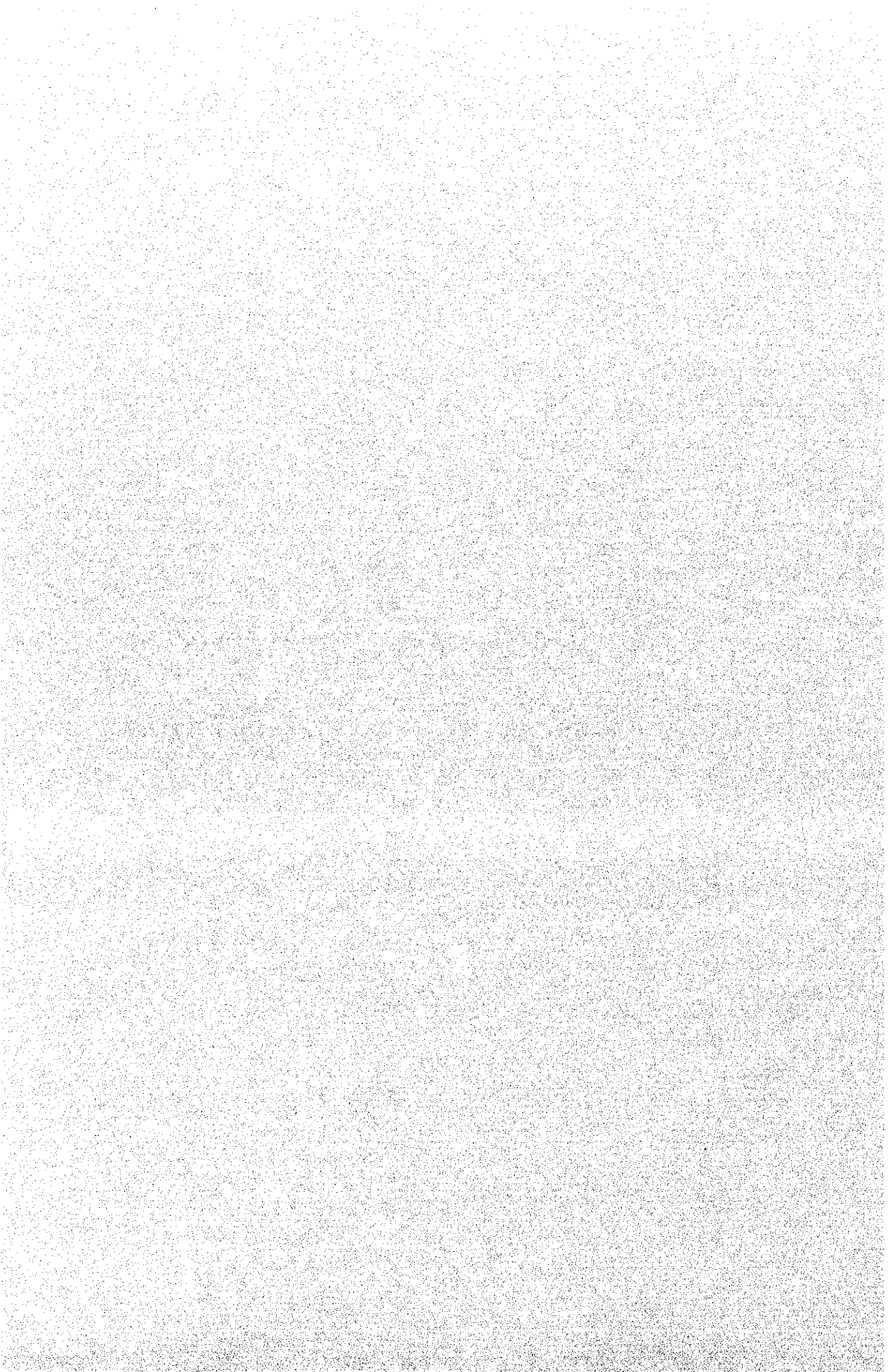


**TABLE**



**Table B.1.1 Public Transport Routes (1/2)**
**I. Bus**

Route		Length (km)	No. of buses		Number of operation times	
Origin/Destination No.	week day (veh.)		week end (veh.)	week day (min.)	week end (min.)	
Open Joint-stock company "Autopark No.1"						
3	OJSC "Atriko" - Railway station	23.3	12	12	116	116
8	Micro-rayon No.9 - sovkhos by Kirov	29.8	14	11	100	80
9	Rayon hospital - Railway station	22.3	11	10	144	94
10	Railway station - Airport	43.3	5	5	40	40
21	Railway station - DOSAAF	18.9	4	4	44.5	44.5
23	Misro-rayon No.9 - Railway station	32.7	14	13	108	75
25	Mental hospital - Railway station	23.0	20	14	184	155
31	station	17.7	4	5	48	60
32	"Kolos" grocery shop - Hothouse complex	19.2	4	6	46	69
35	station	23.8	1	2	9	19
36	Abylai-Khan Avenue - "Prigorodnyi" settlement	38.5	2	2	16	16
37	Railway station - "Prigorodnyi" settlement	37.2	1	2	8	16
Limited Liability Company "Sputnik-2"						
5	Micro-rayon No.9 - Meat packing plant	35.6	12	10	75	59.5
22	Bridge trafficway - Railway station	34.0	7	5	45.5	32.5
34	"Kolos" grocery shop - "AP-2" service station	19.3	1	1	13	13
Limited Liability Company "BUS"						
7	Agrostation - UM TTS	21.1	2	2	10	10
11	Rayon hospital - Railway station	24.1	16	16	120	120
12	OJSC "Gazmashapparat" - Meat packing plant	22.3	5	5	45	45
13	Agrostation - "Promyshlennyi" settlement	40.6	10	10	60	60
15	OJSC "Atriko" - Railway station	23.5	10	10	100	100
19	OJSC "Atriko" - Railway station	23.5	12	12	120	120
20	Agrostation - "Al-Faraby" micro-rayon	28.2	17	17	120	120
26	"Stroitel" cinema - "Karaotkel" settlement	27.5	15	15	90	90
27	"Orbita" grocery shop - "Karaotkel" settlement	10.6	6	6	57	57
33	"Orbita" grocery shop - Pioneer camp	15.0	8	8	84	84
38	"Orbita" grocery shop - Silikatchik	21.1	5	5	50	50
39	"Kolos" grocery shop - Koyandy	45.0	1	1	4	4
41	"Kolos" grocery shop - PMK-6	9.2	2	2	28	28
Limited Liability Company "ALGA"						
17	SPTU No.11 - OJSC "Gazmashapparat"	20.1	11	11	69	69
18	SPTU No.11 - Railway station	34.9	5	5	44	44
42	"Kolos" grocery shop - West	14.0	2	2	29	29
Closed Joint-stock Company "Khalyk Zaman"						
1	OJSC "Gazmashapparat" - "Brick factory" settlement	23.7	4	4	40	40
2	Medical center- Isolation hospital	24.8	6	6	45.5	45.5
4	Micro-rayon No.9 - Dulatov Street	35.0	7	7	42	42
6	Micro-rayon No.9 - "Avtomatika" settlement	34.9	1	1	8	8
14	Micro-rayon No.9 - Railway station	22.0	9	9	60	60
16	"Eurasia" shopping center - Meat packing plant	31.5	10	10	72	72
24	Micro-rayon No.9 - Lunina Street	34.0	12	12	73	73
43	"Kolos" grocery shop - Udarnik	22.4	3	3	24	24

**Table B.1.1 Public Transport Routes (2/2)**

**II. Trolley Bus**

Route Name No.	Length (km)	No. of operation		Required time for operation	
		weekday	week end	weekday	week end
Open Joint-stock Company "Akmolagoelectrotrans"	21.4				
1 "Arman" - Trolleybus depot	20.3	6	6	58	57
2 "Arman" - Trolleybus depot	20.4	6	6	58	57
3 Railway station - SPTU No.5	22.6	12	12	117	115
4 Railway station - Trolleybus depot	21.9	12	12	117	115
5 Railway station - SPTU No.5	21.9	12	12	114	114

**VII. Route Taxi**

Route Name No.	Length (km)	No. of operation		Required time for operation	
		weekday	week end	weekday	week end
101 Railway station - Micro-rayon No.9	24.2	8	8	66	
102 Railway station - Southeast	29.2	6	6	54	
103 Railway station - "Eurasia" shopping center	18.8	5	5	50.5	
104 Railway station - Airport	43.1	2	2	15	
105 "Kirpichnyi" settlement - Plant of Kumisbekov	14.3	5	5	52	
106 "Arman" - School No.38	23.8	8	8	74	
107 Railway station - Rayon hospital	21.4	8	8	76	
108 Railway station - "Sputnik-2" - "Eurasia" shopping center	20.8	5	5	47.5	
109 "Asem" - DSU-36	16.6	6	6	60	
110 DOSAAF - "Asem"	12.6	2	2	22	
111 Railway station - "Doka-khleb" micro-rayon	20.0	6	6	73.5	
112 Railway station - College "Zhas-Ulan"	18.1	6	6	67	
113 "Asem" - sovkhos by Kirov	20.6	2	2	12	

Source: Astana City Hall

Table B.1.2 Traffic Volume at Cordon Line (Inbound)

Number of Vehicles Interviewed in the Car OD Survey (Roadside) -Inbound-

Site	Vehicle type												Total	
	1 Motor- cycle	2 Pass. car	3 Taxi	4 Pick-up, Jeep	5 Mini- bus	Sub-total	6 Light Truck (1.5-3.5t)	7 Middle Truck (3.5-10t)	8 Heavy Truck (10t-)	Sub-total	10 Bus bus	11 Trolley		12 Others
15 Astana-Petropavlovsk (Registered outside Astana)	-	52 49	0 0	14 13	1 1	67 63	7 7	15 8	21 17	43 32	3 2	0 0	5 5	118 102
16 Astana-Yereimantau (Registered outside Astana)	-	57 25	1 0	2 2	3 0	63 27	10 3	18 11	27 15	55 29	4 2	0 0	1 0	123 58
17 Yekaterinburg-Almaty (Registered outside Astana)	-	97 36	2 0	7 5	3 2	109 43	13 6	20 17	28 24	61 47	2 1	0 0	0 0	172 91
18 Astana-Rozhdestvenka (Registered outside Astana) (OD other than Airport)	-	94 56 46	4 1 2	6 0 5	10 5 8	114 62 61	5 3 4	2 0 1	13 6 12	20 9 17	3 0 3	0 0 0	2 1 1	139 72
19 Astana-Korgalzhino (Registered outside Astana)	-	34 26	0 0	1 0	2 2	37 28	4 2	11 9	6 5	21 16	3 1	0 0	0 0	61 45
20 Yekaterinburg-Almaty (Registered outside Astana)	-	57 29	1 0	5 4	2 2	65 35	12 11	8 6	3 2	23 19	4 2	0 0	0 0	92 56
Total (Registered outside Astana)	-	391 221	8 1	35 24	21 12	455 258	51 32	74 51	98 69	223 152	19 8	0 0	8 6	705 424

Source: JICA Study Team

Number of Vehicles in the Traffic Count Survey at Cordon Line -Inbound-

Site	Vehicle type													Total (excl.m- to cycle)
	1 Motor- cycle	2 Pass. car	3 Taxi	4 Pick-up, Jeep	5 Mini- bus	Sub-total (excl.mo- to cycle)	6 Light Truck (1.5-2.0t)	7 Middle Truck (2.0-8.0t)	8 Heavy Truck (8t-)	Sub-total	10 Bus bus	11 Trolley	12 Others	
15 Astana-Petropavlovsk (Registered outside Astana)	13	743 700	6 0	93 86	56 56	898 844	28 28	142 76	60 49	230 171	56	0	87	1,271 1,099
16 Astana-Yereimantau (Registered outside Astana)	73	562 246	20 0	73 73	28 0	683 293	53 16	178 109	167 93	398 210	33	0	153	1,267 597
17 Yekaterinburg-Almaty (Registered outside Astana)	67	821 305	4 0	127 91	69 46	1,021 403	30 14	109 93	111 95	250 193	17	0	33	1,321 699
18 Astana-Rozhdestvenka (Registered outside Astana) (OD other than Airport)	10	1,330 792 651	29 7 15	257 0 214	69 35 55	1,685 916 902	52 31 42	84 0 42	66 30 61	202 91 172	66	0	38	1,991 1,031 1,133
19 Astana-Korgalzhino (Registered outside Astana)	12	333 255	1 0	66 0	15 15	415 314	17 9	31 25	21 18	69 53	29	0	14	527 389
20 Yekaterinburg-Almaty (Registered outside Astana)	3	1,068 543	0 0	199 159	53 53	1,320 711	59 54	76 57	61 41	196 162	14	0	10	1,540 937
Total (Registered outside Astana (est.))	178	4,857 2,842	60 7	815 409	290 205	6,022 3,481	239 152	620 360	486 325	1,345 879	215	0	335	7,917 4,761

Source: JICA Study Team

Table B.1.3 Traffic Volume at Cordon Line (Outbound)

Number of Vehicles Interviewed in the Car OD Survey (Roadside) -Outbound-

Site	Vehicle type												Total	
	1 Motor-	2 Pass.	3 Taxi	4 Pick-up,	5 Mini-	Sub-total	6 Light	7 Middle	8 Heav	Sub-total	10 Bus	11 Trolley		12 Others
	cycle	car		Jeep	bus		Truck	Truck	Truck			bus		
							(1.5-3.5t	(3.5-10t)	(10t-)					
15 Astana-Petropavlovsk (Registered outside Astana)	-	19 7	0 0	21 15	2 1	42 23	4 3	12 10	12 12	28 25	4 1	0 0	3 0	77 49
16 Astana-Yereimentau (Registered outside Astana)	-	54 21	3 1	0 0	2 1	59 23	9 3	8 2	27 9	44 14	3 1	0 0	0 0	106 38
17 Yekaterinburg-Almaty (Registered outside Astana)	-	54 26	0 0	2 2	5 4	61 32	10 9	23 16	15 11	48 36	1 1	0 0	0 0	110 69
18 Astana-Rozhdestvenka (Registered outside Astana) (OD other than Airport)	-	102 16 52	4 0 3	5 1 5	9 3 7	120 20 67	7 1 6	6 2 5	8 4 8	21 7 19	3 0 2	0 0 0	1 0 0	145 27 88
19 Astana-Korgajino (Registered outside Astana)	-	30 17	0 0	1 1	0 0	31 18	1 1	3 0	1 1	5 2	4 3	0 0	1 1	41 24
20 Yekaterinburg-Almaty (Registered outside Astana)	-	24 11	2 0	2 0	5 2	33 13	14 7	5 4	8 5	27 16	0 0	0 0	0 0	60 29
Total (Registered outside Astana)	-	283 98	9 1	31 19	23 11	346 129	45 24	57 34	71 42	173 100	15 6	0 0	5 1	539 236

Source: JICA Study Team

Number of Vehicles in the Traffic Count Survey at Cordon Line -Outbound-

Site	Vehicle type												Total  (excl.mo- to cycle)	
	1 Motor- cycle	2 Pass. car	3 Taxi	4 Pick-up, Jeep	5 Mini- bus	Sub-total (excl.mo- to cycle)	6 Light Truck (1.5-2.0t)	7 Middle Truck (2.0-8.0t)	8 Heav Truck (8t-)	Sub-total	10 Bus bus	11 Trolley		12 Others
15 Astana-Petropavlovsk (Registered outside Astana)	13	741	4	81	51	877	47	133	72	252	64	0	88	1,281
	-	273	0	58	26	480	35	111	72	225				815
16 Astana-Yereimentau (Registered outside Astana)	47	511	9	70	27	617	40	144	146	330	41	0	135	1,123
	-	199	3	0	14	241	13	36	49	105				403
17 Yekaterinburg-Almaty (Registered outside Astana)	39	781	3	125	66	975	40	110	86	236	22	0	33	1,266
	-	376	0	125	53	511	36	77	63	177				794
18 Astana-Rozhdestvenka (Registered outside Astana)	9	1,412	38	238	86	1,774	57	87	44	188	72	0	34	2,068
	-	221	0	48	29	296	8	29	22	63				385
(OD other than Airport)		720	29	238	67	990	49	73	44	170	43		20	1,223
19 Astana-Korgaljino (Registered outside Astana)	11	372	0	61	9	442	24	35	22	81	22	0	20	565
	-	211	0	61	0	257	24	0	22	32				331
20 Yekaterinburg-Almaty (Registered outside Astana)	8	1,051	0	204	56	1,311	42	69	62	173	8	0	2	1,494
	-	482	0	0	22	516	21	55	39	103				722
Total (Registered outside Astana (est.))	127	4,868	54	779	295	5,996	250	578	432	1,260	229	0	312	7,797
	-	1,762	3	291	143	2,301	138	308	266	705				3,414

Source: JICA Study Team

**Table B.1.4 Multipliers for the CAR OD (Roadside Interview)**

**Passenger Vehicle -Inbound-**

Site	Number of passenger vehicles (registered outside of Astana) (est.)					Number of passenger vehicles (Car OD survey) (registered outside of Astana)					Multiplier
	2 Pass. car	3 Taxi	4 Pick-up, Jeep	5 Mini- bus	Total	2 Pass. car	3 Taxi	4 Pick-up, Jeep	5 Mini- bus	Total	
15	700	0	86	56	844	49	0	13	1	63	13.4
16	246	0	73	0	293	25	0	2	0	27	10.8
17	305	0	91	46	403	36	0	5	2	43	9.4
18	792	7	0	35	916	56	1	0	5	62	14.8
19	255	0	0	15	314	26	0	0	2	28	11.2
20	543	0	159	53	711	29	0	4	2	35	20.3
Total	2,842	7	409	205	3,481	221	1	24	12	258	13.5

**Passenger Vehicle -Outbound-**

Site	Number of passenger vehicles (registered outside of Astana) (est.)					Number of passenger vehicles (Car OD survey) (registered outside of Astana)					Multiplier
	2 Pass. car	3 Taxi	4 Pick-up, Jeep	5 Mini- bus	Total	2 Pass. car	3 Taxi	4 Pick-up, Jeep	5 Mini- bus	Total	
15	273	0	58	26	480	7	0	15	1	23	20.9
16	199	3	0	14	241	21	1	0	1	23	10.5
17	376	0	125	53	511	26	0	2	4	32	16.0
18	221	0	48	29	296	16	0	1	3	20	14.8
19	211	0	61	0	257	17	0	1	0	18	14.3
20	482	0	0	22	516	11	0	0	2	13	39.7
Total	1,762	3	291	143	2,301	98	1	19	11	129	17.8

Source: JICA Study Team

Note: The numbers of vehicles are those registered in 2000.

**Table B.1.5 Multipliers for the CAR OD (Roadside Interview)**

**Truck -Inbound-**

Site	Number of trucks (registered outside of Astana) (est.)				Number of trucks (Car OD survey) (registered outside of Astana)				Multiplier
	6 Light	7 Middle	8 Heavy	Total	6 Light	7 Middle	8 Heavy	Total	
	Truck	Truck	Truck		Truck	Truck	Truck		
	(1.5-3.5t)	(3.5-10t)	(10t-)		(1.5-3.5t)	(3.5-10t)	(10t-)		
15	28	76	49	171	7	8	17	32	5.3
16	16	109	93	210	3	11	15	29	7.2
17	14	93	95	193	6	17	24	47	4.1
18	31	0	30	91	3	0	6	9	10.1
19	9	25	18	53	2	9	5	16	3.3
20	54	57	41	162	11	6	2	19	8.5
Total	152	360	325	879	32	51	69	152	-

**Truck -Outbound-**

Site	Number of trucks (registered outside of Astana) (est.)				Number of trucks (Car OD survey) (registered outside of Astana)				Multiplier
	6 Light	7 Middle	8 Heavy	Total	6 Light	7 Middle	8 Heavy	Total	
	Truck	Truck	Truck		Truck	Truck	Truck		
	(1.5-2.0t)	(2.0-8.0t)	(8t-)		(1.5-2.0t)	(2.0-8.0t)	(8t-)		
15	35	111	72	225	3	10	12	25	9.0
16	13	36	49	105	3	2	9	14	7.5
17	36	77	63	177	9	16	11	36	4.9
18	8	29	22	63	1	2	4	7	9.0
19	24	0	22	32	1	0	1	2	16.2
20	21	55	39	103	7	4	5	16	6.4
Total	138	308	266	705	24	34	42	100	-

Source: JICA Study Team

Note: The numbers of vehicles are those registered in 2000.



Table B.1.6 Traffic Volumes on the Street

Site		Vehicle type											Total			
		1 Motor- cycle	2 Pass. car	3 Taxi	4 Pick-up, Jeep	5 Mini- bus	Sub-total	6 Light Truck (1.5-2.0t)	7 Middle Truck (2.0-8.0t)	8 Heavy Truck (8t-)	Sub-total	10 Bus	11 Trolley bus	12 Others	(excl. mo- toycycle)	
1	12h.	34	15565	83	1574	1117	18339	673	822	882	2377	557	0	104	21377	
	24h.(est.)	-	-	-	-	-	-	-	-	-	-	-	-	-	30696	
3	12h.	44	7563	134	1271	467	9435	392	1433	135	1960	339	0	442	12176	
	24h.(est.)	-	-	-	-	-	-	-	-	-	-	-	-	-	17484	
4	12h.	137	4569	417	870	285	6141	290	1098	1044	2432	339	0	601	9513	
	24h.(est.)	-	-	-	-	-	-	-	-	-	-	-	-	-	13660	
5	12h.	31	10358	228	1219	1373	13178	307	0	401	708	1275	174	98	15433	
	24h.(est.)	-	-	-	-	-	-	-	-	-	-	-	-	-	22161	
6	12h.	22	10657	269	1038	1350	13314	370	756	787	1913	1476	0	109	16812	
	24h.(est.)	-	-	-	-	-	-	-	-	-	-	-	-	-	24141	
7	12h.	28	6944	386	1433	1243	10006	311	786	917	2014	773	0	141	12934	
	24h.(est.)	-	-	-	-	-	-	-	-	-	-	-	-	-	18573	
8	12h.	5	8305	314	1346	476	10441	167	45	4	216	97	0	103	10857	
	24h.(est.)	-	-	-	-	-	-	-	-	-	-	-	-	-	15590	
9	12h.	38	4187	64	689	257	5197	257	399	273	929	82	0	69	6277	
	24h.(est.)	-	-	-	-	-	-	-	-	-	-	-	-	-	9013	
10	12h.	22	1149	7	234	97	1487	85	259	158	502	71	0	245	2305	
	24h.	32	1466	10	290	116	1882	107	303	201	611	88	0	274	2855	
11	12h.	40	16423	307	2019	1272	20021	510	774	608	1892	802	0	60	22775	
	24h.	48	21686	501	2506	1614	26307	591	843	767	2201	1024	0	85	29617	
12	12h.	4	22018	360	2371	335	25084	457	255	80	792	1168	0	74	27118	
	24h.	7	32856	499	4107	2231	39693	683	380	82	1145	1504	0	91	42433	
2	12h.	36	13637	146	4652	1462	19897	882	744	355	1981	1595	242	168	23883	
	24h.(est.)	-	-	-	-	-	-	-	-	-	-	-	-	-	34295	
13	12h.	36	10168	114	1827	669	12778	447	1331	650	2428	514	0	163	15883	
	24h.	51	14814	211	2395	837	18257	521	1468	736	2725	666	0	223	21871	
14	12h.	42	19866	349	2136	1614	23965	586	784	1809	3179	1269	261	151	28825	
	24h.	62	29693	672	3147	2463	35975	722	900	2258	3880	1926	358	246	42385	

Source: JICA Study Team

Note: As of May 2000

Table B.1.7 Transport Modes and Access Time

Present Transport Mode (pers.)					
	Public transport mode	Car (self-ownership)	Car (company-ownership) only	Walking	Total
Person with car ownership	3	180	15	2	200
Person with no car ownership	242	0	0	57	299
Total	245	180	15	59	499

Source: JICA Study Team

Public Transport Modes (pers.)							
	Trolley bus	Bus	Mini-bus	Trolley bus + Bus	Bus + Bus	Unknown	Total
	38	156	42	1	5	2	244

Source: JICA Study Team

Personal Income Level (pers. unit: tenge/month)								
	4,000 ~4,000	8,000 ~8,000	16,000 ~16,000	24,000 ~24,000	32,000 ~32,000	40,000 ~40,000	48,000 ~48,000	Total
Person with car ownership	8	30	85	48	14	2	5	200
Person with no car ownership	33	98	112	47	6	1	2	299
Total	41	128	197	95	20	3	7	499

Source: JICA Study Team

Access Time for Commuting (Car Users) (pers. unit: min.)							
	1	2-3	4-5	6-10	11-15	16-	Unknown
	43	46	51	29	13	12	1
Total							195

Source: JICA Study Team

On Board Time for Commuting (Car Users) (pers. unit: min.)							
	1-5	6-10	11-15	16-20	21-25	26-30	31-
	36	46	41	34	15	10	12
Total							1

Source: JICA Study Team

Total Travel Time for Commuting (pers. unit: min.)										
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-
Car	6	22	24	38	32	23	21	8	12	8
Public transport	0	3	16	38	45	45	27	32	22	15
Total										

Source: JICA Study Team

**Table B.1.8 Parking Conditions**

Parking Condition-1	(pers.)			
	Public transport	Car (self-ownership)	Car (company-ownership)	Total
Parking availability at work place	1	117	11	129
No parking availability at working	0	62	4	66
Total	1	179	15	195

Source: JICA Study Team

Parking Condition-2	(pers.)		
	Easy parking	Difficulty in parking	Total
Parking availability at work place	91	38	129

Source: JICA Study Team

Parking Cost at Work Place (Car Users)	(pers. unit: tenge./day)								
	0	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	Unknown	Total
	142	1	14	11	12	9	5	1	195

Source: JICA Study Team

Table B.3.1 Traffic Demand Forecast

		2000						2030					
		Case 0		Case 1-1		Case 1-2		Case 2-1		Case 2-2		Case 3-1	
		V.U.M.	M.S.M. for PC	M.S.M. for PC	E.M. for cargo	M.S.M. for PC	E.M. for cargo	M.S.M. for PC	E.M. for cargo	M.S.M. for PC	E.M. for cargo	M.S.M. for PC	E.M. for cargo
Population	(pers.)	338,200	statistics	796,024	796,024	796,024	796,024	796,024	796,024	796,024	796,024	796,024	796,024
Population over 14 years old	(pers.)	250,268	calculated	589,058	589,058	589,058	589,058	589,058	589,058	589,058	589,058	589,058	589,058
GRDP per capita	(USD/pers.)	1,111	est.	3,604	3,604	3,604	3,604	3,604	3,604	3,604	3,604	3,604	3,604
Average person trips	(pers. trips/day)	2.6	est.	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Person trips total	(pers. trips/day)	650,697	calculated	1,531,550	1,531,550	1,531,550	1,531,550	1,531,550	1,531,550	1,531,550	1,531,550	1,531,550	1,531,550
Person trips (without trips by truck)	(pers. trips/day)	633,874	calculated	1,480,786	1,480,786	1,480,786	1,480,786	1,480,786	1,480,786	1,480,786	1,480,786	1,480,786	1,480,786
Number of vehicles	(vehicle)	38,894	statistics	278,608	278,608	278,608	278,608	278,608	278,608	278,608	278,608	278,608	278,608
Number of passenger cars	(vehicle)	27,819	statistics	238,807	238,807	238,807	238,807	238,807	238,807	238,807	238,807	238,807	238,807
Vehicle ownership	(veh./1,000 pers.)	115	calculated	350	350	350	350	350	350	350	350	350	350
Passenger car ownership	(veh./1,000 pers.)	82	calculated	300	300	300	300	300	300	300	300	300	300
Unreported public transport passenger rate	(%)	30	est.	-	-	-	-	-	-	-	-	-	-
Vehicle occupancy	(pers./veh.)	1.8	est.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Modal split (without trips by truck)													
veh. for pax.	(pers. trips/day)	140,197	calculated	444,236	444,403	444,403	444,403	481,255	481,437	481,437	481,437	518,275	518,470
public	(pers. trips/day)	197,958	calculated	518,275	518,470	518,470	518,470	518,275	518,470	518,470	518,470	555,295	555,504
walk, bicycle, etc.	(pers. trips/day)	295,719	calculated	518,275	518,470	518,470	518,470	481,255	481,437	481,437	481,437	407,369	407,369
Modal share													
veh. for pax.	(%)	22.1	calculated	68	30	30	30	32.5	32.5	32.5	32.5	35.0	35.0
public	(%)	31.2	calculated	2	35	35	35	35.0	35.0	35.0	35.0	37.5	37.5
walk, bicycle, etc.	(%)	46.7	calculated	30	35	35	35	32.5	32.5	32.5	32.5	27.5	27.5
Average trips of vehicle for passengers	(veh. trips/day)	2.80	calculated	2.80	1.24	1.24	1.24	1.34	1.34	1.34	1.34	1.45	1.45
Vehicle trips total	(veh. trips/day)	87,233	surveyed	702,194	330,000	329,740	329,740	354,680	354,429	354,429	354,429	379,359	379,118
Vehicle trips of passenger cars		77,887	surveyed	668,607	296,157	296,269	296,269	320,837	320,958	320,958	320,958	345,517	345,647
Vehicle trips of trucks		9,346	surveyed	33,588	33,843	33,471	33,471	33,843	33,471	33,843	33,471	33,843	33,471

Source: JICA Study Team and Statistics

Not V.U.M. = Vehicle Unit Method for passenger and cargo transport

M.S.M. for PC = Modal Share Method for passenger transport

E.U.M. for cargo = Economic Unit Model for cargo transport

E.M. for Cargo = Elasticity Model for cargo transport

**Table B.3.2 Results of Regression Analysis for Traffic Demand**

**Simple Regression**

Dependent variable	Independent variable				
	1. Population	2. Working population	3. Population+ working pop.	4. Working pop. (industry and construction)	5. Working pop. (tertiary industry)
Veh.trips for passengers	0.89	0.80	0.93	0.48	0.81
Veh.trips for cargo	0.17	0.50	0.30	0.60	0.43

**Multiple Reression**

Dependent variable	Independent variable	
	1. Population, Working pop.	2. Working pop (industry and construction), Working pop (tertiary industry)
Veh.trips for passengers	0.93	-
Veh.trips for cargo	-	0.61

**Table B.3.3 Category of Roads and Streets**

Category of roads and streets	Principal purpose of roads and streets
Main roads: -highways	High speed transport communication between industrial and planning rayons in the biggest and big cities; exits to outer motor roads, airports, large recreation zones and settlements in the settling system. Intersections with main streets and roads at different levels
-of regulated traffic	Transport communication between regions of the city in different directions and sections of mainly freight traffic, carried out outside residential construction, exits to outer motor roads, intersections with roads and streets, as a rule, at one level
Main streets: of city importance: -of continuous traffic	Transport communication between residential, industrial regions and public centers in big cities, and also with other main streets, with city and outer motor roads. Provision of transport traffic in main directions at different levels
-of regulated traffic	Transport communication between residential, industrial regions and city center, between centers of planning rayons, exits to main streets and roads and outer motor roads. Intersection with main streets and roads, as a rule, at one level
Of regional importance: -transport-pedestrian	Transport and pedestrian communication between residential areas, also between residential and industrial areas, public centers, exits to the other main streets
-pedestrian-transport	Pedestrian and transport communication (mainly public passenger transport) within planning rayon
Streets and roads of local importance: -streets in residential construction	Transport (excluding freight transport and public transport) and pedestrian communications in residential areas (micro-districts), exits to main streets and roads of regulated traffic
-streets and roads in scientific , industrial and communal-storage zones (regions)	Transport communication mainly of passenger and freight transport within zones (regions), exits to main city roads. Crossings with streets and roads are arranged at one level
-park roads	Transport communication within territory of parks and forest parks, mainly for passenger car traffic
Pedestrian streets and roads	Pedestrian communication with working places, institutions and enterprises of service, including territory of public centers, recreation zones and stops of public transport
Access roads	Approach of vehicles to residential and public buildings, institutions, enterprises and to other city facilities inside rayons, micro-districts, blocks
Cycle tracks	Riding bicycles along free from other types of transport highways to public centers, and in the biggest and big cities-communication within planning rayons.

Source: SNiP 2.07.01-89

**Table B.3.4 Design Standard of Roads and Streets**

Category of roads and streets	Calculated speed of traffic km/hour	Width of traffic lane, m	Number of traffic lanes	Minimum radius of curves in plan, m	Maximum longitudinal slope, (o/oo)	Width of pedestrian part of sidewalk, m
<b>Main roads:</b>						
-highways	120	3.75	4-8	600	30	-
-of regulated traffic	80	3.50	2-6	400	50	-
<b>Main streets:</b>						
<u>Of city importance:</u>						
-of continuous traffic	100	3.75	4-8	500	40	4,5
-of regulated traffic	80	3.50	4-8	400	50	3,0
<u>Of regional importance:</u>						
-transport-pedestrian	70	3.50	2-4	250	60	2,25
-pedestrian-transport	50	4.00	2	125	40	3,0
<b><u>Streets and roads of local importance:</u></b>						
-streets in residential construction	40	3.00	2-3*	90	70	1,5
	30	3.00	2	50	80	1,5
-streets and roads of scientific, industrial and communal-storage zones	50	3.50	2-4	90	60	1,5
	40	3.50	2	50	70	1,5
-park roads	40	3.00	2	75	80	-
<b><u>Throughfares:</u></b>						
-main	40	2.75	2	50	70	1,0
-secondary	30	3.50	1	25	80	0,75
<b><u>Pedestrian streets:</u></b>						
-main	-	1.00	according to the calculation	-	40	according to the design
-secondary	-	0.75		-	60	
<b><u>Cycle tracks:</u></b>						
-separate	20	1.50	1-2	30	40	-
-isolated	30	1.50	2-4	50	30	-

\* Taking into account use of one lane for parking of passenger cars.

Source: SNIP 2.07.01-89

**Table B.3.5 Classification of Roads**

Road Category	Planned traffic volume (vh./day)		Economic and administrative importance of roads
	Passenger cars	Transport unit	
Ia	>14,000	>7,000	Major highways of Republican significance (including national roads)
Ib	>14,000	>7,000	All roads not belonging to Category Ia of Oblast significance (not belonging to Ia)
II	6,000-14,000	3,000-7,000	All roads not belonging to Category Ia of Oblast significance (not belonging to Ia)
III	2,000-6,000	1,000-7,000	Roads of Republican, Oblast and local significance (not belonging to Ib and II)
IV	200-2,000	100-1,000	Roads of Republican, Oblast and local significance (not belonging to Ib, II and III)
V	upto 200	upto 100	Roads of local significance

Source: SNIP 2.05.02-85



**Table B.3.6 Criteria for Number of Lanes**

	Traffic volume (24 hours)		
	14000-40000	40000-80000	80000-
Number of Lane (m)	4	6	8

Source: SNIP 2.05.02-85

**Table B.3.7 Volume-Capacity Balance in 2030**

	Southern sec.	Southeastern sec.	East sec.	Northern sec.	Railway cros.	River cros.
Capacity (pcu.)	174000	208000	68000	174000	276000	412000
	2X6-lane road	2X6-lane road		2X6-lane road	2X6-lane road	2X6-lane road
	1x4-lane road	2x4-lane road	2x4-lane road	1x4-lane road	4x4-lane road	8x4-lane road
Volume	55500	70200	31300	85200	73800	184100
V/C Ratio	0.32	0.34	0.46	0.49	0.27	0.45

Source: JICA Study Team

Note: pcu.=passenger car equivalent unit

**Table B.3.8 National Highway in 20km radius (Existing)**

Name		Class	Length (km)	Km-posts	No. of lanes	Demarcation stripe
P2	Yekaterinburg - Almaty	III	5	1235-1250	2	
		I	15	1250-1255	4	
		I	16	1262-1278	4	1270.2-176.95 (3m)
		III	1	1278-1279	2	
		I	1	1279-1280	4	
		III	2	1280-1282	2	
P23	Astana - Yereimentua	I	4	0-4	4	
		III	4	4-20	2	
P9	Astana - Petropavlovsk	III	0	0-20	2	
	Access road	III	7	0-7	2	
	Airport access road	I	10	0-10	4	
		II	7	10-17	4	
	North-western bypass	I	8	0-8	4	

Source: Ministry of Transport

Note: As of 15th, April, 2000

**Table B.3.9 National Highway (Planned)**

Name		Class	Length (km)	Km-posts	No. of lanes	Demarcation stripe
KR No.5	Eastern bypass	II		14 0-14		4
KR No.2	Western bypass	II		13.5 0-13.5		4
KR No.4	Northern bypass	II		14 0-14		4
KR No.1	South-western bypass	II		31 0-31		4
KR No. 6	South bypass	II		16 0-16		4
P2	Yekaterinburg - Almaty	I		1 1278-1279		4
		I		2 1280-1282		4

Source: Ministry of Transport

Note: As of 15th, April, 2000

**Table B.3.10 Right of Way Standard**

Table B.3.10 Right of Way Standards		
Category of Roads and Streets	Number of Lanes	Right of Way  (m)
Main Street		
Of city importance		
- of continuous traffic	up to 8	80
- of regulated traffic	up to 6	60
Of regional importance	up to 4	40
Streets and roads		
Of local importance		
-streets in residential construction	2-3	16-35
-streets and roads of scientific, industrial and communal-storage zones	2	16-35
Park roads	2	36
Special roads		
Boulevards		80-100
Riverside Roads(promenade)		50-55
Tram roads		80
District roads		68,80
Residential (parade) roads		80-100

Note: Those are basically derived from Saudi Binladin report.

Table B.3.11 Road Projects (1/3)

No.	Termini	Length (planned) (km)	Lanes (planned)	Lanes (existing)			Length (construction) (km)	Length (Widening) (km)	Remarks
				6	4	2			
sp-1	R1 ring road	83.90	4		8.00		75.90		
a-1	sp-1 - sp-1	28.55	6(4)		14.29		14.26	14.29	Severnoye Highway, Potanin St., Sary Arka St.
a-2	R2 ring road	57.75	4			1.27	56.48	1.27	
a-3	R3 ring road	21.87	6	6.08	4.08		11.71	4.08	Abylaikhan St., Kenesary St.
a-4	a-1 - a-5	13.72	6(4)	1.96	9.72	2.04	0	11.56	Pushkin St., Respublica Ave.
a-5	a-1 - a-1	16.78	6		2.01	1.62	13.15	3.63	Gyote St., Valikhanov St.
a-6	sp-1 - sp-1	19.99	6	9.79	10.20		0	10.00	Astrakhanskoe St., Batyr Bogembai Ave., Panfilov St., Sofievskoye Highway
a-7	a-3 - sp-1	7.04	6	1.70	5.34		0	5.34	Vishnevskoye Highway
a-8	a-1 - a-10	7.61	6				7.61	0	
a-9	a-2 - a-3	6.16	6				6.16	0	
a-10	a-2 - a-3	5.68	6				5.68	0	
p-1	a-4 - a-2	15.28	4		1.10	2.51	11.67	2.51	Imanov St., Mirzoyan St.
p-2	a-5 - p-7	5.84	4		3.90	1.94	0	1.94	Gumilev St.
p-3	a-4 - sp-1	14.60	4		14.60		0	0	Kurgaldzhinskoye Highway
p-4	a-1 - a-5	3.87	4				3.87	0	
p-5	a-5 - a-10	8.30	4			0.49	7.81	0.49	
p-6	a-1 - a-2	13.79	4		6.47		7.32	0	Ugolnaya St., Vishnevskaya St.
p-7	a-2 - p-6	13.55	4			3.84	9.71	3.84	
p-8	a-2 - a-3	4.79	4				4.79	0	
p-9	a-2 - a-3	6.27	4		1.05	3.39	1.83	3.39	Stanislavsky St., Novaya St., Katchenko St., Kumisbekov St.
p-10	a-3 - a-5	3.34	4		3.10	0.24	0	0.24	Pobeda Ave.
p-11	a-4 - p-1	8.11	4	2.41	2.38		3.32	0	Kravtsov St., Manas St.
p-12	a-1 - sp-1	5.41	4		5.41		0	0	

Table B.3.11 Road Projects (2/3)

No.	Termini	Length (planned) (km)	Lanes (planned)	Lanes (existing)	Length (construction)			Length (Widening) (km)	Remarks
					6	4	2		
					(km)	(km)	(km)		
s-1	a-5 - s-5	2.64	4		2.39		0.25	0	Beibitshik St.
s-2	p-9 - s-1	1.80	4				1.80	0	Zatayevich St., Akzhaiyk St.
s-3	a-4 - p-9	1.87	4				1.87	0	Moskovskaya St.
s-4	p-9 - s-7	4.82	4		2.40		1.93	0.49	Seifullin St.
s-5	p-8 - p-9	9.65	4		5.27		2.92	1.46	Abai Ave.
s-6	a-3 - s-4	0.63	4				0.63	0	Lomonosov St.
s-7	a-3 - s-4	0.60	4				0.60	0	Lihachev St.
s-8	a-3 - s-9	5.03	4				2.08	2.95	Rabochaya St.
s-9	a-1 - s-41	6.32	4		1.26		0.78	4.28	Krivoguz St.
s-10	a-2 - a-3	5.84	4				1.57	4.27	
s-11	p-8 - s-12	9.62	4				2.47	7.15	
s-12	a-1 - p-7	2.94	4		0.57			2.37	Sevornoye Highway
s-13	p-7 - p-11	5.61	4	1.52			1.17	2.92	
s-14	a-2 - p-11	7.71	4				1.20	6.51	
s-15	a-1 - a-1	3.39	4					3.39	0
s-16	a-3 - a-4	1.86	2		0.68		0.42	0.76	0.42
s-17	s-13 - s-14	1.66	4				0.94	0.72	0.94
s-18	a-4 - a-5	1.01	4		0.32		0.51	0.18	0.51
s-19	a-7 - s-14	3.60	4				3.60	0	
s-20	a-3 - s-14	1.36	4					1.36	0
s-21	a-10 - p-1	2.59	4					2.59	0
s-22	p-11 - p-11	2.52	4					2.52	0
s-23	a-1 - sp-3	2.77	4					2.77	0
s-24	a-1 - sp-3	2.78	4					2.78	0
s-25	a-3 - a-8	1.28	4					1.28	0
s-26	a-3 - s-33	3.26	4					3.26	0
s-27	s-24 - s-33	2.36	4					2.36	0
s-28	a-4 - s-26	1.22	4					1.22	0
s-29	s-24 - s-33	2.37	4					2.37	0
s-30	a-4 - a-5	1.58	4					1.58	0
s-31	a-4 - a-5	1.52	4					1.52	0
s-32	s-28 - s-33	1.26	4					1.26	0
s-33	a-1 - p-5	4.30	4					4.30	0
s-34	a-1 - a-2	3.51	4					3.51	0
s-35	a-2 - a-8	5.04	4					5.04	0
s-36	p-5 - s-35	1.46	4					1.46	0
s-37	a-2 - a-9	9.86	4					9.86	0
s-38	p-5 - s-35	2.78	4					2.78	0
s-39	a-2 - p-5	2.71	4					2.71	0
s-40	a-2 - p-5	2.27	4					2.27	0
s-41	a-2 - p-3	3.92	4					3.92	0
s-42	a-2 - p-5	1.95	4					1.95	0
s-43	a-2 - sp-1	3.29	4					3.29	0
s-44	a-2 - sp-1	2.87	4					2.87	0
s-45	a-2 - sp-1	2.62	4					2.62	0
s-46	a-2 - sp-1	2.49	4					2.49	0

Table B.3.11 Road Projects (3/3)

No.	Termini	Length (planned) (km)	Lanes (planned)	Lanes (existing)			Length (construction) (km)	Length (Widening) (km)	Remarks
				6	4	2			
t-1	a-5 - p-1	2.04	2			0.61	1.43	0	
t-2	a-3 - p-1	1.41	2				1.41	0	
t-3	a-3 - a-5	2.68	2			1.78	0.90	0	
t-4	p-11 - t-3	0.73	2			0.73	0	0	Miunaipaso Hadzhimukan St.
t-5	p-11 - t-3	0.50	2				0.50	0	
t-6	p-1 - s-20	1.39	2				1.39	0	
t-7	p-1 - s-19	2.27	2				2.27	0	
t-8	p-11 - s-19	3.22	2			0.79	2.43	0	
t-9	s-14 - t-2	1.10	2			0.87	0.23	0	
t-10	a-2 - t-11	2.67	2				2.67	0	
t-11	a-6 - s-9	2.29	2			2.09	0.20	0	Batursynov St., Orenburgskaya St.
t-12	p-10 - t-11	1.20	2			1.20	0	0	Konstitutsiya St.
t-13	s-9 - t-11	0.58	2			0.58	0	0	Vagonnaya St.
t-14	a-6 - s-4	1.64	2				1.64	0	
t-15	a-1 - p-7	3.75	2				3.75	0	
t-16	a-6 - t-15	1.66	2				1.66	0	
t-17	p-8 - s-13	3.51	2			0.94	2.57	0	
t-18	p-6 - p-8	1.80	2				1.80	0	
t-19	p-6 - t-18	1.10	2				1.10	0	
t-20	p-6 - t-21	1.05	2				1.05	0	
t-21	a-2 - p-6	2.75	2			0.99	1.76	0	
t-22	a-2 - a-6	3.60	2			1.38	2.22	0	
t-23	a-6 - s-10	1.40	2			0.69	0.71	0	
t-24	a-3 - s-14	1.37	2			1.37	0	0	
t-25	a-3 - t-26	0.83	2				0.83	0	
t-26	a-10 - s-19	1.70	2				1.70	0	
t-27	s-19 - s-21	1.21	2			1.21	0	0	
t-28	s-21 - t-27	1.33	2				1.33	0	
t-29	t-28 - t-32	1.62	2				1.62	0	
t-30	p-1 - t-29	1.10	2				1.10	0	
t-31	a-7 - t-29	1.03	2				1.03	0	
t-32	a-7 - p-1	2.27	2				2.27	0	
t-33	a-2 - t-32	1.01	2				1.01	0	
t-34	a-10 - s-42	1.43	2				1.43	0	
t-35	a-8 - p-5	1.08	2				1.08	0	
t-36	p-5 - p-11	2.22	2				2.22	0	
t-37	p-9 - s-8	1.42	2				1.42	0	
t-38	a-6 - s-10	1.04	2				1.04	0	
t-39	p-9 - s-10	0.56	2				0.56	0	
t-40	p-9 - s-10	0.29	2				0.29	0	
t-41	a-3 - s-33	1.99	2				1.99	0	
t-42	a-4 - t-41	0.34	2				0.34	0	
t-43	a-4 - t-41	0.40	2				0.40	0	
t-44	a-3 - p-1	2.66	2				2.66	0	
t-45	a-2 - s-37	1.06	2				1.06	0	
t-46	a-1 - s-12	3.77	2				3.77	0	
t-47	a-2 - t-46	0.73	2				0.73	0	
t-48	p-7 - t-46	0.54	2				0.54	0	
t-49	a-1 - a-2	3.98	2				3.98	0	
t-50	a-1 - t-49	1.17	2				1.17	0	
t-51	p-6 - p-7	2.12	2			1.44	0.68	0	Liteinaya St.
t-52	p-7 - t-53	1.08	2		1.08		0	0	
t-53	a-2 - a-6	3.45	2			2.99	0.46	0	
t-54	a-2 - p-7	0.92	2				0.92	0	
t-55	a-2 - sp-1	3.43	2				3.43	0	
t-56	a-2 - sp-1	2.90	2				2.90	0	
t-57	a-2 - p-3	6.99	2				6.99	0	



Parking type 1			Parking type 2			Parking type 3			Parking type 4			Parking type 5			
State & Municipality organization ownership			Approval by district city office (Akimat)			Contract with the Land Committee			Contract with State enterprise (Qorkommunkho z)			Private ownership			
No.	Capacit	Zone #	No.	Capacit	Zone #	No.	Capacit	Zone #	No.	Capacity	Zone #	No.	Capacity	Zone #	
Sary-Arka			Sary-Arka			Sary-Arka			Sary-Arka			Almaty			
1	70	2	1	30	2	1	50	3		1	60	2	1	80	5
2	60	3	2	40	3	2	30	3		2	50	3	2	60-80	5
3	50	3	3	30	3	3	20	3		3	50	3	3	80-100	7
4	45	3	4	40	3	4	40	3	Almaty				4	60-80	7
5	60	4	5	45	3	5	25	3		4	31	7	5	80	5
6	35	4	6	40	3	6	30	3		5	25-30	6	6	80-100	20
7	45	4	7	40	4	7	40	3		6	41	5			
			8	40	5	8	30	3		7	90-100	5			
			9	70	5	9	40	3		8	50	17			
		Almaty				10	40	2		9	40	8			
			10	11	5	11	26	4		10	45	7			
			11	45-50	5	12	40	4		11	35-45	8			
			12	25-30	5	13	55	4		12	110	8			
			13	15-20	6	14	60	4		13	40				
			14	15-20	6	15	35	4							
			15	50-60	6	16	10	4							
			16	52	6	17	40	5							
			17	40-50	6	18	35	5							
			18	14	6	19	30	18							
			19	50-60	6	Almaty									
			20	25-30	6	20	72	6							
			21	22	6	21	22	6							
			22	40-45	6	22	64	8							
			23	15-20	6	23	112	8							
			24	35-40	6	24	56	8							
			25	70-80	5										
			26	70-80	8										
			27	97	8										
			28	46	8										
			29	24	8										
			30	75-80	8										
			31	65-70	8										
			32	40-60	8										
			33	30-40	8										
			34	72	8										
			35	40-50	8										
			36	60-65	9										
			37	120	8										
			38	55-60	9										
			39	40-50	9										
			40	60-70	9										
			41	30	9										
			42	55-60	7										
			43	40-45	7										
			44	50-55	7										
			45	55-60	7										
			46	50-60	7										
			47	53	7										
			48	40-50	7										

**Table B.3.13 Parking Demand and Capacity Required**

Zone No.	Area	Pop.	Working population 2030	Tripends generated and attracted						Trips generated		Permanent Parking Demand 2030 (pcu)		Temporary Parking Demand 2030 (pcu)							Existing Temporary Parking Capacity (pcu)	Required Temporary Parking Capacity (pcu)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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**Table B.3.14 Norms of calculations related to parking lots**

Recreational territories, recreational buildings and facilities	Estimated unit	Number of cars per estimated unit
<b>Recreation territories and facilities</b>		
Beaches and parks in recreational zones	100 single visitors	15-20
Forest-parks and reserves	Ditto	7-10
Bases of short-term rest (sport, skiing, fishery, hunting and others)	"	10-15
Shore bases of small-sized fleet	"	10-15
Rest homes and sanatoriums, health resorts, facilities for rest of employees of enterprises and tourist centers	100 guests and service personnel	3-5
Hotels (tourist and resort)	Ditto	5-7
Motels and camping	"	According to the designed capacity
Enterprises of public meals, trade and communal and household service in recreation zones	100 seats in halls or single visitors and personnel	7-10
Gardening partnerships	10 plots	7-10
<b>Buildings and facilities</b>		
Establishments of management, credit-financial and legal institutions, of significance:		
-national	100 employees	10-20
-local	Ditto	5-7
Scientific and designing organizations, higher and secondary special educational institutions	"	10-15
Industrial enterprises	100 employees in two shifts	7-10
Hospitals	100 beds	3-5
Polyclinics	100 visits	2-3
Sport buildings and facilities with stands at capacity of 500 spectators	100 seats	3-5
Theatres, circuses, cinemas, concert halls, museums, exhibitions	100 seats or single visitors	10-15
Parks of culture and recreation	100 single visitors	5-7
Trade centers, department stores, shops with floor area more than 200 m <sup>2</sup>	100 m <sup>2</sup> of commercial area	5-7
Markets	50 trading seats	20-25
Restaurants and cafes of city significance	100 seats	10-15
High-grade hotels	Ditto	10-15
Other hotels	"	6-8
Depots of all types of transport	100 passengers, distant and local destinations, arriving at rush hours	10-15
Terminal and zone stations of high-speed passenger transport	100 passengers per rush hour	5-10

Footnotes: 1. Length of pedestrian crossings from parking lots for temporary storing of passenger cars to facilities of recreation zones must not exceed 1000m.

2. In national capitals, resort cities and tourist cities parking places for buses and passenger cars, owned by tourists, should be provided for and their number should be determined by calculation. The indicated parking places should be located taking into consideration comfortable approaches to the tourist attractions, but the distance should be not more than 500 m and they must not disturb the integrity of historical environment.

3. Number of cars should be accepted depending on motorization levels, determined for estimated period.

Source: SNIP 2.07.01-89

**Table B.3.15 Advantages and Disadvantages of Trolley Bus**

Compared with Tram	Compared with Bus
<ul style="list-style-type: none"><li>• Advantages<ul style="list-style-type: none"><li>- low cost for infrastructure</li><li>- better acceleration</li><li>- flexible operation on the route</li><li>- low noise</li><li>- low cost of vehicle</li></ul></li><li>• Disadvantages<ul style="list-style-type: none"><li>- complicated power supply cable network</li><li>- large space for turning back loop</li><li>- low transport capacity</li><li>- large consumption of energy</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Advantages<ul style="list-style-type: none"><li>- no emission of exhaust gas</li><li>- low noise</li><li>- low possibility of fire accident</li><li>- stable performance irrespective of altitude</li></ul></li><li>• Disadvantages<ul style="list-style-type: none"><li>- restricted operation defined by power supply cable</li><li>- high cost for vehicle</li><li>- high cost for infrastructure</li><li>- negative effect on the aesthetic appearance of the city</li></ul></li></ul>

**Table B.3.16 Characteristics of Public Transport Means**

		Metro	LRT	Tram	(Trolley) Bus
transport capacity	(pax./h/direction)	2500-40000	1500-18000	1000-6000	700-1800
trip length	(km)	5-15	3-10	1-5	1-5
minimum interval	(min.)	1-2	2-4	4-6	4-6
vehicle length	(m)	50-150	30-90	15-60	8-18
guideway		segregated tunnel	free lane- segregated	road-free lane	road free lane
stations		station	platform station	platform	bus stop platform
floor height	(cm)	80-120	50-90	30-80	30-70
station distance	(m)	800-1500	500-1500	300-700	300-700
operating speed	(km/h)	30-50	25-30	15-20	15-20
investment cost	(mil.USD/km)	15-50	7-15	5-10	1-3

Source: JICA Study Team


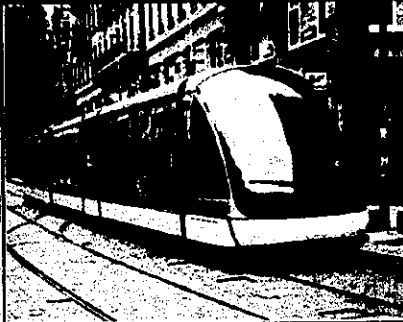


**Table B.3.17 Proposed LRT Routes**

Origin/Destination	Length  (km)		Population in Catchment Area 2030	
			Residential (pers.)	Working (pers.)
L-1 Astana Int. A.P. - Akmola St. route	21.7	16	112,000	74,100
L-2 new housing area route	7.9 (18.9)	8 (21)	111,900	89,800
L-3 R3 loop route	21.9	23	141,500	52,900

Note: Airport passengers are inclusive

Catchment area was assumed within 500m strip along the route.

**Table B.3.18 Reference of Characteristics of LRT**

									
Location									
Country		France		France		Germany		America	
City		Paris		Strasbourg		Oberhausen		Portland	
Population	(x 10,000)	931.9		38.8		22.5		45.1	
City Area	(km <sup>2</sup> )	2,377		171		77		323	
Density	(pers / km <sup>2</sup> )	3,920		2,272		2,922		1,396	
Line									
Route		St. Denis	Seine	A	B	-	East	West	
Operation Start		1992 Jul. 6	1997 Jul. 3	1994 Nov. 26	2000 Sep. 2	1996 Jun. 2	1986 Sep. 5	1998 Sep. 12	
Railway Length	(km)	9.0	11.4	12.6	12.2	8.2	23.9	28.4	
Capacity of LRT									
Train Capacity	(pers / train)	174	174	210	270	168	261 x 2	261 x 2	
Minimum Interval	(minutes)	5	5	3	3	10	6	10	
Transport Capacity	(pers / hr)	2,088	2,088	4,200	5,400	1,008	5,220	3,132	
Operating Speed	(km / hr)	19.0	-	21.8	21.8	-	35.0	34.8	
Station									
Nos.		22	13	22	24	8	28	22	
Ave. Interval	(m)	429	950	600	950	1,171	886	1,352	
Construction Cost	(mil.USD/km)	14.6		26.3		-	36.3**		

Note)

\*: Including construction of underground structures

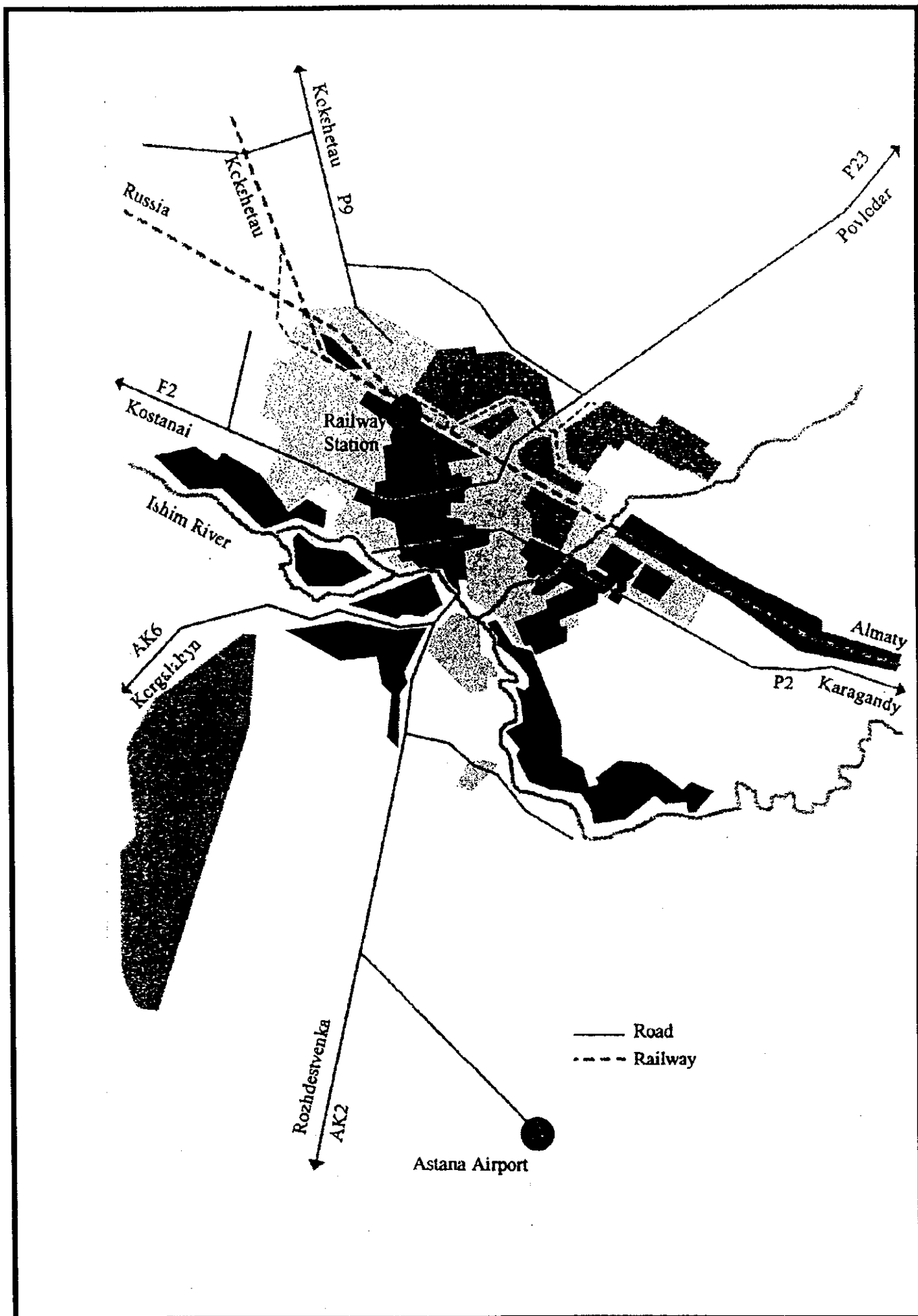
\*\*: Including construction of 4.8km tunnel



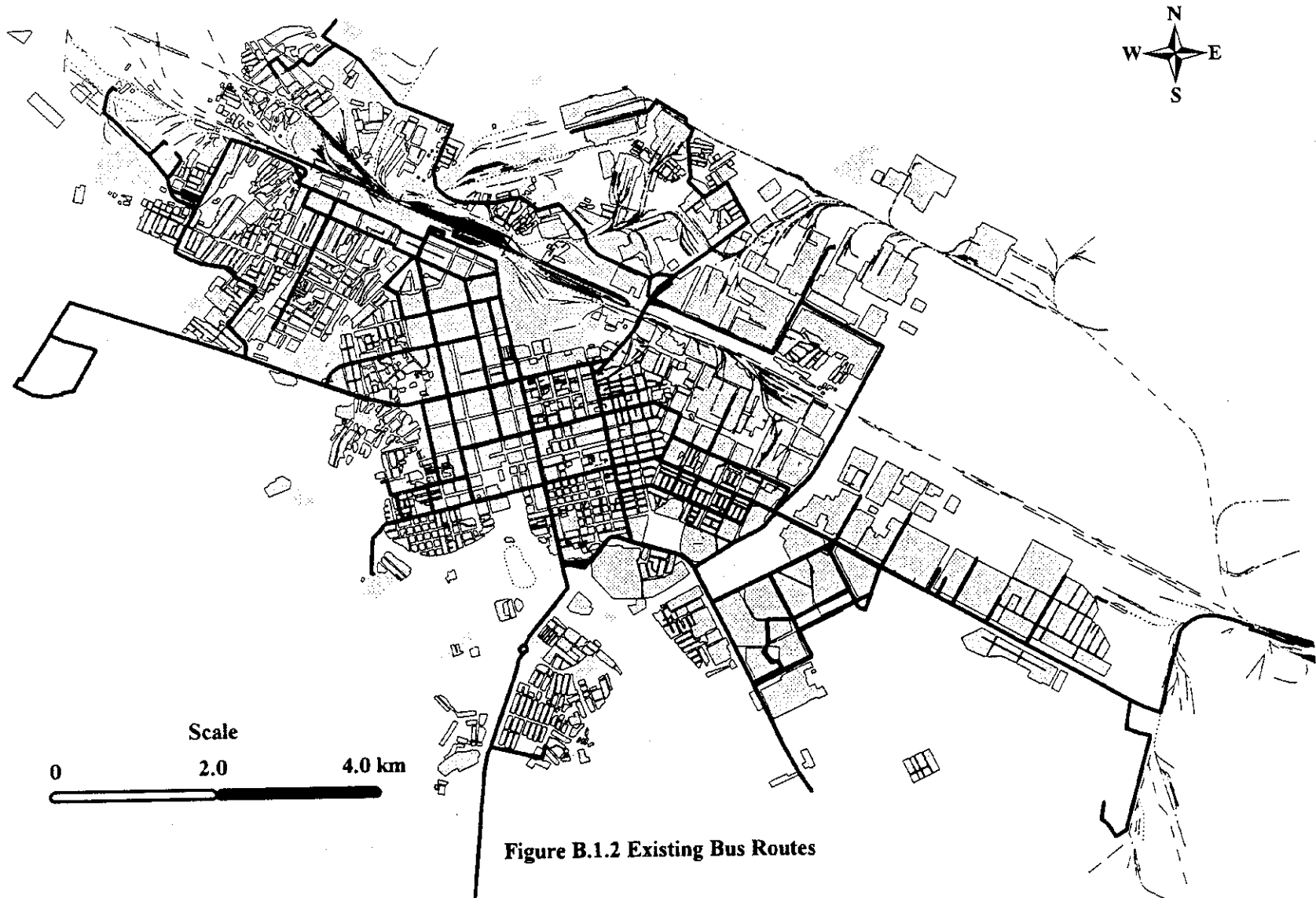


***FIGURE***

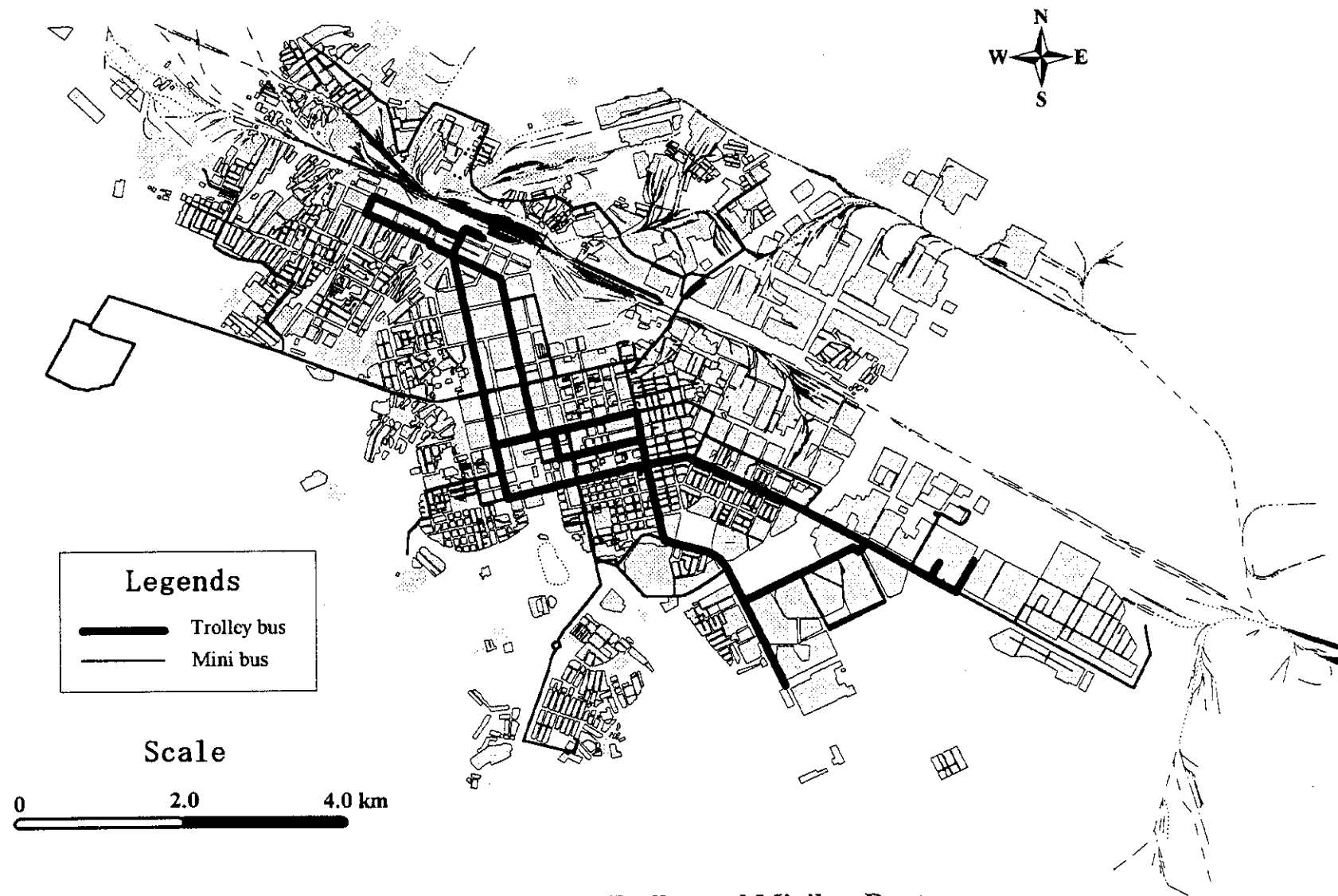




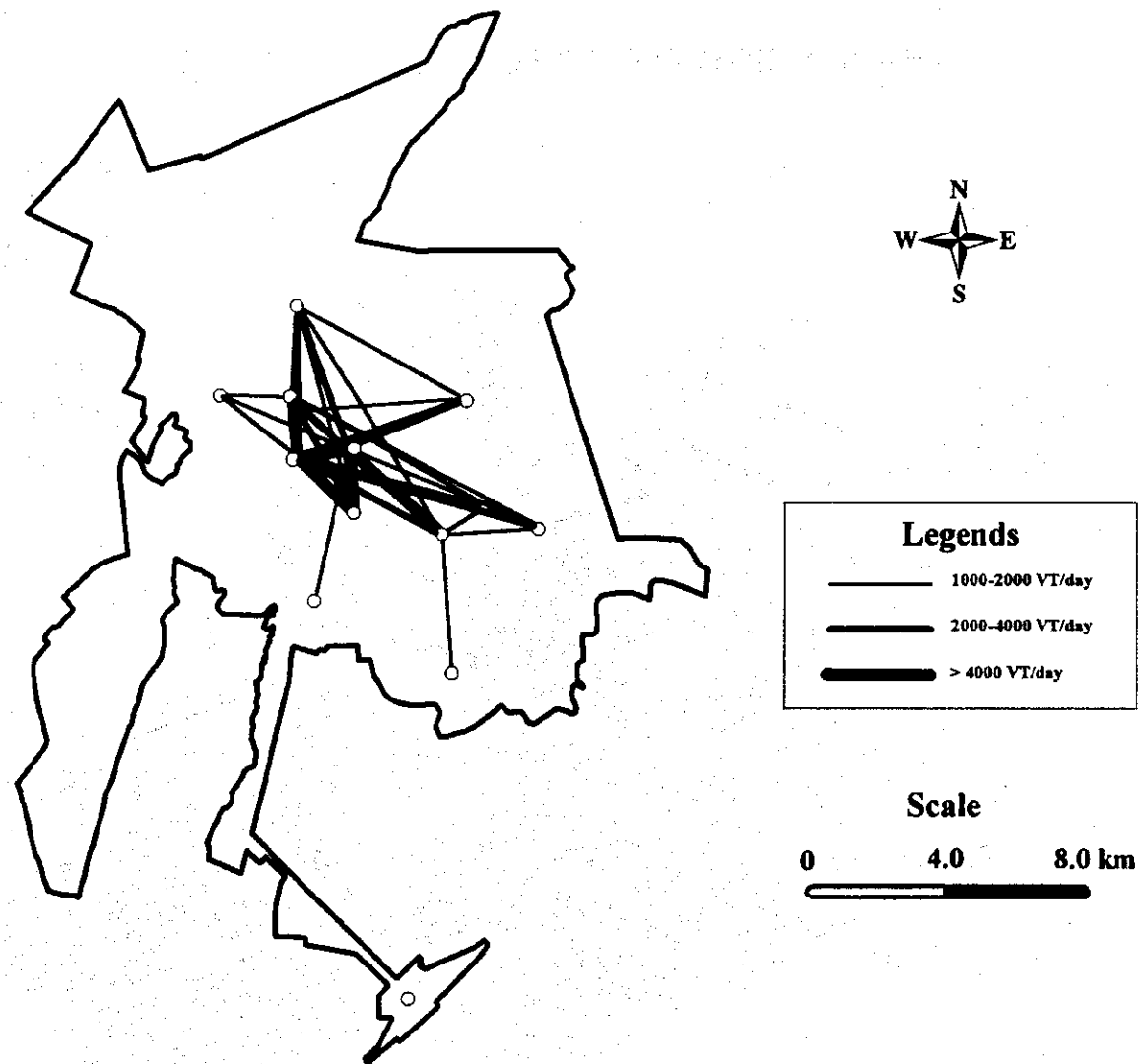
FigureB.1.1 Regional Transport Infrastructure



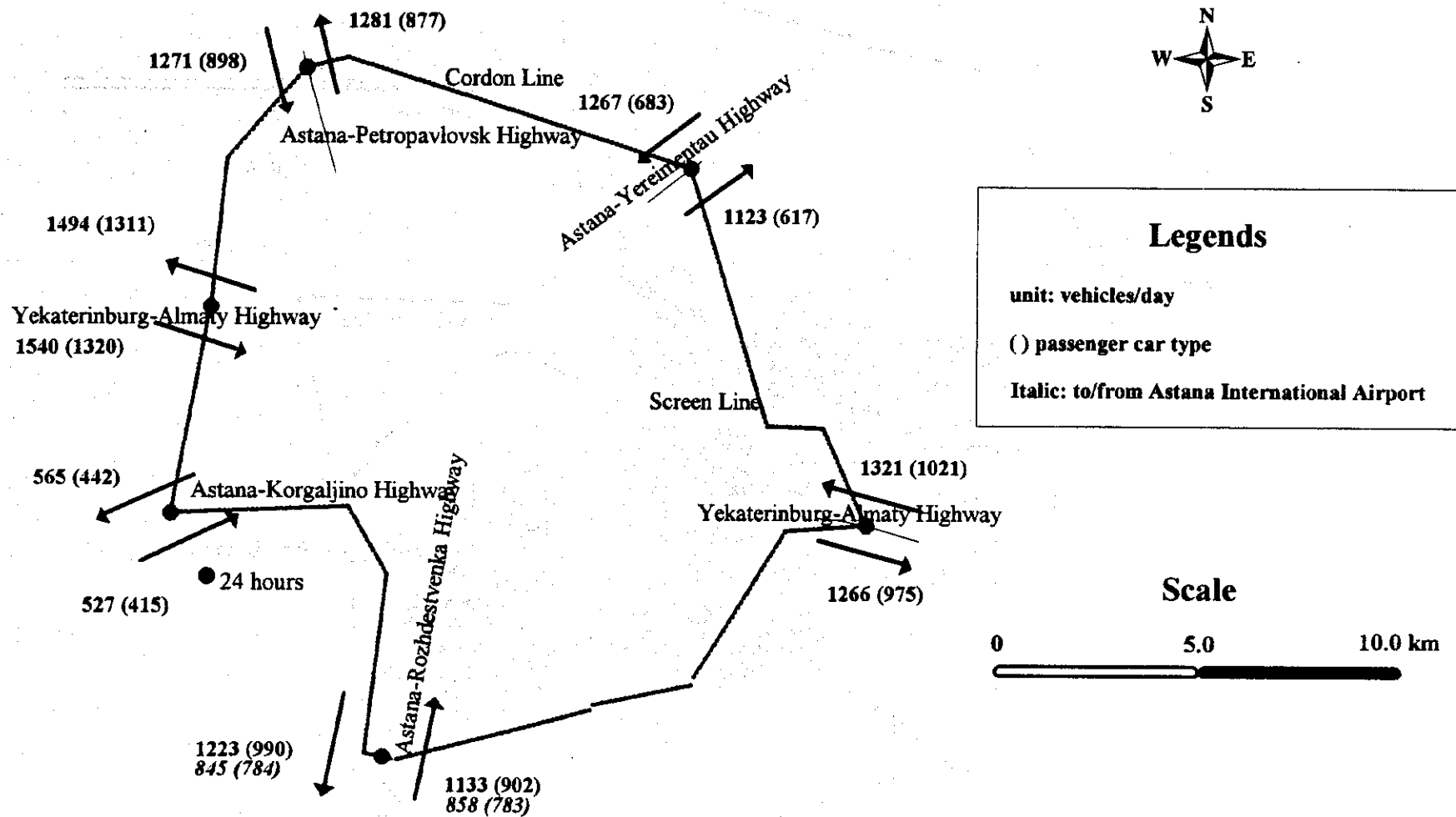
**Figure B.1.2 Existing Bus Routes**



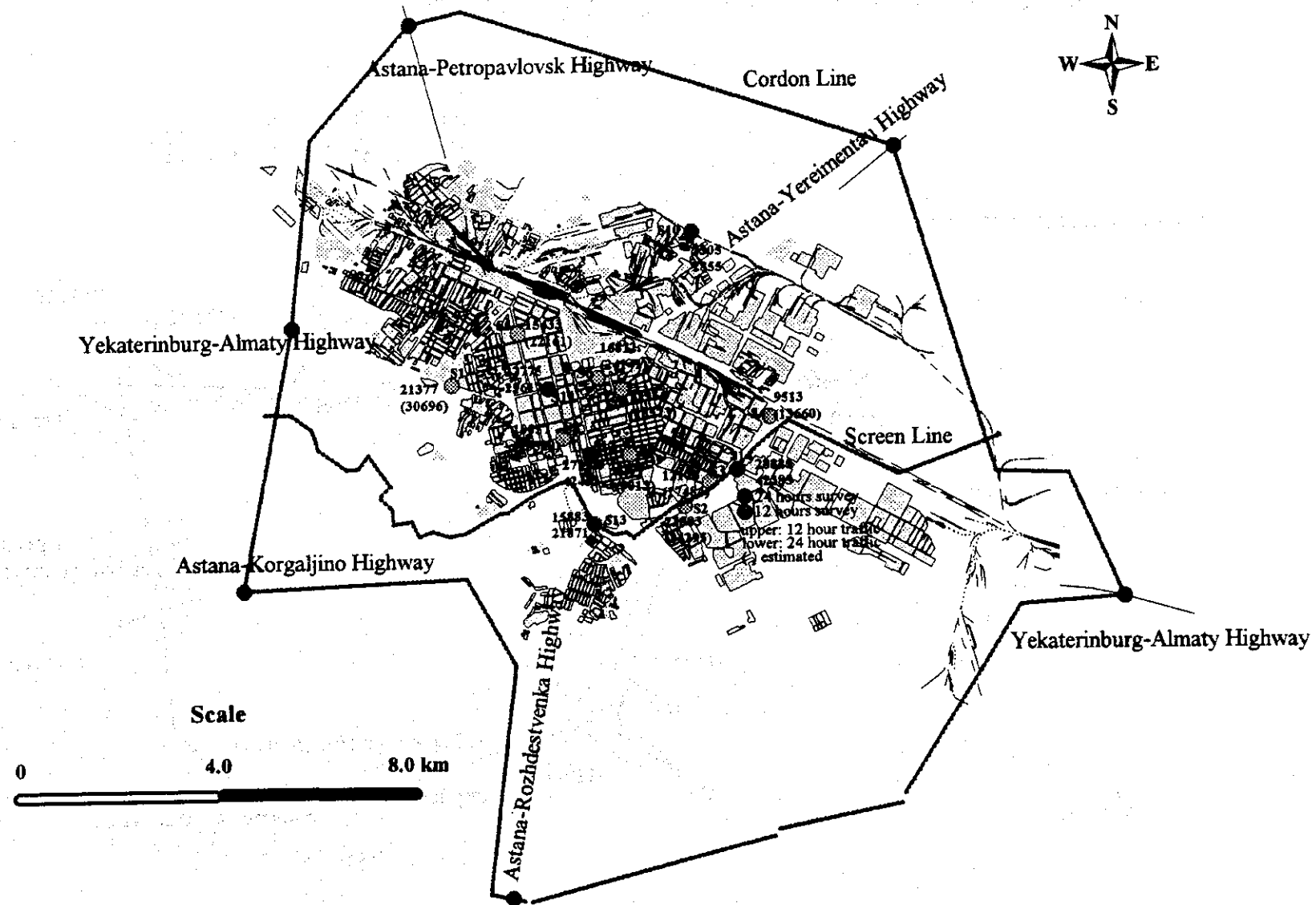
**Figure B.1.3 Existing Trolley and Minibus Routes**



**Figure B.1.4 Desired Line of PC Vehicle Trips in 2000**

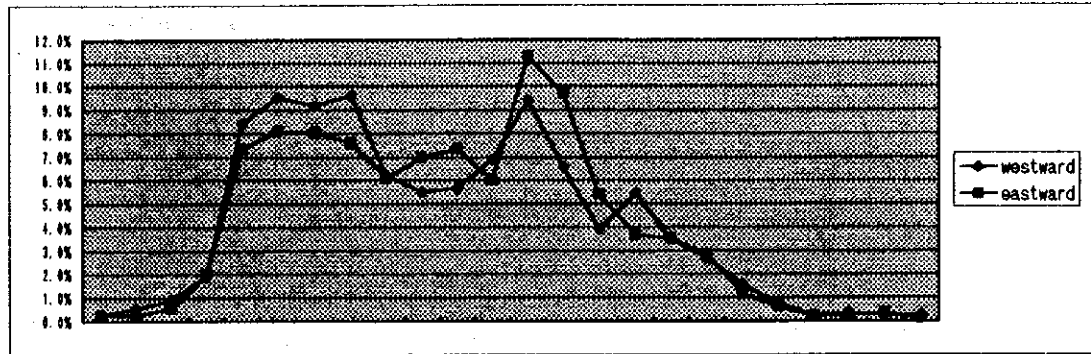


**Figure B.1.5 Traffic Volume to/from Astana, 2000**

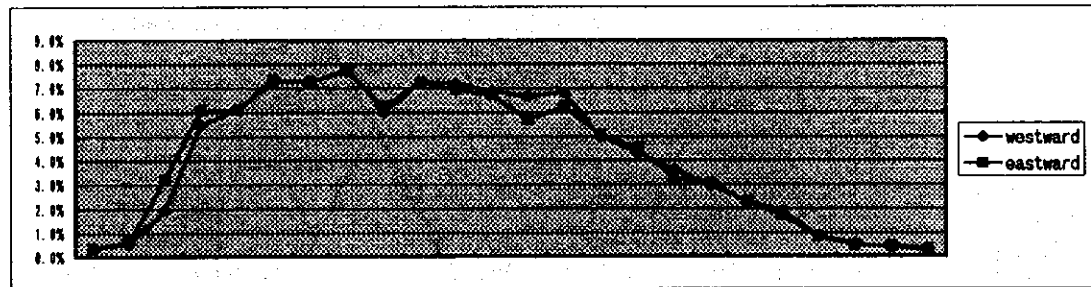




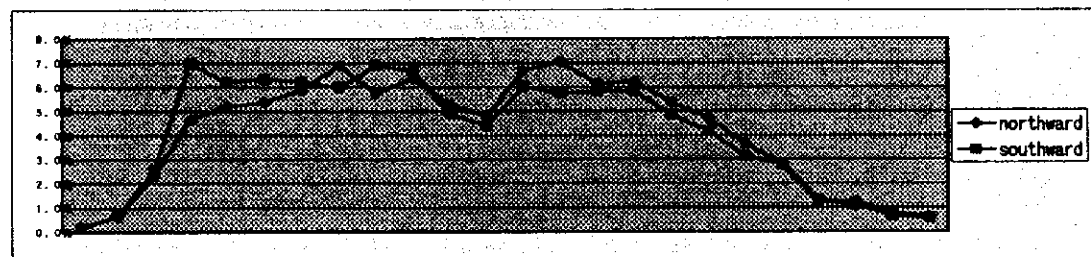
Site 10



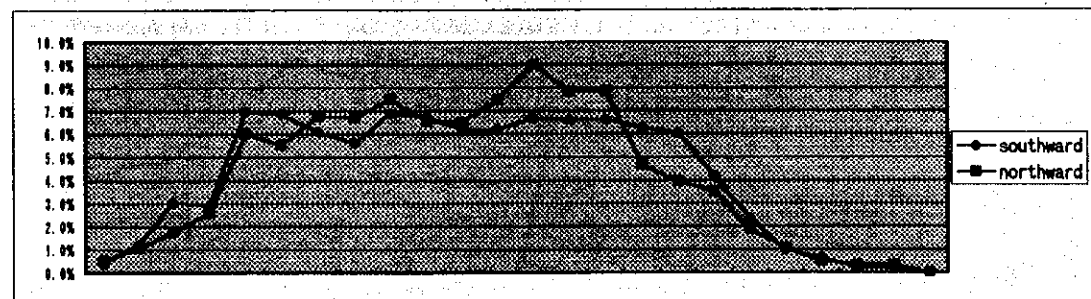
Site 11  
Batyр Bogembai



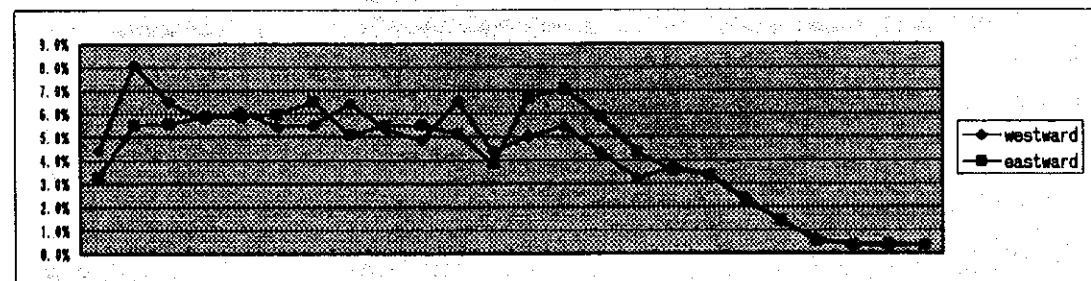
Site 12  
Respublika



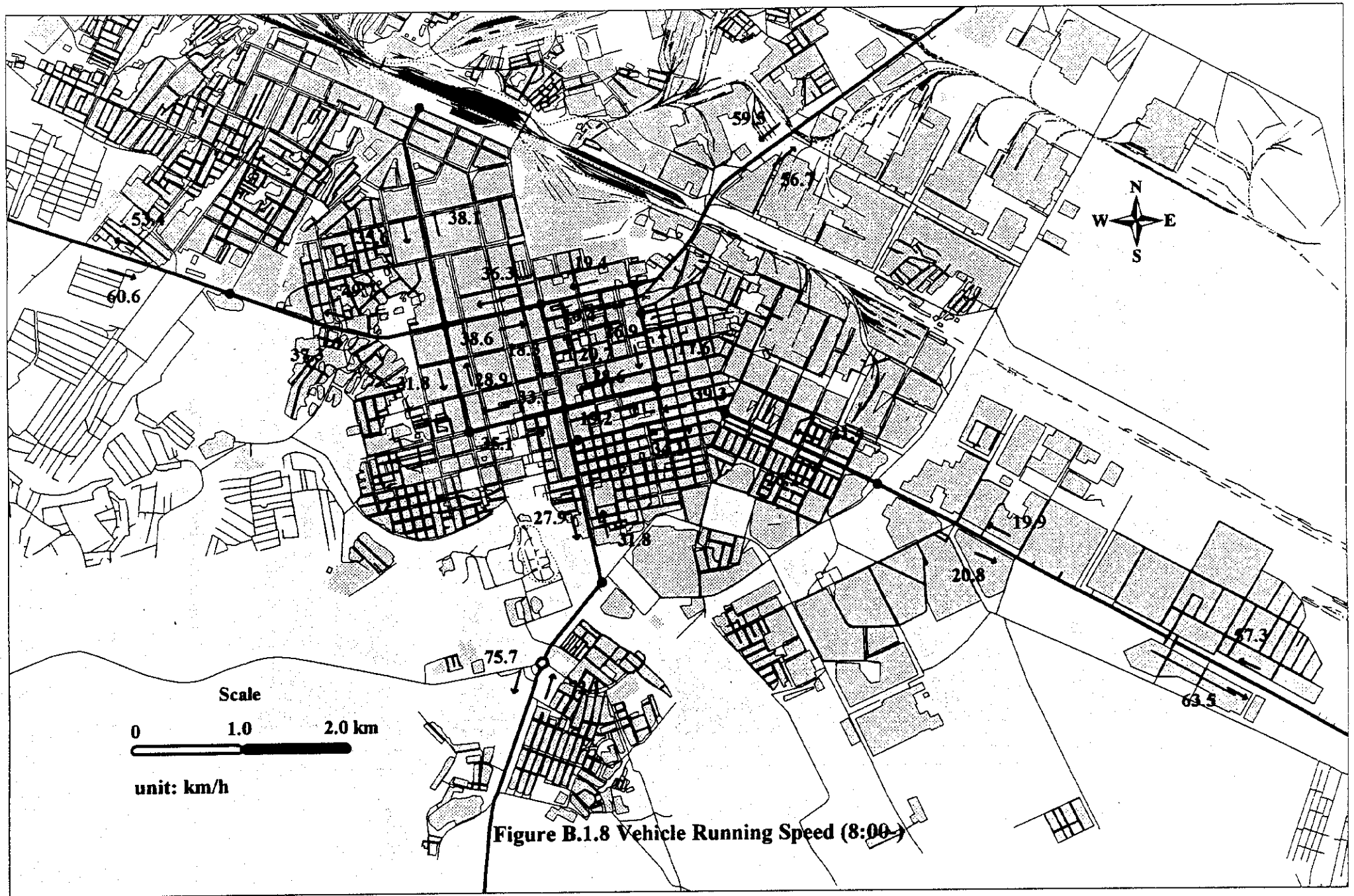
Site 13  
Astana Ro-  
zhdestvenka

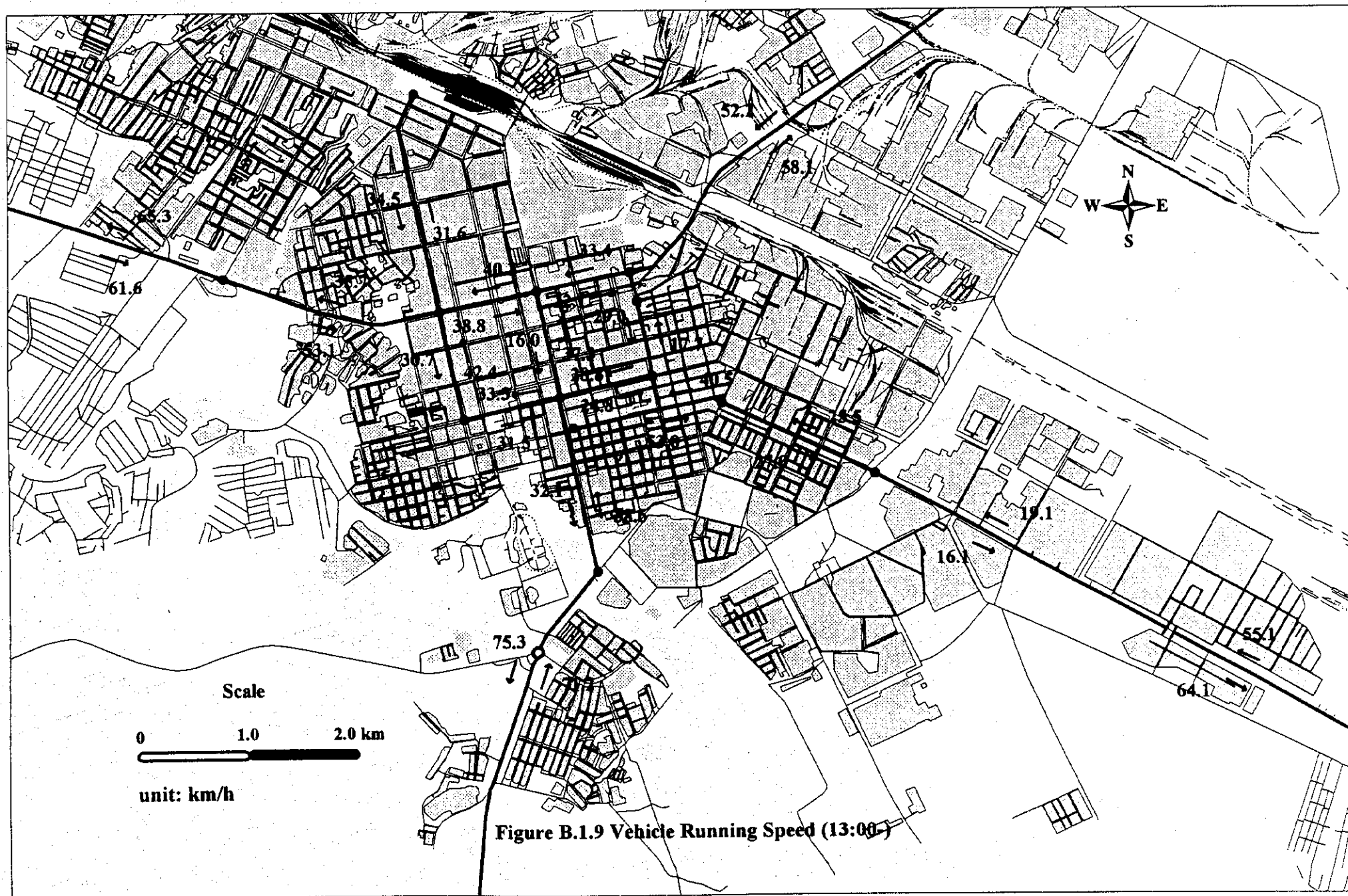


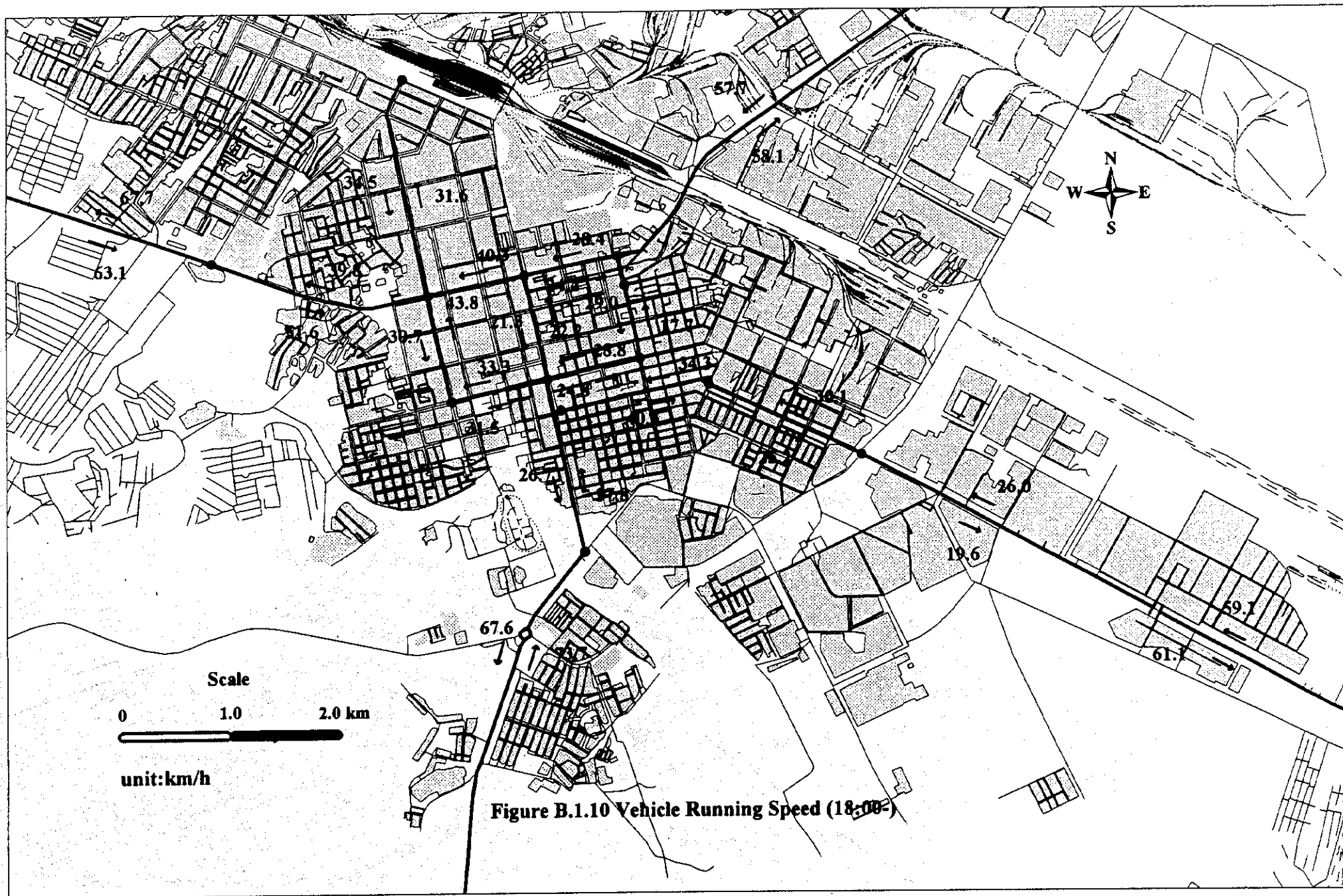
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Abylaikhan

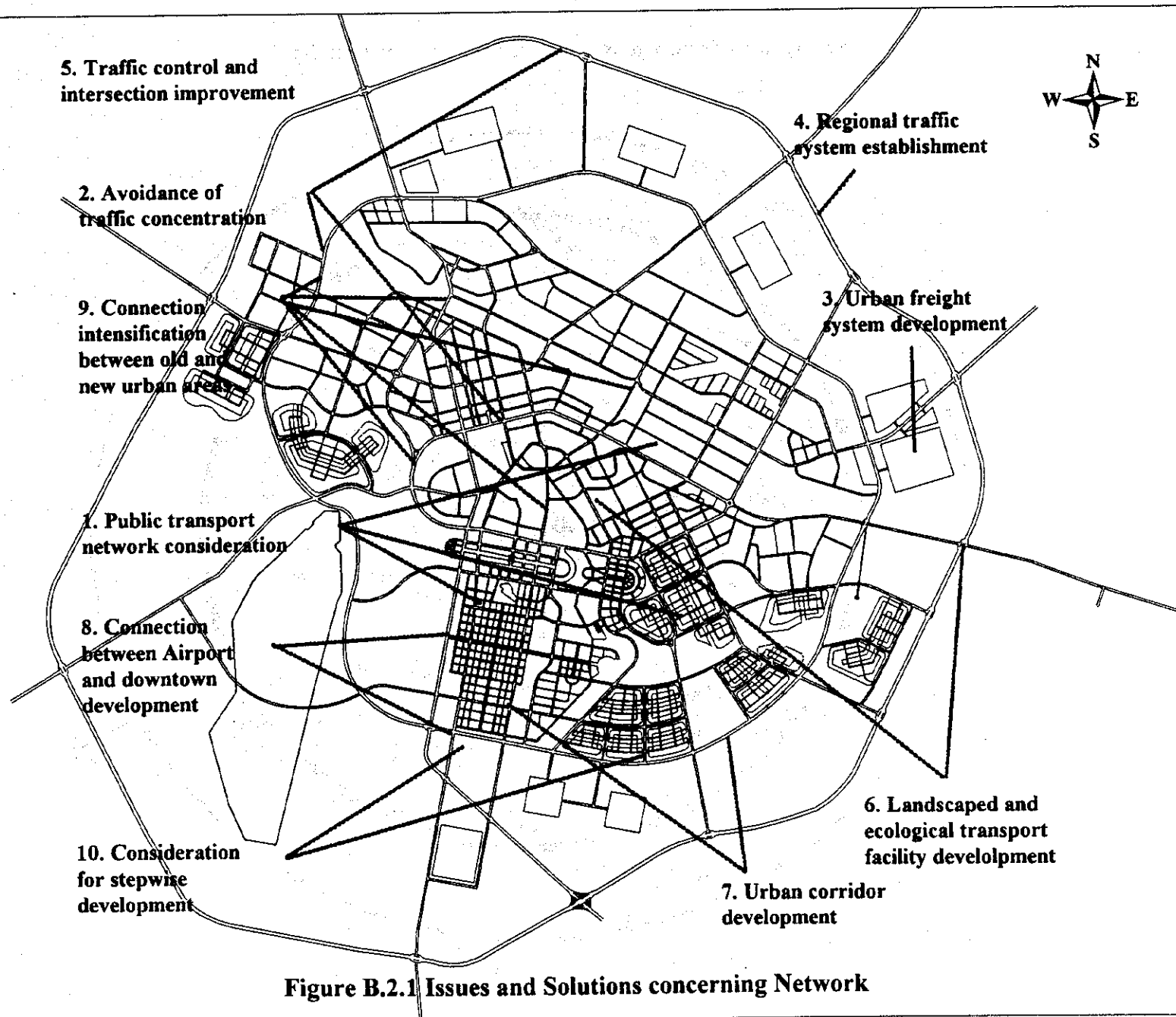


**Figure B.1.7 Hourly Traffic Volume Fluctuation**

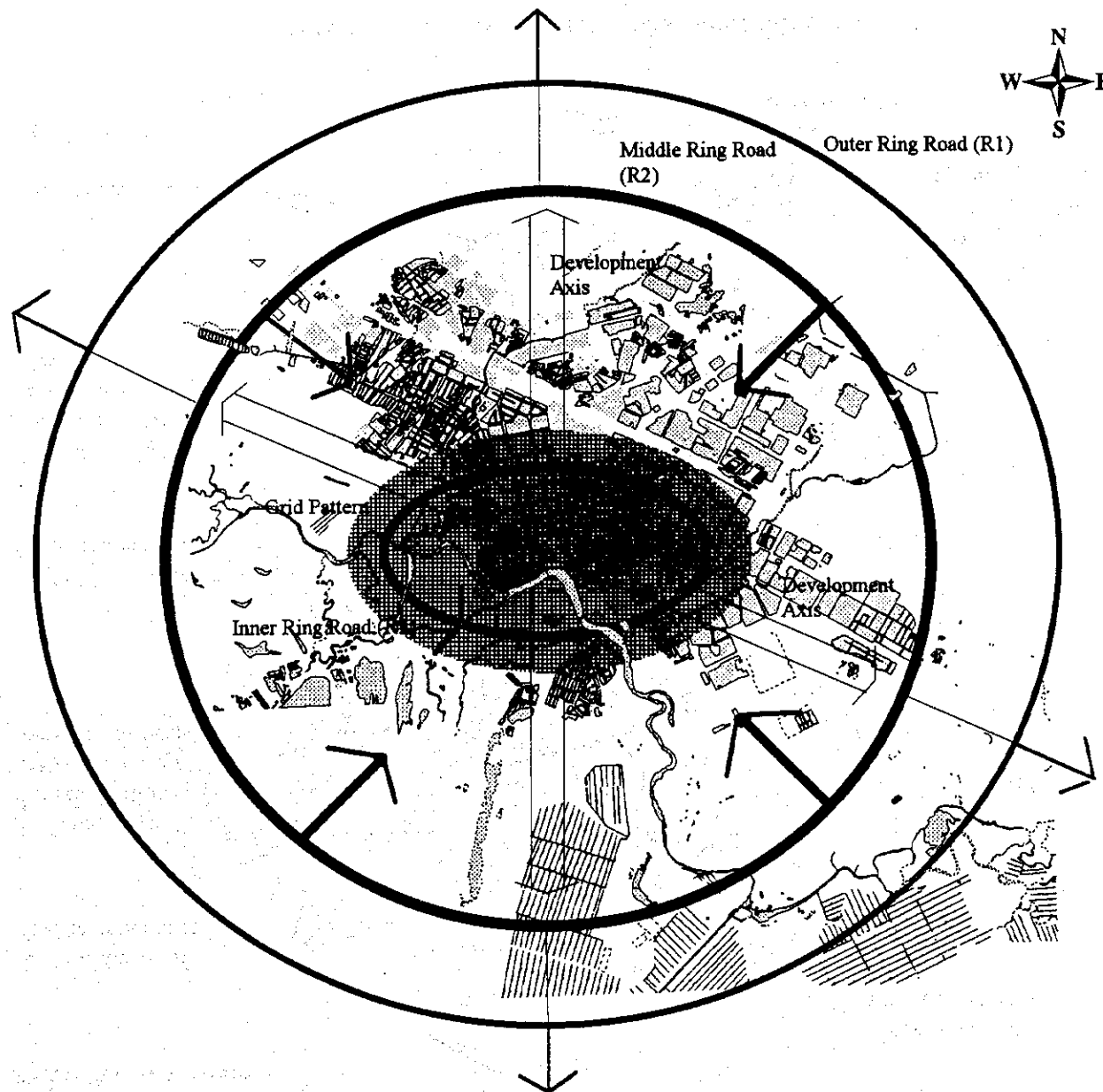








**Figure B.2.1 Issues and Solutions concerning Network**



**Figure B.2.2 Conceptual Pattern of Transport Network**

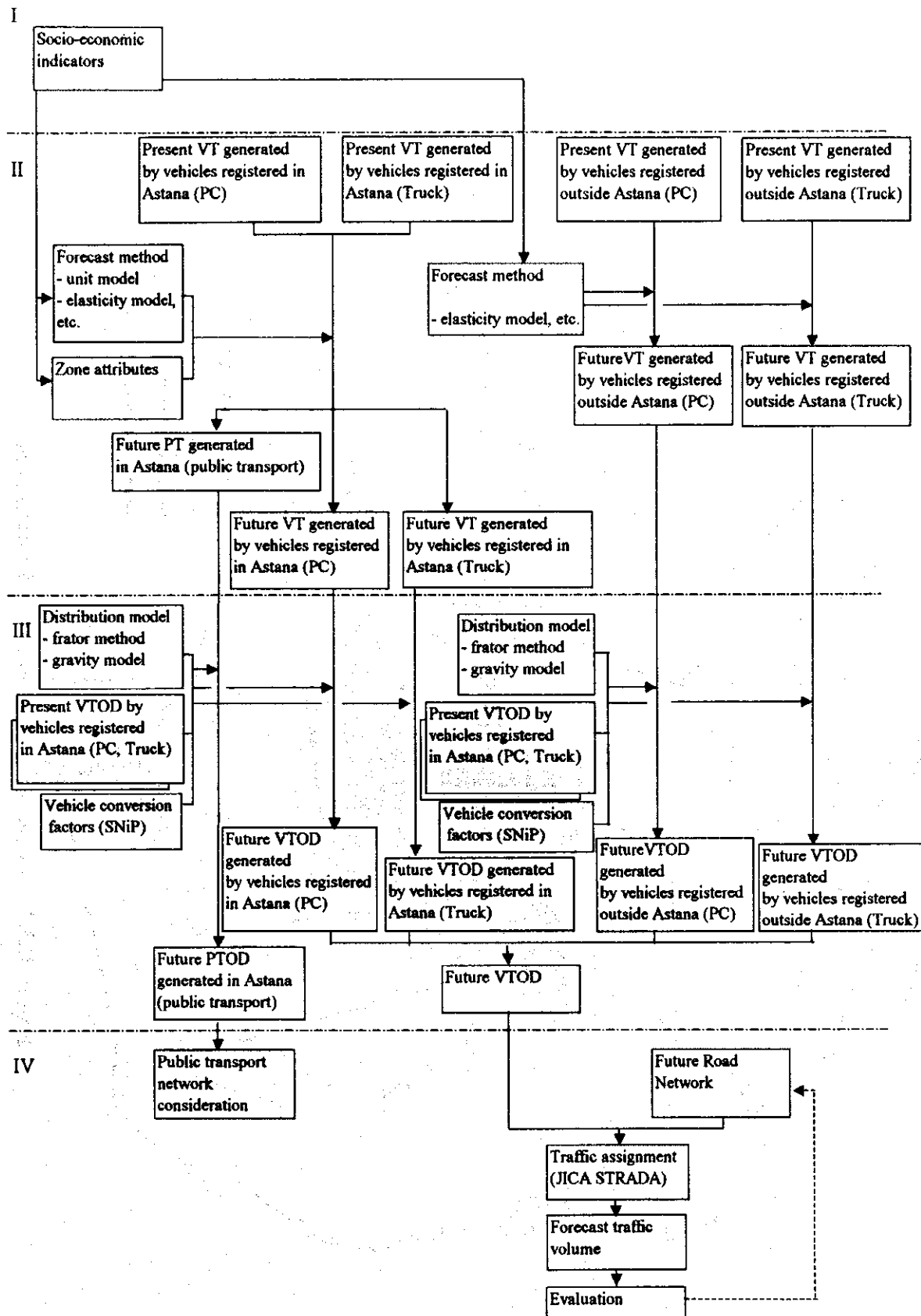
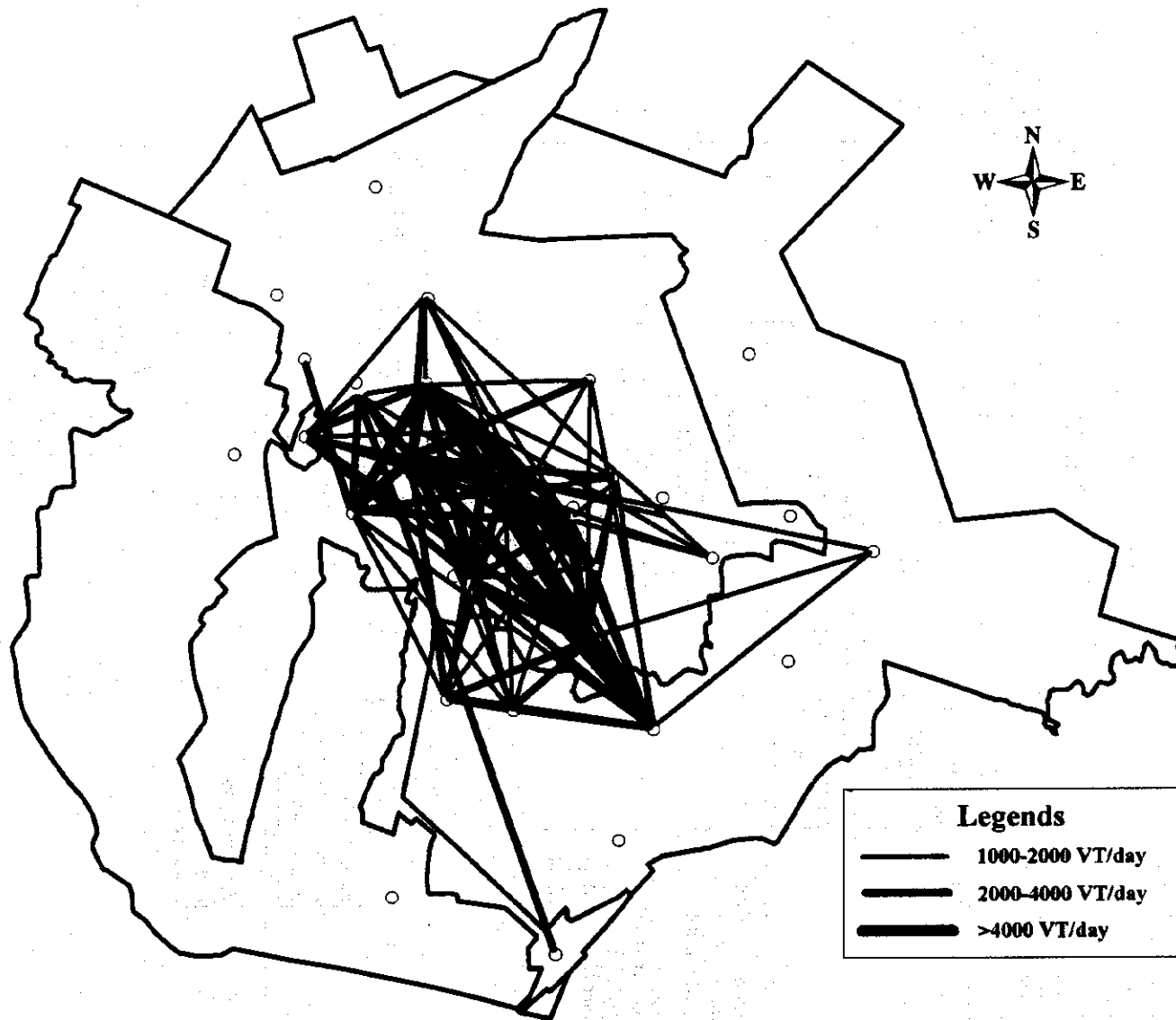
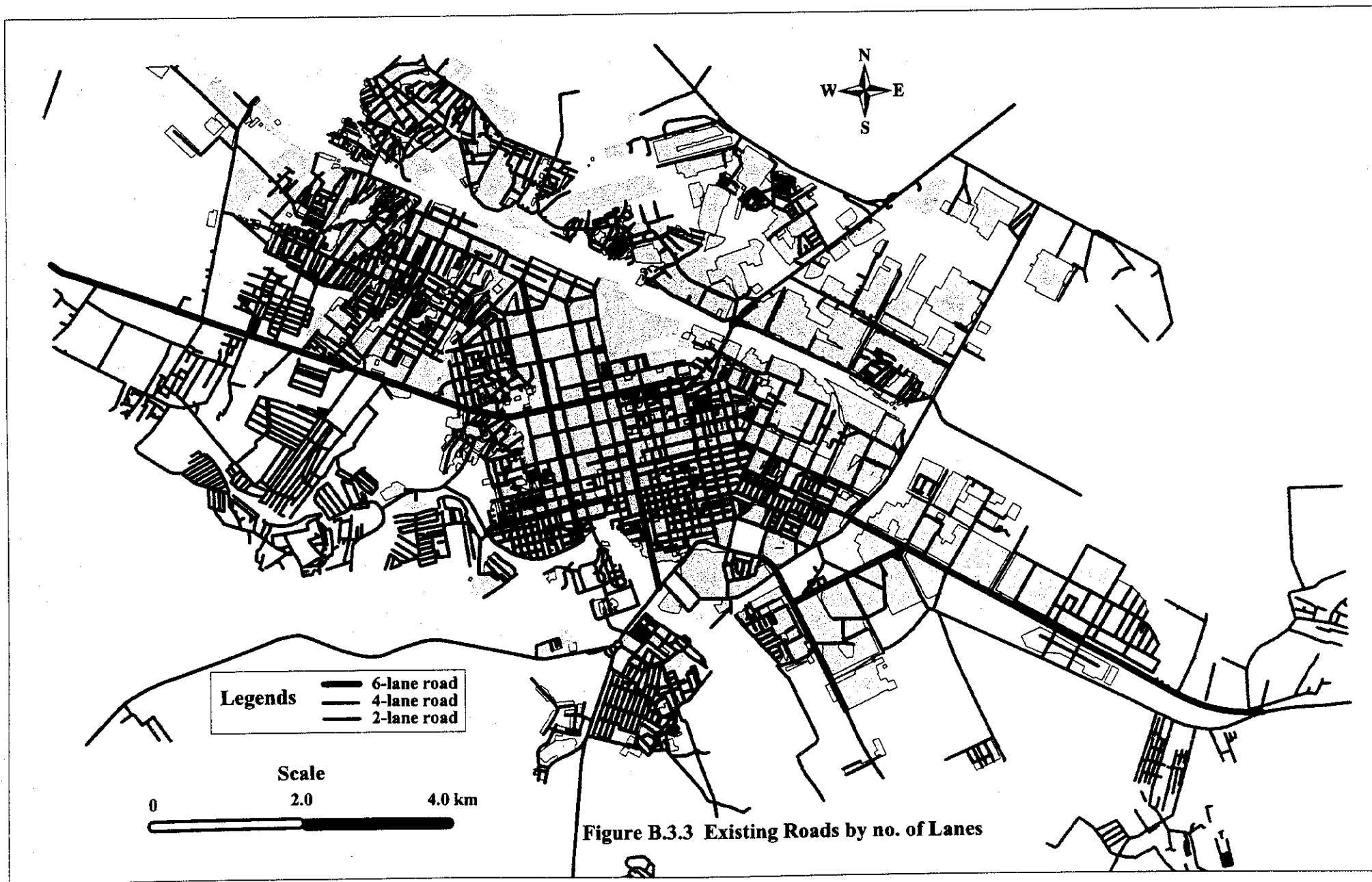


Figure B.3.1 General Flow of Traffic Demand Forecast



**Figure B.3.2 Desired Line of PC Vehicle Trips in 2030**





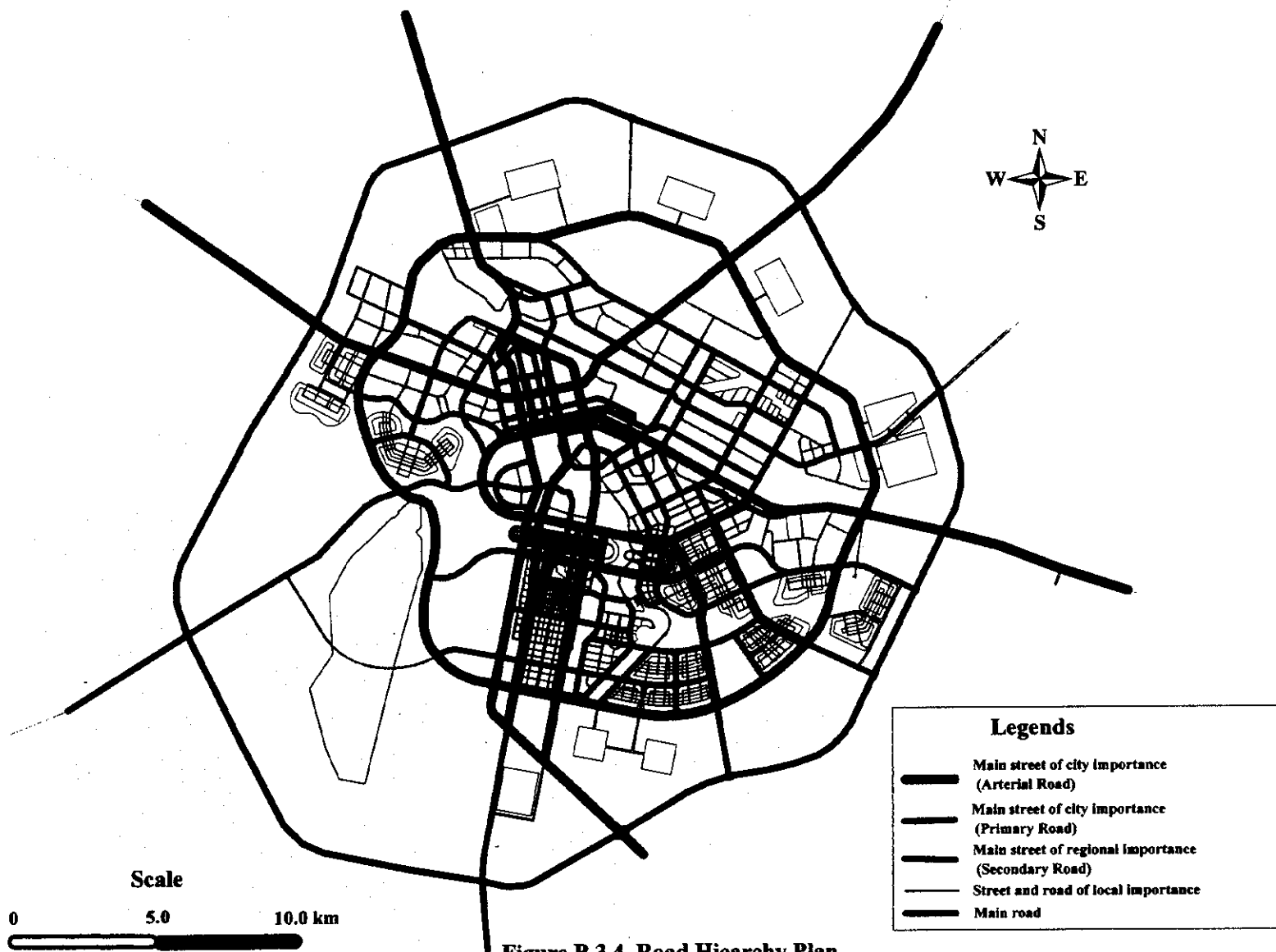
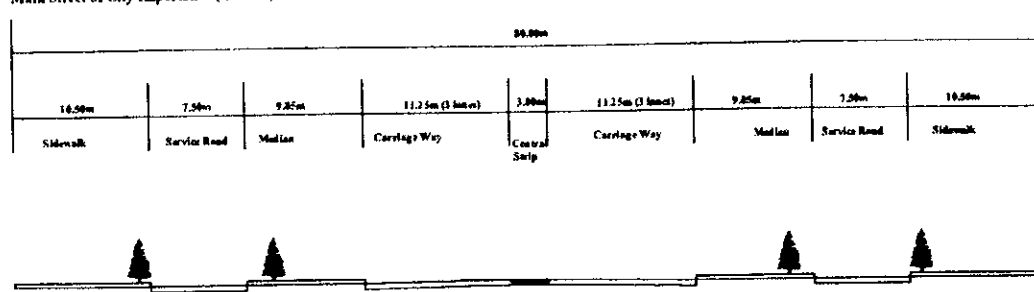


Figure B.3.4 Road Hierarchy Plan

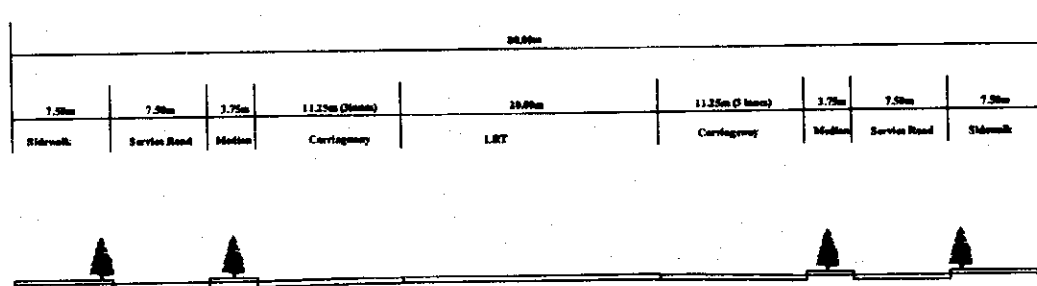
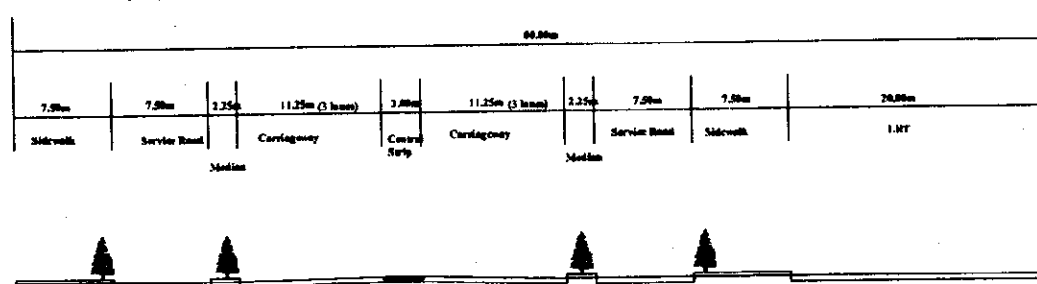


Figure B.3.5 Road Plan by no. of Lanes

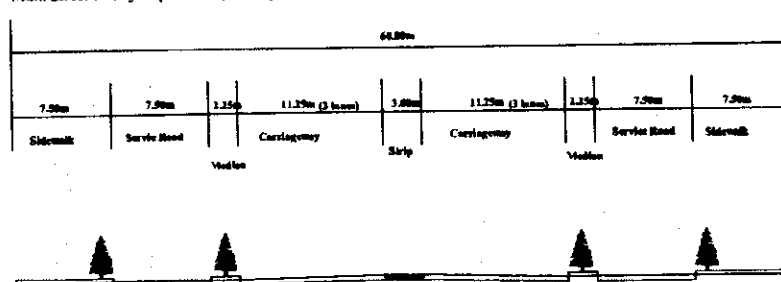
Main Street of City Importance (Arterial)



Main Street of City Importance (Arterial) with LRT



Main Street of City Importance (Primary)



Main Street of Regional Importance

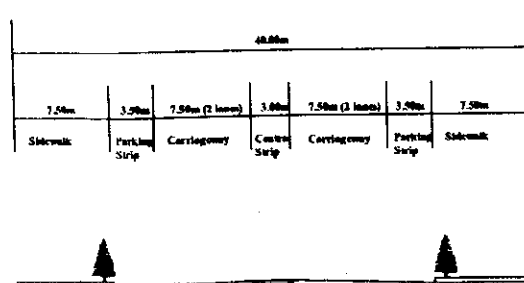


Figure B.3.6 Typical Cross Section of Streets

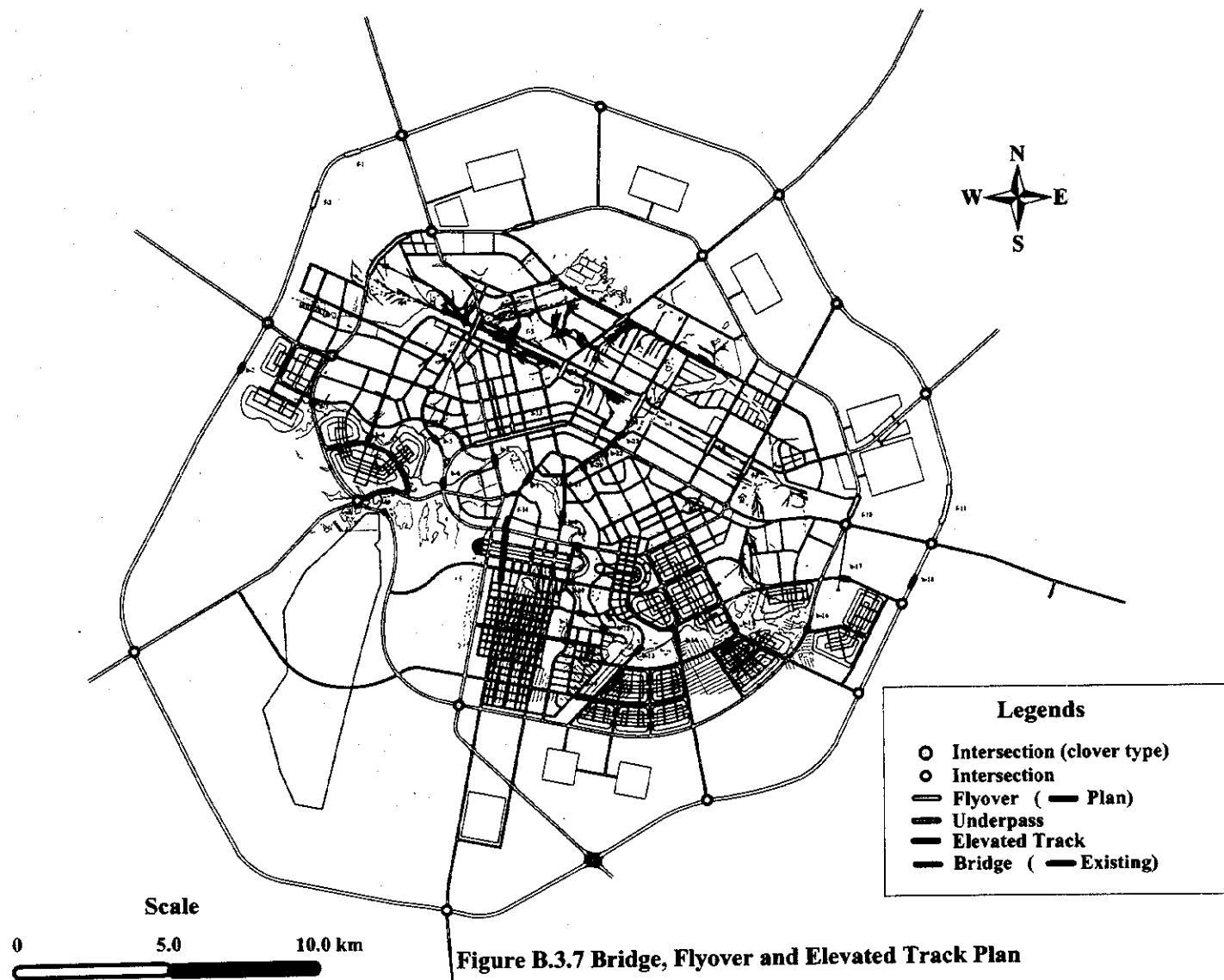
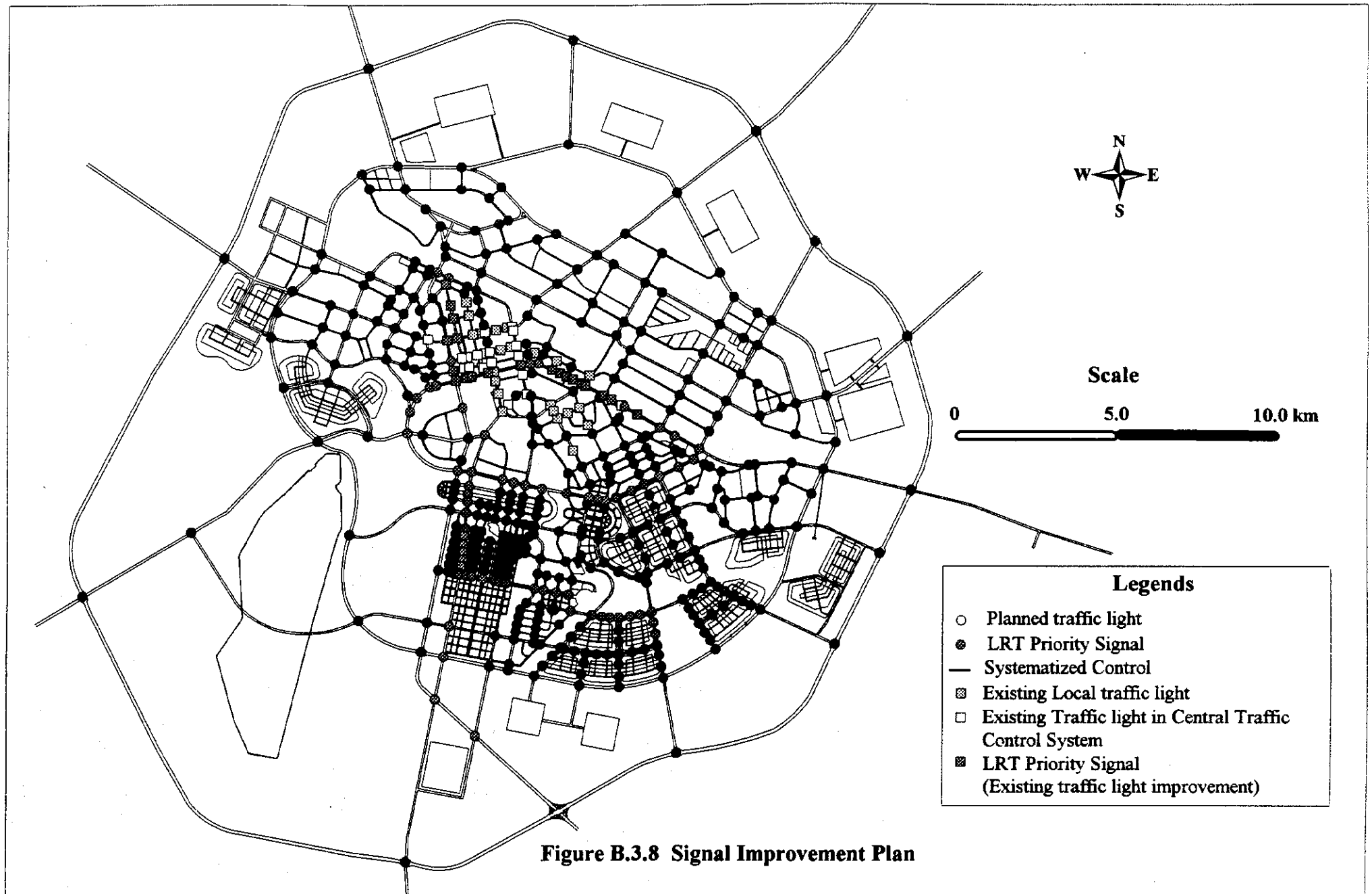
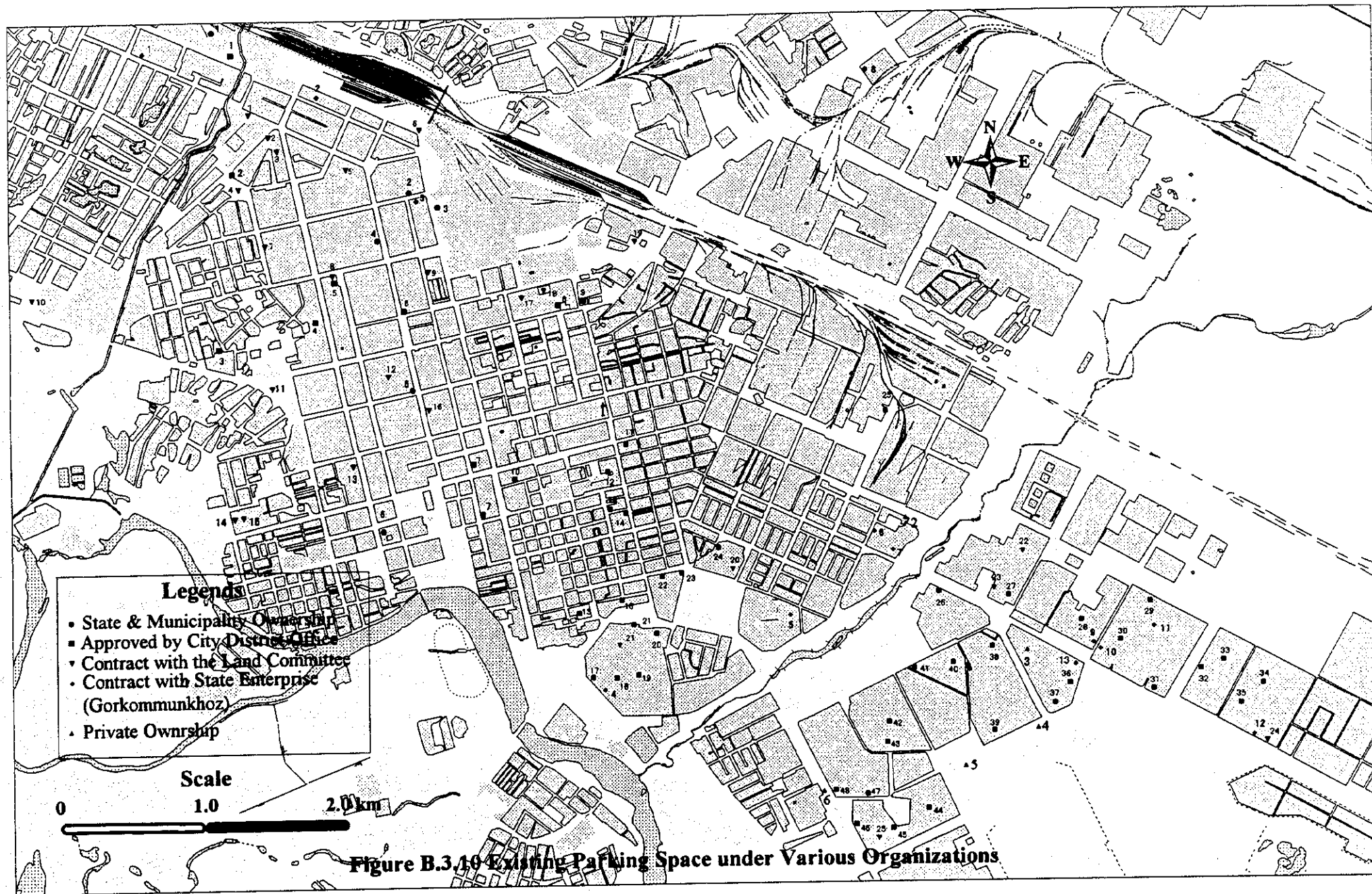


Figure B.3.7 Bridge, Flyover and Elevated Track Plan





**Figure B.3.9 Parking Space under Traffic Police Department**





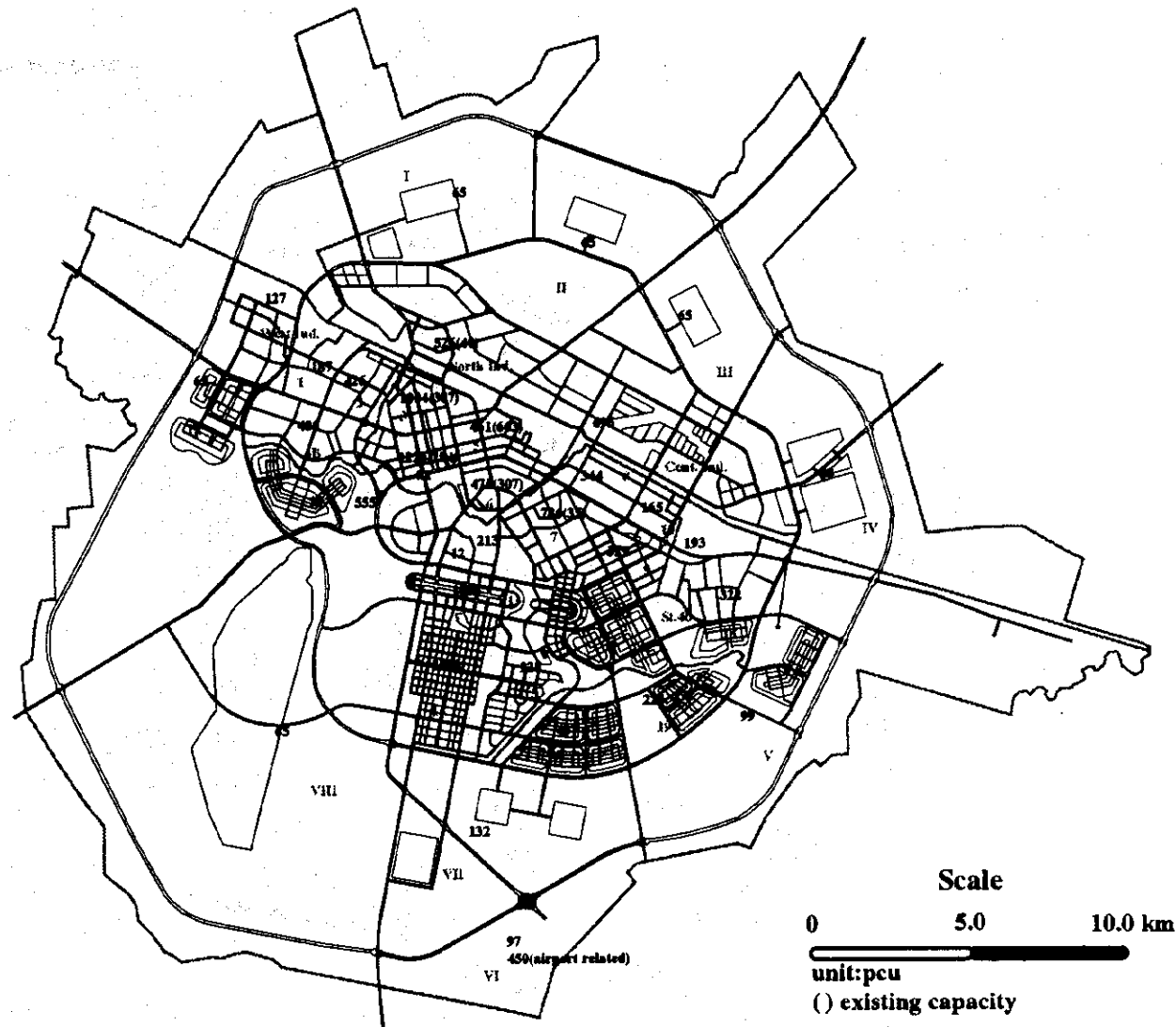
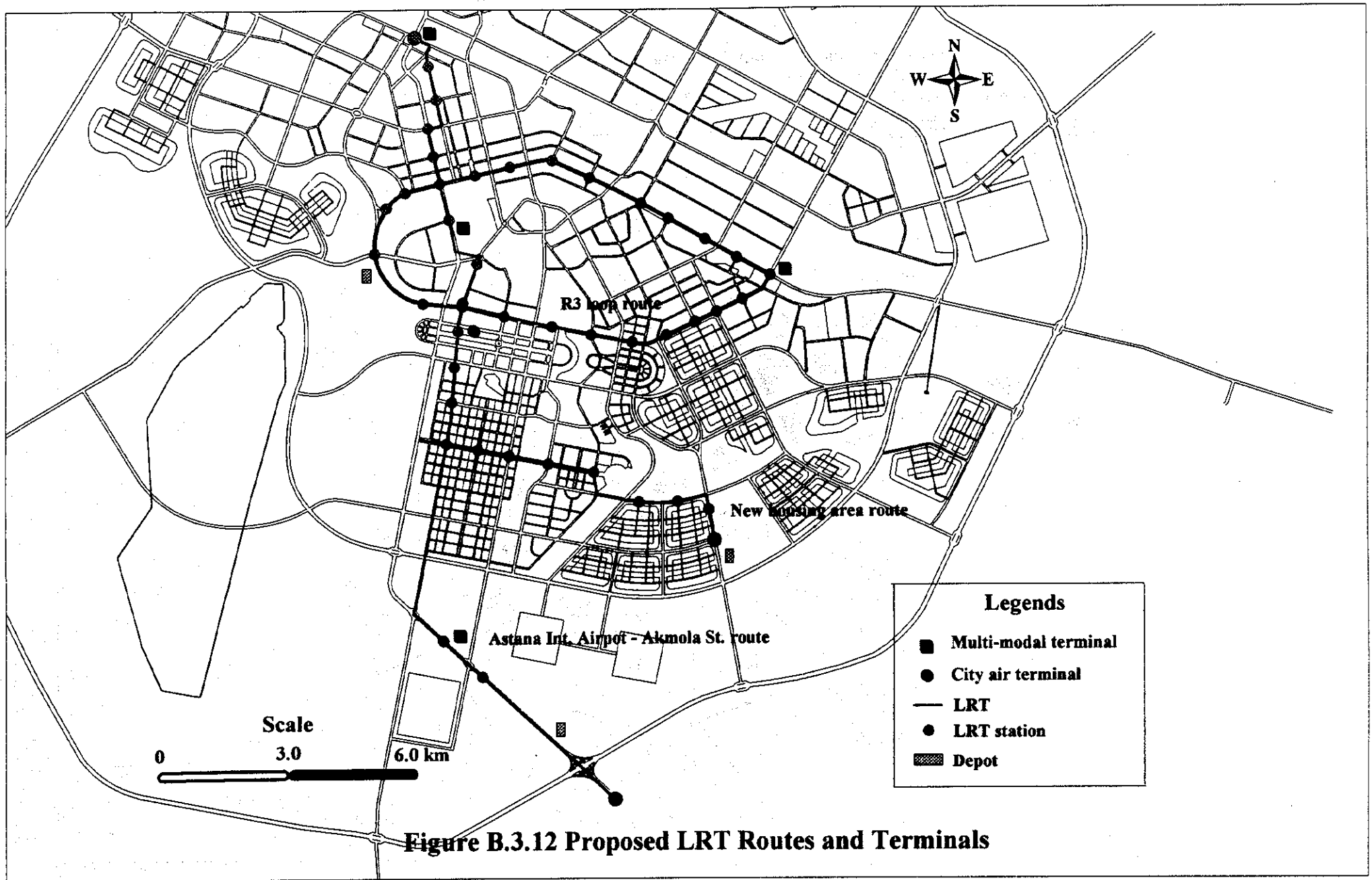


Figure B.3.11 Temporary Parking Demand in 2030



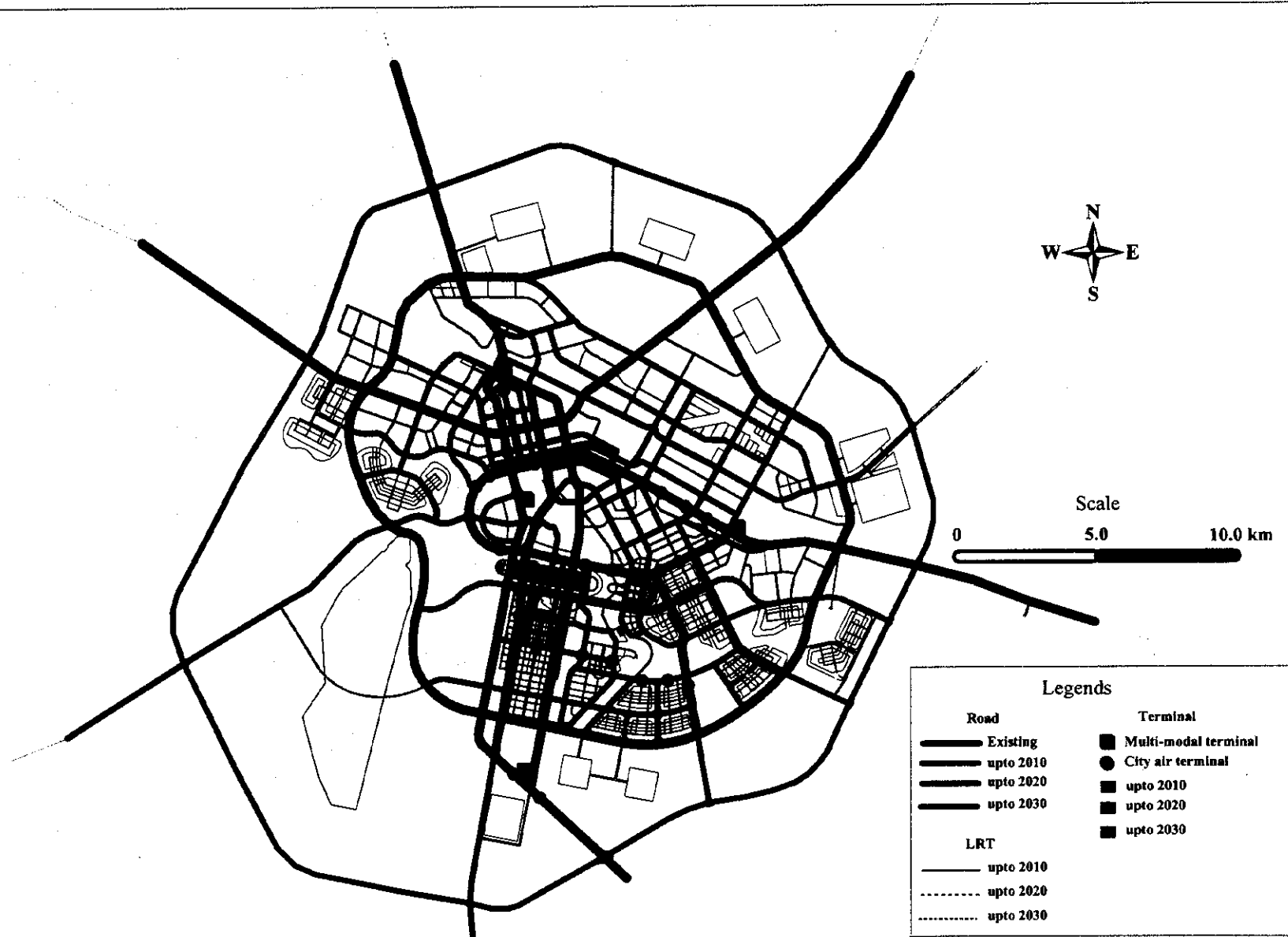


Figure B.3.13 Staged Plan of Road Construction/Improvement

