3.3.7 Airport Utilities

(1) Power Supply System

The power supply system for the new airport is planned to meet the following target demand in Phases I and II, respectively.

Electrical power demand in Phase I .... 1,400 kVA
Electrical power demand in Phase II .... 2,100 kVA

The power supply system consists of one switching station, six substations, distribution lines of 20 kV, 6 kV and 380/220 V connecting each switching station, substation and buildings as shown in Figs. 3.3.14 and 3.3.15.

The outline of the system is as follows:

a) Switching station, substation and generator station

The main usage of each facility is as follows:

S/S-A : Main switching for the receiving 20 kV power

S/S-B : Substation for existing terminal building

S/S-C : Substation for passenger terminal building, VIP building and sewage treatment plant, and switching station for S/S-D

S/S-D : Substation for cargo terminal building, administration building, fire station, control tower, workshop, water treatment plant, airport maintenance building and incinerator, and switching station for S/S-E, S/S-F and S/S-G

S/S-E : Substation for ILS/ LLZ facilities

S/S-F : Substation for ILS/GP facilities

S/S-G : Substation for NDB facilities

b) Electrical power will be supplied by Perushan Umum Listrik Negara (PLN) through a 20 kV 3-phase 3-wire 50 Hz transmission line connected to the primary side of the disconnecting switch in the substation S/S-A located near the airport boundary line.

c) The power supplied will be distributed to substation S/S-B located in the passenger terminal building, by a 20 kV 3-phase, 3-wire underground cable line.

d) One 750 kVA emergency generator will be installed in the substation S/S-D in Phase I and one 750 kVA emergency generator will be added in Phase II to supply power to the essential consumers in the airport in case of a normal power interruption. The starting time of the emergency generator is less than 15 seconds in accordance with the ICAO requirements.

e) From the S/S-C, one 20 kV underground distribution line will be connected to the S/S-D, and two 380/220 V distribution lines for emergency power supply to the essential facilities will be connected to the S/S-C.

f) One 75 kVA step up transformer will be installed in the S/S-D to supply power to S/S-E, S/S-F and S/S-G by a 6 kV 3-phase 3-wire system.

g) The existing power service line will be removed when the new substation (S/S-B) and distribution line will be completed.

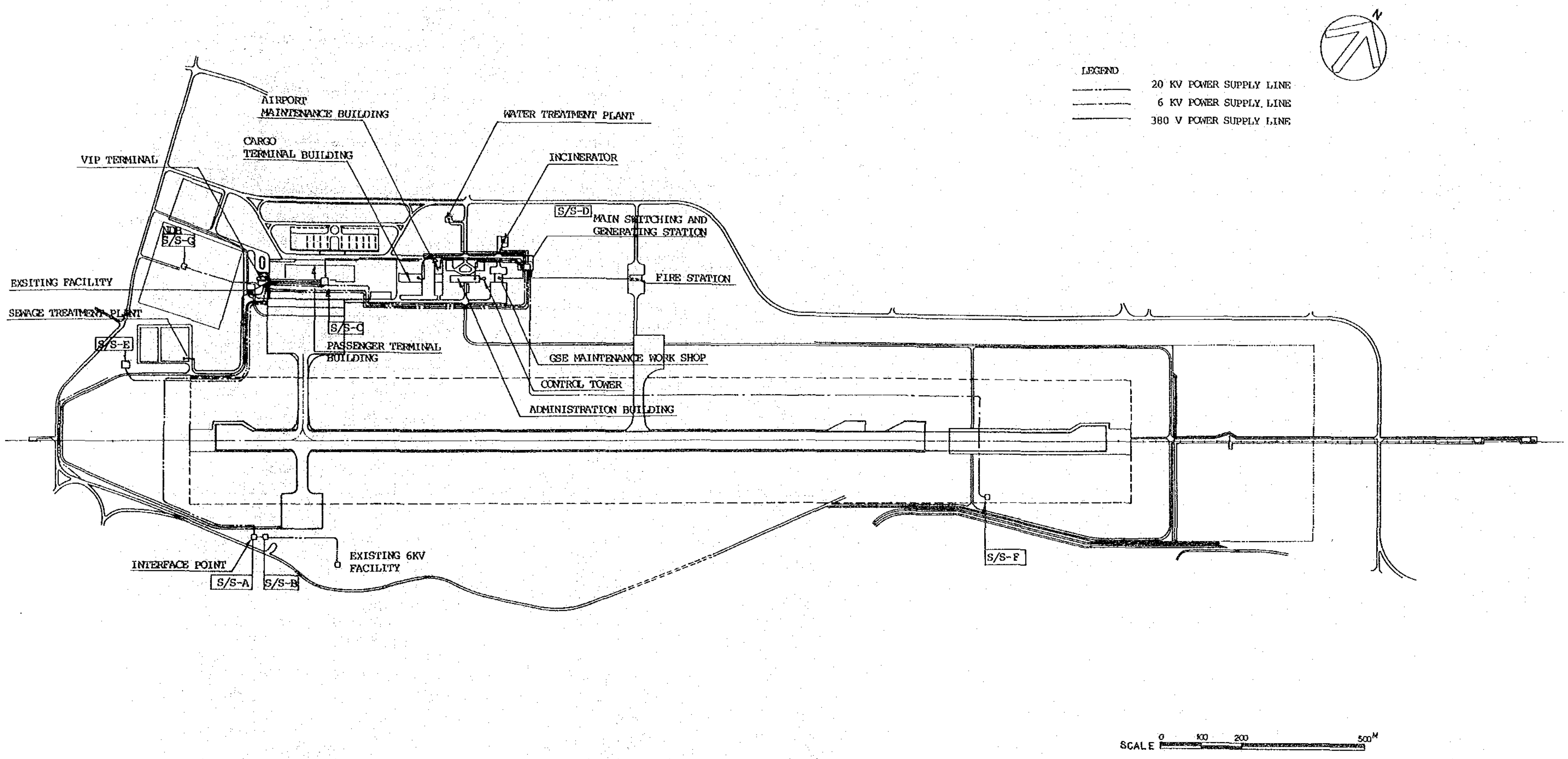


Fig. 3.3.14 Power Supply System Plan

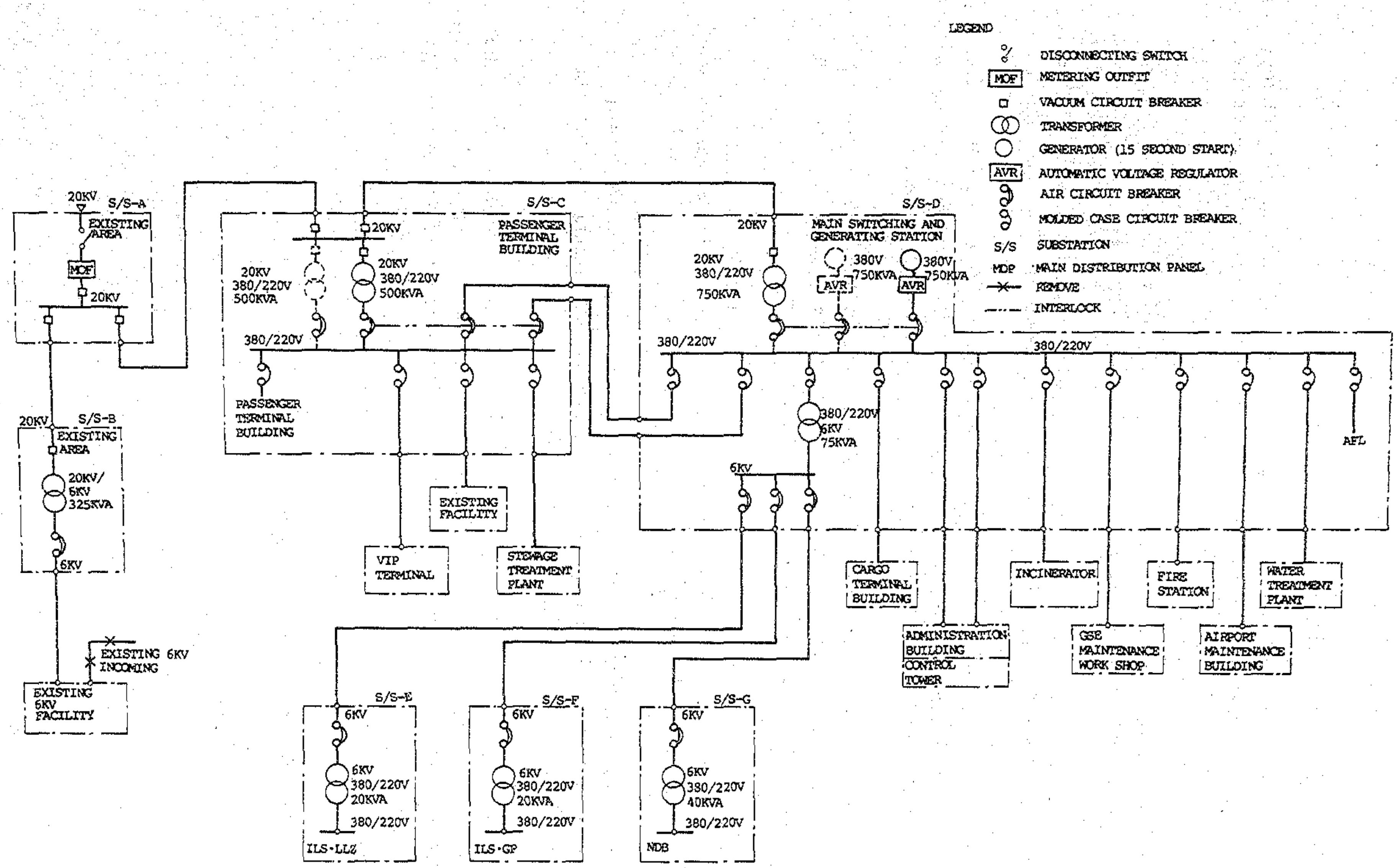


Fig. 3.3.15 Power Supply System Circuit Diagram

(2) Water Supply System

The most suitable and economical water supply system is planned as described below so as to meet water consumption which was estimated in Chapter 2 as follows.

Water consumption for Phase I	200 t/day
Water consumption for Phase II	300 t/day

First, underground water is adopted for the water source and a shallow well is planned intake facility the following reasons.

a) There are no city water mains from which the water for the airport will be supplied and the water supply for the existing airport and its vicinity fully depend on the intake from the wells.

b) Although the depth of aquifer and potability of water has not been confirmed, shallow wells are recommended judging from present circumstances and geological conditions.

c) Shallow wells are the most economical in terms of both construction and operation costs, and maintenance among the various intake facilities is also easier.

The type and dimension of the wells should be planned based on the investigation of hydrological and geological conditions, water quality, etc.

Second, the elevated tank system will be adopted for the water distribution system taking into account the steadier water supply compared to a direct pumping system. The distribution facilities consist of the following:

a) R.C. reservoir
b) Pump
c) Elevated RC tank
d) Distribution main pipe

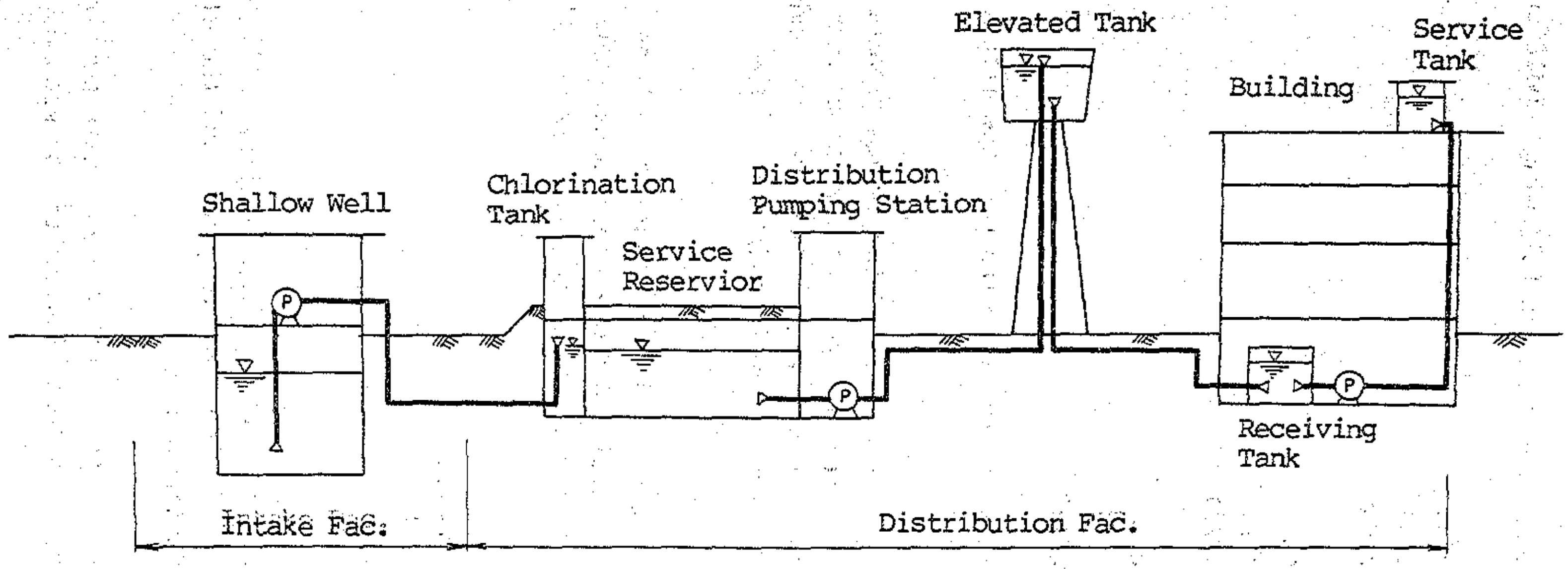


Fig. 3.3.16 Concept of Water Supply System

(3) <u>Sewerage System</u>

The sewerage system is planned based on the following conditions:

a) Quantity of wastewater
   Phase I : 200 t/day
   Phase II : 200 t/day

b) Quality of influent
   BOD : 200 mg/liter
   SS : 220 mg/liter

c) Quality of effluent
   BOD : 20 mg/liter
   SS : 30 mg/liter

(The quality of effluent complies with the specification commonly applied in Indonesia)

There are various systems to be considered for sewage treatment, such as trickling filtration, activated sludge, rotary biochemical contactor, sedimentation, stabilization pond, etc. Each has its advantages and disadvantages according to the external conditions of the system to be adopted.

In this study, the stabilization pond is recommended in terms of relatively high efficiency, lower construction and operating costs. The stabilization pond method consists of a series of facilities which is usually arranged in the following sequence.

(i) Aerated grit chamber
(ii) Facultative pond
(iii) Maturation pond
(iv) Strainer

The wastewater disposed from each building facility will be collected through a piping network the stabilization pond, and the effluent water will be discharged into the Wungu River.

In planning of location of sewege treatment plant, care must be taken so as not to cause water pollution by contamination of the ground water and seepage of waste water.

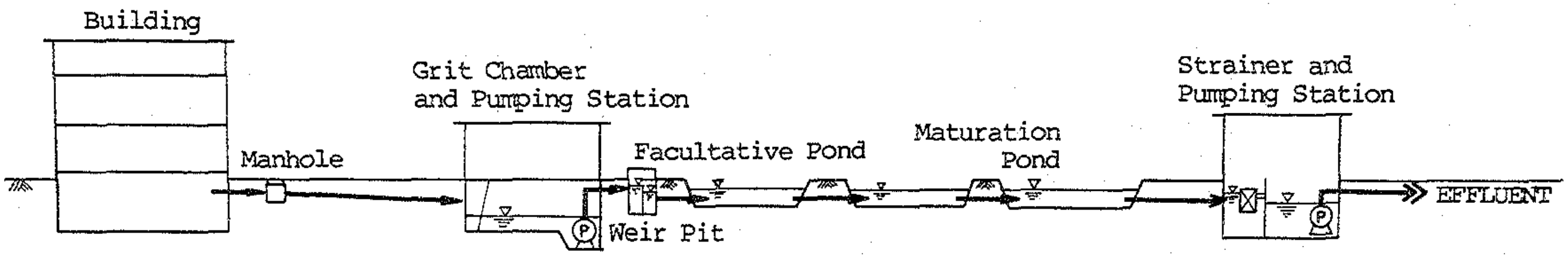


Fig. 3.3.17 Concept of Sewerage System

(4) Solid Waste Disposal System

It is recommended to install a special incinerator which can handle both rubbish and garbage waste. The solid waste collected by trucks will be burned in an incinerator which will be located at the end of terminal area.

(5) Telecommunications System

A microwave link is planned for the public telecommunications network such as telephones, telexes, data communications, etc., and it will be also utilized for aeronautical telecommunications such as AFTN, ATS direct speech circuit, meteorological data link, etc.

The telecommunication system will consist of microwave facilities and cable lines connecting each building as shown in Figs. 3.3.18 and 3.3.19.

The microwave facilities will consist of transmitters and receivers, parabolic antenna, multiplex equipment, main distribution frame, antenna tower, etc.

All cable lines will be buried underground.

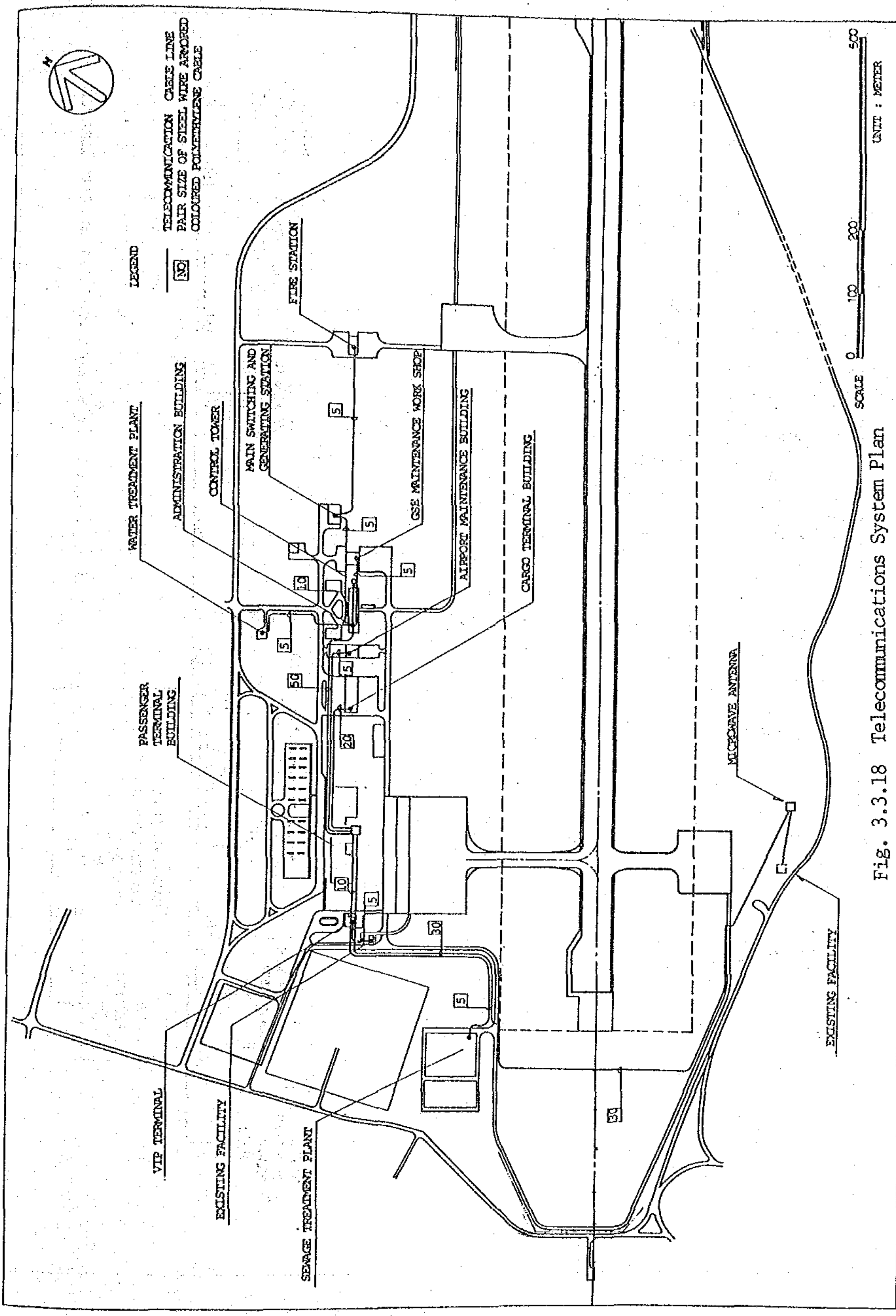


Fig. 3.3.18 Telecommunications System Plan

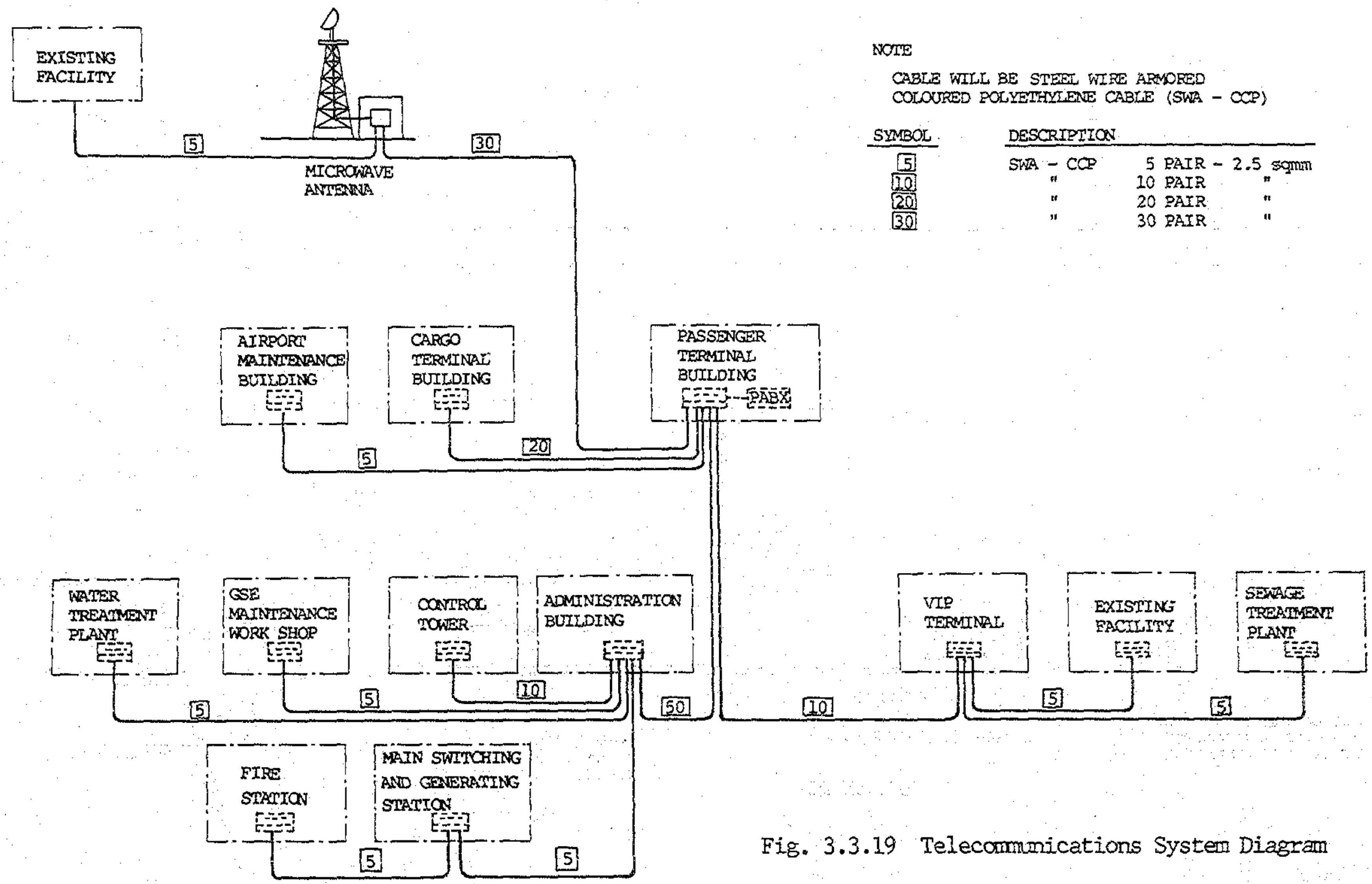


Fig. 3.3.19 Telecommunications System Diagram

3.3.8 General Services

(1) Rescue and Fire Fighting

The airport category for rescue and fire fighting at Surakarta airport is estimated to be category 7 in both Phases I and II, and the requirement for water supply for AFFF of at least 12,100 liters and CO_2 of at least 450 kg are required to be provided in accordance with the ICAO recommendations.

Although there is one major vehicle with a 4,000 liter capacity and one rescue vehicle with 200 Kg CO2, which were equipped especially for this airport in 1983 and 1984 respectively, these are required to be replaced with new ones in Phase I taking into account the service life.

(2) Fuel Supply

The required quantity of aviation fuel is estimated to be 520 kl in Phase I and 660 kl in Phase II, respectively.

The location of the fuel storage yard which has already been decided based on agreement between DGAC and PERTAMINA is incorporated in the airport layout plan. The cost for fuel supply facilities is excluded from the cost estimates in Chapter 6 because these facilities will be constructed by PERTAMINA.

CHAPTER 4 AIRSPACE USE

CHAPTER 4 AIRSPACE USE

4.1 General

The airspace configuration in Yogyakarta Military Controlled Airspace (MCA) is shown in Fig. 4.1.1.

This chapter discusses airspace use and the possibility of establishing aircraft operations procedures for Surakarta airport.

There are no constraints in establishing aircraft operations procedures for this airport. This makes it possible to conduct the optimum aircraft operations with the lowest obstacle clearance limits for precision approach Category-I.

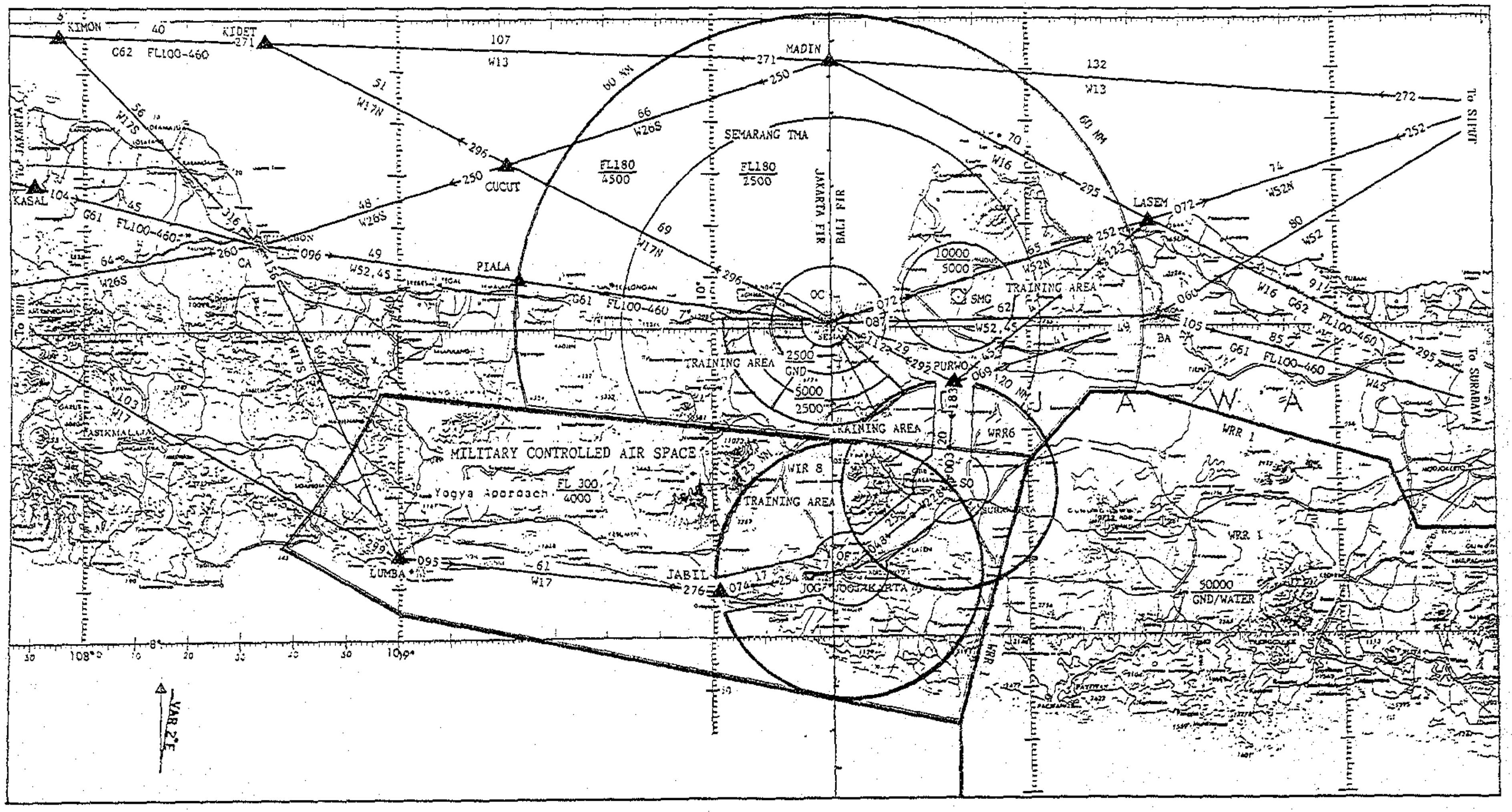


Fig. 4.1.1 Present Condition of Airspace Configuration over Central Java and D.I. Yogyakarta

4.2 Airspace Use around Surakarta Airport in Yogyakarta Military Controlled Airspace (MCA)

4.2.1 Shift of the Training Area

The existing training area WRR6 is established for the area between radii 5 nm and 20 nm centered at "SO" NDB. This area is divided into 9 portions and one training aircraft is alloted to each portion. (Refer to APPENDIX II-2-4) These divisions are made based on roads, rivers, etc. Therefore, it is difficult for trainees to recognize their position when ground targets are invisible to trainees during their flights.

Since most of the training aircraft are equipped with VOR/DME receivers and VOR/DME provides information on both orientation and distance, a trainee can easily recognize his position.

Especially when the training is carried out along the corridor, use of VOR/DME will considerably improve air safety. Thus, it is considered necessary to shift the training area to the area centered at new VOR/DME which is under construction 3.5km east of the airport.

4.2.2 Establishment and Rearrangement of Corridors

A new VOR/DME is presently under construction approximately 3.5km east of Surakarta airport, and a second new VOR/DME will be installed at the new Yogyakarta airport. Accordingly, the corridor between Point "p" and Purwo in the training areas should be established and/or realigned to the new VOR/DMEs with a width of 8 nm in compliance with ICAO ANNEX-11. (Refer to APPENDIX II-1-4(A))

The width of the corridor between "Jabil" and "OF" NDB via VOR/DME should be also widened to 8 nm.

4.2.3. Establishment of Additional Controlled Airspace

To protect the safety of IFR operations around Surakarta airport, and to ensure the joint use of airspace with the safe and expeditious flow of air traffic, the areas as shown in Fig. 4.2.1 should be designated as additional controlled airspace.

Aircraft operating within the abovementioned areas should observe the following guidelines.

Unless otherwise authorized by ATC, an aircraft shall be operated within the areas under IFR.

When an aircraft is authorized to be operated within the areas in accordance with the exception clause of above paragraph, the following condition shall be observed.

a) Maintaining VMC

b) Passing the area as soon as possible or maintaining contact with the ATC unit responsible to the area.

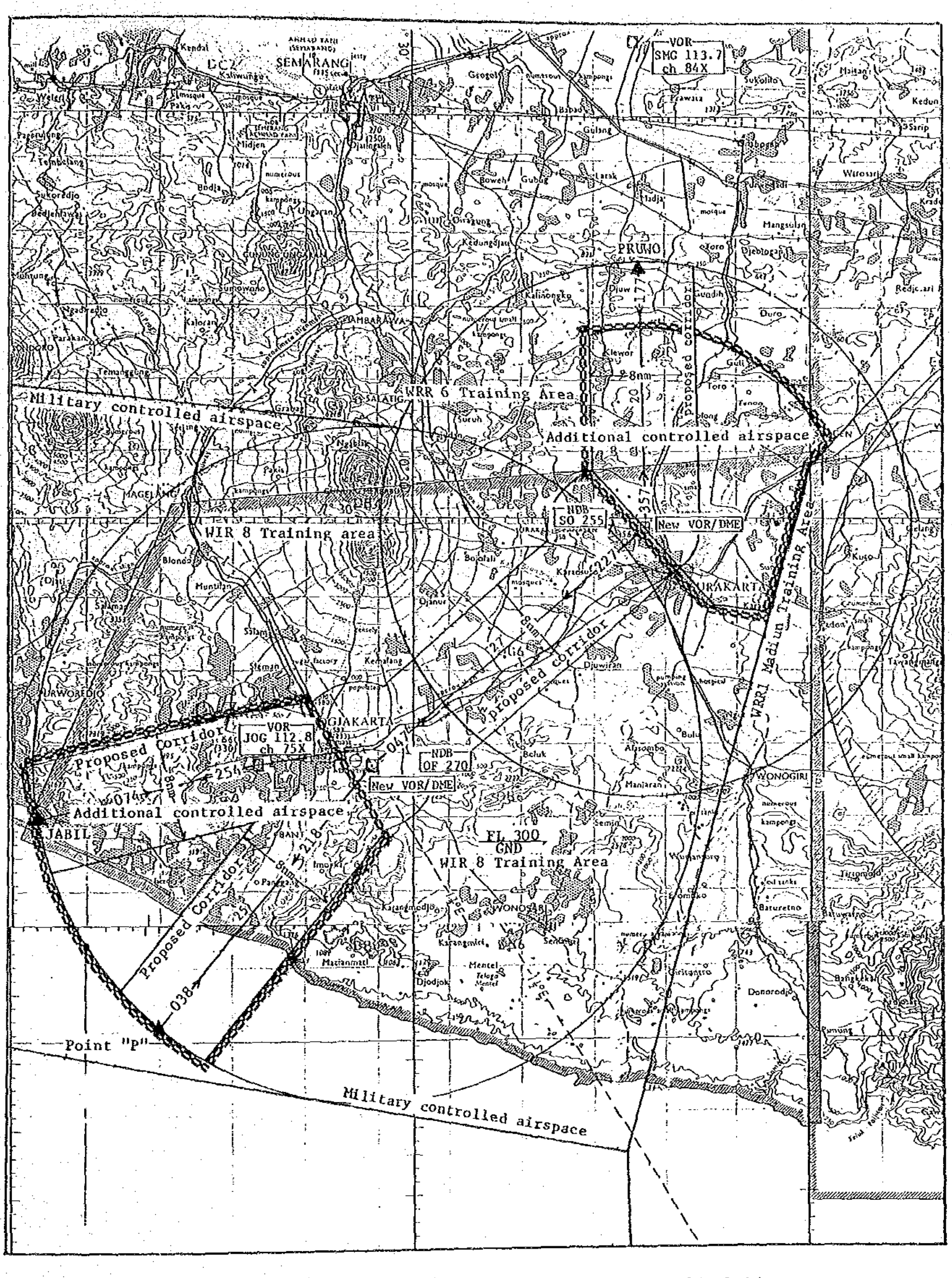


Fig. 4.2.1 Establishment of Additional Controlled Airspaces

4.3 Obstacle Limitation Surfaces and Aircraft Operation Procedures

4.3.1 Basic Assumptions

The basic assumptions and conditions which are employed in this chapter are summarized in Table 4.3.1.

Table 4.3.1 Basic Assumptions

Item	Dimension
Runway Location (ARP)	S 7° 31' E 110° 45'
Runway orientation	08/26 N 77° 15' E
Magnetic Variation	2.0° East
Landing Strip	2,270 m x 300 m
Runway Length	2,150 m x 45 m
Runway Elevation	
ARP	118.6 m
RWY 08 TDZ	125.75 m
RWY 26 TDZ	117.99 m
RWY 08 Threshold	125.75 m
RWY 26 Threshold	115.65 m
Navaids	ILS/VOR/DME

4.3.2 Obstacle Limitation Surfaces

Fig. 4.3.1 shows the obstacle limitation surfaces for Surakarta airport. The obstacle limitation surfaces are evaluated based on the ICAO requirements for precision approach category-I (Code No. 4) for Surakarta airport.

No obstruction which protrudes into the approach and transitional surfaces was found at Surakarta airport.

A small hill, 172 meter AMSL, protrudes into the inner horizontal surface on the western side of the airport as shown in Fig. 4.3.1.

It is considered that there is no problem regarding the circling approach to Runway 08 if a descent altitude having sufficient clearance related to this obstacle is applied.

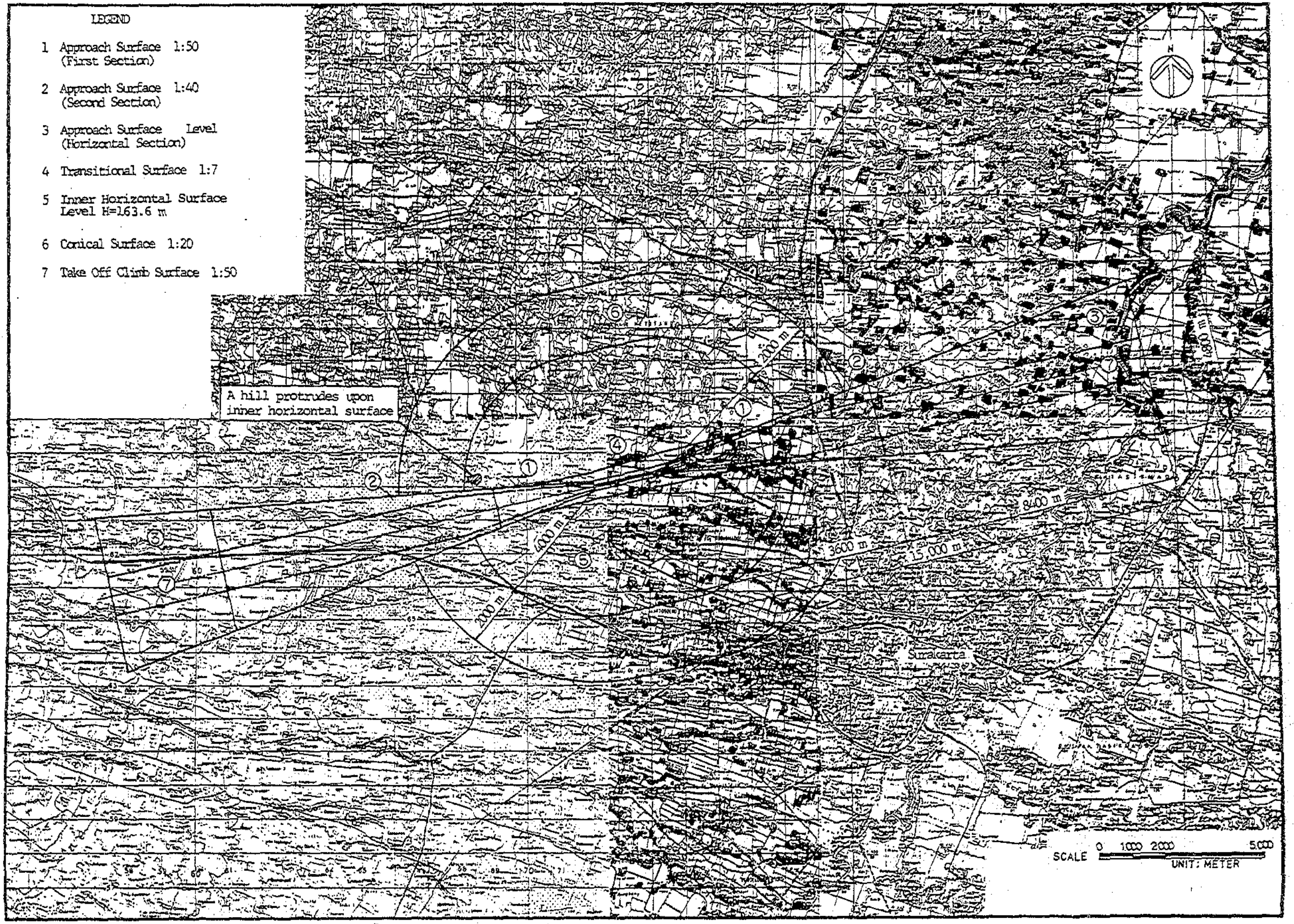


Fig. 4.3.1 Obstacle Limitation Surfaces

4.3.3 Approach and Departure Procedures

Figures 4.3.2 through 4.3.4 show the possible instrument approach and departure procedures for this airport.
These charts are drawn in order to evaluate the actual or possible existence of any constraints for the establishment of procedures and should therefore be considered for reference only.
As basic instrument approach procedures, the ILS approach for Runway 26, VOR/DME approach for Runway 26 was consulted.

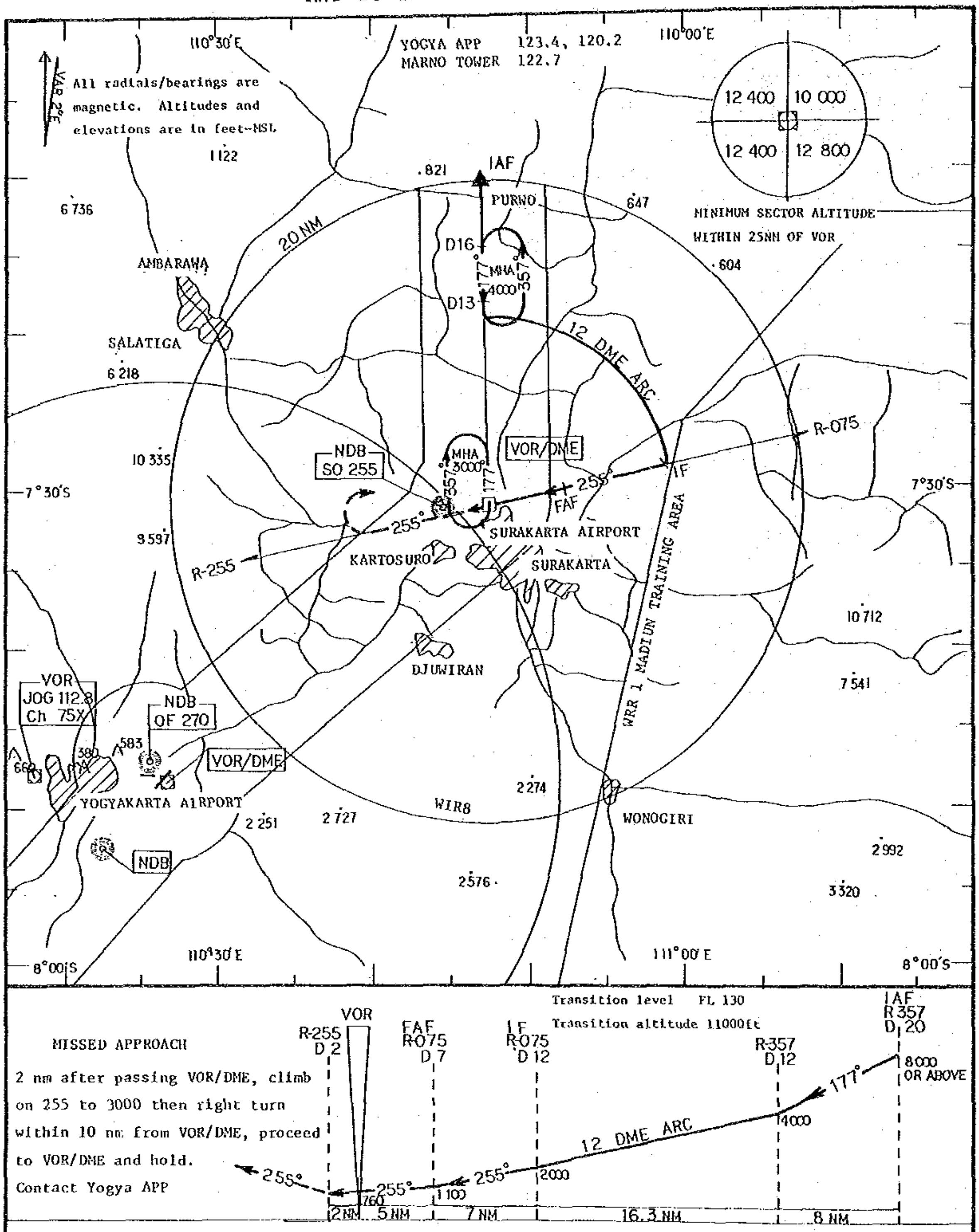
Standard instrument departure routes for both Runways 08 and 26 were also consulted.

No problem is found to exist in the procedures. When aircraft make ILS or VOR/DME approach to Runway 26, however, the intermediate and final courses or protected area for holding pattern over the VOR/DME will penetrate the training areas, WRR-6 and WRR-1.

In order to achieve efficient utilization of airspace in the abovementioned training areas, it is considered highly desirable to maintain close cooperation between DGAC and military authorities responsible for activities that may affect flights of civil aircraft. To ensure the safety of air traffic, Radar monitoring for arriving and departing aircraft is required in the airspace in and around Surakarta airport.

AERODROME ELEVATION 389 SURAKARTA AIRPORT

RWY 26 TDZ ELEVATION 387 VOR/DME/ILS RWY 26



	STA RWY 26 MDA 760'		CIRCLING
	ALS AVBL	ALS OUT	MDA - VIS
A	VIS RVR 1200 m	VIS RVR 1600 m	760'- 1 600 m
B			840'- 1 600 m
C			980'- 2 400 m
D	VIS/RVR 1 400 m	VIS 2 000 m	980'- 3 200 m

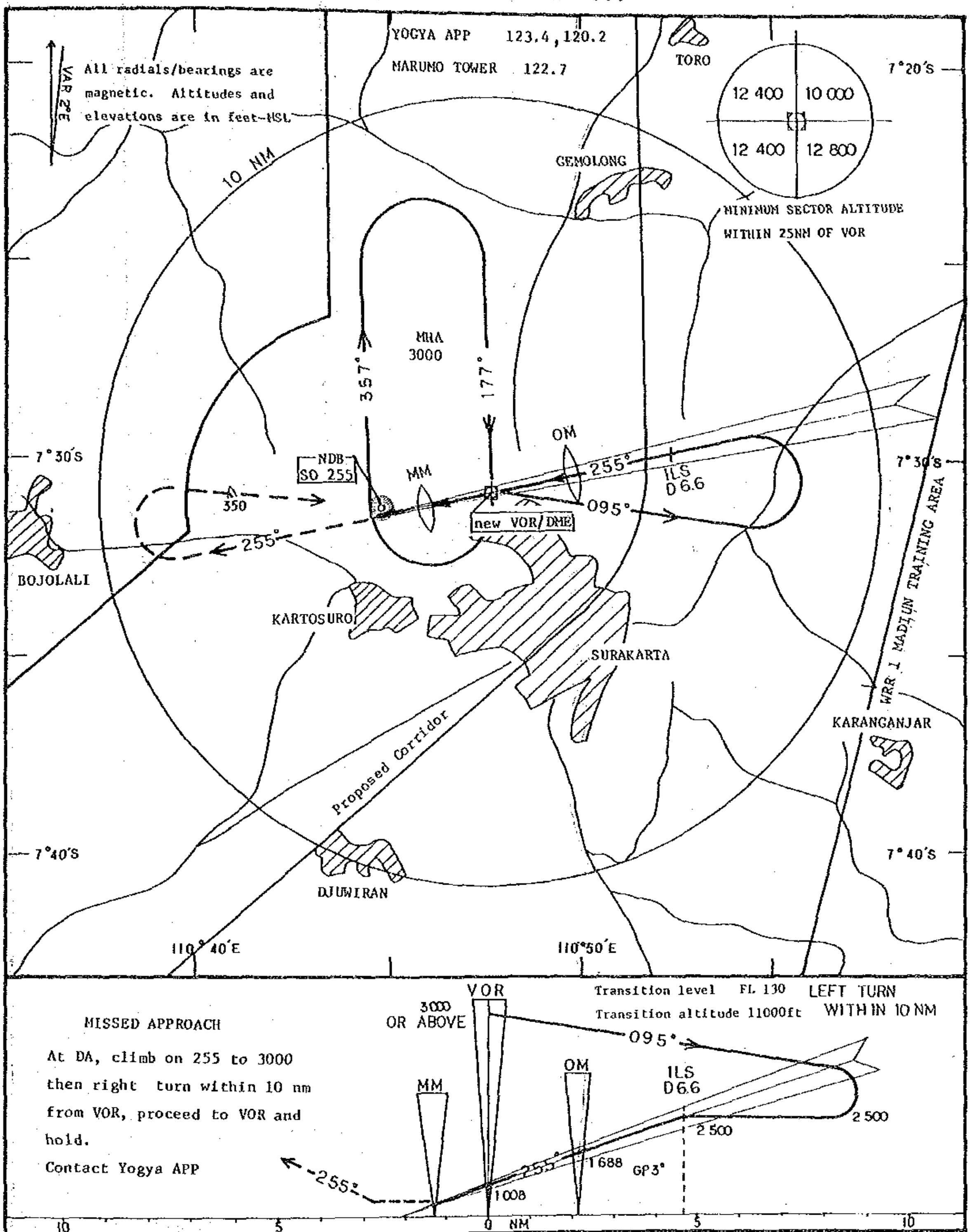
Time from FAF to MAP 255/7 nm

KNOT / TIME	120	130	140	150	160
MIN:SEC	3 : 30	3 : 14	3 : 00	2 : 48	2 : 37

Fig. 4.3.2 VOR/DME/ILS RWY 26

AERODROME ELEVATION 389 SURAKARTA AIRPORT

RWY 26 TDZ ELEVATION 387 VOR/DME RWY 26

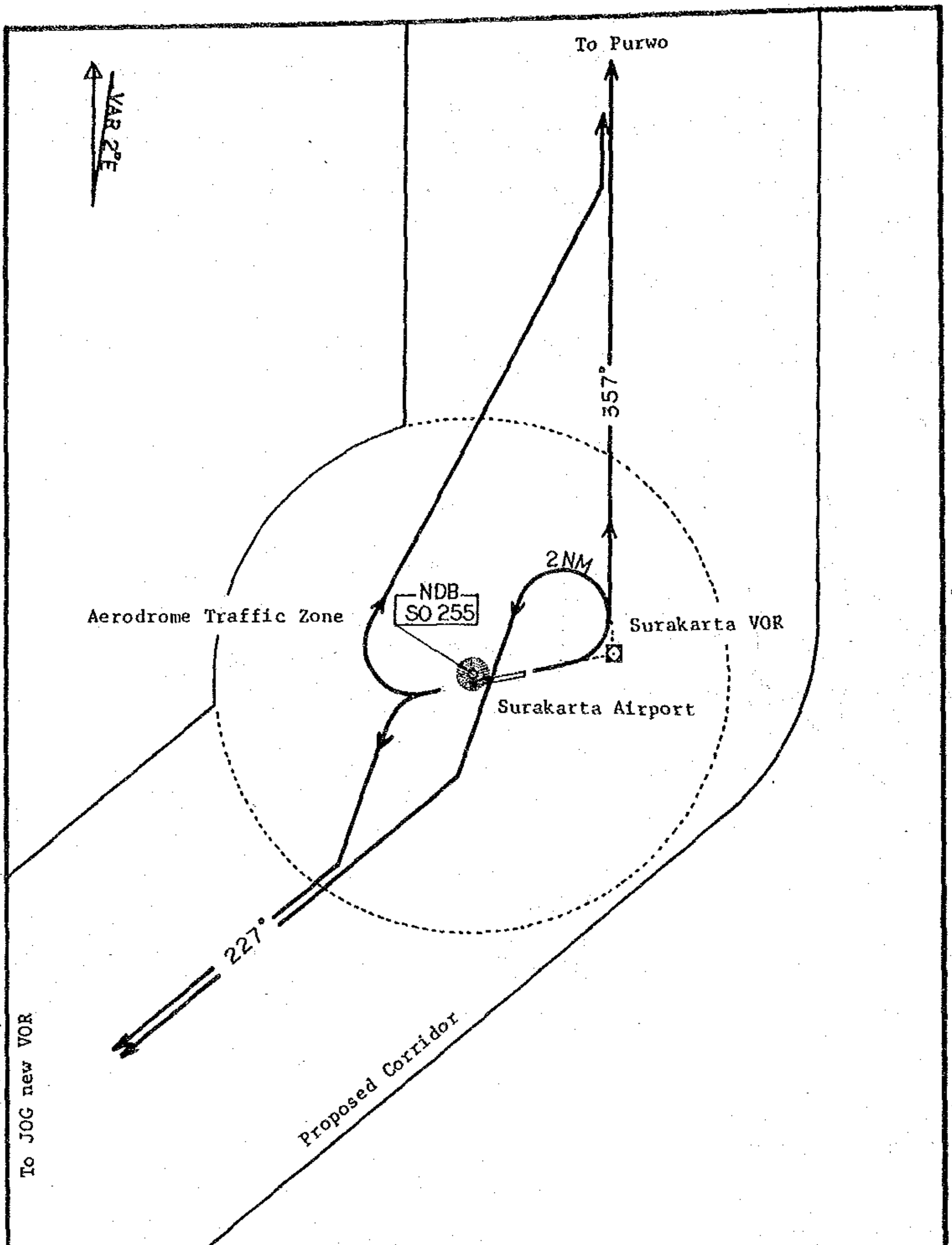


	STA RWY 04						
	DA 587'		DA 637'		MDA 740'		CIRCLING
	CAT I						
	ALS AVBL	ALS OUT	MM OUT ALS AVBL	MM ALS OUT	GP OUT ALS AVBL	GP ALS OUT	MDA - VIS
A	VIS RVR 800m	VIS RVR 1200m	VIS RVR 1000m	VIS RVR 1200m	VIS RVR 1200m	VIS RVR 1400m	740' - 1600m
B							840' - 1600m
C							880' - 2400m
D			VIS/RVR 1200m			VIS/RVR 1800m	880' - 3200m

Time from D6.6 to THR 255/6.4 nm

KNOT / TIME	120	130	140	150	160
MIN'SEC	3:12	2:57	2:44	2:33	2:24

Fig. 4.3.3 VOR/DME RWY 26



Nr.1 Departure

Take off on Runway 26, turn right (take off on Runway 08, turn left)within 2 NM, climb via Surakarta VOR R-357 (SMG VOR R-177) to Purwo.

Nr.2 Departure

Take off on Runways 08/26, turn left within 2 NM, climb via Surakarta VOR R-227 to JOG new VOR.

Fig. 4.3.4 SID at Surakarta Airport

4.3.4 Relationship between IFR Operation and the Training Area

Although the width of the corridors established along VOR/DME defined routes are proposed to be widened to 8 nm in Section 4.2.2, some parts of protected airspaces necessary for aircraft holding patterns overlap with the training area, WRR-6.

Further, some parts of protected airspaces necessary for intermediate course of VOR/DME approach to Runway 26 overlap with the training area, WRR-1. Also intermediate and final courses of VOR/DME approach to runway 26 and VOR/DME/ILS approach to Runway 26 penetrate the training area WRR-6.

At present, approximately 40 Military training movements per day are conducted in the training area, WRR-6.

Most of training flights are basic, advanced practices and practice IFR operations. This means the possibility and potential danger of mid-air collisions or near collisions without well-timed control.

4.3.5 Provision of Radar Monitoring in the Airspace in and around Surakarta Airport

(1) Provision of Radar Monitoring

The relationship between IFR operations and training areas is described in Section 4.3.4 of this report.

The possibility of the occurrence of near collision exists at any time in and around Surakarta Airport.

At present, trainees operating in and around Surakarta airport are given necessary information regarding arriving/departing aircraft at Surakarta airport from Marmo Tower for prevention against near collisions between civil flights and training flights. However, according to the increment of number of civil flights in the near future in and around Surakarta airport, the possibility of the occurrence of a near collision will increase.

In order to solve the abovementioned problem, it is considered necessary that Radar monitoring and Radar assistance to both civil and military training aircraft should be provided.

ATC Radar System for the terminal radar approach control service in Yogya MCA is proposed to be installed near Yogyakarta airport.

This Radar System will provide the capabilities to cover the airspace over Surakarta airport and its vicinity at an altitude 1200 feet or above.

(2) Equipment of SSR Transponder

In order to reinforce the radar target, rapid target identification and unique display of selected codes, the SSR transponder should be equipped on both civil aircraft and military training aircraft operating within the Yogya MCA.

4.3.6 Terminal Area Chart

Fig. 4.3.5 shows the military controlled airspace and terminal area chart for Surakarta airport and the existing and new Yogyakarta airports.

The chart illustrates a new ATS route for the new Yogyakarta airport, establishment and rearrangement of corridors, and shift of the training areas.

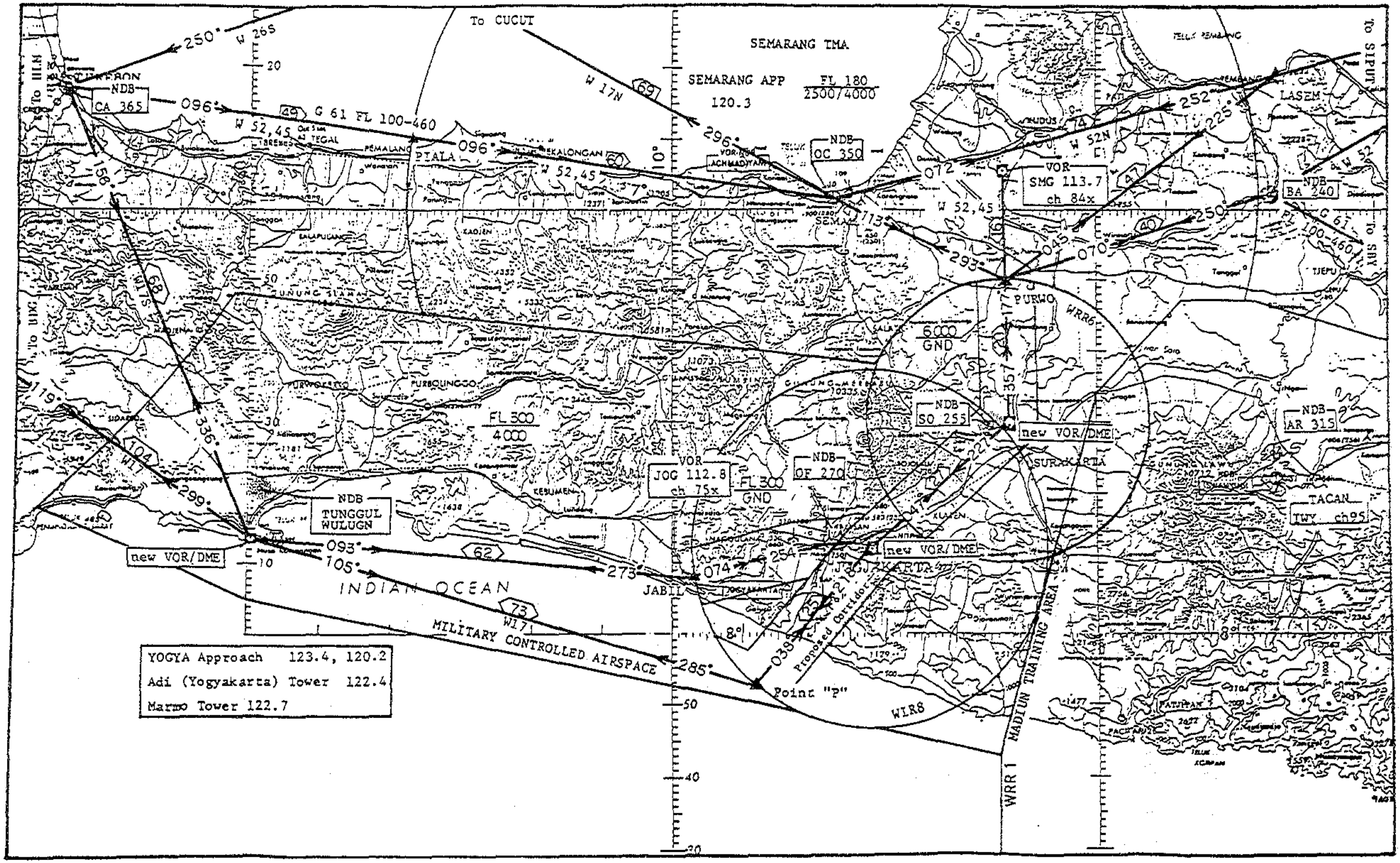


Fig. 4.3.5 Terminal Area chart for New Yogyakarta and Surakarta Airports

4.4 Conclusions and Recommendations

The following are conclusion and recommendation to the airspace utilization system in the Yogya MCA.

As regards the modification of the airspace utilization system, maintaining close cooperation between DGAC and the military authorities concerned is highly desired to enforce the modifications.

Accordingly, a committee should be formed to solve any problems and to discuss frankly about the airspace utilization in the area.

(1) Rearrangement of Corridors

The corridors in the training areas are proposed to be rearranged along Surakarta and new Yogyakarta VOR/DMEs, and widening the corridors is also proposed.

(2) Shift of Training Area

The existing training area centered at "SO" NDB should be shifted to be centered at Surakarta VOR/DME for better self-recognition of aircraft position by air.

(3) Establishment of Additional Controlled Airspace

Additional controlled airspace is proposed to be established in order to ensure the safety of IFR operations in the training area.

(4) Aircraft Operation Procedures

No obstacle is found to exist in the procedures based on Basic instrument approach procedures, (ILS approach for Runway 26 and VOR/DME approach for runway 26) and Standard instrument departure routes for both Runways 08 and 26.

When aircraft make ILS or VOR/DME approach to Runway 26, however, the intermediate and final courses or protected area for holding pattern over the VOR/DME will penetrate the training areas, WRR-6 and WRR-1.

In order to achieve the efficient utilization of airspace in the abovementioned training areas, it is desirable to maintain close cooperation between DGAC and the military authorities responsible for activities that may affect flights of civil aircraft.

(5) Provision of Radar Monitoring

Radar monitoring and Radar assistance for civil and military training aircraft should be provided to prevent near collisions.

(6) Equipment of SSR Transponder

SSR transponder should be equipped on aircraft operating within the Yogya MCA for reinforcement of radar target, rapid target identification and unique display of selected codes.

CHAPTER 5 SUBSIDIARY CONSIDERATIONS

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5.1 General

This chapter explains the study on aircraft noise influence, land use of the area surrounding the airport and airport organization.

Assessment based on aircraft noise contours indicates that the airport requires some countermeasures for the existing land use in the area surrounding the airport.
The countermeasures should, however, be required to harmonize the airport with the surrounding area.

5.2 Aircraft Noise

Aircraft noise contours of the airport are calculated for the year 2010 based on the conditions as tabulated in Table 5.2.1.

Fig. 5.2.1 shows the calculated aircraft noise contours in Weighted Equivalent Continous Perceived Noise Level (WECPNL). (For details, refer to Attachement F to Annex 16 Environmental Protection, Vol. I Aircraft Noise, ICAO).

The contour of WECPNL 70 extends approx. 2.7 km east of the Runway 26 threshold and approx. 3.0 km west of the Runway 08 threshold. Within the area covered by the noise level of WECPNL 70, there are a lot of villages, and the residential areas total about 152.6 ha.

Therefore, some countermeasures are required to prevent aircraft noise from having a detrimental influence on the schools, hospitals, mosques, churches and other houses in the area.

Table 5.2.1 Assumption on the Calculation of Aircraft Noise Contour

Item	Assumptions
Target year	Phase II (year 2010)
Traffic pattern	As stated in the chapter 4
Ratio of Runway use	RWY26 : 95 % RWY08 : 5 %
Runway length	2,150 m
Glide slope angle	3.0 degree
Number of daily flights	NMJ (B767/A310) : 12 flights SJ (F28) : 8 flights Total 20 flights
Distribution of flights	Day time flight : 100 %

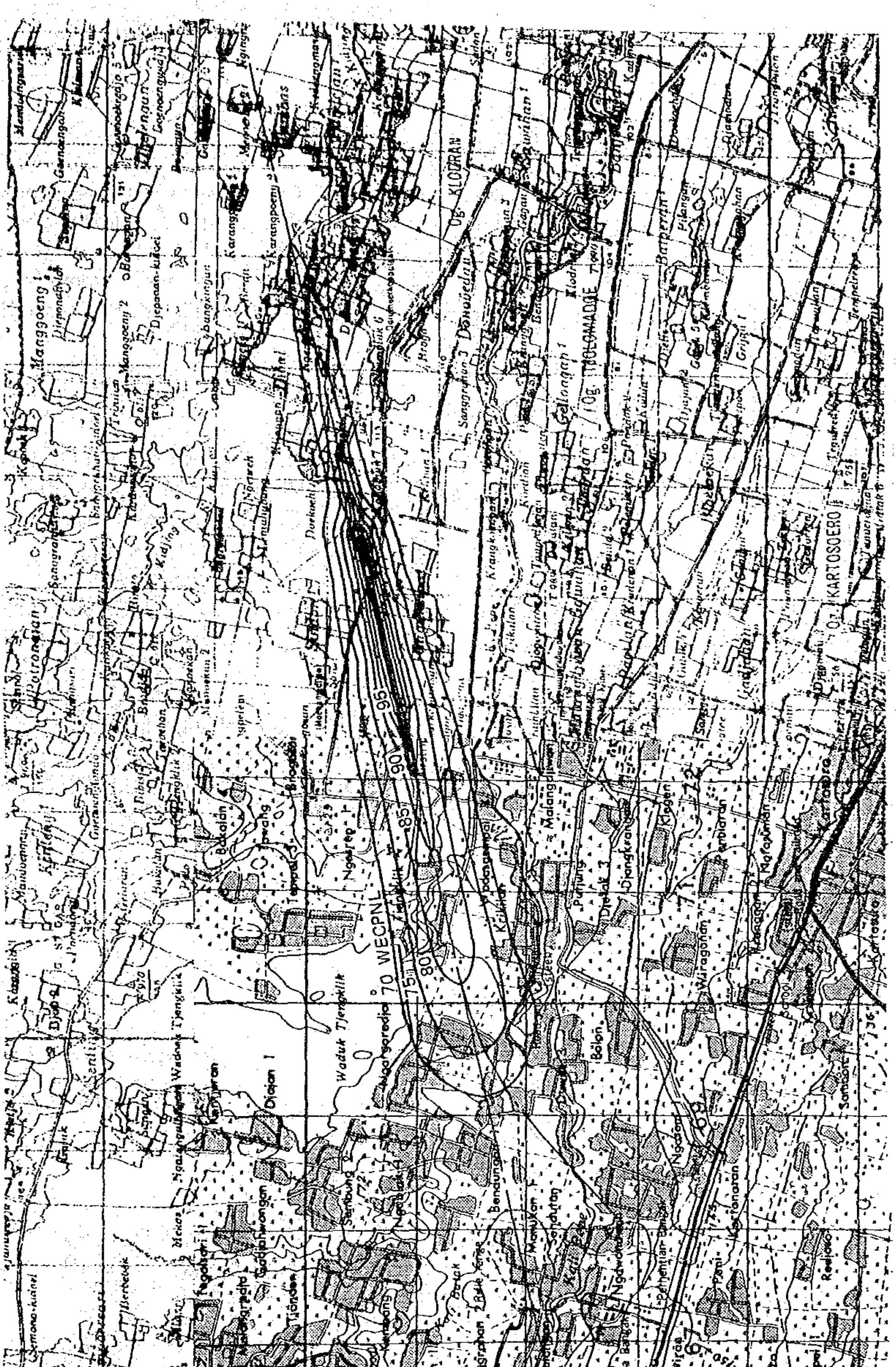

Fig. 5.2.1 Contour Map of Aircraft Noise

5.3 Land Use Planning of the Area Surrounding the Airport

Land use controls are boardly classified into the land use zoning regulations especially based on aircraft noise, height limitation to control to ensure the safe operation of aircraft, etc. Each requirement for protection of environment and required height limitations is explained in detail below and, the land use plan is proposed for the area surrounding the airport as shown in Fig. 5.3.2.

(1) Land Use Planning Concerning Aircraft Noise

The land use in the vicinity of the airport consists of agricultural fields and residential areas as shown in Fig. 5.3.1. Agricultural use except for poultry will not be seriously affected by aircraft noise, however, the residential areas will be exposed to influence of aircraft noise.

As for the present, although there is not any land use planning, taking into account the level of aircraft noise, countermeasures are required from the viewpoint of land use.

Based on the following criteria which are proposed taking into account the current land use controls for aircraft noise in Japan, France etc., some countermeasures are proposed in order to harmonize the airport with the surrounding area.

- Proposed Criteria -

WECPNL ≧ 70 : No school, hospital, mosque, church, etc., is permitted.

≧ 75 : No new residence is permitted in principle.

Agricultural land use is recommended.

≧ 85 : No residence is permitted in principle.

Residents are recommended to relocate. Exchange of noise affected residential area with agricultural area outside WECPNL 70 is recommended.

The residential area of each category estimated based on Fig. 5.3.1 is shown in Table 5.3.1.

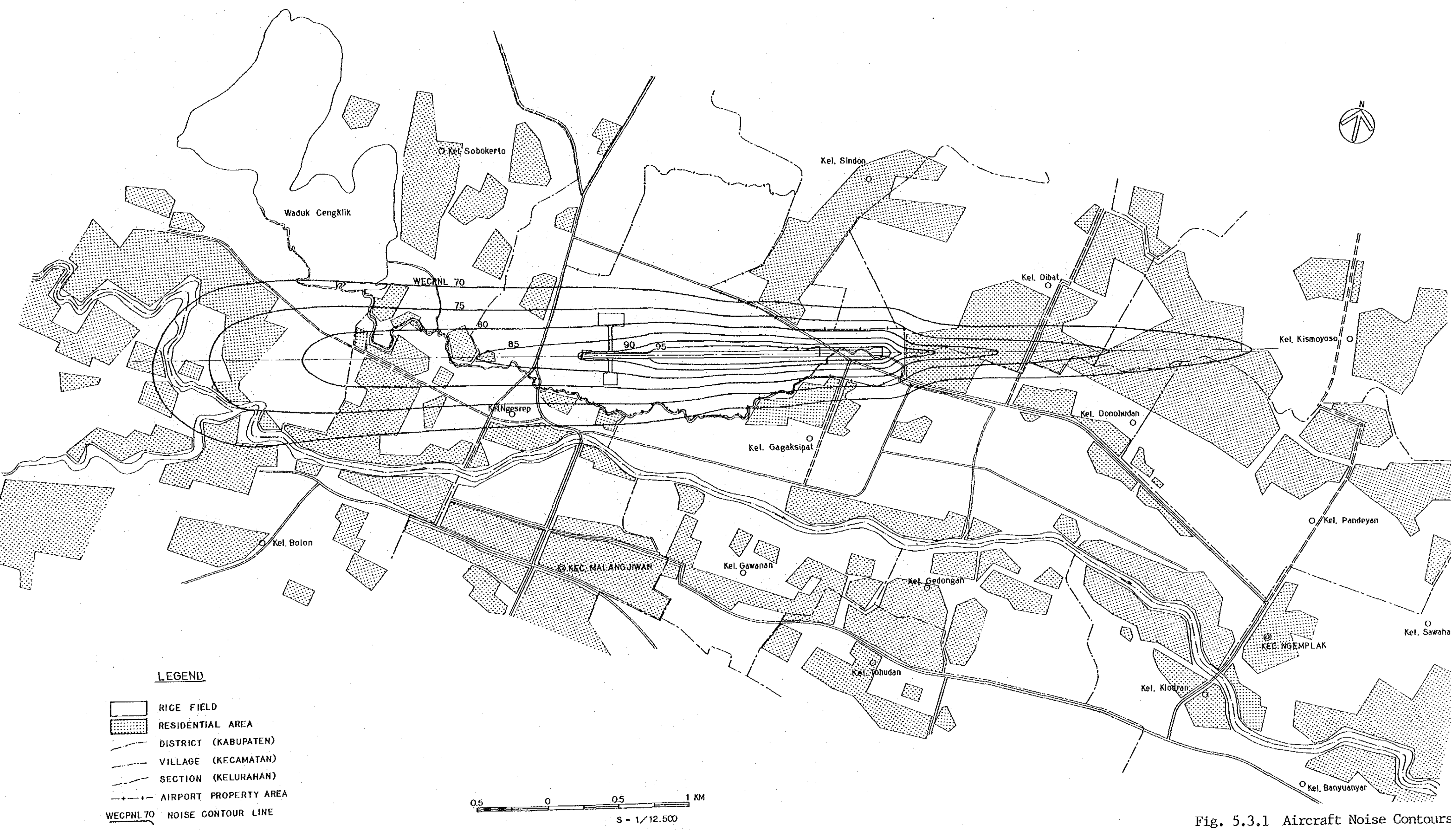

Fig. 5.3.1 Aircraft Noise Contours

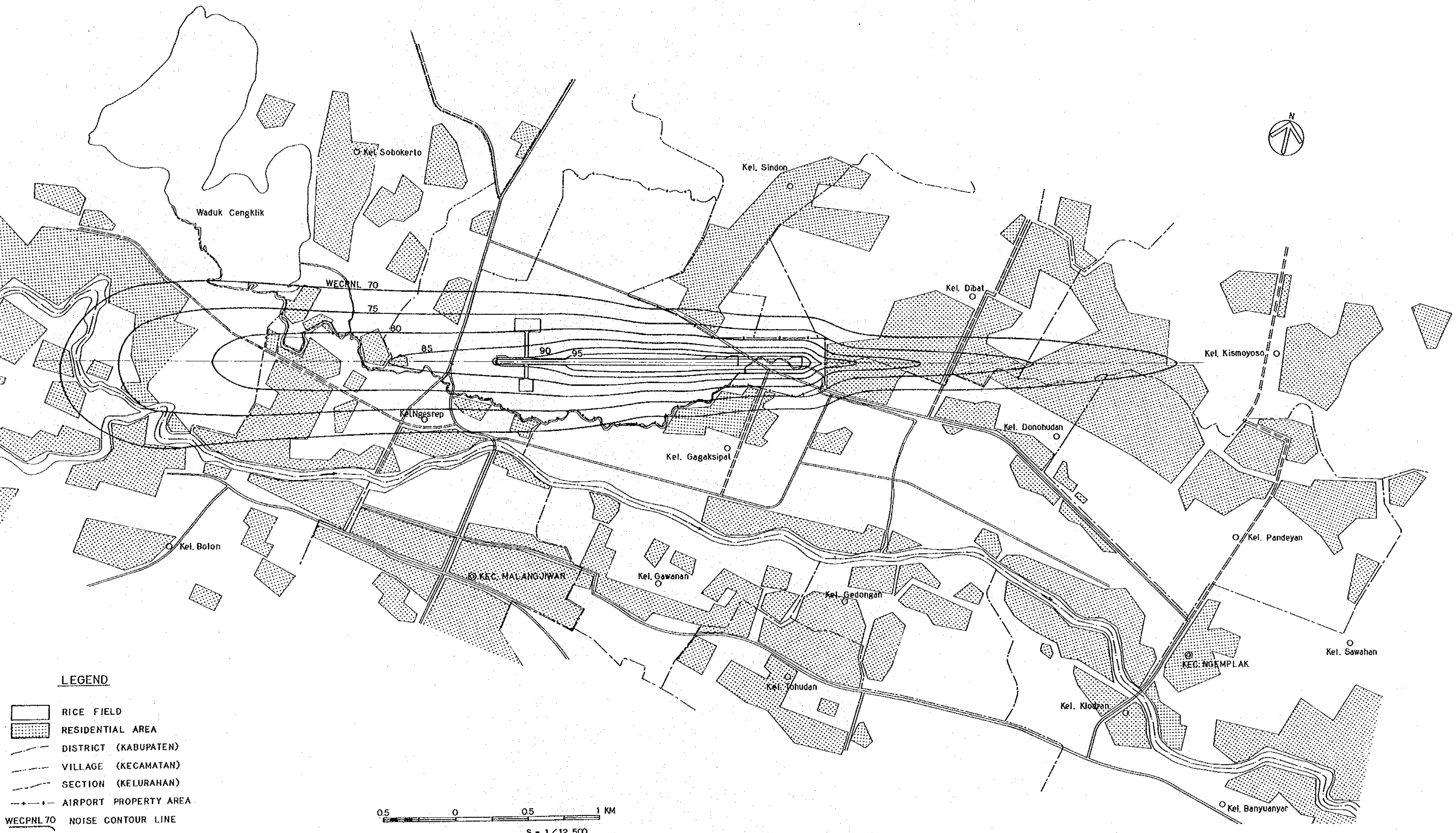

Fig. 5.3.1 Aircraft Noise Contours

The buildings such as schools, hospitals, etc., within a noise contour of WECPNL 70 and the buildings and houses within a noise contour of WECPNL 85 should be relocated. It is, also, desirable that the houses within a noise contour of WECPNL 70 should be relocated outside the contour line of WECPNL 70 as far as possible.

Table 5.3.1 Residential Area Covered by Noise Contours

Noise level (WECPNL)	Residential Area (ha)
70 - 75	84.2
75 - 85	66.7
85 <	1.7
Total	152.6

(2) Land Use Planning for the Future Expansion of the Airport Facilities

The land use plan surrounding Surakarta airport should be made to meet the long-term development of the airport facilities. The area surrounding the terminal area and the area for extending the runway up to 2,500 m are considered as shown in Fig. 5.3.2. It is desirable to restrict the construction of buildings including houses within these areas as much as possible.

(3) Land Use Planning for Obstacle Control

All the structures and trees surrounding the airport property area must be strictly restricted from the viewpoint of ensurance of airport functions.

As for height limitation, the area as shown in Fig. 5.3.2 is proposed for the future runway extension area so as not to infringe the approach surfaces. The area is defined by the lines 1,000 m away from short sides of the runway strip and 100 m away from long sides of the runway strip.

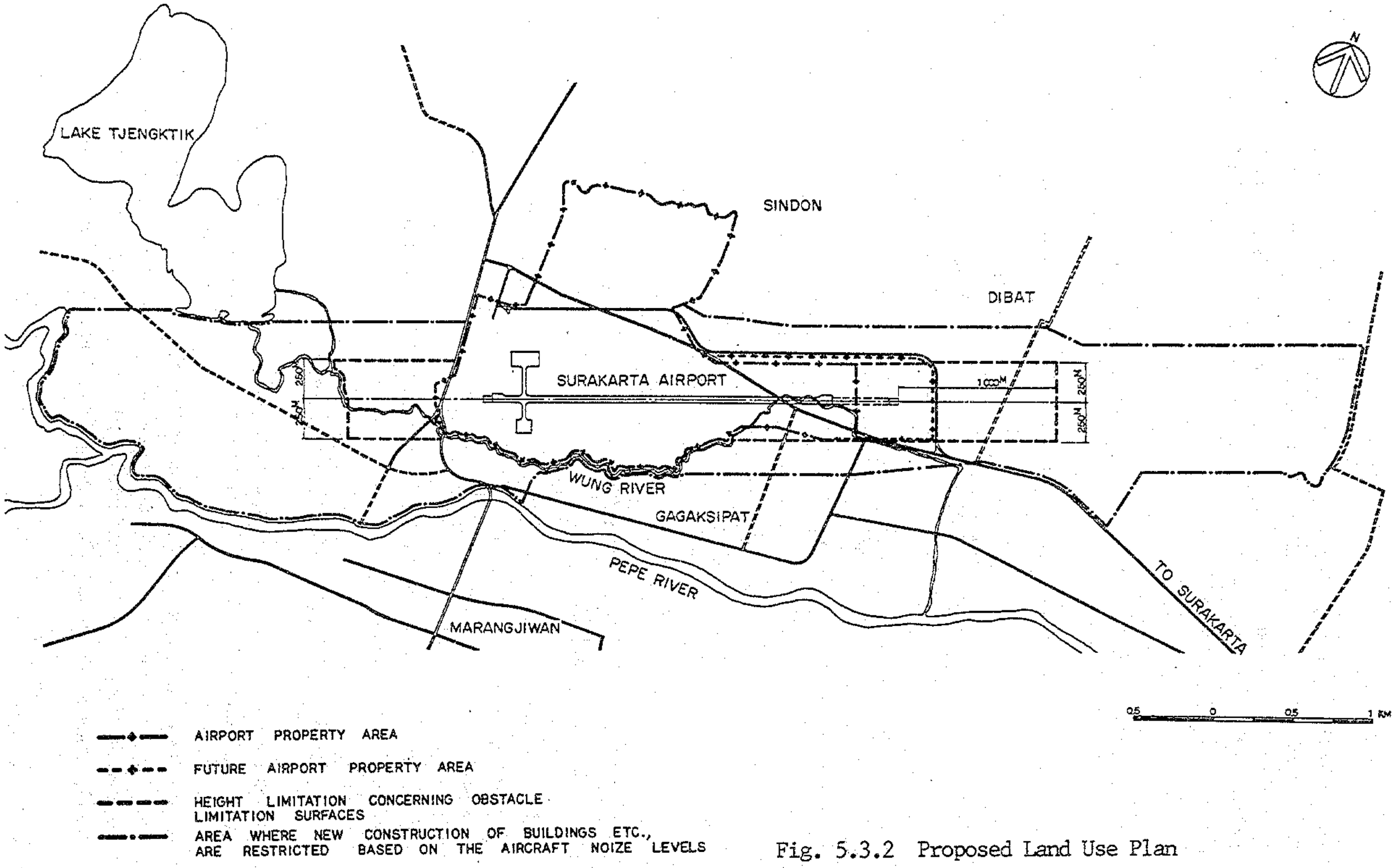

Fig. 5.3.2 Proposed Land Use Plan

5.4 Airport Organization

The existing Surakarta airport is maintained under DGAC. The organization consists of three divisions: administration (15 members), ground operation (30 members) and technical (31 members) and the DGAC Staff numbers 76 members including an airport manager.

The organization of the airport is studied and estimated based on the following assumptions.

- The number of technical and operational staff is assumed to be proportional to the total size (area) of the airport facilities.

- The number of administrative staff is assumed to be proportional to the number of air passengers.

Table 5.4.1 shows the number of employees for the proposed airport in Phases I and II.

Table 5.4.1 Estimated Staff Members

Division	Phase I 2000	Phase II 2010
Technical	65	65
Administration	65	120
Operational *	80	80
Total	210	265

* ATC staff are included.

The total number of the DGAC Staff is estimated to be 210 and 265 members in Phases I and II, respectively.

The organization chart in Phase I is supposed based on the Surakarta airport organization chart as shown in Fig. 5.4.1.

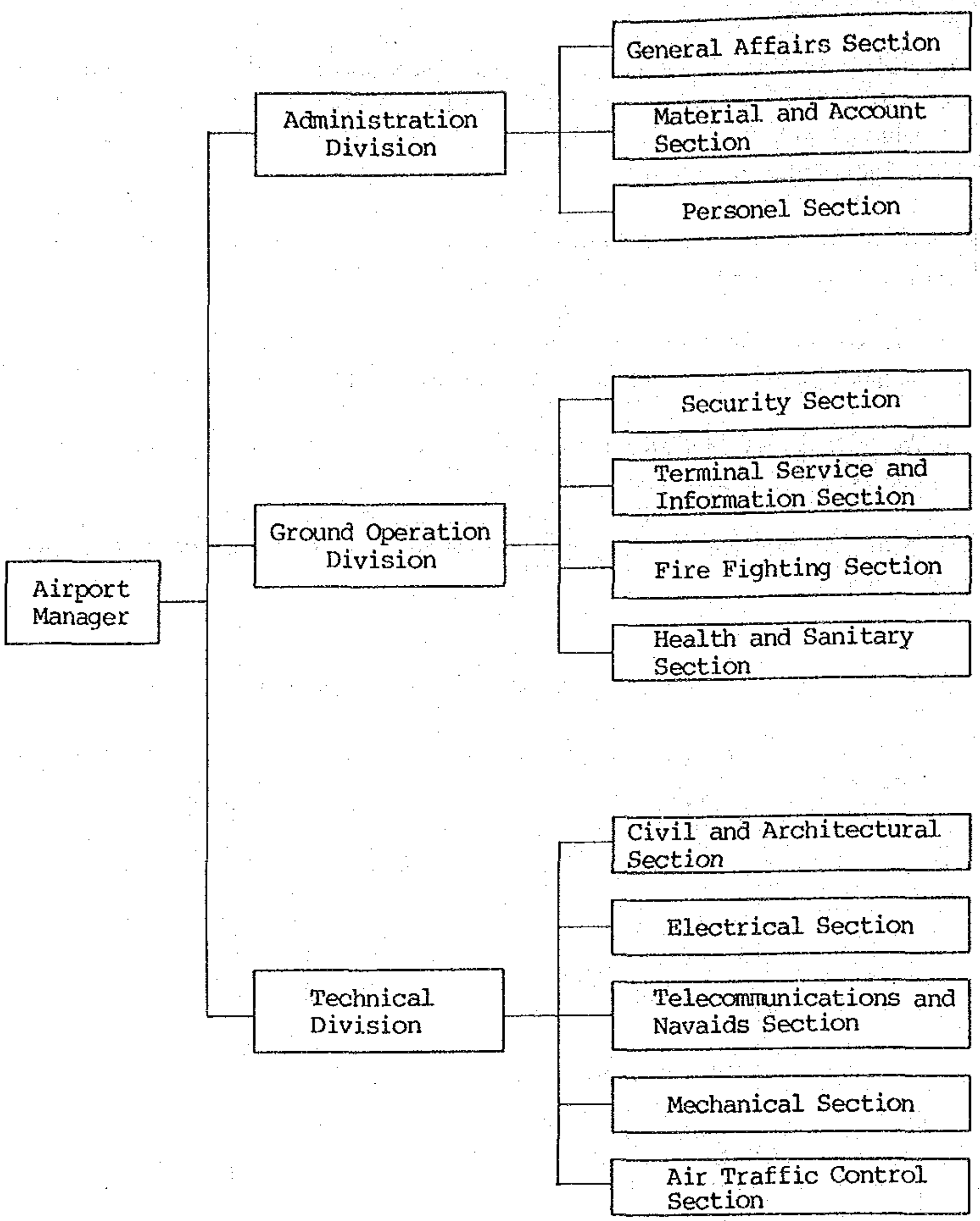

Fig. 5.4.1 Airport Organization Chart