

2-8-5-15

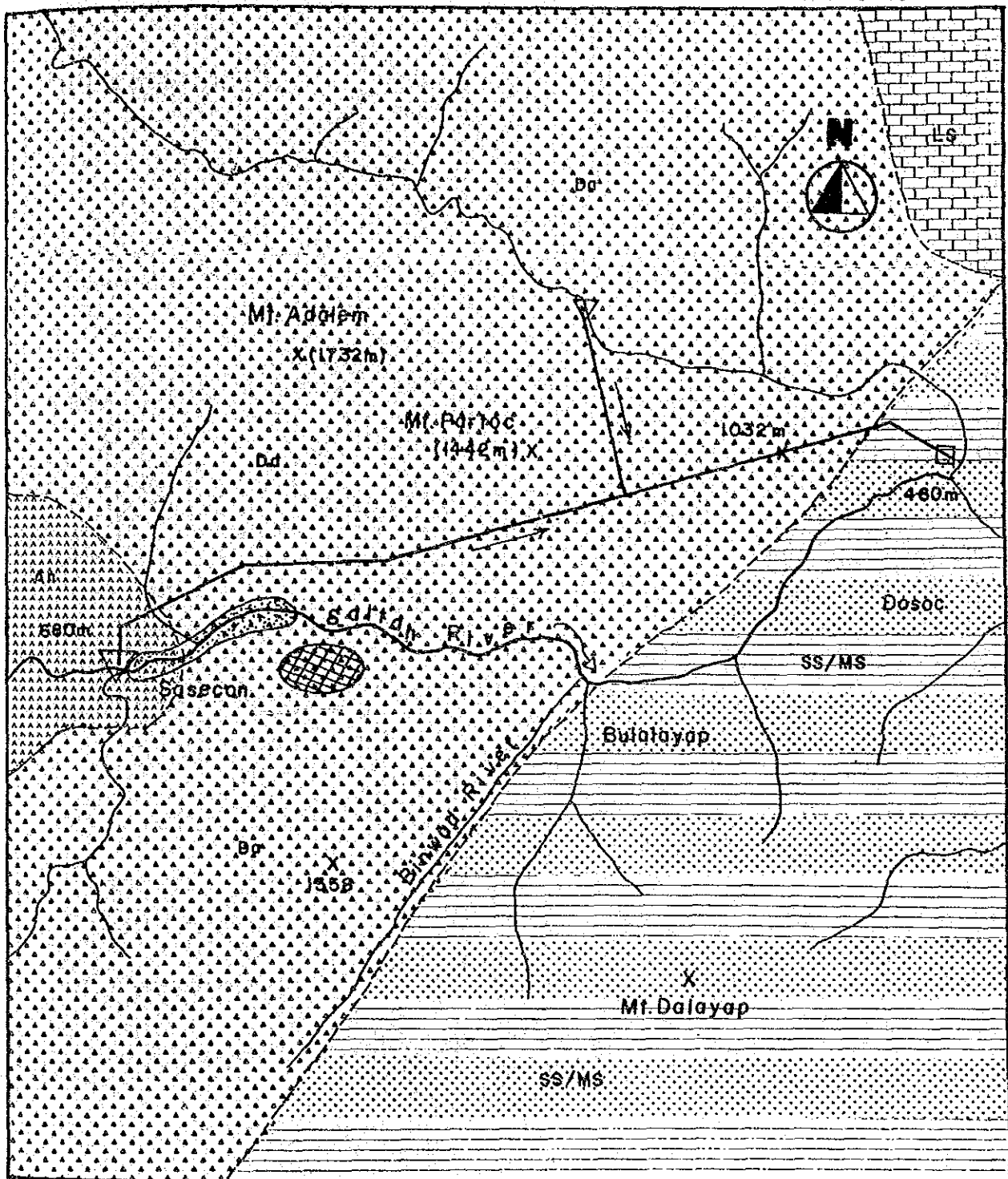
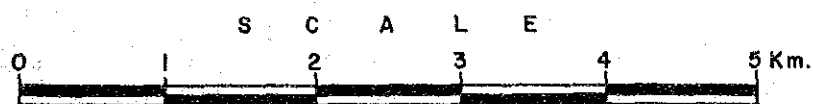


Fig. GEOLOGIC MAP OF SALTAN SCHEME



Geologic map is adapted from Northwest Luzon geological map in scale of 1:250,000.  
(JICA-MMAJ Aug. 1981)

2-8-6-22

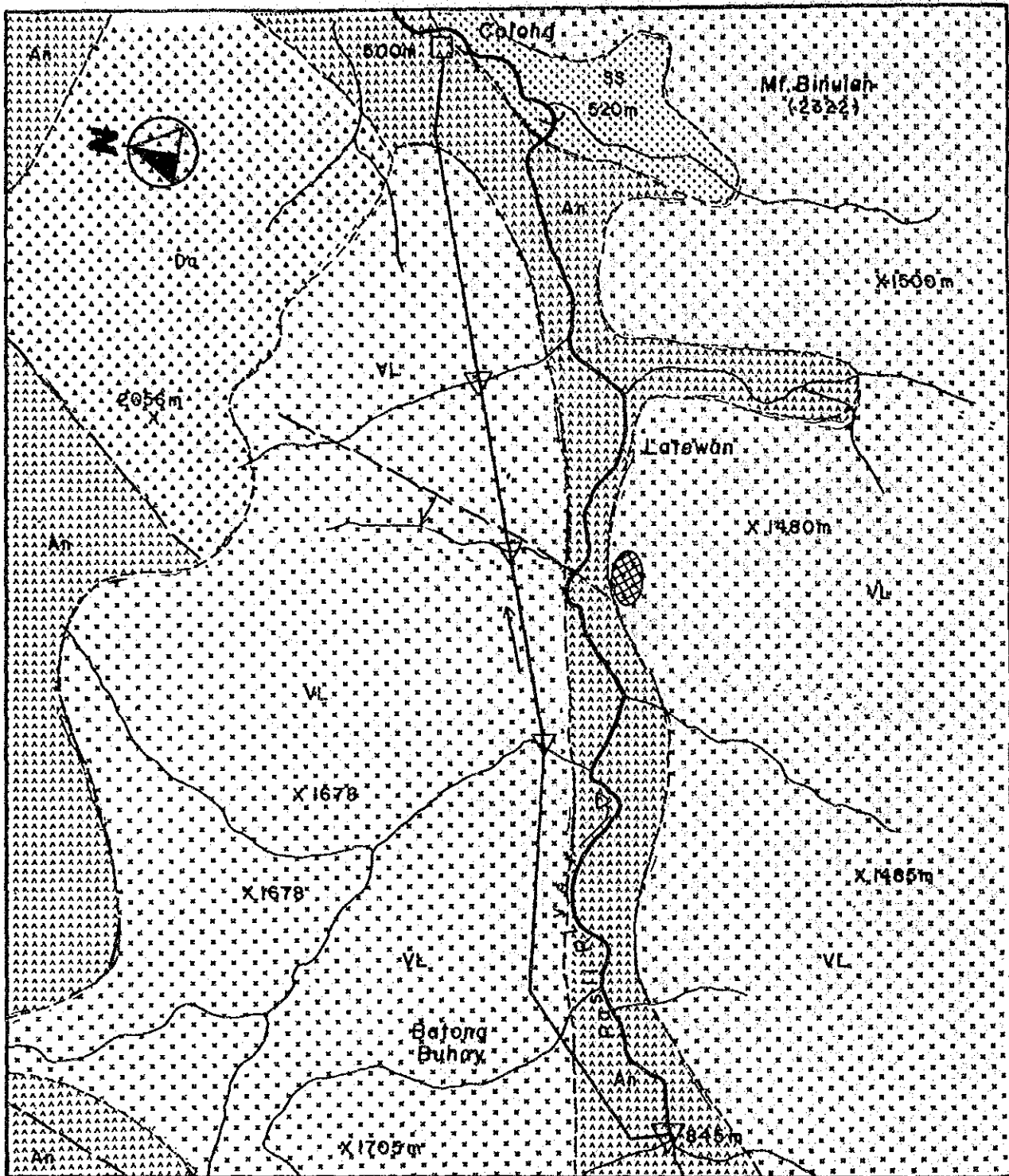
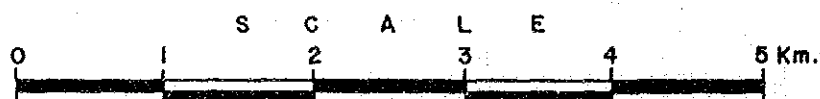


Fig.

## GEOLOGIC MAP OF PASIL SCHEME



Geologic map is adapted from Northwest Luzon geological map in scale of 1:250,000 (JICA-MMAJ Aug.1981)

2-8-6-23

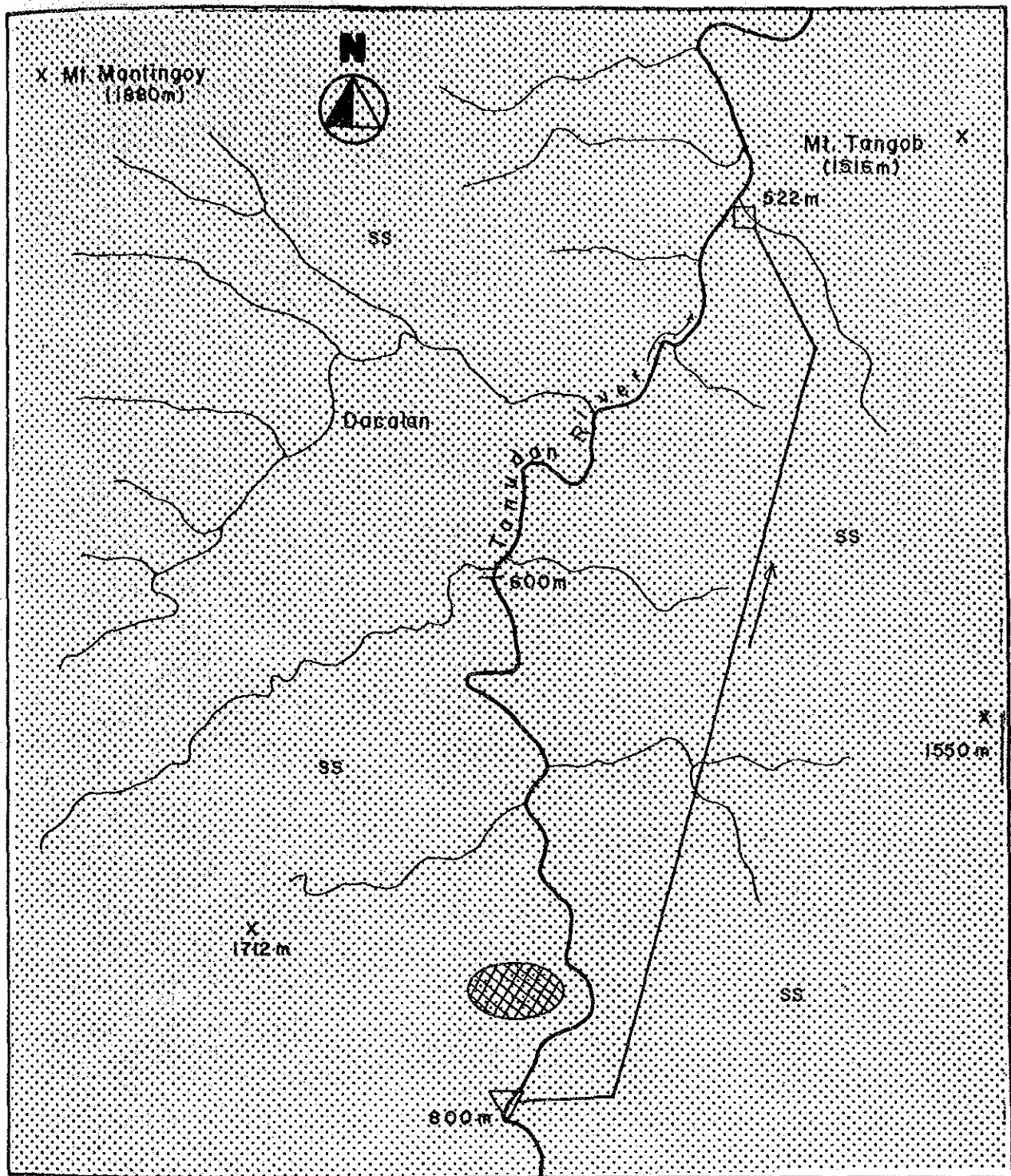
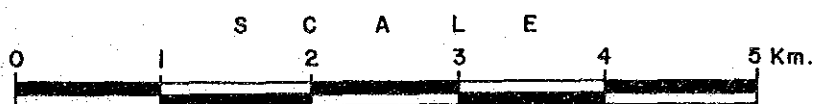


Fig. GEOLOGIC MAP OF TANUDAN SCHEME



Geologic map adapted from North-Western Luzon  
 Geological map in scale of 1:250,000 (JICA-MMJA 1981)

2-8-7-24

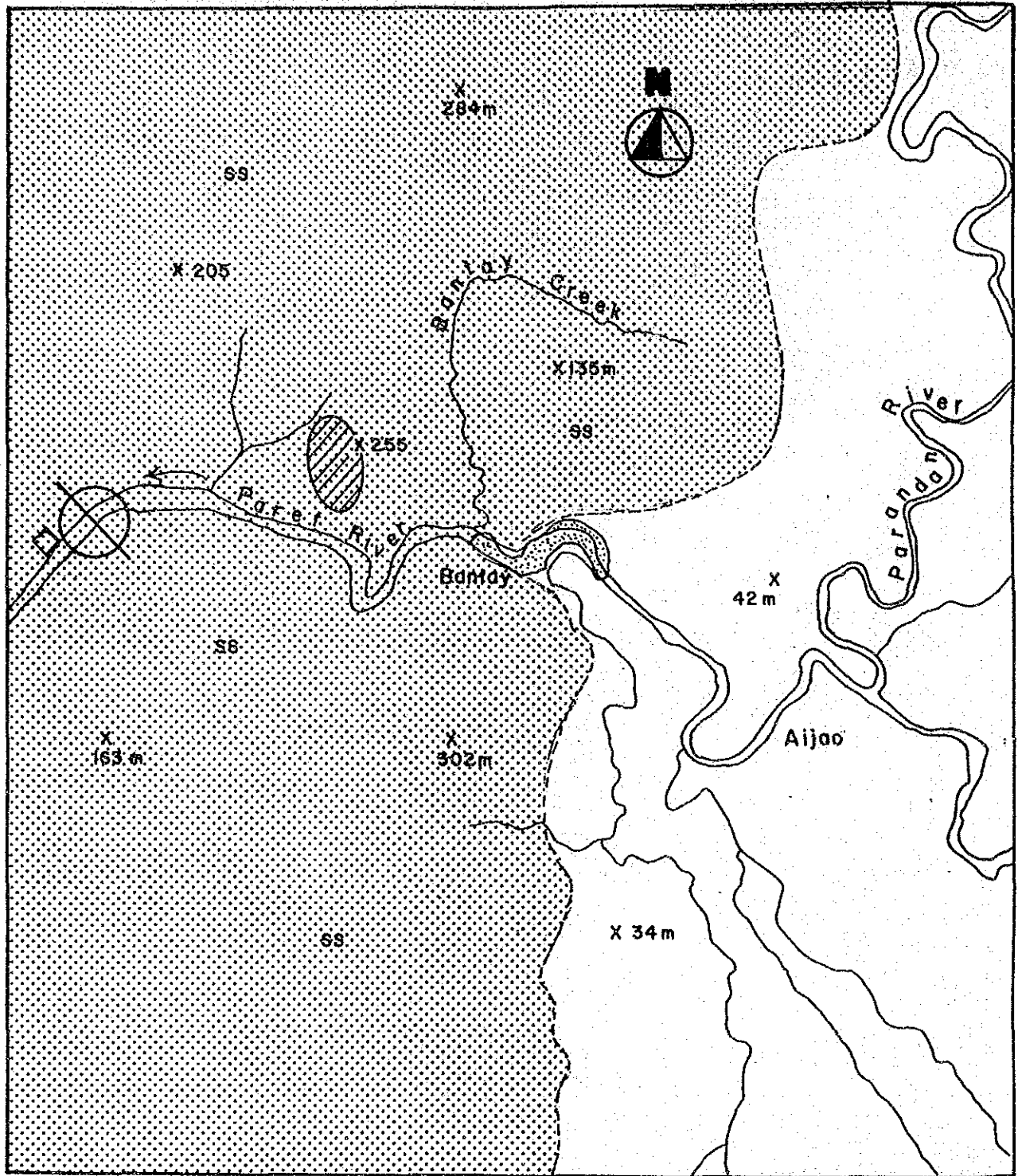
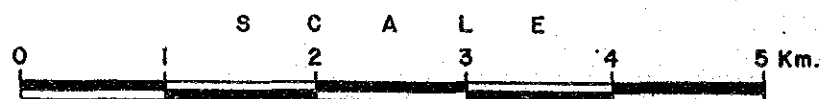


Fig. GEOLOGIC MAP OF BANTAY SCHEME



Geologic map is adapted from general geological map in scale 1:600,000 (Cagayan River Flood Control Basin Wide Study)

2-8-8-25

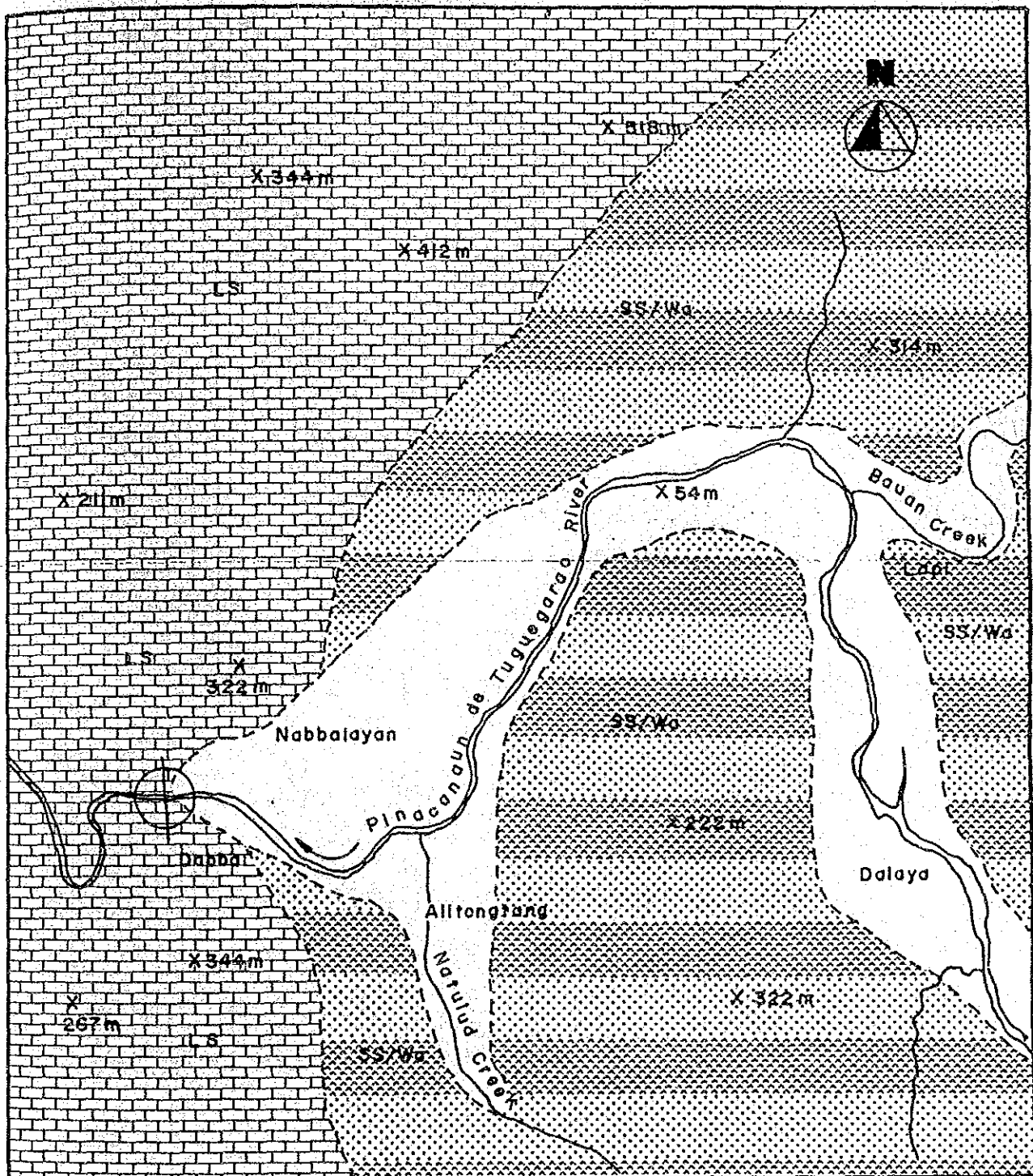
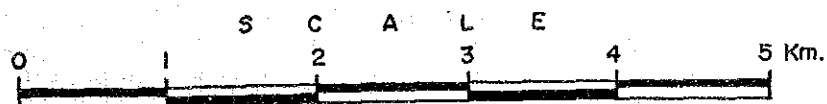


Fig. GEOLOGIC MAP OF DABBA SCHEME



Geologic map is adapted from geological map of Tuguegarao F/S project in scale of 1:100,000 (Phitech and Ministry of Public Works 1983).

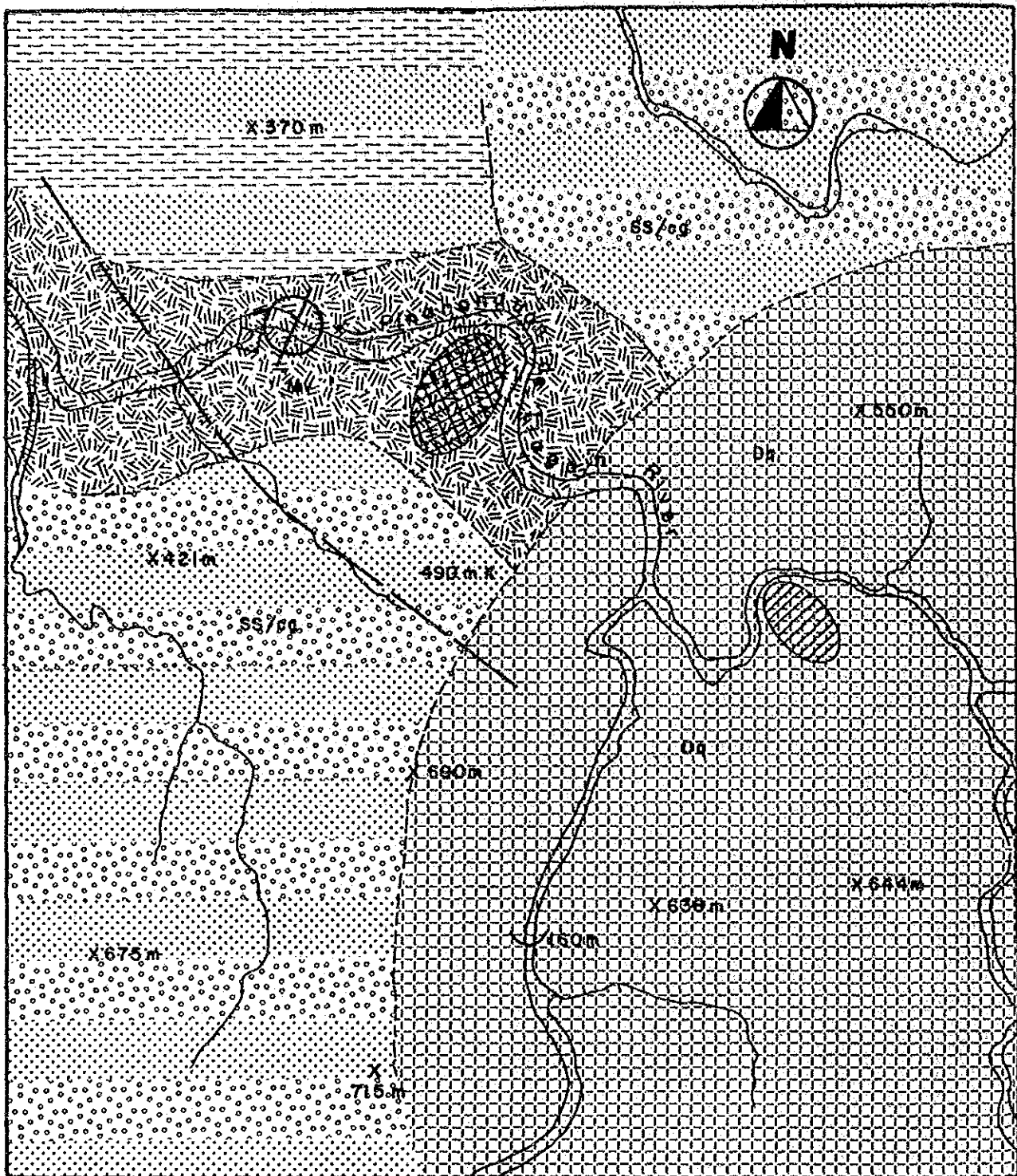
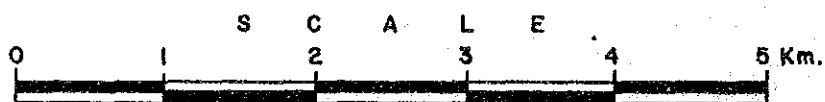


Fig. GEOLOGIC MAP OF MALIANO SCHEME



Geologic map is adapted from geological map of Ilagan No.1 Pre F/S project in scale of 1:100,000 (Phitech and Ministry of Public Works 1983).



A horizontal scale bar with a black and white striped pattern. It is marked with numbers 0, 1, 2, 3, 4, and 5 Km. Above the markers, the letters S, C, A, L, and E are positioned, corresponding to the locations of the study sites.

2 - 29

2-8-28-52

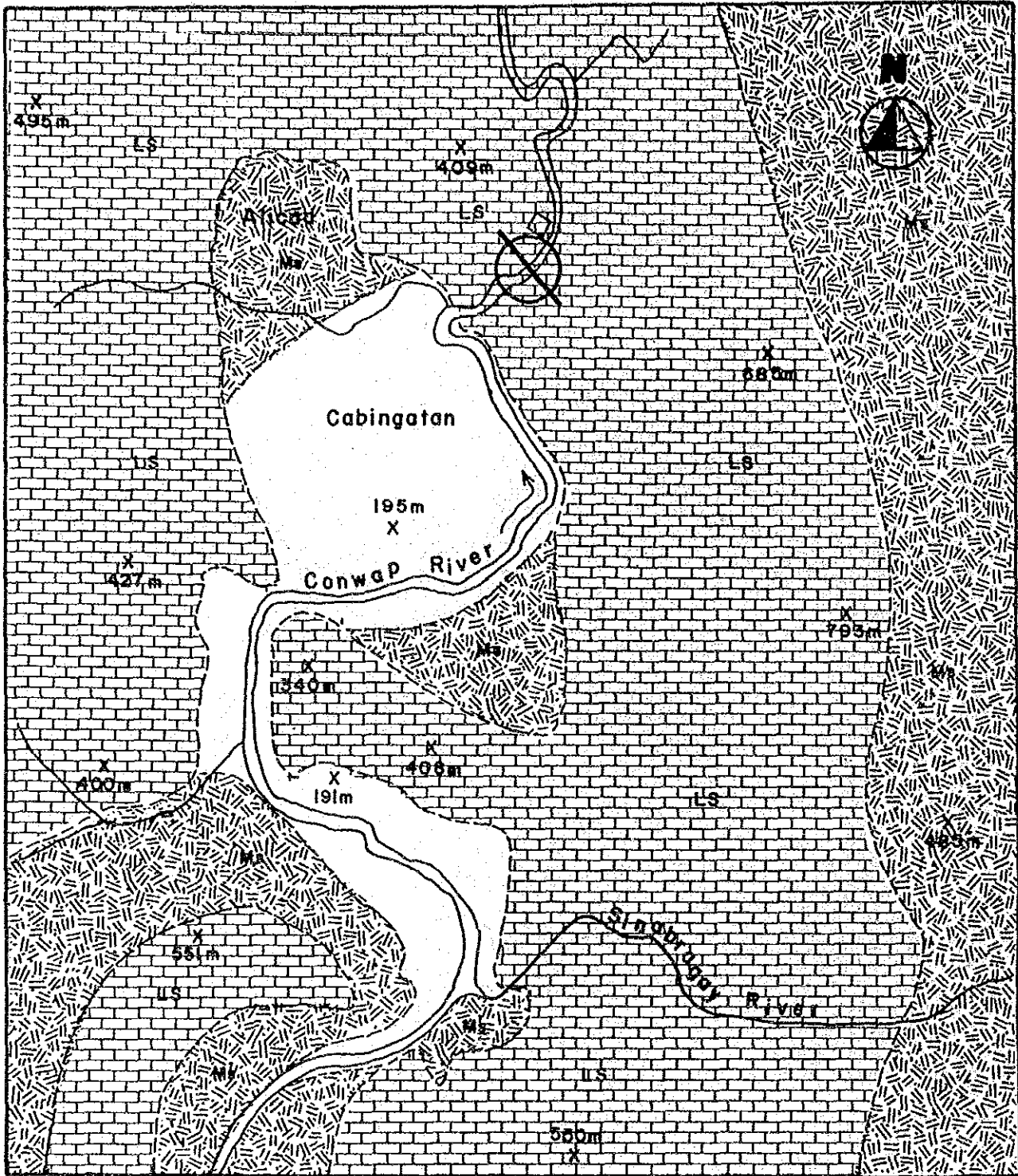
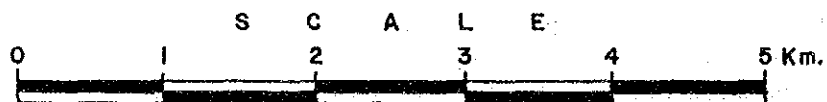


Fig. GEOLOGIC MAP OF CABINGATAN SCHEME



Geologic map is adapted from general geological map in scale of 1:600,000  
(Cagayan River Flood Control Basin Wide Study)



2-8-29-58

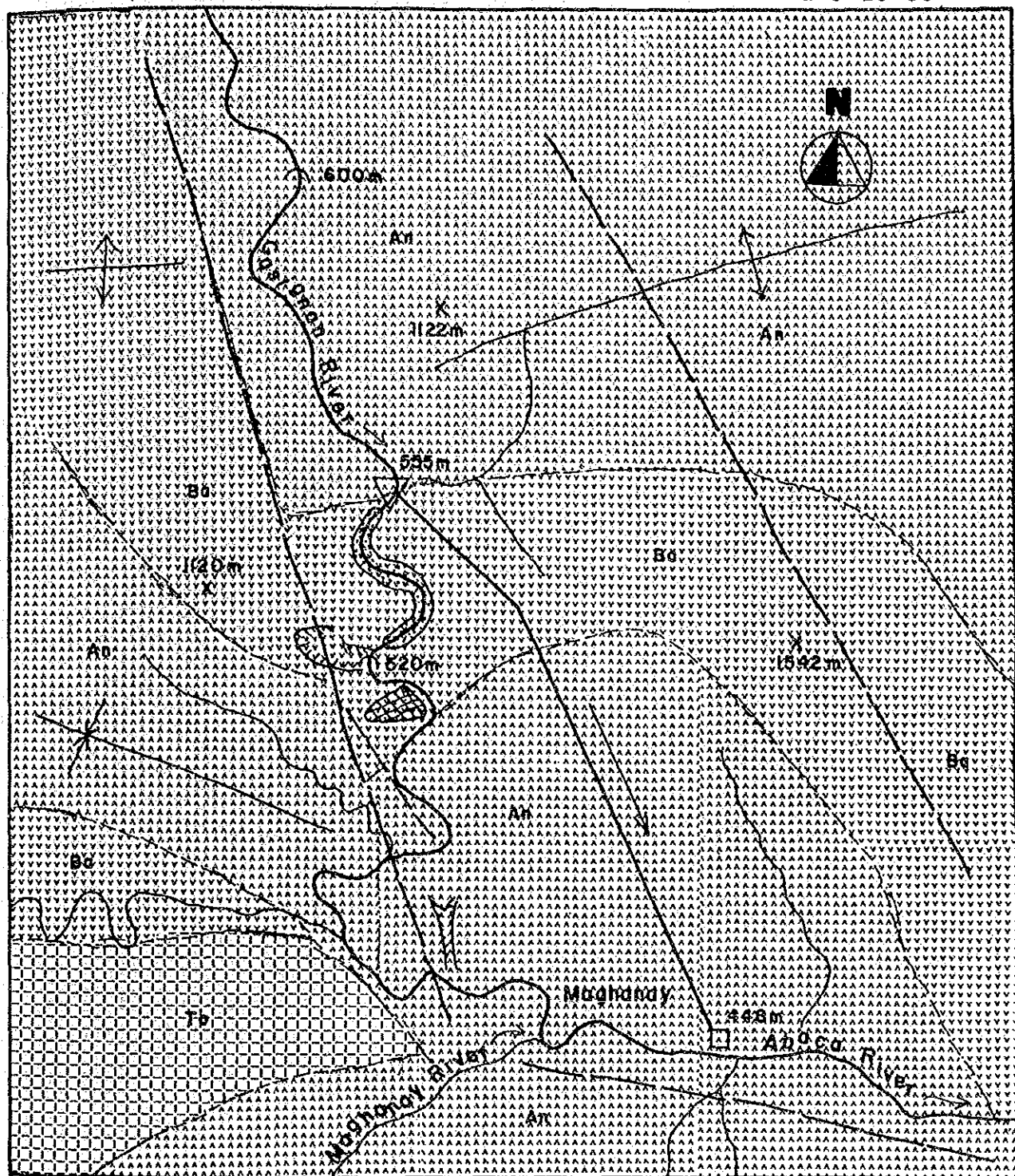
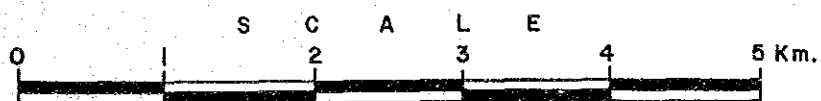


Fig. GEOLOGIC MAP OF CASECNAN SCHEME



Geologic map is adapted from geological map of Northeastern of Luzon Island in scale of 1:250,000 (JICA - MMAJ 1977)

2-8-29-59

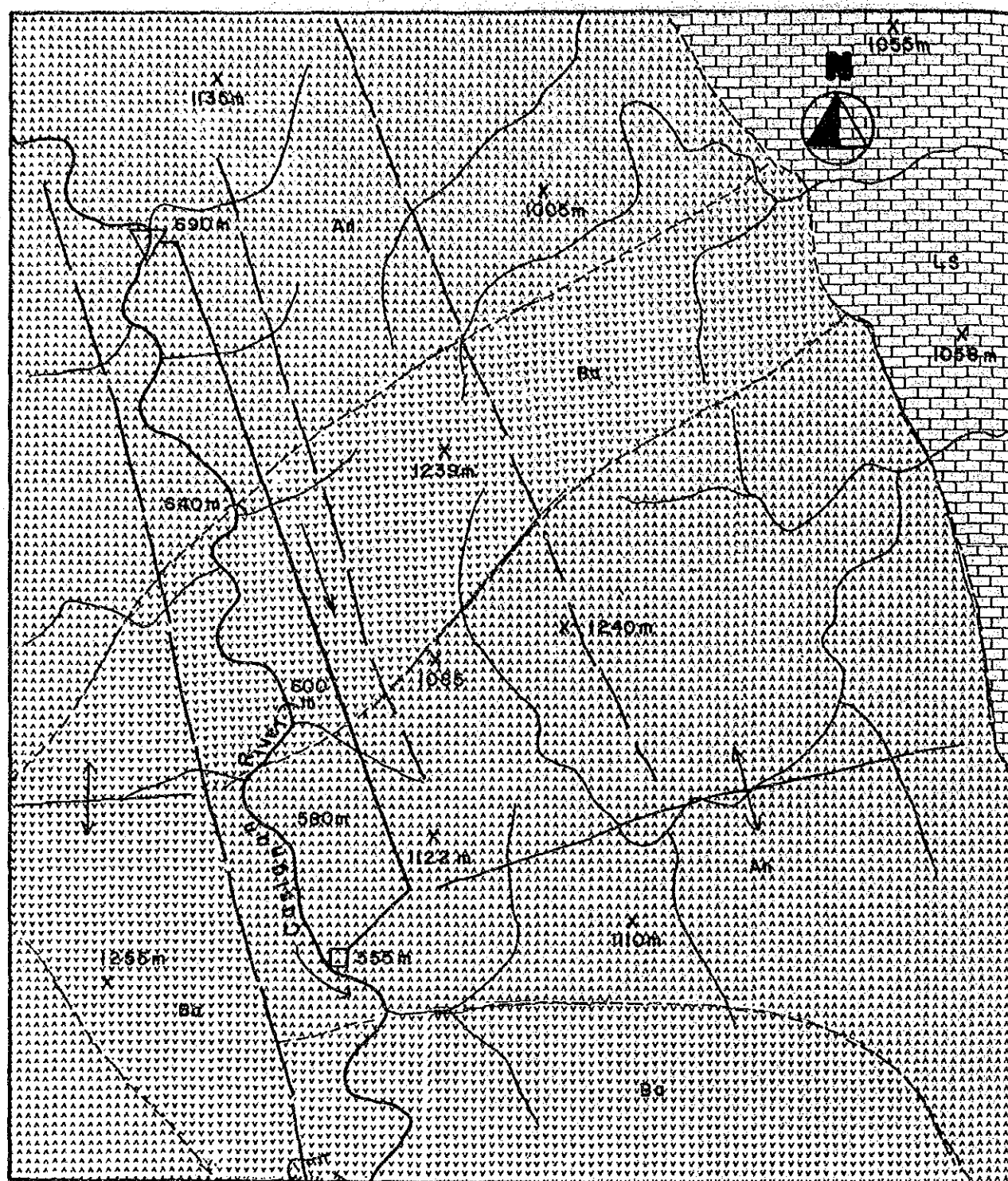
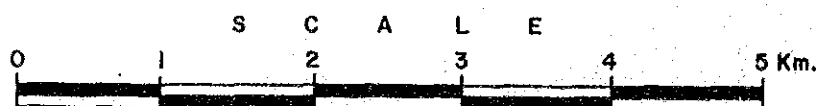


Fig. GEOLOGIC MAP OF UPPER CASECNAN SCHEME



Geologic map is adapted from geological map of Northeastern of Luzon Island in scale of 1:250,000 (JICA-MMAJ 1977)

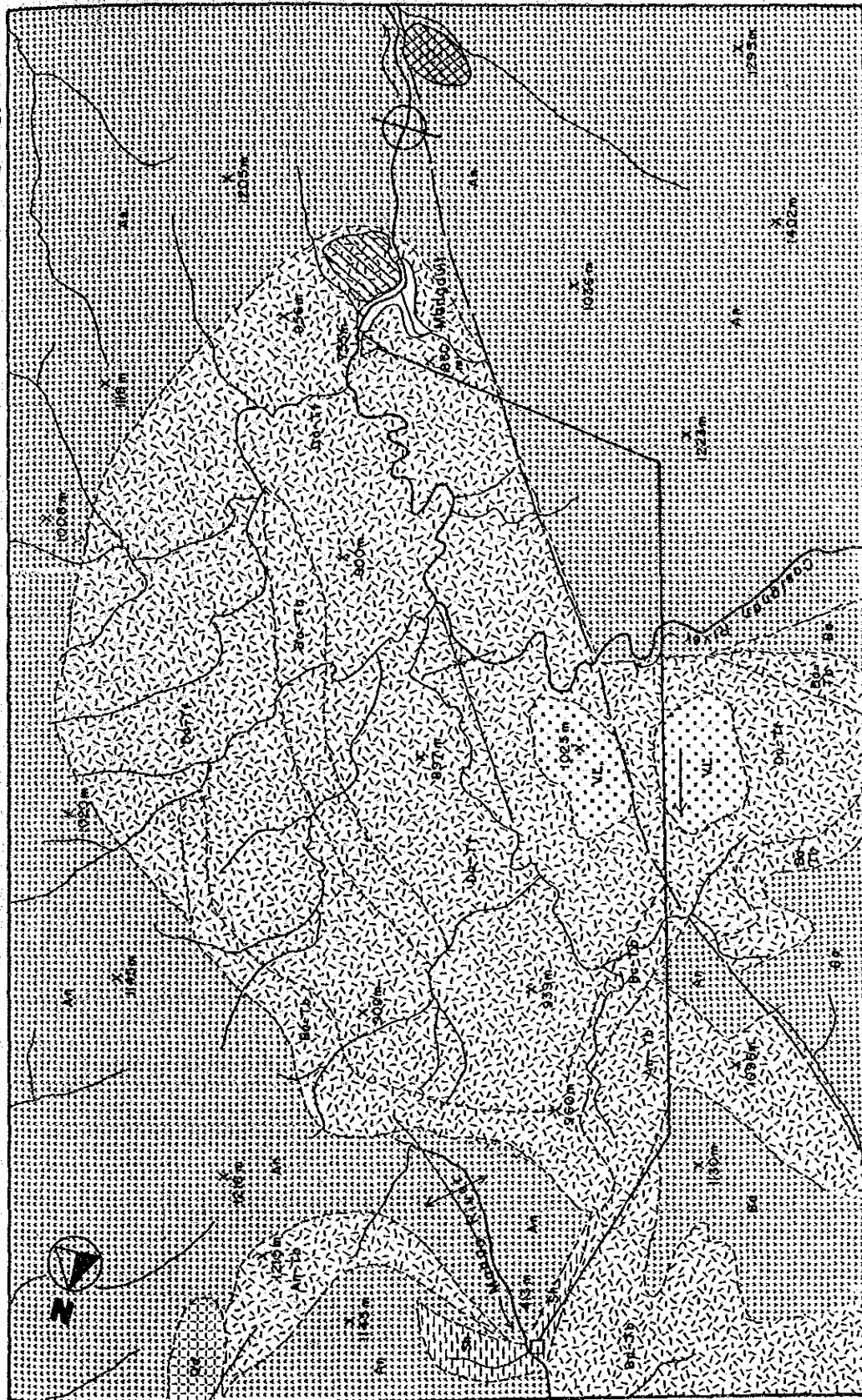


Fig. GEOLOGIC MAP OF UPPER CASECNAN-3 SCHEME



Geologic map is adapted from geological map of Northeastern Luzon in scale of 1:100,000 and 1:250,000 (JICA - MMAJ 1977)

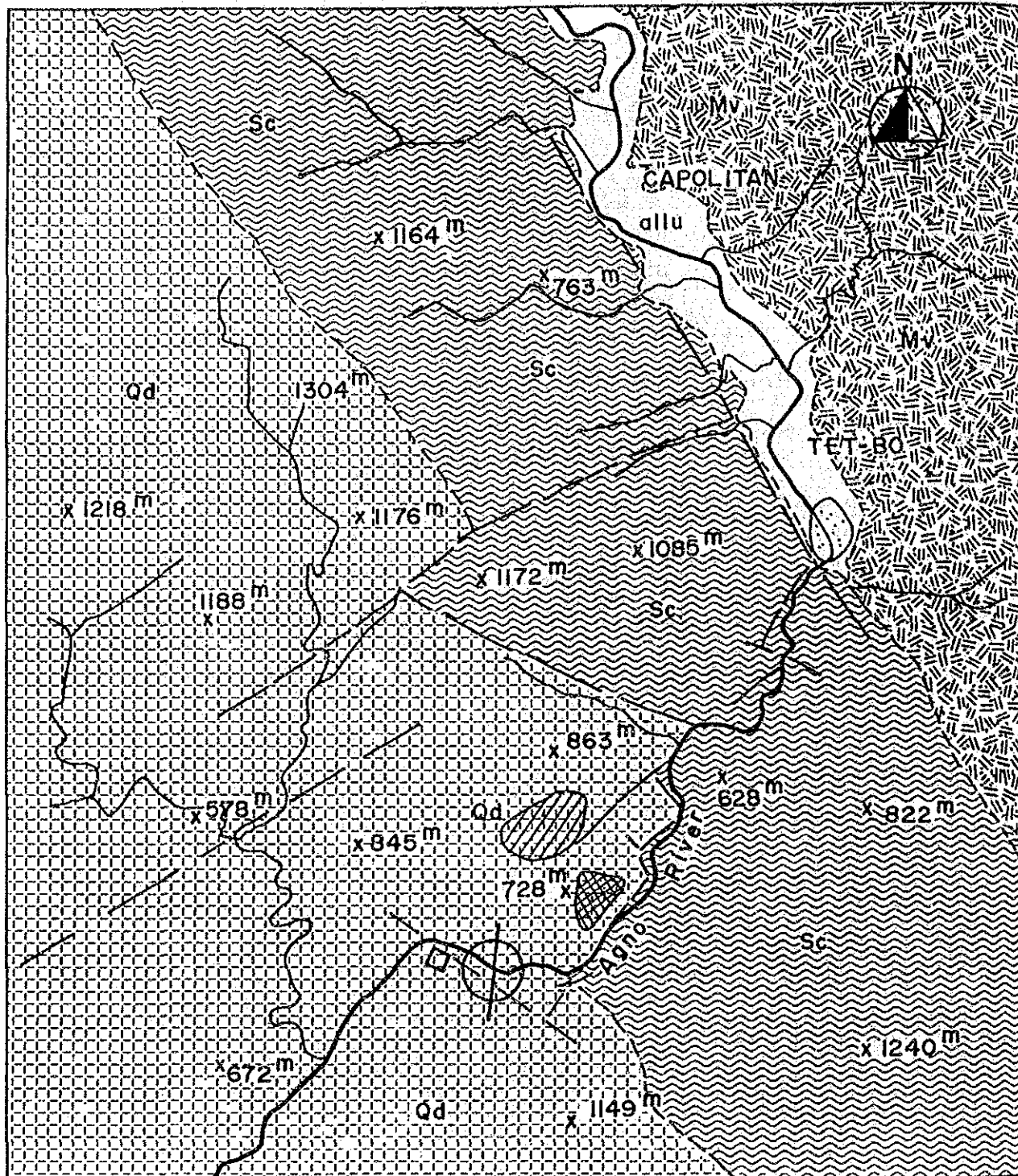
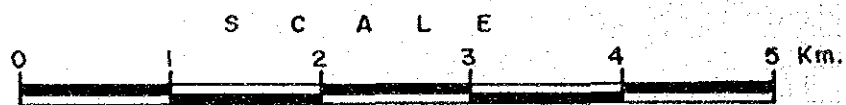


Fig. GEOLOGIC MAP OF TABU SCHEME



Geologic map is adapted from Baglao Area geological map in scale of 1:1000,000  
(JICA - MMAJ Aug. 1977)

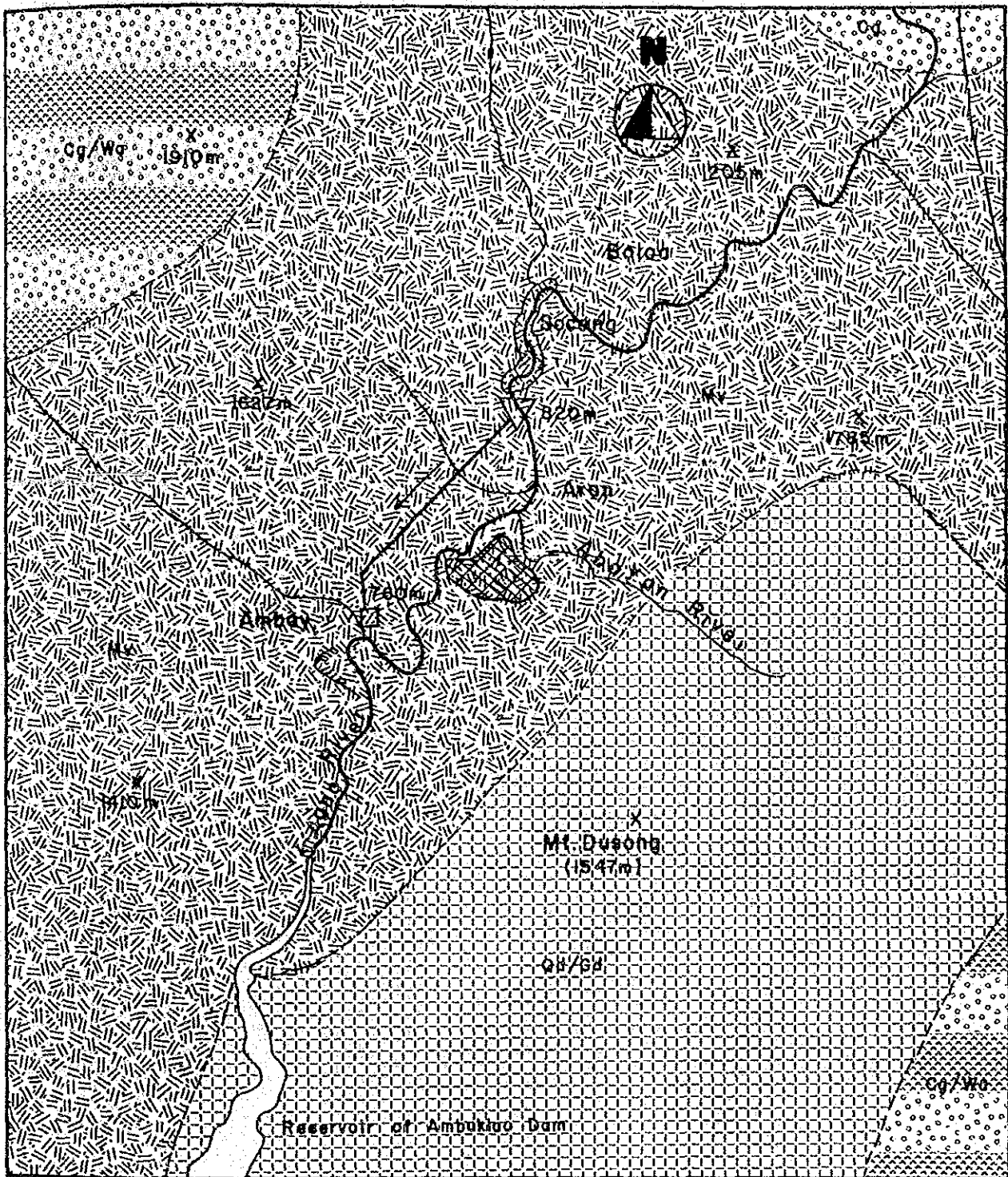
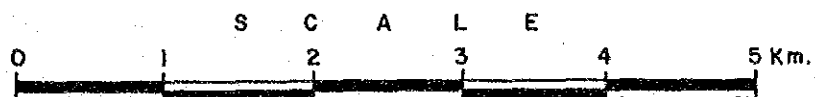


Fig. GEOLOGIC MAP OF AGNO-I SCHEME



Geologic map is adapted from geological map of Benguet Province in scale of 1:250,000 (BMG 1974)



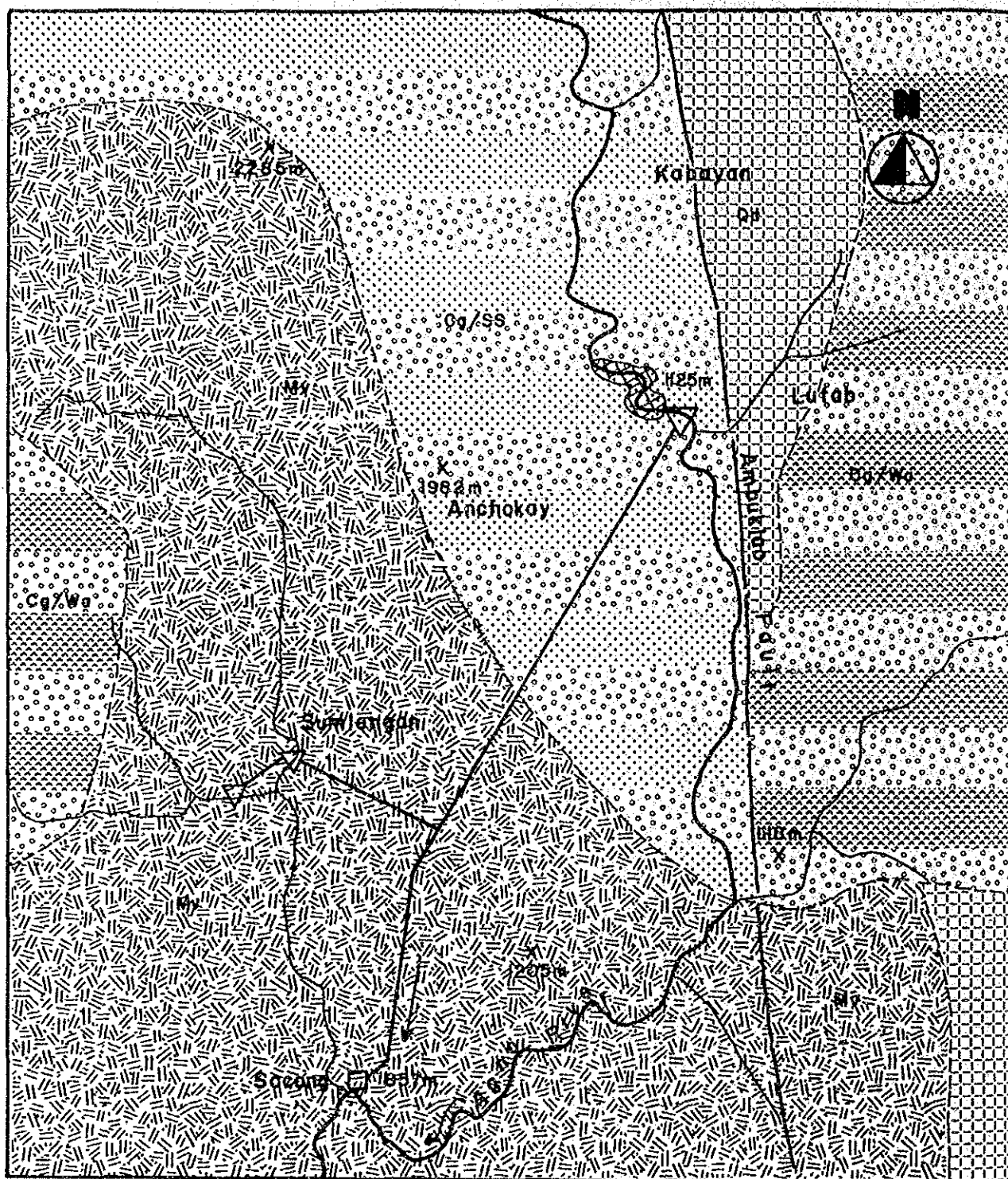
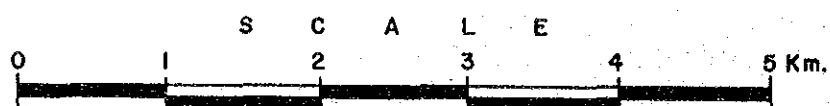


Fig. GEOLOGIC MAP OF AGNO-2 SCHEME



Geologic map is adapted from geological map of Benguet Province in scale of 1:250,000 (BMG 1974)



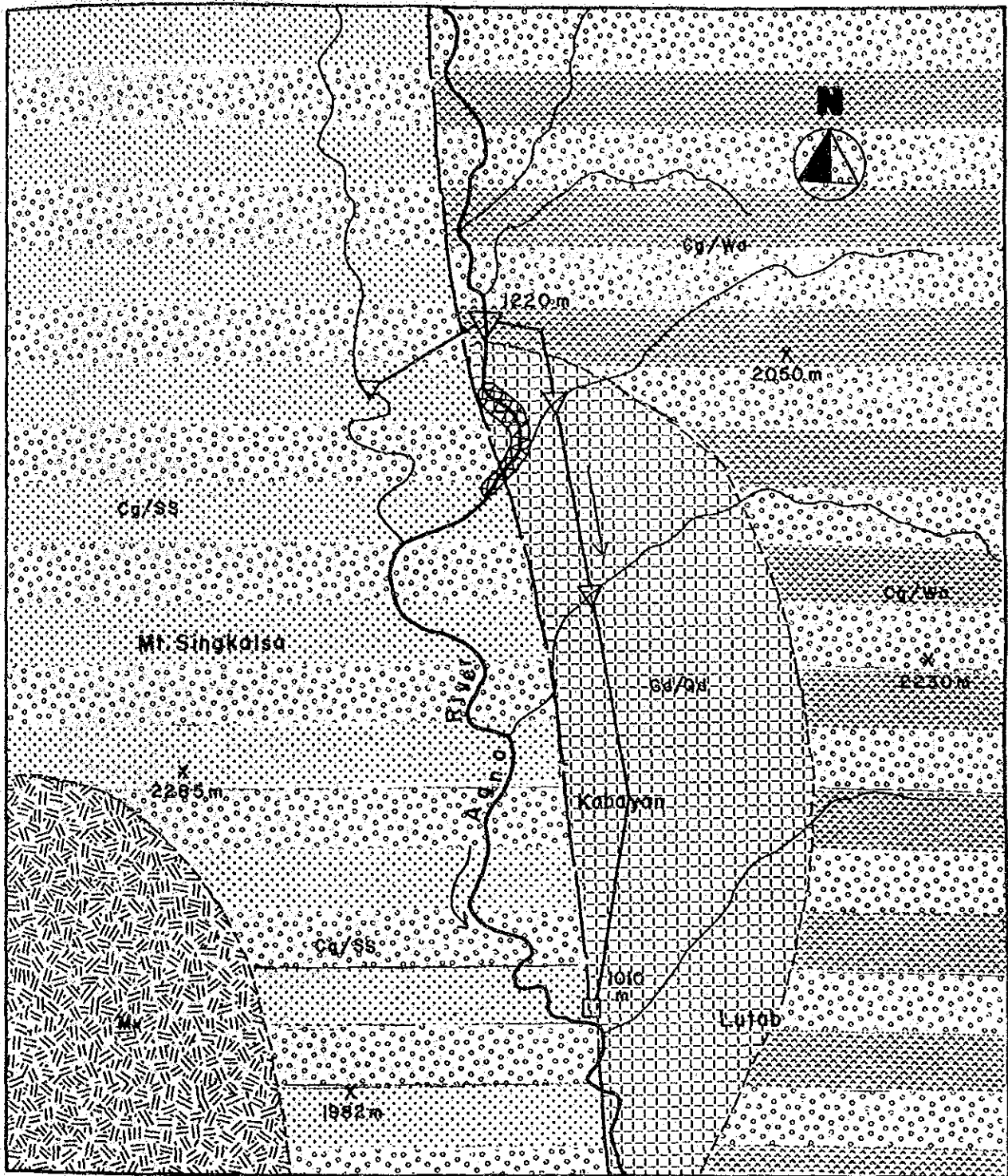
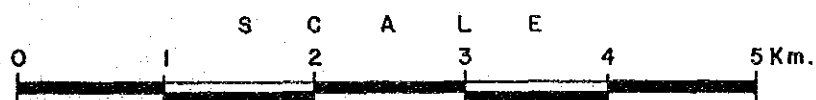


Fig. GEOLOGIC MAP OF AGNO-3 SCHEME



Geologic map is adapted from geological map of Benguet province in scale of 1:250,000 (BMG 1974)

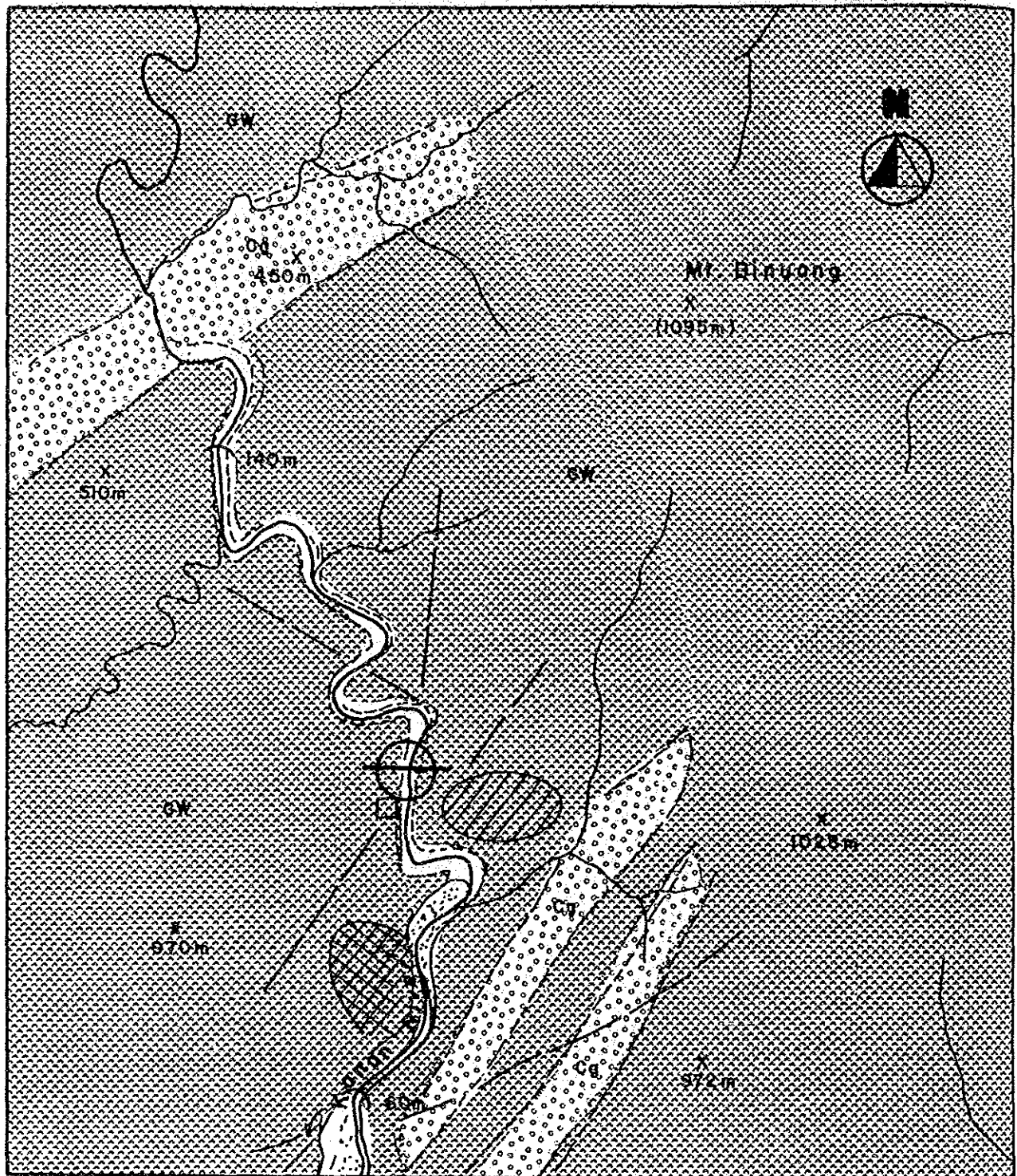
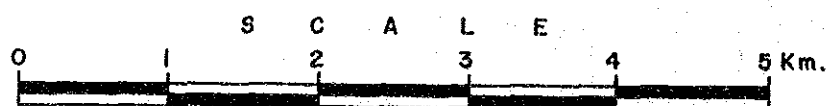


Fig. GEOLOGIC MAP OF KANAN SCHEME



Geologic map is adapted from regional geological map of Agos River Hydro Power Project in scale of 1:115,000 (NPC-JICA Dec. 1980).

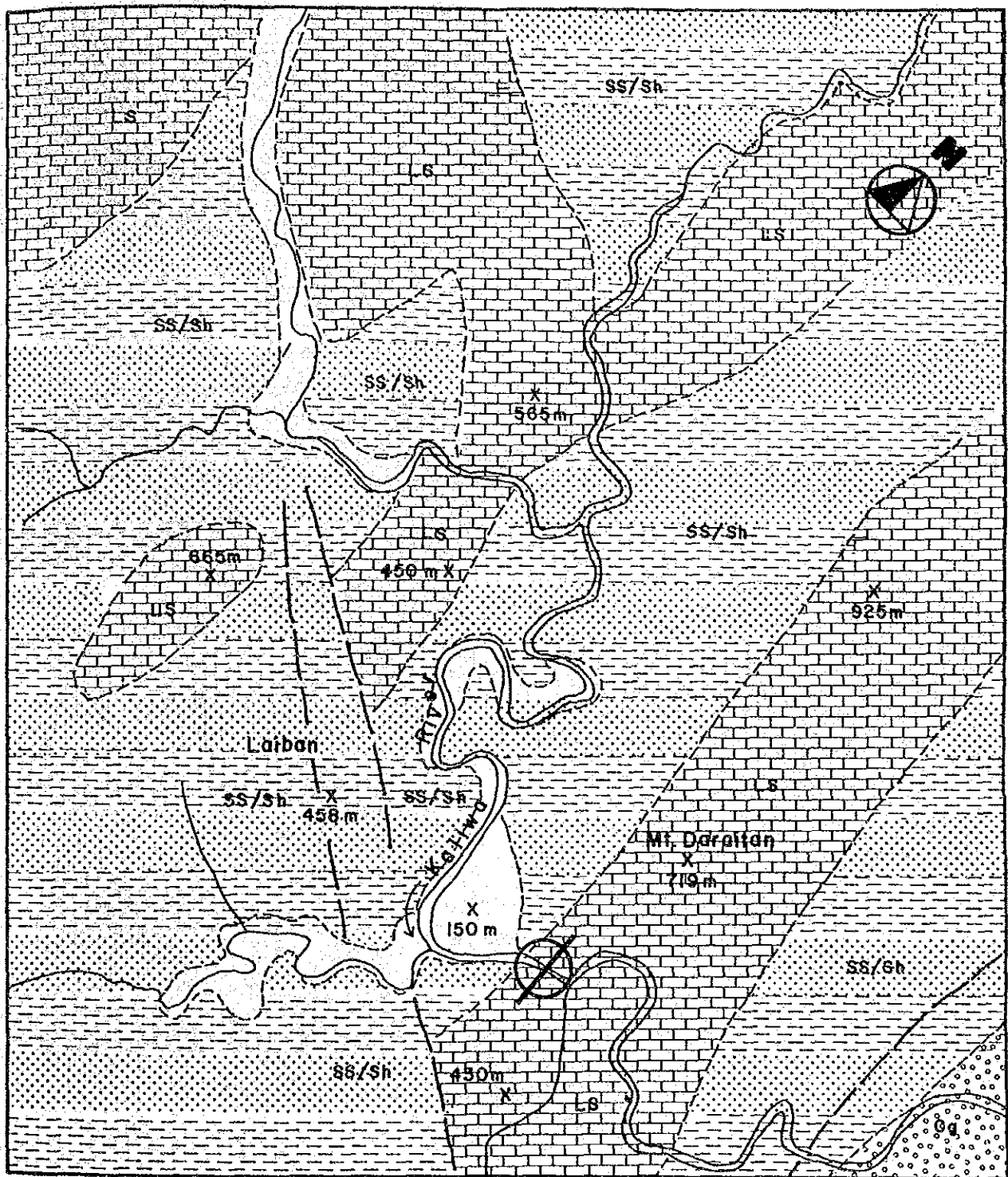
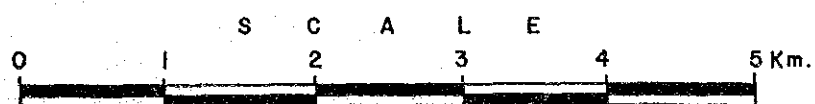


Fig. GEOLOGIC MAP OF DARAITAN SCHEME



Geologic map is adapted from regional geological map of Agos River Hydro Power Project  
 in scale of 1:120,000 (NPC-JICA 1981)

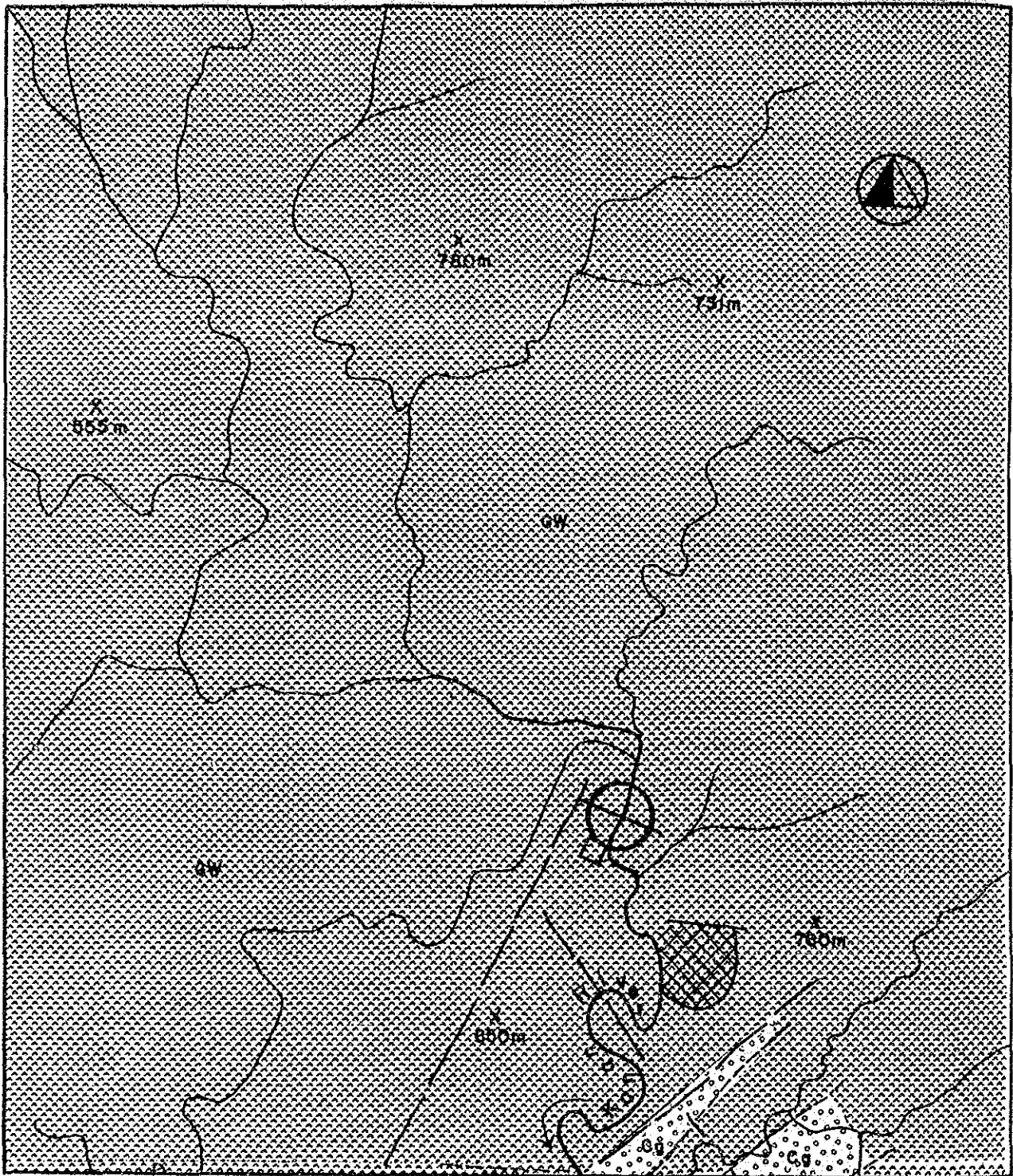
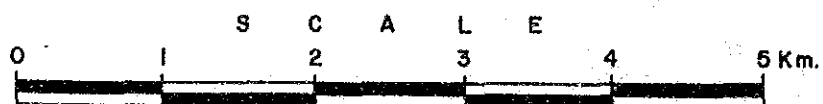


Fig. GEOLOGIC MAP OF UPPER AGOS-2 SCHEME



Geologic map is adapted from regional geological map of Agos River Hydro Power Project in scale of 1:115,000 (NPC-JICA Dec.1980) and geological map of Umiray Quadrangle in scale of 1:50,000 (BMG 1983)

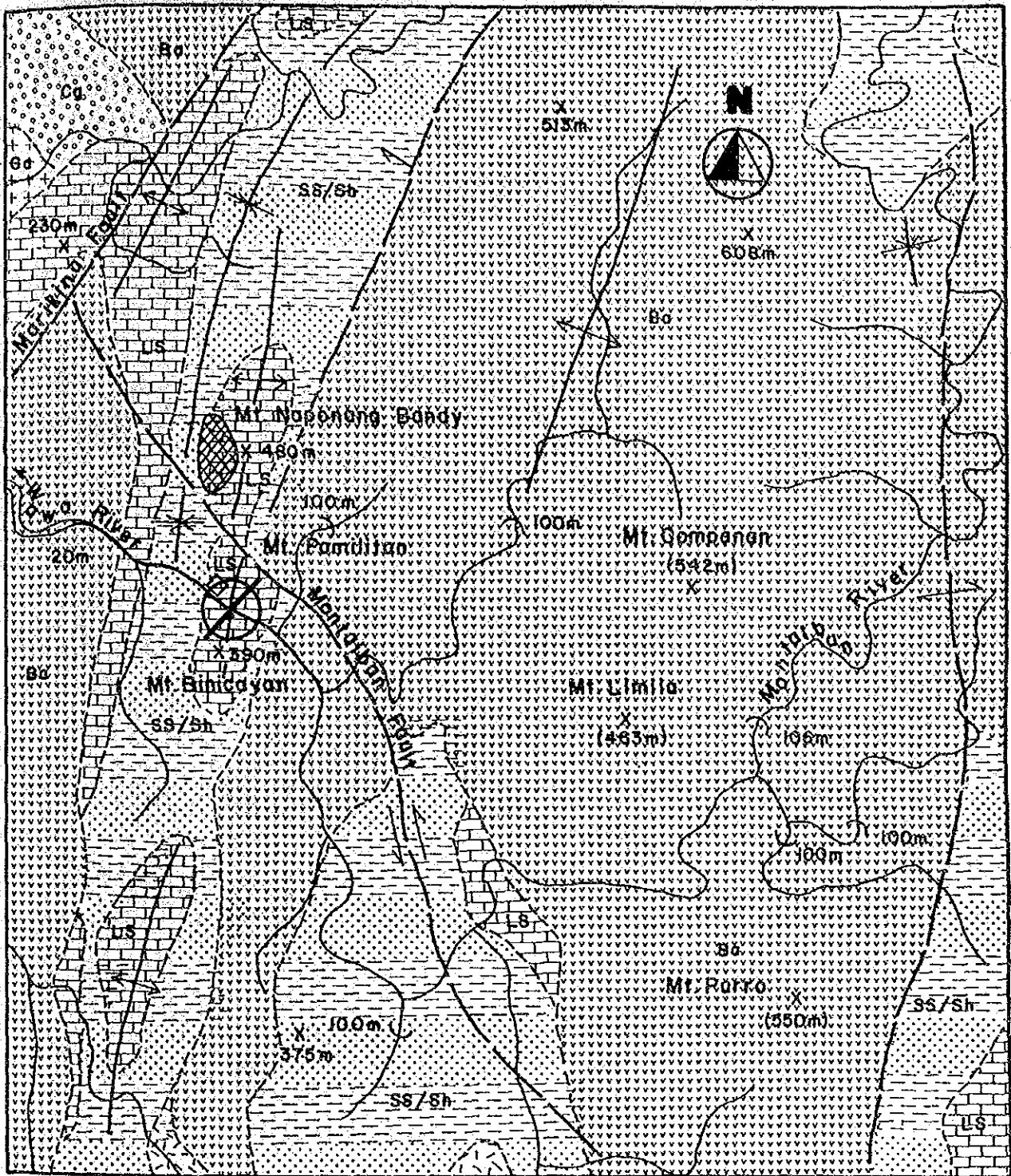
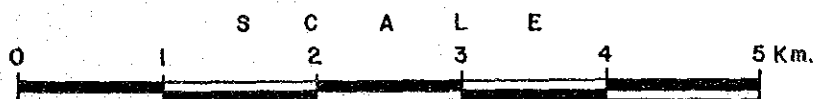


Fig. GEOLOGIC MAP OF WAWA SCHEME



Geologic map is adapted from geological map of Montalban Quadrangle in scale of 1:50,000 (BMG 1983)



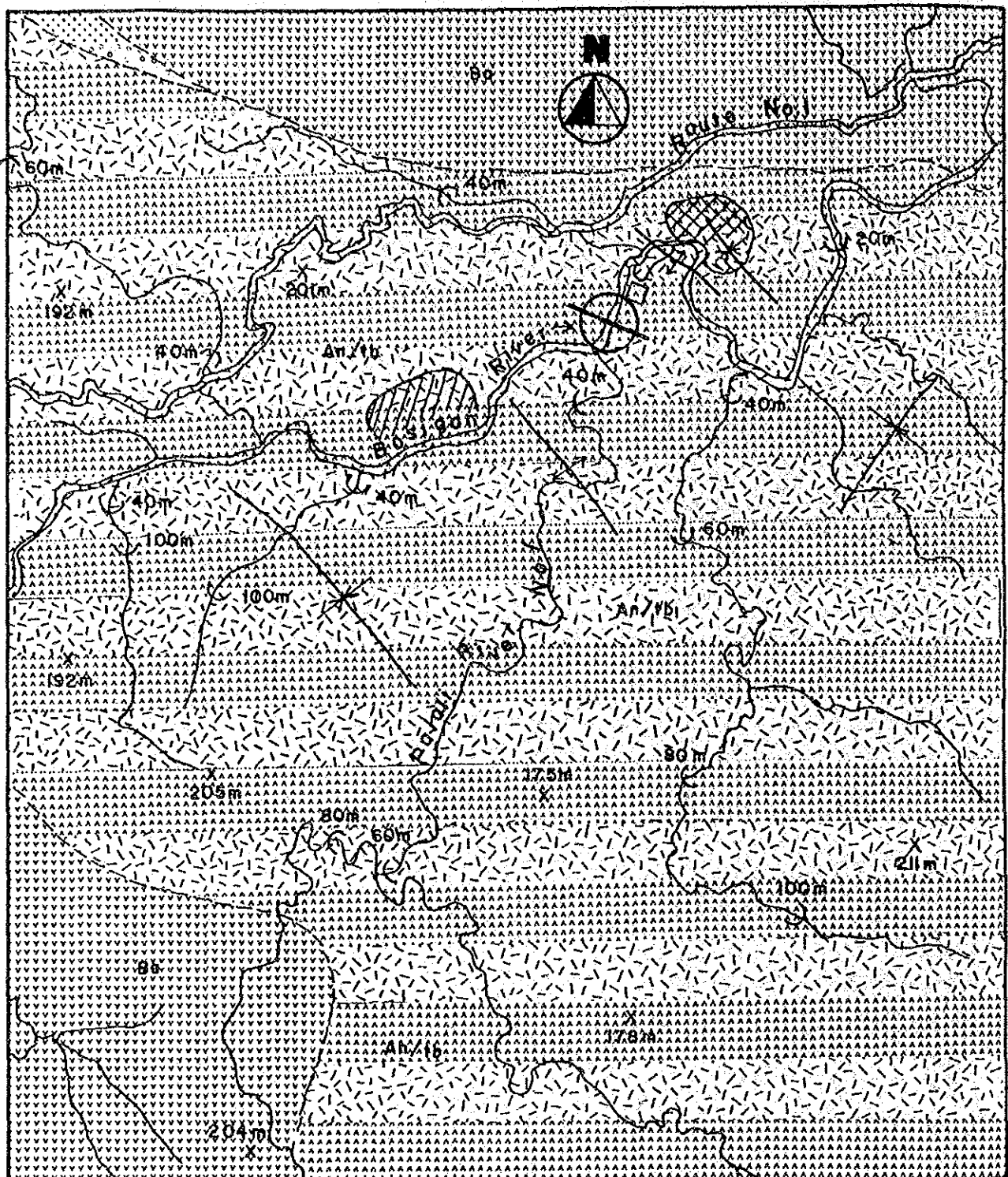
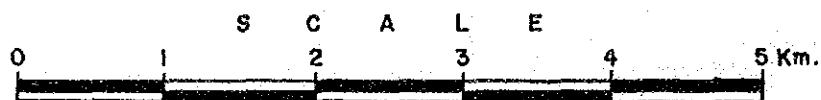


Fig. GEOLOGIC MAP OF BOSIGON SCHEME



Geologic map is base adapted from BMG geological map of Jose Parimban and Bayas Quadrangle 1984.

G E O L O G I C A L   D A T A   S H E E T

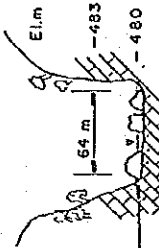
| Region No.            | I           | I.D. No.          | 1-2-0-1   | Scheme                 | R I Z A L          | LA UNION                     | River Basin                                  | ARINGAY                       | Stream                 | G A L I A N O |
|-----------------------|-------------|-------------------|-----------|------------------------|--------------------|------------------------------|----------------------------------------------|-------------------------------|------------------------|---------------|
| Coordi-<br>nates      | 16°23'10"   | 120°26'30"        |           | Type of<br>Development | DAM &<br>RESERVOIR | Province<br>Dam/Weir<br>Type | River<br>Cross<br>Section<br>at Dam/<br>Weir | River-<br>bed<br>Dam<br>Creat | El.<br>184 m<br>Height | 10 m<br>137 m |
| Topo. Map<br>1:50,000 | No. 3089-II | Geo. Map<br>SCALE | 1:250,000 | Length of<br>Water Way |                    | Reservoir<br>Area            |                                              |                               |                        |               |

| Geologic<br>Formation<br>and Age of<br>the Site | Geologic<br>Structure | Rock Type<br>and Age<br>of Bed-<br>rock | Rock<br>Quality | Permea-<br>bility | Over-<br>burden | CONSTRUCTION MATERIALS                                                                   |                                                                   |                                                                                            |                                                                                            | Topographic<br>Condition                                                                   | Geologic<br>Sketch                                                                         | Dam Site                                                                                   | Waterway/Pover Tunnel                                                                      | Pover House                                                                                | Reservoir                                                                                  | Dam Construction<br>Material                                                               |
|-------------------------------------------------|-----------------------|-----------------------------------------|-----------------|-------------------|-----------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
|                                                 |                       |                                         |                 |                   |                 | Geologic<br>Structure                                                                    | Rock Type<br>& Age                                                | Rock<br>Quality                                                                            | Overburden                                                                                 |                                                                                            |                                                                                            |                                                                                            |                                                                                            |                                                                                            |                                                                                            |                                                                                            |
| Geologic<br>Formation<br>and Age of<br>the Site | Geologic<br>Structure | Rock Type<br>and Age<br>of Bed-<br>rock | Rock<br>Quality | Permea-<br>bility | Over-<br>burden | Assumed fault (trend N45°W) intersected<br>Gallano river at 1 Km. downstream of dam site | Assumed fault (trend N45°W) occur 1 Km.<br>downstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site |
|                                                 |                       |                                         |                 |                   |                 | Assumed fault (trend N45°W) intersected<br>Gallano river at 1 Km. downstream of dam site | Assumed fault (trend N45°W) occur 1 Km.<br>downstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site |
|                                                 |                       |                                         |                 |                   |                 | Assumed fault (trend N45°W) intersected<br>Gallano river at 1 Km. downstream of dam site | Assumed fault (trend N45°W) occur 1 Km.<br>downstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site |
|                                                 |                       |                                         |                 |                   |                 | Assumed fault (trend N45°W) intersected<br>Gallano river at 1 Km. downstream of dam site | Assumed fault (trend N45°W) occur 1 Km.<br>downstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site | Assumed fault (trend N45°W) intersected the Gallano<br>river at 5 Km. upstream of dam site |



G E O L O G I C A L   D A T A   S H E E T

|             |                  |                    |                 |                     |              |                |                   |                     |           |             |          |
|-------------|------------------|--------------------|-----------------|---------------------|--------------|----------------|-------------------|---------------------|-----------|-------------|----------|
| Region No.  | 1                | I.D. No.           | 1-3-O-2         | Scheme              | NAGUILIAN    | Province       | BENGUET           | River Basin         | NAGUILIAN | Stream      | TRINIDAD |
| Coordinates | 16°30'37" N. LAT | 120°33'55" E. LONG |                 | Type of Development | RUN OF RIVER | ..../Weir Type | CONCRETE          | River Cross Section | River-bed | 480m Width  | 60m      |
| Topo. Map   | No 3169-IV       | Geo. Map 1:250,000 | SCALX 1:100,000 | Length of Water Way | 8850 m       | Reservoir Area | — km <sup>2</sup> | Weir                | Crest     | 483m Height | 6m       |

|                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                        |                                                                                                                              |                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Geologic formation and Age of the Site</b><br><br>Mi(Early to Middle Miocene Sedimentary Rocks)<br>Conglomerate, calcareous and arkosic sandstone, wacke and siltstone-shale sequence<br>Interbedded volcanics, agglomerate<br>N(Late Miocene to Pliocene Sedimentary Rocks)<br>Tuffaceous shale-claystone-siltstone wacke with conglomerate lenses and coralline limestone<br>Neogene Intrusive: Quariz diorite | <b>Geologic Structure</b><br><br>Rich vertical joints and open cracks 2 to 3 joints per meter<br><br>Limestone (Late Miocene - Pliocene) | <b>Geologic Structure</b><br><br>Assumed fault (trend N-S) occur 1km. east of powerhouse site<br><br>Sandstone, Conglomerate and Agglomerate (Early to Middle Miocene)<br><br>Hard to rather hard partially deeply weathered<br><br>Probably overburden is very thick (more than 5m in thickness)<br><br>Parallel NS joints across tunnel route<br>Assumed fault (trend N70°E) intersect about 2 km. from intake<br><br>Limestone (Late Miocene - Pliocene)<br>Sandstone, Conglomerate and Agglomerate (Oligocene) | <b>CONSTRUCTION MATERIALS</b><br><br>Rock & Coarse Aggregate<br>Sand<br>Material<br>Earth Material<br>Quality & Volume                 | Location<br>Rock Type & Age<br>Quality & Volume<br>Location<br>Quality & Volume<br>Location<br>Soil Type<br>Quality & Volume | On the river bed 0-1km. upstream of weir<br>River deposits and rock fall, Limestone, diorite and volcanic rock<br>Hard to very hard<br>1-2 km. downstream from weir<br>River deposits (sand and gravel) |
| <b>Geologic Formation and Age of the Site</b><br><br>Both Abutments<br>River Bottom<br>Both Abutments<br>River Bottom                                                                                                                                                                                                                                                                                               | High to very high<br>High to very high<br>No residual soil<br>Very big river deposits, big boulder, gravel and many big rock fall        | Hard to very hard but almost surface slightly weathered with open joints and/or covex.<br><br><br><br><br>High to very high<br>High to very high<br>No residual soil<br>Very big river deposits, big boulder, gravel and many big rock fall                                                                                                                                                                                                                                                                        | Topographic Condition<br>Geologic Sketch<br>Dam Site<br>Waterway/Power Tunnel<br>Power House<br>Reservoir<br>Dam Construction Material | U-Shaped<br>Visited Site<br>Acceptable<br>Good<br>Acceptable<br>Acceptable<br>Excellent                                      |                                                                                                                      |

GEOLOGICAL DATA SHEET

| Region No.         | I           | I.D. No.          | I-10-0-1     | Scheme                  | L U Y A      | Province          | ILOCOS SUR | River-<br>Basin            | AMBURAYAN | Stream | AMBURAYAN |
|--------------------|-------------|-------------------|--------------|-------------------------|--------------|-------------------|------------|----------------------------|-----------|--------|-----------|
| Coordi-<br>nates   | 15° 40' 21" | E. LONG           | 120° 34' 00" | Type of<br>Re-alignment | RUN-OF-RIVER | Dam/Weir<br>Type  | CONCRETE   | River-<br>Cross<br>bed     | El. 263   | Width  | 45        |
| Topo. Map<br>Scale | 3170 - III  | Geo. Map<br>SCALE | 1: 250,000   | Length of<br>Water Way  | 6 950        | Reservoir<br>Area | —          | Section<br>of Dam/<br>Weir | El. 273   | Height | 4         |

| Geologic formation and Age of the Site |                                           | Zigzag Formation (Miocene)                |  | Well bedded clastic sedimentary rocks, conglomerate, sandstone, shale |  | Quaternary volcanics andesite, dacite |  | Geologic formation and Age of the Site |                                                   |
|----------------------------------------|-------------------------------------------|-------------------------------------------|--|-----------------------------------------------------------------------|--|---------------------------------------|--|----------------------------------------|---------------------------------------------------|
| Geologic Structure                     | Bedding : N - S (based on Conjecture)     | Both Abutments                            |  | Probably hard and compacted                                           |  | Probably hard and compacted           |  | Geologic Structure                     | N - S trend fault occurs 1 Km west of power house |
|                                        |                                           | Conglomerate, sandstone, shale            |  | Probably hard and compacted                                           |  | Probably hard and compacted           |  |                                        |                                                   |
| Rock Type and Age of Bed-rock          | Conglomerate, sandstone, shale            | Both Abutments                            |  | Probably hard and compacted                                           |  | Probably hard and compacted           |  | Geologic Structure                     | Conglomerate, sandstone, shale ( Miocene )        |
|                                        |                                           | Conglomerate, sandstone, shale            |  | Probably hard and compacted                                           |  | Probably hard and compacted           |  |                                        |                                                   |
| Rock Quality                           | Probably hard and compacted               | Both Abutments                            |  | Probably hard and compacted                                           |  | Probably hard and compacted           |  | Geologic Structure                     | Conglomerate, sandstone, shale ( Miocene )        |
|                                        |                                           | Probably hard and compacted               |  | Probably hard and compacted                                           |  | Probably hard and compacted           |  |                                        |                                                   |
| Permeability                           | Probably watertight of fresh rock portion | Both Abutments                            |  | Probably watertight                                                   |  | Probably watertight                   |  | Geologic Structure                     | Conglomerate, sandstone, shale ( Miocene )        |
|                                        |                                           | Probably watertight of fresh rock portion |  | Probably watertight                                                   |  | Probably watertight                   |  |                                        |                                                   |
| Overburden                             | River Bottom deposits                     | Both Abutments                            |  | Medium thickness of residual soil                                     |  | Probably watertight                   |  | Geologic Structure                     | Conglomerate, sandstone, shale ( Miocene )        |
|                                        |                                           | Medium thickness of residual soil         |  | Probably watertight                                                   |  | Probably watertight                   |  |                                        |                                                   |
| Dam Construction Material              | Excellent                                 | Both Abutments                            |  | Good                                                                  |  | Good                                  |  | Geologic Structure                     | Conglomerate, sandstone, shale ( Miocene )        |
|                                        |                                           | Good                                      |  | Good                                                                  |  | Good                                  |  |                                        |                                                   |



## GEOLOGICAL DATA SHEET

| Region No.            | I            | I.D. No.          | 1-10-0-2               | Scheme                 | BAKUM        | Province          | BENGUET  | River Basin           | AMBURAYAN | Stream | BAKUM                 |
|-----------------------|--------------|-------------------|------------------------|------------------------|--------------|-------------------|----------|-----------------------|-----------|--------|-----------------------|
| Coordi-<br>nates      | 16°48'49"    | 120°38'50"        | E. LONG                | Type of<br>Development | RUN of RIVER | Wair<br>Type      | CONCRETE | River<br>Cross<br>bed | EL.       | 485 m  | Width<br>50 m         |
| Topo. Map<br>1:50,000 | No. 3170-III | Geo. Map<br>SCALE | 1:500,000<br>1:250,000 | Length of<br>Water Way | 5000 m       | Reservoir<br>Area | —        | Section<br>at<br>Wair | Crest EL. | 488 m  | Max.<br>Height<br>6 m |

[illegible]

| Region No.            | I           | I.D. No.          | 1-10-1-3  | Scheme                 | TISUNEC            | Province         | ILOCOS SUR | River Basin                | AMBURAYAN     | Stream | BAKUM |
|-----------------------|-------------|-------------------|-----------|------------------------|--------------------|------------------|------------|----------------------------|---------------|--------|-------|
| Coordi-<br>nates      | 16° 52' 30" | 120° 32' 52"      |           | Type of<br>Development | DAM &<br>RESERVOIR | Dam/Weir<br>Type |            | River                      | River-<br>bed | 64 m   | 20 m  |
| Topo. Map<br>1:50,000 | No. 3170-IV | Geo. Map<br>SCALE | 1:250,000 | Length of<br>Water Way |                    | Reservoir        |            | Section<br>at Dam/<br>Vic. | Dam<br>Crest  | 216 m  | 152 m |

3-6

## GEOLOGICAL DATA SHEET

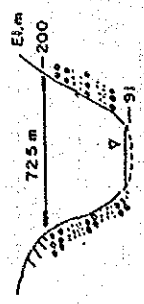
| Region No.            | I           | I.D. No.                    | 1-10-1-4 | Scheme                 | Amburayan    | Province          | Benguet           | River Basin               | Amburayan     | Stream    | Amburayan  |
|-----------------------|-------------|-----------------------------|----------|------------------------|--------------|-------------------|-------------------|---------------------------|---------------|-----------|------------|
| Coordi-<br>nates      | 16°35'53"   | 120°37'54"                  |          | Type of<br>Development | Run of River | Water<br>Type     | Concrete          | River<br>Cross<br>Section | River-<br>bed | El. 510 m | Width 60 m |
| Topo. Map<br>1:50,000 | No. 3169-IV | Geo. Map<br>SCALE 1:100,000 | E. LONG  | Length of<br>Water Way | 13165 m      | Reservoir<br>Area | — km <sup>2</sup> | Water                     | Crest         | El. 513 m | Height 6 m |

|                                        |                                                                                                                                                                                                                                      |              |                              |                                                                                  |                                                                   |                        |                                                           |                          |                                  |                                 |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------|------------------------|-----------------------------------------------------------|--------------------------|----------------------------------|---------------------------------|
| Geologic formation and Age of the Site | N1(Early to Middle Miocene Sedimentary Rocks)<br>Conglomerate, calcareous and arkosic sandstone, wacke and siltstone - shale sequence                                                                                                |              | Geologic Structure           | No major fault occur near powerhouse                                             |                                                                   | CONSTRUCTION MATERIALS |                                                           | Rock & Coarse Aggregates | Location                         | 0-2 Km. upstream from main weir |
|                                        | N2(Late Miocene to Pliocene Sedimentary Rocks)<br>Tuffaceous shale - claystone - siltstone wacke with conglomerate lenses and coralline limestone<br>Neogene Intrusive: Quartz diorite<br>Quaternary volcanics: andesitic to dacitic |              |                              | Rock Type & Age                                                                  | Sandstone, Conglomerate and Agglomerate (Late Miocene - Pliocene) | Rock Type & Age        | River deposits (rock, limestone, Agglomerate and diorite) |                          |                                  |                                 |
| Geologic Structure                     | Bedding: N 20°E / 70°NW<br>Presence of many caves noted at both abutments                                                                                                                                                            |              | Rock Quality                 | Probably rather hard to hard                                                     | GENERAL ASSESSMENT                                                | Dam Site               | Dam Construction Material                                 | Sand                     | Location                         | Within 2 Km. from main weir     |
|                                        | Coralline limestone and conglomerate lenses (Late Miocene - Pliocene)                                                                                                                                                                |              | Overburden                   | Probably, talus deposits and some residual soil                                  |                                                                   |                        |                                                           | Material                 | River deposits (Sand and Gravel) |                                 |
| Rock Type and Age of Bed-rock          | Coralline limestone and conglomerate lenses (Late Miocene - Pliocene)                                                                                                                                                                |              | Geologic Structure           | Assumed fault (trend NE-SW) occur 3 km. from intake dam site.                    | PROFILE OF DAM AXIS                                               | Topographic Condition  | U-Shaped                                                  | Earth Material           | Location                         | —                               |
|                                        | Both Abutments                                                                                                                                                                                                                       |              | Rock Type & Age              | Limestone, Agglomerate and Sandstone locally dacitic rock (Miocene)              |                                                                   |                        |                                                           | Soil Type                | —                                |                                 |
| Rock Quality                           | Rather hard to hard but deeply weathered along the joints and caves                                                                                                                                                                  |              | Rock Quality                 | Rather hard to hard, slightly weathered                                          | Geologic Sketch                                                   | Visited Site           | Limestone                                                 | Quality & Volume         | Quality & Volume                 | —                               |
|                                        |                                                                                                                                                                                                                                      |              | Overburden                   | Enough thickness for tunnel excavation                                           |                                                                   |                        |                                                           | Quality & Volume         | —                                |                                 |
| Permeability                           | High to very high                                                                                                                                                                                                                    |              | Geologic Structure           | Faulted geologic contact (trend NNE - SSW) occur about 500m. upstream of damsite | Dam Site                                                          | Waterway/Power Tunnel  | Acceptable / Poor                                         | 63m                      |                                  |                                 |
|                                        | Both Abutments                                                                                                                                                                                                                       |              | Lithology & Age              | Limestone, Dacite, Sandstone, Conglomerate and Agglomerate (Miocene)             |                                                                   |                        |                                                           | Caves                    |                                  |                                 |
| Overburden                             | High to very high                                                                                                                                                                                                                    |              | Permeability and Groundwater | High permeability due to limestone caves                                         | Power House                                                       | Reservoir              | Good                                                      | Acceptable               |                                  |                                 |
|                                        | Both Abutments                                                                                                                                                                                                                       |              | Slope Stability              | Some small scale rock slides possible at weathered zone                          |                                                                   |                        |                                                           | Acceptable               |                                  |                                 |
|                                        |                                                                                                                                                                                                                                      | River Bottom | Sedimentation                | Less                                                                             |                                                                   |                        |                                                           | Excellent                |                                  |                                 |

G E O L O G I C A L   D A T A   S H E E T

|                       |            |                   |           |                        |                    |                   |                 |                                              |                               |              |       |
|-----------------------|------------|-------------------|-----------|------------------------|--------------------|-------------------|-----------------|----------------------------------------------|-------------------------------|--------------|-------|
| Region No.            | 1          | I.D. No.          | I-11-O-1  | Scheme                 | USO                | Province          | ILOCOS SUR      | River Basin                                  | CHICO                         | Stream       | CHICO |
| Coordi-<br>nates      | 16°58'26"  | 120°32'17"        |           | Type of<br>Development | DAM &<br>RESERVOIR | Dam/Weir<br>Type  |                 | River<br>Cross<br>Section<br>at Dam/<br>Weir | River-<br>bed<br>Dam<br>Crest | 91 m Width   | 10 m  |
| Topo. Map<br>1:50,000 | No.3170-IV | Geo. Map<br>SCALE | 1:250,000 | Length of<br>Water Way | m                  | Reservoir<br>Area | km <sup>2</sup> |                                              |                               | 192 m Height | 101 m |

|                                               |                                                                                                                         |                                                                       |                                                                     |                                                                                                                                                                                             |                                                                                 |                                                                                                                                                       |                                                                                                                                                                                                                                                                         |                                                                     |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <b>Geologic formation and Age of the Site</b> | Zigzag Formation (Miocene)<br>Well bedded clastic sedimentary rocks, Conglomerate, sandstone, wackes                    | Cycline axis intersect the chico river at upstream of powerhouse site | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden | Cycline axis intersect the chico river at upstream of powerhouse site<br>Conglomerate, sandstone (Miocene)<br>Hard and compacted (at left bank site)<br>Terrace deposits and talus deposits | Rock & Coarse Aggre-gates<br>Sand<br>Material<br>Earth<br>Topographic Condition | Location<br>Rock Type & Age<br>Quality & Volume<br>Location<br>Quality & Volume<br>Location<br>Soil Type<br>Quality & Volume<br>Topographic Condition | 2Km.south-east of damsite<br>Conglomerate, sandstone<br>Hard, fresh and compacted<br>2-4Km. downstream from damsite<br>Alluvial deposits sand and gravel<br>2Km.south-east of damsite<br>Residual soil of conglomerate, sandstone<br>Probably suitable<br>Wide V-Shaped |                                                                     |
|                                               | Cycline axis intersect the chico river near damsite. Assumed fault intersect, the chico river 1Km. upstream of damsite. | Conglomerate, sandstone, wackes (Miocene)                             | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                         | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden             | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                   | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                                                                                                     | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden |
|                                               | Both Abutments: Probably hard sound rock, Indurated, compacted with tight joints                                        | Probably hard sound rock, Indurated, compacted with tight joints      | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                         | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden             | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                   | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                                                                                                     | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden |
|                                               | Overall: Probably watertight                                                                                            | Probably watertight                                                   | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                         | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden             | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                   | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                                                                                                     | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden |
|                                               | Both Abutments: Medium thickness of residual soil                                                                       | Medium thickness of residual soil                                     | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                         | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden             | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                   | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                                                                                                     | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden |
|                                               | River Bottom: River bed filled with thick alluvial deposits                                                             | River bed filled with thick alluvial deposits                         | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                         | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden             | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                   | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                                                                                                     | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden |
|                                               | Overall: Excellent                                                                                                      | Excellent                                                             | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                         | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden             | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                   | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                                                                                                     | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden |
|                                               | Overall: Good                                                                                                           | Good                                                                  | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                         | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden             | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                   | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                                                                                                     | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden |
|                                               | Overall: Good                                                                                                           | Good                                                                  | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                         | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden             | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                   | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                                                                                                     | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden |
|                                               | Overall: Excellent                                                                                                      | Excellent                                                             | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                         | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden             | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                   | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden                                                                                                                                                                                                     | Geologic Structure<br>Rock Type & Age<br>Rock Quality<br>Overburden |



## GEOLOGICAL DATA SHEET

| Region No.            | I           | I.D. No.          | 1-11-0-2 | Scheme                 | CHICO - R    | Province          | ILOCOS SUR                 | CHICO                 | Stream | PAUGSUIT |
|-----------------------|-------------|-------------------|----------|------------------------|--------------|-------------------|----------------------------|-----------------------|--------|----------|
| Coördi-<br>nates      | 16° 59' 27" | 120° 35' 00"      | E. LONG  | Type of<br>Development | RUN OF RIVER | Dam/Weir<br>Type  |                            | River<br>Cross<br>bed | 300 m  | 60 m     |
| Topo. Map<br>1:50,000 | No. 3070-IV | Geo. Map<br>SCALE |          | Length of<br>Water Way | 11,465 m     | Reservoir<br>Area | Section<br>at Dam/<br>Year | Crest<br>El.          | 303 m  | 6 m      |

[illegible]





# GEOLOGICAL DATA SHEET

|                    |                  |                    |           |                     |                |      |                                 |                |             |          |
|--------------------|------------------|--------------------|-----------|---------------------|----------------|------|---------------------------------|----------------|-------------|----------|
| Region No.         | I.D. No.         |                    | 1-22-0-2  | LANGSDEN            | Province       | ABRA | River Basin                     | ABRA           | Stream      | MALAPAAO |
| Coordi- nates      | 17°40'50" N. LAT | 120°32'30" E. LONG |           | DAM & RESERVOIR     | Dam/Weir Type  |      | River Cross Section at Dam/Weir | River- bed El. | 105m Width  | 10m      |
| Topo. Map 1:50,000 | No. 3175-III     | Geo. Map SCALE     | 1:250,000 | Length of Water Way | Reservoir Area |      |                                 | Dam Crest El.  | 210m Height | 105m     |

|                                        |                                                                                                                                      |  |                               |                                                        |      |          |          |                 |                     |        |          |          |            |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------|--------------------------------------------------------|------|----------|----------|-----------------|---------------------|--------|----------|----------|------------|
| Geologic formation and Age of the Site | Metasediments (Cretaceous-Paleogene)<br>Undifferentiated graywacke and metamorphosed shale with spilite basic flows and pyroclastics |  | Geologic Structure            | Inferred fault occur (N-S trend) 2 Km. east of damsite | ABRA | Province | LANGSDEN | DAM & RESERVOIR | Type of Development | Scheme | I.D. No. | 1-22-0-2 | Region No. |
|                                        |                                                                                                                                      |  |                               |                                                        |      |          |          |                 |                     |        |          |          |            |
| Geologic Structure                     | Inferred fault occur (N-S trend) 2 Km. east of damsite. Fault extend for North and South direction along the Malapao river.          |  | Geologic Structure            | Metasediments (Cretaceous-Paleogene)                   | ABRA | Province | LANGSDEN | DAM & RESERVOIR | Type of Development | Scheme | I.D. No. | 1-22-0-2 | Region No. |
| Rock Type and Age of Bed-rock          | Metasediments (Cretaceous-Paleogene)                                                                                                 |  | Rock Type & Age               | Metasediments (Cretaceous-Paleogene)                   | ABRA | Province | LANGSDEN | DAM & RESERVOIR | Type of Development | Scheme | I.D. No. | 1-22-0-2 | Region No. |
| Rock Quality                           | Probably hard to very hard and slightly weathered.                                                                                   |  | Rock Quality                  | Probably hard to very hard (at left bank site)         | ABRA | Province | LANGSDEN | DAM & RESERVOIR | Type of Development | Scheme | I.D. No. | 1-22-0-2 | Region No. |
| Permeability                           | Probably waterlight                                                                                                                  |  | Lithology & Age               | Metasediments (Cretaceous-Paleogene)                   | ABRA | Province | LANGSDEN | DAM & RESERVOIR | Type of Development | Scheme | I.D. No. | 1-22-0-2 | Region No. |
| Overburden                             | Medium thickness of residual soil                                                                                                    |  | Permeability and Ground-water | Probably impermeable except fractured fault zone       | ABRA | Province | LANGSDEN | DAM & RESERVOIR | Type of Development | Scheme | I.D. No. | 1-22-0-2 | Region No. |
|                                        | The river bed filled with some cobble and boulder                                                                                    |  | Slope Stability               | Mostly stable except slumping soils after impounding   | ABRA | Province | LANGSDEN | DAM & RESERVOIR | Type of Development | Scheme | I.D. No. | 1-22-0-2 | Region No. |
|                                        |                                                                                                                                      |  | Sedimentation                 | Less to Common                                         | ABRA | Province | LANGSDEN | DAM & RESERVOIR | Type of Development | Scheme | I.D. No. | 1-22-0-2 | Region No. |

|                          |                  |                                                         |  |                       |          |  |  |
|--------------------------|------------------|---------------------------------------------------------|--|-----------------------|----------|--|--|
| CONSTRUCTION MATERIALS   |                  |                                                         |  | PROFILE OF DAM AXIS   |          |  |  |
| Rock & Coarse Aggregates | Location         | 2 Km NNE of damsite                                     |  | Topographic Condition | V-Shaped |  |  |
| Sand                     | Location         | Metasediments (Cretaceous-Paleogene)                    |  | Geologic Sketch       |          |  |  |
| Material                 | Quality & Volume | Hard to very hard                                       |  |                       |          |  |  |
| Earth Material           | Location         | It will be manufactured from rock from the quarry areas |  |                       |          |  |  |
|                          | Quality & Volume | 2.5 Km. NE of damsite                                   |  |                       |          |  |  |
|                          | Soil Type        | -Residual soil of metasediments                         |  |                       |          |  |  |
|                          | Quality & Volume | Probably suitable                                       |  |                       |          |  |  |

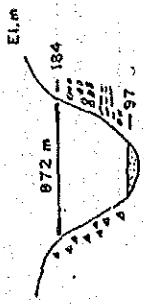
  

|                           |           |  |  |
|---------------------------|-----------|--|--|
| GENERAL ASSESSMENT        |           |  |  |
| Damsite                   | Good      |  |  |
| Waterway/Power Tunnel     | Good      |  |  |
| Power House               | Good      |  |  |
| Reservoir                 | Good      |  |  |
| Dam Construction Material | Excellent |  |  |

G E O L O G I C A L   D A T A   S H E E T

| Region No.            | I            | I.D. No.          | 1-22-0-3   | Scheme                 | BAND I             | Province         | ABRA | River Basin                                  | ABRA                          | Stream       | SAQUET SOOT |
|-----------------------|--------------|-------------------|------------|------------------------|--------------------|------------------|------|----------------------------------------------|-------------------------------|--------------|-------------|
| Coordi-<br>nates      | 17°43'10"    | 120°38'40"        | 120°38'40" | Type of<br>Development | DAM &<br>RESERVOIR | Dam/Weir<br>Type |      | River<br>Cross<br>Section<br>at Dam/<br>Weir | River-<br>bed<br>Dam<br>Creat | 97 m Width   | 10m         |
| Topo. Map<br>1:50,000 | No. 3173-III | Geo. Map<br>SCALE | 1:250,000  | Length of<br>Water Way | M                  | Reservoir        |      |                                              |                               | 184 m Height | 87 m        |

| Geologic<br>formation<br>and Age of<br>the Site | Metasediments (Cretaceous-Paleogene)<br>Undifferentiated graywackes and micromorphosed<br>shales with sparse basic bluffs and Pyroclastics<br>N1 Formation (Early Middle Miocene)<br>Conglomerate, wackes, shales and Limestone<br>Plutonic rocks (Upper Miocene Pliocene)<br>Dacite and/or andesite flows |                                                | Geologic<br>Structure                     |                    | The powerhouses located between two parallel<br>faults (trend N45°E)                           |                | CONSTRUCTION MATERIALS   |                              | Rock &<br>Coarse<br>Aggre-<br>gates |  | Location                           |  |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-------------------------------------------|--------------------|------------------------------------------------------------------------------------------------|----------------|--------------------------|------------------------------|-------------------------------------|--|------------------------------------|--|
|                                                 | Conglomerate is bounded to north-west by a<br>major N45°E trend fault.<br>The dam site located between two parallel<br>faults (trend N45°E)                                                                                                                                                                |                                                | Rock Type<br>& Age                        |                    | Conglomerate, wackes, shales                                                                   |                | Sand                     |                              | Quality<br>& Volume                 |  | Decile<br>(Upper Miocene-Pliocene) |  |
| Geologic<br>Structure                           | Conglomerate, wackes, shales<br>(Early Middle Miocene)<br>Dacite<br>(Upper Miocene Pliocene)                                                                                                                                                                                                               |                                                | Rock<br>Quality                           |                    | Hard and compacted<br>(at right bank site)                                                     |                | Material                 |                              | Quality<br>& Volume                 |  | River deposits (sand and gravel)   |  |
|                                                 | Probably hard, indurated, well<br>cemented and compacted partially.<br>fractured due to effective of faults                                                                                                                                                                                                |                                                | Overburden                                |                    | Residual soil and talus deposits                                                               |                | Earth<br>Material        |                              | Location                            |  | 1-2 Km SE of damsite               |  |
| Rock<br>Quality                                 | Both<br>Abutments<br>Probably hard, indurated, well<br>cemented and compacted partially.<br>fractured due to effective of faults                                                                                                                                                                           |                                                | Geologic<br>Structure                     |                    |                                                                                                |                | Topographic<br>Condition |                              | Soil<br>Type                        |  | Residual soil of Decile            |  |
|                                                 | Probably water-tight except fractured<br>fault zone                                                                                                                                                                                                                                                        |                                                | Rock<br>Quality                           |                    |                                                                                                |                | Not visited site         |                              | Quality<br>& Volume                 |  | Probably suitable                  |  |
| Perme-<br>ability                               | Overall                                                                                                                                                                                                                                                                                                    |                                                | Geologic<br>Structure                     |                    | Several faults (N30-45°E) occur in the<br>reservoir area                                       |                | Geologic<br>Sketch       |                              | Dam site                            |  | Good / Acceptable                  |  |
|                                                 | Probably water-tight except fractured<br>fault zone                                                                                                                                                                                                                                                        |                                                | Lithology<br>& Age                        |                    | Metasediments (Cretaceous-Paleogene)<br>Conglomerate, wackes, shales<br>(Early Middle Miocene) |                | Waterway/Power Tunnel    |                              |                                     |  |                                    |  |
| Over-<br>burden                                 | Both<br>Abutments                                                                                                                                                                                                                                                                                          |                                                | Permeabi-<br>lity and<br>Ground-<br>water |                    | Probably water-tight except fractured<br>fault zone                                            |                | Power House              |                              |                                     |  | Good                               |  |
|                                                 | Medium thickness of residual soil                                                                                                                                                                                                                                                                          |                                                | Slope<br>Stability                        |                    | Probably stable                                                                                |                | Reservoir                |                              |                                     |  | Good                               |  |
| Overall                                         |                                                                                                                                                                                                                                                                                                            | River bed: filled with some gravel<br>and sand |                                           | Sediment-<br>ation |                                                                                                | Less to common |                          | Dam Construction<br>Material |                                     |  | Excellent                          |  |



## GEOLOGICAL DATA SHEET

|                       |                     |                       |                        |                    |                   |          |      |                            |      |        |                |
|-----------------------|---------------------|-----------------------|------------------------|--------------------|-------------------|----------|------|----------------------------|------|--------|----------------|
| Region No.            | I                   | I.D. No.              | 1-22-Q-4               | Scheme             | ALIP              | Province | ABRA | River Basin                | ABRA | Stream | PASIGUAN       |
| Coordi-<br>nates      | 17°47'00"<br>N. LAT | 120°42'00"<br>E. LONG | Type of<br>Development | DAM &<br>RESERVOIR | Dam/Weir<br>Type  |          |      | River-<br>bed              | El.  | 151 m  | Width<br>10m   |
| Topo. Map<br>1:50,000 | No. 3173-III        | Geo. Map<br>SCALE     | Length of<br>Water Way |                    | Reservoir<br>Area |          |      | Section<br>at Dam/<br>Weir | El.  | 298 m  | Height<br>148m |

|                                                 |                                                                                                                               |  |                                                                          |  |                                           |  |                                                                      |  |                                           |  |                                     |                              |                     |      |                                  |  |  |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------|--|-------------------------------------------|--|----------------------------------------------------------------------|--|-------------------------------------------|--|-------------------------------------|------------------------------|---------------------|------|----------------------------------|--|--|
| Geologic<br>formation<br>and Age of<br>the Site | Licuan Group (Eocene)<br>Andesite<br>Kennon Formation (Miocene)<br>Limestones<br>Alluvial deposits; sand and gravel with clay |  | Limestone unconformably overlies andesite                                |  | Geologic<br>Structure                     |  | Limestone (Miocene)<br>Andesite (Eocene)                             |  | Limestone unconformably overlies andesite |  | Rock &<br>Coarse<br>Aggre-<br>gates |                              | Location            |      | 1.5 Km. south-east of damsite    |  |  |
|                                                 | Normal fault, occurred to right abutment<br>Limestone unconformably overlies Andesite                                         |  | Overburden                                                               |  | Rock Type<br>& Age                        |  | Hard to very hard, and slightly weathered<br>(of left abutment)      |  | Talus and rock fault                      |  | Sand                                |                              | Location            |      | 2-3 Km. downstream from damsite  |  |  |
| Geologic<br>Structure                           | Limestones (Miocene)<br>Andesite (Eocene)                                                                                     |  | Geologic<br>Structure                                                    |  | Rock Type<br>& Age                        |  |                                                                      |  |                                           |  | Material                            |                              | Quality<br>& Volume |      | River deposits (sand and gravel) |  |  |
|                                                 | Both<br>Abutments                                                                                                             |  | Probably, hard to very hard. Karstic<br>structure open joints and cracks |  | Rock<br>Quality                           |  |                                                                      |  |                                           |  | Earth<br>Material                   |                              | Soil<br>Type        |      | Residual soil of limestone       |  |  |
| Rock<br>Quality                                 | Overall                                                                                                                       |  | Probably permeable due to Karstic<br>structure of limestones             |  | Overburden                                |  |                                                                      |  |                                           |  | Topographic<br>Condition            |                              | V-Shaped            |      | Not visited site                 |  |  |
|                                                 | Both<br>Abutments                                                                                                             |  | Thin residual soil and some rock<br>fault with talus                     |  | Geologic<br>Structure                     |  | Two faults occur along the Pasiguan river                            |  |                                           |  | Geologic<br>Sketch                  |                              | Ls                  |      |                                  |  |  |
| Permea-<br>bility                               | Overall                                                                                                                       |  | Probably permeable due to Karstic<br>structure of limestones             |  | Lithology<br>& Age                        |  | Andesite (Eocene)<br>Limestone (Miocene)                             |  |                                           |  | Damsite                             |                              | Poor                |      |                                  |  |  |
|                                                 | Both<br>Abutments                                                                                                             |  | Thin residual soil and some rock<br>fault with talus                     |  | Permeabi-<br>lity and<br>Ground-<br>water |  | Probably high permeability of the limestone<br>area and faulted zone |  |                                           |  | Waterway/Power Tunnel               |                              |                     |      |                                  |  |  |
| Over-<br>burden                                 | Both<br>Abutments                                                                                                             |  | Thin residual soil and some rock<br>fault with talus                     |  | Slope<br>Stability                        |  | Probably stable except rock fault and<br>sliding area.               |  |                                           |  | Power House                         |                              | Good                |      |                                  |  |  |
|                                                 | River<br>Bottom                                                                                                               |  | Rather thick sand and gravel<br>deposits                                 |  | Sediment-<br>ation                        |  | Common                                                               |  |                                           |  | Reservoir                           |                              | Acceptable          |      |                                  |  |  |
|                                                 |                                                                                                                               |  |                                                                          |  |                                           |  |                                                                      |  |                                           |  |                                     | Dam Construction<br>Material |                     | Good |                                  |  |  |