4.5 Conclusions and Recommendations

The following are conclusions and recommendations to the airspace utilization system in Yogya MCA. As regards the modification of the airspace utilization system, maintaining close cooperation between DGAC and military authorities concerned is highly desired to enforce the modifications. Accordingly, committee to solve the poroblem should be formed in order to discuss frankly about the airspace utilization in the area.

(1) Establishment of New ATS Route from Jakarta

A new ATS route from Jakarta is proposed for the new airport. A new VOR/DME is planned at the compulsory reporting point "Lumba" or its vicinity in order to cancell existing dead-reckoning flight.

(2) Shift of Training Areas

Training areas WIR-8 and WRR-6 should be shifted to be centered at VOR/DMEs which will be installed in New Yogyakarta and Surakarta airports from the existing NDBs.

(3) Establishment and Rearrangement of Corridors

Corridors in the training area are proposed to be established and/or rearranged along new Yogyakarta and Surakarta VOR/DMEs. Widening of corridors will be also necessary.

(4) Establishment of Additional Controlled Airspaces

In order to avoid near collision in the busy airspace near Yogyakarta and Surakarta airports, additional controlled airspaces should be established.

(5) Installation of Terminal Radar Approach Control System

To achieve the optimum joint use of airspace, promotion of air traffic flow and prevention against near collision, terminal radar approach control system should be introduced for Yogya MCA.

Site-R2 is recommended as a strong candidate site for Radar antenna.

(6) Equipment of SSR Transponder

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

(7) Antenna Site of Semarang PSR

When PSR is introduced for Semarang TMA, it is recommended that the selection of antenna site should be made taking into consideration the PSR coverages of Jakarta and Surabaya and enroute control system.

CHAPTER 5 SUBSIDIARY CONSIDERATIONS

CHAPTER 5 SUBSIDIARY CONSIDERATIONS

5.1 General

This chapter presents the results of 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 new airport requires some countermeasures for the existing land use in the area surrounding the airport.

The countermeasures should, however, harmonize the new airport with the surrounding area.

5.2 Aircraft Noise

Aircraft noise contours of the new airport were 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 Continuous Perceived Noise Level (WECPNL). (For details, refer to Attachment F to Annex 16 Environmental Protection, Vol. I Aircraft Noise, ICAO).

The contour of WECPNL 70 extends approx. 4.0 km southwest of the Runway 04 threshold and approx. 2.5 km northeast of the Runway 22 threshold. Within the area covered by the noise level of WECPNL 70, there are a lot of villages, and the residential areas total about 141.4 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 Chapter 4
Ratio of Runway use	RWY04 : 95 % RWY22 : 5 %
Runway length	2,500 m
Glide slope angle	3.0 degree
Number of daily flights	WB (A300/DC10) : 14 flights NMJ (B767/A310) : 8 flights SJ (F28) : 4 flights SP (F27/HS748) : 4 flights STOL(DHC6) : 4 flights Total 34 flights
Distribution of flights	From/to JKT, DPS Day time flight : 90 % Night time flight : 10 % Other routes Day time flight : 100 %

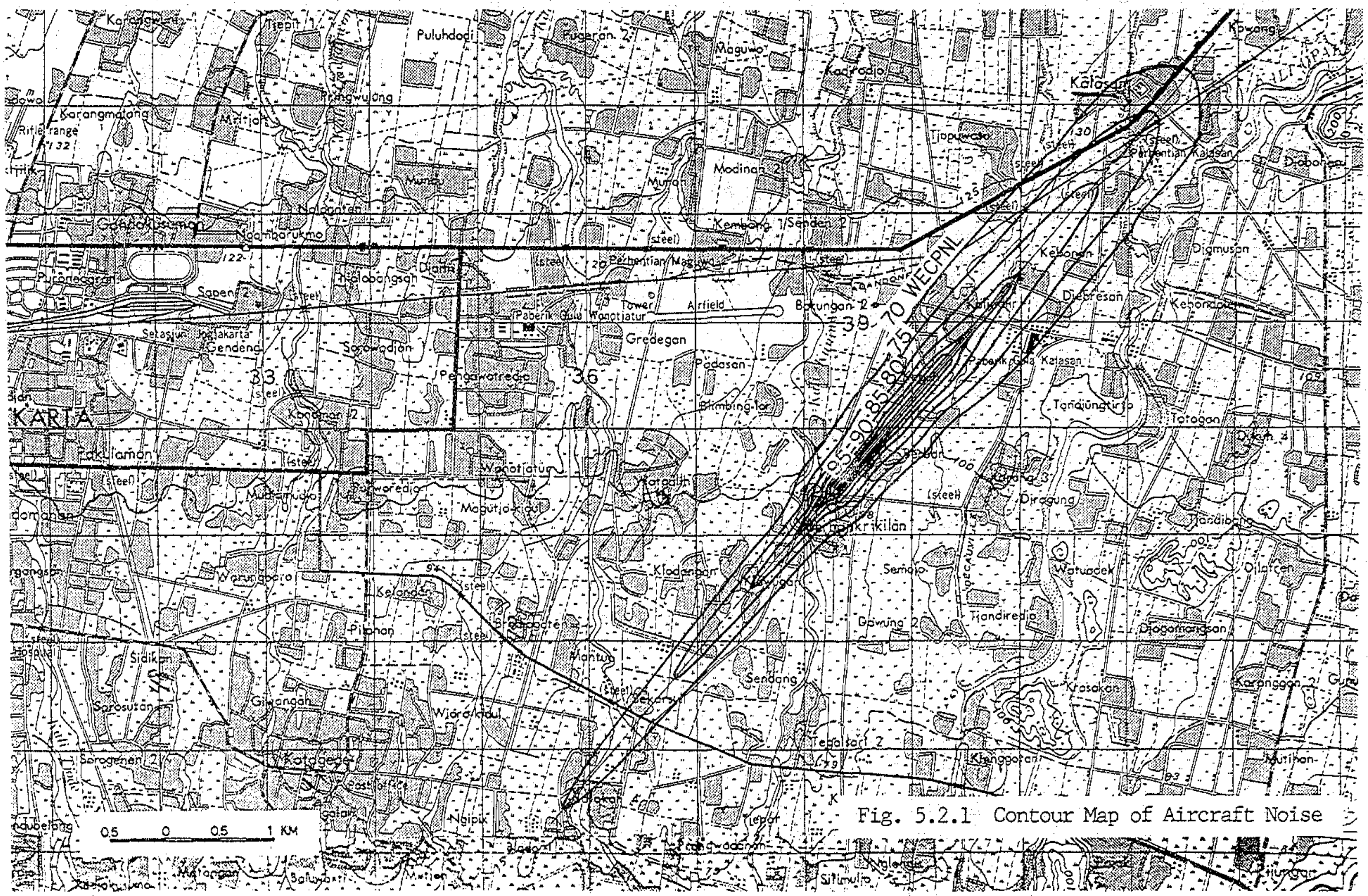


Fig. 5.2.1 Contour Map of Aircraft Noise

5.3 Land Use Planning of the Area Surrounding the Airport

Land use controls are broardly 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 requirment for protection of environment and required height limitations are explained in detail below, and the land use plan is proposed for the area surrounding the airport as shown in Fig. 5.3.2.

Moreover, since the existing irrigation system will be destroyed by the airport construction, readjustment of the irrigation system will be made to be compatible with the airport drainage system and diversion of the Tepus River.

(1) Land Use Planning Concerning Aircraft Noise

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

Judging from the present land use, and 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 new 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.

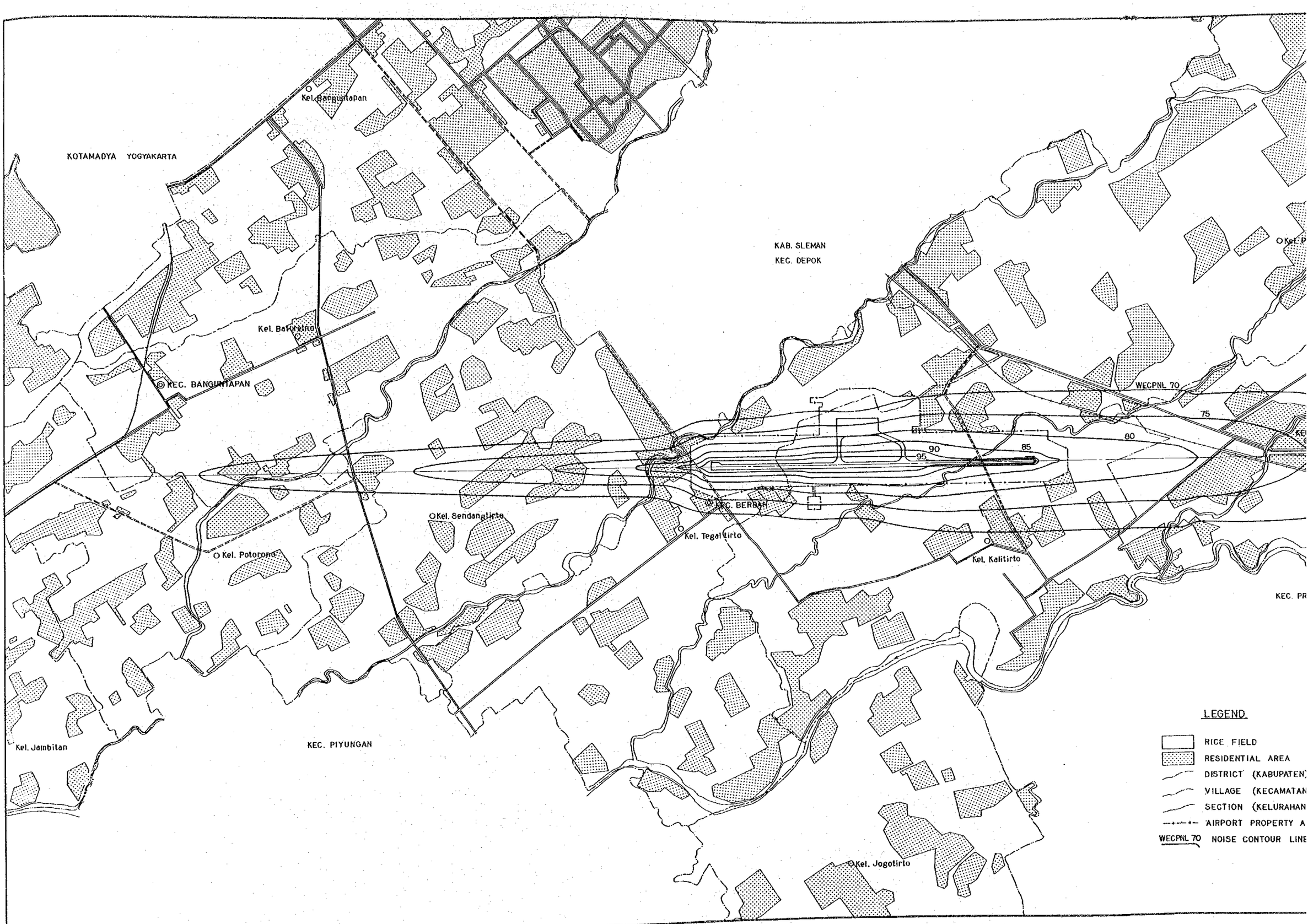
Agricultural, outdoor recreational, commercial and industrial land use are recommended.

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

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 70 WECPNL 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	83.3
75 - 85	56.1
85 <	2.0
Total	141.4


KOTAMADYA YOGYAKARTA
Kel. Banguntapan
Kel. Baturetno
KEC. BANGUNTAPAN
KAB. SLEMAN
KEC. DEPOK
WECPNL 70
75
80
85
90
95
KEC. BERBAH
Kel. Sendangtirto
Kel. Tegaltirto
Kel. Potorono
Kel. Kalitirto
KEC. PR
Kel. Jambitan
KEC. PIYUNGAN
Kel. Jogotirto
LEGEND
RICE FIELD
RESIDENTIAL AREA
DISTRICT (KABUPATEN)
VILLAGE (KECAMATAN
SECTION (KELURAHAN
AIRPORT PROPERTY A
WECPNL 70 NOISE CONTOUR LINE

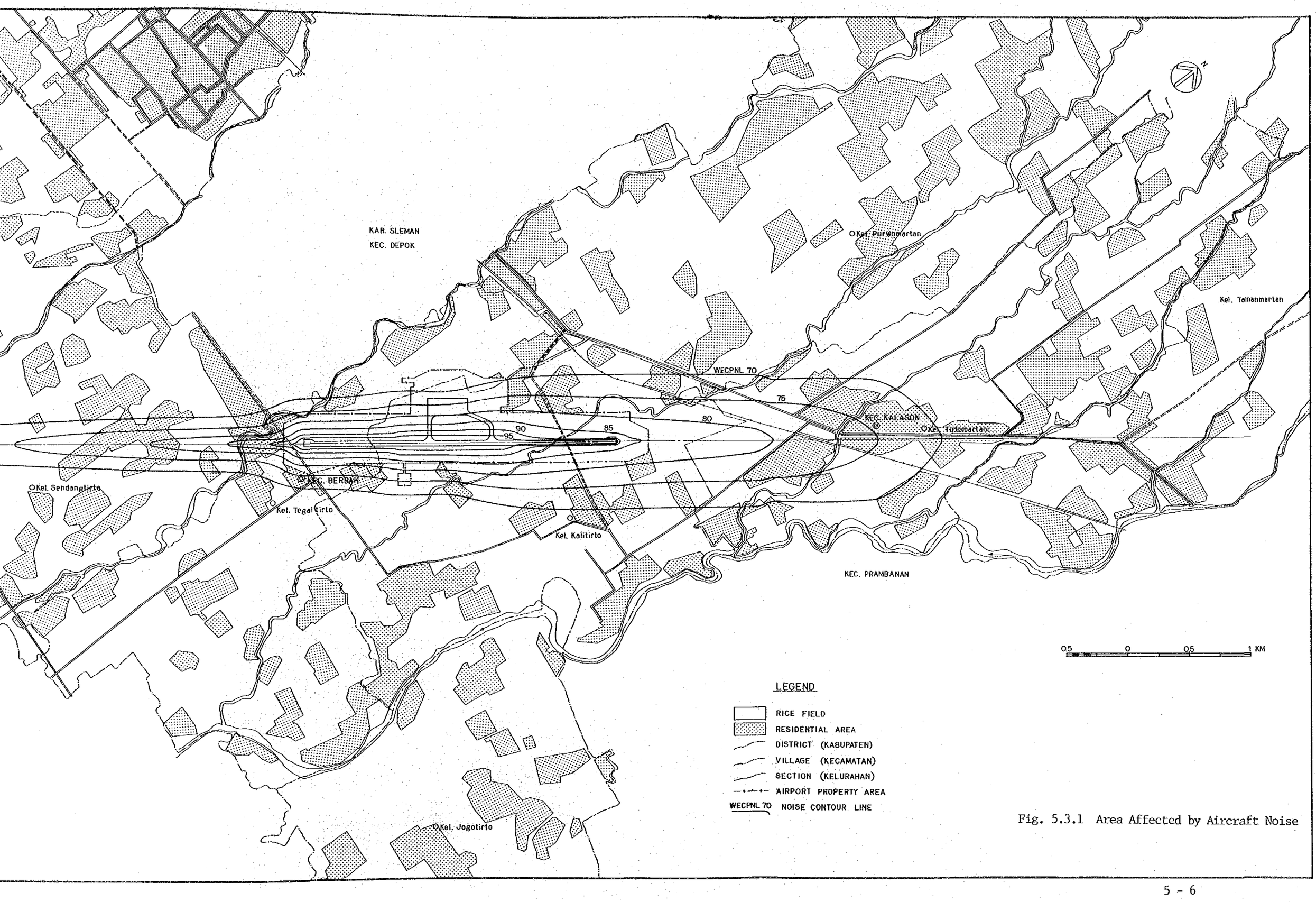


Fig. 5.3.1 Area Affected by Aircraft Noise

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

The land use plan surrounding the new Yogyakarta 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 3,000 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 ensuring 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 upon 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.

(4) Diversion of Tepus River and Readjustment of the existing irrigation system

The Tepus River which runs in the airport property area must be diverted outside the area. Peripheral drainage will be constructed to encompass the airport in order to drain storm water and ground water.

The proposed airport construction will also influence on the irrigation system as the following.

The existing irrigation system is as shown in Fig. 5.3.3. Most of channels run from the north to the south and supply water to the rice fields. The irrigation area shown in Fig. 5.3.3 is about 460 ha.

The irrigation area will be devided into the north and south parts by the airport construction. (See Fig. 5.3.4) The north part (approx. 200 ha) will be able to maintain its function by connecting with each channels of the rice field and the peripheral channel which will be newly constructed surrounding the airport. On the other hand, as for the south part (approx. 130 ha), water will be unable to supply because of interception of the irrigation system by the airport: Therefore, a new diversion weir must be constructed in order to supply water from the Tepus River as shown in Fig. 5.3.4.

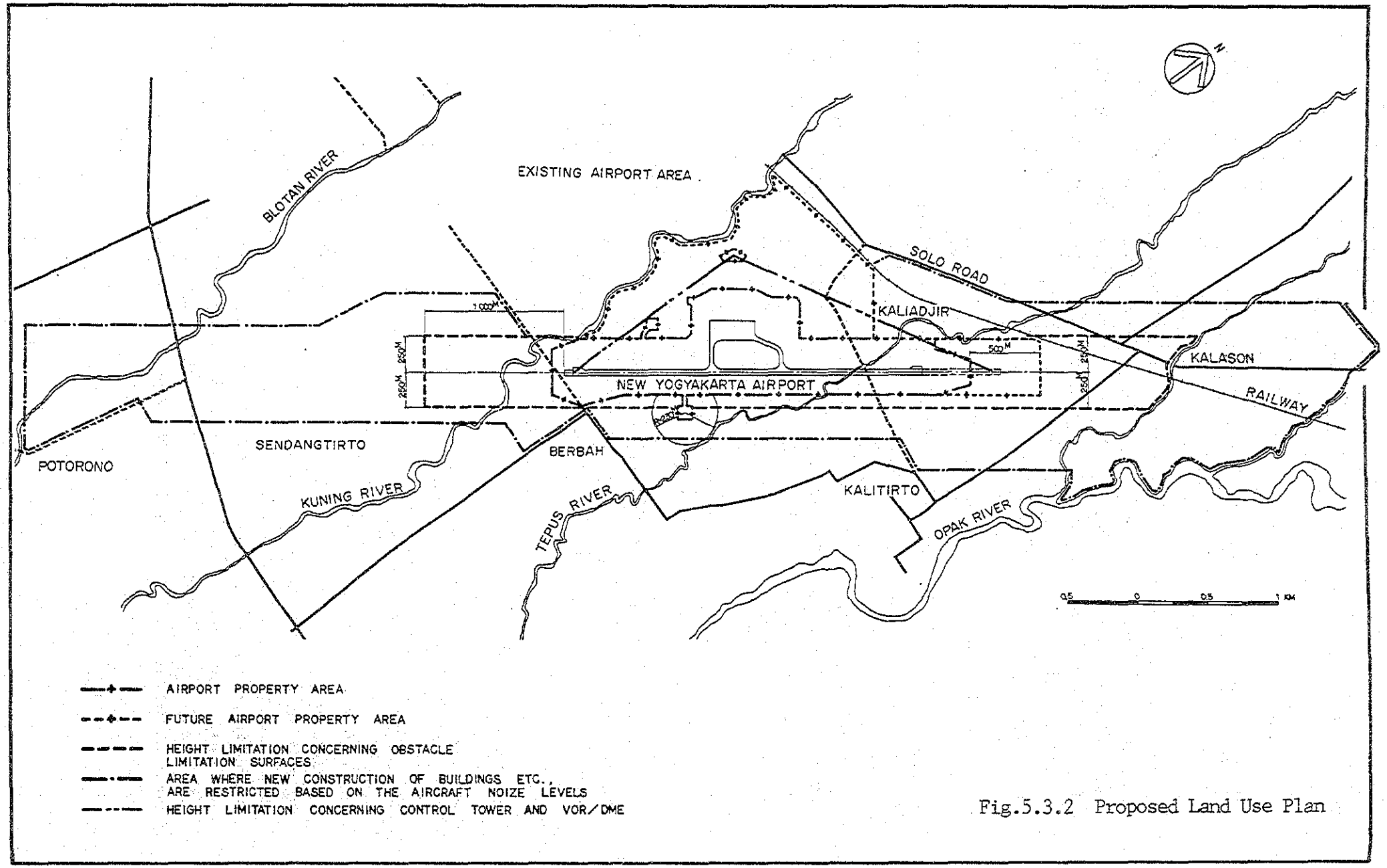


Fig.5.3.2 Proposed Land Use Plan

For the new irrigation system, although the irrigation area will be decreased after completion of the airport construction, a detail hydrological study on water balance, intake water volume from the Tepus River, should be carried out for the whole irrigation area including this area.

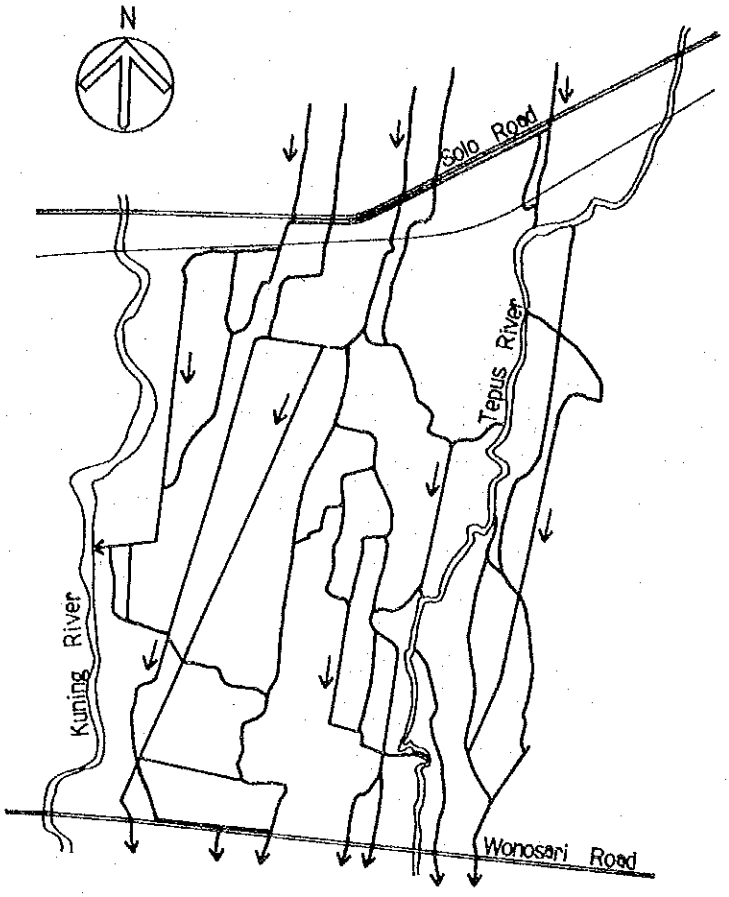


Fig.5.3.3 Existing Irrigation Channel Network

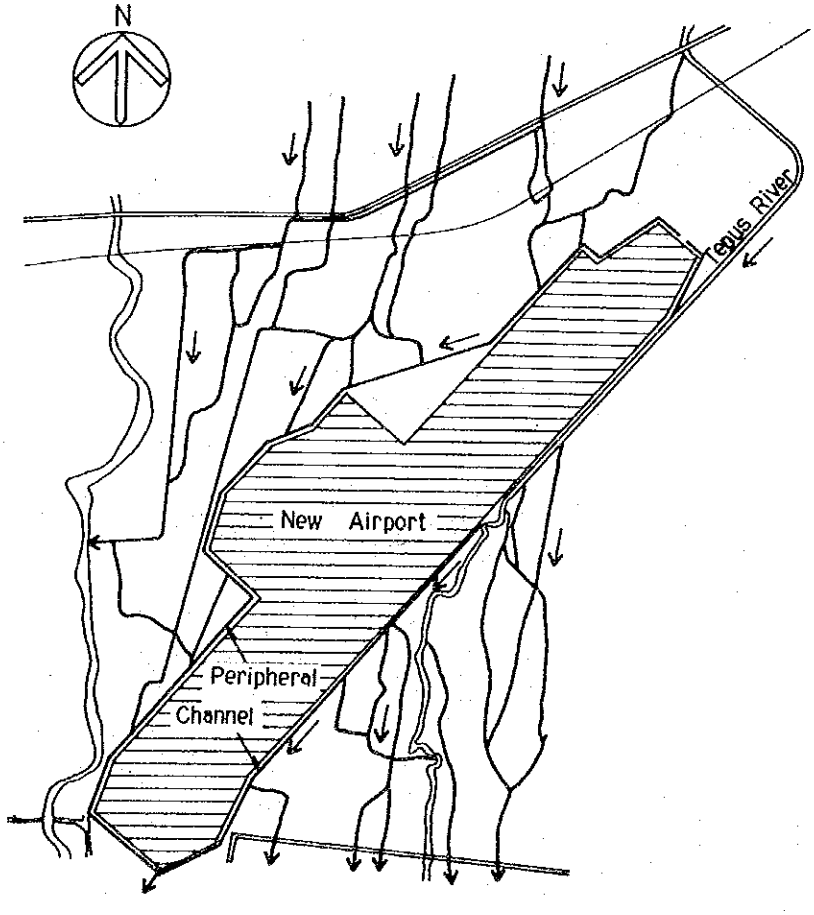


Fig.5.3.4 Proposed Irrigation Channel Network

5.4 Airport Organization

The existing Yogyakarta airport is maintained by DGAC. The organization consists of three divisions: administration (30 members), ground operation (44 members), and technical (49 members).

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

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

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

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

Table 5.4.1 Estimated Staff Number Required

Division	Phase I 2000	Phase II 2010
Technical	115	115
Administration	95	165
Operation and Air Safety	75	75
Total	285	355

The total number of DGAC staff is estimated to be 285 and 355 members in Phases I and II, respectively.

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

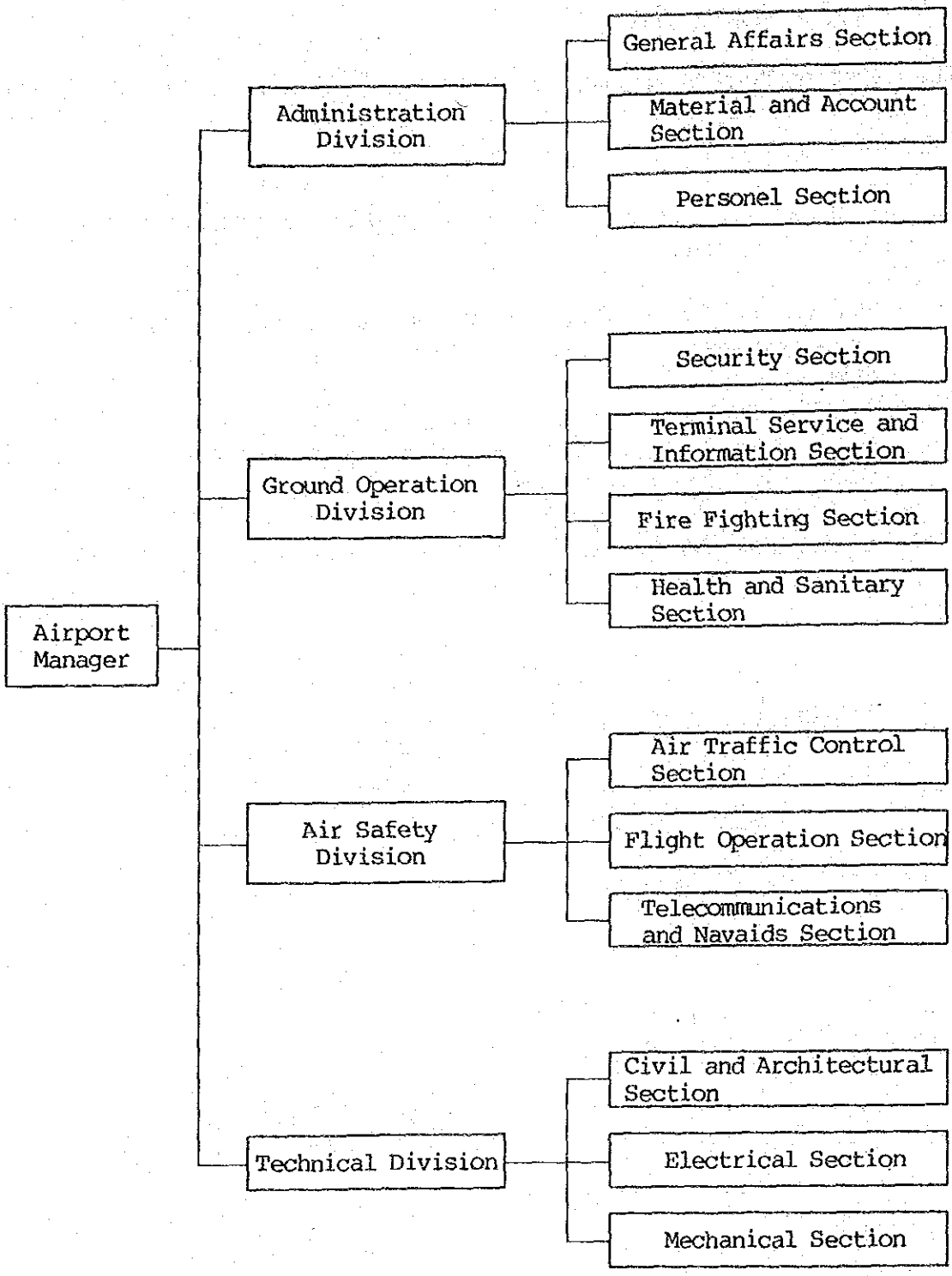


Fig. 5.4.1 Airport Organization Chart

CHAPTER 6 CONSTRUCTION SCHEDULE AND COST ESTIMATES

CHAPTER 6 CONSTRUCTION SCHEDULE AND COST ESTIMATES

6.1 General

This chapter explains the construction schedule and cost estimates based on the Airport Master Plan.

The construction cost necessary for the new Yogyakarta Airport is estimated to total about 104 billion Rupiah in Phase I, and about 30 billion Rupiah in Phase II.

6.2 Construction Conditions

(1) Site Conditions

The new airport site lies on flat terrain with an average elevation of approx. 105 meters above mean sea level at the center of the proposed runway.

The site is located in agricultural area - rice fields - where the irrigation system is developed and a lot of houses with trees for protection against the sun exist and will need to be removed or relocated.

The soil conditions in the site are as follows based on the results of site survey and soil investigation.

- The soils of subsurface mainly consist of soft or loose soils such as clayey silt or silty sand, etc.
- The level of ground water is high, 0.5 - 1.0 m below the land surface. This fact is an important factor in design of not only civil works, but also temporary works.

The rainfall - annual precipitation is about 1,400 mm with most of the rainfall occurring during the rainy season from December to April. In construction planning, this rainfall feature should be studied in relation with the soil conditions characterized by clayey soil.

(2) Construction Materials and Equipment

Ordinary materials and equipment for the construction work can be easily procured in Yogyakarta. Other materials and equipment to be imported will be unloaded at Semarang harbor.

Aggragate materials for pavement, namely the gravel and cobble, will be taken from river deposits near the airport.

6.3 Civil Works

(1) Temporary Works and Preliminary Works

The temporary works including site offices and construction plants shall start as soon as possible after commencement of the construction work and should be completed within three months.

The works preceding the main works are as follows:

- Access Road
- Diversion of Tepus River
- Peripheral Channel

The airport access road should be constructed as soon as possible to be used for the construction road which is required for transportation of construction materials and equipment.

The Tepus River which crosses the airport property area shall be diverted so that it runs outside the airport property area.

The peripheral channel and branch temporary drainages connecting with the channel shall be constructed in order not only to drain storm water, but also to lower the ground water level.

On the other hand, this channel is required to function as a part of the irrigation system surrounding the airport property area.

Prior to commencement of these works, coordination with the related land owners and organizations who maintain the irrigation system and the Tepus River shall be made.

(2) Site Preparation

The site preparation should start immediately after completion of the temporary and preliminary works. The total earth work volume is estimated to be about 540,000 cu.m of cut and fill volume so that the site preparation will take approx. 18 months.

It is desirable to avoid construction in the rainy season in light of the time schedule if possible.

(3) Pavement Work

The pavement work should start immediately after completion of the site preparation and will take approx. 24 months.

6.4 Building Works

The building works including the passenger terminal building, cargo terminal building, etc., should start immediately after completion of the site preparation of the terminal area and will take one year and a half.

6.5 Other Works

Installation of the eqipment of navaids and telecommunications will start after the site preparation and will take 30 months.

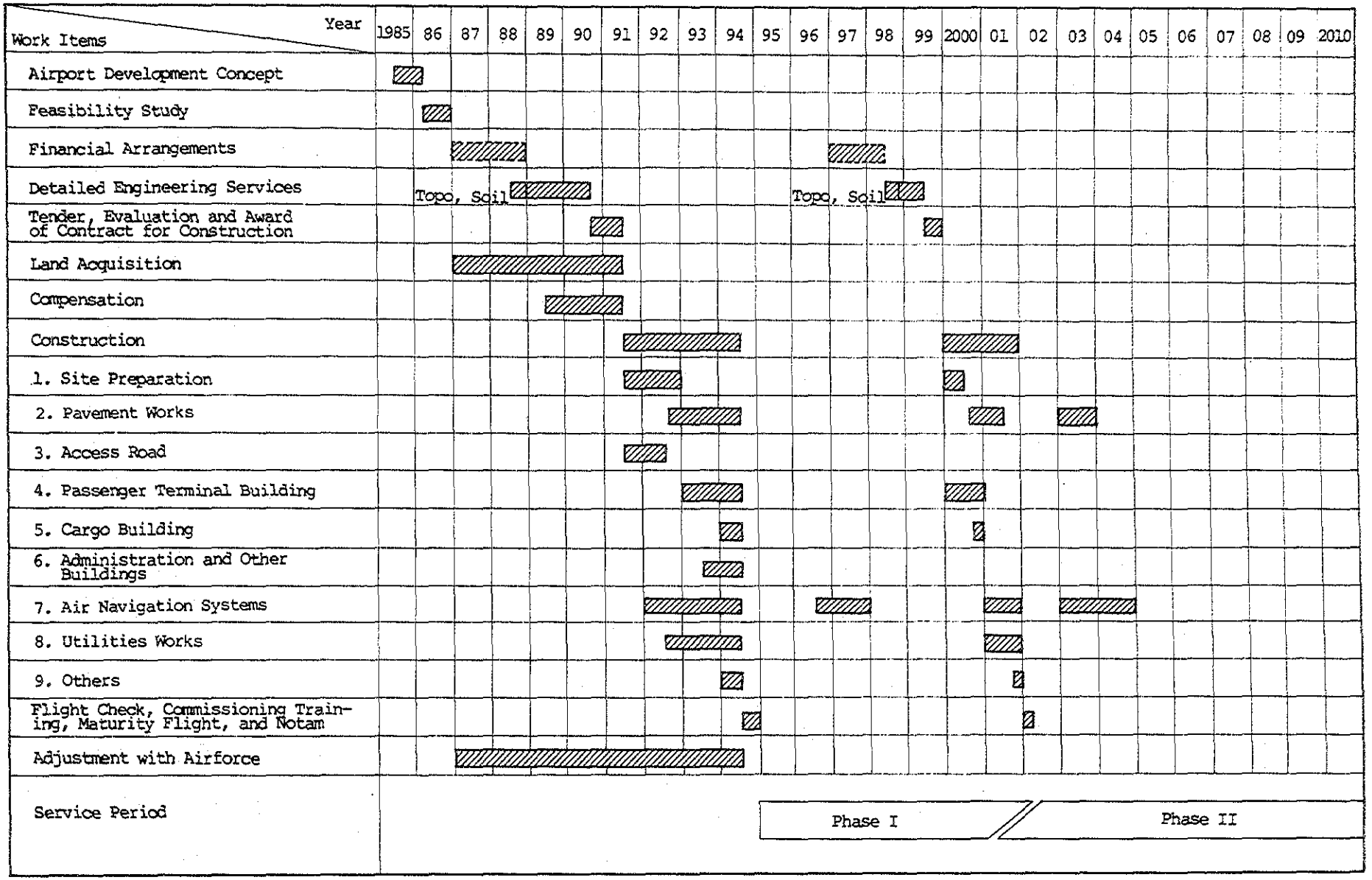
The time schedule for the airport utilities such as power supply and water supply should be adjusted with the related organizations prior to commencement of the construction work.

6.6 Construction Schedule

The construction schedule is summarized in Table 6.6.1.

It is noted that approx. six months for flight check, test operation for various navaids, maturity flight, etc., are required after completion of the construction work.

Table 6.6.1 Construction Schedule



6.7 Construction Cost Estimates

The construction cost is estimated based on the Airport Master Plan for Phases I and II, and is tabulated in Table 6.7.1. The total construction cost is estimated to be about 104 billion Rp. for Phase I and 30 billion Rp. for Phase II.

The cost estimates are based on the following assumptions:

a) The cost is estimated based on unit prices as of April 1986.

b) The exchange rates are assumed to be US$1.00 = Rp. 1,125 = Yen 200.

c) Foreign currency portion of the construction cost includes the foilowing items.

- Purchase cost of imported construction equipment (CIF cost)
- Cost of imported materials such as construction materials (steel bars, steel conduit, etc.) special equipment, etc.
- Salvage cost of construction equipment
- 50% of construction materials procured in Indonesia such as asphalt, cement, fuel and lubricants
- Foreign remittance portion of the overhead and profit for foreign contractors and engineering firms
- Wages of expatriate staff and labor

d) Local currency portion of the cost includes the following items:

- Construction materials procured in Indonesia such as aggregate, timber materials, etc.
- 50% of construction materials procured in Indonesia such as asphalt, cement, fuel and lubricants
- Handling and clearance cost of land transportation
- Overhead cost and profit of local contractors

- Wages of Indonesian staff and labor

- Land acquisition cost

e) Contingencies are estimated to be about 10% of the total construction cost.

f) Price escalation is not considered in this estimation.

Table 6.7.1 Estimated Construction Cost

(Unit: million Rp.)

	Work Item \ Phase of Construction	Phase I			Phase II			Total		
		Local Portion	Foreign Portion	Sub Total	Local Portion	Foreign Portion	Sub Total	Local Portion	Foreign Portion	Total
Land Acquisition	Land Acquisition	15,979	0	15,979	0	0	0	15,979	0	15,979
	Compensation	280	0	280	0	0	0	280	0	280
	Land Acquisition * (Ultimate Expansion Area)	(3,835)	(0)	(3,835)	(0)	(0)	(0)	(3,835)	(0)	(3,835)
	Sub Total	16,259	0	16,259	0	0	0	16,259	0	16,259
Civil Works	Earth Work	2,456	1,767	4,223	45	40	85	2,501	1,807	4,308
	Drainage Works	441	557	998	12	20	32	453	577	1,030
	Pavement Works	5,504	11,061	16,565	2,265	4,445	6,710	7,769	15,506	23,275
	Access Road	500	245	745	0	0	0	500	245	745
	River Diversion	222	422	644	0	0	0	222	422	644
	Sub Total	9,123	14,052	23,175	2,322	4,505	6,827	11,445	18,557	30,002
Architectural Works	Passenger Terminal Building	4,543	5,333	9,876	2,288	2,686	4,974	6,831	8,019	14,850
	Cargo Terminal Building	230	204	434	131	116	247	361	320	681
	Administration Building	473	579	1,052	139	170	309	612	749	1,361
	Other Buildings	322	285	607	0	0	0	322	285	607
	Special Equipment	0	4,462	4,462	0	1,498	1,498	0	5,960	5,960
	Sub Total	5,568	10,863	16,431	2,558	4,470	7,028	8,126	15,333	23,459
Air Navigation Systems	Radio Navigation Aids	501	4,888	5,389	81	1,862	1,943	582	6,750	7,332
	Air Traffic Control and Aeronautical Telecommunications	118	3,570	3,688	43	1,423	1,466	161	4,993	5,154
	ATC Radar System	254	8,928	9,182	99	3,570	3,669	353	12,498	12,851
	Aeronautical Ground Lights	1,262	3,514	4,776	248	699	947	1,510	4,213	5,723
	Meteorological System	62	1,955	2,017	19	582	601	81	2,537	2,618
	Sub Total	2,197	22,855	25,052	490	8,136	8,626	2,687	30,991	33,678
Utilities Works	Power Supply System	370	2,404	2,774	27	959	986	397	3,363	3,760
	Water Supply System	56	107	163	0	4	4	56	111	167
	Sewarage System	243	398	641	12	26	38	255	424	679
	Solid Waste Disposal System	30	131	161	0	0	0	30	131	161
	Telecommunication System	185	619	804	0	0	0	185	619	804
	Sub Total	884	3,659	4,543	39	989	1,028	923	4,648	5,571
Other Equipment	Vehicles for Fire Fighting Services, etc.	0	374	374	0	1,268	1,268	0	1,642	1,642
	Sub Total	0	374	374	0	1,268	1,268	0	1,642	1,642
Total of Construction Works		34,031	51,803	85,834	5,409	19,368	24,777	39,440	71,171	110,611
Engineering Services Cost		3,403	5,180	8,583	541	1,937	2,478	3,944	7,117	11,061
Sub Total		37,434	56,983	94,417	5,950	21,305	27,255	43,384	78,288	121,672
Contingency		3,743	5,698	9,441	595	2,131	2,726	4,338	7,829	12,167
Grand Total		41,177	62,681	103,858	6,545	23,436	29,981	47,722	86,117	133,839

* Land Acquisition Cost for Ultimate Expansion Area is not included in Total Cost.

Exchange Rate: US$ 1.00 = Rp 1,125, ¥ 1 = Rp. 5.625