Chapter 5 Master Planning for Bacolod Airport

CHAPTER 5 MASTER PLANNING FOR BACOLOD AIRPORT

5.1 GENERAL

Bacolod Airport is located at about 3km southwest of Bacolod City, the capitol of Negros Occidental Province, Region 6 (Western Visayas). Figures 4.1.1 and 4.1.2 are the airport vicinity map and the existing airport facility layout plan.

This chapter describes the existing conditions of Bacolod Airport and its surroundings, evaluation of the existing airport facilities, selection of an alternative airport site, airport development master plan and scope of medium term development. Socio-economic conditions of the airport surrounding area are described in Section 2.2.

5.2 EXISTING CONDITIONS OF THE AIRPORT AND ITS SURROUNDINGS

5.2.1 Airport History

Bacolod Airport was an private airport owned and operated by Negros Iloilo Air Charter before Philippine Airlines took it over some 50 years ago. Because of this origin, the original part of the airport including the whole terminal area are PAL's property. The extension of the runway was also undertaken by PAL in the initial years. The concrete cement paving of the runway, taxiways and apron was said to have completed in 1967. Then the runway development was succeeded by the DOTC, and the airport now has 1,958m long, 30m wide runway. The latest developments conipleted at the airport are the overlay of the runway and taxiway pavements in 1993.

PAL constructed a part of the present terminal building in the early 1970. It consisted of existing departure area, existing ticketing office formerly used as arrival area and existing ATO office formerly used as ticketing office. The DOTC constructed the control tower on the top of the terminal. In the mid 1980s, the building was extended to the south to accommodate cargo terminal. The existing arrival are is the latest addition to the terminal in the early 1990s when the previous arrival area was renovated for the ticketing office. The building, except the control tower, is still owned and maintained by PAL. The ATO presently occupies the previous ticketing office for its administration office.

There were two major accidents at Bacolod Airport in the past. In 1988, a general aviation aircraft fall down shortly after takeoff on the western side of the runway within the airport, and the pilot was injured. PAL's B737-300 in 1994 ran off the runway, according to PAL due to a hydroplane effect on the wet runway. The left wing and left engine were damaged by the accident, but fortunately there were no injuries.

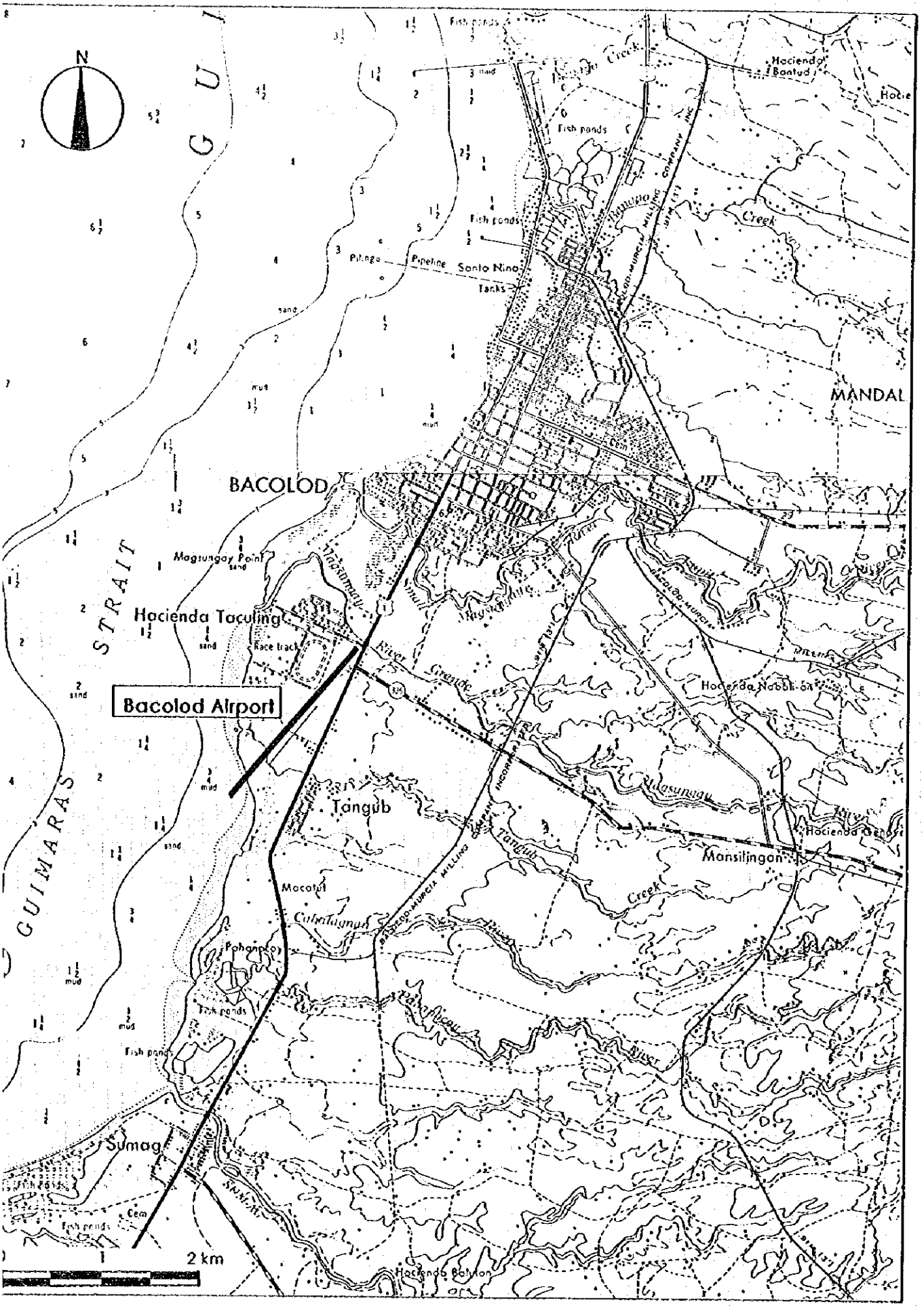

Figure 5.1.1 Vicinity Map of Bacolod Airport

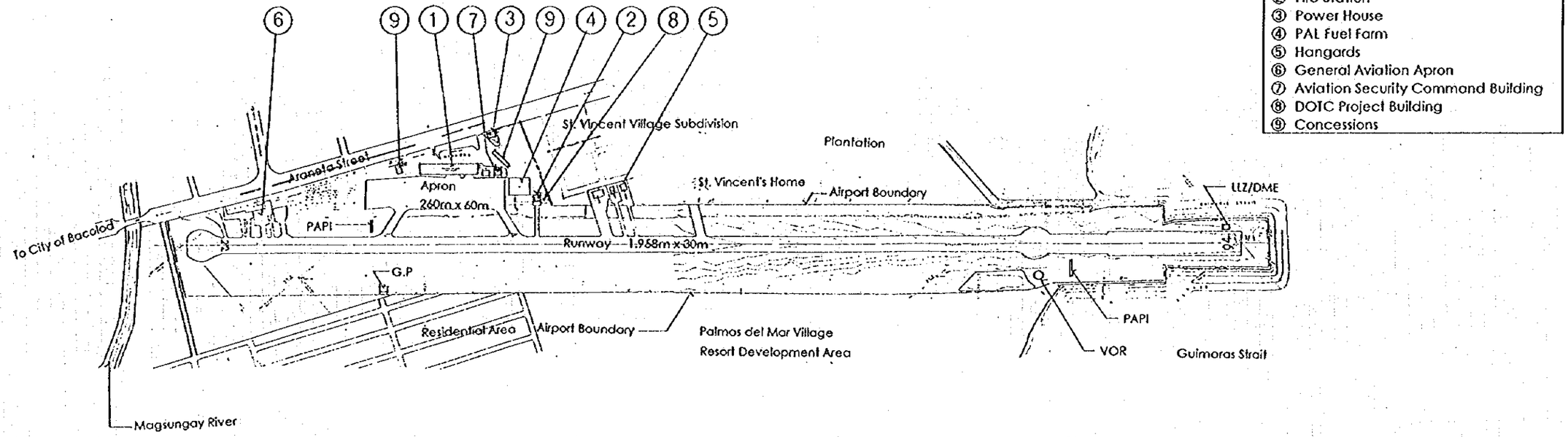

Figure 5.1.2 Existing Layout of Facilities at Bacolod Airport
Scale=1/8,000

5.2.2 Airport Inventory

Table 5.2.1 shows an inventory of Bacolod Airport.

Table 5.2.1 Inventory of Bacolod Airport

Items	Description
1. Aerodrome Data	
City / Aerodrome	Bacolod / Bacolod Airport
Domestic/International	Domestic (Trunkline, Area 5, Satellite)
ICAO Reference Code	4C
Aerodrome Reference Point	10°38'42"N, 122°55'21"E
Distance and Direction from City	3.0km Southwest of city center
Elevation	6.1m
Reference Temperature	32.6°C
Magnetic Variation	N00°05'W
Operational Hours	24 hrs
Seasonal Availability	All seasons
Supervising Authority	Air Transportation Office, DOTC
Transportation Available	Taxi, bus and jeepney
2. Aircraft Operational Data	
Wind Coverage	Data not available
Operational Category	Non-Precision Approach
Established Procedures	VOR RWY04 and 22
Transition Altitude	3,000 ft
Local Flying Restriction	Closed to acft without a functioning 2-way radio IFR not allowed between sunset and sunrise
3. Facilities	
Runway	
Designation	04/22
True Bearing	N40°24'E
Dimension	1,958m x 30m
Longitudinal Slope	0.15%
Stopway	50m (RWY 04), 60m (RWY 22)
Clearway	50m (RWY 04), 60m (RWY 22)
Runway Strip	2,078m x 150m
Surface	Asphalt overlay on cement concrete
Strength	PCN41R/C/W/U
Taxiway	
Configuration	2 connection with apron (2 x 60m)
Width	23m
Surface	Asphalt overlay on cement concrete
Strength	PCN41R/C/W/U
Apron	
Aircraft Stands	B737 x 4
Parking Configuration	Self-maneuvering
Area	260m x 60m
Surface	Concrete
Strength	Data not available

Table 5.2.1 Inventory of Bacolod Airport (Continued)

Items	Description
Passenger Terminal Buildings	(PAL owned)
Structure	Reinforced concrete, 1 story (partially 3 stories)
Floor Area	2,120 sq.m (including cargo terminal, control tower and administration office)
Cargo Terminal Building	(PAL owned)
Structure	Part of passenger terminal building
Floor Area	450 sq.m
Control Tower Building	
Structure	3rd floor of passenger terminal building
Floor Area	172 sq.m (including equipment room downstairs)
Floor Height	10.7m
Administration Building	
Structure	Part of passenger terminal building
Floor Area	75 sq.m
Fire Station	
Structure	Reinforced concrete, 1 story
Floor Area	350 sq.m
Vehicle Parking Area	
Area	4,000 sq.m
Capacity	100 vehicles
Surface	Asphalt
Access Road	
Number of Lanes	2 lanes
Width	15m
Surface	Asphalt
Air Navigation System	
Radio Navigation Aids	C-VOR "BC": 114.9MHz (LLZ: 109.9MHz, DME: Channel 36X on test)
Telecommunication Systems	TWR: 123.6MHz APP: 122.6MHz FSS: 5,205 and 3,872.5KHz
Aeronautical Ground Lighting Systems	Approach Lights (RWY04/22) Approach Path Indicator (RWY04/22) Runway Edge Lights Runway Threshold and End Lights (RWY 04/22) Apron/Taxiway Edge Lights Aerodrome Beacon (out of service) Apron Flood Lights
Meteorological Observation Systems	No PAGASA station. Wind, temperature and air pressure sensors for control tower
Rescue and Fire Fighting Facilities	
Fire Fighting Vehicles	Two major vehicles - 800 gal. water and 80 gal. foam - 500 gal. water and 50 gal. foam One rapid intervention vehicle - 600 gal. water and 60 gal. foam One ambulance

Table 5.2.1 Inventory of Bacolod Airport (Continued)

Items	Description
Rescue and Fire Fighting Facilities (continued)	
Level of Protection	Category 5 (Category 6 in AIP)
Number of Trained Personnel	27
Public Utilities	
Power Supply	
Capacity of Transformers	15KVA x 3
Receiving Voltage	13,000V
Stand-by Generators	80KVA x 1, 100KVA x 1 and 156KVA x 1 PAL has a 60KVA generator set.
Water Supply	
Water Source	Bacolod City Water Works 2 deep wells as back up PAL has one deep well and a small water tank
Supply Capacity	Data not available
Water tank	Elevated tank (600L) and pressure tanks.
Sewerage System	
Type of Treatment	Septic tanks for individual buildings
Solid Waste Disposal System	Collected by the city authority
Telephone System	3 external lines for ATO No PABX Separate contract with PLDT by other users No public telephone
Other Facilities	
Aviation Fuel Supply System	(PAL owned)
Type of Fuel	Jet-A1
Storage Capacity	5,900gal. x 1, 5,200gal. x 1, 5,000gal. x 1 and 4,070gal. x 1
Supply System	Hydrant system with 3 pits
Aircraft Maintenance Hangar	7 for light aircraft
Airport Vehicles	Data not available
Airport Maintenance Equipment	Handy grass cutters
Airport Staff Housing	One within the airport

5.2.3 Current Airport Development Projects

The major development projects ongoing at Bacolod Airport are runway widening, runway extension and the installation of ILS. The runway was widened from 30m to 45m for the first 240m from the runway 04 threshold by 1995. It will be widened for another 117m in 1996 and is expected to be completed in 1998. The runway extension was initiated by reclaiming a 37m long, 90m wide section into the sea in 1995, and the runway pavement of a new 42m section is almost completed. The sea will be reclaimed for another area of 10m by 90m in 1996. The latest DOTC Five Year Airport Development Program indicates that the runway will be extended by another 100m to become 2,100m in accordance with the PAL's request to the DOTC. A set of ILS equipment was provided by USAID. The installation of the localizer has been

completed, and currently tested. The glide path antenna is planned to be commissioned after completing the site preparation and flight checks in June 1996.

Apart from the above major improvements, the DOTC identified several immediate needs for Bacolod Airport. Those include the provision of the perimeter fence, temporary repair of apron pavement by joint sealer, improvement of drainage system, apron grading correction, widening of the taxiways from 23m to 26m, construction of asphalt paved general aviation apron, demolition of structures at former squatter site and the felling of trees infringing the runway 22 approach surface.

The list of projects for Bacolod Airport in DOTC's Five Year National Airport Development Program, including the above-mentioned ongoing projects, is as follows:

Infrastructure:

a) Continuation of runway extention up to 2,100 m (including reclamation works)
b) Concreting of extended part of the runway
c) Completion of improvement of perimeter fence
d) Widening of runway 1,969m x 15m (Asphalt)
e) Site acquisition for relocation of apron, landside area and strip width correction
f) Construction of perimeter fence to the new acquired site
g) Construction of new apron 300m x 100m and 2 taxiways at the relocated site (2-90m x 23m)
h) Construction of new terminal building to the newly acquired site
i) Construction of vehiclar parking area and circulation road at the relocated site
j) Construction of administration building and bodega
k) Construction of new fire station
l) Construction of overhead water tank
m) Construction of motor pool

Air Navigation Systems:

a) Rehabilitaion of power house
b) Construction of VOR concrete shelter
c) Purchase/install of rotating beacon
d) Construction of 5-stort control tower building including purchase/install of equipment

Total investment requirement is estimated to be PHP 132.95 million for infrastructure and PHP 11.51 million for air navigation system.

The estimated costs of the project to be implemented in the fiscal year 1996 is as follows:

a)	Completion of the perimeter fence	PHP 2,850,000
b)	Rehabilitation of water system at fire station building	PHP 380,000

This development program implies a future plan that a new terminal facilities be constructed to the southern side of the existing terminal area, adjacent to existing home for orphans and the aged.

Japan's OECF financed Nationwide Air Navigation Facility Modernization Project Phase III will include following equipment and associated works:

a) PC /Fax Machine
b) VSAT
c) D-VOR/DME
d) VOR/DME Building
e) Site Development

Three new airlines, Air Philippines, Cebu Pacific and Grand International Airways have indicated their interest in operating at Bacolod Airport at present. Since the terminal building was developed and is owned by PAL, PAL declined their request of sharing terminal spaces. As a short-term solution, the airport manager suggested the use of a hangar on the southern side of the fire station as a temporary terminal for new airlines.

5.2.4 Airport Access

National Road No. 1 is only an access road to Bacolod Airport. It is a 15 m wide (enough for four lanes) road with asphalt surfacing, and in a good condition at the time of the site investigation. It normally takes about 8 to 10 minutes from the center of Bacolod City to the airport. Taxis, buses and jeepneys are public transportation available at the airport. Figure 5.2.1 shows existing major road network around the airport.

5.2.5 Public Utilities

1) Water Supply

Water in the City of Bacolod is supplied by Bacolod Water District. Sources of water are two springs at Granada area and 22 deep wells. Existing supply capacity is about 49,000 cu.m per day, while actual supply is 36,500 cu.m. Diameter of pipe connected to the airport is 200mm. It runs along the National Road No.1.

2) Power Supply

Electric power is supplied in the cities of Bacolod, Bago and Silay by Central Negross Electric Coorporative (CENECO). Existing power transmission line to the airport surroundings is 13.2KV, 3-phase, 4-wire, 60Hz. Existing Alijis Sub Station, which supplies power to the airport, has 20MVA capacity, while current load is about 15MVA.

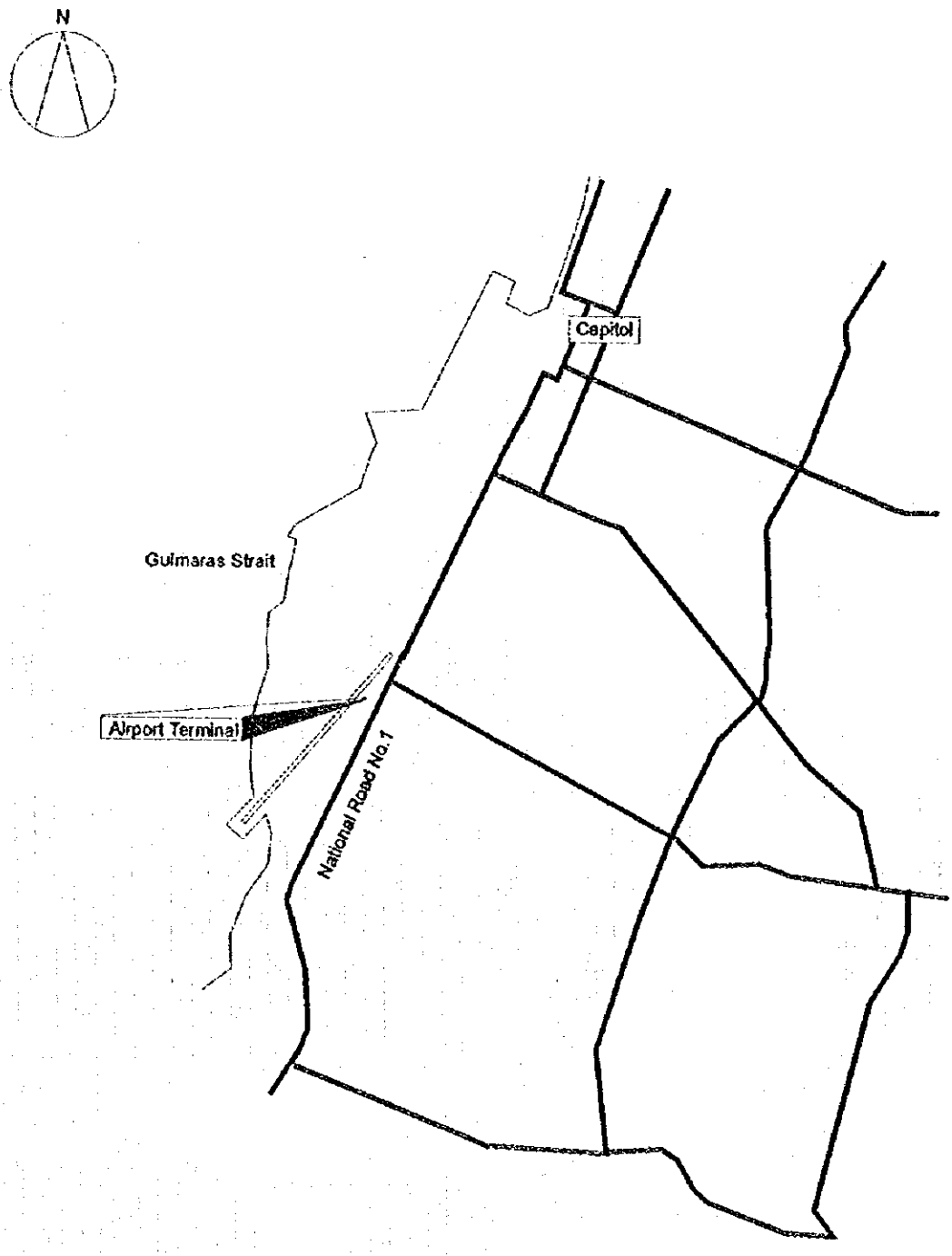

Figure 5.2.1 Existing Road Network around Bacolod Airport

3) Telephone Facility

Telephone facility is provided by Philippine Long Distance Telephone Company. Existing telephone cable to the airport and surrounding area is 300-pair. Additional 1,300 pairs will be installed in 1996 to comply with "Zero Back Log" policy. There is an ongoing project to install Remote Subscriber Unit (RSU) in Tangub; within 2km from the airport. The Tangub RSU will have a capacity of 1,300 lines.

5.2.6 Airport Surroundings

Bacolod Airport is located at about 3km southwest of Bacolod City, between the seashore and the National Road No. 1. There are Magsungay River and Tangub Creek near the airport. These river and creek run from the east to west generally. Magsungay River runs about 50m north from the end of Runway 22. Tangub Creek flows down to the eastern boundary of the airport, and then flows along the airport boundary toward the sea at Runway 02.

Figure 5.2.2 shows existing land use around Bacolod Airport. As seen, the airport surroundings have already been urbanized densely. There are commercial and industrial areas, hotels, hospitals and a church along the National Road which runs along vicinity of the airport. The area to the south of the airport terminal is St. Vincent Village (including St. Vincent Home for Orphans and the Aged), and Villa Cristina Subdivision to the south of the Tangub Creek. There is J.R. Torres Subdivision, Villa Servando Subdivisions and Palms Del Mar Village Beach Club to the west of the airport. There are fisherman village and fishing port in the areas to the southeast and southwest of the airport.

Names and populations (as of 1990) of communities around the airport are as follows:

a) Barangay Singcang Airport : 26,749
b) Barangay Tabgub : 18,091

Future land use plan prepared by the City of Bacolod is shown in Figure 5.2.3. As seen, the area to the east of the airport along the National Road No.1 is designated as light industrial district, and the area to the west of the airport is divided into residential district, commercial district and open space. The area to the north is designated mainly commercial district.

It seems that there are no historical or cultural properties in the vicinity of the airport. There is a small mangrove area at the mouth of Tangub Creek near Runway 02. There has been no complaint for pollution, including aircraft nose, in Bacolod City.

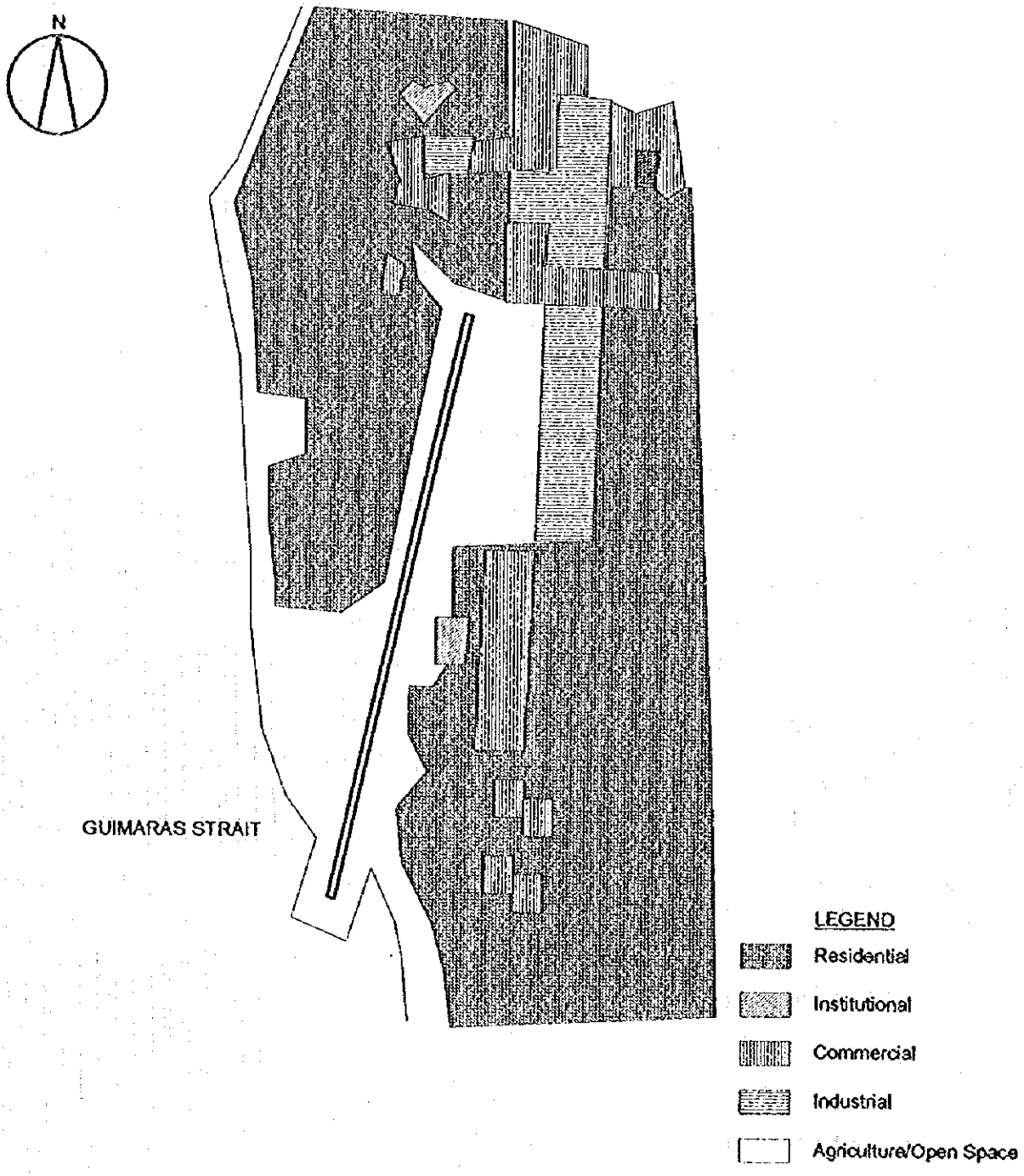

Figure 5.2.2 Existing Land Use around Bacolod Airport

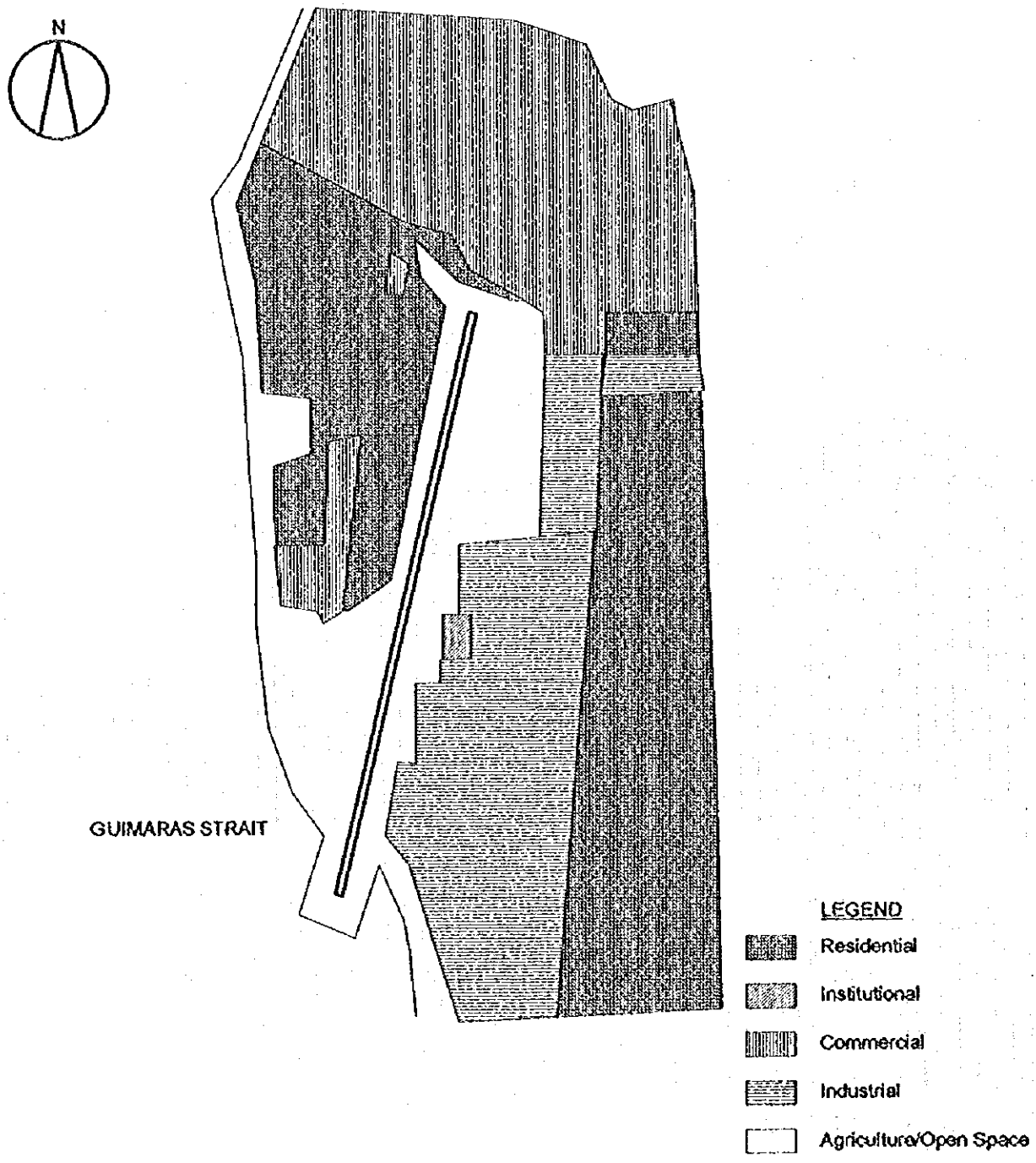

Figure 5.2.3 Future Land Use Plan of Bacolod City around Bacolod Airport

5.3 EVALUATION OF EXISTING AIRPORT FACILITIES

5.3.1 Summary

The evaluation of existing facilities at Bacolod Airport is summarized in Table 5.3.1.

5.3.2 Runway Strip and Obstacle Limitation Surfaces

1) Runway Strip

The dimensions of the runway strip for Bacolod Airport are not officially declared. However, the obstruction survey by the ATO in 1994 used 150m wide runway strip for evaluating obstacles for the transitional surfaces. The 150m wide runway strip is adequate for non-precision instrument approach operation of B737-300, in the light of Philippine's Civil Air Regulation as well as Japanese Standard. According to the ICAO, the airport should have an ICAO reference code of 4C, and the recommended configuration of the runway strip by ICAO is 2,220m by 300m.[1]

Although some 450 squatter shanties were recently eliminated from areas for the ILS glide path as well as from the area between the runway 22 threshold and general aviation area, there are still many problems for the runway strip in terms of obstacle limitation and slope requirements. A part of the National Road No.1 (approx. 80m long section) runs across the area of the 150m wide runway strip. The reclaimed land for the runway extension is of only 90m wide, which is less than the standard. In terms of slope requirements, a canal along the eastern side of the runway located at 50-60m away from the runway centerline, which may endanger aircraft in the event of running off the runway. The grading on the western side of the runway is also unsatisfactory.

If a 300m wide runway strip is applied, the entire part of the existing terminal area will be situated within the 300m wide strip. New residential area development on the western side of the airport will conflict with the wider runway strip. In addition, the proposed site for new terminal facilities in the Five Year National Airport Development Program is not sufficiently separated from the runway centerline.

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[1] ICAO recommends that an object situated on a runway strip which may endanger airplanes should be regarded as an obstacle and should, as far as practicable, be removed, and also that for a 300m wide strip for an instrument runway, a portion with a distance of at least 75m from the centerline of the runway and its extended centerline should provide a graded area for airplanes in the event of running off the runway. The maximum slope on the graded area for the code number 4 should be 1.5% longitudinally and 2.5% transversely.

Table 5.3.1 Evaluation of Existing Facilities at Bacolod Airport

Facilities / Year		2000	2005	2010	2015	Remarks
1) Runway Strip and Obstacle Limitation Surfaces		X				• The National Road No.1 runs within the 150m wide runway strip. The runway strip , not complying with the ICAO's obstacle removal and grading recommendations, may endanger aircraft in the event of running off the runway or low flying. • There are many obstacles intruding above the runway 22 approach surface and the transitional surfaces, including aircraft on the apron, fire station, etc.
2) Runway	- Length	▬	▬	▬	▬	• The existing 1,958m long runway is adequate for operations of B737, A320 and A300 for anticipated domestic destinations by 2015, provided that obstacles upon the runway 22 approach surface are removed.
	- Width	X ▨	▨	▨	▨	• The width of the runway is 30m for about 80% of the total length, which should be widened to 45m as planned in DOTC's Five Year National Airport Development Plan.
3) Taxiway	- Aircraft Handling Capacity	▬	▬	▬	▬	• No parallel taxiway will be required for anticipated peak hour aircraft movements before 2015.
4) Apron	- Aircraft Stand Capacity	▬				• The existing apron can accommodate up to 4 B737s by rearranging parking positions. It has enough capacity for the present level of aircraft movements, but will be saturated by increasing air traffic volume before 2000.
5) Airfield Pavements		X				• The existing pavements designed for B737 will need asphalt overlay to accommodate A300, which is adequate for Bacolod-Manila sector even for the present level of air traffic according to our forecast.
6) Passenger Terminal Building	- Passenger Handling Capacity	X				• The existing 1,003 sq.m passenger terminal area is much smaller than the standard requirement of 2,800 sq.m to handle 280 peak hour passengers at present. The terminal space is not adequate for operations of A300.
	- Quality of Services	X				• No space is available for the public in the terminal building. No baggage screening device is available. No air conditioning is available for check-in lobby and arrival area. • The passenger terminal building is structurally in good condition except roof.
7) Cargo Terminal Building	- Cargo Handling Capacity	▬				• The cargo terminal area has sufficient capacity to handle present level of cargo traffic. The expansion of capacity will be required before 2000.
8) Control Tower and Administration Building		X				• The visibility from the control tower is poor due to trees obstructing the sight and its low elevation. The roof of the control tower has a water leak problem. Very limited space is available for the administration office.
9) Vehicle Parking Area	- Vehicle Parking Capacity	X				• The existing vehicle parking area has insufficient capacity for the present peak hour vehicular traffic volume. Waiting taxis make a long queue on the National Road No.1. The length of the terminal frontage is also insufficient.
10) Radio Navigation Aids		X ▨	▨	▨	▨	• The installation work of ILS is ongoing at present. D-VOR/DME will replace existing C-VOR under Nationwide Air Navigation Facility Modernization Project - Phase III.
11) ATC and Communication Systems		▬	▬	▬	▬	• The existing systems were renewed recently by USAID. PC/Fax machine, VSAT, etc. are planed to be installed under Nationwide Air Navigation Facility Modernization Project - Phase III.
12) Airfield Lighting Systems		X				• The existing approach lights do not comply with ICAO's requirements for precision Category-I approach operations.
13) Meteorological Observation System		X				• No PAGASA station is available at Bacolod Airport. The existing systems are not adequate for civil aviation purpose.
14) Rescue and Fire Fighting		X				• The existing category 5 level of protection is insufficient for the present requirement of category 6. An increase of CRF capability is required. The replacement of 2 old major vehicles needs to be considered.
15) Power Supply System		▬				• Back up generators are operating at near their capacity. The expansion of capacity will be needed to cope with increasing electricity demand.
16) Telephone System		X				• Telephone facility is poor for daily operation of the airport. No public phone is available in the terminal building. A greater capacity may be needed for more efficient airport operation and better service for passengers.
17) Water Supply System		X				• The supply from the city authority is often interrupted and of low pressure. The airport depends on deep wells, of which water quality is poor.
18) Sewage Disposal System		X				• The septic tanks used at the airport are working in good condition. However, increasing effluent will require more sophisticated treatment system.
19) Aviation Fuel Supply System		X				• PAL has own fuel supply system with hydrant pits on the apron. The existing system is working in normal condition. The increase of storage capacity is needed to satisfy standard storage requirement of one-week consumption.

Legend	
	X : Indicates that the capacity or quality of existing facility is inadequate at present.
	▬ : Indicates the serviciable period of existing facility in terms of capacity or span of life.
	▨ : Indicates the serviciable period of existing facility upon completion of ongoing or planned project.

2) **Approach Surface**

The obstruction chart produced by the ATO in 1994 indicates many obstacles protruding upon the 2% approach surface for the runway 22, such as TV antennas, trees, electric posts and a building, Sugar Land Hotel. Since then, when a PAPI was installed, some improvements were made. The fourth floor of the Sugar Land Hotel was removed, and electrical posts along the National Road No.1 were lowered. In addition, the runway 22 threshold was displaced by 60m. However, there are still some trees and TV antennas infringing the approach surface. The degree of infringement is about 7m. There is no obstacle for the runway 04 approach surface.

3) **Transitional Surface**

The ATO obstruction chart in 1994 indicates eight hangars on the eastern side of the runway and one tree on the western side of the runway as obstacles above the 14.3% transitional surfaces. The fire station and the DOTC project office are also obstacles to the transitional surface since they are located 75m from the runway centerline. In addition, B737 parked on the apron also infringes transitional surface as an obstacle since the apron is located too close from the runway.

4) **Other Obstacle Limitation Surfaces**

There are no obstacles protruding upon the inner horizontal surface or conical surface.

5.3.3 Runway, Taxiway and Apron

1) **Runway**

Bacolod Airport has a 1,958m long runway. A 42m extension on the runway 04 side is nearly completed to have a total length of 2,000m, which is adequate for B737-300 for the present flight destinations. However because of obstacles over the runway 04 takeoff surface, PAL's B737-300 must suffer from 3,595kg of payload penalty for Bacolod-Manila sector, which is equivalent to 23% of maximum payload or 88% of cargo capacity for full passenger flights.[2]

B737-300 requires a longer takeoff runway than A300-B4, which PAL intends to introduce to Bacolod-Manila sector in its "Airport Development Requirements, Priority 1: 1995-1997".[3]

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[2] For the present runway length of 1,958m under 30°C and zero wind condition. 80kg per passenger is assumed including bags.

[3] The required takeoff runway length for PAL's B737-300, A300-B4 and A320 for Bacolod-Manila (478km) under full payload, 30°C and zero wind condition is as follows:
B737-300 (141 seats): 1,900m, A300-B4 (246 seats): 1,700m and A320 (150 seats): 1,772m.

Our forecast indicates that operation of A300 may be justified even for the present level of air traffic volume. According to our calculation, a 1,940m long runway is sufficient for entire planning horizon up to 2015.

The runway has a 50m stopway for the runway 04 and 60m stopway for the runway 22. They can also be regarded as clearways. The width of the runway is 45m for a 420m section from the runway 04 threshold, while that of the remaining 1,538m portion is 30m. which will be widened to 45m within the current National Airport Five Year Development Plan (1995-2000). Upon completion of the remaining widening work, the runway will comply with the ICAO's recommendation for the runway width. There are no paved shoulders for the runway.

The main approach runway is the runway 04, from the sea. Approximately 60% of the total arriving aircraft use the runway 04 for landing. According to the branch manager of PAL, weather condition of Bacolod Airport is generally good. However, during rainy season aircraft sometimes divert to Cebu or Iloilo due to poor visibility and low ceiling. The frequency of diversions is 3-4 times a year.

All weather wind coverage of the runway 04/22 was calculated based on the data from the control tower in 1995 as follows: (Refer to Appendix 5.3.1 for more detailed analysis)

Cross wind component less than 13 knot:	93.38%
Cross wind component less than 20 knot:	99.07%

No record for visibility and cloud height is available at Bacolod Airport.

2) **Apron and Taxiway**

The size of the apron at Bacolod Airport is 260m by 60m It is now assigned for two B737 class aircraft and two other small aircraft. With rearrangement of the parking positions, it would be possible to accommodate up to four B737 class aircraft. However, the apron capacity will become insufficient due to increasing air traffic volume before 2000. The apron is connected to the runway with two stub taxiways of 23m wide. No parallel taxiway will be required for anticipated peak hour aircraft movements up to 2015.

3) **Pavement**

The strength of the runway is PCN41/R/C/W/U which is adequate for B737 class aircraft. The structure of the runway and taxiway pavement is 25cm aggregate base, 25cm cement

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PAL has not received detailed performance data for A330, which is now considered as the replacement of A300-B4 by PAL.

concrete slab and 10cm asphalt overlay on it. The overlay work was completed in March 1993. The condition of the pavement appeared good.

The apron pavement is of 25cm cement concrete slab on top of 25cm aggregate base. The standard size of a slab is 6.0m by 3.0m. The condition of the concrete slab is very poor. Many slabs have major cracks stretching to one edge to the other edge. Joint sealant is deteriorated and has lost flexibility. Approximately 40m southeastern part of the apron has no adequate drainage. A detailed investigation report on the existing pavements is shown in Appendix to Section 5.3.2.

The existing pavements will require substantial repairs and a strengthening work to accept A300, which is adequate for Bacolod-Manila sector even at present according to our forecast. PAL evaluated that the existing pavements will require some 25cm (10 inch) overlay to have PCN52 for A300, which will be reviewed in Section 5.5.

4) General Aviation Area

The general aviation area is located on the both side of the terminal area. There are seven general aviation operators, which have hangars at Bacolod Airport. Four hangers are located in-between the apron and the runway 22 threshold while the other three on the southern side of the fire station. In addition, eight operators, including individuals, park their aircraft within the airport without using a hangar. Sixteen light aircraft are stationed at Bacolod Airport. Each hangar has a taxiway and small parking space in its front, some of which are paved with cement concrete. One of the hangars on the southern side of the fire station is not used at present.

5.3.4 Passenger and Cargo Terminal Building (including Control Tower and Administration Office)

1) General

The terminal building accommodates passenger terminal area, cargo terminal area, control tower, administration area and PAL airline office area. The terminal building is mostly one story of a reinforced concrete structure. The control tower located at grid Nos. 7 & 8 is four stories with a reinforced concrete structure (1F-3F) and steel frame structure (4F, VFR room). The terminal building has a total floor area of about 2,100 sq.m. and is owned by PAL. Floor plan of the terminal building is shown in Figure 5.3.1.

The floor area of the passenger terminal, the cargo terminal, etc. are as follows:

a)	Passenger Terminal Area		1,003 sq.m
	(Departure Area	713 sq.m)	
	(Arrival Area	290 sq.m)	
b)	Cargo Terminal Area		450 sq.m
c)	Control Tower and Administration Area		247 sq.m
d)	PAL Airlines Office		420 sq.m
		Total	2, 120 sq.m

The structure of the terminal building is, generally, in good conditions except the roof. Many corrugated sheet roofs are fastened with rust in the south part of the terminal building. It is necessary to repair the roof to prevent from any rain water leakage.

2) Passenger Terminal Area

a) Total Floor Area

As previously stated in Section 4.4, the unit floor area of 10 sq.m per peak hour passenger is considered adequate for estimating the required floor area for the passenger terminal building. Since the current peak hour passengers in two ways are estimated to be 280 passengers based on the current flight schedule, the required floor area is estimated to be 2,800 sq.m, which indicates that the present available floor area of 1,003 sq.m is far from sufficient even for the present peak hour passenger volume.

b) Operational and Functional Aspects

Departing and arriving passengers flows, including baggage flow are shown in Figure 5.3.1. Actual conditions of the major terminal components are compared with the standard requirements in order to evaluate the existing terminal building. As a result, there are many insufficient spaces and facilities at the existing terminal building as shown in Table 5.3.2 below.

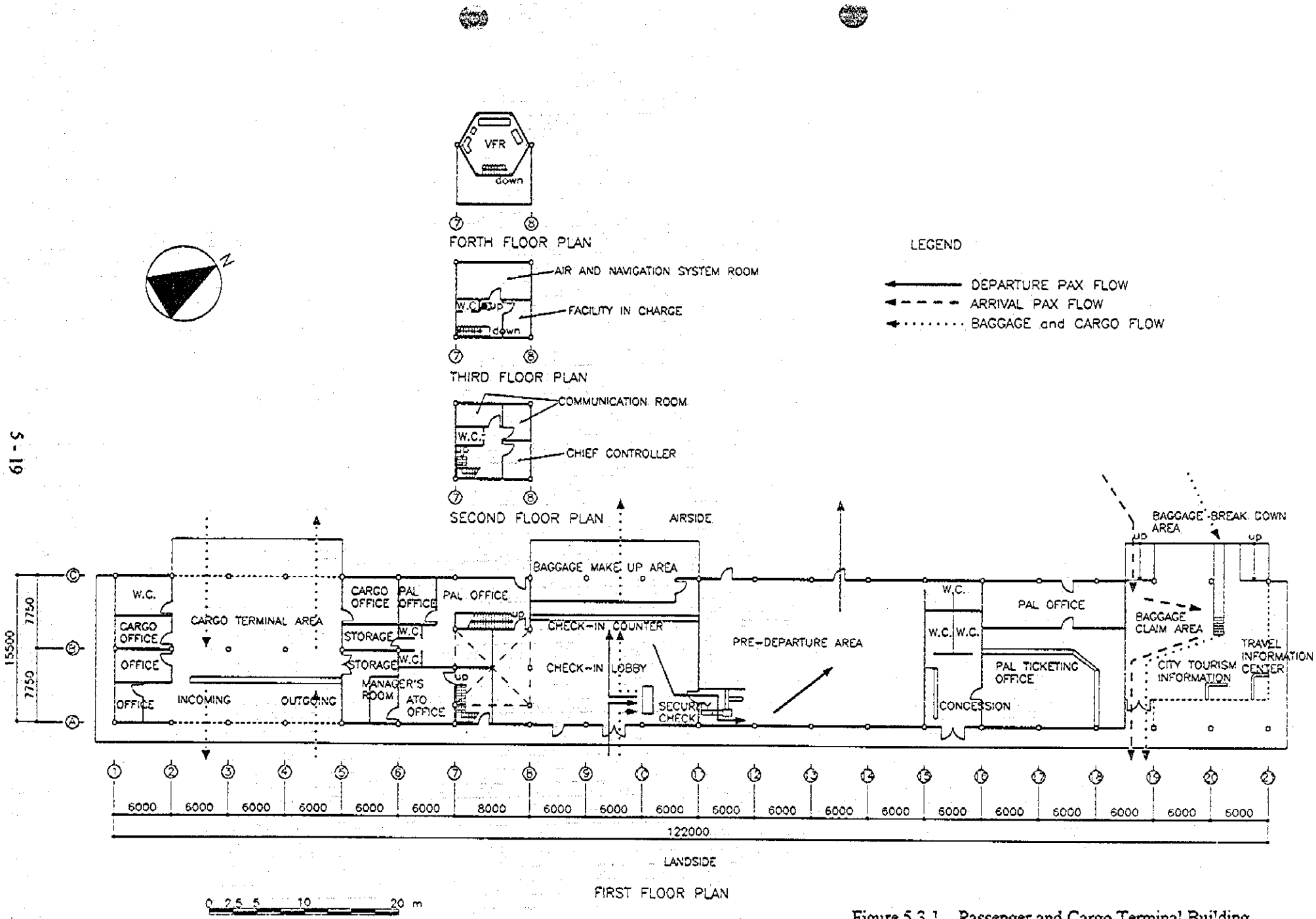

Figure 5.3.1 Passenger and Cargo Terminal Building

Table 5.3.2 Comparison of Standard Requirements and Existing Conditions of Major Components of the Passenger Terminal Building: Bacolod

Major Components and Facilities	Requirements*	Existing	Remarks
Peak Hour Pax 140 One Way			
1. Departure Curb	13m	18m	Sufficient
2. Departure Concourse	284 sq.m	150 sq.m	Insufficient
3. Security Check-Check-in Bag	1 unit X-ray equipment	No X-ray equipment	Insufficient
4. Check-in Queuing Area	39 sq.m	90 sq.m	Sufficient
5. Check-in Counters -Common Use	6 Counters	3 Counters	Insufficient
6. Security Check-Gate Lounge	1 unit X ray equipment & Magnetometer	1 unit Magnetometer but No X-ray equipment	Insufficient
7. Gate Lounge (Pre-Departure Area)	125 sq.m	360 sq.m	Sufficient
8. Baggage Claim Area	139 sq.m	160 sq.m	Sufficient
9. Number of Bag. Claim Devices	1 unit 30 m long	1 unit 10 m long	Insufficient
10. Arrival Concourse	254 sq.m	145 sq.m	Insufficient
11. Arrival Curb	13m	18 m	Sufficient

Note*: The requirements were calculated by using IATA formulas and the more details are explained in Appendix 5.3.3.

Major problems of the existing terminal building in terms of operation and function are summarized as follows:

i) Congestion at Forecourt

There is no public concourse within the terminal building. Thus, visitors are not allowed to enter the building and forced to crowd at the terminal forecourt. As a result, the forecourt is overcrowded by passengers and visitors during peak hours. The eaves over the forecourt is not long enough to prevent people at forecourt from getting wet by pouring rain with wind.

ii) Necessity of X-Ray Equipment at Security Check before Check-in Counter

Passengers are obliged to open all check-in baggage for security check because no X-ray equipment is provided. This manual baggage inspection naturally causes congestion during peak hours. For passenger convenience, operational efficiency and safety reliability, it is necessary to install x-ray equipment.

iii) Necessity of X-Ray Equipment for Cabin Baggage

Magnetometer (metal detector equipment) is provided for the security check prior to entering the pre-departure area, however, no X-ray equipment is provided for security check of cabin baggage. Thus the same problem of manual search described item ii) above is observed. Installation of X-ray equipment is recommended for the same reasons stated under item ii).

3) Cargo Terminal Area

The cargo terminal area is located in the south of the terminal building. It does not seem to have any particular problems at present for cargo handling it self. Considering the overall terminal operation, however, the location of cargo terminal is occupying too precious zone of the airport. The expansion of capacity will be required before 2000 to cope with increasing cargo traffic volume.

4) Control Tower and Administration Area

The control tower and administration area are located in between the cargo terminal and the departure passenger terminal area. The administration area, located on the first floor, is very small for daily activity of airport operation. Equipment rooms and ATO engineering room are on the second and the third floor.

VFR room is on the fourth floor and is a hexagonal configuration with about 10.7m floor height. The visibility from the control tower is poor due to trees obstructing the sight and its low elevation.

5.3.5 Other Buildings

1) Fire Station Building

The building is located to the southwest of the passenger terminal building, next to PAL fuel farm. It is one story with a reinforced concrete structure and has a total floor area of about 350 sq.m. The building conditions, the structure is in good condition, but roofing and under eaves materials are deteriorated seriously. It is necessary to repair the roofing and under eaves.

2) Power House Building

The building is located to the southeast of the passenger terminal building, facing to the main street. It is one story with a reinforced concrete structure and has a total floor area of about 60 sq.m. The building is in good conditions.

3) Hangars

Three hangars are located to the south of the fire station building, some 300m away. Of three hangars, one located in the middle is seriously deteriorated like ruins and is no longer used. The rest of the hangars are being operated and the buildings are in good conditions.

4) General Aviation Buildings

Four general aviation buildings are located to the north of the passenger terminal building, close to the runway 22 threshold and are being operated. The four buildings also used as hangars are generally in good conditions.

5.3.6 Roads and Vehicle Parking Area

The terminal area of Bacolod Airport is located facing the National Road No.1. There are one entrance to the near center of the vehicle parking area and one exit on the southern end of it. The northern part of the parking area is generally used by vehicles for arrivals while the southern part for departures and the cargo terminal. The parking area has approximately 100 designated parking slots, which are roughly divided half and half for arrivals and departures. The existing vehicle parking area is insufficient for the present peak hour traffic. The Bacolod ATO prohibited the parking of taxis in the vehicle parking area so that more space is available for other users. As a result, taxis make a long queue of 15-20 cars along the National Road No.1 before every incoming flight arrives.

The parking area in front of arrival part of the passenger terminal building is in a cul-de-sac configuration, which requires an ATO official to regulate vehicle flows during busy hours. Vehicular flows in the southern part of the vehicle parking area is adequately regulated with one-way traffic system. The terminal curb frontage is available for only some 20m in front of departures and ticketing office.

The vehicle parking area is paved with asphalt concrete, which is in good condition. A small ditch in front of the terminal frontage easily overflows by rain, making passengers inconvenient to get on or off the vehicle .

5.3.7 Air Navigation Systems

1) Radio Navigation Aids

(1) VHF Omni-directional Radio Range (VOR)

A conventional VOR equipment manufactured by Wilcox was installed in 1990 at this airport. Dimensions of this facility are as shown in Table 5.3.3.

Table 5.3.3 Dimensions of Bacolod VOR

STATION	SERVICE	CALL SIGN OR IDENTIFICATION	EMISSION	TRANSMITS		RECEIVES		HOURS UTC	COORDINATES	LOCATION		OPERATING AGENCY AND REMARKS
				kHz	MHz	kHz	MHz			Mag	NM	
1	2	3	4	5	6	7	8	9	10	11	12	13
BACOLOD	VOR	BC	83W		114.9			* 2000-1200	10 38.4 N 122 55.3 E	ON	AD	* OTHER TIMES THR PN OUTPUT = 100 W

Bacolod VOR has the following problems:

i) The VOR is located proximately to the runway (100m inside of the runway 04 threshold and approximately 69m west side of runway centerline). Thus, this facility becomes an obstacle against the aircraft operations.

ii) Houses and trees existing near the site interrupts performance of the facility.

iii) Some module spare parts are not available locally.

iv) Flight calibration tests have not been done for the last few years and the facility is ground checked only.

(2) Instrument Landing System (ILS)

Installation of an ILS facility for the runway 22 is in progress. The works for a localizer (LLZ) and DME (collocated with the LLZ) are almost completed and awaiting flight calibration tests. The works for the glide path (GP) antenna are still in progress. The width of landing strip of this airport and existing approach lighting system for the runway 22 do not conformable with the requirement for the operation of precision approach Category I. Therefore the operation of precision approach Category I for the runway 22 should be strictly restricted.

(3) Evaluation of Existing Radio Navigation Aids

The installation work of ILS is ongoing, and the existing C-VOR at Bacolod Airport is planned to be replaced by a D-VOR/DME under Nationwide Air Navigation Facilities Modernization Project - Phase III. Upon completion of those works, Bacolod Airport will be capable of precision approach Category-I operations which are the standard requirement for modern jet aircraft although there will be restrictions on operational minima due to sub-standard width of the runway strip.

2) ATC and Aeronautical Telecommunication System

(1) Approach Control

Bacolod Approach Control (APP) , call sign "Bacolod Approach", located in the control tower has the responsibilities to control the IFR aircraft operating within Bacolod/Iloilo TMA except

Iloilo and Bacolod ATZs with the frequency of 122.6MHz on a 24 hour basis by non-Radar.

(2) Aerodrome Control

Bacolod Tower has the responsibilities to control the aircraft operating within the Bacolod ATZ with the frequency of 123.6MHz on a 24 hour basis. The console and light gun in the control tower were renewed in 1994 by USAID.

(3) Flight Service Station (FSS)

Flight Service Station (FSS), call sign Bacolod Radio, which is located in the control tower is operative between hours 2200 and 1100 UTC (0600-1900 local time) for transmitting/receiving the flight data between Iloilo airport and Mactan ACC, using frequencies of 5205 and 3872.5KHz.

(4) Equipment Room

Transmitter/receiver and standby equipment of VHF and HF frequencies and Voice Recorder are installed in the equipment room which is located downstairs of the VFR room. These equipment are maintained in good conditions.

(5) Evaluation of Existing ATC and Aeronautical Telecommunication Systems

The existing systems were renewed recently by USAID, and generally operating in good condition. PC/Fax machine and VSAT will be added under Nationwide Air Navigation Facilities Modernization Project - Phase III. The existing systems are adequate for operational needs for anticipated air traffic volume up to 2015 if necessary maintenance and replacement of aging equipment are undertaken.

3) Airfield Lighting Systems

(1) Existing Systems

The lighting systems controlled by the control tower and operative at this airport are as follows:.

- Runway edge lights
- Threshold lights for the both runways 04/22
- Taxiway edge lights
- Aerodrome beacon (out of service)
- PAPI for the both runways 04/22
- Approach lights

  3 barrettes for the runway 22

  4 barrettes for the runway 04

The last barrette of the approach lights for the runway 22 is invisible from the approaching aircraft due to the existing trees and houses around. Aerodrome beacon is out of service. The other lighting systems seemed in good conditions.

(2) Evaluation of Existing Air Field Lighting Systems

The existing systems are operating normally although some of them are obsolescent. The existing approach lights do not comply with precision approach Category I operations, which are the standard requirement for modern jet aircraft. It is desirable to install Precision Approach Category I Lighting System (PALS) for the main approach runway and Simple Approach Lighting System (SALS) for the other side of the runway.

4) Meteorological Systems

PAGASA provides the meteorological services for civil aviation in the Philippines. However, no local office of PAGASA is available at Bacolod airport. Since Bacolod's control tower can not receive the official data, meteorological observations are practiced and recorded hourly by the controllers. The values of wind directions/speeds and atmospheric pressures are decided by the gauges which are provided in the console, and cloud basis and ground visibility are decided by controller's observation. More sophisticated observation and recording systems are required for civil aviation purpose.

5.3.8 Rescue and Fire Fighting Services

The crash, rescue and fire fighting services declared for Bacolod Airport are ICAO's category 6 level of protection, which corresponds to B737 class aircraft. There are one RIV of 2,270L (600 gals.) water capacity, two major vehicles of 3,030L (800 gals.) and 1,890L (500 gals.) water capacities, and one ambulance. The total water tank capacity of the fire vehicles is 7,190L, which is insufficient for the category 6 requirement of 7,900L. An increase of CRF capability is required. The RIV was deployed in 1990. The two major vehicles, deployed in 1962 and 1970, exceed normal operating life and have a spare parts problem. Their working condition is so far normal, but replacement needs to be considered. There are 27 trained personnel for the services. No offshore rescue equipment is available.

The level of protection should be increased at least to category 7 for operating A300, which is justified for Bacolod-Manila sector even at present according to our forecast.

5.3.9 Airport Utilities

1) Storm Water Drainage

Storm water fallen within the airport is drained to either the sea in the southwest or the Magsungay River on the northeast. A main canal on the eastern side of the runway discharges storm water from the terminal area as well as the major part of the eastern side of the runway strip. The system is not well maintained without adequate dredging and grass cutting. As a result, the runway strip often inundated by storm water. In addition, storm water on the other side of the National Road No. 1 flows through the pipe culvert near the power plant, and floods into the airport property.

The area between the two taxiways and its northern adjacent part of the runway strip seem to have no adequate drainage system. Standing water exists on about 40m northern section of the apron and the northern taxiway for a long time after rain. The same situation was observed on the western side of the runway strip.

Storm water on the eastern side of the runway 22 threshold flows into the Magsungay River through a culvert along the National Road No. 1. The drain of storm water in this area is inefficient without adequate slopes.

Regardless of the above problems, it has been seldom that the airport operation was affected by major floods or typhoons. In December 1995, a few hundred meter middle section of the runway was inundated by storm water of a typhoon and the airport was closed for one night. The original function of the storm water drainage system should be restored by re-excavating the canals.

2) Fencing

The airport has in total 3,175m long barbed wire/concrete pole fence, which is not enough to encompass the whole airport property. Except the concrete hollow block fence along the National Road No. 1, the barbed wire/concrete pole fence is dilapidated in many places. In particular, a road along the Magsungay River to the western side of the airport is, regardless of its location within the airport property, used by the public. As a result, the runway 22 threshold is easily accessible. It is necessary to replace barbed wire fence by galvanized wire mesh fence or concrete hollow block fence for greater security and safety.

3) Power Supply System

Electric power for the airport is supplied by Central Negros Electric Cooperative (CENECO). The ATO receives electricity at 13,200V from CENECO through a meter at the power plant.

Electricity received at the power plant is distributed to the control tower, VOR and aeronautical lighting system. The received electricity is decreased its voltage to 220V with three 1972 made old 15KVA transformers, and then regulated and supplied to respective equipment. In addition, there is another meter at the fire station, where it receives 220V electricity from CENECO. Average consumption of the commercial power is about 1,300KWH per month.

There are occasional power failures, 10 times a month on average. The ATO has three emergency generators of 80KVA (installed in 1972), 156KVA (1993) and 100KVA (second hand from other airport). The 80KVA generator is used as a main with automatic starter, while the other two for standby. Those generators are capable of covering all the ATO's facilities. However, the generator is operating at near capacity. It takes less than one minutes to switch from the commercial supply to the back-up system with the automatic system. It is about two minutes when the standby generator with a manual switch is used.

PAL has an independent contract with CENECO for its terminal building and other facilities. It has an old 60KVA generator within the fuel depot.

4) **Telephone System**

The Bacolod ATO has three external telephone lines, one for the control tower and two for the administration office, each of which has one extension. In addition, there is an internal telephone network connecting the administration office, control tower, power plant, fire station and DOTC project office. There are difficulties for daily operation of the airport due to the shortage of telephone lines; however, obtaining new lines from PLDT is very difficult. The installation of PABX needs to be considered for efficient use of external lines.

No public phone is available at Bacolod's passenger terminal.

5) **Water Supply System**

Water is supplied by the Bacolod Water District. It is received through three meters at the fire station, power plant and DOTC project office. There is a 600L elevated water tank behind the power plant, from where water is pressurized and sent to the control tower. Since there are very occasional interruption of the city water supply, the average monthly consumption of the city water is only 100 cu.m. Instead, the power plant and fire station have deep wells. The capacity of the deep wells is large enough; however it is used as a back up system because the quality of ground water is very poor. City water is safe for drinking.

PAL also has a city supply and a set of deep well and water tank for the terminal building. The capacity of the water tank is 5,680L (1,500 gals.).

6) **Sewerage System**

Sewage is treated by septic tanks for individual buildings. The present system is not the one which ensures effluent quality, but is working in good condition. More sophisticated treatment system is desirable to cope with increasing effluent.

7) **Solid Disposal System**

Solid disposal from the airport is collected by the Public Service Department of Bacolod City. There is no incinerating place within the airport.

5.3.10 Aviation Fuel Supply System

The aviation fuel supply system at the Bacolod Airport is owned and operated by PAL. There are four horizontal fuel tanks of 15,400 to 22,330L (4,070 to 5,900 gal.) capacities besides the southwestern edge of the apron. The total capacity of the tank is 76,350L (20,170 gals.). The fuel is supplied to aircraft from four pits on the apron through the hydrant system. Average consumption of fuel at the airport is about 22,700L (6,000 gals.) per day. The fuel is supplied by PETRON's fuel truck three times a day.

Besides coping with increasing supply demand, the storage capacity is desirable to be increased to a seven-day consumption level in the light of normal practice.

5.4 COMPARISON OF NEW AIRPORT SITES

5.4.1 General

Province of Negros Occidental identified four potential new airport sites as shown in Figure 5.4.1. Site 1 is located about 8 km southeast of the existing Bacolod Airport and at the boundary of Felisa (Bacolod City) and Tabunan (Bago City). The land of this site is used mainly for sugarcane cultivation. The runway orientation proposed originally was approximately 08/26, but changed to 18/36 by the Study Team so as to avoid obstacles above an approach surface.

Site 2 is located at about 2 km east of Site 1 and at the boundary of Tabunan, Dulao (Bago City) and Damsite (Murcia). The land of this site is used mainly for sugarcane cultivation. The runway orientation proposed originally was approximately 04/22, but changed to 01/19 by the Study Team to avoid obstacles above an approach surface.

Site 3 is located at about 17 km north-northeast of the existing Bacolod Airport; at the boundary of Bagtic (Silay City) and Bagacay (Talisay). The land of this site is used mainly for sugarcane cultivation. Proposed runway orientation is approximately 03/21.

Site 4 is located in Balaring (Silay City) and at about 22 km north of the existing Bacolod Airport. The land of this site is used for fish farming and sugarcane cultivation. Proposed runway orientation is approximately 04/22.

The following two sites were selected based on the desk study using the maps (scale in 1:50,000) by the Study Team:

Site 5 : located in Dulao (Bago City) and at about 11 km south of the existing Bacolod Airport. Proposed runway orientation is approximately 01/19. It was found by the site investigation that majority of the land of this site is used for rice field.

Site 6 : located in E. Lizares (Talisay) and at about 12 km north-northeast of the existing Bacolod Airport. Proposed runway orientation is approximately 02/20. It was found by the site investigation that the site is used both for sugarcane cultivation and residential district.

Subsequent sections describe advantages and disadvantages of the six sites in the following aspects:

a) Airspace;
b) Wind Coverage;
c) Airport Access;
d) Construction Considerations;
e) Environmental Considerations; and
f) Economic Considerations.

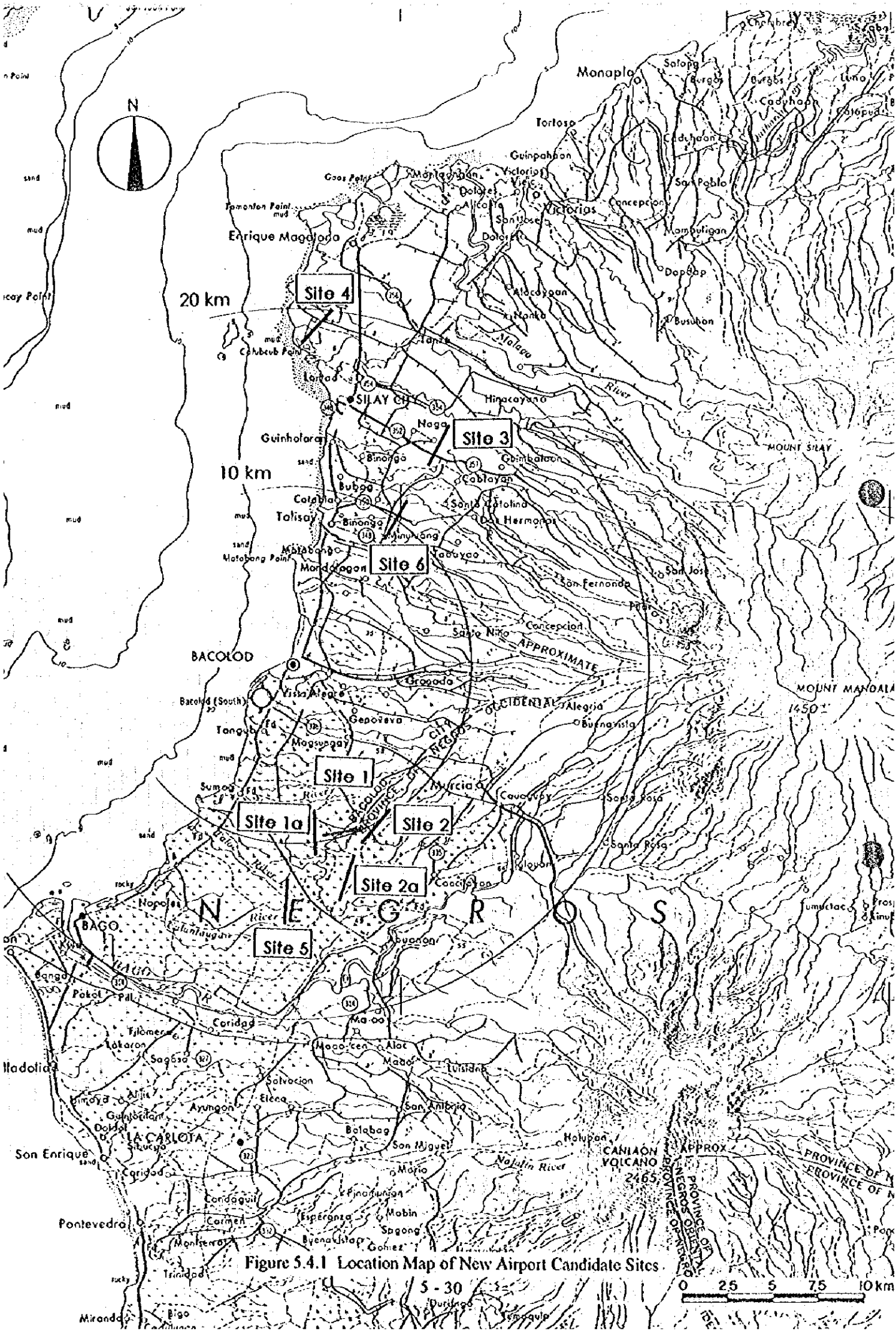

Figure 5.4.1 Location Map of New Airport Candidate Sites

It is assumed for this site selection study that the new airport will have a 2,500 m long runway with 300 m wide runway strip and to be equipped with ILS and Precision Approach Lighting System (PALS). A typical layout of the new airport is shown in Figure 5.4.2.

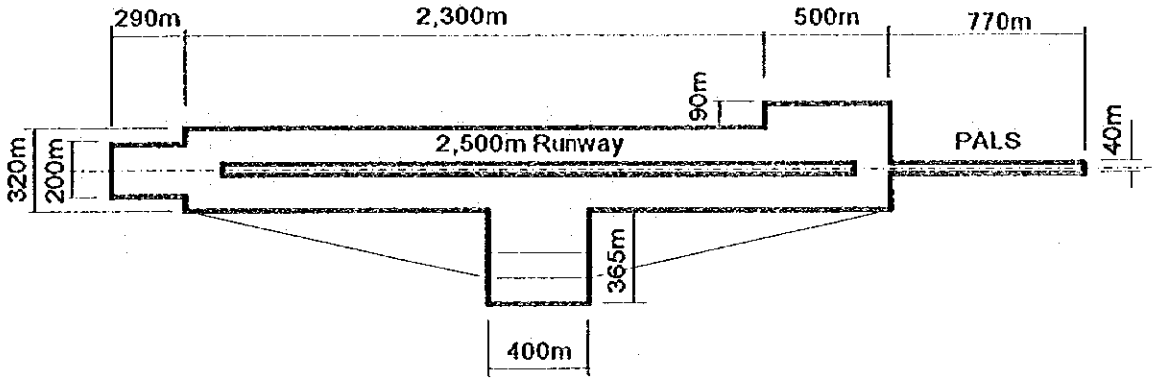

Figure 5.4.2 Typical Layout of New Airport

5.4.2 Airspace

At and around the six sites, there is no danger area, flight training area or other airport except the existing Bacolod Airport. The mountains that may affect the airspace use of these sites are Canlaon Volcano (2,465m), Mt. Mandalagan (1,450 m) and Mt. Silay (about 1,000 m) and are located at about 35 km southeast, 30 km east and 30 km east-northeast of Bacolod City respectively.

The following sections discuss the aspect of potential obstacles around the new airport sites based on the standard obstacle limitation surfaces for precision approach Category I runway (aerodrome code number 4).

1) Site 1

Canlaon Volcano and Mt. Mandalagan are located about 25 km southeast and 30 km northeast of the site. Runway orientation identified by the province is approximately 08/26. This orientation heads toward the airspace between the two mountains. There is, however, a peak (about 1,000 m) under the 08 approach path at about 19 km from the site. The ground elevation at the outer edge of approach surface (15 km from the threshold) is about 300 m above Mean Sea Level (MSL), and very close to the approach surface. (Refer to Figure 5.4.3.)

In order to avoid the foothill to be an obstacles above the approach surface, it is recommended to change the runway orientation from 08/26 to 18/36 (Site 1a) as shown in Figure 5.4.4. By this arrangement there will be no problem in airspace use provided that appropriate control of obstacle is enforced in the vicinity of the new airport site. (Note that a high tension power transmission line runs on the east side and within 3km of the site.) Subsecuent studies was conducted based on the revised orientation (18/36) of the runway.

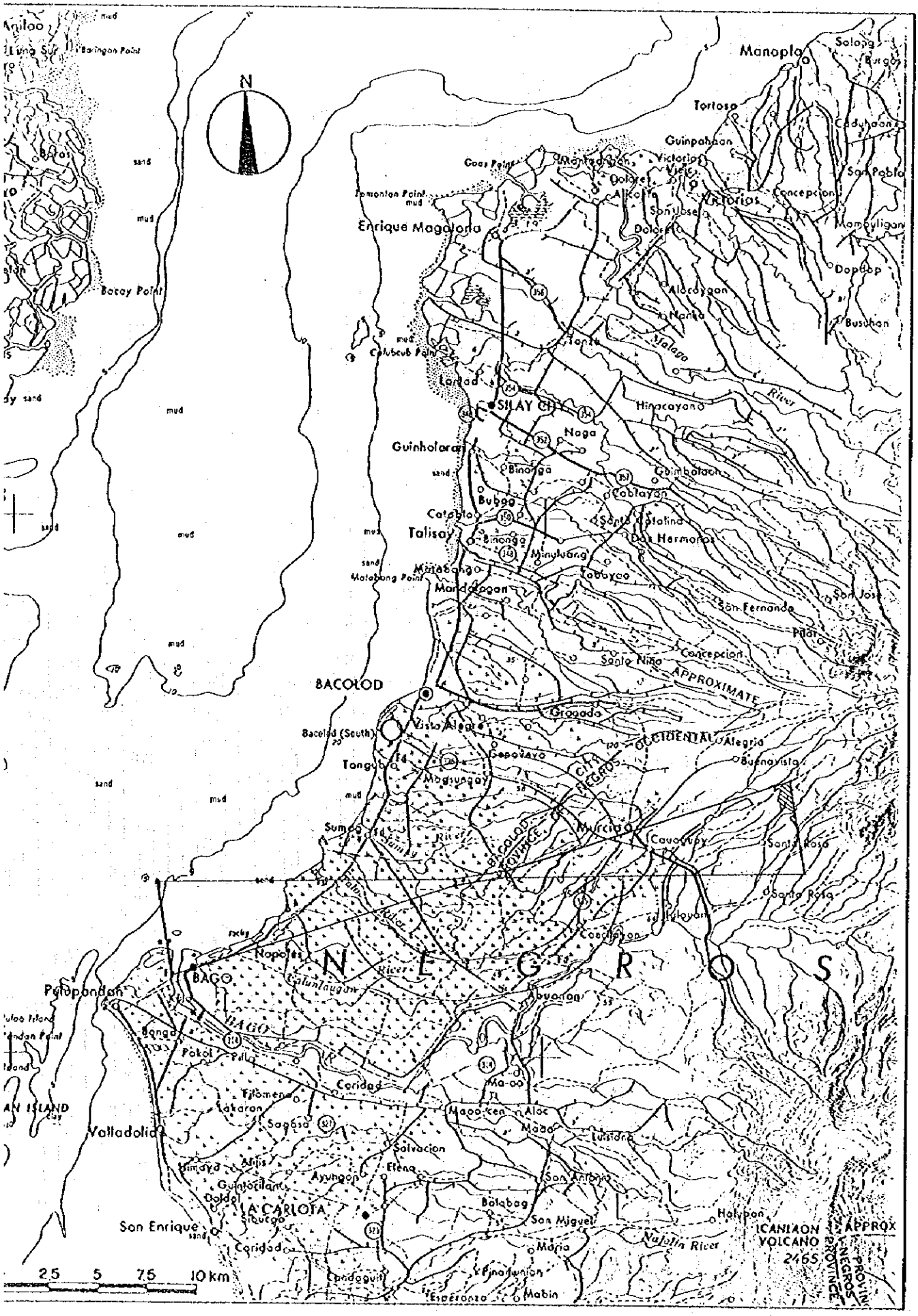

Figure 5.4.3 Obstacle Limitation Surfaces - Site I

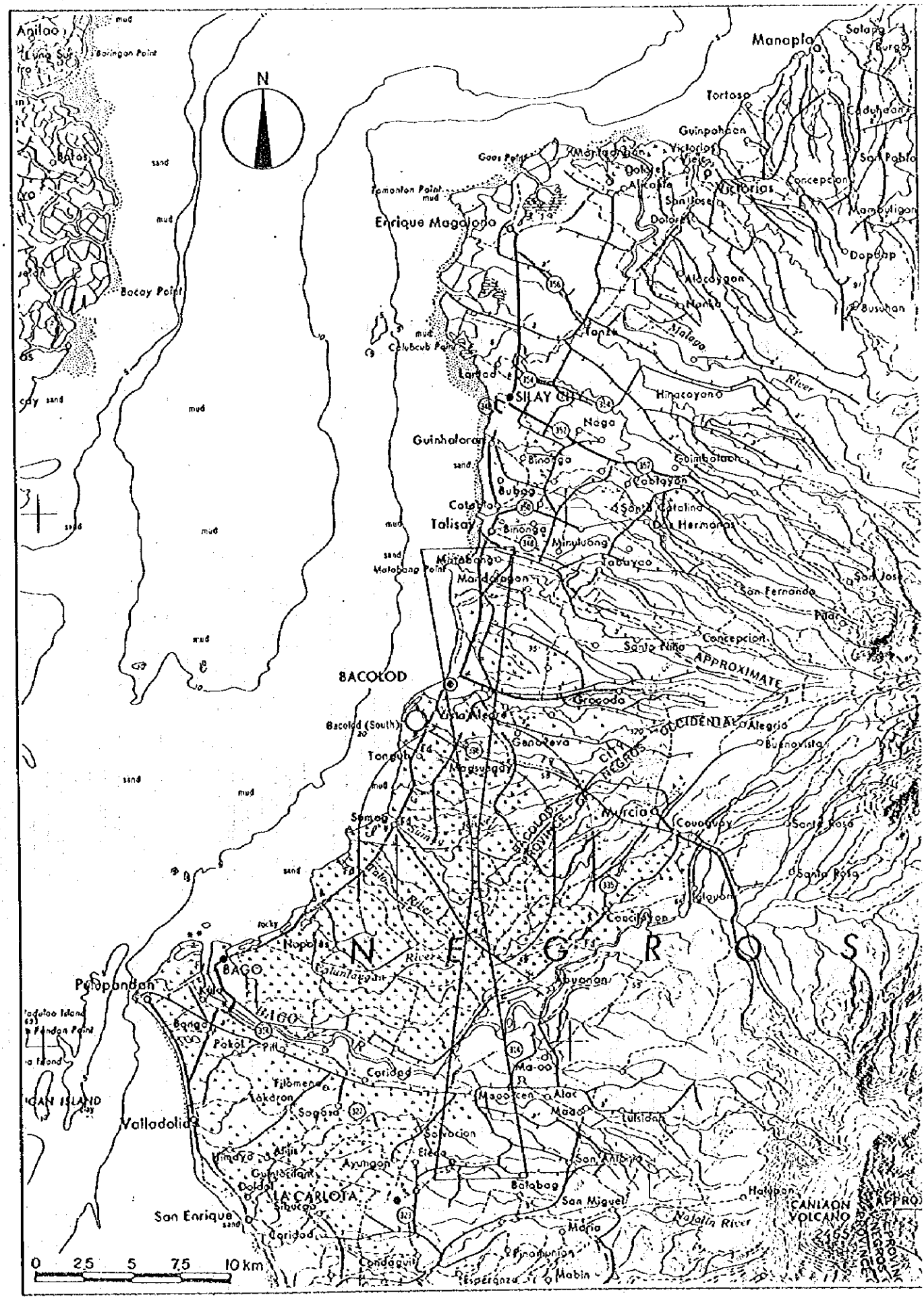

Figure 5.4.4 Obstacle Limitation Surfaces - Site 1a

2) Site 2

Runway orientation proposed by the province is approximately 04/22 which is in line toward the airspace on the west of Mt. Mandalagan. The foot of the mountain at the outer edge of approach surface is about 300 m above MSL, and very close to the approach surface. (Refer to Figure 5.4.5.)

In order to avoid the foot of the mountain to become obstacles above the approach surface, it is recommended to change the runway orientation from 04/22 to 01/19 (Site 2a) as shown in Figure 5.4.6. By this arrangement there will be no problem in airspace use provided that appropriate control of obstacle is enforced in the vicinity of the new airport site. (Note that a high tension power transmission line runs on the west side and within 1km of the site.) Subsecuent studies was conducted based on the revised orientation (01/19) of the runway.

3) Sites 3, 4 and 5

With regard to the airspace around Sites 3, 4 and 5, there is neither natural nor man-made structure that would constitute an obstacle. (Refer to Figures 5.4.7 through 5.4.9.) There will, therefore, be no problem in airspace use provided that appropriate control of obstacle is enforced in the vicinity of these new airport sites. (Note that there are a high tension power transmission line on the west side about 3.5km of Site 3 and two sugar mill factories to the north and southeast about 3km of Site 3. However, they will not obstruct the aircraft operations if emission of smoke is properly controlled.)

4) Sites 6

There is no natural obstacle around the Sites 6. (Refer to Figure 5.4.10.) There are, however, 138 kV power transmission lines of National Power Corporation running across the site. These power lines need to be diverted so as to clear the site for airport development. Once the power lines are relocated properly, there will be no problem in airspace use provided that appropriate control of obstacle is enforced in the vicinity of the new airport site.

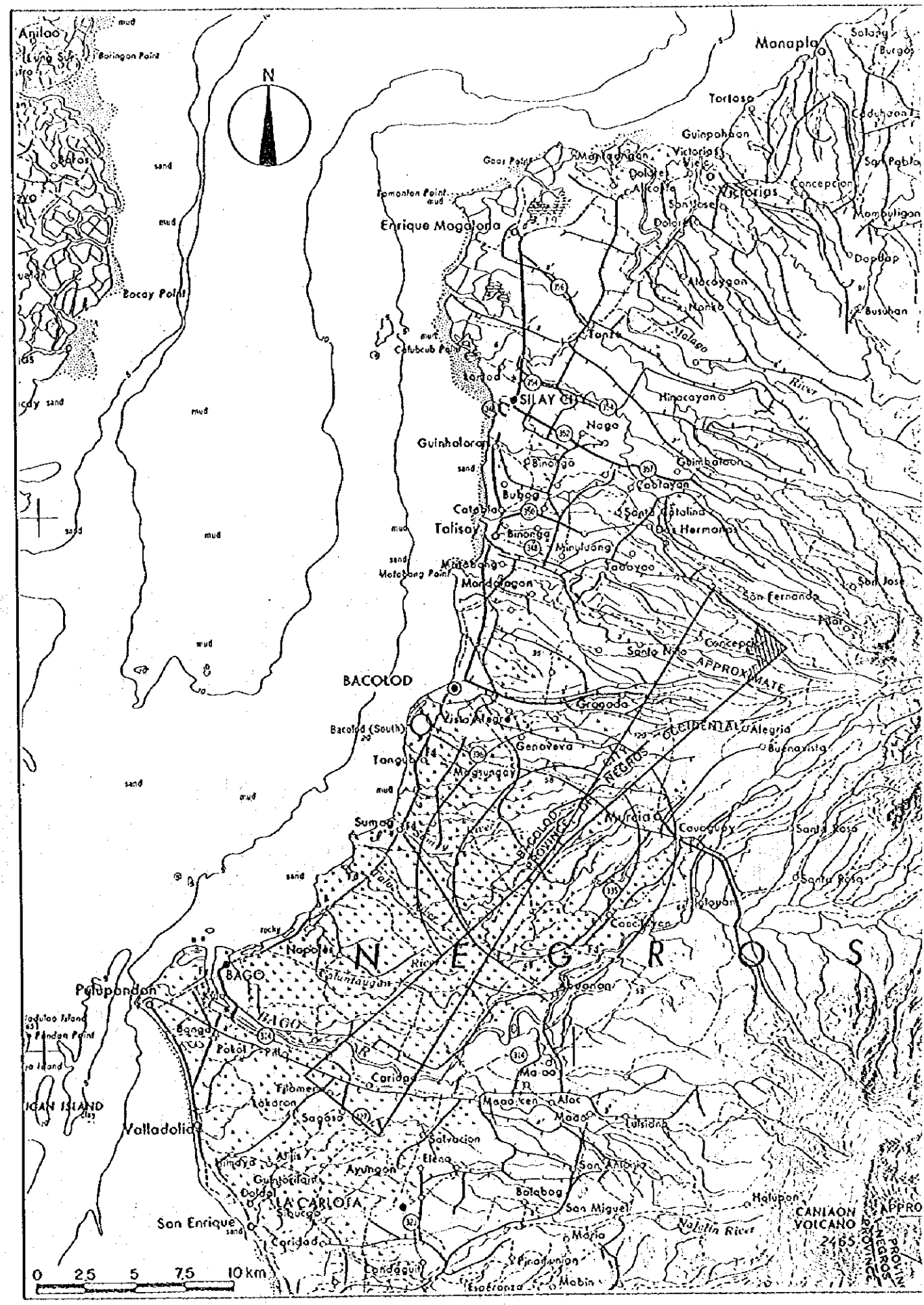

Figure 5.4.5 Obstacle Limitation Surfaces - Site 2

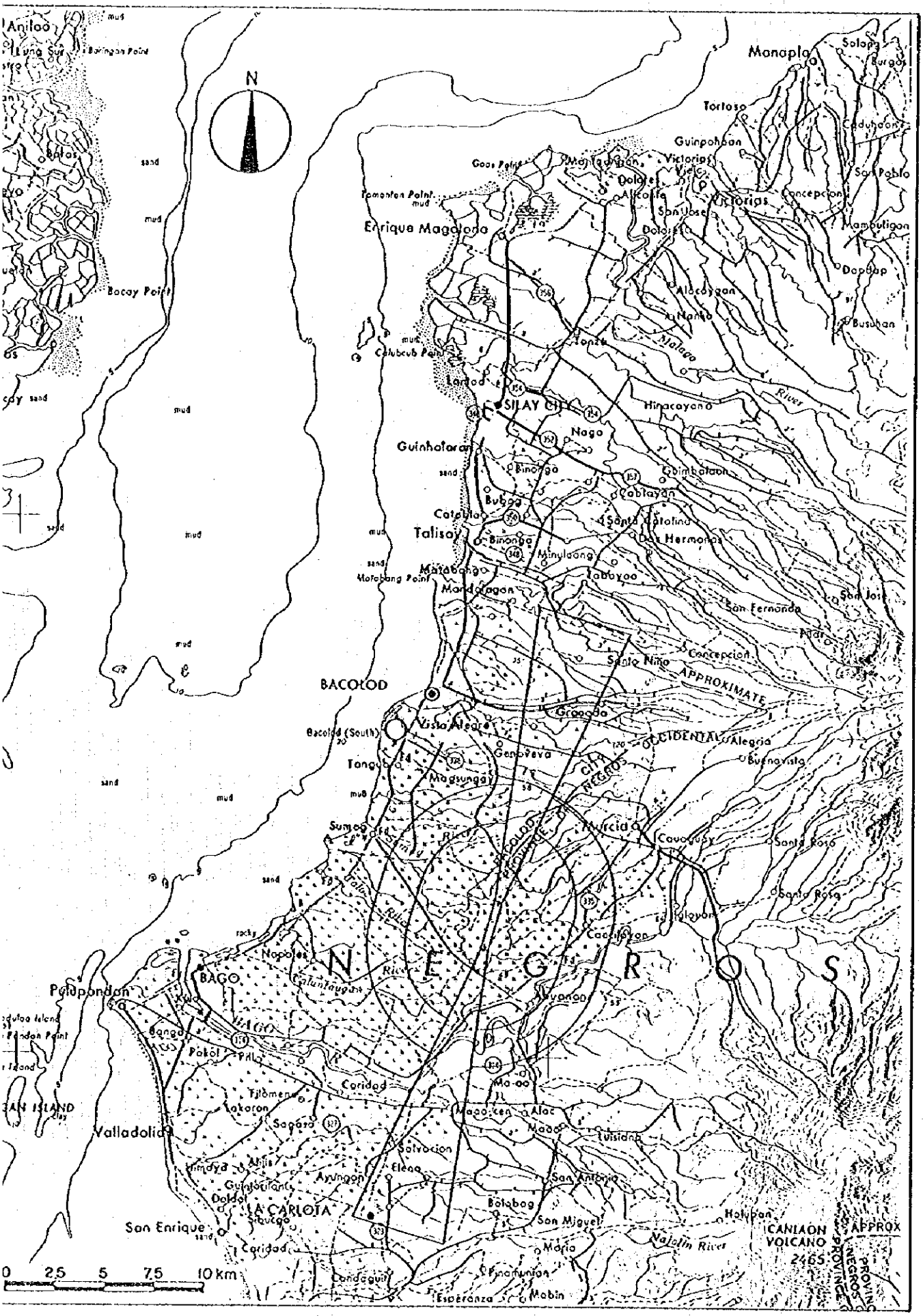

Figure 5.4.6 Obstacle Limitation Surfaces - Site 2a

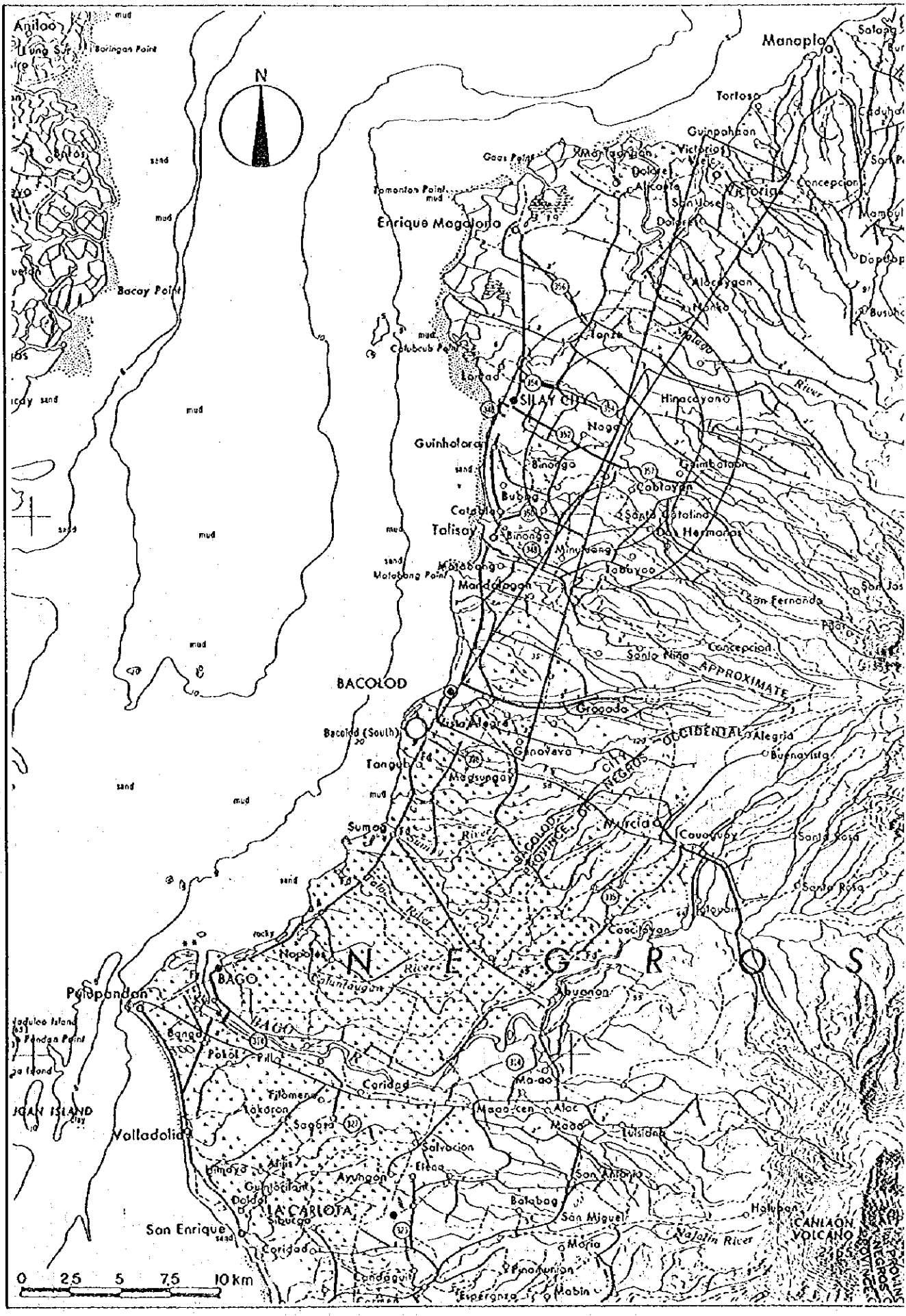

Figure 5.4.7 Obstacle Limitation Surfaces - Site 3

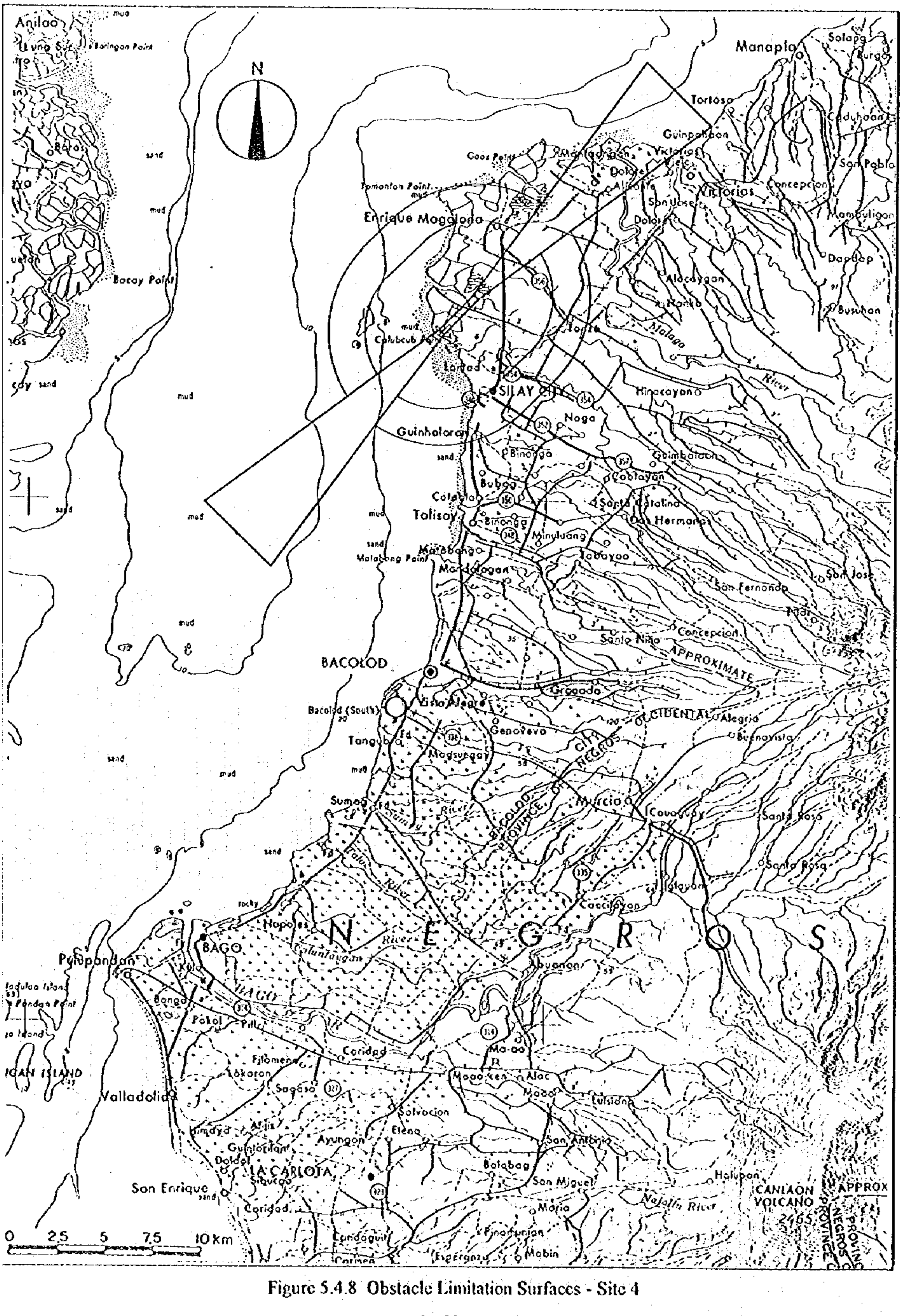

Figure 5.4.8 Obstacle Limitation Surfaces - Site 4

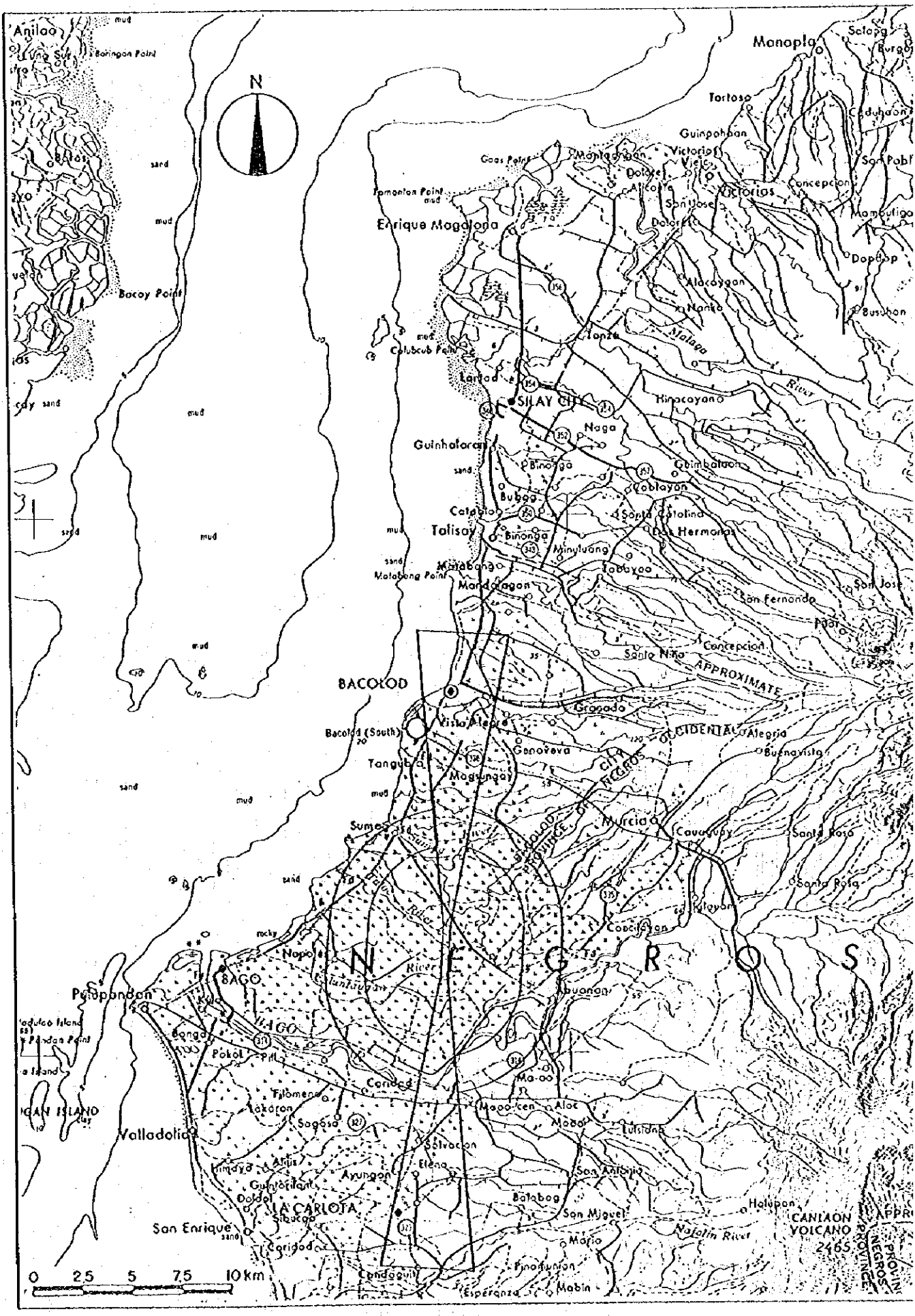

Figure 5.4.9 Obstacle Limitation Surfaces - Site 5

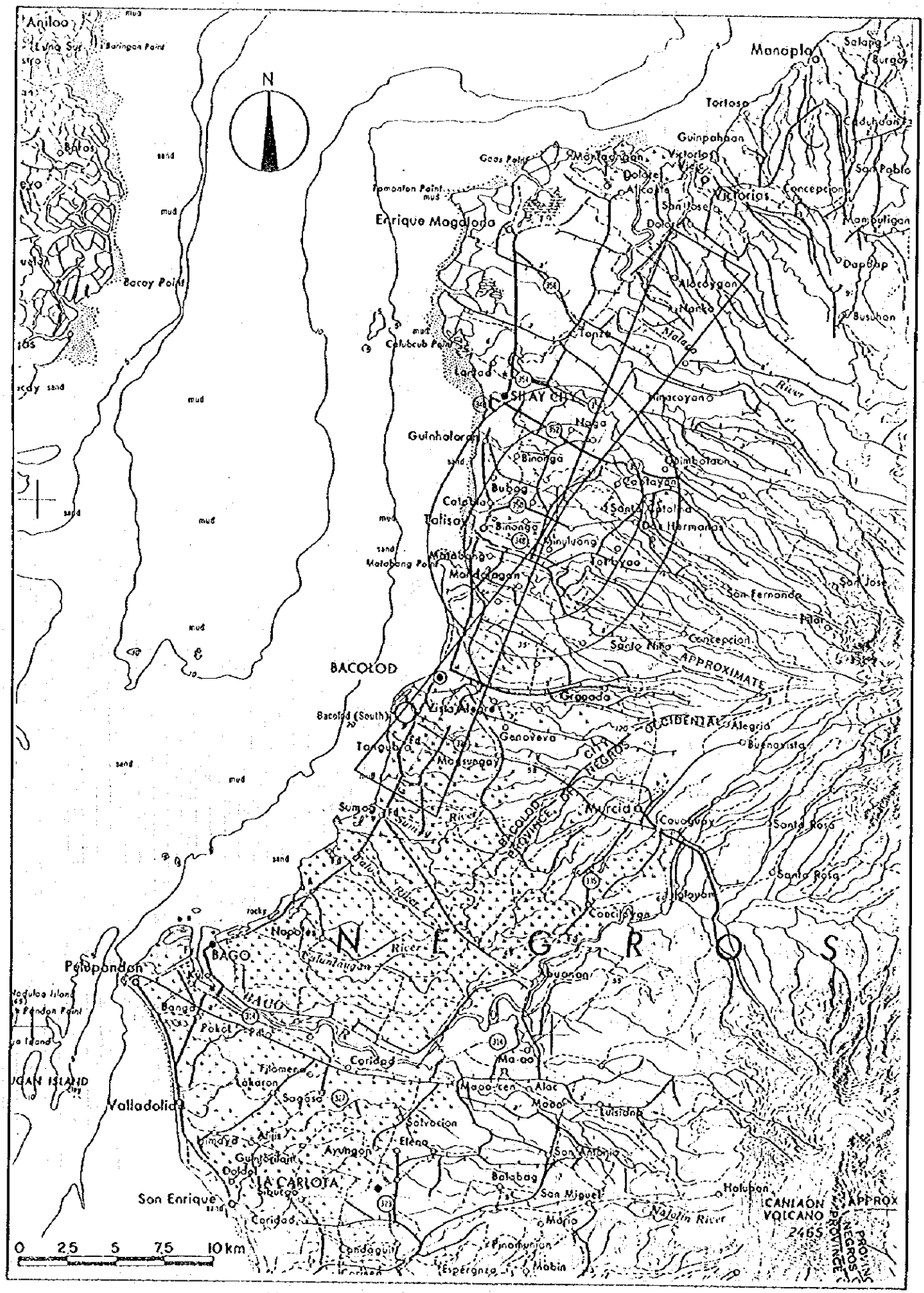

Figure 5.4.10 Obstacle Limitation Surfaces - Site 6

5.4.3 Wind Coverage

Wind coverage of the six sites were estimated based on the hourly weather observation at the existing Bacolod Airport during May 1995 - April 1996. The results are shown in Table 5.4.1.

Table 5.4.1 Wind Coverage

	Site 1a	Site 2a	Site 3	Site 4	Site 5	Site 6
Runway Orientation	18/36	01/19	03/21	04/22	01/19	02/20
Cross-Wind 20 kt	99.9%	99.9%	99.8%	99.8%	99.9%	99.9%
Cross-Wind 13 kt	98.9%	99.5%	99.3%	98.1%	99.5%	99.5%

5.4.4 Airport Access

1) Site 1a

Main access routes from Bacolod, Bago and Silay Cities to Site 1a are shown in Appendix 5.4.1. Travelling distances are about 12 km, 20 km, 20 km and 27 km from Bacolod, Bago, Talisay and Silay, respectively. It takes about 15 to 20 mins from the center of Bacolod to Site 1a. The average distance weighted by populations of the four municipalities (Bacolod : 397,000, Bago : 132,000, Talisay : 68,000, and Silay : 120,000 as of 1990) is about 17 km.

Existing National Road No.1 between Bacolod and Bago Cities is 1-lane, 2-way. Existing provincial road, which may be used for the future airport access, is 6 m wide road with cement concrete surfacing. The road was in good condition at the time of investigation. Construction of a new airport access road (some 3.2 km) will be required.

2) Site 2a

Main access routes from Bacolod, Bago and Silay Cities to Site 2a are shown in Appendix 5.4.2. Route distances are about 15 km, 24 km, 23 km and 30 km from Bacolod, Bago, Talisay and Silay, respectively. It takes about 15 to 20 mins from the center of Bacolod to Site 2a. The average distance weighted by populations of the four municipalities is about 20 km.

Existing National Road No.1 between Bacolod and Bago Cities is of 1-lane, 2-way. Existing provincial road, which may be used for the future airport access, is 6 m wide road with cement concrete surfacing. The road was in good condition at the time of investigation. Construction of a new airport access road (some 4.5 km) will be required.

3) Site 3

Main access routes from Bacolod, Bago and Silay Cities to Site 3 are shown in Appendix 5.4.3. Route distances are about 20 km, 40 km, 12 km and 5 km from Bacolod, Bago, Talisay and Silay, respectively. It takes about 25 to 30 minutes from the center of Bacolod to Site 3. The average distance weighted by populations of the four municipalities is about 20 km.

Existing National Road No.1 between Bacolod and Silay Cities has 2-lane, 2-way. Existing provincial road, which may be used for the future airport access, is 6 m wide road with asphalt surfacing. There are many potholes along the road at the time of investigation. Diversion of the provincial road will be required since the new airport site will cut across the road.

4) Site 4

Main access routes from Bacolod, Bago and Silay Cities to Site 4 are shown in Appendix 5.4.4. Route distances are about 21 km, 41 km, 13 km and 6 km from Bacolod, Bago, Talisay and Silay, respectively. It takes about 25 to 30 mins from the center of Bacolod to Site 4. The average distance weighted by populations of the four municipalities is about 21 km.

Existing National Road No.1 between Bacolod and Silay Cities is of 2-lane, 2-way. There is no appropriate access road to the site at present. Existing road to the site is narrow winding road. Most of the parts are 6 m wide, and have a cement concrete surface, but some parts are unpaved. Therefore, construction of a new airport access road (some 1.8 km) will be required.

5) Site 5

Main access routes from Bacolod, Bago and Silay Cities to Site 5 are shown in Appendix 5.4.5. Route distances are about 12 km, 16 km, 20 km and 27 km from Bacolod, Bago, Talisay and Silay, respectively. It takes about 15 to 20 mins from the center of Bacolod to Site 5. The average distance weighted by populations of the four municipalities is about 16 km.

Existing National Road No.1 between Bacolod and Bago Cities is of 1-lane, 2-way. Existing provincial road, which may be used for the future airport access, is 6 m wide road with cement concrete surfacing. The road was in good condition at the time of investigation. Construction of a new airport access road (some 0.5 km) will be required.

6) Site 6

Main access routes from Bacolod, Bago and Silay Cities to Site 6 are shown in Appendix 5.4.6. Route distances are about 11 km, 31 km, 3 km and 9 km from Bacolod, Bago, Talisay and Silay, respectively. It takes about 15 to 20 mins from the center of Bacolod to Site 6. The average

distance weighted by populations of the four municipalities is about 14 km.

Existing National Road No.1 between Bacolod and Silay Cities is of 2-lane, 2-way. Existing provincial road, which may be used for the future airport access, is 6 m wide road with cement concrete surfacing. The road was in good condition at the time of investigation. Diversion of this road will be required as the new airport site will cut across the road.

5.4.5 Construction Considerations

1) Site 1a (See Figure 5.4.11)

Existing ground elevation of the site varies from about +15 to +30 m above MSL. It is a hilly ground, and there are Sumag River, Butuan Creek and other creeks around the site. In order to provide good drainage at the new airport, it is considered necessary to borrow soil. Maximum height of cut and fill will be about 5 m and more than 10 m, respectively. Order of the volume of cut and fill will be about 1 and 3 million cu. m, respectively.

Precision Approach Lighting System (PALS) will cross a creek, and maximum height of the PALS posts will be about 10 m. Construction of a new access road of about 3.2 km and diversion of a creek will be required.

2) Site 2a (See Figure 5.4.12)

Existing ground elevation of the site varies from about +35 to +50 m above MSL. It is a hilly ground, and there are Sumag River, Caburu Creek and other creeks around the site. In order to provide good drainage at the new airport, it is considered necessary to borrow soil. Maximum height of cut and fill will be about 5 m. Order of the volume of cut and fill will be about 0.5 and 1.5 million cu. m, respectively.

PALS will be installed near a creek, and maximum height of the PALS posts will be about 15 m. Construction of a new access road of about 4.5 km will be required.

3) Site 3 (See Figure 5.4.13)

Existing ground elevation of the site is about +25 m above MSL, and relatively flat. There are Imbang River and Bagacay Creek around the site. In order to provide good drainage at the new airport, it is considered necessary to borrow soil to rise the average ground level by about 1.5 m. Maximum height of fill will be about 3 m. Order of the volume of fill will be about 1.5 million cu. m. Volume of cut will be negligible.

PALS will cross a small creek, and maximum height of the PALS posts will be about 3 m. Diversion of a provincial road (about 3.0 km long) will be required.

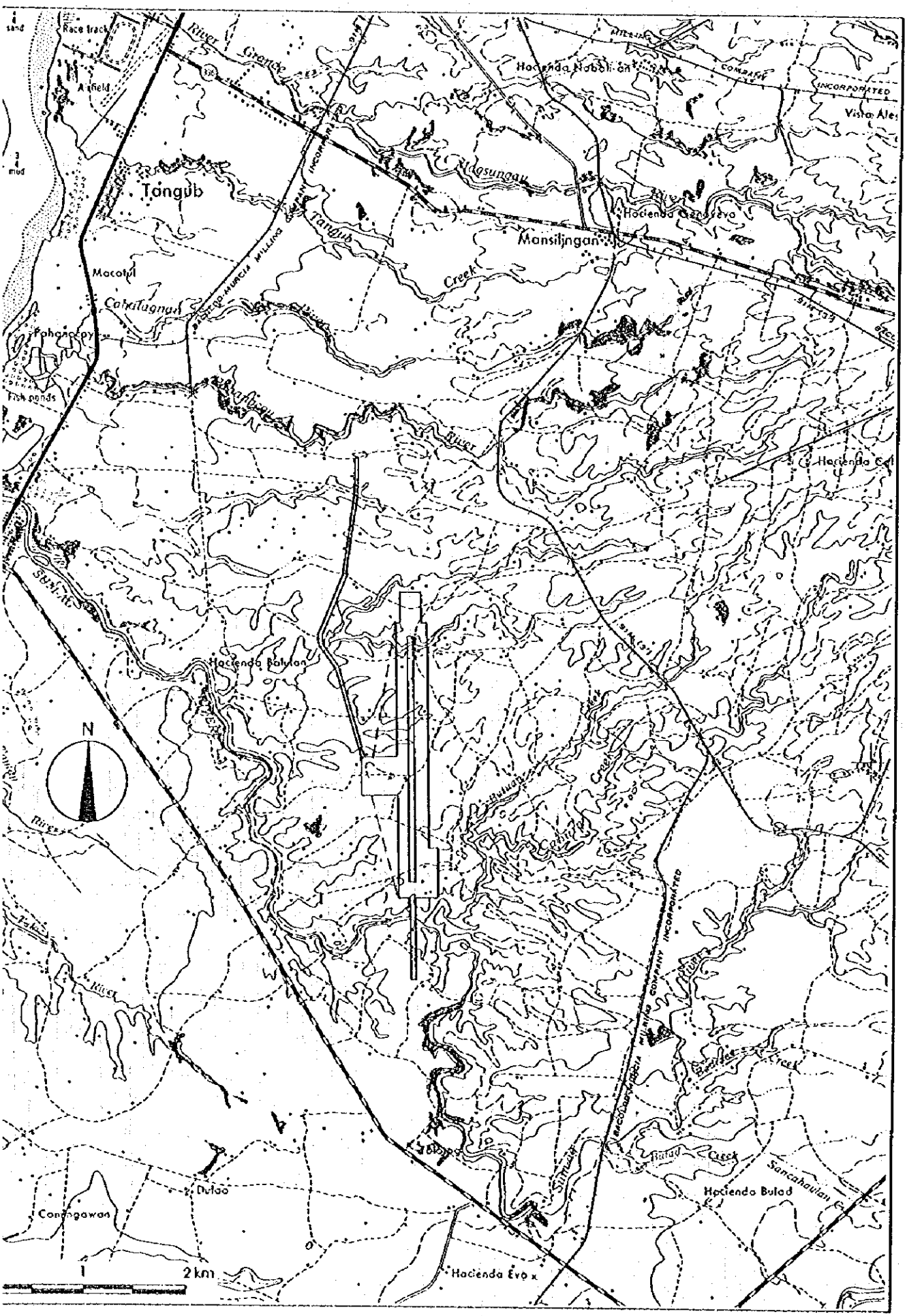

Figure 5.4.11 Layout of New Airport at Site Ia

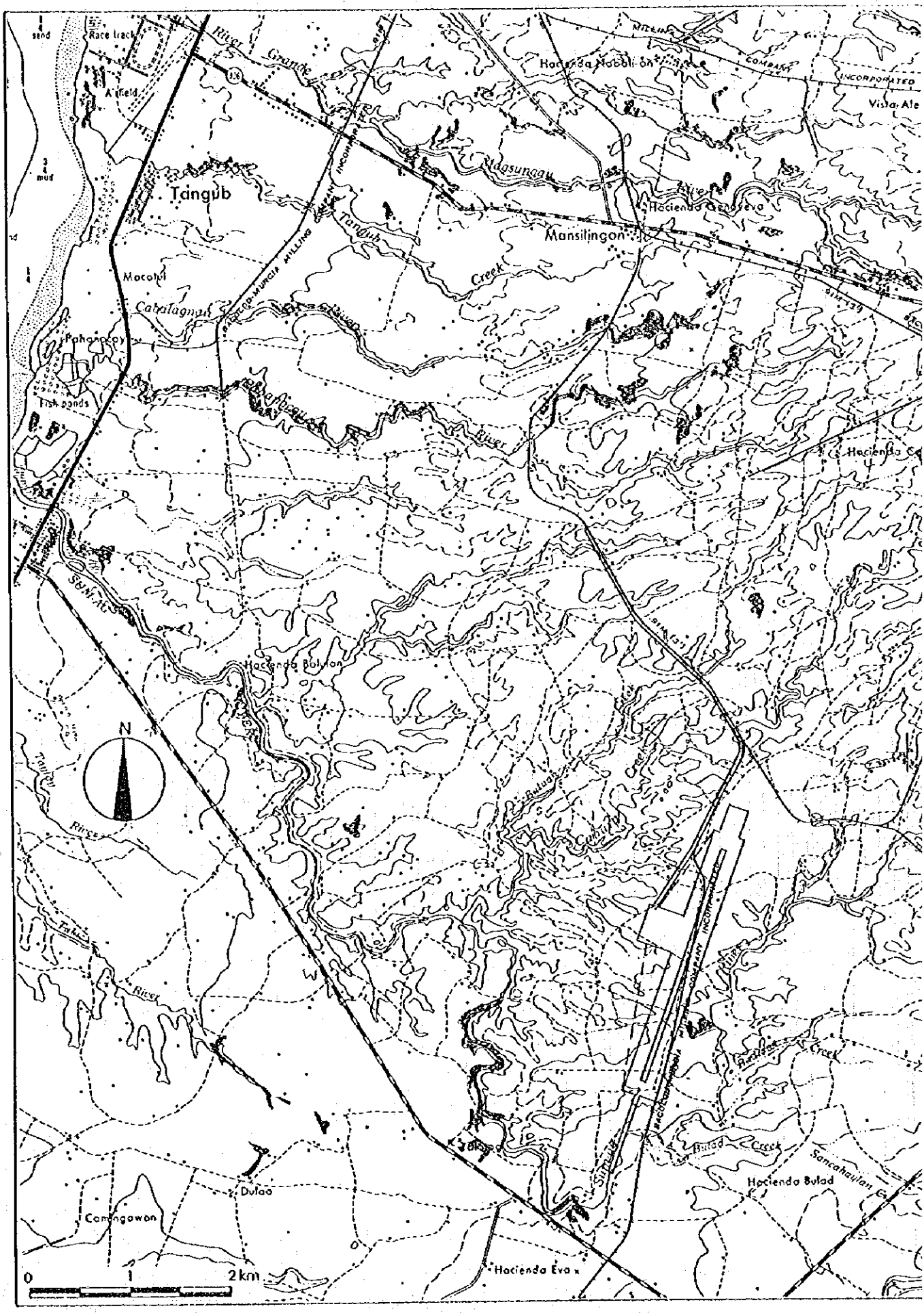

Figure 5.4.12 Layout of New Airport at Site 2a

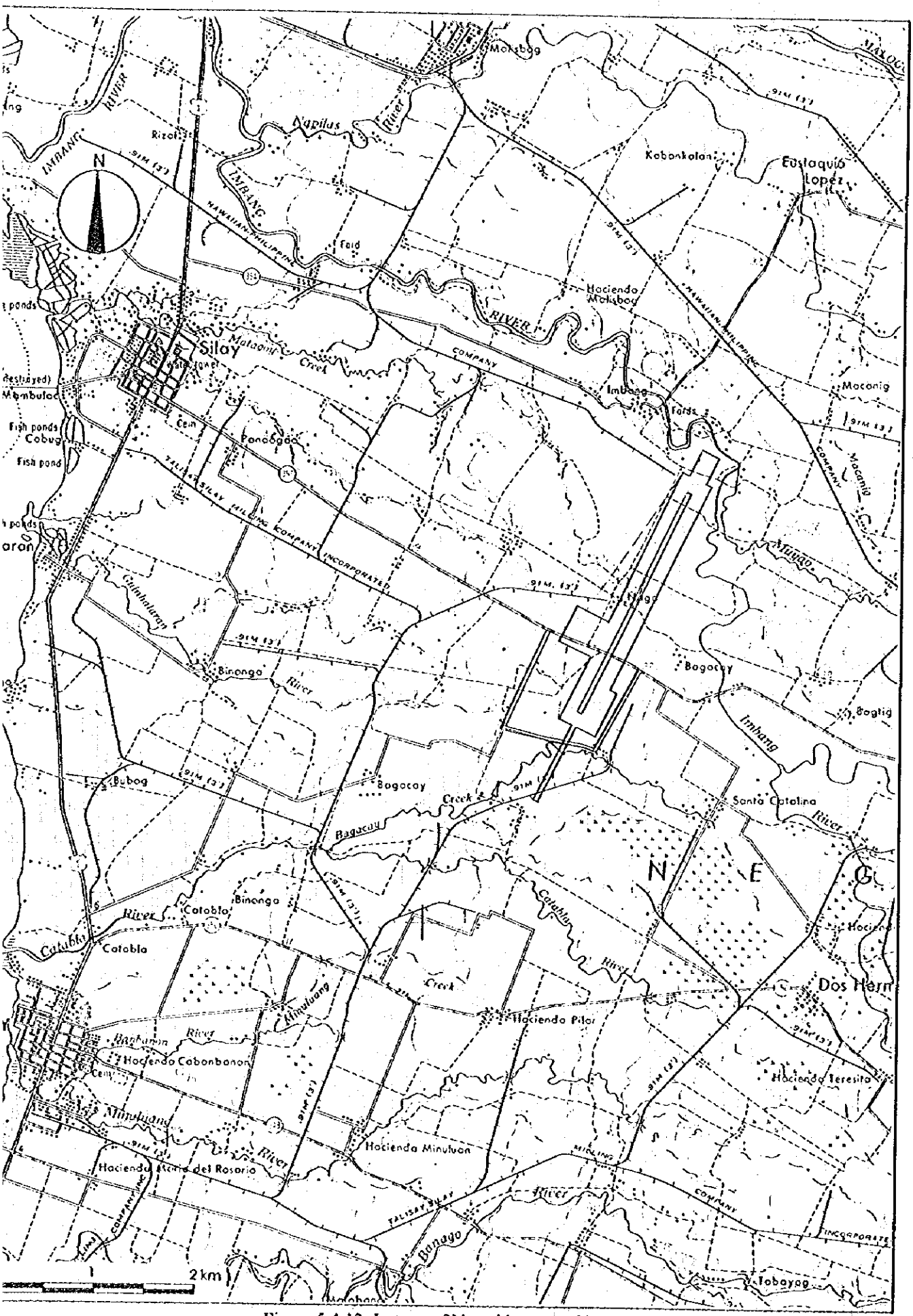

Figure 5.4.13 Layout of New Airport at Site 3

4) **Site 4 (See Figure 5.4.14)**

Existing ground elevation of the site is less than +5 m above MSL. There are many fish cultivation ponds at the southern part of the site. Old rail tracks and Mambagid River run across the middle part of the site. It will be necessary to replace the soil at the bottom of these ponds before filling. Hight of filling of these ponds will be about 1.5 m. In order to provide good drainage at the new airport, it is considered necessary to borrow soil to rise the average ground level by about 1.5 m. Order of the volume of fill will be about 3 million cu. m. Volume of cut will be negligible.

PALS will be installed in the sea, and maximum height of the PALS posts will be about 5 m. Construction of new access road (about 1.8 km long) and diversion of Mambagid River and a road (about 3.4 km long) will be required. Diversion of rail track will also be required, if it is used. (It is worth to note that there is a plan to construct a port near this site and rehabilitate the rail track to transport goods to/from the port.)

5) **Site 5 (See Figure 5.4.15)**

Existing ground elevation of the site is about +25 m above MSL, and relatively flat. There are Taloc River and another creek around the site. It will be necessary to replace the top soil of rice fields. In order to provide good drainage at the new airport, it is considered necessary to borrow soil to rise the average ground level by about 1.5 m. Order of the volume of fill will be about 1.5 million cu. m. Volume of cut will be negligible.

PALS will cross a creek, and maximum height of the PALS posts will be about 5 m. Construction of new access road (about 0.5 km long) and diversion of irrigation channels will be required.

6) **Site 6 (See Figure 5.4.16)**

Existing ground elevation of the site is about +15 m above MSL, and relatively flat. There are Catablan River, Minuluang River, Banbanon River and Minuluang Creek around the site. In order to provide good drainage at the new airport, it is considered necessary to borrow soil to rise the average ground level by about 1.5 m. Order of the volume of fill will be about 1.5 million cu. m. Volume of cut will be negligible.

PALS will cross Minulung River, and maximum height of the PALS posts will be about 5 m. Diversion of Minulug Creek, a provincial road (about 3.1 km long) and 138 kV power transmission lines will be required.

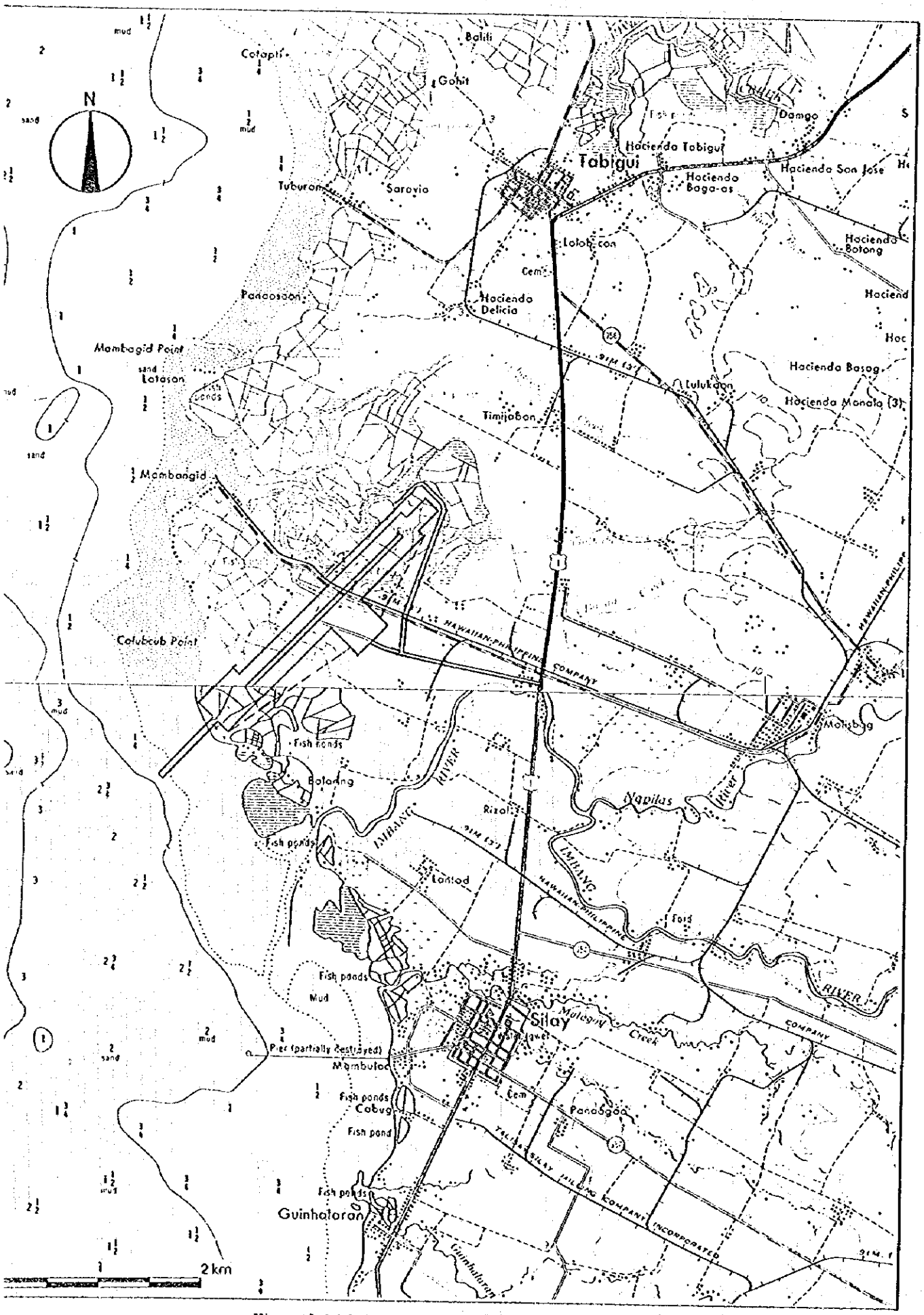

Figure 5.4.14 Layout of New Airport at Site 4

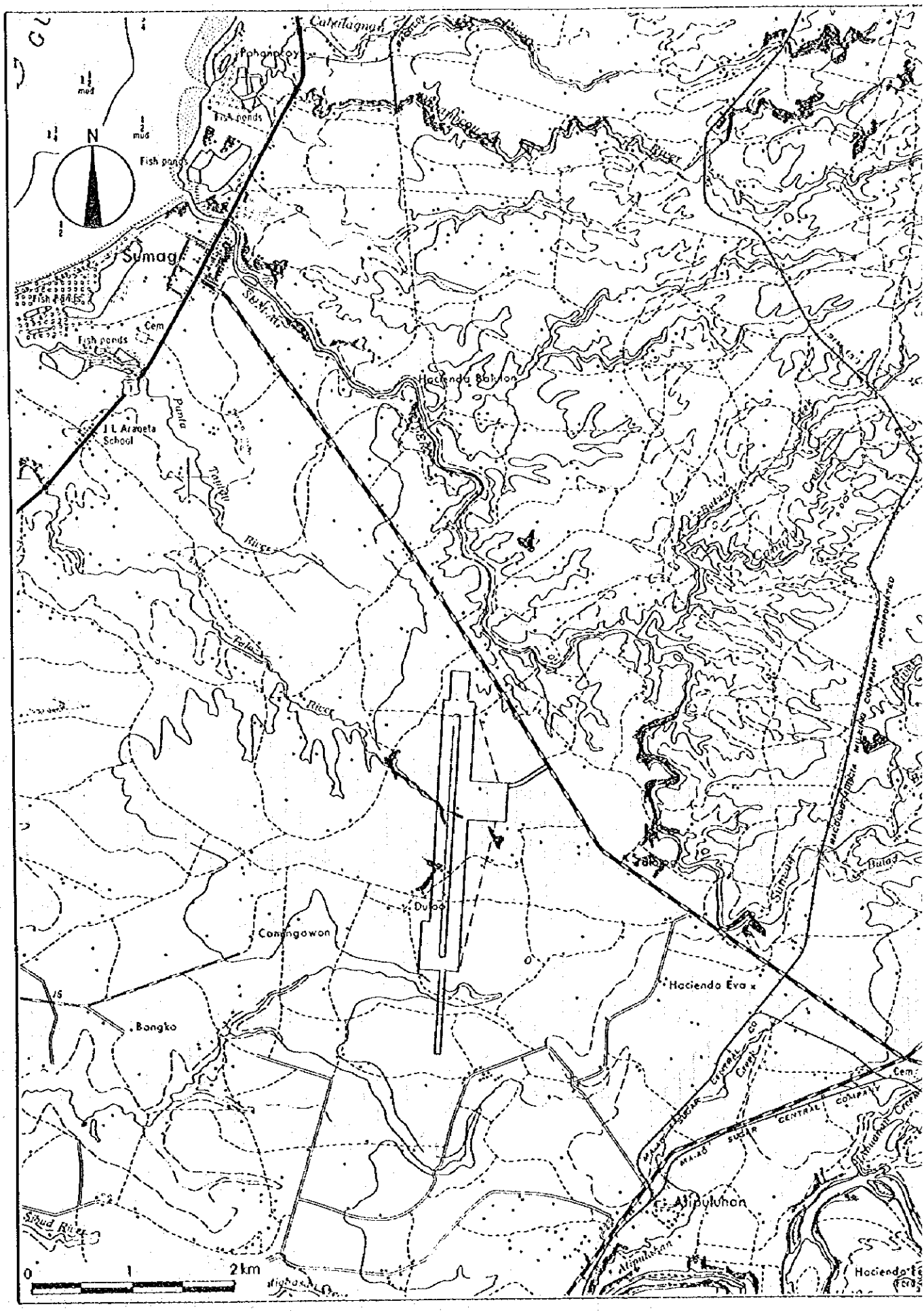

Figure 5.4.15 Layout of New Airport at Site 5

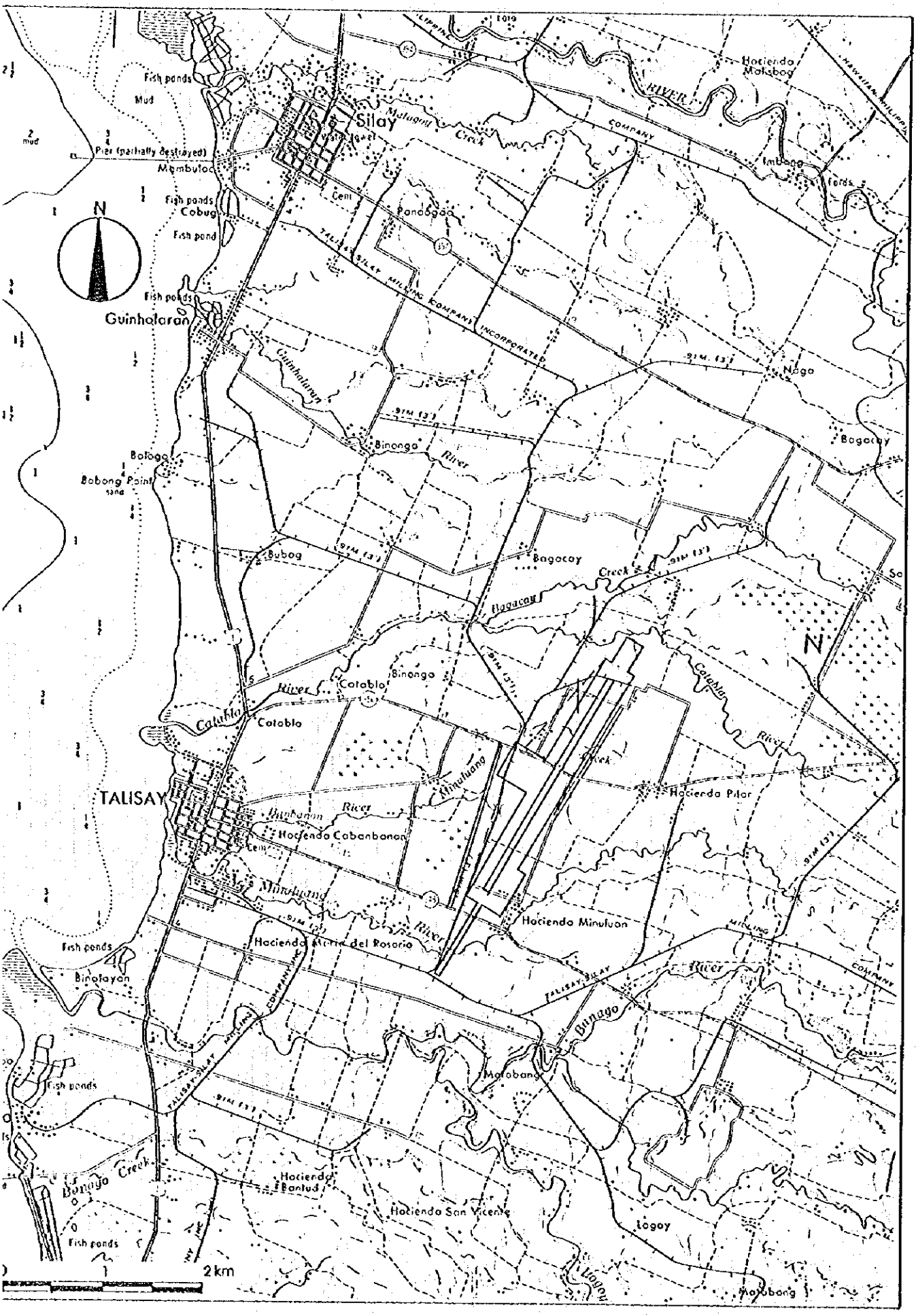

Figure 5.4.16 Layout of New Airport at Site 6

5.4.6 Environmental Considerations

1) General Assumptions

For an airport development project, it normally requires to examine the following environmental impacts:

a) Social environmental impacts related to resettlement, economic activities, traffic and public facilities, split of communities, cultural property, water rights and rights of common, public health condition, waste, and hazards.

b) Natural environmental impacts related to topography and geology, soil erosion, ground water, hydrological situation, coastal zone, flora and fauna, meteorology, and landscape.

c) Pollution including air pollution, water pollution, soil contamination, noise and vibration, land subsidence, and offensive odor.

It is assumed for this comparison study that reasonable environmental considerations will be made during the planning, design and construction of the airport, and that appropriate environmental protection measures, such as sewerage treatment, will be taken. Therefore, only major environmental issues, which has considerable differences by the sites, are described in the following sections.

Positive impact of airport development project on economic activities is not included in this comparison study, because it will not be affected significantly by the sites.

2) Social Environment

(1) Site 1a

Very little social impact is foreseen because of few inhabitants at and around the site. Diversion of a creek will require proper engineering planning and design in order to minimize the change in the downstream water flow.

(2) Site 2a

Very little social impact is foreseen because of few inhabitants at and around the site.

(3) Site 3

Very little social impact is foreseen because of few inhabitants at and around the site. Diversion of existing road will be required to maintain traffic circulation in the community.

(4) Site 4

Some social impacts related to resettlement is foreseen, since considerable number of existing

inhabitants in Sito Bongol need to be relocated. Diversion of existing road will be required to maintain traffic circulation in the community.

(5) Site 5

Although there is only a few inhabitants at and around the site, appropriate measures must be taken to maintain irrigation system. Alteration of the existing land use of rice field to other purpose is considered difficult. It should be noted that Negros Occidental produces only 40% of the total rice consumed in the province.

(6) Site 6

Some social impacts related to resettlement is foreseen since there are new residential areas in the site. Diversion of existing road will be required to maintain traffic circulation in the community.

3) **Natural Environment**

(1) Site 1a and 6

Adverse impacts on natural environment will be very little because these sites and their vicinities have already been developed for agriculture. Proper engineering planning and design of creek diversion will be required to minimize impact on the existing hydrological conditions.

(2) Site 2a, 3 and 5

Adverse impacts on natural environment will be very little because these sites and their vicinities have already been developed for agriculture.

(3) Site 4

Adverse impacts on flora and fauna at coastal zone and in the sea may occur due to the required large scale earthworks and installation of Precision Approach Lighting System in the sea.

4) **Pollution**

Aircraft noise pollution could be the major adverse impact by the airport development.

(1) Sites 1, 2, 3 and 5

As Sites 1, 2, 3 and 5 are basically for agricultural use with scarce inhabitants the aircraft noise problem will be minimal if land use around the new airport is appropriately controled in the future.

(2) Sites 4 and 6

Although it may not be too serious existing inhabitants around Sites 4 and 6 are susceptiable to aircraft noise problem.

5.4.7 Economic Conditions

Order of the costs for land acquisition including resettlement; site preparation including earthworks and diversion of roads, creak and others; and new access road at each site are estimated as shown in Table 5.4.2. (Note that the costs of airport facilities are not included in the estimates. It is because the sizes of the airport facilities are uncertain at the time of site selection, and their costs will be almost the same for all sites.)

Table 5.4.2 Order of Cost for New Airport Development (P. million)

Item	Site 1a	Site 2a	Site 3	Site 4	Site 5	Site 6
Land Acquisition & Resettlement	11	11	14	9	10	707
Site Preparation incl. Road/Creek Diversion	474	233	195	480	258	272
New Access Road	50	70	-	28	8	-
Total	535	314	209	517	376	979

5.4.8 Conclusion

Table 5.4.3 summarizes the advantages and disadvantages of the six site. It seems that Site 3 has more advantages than other sites, and the second best would be Site 1a.

Major differences between Site 1a and Site 3 are airport access and construction cost. Weighted average travel distance of Site 1a is 3km shorter than that of Site 3. Total cost of land acquisition, earthworks, diversion of creek, road, etc., and new access road of Site 1a is PHP 326 million more than that of Site 3. Benefits of travel time and fuel saving of Site 1a against Site 3 is estimated to be about PHP 10 per passenger as follows:

a) Time Saving : (PHP 120 per hour) x (3 minutes per passenger) = PHP 6 per passenger
b) Fuel Saving : (PHP 10 per liter) x (3km per passenger) / (10km per liter) = PHP 3 per passenger
c) Total Benefits : 6 + 3 = 9 .... say PHP 10 per passenger

Economic analysis based on the above figures and the passenger forecast (Medium Case) indicates that the economic benefits of Site 1a over Site 3 is insufficient to cover the additional construction cost (EIRR is only 1.5%). Therefore, Site 3 is selected as the alternative site of Bacolod Airport.

The following are other factors which may support the selection of Site 3.

a) Barangay Handumanan and Cabug are only a few kilometer from Site 1a, and the new airport at Site 1a would become too close to the city in the future as the city grows.

b) Influence of eruptions of Canlaon Volcano will be larger at Site 1a as it is located about 25km from the volcano. (Site 3 is about 40km away from the volcano.)

Table 5.4.3 Summary of Comparison of Six New Airport Sites

Evaluation Item	Site 1a	Site 2a	Site 3	Site 4	Site 5	Site 6
0. Discription						
0.1 Location	Felisa & Tabunan	Dulao, Tabunan & Damsite	Bagtic & Bagacay	Balaring	Dulao	E. Lizares
0.2 Coordinates	10 35' N 122 58' E	10 35' N 122 59' E	10 46' N 123 01' E	10 50' N 122 57' E	10 33' N 122 56' E	10 44' N 122 59' E
0.3 Runway Elevation (above MSL)	approx. 27 m	approx. 43 m	approx. 29 m	approx. 5 m	approx. 27 m	approx. 17 m
0.4 Runway Orientation	18/36	01/19	03/21	04/22	01/19	02/20
0.5 Existing Land Use	Sugar land	Sugar land	Sugar land	Fish ponds & sugar land	Rice field	Sugar land & residential
1. Airspace Use	G	G	G	G	G	G
1.1 Obstacles	g - No mountain, hill or large man-made structure.	g - ditto	g - ditto	g - ditto	g - ditto	g - ditto
1.2 Existing Airspace Use	g - No danger area, flight training area or other airport than Bacolod Airport.	g - ditto	g - ditto	g - ditto	g - ditto	g - ditto
2. Wind Coverage	G	G	G	G	G	G
2.1 Max 20 kt Cross Wind	g 99.9%	g 99.9%	g 99.8%	g 99.8%	g 99.9%	g 99.9%
2.2 Max 13 kt Cross Wind	g 98.9%	g 99.5%	g 99.3%	f 98.1%	g 99.5%	g 99.5%
3. Airport Access	G	F	F	F	G	G
3.1 Access from Bacolod	g 12 km	g 15 km	f 20 km	f 21 km	g 12 km	g 11 km
3.2 Access from Bago	f 20 km	f 24 km	p 40 km	p 41 km	g 16 km	p 31 km
3.3 Access from Talisay	f 20 km	f 23 km	g 12 km	g 13 km	f 20 km	g 3 km
3.4 Access from Silay	f 27 km	p 30 km	g 5 km	g 6 km	f 27 km	g 9 km
3.5 Weighted Average	g 17 km	f 20 km	f 20 km	f 21 km	g 16 km	g 14 km
4. Construction Considerations	P	F	G	F	F	F
4.1 Order of Earthwork Volume	f Cut 1 million cu. m Fill 3 million cu. m	f Cut 0.5 million cu. m Fill 1.5 million cu. m	g Cut negligible Fill 1.5 million cu. m	f Cut negligible Fill 3 million cu. m	g Cut negligible Fill 1.5 million cu. m	g Cut negligible Fill 1.5 million cu. m
4.2 Max. Fill Height	f about 10 m fill	f about 5 m fill	g about 3 m fill	f about 5 m fill	g about 3 m fill	g about 3 m fill
4.3 Soil Condition	f fair	f fair	f fair	p Replacement of soil at fish ponfs	p Replacement of soil at rice field	f fair
4.4 Max. Height of PALS Posts	p Approx. 10 m	p Approx. 15 m	f Approx. 3 m	f Approx. 5 m	f Approx. 5 m	f Approx. 5 m
4.5 Length of New Access Road	f about 3.2 km	p about 4.5 km	g nil	f about 1.8 km	g about 0.5 km	g nil
4.6 Length of Road Diversion	g nil	g nil	f about 3.0 km	f about 3.4 km	g nil	f about 3.1 km
4.7 Others	p - Diversion of a creek.	g nil	g nil	p - Diversion of a river and rail track (if it is used).	p - Diversion of irrigation channel.	p - Diversion of a creek and power transmission line.
5. Environmental Considerations	G	G	G	P	F	F
5.1 Social Environment	g - Very little social impacts, because there are few population and land owners around the site.	g - ditto	g - ditto	p - Some impacts on social environment, because there are considerable number of householeds at the site.	f - Change in irrigation water flow should be minimized.	p - Some impacts on social environment, because there are new residential areas in the site.
5.2 Natural Environment	g - Very little impacts on natural environment, because the site has already been developped for agriculture.	g - ditto	g - ditto	p - Some impacts on flora and fauna at coastal zone and in the sea.	g - same as Site 1a	g - ditto
5.3 Pollution	f - Land use control will be required to minimize aircraft noise pollution problems.	f - ditto	f - ditto	p - Some existing inhabitants around the site are suspectiable to aircraft noise pollution.	f - same as Site 1a	p - same as Site 4
6. Economic Considerations	F	F	G	F	F	P
6.1 Cost of Land Acquisition	g P. 11 million	g P. 11 million	g P. 14 million	g P. 9 million	g P. 10 million	p P.707 million
6.2 Cost of Earthworks and Diversions	p P.474 million	f P.233 million	f P.195 million	p P.480 million	f P.258 million	f P.272 million
6.3 Cost of Access Road	p P. 50 million	p P. 70 million	g nil	f P. 28 million	f P. 8 million	g nil
6.4 Total	f P.535 million	f P.314 million	g P.209 million	f P.517 million	f P.376 million	p P.979 million
Overall Evaluation	G:4, F:2, P:0	G:3, F:3, P:0	G:5, F:1, P:0	G:2, F:3, P:1	G:3, F:3, P:0	G:3, F:2, P:1
Relative Advantages	- Good access condition - Little environmental impacts	- Little environmental impacts	- Ease of construction - Little environmental impacts - Low project cost		- Good access condition	- Good access condition
Relative Disadvantage				- Some impacts on social and natural environment.		- High project cost