FIGURES

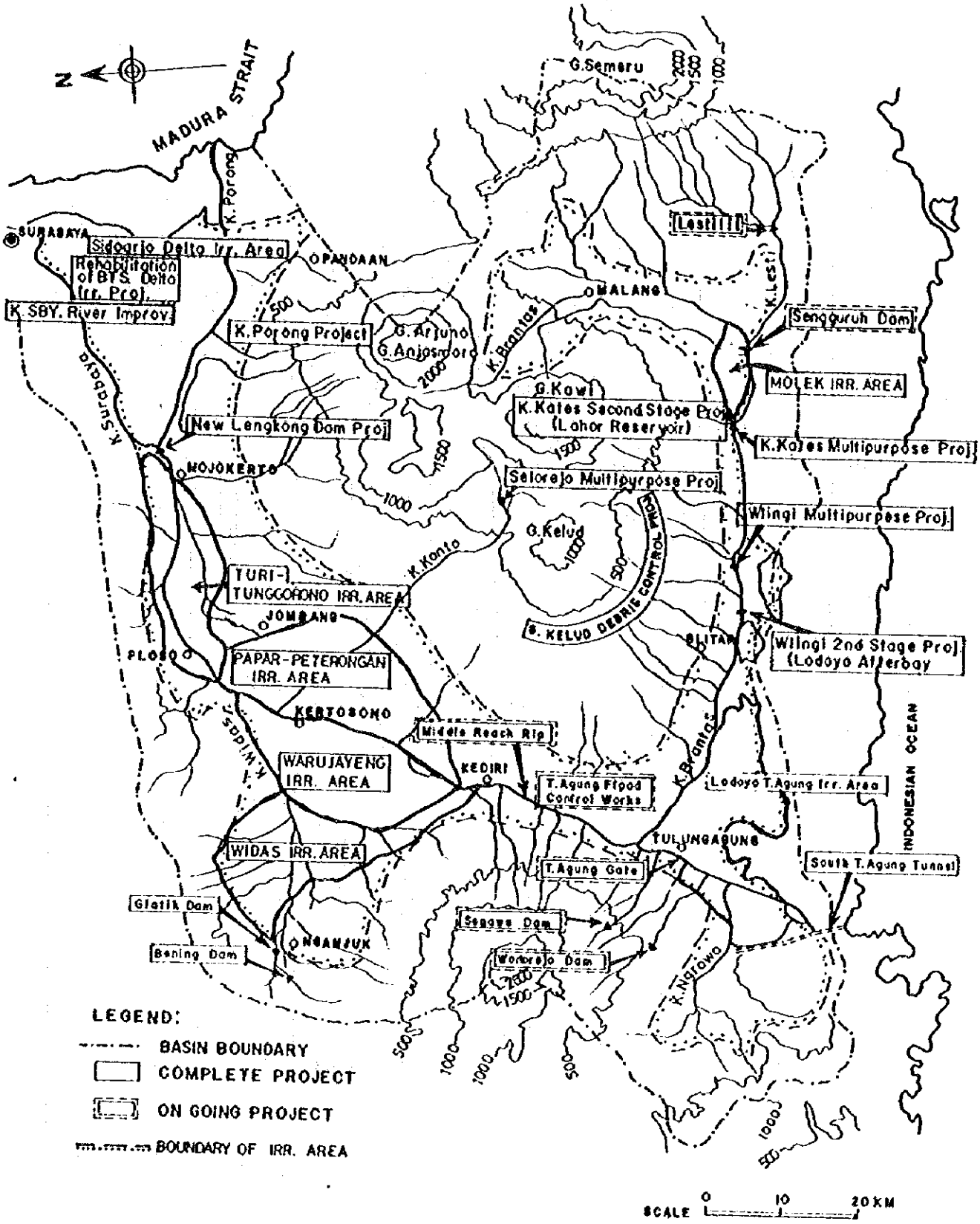


Fig. 2.2.1 GENERAL LOCATION MAP

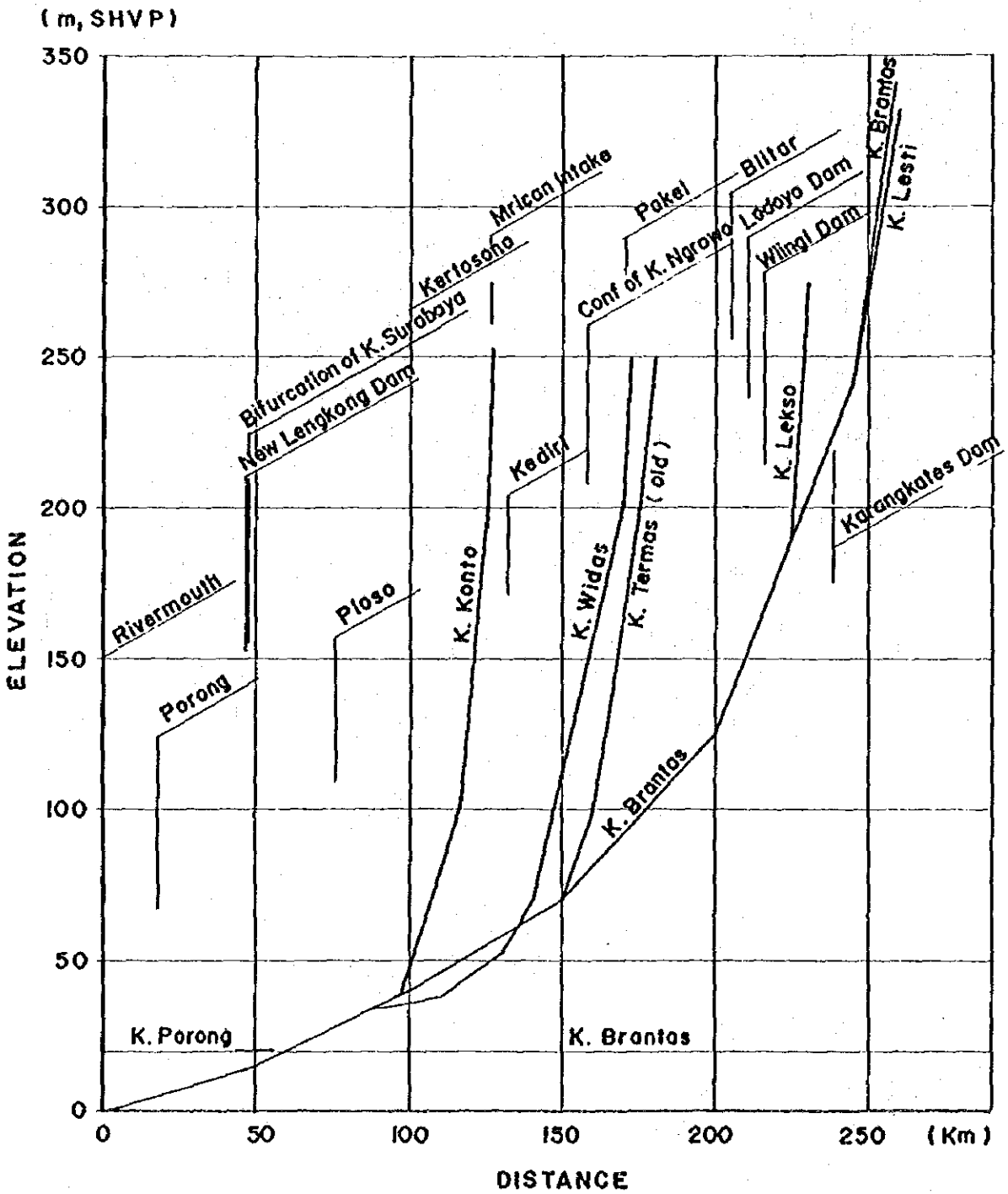


Fig. 2.2.2 RIVER PROFILE OF BRANTAS AND MAYOR TRIBUTARIES

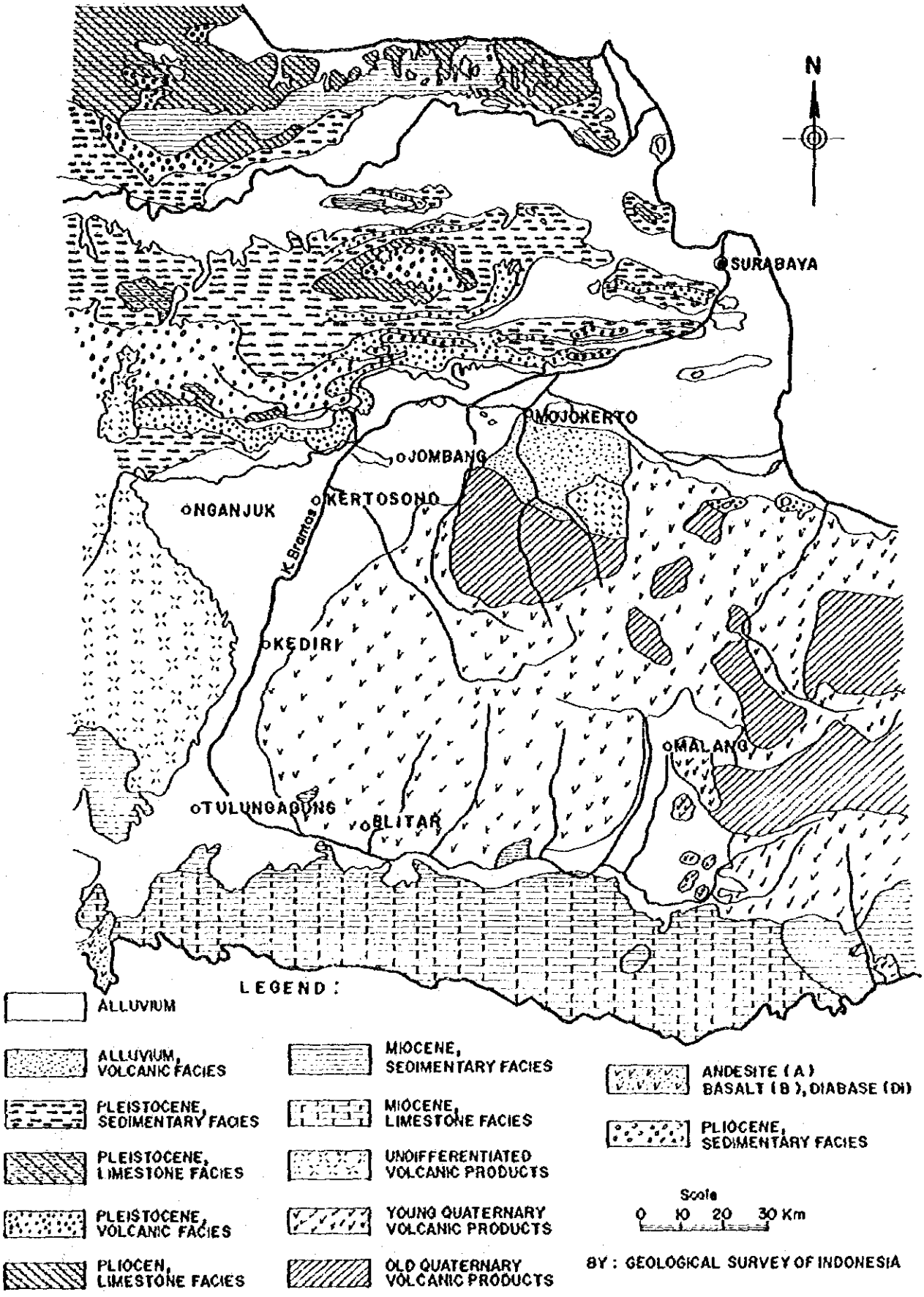


Fig. 2.2.3 GEOLOGICAL MAP IN THE K. BRANTAS BASIN

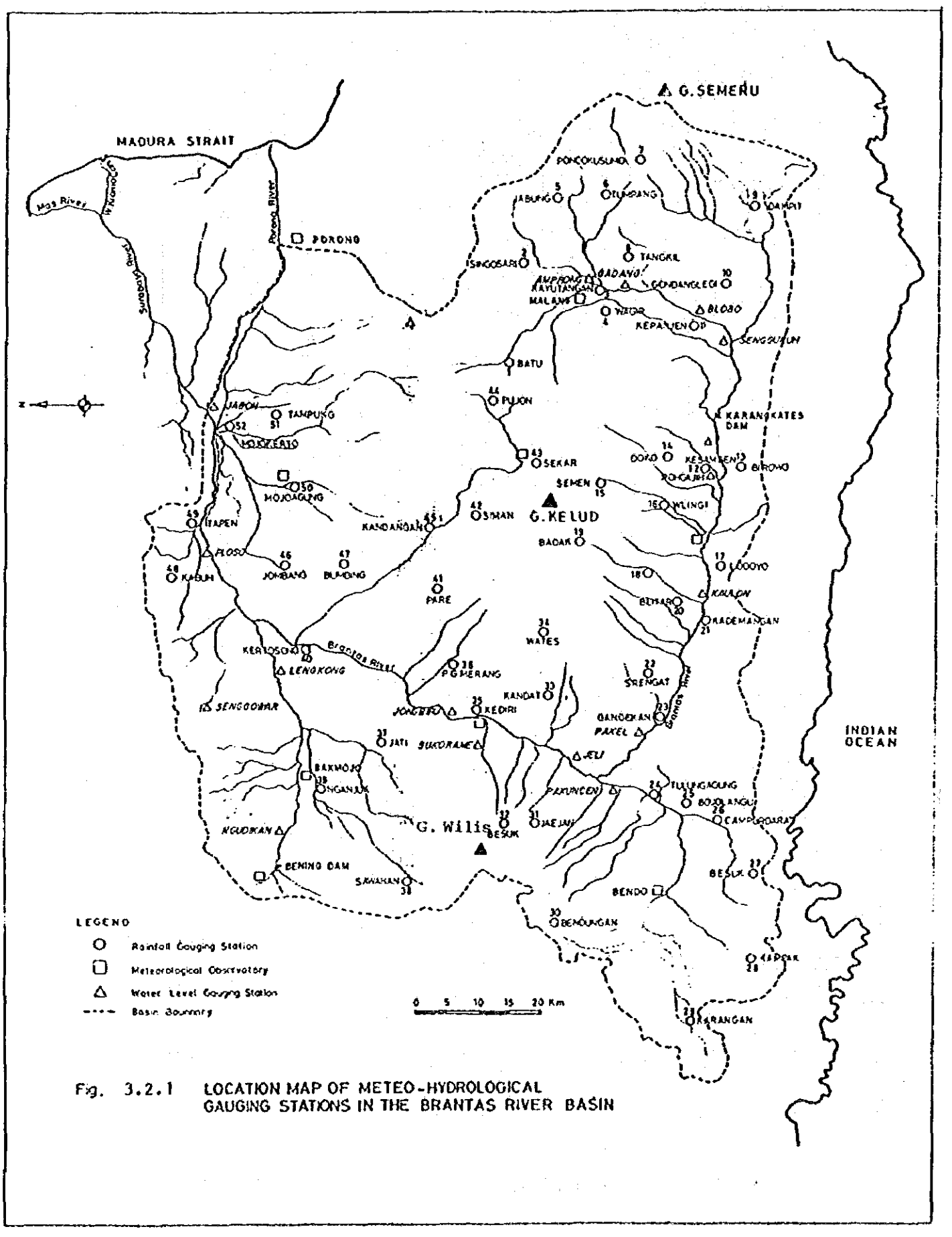


Fig. 3.2.1 LOCATION MAP OF METEO-HYDROLOGICAL GAUGING STATIONS IN THE BRANTAS RIVER BASIN

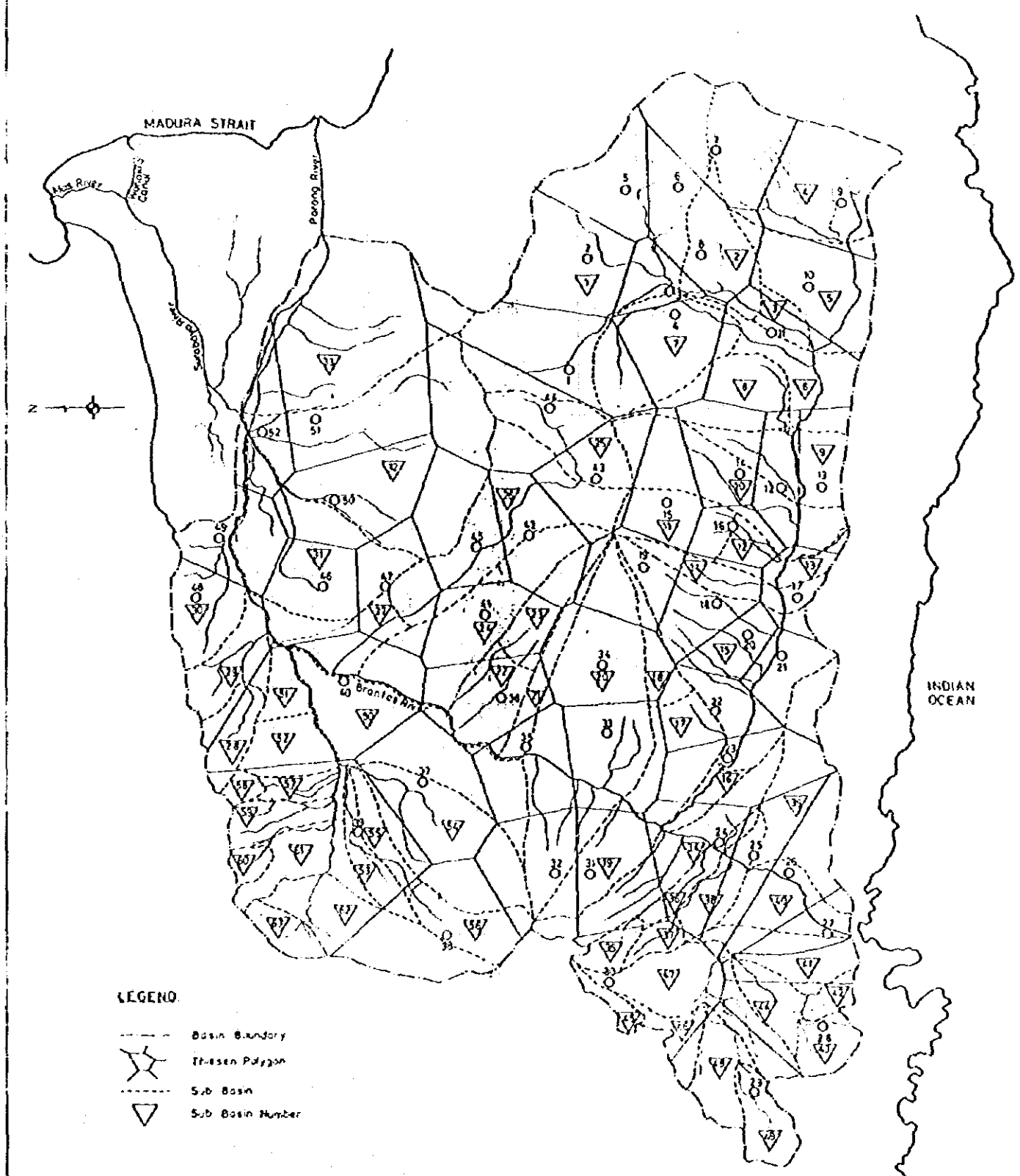


Fig. 3.2.2 THIESEN POLYGON AND SUB-BASIN

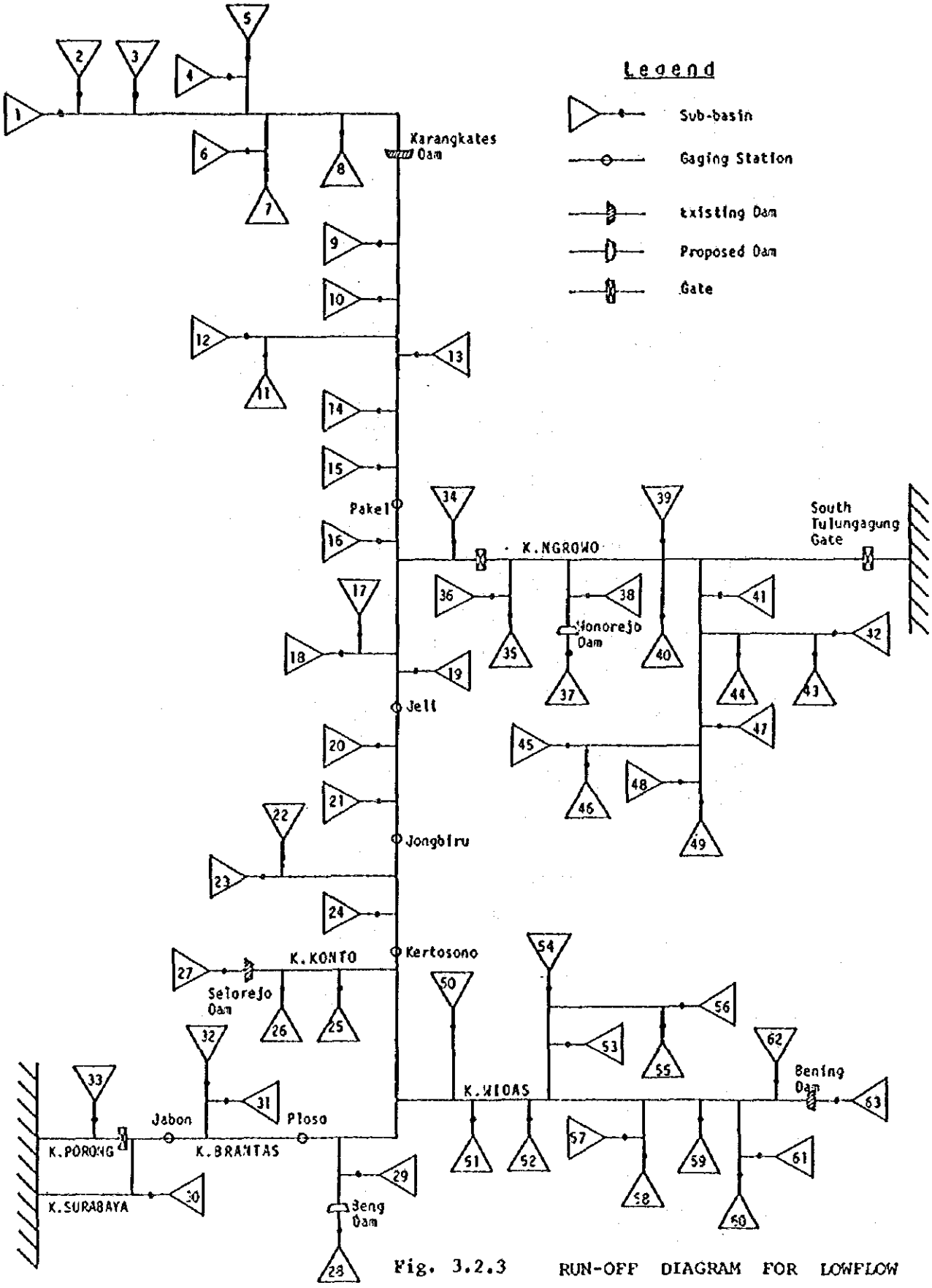


Fig. 3.2.3 RUN-OFF DIAGRAM FOR LOWFLOW

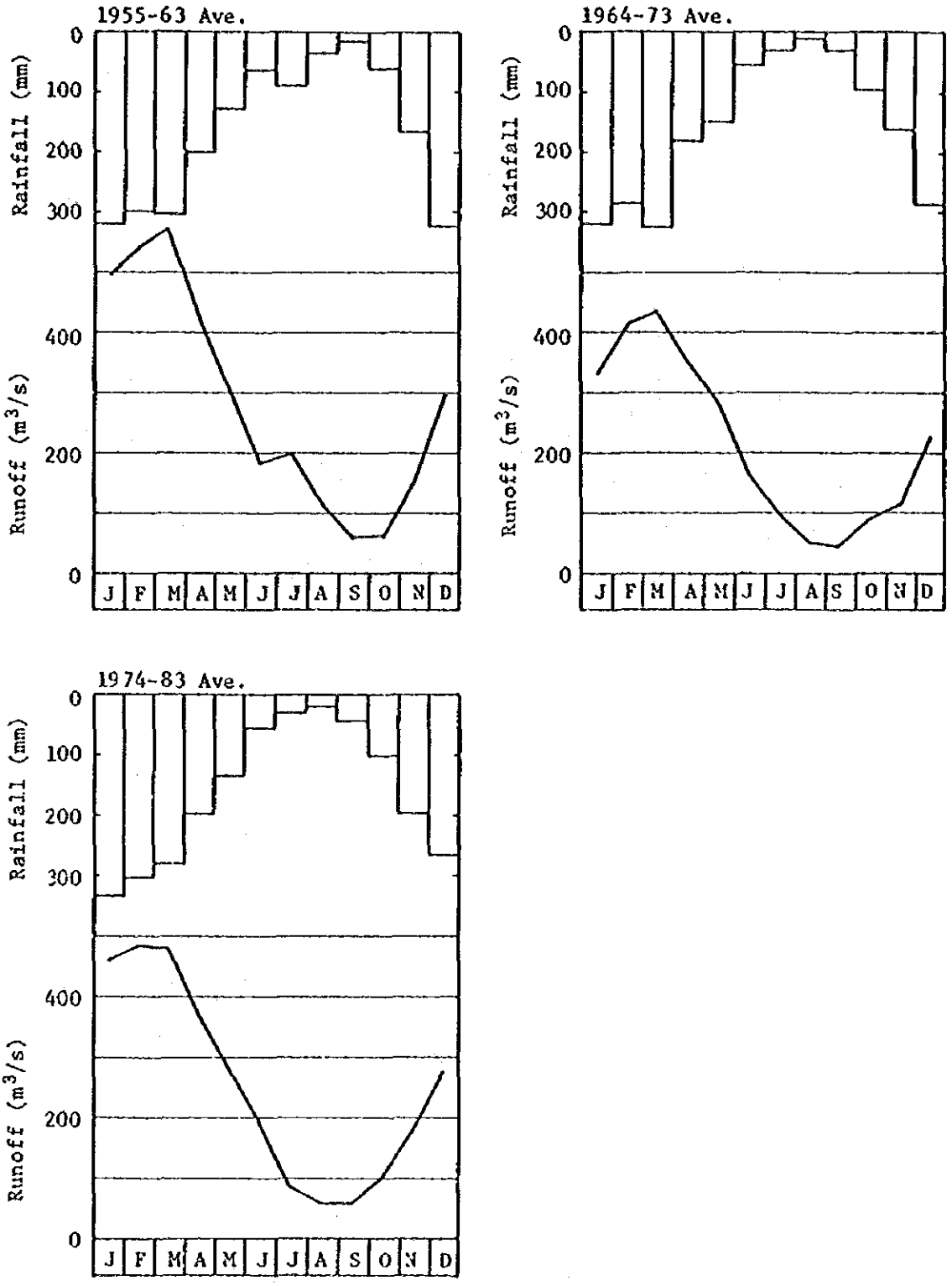


Fig. 3.2.4 RAINFALL AND RUNOFF AT JABON

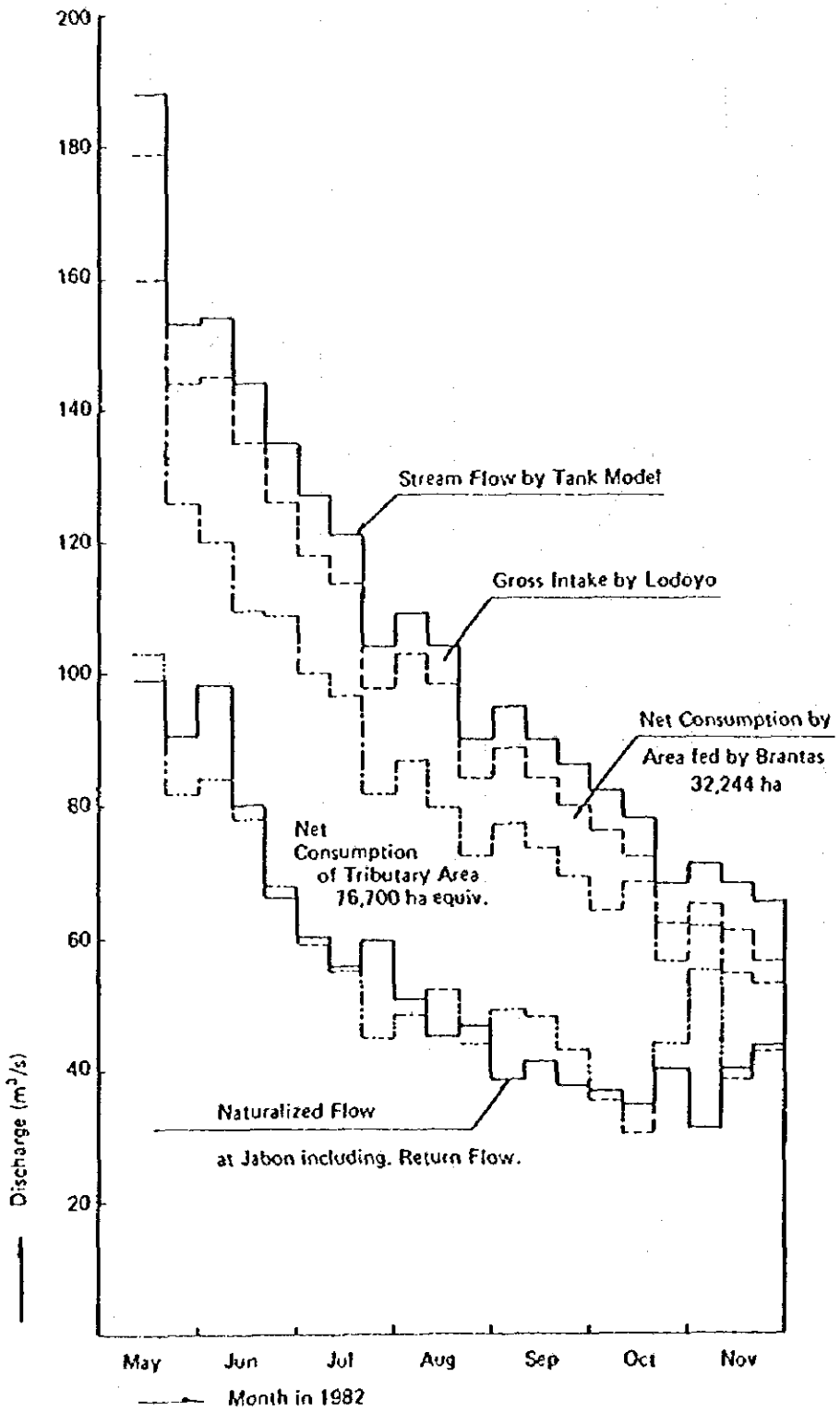


Fig. 3.2.5 DIFFERENCE BETWEEN NATURALIZED AND SIMULATED FLOW AT JABON

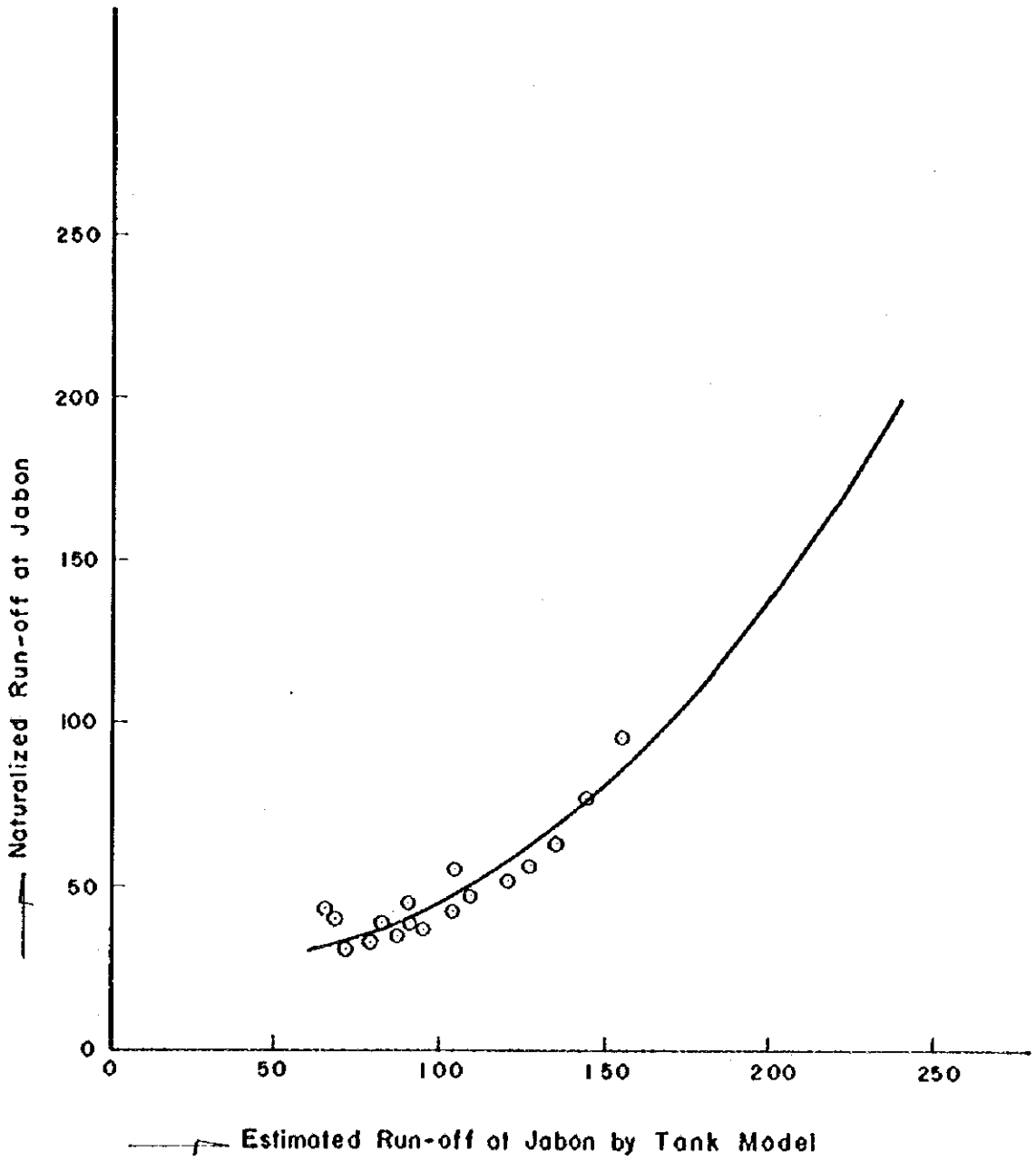


Fig. 3.2.6 RELATION BETWEEN ESTIMATED RUN-OFF BY TANK MODEL AND NATURALIZED RUN-OFF

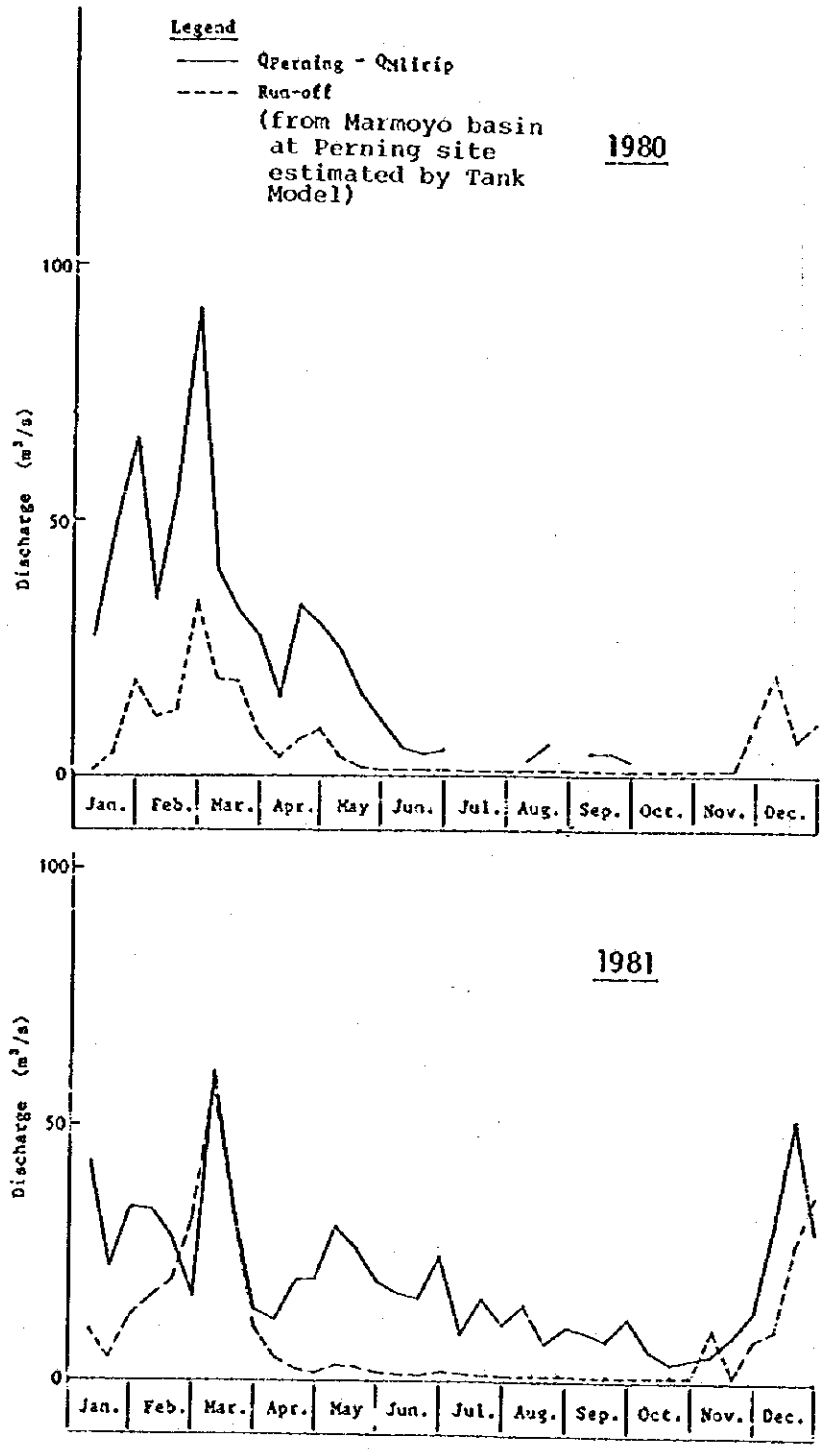


Fig. 3.2.7(1) BALANCE BETWEEN PERNING AND MLIRIP AND ESTIMATED RUN-OFF AT PERNING

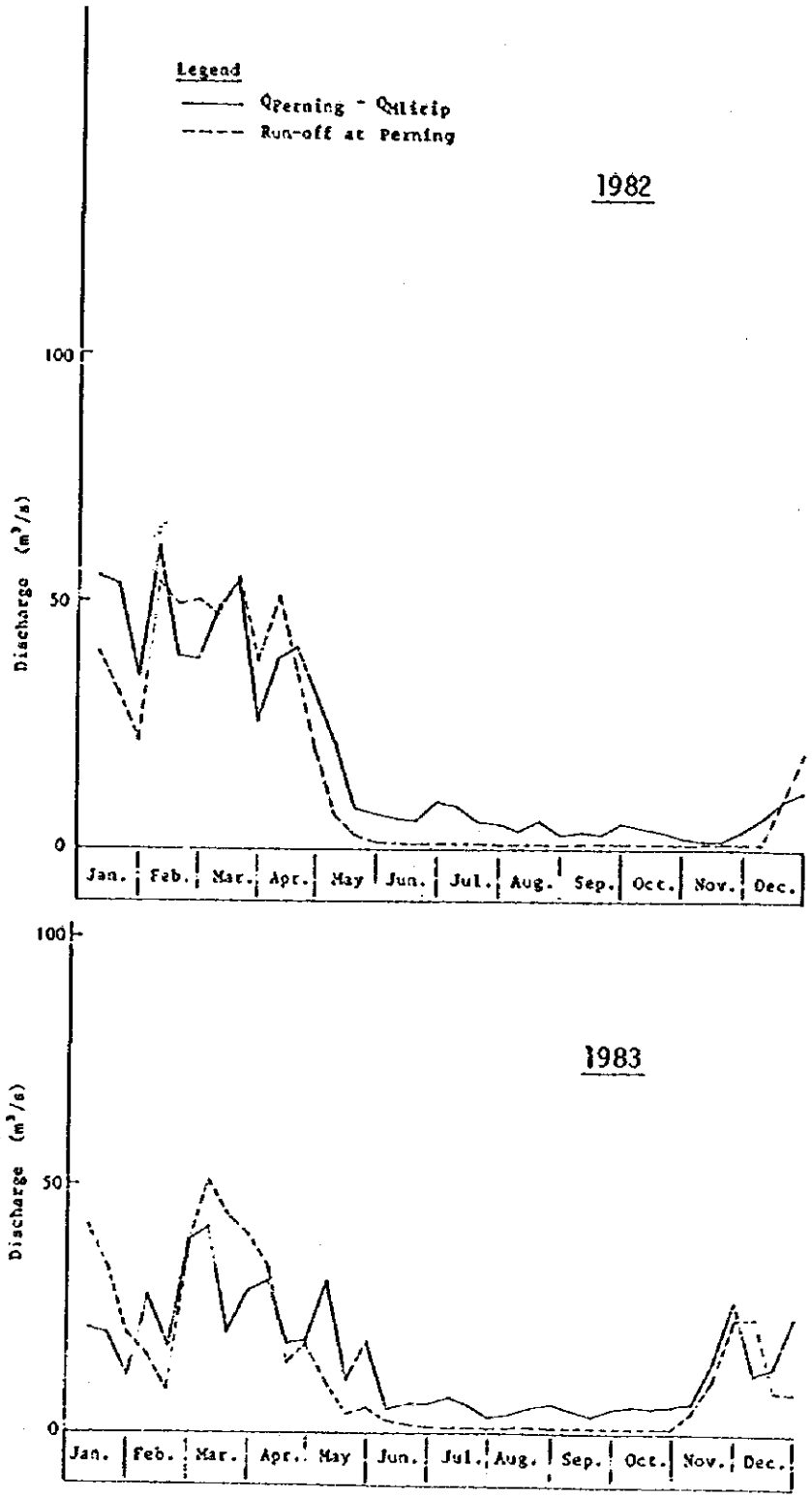


Fig. 3.2.7(2) BALANCE BETWEEN PERNING AND MLIRIP AND ESTIMATED RUN-OFF AT PERNING

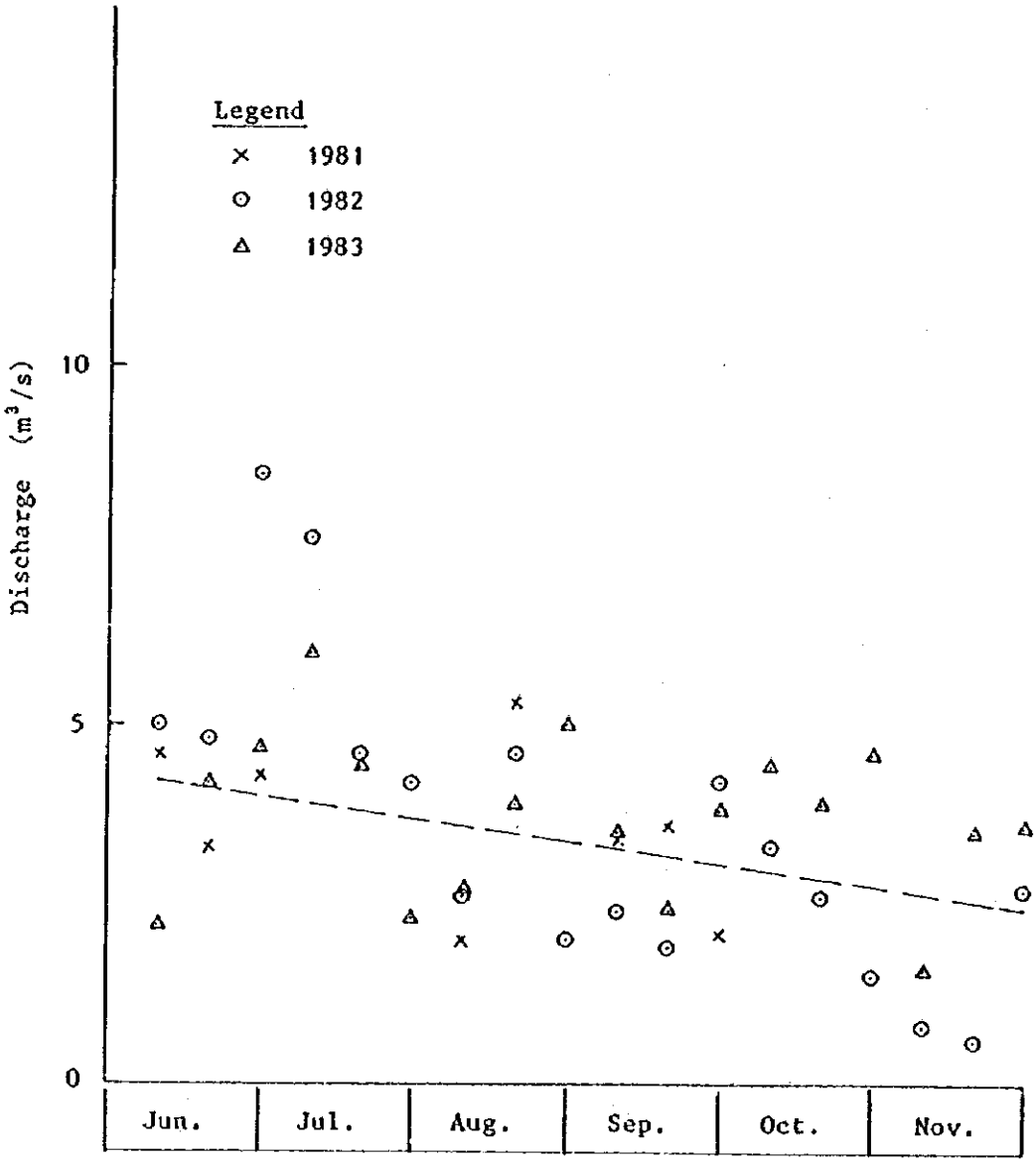
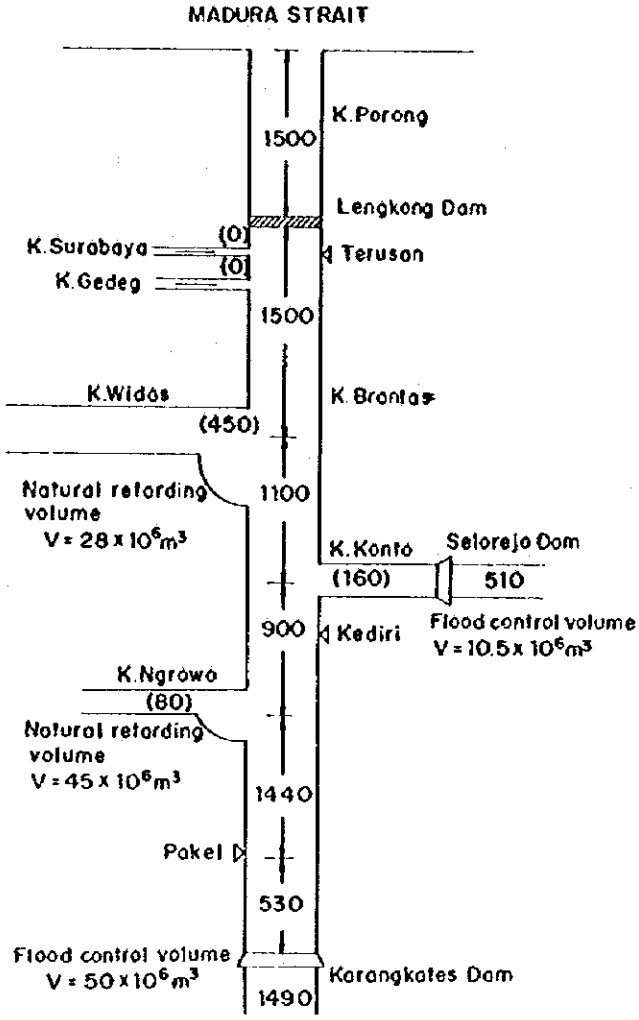


Fig. 3.2.8 ESTIMATED DISCHARGE THROUGH GEDEG SLUICE AND WATUDAKON SYPHON

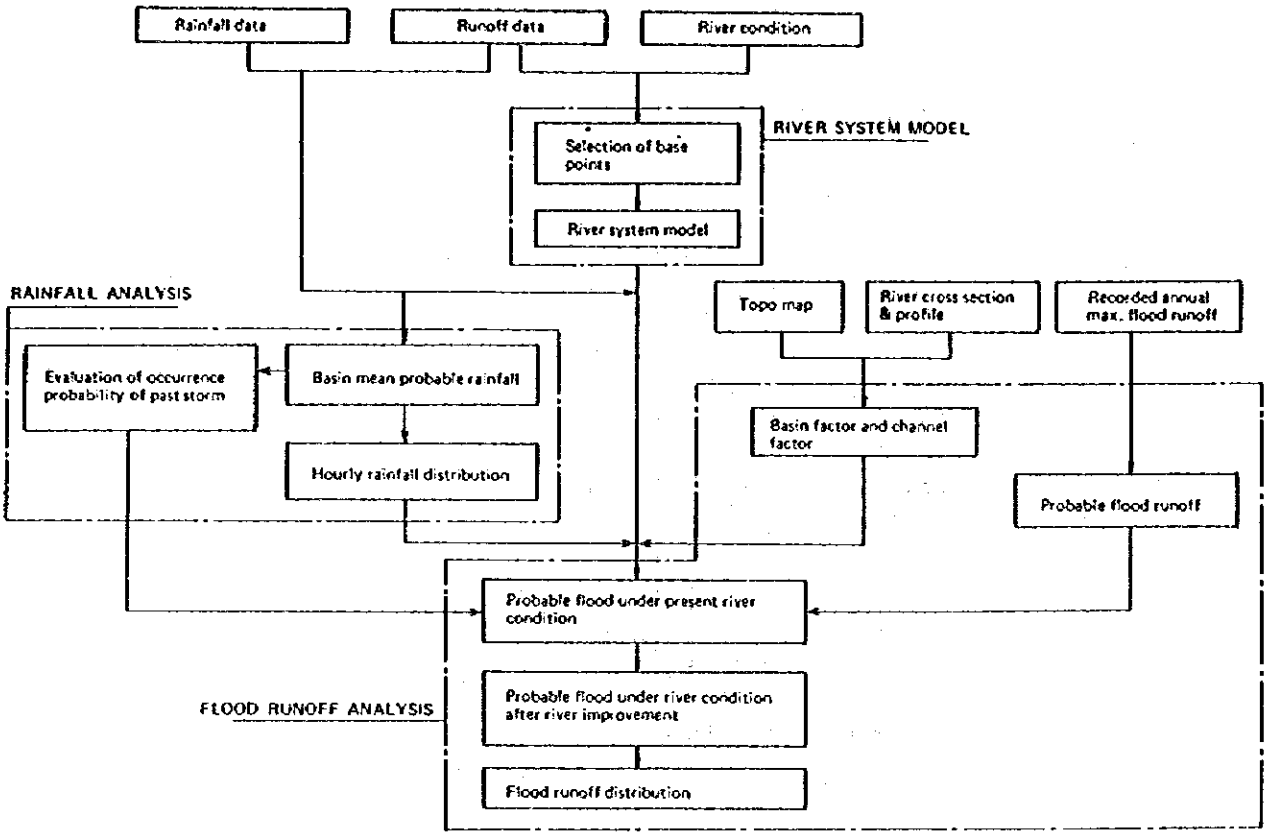


Proposed by

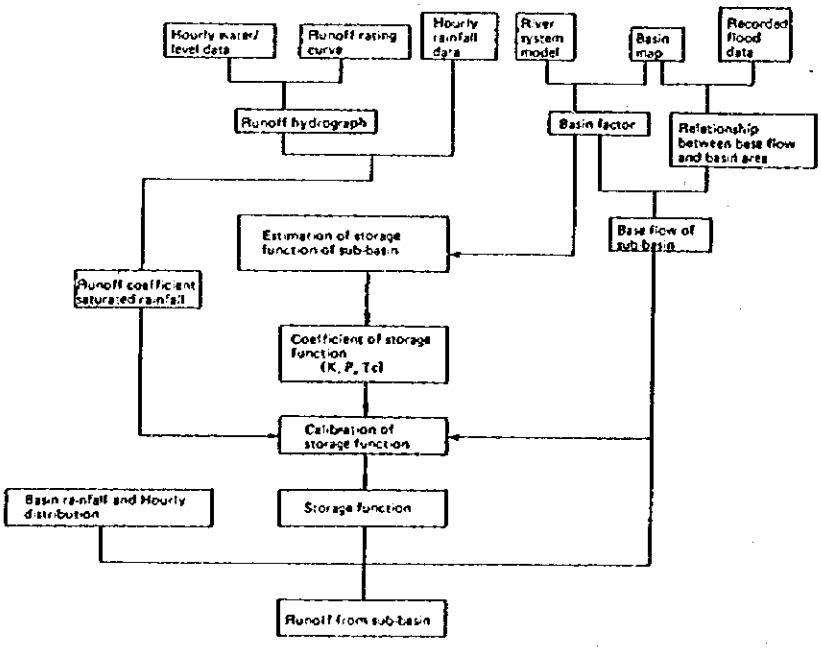
The Brantas River Basin Development Plan

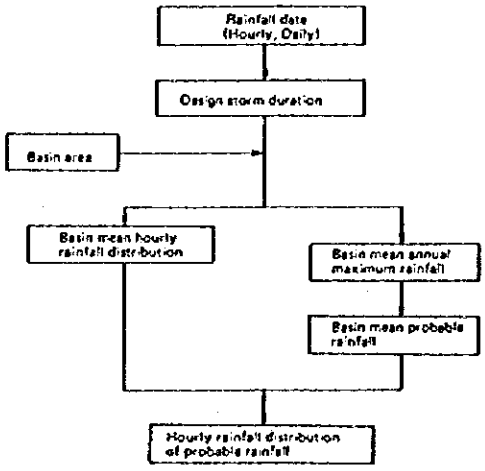
1973 Master Plan

Fig. 3.2.9 FLOOD DISCHARGE DISTRIBUTION



GENERAL FLOW CHART OF FLOOD ANALYSIS





RAINFALL ANALYSIS

Fig. 3.2.10 RUNOFF FROM SUB-BASIN

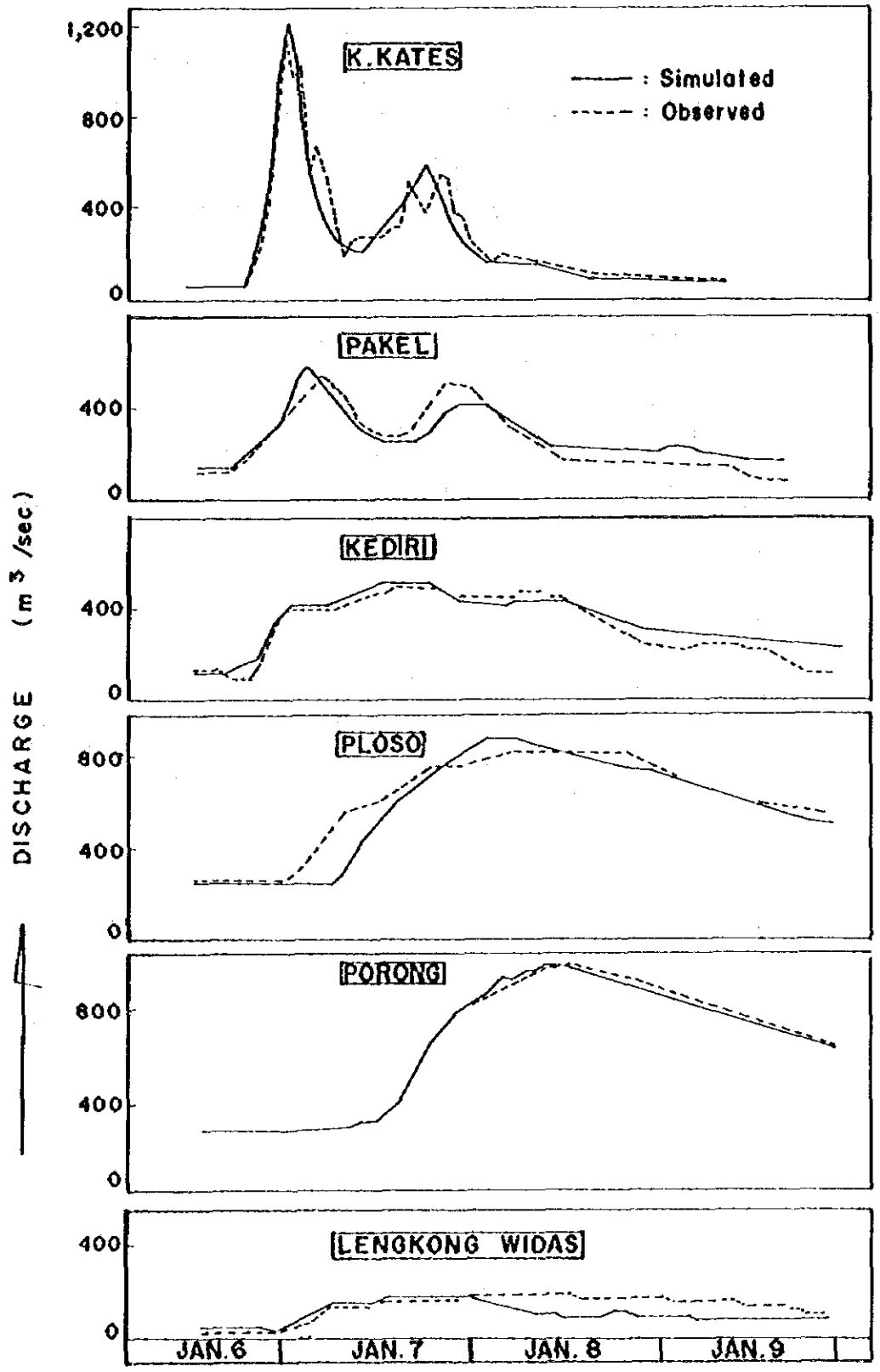


Fig. 3.2.11 (1) FLOOD HYDROGRAPHS ON JAN. 6~9, 1981

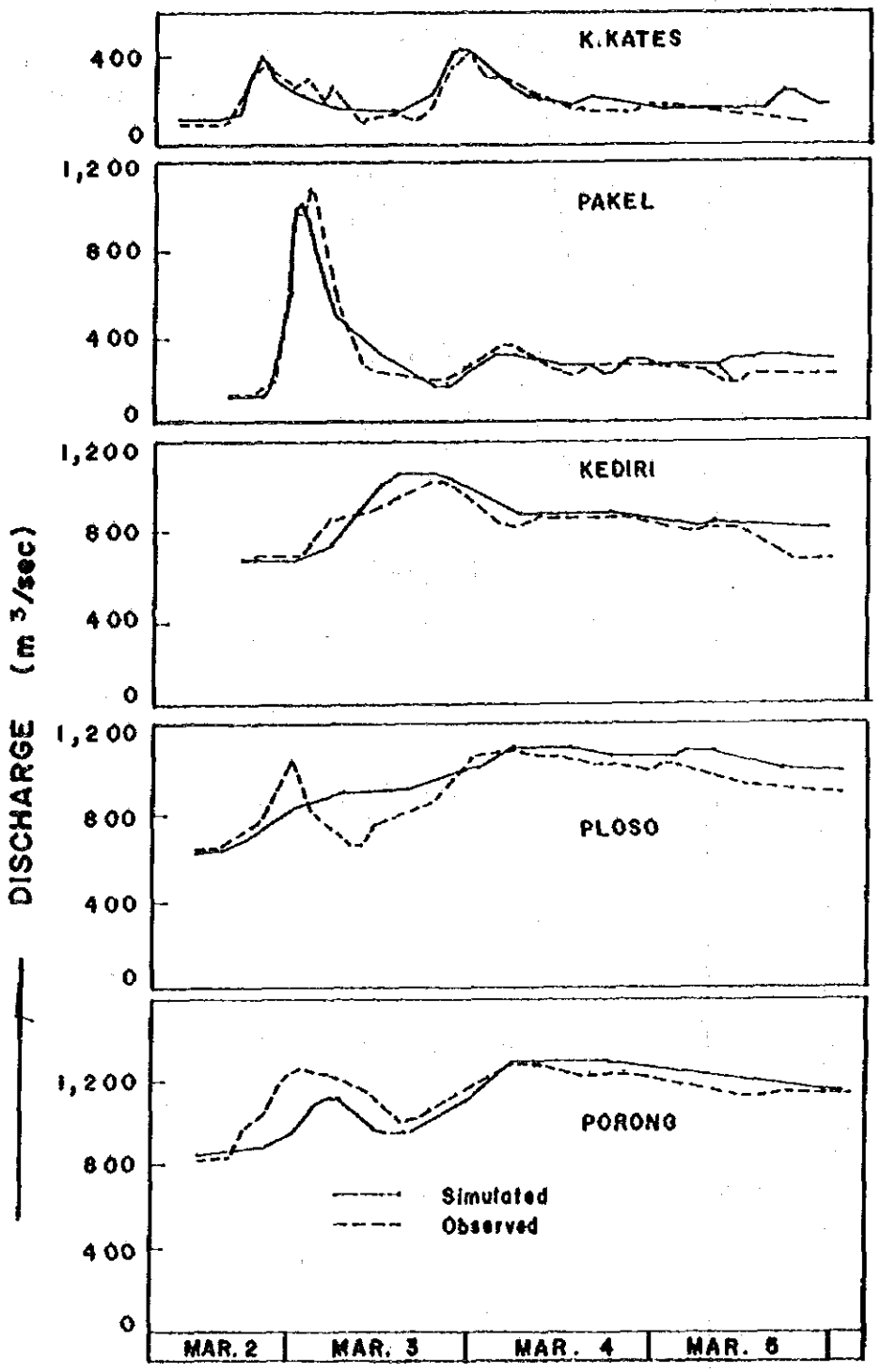


Fig. 3.2.11 (2) FLOOD HYDROGRAPH ON MAR. 2-5, 1984

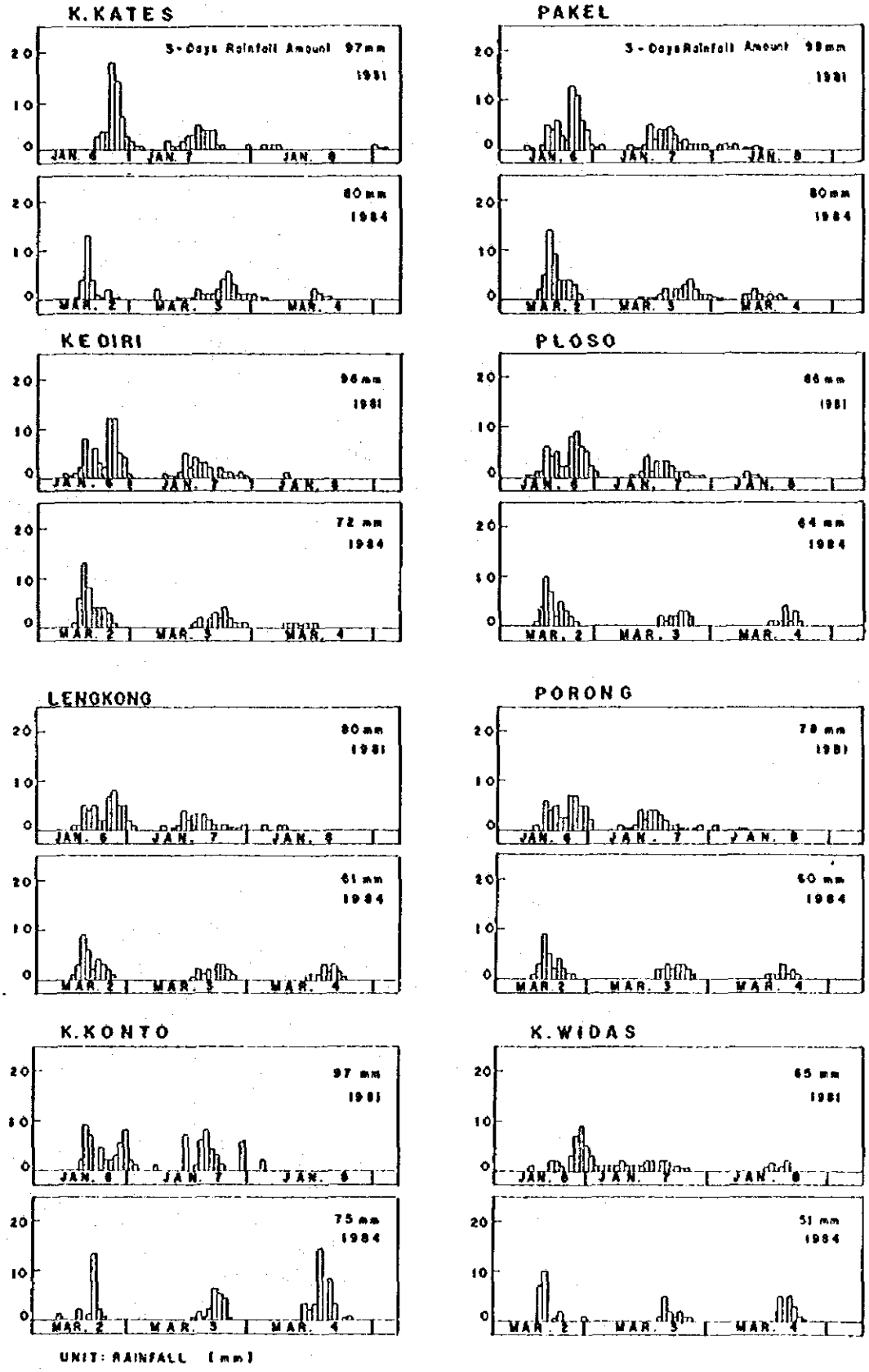
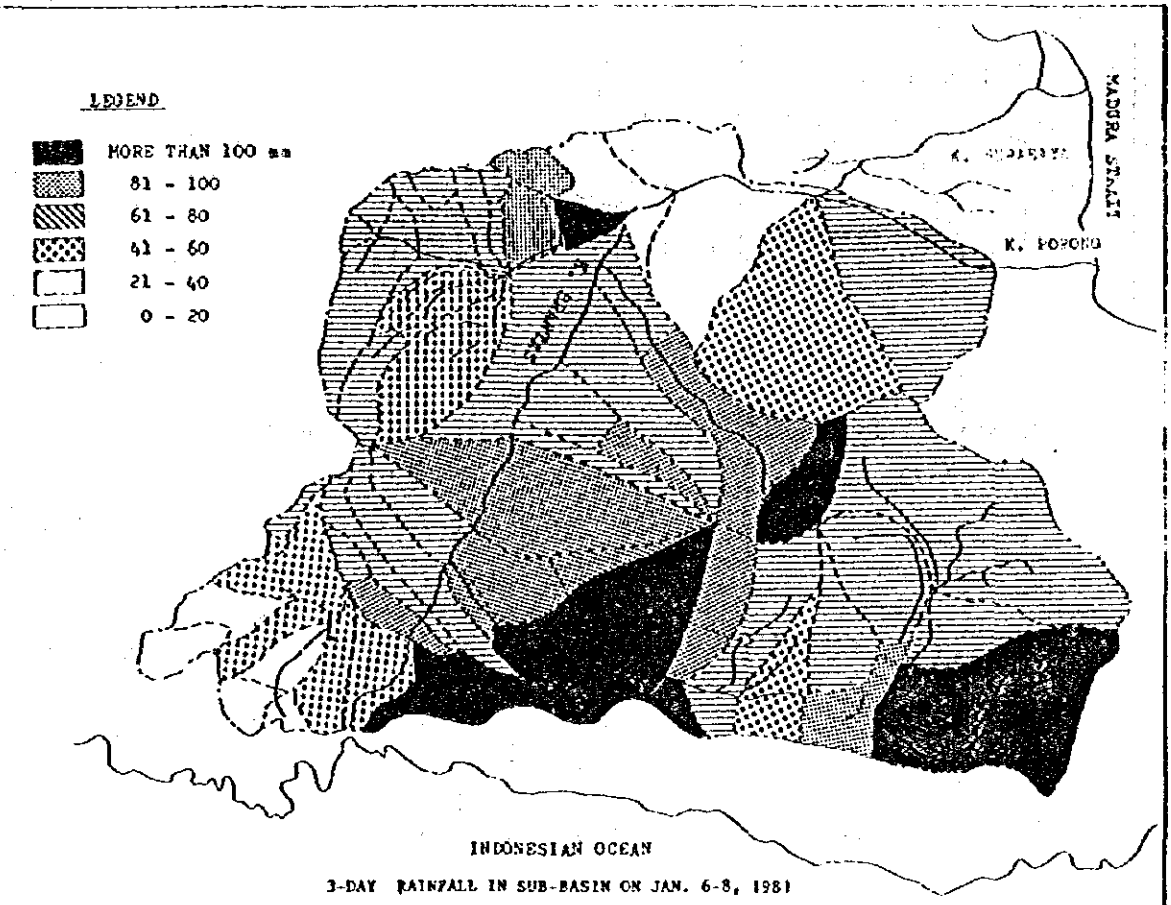
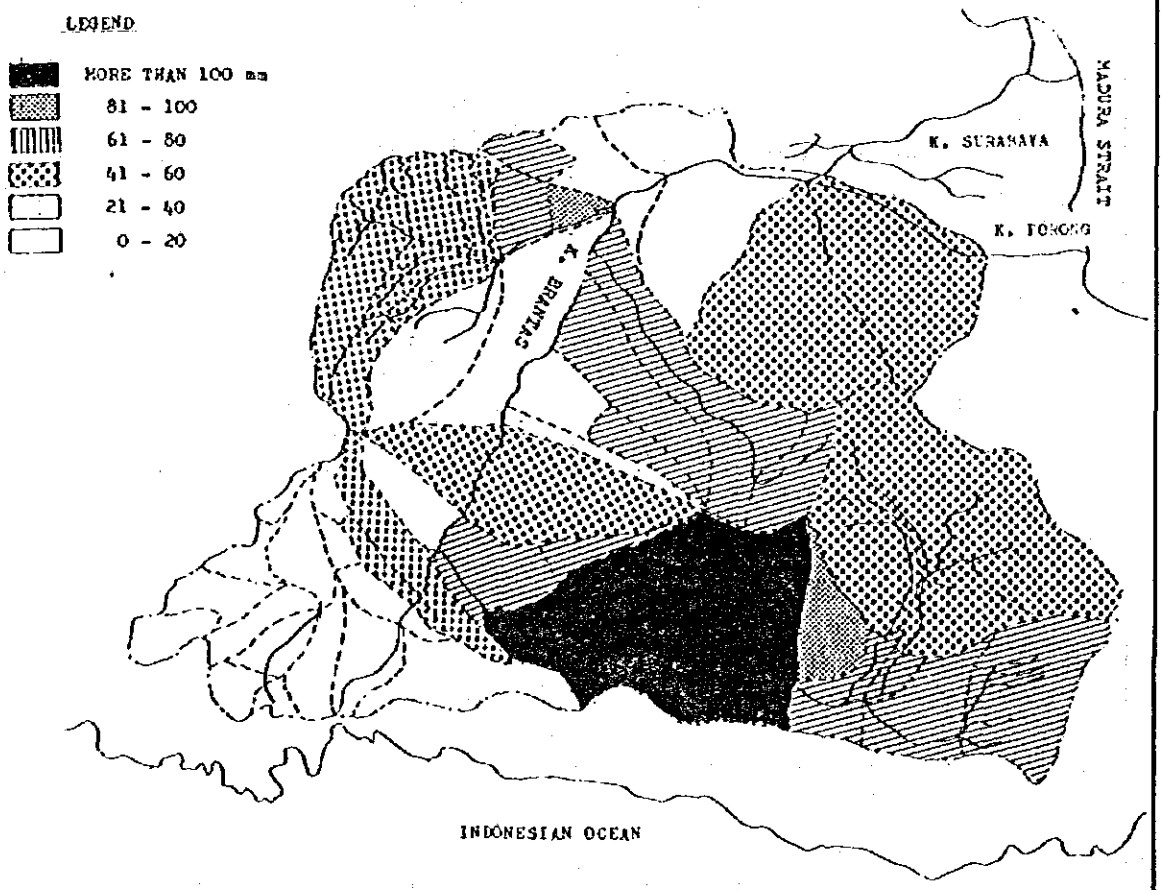


Fig. 3.2.12 BASIN MEAN HOURLY RAINFALL DISTRIBUTION



3-DAY RAINFALL IN SUB-BASIN ON JAN. 6-8, 1981



3-DAY RAINFALL IN SUB-BASINS ON MAR. 2-4, 1984

Fig. 3.2.13 3-DAY RIANFALL OF RAIN STROM IN JAN. 1981 AND MAR. 1984

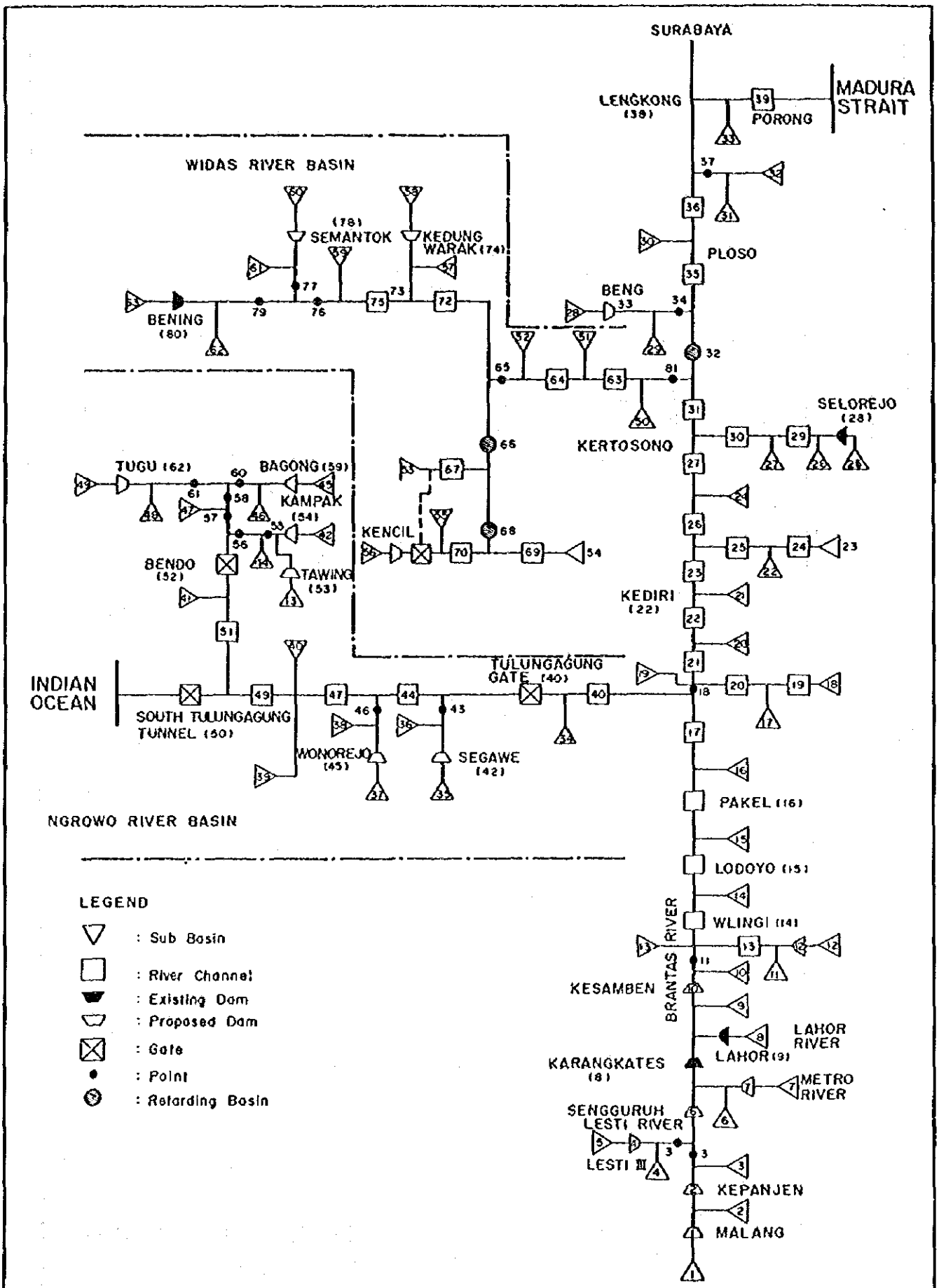


Fig. 3.2.14 RIVER SYSTEM FOR FLOOD ANALYSIS

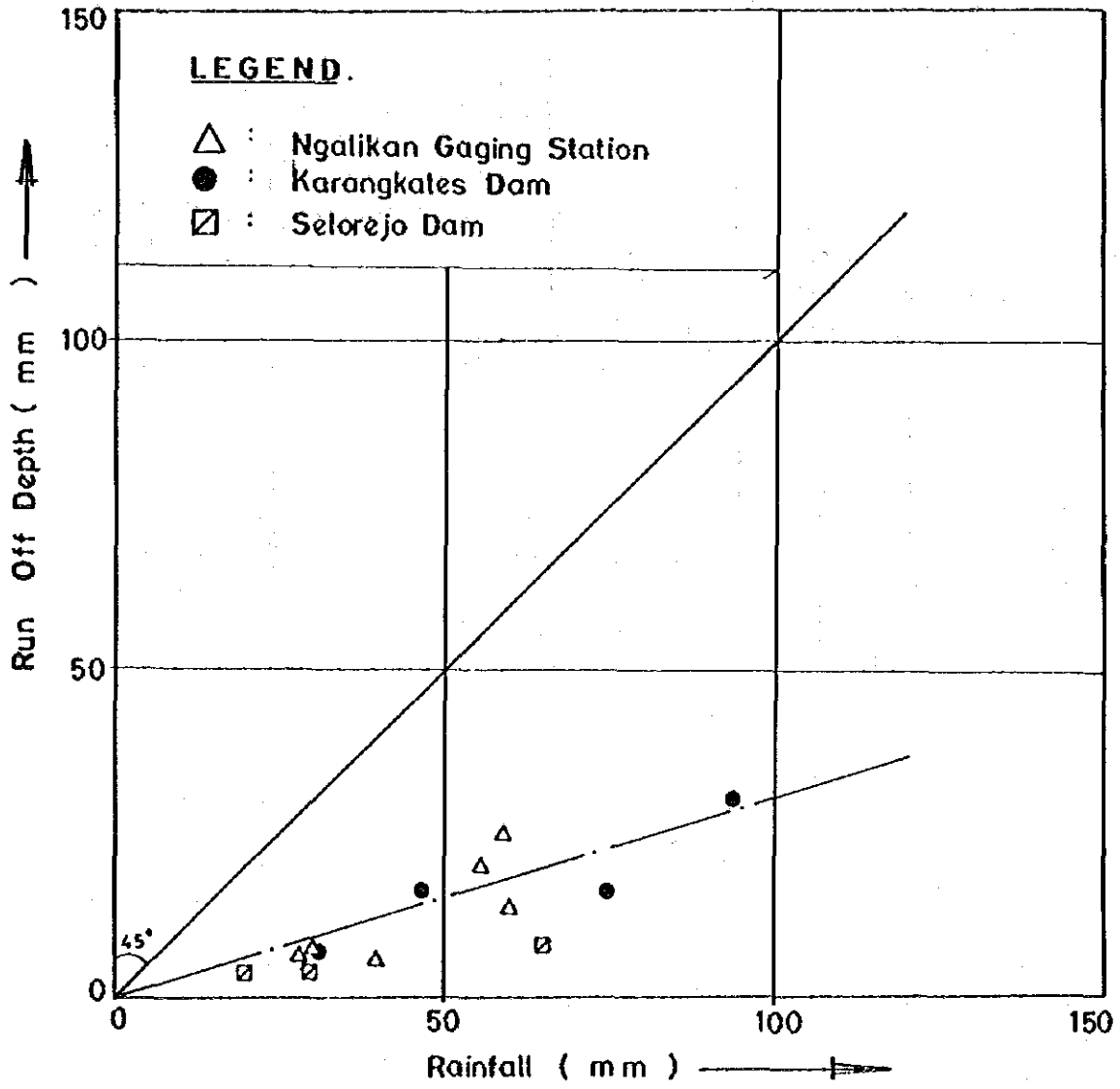


Fig. 3.2.15 RELATION BETWEEN RUN-OFF DEPTH AND RAINFALL AMOUNT DURING FLOOD.

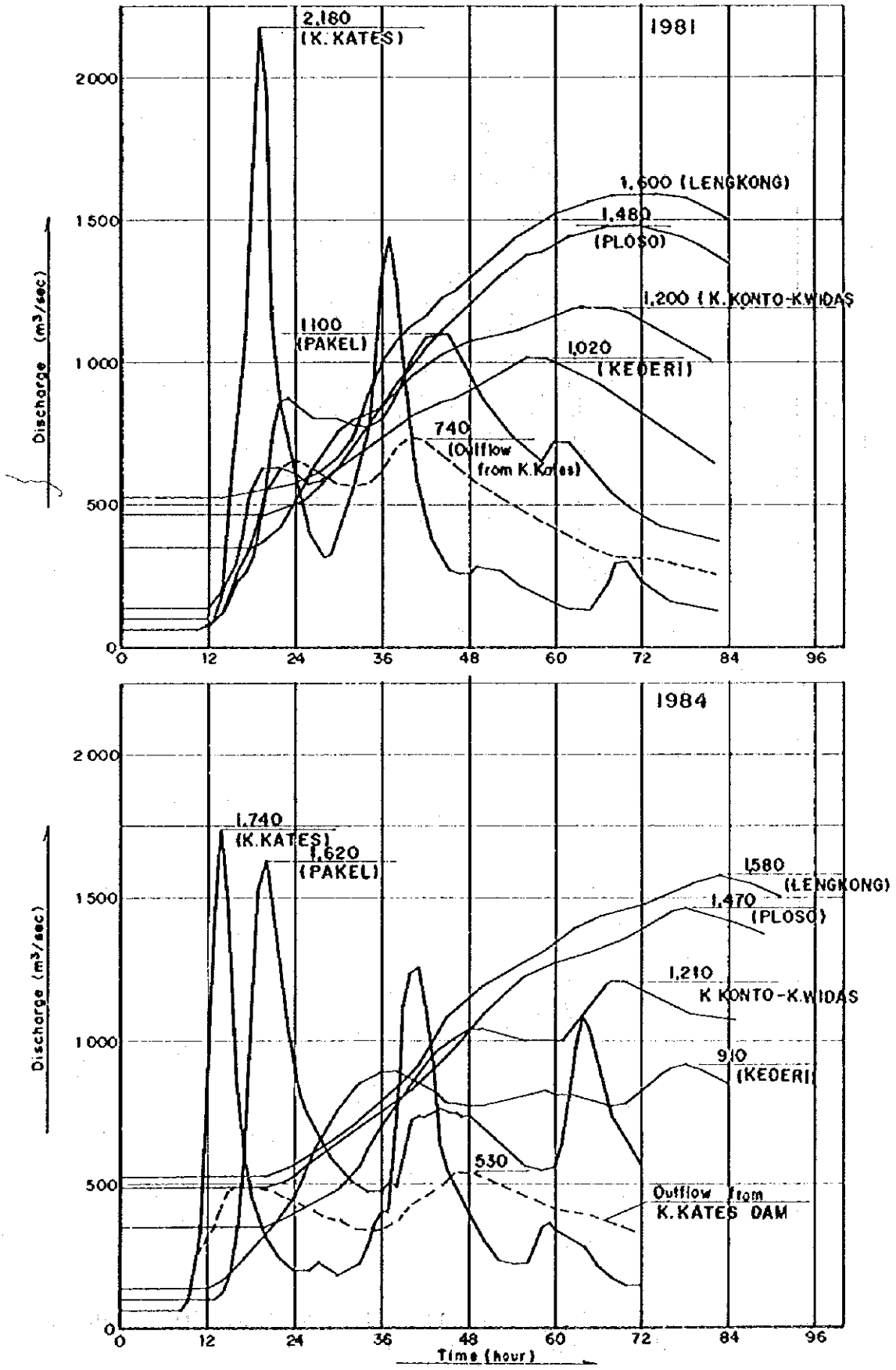


Fig. 3.2.16 PROBABLE 50-YEAR FLOOD HYDROGRAPHS OF K.BRANTAS FOR THE PRESENT CONDITION

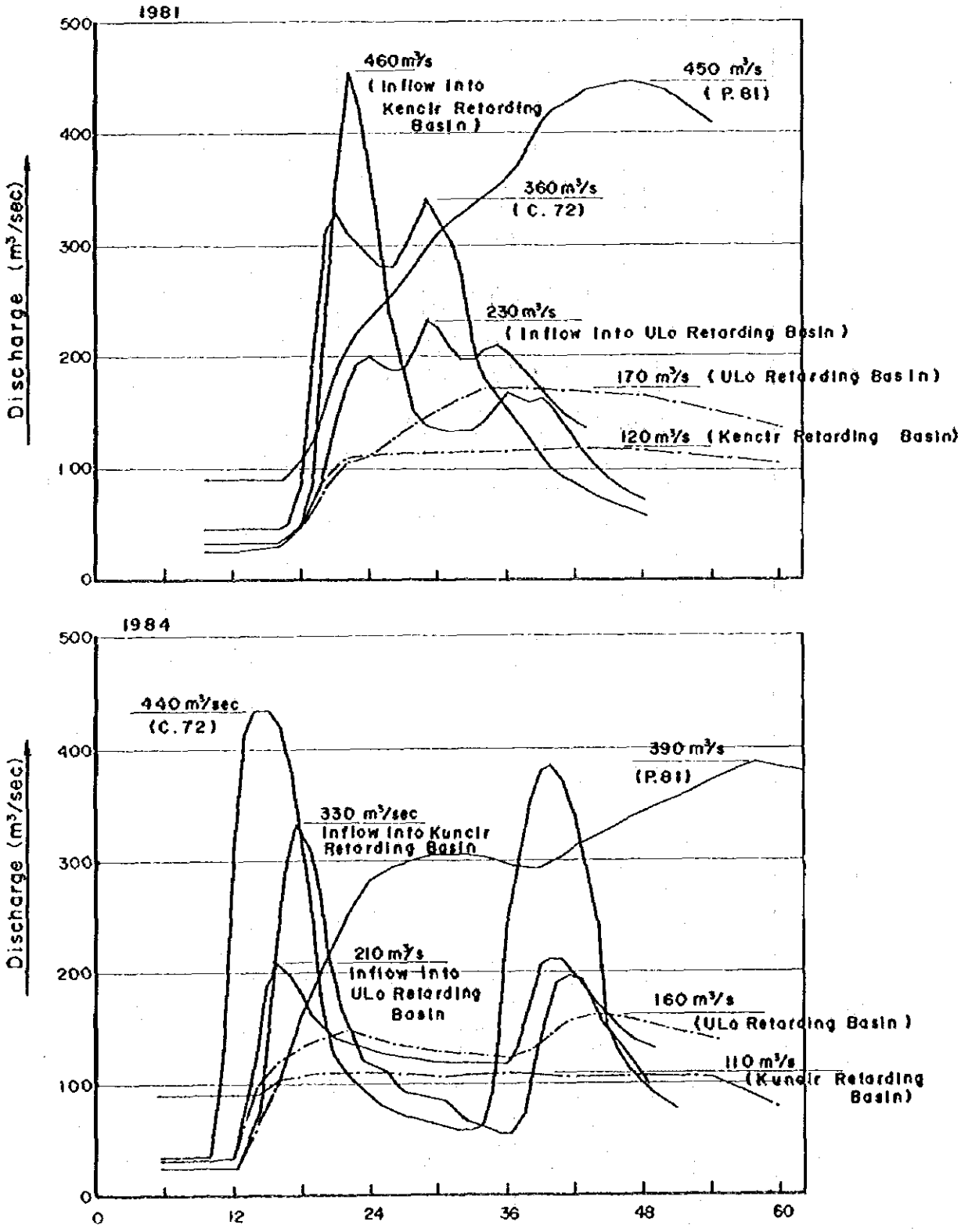


Fig. 3.2.17 PROBABLE 25-YEAR FLOOD HYDROGRAPHS OF K.WIDAS FOR THE PRESENT CONDITIONS

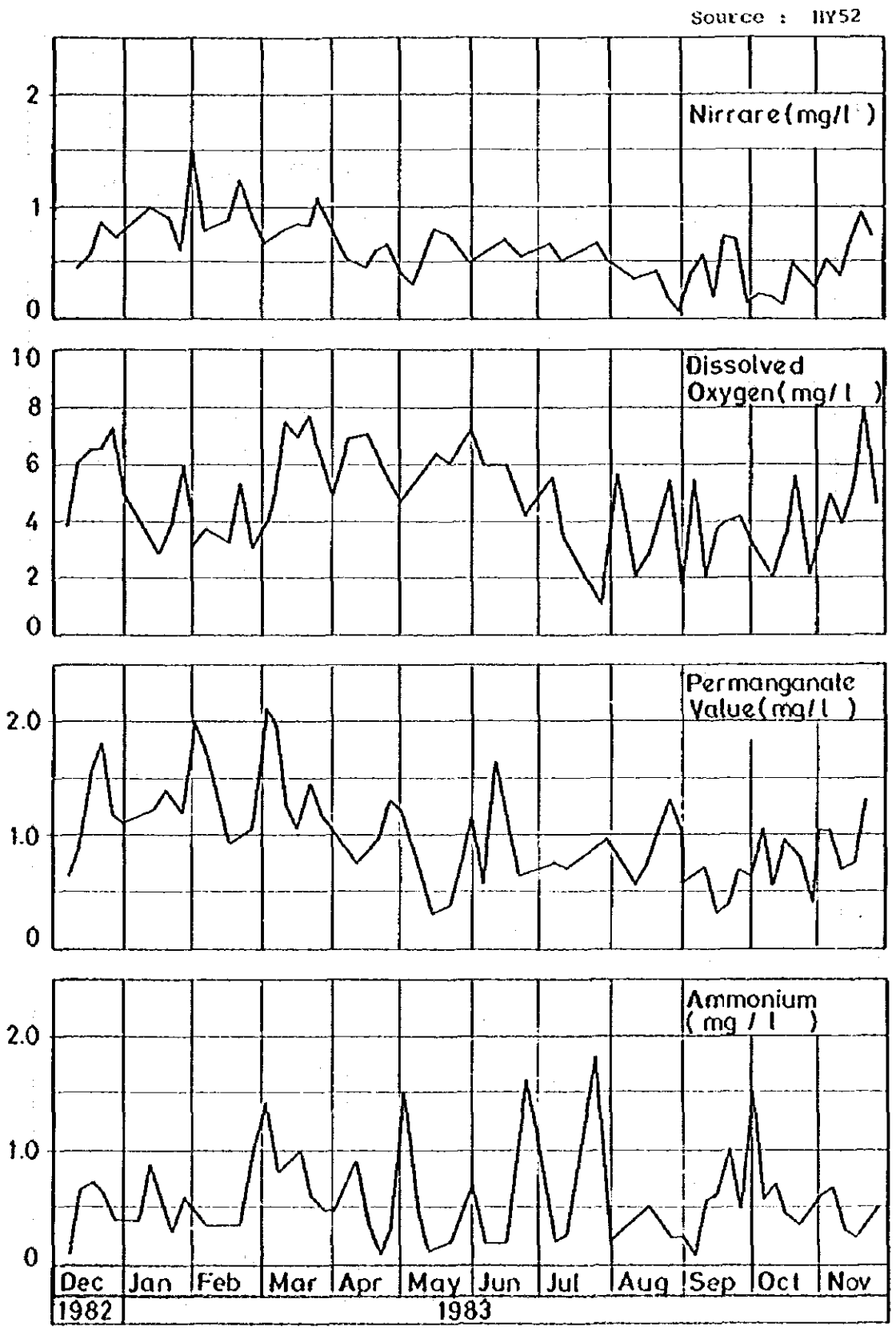


Fig. 3.2.18 ANNUAL FLUCTUATION OF WATER QUALITY AT GUNUNGSARI DAM.

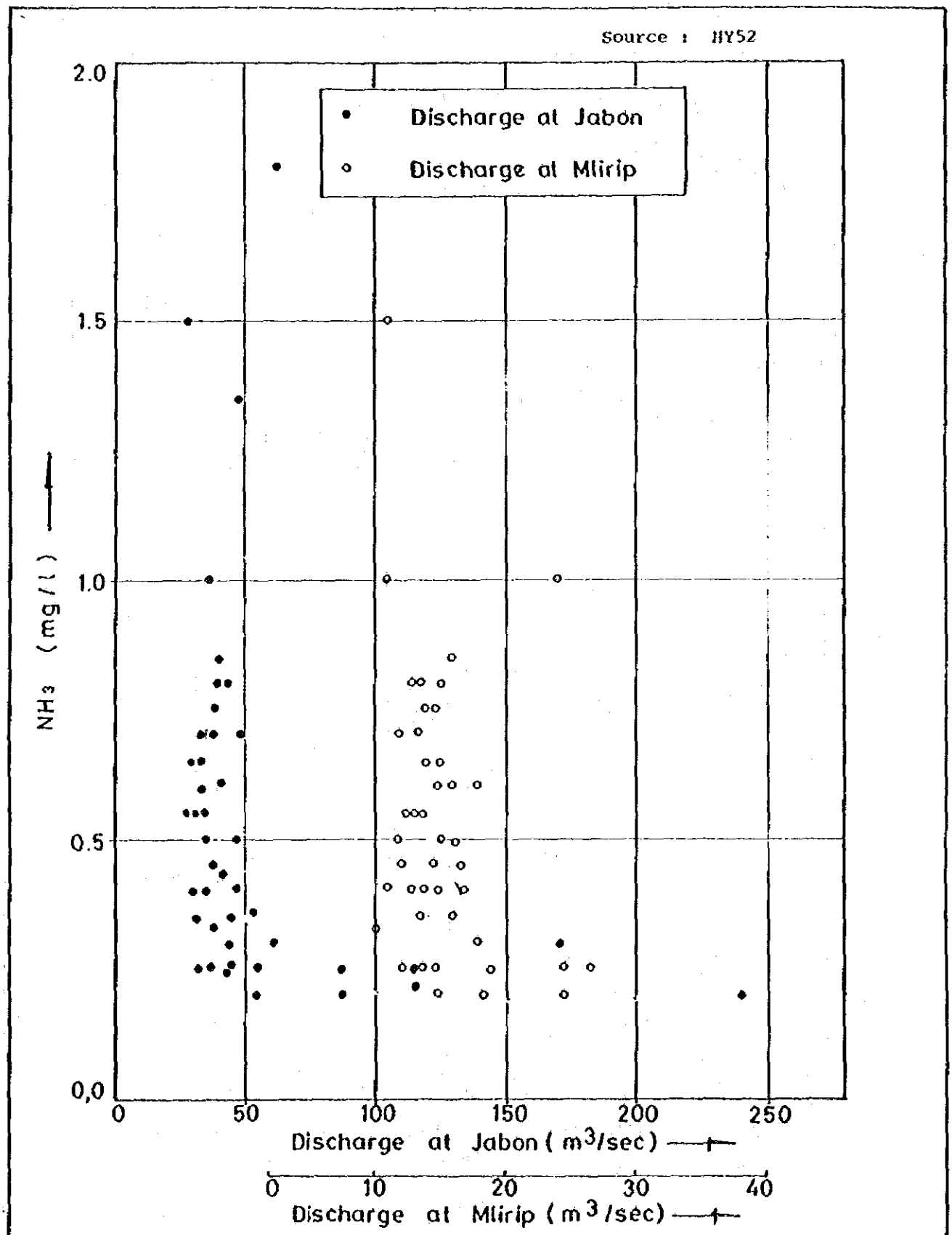
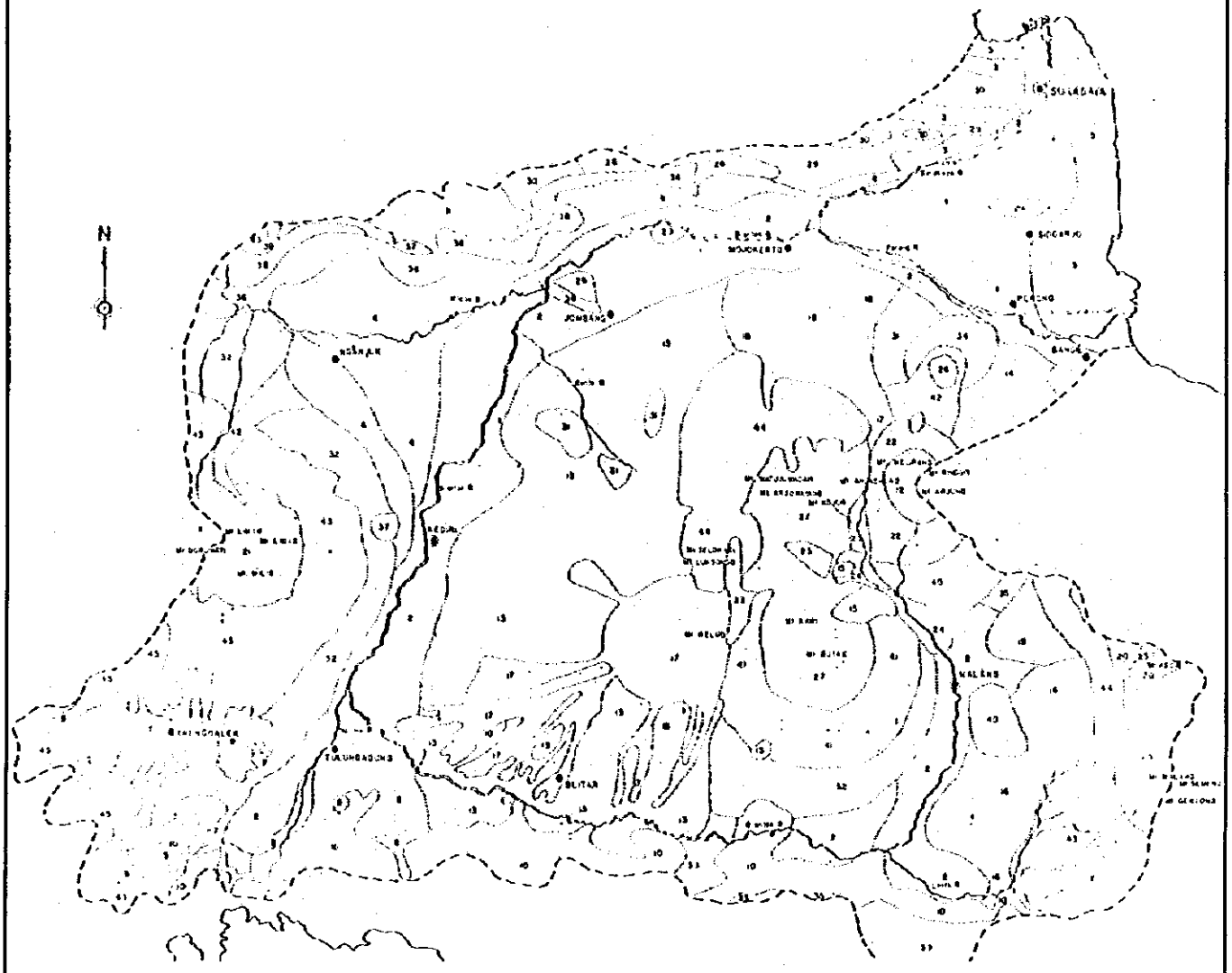


Fig. 3.2.19 RELATION BETWEEN WATER QUALITY/DISCHARGE.



FLUVISOL

1 Grey Alluvial
2 Grey / Greyish Brown Alluvial
4 5 Grey Dark Alluvial
5 - 7 Dark grey Hydromorphic Alluvial

HUMIC GLEY SOILS

9 Humic gley

LITHOSOLS

3 Lithosol
10 Association of Lithosol / reddish brown Mediterranean soil
11 Complex of Lithosol, Mediterranean

REGOSOLS

12 Yellowish brown Regosols
13 Greyish brown Regosols
14 Greyish brown Regosols
15-16 Brown Regosols
17 Grey'sh regosol / Lithosol
18 Yellowish brown regosol / Lithosol

NON - CALCALEOUS BROWN FOREST SOILS

19 Brown forest soil

ANDOSOLS

20 Association of grey andosol / grey regosol
21-22 Association of yellowish brown andosol / yellowish brown regosol
23 Brown andosol
24 Association of brown andosol / humic gley soil
25 Association of brown andosol / brown regosol
26 Complex of yellowish grey andosol / Lithosol
27 Complex of brown andosol / Lithosol

GRUMUSOL

28 Grey grumusol
29-30 Dark grey grumusol

MEDITERRANEAN

31 Association of brown mediterranean / grey grumusol
32-33 Brown reddish brown mediterranean / grey grumusol
34 Association of reddish brown mediterranean / grey grumusol
35 Reddish brown mediterranean
36 Association of reddish brown mediterranean / grey grumusol
37-39 Complex of brown mediterranean / Lithosol

LATOSOL

40 Brown latosol
41 Association of brown latosol / brown regosol
42 Association of brown latosol / grey regosol
43-44 Reddish brown latosol
45 Complex reddish brown latosol / Lithosol

Source: Soil Research Institute, Bogor 1966

Fig. 3.3.1 SOIL IN THE BRANTAS RIVER BASIN.

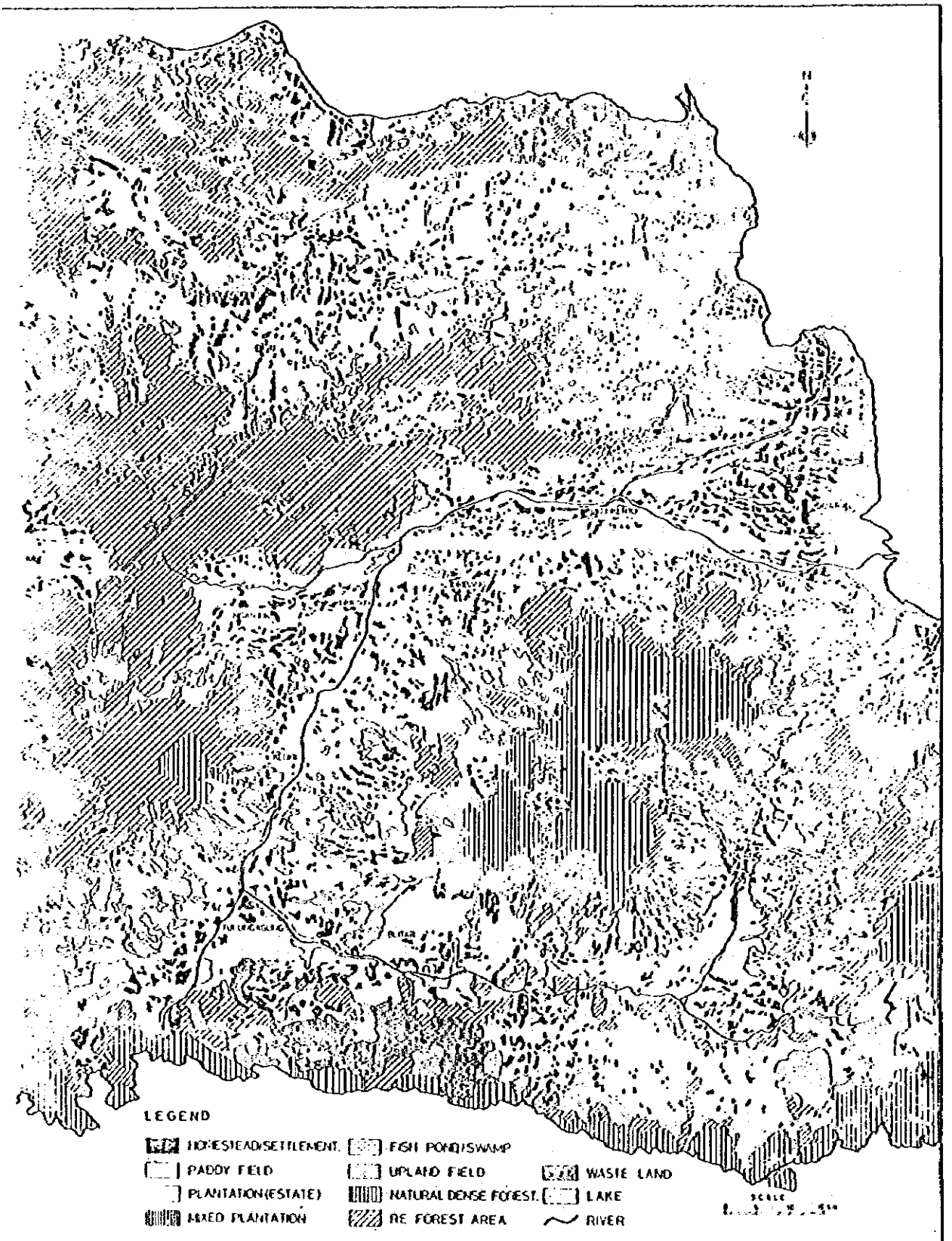


Fig. 3.3.2 LAND USE MAP

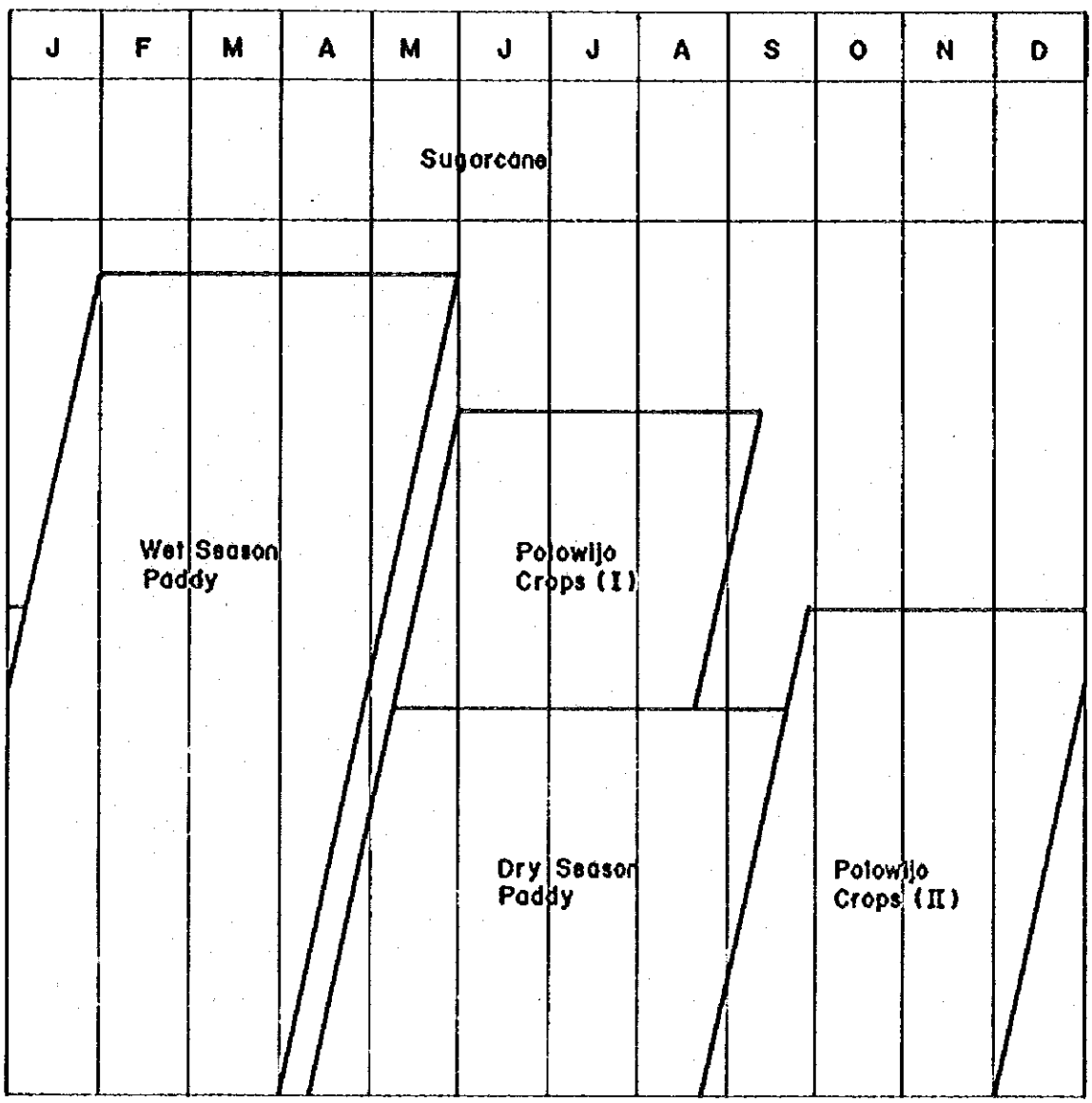


Fig. 3.3.3 PRESENT CROPPING PATTERN PREVAILING IN THE BRANTAS BASIN

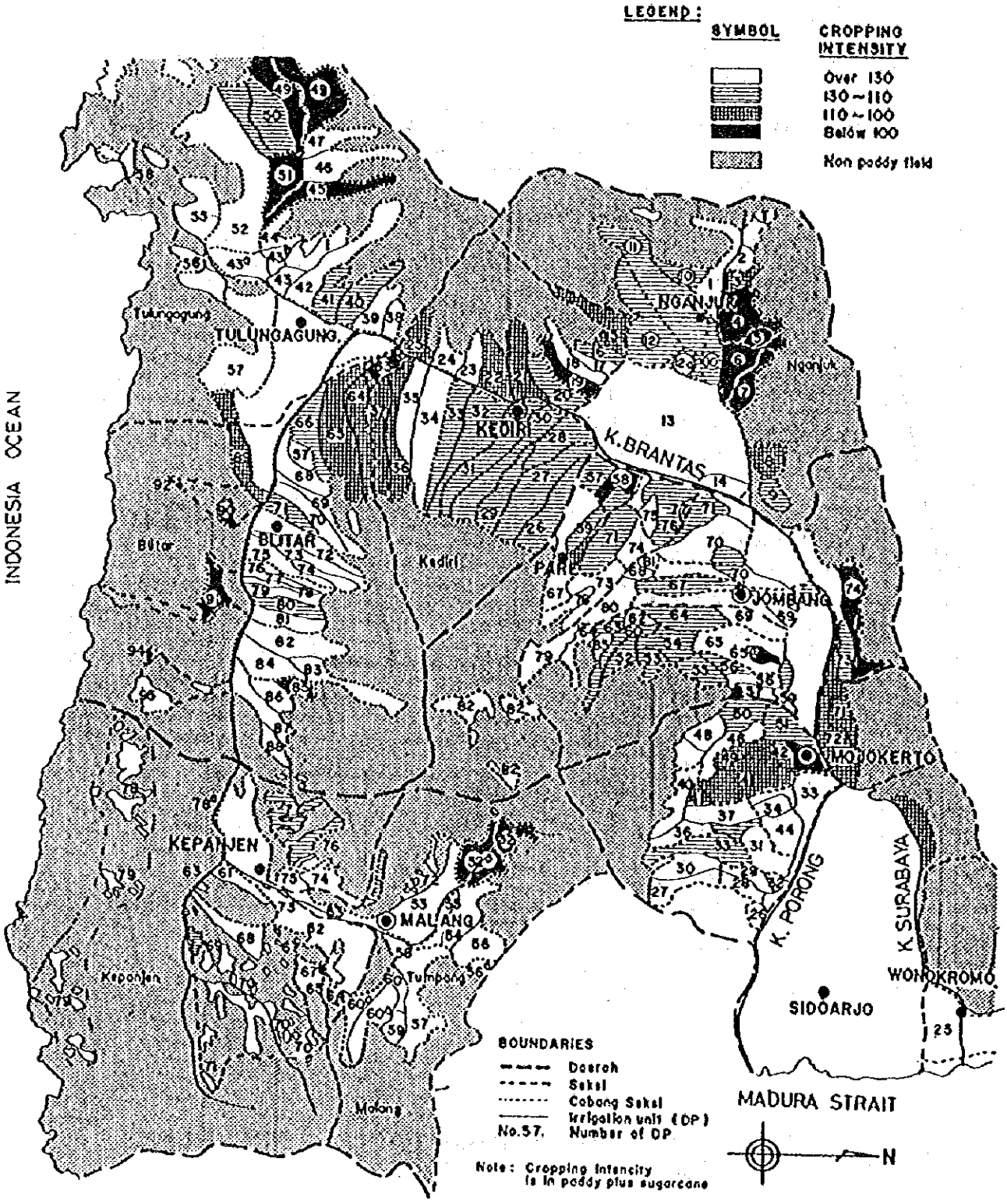


Fig. 3.3.4 DISTRIBUTION OF AREA WITH LOW CROPPING INTENSITY.

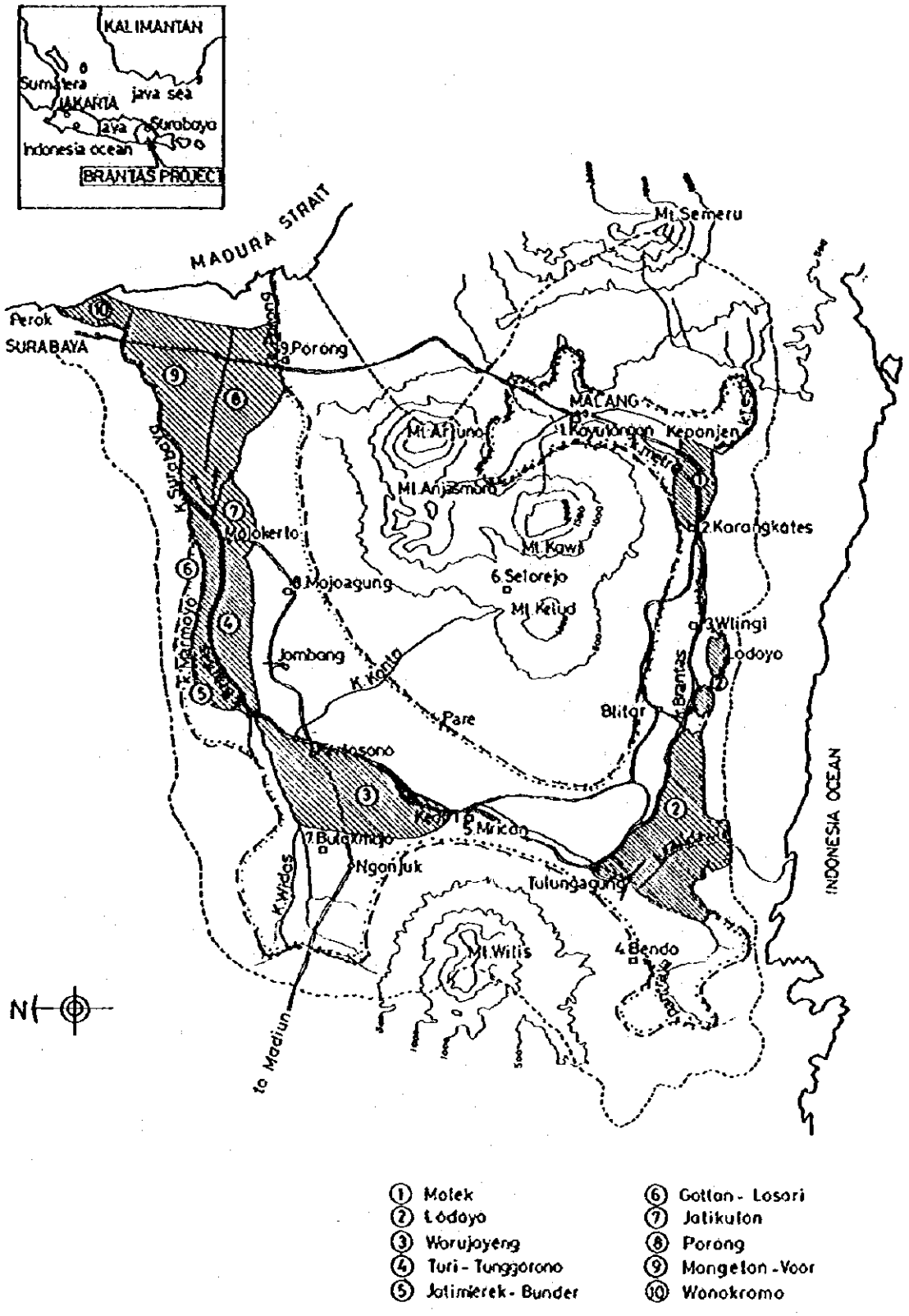
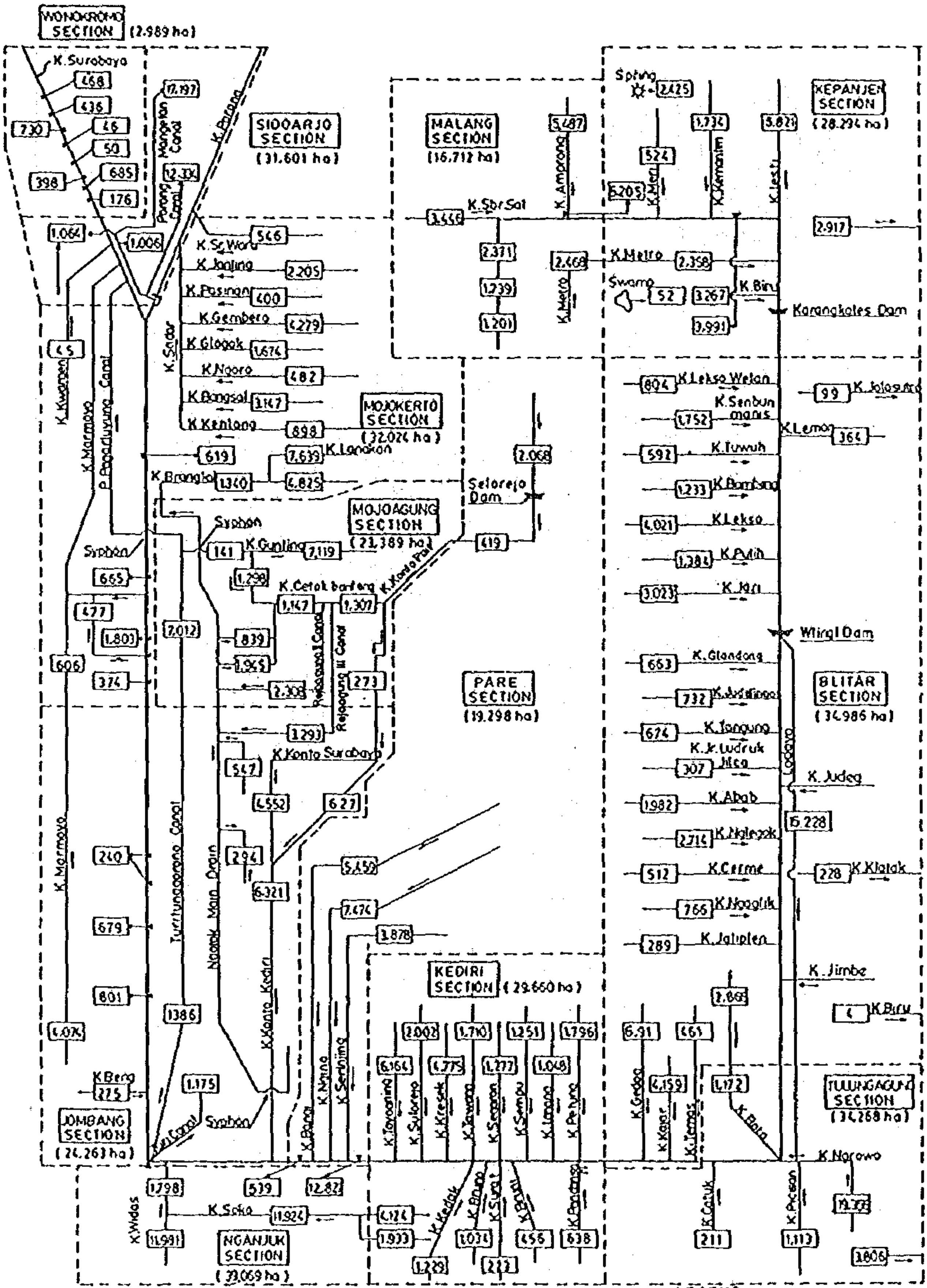


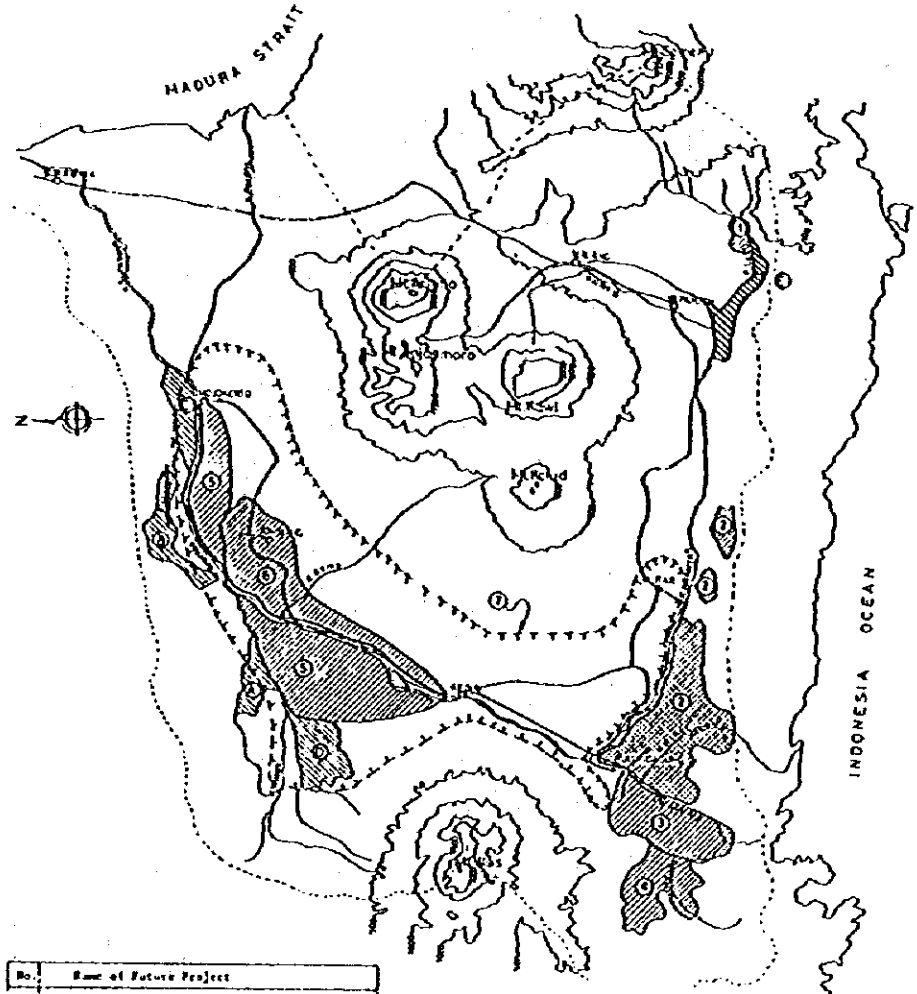
Fig. 3.3.5 IRRIGATION AREA IN THE K. BRANTAS BASIN



SOURCE : AI.52

LEGEND
- Acreage of irrigated land
- River or canal
- Boundary of section
- Inlake

Fig. 3.3.6 IRRIGATION NETWORK MAP



No.	Name of Future Project
A	Widas Extension Project
B	Bong Irrigation Project
C	Gottan-Lesari Irrigation Project
D	Widas South Irrigation Project
E	Lesti Tafe Bank Irrigation Project

No.	Name of Project	Stage
1	Leesti Irrigation Project	Pre - F/S
2	Lodaya Irrigation Project	Const
3	Mancanja Dam and Irrigation Project	D/D
4	Brangkalah Irrigation Project	F/S
5	Varujayeng-Turi Tunggorono Project	D/D
6	Pagar-Petarongan Irrigation Project	F/S
7	East Java Ground Water Project	
*	East Java Rehabilitation Project	Const

LEGEND
: Future Project (A, B, C, D, E)
: On-going Project (2)
: Studied Project (1 3 4 5 6)
: East Java Ground Water Project (7)

Note: 1) Pre-F/S : Pre-Feasibility Study
F/S : Feasibility Study
D/D : Detail Design
Const : Construction

2) The East Java Rehabilitation Project covers all irrigation areas except Lodaya, Varujayeng, Turi-Tunggorono and Brantas Delta

Fig. 3.3.7 LOCATION OF ON-GOING IRRIGATION PROJECT AND FUTURE IRRIGATION PROJECT

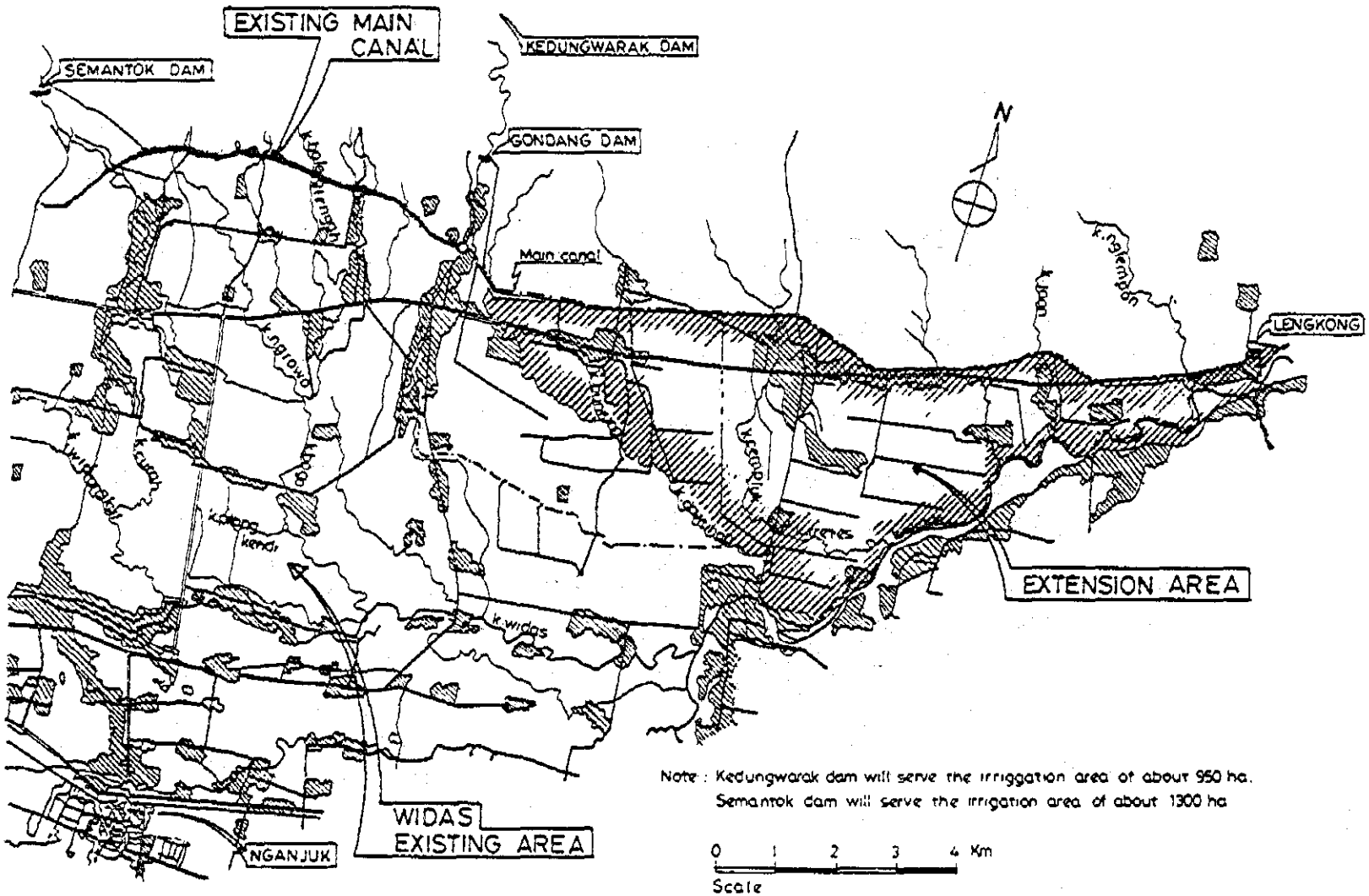


Fig : 3 - 3 - 8. GENERAL PLAN OF WIDAS EXTENSION AREA

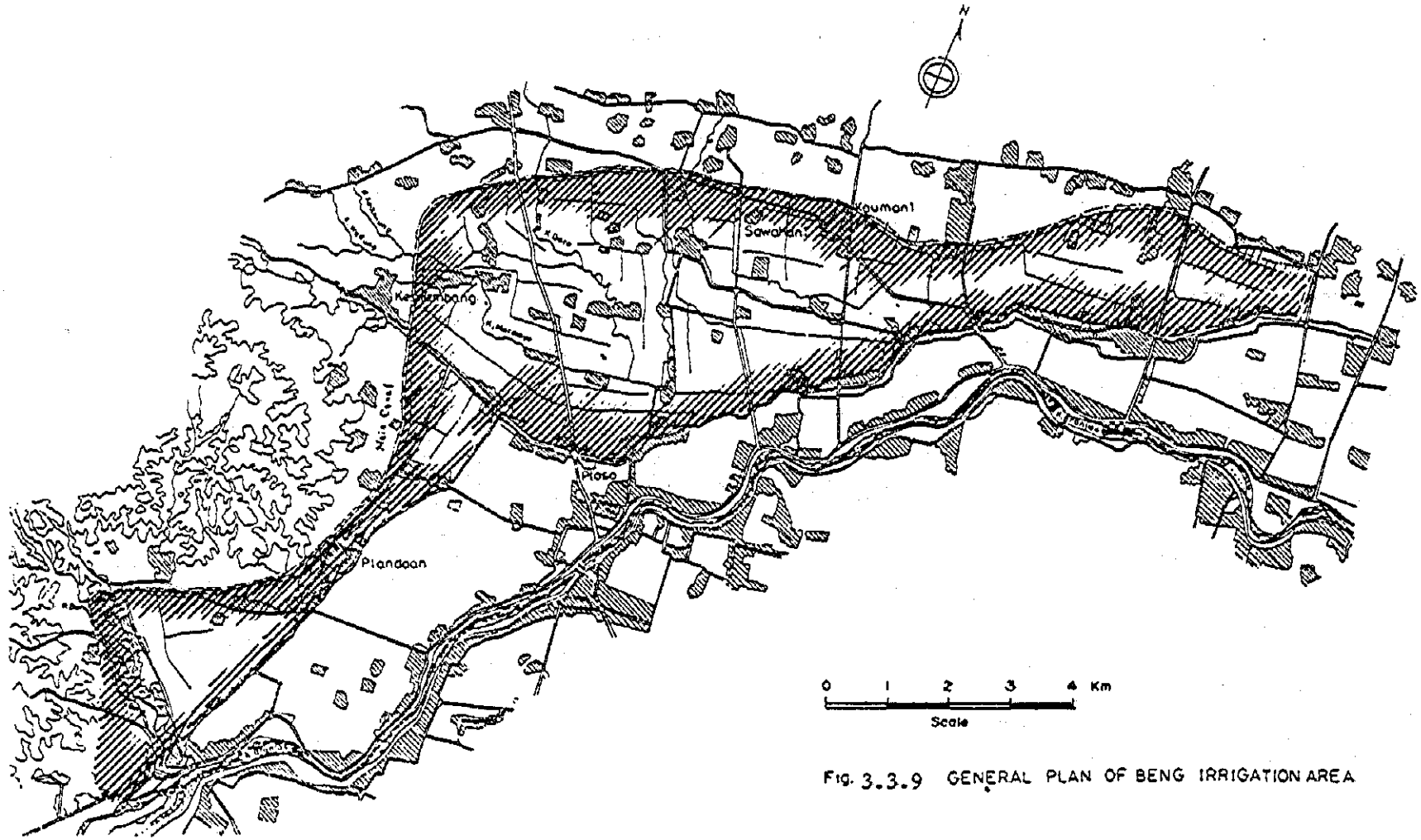


Fig. 3.3.9 GENERAL PLAN OF BENG IRRIGATION AREA

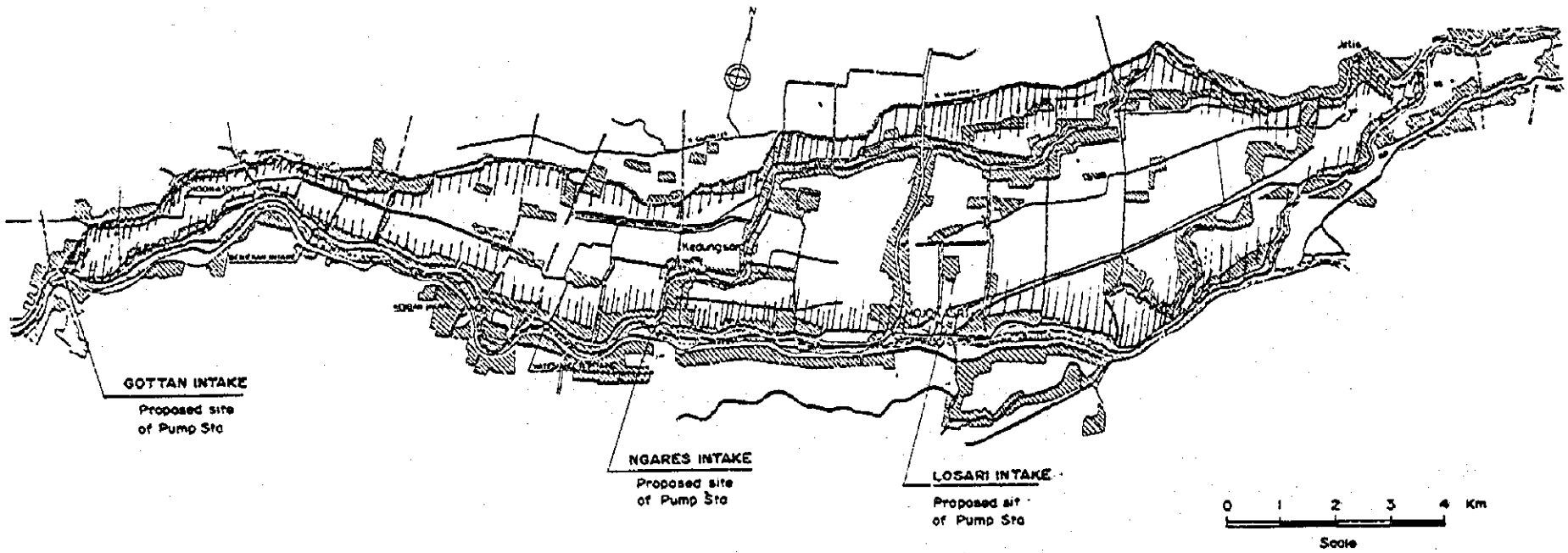


Fig. 3.3.10 GENERAL PLAN OF GOTTAN LOSARI IRRIGATION AREA

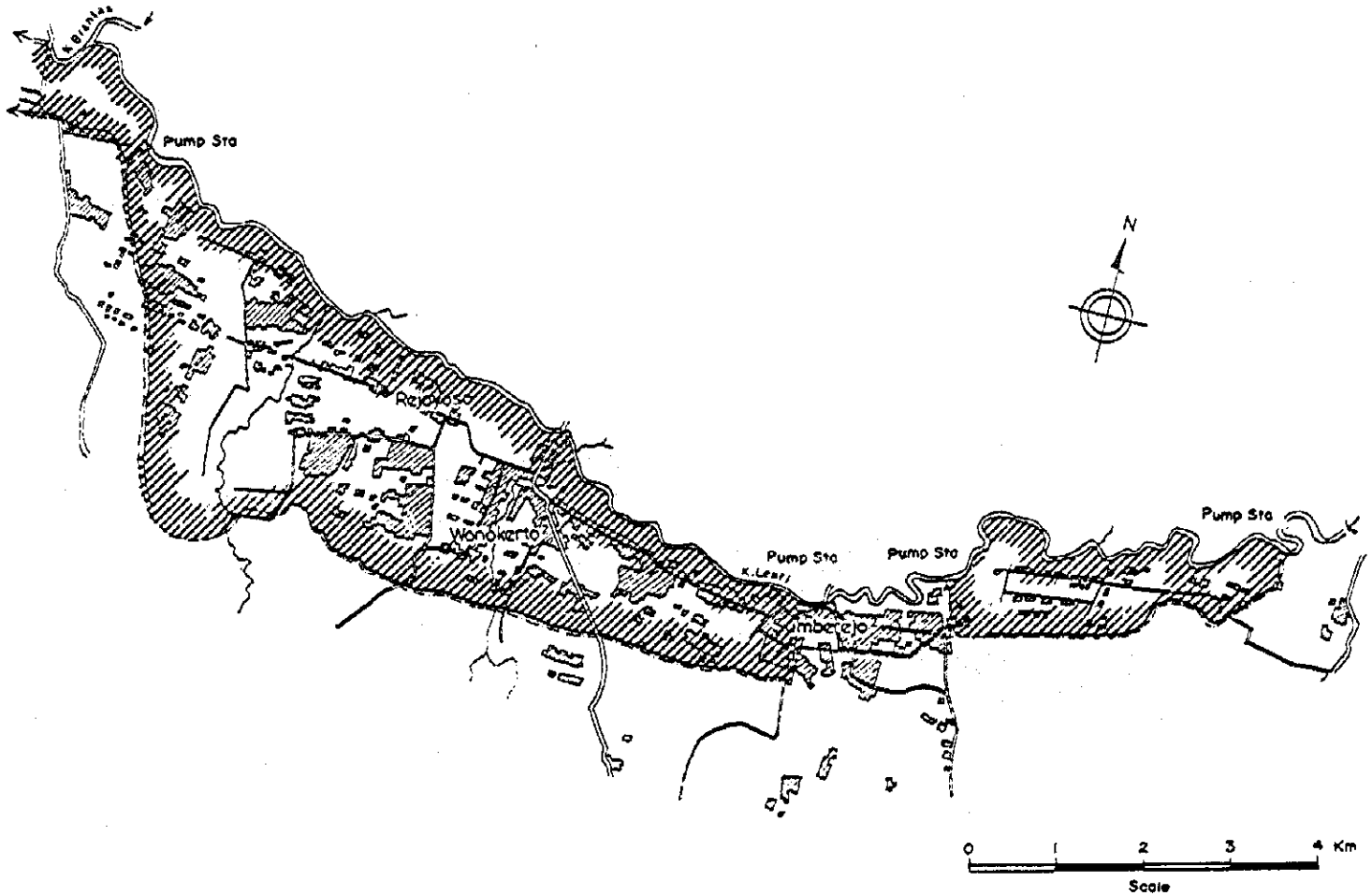


Fig. 3.3.11(1) GENERAL PLAN OF LESTI LEFT AREA
(Up-stream)

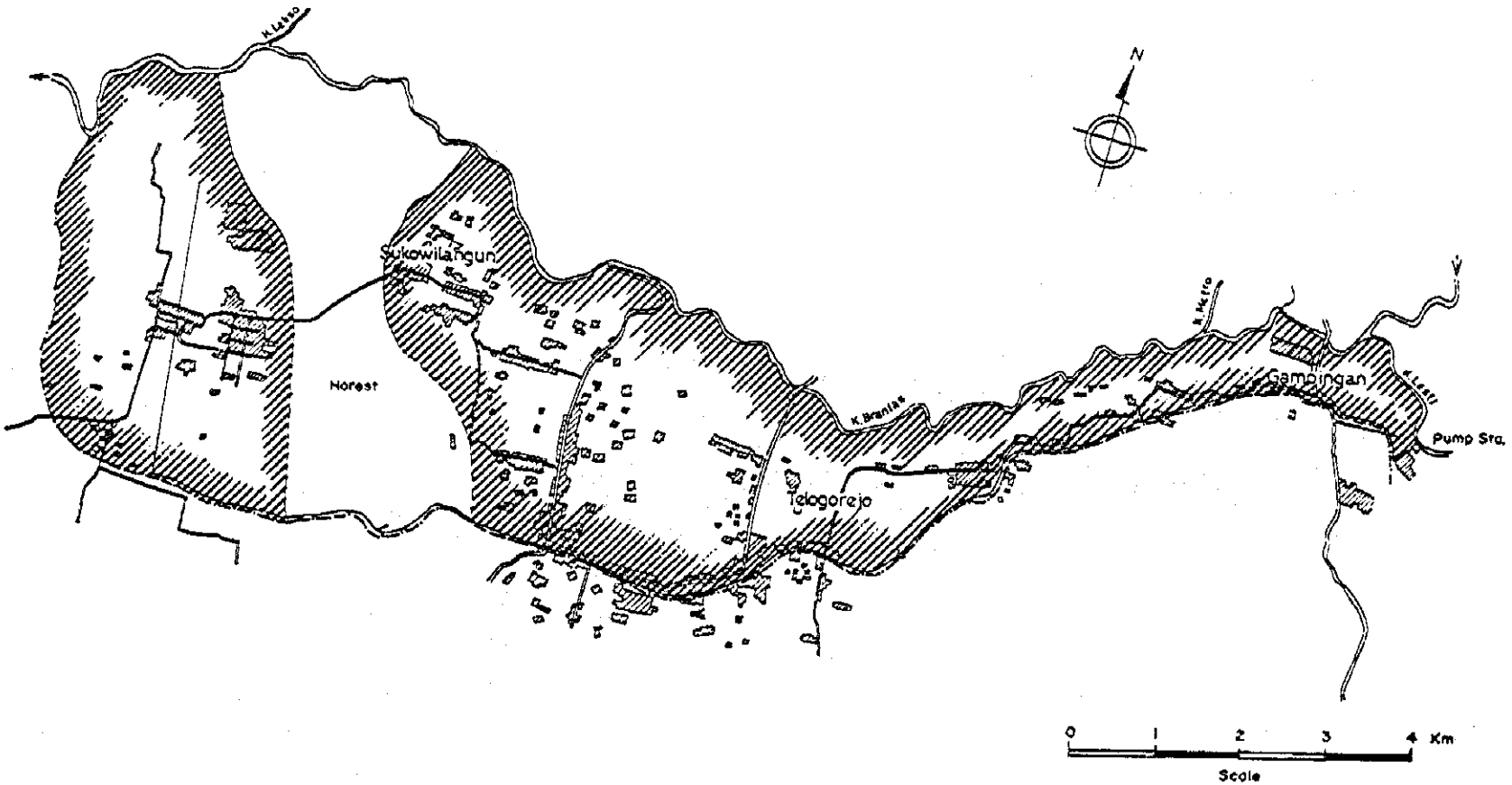


Fig. 3.3.11(2) GENERAL PLAN OF LESTI LEFT AREA
(Down-stream)

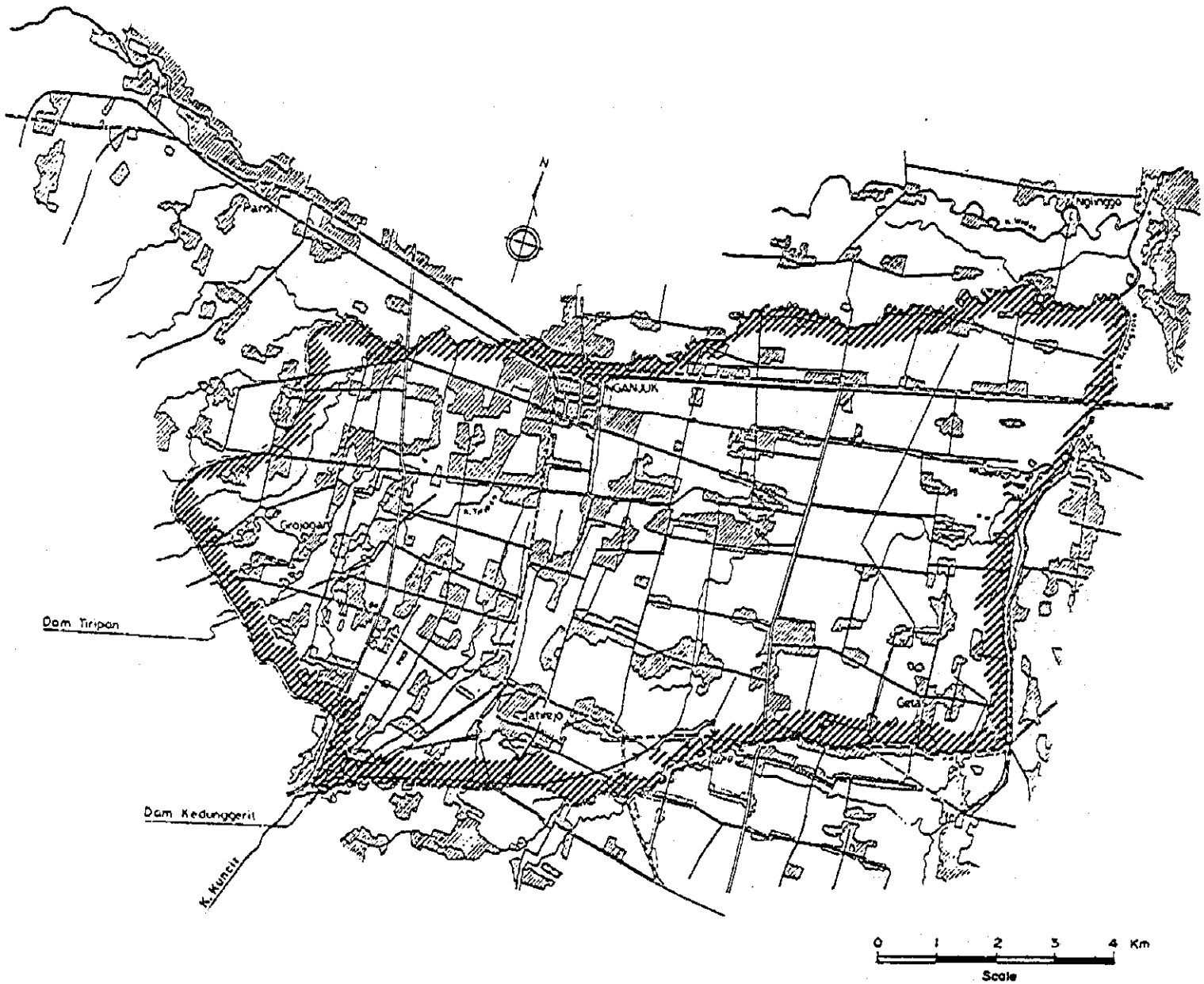
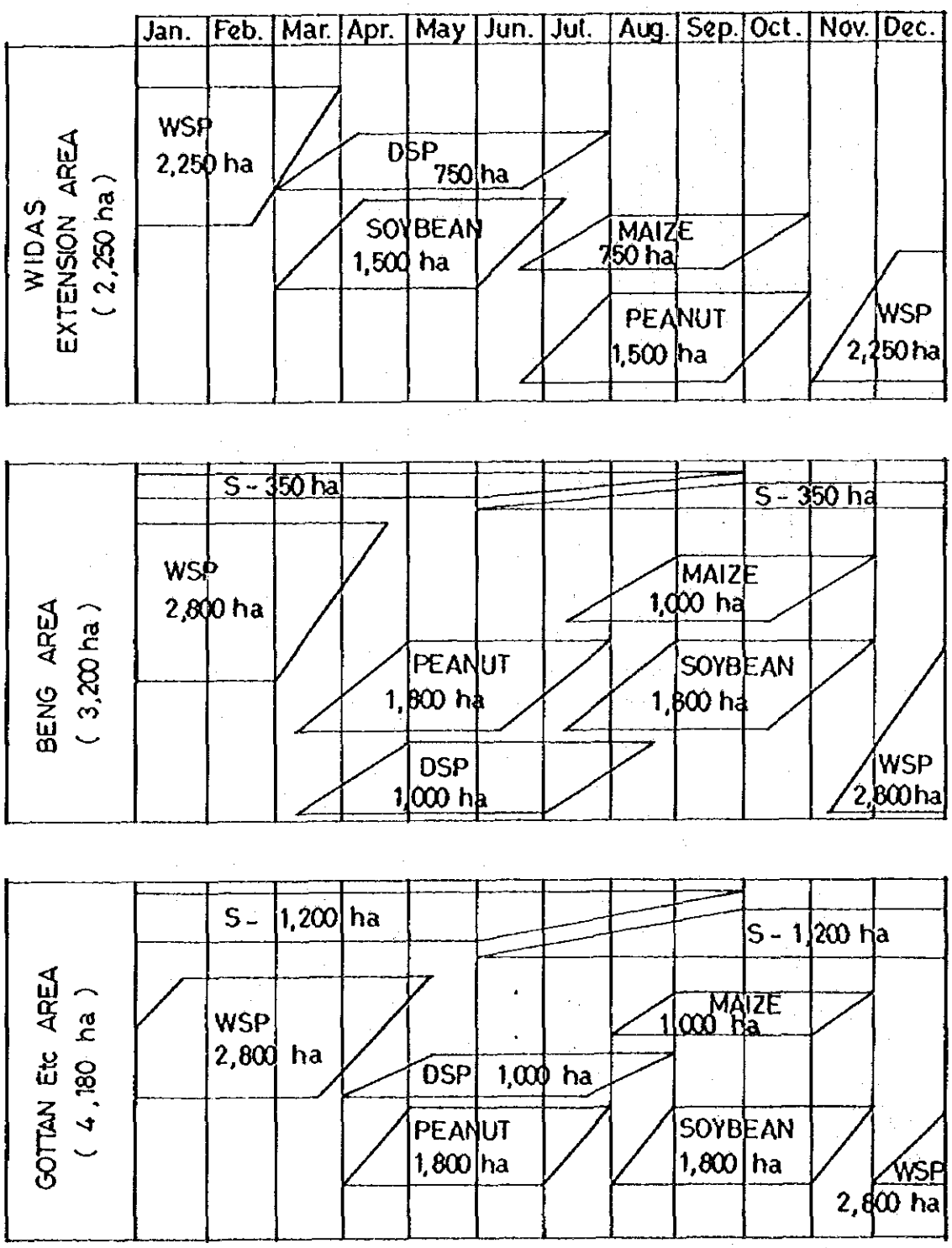
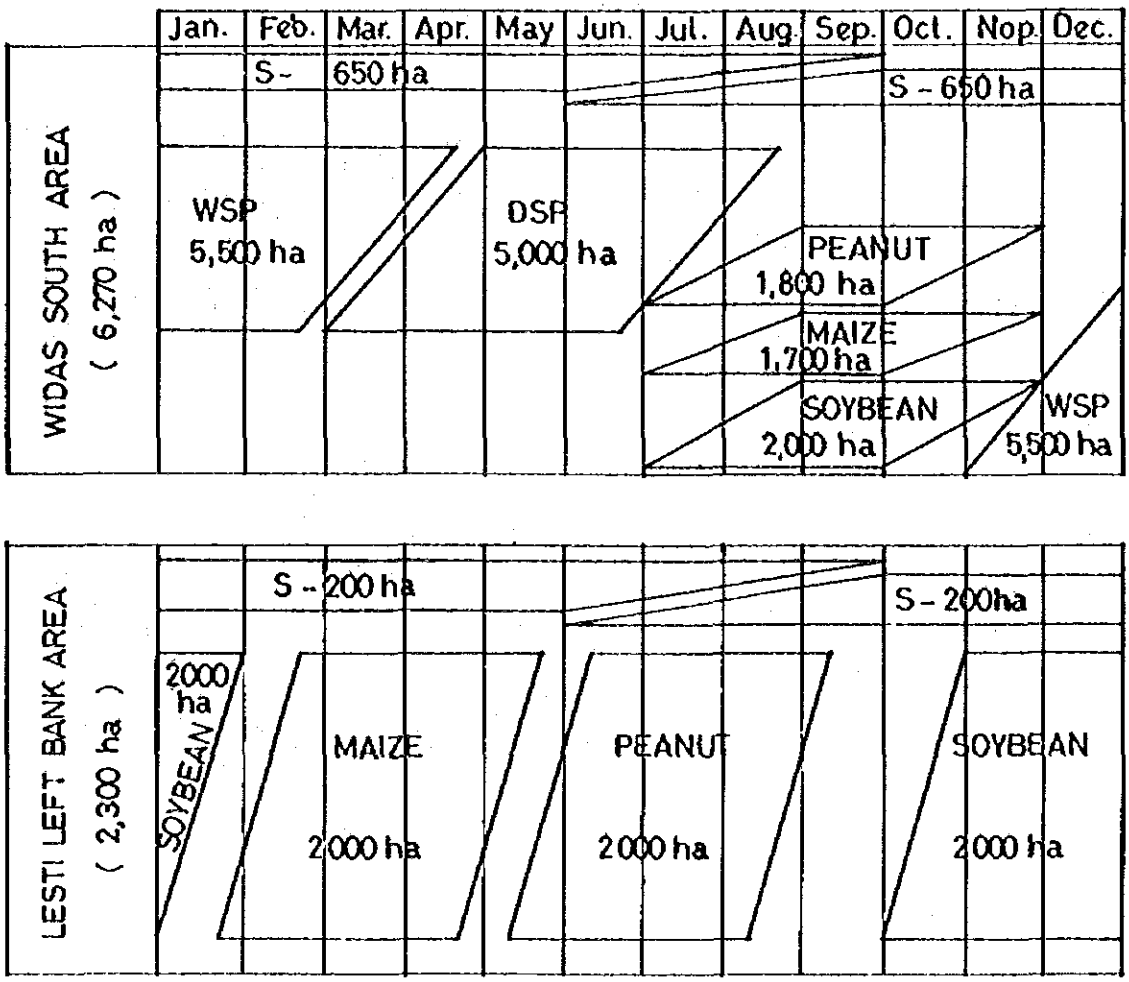


Fig. 3.3.12 GENERAL PLAN OF WIDAS SOUTH EXTENSION AREA



LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
S = Sugarcane
POL = Polowijo

Fig. 3.3.13 (1) FUTURE CROPPING PATTERN WITH PROJECT



LEGEND: WSP = Wet season paddy
DSP = Authorized dry season paddy
S = Sugarcane
POL = Polowijo

NOTE : Irrigation water is not to be supplied for polowijo crops in Widas south area due to shortage of storage capacity of the reservoir proposed in the K. Kuncir

Fig. 3.3.13 (2) FUTURE CROPPING PATTERN WITH PROJECT

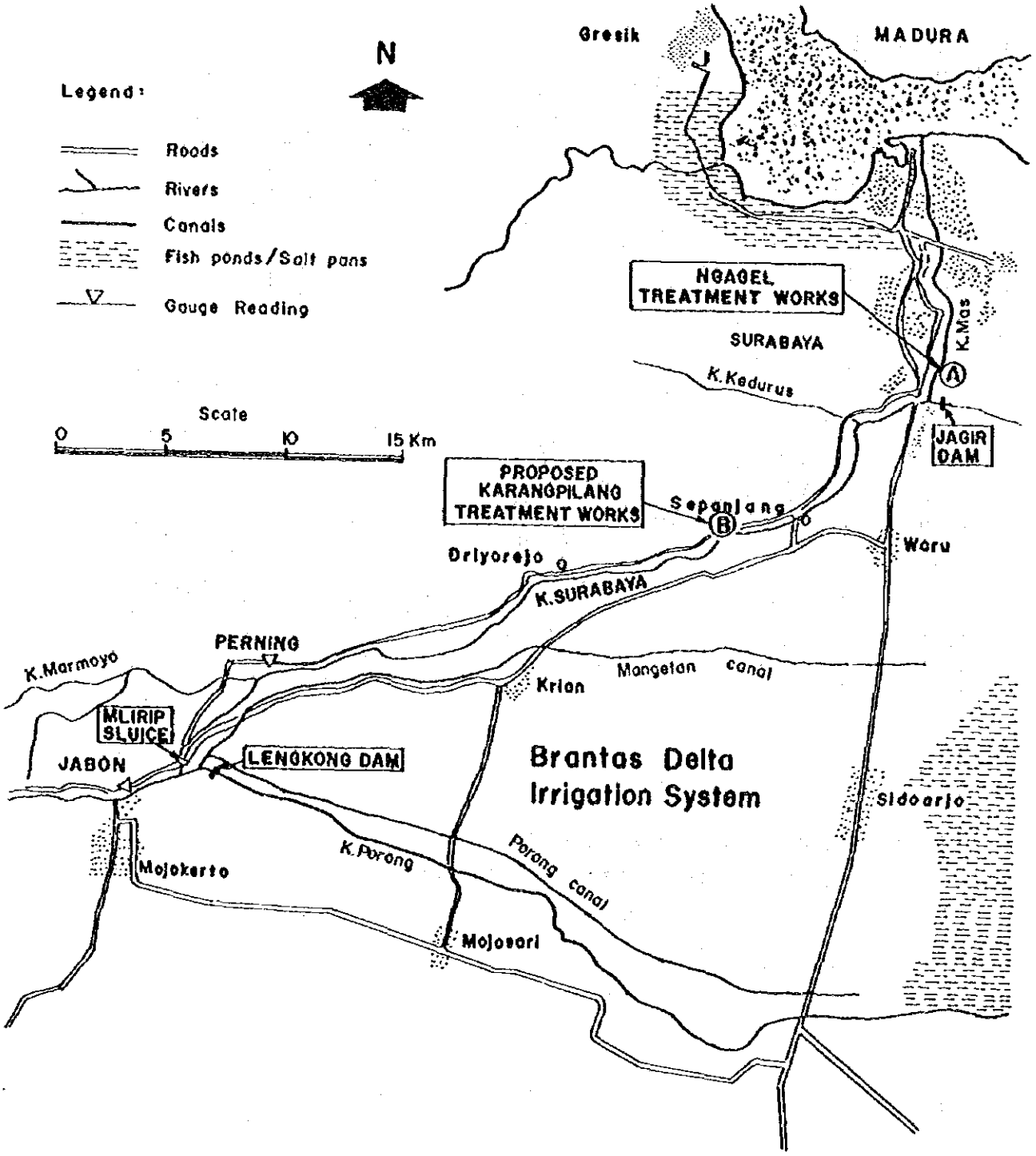


Fig. 3.4.1 LOCATION OF EXISTING NGAGEL AND PROPOSED KARANGPILANG TREATMENT WORKS

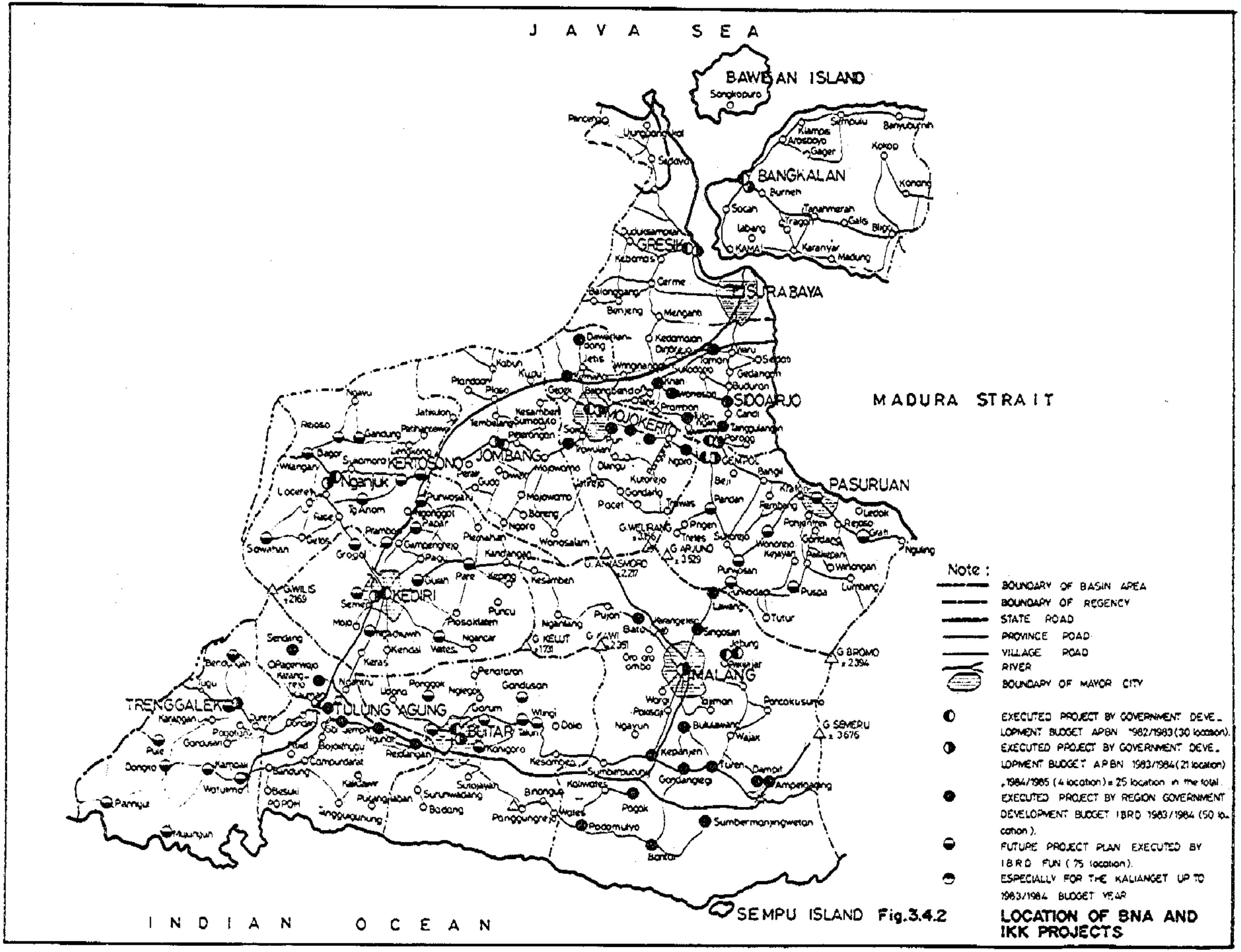


Fig.3.4.2 LOCATION OF BNA AND IKK PROJECTS

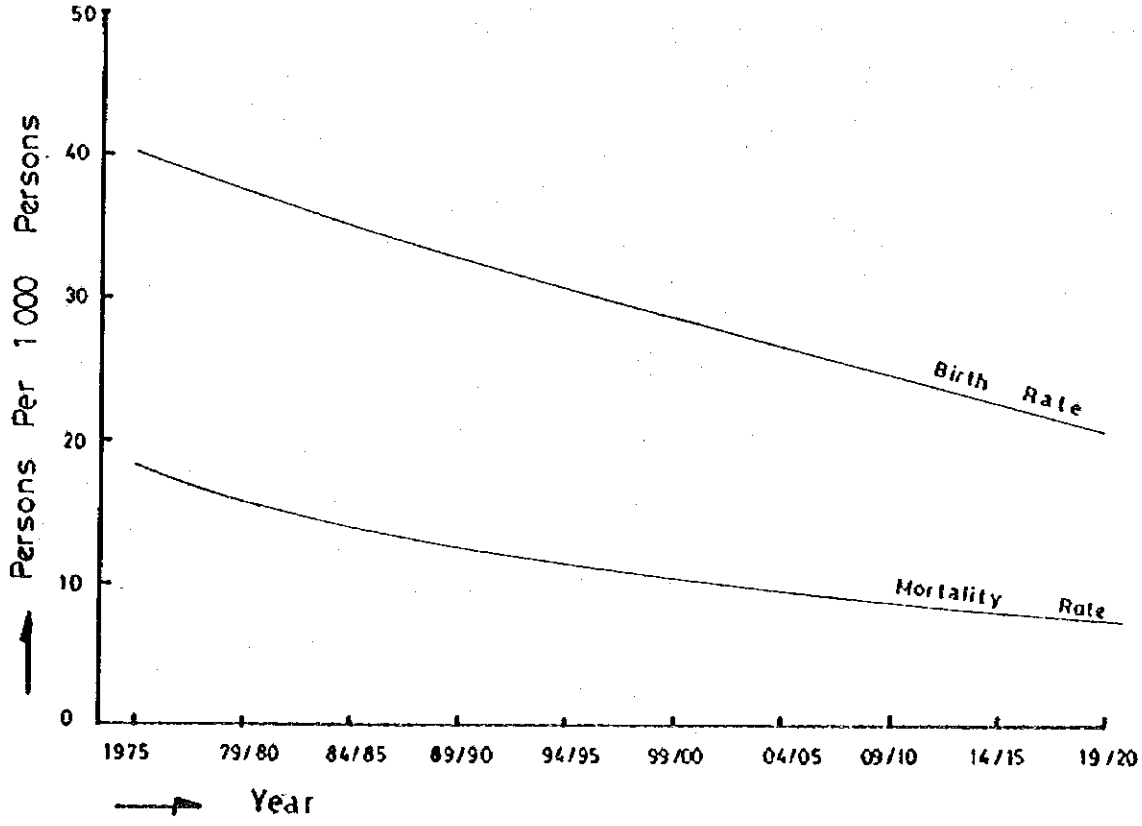


Fig: 3.4.3 BIRTH AND MORTALITY RATES IN INDONENESIA

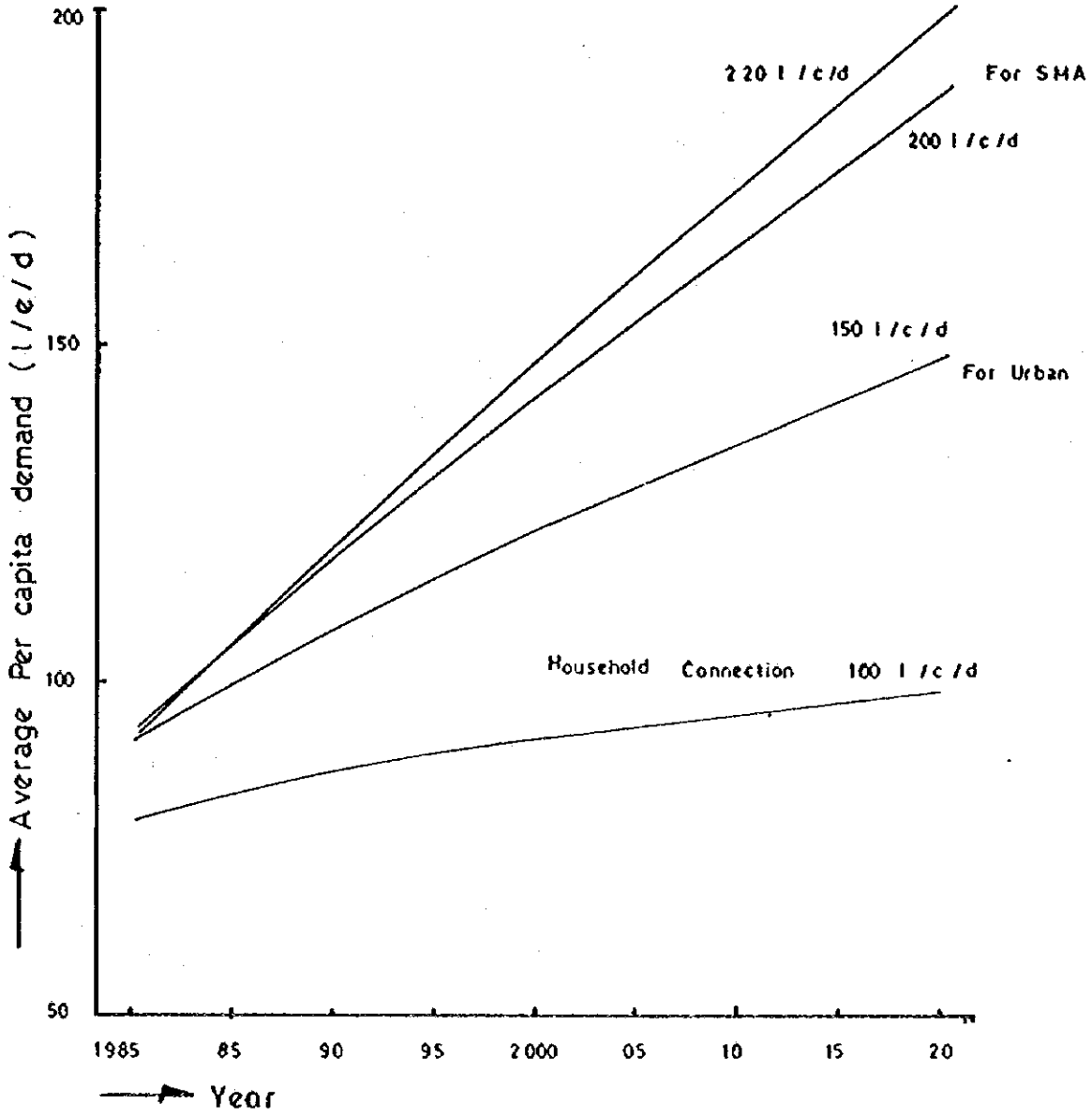


Fig: 3.4.4. PER CAPITA DOMESTIC WATER DEMAND

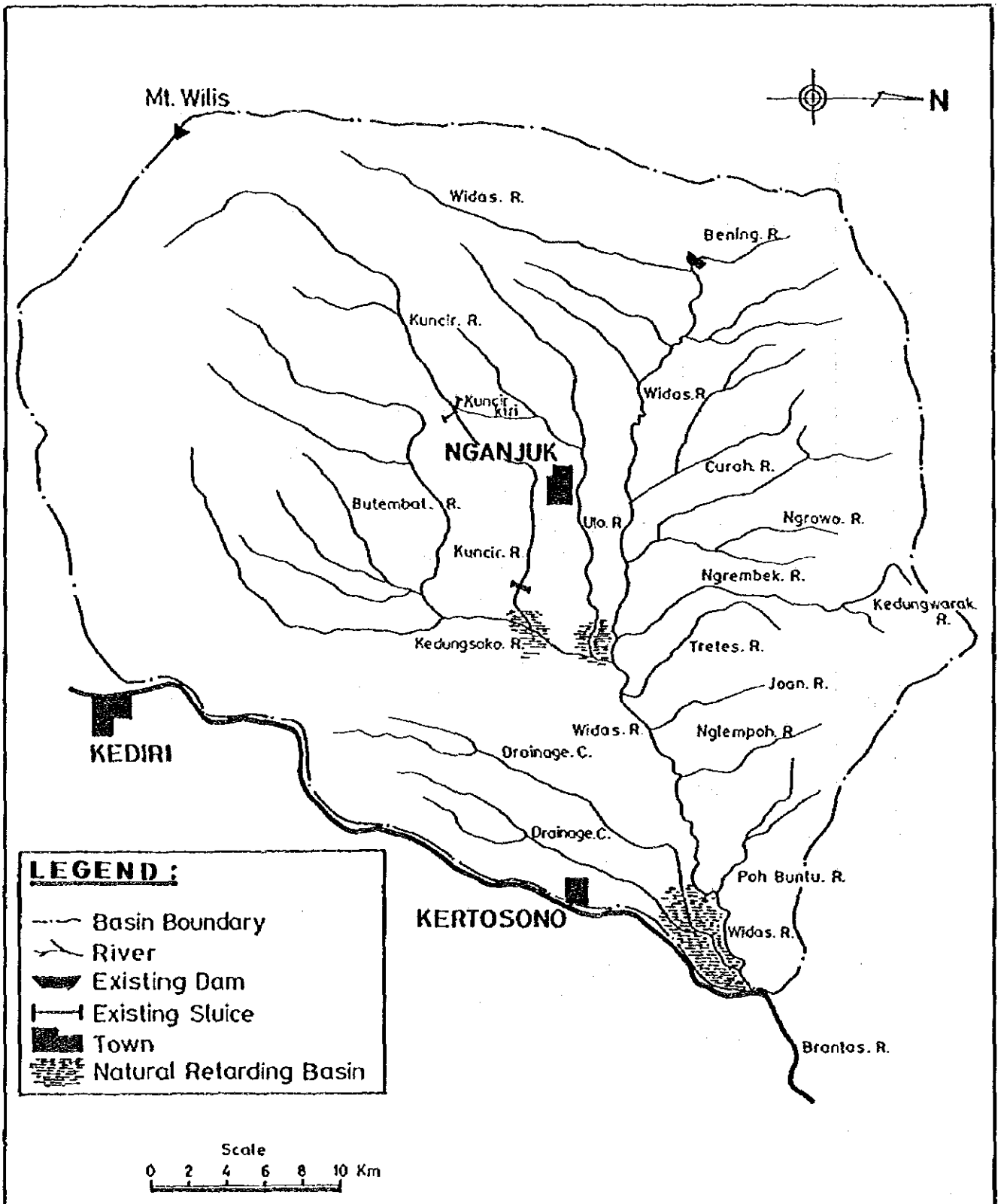
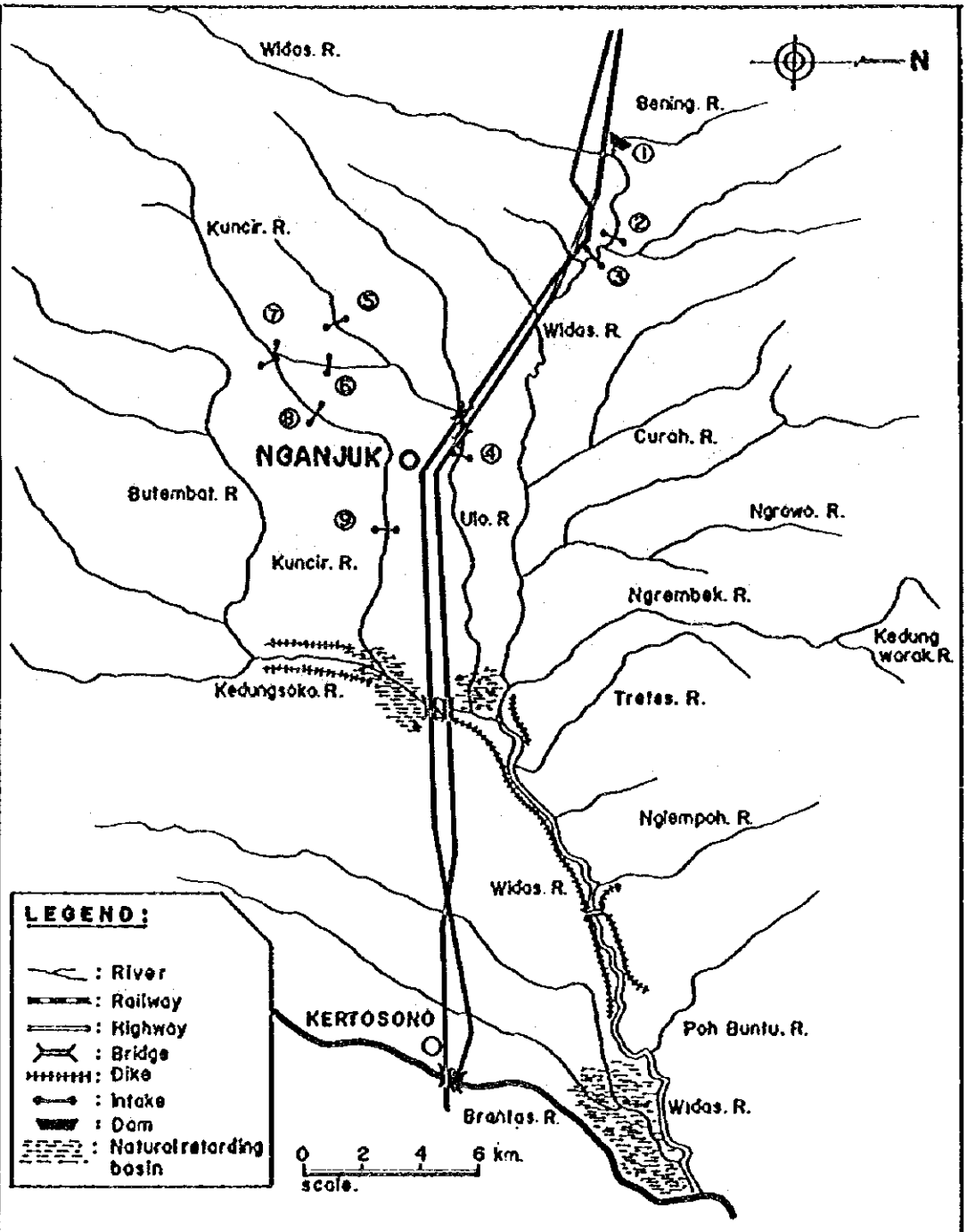


Fig. 3.5.1 RIVER SYSTEM OF THE WIDAS BASIN



REMARKS :

Dam

① Bening Dam

Intake

② Gelatik

③ Ngudikan

④ Dungdat

⑤ Kalipatan

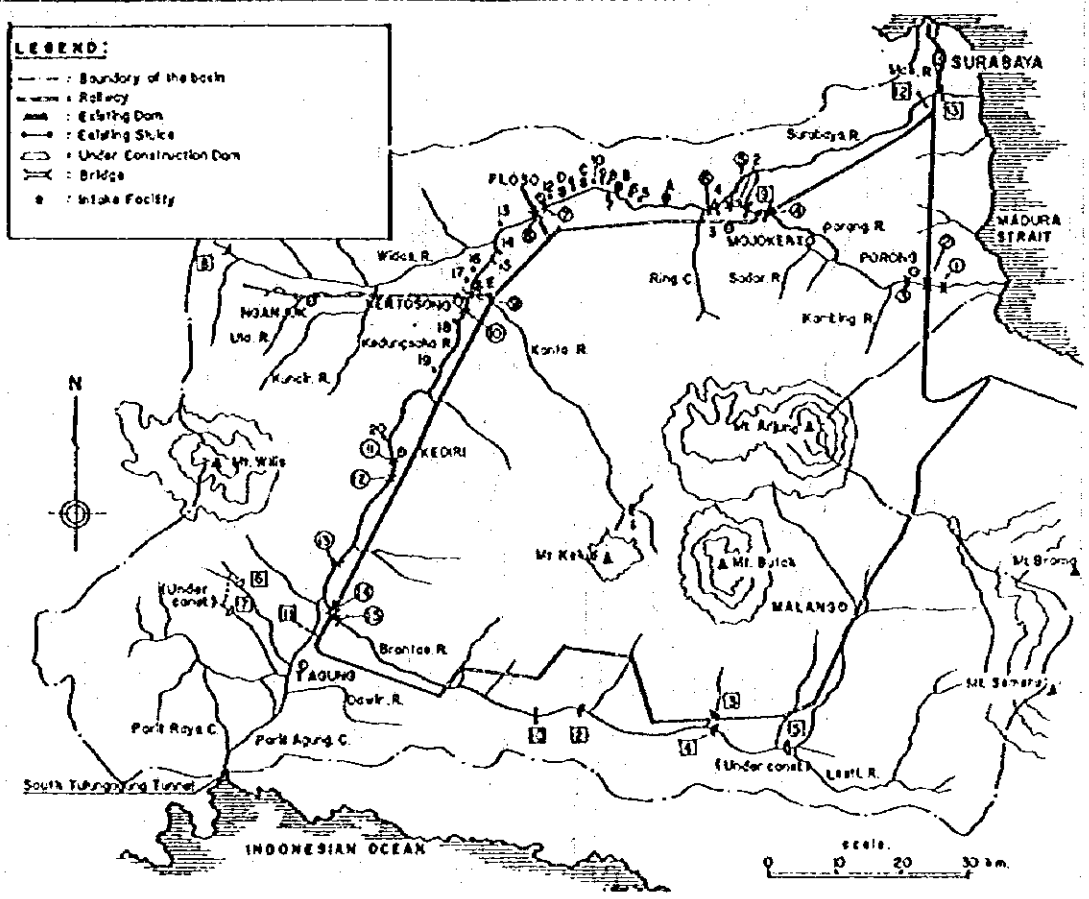
⑥ Titipan

⑦ Kuncir

⑧ Kedunggerit

⑨ Kapos

Fig. 3.5.2 **LOCATION MAP OF EXISTING RIVER STRUCTURE IN WIDAS BASIN.**



REMARKS :

Dam

1. Selorejo
2. Wlingi
3. Lahor
4. Karangkates
5. Sengguruh
6. Sagaya
7. Wonorejo
8. Bening
9. New Langkong
10. Ledoya
11. Tulungagung
12. Gunungsari
13. Jogik

Sluice:

Bridge

1. - (H)
2. Porong (R)
3. Porong (H)
4. - (R)
5. New Mojokerto (H)
6. Mojokerto (H)
7. Plaza (H)
8. Plaza (R)
9. Kertosono (R)
10. Kertosono (H)
11. Kediri (H)
12. New Kediri (H)
13. Jos (T)
14. - (R)
15. - (H)

Note:
R: Railway
H: Highway
T: Torcaty

1. Mlirip
2. Lesari
3. Gedek
4. Sotawuluh
5. Kedungsari
6. Wetesinggir
7. Keboan
8. Bebekan
9. Goten
10. Jatimlorek
11. Tunggorono
12. Turipinggir
13. Pengtel
14. Kedungbudi
15. Besuk
16. Banjarsari
17. Mirloan

Intake:

1. Voor II
2. Voor I
3. Jatikulon

Pumping station

A. Ajinomoto
B. Gempolkerep
C. Mentorus
D. Tepan
E. Bunder

Fig. 3.5.3 **LOCATION MAP OF EXISTING RIVER STRUCTURE IN PORONG AND BRANTAS RIVER.**

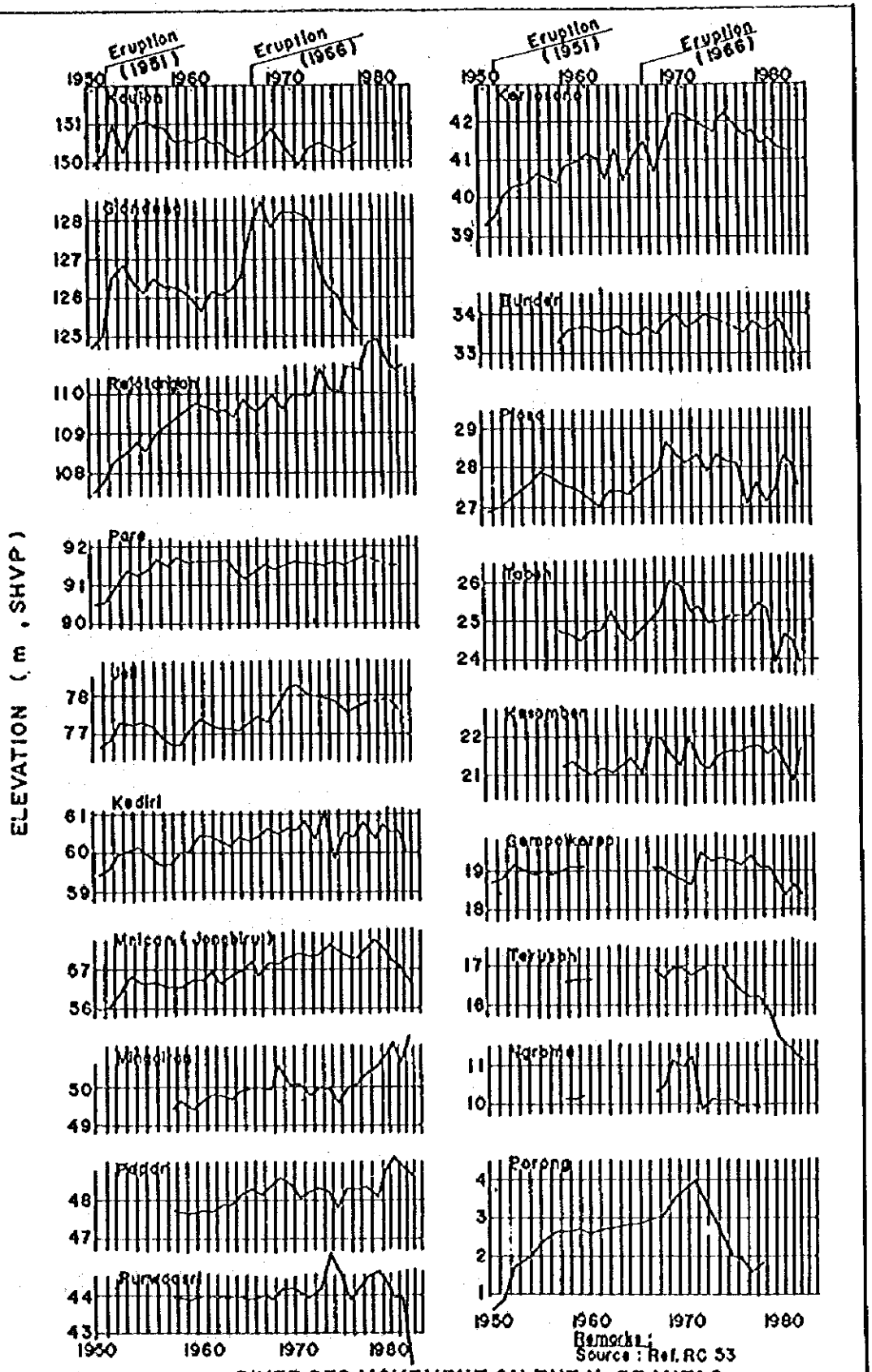


Fig. 3.5.4 RIVER BED MOVEMENT ON THE K. BRANTAS.

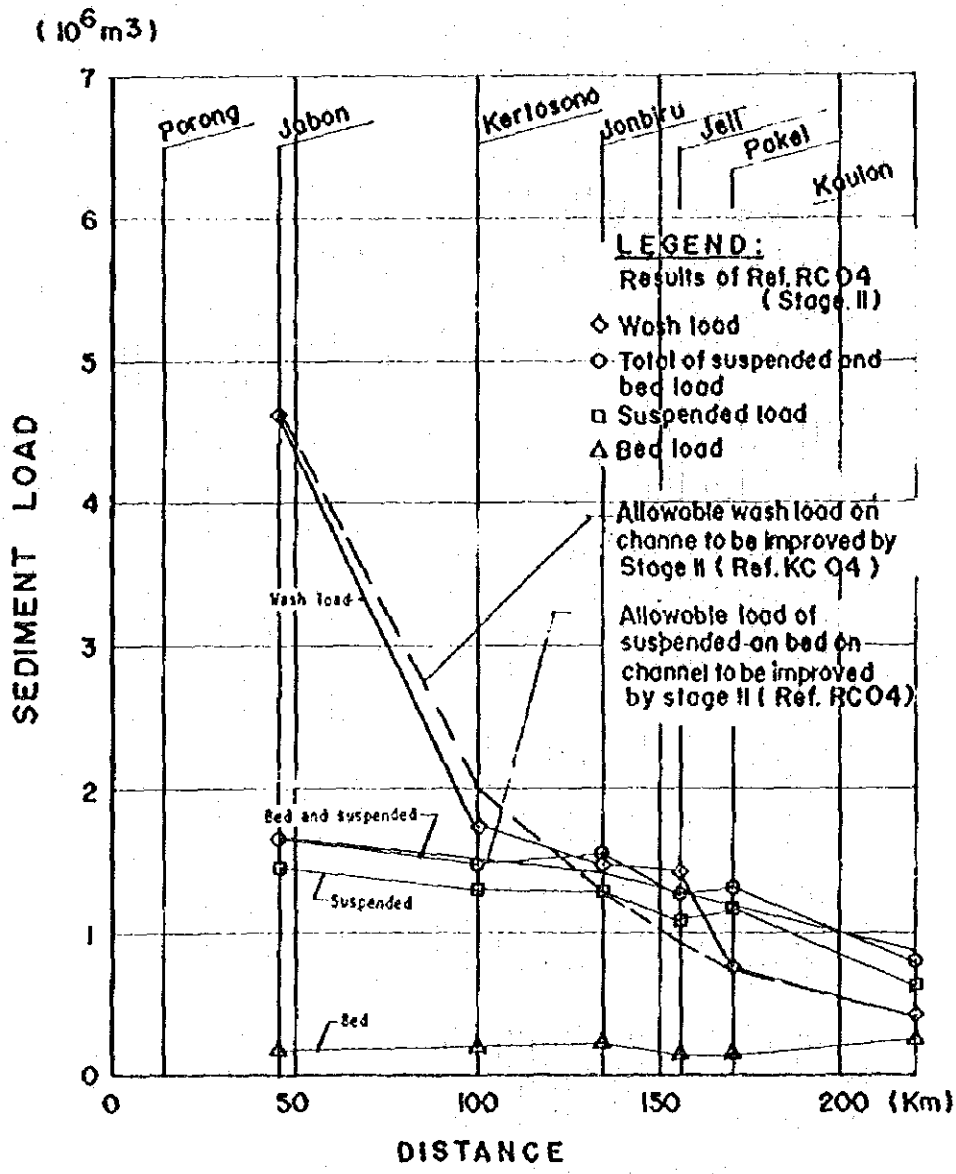


Fig.3.5.5 (1) **SEDIMENT LOAD ON THE K. BRANTAS**

(Design river channel section)

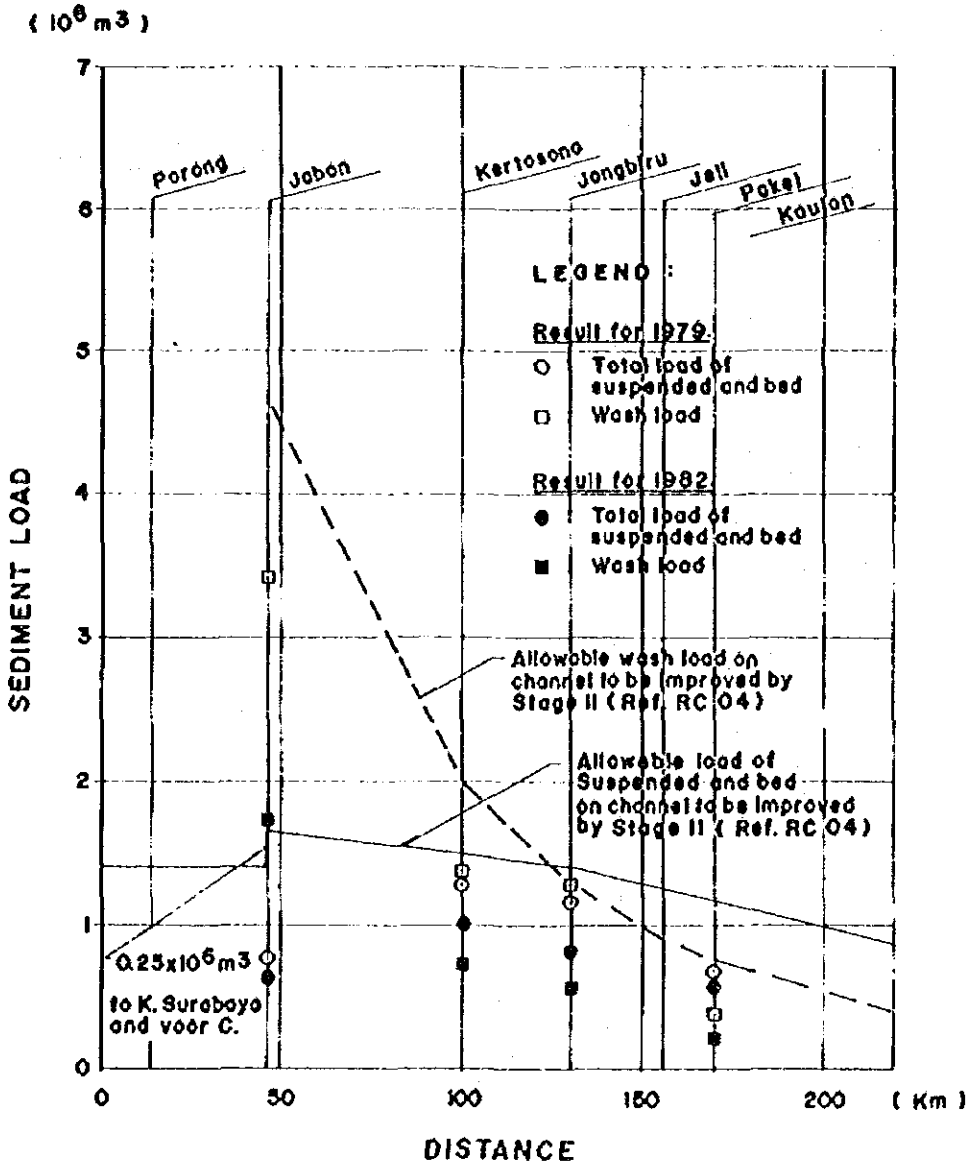


Fig. 3.5.5 (2) **SEDIMENT LOAD ON THE K. BRANTAS**

(Existing river channel)

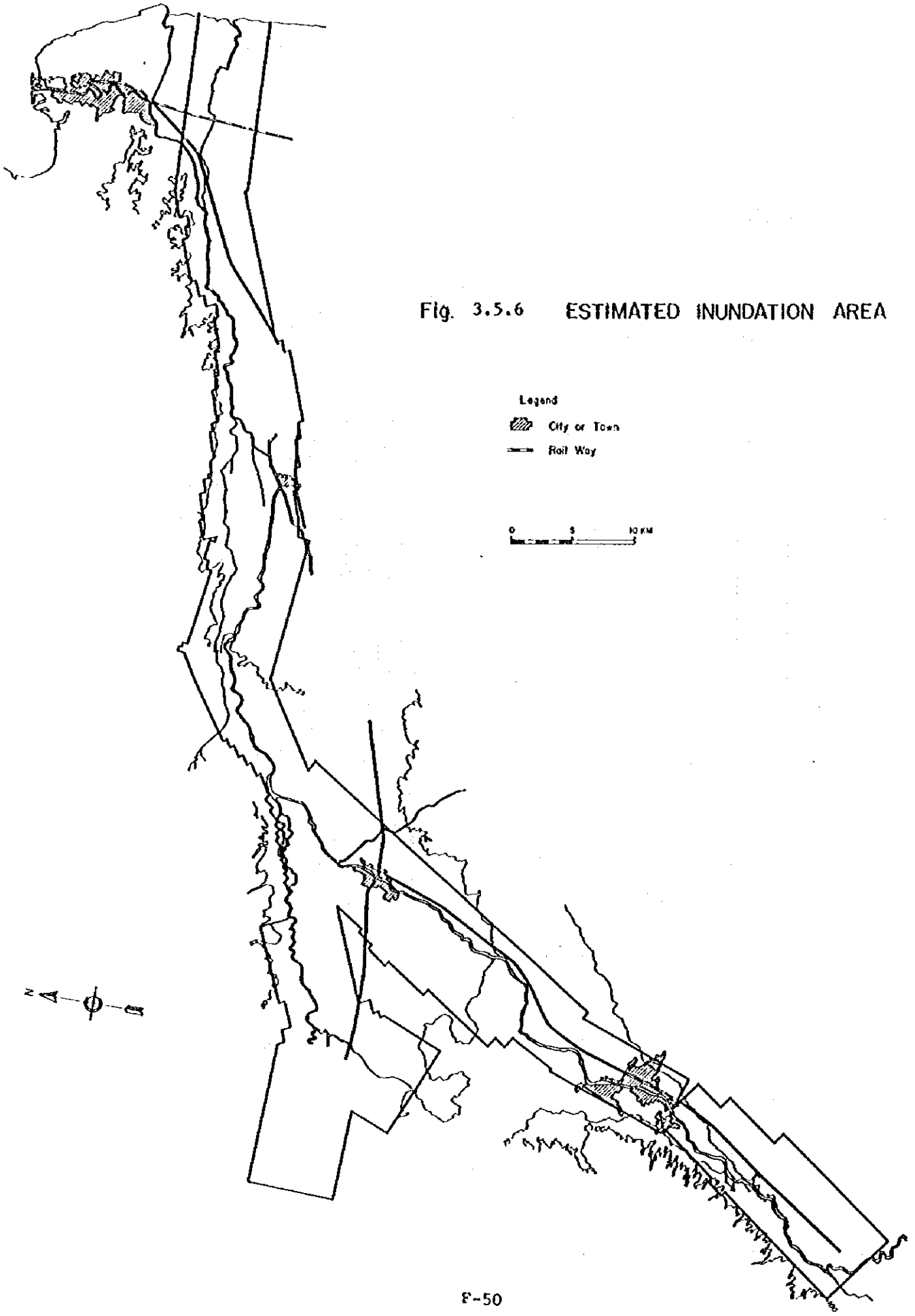


Fig. 3.5.6 ESTIMATED INUNDATION AREA

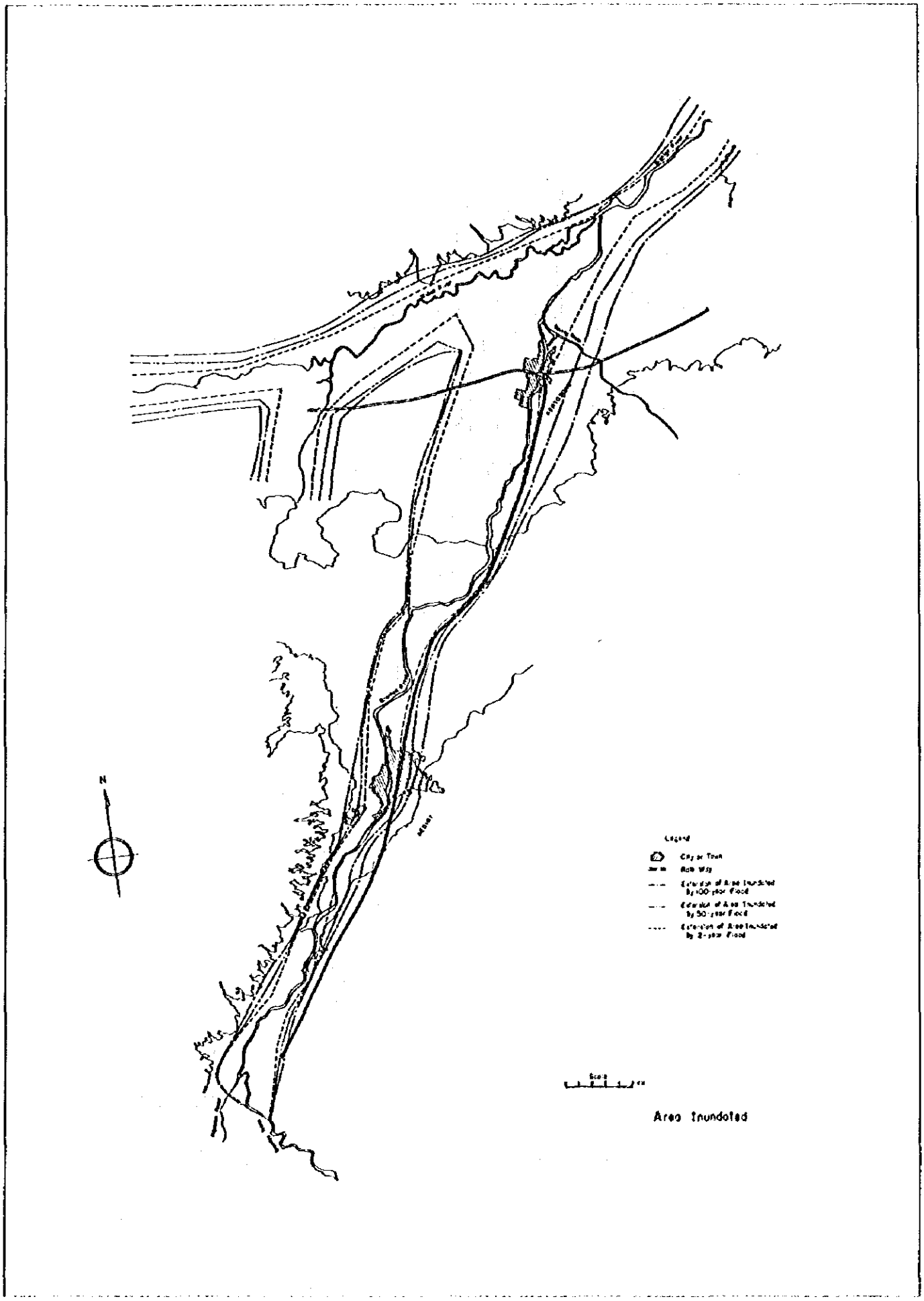


Fig.: 3.5.7 (1) INUNDATION AREA DUE TO PROBABLE FLOOD

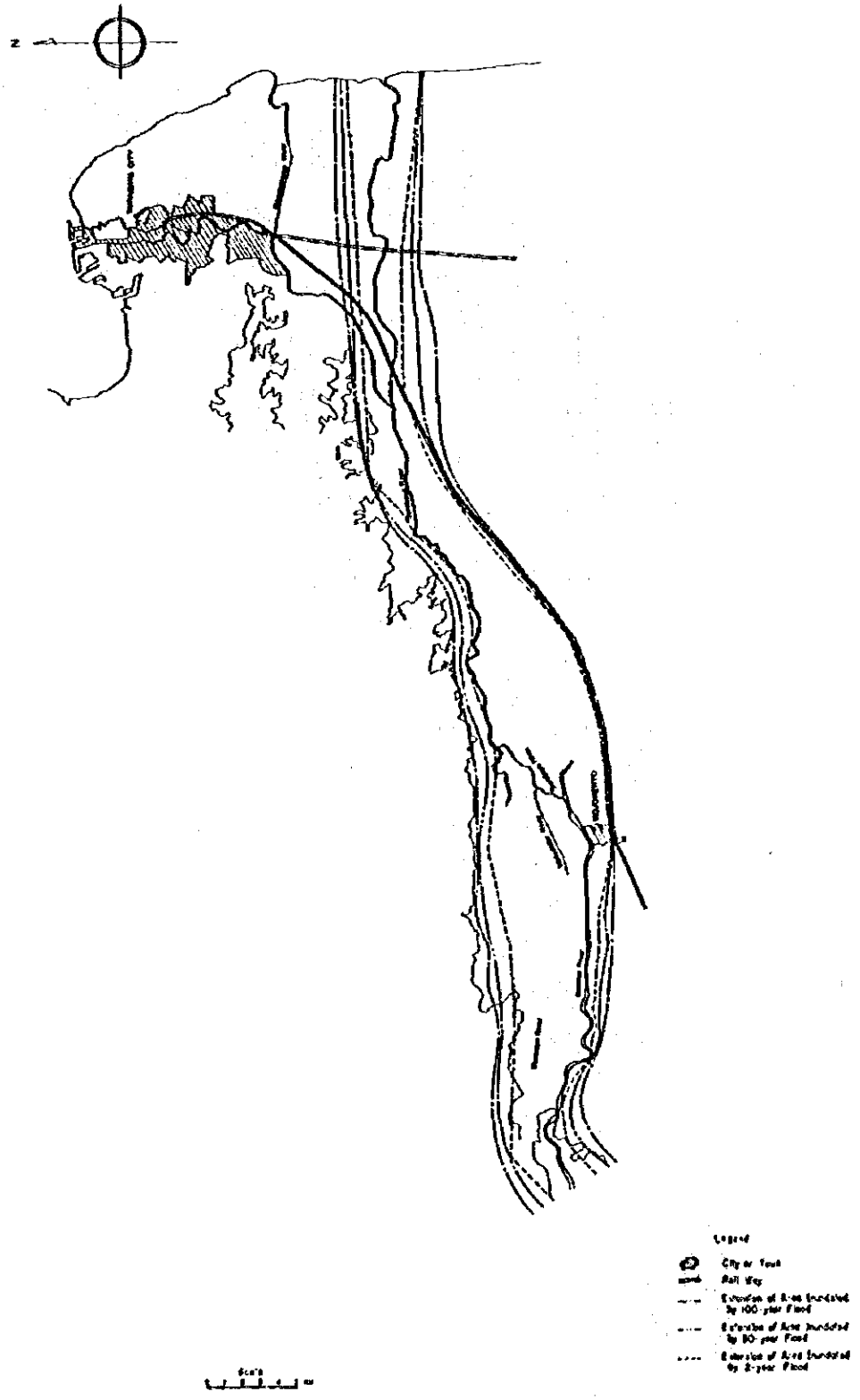
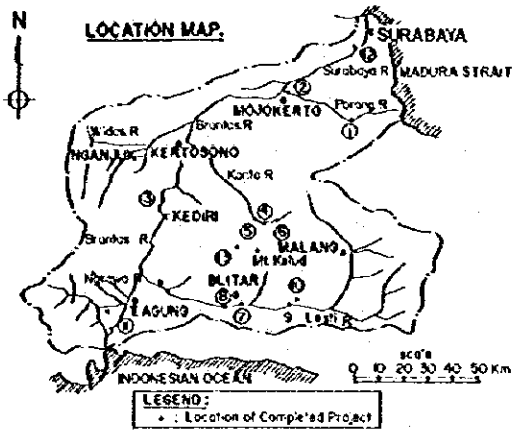


Fig. 3.5.7 (2) INUNDATION AREA DUE TO PROBABLE FLOOD



COMPLETED FLOOD CONTROL PROJECT

Location No.	Project / Works	Completed year
①	Kali Porong River Improvement Project	1977
②	New Lengkong Dam Project	1973
③	Brantas Middle Reach River Improvement Project (stage 1)	1985 *1
④	Selorejo Dam Project	1970
⑤	Mendalan Sabo Dam Project	1973
⑥	Tokal Sabo Dam Project	1975
⑦	Wlingi Raya Dam Project	1977
⑧	Lodoyo Dam Project	1980
⑨	Karangkates Dam Project	1972
⑩	Lahor Dam Project	1977
⑪	Tulungagung Drainage Project (Phase I) still under	1985 *1
⑫	Kali Surabaya River Improvement Project	1981
⑬	Mt Kelud Debris Control Project	*1

Remarks
* 1 : Not yet completely finished and still under construction
Source : Ref RC 14

Fig. 3. 5. 8 LOCATION MAP OF COMPLETED FLOOD CONTROL PROJECT

ON GOING FLOOD CONTROL PROJECT

Location No.	Project / Works
①	Dredging Works of Porong River Mouth (maintenance)
②	Rehabilitation of Existing Levee of Porong River (maintenance)
③	Brantas Middle Reach River Improvement Project (stage II) *1
④	Tulungagung Drainage Project (phase I & II)
⑤	Dredging And Excavation Works Mas River (maintenance)
⑥	Dredging Works at Morokrembangan Boezem (maintenance)

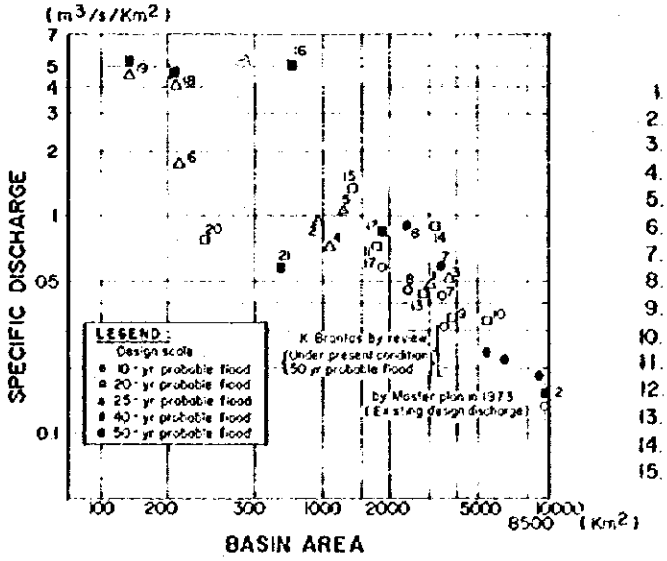
Remarks
* 1 : Not yet started, and is commened in the coming fiscal year (1985/1986)

PROPOSED FLOOD CONTROL PROJECT

1	Widas Lower Reach and Mricon Barrage (Partial river improvement)
2	Widas Flood Control and Drainage
3	Drainage Improvement of Western Urban Area and Kedurus River Basin
4	River Improvement Works by Mt. Kelud Project
5	Tulungagung Drainage Project (phase III & IV)

Remarks
Source : RC 14

Fig. 3. 5. 9 LOCATION MAP OF ON GOING AND PROPOSED FLOOD CONTROL PROJECT



1. Cimanuk R
2. Serang R.
3. Citandui R.
4. Ular R.
5. Pemali R.
6. Cipanas R.
7. Solo R.
8. Madiun R.
9. Wampu R.
10. Arakundo R.
11. Aceh R.
12. Brantas R.
13. Boh Bolon R.
14. Walanae R.
15. Bila R.
16. Jeneberang R.
17. Ciujung R.
18. Kuranji R.
19. Air Dingin R.
20. Marmoyo R
21. Surabaya R.

Fig. 3. 5.10 RELATIONSHIP BETWEEN SPECIFIC DISCHARGE AND BASIN AREA FOR RIVERS IN INDONESIA

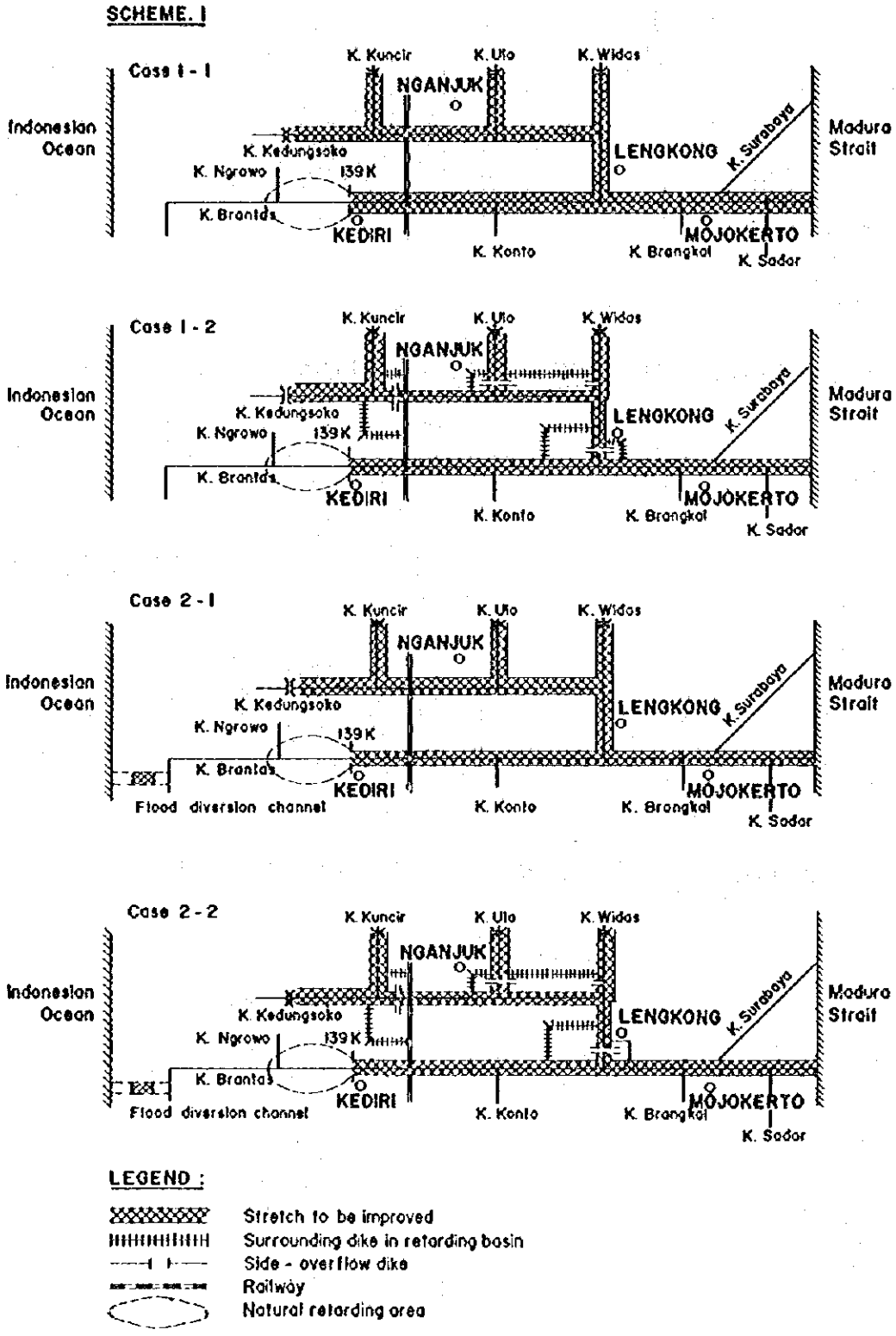


Fig. 3.5.11 (1) ALTERNATIVE SCHEME FOR COMPARATIVE CASE STUDY

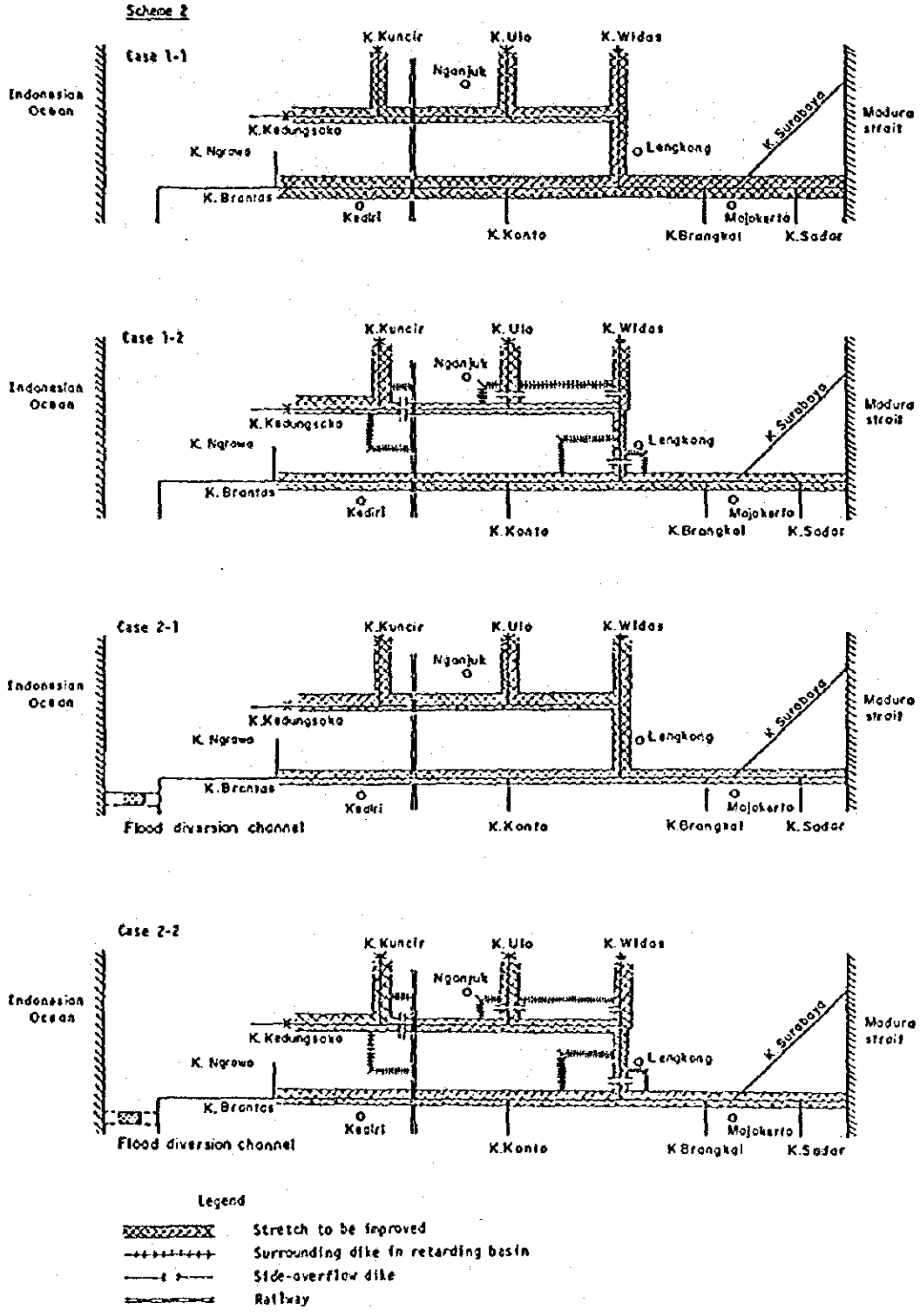


Fig. 3.5.11(2) ALTERNATIVE SCHEME FOR COMPARATIVE CASE STUDY

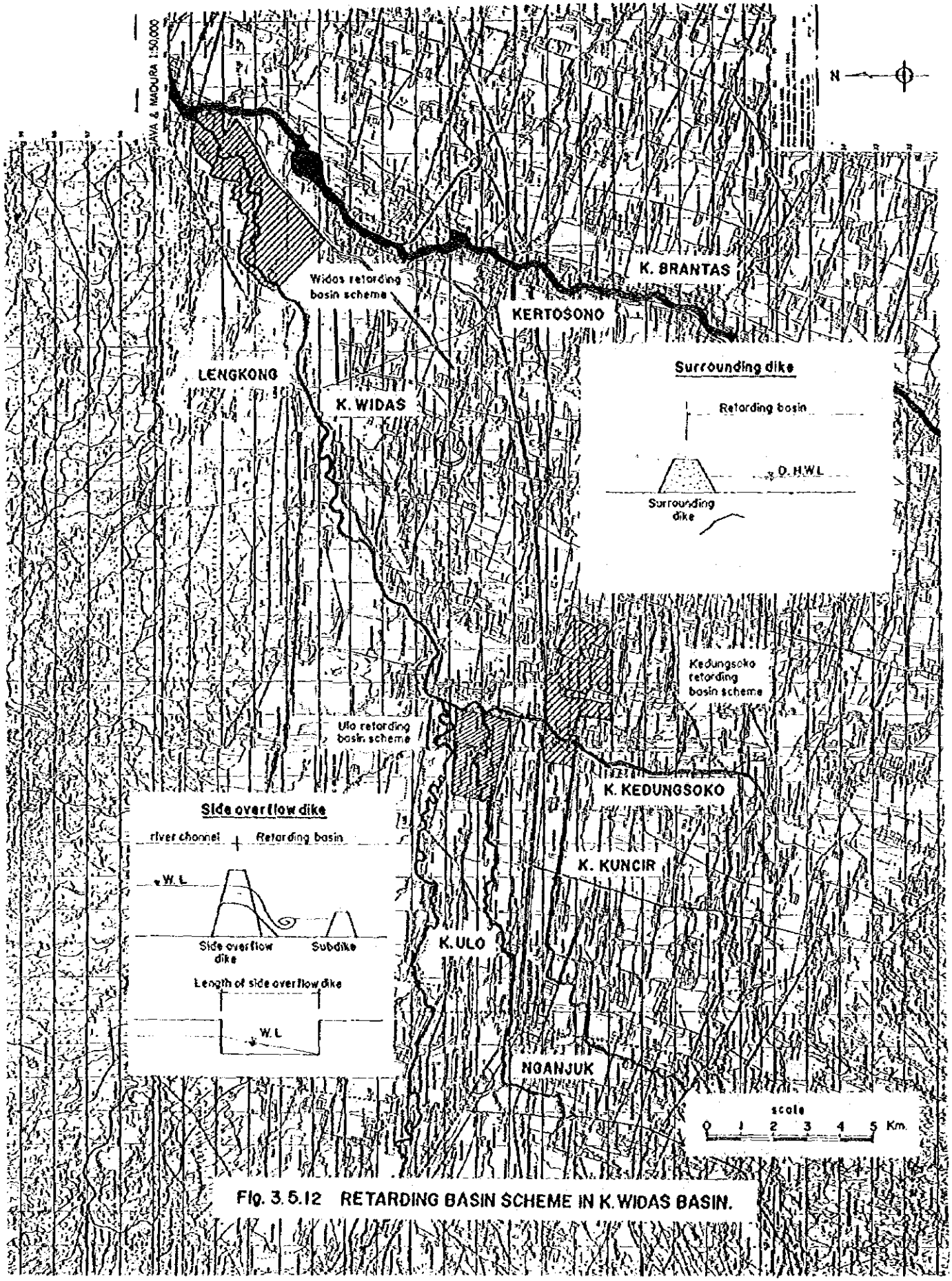
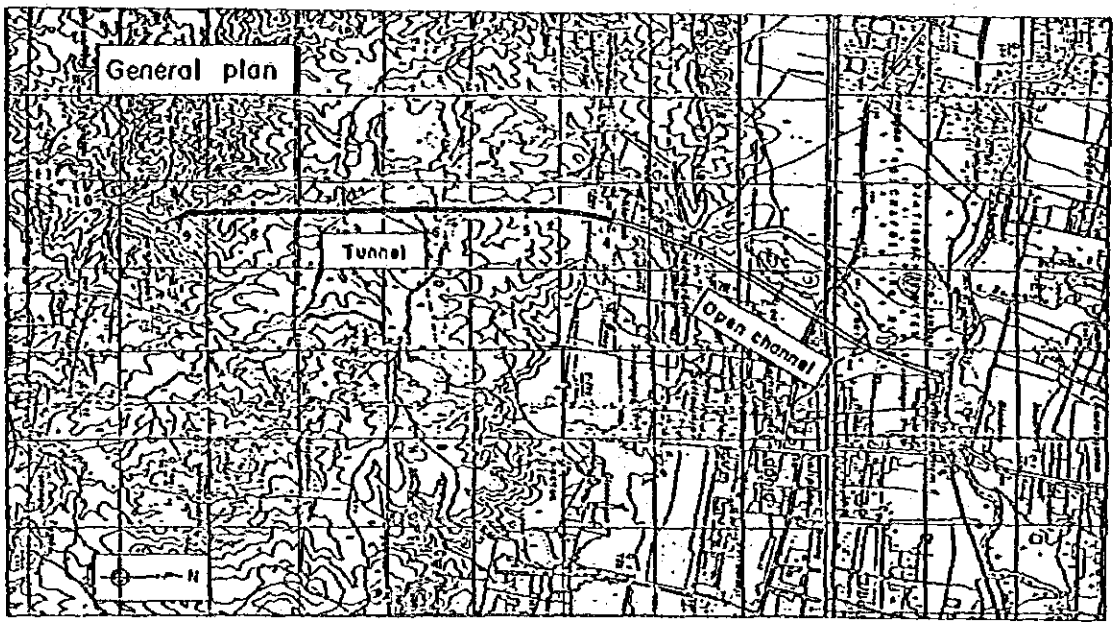
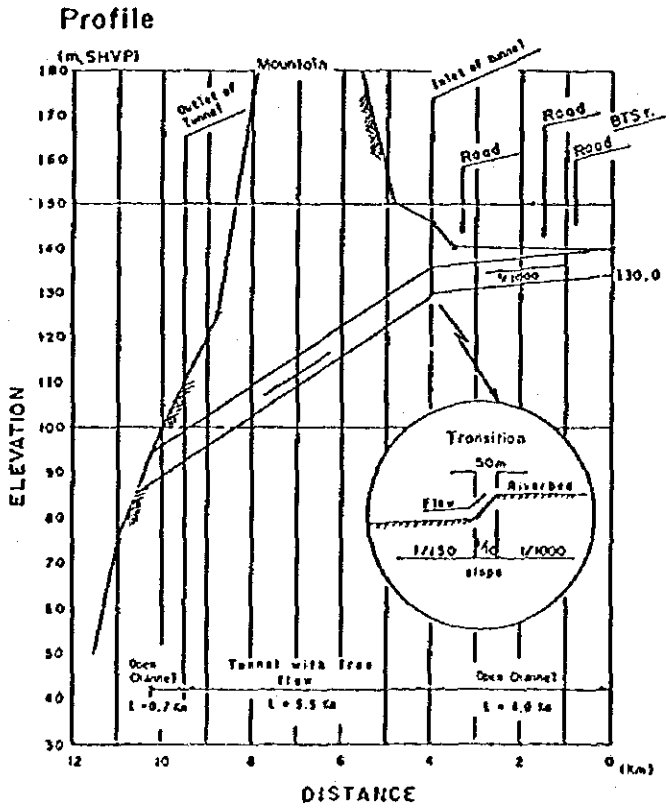
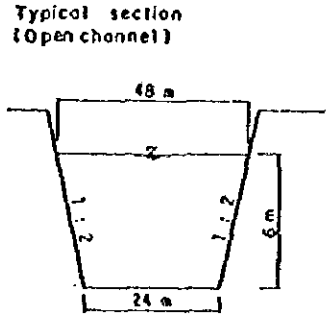


Fig. 3.5.12 RETARDING BASIN SCHEME IN K. WIDAS BASIN.







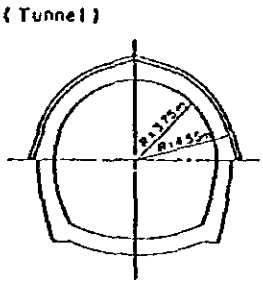


Fig.3.5.13 GENERAL FEATURES OF FLOOD DIVERSION CHANNEL

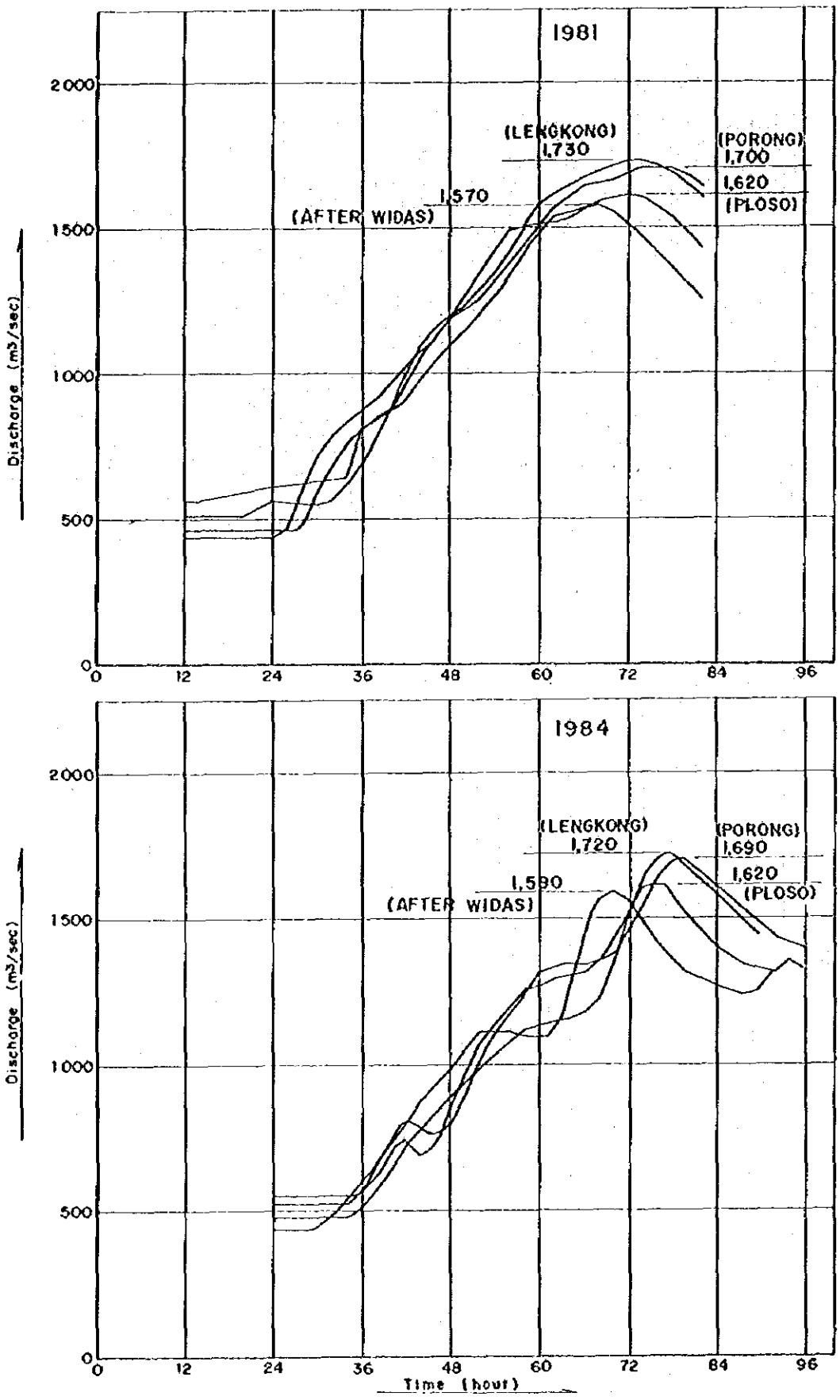


Fig. 3.5.14 PROBABLE FLOOD HYDROGRAPHS FOR SCHEME 1, CASE 1-1

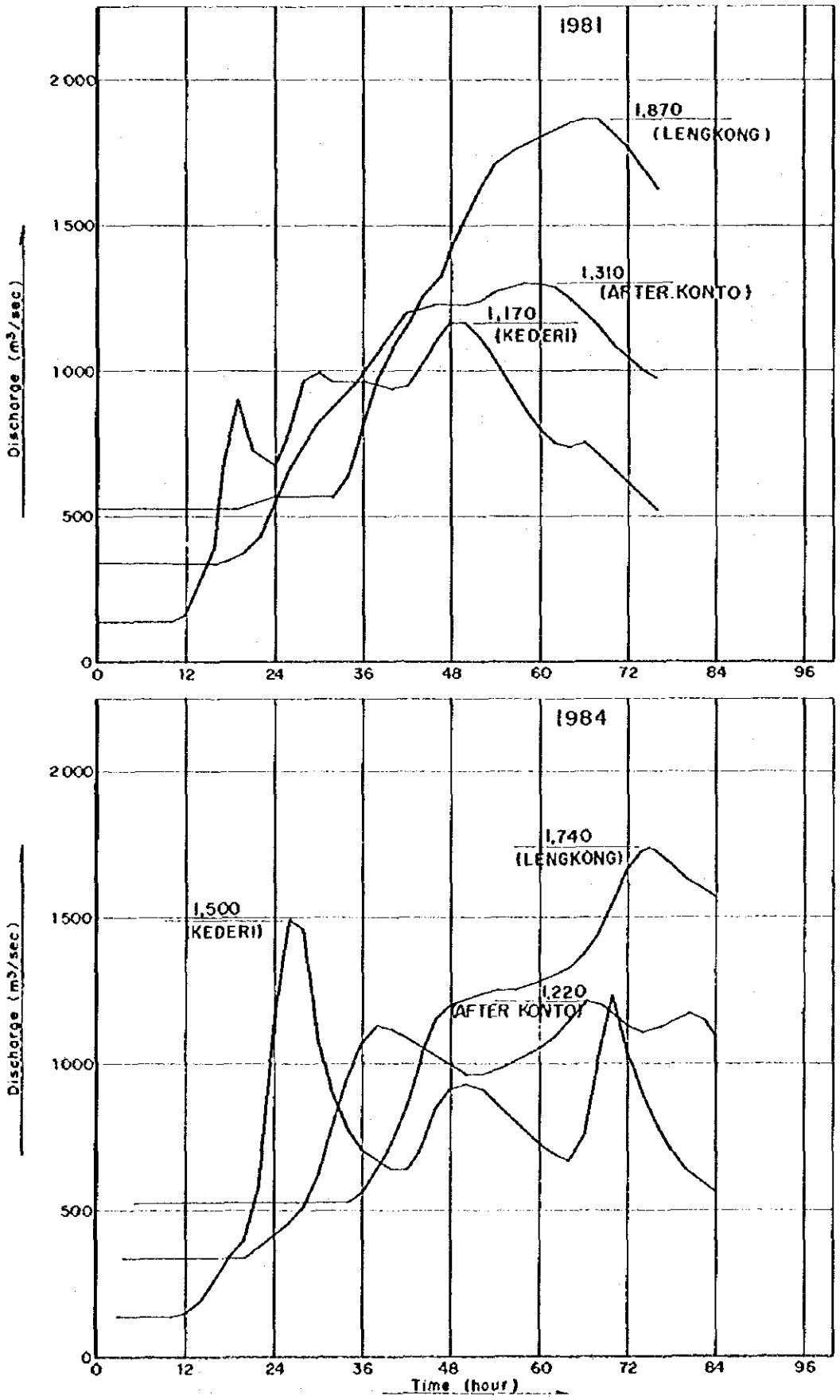


Fig. 3.6.16 PROBABLE FLOOD HYDROGRAPHS FOR SCHEME 2, CASE 1-1

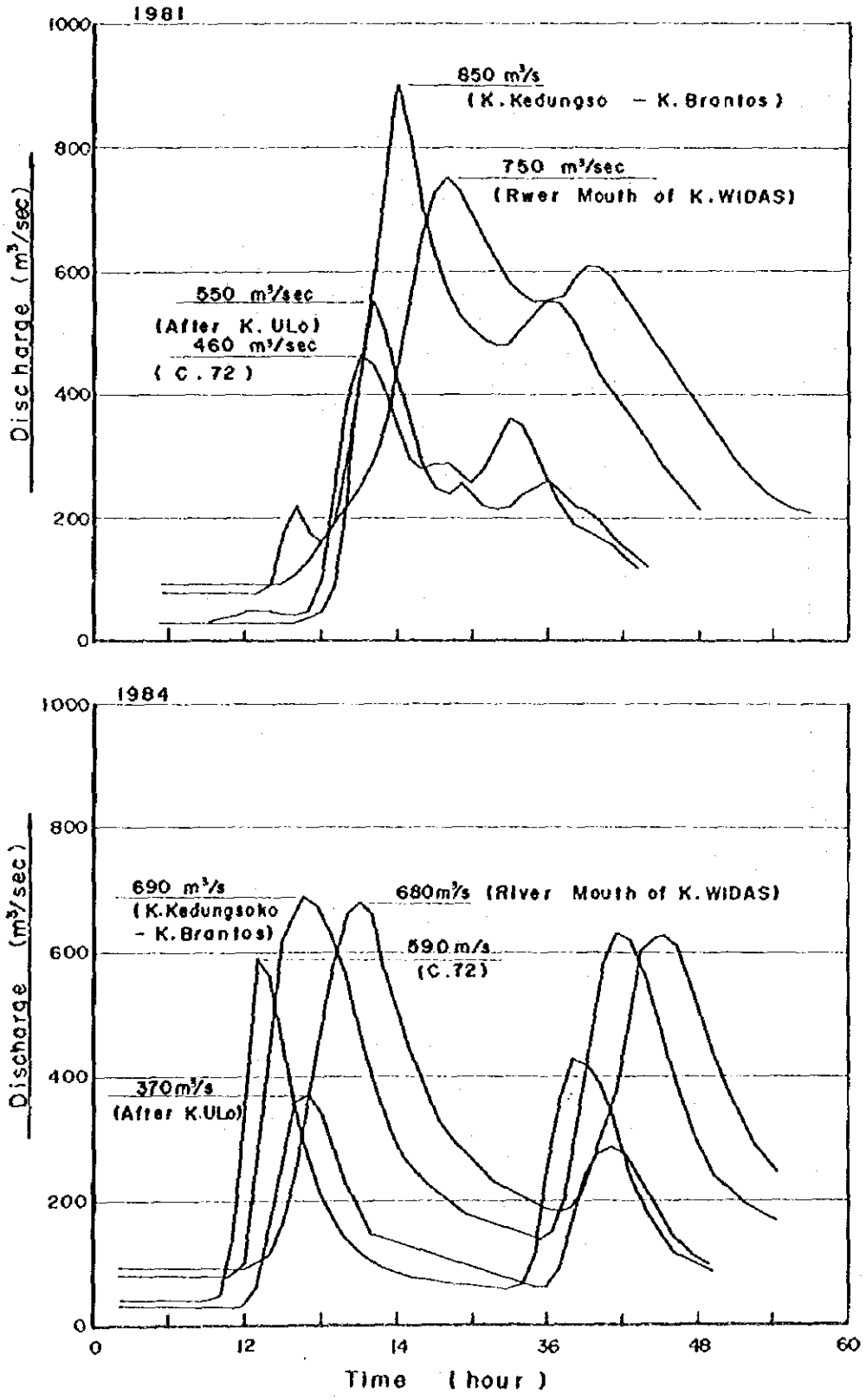
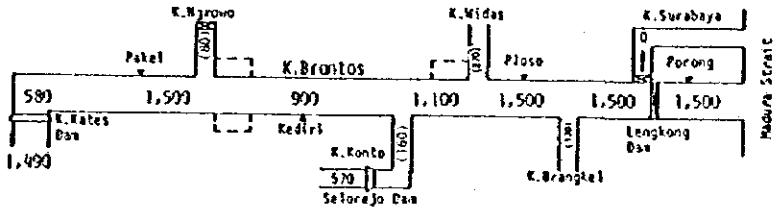


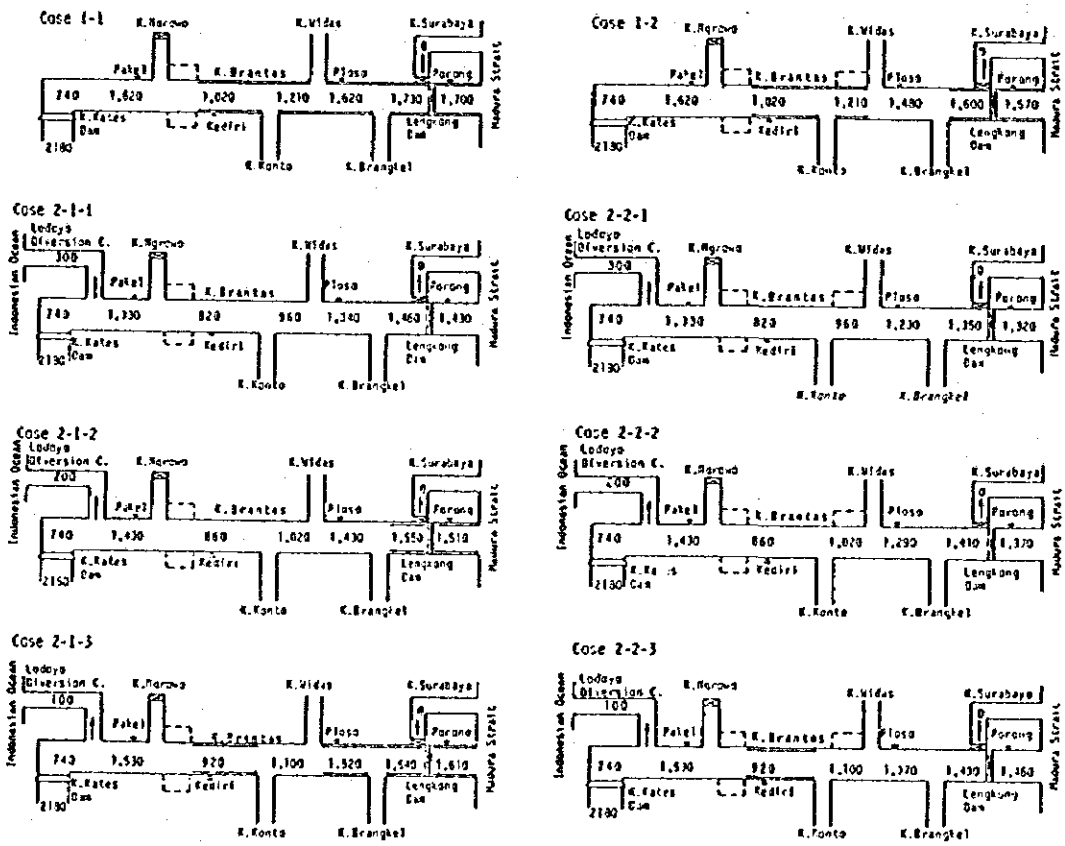
Fig. 3.5.16 PROBABLE 25-YEAR FLOOD HYDROGRAPHS OF K.WIDAS FOR CASE 1 (WITHOUT RETARDING BASIN)



Existing Design Discharge Distribution of the K.Brantas

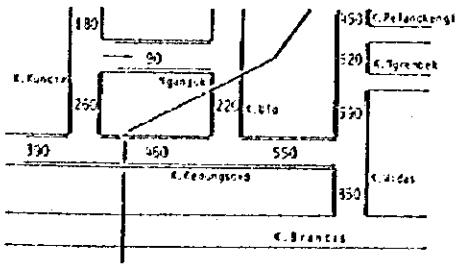
Scheme 1 (upstream from Kediri : present)

Unit : m^3/s



Note. 220 : stretch to be improved

Widas basin (without retarding basin)



Widas basin (with retarding basin)

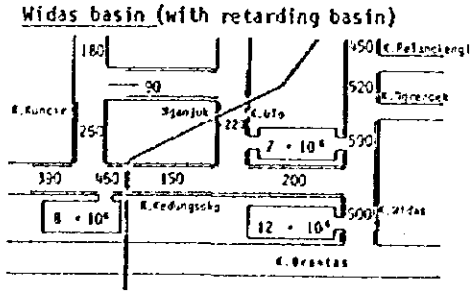
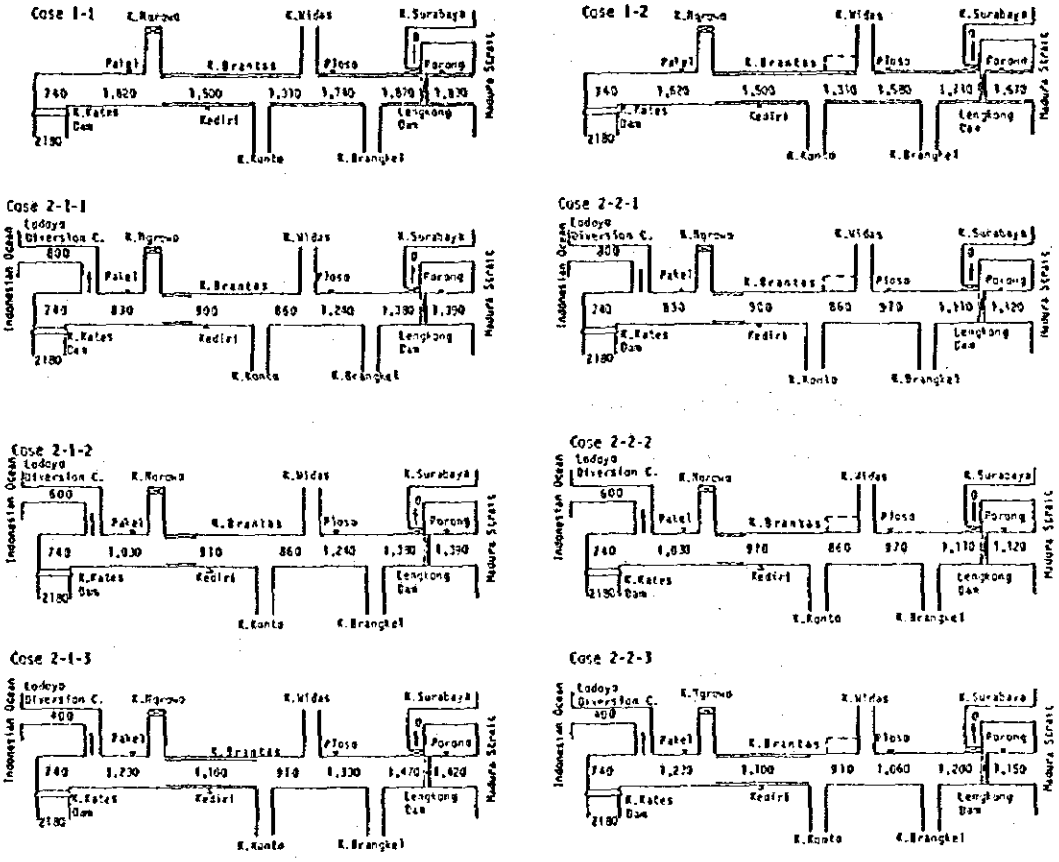


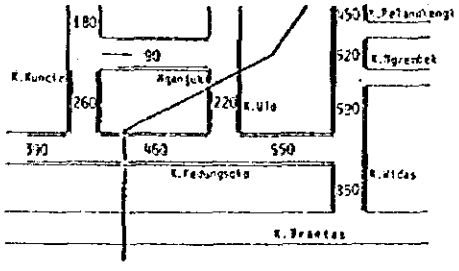
Fig. 3.5.17 FLOOD DISCHARGE DISTRIBUTIONS FOR ALTERNATIVE SCHEME (Scheme 1)

Scheme 2 (upstream from Kediri : confined by dikes)

Unit : m³/s



Widas basin (without retarding basin)



Widas basin (with retarding basin)

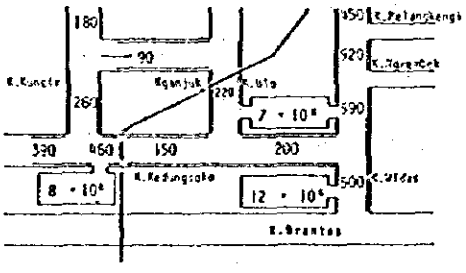
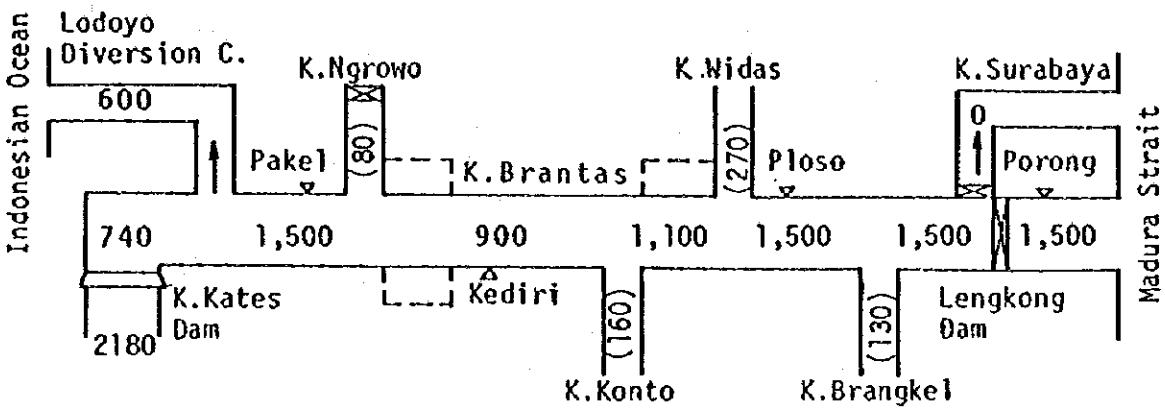


Fig. 3.5.18 FLOOD DISCHARGE DISTRIBUTIONS FOR ALTERNATIVE SCHEME (Scheme 2)



Unit : m^3/s

Fig.3.5. 19 PROPOSED DISCHARGE DISTRIBUTION
OF THE SELECTED PLAN (50-yr probable flood)

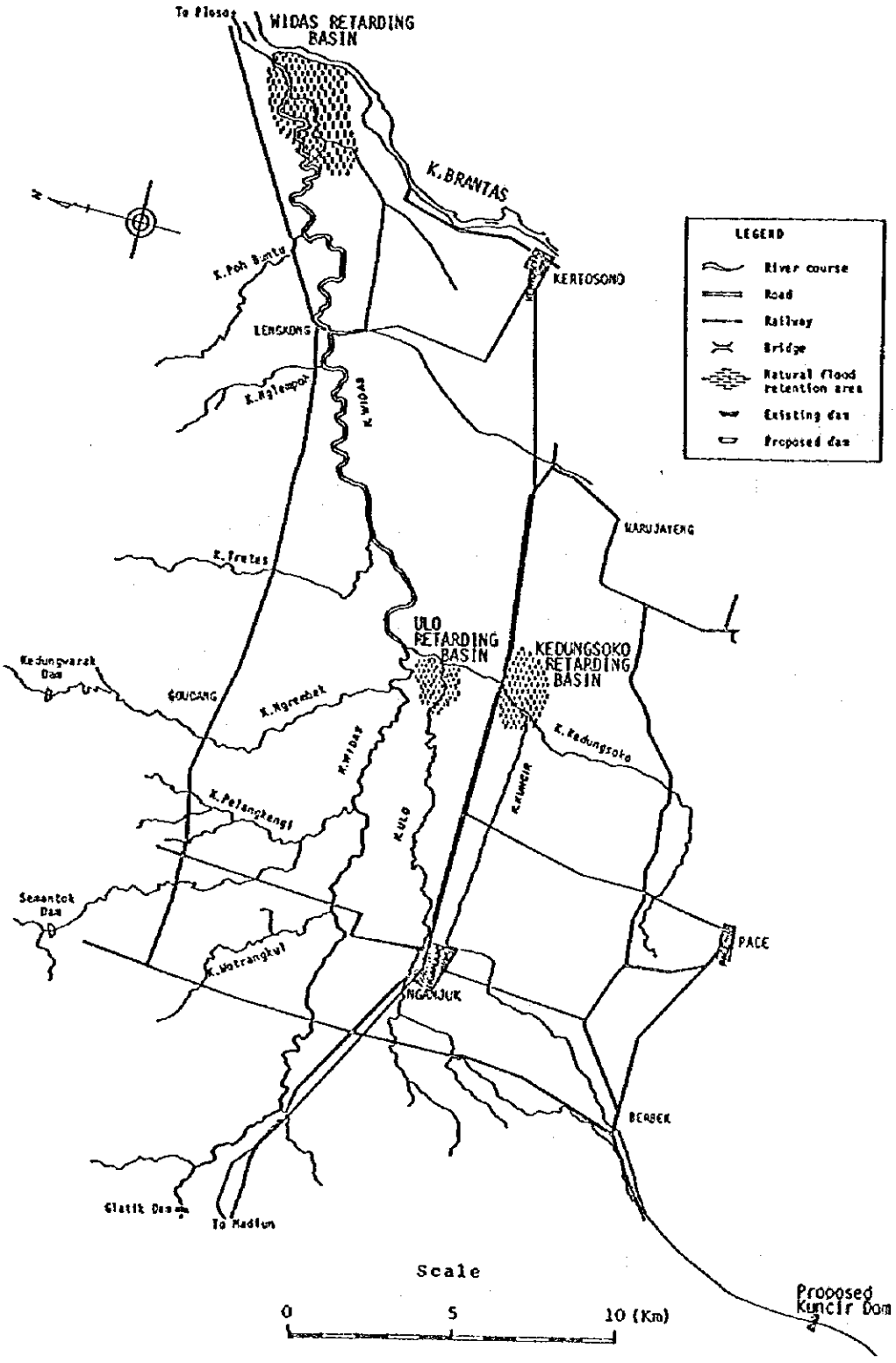


Fig.3.5.20 GENERAL LOCATION MAP OF K.WIDAS BASIN

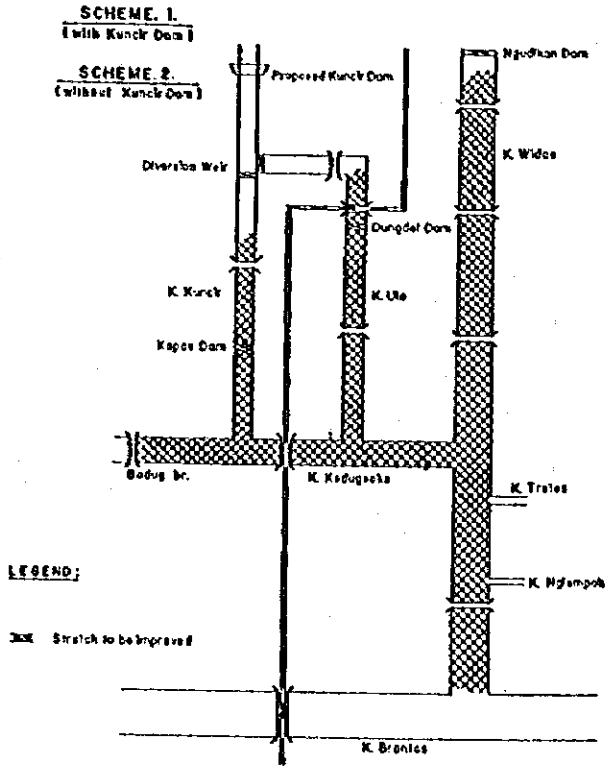


Fig.3.5.21 ALTERNATIVE SCHEME FOR KUNCIR FLOOD CONTROL DAM

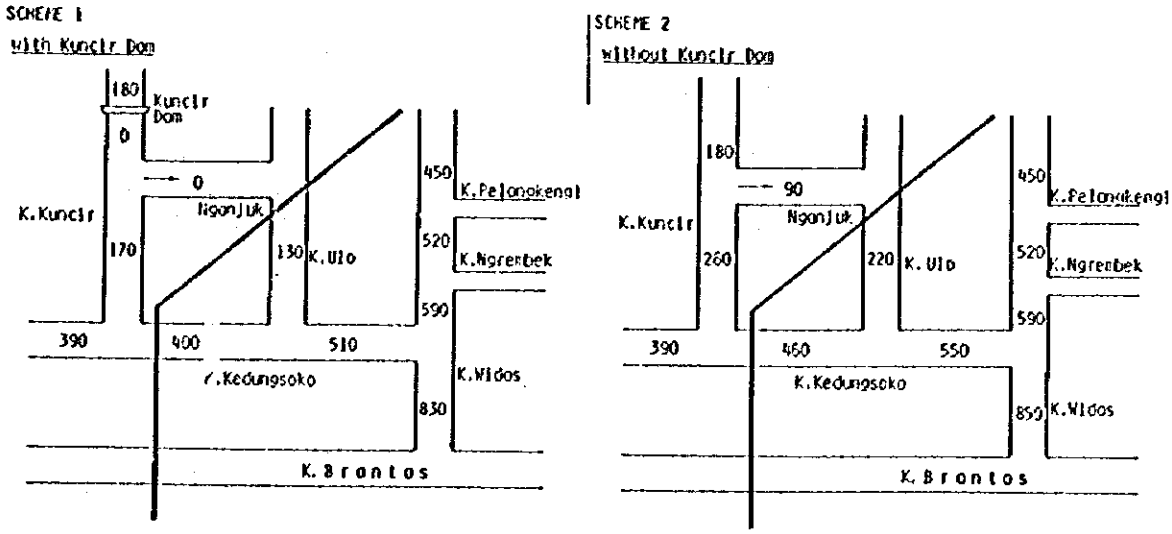
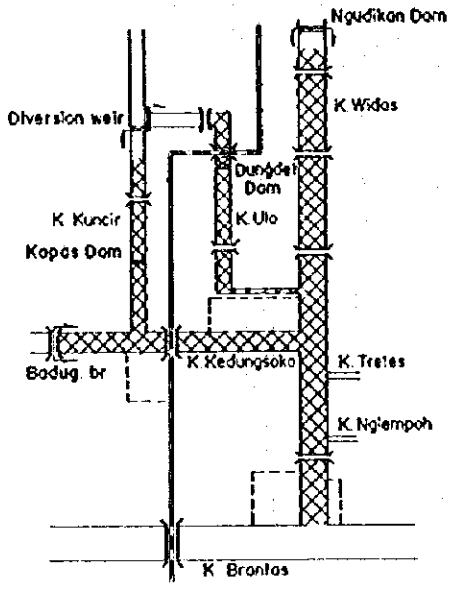


Fig.3.5.22 FLOOD DISCHARGE DISTRIBUTIONS FOR KUNCIR FLOOD CONTROL DAM SCHEME (for 25-yr probable flood)

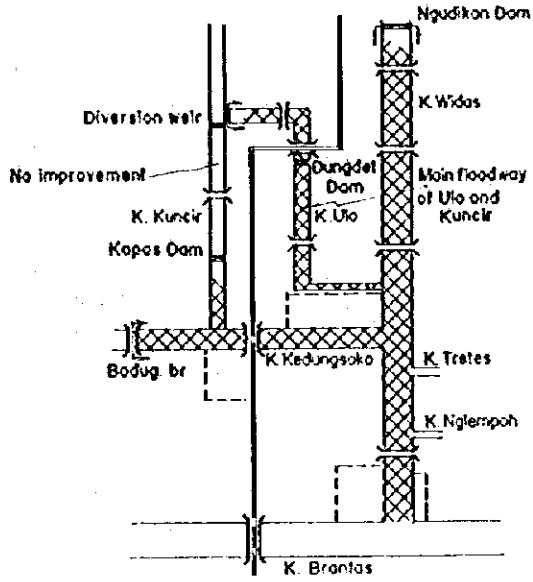
ALTERNATIVE. I

Channel improvement (existing channel) and retarding basin



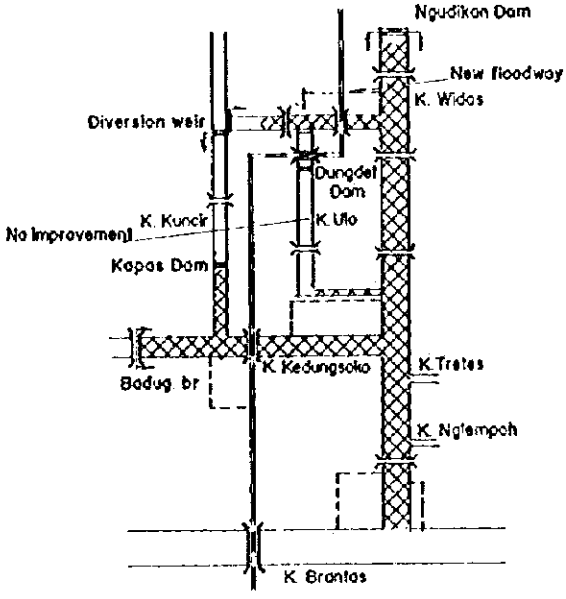
ALTERNATIVE. 2

Channel improvement (Kuncir kiri and Ulo main floodway) and retarding basin



ALTERNATIVE. 3

Channel improvement, retarding basin and new floodway



LEGEND :

- : Objective stretch for Comprehensive plan
- : Stretch to be improved
- : Retarding basin

Fig. 3. 5.23 PROVISIONAL PRINCIPLE ALTERNATIVE SCHEMES OF THE K. WIDAS FLOOD CONTROL

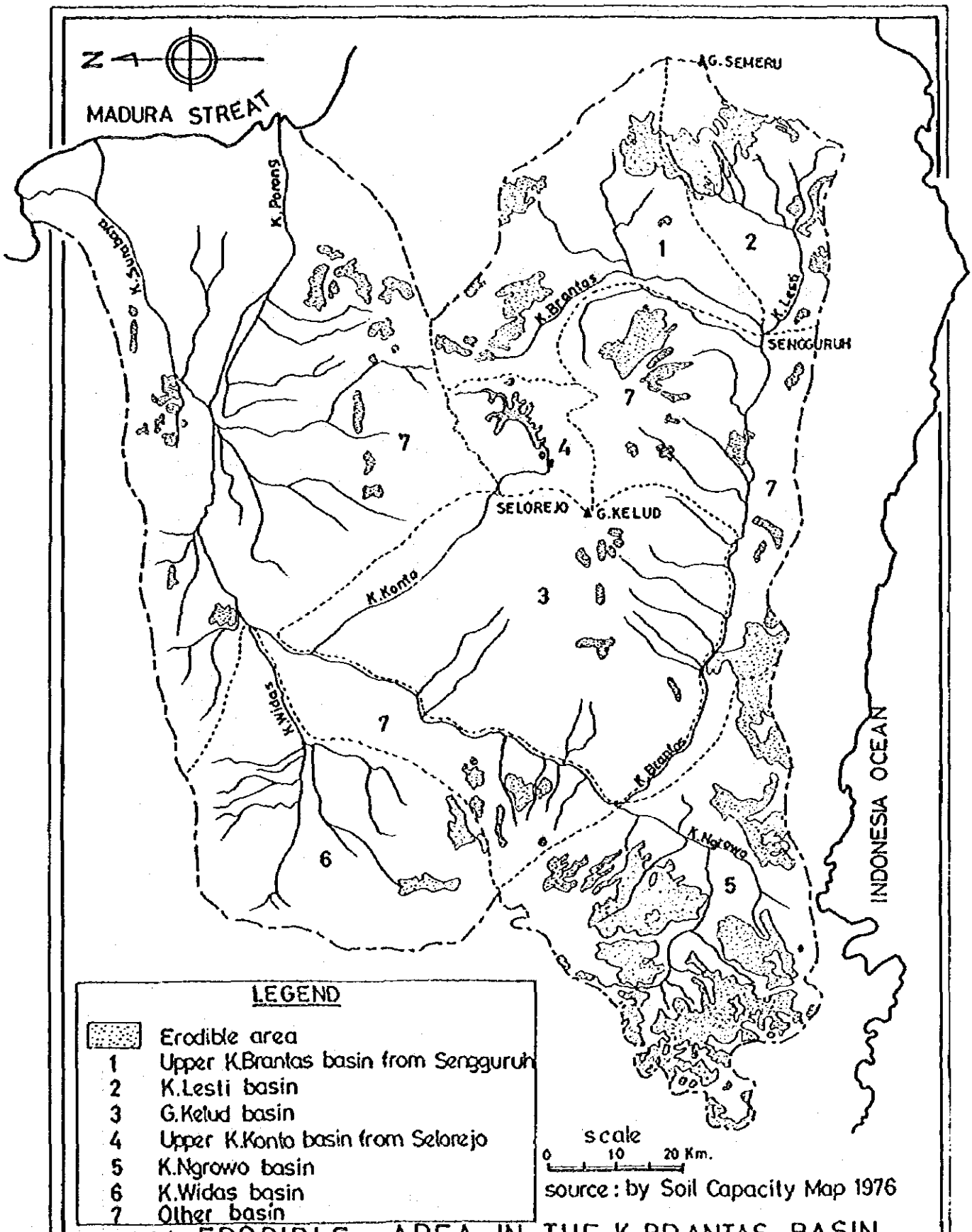


Fig. 3.6.1 ERODIBLE AREA IN THE K.BRANTAS BASIN.

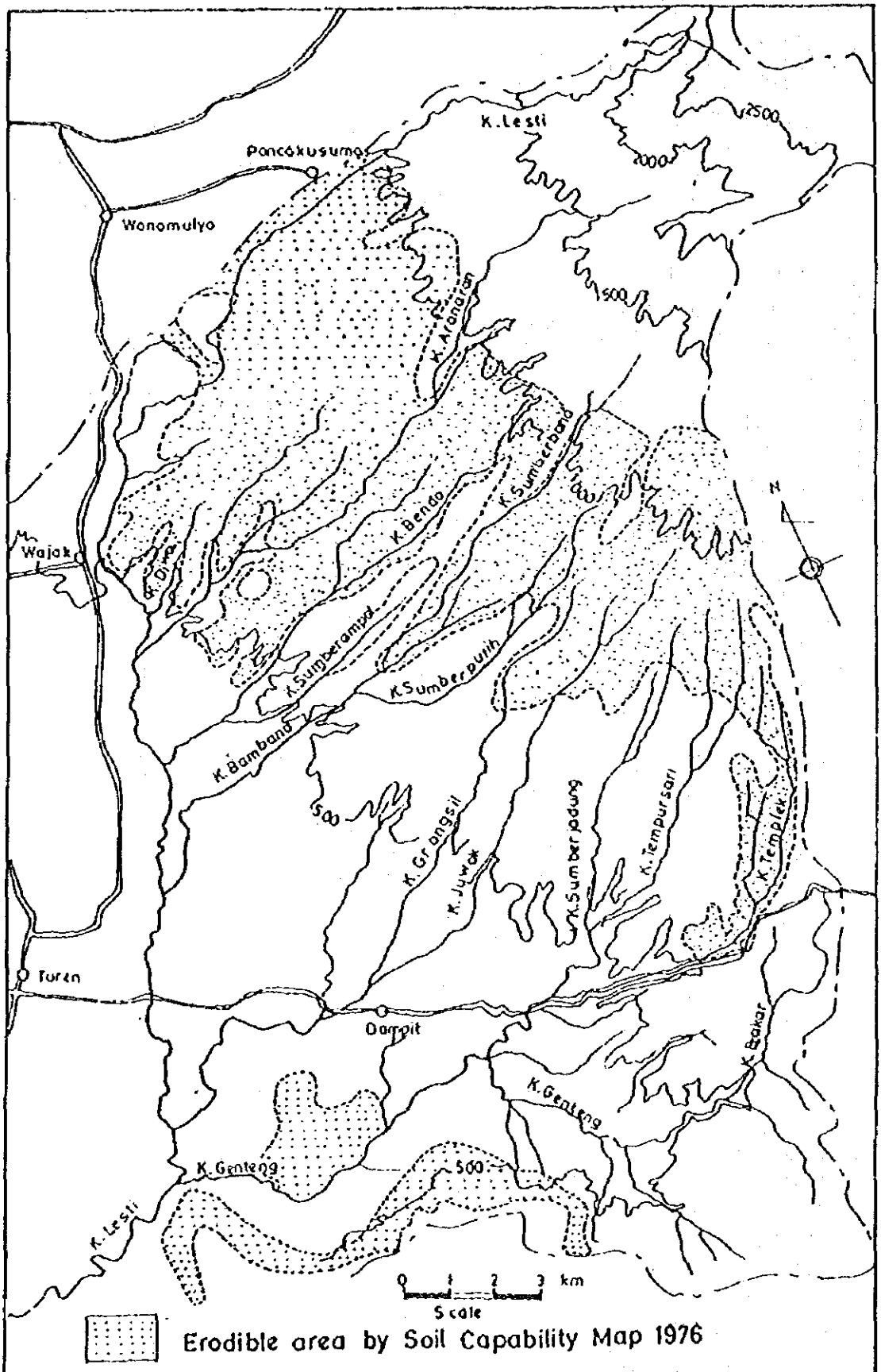


Fig. 3.6.2 ERODIBLE AREA IN THE K LESTI BASIN.

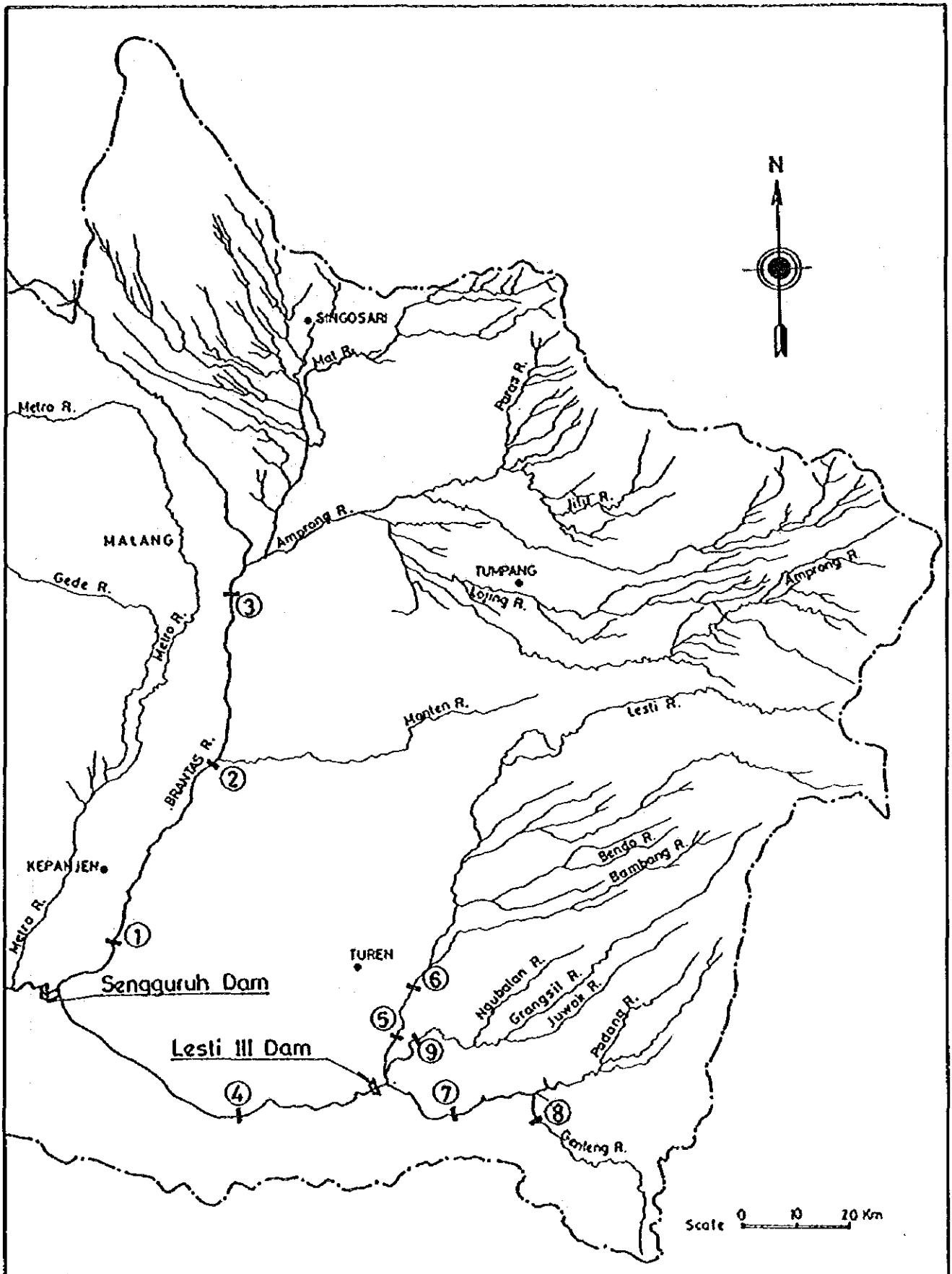


Fig. 3.6.3 LOCATION MAP OF PROPOSED SABO DAM

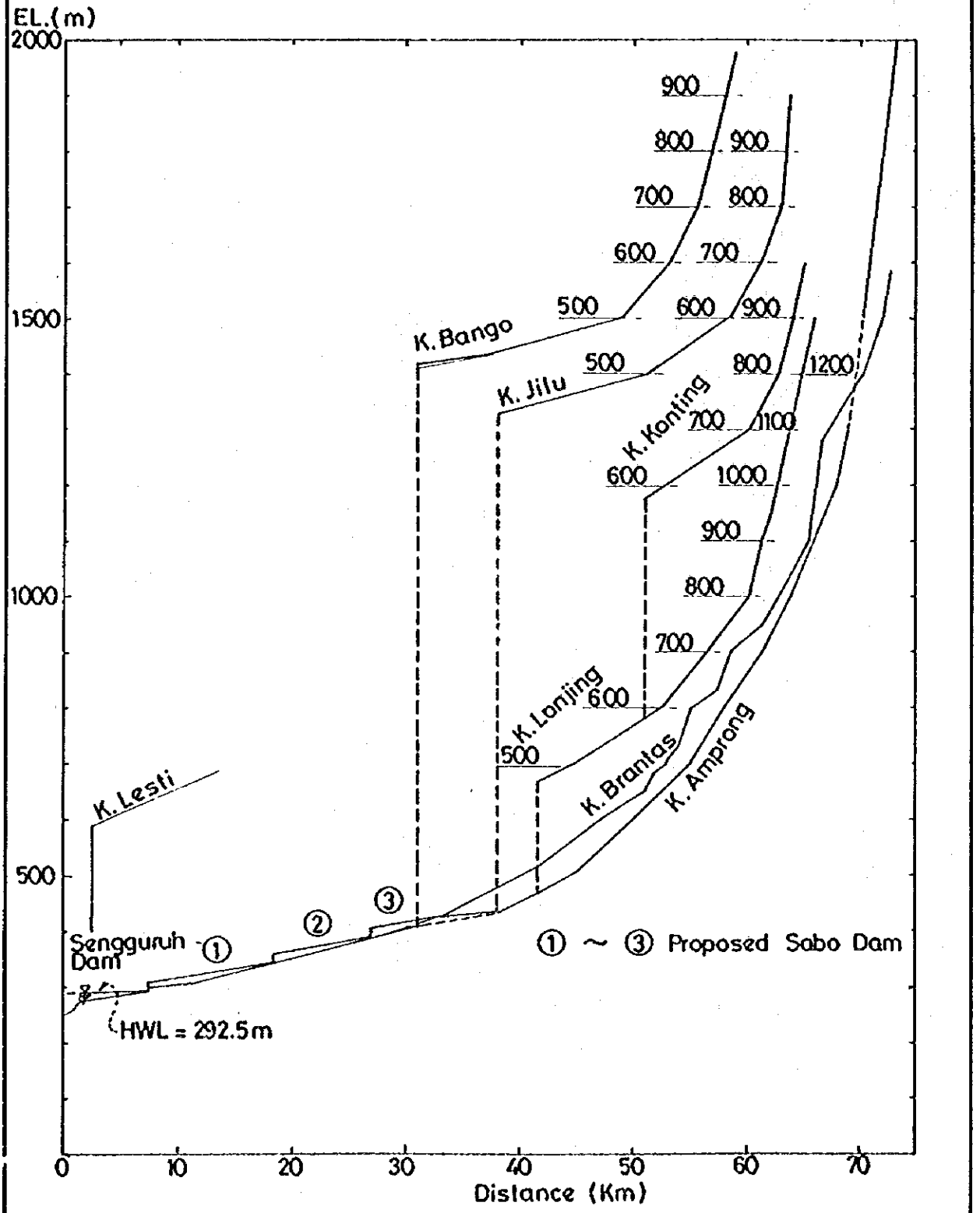


Fig.3.6.4 (1) RIVER BED PROFILE IN THE UPPER K.BRANTAS BASIN

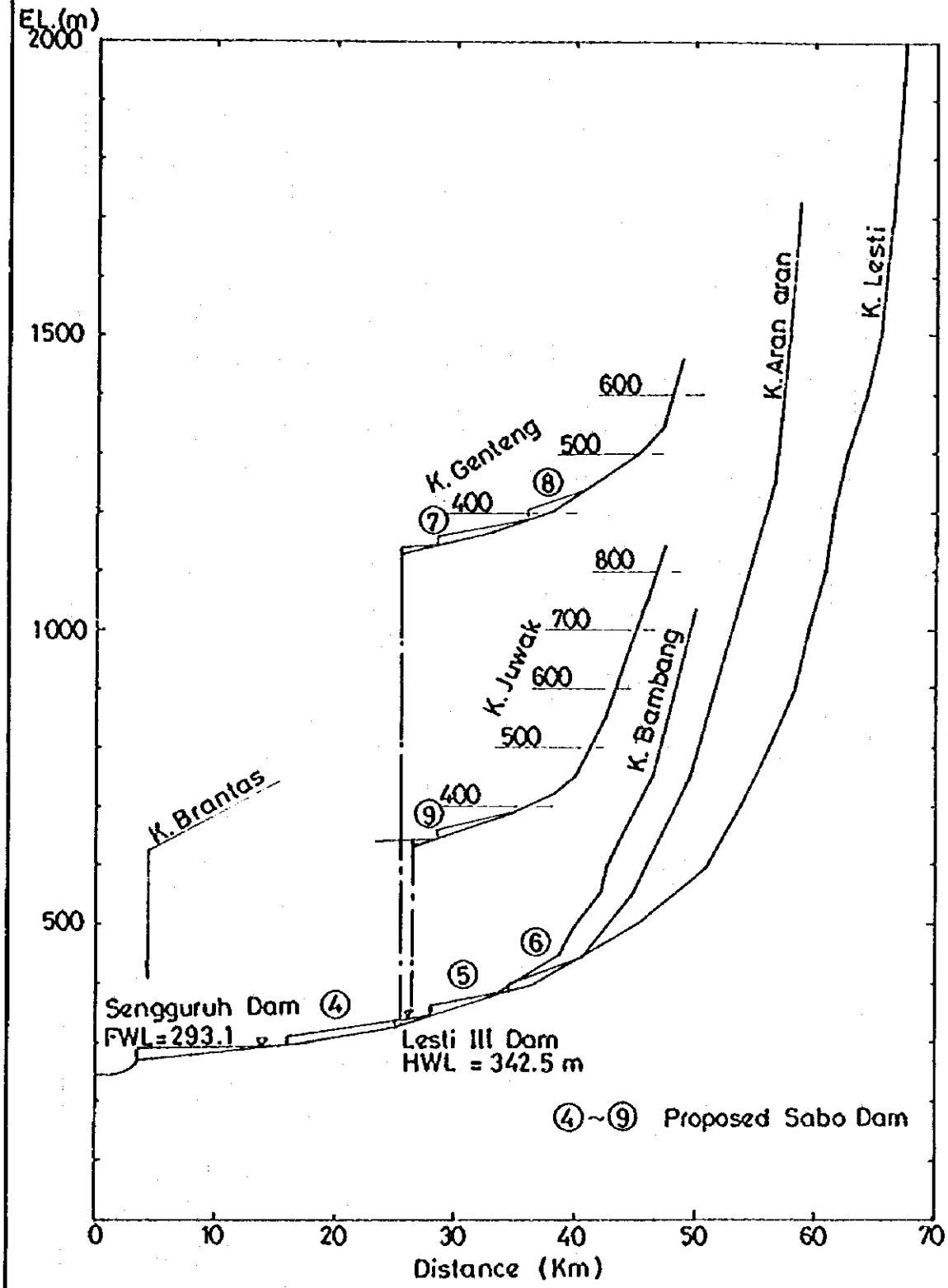


Fig.3.6.4(2) RIVER BED PROFILE IN THE K.LESTI BASIN

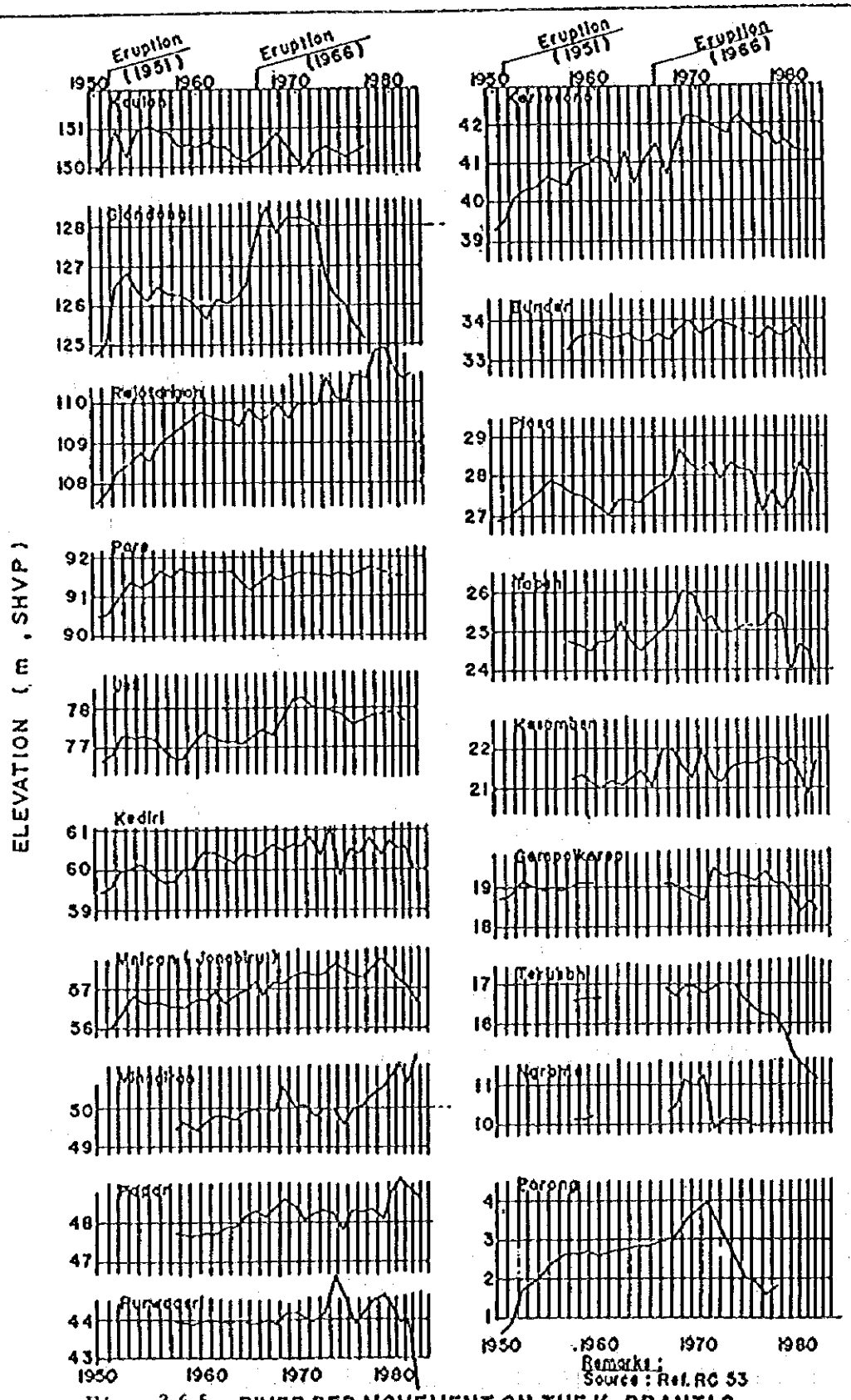
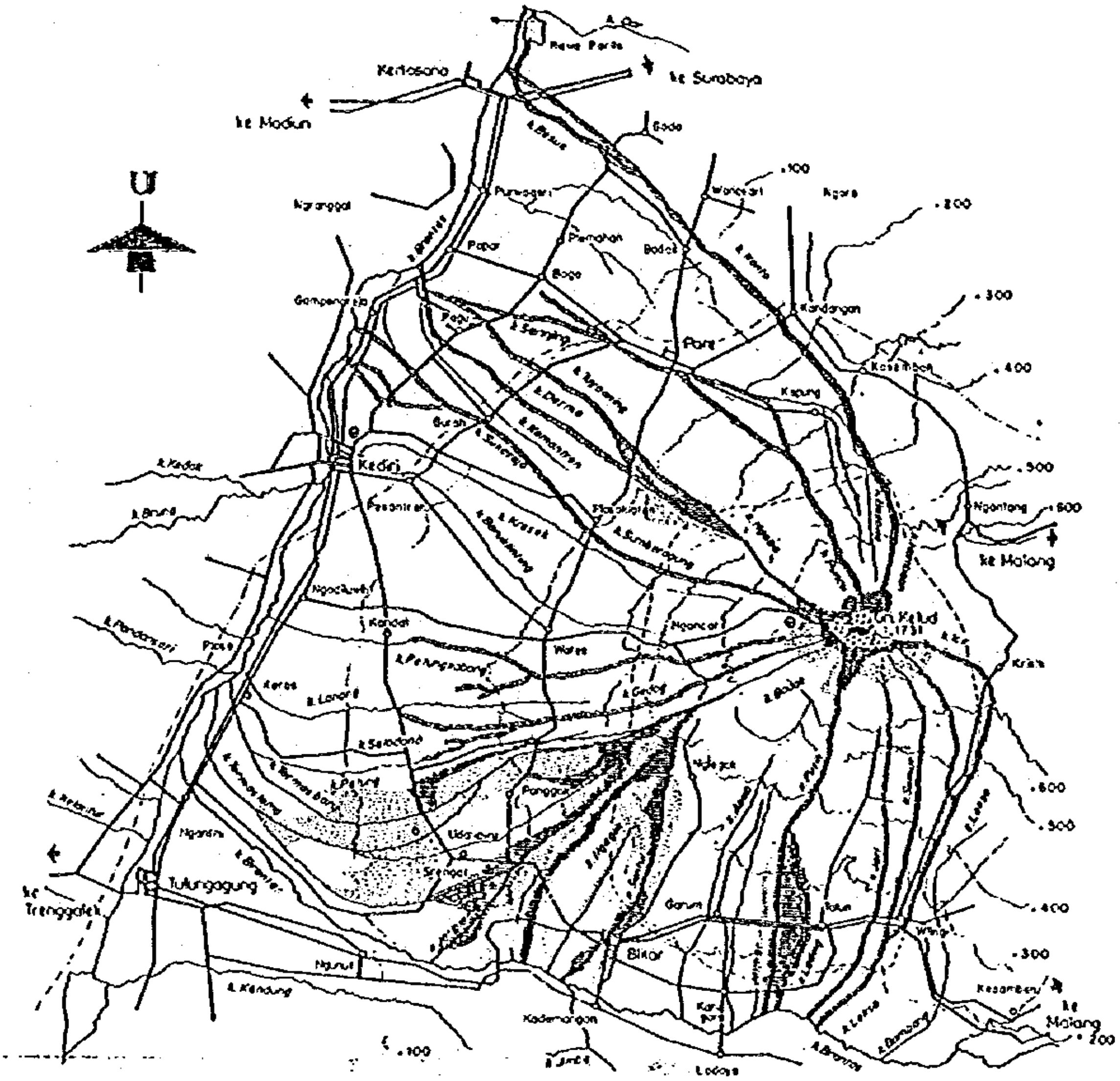


Fig. 3.6.5 RIVER BED MOVEMENT ON THE K. BRANTAS.



- Crater lake
- Area attacked by ladu in 1951
- Area attacked by ladu in 1956
- Area affected by primary lahar in 1919
- Area affected by primary lahar in 1966
- Area affected by secondary lahar in 1966
- Boundary of ladu
- Boundary of ashes

Fig. 3.6.6 DISTRIBUTION OF ERUPTED MATERIALS

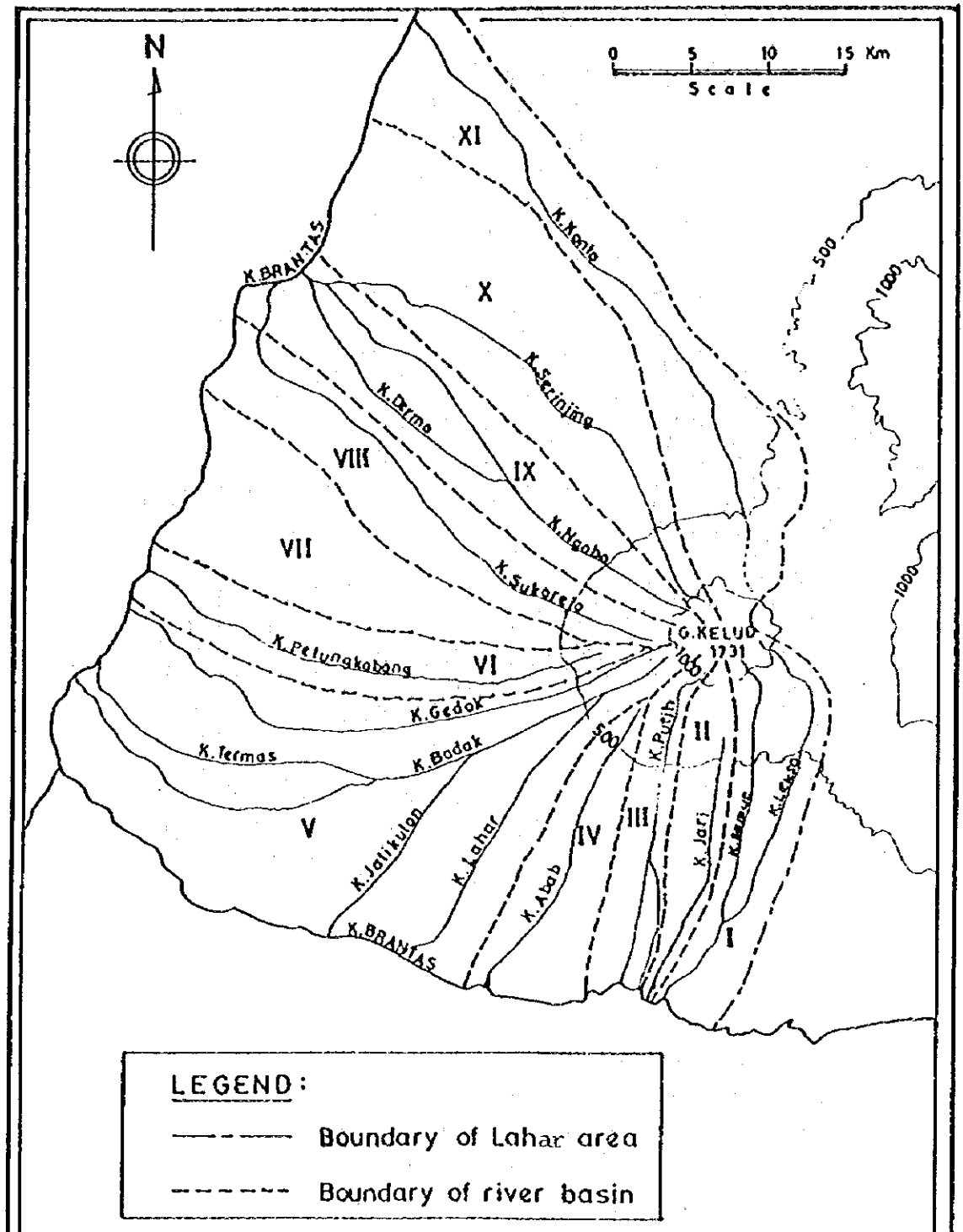
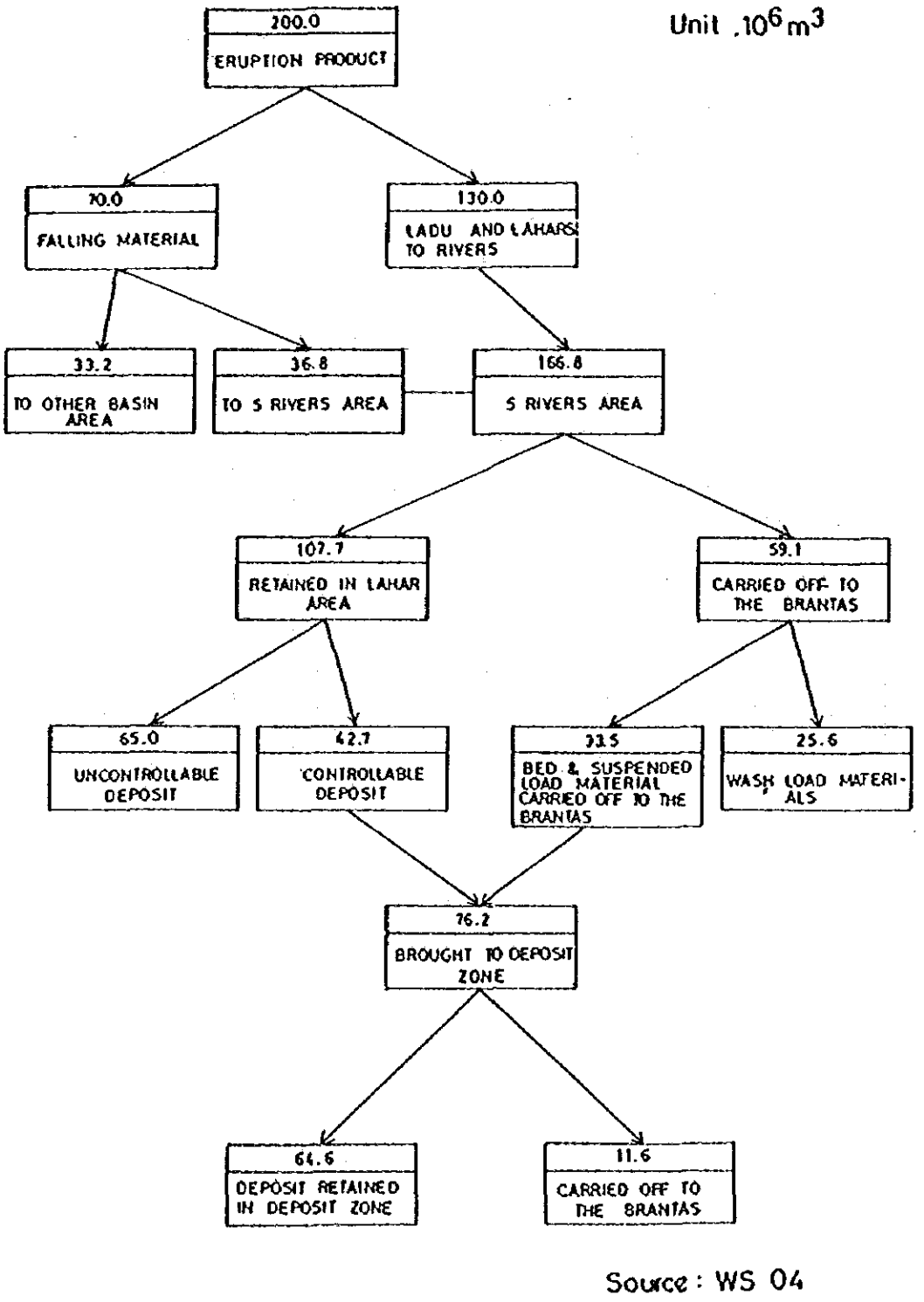


Fig. 3.6.7 CATCHMENT AREA AROUND G.KELUD



Source : WS 04

Fig.3.6.8 PROPOSED SEDIMENT BALANCE DURING 15 YEARS

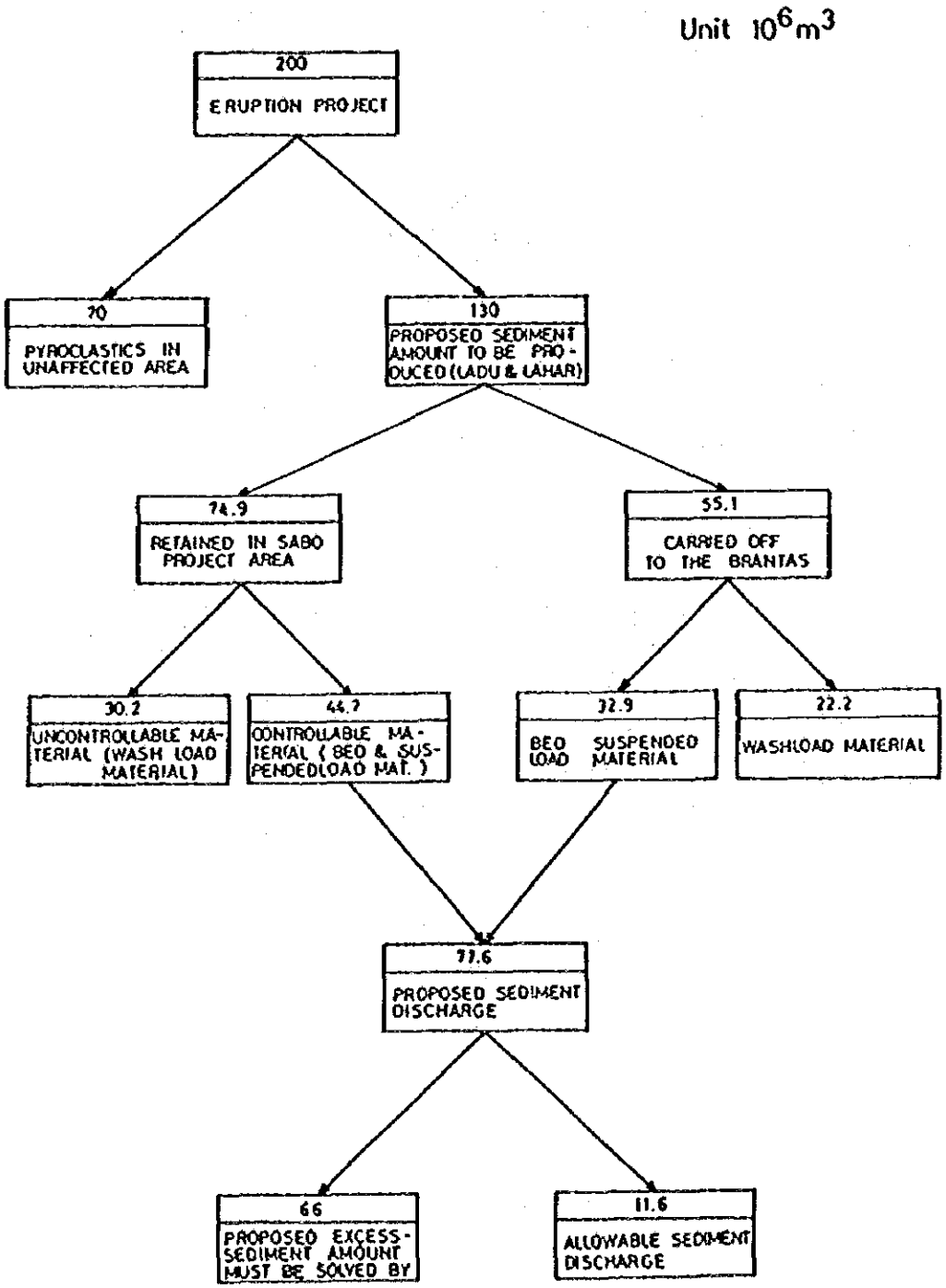


Fig. 3.6.9 BALANCE OF ERUPTION MATERIAL BY G.KELUD PROJECT

Source WS 12

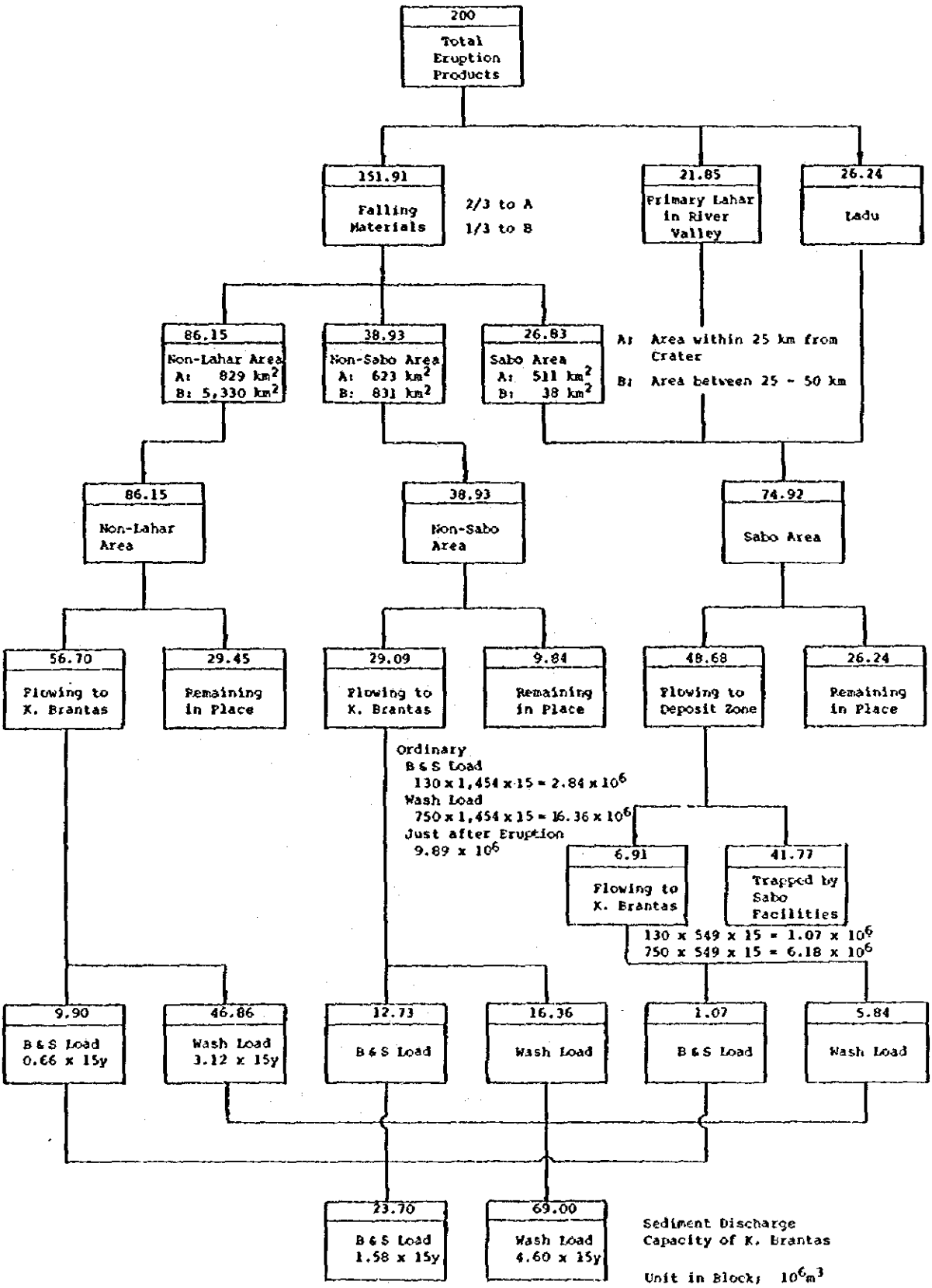


Table 3.6.10 BALANCE OF ERUPTION MATERIAL IN 15 YEARS

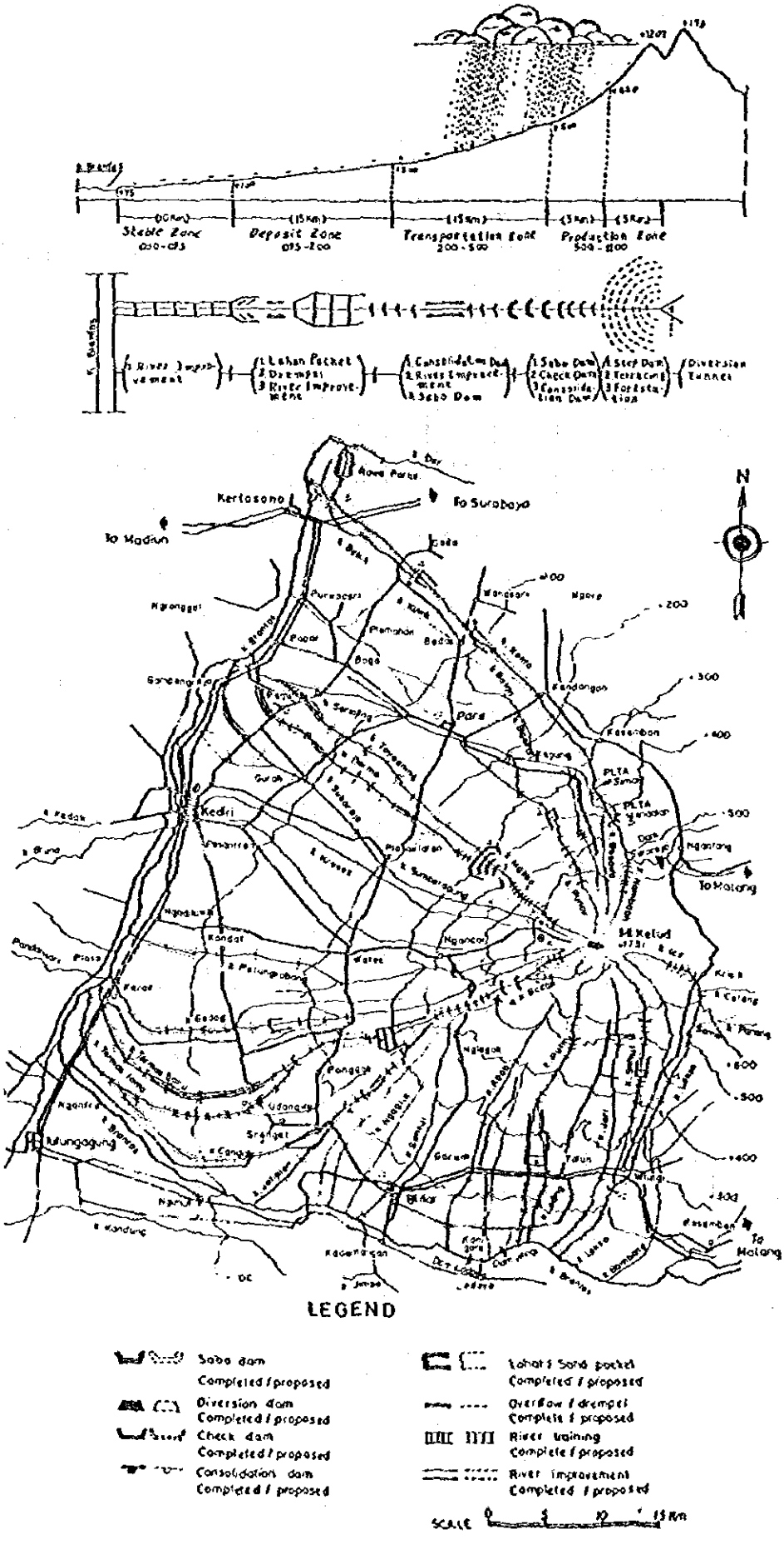


Fig. 3.6.11 PLAN OF DISASTER PREVENTION FACILITIES

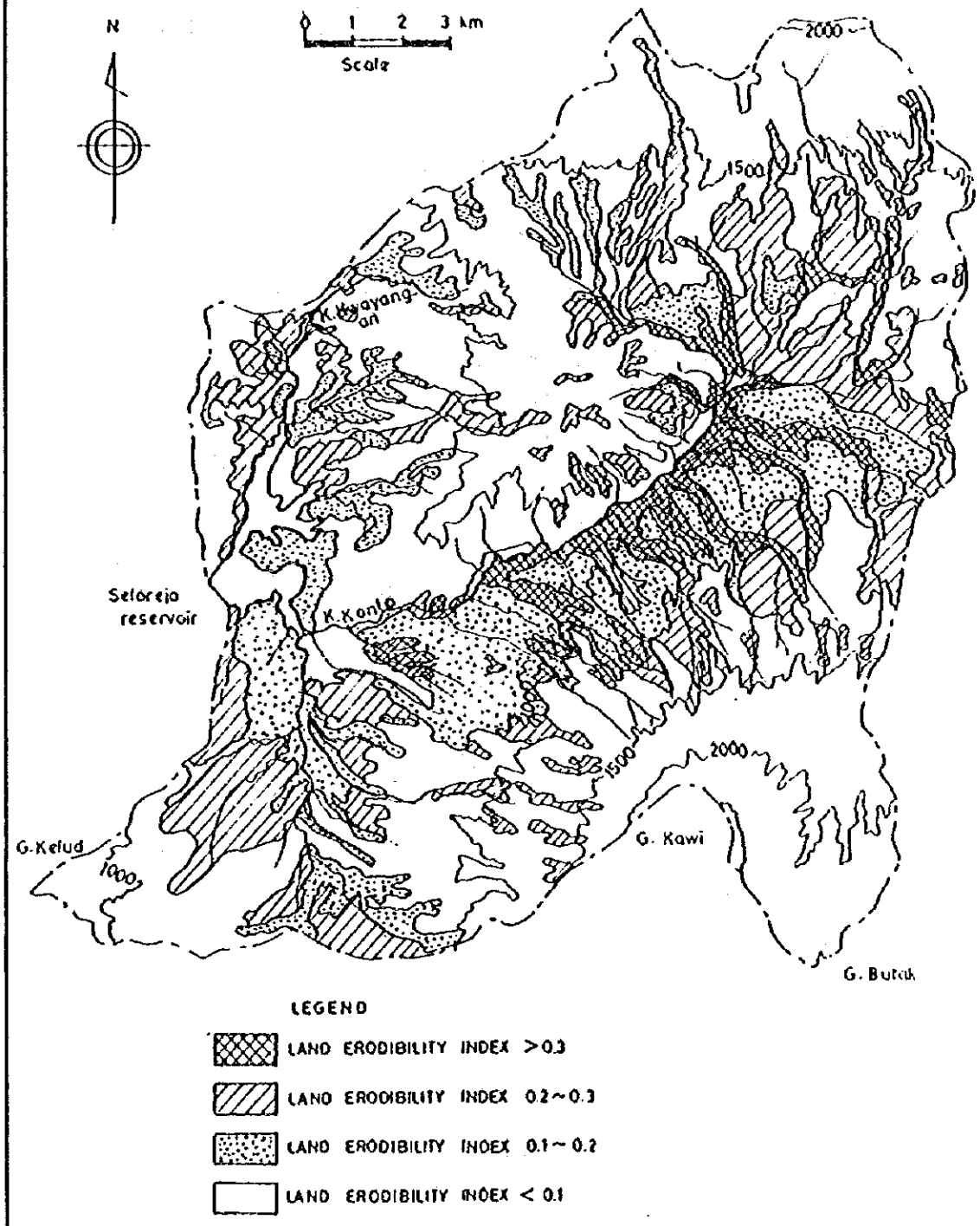
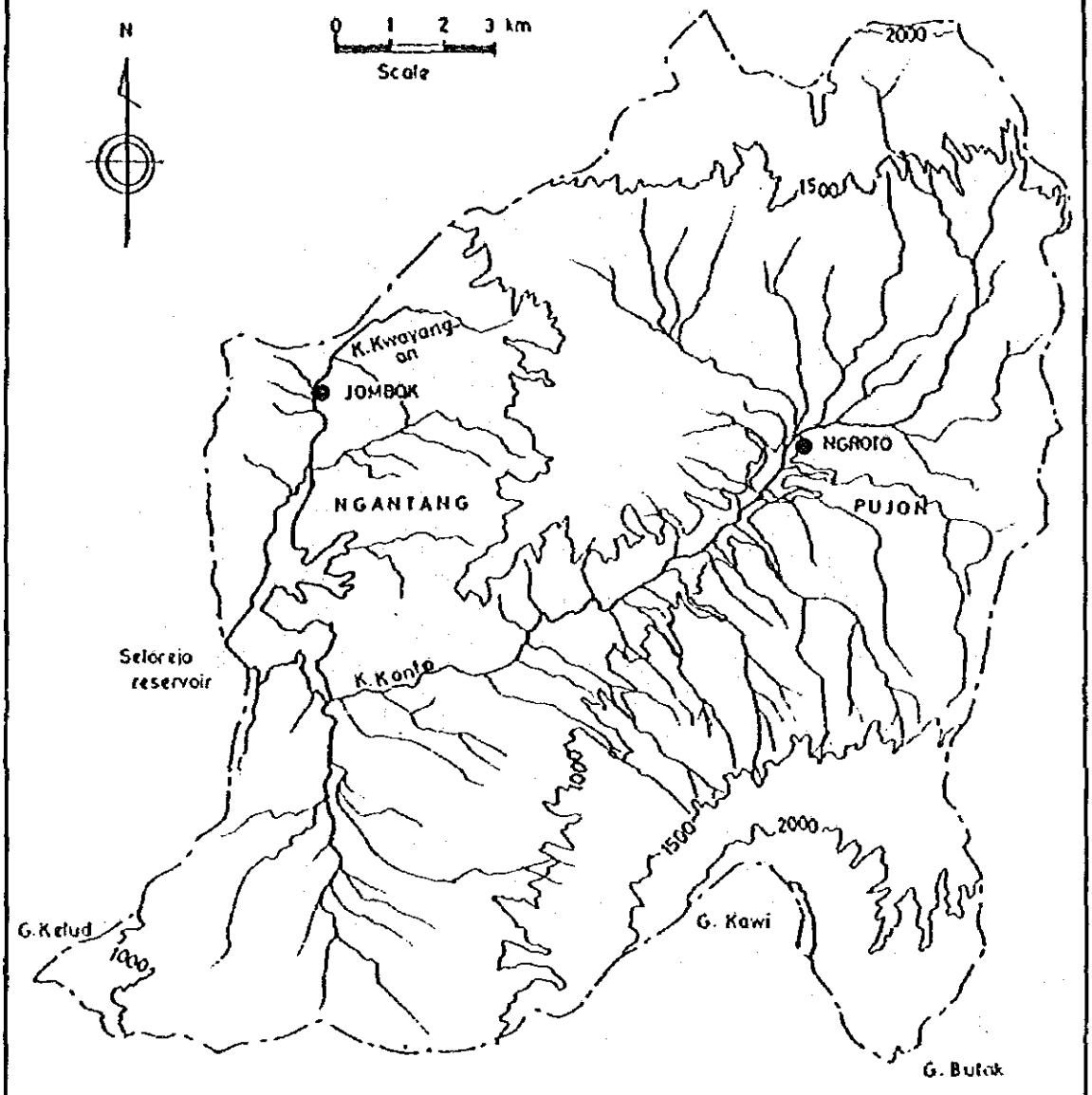


Fig. 3.6.12 LAND ERODIBILITY MAP IN THE UPPER K.KONTO BASIN



● Demonstration Plot

Number of Plot
Jombok 7 Plots
Ngroto 7 Plots

Area of each plot in Jombok
3m x 16.5 m

Fig. 3.6.13 LOCATION OF DEMONSTRATION PLOT IN THE UPPER K.KONTO AREA

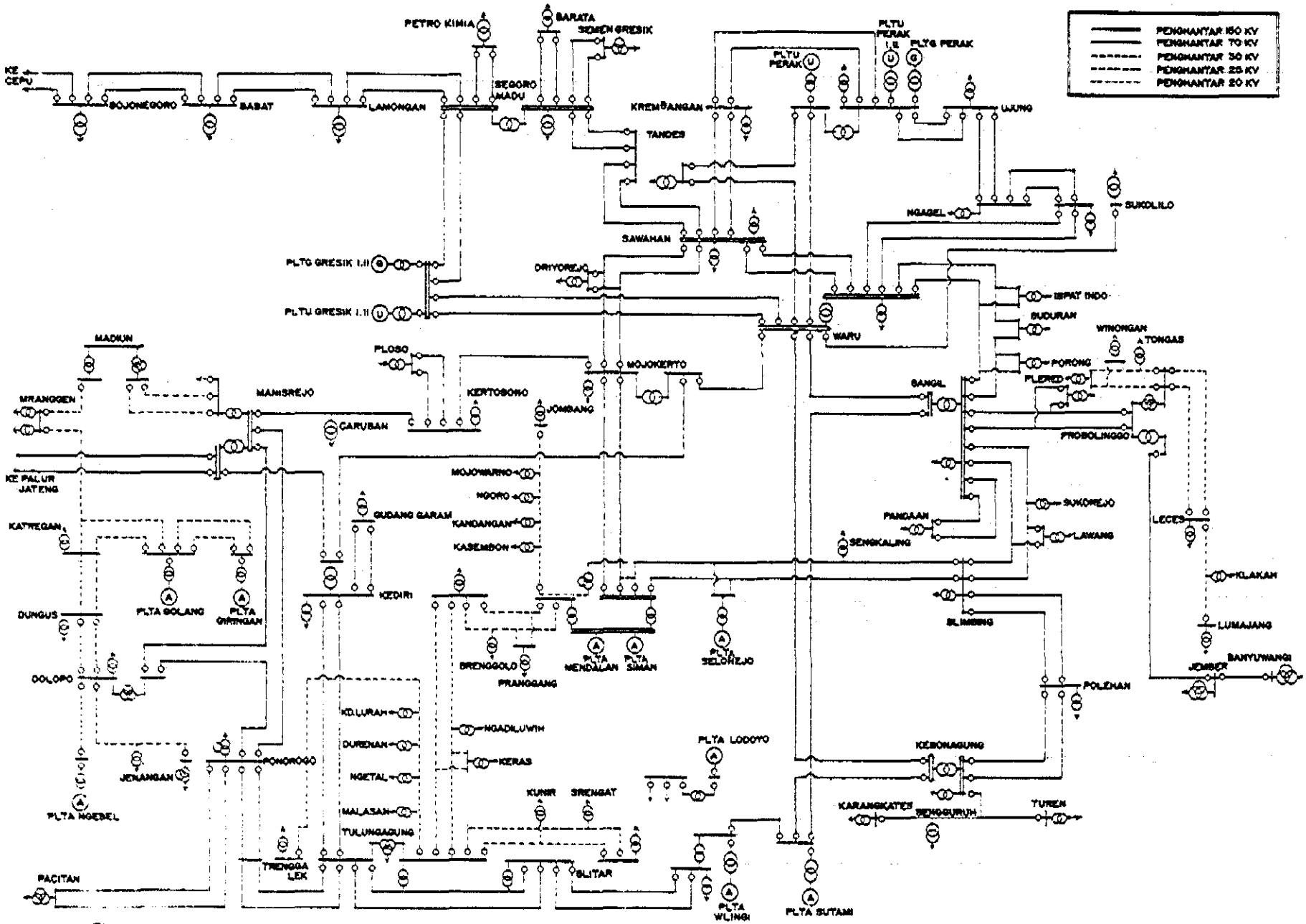
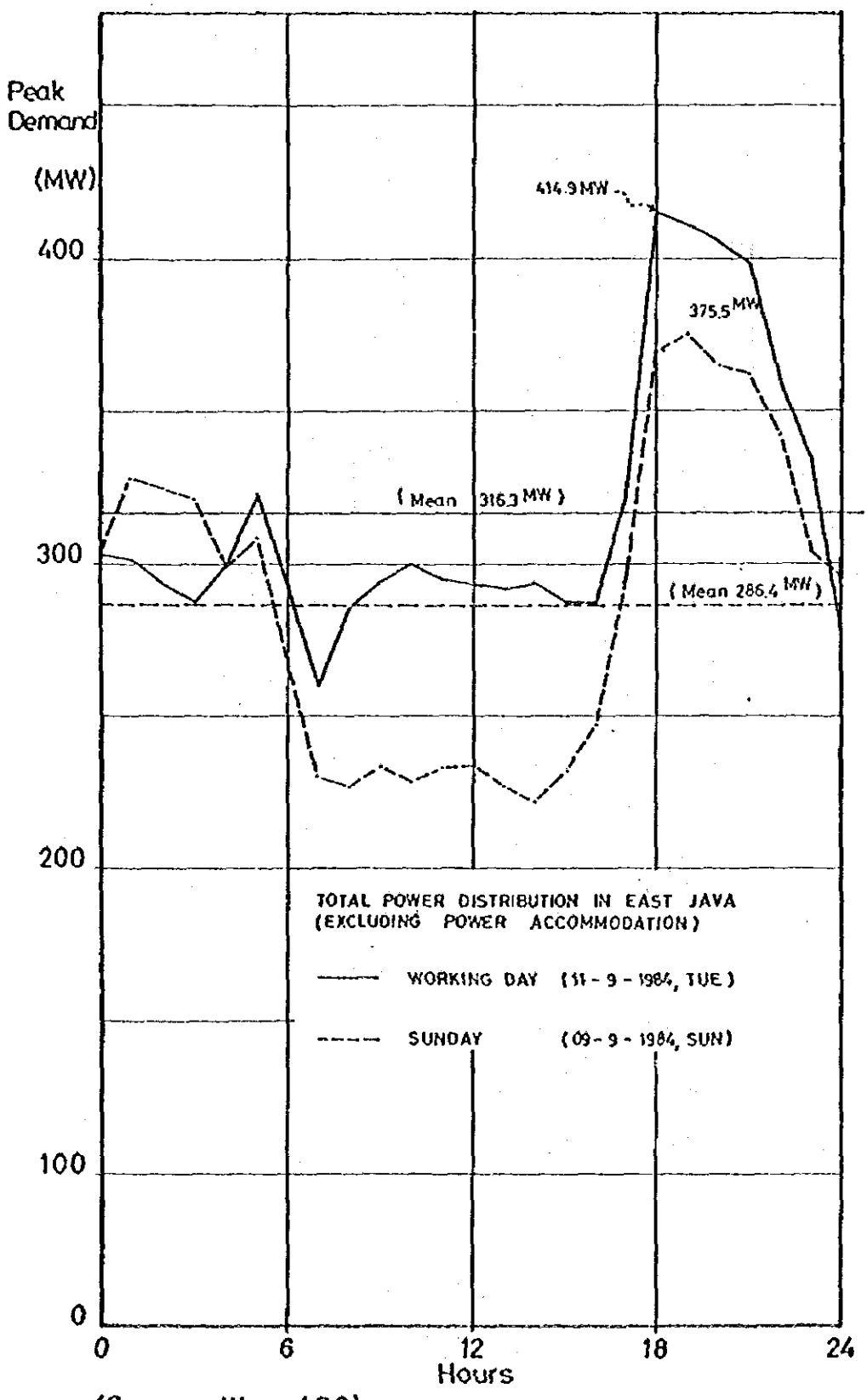
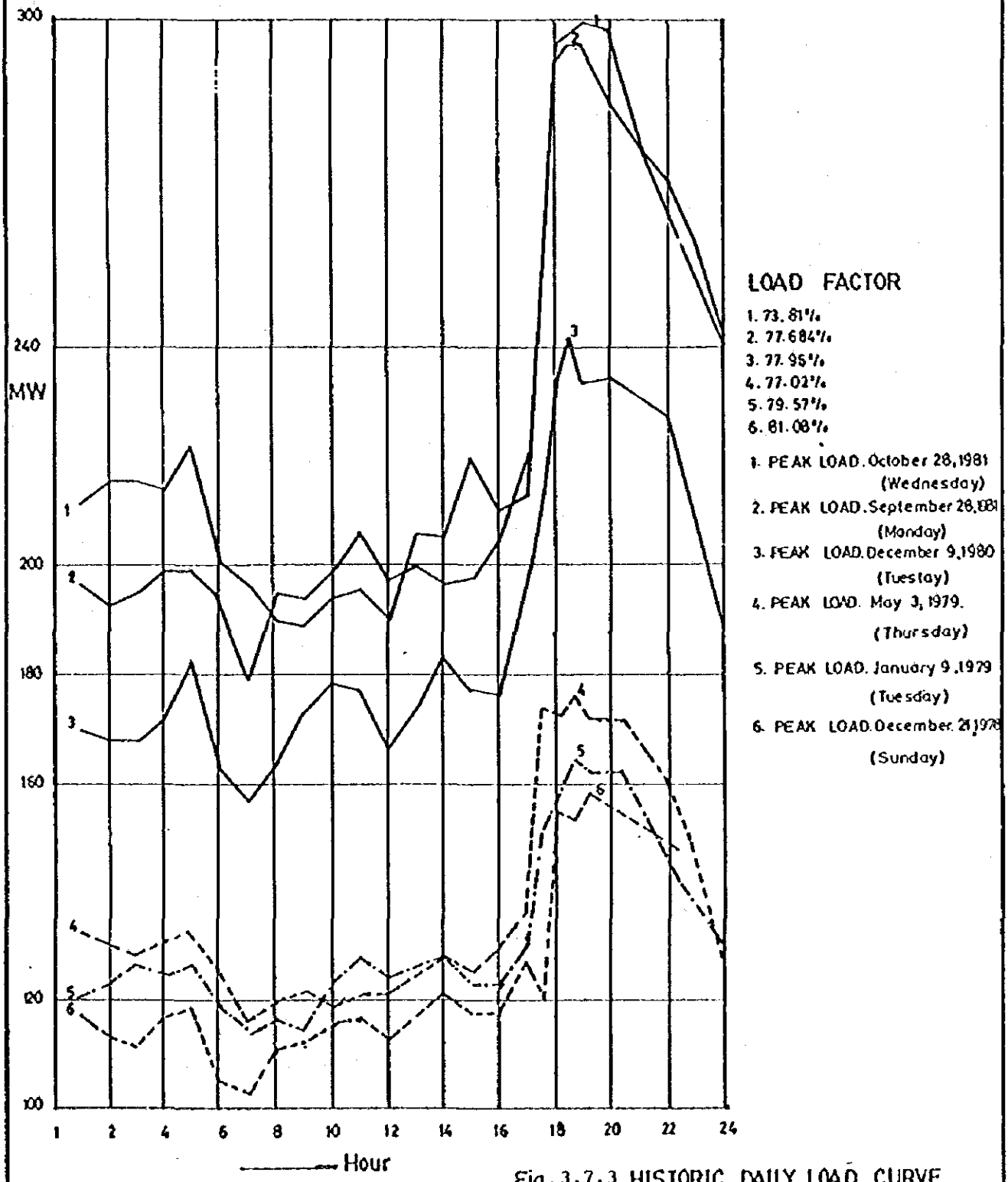


Fig. 3.7.1 EAST JAVA TRANSMISSION SYSTEM



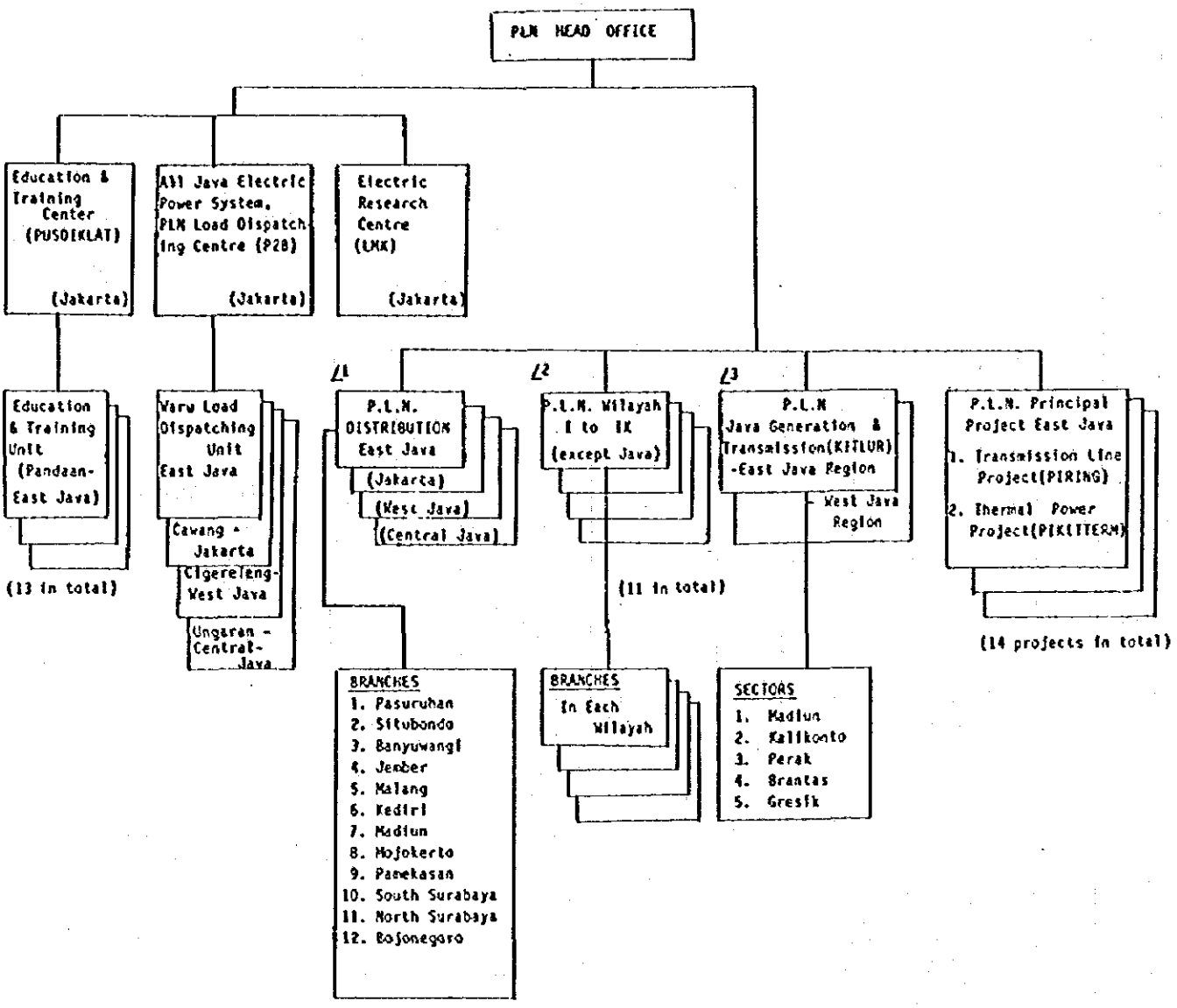
(Source: Waru LDC)

Fig. 3.7.2 DAILY LOAD CURVE IN EAST JAVA SYSTEM



(Source = Ref. EP – 01)

Fig. 3.7.3 HISTORIC DAILY LOAD CURVE IN EAST JAVA SYSTEM



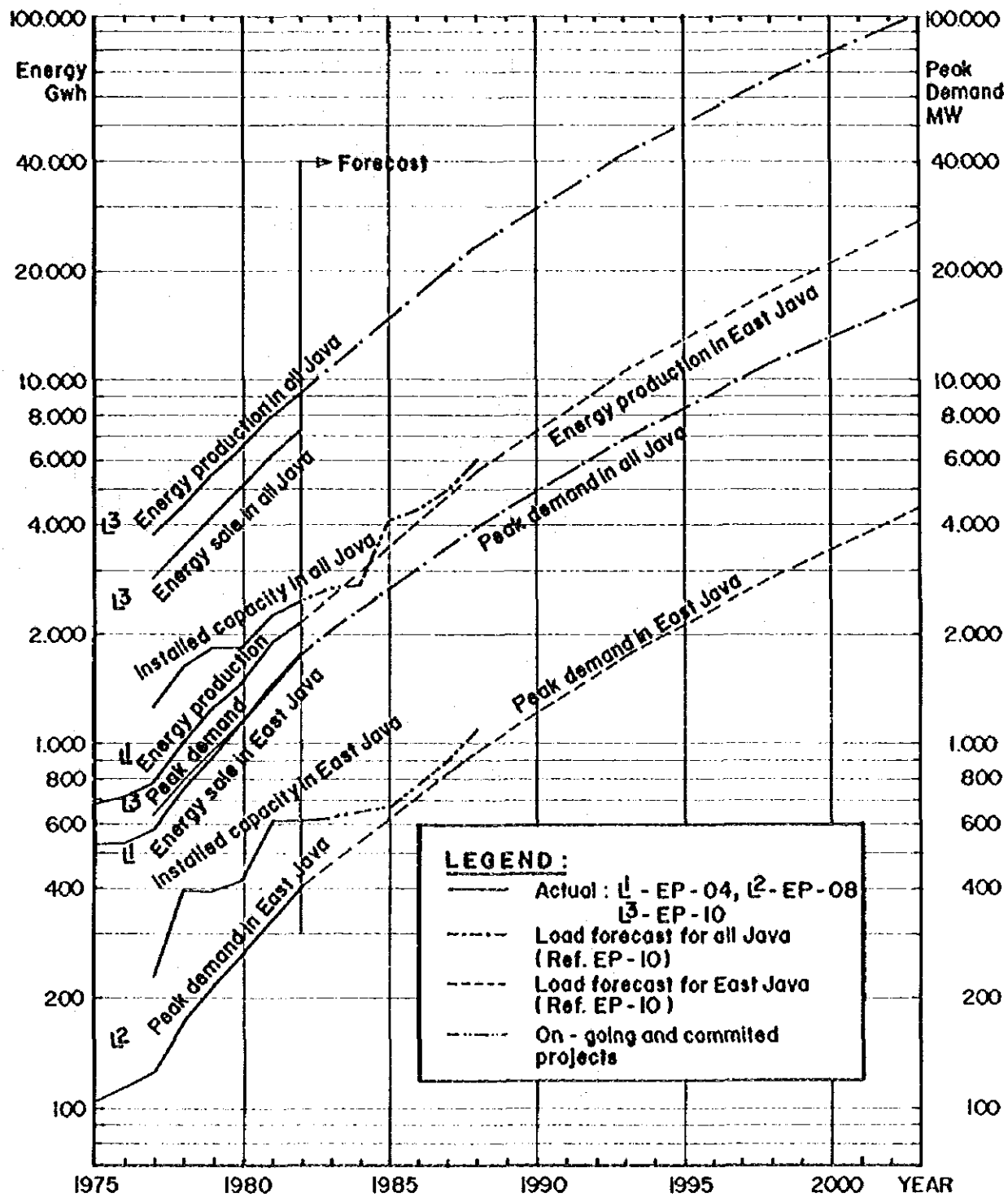
LEGEND		
P2B	:	Pusat Pengatur Beban se Jawa
KITLUR	:	Pembangkit dan Penyaluran
PIRING	:	Proyek Induk Jaringan
PIKLITERM	:	Proyek Induk Pembangkit Termal
PUSDIKLAT	:	Pusat Pendidikan dan Latihan

Note: /1 - PLN Wilayah XII was re-organized as "PLN DISTRIBUSI JAWA TIMUR" as from 22nd January, 1983. PLN Wilayah XI and XIII were also re-organized accordingly.

/2 - New PLN Wilayah XI was organized for Bali Island as from 22nd January, 1983.

/3 - PLN Pembangkitan dan Penyaluran Jawa was also re-organized as from 12 February, 1983. Madura area is included in East Java region.

Fig. 3.7.4 ORGANIZATION OF PLN IN EAST JAVA



(Source : Ref. EP - 04, EP - 08 & EP -)

Fig. 3.7.5 HISTORIC POWER DEMAND AND FORECAST IN EAST JAVA AND ALL JAVA

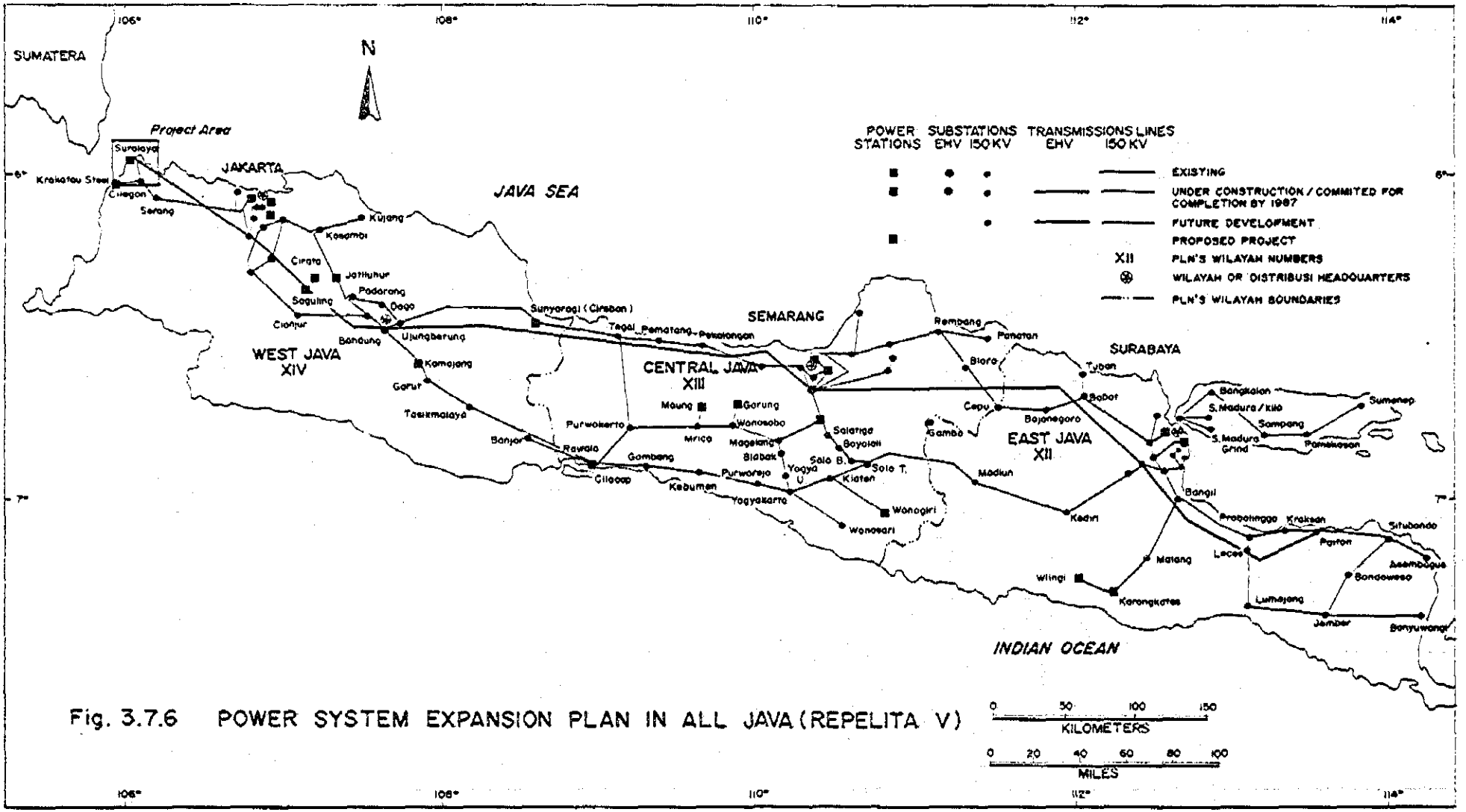


Fig. 3.7.6 POWER SYSTEM EXPANSION PLAN IN ALL JAVA (REPELITA V)

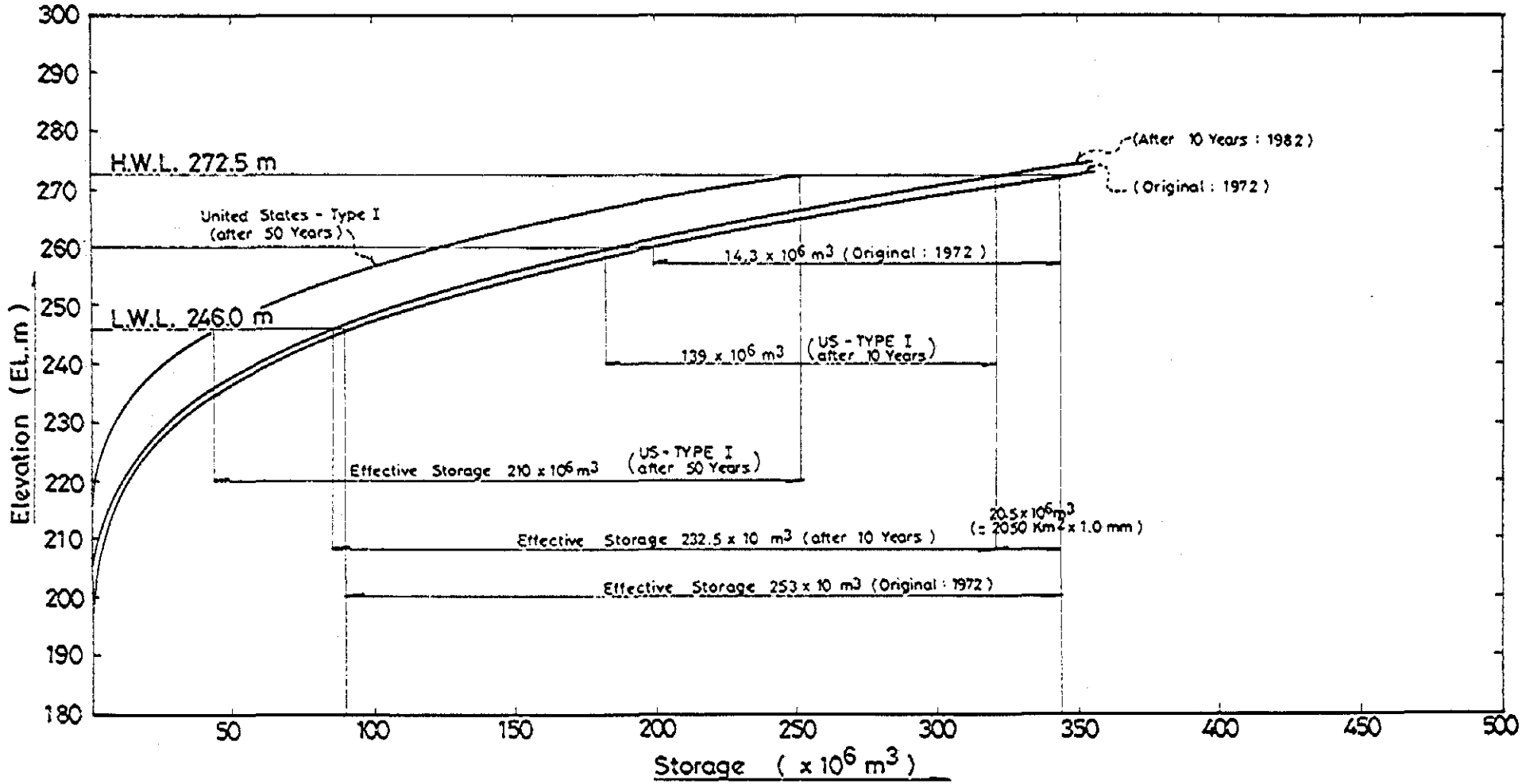


Fig. 3.8.1 ESTIMATED RESERVOIR STORAGE OF KARANGKATES DAM

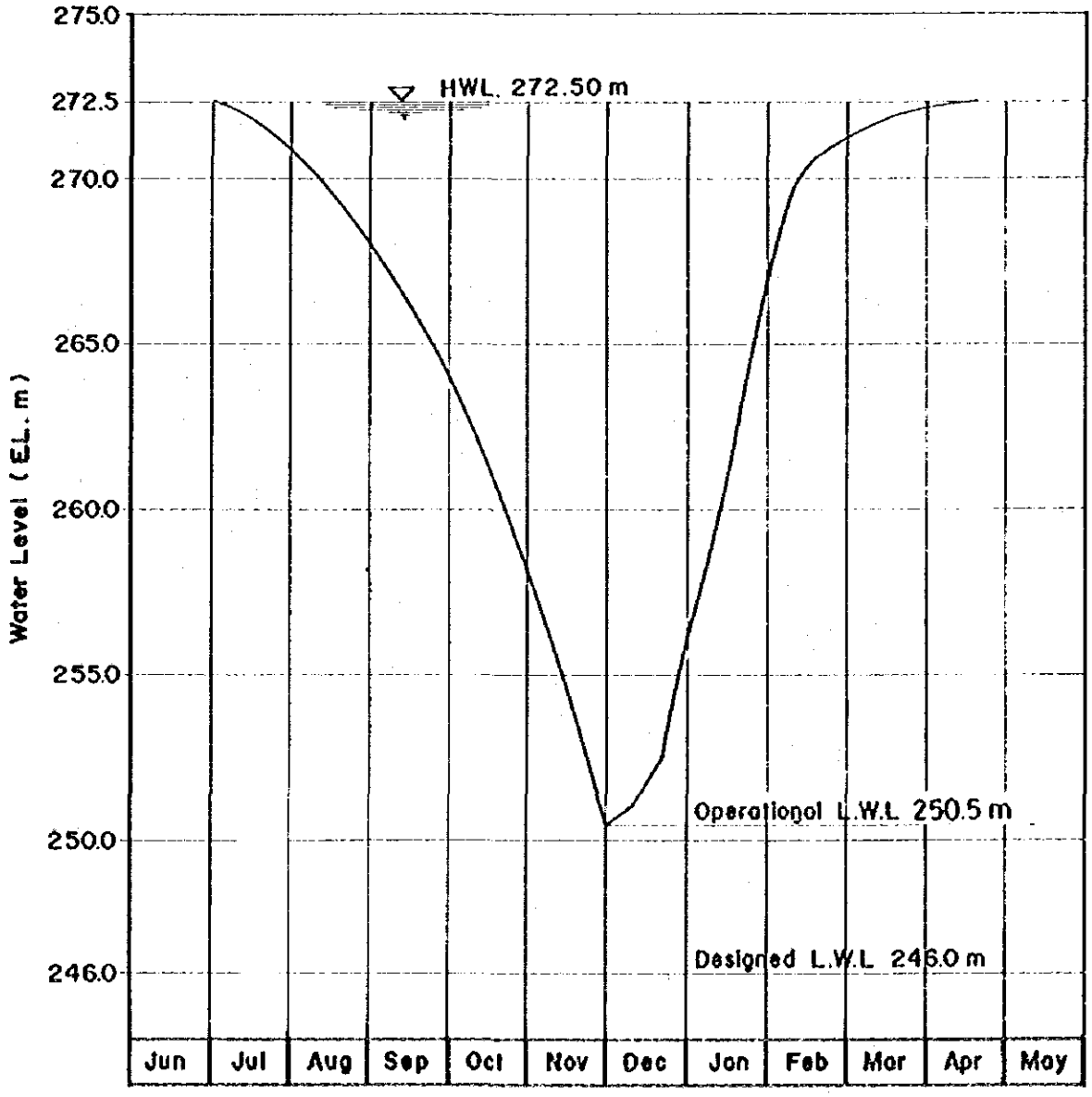


Fig. 3.8.2 SCHEDULED WATER LEVEL. (KARANGKATES DAM)

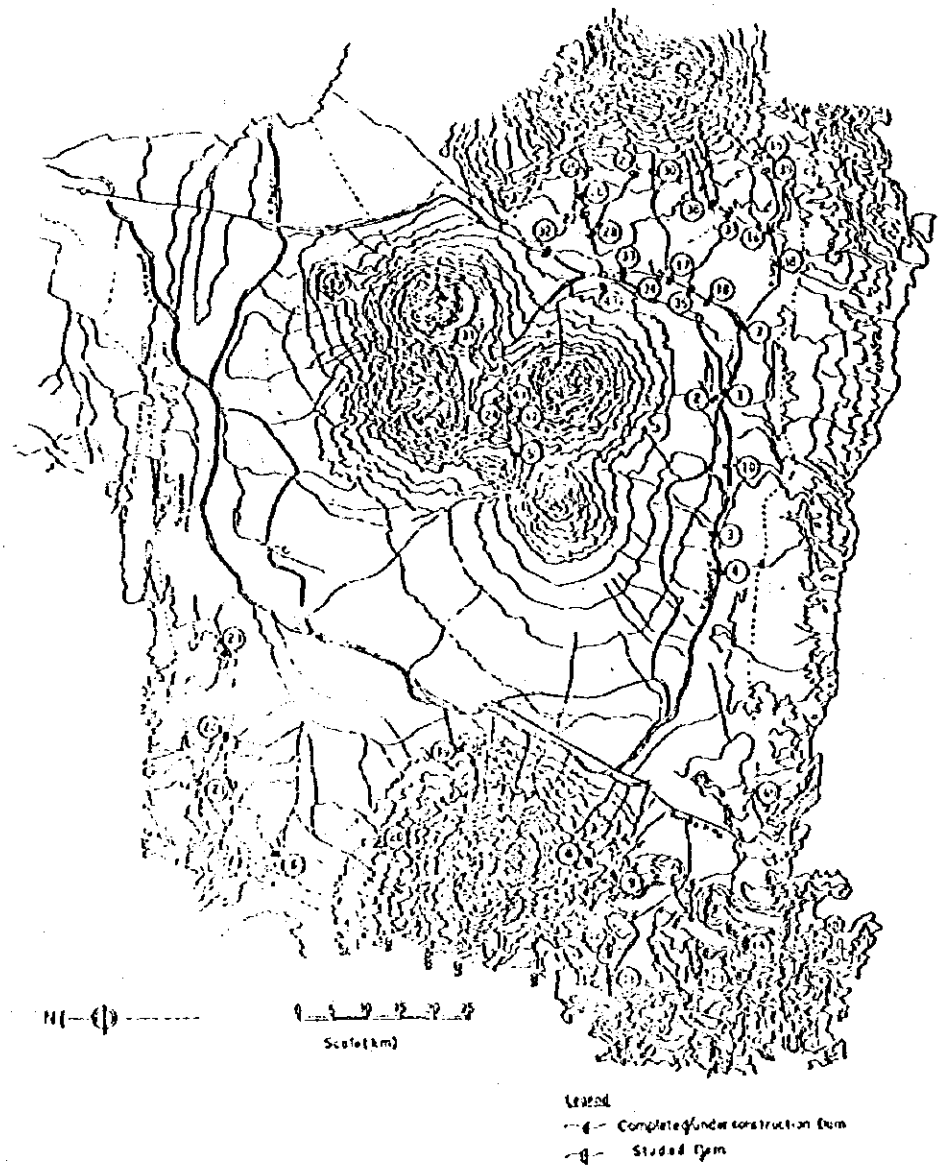


Fig. 3.8.3 LOCATION MAP OF DAM PROJECTS

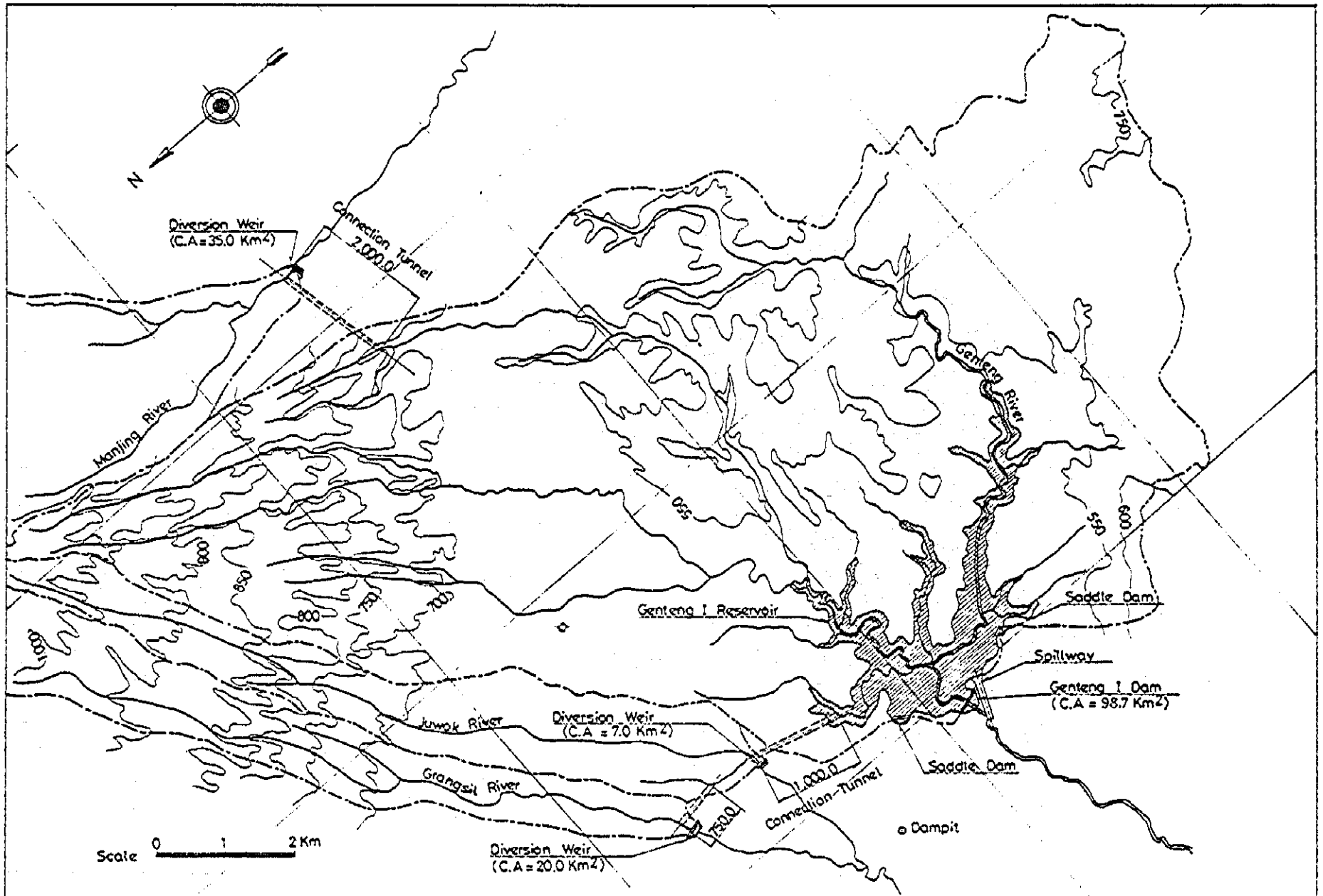
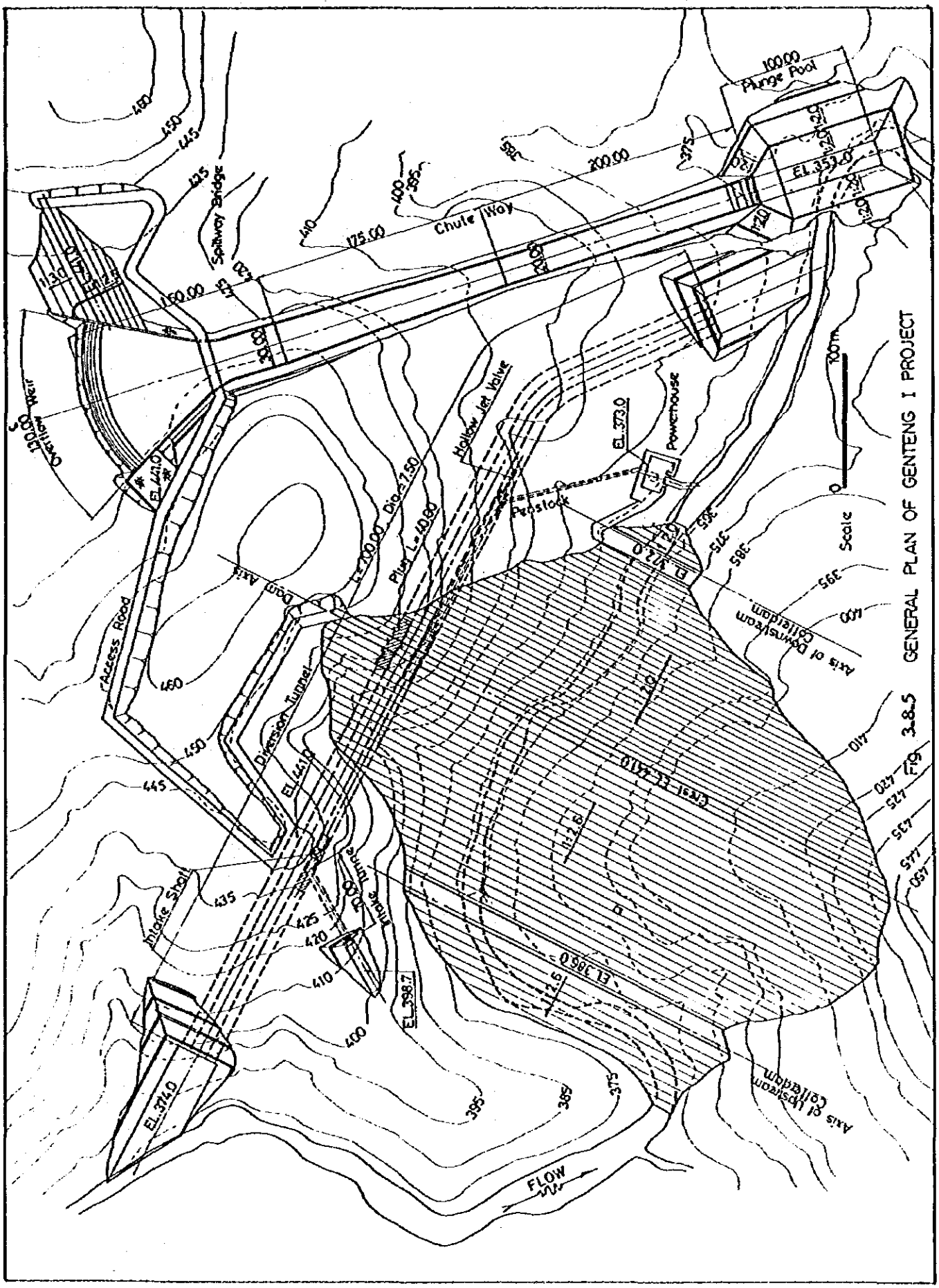


Fig.3.8.4 GENERAL LAYOUT OF GENTENG I PROJECT


GENERAL PLAN OF GENTENG I PROJECT
Fig 3.8.5
Scale
100m
0
Plunge Pool
100.00
EL.353.0
Chute Way
200.00
175.00
150.00
Spillway Bridge
Overflow Weir
EL.441.0
Hollow Jet Valve
Powerhouse
EL.373.0
Penstock
Pipe L=40.80
Dia.7.50
Dam Axis
Access Road
Diversion Tunnel
EL.441.0
Intake Tunnel
Intake Shaft
EL.398.7
EL.374.0
EL.372.0
EL.398.0
Crest EL.410.0
Axis of Downstream Collection
Axis of Upstream Collection
FLOW

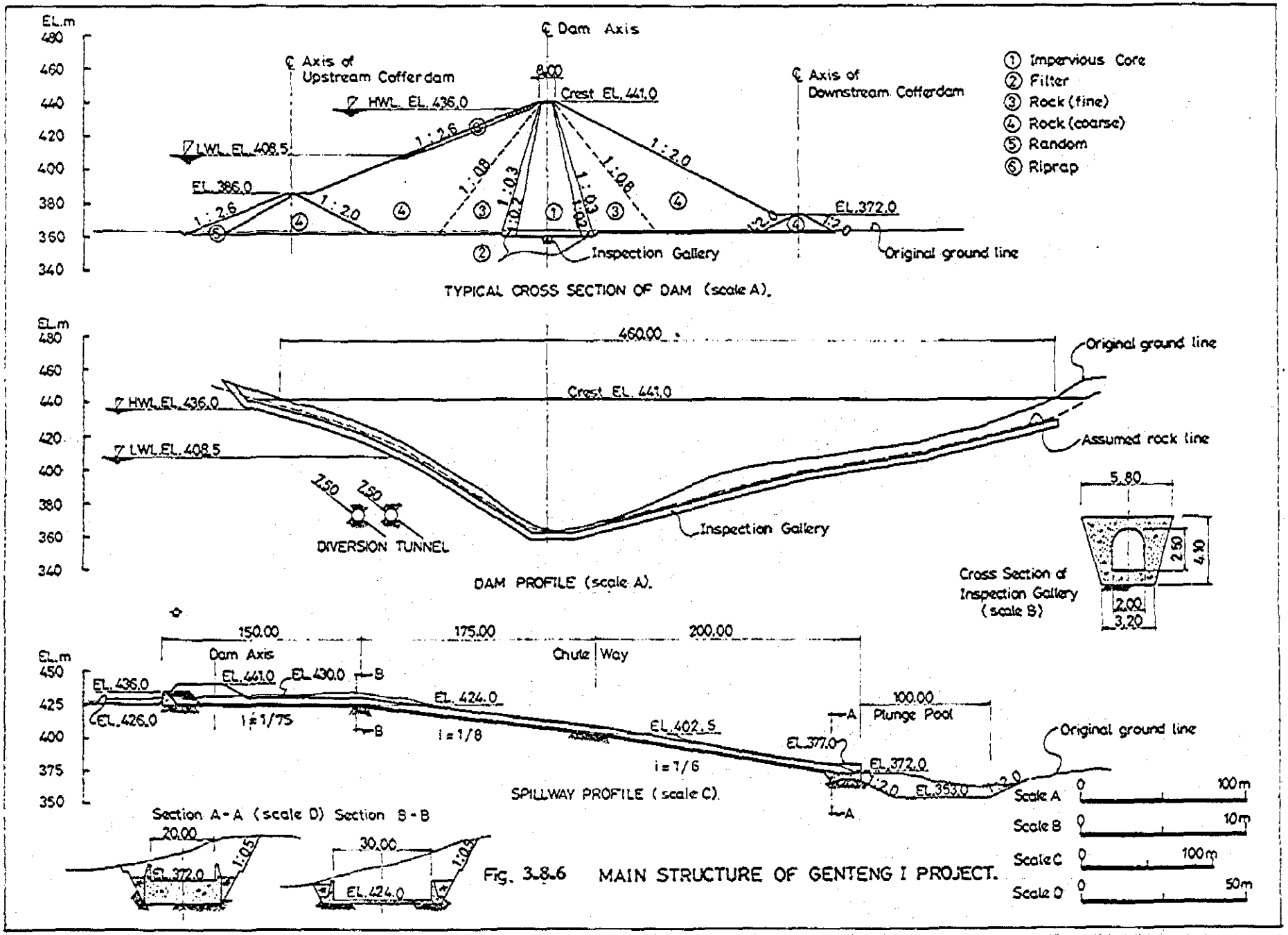


Fig. 3.8.6 MAIN STRUCTURE OF GENTENG I PROJECT.

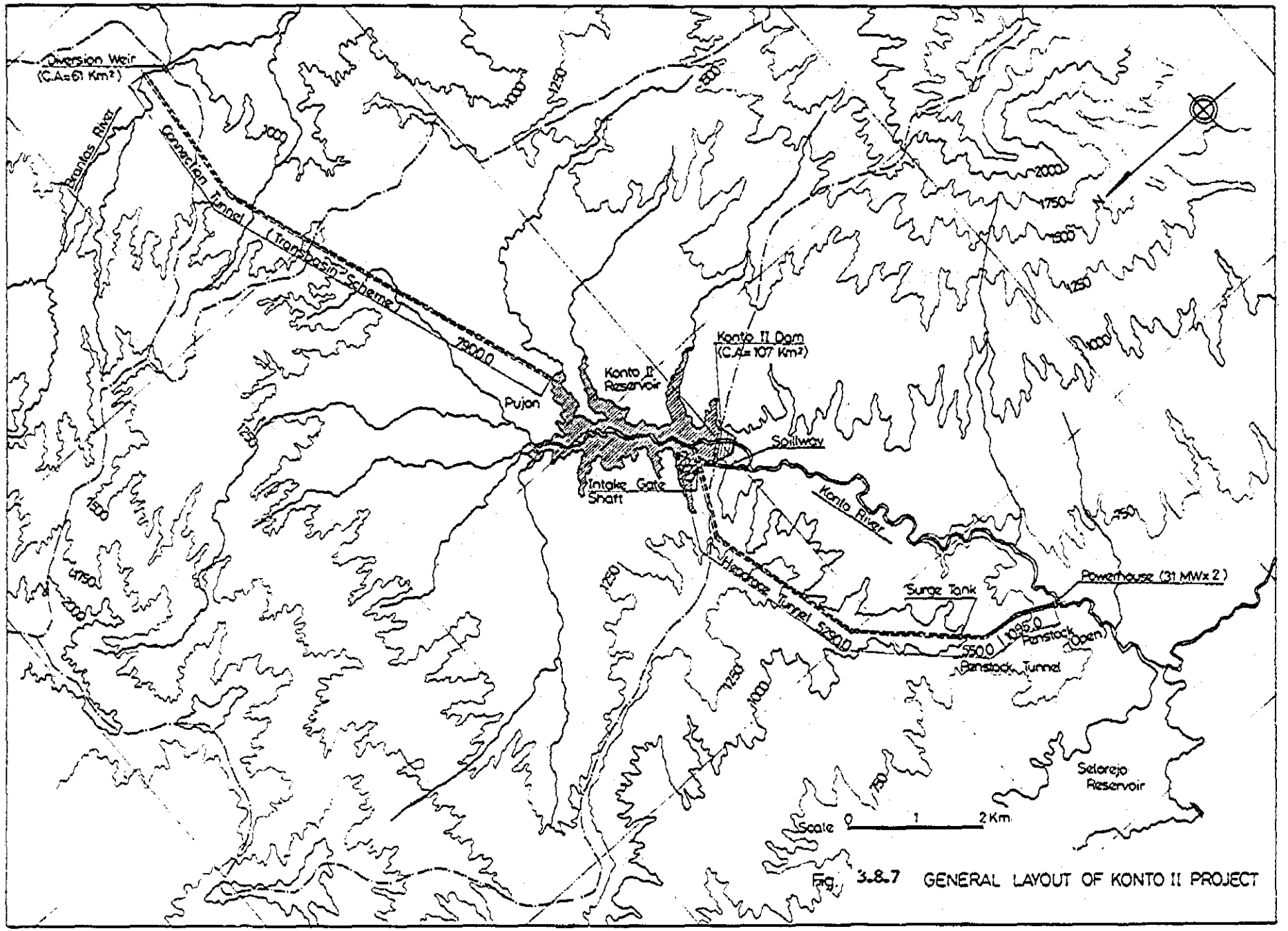


Fig. 3.8.7 GENERAL LAYOUT OF KONTO II PROJECT

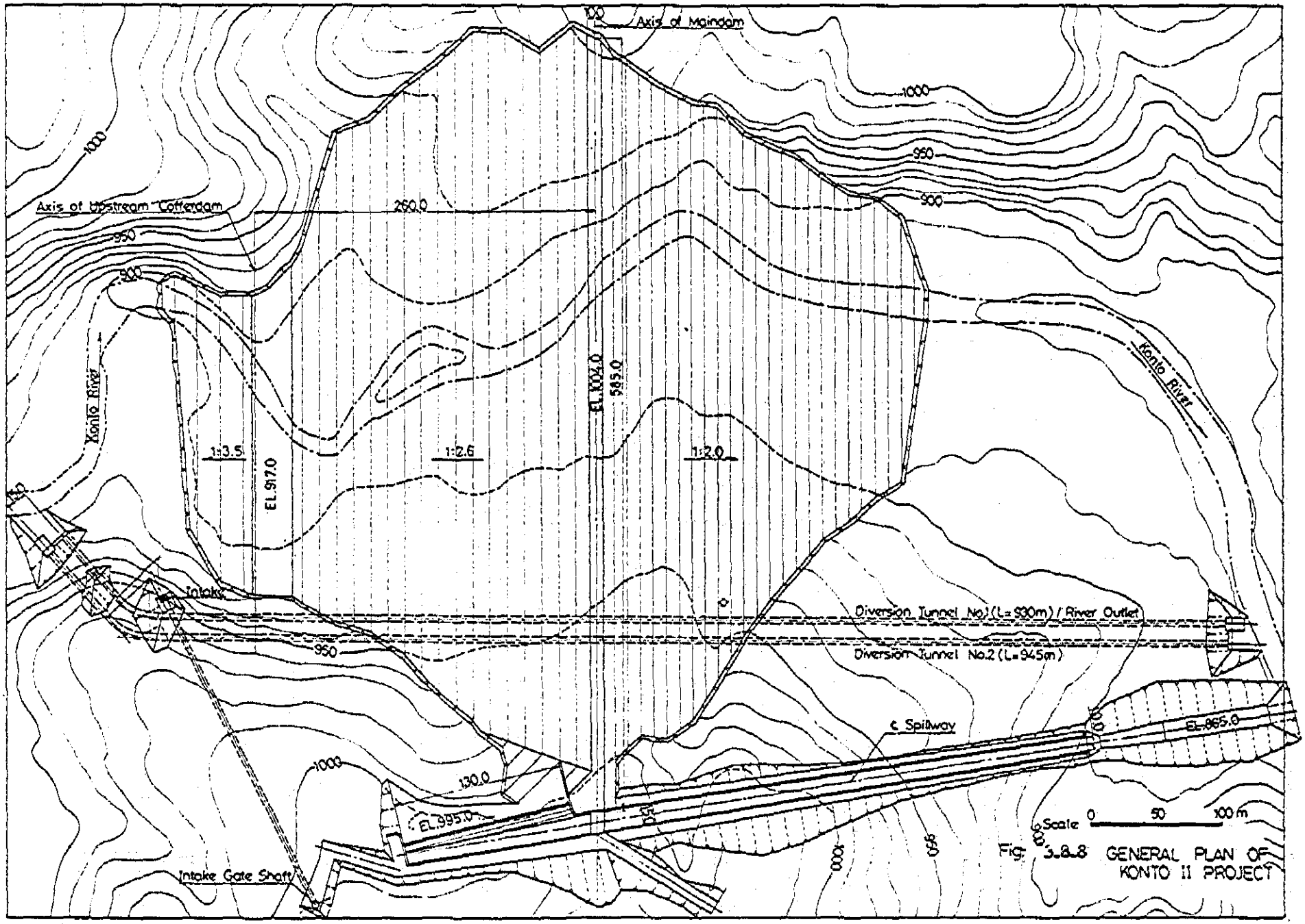


Fig. 3.8.8 GENERAL PLAN OF KONTO II PROJECT

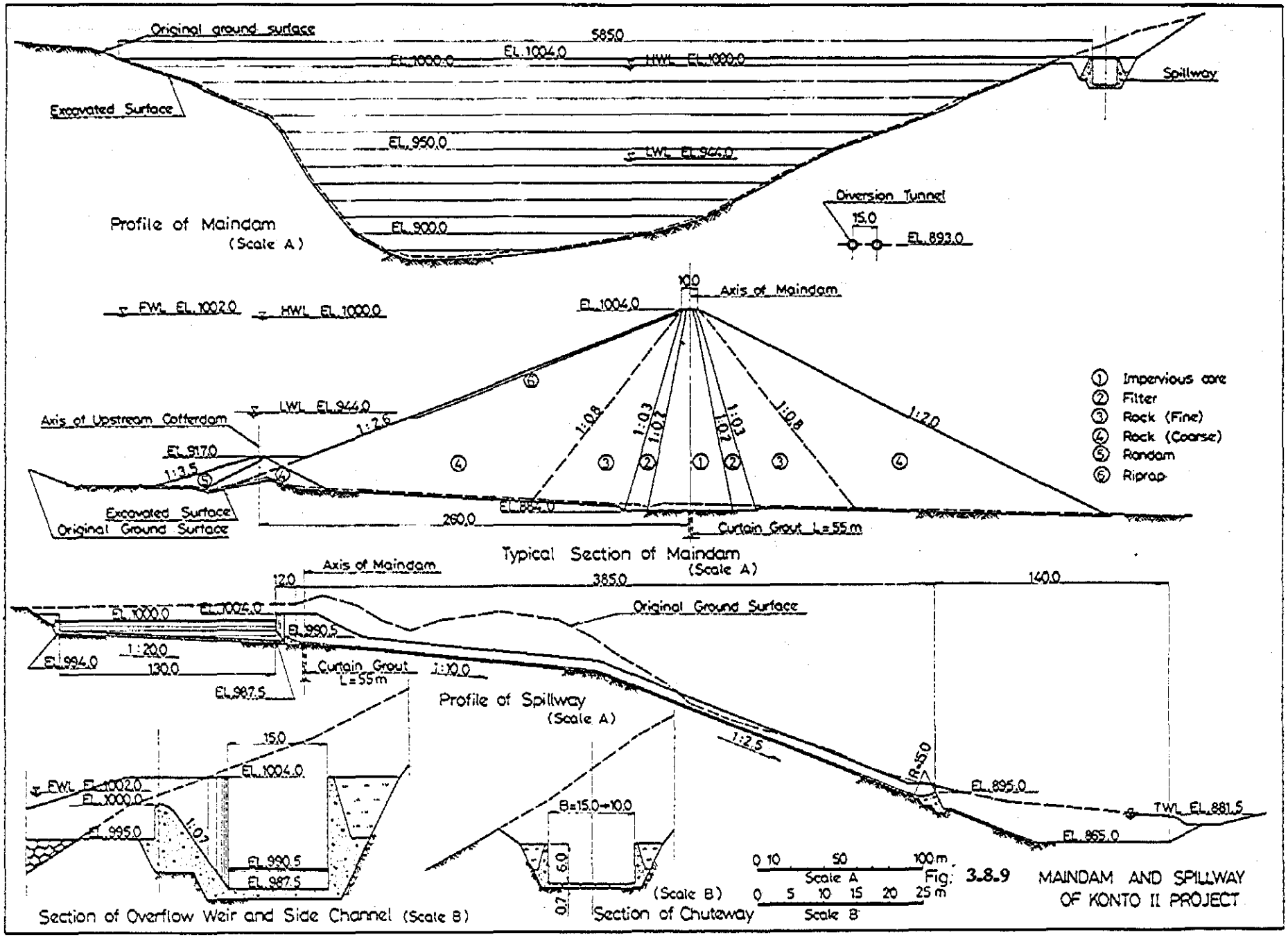


Fig. 3.8.9 MAINDAM AND SPILLWAY OF KONTO II PROJECT

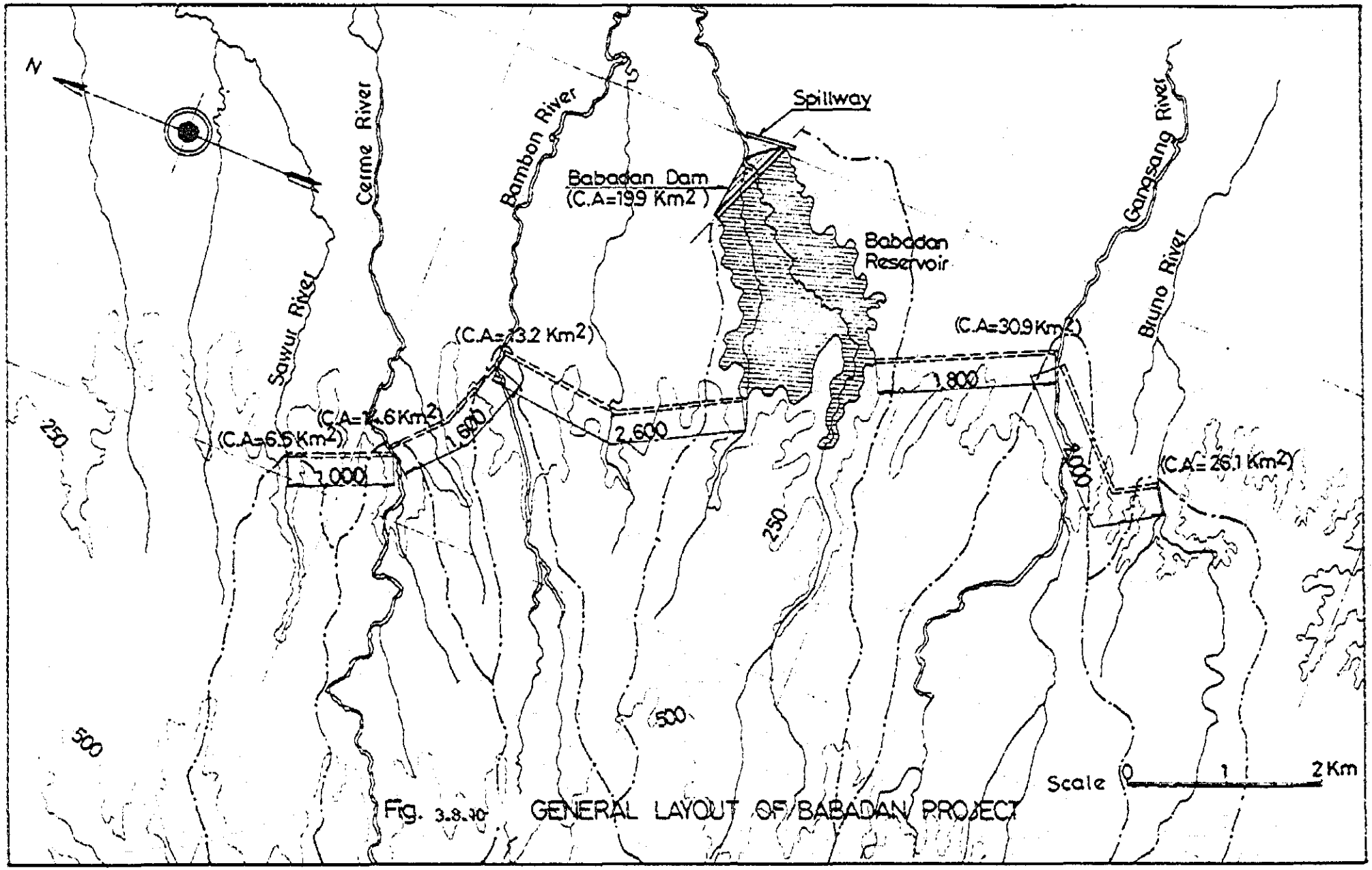


Fig. 3.8.10 GENERAL LAYOUT OF BABADAN PROJECT

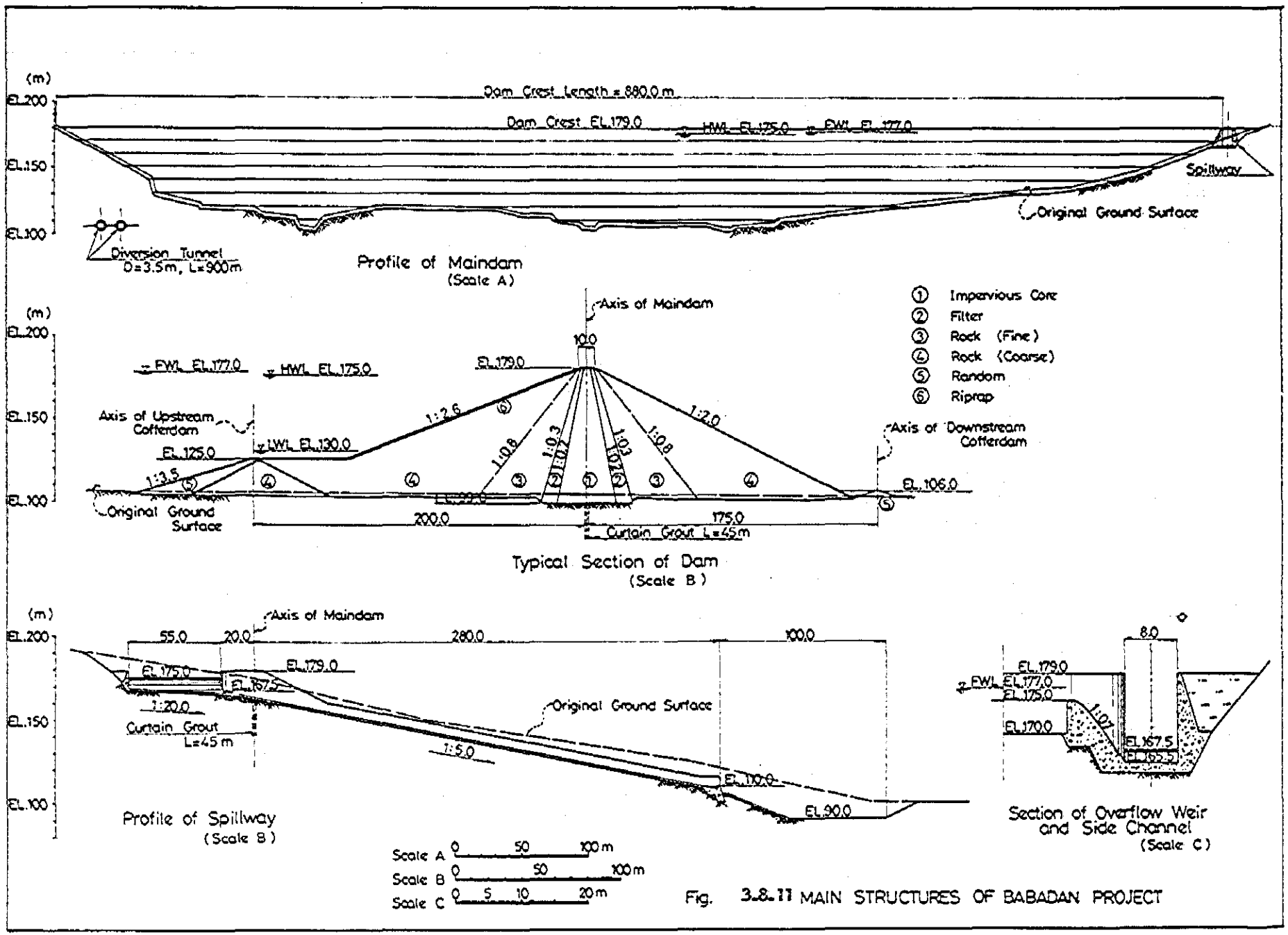


Fig. 3.8.11 MAIN STRUCTURES OF BABADAN PROJECT

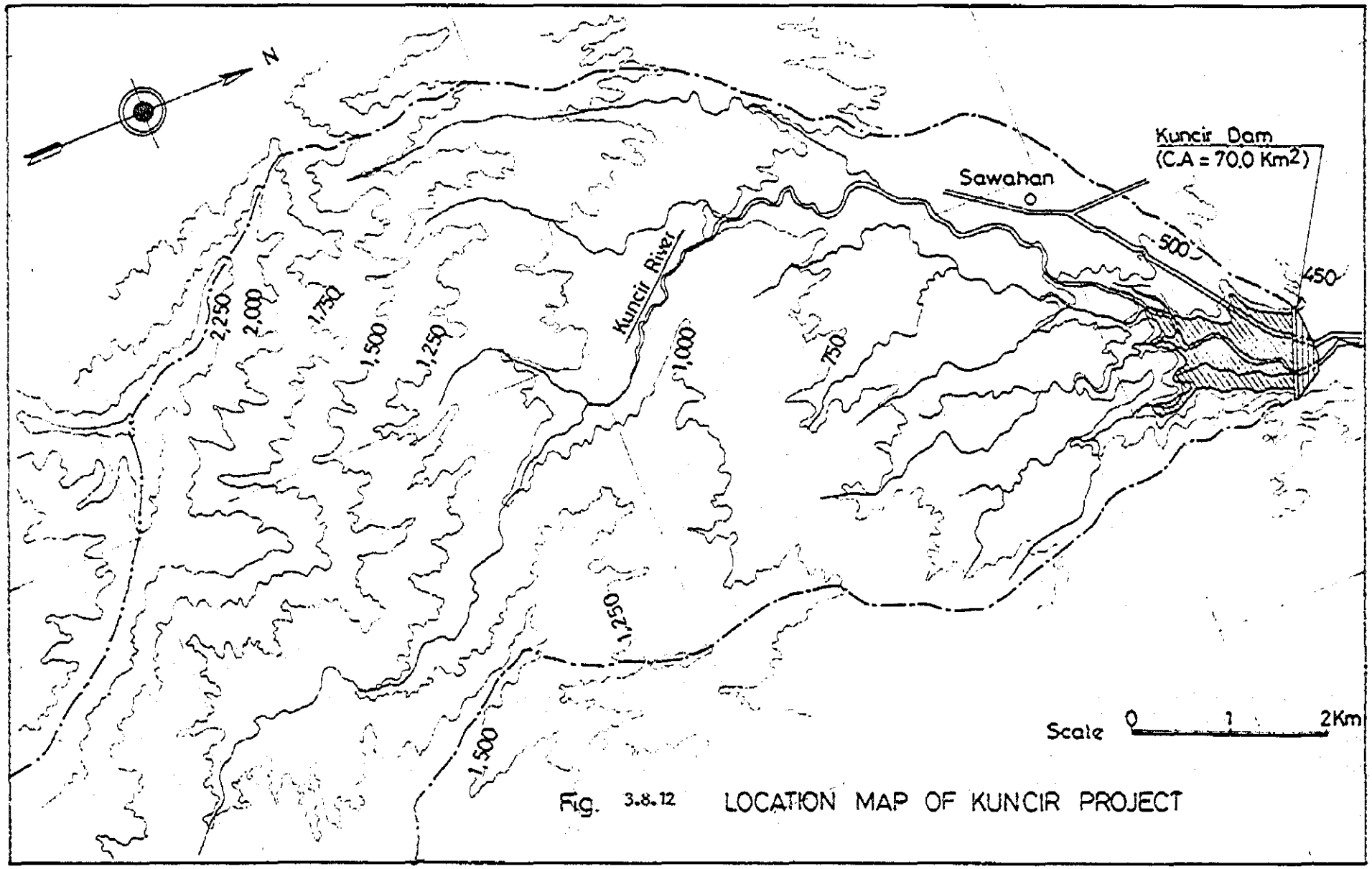


Fig. 3.8.12 LOCATION MAP OF KUNCIR PROJECT

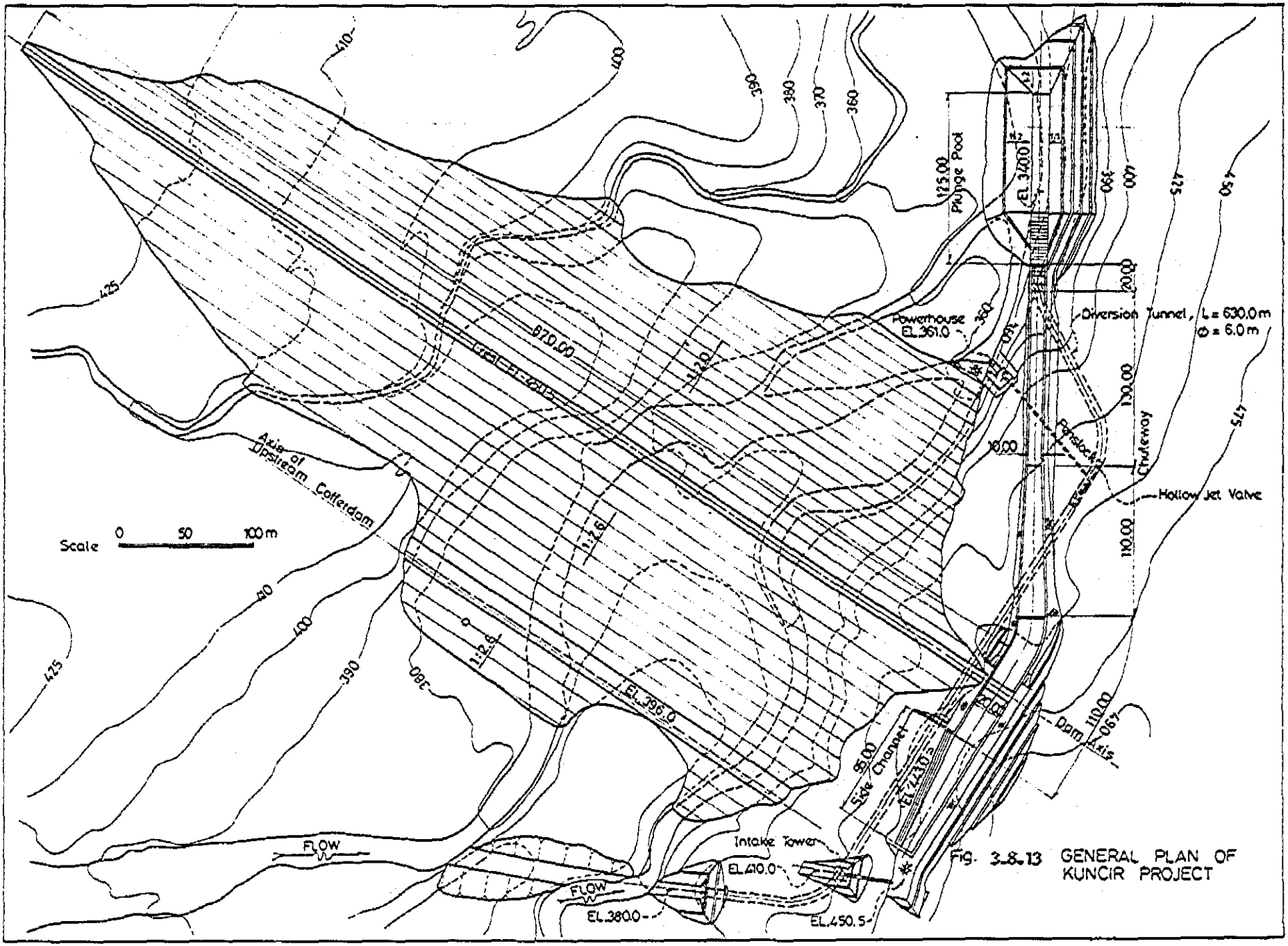


Fig. 3.8.13 GENERAL PLAN OF KUNCIR PROJECT

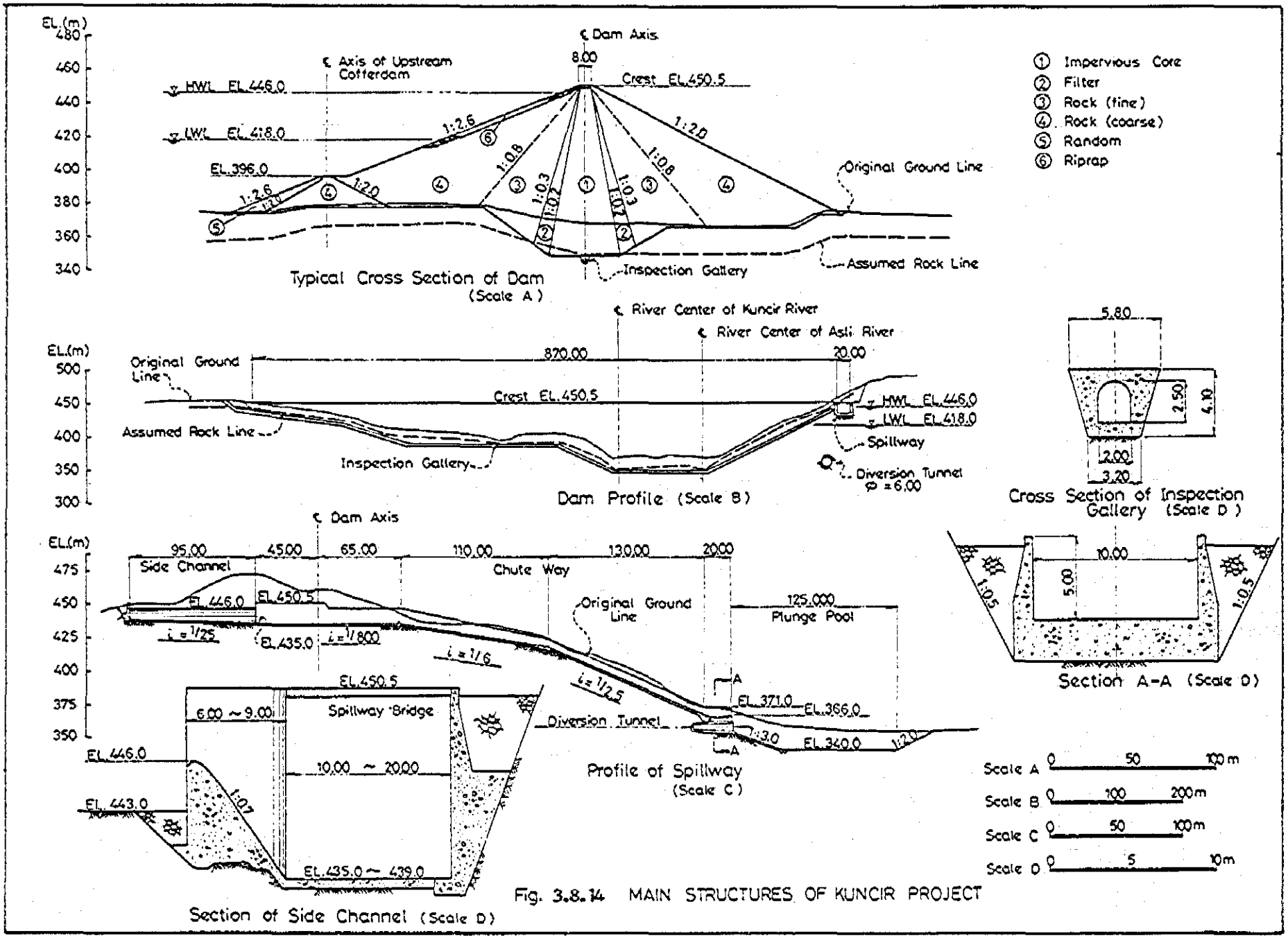


Fig. 3.8.14 MAIN STRUCTURES OF KUNCIR PROJECT

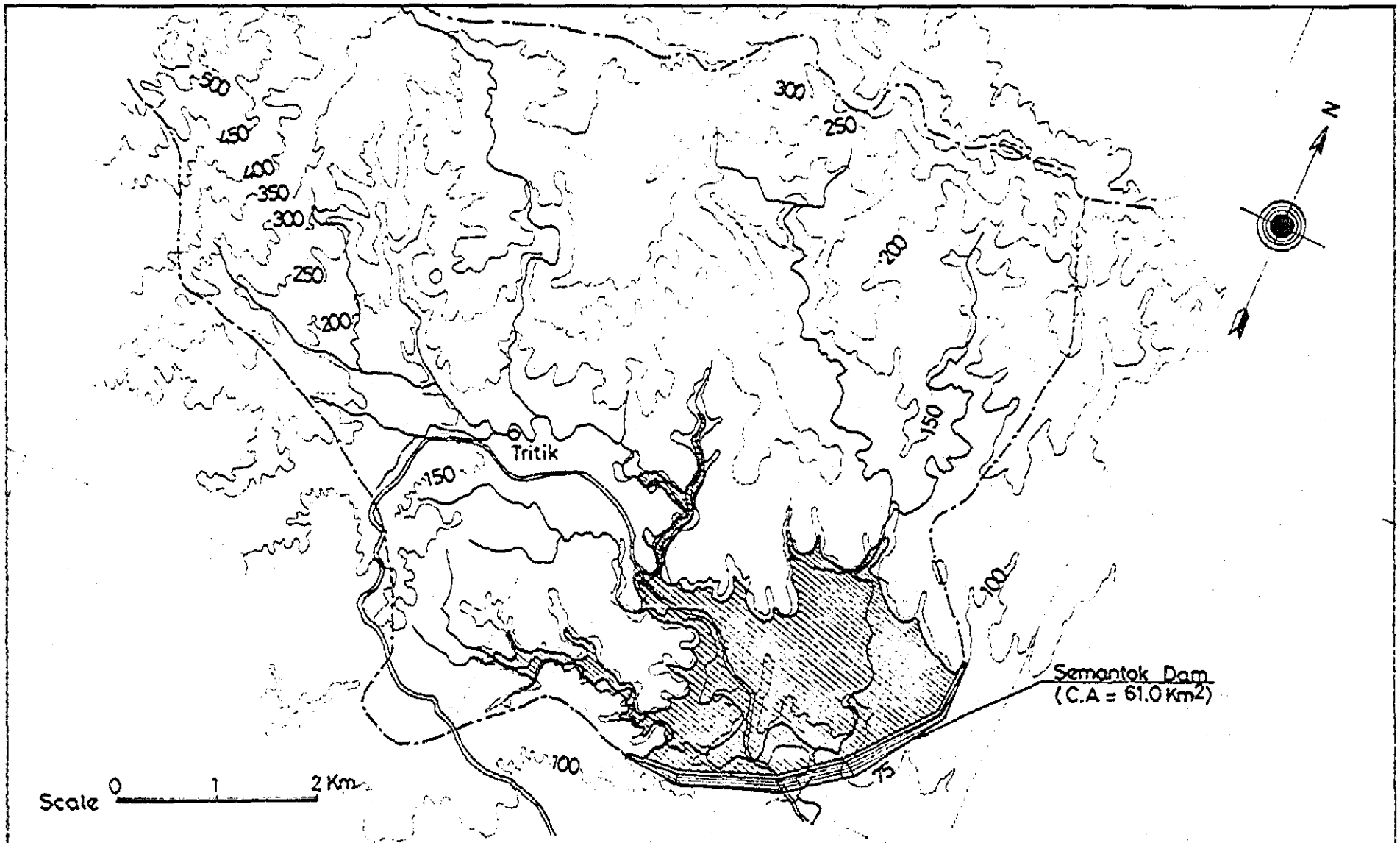


Fig. 3.8.15 LOCATION MAP OF SEMANTOK PROJECT

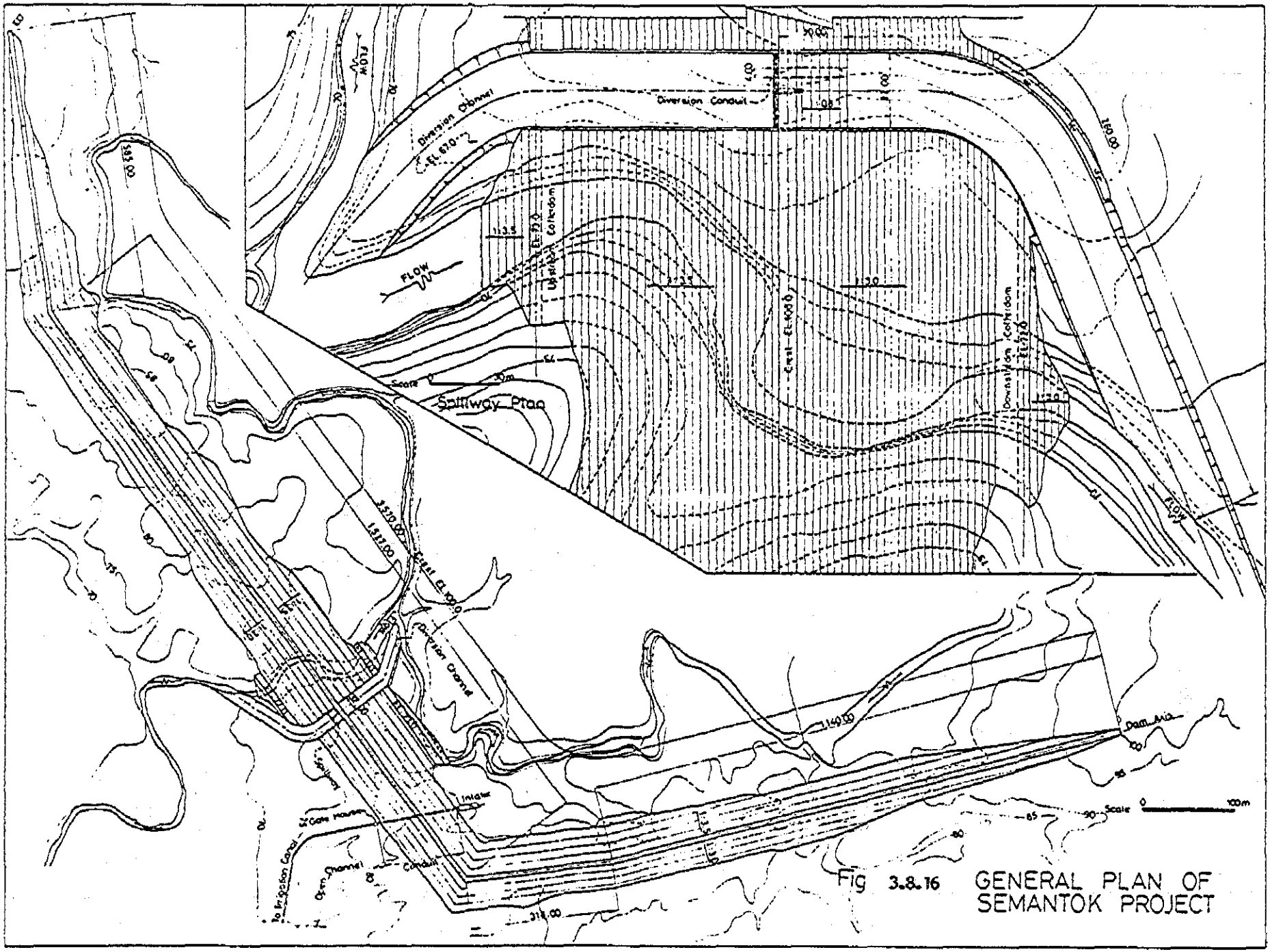


Fig 3.8.16 GENERAL PLAN OF SEMANTOK PROJECT

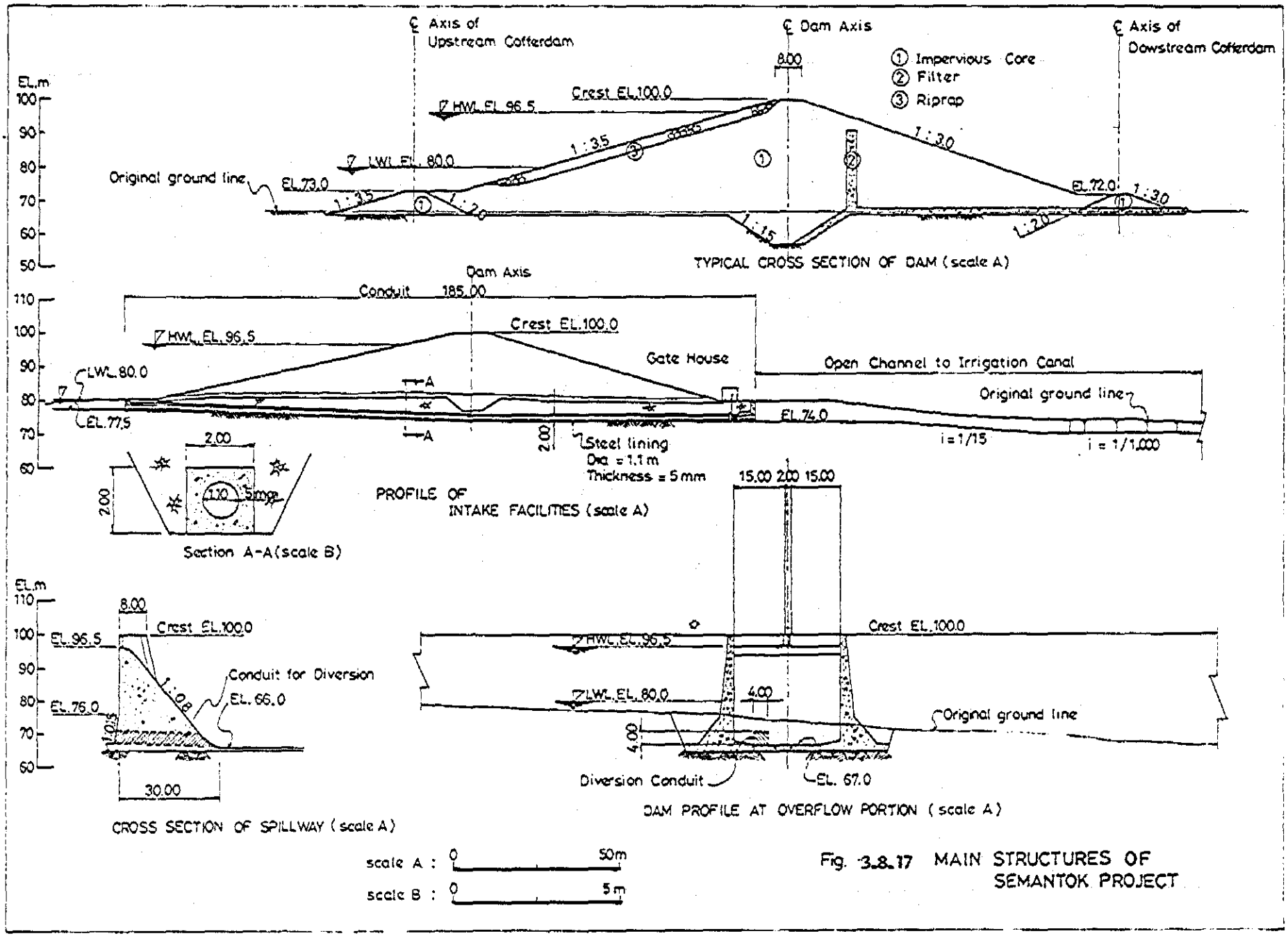


Fig. 3.8.17 MAIN STRUCTURES OF SEMANTOK PROJECT

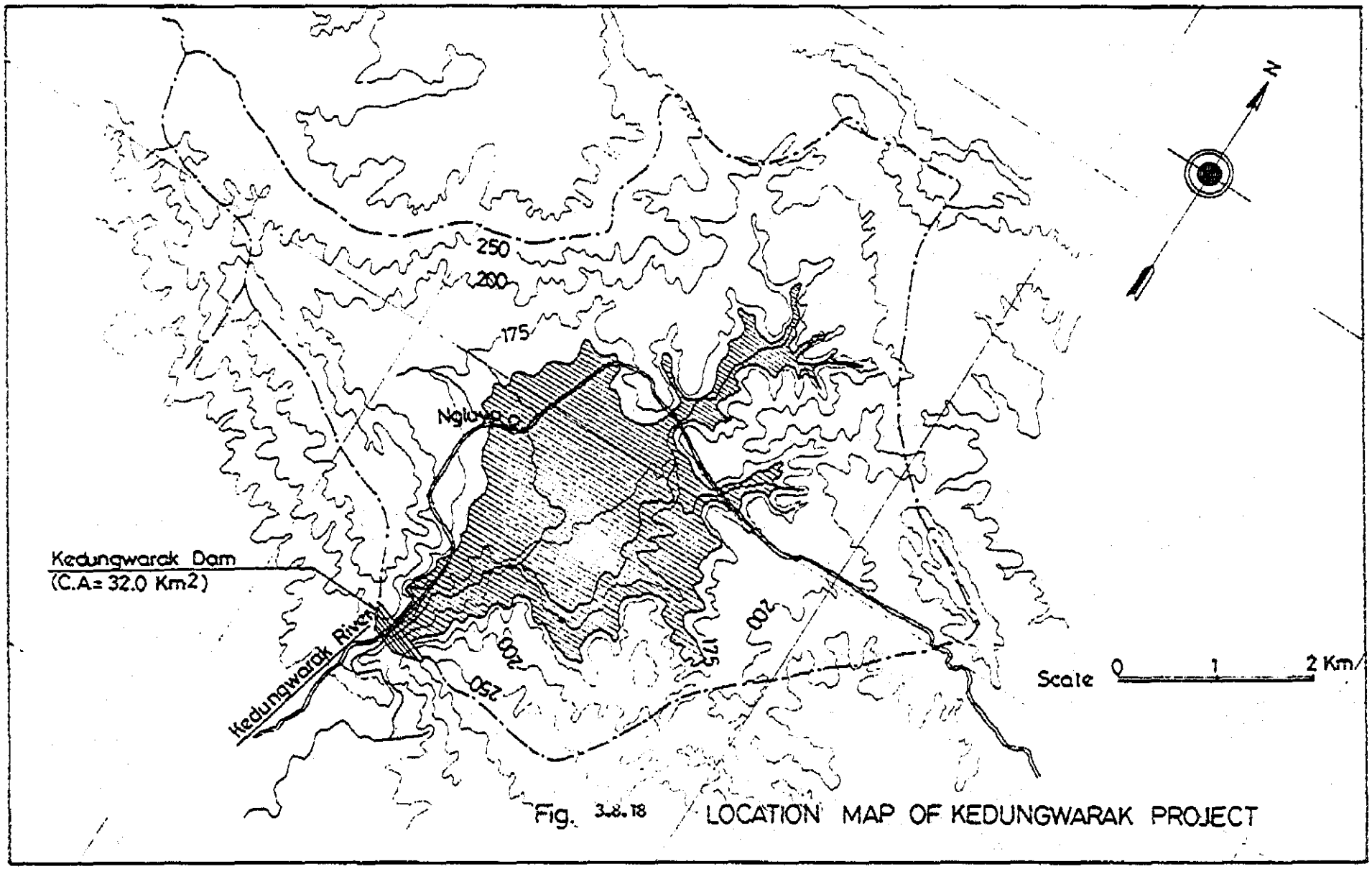


Fig. 3.8.18 LOCATION MAP OF KEDUNGWARAK PROJECT

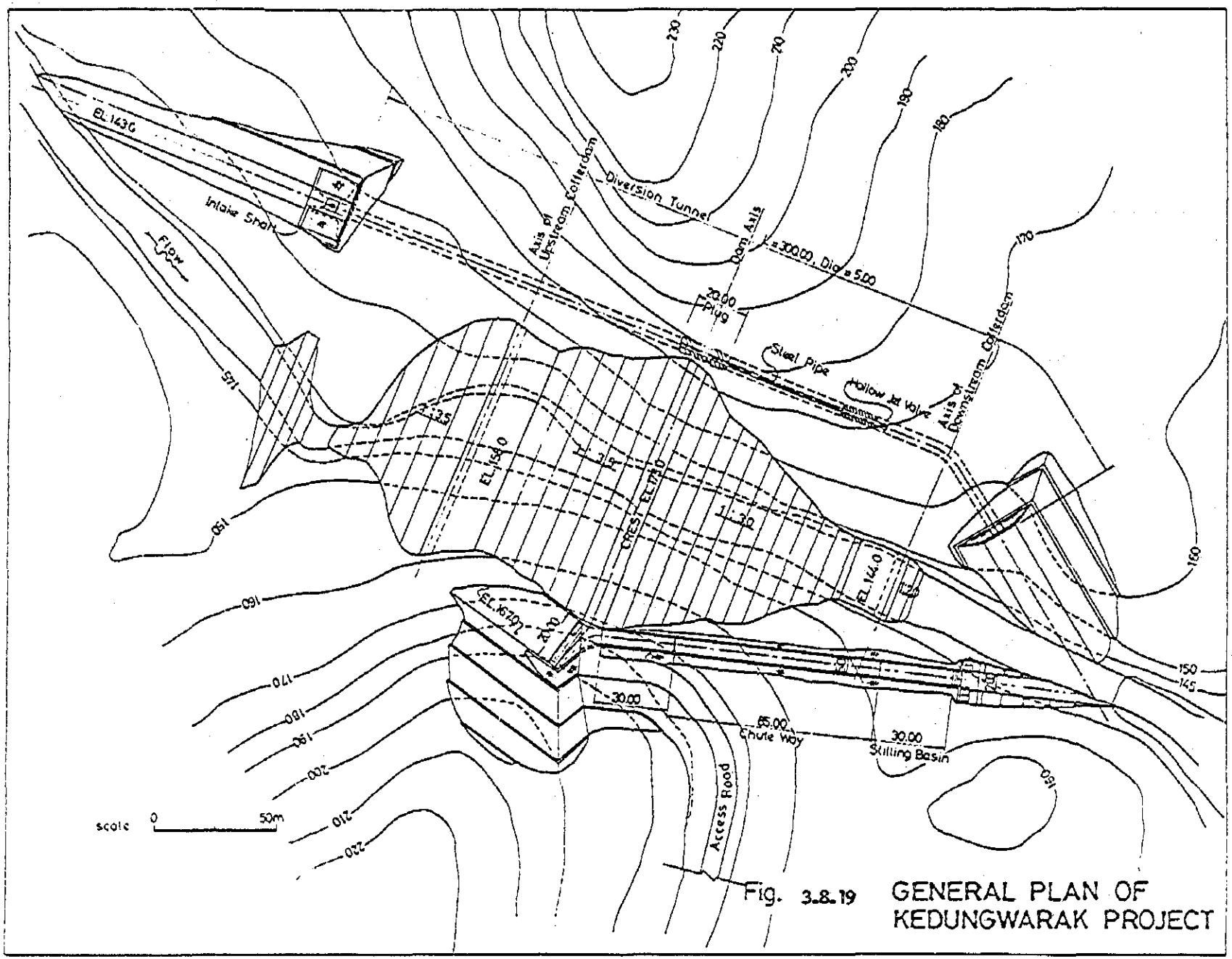


Fig. 3.8.19 GENERAL PLAN OF KEDUNGWARAK PROJECT

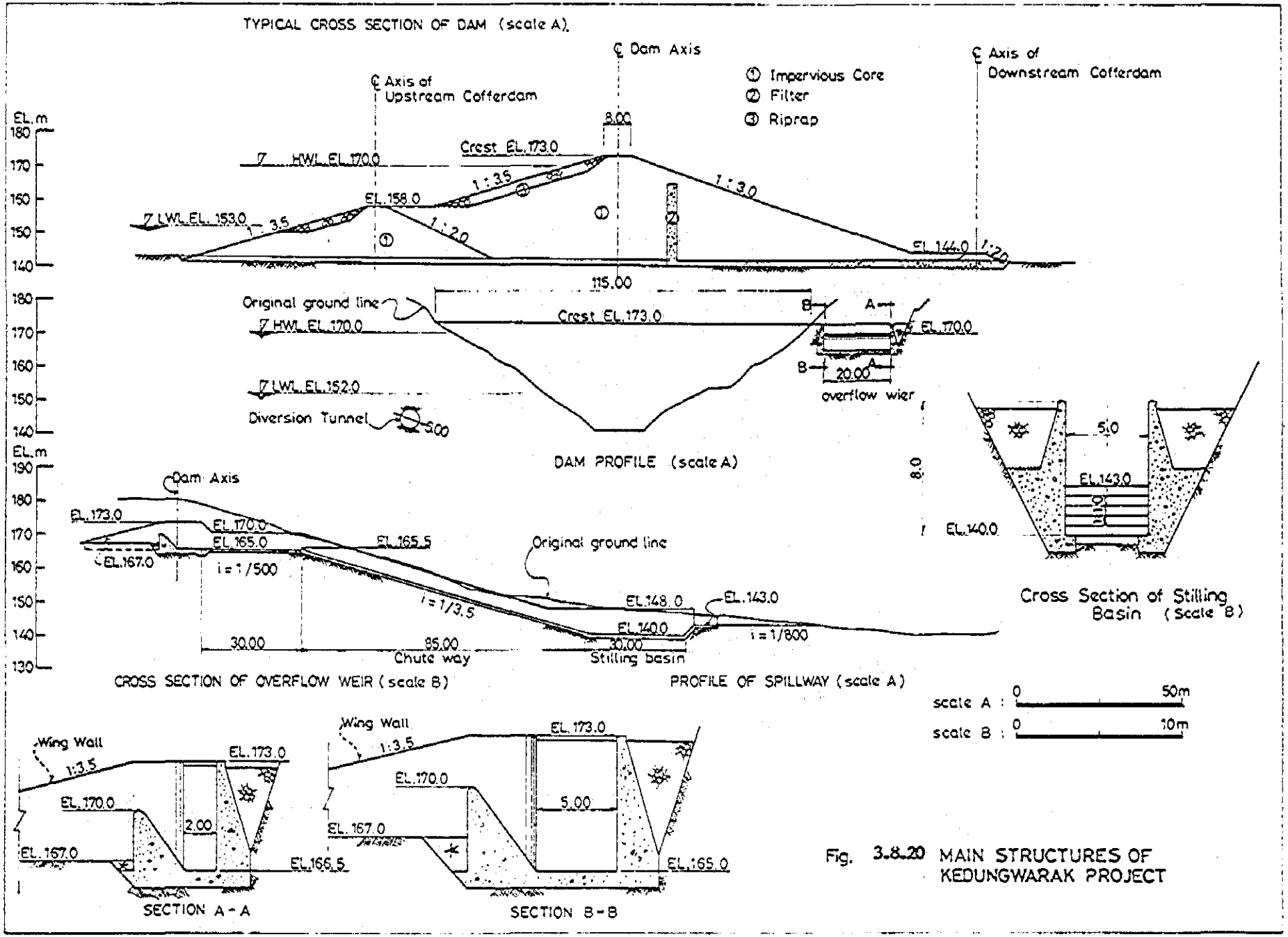


Fig. 3.8.20 MAIN STRUCTURES OF KEDUNGWARAK PROJECT

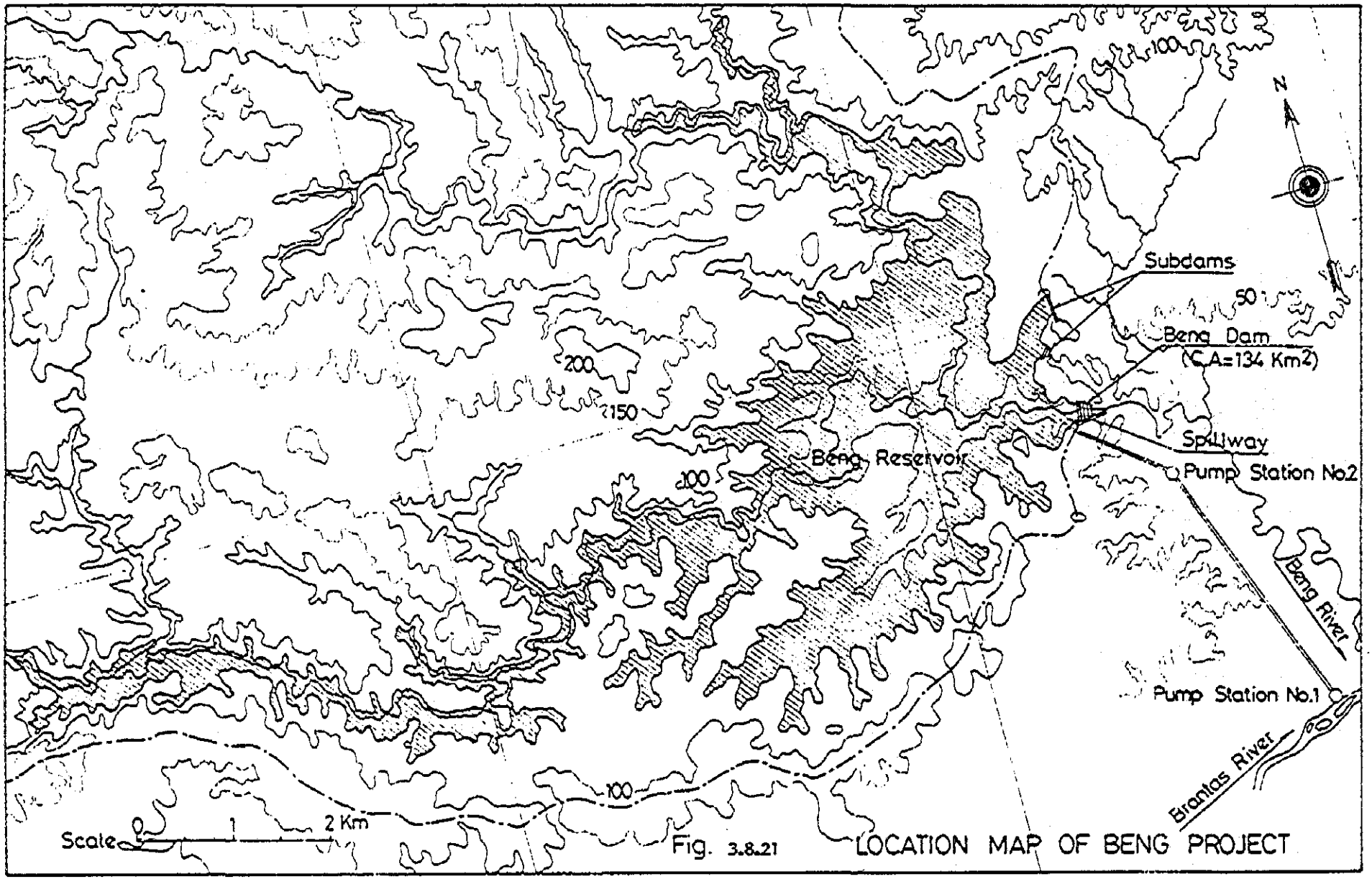


Fig. 3.8.21 LOCATION MAP OF BENG PROJECT

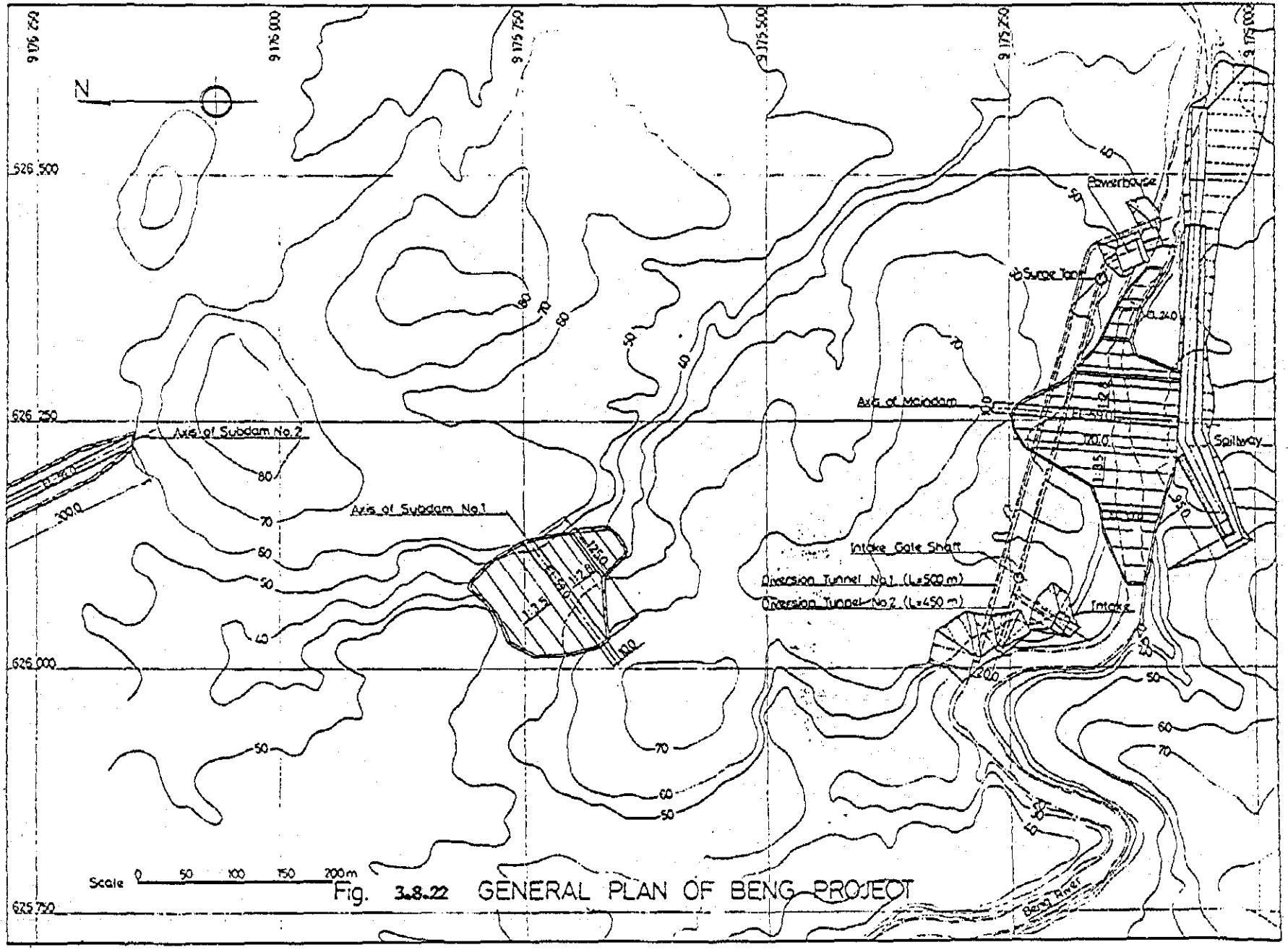


Fig. 3.8.22 GENERAL PLAN OF BENG PROJECT

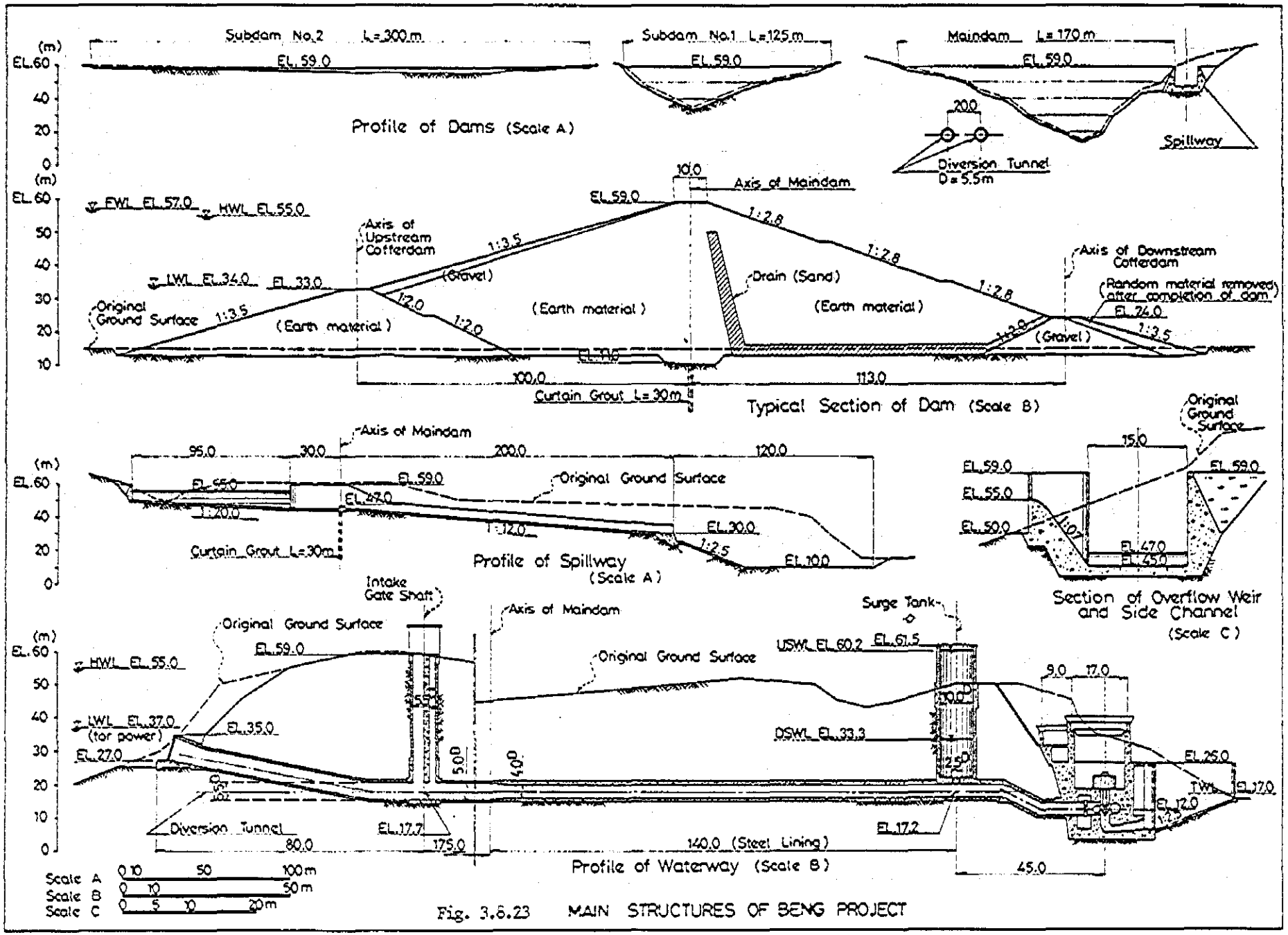


Fig. 3.6.23 MAIN STRUCTURES OF BENG PROJECT

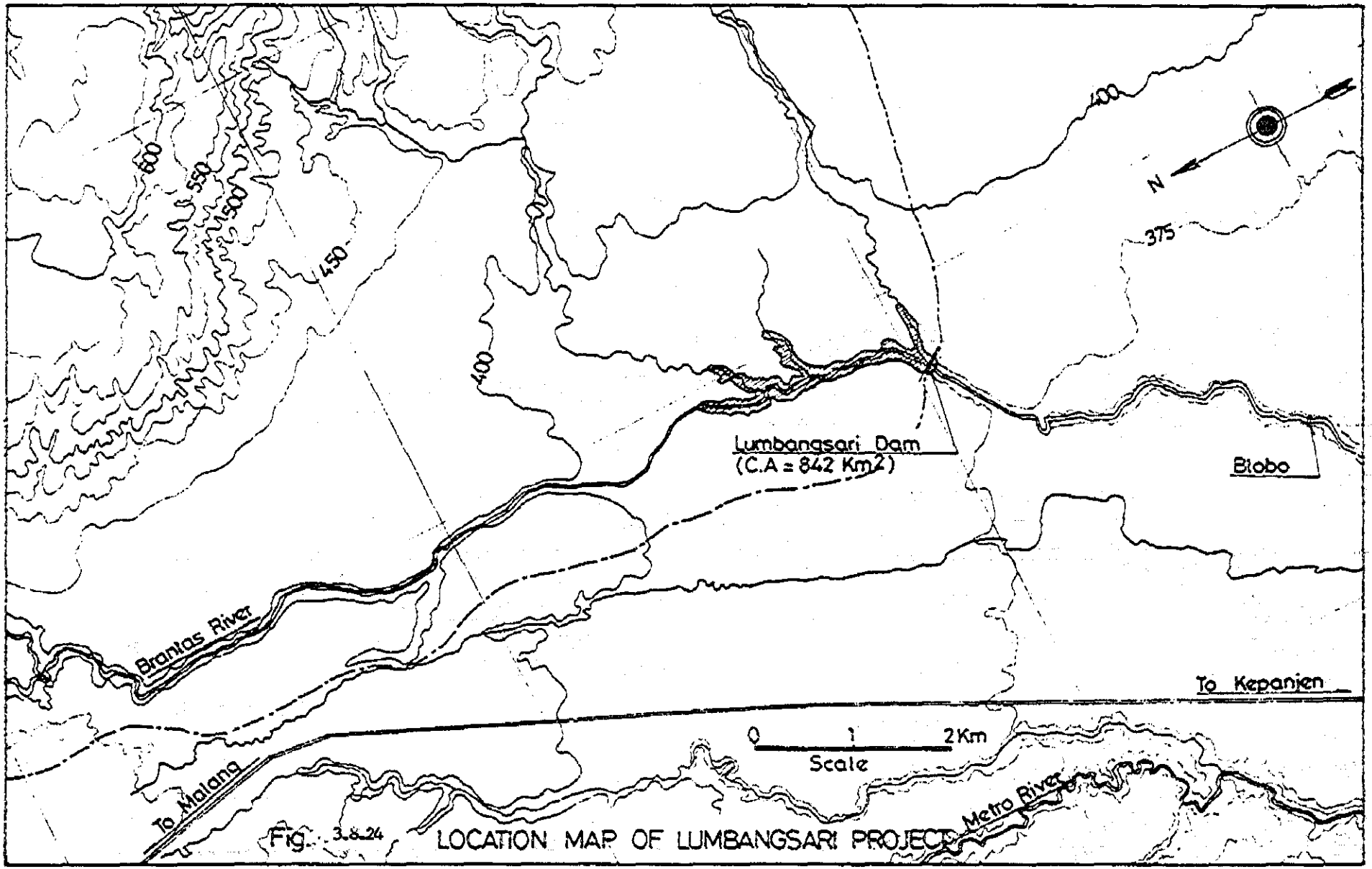


Fig. 3.8.24 LOCATION MAP OF LUMBANGSARI PROJECT

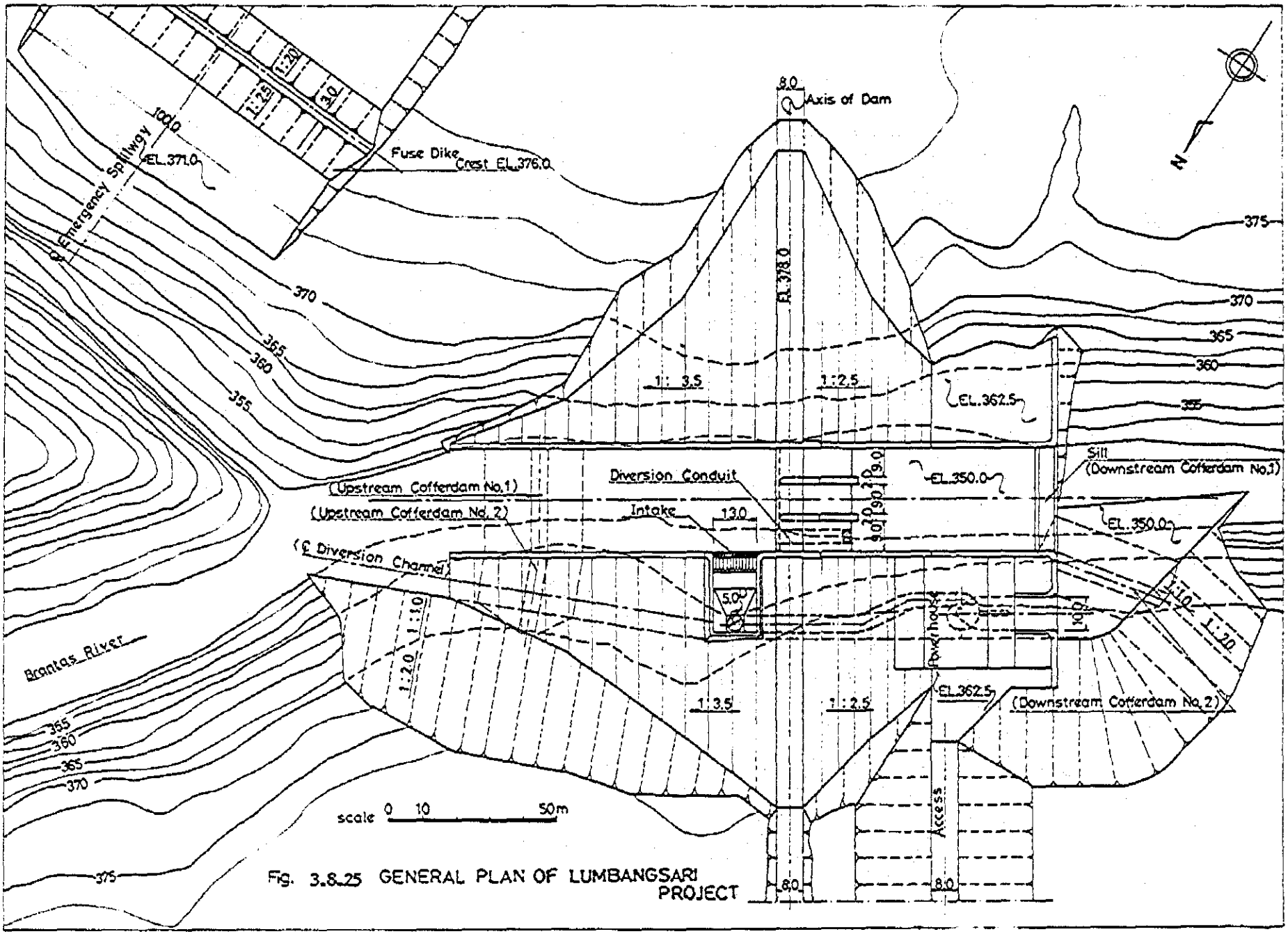


Fig. 3.8.25 GENERAL PLAN OF LUMBANGSARI PROJECT

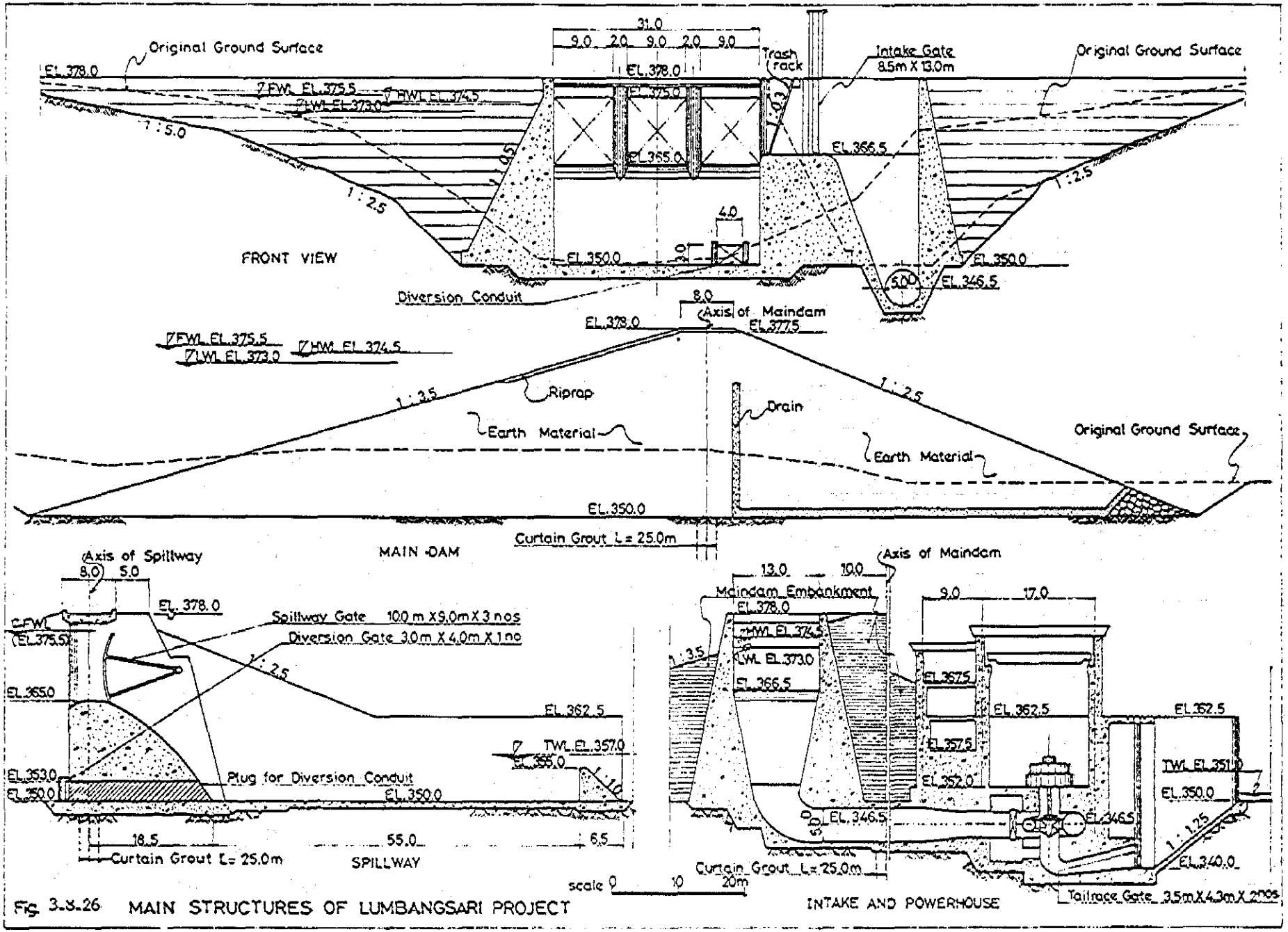


Fig. 3.8.26 MAIN STRUCTURES OF LUMBANGSARI PROJECT

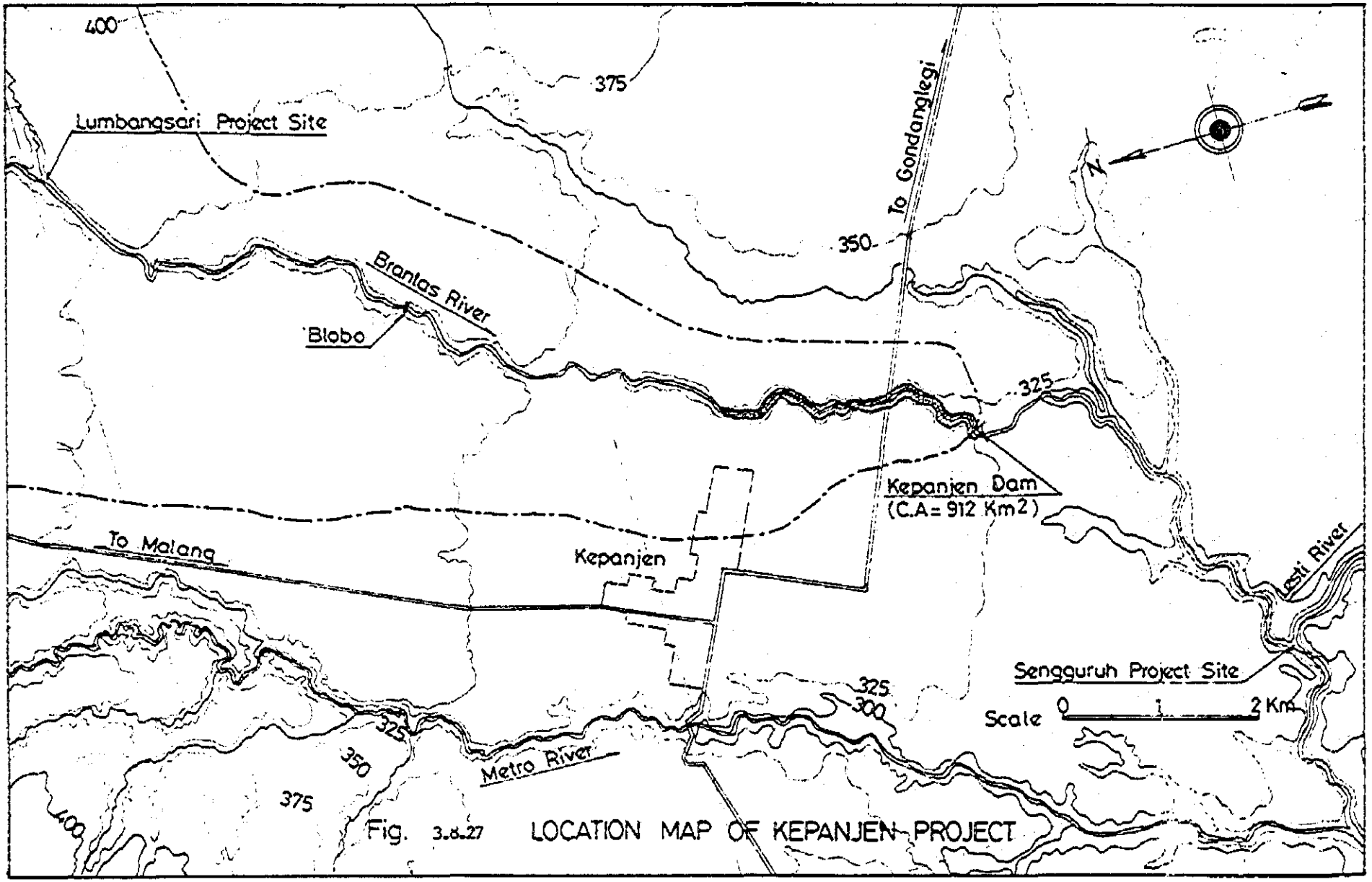


Fig. 3.8.27 LOCATION MAP OF KEPANJEN PROJECT

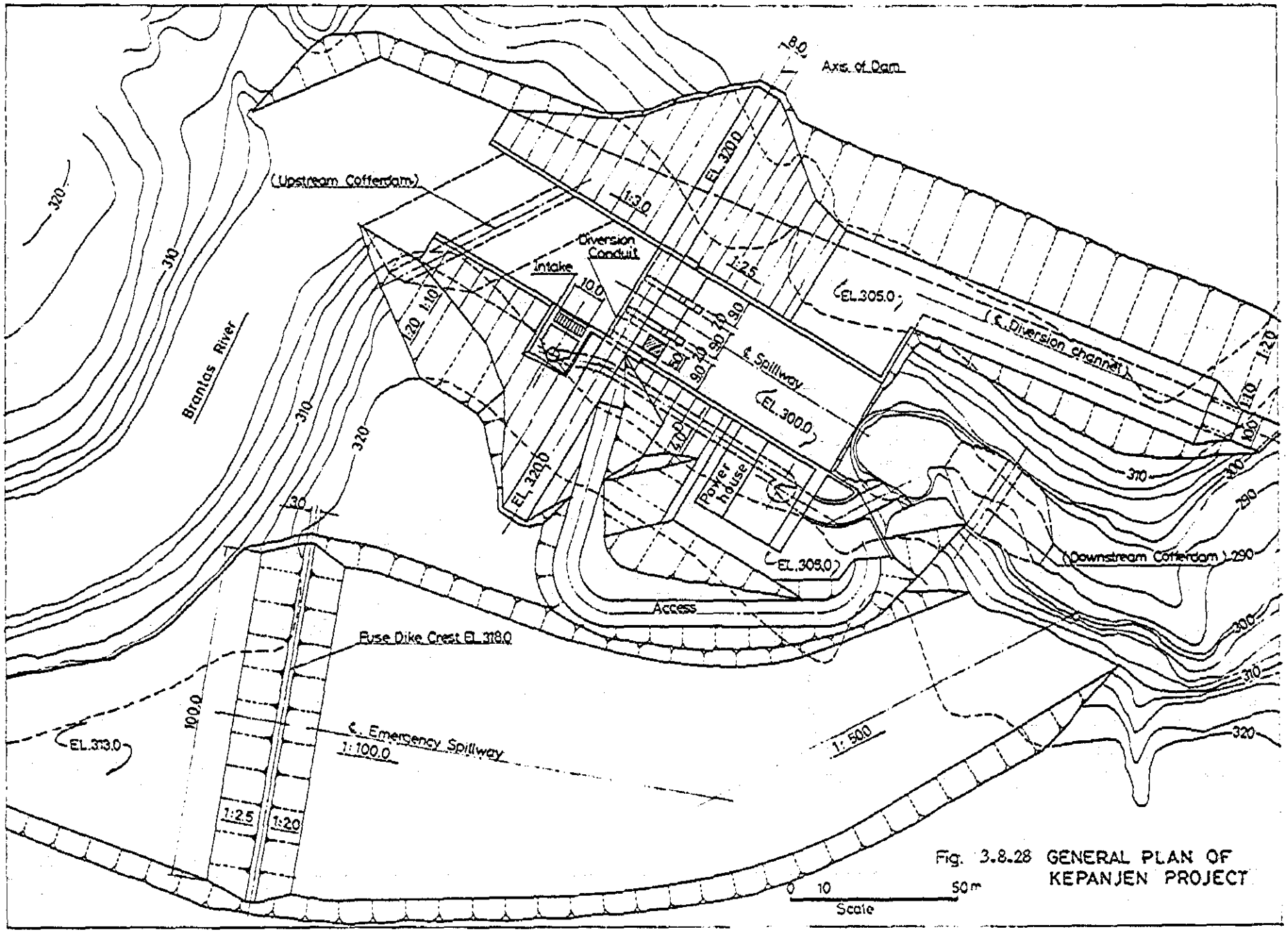


Fig. 3.8.28 GENERAL PLAN OF KEPANJEN PROJECT

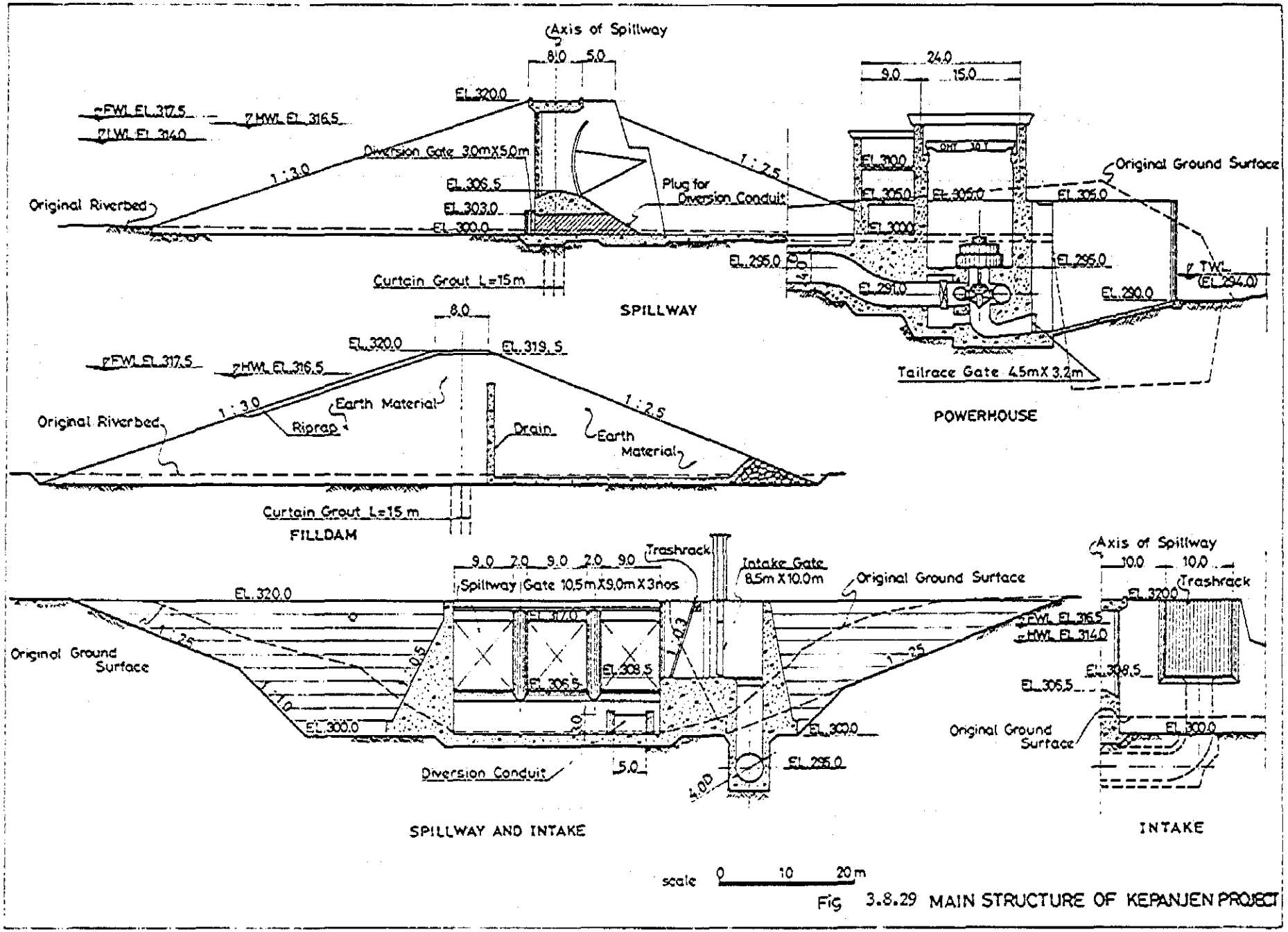


Fig 3.8.29 MAIN STRUCTURE OF KEPANJEN PROJECT

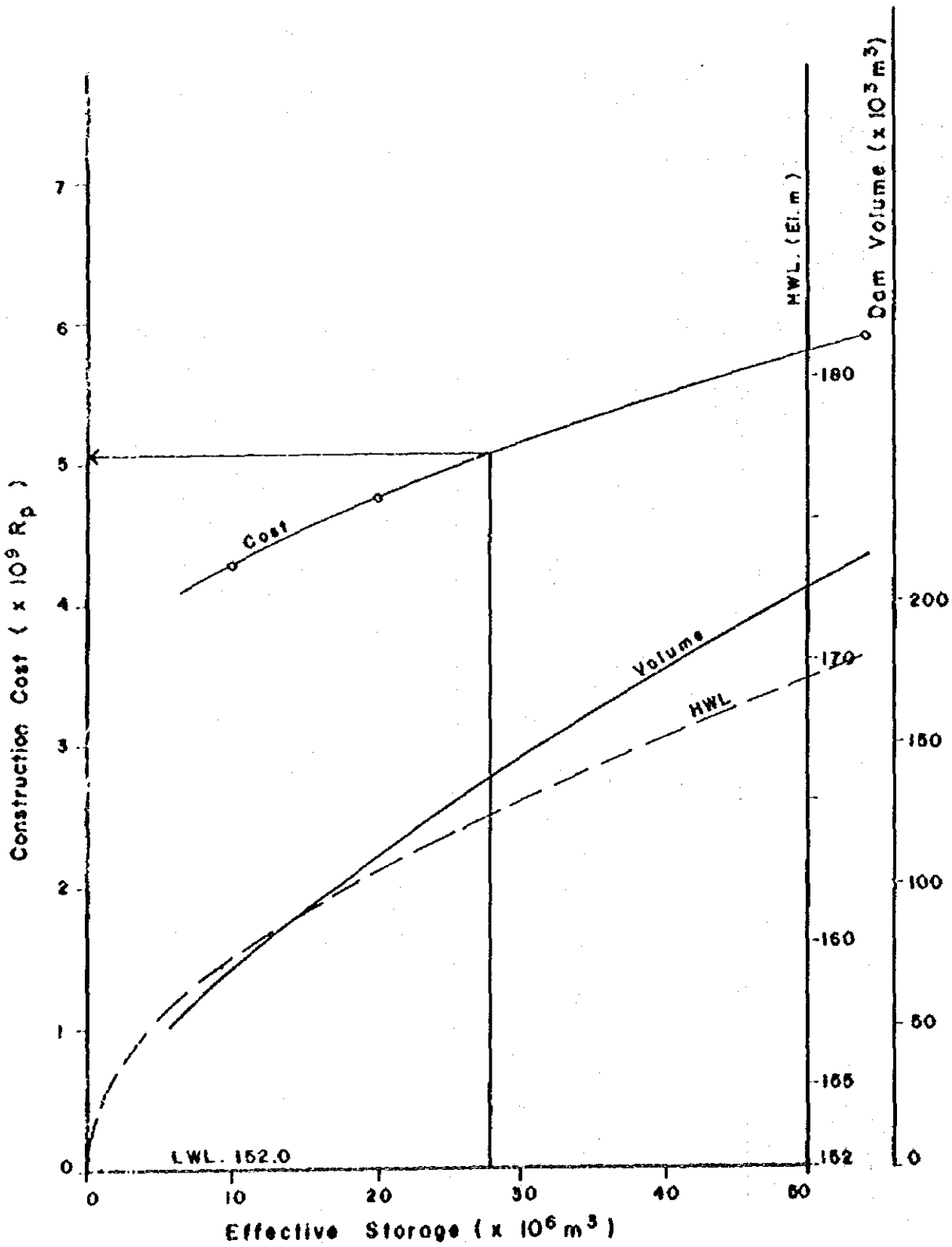


Fig. 3.8.30 RELATION BETWEEN EFFECTIVE STORAGE AND CONSTRUCTION COST OF KEDUNGWARAK DAM.

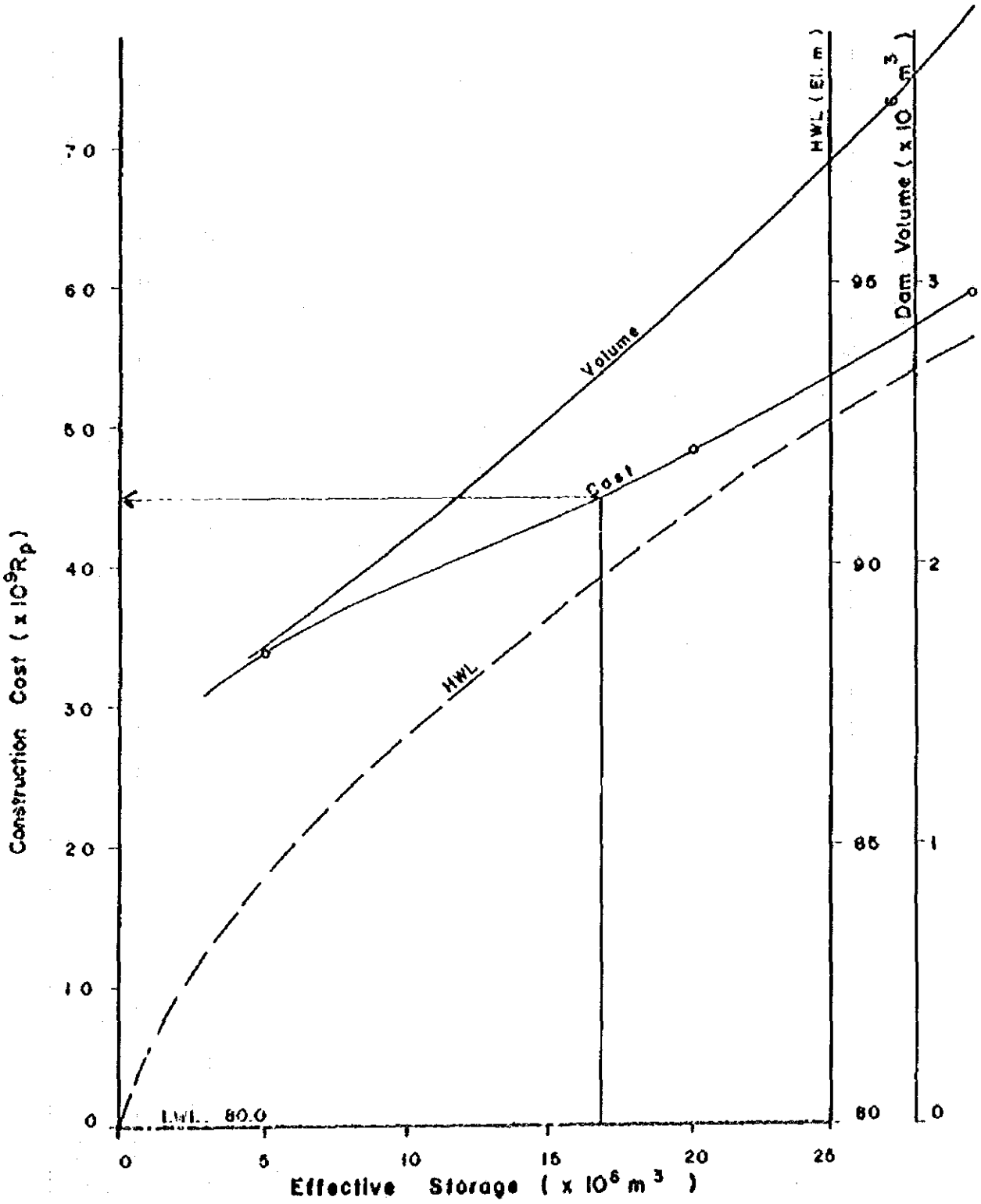


Fig. 3.8.31

RELATION BETWEEN EFFECTIVE STORAGE AND CONSTRUCTION COST OF SEMANTOK DAM.

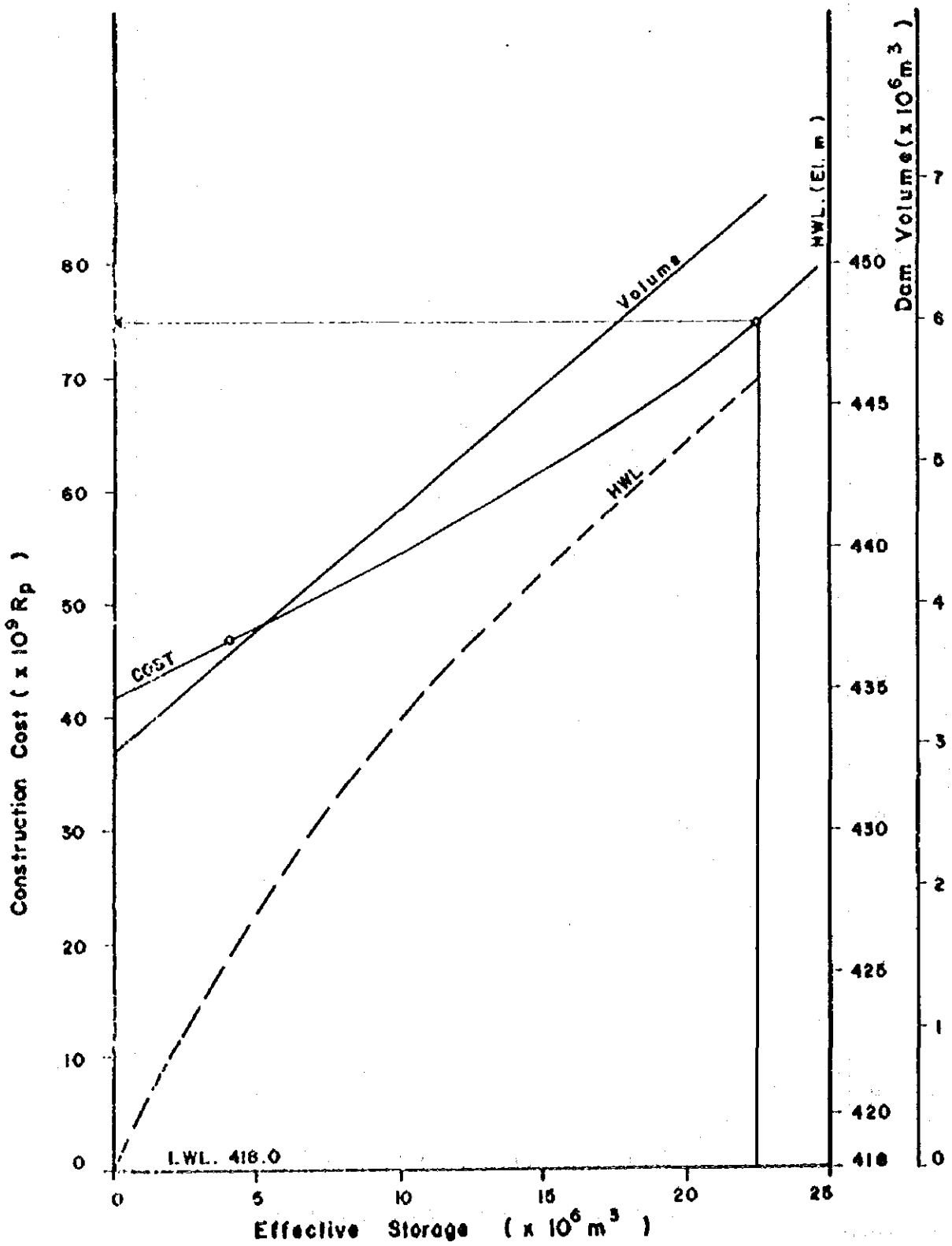


Fig. 3.8.32 RELATION BETWEEN EFFECTIVE STORAGE AND CONSTRUCTION COST OF KUNCIR DAM.

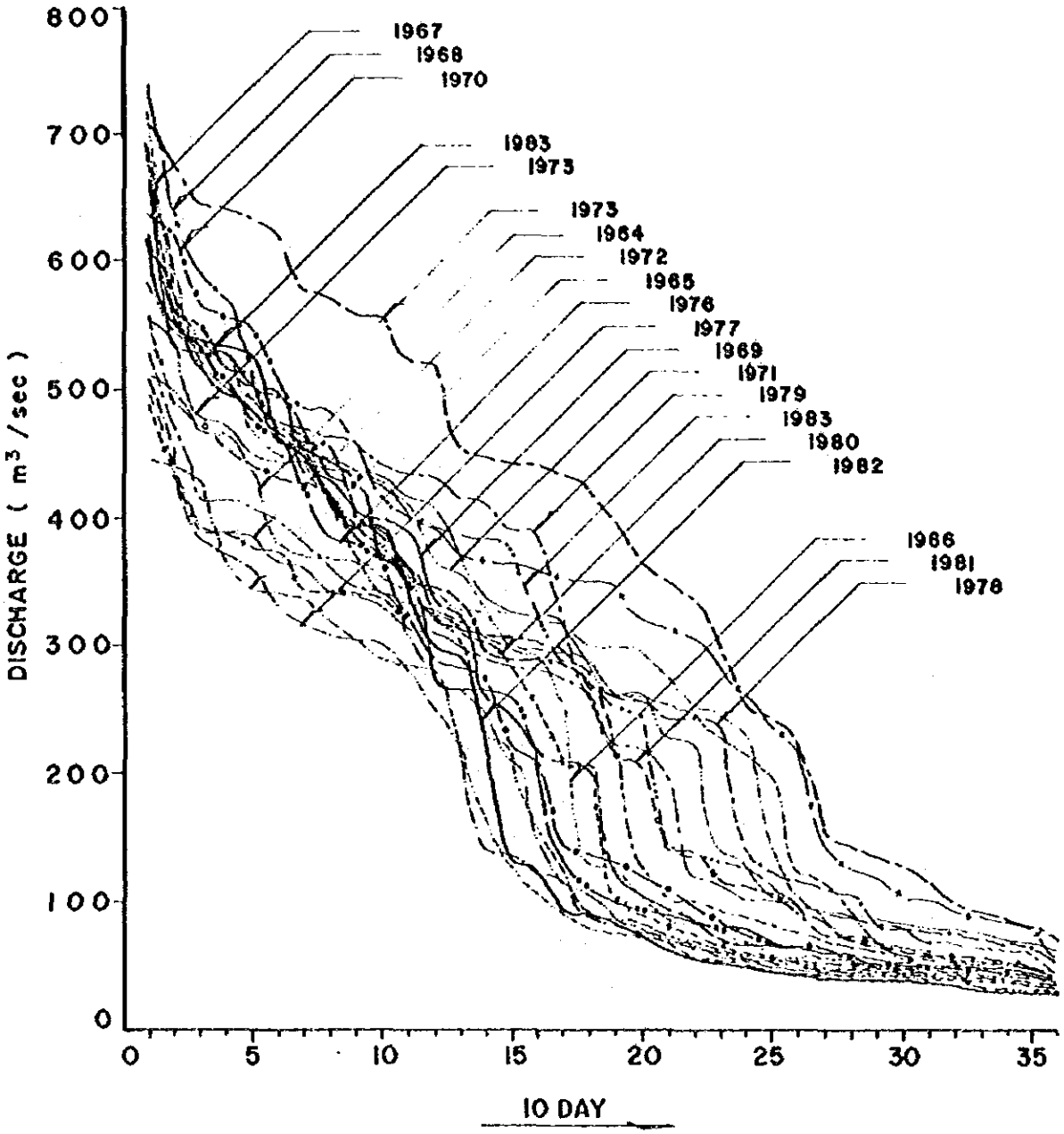


Fig. 3.10.1 DURATION CURVE OF AVAILABLE RIVER FLOW JABON - PERNING SITE

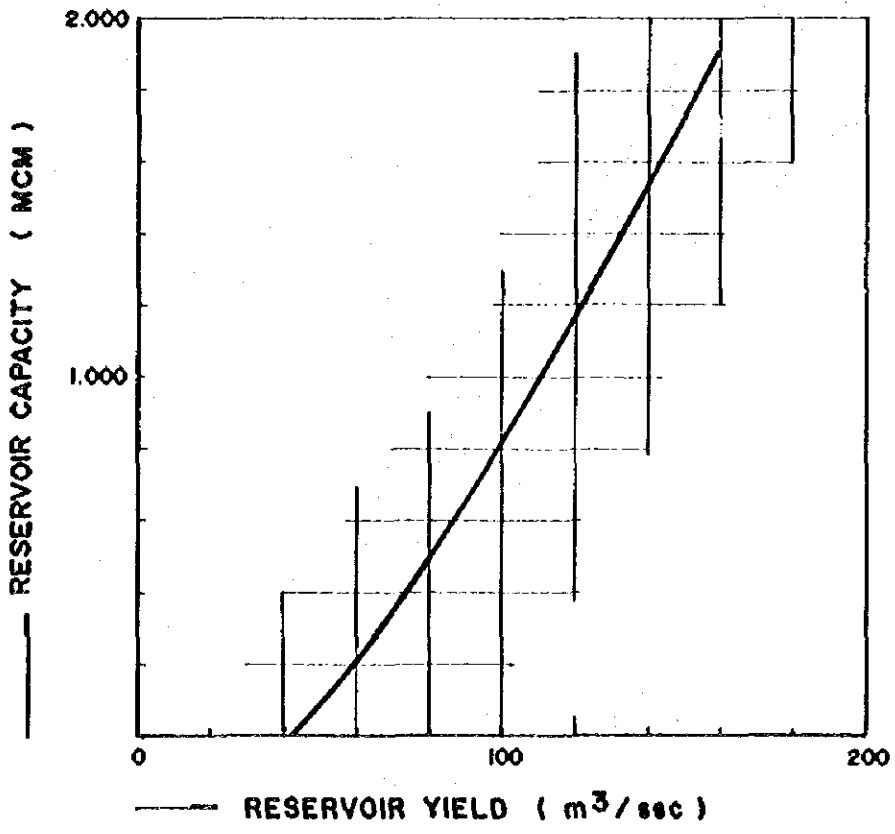


Fig. 3.10.2 RESERVOIR YIELD VERSUS RESERVOIR CAPACITY OF IMAGINATIVE RESERVOIR AT JOBON PERNING

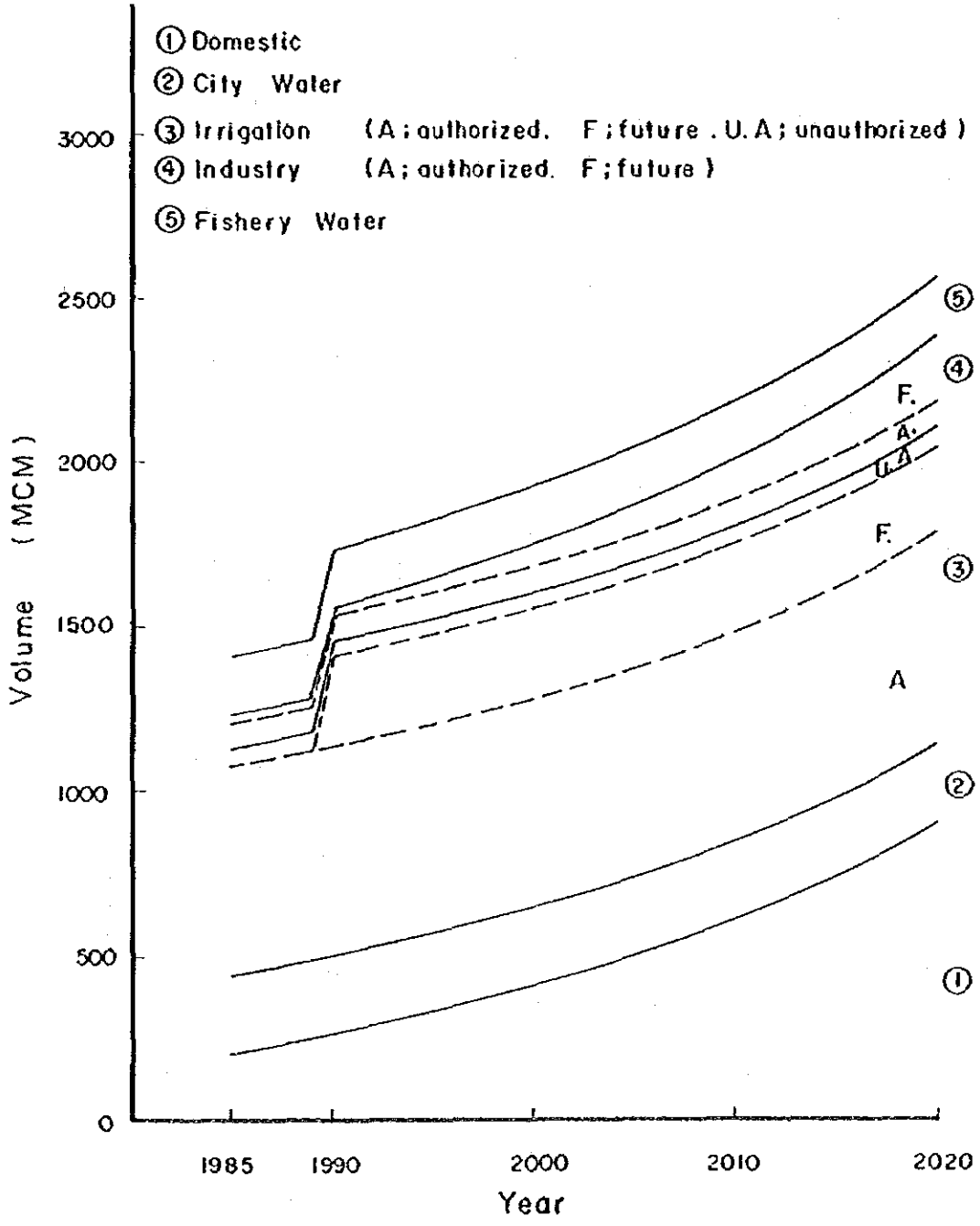


Fig. 3.10.3 VOLUME OF FUTURE WATER DEMAND IN DRY SEASON

① Domestic
② City water
③ Irrigation (authorized)
④ Industry (authorized)
⑤ Irrigation (Future)
⑥ Industry (Future)
⑦ Irrigation (unlicenced)
⑧ Fishery

------ : Water resources inside the K. Brantas basin
—·—·— : Water resources outside the K. Brantas basin

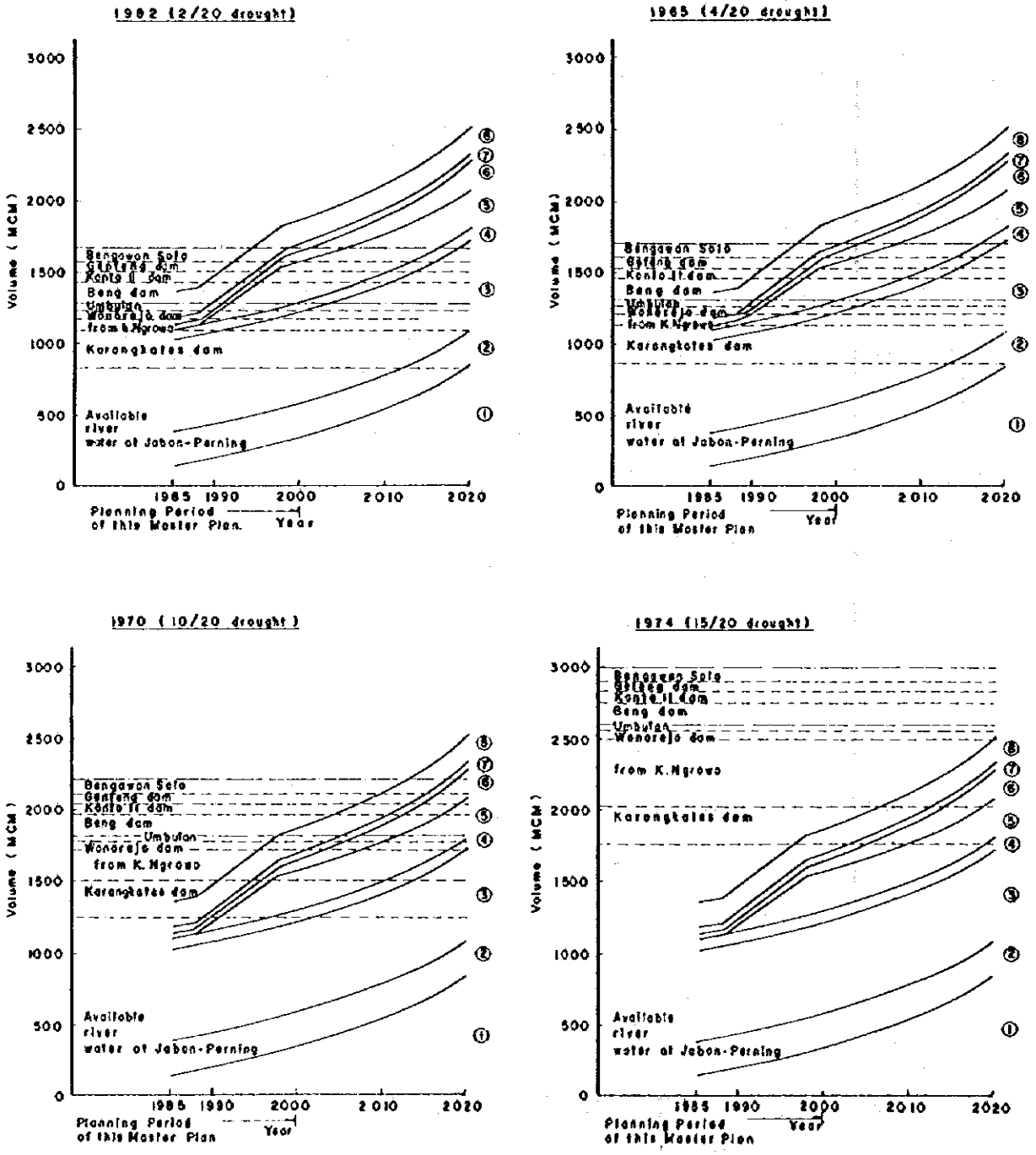
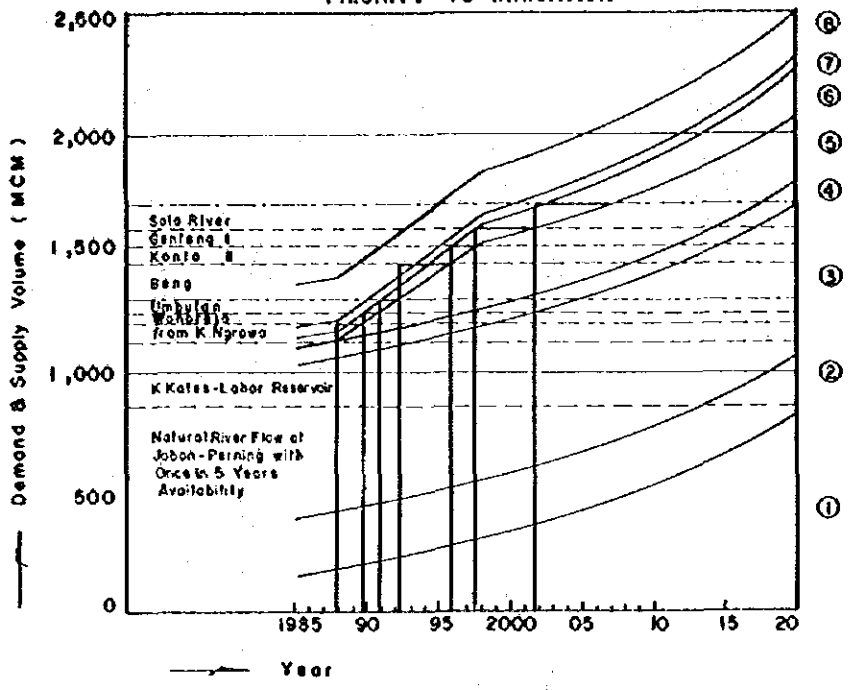


Fig. 3.10.4 FUTURE WATER BALANCE

1 Domestic Water
2 City Water
3 Irrigation(authorized)
4 Industry(licenced water)
5 Irrigation(future) consisting of surface and ground water irrigation
6 Industry (future)
7 Irrigation(unlicenced dry season paddy
8 Fishery

PRIORITY TO IRRIGATION



PRIORITY TO INDUSTRY

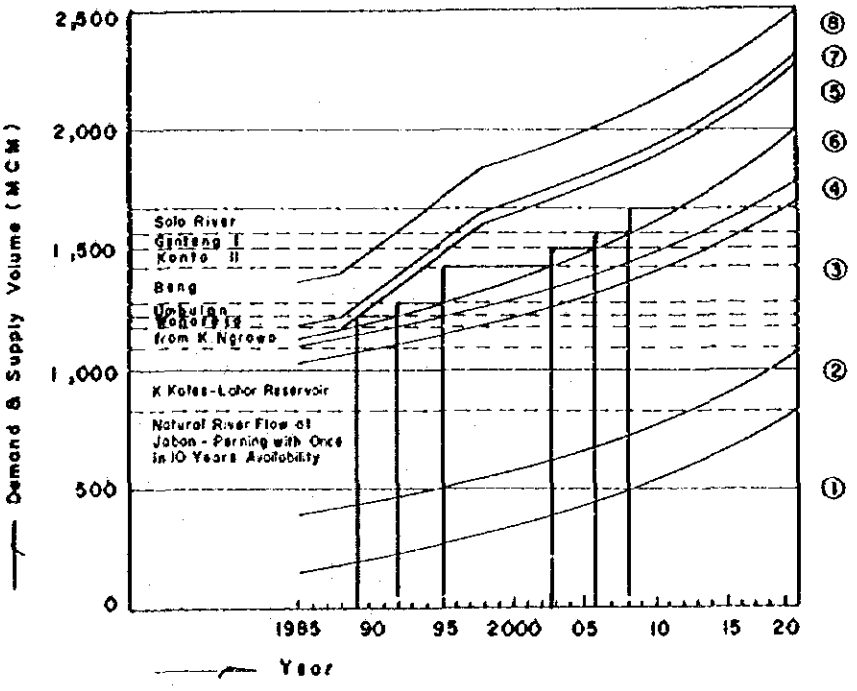
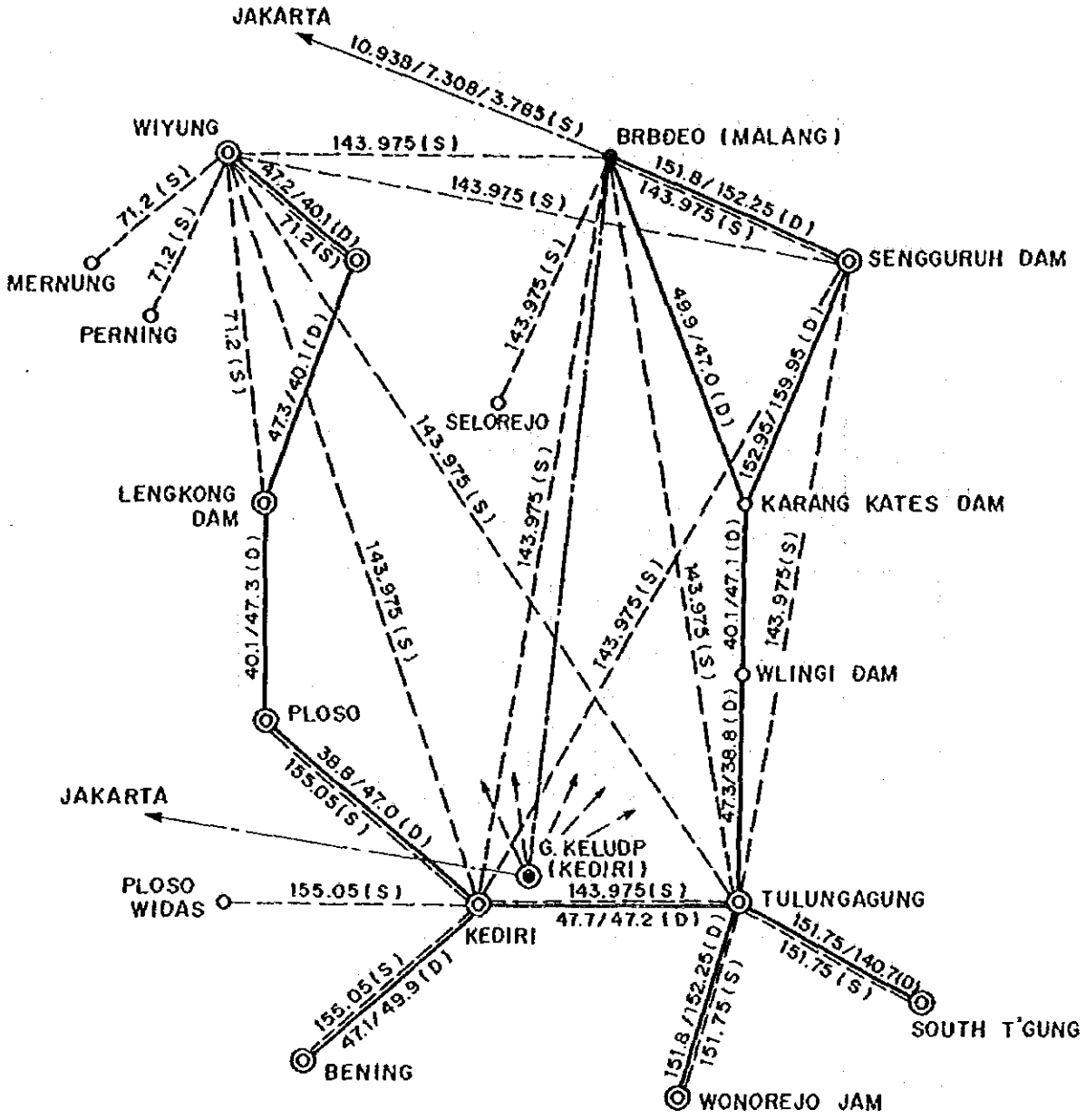


Fig. 3.10.5 FUTURE WATER BALANCE WITH PRIORITY



Brantas System

F (D) : Duplex, F = Radio Frequency

F (S) : S plex, F = Radio Frequency

● : Central office of BRBDEO in Malang

◎ : Branth office with Soth simplex and duplex communication equipment

○ : Bronch office with simplex or duplex communication system equipment

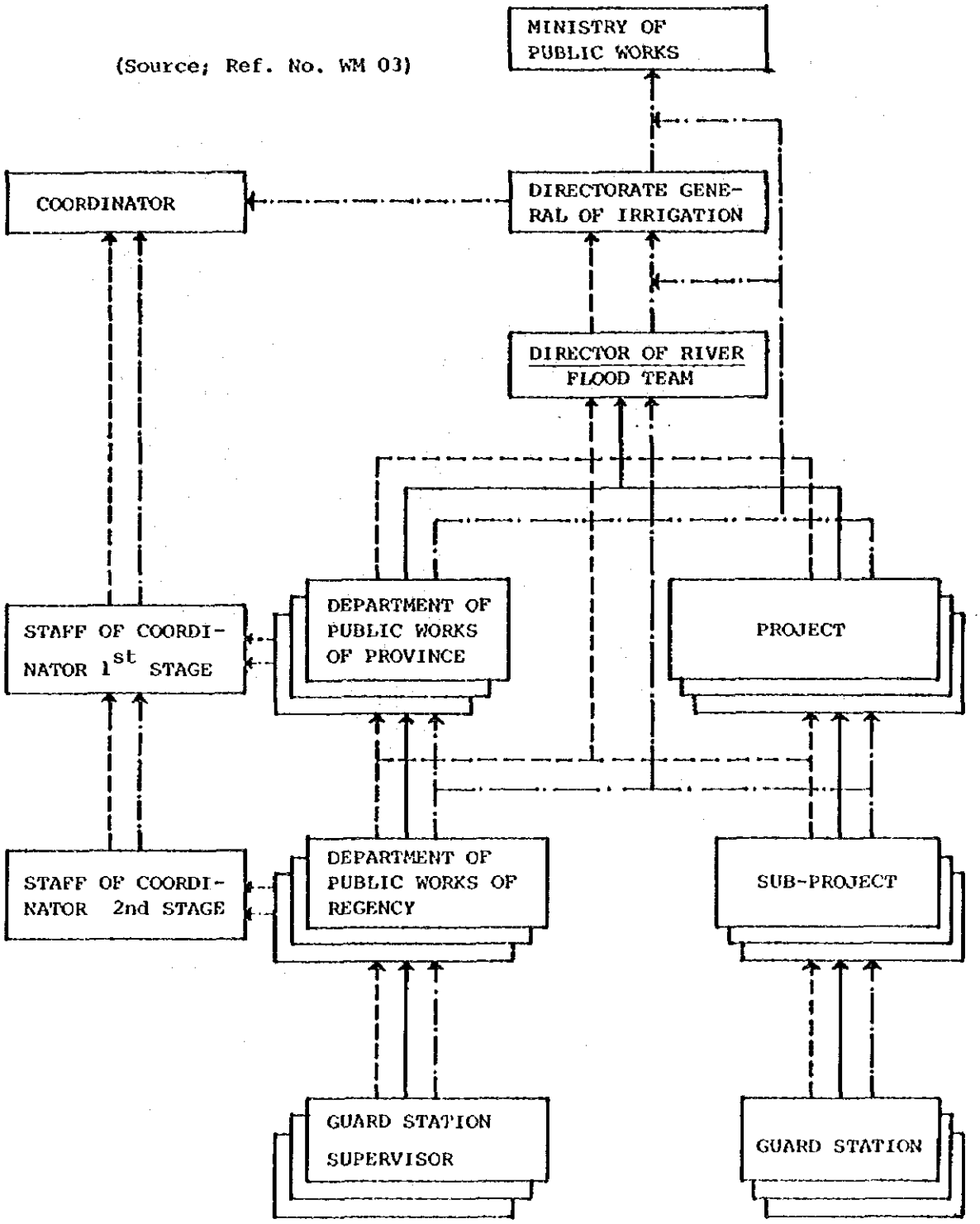
G. Kelud System

◉ : G. Kelud Project office in Kedin

---→ : SSB (UHF) of 143,700 KHz with 11 stations Including G. Kelud Project office

Fig. 3.11.1 EXISTING RADIO TELECOMMUNICATION SYSTEM

(Source; Ref. No. WM 03)



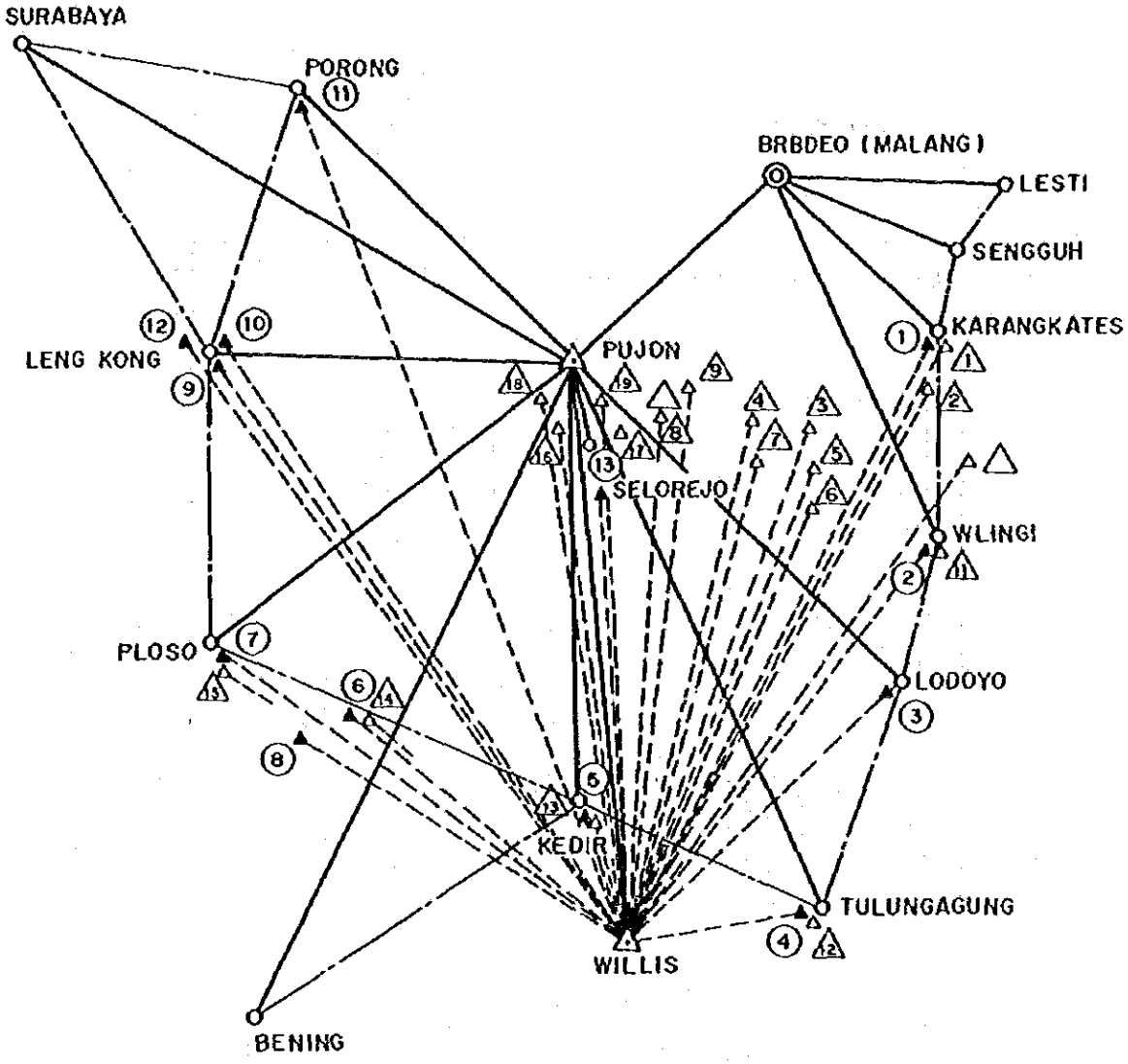
NOTES :

———— : WARNING LINES OF ROUTINE FLOOD

– – – – – : WARNING LINES OF MIDDLE FLOOD

—·—·— : WARNING LINES OF BIG FLOOD

Fig. 3.11.2
SCHEME OF FLOOD WARNING



——— 150 MHz band radio telecom. line (New)

- - - - - 150 MHz band telemetery communication line (New)

—·—·— Existing telecom. line

◎ Flood Foreeasting Center, BRBDEO, Malang

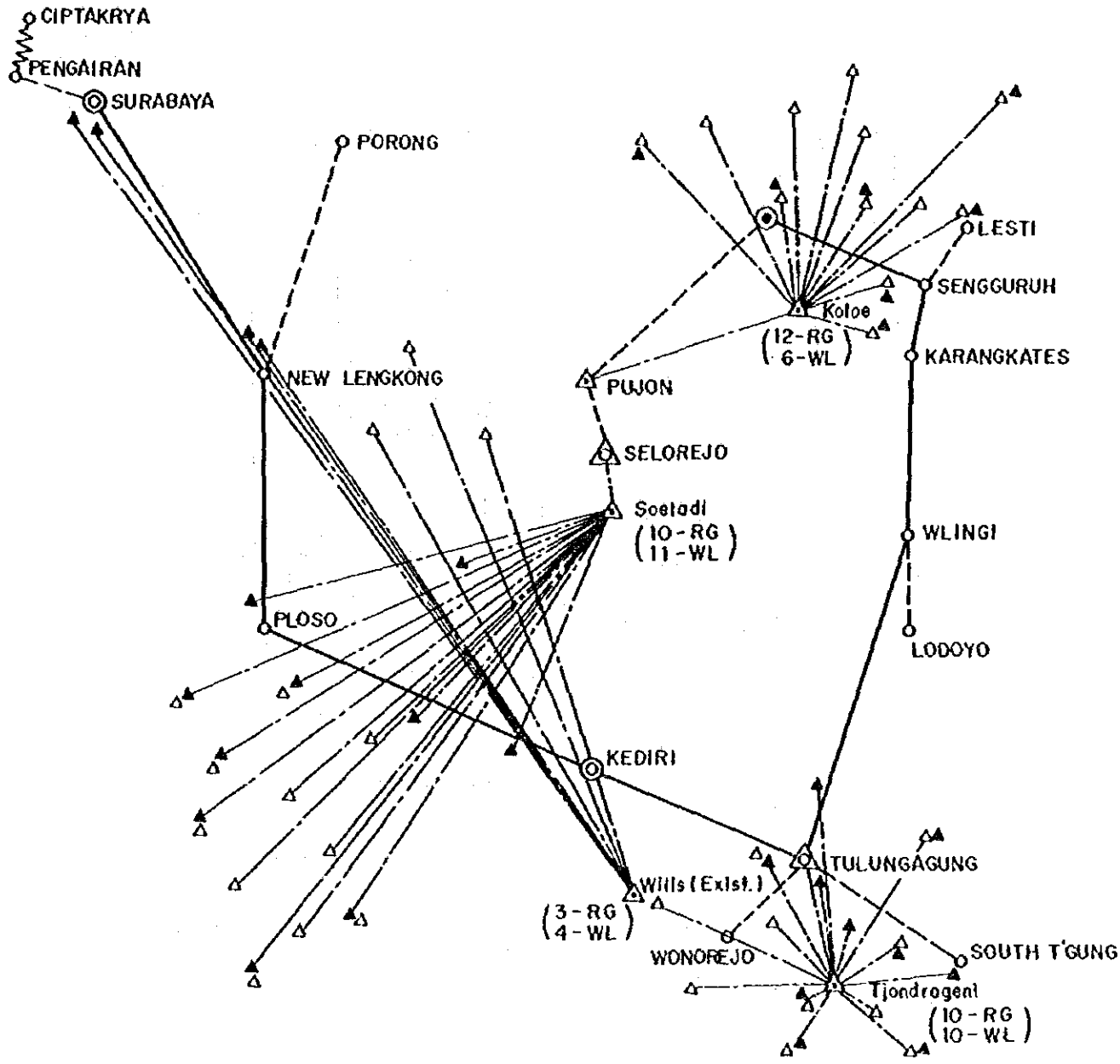
o Branch office

△△ Raingange station

▲⑤ Water level gange station

△ Repeater station

Fig. 3.11.3 ON-GOING FLOOD FORECASTING AND WARNING SYSTEM UNDER MIDDLE REACHES RIVER IMPROVEMENT PROJECT



——— Trunk line, multiplex radio telecom. system
Malang to Kediri : 7-7.5 GHz (60-120 CH, FM)
Kediri to surabaya : 400-800 MHz (24-60CH, FM)

- - - - - Branch line multiplex radio telecom. system (6-12 CH)

ʌʌʌʌʌ Wired line

◉ Water control center, BRBDEO, Malang

◎ Sub center with PABX

Base station for telemeter system

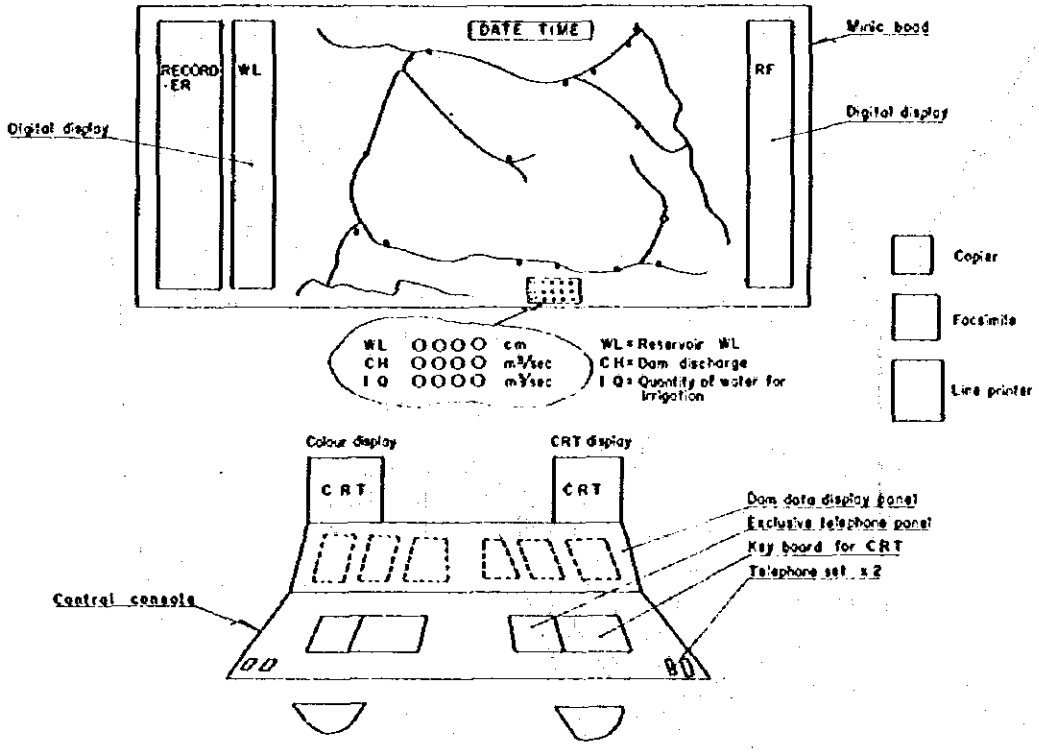
△ Repeater station

o Control office / Dam office

△ Raingange station

▲ Waterlevel gange station

Fig. 3.11.4 PROPOSED INTEGRATED WATER CONTROL SYSTEM
(ON-GOING FLOOD FORECASTING AND WARNING SYSTEM
BE INCORPORATED BUT NOT SHOWN)



BIRDS EYE VIEW OF WATER CONTROL ROOM OF WATER CONTROL CENTER

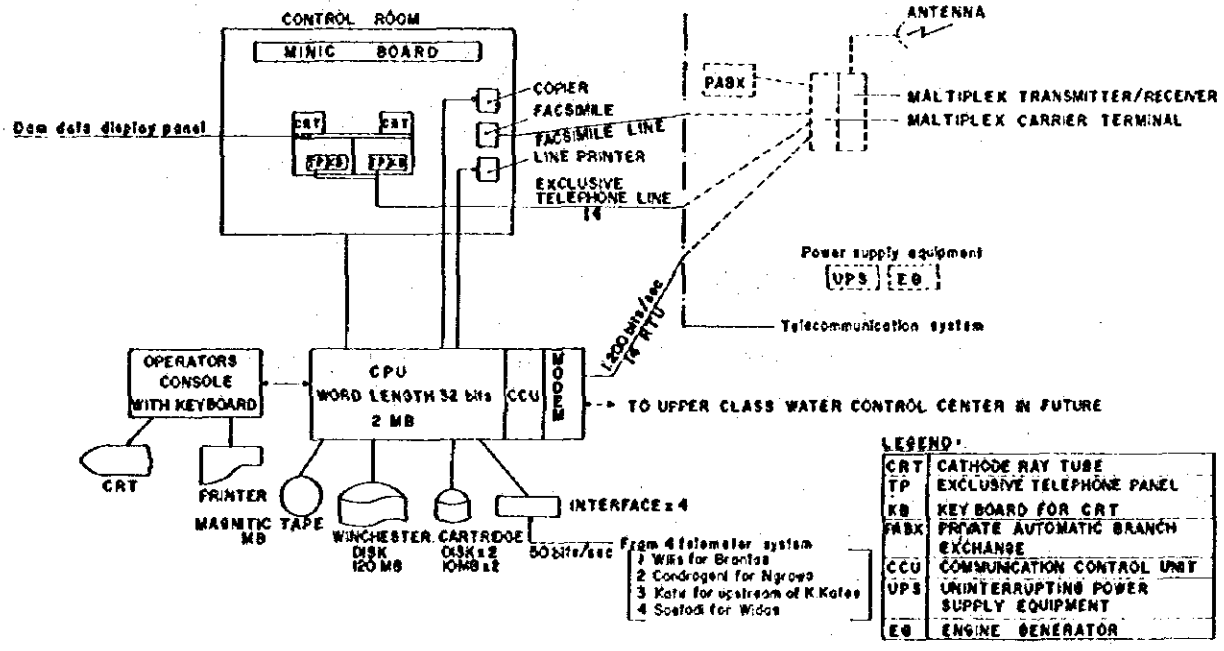


Fig.3.11.5 COMPUTER SYSTEM BLOCK DIAGRAM AT WATER CONTROL CENTER IN MALANG

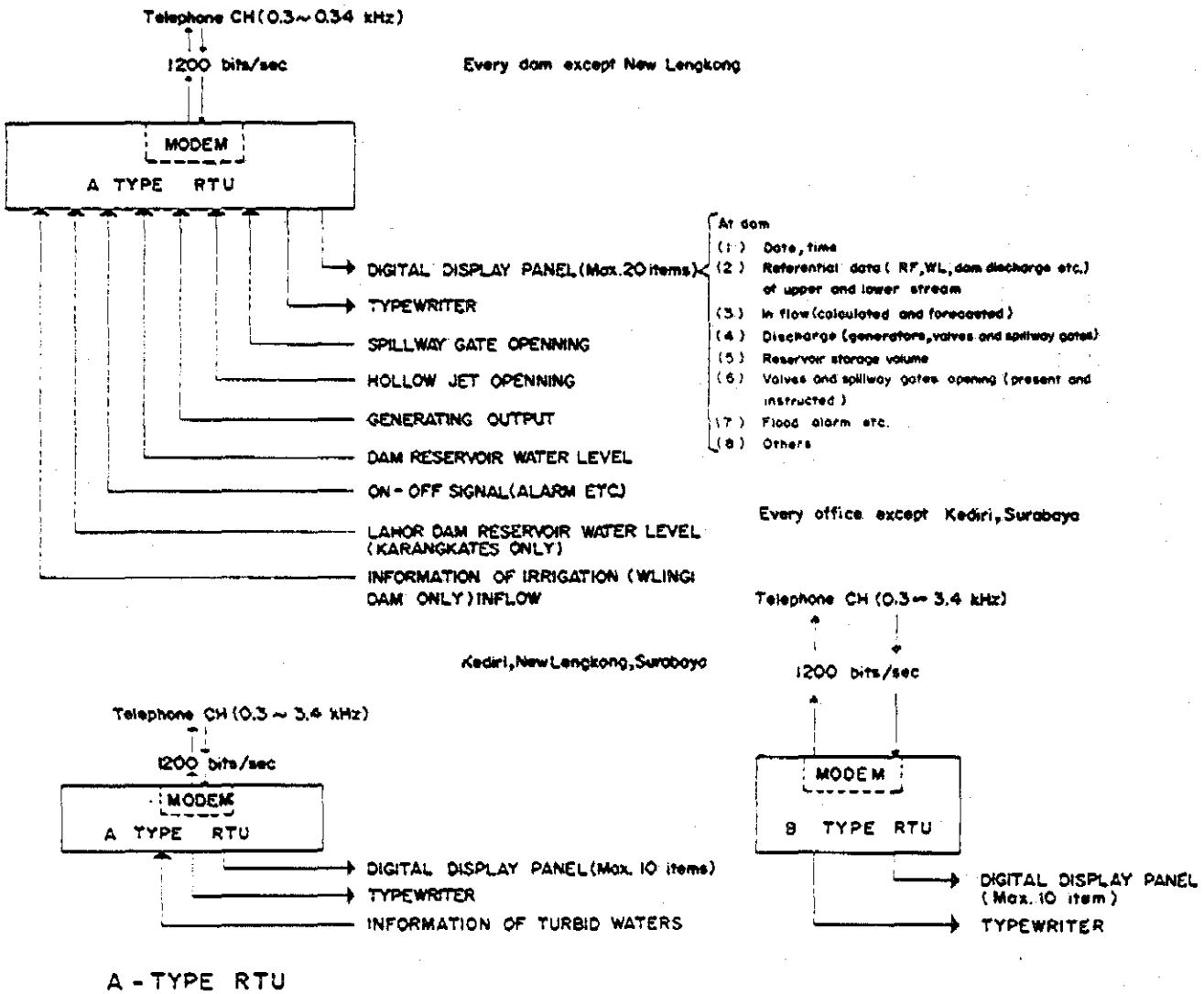


Fig. 3.11.6 ROUGH CONNECTION SKETCH

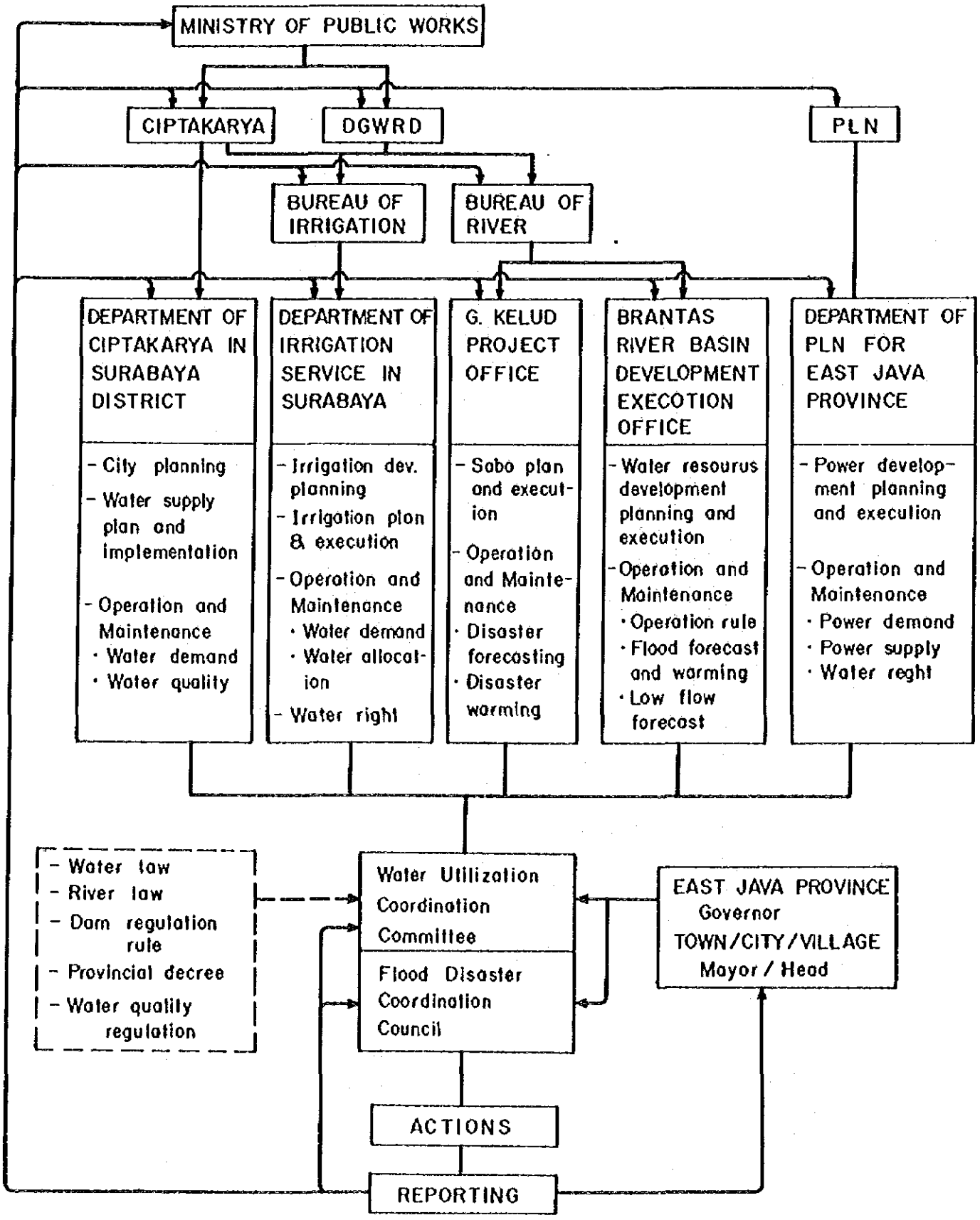


Fig. 3.11.7 ORGANIZATION OF WATER MANAGEMENT

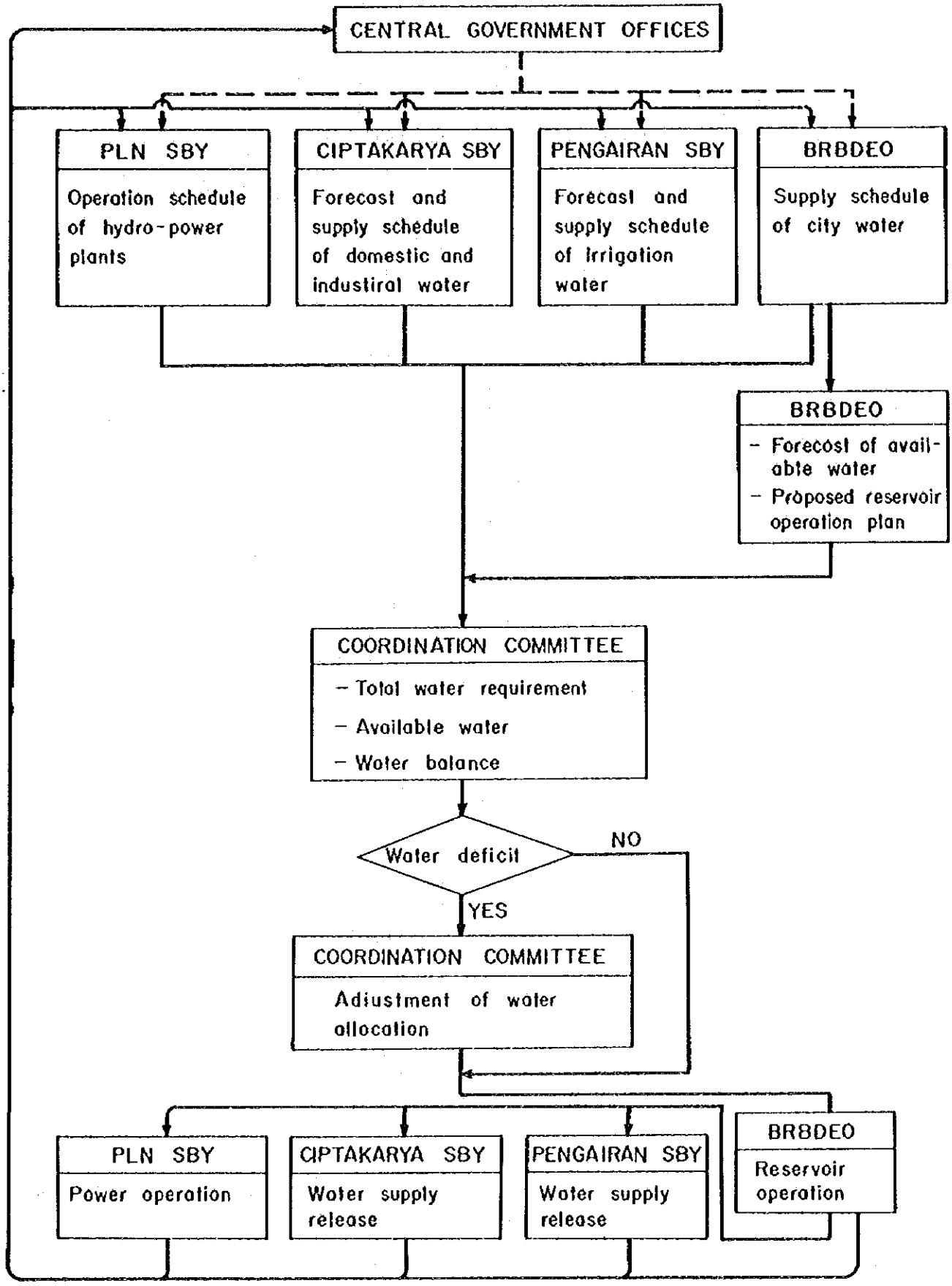


Fig. 3.11.8 FLOW CHART FOR LOW FLOW MANAGEMENT

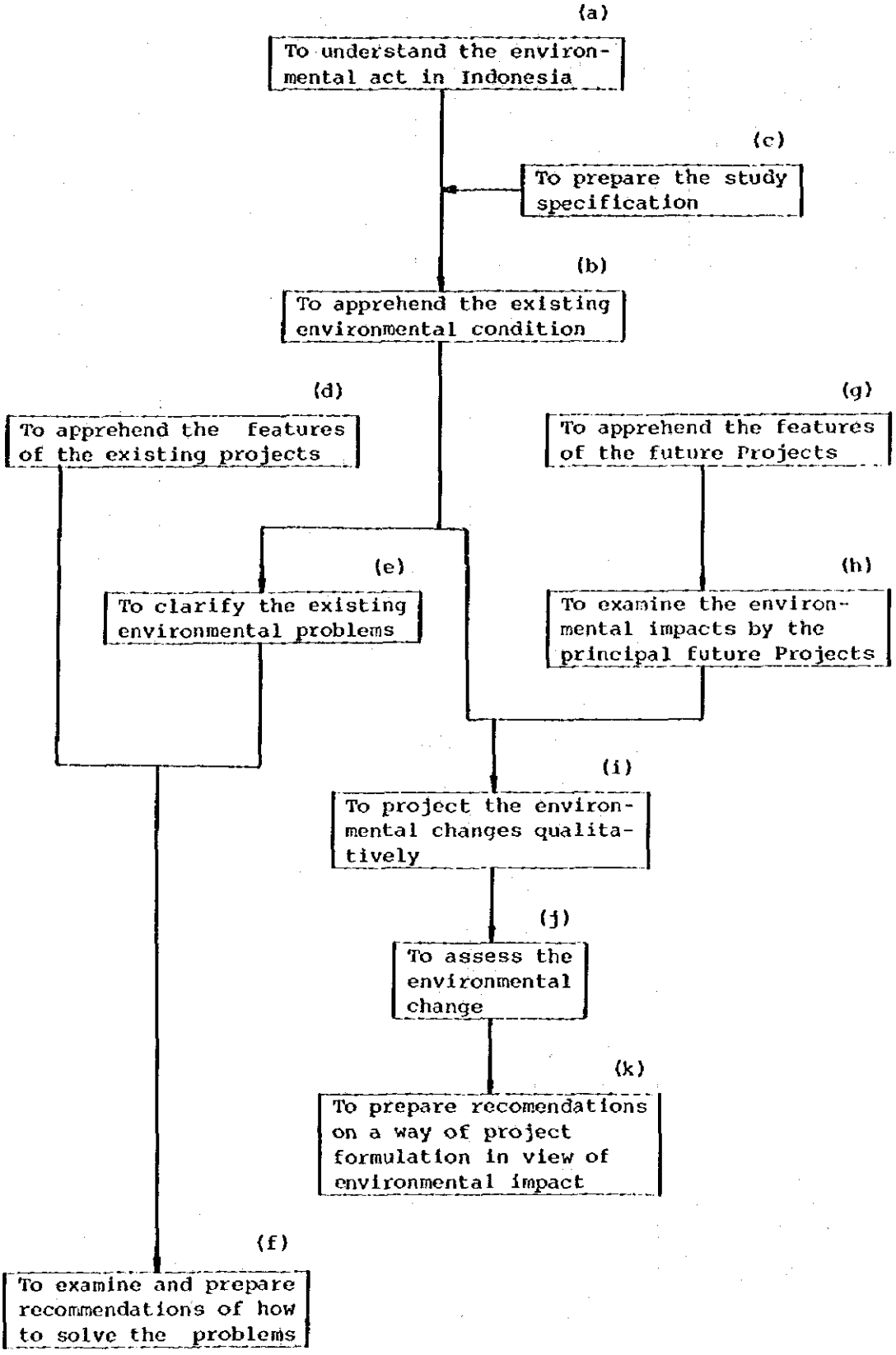


Fig. 3.12.1 THE FLOW CHART OF STUDY

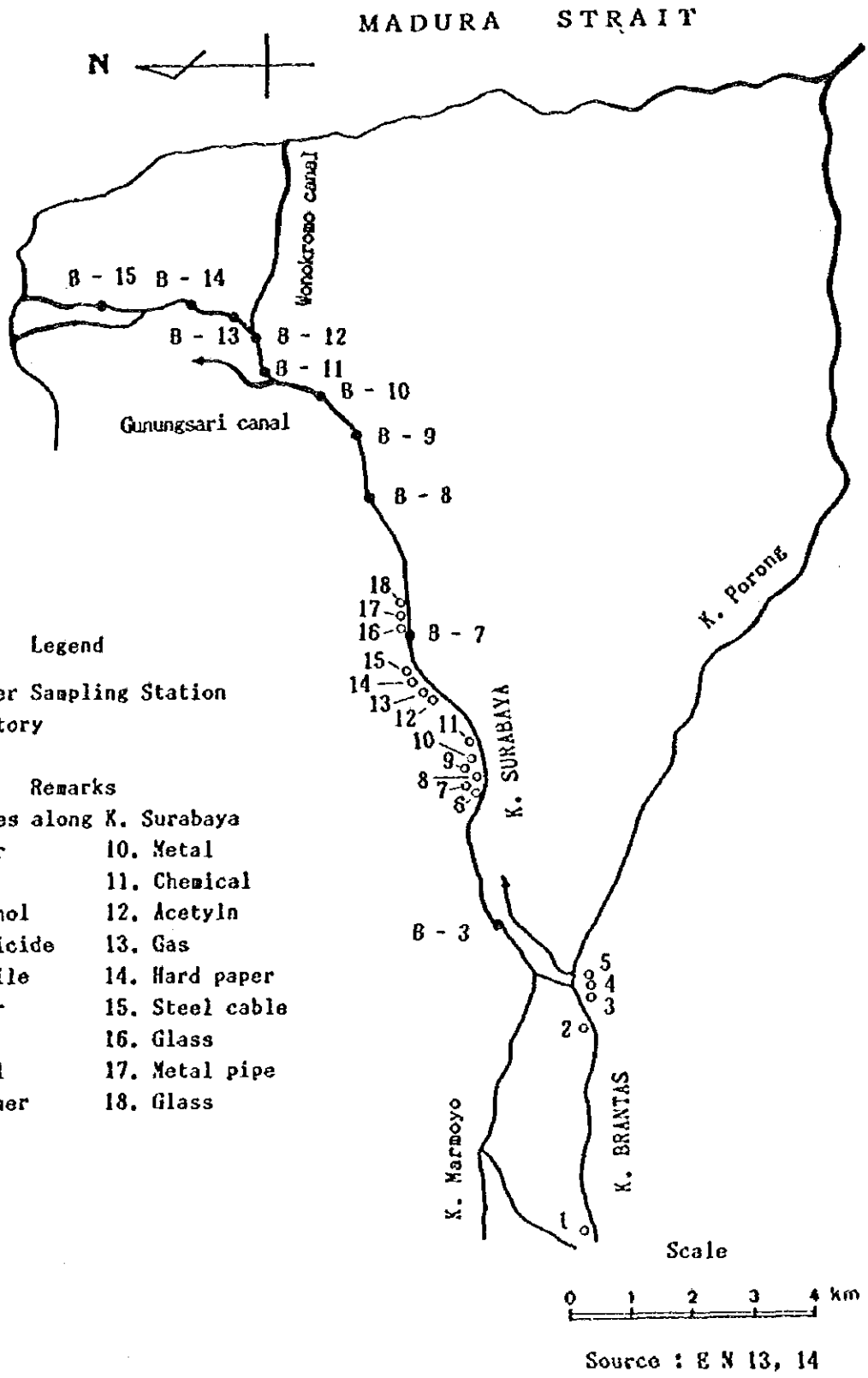


Fig. 3.12.2 LOCATION MAP OF WATER SAMPLING STATIONS AND FACTORIES IN THE SURABAYA AREA

JICA