6.2.3 Development of Namangan Airport

(1) Summary Development Plan

Namangan Airport has been selected as a High Priority Project in the eastern area (Fergana Valley) of Uzbekistan, and the development plan for this to the year 2010 has been prepared in this pre-feasibility study based on the master plan presented in Chapter 4 of this report.

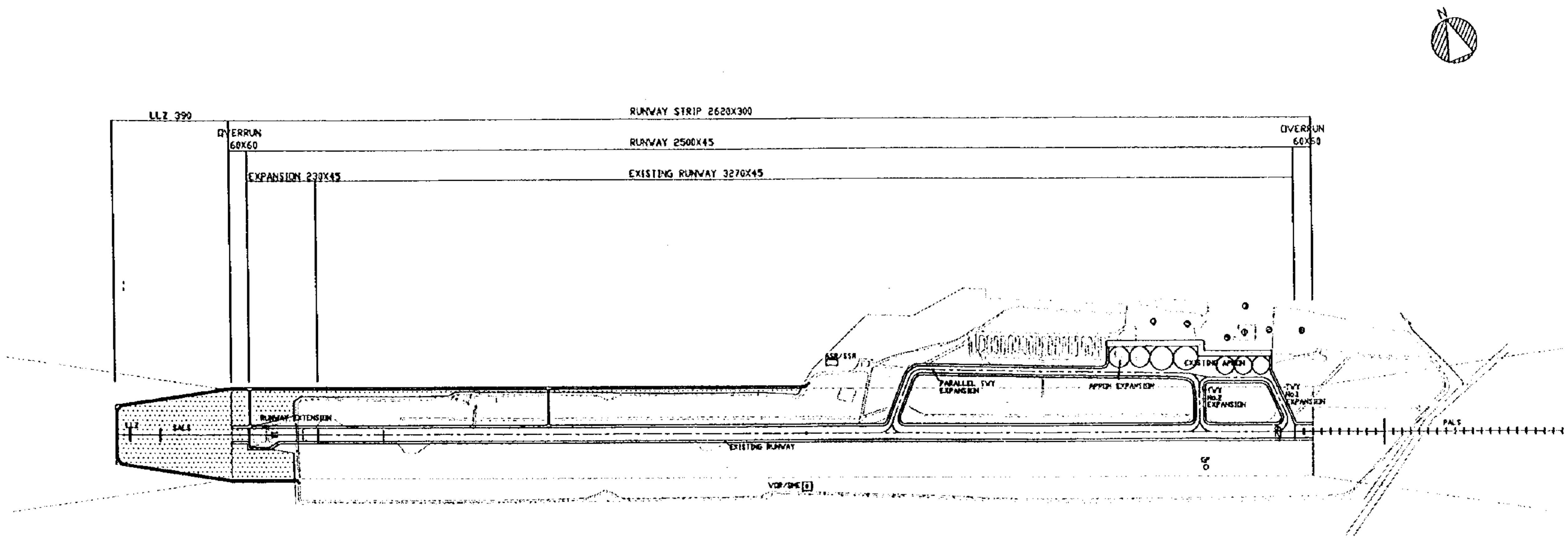
In the master plan, construction of a new runway has been proposed considering the difficulty of correcting the longitudinal slope (1.6 %) of the existing runway to meet ICAO recommendation (no more than 1 %). However, based on the discussions with NAC and the administration office of Namangan Airport it has been decided that the extension of the existing runway adequate to cater for B767 class aircraft without correction of the longitudinal slope is more preferable, considering the following:

- There will be no significant problem such as restriction of allowable cabin load of aircraft even if the existing longitudinal slope is maintained ,
- Extension of the existing runway is more economical than construction of a new runway.

Table 6.2.8 shows summary development plan of Namangan Airport and **Fig.6.2.22** presents airport development plan.

Table 6.2.8 Summary Development Plan of Namangan Airport

FACILITIES		CONTENTS
Air Traffic (Yr.2010)		Passenger : 485 thousand Cargo : 4400 t
Largest Aircraft		B767(Medium-Jet)
Extension Area		19.7 ha
Airfield	Runway	Extension 3270m→3500m ,Provision of a turnaround pad, Pavement overlay ,Shoulder improvement width 7.5m
	Taxiway	Widening 20m→23m ,Shoulder Improvement width 7.5m ,Pavement overlay
	Apron	Passenger : Medium-Jet 3 stands ,Small-Jet/Mini-Plane 3 stands Cargo : Medium -Jet 1 stand Expansion Area 13,800 m^2 ,Overlay Area 36,500 m^2
Terminal	Passenger Bldg.	Int'l/CIS 8,400 m^2, Dom. 2,500m^2
	Cargo Bldg.	3,100m^2
	Other Facilities	New Operations & Control Tower Bldg 2,800m^2 Rescue & Fire Fighting 600m^2(CAT.6) Car park 2.2ha (610 spaces)
Air-Nav	Airfield Lighting	New PALS, PAPI, SALS, etc. Renewal REDL, RTHL, TWEL, AFL etc.
	Radio-Nav.&Telecom.	New VOR/DME etc. Renewal ILS(Cat.I), NDB, ASR/SSR etc.



Development Plan (Case-1) Namangan

FACILITIES		CONTENTS
Air Traffic (Yr.2010)		Passenger 485 thousand Cargo 4.4 thousand
Max. Aircraft		B767(Medium-Jet)
Air-field	Runway	Extension 3270m→3500m ,One Turning Pad Pavement overlay ,Shoulder improvement width 7.5m
	Taxiway	Widening 20m→23m ,Shoulder Improvement width 7.5m ,Pavement overlay
	Apron	Medium-Jet 3 stands ,Small-Jet/Mini-Plane 3 stands Cargo Medium -Jet 1 stand Expansion Area 13,800 m^2 ,Overlay Area 36,500 m^2
Terminal	Passenger Bldg.	Int'l/CIS 8,400 m^2 ,Dom. 2,500m^2
	Cargo Bldg.	3,100m^2
	Other Facilities	New Operations & Control Tower Bldg 2,800m^2 Rescue & Fire Fighting 600m^2(CAT.6) Car parking 2.2ha (610 lots)
Air-Nav	Airfield Lighting	New PALS ,PAPI ,SALS etc. Renewal REDL, RTHL, TWEL, AFL etc.
	Radio-Nav.&Telecom.	New VOR/DME etc. Renewal ILS(Cat I), NDB, ASR/SSR etc.

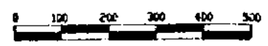


Fig.6.2.22 Namangan Airport Development Plan (2005)

TERMINAL AREA			
1	Passenger Terminal Building	8	Car Park
2	VIP building		
3	Cargo Storage(under construction)		
4	Control Tower		
5	Administration Building		
6	Storage and Garage Area		
7	Fuel Farm		

AIRPORT DATA			
Airport Name	Namangan	Elevation	515m
Class	II	Reference Temperature	35°C
Province	Namangan	New Runway	3500m
Main City	Namangan	(Existing)	(3270m)
Distance from city	8km south-west	Direction (True north)	N 112° 33' E
Reference Point	N 40° 59' 05"	Instrument Runway	29
Coordinates	E071° 33' 27"	ILS Category	CAT-I

The Republic of Uzbekistan National Air Company "Uzbekistan Havo Yullari"			
The Study for The Air Transportation Development in The Republic of Uzbekistan			
Airport	Namangan Airport		
Drawing Tittle	Airport Layout Plan (Year 2010)		
Date		Scale	

(2) Preliminary Design and Scope of the Project

a) Airfield Facilities

- Existing Runway Improvement

The existing runway (3270 m long and 45 m wide) needs to be extended to the west by 230 m to the overall length of 3500 m.

The existing pavement of the runway should be reinforced by a minimum 19cm thick bituminous overlay.

Turnaround pad should be provided at the extended west-end of the runway.
In accordance with ICAO Annex 14, 7.5m wide runway shoulder should be provided on each side of the runway.

- Runway strip

The total dimension of the runway strip should be 3620 m long and 300 m wide, 150 m each from the runway centerline. The rectangular area of the extended portion should be graded in accordance with ICAO Annex 14.

At the extended runway end, a 60m long stopway should be provided. The perimeter fence should be shifted to the extended boundary.

- Existing Taxiway Improvement

The existing taxiways are 20 m wide, and should be widened to 23 m together with provision of a 7.5 m wide shoulder on each side of the taxiways.

Pavement structure of widened portion should be the same as the extended portion of the runway, and minimum 8 cm thick bituminous pavement overlay on the existing portion should be undertaken for reinforcement.

- Existing Apron Improvement

The existing apron capacity is inadequate and expansion of the apron by 13,800 m^2 is required in order to cope with the demand of target year 2010.

The existing apron (36,500 m^2) should be reinforced by minimum 14 cm thick bituminous overlay. Apron service road (20 m wide) should be provided along the edge of apron.

b) Terminal Area Facilities

- Planning Parameters

Table 6.2.9 shows peak-hour aircraft and passenger movements of Namangan Airport for the target year 2010 as planning parameters.

Table 6.2.9 Planning Parameters of the Year 2010 (Namangan Airport)

		MP	S-JET	M-JET	L-JET	Total
Peak-hour aircraft movement	Int'l			2		2
	CIS	0	0	2		2
	Subtotal	0	0	4		4
	Domestic	2	2			4
	Total	2	2	4		8
Peak-hour passenger movement	Int'l			280		280
	CIS	0	0	280		280
	Subtotal	0	0	560		560
	Domestic	70	140			210
	Total	70	140	560		770

Note MP: 50-seater, S-JET: 100-seater, M-JET: 200-seater, L-JET: 350-seater
Load factor: 70%

• Passenger Terminal Building

Existing and required floor spaces of the passenger terminal building are as follows (see Chapter 4):

- required international (year 2010) ; 8,400 m²,
- required domestic (year 2010) ; 2,520 m², Total 10,920 m²
- existing ; 4,220 m²,
- required expansion ; 6,700 m².

Required floor area of each principal element has been estimated as shown in **Table 6.2.10** in the same manner as described in Section 6.2.1. The existing passenger terminal building should be expanded toward the apron. The expanded portion of the building should be a two-story structure so that the required floor space can be obtained in the limited land space. The second floor will be utilized for departure so that passenger boarding bridge can be provided in future. Floor plan of the passenger terminal building is shown in **Fig.6.2.23.**

• Other Terminal Facilities

The following facilities should be expanded to cater for the requirements of the target year 2010:

- Cargo terminal building,
- Car park,
- Rescue & fire fighting facility.

The administration building, control tower and substation should be built in line with modernization of navigation aids.

• Terminal Area Layout Plan

Fig.6.2.24 shows terminal area layout plan of the year 2010.

c) Air Navigation Aids.

Requirement of air navigation aids is shown in Subsection 4.6.3 (11)

Table 6.2.10 Required Floor Space of Principal Elements for Domestic (Namangan Airport Year 2010)

Item	Required Area (m²)	
	Calculated	Planned
1. Check-in lobby	130 (10)	140
2. Check-in counter area	30 (2)	30
(number of check-in positions)	2 positions	2 positions
(length of check-in counter)	8 m	8 m
3. Departure lobby	130 (10)	140
4. Security & passport check area	60 (5)	70
(number of check units)	1unit	1unit
5. Departure lounge	160 (13)	180
6. Baggage claim area	300 (24)	340
(number of claim conveyors)	1unit	1unit
7. Arrival lobby	70 (6)	90
8. Baggage make-up area	180 (15)	210
9. Baggage break-down area	180 (15)	210
Total Passenger-Related Facilities	1,240(100%)	1,410 (56%)
10.Airlines office, VIP Room		200 (8)
11.Concession		480 (19)
12.Others		430 (17)
Others Total		1,110 (44%)
Grand Total		2,520 (100%)

Table 6.2.11 Required Floor Space of Principal Elements for International (Namangan Airport Year 2010)

Item	Required Area(m²)	
	Calculated	Planned
1. Check-in lobby	350 (12)	510
2. Departure customs inspection area	50 (2)	90
(number of customs inspection units)	3 units	3 units
3. Check-in counter area	50 (2)	90
(number of check-in positions)	2 positions	2 positions
(length of check-in counter)	16 m	16 m
4. Departure lobby	350 (12)	510
5. Departure immigration control area	190 (7)	300
(number of immigration control units)	5 units	5 units
6. Security check area	30 (1)	40
(number of security check units)	1unit	1unit
7. Departure lounge	420 (15)	640
8. Arrival immigration control area	190 (7)	300
(number of immigration control units)	6 units	6 units
9. Baggage claim & customs inspection area	650 (23)	980
(number of claim conveyors)	1unit	1unit
(number of customs inspection units)	3 units	3 units
10.Arrival lobby	190 (7)	300
11.Baggage make-up area	180 (6)	260
12.Baggage break-down area	180 (6)	260
Total Passenger-Related Facilities	2,830 (100%)	4,280 (51%)
13.Uzbekistan airways office, VIP room		510 (6)
14.Other airlines office		670 (8)
15.Customs & Immigration office		250 (3)
16.Concession		1,260 (15)
17.Others		1,430(17)
Others Total		4,120(49%)
Grand Total		8,400 (100%)

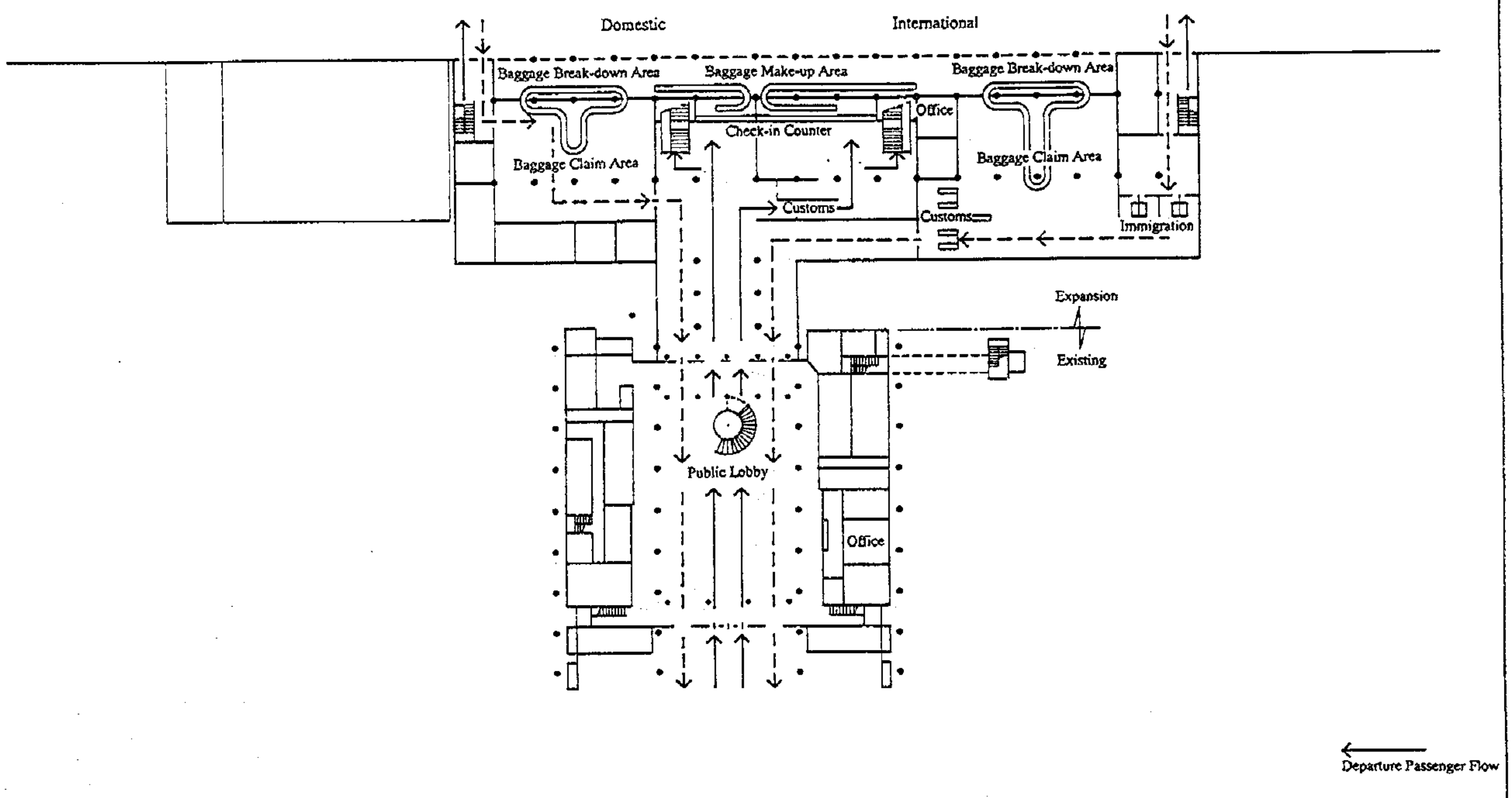


Fig.6.2.23 **(1) Passenger Terminal Building Floor Plan (1st Floor)**

Namangan Airport Passenger Terminal Building 1-st Floor Plan

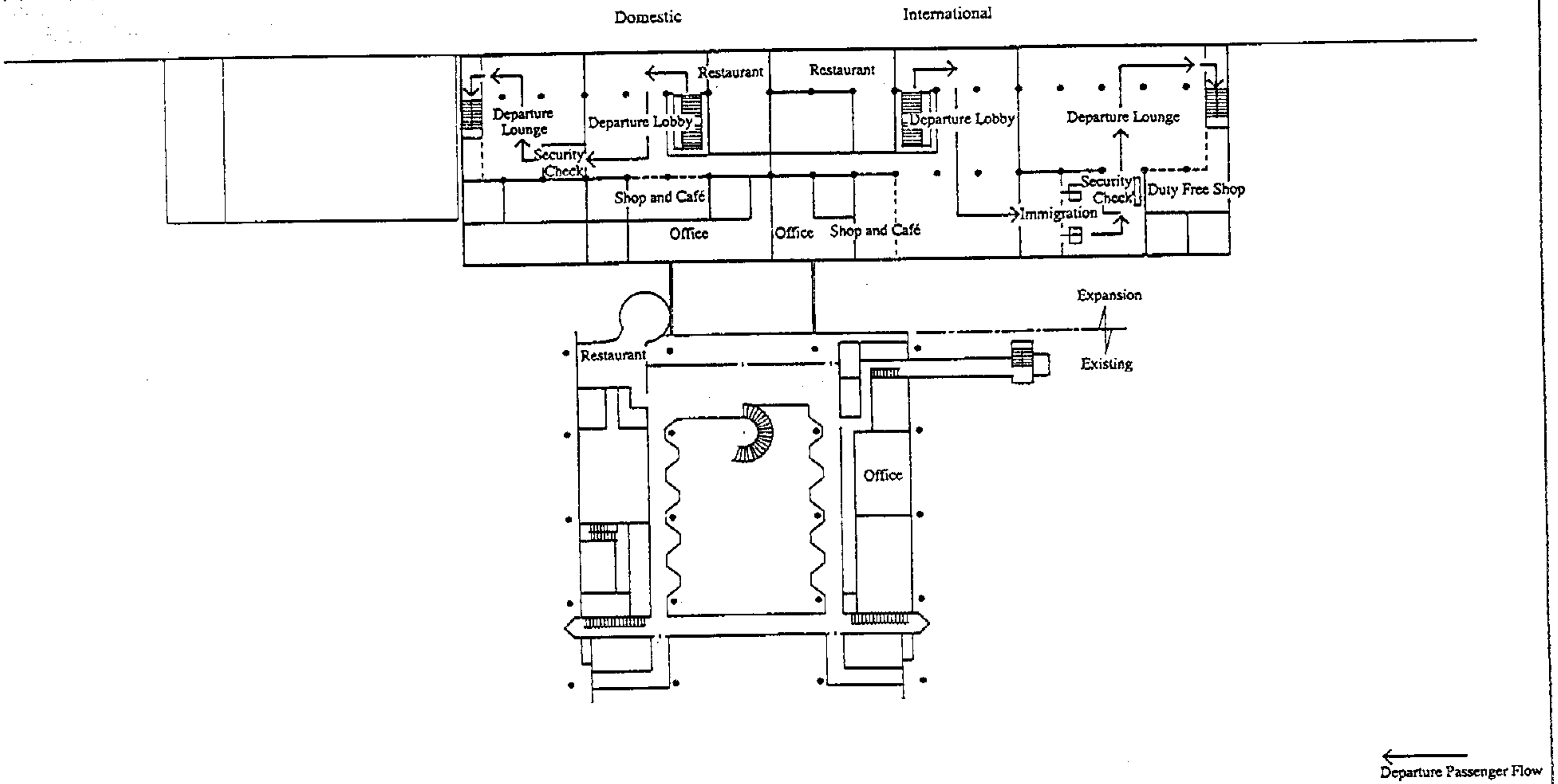
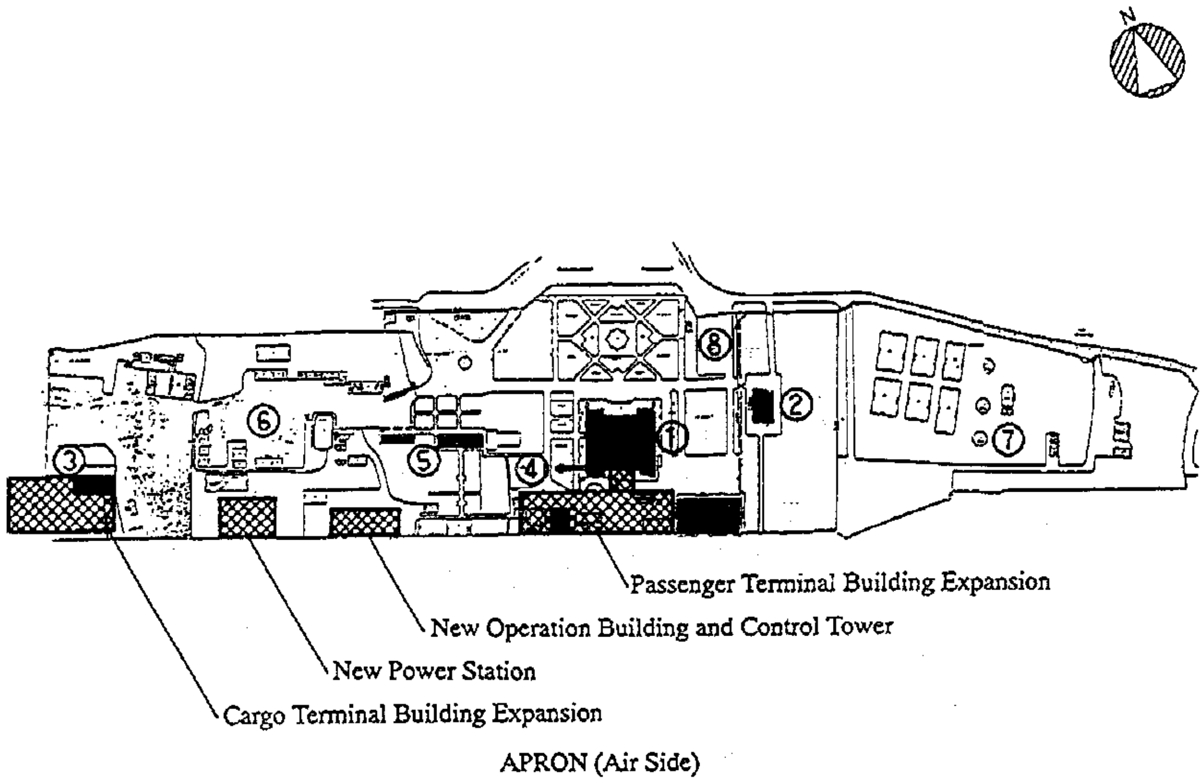


Fig. 6.2.23 **(2) Passenger Terminal Building Floor Plan (2nd Floor)**

Namangan Airport Passenger Terminal Building 2-nd Floor Plan

0 10 20 30M



TERMINAL AREA			
1	Passenger Terminal Building	8	Car Park
2	VIP building		
3	Cargo Storage(under construction)		
4	Control Tower		
5	Administration Building		
6	Storage and Garage Area		
7	Fuel Farm		

Fig.6.2.24 Terminal Area Layout

Namangan Airport Terminal Area Layout Plan (S=1/5,000)

6.2.4 Development of Termez Airport

(1) Summary Development Plan

Termez Airport has been selected as a High Priority Project in the southern area of Uzbekistan, and the development plan for this airport has been prepared based on the master plan presented in Chapter 4 of this report.

Summary development of Termez Airport is shown in **Table 6.2.12**, and airport layout plan of the year 2010 is presented in **Fig.6.2.25**.

Table 6.2.12 Summary Development Plan of Termez Airport

FACILITIES		CONTENTS
Air Traffic (Yr.2010)		Passenger : 440 thousand Cargo : 1.9thousand
Largest Aircraft		B767(Medium-Jet)
Expansion Area		3.6 ha
Airfield	**Runway**	Widen 42m to 45m with provision of 7.5 m wide shoulder. Provision of one Turnaround pad, Pavement overlay
	Taxiway	No.1-3 Widen 20m to 23m with provision of 7.5 m wide shoulder. No.4 Provision of 7.5 m wide shoulder Pavement overlay
	Apron	Medium-Jet 2 stands ,Small-Jet/Mini-Plane 3 stands Expansion : 18,700 m^2 ,Overlay : 13,700 m^2
Terminal	**Passenger Bldg.**	CIS 4,200 m^2 ,Dom. 2,500m^2
	Cargo Bldg.	1,700m^2
	Other Facilities	New Operations & Control Tower Bldg.2,800m^2 Rescue & Fire Fighting 600m^2(CAT.6) Car park 1.4ha (390 spaces)
Air-Nav	**Airfield Lighting**	New PALS, PAPI, SALS etc. Renewal REDL, RTHL, TWEL, AFL etc.
	Radio-Nav.&Telecom.	Renewal ILS (Cat I), NDB, VOR/DME, ASR/SSR etc.

(2) Preliminary Design and Scope of this Project

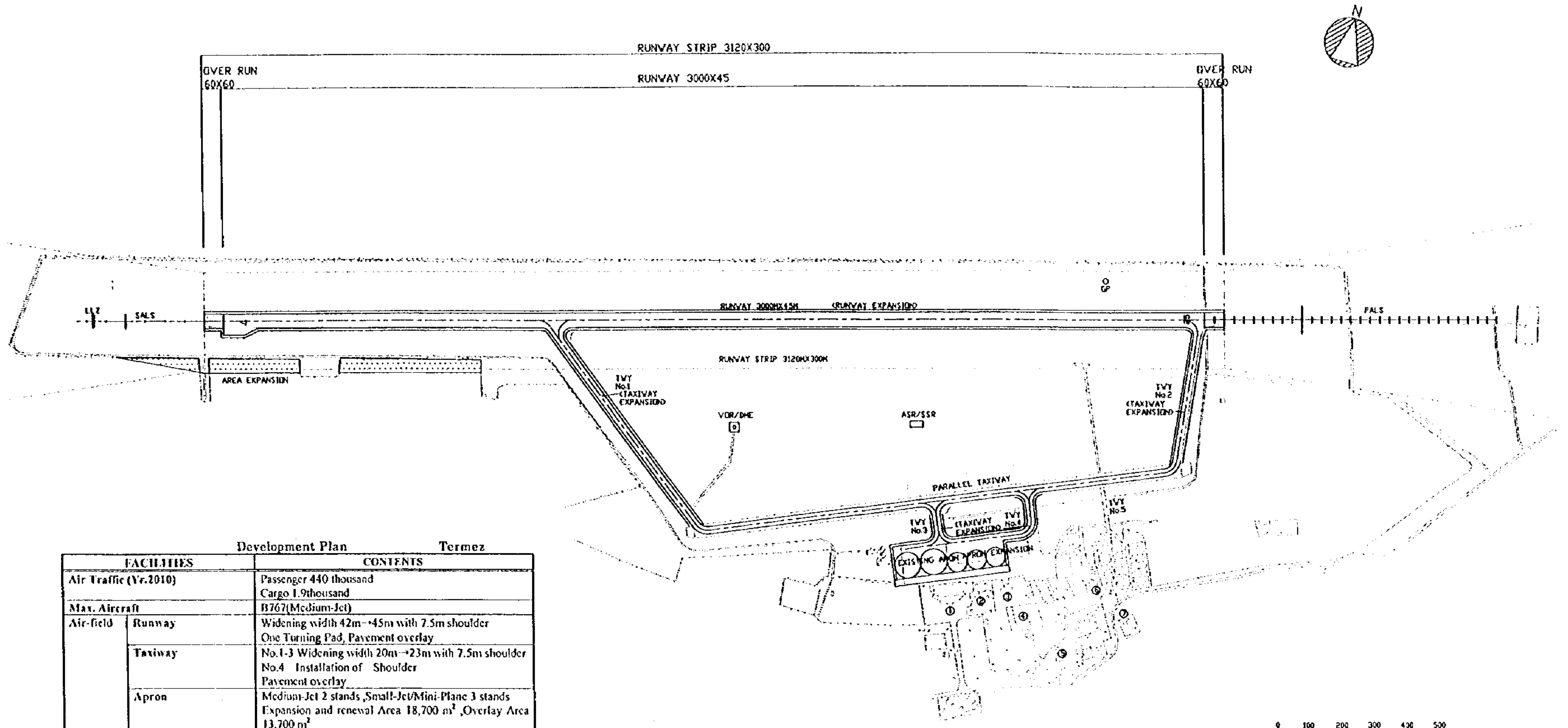
a) Airfield Facilities

- Existing Runway Improvement

The existing runway is 3000 m long and 42 m wide, and needs to be widened to 45 m with 7.5 m shoulder on each side of the runway in accordance with ICAO Annex 14. Turnaround pad should be provided at the west end of the runway. Reinforcement of the existing pavement should be made by a minimum 20 cm thick bituminous overlay.

- Runway Strip

The dimension of the runway strip should be 3120 m long and 300 m wide, 150 m each from the runway centerline. This rectangular area should be graded in accordance with ICAO Annex 14. The perimeter fence should be shifted to the expanded boundary.



Development Plan Termez

FACILITIES		CONTENTS
Air Traffic (Yr.2010)		Passenger 440 thousand Cargo 1.9thousand
Max. Aircraft		B767(Medium-Jet)
Air-field	Runway	Widening width 42m→45m with 7.5m shoulder One Turning Pad, Pavement overlay
	Taxiway	No.1-3 Widening width 20m→23m with 7.5m shoulder No.4 Installation of Shoulder Pavement overlay
	Apron	Medium-Jet 2 stands ,Small-Jet/Mini-Plane 3 stands Expansion and renewal Area 18,700 m^2 ,Overlay Area 13,700 m^2
Terminal	Passenger Bldg.	CIS 4,200 m^2 ,Dom. 2,500m^2
	Cargo Bldg.	1,700m^2
	Other Facilities	New Operations & Control Tower Bldg 2,800m^2 Rescue & Fire Fighting 600m^2(CAT.6) Car parking 1.4ha (390 lots)
Air-Nav	Airfield Lighting	New PALS ,PAPI ,SALS etc. Renewal REDL, RTHL, TWEL, AFL etc.
	Radio-Nav.&Telecom.	Renewal ILS(Cat I), NDB, VOR/DME, ASR/SSR etc.

Fig.6.2.25 Termez Airport Development Plan (2005)

TERMINAL AREA			
1	Passenger Terminal Building	7	Canteen
	Controll Tower		
2	VIP Building		
3	Fire Station		
4	Garage		
5	Sotrage		
6	Hanger		

AIRPORT DATA			
Airport Name	Termez	Elevation	313m
Class	II	Reference Temperature	38°C
Province	Sukhandaria	Runway	3000
Main City	Termez	(Existing)	(3000)
Distance from city	9km	Direction (True north)	N 74° 09' E
Reference Point	N 37° 17' 11"	Instrument Runway	25
Coordinates	E067° 18' 33"	ILS Category	CAT-I

The Republic of Uzbekistan National Air Company "Uzbekistan Havo Yullari"			
The Study for The Air Transportation Development in The Republic of Uzbekistan			
Airport	Termez Airport		
Drawing Tittle	Airport Layout Plan (Year 2010)		
Date		Scale	

- Existing Taxiway Improvement

The existing taxiways are to be maintained for future operation, except taxiway No. 5, which is to be demolished. Existing taxiways No. 1, No. 2 and No. 3 require the following:

- minimum 8 cm thick bituminous overlay on existing pavement,
- widen width of the taxiway form 20 m to 23 m,
- provision of 7.5 m wide shoulder on both sides of the taxiways.

The existing taxiway No. 4 is 30 m wide and is sufficient to accommodate medium class jets. However, a 4 m wide shoulder should be provided on each side of the taxiway in accordance with ICAO Annex 14. Minimum 29 cm thick bituminous overlay should be undertaken for reinforcement.

The existing parallel taxiway is 42 m wide and is sufficient to accommodate the medium class jets. However, the pavement needs to be reinforced by a minimum 9 cm thick bituminous overlay.

- Existing Apron Improvement

The existing apron capacity is inadequate and should be expanded by 18,700 m^2 in order to cope with the forecast demand of the target year 2010. The existing apron (13,700m^2) needs to be reinforced by a minimum 8 cm thick bituminous overlay.

Apron service road (20 m wide) should be provided along the edge of the apron.

b) Terminal Area Facilities

Planning parameters, facility requirement and planning philosophy for terminal area facilities of Termez Airport are the same as those for Namangan Airport. Floor plan of the passenger terminal building is shown in **Fig.6.2.26**, and terminal area layout plan is shown in **Fig.6.2.27**.

c) Air Navigation Facilities

Requirements of air navigation facilities are shown in Subsection 4.6.3 (11).

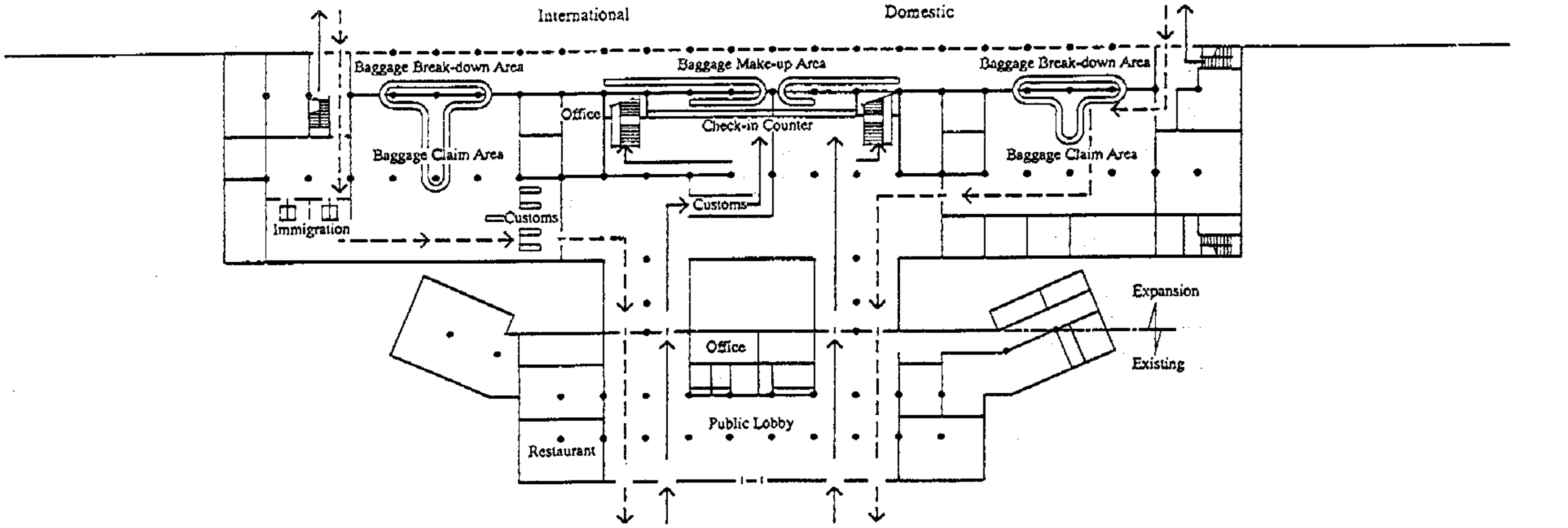


Fig.6.2.26 **(1) Passenger Terminal Building Floor Plan (1st Floor)**

Termez Airport Passenger Terminal Building 1-st Floor Plan

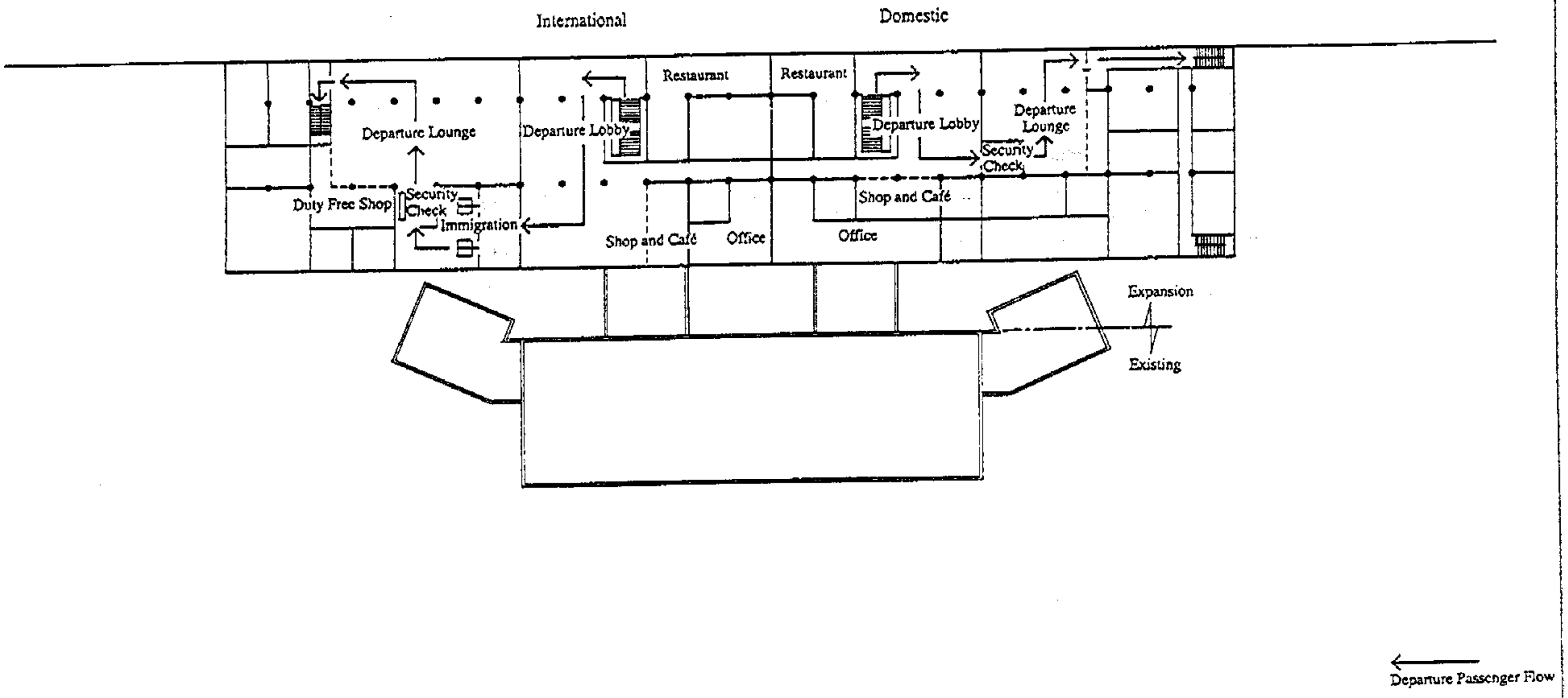
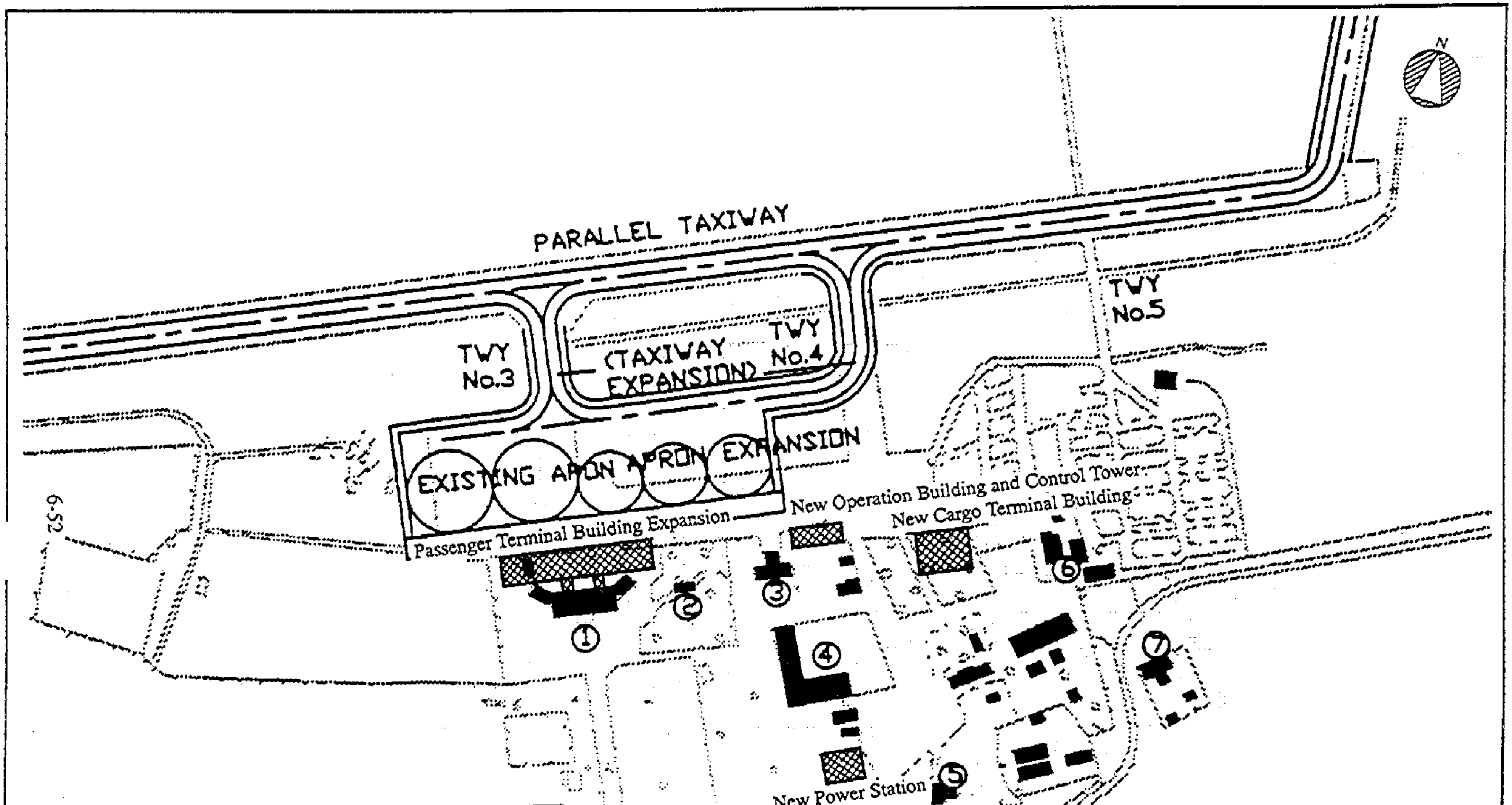


Fig. 6.2.26 **(2) Passenger Terminal Building Floor Plan (1st Floor)**

Termez Airport Passenger Terminal Building 2-nd Floor Plan



TERMINAL AREA			
1	Passenger Terminal Building	7	Canteen
	Controll Tower		
2	VIP Building		
3	Fire Station		
4	Garage		
5	Sotrage		
6	Hanger		

Fig.6.2.27 Terminal Area Layout Plan

Termez Airport Terminal Area Layout Plan (S=1/5,000)

6.2.5 Development of Nukus Airport

(1) Summary Development Plan

Nukus Airport has been selected as a High Priority Project in the northwestern area of Uzbekistan, and for the purpose of this pre-feasibility study the development plan for the year 2010 has been prepared based on the master plan presented in Chapter 4.

Table 6.2.13 shows summary development plan and **Fig.6.2.28** presents facility layout plan respectively, and facility requirement is shown in **Table 4.4.19**.

Table 6.2.13 Summary of Development Plan for Nukus Airport

FACILITIES		CONTENTS
Air Traffic (Yr.2010)		Passenger : 379 thousand Cargo : 1.6 thousand
Largest Aircraft		B767(Medium-Jet)
Airfield	Runway	Widening of shoulder ,Provision of one turnaround pad, Pavement overlay
	Taxiway	Widen taxiways No.2,3,6 and 7 to 23m. with 7.5m shoulder and provide 7.5 m wide shoulder. Pavement overlay
	Apron	Medium-Jet 3 stands ,Small-Jet/Mini-Plane 3 stands Expansion 8,400 m^2 ,Overlay 33,400 m^2
Terminal	Passenger Bldg.	Int'l/CIS 8,400 m^2 ,Dom. 2,500m^2
	Cargo Bldg.	2,100m^2
	Other Facilities	New Operations & Control Tower Bldg 2,800m^2 Rescue & Fire Fighting 600m^2(CAT.6) Car park 2.2ha (610 spaces)
Air-Nav	Airfield Lighting	New PALS, PAPI, SALS etc. Renew REDL, RTHL, TWEL, AFL etc.
	Radio-Nav.& Telecom.	New VOR/DME Renew ILS (Cat I), NDB, ASR/SSR etc.

(2) Preliminary Design and Scope of this Project

a) Airfield Facilities

- Existing Runway Improvement

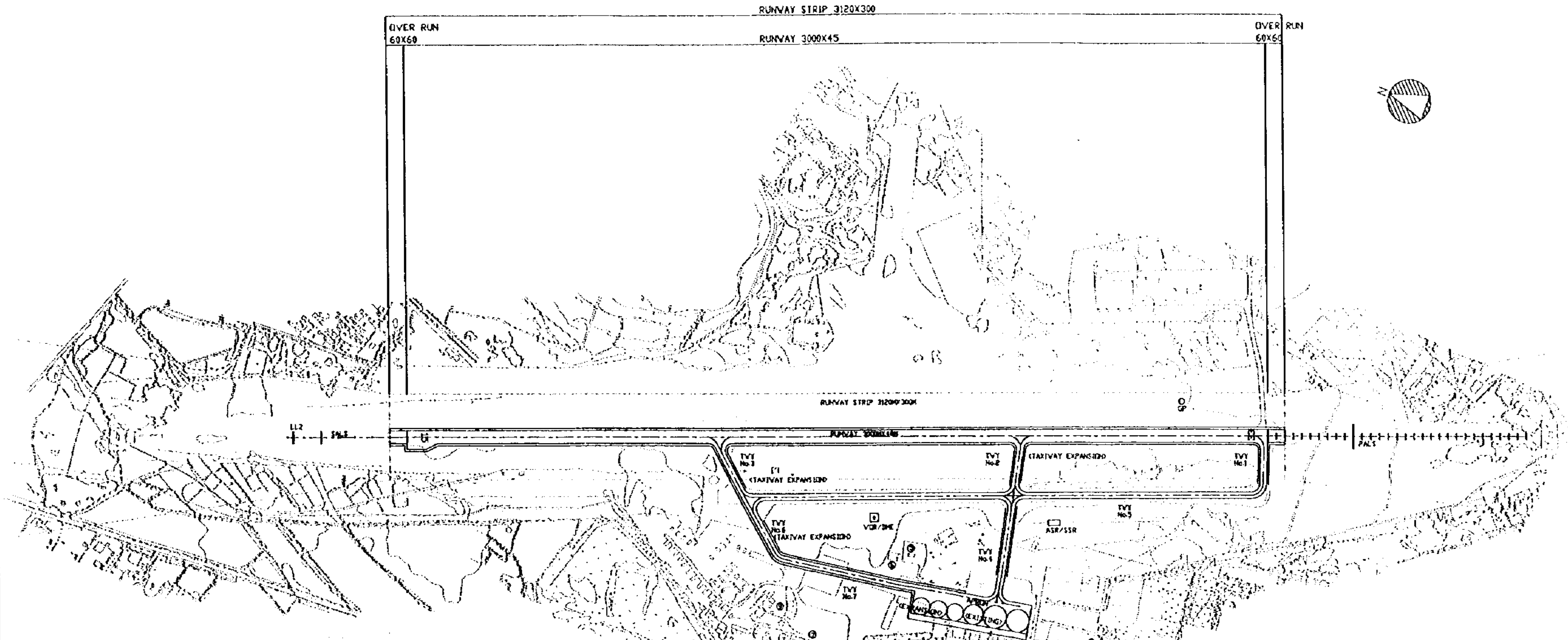
The existing runway is 3000 m long and 48 m wide and is sufficient to accommodate the medium class jets. A 6 m wide shoulder should be provided, however, on each side of the runway in accordance with ICAO Annex 14.

Pavement overlay work by a minimum 20 cm thick bituminous concrete should be undertaken for reinforcement.

- Runway Strip

The dimension of the runway strip should be 3120 m long and 300 m wide, 150 m each from the runway centerline. This rectangular area should be graded in accordance with ICAO Annex 14. Stopway of 60 m long and 60 m wide will be provided. Perimeter fence should be shifted to expanded boundary.

- Existing Taxiway Improvement



Development Plan Nukus

FACILITIES		CONTENTS
Air Traffic (Yr.2010)		Passenger 379 thousand Cargo 1.6thousand
Max. Aircraft		B767(Medium-Jet)
Air-field	Runway	Widen Shoulder ,Improvement one Turning Pad Pavement overlay
	Taxiway	No.2-3,6-7 Widening up to width 23m with 7.5m shoulder Pavement overlay
	Apron	Medium-Jet 3 stands ,Small-Jet/Mini-Plane 3 stands Expansion and renewal Area 8,400 m^2 ,Overlay Area 33,400 m^2
Terminal	Passenger Bldg.	Int'l/CIS 8,400 m^2 ,Dom. 2,500m^2
	Cargo Bldg.	2,100m^2
	Other Facilities	New Operations & Control Tower Bldg 2,100m^2 Rescue & Fire Fighting 600m^2(CAT.6) Car parking 2.2ha (610 lots)
Air-Nav	Airfield Lighting	New PALS ,PAPI ,SALS etc Renewal REDL, RTHL, TWEL, AFL etc.
	Radio-Nav.& Telecom.	New VOR/DME Renewal ILS(Cat I), NDB, ASR/SSR etc.

Fig.6.2.28 Nukus Airport Development Plan (2005)

TERMINAL AREA			
1	Passenger Terminal Building	8	Fuel Tank Farm
2	VIP Building	9	Aircraft Maintenance
3	Cargo Storage	10	Car Park
4	Administration Building		
5	Control Tower		
6	Fire Station		
7	Garage,Storage		

AIRPORT DATA			
Airport Name	Nukus	Elevation	76m
Class	II	Reference Temperature	(36°C)
Province	Karakalpakstan	Runway	3000mx45m
Main City	Nukus	(Existing)	(3000mx48m)
Distance from city	7km north-west	Direction (True north)	N 159° 31' E
Reference Point	N 42° 29' 18"	Instrument Runway	33
Coordinates	E059° 37' 24"	ILS Category	CAT-I

The Republic of Uzbekistan National Air Company "Uzbekistan Havo Yullari"			
The Study for The Air Transportation Development in The Republic of Uzbekistan			
Airport	Nukus Airport		
Drawing Tittle	Airport Layout Plan (Year 2010)		
Date		Scale	

The existing taxiways are to be maintained for future operation. The existing taxiway No.1 is 38m wide and is sufficient to accommodate medium class jets. However, pavement overlay work by a minimum 8 cm thick bituminous concrete layer should be undertaken for reinforcement.

Existing taxiways No. 2 and No. 3 are 22 m wide, and should be widened to 23 m. A 7.5 m wide shoulder should be provided on each side of the taxiways. Pavement overlay work of existing portion by a minimum 8 cm thick bituminous concrete layer should be undertaken for reinforcement.

The existing taxiways No.4 and No.5 are 40 m and 45 m wide respectively and are sufficient to accommodate medium class jets. Pavement overlay work by a minimum 5 cm thick bituminous concrete layer should be undertaken in order to achieve on even surface.

The existing taxiways No. 6 and No. 7 are 16 m wide, and should be widened to 23 m. A 7.5 m wide shoulder on each side of the taxiways should be provided. Pavement overlay work of existing portion by minimum 26 cm thick bituminous concrete layer should be undertaken for reinforcement.

- Existing Apron Improvement

The existing apron capacity is inadequate and needs to be expanded by 8,400 m^2 in order to cope with the demand of the target year 2010. Pavement of the existing apron (33,400 m^2) should be reinforced by a minimum 8 cm thick bituminous overlay. Apron service road (20 m wide) should be provided along the edge of the apron.

b) Terminal Area Facilities

Planning parameters, facility requirement and planning philosophy for terminal area facilities of Nukus Airport are the same as those for Namangan Airport. Floor plan of the passenger terminal building is shown in **Fig.6.2.29** and terminal area layout plan is shown in **Fig.6.2.30**.

c) Air Navigation Facilities

Requirements of air navigation facilities are shown in Subsection 4.6.3 (11).

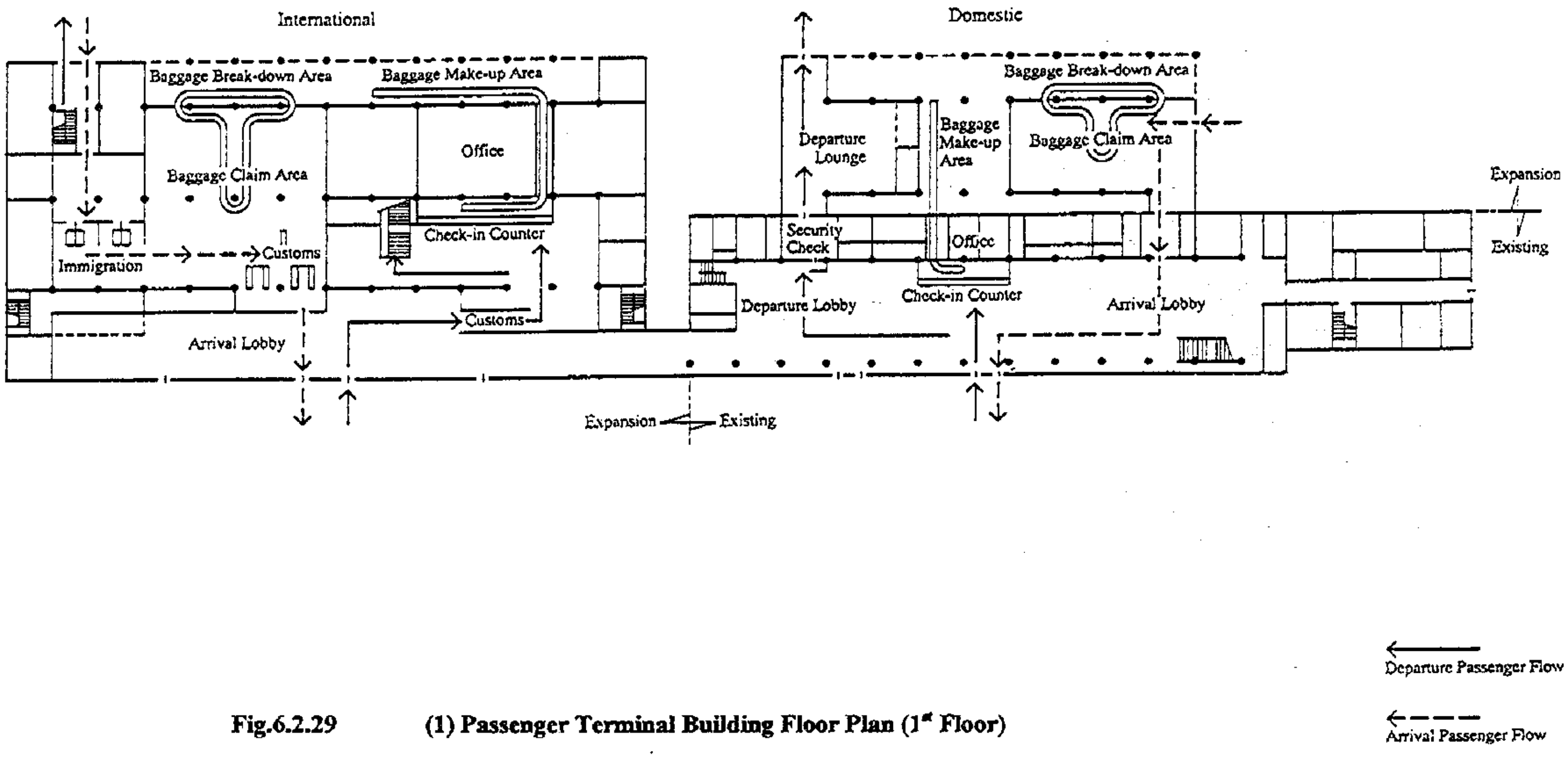


Fig.6.2.29 (1) Passenger Terminal Building Floor Plan (1st Floor)

Nukus Airport Passenger Terminal Building 1-st Floor Plan

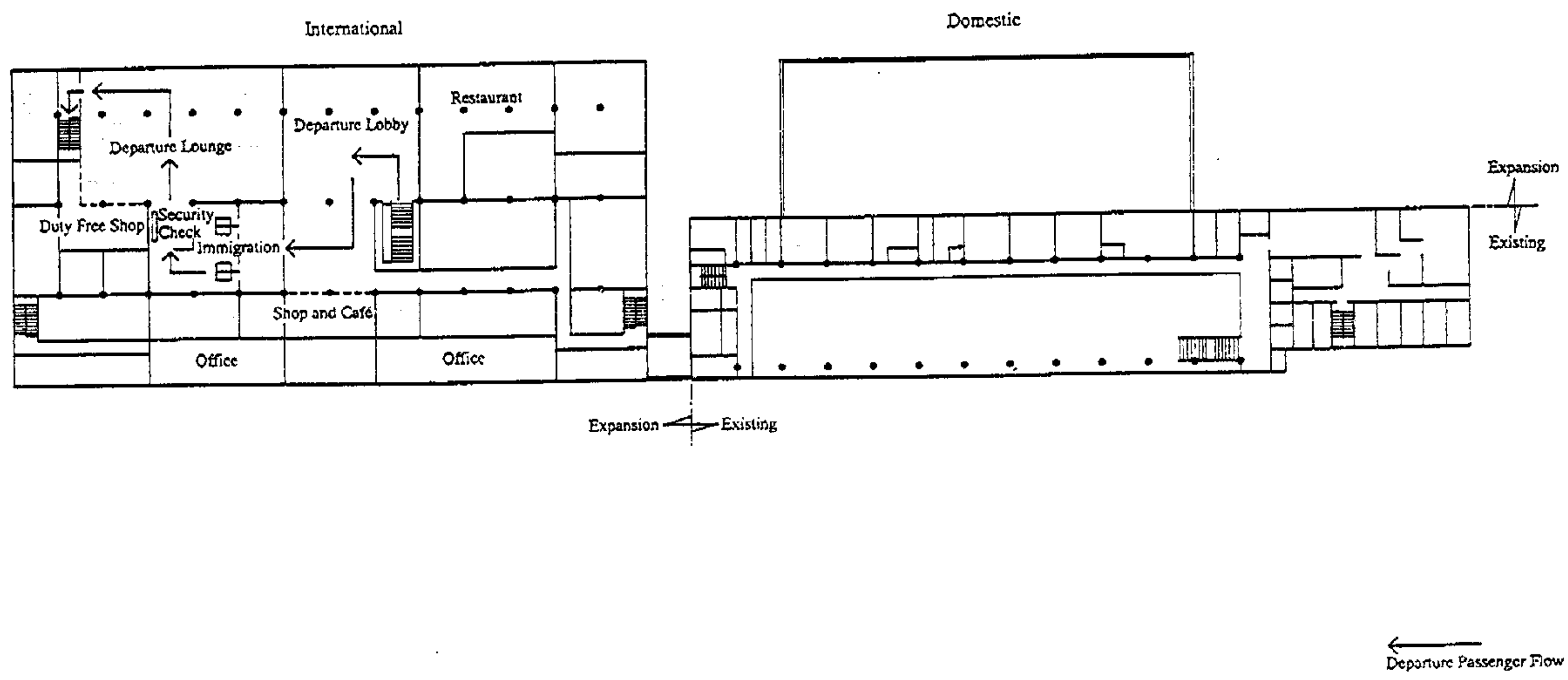
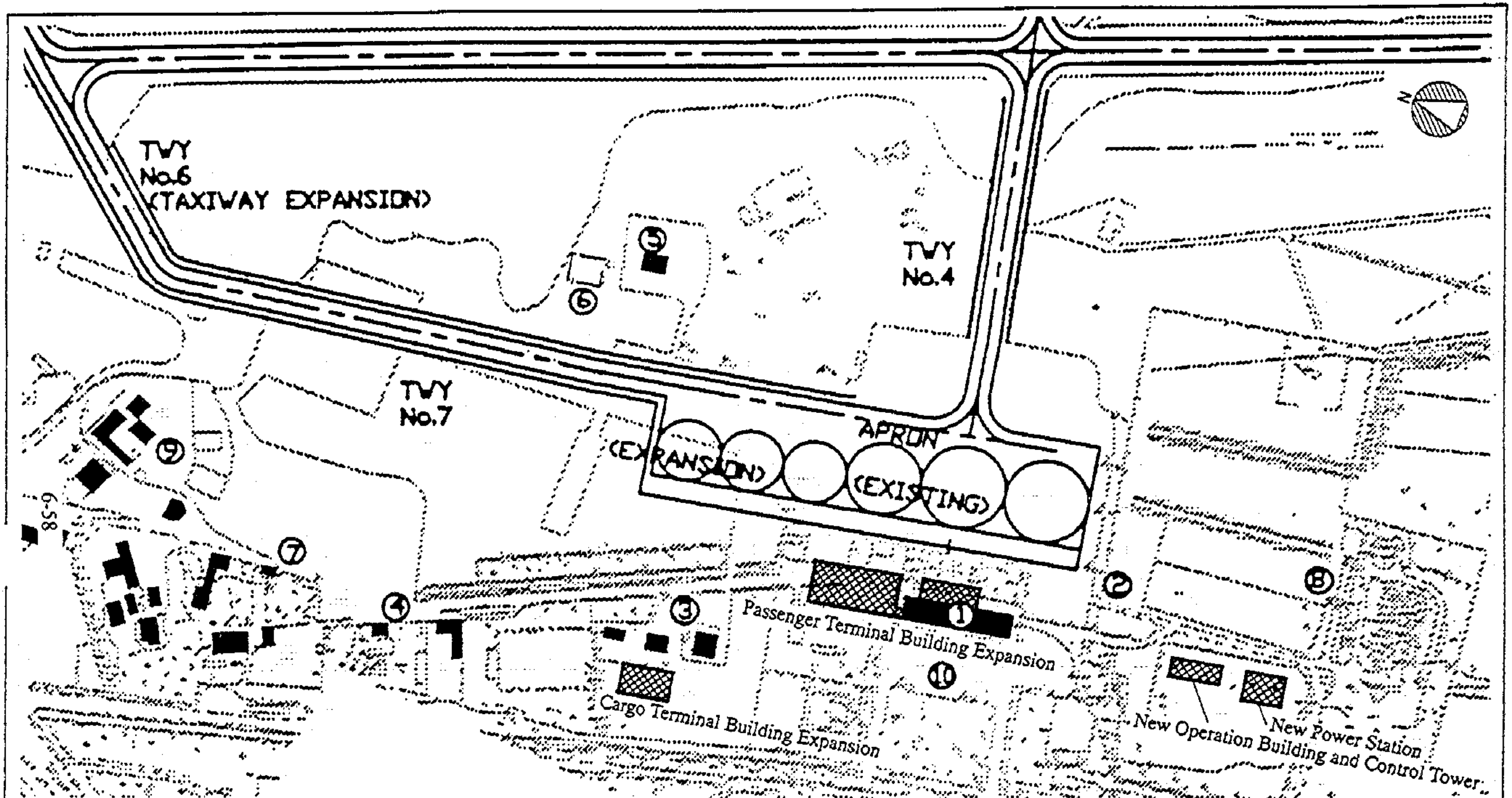


Fig. 6.2.29 (2) Passenger Terminal Building Floor Plan (1st Floor)

Nukus Airport Passenger Terminal Building 2-nd Floor Plan



TERMINAL AREA			
1	Passenger Terminal Building	8	Fuel Tank Farm
2	VIP Building	9	Aircraft Maintenance
3	Cargo Storage	10	Car Park
4	Administration Building		
5	Control Tower		
6	Fire Station		
7	Garage,Storage		

Fig.6.2.30 Terminal Area Layout Plan

Nukus Airport Terminal Area Layout Plan (S=1/5,000)

6.2.6 Nationwide Air Navigation System

(1) Development Plan

Air routes in Uzbekistan are mainly comprised of four (4) sets of VOR/DME, and twenty (20) sets of NDB, which were installed on and off the airports. Present air routes are concentrated at the areas of Tashkent, Samarkand and on the borders.

Given the worldwide en-route navaids, NDB is known to have certain problems in terms of radio wave interference, so that VOR/DME is commonly used as an en-route navaid in order to improve accuracy of air navigation on the air routes, with the following advantages;

- Avoiding mutual radio wave interference between NDB;
- Installing VOR/DME as basic facility enabling Regional Area Navigation System (RNAV);
- Ensuring the alternative function of FANS routes.

Considering the above, it is recommendable that the en-route navaid should be replaced by VOR/DME from the present NBD facilities.

Eight (8) sets of NDB are planned to be replaced by VOR/DME in the first phase up to 2005, taking into account aging of the existing facilities, as shown in **Table 6.2.14**. Location of en-route navaids and proposed air route network of 2005 is shown in **Fig. 6.2.31**.

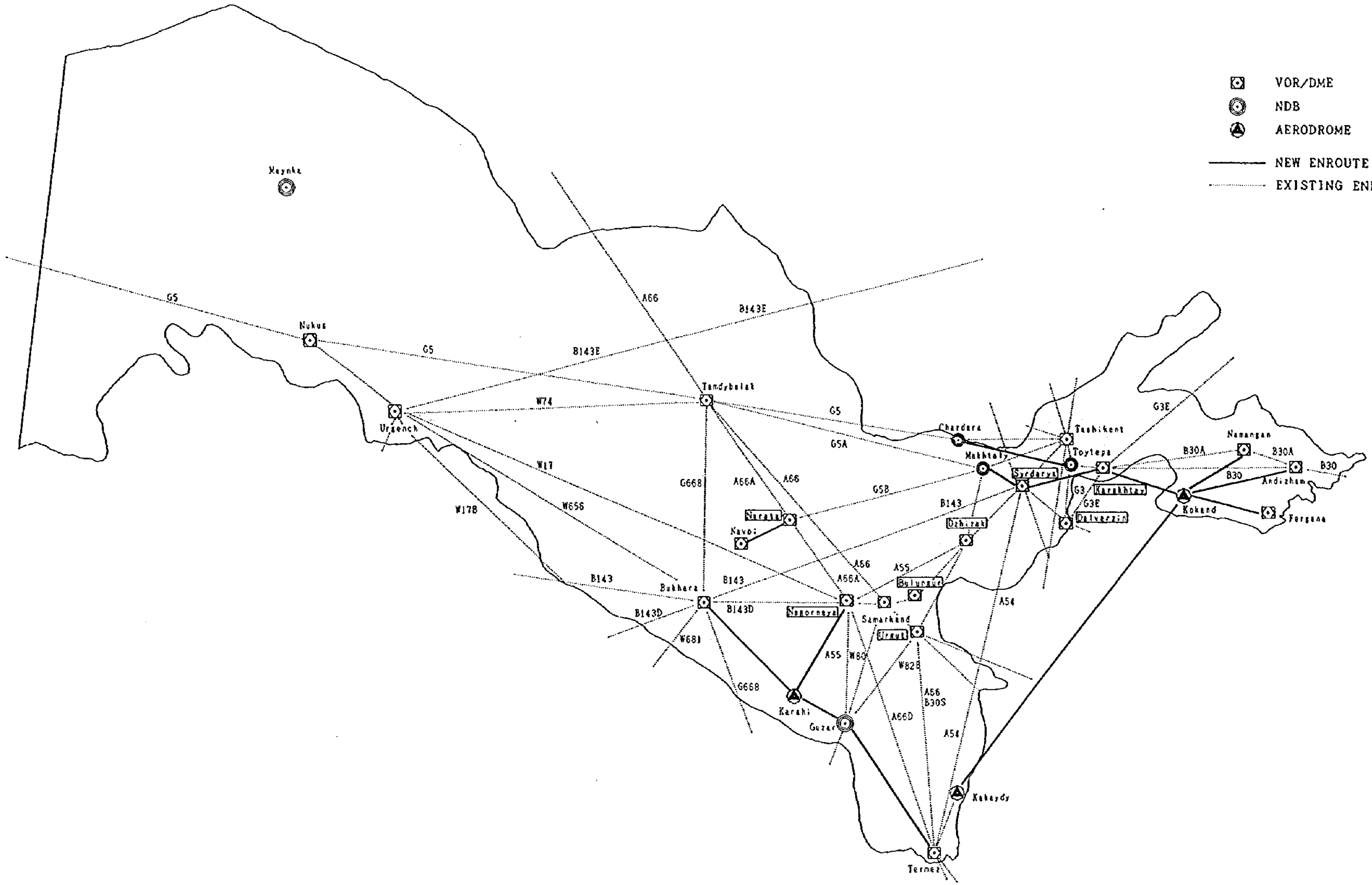
Table 6.2.14 Nationwide Air Navigation System

Point	Year of Installation of NDB
Karakhtay	1989
Dzhizak	1986
Dalverzin	1986
Syrdarya	1990
Nurata	1979
Bulungur	1988
Nagornaya	1982
Urgut	1989

(2) Facility Plan

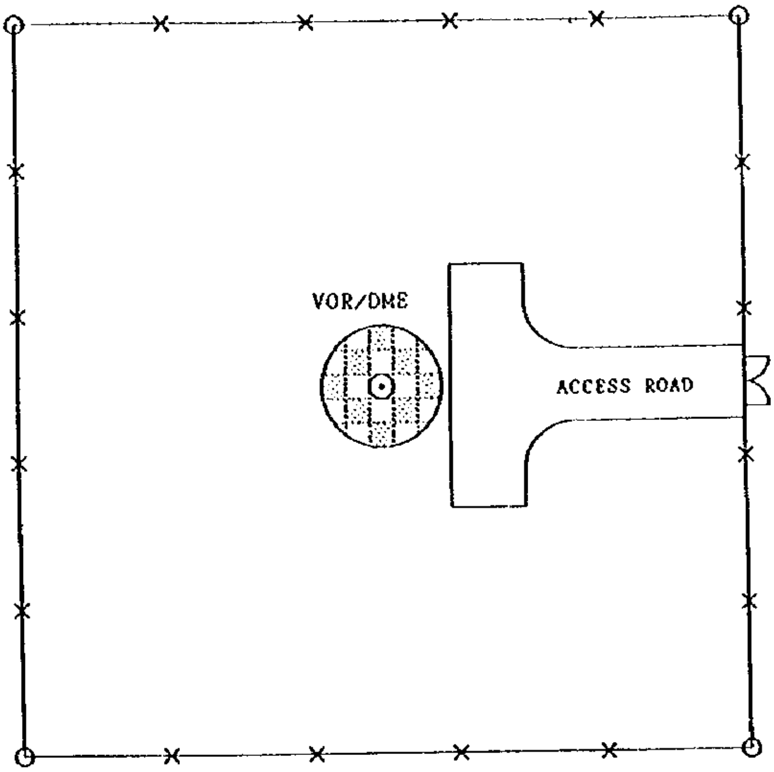
Basic specification of VOR/DME required is shown below, and typical facility plan of VOR/DME is shown in **Fig. 6.2.30**.

- Required land area: 900 m^2 (30 m x 30 m)
- Coverage: 200 N.M.
- Required electric power: 10 kVA



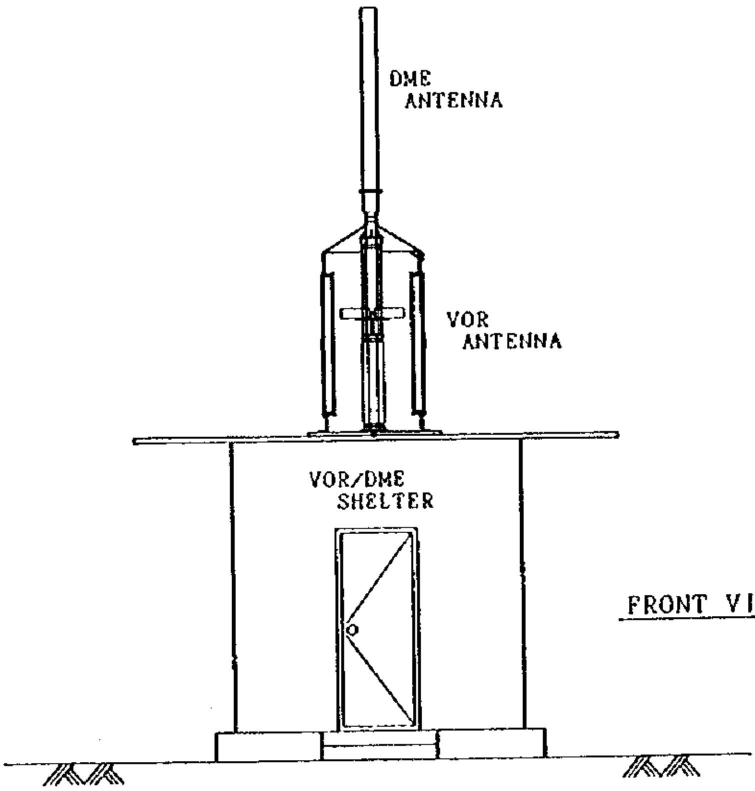
UZBEKISTAN ENROUTE CHART(2005)

Fig.6.2.31 Nationwide Air Navigation Development Plan



LAYOUT PLAN

0 5 10m



FRONT VIEW

VOR/DME FACILITY

Fig.6.2.32 Facility Plan

0 1 2 3m

6.3 Construction Planning

6.3.1 Construction Conditions

(1) Temperature and Rainfall

Uzbekistan belongs to a continental climate, having a long dry and hot summer, with temperatures averaging 32 °C in July, and often rising above 40 °C. Winter lasts for about 1.5-2 months in the south of Uzbekistan, and for about 5 months in the far north of the country. The average temperature in January is below -10 °C in the north area.

There is a small amount of precipitation in the whole area of Uzbekistan. Annual precipitation in the east area is between 200-300 mm, and below 100 mm in the west area.

Normally, it is not recommendable to carry out pavement work during winter season from November to April due to the low temperature.

Possible work seasons at outdoor are limited so that a precise program getting construction materials, manpower, construction equipment and machinery is very important for smooth execution of work.

(2) Construction Market

At present, there are no private construction companies in Uzbekistan. Construction works in Uzbekistan are usually carried out by the state companies. Recently, several foreign companies participate in construction works in Tashkent and other major cites. It is difficult to obtain reasonable price data of construction work and materials due to the lack of market system in construction filed.

Asphalt and concrete plants in Tashkent and other cities are owed by subsidiaries of state companies. Maintenance condition of the plants is generally not in good conditions.

It will be needed to procure major construction equipment and plants into the project sites from outside of Uzbekistan.

(3) Construction Materials

a) Cement

Combined production volume of cement form several mills in Uzbekistan is about 6 million tons per year. The supply of cement from local mills is considered adequate for these projects.

b) Asphalt

Asphalt is produced in Uzbekistan, but its quality is not reliable. Asphalt for use of airport pavement has to be imported from CIS or some other countries.

c) Steel Materials

Hardly any steel is produced in Uzbekistan. Accordingly, steel materials must be imported from CIS or some other countries.

d) Sand, Gravel and Crushed Stone

Sand, gravel and crushed stone are available in sufficient quantities from various places in Uzbekistan. Those materials are normally transported to construction plant by railway.

6.3.2 Construction Plan

Construction work at the existing airports that will remain operational should be executed, completed without causing interruption, inconvenience or danger to the airport operation throughout the period of construction. Therefore, special attention should be given for securing safety of aircraft operation.

Construction schedule for implementation of the project is planned based on the following manner.

(1) Tashkent Airport

a) Airfield Facilities

The required quantities of major works for the project are as follows;

Removal of Existing Pavement:	80,400 m^3 (80,400 m^2 x 1.0 m)
	Required Period 80,400 m^3 /(50 m^3/hr x 8hr/day x 150 days/year) = 1.3 years
Cement Concrete Volume:	28,140 m^3 (80,400 m^3 x 35 cm)
Cement Concrete:	1 set x 1.5 m^3 - class batcher plant 2 sets x 3.0 - 7.5 m-class concrete finisher 2 sets x 3.0 - 7.5 m-class concrete spreader 2 sets x 3.0 - 7.5 m-class concrete spreader
	Required period: 28,140 m^3 / (50 m^3/hr x 0.5 x 7 hr/day) x 150 days/year) = 1.1 year

b) Terminal Area and Other Facilities

New Passenger building	5,480 m^2
Renewal of Passenger Building:	2,920 m^2
New Cargo building	3,700 m^2
Renewal of Cargo building	4,300 m^2

Required period: estimated at 3 years

Construction schedules, including period required for arranging financial budgets and design works, are planed as shown in **Table 6.3.1**.

Table 6.3.1 Implementation Schedule of Tashkent Airport Development

Items	1 1999	2 2000	3 2001	4 2002	5 2003	6 2004	7 2005
Financial Arrangement	—						
Design Works		—	—				
Tender Procedure			—	—			
Construction Works							
- Airfield Facilities				—	—	—	—
- Terminal Facilities				—	—	—	—
- Air Nav. Facilities							—
- Other Facilities					—	—	—

(2) New Tashkent Airport

a) Airfield Facilities

• Earthwork

Prior to earthwork, soft soil in the construction site must be removed and trees are felled and uprooted. Excavation work is done by 21-ton class bulldozer, loaded by 0.6 m^3-class power shovel, and hauled to embankment area by 11-ton class dump track. Rolling and compaction is done by 8-20-ton class tire roller. A temporary road at least 13 m wide with two lanes on either side should be provided for handing of earth soil. Working hours for earthwork is planned on a 10-hour/day basis.

The required quantities of major earthwork for the project are as follows;

Excavation	8,800,000 m^3
Embankment	7,500,000 m^3
Subbase	1,200,000 m^3

Excavation Works: 15 sets x 21-ton class bulldozer
Required period:
8,800,000 m^3 / (840 m^3/hr x 10 hr/day x 300 days/year)
= 3.5 years

Embankment Works: 84 sets x 11-ton class dump truck
20 sets x 0.6 m^3-class power shovel
6 sets x 8-20-ton class tire roller

Required period:
7,500,000 m^3/ (750 m^3/hr x 10 hr/day x 300 days/year)
= 3.4 years

• Pavement Work

Pavement work is planned for execution except during winter season. Working hours for pavement is planned on a 10-hour/day basis.

Subbase Works: 5 sets x 3.7 m-class motorized grader
9 sets x 8-20 ton class tire roller
5sets x 10-12 ton class macadam roller

	Required period: 1,200,000 m^3 /(270 m^3 /hr x 10 hr/day x 300 days /year) = 1.5 years
Bituminous Concrete:	400,000 ton
Bituminous Concrete Works:	2 sets x 100-ton class asphalt plan 2 sets x 3.0-8.5 m-class asphalt finisher 2 sets x 10-12 ton-class macadam roller 4 sets x 8-20-ton class tire roller
	Required period: 400,000 ton/ (2 x 100 ton/hr x 0.8 x 10 hr/day x 150 days/year) = 1.7 years
Cement Concrete (pavement):	1 set x 1.5 m^3-class batches plan 2 sets x 3.0-7.5 m-class concrete finisher 2 sets x 3.0-7.5 m-class concrete spreader 2 sets x 3.0-7.5 m-class inner vibrator
	Required period: 180,000 m^3/ (90 m^3/hr x 0.8 x 10 hr/day x 150 days/year) = 1.7 years
Access road:	2,000 m
b) Terminal Area Facility	
New Passenger Building:	27,300 m^2
New Cargo Building:	8,690 m^2
Control Tower and Administration Building:	5,700 m^2
Other Building:	23,900 m^2
	Required period: 3.5 years

Construction schedule including period required for arranging financial budget and design work is planed as shown in **Table 6.3.2**.

Table 6.3.2 Implementation Schedule of New Tashkent Airport Development

Items	1 2000	2 2001	3 2002	4 2003	5 2004	6 2005	7 2006	8 2007	9 2008	10 2009
Financial Arrangement	━━									
Design Works		━━	━━							
Tender Procedure				━━						
Construction Works										
- Airfield Facilities					━━	━━	━━	━━		
- Terminal Facilities								━━	━━	━━
- Air Nav. Facilities									━━	━━
- Utilities								━━	━━	━━

(3) Namangan Airport

a) Airfield Facilities

The required quantities of major items of the project are as follows;

Excavation:	200,000 m^3
Embankment	200,000 m^3
Subbase	65,000 m^3
Bituminous Concrete	120,000 ton

Earthwork and pavement work shall be executed during nighttime are planned on a 7 hours/day basis.

Excavation: 4 sets x 21-ton class bulldozer

Required period:
200,000 m^3 / (220 m^3/hr x 7 hr/day x 25 days/month)
= 5 months

Embankment: 15 sets x 11-ton class dump track
7 sets x 0.6 m^3-class power shovel
2 sets x 21-ton class bulldozer
2 sets x 8-20-ton class tire roller

Required period:
200,000 m^3/(220 m^3/hr x 7 hr/day x 25 days/month)
= 5 months

Subgrade: 1 set x 3.7 m-class motorized grader
1 set x 8-20 ton-class tire roller
1 set x 10-12 ton-class macadam roller

Required period:
65,000 m^3/(6.0 m^3/hr x 7hr/day x 25 days/month)
= 6 months

Bituminous concrete: 1 set x 100-ton class asphalt plant
1 set x 3.0-8.5 m-class asphalt finisher
1 set x 10-12 ton-class macadam roller
2 sets x 8-20 ton-class tire roller

Required period:
120,000 ton/(100-ton/hr x 0.6 x 5 hr/day x 150 days/year)
= 2.7 years

b) Terminal Area Facilities

New Passenger Terminal Building:	6,700 m^2
Renewal of Passenger Terminal Building:	4,220 m^2
New Cargo Terminal Building:	3,050 m^2
Tower and Admin. Building:	2,800 m^2
Fire Station:	150 m^2
Main Power Station:	1,200 m^2

Required Period: 3 years

Construction schedule, including period required for arranging financial budget and design work, is planed as shown in **Table 6.3.3**.

Table 6.3.3 Implementation Schedule of Namangan Airport Development

Items	1 1999	2 2000	3 2001	4 2002	5 2003	6 2004	7 2005
Financial Arrangement	━						
Design Works		━	━				
Tender Procedure			━	━			
Construction Works							
- Airfield Facilities				━	━	━	
- Terminal Facilities					━	━	━
- Air Nav. Facilities							━
- Utilities							━

(4) Termez Airport

a) Airfield Facilities

The required quantities of major items of the project are as follows;

Subbase (widening portion) 65,000 m^3

Bituminous concrete 110,000 ton

Earthwork and pavement work shall be executed during nighttime and planned on a 7-hours/day basis.

Bituminous concrete:
1set x 100-ton class asphalt plant
1 set x 3.0-8.5 m-class asphalt finisher
1 set x 10-12 ton-class macadam roller
2 set x 8-20 ton-class fire roller

Required period:
110,000 ton /(100ton/hr x 0.6 x 5hr/day x 150 days/year) = 2.4 years

b) Terminal Area Facilities

New Passenger Terminal Building: 4,520 m^2

Renewal of Passenger Terminal Building: 2,200 m^2

New Cargo Building: 1,670 m^2

Tower & Admini. Building: 2,800 m^2

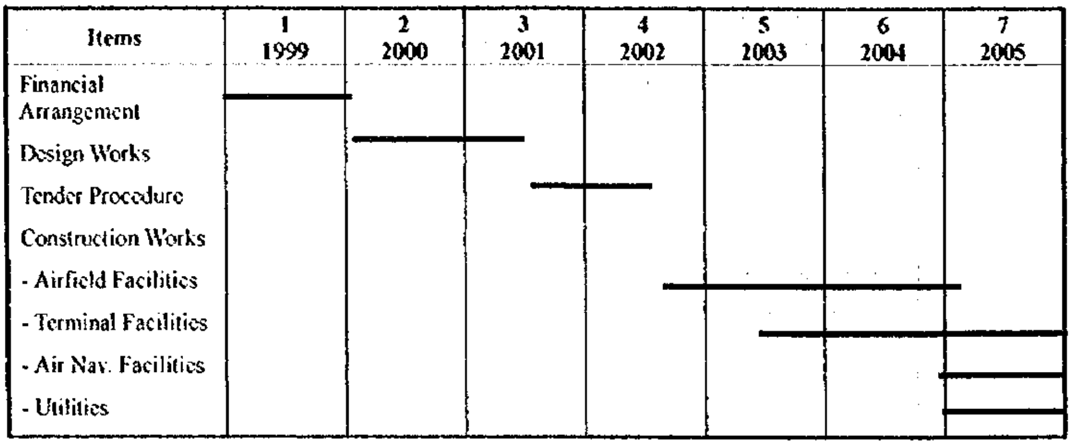
Fire Station: 24 m^2

Main Power Station: 1,200 m^2

Required period: 3 years

Construction schedule, including period required for arranging financial budget and design work, is planed as shown in **Table 6.3.4**.

Table 6.3.4 Implementation Schedule of Termez Airport Development



(5) Nukus Airport

a) Airfield Facilities

The required quantities of major items of the project are as follows;

Subbase (widening portion) 32,000 m^3

Bituminous concrete 110,000 ton

Earthwork and pavement work shall be executed during nighttime and planned on a 7-hours/day basis.

Bituminous Concrete: 1 set x 100-ton class asphalt plant
1 set x 3.0-8.5 m-class asphalt finisher
1 set x 10-12 ton-class macadam roller
2 sets x 8-20 ton-class fire roller

Required period:
110,000 ton /(100ton/hr x 0.6 x 5hr/day x 150 days/year)
= 2.4 years

b) Terminal Building Facilities

New Passenger Terminal Building: 8,720 m^2

Renewal of Passenger Terminal Building: 2,200 m^2

New Cargo Building: 1,570 m^2

Renewal of Cargo Building: 550 m2

Tower & Admini. Building: 2,800 m^2

Fire Station: 155 m^2

Main Power Station: 1,200 m^2

Required period: 3 years

Construction schedule, including period required for arranging financial budget and design work, is planed as shown in **Table 6.3.5**.

Table 6.3.5 Implementation Schedule of Nukus Airport Development

Items	1 1999	2 2000	3 2001	4 2002	5 2003	6 2004	7 2005
Financial Arrangement							
Design Works							
Tender Procedure							
Construction Works							
- Airfield Facilities							
- Terminal Facilities							
- Air Nav. Facilities							
- Utilities							

(6) Nationwide Air Navigation System

Implementation schedule for Nationwide Air Navigation System Development is planed as shown in **Table 6.3.6**.

Number of VOR/DME: 8 sets

Manufacturing: 1.5 years

Installation: 2.7 years (3 sets/year)

Table 6.3.6 Implementation Schedule of Nationwide Air Navigation System Development

Items	1 1999	2 2000	3 2001	4 2002	5 2003	6 2004	7 2005
Financial Arrangement							
Design Works							
Tender Procedure							
Manufacturing							
Installation							

6.4 Land Use Plan

6.4.1 General

Development of an airport widely influences the surrounding area directly or indirectly.

Negative aspects of the influence are:

- aircraft noise pollution in neighboring residential area,
- occupation of land area by the airport itself,
- wide range of height restriction around an airport necessary to secure safe aircraft operation.

In order to minimize such negative impacts, a proper land use plan needs to be prepared from a long-term viewpoint on the basis of close coordination with the authorities concerned.

In this pre-feasibility study, guideline land use plans for the High Priority Airports have been presented based on the forecast aircraft noise contours around airports as well as obstacle restriction requirements to be established surrounding the airports.

6.4.2 Obstacle Limitation Surfaces

Obstacle limitation surfaces that need to be established for safe aircraft takeoff/landing have to be taken into account when preparing land use plans for the neighboring area of the airport. In this pre-feasibility study, the obstacle limitation requirements specified in ICAO Annex 14 as the international standards and recommended practices have been employed.

Table 6.4.1 shows obstacle limitation surfaces to be established for each High Priority Airport, and **Table 6.4.2** summarizes dimensions and slope of obstacle limitation surfaces specified in Annex 14.

Table 6.4.1 Obstacle Limitation Surfaces for Each Airport

Airport	Runway	Surfaces
Tashkent	Precision approach CAT II (08L/08R/26R)	Conical, inner horizontal, approach, Transitional, inner approach, Inner transitional, balked landing Take-off climb
New Tashkent	Precision approach CAT II (06/24)	Conical, inner horizontal, approach, Transitional, inner approach, Inner transitional, balked landing Take-off climb
Namangan	Precision approach CAT I (28)	Conical, inner horizontal, approach, Transitional Take-off climb
Termez	Precision approach CAT I (25)	Conical, inner horizontal, approach, Transitional Take-off climb
Nukus	Precision approach CAT I (18)	Conical ,inner horizontal ,approach, Transitional Take-off climb

Table 6.4.2 Dimensions and Slopes of Obstacle Limitation Surface

Surface	Dimensions and Slopes
Conical	Slope 5% Height 100m
Inner Horizontal	Height 45m Radius 4000m
Approach	Length of inner edge 300m Distance from threshold 60m Divergence (each side) 15%
1st section	Length 3000m slope 2%
2nd section	Length 3600m(variable) slope 2.5%
Horizontal Section	Length 8400m(variable)
Transitional	Slope 14.3%(1/7)
Inner Approach	Width 120m Distance from threshold 60m Length 900m Slope 2%
Inner Transitional	Slope 33.3%(1/3)
Balked Landing	Length of inner edge 120m Distance from threshold 1800m Divergence (each side) 10% Slope 3.33%(1/3)
Take-off Climb	Length of inner edge 180m Distance from runway end 60m Divergence(each side) 12.5% Final width 1200m Length 15000m Slope 2%

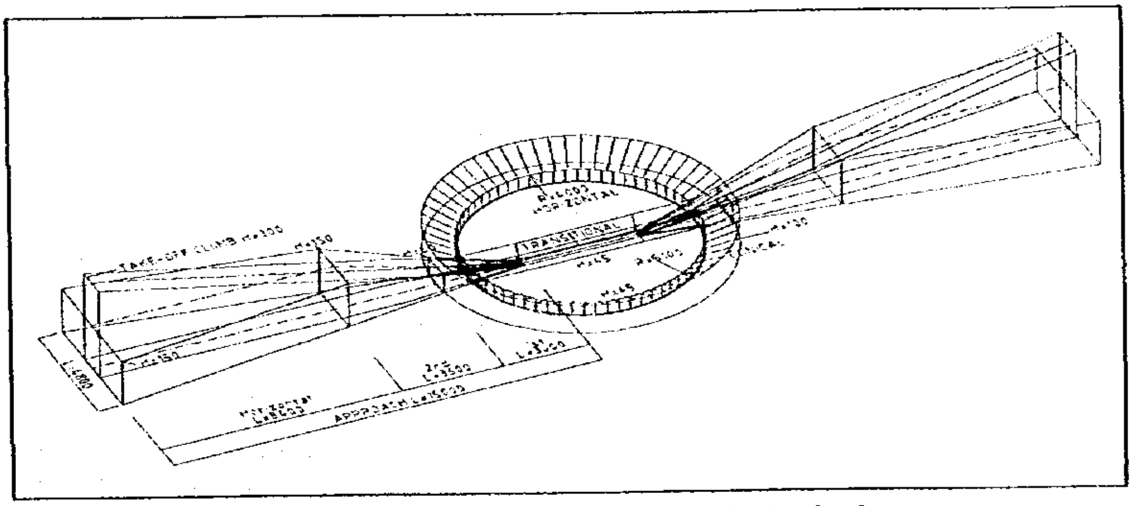


Fig 6.4.1 Principal Obstacle Limitation Surfaces

6.4.3 Aircraft Noise

There are many internationally accepted noise level indices, and the following are adopted in Uzbekistan:

- Equivalent Continuous A-weighted sound pressure level (LAeq dB),
- Maximum noise A-weighted sound pressure level (LAmax dB).

In this pre-feasibility study, a noise level of Weighted Equivalent Continuous Perceived Noise Level (WECPNL), the one is adopted in Japan, has been used in order to clarify the relationship between noise level and appropriate land use shown below:

Table 6.4.3 WECPNL and Land Use Criteria

WECPNL	Land Use to be Restricted	Appropriate Land Use	Mitigating Measures Employed in Japan
70~75	Housing	Commercial and Industrial activities, green belt	Sound-proofing
75~90	Housing, Commercial and Industrial activities	Green belt for production and recreation	Sound-proofing
90~	Housing, Commercial and Industrial activities	Green belt as buffer zone	Relocation

Aircraft noise contours of the year 2020 for the High Priority Airports have been prepared by Integrated Noise Model (INM) as shown in **Figs. 6.4.2** through **6.4.6** based on the forecasting conditions shown in the Appendix. For detail on the aircraft noise, see Section 6.7.

6.4.4 Land Use Plan

Land use plan for the High Priority Airports has been prepared as shown in **Figs. 6.4.7** through **6.4.11**, taking into account the height limitation and aircraft noise level.
Zoning of airport neighboring area has been made as follows:

- Zone A ; not less than WECPNL 90, or within 1 km from precision approach end of a runway under the approach surface where strict height limitation is imposed and higher risk of aircraft accident is expected, to be utilized as a buffer zone between airport and neighboring area, planted with trees for sound-proofing purposes,
- Zone B ; WECPNL 75 to 90 where housing and commercial activities should be restricted, and preferably utilized as a green belt or park,
- Zone C ; WECPNL 70 to 75 where public facilities such as hospitals and schools should not be permitted and housing should be restricted as far as practicable, preferably utilized so farm land for, parks, and commercial and industrial purposes. Existing houses seriously influenced by aircraft noise may require sound-proofing.

The New Tashkent Airport will require the second runway in the long-term, and it has been proposed that the expansion area for the second close-parallel runway, as well as the area within 1 km of the end of the future runway should be taken as zone A in preparing the land use plan.

6.4.5 Height Restriction Plan

To facilitate an easy understanding by the public and permit effective control by the authorities, it has been proposed that a heights restriction plans showing the permissible height of buildings and structures should be established, as shown in **Figs. 6.4.12** through **6.4.16**.

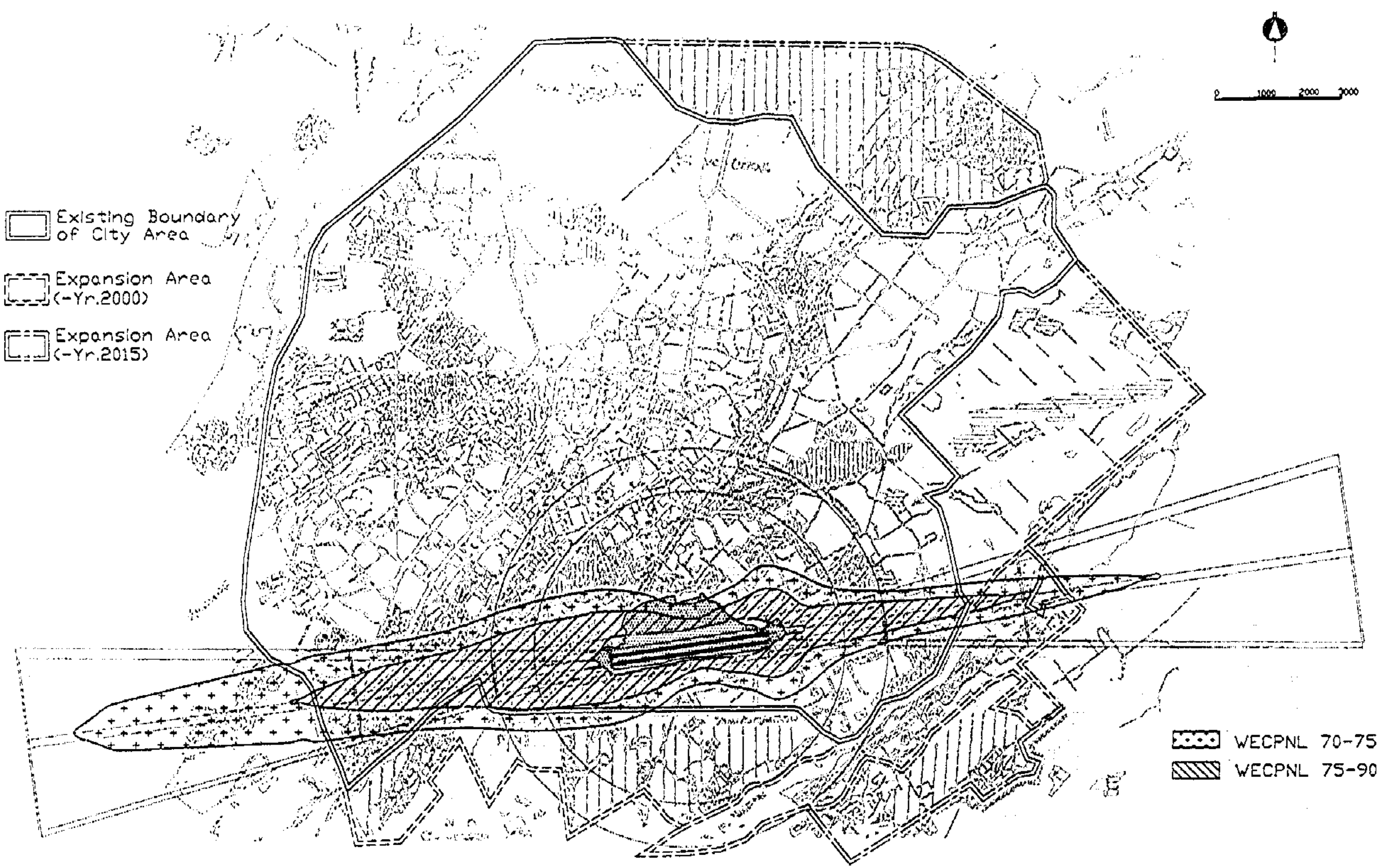
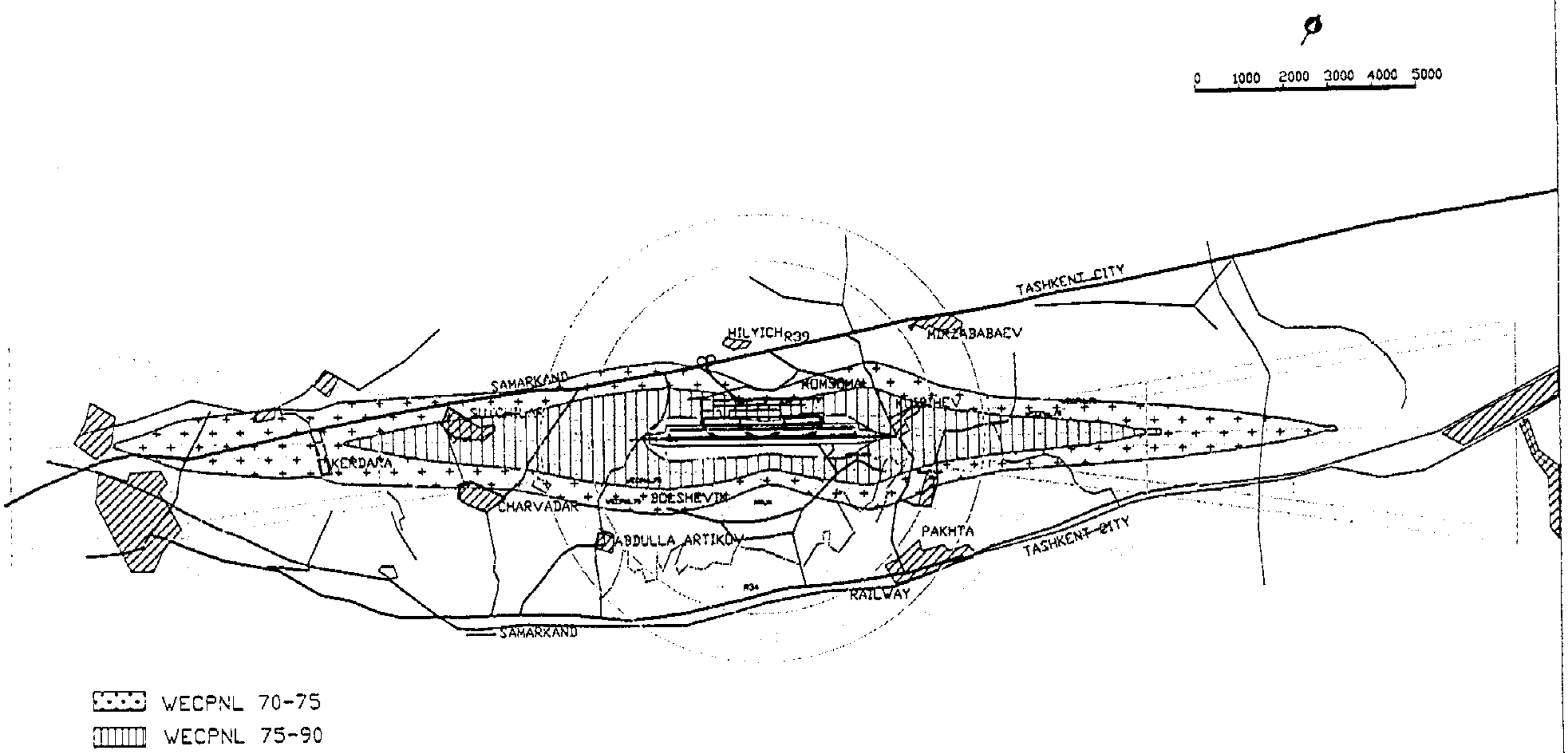


Fig. 6.4.2 Current Land Use and Impact Area of Aircraft Noise (Tashkent)



Item		Traffic Volume Year 2020				
		Mini plane	Small Jet	Med. Jet	Large Jet	TTL
Departure	Weekly	87	87	213	18	405
	Dayly	14	13	35	4	66
	Daytime	11.2	10.1	23	2.3	46.6
	Evening	2.3	2.2	5.4	0.8	10.7
	Night	0.6	0.8	6.9	0.9	9.2
Arrival	Weekly	87	87	213	18	405
	Dayly	14	13	35	4	66
	Daytime	10.2	9.1	19.7	2	41
	Evening	2.7	2.5	3.9	0.3	9.4
	Night	0.6	0.7	8.6	1.1	11

Dimensions of Obstacle Limitation Surface

Surface	Dimensions
Conical	Slope 5% Height 100m
Inner Horizontal	Height 45m Radius 4000m
Approach	Length of inner edge 300m
	Distance from threshold 60m
	Divergence (each side) 15%
1st section	Length 3000m slope 2%
2nd section	Length 3600m (variable) slope 2.5%
Horizontal Section	Length 8400m (variable)
Transitional	Slope 14.3% (1/7)

Fig. 6.4.3 Current Land Use and Impact Area of Aircraft Noise (New Tashkent)

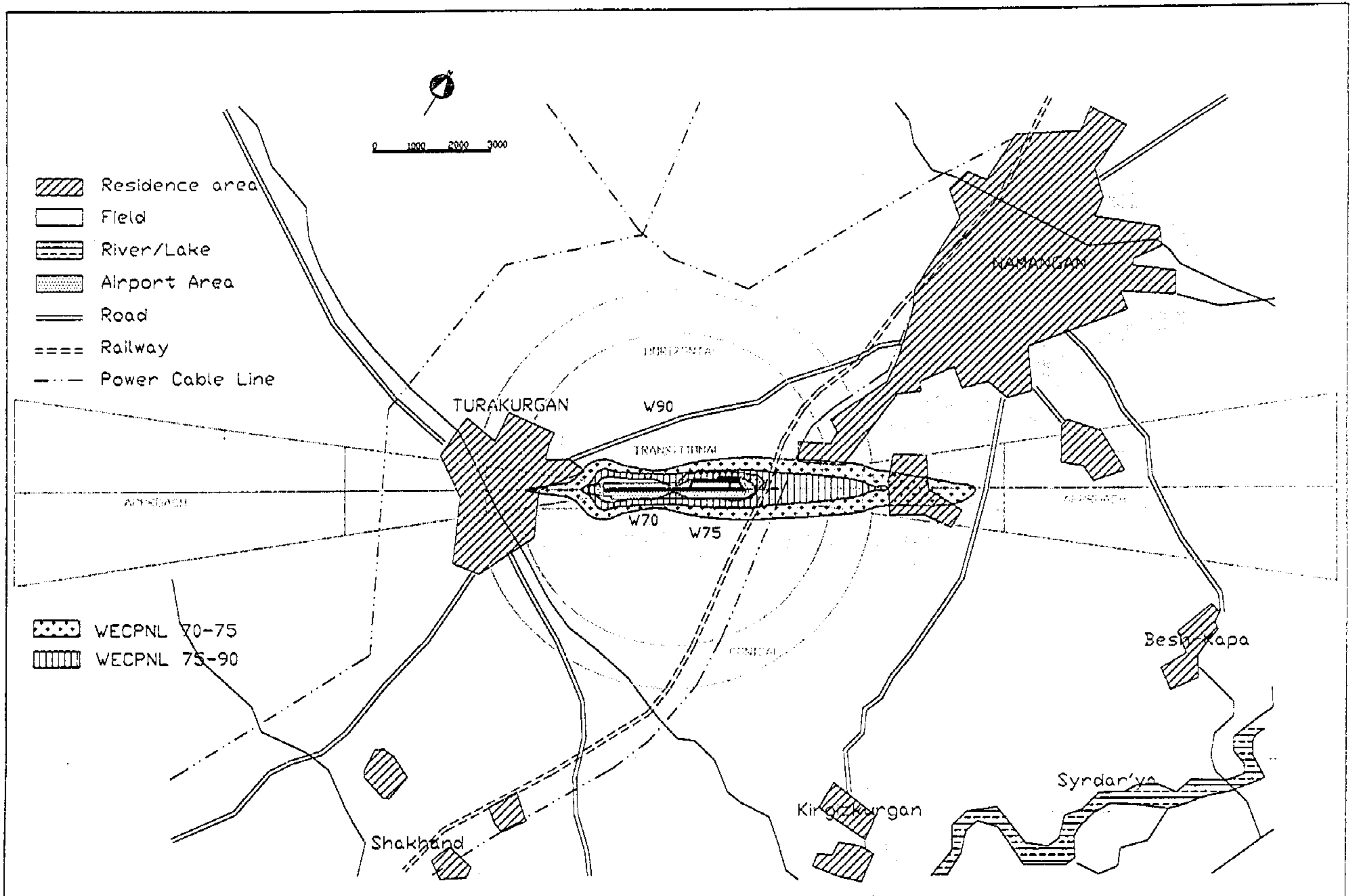


Fig. 6.4.4 Current Land Use and Impact Area of Aircraft Noise (Namangan)

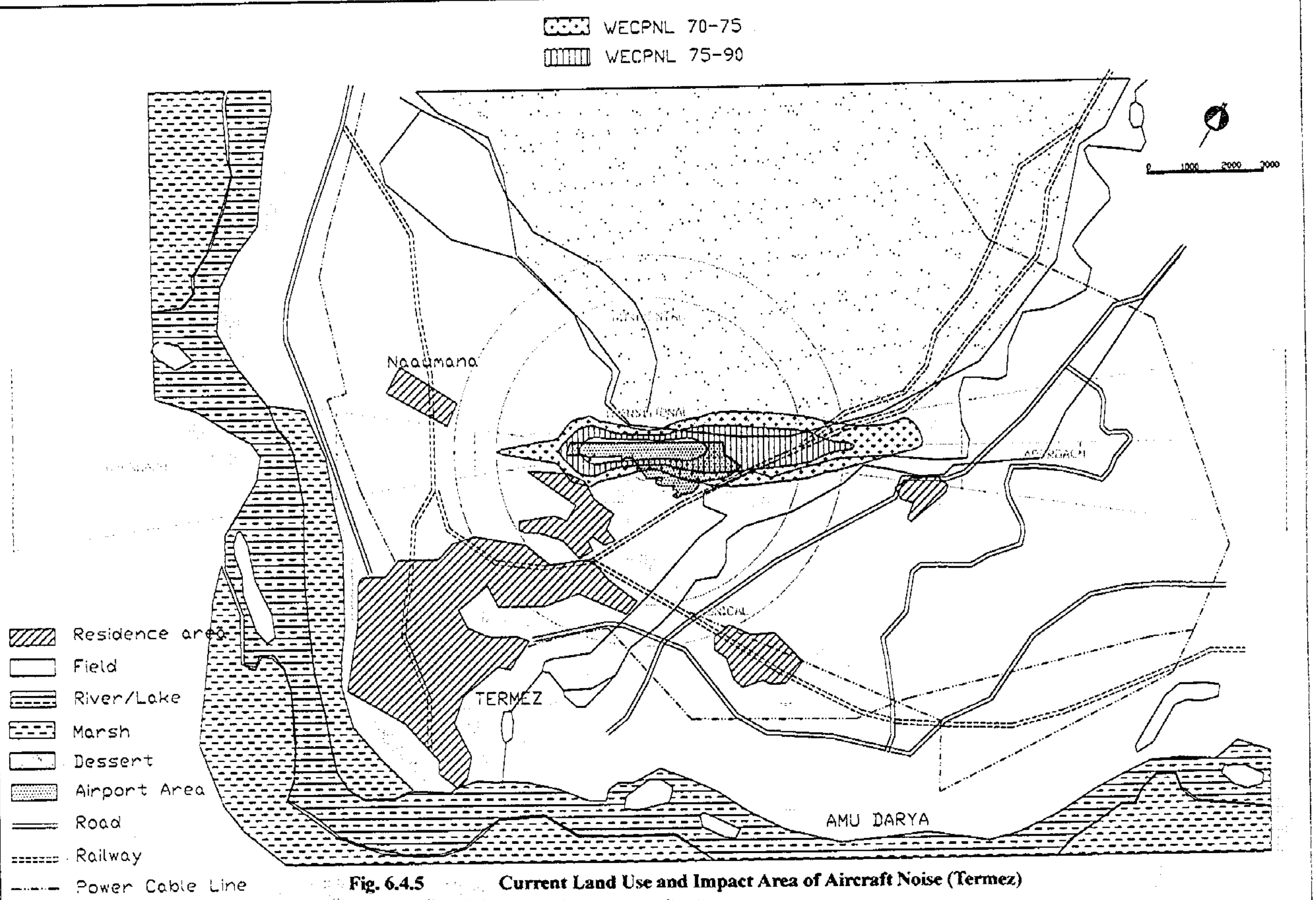


Fig. 6.4.5 Current Land Use and Impact Area of Aircraft Noise (Termez)

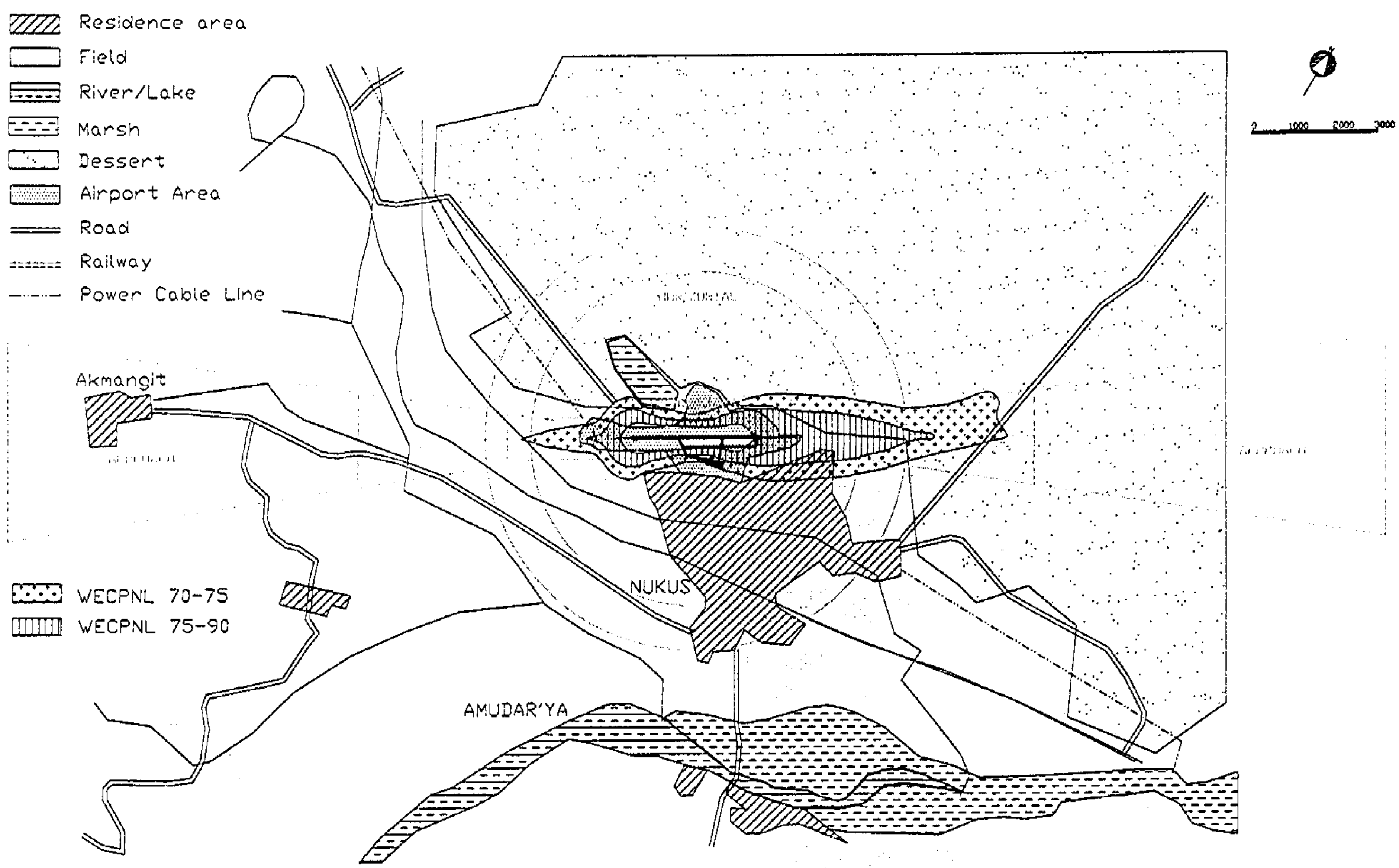


Fig. 6.4.6 Current Land Use and Impact Area of Aircraft Noise (Nukus)

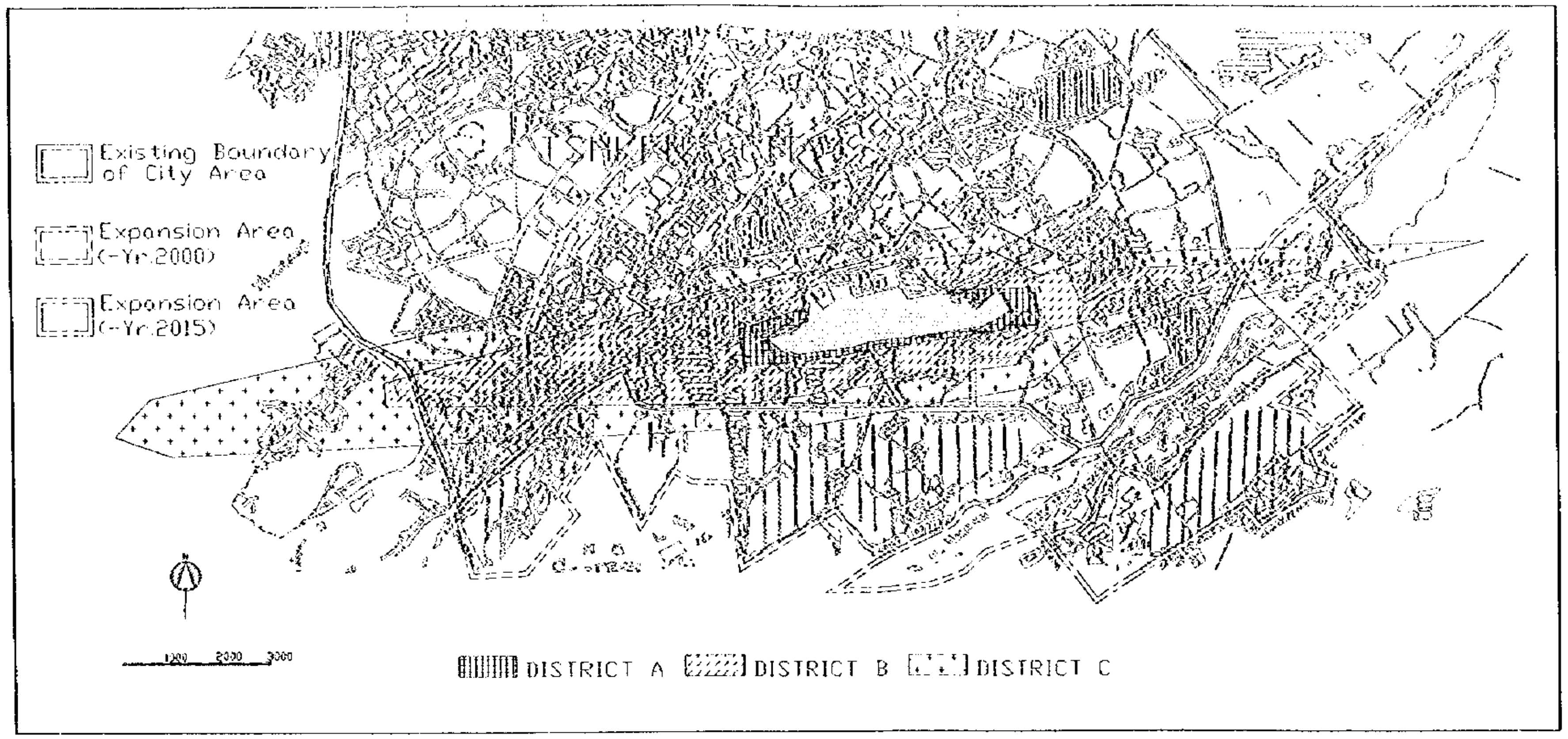


Fig. 6.4.7 Land Use Plan in the Vicinity of Tashkent Airport

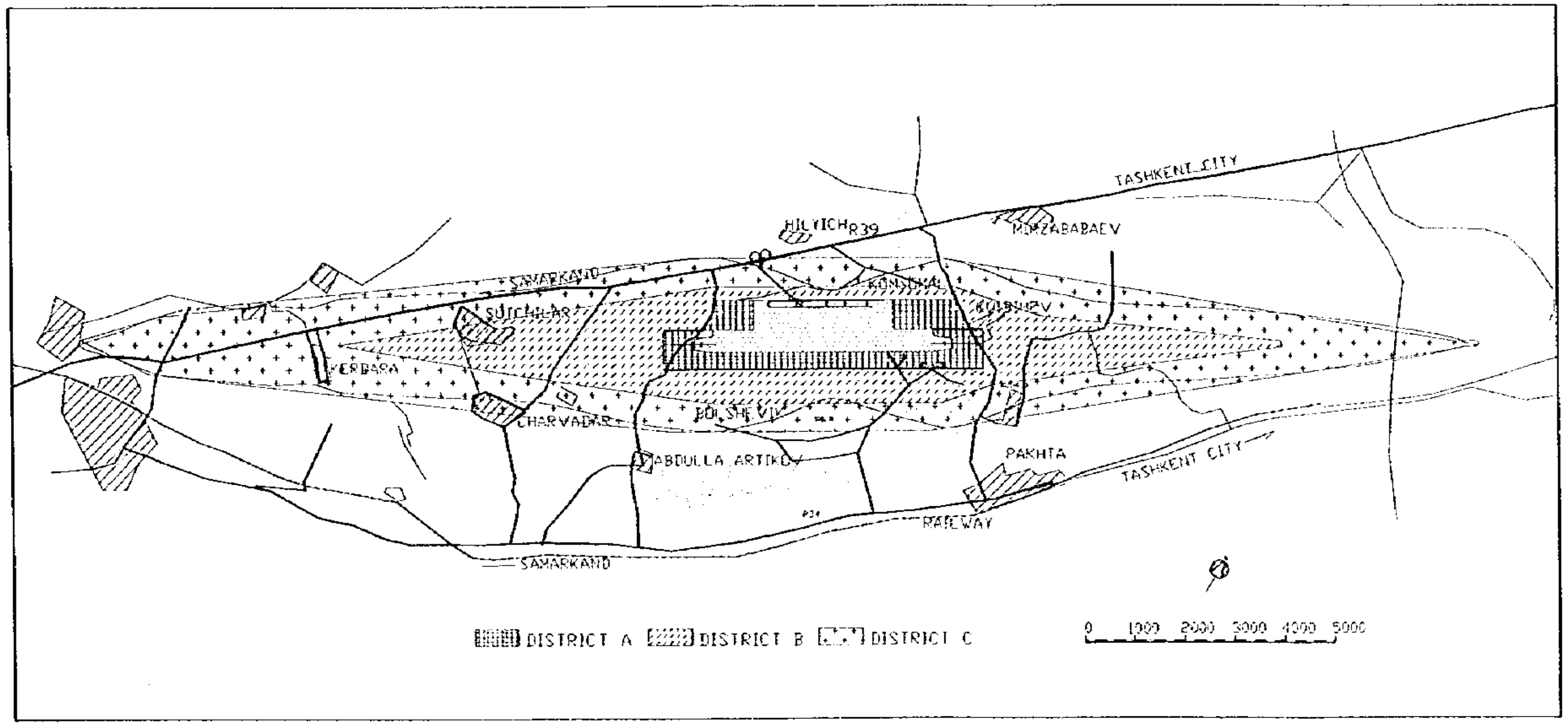


Fig. 6.4.8 Land Use Plan in the Vicinity of New Tashkent Airport

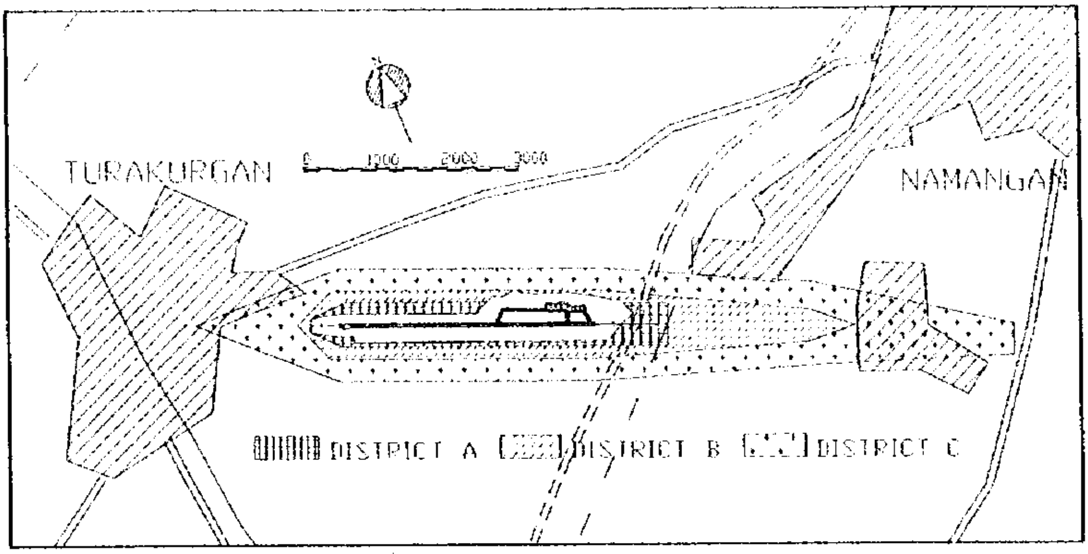


Fig. 6.4.9 Land Use Plan in the Vicinity of Namangan Airport

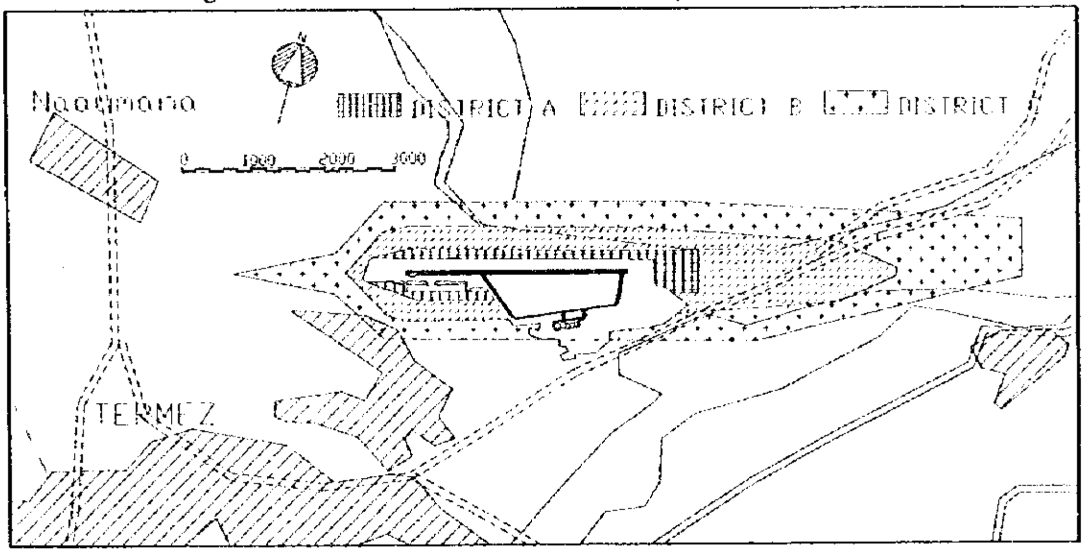


Fig. 6.4.10 Land Use Plan in the Vicinity of Termez Airport

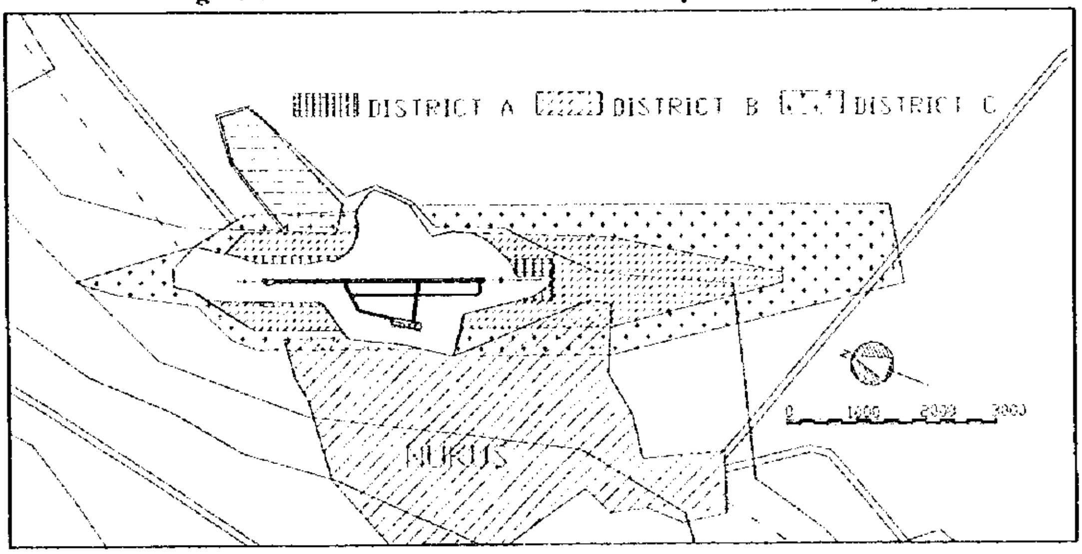


Fig. 6.4.11 Land Use Plan in the Vicinity of Nukus Airport

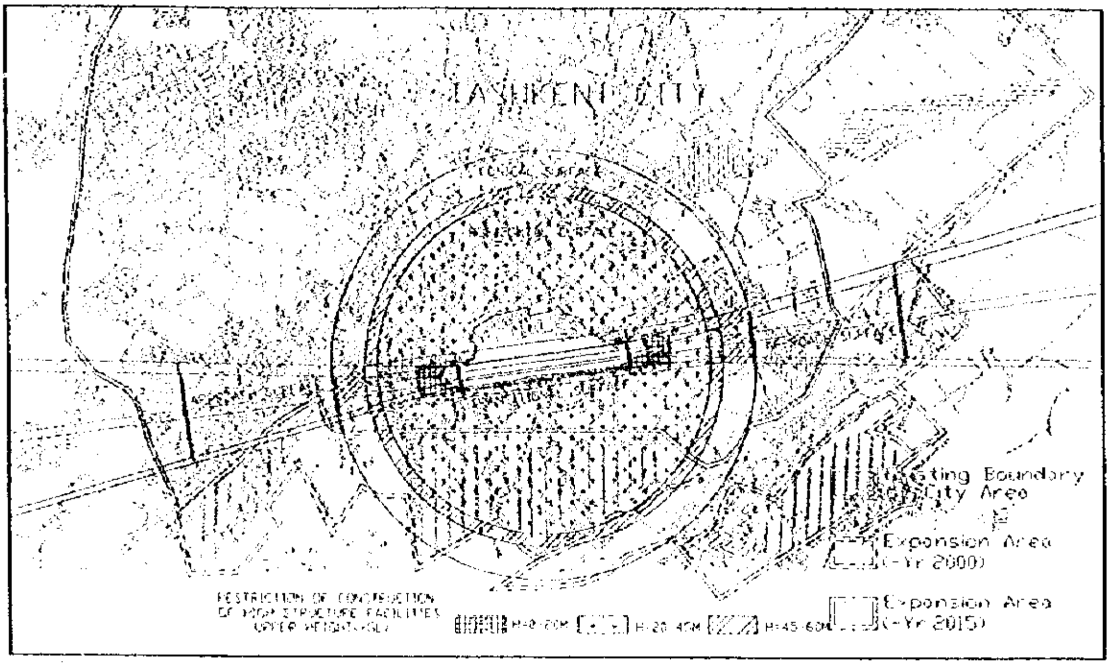


Fig. 6.4.12 Restriction Plan of Construction of High Structure Facilities (Existing Tashkent Airport)

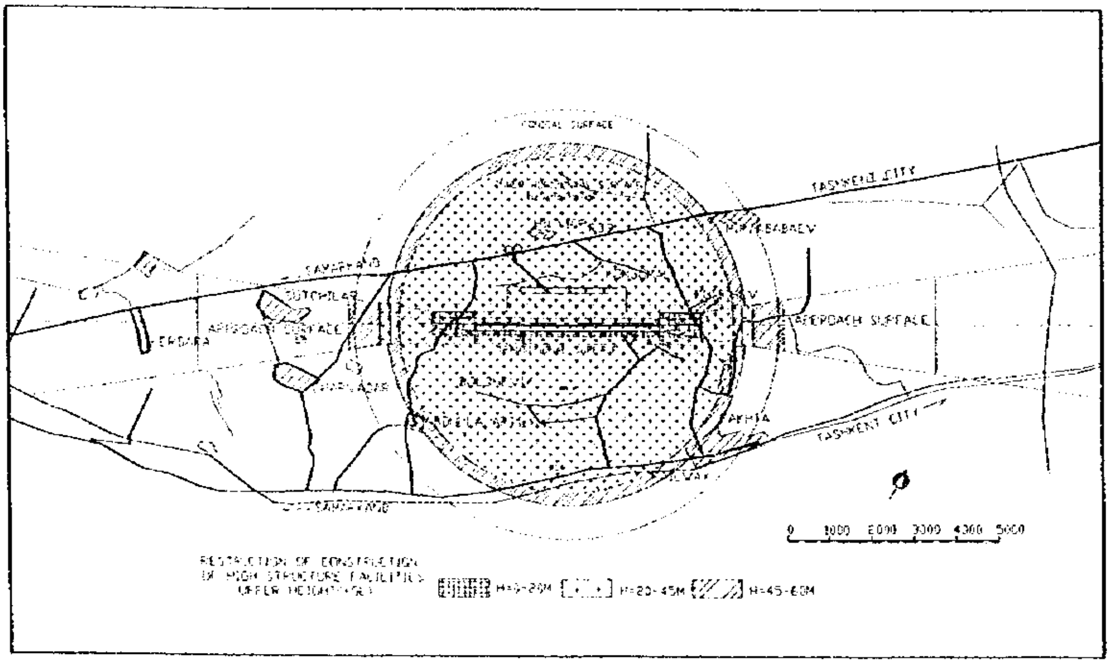


Fig. 6.4.13 Restriction Plan of Construction of High Structure Facilities (New Tashkent Airport)

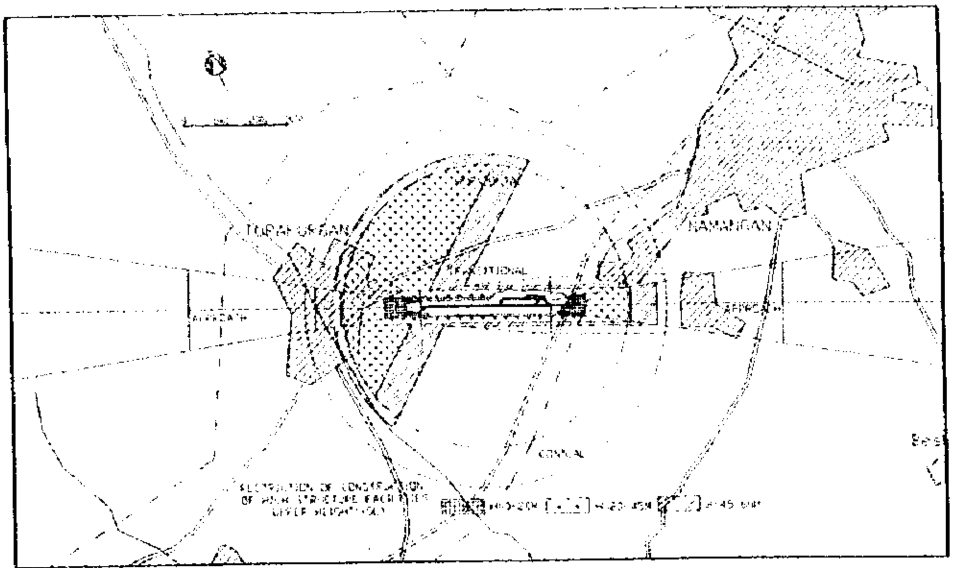


Fig. 6.4.14 Restriction Plan of Construction of High Structure Facilities (Namangan Airport)

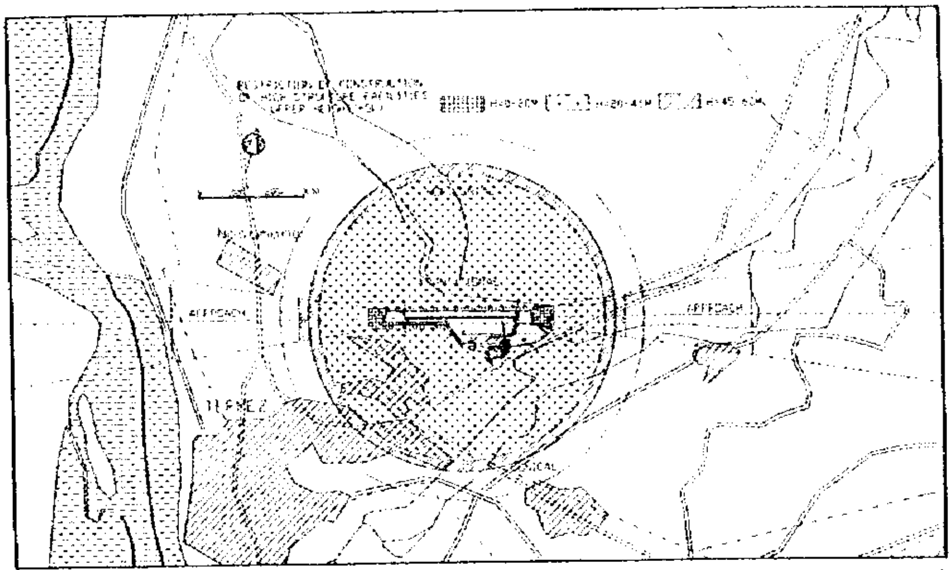


Fig. 6.4.15 Restriction Plan of Construction of High Structure Facilities (Termez Airport)

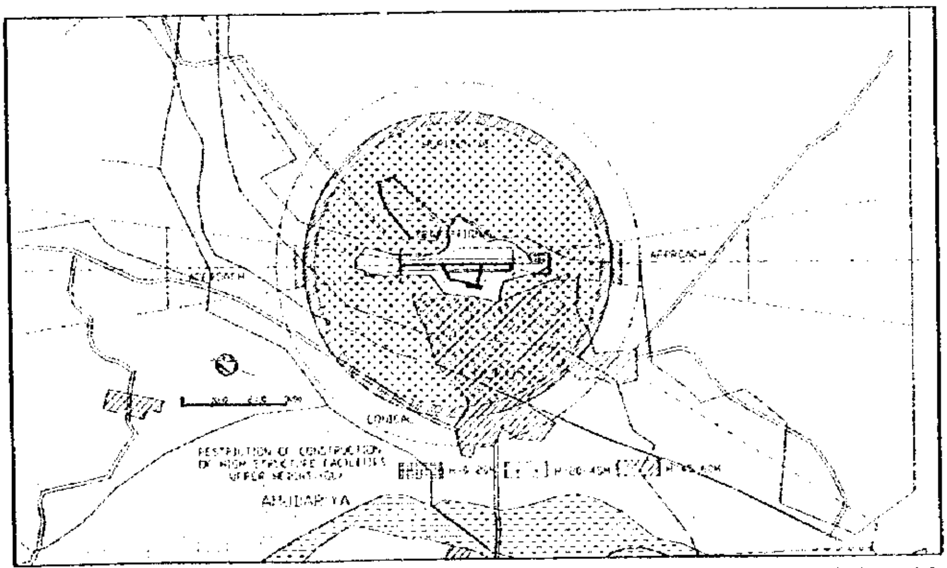


Fig. 6.4.16 Restriction Plan of Construction of High Structure Facilities (Nukus Airport)

6.5 Cost Estimates of Projects

6.5.1 Premise of Cost Estimates

Since Uzbekistan has not yet developed a market system in construction field, it is difficult to obtain information on prices of materials and construction works. Cost estimates of construction costs are, therefore, based on the Three Local Airports Modernization Project currently being implemented. Comparison of unit prices of major materials and works between similar projects in the CIS contraries and Three Local Airport Projects is shown in **Table 6.5.1**.

Table 6.5.1 Prices of Major Materials and Works

Price Items	Unit	Three Local Airport Project (US$)	Similar Project (US$)	Adopted Price (US$)
Cement	Ton	37		
Asphalt (Kazakhstan)	Ton	162		
Asphalt (Iranian)	Ton	250 – 300		
Steel bar	Ton	300		
Local Labour	Day	2		
Crusher run	m^3	9.3		
Sand	m^3	9.3		
Striping	m^2		2.0	2.0
Excavation	m^3	8.1	11.15	10.0
Embankment	m^3	6.9	4.4	5.0
Sodding	m^2		4.9	3.0
Granular subbase (t = 20 cm)	m^2	8.7 – 20.3		12.0
Bituminous surface (t = 4 cm)	m^2	9.7 – 19.1		12.0
Bituminous surface (t = 5 cm)	m^2	11.7 – 20.2		15.0
Asphalt mixture	m^3			300
Tack coat	m^2	0.30 – 0.40		0.5
Prime coat	m^2	0.60 – 0.70		0.6
Marking	m^2	7.1 – 15.0		12.0
Passenger terminal building	m^2	2,125	2,000	2,200
Cargo building	m^2		1,500	1,500
Tower	m^2	2,390	4,000	3,200
Fire station	m^2	1,380	1,500	1,400
Power station	m^2	1,380	1,500	1,400

The present cost estimate for the pre-feasibility study is based on the following premise:

a) Cost estimate is made by classifying into 7 main categories, namely, compensation works, airfield facilities, terminal area facilities, air navigation facilities, airport special equipment, utilities and project administration expenses;

b) Compensation works will include such works as detouring of electric power cable, roads and irrigation canals;

c) Airfield facilities will include earthworks, pavement, drainage and miscellaneous work, which are normally located at air side area;

d) Terminal area facilities will consist of new passenger and cargo terminal buildings, control tower with administration/operation building, fire station, power station, other buildings, car parks and public side roads, including normal mechanical and electrical works;

e) Air navigation facilities will include radio navigational aids, ATC system, airfield lighting system, and meteorological facilities.

f) Airport special equipment will include special equipment such as boarding bridge, baggage handling system, flight information display system, cold storage, fire fighting vehicle, and airport maintenance equipment.

g) Utilities will include access roads to airports, telephone system, power supply, water supply, sewage treatment facility, hot water supply system, fuel supply system, and airport staff housing.

h) Administration Expenses are the costs for the project implementation administration unit, and are assumed to be 1% of the construction costs.

i) Survey and Engineering is assumed at 15% of the Total of Works except case of New Tashkent Airport Development. That of New Tashkent Airport is assumed at 12% of the Total of Work.

j) Contingency is 10 % of sum of Total of Works and Survey and Engineering

k) Unit prices used in the cost estimate are based on the data collected by the study team in June and December 1997. Conversion between US Dollar, Japanese Yen, and Uzbekistan Sum is based on the average exchange rate during the first field survey from April to June 1997 of US$1.0 = Yen 120 = Sum 100.

6.5.2 Project Cost

Project costs of each project based on the above conditions are shown in **Tables 6.5.3 to 6.5.14**. The cost does not include any provisions for future inflation. Detailed cost estimate for the respective projects are achieved in Appendix.

Project costs were estimated in the following cases to facilitate economic and financial analysis.

Table 6.5.2 Cases of Project Cost

Project	Case	Description of Development
Existing Tashkent		Domestic passenger and cargo facilities
New Tashkent	Case-1	International facilities only
	Case-2	International + Domestic facilities
Namangan	Case-1	All facilities
	Case-2	(Case-1) – (Air Navigation Facilities)
Termez	Case-1	All facilities
	Case-2	(Case-1) – (Air Navigation Facilities)
Nukus	Case-1	All facilities
	Case-2	(Case-1) – (Air Navigation Facilities)
Nationwide Air Navigation Facilities	Case-1	Air route navigation facilities only
	Case-2	Air route navigation facilities only + Air navigation facilities of Namangan, Termez and Nukus

Table 6.5.3 Project Costs of Airports and Nationwide Air Navigation Facility

(US$ 1,000)

Cost Items	Tashkent	New Tashkent		Namangan		Termez		Nukus		Nationwide Air Navigation	
		Case-1	Case-2	Case-1	Case-2	Case-1	Case-2	Case-1	Case-2	Case-1	Case-2
		International	All Facilities	All Facilities	Without Airnav.	All Facilities	Without Airnav.	All Facilities	Without Airnav.	Air Route Only	Air Route + 3-Airports
A) Compensation Work	0	4,991	4,991	0	0	0	0	0	0	0	0
B) Airfield Facility	12,912	319,314	337,300	26,258	26,258	19,277	19,277	16,885	16,885	0	0
C) Terminal Area Facility	26,536	136,753	172,777	37,209	26,569	27,021	16,381	37,713	27,073	0	31,920
D) Air Navigation Facility	14,884	41,242	41,242	29,742	0	29,658	0	29,658	0	10,400	99,458
E) Airport Special Equipment	462	13,469	13,931	4,541	4,541	4,310	4,310	4,540	4,540	0	0
F) Utilities	30,036	81,836	81,836	12,071	12,071	8,682	8,682	13,588	13,588	0	7,500
G) Total of Work	**84,830**	**597,605**	**652,077**	**109,821**	**69,439**	**88,948**	**48,650**	**102,384**	**62,086**	**10,400**	**138,878**
H) Land Acquisition	0	39,000	39,000	1,966	1,966	355	355	0	0	0	0
I) Administration Expenses	848	5,976	6,521	1,098	694	889	486	1,024	621	104	1,389
J) Survey and Engineering	12,725	59,761	65,208	16,473	10,416	13,342	7,297	15,358	9,313	1,560	20,832
K) Contingency	9,755	65,736	71,728	12,629	7,985	10,229	5,595	11,774	7,140	1,196	15,970
L) Total	**108,158**	**768,078**	**834,534**	**141,987**	**90,500**	**113,763**	**62,383**	**130,540**	**79,160**	**13,260**	**177,069**

Note: Administration Expenses = (Total of Works) x 1%
Survey and Engineering = (Total of Works) x 15% (All cases except New Tashkent)
= (Total of Works) x 12% (New Tashkent)
Contingency = (Total of Works + Survey and Engineering) x 10%

C) Terminal Area Facility of Case-2 in Nationwide Air Navigation includes only control tower & operation building and substation.

Table 6.5.4 Project Costs for Existing Tashkent Airport

Cost Items	Foreign(US$1,000)	Local(US$1,000)	Total(US$1,000)
A) Compensation	0	0	0
B) Airfield Facility	11,621	1,291	12,912
C) Terminal Area Facility	22,025	4,511	26,536
D) Air Navigation Facility	13,693	1,191	14,884
E) Airport Special Equipment	462	0	462
F) Utilities	26,732	3,304	30,036
G) Total of Work	**74,533**	**10,297**	**84,830**
H) Land Acquisition	0	0	0
I) Administration Expenses	0	848	848
J) Survey and Engineering	11,180	1,545	12,725
K) Contingency	8,571	1,184	9,755
L) Total	**94,284**	**13,874**	**108,158**

Table 6.5.5 Project Costs for New Tashkent Airport (Case-1)

Cost Items	Foreign(US$1,000)	Local(US$1,000)	Total(US$1,000)
A) Compensation	4,492	499	4,991
B) Airfield Facility	287,383	31,931	319,314
C) Terminal Area Facility	113,505	23,248	136,753
D) Air Navigation Facility	37,943	3,299	41,242
E) Airport Special Equipment	13,469	0	13,469
F) Utilities	72,941	8,895	81,836
G) Total of Work	**529,733**	**67,872**	**597,605**
H) Land Acquisition	0	39,000	39,000
I) Administration Expenses	0	5,976	5,976
J) Survey and Engineering	52,973	6,787	59,761
K) Contingency	58,270	7,466	65,736
L) Total	**640,976**	**127,102**	**768,078**

Table 6.5.6 Project Costs for New Tashkent Airport (Case-2)

Cost Items	Foreign(US$1,000)	Local(US$1,000)	Total(US$1,000)
A) Compensation	4,492	499	4,991
B) Airfield Facility	303,570	33,730	337,300
C) Terminal Area Facility	143,405	29,372	172,777
D) Air Navigation Facility	37,943	3,299	41,242
E) Airport Special Equipment	13,931	0	13,931
F) Utilities	72,941	8,895	81,836
G) Total of Work	**576,282**	**75,795**	**652,077**
H) Land Acquisition	0	39,000	39,000
I) Administration Expenses	0	6,521	6,521
J) Survey and Engineering	57,628	7,580	65,208
K) Contingency	63,391	8,337	71,728
L) Total	**697,301**	**137,233**	**834,534**

Table 6.5.7 Project Costs for Namangan Airport (Case-1)

Cost Items	Foreign(US$1,000)	Local(US$1,000)	Total(US$1,000)
A) Compensation	0	0	0
B) Airfield Facility	23,632	2,626	26,258
C) Terminal Area Facility	30,884	6,325	37,209
D) Air Navigation Facility	27,363	2,379	29,742
E) Airport Special Equipment	4,541	0	4,541
F) Utilities	10,743	1,328	12,071
G) Total of Work	**97,163**	**12,658**	**109,821**
H) Land Acquisition	0	1,966	1,966
I) Administration Expenses	0	1,098	1,098
J) Survey and Engineering	14,574	1,899	16,473
K) Contingency	11,173	1,456	12,629
L) Total	**122,910**	**19,077**	**141,987**

Table 6.5.8 Project Costs for Namangan Airport (Case-2)

Cost Items	Foreign(US$1,000)	Local(US$1,000)	Total(US$1,000)
A) Compensation	0	0	0
B) Airfield Facility	23,632	2,626	26,258
C) Terminal Area Facility	22,052	4,517	26,569
D) Air Navigation Facility	0	0	0
E) Airport Special Equipment	4,541	0	4,541
F) Utilities	10,743	1,328	12,071
G) Total of Work	**60,968**	**8,471**	**69,439**
H) Land Acquisition	0	1,966	1,966
I) Administration Expenses		694	694
J) Survey and Engineering	9,145	1,271	10,416
K) Contingency	7,012	973	7,985
L) Total	**77,125**	**13,375**	**90,500**

Table 6.5.9 Project Costs for Termez Airport (Case-1)

Cost Items	Foreign(US$1,000)	Local(US$1,000)	Total(US$1,000)
A) Compensation	0	0	0
B) Airfield Facility	17,349	1,928	19,277
C) Terminal Area Facility	22,427	4,594	27,021
D) Air Navigation Facility	27,286	2,372	29,658
E) Airport Special Equipment	4,310	0	4,310
F) Utilities	7,727	955	8,682
G) Total of Work	**79,099**	**9,849**	**88,948**
H) Land Acquisition	0	355	355
I) Administration Expenses	0	889	889
J) Survey and Engineering	11,865	1,477	13,342
K) Contingency	9,096	1,133	10,229
L) Total	**100,060**	**13,703**	**113,763**

Table 6.5.10 Project Costs for Termez Airport (Case-2)

Cost Items	Foreign(US$1,000)	Local(US$1,000)	Total(US$1,000)
A) Compensation	0	0	0
B) Airfield Facility	17,349	1,928	19,277
C) Terminal Area Facility	13,596	2,785	16,381
D) Air Navigation Facility	0	0	0
E) Airport Special Equipment	4,310	0	4,310
F) Utilities	7,727	955	8,682
G) Total of Work	**42,982**	**5,668**	**48,650**
H) Land Acquisition	0	355	355
I) Administration Expenses	0	486	486
J) Survey and Engineering	6,447	850	7,297
K) Contingency	4,943	652	5,595
L) Total	**54,372**	**8,011**	**62,383**

Table 6.5.11 Project Costs for Nukus Airport (Case-1)

Cost Items	Foreign(US$1,000)	Local(US$1,000)	Total(US$1,000)
A) Compensation	0	0	0
B) Airfield Facility	15,196	1,689	16,885
C) Terminal Area Facility	31,302	6,411	37,713
D) Air Navigation Facility	27,285	2,373	29,658
E) Airport Special Equipment	4,540	0	4,540
F) Utilities	12,094	1,494	13,588
G) Total of Work	**90,417**	**11,967**	**102,384**
H) Land Acquisition	0	0	0
I) Administration Expenses	0	1,024	1,024
J) Survey and Engineering	13,563	1,795	15,358
K) Contingency	10,398	1,376	11,774
L) Total	**114,378**	**16,162**	**130,540**

Table 6.5.12 Project Costs for Nukus Airport (Case-2)

Cost Items	Foreign(US$1,000)	Local(US$1,000)	Total(US$1,000)
A) Compensation	0	0	0
B) Airfield Facility	15,196	1,689	16,885
C) Terminal Area Facility	22,471	4,602	27073
D) Air Navigation Facility	0	0	0
E) Airport Special Equipment	4,540	0	4,540
F) Utilities	12,094	1,494	13,588
G) Total of Work	**54,301**	7,785	**62,086**
H) Land Acquisition	0	0	0
I) Administration Expenses	0	621	621
J) Survey and Engineering	8,145	1,168	9,313
K) Contingency	6,244	895	7,140
L) Total	**68,690**	**10,469**	**79,160**

Table 6.5.13 Project Costs for Nationwide Air Navigation Facilities (Case-1)

Cost Items	Foreign(US$1,000)	Local(US$1,000)	Total(US$1,000)
A) Compensation	0	0	0
B) Airfield Facility	0	0	0
C) Control Tower & Substation	0	0	0
D) Air Navigation Facility	9,568	832	10,400
E) Airport Special Equipment	0	0	0
F) Utilities	0	0	0
G) Total of Work	**9,568**	**832**	**10,400**
H) Land Acquisition	0	0	0
I) Administration Expenses	0	104	104
J) Survey and Engineering	1,435	125	1,560
K) Contingency	1,100	96	1,196
L) Total	**12,103**	**1,157**	**13,260**

Table 6.5.14 Project Costs for Nationwide Air Navigation Facilities (Case-2)

Cost Items	Foreign(US$1,000)	Local(US$1,000)	Total(US$1,000)
A) Compensation	0	0	0
B) Airfield Facility	0	0	0
C) Control Tower & Substation	26,645	5,275	31,920
D) Air Navigation Facility	91,501	7,957	99,458
E) Airport Special Equipment	0	0	0
F) Utilities	6,900	600	7,500
G) Total of Work	**125,046**	**13,832**	**138,878**
H) Land Acquisition	0	0	0
I) Administration Expenses	0	1,389	1,389
J) Survey and Engineering	18,757	2,075	20,832
K) Contingency	14,380	1,590	15,970
L) Total	**158,183**	**18,886**	**177,069**

6.6 Environmental Impact Assessment (EIA)

6.6.1 General

Environmental Impact Assessment (EIA) was conducted for the development projects of five (5) airports. Four of these were planned for improvement and expansion of the existing airports and one was planned for new construction.

For the existing airport, air pollution, noise and vibration generated from the increased number of aircraft are therefore considered as the major impacts on the environment. As the New Tashkent Airport will add to the above problems during operation, the destruction of nature at the construction site and various other forms of environmental impact due to construction, including air pollution, water pollution, noise and vibration may occur.

In this Chapter, the environmental impacts for the existing and new airports are investigated.

6.6.2 Environmental Impact Assessment of Existing Tashkent Airport Development

(1) Current Condition

a) Air Quality

Air quality at Tashkent Airport was monitored by NAC in 1994 for five air pollutants: inorganic dust, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), and phenol. The monitoring results are shown in **Table 6.6.1**.

Some substances affecting air quality at Tashkent Airport, including inorganic dust, nitrogen dioxide, and carbon monoxide, exceeded the standard permissible concentrations.

Table 6.6.1 Air Quality Monitoring Data at Tashkent Airport

Inorganic dust	0.9 mg/m^3
Nitrogen dioxide (NO_2)	0.17 mg/m^3
Sulfur dioxide (SO_2)	0.05 mg/m^3
Carbon monoxide (CO)	8 mg/m^3
Phenol	0.018 mg/m^3

b) Air Pollutant Emission

The total amounts of carbon oxide (CO) and nitrogen oxides (NO_x) emitted from airport area were estimated as shown in **Table 6.6.2**.

Table 6.6.2 Gas Emission Amount from Tashkent Airport. in 1994 and 1996

Year	Carbon oxides (CO_x) mg/m^3	Nitrogen oxides (NO_x) mg/m^3	Number of sources
1994	1.1790	0.6440	30
1996	0.6220	0.0970	30

Emission levels of CO and NO_x were estimated to be 1.179 t/year and 0.644 t/year in 1994, respectively. The values were estimated to be 0.622 t/year for CO and 0.097 t/year for NO_x in 1996. Emission levels in 1996 are one order lower than these of 1994, for both pollutants.

c) Aircraft Noise

Aircraft noise and ambient noise levels were measured continuously for three days at the six stations of the sensitive receptors around the airport, as shown in **Fig. 6.6.1**. The following noise levels were calculated according to the standards.

- -Aircraft noise: Maximum A-weighted sound pressure level (L_{Amax}) and Weighted equivalent continuous perceived noise level (WECPNL)
- -Ambient noise: Equivalent continuous A-weighted sound pressure level (L_{Aeq})

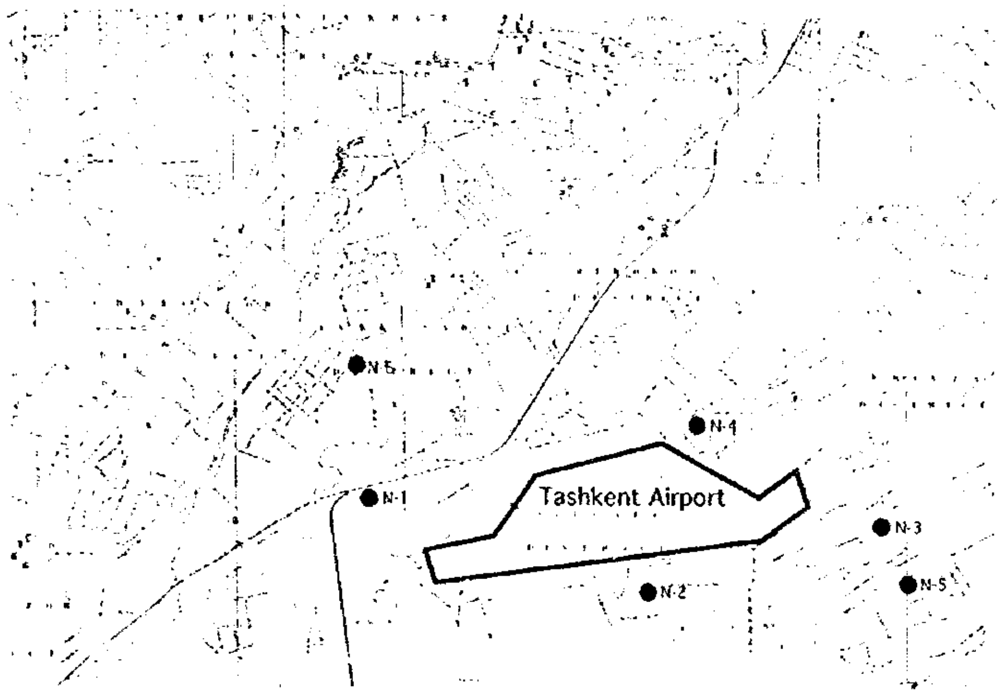


Fig. 6.6.1 Ambient Aircraft Noise Monitoring Station in Tashkent Airport Area, May 6-8, 1997

The results are shown in **Tables 6.6.3 and 6.6.4**.

The L_{Aeq} at the six stations ranged from 54.3 to 78.1 dB during daytime and from 49.8 to 77.8 dB in the nighttime. The maximum L_{Aeq} level was observed at N3 station that located at the eastern side of the runway under take-off flight course. The values were 78.1 dB during the daytime and 77.8 dB in the nighttime.

The L_{Amax} at the six stations ranged from 75.6 to 106.4 dB during daytime and from 65.1 to 106.4 dB in the nighttime. The maximum L_{Amax} level was observed at N3 station that located at the eastern side of the runway under take-off flight course. The value was 106.4 dB for the day and in the nighttime.

Table 6.6.3 Measured Ambient Noise Levels in Tashkent Airport Area

LOCATION	DATE	L_{Aeq}(dB)		L_{Amax}(dB)	
		Daytime (07:00-23:00)	Nighttime (23:00-07:00)	Daytime (07:00-23:00)	Nighttime (23:00-07:00)
N1	1997/5/6	68.8	68.6	96.7	92.0
	1997/5/7	69.0	66.0	94.1	89.8
	1997/5/8	68.8	63.7	97.1	92.7
N2	1997/5/9	63.9	62.7	91.8	87.0
	1997/5/10	63.2	61.0	88.6	88.8
	1997/5/11	60.2	61.0	90.6	85.9
N3	1997/5/2	76.0	61.1	102.8	85.1
	1997/5/3	78.1	77.8	106.4	106.4
	1997/5/4	75.6	72.9	102.0	99.2
N4	1997/5/6	55.8	54.8	81.9	77.8
	1997/5/7	59.4	54.9	88.7	79.9
	1997/5/8	56.3	54.5	78.2	74.5
N5	1997/5/6	71.5	72.8	96.1	98.6
	1997/5/7	71.5	70.5	96.2	94.8
	1997/5/8	65.9	68.8	95.8	95.9
N6	1997/5/2	55.0	49.8	84.8	72.2
	1997/5/3	54.3	50.5	76.1	73.6
	1997/5/4	54.8	50.7	75.6	65.1

Table 6.6.4 Measured Aircraft Noise Levels in Tashkent Airport Area

LOCATION	DATE	WECPNL1	WECPNL3
N1	1997/5/27	77.0	
	1997/5/28	79.8	77.7
	1997/5/29	74.7	
N2	1997/5/27	73.4	
	1997/5/28	75.8	74.1
	1997/5/29	72.4	
N3	1997/5/24	89.4	
	1997/5/25	86.2	87.4
	1997/5/26	85.5	
N4	1997/5/24	72.9	
	1997/5/25	72.5	72.4
	1997/5/26	71.8	
N5	1997/5/24	82.1	
	1997/5/25	83.4	82.4
	1997/5/26	81.5	
N6	1997/5/27	67.9	
	1997/5/28	70.7	68.8
	1997/5/29	66.8	

N1: Western side of runway, located under landing course

N2: Southwestern side of runway, located under landing course

N3: Eastern side of runway, located under take-off course

N4: Northeastern side of runway

N5: Southeastern side of runway, located under take-off course

N6: Northwestern side of runway

(2) Prediction and Evaluation

a) Air Pollution

The US EPA approved model of ISCLT3 (Industrial Source Complex - Long Term) was used to predict the ground level concentrations from emission sources at the site. The receptor grid for the ISCLT3 simulation is within a 15 kilometer area range at 1-kilometer increment.

Standard Landing and Take-Off (LTO) cycle of EPA and operation mode was used to calculate emission rates from airplane engines as shown in **Table 6.6.5.**

Table 6.6.5 Standard LTO Cycle (unit: second)

Mode	Turboprop	Engine power
Stay and		
Movement to apron	1,140	5%
Take-off	35	100%
Climbing	150	85%
Landing	270	30%
Movement to terminal	420	5%
Average cycle	2,010	

The simulation conditions summarized on the basis of the above LTO cycle date, future operation plan in the year 2020, and existing literature are shown in **Table 6.6.6.**

Table 6.6.6 NOx Emission from Airplanes (unit : g/s)

Operation Mode	Daytime	Evening	Nighttime
Stay and Take-Off	5.894	1.703	1.265
Rise	0.522	0.151	0.112
Climbing	0.313	0.090	0.067
Approach	0.209	0.060	0.045

Note: Daytime: 07:00 - 15:00, Evening: 15:00 - 23:00
Nighttime: 23:00 - 07:00

Averaging time ground level concentrations were estimated for statistical Annual Meteorological Data measured at the meteorological station "Sirdarya". Since there are no data for Stability Category it was calculated on the assumption that the distributions of six stability categories (A, B, C, D, E, F) corresponds to the same frequency pattern as that observed during the measurement period.

The predicted result indicates that the maximum annual average ground level concentration of NO_2 is 8.86 $\mu g/m^3$, as shown in **Table 6.6.7.** The maximum values found within the airport area and annual average ground level concentrations within airport are lower than EPA ambient air criteria 100 $\mu g/m^3$. The effects of emission gas from airplanes on the ambient air quality are therefore considered to be low.

Table 6.6.7 Predicted Maximum Annual Average NOx Ground Level Concentration

Rank	Ground Level Concentration $\mu g/m^3$	Receptor	
		East, West	South, North
		M	m
1	8.86	W 1,000	0
2	8.67	0	S 1,000
3	8.54	0	N 1,000
4	8.06	E 1,000	0
5	4.10	W 1,000	N 1,000
6	4.09	W 1,000	S 1,000
7	3.75	E 1,000	S 1,000
8	3.28	E 1,000	N 1,000
9	3.17		S 2,000
10	3.13	W 2,000	0

b) Water Pollution

The effluents affecting the ambient water quality in the year 2020 can be classified as follows:

- -Waste water discharged from mechanic area,
- -Waste water discharged from terminal area,
- -Sanitary wastes.

The total volume of wastewater generated from Tashkent airport in the year 2020 is estimated to be about 1,230 ton/day. All the airport wastewater will be discharged into the wastewater facility in Tashkent City through the sewerage system. It is therefore expected that wastewater generated from Tashkent airport area will not affect the environment.

c) Aircraft Noise

The predicted WECPNL is shown in **Fig. 6.6.2**. According to the future plan, most aircraft will be converted to a low-noise level type in the year 2020, as shown in Appendixes. It is expected that aircraft noise will be similar to the present condition. However, the present noise level is not lower so that the mitigation measures for aircraft noise shown in **Fig. 6.6.3** should be adopted.

Fig. 6.6.2 Predicting Contour of Aircraft Noise Level "WECPNL" (Tashkent)

d) Environmental Impact during Construction Phase

It is expected that the impact on the environment including air and water quality, and noise during the construction phase will be negative, because the construction work will be conducted within the existing airport area. However, the mitigation plan for decreasing the impact on the surrounding environment should be adopted.

(3) Mitigation Measures

Aircraft noise and air pollution are the major impact factors. **Fig. 6.6.3** shows the example of aircraft noise mitigation measures in Japan.

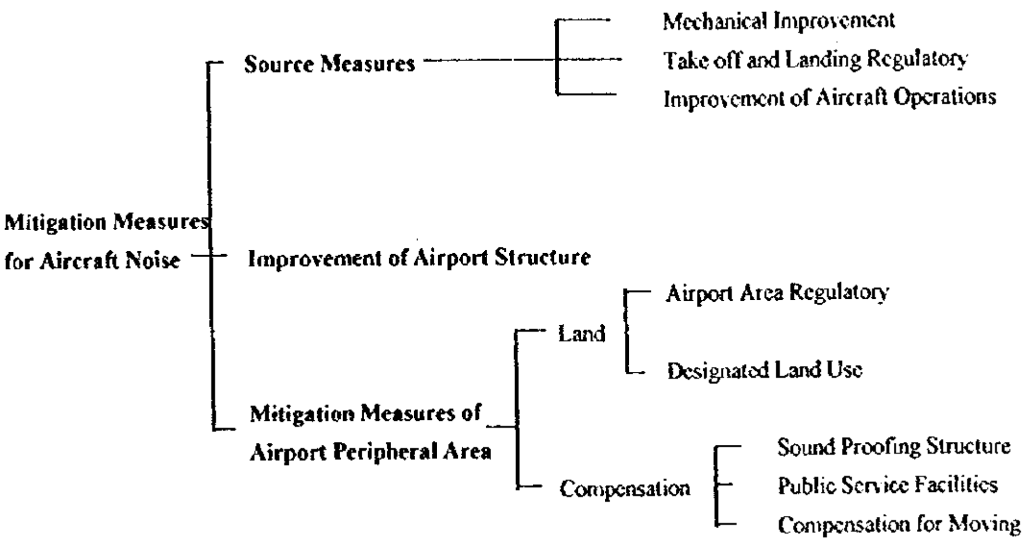


Fig.6.6.3 Mitigation Measures of Aircraft Noise in Japan

6.6.3 Environmental Impact Assessment of Namangan Airport Development

(1) Current Condition

a) Air Pollution

Ambient air quality was measured for two air pollutants in 1994, 1995, and 1996: carbon oxides (CO) and nitrogen oxides (NO_x).

The total amounts of air pollutants emitted from the airport area were estimated as shown in **Table 6.6.8**.

Table 6.6.8 Gas Emission Amount from Namangan Airport.

Year	Carbon Oxides (CO) (t/year)	Nitrogen oxides (NO_x) (t/year)	Number of sources
1994	3.1640	0.5560	
1995	0.2540	0.1070	24
1996	1.0830	0.0020	24

CO emission ranged from 0.2540 t/year to 3.1640 t/year. The highest value was observed in 1994 and the lowest value was observed in 1995.

NO_x ranged from 0.0020 t/year to 0.5560 t/year and had a tendency to decrease year by year.

(2) Prediction and Evaluation

a) Air Pollution

The US EPA approved model ISCLT3 (Industrial Source Complex - Long Term) was used to predict the ground level concentrations from emission sources at the site. The receptor grid for the ISCLT3 simulation is within 15 kilometer at 1-kilometer increments

Standard Landing and Take-Off (LTO) cycle of EPA and operation mode was used to calculate emission rate from airplane engines as shown in **Table 6.6.9**.

Table 6.6.9 Standard LTO Cycle (unit: second)

Mode	Turboprop	Engine Power
Stay and Movement to Apron	1,140	5%
Take-Off	35	100%
Climbing	150	85%
Landing	270	30%
Movement to Terminal	420	5%
Average Cycle	2,010	

The simulation conditions summarized based on the above LTO cycle date, future operation plan in the year 2020, and existing literature is shown in **Table 6.6.10**.

Table 6.6.10 NOx Emission from Airplanes (unit: g/s)

Operation Mode	Daytime	Evening	Nighttime
Stay and Take-Off	1.708	0.658	0.508
Rise	0.151	0.058	0.045
Climbing	0.091	0.035	0.027
Approach	0.060	0.023	0.018

Note: Daytime: 07:00 - 15:00 Evening : 15:00 - 23:00
Nighttime: 23:00 - 07:00

Averaging time ground level concentrations were estimated for statistical Annual Meteorological Data measured at the meteorological station "Sirdarya". Since there are no data of Stability Category it was calculated by the assumption that the distributions of six stability categories (A, B, C, D, E, F) corresponds to the same frequency pattern as that during the measurement period.

The predicted result indicates that the maximum annual average ground level concentrations of NO_2 is 2.88 $\mu g/m^3$ as shown in **Table 6.6.11**. The maximum values registered within the airport area and annual average ground level concentrations within the airport are lower than the EPA ambient air criteria 100 μg/m³. Therefore, the effects of emission gas from airplanes on ambient air quality are considered to be low.

Table 6.6.11 Predicted Maximum Annual Average NOx Ground Level Concentration

Rank	Ground Level Concentration μg/m³	Receptor	
		East, West M	South, North m
1	2.88	W 700	S 700
2	2.81	E 700	S 700
3	2.77	W 700	N 700
4	2.62	E 700	N 700
5	1.33	0	N 1,400
6	1.33	0	S 1,400
7	1.22	E 1,400	0
8	1.06	W 1,400	0
9	1.03	0	S 1,400
10	1.02	W 1,400	0

b) Water Pollution

The effluents affecting the ambient water quality in the year 2020 can be classified as follows:

- -Waste water discharged from mechanic area,
- -Waste water discharged from terminal area,
- -Sanitary wastes.

Wastewater at Namangan Airport in the year 2020 will be planned to be about 310 ton/day. The wastewater will be treated at the Namangan City wastewater facility through the sewerage system. It is therefore expected that wastewater generated from Namangan Airport area will not affect the environment.

c) Aircraft Noise

The prediction contour of aircraft noise level with the weight equivalent continuous perceived noise level (WECPNL) is shown in **Fig. 6.6.4**. According to future aircraft movement plan, most aircraft were assumed to be converted to the low-noise type in the year 2020, as shown in Appendix. It is expected that noise impact from aircraft will be small because the urban area is far from the airport and there is no sensitive receptor near the site. However, it is desirable to monitor aircraft noise and to take mitigation measures for aircraft noise.

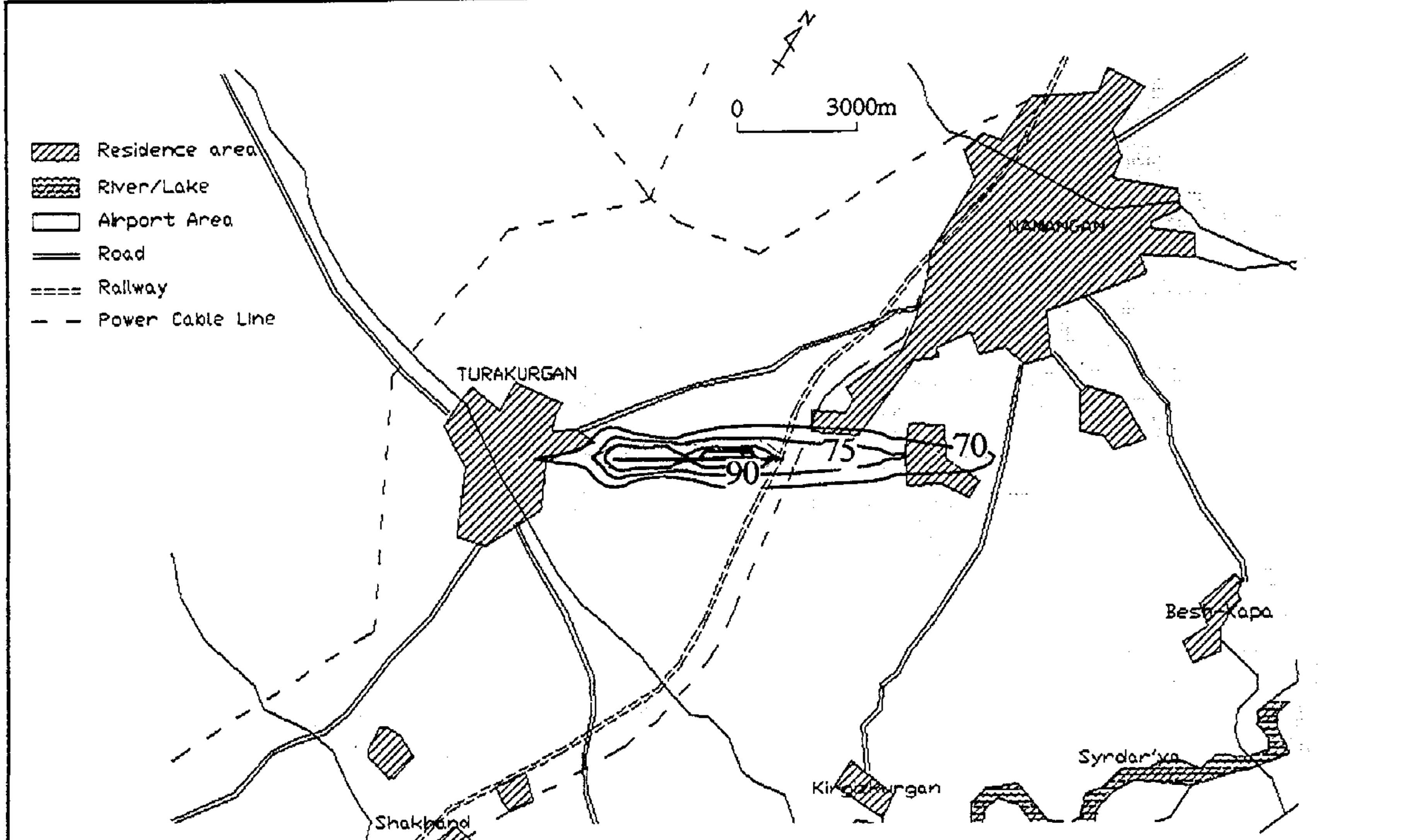


Fig. 6.6.4 Predicting Contour of Aircraft Noise Level "WECPNL" (Namangan)

d) Environmental Impact during Construction Phase

It is expected that the impact on environment including air and water quality, and noise during the construction phase will be negative, because the construction work will be conducted within the existing airport area. However, the mitigation plan for decreasing the impact on the surrounding environment should be adopted.

(3) Mitigation Measures

Aircraft noise and air pollution are the major impact factors. **Fig. 6.6.3** shows the example of aircraft noise mitigation measures in Japan.

6.6.4 Environment Impact Assessment of Termez Airport Development

(1) Current Condition

a) Air Pollution

The two air pollutants were measured in 1994, 1995, and 1996: carbon oxides (CO) and nitrogen oxides (NO_x). The total amounts of these pollutants emitted from the airport area were estimated as shown in **Table 6.6.12**.

Table 6.6.12 Gas Emission Amount from Termez Airport.

Year	Carbon Oxides (CO) (t/year)	Nitrogen Oxides (NO_x) (t/year)	Number of sources
1994	3.4600	3.6400	
1995	5.0000	3.1360	
1996	5.0000	3.1360	

CO emission was estimated to range from 3.4600 t/year to 5.0000 t/year. The lowest value was observed in 1994, there is no difference in the CO values between 1995 and 1996.

NO_x value ranged from 3.1360 t/year to 3.6400 t/year. The highest value was observed in 1994. There is no large annual fluctuation in NO_x concentrations. However, the NO_x emissions from the Termez and Nukus airports are 10 times values of the airports.

(2) Prediction and evaluation

a) Air Pollution

The US EPA approved model ISCLT3 (Industrial Source Complex - Long Term) was used to predict the ground level concentrations from emission sources of the site. The receptor grid for the ISCLT3 simulations is within 15-kilometer area range at 1-kilometer increments.

Standard Landing and Take-Off (LTO) cycle of EPA and operation mode was used to calculate emission rate from airplane engines as shown in **Table 6.6.13**.

Table 6.6.13 **Standard LTO Cycle (unit: second)**

Mode	Jets	Turboprop	Engine Power
Stay and			
Movement to Apron	1,140	1,140	5%
Take-Off	42	35	100%
Climbing	132	150	85%
Landing	240	270	30%
Movement to Terminal	420	420	5%
Average Cycle	1,974	2,010	

The simulation conditions summarized based on the above LTO cycle date, future operation plan in the year 2020, and existing literature is shown in **Table 6.6.14**.

Table 6.6.14 NO_x Emission from Airplanes (unit: g/s)

Operation Mode	Daytime	Evening	Nighttime
Stay and Take-Off	1.230	0.508	0.397
Rise	0.109	0.045	0.035
Climbing	0.109	0.045	0.035
Approach	0.044	0.018	0.014

Note : Daytime : 07:00 - 15:00 Evening : 15:00 - 23:00
Nighttime : 23:00 - 07:00

Averaging time ground level concentrations were estimated for statistical Annual Meteorological Data measured at the meteorological station "Sirdarya". Since there are no data of Stability Category this was calculated on the assumption that the distribution of the six stability categories (A, B, C, D, E, F) corresponds to the same frequency pattern as that during the measurement period.

The predicted result indicates that the maximum annual average ground level concentrations of NO_2 is 2.14 $\mu g/m^3$ as shown in **Table 6.6.15**. The maximum values recorded within the airport area and annual average ground level concentrations within the airport are lower than the EPA ambient air criteria 100 $\mu g/m^3$. The effects of emission gas from airplanes on ambient air quality are therefore considered to below.

Table 6.6.15 **Predicted Maximum Annual Average NOx Ground Level Concentration**

Rank	Ground Level Concentration $\mu g/m^3$	Receptor East, West m	Receptor South, North m
1	2.14	W 700	S 700
2	2.09	E 700	S 700
3	2.06	W 700	N 700
4	1.94	E 700	N 700
5	0.99	0	N 1,400
6	0.97		S 1,400
7	0.90	E 1,400	0
8	0.79	W 1,400	0
9	0.76	0	S 1,400
10	0.75	W 1,400	0

b) Water Pollution

The effluents affecting the ambient water quality in the year 2020 can be classified as follows:

- -Waste water discharged from mechanic area,
- -Waste water discharged from terminal area,
- -Sanitary wastes.

Wastewater generated from Termez Airport in the year 2020 can be established to be about 370 ton/day. The airport wastewater will be discharged into the wastewater facility in Termez City. Therefore, it is expected that wastewater generated from Termez airport area will not cause the environmental problem.

c) Aircraft Noise

The prediction contour of aircraft noise level with the weight equivalent continuous perceived noise level (WECPNL) is shown in the **Fig. 6.6.5**. According to future aircraft movement plan, most aircraft was assumed to be converted to the low-noise type in the year 2020 as shown in Appendix. It is expected that noise impact from aircraft would be small because the urban area is far from the airport and there is no sensitive receptor near the site. However, it is desirable to monitor aircraft noise and to take mitigation measures for aircraft noise.

d) Environmental Impact during Construction Phase

It is expected that the impact on environment including air quality, water quality, and noise during construction phase will be negative, because the construction work will be conducted within the existing airport area. However, the mitigation plan for decreasing the impact on the surrounding environment should be adopted.

(3) Mitigation Measures

Aircraft noise and air pollution are the major impact factors. Example of aircraft noise mitigation measures in Japan is shown in **Fig. 6.7.3**.

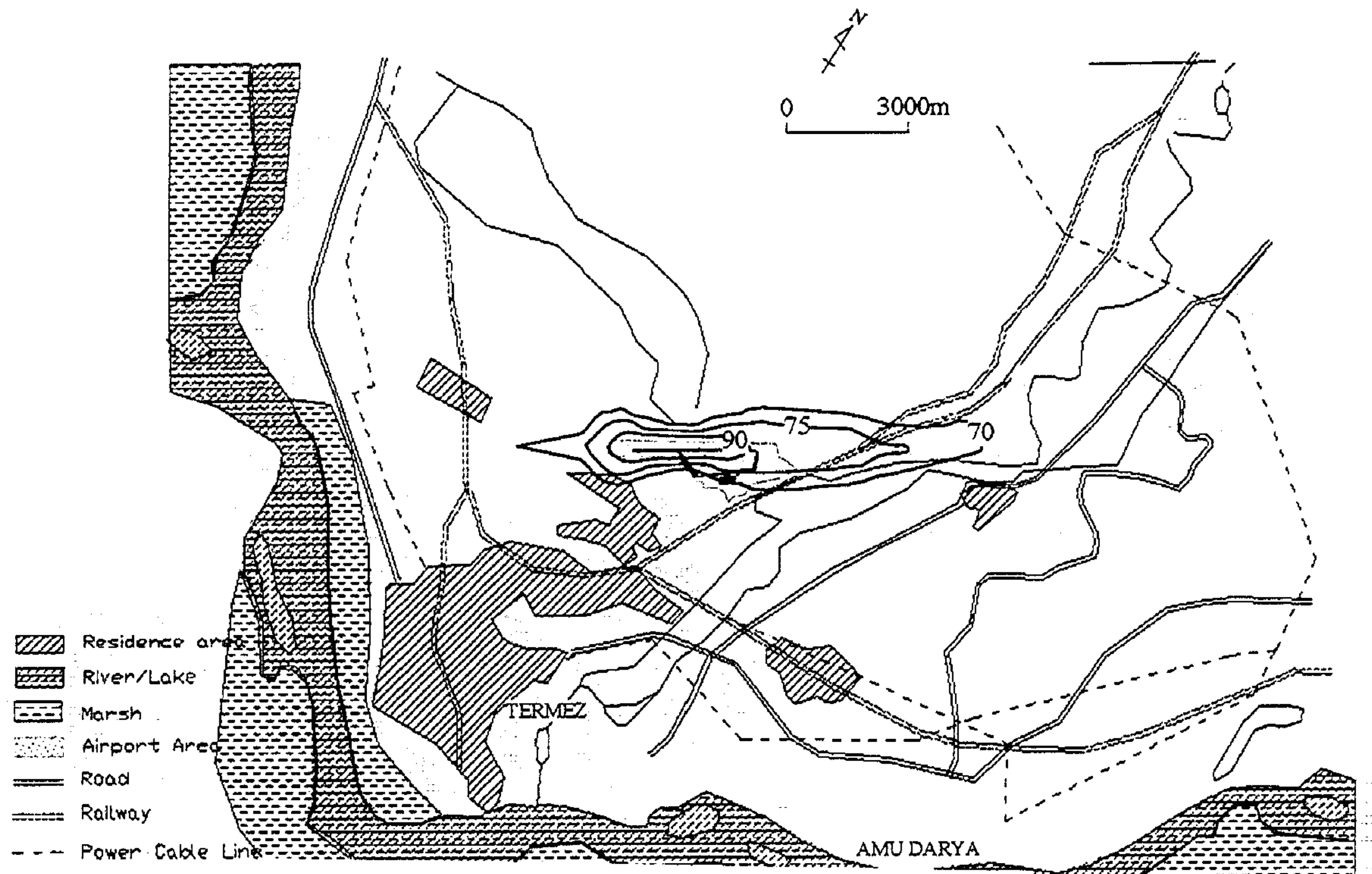


Fig. 6.6.5 Predicting Contour of Aircraft Noise Level "WECPNL" (Termez)

6.6.5 Environment Impact Assessment of Nukus Airport Development

(1) Current Condition

a) Air Quality

The ambient air quality at Nukus Airport was monitored for dust pollutants by NAC in 1997.

Dust concentration in the air at Nukus Airport was observed to be about 0.2 mg/m^3 on average and 1.0 mg/m^3 in maximum. It exceeded the permissible levels.

b) Air Pollutant Emission

The two air pollutants were measured in 1994, 1995, and 1996: carbon oxides (CO) and nitrogen oxides (NO_x). Total amounts of air pollutants emitted from the airport area were estimated as shown in **Table 6.6.16**.

Table 6.6.16 Gas Emission Levels at Nukus Airport

year	Carbon Oxides (CO) (t/year)	Nitrogen oxides (NO_x) (t/year)	Number of sources
1994	19.1530	4.1810	
1995	25.5370	5.5720	40
1996	22.3450	4.8760	40

CO emissions ranging from 19.1530 t/year to 25.5370 t/year were measured from 1994 to 1996. The highest value was observed in 1995 and the lowest value in 1994. CO_x emission from the airport is one order higher than at the other airports.

NO_x emission was also recorded at higher levels. NO_x concentrations ranged from 4.1810 t/year to 5.5720 t/year. The highest value was observed in 1995 and the lowest value in 1994.

(2) Prediction and Evaluation

a) Air Pollution

The US EPA approved model ISCLT3 (Industrial Source Complex - Long Term) was used to predict the ground level concentrations from emission sources of the site. The receptor grid for the ISCLT3 simulations is within 15-kilometer range at 1-kilometer increments.

Standard Landing and Take-Off (LTO) cycle of EPA and operation mode was used to calculate emission rate from airplane engines as shown in **Table 6.6.17**.

Table 6.6.17 **Standard LTO Cycle (unit : second)**

Mode	Jets	Turboprop	Engine Power
Stay and Movement to Apron	1,140	1,140	5%
Take-Off	42	35	100%
Climbing	132	150	85%
Landing	240	270	30%
Movement to Terminal	420	420	5%
Average Cycle	1,974	2,010	

The simulation conditions summarized on the basis of the above LTO cycle date, future operation plan in the year 2020, and existing literature are shown in **Table 6.6.18**.

Table 6.6.18 **Standard LTO Cycle (unit: second)**

Operation Mode	Daytime	Evening	Nighttime
Stay and Take-Off	1.339	0.528	0.428
Rise	0.118	0.047	0.038
Climbing	0.071	0.028	0.023
Approach	0.047	0.019	0.015

Note : Daytime : 07:00 - 15:00 Evening : 15:00 - 23:00
Nighttime: 23:00 - 07:00

Averaging time ground level concentrations were estimated for statistical Annual Meteorological Data measured at the meteorological station "Sirdarya". Since there are no data on Stability Category this was calculated on the assumption that the distributions of six stability categories (A, B, C, D, E, F) corresponds to the same frequency pattern as that during the measurement period.

The predicted result indicates that the maximum annual average ground level concentrations of NO_2 is 2.30 $\mu g/m^3$ is shown in **Table 6.6.19**. The maximum values found within the airport area and annual average ground level concentrations within airport are lower than EPA ambient air criteria 100 $\mu g/m^3$. The effects of emission gas from airplanes on ambient air quality are therefore considered to be low.

Table 6.6.19 **Predicted Maximum Annual Average NOx Ground Level Concentration**

Rank	Ground Level Concentration $\mu g/m^3$	Receptor East, West m	Receptor South, North m
1	2.30	W 700	S 700
2	0.44	E 700	S 700
3	0.21	W 700	N 700
4	2.09	E 700	N 700
5	1.06	0	N 1,400
6	1.06	0	S 1,400
7	0.97	E 1,400	0
8	0.85	W 1,400	0
9	0.82		S 1,400
10	0.81	W 1,400	

b) Water Pollution

The effluents affecting the ambient water quality in the year 2020 can be classified as follows:

- -Waste water discharged from mechanic area,
- -Waste water discharged from terminal area,
- -Sanitary wastes.

Wastewater at Nukus airport in the year 2020 can estimated to be about 350 ton/day. The wastewater will be treated at the Nukus City wastewater facility through the sewerage system. It is therefore expected that wastewater generated from Nukus airport area will not lead to environmental problems.

c) Aircraft Noise

The prediction contour of aircraft noise level with the Weighted Equivalent Continuous Perceived noise Level (WECPNL) is shown in **Fig. 6.6.6.** According to future aircraft movement plan, most aircraft was assumed to be converted to low-noise type in the year 2020 as shown in Appendix. It is expected therefore that noise impact from aircraft would be small because the urban area is far from the airport and there is no sensitive receptor near the site. However, it is desirable to monitor aircraft noise and to take the mitigation measures for aircraft noise.

d) Environmental Impact during Construction Phase

It is expected that the impact on environment including air and water quality, and noise during the construction phase will be negative, because the construction work will be conducted within the existing airport area. However, the mitigation plan for decreasing the impact on the surrounding environment should be adopted.

(3) Mitigation Measures

Aircraft noise and air pollution are the major impact factors. **Fig. 6.6.3** shows the example of aircraft noise mitigation measures in Japan.

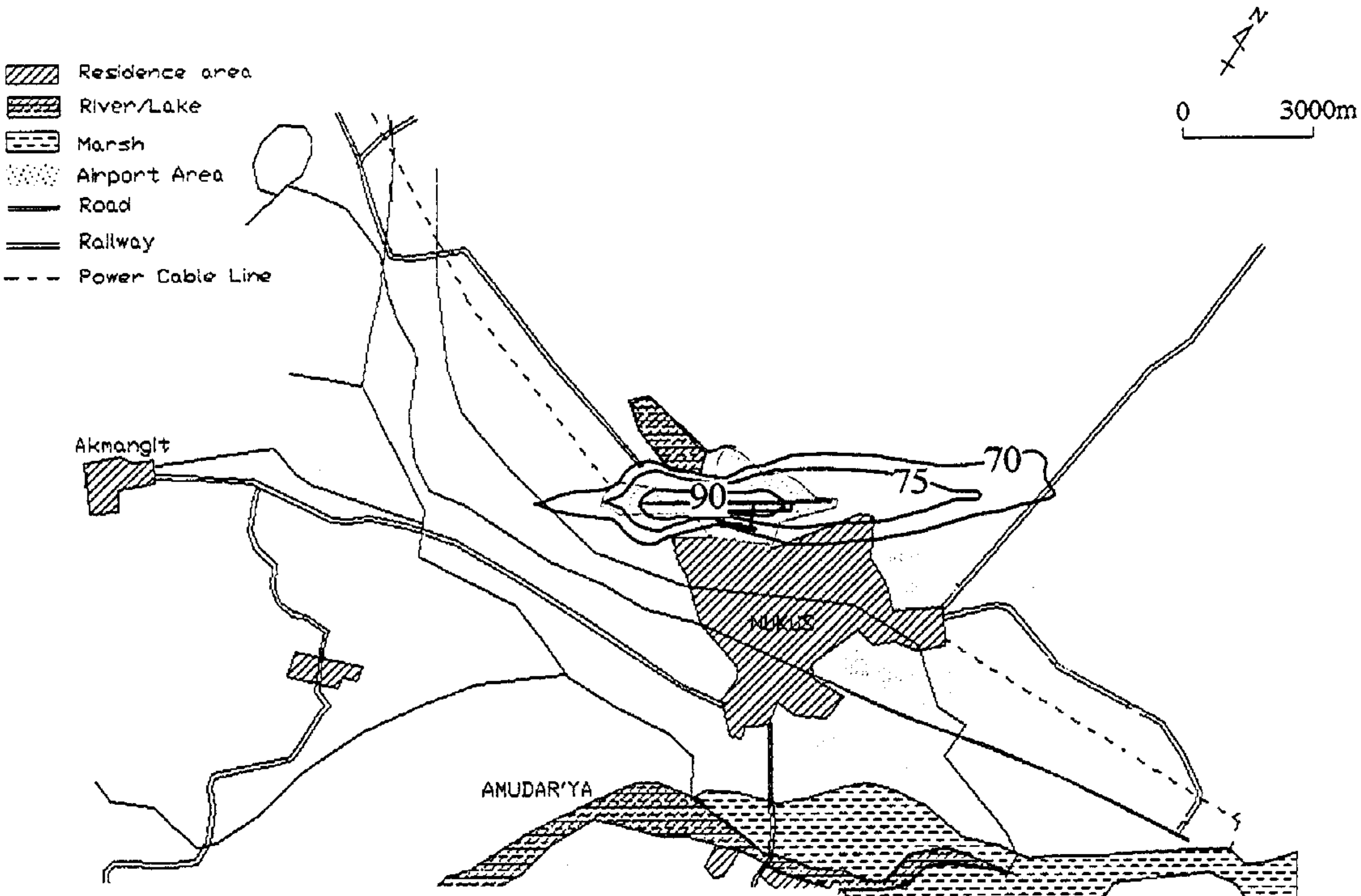


Fig. 6.6.6 Predicting Contour of Aircraft Noise Level "WECPNL" (Nukus)