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KINGDOM OF THAILAND

**MASTER PLAN STUDY REPORT  
ON  
NAM YUAM RIVER BASIN  
HYDROELECTRIC DEVELOPMENT  
PROJECT**

**APPENDIX**

**KINGDOM OF THAILAND  
MASTER PLAN STUDY REPORT ON NAM YUAM RIVER BASIN  
HYDROELECTRIC DEVELOPMENT PROJECT APPENDIX**

**MAR . 87**

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**KINGDOM OF THAILAND**

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ON  
NAM YUAM RIVER BASIN  
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PROJECT**

**APPENDIX**

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## APPENDIX

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## **A-1. GEOLOGY**

- [1] Microscopic Observation of Rock Samples  
(Nam Mae Ngao No. 2 and Nam Mae Rit Dam Site)
- [2] Chemical Analysis of Rock Samples  
(Nam Mae Ngao No. 2 and Nam Mae Rit Dam Site)
- [3] Geologic Log of Drill Hole  
Nam Mae Ngao No. 2  
Upper Mae Yuam 1  
Upper Mae Yuam 2  
Nam Mae Rit



**[1] Microscopic Observation of Rock Samples**  
**(Nam Mae Ngao No. 2 and Nam Mae Rit Dam Site)**





[1] Microscopic Observation of Rock Samples

Thin sections were prepared from 4 samples obtained in drill hole DL-2 at Nam Mae Ngao No.2 dam site, and drill hole DR-2 and DL-2 at Nam Mae Rit dam site.

The results of the microscopic observation are shown in Table 1 through 4 with the microscopic photographs.

Table 1 Petrographic Description of Rock

Project: Nam Yuam River Basin Hydroelectric Development  
 Locality: Nam Mae Ngao No.2 Drill Hole DL-2, 75.20 - 75.30 m  
 Sample No.: 1 Slice No.: 1  
 Rock name: Dolomitic limestone  
 Texture: Sedimentary depositional structure  
 Non-particulate texture: Crystalline texture

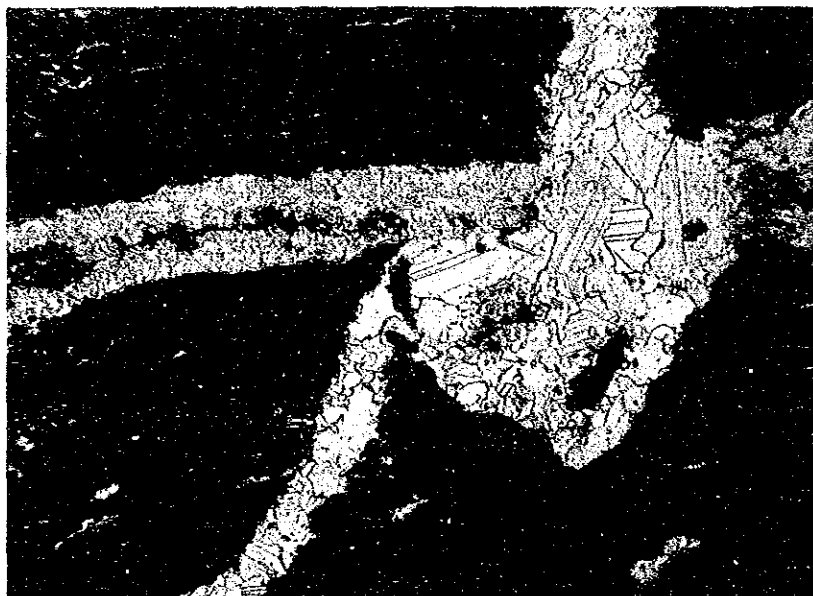
	Name	Characteristics
Rock Forming Mineral	Constituents: Calcite with dolomite: Light grey colored zone:  Clear zone:  Grey colored zone:  Calcite stringers:	Generally composed of three layered zones  15 mm., in wide. Cryptocrystalline calcite micrite matrix, including some microcrystalline dolomite sparites, that are euhedral rhombohedral and singled crystals, 0.015 - 0.06 mm., in size. 2 - 4 mm., in wide. Halloysite clay matrix, including some microcrystalline dolomite and few microcrystalline silty grade quartz-feldspar grains, 0.01 - 0.075 mm., in size. about 7 mm., in wide. Dark grey colored cryptocrystalline calcite micrite matrix, including some microcrystalline calcite sparite, clear halloysite shelly clasts and blackish carbonaceous matters. 0.3 - 2 mm., in wide. Cutting across and intruding to parallel in layered matrix, composing of largely anhedral mozaic calcite crystals, 0.01 - 0.025 mm., and up to 0.1 mm., in size.
Description	This rock was determined by the crystalline calcite and including some dolomite, as the dolomitic limestone.	
Degree of alteration	Carbonatization: Intermediate grade, forming calcite stringers.	

Macroscopic observation;

This rock is the light grey colored, massive and fine grained limestone, cutting by the networks, consisting of the whitish colored calcite hair veins, and associating with the light buff bands.

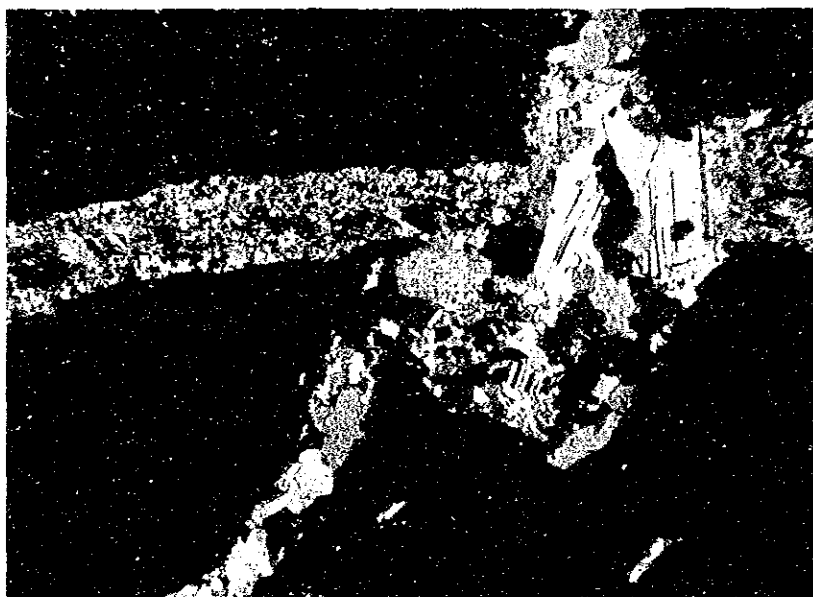
Microscopic Photograph

Project: Nam Yuam River Basin  
Hydroelectric Development      Locality: Nam Mae Ngao No.2  
Drill Hole DL-2  
Sample No.: 1      Slice No.: 1  
Rock Name: Dolomitic limestone      75.20-75.30 m



Cryptocrystalline calcite micrite matrix in grey colored zone with calcite stringers.

Parallel polars      Magn. X 20



Crossed polars      Magn. X 20

0      0.7 mm  
└──────────┘  
Scale

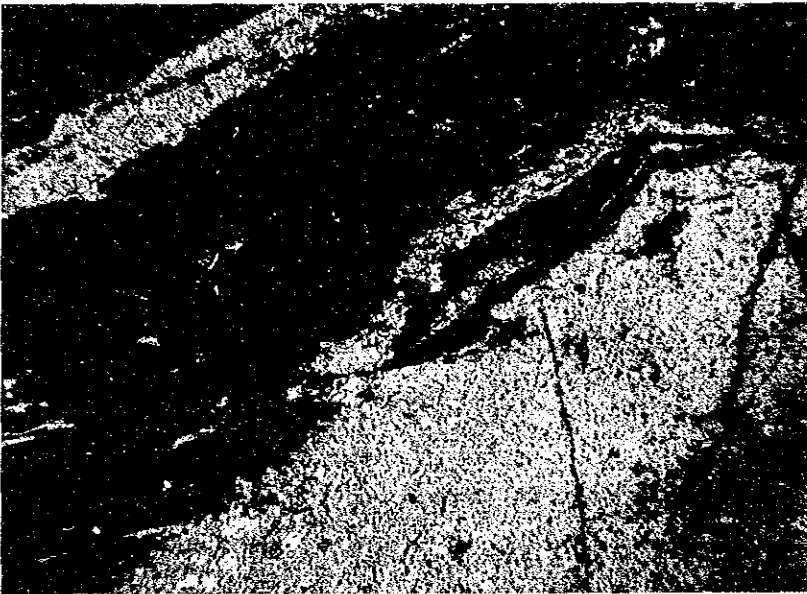


Microscopic Photograph

Project: Nam Yuam River Basin  
Hydroelectric Development      Locality: Nam Mae Ngao No.2  
Drill Hole DL-2  
75.20-75.30 m.

Sample No.: 1      Slice No.: 1

Rock Name: Dolomitic limestone



Upper left side: grey colored zone.  
Lower right side: clear zone.

Parallel polars      Magn. X 20



Crossed polars      Magn. X 20

0      0.7 mm  
|-----|  
Scale



Table 2 Petrographic Description of Rock

Project: Nam Yuam River Basin Hydroelectric Development  
 Locality: Nam Mae Rit Drill Hole DR-2, 49.70 m  
 Sample No.: 2 Slice No.: 2  
 Rock name: Cordierite - biotite spotted pelitic hornfels  
 Texture: Sedimentary depositional structure.  
 Particulate texture:  
 Grain Packing: Mudstone texture.  
 Porphyroblastic and granoblastic fabrics by thermal metamorphism.

	Name	Characteristics
Rock Forming Mineral	Constituents:  Porphyroblastic cordierite:  Granoblastic groundmass:	0.2 - 0.8 mm., in diameter. Abundant. Consisting of ill-defined assembled round grains, including few poikiloblastic biotite.  Consisting of crypto- to micro-crystalline equigrano blastic very abundant euhedral biotite with muscovite-commonly anhedral interstitial kaolin - some clastic quartz-feldspar grains, biotite granules are 0.005 - 0.025 mm., in size, greenish brown to brown colored, and strongly pleochroism, and laminated orientation is survived by biotite granules, arranged to parallel, as relicts of lamination texture in original mudstone.
Description	This rock was determined by the presence of the porphyroblastic cordierite and granoblastic biotite groundmass, as the cordierite spotted pelitic hornfels.	
Degree of alteration	—	

Macroscopic observation:

This rock is the darkish grey, crystalline mudstone, including the much cordierite spotted patches.









Table 3 Petrographic Description of Rock

Project: Nam Yuam River Basin Hydroelectric Development  
 Locality: Nam Mae Rit Drill Hole DR-2, 57.80 m  
 Sample No.: 3 Slice No.: 3  
 Rock name: Cordierite spotted pelitic hornfels  
 Texture: Sedimentary depositional structure.  
 Particulate texture:  
 Grain Packing: Mudstone texture and Lamination texture.  
 Porphyroblastic and granoblastic fabrics by thermal metamorphism.

	Name	Characteristics
Rock Forming Mineral	Constituents: Porphyroblastic cordierite:  Granoblastic groundmass:	0.1 - 0.4 mm., up to 0.8 mm., in size. Abundant. Consisting of ill-defined assembled round grains, often showing sector shapes, concentric arrangements of inclusions, and hexagonal outlines.  Consisting of cryptocrystalline to microcrystalline, abundant carbonaceous matters - commonly anhedral kaoline - some clastic quartz-feldspar silty grains - some granular biotite with muscovite. Quartz-feldspar grains are arranged very much to parallel along lamination bands, with carbonaceous matters, and grains are 0.01 - 0.03 mm., in size.
Description	This rock was determined by the porphyroblastic cordierite and granoblastic groundmass, as the cordierite spotted pelitic hornfels.	
Degree of alteration	—	

Marcoscopic observation;

This rock is the dark grey, cystalline mudstone, with cordierite spotted patches.

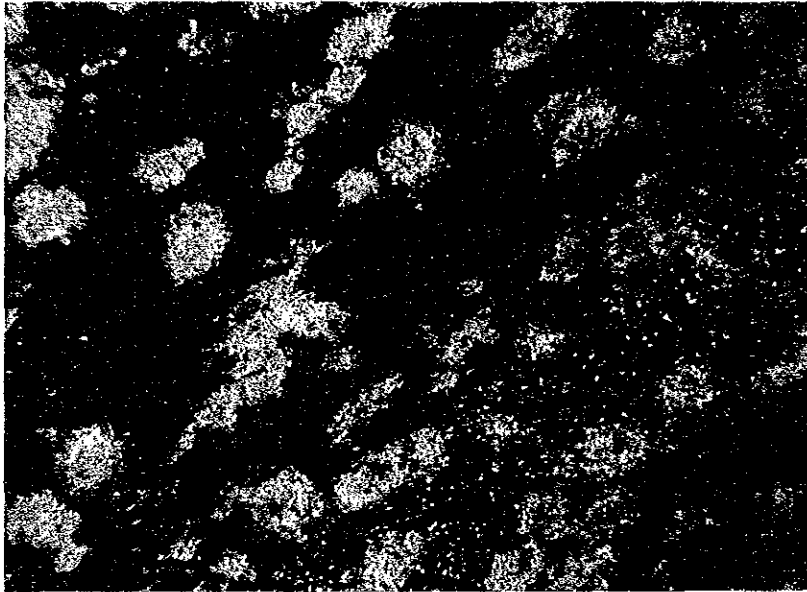


Microscopic Photograph

Project: Nam Yuam River Basin Hydroelectric Development      Locality: Nam Mae Rit  
Drill Hole DR-2  
57.80 m

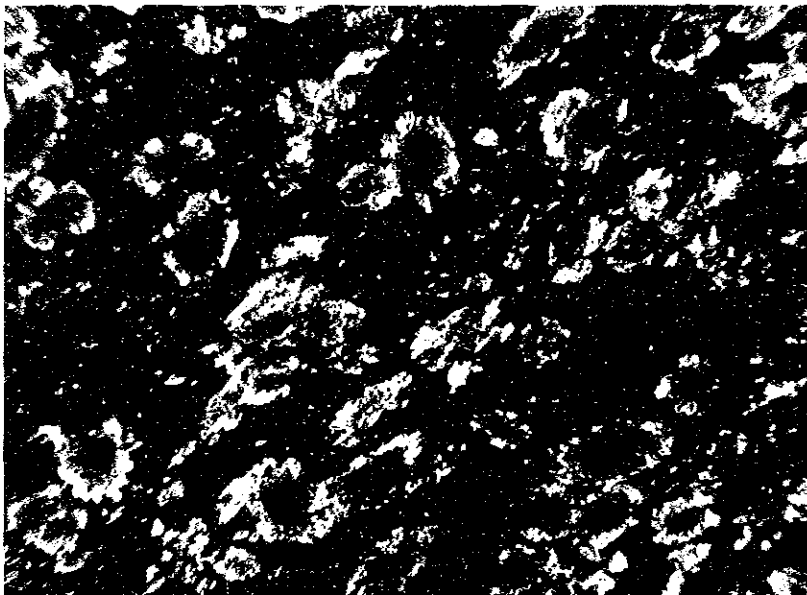
Sample No.: 3      Slice No.: 3

Rock Name: Cordierite spotted pelitic hornfels



Parallel polars      Magn. X 20

Granoblastic groundmass with porphyroblastic cordierite patches. Lower right hand: intercarating with the lamination band rich in quartz-feldspar particles.



Crossed polars      Magn. X 20

0      0.7 mm  
└──────────┘  
Scale



Table 4 Petrographic Description of Rock

Project: Nam Yuam River Basin Hydroelectric Development

Locality: Nam Mae Rit Drill Hole DL-2, 39.80 m

Sample No.: 4 Slice No.: 4

Rock name: Cordierite spotted pelitic hornfels

Texture: Sedimentary depositional structure.  
 Particulate texture:  
 Grain Packing: Mudstone texture.  
 Porphyroblastic and granoblastic fabrics by thermal metamorphism.

	Name	Characteristics
Rock Forming Mineral	Constituents: Porphyroblastic cordierites:	0.1 - 0.4 mm., up to 0.8 mm., abundant. Consisting of two types: ill-defined round grains, and clear tabular euhedral rectangular well-crystallized grains.
	Granoblastic groundmass:	Consisting of crypto- to micro-crystalline, very abundant blackish banded carbonaceous matters - abundant anhedral kaolin clays - very few clastic quartz-feldspar silty grains, and partially including biotite and tourmaline granules.
	Quartz veins:	2 - 8 mm., in wide. Consisting of polycrystalline mosaic quartz crystals (0.02 - 0.20 mm., in size) and cutting across hornfels.
Description	This rock was determined by the porphyroblastic cordierites and granoblastic groundmass, as the cordierite spotted pelitic hornfels, and appear to be crystallized higher than the other samples.	
Degree of alteration	_____	

Macroscopic observation;

This rock is the dark grey, crystalline mudstone, including cordierite spotting patches, and cutting across the rocks by the quartz veins.





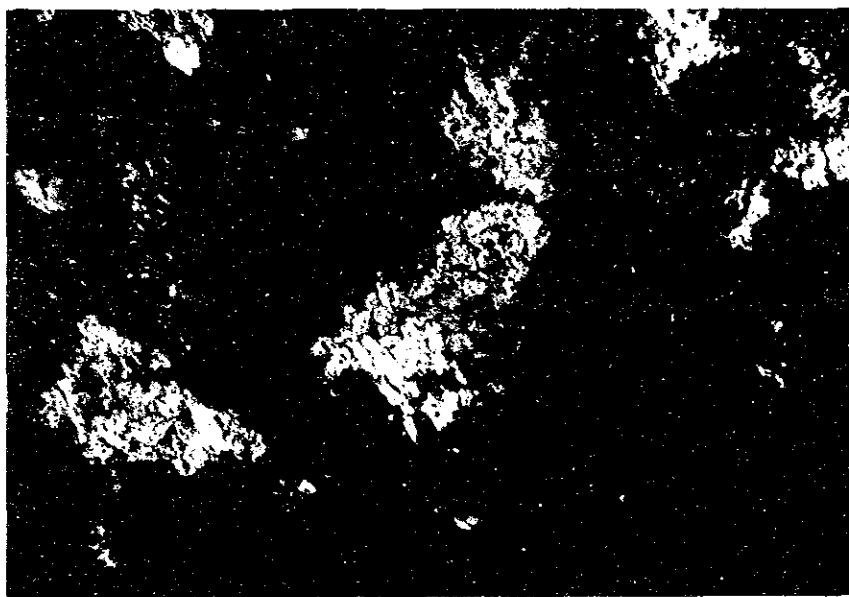
Microscopic Photograph

Project:	<u>Nam Yuam River Basin Hydroelectric Development</u>	Locality:	<u>Nam Mae Rit Drill Hole DL-2 39.80 m</u>
Sample No.:	<u>4</u>	Slice No.:	<u>4</u>
Rock Name:	<u>Cordierite spotted pelitic hornfels</u>		



Cordierite porphyroblasts  
in granoblastic groundmass.

Parallel polars Magn. X 100



Crossed polars Magn. X 100

0 0.14 mm  
Scale



**[2] Chemical Analysis of Rock Samples  
(Nam Mae Ngao No. 2 and Nam Mae Rit Dam Site)**



## [2] Chemical Analyses of Rock Samples

Quantitative chemical analyses of rocks were carried out aiming at knowing the carbonate contents of rocks distributed at Nam Mae Ngao No.2 dam site and in the reservoir area of Nam Mae Rit.

Samples analyzed are as follows:

Limestone	4 pieces
Argillaceous band in limestone	1 piece
Calcareous sandstone	1 piece

The components analyzed are CaO, MgO, SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub>. The results of analyses are shown in Table 5.

The limestone (Drill hole DR-1) distributed at right-bank ridge of Nam Mae Ngao No.2 dam site contains the large content of CaCO<sub>3</sub> and CaMg(CO<sub>3</sub>)<sub>2</sub>, being 85.9 to 93.6%.

The argillaceous band interbedded with limestone (Drill Hole DL-2) which is distributed at the left-bank ridge of Nam Mae Ngao No.2 dam site has the large content of SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub>, being 59.7%.

The limestones distributed at the upstream of Nam Mae Ngao No.2 dam axis and Nam Mae Rit dam axis have the large content of SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub>, being 28.8 to 31.9%.

The calcareous sandstone (Drill hole DR-3) distributed at the right-bank side of Nam Mae Ngao No.2 dam site has the large content of SiO<sub>2</sub> + Al<sub>2</sub>O<sub>3</sub>, being 81.6%.

As described above, rocks other than limestone distributed at the right-bank ridge of Nam Mae Ngao No.2 dam site contain the larger content of SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub>, so that they have strong resistance against solution.

Table 5 Quantitative Chemical Analysis of Rock

Sample No.	Locality	Rock Name	Result of Analysis	1/ Result of Norm Calculation	2/ Result of Norm Calculation	Remarks
			Composition % (Wt)	Composition % (Wt)	Composition % (Wt)	
5	Nam Mae Ngao No.2 Drill Hole DR-1 (Depth: 18.85 - 18.95 m)	Limestone	CaO 45.10	CaCO <sub>3</sub> 80.49	CaCO <sub>3</sub> 74.09	
			MgO 2.58	MgCO <sub>3</sub> 5.40	CaMg(CO <sub>3</sub> ) <sub>2</sub> 11.80	
			SiO <sub>2</sub> 9.93	SiO <sub>2</sub> 9.93	SiO <sub>2</sub> 9.93	
			Al <sub>2</sub> O <sub>3</sub> 2.40	Al <sub>2</sub> O <sub>3</sub> 2.40	Al <sub>2</sub> O <sub>3</sub> 2.40	
			Total 60.01	Total 98.22	Total 98.22	
6	Nam Mae Ngao No.2 Drill Hole DR-1 (Depth: 83.2 - 83.25 m)	Limestone	CaO 51.89	CaCO <sub>3</sub> 92.60	CaCO <sub>3</sub> 91.43	
			MgO 0.47	MgCO <sub>3</sub> 0.98	CaMg(CO <sub>3</sub> ) <sub>2</sub> 2.15	
			SiO <sub>2</sub> 3.37	SiO <sub>2</sub> 3.37	SiO <sub>2</sub> 3.37	
			Al <sub>2</sub> O <sub>3</sub> 1.30	Al <sub>2</sub> O <sub>3</sub> 1.30	Al <sub>2</sub> O <sub>3</sub> 1.30	
			Total 57.03	Total 98.25	Total 98.25	
7	Nam Mae Ngao No.2 Drill Hole DR-3 (Depth: 45.9 - 46.0 m)	Calcareous Sandstone	CaO 4.11	CaCO <sub>3</sub> 7.33	CaCO <sub>3</sub> 0.26	
			MgO 2.85	MgCO <sub>3</sub> 5.96	CaMg(CO <sub>3</sub> ) <sub>2</sub> 13.03	
			SiO <sub>2</sub> 69.25	SiO <sub>2</sub> 69.25	SiO <sub>2</sub> 69.25	
			Al <sub>2</sub> O <sub>3</sub> 12.32	Al <sub>2</sub> O <sub>3</sub> 12.32	Al <sub>2</sub> O <sub>3</sub> 12.32	
			Total 88.53	Total 94.86	Total 94.86	
1	Nam Mae Ngao No.2 Drill Hole DL-2 (Depth: 75.2 - 75.3 m)	Argillaceous Band	CaO 18.41	CaCO <sub>3</sub> 32.85	CaCO <sub>3</sub> 29.52	Argillaceous band in limestone
			MgO 1.34	MgCO <sub>3</sub> 2.80	CaMg(CO <sub>3</sub> ) <sub>2</sub> 6.13	
			SiO <sub>2</sub> 53.53	SiO <sub>2</sub> 53.53	SiO <sub>2</sub> 53.53	
			Al <sub>2</sub> O <sub>3</sub> 6.19	Al <sub>2</sub> O <sub>3</sub> 6.19	Al <sub>2</sub> O <sub>3</sub> 6.19	
			Total 79.47	Total 95.37	Total 95.37	
8	Nam Mae Ngao No.2 Right Bank Upstream of Dam Axis	Limestone	CaO 38.29	CaCO <sub>3</sub> 68.33	CaCO <sub>3</sub> 66.07	
			MgO 0.91	MgCO <sub>3</sub> 1.90	CaMg(CO <sub>3</sub> ) <sub>2</sub> 4.16	
			SiO <sub>2</sub> 26.96	SiO <sub>2</sub> 26.96	SiO <sub>2</sub> 26.96	
			Al <sub>2</sub> O <sub>3</sub> 1.86	Al <sub>2</sub> O <sub>3</sub> 1.86	Al <sub>2</sub> O <sub>3</sub> 1.86	
			Total 68.02	Total 99.05	Total 99.05	
9	Nam Mae Rit Left Bank Upstream of Dam Axis	Limestone	CaO 39.39	CaCO <sub>3</sub> 70.30	CaCO <sub>3</sub> 67.30	
			MgO 1.21	MgCO <sub>3</sub> 2.53	CaMg(CO <sub>3</sub> ) <sub>2</sub> 5.53	
			SiO <sub>2</sub> 22.22	SiO <sub>2</sub> 22.22	SiO <sub>2</sub> 22.22	
			Al <sub>2</sub> O <sub>3</sub> 9.67	Al <sub>2</sub> O <sub>3</sub> 9.67	Al <sub>2</sub> O <sub>3</sub> 9.67	
			Total 72.49	Total 104.72	Total 104.72	

[3] Geologic Log of Drill Hole





**Nam Mae Ngao No. 2**

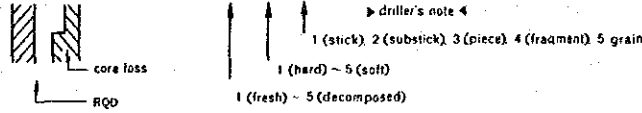


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR-0 (SHEET 1 OF 2)

LOCATION	Dam right bank	DEPTH OF HOLE	35.0 m	COMMENCED	18-Mar-'86
ELEVATION	271.906 m	DEPTH OF OVERBURDEN	2.4 m	COMPLETED	27-Mar-'86
COORDINATE	1.967, 392.658 N 393.859, 171 E	LENGTH OF ROCK DRILLING	32.6 m	DRILLED BY	Surin
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	18.4 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	52.6%		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BY CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION													
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING	DESCRIPTION																
0m		0-100								0	40	0m												
1	Overburden	△		rdx brn				0.0~2.4m : Overburden clayey silt.				1												
2	Overburden	△										2												
3	Weathered SANDSTONE	•••		brn to lt brn	5	5	5	2.4~12.3m : Fine to medium grained SANDSTONE; intercalated with SHALE. Non calcareous.  Completely to highly weathered.  Almost soil like cores. Rock fragments broken by hands.  Sheared and clayey at 11.2~12.3m.	No Test															
4		•••																						
5		•••																						
6		•••																						
7		•••																						
8		•••																						
9		•••																						
10		•••													4	4	5	4						
11		•••													5	5	5							
12		•••	▲▲																12.3~15.0m : Fine to medium grained S-S. Non calcareous. Weathered and cracks stained. Sheared and clayey at 14.3~15.0m.					
13	•••	▲▲		brmx gry	3	3	3																	
14	•••	▲▲			3	4	5																	
15	•••	▲▲			3	1	1																	
16	•••	▲▲			5	5	4																	
17	SANDSTONE	•••		dk gry	1	3	4-5	15.0~17.7m : Almost cuttings. Fragmental cores at 16.2 ~16.5m and 17.45~17.65m. No stained. Some parts clayey.	G.L. - 15.5m															
18	•••														5	5								
19	•••														3	4								
20								17.9~21.0m : Obtained only cuttings. Drilled by Tricone Bit.																



# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR-0 (SHEET 2 OF 2)

LOCATION	Dam right bank	DEPTH OF HOLE	35.0 m	COMMENCED	18-Mar-'86
ELEVATION	271.906 m	DEPTH OF OVERBURDEN	2.4 m	COMPLETED	27-Mar-'86
COORDINATE	1,967,292.658 N 393,859,171 E	LENGTH OF ROCK DRILLING	32.6 m	DRILLED BY	Surin
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	18.4 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	52.6 %		

DEPTH	ROCK NAME	LOG	CEMENTA-KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
				COLOR	WEATHER-ING	HARD-NESS	CORE CUTTING	DESCRIPTION				
20m		0 → 100 %	Tricone						0	40	20m	
1							5	21.0~28.2m : Fine to medium grained SANDSTONE. Non calcareous. Almost cuttings.			1	
2							4	Gravelly cores at 21.0~23.2m, 23.8~24.0m, 26.9~27.0m and 27.5~28.0m.			2	
3							4	Fragments are fresh and hard.			3	
4							4	Sheared and clayey cores at 21.4 ~ 21.7m and 22.8 ~ 23.0m.			4	
5							4				5	
6							4		No Test		6	
7							4				7	
8							4				8	
9							4	28.2~35.0m : Obtained only cuttings. Drilled by Tricone Bit.			9	
30							4				30	
1							4				1	
2							4				2	
3							4				3	
4							4				4	
35							4				35	
6							4				6	
7							4				7	
8							4				8	
9							4				9	
0							4				0	

↓ core loss  
 ↓ RQD  
 ↓ driller's note 4  
 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR - 1 (SHEET 1 OF 5)

LOCATION	Dam right bank	DEPTH OF HOLE	90.0 m	COMMENCED	18-Feb-'86
ELEVATION	271.25 m	DEPTH OF OVERBURDEN	3.2 m	COMPLETED	14-Mar-'86
COORDINATE	1,967,248.685 N 393,919.829 E	LENGTH OF ROCK DRILLING	86.8 m	DRILLED BY	Surin
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	87.1 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	96.8 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION			
0m		0-100%							0	40	0m
0.0~3.2m	Overburden	△		rdx brn				0.0~3.2m : Overburden. Silty clay with few rock fragments.			
3.2~20.0m	Limestone	□		gry	3	3	4	3.2~20.0m : LIMESTONE. Massive.			
3.2~3.8m					4	4	2~3	3.2~3.8m Hard. Cracks stained.			
3.8~5.0m								3.8~5.0m Highly wtd. Cores broken by hands.			
4.15~4.3m					5	5	4	Brownish clay at 4.15~4.3m.	No Test		
4.1m					5	5	4	Argillaceous band at 4.1m, Dip of bedding plane is 60~70°.			
5.0~10.0m								5.0~10.0m Decomposed. Almost soil like cores. Partially substicky cores.			
10.5~17.0m								10.5~17.0m Highly to moderately weathered.			
11.0m, 11.7m and 12.1m					3	3	2	Rock itself discolored and broken by light hammer blow.	Lu <sup>1</sup> =48.8 (P <sub>max</sub> =2.56 kg/cm <sup>2</sup> )		
16.4~16.55m					4	4	2	Some cracks filled with brownish clay.			
17.0~18.4m								Solution cracks at 11.0m, 11.7m and 12.1m (60°). Clayey at 16.4~16.55m.			
18.4~20.0m					4	4	4	17.0~18.4m Dips of cracks are generally 20~30° and 60°. Cracks stained.	Leakage of Drilling Water		
18.4~20.0m					3	3	3	18.4~20.0m Fresh and hard. Good rock.	Lu <sup>1</sup> =35.2 (P <sub>max</sub> =2.99 kg/cm <sup>2</sup> )		
20.0m					2	2	2	Intercalated with argillaceous band. Dips of bedding planes are 60~70°.			

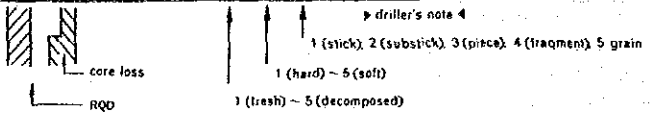
driller's note 4  
 1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain  
 core loss  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR-1 (SHEET 2 OF 5)

LOCATION	Dam right bank	DEPTH OF HOLE	90.0 m	COMMENCED	18-Feb-'86
ELEVATION	271.25 m	DEPTH OF OVERBURDEN	3.2 m	COMPLETED	14-Mar-'86
COORDINATE	1967 248 685 N 393 319 829 E	LENGTH OF ROCK DRILLING	86.8 m	DRILLED BY	Surin
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	87.1 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	96.8 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BITTING CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION		
				COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER				
20m		0 → 100								40	20m	4		
1	LIMESTONE	CASING		grey	2	2	2	20.0~40.0m :	LUGEON		40	20m	4	
2								LIMESTONE.						Lu <sup>1</sup> =13.9
3								Intercalated with argillaceous bands.						(Pmax=3.49kg/cm <sup>2</sup> )
4								Dips of bedding planes are generally 60~70°						
5								20.0~25.6m						
6								Fresh and hard.						
7								Good rock.						
8								Few cracks stained.						
9								Brownish clay at 21.6m.						
10								Solution crack at 23.9m.						
11	LIMESTONE			grey	3	3	3	25.6~28.1m	Lu <sup>1</sup> =2.7		40	20m	4	
12								Cracks stained.						(Pmax=8.03kg/cm <sup>2</sup> )
13								Rock itself somewhat discolored.						
14								Dips of cracks are generally 60°.						
15								Solution cracks at 26.2m, 26.6m and 27.4m.						
16								28.1~29.8m						
17								Sheared and clayey at 28.0~28.1m						
18								Some cracks stained.						
19								Generally fresh and hard.						
20								Good rock.						
21	Solution cracks at 28.9m and 29.8m.													
22	LIMESTONE			grey	2	2	2	29.8~30.0m	Lu <sup>1</sup> =24.6		40	20m	4	
23								Core loss.						(Pmax=5.53kg/cm <sup>2</sup> )
24								30.0~32.3m						
25								Cracks stained.						
26								Rock itself somewhat discolored.						
27								Brownish clay on cracks at 30.4m, 31.0m, 31.5m, 32.0m and 32.1m.						
28								32.3~35.1m						
29								Cracks stained.						
30								Crack filled with brownish clay at 34.9m (70°).						
31								LIMESTONE						
32	Generally, fresh and hard.	(Pmax=8.99kg/cm <sup>2</sup> )												
33	Good rock.													
34	Some cracks stained.													

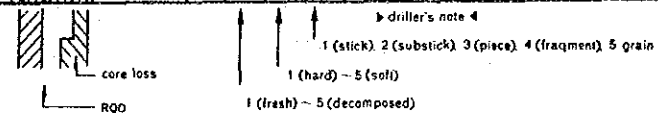


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR-1 (SHEET 3 OF 5)

LOCATION	Dam right bank	DEPTH OF HOLE	90.0 m	COMMENCED	18-Feb-'86
ELEVATION	271.25 m	DEPTH OF OVERBURDEN	3.2 m	COMPLETED	14-Mar-'86
COORDINATE	1967.248.685 N 393.919.829 E	LENGTH OF ROCK DRILLING	86.8 m	DRILLED BY	Surin
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	87.1 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	96.8%		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE			DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS		CORE CUTTING	WATER PRESSURE TEST		
40m		0 → 100%								40m	m
1	LIMESTONE			grey	2	3	40.0~60.0m :	Lu' = 23.1 (Pmax = 5.47kg/cm²)		40	40m
2							LIMESTONE.				
3							Intercalated with argillaceous bands.				
4							Dips of bedding planes are generally 70°				
5							40.0~40.8m				
6							Cracks stained and rock itself somewhat discolored.				
7							Calcite vug at 40.4m (80°).				
8							Solution cracks at 40.5m and 40.8m.				
9							40.8~51.4m				
10							Some cracks stained.				
11	LIMESTONE			grey	2	3	51.4~52.2m	Lu = 12.4 (Pmax = 14.09kg/cm²)		40	40m
12							Core loss.				
13							52.2~60.0m				
14							Few cracks stained.				
15							Generally fresh and hard.				
16							Hair cracks developed at 57.9~59.6m.				
17							Brownish clay on cracks at 59.6m and 59.7m.				
18											
19											
20											
21											
22											
23											
24											
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# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR-1 (SHEET 4 OF 5)

LOCATION	Dam right bank	DEPTH OF HOLE	90.0 m	COMMENCED	18-Feb-'86
ELEVATION	271.25 m	DEPTH OF OVERBURDEN	3.2 m	COMPLETED	14-Mar-'86
COORDINATE	1,967,248.685 N 333,919.829 E	LENGTH OF ROCK DRILLING	86.8 m	DRILLED BY	Surin
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	87.1 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	96.8 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE			DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER			
60m		0 ~ 100							LUGEON			60m	
1	LIMESTONE			grey	2	3	4	60~80m :	LUGEON				
2								LIMESTONE.					
3								Intercalated with orgillaceous bands.					
4													
5													
6													
7													
8													
9													
10													
11								60.0~67.55m					
12								Few cracks stained.					
13								Hair cracks developed and somewhat brittle.					
14													
15								67.55~70.0m					
16								Cracks stained.					
17								Rock itself somewhat discolored.					
18								Generally cracks filled with brownish clay.					
19								Core loss at 68.7~69.85m.					
20													
21								70.0~72.0m					
22								Some cracks stained.					
23								72.0~73.65m					
24								Cracks stained, and rock itself somewhat discolored.					
25								Crack filled with whitish clay at 72.1m (30°).					
26								Brownish clay on cracks at 73.0m, 73.1~73.3m (80°) and 73.5m (90°).					
27								73.65~76.0m					
28								Fresh and hard rock.					
29								76.0~77.75m					
30								Cracks stained and rock itself somewhat discolored.					
31								Brownish clay on cracks at 77.0m, 77.15m, 77.3~77.55m (80°) and 77.6~77.7m					
32								77.75~80.0m					
33								Some cracks stained					

Lu' = 20.8  
(Pmax = 7.6 kg/cm<sup>2</sup>)

No Test

Cementation

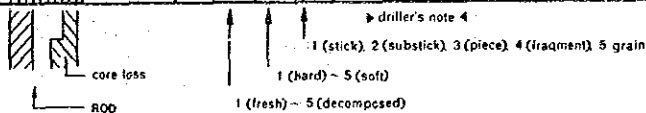
▶ driller's note 4  
 1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

## GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR-1 (SHEET 5 OF 5)

LOCATION	Dam right bank	DEPTH OF HOLE	90.0 m	COMMENCED	18-Feb-'86
ELEVATION	271.25 m	DEPTH OF OVERBURDEN	3.2 m	COMPLETED	14-Mar-'86
COORDINATE	1967 248 685 N 393 919 829 E	LENGTH OF ROCK DRILLING	86.8 m	DRILLED BY	Surin
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	87.1 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	96.8 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE			DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH		
80m		0 → 100							LUGEON			40	80m
1	LIMESTONE	70°		grey				80.0~90.0m :	No Test				
2								LIMESTONE. Intercalated with argillaceous bands.					
3								Dips of bedding planes are approximately 70°.					
4								Generally, fresh and hard. Good rock.					
5								Some cracks stained.					
6								Rock itself somewhat discolored at 83~84.2m and 86.1~86.3m.					
7								Brownish clay on cracks at 83~83.4m (80°).					
8								84.2m (45°) and 86.1m (60°).					
9													
0													





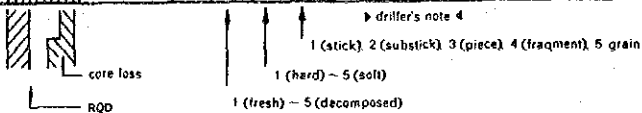
# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR-2 (SHEET 2 OF 2)

LOCATION	Dam right bank	DEPTH OF HOLE	35.0 m	COMMENCED	3-Mar-'86
ELEVATION	223.83 m	DEPTH OF OVERBURDEN	0.5 m	COMPLETED	19-Mar-'86
COORDINATE	1957 208 138 N 393 792 266 E	LENGTH OF ROCK DRILLING	34.5 m	DRILLED BY	Samang
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	16.35 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	46.7%		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION		
				COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER				
20m		0 → 100%								0	40	20m	m	
1	S.S		CASING	grey	1	4	4	20.0~35.0m : Fine to medium grained SANDSTONE. None calcareous. Generally sheared and cracky.						
2								20.0~22.0m Almost cuttings.						
3								22.0~25.5m Sheared at 22.0~22.25m, 23.0~23.7m, 24.3~24.4m and 24.65~25.5m, Sheared plane 80°						
4	S.S			grey		4	3							
5								25.5~28.45m Cracky and fragmental cores. Slickenside in parts.						
6	S.S			grey		4	3							
7								28.45~29.9m Cuttings. Gravelly cores in parts.						
8								29.9~30.7m Fragmental cores.						
9								30.7~31.3m Cuttings. Drilled by tricone bit.						
30								31.3~31.7m Fragmental cores. Sheared at 31.7m.						
1	SANDSTONE		Tricone	grey				31.7~35.0m Obtained only cuttings. Drilled by tricone bit.						
2			Tricone Bit											
3														
4														
5														
6														
7														
8														
9														
0														

No Test



# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR-3 (SHEET 1 OF 3)

LOCATION Dam right bank DEPTH OF HOLE 55.0 m COMMENCED 12-Feb-'86  
 ELEVATION 180.65 m DEPTH OF OVERBURDEN 1.7 m COMPLETED 22-Feb-'86  
 COORDINATE 1967 051 193 N LENGTH OF ROCK DRILLING 53.3 m DRILLED BY Samang  
393 227 917 E TOTAL LENGTH OF CORE 52.6 m LOGGED BY K. Ishikawa  
 ANGLE FROM HORIZONTAL 90° CORE RECOVERY 95.6%

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING				
0m			0 → 100%						0	40	0m
0.0~1.7m	O·B	△		rdx brn				0.0~1.7m : Overburden. Silty clay.			1
1.7~20.0m	Withd S-S	•		rdx brn	5	5	3, 4	1.7~20.0m : Medium grained SANDSTONE. Non calcareous.			2
1.6~3.5m	Withd S-S	•		pale brn	4	4	3, 4	1.6~3.5m Decomposed. Rock fragments crushed by finger pressure.	No test		3
3.5~4.4m				pale brn	3	4	4	3.5~4.4m Core loss. 4.4~5.9m Weathered. Cracks stained. Rock fragments broken by hands.			4
5.9~10.0m	SANDSTONE	•		grey	2	3	2	5.9~10.0m Cracks stained up to 6.8m. Dips of cracks are 10~30°, 60~70°. Somewhat sheared at 9.1~10.0m.			5
10.0~11.5m								10.0~11.5m Core loss.	G.L. - 10.0m Lu = 3.8 (Pmax = 3.9 kg/cm <sup>2</sup> )		6
11.5~20.0m	SANDSTONE	•		grey	2	3	2, 3	11.5~20.0m Generally fresh and hard. Dips of cracks are 10~30° and 60°. Cracks no stained. Many calcite veinlets are found.			
15.0~15.5m								15.0~15.5m are soft and crushed by hands.	Lu = 0.2 (Pmax = 3.8 kg/cm <sup>2</sup> )		8

driller's note  
 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

## GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nani Mae Ngao No.2 HOLE No. DR-3 (SHEET 2 OF 3)

LOCATION	Dam right bank	DEPTH OF HOLE	55.0 m	COMMENCED	12-Feb-'86
ELEVATION	180.65 m	DEPTH OF OVERBURDEN	1.7 m	COMPLETED	22-Feb-'86
COORDINATE	1967 051 193 N 393 227 917 E	LENGTH OF ROCK DRILLING	53.3 m	DRILLED BY	Samang
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	52.6 m	LOGGED BY	K.Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	95.6 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING	OBSERVATION OF CORE  DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
												LUGEON
2.0m		0 → 100%								0	20m	
1	Calcareous SANDSTONE			grey			2	20.0~40.0m	Lu <sup>1</sup> =0.1 (Pmax=4.89 kg/cm <sup>2</sup> )	1		
2							3	Medium grained SANDSTONE.		2		
3							4	Calcareous.		3		
4							3	Fresh, but somewhat brittle.		2		
5							3	Many calcite veinlets are found.		3		
6							2	Dips of cracks are generally 30° and 60~80°		2		
7							2	Sheared and clayey at 21.1m, 21.6~22.0m, 22.1~22.3m, 33.95m, 34.25m, 36.1m and 39.85~40.25m.		3	Lu <sup>1</sup> =0.1 (Pmax=5.83 kg/cm <sup>2</sup> )	7
8							3	Dips of shear planes are 70~80° at 34.25m, 60° at 33.95m, 30° at 36.1m.		2		8
9							3	Interbedded with SHALE at 32.6~32.7m.		3	Lu <sup>1</sup> =0.3 (Pmax=6.95 kg/cm <sup>2</sup> )	9
30							3	Dip of bedding is 45°		2		30
1			2		1							
2			3		2							
3			2		3							
4			3		4							
5			2		5							
6			3		6							
7			2		7	Lu <sup>1</sup> =0.1 (Pmax=7.83 kg/cm <sup>2</sup> )						
8			3		8							
9			2		9							
40			3		40							
			4									

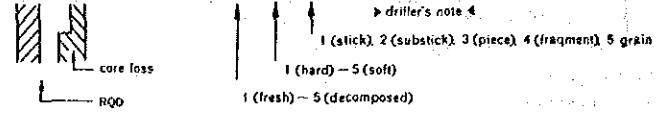
▶ driller's note 4  
 1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR-3 (SHEET 3 OF 3)

LOCATION	Dam right bank	DEPTH OF HOLE	55.0 m	COMMENCED	12-Feb-'86
ELEVATION	180.65 m	DEPTH OF OVERBURDEN	1.7 m	COMPLETED	22-Feb-'86
COORDINATE	1967051.193 N 385227.917 E	LENGTH OF ROCK DRILLING	53.3 m	DRILLED BY	Samong
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	52.6 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	95.6 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION		
				COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION					
40m		0 → 100%								40	40m		
1	Calcareous SANDSTONE	A		grey	1	2	2	40.0 ~ 55.0m	LUGEON	40	40m		
2								Medium to coarse grained SANDSTONE.				Lu' = 1.8 (Pmax = 8.82 kg/cm <sup>2</sup> )	
3								Calcareous.					
4								Fresh and hard.					
5								Generally good rock.					
6								Many calcite veinlets.					
7								Dips of cracks are generally 30° and 60°					
8								Sheared at 40.0 ~ 40.25m.					Lu' = 0.0 (Pmax = 9.93 kg/cm <sup>2</sup> )
9								Cracky at 40.25 ~ 40.65m and 54.8 ~ 55.0m. Some cracks filled with clay.					
50													
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9													
0													





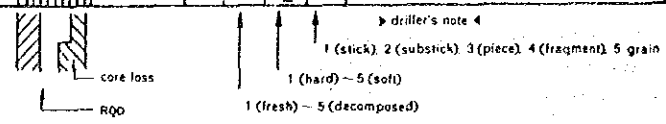


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuom PROJECT Nam Mae Ngao No.2 HOLE No. DR-4 (SHEET 2 OF 5)

LOCATION	Dam right bank	DEPTH OF HOLE	90.0 m	COMMENCED	13-Jan-86
ELEVATION	161.05 m	DEPTH OF OVERBURDEN	1.5 m	COMPLETED	12-Feb-86
COORDINATE	1967 131 422 N 393 520 217 E	LENGTH OF ROCK DRILLING	88.5 m	DRILLED BY	Phadung
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	87.6 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	97.6%		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	OBSERVATION OF CORE	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
20m		0 → 100								0	20m
1	SHALE			black	1	2	2	20.0 ~ 41.9 m : Alternating beds of SHALE and SANDSTONE. SHALE predominant. Thickness of SANDSTONE beds are 1 ~ 5m/m in general. Generally, SANDSTONE is calcareous.	Lu = 0.3 (Pmax = 4.4 kg/cm <sup>2</sup> )	1	
2										2	
3										3	
4	SHALE			black	1	2	2			4	
5								Fresh and hard, good rock.		5	
6									Lu = 0.8 (Pmax = 5.39 kg/cm <sup>2</sup> )	6	
7	SHALE			bik	1	2	4			7	
8										8	
9								Thick bed of calcareous SANDSTONE at 30.3 ~ 31.0m.		9	
30	SH			bik			3			30	
1	S-S			gry			2			1	
2									Lu = 0.3 (Pmax = 6.37 kg/cm <sup>2</sup> )	2	
3										3	
4	SHALE			black	1	2	2	Clayey at 34.6m.		4	
5										5	
6								Thick bed of calcareous SANDSTONE at 37.7 ~ 38.7m.		6	
7									Lu = 0.9 (Pmax = 7.35 kg/cm <sup>2</sup> )	7	
8	S-S			gry			3	Many slicken sides at 39.0 ~ 40.0m.		8	
9	SH			bik			3	Sheared at 39.5 ~ 39.85m.		9	
40										40	

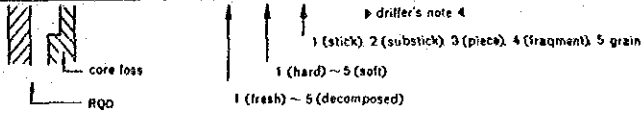


## GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR-4 (SHEET 3 of 5)

LOCATION	Dam right bank	DEPTH OF HOLE	90.0 m	COMMENCED	13-Jan-'86
ELEVATION	161.05 m	DEPTH OF OVERBURDEN	1.5 m	COMPLETED	12-Feb-'86
COORDINATE	1.967 131.422 N 393.520 217 E	LENGTH OF ROCK DRILLING	88.5 m	DRILLED BY	Phadung
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	87.6 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	97.6%		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				WATER TABLE		DEPTH	ELEVATION	
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST			LEAKAGE OF DRILLING WATER
40m										0	40m	
1	SHALE			b/k			3	41.9~60.0m : Alternating beds of SHALE and SANDSTONE.  SANDSTONE predominant.  SANDSTONE is medium grained and calcareous.  Fresh and hard, good rock.  Dips of bedding planes are 60°.  Calcite veinlets in parts.	Lu=1.0 (Pmax=8.35 kg/cm <sup>2</sup> )		1	
2						4					2	
3						3					3	
4						4					4	
5						3					5	
6				grey		2					6	
7	Calcareous SANDSTONE						3	No Test			7	
8							3				8	
9							3				9	
50							2			50		
1	SH			b/k			4	Core loss at 59.0 ~ 59.5m.  Somewhat sheared at 59.75~60.25m. Slicken- side are found.	Lu=0.9 (Pmax=10.32 kg/cm <sup>2</sup> )		1	
2	S-S			grey			3				2	
3	S-S			grey			3				3	
4	SH			b/k			3				4	
5							3			5		
6	S-S			grey			2			6		
7	SH			b/k			4	Lu=0.4 (Pmax=11.35 kg/cm <sup>2</sup> )			7	
8	S-S			gy			3				8	
9	S-S						3				9	
60							3			60		

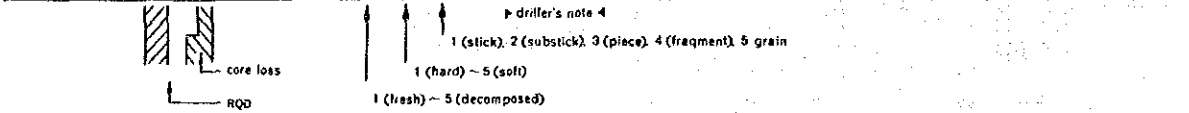


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR-4 (SHEET 4 OF 5)

LOCATION Dam right bank DEPTH OF HOLE 90.0 m COMMENCED 13-Jan-'86  
 ELEVATION 161.05 m DEPTH OF OVERBURDEN 1.5 m COMPLETED 12-Feb-'86  
 COORDINATE 1967 131 422 N LENGTH OF ROCK DRILLING 88.5 m DRILLED BY Phadung  
993 520 217 E TOTAL LENGTH OF CORE 87.6 m LOGGED BY K. Ishikawa  
 ANGLE FROM HORIZONTAL 90 ° CORE RECOVERY 97.6 %  
 BEARING OF ANGLE HOLE \_\_\_\_\_

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	OBSERVATION OF CORE					WATER TABLE	WATER PRESSURE TEST	DEPTH	ELEVATION	
						HARDNESS	CORE CUTTING	DESCRIPTION	LEAKAGE OF DRILLING WATER	DEPTH					ELEVATION
60m		0 → 100%											40	60m	
1	SH			bik		3	4	60.0~80.0m							1
2	S-S			gry		4	2	Alternating beds of							2
3	SHALE			bik		2	3	SHALE and SANDSTONE.							3
4	SHALE			bik		4	2	SANDSTONE is medium							4
5	SHALE			bik		3	3	to coarse grained and							5
6	SHALE			bik		2	2	calcareous.							6
7	SHALE			bik		3	3	SANDSTONE predominant							7
8	SHALE			bik		4	2	up to 73.55m.							8
9	SHALE			bik		4	2	Dips of bedding planes							9
70	SHALE			black		3	3	are 45~60°							70
1	S-S			grey		3	3	Fresh and hard.							1
2	S-S			grey		2	2	Good rock.							2
3	S-S			grey		3	3							3	
4	S-S			grey		4	2							4	
5	S-S			grey		3	3							5	
6	S-S			grey		2	2							6	
7	S-S			grey		3	3							7	
8	S-S			grey		2	2							8	
9	S-S			grey		3	3							9	
80	SHALE			black		1	2							80	



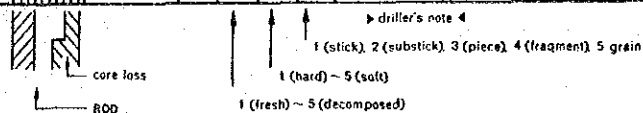
driller's note 4  
 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DR-4 (SHEET 5 OF 5)

LOCATION	Dam right bank	DEPTH OF HOLE	90.0 m	COMMENCED	13 Jan '86
ELEVATION	161.05 m	DEPTH OF OVERBURDEN	1.5 m	COMPLETED	12 Feb '86
COORDINATE	1967 131 422 N 393 520 217 E	LENGTH OF ROCK DRILLING	88.5 m	DRILLED BY	Phadung
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	87.8 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	97.6 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER LUGEON	DEPTH	ELEVATION
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING				
80m		0 → 100%							0	80m	
1	SH			black			1	80.0~90.0m :			
2	S-S			gry			2	Alternating beds of	LU=1.3		
3							3	SHALE and SANDSTONE.	(Pmax=16.42 kg/cm <sup>2</sup> )		
4							2	SHALE predominant.			
5							3	Thickness of SANDSTONE			
6							2	beds are 1~30m.			
7							3	SANDSTONE is medium			
8							2	grained and calcareous.			
9							3	Dips of bedding planes			
10							2	are 45~60°.			
11							1	Fresh and hard.			
12							2	Good rock.	Lu=1.3		
13							3	Sheared at 82.5 ~	(Pmax=17.41 kg/cm <sup>2</sup> )		
14							3	82.9m and 89.6 ~			
15							3	89.8m.			
16							3	Dips of sheared planes			
17							3	are 60° slickensides			
18							3	are found.			



# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DL-1 (SHEET 1 OF 4)

LOCATION	Dam left bank	DEPTH OF HOLE	70.0 m	COMMENCED	24-Feb-'86
ELEVATION	220.38 m	DEPTH OF OVERBURDEN	1.5 m	COMPLETED	8-Mar-'86
COORDINATE	1967 083.846 N 393.344 150 E	LENGTH OF ROCK DRILLING	68.5 m	DRILLED BY	Kanchano
ANGLE FROM HORIZONTAL	90 °	TOTAL LENGTH OF CORE	67.4 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	96.3 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION	
				COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER			
0m										0	40	0m	
1	O-B	△		rdx brn				0.0~1.5m: Overburden. Clayey silt.					1
2								1.5~20.0m: SANDSTONE. Fine to medium grained. Non calcareous.					2
3													3
4								1.5~7.0m and 10.0~11.0m Decomposed. Soft. Rock fragments crushed by finger pressure.					4
5													5
6								7.0~10.0m, 11.0~12.5m Decomposed. Soft. Rock fragments can not be crushed by finger pressure.					6
7													7
8													8
9								12.5~18.9m Highly weathered. Cracky.					9
10													10
11	Weathered SANDSTONE			pale brn				Cracks stained, and rock itself stained.					11
12								Cores broken by hands.					12
13								Core loss at 16.75 ~17.5m and 18.4 ~ 18.6m.					13
14													14
15								18.9~20.0m Cracks stained, but rock itself fresh.					15
16													16
17								Piece to substicky cores.					17
18	Whd S-S			pale brn									18
19	S-S			grey									19
20													20

No Test

G.L.-18.0m

↑ driller's note 4  
 1 (stick) 2 (substicky) 3 (piece) 4 (fragment) 5 grain  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

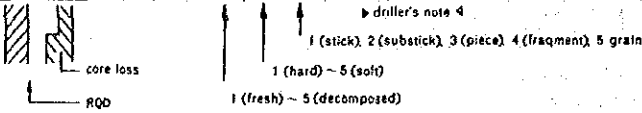


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DL-1 (SHEET 3 OF 4)

LOCATION Dam left bank DEPTH OF HOLE 70.0 m COMMENCED 24-Feb-'86  
 ELEVATION 220.38 m DEPTH OF OVERBURDEN 1.5 m COMPLETED 8-Mar-'86  
 COORDINATE 1,967,083.846 N LENGTH OF ROCK DRILLING 68.5 m DRILLED BY Kanchana  
393,344.150 E TOTAL LENGTH OF CORE 67.4 m LOGGED BY K. Ishikawa  
 ANGLE FROM HORIZONTAL 90° CORE RECOVERY 96.3%  
 BEARING OF ANGLE HOLE \_\_\_\_\_

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE			DEPTH	ELEVATION																																																																				
				COLOR	WEATHERING	HARDNESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER	LUGEON																																																																							
40m		0-100%										40	40m																																																																					
1	SANDSTONE	[Pattern]		grey	1	2	3	2	40.0~60.0m : SANDSTONE. Fine to medium grained. Fresh and hard. Good rock. Partially cracky. Cracks 30~45°, 70~80°	Lu=1.1 (Pmax=10.14 kg/cm <sup>2</sup> )		1	2																																																																					
2															3	4	5	6	7	8	9	10																																																												
3																							2	3	4	5	6	7	8	9	10																																																			
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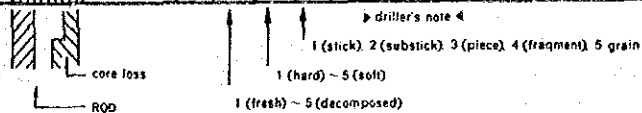


## GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DL-1 (SHEET 4 of 4)

LOCATION	Dam left bank	DEPTH OF HOLE	70.0 m	COMMENCED	24-Feb-'86
ELEVATION	220.38 m	DEPTH OF OVERBURDEN	1.5 m	COMPLETED	8-Mar-'86
COORDINATE	1967 083.846 N 393 344.150 E	LENGTH OF ROCK DRILLING	68.5 m	DRILLED BY	Kanchana
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	67.4 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	96.3 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT OF CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION	
				COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER			
60m	SANDSTONE	0 → 100							LUGEON		40 60m	m	
1			2	10.0 ~ 70.0m :								1	
2			3	SANDSTONE.								2	
3				Fine to medium grained.						Lu = 0.2			
4				Non calcareous.						(Pmax = 14.21 kg/cm <sup>2</sup> )			
5				Fresh and hard.									
6				Good rock.									
7				Cracks 60~80°									
8				Calcite veinlets at some parts.									
9													
70													
1													
2													
3													
4													
5													
6													
7													
8													
9													
0													





# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DL-2 (SHEET 1 OF 5)

LOCATION	Dam left bank	DEPTH OF HOLE	92.0 m	COMMENCED	17-Jan-'86
ELEVATION	302.412 m	DEPTH OF OVERBURDEN	4.0 m	COMPLETED	15-Feb-'86
COORDINATE	1 967 051.193 N 393 227.917 E	LENGTH OF ROCK DRILLING	88.0 m	DRILLED BY	Kanchana
ANGLE FROM HORIZONTAL	90 °	TOTAL LENGTH OF CORE	53.9 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	58.6 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
				COLOR	WEATHERING	HARDNESS	CORE CUTTING					
0m		0 → 100%							0	40	4	
1	Overburden	△		redx brn				0.0~4.0m : Overburden Silty clay.			1	
2												2
3												3
4												4
5		×						4.0~5.0m : Core loss.			5	
6	Weathered SHALE	CROSS-HATCH	CASING	yell brn to brn	4 3	3	5 4	5.0~20.0m Mostly cuttings. Supposedly highly weathered SHALE. Siliceous.	No Test		6	
7								7				
8								8				
9								9				
10								10				
11								11				
12								12				
13								13				
14								14				
15								15				
16							5.0~12.0m Cutting size 0.5~2mm. Not crushed by finger nail. Gravelly cores of Qz vein at 6.0~6.4m. ϕ 1~3cm.			9		
17							12.0~20.0m Cutting size 0.5~4mm. Not crushed by finger nail. Gravelly cores of Qz vein in local at 16.0~17.0m, ϕ 1~5cm.			10		
18							15.6~24.0m Drilled by NW casing shoe.			11		
19										12		
20										13		

Drilled by Casing Shoe

driller's note 4  
1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain  
1 (hard) ~ 5 (soft)  
1 (fresh) ~ 5 (decomposed)

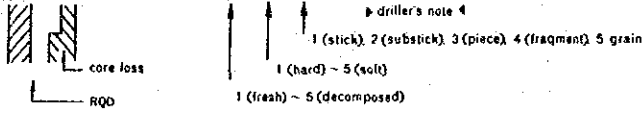
core loss  
RQD

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DL-2 (SHEET 2 of 5)

LOCATION: Dam left bank DEPTH OF HOLE: 92.0 m COMMENCED: 17-Jan-'86  
 ELEVATION: 302.41 m DEPTH OF OVERBURDEN: 4.0 m COMPLETED: 15-Feb-'86  
 COORDINATE: 1967 051 193 N 393 227.917 E LENGTH OF ROCK DRILLING: 88.0 m DRILLED BY: Kanchana  
 ANGLE FROM HORIZONTAL: 90° TOTAL LENGTH OF CORE: 53.9 m LOGGED BY: K. Ishikawa  
 BEARING OF ANGLE HOLE: \_\_\_\_\_ CORE RECOVERY: 58.6%

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER			
20m		0 → 100%									0	20m	
1			Cementation KIND OF BIT CASING  Drilled by Casing Shoe	yell brn to brn				20.0~41.0m :	No Test				
2								Mostly cutting, Supposedly highly weathered SHALE. Siliceous.					
3								20.0~22.0m Cutting size 0.5~2mm. Not crushed by finger nail.					
4								22.0~23.0m Core loss.					
5								23.0~27.0m Cutting size 0.5~2mm. Flaky.					
6								27.0~28.0m Gravelly cores in local. ϕ 0.5~3cm. Siliceous.					
7								Whitish clay at some parts.					
8								28.0~33.0m Gravelly core in local. ϕ 0.2~1cm					
9								33.0~41.0m Fine to medium grained Sand size cuttings. Somewhat flaky. Particles are hard.					
30													
1			Cementation KIND OF BIT CASING  Drilled by Casing Shoe	yell brn to brn					No Test				
2													
3													
4													
5													
6													
7													
8													
9													
40													



# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DL-2 (SHEET 3 OF 5)

LOCATION Dam left bank DEPTH OF HOLE 92.0 m COMMENCED 17 Jan '86  
 ELEVATION 302.41 m DEPTH OF OVERBURDEN 4.0 m COMPLETED 15 Feb '86  
 COORDINATE 1,967,051, 193 N 393,227, 917 E LENGTH OF ROCK DRILLING 88.0 m DRILLED BY Kanchana  
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 53.9 m LOGGED BY K. Ishikawa  
 BEARING OF ANGLE HOLE \_\_\_\_\_ CORE RECOVERY 58.6 %

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS	CORE CUTTING	LUGEON				
40m		0 → 100%								0	40m	m
1	LS			brn					41.0~60.0m : Limestone. Interbedded with argillaceous band at some parts.	Leakage of Drilling Water	1	
2	LS			yel gry	3	3	3		Yellowish grey. Moderately weathered. Cracky in general.	Packer could not be set.	2	
3	LS			yel gry	3	3	3		Cracks stained, and some cracks filled with brownish fine materials.	Water loss 55L/min	3	
4	LS			yel gry	3	3	4		Solution cracks at 42.75~43.0m. Dip of bedding 45~60°. Most cracks along bedding plane.		4	
5	LS			yel gry	3	3	4		Some cracks 20~30°		5	
6	LS			yel gry	3	3	4		Calcite vugs at 41.15m, 41.25m, 42.75, 43.0m, 43.9m, 46.2m, 46.9m, 55.9m and 56.45m.	Packer could not be set.	6	
7	LS			yel gry	3	3	4		47.1~49.9m	Water loss 60L/min	7	
8	LS			pale brn	5	5	5		Pale brn. silt size soil included fragments of 0.5~3cm. Filling materials of cave		8	
9	LS			pale brn	5	5	5		Core loss at 43.0~43.45m, 44.9~45.35m and 46.9~47.1m.	Packer could not be set.	9	
50	LS			pale brn	5	5	5			Water loss 55L/min	50	m
1	LIMESTONE			yel gry	3	3	4				1	
2	LIMESTONE			yel gry	3	3	4				2	
3	LIMESTONE			yel gry	3	3	4				3	
4	LIMESTONE			yel gry	3	3	4				4	
5	LIMESTONE			yel gry	3	3	4				5	
6	LIMESTONE			yel gry	3	3	4				6	
7	LIMESTONE			yel gry	3	3	4				7	
8	LIMESTONE			yel gry	3	3	4				8	
9	LIMESTONE			yel gry	3	3	4				9	
60	LIMESTONE			yel gry	3	3	4				60	m

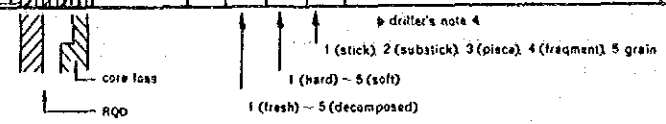
driller's note 4  
 1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DL-2 (SHEET 4 OF 5)

LOCATION	Dam left bank	DEPTH OF HOLE	92.0 m	COMMENCED	17 Jan '86
ELEVATION	302.41 m	DEPTH OF OVERBURDEN	4.0 m	COMPLETED	15 Feb '86
COORDINATE	1957 051 193 N 393 227 917 E	LENGTH OF ROCK DRILLING	88.0 m	DRILLED BY	Konchana
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	53.9 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	58.6 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER LUGEON	DEPTH	ELEVATION	
				COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION				
60m		0 = 100							0	60m	m	
1	LIMESTONE			2	2		1	LIMESTONE. Interbedded with argillaceous bands. yell grey to grey.		1		
2										2		
3						3	4		Thickness of argillaceous bands about 5~10m/m.		3	
4						3		2	Dips of bedding plane are 70~90°.	Packer could not be set.	4	
5						3			Most cracks along bedding plane, 70 to 90°.	Water loss 55L/min	5	
6						2	1		Cracks stained up to 90.5m.		6	
7						3	3				7	
8						3	2		Some cracks filled with brownish fine materials.		8	
9						3	3	4			9	
70						4	4				70	
1	LIMESTONE						2	Calcite vugs at 61.1m and 64.8m.	Lu=1.3 (Pmax=17.76kg/cm <sup>2</sup> )	1		
2										2		
3						3	2		Core loss at 68.0~68.4m.		3	
4						3	4				4	
5						2	2				5	
6						3	3				6	
7						2	2			Lu=4.3 (Pmax=22.08kg/cm <sup>2</sup> )	7	
8									8			
9				grey	2	2	2		9			
80									80			

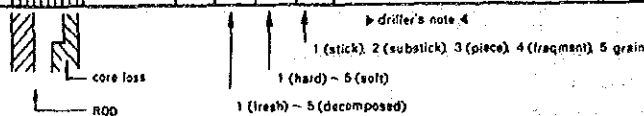


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Ngao No.2 HOLE No. DL-2 (SHEET 5 OF 5)

LOCATION	Dam left bank	DEPTH OF HOLE	92.0 m	COMMENCED	17-Jan-'86
ELEVATION	302.41 m	DEPTH OF OVERBURDEN	4.0 m	COMPLETED	15-Feb-'86
COORDINATE	1,969,051.193 N 393,227.917 E	LENGTH OF ROCK DRILLING	88.0 m	DRILLED BY	Kanchana
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	53.9 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	58.6 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	OBSERVATION OF CORE DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
									WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
80m	LIMESTONE	0 → 100%		grey	2	2	2	77.0 ~ 89.0m :	LUGEON	Lu = 1.2 (Pmax = 22.04 kg/cm <sup>2</sup> )	0	80m
1								2			LIMESTONE.	
2								4			Interbedded with	
3								2			argillaceous band.	
4								3			Cracks stained.	
5								3			Most cracks 70~90°	
6								2			Generally rock itself	
7								3			fresh, and hard.	
8								2			Good rock.	
9								3			Core loss at 89.0	
90	S-S					2	2	90.5 ~ 92.0m :	Packer could not be set. Water loss 52l/min (Depth of casing) 51.0m	G.L. = 89.0m	90	
1								3			SANDSTONE.	
2								2			Fine to medium grained.	
3								3			Calcareous.	
4								2			Somewhat argillaceous.	
5								3			No stained.	
6											Somewhat sheared.	
7											Clayey at 90.7 ~	
8											90.9m.	
9								1			3	4
92												



**Upper Mae Yuam 1**

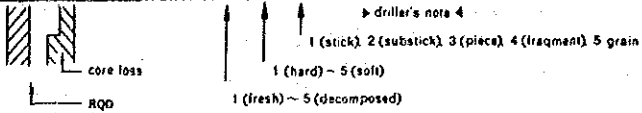


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No.1 HOLE No. DR-1 (SHEET 1 OF 3)

LOCATION	Dam right bank	DEPTH OF HOLE	50.0 m	COMMENCED	16 Jun - '86
ELEVATION	344.785 m	DEPTH OF OVERBURDEN	2.7 m	COMPLETED	30 Jun - '86
COORDINATE		LENGTH OF ROCK DRILLING	47.3 m	DRILLED BY	P. Samang
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	26.6 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	53.2 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE			DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS		CORE CUTTING	WATER PRESSURE TEST		
0m		0 → 100%								0	0m
0-2.7	Overburden	△		rdx brn							
2.7-20.8	SHALE			pale brn							
2.7-7.7				dk brn	5	5	5				
7.7-10.0				yex dk brn	4	4	4				
10.0-20.8	Weathered SHALE			purpx brn							
				pale brn							



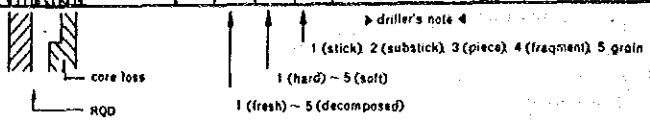


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No. 1 HOLE No. DR-1 (SHEET 2 OF 3)

LOCATION Dam right bank DEPTH OF HOLE 50.0 m COMMENCED 16 Jun '86  
 ELEVATION 344.785 m DEPTH OF OVERBURDEN 2.7 m COMPLETED 30 Jun '86  
 COORDINATE \_\_\_\_\_ LENGTH OF ROCK DRILLING 47.3 m DRILLED BY P. Samang  
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 26.6 m LOGGED BY K. Ishikawa  
 BEARING OF ANGLE HOLE \_\_\_\_\_ CORE RECOVERY 53.2 %

DEPTH	ROCK NAME	LOG	CEMENTA- TION KIND OF BLIND CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE			DEPTH	ELEVATION
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION		
20m		0 → 100										0	20m	43
1	Withd SS		CASING	pink br	4	4	3	4	20.8~22.0m: SANDSTONE. Fine grained. Non calcareous. Highly weathered.	No Test				
2	Withd LS			gry	4	4	4	4						
3				gry	4	4	4	4						
4				gry	4	4	4	4						
5	LIMESTONE			gry	3	2	3	3						
6				gry	3	2	3	3						
7				gry	3	2	3	3						
8				gry	3	2	3	3						
9				gry	3	2	3	3						
30	LS			gry	3	2	3	3						
1			gry	5	5	5	5	29.4~30.5m Cracks stained. Some cracks filled with brownish clay. Dips of cracks are generally 30° and 60°						
2			gry	2	2	2	2							
3			gry	2	2	2	2							
4			gry	2	2	2	3	32.9~33.15m Brownish clay (lmy) includes SHALE fragments.	No Test					
5			gry	2	2	2	3							
6	LS		gry	2	2	2	3	33.15~33.5m Solution crack at 33.15m						
7			gry	2	2	2	3							
8	LS		gry	2	2	2	3	35.1~38.7m Cracks stained. Dips of cracks are generally 10~30° Intercalated with argillaceous bands. Dips of bedding planes are 30° Calcite vug at 37.4m.						
9			gry	2	2	2	3							
40			gry	2	2	2	3							



# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No. 1 HOLE No. DR-1 (SHEET 3 OF 3)

LOCATION Dam right bank DEPTH OF HOLE 50.0 m COMMENCED 16 Jun '86  
 ELEVATION 344.785 m DEPTH OF OVERBURDEN 2.7 m COMPLETED 30 Jun '86  
 COORDINATE \_\_\_\_\_ LENGTH OF ROCK DRILLING 47.3 m DRILLED BY P. Samang  
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 26.6 m LOGGED BY K. Ishikawa  
 BEARING OF ANGLE HOLE \_\_\_\_\_ CORE RECOVERY 53.2%

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE			DEPTH	ELEVATION
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTINGS	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION		
40m		0 → 100											40m	43
1	SH			4	4	4	5	40.0 ~ 46.6m :						
								SHALE. Brownish grey.						
								Weathered.						
2	SH			4	4	4	4	Cracky. Cracks stained.						
3	SH													
4	SH			brk gry	4	4	5 (4)	47.5 ~ 50.0m :						
								SHALE. Black.						
								Calcareous.						
								Cracky. Cracks no stained.						
5								Sheared and clayey at 47.4 ~ 47.9m.						
6	SH			brk gry	3	3	4	Slickensides are found at 47.9 ~ 50.0m.						
7														
8	SH			blk	1	4	5	Core loss at 40.4 ~						
								41.5m, 42.0 ~ 43.0m,						
								43.8 ~ 45.8m, 46.6 ~ 47.5m						
								and 48.2 ~ 49.0m.						
9	SH			blk	1	3	4							
50													50	

driller's note  
 1 (stick) 2 (substick) 3 (piece) 4 (fragman) 5 grain  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No.1 HOLE No. DL-1 (SHEET 1 OF 3)

LOCATION	Dam left bank	DEPTH OF HOLE	50.0 m	COMMENCED	23-Apr-'86
ELEVATION	330.606 m	DEPTH OF OVERBURDEN	2.5 m	COMPLETED	9-May-'86
COORDINATE		LENGTH OF ROCK DRILLING	47.5 m	DRILLED BY	P. Samong
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	35.05 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	70.1 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE				DEPTH	ELEVATION	
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER					
0m		0 → 100%										0	40	0m	43
1	Overburden	△		rdx brn				0.0~2.5m : Overburden silty sand with some rock fragments.						1	
2	Overburden	△												2	
3	SHALE			yelx brn	5	5	5	2.5~20.0m : SHALE: interbedded with SANDSTONE. Dips of cracks are generally 10°-30° and 60°.							
4					4	4	4	2.5~3.65m Decomposed. Soil like core. Soft.							
5	SHALE			yelx brn	4	4	4	3.65~7.7m Highly weathered. Cores broken by hands.							
6								3							
7	SH			yelx brn	4	4	4	10.6~11.5m, 12.0~12.5m, 14.2~15.5m Highly weathered. Rock fragments can not be crushed by finger pressure.							
8								4							
9	SHALE			yelx brn	4	4	4	19.75~20.0m Medium grained S-S Rock fragments crushed by finger pressure.							
10								3							
11	SH			yelx brn	4	4	4								
12								4							
13	SH			yelx brn	4	4	4								
14								4							
15	SHALE			yelx brn	4	4	4								
16								3							
17	SHALE			yelx brn	4	4	4								
18								3							
19	SHALE			yelx brn	4	4	4								
20								4							

No Test

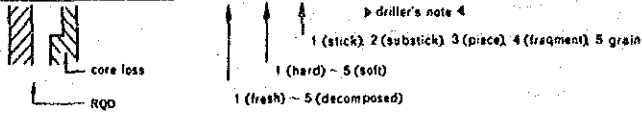
driller's note 4  
 1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain  
 1 (hard) - 5 (soft)  
 1 (fresh) - 5 (decomposed)  
 core loss  
 RQD

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No.1 HOLE No. DL-1 (SHEET 2 OF 3)

LOCATION	Dam left bank	DEPTH OF HOLE	50.0 m	COMMENCED	23-Apr-'86
ELEVATION	330.606 m	DEPTH OF OVERBURDEN	2.5 m	COMPLETED	9-May-'86
COORDINATE		LENGTH OF ROCK DRILLING	47.5 m	DRILLED BY	P. Samang
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	35.05 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	70.1 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER LUGEON	DEPTH	ELEVATION
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING					
20m		0 → 100								0	20m	43
1	SANDSTONE	[Pattern]		pale brn	4	4	4	3	22.0~33.7m :	No Test		
2									SANDSTONE.			
3									Medium to coarse grained.			
4									Massive.			
5	SANDSTONE	[Pattern]		brn grey	3	3	3	22.0~25.0m	Leakage of Drilling water			
6								Highly weathered.				
7								Almost cuttings.				
8								Piece to fragmental cores in local.				
9	SANDSTONE	[Pattern]		brn grey	3	3	3	25.0~33.7m				
10								Moderately weathered.				
11								Cracks stained and rock itself somewhat discolored.				
12								Somewhat brittle.				
13	SANDSTONE	[Pattern]		brn grey	3	3	3	Rock fragments crushed by finger pressure at 31.75~32.0m and 33.0~ 33.3m.				
14												
15												
16												
17	SANDSTONE	[Pattern]		brn grey	3	3	3	34.0~40.0m :				
18								LIMESTONE.				
19								Massive.				
20								Dips of cracks are generally 10°~30° and 60°~70°:				
21	SANDSTONE	[Pattern]		brn grey	3	3	3	Cracks somewhat stained.				
22												
23												
24												
25	SANDSTONE	[Pattern]		brn grey	3	3	3	Solution cracks at 38.65m (30°), 38.75 ~ 38.85m (90°) and 39.15m.				
26												
27												
28												
29	SANDSTONE	[Pattern]		brn grey	3	3	3	SHALE intercalated at 37.4~37.5m. Flaky core. Soft.				
30												
31												
32												
33	SANDSTONE	[Pattern]		brn grey	3	3	3	Core loss at 20.0~22.0m, 25.0~25.4m, 32.0~33.0m, 33.7~34.0m, 34.7~35.0m, 35.2~35.8m, 36.4~36.8m, 37.5~37.8m and 39.6~ 39.9m.				
34												
35												
36												

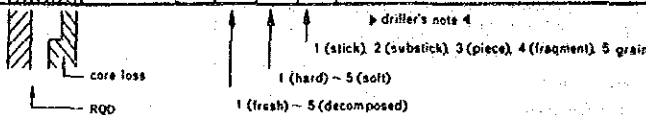


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No.1 HOLE No. DL-1 (SHEET 3 OF 3)

LOCATION	Dam left bank	DEPTH OF HOLE	50.0 m	COMMENCED	23-Apr-'86
ELEVATION	330.606 m	DEPTH OF OVERBURDEN	2.5 m	COMPLETED	9-May-'86
COORDINATE		LENGTH OF ROCK DRILLING	47.5 m	DRILLED BY	R. Samang
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	35.05 m	LOGGED BY	K. Ishicawa
BEARING OF ANGLE HOLE		CORE RECOVERY	70.1 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
40m		0-100%									40m	
1	LS			grey	2	2	3	40.0~50.0m : LIMESTONE. Massive. Dips of cracks are generally 10~30° Cracks somewhat stained.  Whitish clay on cracks at 40.0m (30°), 40.45m (30°), 40.8m (10°), Solution cracks at 47.0m (20°) and 47.2m (30°). Brownish clay on cracks at 48.65m (30°) and 48.8m (10°).  Calcite vugs at 40.9m and 41.65m.  Core loss at 41.65 ~ 43.9m and 44.1~46.6m.	No Test			
2												
3												
4	LS				2	2	4					
5												
6												
7							4 3-4					
8	LIMESTONE			grey	2	2	3			No Groundwater Table		
9												
50											50	



**Upper Mae Yuam 2**

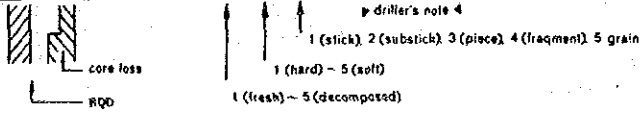


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No. 2 HOLE No. DR-1 (SHEET 1 OF 3)

LOCATION	Dam right bank	DEPTH OF HOLE	60.0 m	COMMENCED	13-Mar-'86
ELEVATION	352.332 m	DEPTH OF OVERBURDEN	0.3 m	COMPLETED	23-Mar-'86
COORDINATE	2 051 680.912 N 365 181.438 E	LENGTH OF ROCK DRILLING	59.7 m	DRILLED BY	Vichaen
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	58.1 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	96.8 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE			DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS				
0.0		0-100						0	0m	
0.0-0.3		△					0.0~0.3m : Overburden. Clayey silt.			
0.3-20.0				rdx brn	5	5	0.3~20.0m : SILTSTONE. lt grey. Massive. Dip of cracks 10~30° and 60~70°			
0.3-4.8				yelx brn	5	5	0.3~4.8m Decomposed to highly weathered. Soft. Rock fragments crushed by finger pressure.	No Test		
4.8-10.4				yelx brn	4	4	4.8~10.4m Highly to moderately weathered. Piece to fragmental core. Cracks stained remarkably. Slaking phenomena are found. Clayey part at 5.8m	G.L. - 9.0m		
10.4-18.0				light grey	4	4	10.4~18.0m Moderately weathered. Piece to substicky core. Cracks stained remarkably. Slaking phenomena are found. Brownish clay on cracks at 14.4m (70°).			
18.0-20.0				light grey	3	3	18.0~20.0m Substicky core. Cracks stained. Few slaking phenomena.	Lu = 5.8 (Pmax = 4.2 kg/cm <sup>2</sup> )		
20.0					2	2				



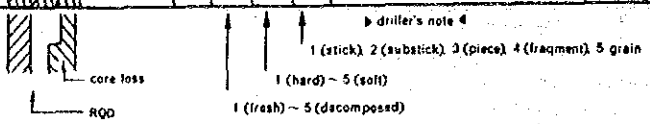


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No. 2 HOLE No. DR-1 (SHEET 2 OF 3)

LOCATION	Dam right bank	DEPTH OF HOLE	60.0 m	COMMENCED	13-Mar-86
ELEVATION	352.332 m	DEPTH OF OVERBURDEN	0.3 m	COMPLETED	23-Mar-86
COORDINATE		LENGTH OF ROCK DRILLING	59.7 m	DRILLED BY	Vichan
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	58.1 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	96.8 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING	LUGEON					
20m		0 → 100								0	40	20m	
1	SILTSTONE			light grey	2	3	3	4	20.0~32.4m :				
2									SILTSTONE: Interbedded with dk grey SHALE.	Lu <sup>1</sup> = 4.8 (P <sub>max</sub> = 5.2 kg/cm <sup>2</sup> )			
3									Massive.				
4									Dips of cracks generally 20~30° and 60~70°.				
5	SILTS	45°		lt dk gry	2	3	2		Cracks somewhat stained.				
6									Brittle.				
7									Sheared at 20.0~20.5m, 25.7~ 25.8m, 26.0~26.5m, 28.25~28.9m(30°), 29.9~ 30.05m and 32.1~ 32.2m(60°),	Lu <sup>1</sup> = 1.5 (P <sub>max</sub> = 6.25 kg/cm <sup>2</sup> )			
8	SILTSTONE			dark grey	2	3	3	4	Core loss at 23.5~ 23.8m, 25.85~26.0m and 32.2~32.4m.				
9													
30													
1										Lu <sup>1</sup> = 5.2 (P <sub>max</sub> = 7.25 kg/cm <sup>2</sup> )			
2									32.4~40.0m :				
3									SHALE. dk grey				
4									Cracks no stained.				
5									Generally fresh and hard. Good rock.				
6									Dips of cracks generally 10°~30° and 60°~70°.	Lu <sup>1</sup> = 2.4 (P <sub>max</sub> = 6.27 kg/cm <sup>2</sup> )			
7	SHALE			dark grey	1	2	2						
8													
9													
40													

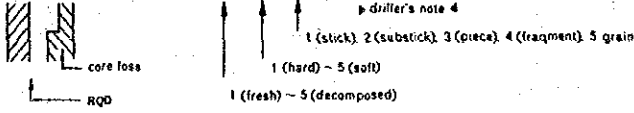


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No. 2 HOLE No. DR-1 (SHEET 3 OF 3)

LOCATION	Dam right bank	DEPTH OF HOLE	60.0 m	COMMENCED	13-Mar-'86
ELEVATION	352.332 m	DEPTH OF OVERBURDEN	0.3 m	COMPLETED	23-Mar-'86
COORDINATE		LENGTH OF ROCK DRILLING	59.7 m	DRILLED BY	Vichoen
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	58.1 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	96.8 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING	OBSERVATION OF CORE		WATER TABLE	WATER PRESSURE TEST	DEPTH	ELEVATION
								DESCRIPTION	LEAKAGE OF DRILLING WATER				
40m		0 → 100										40	40m
1	SHALE	[Log pattern]		dark grey			3	40.0~51.3m :		0		40	40m
2								SHALE, dk grey.	Lu' = 1.4				
3								Massive.	(Pmax = 9.24 kg/cm <sup>2</sup> )				
4								Dips of cracks generally 10~30° and 60~70°					
5								Cracks no stained.					
6	Fresh and hard.												
7	Good rock.												
8	Many calcite veinlets.												
9	Slickenside at 43.3m (60°).												
10													
50								51.3~60.0m :					
1	SILTSTONE	[Log pattern]		light grey			3	SILTSTONE, lt grey.		0		50	50
2								Dk grey SHALE interbedded at 57.0~59.3m.	Lu = 0.4				
3								Fresh and hard.	(Pmax = 11.26 kg/cm <sup>2</sup> )				
4	Good rock.												
5	Many calcite veinlets.												
6													
7													
8													
9													
60													

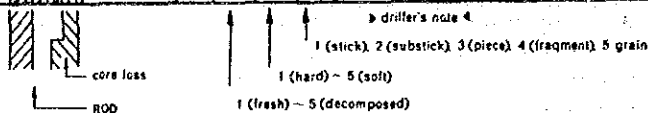


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No. 2 HOLE No. DR-2 (SHEET 1 OF 3)

LOCATION	Dam right bank	DEPTH OF HOLE	50.0 m	COMMENCED	26 Feb '86
ELEVATION	337.192 m	DEPTH OF OVERBURDEN	7.8 m	COMPLETED	8 Mar '86
COORDINATE	2 051 731.151 N 385 225.552 E	LENGTH OF ROCK DRILLING	42.2 m	DRILLED BY	Phadung
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	48.7 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	97.4 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING	OBSERVATION OF CORE DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
0m		0 → 100 %						0.0 ~ 7.8m : Overburden.		0	m
1		△		redx brn				0.0 ~ 2.4m Sandy silt.		1	
2		△						2.4 ~ 6.2m Silty sand. Fine grained.		2	
3										3	
4				yelx brn				6.2 ~ 7.8m Gravel of CHERT and SANDSTONE. Rounded. Size about 5 ~ 100 m/m.		4	
5										5	
6										6	
7									G.L. - 7.0m	7	
8				lt grey	3		4	7.8 ~ 10.1m : SILTSTONE. Lt grey.	No Test	8	
9	SILTSTONE						3	10.1 ~ 20.0m SHALE: interbedded with fine to medium grained SANDSTONE.		9	
10								Dip of bedding about 20°		10	
1							4	Dip of cracks generally 30° and 60 ~ 70°	Lu' = 22.9 (Pmax = 3.95 kg/cm <sup>2</sup> )	1	
2							3	Few cracks stained up to 18.5m.		2	
3							2	Crocky and somewhat brittle up to 18.5m.		3	
4				dark grey	2	3				4	
5							3	Sheared at 16.65 ~ 16.95m.		5	
6							4	Sheared plane 70° Somewhat sheared at 18.0 ~ 18.5m.	Lu' = 16.0 (Pmax = 4.03 kg/cm <sup>2</sup> )	6	
7							4			7	
8							4-5			8	
9							3			9	
20					1	2	2			20	

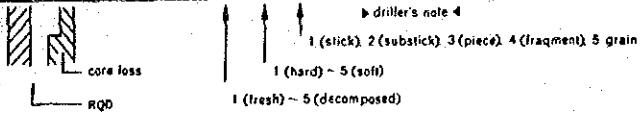


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No. 2 HOLE No. DR-2 (SHEET 2 OF 3)

LOCATION	Dam right bank	DEPTH OF HOLE	50.0 m	COMMENCED	26-Feb-'86
ELEVATION	337.192 m	DEPTH OF OVERBURDEN	7.8 m	COMPLETED	8-Mar-'86
COORDINATE		LENGTH OF ROCK DRILLING	42.2 m	DRILLED BY	Phodung
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	48.7 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	97.4 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION		
				COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER				
20m		0 → 100%									0	20m	m	
1	SHALE			dk grey	1	2	3	20.0 ~ 40.0m : SHALE: interbedded with fine to medium grained SANDSTONE.  Dip of bedding about 30°.  Dips of cracks generally 10~30° and 60~80°. Cracks no stained.	Lu' = 1.1 (Pmax = 5.09 kg/cm²)		1	m		
2							2				2		2	2
3							3				3		3	3
4							2				2		2	2
5							3				3		3	3
6							2				2		2	2
7							3				3		3	3
8							2				2		2	2
9							3				3		3	3
30														
1	SHALE			dk grey	1	2	4	Core loss at 30.0 ~30.9m and 34.6 ~ 35.0m.	Lu' = 0.7 (Pmax = 7.0 kg/cm²)		1			
2							4				2	2		
3							2				2	2		
4							3				3	3		
6	SHALE			lt grey	1	2	3	Lu' = 1.6 (Pmax = 7.94 kg/cm²)		6				
7							2			2	2			
8							3			3	3			
9							2			2	2			
40							3			40				



# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No.2 HOLE No. DR - 2 (SHEET 3 OF 3 )

LOCATION Dam right bank DEPTH OF HOLE 50.0 m COMMENCED 26-Feb-'86  
 ELEVATION 337.192 m DEPTH OF OVERBURDEN 7.8 m COMPLETED 8-Mar-'86  
 COORDINATE \_\_\_\_\_ LENGTH OF ROCK DRILLING 42.2 m DRILLED BY Phadung  
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 48.7 m LOGGED BY K. Ishikawa  
 BEARING OF ANGLE HOLE \_\_\_\_\_ CORE RECOVERY 97.4 %

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION					
				COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER							
40m		0-100%								0	40m						
1	SHALE			dark grey	1	4	4	40.0~50.0m :	Fresh and hard. Generally good rock. Some parts cracky and sheared. Calcite veinlets in some parts. Sheared and clayey at 45.25~46.0m (shear plane 80~90°) and 49.1~49.7m (shear plane 60~70°).	Lu=12.1 (Pmax=8.8 kg/cm)		1	40m				
2						3	3	3				3		3	3	3	2
3						2	2	2				2		2	2	2	3
4						3	3	3				3		3	3	3	4
5						4	4	4				4		4	4	4	5
6						3	3	3				3		3	3	3	6
7						2	2	2				2		2	2	2	7
8						3	3	3				3		3	3	3	8
9						4	4	4				4		4	4	4	9
50						2	2	2				2		2	2	2	50
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
0																	

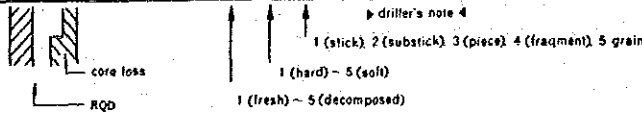
driller's note 4  
 1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain  
 core loss  
 RQD  
 1 (hard) - 5 (soft)  
 1 (fresh) - 5 (decomposed)

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No. 2 HOLE No. DL-1 (SHEET 1 OF 3)

LOCATION	Dam left bank	DEPTH OF HOLE	60.0 m	COMMENCED	29-Mar-'86
ELEVATION	354.394 m	DEPTH OF OVERBURDEN	0.3 m	COMPLETED	8-Apr-'86
COORDINATE	2.051.807.835N 385.249.314E	LENGTH OF ROCK DRILLING	59.7 m	DRILLED BY	Vichaen
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	58.35 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	97.75 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
0m	O-B	△						0.0~0.3m : Overburden.			0	4.8
1	ST-S	—		pale brn	5	5	5	Silty sand.				
2	ST-S	—		pale brn	4	4	4	0.3~12.0m : SILTSTONE. lt grey. Massive.				
3	ST-S	—		pale brn	4	4	4	Dips of cracks generally 30° and 60°				
4	ST-S	—		pale brn	5	5	5	0.3~4.2m				
5	SILTSTONE	—		brn pale brn				Decomposed to highly wthd.				
6	SILTSTONE	—		brn pale brn	4	3	3	Fragmental core.		No Test		
7	SILTSTONE	—		brn pale brn	4	4	4	Clayey at 3.4~3.85m.				
8	SILTSTONE	—		brn pale brn	3	3	3	Core loss at 2.1~2.6m and 3.85~4.2m.				
9	SILTSTONE	—		brn pale brn	4	4	4	4.2~8.0m				
10	SILTSTONE	—		brn pale brn	3	3	3	Highly weathered. Rock itself discolored. Brittle.				
11	SILTSTONE	—		light grey	3		2	Brownish clay on cracks at 7.5m (60°) and 7.7m (30°)				
12	SILTSTONE	—		light grey			1	8.0~12.0m				
13	SILTSTONE	—		light grey			4	Moderately weathered. Cracks stained remarkably.				
14	SILTSTONE	—		light grey			2	Rock itself fresh and hard.				
15	SHALE	—		light grey	2	3	3	12.0~24.0m				
16	SHALE	—		light grey	2	3	3	SHALE: interbedded with SILTSTONE. dk grey. Massive.				
17	SHALE	—		light grey	2	3	3	12.0~21.2m				
18	SHALE	—		light grey	2	3	3	Cracks stained. 15.9~18.8m somewhat brittle.				
19	SHALE	—		light grey	2	3	3	Sheared at 19.2 ~19.4m (60°).				
20	SHALE	—		light grey	3	3	3	Greyish clay on cracks at 18.5m (80°).				
21	SHALE	—		light grey	2	3	3	Core loss at 18.8 ~ 19.2m				
22	SHALE	—		light grey	2	3	3					



### GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No.2 HOLE No. DL-1 (SHEET 2 OF 3)

LOCATION	Dam left bank	DEPTH OF HOLE	60.0 m	COMMENCED	29-Mar-'86
ELEVATION	354.394 m	DEPTH OF OVERBURDEN	0.3 m	COMPLETED	8-Apr-'86
COORDINATE		LENGTH OF ROCK DRILLING	59.7 m	DRILLED BY	Vichan
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	58.35 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	97.75%		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS	CORE CUTTING				
20m		0-100							LUGEON	40	20m
1	SHALE			dk grey	2	4	4	21.2~24.0m			
2						3	2	Cracks no stained. Fresh and hard.	Lu <sup>1</sup> =10.4 (Pmax=6.38 kg/cm <sup>2</sup> )		1
3					2	3	2	24.0~43.2m : SHALE interbedded with SANDSTONE.			2
4					1	4	4	grey to dk grey. Dip of bedding 45°.			3
5						3	2				4
6						4	4				5
7					1	2	4-3	Generally, fresh and hard. Good rock.			6
8						3	3	Some parts cracky and sheared.	Lu <sup>1</sup> =3.3 (Pmax=6.96 kg/cm <sup>2</sup> )		7
9						2	2	Sheared and clayey at 24.65~24.9m, 34.55~ 34.65m and 36.0~ 36.3m.			8
10						3	3				9
11						2	2	Slickensides are found at 26.0m (45°), 26.5m (70°), 26.7~ 34.55m and 36.45m (60°).	Lu <sup>1</sup> =0.3 (Pmax=9.01 kg/cm <sup>2</sup> )		10
12	SHALE			dark grey	1	2	3				11
13						4	4				12
14						2	2				13
15						3	3				14
16						4	4				15
17						3	3		Lu <sup>1</sup> =3.0 (Pmax=9.04 kg/cm <sup>2</sup> )		16
18						4	4				17
19						3	3				18
20						4	4				19
21						3	3				20
22						4	4				21
23						2	2				22
24						3	3				23
25						4	4				24
26						3	3				25
27						4	4				26
28						2	2				27
29						3	3				28
30						4	4				29
31						2	2				30
32						3	3				31
33						4	4				32
34						2	2				33
35						3	3				34
36						4	4				35
37						2	2				36
38						3	3				37
39						4	4				38
40						2	2				39

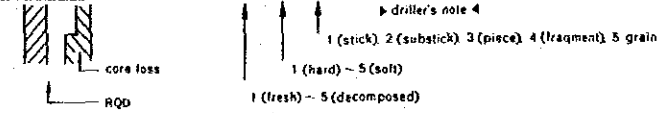
driller's note 4  
 1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Upper Mae Yuam No. 2 HOLE No. DL-1 (SHEET 3 OF 3)

LOCATION	Dam left bank	DEPTH OF HOLE	60.0 m	COMMENCED	29-Mar-'86
ELEVATION	354.394 m	DEPTH OF OVERBURDEN	0.3 m	COMPLETED	8-Apr-'86
COORDINATE		LENGTH OF ROCK DRILLING	59.7 m	DRILLED BY	Vichan
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	68.35 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	97.75 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE	WATER PRESSURE TEST	DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION				
40m		0 → 100								0	40m	43
1	SHALE			dk grey		2						1
2	SHALE			dk grey		3						2
3	SHALE			dk grey		2						3
4	SHALE			dk grey		3-4						4
5	SILTSTONE			light grey		2						5
6	SILTSTONE			light grey		2						6
7	SILTSTONE			light grey		4						7
8	SILTSTONE			light grey		2						8
9	SILTSTONE			light grey		4						9
50	SILTSTONE			light grey		3						50
1	SILTSTONE			light grey		3						1
2	SILTSTONE			light grey		4						2
3	SILTSTONE			light grey		3						3
4	SILTSTONE			light grey		2						4
5	SILTSTONE			light grey		3						5
6	SILTSTONE			light grey		2						6
7	SILTSTONE			light grey		2						7
8	SILTSTONE			light grey		2						8
9	SILTSTONE			light grey		2						9
60	SILTSTONE			light grey		2						60







Nam Mae Rit



# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DR-1 (SHEET 1 OF 3)

LOCATION Dam right bank DEPTH OF HOLE 49.8 m COMMENCED 19-Apr-'86  
 ELEVATION 334.894 m DEPTH OF OVERBURDEN 5.1 m COMPLETED 8-May-'86  
 COORDINATE 1. 981.543.079 N LENGTH OF ROCK DRILLING 44.7 m DRILLED BY Learkchal  
394.165.979 E TOTAL LENGTH OF CORE 34.0 m LOGGED BY K. Ishikawa  
 ANGLE FROM HORIZONTAL 90° CORE RECOVERY 68.3 %  
 BEARING OF ANGLE HOLE \_\_\_\_\_

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE			DEPTH	ELEVATION		
				COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH			ELEVATION	
0m		0 → 100%										0	40	0m	
0-5.1m	Overburden	△		rdx brn				0.0~5.1m : Overburden. Silty clay.							
5.1-11.8m	Weathered HORNFELS	□		yeix brn	5	5	5	5.1~11.8m : Pelitic HORNFELS. Decomposed. 5.1~8.8m Rock fragments crushed by finger pressure. 8.8~10.8m Rock fragments somewhat hard. Core loss at 10.8~11.8m.							
11.8-16.0m	CH	⊗		gfy	3	3	4	11.8~16.0m : Brecciated rock. Siliceous matrix including SHALE fragments. Moderately weathered. Cracks stained remarkably. Qz vugs in some parts. Most parts no core. Core loss at 12.0~13.2m, 13.8~15.4m and 15.65 ~16.0m.	No Test						
16.0-20.15m	CH	⊗		gfy	3	2	3, 4	16.0~20.15m : CHERT: interbedded with argillaceous bands. Dip of bedding about 60° Mostly no cores. Core loss at 16.5 ~ 19.35m and 19.55 ~ 20.15m.							

driller's note

1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain

1 (hard) ~ 5 (soft)

1 (fresh) ~ 5 (decomposed)

core loss

RQD

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit. HOLE No. DR-1 (SHEET 2 OF 3)

LOCATION	Dam right bank	DEPTH OF HOLE	49.8 m	COMMENCED	19-Apr-86
ELEVATION	334.894 m	DEPTH OF OVERBURDEN	5.1 m	COMPLETED	8-May-86
COORDINATE	1.981.543.079 N 394.165.979 E	LENGTH OF ROCK DRILLING	44.7 m	DRILLED BY	Larkchai
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	34.0 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	68.3 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE			DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS		CORE CUTTING	WATER PRESSURE TEST		
20m										20m	
1	LIMESTONE	Casing		grey	4	3	20.15~27.0m :	No Test	Lu' = 21.7 (Pmax = 6.73 kg/cm <sup>2</sup> )	1	
2							LIMESTONE: interbedded with SHALE.				
3							Brecciated and reconsolidate.				
4							SHALE breccia size 1~20mm included into LIMESTONE matrix. Highly to moderately weathered. Brittle. Calcite vugs at 22.3m (60°), 23.7m (60°) and 26.0m (60°). Core loss at 24.4~25.8m.				
5	LS			gry	4						
6	Calc. SHALE	Casing		dark grey	3	4	27.0~32.25m :	Lu' = 6.1 (Pmax = 3.29 kg/cm <sup>2</sup> )		8	
7							Calc. SHALE: calcareous SHALE: interbedded with CHERT.				
8							Brecciated and reconsolidate.				
9	Calc. SH	Casing		dk gry	2	4	CHERT breccia size 1~50mm included into SHALE matrix.			9	
30							SHALE is calcareous. LIMESTONE breccia at 28.0~28.2m.				
1	Calc. SH	Casing		dk gry	2	4	Moderately weathered. Brittle.			1	
2							Slickenside and clayey at 32.25m (60°).				
3	LS	Casing		grey	4	3	32.25~35.1m :	Lu' = 21.4 (Pmax = 6.6 kg/cm <sup>2</sup> )		3	
4							LIMESTONE: interbedded with CHERT and SHALE.				
5							Brecciated and reconsolidate. SHALE and CHERT breccia included in LS matrix.				
6	HORNFELS	Casing		dark grey	3	3	Moderately with. Brittle. Calcite vug at 33.9m (70°). Clayey at 33.4~33.7m.			4	
7							35.1~40.6m :				
8							Pelitic HORNFELS. Non brecciated. Moderately with.				
9							Many calcite veinlets. Dip of bedding about 30°.				
40							Sheared zone at 39.15~39.5m.			40	

driller's note 4

1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain

1 (hard) - 5 (soft)

1 (fresh) - 5 (decomposed)

core loss

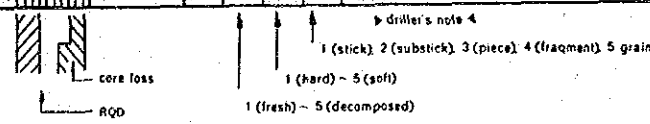
RQD

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DR-1 (SHEET 3 OF 3)

LOCATION Dam right bank DEPTH OF HOLE 49.8 m COMMENCED 19-Apr-'86  
 ELEVATION 334.894 m DEPTH OF OVERBURDEN 5.1 m COMPLETED 8-May-'86  
 COORDINATE 1981 543 079 N 394 165 979 E LENGTH OF ROCK DRILLING 44.7 m DRILLED BY Learkchal  
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 34.0 m LOGGED BY K. Ishikawa  
 BEARING OF ANGLE HOLE \_\_\_\_\_ CORE RECOVERY 68.3 %

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
40m		0=100								0	40m	43
1	LS HR			dk gry	3	3	2	38.7~40.6m	Leakage of Drilling Water	No Test	1	
2	LS			gry	3	2	40.6~49.8m : LIMESTONE. Massive. Moderately to slightly withd. Cracks stained remarkably up to 45.2m. Deeper than 45.2m, few cracks stained. Generally hard, but cracky. Calcite vugs at 40.9m and 42.2m. Solution cracks at 41.05 ~41.2m (80°) and 42.8m. Some parts interbedded with thin SHALE beds.	2				
3	LS			gry	3	2	4				3	
4	LS			gry	3	2	4				4	
5	LS			gry	3	2	4				5	
6											6	
7											7	
8	LS			grey	2	2	4				8	
9							3				9	
49.8							4				0	
0							~3	Core loss at 41.2~41.5m, 43.0~44.25m and 45.2~45.65m.			0	



# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DR-2 (SHEET 1 OF 4)

LOCATION Dam right bank DEPTH OF HOLE 70.0 m COMMENCED 28-Feb-'86  
 ELEVATION 237.927 m DEPTH OF OVERBURDEN 6.0 m COMPLETED 18-Mar-'86  
 COORDINATE 1.981.461.980 N LENGTH OF ROCK DRILLING 64.0 m DRILLED BY Learkchai  
394.246.574 E TOTAL LENGTH OF CORE 64.05m LOGGED BY K. Ishikawa  
 ANGLE FROM HORIZONTAL 90° CORE RECOVERY 91.5%  
 BEARING OF ANGLE HOLE \_\_\_\_\_

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING					
0m		0-100%							0	40	0m	
0-6	Overburden	△		redx brown				0.0~6.0m : Overburden. Silty sand with rock fragments size 2~100m/m.			1-6	
6-7	HR	△			5	5	5	6.0~7.0m : Core loss.			7	
7-8	HR	△		dk gry	4	4	5	7.0~20.1m : Pelitic HORNFELS. grey. Non calcareous.			8	
8-9	HR	△						7.0~7.4m Decomposed. Rock fragments crushed by finger pressure.			9	
9-10	HR	△		dk gry	3	4	4	7.7~8.9m Highly weathered. Clayey. Rock fragments broken by hands.			10	
10-11	HR	△						10.4~20.1m Moderately withd. Brittle and cracky. Cracks stained remarkably. Dip of bedding about 30°	No Test		1	
11-12	HR	△									2	
12-13	HR	△									3	
13-14	HR	△									4	
14-15	HR	△									5	
15-16	HR	△		dk gry	3	4	4				6	
16-17	HR	△						Core loss at 7.4~7.7m, 8.9~10.4m, 11.35~12.7m, 13.05~13.65m, 14.25~14.8m, 16.45~17.0m, 18.1~18.8m and 18.95~19.1m.				7
17-18	HR	△		dk gry	3	4	4				8	
18-19	HR	△									9	
19-20	HR	△		dk gry	3	3	3				20	

→ driller's note 4  
 1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain  
 1 (hard) - 5 (soft)  
 1 (fresh) - 5 (decomposed)

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DR-2 (SHEET 2 OF 4)

LOCATION Dam right bank DEPTH OF HOLE 70.0 m COMMENCED 28-Feb-'86  
 ELEVATION 237.927 m DEPTH OF OVERBURDEN 6.0 m COMPLETED 18-Mar-'86  
 COORDINATE 1981 461 980 N LENGTH OF ROCK DRILLING 64.0 m DRILLED BY Learkchai  
394 246 574 E TOTAL LENGTH OF CORE 64.05 m LOGGED BY K. Ishikawa  
 ANGLE FROM HORIZONTAL 90° CORE RECOVERY 91.5 %  
 BEARING OF ANGLE HOLE

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH		
20m		0 → 100%										
1	CHERT			gryx wht		2	20.1~22.7m : CHERT, greyish white. Moderately whtd. Cracks stained remarkably. Substicky core.		Lu = 26.6 (Pmax = 5.56 kg/cm <sup>2</sup> )			
2						3						
3						3	22.7~28.4m : Pelitic HORNFELS: interbedded medium grained S.S. Moderately whtd. Cracks stained remarkably. Dip of bedding about 30°					
4						3						
5	HORNFELS			grey		3						
6						4	Sheared zone at 22.7 ~22.8m, 27.2m (60°) and 28.2~28.4m (60°).		Lu = 17.8 (Pmax = 7.66 kg/cm <sup>2</sup> )			
7						4						
8						3	28.4~30.45m : CHERT: interbedded with SANDSTONE. It grey. Moderately whtd. Cracks stained remarkably. Dip of bedding 30~40°					
9	CHERT			lt gry		3						
30						2	Sheared at 28.4 ~ 28.85m.		Lu = 23.6 (Pmax = 8.55 kg/cm <sup>2</sup> )			
1	HR CHERT					3	30.45~30.9m : Pelitic HORNFELS. grey. Siliceous.					
2						3						
3						3	30.9~39.75m : CHERT: interbedded Sandy SHALE. It grey. Moderately whtd. Cracks stained. Hard, but somewhat cracky.					
4						2			GL = 34.0m			
5	CHERT			light grey		4						
6						4			Lu = 52.3 (Pmax = 3.54 kg/cm <sup>2</sup> )			
7						4						
8						4						
9						2						
40						3						

driller's note 4  
 1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain  
 core loss  
 RQD  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

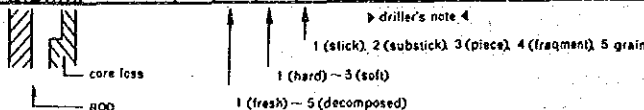


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DR-2 (SHEET 3 OF 4)

LOCATION Dam right bank DEPTH OF HOLE 70.0 m COMMENCED 28-Feb-86  
 ELEVATION 237.927 m DEPTH OF OVERBURDEN 6.0 m COMPLETED 18-Mar-86  
 COORDINATE 1 981 461.980 N 394 246.574 E LENGTH OF ROCK DRILLING 64.0 m DRILLED BY Learkchai  
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 64.05 m LOGGED BY K. Ishikawa  
 BEARING OF ANGLE HOLE \_\_\_\_\_ CORE RECOVERY 91.5 %

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
40m		0 → 100 %								0	40m	
1	HORNFELS			dark grey	2	3	2	39.75~52.6m :	Lu=12.4 (Pmax=10.68kg/cm <sup>2</sup> )		1	
2								Pelitic HORNFELS. dark grey.			2	
3								Non calcareous.			3	
4								Few cracks stained.			4	
5	HORNFELS			dark grey	2	3	2	47.35~51.9m	Lu=18.1 (Pmax=11.53kg/cm <sup>2</sup> )		5	
6								Purplish grey.			6	
7								Non calcareous.			7	
8								Cracks almost no stained.			8	
9	HORNFELS			purplish grey	2	3	3	51.9~52.6m	Lu=3.3 (Pmax=12.63kg/cm <sup>2</sup> )		9	
50								Fresh and hard.			50	
1								Pyrite on cracks at 51.75m			1	
2											2	
3	CHERT			dk gry	3	3	3	52.6~55.6m :			3	
4								CHERT. lt grey.			4	
5								Fresh and hard.			5	
6								Pyrite on cracks at 52.8m (90°).			6	
7	HORNFELS			lt grey	1	3	3	55.6~59.15m :	Lu=1.0 (Pmax=13.62kg/cm <sup>2</sup> )		7	
8								Pelitic HORNFELS. dk grey.			8	
9								Non calcareous.			9	
60								Dips of cracks generally 45° and 60°			60	

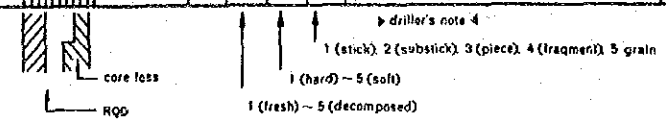


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DR-2 (SHEET 4 OF 4)

LOCATION	Dam right bank	DEPTH OF HOLE	70.0 m	COMMENCED	28-Feb-'86
ELEVATION	237.927 m	DEPTH OF OVERBURDEN	6.0 m	COMPLETED	18-Mar-'86
COORDINATE	1.987461, 980N 394.236, 574 E	LENGTH OF ROCK DRILLING	64.0 m	DRILLED BY	Larkchai
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	64.05m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	91.5 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION			
60m		0 → 100%								40 60m	143
1	HORNFELS	dark grey							Lu = 0.2 (Pmax = 14.68kg/cm <sup>2</sup> )	1	
2										2	
3										2	
4										3	
5											
6											
7											
8											
9											
70											
1										1	
2										2	
3										3	
4										4	
5										5	
6										6	
7										7	
8										8	
9										9	
0										0	



# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DL-1 (SHEET 1 OF 4)

LOCATION	Dam right bank	DEPTH OF HOLE	60.5 m	COMMENCED	23-Mar-'86
ELEVATION	193.697 m	DEPTH OF OVERBURDEN	2.9 m	COMPLETED	1-May-'86
COORDINATE	1981 408 528 N 394 326 509 E	LENGTH OF ROCK DRILLING	57.6 m	DRILLED BY	Kanchana
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	60.5 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	100.0 %		

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF RYING CASING	OBSERVATION OF CORE					WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION				
				COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION									
0m		0 → 100%										0m					
0.0~2.9m	Overburden	△															
2.9~15.2m	CHERT	□		light grey													
2.9~4.15m														3	4	CHERT, light grey.	No Test
4.15~7.1m														2	3	Moderately whtd.	
7.1~15.2m														3	4	Cracky and cracks stained.	
														2	3	Few cracks stained.	
														3	4		
														2	3		
														3	4		
														2	3		
														3	4		
	2	3															
15.2~20.0m	SANDSTONE	□		dark grey													
														3	4	Fine grained SANDSTONE.	
														2	3	dark grey.	
														3	4	Non calcareous.	
														2	3	Fresh and hard.	
	3	4	Cracky at 15.2~16.45m.														
	2	3	Quartz vag at 16.45~17.0m														

driller's note

1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain

1 (hard) - 5 (soft)

1 (fresh) - 5 (decomposed)

core loss

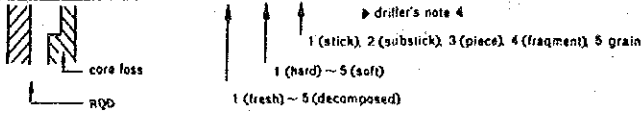
RQD

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DL-1 (SHEET 2 OF 4)

LOCATION Dam right bank DEPTH OF HOLE 60.5 m COMMENCED 23-Mar-'86  
 ELEVATION 193.697 m DEPTH OF OVERBURDEN 2.9 m COMPLETED 1-May-'86  
 COORDINATE 1,981,408.528 N 394,326.509 E LENGTH OF ROCK DRILLING 57.6 m DRILLED BY Kanchana  
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 60.5 m LOGGED BY K. Ishikawa  
 BEARING OF ANGLE HOLE \_\_\_\_\_ CORE RECOVERY 100.0 %

DEPTH	ROCK NAME	L.O.G.	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING	DESCRIPTION				
20.0		0 → 100 %							0	20m		
1	SANDSTONE	[Log pattern]		dark grey	1	1	3	20.0~40.4m :	Lu' = 2.5 (Pmax = 4.64kg/cm <sup>2</sup> )	40	20	
1								2				Fine grained SANDSTONE.
2								4				dark grey.
2								3				Non calcareous.
3								2				Fresh and hard.
3												Some parts cracky,
4								3				but generally
4												good rock.
5												Dips of cracks generally
6								4				10~30° and 60°.
6												Some cracks filled
7								3				with calcite film.
7								2				Lu' = 6.1 (Pmax = 5.59kg/cm <sup>2</sup> )
8								4				
8								3				
9	4											
9	3											
30									30			
1								Lu' = 0.7 (Pmax = 6.79kg/cm <sup>2</sup> )		1		
2										2		
3										3		
4										4		
6										6		
6										6		
7								Lu' = 0.1 (Pmax = 7.78kg/cm <sup>2</sup> )		7		
8										8		
9										9		
40										40		

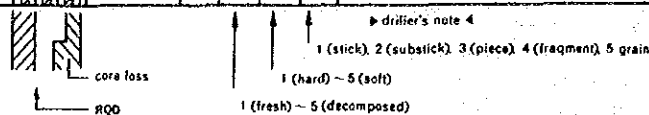


# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DL-1 (SHEET 3 OF 4)

LOCATION	Dam right bank	DEPTH OF HOLE	60.5 m	COMMENCED	23-Mar-86
ELEVATION	193.697 m	DEPTH OF OVERBURDEN	2.9 m	COMPLETED	1-May-86
COORDINATE	1931408 N 394326509 E	LENGTH OF ROCK DRILLING	57.6 m	DRILLED BY	Kanchana
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	60.5 m	LOGGED BY	K. Ishikawa
BEARING OF ANGLE HOLE		CORE RECOVERY	100.0 %		

DEPTH	ROCK NAME	LOG	CEMENTA- TION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION	
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER			
40m		0 → 100%									0	40m	43
1	CHERT	S-S		lt grey		1	3	40.4~42.75m : CHERT: interbedded with LIMESTONE. Fresh and hard. Good rock.	Lu <sup>1</sup> = 0.1 (Pmax = 3.57 kg/cm <sup>2</sup> )		1		
2						2	2				2		
3				dk grey		2	3	42.75~44.25m : Fine grained SANDSTONE. Fresh and hard, but cracky.			3		
4						3	3				4		
5						4	4				5		
6						1	2	44.25~60.5m : CHERT: interbedded with LIMESTONE. Fresh and hard. Good rock. Some parts sheared. Dip of bedding 30~40° Dips of cracks generally 10~30° and 45~60°	Lu <sup>1</sup> = 1.1 (Pmax = 9.63 kg/cm <sup>2</sup> )		6		
7						1	3				7		
8						1	1				8		
9						1	1				9		
50						2	2				50		
1						3	4	Sheared at 51.1~51.7m (shear plane 60°) and 52.8~53.4m (shear plane 45°).	Lu = 0.5 (Pmax = 10.77 kg/cm <sup>2</sup> )		1		
2				light grey		1	2				2		
3						3	5				3		
4						3	4				4		
5						2	2				5		
6						1	1				6		
7						1	2		Lu = 0.8 (Pmax = 11.56 kg/cm <sup>2</sup> )		7		
8						1	1				8		
9						1	1				9		
60						1	2				60		




## GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DL-1 (SHEET 4 of 4)

LOCATION Dam right bank DEPTH OF HOLE 60.5 m COMMENCED 23-Mar-'86  
 ELEVATION 193.697 m DEPTH OF OVERBURDEN 2.9 m COMPLETED 1-May-'86  
 COORDINATE 108° 40' 52" N 99° 32' 50" E LENGTH OF ROCK DRILLING 57.6 m DRILLED BY Kanehana  
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 60.5 m LOGGED BY K. Ishikawa  
 BEARING OF ANGLE HOLE \_\_\_\_\_ CORE RECOVERY 100.0 %

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	OBSERVATION OF CORE DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
60m			0 → 100%							40	60m
60.5	CH				1	1	2				
1											
2											
3											
4											
5											
6											
7											
8											
9											
0											
1											
2											
3											
4											
5											
6											
7											
8											
9											
0											


  
 core loss  
 RQD  
 ↑ driller's note 4  
 1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DL-2 (SHEET 1 OF 4 )

LOCATION Dam left bank DEPTH OF HOLE 70.0 m COMMENCED 6 Jun '86

ELEVATION 224.992 m DEPTH OF OVERBURDEN 2.0 m COMPLETED 22 Jun '86

COORDINATE 108° 38' 9.91" E 394° 36' 16.6" N LENGTH OF ROCK DRILLING 68.0 m DRILLED BY Phadung

ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 60.9 m LOGGED BY K. Ishikawa

BEARING OF ANGLE HOLE \_\_\_\_\_ CORE RECOVERY 87.0 %

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
				COLOR	WEATHERING	HARDNESS	CORE CUTTINGS	DESCRIPTION			
0m		0 → 100%							0	40	0m
0.0~2.0m	Overburden	△		rdx brn				0.0~2.0m : Overburden. Silty sand with rock fragments.			1
2.0~20.0m	Weathered HORNFELS	△		brnx grey	4	5	5	2.0~20.0m : Pelitic HORNFELS. Massive.			2
2.0~5.0m							4	2.0~5.0m Highly weathered. Soft.			3
5.0~11.3m							4	5.0~11.3m Core loss.			4
11.3~11.65m								11.3~11.65m Moderately weathered. Cracks stained remarkably. Rock itself somewhat discolored. Gravelly to fragmental core.	No Test		5
11.65~14.0m								11.65~14.0m Core loss.			6
14.0~14.7m							3	14.0~14.7m Highly weathered. Rock itself discolored. Rock fragments broken by hands.			6
14.7~15.0m							4	14.7~15.0m Core loss.			7
15.0~20.0m	HORNFELS			dark grey			4	15.0~20.0m Moderately weathered. Cracks stained remarkably. Rock itself somewhat discolored. Cracky in general. Dips of cracks generally 60° Sheared zone at 19.45~19.55m with clay gouge.	Lu' = 4.7.4 (Pmax = 2.11 k/cm <sup>2</sup> )		7
							3				8
							3				9
							4				20

driller's note 4  
 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain  
 1 (hard) ~ 5 (soft)  
 1 (fresh) ~ 5 (decomposed)

core loss  
 RQD

# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DL-2 (SHEET 2 of 4 )

LOCATION Dam left bank DEPTH OF HOLE 70.0 m COMMENCED 6 -Jun- '86

ELEVATION 224.992 m DEPTH OF OVERBURDEN 2.0 m COMPLETED 22 -Jun- '86

COORDINATE 1.981.386.919 N LENGTH OF ROCK DRILLING 68.0 m DRILLED BY Phadung

334.360.166 E TOTAL LENGTH OF CORE 60.9 m LOGGED BY K. Ishikawa

ANGLE FROM HORIZONTAL 90° CORE RECOVERY 87.0 %

BEARING OF ANGLE HOLE

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	OBSERVATION OF CORE DESCRIPTION	WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION				
														LUGEON			
20m		0 → 100%										0	20m	43			
1	HORNFELS			dark grey		3	3	20.0~40.0m :									
2								4						4	4-5	3	Pelitic HORNFELS
3								4						4	4	3	Massive.
4								4						4	4	4	Non calcareous.
5								3						3	3	3	20.0~29.5m
6								3						3	3	3	Moderately weathered.
7								3						3	3	3	Cracks stained remarkably.
8								3						3	3	3	Rock itself somewhat discolored.
9								3						3	3	3	Somewhat brittle and cracky.
30								3						3	3	3	Dips of cracks generally 20~30° and 60~90°
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
40																	

driller's note

1 (stick) 2 (substick) 3 (piece) 4 (fragment) 5 grain

1 (hard) ~ 5 (soft)

1 (fresh) ~ 5 (decomposed)

core loss

RQD



# GEOLOGIC LOG OF DRILL HOLE

Nam Yuam PROJECT Nam Mae Rit HOLE No. DL-2 (SHEET 3 of 4 )  
 LOCATION Dam left bank DEPTH OF HOLE 70.0 m COMMENCED 6-Jun-'86  
 ELEVATION 224.992 m DEPTH OF OVERBURDEN 2.0 m COMPLETED 22-Jun-'86  
 COORDINATE 1,981,386.919 N 394,360.166 E LENGTH OF ROCK DRILLING 68.0 m DRILLED BY Phadung  
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 60.9 m LOGGED BY K. Ishikawa  
 BEARING OF ANGLE HOLE CORE RECOVERY 87.0 %

DEPTH	ROCK NAME	LOG	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION				
				COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING	DESCRIPTION							
40m		0 → 100%							0	40m					
1	HORNFELS			dark grey	1	3	3	40.0~60.0m : Pelitic HORNFELS Massive. Fresh and hard. Generally good rock. Many calcite and quartz veinlets. Dips of cracks generally 30~45° and 60~70° Sheared zone at 41.85m with slickenside (70°). Sheared zone at 45.7 ~46.65m and 47.75 ~48.2m with clay gouge.	Lu = 3.9 (Pmax = 11.0 kg/cm <sup>2</sup> )	1	40				
2						4	2			2	2	2	2	2	39
3						2	3			3	3	3	3	3	38
4						1	4			4	4	4	4	4	37
5						3	3			3	3	3	3	3	36
6						3	3			3	3	3	3	3	35
7						2	2			2	2	2	2	2	34
8						4	4			4	4	4	4	4	33
9						2	2			2	2	2	2	2	32
50						HORNFELS					dark grey	1	2	2	Lu = 0.2 (Pmax = 12.95 kg/cm <sup>2</sup> )
1	3	3	3	3	3			3	30						
2	2	2	2	2	2			2	29						
3	3	3	3	3	3			3	28						
4	2	2	2	2	2			2	27						
5	3	3	3	3	3			3	26						
6	2	2	2	2	2			2	25						
7	2	2	2	2	2			2	24						
8	2	2	2	2	2	2	23								
60									60	22					

