

CHAPTER 7 REDEVELOPMENT PLANS OF THE EXISTING AIRPORTS

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7.1 General

In this chapter the redevelopment plans of the existing airports were studied based upon the concepts for airports development already described in the previous Chapter 6.

The redevelopment plans of the existing Yogyakarta and Surakarta airports were studied considering the extension possibility of the existing runway and the new runway construction within the existing airport confines and in the vicinity as well.

With respect to Semarang airport, the feasibility study in "Studies for the Improvement of Seven Domestic Airports ", and the master plan and detailed design in "First Development Phase of 9 Airports" have already been made in 1981 and 1984, respectively.

7.2 Redevelopment Plans of Yogyakarta Airport

7.2.1 Existing Conditions of the Airport and Its Vicinity

The existing conditions of facilities at Yogyakarta airport have already been explained previously in Chapter 5.2. The redevelopment plans were studied considering the geographical features, airport property area, facilities, and present and future land use plan in and around the existing airport.

Fig. 7.2.1 shows the general situation of the existing airport.

(1) Geographical Features

The existing Yogyakarta airport stands at an elevation of about 110 m above mean sea level, and slopes gently from north to south with a gradient of approximately 1 %. There are no remarkable undulating features surrounding the existing airport.

There are 2 rivers which pass through from north to south in parallel with one another and run the areas away from runway ends almost perpendicular to the existing runway.

The preliminary topographic survey of these 2 rivers was carried out during this Study period and the survey results are mentioned below:

- Blotan River 153 m wide
(RWY 09 side (the west)) About 11 m below the airfield elevation

- Kuning River 36 m wide
(RWY 27 side (the east)) About 7 m below the airfield elevation

From the reclamation work viewpoint, the reclamation work of Kuning River is easier than that of Blotan River due to a lesser volume of earthwork if the existing runway is expanded.

(2) Airport Property Area and Facilities Therein

The area of the airport property is shown in Fig. 7.2.1. Most of the airport facilities other than the aprons and terminal facilities are controlled by the air force. There are an air force academy, hangars for the academy, a golf course, air force facilities and Sultan prince tomb in the airport property area.

Moreover, there is a grass strip (1,200 m long x 30 m wide) for glider training located about 110 m south of and in parallel with the existing runway.

According to the site reconnaissance and interviews with the airport authorities as well as various government agencies, the air force facilities and Sultan prince tomb are considered very difficult to be relocated for the redevelopment of the existing airport.

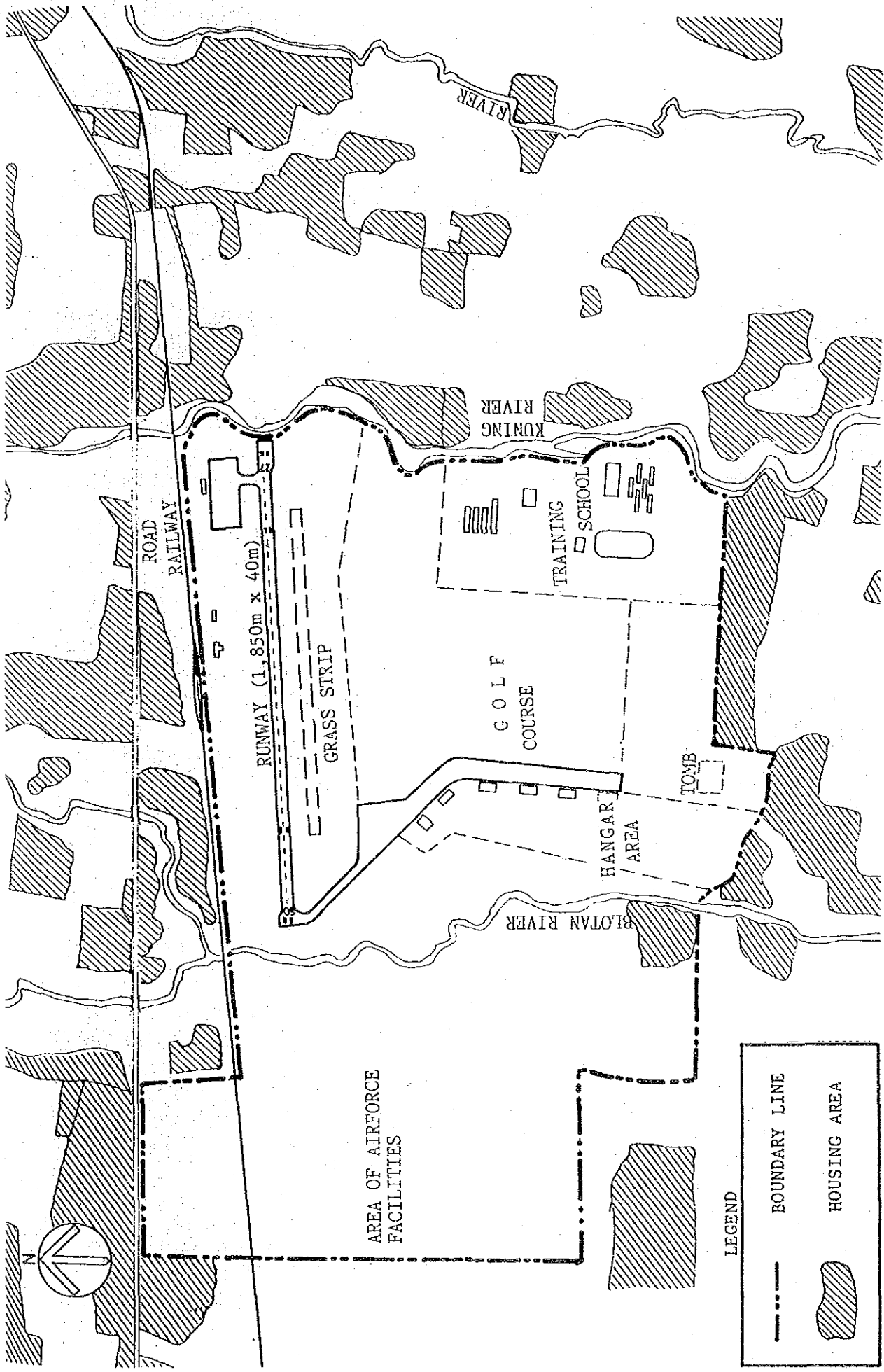


Fig. 7.2.1 General Situation of the Existing Yogyakarta Airport

(3) Present Land Use and Future Plan

In the area surrounding the airport except the northern area, there are many paddy fields together with many interspersed houses. In the northern area, a railway and road run through in parallel with the existing runway. In particular, many houses are found along the road and the railway.

The surrounding area has been planned to be used for agricultural purpose according to the future land use plan obtained from BAPPEDA in D.I. Yogyakarta.

In order to carry out the redevelopment of the airport under these circumstances, it is inevitable that many paddy fields and residential areas will have to be acquired and many houses removed for residential resettlement.

7.2.2 Basic Considerations for the Redevelopment Plan of Yogyakarta Airport

Ten alternative plans were selected and examined as the redevelopment plan in the "Pre-Master Planning, Yogyakarta Airport" studied in 1979.

In this Study, however, 4 redevelopment plans were selected based on the following considerations and evaluated in order to select the most superior redevelopment plan.

a) Considerations to the Air Force Facilities

Relocation of the air force facilities such as the hangars, apron and air force academy is considered difficult. The redevelopment plans will have to be made without relocating the air force facilities.

b) Considerations to the Sultan Prince Tomb

The Sultan prince tomb located in the southern area of the existing airport is highly revered by nearby residents as a holy place. For this reason, the redevelopment will be carried out so as not to disturb the tomb.

c) New Runway Plan in the Vicinity

A new runway construction outside the existing airport area will necessitate the acquisition of vast field and residential areas. The redevelopment plans with a new runway will be planned to be free from obstacles so as to ensure safe aircraft operations.

The redevelopment concepts with a new runway are also planned on condition that air traffic control should be centralized for simultaneous operations on both the existing and a new runway.

7.2.3 Study on Redevelopment Plans

Four redevelopment plans for the existing Yogyakarta airport were selected as described below. (see Fig. 7.2.3)

(1) Extension of the Existing Runway

For the effective use of the existing airport facilities and economical construction, an extension of existing runway was included in the redevelopment plan. The runway length required for the future development at Yogyakarta airport is 2,500 m as described in Chapter 4. The existing 1,850 m long runway may be extended to either the 09 side (west) or 27 side (east). Therefore, 2 alternative plans were proposed as follows:

- Alternative (ALT.) Y1 : Extension of the existing runway to the east (27 side)
- Alternative (ALT.) Y2 : Extension of the existing runway to the west (09 side)

With regard to ALT. Y2, a lot of earthwork will be required to carry out the reclamation works, and the problems are that many air force facilities are located in the western airport area near the Blotan River. However, it has an advantage that the extension of the existing runway can be done within the existing airport property area.

(2) New Runway Plan

Two alternatives of the new runway were proposed as follows:

- a) A new runway to be planned within the existing airport property area.
- b) A new runway to be planned outside of the existing airport property area.

With regard to proposal a) above, based on the considerations described in the previous Section 7.2.2, ALT. Y3 shown in Fig. 7.2.3 was considered as the more realistic plan because of effective use of the existing airport property area (golf course area).

On the other hand, in proposal b), the new runway should be located at a distance within about 2.0 km from the existing runway on the premise that the centralized control will be conducted.

A parallel runway configuration is generally the best solution in terms of runway capacity. However, the new runway should be planned so that no mountainous terrain at the east will infringe the obstacle limitation surfaces. Fig. 7.2.2 shows the new parallel runway concepts.

As shown in Fig. 7.2.2, the new parallel runway planned to the south of the existing runway is situated in the built-up area of Yogyakarta. On the other hand the northern parallel runway will have following problems:

- a) The university town situated to the west will be greatly influenced by the aircraft noise.
- b) It involves large-scale earthwork with about 2.5 million cu.m including 1.5 million cu.m of soil from borrow-pits as the runway crosses over two rivers and, the construction cost will be higher.
- c) The foot of Mt. Merapi situated on the north infringes the horizontal surface, therefore the circling approach is limited to the south where the existing airport is situated.
- d) As there are high-tension lines nearly parallel with the new runway, they will have to be replaced.

Judging from the above issues, the parallel runway concept shown in Fig. 7.2.2 is considered difficult.

The open "V" shaped runway configuration (ALT. Y4) was, consequently, planned on the eastern area of the existing airport property taking the above-mentioned problems into account.

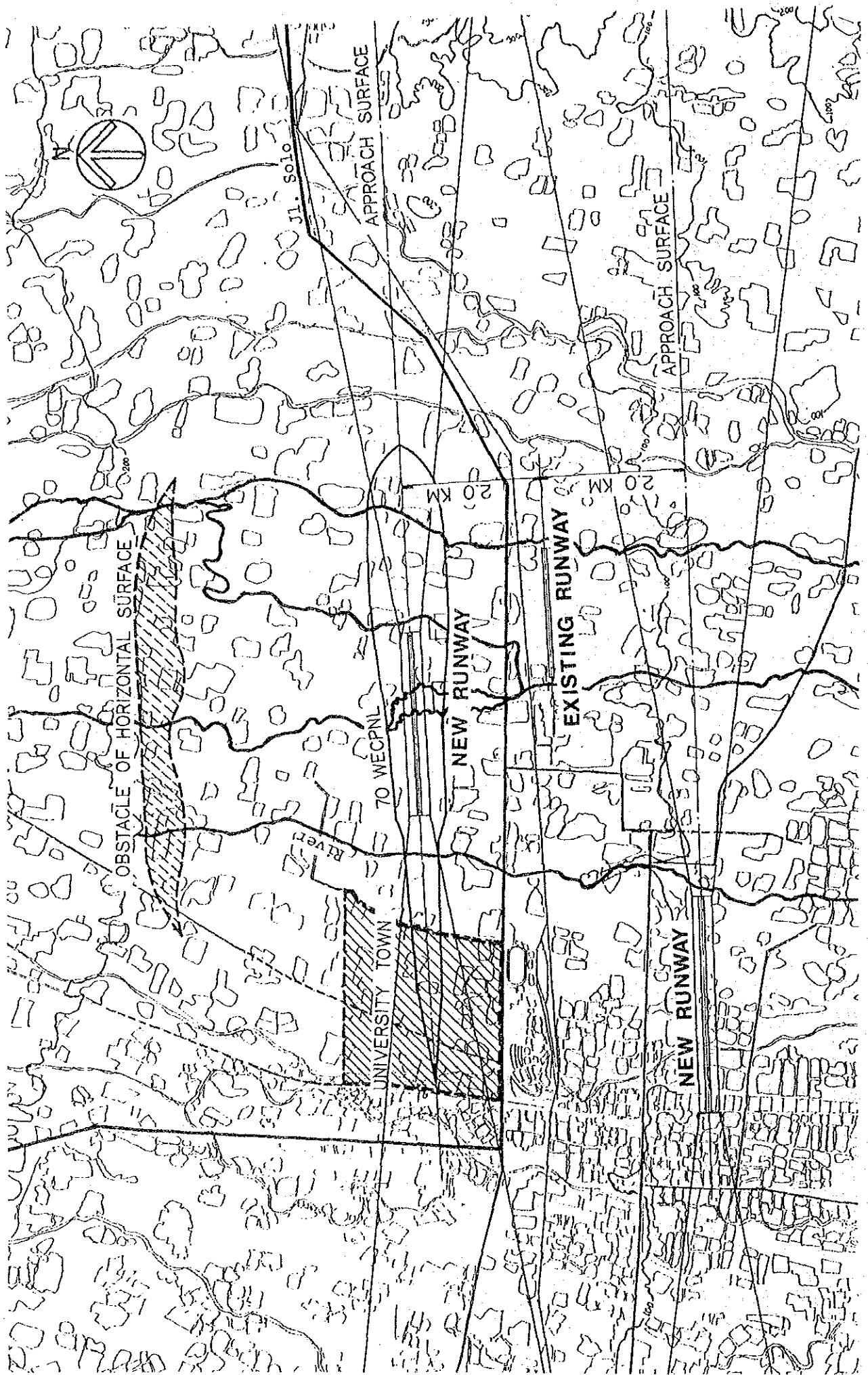


Fig. 7.2.2 Concepts of New Parallel Runway

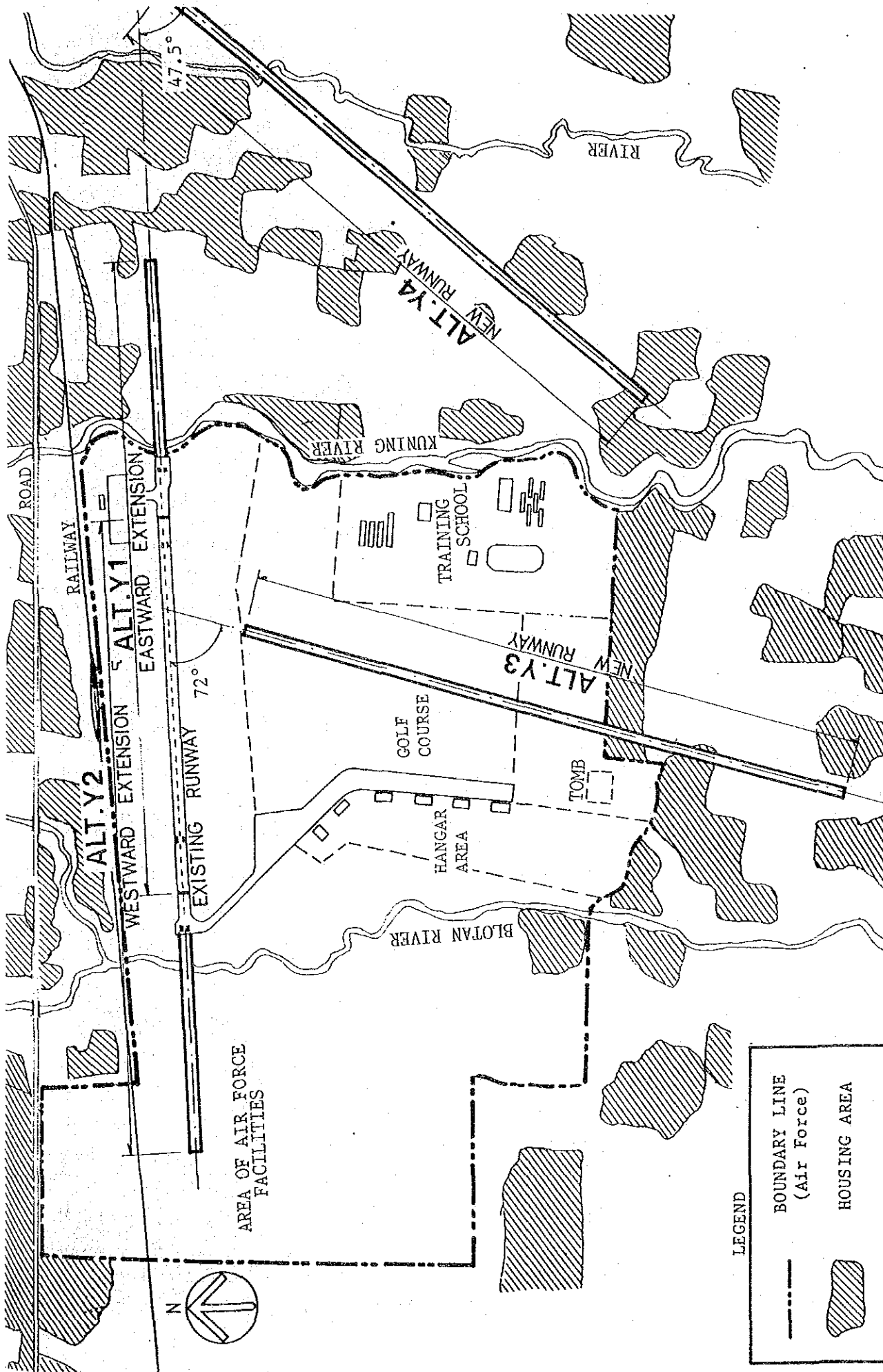


Fig. 7.2.3 Alternative Redevelopment Schemes for Yogyakarta Airport

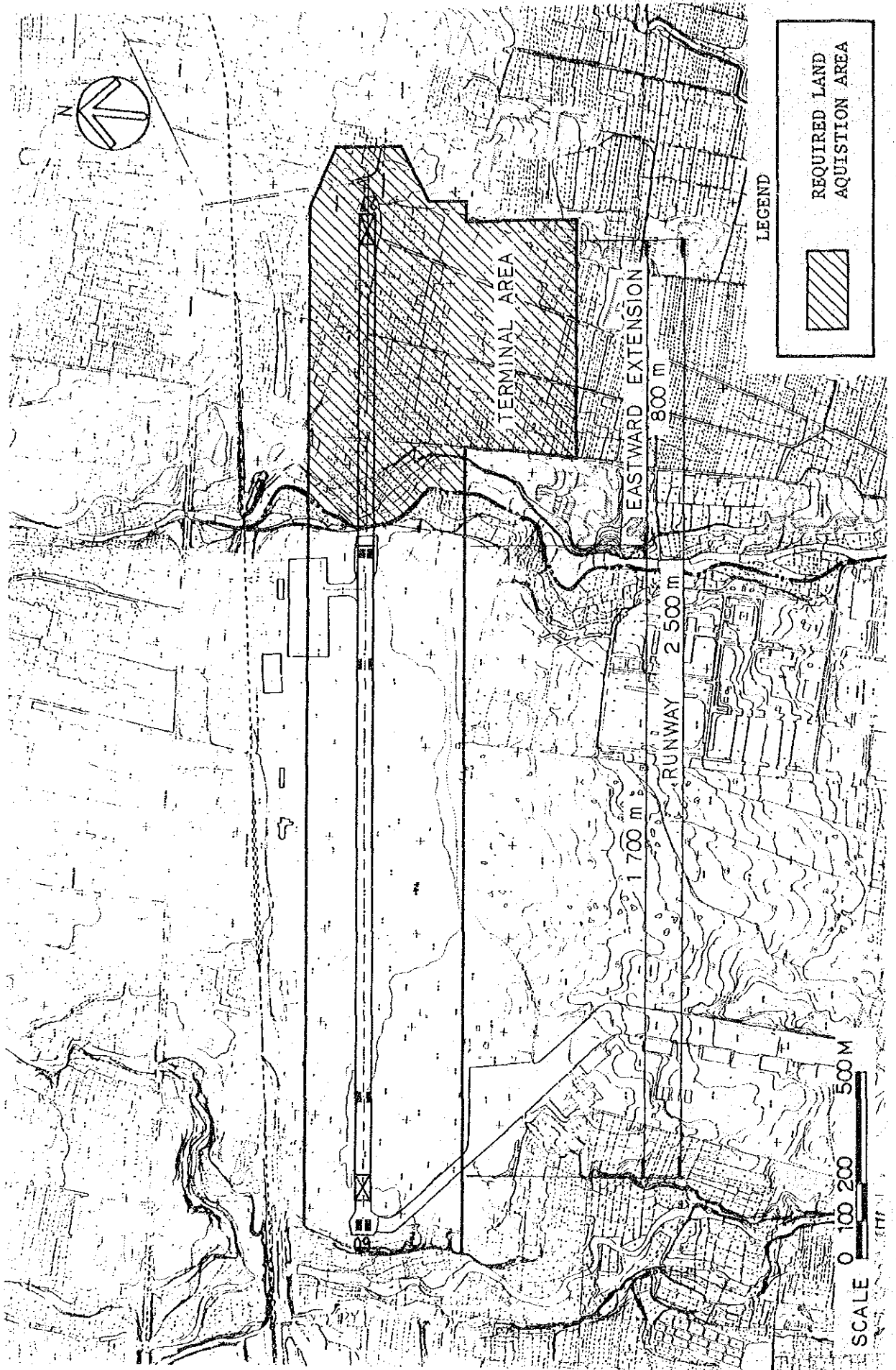


Fig. 7.2.4 Redevelopment Scheme - Alternative Y1

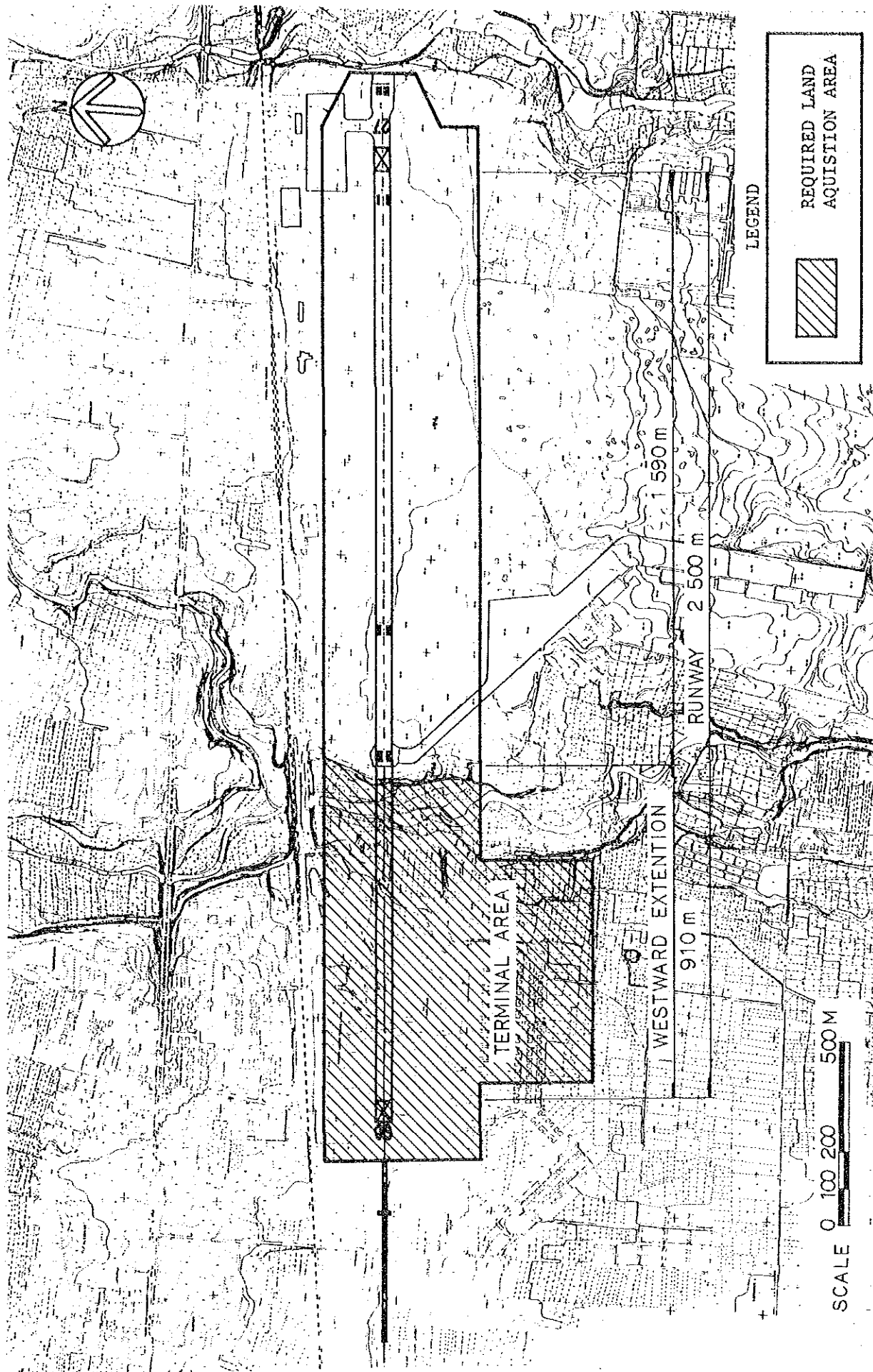


Fig. 7.2.5 Redevelopment Scheme - Alternative Y2

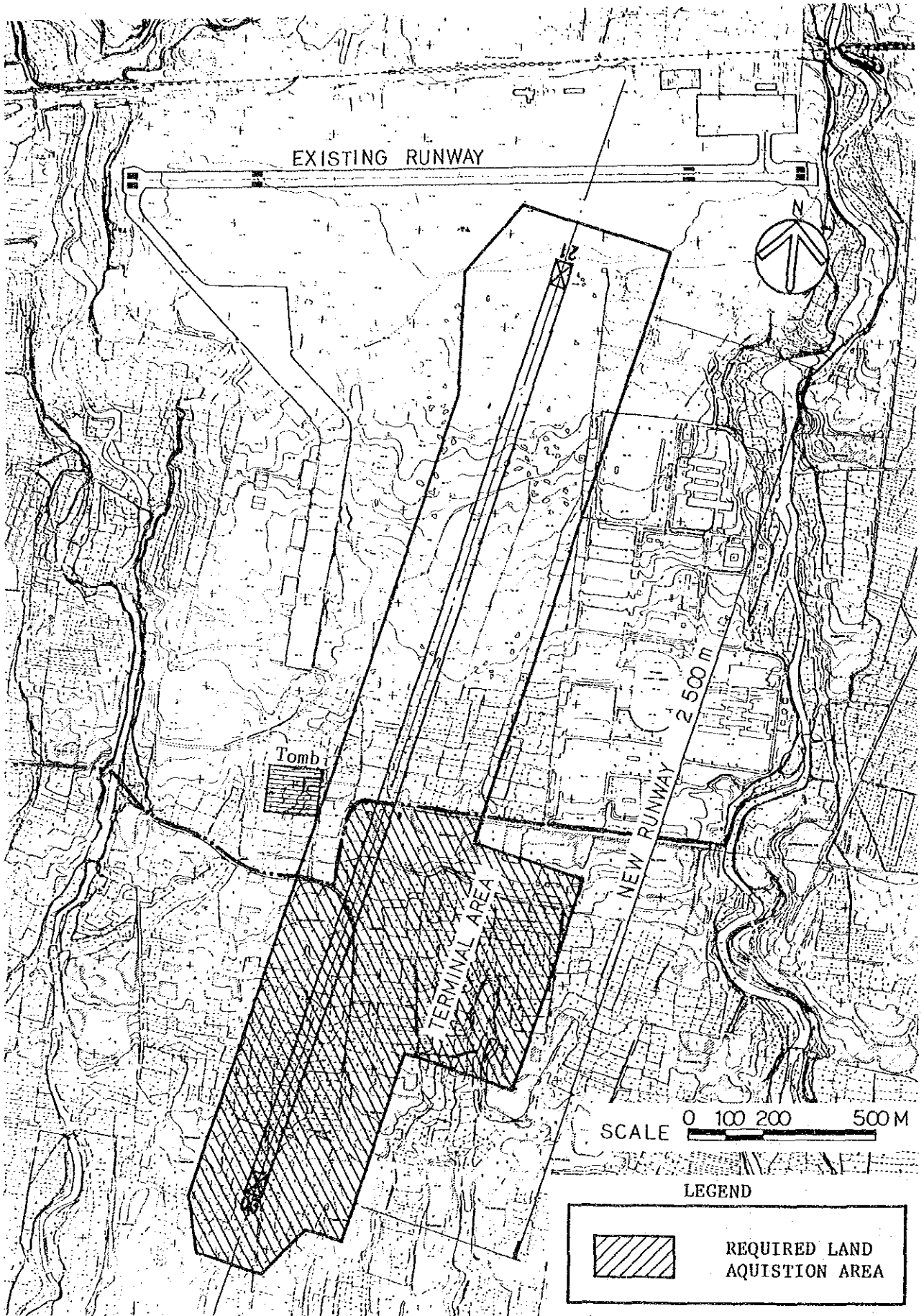


Fig. 7.2.6 Redevelopment Scheme - Alternative Y3

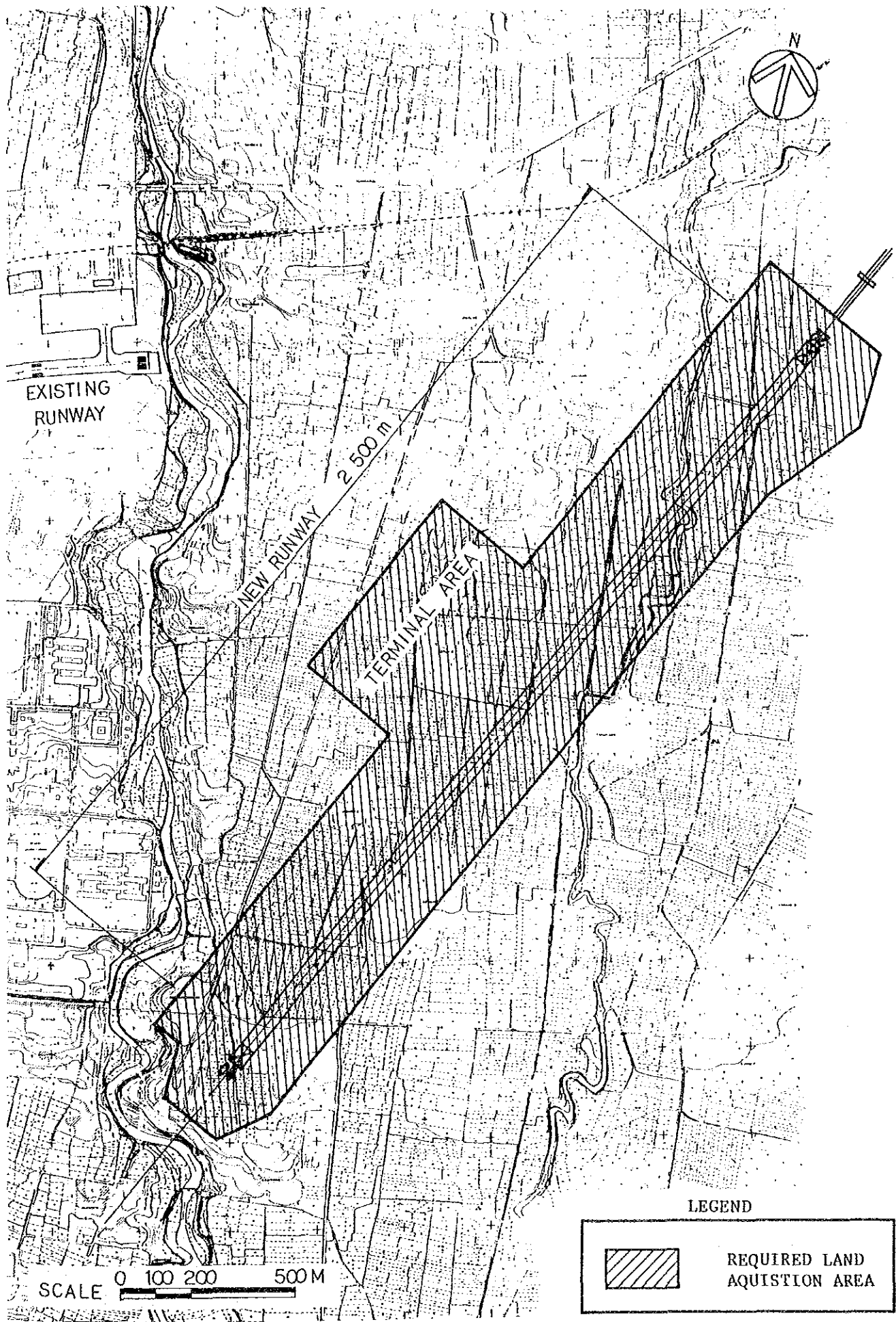


Fig. 7.2.7 Redevelopment Scheme - Alternative Y4

7.2.4 Comparative Evaluation of Redevelopment Plans for Yogyakarta Airport

Table 7.2.1 describes the results of the comparative evaluation for the alternative redevelopment plans, i.e., ALTs, Y1 through Y4 for Yogyakarta airport. In this table, "X" indicates greater disadvantage or poorer performance.

As a result, for the redevelopment plan of Yogyakarta airport, ALT. Y4 in which a new runway is constructed outside the existing airport property area, was selected as the best. The reasons are as stated below:

a) Ensuring Airspace for Instrument Approaches and Departures

As seen in Chapter 5, Figs. 5.2.3 and 5.2.4, the mountains on the east protrude upon the approach surface for Yogyakarta airport. These also protrude upon the obstacle clearance surface for instrument departures (straight and turning) and constitute the major obstacle to landing and take-off aircraft to and from the east. Consequently, ALTs. Y1 and Y2 to extend the existing runway possess the same problems, and it can be said that this is a major defect in fixing the long-term plan to develop Yogyakarta airport into a large-size commercial airport.

b) Construction Cost

The following are rough construction costs for each redevelopment concept:

- Existing runway extension alternatives

ALT. Y1 Rp. 101.1 billion

ALT. Y2 Rp. 106.7 billion

- New runway alternatives

ALT. Y3 Rp. 100.1 billion

ALT. Y4 Rp. 102.8 billion

As a result it can be understood that the construction costs of redevelopment alternatives are nearly the same as redevelopment cost for the new runway alternatives or higher, even if the existing runway is effectively utilized. The reason is that the costs for crossing the river in developing ALTs. Y1 and Y2 are high. Therefore, ALT. Y1 and Y2 do not have any big merit in view of cost.

c) Relation with Air Force Facilities

ALTs. Y1, Y2 and Y3 require adjustment to air force facilities. Among them, ALT. Y1 allows comparatively easier adjustment.

However, the adjustment to air force can be considered extremely difficult in case of ALT. Y2, as the large-size air force facilities situated on the west of Blotan River (housing area, offices, etc.) have to be relocated.

On the other hand, in case of ALT. Y3, only the existing golf course needs to be adjusted.

The southern area necessary for the development of ALT. Y3, however, conflicts with the future facilities development plan of the air force. In addition, airport facilities are to be constructed abutting the Sultan prince tomb which does not belong to air force and is considered a holy site by local residents.

ALT. Y4 has no competitive issue with air force facilities at all and is most advantageous under this condition.

d) Influence of Aircraft Noise

Concerning aircraft noise to residential area, ALTs. Y1 and Y2 in which the runway is directed toward Yogyakarta city, will have the largest influence. From an environmental viewpoint, ALTs. Y1 and Y2 are considered undesirable.

Table 7.2.1 Comparison Table of Alternative Airport Redevelopment Schemes for Yogyakarta

COMPARISON ITEMS	ALTERNATIVES			
	ALT. Y1	ALT. Y2	ALT. Y3	ALT. Y4
I. Runway Dimensions				
Total Length	2,500 m	2,500 m	2,500 m	2,500 m
New Construction Length	800 m	910 m	2,500 m	2,500 m
Width	45 m	45 m	45 m	45 m
II. Runway Designation Number	09/27	09/27	03/21	04/22
III. ILS Category	CAT - 1	CAT - 1	CAT-1	CAT-1
IV. Aircraft Operational Considerations				
1. Obstacles	<ul style="list-style-type: none"> - RWY 27 Approach and RWY 09 Take Off Climb Surface : x A mountain with height about 427 m above mean sea level (AMSL) located about 7 km from RWY 27 threshold x - RWY 09 Approach Surface : x Two antennas and a building located in air force area - RWY 27 Take Off Climb Surface : x An antenna and a building located in the air force area - Transitional Surface : x Within existing airport property, a control tower, tower, NDB antenna, a pax. terminal bldg. and SSB antenna x 	<ul style="list-style-type: none"> - Same as ALT. Y1 x - Same as ALT. Y1 x - Same as ALT. Y1 x - RWY 21 Approach Surface : x The same as above, in addition to the above a control tower, ABN and two antennas - RWY 03 Approach Surface : x Many trees 	<ul style="list-style-type: none"> - RWY 04 Approach and Take Off Climb Surface : x Trees - RWY 22 Approach and Take Off Climb Surface : x Trees 	

Table 7.2.1 (Cont'd)



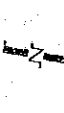

COMPARISON ITEMS	 ALT.Y1	 ALT.Y2	 ALT.Y3	 ALT.Y4
2. Aircraft Operational Procedures	x x - RWY 27 Approach : Establishment of ILS, VOR straight approach are im- possible due to an ob- stacle of the mountain situated in the eastern area. The approach will be solved by means of circling approach only. x x - RWY 09 Departure : Complete left climbing turn within 2 NM	x x - Same as ALT.Y1	- No problem occurs if obstacles are removed.	- Same as ALT.Y3
3. Approach and Departure Control	x x - Same as the present control system	x x - Same as ALT.Y1	x - Aerodrome Control should be centralized necessary for simultaneous operation on two runways	- Same as ALT.Y3
4. Air Space Utilization	- RWY 09 ILS Approach : Adjustment of corridor and ILS final course required	- Same as ALT.Y1	- Installation of RAPCON necessary - Adjustment of training area and corridor due to a large modification of direction for taking off and approach necessary	- Same as ALT.Y3
5. Cross Wind Coverage	- RWY 09/27 13 KT 98.0 % 20 KT 99.8 %	- Same as ALT.Y1	- RWY 03/21 13 KT 96.9 % 20 KT 99.9 %	- RWY 04/22 13 KT 98.6 % 20 KT 99.8 %
Main Disadvantages	x x x - A mountain located in the eastern area and many other obstacles - Adjustment of air space	x x x - Same as ALT.Y1 - Same as ALT.Y1	- Same as ALT.Y1	- Same as ALT.Y1
V. Airport Development Considerations	x x - Residential Area 10.4 ha Rice Field 47.7 ha (Air Force Area 82.6 ha)	- Residential Area 0.5 ha (Air Force area 142.3 ha)	x x x - Residential Area 17.6 ha Rice field 55.7 ha (Air Force Area 69.5 ha)	- Residential Area 28 ha Rice Field 115 ha
1. Land Acquisition	x - Residential Area 10.4 ha Rice Field 47.7 ha (Air Force Area 82.6 ha)	x x - Residential Area 0.5 ha (Air Force area 142.3 ha)	x x x - Residential Area 17.6 ha Rice field 55.7 ha (Air Force Area 69.5 ha)	- Residential Area 28 ha Rice Field 115 ha
2. Installation of ALS	x - Installation of ALS	x - Installation of ALS is difficult.	- Installation of ALS is difficult.	- Installation of ALS is difficult.

Table 7.2.1 (Cont'd)


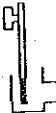
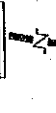

ALTERNATIVES COMPARISON ITEMS	ALT. Y1		ALT. Y2		ALT. Y3		ALT. Y4	
								
3. Access Road		- New Access Road: 2 Km	- Same as ALT.Y1 : 2 Km	- Same as ALT.Y1 : 2.5 Km	- Same as ALT.Y1 : 3.5 Km			
4. Others	x	- Close coordination with Air Force necessary for airport development	x x x	- Same as ALT.Y1	x			
Main Disadvantages	x x	- Close coordination with Air Force	x x x	- Same as ALT.Y1	x x			
	x x	- Relocation of many residential houses and land acquisition of about 58 ha in total	x x	- Relocation of many residential houses and land acquisition of about 73 ha in total	x x			- Relocation of many residential houses and land acquisition of about 143 ha in total
VI. Social Considerations								
1. Aircraft Noise Influence	x	- Aircraft noise in Yogyakarta built-up area is expected to be more influential	x x	- Same as ALT.Y1				- Same as ALT.Y3
2. Land use	x	- Aircraft noise influence area to be controlled by strict land use ordinance	x x	- Same as ALT.Y1				- Same as ALT.Y1
		- Keeping free of obstacles in obstacle surface limitation area to be controlled	x	- Keeping free of obstacle limitation surface area to be controlled by regulation. Especially in the western area of the city to be controlled.				- Same as ALT.Y1
3. Compensation	x	- Relocation of airport facilities for Air Force necessary	x x x	- Same as ALT.Y1	x			
	x	- Many houses to be removed (10.4 ha)		- Many houses to be removed (17.6 ha)	x			- Many houses to be removed (28 ha)
		- Reconstruction of water canals for agriculture necessary		- Same as ALT.Y1				- Same as ALT.Y1

Table 7.2.1 (Cont'd)

COMPARISON ITEMS	ALTERNATIVES			
	ALT. Y1	ALT. Y2	ALT. Y3	ALT. Y4
Main disadvantages	x	- Same as ALT. Y1	- Same as ALT. Y1	- Compensation for relocation of many houses.
	x	- Compensation for relocation of air force facilities and many houses - Aircraft noise influence to Yogyakarta built-up area	- Same as ALT. Y1	- Same as ALT. Y1
VII. Construction Considerations.	x	- Fill of about 230 thousand m ³ earthwork together with 6 units of C-box construction (3 m wide x 2 m high) for land reclamation work of Kuning river to be carried out.	- Fill of about 1,300 thousand m ³ earthwork together with 6 units of C-box construction (3 m wide x 2 m high) for land reclamation work of Blotan river to be carried out.	- None
	x	- At least 11 m high super-structure for ALS in Kuning river to be constructed	- Same as ALT. Y1	- None
2. Construction At Night	x	- Expansion of RWY in width (40 m - 45 m) to be carried out. - Extension of RWY to be constructed.	- Same as ALT. Y1	- None
		- ILS and AFL to be installed	- ILS to be installed	- Bank 700,000 m ³
3. Earthwork Volume		- Bank 500,000 m ³ (Borrowed soil)	- Bank 1,700,000 m ³ (Borrowed soil)	
4. Construction Cost of Civil Works (Unit : Million Rp.)		11,915 100 7,523 (0.5)	4,655 100 21,779 (1.7)	13,594 280 6,063 (0.7)
		17,651 840 1,508 39,537	19,138 840 1,508 36,518	20,560 745 37 41,279
Main Disadvantages	x	- Reclamation of rivers	- Same as ALT. Y1	
	x	- Construction at night	- Same as ALT. Y1 - Same as ALT. Y1	

7.3 Redevelopment Plans of Surakarta Airport

7.3.1 Existing Conditions of the Airport and Its Vicinity

(1) Geographical Features

The existing Surakarta airport is located on almost flat land about 120 m above mean sea level, and slopes very gently from west to east.

The effective runway gradient of the existing runway is about 0.7 %. As seen in Fig. 7.3.1, there is a river called "Wungu River" passing along the existing runway, at Runway 08 side (western side) about 10 m deep, at Runway 26 side (eastern side) about 2 m deep.

(2) Airport Property Area and Facilities Therein

Fig. 7.3.1 shows the general layout of the airport facilities such as the runway, terminal area, aprons, a golf course and so on.

The airport property area is completely controlled by the Indonesian Air Force. The large area north of the existing runway within the airport property area is mainly used as agricultural fields.

The civil aviation terminal facilities are situated at the south of the existing runway. Besides, the terminal facilities used for transmigrants are located on the other side of the existing runway (north side).

The air force facilities are mainly composed of a control tower, hangar, apron and so on, and are small in scale. In addition, there is a grass strip from northeast to southwest at the north of the existing runway for an occasional use for military glider training.

(3) Present Land Use and Future Development Plan

There is a big cluster of houses located along the extended center line of the existing runway at Runway 26 side. According to the future development plan of Surakarta, no substantial land use to which close coordination may become necessary has been planned for the area surrounding the existing airport.

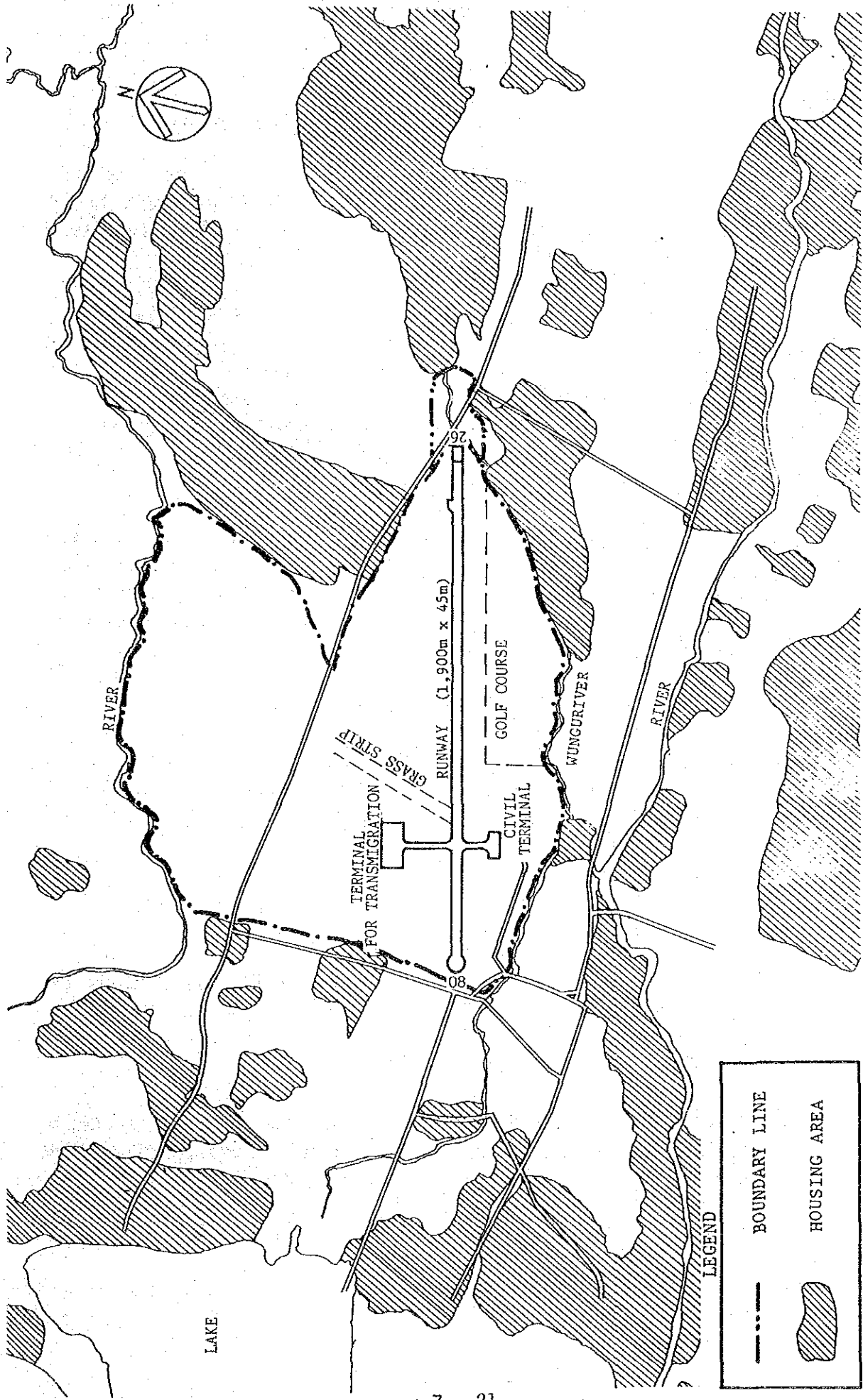


Fig. 7.3.1 General Situation of the Existing Surakarta Airport

7.3.2 Basic Considerations for Redevelopment Plans of Surakarta Airport

Extension work of the existing runway to 1,900 m to the east was completed during this study period. In the previous master plan "TATA LETAK PELABUHAN UDARA ADI SUMARMO - SOLO" in June 1983, a new terminal for civil use was planned in the north area of the existing runway.

There are air force facilities being of small capacity located near the existing civil aviation terminal area. These facilities are not considered to affect the redevelopment plan of the existing airport. The following considerations were taken for establishing the redevelopment plans for Surakarta airport.

a) Effective Use of the Existing Facilities

The existing runway and the property area will be effectively utilized for the redevelopment. The existing terminal area will, however, be relocated at the north of the runway since the expansion of the existing terminal area is considered very difficult due to the limited area and steep southward terrain.

b) Compatibility with the Land Use of the Surrounding Area

Many houses are located on both sides of the extended runway center line. Therefore, a new runway layout will be established so as to minimize the influence of aircraft noise to the houses and number of houses to be relocated for land acquisition.

7.3.3 Study on Redevelopment Plans

Based on the above considerations, 3 alternative redevelopment plans for the existing Surakarta airport were studied (see Fig. 7.3.2).

(1) Extension of the Existing Runway

It is necessary for future air traffic demand that the existing runway be extended from 1,900 m to 2,150 m. Hence, 2 alternative redevelopment plans with the extension of the existing runway were studied:

- Alternative (ALT.) S1 : Extension of the existing runway to the east (26 side)
- Alternative (ALT.) S2 : Extension of the existing runway to the west (08 side)

(2) New Runway Plan

Location of a new runway at Surakarta airport is to be planned so as to effectively utilize the existing property area and minimize aircraft noise influence to areas surrounding the airport. From these viewpoints, ALT. S3 was proposed (see Fig. 7.3.2).

It is necessary to acquire agricultural fields for ALT. S3. However, relocation of houses is not necessary for this alternative.

Moreover, ALT. S3 could lessen aircraft noise influence compared with ALTs. S1 and S2.

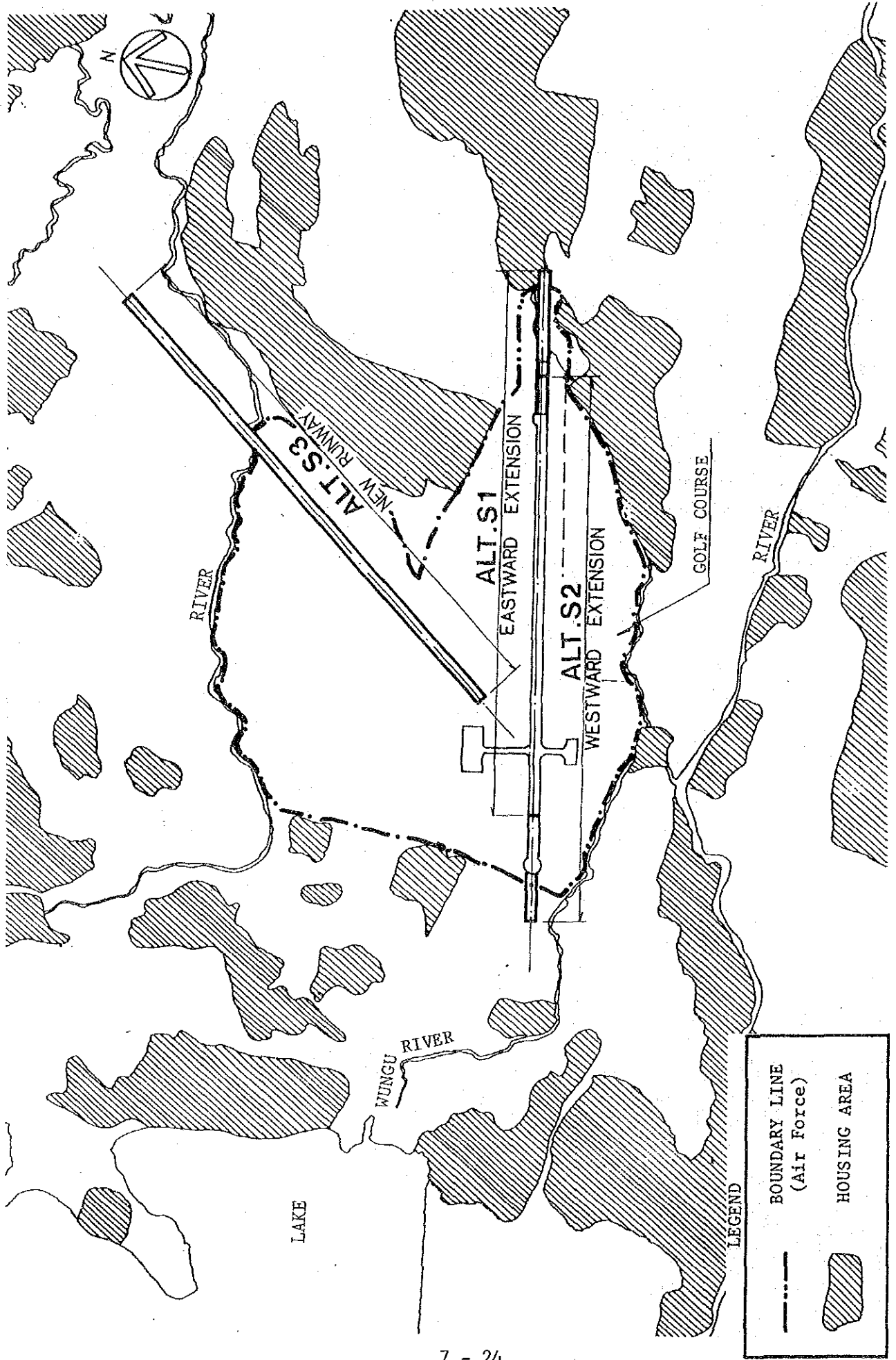


Fig. 7.3.2 Alternative Redevelopment Schemes - Surakarta

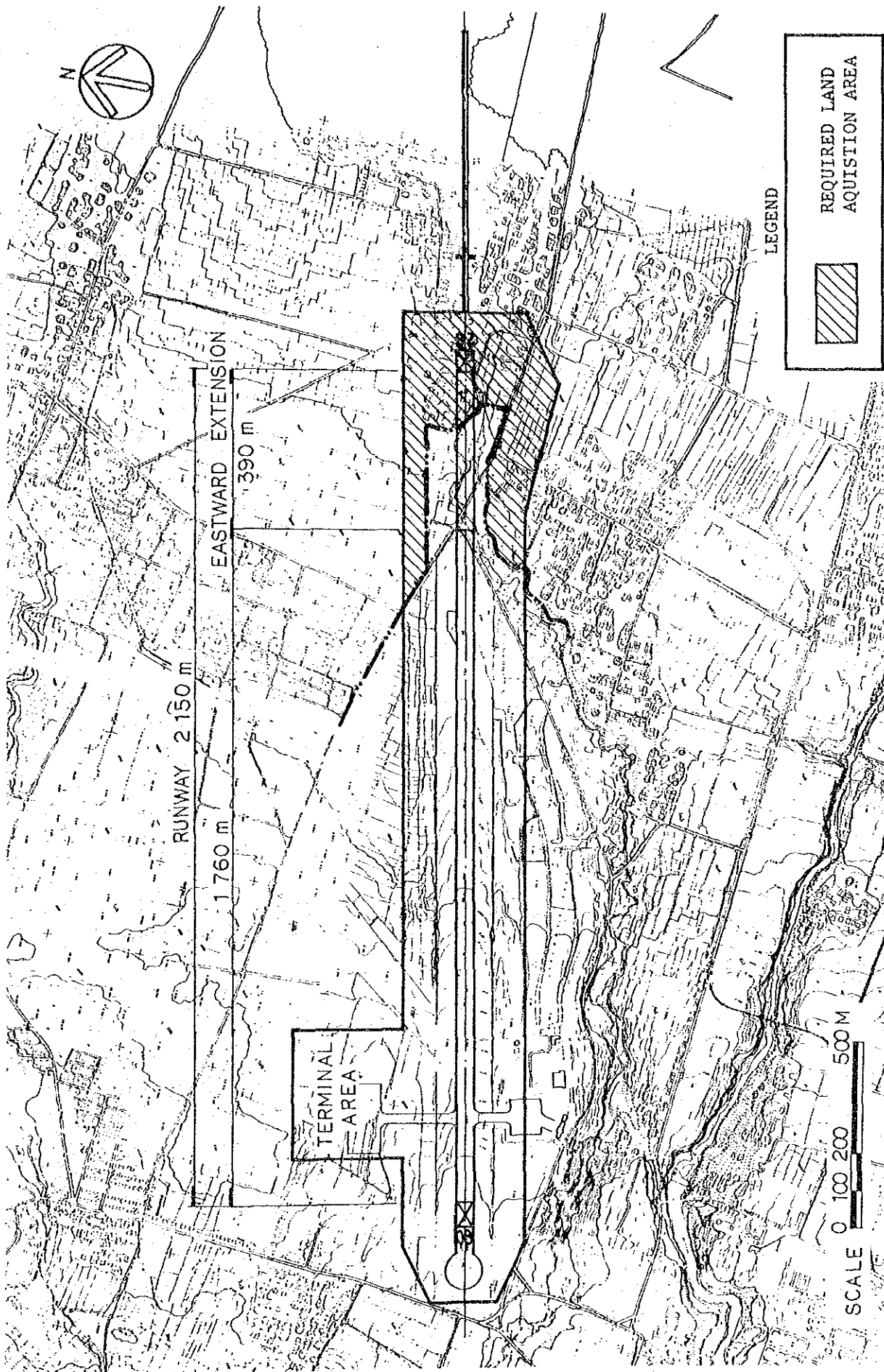


Fig. 7.3.3 Redevelopment Scheme - Alternative S1

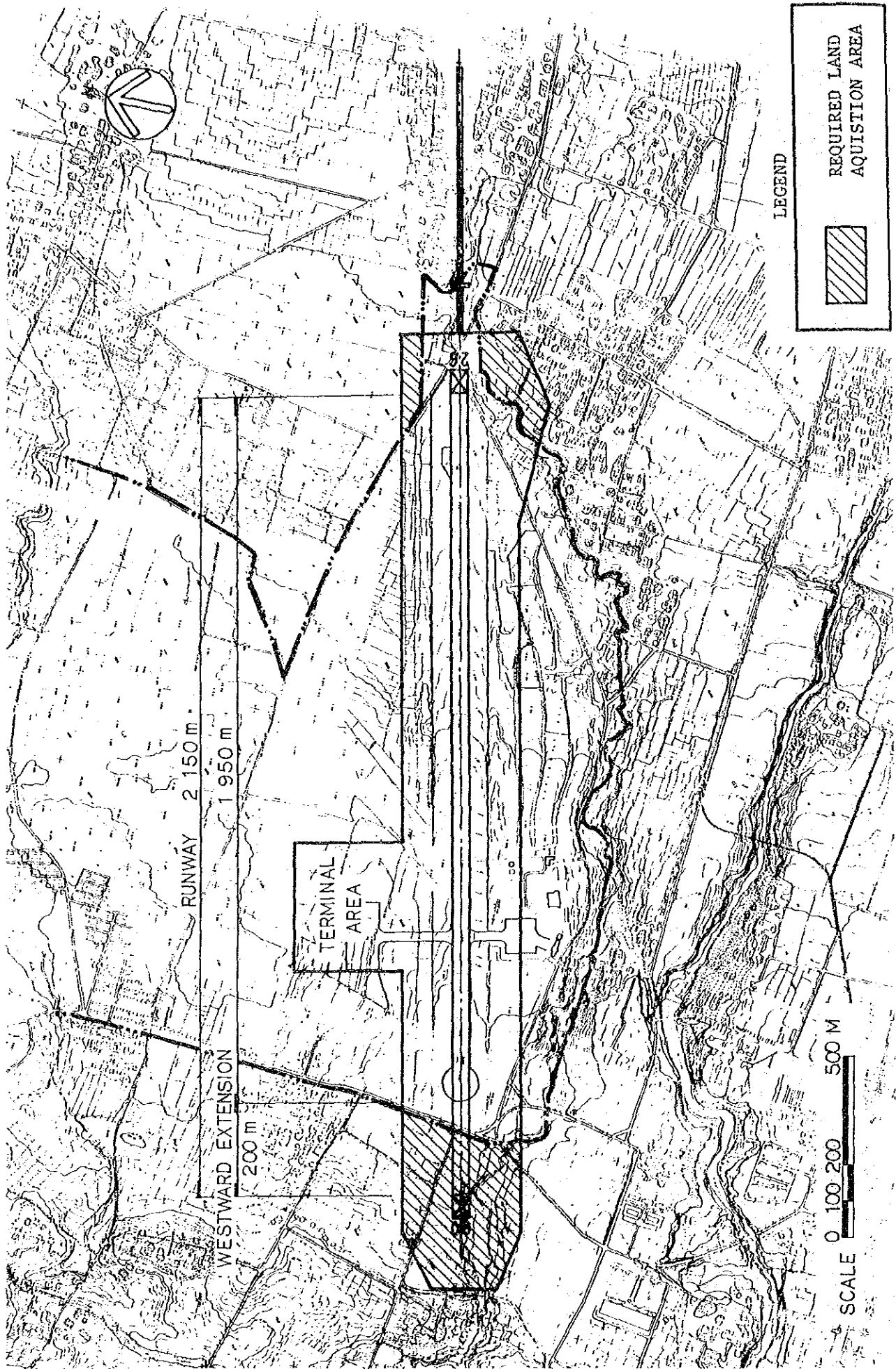


Fig. 7.3.4 Redevelopment Scheme - Alternative S2

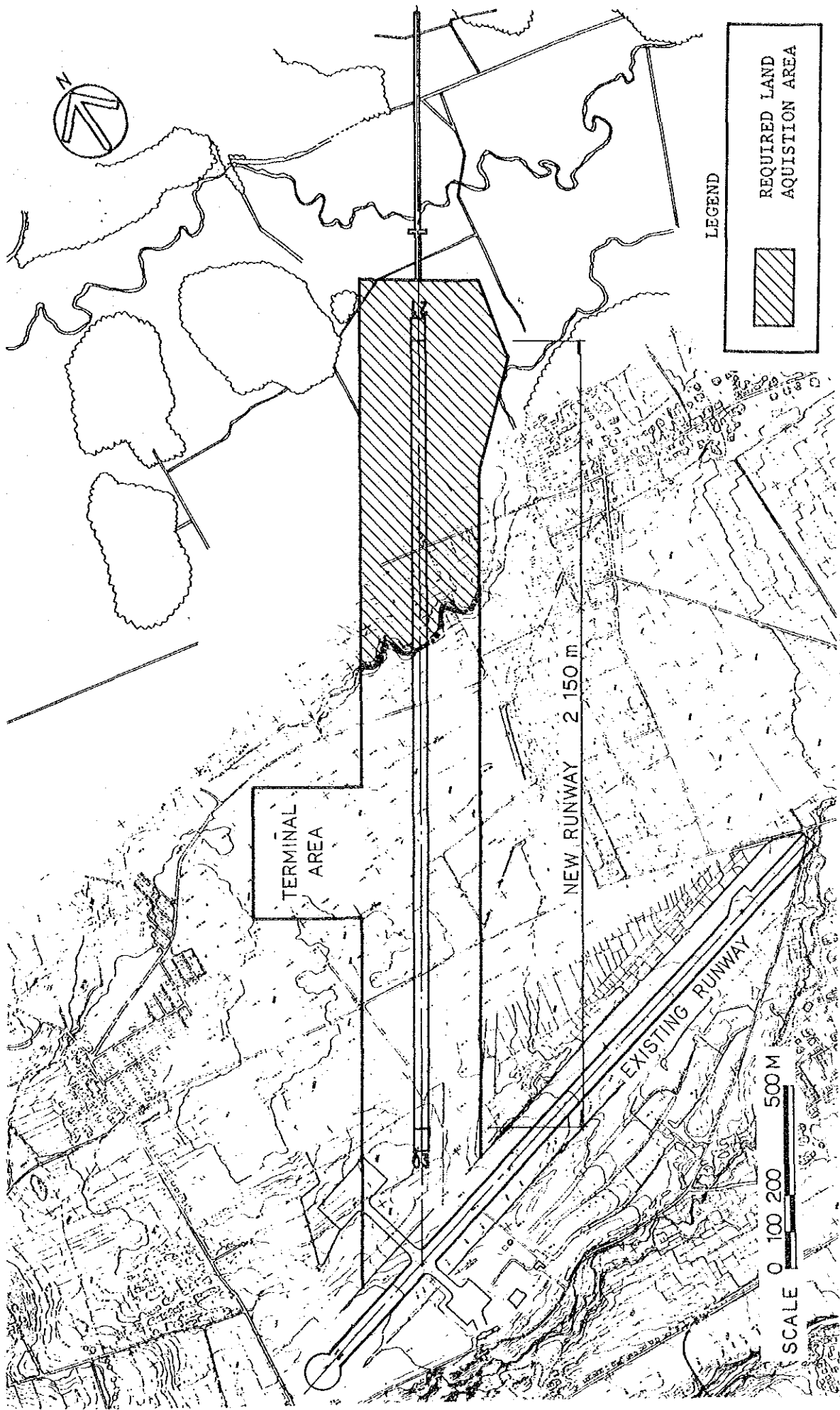


Fig. 7.3.5 Redevelopment Scheme - Alternative S3

7.3.4 Comparative Evaluation of Redevelopment Plans For Surakarta Airport

Table 7.3.1 explains the results of comparative evaluation for the redevelopment plans, i.e., ALTs. S1 through S3.

As a result, ALT. S1 was selected as the best alternative among the redevelopment plans for Surakarta airport. The reasons are as mentioned below:

a) Ease of Development

The 3 redevelopment plans pose no major problems of which solutions are expected to be difficult in terms of both airspace use and land utilization.

The air force facilities in the existing Surakarta airport comprise 2 hangars for small aircraft, apron, grass strip, golf course, offices, etc., however, they are of a small size compared with those of Yogyakarta airport, and do not greatly conflict with the redevelopment.

The redevelopment plans of ALTs. S1, S2 and S3 of Surakarta airport are, therefore, considered quite feasible from these points of view.

b) Construction Cost

With regard to rough construction cost for redevelopment plans, ALT. S1 is the cheapest at Rp.47.4 billion, and the new runway alternative (ALT. S3) is the most expensive at Rp.57.7 billion.

In other words, redevelopment plans of Surakarta airport suggest that the utilization of the existing runway is more economical.

Alt. S2 is more expensive by Rp.4.8 billion than ALT. S1 because of the cost for earthwork necessary for the diversion of the Wungu River of which riverbed is about 10 m lower than the ground level of the airport.

ALT. S1, which is the cheapest in construction cost, was therefore selected as there are almost no difference among redevelopment plans of Surakarta airport other than construction cost.

Table 7.3.1 Comparison Table of Alternative Airport Redevelopment Schemes for Surakarta

COMPARISON ITEMS	ALTERNATIVES			REMARKS
	ALT. S1	ALT. S2	ALT. S3	
I. Runway Dimensions				
Total Length	2,150 m	2,150 m	2,150 m	
New Construction Length	390 m	200 m	2,150 m	
Width	45 m	45 m	45 m	
II. Runway Designation Number	08/26	08/26	03/21	
III. ILS Category	CAT - I	CAT - I	CAT - I	
IV. Aircraft Operational Considerations				
1. Obstacles	x - Transitional Surface : Control tower, AEN, NDB antenna, microwave antenna	x - Same as ALT.S1	x - RWY 03 Approach Surface : Apron floor light - Transitional Surface : Apron Flood light, microwave antenna - The obstacles mentioned above to be removed - Aerodrome control should be centralized and necessary for simultaneous operation on two RWYS. - Installation of RAPCON necessary	
2. Aircraft Operational Procedures				
3. Approach and Departure Control				
4. Air Space Utilization	- Adjustment of training area for Air Force necessary - RWY 08/26 13 KT 98.4 % 20 KT 99.7 %	- Same as ALT.S1	- Same as ALT.S1	
5. Cross Wind Coverage			- RWY 03/21 13 KT 99.6 % 20 KT 99.9 %	

Table 7.3.1 (Cont'd)

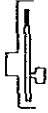

COMPARISON ITEMS	ALTERNATIVES			REMARKS
	ALT.S1	ALT.S2	ALT.S3	
V. Airport Development Considerations				
	1. Land Acquisition	<ul style="list-style-type: none"> - Residential Area 9.5 ha - Rice Field 7.3 ha (Air Force Area 72.1 ha) - Improvement of existing road : 1.5 Km 	<ul style="list-style-type: none"> - Residential Area 2.1 ha - Rice Field 15.9 ha (Air Force Area 74.8 ha) - New access road : 1 Km - Improvement of existing road : 1 Km - Same as ALT.S1 	<ul style="list-style-type: none"> - Rice Field 35.1 ha (Air Force Area 60.0 ha) - Improvement of existing road : 2.4 Km - Same as ALT.S1
	2. Access Road			
3. Others	<ul style="list-style-type: none"> - Close coordination with Air Force to be necessary for airport development. 			
Main Disadvantages				
				<ul style="list-style-type: none"> - Acquisition of Rice Field (about 35 ha)
VI. Social Considerations				
	1. Aircraft Noise Influence	<ul style="list-style-type: none"> - Many houses located toward extension of runway to be more influenced by Aircraft noise - Aircraft noise influence area to be controlled by strict land use ordinance 	<ul style="list-style-type: none"> - Same as ALT.S1 - Same as ALT.S1 - Same as ALT.S1 	<ul style="list-style-type: none"> - Less influence than ALT.S1 and S2 - Same as ALT.S1 - Same as ALT.S1
	2. Land Use			
3. Compensation	<ul style="list-style-type: none"> - Relocation of airport facilities for Air Force necessary - Many houses to be removed (9.5 ha) - Reconstruction of roads (the eastern area) with 1.3 Km length necessary - Reconstruction of water canals for agriculture necessary 	<ul style="list-style-type: none"> - Reconstructions of roads with 1.0 Km length necessary - Same as ALT.S1 	<ul style="list-style-type: none"> - Reconstruction of road (northern area) with 2.4 Km length necessary - Same as ALT.S1 	

Table 7.3.1 (Cont'd)

COMPARISON ITEMS	ALTERNATIVES	ALT.S1	ALT.S2	ALT.S3	REMARKS
Main Disadvantages	x	- Compensation for relocation of Air Force facilities and many houses	x	- Same as ALT.S1	
VII. Construction Considerations 1. Topographical and Geological Conditions 2. Construction At Night 3. Earthwork Volume (Borrowed soil) 4. Construction Cost of Civil Works (Unit : Million Rp.) <ul style="list-style-type: none"> - Land Acquisition - Compensation - Site Preparation (Earthwork Volume, mil. Rp.) - Pavement - Access Raod Total 	x None x 1,789 60 2,317 (0.2) 9,341 822 14,329	- Reclamation works 11 m wide and 0.6 Km long for the river required - Same as ALT.S1 - AFL to be installed - Bank : 200,000 m' 4,866 20 4,813 (0.6) 8,983 420 19,102	x x x 8,211 0 4,478 (0.55) 12,471 504 24,664		
Main Disadvantages	x	- Large earthwork volume required	x	- Same as ALT.S2	

CHAPTER 8 SITE SELECTION OF THE NEW AIRPORTS

CHAPTER 8 SITE SELECTION OF THE NEW AIRPORTS

8.1 General

The new airport is considered to be one of the alternatives to alleviate the problems of the existing airports. As mentioned in Chapter 6, the following three alternatives for new airport construction can be considered in this Study area:

1. New airport to combine both existing Yogyakarta and Surakarta airports (Concept-F in Table 6.2.1),
2. New airport to replace the existing Yogyakarta airport (Concepts C and D in Table 6.2.1), and
3. New airport to replace the existing Surakarta airport (Concepts B and D in Table 6.2.1).

The results of Chapter 7 reveals that whichever plan is selected, there will be some difficulty in the redevelopment of the existing Yogyakarta airport. On the other hand, redevelopment of the existing Surakarta airport can be easily executed compared with Yogyakarta.

Therefore, the site selection in this Chapter was made for the two new airport alternatives of 1 and 2 stated above.

8.2 Selection of the Possible New Airport Sites

Site selection in this Study was carried out in two steps.

In the first step, the limit for site selection area was set at 50 km radius (approximately one hour by car) from Yogyakarta city, taking into account that the most of air traffic demand falls in Yogyakarta city, in either of the alternatives.

Within this limit, preliminary zoning was established on a geographical map with a scale of 1:200,000 from the viewpoint of mountainous terrain and distribution of villages.

Fig. 8.2.1 shows both the adequate and inadequate zones for the site selection based on these macroscopic viewpoints.

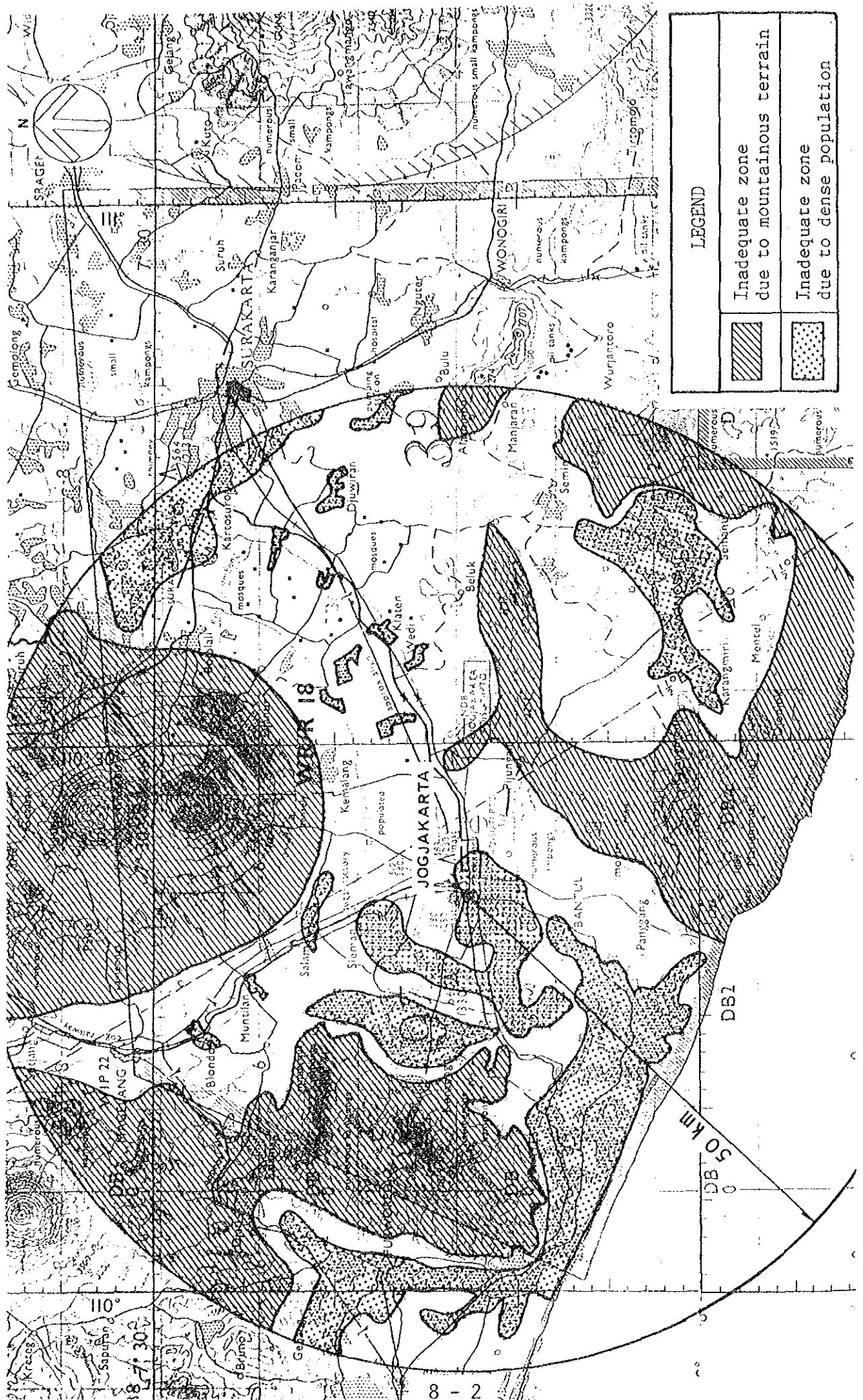


Fig. 8.2.1. Preliminary Zoning for Site Selection of New Airports

In the second step, possible new airport sites were selected from the area judged to be an adequate zone in the first step based on the following considerations:

- to minimize the numbers of houses to be relocated for the land acquisition for the new airport.

The approximate size required for the new airport is as illustrated in Fig. 8.2.2 based on the results of Chapter 4, "Airport Facility Requirement Analysis". As for the terminal area, although the size is a little different between the new airport combining the two existing airports and that as replacement of the existing Yogyakarta airport, the difference is not very important for the site selection study. Therefore, the size shown in Fig. 8.2.2 was adopted in this Study for convenience sake.

- to minimize earthwork as possible.
- to avoid conflict with major roads, railways and large rivers.

After extensive and systematic examination of the topographical maps with a scale of 1:50,000 and through the site reconnaissance, 3 possible sites (K1 to K3 in Fig. 8.2.3) for the new airport combining 2 existing airports were selected in the Klaten area, and 5 possible sites (W1 to W3 and B1, B2 in Fig. 8.2.3) in Wonosari and Bantul areas as the alternative new airport for the existing Yogyakarta airport.

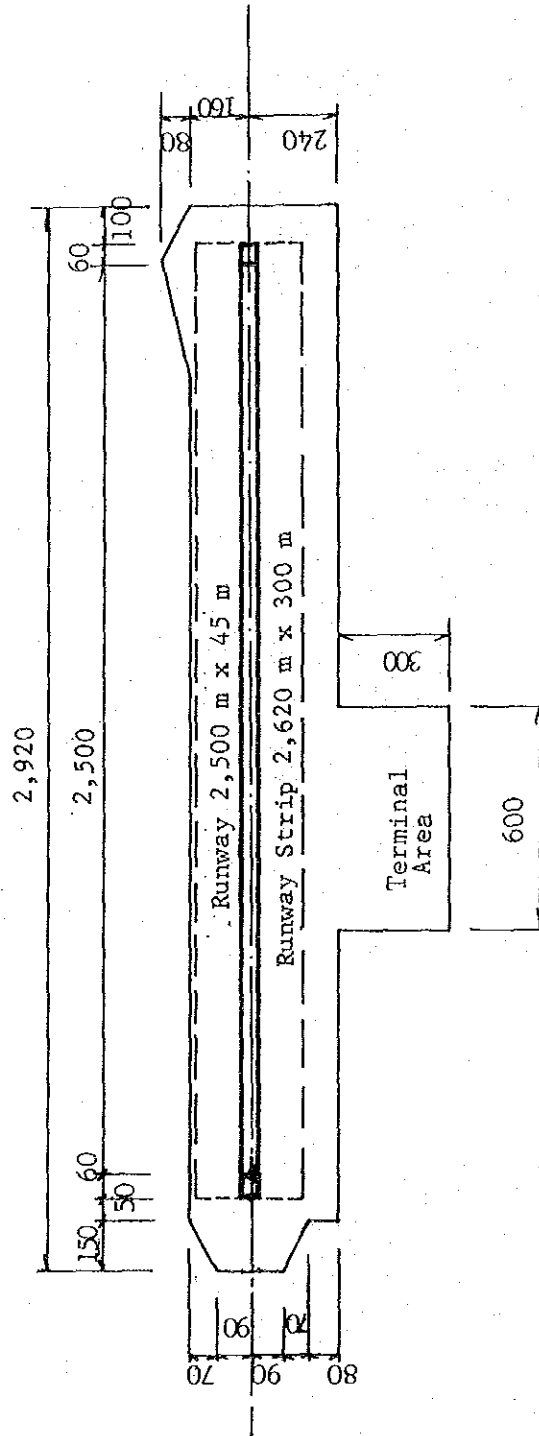


Fig. 8.2.2 General Dimensions of the New Airport

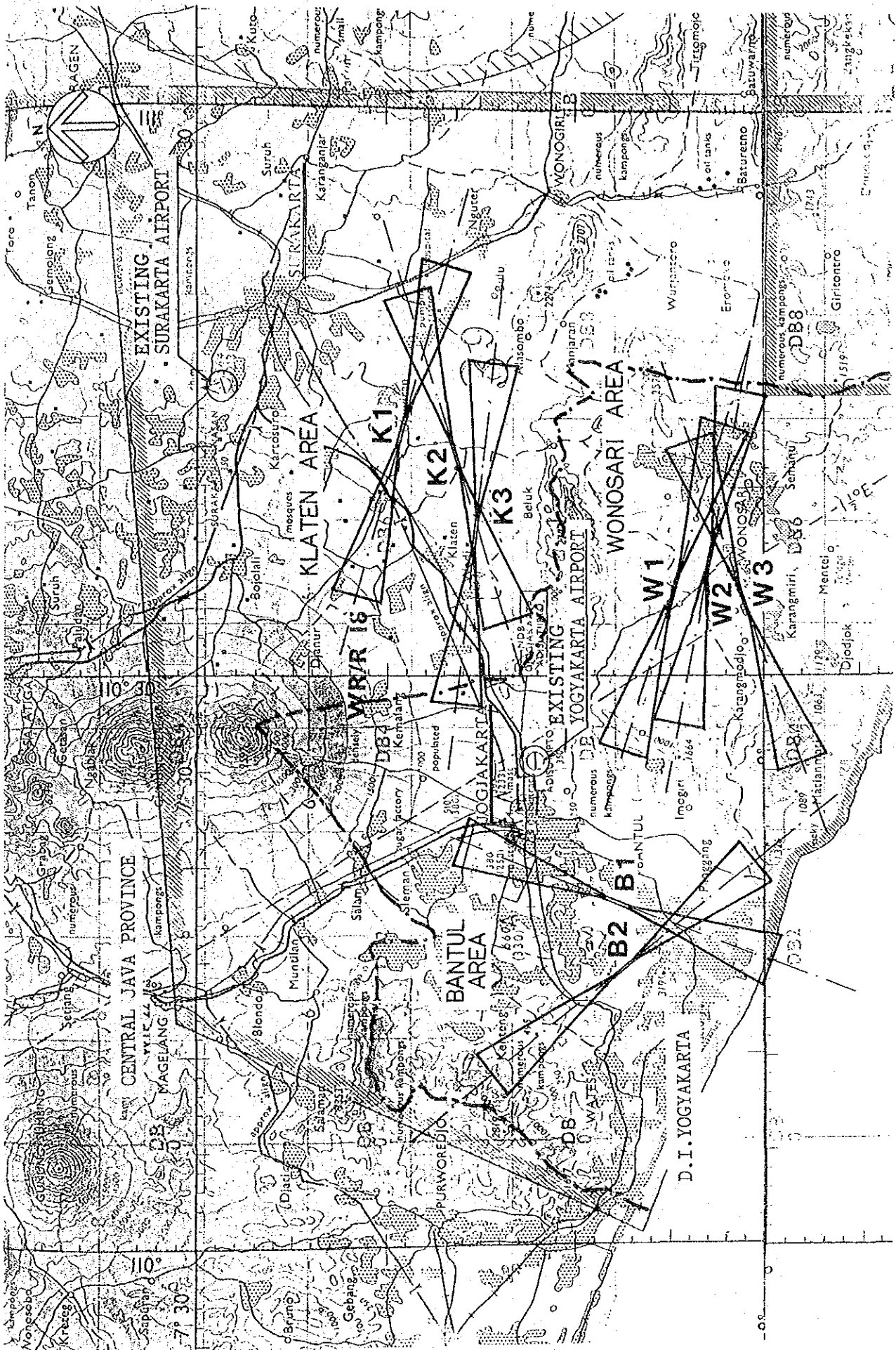


Fig. 8.2.3 Location of Possible New Airport Sites

8.3 General Situations of the Possible New Airport Sites

8.3.1 Possible New Airport Sites (K1, K2 and K3)

The major characteristics of each site are described hereafter (refer to Fig. 8.3.1).

(1) Site-K1

Site-K1 is located approximately 40 km northwest of Yogyakarta city and 17 km southwest of Surakarta city, and belongs to the administrative unit of Klaten regency in Central Java province.

An airstrip was constructed here by the Japanese military during the World War II, but the site is well developed as a field for crops at present.

The site is almost flat land with elevation of about 112 m, consisting of pervious soil.

There are no houses to be relocated for the new airport construction.

(2) Site-K2

Site-K2 is located 6 km southwest of Site-K1 and the terrain is almost flat with an elevation of about 105 m.

All of the land is used presently as rice fields and there can be seen some irrigational canals.

There are few houses to be relocated for the new airport construction.

(3) Site-K3

Site-K3 is on a hilly terrain with a maximum difference of 25 m in elevation, located 28 km northeast of Yogyakarta city and 30 km southwest of Surakarta city.

Most of the land is underdeveloped with the exception of being partially used as a coconut plantation.

Approximately 70 houses are settled in the site, and are to be relocated for the new airport construction.

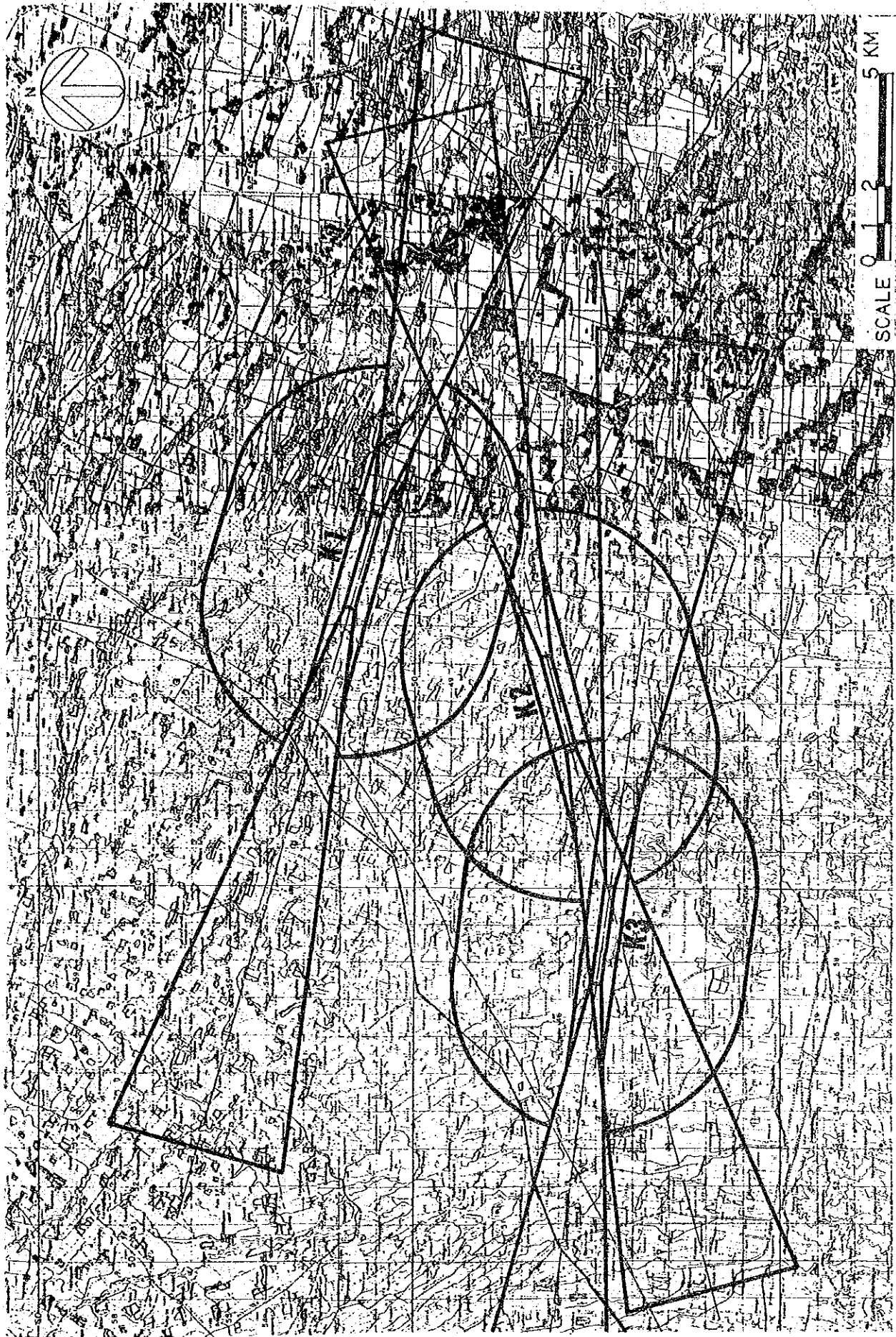


Fig. 8.3.1 Possible New Airport Sites - Klaten Area

8.3.2 Possible New Airport Sites (W1, W2, W3, B1 and B2)

Sites W1 to W3, B1 and B2 were selected as the possible new airport sites to replace the existing Yogyakarta airport. The major characteristics of the sites are discussed hereafter (refer to Figs. 8.3.2 and 8.3.3).

(1) Site-W1

Site-W1 is located approximately 28 km southeast of Yogyakarta city and belongs to an administrative unit of Wonosari regency in D.I. Yogyakarta.

The site is on a plateau with an elevation of about 200 m and mainly composed of hard limestone.

The existing land use at the site consists of an airstrip which is rarely utilized by the Indonesian Air Force and a well developed crop field.

(2) Site-W2

Site-W2 is located 4 km southeast of Site-W1. The site is almost completely waste land at present, and no future land use plan exists according to BAPPEDA in D.I. Yogyakarta.

There are about 15 houses to be relocated for the new airport construction.

(3) Site-W3

Site-W3 is in the same Wonosari regency and about 30 km southeast of Yogyakarta city.

The terrain is almost flat with elevation of about 175 m. There is a small river at the east of the site which will be diverted for the new airport construction.

The site was well cultivated as a crop field during the period of PELITA III.

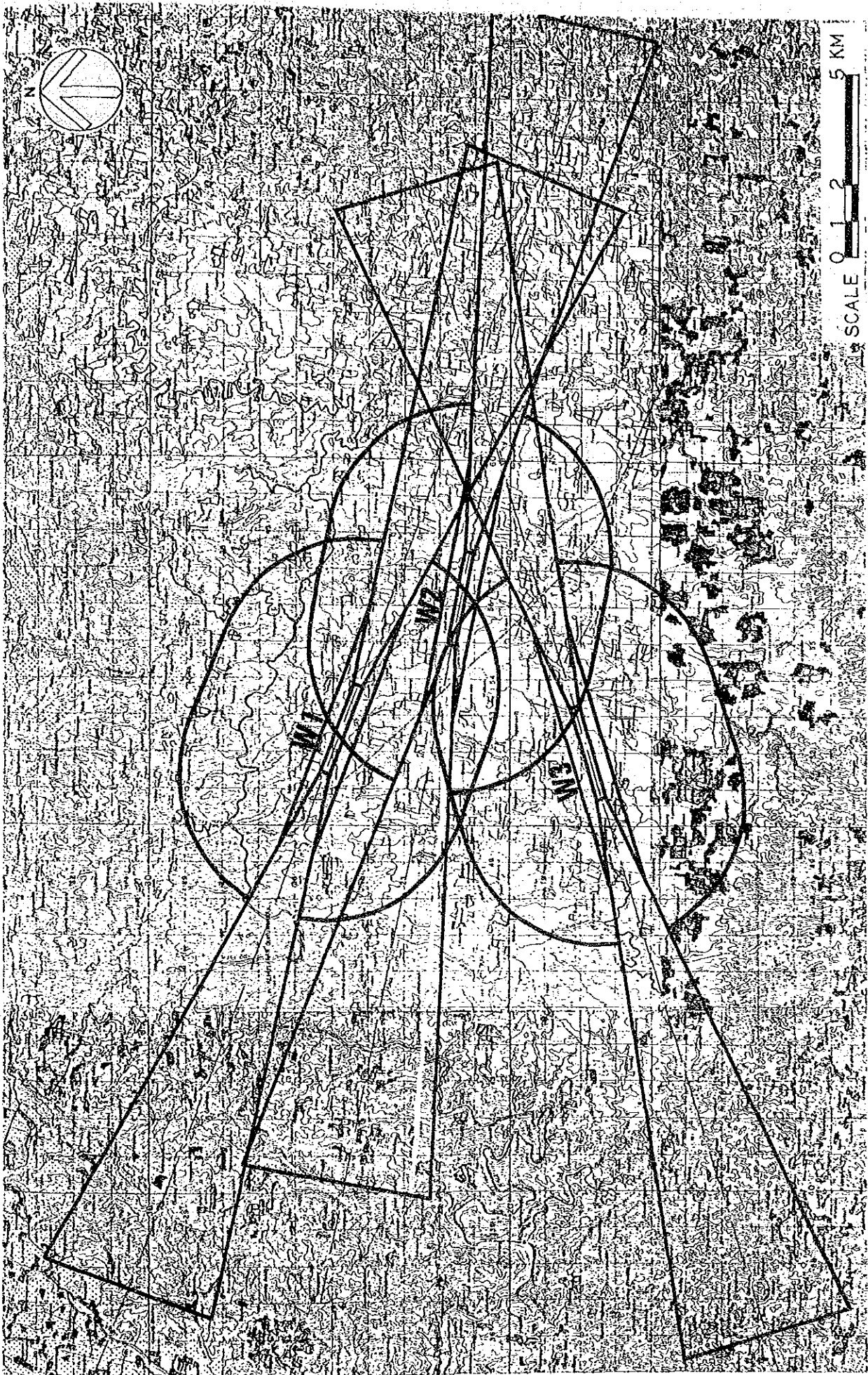


Fig. 8.3.2 Possible New Airport Sites - Wonosari Area

(4) Site-B1

Site-B1 which belongs to the administrative unit of Bantul regency is located about 10 km southwest of Yogyakarta city and on a hilltop with an elevation of about 120 m.

The site is considered to be composed of fragile limestones and therefore, most of the land is underdeveloped.

(5) Site-B2

Site-B2, being located 15 km southwest of Yogyakarta city, is almost completely underdeveloped other than being used as training area for transmigration.

There are about 25 houses to be relocated for the new airport construction.

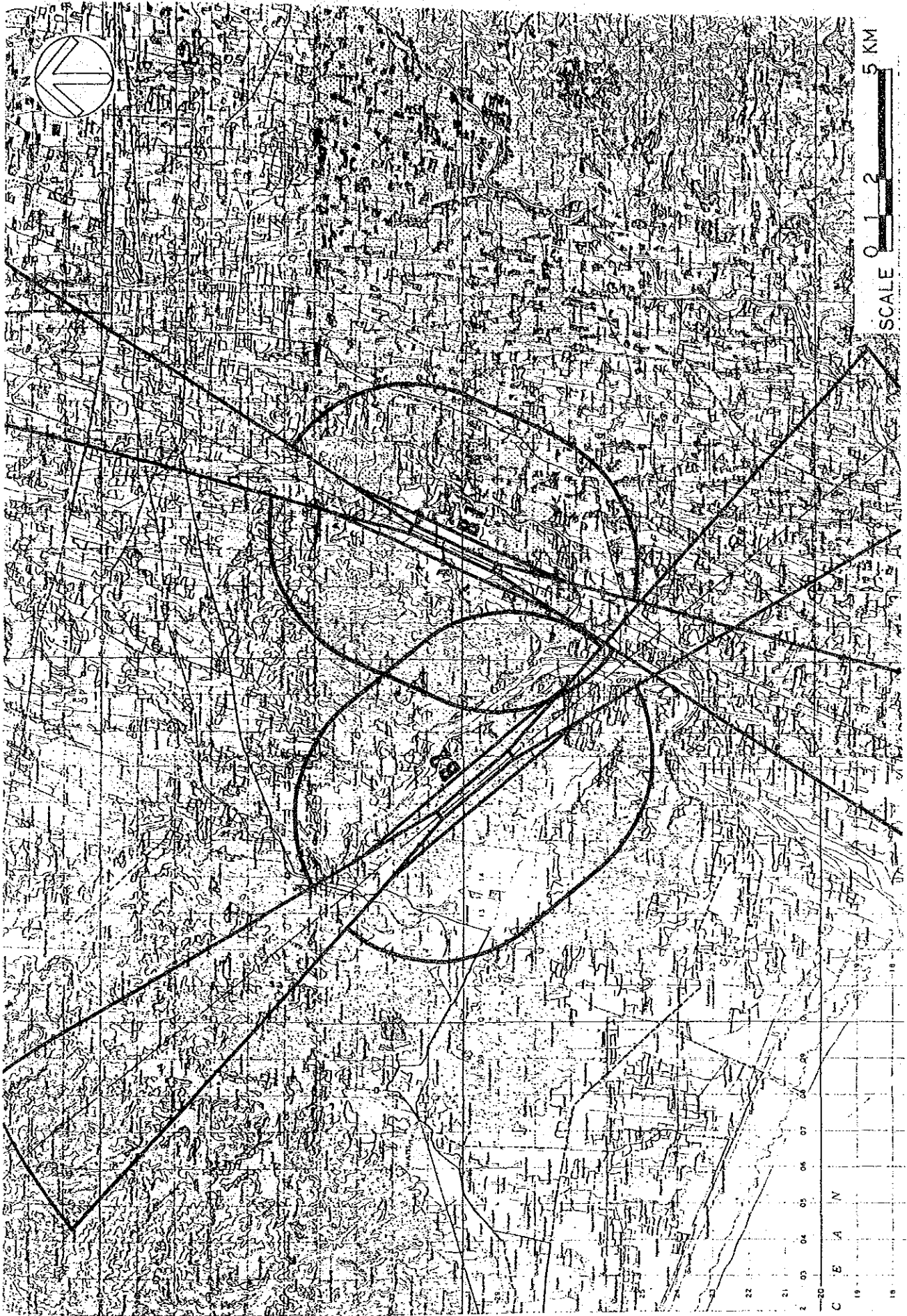


Fig. 8.3.3 Possible New Airport Sites - Bantul Area