3.4 Airport Traffic Characteristics

This section describes airport traffic characteristics particular to Henderson International Airport. Peaks of traffic, passenger characteristics and processing time of airlines' passenger handling and government formalities are evaluated based on the past traffic statistics and the result of the traffic survey conducted at the airport.

3.4.1 Peak Characteristics

(1) Peak Month

The monthly distribution of passenger traffic in 1989 is shown in Table 3.4.1.

Table 3.4.1 Monthly Passenger Traffic in 1989

Month	Int'l Passengers	Domestic Passengers
Jan.	2,797 (8.4%)	4,595 (11.1%)
Feb.	2,829 (8.5%)	3,423 (8.3%)
Mar.	2,542 (7.6%)	3,090 (7.5%)
Apr.	2,563 (7.7%)	3,143 (7.6%)
May.	2,476 (7.4%)	3,452 (8.4%)
Jun.	2,941 (8.8%)	3,207 (7.8%)
Jul.	3,280 (9.9%)	3,657 (8.8%)
Aug.	2,906 (8.7%)	3,228 (7.8%)
Sep.	3,154 (9.5%)	3,191 (7.7%)
Oct.	2,478 (7.5%)	3,083 (7.5%)
Nov.	3,177 (9.5%)	3,199 (7.7%)
Dec.	2,131 (6.5%)	4,071 (9.8%)
	33,283 (100.0%)	41,339 (100.0%)

Source: International passengers from Tourism Statistical Bulletin and domestic passengers from Solomon Airlines.

Note 1: Data of exit and entry numbers from/to Solomon Islands are used assuming there is no big difference from international passengers at Henderson International Airport.

Note 2: Domestic passengers do not include passengers on Western Pacific Airservices due to absence of monthly data.

The peak month of international passengers in 1989 appeared in July. It was caused by concentration of tourist movements in that period, and has been the same for the recent three years. The peak month ratio (peak month traffic volume/total annual traffic volume of the international passenger showed relatively small value) of 9.9% or 1/10.1 in 1989 and that of the domestic passengers was 11.1% or 1/9.0 in 1989. The peak month of domestic passengers usually occurs in January at the end of the Christmas and New Year holidays.

(2) Typical Peak Hour

Based on the daily passenger record from the immigration office and the present flight schedule at Henderson International Airport, the typical peak hour aircraft movements and passengers are estimated as shown in Table 3.4.2.

Table 3.4.2 Typical Peak Hour Traffic

(a) International			
- Passengers	:	140	passengers
- Aircraft	:	2	movements
		(1	arrival and 1 departure of B737)
(b) Domestic			
- Passengers	:	60	passengers
- Aircraft	:	7	movements
		(1	arrival and 1 departure of DHC-6,
		3	arrivals and 2 departures of BNI)
(c) Overall			
- Passengers	:	180	passengers
		(140	international and 40 domestic)
- Aircraft	:	6	movements
		(1	arrival and 1 departure of B737,
		1	arrival and 1 departure of DHC-6,
		1	arrival and 1 departure of BNI)

As the available number of seats of B737 is 100, the passenger load factor during the peak hour is calculated to be 70% (load factor = no. of passengers/no. of available seats x 100 = 140/(100x2)x100=70%). Higher than 70% passenger load factors were observed mainly for Brisbane route.

The present flight schedule at Henderson International Airport is shown in Appendix-3.4.1.

3.4.2 Passenger Characteristics

The majority of international passengers at Henderson International Airport are visitors from overseas. Solomon Islands residents accounted for only 29% of the departing passengers during a three-day interview survey conducted at the airport.

The Tourism Statistical Bulletin which may provide more accurate proportions than the above brief survey, indicates that Solomon Islands residents accounted for 40% of the annual international passengers in 1989. According to the

Tourism Statistical Bulletin, approximately 45% of the total visitors to Solomon Islands were on holiday vacation trips, and some 30% of the same were on business trips in 1989. The details of the passenger characteristics obtained from the passenger interview survey are described in Appendix-3.4.2. The major planning parameters obtained from the interview survey are summarized as follows:

a) Transportation mode to airport

a.	Private Car	: 50%
b.	Bus (Red Bus)	: 19%
c.	Company Car	: 13%
d.	Rental Car	: 7%
e.	Taxi	: 7%
f.	Other	: 4%

b) Average number of well-wishers per passenger : 1.1
(Solomon Islands Residents) : 1.4
(Visitors) : 0.9

c) Average number of check-in baggage : 2.1

The private cars and "Red Bus" were the major transportation modes to the airport, while the utilization of taxis was minimum. The average number of well-wishes per passenger was relatively small as compared with other South Pacific countries such as Western Samoa or Vanuatu.

3.4.3 Passenger Processing Time

Passenger processing time survey was conducted at the airport. The result of the survey is detailed in Appendix-3.4.3 and summarized in Table 3.4.3.

Table 3.4.3 Passenger Processing Time

Location	Processing Time Per Passenger
1. Check-in	1'50"
2. Departure Immigration	30"
3. Security Check	55"
4. Arrival Immigration	1'50"
5. Customs/Quarantine	25"

The security check for hand carried baggage consumed a long time due to manual inspection. The arrival immigration required an extraordinary long time as compared to other international airports, while customs inspection was relatively simple and short in time.

3.4.4 Utilization of Car Parking

The utilization of the car parking was also investigated in relation to the number of passengers. The result of the survey is detailed in Appendix-3.4.4. Average parking ratio (the number of parked cars/the number of peak hour passengers) of 0.58 was obtained from the survey. This ratio is almost the same value observed at Port Vila in Vanuatu.

3.5 Land Use

A land use map around the airport is as shown in Figure 3.5.1. The land use around the airport is generally for agricultural purposes, such as coconut plantation, cocoa plantation scattered trees, grass field and cultivated land.

On the northern side of the airport, 90 people live in the airport housing, and several houses with some 80 inhabitants are scattered along the north side of Henderson Road. Scattered houses with some 100 inhabitants are also located 500 - 1,000 m to the south of the airport. Major housing around the airport is in Mbetikama Village located 1.5 km from the runway 06 threshold and just under the approach path. Approximate number of inhabitants in this village is 500. There is Mbetikama Secondary School in the village.

As for future land use plan around the airport, an industrial estate is planned by the Ministry of Agriculture and Lands as indicated in Figure 3.5.1. Light industries and aviation related facilities are deemed to be developed. This project is scheduled to be financed by Asian Development Bank in 1991.

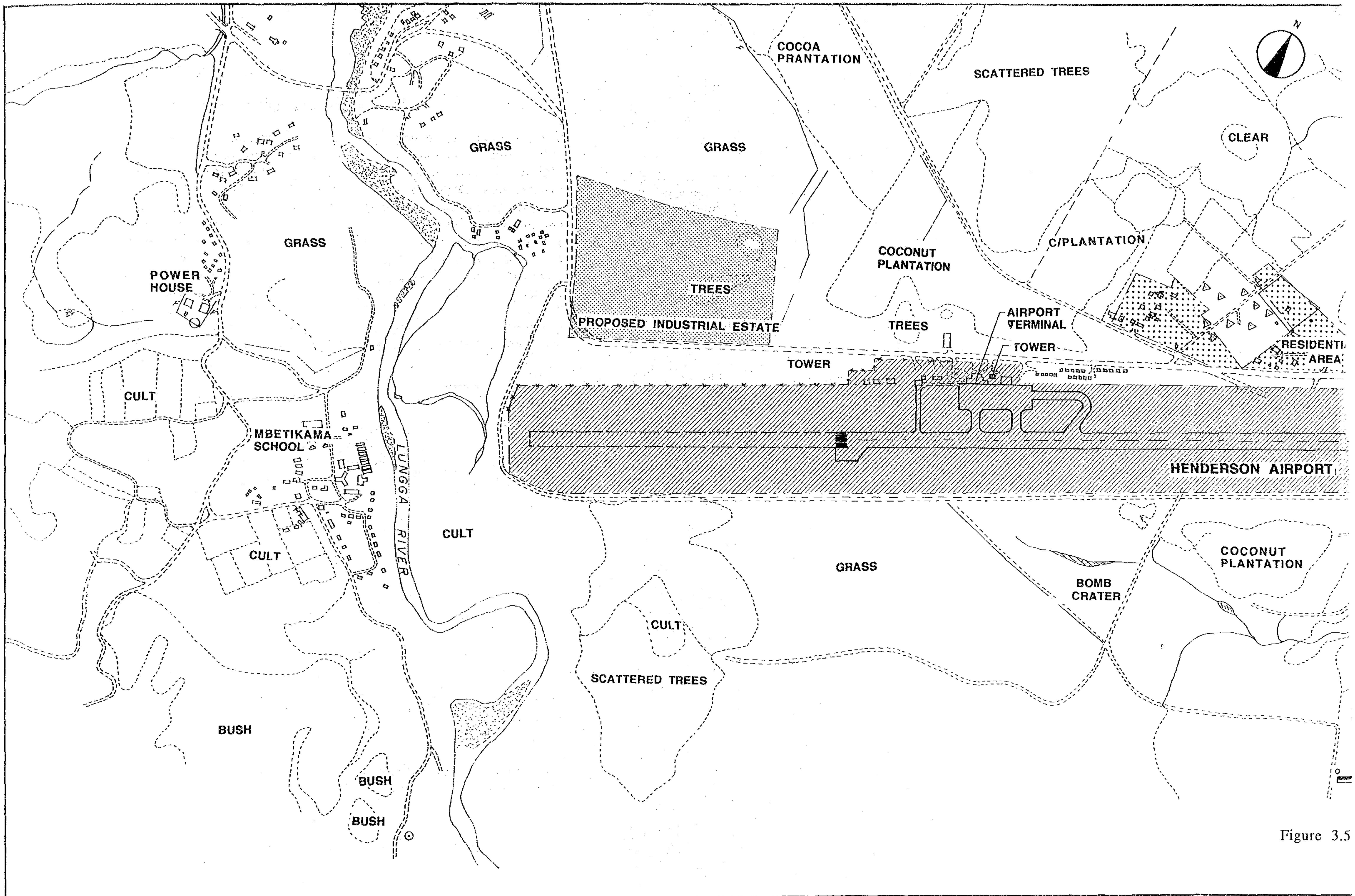

COCOA PRANTATION
SCATTERED TREES
CLEAR
GRASS
GRASS
GRASS
POWER HOUSE
TREES
PROPOSED INDUSTRIAL ESTATE
COCONUT PLANTATION
C/PLANTATION
TREES
AIRPORT TERMINAL
TOWER
TOWER
RESIDENTI
AREA
CULT
MBETIKAMA SCHOOL
LUNGGA RIVER
HENDERSON AIRPORT
CULT
CULT
GRASS
COCONUT PLANTATION
BOMB CRATER
CULT
SCATTERED TREES
BUSH
BUSH
BUSH

Figure 3.5

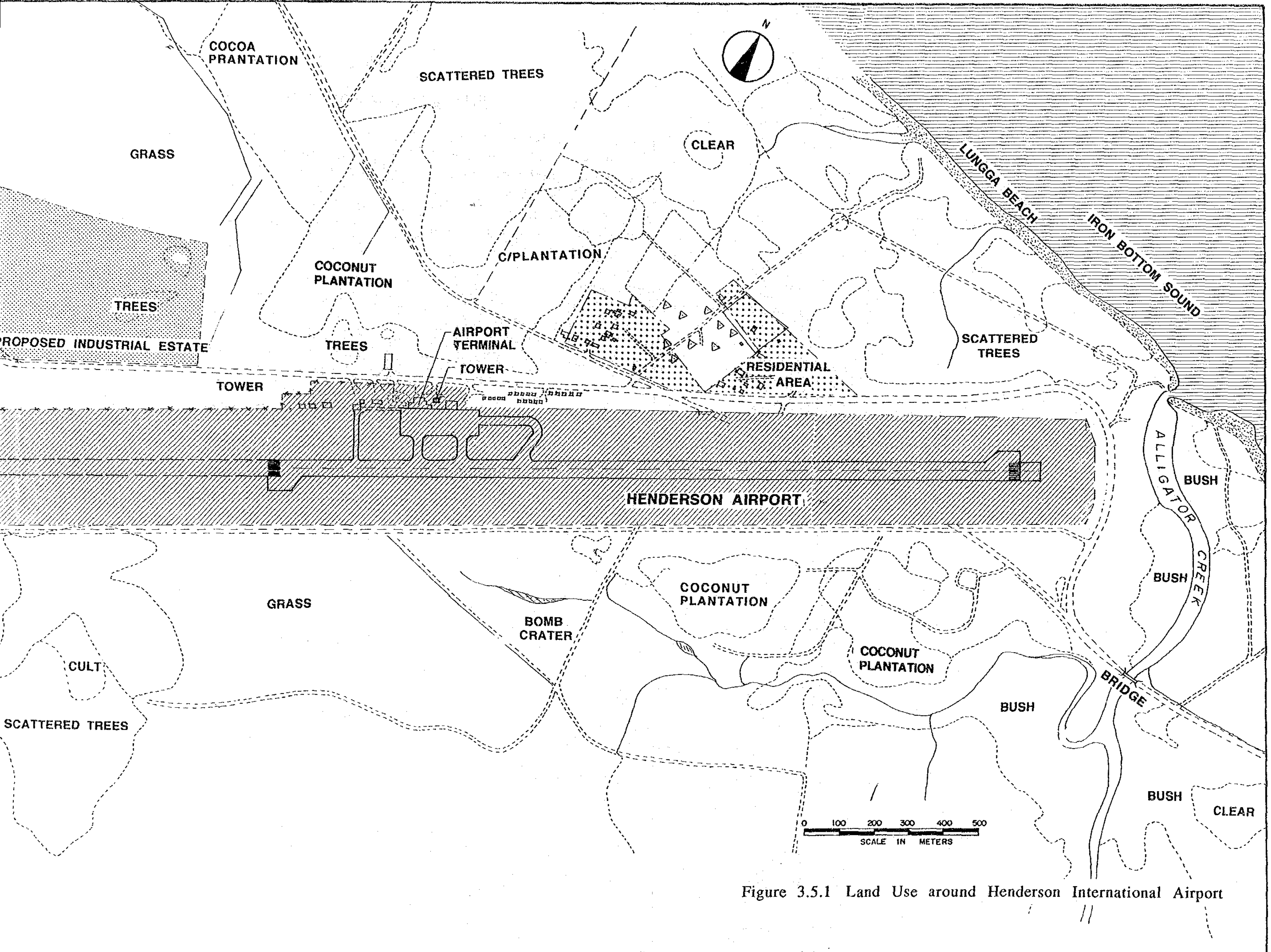


Figure 3.5.1 Land Use around Henderson International Airport

3.6 Meteorological Condition

3.6.1 Temperature, Humidity and Rainfall

The Solomon Islands has a climate typical of many tropical islands characterized by high and uniform temperature, high humidity throughout the year and abundant annual rainfall. Mean daily maximum temperature exceeds 30°C with relative humidity (2pm) more than 70% throughout the year. Average annual rainfall is said to vary from 3,000 to 5,000mm and could exceed 9,000mm in some of high places in the mountains. According to observations maintained by Meteorological Service Office at Henderson Airport, however, its rainfall is some 2,000mm. The dry season is generally from May to October. The remaining months make up the wet season. Monthly variations of temperature, relative humidity and rainfall at Henderson International Airport for the past 15 years is given in Appendix-3.6.1.

3.6.2 Wind Speed and Direction

Based on the meteorological data of wind velocity and direction at Henderson International Airport from 1975 to 1986, wind distribution charts for all months, dry season and wet season are prepared as shown in Appendix-3.6.2. The characteristics of wind distribution at the airport are summarized as follows:

a) The calm condition (wind speed from nil up to 5kt) accounts for 83.3% of the total observations.

b) Occurrence of the wind speed more than 10kt is rare at the airport with only 3.4% of the total observations.

c) The dry season is slightly windier than the wet season.

d) The northeast to east winds are predominant throughout the year accounting for 19.5% of total observations excluding calm condition. This becomes more apparent during the dry season. (23.1%)

e) The northeast wind is predominant also during the wet season (14.2%). However, the west, northwest, north and northeast winds are mixed in this season.

3.6.3 Cyclones

The Solomon Islands is subjected to tropical cyclones associated, by definition, with winds of at least gale force of 34 kt. The average frequency of cyclone occurrence is one to two per year over the past 30 years. As cyclones affecting the Solomon Islands are usually in their early stages, they are small in general. However, several severe cyclones caused extensive damage to structure, crops, and forests and killed people in the past. Cyclones associated with more than 300 mm rainfall during a day in Honiara are listed in Appendix-3.6.3.

In mid May of 1986, the cyclone "Namu" hit three of the country's main islands. One hundred and fourty lives were lost, and extensive damage was caused on the infrastructure, plantation and forests on the Guadalcanal Plain. It was reported that one-third of the total population in the country suffered from damages to their houses, subsistence gardens, cash crops, water supply, etc. The entire airport was flooded at that time due to the overflow of Lungga River.

3.7 Topographic Survey and Obstruction Survey

3.7.1 Topographic Survey

A topographic survey was executed to cover the entire airport property area and possible areas for future terminal facilities and runway extension. The areas covered by the survey are shown in Figure 3.7.1. Topographic maps, runway centerline profile and cross sections were produced by the survey in compliance with technical specifications in Attachment-C of the Inception Report, and will be used for the airport master planning and preliminary design.

The airport is situated basically on a flat land on Guadalcanal Plain. The land has a very slight slope towards Alligator Creek which runs at the northeast end of the airport. Lungga River runs on the southwest side of the airport.

The runway has a longitudinal slope of about 0.2% from the southwest to the northeast, and transverse slope of 1.3-1.5% towards its edges from the center crown. The slopes and slope changes on the runway except some western sections comply with ICAO Annex 14 recommendations.

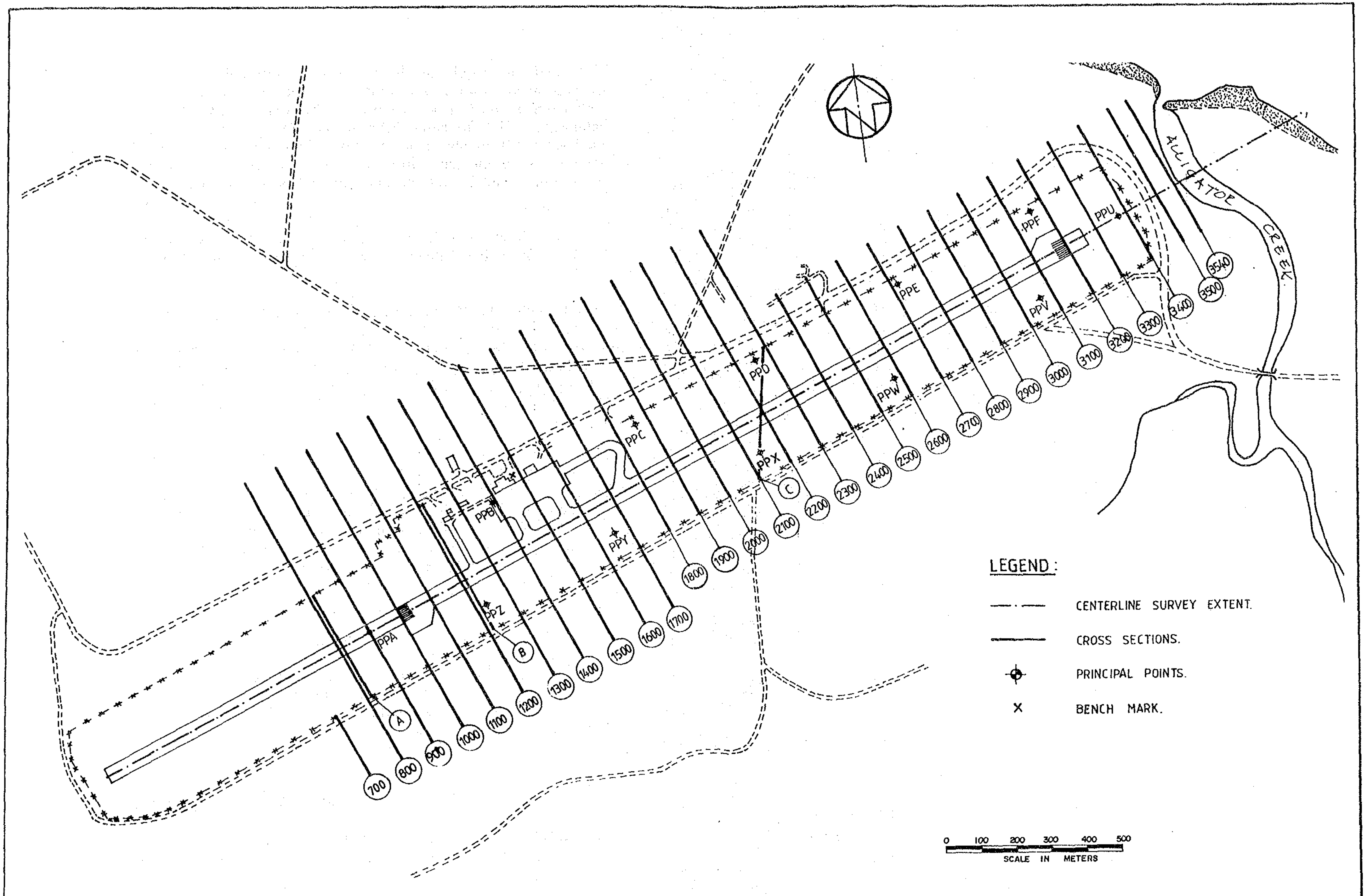


Figure 3.7.1 Area of Topographic Survey

The 150m wide runway strip has down slopes of about 1.5-3.0% in transverse directions from the runway centerline to its edges. Some parts of the runway strip have a transverse slope more than ICAO recommended value of 2.5%. Triangular shaped open ditches are located on each side of the runway at a distance of approximately 77m from the runway centerline. These open ditches are located outside the 150m wide runway strip.

The slopes on the apron are about 1.5% towards the runway, which apparently exceed the recommended value of 1.0% in ICAO Annex 14.

The area to the north side of Henderson Road, where future terminal facilities will be located, is generally flat with a slight slope towards Alligator Creek. The mouth of Alligator Creek was closed at the time of the survey; however, it has almost the same water level as the mean sea level. The depth of the water was about 1.7m.

3.7.2 Obstruction Survey

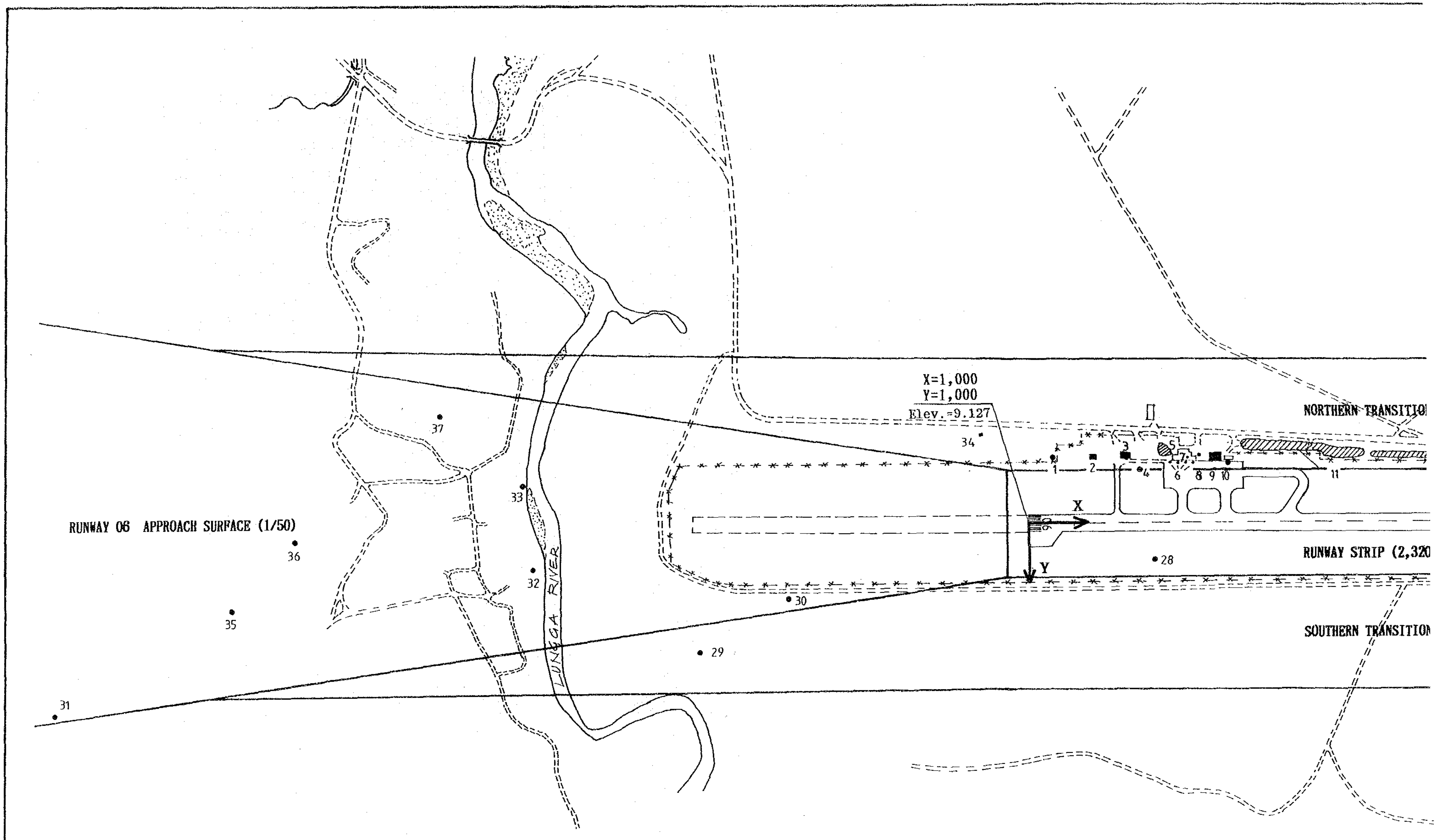
An obstacle survey was carried out in order to check the existence of obstacles around the airport which may prevent safe operation of aircraft. An obstruction chart and list of obstacles for ICAO recommended obstacle limitation surfaces for 300 m wide strip are shown in Figure 3.7.2 and Table 3.7.1 respectively.

(1) Runway 06 Approach Surface

The 1:50 slope approach surface to runway 06 is free from obstacles except for a trees (no.30) located about 1,400 m from runway 06 threshold. A hill (no.31) is closest to the surface with about 3.4m vertical clearance. There are no trees on this hill.

(2) Runway 24 Approach Surface

Clusters of trees (no.15 and 17) beside Alligator Creek are obstacles to the 1:50 slope approach surface to runway 24.



Note 1: This obstruction map is produced for 300m wide runway strip based on ICAO recommendation.

Note 2: All the objects listed as obstacles to northern and southern transitional surfaces from 300m wide runway strip are not obstacles to transitional surfaces from existing 150m wide runway strip except two windsock masts.

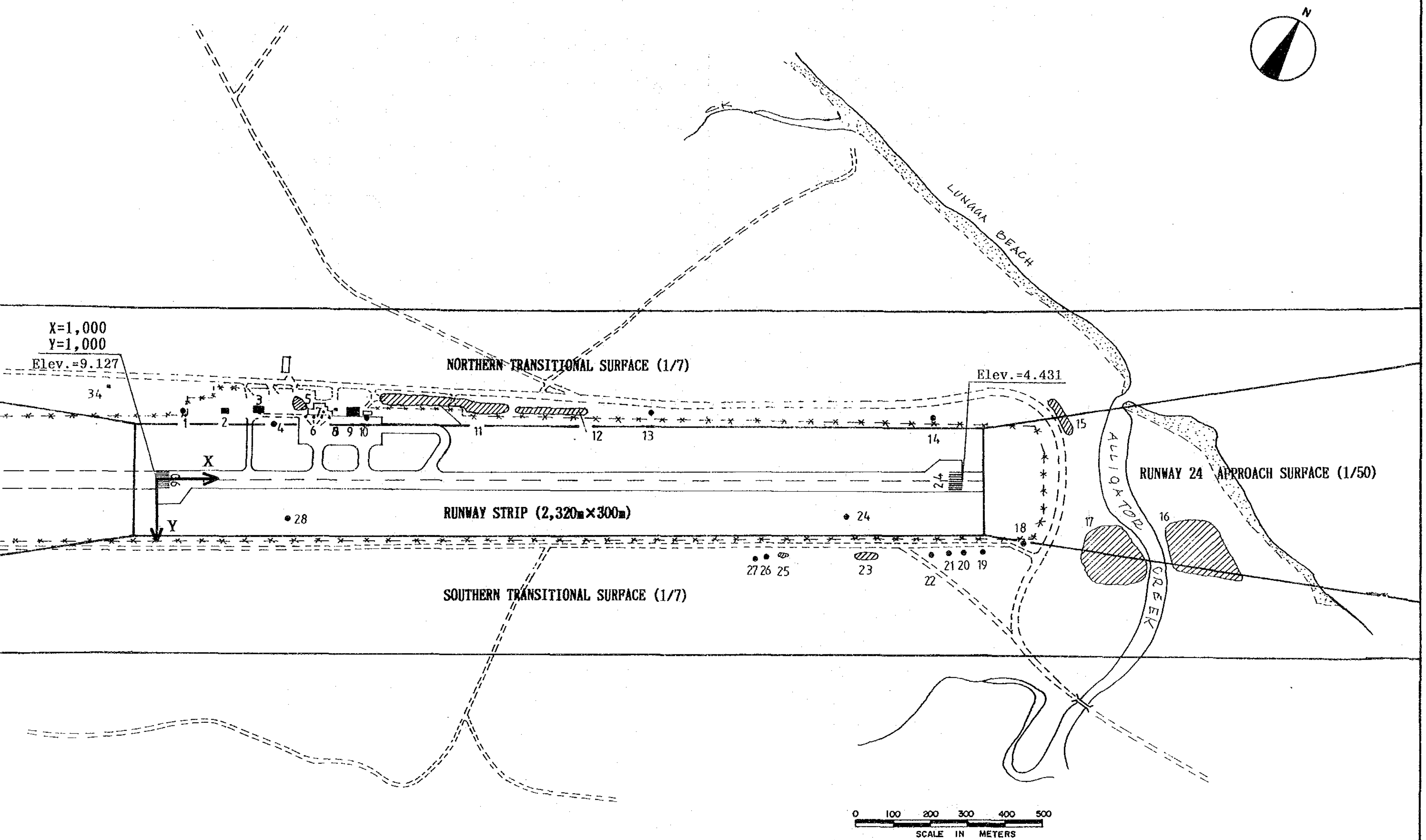


Figure 3.7.2 Location of Obstacles to ICAO Recommended Obstacle Limitation Surfaces

Table 3.7.1 List of Obstacles to ICAO Recommended Obstacle Limitation Surfaces

RWY 24 APPROACH SURFACE

NO	OBJECT	X	Y	ELEVATION	ELEVATION OF THE SURFACE	DEGREE OF INFRINGEMENT
15	CLUSTER OF TREES	3486.000	890.350	12.450	8.670	-3.780
16	CLUSTER OF TREES BEYOND CREEK	3850.000	1150.000	15.300	15.950	0.650
17	CLUSTER OF TREES BY CREEK	3634.000	1170.000	17.240	11.930	-5.310

RWY 06 APPROACH SURFACE

NO	OBJECT	X	Y	ELEVATION	ELEVATION OF THE SURFACE	DEGREE OF INFRINGEMENT
30	TREE	315.081	1203.283	27.330	21.625	-5.705
31	HILL	-1696.602	1663.367	58.506	61.859	3.353
32	TREE	-406.820	1123.799	43.029	36.063	-6.966
33	TREE	-412.289	884.754	31.413	36.172	4.759
35	KAMA HILL	-1261.454	1245.459	44.460	53.156	8.696
36	HILL BEYOND SCHOOL	-1081.858	1056.720	35.211	49.564	14.353
37	HILL IN FRONT OF P/STATION	660.415	697.660	31.107	41.135	10.028

NORTHERN TRANSITIONAL SURFACE

NO	OBJECT	X	Y	ELEVATION	ELEVATION OF THE SURFACE	DEGREE OF INFRINGEMENT
34	OLD CONTOROL TOWER	874.6600	740.7560	27.3800	24.7330	-2.6470
1	PAWPAN TREE	1095.3000	830.7000	13.2600	11.4200	-1.8400
2	SDA HANGAR	1196.2000	820.8670	15.2480	12.5760	-2.6720
3	FIRE SERVICE BLDG	1279.4800	822.7000	14.7750	12.2720	-2.5030
4	WINDVANE MAST(MET.OBS)	1319.4600	849.6200	15.3200	8.4300	-6.8900
5	TREES IN CARPARK	1395.0000	797.5000	21.3800	16.3600	-5.0200
6	4 FLOODLIGHT MASTS	-	819.6700	18.1600	13.1930	-4.9670
7	RADIO ANTENNA MAIN BLDG	1479.3600	814.7300	14.7600	13.6880	-1.0720
8	CONTROL TOWER	1518.1200	806.4000	23.2600	14.8280	-8.4320
9	SOLAIR HANGAR WITH MAST	1552.2000	819.6500	19.5100	12.9460	-6.5640
10	SOLAIR BLDG MAST	1586.3800	822.1800	16.8000	12.5950	-4.2050
11	TREES AROUND STAFF HOUSES	-	825.0000	15.6000	11.6550	-3.9450
12	SCATTERED BANANA TREES	-	825.0000	12.8000	10.8070	-1.9930
13	TWO TREES	2342.6700	807.6500	14.3300	12.5930	-1.7370
14	TREE	3125.6000	824.1500	12.8300	8.2630	-4.5670

SOUTHERN TRANSITIONAL SURFACE

NO	OBJECT	X	Y	ELEVATION	ELEVATION OF THE SURFACE	DEGREE OF INFRINGEMENT
18	CLUSTER OF TREES	3378.710	1172.340	13.260	7.570	-5.690
19	TWO TREES	3263.100	1101.920	19.340	8.853	-10.487
20	TREE	3212.650	1182.700	19.610	9.020	-10.590
21	TREE	3167.930	1181.370	17.540	8.980	-8.560
22	TREE	3125.350	1184.670	12.760	9.430	-3.330
23	CLUSTER OF TREES	2949.600	1189.000	19.830	10.520	-9.310
25	CLUSTER OF TREES	2712.000	1186.000	13.730	10.660	-3.070
26	TREES	2673.000	1191.790	14.960	11.500	-3.460
27	TREES	2659.630	1194.750	12.830	11.926	-0.904
29	TREE	75.741	1365.643	38.015	38.933	0.918

RUNWAY STRIP

NO	OBJECT	X	Y	ELEVATION	ELEVATION OF THE SURFACE	DEGREE OF INFRINGEMENT
24	WINDSTOCK MAST	2886.3500	1109.3800	12.3400	5.1000	-7.2400
28	WINDSTOCK MAST	1358.0000	1109.3000	15.2400	8.5950	-6.6450

Note :1 This list of obstacles is produced for 300m wide runway strip based on ICAO recommendation.
Note :2 Objects with "-" in degree of infringement are obstacles.
Note :3 Objects with "+" in degree of infringement are not obstacles though they were surveyed in the field.
Note :4 All the objects listed as obstacles to northern and southern transitional surfaces from 300m wide runway strip are not obstacles to transitional surfaces from existing 150m wide runway strip except two windsock masts.

(3) Northern Transitional Surface

There are no obstacles except one windsock mast to the 1:7 slope transitional surface starting from the northern edge of the existing 150 m wide runway strip. However, if it is widened to 300 m in accordance with ICAO recommendation, passenger terminal building, control tower, fire station, hangars, apron flood lights, old control tower etc. in the existing terminal area and a number of trees in and around the carpark and staff housings will penetrate the transitional surface as obstacles.

(4) Southern Transitional Surface

There are no obstacles except one windsock mast to the 1:7 slope transitional surface for the existing 150 m wide strip. However, if it is widened to 300 m, a number of trees on the south side of the airport will penetrate the transitional surface as obstacles.

3.8 Soil Investigations and Pavement Structure Investigations

3.8.1 General

Investigations on strata of soils and existing runway pavement structure were carried out in accordance with technical specifications in Attachment-D of the Inception Report in order to obtain essential information for the airport master planning and preliminary design. A key map of soil investigations and test items in each location are shown in Figure 3.8.1 and Table 3.8.1 respectively. The results of the investigations are included in Appendices-3.8.1 through 3.8.9:

a) Bore Hole and Test Pit profiles (Appendix - 3.8.1)
b) Standard Penetration Tests (Appendix - 3.8.2)
c) Static Cone Penetrometer Tests (Appendix - 3.8.3)
d) Undisturbed CBR Tests (Appendix - 3.8.4)
e) Modified CBR Tests (Appendix - 3.8.5)
f) Density in Place Tests (Appendix - 3.8.6)
g) Compaction Tests (Appendix - 3.8.7)
h) Consolidation and Triaxial Shear Tests (Appendix - 3.8.8)
i) Bituminous Core Tests (Appendix - 3.8.9)

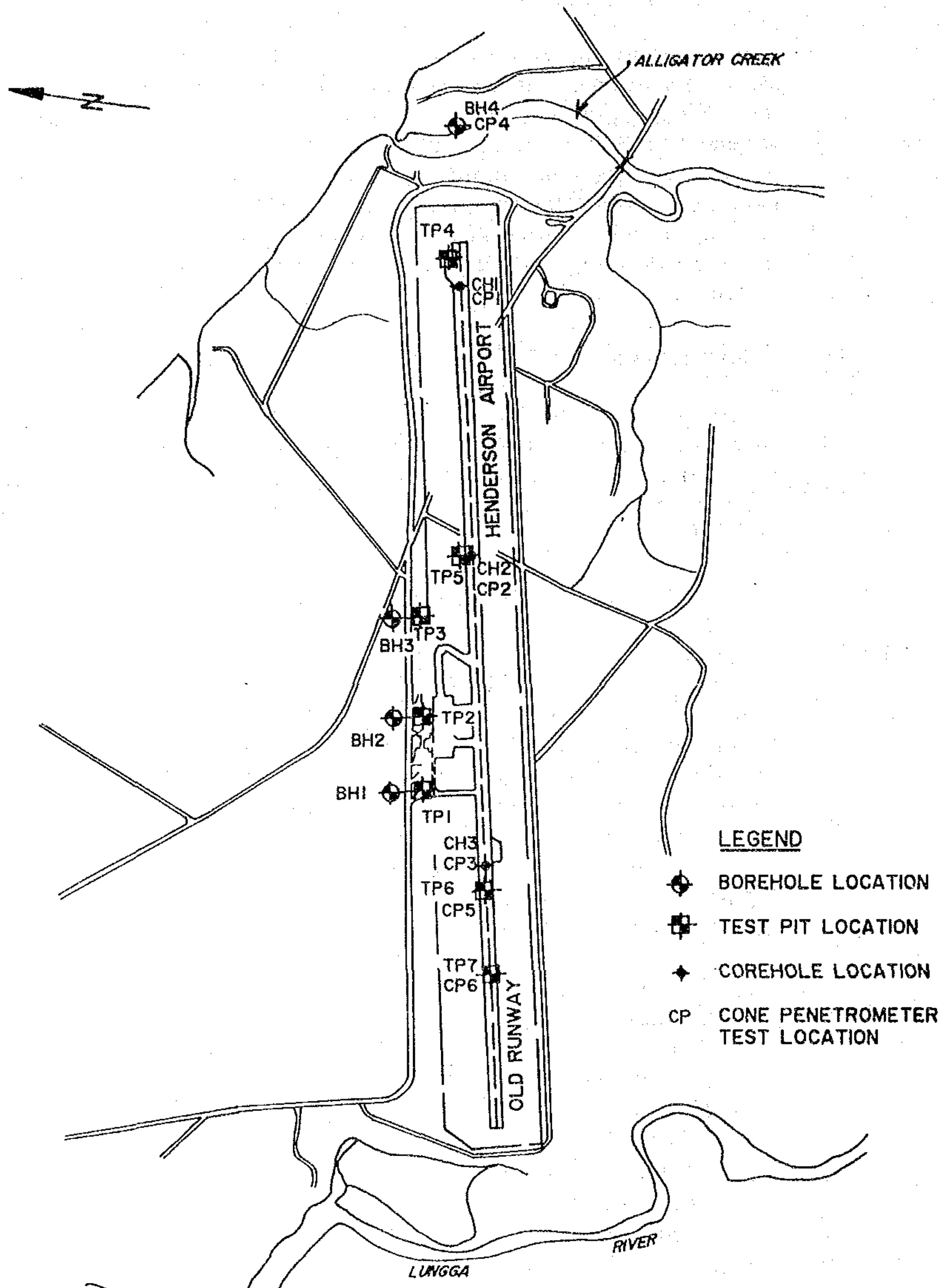


Figure 3.8.1 Location of Soil Investigations

Table 3.8.1 Items of Soil Investigation at Each Location

Items	BH1	BH2	BH3	BH4	TP1	TP2	TP3	TP4	TP5	TP6	TP7	CP1	CP2	CP3	CP4	CP5	CP6
a) Bore Hole and Test Pit Profiles	20m	20m	30m	10m	2m	2m	2m	2m	2m	30cm	60cm						
b) Standard Penetration Tests	20m	20m	30m	10m													
c) Static Cone Penetorometer Test												○	○	○	○	○	○
d) Undisturbed CBR Tests							○				○						
e) Modified CBR Tests					○	○	○	○	○	○	○						
f) Density in Place Tests					○	○	○	○	○	○	○						
g) Compaction Tests					○	○	○	○	○	○							
h) Consolidation and Triaxial Shear Tests		○	○														
i) Bituminous Core Tests												○	○	○			

Note: Physical property tests including specific gravity, natural water content, sieve analysis, liquid limit, plastic limit and plastic index are carried out for samples from each 2m depth of bore holes and at the bottom of test pits.

3.8.2 Bore Hole Profies and Standard Penetration Tests

In brief summary, three boreholes at the possible future terminal building locations (BH1, BH2, BH3) encountered similar subsurface conditions as follows:

GL to 4-5m:
- Stiff to very stiff and hard clay, becoming generally less stiff with depth
- Classification of soil in the unified system was mainly CH, highly plastic inorganic clays
- N-value was 9-10 at 2m depth, and gradually declined to 6-7 at the bottom of the layer

4-5m to 5-6m:
- A thin layer of firm to soft clay and sandy clay or very loose clayey sand
- Soil groups in SC - CL
- N-value was 2 - 5

5-6m to 20m:
- Medium dense sand and clayey sand with some denser bands, some gravelly zones and an occasional looser layer
- Mainly SM group of soil with SW - GW zone and thin layers of SC - CL

Groundwater:
- 4.4 - 4.8m depth, around the same level as the thin softer clay or looser sand zones

Stiff to very stiff and hard clay to the depth of 4-5m in the above three bore holes was also found at the seven test pits in the airfield, and seems to constitute the surficial layer of natural soil in the entire airport area.

Bore hole in Alligator Creek Area (BH4) did not encounter the surficial clay soils observed elsewhere in the airport area, but immediately encountered very loose to mainly loose clayey to silty sands, with some gravelly zones, and layer of silty clay, to 7m depth. Below 7m medium dense silty sands were encounted.

Information obtained from the Department of Natural Resources of the Ministry of Transport, Works and Utilities was that geographic surveys of the area indicate that bedrock is at depths of the order of 100m in the vicinity of the airport.

3.8.3 Subgrade Condition of the Pavement

Three types of tests were conducted in order to investigate subgrade condition of the pavements. Those included static cone penetrometer tests, undisturbed CBR tests and modified CBR tests.

Undisturbed CBR at the possible future apron area showed CBR of about 6%. Modified CBRs at the edge of the runway shoulder showed generally low values, about 2.5% at the center of the runway and possible future apron area, and about 4% at the east end the runway. CBR values obtained from modified CBR tests which generally give lower values than those from field CBR tests in case of the subgrade under existing pavements are not used for the evaluation of the existing subgrade.

Static cone penetrometer tests for the subgrade of the existing runway showed the following value:

a) East end (CP1) CBR=8%
b) Center (CP2) CBR=5%
c) West end (CP3) CBR=3.5%

For the evaluation of the subgrade strength of the existing ruway, the results from cone penetrometer tests which are considered to represent the actual condition most precisely are empolyed. A suspiciously low CBR of 3.5% at the west end of the runway is omitted from the evaluation by refering to the test results of extensive dynamic cone penetrometer tests by the German consultants in 1983 which show approximately the same subgrade strength for the western half of the existing runway. Taking one standard deviation below the mean value of 8% and 5%, the subgrade CBR of the existing runway is evaluated to be 5%. This value is 1% less than the previous estimation of 6% by the German consultants in 1983. It is noted that when the project proceeds to the implementation stage, it will be necessary to confirm the subgrade strength of the western end of the runway.

3.8.4 Pavement Structure Investigations

Three core samples taken from the existing runway had the structure shown in Table 3.8.2.

Table 3.8.2 Struture of Existing Runway Pavement from Core Sampling

Layer	East End (CP1)	Center (CP2)	West End (CP3)
a) Surface Course (Particles to 10 mm, mainly < 5 mm)	55 mm	39 mm	46 mm
b) Binder Course (Particles mainly < 15 mm)	63 mm	71 mm	59 mm
c) Binder Course (Particles mainly < 15 mm)	47 mm	60 mm	70 mm
d) Base Course* (Well graded crushed river gravel)	435 mm	430 mm	425 mm
Total	600 mm	600 mm	600 mm

Note : Approximate thickness estimated from sounding with cone penetrometer.*

The thickness of each layer confirmed the design documents (by the German consultant), which stated the pavement structure as shown in Table 3.8.3.

Table 3.8.3 Structure of Existing Runway Pavement in the Original Design

Layer	Thickness
a) Surface Course	40 mm
b) Binder Course	60 mm
c) Binder Course	60 mm
d) Base Course	200 mm
e) Subbase Course	200 mm
Total	560 mm

Marshall tests of the bituminous cores showed sufficient stability of more than 11.4 KN.

CHAPTER 4 AIR TRAFFIC DEMAND FORECASTS

CHAPTER 4 AIR TRAFFIC DEMAND FORECASTS

4.1 General

Air traffic demands, which are the principal planning factors for all airport facilities, are forecast up to the year 2010 at five year intervals covering the following categories:

a) International Passengers
b) Domestic Passengers
c) International Cargo
d) Domestic Cargo
e) International Aircraft Movements
f) Domestic Aircraft Movements

The forecasts are made in the followings steps:

1) Preparation of basic variables for forecasts such as future population and GDP (section 4.2)

2) Estimation of annual passenger and cargo demands by various methods for different categories of demands (sections 4.3 through 4.6)

3) Determination of design basis (section 4.7)

4) Decomposition of annual passenger demands to the design basis (sections 4.8 and 4.9)

5) Estimation of annual aircraft movements (section 4.10)

The summary of the air traffic demand forecasts are shown in Table 4.1.1, Figures 4.1.1 and 4.1.2.

4.2 Preparation of Basic Variables for the Forecasts

4.2.1 Population in Solomon Islands

Population by province up to 2010 is estimated as shown in Table 4.2.1 using the growth rate predicted by the statistical office of the Solomon Islands.

Table 4.1.1 Summary of Air Traffic Demand Forecasts

	Unit	Present Condition (as of 1990)	Year 1995	Year 2000	Year 2005	Year 2010
1. Annual Passengers						
- International	no.	33,600 (1989)	58,300	88,800	131,700	192,200
- Domestic	no.	49,100 (1989)	74,000	99,400	128,800	163,200
- Total	no.	82,700	132,300	188,200	260,500	355,400
2. Annual Cargo						
- International	ton	659 (1986)	1,200	1,700	2,400	3,300
- Domestic	ton	239 (1989)	390	500	630	870
- Total	ton	898	1,590	2,200	3,030	4,170
3. Annual Aircraft Movements						
- International	no.	940 (1989)	1,150	1,350	1,750	2,000
B767			100	200	500	1,150
B737			1,050	1,150	1,250	850
- Domestic	no.	6,440 (1989)	10,500	13,500	17,000	23,500
DHC-6			2,600	4,100	5,900	9,500
BNI			7,900	9,400	11,100	14,000
- Total	no.	7,129	11,650	14,850	18,750	25,500
4. Typical Week Passengers						
- International	no.	780	1,310	2,000	2,970	4,320
- Domestic	no.	1,250	1,860	2,500	3,250	4,110
- Total	no.	2,030	3,170	4,500	6,220	8,430
5. Typical Week Aircraft Movements						
- International	no.	20	22	26	34	38
B767 class	no.	-	2	4	10	22
B737 class	no.	20	20	22	24	16
- Domestic	no.	126	202	260	326	452
DHC-6	no.	22	50	78	114	182
BNI	no.	104	152	182	212	270
- Total	no.	146	224	286	360	490
6. Peak Hour Passengers (both-way)						
- International	no.	140	360	360	440	520
- Domestic	no.	60	58	80	102	146
7. Peak Hour Aircraft Movements (both-way)						
- International	no.	2	4	4	4	4
B767	no.	-	-	-	1	2
B737	no.	2	4	4	3	2
- Domestic	no.	7	6	8	10	14
DHC-6	no.	2	2	3	4	6
BNI	no.	5	4	5	6	8
8. Peak Hour Passengers (one-way)						
- International	no.	70	180	180	260	260
- Domestic	no.	32	29	44	51	73
9. Peak Hour Aircraft Movements (one-way)						
- International	no.	1	2	2	2	2
B767	no.	-	-	-	1	1
B737	no.	1	2	2	1	1
- Domestic	no.	-	3	4	5	7
DHC-6	no.	1	1	2	2	3
BNI	no.	3	2	2	3	4

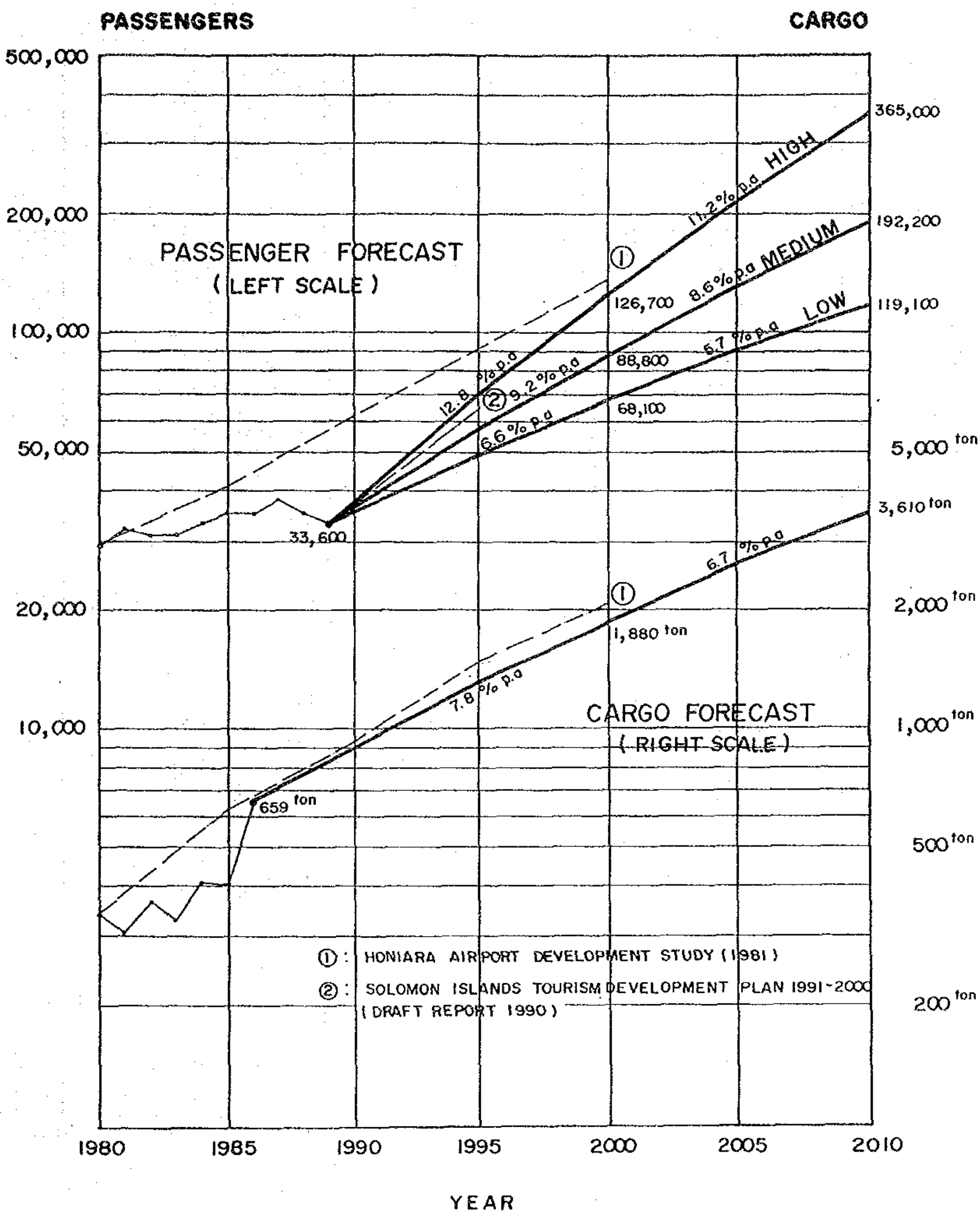


Figure 4.1.1 International Passenger and Cargo Forecasts

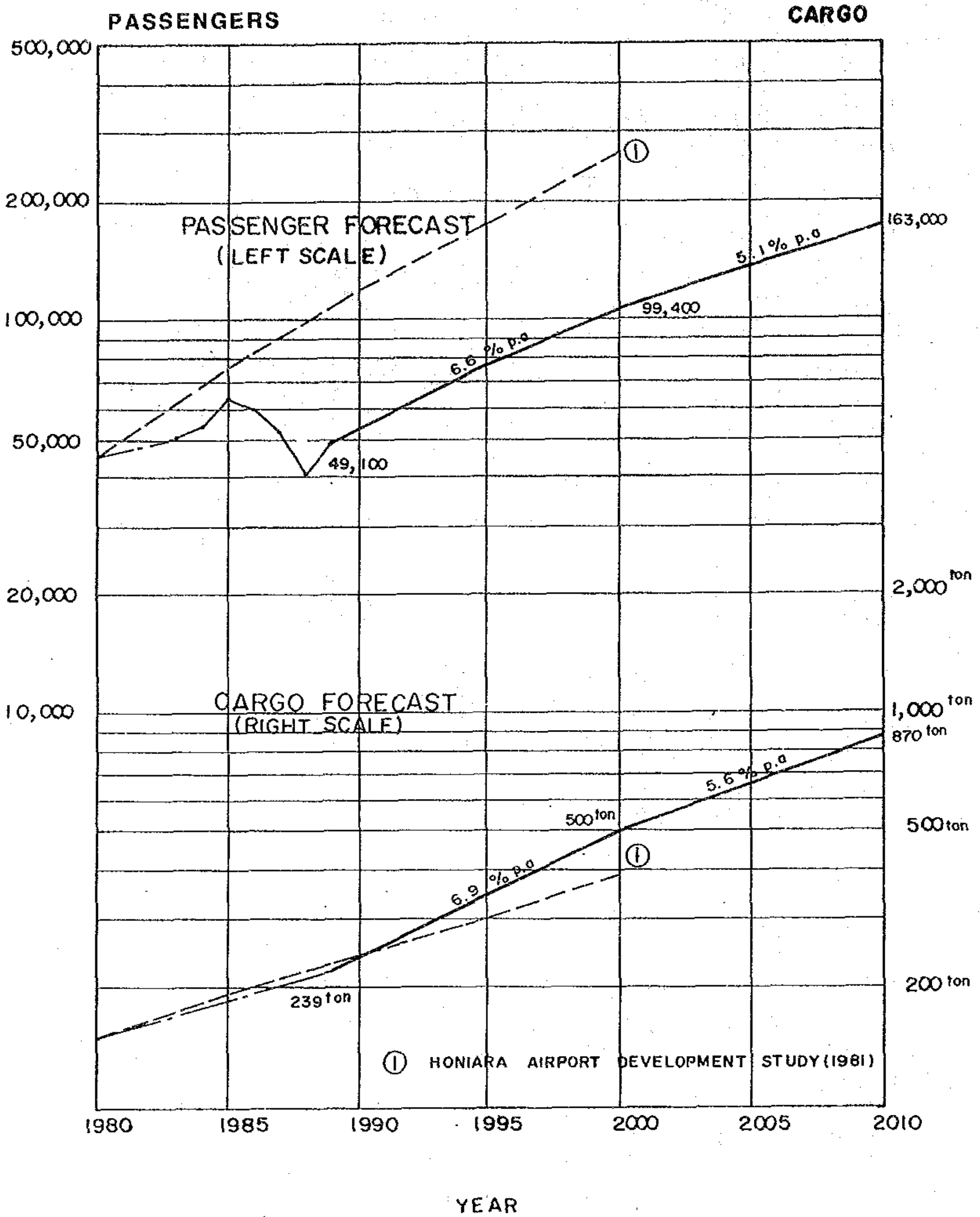


Figure 4.1.2 Domestic Passenger and Cargo Forecasts

Table 4.2.1 Population Projection by Province

	1989	1995	2000	2005	2010
Population					
Western	61,700	75,300	87,600	100,200	112,800
Isabel	15,900	18,800	21,100	23,900	26,200
N. Central	18,200	21,700	24,800	27,800	30,900
S. Central	2,000	2,100	2,300	2,400	2,500
Gudalcanal	57,100	73,600	90,100	108,400	129,800
Malaita	85,300	94,700	102,300	109,200	115,400
Makira/Ulawa	24,100	29,500	34,500	39,800	44,800
Temotu	16,000	18,500	20,600	22,600	24,200
Honiara	34,700	45,800	57,700	71,700	88,400
Total	315,000	380,000	441,000	506,000	575,000
Annual Growth Rate					
Western	-	3.4%	3.0%	2.7%	2.4%
Isabel	-	2.8%	2.3%	2.6%	1.8%
N. Central	-	3.0%	2.6%	2.4%	2.2%
S. Central	-	1.4%	1.3%	1.0%	1.0%
Gudalcanal	-	4.3%	4.1%	3.8%	3.7%
Malaita	-	1.8%	1.5%	1.3%	1.1%
Makira/Ulawa	-	3.4%	3.2%	2.9%	2.4%
Temotu	-	2.5%	2.1%	1.9%	1.4%
Honiara	-	4.7%	4.7%	4.5%	4.3%
Total	-	3.2%	3.0%	2.8%	2.6%

4.2.2 GDP of Solomon Islands

The gross domestic product (GDP) of the Solomon Islands up to 2010 is predicted as shown in Table 4.2.2. As seen in the table, the 5% growth rate at the initial stage, which agrees with the estimates by the Government, is assumed to decline gradually to 4% from 2005 to 2010. A provincial break-down of the GDP, gross regional product (GRP), is estimated based on provincial distribution of employees for all industries and average monthly earnings.

Table 4.2.2 GDP Projection by Province

	1989	1995	2000	2005	2010
GDP (Thousand SI$, 1984 Factor Prices)					
Western	42,800	56,600	69,300	83,700	99,600
Isabel	5,700	7,400	8,900	10,600	12,500
N. Central	16,000	20,900	25,300	30,300	35,800
S. Central	1,700	2,100	2,500	2,800	3,300
Gudalcanal	41,900	56,900	71,500	88,500	108,600
Malaita	17,300	21,700	25,700	29,900	34,500
Makira/Ulawa	10,300	13,600	16,700	20,200	24,100
Temotu	5,300	6,800	8,100	9,600	11,200
Honiara	89,100	122,400	156,100	196,300	244,600
Total	230,000	308,200	384,200	471,900	574,200
Annual Growth Rate					
Western	-	4,8%	4.1%	3.8%	3.5%
Isabel	-	4.4%	3.8%	3.6%	3.4%
N. Central	-	4.6%	3.9%	3.7%	3.4%
S. Central	-	3.6%	3.5%	2.3%	3.3%
Gudalcanal	-	5.2%	4.7%	4.4%	4.2%
Malaita	-	3.8%	3.4%	3.1%	2.9%
Makira/Ulawa	-	4.7%	4.2%	3.9%	3.6%
Temotu	-	4.2%	3.6%	3.5%	3.1%
Honiara	-	5.4%	5.0%	4.7%	4.5%
Total	-	5.0%	4.5%	4.2%	4.0%

Using the above mentioned estimated population and GDP, the GDP per capita of Solomon Islands is calculated as shown in Table 4.2.3.

Table 4.2.3 GDP per Capita Projection

Year	GDP/Capita (SI$)
1989 (Actual)	730
1995	811
2000	871
2005	932
2010	999

Note: GDP per Capita in 1984 factor costs.

4.2.3 GDP Growth in Selected Foreign Countries

The growth rates of GDP for selected foreign countries are also projected. The GDP growth rates in Table 4.2.4 are used for the forecast of international traffic as these selected countries share major part of traffic to and from the Solomon Islands.

Table 4.2.4 GDP Growth Rates in Selected Foreign Countries

Country	Annual Growth Rate in Real Terms			
	1989 - 1995	1995 - 2000	2000 - 2005	2005 - 2010
Australia	3.0%	2.8%	2.6%	2.5%
New Zealand	3.0%	2.8%	2.6%	2.5%
Papua New Guinea	5.0%	4.5%	4.2%	4.0%
Fiji	5.0%	4.5%	4.2%	4.0%
Japan	4.0%	3.8%	3.6%	3.5%
United Kingdom	3.0%	2.8%	2.6%	2.5%
USA	3.0%	2.8%	2.6%	2.5%

Note: Projected with reference to World Development Report 1990 (World Bank) which forecasts 3.0% annual growth for industrialized countries and 5.1% annual growth for developing countries up to 2000.

4.2.4 Tourism Development

The Solomon Islands has the second largest population next to Fiji in the South Pacific islands countries. The number of Solomon Islander international passengers are expected to increase along with the economic development of the country. However, the most important governing factor for determining the future increase of international passengers is the progress of the tourism development.

The Solomon Islands is favored by a tropical climate and an idyllic marine environment, and the potential of the tourism development has been confirmed for beach resort holiday market, dive travel market, war veteran's travel market, game fishing market, culture-oriented tour market etc. by the Tourism Council of the South Pacific (TCSP). Although such qualitative potential is not explicitly incorporated in the forecasts, it is required for the Government will make an overall effort on development of tourism infrastructure, provision of incentives to obtain foreign capital, enhancement of promotion activities, development of human resources, preservation of natural environment, and eradication of malaria. In this respect, the Government should follow the Tourism Development Plan 1991-2000 prepared by TCSP.

4.3 Annual International Passenger Forecast

4.3.1 Methodology of the Forecast

(1) Utilization of Past Data

As mentioned in section 2.5.3 (1), the past records of annual international passengers are only available up to 1986. On the other hand, immigration data is more complete with annual data up to 1989; a breakdown into visitors and residents is available. In this study, immigration data are utilized because they cover recent figures. Although they include passengers arriving at and departing from at airports other than Honiara, the number of passengers are very limited and are considered negligible.

(2) Gravity Model

A gravity model which assumes that the traffic demand between a pair of regions can be explained by the size of socio-economic activities of the two regions (population, GDP, etc.) and inconvenience of trip between the two regions (distance, trip time, etc.).

A typical gravity model to estimate the traffic demand between region i and region j is expressed as follows:

$$Tij = a \times \frac{(Gi \times Gj)^b}{Dij^c}$$

where, Tij : Traffic demand between region i and region j
Gi : Size of socio-economic activities of region i
Dij : Inconvenience of trip between region i and region j
a, b, c : coefficients

This type of the gravity model is employed for the forecast of international passengers using GDP as a representative value for socio-economic activities and trip time as that for inconvenience of trip.

(3) Procedure of the Forecast

The forecast of international passengers are carried out in the following steps:

a) Applicability of the gravity model for the traffic between a foreign country and the Solomon Islands is tested using the cross-section analysis on actual data.

b) Upon confirmation of the gravity model to explain the past traffic demand, the model is modified to be used for the forecast. This step is necessary because the model obtained in a) uses actual traffic data which were restricted by undersupply of accommodation facility as mentioned in section 2.4.2.

c) Future traffic demand is estimated by applying future GDP into the modified model.

4.3.2 Cross-Section Analysis on Actual Data

A cross-section analysis is undertaken to show the applicability of a gravity model to explain traffic demand between selected foreign countries (Australia, New Zealand, PNG, Fiji, Japan, UK and USA) and Solomon Islands. The following equation (4.3.1) is obtained by applying least square method for traffic data, GDP and trip time in 1987 and 1988. Detailed data used for the analysis are shown in Appendix-4.3.1.

$$Tij = 12{,}350 \times \frac{(Gi \times Gj)^{0.3167}}{tij^{1.068}}, \quad r = 0.864 \qquad \ldots\ldots (4.3.1)$$

where, i denotes Solomon Islands
- j denotes a foreign country
- Tij : Traffic demand between Solomon Islands and a foreign country (passengers)
- Gi : GDP of Solomon Islands (million US$, 1988 prices)
- Gj : GDP of a foreign country (million US$, 1988 prices)
- Tij : Trip time between Solomon Islands and a foreign country (minutes)
- r : Correlation coefficient

The above equation is significant with a fair correlation coefficient of 0.864 for a cross section analysis. Therefore, it is confirmed that the gravity model employed here is adequate for the forecast.

4.3.3 Modification of the Equation

The equation obtained in section 4.3.2 is modified for the estimation of future traffic demand. The traffic demand from/to Solomon Island has been stagnant during the 1980s mainly due to limitation of accommodation facility for visitors. However, the expansion of accommodation capacity has begun to be seen from place to place in the country as shown in Table 2.4.5, and a comprehensive tourism policy was established by the government. In order to reflect such changes in the forecast it is necessary to modify the equation (4.3.1) which is obtained using the past data.

So called "demand elasticity" which indicates marginal demand change with regard to GDP growth is modified with reference to traffic analysis between Japan and other foreign countries.

The demand elasticities are was calculated using the equation (4.3.2) for traffic demand between Japan and several industrialized countries for a period from 1980 to 1988.

$$Tmn = a \times (Gm \times Gn)^k \quad \ldots\ldots (4.3.2)$$

where, m denotes Japan
n denotes an industrialized country
Tmn : Traffic demand between Japan and an industrialized country (passengers)
Gm, Gn : GDP of m and n (million US$, 1988 prices)
k : Demand elasticity

The estimated demand elasticities are shown in Table 4.3.1. Detailed data used for the estimation is included in Appendix-4.3.2.

Table 4.3.1 Demand Elasticity

	Elasticity (k)	Correlation Coefficient (r)
Japan - USA	1.22	0.982
Japan - Canada	1.49	0.936
Japan - United Kingdom	0.90	0.858
Japan - Korea	0.76	0.974
Average	1.09	-

The estimated demand elasticities (k) from equation (4.3.2) range between 0.8 and 1.5 with 1.1 on an average. In this Study, three different projections are prepared using low, medium and high elasticities respectively correspond to $k = 0.8$, $k = 1.1$ and $k = 1.5$. Applying these elasticities to equation (4.3.1), a modified equation for the estimation of future international passenger demand is obtained as follows:

$$Tij = 12{,}350 \times \frac{(Gi \times Gj)^k}{tij^{1.068}} \quad \ldots\ldots (4.3.3)$$

Three values of demand elasticity (k) are:

k = 0.8 (Low Projection) as lowest elasticity in Table 4.3.1.
k = 1.1 (Medium Projection) as average elasticity in Table 4.3.1.
k = 1.5 (High Projection) as highest elasticity in Table 4.3.1.

The provision of three different projections is considered necessary since the progress of tourism development will considerably influence the growth of international passengers, but at the same time, is an uncertain factor which is difficult to predict.

Assuming tij is constant for the future, the equation (4.3.3) can be transformed as follows:

$$Tij = (Gi \times Gj)^k \times Tij89 \quad \ldots\ldots (4.3.4)$$

where, Gi x Gj : Growth factor of Gi x Gj (1989 =1.0)
Tij89: Actual volume of traffic demand between Solomon Islands and a foreign country in 1989

4.3.4 Estimation of Annual International Passengers

The future volume of annual international passengers can be estimated by substituting future GDP of the Solomon Islands and major foreign countries in the form of growth factor into equation (4.3.4).

The results of the estimation for medium projection are shown in Table 4.3.2.

Table 4.3.2 Annual International Passenger Demand by Orign/Destination Country (Medium Projection)

From/to Solomon Is.	1989	1995	2000	2005	2010
Australia	12,500	20,900	31,000	44,800	53,700
New Zealand	3,800	6,300	9,400	13,500	19,200
Papua New Guinea	3,800	7,200	11,700	18,500	28,400
Fiji	1,000	2,000	3,200	5,100	7,800
Japan	1,900	3,300	5,200	7,900	11,800
United Kingdom	1,500	2,500	3,800	5,400	7,700
USA	3,400	5,700	8,400	12,200	17,300
Other Pacific	2,200	4,200	6,900	10,800	16,700
Other Europe	700	1,100	1,600	2,400	3,400
Others	2,900	5,000	7,600	11,100	16,200
Total	33,600	58,300	88,800	131,700	192,200

The same estimates for the case of low and high projections are shown in Appendices-4.3.3 and -4.3.4.

The total demand for all orign/destination countries from/to Solomon Islands estimated for low, medium and high projections are summarized in Table 4.3.3.

Table 4.3.3 Annual International Passenger Demand

Item	Projections		
	Low	Medium	High
Annual Demand			
1989 (Actual)	33,600	33,600	33,600
1995	50,200	58,300	71,300
2000	68,100	88,800	126,700
2005	90,600	131,700	217,400
2010	119,100	192,200	365,000
Annual Growth Rate			
1989 - 1995	6.9%	9.6%	13.4%
1995 - 2000	6.3%	8.8%	12.2%
2000 - 2005	5.9%	8.2%	11.4%
2005 - 2010	5.6%	7.9%	10.9%

For planning purpose, the value of medium projection is selected as most likely forecast. However, the international passenger demand by the aforementioned procedure is based on demand elasticities which are not particular to the Solomon Islands. Therefore, it is necessary to check their appropriateness in some aspects. These are described in succeeding sections 4.3.5 and 4.3.6.

4.3.5 Comparison with Other Forecasts

Various traffic growth rates used in different existing international passenger forecasts for the Solomon Islands and the South Pacific region are compared in Table 4.3.4.

Table 4.3.4 Comparison with Other Forecast

Forecast		Annual Growth Rate
JICA Study	- Low	6.6% (1989 - 2000)
	- Medium	9.2% (1989 - 2000)
	- High	12.8% (1989 - 2000)
Tourism Development Plan (Medium Projection)		11.7% (1989 - 1995)
Solomon Airlines		15.3% (1990 - 2000)
IATA (South Pacific Region)		8.0% (1989 - 1994)
ICAO (Asia/Pacific Region)		10.5% (1988 - 2000)

The growth rate of the medium projection adopted in this study as the most likely case is situated in-between the growth rates of IATA and ICAO regional forecasts.

The growth rate of the high projection in this study is slightly higher than that of the medium projection by Solomon Islands Tourism Development Plan 1991-2000. It means that the high projection in this study will be realized if the tourism development in Solomon Islands is implemented with full success in accordance with the above Tourism Development Plan.

The growth rate of the low projection in this study is more or less the same growth rate which the South Pacific region enjoyed for the recent few years (7.0% per annum from 1987 to 1989). Therefore, the low projection may be considered to be minimum growth rate enjoyable by the Solomon Islands as an average growth of visitor arrivals to the South Pacific region.

4.3.6 Compatibility with Tourism Development

This section describes the compatibility of the international passenger forecast with the progress of the tourism development in Solomon Islands. The number of hotel room requirement is estimated for low, medium and high projections of the forecast, and then compared with scheduled hotel development in the Solomon Islands.

The number of foreign passengers at the airport is estimated as shown in Table 4.3.5.

Table 4.3.5 Number of Foreign Passengers

Year	Low	Medium	High
1989 (Actual)	20,000	20,000	20,000
1995	29,400	37,500	50,500
2000	39,600	60,300	98,200

Note: The number of Solomon Islander passengers is estimated using demand elasticity of 1.45 with regard to GDP. The number is 20,800 in 1995 and 28,500 in 2000.

Of the total number of foreign visitors, approximately 55% use hotels for accommodation at present. The number of foreign hotel guests is estimated assuming that this ratio will gradually increase with increase of foreign visitors as shown in Table 4.3.6.

Table 4.3.6 Number of Foreign Hotel Guests

	Ratio of Hotel Use			Foreign Hotel Guests		
Year	Low	Medium	High	Low	Medium	High
1989	55%	55%	55%	5,500	5,500	5,500
1995	57%	59%	62%	8,400	11,100	15,700
2000	60%	64%	73%	11,900	19,300	35,800

Note: Ratio of hotel use from Tourism Development Plan 1991 - 2000

Since existing hotels particularly two major high-grade hotels in Honiara is facing the capacity problem during peak season, the increase of hotel guests in the future will need to be accommodated in new accommodation facilities. The additional number of hotel rooms is estimated as shown in Table 4.3.7 assuming 65% average annual occupancy rate, 12 day average length of stay and 1.5 guests in a room.

Table 4.3.7 Additional Number of Hotel Rooms Required Since 1990

Year	Low	Medium	High
1995	80	170	320
2000	190	440	1,000

Comparing the above number of hotel rooms required to accommodate foreign visitors to the Solomon Islands with scheduled hotel construction in Table 2.4.5, it can be confirmed that the demand forecast of international passenger demand in this study is consistent with the current progress of tourisun development as follows:

- High projection of international passenger forecast in this Study will be attained if all the hotel developments up to 1992 (184 rooms) and one out of two hotel developments scheduled in 1994 (approximately 150 rooms) are implemented as an optimistic case.
- Most increments of international passengers in low projection will be accommodated even in a pessimistic case with the realization of hotel developments only in 1991 (68 rooms).
- The medium projection of international passengers will be met by the scheduled hotel developments in 1991 and 1992 (184 rooms), and this projection situating in-between the above optimistic and pessimistic cases is considered most plausible from the viewpoint of the progress of tourism development.

Although no information is available about hotel construction plans after 1995, the number of international passengers will increase at a pace between the high and low projections if the Tourism Development Plan 1991-2000 by TCSP is fully implemented. Therefore, the forecast in this study is considered reliable also in the longer term.

4.4 Annual Domestic Passenger Forecast

4.4.1 Methodology of the Forecast

(1) Competition between Air and Sea Transportation

The domestic passenger transportation connecting lots of islands are maintained by the airway and seaway networks. Air and sea transportation completes in the domestic transportation market, thus due consideration should be paid on change of modal shares in the future.

(2) Procedure of the Forecast

The forecast of domestic passengers are carried out in the following steps:

a) The current domestic passenger traffic (air + sea) by OD pair is estimated based on actual data.

b) The future domestic passenger traffic (air + sea) by OD pair is forecast by applying a gravity model to the current OD traffic in a).

c) The future change of share for air transportation mode is estimated for each OD pair using a modal split model.

d) The future domestic air passenger demand is calculated as a product of total passenger demand in b) and share of air transportation mode in c).

(3) Some Propositions

a) Zone OD Pairs to be studied

Zone OD Pairs to be studied are set as follows:

i) Honiara - Western Province
ii) Honiara - Isabel Province
iii) Honiara - North Central Province
iv) Honiara - South Central Province
v) Honiara - Guadalcanal Province
vi) Honiara - Malaita Province
vii) Honiara - Makira/Ulawa Province
viii) Honiara - Temotu Province

Central Province is divided into North Central and South Central in order to reflect their difference in geographic condition.

b) Transport Modes to be Studied

Transport modes to be studied are two modes of air and sea transportation.

c) Transport Conditions by Mode

Transport conditions (trip time and trip cost) by OD pair are shown in Appendix-4.4.1.

4.4.2 Current Domestic Passenger Traffic by OD Pair

The air passenger traffic by OD pair in 1989 is estimated based on data from Solomon Airlines and Western Pacific Air Services. The seaborne passenger traffic by OD pair in 1989 is also estimated based on data from the Marine Division of Ministry of Transport, Works and Utilities and an existing report on maritime transportation by British consultants. They are summarized in Table 4.4.1.

Table 4.4.1 Domestic Passenger Traffic by OD Pair in 1989

From/to Honiara	Air	Sea	Total
Western	15,900	11,900	27,800
Isabel	2,900	5,900	8,800
N. Central	1,200	35,800	37,000
S. Central	1,700	800	2,500
Guadalcanal	4,000	83,500	87,500
Malaita	16,000	29,500	45,500
Makira/Ulawa	5,400	5,500	10,900
Temotsu	2,000	400	2,400
Total	49,100	173,300	222,400

4.4.3 Future Domestic Passenger Traffic by OD Pair

A gravity model is applied for the forecast of the total passenger traffic by OD pair. A similar equation used for the international passenger forecast is employed as shown below:

$$Tij = (Gi \times Gj)^k \times Tij89 \ldots\ldots \quad (4.4.1)$$

where, i denotes Honiara
- j denotes a province
- Tij : Traffic demand between Honiara and a province
- Gi : GRP of Honiara Town Council (thousand SI$, 1984 factor costs)
- Gj : GRP of a province (thousand SI$, 1984 factor costs)
- Gi x Gj : Growth factor of Gi x Gj (1989 = 1.0)
- Tij89 : Actual volume of traffic demand between Honiara and a province in 1989
- k : Demand elasticity with regard to GRP (= 0.42 from the analysis of past data)

The future volume of the total passenger by OD pair can be estimated by substituting future GRP of provinces in the form of growth factor into equation (4.4.1).

The results of the estimation are shown in Table 4.4.2.

Table 4.4.2 Annual Domestic Passenger Demand by OD Pair (Air + Sea)

From/to Honiara	1989	1995	2000	2005	2010
Western	27,800	35,700	43,000	51,300	60,500
Isabel	8,800	11,200	13,400	15,900	18,700
N. Central	37,000	47,300	56,800	67,400	79,300
S. Central	2,500	3,100	3,700	4,300	5,100
Guadalcanal	87,500	113,700	138,600	166,900	199,400
Malaita	45,500	57,200	68,000	79,800	92,900
Makira/Ulawa	10,900	14,100	17,000	20,200	23,900
Temotu	2,400	3,100	3,700	4,400	5,100
Total	222,400	285,300	344,200	410,200	485,000

4.4.4 Estimation of Share for Air Transport Mode

The market share of the air passenger traffic and its competitive transport mode for an OD pair are estimated applying the so called a "modal split model." In this forecast, a modal demand model (MD Model) is utilized. The basic concept of the MD Model is that the traffic demand for each of the competitive modes is generated as the result of the rational modal selection by individual passengers after their due comparison and weighing so that each of the passengers total cost (the aggregation of his trip time and trip cost) may be the least. A rough concept of the MD Model is shown in Appendix-4.4.2.

This model is composed of two different types of logarithmic normal distribution concerning time value and total cost of a trip. The parameters of the distributions are obtained by a calibration. The parameters applied for the forecasting in this study are shown in Appendix-4.4.3.

The shares of air transportation mode by OD pair obtained from the MD Model are shown in Table 4.4.3. As seen in the table, the share of air transportation mode will increase in accordance with growth of economic activities in the Solomon Islands.

Table 4.4.3 Share of Air Transportation Mode by OD Pair

From/to Honiara	1989	1995	2000	2005	2010
Western	57%	65%	71%	76%	80%
Isabel	32%	40%	46%	52%	58%
N. Central	3%	4%	5%	6%	7%
S. Central	69%	76%	81%	84%	88%
Guadalcanal	5%	6%	7%	8%	8%
Malaita	35%	43%	49%	55%	60%
Makira/Ulawa	49%	57%	63%	69%	74%
Temotu	81%	86%	89%	91%	93%

4.4.5 Future Domestic Air Passenger Traffic by OD Pair

The domestic air passenger traffic by OD pair in the future are calculated by multiplying the total passenger (air + sea) by share of air transportation mode for each OD pair.

The results of estimation are shown in Table 4.4.4.

Table 4.4.4 Annual Domestic Air Passenger Demand

From/to Honiara	1989	1995	2000	2005	2010
Western	15,900	23,200	30,500	38,800	48,300
Isabel	2,900	4,500	6,200	8,300	10,800
N. Central	1,200	2,100	3,000	4,000	5,200
S. Central	1,700	2,400	3,000	3,600	4,400
Guadalcanal	4,000	6,700	9,400	12,500	16,200
Malaita	16,000	24,400	33,300	43,700	55,900
Makira/Ulawa	5,400	8,000	10,700	13,900	17,600
Temotu	2,000	2,700	3,300	4,000	4,800
Total	49,100	74,000	99,400	128,800	163,200
Annual Growth Rate	-	7.1%	6.1%	5.3%	4.8%

4.5 Annual International Cargo Forecast

4.5.1 Methodology of the Forecast

The future demand of international cargo is forecast based on the regression analysis on past trend of cargo demand and change of economic indices.

4.5.2 Estimation of Annual International Cargo

(1) Inbound Cargo

The regression analysis on the past trend of cargo demand showed significant relationships between GDP of the Solomon Islands and inbound cargo demand as follows:

$$IM = 0.09813 \times GDP^{1.649}, \quad r = 0.789 \qquad \ldots\ldots (4.5.1)$$

where, IM : Inbound cargo demand (ton)
GDP: GDP of Solomon Islands (million SI$, 1984 prices)
r : Correlation Coefficient

The equation obtained from the regression analysis has been adjusted so that the actual volume in 1986 (latest data available) can be expressed by the equation without error assuming that the demand elasticity in the regression analysis is correct.

The future inbound cargo demand is estimated as shown in Table 4.5.1 by substituting GDP projection into the equation (4.5.1).

Table 4.5.1 Annual Inbound Cargo Demand

Year	Cargo Volume (ton)	Annual Growth Rate
1986 (Actual)	612	-
1995	1,250	8.2%
2000	1,790	7.4%
2005	2,520	7.1%
2010	3,480	6.7%

(2) Outbound Cargo

Outbound cargo volume at the airport has been very limited amount as compared with inbound cargo volume. It accounted for only 7% of the total cargo volume in 1986. Major items of outbound cargo from the airport consist of agricultural products and marine products.

Due to erratic growth of the outbound cargo which have been influenced by the climatic condition, no significant relation has been found between the outbound cargo demand and any economic indices.

Taking into account its limited volume, the outbound cargo demand is estimated based on an assumption that it will increase at the same growth rate of GDP. This assumption may be justified by the recent change of economic structure from primary industries to secondary and tertiary industries.

The estimation of the outbound cargo is shown in Table 4.5.2.

Table 4.5.2 Annual Outbound Cargo Demand

Year	Cargo Volume (ton)	Annual Growth Rate
1986 (Actual)	47	-
1995	70	4.5%
2000	90	4.5%
2005	110	4.2%
2010	130	4.0%

(3) Total Cargo Demand

International cargo demand is estimated as a total of inbound and outbound demands as follows:

Table 4.5.3 Annual International Cargo Demand

Year	Cargo Volume (ton)	Annual Growth Rate
1986 (Actual)	659	-
1995	1,320	8.0%
2000	1,880	7.3%
2005	2,630	6.9%
2010	3.610	6.5%

4.6 Annual Domestic Cargo Forecast

4.6.1 Methodology of the Forecast

Since the past data of domestic cargo demand at the airport were very poor. It was obtained only for 1989 with a breakdown between the two airlines. The cargo demand at the airport is very small, and has least impact on the airport master plan. Therefore, a simple method using an unit volume of cargo per aircraft movement is employed.

4.6.2 Estimation of Annual Domestic Cargo

The cargo space available for presently operating DHC-6 and BNI is very limited in weight and size. Therefore, it can be assumed that the average cargo volume carried by one aircraft movements will be maintained as the present value.

The future domestic cargo demand is estimated using 37kg per aircraft movement as shown in Table 4.5.1.

Table 4.6.1 Annual Domestic Cargo Demand

Year	Annual Airport Movements	Cargo Demand	
		Volume (ton)	Annual Growth Rate
1989 (Actual)	6,440	239	-
1995	10,500	390	8.5%
2000	13,500	500	5.1%
2005	17,000	630	4.7%
2010	23,500	870	6.7%

Note: Annual aircraft movements from Table 4.10.1

4.7 Design Basis

4.7.1 Peak Hour Traffic

Since capacity utilization of airport facilities becomes most critical during daily and hourly traffic peaks, airport facilities should be planned on the peak traffic demand. However, the design traffic demand should be determined so that the facilities may not unnecessarily cater for peak traffic. Peak hour traffic of an average day of the peak month, which is the most common design basis for planning airport facilities, is employed in this Study. In the following sections, annual passenger demands estimated in sections 4.3 and 4.5 are decomposed to the above design basis.

4.7.2 Charter Flights

Apart from peak hour traffic generated by scheduled flight, another factor which may considerably affect the airport facility requirements is operations of charter or non-scheduled flights with high capacity aircraft.

Charter flights are operated in the South Pacific region on limited occasions during Christmas and New Year Holidays. B767s were operated at Henderson International Airport respectively once in 1989 and 1990. Aircraft types used for charter flights at Apia (Western Samoa), Pago Pago (American Samoa) and Nakualofa (Tonga) at present are up to B747.

Although the number of charter operations are very limited at Henderson International Airport at present, it may be necessary to consider B747 operations for the future provision. In this study, B747 is assumed to be introduced around 2005 when the annual international passenger demand reaches around 150,000 passengers based on the practice in Western Samoa.

Peak hour number of one-way passengers by a B747 is 400 passengers assuming full passenger load factor. Although this number of peak hour passengers should not be used as a design basis for the planning of passenger terminal building, it is necessary to accommodate B747 on the apron.

4.8 Decomposition of Annual International Passenger Demand

4.8.1 Future Route Structure

The existing international route structure from/to Honiara is basically composed of four routes; namely Australian route (Brisbane, Cairns), New Zealand route (Auckland, Nadi, Port Vila), PNG route (Port Moresby) and Nauru route. Passengers from other countries such as the United States, Japan and European countries have no direct connection with Honiara. As the result, they presently utilize transfer connections mainly in Australia and New Zealand.

With regards to future prospects of the existing four routes, the Australian route is expected to either expand the existing Brisbane route or commence direct flights from/to Sydney and Melbourne. New Zealand, PNG and Nauru routes are considered to maintain their present destinations.

Honolulu-Honiara and Tokyo-Honiara will be the most probable new routes if high potential of the United States and Japan as tourist market is considered. Assuming that 50% of passengers will utilize direct flights and others will continue transfer connections, the minimum passenger demand which justifies one weekly direct flight of B767 is about 30,000 passengers per annum. The annual passengers from/to the United States or Japan will not reach this level of passenger demand in the medium projection before 2010. Therefore, direct flights of Honolulu-Honiara and Honolulu-Tokyo are considered to be operated on charter a basis only, not on a regular basis.

4.8.2. International Route Demand

Based on the discussion in the previous section, the route demand of international passengers is estimated assuming that the existing route structure will be maintained for the future.

By an analysis of past travel patterns of visitors to the Solomon Islands, passenger distribution rates by routes can be estimated as shown in Table 4.8.1.

Table 4.8.1 Distribution Rates by Routes

Route	O/D Country	Distribution Rate
Australia	Australia	100%
(BNE/SYD)	Japan	100%
	United Kingdom	100%
	United States	50%
	Other Europe	100%
New Zealand	New Zealand	100%
(VIL/NAN/AKL)	United States	50%
	Other Pacific	50%
PNG (POM)	PNG	100%
	Other Country	100%
NAURU (NUI)	Other Pacific	50%

Note: BNE: Brisbane, SYD: Sydney, VIL: Port Villa, NAN: Nadi, AKL: Auckland, POM: Port Morsby, NUI: Nauru

By applying the above distribution rates to annual international demands shown in Table 4.3.2 the annual international passenger demand by route is estimated as shown in Table 4.8.2.

Table 4.8.2 Annual International Passenger Demand by Route

Route	1995	2000	2005	2010
BNE/SYD	30,700	45,800	66,600	95,250
VIL/NAN/AKL	13,300	20,250	30,100	44,000
POM	12,200	19,300	29,600	44,600
NUI	2,100	3,450	5,400	8,350
Total	58,300	88,800	131,700	192,200

4.8.3 Aircraft Types and Seat Capacity

In the South Pacific region, the most commonly utilized aircraft type for low traffic routes is B737-200 (100-115 seats). B727s (160-180 seats) are used for low-medium traffic routes. This type of aircraft, however, is old, and has been gradually replaced by new generation of aircraft such as B767 or A310 (200-240 seats). Qantas Airways, Air New Zealand and Air Pacific (Fiji) are operating B767s. Air New Guinea has an A310.

As B737 and B727 were designed for short-range operations, they are subject to weight restriction for medium-range operations over 2,000 km. Therefore, these types of aircraft are considered to be replaced by B767 class aircraft in accordance with traffic increase.

Aircraft types and seat capacity anticipated at Henderson International Airport are shown in Table 4.8.3 based on the trend of aircraft replacement in the South Pacific region and fleet plan of Solomon Ainlines.

Table 4.8.3 Aircraft Types and Seats Capacity

	Present - 2000	2001 - 2010
B767 Class	220*1	240*2
B737 Class	130*3	130*3

*Note: *1: B767-200 series (2-class seat arrangement)*
**2: B767-300 series (2-class seat arrangement)*
**3: B737-400 (130 seats) witch Solomon Airlines plans to introduce in 1992*

4.8.4 Introduction of B767 Class Aircraft

Air transport industry in the region is in oligopolic situation due to small size of market. In such a situation, airline companies cope with demand increase by introducing larger capacity aircraft instead of increasing flight frequency in order to reduce operating expenses. In the South Pacific region, B767s are operated for routes with annual passenger demand more than 25,000.

The annual passengers of Honiara-Brisbane route will reach this level in 1993 in the medium projection. B-767s will be introduced in 1995 even in case of the low projection.

The timing of non-scheduled operations of B767 would be earlier than 1993 in order to cater for peak traffic during the peak month. This estimation is very probable since such flights have already operated at the airport respectively once in 1989 and 1990.

4.8.5 Typical Week International Passengers by Route

Peak month ratios of the international passengers at the airport was 1/10.1 (9.9%) in 1989 as aforementioned in section 3.4.1 (1). As flight schedules will be established on a weekly basis for international flights, it is necessary to estimate typical week passengers of the peak month. This is calculated by multiplying annual passenger demand of each route by the peak month ratio (1/10.1) and dividing the product by the average number of weeks (4.4) in a month. The result of the calculation is show in Table 4.8.4.

Table 4.8.4 Typical Week International Passengers of the Peak Month

Route	1995	2000	2005	2010
BNE/SYD	690	1,030	1,500	2,140
VIL/NAN/AKL	300	460	680	990
POM	270	430	670	1,000
NUI	50	80	120	190
Total	1,310	2,000	2,970	4,320

4.8.6 Typical Week and Design Day International Traffic

Based on the consideration in the previous section, international aircraft movements of the typical week of the peak month are projected as shown in Table 4.8.5.

Table 4.8.5 Typical Week International Aircraft Movements of the Peak Month

Route	Actual	Projection			
	1990	1995	2000	2005	2010
BNE/SYD	B737: 6	B767: 2	B767: 4	B767: 6	B767: 14
	-	B737: 6	B737: 6	B737: 8	-
VIL/NAN/AKL	B737: 6	B737: 6	B737: 6	B767: 2	B767: 4
				B737: 6	B737: 6
POM	B737: 2	B737: 4	B737: 6	B767: 2	B767: 4
	F28: 2	-	-	B737: 6	B737: 6
NUI	B737: 4	B737: 4	B737: 4	B737: 4	B737: 4
B767	-	2	4	10	22
B737	20	20	22	24	16
Total	20	22	26	34	38

Note 1: 60% load factor for passenger seats is assumed for typical week

Note 2: Transit operations from/to Sydney at present are assumed to be continued for Nauru route.

Design day traffic is the average day traffic of the typical week as shown in Table 4.8.6. Although seven flights out of 20 weekly flights are concentrated on Wednesday at present, such heavy concentration over the week will assumably gradually flatten out in the future.

Table 4.8.6 Design Day International Aircraft and Passenger Movements

Item		1995	2000	2005	2010
Aircraft Movements					
	B767	-	-	2	6
	B737	7	8	8	5
	Total	7	8	10	11
Passengers		560	640	930	1,270

4.8.7 Peak Hour International Traffic

Peak hour international traffic of the design day is estimated as shown in Table 4.8.7. The peak hour factor which indicates the percentage of peak hour aircraft movements in the design day is also assumed to gradually decline.

Table 4.8.7 Peak Hour International Traffic in Medium Projection

Item		1995	2000	2005	2010
Aircraft Movements (both-ways)					
	B767	-	-	1	2
	B737	4	4	3	2
	Total	4	4	4	4
Passengers (both-ways)		360	360	440	520
Aircraft Movements (one-way)					
	B767	-	-	1	1
	B737	2	2	1	1
	Total	2	2	2	2
Passengers (one-way)		180	180	260	260

Note : 70% load factor for passenger seats is assumed for peak hour.

For the high projection, peak hour international traffic is estimated as shown in Table 4.8.8.

Table 4.8.8 Peak Hour International Traffic in High Projection

Item		1995	2000	2005	2010
Aircraft Movements (both-ways)					
	B767	1	1	2	3
	B737	3	3	2	1
	Total	4	4	4	4
Passengers (both-ways)		425	425	520	600
Aircraft Movements (one-way)					
	B767	1	1	1	2
	B737	1	1	1	-
	Total	2	2	2	2
Passengers (one-way)		245	245	260	340

As the air traffic forecasts include various unknown factors, such as success or failure of tourism development, airport planning should be flexible enough to cater for demand change by such factors.

Although all the facilities should be planned based on the peak hour traffic in case of the medium projection, some basic facilities, such as aircraft parking apron will be given consideration to accommodate peak hour traffic in the high projection.

4.9 Decomposition of Annual Domestic Passenger Demand

4.9.1 Typical Week Passengers

The number of peak month domestic passengers and typical week domestic passengers are calculated from the annual domestic passenger demand, the peak month ratio (1/9.0) and the average number of weeks (4.4) in a month. The result of the calculation is shown in Table 4.9.1.

Table 4.9.1 Typical Week Domestic Passengers of the Peak Month

Item	1995	2000	2005	2010
Annual Passengers	74,000	99,400	128,800	163,200
Peak Month Passengers	8,200	11,000	14,300	18,100
Typical Week Passengers	1,860	2,500	3,250	4,110

4.9.2 Aircraft Types and Seat Capacity

DHC-6s (19 seats) and BNIs (9 seats) are currently utilized for scheduled service of the domestic operations. PA-23s (5 seats) are mainly used for charter operations. Due to the small size of domestic air traffic demands in the Solomon Islands, it is estimated that the present aircraft types are continuously utilized for domestic operations up to 2010. Introduction of larger aircraft with 40-50 seats such as F-50, ATR-42 or DHC-8 is most probable for Honiara-Auki and Honiara-Munda, but would be after 2010. As the new apron will be given sufficient expansion area reserved for the future in the master plan, the expansion and strengthening of the new apron and/or rearrangement of aircraft stands should be considered when the necessity of these larger aircraft becomes obvious due to unexpected increase of traffic demand.

4.9.3 Typical Week and Design Day Domestic Traffic

The number of typical domestic aircraft movements are estimated by assuming the aircraft mix towards the future. The percentage of DHC-6s will increase in accordance with the increase of traffic demand. The estimated domestic aircraft movements in the typical week of the peak month is shown in Table 4.9.2.

Table 4.9.2 Typical Week Domestic Aircraft Movements of the Peak Month

Item		Actual 1990	Projection 1995	2000	2005	2010
Aircraft Mix						
	DHC-6	17%	25%	30%	35%	40%
	BNI	83%	75%	70%	65%	60%
	Total	100%	100%	100%	100%	100%
Aircraft Movements						
	DHC-6	22	50	78	114	182
	BNI	104	152	182	212	270
	Total	126	202	260	326	452

Note 1: 80% load factor for passenger seats is assumed
Note 2: Aircraft movements of BNI in 1990 include two movements of PA-23

Design day domestic traffic, average day traffic of the typical week, is estimated as shown in Table 4.9.3.

Table 4.9.3 Design Day Domestic Aircraft and Passenger Movements

Item		1995	2000	2005	2010
Aircraft Movements					
	DHC-6	8	12	18	26
	BNI	22	26	30	40
	Total	30	38	48	66
Passengers		274	362	480	670

4.9.4 Domestic Peak Hour Traffic

Peak hour aircraft movements of the design day is estimated by multiplying the design day aircraft movements by a peak hour factor which indicates the concentration of aircraft movements during the peak hour by percentage of aircraft movement during peak hour to design day. The peak hour factor is estimated to be 20% based on the analysis of the present flight schedule.

Estimated peak hour domestic traffic of the design day is summarized in Table 4.9.4.

Table 4.9.4 Peak Hour Domestic Aircraft and Passenger Movements

Item		1995	2000	2005	2010
Aircraft Movements (both-ways)					
	DHC-6	2	3	4	6
	BNI	4	5	6	8
	Total	6	8	10	14
Passengers (both-ways)		58	80	102	146
Aircraft Movements (one-way)					
	DHC-6	1	2	2	3
	BNI	2	2	3	4
	Total	3	4	5	7
Passengers (one-way)		29	44	51	73

Note: One way traffic are estimated as approximately 50% of the two-way traffic based on the analysis of the present flight schedule.

4.9.5 Overnight Stay of Domestic Aircraft

The number of overnight stay domestic aircraft at the airport is estimated as it will be the governing factor to determine the number of aircraft stands required for domestic aircraft. It is estimated based on an equation below:

$$SN = MD \times C$$

where, NS : Number of aircraft stands for overnight stay
MD : Number of aircraft landings of the design day
C : Overnight stay ratio

The overnight stay ratio which is the number of overnight stay aircraft divided by the number of aircraft landing of a day is 0.4 at present. This ratio is considered to decline in accordance with increase in frequency of operations, average operational hours of an aircraft and the number of overnight stay in other airports. The result of estimation is shown in Table 4.9.5.

Table 4.9.5 Number of Overnight Stay Domestic Aircraft

Item		Projection			
		1995	2000	2005	2010
Number of Aircraft Landing					
	DHC-6	4	6	9	13
	BNI	11	13	15	20
	Total	15	19	24	33
Overnight Stay Ratio		0.35	0.30	0.25	0.20
Number of Overnight Stay					
	DHC-6	2	2	3	4
	BNI	4	4	4	4
	Total	6	6	7	8

4.9.6 Overall Peak Hour Traffic of International and Domestic Passenger and Aircraft Movements

As the peak hours of international and domestic traffic do not occur simultaneously, the traffic volume of overall peak hour is not a sum of international and domestic peak hour traffic shown in Tables 4.8.7 and 4.9.4 respectively.

Although it is difficult to infer the future overall peak hour from the present flight schedule, it is certain that the overall peak hour traffic will be generated during the peak hour of international traffic. The overall peak hour traffic is therefore estimated assuming that about 50% of the domestic peak hour traffic will be generated during the peak hour of international traffic.

The result of the estimation is shown in Table 4.9.6.

Table 4.9.6 Aircraft and Passenger Movements during Overall Peak Hour of International and Domestic Traffic

Item		1995	2000	2005	2010
Aircraft Movements (both-ways)					
	B767	-	-	1	2
	B737	4	4	3	2
	DHC-6	1	2	2	3
	BNI	2	2	3	4
	Total	7	8	9	11
Passengers (both-ways)		389	404	491	564
Aircraft Movements (one-way)					
	B767	-	-	1	1
	B737	2	2	1	1
	DHC-6	1	1	1	1
	BNI	1	1	1	2
	Total	4	4	4	5
Passengers (one-way)		202	202	282	289

4.10 Annual Aircraft Movements

Annual aircraft movements are estimated by annualizing the typical peak week aircraft movements. As the variation of aircraft movements in each month is very small at the airport, the annual aircraft movements are calculated by multiplying the typical week aircraft movements by the number of week in a year (52). The result of the calculation is shown in Table 4.10.1.

Table 4.10.1 Annual Aircraft Movements

Item		1995	2000	2005	2010
International					
	B767	100	200	500	1,150
	B737	1,050	1,150	1,250	850
	Total	1,150	1,350	1,750	2,000
Domestic					
	DHC-6	2,600	4,100	5,900	9,500
	BNI	7,900	9,400	11,100	14,000
	Total	10,500	13,500	17,000	23,500
Total		11,650	14,850	18,750	25,500

CHAPTER 5 AIRPORT FACILITY REQUIREMENTS

CHAPTER 5 AIRPORT FACILITY REQUIREMENTS

5.1 General

The airport facility requirements are estimated based on the air traffic demand forecast in Chapter 3. The requirements are estimated for the period from 1995 to 2010 at five year intervals in compliance with relevant standards and recommended practices of the International Civil Aviation Organization (ICAO). Those of Japan Civil Aviation Bureau (JCAB), Federal Aviation Administration (FAA) of the United States and International Air Transport Association (IATA) are also referred to where ICAO does not specify.

The established airport facility requirements are summarized in Table 5.1.1.

5.2 Runway and Runway Strip

5.2.1 Runway

(1) Aerodrome Reference Code and Operational Category

The aerodrome reference codes, i.e., code number and code letter will be as shown in Table 5.2.1 in accordance with largest aircraft anticipated to serve the airport, i.e., B767 for 1995 and 2000 and B747 for 2005 and 2010.

Even for an airport with favorable meteorological conditions, a precision approach procedure is a standard requirement for safe operations of modern jet aircraft. Landing by auto-pilot using integrated flight system (flight director system) and ILS are standard procedure to reduce operational routine work of flight crew. Therefore, the operational category of the airport is recommended to be precision approach.

Although declaring category-I precision approach should accompany the widening of runway strip to 300m according to ICAO standard, installation of an ILS for 150m wide runway strip will also improve air safety as a guidance system as practiced in Apia of Western Samoa.

Table 5.1.1 Summary of Airport Facility Requirements

Items	Unit	Present Condition (as of 1990)	Year 1995	Year 2000	Year 2005	Year 2010
1. Annual Passengers						
- International	no.	33,600 (1989)	58,300	88,800	131,700	192,200
- Domestic	no.	49,100 (1989)	74,000	99,400	128,800	163,200
- Total	no.	82,700	132,300	188,200	260,500	355,400
2. Annual Cargo						
- International	ton	659 (1986)	1,200	1,700	2,400	3,300
- Domestic	ton	239 (1989)	390	500	630	870
- Total	ton	898	1,590	2,200	3,030	4,170
3. Annual Aircraft Movements						
- International	no.	940 (1989)	1,150	1,350	1,750	2,000
- Domestic	no.	6,440 (1989)	10,500	13,500	17,000	23,500
- Total	no.	7,380	11,650	14,850	18,750	25,500
4. Peak Hour Passengers						
- International	no.	140	360	360	440	520
- Domestic	no.	60	58	80	102	146
- Overall	no.	180	389	404	491	564
5. Peak Hour Aircraft Movements						
- International	no.	2	4	4	4	4
- Domestic	no.	7	3	4	5	7
- Overall	no.	6	7	8	9	11
6. Maximum Aircraft in Operation		B737	B767	B767	B747	B747
7. Reference Code		4C	4D	4D	4E	4E
8. Runway						
- Length	m	2,200	2,200	2,200	2,500	2,500
- Width	m	45	45	45	45	45
9. Runway Strip						
- Length	m	2,320	2,320	2,320	2,620	2,620
- Width	m	150	150	150	300	300
10. Taxiway						
- System		Right Angle Taxiways	R-Angle Taxiways	R-Angle Taxiways	R-Angle Taxiways	R-Angle Taxiways
- Width	m	23	30	30	30	30
11. Apron						
- Aircraft Stands	no.	B737 : 3 or B737 : 1 DHC-6: 1 BNI : 4 PA-23: 1 Total: 7	B767 : 2 DHC-6: 2 BNI : 3 Total: 7	B767 : 2 DHC-6: 2 BNI : 4 Total: 8	B767 : 2 B737 : 1 DHC-6: 3 BNI : 4 Total: 10	B767 : 2 B737 : 1 DHC-6: 4 BNI : 4 Total: 11
12. Passenger Terminal Building						
- International	sq.m	742	2,900	2,900	4,000	4,000
- Domestic	sq.m	108	300	400	500	700
- Total	sq.m	850	3,200	3,300	4,500	4,700
13. VIP Building	sq.m	103	120	120	120	120
14. Cargo Terminal Building	sq.m	NIL	400	600	800	1,100
15. Administration and Operations Building	sq.m	Adm. : 284 Ops. : 150 Total: 434	600	600	600	600
16. Access Road		One lane per direction	One lane per direc.	One lane per direc.	One lane per direc.	One lane per direc.
17. Car Parking						
- Parking Lots	no.	70	225	235	285	325
- Area	sq.m	2,300	7,900	8,200	10,000	11,400
18. Passenger Building Curb	m	28	90	95	115	130
19. Air Navigation Systems		Non-Precision (VOR/DME,NDB)	Precision (ILS,VOR/ DME,NDB)	Precision (ILS,VOR/ DME,NDB)	Precision (MLS,VOR/ DME,NDB)	Precision (MLS,VOR/ DME,NDB)
20. Public Utilities						
- Power Supply	KVA	300	390	400	430	480
- Water Supply	L/day	-	90,000	100,000	120,000	140,000
- Sewage Disposal	L/day	-	90,000	100,000	120,000	140,000
- Solid Waste Disposal	kg/day	-	230	250	290	350
21. Rescue and Fire Fighting						
- Level of Protection		Category-4	Category-6	Category-6	Category-8	Category-8
- Fire Vehicles	no.	2	3	3	3	3
- Fire Station	sq.m	280	450	450	450	450
22. Fuel Supply Facility						
- Jet A1 Tank Capacity	KL	62	140	170	240	320
- Avgas Tank Capacity	KL	25	70	80	110	150
- Fuel Farm	sq.m	1,600	3,150	3,150	3,950	3,950

Table 5.2.1 Reference Code and Operational Category

Item	1995	2000	2005	2010
Reference Number	4	4	4	4
Reference Letter	D	D	E	E
Operational Category	Precision	Precision	Precision	Precision

(2) Number of Runways

A single runway with proper exit taxiways can handle 30 aircraft movements per hour when 60 to 90% of the total traffic is composed of small aircraft. Since the number of peak hour aircraft movements is estimated to be ten in 2010, a single runway can cope with the traffic demands for a considerable period even after 2010.

(3) Runway Length and Width

The aircraft range vs. runway length is analyzed based on airplane characteristics of B737, B767 and B747 for two different load conditions as indicated in Appendix-5.2.1 and summarized in Table 5.2.2. Taking into account relatively low cargo demand in Honiara, the planning of the runway length can assume full passenger load condition rather than maximum payload condition. In this assumption, the increase of aircraft range by the extension of the existing 2,200m long runway is marginal for B737 and B767.

As the maximum aircraft serving the airport as scheduled flights up to 2010 is B767 class aircraft according to the demand forecast, there would be no urgent need to extend the runway. However, as discussed in section 4.7.2, it is necessary to consider charter operations of B747 on limited occasions during the Christmas and New Year holidays in a long term. Therefore, a 2,500m long runway will assumably be provided in 2005.

The required width of the runway is 45m with a 7.5m shoulder on each side for an aerodrome with the reference code of 4D or 4E.

Table 5.2.2 Runway Length vs. Aircraft Range

Aircraft Types	Load Condition	Runway length 2,200m	2,500m	3,000m
B737-200	Full Passengers	SYD	SYD	SYD
	Max Payload	VIL	POM	BNE, NAN
B737-400	Full Passengers	GUM, AKL	GUM, AKL	GUM, AKL
	Max Payload	POM	POM	BNE, NAN
B767-200	Full Passengers	SIN, HKG	SIN, HKG	SIN, HKG
	Max Payload	GUM, AKL	GUM, AKL	GUM, AKL
B767-200ER	Full Passengers	SIN, HKG	SIN, HKG	LAX
	Max Payload	TYO, HNL	SIN, HKG	SIN, HKG
B767-300ER	Full Passengers	SIN, HKG	SIN, HKG	SIN, HKG
	Max Payload	GUM, AKL	TYO, HNL	SIN, HKG
B747-200B	Full Passengers		SIN, HKG	LAX
	Max Payload		TYO, HNL	SIN, HKG
B747-400	Full Passengers		SIN, HKG	LAX
	Max payload		GUM, AKL	SIN, HKG

Note 1: Required landing runway length for B747 series aircraft is 2,500m.
Note 2: AKL: Auckland, BNE: Brisbane, GUM: Guam, HKG: Hong Kong, LAX: Los Angeles, NAN: Nadi, POM: Port Moresby, SIN: Singapore, TYO: Tokyo, VIL: Port Vila

5.2.2 Runway Strip

A runway strip should extend before the threshold and beyond the end of the runway for a distance of at least 60m where the aerodrome code number is 4.

As for the width of runway strips, ICAO Annex 14 stipulates as a standard that at least 300m wide strip shall be provided for a precision runway of the code number 3 or 4, wherever practicable (paragraph 3.3.3).

Apart from such a standard, it is also necessary to consider the affect of the widening the runway strip on the existing airport in determining the strip width. Actually there are a lot of airfields in which precision approach operations are conducted with 150m wide strips due to difficulty of widening runway strips. In case of Henderson International Airport, if the existing 150m wide runway strip is widened to 300m, most terminal facilities including the apron, passenger terminal building, control tower, fire station, hangars, etc. will be obstacles to aircraft operations and need to be removed. A complete new terminal will require considerable amount of capital if the widening of the runway strip is done immediately. Therefore, it is considered practical to maintain the existing width until all the terminal facilities are relocated at a different location with more separation distance from the runway centerline after 2000.

5.3 Obstacle Limitation Surfaces

The requirements of obstacle limitation surfaces for non-precision and precision runways with the code number of 4 are summarized in Figure 5.3.1. New objects or extension of existing objects should not be permitted above those obstacle limitation surfaces, and existing objects above an approach surface, transitional surface, conical surface and inner horizontal surface should as far as practicable be removed. The detailed evaluation of the existing objects is described in section 6.4.

5.4 Taxiway and Apron

5.4.1 Taxiway

A complete parallel taxiway with right angle exits is economically justifiable where the number of instrument approaches exceeds four during peak hour and operations of wide body jet become frequent. In these criteria, no parallel taxiway will be required up to 2010. At least one connecting taxiway for each apron will be sufficient to handle anticipated ground movements of aircraft. However, the land area required for the future parallel taxiway is recommended to be reserved at an early stage.

5.4.2 Apron

The size of aircraft stands for jet aircraft of international flight will be determined by the maximum aircraft in operations, i.e., B767. Minimum two aircraft stands will be required reserving one extra stand for unexpected occasions such as delay or technical trouble of aircraft, the number of aircraft stands up to 2010 are estimated as shown in Table 5.4.1. The number of overnight stay jet aircraft will be maximally two up to 2010, and it will be accommodated by the above requirements.

It is noted that the number of aircraft stands estimated below can accommodate peak hour aircraft in the high projection by use of the extra stand.

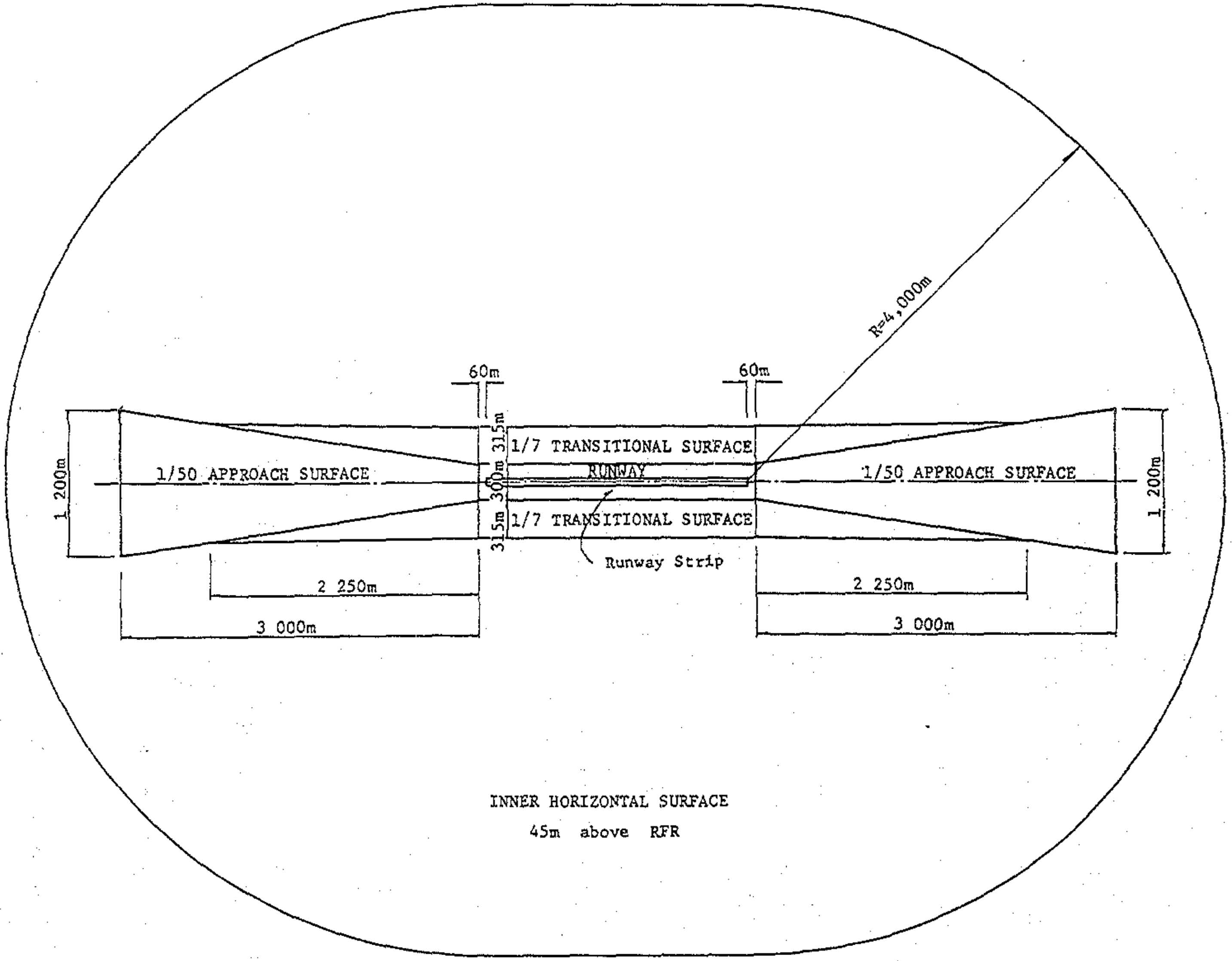


Figure 5.3.1 Required Obstacle Limitations Surfaces

Note 1: The width of the runway strip is 300m in accordance with ICAO. However, the existing 150m strip is planned to be widened to 300m when all the terminal facilities are relocated at a different location after 2000.

Note 2: The second and horizontal sections of approach surface should be added for a runway with precision approach operations.

As for domestic aircraft, the number of aircraft stands will be determined by the overnight stay requirement of aircraft estimated in section 4.9.5.

Table 5.4.1 Required Number of Aircraft Stands

Item	1995	2000	2005	2010
International				
B-767 class	2	2	2	2
B-737 class	-	-	1	1
Domestic				
DHC-6	2	2	3	4
BNI	3	4	4	4
Total	7	8	10	11

The apron location should be planned so that any part of the parked aircraft may not infringe the transitional surface for safe aircraft operations. It is also necessary to determine the apron location with sufficient future provision. In this respect, the apron location is determined by considering possible future introduction of B747 so that the parked B747 would meet clearance requirements in respect of runway centerline, passenger terminal building and other fixed objects.

5.5 Airfield Pavement

The required thickness of the runway, taxiway and apron should be determined so that the pavement can withstand repetitious loading of a design aircraft. The required reference thickness of the runway pavement is 97cm for the expected traffic during 10 year pavement life. The above strength of the pavement will be achieved by minimum 19cm thick asphalt concrete overlay on the existing runway. The details of the estimation for pavement thickness are shown in Appendix-6.6.1.

5.6 Passenger Terminal Building

The floor area required for the passenger terminal building is calculated by use of the floor area requirement formula set forth by IATA, which is;

$RTA = UA \times PAX$

where, RTA: Required terminal area in sq.m
UA: Unit floor area required per peak hour passenger
PAX: Number of both-way typical peak hour passengers.

IATA defines UA = 9.3 sq.m per peak hour international passenger. UA = 5.0 sq.m per passenger is applied for the domestic terminal based on practices of small domestic airports. The floor area requirement up to 2010 is shown in Table 5.6.1.

Table 5.6.1 Required Floor Area for Passenger Terminal Building

(Unit: sq.m)

Item	1995	2000	2005	2010
International	3,350	3,350	4,100	4,850
Domestic	300	400	500	750
Total	3,650	3,750	4,600	5,600

5.7 VIP Building

The required floor area of the VIP building is assumed to be 120 sq.m based on the size of the existing VIP lounge and practices in other airports in the South Pacific region.

5.8 Cargo Terminal Building

The floor area required for the cargo terminal building is estimated based on the annual cargo volume and unit cargo handling capacity. As manual cargo handling capacity is generally considered as five ton/sq.m, this unit capacity is used for the calculation of cargo handling area. The total floor area of the cargo terminal building is estimated to be 1.33 times that of the cargo handling area for the accommodation of airline office, customs office, cargo agents, etc.

Table 5.8.1 Required Floor Area for Cargo Terminal Building

(Unit: sq.m)

Item	1995	2000	2005	2010
Cargo Handling Area	300	450	600	850
Total Floor Area	400	600	800	1100

5.9 Administration and Operations Building and Control Tower

The required total floor area of the building for administrative and operational functions of the Civil Aviation Division and Meteorological Service Office is estimated to be about 600 sq.m. This size is estimated as a sum of floor area of existing administration office and twice the floor area of existing operations office. A control tower should be provided for air traffic control. It's location and height should be determined to secure unobstructed view of the airfield and a minimum sight angle of 35 minutes to runway thresholds from its VFR room.

5.10 Airline Office Buildings

Solomon Airlines has a building for the engineering and training sections other than the office space for flight operations and passenger handling in the existing passenger terminal building. They also have a plan to construct a new headquarter building at the airport relocating the existing headquarters in the town. Western Pacific Air Services presently has a headquarters and engineering section at the airport.

In the future plan of the airport, sufficient area should be reserved to fulfill such requirements to construct airline office buildings in the airport.

5.11 Access Road and Car Parking

5.11.1 Access Road

According to the Basic Design Study for reconstructing Lungga Bridge by JICA in 1989, both-way traffic volume at Lungga Bridge was estimated to reach 7,820 vehicles/day in 2007 assuming approximately 6% annual growth of traffic, and planned to handle the traffic by one lane two-way road. Although the growth rate of passenger demand at the airport up to 2010 is more than the above 6% per annum, vehicle traffic volume will not exceed 20,000 vehicles/day in 2010 which is the maximum capacity of one lane two-way road. Therefore, the required number of the access road is then one lane for each direction up to 2010.

5.11.2 Car Parking

The following formula is applied to calculate the required number of parking slots:

LOT = PAX x PR

where, LOT: Required number of parking slots
PAX: Number of both-way peak hour passengers
PR: Number of parked car ratio per peak hour passengers
(PR = 0.58 from the traffic survey)

The required total on-grade car parking area is estimated as shown in Table 5.11.1 by applying unit space of 35 sq.m for a parking slot, which includes internal roads and green zones in addition to net parking slots.

Table 5.11.1 Required Number of Car Parking Slots and Carparking Area

(Unit: sq.m)

Item	1995	2000	2005	2010
Total Parking Slots	225	235	285	325
Required Area (sq.m)	7,900	8,200	10,000	11,400

5.11.3 Passenger Building Curb

The required curb length of the passenger building is calculated by the following formula as shown in Table 5.11.2.

PBC = PAX (1 + a)/Q x T/60 x L

where, PBC: Required curb length of building in meter
PAX: Number of both-way peak hour passengers
a: Number of greeters per passenger (1.1)
Q: Number of occupants per vehicle (2.0)
T: Average dwell time at curb (2.0 min)
L: Length of parking slot per vehicle (6.7m)

Table 5.11.2 Required Curb Length of Passenger Building

(Unit: sq.m)

Item	1995	2000	2005	2010
Curb Length (m)	90	95	115	130

5.12 Air Navigation Systems

Air navigation systems consisting of the following should be planned to satisfy the requirements of aircraft operations and air traffic control.

a) Radio Navigation System
b) Aeronautical Telecommunication System
c) Aeronautical Ground Lights
d) Meteorological Observation System

5.12.1 Radio Navigation System

Radio navigation aids required for precision approach runways are;

a) ILS or MLS
b) VOR
c) NDB
d) DME

At the time this report is prepared ICAO says that ILS cease to be an ICAO standard system for precision approach runways on January 1, 1988, but can remain in service at international airports until January 1, 2000 on the basis of Regional Agreement. MLS is a sole ICAO standard system from 2000 although there are strong objections against MLS installation for various reasons.

In this study, ILS is planned to be installed up to 2000 and replaced by MLS after that.

5.12.2 Aeronautical Telecommunications

Air to ground VHF/HF communications and aeronautical fixed services should be provided to satisfy required services of air traffic control.

5.12.3 Aeronautical Ground Lights

Aeronautical ground lights required for the airport with a precision and non-precision approach runways are shown in Table 5.12.1.

Table 5.12.1 Required Aeronautical Ground Lights

Operational Category	Precision Cat-I
Precision Approach Lighting System	X *1
Simple Approach Lighting System	X *2
PAPI	X (RWY 06/24)
Runway Edge Lights	X
Runway Threshold/End Lights	X (RWY 06/24)
Wing Bar Lights	X *1
Taxiway Edge Lights	X
Apron Floodlighting	X
Aerodrome Beacon	X
Illuminated Wind Direction Indicator	X (RWY 06/24)
Obstacle Lights	X
AGL Control System	X

Note 1: "X" indicates required item.
*Note 2: *1 for main approach direction*
*Note 3: *2 for opposit side of main approach direction*

5.12.4 Meteorological Observation System

Wind speed, wind direction, atmospheric pressure, temperature, humidity, rainfall, visibility, cloud amount and cloud base should be observed at the airport. Runway visual range should be added for precision approach operations.

Forecast services covering en-route, terminal and area are also a basic requirement of meteorological system at the airport.

5.13 Rescue and Fire Fighting Services

The facility requirements for the rescue and fire fighting services are estimated in compliance with ICAO AIRPORT SERVICE MANUAL PART I. The standard levels of protection shall be determined first. Those for B767 and B747 class aircraft are Category-8 and Category-9 respectively. However, these can be reduced to Category-6 and Category-7 respectively by taking infrequent aircraft operations into account. The requirements of fire fighting services for a corresponding level of protection up to the year 2010 are shown in Table 5.13.1.

Table 5.13.1 Requirements of Rescue and Fire Fighting Facilities

Year 1995 and 2000		
Level of Protection	:	Category-6
Extinguishing Agent		
- Water for Fluoroprotein Foam Production (L)	:	7,900
- Discharge Rate (L/min)	:	4,000
- Dry Chemical Powders (kg)	:	225
Vehicles		
- Rapid Intervention Vehicle	:	1
- Major Vehicle	:	2
- Ambulance	:	1
Fire Station		
- Required Floor Area (sq.m)	:	450
Years 2005 and 2010		
Level of Protection	:	Category-7
Extinguishing Agent		
- Water for Fluoroprotein Foam Production (L)	:	12,100
- Discharge Rate (L/min)	:	5,300
- Dry Chemical Powders (kg)	:	225
Vehicles		
- Rapid Intervention Vehicle	:	1
- Major Vehicle	:	2
- Ambulance	:	1
Fire Station		
- Required Floor Area (sq.m)	:	450

The fire station should be located so that the response time to the furthest threshold will be within three minutes.

5.14 Airport Utilities

The airport utility requirements are calculated based on the unit demand shown in Table 5.14.1.

Table 5.14.1 Unit Demand

Utilities	Unit Demand
Electricity	Passenger Terminal Building : 40 VA/sq.m Cargo Terminal Building : 20 VA/sq.m Administration Building and others : 40 VA/sq.m Equipment : Calculated by Equipment
Water	Passenger Terminal Building : 23 L/sq.m/day Cargo Terminal Building : 3 L/sq.m/day Administration Building and others : 10 L/sq.m/day
Sewage	Passenger Terminal Building : 23 L/sq.m/day Cargo Terminal Building : 3 L/sq.m/day Administration Building and others : 10 L/sq.m/day
Waste	Passenger Terminal Building : 0.035 kg/sq.m/day Cargo Terminal Building : 0.070 kg/sq.m/day Administration Building and others : 0.070 kg/sq.m/day

Source: Average unit demand of airports in Japan

The demand of airport utilities anticipated at the airport is estimated as shown in Table 5.14.2 by multiplying above unit demand by the required floor area of each building.

Table 5.14.2 Airport Utility Demands

Utilities	1995	2000	2005	2010
Electricity Demand (KVA)	390	400	430	480
Water Demand (L/day)	90,000	100,000	12,000	14,000
Sewage (L/day)	90,000	100,000	12,000	14,000
Waste Deposit (Kg/day)	230	250	290	350

5.15 Other Facilities and Services

5.15.1 Aviation Fuel Supply

The fuel requirements are calculated by multiplying the trip fuel by the number of departing flights for each route and aircraft type. The required fuel storage capacity is estimated based on the calculated fuel requirements and seven day reserve policy (JCAB standard practice). A 40% allowance on tank capacity is also considered. The aviation fuel storage requirements as well as required area for a fuel farm up to 2010 are shown in Table 5.15.1.

Table 5.15.1 Requirements for Aviation Fuel Storage and Fuel Farm Area

Item	1995	2000	2005	2010
Seven-day Consumption				
JET AI (KL)	100	120	170	230
AVGAS (KL)	50	60	80	110
Tank Capacity				
JET A1 (KL)	140	170	240	320
AVGAS (KL)	70	80	110	150
Fuel Farm (sq.m)	4,000	4,000	5,400	5,400

5.15.2 Aircraft Maintenance Facilities

As Henderson International Airport is a base airport of Solomon Airlines and Western Pacific, it should have appropriate facilities to satisfy maintenance requirements for their aircraft. Solomon Airlines has a plan to commence line maintenance of B737 and heavy maintenance of DHC-6 in Honiara in the future.

Western Pacific Air Services would need to maintain existing aircraft hangar spaces. The required number of aircraft maintenance hangars are shown in Table 5.15.2 based on the existing condition and future plans of maintenance facilities at the airport.

Table 5.15.2 Required Aircraft Maintenance Facilities

Solomon Airlines	B737:	1
	DHC-6:	2
Western Pacific Air Services	BNI:	2
Heli Solomon	Bell 206:	1
	Hughes 500:	1
	Grumman 448	1

As these hangars are facilities to be constructed by airline companies, only the provision of appropriate space for their construction will be included in the airport master plan.

5.15.3 Airport Maintenance Facilities

For the efficient maintenance of runway strip, the adequate number of tractor associated mowing machines should be provided.

5.15.4 Ground Service Equipment

The minimum number of ground service equipment (GSE) required for loading/unloading of passengers and cargo are estimated as follows:

a)	Passenger Step Car :	1 no.
b)	Belt Loader :	1 no.
c)	Baggage Tractor :	1 no.
d)	Baggage Cart :	5 nos.

These are equipment to be provided principally by an airline company or ground service agent.

CHAPTER 6 EVALUATION OF EXISTING HENDERSON INTERNATIONAL AIRPORT

CHAPTER 6 EVALUATION OF EXISTING HENDERSON INTERNATIONAL AIRPORT

6.1 General

The development of the existing airport is foreseen to require large-scale construction with substantial capital investment. To achieve optimum capital utilization, the development to be made should have the longest possible useful life. The development also should ensure safe and efficient aircraft operations, minimum adverse environmental impact on the airport surroundings and the future expansion capability.

The starting point to accomplish the above objectives is the evaluation of the existing airport facilities against current and future traffic demands. This chapter discusses the present conditions of the airport facilities and evaluates capacities against future facility requirements estimated in Chapter 5.

A summary of the evaluation for existing airport facilities is illustrated in Figure 6.1.1.

6.2 Airspace Use

6.2.1 Airspace Configuration

(1) Flight Information Region

Honiara Flight Information Region (FIR) consists of the airspace over Solomon Islands, including its adjacent high seas, as shown in Figure 6.2.1. Detailed dimensions of the FIR is given in Appendix-6.2.1.

(2) Control Area

At present, no control area is established within Honiara FIR. Accordingly, Honiara/Henderson aerodrome has neither a terminal control area nor an aerodrome control zone.

(3) Prohibited, Danger and Restricted Areas

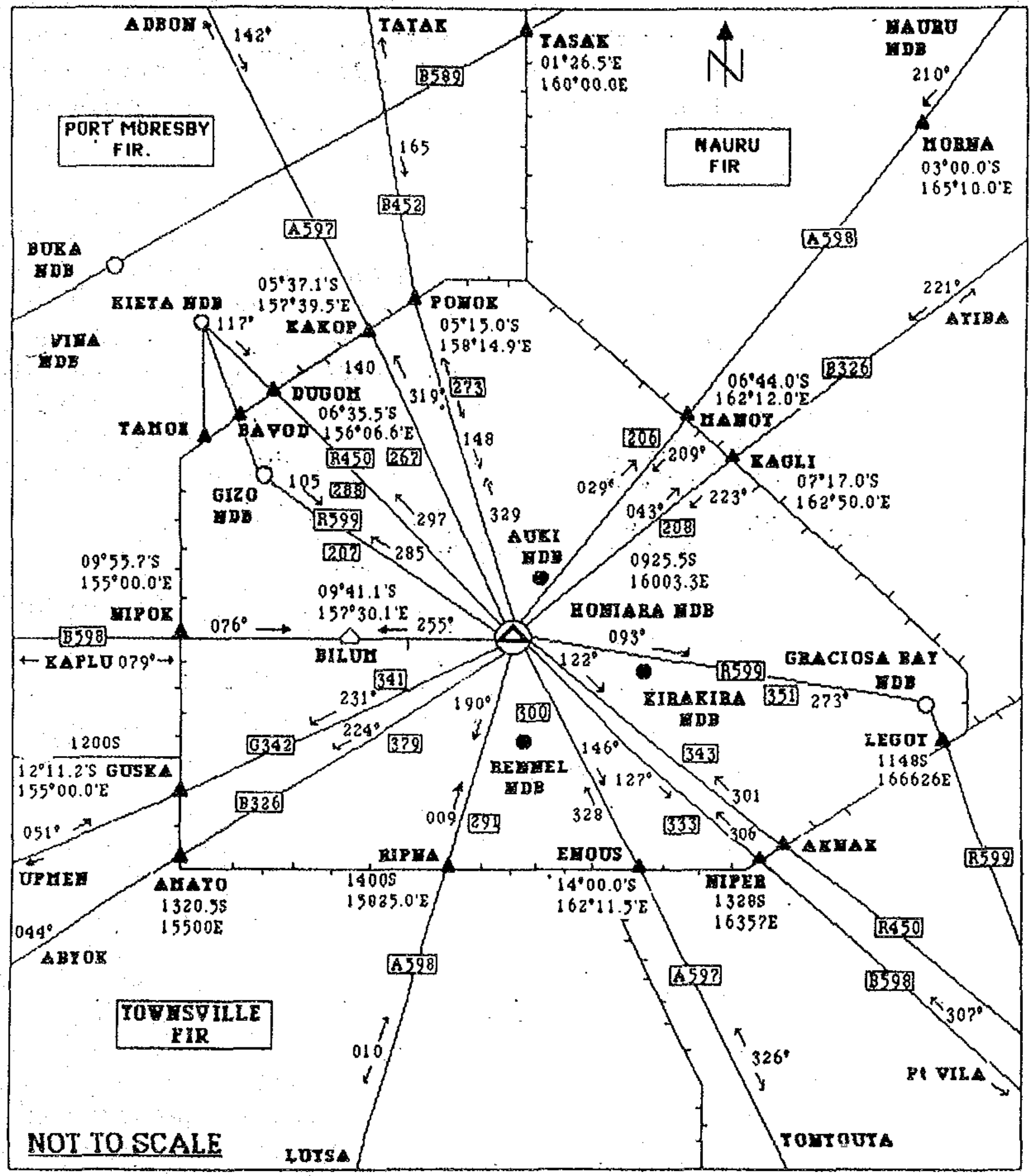
No prohibited or danger area is established at present. Only restricted areas established in Honiara FIR are at two bomb blasting areas, one at Hell's Point at northeast of runway 24

Figure 6.1.1 Summary of Evaluation for Existing Facilities

No.	Facilities		Year 1990 1995 2000 2005 2010	Remarks
1	Runway	* Number		- A single runway can handle aircraft movements up to 2010.
		* Length		- A 2,500m long runway will be required to introduce B747 charter flights.
		* Width		- A 45m wide runway is adequate for aircraft up to B747.
2	Runway Strip	* Length		- The length of the strip should be extended when the runway is extended.
		* Width		- A 300m wide strip is recommended in a long term.
3	Obstacle Limitation Surfaces	- Approach Surface		- First section of approach surfaces are free from obstacles if some trees are felled.
		- Transitional Surface		- Transitional surfaces are free from obstacles until the runway strip is widened to 300m.
4	Taxiway	* System		- No parallel taxiway is required for aircraft movements up to 2010.
5	Apron	* Aircraft	x	- There is no space to accommodate additional aircraft while maintaining appropriate clearance between aircraft for self maneuvering.
6	Airfield Pavement	* Strength		- The strengthening of the existing pavement is required for operations of B767s.
7	Passenger Terminal Building	- International	x	- Passenger terminal building is too small to handle present peak hour passengers.
		- Domestic	x	
8	Cargo Terminal Building		x	- No cargo terminal building is available at the airport.
9	Administration and Operations Building		x	- Operations office is too small for present activities.
10	Access Road			- One-lane two-way access road is sufficient for vehicular traffic up to 2010.
11	Car Parking		x	- Existing car parking overflows during peak hours.
12	Air Navigation Systems	- VOR/DME		- VOR/DME will reach their operational life around 2000.
		- NDB		- NDB will reach its operational life around 1995.
		- ATC & COM		- ATC & COM equipment will reach their operational life around 2000.
		- AGL		- AGLs will reach their operational life around 2005.
		- MET		- MET equipment will reach their operational life around 2000.
		- Emergency Generator		- Emergency generator will reach its operational life around 2000.
13	Rescue and Fire Fighting			- Level of protection should be upgraded to Category-6 when B767 is introduced.
14	Airport Utilities	- Power Supply		- The capacity of the transformer should be increased when a new terminal is constructed.
		- Water Supply		- The capacity of the water main from the town is sufficient for the future demand.
		- Sewage Disposal	x	- Existing septic tanks cause a continuous blockage during heavy rain.
		- Solid Waste Disposal	x	- No incinerator is available at the airport.
15	Aviation Fuel Supply		x	- Storage capacity of the fuel tanks is far below standard requirements.

Note: "x" indicates facility reached its capacity or is not available.

HONIARA FIR



CIVIL AVIATION DIVISION 18 OCTOBER 1990

Figure 6.2.1 The Extent of Honiara FIR

threshold and the other at Luugga Beach located north of the airport. Since the restricted area is located in the vicinity of Honiara/Henderson Aerodrome, close co-ordination is maintained by radio between the Royal Solomon Islands Police (controlling agency of the restricted area) and the aerodrome Flight Information Service (FIS) to ensure the safety of aircraft operations. Detailed dimensions of the restricted area is shown in Appendix-6.2.2.

(4) Airway Structure

Figure 6.2.2 shows international Air Traffic Services (ATS) routes within Honiara FIR. The width and lower/upper limit of each ATS route are 100n.m. and Average Mean Sea Level (AMSL)/Flight Level (FL) 450 respectively. Internal routes in Solomon Islands are basically established by connecting NDBs. Minimum en-route altitude is established for each route segment. The width of routes is not defined in the AIP but it is considered to be 10n.m. as an international normal practice.

(5) Aircraft Operation Procedure

The following instrument approach procedures are established at this aerodrome:

a) RWY 24 VOR (See Appendix - 6.2.3);

b) RWY 24 VOR/DME (See Appendix - 6.2.4);

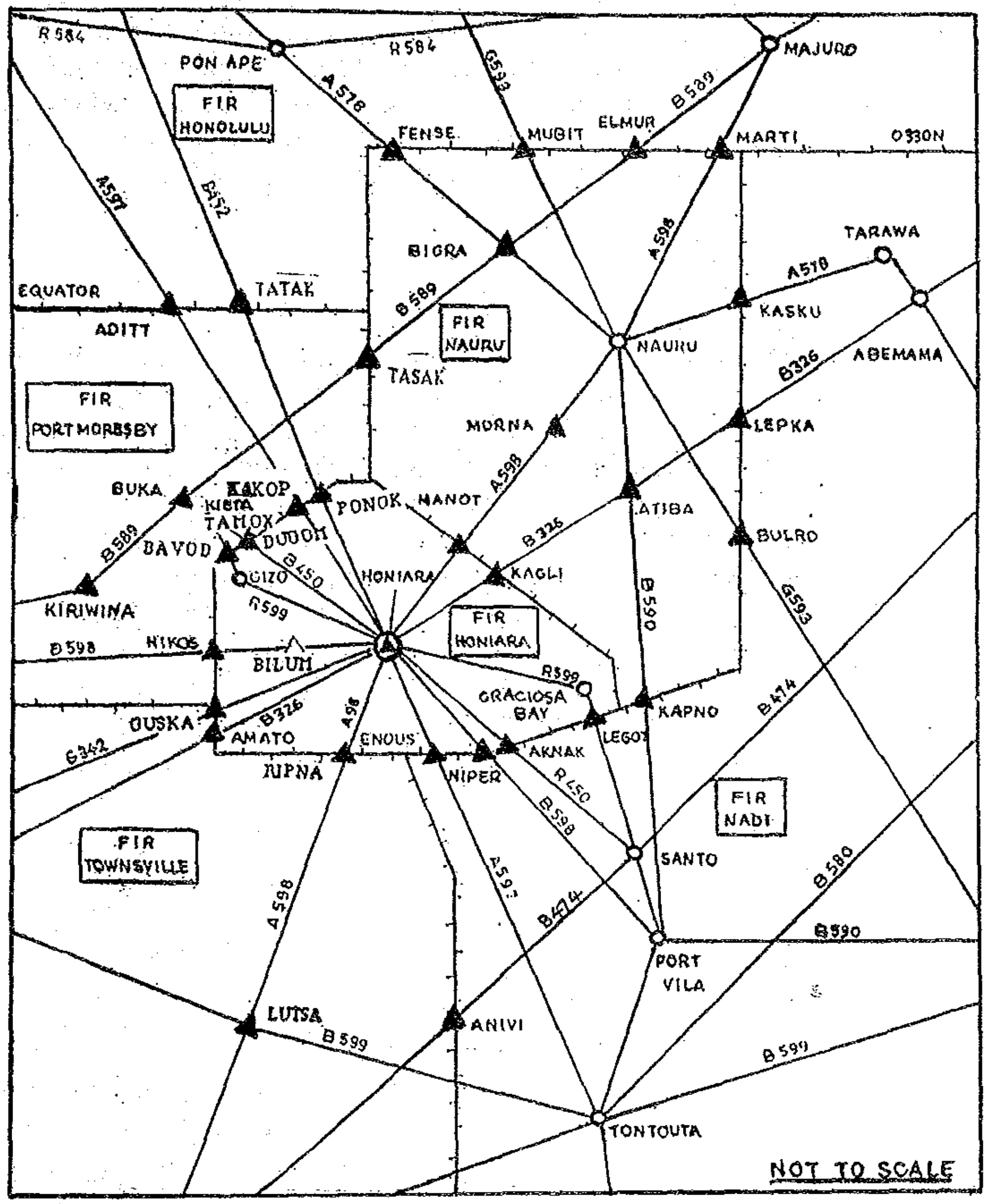
c) RWY 06 VOR/DME (See Appendix - 6.2.5); and

d) RWY 24 NDB or NDB/DME (See Appendix - 6.2.6)

Standard instrument departure and weather minima for this aerodrome are not published. As mentioned earlier, an air traffic control area/control zone is not established within Honiara FIR yet. However, taking air safety into account particularly for mixed operations of small propeller aircraft and large jet aircraft, in and around Henderson aerodrome as well as the future increase of air traffic volume, it is recommended to establish necessary control areas and control zones with a modernized air traffic control system for Henderson aerodrome. Established control areas/zone would contribute greatly to air safety and an effective use of the airspace.

AIP SOLOMON ISLANDS RAC 6-1

-INTERNATIONAL ATS ROUTES - HONIARA / NAURU FIRS -



CIVIL AVIATION DIVISION 18 OCTOBER 1990

Figure 6.2.2 International ATS Routes within Honiara FIR

Henderson aerodrome has no precision approach system for approaching aircraft at present. Installation of an instrument landing system (ILS) is recommended to ensure air safety and reduce workload of flight crew and controller, particularly for international flights.

Standard instrument departures (SID) and weather minima for taking-off from Henderson aerodrome are not published in the AIP. Since hills and relatively high mountains prevail in the southern part of this aerodrome, SIDs which can avoid those hills and mountains and weather minima for takeoff from this aerodrome should be published.

(6) Air Traffic Control

At present, only Flight Information Service (FIS) which provides aircraft with information about aerodrome and meteorological conditions is undertaken by the operation section of the Civil Aviation Division. Thus, no air traffic control service for VFR and IFR aircraft is available at the airport. However, two personnel from the CAD are presently being trained in Australia, and air traffic control service will be commenced by establishing an aerodrome control zone within two years. It will improve the safety of aircraft operations.

6.3 Runway and Runway Strip

6.3.1 Runway

(1) General

The existing runway of Henderson International Airport is 2,200m in length and 45m in width. It is oriented in 068/248 directions for true north. The runway designators, however, are 06/24 taking into account 9-degree magnetic variation to the east. The pavement surface is asphalt concrete. The runway profile is relatively flat with 0.2% down slope from southwest end to the northeast end. The declared runway strength in the AIP Solomon Islands is PCN29/F/C/W/T, which is capable of accommodating aircraft up to B737 aircraft.

(2) Runway Usability

Based on the meteorological data at the airport, usability factors of the runway was examined. Details of the examination procedure are presented in Appendix-6.3.1. Table 6.3.1 summarizes the runway usability factor in all cases of cross-wind components.

Table 6.3.1 Runway Usability Factor

Cross-wind Component	Usability Factor
Less than 10 KN	99.2%
Less than 13 KN	99.5%
Less than 20 KN	99.8%

Note: An introduction of ILS CAT-I would improve the usability factor by 0.1 point in respective cross-wind component cases.

As seen in the table, the runway usability factor at the airport is more than 99% in all cases of cross-wind components which sufficiently exceeds the 95% usability factor recommended by ICAO Annex 14, paragraph 3.1.2 representing very favorable meteorological conditions at the airport and the adequate runway orientation made for the prevailing winds.

(3) Number of Runways

As analyzed in section 5.2.2 (1), the existing single runway will face no capacity problem in terms of aircraft movements at least up to 2010 and it seems that it will remain so for quite a while even after 2010.

(4) Runway Length and Width

Length and width of the existing runway are 2,200m and 45m respectively which qualify the airport as a 4C aerodrome by ICAO Annex 14 definitions. As analysed in section 5.2.2 (2), the existing 2,200m long runway is sufficient for requirements up to 2005 until B747s are introduced for charter flights. The existing runway width of 45m is adequate for all types of aircraft used for civil aviation at present.

(5) Shoulder

The 7.5m wide shoulders are provided on each side of the runway in accordance with ICAO Annex 14 recommendation (paragraph 3.2.3). The surface of the shoulder is covered by 2 cm thick gravel. No problem so far has been incurred by the twin-engine jet aircraft by the unpaved shoulder. However, it is preferable to pave the surface to prevent possible engine ingestion of pebbles by strayed aircraft or support aircraft running off the runway. When B747s are introduced in 2005 it becomes mandatory to pave them since their outboard engines would hang over shoulders.

6.3.2 Runway Strip

The width and length of the existing runway strip are 150m and 2,320m respectively. The grass cutting is done frequently and the runway strip is well maintained. No fixed obstacle is erected on the runway strip. The existing runway strip is considered appropriate for existing non-precision operations.

It should be widened to 300m as far as practicable for safer aircraft operations in accordance with paragraph 3.3.4 of ICAO Annex-14. However, since the immediate widening of runway strip to 300m is considered impractical from an economic reason as mentioned in section 5.2.2, the existing 150m wide runway strip will be maintained until all the terminal facilities are relocated at a different location.

6.4 Obstacle Limitation Surfaces

As mentioned in section 3.7.2, the first section of existing approach surfaces which are required for non-instrument operations are free from obstacles except some trees listed below (refer to Figure 3.7.2 and Table 3.7.1):

a) Runway 06 Approach Surface
- Tree (No. 30)

b) Runway 24 Approach Surface
- Cluster of trees (No. 15)
- Cluster of trees (No. 17)

The above trees should be felled in order to assure safe aircraft operations.