in m	Depth in m	Thickness in m	Legend	Type of Soil	Colour	Relative Density or Consistency	General Remarks	Sampling		Dynamic Cone Penetration Test																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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1		0.30 0.80	0.30 0.50		Silty Sand Sand and Gravel	Black Light Brown		Sand is very fine grained. Very silty. Roots at top.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															

Prepared by: \_\_\_\_\_

Checked by: \_\_\_\_\_

Approved by: \_\_\_\_\_

# FIG DRILLING LOG

Project No. \_\_\_\_\_

Project The Feasibility Study on  
Construction of Eastern Arterial  
Road in Mongolia

Type of Drilling Dry Coring

Hole Number BH-1 at Uri Valley  
N47 34'28" E 109°24'872

Date 21/05/01

Water Table GL-8.6 m.

Driller \_\_\_\_\_

## Remarks

D : Dynamic Cone Penetration Test  
Coring depth : 15m  
Seepage of water at 12.5m  
Foster between 2.3 and 3.0m  
The sample at 17m could not be recovered due to  
caving of the wall

Scale in m	Elevation in m	Depth in m	Thickness in m	Legend	Type of Soil	Colour	Relative Density or Consistency	General Remarks	Sampling		Standard Penetration Test								
									Depth in m	Sample No.	N-Value Blows/30cm	Blows Per Each 15 cm	N - Value						
											15cm	15cm	15cm	10	20	30	40	50	
1		0.40	0.40		Silty Sand	Dark Grey		With roots at top. Subangular gravel, $\phi$ max 80mm. Prevailing < 20mm.	1.15	D-1	54	9	24	30					
2		1.50	1.10		Clayey Sand and Gravel	Reddish Brown	Very Dense	Moist. Gravel: subangular/subrounded gravel. Boulder at bottom $\phi$ 200mm. Prevailing < 30mm.	1.45										
3		2.00	0.50		Clayey Sand and Gravel	Light Brown	Very Dense		2.00	D-2	50/70	50/70							
4		2.50	0.50		Clayey Sand and Gravel	Reddish Brown		Gravel: $\phi$ max 80mm. Prevailing < 30mm.	2.10										
5		2.75	0.25		Silty Clay	Reddish Brown	Stiff	Gravel: $\phi$ max 80mm. Prevailing < 40mm.	3.15	D-3	13	7	7	6					
6								With boulder, max 120mm.	3.45										
7							Medium	Moist. Traces of subangular gravel throughout of the layer.	4.15	D-4	4	2	2	2					
8								$\phi$ max 80mm. Prevailing < 10mm.	4.45										
9								Trace of fine sand throughout of the layer. Sandy clay between 7.0 and 7.8m.	5.15	D-5	11	3	5	6					
10									5.45										
11							Stiff to Very Stiff		6.15	D-6	10	3	5	5					
12									6.45										
13									7.15	D-7	18	5	8	10					
14									7.45										
15		12.50	9.75		Sandy Silt	Reddish Brown	Stiff to Very Stiff	Sand is very fine grained.	8.15	D-8	11	3	5	6					
16									8.45										
17									9.15	D-9	14	4	6	8					
18									9.45										
19									10.15	D-10	23	11	10	13					
20									10.45										
21		14.50	2.00		Clayey Sand with Gravel	Reddish Brown	Very Dense	Gravel is subangular to subrounded type. Prevailing < 30mm. Trace of boulder throughout of the layer. Very clayey throughout of the layer.	11.15	D-11	11	4	5	6					
22									11.45										
23									12.15	D-12	14	4	6	8					
24									12.45										
25									13.15	D-13	14	3	6	8					
26									13.45										
27									14.15	D-14	16	4	7	9					
28									14.45										
29									15.15	D-15	50/8	46	50/8						
30									15.23										
31									16.15	D-16	50/12	52	50/12						
32									16.27										
33		17.90	3.40		Clayey Sand and Gravel	Light Brown	Very Dense	Sand is fine to coarse grained. Gravel: subangular. $\phi$ max 50mm. Prevailing < 10mm. Less clay content in upper layer.	17.15	D-17	50/10	50	50/10						
34		19.40	1.50						17.25										
35								-END OF DRILLING-	18.15	D-18	53/25	25	28	25/10					
36									18.40										
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Prepared by: \_\_\_\_\_

Checked by: \_\_\_\_\_

Approved by: \_\_\_\_\_

# FIG DRILLING LOG

Project No. \_\_\_\_\_ Project The Feasibility Study on \_\_\_\_\_ Type of Drilling Dry Core  
 Hole Number BH-1 at Munan River Construction of Eastern Arterial Road in Mongalla Date 09/05/01 - 10/05/01  
 Water Table GL-0.35 m Driller Ts. Gansiah

**Remarks**  
 D : Dynamic Cone Penetration Test  
 Forzen between 0.40 and 2.50m

Scale in m	Elevation in m	Depth in m	Thickness in m	Legend	Type of Soil	Colour	Relative Density or Consistency	General Remarks	Sampling		Dynamic Cone Penetration Test								
									Depth in m	Sample No.	N-Value Blows/30cm	Blows Per Each 15 cm			N - Value				
												15m	15m	15m	10	20	30	40	50
1		0.40 0.80	0.40 0.40		Silty Sand	Grey		Top 10mm with roots. Sand is very fine grained.	1.15 1.20	D-1	50/5	40	50/5						
2		1.30	0.50		Sandy Silty Sand and Gravel	Light Grey		Plastic. High moisture content with organic fragments. Sand is fine to coarse grained. $\phi_{max}$ 300mm.	2.15 2.18	D-2	50/3	50	50/3						
3		3.00	1.70		Sand and Gravel	Light Brown		Sand is fine to coarse grained. With boulder. $\phi_{max}$ 150mm. $\phi_{prevailing} < 30mm$ .	3.15 3.40	D-3	44	7	20	24					
4		4.00	1.00		Silty Sand and Gravel	Brownish Grey	Dense	$\phi_{max}$ 150mm. $\phi_{prevailing} < 30mm$ .	4.15 4.45	D-4	47	7	25	22					
5					Sand with Gravel	Light Brown to Brown	Dense to Very Dense	Sand is fine to coarse grained. $\phi_{max}$ 40mm. $\phi_{prevailing} < 10mm$ .	5.15 5.45	D-5	56	8	25	31	56 BLOWS/30cm				
6		5.80	1.80		Silty Sand and Gravel	Light Bluish Grey	Very Dense	With boulder occasionally. $\phi_{max}$ 130mm. $\phi_{prevailing} < 30mm$ . Less gravel contents at 7 m.	6.15 6.40	D-6	105/25	16	55	50/10	105 BLOWS/25cm				
7					Silty Sand and Gravel				7.15 7.40	D-7	108/25	16	58	50/10	108 BLOWS/25cm				
8		6.50	2.70		Silty Clay				8.15 8.35	D-8	110/20	18	60	50/5	110 BLOWS/20cm				
9		9.00	0.50		Silty Sand and Gravel	Light Bluish Grey	Very Dense	With boulder occasionally. $\phi_{max}$ 130mm. $\phi_{prevailing} < 30mm$ . Less gravel contents at 9m.	9.15 9.40	D-9	105/25	20	55	50/10	105 BLOWS/25cm				
10		10.80	2.30		Silty Clay	Yellowish Brown	Hard	Moist. Traces of sand seams.	10.15 10.38	D-10	108/23	20	58	50/8	108 BLOWS/23cm				
11		11.50	0.70		Sand	Brown Bluish Grey	Medium	Sand is very fine grained. With some silt at bottom.	11.15 11.45	D-11	32	10	20	12					
12					Sand	Brown Bluish Grey	Medium		12.15 12.45	D-12	20	6	9	11					
13									13.15 13.45	D-13	23	7	10	13					
14		14.50	3.00		Sand and Gravel	Bluish Grey	Dense	Sand is fine to coarse grained. Gravel is subangular one dia. 15 to 25mm.	14.15 14.45	D-14	27	7	12	15					
15		15.45	0.95		Sand and Gravel				15.15 15.45	D-15	31	9	13	18					
16					-END OF DRILLING-														
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Prepared by: \_\_\_\_\_

Checked by: \_\_\_\_\_

Approved by: \_\_\_\_\_



### E-3. Summary of Laboratory Soil Tests

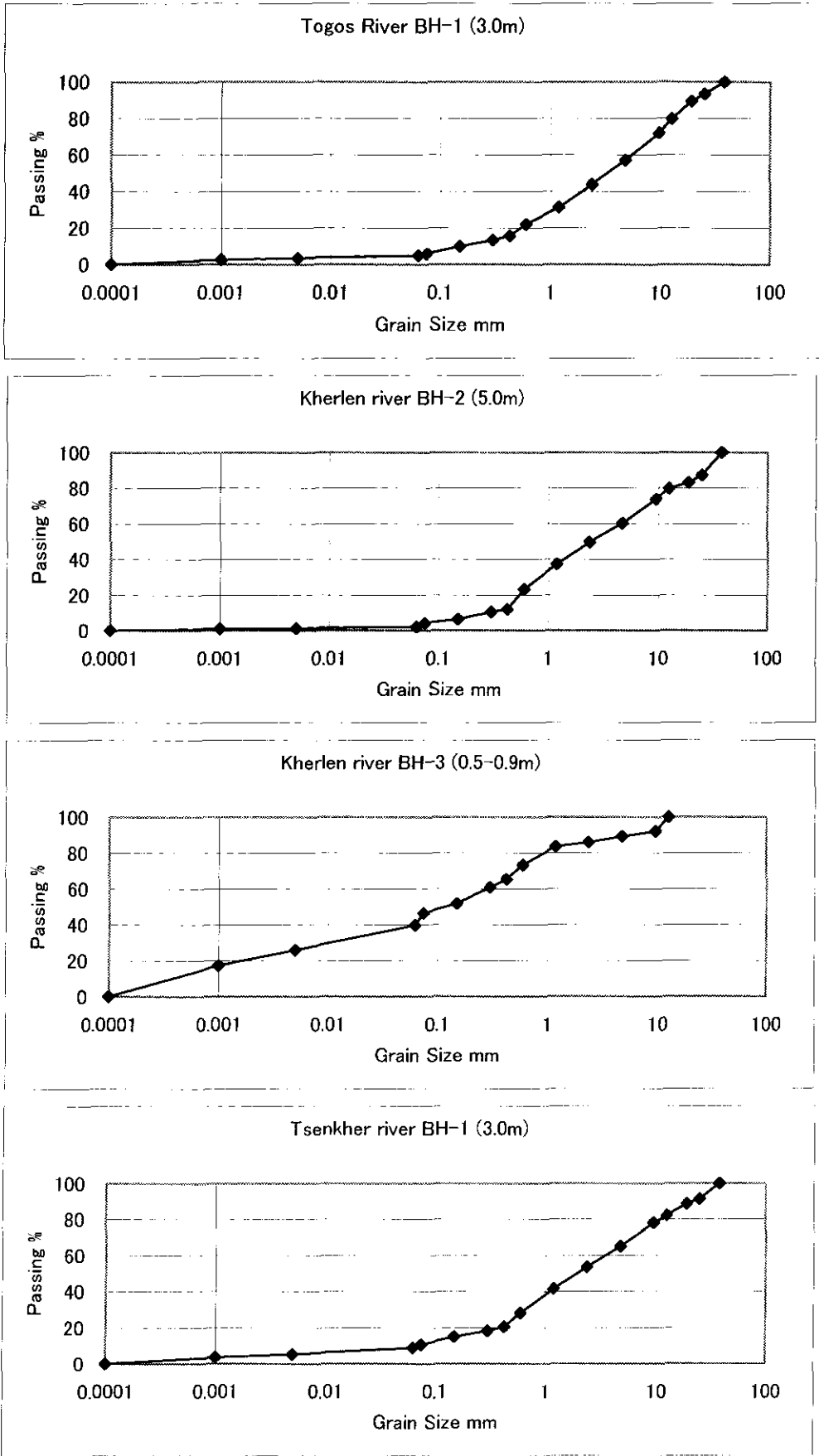
Summary of Laboratory Soil Tests on Samples Collected from Boreholes

Borehole No.	Togos River BH-1	Kherlen River BH-2	Kherlen River BH-3	Tsenkher River BH-1	Urugun Valley BH-1	Urt Valley BH-1	Murun River BH-1	Murun River BH-1	Swamp at Tsenkhermandal
Sampling depth (m)	3.0	5.0	0.5 to 0.9	3.0	4.0	8.0	0.4 to 0.9	4.0	0.15
Natural Moisture Content (%)	7.3	7.7	28.8	8.1	17.4	20.9	9.1 39.6**	8.3	-
Specific Gravity	2.68	2.65	2.57	2.67	2.68	2.66	2.65	2.67	2.68
Wet Density (g/cm <sup>3</sup> )	-	-	1.763	-	-	-	-	-	-
Liquid Limit (%)	-	-	22.0	-	14.8	28.5	-	-	18.8
Plastic Limit (%)	-	-	16.9	-	12.1	18.1	-	-	6.3
Plasticity Index	-	-	5.0	-	3	10	-	-	13
Gravel Content * (%)	43	40	11	35	2	5	38	8	-
Sand Content (%)	51	56	42	55	47	44	61	81	-
Clay and Silt Content (%)	6	4	47	10	51	51	1	11	-
Unified Soil Classification	SW - SM	SW	SC-SM	SW - SM	ML	CL	SW	SW - SM	CL
Compression Index	-	-	0.18	-	-	-	-	-	-
Unconfined Compressive Strength (KN/m <sup>2</sup> )	-	-	15.0	-	-	-	-	-	-

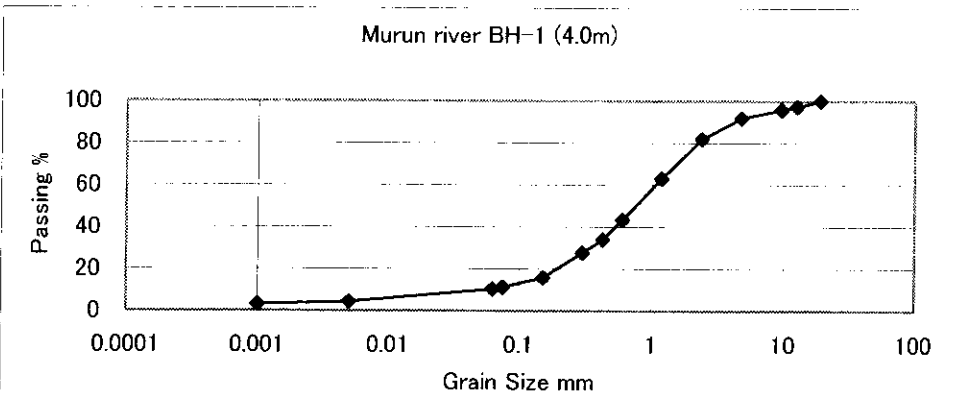
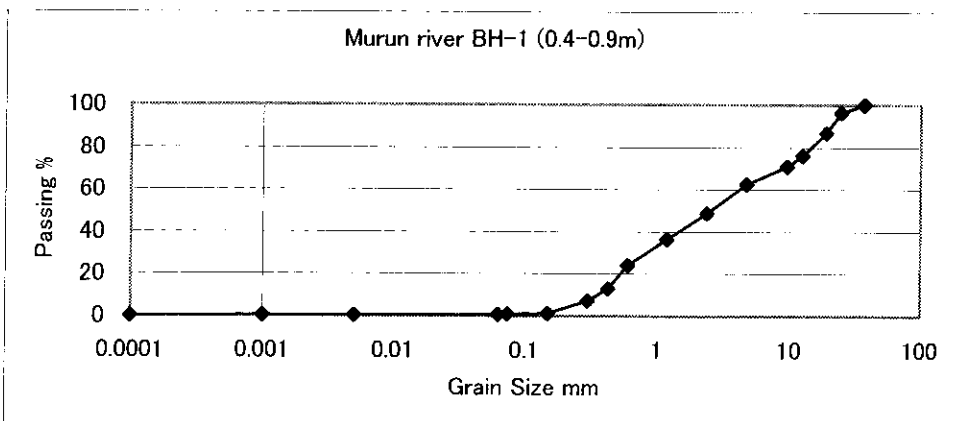
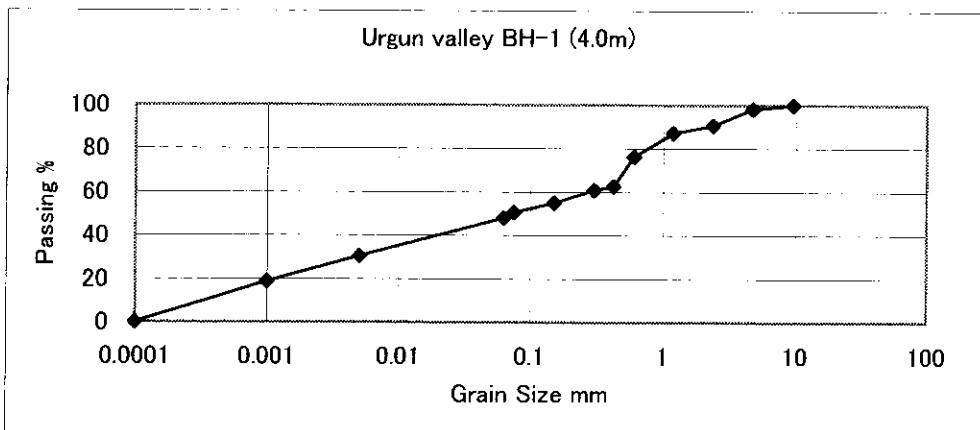
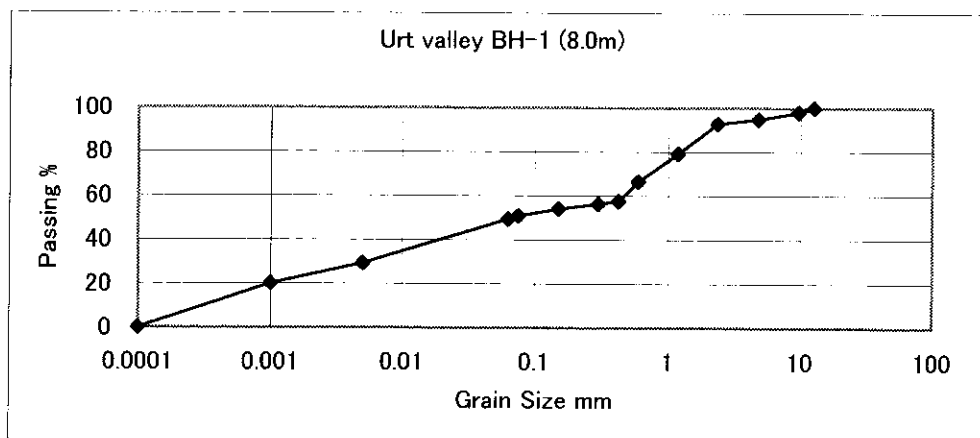
\* Retained on a 4.75mm sieve

\*\* Sample contains organic matter.

**E-4. Grading Curves of Samples**

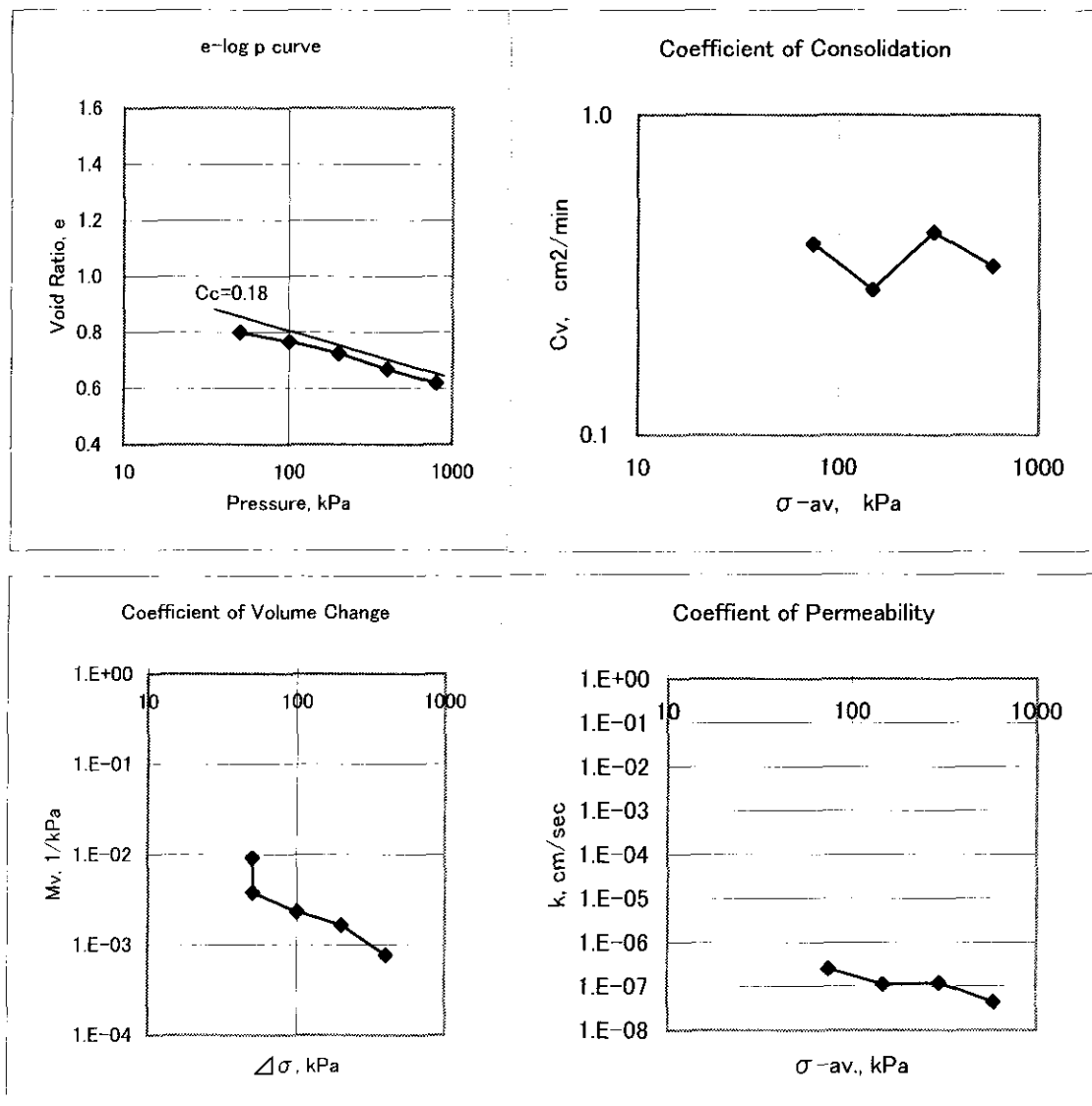


**Grading Curves of Samples Taken from Boreholes**



**Grading Curves of Samples Taken from Boreholes**

## E-5. Consolidation Test Results



Consolidation Test Results (BH-3 at Kherlen River)

Initial condition of soil		Final condition of soil
Gs	2.58	2.58
W, %	28.8	18.8
e	0.88	0.62
$\gamma_t, \text{g/cm}^3$	1.763	1.89
$\gamma_d, \text{g/cm}^3$	1.37	1.59
Sr, %	84	78
Hs, mm	13.26	13.26

		Settlement, mm					
Pressure, kPa	Time, m	0	50	100	200	400	800
	0		0.040	1.140	1.587	2.125	2.865
	0.1		0.205	1.210	1.760	2.360	3.110
	0.25		0.390	1.215	1.770	2.375	3.125
	0.5		0.505	1.220	1.780	2.395	3.140
	1		0.622	1.250	1.787	2.505	3.200
	2		0.690	1.280	1.822	2.535	3.245
	4		0.860	1.325	1.880	2.565	3.270
	8		0.935	1.370	1.935	2.600	3.300
	15		1.041	1.415	1.980	2.620	3.350
	30		1.057	1.440	2.010	2.660	3.400
	60		1.085	1.475	2.035	2.700	3.445
	120		1.117	1.547	2.045	2.745	3.480
	900		1.137	1.580	2.107	2.845	3.527
	1440	0	1.140	1.587	2.125	2.865	3.532
f		1.88	1.799	1.765	1.725	1.669	1.619
e <sub>f</sub>		0.88	0.799	0.765	0.725	0.669	0.619
t <sub>50</sub>			—	3.00	4.00	2.50	3.00
h-average		2.50	2.44	2.36	2.31	2.25	2.18
C <sub>v</sub> , cm <sup>2</sup> /min				0.39	0.28	0.43	0.34
M <sub>v</sub> , /kPa			9.1E-03	3.8E-03	2.3E-03	1.6E-03	7.6E-04
k, cm/s				2.5E-07	1.1E-07	1.2E-07	4.3E-08
$\Delta\sigma$ , kPa			50	50	100	200	400
$\sigma$ -average, kPa			25	75	150	300	600

Summary of Consolidation Test Results (BH-3 at Kherlen River)

Material Test Results of Bulk Soil Samples Taken along Road Alignment

Sample No.	Sampling Location		Sampling Depth (m)	Geological Unit	AASHTO Soil Classification	Grading Analysis (%)			LL (%)	Ip	Wn (%)	Wopt (%)	MDD g/cm <sup>3</sup>		CBR-value (%)	
	N	E				G	S	F							95%MDD	98%MDD
BCD-4	47°41'227	107°52'556	0.3 to 0.7	Aeolian /Talus deposits	A-2-4	58	21	21	30	10	5.2	4.8	2.229	7	11	
BCD-3	47°43'023	107°57'712	0.45 to 1.00	Talus/ fan deposits	A-2-4	35	54	11	27	9	4.9	6.2	2.125	-	5	
BCD-2	47°42'803	108°03'387	0.2 to 0.4	Fluvial deposit	A-1-a	53	37	10	Non plastic		5.6	11.5	1.753	-	24	
BCD-1	47°41'570	108°10'105	0.45 to 1.00	Alluvial deposit	A-2-4	14	59	27	12	2	4.8	14.1	1.830	14	19	
BC1A-2	47°39'155	108°17'453	0.30 to 1.00	Fluvial deposit	A-1-a	52	37	15	Non plastic		4.4	4.6	1.855	-	14	
BC1A-1A	47°41'533	108°23'352	0.25 to 0.60	Alluvial deposit	A-1-b	42	46	12	19	3	4.2	4.3	2.223	-	17	
BC1A-1B	47°41'533	108°23'352	0.65 to 1.00	Fluvial deposit	A-1-b	29	60	11	16	3	7.6	6.0	2.083	-	25	
BC4A-5	47°41'736	108°32'564	0.40 to 0.75	Terrace deposit	A-1-b	25	67	8	Non plastic		4.0	4.5	2.076	-	10	
BC4A-4	47°45'384	108°37'606	0.42 to 0.84	Terrace or fluvial deposits	A-2-4	10	72	18	24	2	4.6	6.0	1.932	-	34	
BC4A-3	47°48'343	108°44'014	0.25 to 0.70	Talus deposit (diorite origin)	A-1-b	47	39	14	25	6	7.0	6.8	2.161	-	30	
BC4A-2	47°47'154	108°50'181	0.30 to 1.00	Talus deposit (diorite origin)	A-2-4	29	36	35	29	5	4.9	5.4	2.199	-	10	
BC4A-1	47°45'149	108°57'347	0.30 to 1.00	Talus or weathered diorite	A-1-a	56	30	14	18	2	4.6	5.0	2.223	15	20	
BC5-1	47°42'484	109°03'335	0.20 to 0.50	Fluvial deposit	A-6	20	41	39	32	14	5.1	7.8	2.127	9	11	
BC6-4	47°38'223	109°09'452	0.15 to 0.40	Aeolian / fluvial deposits	A-2-4	23	42	35	21	1	10.4	7.6	2.126	-	4	
BC6-3	47°35'065	109°15'285	0.20 to 0.40	Aeolian/fluvial dep.s (diorite origin)	A-4	10	43	47	28	6	9.2	9.0	2.119	-	19	
BC6-2	47°32'793	109°22'787	0.15 to 0.50	Aeolian/fluvial dep.s (diorite origin)	A-4	10	45	45	19	6	9.0	12.6	1.961	-	4	
BC6-1	47°28'961	109°29'967	0.30 to 0.65	Lake deposit	A-2-4	19	56	25	25	8	8.8	6.1	2.050	-	9	
BC7-1	47°27'955	109°34'863	0.25 to 0.35	Aeolian or alluvial deposits	A-4	8	44	48	31	6	7.1	11.1	1.969	9	14	
BC7-2	47°27'244	109°41'328	0.25 to 0.45	Alluvial deposit	A-4	5	47	48	32	6	8.4	11.8	2.007	-	4	
BC8-1	47°25'497	109°51'133	0.20 to 0.55	Fluvial deposit	A-2-6	52	32	16	37	19	3.4	7.6	2.157	-	21	
BC8-2	47°25'136	109°57'586	0.20 to 0.45	Aeolian / lake deposits	A-2-4	32	39	29	35	7	5.9	9.5	2.085	5	13	
BC9-3	47°25'306	110°04'905	0.30 to 0.50	Fluvial deposit	A-2-4	3	75	22	26	6	6.5	8.6	2.019	-	13	
BC9-2	47°24'655	110°12'549	0.20 to 0.60	Fluvial deposit	A-2-4	17	62	21	26	6	1.2	5.5	2.053	14	44	
BC9-1	47°22'836	110°21'462	0.30 to 0.75	Fluvial or fan deposit	A-1-b	42	46	12	17	4	2.4	7.4	2.026	21	30	
BC10-1	47°21'778	110°29'827	0.30 to 0.50	Alluvial deposit	A-6	3	47	50	36	15	5.4	8.5	2.105	18	20	
BC10-2	47°19'793	110°37'142	0.20 to 0.70	Alluvial deposit mix with Aeolian dep.s	A-2-4	25	48	27	28	6	4.5	9.5	2.085	4	5	

**G** Gravel content  
**S** Sand content  
**F** Particles finer than 0.075mm  
**LL** Liquid limit  
**Ip** Plasticity index  
**NP** Non plastic  
**Wn** Natural moisture content  
**Wopt** Optimum moisture content determined by Modified Proctor test  
**MDD** Maximum dry density determined by Modified Proctor test

**Material Test Results of Bulk Soil Samples Taken from Possible Borrow Pits**

Sample No.	Sampling Location		Geological Unit	Present Status	AASHTO Soil Classification	Grading Analysis (%)			LL (%)	Ip	Wn (%)	Gs	Wopt (%)	MDD g/cm3	CBR-value (%)	
	N	E				G	S	F								
BPD-5	47°42'	107°50'	Weathered shale	In operation	A-1-a	85	7	8	Non plastic		4.8	2.66	9.3	2.048	95%MDD	98%MDD
BPD-4	47°41'22Z	107°52'	Weathered granite & shale	Abandoned borrow pit	A-1-b	66	17	17	26	6	3.1	2.65	5.9	2.045	29	4
BPD-3	47°42'20Z	108°00'	Talus deposit (granite origin)	No borrow pit	A-2-4	77	15	8	23	8	3	2.73	7.8	2.059	14	32
BPD-2	47°42'45Z	108°07'	Terrace deposit	No borrow pit	A-2-4	44	41	15	26	8	5.2	2.71	5.5	2.073	-	26
BPD-1	47°41'286	108°11'	Terrace deposit	Close to abandoned b.p	A-1-b	50	30	20	23	6	5.4	2.69	10.4	2.167	18	5
BP1A-2	47°38'712	108°16'	Alluvial deposit	Close to abandoned b.p	A-1-b	33	56	11	20	6	5.8	2.68	3.5	2.182	5	8
BP1A-1	47°41'023	108°24'	Talus deposit (granite origin)	No borrow pit	A-1-b	22	66	12	22	5	4.7	2.67	7.2	2.093	5	9
BP3A-1	47°41'907	108°27'	Talus deposit & weathered granite	Abandoned borrow pit	A-1-b	47	30	23	17	2	5.1	2.72	5	2.067	15	25
BP4A-5	47°43'005	108°34'	Talus deposit (granite origin)	No borrow pit	A-1-b	38	50	12	30	5	5.3	2.69	4.4	2.139	-	27
BP4A-4	47°47'229	108°39'	Talus deposit (diorite origin)	No borrow pit	A-1-b	38	49	13	Non plastic		5.6	2.68	5.5	2.199	-	3
BP4A-3	47°48'458	108°46'	Talus or terrace deposit	No borrow pit	A-1-b	42	45	13	21	8	4.6	2.67	8.4	2.104	-	20
BP4A-2	47°45'287	108°54'	Talus deposit (granite origin)	No borrow pit	A-1-b	34	48	18	16	NP	4.9	2.68	6.1	2.178	18	26
BP5-1	47°44'648	108°59'	Fluvial deposit	Abandoned borrow pit	A-2-4	56	34	10	25	10	2.1	2.70	5.4	2.23	-	20
Tin	47°43'299	109°03'	Fluvial deposit	Tailing waste	A-1-b	31	63	6	Non plastic		2	2.61	2.9	2.081	9	13
Tin	47°40'640	109°07'	Fluvial deposit	Tailing waste	A-1-a	62	36	2	Non plastic		1.8	2.65	6	2.134	9	13
BP6-3	47°38'853	109°15'	Talus deposit (diorite origin)	Garbage dumping ground	A-2-4	60	26	14	29	9	2.2	2.70	5	2.15	-	25
BP6-2	47°33'955	109°19'	Weathered granite rock	Abandoned borrow pit	A-1-b	39	37	24	Non plastic		2.5	2.71	8.2	1.965	-	25
BP6-1	47°32'376	109°23'	Weathered sedimentary rock	Abandoned borrow pit	A-2-4	43	30	27	18	2	2.3	2.70	4	2.246	-	6
BP7-1	47°28'185	109°32'	Weathered shale	Abandoned borrow pit	A-1-b	70	11	19	31	6	2.1	2.71	5.4	2.334	16	21
BP7-2	47°27'193	934	Talus deposits & weathered Sedimentary rock	Abandoned borrow pit	A-2-4	50	16	34	25	9	3.3	2.72	5.9	2.189	8	9
BP7-3	47°26'642	109°44'	Talus deposit (sandstone origin)	No borrow pit	A-1-a	74	15	11	27	5	4.9	2.67	8.6	2.125	-	-
BP8-1	47°27'095	109°47'	Talus deposit (shale origin)	Abandoned borrow pit	A-1-a	71	16	13	19	4	2.2	0.66	9.2	1.759	-	10
BP9-3	47°24'313	110°01'	Fluvial deposits	Abandoned borrow pit	A-1-b	57	22	21	26	1	2.4	2.71	16.6	1.839	-	13
BP9-2	47°24'239	110°14'	Alluvial deposit	Abandoned borrow pit	A-1-b	21	71	8	Non plastic		2.2	2.65	5.6	1.957	-	13
BP9-1	47°23'190	110°20'	Fluvial deposit	Abandoned borrow pit	A-1-b	30	48	22	17	4	2.4	2.70	6.1	2.217	-	12
BP10-2	47°23'083	110°27'	Fluvial deposit	Abandoned borrow pit	A-1-a	58	14	28	25	1	4.7	2.67	11.8	2.11	-	11
BP10-1	47°21'581	110°36'	Talus deposit & weathered diorite	In operation	A-1-b	48	36	16	22	4	4.8	2.68	6.2	2.304	-	20

G Gravel content

S Sand content

F Particles finer than 0.075mm

LL Liquid limit

Ip Plasticity index

NP Non plastic

Wn Natural moisture content

Gs Specific Gravity

Wopt Optimum moisture content determined by Modified Proctor test

MDD Maximum dry density determined by Modified Proctor test

# Summary of Results of Index Property Tests on Bulk Soil Samples Taken along Road Alignment

E-7. Summary of Results of Index Property Test on Bulk Soil Samples

Sample No.	Sampling Location		Sampling Depth (m)	Sieving Test Result (Percent passing at each sieve)														LL (%)	Ip	Soil Classification	
	N	E		50.0	37.5	25	19	12.5	9.5	4.75	2.36	1.18	0.6	0.425	0.300	0.15	0.075				
BCD-4	47°41'227	107°52'556	0.3 to 0.7	100	96.2	75.7	68.6	59.6	55.8	48.8	42.7	37.7	31.6	27.8	26.4	22.9	21.2	30	10	A-2-4	
BCD-3	47°43'023	107°57'712	0.45 to 1.00			100	97.6	91.3	90.6	85.2	68.8	43.2	27.8	23.4	22.1	14.7	11	27	9	A-2-4	
BCD-2	47°42'803	108°03'387	0.2 to 0.4		100	91.3	85.9	82.2	74.2	63.8	49.5	41.4	32.7	24.7	17.3	10.9	9.5	Non plastic		A-1-a	
BCD-1	47°41'570	108°10'105	0.45 to 1.00						100	98.1	88.4	68.7	55	42	37	31.2	26.6	12	NP	A-2-4	
BC1A-2	47°39'155	108°17'453	0.30 to 1.00	100	88	81.2	72.9	66.9	65.3	57.6	50	32.8	27.7	24.4	21.1	17.5	15.3	Non plastic		A-1-a	
BC1A-1A	47°41'533	108°23'352	0.25 to 0.60		100	95.4	90.1	87	78.5	69.8	60.5	51.8	45	38.2	26.9	16.4	12.3	19	3	A-1-b	
BC1A-1B	47°41'533	108°23'352	0.65 to 1.00			100	96	90.5	86.2	77.9	71.9	63.6	45.4	33.9	29.6	16.6	10.8	16	3	A-1-b	
BC4A-5	47°41'736	108°32'564	0.40 to 0.75		100	94.0	90.2	89.0	86.7	81.2	77.2	63.2	55.9	33.7	23.4	13.1	8.1	Non plastic		A-1-b	
BC4A-4	47°45'384	108°37'606	0.42 to 0.84					100	99.5	97.8	94.8	84.7	75	60	48.6	23.6	17.6	24	2	A-2-4	
BC4A-3	47°48'343	108°44'014	0.25 to 0.70		100	96.5	93.9	90.6	87.6	78.3	57.3	38	21	18.4	16.6	15.1	13.8	25	6	A-1-b	
BC4A-2	47°47'154	108°50'181	0.30 to 1.00			100	98.2	97.4	94.5	84.7	72.6	62.6	57.8	52.8	47.8	40.0	35.0	29	5	A-2-4	
BC4A-1	47°45'149	108°57'347	0.30 to 1.00			100	98.4	96.3	83.3	74.8	45.5	33	26.5	22	19.7	15.7	13.9	18	2	A-1-a	
BC5-1	47°42'484	109°03'335	0.20 to 0.50				100	97.5	92.6	90.6	84.8	80.9	77.1	73.0	53.3	48.7	40.8	38.8	32	14	A-6
BC6-4	47°38'223	109°09'452	0.15 to 0.40					100	95.6	85.8	79	68.3	60.8	52.2	46.2	39.7	34.8	21	1	A-2-4	
BC6-3	47°35'065	109°15'285	0.20 to 0.40						100	96	90.8	81.8	69.5	61	56.5	52.2	47.3	28	6	A-4	
BC6-2	47°32'793	109°22'787	0.15 to 0.50					100	98.3	95	90.7	82.3	72.3	66.7	62.7	54.3	45	32	10	A-4	
BC6-1	47°28'961	109°29'967	0.30 to 0.65			100	99.5	99.1	97.7	94.7	83.1	69.1	54.1	46.2	39.7	31.6	25.4	25	8	A-2-4	
BC7-1	47°27'955	109°34'863	0.25 to 0.35				100	98.9	98.4	96.7	92.9	87.4	78.4	72.4	66	56.9	47.8	31	6	A-4	
BC7-2	47°27'244	109°41'328	0.25 to 0.45					100	99.9	99.2	96.2	89.8	82.1	74.7	65.2	52.1	47.6	32	6	A-4	
BC8-1	47°25'497	109°51'133	0.20 to 0.55		100	92.5	90.5	84.4	80	66.5	51.6	36.2	27.8	24.1	20.5	17.8	16	37	19	A-2-6	
BC8-2	47°25'136	109°57'586	0.20 to 0.45		-	100	99.5	95.8	94.2	85.8	72	55.7	11.3	40.4	37.3	33	29.3	35	7	A-2-4	
BC9-3	47°25'306	110°04'905	0.30 to 0.50						100	99.6	98.2	89	75.2	61.4	55.3	33.1	21.9	26	6	A-2-4	
BC9-1	47°22'836	110°21'462	0.30 to 0.75			100	94.2	91.2	89.0	85.7	84.4	79.1	66.6	60.2	49.7	28.7	21.1	17	4	A-2-4	
BC9-2	47°24'655	110°12'549	0.20 to 0.60		100	88.2	82.3	79.9	76.2	68.0	59.7	50.2	42.2	35.4	28.0	17.1	12.0	26	6	A-1-b	
BC10-1	47°21'778	110°29'827	0.30 to 0.50							100	98.5	94.9	88.4	81.7	74.2	59.9	50.4	36	15	A-6	
BC10-2	47°19'793	110°37'142	0.20 to 0.70				100	91.7	89.6	84.2	76.8	68	56.9	48.2	42.1	33.7	27	28	6	A-2-4	

**G** Gravel content  
**S** Sand content  
**F** Particles finer than 0.075mm  
**LL** Liquid limit  
**Ip** Plasticity index  
**NP** Non plastic  
**Wn** Natural moisture content  
**Wopt** Optimum moisture content determined by Modified Proctor test  
**MDD** Maximum dry density determined by Modified Proctor test



### Summary of Results of Index Property Tests on Bulk Soil Samples Taken from Possible Borrow Pits

Sample No.	Sampling Location		Sieving Test Result (Percent passing at each sieve)														LL (%)	Ip	Soil Classification
	N	E	50.0	37.5	25	19	12.5	9.5	4.75	2.36	1.18	0.6	0.425	0.300	0.15	0.075			
BPD-5	47°42'208	107°50'500	75.8	68	58	48	38.1	30.5	22.8	15.1	12.1	10.8	10.2	9.9	9.2	7.9	Non Plastic		A-1-a
BPD-4	47°41'227	107°52'556	100	89.4	82.5	73.4	64.8	58.2	46.2	35.4	29.2	23.5	20.2	19	17.9	17.4	26	6	A-1-b
BPD-3	47°42'207	108°00'510		100	85.7	77.7	66.2	56.2	37.6	25.6	18.3	15.0	12.5	11.5	9.2	7.7	23	8	A-2-4
BPD-2	47°42'454	108°07'173		100	87.6	84.9	82.2	76.6	69.8	61.8	49.7	39.7	31.1	27.6	20.3	14.6	26	8	A-2-4
BPD-1	47°41'286	108°11'803		100	81.5	73.7	73.4	67.9	58.6	50.6	43.3	37.3	32.5	36.2	24.7	20.4	23	6	A-1-b
BPIA-2	47°38'712	108°16'600			100	99.5	98.7	96.3	89.6	71.5	51.8	38.5	31.5	24.4	17.4	11.1	20	6	A-1-b
BPIA-1	47°41'023	108°24'347			100	97.6	94.8	93.5	89.3	79.9	65.3	44.9	36	29.2	18.5	12.2	22	5	A-1-b
BP3A-1	47°41'907	108°27'102			100	94.7	90.5	85.5	74	55	44.9	39.2	34.6	32.4	28.6	22.6	17	2	A-1-b
BP4A-5	47°43'005	108°34'922		100	98	96.7	92	85.2	74.4	63.2	53.7	42.1	33.9	26.6	18.4	11.6	30	5	A-1-b
BP4A-4	47°47'229	108°39'724		100	99.4	98.0	92.3	85.0	73.7	63.0	53.8	43.7	34.5	26.3	19.0	12.9	Non Plastic		A-1-b
BP4A-3	47°48'458	108°46'637			100	94.2	89.7	81.2	70.6	59.1	46.6	36.1	27.3	22.3	16.8	13.3	21	5	A-1-b
BP4A-2	47°45'287	108°54'323			100	99.0	94.2	89.7	75.4	67.4	60.4	48.1	38.1	29.3	23.1	17.8	16	NP	A-1-b
BP5-1	47°44'648	108°59'570		100	96.8	87.2	80.8	76.5	57.3	45.9	39.9	32.4	23.1	17.1	12.1	10.4	25	10	A-2-4
Tin mine2	47°43'299	109°03'973				100	98.5	96.4	86.9	72.9	55.1	40.3	27.3	19.0	9.2	5.7	Non Plastic		A-1-b
Tin mine1	47°40'640	109°07'966	84.2	75.4	91.6	66.1	60.1	56.8	49.2	40.0	32.5	27.2	23.6	22.1	19.5	2.3	Non Plastic		A-1-a
BP6-3	47°38'853	109°15'469		100	84.8	75.3	69.3	59.8	48.6	41.9	35.6	31.4	24.4	20.1	16.1	13.7	29	9	A-2-4
BP6-2	47°33'955	109°19'720				100	99	94.5	79.8	62.8	49.5	34.8	31.8	28.5	26.8	24.3	Non Plastic		A-1-b
BP6-1	47°32'376	109°23'126	100	94.3	93.4	92.3	88	81.3	67	59.1	45.6	37.1	34.4	31.1	29.3	26.6	18	2	A-2-4
BP7-1	47°28'185	109°32'330	88.4	78.0	74.4	65.0	53.1	47.5	41.7	31.7	26.0	23.4	22.4	21.7	20.4	19.4	31	6	A-1-b
BP7-2	47°27'193	109°39'934	100	92.7	78.3	69.0	65.3	62.4	55.9	51.1	47.1	45.0	41.0	39.7	37.0	34.0	25	9	A-2-4
BP7-3	47°26'642	109°44'519	93.5	85.3	73.8	64.6	50.9	45.7	35.1	28.6	23.2	19.2	16.6	15.2	12.6	11.1	27	5	A-1-a
BP8-1	47°27'095	109°47'594	100	74.6	65.7	60.3	62.2	46.3	35.4	30.0	25.2	21.4	20.3	18.4	15.0	12.8	19	4	A-1-a
BP9-3	47°24'313	110°01'365		100	86	77.3	68.7	63.1	51.8	44.8	38.7	32.7	27.5	25.2	22.5	20.5	26	1	A-1-b
BP9-2	47°24'239	110°14'123		100	90.3	86.5	86	83.8	81.4	79.9	79.3	60.1	44.3	32.7	14.1	7.6	Non Plastic		A-1-b
BP9-1	47°23'190	110°20'311		100	95.4	92.3	89.1	87.1	81.0	72.4	62.4	54	47.1	38.6	28	22.2	17	4	A-1-b
BP10-2	47°23'083	110°27'021	98.9	96.5	87.8	81.7	70.2	61.5	41.4	30.2	23.2	19.7	16.9	15.9	12.4	10.3	25	1	A-1-a
BP10-1	47°21'581	110°36'300	82.6	80.2	77.6	75.9	73.4	69.7	62.3	53	45.2	32.1	26.2	22.2	18.1	16	22	4	A-1-b

<b>G</b>	Gravel content	<b>Ip</b>	Plasticity index
<b>S</b>	Sand content	<b>NP</b>	Non plastic
<b>F</b>	Particles finer than 0.075mm	<b>Wn</b>	Natural moisture content
<b>LL</b>	Liquid limit	<b>Wopt</b>	Optimum moisture content determined by Modified Proctor test
		<b>MDD</b>	Maximum dry density determined by Modified Proctor test

**E-8. Summary of Aggregate Tests**

**Summary of Aggregate Tests Results for Rock Samples**

Name of Sampling Location	Sampling Location		Type of Material	Soundness* (%)	Los Angeles Abrasion (%)	Flakiness Index**	Specific Gravity***	Water Absorption*** (%)	Bitumen Coated Area**** (%)
	N	E							
Quarry at Tumur Ulgi Mt., Kherlen	47°42'932	108°25'847	Granodiorite fragments	2	8.6	10	2.64	1.1	>95
							2.61	2.0	
Stock Pile of Tailing Deposits (Boulder) at Tsenkhermandal	47°40'640	109°03'973	Alluvial boulder stones collected from surface of gravel tailings	2	8.7	11	2.54	1.6	>95
							2.52	1.8	
Delger Mt. at Murun	47°24'391	110°35'890	Boulder size of weathered tuff scattered on slope of the Delger mountain	2	10.4	10	2.56	1.5	-
							2.54	1.9	

\* By sodium sulphate

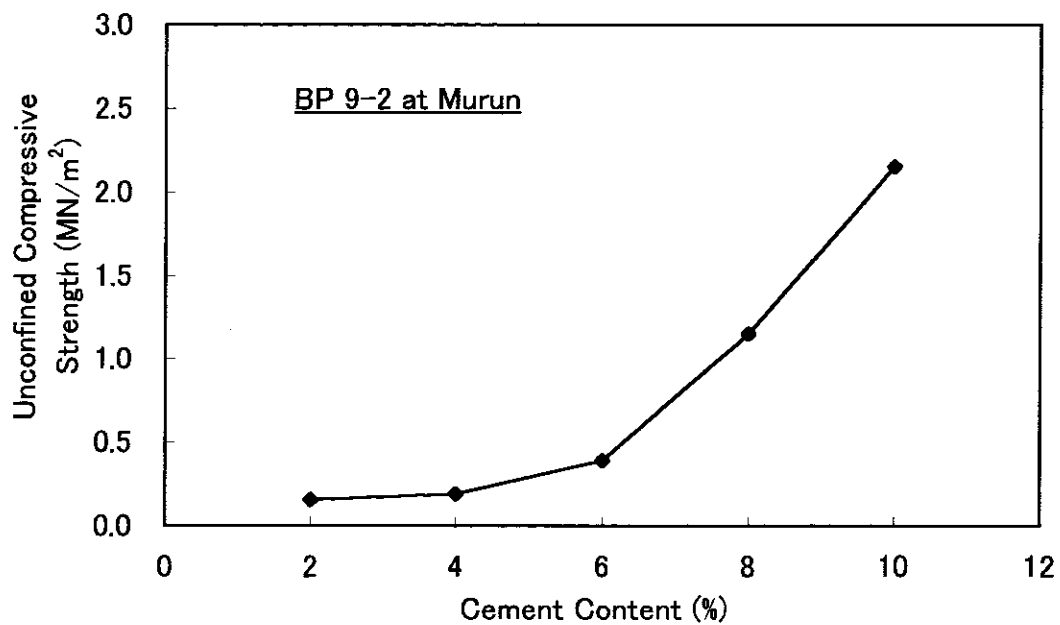
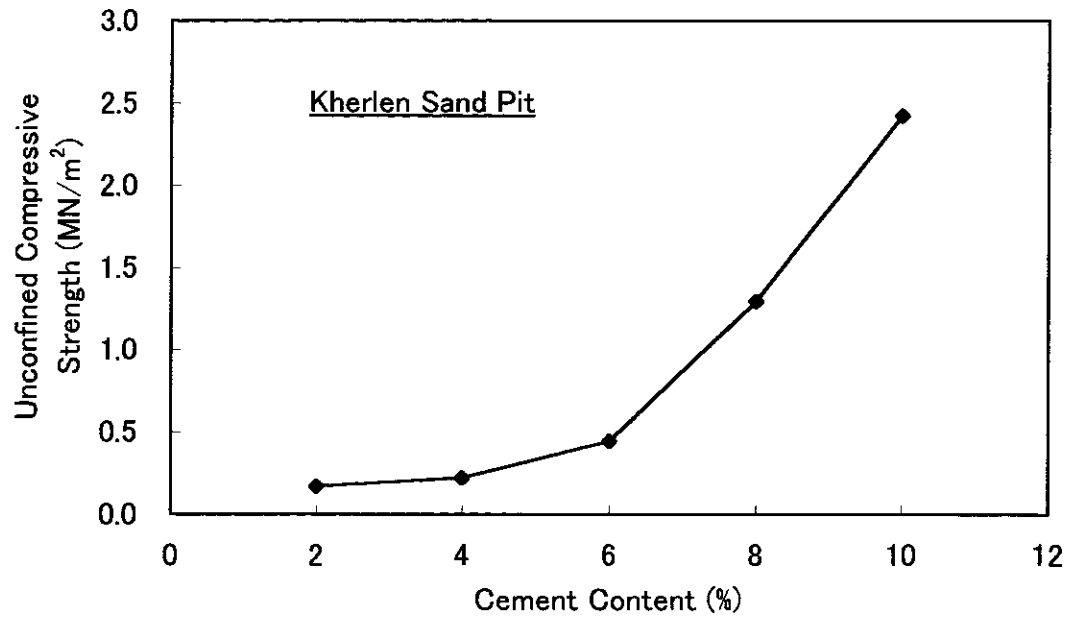
\*\* Aggregates passing a 37.5mm sieve and retained on a 10.0mm sieve

\*\*\* Above the line : size 4.75mm to 12.5mm

Below the line : size 19.0mm to 37.5mm

\*\*\*\* After 30 minutes immersion into water kept  $80 \pm 1^\circ\text{C}$

E-9. Results of Cement Stabilization Test



Results of Cement Stabilization Test

**E-10. Record of Test Pit for Bulk Soil Sampling**

**Record of Test Pit for Bulk Soil Sampling**

Sample No.:BCD-4

Coordinates N:47°41'227

E:107°52'556

Depth (m)	Type of Soil	Color	Description
0.40	Sandy Silt	Dark Brown	With some gravel up to 30 cm from the ground surface. Gravel: Rock fragments Max size: 150 mm
0.60	Sandy Silt	Dark Brown to Brown	Prevailing size: ≤20mm. With roots at top
0.80	Sandy Silt with Gravel	Brown	Trace of gravel (rock fragments). Material is same as the upper layer. Max size: 80mm
1.00	Silty Sand with Gravel	Slightly Greenish Green	Prevailing size: ≤30mm Very silty

0.30

Sampling

0.70

**Material Test Results**

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F	(%)	(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
58	21	21	30	10	4.8	2.229	7	11

**G** Gravel content

**S** Sand content

**F** Particles finer than 0.075mm

**LL** Liquid Limit

**Ip** Plasticity index

**Wn** Natural moisture content

**Wopt** Optimum moisture content determined by Modified Proctor test

**MDD** Maximum dry density determined by Modified Proctor test

### Record of Test Pit for Bulk Soil Sampling

Sample No.:BCD-3      Coordinates N:47°43'023      E:107°57'712

Depth (m)	Type of Soil	Color	Description
0.35	Silty Sand	Dark Brown	Sand is very fine grained. With roots throughout of the layer.
0.45	Silty Sand with Gravel	Brown to Dark Brownish Yellow	Sand is very fine grained. With subangular gravel, max: $\phi$ 100mm, $\phi$ prevailing $\leq$ 30mm.
1.00	Silty Sand	Yellowish Brown to Light Brown	Sand is very fine grained. Trace of rock fragments and subangular gravels. max.size: 80mm, prevailing size: $\leq$ 25mm.

0.45  
Sampling  
1.00

### Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F	(%)	(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
35	54	11	27	9	4.9	6.2	-	5

<b>G</b> Gravel content	<b>Ip</b> Plasticity index	
<b>S</b> Sand content	<b>Wn</b> Naitional moisture content	
<b>F</b> Particles finer than 0.075mm	<b>Wopt</b> Optimum moisture content determined by Modified Proctor test	
<b>LL</b> Liquid Limit	<b>MDD</b> Mazimum dry density determined by Modified Proctor test	

### Record of Test Pit for Bulk Soil Sampling

**Sample No.:** -

**Coordinates N:**  
**Gully close to BCD-3**



Depth (m)	Type of Soil	Color	Description
0.15	Silty Sand	Black to Dark Brown	Sand is very fine grained. With roots Occasionally with rock fragments.
0.50	Silty Sand with Gravel	Yellowish Brown to Light Brown with Whitish Parts	Very silty, with rock fragments
0.80	Silty Sand		Very silty. Sand is very fine grained.
0.85	Silty Sand		With some rock fragments.
1.00	Sand & Gravel		Gravel: Subgranular to subrounded. ø max: 40mm, ø prevailing <20mm.

### Record of Test Pit for Bulk Soil Sampling

SampleNo.:BCD-2

Coordinates N:47°42'803

E:108°03'387

Depth (m)	Type of Soil	Color	Description
0.10	Silty Sand	Dark Brown	With roots. Sand is very fine grained.
0.20	Sand & Gravel with Silt	Dark Brown	<u>Fluvial deposits</u>
0.40/0.60	Silty Sand with Gravel		<u>Fluvial deposits</u> Sand is very fine to fine grained. Gravel: Subangular to subrounded. $\phi$ prevailing $\leq 20$ mm.
0.80	Silty Sand & Gravel		<u>Fluvial deposits</u> Sand is very fine grained. Silt content is less than that in the upper layer. $\phi$ prevailing $\leq 30$ mm.
1.00	Sand & Gravel	Yellowish Brown	<u>Fluvial deposits</u> Sand is fine grained. Gravel: Subangular to subrounded $\phi$ max: 50mm, $\phi$ prevailing $\leq 20$ mm.

### Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F				g/cm <sup>3</sup>	95%MDD	98%MDD
53	37	10	Non Plastic	Non Plastic	5.6	11.5	1.753	24

<b>G</b>	Gravel content	<b>Ip</b>	Plasticity index
<b>S</b>	Sand content	<b>Wn</b>	Naitonal moisture content
<b>F</b>	Particles finer than 0.075mm	<b>Wopt</b>	Optimum moisture content determined by Modified Proctor test
<b>LL</b>	Liquid Limit	<b>MDD</b>	Mazimum dry density determined by Modified Proctor test

### Record of Test Pit for Bulk Soil Sampling

Sample No.: BCD-1

Coordinates N: 47°41'570

E: 108°10'105

Depth (m)	Type of Soil	Color	Description
0.20	Silty Sand	Dark Brown	With roots. Very silty. Sand is very fine grained.
0.40	Silty Sand	Dark Brown	Sand is very fine grained. Silt content is less than that in the upper layer. Trace of gravel.
0.45	Silty Sand	Brown	Sand is very fine to fine grained. With some fine subrounded quartz particles.
1.00	Silty Sand	Light Brown Grey	Sand is very fine grained. With very silty portions.

0.45  
Sampling  
1.00

### Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F	(%)	(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
14	59	27	12	Non Plastic	4.8	14.1	1.83	19

<b>G</b> Gravel content	<b>Ip</b> Plasticity index	
<b>S</b> Sand content	<b>Wn</b> Naitional moisture content	
<b>F</b> Particles finer than 0.075mm	<b>Wopt</b> Optimum moisture content determined by Modified Proctor test	
<b>LL</b> Liquid Limit	<b>MDD</b> Mazimum dry density determined by Modified Proctor test	



**Record of Test Pit for Bulk Soil Sampling**

**SampleNo.:BC 1A-2**

**Coordinates N:47°39'155**

**E:108°17'453**

Depth (m)	Type of Soil	Color	Description
0.15	Silty Sand	Dark Brown	With roots. Sand is very fine grained.
0.30	Sand & Gravel with Silt	Dark Brown	With roots. Gravel: Subrounded to Subangular ø max: 80mm, ø prevailing ≤30mm.
1.00	Sand & Gravel	Yellowish Brown to Brown	Fluvial deposits Sand is fine to coarse grained. ø max: 80mm. ø prevailing ≤40mm. Moist throughout of the layer.

0.30

Sampling

1.00

**Material Test Results**

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F		(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
52	37	15	Non Plastic	4.4	4.6	1.855	-	14

**G**

Gravel content

**S**

Sand content

**F**

Particles finer than 0.075mm

**LL**

Liquid Limit

**Ip**

Plasticity index

**Wn**

Naitional moisture content

**Wopt**

Optimum moisture content determined by Modified Proctor test

**MDD**

Mazimum dry density determined by Modified Proctor test

### Record of Test Pit for Bulk Soil Sampling

Sample No.: BC 1A-1

Coordinates N: 47°41'53.4

E: 108°23'34.9

Depth (m)	Type of Soil	Color	Description
0.15	Silty Sand	Dark Brown	Very silty. With roots. Sand is very fine grained.
0.35	Silty Sand	Dark Brown	Sand is very fine grained. With some roots.
0.65	Silty Sand	Greenish Brown	Silt content is less than that in the layer.
1.00	Sand with Gravel	Brown	Sand is very fine grained.
			Material is same as the upper layer, but less silt content.
			Fluvial deposits
			Clean sand with gravel.

0.25

A

Sampling

0.60

0.65

1.00

B

Sampling

### Material Test Results

Sample	Grading Analysis (%)			LL (%)	Ip	Wn (%)	Wopt (%)	MDD g/cm <sup>3</sup>	CBR-Value (%)	
	G	S	F						95%MDD	98%MDD
A	42	46	12	19	3	4.2	4.3	2.223	-	17
B	29	60	11	16	3	7.6	6	2.083	-	25

G

Gravel content

S Sand content

F Particles finer than 0.075mm

LL Liquid Limit

Ip

Plasticity index

Wn Naïtonal moisture content

Wopt Optimum moisture content determined by Modified Proctor test

MDD Mazimum dry density determined by Modified Proctor test

### Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 4A-5

Coordinates N:47°41'736

E:108°32'564

Depth (m)	Type of Soil	Color	Description
0.15	Silty Sand	Dark Brown	With roots. Sand s fine grained.
			Sand is fine grained.
0.20/0.30	Silty Sand	Dark Brown	Less silt content in comparison with the upper layer.
			Sand is fine grained.
0.40	Sand	Dark Brown to Brown	With some silt and trace of gravel with less than 50mm in diameter.
0.50	Sand	Brown	Sand is fine grained.
			With some gravel. Moist.
0.75	Sand & Gravel	Brown	With subangular gravel, ømax. 90mm, ø prevailing ≤40mm, Moist.
1.00	Sand & Gravel to Sand with Gravel	Yellowish Brown	Clean, Moist. Sand is fine grained. ø max: 150mm, ø prevailing ≤60mm.

0.30

Sampling

0.75

### Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F	(%)	(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
25	26	8	Non Plastic	Non Plastic	4.0	4.5	-	7

**G** Gravel content  
**S** Sand content  
**F** Particles finer than 0.075mm  
**LL** Liquid Limit

**Ip** Plasticity index  
**Wn** Naitional moisture content  
**Wopt** Optimum moisture content determined by Modified Proctor test  
**MDD** Mazimum dry density determined by Modified Proctor test

# Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 4A-4

Coordinates N:47°45'384

E:108°37'606

Depth (m)	Type of Soil	Color	Description
0.30	Silty Sand	Dark Brown	With roots. Sand is very fine grained.
0.42			Sand is fine grained.
		Greyish Brown to Brown	With some roots up to this layer
	Silty Sand		Less silt content in comparison with the upper layer.
0.80		Light Brown to	
		Light Brownish	Sand is fine grained.
	Sand	Grey	With some silt at top of this layer.
1.00	Sand	Brown	Sand is fine grained.

0.42

0.80

Sampling

## Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F	(%)	(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
10	72	18	24	2	4.6	6	1.932	10

G	Gravel content	Ip	Plasticity index
S	Sand content	Wn	Naitonal moisture content
F	Particles finer than 0.075mm	Wopt	Optimum moisture content determined by Modified Proctor test
LL	Liquid Limit	MDD	Mazimum dry density determined by Modified Proctor test

### Record of Test Pit for Bulk Soil Sampling

**Sample No.:** -

Coordinates N:

**ii**

**No. BC4A-4 + 7.6km along the existing trail**

Depth (m)	Type of Soil	Color	Description
0.15	Sandy Silt	Dark Brown	With roots, very silty
0.50		Light Brownish	Sand is very fine grained.
	Sandy Silt	Grey	Moist.

# Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 4A-3

Coordinates N:47°48'343

E:108°44'014

Depth (m)	Type of Soil	Color	Description
0.25	Silty Sand	Brown	Sand is very fine grained. With roots at top. Very silty.
0.70	Silty Sand	Brown	Sand is fine to coarse grained. Very silty. Occasionally with angular gravel, ømax. 50mm.
1.00	Sand & Gravel with Silt	Brown	Decomposed diorite Sand is fine to coarse grained. Gravel: Angular rock fragments. Max.size: 80mm, prevailing size <20mm.

0.25

0.70

Sampling

## Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F	(%)	(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
47	39	14	25	6	7.0	6.8	2.161	30

G

Gravel content

Ip

Plasticity index

S

Sand content

Wn

Naitional moisture content

F

Particles finer than 0.075mm

Wopt

Optimum moisture content determined by Modified Proctor test

LL

Liquid Limit

MDD

Mazimum dry density determined by Modified Proctor test

### Record of Test Pit for Bulk Soil Sampling

Sample No.: BC 4A-2

Coordinates N: 47°47'154

E: 108°50'181

Depth (m)	Type of Soil	Color	Description
0.15	Silty Sand	Dark Brown	With roots. Sand is very fine grained. Very silty.
0.30	Silty Sand	Dark Brown	Sand is very fine grained. Less silt content in comparison with the upper layer. Dry.
1.00	Silty Sand with Gravel	Light Greenish Brown	Sand is very fine to fine grained. Gravel: Angular diorite fragments. Max. size: 50mm, prevailing size ≤ 15mm.

Sampling

### Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F		(%)	(%)	g/cm <sup>3</sup>	95% MDD	98% MDD
29	36	35	5	4.9	5.4	2.199	-	10

<b>G</b>	Gravel content	<b>Ip</b>	Plasticity index
<b>S</b>	Sand content	<b>Wn</b>	Natural moisture content
<b>F</b>	Particles finer than 0.075mm	<b>Wopt</b>	Optimum moisture content determined by Modified Proctor test
<b>LL</b>	Liquid Limit	<b>MDD</b>	Maximum dry density determined by Modified Proctor test

**Record of Test Pit for Bulk Soil Sampling**

**Sample No.:**Gully developed on the slope of Pass (UB side)

Depth (m)	Type of Soil	Color	Description
0.30	Sandy Silt to Silty Sand	Black	With roots at top. Sand is very fine grained. Silty sand is prevailing.
			<u>Hetrogeneous layer.</u>
	Silty Sand with Gravel to Silty Sand & Gravel	Yellowish Brown	Sand is very fine to medium grained, originated from decomposed diorite. Gravel content is variable from place to place. Gravel: diorite fragments. Prevailing size $\leq 50\text{mm}$ .
0.80			



### Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 4A-1

Coordinates N:47°45'149

E:108°57'347

Depth (m)	Type of Soil	Color	Description
0.10	Silty Sand	Dark Brown	With roots. Sand is very fine grained. With some rock fragments.
0.30	Sand & Gravel with Silt	Dark Brown	Gravel consists of weathered brown coloured rock fragments. Max. size: 80mm, Prevailing size <40mm.
1.00	Sand & Gravel	Brown	Decomposed diorite Material is same as the upper layer. Max. size: 60mm, Prevailing size <40mm. With clayey portion at 1m.

0.30

Sampling

1.00

### Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F		(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
56	30	14	18	2	4.6	5	15	20

**G** Gravel content

**S** Sand content

**F** Particles finer than 0.075mm

**LL** Liquid Limit

**Ip** Plasticity index

**Wn** Natural moisture content

**Wopt** Optimum moisture content determined by Modified Proctor test

**MDD** Maximum dry density determined by Modified Proctor test

# Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 4-1

Coordinates N:47°45'814

E:108°51'149

Depth (m)	Type of Soil	Color	Description
0.30	Silty Sand	Dark Grey	With roots. Sand is very fine grained. Trace of gravel.
0.60	Sand with Gravel	Brown to Yellowish Brown	Sand is fine grained. With angular granite fragments; Prevaling size ≤25mm. Silty at the top.
1.00	Sand & Gravel	Yellowish Brown	Sand is fine grained. Gravel: granite fragments. Occasionally with boulder Max. size: 180mm, Prevailing size ≤30mm.

0.20  
0.60  
Sampling

### Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 5-1

Coordinates N:47°42'484

E:109°03'335

Depth (m)	Type of Soil	Color	Description
0.20	Silty Sand	Dark Brown	Very silty. Sand is very fine grained. With roots.
0.50	Silty Sand & Gravel	Dark Brown to Yellowish Brown	Gravel: subangular to subrounded. ø max: 200mm, ø prevailing ≤30mm.
1.00	Sand with Gravel	Yellowish Brown	Sand is fine grained. Gravel: subangular to subrounded. ø max: 90mm, ø prevailing ≤30mm.

0.20

0.50

Sampling

### Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F		(%)	(%)	g/cm3	95%MDD	98%MDD
20	41	39	32	14	5.1	7.8	9	11

**G** Gravel content

**S** Sand content

**F** Particles finer than 0.075mm

**LL** Liquid Limit

**Ip** Plasticity index

**Wn** Naïtional moisture content

**Wopt** Optimum moisture content determined by Modified Proctor test

**MDD** Maximum dry density determined by Modified Proctor test

# Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 6-4

Coordinates N:47°38'223

E:109°09'452

Depth (m)	Type of Soil	Color	Description
0.30	Silty Sand	Dark Brown	Sand is very fine grained. With roots up to 15cm from the ground surface.
0.40	Silty Sand	Brownish Grey	Sand is fine to medium grained. With some fine gravel. With some roots.
0.55	Silty Sand & Gravel	Light Brown	Fluvial deposits With some roots up to 50cm, from the ground surface. Gravel: Subrounded ø max size: 50mm, ø prevailing ≤10mm.
0.70	Sand with Gravel	Light Brown	Fluvial deposits ø max size: 30mm, ø prevailing ≤10mm.
0.80	Sand	Light Brown	Fluvial deposits Sand is fine grained. With some gravel.
1.00	Sand	Light Brown	Material is same as the upper layer, but moisture content is higher.

0.15  
0.40  
Sampling

## Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F	(%)	(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
23	42	35	21	1	10.4	7.6	-	4

<b>G</b>	Gravel content	Ip	Plasticity index
<b>S</b>	Sand content	Wn	Naitonal moisture content
<b>F</b>	Particles finer than 0.075mm	Wopt	Optimum moisture content determined by Modified Proctor test
<b>LL</b>	Liquid Limit	MDD	Mazimum dry density determined by Modified Proctor test

### Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 6-3

Coordinates N:47°35'06S

E:109°15'28S

Depth (m)	Type of Soil	Color	Description
0.15	Silty Sand	Dark Brown	Sand is very fine grained. Very silty. With roots.
0.30	Silty Sand	Dark Brown	Sand is very fine to fine grained. Trace of roots.
0.50	Silty Sand	Dark Brown	Sand is fine to medium grained. Sand is derived from weathered granite. Trace of roots.
1.00	Sand with Gravel	Slightly Greenish Grey	Residual soil of granite rock Sand is fine to coarse grained. With fine gravel size granite fragments throughout of the layer.

0.20

0.40

Sampling

### Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F	(%)	(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
10	43	47	28	6	9.2	2.119	-	19

**G**

Gravel content

**Ip**

Plasticity index

**S**

Sand content

**Wn**

Naitional moisture content

**F**

Particles finer than 0.075mm

**Wopt**

Optimum moisture content determined by Modified Proctor test

**LL**

Liquid Limit

**MDD**

Mazimum dry density determined by Modified Proctor test

### Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 6-2

Coordinates N:47°32'793

E:109°22'787

Depth (m)	Type of Soil	Color	Description
0.15	Silty Sand	Dark Brown	With roots. Sand is very fine grained. Trace of rock fragments, size<20mm.
0.50	Silty Sand	Dark Brown	Sand is very fine grained. Trace of rock fragments, size≤40mm. With roots up to 65cm from the ground surface.
1.00	Silty Sand	Slightly Greenish Light Brown	Sand is very fine to fine grained. Less silt content in comparison with the upper layer.

0.15  
0.50  
Sampling

### Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F		(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
10	45	45	32	10	9	1.961	-	4

<b>G</b>	Gravel content	<b>Ip</b>	Plasticity index
<b>S</b>	Sand content	<b>Wn</b>	Naitonal moisture content
<b>F</b>	Particles finer than 0.075mm	<b>Wopt</b>	Optimum moisture content determined by Modified Proctor test
<b>LL</b>	Liquid Limit	<b>MDD</b>	Mazimum dry density determined by Modified Proctor test

# Record of Test Pit for Bulk Soil Sampling

Jargalkhaan Sum

Sample No.:BC 6-1 Coordinates N:47°28'961 E:109°29'967

Depth (m)	Type of Soil	Color	Description
0.30	Silty Sand	Dark Brown	With roots. Sand is very fine grained. With some angular gravel, size 15 to 20mm.
0.40	Silty Sand	Dark Brown	Material is same as the upper layer, but less gravel content.
0.80	Silty Sand	Light Grey to Light	Sand is very fine to fine grained. Trace of subangular to subrounded gravel. ø max: 10mm.
0.95	Silty Sand with Gravel	Brown Grey	Trace of organic fragments.
1.00	Clayey Silt with Sand	Light Grey	Sand is fine to coarse grained. ø max: 70mm, ø prevailing <25mm.
		Light Brown	

0.30  
Sampling  
0.65

## Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F		(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
19	56	25	8	8.8	6.1	2.05	-	9

**G** Gravel content **Ip** Plasticity index  
**S** Sand content **Wn** Naitional moisture content  
**F** Particles finer than 0.075mm **Wopt** Optimum moisture content determined by Modified Proctor test  
**LL** Liquid Limit **MDD** Mazimum dry density determined by Modified Proctor test

### Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 7-1

Coordinates N:47°27'955

E:109°34'863

Depth (m)	Type of Soil	Color	Description
0.25	Silty Sand	Dark Brown	With roots. Sand is very fine grained. Very silty. Trace of fine gravel.
0.35	Silty Sand	Dark Brown to Brown	Very silty. Sand is very fine grained.
0.55	Sandy Clayey Silt	Greenish Grey mottled White	Very silty. Trace of fine gravel size rock fragments.
1.00	Silty with Sand	Grey	Sand is fine grained. Trace of rock fragments, size ≤ 10mm.

### Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F	(%)	(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
8	44	48	31	6	7.1	11.1	9	14

G	Gravel content	Ip	Plasticity index
S	Sand content	Wn	Nattonal moisture content
F	Particles finer than 0.075mm	Wopt	Optimum moisture content determined by Modified Proctor test
LL	Liquid Limit	MDD	Mazimum dry density determined by Modified Proctor test



# Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 7-2

Coordinates N:47°27'244

E:109°41'328

Depth (m)	Type of Soil	Color	Description
0.20	Silty Sand with Gravel	Brown	With roots at top. Sand is fine grained. With rock fragments, 20 to 30mm in length.
0.35	Silty Sand	Light Brown	Sand is fine grained. Very Silty.
0.75	Sandy Silt	Light Grey	Sand is very fine grained. Moist.
1.05	Silt	Reddish Brown	Moist. Mottled white.

0.25

0.45

Sampling

## Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F	(%)	(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
5	47	48	32	6	8.4	11.6	-	3

G Gravel content

S Sand content

F Particles finer than 0.075mm

LL Liquid Limit

Ip Plasticity index

Wn Naitional moisture content

Wopt Optimum moisture content determined by Modified Proctor test

MDD Mazimum dry density determined by Modified Proctor test

### Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 8-1

Coordinates N:47°25'497

E:109°51'133

Depth (m)	Type of Soil	Color	Description
0.20	Silty Sand	Brown	Sand is very fine grained. With roots (up to 45cm from the ground surface).
0.55	Silty Sand & Gravel	Light Grey	Gravel: Angular to subangular ø max: 150mm, ø prevailing ≤30mm. Origin of gravel: Slate, shale.
1.00	Silty Sand & Gravel	Slightly Greenish Light Grey	Material is same as the upper layer.

0.20  
0.55  
Sampling

### Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F	(%)	(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
52	32	16	37	19	3.4	7.6	2.157	21

**G** Gravel content  
**S** Sand content  
**F** Particles finer than 0.075mm  
**LL** Liquid Limit  
**Ip** Plasticity index  
**Wn** Natural moisture content  
**Wopt** Optimum moisture content determined by Modified Proctor test  
**MDD** Maximum dry density determined by Modified Proctor test

# Chandgana Steppe /7km/

## Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 8-2

Coordinates N:47°25'136

E:109°57'586

Depth (m)	Type of Soil	Color	Description
0.40	Silty Sand	Dark Brown	With roots. Sand is very fine grained. Trace of fine gravel. Very silty.
1.00	Silty Sand & Gravel	Light Brownish Grey	Moist. Gravel: subangular ø prevailing size ≤15mm.

0.20  
0.45  
Sampling

## Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F	(%)	(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
32	39	29	35	7	5.9	2.085	5	13

G	Gravel content	Ip	Plasticity index
S	Sand content	Wn	Naitonal moisture content
F	Particles finer than 0.075mm	Wopt	Optimum moisture content determined by Modified Proctor test
LL	Liquid Limit	MDD	Mazimum dry density determined by Modified Proctor test

# Chandgana Steppe /20km/

## Record of Test Pit for Bulk Soil Sampling

Sample No.:BC 9-3

Coordinates N:47°25'306

E:110°04'905

Depth (m)	Type of Soil	Color	Description
0.30	Silty Sand	Dark Grey	Sand is fine to medium grained. With many roots for the first 5cm. With some coarse sand particles, ø 1.0 to 2.0mm.
0.50	Sand	Light Brownish Grey	Sand is fine grained. With some silt.
1.50	Sand with Gravel	Brown	Sand mainly consists of fine grained particles. Gravel: ø prevailing ≤4mm.

0.3  
Sampling  
0.5

## Material Test Results

Grading Analysis (%)		LL	Ip	Wn	Wopt	MDD	CBR-Value (%)	
G	S	F		(%)	(%)	g/cm <sup>3</sup>	95%MDD	98%MDD
3	75	22	6	6.5	8.6	2.019	-	13

G Gravel content  
S Sand content  
F Particles finer than 0.075mm  
LL Liquid Limit

Ip Plasticity index  
Wn Naitional moisture content  
Wopt Optimum moisture content determined by Modified Proctor test  
MDD Mazimum dry density determined by Modified Proctor test