# 付　表

表－1.3.1　計画対象地域に襲来した台風

| Year | Name of Typhoon | Occurrence Date |
|---|---|---|
| 1970 | Atang | Feb. 23 - Feb. 27 |
| | Yoning | Nov. 17 - Nov. 20 |
| 1971 | Herming | May 25 - May 27 |
| 1972 | Konsing | Jan. 23 - Jan. 26 |
| 1973 | Luming | Oct. 2 - Oct. 9 |
| 1974 | Bising | Jan. 8 - Jan. 11 |
| | Iling | Jun. 22 - Jul. 2 |
| | Tening | Oct. 14 - Oct. 17 |
| | Aning | Nov. 4 - Nov. 7 |
| 1976 | Huaning | Jun. 22 - Jul. 2 |
| 1977 | Unding | Nov. 10 - Nov. 17 |
| 1978 | Atang | Apr. 18 - Apr. 26 |
| | Weling | Sept.24 - Sept.28 |
| | Yaning | Oct. 7 - Oct. 14 |
| | Kading | Oct. 25 - Oct. 29 |
| 1979 | Bebeng | Apr. 13 - Apr. 19 |
| | Etang | Jun. 30 - Jul. 1 |
| | Pepang | Sept.16 - Sept.20 |
| | Yayang | Nov. 4 - Nov. 7 |
| 1980 | Nitang | Jul. 19 - Jul. 22 |
| | Osang | Jul. 22 - Jul. 27 |
| | Yoning | Oct. 28 - Oct. 30 |
| | Aring | Nov. 1 - Nov. 7 |
| 1981 | Yeyeng | Nov. 17 - Nov. 21 |
| | Dinang | Dec. 23 - Dec. 27 |
| | Daling | Jun. 28 - Jul. 2 |

表－1.3.2　台風ペパン（1979年）による洪水被害を受けた村落

| River Basin | Municipality | Name of Barangay |
|---|---|---|
| Quinali (A) River Basin | Polangui | Centro Occidential, Basud, Obaliw, Alomon, Balangibang, Kinali |
| | Libon | Zone 2, Zone 3, Zone 4, Zone 5, Bacolod, Buga, Bulusan, Carisac-East, Carisac-West, Marayag, San-Agustin, San Isidro, Sta Cruz |
| | Oas | Centro Poblacion, Bagumbayan, Bongoran, Busac, Ilaor-Sur, Iraya-Sur, Mayao, Obaliw-Rinas, Rizal, San Agustin, Talongog |
| | Ligao | Bagumbayan, Binatagon, Calzada, Dunao, Guilid, Bobonsuran, Tinago, Bonga, Busay, Cavasi, Pandan, Tagpo |
| | Guinobatan | Ilawod, Iraya |
| | Camalig | Ilawod, Ligban, Tagaytay |
| Yawa River Basin | Daraga | Kilicao, Banag |
| | Legazpi | San Roque, Houses along Yawa River |
| Quinali (B) River Basin | Malinao | Balading, Bagumbayan, Balza, Malolos, Libod, Matalipni |

Remarks: Above inundated barangays is re-assessed by the inundation area due to typhoon "Daling" in 1981. The inundation area due to typhoon "Daling" is assumed to be almost the same as the area of typhoon "Pepang".

表－1.3.3　台風ダーリン（1981年）により土石流・泥流の家屋被害

| | Name of River | Totally Destroyed | | Partially Damaged | | Total Damage | |
|---|---|---|---|---|---|---|---|
| | | Houses | Value (₱10$^3$) | Houses | Value (₱10$^3$) | Houses | Value (₱10$^3$) |
| I) | Quinali (A) | 39 | 113 | 335 | 67 | 374 | 180 |
| | 1) Quirangay | 20 | 58 | 200 | 40 | 220 | 98 |
| | 2) Tumpa | 4 | 12 | 100 | 20 | 104 | 32 |
| | 3) Maninila | 10 | 29 | 15 | 3 | 25 | 32 |
| | 4) Masarawag | 5 | 14 | 20 | 4 | 25 | 18 |
| | 5) Ogsong | - | - | - | - | - | - |
| | 6) Nasisi | - | - | - | - | - | - |
| II) | Yawa | 196 | 568 | 605 | 121 | 801 | 689 |
| | 1) Anuling | 23 | 67 | 130 | 26 | 153 | 93 |
| | 2) Budiao | 142 | 411 | 373 | 75 | 515 | 486 |
| | 3) Pawa-Burabod | 31 | 90 | 102 | 20 | 133 | 110 |
| III) | Quinali (B) | - | - | - | - | - | - |
| IV) | East and North-east | 65 | 189 | 188 | 38 | 253 | 227 |
| | Total | 300 | 870 | 1,128 | 226 | 1,428 | 1,096 |

Note: Damage value per house at the foot of Mayon Volcano is estimated as below, on the basis of the result of field interview survey in 1982.

- Totally destroyed : ₱2,900/house
- Partially damaged : ₱ 200/house

Source: Result of field interview survey in 1982.

表－1.3.4　道路施設の被害

(Unit: Pesos)

| River Basin<br>Kinds of Road | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|---|---|---|
| Quinali (A)<br>River Basin | | | | | | | |
| National | 800,000 | - | 1,500,000 | 351,000 | 722,500 | - | 1,993,000 |
| Provincial | 368,000 | - | - | - | 103,900 | - | 800,000 |
| Municipal & City | - | 52,500 | 302,000 | - | - | - | - |
| Barangay | 100,000 | 170,000 | 323,500 | 328,500 | 7,500 | - | - |
| Sub-Total | 1,268,000<br>(2,984,000) | 222,500<br>(463,000) | 2,125,500<br>(3,915,000) | 679,500<br>(1,108,000) | 833,900<br>(1,203,000) | | 2,793,000<br>(3,156,000) |
| Yawa River<br>Basin | | | | | | | |
| National | - | - | 27,000 | 96,000 | 30,500 | - | - |
| Provincial | 30,000 | - | - | - | 45,000 | - | 70,000 |
| Municipal & City | 170,000 | 22,500 | 62,500 | 40,000 | 40,000 | - | 20,000 |
| Barangay | 10,000 | 82,500 | 108,000 | 209,500 | 277,500 | - | 235,000 |
| Sub-Total | 210,000<br>(494,000) | 105,000<br>(219,000) | 197,500<br>(364,000) | 345,500<br>(563,000) | 393,000<br>(567,000) | | 325,000<br>(367,000) |
| East and North-<br>East Area | | | | | | | |
| National | 150,000 | - | - | - | 46,000 | - | - |
| Provincial | 150,000 | - | - | - | 26,000 | - | 69,000 |
| Municipal & City | - | 39,700 | 220,700 | - | - | - | - |
| Barangay | 95,000 | 296,000 | 228,000 | 178,000 | 330,000 | - | - |
| Sub-Total | 395,000<br>(929,000) | 335,700<br>(699,000) | 448,700<br>(827,000) | 178,000<br>(290,000) | 402,000<br>(580,000) | | 69,000<br>(78,000) |

- Continued -

| River Basin<br>Kinds of Road | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|---|---|---|
| Quinali (B)<br>River Basin | | | | | | | |
| National | 51,000 | - | 204,000 | 45,000 | 47,000 | - | 230,000 |
| Provincial | 45,000 | - | - | - | 121,500 | - | 120,000 |
| Municipal & City | - | 5,100 | 43,700 | - | - | - | - |
| Barangay | 30,000 | 81,000 | 90,000 | 155,000 | 300,000 | - | - |
| Sub-Total | 126,000<br>(296,000) | 86,100<br>(179,000) | 337,700<br>(622,000) | 200,000<br>(326,000) | 468,500<br>(676,000) | | 350,000<br>(396,000) |
| Total | 1,999,000<br>(4,703,000) | 749,300<br>(1,560,000) | 3,109,400<br>(5,728,000) | 1,403,000<br>(2,287,000) | 3,097,400<br>(3,026,000) | | 3,537,000<br>(3,997,000) |

Remarks: Amounts in the parentheses are estimated at 1982 price level.

表－1.3.5　鉄道施設の被害

(Unit: Pesos)

| River Basin | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|---|---|---|
| Quinali (A) River Basin | 634,000 (1,492,000) | - | - | - | 320,000 (462,000) | 200,000 (255,000) | 1,500,000 (1,695,000) |
| Yawa River Basin | 3,700,000 (8,706,000) | - | - | - | - | - | - |
| Total | 4,334,000 (10,198,000) | | | | 320,000 (462,000) | 200,000 (255,000) | 1,500,000 (1,695,000) |

Remarks: Amounts in the parentheses are estimated at 1982 price level.

表－1.3.6　河川構造物の被害

(Unit: Pesos)

| River Basin | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|---|---|---|
| Quinali (A) River Basin | 455,000 (1,071,000) | - | 115,000 (212,000) | 327,000 (533,000) | 801,000 (1,156,000) | 2,861,000 (3,653,000) | 7,439,000 (8,406,000) |
| Yawa River Basin | 60,000 (141,000) | 50,000 (104,000) | - | 100,000 (163,000) | 170,000 (245,000) | - | - |
| East & North-East Area | - | - | - | - | - | 27,000 (34,000) | 350,000 (396,000) |
| Quinali (B) River Basin | 45,000 (106,000) | - | - | 133,000 (217,000) | - | 90,000 (115,000) | 150,000 (170,000) |
| Total | 560,000 (1,318,000) | 50,000 (104,000) | 115,000 (212,000) | 560,000 (913,000) | 971,000 (1,401,000) | 2,978,000 (3,802,000) | 7,939,000 (8,972,000) |

Remarks: Amounts in the parentheses are estimated at 1982 price level.

表－1.3.7　河川構造物の被害（内訳）

(Unit: Pesos)

| Date and Typhoon | Quinali (A) River Basin | Yawa River Basin | East North-East Area | Quinali (B) River Basin | Total Damage Cost |
|---|---|---|---|---|---|
| Typhoon 'Dinang' Dec. 1981 | 3,492,000 | - | 67,000 | - | 3,559,000 |
| Typhoon 'Anding' Nov. 1981 | 3,470,000 | - | 70,000 | - | 3,540,000 |
| Typhoon 'Daling' June, 1981 | 7,439,000 | - | 350,000 | 150,000 | 7,939,000 |
| Typhoon 'Aring' Nov. 1980 | 2,861,000 | - | 27,000 | 90,000 | 2,978,000 |
| Typhoon 'Pepang' Sep. 1979 | 801,600 | 170,000 | - | - | 991,000 |
| Typhoon 'Kading' Oct. 1978 | 327,000 | 100,000 | - | 133,000 | 560,000 |
| Typhoon 'Weling' Sep. 1978 | - | 100,000 | - | - | 100,000 |
| Typhoon 'Elang' July 1977 | 115,000 | - | - | - | 115,000 |
| Typhoon 'Aring' Dec. 1976 | - | 50,000 | - | - | 50,000 |
| Typhoon 'Sisang' Dec. 1975 | 455,000 | 60,000 | - | 45,000 | 560,000 |

Remarks: Data Source - Ministry of Public Works and Highways, the District Engineering Office and City Engineering Office.

Amount - Damage costs are based on the price level in each year.

表－1.3.8　上水道施設の被害

(Unit: Pesos)

| Date and Typhoon | Quinali (A) River Basin | Yawa River Basin | East North-East Area | Quinali (B) River Basin | Total Damage Cost |
|---|---|---|---|---|---|
| Typhoon 'Dinang' Dec. 1981 | 97,000 | - | - | 147,000 | 244,000 |
| Typhoon 'Anding' Nov. 1981 | 100,000 | - | - | 150,000 | 250,000 |
| Typhoon 'Daling' June. 1981 | 420,000 | 350,000 | - | 200,000 | 970,000 |
| Total | 617,000<br>(697,000) | 350,000<br>(396,000) | - | 497,000<br>(562,000) | 1,464,000<br>(1,655,000) |

Remarks: Data Source - Ministry of Public Works and Highways

Amount in the parentheses are estimated at 1982 price level.

表－1.3.9　公共インフラストラクチャの被害

(Unit: Pesos)

| Riber Basin | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|---|---|---|
| Quinali (A) River Basin | | | | | | | |
| Roads | 2,984,000 | 463,000 | 3,915,000 | 1,108,000 | 1,203,000 | - | 3,156,000 |
| Railways | 1,492,000 | - | - | - | 462,000 | 255,000 | 1,695,000 |
| River Facilities | 1,071,000 | - | 212,000 | 533,000 | 1,156,000 | 3,653,000 | 8,406,000 |
| Water works | - | - | - | - | - | - | 697,000 |
| Total | 5,547,000 | 463,000 | 4,127,000 | 1,641,000 | 2,821,000 | 3,908,000 | 13,954,000 |
| Yawa River Basin | | | | | | | |
| Roads | 494,000 | 219,000 | 364,000 | 563,000 | 567,000 | - | 367,000 |
| Railways | 8,706,000 | - | - | - | - | - | - |
| River Facilities | 141,000 | 104,000 | - | 163,000 | 245,000 | - | - |
| Water works | - | - | - | - | - | - | 396,000 |
| Total | 9,341,000 | 323,000 | 364,000 | 726,000 | 812,000 | | 763,000 |

- Continued -

| River Basin | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|---|---|---|
| East & North-East Area | | | | | | | |
| Roads | 929,000 | 699,000 | 827,000 | 290,000 | 580,000 | - | 78,000 |
| Railways | - | - | - | - | - | - | - |
| River Facilities | - | - | - | - | - | 34,000 | 396,000 |
| Water works | - | - | - | - | - | - | - |
| Total | 929,000 | 699,000 | 827,000 | 290,000 | 580,000 | 34,000 | 474,000 |
| Quinali (B) River Basin | | | | | | | |
| Roads | 296,000 | 179,000 | 622,000 | 326,000 | 676,000 | - | 396,000 |
| Railways | - | - | - | - | - | - | - |
| River Facilities | 106,000 | - | - | 217,000 | - | 115,000 | 170,000 |
| Water works | - | - | - | - | - | - | 562,000 |
| Total | 402,000 | 179,000 | 622,000 | 543,000 | 676,000 | 115,000 | 1,128,000 |
| Total | 16,219,000 | 1,664,000 | 5,940,000 | 3,200,000 | 4,889,000 | 4,057,000 | 16,319,000 |

Remarks: Amounts are estimated at 1982 price level.

表－1.3.10　かんがい施設の被害

(Unit: Pesos)

| Date and Typhoon | Quinali (A) River Rasin | Quinali (B) River Basin | Yawa River Basin | East and North-East Area | Total Damage Cost |
|---|---|---|---|---|---|
| Typhoon 'Anding' Nov. 1981 | 349,800 | 36,800 | 36,800 | 105,800 | 529,200 |
| Typhoon 'Aring' Nov. 1980 | 325,400 | 108,000 | - | 25,000 | 458,400 |
| Typhoon 'Pepang' Sep. 1979 | 622,300 | 26,400 | - | 61,400 | 710,100 |
| Typhoon 'Weling' Sep. 1979 | 414,200 | 43,400 | - | 150,500 | 608,100 |
| Typhoon 'Kading' Oct. 1978 | 339,200 | 31,900 | - | 116,400 | 487,500 |
| Typhoon 'Unding' Nov. 1977 | 195,000 | - | - | 54,200 | 249,200 |
| Typhoon 'Didnag' May, 1976 | 71,800 | 19,200 | - | 60,300 | 151,300 |
| Typhoon 'Sisang' Dec. 1975 | 228,300 | 5,200 | - | - | 233,500 |

Remarks: Data Source - National Irrigation Administration, Region V.
Damage cost is estimated at 1982 price level.

表－1.3.11 台風ペパン（1979年）による水稲被害

| Municipality | Area of Standing Palay (ha) | Affected Area | | | Yield | | Production Loss (cavan) |
|---|---|---|---|---|---|---|---|
| | | Total (ha) | No Recovery (ha) | With Recovery (ha) | Potential (cavan/ha) | Actual (cavan/ha) | |
| Quinali (A) River Basin | | | | | | | |
| Polangui | 964 | 292 | 0 | 292 | 86 | 49 | 10,804 |
| Libon | 1,773 | 1,773 | 1,291 | 482 | 89 | 48 | 134,061 |
| Oas | 1,411 | 1,411 | 52 | 1,359 | 85 | 70 | 24,805 |
| Ligao | 622 | 622 | 42 | 580 | 85 | 70 | 12,270 |
| Total: | 4,770 | 4,098 | 1,385 | 2,713 | 87 | 59 | 182,540 (9,127 ton) |
| Quinali (B) River Basin | | | | | | | |
| Malinao | 1,369 | 1,369 | 15 | 1,354 | 80 | 75 | 7,970 |
| Tabaco | 41 | 41 | 8 | 33 | 75 | 45 | 1,590 |
| Total: | 1,410 | 1,410 | 23 | 1,387 | 80 | 74 | 9,560 (478 ton) |

Source: BAEx, Municipal office, 1980.

表－1.3.12　台風ダーリン（1981年）による水稲被害

| Municipality Affected | Area Planted (ha) (1) | Stage of Crop (2) | Affected Area: Total (ha) (3) | Affected Area: Completely Damaged/1 (ha) (4) | With Chance of Recovery (ha) (5) | Estimated Yield: Before Calamity (ton/ha) (6) | Estimated Yield: After Calamity (ton/ha) (7) | Production Loss/2 (ton) (8) |
|---|---|---|---|---|---|---|---|---|
| Quinali (A) | 6,217 | | 2,054 | 1,554 | 500 | | | 6,010 |
| - Polangui | 1,231 | Vegetative | 578 | 405 | 96 | 3.80 | 3.50 | 1,570 |
| - Libon | 1,126 | " | 582 | 534 | 72 | 3.90 | 3.55 | 2,110 |
| - Oas | 1,188 | " | 388 | 265 | 123 | 3.50 | 3.00 | 990 |
| - Ligao | 1,170 | " | 276 | 213 | 116 | 3.50 | 3.25 | 770 |
| - Camalig | 770 | " | 90 | 61 | 29 | 3.50 | 2.50 | 240 |
| - Guinobatan | 732 | " | 140 | 76 | 64 | 3.75 | 3.00 | 330 |
| Yawa | 440 | | 391 | 171 | 39 | | | 600 |
| - Legazpi City | 312 | " | 312 | 131 | - | 3.25 | 0 | 430 |
| - Daraga | 128 | " | 79 | 40 | 39 | 3.25 | 2.25 | 170 |
| Total: | 6,657 | | 2,445 | 1,725 | 539 | | | 6,610 |

/1: No chance of recovery　　/2: $(8) = (4) \times (6) + (5) \times \{(6) - (7)\}$

Source: Crop Damage Survey, Regional Office of Ministry of Agriculture

表－1.3.13　土石流・泥流（1980年－1982年）による農作物被害

| Basin | Palay | | Coconut | | Total |
|---|---|---|---|---|---|
| | Area (ha) | Value/1 (₱10³) | Area (ha) | Value/1 (₱10³) | (₱10³) |
| Quinali (A) | 105 | 214 | 45 | 68 | 282 |
| Quinali (B) | - | - | - | - | - |
| Yawa | 91 | 142 | 23 | 35 | 177 |
| Northeast Area | 6 | 12 | 15 | 23 | 35 |
| Total | 202 | 368 | 83 | 126 | 494 |

/1 : Damage value per hectare is estimated as follows:

| Crop | Unit Yield (ton/ha) | Price (₱/ton) | Damage Value (₱/ha) |
|---|---|---|---|
| Palay | | | |
| Quinali (A) | 1.7 | 1,200 | 2,040 |
| Quinali (B) | 1.7 | 1,200 | 2,040 |
| Yawa | 1.3 | 1,200 | 1,560 |
| Northeast Area | 1.6 | 1,200 | 1,920 |
| Coconut | | | |
| (Copra) | 0.88 | 1,600 | 1,410 |
| (Charcoal) | 0.20 | 450 | 90 |

Source: Results of risk analysis

表－1.3.14　災害救助活動に要した費用（台風ダーリン）

(Unit: ₱10$^3$)

| Area | Pepang | Daling |
|---|---|---|
| Quinali (A) | 1.7 | 38.1 |
| Quinali (B) | - | 1.1 |
| Yawa | - | 2.0 |
| Northeast | - | 5.5 |
| Total | 1.7 | 46.7 |

Source: Regional Office of the
Philippine National Red Cross

表－1.3.15　死傷者に対する医療活動に要した費用（台風ダーリン）

| Basin | No. of Health Personnel Involved (man-day) | Cost of Personnel /1 (₱10³) | Cost of Medicines /2 (₱10³) | Total (₱10³) |
|---|---|---|---|---|
| Quinali (A) | 7,020 | 399 | 234 | 633 |
| | Physicians - 1,080 | 162 | | |
| | Nurses - 1,080 | 43 | | |
| | Midwives - 4,050 | 162 | | |
| | Sanitary Inspectors - 810 | 32 | | |
| Yawa | 220 | 11 | 10 | 21 |
| | Physicians - 20 | 3 | | |
| | Nurses - 30 | 1 | | |
| | Midwives - 130 | 5 | | |
| | Sanitary Inspectors - 40 | 2 | | |
| Total | 7,240 | 410 | 244 | 654 |

/1 : Unit cost of personnel is assumed as follows.

| | | |
|---|---|---|
| Physicians | : | ₱150/day |
| Nurses | : | ₱ 40/day |
| Midwives | : | ₱ 40/day |
| Sanitary Inspectors | : | ₱ 40/day |

Source : Provincial Health Office

表－1.3.16　洪水および土石流・泥流による総被害額（台風ペパン、1979年）

(Unit: P10$^3$)

| Damage Category | River Basin | | | | Whole Project Area |
|---|---|---|---|---|---|
| | Quinali (A) | Quinali (B) | Yawa | East and Northeast Area | |
| 1) Infrastructure | 2,821 | 676 | 812 | 580 | 4,889 |
| - Road | 1,203 | 676 | 567 | 580 | 3,026 |
| - Railway | 462 | - | - | - | 462 |
| - River facilities | 1,156 | - | 245 | - | 1,401 |
| - Waterworks | */1 | * | * | * | * |
| 2) Houses and Buildings | 15,777 | 1,085 | 1,812 | - | 18,674 |
| 3) Irrigation Facilities | 622 | 26 | - | 62 | 710 |
| 4) Agricultural Product | 10,950 | 580 | - | - | 11,530 |
| 5) Indirect Damage/2 | 423 | 101 | 122 | 87 | 733 |
| Total | 30,593 | 2,468 | 2,746 | 729 | 36,536 |

/1 : No data

/2 : 15 % of total damage to infrastructure

表－1.3.17　洪水および土石流・泥流による総被害額（台風ダーリン、1981年）

| Damage Category | River Basin | | | | Whole Project Area |
|---|---|---|---|---|---|
| | Quinali (A) | Quinali (B) | Yawa | East and Northeast Area | |
| 1) Infrastructure | 13,954 | 1,128 | 763 | 474 | 16,319 |
| - Road | 3,156 | 396 | 367 | 78 | 3,997 |
| - Railway | 1,695 | - | - | - | 1,695 |
| - River facilities | 8,406 | 170 | - | 396 | 8,972 |
| - Waterworks | 697 | 562 | 396 | - | 1,655 |
| 2) Houses and Buildings | 16,124 | 1,085 | 2,561 | - | 19,770 |
| 3) Irrigation Facilities | 1,661 | 384 | 68 | 271 | 2,384 |
| 4) Agricultural Product | 7,494 | - | 897 | 35 | 8,426 |
| 5) Indirect Damage/1 | 2,093 | 169 | 114 | 71 | 2,447 |
| Total | 41,326 | 2,766 | 4,403 | 851 | 49,346 |

/1 : 15 % of total damage to infrastructure

表－1.3.18　台風ダーリン（1981年）の災害による死傷者および被害所帯

| Basin | Casualties (persons) | | | | Families Affected | Population Affected (persons) |
|---|---|---|---|---|---|---|
| | Dead | Injured | Missing | Total | | |
| Flood Damage | 99 | 0 | 3 | 102 | 571 | 3,250 |
| - Quinali (A) | 96 | 0 | 2 | 98 | 482 | 2,750 |
| - Quinali (B) | 3 | 0 | 1 | 4 | 37 | 210 |
| - Yawa | 0 | 0 | 0 | 0 | 6 | 30 |
| - Northeast | 0 | 0 | 0 | 0 | 46 | 260 |
| Mud/Debris Flow Damage | 39 | 107 | 13 | 159 | 1,428 | 8,140 |
| - Quinali (A) | 10 | 12 | 0 | 22 | 576 | 3,280 |
| - Quinali (B) | 0 | 0 | 0 | 0 | 0 | 0 |
| - Yawa | 29 | 95 | 13 | 137 | 852 | 4,860 |
| - Northeast | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 138 | 107 | 16 | 261 | 1,999 | 11,390 |
| - Quinali (A) | 106 | 12 | 2 | 120 | 1,058 | 6,030 |
| - Quinali (B) | 3 | 0 | 1 | 4 | 37 | 210 |
| - Yawa | 29 | 95 | 13 | 137 | 858 | 4,890 |
| - Northeast | 0 | 0 | 0 | 0 | 46 | 260 |

Source : - Regional Office of Ministry of Social and Service Development

- Results of field interview survey

表－1.3.19　台風ダーリン（1981年）の土石流・泥流による死傷者

| City/Barangay | Dead | Missing | Injured | Total |
|---|---|---|---|---|
| Legazpi | | | | |
| Mabinit | 14 | 5 | 30 | 49 |
| Bonga | 4 | - | 30 | 34 |
| Daraga | | | | |
| Budiao | 3 | - | 2 | 5 |
| Salvacion | 7 | 7 | 10 | 24 |
| Banadero | 1 | 1 | 3 | 5 |
| Kilikao | - | - | 20 | 20 |
| Camalig | | | | |
| Quirangay | 2 | - | 6 | 8 |
| Guinobatan | | | | |
| Maninila | 3 | - | - | 3 |
| Muladbucad Pequeno | 2 | - | 1 | 3 |
| Ligao | | | | |
| Batang | 2 | - | 5 | 7 |
| Nasisi | 1 | - | - | 1 |
| Total | 39 | 13 | 107 | 159 |

Source: Result of field interview survey in 1982.

表－1.3.20　襲来した台風による死傷者

| Name of Typhoon | Year | Number of Casualty | | | |
|---|---|---|---|---|---|
| | | Dead | Missing | Injured | Total |
| Sening | 1970 | 206 | 137 | 865 | 1,208 |
| Herming | 1971 | 3 | 3 | - | 6 |
| Konsing | 1972 | 11 | 4 | - | 15 |
| Luming | 1973 | 1 | - | - | 1 |
| Sisang | 1975 | 8 | - | - | 8 |
| Daling | 1981 | 138 | 16 | 107 | 261 |

Source: (1) The Philippine National Red Cross, Legazpi, 1980
(2) Regional Office of Ministry of Social and Service Development, Legazpi, 1982
(3) Result of field interview survey in 1982

表－2.2.1　砂防プロジェクト（第1ステージ）の工事費

(Unit: 1,000 Pesos)

| Description | Foreign Currency Portion | Local Currency Portion | Total |
|---|---|---|---|
| 1. Contract Cost | | | |
| (1) Direct Cost | 23,622 | 43,926 | 67,548 |
| (2) General | 2,363 | 4,392 | 6,755 |
| (3) Supervision & Miscellaneous | 1,559 | 2,899 | 4,458 |
| (4) Profit | 2,755 | 5,122 | 7,877 |
| (5) Contractor's Tax | 910 | 1,689 | 2,599 |
| Sub total | 31,209 | 58,028 | 89,237 |
| 2. Right of Way/Site Acquisition | - | 25 | 25 |
| 3. Resettlement | - | - | - |
| 4. Engineering Cost | - | 8,923 | 8,923 |
| 5. Project Management Cost | - | 4,462 | 4,462 |
| 6. Contingency | | | |
| (1) Physical Contingency | 4,681 | 8,704 | 13,385 |
| (2) Price Escalation | 8,074 | 37,390 | 45,464 |
| Total | 43,964 | 117,532 | 161,496 |

表－2.2.2　砂防プロジェクト（第１ステージ）の年次別工事費支出表

(Unit: 1,000 Pesos)

| Description | 1st Year (1983) | | 2nd Year (1984) | | 3rd Year (1985) | | 4th Year (1986) | | 5th Year (1987) | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Foreign | Local | Foreign | Local | Foreign | Local | Foreign | Local | Foreign | Local | Foreign | Local |
| 1. Contract Cost | | | | | | | | | | | | |
| (1) Direct Cost | 2,848 | 5,376 | 4,180 | 7,829 | 5,213 | 9,293 | 5,219 | 9,657 | 6,342 | 11,771 | 23,622 | 43,926 |
| (2) General | 285 | 538 | 418 | 783 | 504 | 929 | 522 | 965 | 634 | 1,178 | 2,363 | 4,392 |
| (3) Supervision & Miscellaneous | 188 | 355 | 276 | 517 | 332 | 613 | 344 | 637 | 418 | 777 | 1,559 | 2,899 |
| (4) Profit | 332 | 627 | 487 | 913 | 587 | 1,083 | 609 | 1,126 | 739 | 1,373 | 2,755 | 5,122 |
| (5) Contractor's Tax | 110 | 207 | 162 | 301 | 194 | 357 | 201 | 372 | 243 | 453 | 910 | 1,689 |
| Sub total | 3,763 | 7,103 | 5,523 | 10,343 | 6,650 | 12,275 | 6,895 | 12,757 | 8,376 | 15,552 | 31,209 | 58,028 |
| 2. Right of Way/Site Acquisition | - | 3 | - | 5 | - | 5 | - | 5 | - | 7 | - | 25 |
| 3. Resettlement | - | - | - | - | - | - | - | - | - | - | - | - |
| 4. Engineering Cost | - | 1,086 | - | 1,586 | - | 1,893 | - | 1,965 | - | 2,393 | - | 8,923 |
| 5. Project Management Cost | - | 543 | - | 794 | - | 946 | - | 983 | - | 1,196 | - | 4,462 |
| 6. Contingency | | | | | | | | | | | | |
| (1) Physical Contingency | 564 | 1,065 | 828 | 1,551 | 998 | 1,841 | 1,034 | 1,914 | 1,257 | 2,333 | 4,681 | 8,704 |
| (2) Price Escalation | 263 | 1,136 | 800 | 3,524 | 1,496 | 6,695 | 2,143 | 9,905 | 3,372 | 16,130 | 8,074 | 37,390 |
| Total | 4,590 | 10,936 | 7,151 | 17,803 | 9,144 | 23,655 | 10,072 | 27,529 | 13,005 | 37,611 | 43,964 | 117,532 |

表－2.2.3　砂防プロジェクト（第1ステージ）の経済的事業費

(Unit: 1,000 Pesos)

| Description | Foreign Currency Portion | Local Currency Portion | Total |
|---|---|---|---|
| 1. Contract Cost | | | |
| (1) Direct Cost | 23,622 | 37,705 | 61,327 |
| (2) General | 2,362 | 3,771 | 6,133 |
| (3) Supervision & Miscellaneous | 1,558 | 2,490 | 4,048 |
| (4) Profit | - | - | - |
| (5) Contractor's Tax | - | - | - |
| Sub total | 27,542 | 43,966 | 71,508 |
| 2. Right of Way/Site Acquisition | - | - | - |
| 3. Engineering Cost | - | 7,152 | 7,152 |
| 4. Project Management Cost | - | 3,575 | 3,575 |
| 5. Contingency | | | |
| (1) Physical Contingency | 4,132 | 6,595 | 10,727 |
| (2) Price Escalation | - | - | - |
| Total | 31,674 | 61,288 | 92,962 |

表－2.2.4　砂防プロジェクト（第1ステージ）の経済的事業費の
年次別工事費支出表

(Unit: 1,000 Pesos)

| Description | 1st Year (1983) | | 2nd Year (1984) | | 3rd Year (1985) | | 4th Year (1986) | | 5th Year (1987) | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Foreign | Local | Foreign | Local | Foreign | Local | Foreign | Local | Foreign | Local | Foreign | Local |
| 1. Contract Cost | | | | | | | | | | | | |
| (1) Direct Cost | 2,848 | 4,627 | 4,180 | 6,730 | 5,033 | 7,966 | 5,219 | 8,282 | 6,342 | 10,100 | 23,622 | 37,705 |
| (2) General | 285 | 463 | 418 | 673 | 503 | 797 | 522 | 828 | 634 | 1,010 | 2,362 | 3,771 |
| (3) Supervision & Miscellaneous | 188 | 305 | 276 | 445 | 332 | 527 | 344 | 547 | 418 | 666 | 1,558 | 2,490 |
| (4) Profit | - | - | - | - | - | - | - | - | - | - | - | - |
| (5) Contractor's Tax | - | - | - | - | - | - | - | - | - | - | - | - |
| Sub total | 3,321 | 5,395 | 4,874 | 7,848 | 5,868 | 9,290 | 6,085 | 9,657 | 7,394 | 11,776 | 27,542 | 43,966 |
| 2. Right of Way/Site Acquisition | - | - | - | - | - | - | - | - | - | - | - | - |
| 3. Resettlement | - | - | - | - | - | - | - | - | - | - | - | - |
| 4. Engineering Cost | - | 872 | - | 1,272 | - | 1,516 | - | 1,574 | - | 1,918 | - | 7,152 |
| 5. Project Management Cost | - | 436 | - | 636 | - | 758 | - | 787 | - | 958 | - | 3,575 |
| 6. Contingency | | | | | | | | | | | | |
| (1) Physical Contingency | 498 | 809 | 731 | 1,177 | 881 | 1,394 | 913 | 1,448 | 1,109 | 1,767 | 4,132 | 6,595 |
| (2) Price Escalation | - | - | - | - | - | - | - | - | - | - | - | - |
| Total | 3,819 | 7,512 | 5,605 | 10,933 | 6,749 | 12,958 | 6,998 | 13,466 | 8,503 | 16,419 | 31,674 | 61,288 |

表－2.2.5　台風グーリン（1981年）の土石流・泥流による農作物被害

| Item | | Quinali (A) | Yawa |
|---|---|---|---|
| I) Damage to Coconut | | | |
| 1) Damage area | (ha) | 45 | 23 |
| 2) Re-transplanting cost of coconut | | | |
| - Unit cost /1 | (₱10³/ha) | 3.18 | 3.18 |
| - Total cost | (₱10³) | 143 | 73 |
| 3) Loss of net return (net income) | | | |
| - Loss of net return per hectare /2 | (₱10³/ha) | 17.7 | 17.7 |
| - Total loss | (₱10³) | 797 | 407 |
| II) Damage to Paddy Field | | | |
| 1) Damage area | | 105 | 91 |
| 2) Rehabilitation cost per hectare /3 | (₱10³/ha) | 75 | 75 |
| 3) Total rehabilitation cost | (₱10³) | 7,875 | 6,825 |
| Total | | 8,815 | 7,305 |

/1: See TABLE-2.2.6.

/2: Loss of net return per hectare is estimated as below:

| | | |
|---|---|---|
| - Annual net return of coconut | : | ₱2,950/ha |
| - Period of loss* | : | 6 year |
| - Total loss per hectare | : | ₱17,700/ha |

* The period of loss is assumed at 6 years from re-transplanting to first production of coconut.

/3:

| | | |
|---|---|---|
| Average depth of sediment | : | 0.5 m |
| Volume of sediment per hectare | : | 5,000 $m^3$ |
| Excavation cost per $m^3$ | : | ₱15.0/$m^3$ |
| Rehabilitation cost per hectare | : | ₱75,000/ha |

表－2.2.6　ココナツのヘクタール当りの移植費

(Unit: ₱/ha)

| Item | Establishing Period | | | Total |
|---|---|---|---|---|
| | 1-year | 2-year | 3-year | |
| A) Materials/Equipment | | | | |
| 1) Seedling: 143 at ₱1.0/ seedling | 143 | - | - | 143 |
| 2) Fertilizer - N: 11 kg/ha | 75 | 75 | 75 | 225 |
| K: 38 kg/ha | 122 | 122 | 122 | 366 |
| 3) Pesticide | 200 | 200 | 200 | 600 |
| 4) Tools | 200 | - | - | 200 |
| 5) Covercrop seeds: 20 kg at ₱10.0/kg | 200 | - | - | 200 |
| 6) Replanting - 10% of stand seedlings: 14 at ₱1.0/ seedling | 14 | - | - | 14 |
| B) Labour | | | | |
| 1) Clearing, ready to plant | 1,000 | - | - | 1,000 |
| 2) Layouting, staking and holing: 0.5 x 0.5 m at ₱0.75/hole | 107 | - | - | 107 |
| 3) Planting: 143 at ₱0.2/ seedling including basal application of fertilizer | 29 | - | - | 29 |
| 4) Replanting: 14 at ₱0.2/ seedling including basal application of fertilizer | 3 | - | - | 3 |
| 5) Fertilizer/chemical application: | | | | |
| - 6 months after planting at ₱0.1/palm | 14 | - | - | 14 |
| - 143 palms at ₱0.5/palm | | 72 | 72 | 144 |
| 6) Ringweeding: 143 at ₱0.3/palm | - | 43 | 43 | 86 |
| 7) Rolling of covercrops: 2 man-animal day at ₱25.0/day | - | - | 50 | 50 |
| Total | 2,107 | 512 | 562 | 3,181 |

Source: Regional office of PCA

表－2.2.7　流出土砂の軽減便益

| Name of River | Sediment Runoff Volume ($10^3 m^3$) | Allowable Sediment Volume ($10^3 m^3$) | Reduction of Sediment Runoff/1 ($10^3 m^3$) | Dredging Cost/4 (₱$10^3$) | Annual Benefit/5 (₱$10^3$) |
|---|---|---|---|---|---|
| I) Quinali (A) | 1,807.3 | 543.2 | 1,264.1 | 50,564 | 1,011 |
| - Quirangay | 260.1 | 82.6 | 177.5 | 7,100 | 142 |
| - Tumpa | 43.8 | 35.2 | 8.6 | 344 | 7 |
| - Maninila | 94.0 | 36.7/2 | 57.3 | 2,292 | 46 |
| - Masarawag | 276.8 | 77.6 | 199.2 | 7,968 | 159 |
| - Ogsong | 140.5 | 32.7 | 107.8 | 4,312 | 86 |
| - Nasisi | 992.1 | 278.4/3 | 713.7 | 28,548 | 571 |
| II) Yawa | 902.2 | 213.4 | 688.8 | 27,552 | 551 |
| - Anuling | 415.6 | 85.8 | 329.8 | 13,192 | 264 |
| - Budiao | 234.6 | 58.1 | 176.5 | 7,060 | 141 |
| - Pawa-Burabed | 252.0 | 69.5 | 182.5 | 7,300 | 146 |
| Total | 2,709.5 | 756.6 | 1,952.9 | 78,116 | 1,562 |

/1　Sediment runoff volume after the implementation of the Sabo project is reduced less than the allowable sediment volume, therefore, reduction volume of sediment for the project benefit is estimated at difference between them.

/2　For the Maninila river, the sediment runoff volume under with project condition is reduced to 42,600 $m^3$ which is over the allowable sediment volume, however, this excess is included in the reduction benefit because excess volume is regulated by sand retarding function of consolidation works of the Sabo project.

/3　Sediment runoff volume under with project condition is more than the allowable sediment volume, and this excess is regulated by the natural retarding function. Therefore, this excess volume is excluded from the reduction benefit.

/4　Unit dredging cost = ₱40/$m^3$

/5　Dredging cost/50 years (probable flood)

表－2.2.8　砂防プロジェクトの事業費および便益費

(Unit: ₱10$^3$)

| Item | Total |
|---|---|
| I) Annual Project Benefit | 5,064 |
| 1) Mud/debris flow damage reduction benefit | 3,502 |
| - Crops/1 | 3,224 |
| - Houses/2 | 174 |
| - Indirect benefit/3 | 104 |
| 2) Sediment runoff reduction benefit | 1,562 |
| II) Project Cost | |
| 1) Construction Cost | 152,128 |
| - 1st stage | 92,962 |
| - 2nd stage | 59,166 |
| 2) O & M cost | 949 |
| - 1st stage | 580 |
| - 2nd stage | 369 |

/1: Total damage of crops (Quinali (A) and Yawa)/Return period of mud/debris flow = ₱16,120,000/5 years ≒ ₱3,224,000

/2: Total damage of houses (Quinali (A) and Yawa)/5 years = ₱869,000/5 years ≒ ₱174,000

/3: Number of population affected x cost of relief goods and medical assistence per person/5 years = 8,140 persons x ₱64/person/5 years ≒ ₱104,000

表－2.2.9　経済評価便益・費用の流れ－砂防プロジェクト－

(Unit: ₱ $10^3$)

| Year in Order | Project Benefit | | | Project Cost | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 1st Stage | | 2nd Stage | | |
| | Mud/debris Flow Damage Reduction Benefit | Sediment Runoff Reduction Benefit | Total | Construction Cost | O & M Cost | Construction Cost | O & M Cost | Total |
| 1 | - | - | - | 11,331 | - | - | - | 11,331 |
| 2 | - | - | - | 16,538 | 71 | - | - | 16,609 |
| 3 | - | - | - | 19,707 | 155 | - | - | 19,862 |
| 4 | - | - | - | 20,464 | 297 | - | - | 20,761 |
| 5 | - | - | - | 24,922 | 425 | - | - | 25,347 |
| 6 | 3,502 | 1,562 | 5,064 | - | 580 | 25,133 | - | 25,713 |
| 7 | 3,502 | 1,562 | 5,064 | - | 580 | 22,799 | 157 | 23,536 |
| 8 | 3,502 | 1,562 | 5,064 | - | 580 | 11,234 | 299 | 12,113 |
| 9 | 3,502 | 1,562 | 5,064 | - | 580 | - | 369 | 949 |
| 10 | 3,502 | 1,562 | 5,064 | - | 580 | - | 369 | 949 |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| 50 | 3,502 | 1,562 | 5,064 | - | 580 | - | 369 | 949 |

表－2.2.10　予警報システムプロジェクト（第1ステージ）の工事費

| Description | Foreign Currency (Japanese Yen) | Local Currency (Peso) |
|---|---|---|
| 1. Telemetry System by 150 MHz Radio System | 156,802,000 | - |
| 2. Warning System by Multi-Access Radio System | 300,083,000 | - |
| 3. Multiplex Radio Communication System | 249,348,000 | - |
| 4. HF Communication System | 9,800,000 | - |
| 5. Installation Materials | 93,560,000 | - |
| 6. Installation Work | 211,803,000 | 2,048,000 |
| 7. Training (Factory & on the Job) | 27,000,000 | - |
| 8. Maintenance Service (on year) | 73,000,000 | - |
| 9. Consultancy Service | 145,676,000 | - |
| Sub total 1 to 9 | 1,267,072,000 | 2,048,000 |
| 10. Contingency | 126,707,000 | 205,000 |
| Total | 1,393,779,000 | 2,253,000 |

表－2.2.11　予警報システムプロジェクト（第1ステージ）の年次別

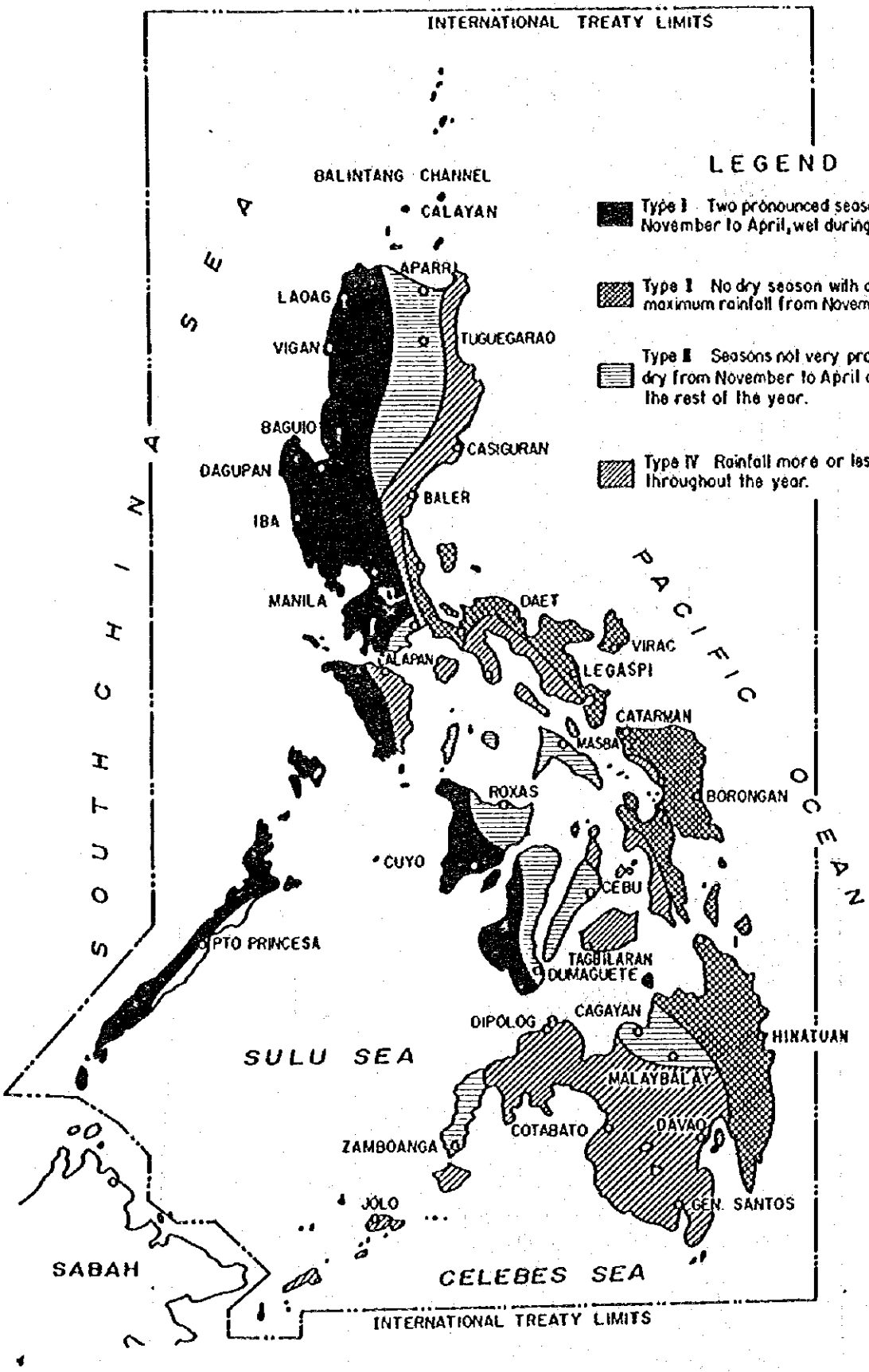
工事費支出表

(Unit: 1,000 Yen, 1,000 Peso)

| | 1st Year | | 2nd Year | | 3rd Year | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Foreign | Local | Foreign | Local | Foreign | Local | Foreign | Local |
| 1. Telemetry System by 150 MHz Radio System | - | - | 78,401 | - | 78,401 | - | 156,802 | - |
| 2. Warning System by Multi-Access Radio System | - | - | 150,042 | - | 150,041 | - | 300,083 | - |
| 3. Multiplex Radio Communication System | - | - | 124,674 | - | 124,674 | - | 249,348 | - |
| 4. HF Communication System | - | - | 4,900 | - | 4,900 | - | 9,800 | - |
| 5. Installation Materials | - | - | 46,780 | - | 46,780 | - | 93,560 | - |
| 6. Installation Work | | | - | - | 211,803 | 2,048 | 211,803 | 2,048 |
| 7. Training | - | - | 10,000 | - | 17,000 | - | 27,000 | - |
| 8. Maintenance Service | | | - | - | 73,000 | - | 73,000 | - |
| 9. Consultancy Service | 50,000 | - | 47,838 | - | 47,838 | - | 145,676 | - |
| Sub total | 50,000 | - | 462,635 | - | 754,437 | 2,048 | 1,267,072 | 2,048 |
| 10. Contingency | 5,000 | - | 46,264 | - | 75,443 | 205 | 126,707 | 205 |
| Total | 55,000 | - | 508,899 | - | 829,880 | 2,253 | 1,393,779 | 2,253 |

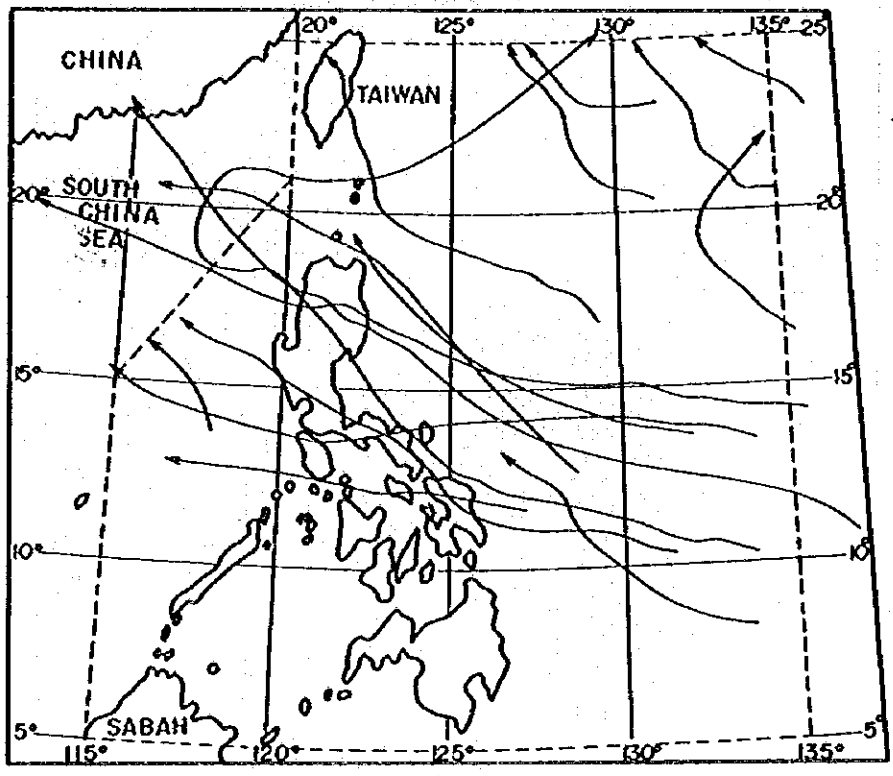
# 付　図

図－1.3.1　フィリピンの気象図

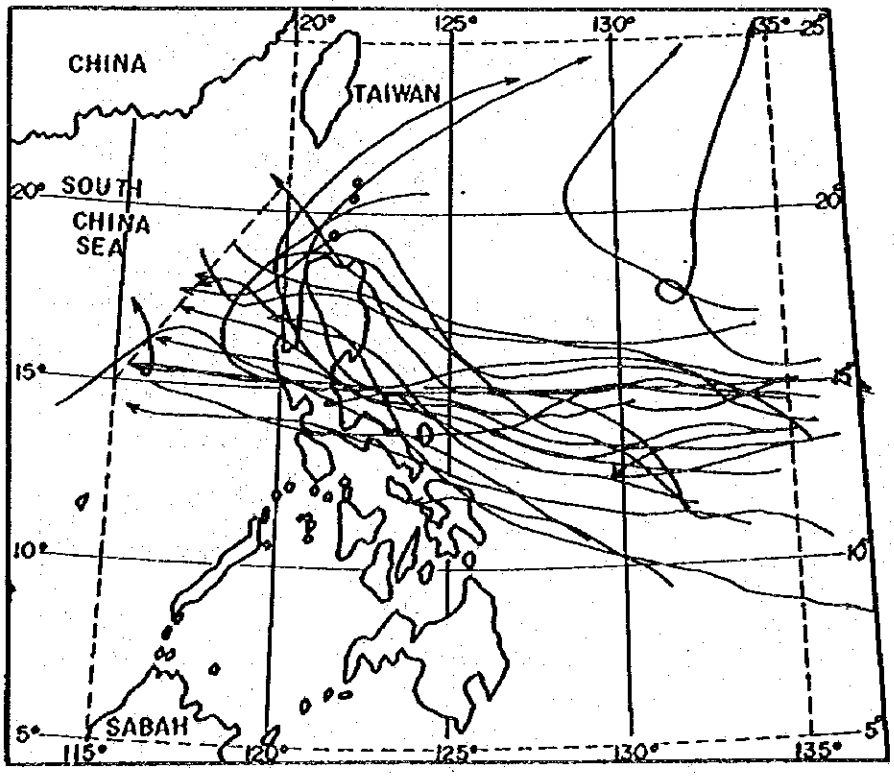


図－1.3.2　熱帯性サイクロンの進路

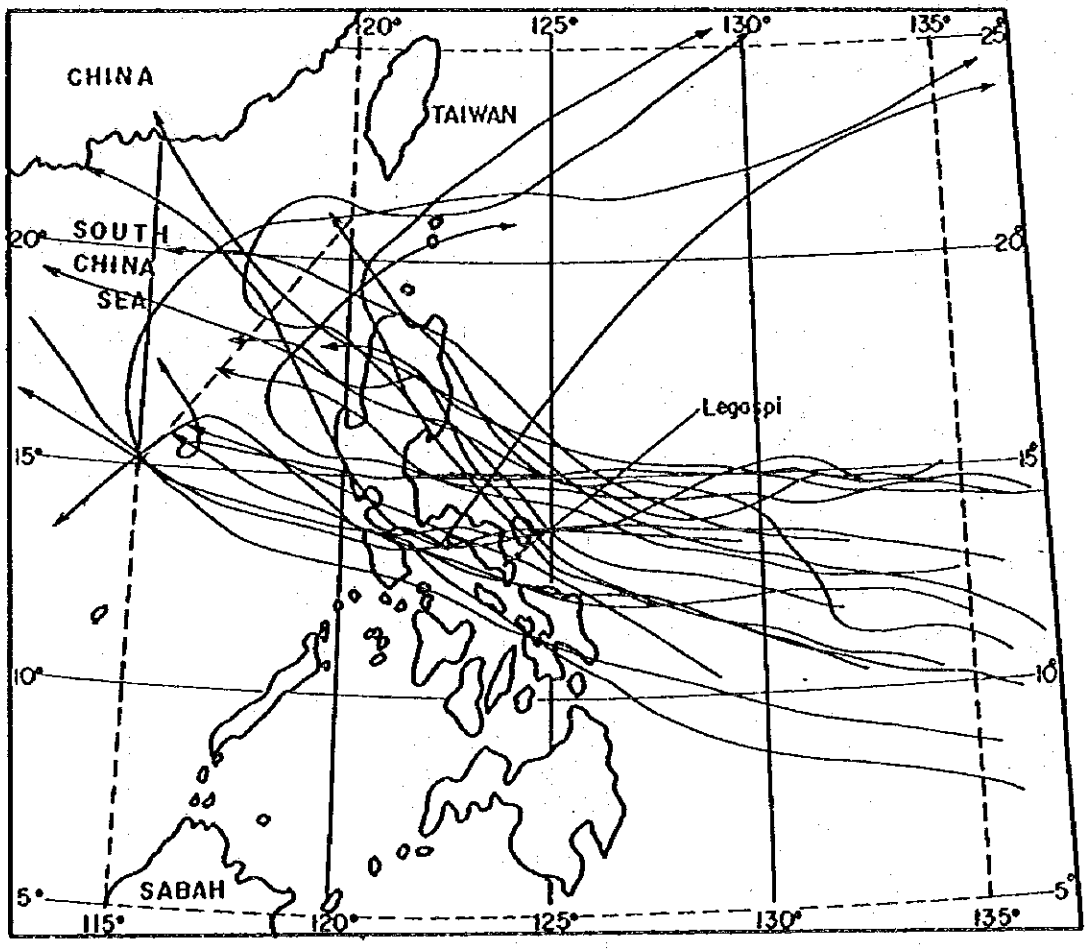
a)　June and July

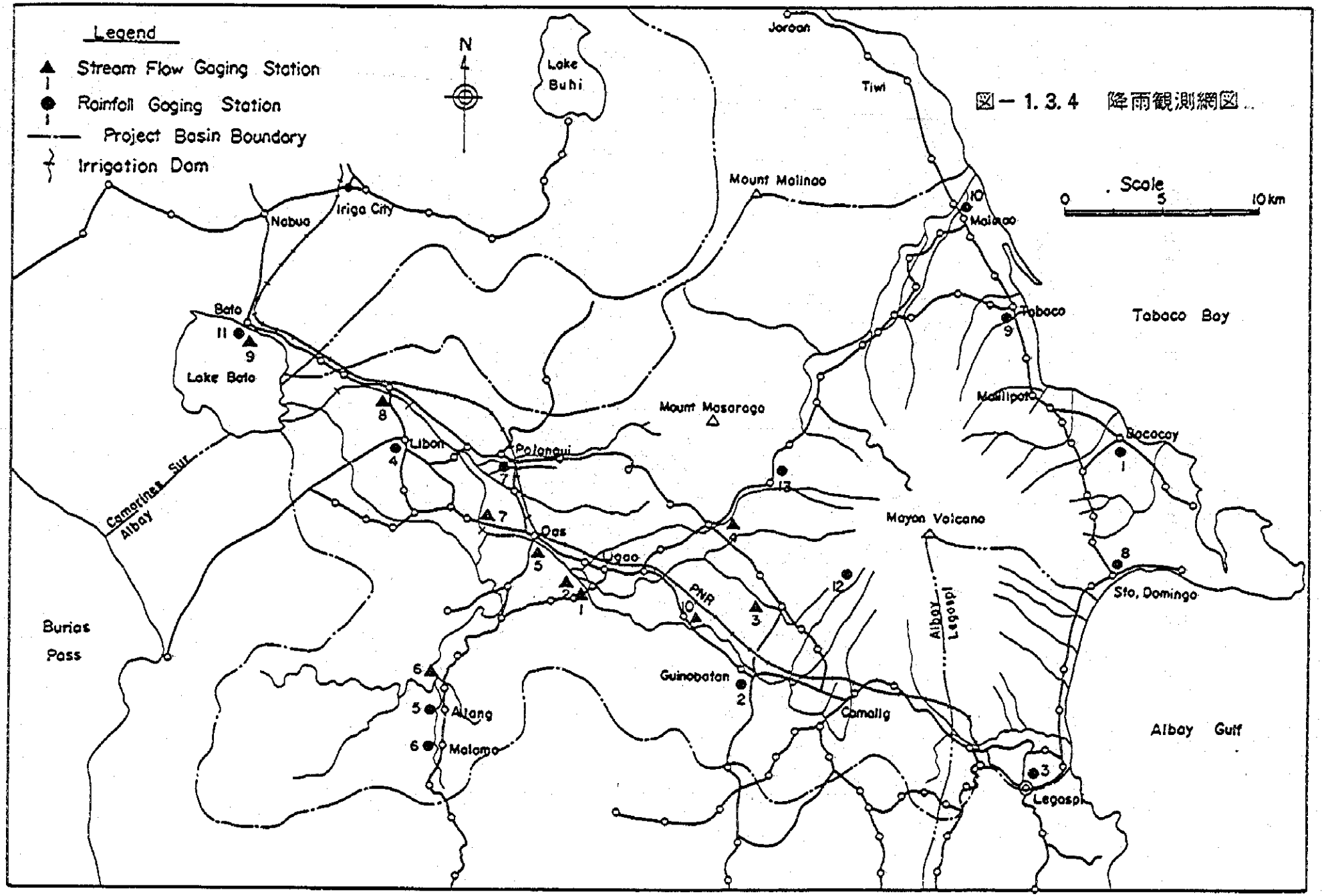



b)　October and November

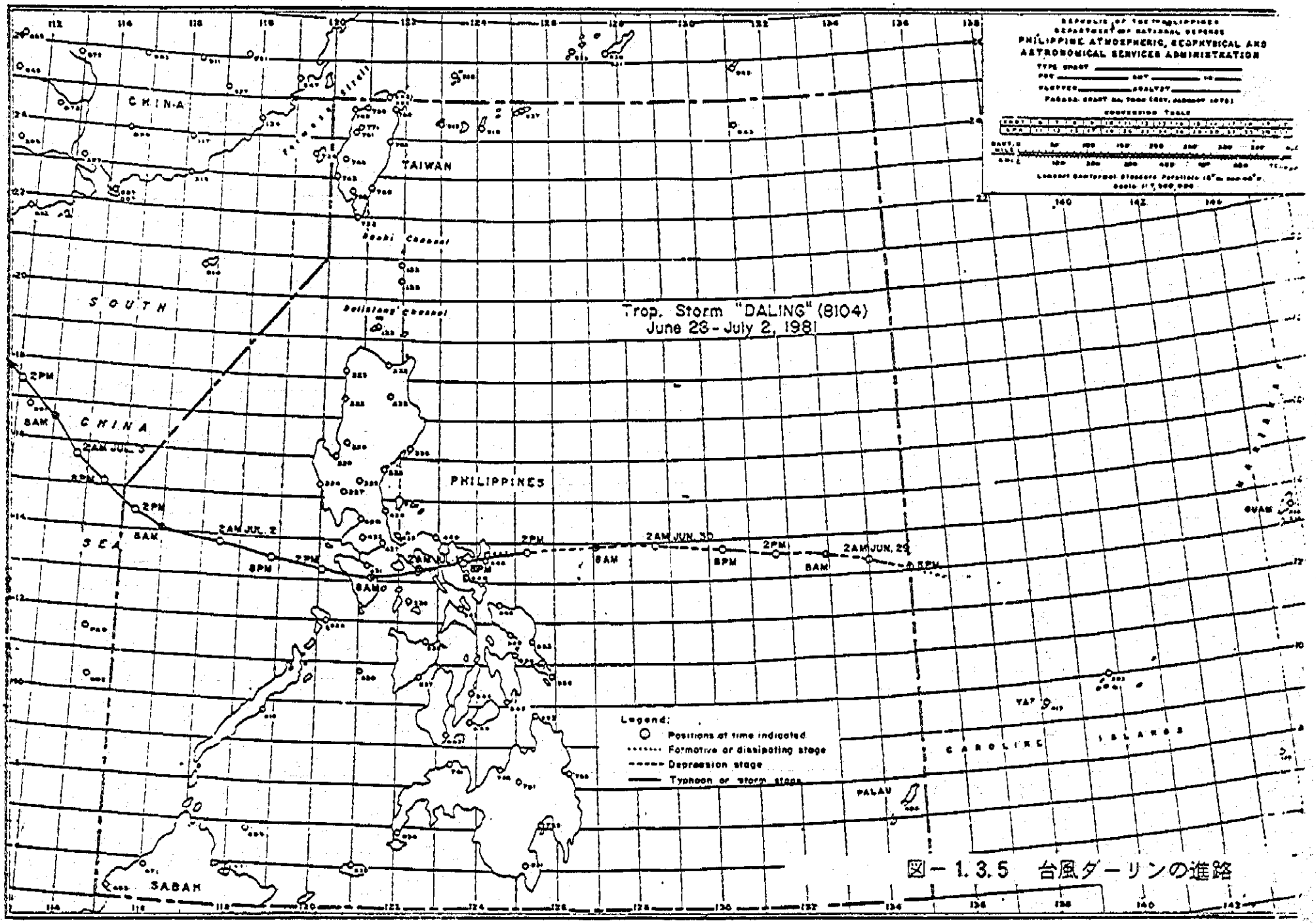


図－1.3.3　1971年以降に発生した台風の進路



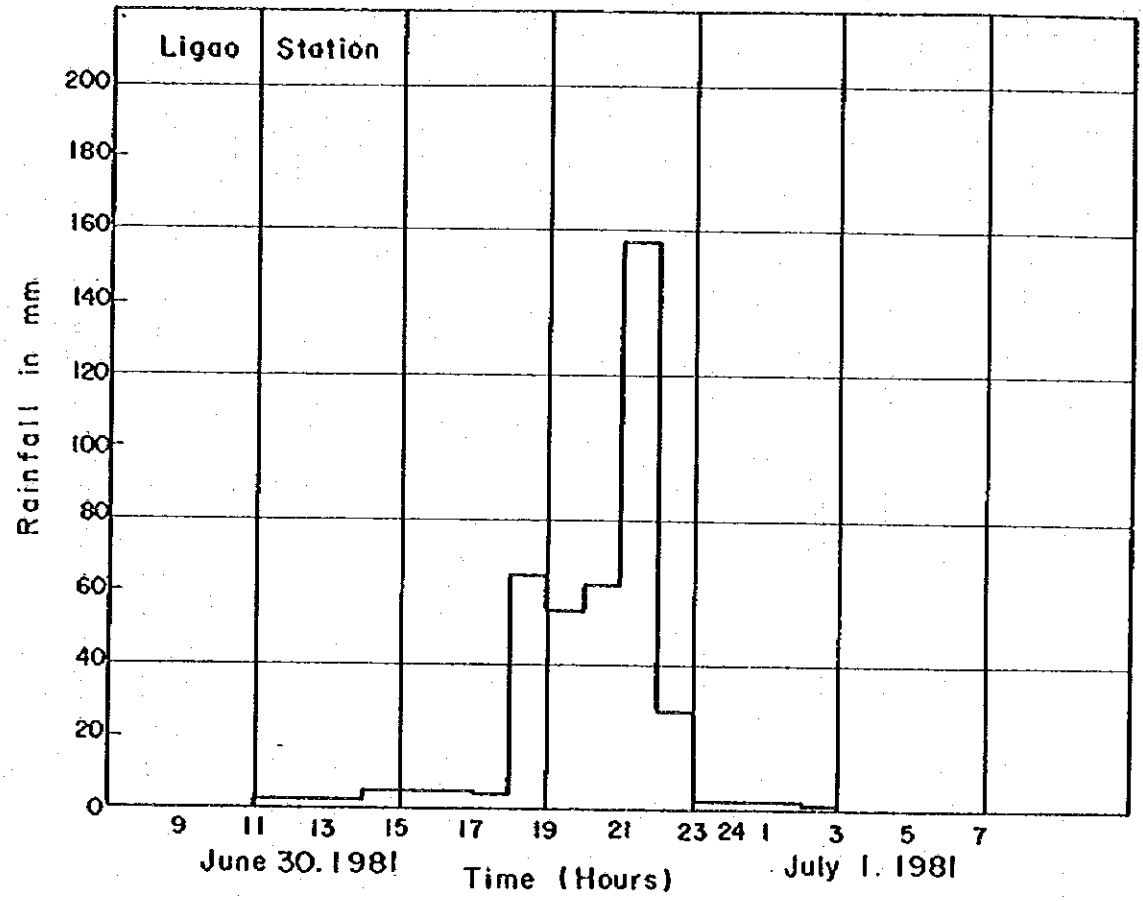

Legend
Stream Flow Gaging Station
Rainfall Gaging Station
Project Basin Boundary
Irrigation Dam
N
Scale
0 5 10 km
Jovoan
Tiwi
Lake Buhi
Mount Malinao
Malinao
Nabua
Iriga City
Bato
Lake Bato
Tabaco
Tabaco Bay
Mount Masaraga
Malilipot
Bacacay
Libon
Polangui
Camarines Sur
Albay
Oas
Ligao
Mayon Volcano
Sto. Domingo
PNR
Albay Legaspi
Burias Pass
Guinobatan
Camalig
Albay Gulf
Legaspi
Aliang
Malampo

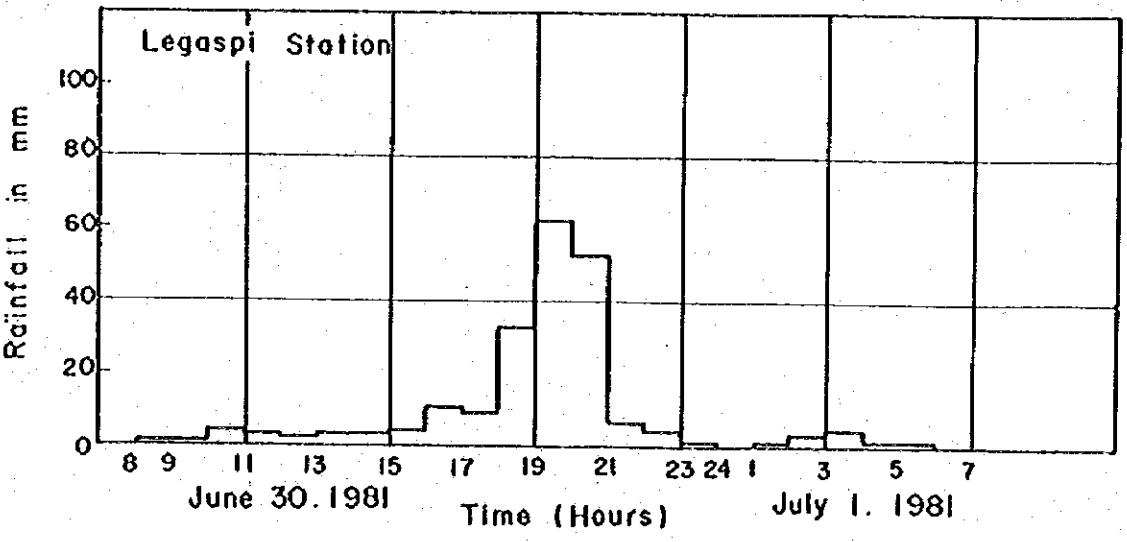
図－1.3.4　降雨観測網図



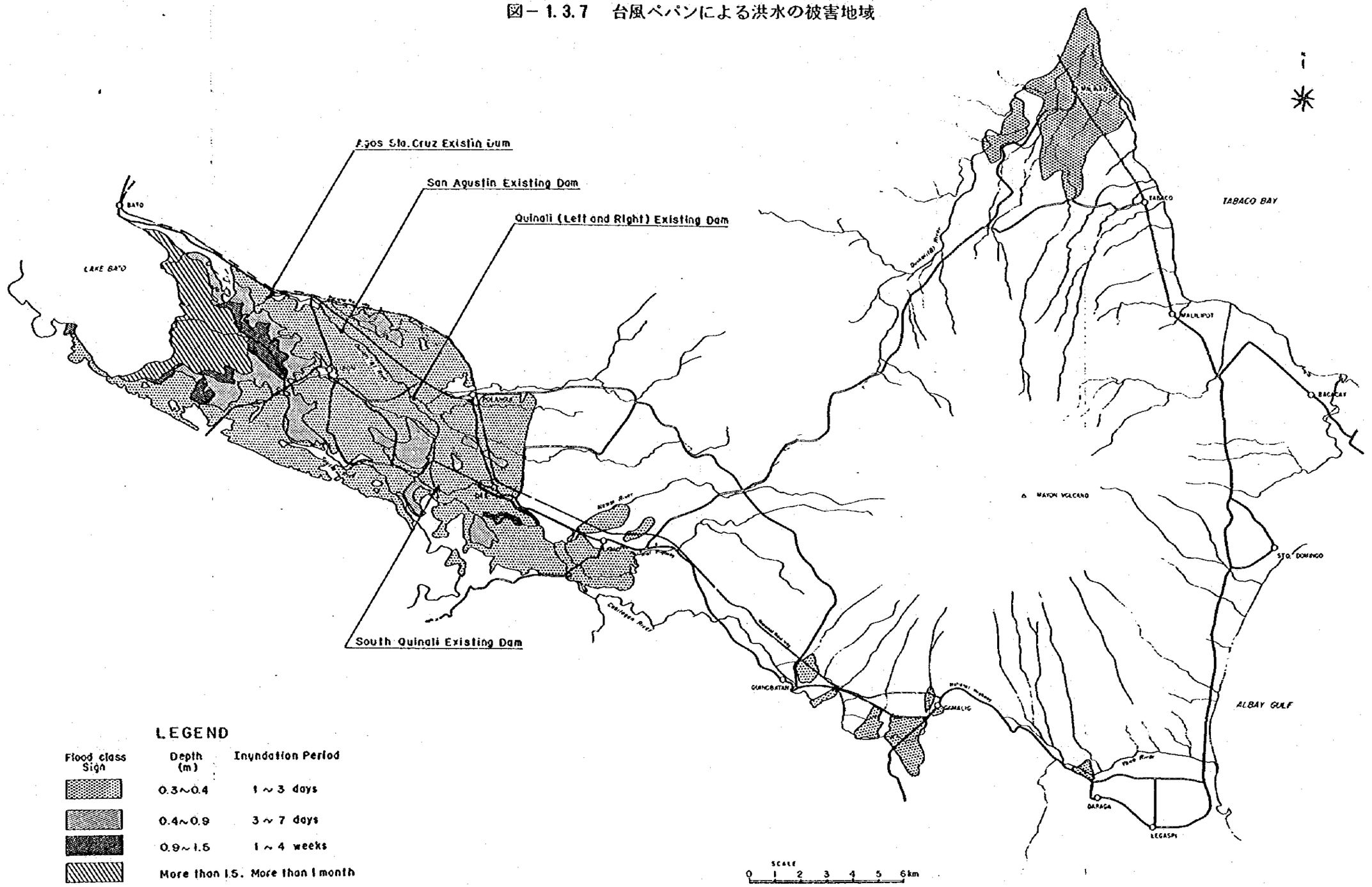

図－1.3.5　台風ダーリンの進路

図－1.3.6　時間雨量分布（台風ダーリン）



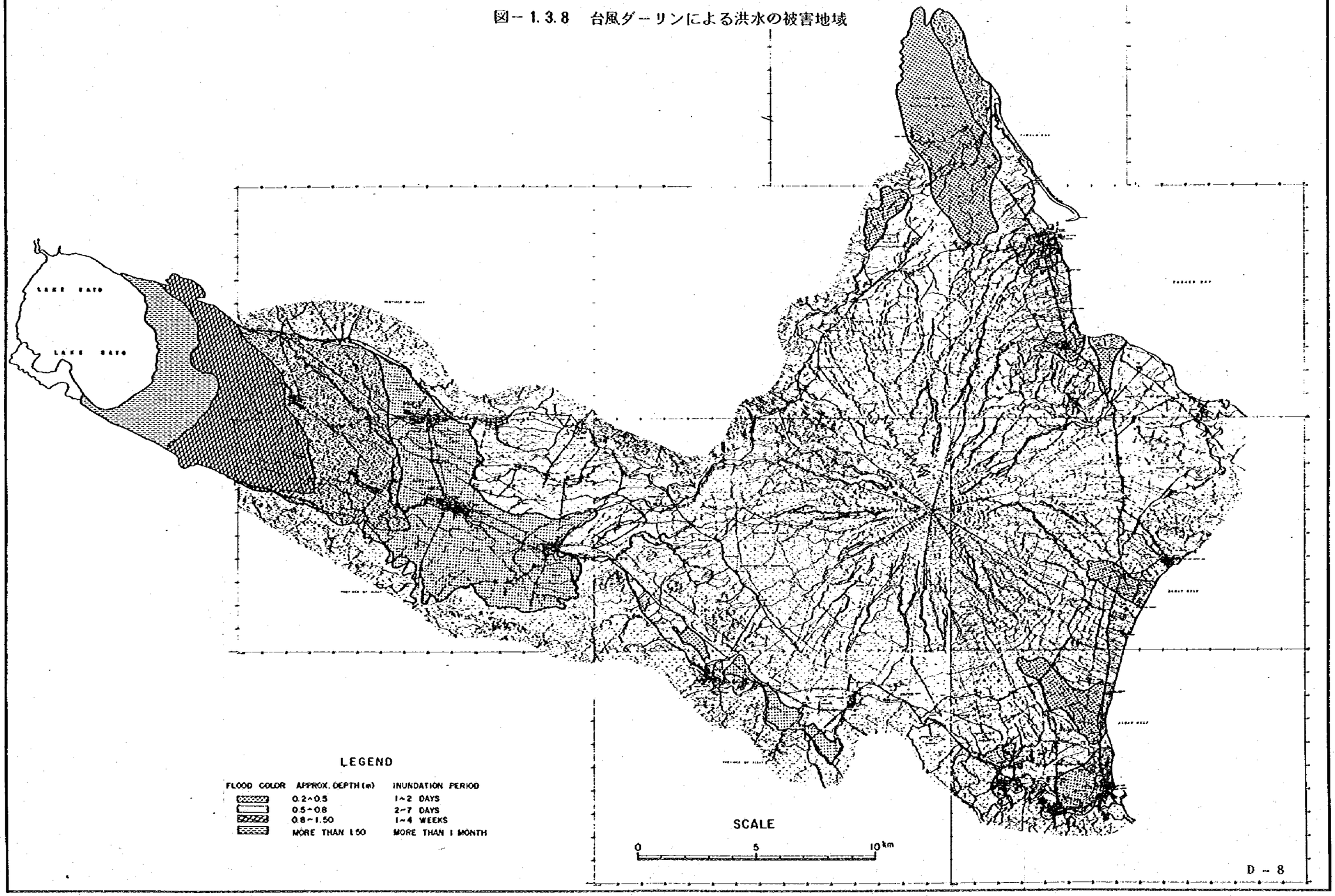
図－1.3.7　台風ペパンによる洪水の被害地域



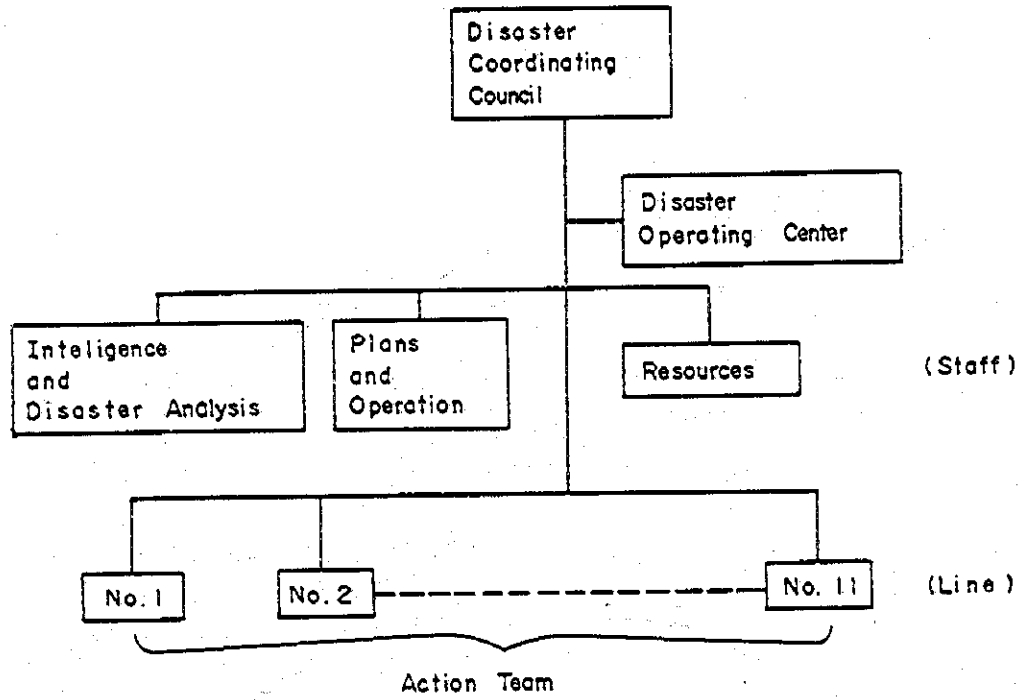

LEGEND

| Flood class Sign | Depth (m) | Inundation Period |
|---|---|---|
| | 0.3~0.4 | 1 ~ 3 days |
| | 0.4~0.9 | 3 ~ 7 days |
| | 0.9~1.5 | 1 ~ 4 weeks |
| | More than 1.5. | More than 1 month |

図－ 1.3.8　台風ダーリンによる洪水の被害地域



# 図－1.3.9　災害対策協議会の組織構成図

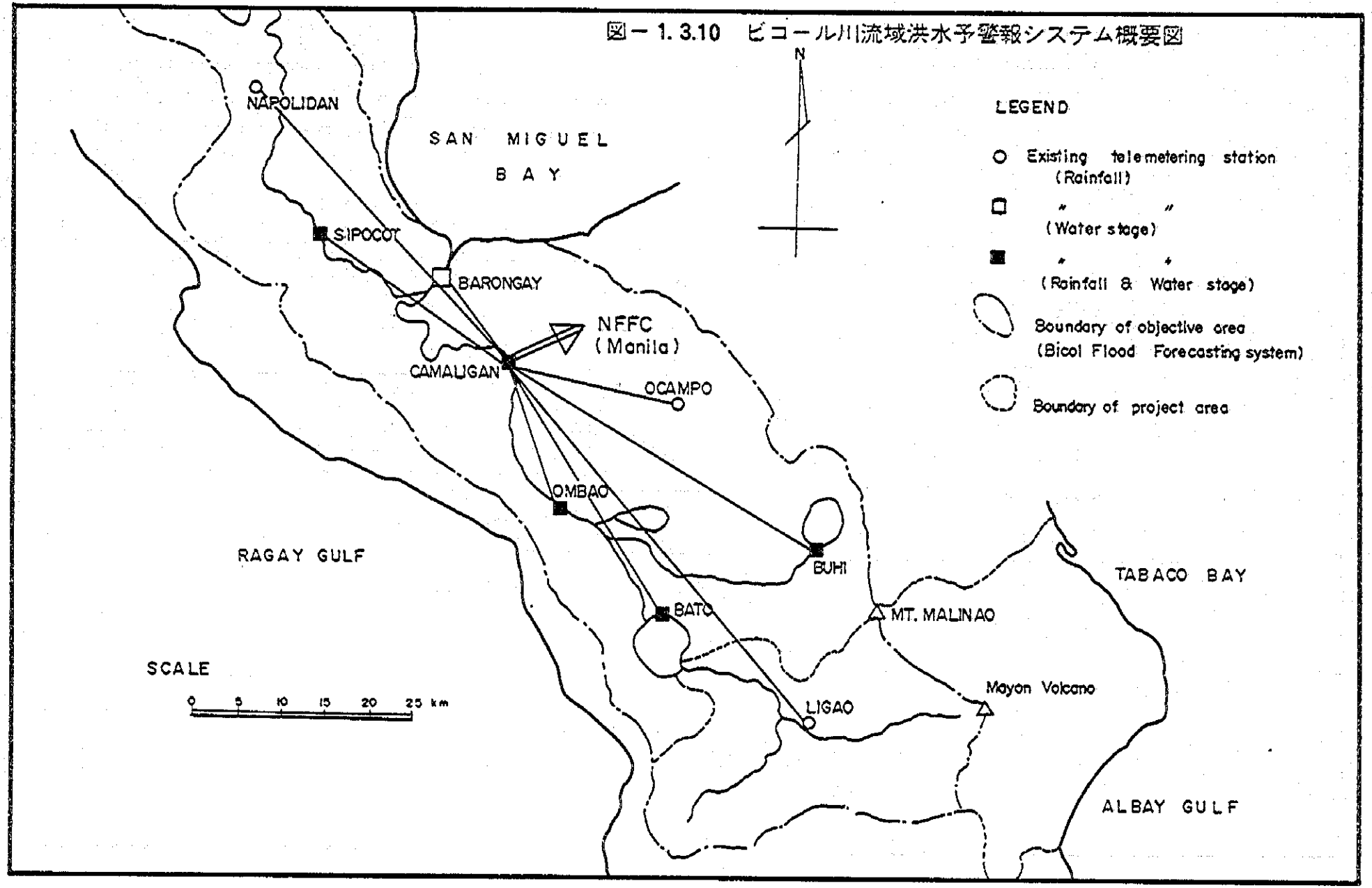



- The regional, provincial and munincipal DCC do not hold the functions specified as No.2 and 4 among 11 functions.
- The barangay DCC holds the whole of 11 functions.

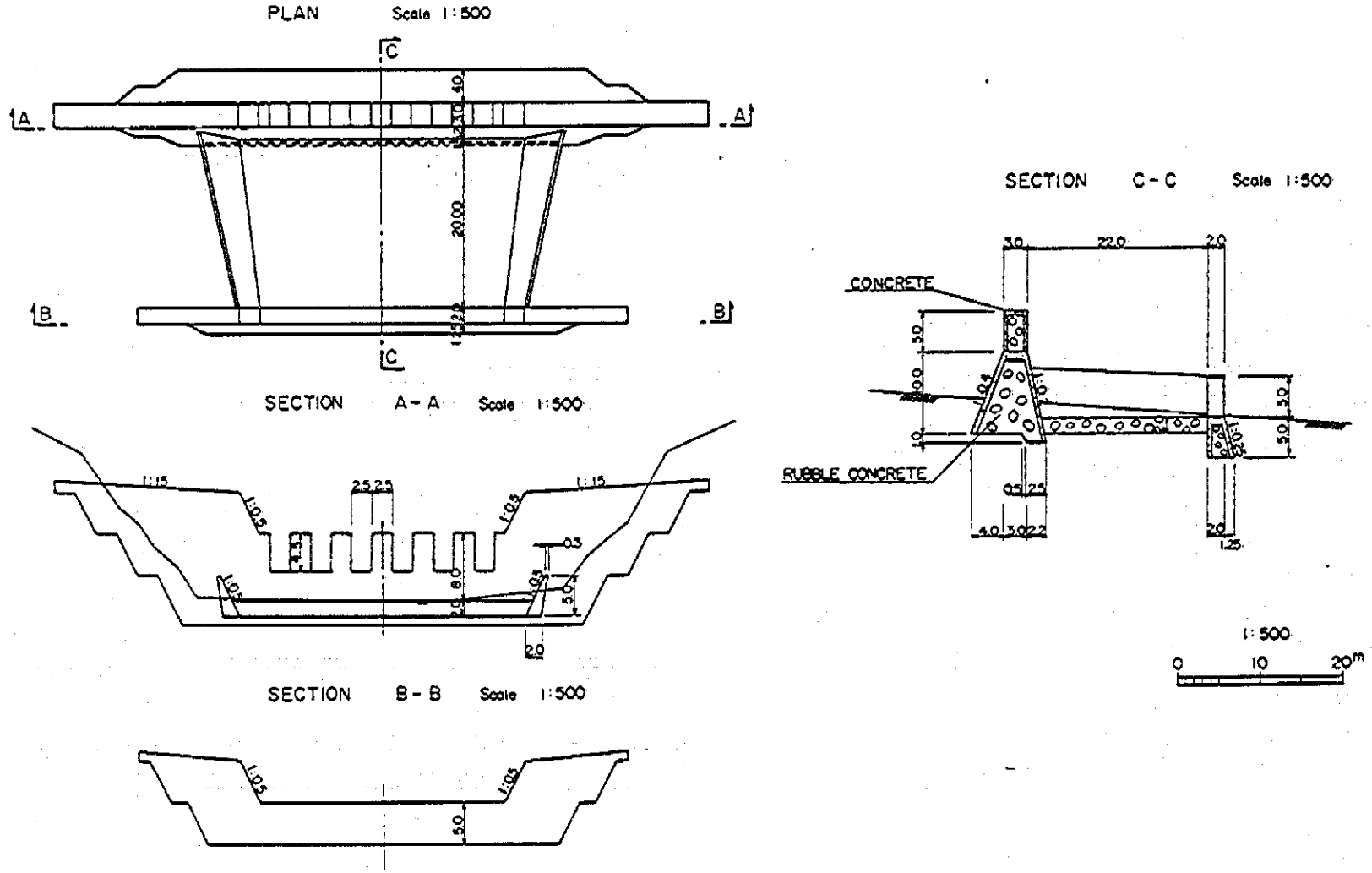
FUNCTIONS

| No. | Activities |
|---|---|
| 1 | Communication and warning |
| 2 | Evacuation |
| 3 | Transportation |
| 4 | Damage control |
| 5 | Relief and rehabilitation |
| 6 | Rescue and recovery |
| 7 | Health |
| 8 | Welfare and rehabilitation |
| 9 | Fire |
| 10 | Police or security |
| 11 | Public information |

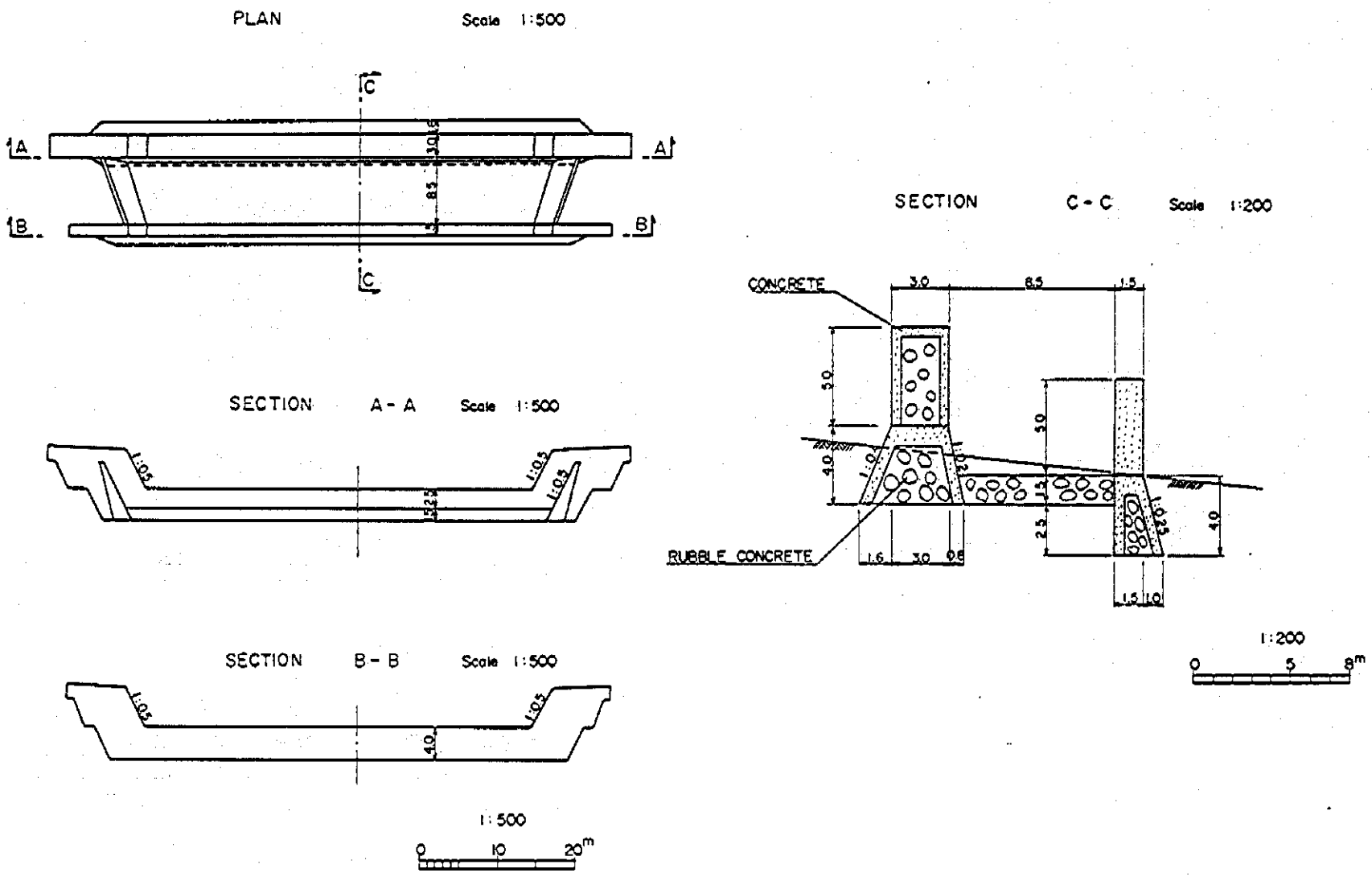
図－1.3.10　ビコール川流域洪水予警報システム概要図



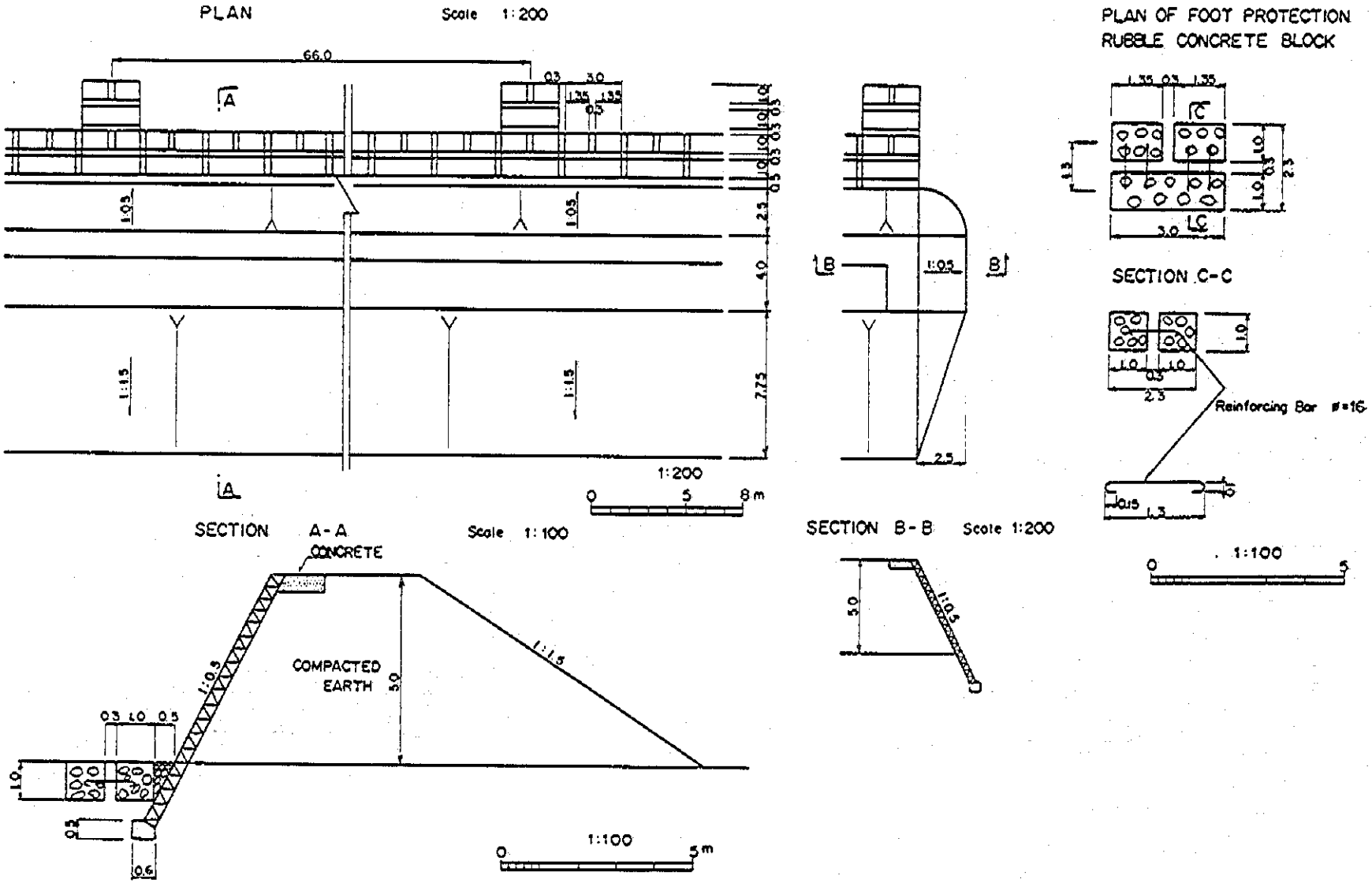
図－2.1.1　砂防ダム（スリット型式）の一般図



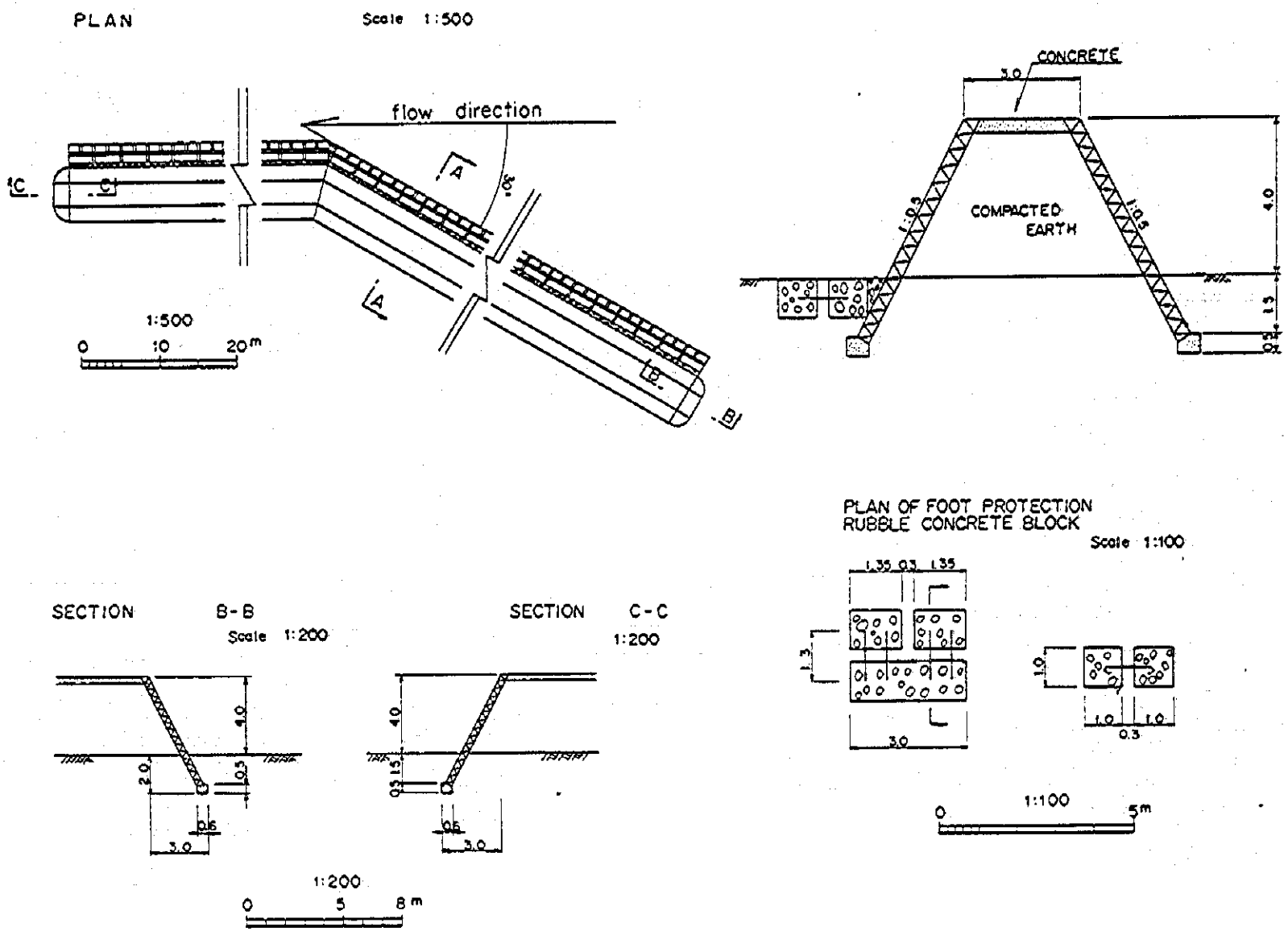
# 図－2.1.2　床固ダムの一般図



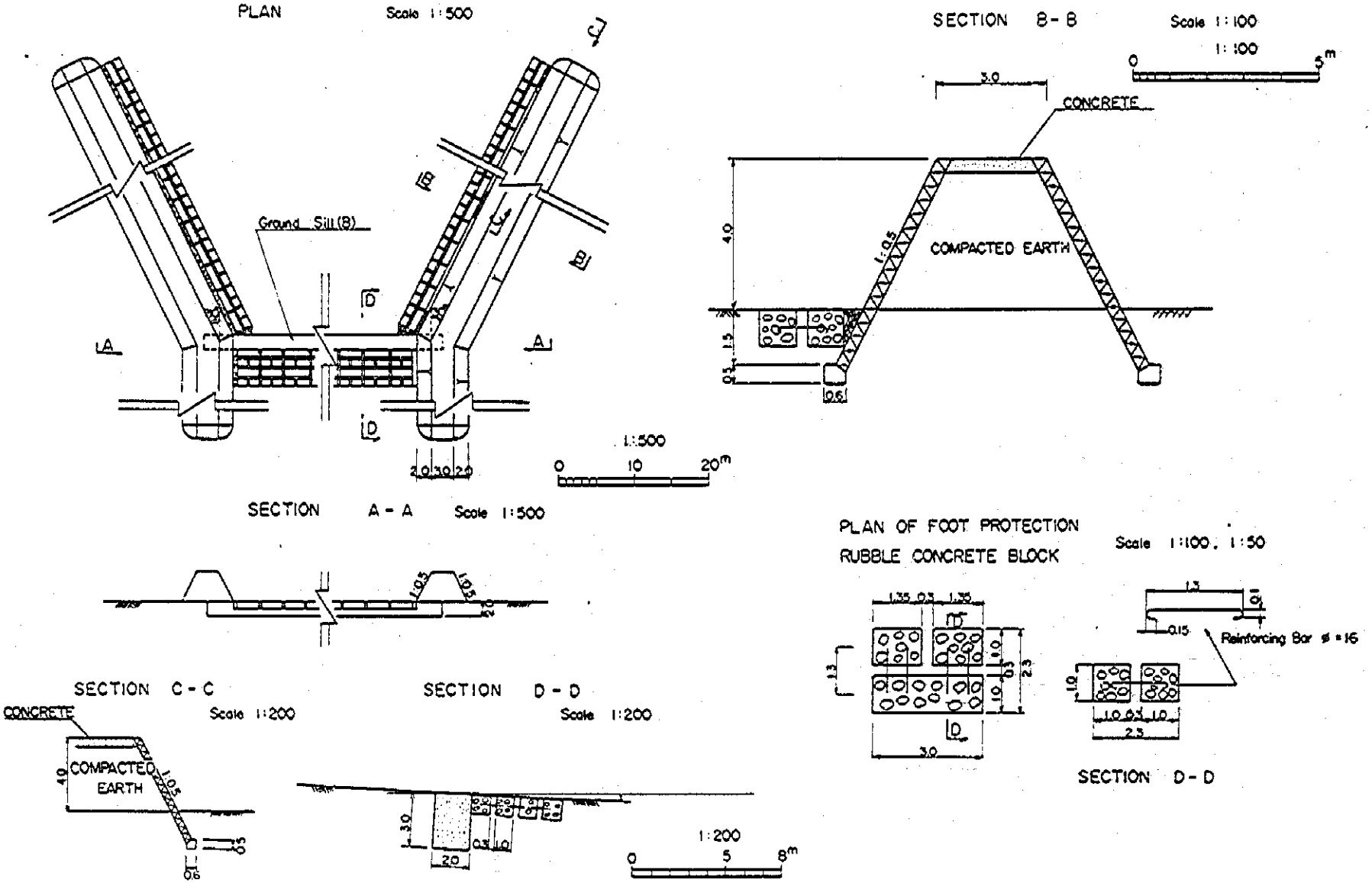
# 図－2.1.3　導流堤の一般図



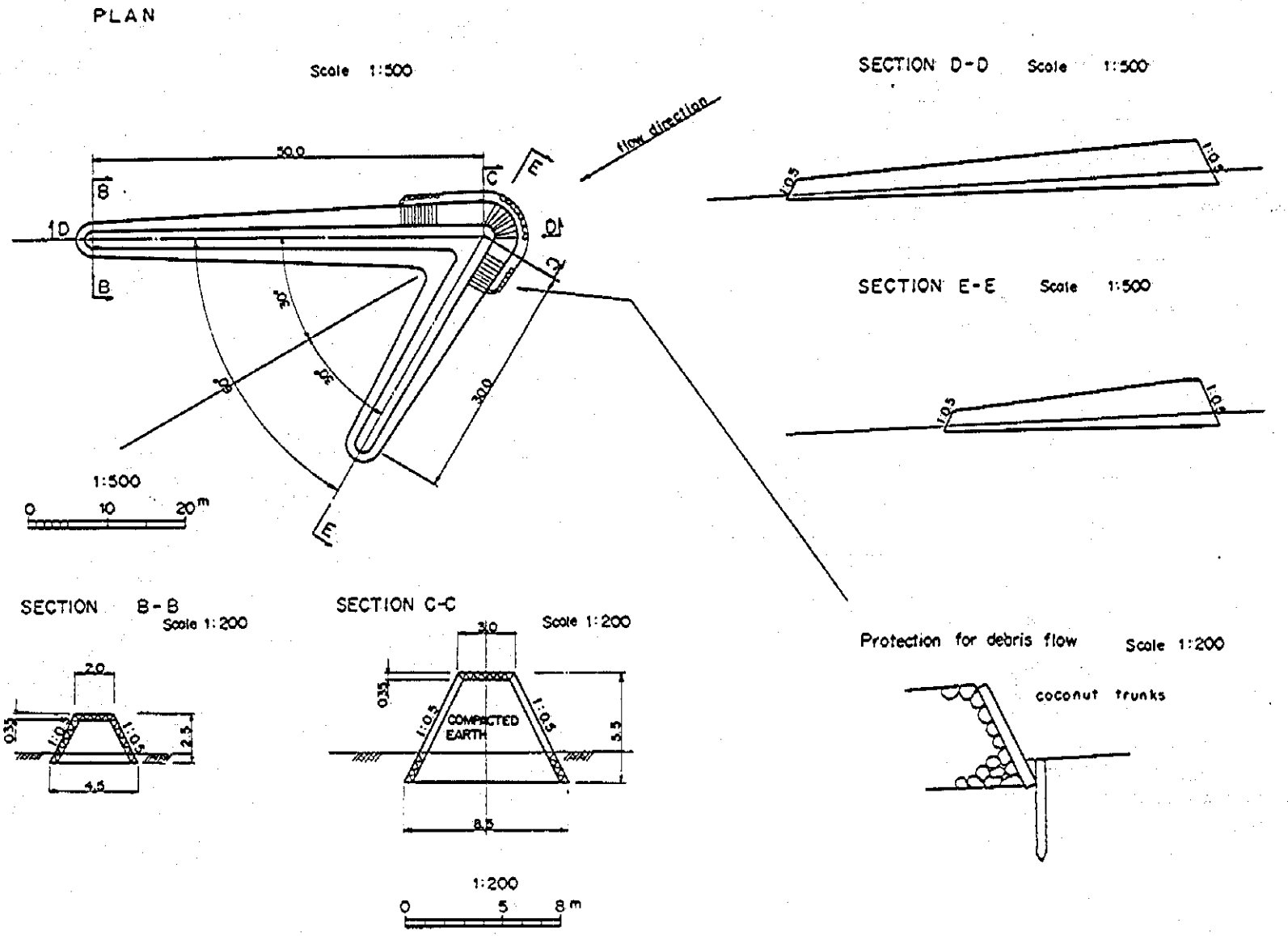
# 図－2.1.4　遊砂堤（Aタイプ）の一般図



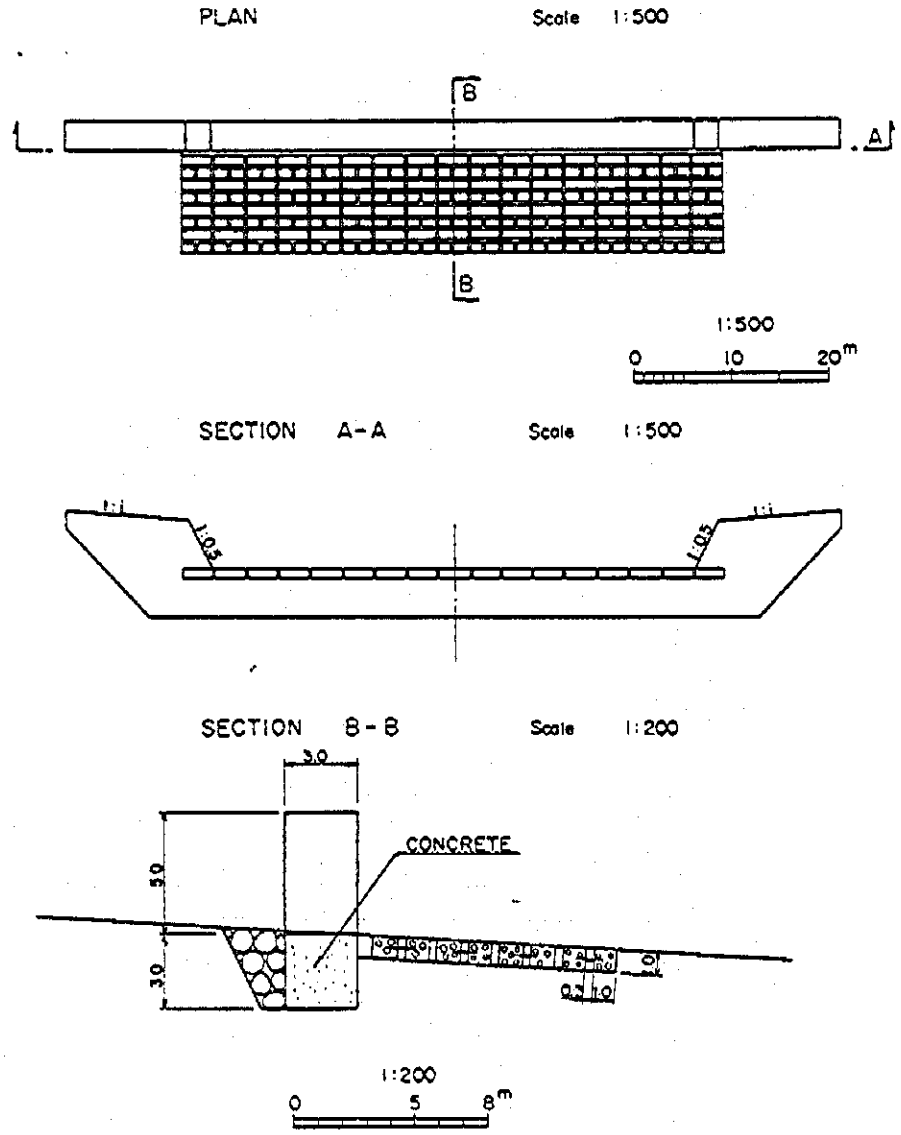
# 図－2.1.5　遊砂堤（Bタイプ）の一般図

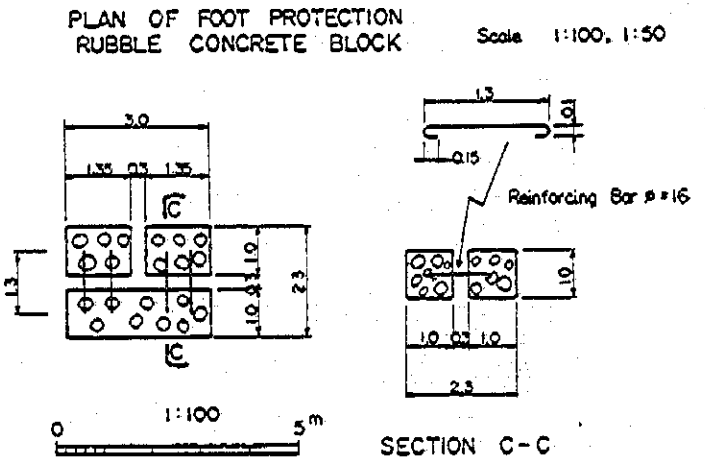


# 図－2.1.6　遊砂突堤の一般図

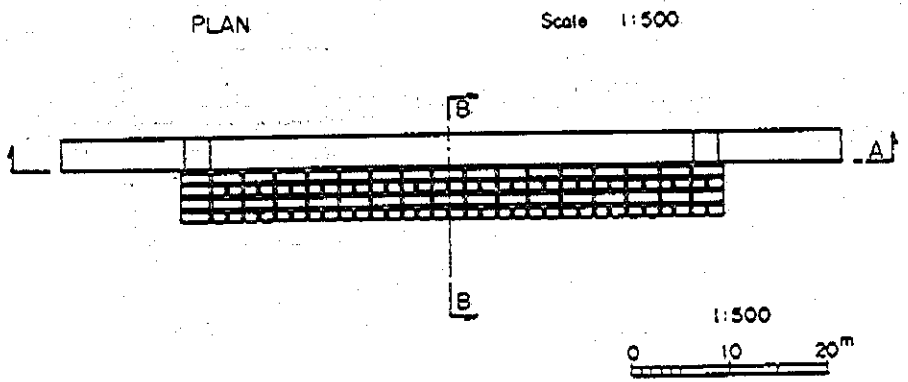


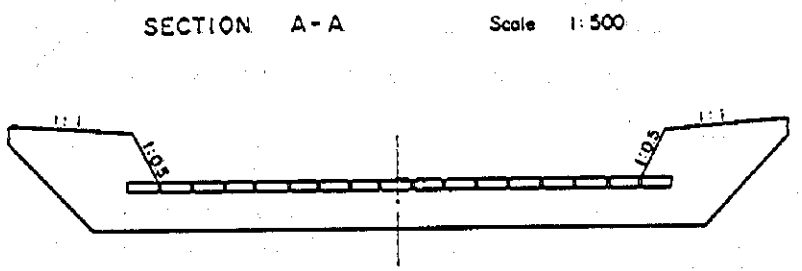
# 図－2.1.7　床固（Aタイプ）の一般図

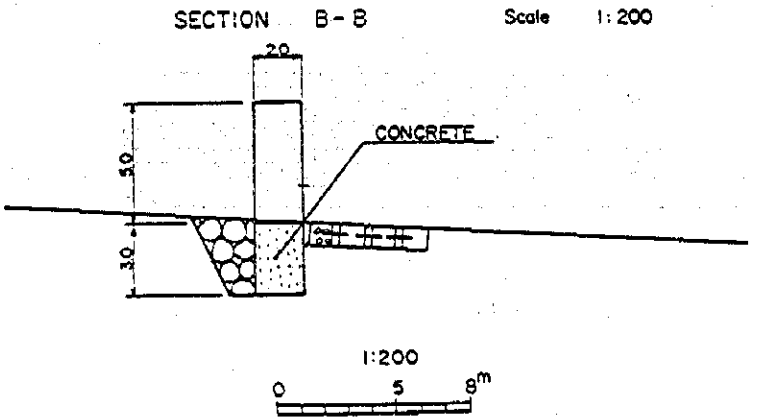


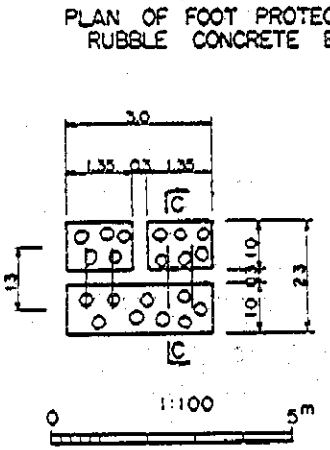



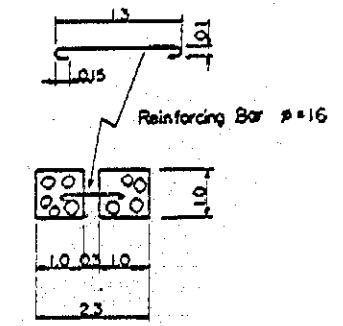
# 図－2.1.8　床固（Bタイプ）の一般図



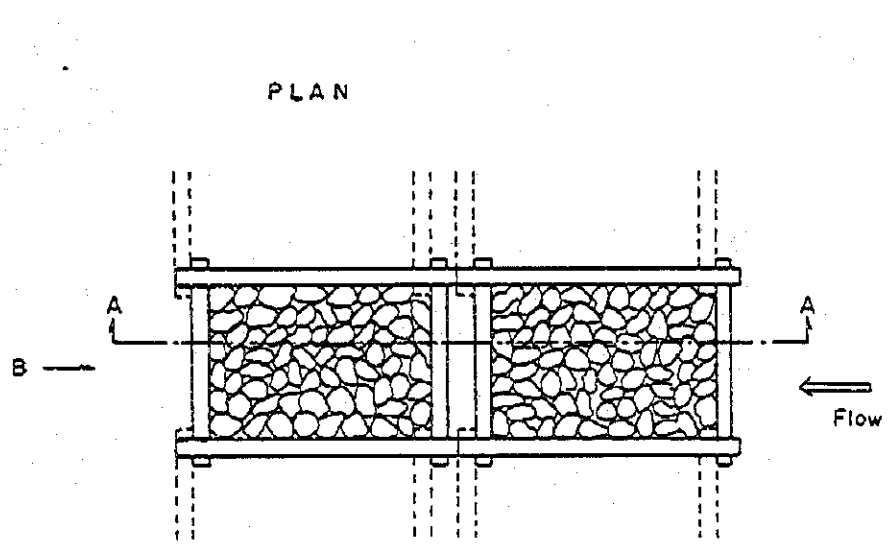



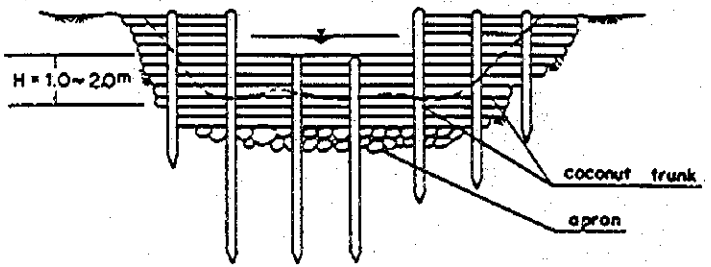



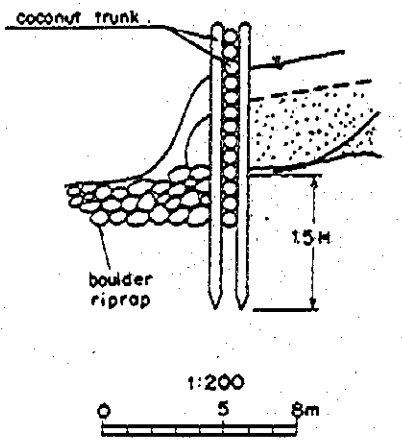



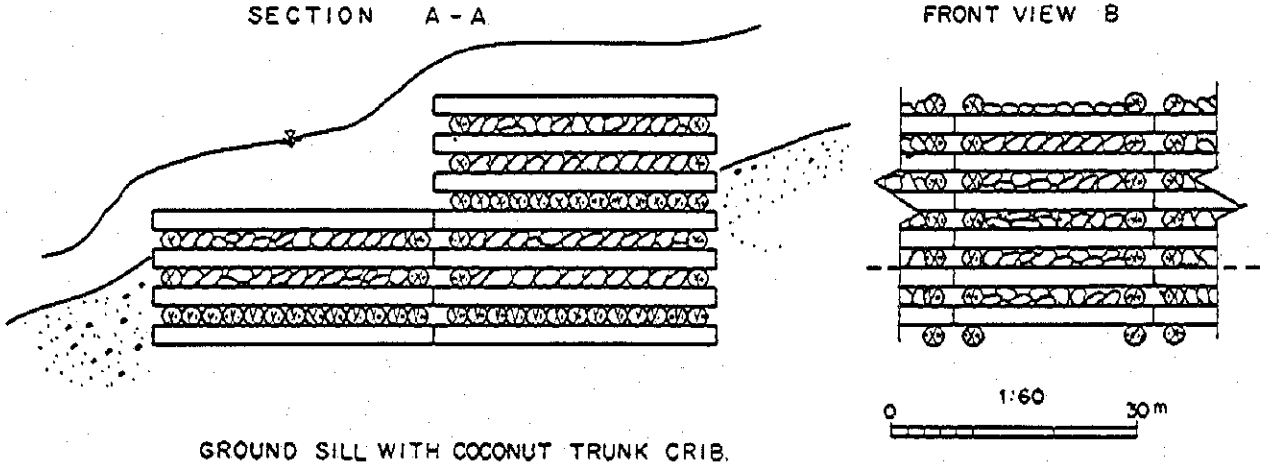
図－2.1.9　床固（枠工，柵工）の一般図



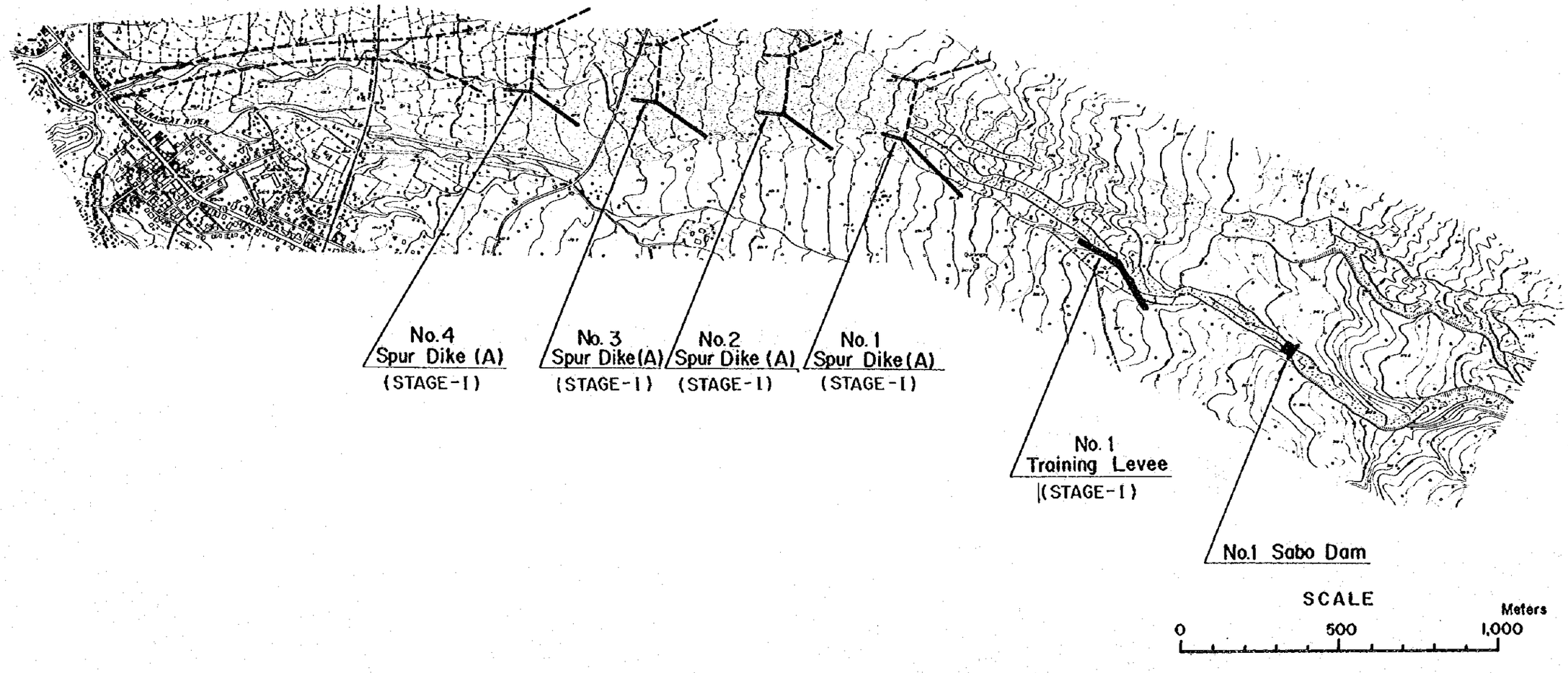

GROUND SILL WITH COCONUT TRUNK FENCE



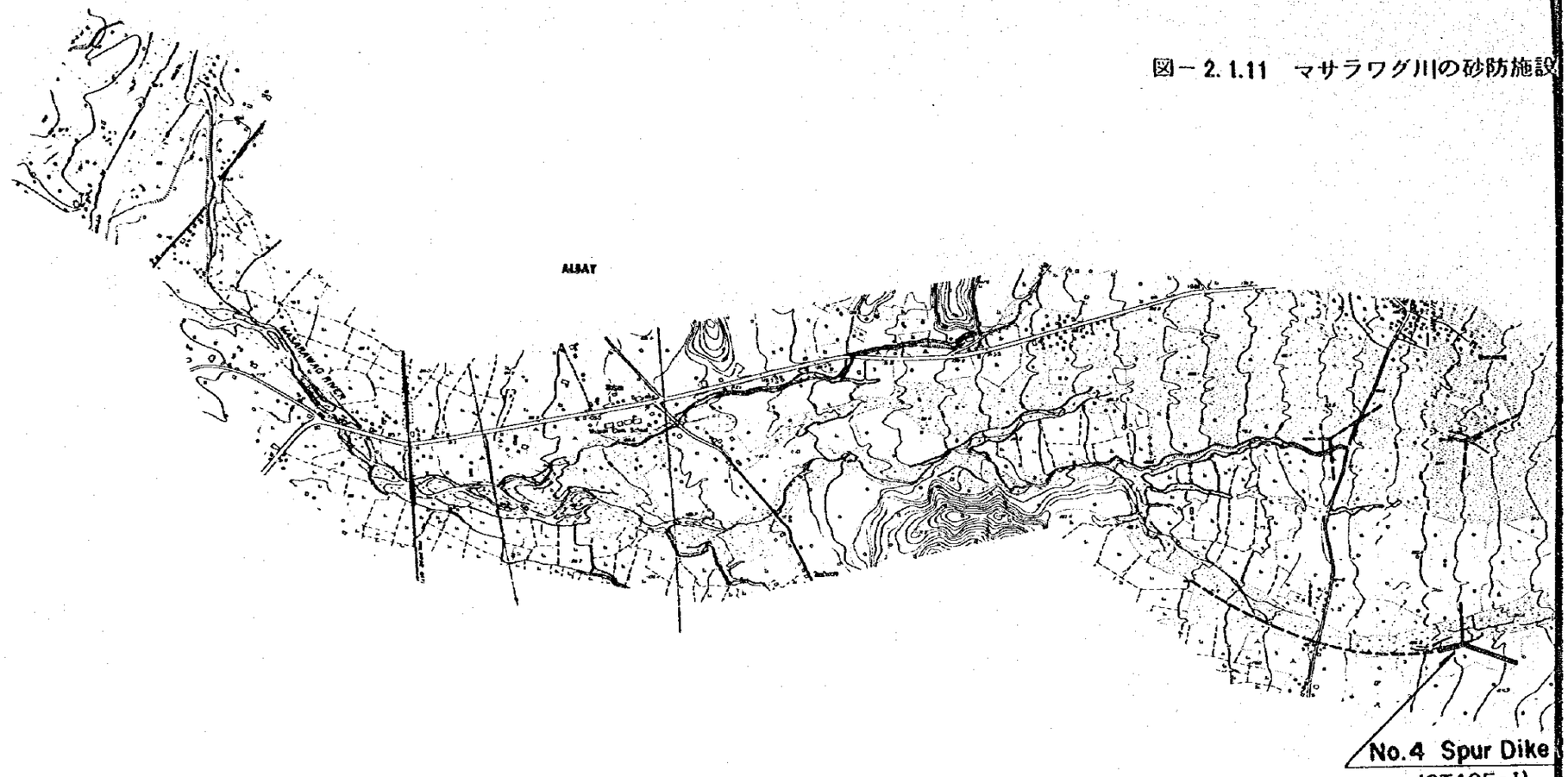




GROUND SILL WITH COCONUT TRUNK CRIB.

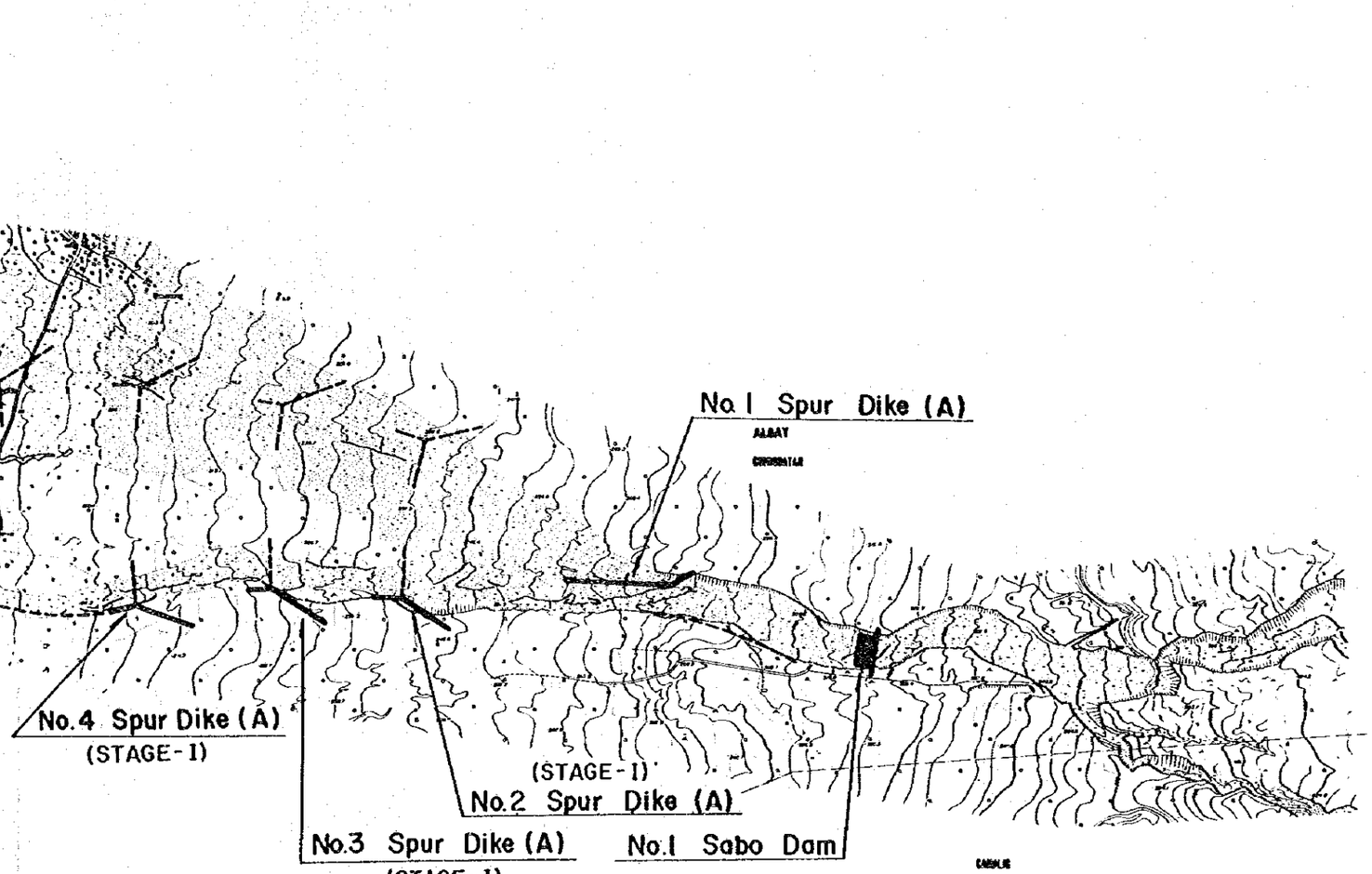
図－2. 1.10　キランガイ川の砂防施設配置図



図－2.1.11　マサラワグ川の砂防施設



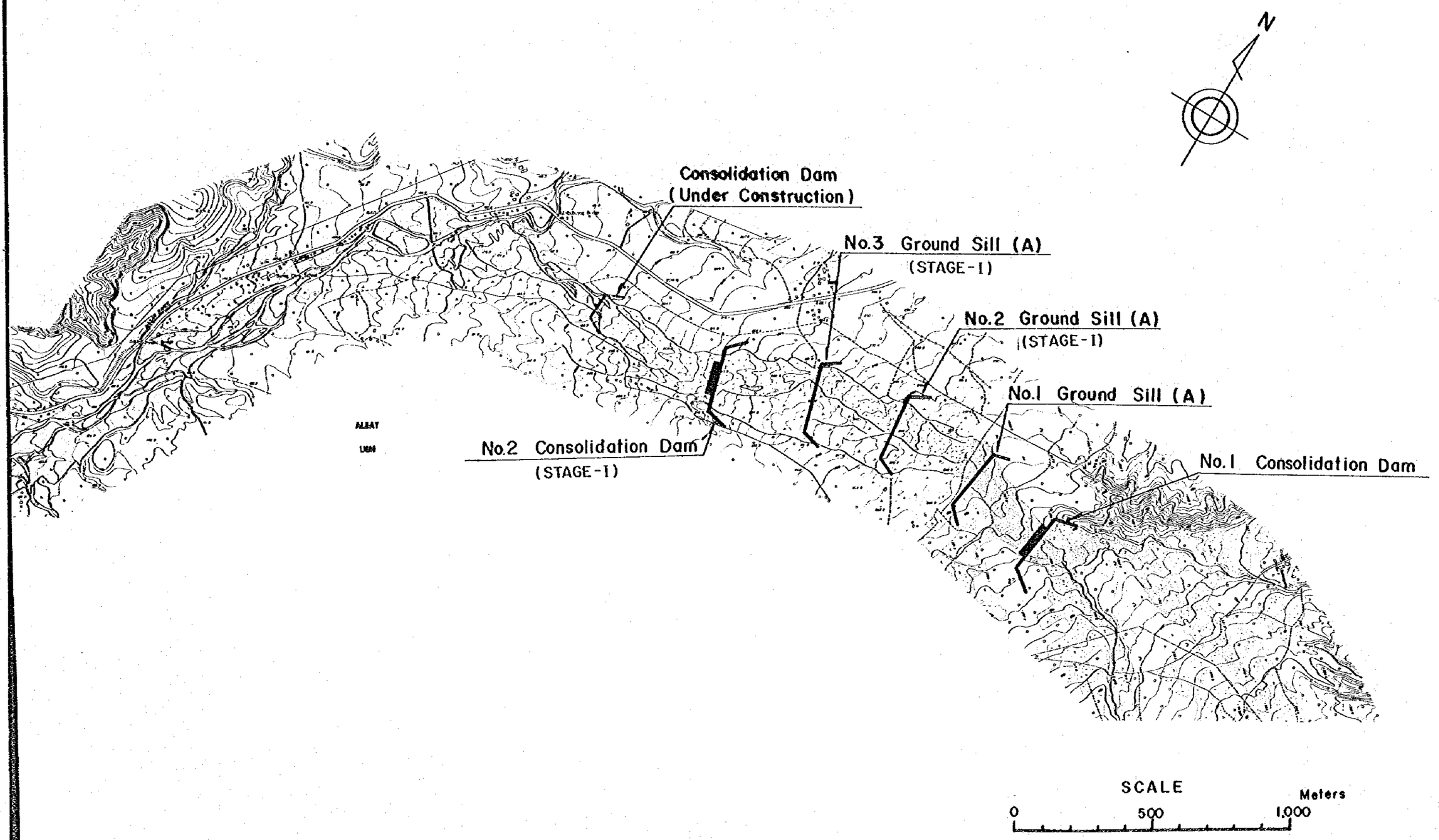
1.11 マサラワグ川の砂防施設配置図



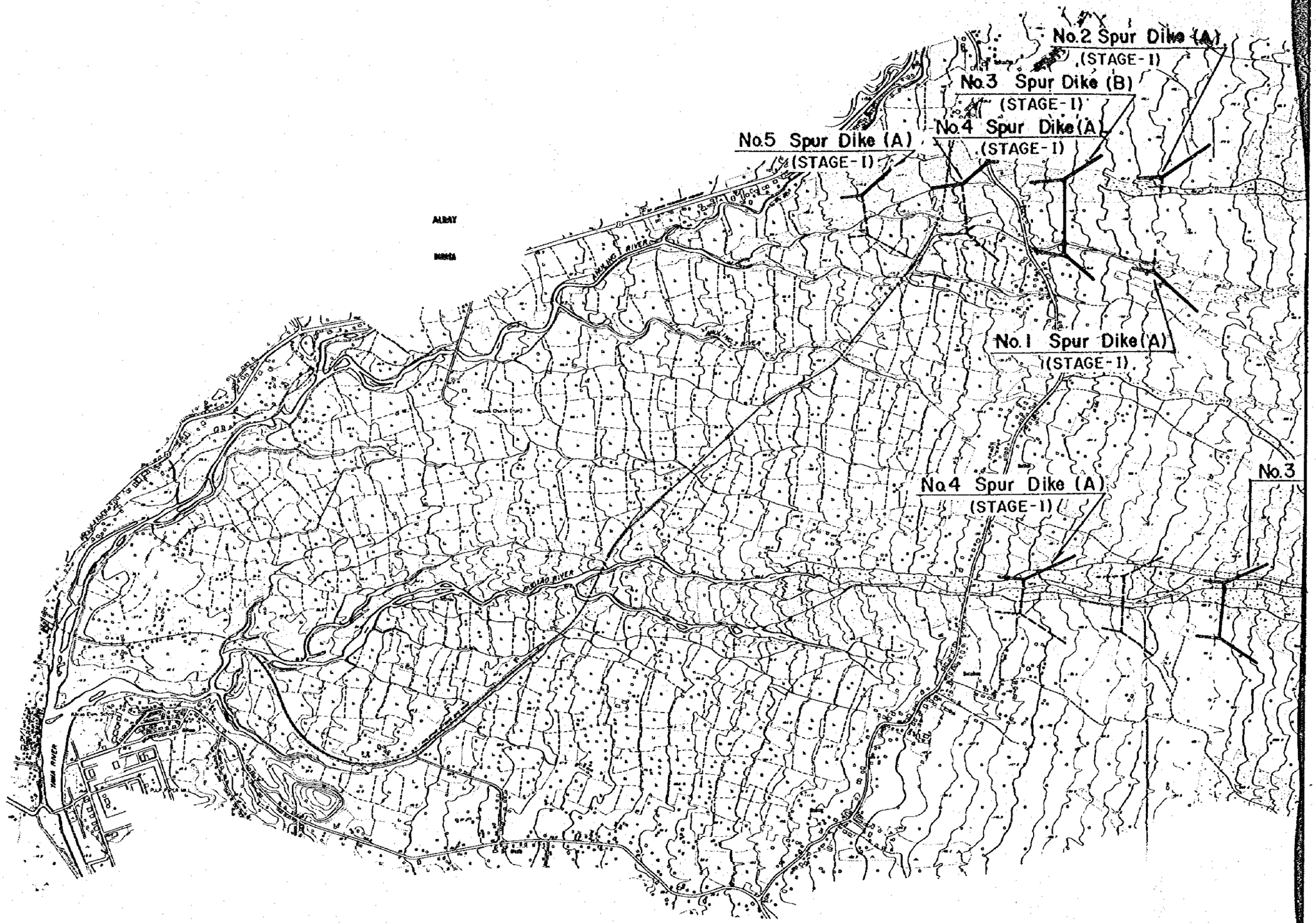

SCALE Meters
0 500 1,000

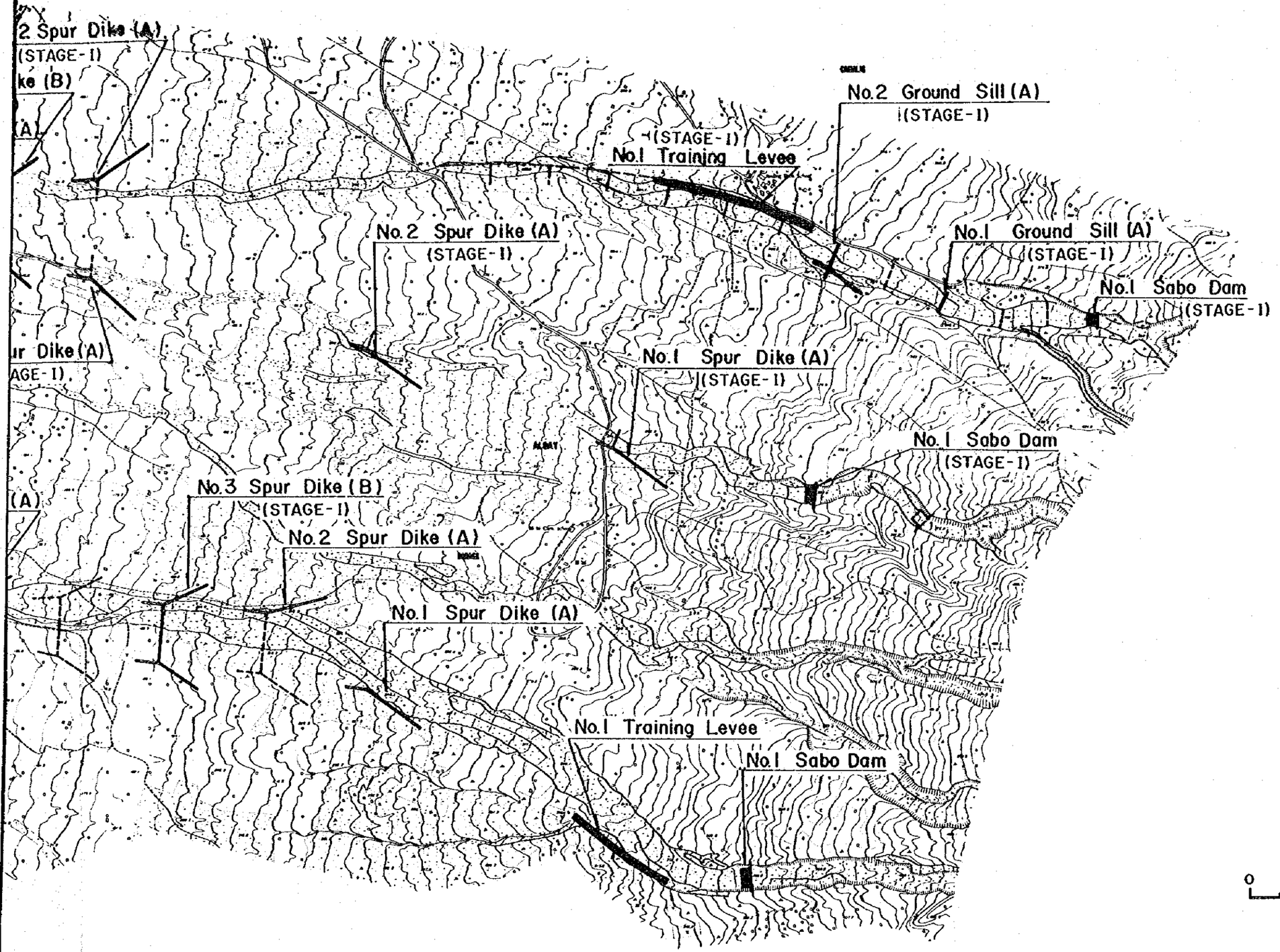
図－2.1.12　ナシシ川の砂防施設配置図

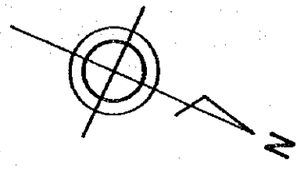
図－2.1.12　ナシシ川の砂防施設配置図

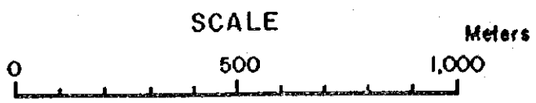


図－2.1.13　アヌリン川およびブジャオ川の砂防施設計

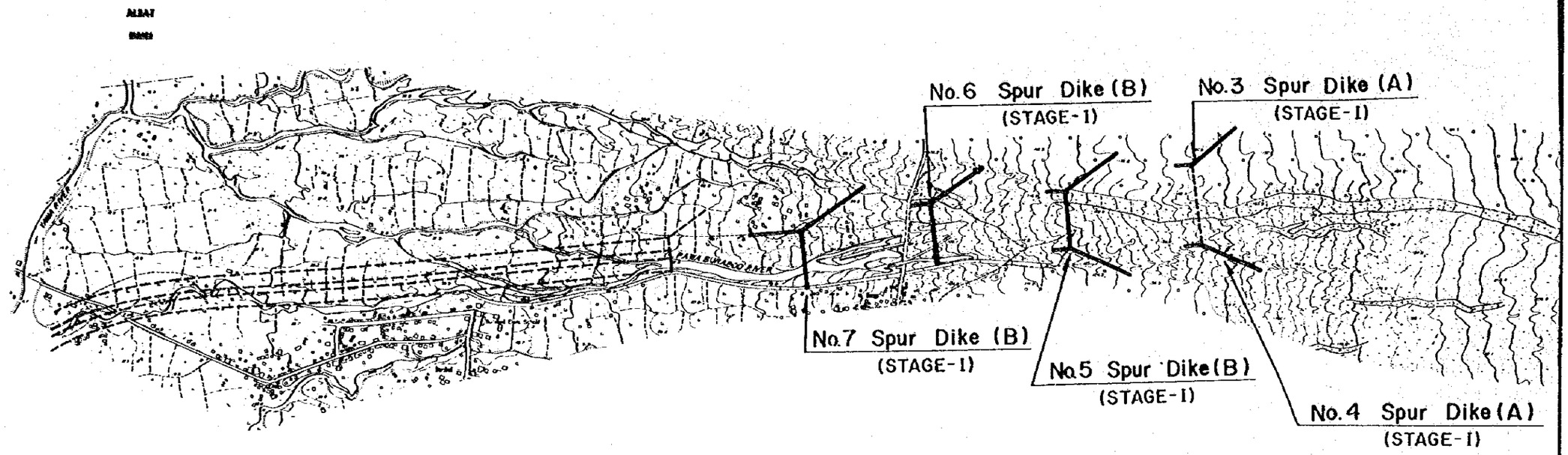



2 Spur Dike (A)
(STAGE-I)
ke (B)
(A)
ur Dike (A)
AGE-I)
No.2 Ground Sill (A)
(STAGE-I)
(STAGE-I)
No.1 Training Levee
No.2 Spur Dike (A)
(STAGE-I)
No.1 Ground Sill (A)
(STAGE-I)
No.1 Sabo Dam
(STAGE-I)
No.1 Spur Dike (A)
(STAGE-I)
No.1 Sabo Dam
(STAGE-I)
No.3 Spur Dike (B)
(STAGE-I)
No.2 Spur Dike (A)
No.1 Spur Dike (A)
No.1 Training Levee
No.1 Sabo Dam

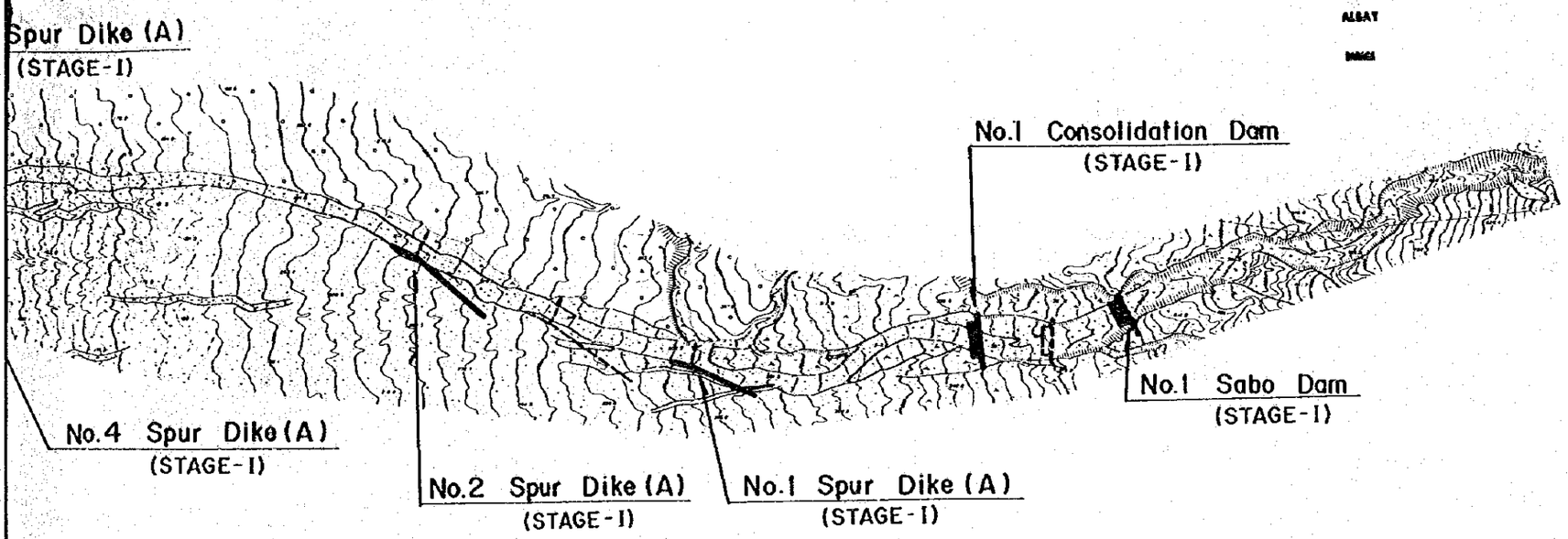

N

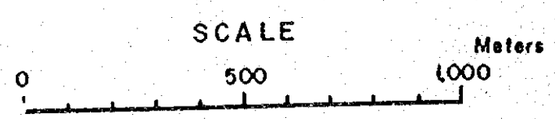

SCALE
Meters
0
500
1,000

図－2.1.14　パワ・ブラボド川の砂防

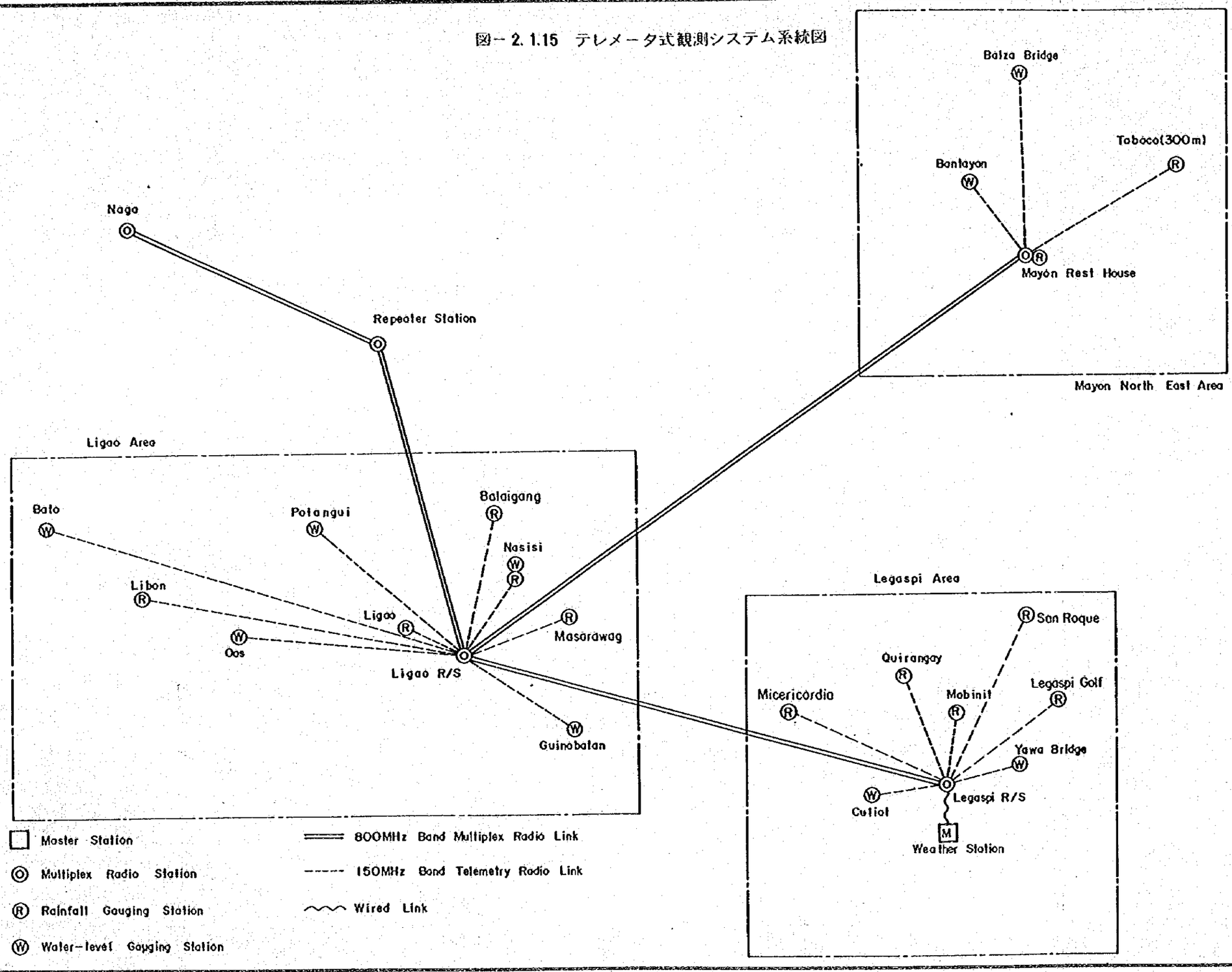


1.14 パワ・ブラボド川の砂防施設配置図

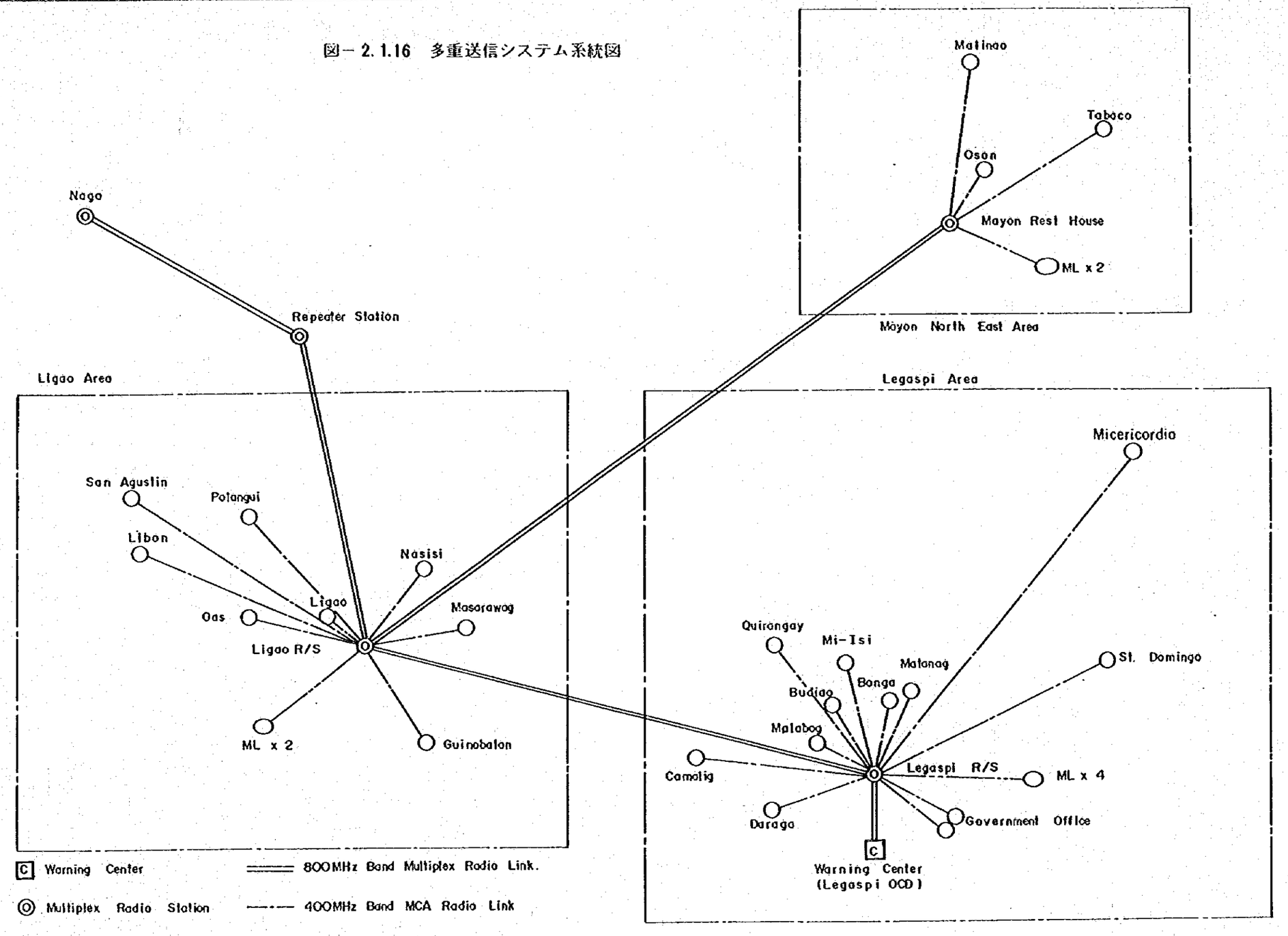


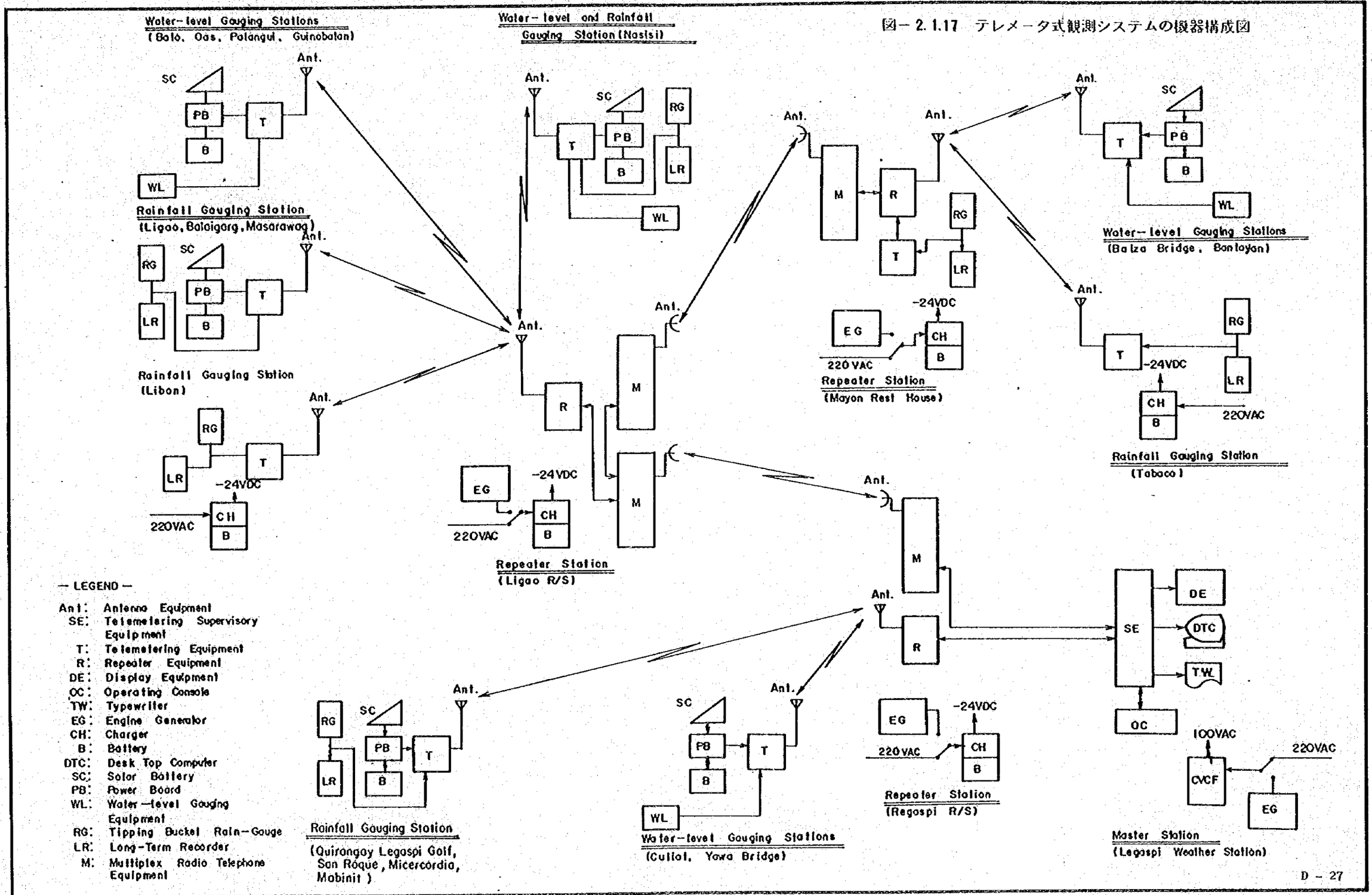
図－2.1.15　テレメータ式観測システム系統図



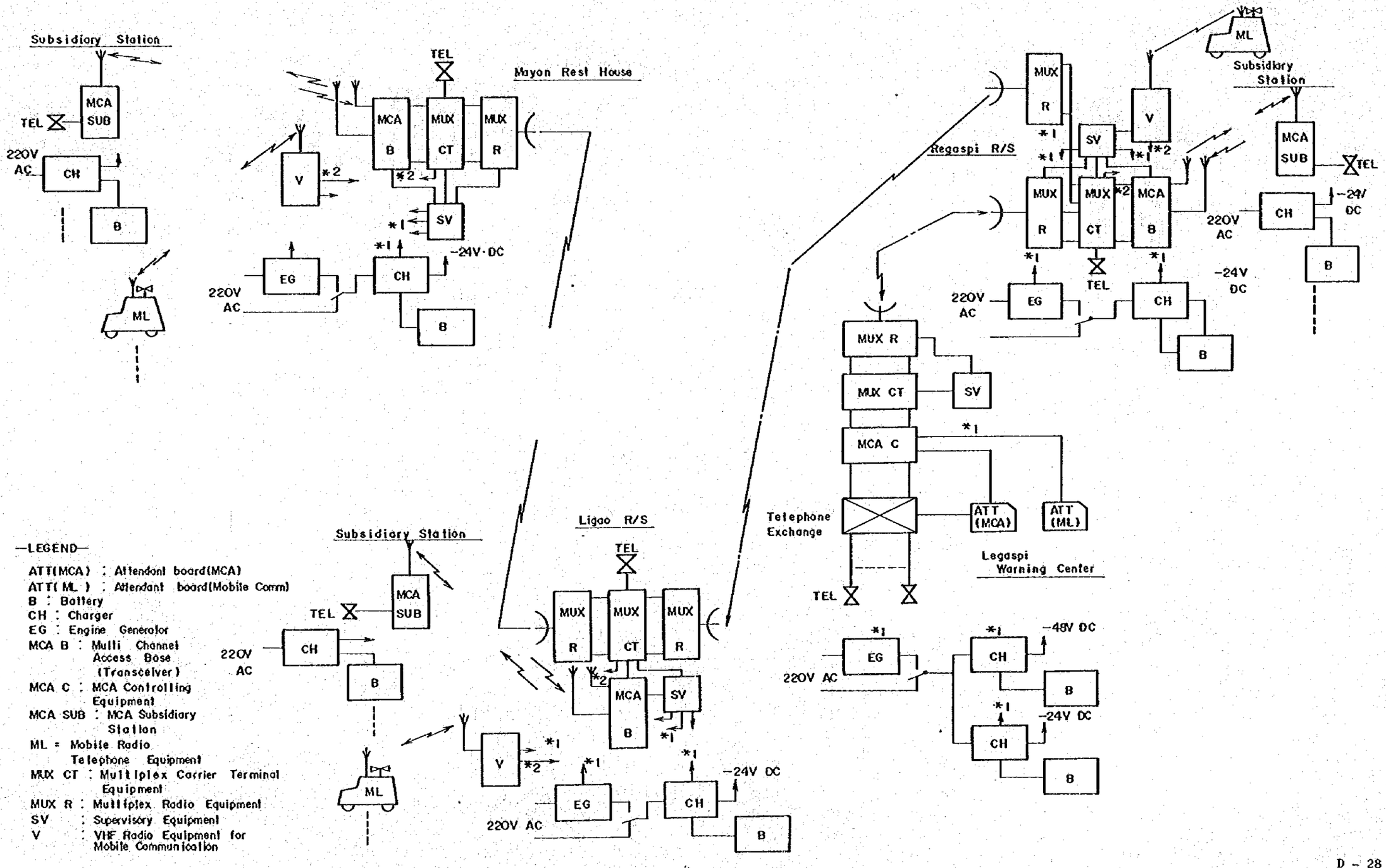
図－ 2.1.16　多重送信システム系統図



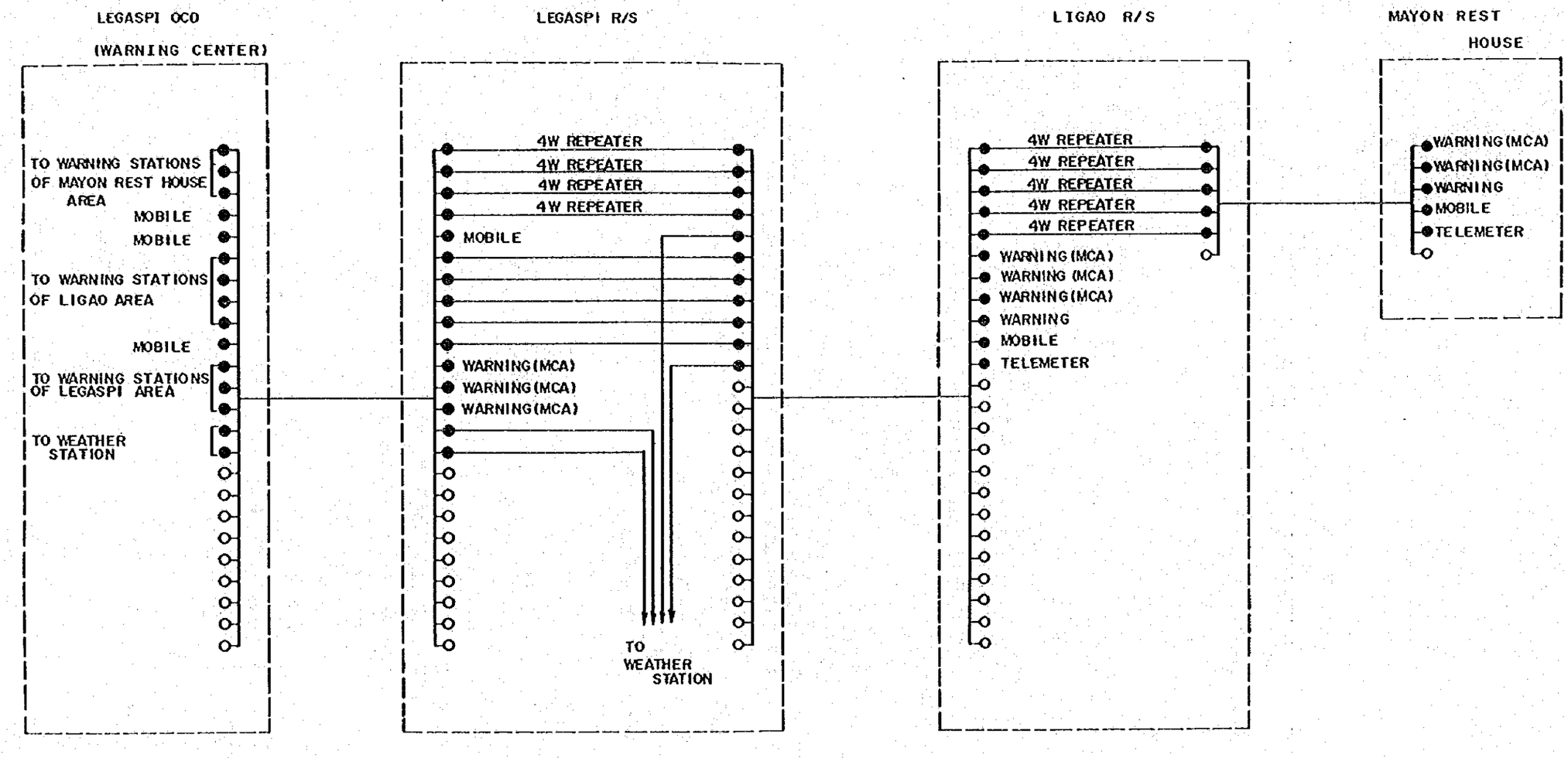
図－2.1.17　テレメータ式観測システムの機器構成図



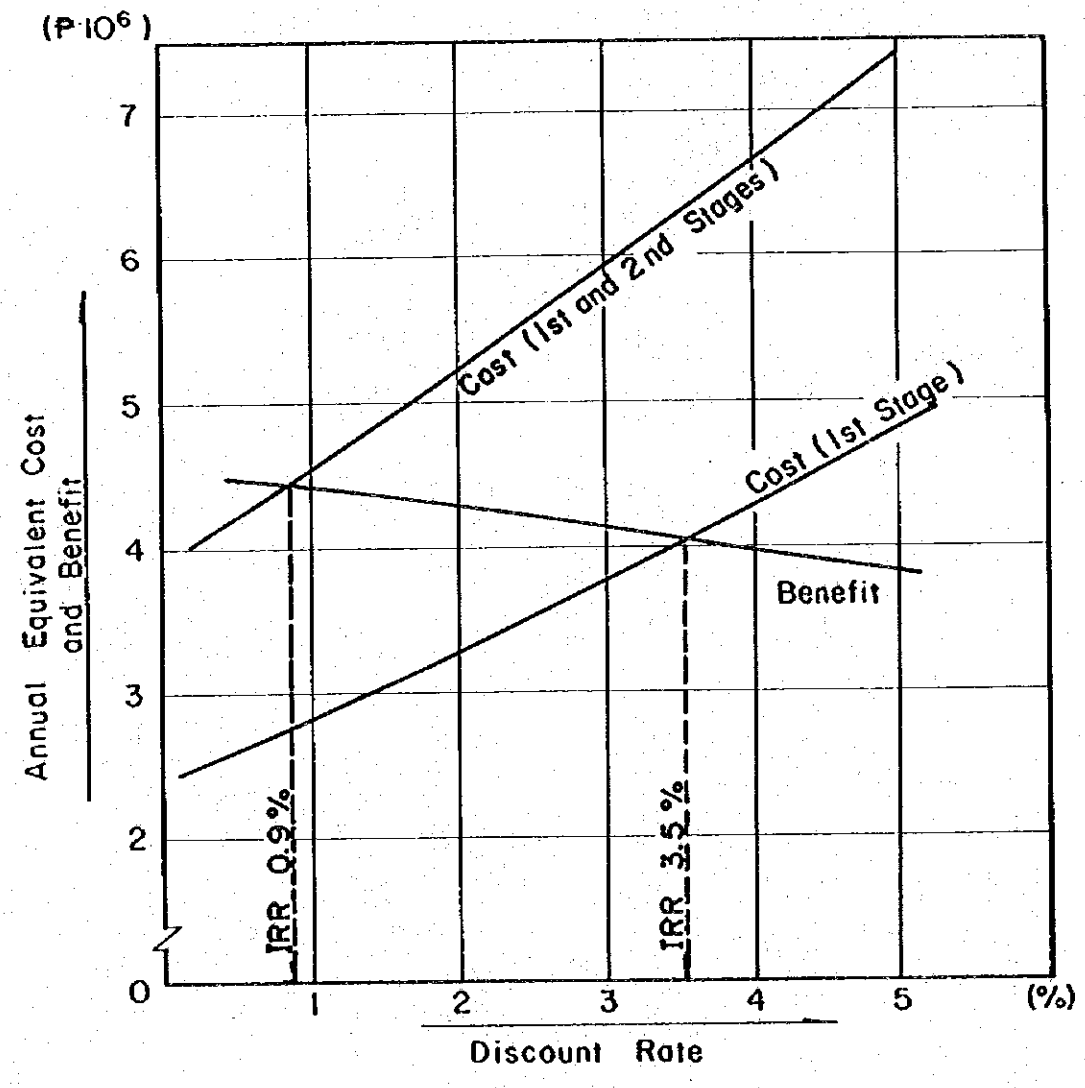
図－2.1.18　多重送信システムの機器構成図



図－2.1.19　チャンネル収容図



図－2.2.1　砂防プロジェクトの内部収益率

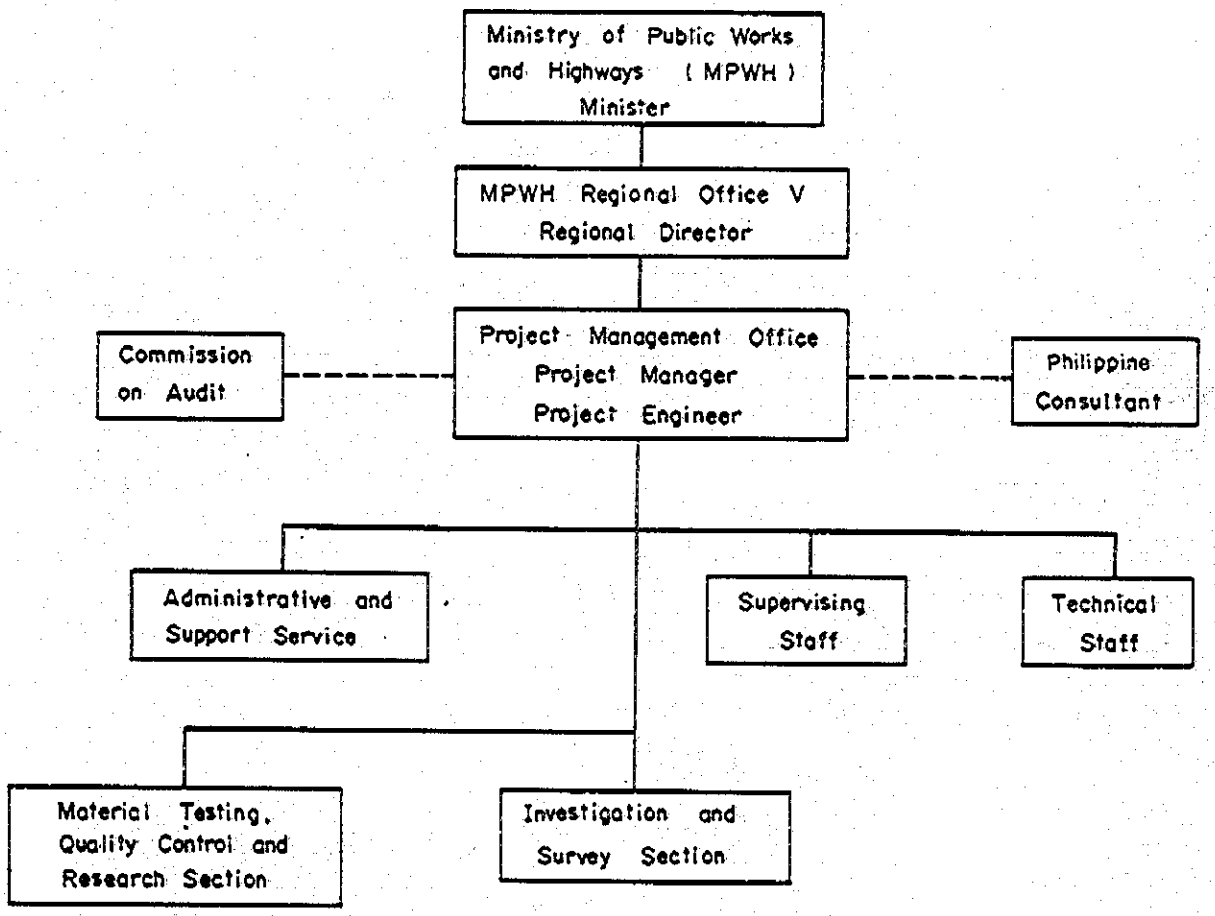



Note: Most benefit of the Sabo project is expected just after completion of the Stage-I construction works. The Stage-II construction works are planned mainly ensuring and maintaining function of the Stage-I construction works and the benefit from the Stage-II construction works is not significant. Therefore, the benefit curve is commonly used for both stage works.

図－3.2.1　砂防プロジェクト（第1ステージ）の工事工程表

| Description | 1983 | | | | | | | | | | | | 1984 | | | | | | | | | | | | 1985 | | | | | | | | | | | | 1986 | | | | | | | | | | | | 1987 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D |
| a. Detailed Design | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b. Preparation of Tender Document | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| c. Tender and Contract | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Quirangay River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.1 Training Levee | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.1 - No.4 Spur Dike | | | | | | | | | | | | | (No.2 Spur Dike) | | | | | | | | | | | | (No.3 a No.4 Spur Dike) | | | | | | | | | | | | (No.1 Spur Dike) | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Masarawag River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.2 - No.4 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Nasisi River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.2 Consolidation Dam | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.2 - No.3 Ground Sill | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Anuling River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.1 Sabo Dam | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.1 Ground Sill | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.2 Ground Sill | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.1 Training Levee | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.1 - No.2 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.3 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.4 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No 5 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No 1 Sabo Dam (Anuling 2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. 1 - No.2 Spur Dike (Anuling 2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Budiao River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.3 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.4 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. Pawa - Burabod River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.1 Sabo Dam | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.1 Consolidation Dam | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.1 - No.2 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.3 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.4 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.5 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.6 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No.7 Spur Dike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

図－3.2.2　砂防プロジェクトの組織構成図



# 添　附　資　料

（調査実施概要）

Ⅰ．調査団名簿および関係者リスト

Ⅱ．組　　織

Ⅲ．調査作業工程および概要

Ⅳ．調査業務仕様書

Ⅴ．実施協定書

Ⅵ．議 事 録

# Ⅰ．調査団名簿および関係者リスト

## 1.1 調査団名簿

| | 氏名 | 担当 | 所属 |
|---|---|---|---|
| 1. | 吉松昭夫 | 団長（総括） | 日本工営株式会社 |
| 2. | 広住富夫 | 砂防計画 | 財団法人 砂防・地すべり技術センター |
| 3. | 大久保友次 | 砂防計画 | 財団法人 砂防・地すべり技術センター |
| 4. | 松村和樹 | 砂防施設設計 | 財団法人 砂防・地すべり技術センター |
| 5. | 稲葉明光 | 河川計画 | 日本工営株式会社 |
| 6. | 大内実 | 河川構造物設計（水文） | 日本工営株式会社 |
| 7. | 鵜飼昭一 | 危険分析および地域区分 | 朝日航洋株式会社 |
| 8. | 高柳則男 | 予警報システム計画（水文） | 日本工営株式会社 |
| 9. | 鈴木喬 | 予警報システム機器 | 日本工営株式会社 |
| 10. | 小沢拓夫 | 施工計画・積算 | 日本工営株式会社 |
| 11. | 室野忠温 | 経済評価 | 日本工営株式会社 |
| 12. | 玉田丞 | 地上測量監督 | 朝日航洋株式会社 |

## 1.2 関係者リスト

(1) Ministry of Public Works and Highways (MPWH), Manila Office

| | |
|---|---|
| Mr. Antonio A. Alpasan | Assistant Director, Project Manager for Flood Control and Drainage |
| Mr. Rogelio A. Flores | Chief Civil Engineer, Planning Service |
| Mr. Takashi Inoue | JICA Colombo Plan, Flood Control Expert for MPWH |

(2) MPWH, Regional Office

| | |
|---|---|
| Mr. Vicente B. Lopez | Regional Director |
| Mr. Benjamin T. Marcial | Assistant Regional Director |
| Mr. Eleuterio Y. Rosal, Jr. | Chief Civil Engineer, Construction and Maintenance Division |
| Mr. Domingo Villaseñor | District Engineer, Albay |

(3) PAGASA

| | |
|---|---|
| Mr. Osamu Machida | JICA, Hydrology Consultant, Typhoon Committee Secretariat |
| Mr. Tolentino Bachiller | Chief Meteorological Officer |

(4) Counterpart Experts

MPWH Manila Office and MPWH Regional Office agreed the following counterpart experts assigned timely based on the assignment schedule of the Study Team.

| Designation | Name | Agency |
|---|---|---|
| Project Engineer | Mr. Pedro P. Jao<br>Chief Civil Engr. | MPWH Regional Office<br>Planning and Design Division |
| Sabo Engineer | Mr. Resito David<br>Sr. Civil Engineer | MPWH, Manila Office |
| | Mr. Fermin E. Peteza<br>Materials Testing Engineer | MPWH, Regional Office |

| Designation | Name | Agency |
|---|---|---|
| River Engineer | Mr. Roberto Jamilla<br>Sr. Civil Engineer | MPWH, Manila Office |
| | Mr. Vicente Umali<br>Supervising Civil Engineer II | MPWH, Albay District Office |
| Hydrologist | Mr. Benjamin S. Paras<br>Supervising Civil Engineer III | MPWH, Regional Office |
| Geologist (Risk Analysis) | Miss Esterlita Saliva<br>Geologist/Volcanologist | Phil. Institute on Volcanology |
| Economist | Mr. Francis Hilarie<br>Sr. Economist | MPWH, Manila Office |
| | Miss Mila Mateum<br>Sr. Economist | MPWH, Regional Office |
| Disaster Prediction and Warning System Engineer | Mr. Renato Arevalo<br>Regional Director, OCD-MND | Office of Civil Defense - Ministry of National Defense |
| | Mr. Ricardo Dy<br>Operation Officer | - do - |
| Construction Plan Engineer | Mr. Henry Paul Paua<br>Supervising Civil Engineer I | MPWH, Albay District Office |
| Supervisor for Topographic Survey | Mr. Honesto Masbate<br>Geodetic Engineer | MPWH, Albay District |
| Materials Laboratory Technician | Mrs. Aduvigis Cortes | MPWH, Regional Office |
| Secretary | Miss Evelyn N. Arquero | MPWH, Regional Office |
| Typist | Miss Tita B. Bartolata | MPWH, Regional Office |
| Draftsman | Mr. Tamy M. Neptuno | MPWH, Regional Office |
| Drivers | Mr. Diego Ramirez | MPWH, Manila Office |
| | Mr. Cesar Dalisay | - do - |
| | Mr. Henry Soriano | - do - |
| | Mr. Salvador Espartinez | MPWH Regional Office |
| | Mr. Rolly Lofamia | - do - |

(5) JICA Advisory Committee

| Name | Designation |
|---|---|
| Mr. Toshihiro Sugiyama | Chairman |
| Mr. Yuji Ogawa | Sabo Engineer |
| Mr. Saburo Yoshida | Sabo Engineer |
| Mr. Takeki Harada | River Engineer |