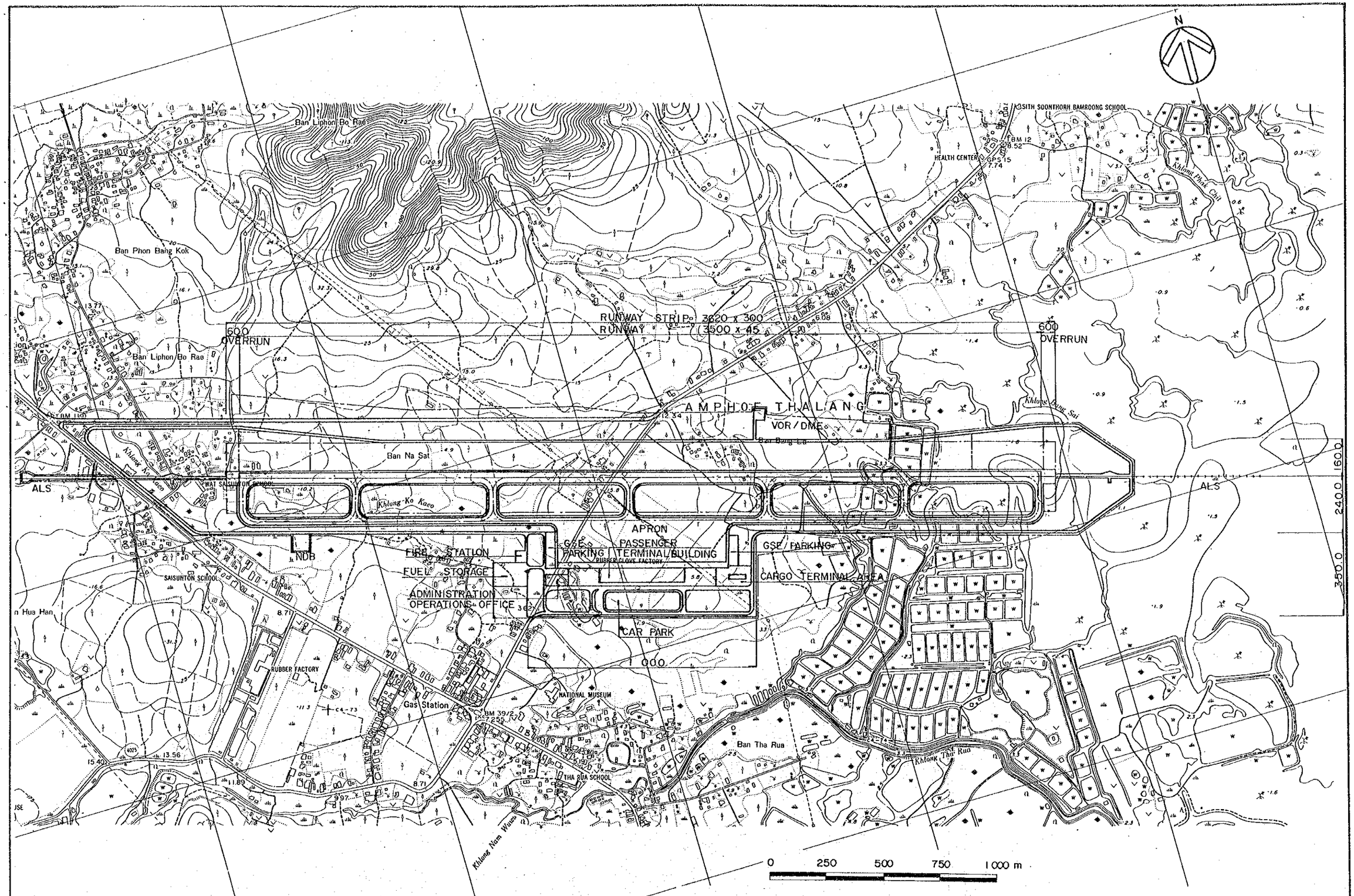


Figure 8.5.7 General Layout of New Airport Site I-3

CHAPTER 9

ALTERNATIVE AIRPORT MASTER PLAN

CHAPTER 9 ALTERNATIVE AIRPORT MASTER PLAN

9.1 WORK ITEMS FOR EACH ALTERNATIVE

In this chapter, Airport Development Alternatives shall be established in accordance with the basic policy mentioned in Chapter 7.

Work items to be included in each alternative are summarized as shown in the following **Table 9.1.1**.

Table 9.1.1 Work Items for Alternatives-1, 2 and 3

Facilities		Problems at existing airport	Countermeasures		
			Alt-1	Alt-2	Alt-3
			Expansion to cope with the traffic demand of the target year	Upgrading mostly in compliance with international standard	New airport construction mostly in compliance with international standard
Runway	Length	Not sufficient for the required length	Extension to 3,500m	Extension to 3,500m	New construction (3,500m)
	Pavement	Not sufficient for B747/MD11 class aircraft	Overlay for strengthen-ing	Overlay for strengthen-ing	New construction (>PCN67)
Runway Strip	Width	Existing width of 150m is below ICAO recommendation (300 m)	Same as Existing (150 m) ◇	Expansion to 300 m ◆	New construction (300 m) ◆
Parallel Taxiway	Separation distance with runway	Existing separation 150m is below ICAO recommendation (182.5 m)	Same as Existing (150 m) ◇	To be increased to 182.5 m ◆	New construction (182.5m) ◆
	Length	Shorter than runway length	To be extended to R/W27 threshold	To be extended to R/W27 threshold	New construction

	Pavement	Not sufficient for B747/MD11 class aircraft	Overlay	Overlay	New construction
Apron	Number of aircraft stands	Not sufficient to meet requirement	Expansion	Expansion	New construction
Passenger Terminal Building	Total floor area	Not sufficient to meet requirement	Expansion	Expansion	New construction
Cargo Terminal Building	Total floor area	Not sufficient to meet requirement	Expansion	Expansion	New construction
Car Park	Number of parking lots	Not sufficient to meet requirement	Expansion	Expansion	New construction
Control Tower	Visibility	Parking Aircraft is not visible from VFR room	No relocation	Relocation	New construction
Air Navigation System	ILS	Offset localizer	Same as existing	ILS approach to be established in the both directions of the runway	ILS approach to be established in the both directions of the runway
		Middle marker site is close to the runway threshold.	Relocation to a suitable site	Relocation to a suitable site	New installation
	Approach Lighting System	Insufficient configuration (length = 300 m)	Extension to ICAO standard configuration (900 m) ◆	Extension to ICAO standard configuration (900 m) ◆	New installation (900 m) ◆
Obstacle Clearance Surfaces	Approach Surface (East)	Hill intrudes approach surface. Glide slope is set at 3.2 deg.	Hill is to be cut ◆	Hill is to be cut ◆	No obstruction ◆
	Approach Surface (West)	No obstruction	---	---	---
	Transitional surfaces (North)	Hills are intruding.	No cutting ◇	Hills are to be cut. ◆	No obstruction ◆
	Transitional surfaces (South)	Hills and Control Tower are intruding.	No cutting ◇	Hills are to be cut and Control Tower to be relocated◆	No obstruction ◆

Inner Horizontal Surface (North)	Hills are intruding.	No cutting ◇	No cutting ◇	No cutting ◇
Inner Horizontal Surface (South)	Hills are intruding.	No cutting ◇	No cutting ◇	No cutting ◇

Key to Symbol : ◆ Compliance with international standard

◇ Not Compliance with international standard

9.2 ALTERNATIVES FOR EXISTING AIRPORT DEVELOPMENT

9.2.1 Expansion of Existing Airport (Alternative-1)

(1) General

This alternative includes the extension and expansion works of the major facilities such as the runway, taxiway, apron, terminal building and car park which will be insufficient in terms of capacity for future demand. Therefore, the existing airport will be improved so as to have enough capacity for handling of future traffic demand.

(2) Runway and Taxiway Development

a) Direction of Runway Extension

Extension of the existing runway to 3,500 m will be planned in order to accommodate B-747 class aircraft which is anticipated to be operated in year 2010. There are two alternatives for the direction of the runway extension. One is the 500 m extension to the east which includes embankment works and diversion of the existing trunk road (Route 402). Another alternative is the 500 m extension into the sea west of the airport which will accompany the reclamation and revetment works.

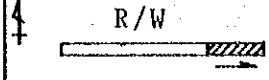
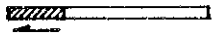
Comparison of the both alternatives is shown in **Table 9.2.1**. Considering the construction cost and environmental problem by reclamation works, extension to the east is recommendable.

b) Pavement

Existing pavement strength is PCN 61 and 56 for the runway and parallel taxiway respectively which are capable to accommodate A300 class aircraft or smaller ones. Pavement is therefore to be strengthened by overlay for introduction of larger aircraft such as B-747.

(3) Terminal Area Development

Table 9.2.1 Comparison of Runway Extension Alternatives

Item	Alt-A	Alt-B
Direction of R/W Extension		
1 Aircraft Operational Aspects		
(1) Take Off Climb Surface (RWY27)		
a. Height of Cut (m)	20.4	10.4
b. Volume of Cut (Million m3)	18.3	3.6
(2) Transitional Surface		
a. Volume of Cut ,North (Million m3)	26.8	26.8
b. Volume of Cut ,South (Million m3)	63.4	63.4
2 Construction Aspects		
(1) Earth Works		
a. Excavation (Million m3)	108.5	93.8
b. Embankment (Million m3)	101.6	None
c. Reclamation (Million m3)	None	247.8
(2) Length of Revetment (m)	None	1,280
(3) Diversion of Roads (m)	900	None
(4) Demolition of Existing Houses (no)	86	28
3 Enviromental Aspects		
(1) Area of Reclamation (ha)	None	16.3
(2) Destruction of Mangrove (m2)	None	None
(3) Compensation for Shrimp Farms (m2)	2,700	None
4 Others	Off Set Localizer	Off Set Localizer
5 Overall Evaluation	This alternative is more practical than Alt-B. Because the construction cost is cheaper and the influence of the enviro-mental problems will be smaller than Alt-B.	The reclamation will be a bad influence for the environment.

The apron and the passenger terminal building shall be developed in order to cope with future traffic demand.

(4) Air Navigation System

The existing air navigation system will be maintained in this alternative except described hereinafter.

a) Radio Navigation Aids

ILS : The existing glide slope facility will be relocated to the opposite side of the runway to avoid interference from extended taxiway. Middle marker facility should be relocated to the preferable location.

b) Air Traffic Control System

ASR : Secondary surveillance radar should be provided to the existing ASR facility. Improvement of soft ware of the existing radar data processor will also be required.

Voice Logging Recorder: One additional tape recorder which is having 40 channel capacity should be provided to ATC tower.

Closed Circuit Television : Closed circuit television should be provided to the apron area and the control tower which covers sighting ground movement control area.

c) Airfield Lighting System

Runway edge light, threshold/end light, taxiway edge light and apronflood light are required in conjunction with extension of the runway, taxiway and apron.

PAPI for runway 27 approach should be conformable to the new touch down point.

Approach lighting system with complete lighting configuration should be installed to runway 27 approach.

Primary and secondary electrical power for air navigation system should be fed form ATC tower substation and AFL substation by under ground electrical cable independently.

All of the facilities should be supported by secondary power supply with enough capacity.

d) Meteorological Observation System

Meteorological observation facilities which is installed to meteorological center should be supported by secondary power supply. Critical facility such as data processor, communication facility and radar data processor should be supplied via UPS (uninterrupted power supply).

(5) Airport Utilities

a) Electricity

Since capacity of the existing electrical power supply for airport facilities may be insuffucuent due to the new terminal building construction, additional power facility should be provided. Required capacity for the airport up to the year of 2010 is estimated about 5,500 kvA. The new central power substation will be required to accommodate the equipment such as distribution board, secondary power supply generators etc.

b) Water

Potable water for the airport is supplied by taking from the seven deep wells. According to the increase of the demand in future, new wells shall be installed.

c) Sewage

The oxidation pond in the terminal area shall be expanded so as to treat the future demand.

d) Waste

An incinerator is planned in the airport to dispose the waste.

e) Telephone exchange

The existing telephone exchange system which is installed to passenger terminal building should be expanded in capacity so as to comply with requirement of the new domestic terminal building and cargo terminal building expansion.

(6) Alternative Layout Plan

Layout plan for Alternative-1 is shown in **Figure 9.2.1.**

If land acquisition around the existing airport is difficult, expansion of the facilities will be limited inside the existing airport boundary. The layout plan for this case (Alternative-1') is shown in **Appendix 9.2.1.**

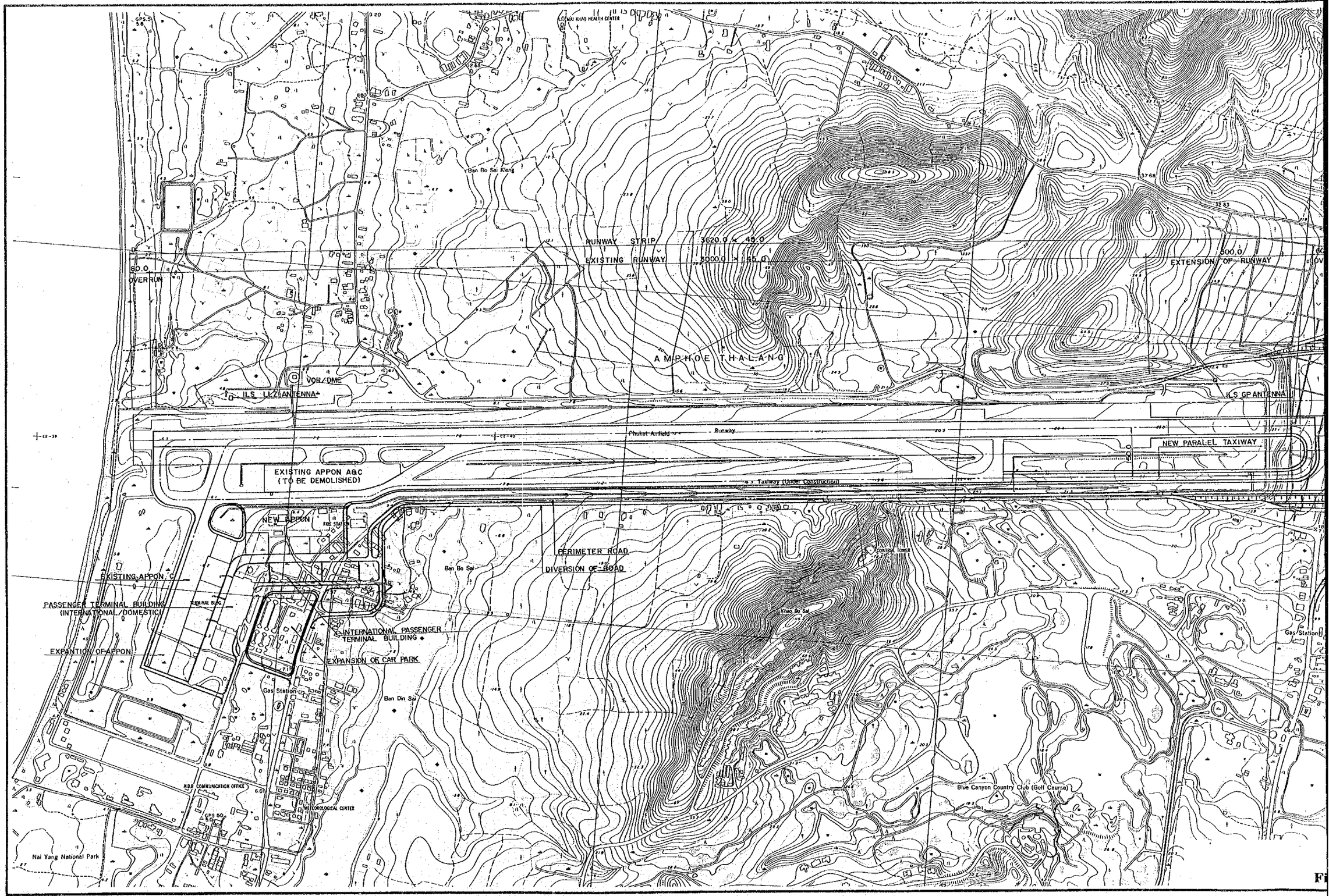
9.2.2 Upgrading of Existing Airport (Alternative-2)

(1) General

In this alternative, the existing airport will not only be expanded the same as Alternative-1 but also be improved to eliminate the problems mainly on the aircraft operation mostly in compliance with the international standards such as ICAO requirements and to secure safe operation.

(2) Obstacle Clearance Surface

The following point has been studied in connection with the Obstacle Limitation Surface.


RUNWAY STRIP 3620.0 x 45.0
EXISTING RUNWAY 3000.0 x 45.0
60.0
OVERRUN
EXTENSION OF RUNWAY
500.0
AMPHOE THALANG
VOR/DME
ILS LLZ ANTENNA
ILS GP ANTENNA
Ban Bo Sai Klang
Phuket Airfield
Runway
NEW PARALEL TAXIWAY
Taxiway (Under Construction)
EXISTING APRON A&C
(TO BE DEMOLISHED)
NEW APRON
FIRE STATION
PERIMETER ROAD
DIVERSION OF ROAD
Ban Bo Sai
Khao Bo Sai
Control Tower
EXISTING APRON
PASSENGER TERMINAL BUILDING
(INTERNATIONAL / DOMESTIC)
TERMINAL BLDG.
INTERNATIONAL PASSENGER
TERMINAL BUILDING
EXPANTION OF APRON
EXPANSION OF CAR PARK
Gas Station
Ban Din Sai
Gas Station
AERONAUTICAL RADIO COMMUNICATION OFFICE
METEOROLOGICAL CENTER
Nai Yang National Park
Blue Canyon Country Club (Golf Course)

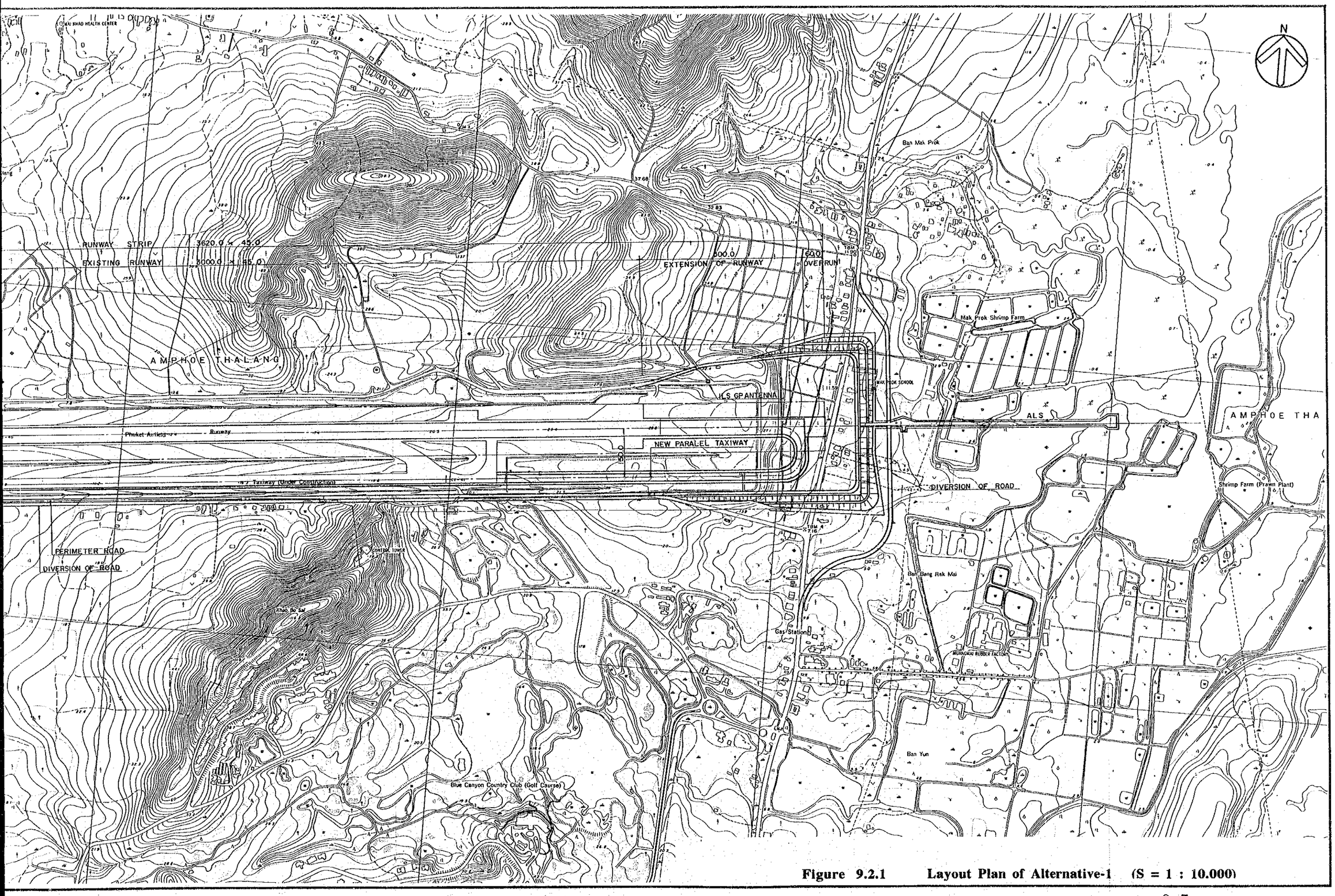


Figure 9.2.1 Layout Plan of Alternative-1 (S = 1 : 10.000)

As the establishment of approach procedures at the airport with frequent operation, circling procedure and straight-in landing procedures shall be usually established so as to correspond to the various aircraft types operated. For this purpose, a horizontal surface being cleared from the existence of obstacles is to be established in addition to the approach surface and transitional surface to secure safe aircraft operation.

Accordingly, in this Study, management of the obstructions intruding upon the inner horizontal surface is carefully studied from the viewpoint of the basic airport planning concept in consideration of the operational aspects. As a result of the study, it is considered that one side, at least, of the horizontal surface should be established by clearing the obstructions taking account of the mountainous terrain in the Study area.

Although the actual fact shall be considered that straight - in/out procedure has been established from the practical viewpoint instead of the circling procedure at some airports in Thailand, according to the actual circumstances of the respective airport.

There are some mountains intruding upon the inner horizontal surface as already explained. In order to secure one side of the inner horizontal surface, a mountain of 253 m height and other mountains intruding upon the north side of the inner horizontal surface are necessary to be removed. However, the cutting volume of those obstruction is estimated to be about 174 million cu.m. Cost of cutting works of the obstructions is estimated to be about sixty five billion Baht, and it is considered to be not realistic.

As an airport master plan alternative, a more practical plan is to be established in consideration of phasing for the realization of ideal airport master planning. Therefore, the removal of the obstructions upon the inner horizontal surface are eliminated because of the minimum investment based on the practical judgment for the realization of the project to cope with the operational countermeasures.

(3) Runway, Taxiway and Runway Strip Development

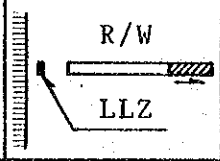
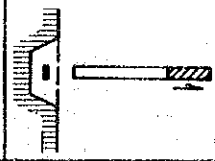
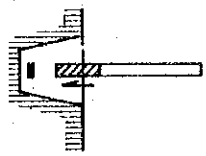
a) Runway Extension and Localizer Area

The runway will be extended to 3,500 m, the existing off-set localizer will be shifted to the right position. Therefore, three alternatives are established for the runway extension and localizer position as shown in **Table 9.2.2**. According to the selected alternative through this comparison study, runway 27 threshold will be shifted 700 m to the east and 09 threshold 200 m to the east. As a result, the total runway length will be extended to 3,500 m, and a localizer can be placed in a normal position within the airport boundary.

b) Separation Distance between Runway and Parallel Taxiway

In order to keep the ICAO requirement, the separation distance between the runway and the parallel taxiway will be expanded from existing 150 m to 182.5 m for ICAO code letter E.

Table 9.2.2 Comparative Evaluation of Runway Extension for Alternative-2

Item	Alt-A	Alt-B	Alt-C
Direction of R/W Extension			
1 Aircraft Operational Aspects			
(1) Take Off Climb Surface (RWY27)			
a. Height of Cut (m)	24.4	20.4	10.4
b. Volume of Cut (Million m3)	38.3	18.3	3.6
(2) Transitional Surface			
a. Volume of Cut ,North (Million m3)	221.2	221.2	221.2
b. Volume of Cut ,South (Million m3)	191.5	191.5	191.5
2 Construction Aspects			
(1) Earth Works			
a. Excavation (Million m3)	451	431	416.3
b. Embankment (Million m3)	410	228	None
c. Reclamation (Million m3)	None	68.3	360.7
(2) Length of Revetment (m)	None	550	1560
(3) Diversion of Roads (m)	1,610	1,100	None
(4) Demolition of Existing Houses (no)	126	114	83
3 Enviromental Aspects			
(1) Area of Reclamation (ha)	None	4.1	23.1
(2) Destruction of Mangrove (m2)	15,000	None	None
(3) Compensation of the Shrimp Farm (m2)	68,000	6,000	None
4 Overall Evaluation	This alternative is more practical than the other alternatives. Because the influence of the enviromental problems are smaller than other alternatives.	The reclamation will be bad for the environment.	The reclamation will be bad for the environment.

Two alternatives are considered: one is shifting of the runway and another is shifting of the parallel taxiway. Detailed comparison is shown in **Table 9.2.3**. Because of the earthwork volume, it is appropriate to shift the taxiway to the south.

c) Expansion of Runway Strip Width

The width of the runway strip will be expanded to 300 m from existing 150 m in accordance with ICAO recommendation for a precision approach runway Cat.I.

d) Pavement

Existing pavement will be strenghthened same as Alternative-1.

(4) Terminal Area Development

Terminal area will be developed same as in Alternative-1.

(5) Control Tower

Since the mountain on which the control tower is located intrudes on the transitional surface, the control tower will be relocated to the terminal area.

(6) Air Navigation Systems

The existing offset localizer antenna will be relocated and installed on the extension of the center line of the runway where is prescribed in ICAO Annex 10 standard. The collocated DME should be relocated from the existing localizer site to the new glide slope site.

According to the ILS siting criteria of FAA, localizer antenna should be installed at the range of within 300m to 600m from the runway end (threshold).

However, the localizer antenna can barely keep the distance of 200m from the displaced runway threshold because of closeness to the shore. This distance, however, should consider the effect of jet blast, take off thrust velocity of B-747 assume about 120km/h on this distance. Typical localizer antenna will endure to wind velocity up to 200km/h.

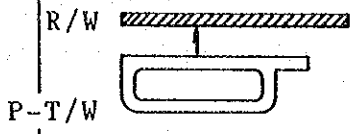
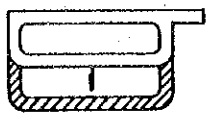
MLS azimuth antenna site also is preferable within the range of 200m. ILS and collocated DME for runway 09 approach will also be provided.

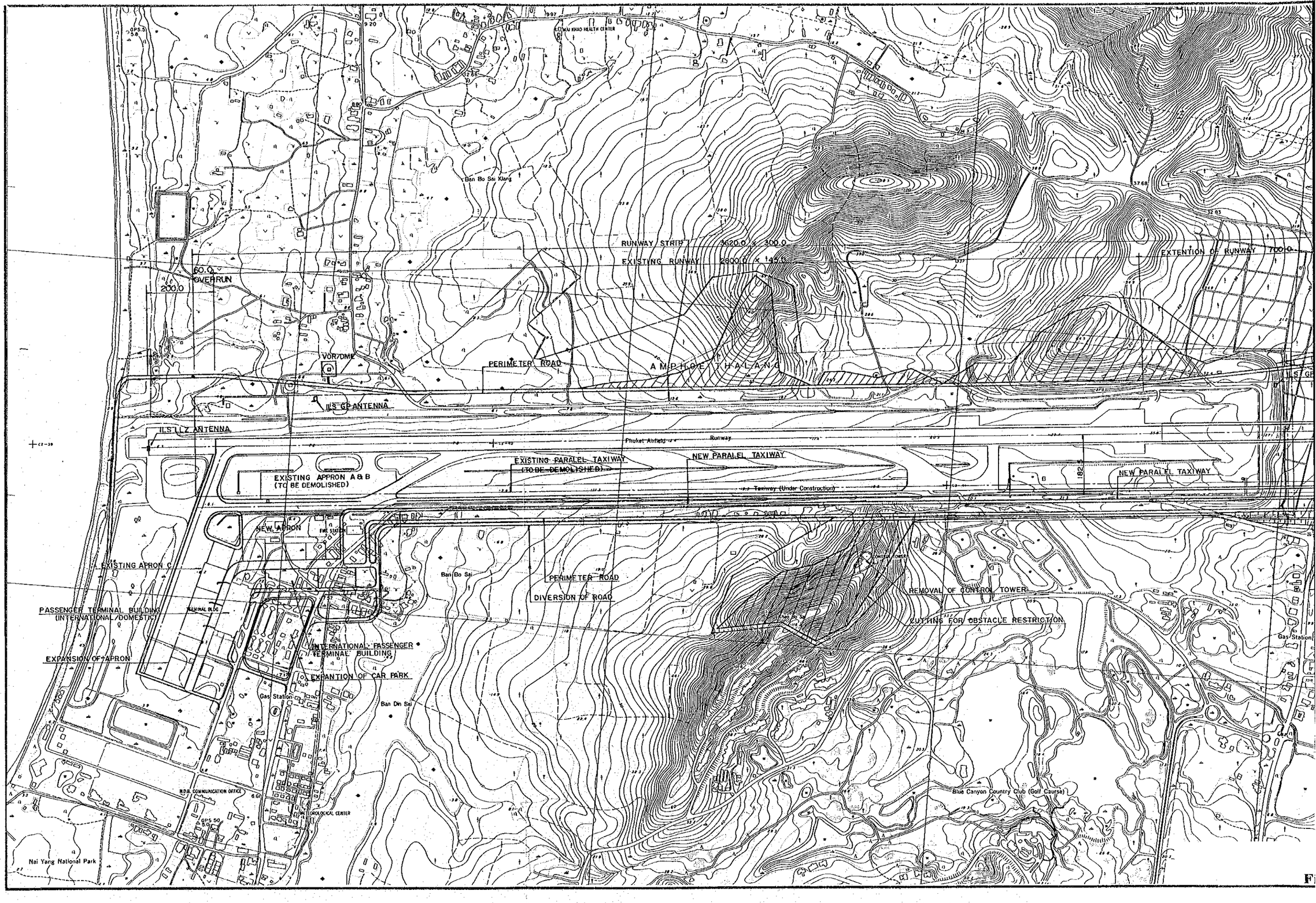
The other air navigation system should be improved as Clause 9.2.1.

(7) Alternative Layout Plan

Layout plan for Alternative-2 is shown in **Fig.9.2.2**.

Table 9.2.3 Alternatives for Improvement of the Separation Distance between Runway and Taxiway

Item	Alt-A	Alt-B
Direction of Runway and Taxiway		
1 Aircraft Operational Aspects		
(1) Take Off Climb Surface (RWY27)		
a. Height of Cut (m)	24.4	24.4
b. Volume of Cut (Million m3)	38.3	38.3
(2) Transitional Surface		
a. Volume of Cut ,North (Million m3)	421.8	221.2
b. Volume of Cut ,South (Million m3)	63.4	191.5
2 Construction Aspects		
(1) Earth Works		
a. Excavation (Million m3)	523.5	451.0
b. Embankment (Million m3)	410.0	410.0
(2) Demolition of Existing Facilities		
a. Runway (Incldg Shoulder) (m2)	180,000	None
b. Overrun (m2)	7,200	None
c. Taxiway (Incldg Shoulder) (m2)	None	72,200
(3) Construction of Facilities		
a. Runway (Incldg Shoulder) (m2)	210,000	42,000
b. Overrun (m2)	7,200	3,600
c. Taxiway (Incldg Shoulder) (m2)	None	121,000
3 Overall Evaluation	The construction cost is expensive compared with Alt-B.	This alternative is more practical than Alt-A, because the construction cost is cheaper than Alt-A.


RUNWAY STRIP 3620.0 x 300.0
EXISTING RUNWAY 2800.0 x 147.0
EXTENTION OF RUNWAY 700.0
60.0
OVERRUN
200.0
VOR/DME
PERIMETER ROAD
ILS GP ANTENNA
ILS LZ ANTENNA
EXISTING APRON A&B
(TO BE DEMOLISHED)
EXISTING PARALEL TAXIWAY
(TO BE DEMOLISHED)
NEW PARALEL TAXIWAY
NEW APRON
EXISTING APRON C
PASSENGER TERMINAL BUILDING
(INTERNATIONAL/DOMESTIC)
EXPANSION OF APRON
INTERNATIONAL PASSENGER
TERMINAL BUILDING
EXPANTION OF CAR PARK
DIVERSION OF ROAD
REMOVAL OF CONTROL TOWER
CUTTING FOR OBSTACLE RESTRICTION
Ban Bo Sai
Ban Din Sai
Gas Station
Nai Yang National Park
Blue Canyon Country Club (Golf Course)
Phuket Airfield
Runway
Taxiway (Under Construction)

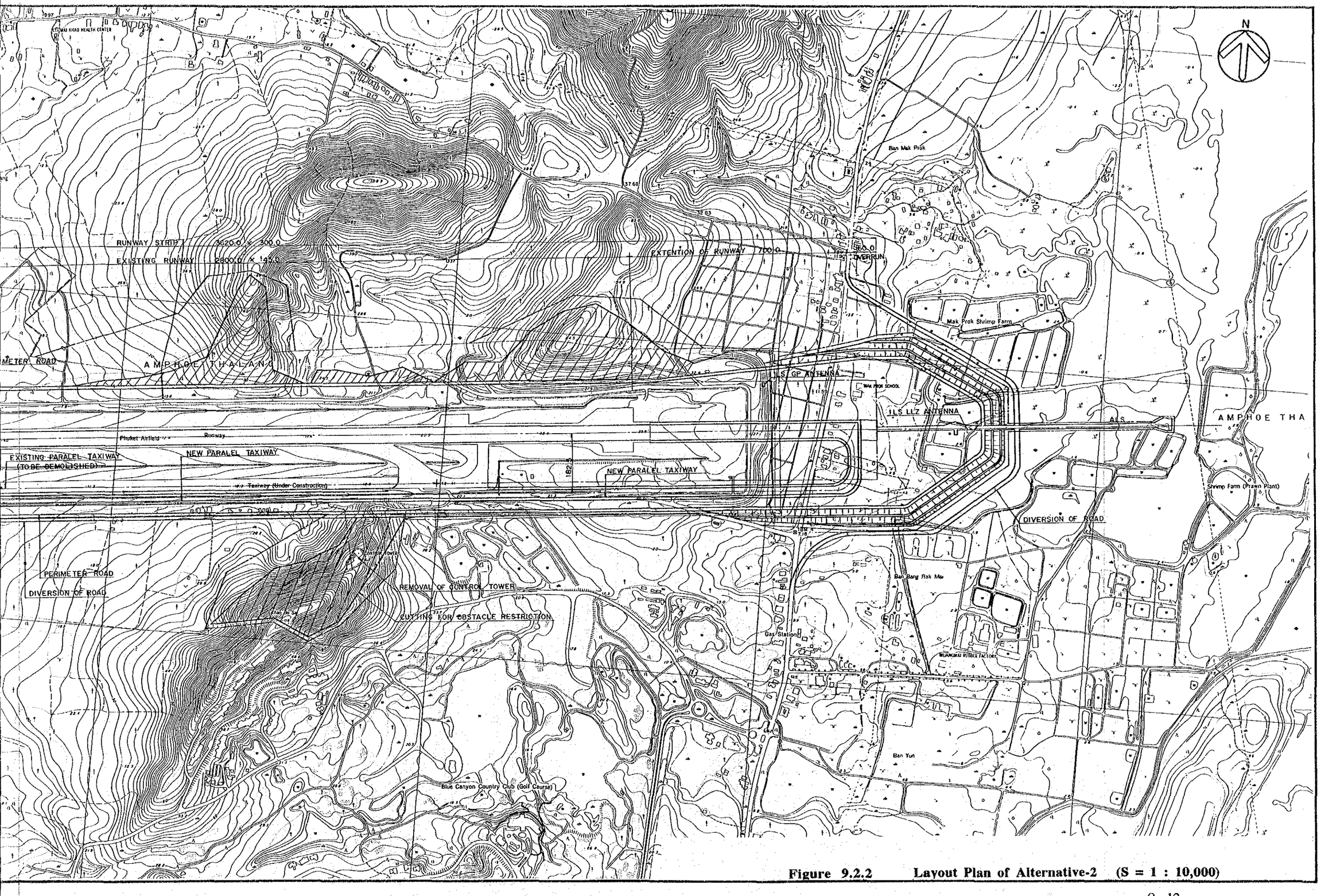


Figure 9.2.2 Layout Plan of Alternative-2 (S = 1 : 10,000)

9.3 ALTERNATIVE FOR NEW AIRPORT DEVELOPMENT

9.3.1 General

In this alternative, a new airport will be planned mostly in accordance with international standards to obtain release from the current constraints and problems of the facilities.

9.3.2 Obstruction Clearance Surface

Some mountains are penetrating the northern half of the inner horizontal surface as well as Alternative-2. In the southern half of the inner horizontal surface, there are very few obstructions except a hill of 120 m height and a part of the mountain of 150 m high. However, the volume to be cut for removal of these obstructions is estimated to be 16 million cu.m and it will cost about six billion Baht. Although the cutting volume of the penetrating mountains on the horizontal surface is smaller than the case of Alternative-2, the volume is still more than 10 million cu.m, which will require large costs and long construction periods. This cutting work is not considered to be a feasible alternative as well as Alternative-2.

This alternative, therefore, excludes the removal of obstructions on the horizontal surface. The straight - in/out procedure is established which was agreed by AEROTHAI who is the competent authority of air traffic control at Phuket International Airport.

According to our study results, candidate sites for a new airport construction completely in compliance with the international standard cannot be found inside Phuket Island. Regarding the possibility for the construction of a new airport in the sea or on adjacent main land, we would like to recommend that this be executed as a separate study.

9.3.3 Runway and Taxiway

A 3,500 m long runway and a complete parallel taxiway are planned.

9.3.4 Apron

A passenger terminal apron is planned in the south side of the runway in consideration of connection with existing trunk road and terrain. A linear concept of parking configuration is adopted for passenger terminal apron.

9.3.5 Terminal Building

A linear type concept with two floor levels will be employed.

9.3.6 Air Navigation System

The following air navigation systems will be provided for the new airport.

(1) Radio Navigation Aids

- ILS or MLS collocated with DME for both runway approaches
- Terminal DME
- NDB

(2) Air Traffic Control System

- ASR/SSR
- ATS console
- Voice Logging Recorder/Reproducer

(3) Aeronautical Telecommunication

- VHF radio (Air to ground / Ground to ground)
- SHF/UHF radio link
- Teletype

(4) Airfield Lighting System

- Approach Lighting Systems
- PAPI
- Runway edge light
- Runway threshold/end light
- Taxiway light
- Apron flood light
- Illuminated wind direction indicator
- Obstacle light
- Information sign
- Aerodrome beacon light
- Power supply system

(5) Meteorological Observation Systems

- Automatic meteorological observation system
- Weather radar
- Radiosonde
- Weather satellite receiver
- Communication facility

9.3.8 Alternative Layout Plan

Layout plan for Alternative-3 is shown in **Fig.9.3.1**.

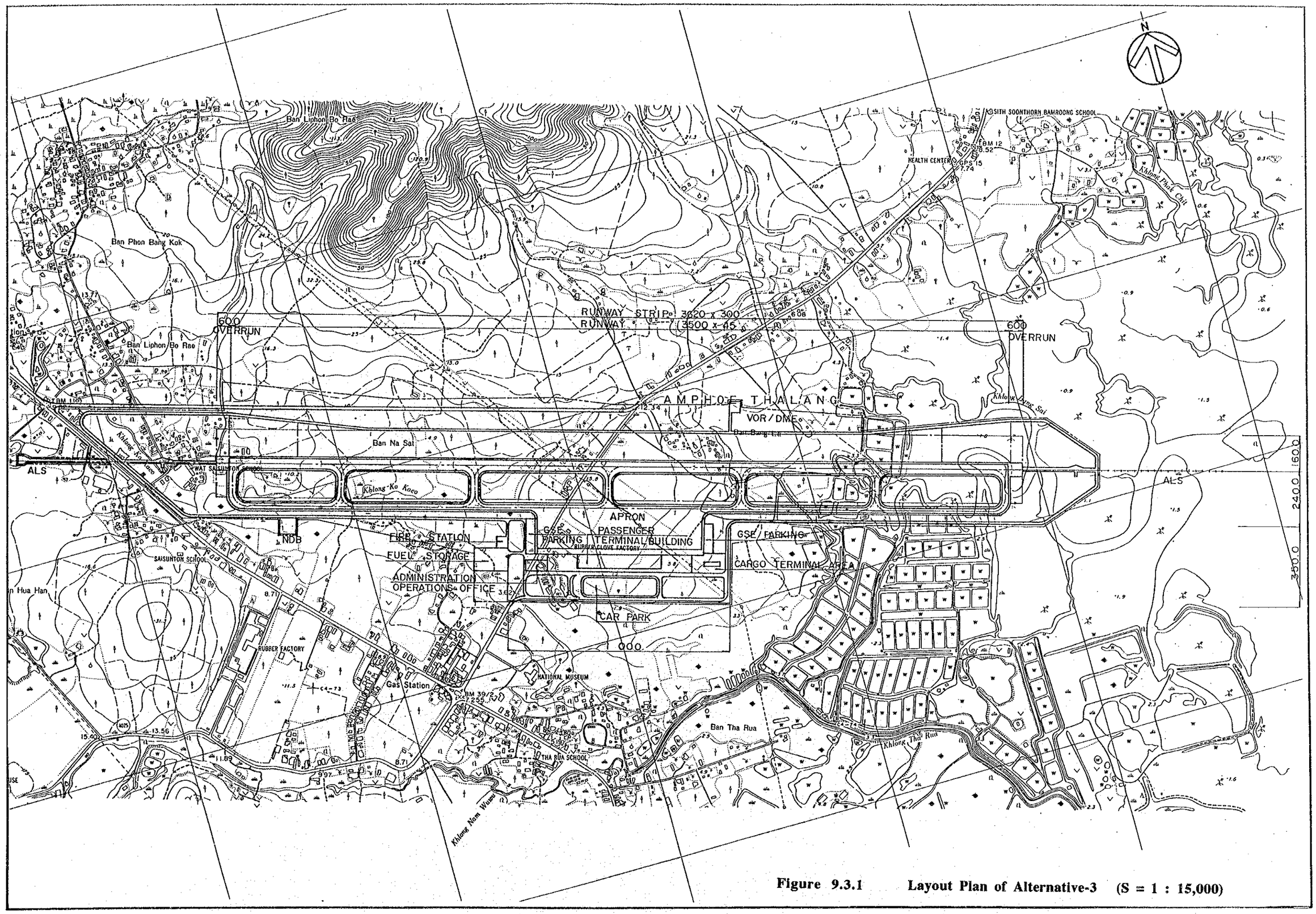


Figure 9.3.1 Layout Plan of Alternative-3 (S = 1 : 15,000)

CHAPTER 10

AIRSPACE USE PLAN

CHAPTER 10 AIRSPACE USE PLAN

10.1 GENERAL

This chapter describes the results of studies pertaining to the airspace use plan for the development plan of the existing airport including the extension of runway and a new airport in Phuket Island. The studies are basically include inspection of the obstacle limitation surfaces and the possibility of the establishment of precision approach Category-I Procedures for the existing airport and the new airport. The study of obstacle limitation surfaces is based on the standards and recommended practices described in the ICAO Annex 14, Aerodromes. The study of the possibility of the establishment of the precision approach Category I procedures is based on the criteria and procedures described in the ICAO DOC 8168-OPS/611, PANS-OPS (Procedures for Air Navigation Services, Aircraft Operations).

10.2 EXISTING AIRPORT

At present, two alternative plans for the development of the existing airport are being studied. The Alternative-1 has a plan of 500 m length extension of the existing runway to the east.

The Alternative-2 has plans of runway modification as follows:

(1) displacement of runway 09 threshold to a point 200 m inside of existing runway threshold to replace the ILS/LLZ to a normal position.

(2) 500 m length extension of runway to the east.

Accordingly, airspace use for the existing airport in the future is studied for each alternative plan.

10.2.1 Alternative 1

The condition of study for Alternative 1 is assumed as follows.

- ICAO Aerodrome reference code : 4E
- Elevation of east end of landing strip : 26.300 m AMSL
- Elevation of west end of landing strip : 4.859 m AMSL
- Elevation of Runway 09 threshold : 5.705 m AMSL
- Elevation of Runway 27 threshold : 26.900 m AMSL
- Highest elevation of the runway : 26.900 m AMSL
- Dimension of landing strip : 3.620 m x 150 m
- Elevation of Inner Horizontal Surface : 71.9 m AMSL

(1) Obstacle Limitation Surfaces

The obstacle limitation surfaces for Alternative 1 are as shown in **Figure 10.2.1**.

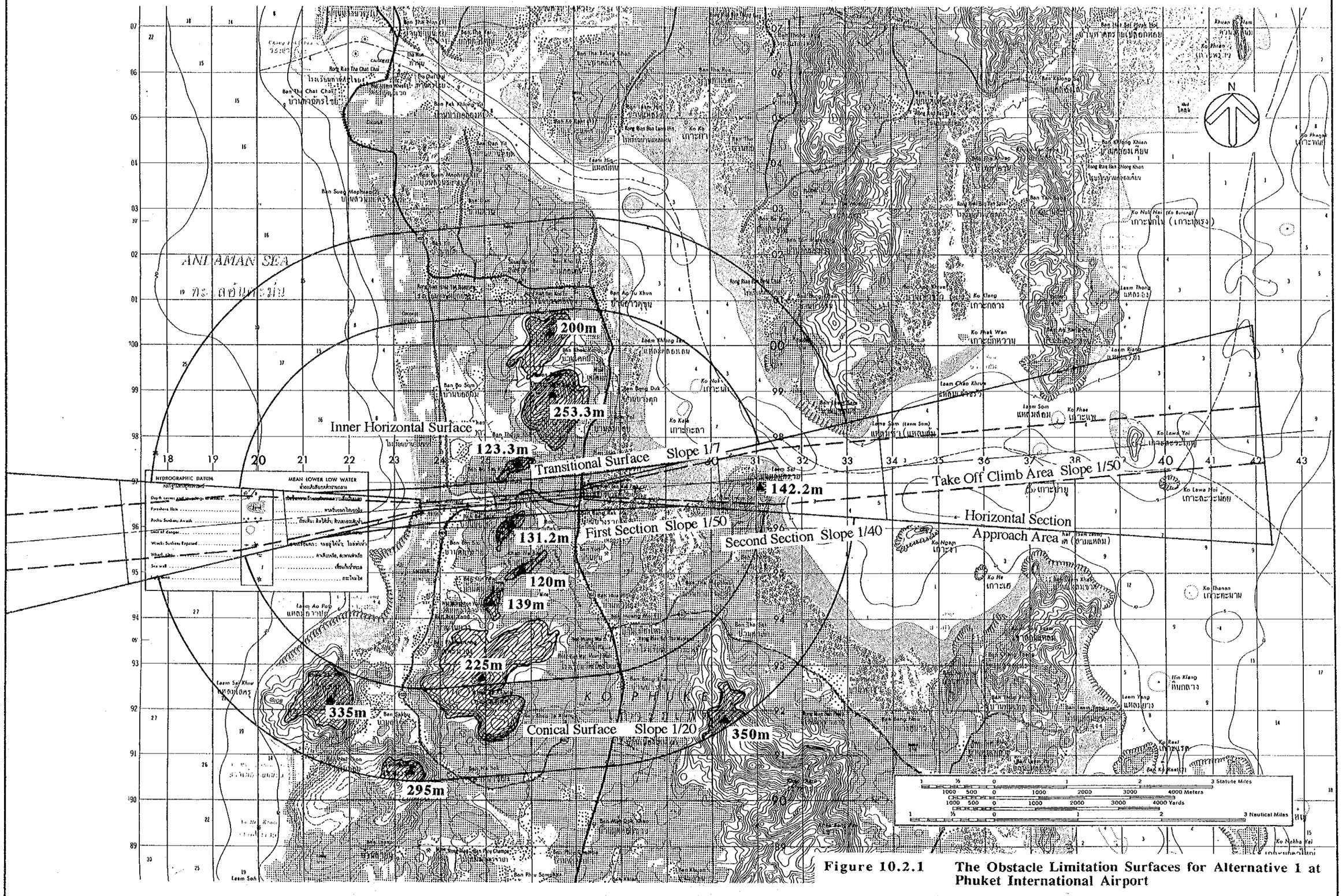


Figure 10.2.1 **The Obstacle Limitation Surfaces for Alternative 1 at Phuket International Airport**

a. Approach Surfaces

(a) Runway 09

The condition of the approach surface for Runway 09 is the same as the existing approach surface. Since most parts of the approach area for Runway 09 is established on the Andaman Sea, no obstacle is projected above the approach surface of 1/50.

(b) Runway 27

At present, a hill with trees, 142.2 m AMSL in total, is located at a point approximately 4,575 m to the east of the existing Runway 27 threshold on the extended runway centerline. This hill projects above the existing second section of the approach surface. When Runway 27 threshold is moved 500 m toward the east, this hill will become a more severe obstacle as shown in **Figure 10.2.2**.

b. Inner Horizontal Surface

The elevation datum of inner horizontal surface will be 71.9 m AMSL. As shown in **Figure 10.2.1**, hills located on the northern and southern parts of this surface are projected above this surface.

c. Conical Surface

Hills located on southern part of this surface project above this surface.

d. Transitional Surfaces

Figure 6.12.5 shows hills located on both sides of runway which rise and project above these surfaces.

e. Take Off Climb Surface

Figure 10.2.3 shows the profile of the relationship between the take off climb surface for take off runway 09 and the 142.2 m AMSL hill. This hill projects above this surface for the 1/50 slope.

The projected part of this hill should be lowered by cutting to ensure the safety of aircraft operations during the initial climb out phase.

The take off climb surface for take off runway 27 is free of obstacles.

(2) Possibility of the Establishment of Precision Approach Procedure

The study for the possibility of the establishment of a precision approach procedure for Runway 27 is based on the following assumptions:

Figure 10.2.4 shows the Obstacle Assessment Surfaces (OAS) for Runaway 27 with the following conditions:

Threshold - localizer distance	:	3,600 m
GP angle	:	3.2°
Approach Category	:	CAT I

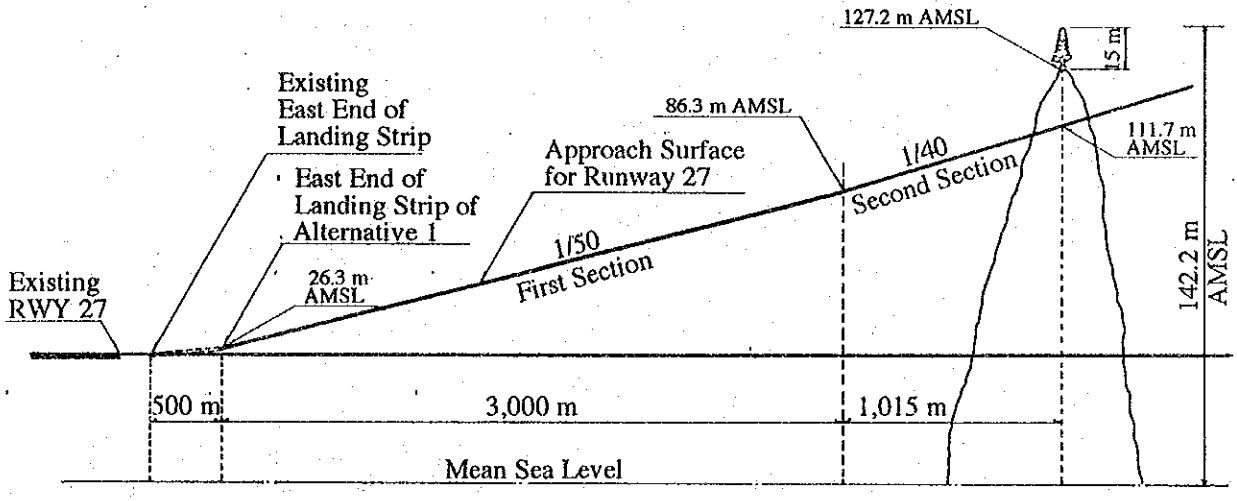


Figure 10.2.2 Profile of the Relationship between the Approach Surface for Runway 27 of Alternative 1 and 142.2 m AMSL Hill

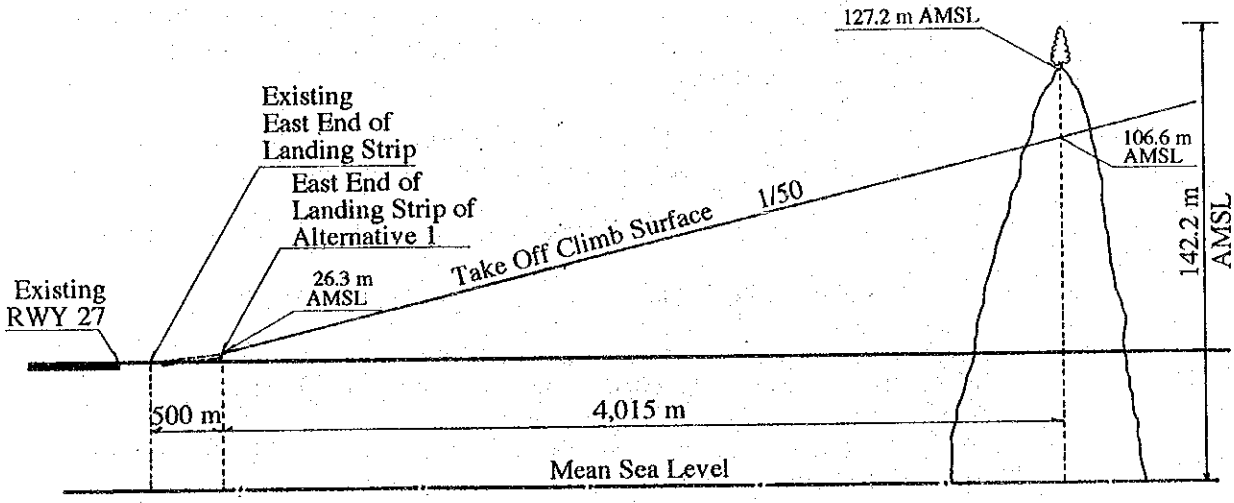


Figure 10.2.3 Profile of the Relationship between the Take of Climb Surface for Runway 27 of Alternative 1 and 142.2 m AMSL Hill

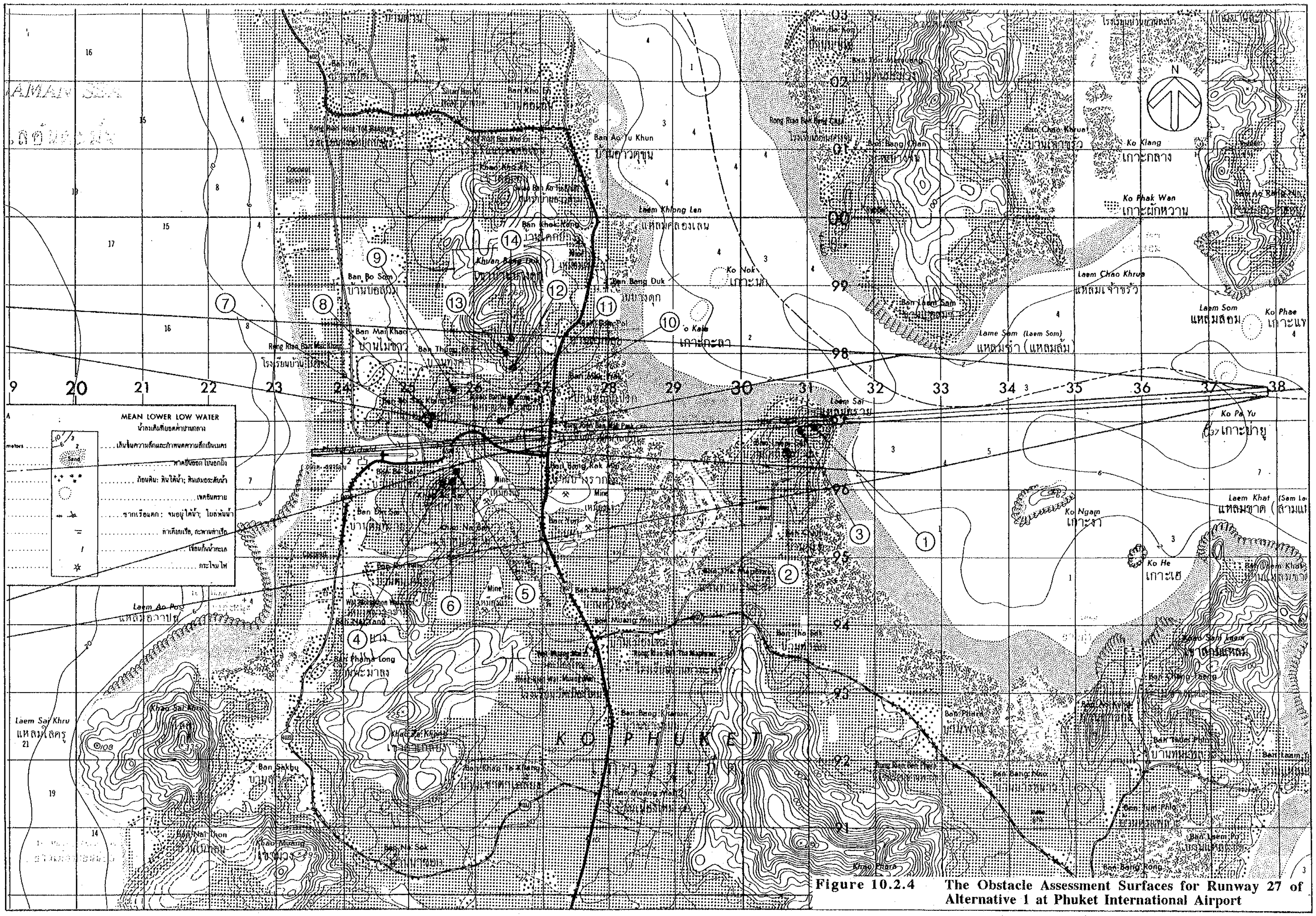


Figure 10.2.4 The Obstacle Assessment Surfaces for Runway 27 of Alternative 1 at Phuket International Airport

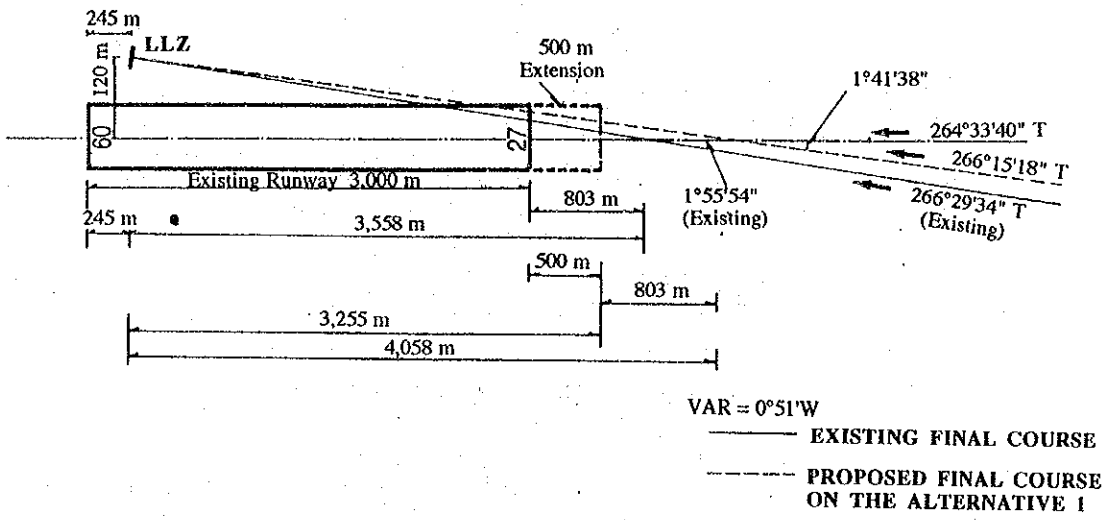


Figure 10.2.5 The Assumption for Study of Precision Approach Procedures for Runway 27

Table 10.2.1 Assessment of Obstacles within OAS for Runway 27 of Alternative 1 at Phuket International Airport

Airport : Phuket Runway 27 Threshold Elevation : 26.9 m

ILS Inbound Course : 266°15'18"T VAR : 0°51'00" W

OAS LLZ - THR Distance : 3,600 m, GP : 3.2°, CAT I Offset

No.	Elevation of Obstacle (m) (+15 : Trees)	Height above Threshold of Obstacle	Distance of X (m)	Distance of Y (m)	Surface Concerned	Height of Surface at Obstacle (m)	Remarks	
1	127.2+15	115.3	4110	300	x SFC	165.4	OK	
2	79.6+15	67.7	3660	490	x	190.8	OK	
3	100+15	88.1	3910	290	x	158.7	OK	
4	116.2+15	104.3	-1560	560	y	62.2	NO	ha=58.6m
5	113	86.1	-1335	360	y	22.6	NO (TWR)	ha=50.2m
6	100+15	88.1	-1420	470	y	45.4	NO	ha=50.1m
7	60+15	48.1	-1675	380	z	18.0	NO	ha=19.1m
8	69.3+15	57.4	-1640	490	y	44.0	NO	ha=25.9m
9	108.3+15	96.4	-1290	780	y	119.6	OK	
10	64.5+15	52.6	-680	300	y	26.5	NO	ha=38.8m
11	63.0+15	51.1	-485	640	y	109.3	OK	
12	62.3+15	50.4	-440	980	y	188.1	OK	
13	93.7+15	81.8	-470	1170	y	230.6	OK	
14	160+15	148.1	-390	1500	y	308.1	OK	

W = 0.030340x - 7.38 Y = 0.026881x+0.228134y-23.61

X = 0.030628x + 0.198685y-18.63 Z = -0.025x - 22.5

The obstacles within the OAS were checked as shown in **Table 10.2.1**. The obstacles, numbered 4 ~ 8 and 10, project above these surfaces.

Among the obstacles, obstacle No. 4 is considered as the most critical obstacle for decision of the OCH/A (obstacle clearance height/altitude).

Accordingly, OCH/A are calculated by the following formula described in PANS-OPS provided that obstacle No. 4 is critical for decision of OCH/A.

$$h_a = \frac{h_{ma} \cot Z + (900 + x)}{\cot Z + \cot \theta}$$

Where: h_a = height of equivalent approach obstacle
h_{ma} = height of missed approach obstacle
θ = glide path angle
Z = angle of missed approach surface
x = range of obstacle relative to threshold (negative after threshold)

Table 10.2.2 shows the result of calculations for OCH/A for each approach category aircraft.

Table 10.2.2 OCH/A for Precision Approach Category I to Runway 27

Approach category	OCH/A ft
A	323/406
B	335/418
C	343/426
D	354/437

From **Table 10.2.2**, the hills located in close proximity to the runway are affected by the decision of the OCH/A. So, improvement of OCH/A can not be expected by the exception of reducing the height by cutting of most parts of these hills.

10.2.2 Alternative 2

The conditions of studies for Alternative 2 is assumed as follows:

- ICAO Aerodrome reference code : 4E
- Elevation of east end of landing strip : 26.9 m AMSL
- Elevation of west end of landing strip : 6.053 m AMSL
- Elevation of Runway 09 threshold : 6.245 m AMSL
- Elevation of Runway 27 threshold : 27.50 m AMSL
- Highest elevation of the runway : 27.50 m AMSL
- Dimensions of landing strip : 3,620 m x 300 m
- Elevation of Inner Horizontal Surface : 72.5 m AMSL

(1) Obstacle Limitation Surfaces

The obstacle limitation surfaces for Alternative 2 are as shown in **Figure 10.2.6**.

a. Approach Surfaces

(a) Runway 09

The west end of landing strip will be displaced 200 m to the east. Since most parts of the approach area is still spread over the Andaman Sea, there are no obstacles that exist in the approach area.

(b) Runway 27

The east end of landing strip will be extended 700 m to the east of the existing landing strip. The hill 142.2 m AMSL, located at point approximately 4,575 m east of the existing runway threshold will become a more hazardous obstacle for the aircraft operations as shown in **Figure 10.2.7**, therefore, portions of the hill which infringes above the approach surface should be cut off to ensure the safety of aircraft operations especially initial take off phase from take off Runway 09.

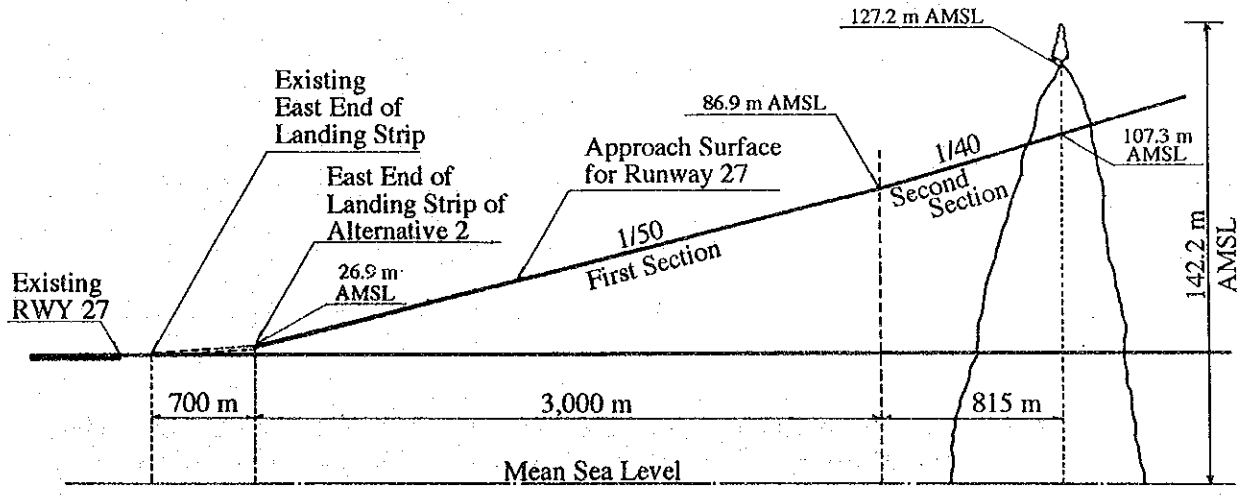


Figure 10.2.7 Profile of the Relationship between the Approach Surface for Runway 27 of Alternative 2 and 142.2 m AMSL Hill

b. Inner Horizontal Surface

The elevation datum of inner horizontal surface will be 72.5 m AMSL. As shown in **Figure 10.2.7**, hills located on the northern and southern parts of this surfaces project above this surface.

c. Conical Surface

Hills located on the southern part of this surface project above this surface.

d. Transitional Surfaces

Figure 6.12.5 shows hills located on both sides of runway rise and project above these surfaces.

e. Take Off Climb Surface

Figure 10.2.8 shows the profile of the relationship between the take off climb surface for take off runway 09 and the 142.2 m AMSL hill. This hill projects above this surface by approximately 39 m.

Even if the 1/40 slope of OIS (Obstacle Identification Surface) described in PANS-OPS is applied, this hill still projects above this surface by approximately 20 m.

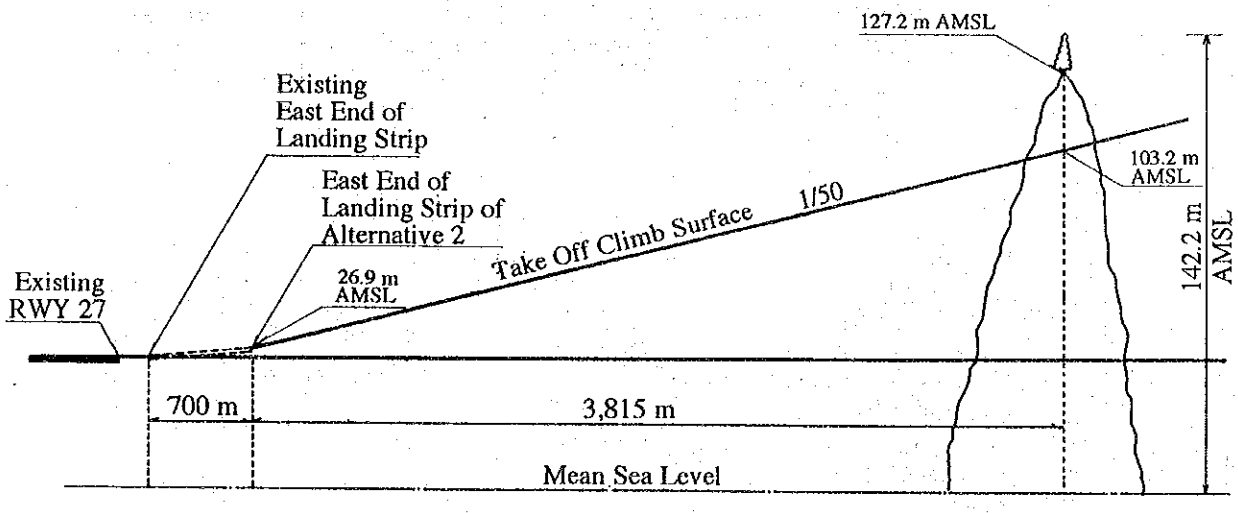


Figure 10.2.8 Profile of the Relationship between the Take Of Climb Surface for Runway 27 of Alternative 2 and 142.2 m AMSL Hill

Figure 10.2.6 **The Obstacle Limitation Surfaces for Alternative 2 at Phuket International Airport**