APPENDICES

APPENDIX 1

PHOTOGRAPHS OF UNDERGROUND TRANSMISSION LINE

Appendix-1 Photographs of Underground Transmission Line

UG_Route4 (April 24, 2014)

Point 1 (UG_Route4: GS5 >NCC)

Point 2 (UG_Route4: GS5 >NCC)

Point 3 (UG_Route4: GS5 >NCC)
Waterway

Point 4 (UG_Route4: GS5 >NCC)
Railway

Point 5 (UG_Route4: GS5 >NCC)

UG_Route4 (GS5 - NCC)
230kV Cable

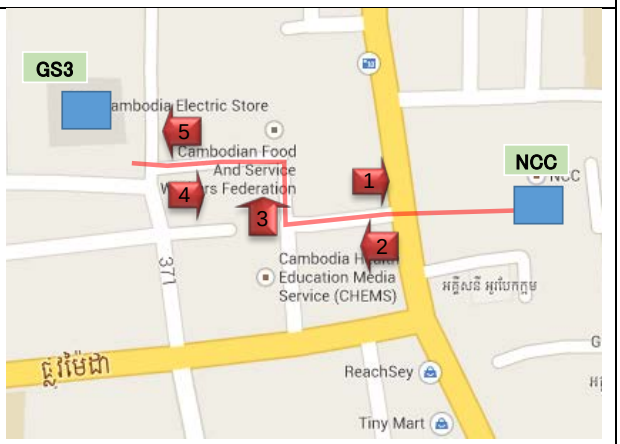
Point 1 (UG_Route5: NCC > GS3)

Point 2 (UG_Route5: NCC > GS3)

Point 3 (UG_Route5: NCC > GS3)

Point 4 (UG_Route5: NCC > GS3)

Point 5 (UG_Route5: NCC > GS3)



UG_Route5 (NCC - GS3)
115kV Cable

APPENDIX 2

GEOLOGICAL INSPECTION

FINAL REPORT FOR DRILLING AND SPT TEST

I. INTRODUCTION

The objective of soil investigation is to obtain soil parameters for foundation design of substation and transmission line infrastructure. Soil investigation works included drilling, SPT test, soil sampling, site testing and laboratory testing. The works are carried out at NCC, Tuol Kork SS, Chroy Changvar SS; GS5 SS and along the transmission line route as shown in table below.

Table 1: Borehole location name

No.	Borehole No.	Site	Coordination	
			Easting	Northing
1	S1	NCC Substation (O Bek Ka Orm)	487759	1277252
2	S2	NCC Substation (O Bek Ka Orm)	487801	1277255
3	S3	Tuol Kork Substation	489221	1281345
4	S4	Tuol Kork Substation	489221	1281305
5	S5	GS5 Substation	482764	1281059
6	S6	GS5 Substation	482780	1281019
7	S7	GS5 Substation	482743	1281016
8	S8	Chroy Changvar Substation	488653	1293456
9	S9	Chroy Changvar Substation	488633	1293386
10	T1	Transmission line 230kV Mid point WPP/NPP to GS5 SS	478878	1278792
11	T2	Transmission line 230kV Mid point WPP/NPP to GS5 SS	474097	1278396
12	T3	Transmission line 115kV GS5 to Chroy Changvar SS	482136	1286158
13	T4	Transmission line 115kV GS5 to Chroy Changvar SS	483190	1292173
14	T5	Transmission line 115kV GS5 to Chroy Changvar SS	485450	1294126

II. METHODOLOGY OF TEST

The Standard Penetration Test (SPT) is a soil boring test; Rotary Auger Method is used to take in all boreholes drilling with SPT split-spoon sampler. The Standard Penetration Test were made borehole at every 1.50 meter intervals till the end of the proposed depth.

II.1. DESCRIPTION OF TEST

This method describes the standard penetration test using the split-spoon sampler to obtain the resistance of soil to penetration (N-value), using a 63.5 kg hammer falling 0.76 m; and to obtain representative samples for identification and laboratory tests.

The method is applicable to all soil types. It is most often used in granular materials but also in other materials when simple in-place bearing strengths are required. It is also used when samples cannot easily be recovered by other means.

II.2. APPARATUS AND MATERIAL

Drilling equipment - any drilling equipment is acceptable that provides a reasonably clean hole, which is at least 5 mm larger than the sampler or sampling rods, and less than 170 mm diameter.

Sampling rods - steel A-rod is used to connect the sampler to the drive weight assembly. A-rod should be used unless otherwise directed.

Split-spoon sampler - consists of 3 main parts; head, split-barrel and shoe, as shown in Figure 3. A core catcher should be installed to prevent loss of sample. Shoes which have been damaged should be replaced or repaired.

Drive-weight assembly - consisting of a 63.5 kg weight (hammer), a driving head (anvil) and a guide permitting free fall of 0.76 m and an over lift capability of at least 100 mm.

Cathead operating at approximately 100 rpm, equipped with suitable rope and overhead sheave for lifting drive-weight.

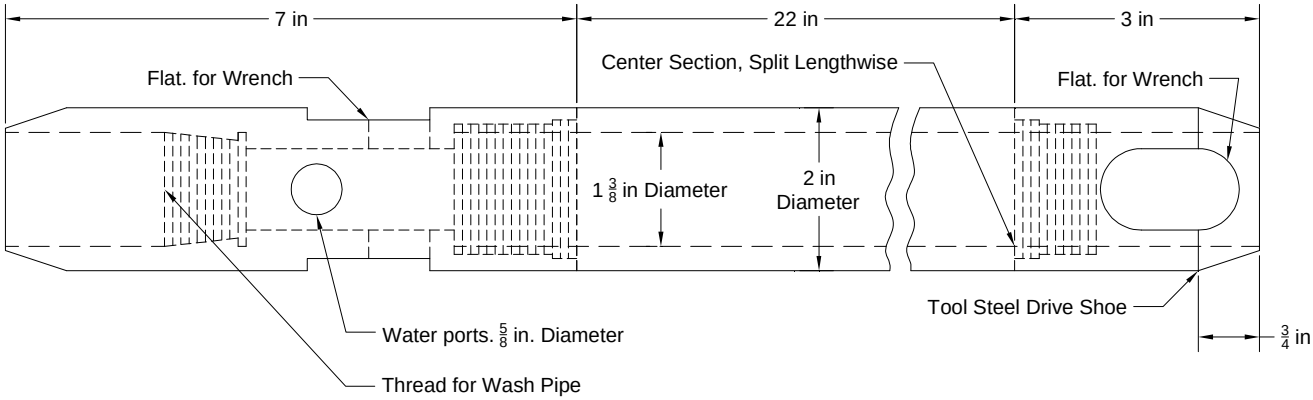


Figure 1 – Split-spoon sampler for the standard penetration test

II.3. PROCEDURE

a. Test Hole

Drill the hole to the desired sampling depth and clean out all disturbed material. If a wet drill is used, flush out all cuttings.

b. Assembling Equipment

Attach the split-spoon sampler to the A-rod and lower into the hole until it is sitting on the undisturbed material. Attach the drive weight assembly. Lift the 63.5 kg hammer approximately 0.76 m and allow it to fall on the anvil delivering one seating blow. Mark the drill rod in 3 successive 0.15 m increments to observe penetration. Mark the drive weight assembly to indicate a 0.76 m hammer lift.

c. Penetration Testing

Raise and drop the hammer 0.76 m successively by means of the rope and cathead, using no more than 2 1/4 wraps around the cathead. The hammer should be operated between 40 and 60 blows per minute and should drop freely. Continue the driving until either 0.45 m has been penetrated or 100 blows has been applied.

Record the number of blows for each .15 m of the penetration. The first 0.15 m increment is the "seating" drive. The sum of the blows for second and third increment of 0.15 m penetration is

termed "penetration resistance or "N-value". If the blow count exceeds 100 in total, terminate the test and record the number of blows for the last 0.30 m of penetration as the N-value. If less than 0.30 m is penetrated in 100 blows, record the depth penetrated and the blow count. If the sampler advances below the bottom of the hole under its own weight, note this condition on the log.

d. Handling Sample

Bring the sampler to the surface and open it. Remove any obvious contamination from the ends or sides and drain excess water. Carefully scrape or slice along one side to expose fresh material and any stratification. Record the length, composition, color, stratification and condition of sample. Remove sample and wrap it or seal in a plastic bag to retain moisture. If the sample can be removed relatively intact, wrap it in several layers of plastic to strengthen it and seal ends with tape. Mark the sample "top" and "bottom" if applicable and label it with an identification number.

e. Mobilization of Drilling Machine

For drilling machine, we use PAT DRILL 201 and YBM-2 (as shown in picture below) which is really light weight machine. YBM-2 was used at some location that is easy to mobilize in. For some others location we used PAT DRILL 201 that is installed on the steel tube scaffolding and operated by modified motor to drill, hang up and drops 63.5Kg of SPT hammer.

Figure 2 – PAT DRILL 201

Figure 3 – YBM-2

This type of machine is easy to mobilize part by part into the difficult condition of site location such as in the rice field which has no access road and on the water that is suitable for bridge construction project. The area damaged of drilling work is about 5m x 5m and it would be tested around 10m far away from the tower location so we can adjust the testing location to where the damage of rice field is much reduced.

In figure below is described about the drop weight arrangement part which can be separated piece by piece and bring to the testing location.

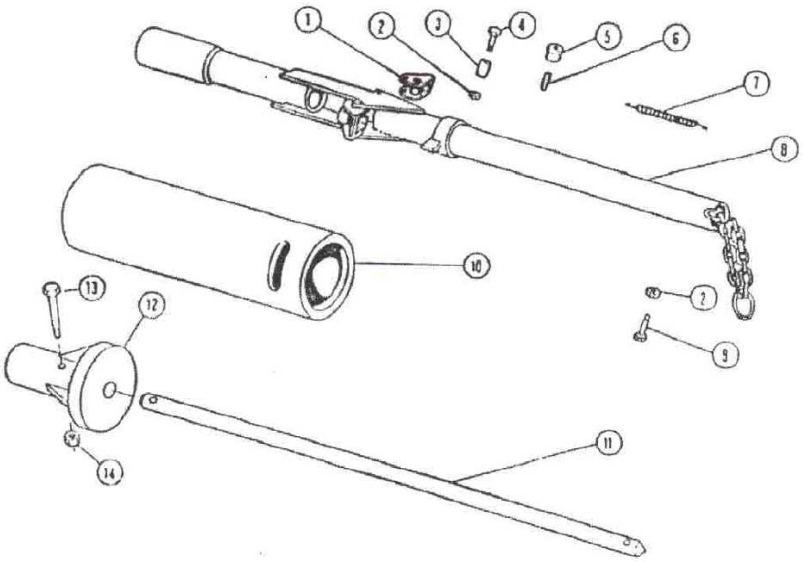


Figure 4 – Drop weight arrangement

1. Latching finger
2. Nut
3. Nylon bush
4. Hex head bolt
5. Roller
6. Pin
7. Spring
8. Lifting tube
9. Hex head bolt
10. Barrel
11. Anvil assembly
12. Gulde
13. Hex head bolt
14. Nyloc nut

II.4. FIELD WORK

a. Boring with Sampling and SPT

Rotary Auger Method carried out with 90mm of normal diameter by drilling machine model PAT Drill 201. Disturbed sample will be taken in all strata and undisturbed sample will be taken in all boreholes drilling with the SPT Split – spoon sampler. The standard penetration test (SPT) will make borehole at every 1m intervals till the end of the proposed depth.

All Sample and Undisturbed Samples have been kept in the PVC pipe and plastic bag to maintain in to be in good condition and were put it in the core box, for analyzing in laboratory.

b. Taking Undisturbed Sample

All sample and undisturbed sample will be kept in PVC pipe and plastic bag to maintain in a good condition and put it in the core box, for analyzing in laboratory.

10 samples will be taken as undisturbed soil sample and 8 by borehole drilling. The diameter of undisturbed sample by 35mm and the depth that has to take from 1.45m to 15.45m depth to compare the natural ground level.

II.5. LABORATORY TESTING PROGRAM AND EQUIPMENT

a. Soil Laboratory Testing Program

The Laboratory Testing program included:

1. Soil Classification
2. Natural water contents determination
3. Density and dry density determination
4. Atterberg limit tests of selected cohesive or sandy soil
5. Sieves distribution test
6. Unconfined compression test

The laboratory testing was supervised By Mr. KETCHANSAVUTH Geology engineer and director of Soil Laboratory, and Operator of testing as follow:

- Mrs. BO CHAN THOL (assistant engineer)
- Mrs. CHOU SAREM (assistant engineer)

The tests were carried out at the soils laboratory facility. The testing procedure used in general accordance with ASTM Standard and AASHTO Standard.

The following were carried out:

1- Soil Classification (AASHTO)
2- Natural Moisture Content (AASHTO T-265)
3- Plastic Limit (AASHTO T-90)
4- Liquid Limit (AASHTO T-89)
5- Grain Size (AASHTO T-1557)
6- Bulk and dry density with moisture content of undisturbed sample (AASHTO T-204-90)
7- Unconfined compression test with moisture content (ASTM D2166-85)

b. Soil Laboratory Equipment

- SIEVE & AGGREGATE SHAKERS EL 80-0350
- CASAGRAMDE devices for liquid limit determination
- PROCTOR and CBR probes EL 24-9160 Series CBR-Test 50
- OVEN EL22-0110
- BALANCES (EL 22-5701 x EL 22-7090)

III. RESULT

III.1. BORING LOG

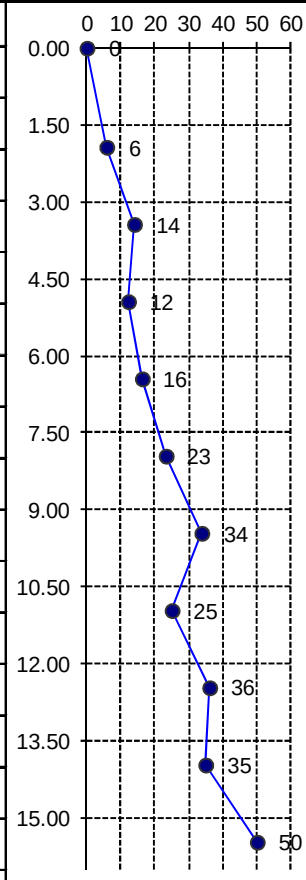
a. NCC Substation

PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **S1**	
SITE: NCC Substation (O Bek Ka Orm)											Date Started: 27/6/2014	
E:487759 , N:1277252 , BH Elevation: 0.00						EQUIPMENT: YBM - 2					Date Finished: 27/6/2014	
	Samples	Sample Type	DESCRIPTION OF STRATA	Dept h & Thick	Legend	Depth testing	SPT Test					Recovery ratio
							N_0	N_1	N_2	N-value (Blows / 300mm)		
m	No			m.		m.	Blow s / 150mm			0 10 20 30 40 50 60		mm.
1			Soil Filling (0.00m - 1.50m)	1.50						0.00 0		
2						1.50-1.95	1	3	3	1.50 6		
3			Firm to Stiff Red CLAY (1.50m - 5.00m)	3.50						3.00		
4						3.00-3.45	3	4	8	12		
5						4.50-4.95	5	9	15	4.50 24		
6			Very Stiff Grey Sandy CLAY (5.00m - 9.50m)	4.30						6.00		
7						6.00-6.45	3	6	10	16		
8						7.50-7.95	4	7	14	7.50 21		
9												
10			Hard to Very Very Hard Yellow Clayey SAND (9.50m - 15.00m)	6.50		9.00-9.45	5	9	15	9.00 24		
11						10.50-10.95	6	11	12	10.50 23		
12												
13						12.00-12.45	15/15	15/10	50	12.00 50		
14						13.50-13.95	35/15	15/5	50/20	13.50 50		
15												
						15.00-15.45				15.00		
										16.50		
LEGEND:				Water Strike: No						> 50 blows / 30 cm		
UD - Undisturbed Sample				Water Level: No								

PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **S2**
SITE: NCC Substation (O Bek Ka Orm)											Date Started: 28/6/2014
E:487801 , N:1277255 , BH Elevation: 0.00					EQUIPMENT: YBM - 2						Date Finished: 28/6/2014
	Samples	Sample Type	DESCRIPTION OF STRATA	Dept h & Thick	Legend	Depth testing	SPT Test			N-value (Blows / 300mm)	Recovery ratio
							N_0	N_1	N_2		
m	No			m.		m.	Blow s / 150mm			0 10 20 30 40 50 60	mm.
1			Soil Filling (0.00m - 1.60m)	1.60						0.00 0	
2			Firm to Stiff Red Grey CLAY (1.60m - 5.00m)	3.40		1.50-1.95	1	1	4	1.50 5	
3											
4						3.00-3.45	2	4	7	3.00 11	
5						4.50-4.95	4	6	9	4.50 15	
6			Very Stiff to Hard Grey Sandy CLAY (5.00m - 8.50m)	3.50							
7						6.00-6.45	4	6	10	6.00 16	
8						7.50-7.95	4	10	20	7.50 30	
9											
10			Hard to Very Hard CLAY (8.50m - 15.00m)	7.50		9.00-9.45	6	10	14	9.00 24	
11						10.50-10.95	8	12	19	10.50 30	
12											
13						12.00-12.45	10	15	15	12.00 30	
14						13.50-13.95	25	> 50	> 50	13.50 50	
15											
						15.00-15.45				15.00	
										16.50	
LEGEND:				Water Strike: No						> 50 blows / 30 cm	
UD - Undisturbed Sample				Water Level: No							

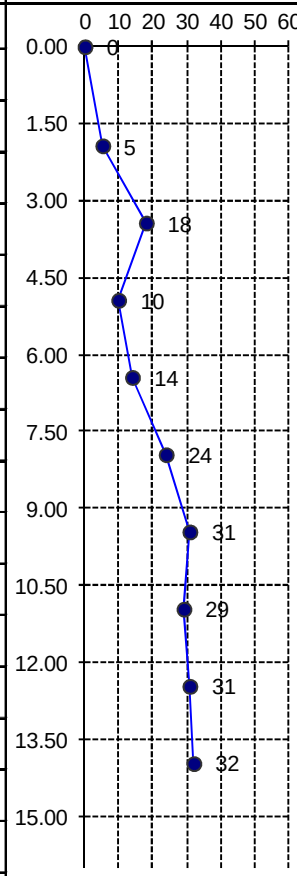
b. Tuol Kork Substation

PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **S3**	
SITE: Tuol Kork Substation											Date Started: 31-May-14	
E:489221 , N:1281345 , BH Elevation: 0.00					EQUIPMENT: YBM - 2						Date Finished: 1-Jun-14	
	Samples	Sample Type	DESCRIPTION OF STRATA	Depth & Thick	Legend	Depth testing	SPT Test					Recovery ratio
							N_0	N_1	N_2	N-value (Blows / 300mm)		
m	No			m.		m.	Blows / 150mm					mm.
1			Firm Brown CLAY (0.00m - 3.00m)	3.00								
2						1.50-1.95	2	3	3			
3												
4			Stiff Red Sandy CLAY (3.00m - 4.50m)	1.50		3.00-3.45	3	6	8			
5						4.50-4.95	2	5	7			
6			Red Meduim Dense SAND (4.50m - 14.50m)	10.00								
7						6.00-6.45	5	6	10			
8						7.50-7.95	6	11	12			
9												
10						9.00-9.45	6	12	21			
11						10.50-10.95	6	9	16			
12												
13						12.00-12.45	10	16	20			
14						13.50-13.95	10	16	15			
15			Hard Grey Clayey SAND (14.50m - 16.00m)	1.50								
16						15.00-15.45	15	21	29			
17						16.50-16.95						



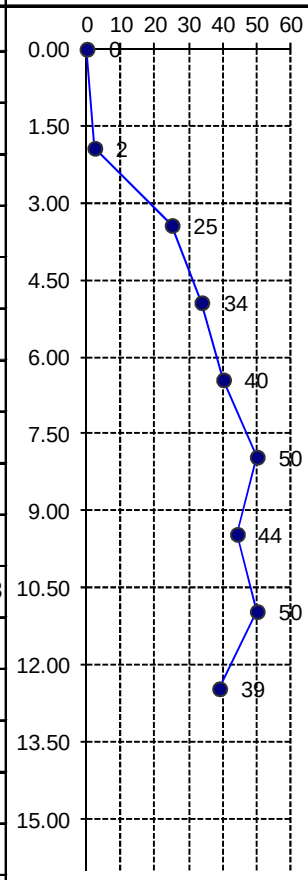
LEGEND:	Water Strike: No	> 50 blows / 30 cm
UD - Undisturbed Sample	Water Level: No	

PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **S4**
SITE: Tuol Kork Substation											Date Started: 30/5/2014
E:489221 , N:1281305 , BH Elevation: 0.00					EQUIPMENT: YBM - 2						Date Finished: 31/5/2014
	Samples	Sample Type	DESCRIPTION OF STRATA	Dept h & Thick	Legend	Depth testing	SPT Test			N-value (Blows / 300mm)	Recovery ratio
							N_0	N_1	N_2		
m	No			m.		m.	Blow s / 150mm				mm.
1			Firm Sandy CLAY (0.00m - 1.50m)	1.50							
2						1.50-1.95	1	2	3		
3			Firm to Stiff Grey Organic CLAY	1.00							
4			(1.50m - 2.50m)			3.00-3.45	4	8	10		
5			Stiff Red Grey Sandy CLAY	2.00		4.50-4.95	2	4	6		
6											
7			(2.50m - 4.50m)			6.00-6.45	3	6	8		
8						7.50-7.95	6	11	18		
9											
10			Meduim Dense Grey SAND	9.50		9.00-9.45	7	12	19		
11			(4.50m - 14.00m)			10.50-10.95	6	13	16		
12											
13						12.00-12.45	11	14	17		
14						13.50-13.95	7	14	18		
15											
16						15.00-15.45					
17						16.50-16.95					
LEGEND:				Water Strike: No						32 blows / 30 cm	
UD - Undisturbed Sample				Water Level: No							



c. GS5 Substation

PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **S5**	
SITE: GS5 Substation											Date Started: 19/6/2014	
E:482764 , N:1281059 , BH Elevation: 0.00					EQUIPMENT: YBM - 2						Date Finished: 19/6/2014	
	Samples	Sample Type	DESCRIPTION OF STRATA	Depth & Thick	Legend	Depth testing	SPT Test					Recovery ratio
							N_0	N_1	N_2	N-value (Blows / 300mm)		
m	No			m.		m.	Blows / 150mm					mm.
1			Soft Red CLAY	2.30								
2			(0.00m - 2.30m)			1.50-1.95	0	1	1			
3												
4			Very Hard Grey Sandy CLAY	7.80		3.00-3.45	6	11	14			
5						4.50-4.95	5	13	21			
6			(2.30m - 9.50m)									
7						6.00-6.45	10	18	22			
8						7.50-7.95	13	23	27			
9												
10						9.00-9.45	18	23	21			
11			Dense Grey SAND	3.00		10.50-10.95	31/15	19/8	50/23			
12			(9.50m - 12.50m)									
13						12.00-12.45	7	15	24			
14						13.50-13.95						
15												
16						15.00-15.45						
17						16.50-16.95						
LEGEND:				Water Strike: No						39 blows / 30 cm		
UD - Undisturbed Sample				Water Level: No								

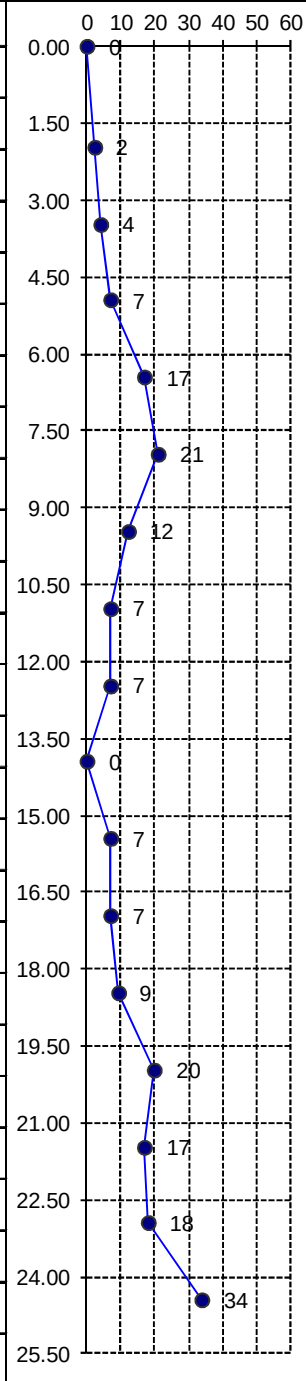


PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **S6**
SITE: GS5 Substation											Date Started: 17/6/2014
E:482780 , N:1281019 , BH Elevation: 0.00					EQUIPMENT: YBM - 2						Date Finished: 17/6/2014
	Samples	Sample Type	DESCRIPTION OF STRATA	Dept h & Thick	Legend	Depth testing	SPT Test				Recovery ratio
							N_0	N_1	N_2	N-value (Blows / 300mm)	
m	No			m.		m.	Blow s / 150mm			0 10 20 30 40 50 60	mm.
1			Firm to Stiff Yellow CLAY with Gravel (0.00m - 4.50m)	4.50						0.00 0	
2						1.50-1.95	4	2	2	1.50 4	
3											
4						3.00-3.45	3	4	6	3.00 10	
5						4.50-4.95	2	4	7	4.50 11	
6			Medium Dense Grey SAND with Gravel (4.50m - 12.30m)	7.80							
7						6.00-6.45	5	11	12	6.00 23	
8						7.50-7.95	11	15	2	7.50 38	
9											
10						9.00-9.45	10	20	22	9.00 41	
11						10.50-10.95	10	12	18	10.50 30	
12											
13			Hard Grey Sandy CLAY (12.30m - 14.00m)	1.70		12.00-12.45	12	11	35	12.00 46	
14						13.50-13.95	10	15	18	13.50 33	
15											
16						15.00-15.45				15.00	
17						16.50-16.95					
LEGEND:				Water Strike: No						33 blows / 30 cm	
UD - Undisturbed Sample				Water Level: No							

PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **S7**
SITE: GS5 Substation											Date Started: 18/6/2014
E:482743 , N:1281016 , BH Elevation: 0.00					EQUIPMENT: YBM - 2						Date Finished: 18/6/2014
	Samples	Sample Type	DESCRIPTION OF STRATA	Dept h & Thick	Legend	Depth testing	SPT Test				Recovery ratio
							N_0	N_1	N_2	N-value (Blows / 300mm)	
m	No			m.		m.	Blow s / 150mm			0 10 20 30 40 50 60	mm.
1			Soil Filling (0.00m - 1.50m)	1.50						0.00 0	
2						1.50-1.95	5	5	1	1.50 6	
3			Firm to Stiff Grey SAND (1.50m - 3.00m)	1.50							
4			Firm Red Grey Sandy CLAY	2.60		3.00-3.45	2	5	9	3.00 14	
5			(3.00m - 5.60m)			4.50-4.95	3	5	4	4.50 9	
6											
7						6.00-6.45	10	14	19	6.00 33	
8						7.50-7.95	17	26	24/5	7.50 50	
9			Dense Red Grey Sand	6.70							
10			(5.60m - 12.30m)			9.00-9.45	16	15	16	9.00 31	
11						10.50-10.95	15	24	26/2	10.50 50	
12											
13			Dense Grey SAND with Gravel	0.20		12.00-12.45	6	13	25	12.00 38	
14			(12.30m - 12.50m)			13.50-13.95				13.50	
15											
16						15.00-15.45				15.00	
17						16.50-16.95					
LEGEND:				Water Strike: No						38 blows / 30 cm	
UD - Undisturbed Sample				Water Level: No							

d. Chroy Changvar Substation

PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **S8**	
SITE: Chroy Changvar Substation											Date Started: 1/7/2014	
E:488653 , N:1293456 , BH Elevation: 0.00						EQUIPMENT: PAT Drill 201					Date Finished: 2/7/2015	
	Samples	Sample Type	DESCRIPTION OF STRATA	Depth & Thick	Legend	Depth testing	SPT Test					Recovery ratio
							N_0	N_1	N_2	N-value (Blows / 300mm)		
m	No			m.		m.	Blows / 150mm					mm.
1												
2						1.50-1.95	1	1	1			
3												
4			Soft to Very Stiff Yellow CLAY	9.00		3.00-3.45	0	2	2			
5			(0.00m - 9.00m)			4.50-4.95	2	3	4			
6												
7						6.00-6.45	4	8	9			
8						7.50-7.95	6	9	12			
9												
10						9.00-9.45	4	5	7			
11						10.50-10.95	2	2	5			
12												
13						12.00-12.45	1	2	5			
14			Very Soft to Firm Grey CLAY			13.50-13.95	0	0	0			
15												
16			(9.00m - 19.50m)	10.50		15.00-15.45	0	3	4			
17						16.50-16.95	3	4	3			
18												
19						18.00-18.45	3	4	5			
20						19.50-19.95	5	9	11			
21			Very Stiff Brown CLAY									
22			(19.50m - 22.00m)	2.50		21.00-21.45	7	8	10			
23			Medium Dense Grey SAND			22.50-22.95	5	9	9			
24				2.45								
25			(22.00m - 24.45m)			24.00-24.45	7	14	20			
26												
LEGEND:				Water Strike: No						34 blows / 30 cm		
UD - Undisturbed Sample				Water Level: No								

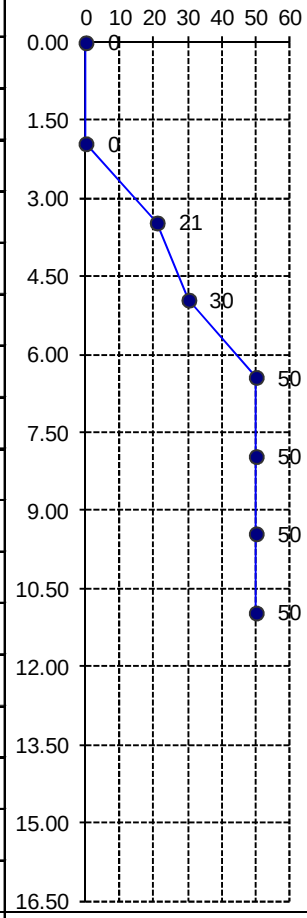


PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **S9**
SITE: Chroy Changvar Substation											Date Started: 02/07/2014
E:488633 , N:1293386 , BH Elevation: 0.00					EQUIPMENT: PAT Drill 201						Date Finished: 02/07/2015
	Samples	Sample Type	DESCRIPTION OF STRATA	Dept h & Thick	Legend	Depth testing	SPT Test			N-value (Blows / 300mm)	Recovery ratio
							N_0	N_1	N_2		
m	No			m.		m.	Blow s / 150mm			0 10 20 30 40 50 60	mm.
1			Very Soft Red CLAY							0.00 0	
2			(0.00m - 3.00m)			1.50-1.95	1	1	1	1.50 2	
3											
4				7.50		3.00-3.45	1	1	2	3.00 3	
5						4.50-4.95	1	4	4	4.50 8	
6			Soft to Firm Grey CLAY								
7			(3.00m - 7.50m)			6.00-6.45	3	6	10	6.00 16	
8						7.50-7.95	0	0	3	7.50 3	
9											
10						9.00-9.45	1	3	4	9.00 7	
11						10.50-10.95	0	0	0	10.50 0	
12											
13			Very Soft to Hard Sandy CLAY			12.00-12.45	0	1	1	12.00 2	
14			(7.50m - 22.00m)	10.50		13.50-13.95	0	1	1	13.50 2	
15											
16						15.00-15.45	1	2	3	15.00 5	
17						16.50-16.95	1	2	4	16.50 6	
18											
19						18.00-18.45	2	3	4	18.00 7	
20						19.50-19.95	4	7	9	19.50 16	
21											
22						21.00-21.45	3	12	17	21.00 19	
23			Medium Dense Grey SAND			22.50-22.95	4	10	16	22.50 26	
24				2.50							
25			(22.00m - 24.45m)			24.00-24.45	7	15	21	24.00 36	
26										25.50	
LEGEND:				Water Strike: No						36 blows / 30 cm	
UD - Undisturbed Sample				Water Level: No							

e. Transmission line 230kV Mid point WPP/NPP to GS5 Substation

PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **T1**	
SITE: Transmission Line 230Kv Mid Point WPP/NPP to GS5 SS											Date Started: 26/6/2014	
E:478878 , N:1278792 , BH Elevation: 0.00						EQUIPMENT: PAT Drill 201					Date Finished: 26/6/2014	
	Samples	Sample Type	DESCRIPTION OF STRATA	Dept h & Thick	Legend	Depth testing	SPT Test			N-value (Blows / 300mm)		Recovery ratio
							N_0	N_1	N_2			
m	No			m.		m.	Blow s / 150mm			0 10 20 30 40 50 60		mm.
1			Fine SAND (0.00m - 1.50m)	1.50						0.00		
2						1.50-1.95	30		> 50	1.50	50	
3			Very Dense Clayey SAND (1.50m - 6.00m)	4.50						3.00	50	
4						3.00-3.45	25/6		> 50	4.50	50	
5						4.50-4.95	25/5		> 50	6.00	32	
6										7.50	50	
7			Hard Yellow CLAY (6.00m - 7.60m)	1.60		6.00-6.45	10	15	17	9.00	50	
8						7.50-7.95	15/15	35/5	> 50	10.50	50	
9			Very Hard Sandy CLAY (7.60m - 11.00m)	3.40						12.00		
10						9.00-9.45	20/5		> 50			
11						10.50-10.95	15/7		> 50			
12												
13						12.00-12.45						
LEGEND:				Water Strike: No						> 50 blows / 30 cm		
UD - Undisturbed Sample				Water Level: No								

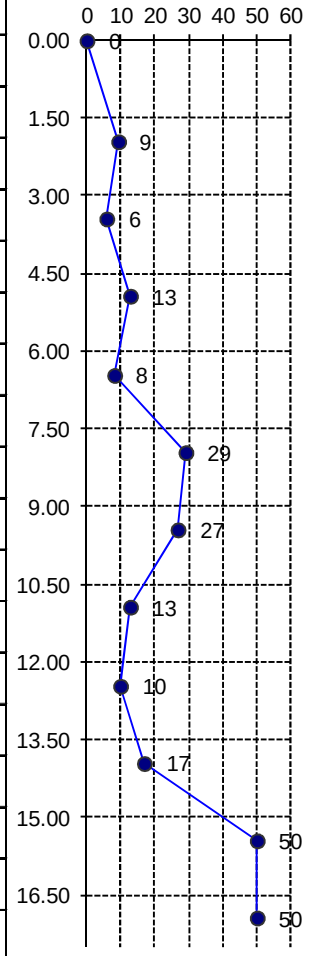
PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **T2**	
SITE: Transmission Line 230Kv Mid Point WPP/NPP to GS5 SS											Date Started: 24/6/2014	
E:474097 , N:1278396, BH Elevation: 0.00						EQUIPMENT: PAT Drill 201					Date Finished: 24/6/2014	
	Samples	Sample Type	DESCRIPTION OF STRATA	Dept h & Thick	Legend	Depth testing	SPT Test			N-value (Blows / 300mm)		Recovery ratio
							N_0	N_1	N_2			
m	No			m.		m.	Blow s / 150mm					mm.
1			Soft Grey Sandy CLAY (0.00m - 3.00m)	3.00								
2						1.50-1.95						
3												
4			Very Soft to Very Hard Yellow Sandy CLAY with Gravel (3.00m - 11.00m)	8.00		3.00-3.45	5	9	14			
5						4.50-4.95	5	12	19			
6												
7						6.00-6.45	9	19/15	31/10			
8						7.50-7.95	11	30/15	20/10			
9												
10						9.00-9.45	15	30/15	20/9			
11						10.50-10.95	25/15	25/11	> 50			
12												
13						12.00-12.45						
14						13.50-13.95						
15												
16						15.00-15.45						
LEGEND:				Water Strike: No						> 50 blows / 30 cm		
UD - Undisturbed Sample				Water Level: No								



f. Transmission line 115kV GS5 to Chroy Changvar Substation

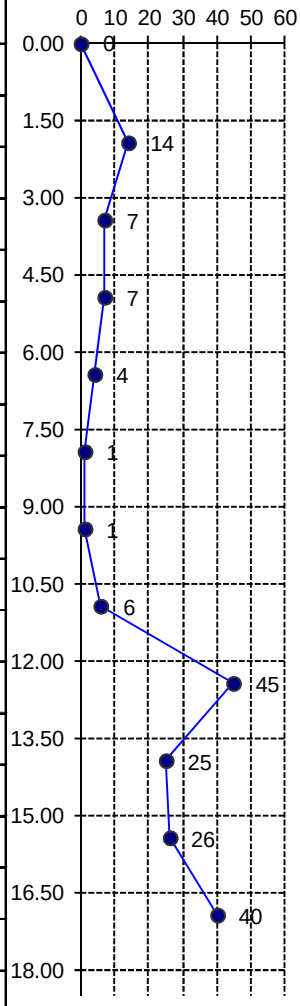
PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **T3**	
SITE: Transmission Line 115 Kv GS5 to Chroy Chongvar SS											Date Started: 21/6/2014	
E:482136 , N:1286158 , BH Elevation: 0.00						EQUIPMENT: PAT Drill 201					Date Finished: 21/6/2014	
	Samples	Sample Type	DESCRIPTION OF STRATA	Depth & Thick	Legend	Depth testing	SPT Test			N-value (Blows / 300mm)		Recovery ratio
							N_0	N_1	N_2			
m	No			m.		m.	Blows / 150mm			0 10 20 30 40 50 60		mm.
1			Very Stiff to Hard Brown CLAY (0.00m - 9.00m)	9.00						0.00 6		
2						1.50-1.95	5	6	6	1.50 12		
3												
4						3.00-3.45	5	7	9	3.00 16		
5						4.50-4.95	8	14	20	4.50 34		
6												
7						6.00-6.45	7	16	20	6.00 36		
8						7.50-7.95	4	5	7	7.50 12		
9												
10			Meduim Dense to Very Dense SAND (9.00m - 16.00m)	7.00		9.00-9.45	4	7	6	9.00 13		
11						10.50-10.95	6	6	7	10.50 13		
12												
13						12.00-12.45	15	19	25	12.00 44		
14						13.50-13.95	7	15	27	13.50 42		
15												
16						15.00-15.45	11	23	27	15.00 50		
17						16.50-16.95						
LEGEND:				Water Strike: No						> 50 blows / 30 cm		
UD - Undisturbed Sample				Water Level: No								

PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **T4**
SITE: Transmission Line 115 Kv GS5 to Chroy Chongvar SS											Date Started: 29/6/2014
E:483190 , N:1292173 , BH Elevation: 0.00					EQUIPMENT: PAT Drill 201						Date Finished: 29/6/2014
	Samples	Sample Type	DESCRIPTION OF STRATA	Dept h & Thick	Legend	Depth testing	SPT Test			N-value (Blows / 300mm)	Recovery ratio
							N_0	N_1	N_2		
m	No			m.		m.	Blow s / 150mm				mm.
1			Firm to Very Stiff Grey CLAY (0.00m - 13.70m)	13.70							
2						1.50-1.95	3	4	5		
3											
4						3.00-3.45	3	2	4		
5						4.50-4.95	3	5	9		
6											
7						6.00-6.45	1	3	5		
8						7.50-7.95	5	12	17		
9											
10						9.00-9.45	5	12	15		
11						10.50-10.95	4	6	7		
12											
13						12.00-12.45	1	6	4		
14			Very Dense Grey SAND with Gravel (13.70m - 17.00m)	3.30		13.50-13.95	1	7	10		
15											
16						15.00-15.45	15	22	28		
						16.50-16.95	22/15	28/5			



LEGEND:	Water Strike: No	> 50 blows / 30 cm
UD - Undisturbed Sample	Water Level: No	

PROJECT NAME: Preparatory Suvey for PP Transmission and Distribution System Expansion Project in Cambodia Phapse 2											Borehole No. **T5**	
SITE: Transmission Line 115 Kv GS5 to Chroy Chongvar SS											Date Started: 05/07/2014	
E:485450 , N:1294126 , BH Elevation: 0.00						EQUIPMENT: PAT Drill 201					Date Finished: 06/07/2015	
	Samples	Sample Type	DESCRIPTION OF STRATA	Dept h & Thick	Legend	Depth testing	SPT Test			N-value (Blows / 300mm)		Recovery ratio
							N_0	N_1	N_2			
m	No			m.		m.	Blow s / 150mm					mm.
1												
2			Stiff Brown CLAY	3.50		1.50-1.95	4	6	8			
3			(0.00m - 3.50m)									
4						3.00-3.45	1	3	4			
5						4.50-4.95	1	3	4			
6			Very Soft Dark Grey Silty CLAY									
7			(3.50m - 10.80m)	7.30		6.00-6.45	1	1	3			
8						7.50-7.95	0	0	1			
9												
10						9.00-9.45	0	0	1			
11			Loose Dark Grey Clayey SAND	1.20		10.50-10.95	0	0	6			
12			(10.80m - 12.00m)									
13						12.00-12.45	6	15/11	10/30			
14			Medium Dense to Dense Grey SAND	5.00		13.50-13.95	4	10	15			
15			(12.00m - 17.00m)									
16						15.00-15.45	5	11	15			
17						16.50-16.95	15	18	22			
18												
LEGEND:				Water Strike: No						40 blows / 30 cm		
UD - Undisturbed Sample				Water Level: No								



III.2. LABORATORY TEST

a. Sieving analysis

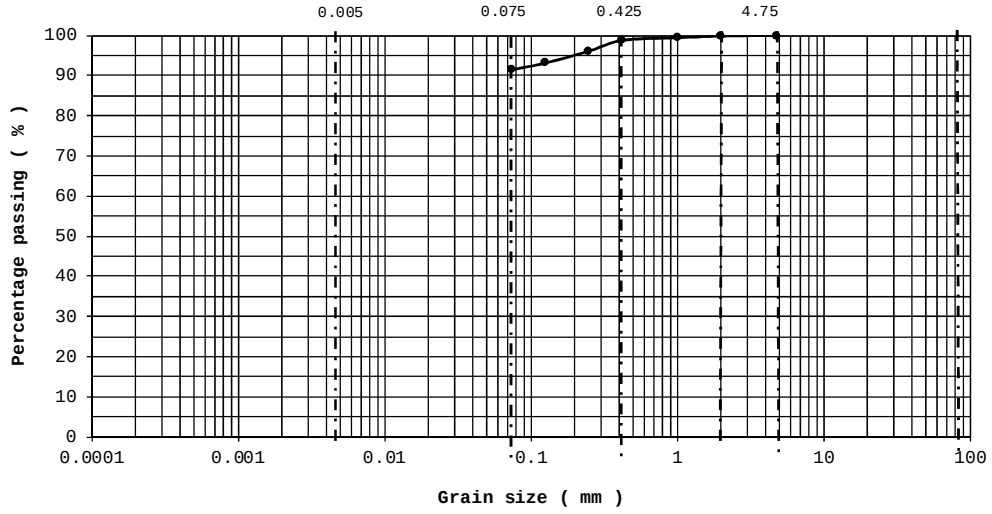
- **NCC Substation**

SIEVING ANALYSIS

Borehole: S-1 Testing Date : 20-Jul-14
Depth : 3.00- 3.45m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	19.83 %
Grain size(mm)	% passing
0.075	91.44
0.125	93.08
0.250	96.08
0.425	98.78
1	99.41
2	99.82
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	91 %
Sand :	9 %
Gravel :	0 %

Sample Description :

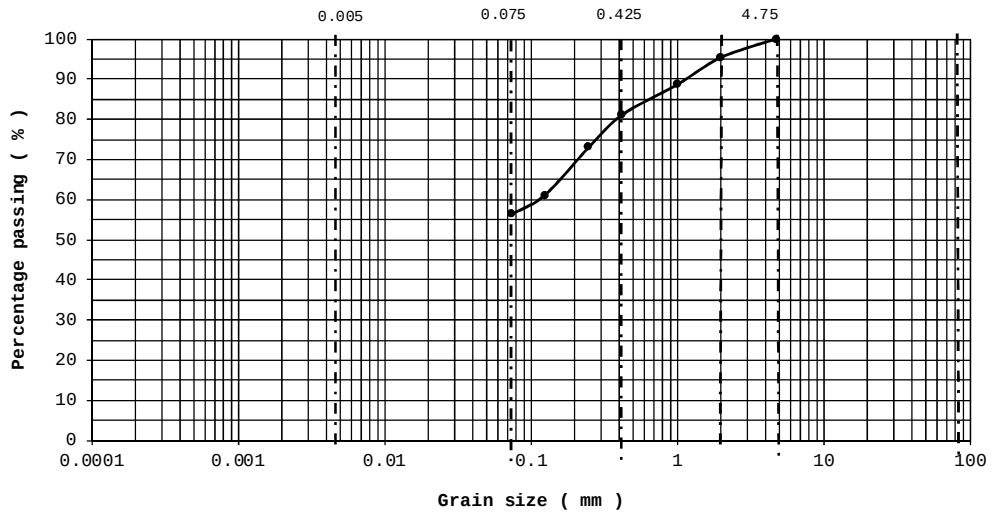
CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

Borehole: S-1 Testing Date : 20-Jul-14
Depth : 7.50- 7.95m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	13.05 %
Grain size(mm)	% passing
0.075	56.38
0.125	61.08
0.250	73.04
0.425	81.18
1	88.59
2	95.40
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	56 %
Sand :	44 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

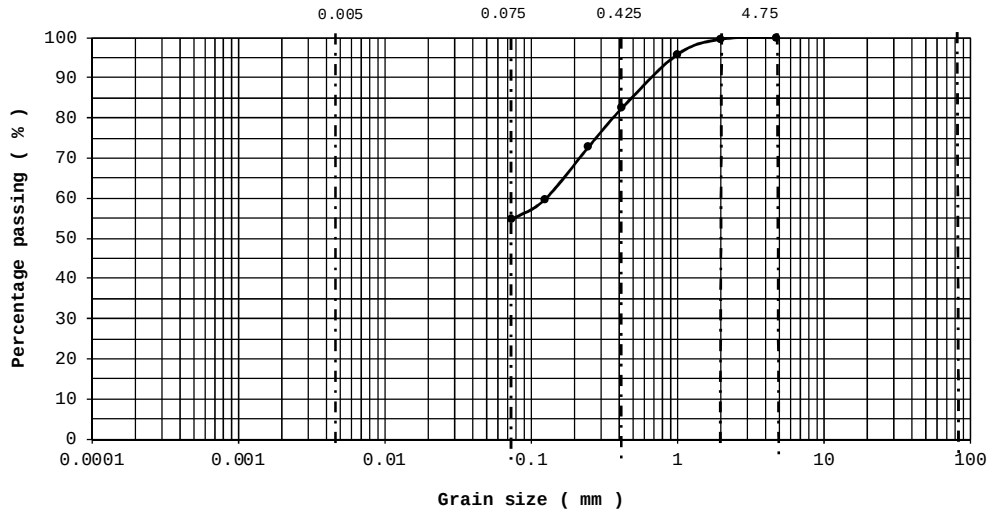
Borehole: S-1 Testing Date : 20-Jul-14

Depth : 12.00- 12.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	21.88 %
Grain size(mm)	% passing
0.075	54.73
0.125	59.63
0.250	72.83
0.425	82.59
1	95.71
2	99.60
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	55 %
Sand :	45 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

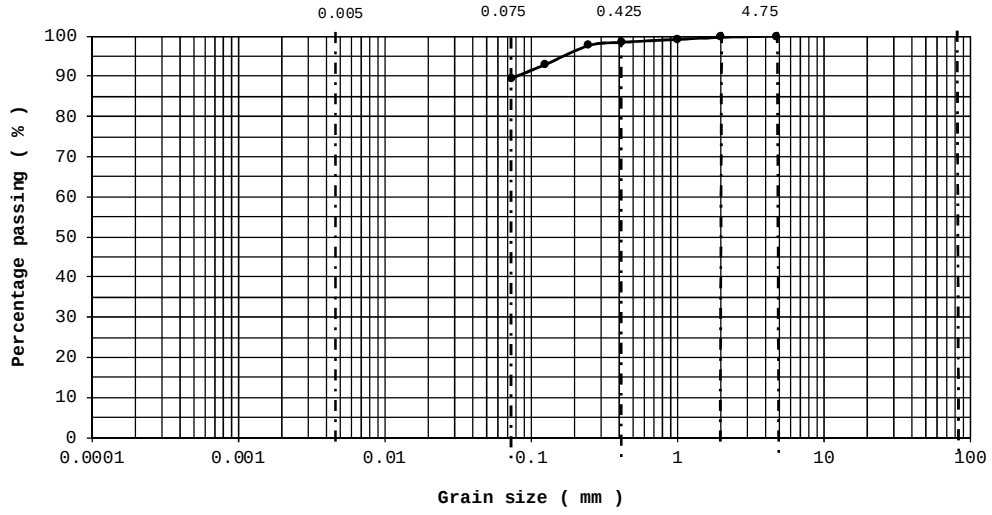
Borehole: S-2 Testing Date : 20-Jul-14

Depth : 3.00- 3.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	19.58 %
Grain size(mm)	% passing
0.075	89.56
0.125	92.86
0.250	97.63
0.425	98.46
1	99.16
2	99.70
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	90 %
Sand :	10 %
Gravel :	0 %

Sample Description :

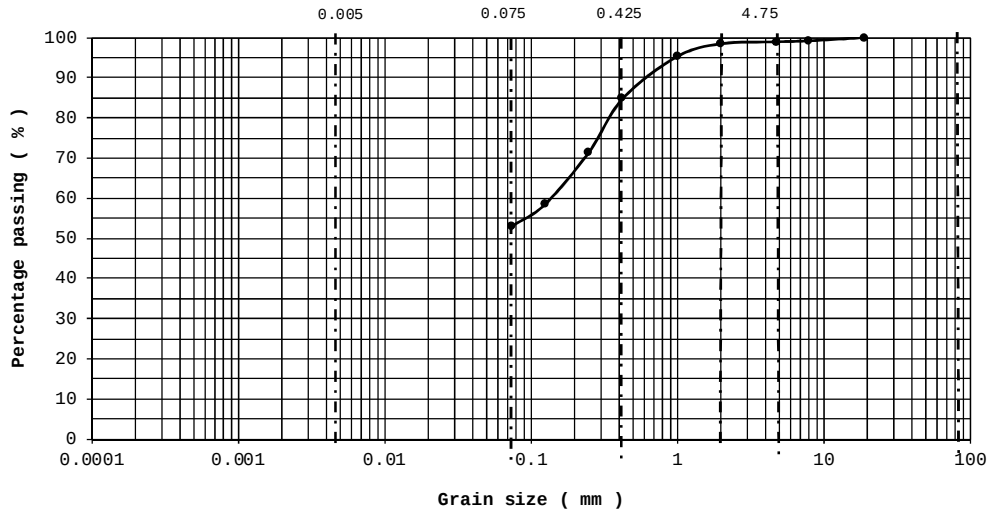
CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

Borehole: S-2 Testing Date : 20-Jul-14
Depth : 7.50- 7.95m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	13.49 %
Grain size(mm)	% passing
0.075	53.05
0.125	58.38
0.250	71.41
0.425	84.77
1	95.23
2	98.45
4.75	98.93
8	99.19
19	100.00
31.5	
63	

Silt+Clay :	53 %
Sand :	46 %
Gravel :	1 %

Sample Description :

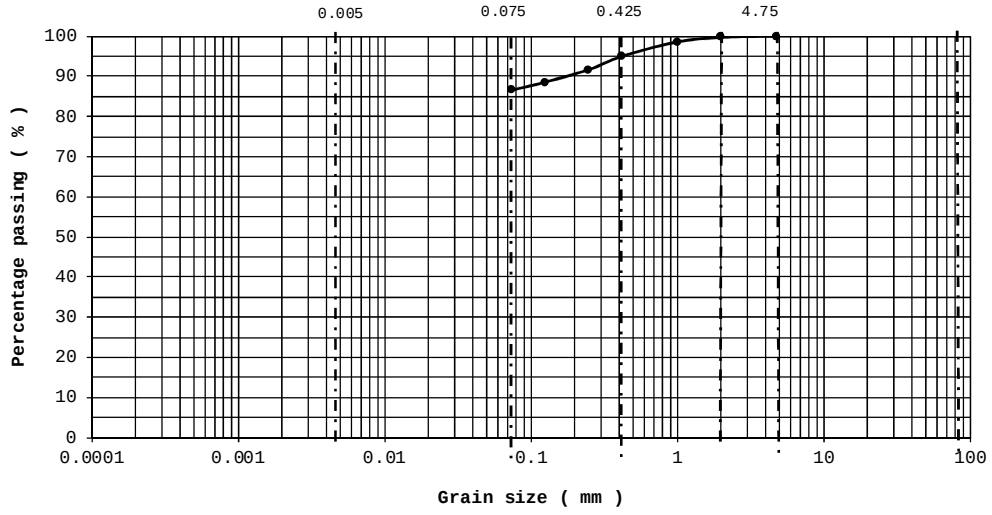
CLAY	SILT	SAND: Fine / Medium / Coarse	GRAVEL	Cobble

SIEVING ANALYSIS

Borehole: S-2 Testing Date : 20-Jul-14
Depth : 10.50- 10.95m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	23.45 %
Grain size(mm)	% passing
0.075	86.54
0.125	88.51
0.250	91.66
0.425	95.01
1	98.54
2	99.66
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	87 %
Sand :	13 %
Gravel :	0 %

Sample Description :

CLAY	SILT	SAND: Fine / Medium / Coarse	GRAVEL	Cobble

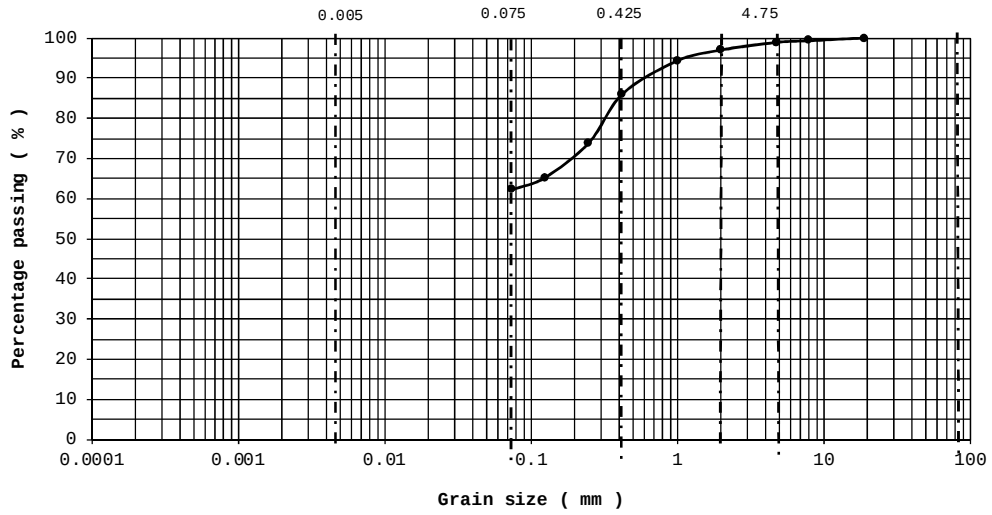
- **Tuol Kork Substation**

SIEVING ANALYSIS

Borehole: **S3** Testing Date : 3-Jun-14
Depth : 3.00- 3.45m Sample No.: SPT-2

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	14.26 %
Grain size(mm)	% passing
0.075	62.22
0.125	65.17
0.250	73.89
0.425	86.07
1	94.27
2	96.99
4.75	98.88
8	99.31
19	100.00
31.5	
63	

Silt+Clay :	62 %
Sand :	37 %
Gravel :	1 %

Sample Description :

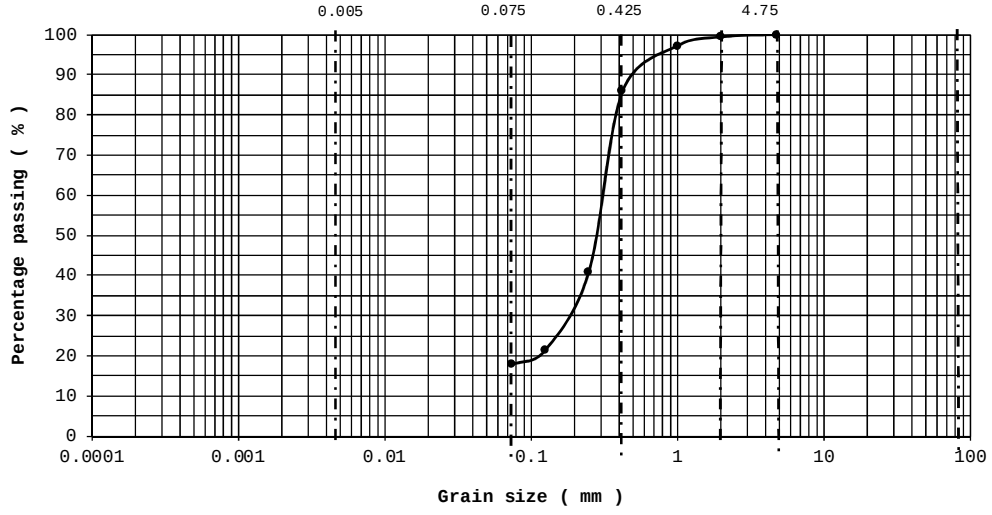
CLAY	SILT	SAND: Fine / Medium / Coarse	GRAVEL	Cobble

SIEVING ANALYSIS

Borehole: **S3** Testing Date : 3-Jun-14
Depth : 6.00- 6.45m Sample No.: SPT-4

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	18.75 %
Grain size(mm)	% passing
0.075	17.80
0.125	21.25
0.250	40.89
0.425	85.89
1	97.15
2	99.43
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	18 %
Sand :	82 %
Gravel :	0 %

Sample Description :

CLAY	SILT	SAND: Fine / Medium / Coarse	GRAVEL	Cobble

SIEVING ANALYSIS

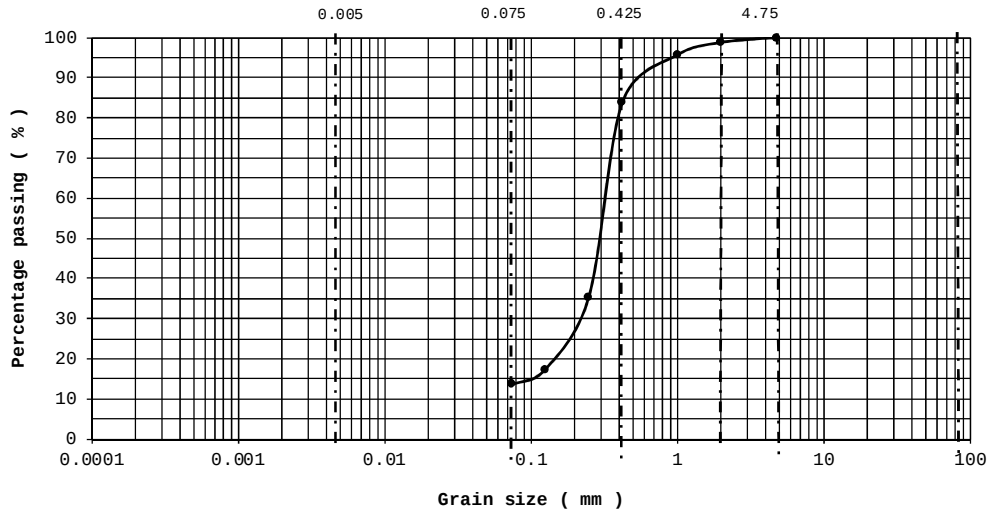
Borehole: **S3** Testing Date : 3-Jun-14

Depth : 9.00- 9.45m Sample No.: SPT-6

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	18.84 %
Grain size(mm)	% passing
0.075	13.58
0.125	17.19
0.250	35.39
0.425	84.00
1	95.64
2	98.78
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	14 %
Sand :	86 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

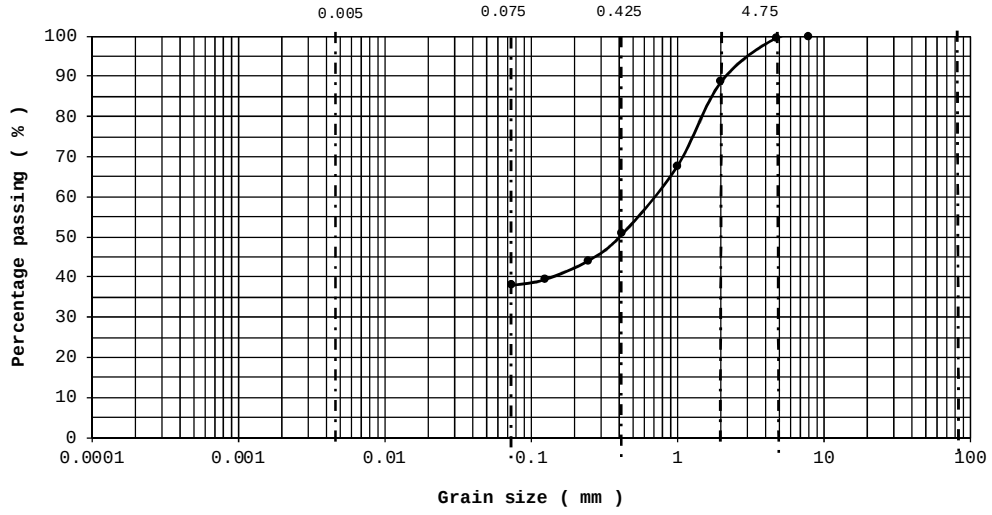
Borehole: **S3** Testing Date : 3-Jun-14

Depth : 15.00- 15.45m Sample No.: SPT-10

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	14.08 %
Grain size(mm)	% passing
0.075	37.90
0.125	39.34
0.250	44.10
0.425	50.73
1	67.47
2	88.60
4.75	99.49
8	100.00
19	
31.5	
63	

Silt+Clay :	38 %
Sand :	62 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

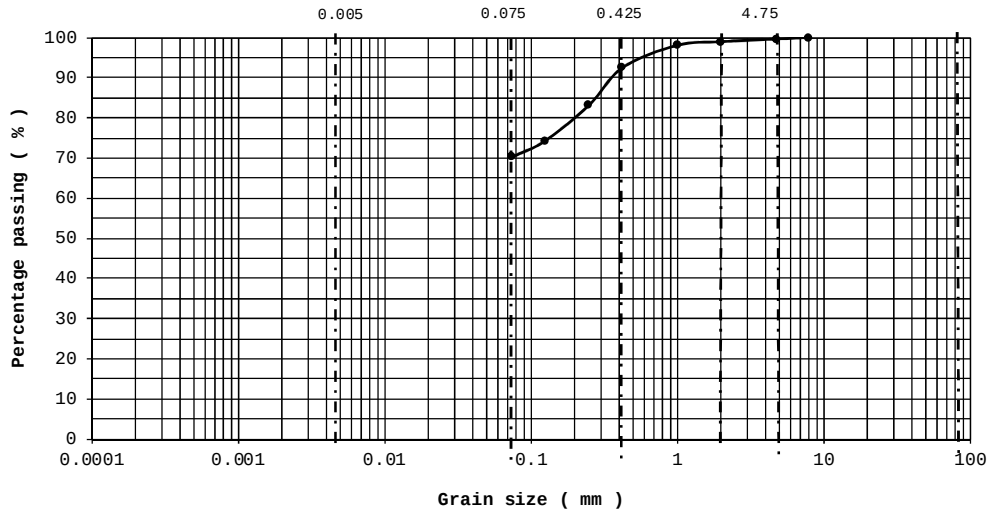
Borehole: **S4** Testing Date : 3-Jun-14

Depth : 1.50- 1.95m Sample No.: SPT-1

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	26.46 %
Grain size(mm)	% passing
0.075	70.23
0.125	74.20
0.250	83.11
0.425	92.50
1	98.04
2	98.96
4.75	99.64
8	100.00
19	
31.5	
63	

Silt+Clay :	70 %
Sand :	29 %
Gravel :	1 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

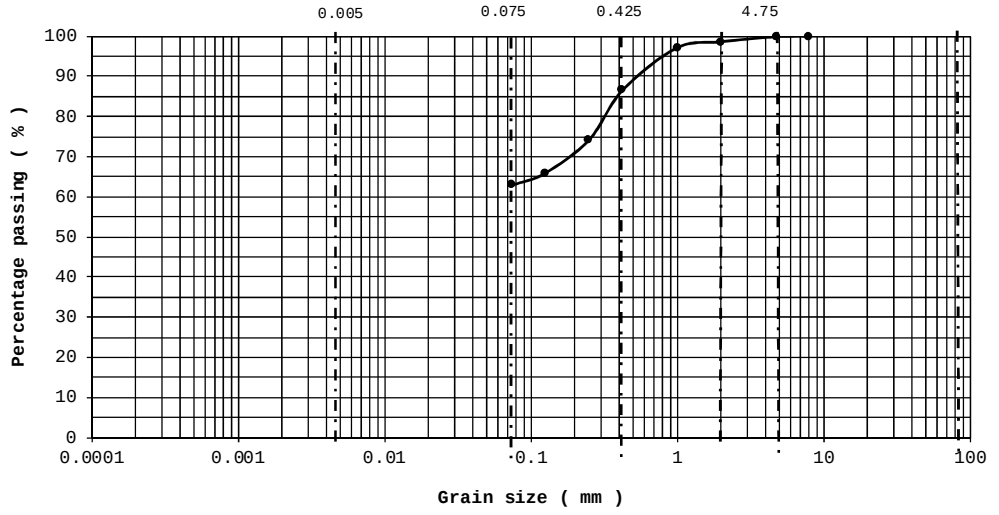
Borehole: **S4** Testing Date : 3-Jun-14

Depth : 3.00- 3.45m Sample No.: SPT-2

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	16.06 %
Grain size(mm)	% passing
0.075	62.87
0.125	65.79
0.250	74.08
0.425	86.55
1	97.08
2	98.59
4.75	99.86
8	100.00
19	
31.5	
63	

Silt+Clay :	63 %
Sand :	37 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

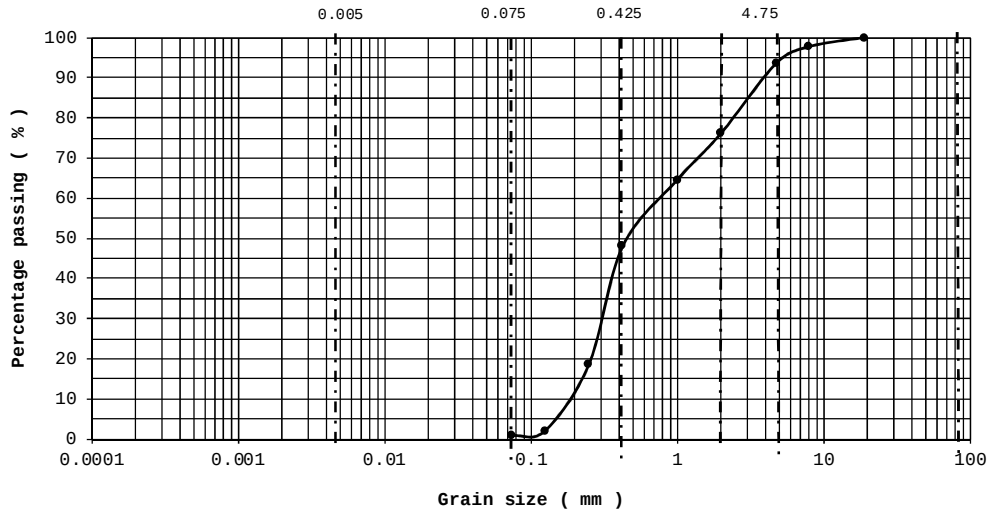
Borehole: **S4** Testing Date : 3-Jun-14

Depth : 4.50-4.95m Sample No.: SPT-3

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	17.45 %
Grain size(mm)	% passing
0.075	0.81
0.125	1.96
0.250	18.54
0.425	47.94
1	64.48
2	76.15
4.75	93.53
8	97.74
19	100.00
31.5	
63	

Silt+Clay :	1 %
Sand :	93 %
Gravel :	6 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

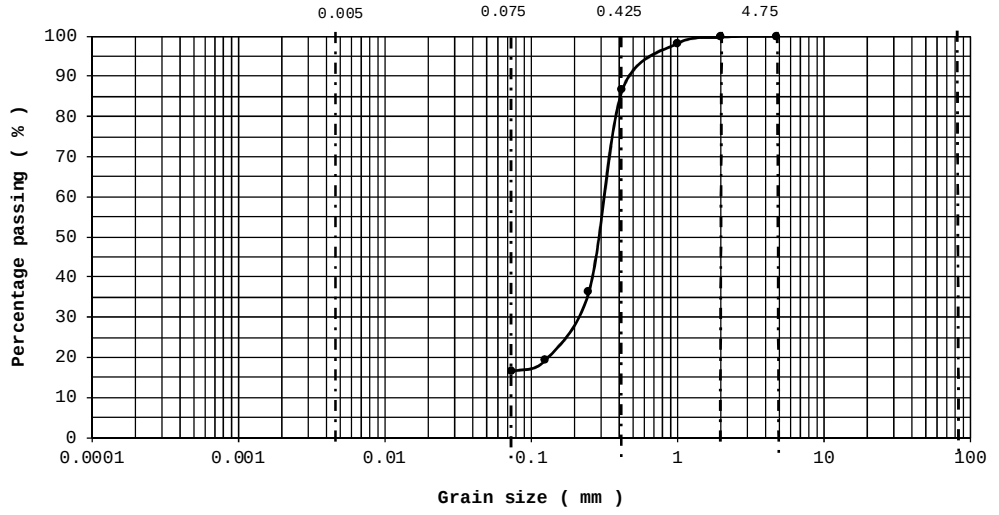
Borehole: **S4** Testing Date : 3-Jun-14

Depth : 9.00- 9.45m Sample No.: SPT-6

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	17.80 %
Grain size(mm)	% passing
0.075	16.45
0.125	19.12
0.250	36.21
0.425	86.76
1	98.12
2	99.71
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	16 %
Sand :	84 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

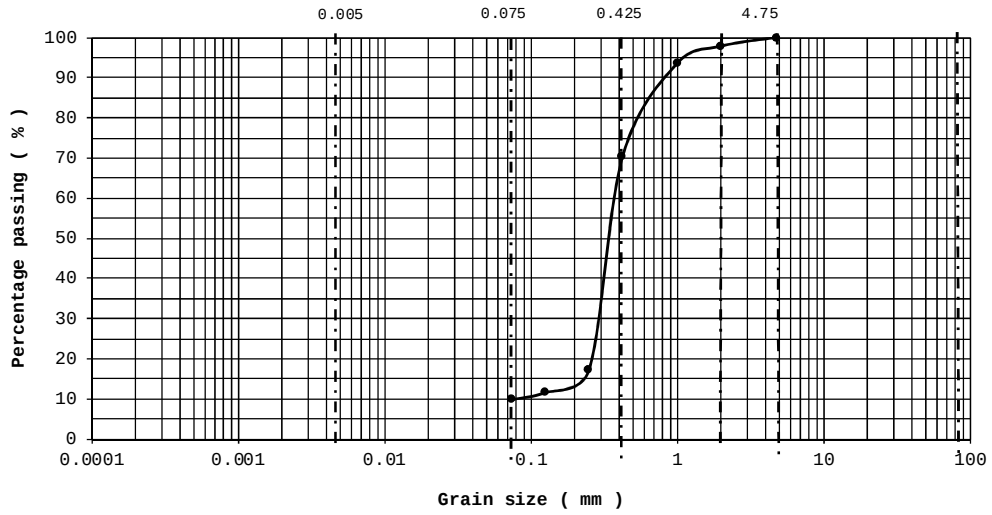
Borehole: **S4** Testing Date : 3-Jun-14

Depth : 12.00- 12.45m Sample No.: SPT-8

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	17.12 %
Grain size(mm)	% passing
0.075	9.78
0.125	11.53
0.250	17.10
0.425	70.38
1	93.52
2	97.86
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	10 %
Sand :	90 %
Gravel :	0 %

Sample Description :

CLAY	SILT	SAND: Fine / Medium / Coarse	GRAVEL	Cobble

- **GS5 Substation**

SIEVING ANALYSIS

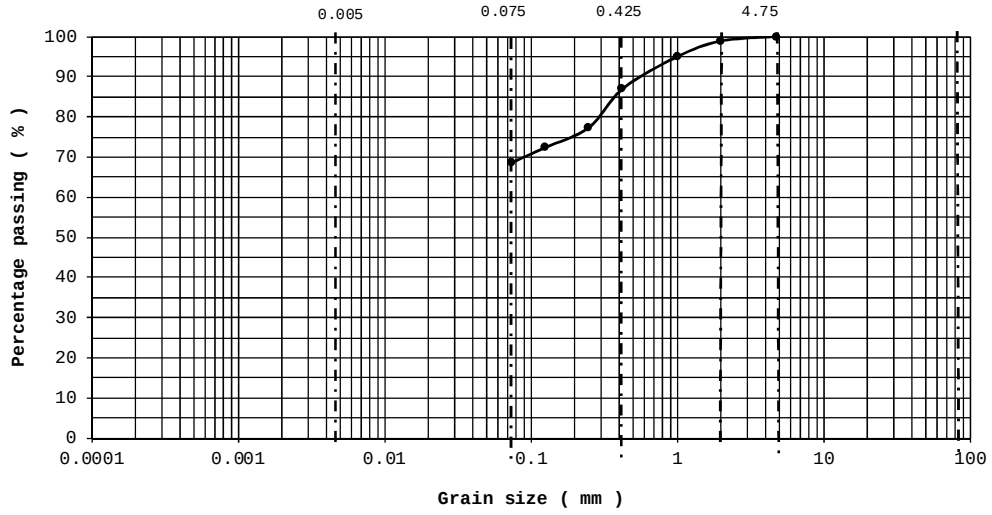
Borehole: S5 Testing Date : 20-Jul-14

Depth : 3.00- 3.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	13.79 %
Grain size(mm)	% passing
0.075	68.64
0.125	72.30
0.250	77.34
0.425	86.95
1	94.96
2	98.90
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	69 %
Sand :	31 %
Gravel :	0 %

Sample Description :

CLAY	SILT	SAND: Fine / Medium / Coarse	GRAVEL	Cobble

SIEVING ANALYSIS

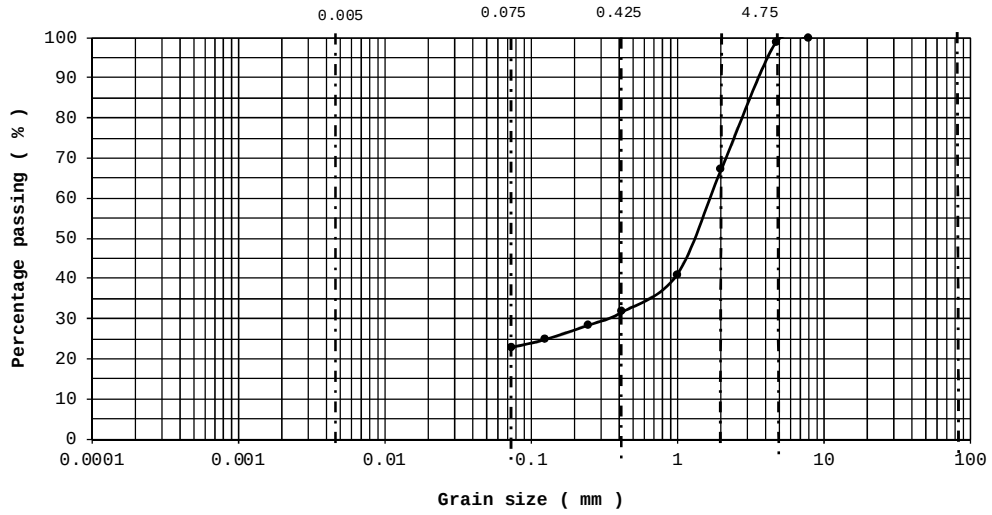
Borehole: S5 Testing Date : 20-Jul-14

Depth : 7.50- 7.95m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	10.64 %
Grain size(mm)	% passing
0.075	22.83
0.125	24.74
0.250	28.36
0.425	31.63
1	40.92
2	67.04
4.75	98.86
8	100.00
19	
31.5	
63	

Silt+Clay :	23 %
Sand :	76 %
Gravel :	1 %

Sample Description :

CLAY	SILT	SAND (Fine / Medium / Coarse)	GRAVEL	Cobble

SIEVING ANALYSIS

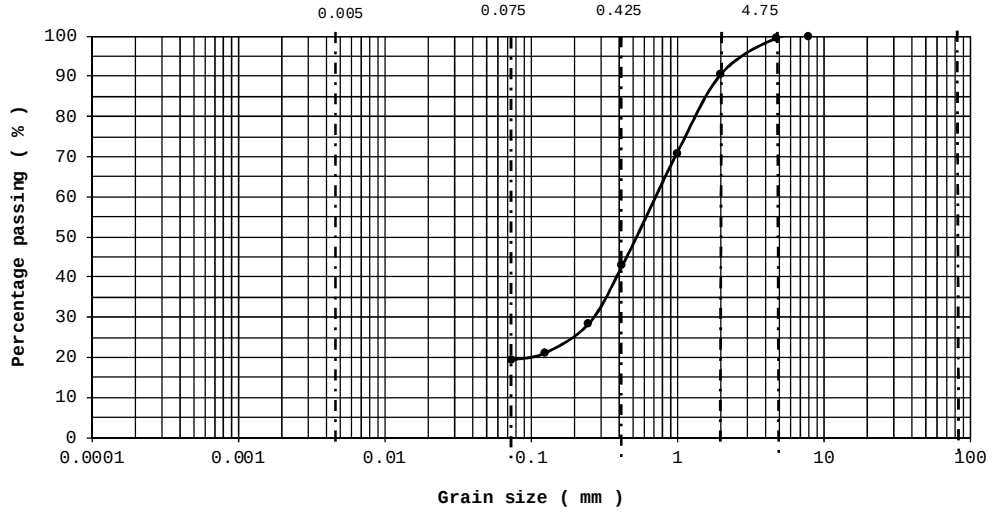
Borehole: S5 Testing Date : 20-Jul-14

Depth : 12.00- 12.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	13.43 %
Grain size(mm)	% passing
0.075	19.33
0.125	21.03
0.250	28.40
0.425	42.95
1	70.83
2	90.57
4.75	99.45
8	100.00
19	
31.5	
63	

Silt+Clay :	19 %
Sand :	80 %
Gravel :	1 %

Sample Description :

CLAY	SILT	SAND (Fine / Medium / Coarse)	GRAVEL	Cobble

SIEVING ANALYSIS

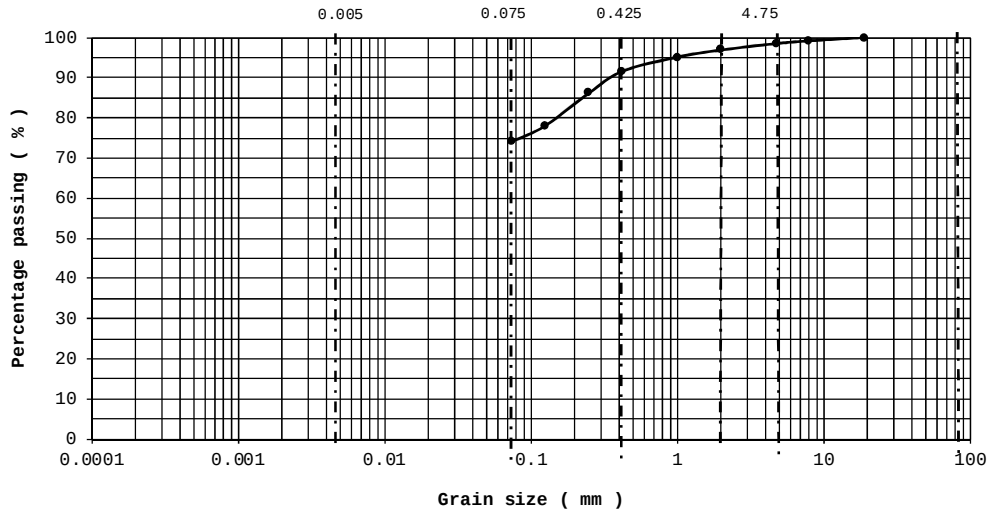
Borehole: S6 Testing Date : 20-Jul-14

Depth : 3.00- 3.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content 19.17 %

Grain size(mm)	% passing
0.075	74.14
0.125	77.94
0.250	86.16
0.425	91.60
1	95.11
2	96.88
4.75	98.49
8	99.17
19	100.00
31.5	
63	

Silt+Clay :	74 %
Sand :	24 %
Gravel :	2 %

Sample Description :

CLAY	SILT	SAND (Fine / Medium / Coarse)	GRAVEL	Cobble

SIEVING ANALYSIS

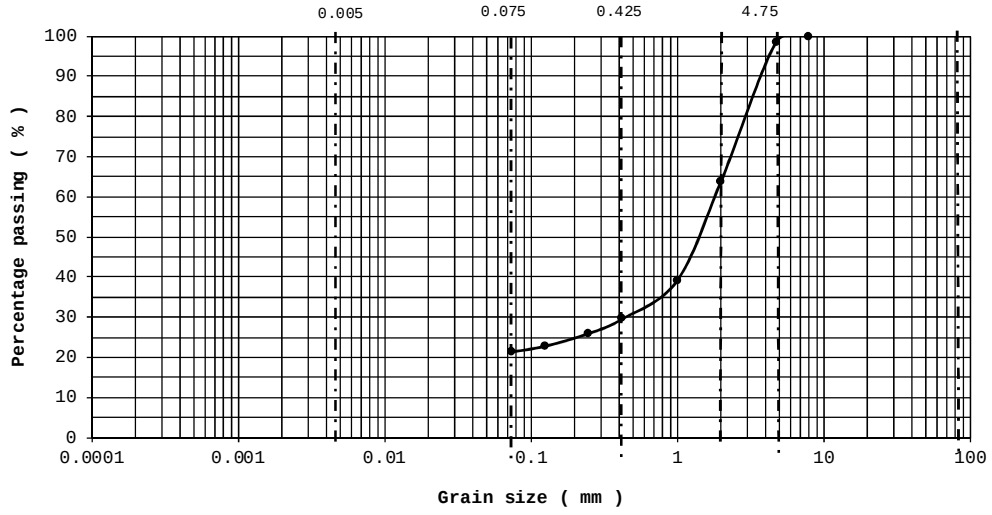
Borehole: S6 Testing Date : 20-Jul-14

Depth : 7.50- 7.95m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content 12.71 %

Grain size(mm)	% passing
0.075	21.32
0.125	22.72
0.250	25.93
0.425	29.56
1	39.01
2	63.81
4.75	98.45
8	100.00
19	
31.5	
63	

Silt+Clay :	21 %
Sand :	77 %
Gravel :	2 %

Sample Description :

CLAY	SILT	SAND (Fine / Medium / Coarse)	GRAVEL	Cobble

SIEVING ANALYSIS

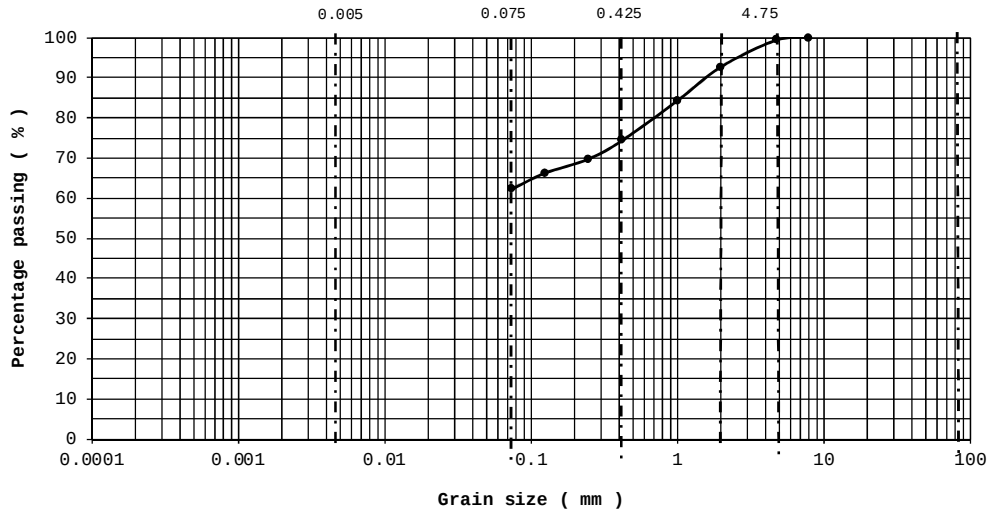
Borehole: S6 Testing Date : 20-Jul-14

Depth : 12.00- 12.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	17.19 %
Grain size(mm)	% passing
0.075	62.28
0.125	66.18
0.250	69.75
0.425	74.42
1	84.17
2	92.69
4.75	99.31
8	100.00
19	
31.5	
63	

Silt+Clay :	62 %
Sand :	37 %
Gravel :	1 %

Sample Description :

CLAY	SILT	SAND: Fine / Medium / Coarse	GRAVEL	Cobble

SIEVING ANALYSIS

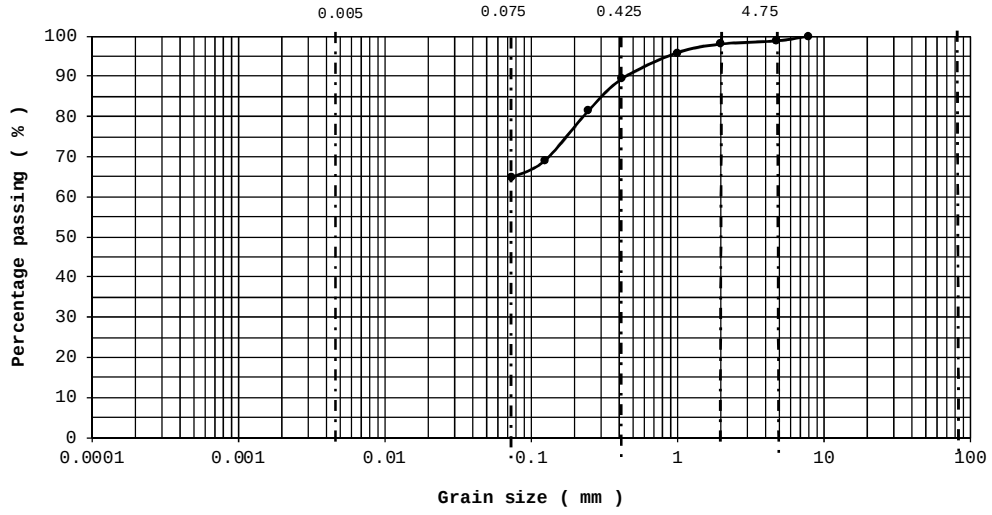
Borehole: S7 Testing Date : 20-Jul-14

Depth : 3.00- 3.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	21.83 %
Grain size(mm)	% passing
0.075	64.77
0.125	69.00
0.250	81.53
0.425	89.46
1	95.82
2	98.02
4.75	98.81
8	100.00
19	
31.5	
63	

Silt+Clay :	65 %
Sand :	34 %
Gravel :	1 %

Sample Description :

CLAY	SILT	SAND: Fine / Medium / Coarse	GRAVEL	Cobble

SIEVING ANALYSIS

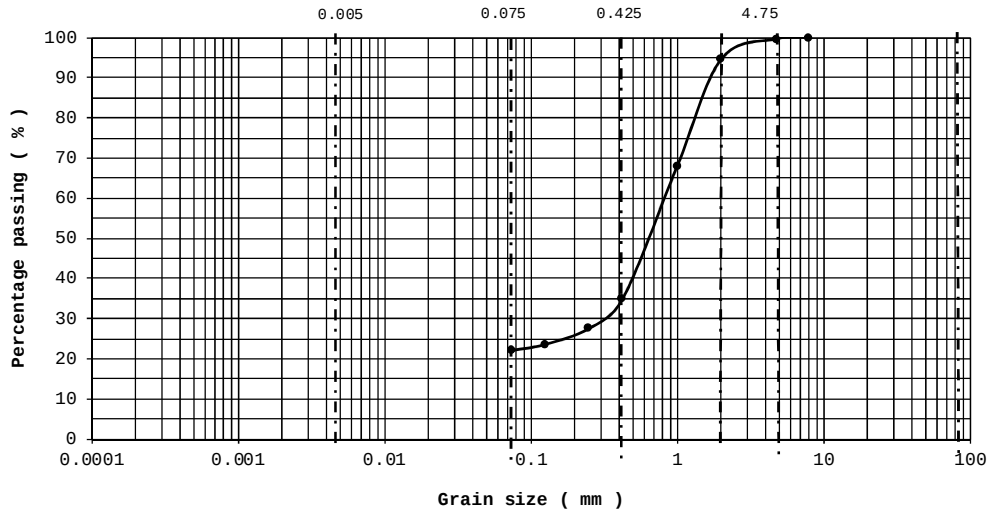
Borehole: S7 Testing Date : 20-Jul-14

Depth : 6.00- 6.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	12.92 %
Grain size(mm)	% passing
0.075	22.05
0.125	23.50
0.250	27.49
0.425	34.88
1	67.83
2	94.58
4.75	99.65
8	100.00
19	
31.5	
63	

Silt+Clay :	22 %
Sand :	78 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

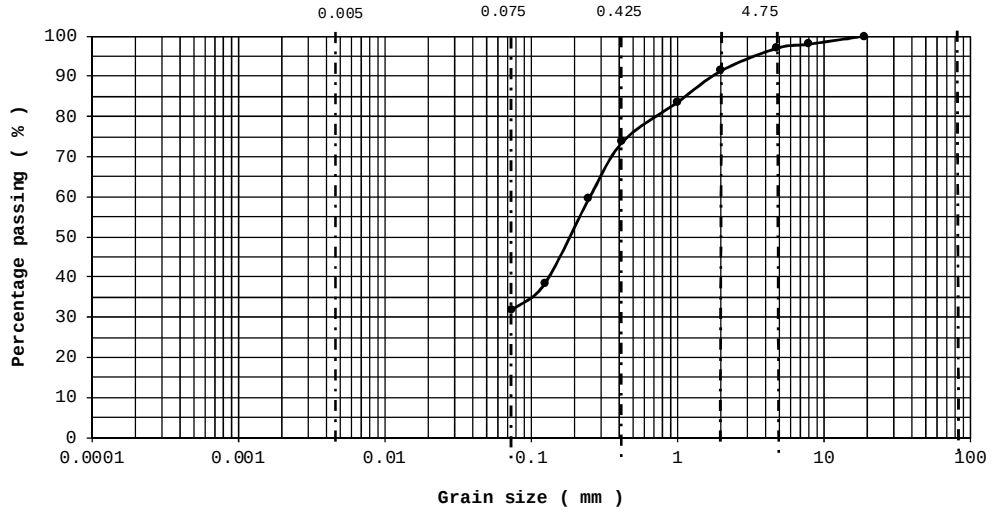
Borehole: S7 Testing Date : 20-Jul-14

Depth : 12.00- 12.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	10.79 %
Grain size(mm)	% passing
0.075	31.80
0.125	38.32
0.250	59.45
0.425	73.62
1	83.43
2	91.32
4.75	96.92
8	97.99
19	100.00
31.5	
63	

Silt+Clay :	32 %
Sand :	65 %
Gravel :	3 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

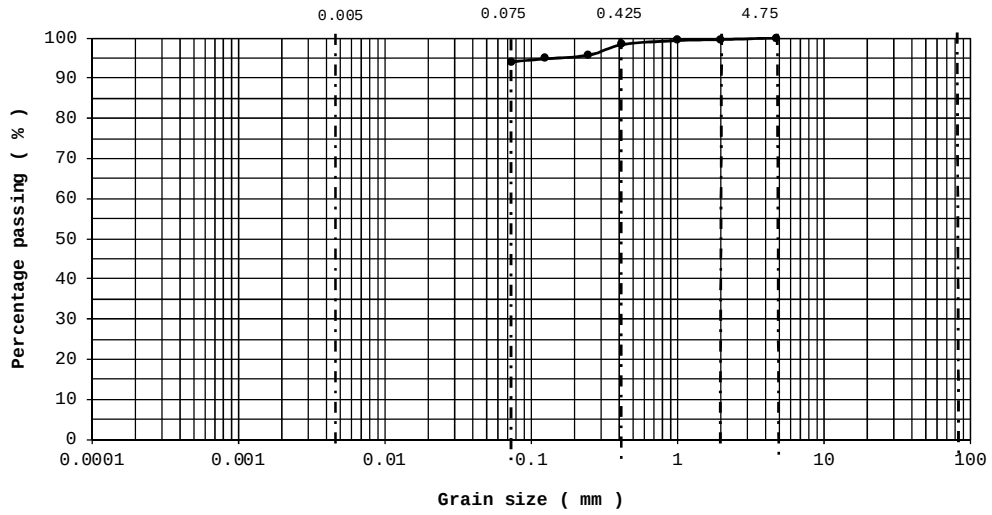
- **Chroy Changvar Substation**

SIEVING ANALYSIS

Borehole: S8 Testing Date : 20-Jul-14
Depth : 6.00- 6.45m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	19.25 %
Grain size(mm)	% passing
0.075	94.08
0.125	94.80
0.250	95.71
0.425	98.36
1	99.36
2	99.61
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	94 %
Sand :	6 %
Gravel :	0 %

Sample Description :

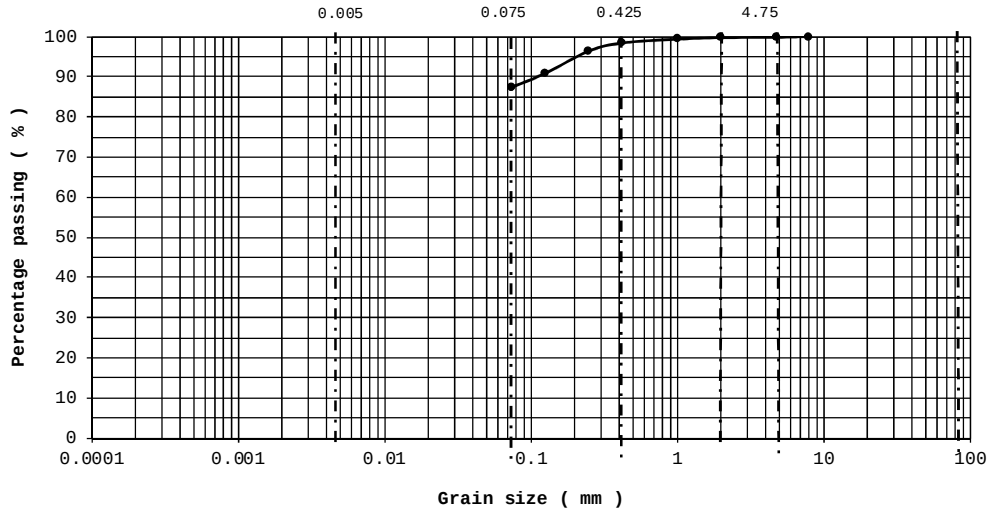
CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

Borehole: S8 Testing Date : 20-Jul-14
Depth : 19.50- 19.95m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	21.53 %
Grain size(mm)	% passing
0.075	87.45
0.125	90.77
0.250	96.40
0.425	98.41
1	99.33
2	99.72
4.75	99.81
8	100.00
19	
31.5	
63	

Silt+Clay :	87 %
Sand :	12 %
Gravel :	1 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

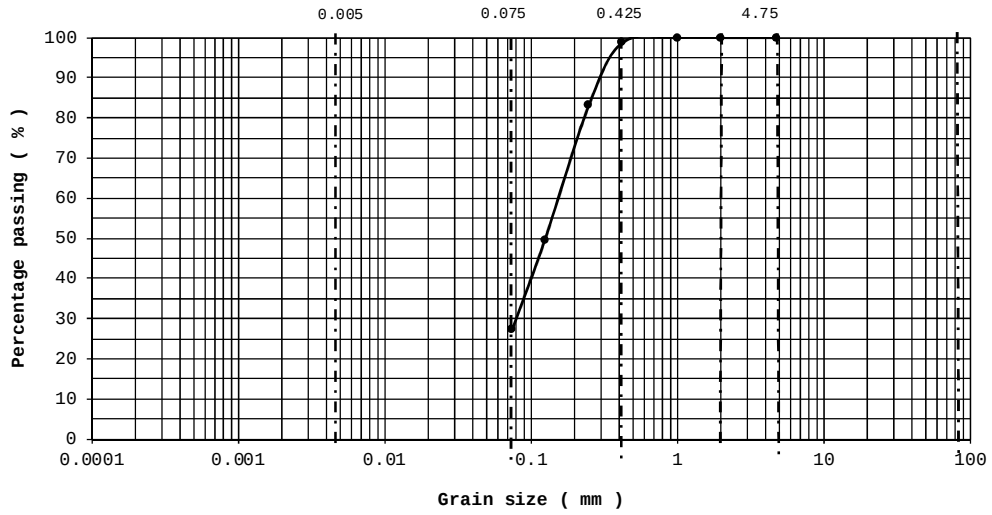
Borehole: S8 Testing Date : 20-Jul-14

Depth : 24.00-24.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	18.68 %
Grain size(mm)	% passing
0.075	27.27
0.125	49.58
0.250	83.11
0.425	98.75
1	100.00
2	100.00
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	27 %
Sand :	73 %
Gravel :	0 %

Sample Description :

CLAY	SILT	SAND: Fine / Medium / Coarse	GRAVEL	Cobble

SIEVING ANALYSIS

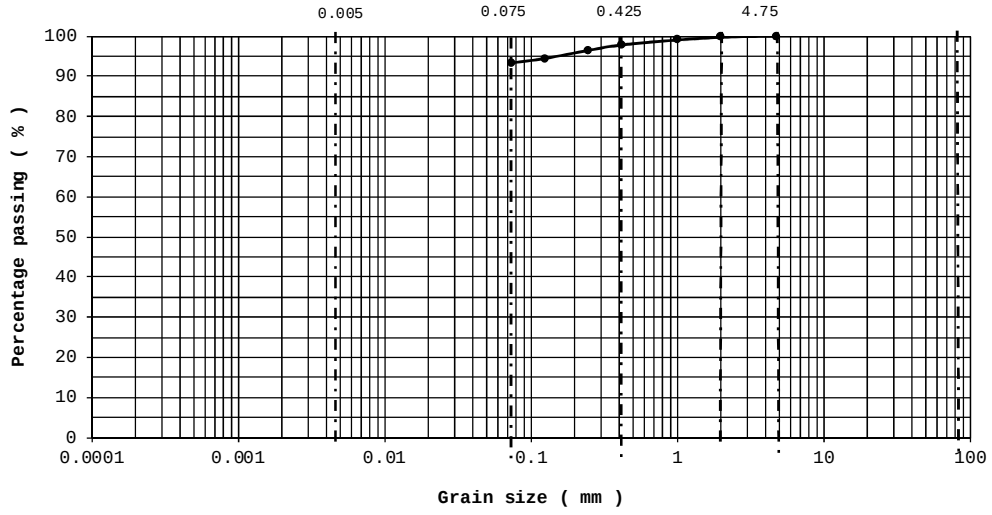
Borehole: S9 Testing Date : 20-Jul-14

Depth : 6.00- 6.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	22.92 %
Grain size(mm)	% passing
0.075	93.33
0.125	94.44
0.250	96.47
0.425	97.83
1	99.02
2	99.70
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	93 %
Sand :	7 %
Gravel :	0 %

Sample Description :

CLAY	SILT	SAND: Fine / Medium / Coarse	GRAVEL	Cobble

SIEVING ANALYSIS

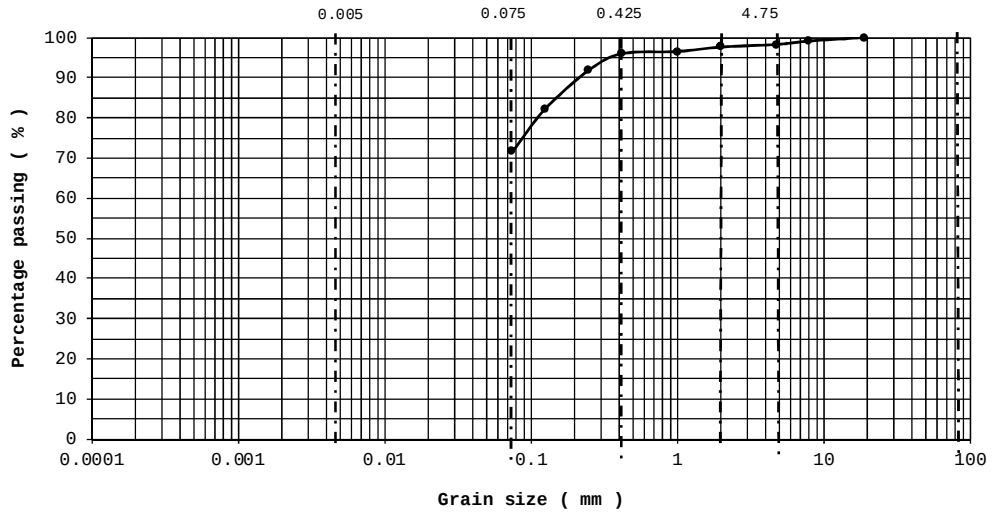
Borehole: S9 Testing Date : 20-Jul-14

Depth : 19.50-19.95m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	20.69 %
Grain size(mm)	% passing
0.075	71.54
0.125	82.11
0.250	91.87
0.425	95.99
1	96.51
2	97.63
4.75	98.26
8	99.13
19	100.00
31.5	
63	

Silt+Clay :	72 %
Sand :	27 %
Gravel :	1 %

Sample Description :

CLAY	SILT	SAND: Fine / Medium / Coarse	GRAVEL	Cobble

SIEVING ANALYSIS

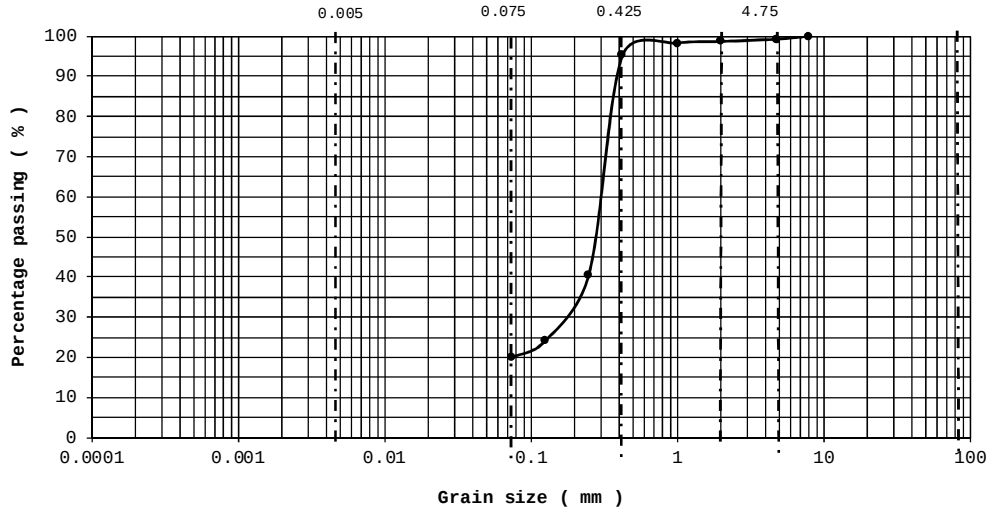
Borehole: S9 Testing Date : 20-Jul-14

Depth : 24.00- 24.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	18.50 %
Grain size(mm)	% passing
0.075	19.96
0.125	23.98
0.250	40.58
0.425	95.22
1	98.24
2	98.68
4.75	99.22
8	100.00
19	
31.5	
63	

Silt+Clay :	20 %
Sand :	79 %
Gravel :	1 %

Sample Description :

CLAY	SILT	SAND: Fine / Medium / Coarse	GRAVEL	Cobble

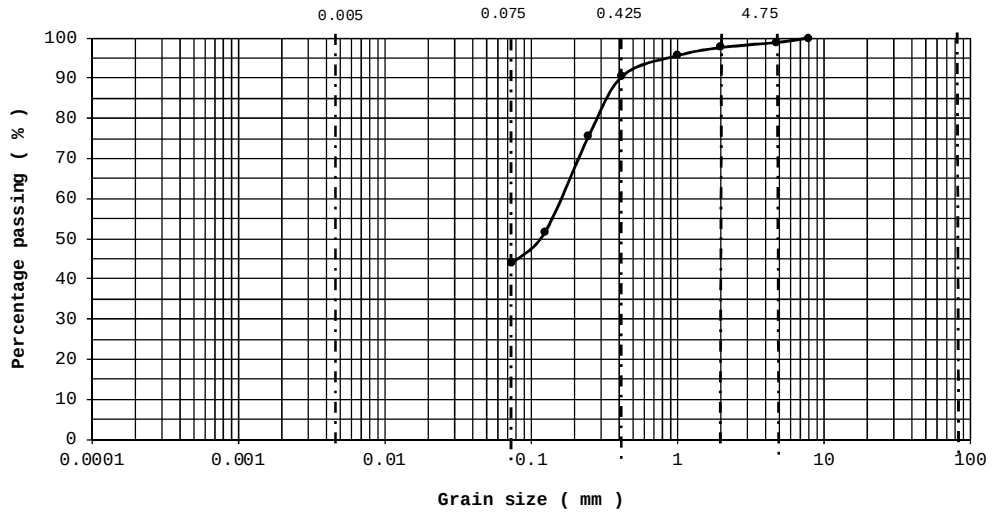
- Transmission line 230kV Mid point WPP/NPP to GS5 Substation

SIEVING ANALYSIS

Borehole: T1 Testing Date : 20-Jul-14
Depth : 3.00- 3.45m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	13.20 %
Grain size(mm)	% passing
0.075	43.89
0.125	51.54
0.250	75.65
0.425	90.53
1	95.56
2	97.61
4.75	98.87
8	100.00
19	
31.5	
63	

Silt+Clay :	44 %
Sand :	55 %
Gravel :	1 %

Sample Description :

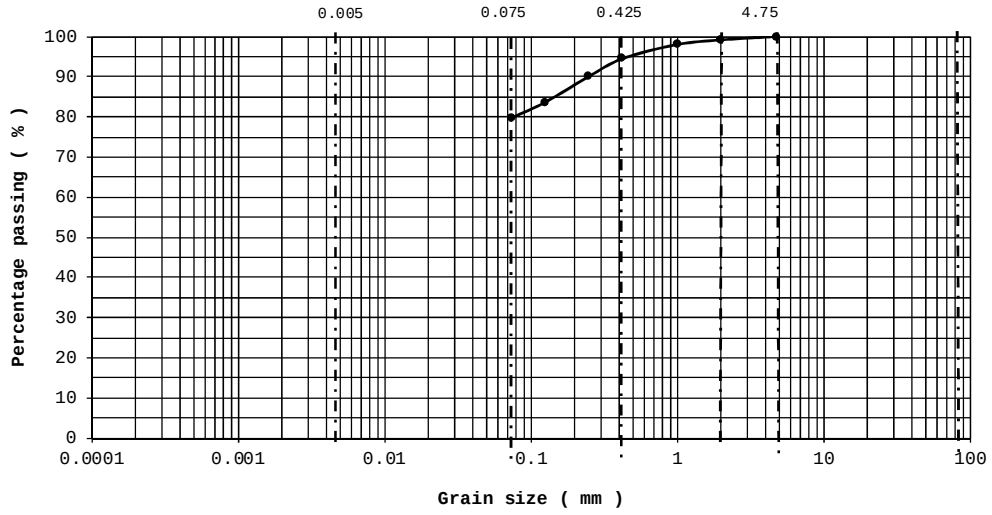
CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

Borehole: T1 Testing Date : 20-Jul-14
Depth : 6.00- 6.45m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	15.35 %
Grain size(mm)	% passing
0.075	79.82
0.125	83.59
0.250	90.04
0.425	94.50
1	98.00
2	99.16
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	80 %
Sand :	20 %
Gravel :	0 %

Sample Description :

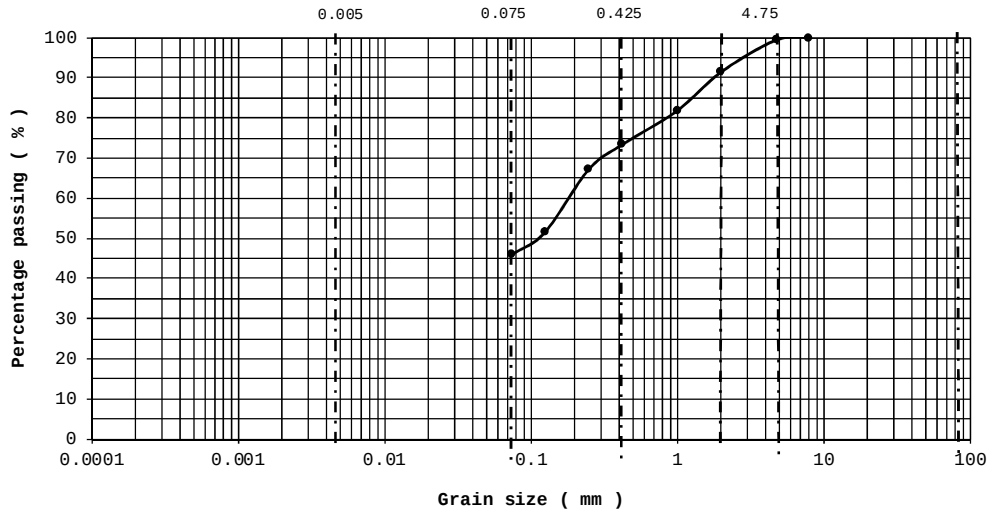
CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

Borehole: T1 Testing Date : 20-Jul-14
Depth : 10.50- 10.95m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	17.40 %
Grain size(mm)	% passing
0.075	45.99
0.125	51.44
0.250	67.15
0.425	73.37
1	81.72
2	91.39
4.75	99.37
8	100.00
19	
31.5	
63	

Silt+Clay :	46 %
Sand :	53 %
Gravel :	1 %

Sample Description :

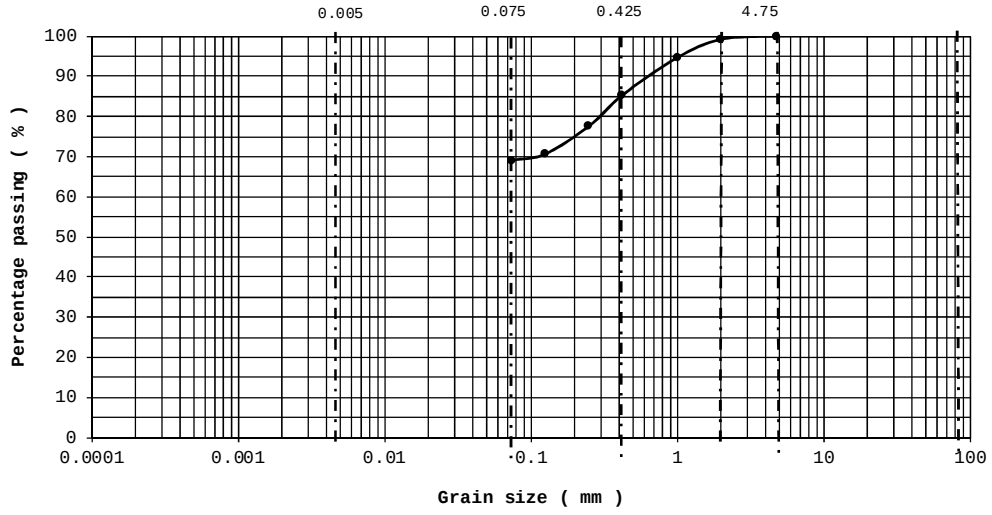
CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

Borehole: T2 Testing Date : 20-Jul-14
Depth : 3.00- 3.45m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	10.97 %
Grain size(mm)	% passing
0.075	69.08
0.125	70.58
0.250	77.55
0.425	85.33
1	94.59
2	99.20
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	69 %
Sand :	31 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

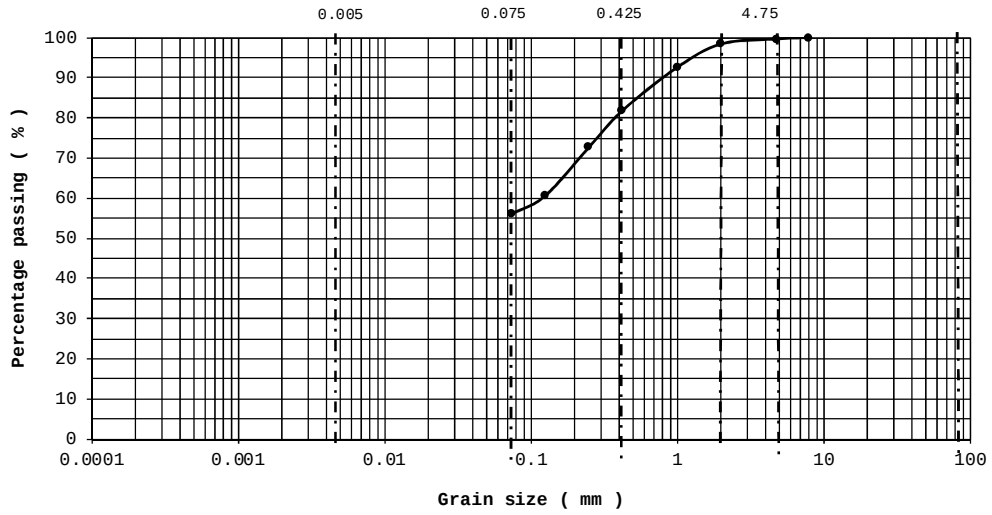
Borehole: T2 Testing Date : 20-Jul-14

Depth : 4.50-4.95m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	14.58 %
Grain size(mm)	% passing
0.075	56.14
0.125	60.49
0.250	72.64
0.425	81.83
1	92.52
2	98.39
4.75	99.64
8	100.00
19	
31.5	
63	

Silt+Clay :	56 %
Sand :	43 %
Gravel :	1 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

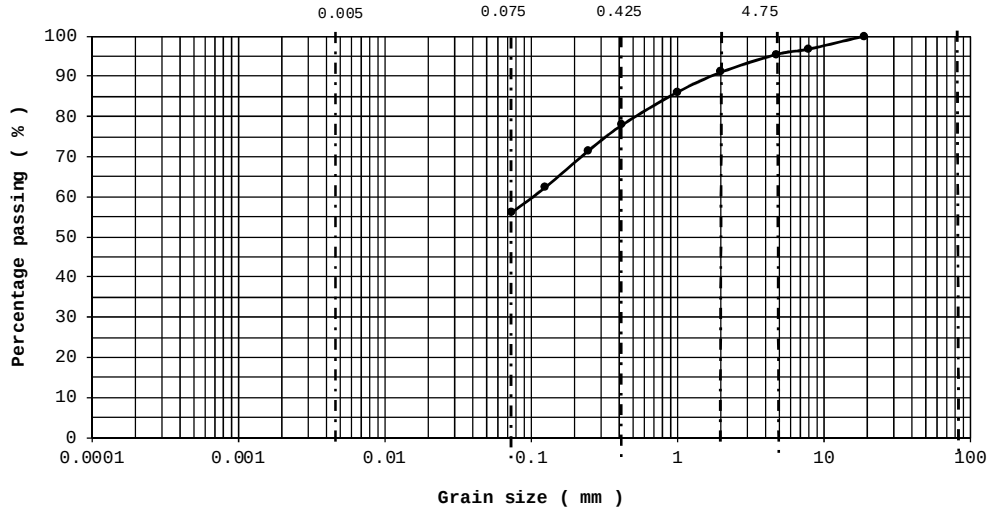
Borehole: T2 Testing Date : 20-Jul-14

Depth : 6.00- 6.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	16.48 %
Grain size(mm)	% passing
0.075	56.17
0.125	62.21
0.250	71.52
0.425	77.93
1	85.96
2	90.99
4.75	95.40
8	96.78
19	100.00
31.5	
63	

Silt+Clay :	56 %
Sand :	39 %
Gravel :	5 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

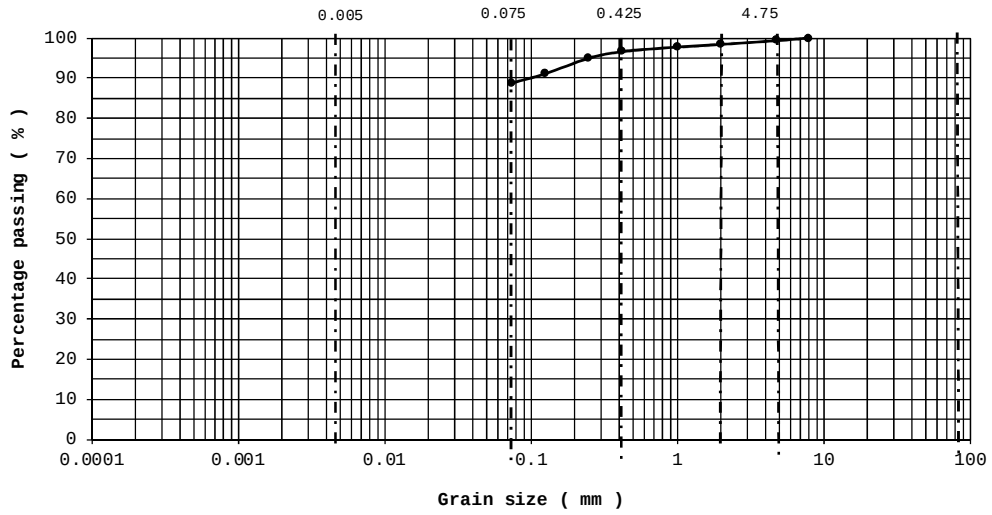
- **Transmission line 115kV GS5 to Chroy Changvar Substation**

SIEVING ANALYSIS

Borehole: T3 Testing Date : 20-Jul-14
Depth : 3.00- 3.45m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	14.89 %
Grain size(mm)	% passing
0.075	88.79
0.125	91.04
0.250	94.95
0.425	96.60
1	97.73
2	98.39
4.75	99.31
8	100.00
19	
31.5	
63	

Silt+Clay :	89 %
Sand :	11 %
Gravel :	0 %

Sample Description :

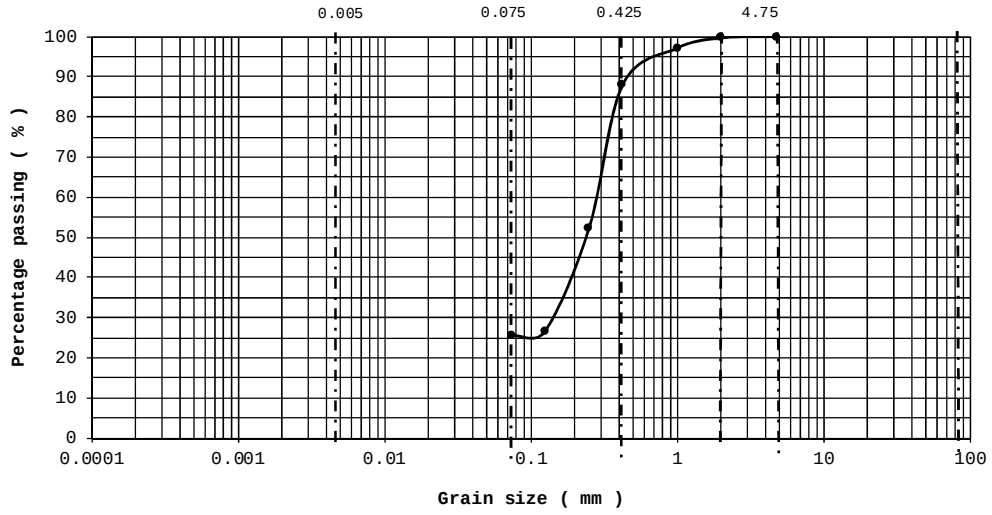
CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

Borehole: T3 Testing Date : 20-Jul-14
Depth : 9.00- 9.45m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	19.31 %
Grain size(mm)	% passing
0.075	25.52
0.125	26.53
0.250	52.09
0.425	87.96
1	97.09
2	99.67
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	26 %
Sand :	74 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

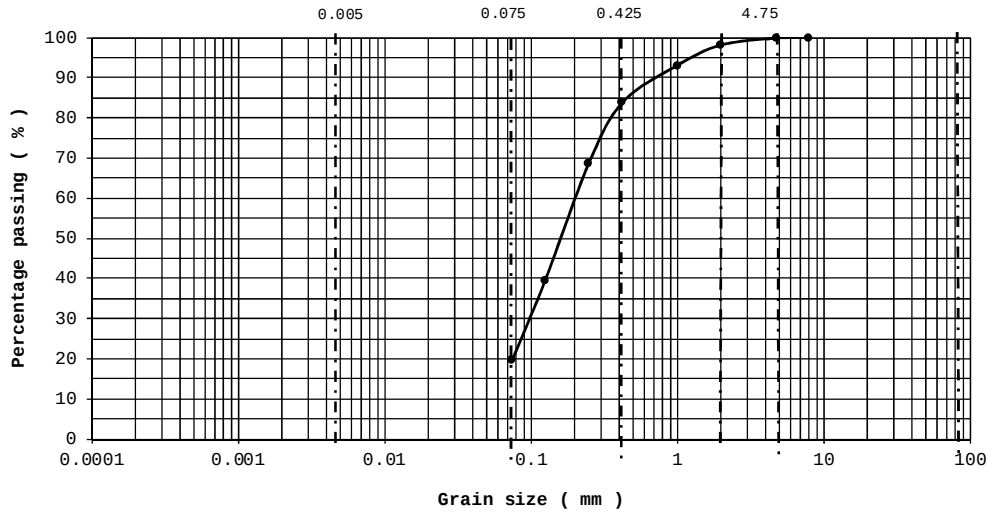
Borehole: T3 Testing Date : 20-Jul-14

Depth : 12.00- 12.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	15.63 %
Grain size(mm)	% passing
0.075	19.64
0.125	39.26
0.250	68.71
0.425	83.84
1	93.02
2	98.12
4.75	99.84
8	100.00
19	
31.5	
63	

Silt+Clay :	20 %
Sand :	80 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

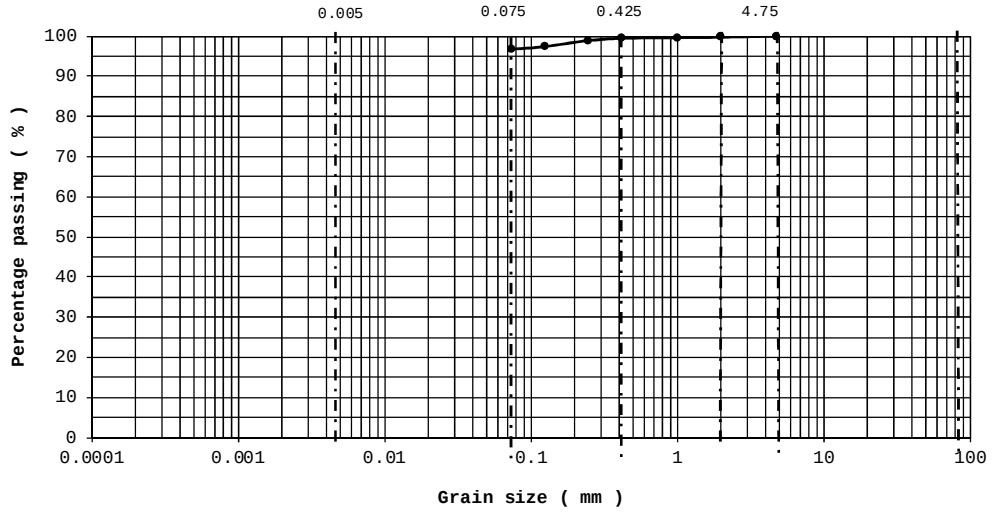
Borehole: T4 Testing Date : 20-Jul-14

Depth : 3.00- 3.45m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	21.44 %
Grain size(mm)	% passing
0.075	96.73
0.125	97.38
0.250	98.90
0.425	99.45
1	99.61
2	99.72
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	97 %
Sand :	3 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

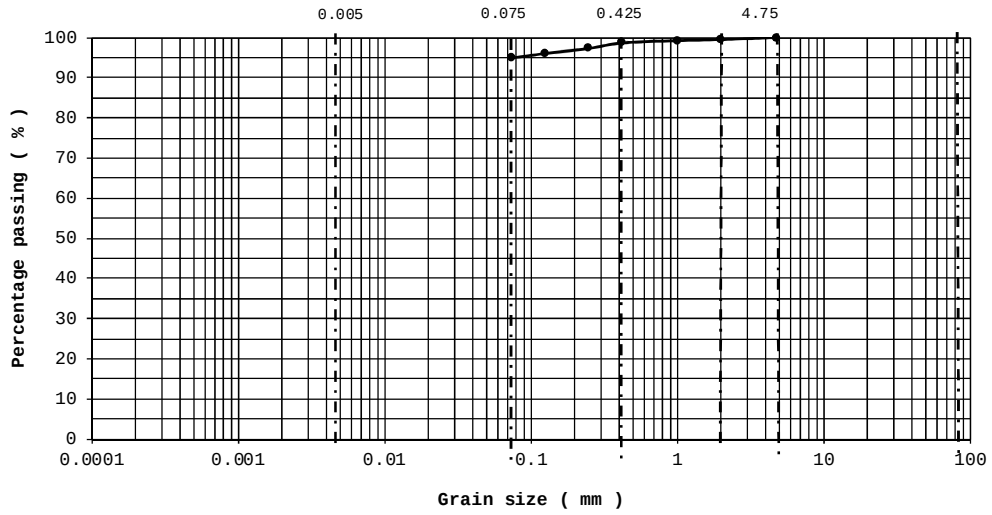
Borehole: T4 Testing Date : 20-Jul-14

Depth : 7.50- 7.95m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	21.95 %
Grain size(mm)	% passing
0.075	94.95
0.125	96.00
0.250	97.29
0.425	98.66
1	99.22
2	99.49
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	95 %
Sand :	5 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

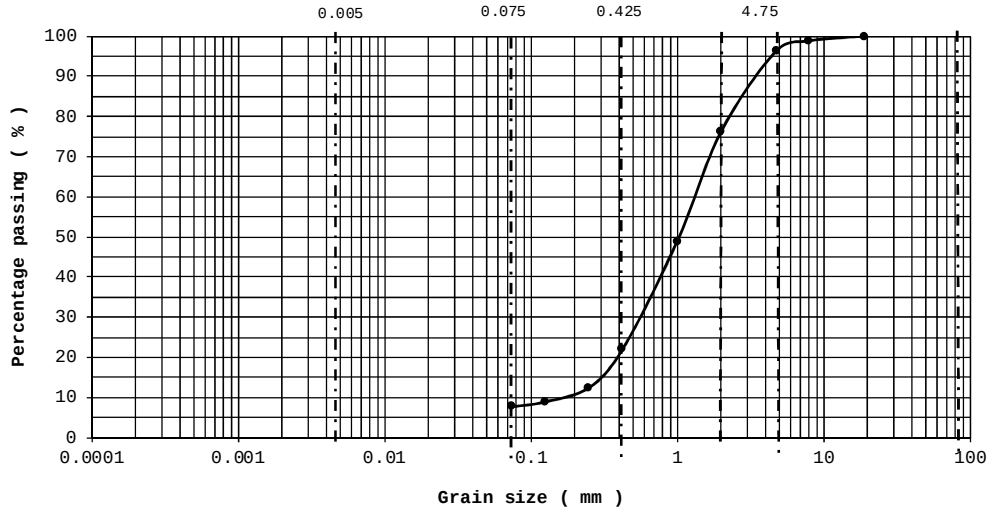
Borehole: T4 Testing Date : 20-Jul-14

Depth : 16.50- 16.95m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	13.20 %
Grain size(mm)	% passing
0.075	7.67
0.125	8.85
0.250	12.38
0.425	21.98
1	48.78
2	76.18
4.75	96.23
8	98.83
19	100.00
31.5	
63	

Silt+Clay :	8 %
Sand :	89 %
Gravel :	3 %

Sample Description :

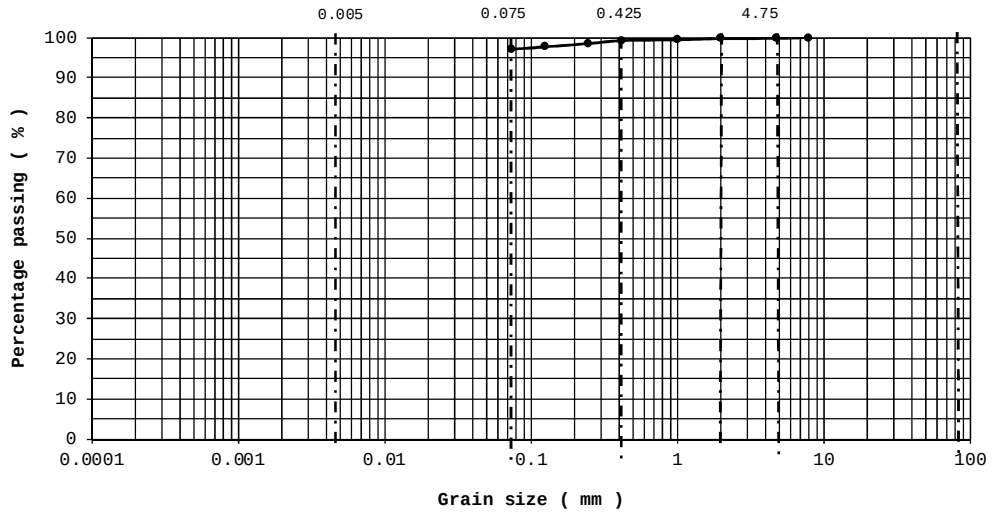
CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

Borehole: T5 Testing Date : 20-Jul-14
Depth : 3.00- 3.45m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	24.84 %
Grain size(mm)	% passing
0.075	97.06
0.125	97.67
0.250	98.50
0.425	99.25
1	99.42
2	99.72
4.75	99.79
8	100.00
19	
31.5	
63	

Silt+Clay :	97 %
Sand :	3 %
Gravel :	0 %

Sample Description :

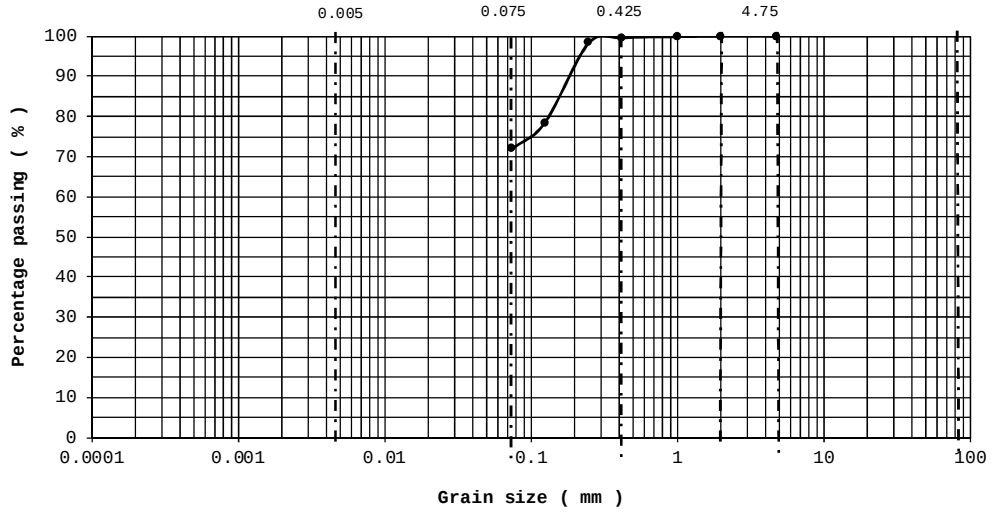
CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

Borehole: T5 Testing Date : 20-Jul-14
Depth : 7.50- 7.95m Sample No.:

Checked by : Ket Chansavuth
Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	32.76 %
Grain size(mm)	% passing
0.075	71.96
0.125	78.37
0.250	98.32
0.425	99.55
1	99.85
2	100.00
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	72 %
Sand :	28 %
Gravel :	0 %

Sample Description :

CLAY	SILT	Fine	Medium	Coarse	GRAVEL	Cobble
		SAND				

SIEVING ANALYSIS

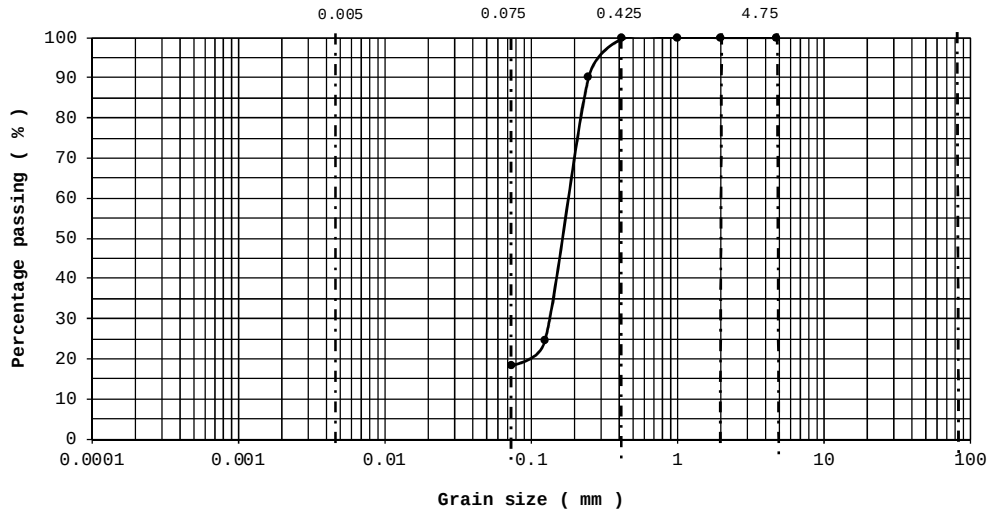
Borehole: T5 Testing Date : 20-Jul-14

Depth : 16.50- 16.95m Sample No.:

Checked by : Ket Chansavuth

Tested by : Chou Sarem

PARTICLE SIZE DISTRIBUTION CURVE



Moist. Content	27.97 %

Grain size(mm)	% passing
0.075	18.11
0.125	24.37
0.250	90.23
0.425	99.68
1	100.00
2	100.00
4.75	100.00
8	
19	
31.5	
63	

Silt+Clay :	18 %
Sand :	82 %
Gravel :	0 %

Sample Description :

CLAY	SILT	SAND: Fine	SAND: Medium	SAND: Coarse	GRAVEL	Cobble

b. Unconfined compression test

- NCC Substation

Borehole : **S1**

Sample No:	Depth: 3.00- 3.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9.2	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_0 , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**1.961**	
Proving ring capacity	680.27kg	Moisture Cont., %	**19.83**	
		Dry Density , g/cm^3	**1.636**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	σ = P (1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5435**	6	0.263	**26.13**
1	**1.0870**	14	0.613	**60.64**
1.5	**1.6304**	21	0.920	**90.46**
2	**2.1739**	28	1.226	**119.95**
2.5	**2.7174**	33	1.445	**140.58**
3	**3.2609**	38	1.664	**160.98**
3.5	**3.8043**	40	1.752	**168.50**
4	**4.3478**	40	1.752	**167.55**
4.5	**4.8913**	36	1.576	**149.93**
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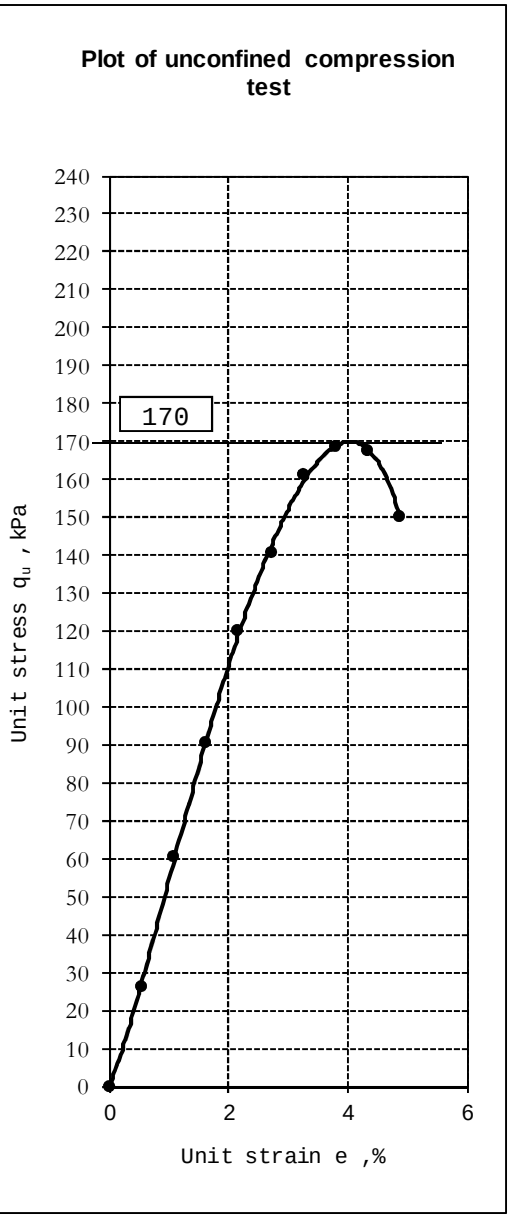

Unconfined Compressive Strength q_U = **170** kPa

Cohesion = q_u / 2 = **85** kPa

Borehole : **S1**

Sample No:	Depth: 7.50- 7.95m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_0 , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**2.174**	
Proving ring capacity	680.27kg	Moisture Cont., %	**13.05**	
		Dry Density , g/cm^3	**1.923**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5556**	10	0.438	**43.55**
1	**1.1111**	18	0.788	**77.95**
1.5	**1.6667**	24	1.051	**103.35**
2	**2.2222**	30	1.314	**128.45**
2.5	**2.7778**	36	1.576	**153.27**
3	**3.3333**	42	1.839	**177.79**
3.5	**3.8889**	42	1.839	**176.77**
4	**4.4444**	39	1.708	**163.19**
4.5	**5.0000**	37	1.620	**153.92**
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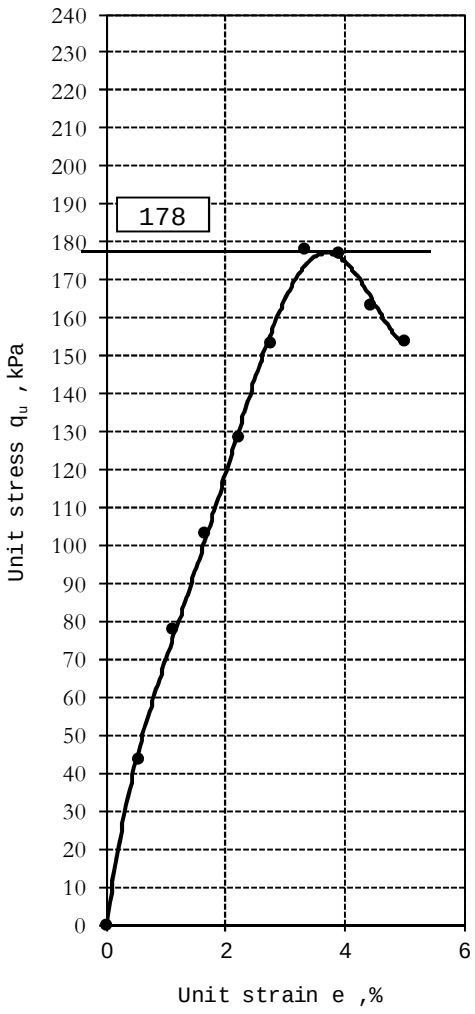
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **178** kPa

Cohesion = q_u / 2 = **89** kPa

Borehole : **S2**

Sample No:	Depth:6.00- 6.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	8.8	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_o , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**1.965**	
Proving ring capacity	680.27kg	Moisture Cont., %	**19.58**	
		Dry Density , g/cm^3	**1.643**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5682**	6	0.263	**26.12**
1	**1.1364**	13	0.569	**56.28**
1.5	**1.7045**	18	0.788	**77.48**
2	**2.2727**	22	0.963	**94.15**
2.5	**2.8409**	26	1.139	**110.62**
3	**3.4091**	30	1.314	**126.89**
3.5	**3.9773**	34	1.489	**142.97**
4	**4.5455**	36	1.576	**150.48**
4.5	**5.1136**	36	1.576	**149.58**
5	**5.6818**	32	1.401	**132.17**
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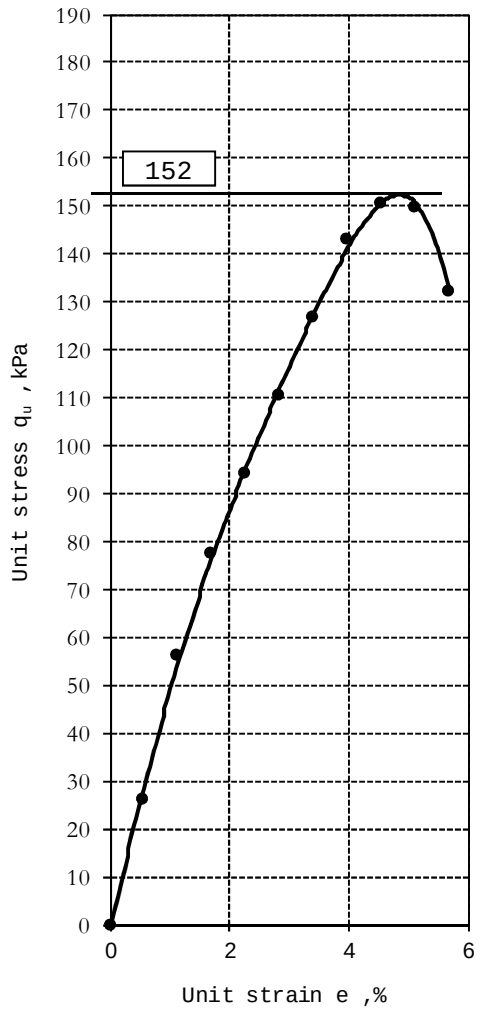
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **152** kPa

Cohesion = q_u / 2 = **76** kPa

Borehole : **S2**

Sample No:	Depth: 10.50- 10.95m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9.1	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_o , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**2.012**	
Proving ring capacity	680.27kg	Moisture Cont., %	**23.45**	
		Dry Density , g/cm^3	**1.630**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5495**	10	0.438	**43.55**
1	**1.0989**	20	0.876	**86.62**
1.5	**1.6484**	30	1.314	**129.21**
2	**2.1978**	36	1.576	**154.18**
2.5	**2.7473**	42	1.839	**178.87**
3	**3.2967**	48	2.102	**203.26**
3.5	**3.8462**	50	2.190	**210.53**
4	**4.3956**	50	2.190	**209.33**
4.5	**4.9451**	47	2.058	**195.64**
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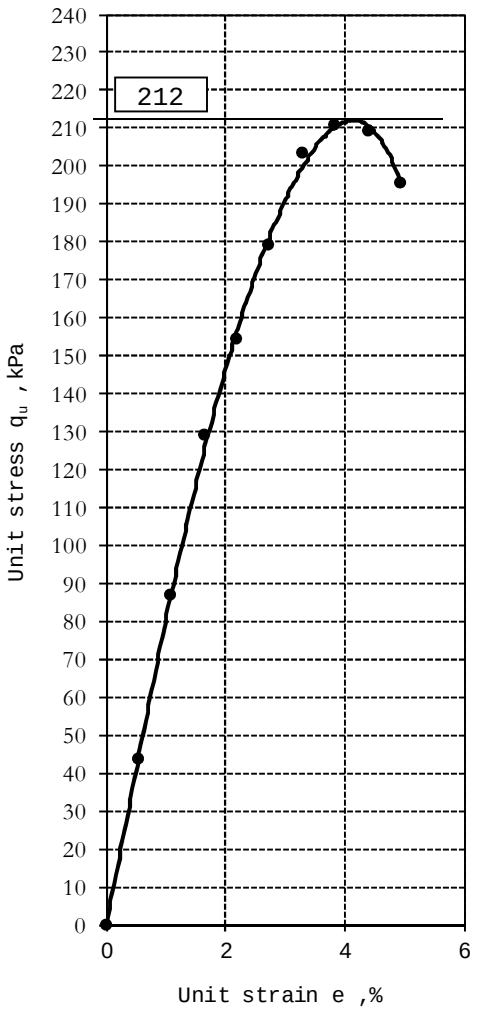
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **212** kPa

Cohesion = q_u / 2 = **106** kPa

- **Tuol Kork Substation**

Borehole : **S3**

Sample No: SPT-2	Depth: 3.00- 3.45m	Tested date :4/06/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9.2	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_0 , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**2.148**	
Proving ring capacity	680.27kg	Moisture Cont., %	**14.26**	
		Dry Density , g/cm^3	**1.880**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	σ = P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5435**	4	0.175	**17.42**
1	**1.0870**	8	0.350	**34.65**
1.5	**1.6304**	11	0.482	**47.38**
2	**2.1739**	15	0.657	**64.26**
2.5	**2.7174**	18	0.788	**76.68**
3	**3.2609**	21	0.920	**88.96**
3.5	**3.8043**	23	1.007	**96.89**
4	**4.3478**	26	1.139	**108.90**
4.5	**4.8913**	28	1.226	**116.62**
5	**5.4348**	30	1.314	**124.23**
5.5	**5.9783**	30	1.314	**123.52**
6	**6.5217**	27	1.182	**110.52**
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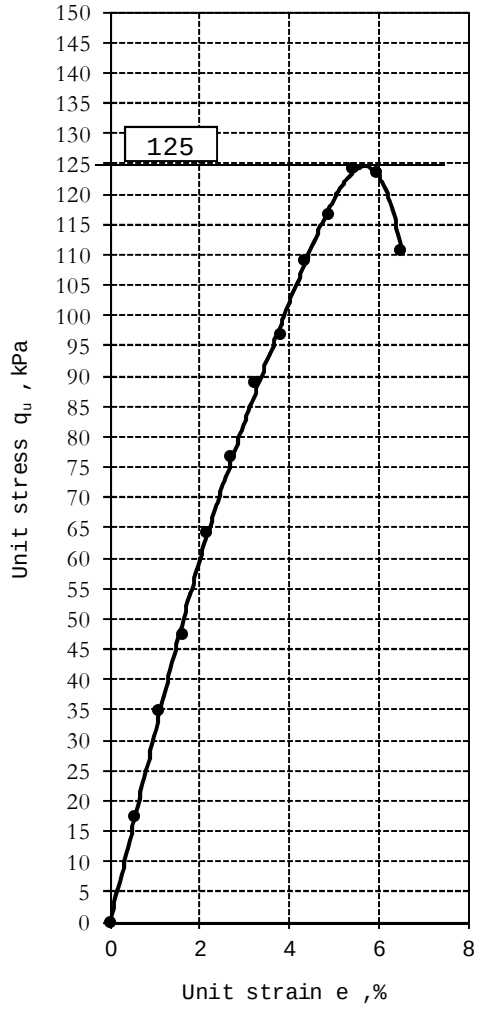
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **125** kPa

Cohesion = q_u / 2 = **62.5** kPa

Borehole : **S4**

Sample No: SPT-1	Depth: 1.50- 1.95m	Tested date :4/06/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	8.9	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_o , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**1.923**	
Proving ring capacity	680.27kg	Moisture Cont., %	**26.46**	
		Dry Density , g/cm^3	**1.521**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5618**	4	0.175	**17.42**
1	**1.1236**	6	0.263	**25.98**
1.5	**1.6854**	8	0.350	**34.44**
2	**2.2472**	10	0.438	**42.81**
2.5	**2.8090**	12	0.525	**51.07**
3	**3.3708**	14	0.613	**59.24**
3.5	**3.9326**	14	0.613	**58.90**
4	**4.4944**	12	0.525	**50.19**
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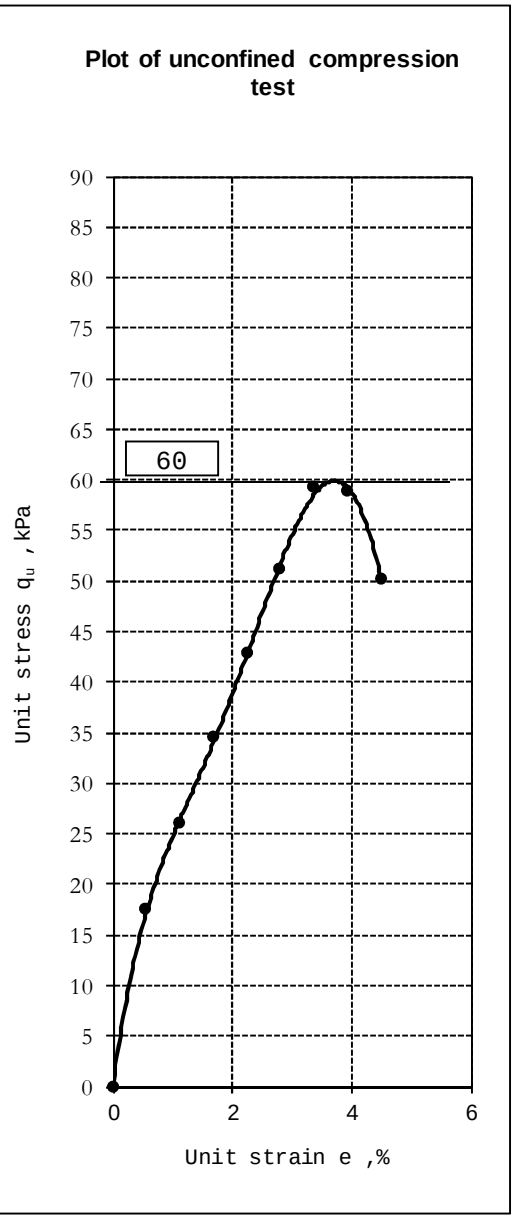

Unconfined Compressive Strength q_U = **60** kPa

Cohesion = q_u / 2 = **30** kPa

Borehole : **S4**

Sample No: SPT-1	Depth: 3.00- 3.45m	Tested date :4/06/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9.6	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_o , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**2.173**	
Proving ring capacity	680.27kg	Moisture Cont., %	**16.06**	
		Dry Density , g/cm^3	**1.872**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5208**	10	0.438	**43.56**
1	**1.0417**	20	0.876	**86.67**
1.5	**1.5625**	26	1.139	**112.08**
2	**2.0833**	30	1.314	**128.63**
2.5	**2.6042**	36	1.576	**153.54**
3	**3.1250**	40	1.752	**169.69**
3.5	**3.6458**	45	1.971	**189.87**
4	**4.1667**	45	1.971	**188.85**
4.5	**4.6875**	43	1.883	**179.47**
5	**5.2083**	42	1.839	**174.34**
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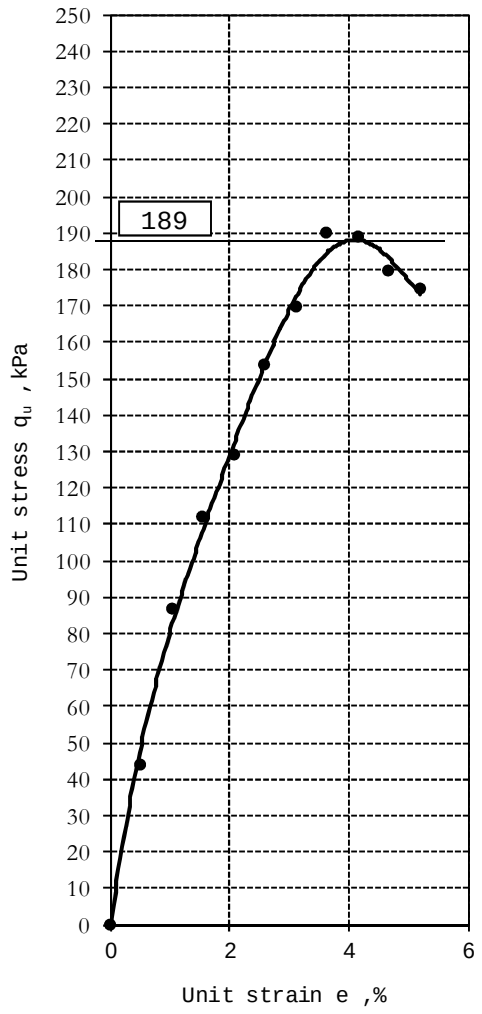
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **189** kPa

Cohesion = q_u / 2 = **94.5** kPa

- **GS5 Substation**

Borehole : **S5**

Sample No:	Depth:3.00- 3.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9.1	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_o , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**2.046**	
Proving ring capacity	680.27kg	Moisture Cont., %	**13.79**	
		Dry Density , g/cm^3	**1.798**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	σ = P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5495**	10	0.438	**43.55**
1	**1.0989**	20	0.876	**86.62**
1.5	**1.6484**	30	1.314	**129.21**
2	**2.1978**	40	1.752	**171.31**
2.5	**2.7473**	44	1.927	**187.38**
3	**3.2967**	47	2.058	**199.03**
3.5	**3.8462**	47	2.058	**197.90**
4	**4.3956**	45	1.971	**188.40**
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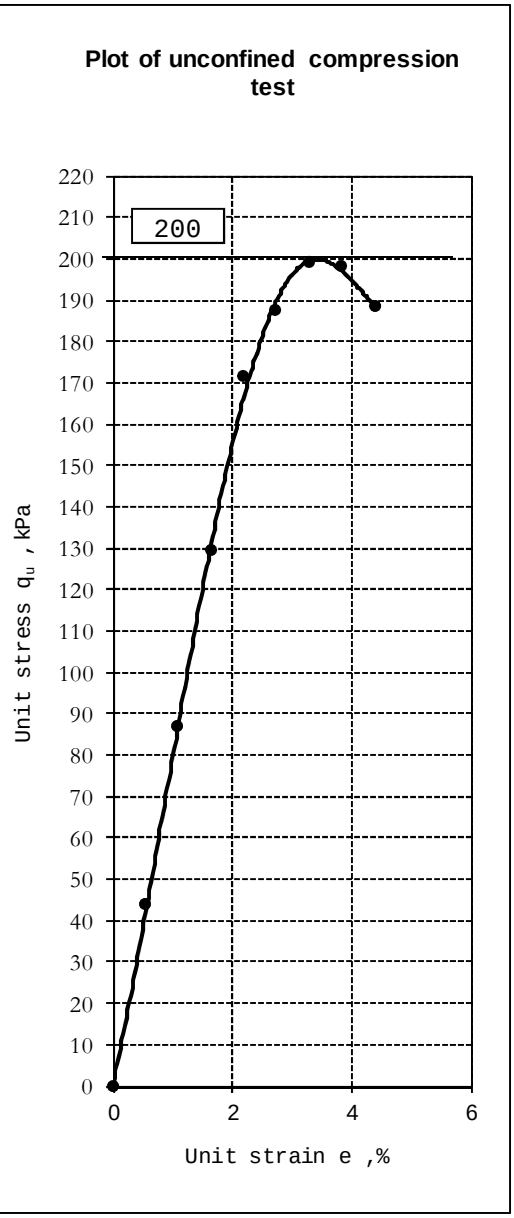

Unconfined Compressive Strength q_U = **200** kPa

Cohesion = q_u / 2 = **100** kPa

Borehole : **S5**

Sample No:	Depth:3.00- 3.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	8.6	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_o , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**2.220**	
Proving ring capacity	680.27kg	Moisture Cont., %	**13.43**	
		Dry Density , g/cm^3	**1.957**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5814**	9	0.394	**39.18**
1	**1.1628**	18	0.788	**77.91**
1.5	**1.7442**	25	1.095	**107.57**
2	**2.3256**	35	1.533	**149.70**
2.5	**2.9070**	35	1.533	**148.81**
3	**3.4884**	33	1.445	**139.47**
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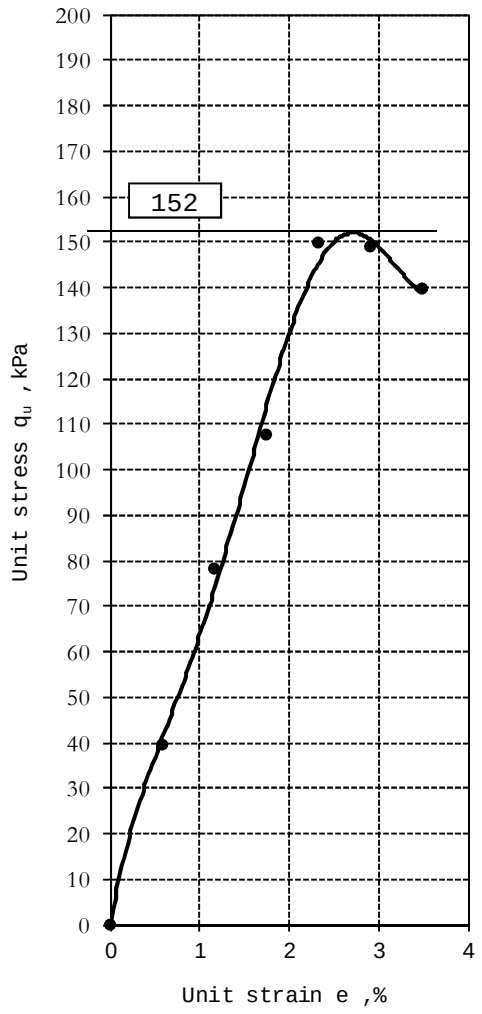
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **152** kPa

Cohesion = q_u / 2 = **76** kPa

Borehole : **S6**

Sample No:	Depth:3.00- 3.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	8.6	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_o , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**2.047**	
Proving ring capacity	680.27kg	Moisture Cont., %	**19.17**	
		Dry Density , g/cm^3	**1.718**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5814**	6	0.263	**26.12**
1	**1.1628**	10	0.438	**43.28**
1.5	**1.7442**	16	0.701	**68.84**
2	**2.3256**	22	0.963	**94.10**
2.5	**2.9070**	26	1.139	**110.55**
3	**3.4884**	30	1.314	**126.79**
3.5	**4.0698**	34	1.489	**142.83**
4	**4.6512**	34	1.489	**141.96**
4.5	**5.2326**	32	1.401	**132.80**
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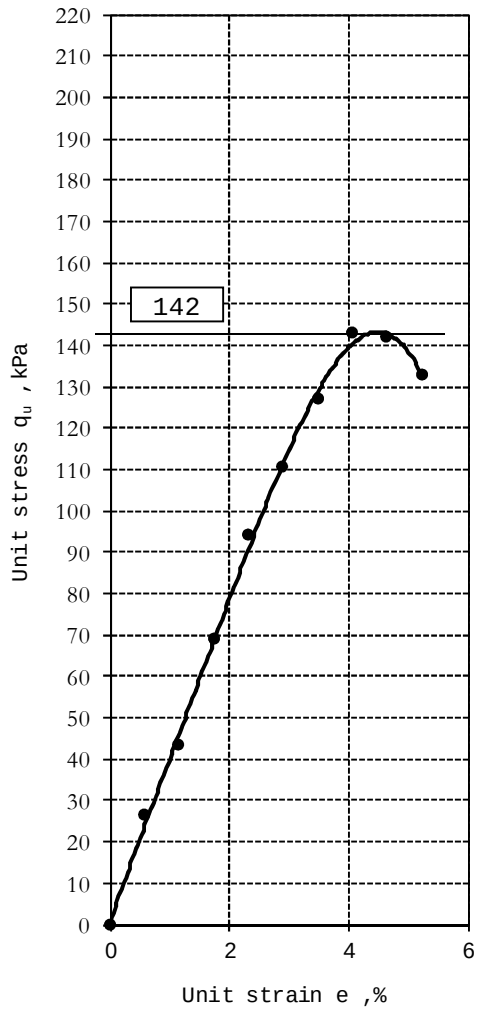
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **142** kPa

Cohesion = q_u / 2 = **71** kPa

Borehole : **S7**

Sample No:	Depth:3.00- 3.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9.3	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.60	
Plasticity Index I_P (%)		Area A_o , cm^2	10.174	
Specific gravity G_s		Bulk Density , g/cm^3	**1.997**	
Proving ring capacity	680.27kg	Moisture Cont., %	**19.14**	
		Dry Density , g/cm^3	**1.677**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5376**	6	0.248	**24.70**
1	**1.0753**	11	0.455	**45.04**
1.5	**1.6129**	13	0.538	**52.94**
2	**2.1505**	15	0.621	**60.75**
2.5	**2.6882**	17	0.704	**68.47**
3	**3.2258**	19	0.786	**76.11**
3.5	**3.7634**	21	0.869	**83.65**
4	**4.3011**	22	0.911	**87.14**
4.5	**4.8387**	22	0.911	**86.65**
5	**5.3763**	20	0.828	**78.33**
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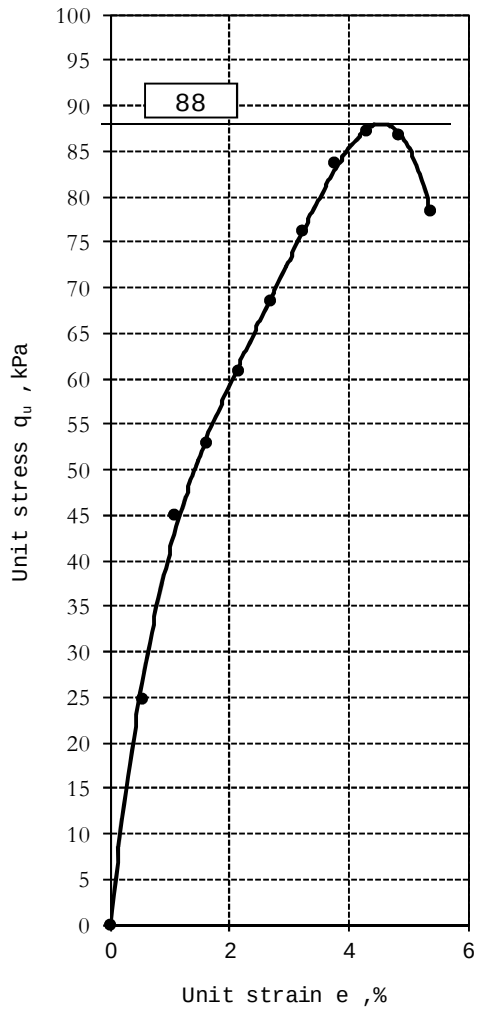
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **88** kPa

Cohesion = q_u / 2 = **44** kPa

Borehole : **S7**

Sample No:	Depth:6.00- 6.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9.4	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.60	
Plasticity Index I_P (%)		Area A_o , cm^2	10.174	
Specific gravity G_s		Bulk Density , g/cm^3	**2.016**	
Proving ring capacity	680.27kg	Moisture Cont., %	**14.03**	
		Dry Density , g/cm^3	**1.768**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5319**	6	0.248	**24.70**
1	**1.0638**	10	0.414	**40.95**
1.5	**1.5957**	14	0.579	**57.02**
2	**2.1277**	18	0.745	**72.92**
2.5	**2.6596**	22	0.911	**88.64**
3	**3.1915**	26	1.076	**104.18**
3.5	**3.7234**	30	1.242	**119.55**
4	**4.2553**	30	1.242	**118.89**
4.5	**4.7872**	27	1.118	**106.41**
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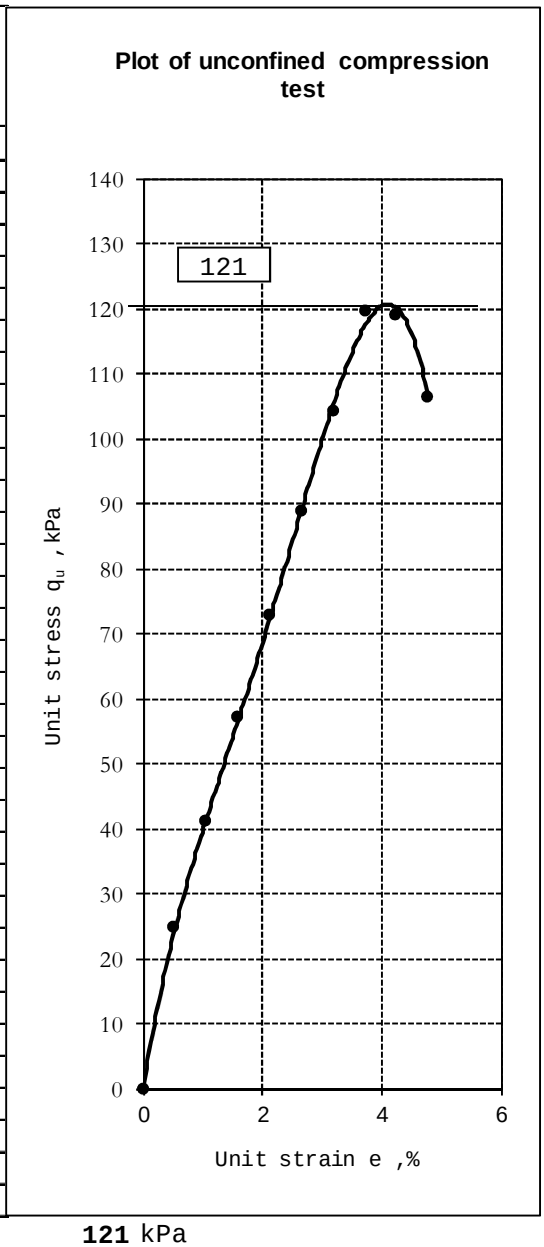

Unconfined Compressive Strength q_U = **121** kPa

Cohesion = q_u / 2 = **60.5** kPa

- **Chroy Changvar Substation**

Borehole : **S8**

Sample No:	Depth:6.00- 6.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_0 , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**1.923**	
Proving ring capacity	680.27kg	Moisture Cont., %	**19.25**	
		Dry Density , g/cm^3	**1.612**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	σ = P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5556**	6	0.263	**26.13**
1	**1.1111**	15	0.657	**64.96**
1.5	**1.6667**	25	1.095	**107.65**
2	**2.2222**	35	1.533	**149.86**
2.5	**2.7778**	45	1.971	**191.58**
3	**3.3333**	53	2.321	**224.35**
3.5	**3.8889**	56	2.452	**235.69**
4	**4.4444**	56	2.452	**234.33**
4.5	**5.0000**	54	2.365	**224.65**
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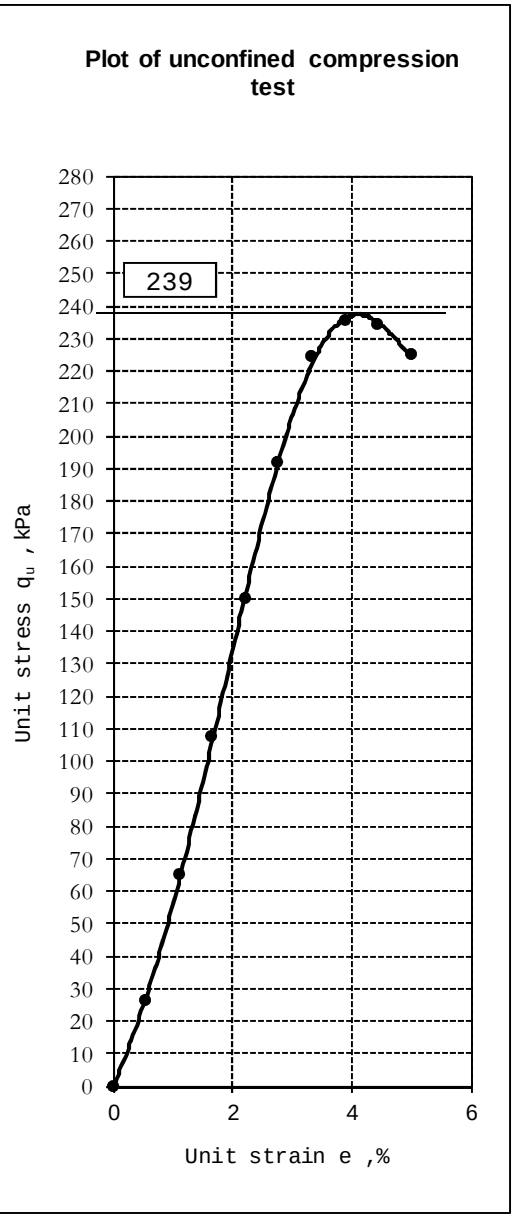

Unconfined Compressive Strength q_U =	**239** kPa
Cohesion = q_u / 2 =	**119.5** kPa

Borehole : **S8**

Sample No:	Depth:19.5- 19.55m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.70	
Plasticity Index I_P (%)		Area A_0 , cm^2	10.747	
Specific gravity G_s		Bulk Density , g/cm^3	**1.981**	
Proving ring capacity	680.27kg	Moisture Cont., %	**14.70**	
		Dry Density , g/cm^3	**1.727**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5556**	9	0.353	**35.07**
1	**1.1111**	20	0.784	**77.50**
1.5	**1.6667**	30	1.176	**115.59**
2	**2.2222**	40	1.567	**153.25**
2.5	**2.7778**	50	1.959	**190.48**
3	**3.3333**	50	1.959	**189.39**
3.5	**3.8889**	47	1.842	**177.00**
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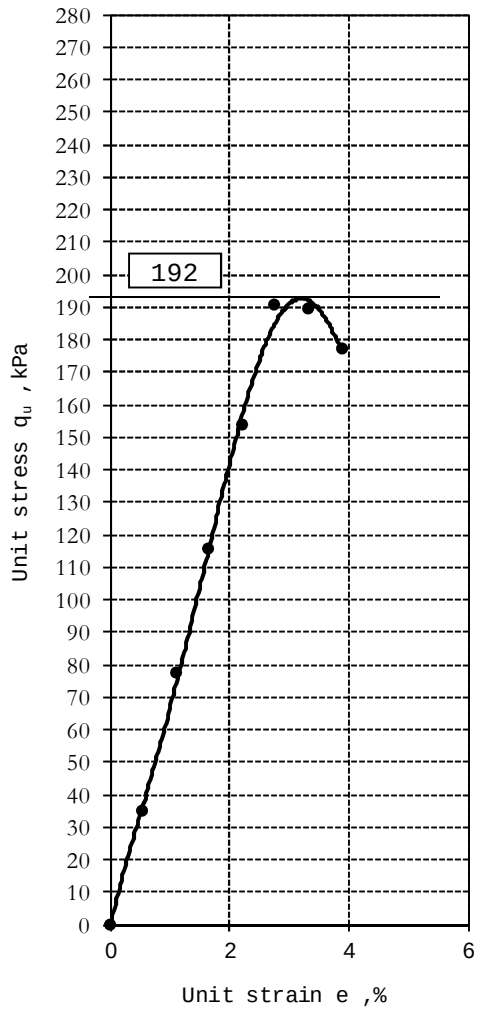
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **192** kPa

Cohesion = q_u / 2 = **96** kPa

Borehole : **S9**

Sample No:	Depth:6.00- 6.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	8.5	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_o , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**1.953**	
Proving ring capacity	680.27kg	Moisture Cont., %	**22.92**	
		Dry Density , g/cm^3	**1.589**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5882**	6	0.263	**26.12**
1	**1.1765**	12	0.525	**51.93**
1.5	**1.7647**	16	0.701	**68.83**
2	**2.3529**	20	0.876	**85.52**
2.5	**2.9412**	24	1.051	**102.01**
3	**3.5294**	28	1.226	**118.29**
3.5	**4.1176**	30	1.314	**125.96**
4	**4.7059**	30	1.314	**125.19**
4.5	**5.2941**	27	1.182	**111.97**
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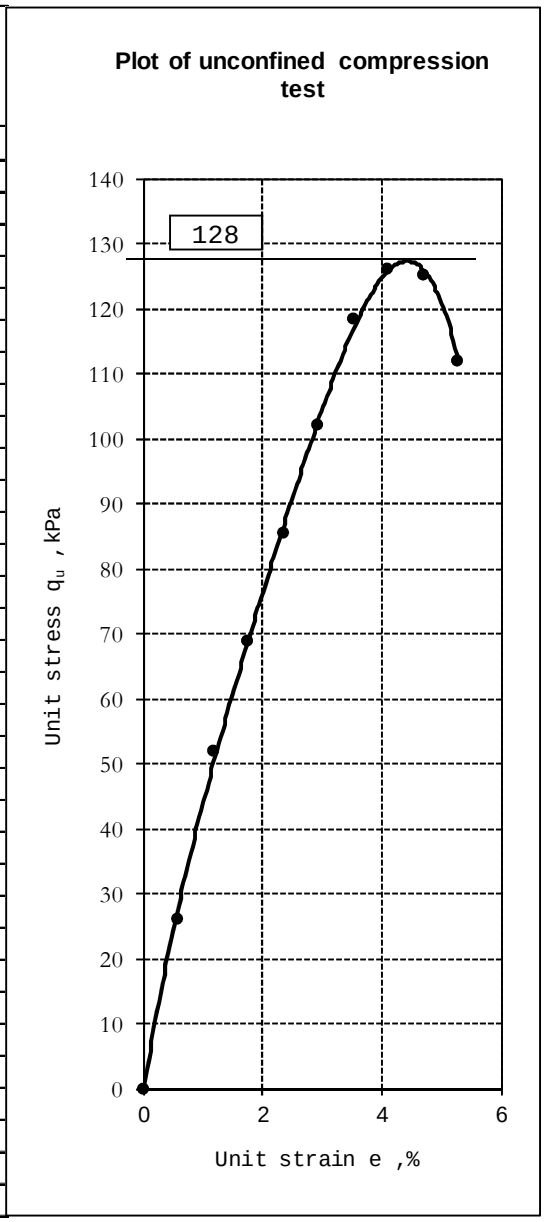

Unconfined Compressive Strength q_U = **128** kPa

Cohesion = q_u / 2 = **64** kPa

Borehole : **S9**

Sample No:	Depth: 19.50- 19.95m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_0 , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**2.140**	
Proving ring capacity	680.27kg	Moisture Cont., %	**20.69**	
		Dry Density , g/cm^3	**1.773**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	σ = P (1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5556**	6	0.263	**26.13**
1	**1.1111**	10	0.438	**43.30**
1.5	**1.6667**	14	0.613	**60.28**
2	**2.2222**	18	0.788	**77.07**
2.5	**2.7778**	22	0.963	**93.66**
3	**3.3333**	26	1.139	**110.06**
3.5	**3.8889**	30	1.314	**126.26**
4	**4.4444**	30	1.314	**125.53**
4.5	**5.0000**	27	1.182	**112.32**
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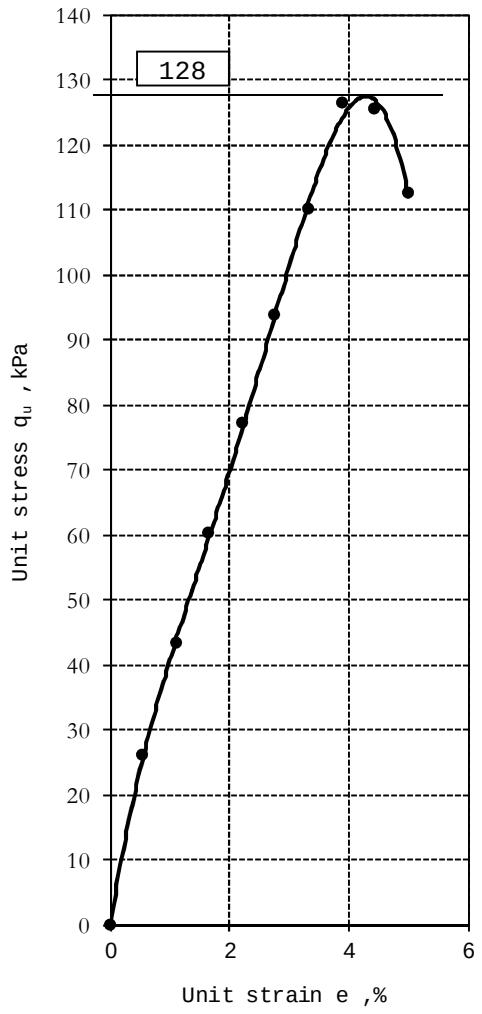
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **128** kPa

Cohesion = q_u / 2 = **64** kPa

- **Transmission line 230kV Mid point WPP/NPP to GS5 Substation**

Borehole : **T1**

Sample No:	Depth: 6.00- 6.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9.1	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_0 , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**2.022**	
Proving ring capacity	680.27kg	Moisture Cont., %	**15.35**	
		Dry Density , g/cm^3	**1.752**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	σ = P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5495**	10	0.438	**43.55**
1	**1.0989**	20	0.876	**86.62**
1.5	**1.6484**	30	1.314	**129.21**
2	**2.1978**	40	1.752	**171.31**
2.5	**2.7473**	50	2.190	**212.94**
3	**3.2967**	60	2.627	**254.08**
3.5	**3.8462**	70	3.065	**294.74**
4	**4.3956**	80	3.503	**334.92**
4.5	**4.9451**	90	3.941	**374.62**
5	**5.4945**	100	4.379	**413.84**
5.5	**6.0440**	100	4.379	**411.44**
6	**6.5934**	97	4.248	**396.76**
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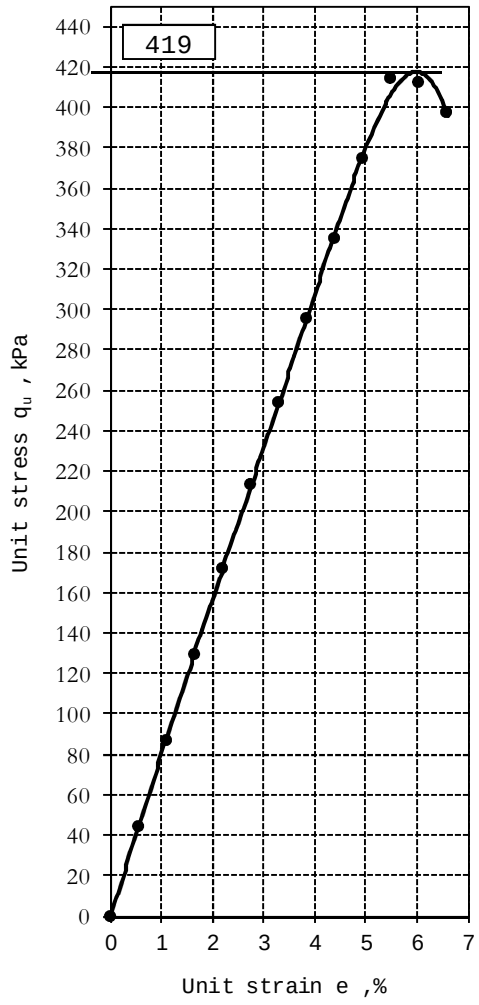
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **419** kPa

Cohesion = q_u / 2 = **209.5** kPa

Borehole : **T2**

Sample No:	Depth: 4.50- 4.95m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9.1	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.60	
Plasticity Index I_P (%)		Area A_0 , cm^2	10.174	
Specific gravity G_s		Bulk Density , g/cm^3	**2.175**	
Proving ring capacity	680.27kg	Moisture Cont., %	**14.58**	
		Dry Density , g/cm^3	**1.899**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5495**	10	0.414	**41.16**
1	**1.0989**	20	0.828	**81.87**
1.5	**1.6484**	30	1.242	**122.13**
2	**2.1978**	40	1.656	**161.93**
2.5	**2.7473**	50	2.070	**201.27**
3	**3.2967**	60	2.483	**240.16**
3.5	**3.8462**	70	2.897	**278.60**
4	**4.3956**	80	3.311	**316.58**
4.5	**4.9451**	90	3.725	**354.10**
5	**5.4945**	95	3.932	**371.61**
5.5	**6.0440**	95	3.932	**369.45**
6	**6.5934**	91	3.767	**351.83**
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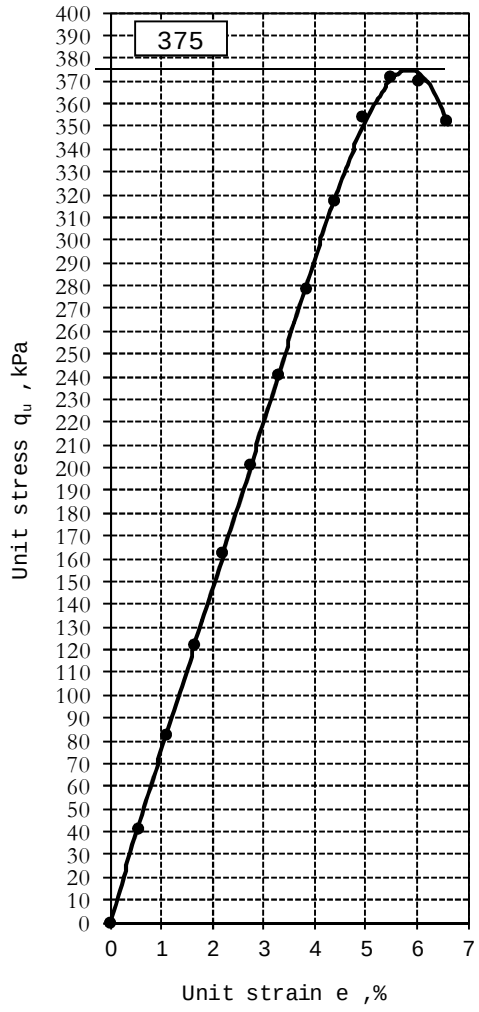
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **375** kPa

Cohesion = q_u / 2 = **187.5** kPa

Borehole : **T2**

Sample No:	Depth: 6.00- 6.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	8.6	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_o , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**2.058**	
Proving ring capacity	680.27kg	Moisture Cont., %	**16.48**	
		Dry Density , g/cm^3	**1.767**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5814**	10	0.438	**43.54**
1	**1.1628**	15	0.657	**64.92**
1.5	**1.7442**	25	1.095	**107.57**
2	**2.3256**	35	1.533	**149.70**
2.5	**2.9070**	45	1.971	**191.33**
3	**3.4884**	51	2.233	**215.54**
3.5	**4.0698**	51	2.233	**214.24**
4	**4.6512**	49	2.146	**204.59**
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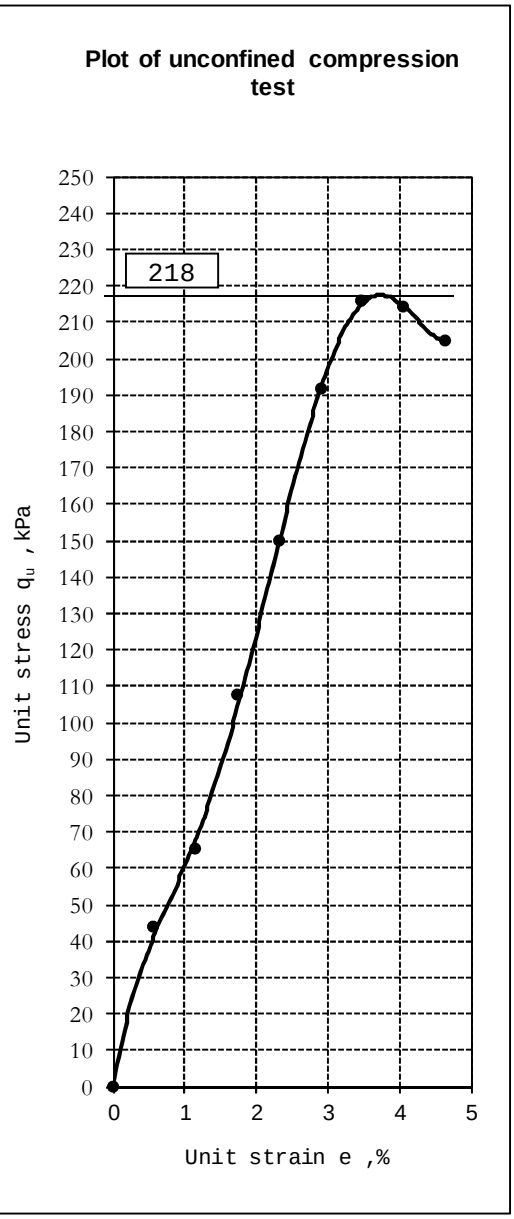

Unconfined Compressive Strength q_U = **218** kPa

Cohesion = q_u / 2 = **109** kPa

- **Transmission line 115kV GS5 to Chroy Changvar Substation**

Borehole : **T3**

Sample No:	Depth: 3.00- 3.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.50	
Plasticity Index I_P (%)		Area A_0 , cm^2	9.616	
Specific gravity G_s		Bulk Density , g/cm^3	**1.905**	
Proving ring capacity	680.27kg	Moisture Cont., %	**14.89**	
		Dry Density , g/cm^3	**1.658**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	σ = P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5556**	10	0.438	**43.55**
1	**1.1111**	20	0.876	**86.61**
1.5	**1.6667**	30	1.314	**129.18**
2	**2.2222**	40	1.752	**171.27**
2.5	**2.7778**	47	2.058	**200.10**
3	**3.3333**	51	2.233	**215.89**
3.5	**3.8889**	51	2.233	**214.65**
4	**4.4444**	47	2.058	**196.67**
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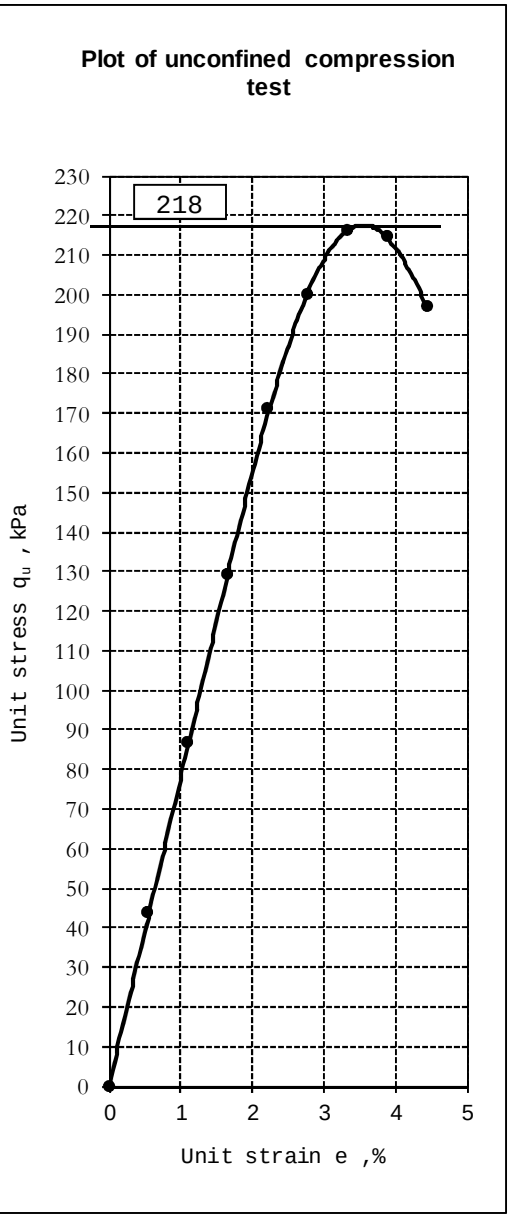

Unconfined Compressive Strength q_U = **218** kPa

Cohesion = q_u / 2 = **109** kPa

Borehole : **T4**

Sample No:	Depth: 3.00- 3.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	8.5	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.60	
Plasticity Index I_P (%)		Area A_o , cm^2	10.174	
Specific gravity G_s		Bulk Density , g/cm^3	**1.681**	
Proving ring capacity	680.27kg	Moisture Cont., %	**27.05**	
		Dry Density , g/cm^3	**1.323**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5882**	4	0.166	**16.46**
1	**1.1765**	8	0.331	**32.72**
1.5	**1.7647**	13	0.538	**52.86**
2	**2.3529**	16	0.662	**64.67**
2.5	**2.9412**	20	0.828	**80.35**
3	**3.5294**	20	0.828	**79.86**
3.5	**4.1176**	17	0.704	**67.47**
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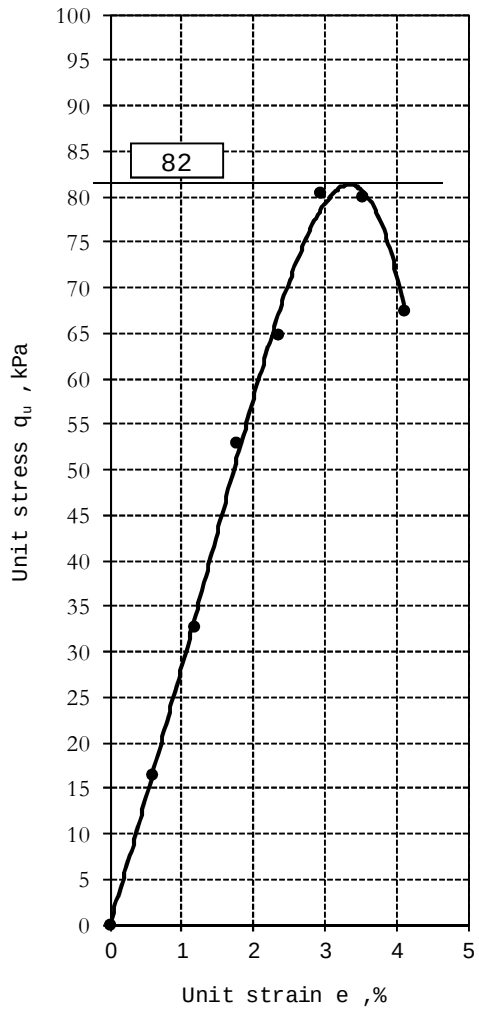
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **82** kPa

Cohesion = q_u / 2 = **41** kPa

Borehole : **T4**

Sample No:	Depth: 17.50- 17.95m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	8.7	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.60	
Plasticity Index I_P (%)		Area A_0 , cm^2	10.174	
Specific gravity G_s		Bulk Density , g/cm^3	**1.866**	
Proving ring capacity	680.27kg	Moisture Cont., %	**25.82**	
		Dry Density , g/cm^3	**1.483**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	$\sigma =$ P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5747**	6	0.248	**24.69**
1	**1.1494**	15	0.621	**61.37**
1.5	**1.7241**	22	0.911	**89.49**
2	**2.2989**	26	1.076	**105.14**
2.5	**2.8736**	30	1.242	**120.61**
3	**3.4483**	36	1.490	**143.87**
3.5	**4.0230**	40	1.656	**158.91**
4	**4.5977**	44	1.821	**173.75**
4.5	**5.1724**	48	1.987	**188.40**
5	**5.7471**	48	1.987	**187.26**
5.5	**6.3218**	45	1.863	**174.49**
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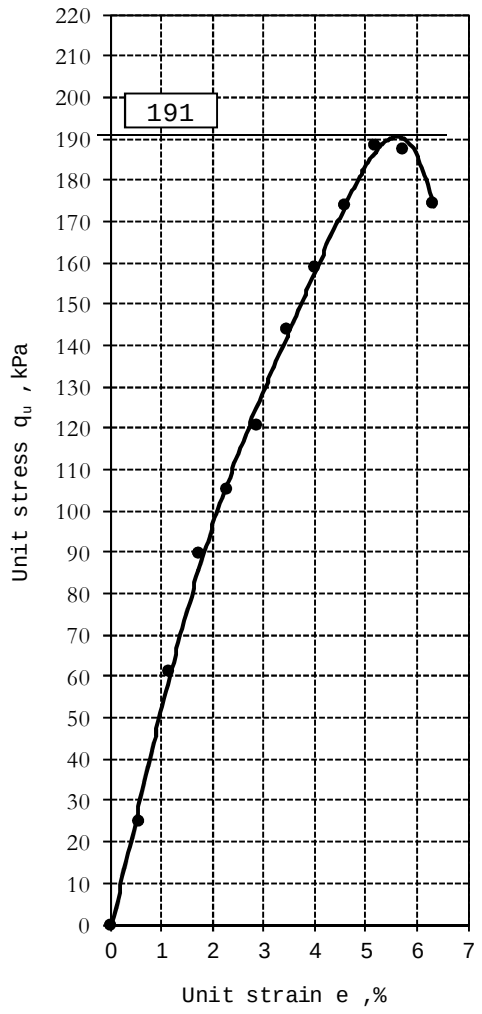
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **191** kPa

Cohesion = q_u / 2 = **95.5** kPa

Borehole : **T5**

Sample No:	Depth: 3.00- 3.45m	Tested date :20/07/2014
Tested by: Mr.Sum Bunkong	Checked by:Mr. Ket Chansavuth	

Liquid Limit W_L (%)		Height L_0 , cm	9.5	Sketch of failure
Plastic Limit W_P (%)		Diameter , cm	3.40	
Plasticity Index I_P (%)		Area A_o , cm^2	9.075	
Specific gravity G_s		Bulk Density , g/cm^3	**1.985**	
Proving ring capacity	680.27kg	Moisture Cont., %	**24.84**	
		Dry Density , g/cm^3	**1.590**	

Sample deformation (mm)	ε , % $\Delta L/L_0 *100$	Proving ring 1/100mm	Total load on sample kgf/cm^2	σ = P(1-ε/100) kN/m^2
0	**0**	0	0	**0**
0.5	**0.5263**	4	0.186	**18.46**
1	**1.0526**	7	0.325	**32.14**
1.5	**1.5789**	9	0.418	**41.10**
2	**2.1053**	11	0.510	**49.97**
2.5	**2.6316**	13	0.603	**58.74**
3	**3.1579**	13	0.603	**58.42**
3.5	**3.6842**	10	0.464	**44.69**
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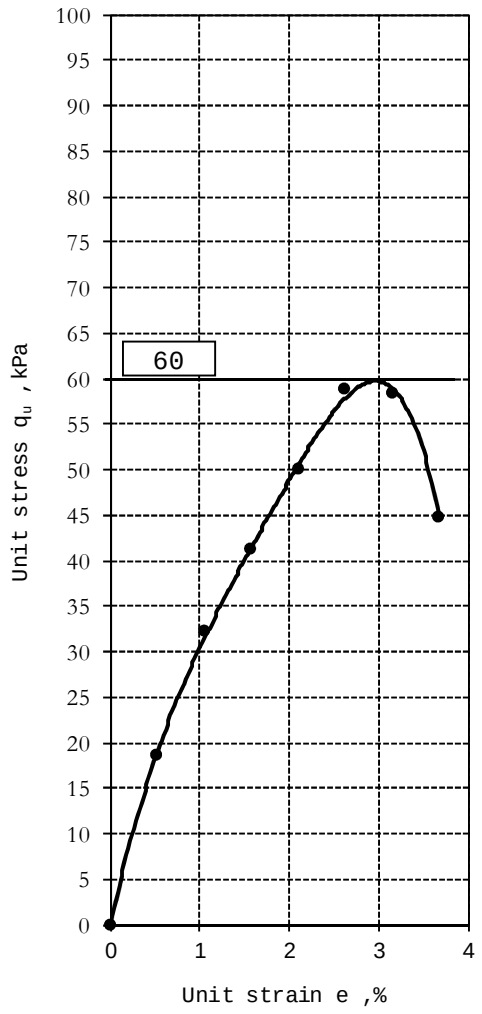
Plot of unconfined compression test



Unconfined Compressive Strength q_U = **60** kPa

Cohesion = q_u / 2 = **30** kPa

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 24-Jul-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. S1 Elevation: m
PROJECT : CHROY CHANGVAR SUBSTATION
LOCATION:

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 µ m (%)		q_u (kPa)	Cohesion (kPa)	ϕ (°)	C (kPa)	
	3.00- 3.45	19.83	1.961	1.636		36.3	18.3	18.1	8.6	0	9	91	98.78	CL	170	85			
	7.50- 7.95	13.05	2.174	1.923		32.4	17.2	15.3	-26.9	0	44	56	81.18	CL	178	89			
	12.00- 12.45	21.88				32.2	12.3	19.9	48.2	0	45	55	82.59	CL					

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Director Laboratory

KET CHANSAVUTH

Table No.S1

Date :24/07/2014

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 24-Jul-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. S2 Elevation: m
PROJECT : CHROY CHANGVAR SUBSTATION
LOCATION:

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 μ m (%)		q_u (kPa)	Cohesion (kPa)	φ (°)	C (kPa)	
	3.00- 3.45	19.58	1.965	1.643		44.6	12.7	31.8	21.5	0	10	90	98.46	CL	152	76			
	7.50- 7.95	13.49				32.7	14.2	18.5	-3.9	1	46	53	84.77	CL					
	10.50- 10.95	23.45	2.012	1.630		32.9	17.9	15.0	36.9	0	13	87	95.01	CL	212	106			

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Table No.S2

Date :.....24...../..07...../2014.....

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 06-Jun-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. **S3** Elevation: m
PROJECT :
LOCATION: **Tuol Kork**

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 μ m (%)		q_u (kPa)	Cohesion (kPa)	φ (°)	C (kPa)	
SPT-2	3.00- 3.45	14.26	2.148	1.880		37.6	17.6	20.1	-16.4	1	37	62	86.07	CL	125	62.5			
SPT-4	6.00- 6.45	18.75								0	82	18	85.89	SM					
SPT-6	9.00- 9.45	18.84								0	86	14	84.00	SM					
SPT-10	15.00- 15.45	14.08				23.8	14.2	9.6	-1.4	0	62	38	50.73	SC					

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KET CHANSAVUTH

Table No.S3

Date :..06...../..06...../..2014.....

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 06-Jun-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. **S4** Elevation: m
PROJECT :
LOCATION: **Tuol Kork**

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 µ m (%)		q_u (kPa)	Cohesion (kPa)	ϕ (°)	C (kPa)	
SPT-1	1.50- 1.95	26.46	1.923	1.521		45.0	17.6	27.4	32.3	1	29	70	92.50	CL	60	30			
SPT-2	3.00- 3.45	16.06	2.173	1.872		39.0	18.2	20.8	-10.3	0	37	63	86.55	CL	189	94.5			
SPT-3	4.50- 4.95	17.45								6	93	1	47.94	SM					
SPT-6	9.00- 9.45	17.80								0	84	16	86.76	SM					
SPT-8	12.00- 12.45	17.12								0	90	10	70.38	SM					

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KET CHANSAVUTH

Table No.S4

Date: 06 / 06 / 2014

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 24-Jul-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No: **S5** Elevation: m
PROJECT : **GS 5 SUBSTATION**
LOCATION:

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 μ m (%)		q_u (kPa)	Cohesion (kPa)	ϕ (°)	C (kPa)	
	3.00- 3.45	13.79	2.046	1.798		54.2	15.4	38.8	4.1	0	31	69	86.95	CH	200	100			
	7.50- 7.95	10.64				19.0	18.5	0.5	-1679	1	76	23	31.63	SM					
	12.00- 12.45	13.43	2.220	1.957		26.2	18.5	7.7	-66.5	1	80	19	42.95	SM	152	76			

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Director Laboratory

KET CHANSAVUTH

Table No.GS5

Date :.....24...../.....07...../.....2014.....

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 24-Jul-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. **S6** Elevation: m
PROJECT : **GS 5 SUBSTATION**
LOCATION:

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 μ m (%)		q_u (kPa)	Cohesion (kPa)	φ (°)	C (kPa)	
	3.00- 3.45	19.17	2.047	1.718		45.3	16.5	28.9	9.4	2	24	74	91.60	CL	142	71			
	7.50- 7.95	12.71				30.4	13.0	17.4	-1.6	2	77	21	29.56	SC					
	12.00- 12.45	17.19				33.5	17.3	16.1	-0.9	1	37	62	74.42	CL					

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Director Laboratory

KET CHANSAVUTH

Date :24 /07 /2014

Table No.GS6

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 24-Jul-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. S7 Elevation: m
PROJECT : GS 5 SUBSTATION
LOCATION:

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 µ m (%)		q_u (kPa)	Cohesion (kPa)	ϕ (°)	C (kPa)	
	3.00- 3.45	19.14	1.997	1.676		53.8	16.9	36.9	6.2	1	34	65	89.46	CH	88	44			
	6.00- 6.45	14.03	2.016	1.768		23.8	11.5	12.3	20.7	0	78	22	34.88	SC	121	60.5			
	12.00-12.45	10.79				23.3	13.0	10.4	-21.0	3	65	32	73.62	SC					

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Table No.GS7

Date :.....24...../.....07...../.....2014.....

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 24-Jul-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. S8 Elevation: m
PROJECT : CHROY CHANGVAR SUBSTATION
LOCATION:

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 μ m (%)		q_u (kPa)	Cohesion (kPa)	φ (°)	C (kPa)	
	6.00- 6.45	19.25	1.923	1.613		40.2	20.1	20.1	-4.1	0	6	94	98.36	CL	239	119.5			
	19.50- 19.95	14.70	1.981	1.727		41.0	18.1	22.9	-14.8	1	12	87	98.41	CL	192	96			
	24.00- 24.45	18.68				21.0	12.7	8.3	71.9	0	73	27	98.75	SC					

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KET CHANSAVUTH

Table No.S8

Date :....24..../..07...../2014.....

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 24-Jul-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. S9 Elevation: m
PROJECT : CHROY CHANGVAR SUBSTATION
LOCATION:

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 μ m (%)		q_u (kPa)	Cohesion (kPa)	φ(°)	C (kPa)	
	6.00- 6.45	22.92	1.953	1.589		55.4	15.5	40.0	18.6	0	7	93	97.83	CH	128	64			
	19.50- 19.95	20.69	2.140	1.773		31.2	16.2	15.0	30.1	1	27	72	95.99	CL	128	64			
	24.00- 24.45	18.50								1	79	20	95.22	SM					

Table No.S9

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Date :.....24...../.....07...../.....2014.....

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 24-Jul-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. T1 Elevation: m
PROJECT : Transmission Line 230KV mid point WPP/NPP
LOCATION:

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 μ m (%)		q_u (kPa)	Cohesion (kPa)	ϕ (°)	C (kPa)	
	3.00- 3.45	13.20				29.4	14.9	14.6	-11.3	1	55	44	90.53	SC					
	6.00- 6.45	15.35	2.022	1.753		29.7	14.0	15.7	8.7	0	20	80	94.50	CL	419	209.5			
	10.50- 10.95	17.40				27.0	19.9	7.1	-34.9	1	53	46	73.37	SC					

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Table No.T1

Date :....24...../...07...../2014.....

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 24-Jul-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. T2 Elevation: m
PROJECT : Transmission Line 230KV mid point WPP/NPP
LOCATION:

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 μ m (%)		q_u (kPa)	Cohesion (kPa)	φ (°)	C (kPa)	
	3.00- 3.45	10.97				53.6	18.0	35.6	-19.9	0	31	69	85.33	CH					
	4.50- 4.95	14.58	2.175	1.898		37.7	18.1	19.6	-18.0	1	43	56	81.83	CL	375	187.5			
	6.00- 6.45	16.48	2.058	1.767		38.2	16.0	22.2	2.3	5	39	56	77.93	CL	218	109			

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Date :..24../..07../..2014....

Table No.T2

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 24-Jul-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. T3 Elevation: m

PROJECT : Transmission Line 230KV mid point WPP/NPP

LOCATION:

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay (%)	<425 μ m (%)		q_u (kPa)	Cohesion (kPa)	φ (°)	C (kPa)	
	3.00- 3.45	14.89	1.905	1.658		37.5	14.1	23.4	3.4	0	11	89	96.60	CL	218	109			
	9.00- 9.45	19.31				21.4	13.7	7.7	72.9	0	74	26	87.96	SC					
	12.00- 12.45	15.63								0	80	20	83.84	SM					

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Table No.T3

Date :.....24...../...07...../2014.....

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 24-Jul-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. T4 Elevation: m
PROJECT : Transmission Line 230KV mid point WPP/NPP
LOCATION:

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 μ m (%)		q_u (kPa)	Cohesion (kPa)	φ (°)	C (kPa)	
	3.00- 3.45	27.05	1.681	1.323		42.1	14.9	27.2	44.6	0	3	97	99.45	CL	82	41			
	7.50- 7.95	21.95				46.4	17.4	28.9	15.7	0	5	95	98.66	CL					
	16.50- 16.95	13.20								3	89	8	21.98	SM					
	17.50- 17.95	25.82	1.866	1.483											191	95.5			

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Table No.T4

Date :....24..../..07..../2014.....

Ministry of Water Resources and Meteorology
Engineering Department
Soil Quality Analysis Office

Sheet No.
Date: 24-Jul-14

SUMMARY OF LABORATORY TEST RESULTS

BOREHOLE No. **T5** Elevation: m

PROJECT : Transmission Line 230KV mid point WPP/NPP

LOCATION:

Sample No.	Depth (m)	W (%)	Densities		G_s	Atterberg Limits				Grain size distribution				Soil Class	Uncof.Compr.		Direct Shear		Es (kPa)
			ρ_w (T/m^3)	ρ_d (T/m^3)		LL (%)	PL (%)	PI (%)	I_L (%)	Gravel (%)	Sand (%)	Silt+Clay(%)	<425 μ m (%)		q_u (kPa)	Cohesion (kPa)	φ (°)	C (kPa)	
	3.00- 3.45	24.84	1.985	1.590		42.7	18.9	23.8	24.9	0	3	97	99.25	CL	60	30			
	7.50- 7.95	32.76				30.9	15.2	15.7	112.0	0	28	72	99.55	CL					
	16.50- 16.95	27.97				19.2	16.1	3.1	385.7	0	82	18	99.68	CL-ML					

Table No.T5

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Date :.....24...../.....07...../2014.....

IV. CONCLUSION

The calculation results here are just a calculation base on the data obtained from limited soil test study. To obtain more precise and more reliable data and results, further full-scale investigation and study shall be conducted prior to the construction time.

Further detail foundation size and embedded depth will be design according to loads of tower, substation building or high voltage electrical equipment and underground water level.

Every soil test locations are not too bad for construction except borehole S8 and S9 at Chroy Changvar Substation which is the needed to consider about the design depth of pile plus the height of soil backfill.

V. BOREHOLE LOCATION LAYOUT

Figure 5 – NCC Substation

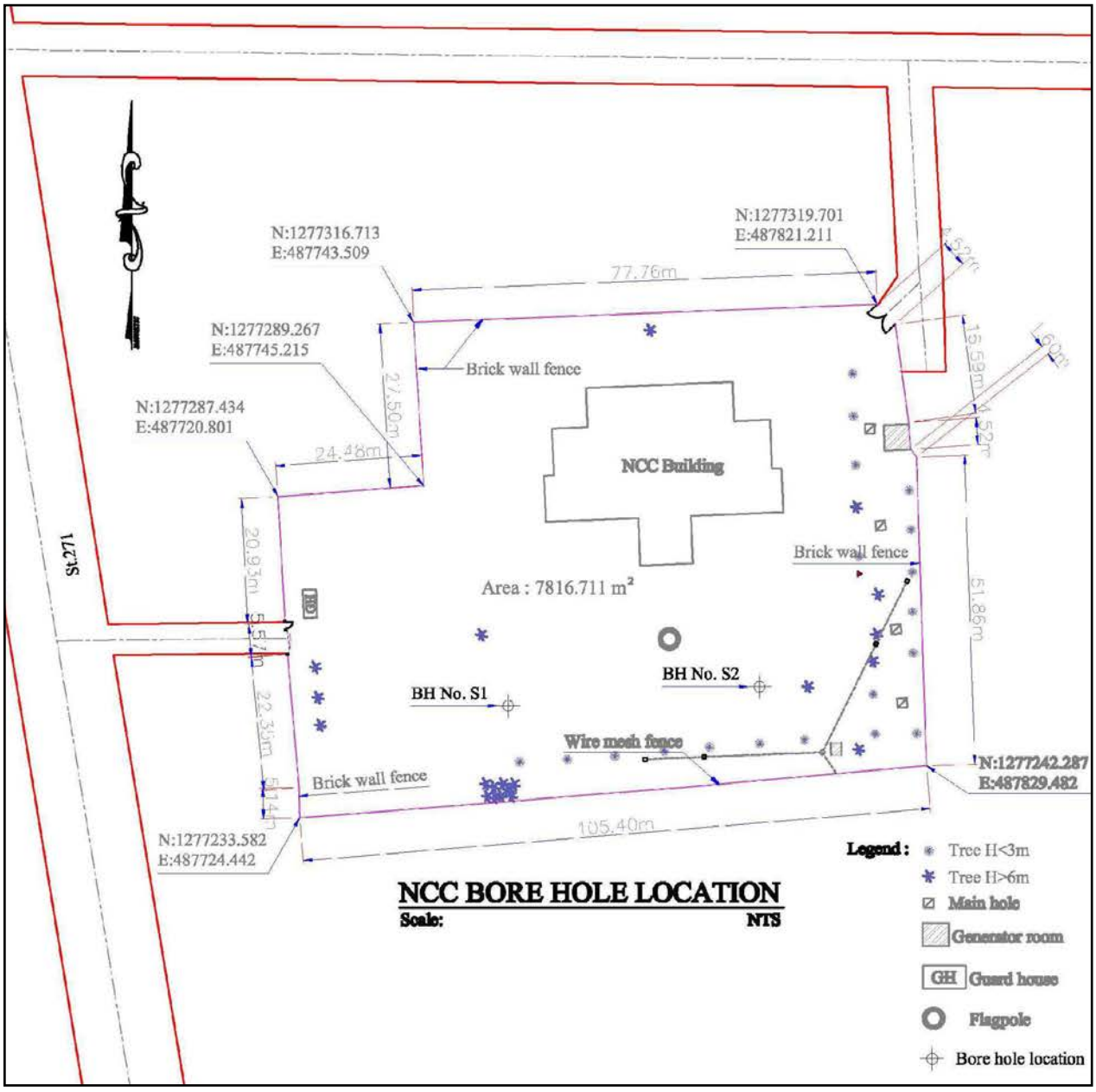


Figure 6 – Tuol Kork Substation

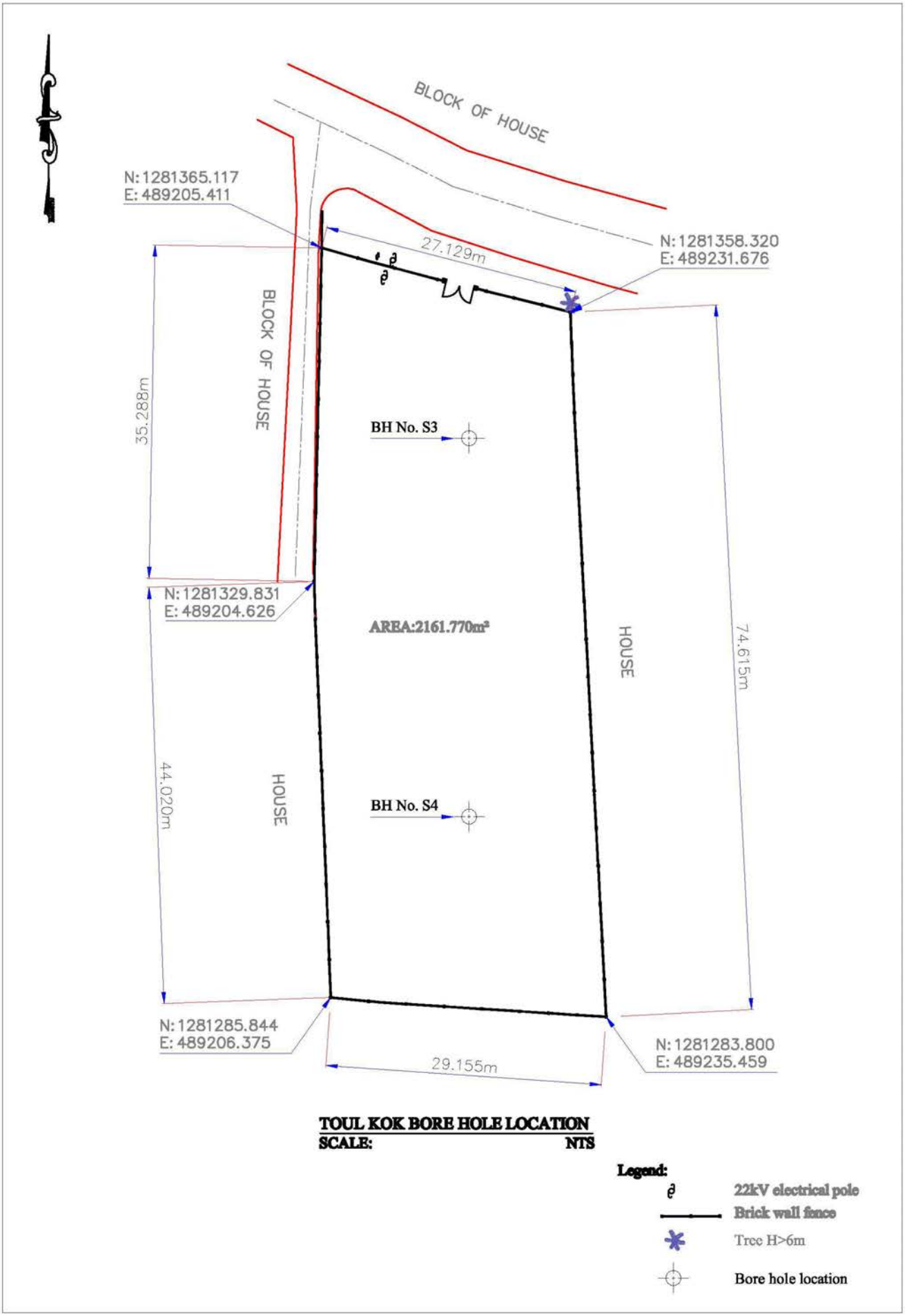


Figure 7 – GS5 Substation

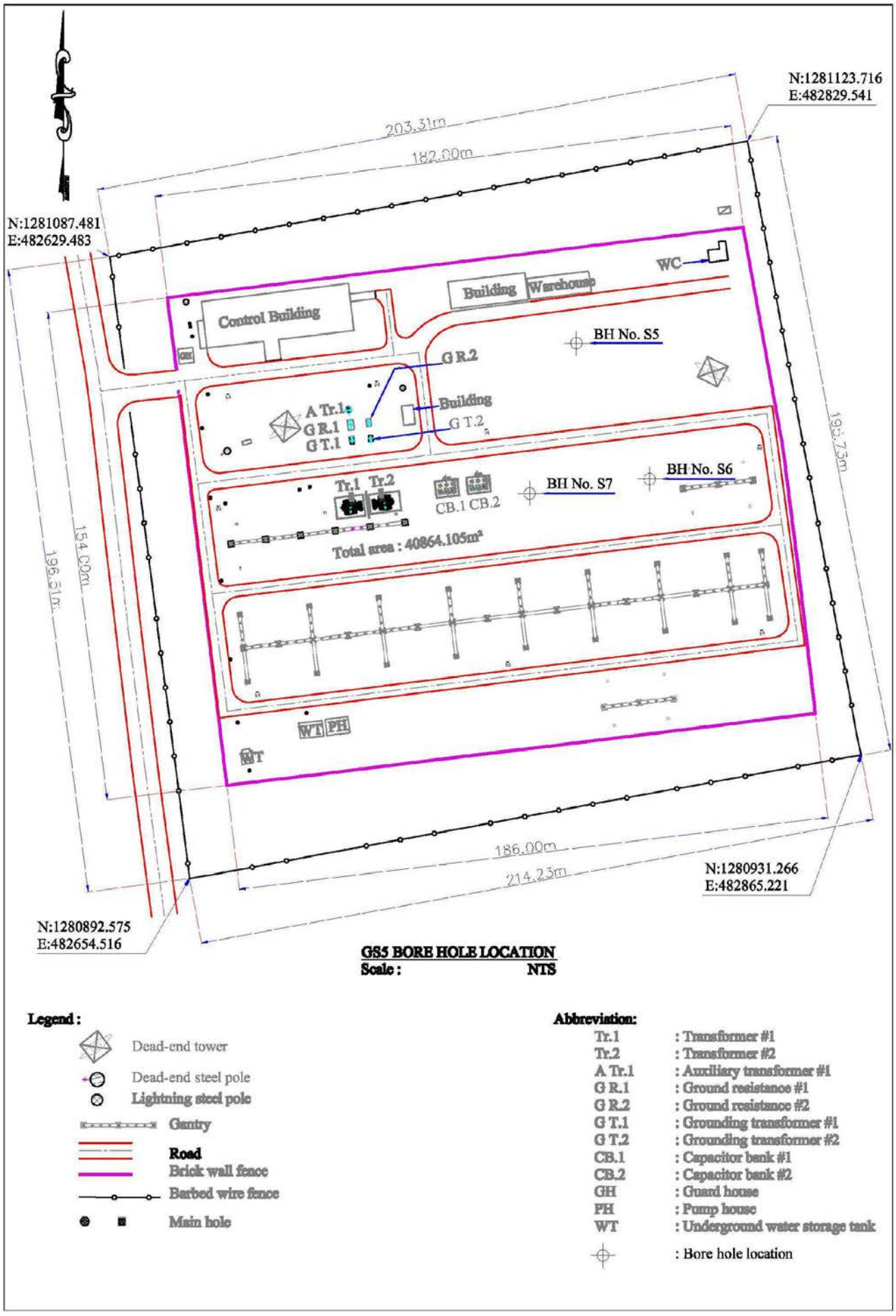


Figure 8 – Chroy Changvar Substation

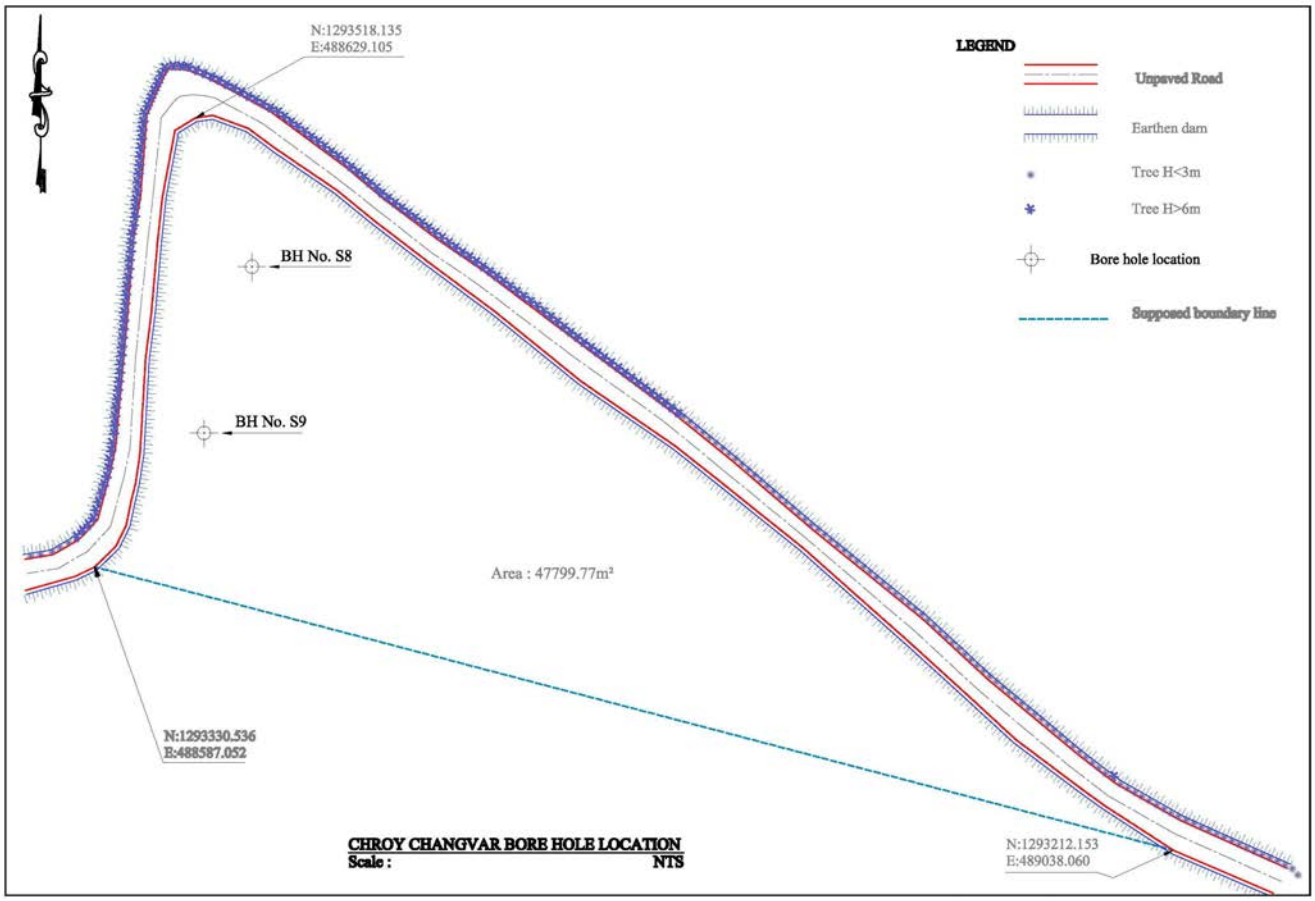


Figure 9 – Transmission line 230kV Mid point WPP/NPP to GS5 Substation

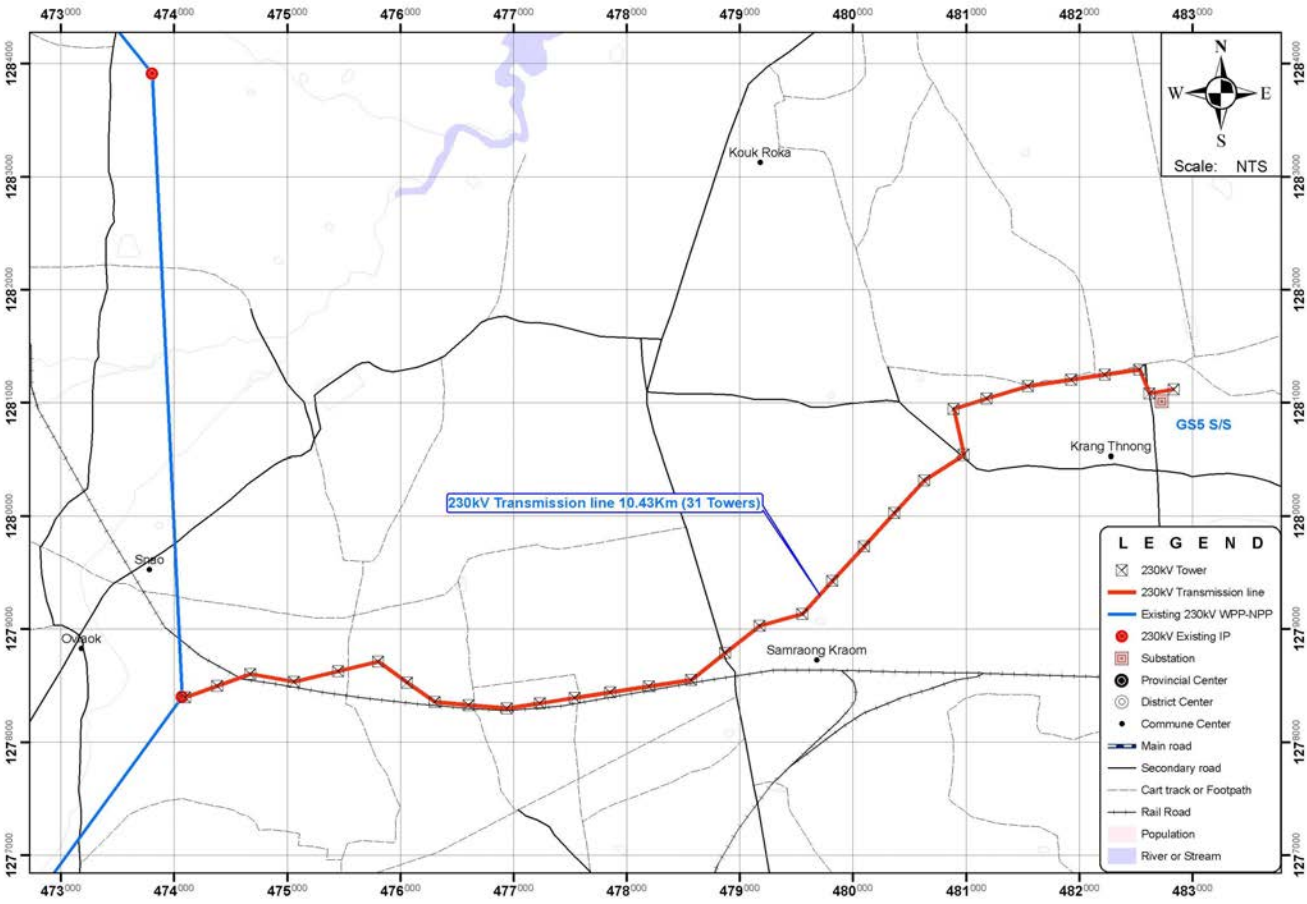
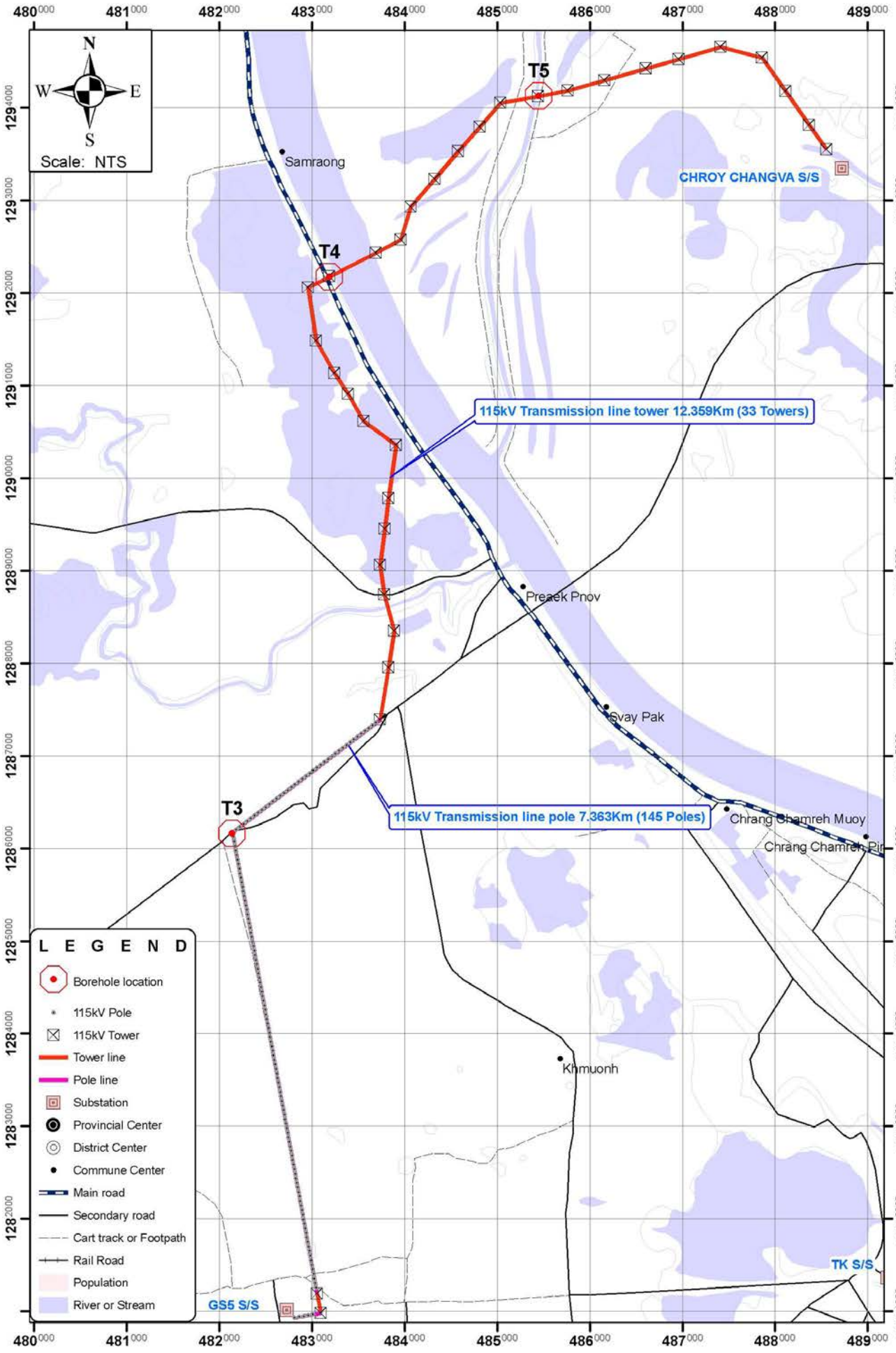


Figure 10 – Transmission line 115kV GS5 to Chroy Changvar Substation



VI. PICTURE OF ACTIVITIES

Field test

BH: S1 (GS5 SS)

BH: S1 (GS5 SS)

BH: S3 (Tuol Kork SS)

BH: S4 (Tuol Kork SS)

BH: S5 (GS5 SS)

BH: S6 (GS5 SS)

BH: S7 (GS5 SS)

BH: S8 (Chroy Changvar SS)

BH: S9 (Chroy Changvar SS)

BH: T1

BH: T2

BH: T3

BH: T4

BH: T5

Laboratory test

APPENDIX 3

MINUTES OF MEETING

Appendix-3 Minutes of Meetings

==========

1. Minutes of First Stakeholder Meeting

Date:	Tuesday, April 29th, 2014		
Time:	9:00AM-11:15AM		
Location:	Conference Room of EDC, Building A		
Purpose:	1. Public Disclosure for Stakeholders; 2. Collection of Stakeholders on the Project and Envisaged Environmental Impact		
Attendees: **(28 persons)**	JICA Survey Team	6 persons	See attached list
	Representative of JICA Cambodia	1 person	
	Phnom Penh City Hall	1 person	
	EIA office, Ministry of Environment (MOE)	2 persons	
	Department of Land Management Urban Planning, Construction and Cadastral	1 person	
	Department of Land Management, Urban Planning and Construction, Phnom Penh	1 persons	
	Ang Snuol District, Kandal province	1 person	
	Por Senchey Khan[1]	1 person	
	Saen Sok Khan	1 person	
	Tuol Kouk Khan	1 person	
	EDC	12 persons	
Outcome:			
Dr. **Chulasa PRAING** (9:10AM-9:35AM)	The meeting was chaired by Dr. Chulasa Praing, Deputy Managing Director, EDC. Summary of his opening remarks of Dr. Praing Chulasa is as follows: "Today, I am very pleased to meeting all of you. I much appreciate and welcome for your participation today. Before starting the presentation for the first stakeholder meeting for Phase - 2 of the subject Project, I would like to share you some information related to the Phase – 1 Project. For Phase-1 of the Project, the study itself has already been completed. The two consulting firms, namely Tokyo Electric and NIPPON KOEI conducted the study of Phase - 1. There were two main line routes for the underground of High Voltage Transmission Line of 115 kV. (1) From substation (GS3) in O Bek Kaom to substation at Olympic stadium with 300 MVA of the transformer capacity. It continued from the substation at Olympic stadium to another substation in Hun Sen Garden (next to Koh Pich island) with about 150 MVA of the transformer capacity. (2) Another line started from Grid Substation #1 in Toul Sangkae (at the North of Phnom Penh) to the new substation at EDC headquarters. This line also linked to the substation at Hun Sen Garden (next to Koh Pich island). Anyway, for the line from substation at Hun Sen Garden to GS2 at Khbal Khnal was not included in the Phase 1 project. Our Prime Minister, Samdech Hun Sen, provided land in Hun Sen Garden for the substation construction and office. We will have team in this office for intervention whenever it faces problem, because here there are building of national assembly, foreign affairs and international cooperation, Royal Palace, etc., so we need another office here. For location in Olympic Stadium, Ministry of Education, Youth and Sports has already agreed to provide the land to EDC for substation construction. It is the first time that we will have substations constructed in the building in Phnom Penh like Olympic Stadium, Hun Sen Garden with high capacity, Really, the cost of land in these locations is very high; however for substation in suburban areas, we can construct		

[1] Khan is Khmer word used for district in City (Khan=District).

	our substation as usual in the open land due to its cost of land. For Phase-1 project, it is preparing for bid for implementation next year. Anyway, this Phase-2 project is going to extend from Phase 1. High-voltage transmission line of 230 kV will be installed to reach Phnom Penh City in this phase. As present condition, High-voltage transmission line of 230 kV is just located at around Phnom Penh. We will distribute to the central part of Phnom Penh through overhead transmission line of 115 kV. Thus, Phnom Penh City will get electricity around 500 or 600 MW after the completion of Phase-2 project. The requirement of electricity for Phnom Penh is very high; it is about 70% in total demand in the country. So, this meeting is the first stakeholder meeting for Phase-2 project. We would like to suggest all of the participants from the affected areas by the project in Phnom Penh City and Kandal province *(Phnom Penh: Toul Kork Khan, Sen Sok Khan, Pour Senchey Khan, Rousey Keo Khan and Ang Snoul district in Kandal province)* to facilitate and cooperate with our study team in order to resolve any problems because it is the project of Royal Government in which the loan comes from the Government of Japan including the Consultant from Japan too. Therefore, we have to cooperate in order to get good results. After general introduction of the Project and its purpose, Dr. Chulasa Praing, he declared to open the meeting then let JICA survey team to give the presentation."
Mr. Say Bora Representative of JICA-Cambodia (9:35-9:40)	Mr. Bora gave some words on behalf of JICA as Mr. Watanabe could not attend in the meeting. "We hope that all of the stakeholders will participate well with this Project; then the Consultant should do with the good solution for any affection. Thanks to you all."
Mr. Yukao Tanaka, Team Leader (9:40-10:00)	Mr. Tanaka provided statement on behalf of the JICA Survey Team. "Good morning. First of all, I would like to say hello to all participants. My name is Yukao Tanaka, Team Leader for this Preparatory Survey for Phase 2. Surely, this Project is very important for Phnom Penh City as Dr. Praing Chulasa mentioned in his opening remarks. The Project will contribute to meet the future power demand. Anyway, this Project is similar to the Phase 1 Project of which the tudy was completed earlier. After completion of Phase 1 study, JICA decided to continue for Phase 2 Study. NEWJEC and The Chugoku Electric were selected by JICA to conduct the Preparatory Survey for Phase 2 Project. Thus, we will try our best to complete the study satisfactory to Cambodian side including environmental issues. So, this meeting is very essential and important for carrying out the study. Finally, in this opportunity we express heartfelt gratitude to your kind cooperation and understanding on the project in advance.
Mr. Sour Sethy and Mr. Mao Visal (10:00-10:30)	Based on the Presentation Paper as attached to this Minutes, presentation in Khmer language was done.
	Discussion Session
Mr. Khiev Sam Oeun, Vice Governor of Sen Sok Khan (10:35-10:45)	As previous time, we had already faced with some problems on the affected land by large poles of transmission line. Thus, please tell us the way or method of solution for the affected people. Does the project pay to the affected people based on the present market price of land or assets? They (developer) have negotiated with the affected people for the cost of land based on the present value. However, it was not the same price when EDC paid the compensation. **<u>Suggestion</u>**: - Please show me the affected locations in Sen Sok Khan. - Please provide us the clear route of that line. We will be easy to inform to the people. **<u>Responded by</u>**: EDC (Dr. **Chulasa PRAING)** - For this matter, we had the independent team to investigate and study about the cost of land in 2010. However, they started to compensate in 2012, while the cost

	of land was increasing by month. The most of the problems resulted from long time delay for compensation thus the price changed from the time of study. Thus, we know about this problem. - So, we suggested this Project (Phase-2) should proceed faster to avoid happening of this kind of matter again. - We will try to reduce impacts and the problems as much as possible.
Mr. Ou Sophorn, EIA Department, MoE	We are happy with EDC to proceed this Project. But, related to EIA's works I would like to share some information as follows: - At the moment, we have the new procedure to make faster in the department of EIA. - Project owner should submit the TOR for the EIA study to EIA Department (MoE) before starting the study. - International Consultant should do operate with local consultants which is listed by MoE to study and prepare report of IEIA or EIA. - As this Project is categorized as B, it should prepare the IEIA. Thus please add and follow the guideline of Environmental Impact Assessment, Prakas No. 376. We also have the new internal procedure as follows: - There is no more inter-ministry meeting for EIA or IEIA report. - MoE established a unit to check quality of the EIA/IEIA report. - EIA department will visit the project site in order to decide and evaluate the submitted report. **Question raised by EDC, Mr. Mao Visal** - Will the project of Royal Government also need to submit the report of EIA/IEE to obtain approval from CDC? - What is the format of TOR? Does MoE have the format? If there is, we will follow that one. **Answered by Mr. Ou Sophorn, EIA Department, MoE** - No need to submit EIA/IEE to CDC because it is the project of the government. The report will be approved only by MoE for this EDC project. Only private sector will continue to submit it to the CDC.
Mr. Pen Say, vice governor of Ang Snoul District, Kandal Province	**Question:** - How many of communes will be affected by this Project? - How the Project will compensate to the affected people? **Answered by EDC, Dr. Praing Chulasa** - We will have a team to study about that soon. - Now, the Project is ongoing, thus the location has not yet been clear. We will inform you after the study.
Mr. Chea Lyse, City Hall	We did not know about the location of the project sites, thus, we do not have idea. **Suggested by EDC, Dr. Praing Chulasa** - Local authority should cooperate with our study team in order to complete the study successfully. - Again I would like to ask your cooperation with our team.
Mr. Em Vannarith, presentation from Toul Kork Khan	I have no idea about this matter when EDC and JICA did not show us the clear location of the project in Toul Kork Khan. However, please provide us the information about this after EDC and JICA finished this study. Please tell us about the compensation method for the affected people.
Dr. Chulasa Praing (11:15 AM)	Finally, I suggested all of the participants from all institutions and Khans/Districts to please kindly cooperate with our survey team for the purpose of development in our City. I would like to express our thanks and close the meeting.

Participant List

No.	Name	Position	Organization
1	Tomokazu Kimura	Manager	JICA Survey Team
2	Dr. Praing Chulasa	Deputy Managing Director	EDC
3	Mao Visal	Manager, Social, Environmental, and Public Relation Office	EDC
4	Heav Chanvisal	Deputy Manager, Social, Environmental, and Public Relation Office	EDC
5	Kgin Kanida	Deputy Chief, Plannning, Management Information System, and Tariff Office	EDC
6	Miki Haga	Coodinator	JICA Survey Team
7	Muon Vathana	Staff, Transmission Department	EDC
8	Pen Say	Deputy Chief	Angsnoul District
9	Chet Chanprasour	Deputy Chief, Project Procurement Office	EDC
10	Dy Sanith	Deputy Chief, Urban Plannning	Ministry of Urban Planning and Construction
11	Oishi Yoshiko	Environmental Engineer	JICA Survey Team
12	Shunsuke Matusmoto	Transmissionline Engineer	JICA Survey Team
13	Junya Shinohara	Sub Team Leader / Demand Forecast, Chugoku Electric Power Co., Inc	JICA Survey Team
14	Yukao Tanaka	Team Leader / System Planning	JICA Survey Team
15	Say Bora	Officer	JICA Cambodia office
16	Sok Pounlork	Vice Chief, Legistrative Disputed and International Cooperation Office	MOE
17	Ou Sophorn	Chief of Project Review Office	MOE
18	Em Vannarith		Toul Kork Distrct
19	Bin Sopheakda	Vice Chief, Envieonmental Management Division	EDC
20	Sour You	Environmental Assistant	Chean Engineering
21	Sambath Chariya	Chief, Public Relation Division	EDC
22	Sorn Phearun	Deputy Chief, Project Study Division	EDC
23	Chhon Virys	Staff, Project Procurement Office	EDC
24	Dork Sovanmony	Chief, Procurement Office	EDC
25	Teav Someourn	Deputy Chief	Sen Sok District
26	Chea Lysae	Staff, Urban Planning Phnom Pehn	Ministry of Urban Planning and Construction
27	Ang Men	Staff	Pur Senchery District
28	Mao Kolmardi	Deputy Director, Department of Urban Management	Phnom Pehn City Hall
29	Nget Sokhan	Director, Procurement Department	EDC
30	Sour Sethyethy	Facilitator / Environmental Spacialist	Chean Engineering
31	Chun Piseth	Director of Planning & Project	EDC

2. Minutes of Second Stakeholder Meeting

Date:	Wednesday, September 10th, 2014		
Time:	3:00 PM - 5:35 PM		
Location:	Conference Room of EDC, Building A		
Purpose:	1. Public Disclosure for Stakeholders about project outline and Draft results of Environmental and Social Consideration; 2. Collection of Stakeholders' opinions on the Project and Expected Environmental Impacts and Mitigation.		
Attendees: **(29 persons)**	JICA Survey Team	4 persons	See attached list
	Phnom Penh City Hall	1 person	
	EIA office, Ministry of Environment (MOE)	1 person	
	Department of Land Management Urban Planning, Construction and Cadastral	1 person	
	Department of Public Works, Phnom Penh	2 persons	
	Ang Snuol District, Kandal province	1 person	
	Russei Keo Khan[2]	2 person	
	Sen Sok Khan	1 person	
	Tuol Kork Khan	1 person	
	EDC	7 persons	
Outcome:			
Dr.Chulasa PRAING (3:00PM-3:09PM)	The meeting was chaired by Dr. **Chulasa Praing**, Deputy Managing Director of EDC. Today, I am very pleasure to meeting you all. I much appreciate and welcome for your participation today. I would like to inform that this is the Phase 2 of the project. Phase 1 was for inside Phnom Penh, by JICA as well, 115kV underground networks starting from Ou Baek Kaom Grid Substation (GS3) - Olympic Stadium Substation (new) – Samdech Hun Sen's Park Substation (new) – EDC Headquarter (new substation) – Tuol Sangkae Grid Substation (GS1). This is the first 115kV underground networks ever be built together with another EDC's funded project (also 115kV underground networks) connecting from Kbal Thnal Grid Substation (GS2) to Samdech Hun Sen's Park Substation. This is to enhance the security and reliability of power supply for Phnom Penh. For this phase 2, the purpose is to tap power from 230kV transmission line from NPP (GS6) to supply Phnom Penh. JICA's study Phase 2 concludes that it is necessary to import huge capacity power to supply Phnom Penh area through GS5. Our transmission capacity into Phnom Penh area is nearly 1000MW. With these new transmission lines in collaborated with current transmission system will secure power supply for Phnom Penh area until year 2030, meaning over 10 years guaranteed. After general introduction of project and its purpose, Dr. Chulasa Praing, he declared to open the meeting then let JICA survey team to give the presentation about the essential of the project, open discussion about how resettlement and mitigation measures to implement to speed up the project.		
Mr. Yukao Tanaka & Translation (3:09PM-3:11PM)	Good Afternoon, My name is Yukao Tanaka. The outline was already explained by Dr. Chulasa. Firstly, we appreciate very much for your kind cooperation in our study and we hope this project will evolve smoothly of course from the support of all relevant stakeholders. We will explain the project in detail including environmental evaluation; of course, you are sharing your valuable time on this project. Thank you.		
Mr. Sour Sethy and Mr. Mao Visal (3:11PM-4:00PM)	Made the presentation		

[2] Khan is Khmer word used for district in City (Khan=District).

	Discussion Session
Mr. Duong Samkeat, Deputy Director of EIA Dpt, MoE (4:01PM-4:20PM)	Thank you for the presentation. First of all, I would like to support this project; however, I have a series of questions and/or suggestions as follows. **Suggestion**: (1) Concerning slide no. 9, Organization Chart of the Preparatory Survey for the Project, I saw the project study is by two parties, one side is a governmental institution i.e. EDC, and another side is the JICA Study Team incorporated with Consultants (two international Consultants, Newjec & Chugoku EPCO). I just would like to remind, as I expect my colleague might informed you all in the first meeting, that every project study it is oblige to cooperate with local consultant, which are listed by MoE. This is to conform to new Ministerial Prakas No. 215 issued on May 19, 2014. This requirement is to facilitate EDC when JICA Team leaves. (2) Regarding Slide No. 15, Procedure of Environmental and Social Consideration (1), my question is: Is that JICA's idea that this project requires only IEE level? Also, you show guideline of JICA, why not show guideline of MoE as well? (3) In slide No. 17, Procedure of Environmental and Social Consideration (3), after "PO submits IEIA to MoE", there are two phases for the review and comment prior to get approval by MoE. Phase 1 is "Review and comments by Dept. of EIA, MoE" and Phase 2 (which is missing in the flowchart) is **"Review and comments by ministerial level of MoE"**. (4) In slide No. 19; Please consider to include "**Traffic impact/disturbance**". (5) Concerning Slide No. 20, I saw you used mostly **secondary data**. Do you have primary data? Please consider about **primary data**. (6) Regarding Slide No. 28, you mentioned in the Mitigation measures to be EDC responsible in case of **"fishery catching greatly reduce"**. Are there any kind of this happens in the project area actually? If no, please consider to remove the item. **Responded to Question (6) by**: EDC (Mr. Chun Piseth and Dr. Chulasa**)** - This is maybe general guideline of JICA to consider all possible impacts to include in the study. Based on above question, JICA should reply and indicate the location of impact. If in reality, there is no impact on fishery production, we will consider removing this item from the document. - Some areas showing in the map indicating water bodies that may concern you about fishery catching activities over there, but, for your info, in the very near future these areas will be all backfilled, as they are located in the **developing areas**.
Mr. Duong Samkeat, Deputy Director, MoE (4:30PM-4:35PM)	My last questions, (7) Refer to slide no. 31, It's Environment Monitoring Plan. Please consider **budget** for the implementation as it will be under EDC's responsibilities in the future. (8) The same slide, please consider removing some items which are actually not exist in the project such as water pollution (pH, TSS, DO, COD), Ecosystem and Livelihood. **Answered by Mr. Chun Piseth, EDC** - Normally this spending is included in the Project's budget. In particular, compensation of land for towers is under EDC responsibilities. - EDC and JICA will consider the suggestion to remove the items.
Officer from Department of Public works and Transport 4:45PM-4:55PM	**Suggestion:** - My primary concern is about road damage/shrinkage after first year of the construction. As I saw many previous projects, during first year the repaired road is ok, but after that it became damage that may sometime cause accidents. I would like to request more responsibilities from the project owner about this matter. - Another thing, please consult with department of public works and transport to get proper information about the road expansion plan for correctly spotting the towers or underground cable crossings. **Answered by EDC, Mr. Chun Piseth** - Thank you very much for the suggestions and feedbacks.

JICA Expert, Dr. Pascal Seng and EDC translation 5:15PM-5:25PM	I just would like to confirm of the converting a portion of existing 115kV transmission line to 230kV line by this project. We don't have to secure the compensation of ROW for that portion. So our first question is, we got the information that when this 115kV line was laid 10 years ago, the compensation was done. We don't know how width, 15m or 30m? We don't know yet. So in this project we will not compensate the ROW for this line portion. Is that all right? I think we will obtain the detail information about the compensation here 10 years ago from somebody in EDC. Second question, here is railway with some right-of-way. New idea is to build a segment of 230kV line just along ROW of the railway so that we don't have to get new ROW for this 230kV line. Is there anybody from Ministry of Public Works? How wide is the railway's right-of-way? And are we able to build a transmission line just on along this ROW of the railway? **Answered by EDC Personnel** - Compensation for 115kV line from Kirirom 10 years ago is only for tower location, ROW compensation is not sure but EDC has all the documents. **Answered by Officer from Ministry of Public Works** - In a sub-decree, Right-of-Way for railway is 30m from centerline. In a Prakas, it preserves Right-of-Way to be used for public facilities the last outer 2 meter (i.e. between 28^{th} – 30^{th} meters). Therefore it is to cooperate with the ministry of public works.
JICA Expert, Dr. Pascal Seng translation 5:25PM-5:27PM	Question to MoE: How long does it take to review and approve the document after submission? (a) TOR (b) Report **Answered by Mr. Duong Samkeat, MoE** - About one or two weeks for TOR review and approve. - 30 working days for final report review and approve.
Mr. Chun Piseth, EDC (5:35PM)	Finally, I suggested all of participants from all institutions and Khans/districts, please kindly cooperate with our study team in order to execute this project smoothly. I would like to thank and close the meeting.

Participant List

No.	Name	Position	Organization
1	Dr. Praing Chulasa	Deputy Management Director	EDC
2	Mao Visal	Manager of Social Environment	EDC
3	Chun Piseth	Director of Planning & Project	EDC
4	Chen Sophanna	Deputy Head of Social Environment	EDC
5	Duong Samkeat	Deputy Director	MoE
6	Dy Sanith	Deputy Director of Department of Land Management Urban Planning, Construction and Cadastral	ML.C
7	Ouk Sophea	Officer	Sensok Khan, Phnom Penh
8	Dy Lack	Officer	Toul Kork Khan, Phnom Penh
9	Kheng Chireakmony	Officer	Dept. of Public Works
10	Eng Kim Bora	Officer	Dept. of Public Works
11	Sor Phara	Officer	Phnom Penh City Hall Representative
12	Neak Bo	Deputy Director of Administration	Russei Keo Khan, Phnom Penh
13	Yukao Tanaka	Team Leader	JICA Study team
14	Shinohara Junya	Sub Team Leader	The Chugoku Electric Power Co., Inc
15	Kenichir Yagi	N/A	JICA Study team
16	Masaru Nishida	N/A	JICA Study team
17	Yoshiko Oishi	Environmental Engineer	JICA Study team
18	Dr. Seng T. Pascal	Managing Director	Cheang Engineering Consultants (CEC)
19	Sour Sothy	Coordinator	CEC
20	Sokh Channak	Officer	Ang Snuol District Hall, Kandal Province
21	Shunsuke Matsumoto	Transmission Line Engineer	The Chugoku Electric Power Co., Inc
22	Naoyuki Nemoto	N/A	JICA
23	Miki Haga	Assistant Coordinator	JICA Study team
24	Hiroki Kato	N/A	JICA
25	Yushi Tsukada	N/A	JICA
26	Misaki Kawaguchi	N/A	JICA
27	Bin Sopheada	Vice Chief of Environmental Management Division	EDC
28	Sorn Phearun	Deputy Chief of Project Study Division	EDC
29	Sambath Chariya	Chief of Public Relation Division	EDC

3. Minutes of First Public Consultation Meeting on 230kV OHL Area

Date:	Saturday, August 30th, 2014
Time:	9:00AM-10:15AM
Location:	Pong Ro village, Snoar Sagkat, Por Sen Chey Khan
Participants:	17 persons; villages and village chiefs from affected villages
Purpose:	1. Public Disclosure for affected villagers; 2. Collection of opinions from affected villagers about the project and compensation policy

Statements and Inquiries Provided by Attendees:

No.1 Name: Mr. Kong Bunsong	Sex: Male Age: 64	Occupation: Representative of Sak Proyuth village and Commune council member in Snoar Sangkat, Por Sen Chey Khan
Statement or Inquiry: I suggested all participants raise their idea and suggestion in this meeting. On be haft of Snoar Sangkat, I support the project of government, but I suggest EDC and JICA Survey Team to minimize the impact on affected villages in this Sangkat. Our people need the safety and fair compensation.		
No.2 Name: Mr. Souen Soth	Sex: Male Age: 66	Occupation: Village chief of Pong Ro village, Snaor Sankat
Statement or Inquiry: There are two towers affected in my land. How to compensate these affected land?		
Response if any: At the tower location EDC will purchase at replacement cost. After acquisition all the lands will be transferred to the EDC property. The land located under the transmission line ROW will be compensated through different methods based on types of land use such rice field, commercial area, residential area etc. After detail design, EDC team and Provincial Resettlement Sub-Committee (PRSC) will discuss in detail with you about the price of affected land with acceptable price.		
No.3 Name: Mr. Moeurn Sophal	Sex: Male Age: 55	Occupation: Villager in Pong Ro village
Statement or Inquiry: Whenever transmission line goes across our village, the price of land in our village will decrease the price. So, we need the acceptable price of affected land.		
Response if any: This project is a government project, funded by JICA, Japan. You can negotiate with the compensation team. After detail design, EDC team and Provincial Resettlement Sub-Committee (PRSC) will discuss in detail with you about the price of affected land with acceptable price.		
No.4 Name: Phay Path	Sex: Female Age: 55	Occupation: Villager in Pong Ro village
Statement or Inquiry: If my land is affected by this project, you should buy all of my land. I need the price of land as in current market.		
Response if any: As the first question, at the tower location EDC will purchase at replacement cost. Under the transmission line ROW the land will be acquired through different methods based on types of land use such rice field, commercial area, residential area etc.		
No.5 Name: Sun Chanthy	Sex: Female Age: 45	Occupation: Villager of Ta En village, Snoar Sankat
Statement or Inquiry: The line across my land; you should pay me all of affected land. I need the price of land as in current market.		
Response if any: If the line across your land, EDC will compensate as I told you following the type of land. After compensate the land still belongs to you but the land cannot be used for residence.		
No.6 Name: Mr. Moeurn Nat	Sex: Male Age: 43	Occupation: Villager of Ta En village, Snoar Sankat
Statement or Inquiry: I need the acceptable compensation for affected land, but I also need the safety from this high-voltage transmission line. So, I suggest the designed team should install the security tools to protect our villagers from electric shock and lightening.		

Response if any: We will write your suggestion in report then submit to JICA Survey Team to know about what you worried about.		
No.7 Name: Chan Oeurn	Sex: Female Age: 63	Occupation: Villager of Ta En village, Snoar Sankat
Statement or Inquiry: This transmission line is close to my house, so I worry about my safety from electricity. So, I suggest the designed team should install the security tools to protect our villagers from electric shock and lightening. Moreover, if it is too close to my house, JICA Survey Team and EDC should resettle my house to safety location.		
Response if any: We will inform all your suggestions to EDC and JICA Team.		
No.8Name: Mr. Som Poum	Sex: Male Age: 50	Occupation: Villager of Ta En village, Snoar Sankat
Statement or Inquiry: I have two suggestion: (1). EDC and JICA Survey Team should consider my people to get safety from electricity, (2). All affected people should be compensate with price in market.		
Response if any: We will inform all your suggestions to EDC and JICA Team.		

Participant List

Attendant list of Public Consultation Meeting

[illegible] 230 KV ពី [illegible] GS5 ទៅ [illegible] GS6

Date: 30/8/2014

ល.រ No	ឈ្មោះ Name	ភេទ Sex	អាយុ Age	ភូមិ Village	តួនាទី Position	ឃុំ Commune	ហត្ថលេខា Signature
1	[illegible]	ប	64	[illegible]	[illegible]	[illegible]	[signature]
2	[illegible]	ប	33	[illegible]	[illegible]	〃	[signature]
3	[illegible]	ប	54	[illegible]	[illegible]	〃	[signature]
4	[illegible]	ស	50	〃	〃	〃	[signature]
5	[illegible]	ស	43	〃	〃	〃	[signature]
6	[illegible]	ប	55	〃	〃	〃	[signature]
7	[illegible]	ប	43	〃	〃	〃	[signature]
8	[illegible]	ប	66	〃	[illegible]	[illegible]	[signature]
9	[illegible]	ស	63	〃	[illegible]	〃	[signature]
10	[illegible]	ស	70	〃	〃	〃	[signature]
11	[illegible]	ស	69	[illegible]	〃	[illegible]	[signature]
12	[illegible]	ប	42	[illegible]	〃	[illegible]	[signature]
13	[illegible]	ស	45	[illegible]	〃	〃	[signature]
14	[illegible]	ស	63	〃	〃	〃	[signature]
15	[illegible]	ប	50	[illegible]	[illegible]	[illegible]	[signature]
16	[illegible]	〃	68	[illegible]	〃	[illegible]	[signature]
17	[illegible]	〃	52	[illegible]	[illegible]	[illegible]	[signature]

4. Minutes of Second Public Consultation Meeting on 230kV OHL Area

Date:	Saturday, October 18th, 2014
Time:	9:30AM-11:00AM
Location:	Prey Muol village, Kraing Thnung Sagnat Sagkat, Sen Sok Khan
Participants:	21 persons; villages and village chiefs from affected villages
Purpose:	1. Public Disclosure for affected villagers; 2. Collection of opinions from affected villagers about the project and compensation policy

Statements and Inquiries Provided by Attendees:

No.1 Name: Mr. Kong Yat	Sex: Male Age: 49	Occupation: Villager in Pry Kla village
Statement or Inquiry: I am happy to know that you change the line route. I come from Prey Kla village. How you compensate the tower location on the existing location, new location and the ROW.		
Response if any: We are also happy to know that EDC decided to change the line route. At the tower location EDC will purchase at replacement cost. The foundation of each tower is around 10m x 10m = 100 m2. EDC will compensate 15m x 15m = 225 m2 for a new location and probably an additional 225 m2 – 100m2=125 m2 for the existing location. After acquisition all the lands will be transferred to the EDC property. The land located under the transmission line ROW will be acquired through different methods based on the types of land use such rice field, commercial area, residential area. After detail design, The compensation committee including EDC team and Provincial Resettlement Sub-Committee (PRSC) will discuss in detail with you about the procedure and price of affected land with acceptable price. Today, it is the public consultation, we come to provide you the information and collect the information from all of you.		
No.2 Name: Mrs. Chim Sokheng	Sex: Female Age: 55	Occupation: Samroang Krom village, Po SenChey,
Statement or Inquiry: I worry about my house affected by this transmission line ROW. How many meters from center line of transmission route will be affected by this ROW? How to compensate the house and the land on the ROW?		
Response if any: We need only 15 meters from centerline (30 meters in total) for the ROW. Please prepare your title of property showing that you are the land owner, the compensation committee will discuss in detail with you about the procedure and price of house and affected land.		
No.3 Name: Mr. Suong Suy	Sex: Male Age: 50	Occupation: Chief of Prey Moul village
Statement or Inquiry: Use the clearance of Railroad is a good idea. I support this option. How many towers will be installed in the private land? On be haft of people in my village, I suggest EDC and Government to pay the affected people with the current price of market for affected land.		
Response if any: 5 towers will be installed in the private land. Regarding the compensation policy a committee including EDC team and Provincial Resettlement Sub-Committee will discuss in detail with you about the procedure and price of affected land with acceptable price. Today, it is the public consultation, we come to provide you the information and collect the information from all of you.		
No.4 Name: Chhim Samrith	Sex: Female Age: 69	Occupation: Villager of Kork Rokar village, Prey Pnov Sankat
Statement or Inquiry: I am happy to know that you use the existing transmission line route. The old transmission line route passed in the middle of my land. When will you start the compensation negotiation?		
Response if any: The compensation committee including EDC team and Provincial Resettlement Sub-Committee will discuss in detail with you about the procedure and price after detail design. According to my experience the compensation negotiation will start may be in 2016.		
No.5 Name: Sim Soknae	Sex: Female Age: 24	Occupation: Villager in Prey Moul village
Statement or Inquiry: Do you compensate with the current price in the market our affected land? How long will be took from the end of negotiation to the payment?		
Response if any: The compensation cost depends on your negotiation between EDC and you. After your approval at the end of negotiation, you will receive the payment within one month. Any way you will have a Public Consultation Meeting with EDC and compensation team before negotiation. You can discuss in detail with them.		

Participant List

Attendant list of Public Consultation Meeting

[illegible] 230 kV [illegible] GS5 [illegible] GS6

Date: 18/10/2014

ល.រ No	ឈ្មោះ Name	ភូមិ Village	តួនាទី Position	ឃុំ Commune	ហត្ថលេខា Signature
1	[illegible]	[illegible]	[illegible]	[illegible]	
2	[illegible]	-//-	[illegible]	[illegible]	
3	[illegible]	[illegible]	[illegible]	[illegible]	
4	[illegible]	[illegible]	[illegible]	-//-	
5	[illegible]	[illegible]	[illegible]	[illegible]	
6	[illegible]	[illegible]		[illegible]	
7	[illegible]	[illegible]	[illegible]	[illegible]	
8	[illegible]	[illegible]	-//-	-//-	
9	[illegible]	[illegible]	-//-	-//-	
10	[illegible]	[illegible]	-//-	-//-	
11	[illegible]	[illegible]	-//-	-//-	
12	[illegible]	-//-	-//-	-//-	
13	[illegible]	-//-	-//-	-//-	
14	[illegible]	-//-	-//-	-//-	
15	[illegible]	-//-	-//-	-//-	
16	[illegible]	-//-	-//-	-//-	
17	[illegible]	-//-	-//-	-//-	
18	[illegible]	-//-	-//-	-//-	
19	[illegible]	[illegible]	[illegible]	-//-	
20	[illegible]	[illegible]	[illegible]	[illegible]	
21	[illegible]	[illegible]		[illegible]	

5. Minutes of Second Public Consultation Meeting on 115kV OHL Area

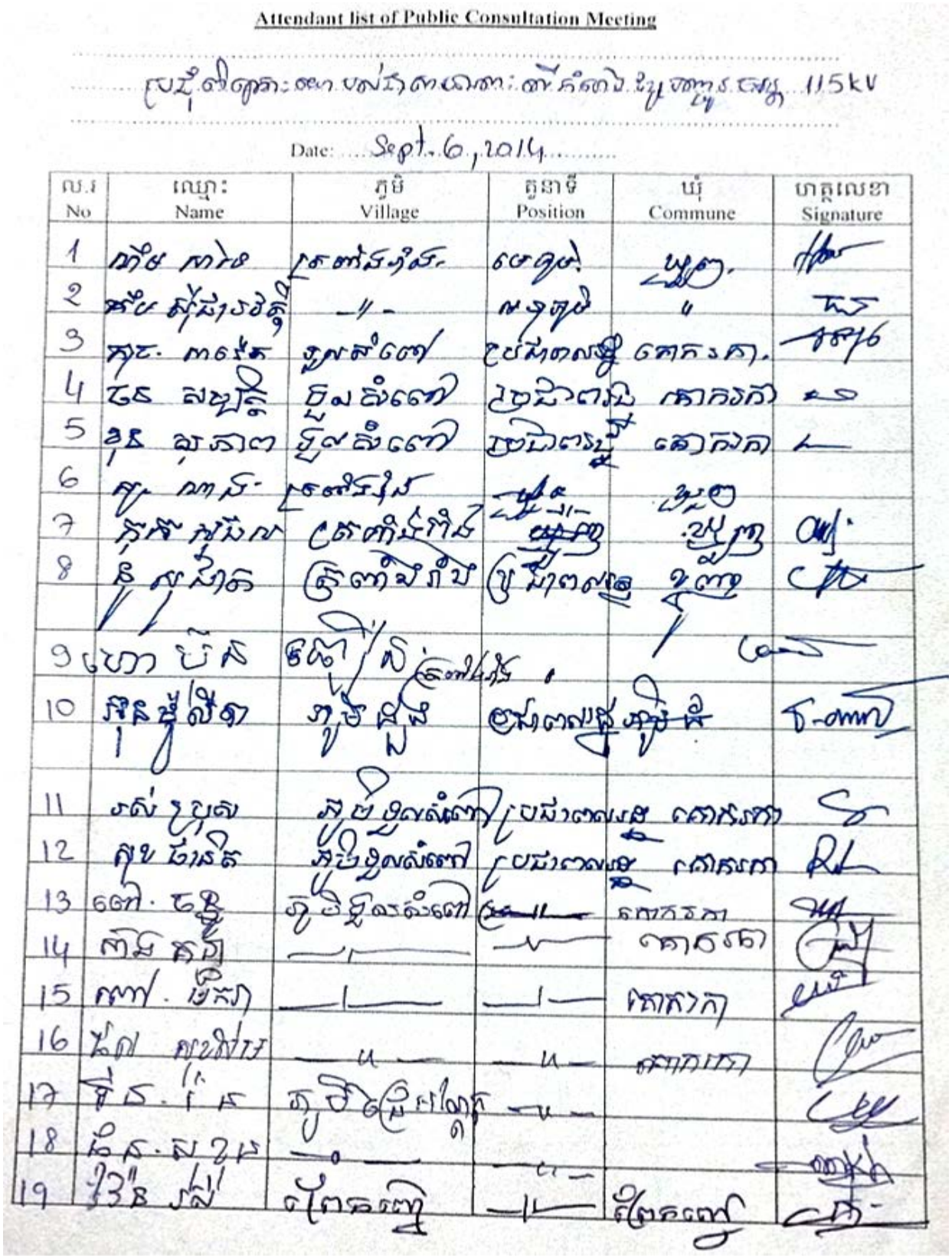
Date:	Saturday, August 6th, 2014
Time:	8:00AM-10:30AM
Location:	Doung primary school in Doung village, Preak Phnao, Sagnat Por Sen Sok Khan
Participants:	36 persons; villages and village chiefs from affected villages
Purpose:	1. Public Disclosure for affected villagers; 2. Collection of opinions from affected villagers about the project and compensation policy

Statements and Inquiries Provided by Attendees:

No.1 Name: Mr. Sim Ngim	Sex: Male Age: 50	Occupation: Villager in Preak Kroum village
Statement or Inquiry: I have a land in Chrey Andet village, but please tell me the size of this affection. Could I build any building under this wire line? Who will compensate my affected land?		
Response if any: The required land for steel tower is three types, 15x15, 20x20, and 25x25. But your land will be acquired by 15x15. At the tower location EDC will purchase at replacement cost. Under the transmission line ROW, the land will be acquired through different methods based on types of land use such rice field, commercial area, residential area etc. If the line across only your land, EDC will compensate as I told you following the type of land. After compensation the land still belongs to you but the land cannot be used for construct building. Also, the trees higher than 3 meters shall be cut.		
No.2 Name: Ngil Chhoum	Sex: Male Age: 55	Occupation: Samroung Tiev Village Chief
Statement or Inquiry: I think that my village will not be affected much by this project, because the new line will construct on the existing route. This project will use the concrete pole to install there. So, it is no problem. Moreover, this project will construct next to the embankment of canal, thus, I think that it will have no affection.		
Response if any: We note your observations. EDC and JICA team will take care about the technical problem of this pole according to the technical standard.		
No.3 Name: Poa Chanthou	Sex: Female Age: 40	Occupation: Village Chief, Samroung Toul village
Statement or Inquiry: My house will also be affected by pole and row; so, will this project give the good compensation for affection of my house and land? Moreover, many houses in my village also affected by row, thus, I suggest survey team to compensate these affection.		
Response if any: After finalizing the detailed engineering drawing by PIC, the compensation team including EDC and PSRC (representative of commune, district and province) will conduct demarcation at ground, the exact locations of towers, the ROW and the boundary. Land, structures, crops and trees located with the demarcated boundary will be properly recorded. Moreover, they will calculate the fee for move your house and other from the ROW. So, you and your villagers can negotiate with the compensation team.		
No.4 Name: Mr. Tin Rorn	Sex: Male Age: 45	Occupation: Villager in Chrey Andet village
Statement or Inquiry: My land and Aquaculture pond will affect by tower 25x25, it in the middle of my land. I will not able to do anything for my aquaculture. So, could study team move to the edge of my land? so that I can continue my career.		
Response if any: We will report this to design team.		
No.5 Name: Ven Ros	Sex: Male Age: 40	Occupation: Villager of Preak Pnov Sankat
Statement or Inquiry: My house is under the ROW, so, will project give the compensation of this affection or relocation of my house?		

Response if any: Sure, as I informed before, that after finalizing the detailed engineering drawing by PIC, the compensation team including EDC and PSRC will conduct demarcation at ground, the exact locations of towers, the ROW, the houses and the boundary of your land. Please prepare your title of property of your land or your house or others documents able to justify that you are the owner of them		
No.6 Name: Bun Thong	Sex: Male Age: 60	Occupation: Village chief of Doung village
Statement or Inquiry: We have no objection for the construction of this transmission line project. JICA is a serious organization, I hope that the affected properties and land will compensate with the current price in the market.		
Response if any: EDC will compensate your affected land with the acceptable price according to JICA and government guideline.		

Participant List



Attendant list of Public Consultation Meeting

ប្រជុំពិគ្រោះយោបល់សាធារណៈ ស្តីពីគំរោងដំឡើងខ្សែបន្ទាត់ 115kV

Date: Sept. 6, 2014

ល.រ No	ឈ្មោះ Name	ភូមិ Village	តួនាទី Position	ឃុំ Commune	ហត្ថលេខា Signature
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	ឈ្មោះ Name	ភូមិ Village	តួនាទី Position	ឃុំ Commune	ហត្ថលេខា Signature
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21					
22					
23					
24					
25					
26					
27					
28					

	ឈ្មោះ Name	ភូមិ Village	តួនាទី Position	ឃុំ Commune	ហត្ថលេខា Signature
29					
30					
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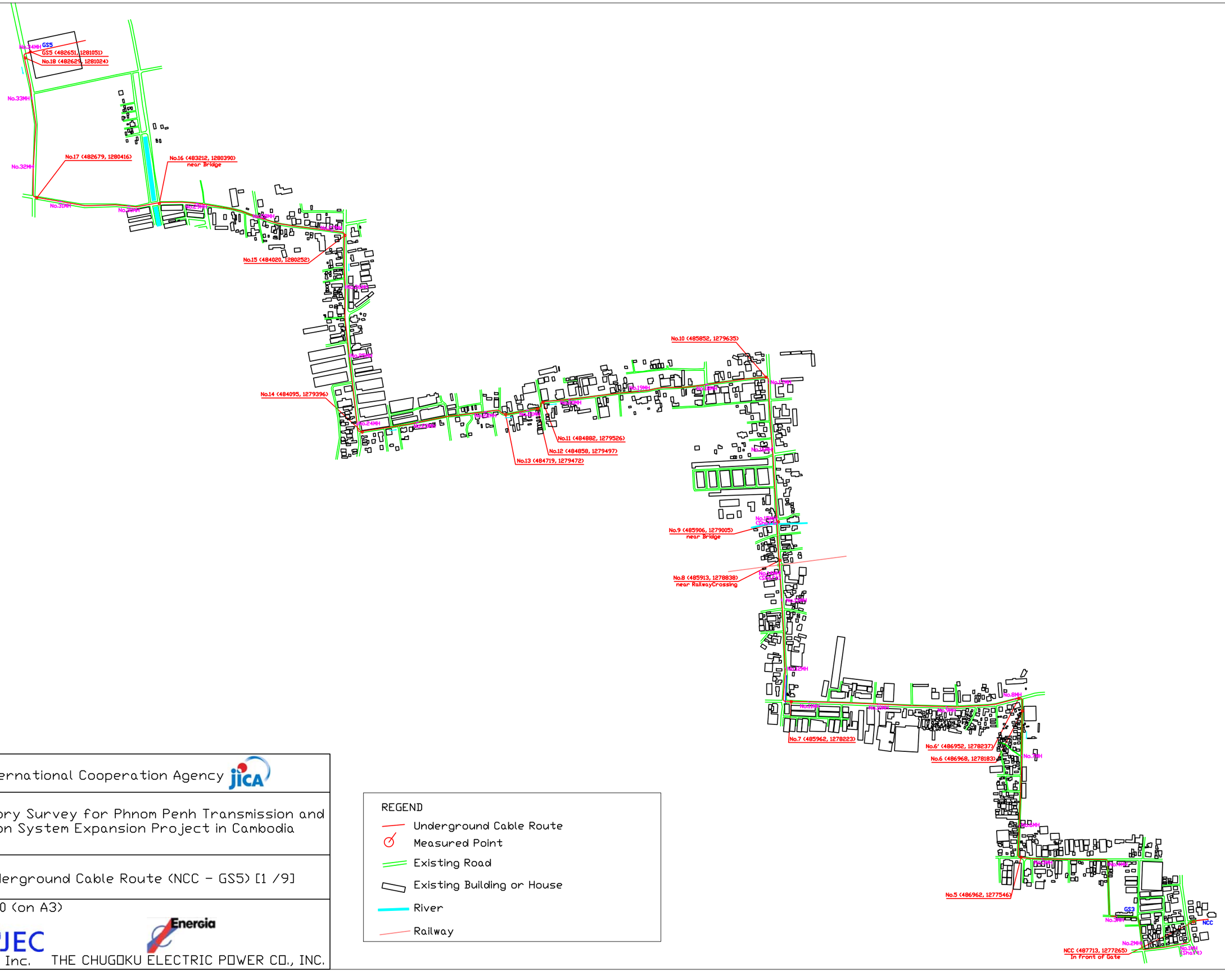
36					

APPENDIX 4

UNDERGROUND TRANSMISSION LINE ROUTE MAP (GS5-NCC)

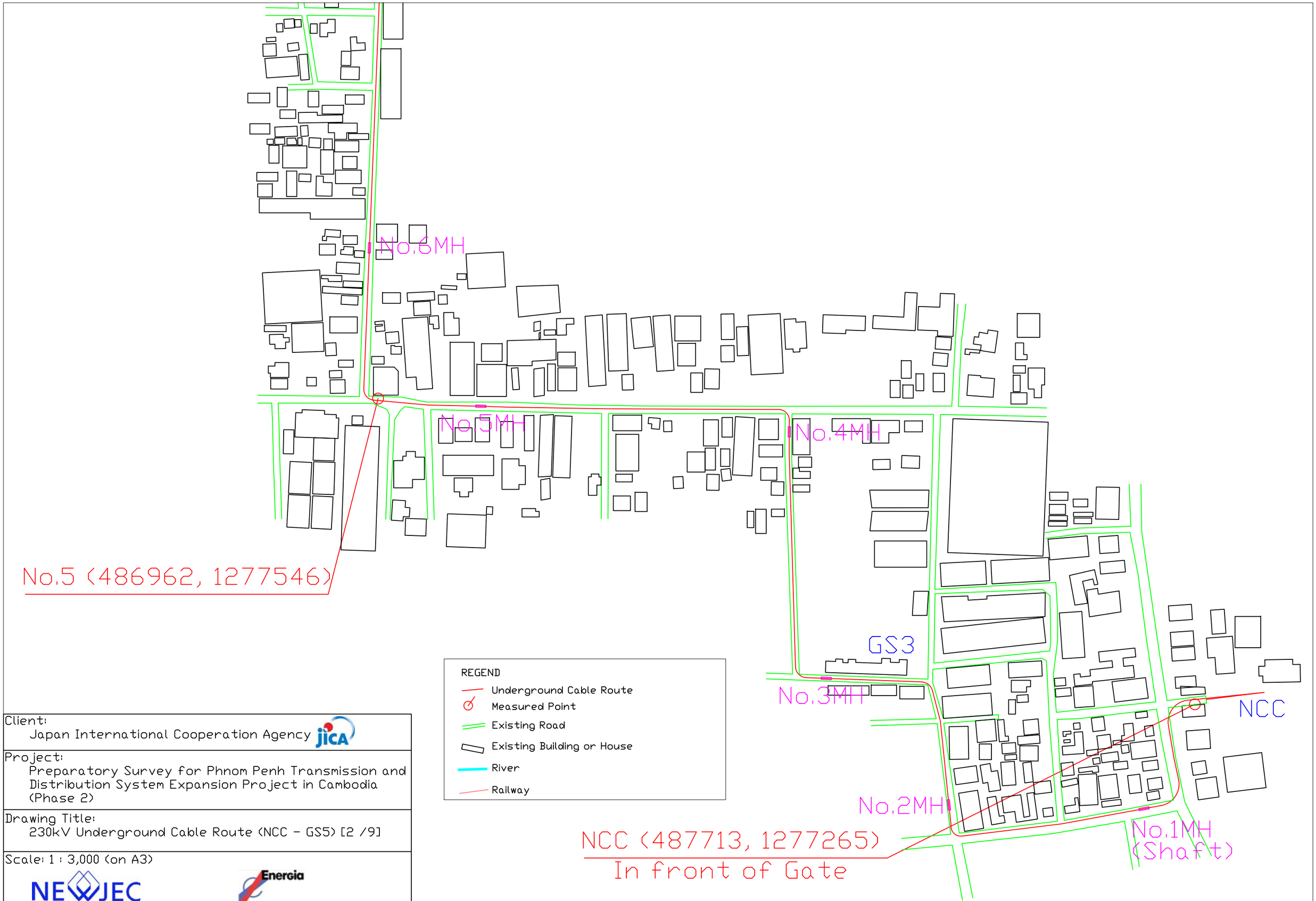


Client:	Japan International Cooperation Agency JICA
Project:	Preparatory Survey for Phnom Penh Transmission and Distribution System Expansion Project in Cambodia (Phase 2)
Drawing Title:	230kV Underground Cable Route (NCC – GS5) [1 /9]
Scale: 1 : 15,000 (on A3)	

NEWJEC Inc. THE CHUGOKU ELECTRIC POWER CO., INC.

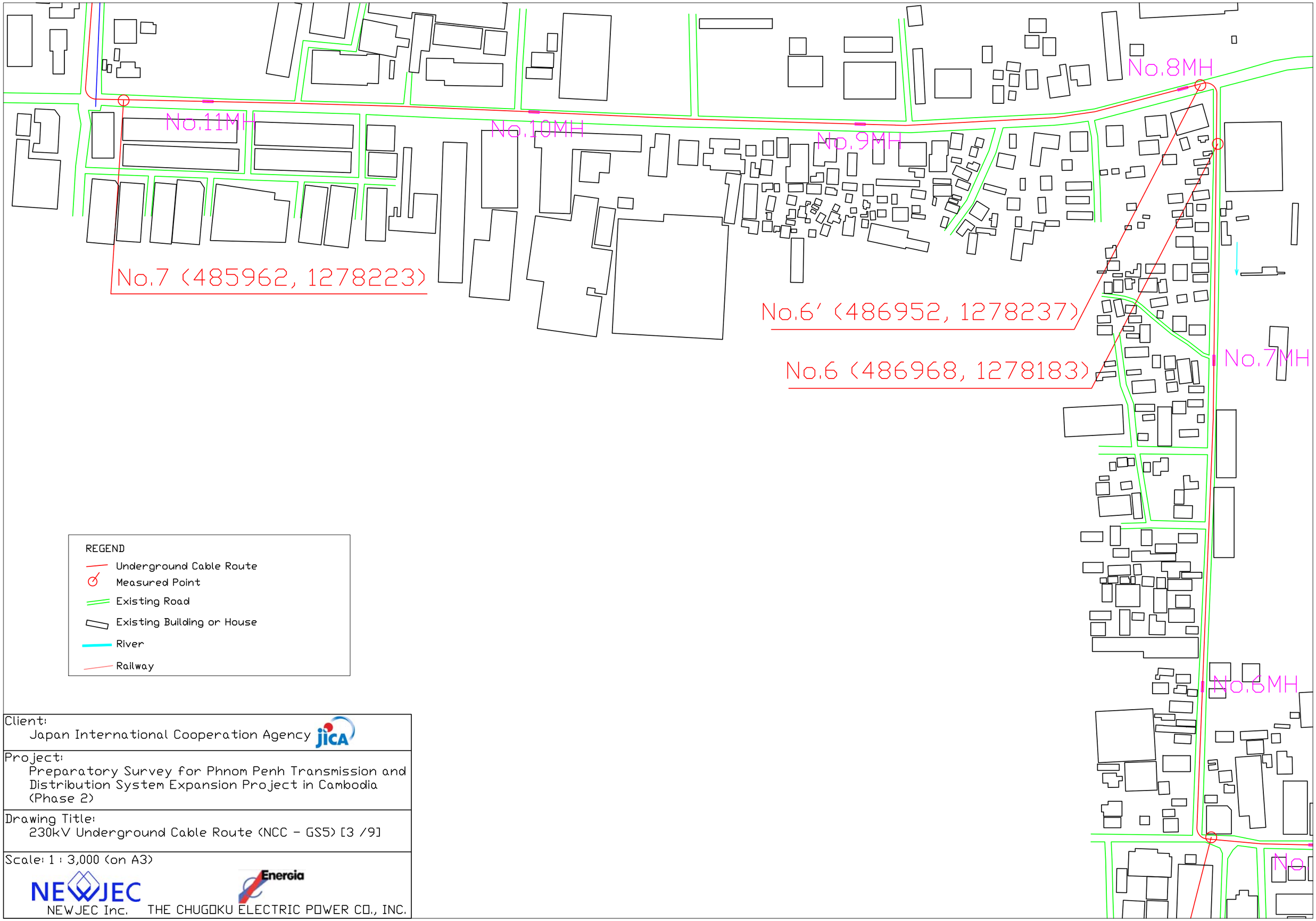
REGEND

- Underground Cable Route
- Measured Point
- Existing Road
- Existing Building or House
- River
- Railway



Client:	Japan International Cooperation Agency JICA
Project:	Preparatory Survey for Phnom Penh Transmission and Distribution System Expansion Project in Cambodia (Phase 2)
Drawing Title:	230kV Underground Cable Route (NCC – GS5) [2 /9]
Scale: 1 : 3,000 (on A3)	

NEWJEC Inc. THE CHUGOKU ELECTRIC POWER CO., INC.



Client:
Japan International Cooperation Agency JICA

Project:
Preparatory Survey for Phnom Penh Transmission and Distribution System Expansion Project in Cambodia (Phase 2)

Drawing Title:
230kV Underground Cable Route (NCC - GS5) [3 /9]

Scale: 1 : 3,000 (on A3)

NEWJEC Inc. THE CHUGOKU ELECTRIC POWER CO., INC.

No.16MH

No.15MH
(Shaft)

No.9 (485906, 1279005)
near Bridge

No.8 (485913, 1278838)
near RailwayCrossing

No.14MH
(Shaft)

No.13MH

No.12MH

No.11MH

REGEND

- Underground Cable Route
- Measured Point
- Existing Road
- Existing Building or House
- River
- Railway

Client:
Japan International Cooperation Agency JICA

Project:
Preparatory Survey for Phnom Penh Transmission and Distribution System Expansion Project in Cambodia (Phase 2)

Drawing Title:
230kV Underground Cable Route (NCC – GS5) [4 /9]

Scale: 1 : 3,000 (on A3)

NEWJEC Inc. THE CHUGOKU ELECTRIC POWER CO., INC.

No.19MH

No.18MH

No.17MH

No.20MH

21MH

No.11 (484882, 1279526)

No.12 (484858, 1279497)

3 (484719, 1279472)

No.16MH

No.15MH
(Shaft)

No.9 (485906, 1279005)
near Bridge

REGEND

- Underground Cable Route
- Measured Point
- Existing Road
- Existing Building or House
- River
- Railway

Client:
Japan International Cooperation Agency JICA

Project:
Preparatory Survey for Phnom Penh Transmission and Distribution System Expansion Project in Cambodia (Phase 2)

Drawing Title:
230kV Underground Cable Route (NCC - GS5) [5 /9]

Scale: 1 : 3,000 (on A3)

NEWJEC Inc. THE CHUGOKU ELECTRIC POWER CO., INC.

No.25MH

96)

No.24MH

No.23MH

No.22MH

No.21MH

No.20MH

No.11 (484882,

No.12 (484858, 12

No.13 (484719, 1279472)

REGEND

- Underground Cable Route
- Measured Point
- Existing Road
- Existing Building or House
- River
- Railway

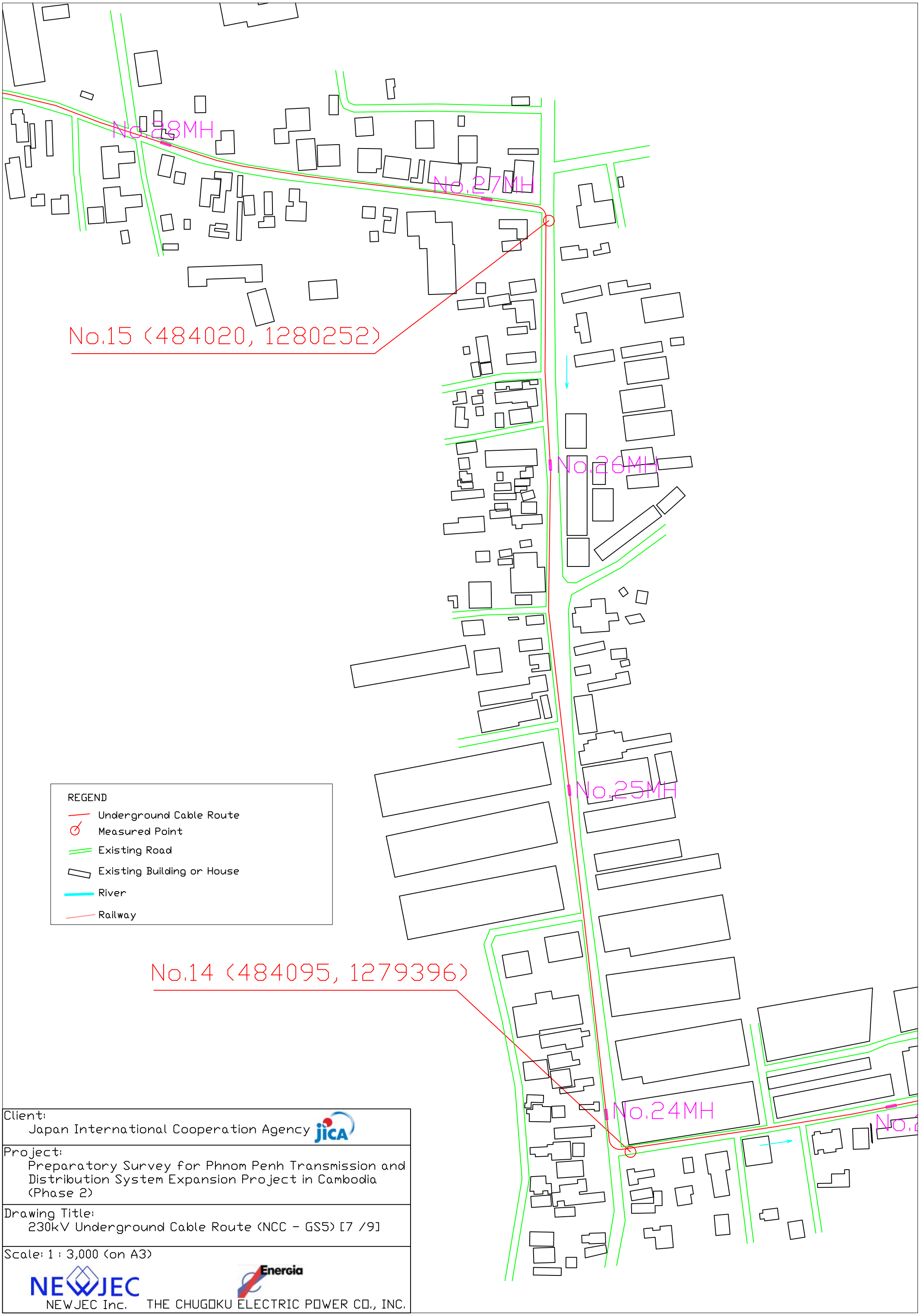
Client:
Japan International Cooperation Agency JICA

Project:
Preparatory Survey for Phnom Penh Transmission and Distribution System Expansion Project in Cambodia (Phase 2)

Drawing Title:
230kV Underground Cable Route (NCC – GS5) [6 /9]

Scale: 1 : 3,000 (on A3)

NEWJEC Inc. THE CHUGOKU ELECTRIC POWER CO., INC.



Client:
Japan International Cooperation Agency

Project:
Preparatory Survey for Phnom Penh Transmission and Distribution System Expansion Project in Cambodia (Phase 2)

Drawing Title:
230kV Underground Cable Route (NCC – GS5) [7 /9]

Scale: 1 : 3,000 (on A3)

NEWJEC Inc. THE CHUGOKU ELECTRIC POWER CO., INC.

32679, 1280416)

No.16 (483212, 1280390)
near Bridge

No.30MH

No.29MH

No.28MH

No.27MH

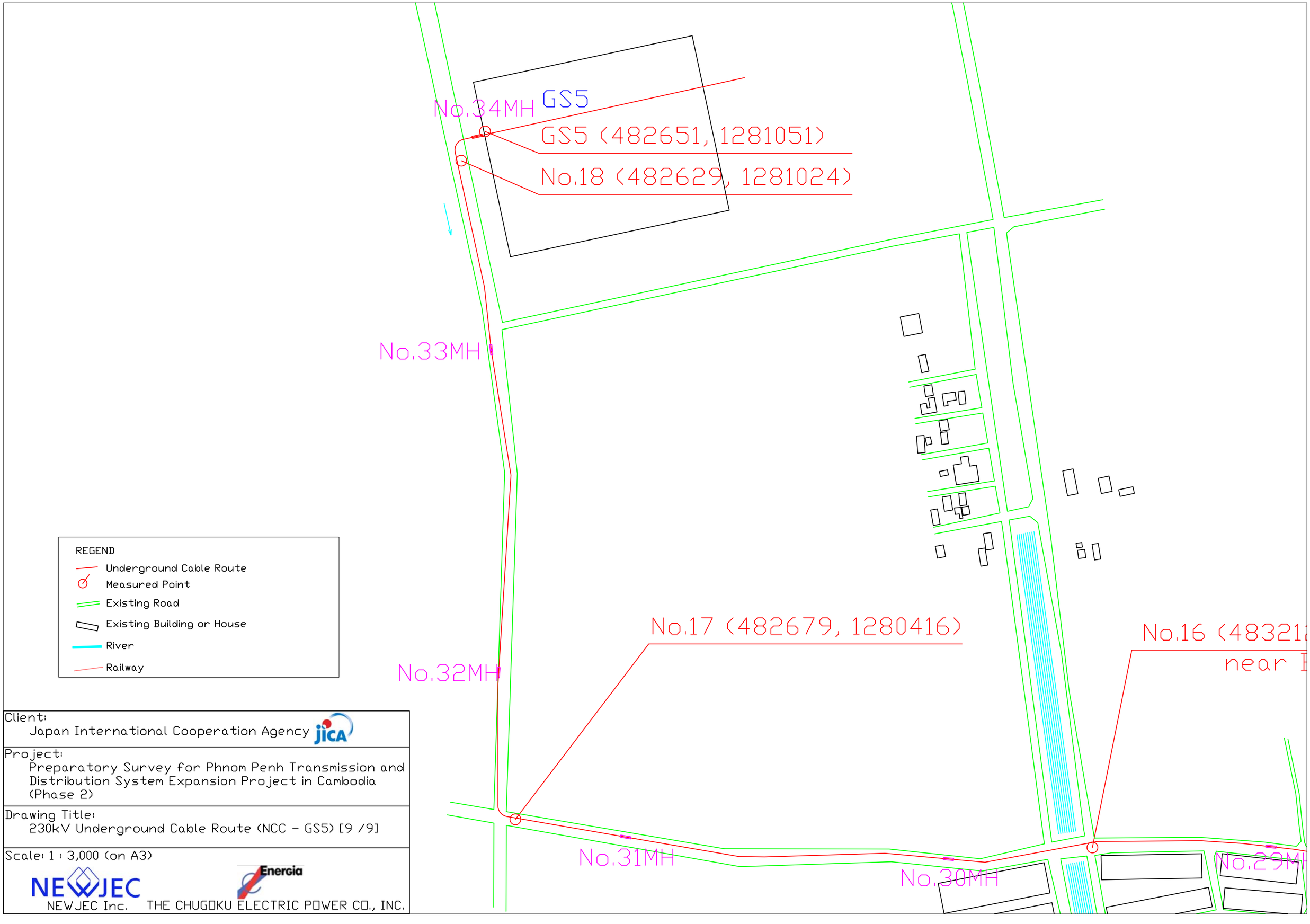
No.15 (484020, 1280252)

No.26MH

Client: Japan International Cooperation Agency JICA	
Project: Preparatory Survey for Phnom Penh Transmission and Distribution System Expansion Project in Cambodia (Phase 2)	
Drawing Title: 230kV Underground Cable Route (NCC – GS5) [8 /9]	
Scale: 1 : 3,000 (on A3)	
NEWJEC Inc.	THE CHUGOKU ELECTRIC POWER CO., INC.

REGEND

- Underground Cable Route
- Measured Point
- Existing Road
- Existing Building or House
- River
- Railway



REGEND

- Underground Cable Route
- Measured Point
- Existing Road
- Existing Building or House
- River
- Railway

Client:
Japan International Cooperation Agency

Project:
Preparatory Survey for Phnom Penh Transmission and Distribution System Expansion Project in Cambodia (Phase 2)

Drawing Title:
230kV Underground Cable Route (NCC – GS5) [9 /9]

Scale: 1 : 3,000 (on A3)

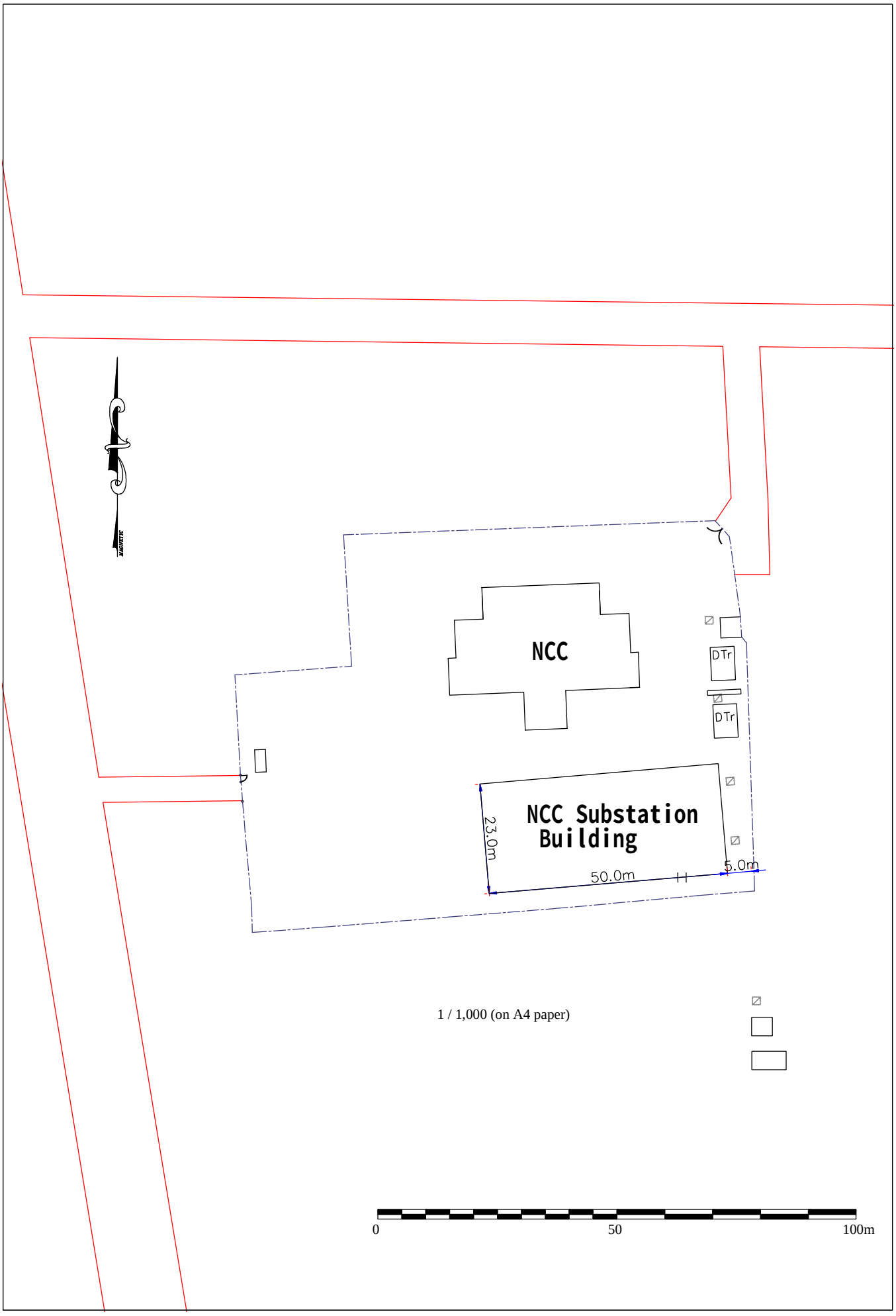
NEWJEC Inc. THE CHUGOKU ELECTRIC POWER CO., INC.

APPENDIX 5

LAYOUT OF SUBSTATION FACILITY

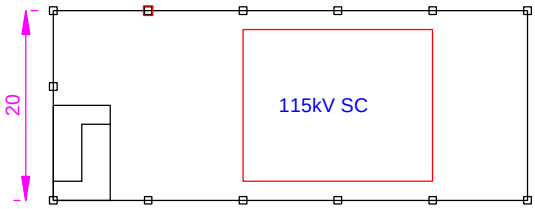
NCC Substation Layout Plan

Appendix 5-1-1

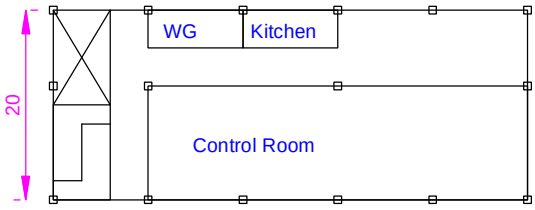


NCC Substation Building Floor Layout Plan

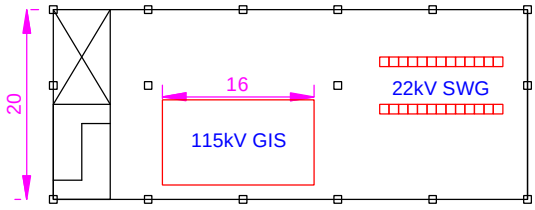
Rooftop



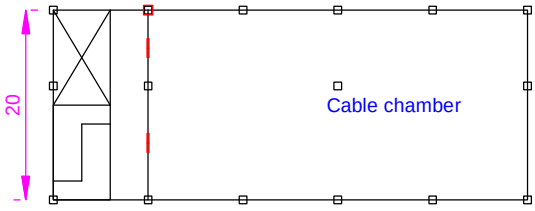
3rd



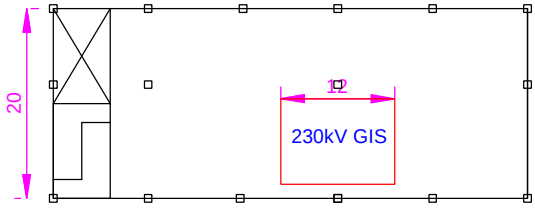
2nd



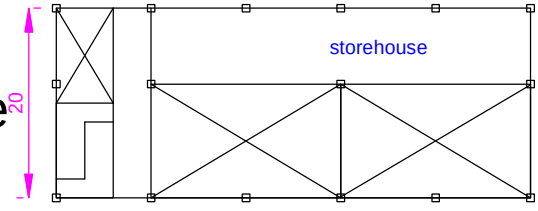
Cable



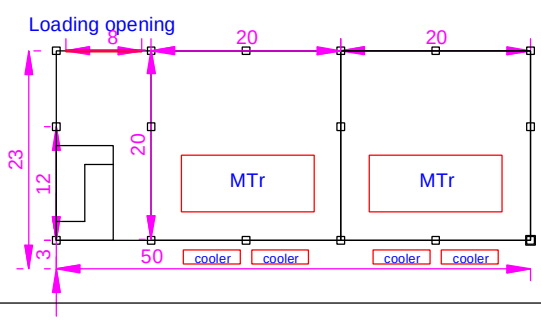
1st



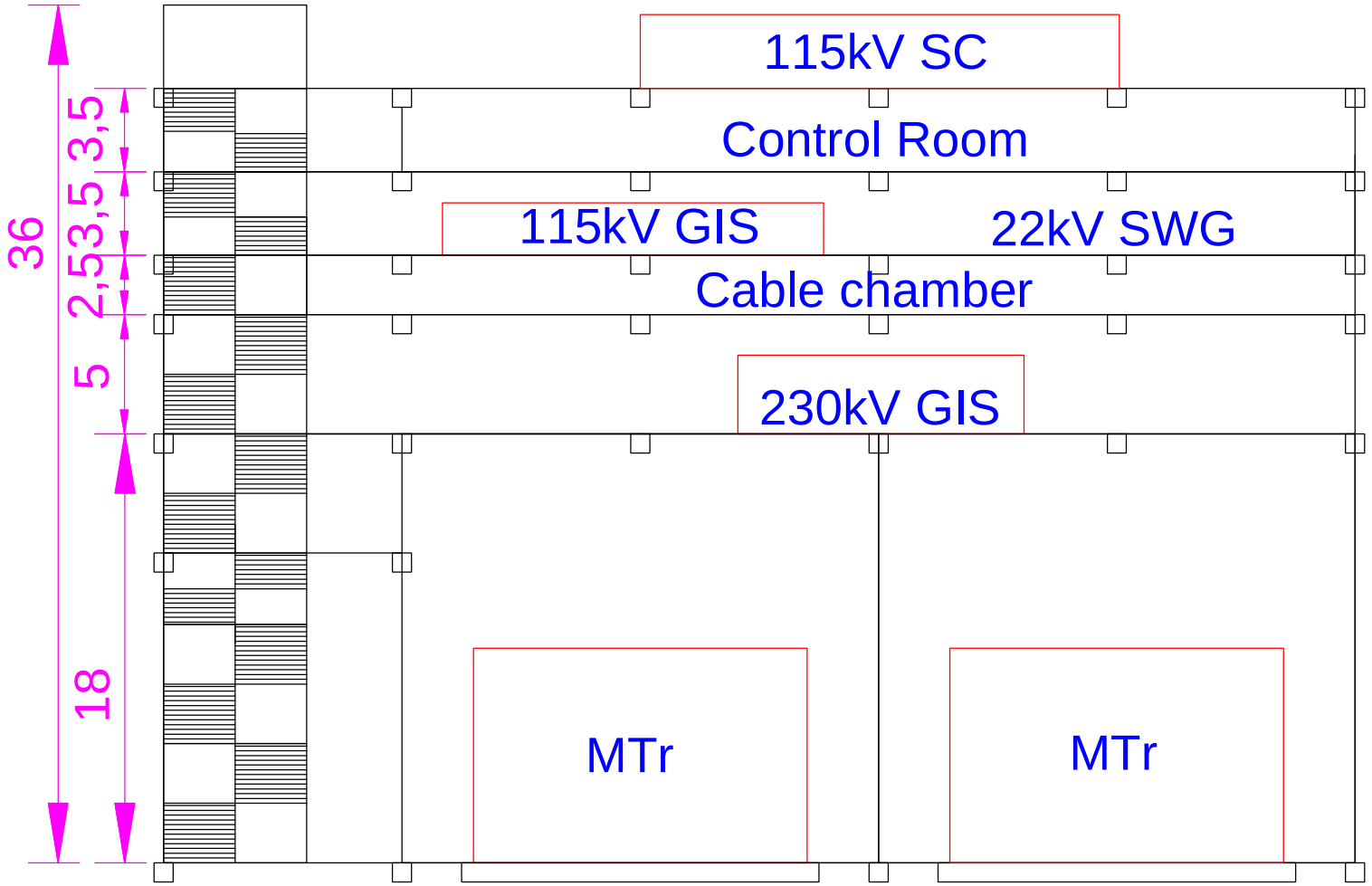
Mezzanine



Ground



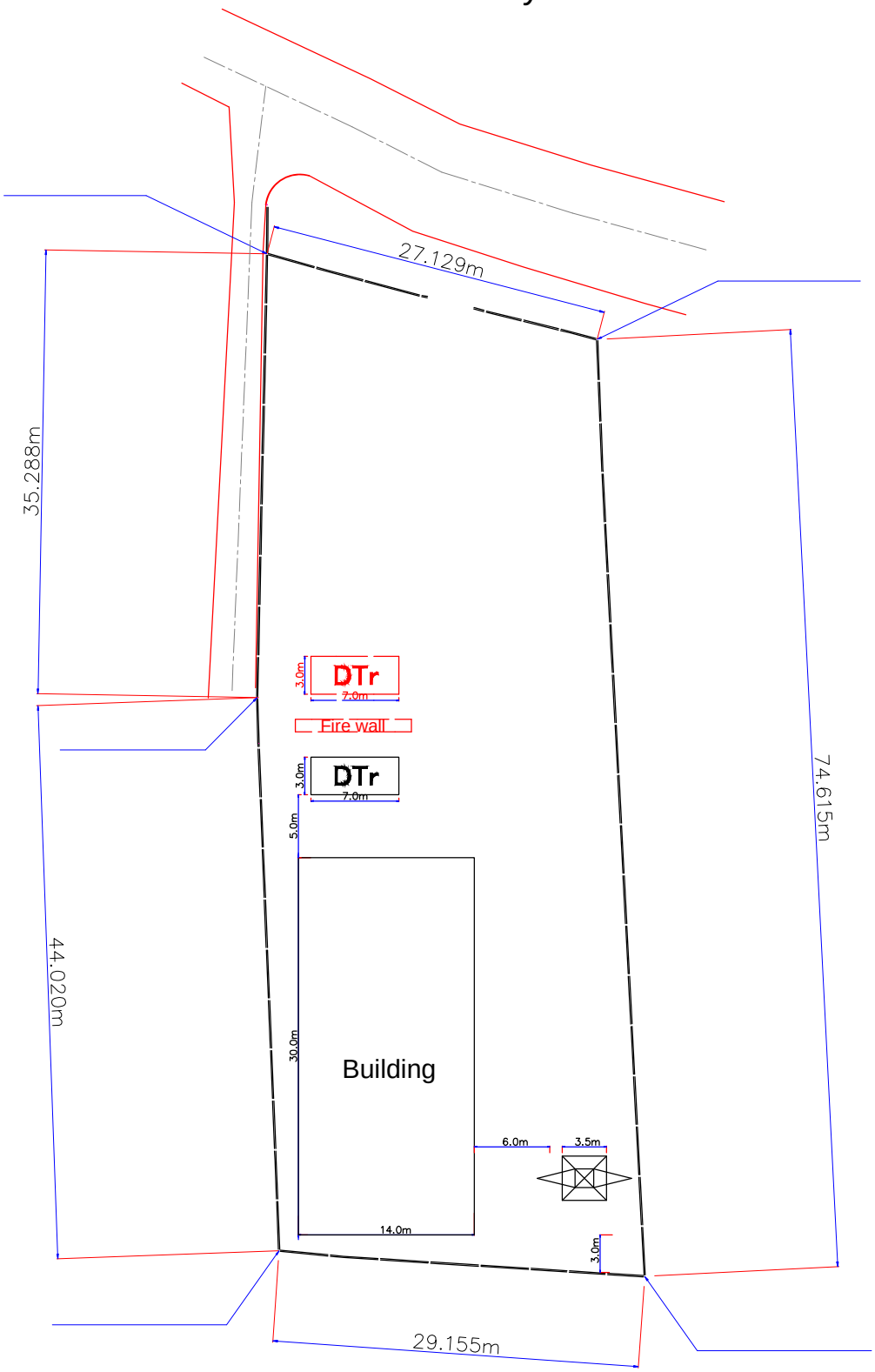
NCC Substation Building Floor Layout Plan (Sectional view)



Rooftop
3rd
2nd
Cable
1st
Mezzanine

Ground

Toul Kork Substation Layout Plan

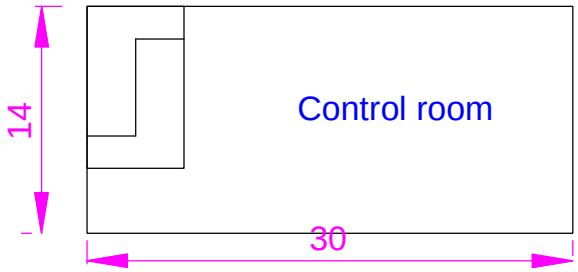


1 / 500 (on A4 paper)

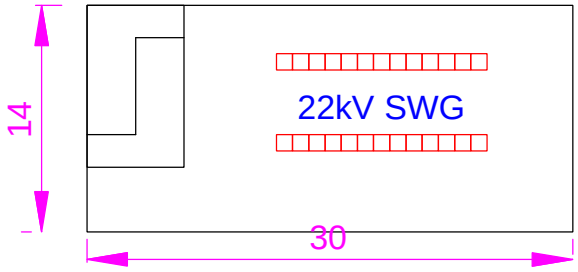
0 10 20 30 40 50m

Toul Kork Substation Building Floor Layout Plan

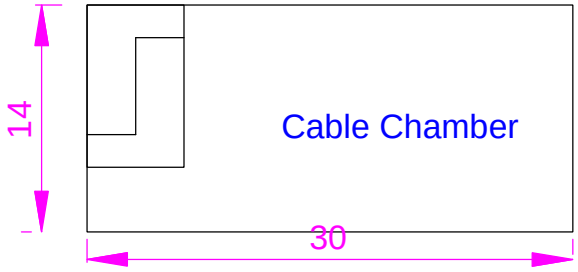
2nd



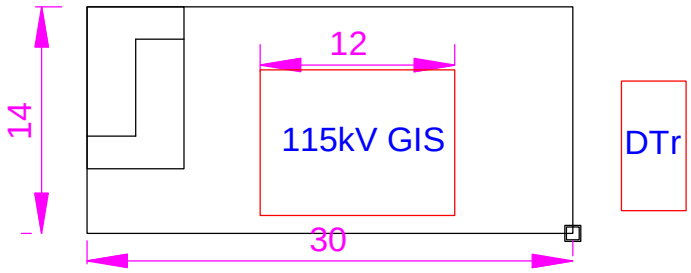
1st



Cable

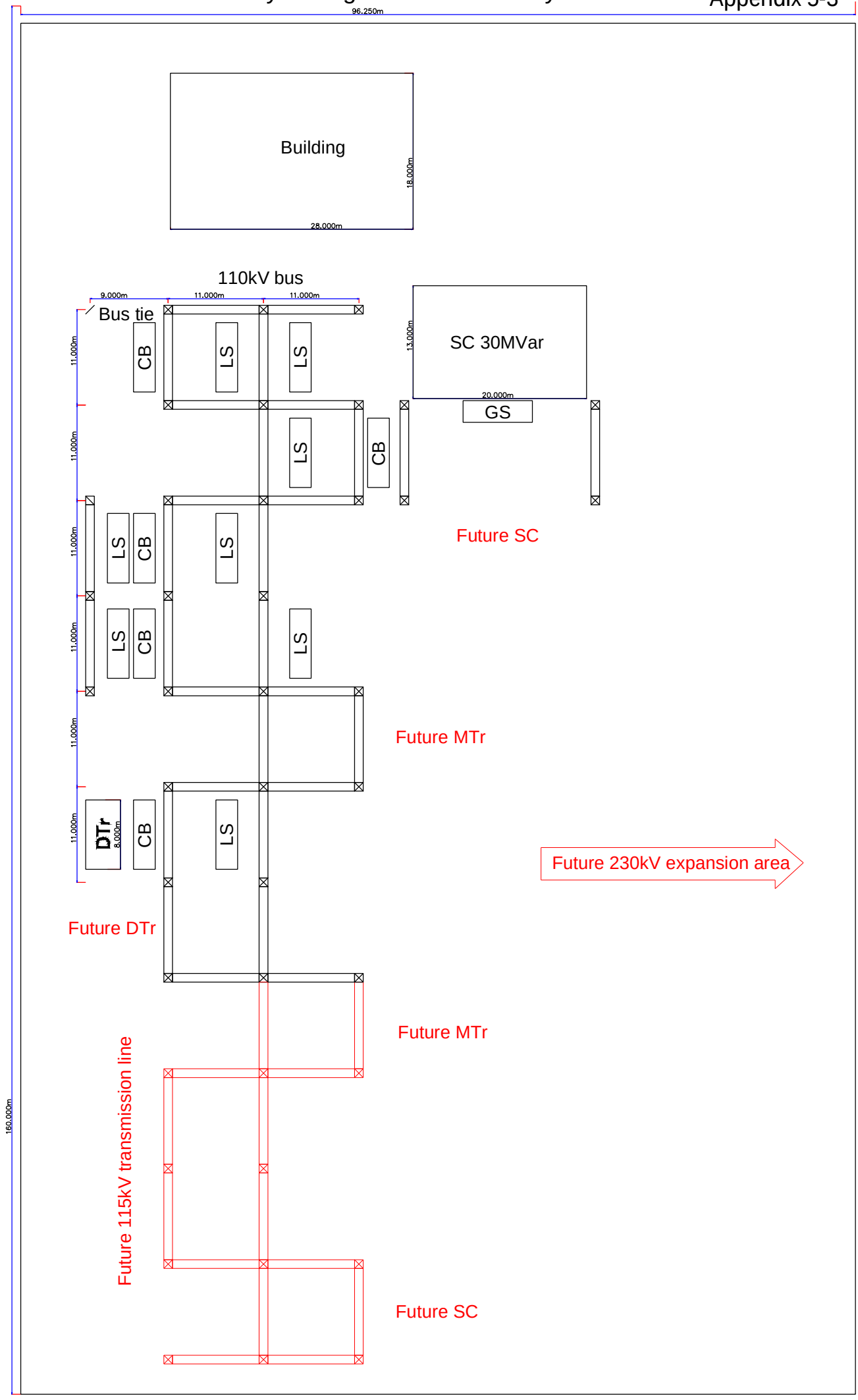


Ground

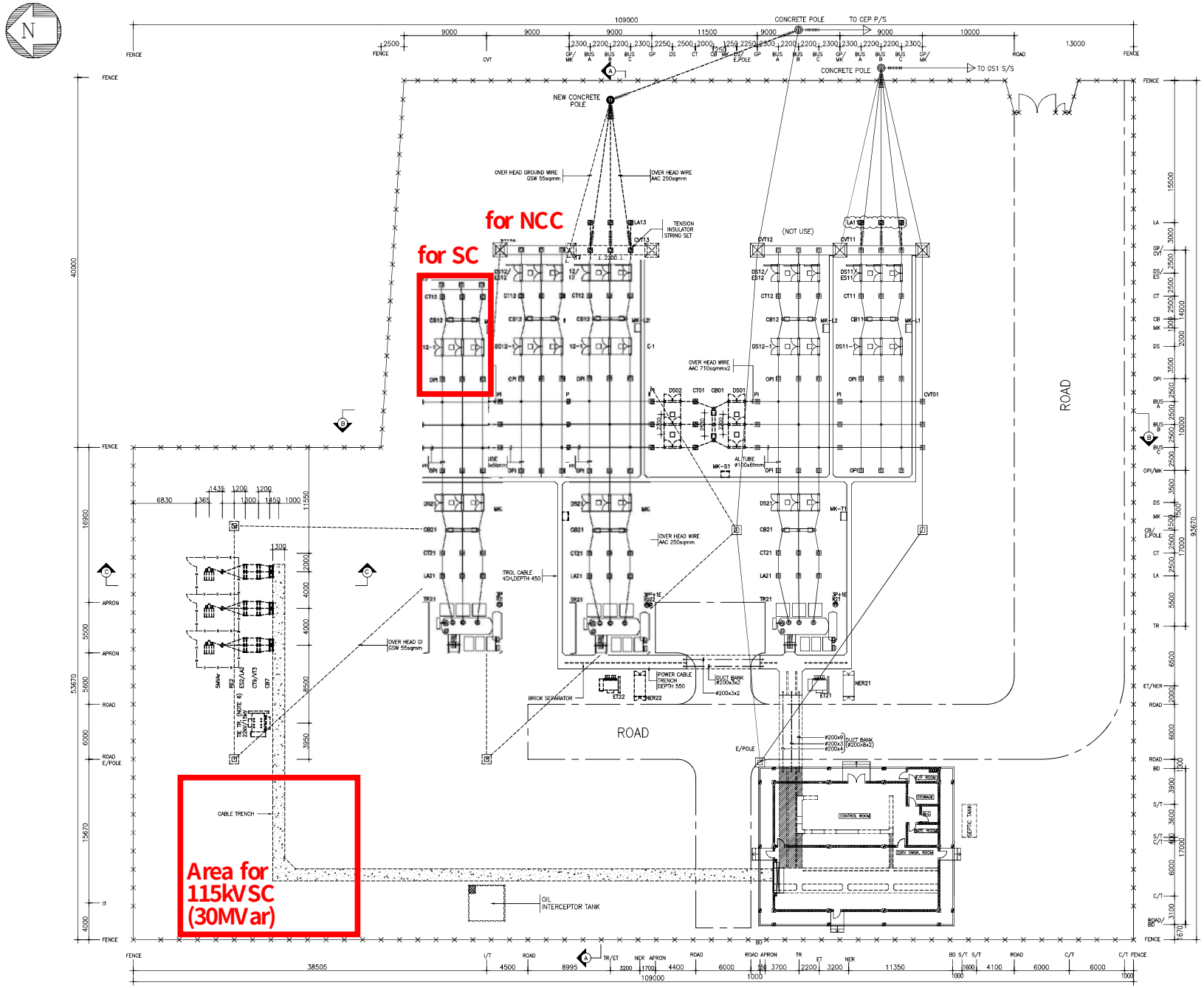


Chroy Changvar Substation Layout Plan

Appendix 5-3



GS3 Layout Plan



EQUIPMENT LIST

(NEW EQUIPMENTS WERE UNDERLINED AT FIRST COLUMME IN BELOW TABLE)

TAG. NO.	DESCRIPTION	REMARKS
CVT11,CVT12,CVT13, CVT01,CVT02	115/√3/0.11/√3/0.11KV T06VA CL0.5 3P/3P	
DS11/ES11,DS12/ES12,DS13/ES13	123KV 1250A 31.5KA	
DS11-1,DS12-1,DS13-1 DS21,DS22	123KV 1250A 31.5KA	
DS01,DS02	123KV 2000A 31.5KA	
CT11,CT12,CT13	123KV 1250A 15VA 1000-500/1/1/1/1A CLX 1000-500/1A CL0.5	
CT21,CT22	123KV 1250A 15VA 600-300/1A CLX 600-300/1A CL10P20 1000-500/1/1A CLX 600-300/1A CL0.5	
CT01	123KV 2000A 15VA 1000-500/1/1/1/1A CLX 2000-1000-500/1A CL0.5	
CB11,CB12,CB13 CB21,CB22,CB21	123KV 3150A 31.5KA	
DPI	123KV	
PI	123KV	
MK-L1,MK-L2,MK-L3 MK-S1,MK-T1,MK-T2	OUTDOOR, WEATHER-PROOF, SELF STANDING TYPE	
LA11,LA12,LA13,LA21,LA12,LA13	72KV 10KA W/SURGE COUNTER	
TR21	3PH 115/22KV 30/50MVA ONAN/ODAF,Ynd11yn0,%Z=10	
TR22	3PH 115/22KV 30/50MVA ONAN/ODAF,Ynd11,%Z=10	
ET11	1PH 15/√3/0.23KV 150KVA %Z=4	
ET12,ET22	3PH 22/0.4-0.23KV 250KVA Zyyn11,%Z=4	
ER11	230V 376.5A 0.665Ω 30sec	
NER12,NER22	22/√3KV 787A 30SEC, 50A CONTIN, 3.76 Ω	
R1,R2	POWER RECEPTACLE OUTDOOR, WEATHER PROOF 3P+1E 400V,100A	
CB7	CIRCUIT BREAKER – 36KV 2000A 31.5KA	
CT9	22KV 300-600/1A, 10P20 15VA 300-600/1A, CL 1.0 15VA	
VT3	22/√3-0.11/√3-0.11/√3 KV 50VA 0.5CL 3P/3P	
ES2	EARTHING SWITCH 24KV,630A,25kA/1s	
LA2	LIGHTNING ARRESTER 21KV,10KA	
RE2	REACTOR 24kV,0.2mH,200A,25kA/1s	
5MVar	CAPPACITOR BANK 22KV 5.0MVAr 50Hz	

NOTE:

1. EXISTING CABLE TRENCH
   NEW CABLE TRENCH
   EXISTING CABLE TUNNEL
2. SCOPE OF WORK
   EXISTING EQUIPMENT
3. ALL DIMENSIONS IN THIS DRAWING MEAN MILLIMETER.
4. ALL DIMENSIONS OF CABLE TRENCHES INDICATE IT OF INSIDE.
5. : ADDITIONAL SCOPE
6. EXISTING 22/15kV TIE-TRANSFORMER SHALL RELOCATED FROM TRANSFORMER BAY (TR22) TO NEW LOCATION

DOCUMENT STATUS:

Rev.	Date	Description	Author	Chkd.	Appd.
0	Jan 23, 2008	Issued for approval	MAIT	NGUY	NGUY

Project: RURAL ELECTRIFICATION AND TRANSMISSION PROJECT
IDA Credit No. 3840-KH
MODIFICATION OF 115KV GRID SUBSTATIONS IN PHNOM PENH

Customer: ELECTRICITE DU CAMBODGE

Consultant: NIPPON KOEI Co. Ltd in association with R&N Engineering Consultants

Contractor: CONSORTIUM AREVA T&D Ltd./ COMINASIA Pte.Ltd/ COMINKHMERE Co.Ltd.

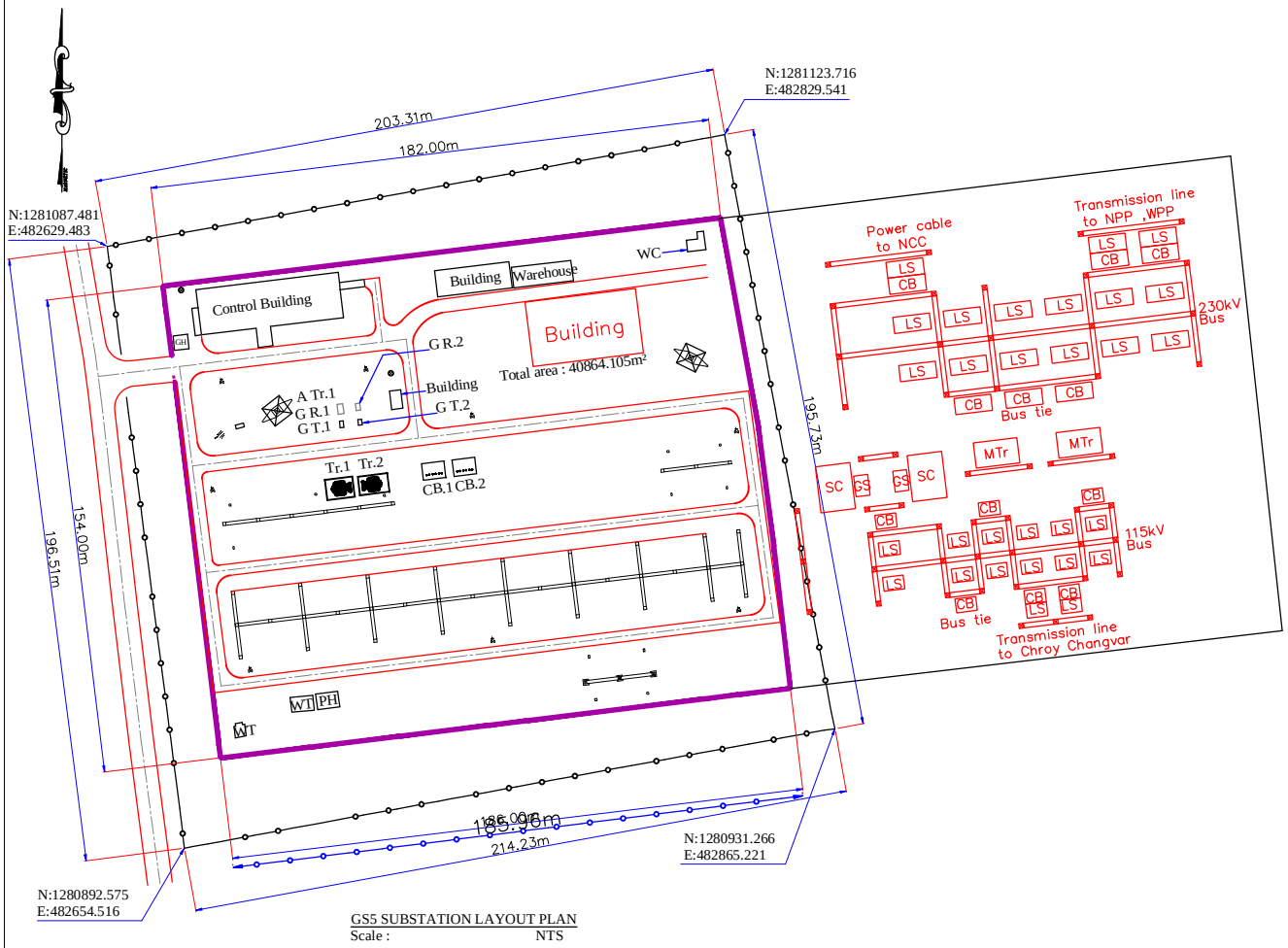
Document Title: GS3 - SWITCHYARD EQUIPMENT ARRANGEMENT

Project No.:				Format:				Total page:	
Designed by:	MAI NGOC TUAN			Checked & Approved by:	NGUYEN VAN NGOC				
Function	Name	Sign	Date	Function	Name	Sign	Date		
Approved	NGUN								
Checked	NGUN								
Author	MAIT								

Drawing No.: D1506-100-302 Date: Rev:

GS5 Layout Plan

Appendix 5-5



GS5 SUBSTATION LAYOUT PLAN
Scale : NTS

Legend :

- Dead-end tower
- Dead-end steel pole
- Lightning steel pole
- Gantry
- Road
- Brick wall fence
- Barbed wire fence
- Main hole
- Contour line

Abbreviation:

Tr.1	: Transformer #1
Tr.2	: Transformer #2
A Tr.1	: Auxiliary transformer #1
G R.1	: Ground resistance #1
G R.2	: Ground resistance #2
G T.1	: Grounding transformer #1
G T.2	: Grounding transformer #2
CB.1	: Capacitor bank #1
CB.2	: Capacitor bank #2
GH	: Guard house
PH	: Pump house
WT	: Underground water storage tank

APPENDIX 6

TRAFFIC COUNT VOLUME

Appendix 6 Traffic Count Volume

Point 1 : Toul Kork S/S

Point No. 1	Date: 04/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
6:00 - 6:10	54	17	2	0
6:10 - 6:20	81	12	0	0
6:20 - 6:30	159	16	3	0
6:30 - 6:40	329	24	3	0
6:40 - 6:50	380	29	3	0
6:50 - 7:00	342	32	5	0
7:00 - 7:10	417	38	7	0
7:10 - 7:20	285	29	4	0
7:20 - 7:30	192	19	2	0
7:30 - 7:40	199	37	7	0
7:40 - 7:50	218	35	7	0
7:50 - 8:00	250	24	9	0
8:00 - 8:10	178	28	7	0
8:10 - 8:20	189	24	8	0
8:20 - 8:30	181	25	7	0
8:30 - 8:40	135	35	3	0
8:40 - 8:50	144	14	7	0
8:50 - 9:00	141	26	4	0
9:00 - 9:10	168	21	13	0
9:10 - 9:20	200	21	4	0
9:20 - 9:30	131	29	5	0
9:30 - 9:40	113	23	4	0
9:40 - 9:50	144	20	12	0
9:50 - 10:00	159	27	14	0
10:00 - 10:10	136	27	8	0
10:10 - 10:20	172	29	10	0
10:20 - 10:30	150	22	16	0
10:30 - 10:40	216	24	9	0
10:40 - 10:50	167	30	9	0
10:50 - 11:00	163	24	4	0
11:00 - 11:10	193	24	6	0
11:10 - 11:20	191	26	8	0
11:20 - 11:30	157	28	8	1
11:30 - 11:40	215	39	13	0
11:40 - 11:50	196	22	11	0
11:50 - 12:00	189	40	10	0
12:00 - 12:10	183	30	6	0
12:10 - 12:20	150	20	8	0
12:20 - 12:30	174	25	6	0
12:30 - 12:40	148	28	7	1
12:40 - 12:50	163	23	6	0
12:50 - 13:00	155	13	4	0
13:00 - 13:10	145	22	7	0
13:10 - 13:20	143	20	7	0
13:20 - 13:30	148	15	8	0
13:30 - 13:40	103	33	13	0

Point No. 1	Date: 04/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
13:40 - 13:50	117	23	7	1
13:50 - 14:00	122	30	9	0
14:00 - 14:10	134	25	16	1
14:10 - 14:20	104	57	7	0
14:20 - 14:30	159	28	11	0
14:30 - 14:40	124	29	6	0
14:40 - 14:50	118	30	10	1
14:50 - 15:00	129	25	13	0
15:00 - 15:10	170	41	10	0
15:10 - 15:20	130	29	8	0
15:20 - 15:30	136	38	12	0
15:30 - 15:40	158	32	14	0
15:40 - 15:50	149	31	10	0
15:50 - 16:00	154	25	13	0
16:00 - 16:10	208	31	14	0
16:10 - 16:20	206	28	6	0
16:20 - 16:30	203	36	10	0
16:30 - 16:40	195	42	9	0
16:40 - 16:50	174	43	2	0
16:50 - 17:00.	187	44	6	0
17:00 - 17:10	238	34	5	1
17:10 - 17:20	313	38	10	0
17:20 - 17:30	227	35	11	1
17:30 - 17:40	198	52	7	0
17:40 - 17:50	145	27	8	0
17:50 - 18:00	90	36	1	1
18:00 - 18:10	152	38	8	0
18:10 - 18:20	175	41	6	0
18:20 - 18:30	151	29	1	0
18:30 - 18:40	254	27	3	0
18:40 - 18:50	153	25	2	0
18:50 - 19:00	176	26	3	0
19:00 - 19:10	146	30	3	0
19:10 - 19:20	172	22	2	0
19:20 - 19:30	124	20	3	0
19:30 - 19:40	145	19	1	0
19:40 - 19:50	107	11	0	0
19:50 - 20:00	87	19	1	1
20:00 - 20:10	139	27	1	0
20:10 - 20:20	79	8	2	0
20:20 - 20:30	67	13	4	0
20:30 - 20:40	123	15	1	0
20:40 - 20:50	84	15	3	3
20:50 - 21:00	37	14	2	0
21:00 - 21:10	38	16	1	0
21:10 - 21:20	31	10	0	0
21:20 - 21:30	30	5	1	0
21:30 - 21:40	29	12	0	0
21:40 - 21:50	16	10	1	0
21:50 - 22:00	18	4	0	0

Point No. 1	Date: 04/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
22:00 - 22:10	34	11	5	0
22:10 - 22:20	22	3	1	0
22:20 - 22:30	18	3	3	0
22:30 - 22:40	9	3	2	0
22:40 - 22:50	15	1	1	0
22:50 - 23:00	7	4	1	0
23:00 - 23:10	9	2	0	0
23:10 - 23:20	2	3	0	0
23:20 - 23:30	8	4	1	0
23:30 - 23:40	9	4	1	0
23:40 - 23:50	5	2	1	0
23:50 - 24:00	4	5	0	0
24:00 - 24:10	5	4	0	0
24:10 - 24:20	4	1	0	0
24:20 - 24:30	8	0	0	0
24:30 - 24:40	0	1	0	0
24:40 - 24:50	2	0	0	0
24:50 - 1:00	3	1	0	0
1:00 - 1:10	5	0	1	0
1:10 - 1:20	1	3	0	0
1:20 - 1:30	1	1	0	0
1:30 - 1:40	3	2	0	0
1:40 - 1:50	4	1	0	0
1:50 - 2:00	1	5	0	0
2:00 - 2:10	2	0	2	0
2:10 - 2:20	3	0	0	0
2:20 - 2:30	0	2	0	0
2:30 - 2:40	2	0	0	0
2:40 - 2:50	1	0	0	0
2:50 - 3:00	1	0	0	0
3:00 - 3:10	2	0	0	0
3:10 - 3:20	1	0	2	0
3:20 - 3:30	1	0	1	0
3:30 - 3:40	4	1	1	0
3:40 - 3:50	7	2	2	0
3:50 - 4:00	1	2	0	0
4:00 - 4:10	4	1	1	0
4:10 - 4:20	1	3	0	0
4:20 - 4:30	7	4	1	0
4:30 - 4:40	8	2	4	0
4:40 - 4:50	6	1	0	0
4:50 - 5:00	10	1	2	0
5:00 - 5:10	18	3	3	0
5:10 - 5:20	31	6	4	0
5:20 - 5:30	33	1	2	0
5:30 - 5:40	65	5	1	0
5:40 - 5:50	65	4	3	0
5:50 - 6:00	91	7	8	1

Point 2 : Chroy Changvar S/S

Point No. 2	Date: 05/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
6:00 - 6:10	44	34	8	2
6:10 - 6:20	54	52	8	0
6:20 - 6:30	55	48	8	0
6:30 - 6:40	62	57	11	0
6:40 - 6:50	77	73	16	0
6:50 - 7:00	90	68	12	0
7:00 - 7:10	87	66	13	0
7:10 - 7:20	86	64	8	0
7:20 - 7:30	70	58	9	2
7:30 - 7:40	71	59	10	0
7:40 - 7:50	77	59	14	0
7:50 - 8:00	79	60	10	0
8:00 - 8:10	74	62	9	0
8:10 - 8:20	79	56	6	0
8:20 - 8:30	87	57	9	1
8:30 - 8:40	87	67	9	0
8:40 - 8:50	92	71	11	0
8:50 - 9:00	96	76	11	0
9:00 - 9:10	105	103	12	2
9:10 - 9:20	36	43	5	0
9:20 - 9:30	90	104	16	1
9:30 - 9:40	82	111	18	2
9:40 - 9:50	86	107	22	2
9:50 - 10:00	83	97	15	1
10:00 - 10:10	86	142	13	1
10:10 - 10:20	48	59	9	0
10:20 - 10:30	50	94	13	0
10:30 - 10:40	119	158	31	0
10:40 - 10:50	54	91	18	0
10:50 - 11:00	79	54	21	0
11:00 - 11:10	63	73	6	0
11:10 - 11:20	68	79	11	0
11:20 - 11:30	52	60	22	0
11:30 - 11:40	63	73	13	1
11:40 - 11:50	50	72	10	0
11:50 - 12:00	36	50	6	1
12:00 - 12:10	30	40	3	0
12:10 - 12:20	37	32	5	0
12:20 - 12:30	27	30	8	0
12:30 - 12:40	34	29	6	0
12:40 - 12:50	40	36	8	0
12:50 - 13:00	48	42	12	1
13:00 - 13:10	53	44	12	0
13:10 - 13:20	48	37	10	0
13:20 - 13:30	54	46	11	1
13:30 - 13:40	59	53	11	0
13:40 - 13:50	67	67	15	0
13:50 - 14:00	70	87	17	0
14:00 - 14:10	59	95	11	1

Point No. 2	Date: 05/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
14:10 - 14:20	63	99	13	0
14:20 - 14:30	53	79	10	0
14:30 - 14:40	52	69	9	0
14:40 - 14:50	53	82	12	1
14:50 - 15:00	61	82	8	1
15:00 - 15:10	46	57	8	0
15:10 - 15:20	41	48	8	0
15:20 - 15:30	36	46	9	0
15:30 - 15:40	44	52	8	0
15:40 - 15:50	45	60	11	0
15:50 - 16:00	51	57	11	1
16:00 - 16:10	54	58	11	0
16:10 - 16:20	57	58	9	0
16:20 - 16:30	61	58	8	0
16:30 - 16:40	59	61	9	0
16:40 - 16:50	66	62	12	0
16:50 - 17:00.	73	63	11	0
17:00 - 17:10	71	60	9	0
17:10 - 17:20	76	61	8	0
17:20 - 17:30	84	60	7	0
17:30 - 17:40	86	66	10	0
17:40 - 17:50	93	75	9	0
17:50 - 18:00	91	75	7	0
18:00 - 18:10	80	66	7	0
18:10 - 18:20	72	65	7	0
18:20 - 18:30	66	59	5	0
18:30 - 18:40	59	58	4	0
18:40 - 18:50	57	58	4	0
18:50 - 19:00	50	52	3	0
19:00 - 19:10	51	48	3	0
19:10 - 19:20	45	44	1	0
19:20 - 19:30	44	44	3	0
19:30 - 19:40	37	38	2	0
19:40 - 19:50	32	36	2	0
19:50 - 20:00	25	32	1	0
20:00 - 20:10	21	27	0	0
20:10 - 20:20	19	22	1	0
20:20 - 20:30	19	20	3	0
20:30 - 20:40	16	18	2	0
20:40 - 20:50	14	16	1	0
20:50 - 21:00	12	16	2	0
21:00 - 21:10	9	17	4	0
21:10 - 21:20	10	20	3	0
21:20 - 21:30	7	19	4	0
21:30 - 21:40	8	17	3	0
21:40 - 21:50	10	13	2	0
21:50 - 22:00	6	13	2	0
22:00 - 22:10	4	9	2	0
22:10 - 22:20	4	11	4	0
22:20 - 22:30	6	6	3	0

Point No. 2	Date: 05/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
22:30 - 22:40	5	4	3	0
22:40 - 22:50	5	6	3	0
22:50 - 23:00	2	5	2	0
23:00 - 23:10	3	3	1	0
23:10 - 23:20	5	2	1	0
23:20 - 23:30	1	4	2	0
23:30 - 23:40	2	2	1	0
23:40 - 23:50	4	3	1	0
23:50 - 24:00	2	3	0	0
24:00 - 24:10	1	2	1	0
24:10 - 24:20	2	1	1	0
24:20 - 24:30	2	1	0	0
24:30 - 24:40	0	2	0	0
24:40 - 24:50	3	1	1	0
24:50 - 1:00	2	1	0	0
1:00 - 1:10	1	2	0	0
1:10 - 1:20	3	2	1	0
1:20 - 1:30	1	1	0	0
1:30 - 1:40	3	2	1	0
1:40 - 1:50	0	1	0	0
1:50 - 2:00	1	0	0	0
2:00 - 2:10	1	2	0	0
2:10 - 2:20	1	1	0	0
2:20 - 2:30	2	2	0	0
2:30 - 2:40	1	2	0	0
2:40 - 2:50	1	1	0	0
2:50 - 3:00	3	4	1	0
3:00 - 3:10	2	2	0	0
3:10 - 3:20	4	2	0	0
3:20 - 3:30	3	2	0	0
3:30 - 3:40	3	3	0	0
3:40 - 3:50	3	2	0	0
3:50 - 4:00	5	3	1	0
4:00 - 4:10	4	5	0	0
4:10 - 4:20	7	6	0	0
4:20 - 4:30	7	5	1	0
4:30 - 4:40	7	4	0	0
4:40 - 4:50	9	7	1	0
4:50 - 5:00	9	7	0	0
5:00 - 5:10	12	15	2	0
5:10 - 5:20	17	10	0	0
5:20 - 5:30	23	14	6	1
5:30 - 5:40	27	16	4	0
5:40 - 5:50	41	25	4	0
5:50 - 6:00	50	38	13	0

Point 3 : NCC S/S

Point No. 3	Date: 05/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
6:00 - 6:10	584	30	5	0
6:10 - 6:20	953	72	14	1
6:20 - 6:30	641	109	9	0
6:30 - 6:40	755	92	5	0
6:40 - 6:50	758	150	9	2
6:50 - 7:00	2180	109	14	1
7:00 - 7:10	2941	139	10	0
7:10 - 7:20	1545	127	22	0
7:20 - 7:30	1665	167	29	0
7:30 - 7:40	1357	147	13	0
7:40 - 7:50	1236	170	30	1
7:50 - 8:00	1249	194	20	0
8:00 - 8:10	1227	194	20	4
8:10 - 8:20	898	142	31	0
8:20 - 8:30	1041	169	24	0
8:30 - 8:40	850	186	32	0
8:40 - 8:50	863	239	36	0
8:50 - 9:00	800	165	27	0
9:00 - 9:10	785	159	33	0
9:10 - 9:20	809	143	34	0
9:20 - 9:30	795	132	38	0
9:30 - 9:40	788	154	37	1
9:40 - 9:50	734	164	40	0
9:50 - 10:00	825	135	37	0
10:00 - 10:10	811	143	40	2
10:10 - 10:20	786	148	49	0
10:20 - 10:30	834	142	29	0
10:30 - 10:40	892	123	39	1
10:40 - 10:50	859	155	28	1
10:50 - 11:00	972	151	30	0
11:00 - 11:10	1103	142	22	0
11:10 - 11:20	1045	181	16	1
11:20 - 11:30	936	144	31	2
11:30 - 11:40	873	154	28	1
11:40 - 11:50	951	162	25	4
11:50 - 12:00	735	134	25	0
12:00 - 12:10	821	159	21	0
12:10 - 12:20	843	145	31	1
12:20 - 12:30	685	136	20	0
12:30 - 12:40	816	127	28	0
12:40 - 12:50	821	143	31	0
12:50 - 13:00	920	119	46	0
13:00 - 13:10	946	100	29	0
13:10 - 13:20	894	131	32	1
13:20 - 13:30	922	140	30	2
13:30 - 13:40	886	158	43	2
13:40 - 13:50	834	127	31	0
13:50 - 14:00	937	148	36	0
14:00 - 14:10	471	71	23	0

Point No. 3	Date: 05/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
14:10 - 14:20	814	174	42	5
14:20 - 14:30	775	167	35	1
14:30 - 14:40	689	149	37	4
14:40 - 14:50	781	167	36	5
14:50 - 15:00	769	168	31	2
15:00 - 15:10	714	149	48	1
15:10 - 15:20	859	177	45	1
15:20 - 15:30	540	123	26	1
15:30 - 15:40	746	153	32	1
15:40 - 15:50	734	181	39	2
15:50 - 16:00	791	180	43	0
16:00 - 16:10	724	196	37	1
16:10 - 16:20	810	188	39	1
16:20 - 16:30	1027	190	41	0
16:30 - 16:40	990	179	26	3
16:40 - 16:50	1106	157	34	1
16:50 - 17:00.	1213	171	23	1
17:00 - 17:10	1488	151	26	0
17:10 - 17:20	1231	155	17	2
17:20 - 17:30	1537	134	21	2
17:30 - 17:40	1335	126	33	1
17:40 - 17:50	1168	161	15	1
17:50 - 18:00	1195	133	22	2
18:00 - 18:10	1237	188	20	2
18:10 - 18:20	1185	168	20	1
18:20 - 18:30	1203	164	22	1
18:30 - 18:40	1180	155	18	0
18:40 - 18:50	1126	133	16	0
18:50 - 19:00	1102	152	24	1
19:00 - 19:10	919	127	10	2
19:10 - 19:20	1051	165	27	2
19:20 - 19:30	866	151	11	3
19:30 - 19:40	946	132	16	3
19:40 - 19:50	687	105	11	1
19:50 - 20:00	743	116	20	3
20:00 - 20:10	741	131	15	1
20:10 - 20:20	893	109	14	4
20:20 - 20:30	889	110	6	1
20:30 - 20:40	855	116	22	3
20:40 - 20:50	716	111	16	3
20:50 - 21:00	556	109	13	3
21:00 - 21:10	413	79	17	0
21:10 - 21:20	430	109	15	0
21:20 - 21:30	371	100	10	6
21:30 - 21:40	343	94	17	4
21:40 - 21:50	300	81	8	4
21:50 - 22:00	279	56	3	3
22:00 - 22:10	325	55	5	0
22:10 - 22:20	360	50	10	0
22:20 - 22:30	244	43	10	1

Point No. 3	Date: 05/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
22:30 - 22:40	247	66	16	0
22:40 - 22:50	213	56	9	1
22:50 - 23:00	216	35	11	0
23:00 - 23:10	198	37	7	0
23:10 - 23:20	187	37	3	0
23:20 - 23:30	144	30	6	0
23:30 - 23:40	150	32	5	0
23:40 - 23:50	130	29	4	0
23:50 - 24:00	132	25	7	0
24:00 - 24:10	144	20	4	0
24:10 - 24:20	116	16	6	0
24:20 - 24:30	99	26	6	0
24:30 - 24:40	81	6	2	0
24:40 - 24:50	79	17	6	0
24:50 - 1:00	74	13	6	0
1:00 - 1:10	71	18	4	0
1:10 - 1:20	61	18	3	0
1:20 - 1:30	91	16	1	0
1:30 - 1:40	68	10	3	0
1:40 - 1:50	56	4	3	0
1:50 - 2:00	79	10	2	0
2:00 - 2:10	96	11	3	0
2:10 - 2:20	65	11	5	0
2:20 - 2:30	52	8	3	0
2:30 - 2:40	64	10	2	0
2:40 - 2:50	75	5	5	0
2:50 - 3:00	85	13	4	0
3:00 - 3:10	70	11	3	0
3:10 - 3:20	67	1	3	0
3:20 - 3:30	42	5	4	0
3:30 - 3:40	52	12	3	0
3:40 - 3:50	63	8	4	0
3:50 - 4:00	61	6	7	0
4:00 - 4:10	79	5	14	0
4:10 - 4:20	91	9	14	0
4:20 - 4:30	79	7	9	0
4:30 - 4:40	97	19	13	0
4:40 - 4:50	177	13	11	1
4:50 - 5:00	156	13	12	0
5:00 - 5:10	170	19	21	0
5:10 - 5:20	272	29	19	1
5:20 - 5:30	305	42	22	2
5:30 - 5:40	494	20	21	1
5:40 - 5:50	520	40	18	10
5:50 - 6:00	657	42	17	23

Point 4 : Road 2002

Point No. 4	Date: 04/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
6:00 - 6:10	127	21	4	0
6:10 - 6:20	155	21	3	0
6:20 - 6:30	407	28	4	0
6:30 - 6:40	220	29	3	0
6:40 - 6:50	422	38	2	0
6:50 - 7:00	360	36	4	0
7:00 - 7:10	334	30	6	0
7:10 - 7:20	350	47	11	0
7:20 - 7:30	259	43	8	0
7:30 - 7:40	278	67	7	0
7:40 - 7:50	270	46	12	0
7:50 - 8:00	358	50	8	0
8:00 - 8:10	220	50	15	0
8:10 - 8:20	141	69	6	0
8:20 - 8:30	164	49	14	0
8:30 - 8:40	187	40	12	0
8:40 - 8:50	191	43	10	0
8:50 - 9:00	211	34	10	0
9:00 - 9:10	163	28	15	0
9:10 - 9:20	190	35	11	0
9:20 - 9:30	139	37	11	0
9:30 - 9:40	137	22	17	0
9:40 - 9:50	122	23	13	0
9:50 - 10:00	121	17	12	0
10:00 - 10:10	144	19	11	0
10:10 - 10:20	182	26	15	0
10:20 - 10:30	154	24	5	0
10:30 - 10:40	212	28	35	0
10:40 - 10:50	231	26	10	0
10:50 - 11:00	284	43	12	0
11:00 - 11:10	257	48	15	1
11:10 - 11:20	283	49	10	0
11:20 - 11:30	253	53	12	0
11:30 - 11:40	246	44	10	0
11:40 - 11:50	215	53	14	1
11:50 - 12:00	170	54	8	0
12:00 - 12:10	171	37	13	0
12:10 - 12:20	169	32	8	0
12:20 - 12:30	188	33	17	1
12:30 - 12:40	200	30	12	0
12:40 - 12:50	268	28	12	0
12:50 - 13:00	241	41	8	0
13:00 - 13:10	200	32	11	0
13:10 - 13:20	203	34	9	0
13:20 - 13:30	212	35	9	0
13:30 - 13:40	172	42	8	0
13:40 - 13:50	176	36	11	0
13:50 - 14:00	153	33	13	0
14:00 - 14:10	155	31	11	0

Point No. 4	Date: 04/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
14:10 - 14:20	170	26	14	0
14:20 - 14:30	151	25	19	0
14:30 - 14:40	145	21	16	0
14:40 - 14:50	146	30	8	0
14:50 - 15:00	172	26	14	0
15:00 - 15:10	178	37	12	0
15:10 - 15:20	149	20	7	0
15:20 - 15:30	166	26	14	0
15:30 - 15:40	179	29	9	0
15:40 - 15:50	161	27	6	0
15:50 - 16:00	197	24	21	0
16:00 - 16:10	211	25	5	0
16:10 - 16:20	208	26	6	0
16:20 - 16:30	234	32	19	0
16:30 - 16:40	258	37	12	0
16:40 - 16:50	270	39	10	0
16:50 - 17:00.	330	42	12	0
17:00 - 17:10	375	36	12	1
17:10 - 17:20	436	35	7	0
17:20 - 17:30	436	38	9	0
17:30 - 17:40	438	32	6	0
17:40 - 17:50	481	41	9	0
17:50 - 18:00	431	39	4	1
18:00 - 18:10	387	34	14	0
18:10 - 18:20	337	28	4	0
18:20 - 18:30	347	36	10	0
18:30 - 18:40	342	31	6	0
18:40 - 18:50	436	55	5	0
18:50 - 19:00	291	32	4	0
19:00 - 19:10	326	33	6	0
19:10 - 19:20	268	25	7	0
19:20 - 19:30	255	16	7	0
19:30 - 19:40	248	29	1	0
19:40 - 19:50	251	26	4	0
19:50 - 20:00	199	21	3	0
20:00 - 20:10	211	34	10	0
20:10 - 20:20	193	38	4	0
20:20 - 20:30	194	33	4	0
20:30 - 20:40	190	26	3	0
20:40 - 20:50	158	20	0	0
20:50 - 21:00	98	25	2	0
21:00 - 21:10	88	31	1	0
21:10 - 21:20	67	18	0	0
21:20 - 21:30	88	13	1	0
21:30 - 21:40	56	46	2	0
21:40 - 21:50	61	18	3	0
21:50 - 22:00	70	12	0	0
22:00 - 22:10	45	13	1	1
22:10 - 22:20	51	10	1	0
22:20 - 22:30	49	10	0	0

Point No. 4	Date: 04/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
22:30 - 22:40	19	6	0	0
22:40 - 22:50	43	6	0	0
22:50 - 23:00	33	5	1	0
23:00 - 23:10	17	8	1	0
23:10 - 23:20	30	2	0	0
23:20 - 23:30	16	4	0	0
23:30 - 23:40	33	9	0	0
23:40 - 23:50	15	5	2	0
23:50 - 24:00	18	2	0	0
24:00 - 24:10	16	2	1	0
24:10 - 24:20	15	3	0	0
24:20 - 24:30	17	6	1	0
24:30 - 24:40	6	1	1	0
24:40 - 24:50	9	2	1	0
24:50 - 1:00	9	2	3	0
1:00 - 1:10	6	4	0	0
1:10 - 1:20	9	5	0	0
1:20 - 1:30	13	4	0	0
1:30 - 1:40	6	0	0	0
1:40 - 1:50	19	7	0	0
1:50 - 2:00	18	1	0	0
2:00 - 2:10	3	1	0	0
2:10 - 2:20	13	1	0	0
2:20 - 2:30	11	0	0	0
2:30 - 2:40	7	2	0	0
2:40 - 2:50	3	1	5	0
2:50 - 3:00	6	4	1	0
3:00 - 3:10	9	1	1	0
3:10 - 3:20	8	1	1	0
3:20 - 3:30	5	0	0	0
3:30 - 3:40	7	1	1	0
3:40 - 3:50	6	1	1	0
3:50 - 4:00	2	1	0	0
4:00 - 4:10	3	0	1	0
4:10 - 4:20	3	0	1	0
4:20 - 4:30	4	2	1	0
4:30 - 4:40	10	3	5	0
4:40 - 4:50	4	1	0	0
4:50 - 5:00	21	0	4	0
5:00 - 5:10	22	2	4	0
5:10 - 5:20	29	6	3	0
5:20 - 5:30	40	3	8	1
5:30 - 5:40	49	3	3	0
5:40 - 5:50	48	9	2	1
5:50 - 6:00	94	7	4	0

Point 5 : Russian Confederation Blvd.

Point No. 5	Date: 09/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
6:00 - 6:10	1123	188	7	2
6:10 - 6:20	1637	284	14	3
6:20 - 6:30	1746	264	17	6
6:30 - 6:40	3043	323	10	8
6:40 - 6:50	2670	383	17	5
6:50 - 7:00	3464	440	18	11
7:00 - 7:10	3368	503	20	14
7:10 - 7:20	2997	374	20	8
7:20 - 7:30	2894	362	16	1
7:30 - 7:40	2774	643	12	6
7:40 - 7:50	2669	529	17	3
7:50 - 8:00	2606	544	31	5
8:00 - 8:10	2609	603	23	4
8:10 - 8:20	2543	608	31	6
8:20 - 8:30	2105	575	31	9
8:30 - 8:40	1754	624	31	6
8:40 - 8:50	1547	538	27	7
8:50 - 9:00	2048	551	28	1
9:00 - 9:10	2039	629	23	3
9:10 - 9:20	1800	559	20	3
9:20 - 9:30	2016	552	32	1
9:30 - 9:40	2013	706	38	4
9:40 - 9:50	1354	752	37	7
9:50 - 10:00	1604	619	24	5
10:00 - 10:10	1451	490	32	5
10:10 - 10:20	1502	529	37	7
10:20 - 10:30	1505	620	31	2
10:30 - 10:40	1798	461	35	7
10:40 - 10:50	2450	553	30	5
10:50 - 11:00	2205	554	22	3
11:00 - 11:10	2238	493	20	3
11:10 - 11:20	1557	537	32	4
11:20 - 11:30	2109	524	27	2
11:30 - 11:40	977	594	26	6
11:40 - 11:50	1679	536	25	3
11:50 - 12:00	1925	525	21	4
12:00 - 12:10	1403	491	20	2
12:10 - 12:20	1640	461	19	3
12:20 - 12:30	1890	489	27	4
12:30 - 12:40	1582	542	35	4
12:40 - 12:50	1670	489	28	1
12:50 - 13:00	1693	553	24	9
13:00 - 13:10	1653	495	31	1
13:10 - 13:20	1751	475	29	1
13:20 - 13:30	1796	484	39	2
13:30 - 13:40	1636	528	33	4
13:40 - 13:50	1607	531	25	7
13:50 - 14:00	1634	681	38	8
14:00 - 14:10	1361	464	33	5

Point No. 5	Date: 09/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
14:10 - 14:20	1625	479	31	3
14:20 - 14:30	1497	475	24	2
14:30 - 14:40	1514	446	27	6
14:40 - 14:50	1395	377	15	2
14:50 - 15:00	1518	491	12	6
15:00 - 15:10	1439	548	25	2
15:10 - 15:20	1460	465	40	4
15:20 - 15:30	1674	483	41	5
15:30 - 15:40	1548	528	30	5
15:40 - 15:50	1510	513	28	1
15:50 - 16:00	2189	589	12	2
16:00 - 16:10	2278	472	25	4
16:10 - 16:20	2182	337	23	2
16:20 - 16:30	2195	363	30	5
16:30 - 16:40	2825	566	30	1
16:40 - 16:50	2015	549	27	5
16:50 - 17:00.	2846	525	28	4
17:00 - 17:10	3176	540	25	8
17:10 - 17:20	3312	413	11	3
17:20 - 17:30	3227	503	19	5
17:30 - 17:40	3105	564	36	4
17:40 - 17:50	3380	576	12	8
17:50 - 18:00	4158	623	6	5
18:00 - 18:10	3749	527	3	4
18:10 - 18:20	3448	545	18	6
18:20 - 18:30	3122	513	9	7
18:30 - 18:40	2117	571	6	3
18:40 - 18:50	2553	545	9	4
18:50 - 19:00	2401	533	10	3
19:00 - 19:10	2867	621	12	1
19:10 - 19:20	2430	496	8	5
19:20 - 19:30	2295	482	6	5
19:30 - 19:40	2561	425	11	6
19:40 - 19:50	2171	405	9	1
19:50 - 20:00	1949	428	10	3
20:00 - 20:10	1953	338	15	4
20:10 - 20:20	1941	368	13	0
20:20 - 20:30	1914	332	8	0
20:30 - 20:40	1739	372	8	3
20:40 - 20:50	1745	418	13	3
20:50 - 21:00	1742	454	3	3
21:00 - 21:10	1431	396	9	3
21:10 - 21:20	1256	398	9	1
21:20 - 21:30	1091	381	4	1
21:30 - 21:40	945	355	9	5
21:40 - 21:50	953	389	5	1
21:50 - 22:00	510	386	7	0
22:00 - 22:10	1085	529	5	1
22:10 - 22:20	1199	333	3	1
22:20 - 22:30	564	258	6	3

Point No. 5	Date: 09/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
22:30 - 22:40	1206	273	7	2
22:40 - 22:50	964	217	14	1
22:50 - 23:00	613	185	9	1
23:00 - 23:10	758	203	5	0
23:10 - 23:20	923	301	5	1
23:20 - 23:30	989	177	4	0
23:30 - 23:40	490	237	4	1
23:40 - 23:50	485	193	6	1
23:50 - 24:00	622	153	3	1
24:00 - 24:10	320	113	3	2
24:10 - 24:20	394	99	2	0
24:20 - 24:30	344	86	3	0
24:30 - 24:40	282	65	3	0
24:40 - 24:50	262	53	7	1
24:50 - 1:00	242	61	8	0
1:00 - 1:10	250	80	1	0
1:10 - 1:20	270	66	10	0
1:20 - 1:30	221	74	2	0
1:30 - 1:40	224	83	5	0
1:40 - 1:50	242	48	6	0
1:50 - 2:00	139	30	6	0
2:00 - 2:10	196	56	9	0
2:10 - 2:20	186	62	8	0
2:20 - 2:30	194	52	13	0
2:30 - 2:40	176	48	5	0
2:40 - 2:50	189	42	6	0
2:50 - 3:00	184	45	12	0
3:00 - 3:10	209	20	9	0
3:10 - 3:20	197	43	11	1
3:20 - 3:30	180	65	19	0
3:30 - 3:40	285	31	13	3
3:40 - 3:50	186	26	12	1
3:50 - 4:00	215	43	11	4
4:00 - 4:10	211	44	14	3
4:10 - 4:20	166	108	13	10
4:20 - 4:30	254	92	9	2
4:30 - 4:40	359	96	17	4
4:40 - 4:50	602	129	14	7
4:50 - 5:00	613	131	12	9
5:00 - 5:10	637	147	22	7
5:10 - 5:20	605	156	9	2
5:20 - 5:30	967	204	20	3
5:30 - 5:40	968	190	15	1
5:40 - 5:50	1013	278	11	5
5:50 - 6:00	1474	200	13	4

Point 6 : Hanoi Highway

Point No. 6	Date: 10/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
6:00 - 6:10	137	12	5	0
6:10 - 6:20	129	23	6	0
6:20 - 6:30	169	15	11	0
6:30 - 6:40	311	33	17	0
6:40 - 6:50	386	38	25	0
6:50 - 7:00	435	28	14	1
7:00 - 7:10	434	40	13	0
7:10 - 7:20	360	61	18	0
7:20 - 7:30	329	50	15	0
7:30 - 7:40	352	55	18	0
7:40 - 7:50	484	58	33	0
7:50 - 8:00	408	52	15	0
8:00 - 8:10	319	50	15	0
8:10 - 8:20	387	83	25	0
8:20 - 8:30	315	76	29	0
8:30 - 8:40	342	84	25	0
8:40 - 8:50	303	63	18	0
8:50 - 9:00	370	141	23	0
9:00 - 9:10	316	80	29	1
9:10 - 9:20	261	44	24	0
9:20 - 9:30	335	63	32	0
9:30 - 9:40	234	65	17	0
9:40 - 9:50	313	65	23	0
9:50 - 10:00	291	68	20	1
10:00 - 10:10	278	104	24	0
10:10 - 10:20	320	61	45	2
10:20 - 10:30	323	93	24	0
10:30 - 10:40	266	73	22	0
10:40 - 10:50	292	82	26	0
10:50 - 11:00	297	65	23	0
11:00 - 11:10	198	46	20	0
11:10 - 11:20	266	62	29	0
11:20 - 11:30	291	78	26	0
11:30 - 11:40	310	94	31	0
11:40 - 11:50	347	80	29	0
11:50 - 12:00	218	59	19	0
12:00 - 12:10	274	90	12	0
12:10 - 12:20	220	60	15	0
12:20 - 12:30	182	50	9	0
12:30 - 12:40	179	47	10	0
12:40 - 12:50	229	43	20	0
12:50 - 13:00	248	58	24	1
13:00 - 13:10	260	62	24	0
13:10 - 13:20	272	85	17	0
13:20 - 13:30	289	61	23	0
13:30 - 13:40	233	72	22	0
13:40 - 13:50	298	56	20	0
13:50 - 14:00	253	60	30	0
14:00 - 14:10	228	33	31	0

Point No. 6	Date: 10/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
14:10 - 14:20	319	39	35	0
14:20 - 14:30	260	60	14	0
14:30 - 14:40	311	74	25	0
14:40 - 14:50	350	89	26	1
14:50 - 15:00	277	46	15	1
15:00 - 15:10	339	70	30	0
15:10 - 15:20	324	58	20	0
15:20 - 15:30	310	42	24	0
15:30 - 15:40	367	65	14	1
15:40 - 15:50	365	77	27	0
15:50 - 16:00	426	64	28	0
16:00 - 16:10	448	63	22	0
16:10 - 16:20	391	82	32	0
16:20 - 16:30	409	69	21	0
16:30 - 16:40	439	92	14	0
16:40 - 16:50	423	70	18	0
16:50 - 17:00.	436	66	22	0
17:00 - 17:10	499	85	5	0
17:10 - 17:20	457	59	16	0
17:20 - 17:30	481	62	11	0
17:30 - 17:40	491	99	11	1
17:40 - 17:50	431	83	10	0
17:50 - 18:00	417	95	16	0
18:00 - 18:10	595	113	15	0
18:10 - 18:20	489	76	17	0
18:20 - 18:30	455	82	11	0
18:30 - 18:40	441	74	12	2
18:40 - 18:50	500	68	15	0
18:50 - 19:00	463	80	13	0
19:00 - 19:10	366	55	8	0
19:10 - 19:20	402	75	8	1
19:20 - 19:30	354	47	17	0
19:30 - 19:40	318	36	11	0
19:40 - 19:50	337	48	14	0
19:50 - 20:00	195	26	9	0
20:00 - 20:10	224	47	15	0
20:10 - 20:20	248	62	9	0
20:20 - 20:30	232	40	11	2
20:30 - 20:40	206	25	15	0
20:40 - 20:50	201	35	11	1
20:50 - 21:00	210	35	18	1
21:00 - 21:10	171	42	9	0
21:10 - 21:20	164	41	13	0
21:20 - 21:30	154	31	11	0
21:30 - 21:40	148	24	5	0
21:40 - 21:50	139	21	3	0
21:50 - 22:00	121	24	1	0
22:00 - 22:10	71	14	10	0
22:10 - 22:20	106	14	11	0
22:20 - 22:30	112	33	5	0

Point No. 6	Date: 10/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
22:30 - 22:40	124	23	9	0
22:40 - 22:50	73	17	10	0
22:50 - 23:00	61	24	5	1
23:00 - 23:10	121	40	16	0
23:10 - 23:20	75	20	8	0
23:20 - 23:30	67	16	3	1
23:30 - 23:40	50	4	2	0
23:40 - 23:50	49	5	3	0
23:50 - 24:00	72	9	4	0
24:00 - 24:10	26	9	1	0
24:10 - 24:20	28	10	4	0
24:20 - 24:30	20	6	2	0
24:30 - 24:40	19	6	2	0
24:40 - 24:50	34	9	3	0
24:50 - 1:00	39	7	3	0
1:00 - 1:10	12	7	2	0
1:10 - 1:20	20	7	5	0
1:20 - 1:30	41	3	1	0
1:30 - 1:40	20	3	3	0
1:40 - 1:50	42	3	3	0
1:50 - 2:00	46	7	2	0
2:00 - 2:10	18	2	1	0
2:10 - 2:20	24	1	6	0
2:20 - 2:30	10	4	2	0
2:30 - 2:40	8	15	6	1
2:40 - 2:50	29	3	4	0
2:50 - 3:00	31	4	3	0
3:00 - 3:10	18	1	2	0
3:10 - 3:20	24	2	6	0
3:20 - 3:30	16	3	0	0
3:30 - 3:40	6	2	1	0
3:40 - 3:50	28	5	4	0
3:50 - 4:00	28	12	5	0
4:00 - 4:10	22	13	9	0
4:10 - 4:20	32	7	12	0
4:20 - 4:30	24	1	2	0
4:30 - 4:40	21	4	4	0
4:40 - 4:50	46	5	3	0
4:50 - 5:00	38	5	5	0
5:00 - 5:10	53	10	13	0
5:10 - 5:20	73	13	7	0
5:20 - 5:30	87	15	16	3
5:30 - 5:40	137	18	20	3
5:40 - 5:50	212	12	13	0
5:50 - 6:00	196	16	12	0

Point 7 : GS5 S/S

Point No. 7	Date: 11/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
6:00 - 6:10	12	0	2	0
6:10 - 6:20	10	0	1	0
6:20 - 6:30	14	2	0	0
6:30 - 6:40	20	0	0	0
6:40 - 6:50	26	3	2	0
6:50 - 7:00	30	2	1	0
7:00 - 7:10	33	3	3	0
7:10 - 7:20	13	2	4	0
7:20 - 7:30	15	1	7	0
7:30 - 7:40	14	4	3	0
7:40 - 7:50	13	4	10	0
7:50 - 8:00	20	2	3	0
8:00 - 8:10	12	3	1	0
8:10 - 8:20	18	3	5	0
8:20 - 8:30	23	1	2	0
8:30 - 8:40	23	3	3	0
8:40 - 8:50	12	2	0	0
8:50 - 9:00	22	3	3	0
9:00 - 9:10	20	2	6	0
9:10 - 9:20	11	0	3	0
9:20 - 9:30	9	1	3	0
9:30 - 9:40	7	2	6	0
9:40 - 9:50	22	0	4	0
9:50 - 10:00	17	2	4	0
10:00 - 10:10	10	2	6	0
10:10 - 10:20	9	0	3	0
10:20 - 10:30	4	2	2	0
10:30 - 10:40	10	3	6	0
10:40 - 10:50	13	6	4	0
10:50 - 11:00	10	2	10	0
11:00 - 11:10	10	3	1	0
11:10 - 11:20	8	4	2	0
11:20 - 11:30	8	2	2	0
11:30 - 11:40	6	2	4	0
11:40 - 11:50	15	2	3	0
11:50 - 12:00	11	2	2	0
12:00 - 12:10	14	2	2	0
12:10 - 12:20	13	2	5	0
12:20 - 12:30	11	2	2	0
12:30 - 12:40	12	1	2	0
12:40 - 12:50	10	1	0	0
12:50 - 13:00	10	0	4	0
13:00 - 13:10	8	0	2	0
13:10 - 13:20	6	0	5	0
13:20 - 13:30	6	0	7	0
13:30 - 13:40	14	1	5	0
13:40 - 13:50	8	0	7	0
13:50 - 14:00	6	1	4	0
14:00 - 14:10	7	4	1	0

Point No. 7	Date: 11/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
14:10 - 14:20	2	0	5	0
14:20 - 14:30	13	0	7	0
14:30 - 14:40	11	5	8	0
14:40 - 14:50	11	2	6	0
14:50 - 15:00	9	3	6	0
15:00 - 15:10	6	2	1	0
15:10 - 15:20	11	1	7	0
15:20 - 15:30	13	2	1	0
15:30 - 15:40	12	0	1	0
15:40 - 15:50	10	1	2	0
15:50 - 16:00	9	3	5	0
16:00 - 16:10	9	1	5	0
16:10 - 16:20	13	3	4	0
16:20 - 16:30	11	0	6	0
16:30 - 16:40	16	1	2	0
16:40 - 16:50	13	1	5	0
16:50 - 17:00.	8	3	2	0
17:00 - 17:10	28	0	8	0
17:10 - 17:20	19	4	5	0
17:20 - 17:30	14	1	6	0
17:30 - 17:40	11	0	4	0
17:40 - 17:50	13	0	5	0
17:50 - 18:00	15	1	6	0
18:00 - 18:10	11	1	9	0
18:10 - 18:20	24	1	0	0
18:20 - 18:30	17	1	1	0
18:30 - 18:40	29	0	2	0
18:40 - 18:50	14	1	0	0
18:50 - 19:00	22	1	1	0
19:00 - 19:10	17	2	2	0
19:10 - 19:20	7	1	0	0
19:20 - 19:30	2	1	0	0
19:30 - 19:40	6	1	2	0
19:40 - 19:50	5	0	1	0
19:50 - 20:00	9	2	0	0
20:00 - 20:10	2	2	0	0
20:10 - 20:20	4	0	0	0
20:20 - 20:30	3	0	0	0
20:30 - 20:40	3	0	0	0
20:40 - 20:50	0	0	0	0
20:50 - 21:00	2	0	0	0
21:00 - 21:10	0	0	0	0
21:10 - 21:20	2	0	0	0
21:20 - 21:30	0	1	0	0
21:30 - 21:40	0	0	0	0
21:40 - 21:50	0	0	0	0
21:50 - 22:00	1	0	0	0
22:00 - 22:10	3	1	2	0
22:10 - 22:20	0	1	0	0
22:20 - 22:30	0	0	0	0

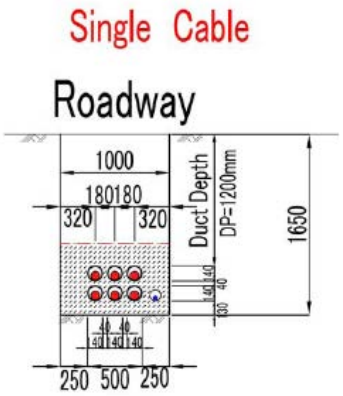
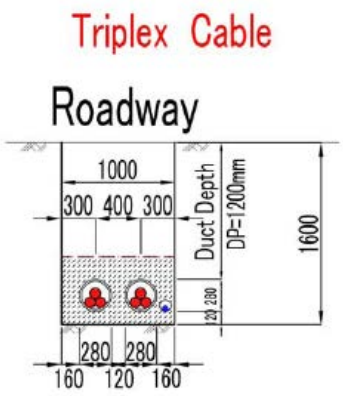
Point No. 7	Date: 11/06/2014			
Time	Type 1	Type 2	Type 3	Type 4
22:30 - 22:40	1	0	0	0
22:40 - 22:50	0	0	0	0
22:50 - 23:00	1	0	0	0
23:00 - 23:10	0	0	0	0
23:10 - 23:20	0	0	0	0
23:20 - 23:30	0	0	1	0
23:30 - 23:40	3	0	0	0
23:40 - 23:50	0	0	1	0
23:50 - 24:00	0	0	0	0
24:00 - 24:10	0	0	0	0
24:10 - 24:20	4	1	0	0
24:20 - 24:30	0	0	0	0
24:30 - 24:40	0	1	1	0
24:40 - 24:50	0	0	0	0
24:50 - 1:00	2	0	0	0
1:00 - 1:10	1	0	0	0
1:10 - 1:20	0	0	0	0
1:20 - 1:30	0	0	0	0
1:30 - 1:40	1	0	0	0
1:40 - 1:50	0	0	0	0
1:50 - 2:00	0	0	0	0
2:00 - 2:10	0	0	0	0
2:10 - 2:20	0	0	0	0
2:20 - 2:30	0	0	0	0
2:30 - 2:40	0	0	0	0
2:40 - 2:50	0	0	0	0
2:50 - 3:00	1	0	0	0
3:00 - 3:10	0	0	0	0
3:10 - 3:20	0	0	0	0
3:20 - 3:30	1	0	0	0
3:30 - 3:40	3	0	0	0
3:40 - 3:50	0	0	1	0
3:50 - 4:00	1	0	0	0
4:00 - 4:10	0	0	1	0
4:10 - 4:20	1	0	0	0
4:20 - 4:30	1	0	0	0
4:30 - 4:40	0	0	0	0
4:40 - 4:50	0	0	1	0
4:50 - 5:00	2	0	0	0
5:00 - 5:10	2	0	1	0
5:10 - 5:20	3	0	0	0
5:20 - 5:30	1	0	0	0
5:30 - 5:40	4	1	0	0
5:40 - 5:50	7	0	0	0
5:50 - 6:00	6	0	0	0

APPENDIX 7
単心ケーブルと 3 心タイプケーブルの比較

Appendix-7　単心ケーブルと 3 心タイプケーブルの比較

出典：カンボジア国　プノンペン送配電網整備事業準備調査　ファイナルレポート（2013 年 11 月）

単心ケーブルと 3 心タイプケーブルの比較（300MVA 送電の場合）

	単心ケーブル	3 心タイプケーブル
布　設　図		
ケーブルサイズ	1,000mm^2	1,000mm^2
工　事　工　程	12 months	11 months
材　料　費	1,637US$/m	1,649US$/m
土木、敷設工事費	1,084US$/m	976US$/m
ケーブル工事費合計	2,721US$/m	2,625US$/m
評　価	△	◎

（工事区間が 3.6 km の場合）　　出典：JICA Phase1 調査団

上記の検討の結果、3 心タイプケーブルの方が工事費が安くなり、さらに工程の短縮が可能であるため、3 心タイプケーブルを採用することとした。なお、100kV 以上のクラスで、実用化されている 3 心ケーブルとしては、3 心撚り合わせ型のトリプレックス型ケーブルが日本において多くの採用実績がある。

APPENDIX 8

ENVIRONMENTAL CHECKLIST, ENVIRONMENTAL MONITORING FORM AND ENVIRONMENTAL MONITORING COST

Environmental Checklist

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) We are preparing IEIA at present. (b) ditto (c) This project is not required other environmental permit. (d) ditto
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) EDC explained contents of the project and the potential impacts to stakeholder's authorities and line ministries in the stakeholder meetings (SHM) on 29 April 2014 and 10 September. And public consultation meetings for local residents were organized on 10 August and 6 September. (b) The comments from stakeholders will be reflected to the project design.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) The routes of overhead transmission lines (OHL) of 230kV and 115kV were compared in order to minimize the impact on environment and social. At the result 230kV OHL was selected the route to avoid residential area as far as possible. And 115kV was selected the route to pass the most shallow area of the lake.
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) N	(a) Works which cause water quality degradation in down stream water areas are not expected.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) There is no protected area in and around the project area. But the OHL will pass near Basset Marsh, one of Important Bird and Biodiversity Areas (IBAs) which is categorised by Birdlife International. If the possibility that affected it will be expected, mitigation measures such as bird fly diverter will be put in.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?	(a) N (b) N (c) Y (d) Y (e) Y (f) N	(a) Most of project areas are located in the urban developed area and farm lands. Part of project area is in the wetland, but this area is limited. (b) Protected habitats of endangered species are not included in the project area. (c) Adequate protection measures will be taken to reduce the impacts on the ecosystem if significant ecological impacts will be anticipated. (d) Adequate measures will be taken to if migration routes and habitat fragmentation of wildlife and livestock will be prevented and disrupted. (e) Partially overhead transmission line will pass through the lake. In order to minimize the impact on fishes, the temporary access road is planned not to cut off the lake to construct towers in the lake. (f) Most of project area have already been developed.
	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) N (c) N	(a) The possibility of slope failures or landslides is identified on the route of power transmission and distribution lines. (b) Works which cause slope failures or landslides are not expected. (c) Works which soil run off are not expected. If soil run off, adequate measures will be taken to prevent.

Environmental Checklist

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) Y (b) Y (c) Y (d) Y (e) Y (f) Y (g) Y (h) Y (i) Y (j) Y	(a) - In 230kV TL, land acquisition for the towers is 0.225ha. 11 APs are found as these owners. The scale of land acquisition of every affected person is small. Since the 3 structures are found in the ROW, 15 APs total of 3 AHs may resettle. Land acquisition for the GS5 S/S is 4.41ha. The owner is a village comunity. Village comunity's land is vacant. - In 115kV TL, land acquisition for the towers and pokes is 0.808 ha. 21 APs are hound as these owners. The scale of land acquisition of every affected person is small. Since the 17 structures are found in the ROW of 230kV, 59 APs total of 13 AHs may resettle. Land acquisition for Chroy Changvar S/S is 3.24 ha. The owner is LYP (developer). (b) Compensation for land acquisition will be adequately explained to affected people at the consultation meeting. But the impact by land acquisition is not significant. (c) The adequate compensation costs will be planned based on the replacemet cost. (d) The compensation wil be paid prior to the resettlement. (e) The compensation policies will be included in the resettlement plan. (f) The resettlement plan will be prepared taking them into consideration . (g) Public consultation will be organized to obtain agreements on compensation with the affected people.
4 Social Environment	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (c) Is there any possibility that installation of structures, such as power line towers will cause a radio interference? If any significant radio interference is anticipated, are adequate measures considered? (d) Are the compensations for transmission wires given in accordance with the domestic law?	(a) Y (b) Y (c) N (d) Y	(a) - The fishery may be impacted by construction of the towers in the lake. But it is expected not to be significant. - The temporary and small impact on the surrounding traffic situation, is anticipated. However, the impact is limited. The construction schedule and time period will be considered and shared with the neighborhood. The traffic order or facilitator will be provided at crossing points of busy road in period of the project construction. (b) Health education such as HIV/AIDS will be provided to the project workers by EDC and contractor. Firstly, EDC and contractor will aid training about diseases including HIV/AIDS to project staff etc. to avoid the spread of disease to between people. (c) The radio interference is not expected by the project. But if any significant radio interference is anticipated, adequate measures such as construction of the comunity antenna will be implemented. (d) The compensations for ROW of transmission line are implemented according to land law, EDC regulation, and General Requirements of Electri Power Technical Standards of Kingdom of Cambodia, Ministry of Industry, Mine and Energy, 2004, amended 2007.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) Not applicable since there is any local archeological, historical, cultural, and religious heritage affected by project.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) Y	(a) The towers and overhead transmission lines cause change of landscape in rural area. But the impact is limited.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N (b) N	(a) (b) There are not ethnic minorities and indigenous peoples in and around the project area.

Environmental Checklist

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a) The EDC and constructor will implement the project in compliance with the Labor Law stipulated by RGC. (b) The contractor will follow all safety working standards by providing safety tool and equipment such as boot, gloves, eye-glasses, and helmet. And they will conduct periodical patrol of working conditions. (c) The safety education and training for labors about sanitation, security and rules/discipline and daily activity will be are implemented by EDC and DCC. And the safety management plan will be prepared and observed by DCC. (d) As mentioned above, not only security guards but also all construction labors will be trained by education program for social consideration. In addition, periodical patrol of workers will be implemented to avoid local conflict.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) Following measures are proposed to reduce impacts by the construction (i) Noise; to use noise-reducing machineries, (ii) Dust and emission; to use low-emission vehicle and equipment, dust prevention such as covering of solid or sprinkling of water (iii) Turbid water; proper and quick treatment of suspended solids or soil, (iv) Waste; minimalize of the waste and proper treatment. (b) As mentioned above, in order to minimize the impact on fishes, the temporary access road is planned not ot cut off the lake to construct towers in the lake. (c) The following measures are proposed to reduce any negative impacts: (i) to disseminate information on the limitation period of construction works to commune council and other, (ii) to publicize the construction schedule to the neighborhood etc. (iii) to provide a traffic order ot facilitator at crossing points of busy road in period of the project construction.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) N	(a) About noise, water quality, birds, fish, fishery, and appropriate compensation, monitoring program are implemented. In addition, checking at the construction site is proposed for the potential impact. (b) Noise monitoring by observation and instrumental measurement in the field monthly are proposed. (c) Monitoring is proposed to be carried out by Design and Construct Contractor, supervised by Project Implementation Consultant under the responsibility of EDC. (d) At present, the format and the frequency of the report are not provided from regulatory authorities.
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) N	(a) Temporary access road will be constructed, but its distance is short.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) There is no possibility to impact on the transboundary or global environment.

1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made.
In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Monitoring Form: Monitoring of Noise and Vibration

a) Type of work: _____

b) Monitoring Frequency: □ 1st / □ 2nd / □ 3 rd

c) Monitoring Period: From Date Month Year

To Date Month Year

		Item		Unit	Date1 DD/MM /YY	Date2 DD/MM /YY	Date3 DD/MM /YY	Remark (Date)
		Day Time (6:00-18:00) Noise - Residential Area :60 dB(A) - Commercial Area: 70dB(A)						
No.1	(Detail of Location)	Noise-1	L_{eq}	dB(A)				
		Noise-2	L_{min}	dB(A)				
		Noise-3	L_{max}	dB(A)				
No.2	(Detail of Location)	Noise-1	L_{eq}	dB(A)				
		Noise-2	L_{min}	dB(A)				
		Noise-3	L_{max}	dB(A)				
No.3	(Detail of Location)	Noise-1	L_{eq}	dB(A)				
		Noise-2	L_{min}	dB(A)				
		Noise-3	L_{max}	dB(A)				
No.4	(Detail of Location)	Noise-1	L_{eq}	dB(A)				
		Noise-2	L_{min}	dB(A)				
		Noise-3	L_{max}	dB(A)				
No.5	(Detail of Location)	Noise-1	L_{eq}	dB(A)				
		Noise-2	L_{min}	dB(A)				
		Noise-3	L_{max}	dB(A)				

Monitoring Form: Monitoring of Waste Management

a) Detail of location: _____

b) Type of work: _____

c) Monitoring Period: From Date Month Year

To Date Month Year

No.	Type of waste	Volume (Unit)	Detail	Treatment Measure	Remark
1	Construction soil	(ton)			
2	Concrete	(ton)			
3	……				
4					
5					

Monitoring Form : Compensation

a) Detail of location: _____

b) Type of work: _____

c) Monitoring Period: From Date Month Year

To Date Month Year

Resettlement Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Compensation	Responsible Organization
			During the Quarter	Till the last Quarter	Up to the Quarter	Till the last Quarter	Up to the Quarter		
Preparation of RAP									EDC
Employment of Census Survey		Man-month							
Implementation of Census Survey									
Approval of RAP									
Finalization of PAPs List		No. of PAPs							
Progress of Compensation Payment		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		No. of HHs							
Progress of Land Acquisition (All Lots)		ha							
Lot 1		ha							
Lot 2		ha							
Lot 3		ha							
Lot 4		ha							
Progress of Asset Replacement (All Lots)		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		No. of HHs							

Monitoring Form: Visual Checking at the Construction Site

a) Detail of location: _____

b) Type of work: _____

c) Monitoring Period: From Date Month Year

To Date Month Year

Item	DD/MM /YY	Result	DD/MM /YY	Result	DD/MM /YY	Result	DD/MM /YY	Result
1) Air pollution (dust, noise) at the water body near the construction site								
2) Water pollution (turbidity, soil sediment) at the water body near the construction site								
2) Public Health and work safety								
3) Traffic near the construction site								
4) Others, if any								

Environmental Monitoring Cost

Item		Price (US$)	Q'ty		Total (US$)	Remarks
Cost Estimate for EMP Implemetation						
Consultation & Workshop		3,000	1	set	3,000	-
Provision of Public Health Insformation		2,500	1	set	2,500	-
Cost Estimate for Monitoring						
Weekly Checking by DCC	Payroll including Transport Fee	120	152	days	18,240	- Monitoring requires 2 days/time for covering project area - Monitoring requires 1 month before the construction and 1 month after construction in addition to 33 months of construction period - 152weeks * 1day
Quarter Checking by EDC	Payroll including Transport Fee	120	24	days	2,880	- 36months/3months * 2days
Monthly Checking by DCC	Payroll including Transport Fee	120	70	days	8,400	- Monitoring requires 2 days/time for covering project area - Monitoring requires 1 month before the construction and 1 month after construction in addition to 33 months of construction period - 35months * 2days
Monthly Checking by EDC	Payroll including Transport Fee	120	70	days	8,400	ditto
Checking of Public Health and Workers Safety	Payroll including Transport Fee	120	2	days	240	- Checking requires 2 times during construction period
Contingency 10%					4,366	-
Grand Total					**48,026**	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