

Legend

- Gs/Az
- Gs/Tr
- Ta
- Gn
- Gr
- Shared zone, Clay (Kaolinite) with breccia
- Mica schist
- Landslide zone
- Cracky zone
- Bedding Gneissose structure
- Joint
- Assumed geological boundary

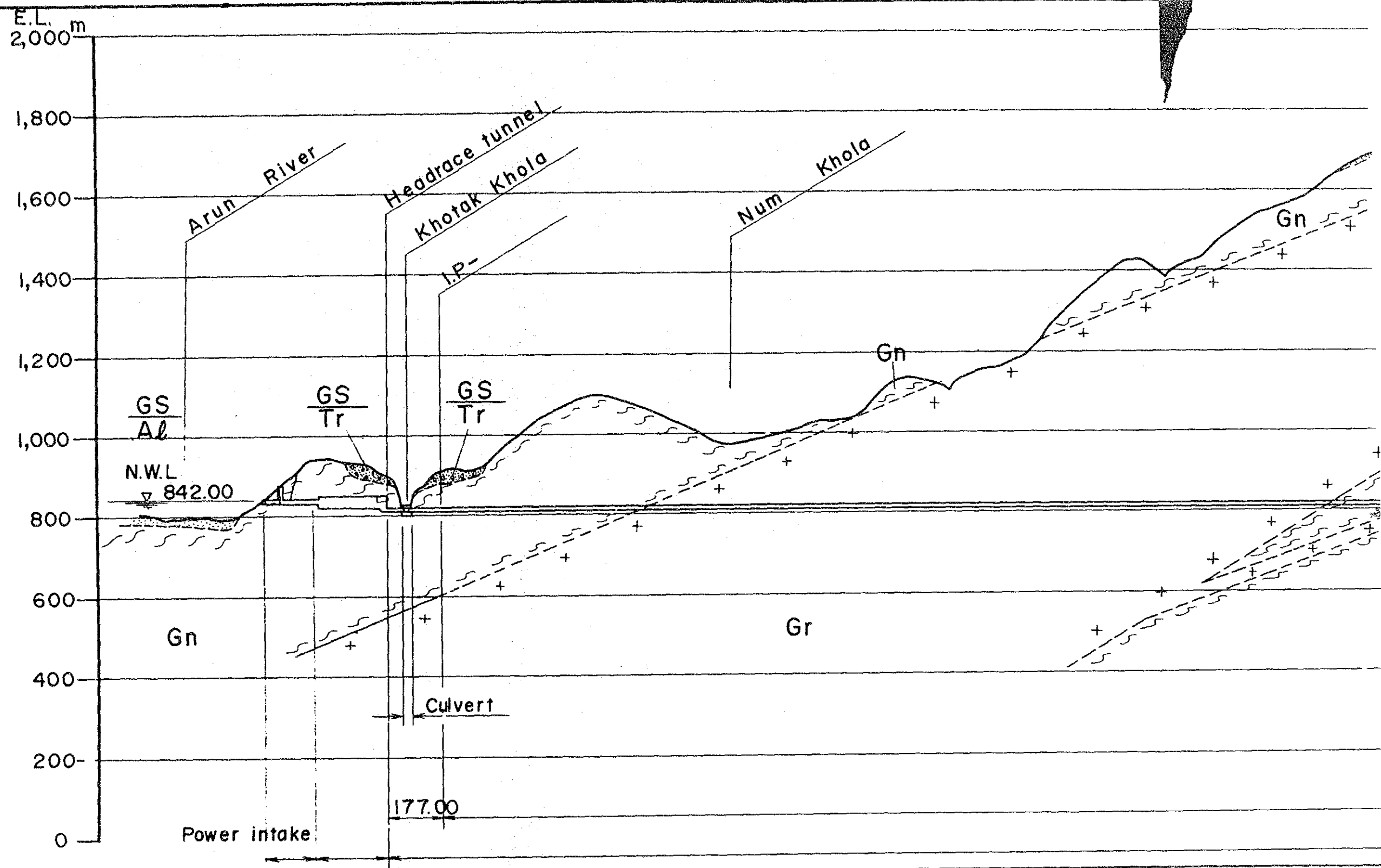
Seismic Line NO Length
 Drilling point
 Low velocity layer in basement layer

0 100 200 300 400 500 m

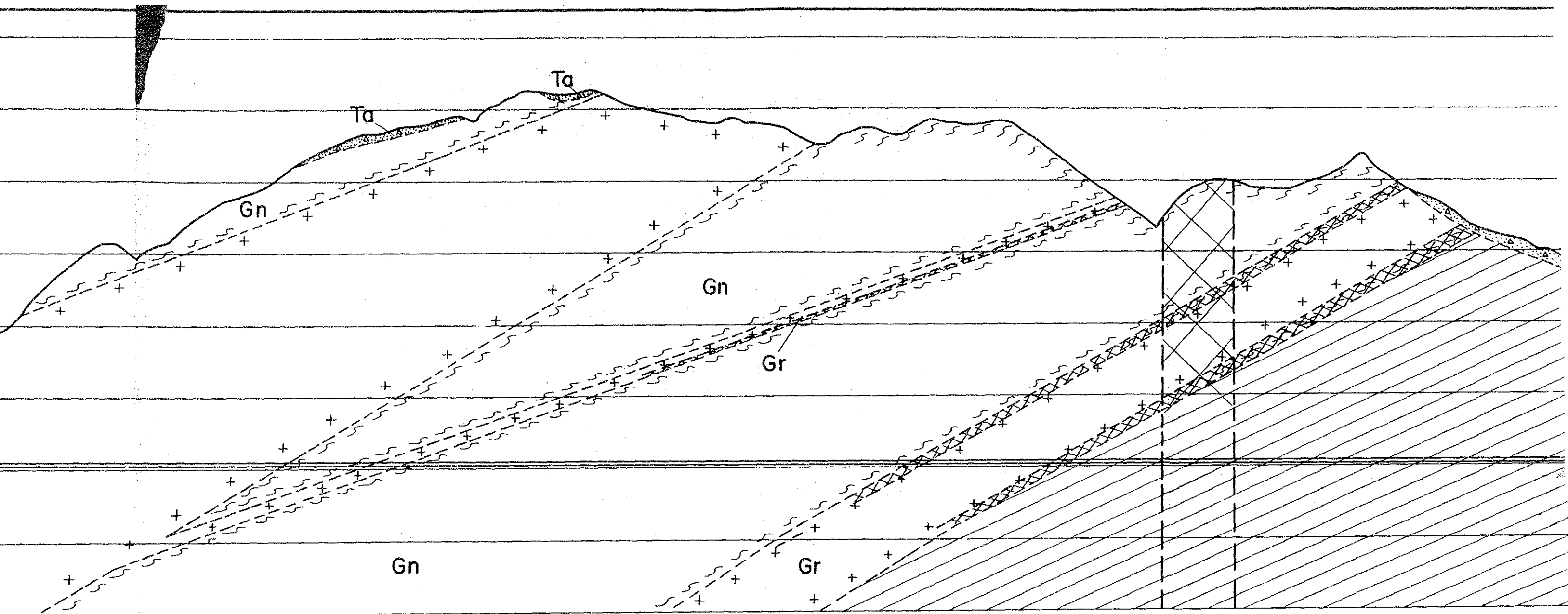
ARUN 3 HYDRO POWER PROJECT
 FEASIBILITY STUDY

**GEOLOGY
 HEADRACE TUNNEL
 ALIGNMENT AREA PLAN**

DWG-G-1 Date JUNE 1987



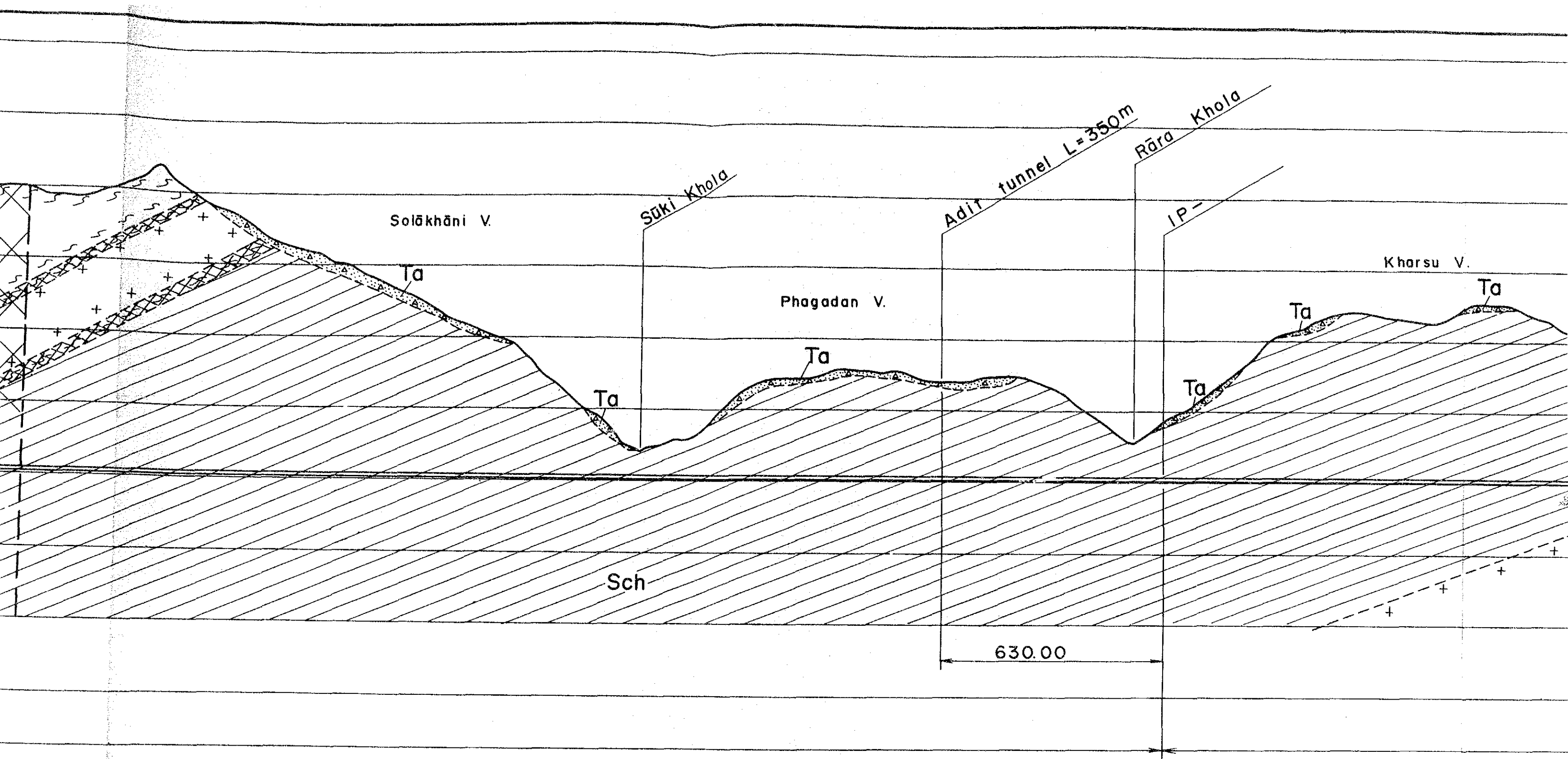
Underground Condition on the Tunnel Formation	Length (m)	Sedimentation basin		
	Geology	Gneiss (Gn)	1	2
	Assumed seismic Vp (km/sec)	4.4 ~ 4.5		
	Classification of Foundation	B - a	B - c	B - a
	Remarks	Assumed $qu = 150 \text{ kgf/cm}^2$ • This formation are intercalated many micaceous thin beds	• Assumed $qu = 500 \sim 600 \text{ kgf/cm}^2$ • Partly sheared, with clay zone.	• Assumed $qu = 150 \text{ kgf/cm}^2$ • Partly sheared



8,100.00

Headrace tunnel

2		3		4		5	
ite (Gv) gneissosed	Gn	Gr	Gn	Gr	Mica sch.	Shear zone	
		2.0±	4.0	2.0±	4.4 ~ 4.5	2.0±	3.5
B-a	B-c	E ~ DI-c	B-a	E ~ DI-c	B-c	E ~ DI-a	DI-d2
<ul style="list-style-type: none"> Assumed $q_u \approx 150 \text{ kgf/cm}^2$ Partly sheared 	<ul style="list-style-type: none"> Assumed $q_u \approx 500 \sim 600 \text{ kgf/cm}^2$ Partly sheared 	<ul style="list-style-type: none"> Clay with breccia Sheared zone 	<ul style="list-style-type: none"> Assumed $q_u \approx 150 \sim 200 \text{ kgf/cm}^2$ Intercalated many micaceous thin bed and thin gneissosed granite. Above parts are weak zone 	<ul style="list-style-type: none"> Clay with breccia Sheared zone 	<ul style="list-style-type: none"> Assumed $q_u \approx 500 \sim 600 \text{ kgf/cm}^2$ Partly sheared 	<ul style="list-style-type: none"> Clay with breccia Sheared zone 	<ul style="list-style-type: none"> Water seepage maybe originated by excavation
							<ul style="list-style-type: none"> Assumed Generally Water see

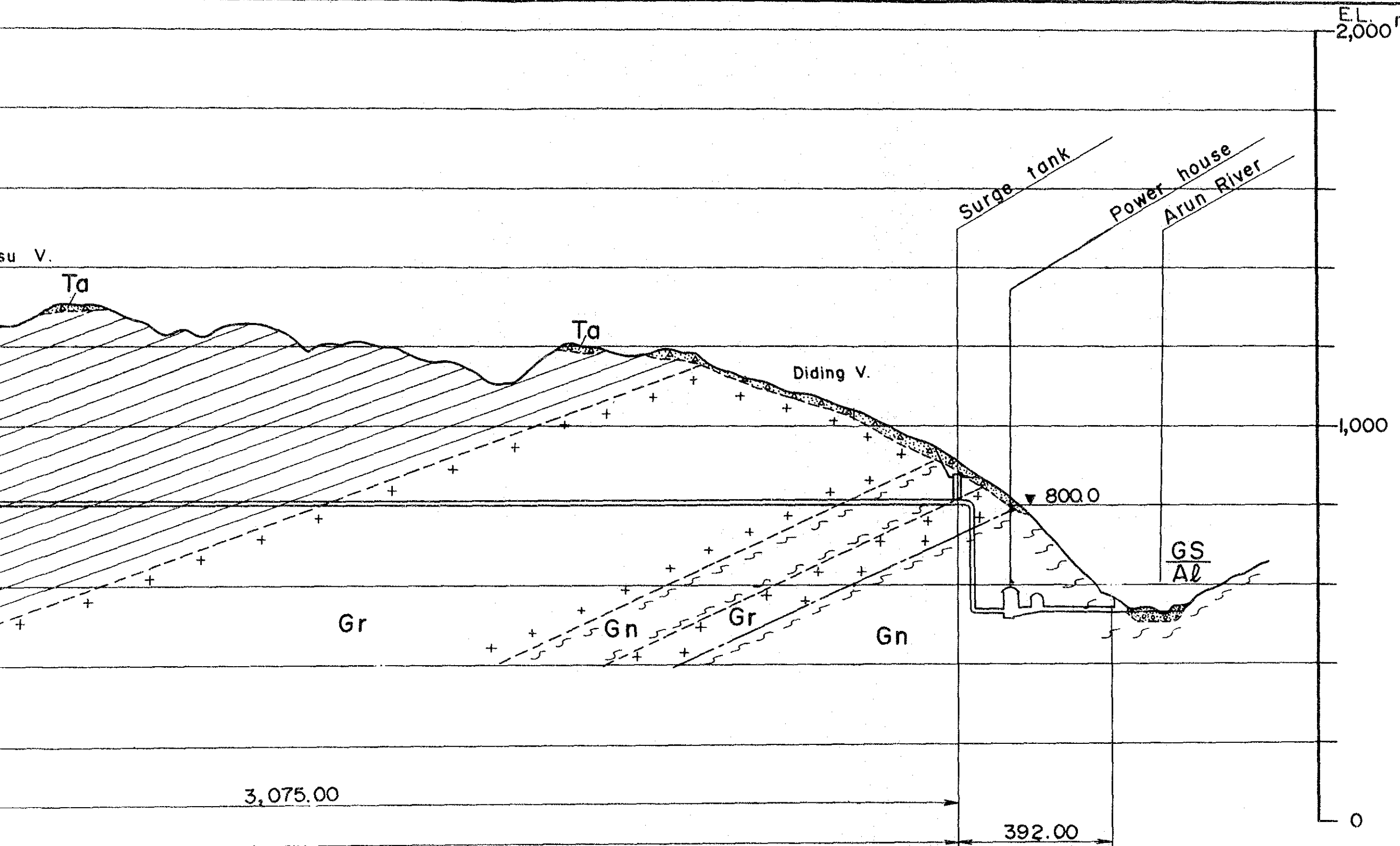


Headrace tunnel 11,352.00 1:840

5	6	7	8	9
Mica Schist				
3.5 ± 0.5				
CI-d ~ CI-d2	CI-d ~ CI-d2	DI-d2	CI-a ~ CI-d2	DI-d2
CI-a ~ CI-d2				CI-a ~ CI-d2

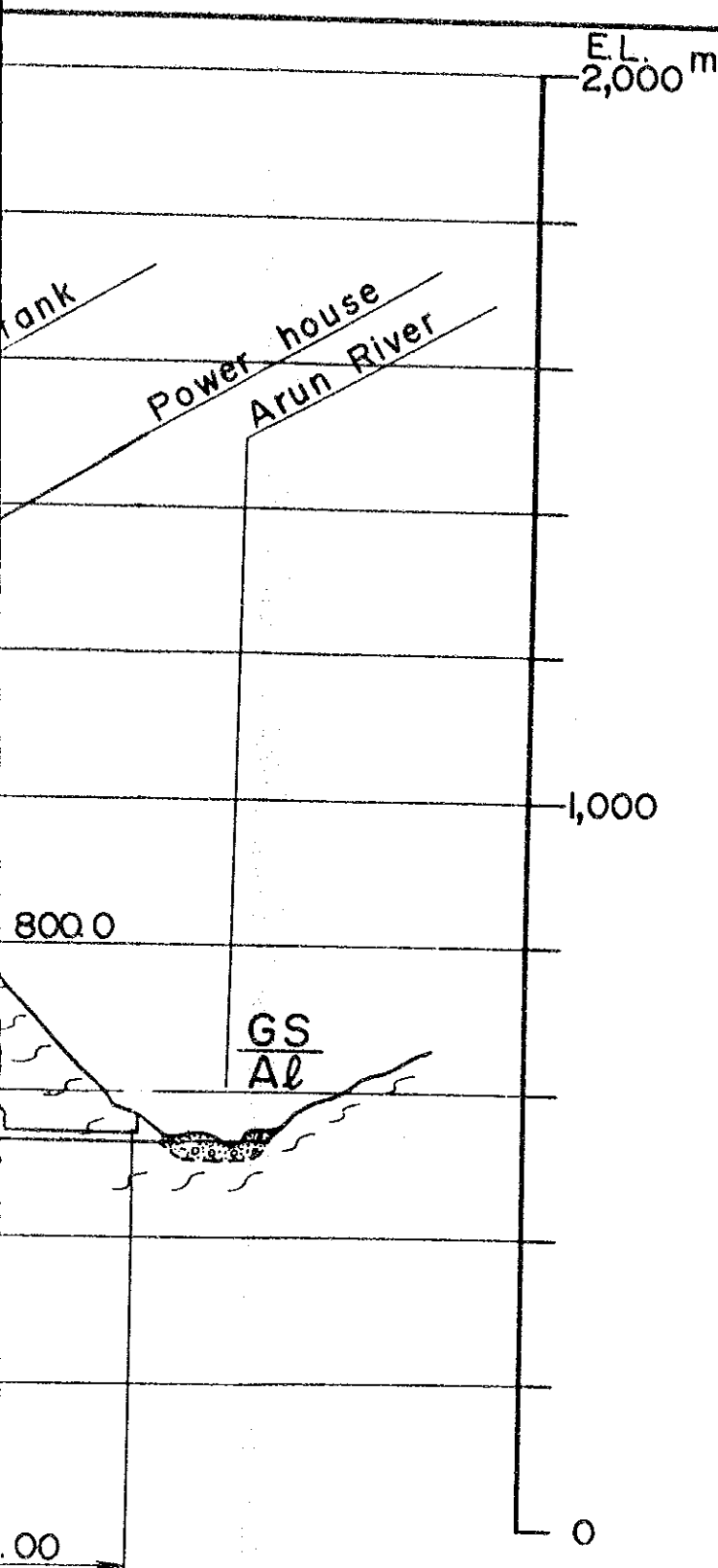
er seepage
e originated
xcavation

- Assumed maximum q_u is less than 100kgf/cm²
- Generally plastic deformation may be originated by tunnel excavation in this formation, especially on the thick overburden zone.
- Water seepage may be originated by tunnel excavation on the underground passing location of the river, sukikhola and Rava Khola.



Station	Geology				Length (m)	Underground Condition on the Tunnel Formation
	9	10	11	K (11,280)		
		fine grained granite, Gneissosed	Gn	Gr	Gn	
		4.4 ~ 4.5				Assumed seismic Vp (km/sec)
CI - d 2		B - c	B - a	B - c	B - a	Classification of Foundation
		Assumed qu * 500 ~ 600 kgf/cm ² Intercalated many micaceous thin bed.	Assumed qu * 400 ~ 500 kgf/cm ² Intercalated many micaceous thin bed.	Assumed qu * 500 ~ 600 kgf/cm ² Intercalated many micaceous thin bed.	Assumed qu * 400 ~ 500 kgf/cm ² Intercalated many micaceous thin bed.	Remark

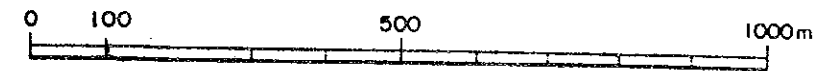
Classification of Foundation Rock	Type of Rock	Assumed condition excavation
A	a	Plastic
	b	is not
	c	loosene
	d1	less 1
B	a	General
	b	is not
	c	be acti
	d1	with sh
C	a	water
	b	loosene
	c	1.5
	d1	Many tim
D	a	pressure
	b	loosene
	c	plastic
	d1	2.0
E	a	Plastic
	b	sometime
	c	Pressure
	d1	loosene
F	a	Plastic
	b	manytime
	c	unsymmetr
	d1	is activ
G	a	Plastic
	b	more than 7.0
	c	
	d1	



Classification of Foundation Rock	Type of Rock	Assumed condition after excavation			
		Assumed geological condition after excavation.	Space displacement (mm)		
A	a	Plastic ground pressure is not active. loosened height less than 1.6 m	Very small.		
	b				
	c				
	d1				
B	a	Generally plastic pressure is not active and may be active combining with sheare zone and water seepage. loosened height 1.5~3.0 m	Very small		
	b				
	c				
	d1				
C	a	Manytime plastic ground pressure is active. loosened height or plastic zone: 2.0~4.0 m	below 50		
	b				
	c				
	d1				
	d				
	a			Plastic ground pressure, sometime big unsymmetrical Pressure is active loosened height or plastic zone 3.0~6.0m	below 60
	b				
	c				
d1					
D	d2	Plastic zone 3.0~6.0m	below 200		
	e				
	a				
	b				
	c				
E	d1	Plastic ground pressure, manytime remarkable unsymmetrical pressure is active Plastic zone: more than 7.0 m	below 400		
	d2				
	e				
	a				
	b				
	c				

Legend

- Alluvium river deposit, Sand/Gravel.
- Terrace deposit, - do -
- Talus deposit, Sand/Clay with debris, -include huge stone.
- Augengneiss with thin mica schist.
- Granite, fine grained and gneisosed.
- Schist, garnetiferous and micaceous.
- Sheared zone, with clay.
- Cracky zone.
- Assumed geological boundary.
-

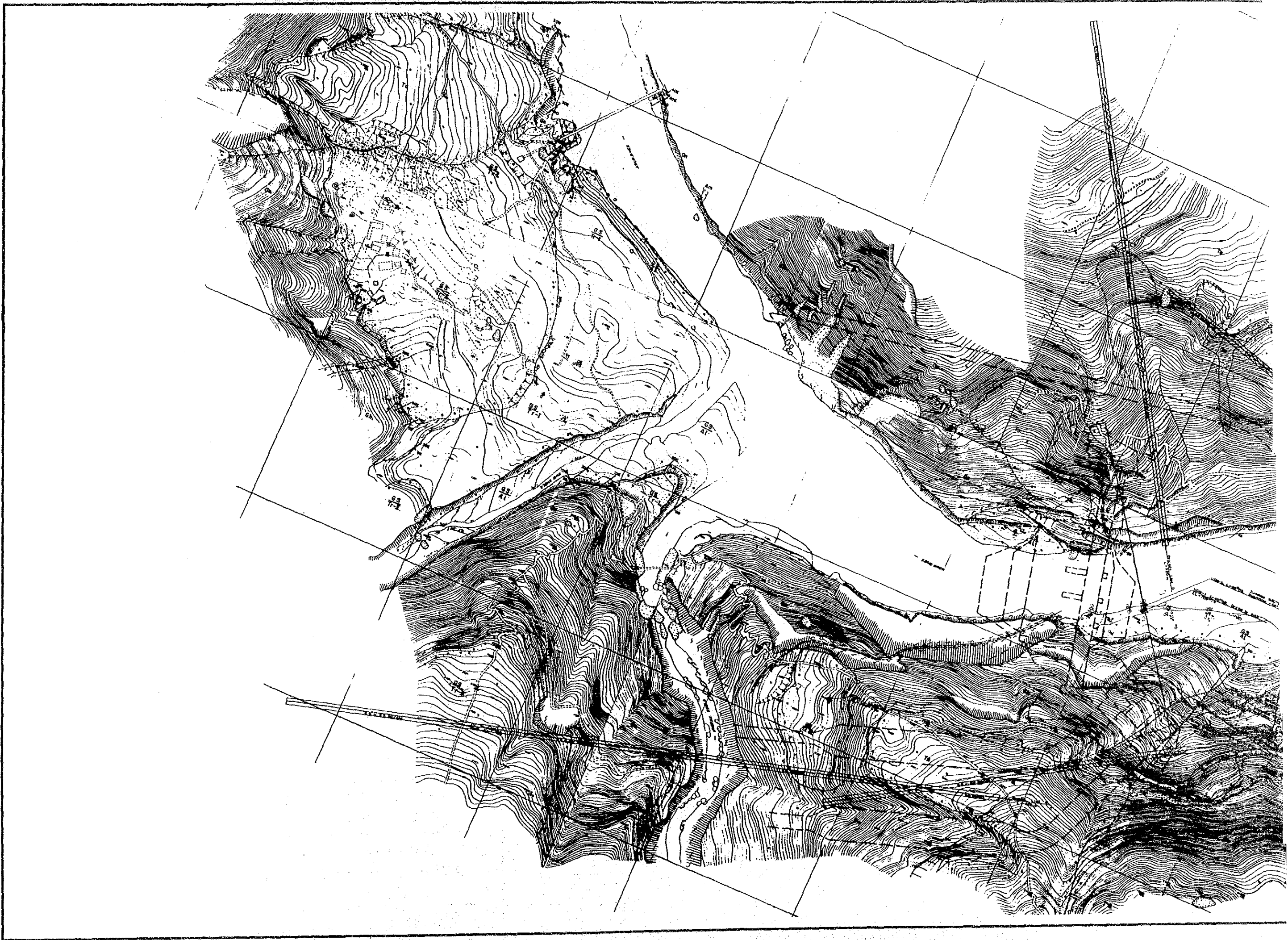


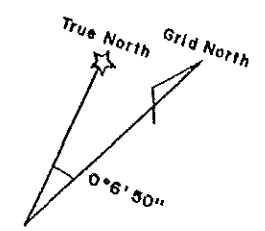
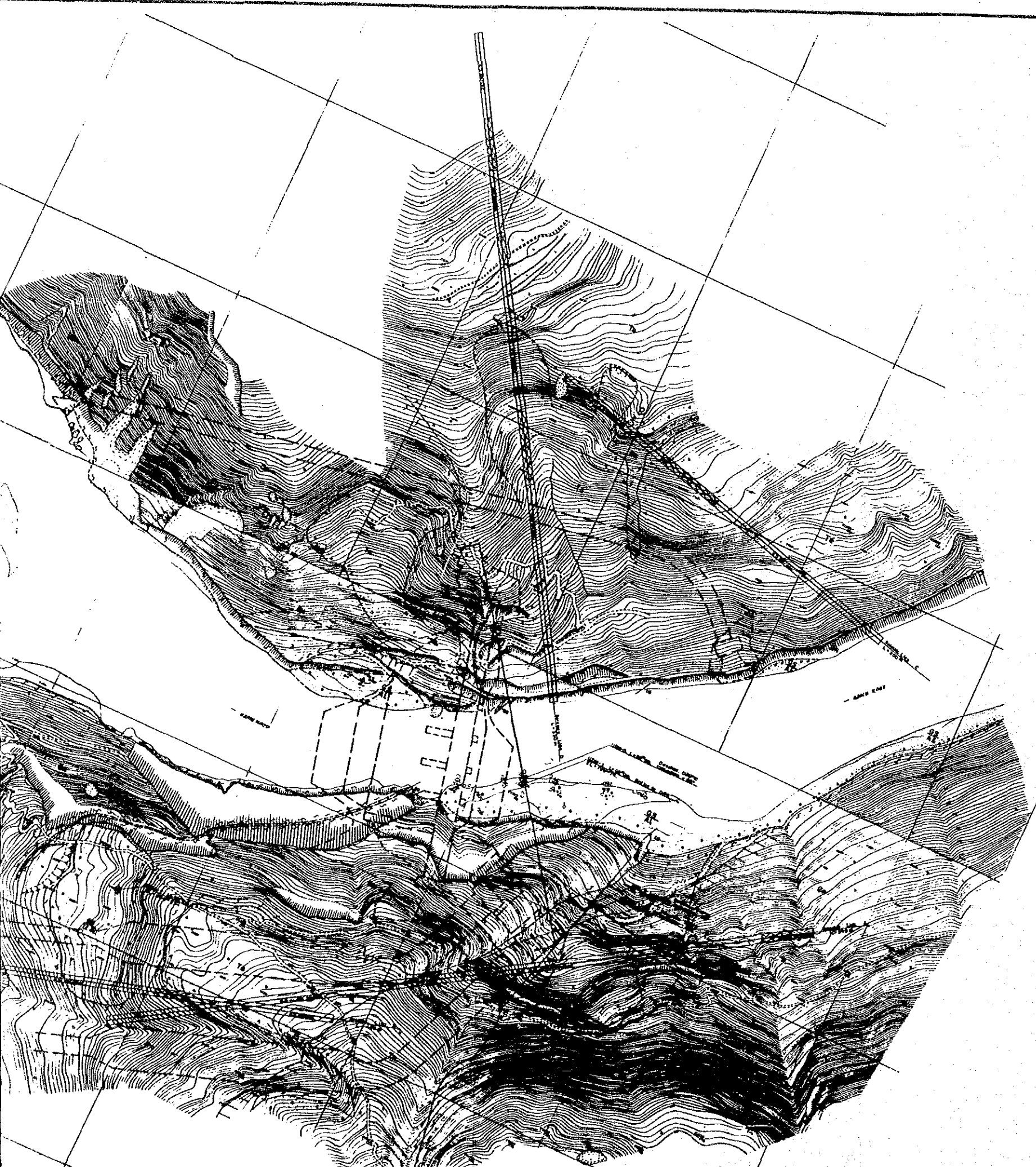
	Length(m)	Underground Condition on the Tunnel Formation
Gn	Geology	
	Assumed seismic Vp(km/sec)	
B - a	Classification of Foundation	
0kgf/cm ² d many thin bed.	Remark • Assumed qu #400~500 kgf/cm ² • Intercalated many micaceous thin bed.	

ARUN 3 HYDRO POWER PROJECT
FEASIBILITY STUDY

**GEOLOGY
HEADRACE TUNNEL
ALIGNMENT AREA PROFILE**

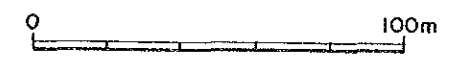
DWG. G-2 Date JUNE 1987





Legend.

	GS	Aluvium river deposit, Sand / Gravel.
	TI	Terrace deposit, - do -
	To	Talus deposit, Sand/Clay with debris, -include huge stone.
	Gn	Augengneiss with thin mica schist.
	Gr	Granite fine grained and gneissoid.
	Am	Amphibolite.
		Bedding, Gneissose structure.
		Joint.
		Drilling point.
		Seismic Line No. Length.
		P-wave velocity in basement layer
		Low velocity layer in basement layer.
		Geological boundary



ARUN 3 HYDRO POWER PROJECT
FEASIBILITY STUDY

**GEOLOGY
DAM SITE AREA
PLAN**

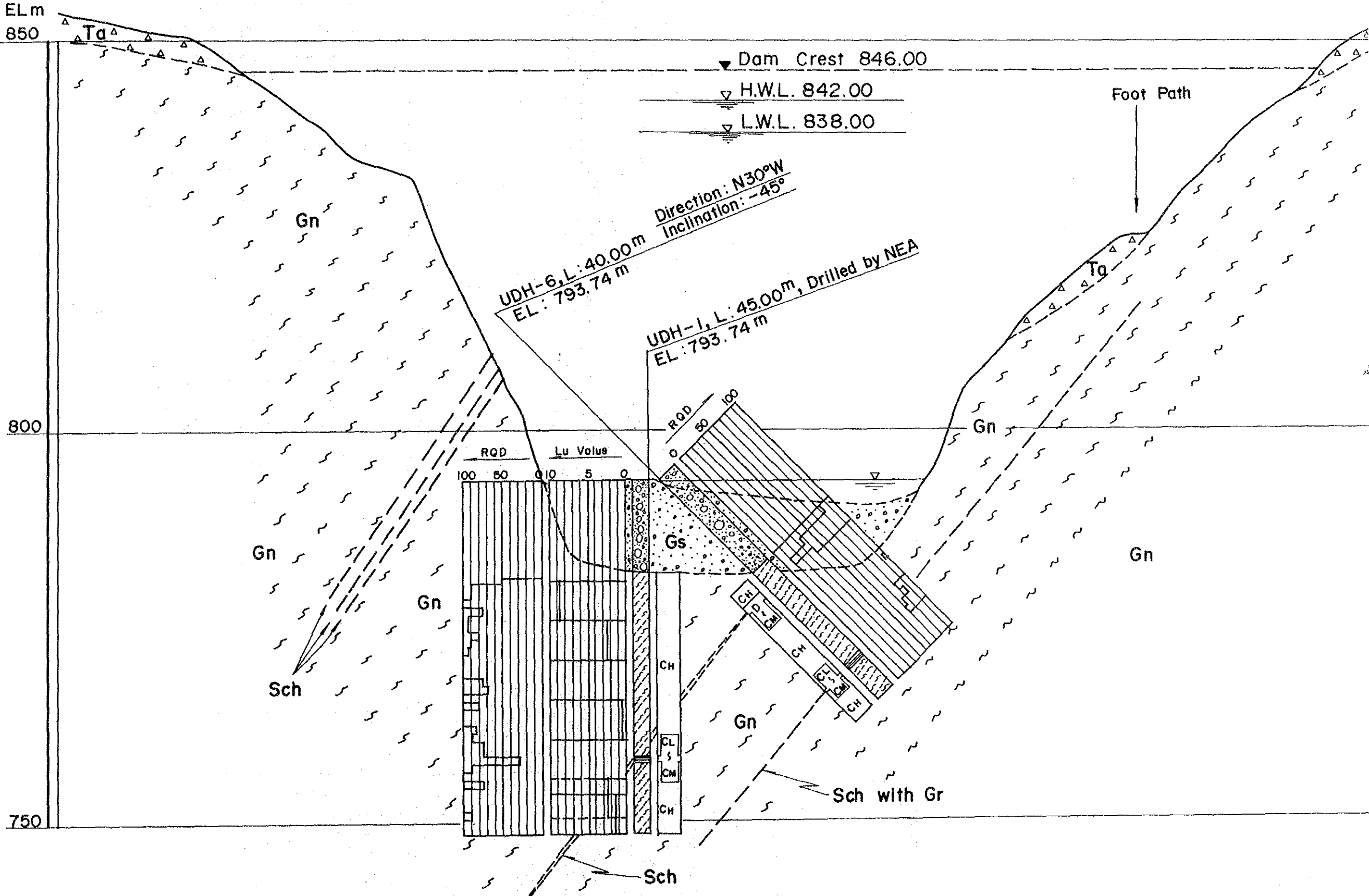
DWG·G-3 Date JUNE 1987

Geological Profile of Dam Site

Left Bank

Right

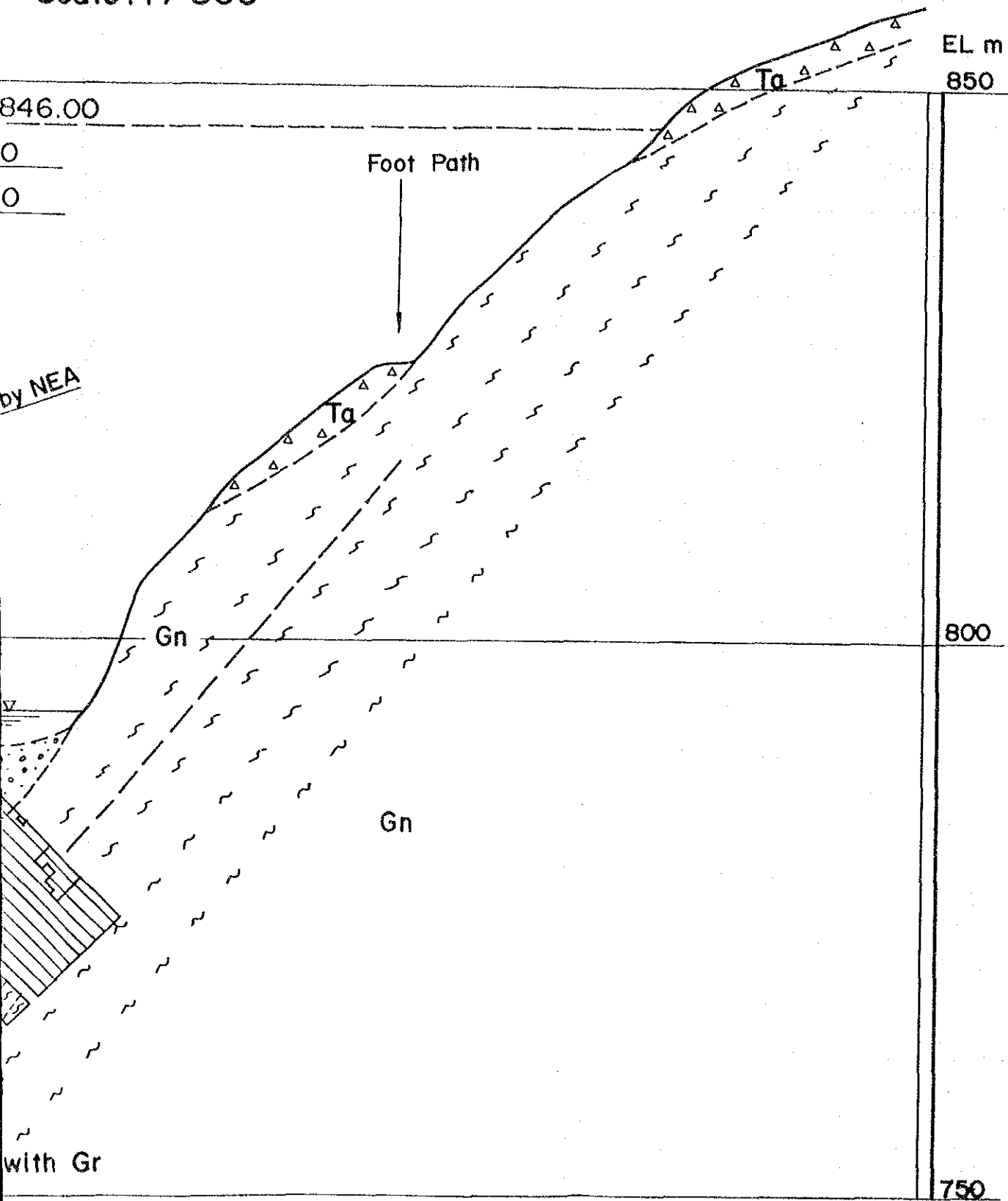
Scale: 1 / 500



Site

Scale: 1 / 500

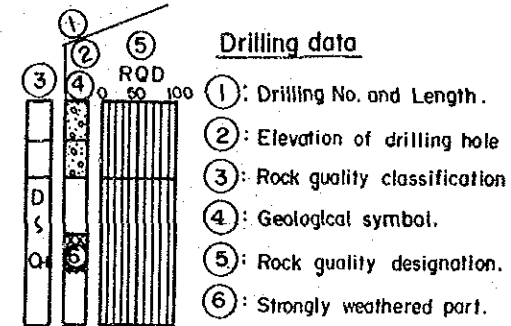
Right Bank



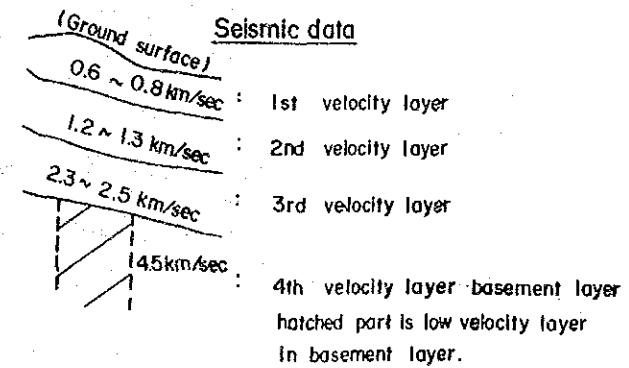
Legend

- : (Gs), Alluvium deposit, Sand/Gravel.
- : (Tr), Terrace deposit, Sand/Gravel.
- : (Ta), Talus deposit, Sand/Clay with debris, -Include huge stone.
- : (Gn), Augengneiss with thin mica schist.
- : (Gr), Granite, fine grained and gneissosed.
- : (Am), Amphibolite.
- : Geological boundary

Drilling data



Seismic data

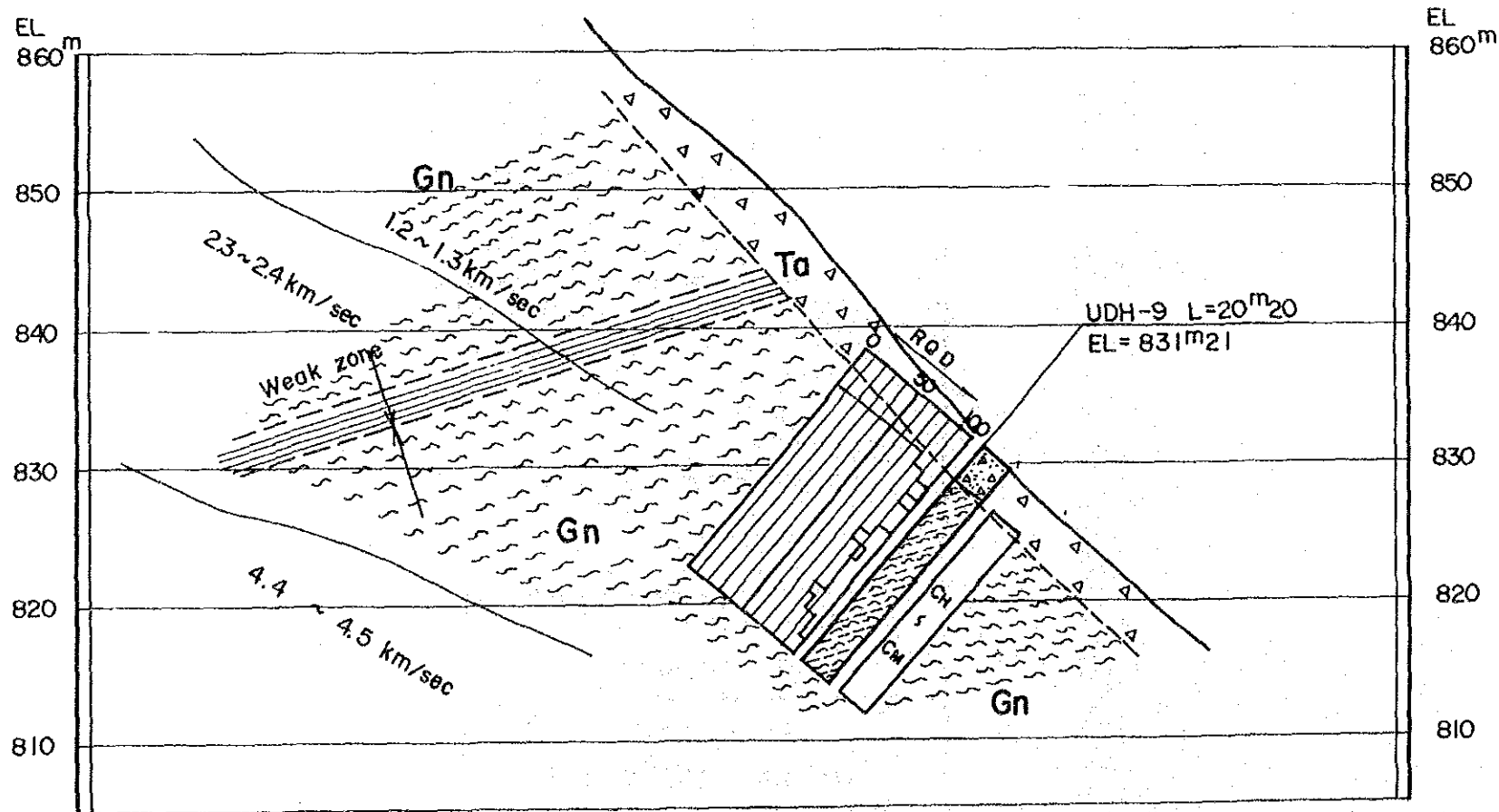
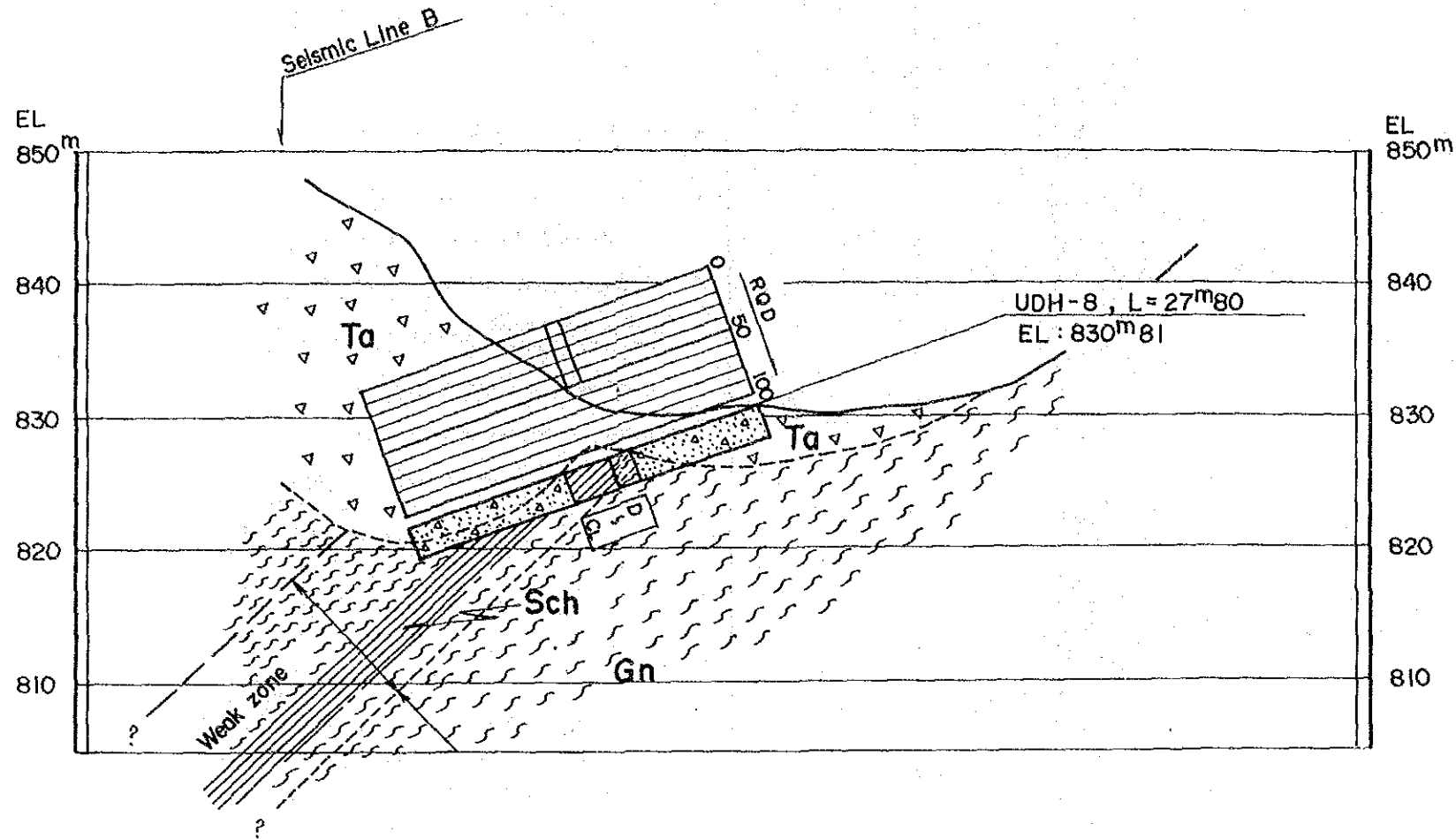


ARUN 3 HYDRO POWER PROJECT
FEASIBILITY STUDY

GEOLOGY
DAM SITE AREA
PROFILE

DWG. G-4

Date JUNE 1987



Legend

- : (Gs/Al), Alluvium deposit, Sand/Gravel.
- : (Gs/Tr), Terrace deposit, Sand/Gravel.
- : (Ta), Talus deposit, Sand Clay with debris, -Include huge stone.
- : (Gn), Augengneiss with thin mica schist.
- : (Gr), Granite, fine grained and gneissosed
- : (Am), Amphibolite
- : Geological boundary

Drilling data

- ① : Drilling No. and Length.
- ② : Elevation of drilling hole
- ③ : Rock quality classification
- ④ : Geological symbol.
- ⑤ : Rock quality designation.
- ⑥ : Strongly weathered part

Seismic data

(Ground surface)

- 0.6 ~ 0.8 km/sec : 1st velocity layer
- 1.2 ~ 1.3 km/sec : 2nd velocity layer
- 2.3 ~ 2.5 km/sec : 3rd velocity layer
- 4.5 km/sec : 4th velocity layer basement layer
hatched part is low velocity layer in basement layer.

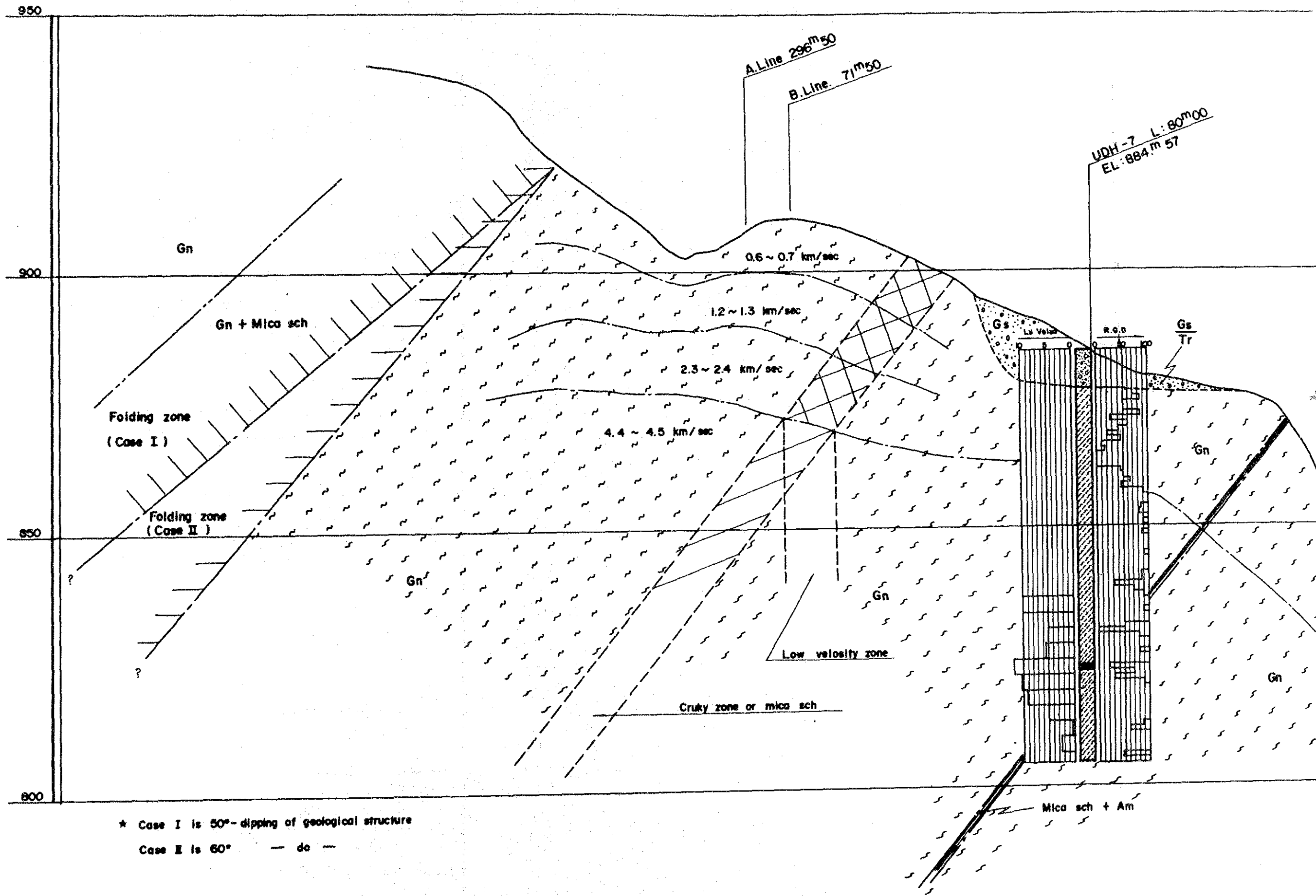


ARUN 3 HYDRO POWER PROJECT
FEASIBILITY STUDY

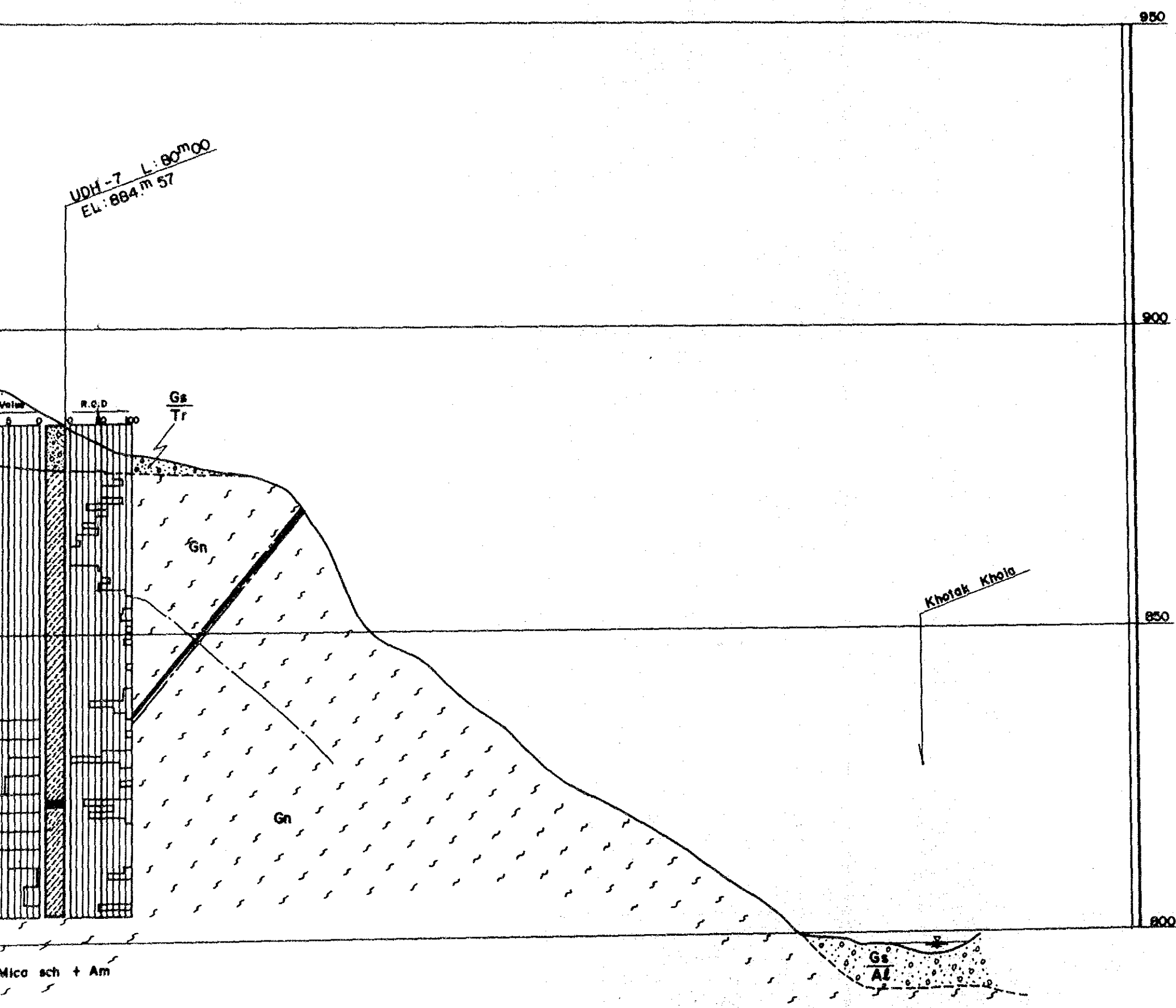
**GEOLOGY
INTAKE AREA
SECTIONS**

DWG. G - 5 Date JUNE 1987

Along A — B section



★ Case I is 50°-dipping of geological structure
 Case II is 60° — do —



Legend

- : (Gs / Al), Alluvium deposit, Sand/Gravel
- : (Gt / Tr), Terrace deposit, Sand/Gravel.
- : (Ta), Talus deposit, Sand Clay with debris, - include huge stone.
- : (Gn), Augengneiss with thin microschist
- : (Gr), Granite, fine grained and gneissoid
- : (Am), Amphibolite
- : Geological boundary

Drilling data

- ①: Drilling No. and Length
- ②: Elevation of drilling hole
- ③: Rock quality classification
- ④: Geological symbol
- ⑤: Rock quality designation
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Seismic data

(Ground surface)

- 0.6 - 0.8 km/sec : 1st velocity layer
- 1.2 - 1.3 km/sec : 2nd velocity layer
- 2.3 - 2.5 km/sec : 3rd velocity layer
- 4.5 km/sec : 4th velocity layer, basement layer
hatched part is low velocity layer in basement layer

ARUN 3 HYDRO POWER PROJECT
FEASIBILITY STUDY

GEOLOGY
DESANDING BASIN
PROFILE (LINE A-B)

DWG. G-6 Date JUNE 1987