13.2 Land Reservation for Future Infrastructure Development

13.2.1 Land Reservation

In connection to the implementation of the before mentioned infrastructure projects in the proposed master plan, it is recommended to reserve necessary lands prior to any decision.

These projects of interchange improvement (fly-overs), construction of bridge(s) and/or LRT system often need some extent of land area where most of the land is owned by private owners.

It would be financially and socially favourable for the TEPA/LDA or any other organization to conduct above development project to secure necessary land area before the implementation of any projects. To avoid inflation of the land prices is one of the reasons for this, as those projects will be implemented several years later. Another reason for this is to avoid social conflict in the course of project implementation.

As the Study Team made a detailed survey on "City Planning Act/ Implementation Procedure" (CSTS-L JICA Working Paper), the Team understands that TEPA/LDA is empowered to declare a "Controlled Area" where land-owners and/or developers cannot conduct development projects without prior consultation and official permission. With this declaration, TEPA/LDA can extend its intention to purchase or own the land. If the land is really necessary for any public purpose, with the Land Acquisition Act, 1894, the Land Collector on behalf of TEPA/LDA can acquire the land and announce the Award for compensation either by market prices or by giving alternative land.

Although the Land Collector is empowered to acquire the land by "Forcible Acquisition" (Section 17 of the Act), land-owners and/or developers within the "Controlled Area" usually consult with TEPA/LDA and would offer the land as the "betterment effect" of the development project. This usually compensates the loss of land area (especially in case of construction or improvement of roads).

Figure 13.2.1 is an example of planed Ring Road, showing the sections which already the Right of Way is acquired/reserved and others in the planning stage to acquire.

As such is the present situation, it is still strongly recommended for the Authority to secure the necessary land for the "Right of Way" of proposed roads and LRT projects as earlier stage as possible.

With the national population growth rate of nearly 3 percent per annum, the urbanization of Lahore Metropolitan Area will progress rapidly. It will lead to higher land prices and bring more inhabitants within the area. Moreover, much more financial and social problems will be created if the land is acquired at the time of project implementation.

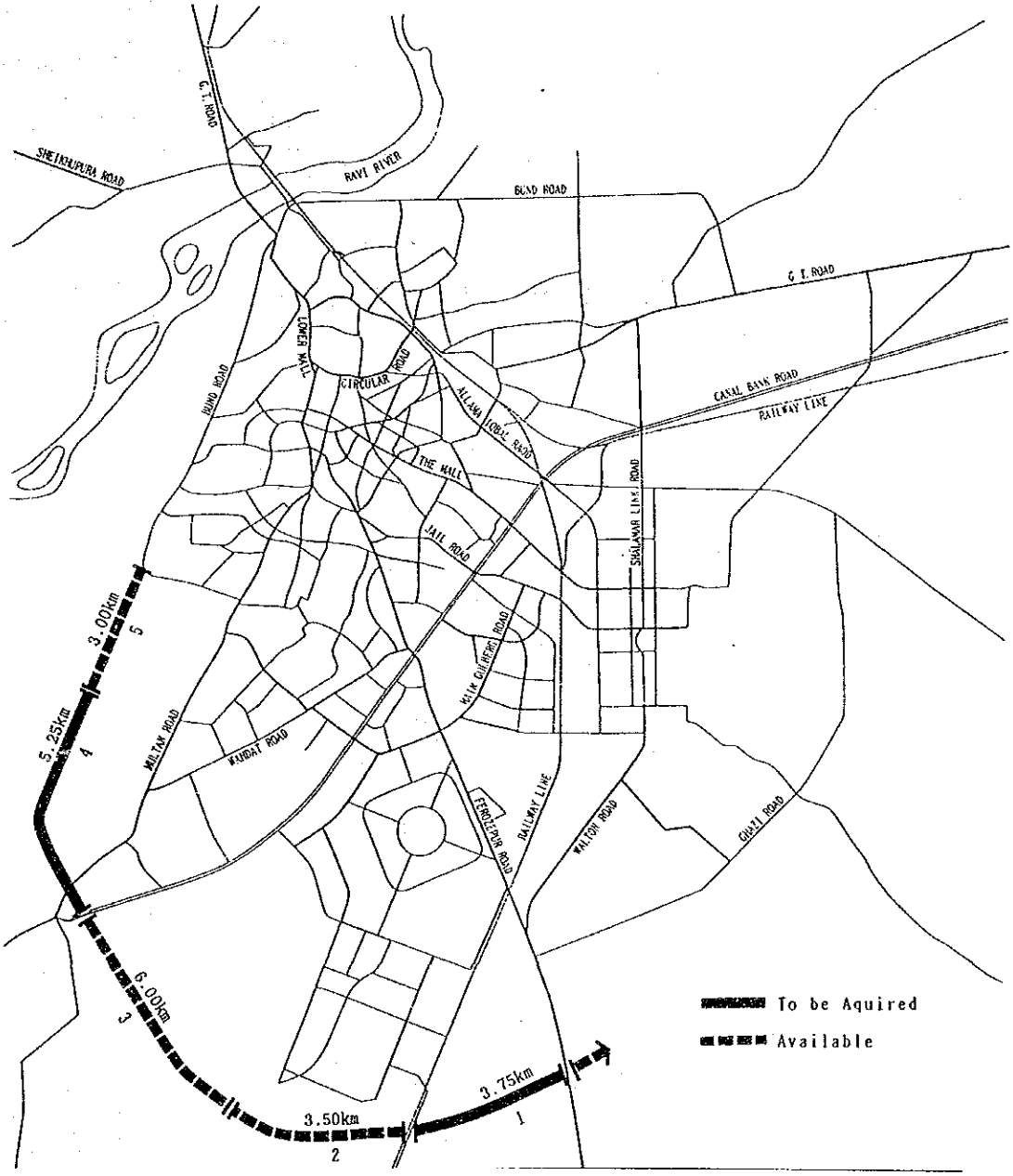
13.2.2 Environmental Consideration

By securing the lands in the earlier stage, a harmonious city planning/ development will be achieved and this will lead to a conservation of

natural and physical environment especially when a green-belt is secured together with "Right of Way".

It will also contribute to social environment by avoiding most of conflicts on compensation, eviction of squatters and other foreseeable problems.

Figure 13.2.1 Acquisition of Land for the Ring Road



No.	Status	Section	Width (m)	Length (km)	Area (sm)	Area (kanal)
1	To be Aquired	Ferozepur Road to Thiat R/W line	61	3.75	228,750	547.25
2	Available	R/W line to Sutto Katla Drain	61	3.50	213,500	510.76
3	Available	Sutto Katla Drain to Canal	61	6.00	366,000	875.60
4	To be Aquired	Canal to Sabzazar Nala	61	5.25	320,250	766.15
5	Available	Sabzazar H. Scheme to Babu Sabu	61	3.00	183,000	437.80
Total				21.50	1,311,500	3137.56

13.3 PR Improvement for Urban Transport

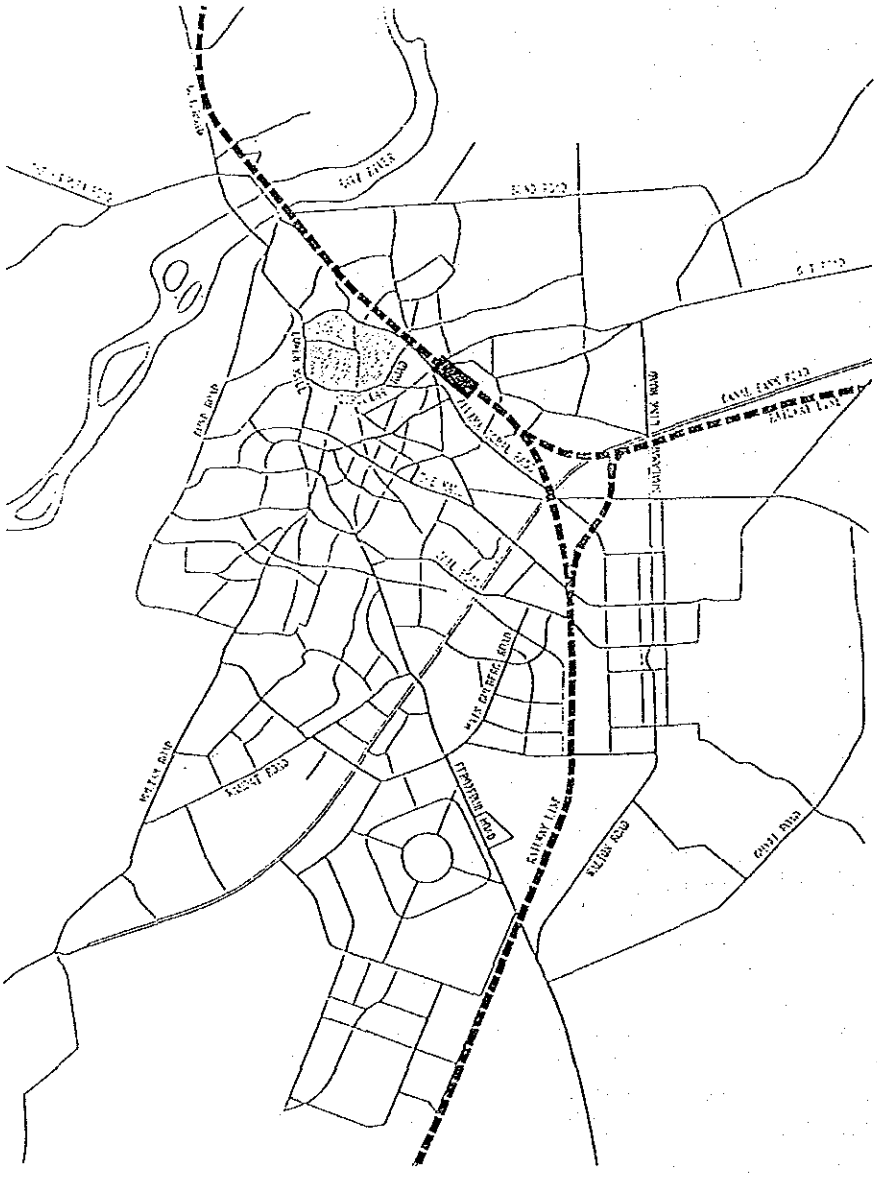
13.3.1 Existing Situation of PR in LMA

(1) Network in LMA

The network of PR in LMA is shown in Figure 13.3.1. The lines are stretched radially from Lahore Station to south, north and east directions, and every line seems located so as to contribute to urban and suburban passenger traffic.

However, PR is now contributing mostly to inter-city (long distance) transport of nation wide. Also in LMA, PR is providing scarcely urban traffic service, though it has well located line alignment for urban passenger traffic. Moreover, PR has no existing plans to develop urban traffic service in LMA.

Figure 13.3.1 Netwokk of PR in LMA

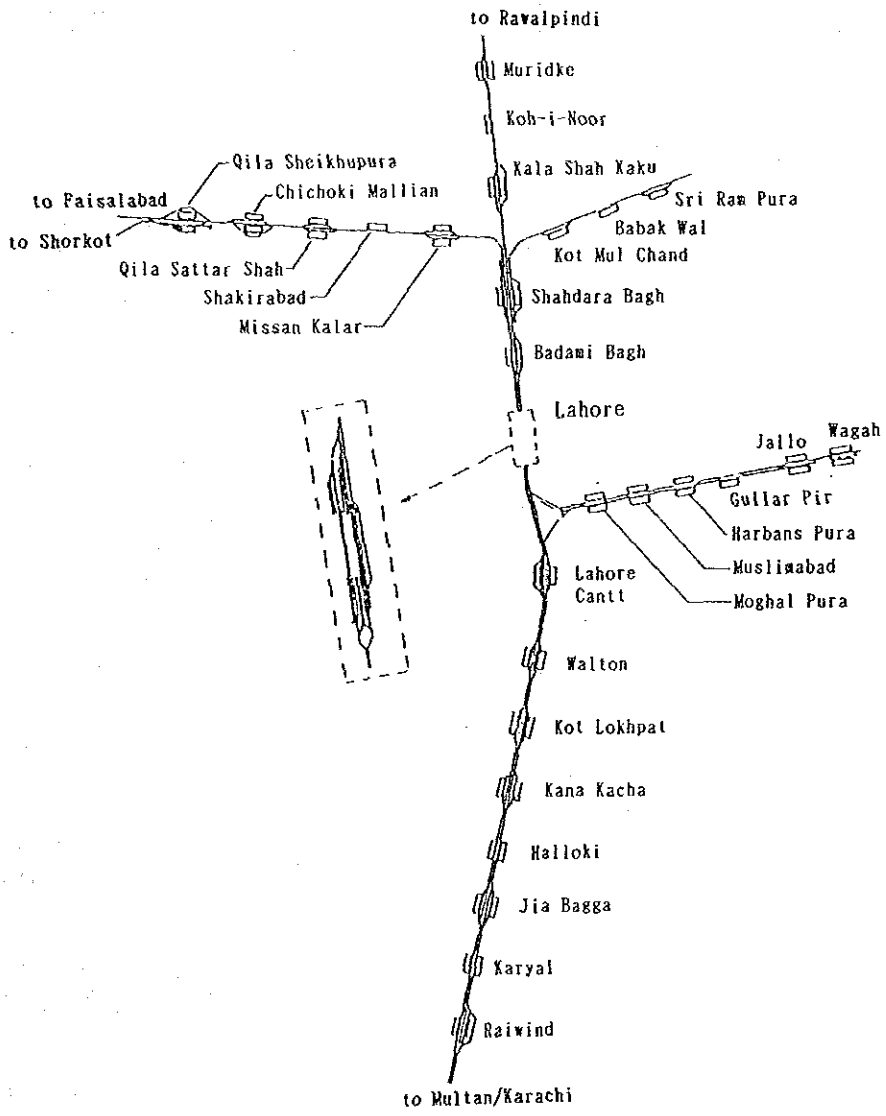


(2) Facilities in LMA

1) Track Alignment

The main track alignment in LMA is shown in Figure 13.3.2. The line between Shahdara Bagh and Raiwind as well as between Lahore and Wagah are double tracked, and the remains are single. The Lahore Station is a big terminal station with many sidings. On the double tracked line, the stations between Lahore Cantt. and Jia Bagga except the halts have two through main lines and two or three platform sidings, and the stations between Moghalpura and Wagah have only two main lines with platforms. On the single tracked line, most of the stations have a main line and one or two sidings with platforms.

Figure 13.3.2 Track Alignment of PR



2) Signaling and Telecommunications System

The signaling system of PR in LMA is shown in Figure 13.3.3. An automatic signaling system is equipped only on the line between Lahore and Shahdara Bagh. Tokenless block systems are equipped on the line to south, north and west. The line to Wagah is equipped with a token block system, and the line to Narowal is adopted with paper line clear system.

The line to the south is adopted with U style tokenless block system (Westing House), while the other two lines are adopted with Siemens tokenless block system.

Extension of automatic signaling system is not planned now.

3) Electrification

The line between Lahore and Khanewal via Raiwind has been electrified at 25 kV AC single phase, which covers a distance of 286 kilometres of the main line. The electrification has been further extended on Lahore - Moghalpura section comprising 7.5 kilometres.

4) Rolling Stocks and Maintenance

There are no locomotives and cars of which operation is limited within LMA. Therefore, the total number of locomotives, coaches and wagons of all over the PR is tabulated in the following table, and there are no electric railcars.

Table 13.3.1 Rolling Stocks (Broad gauge only)

(as of 30 June, 1989)

Locomotives			Coach	Wagon		
Steam	Diesel	Electric		Covered	Open	Special
125	565	29	2,902	22,399	8,803	3,910

(3) Train Operation

Number of trains operated on the lines in LMA are shown in Figure 13.3.4. They are much less than the track capacity (number of trains to be able to operate on each section).

Number of trains scheduled to stop at every station are a few, and it is inconvenient for commuter passengers to ride from these intermediate stations.

There are some rooms to increase the number of trains on those lines, especially on the electrified double tracked line in southern parts.

Figure 13.3.3 Signaling System of PR

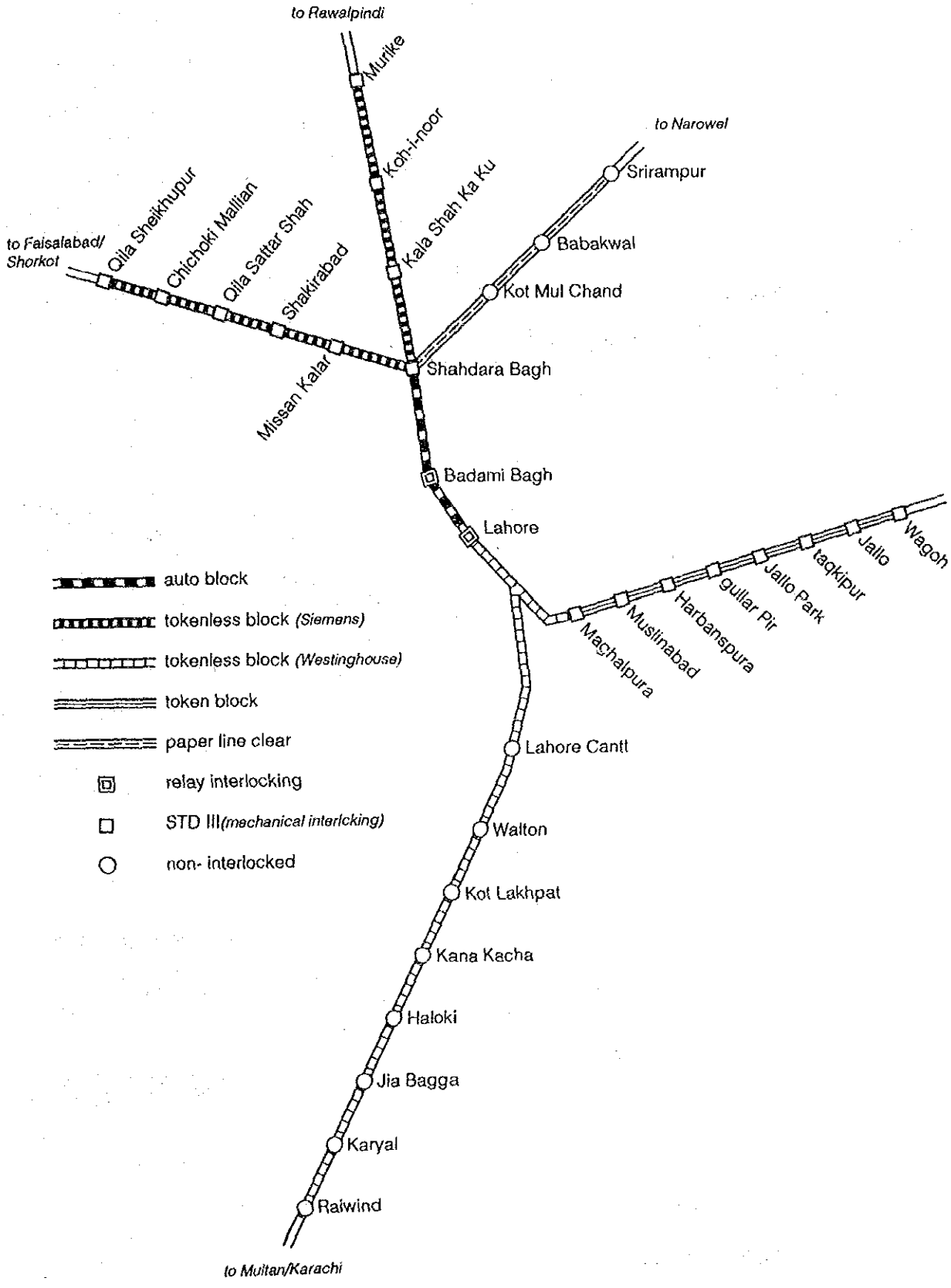
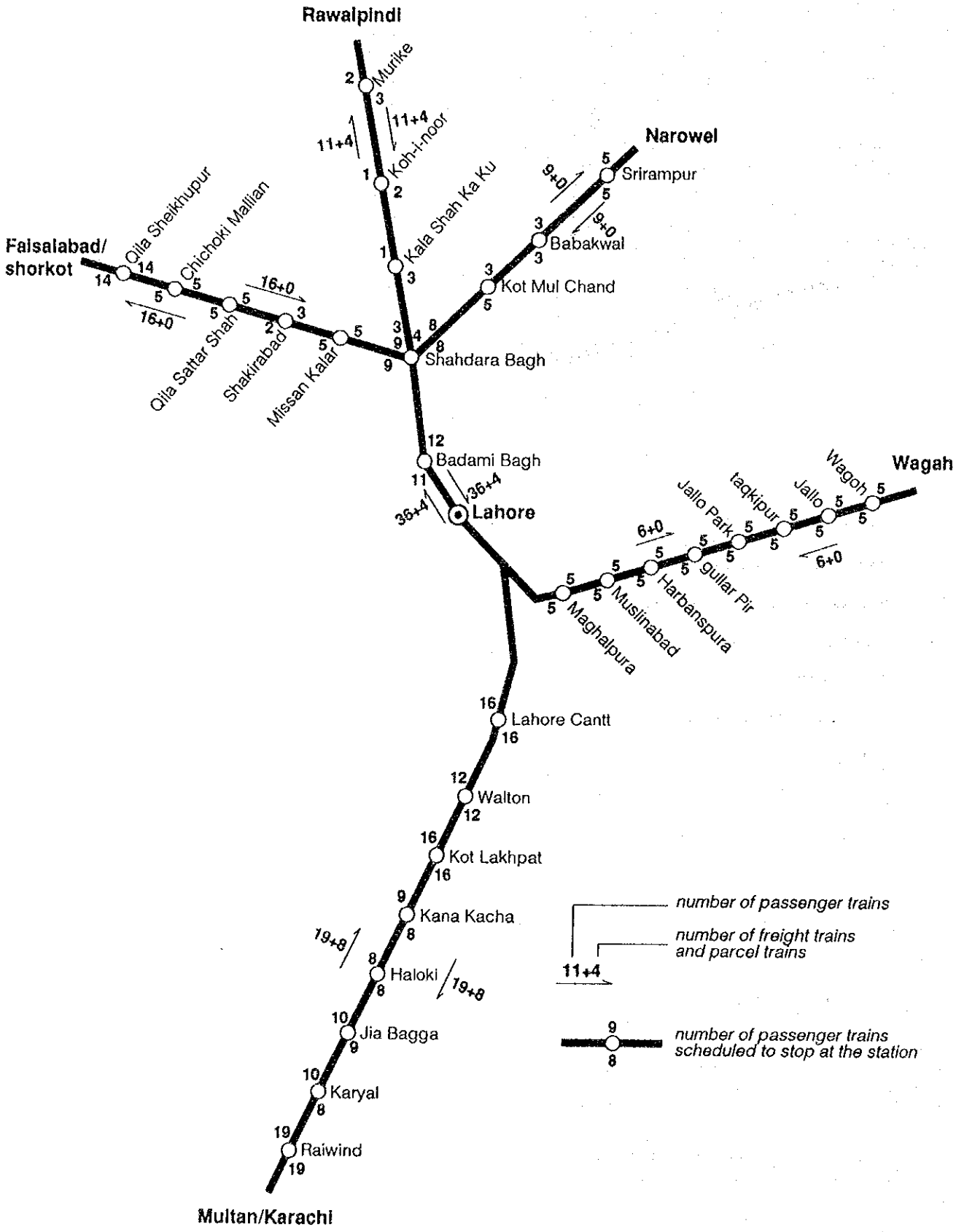


Figure 13.3.4 Number of Trains Operated



13.3.2 Utilization of Railway for Urban Transport

A railway has the characteristic features of high speed mass transportation, which is capable to share in the mass rapid transports for commuter passengers of the metropolitan area. It brings the effect to expand urbanized area due to reduction of travelling time of passengers, which result in mitigation of congestion at civic center. Furthermore, it brings development of areas around the railway stations according to the increase of the railway passengers.

In order to attract passengers to railway, it is essencial to improve the access to the stations, to equip wide station plaza and to construct attractive station building with functional facilities.

In Lahore Metropolitan Area, the PR's network is extended from the Lahore Station to south, east and north direction, which is capable to connect the civic centre with other urban areas as well as suburban areas. Therefore, it has potencial capabilities to contribute towards the urban transport, although it is executing almost the intercity transportation now. It seems that there are rooms to operate some commuter trains to transport urban passengers without large scale improvement, as mentioned in the previous paragraph.

13.3.3 Availability of Operation of Electric Railcar Trains

In order to utilize Pakistan Railways for the urban transportation in LMA, it is recommended that electric railcar trains are introduced to operate on the existing electrified double track section for urban commuter service, as shown in Figure 13.3.5.

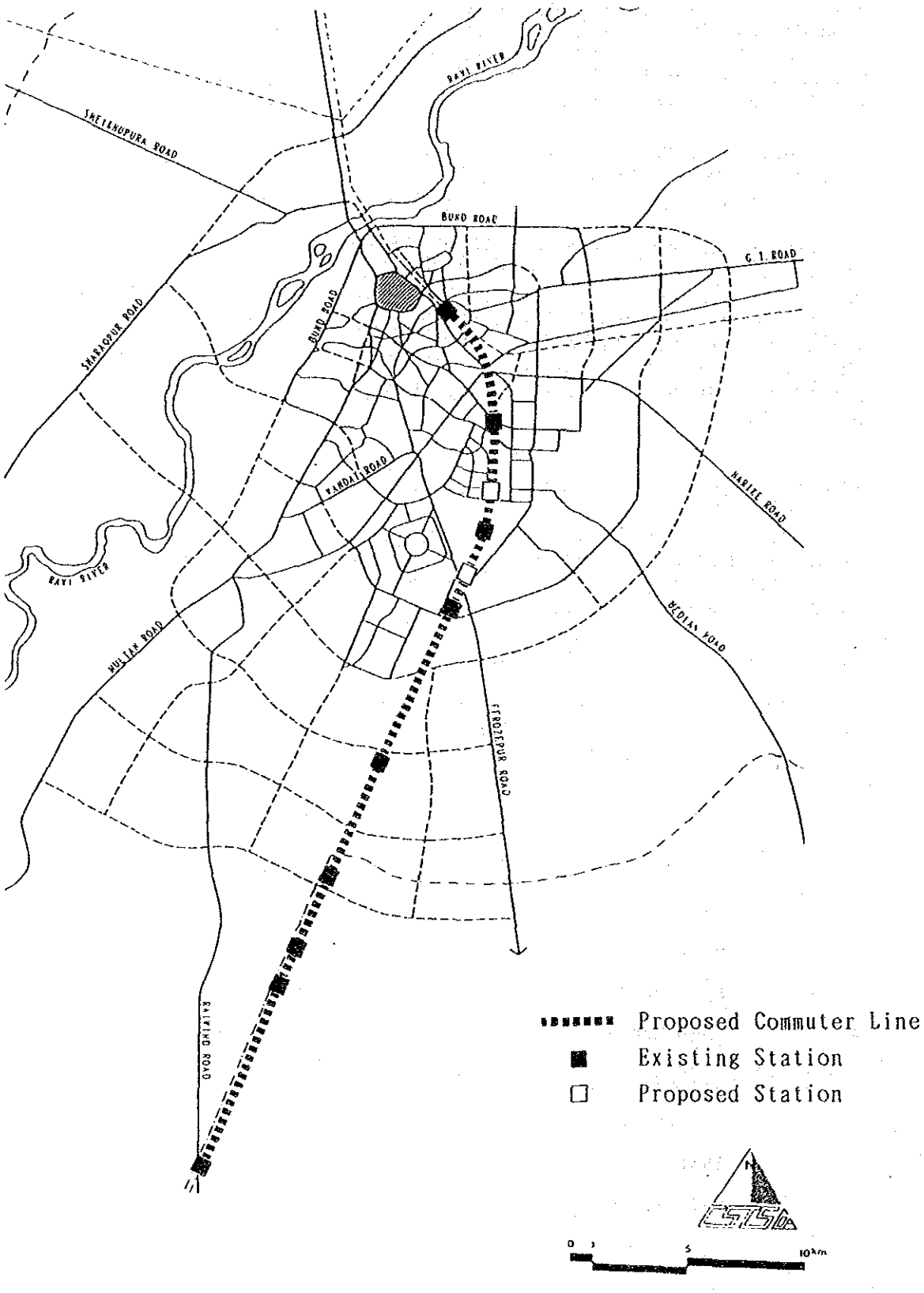
(1) Track Capacity of Proposed Line

The current minimum travelling time of passenger trains between stations on the proposed line are found as follows, according to the Time & Fare Table Summer 1990, Pakistan Railways:

Station	Minimum Travelling time
Lahore	
	9 minutes
Lahore Cantt	
	7
Walton	
	6
Kot Lakhpat	
	8
Kana Kacha	
	5
(Halloki)	
	7
Jia Bagga	
	5
(Karyal)	
	7
Raiwaind	

( ): Halts

Figure 13.3.5 Proposed Section for Commuter Service



The proposed electric railcar trains will have characteristic performance to run with higher average speed than the existing trains. Accordingly the proposed trains are able to be operated with minimum headway of 12 minutes on the proposed line. It means that five trains can be operated in one hour. However, in case that passenger trains and freight trains are operated by turns, the number of trains operated in one hour will be decreased due to the difference of speeds between the passenger train and the freight train. The minimum number of trains to be able to operate is estimated at three, considering the train speed, the signalling system and the track alignment of the stations on the proposed line. Therefore, the minimum track capacity, namely the number of trains to be able to operate daily on the proposed line is estimated as follows:

$$N = n \times 24 \text{ hour} \times k$$

N: track capacity for one way
(= number of trains operated a day)

n: minimum number of trains to be able to operate in one hour

k: coefficient for track utilization
(assumed to be 0.7)

Therefore,

$$N = 3 \times 24 \times 0.7 = 50$$

As mentioned above, 50 trains can be operated on the proposed line for one direction. While the current number of trains operated now on the line are only 27 trains including 19 passenger trains and 8 freight trains as shown in Figure 13.3.4. Therefore, there is some room to operate additional trains on the line.

The following table shows the number of passenger trains operated on the railway lines in Jakarta, Indonesia, which are equipped with facilities similar to the proposed line.

Table 13.3.2 Number of Trains Operated in Jakarta (1987)

Time Zone	Whole day (both directions)			Peak two hours (one direction)		
Kind of Line / train	Commuter Train	Long/Middle Distance Train	Total	Commuter Train	Long/Middle Distance Train	Total
Central Line	49	36	85	8	5	13
Western Line	31	41	72	5	7	12

(2) Capacity of Station Tracks

When the proposed electric trains are operated, the following tracks will be required at the stations on the proposed line.

1) Platform and platform track for the proposed trains at Lahore station and Raiwind station

The proposed electric railcar trains will be turned back at Lahore station and Raiwind station. A platform and a platform track shall be provided at both stations. If the existing platforms and platform tracks are not sufficient to operate the proposed electric railcar

trains, additional ones shall be constructed at the stations.

2) Passing over tracks at en-route stations

When the electric railcar trains are introduced, those trains, other passenger trains hauled by locomotives and freight trains will be operated together on the proposed line, speeds of which are different each other. Accordingly, faster trains may pass over slower trains at en-route stations. Auxiliary main tracks are necessary to be used for such passing over of trains. Each existing en-route station except two halts has two through main tracks and two platform tracks. Therefore, trains can pass other trains at the en-route stations.

13.3.4 Improvement Plan

(1) Train Operation Programme

The train operation programme is proposed as follows:

a. Operating Line

Section : Lahore - Raiwind
Route length : 40 Km
Number of stations : 11 (including two new stations)

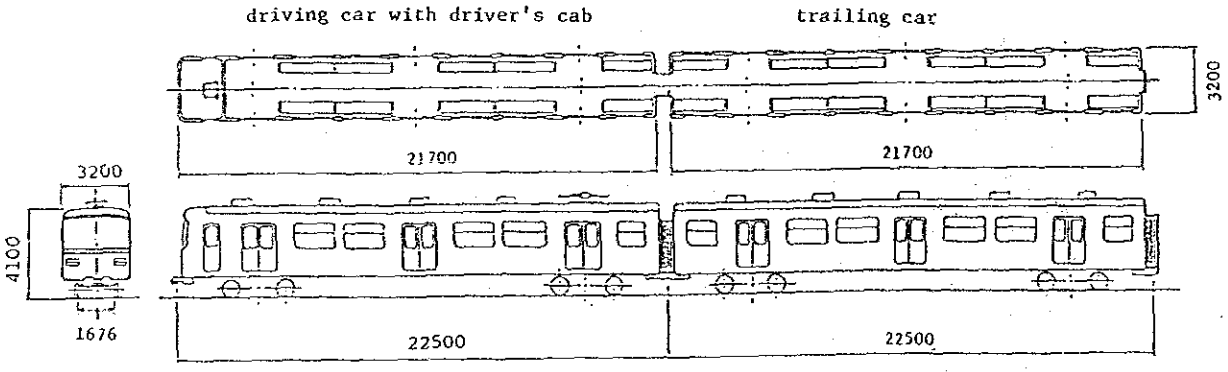
b. Electric Railcar

A electric railcar unit consists of a driving car and a trailing car.

Power source : AC 25 kV
Maximum speed : 100 Km/hr

The general view of the proposed electric railcars are shown in Figure 13.3.6.

Figure 13.3.6 General View of Proposed Railcar



c. Train Formation

A train consists of 3 units or six railcars.

Passenger capacity/trains:

Standard	1,200
in rush hour	1,560
(load factor)	(130 %)

Total length of a train: 135 m

d. Train Operation Method

Kind of train: The trains stop at every station, but operation of rapid service trains, which stop only at main stations, is also possible.

Minimum train headway: 12 minutes

The traffic capacity in peak one hour is estimated at 7,800 passenger/hour.

(2) Improvement of Facilities

The facilities to be constructed or reconstructed in order to operate the proposed electric railcar trains are as follows:

a. Station

New shunting track shall be constructed at Jia Bagga and Raiwind.

Two new stations will be constructed to cope with traffic demand and to increase the service level. One is located between Lahore Cantt. and Walton, and another between Walton and Kot Lakhpat connecting to the LRT south terminal station.

Track alignment and platforms at Lahore Station will need some minor modification.

b. Track

No additional rehabilitation is necessary.

c. Signalling and telecommunications system

The existing U style instrument (tokenless block system) will be used, but introduction of automatic signalling system is recommended in the future.

d. Electric power facility

Some additional capacity of substation and distributing network is required.

e. Electric railcar

The following number of electric railcars will be purchased to transport traffic volume mentioned above.

Driving cars	29
Trailing cars	29
Total	58

f. Car depot

New car depot to stable and maintain the electric railcars will be constructed in Jia Bagga area.

(3) Traffic Demand

Forecast of passenger demand is done based on 1990 OD and 2010 OD, applying modal-choice simulation model.

The results are as follows:

Table 13.3.3 Estimated Passenger Demand for Improved PR

Section	in 2010
1. Lahore-Lahore Cantt.	17,600 pass./day
2. Lahore Cantt.-Park Rd.*	27,500
3. Park Rd.*-Walton	28,400
4. Walton-Lahore Brdg.*	28,800
5. Lahore Brdg.*-Kot Lakhpat	53,700
6. Kot Lakhpat-Kana Kacha	51,200
7. Kana Kacha-Haloki	46,100
8. Haloki-Jia Bagga	35,300
9. Jia Bagga-Karyal	28,200
10. Karyal- Raiwind	28,200
Total Number of Passengers:	71,300

* New station

(4) Cost for Improvement

The required cost for this improvement of PR is summarized as follows:

Table 13.3.4 Estimated Cost for PR Improvement

Unit : million Rupees

Item	Without taxes & duties	With taxes & duties
[Local cost]		
Labor	6.664	
Material	12.554	
Other	6.089	
Land	1.188	
Subtotal	26.495	26.495
Import taxes & duties		16.733
Taxes on local materials		0.879
Total local costs		44.107
[Foreign cost]		
Foreign cost	20.220	
Freight on import	0.901	
Total foreign costs	21.121	21.121
T O T A L	47.617	65.228

Table 13.3.5 Cost Breakdown of PR Improvement

COST TABULATION (HRT SYSTEM)

unit : million Rs.

item	unit cost Rs	unit	quantity	costs without taxes & duties	foreign costs %	foreign costs	local costs %	local costs	labor %	labor Rs	material %	material Rs	other %	other Rs	land Rs	import taxes & duties %	import taxes & duties	taxes 12.5% on lcl mtl %	taxes 12.5% on lcl mtl	freight on import %	freight on import
shunting track	21,290,000	km	1.0	21.290	27	5.748	73	15.542	20	3.108	55	8.548	25	3.885		113	6.496	56	0.598	5	0.287
sations	173,520,000	each	2	347.040	27	93.701	73	253.339	20	50.668	55	139.337	25	63.335		113	105.882	56	9.754	5	4.685
yards and shops	4,800,000	veh	58	278.400	27	75.168	73	203.232	20	40.646	55	111.778	25	50.808		113	84.940	56	7.824	5	3.758
yard & shop equipment	1,366,000	veh	58	79.228	27	21.392	73	57.836	20	11.567	55	31.810	25	14.459		113	24.172	56	2.227	5	1.070
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
substation facil.	13,280,000	each	1	13.280	27	3.586	73	9.694	20	1.939	55	5.332	25	2.424		113	4.052	56	0.373	5	0.179
power distribution	378,000	each	1	0.378	27	0.102	73	0.276	20	0.055	55	0.152	25	0.069		113	0.115	56	0.011	5	0.005
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
rolling stocks	13,248,000	each	58	768.384	61	468.714	39	299.670	20	59.934	55	164.818	25	74.917		70	328.100	56	11.537	5	23.436
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
total facilities & systems				1508.000		668.411		839.589		167.918		461.774		209.897			553.757		32.324		33.421
land	400	m2	80000	32.000	0	0.000	100	32.000	0	0.000	0	0.000	0	0.000	32.000	0	0.000	56	0.000	0	0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
training & startup	5	%	1508.000	75.400	27	20.358	73	55.042	80	44.034	20	11.008	0	0.000		113	23.005	56	0.771	0	0.000
spare parts	15	%	1508.000	226.200	27	61.074	73	165.126	5	8.256	75	123.845	20	33.025		113	69.014	56	8.669	5	3.054
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
engineering	15	%	1508.000	226.200	27	61.074	73	165.126	40	66.050	20	33.025	40	66.050		113	69.014	56	2.312	0	0.000
project admin.	5	%	1508.000	75.400	27	20.358	73	55.042	80	44.034	20	11.008	0	0.000		113	23.005	56	0.771	0	0.000
						0.000		0.000		0.000		0.000		0.000			0.000		0.000		0.000
subtotal				2143.200		831.275		1311.925		330.292		640.661		308.973	32.000		737.793		44.846		36.474
contingencies	10	%		214.320		83.127		131.193		33.029		64.066		30.897	3.200		73.779		4.485		3.647
TOTAL				2357.520		914.402		1443.118		363.321		704.727		339.870	35.200		811.572		49.331		40.122

13.4 Bus Service Improvement Measures

13.4.1 Changes in Bus Size

Bus service improvement plans are discussed here. However prior to those service improvements, a traffic management policy to re-arrange slow moving vehicles on main streets is necessary. Slow vehicular movement causes traffic friction with motorized vehicles and accidents. If these slow moving vehicles continue to move freely as they do today, the congestion and accidents will continue to increase and any bus lane operations will be significantly deteriorated.

Currently, LDA is conducting traffic management by implementing the following improvement plans

- Roadway and pedestrian path improvement
- Traffic signals and sign boards installation
- Improvements of driver education

No explicit plans to regulate slow moving traffic on main roads outside the Circular Road are shown yet. More constraints on slow moving vehicles would cause social problems because the living of low income classes depend much on these modes. However, urban development will generate much traffic demand and will mandate re-arrangement.

It is supposed this kind of management will require more than several years for a gradual shift and implementation. In the years in the 1990s, the plan to enlarge minibuses should be implemented simultaneously with restrictions on slow moving vehicles. After that, i.e. around the year 2000, bus lane management programs in 13.4.2 can be implemented.

Route restructuring and number of bus fleet in operation should be reviewed once or twice in a year by conducting a field survey. Revision should be initiated by RTA to have updated better service of public service. The revision system should be incorporated in the function of RTA.

The following subsections (1)-(4) discuss the plan to encourage to enlarge the capacity of minibuses.

(1) Trips of Buses and Mini-buses

Service trips of buses and mini-buses were aggregated on the main routes in Figure 13.4.1 by using Table 4.4.1, Appendix Tables 4.2.1 through 4.2.4 and data of each route. Figure 13.4.1 indicates trips or service frequency of both directions of bus, minibus an Suzuki in 1990. (Duplicated from Figure 4.2.3)

In order to discuss the effect of replacing "mini-buses" to "medium sized buses", traffic volumes on selected road-sections were tabulated in Table 13.4.1. Figure 13.4.1 shows the sections corresponding to those in Table 13.4.1. The followings are supplements to Table 13.4.1.

- Numbers of mini-bus and bus trips are tabulated by the data of PRTC, PTA, PTA.

- Traffic volumes in ADT 1990 including non-motorized vehicles are from Table 3.3.1 of the Report. When some sections have no traffic data,

traffic data of an adjacent section is quoted and used for the approximated volume of those sections. The average occupants per mini-bus was 14 persons according to a survey in this Study, being shown in other chapter. Using the figure of 14 persons, the required mini-bus numbers were tabulated.

- The estimated traffic volume, assumed to include medium buses instead of mini-buses, are tabulated by using the average occupants of 30 persons. (Column E).

- Reduction in traffic volume by using "medium buses" instead of mini-buses is shown by a ratio of the total traffic "including medium/including mini". (Column F).

- PCU is 1.5 for mini-bus and 2.0 for medium bus.

Figure 13.4.1 Trips of Buses and Mini-buses

Legend: The total of PRTC, private, Suzuki and mini-bus. (Inter and urban city service)
: both directions per day, 1990

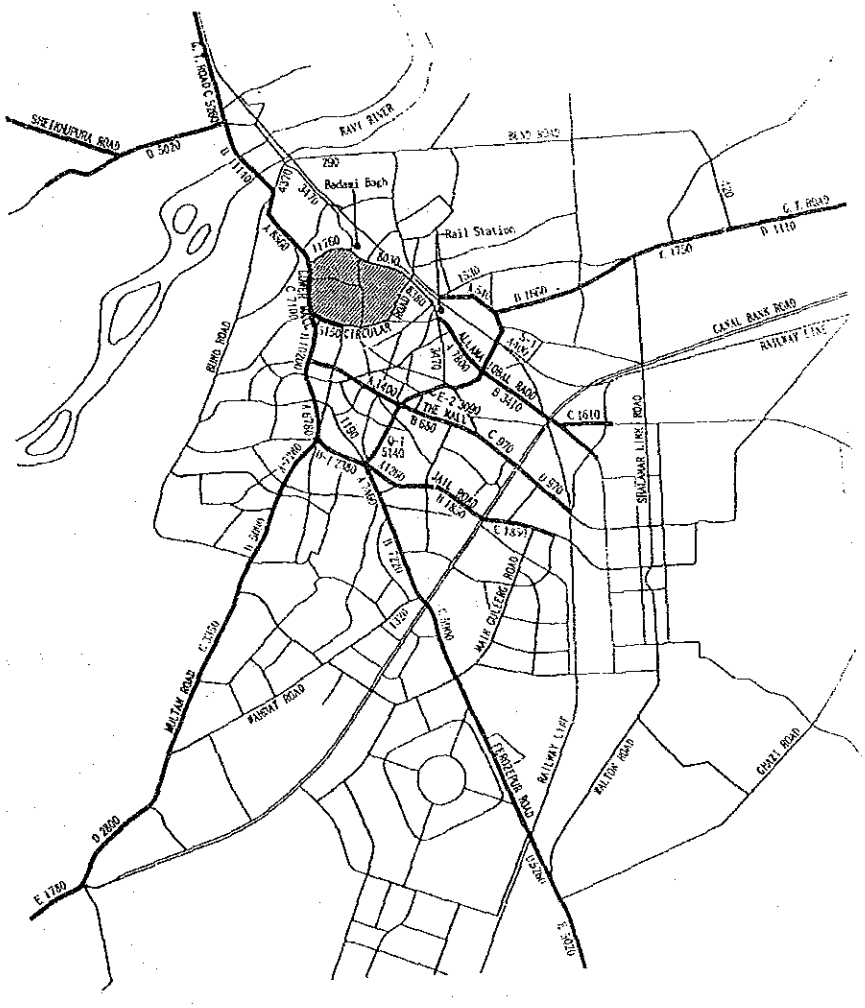


Table 13.4.1 Changes in Traffic Volume by Using Medium Buses

(1)

A Road & Section	B Minibus trips & PCU	C Medium bus trips & PCU	D Traffic Vol. with Mini PCU	E Traffic Vol. with Medium PCU	F Ratio of change D/E	G Remarks
Ferozepur Road						
a. veh	6,070	2,833	124,864	121,627	0.974	D:c*1.25
PCU	9,105	5,666	102,131	98,692	0.966	
b. veh	5,827	2,719	119,869	116,761	0.974	D:c*1.20
PCU	8,742	5,438	98,046	94,742	0.966	
c. veh	4,856	2,266	99,891	97,301	0.974	T
PCU	7,284	4,532	81,705	78,953	0.967	
d. veh	4,300	2,007	46,112	43,819	0.950	T
PCU	6,450	4,014	43,287	40,851	0.944	
e. veh	3,885	1,813	79,913	77,841	0.974	D:c*0.8
PCU	5,828	3,626	65,364	63,162	0.966	
Multan Road						
a. veh	5,286	2,466	142,526	139,706	0.980	T
PCU	7,929	4,932	124,498	121,501	0.976	
b. veh	3,698	1,726	114,021	112,049	0.983	D:a*0.8
PCU	5,547	3,452	99,598	97,503	0.979	
c. veh	2,030	947	46,096	45,013	0.976	T
PCU	3,045	1,894	37,049	35,898	0.969	
d. veh	1,430	667	35,688	34,925	0.979	D:c*0.8
PCU	2,145	1,334	29,639	28,828	0.973	
e. veh	1,406	656	14,824	14,074	0.947	T
PCU	2,109	1,312	25,072	24,275	0.968	
the Mall						
a. veh	1,128	526	110,557	109,955	0.995	T
PCU	1,692	1,052	91,351	90,711	0.993	
b. veh	528	246	110,557	110,275	0.997	T
PCU	792	492	91,351	91,051	0.997	
c. veh	528	246	49,385	49,103	0.994	D:d*1.2
PCU	792	492	41.239	40,939	0.993	
d. veh	528	246	41,154	40,872	0.993	T
PCU	792	492	34,366	34,066	0.991	

A Road & Section	B Minibus trips & PCU	C Medium-bus trips & PCU	D Traffic Vol. with Mini PCU	E Traffic Vol. with Medium PCU	F Ratio of change D/E	G Remarks
GT. Road						
a. veh	420	196	44,610	44,386	0.995	T
PCU	630	392	37,049	36,811	0.994	
b. veh	1,166	544	65,137	64,515	0.990	T
PCU	1,749	1,088	48,368	47,707	0.986	
c. veh	1,132	528	65,137	64,533	0.991	T
PCU	1,698	1,056	48,368	47,726	0.987	
d. veh	688	321	9,408	9,041	0.961	T
PCU	1,032	642	10,733	10,343	0.964	
Allama Iqbal Road						
a. veh	5,452	2,544	113,338	110,430	0.974	D:c*2.0
PCU	8,178	5,088	87,564	84,474	0.965	
b. veh	1,744	813	113,338	112,407	0.992	D:c*2.0
PCU	2,616	1,626	87,564	86,574	0.989	
c. veh	312	146	56,669	56,503	0.997	T
PCU	468	292	43,782	43,606	0.996	
Lower Mall St.						
a. veh	4,282	1,998	77,297	75,013	0.970	D:b*0.8
PCU	6,432	3,996	* 67,520	65,084	0.964	
b. veh	6,854	3,199	96,621	92,966	0.962	File TEPA
PCU	10,281	6,398	* 84,399	80,516	0.954	
c. veh	5,146	2,401	102,933	100,188	0.973	T
PCU	7,719	4,802	* 89,913	86,996	0.968	
Ravi Road						
a. veh	6,606	3,083	56,120	52,597	0.937	T
PCU	9,909	6,166	61,502	57,759	0.939	
b. veh	6,980	3,257	70,150	66,427	0.947	T
PCU	10,470	6,514	76,878	72,922	0.949	
c. veh	3,884	1,813	28,485	26,414	0.927	T
PCU	5,826	3,626	38,578	36,378	0.943	
d. veh	2,834	1,323	22,788	21,277	0.934	D:c*0.8
PCU	4,251	2,646	30,862	29,257	0.948	
Badami Bagh Road						
C-2 Veh	8,564	3,997	56,120	51,553	0.919	D=Ravi,a
PCU	12,846	7,994	61,502	56,650	0.921	
C-3 Veh	5,836	2,723	113,338	110,225	0.973	D=A
PCU	8,754	5,446	87,564	84,256	0.962	Iqbal,a

A Road & Section	B Minibus trips & PCU	C Mediumbus trips & PCU	D Traffic Vol. with Mini PCU	E Traffic Vol. with Medium PCU	F Ratio of change D/E	G Remarks
Queen's Road, etc.						
S-1 Veh	3,708	1,730	65,137	63,159	0.970	File TEPA
PCU	5,558	3,460	48,368	46,270	0.957	
E-2 Veh	2,810	1,311	44,900	43,401	0.967	File TEPA
PCU	4,215	2,622	37,150	35,557	0.957	
Q-1 Veh	4,772	2,227	46,060	43,515	0.945	File TEPA
PCU	7,158	4,454	58,880	56,176	0.954	
B-1 Veh	1,648	769	38,649	37,771	0.977	File TEPA
PCU	2,472	1,538	33,760	32,826	0.972	

Remarks

T: Table 3.3.1 of the Report.

D: Traffic volume of mini-bus was not counted in this section. To determine the volume on the section, the counted volume in an adjacent section was quoted and adjusted by a factor such as 1.20 or 0.80.

File TEPA: Traffic movement at the junction was counted by TEPA in 1990. The data was only for 4 hours including the peak hour, and needed to estimate for 24 hours. A peak ratio of 9% is used to arrive at the ADT.

*: In order to have PCU, the ratio of Traffic Vol. / PCU at "a" section of Multan Road was used.

c: Medium buses in number was determined by (Minibus trips) * 14/30. The PCU of medium-bus was 2.0 for a vehicle.

(2) Transport cost per passenger-km

It becomes clear that reduction in traffic volume caused by medium buses instead of minibuses are different among the sections of the roads in Table 13.4.1. These changes are 53% in number of minibus vehicles and 0.5 - 5.0% of the total traffic on each section as shown in the table. However, the transport cost per person on mini-bus and medium-bus per Km can be enumerated as below:

Ferozepur Road, a & b sections

Km	Mini	Mini-Km	Persons/Km carried	Medium	Medium-Km
1.1	4,856	5,342	74,782	2,266	2,493
2.5	4,300	10,750	150,500	2,007	5,018

the Mall, b section

1.9	528	1,030	14,420	246	467

Ravi Bridge

1.9	6,980	13,262	185,668	3,257	6,188

Economic vehicle operation cost of a mini-bus and a medium-bus is shown in Chapter 9 of the Report.

Minibus	v=20 Km	Rs.3.018 /Km
Medium	v=20 Km	Rs.3.726 /Km

Accordingly, transport cost of the above example number of persons can be compared as follows:

Ferozepur Road, a & b sections

a. Mini	5342x3.018	= Rs.16,122		
Medium	2493x3.726	= Rs. 9,289		
Savings		= Rs. 6,833	6833/74782=Rs.0.091/pass.km	
a. Mini	10750x3.018	= Rs.32,444		
Medium	5018x3.726	= Rs.18,677		
Savings		= Rs.13,769	13769/150500=Rs.0.091/pass.km	

Mall Str. b section

b. Mini	1030x3.018	= Rs. 3,109	
Medium	467x3.726	= Rs. 1,740	
Savings		= Rs. 1,369	1369/14420=Rs.0.095/pass.km

Ravi Bridge b section

b. Mini	13262x3.018	= Rs.40,025	
Medium	6188x3.726	= Rs.23,056	
Savings		= Rs.16,969	16969/185668=Rs.0.091/pass.km

The above calculations of savings show that medium buses of average loading of 30 persons would result in the savings in Rs.0.09 per passenger-Km when compared to the cost of passenger-Km of mini-bus.

(3) Owners' comments

Persons in RTA say if some owners of minibuses offer to use medium sized buses on the route by satisfying the conditions of operation permit, the medium bus operation will be authorized. But no plans nor policies to encourage the use of medium buses are formulated yet in RTA.

Several owners of Hiace mini-buses were interviewed at the terminal area in front of the Railway Station and Bhatti Gate in May 1991. These discussions have shown the following problems:

- Bank loan is not extended for the purchase of commercial vehicles. Those who need the fund get the finance from any private persons at a certain interest charges.

- Owners and drivers are commenting the existing student fare concession system. If students use the medium and large sized buses, they pay only 25 paisa for a ride. If they use mini-buses of HiAce, Ford and others, students have to pay a normal fare. Per passenger revenue decreases if medium buses are used. Mini-bus owners do not intend to Buse the medium buses under the present student concession fare system.

- Spare parts and repair work technology are widely accustomed with HiAce Model of mini-bus.

- Driving maneuverability of the HiAce typed minibus is better in the mixed and congested traffic flows. Drivers prefer to use smaller buses in front of markets, hospitals, and schools.

(4) Recommendations

- In order to alleviate the loss in revenue of owners of minibus who may change the vehicle to medium or large buses, discounted student fares should be abolished.

  A new system with budgetary funds should be stipulated, which supplies students transport subsidiary directly at the school.

- It is likely private vehicle owners will find it difficult to obtain a loan from the bank to purchase vehicles serving for public transport. A system should be developed which makes the owner in obtaining a loan. It may include the formulation of the owners association which guarantees repayment.

- Changes into a medium or larger bus size should be enforced gradually by implementing the above two actions. Currently, RTA has a regulation that the use of minibuses is 8 years maximum. It is anticipated the transition years will be in ten years, say 2000. At the beginning of the next century we may see medium and large size buses dominant on main streets of Lahore.

13.4.2 Bus Priority Lane Operation

Different types of bus lane operation are discussed here. They are less extensive in cost, however, there are two hindrances which should be cleared before bus lane operations are implemented; namely conflicts with slow moving traffic and difficulty in changing the mini-buses into medium/large sized buses in the private ownership.

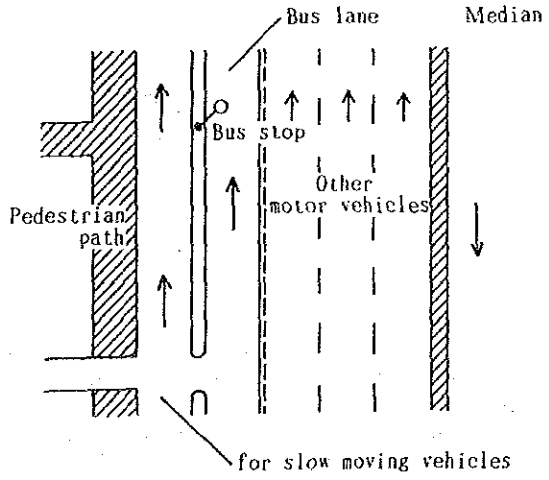
It is supposed that ten years will be needed to clear the above obstacles. This means the 1990s is the transition period in which rationalization of overall transport management, such as solving the above problems, should show substantial progress. At the beginning of the 21st century, the following bus lane operations can be implemented effectively, where adoption of any operation depends on the nature of the corridor or the road:

- Inside lane bus way, segregated
- Outside lane bus way, marking
- One-way traffic and a reversed bus lane

Of these operations, the inside lane bus way system has the highest flexibility due to its potential to convert the right of way to an elevated busway or rail transit way.

(1) Bus Lane and Slow Moving Traffic Lanes

There are different types of vehicles commonly mixed in Lahore traffic. Some area have components of animal carts: Tanga, Rehra, etc. All areas have a bicycle component of traffic. If slow moving non-motorized vehicles are on the road, they normally run the outside lane. Consequently, if the bus lane is marked on the outside lane, there will be continuous conflicts among buses/minibuses and slow moving traffic.



In order to have the efficient operational bus lane, slow moving traffic should not be on roadway. In other words, bus priority lanes would be useless if the road is shared by mixed traffic with slow moving vehicles.

Present main roads are generally not wide enough to design and construct separate lanes for slow moving traffic, and only in a few sections can the ROW be changed. An example of a wide ROW is Jail road from the Canal 2 Km toward Muzang Chungi.

A lane for slow moving traffic could be arranged in such manner as this sketch. It is evident that passengers boarding and alighting a bus in the lane will conflict with slow moving vehicles when they cross the lane between the pedestrian path and the bus stop.

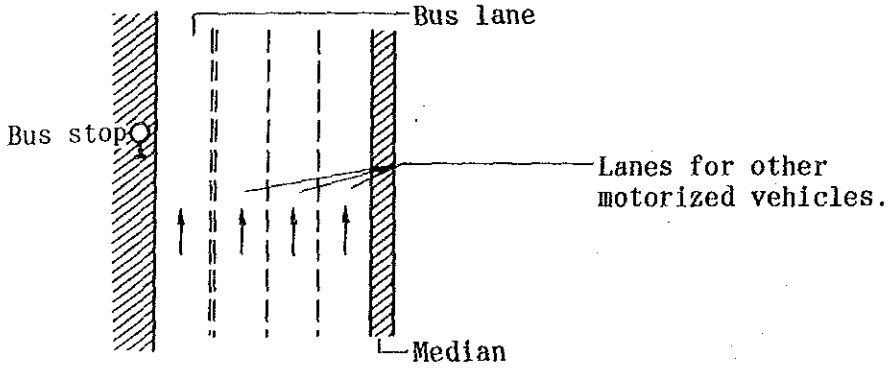
However the length of the section with wide ROW is too short to suffice for an effective bus lane. Moreover vehicles are not yet at the saturated volume to travel at 15-10 Km/hr on the Jail Road. Only at major junctions are traffic jams observed. Thus a bus lane is not urgently needed on Jail Road, and their construction would be a mid-term or long-term project.

Under the current situation of traffic on main roads, it is urgent to consider the separation of slow moving traffic. The separation would reduce conflicts in the traffic flow. If it is difficult because of ROW and social and political constraints, they should be not allowed to run in the daytime, for example, between 7.00 a.m. and 7.00 p.m.

(2) Bus Lanes

1) Outside Lane

Bus lane operation by lane-marking and traffic police guidance can be discussed assuming slow moving vehicles are reduced from main roads. The first is the reserved bus land proposed on the outside lane of multi lane roads. The reserved lane can be one of two lanes depending on the road width and traffic characteristics.

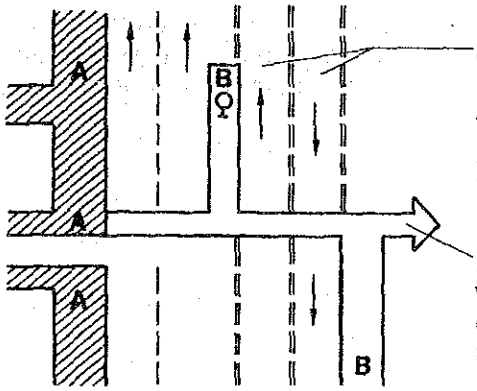


As shown in the above illustration, a bus lane can be posted at the curbside lane because passengers are able to get on/off the buses directly from the pedestrian path. When the bus lane is marked and implemented buses cannot surpass the others ahead, since they have to queue in one lane in general.

However, this kind of separated lane would not function better than the current traffic flow. Even in the case without the bus lane, buses tend to travel in the outside lane and passengers board and alight from the curb. It is quite common for buses and minibuses to weave from a lane to others to pass other vehicles. Hiace-sized minibuses which are dominant in Lahore are small and easily weave among the lanes.

When the bus priority lane is marked and implemented, buses cannot surpass others since they have to queue in one lane. It is likely that no better traffic flow will be realized if a bus lane is imposed on the roads without traffic flow re-arrangement and the use of medium-large buses.

2) Busways segregated on the inside lane



Segregated bus lanes

A : Side walk

B : Bus stand
on the median

Pedestrian crossing between the side walk and the bus stand islands at level crossing, an overhead bridge or underground path.

When the segregated bus lanes are located on the inside lane as illustrated above, a safe walking path across the roadway is required. The path can be on the surface level with signalized traffic control, underground, or an overhead pedestrian bridge.

The islands of bus stop on the medians (B) should be guarded by a fence, and passengers can come to the island only by the path crossing the road way. Length of island should be enough to stop several buses simultaneously.

Characteristics of this median segregated bus lanes are 1) mixed traffic flows would not affect the bus running in the segregated lanes, 2) the fence-guard bus island is to be constructed, 3) the linking path of passengers between the island and the walk side is necessary, 4) the bus lanes can be replaced by LRT or other mass transit when demand becomes larger in the future.

Minibuses would be too numerous to be forced in the segregated lanes together with PRTC and private buses. Medium or larger buses should be introduced when this type of bus lanes is implemented. A peak hour traffic flow can be estimated as follows:

- Large buses 100 veh/hr x crush cap. 80 pass.
- Medium buses 250 veh/hr x crush cap. 40 pass.
- The total 350 veh/hr and 18,000 passengers
  (at an average travel speed of 15 - 20 km/hr)

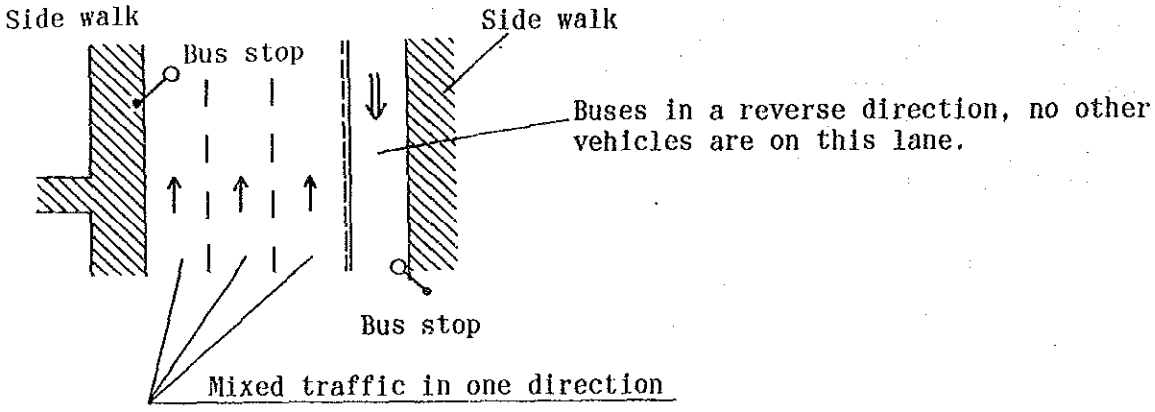
The above figures are consistent with the discussion in Urban Transit System (Alan Armstrong-Wright, World Bank Tech. Paper 52, 1988).

If the segregated bus lanes have flyovers at major junctions and the bus stands are at intervals of 700-800 meters, the lane capacity can be 22-24,000 persons per direction per hour and the travel speed would be 20-25 Km/hr.

The above median bus segregated lanes should be implemented on selected major roads in the middle of the planning period, around 2000. At that time medium sized buses should be commonly used for city bus service.

(3) One Way Traffic and Reverse Bus Lanes

In order to restructure the traffic flow in Lahore, a management plan of one-way traffic flow with a reverse bus lane is suggested. This kind of management is undertaken in other countries and Bangkok is often referred to as an example.



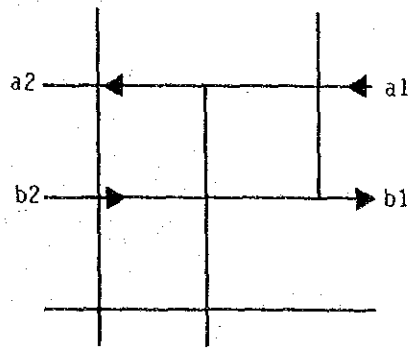
As shown above one direction flow is with normal vehicle types of buses, minibuses, private vehicles, and slow moving vehicles. (If slow moving animal carts and bicycles are excluded, it is far better in maintaining efficient flow on this section). buses and minibuses or medium buses would run and stop as in the current manner. They will carry in the peak hours about 13,000 - 25,000 persons in using multilane roadway together with private vehicles in this direction.

The reverse direction bus lane will be marked by paint and triangle safety cones will be placed at a certain interval. It is better to have flexibility in changing the hours of regulation or the number of lanes and no fixed physical separation is proposed. Public service vehicles on the reverse direction will encounter many cross sectional movements and will run at 15 - 20 Km/hr. The passenger volume would be about 13,000 per hour in this direction.

- Large buses 80 veh x (capacity 80 persons) = 6,400
- Medium 250 veh x (capacity 30 persons) = 7,500

Total in one-way, peak hour = 13,900 persons/hr.

When we compare these flows in two directions on the road, it is evident the private vehicle flow in the reverse direction is neglected on this section. In order to provide a balanced movement of all vehicles, the above reverse bus lane should be placed on a parallel roads at the opposite direction.



If the road is managed to have a reversed lane from a1, to a2, the adjacent parallel road b should have an arranged flow from b2 to b1.

From these viewpoints, some multilane roads in Lahore can be selected to have the parallel functional alignments. The regulation can be for 12 hours, 10 hours or less depending on the traffic. The system can be also shifted from a road to another, an area to the other, and the duration timing and others can be revised after studying the impact of this management.

There are a number of strict actions pre-requisite to implement this traffic management. They are shown as:

- Traffic rules
- Signals and traffic signs
- Traffic police guidances

At present traffic flow conflicts and jams are caused by neglect of traffic rules and discipline and mixture of slow moving vehicles. It is considered that most of the roads are not reaching the maximum level of the capacity if slow moving vehicles are excluded or arranged to run in a disciplined manner. Accordingly, the management of "one-way traffic and reverse bus lanes" is better to be implemented some years after when traffic rules are implemented effectively and slow moving vehicles are under strict regulations in running the main streets.

13.4.3. Articulated Buses and Double Deckers

Some cities in the world use articulated buses and double deckers. Physical characteristics and advantages and disadvantages are discussed in "Urban Public Transportation" (Vukan R. Vuchic, Prentice hall, 1981) for an example. In Islamabad, a four-body trailer buses are in operation. Use of these buses in Lahore can be studies in association with the following factors.

- Road: width, turning corners, vertical alignments and junction types
- Traffic volumes on the road and friction with other vehicles
- Riderships volumes on the selected subject routes
- Mechanical maintenance capability

- Ownership and financial consequences

As discussed elsewhere, a lot of improvement is necessary in traffic managements in Lahore. When more efficient traffic flow management is realized, the use of any type of those larger capacity buses should be studied. It is premature to study the use in the immediate action plans.

13.4.4 Bus Fleet and Cost

(1) General Prospects

The overall transport demand over the years 1990-2010 was estimated in Chapter 6 and part of the estimate are in Table 13.4.2. In order to meet the increase in demand as in the table, buses should be increased for services in LMA. The following discussions would present the approximated cost of various types of buses on roads.

Table 13.4.2 Overall Transport Demand in LMA

	1990	2010	2010 /1990	Average Annual Growth
				(%)
Population ('000)	5,430	10,400	1.915	3.303
GNP per capita (Rs./yr of 1990)	7,590	13,900	1.831	3.071
Transport demand ('000 trips)				
				(%)
Walk	5,121	8,990	1.755	2.854
Private	3,280	7,269	2.216	4.059
Public	1,848	3,975	2.151	3.904

1) Table 4.2.1 in Chapter 4 shows the existing public buses by type in LMA in 1990.

2) Most of the public buses are assumed to have a service life of 8 years since RTA declares the route permit will not be given to the vehicles servicing in Lahore more than 9 years. Replacement of 1/8 of the existing buses per year is assumed.

3) Buses are supposed to increase in proportion to the growth rate of demand and no change in bus type are is assumed including PRTC buses.

4) Average occupants are assumed as under. They are the result of field observation in 1990 (Table 9.3.3 of Chapter 9).

Large	40	(PRTC & private)
Medium	30	(Mazda)
Mini-bus	14	(minibuses)
Suzuki	8	(Suzuki)

5) Market prices of classified bus types are shown in financial and

market prices of 1990.

Large	Rs.460,000	(Locally assembled)
Medium	Rs.330,000	(Reconditioned import)
Mini-bus	Rs.230,000	(- do -)
Suzuki	Rs. 70,000	(Locally assembled)

6) Additionally purchased vehicles are also serving for the 8 years period.

7) Of Hiace-minibuses, 1/3 will be replaced by Coastee type medium buses in 1996 and 2/3 in 2001.

(2) Cost of bases without "a medium bus policy".

It is estimated the cost of buses for replacement and new additions is summarized including PRTC and privates as under in 1990 prices (See Appendix Table 13.4.1 though 13.4.6)

1990-1995	Rs. 565.6 million
1996-2000	Rs. 618.6 million
2010-2010	Rs.1,397.1 million
Total	Rs.2,581.2 million

(3) Cost of buses with "a medium bus policy"

The above (2) is termed as "without project". However, if the case where part of mini buss are replaced by medium sized buses, the cost is less than the above because of relatively larger capacity than the unit cost increase. (See Appendix Tables 13.4.7 and 13.4.8)

1991-1995	Rs. 565.6 million
1996-2000	Rs. 571.9 million
2001-2010	Rs.1,186.4 million
Total	Rs.2,323.8 million

Balance : 2,581.2-2,323.8 = Rs.257.4 million

Consequently, savings in bus purchase cost of the above balance 2,581.2-2,323.8 = Rs.257.4 million will be realized over the years 1996-2010 if part of Hiace-type minibuses are replaced by mediumbuses. The savings will not reduce the investment burden of the LDA on Province of Punjab as the buses belong to private sectors. However, they will benefit to save the nation's foreign currency reserve.

(4) LRT and medium buses

It is proposed the LRT be constructed during 5 years from 1995 and opened for service in 2010 on Ferozepur Road. The traffic distribution with LRt and without it was discussed in Chapter 12. Table 12.3.1 shows the traffic counting estimate of buses on the mid-Ferozepur section with and without LRT. Estimate of medium buses are also shown in the table.

From Table 12.3.1, the following points are estimated when the LRT is opened in 2010.

1) In 2010, public serving mini-buses of 4,800 vehicle trips run the section for the total of both ways.

2) If 2/3 of minibuses are replaced by medium buses the medium buses of 1,500 and minibuses of 1,600 will be in operation on the section.

3) Assuming 5 round trips per mini bus per day, the saving in vehicle purchase cost will be as under:-

   (5300x1/10x230,000)-[(1,500x1/10x330,000)+(1600x1/10x230,000)]
   = Rs.35.5 million

Minibuses equivalent to this saving can be converted to other service routes in Lahore, if medium buses are used extensively on the section.

13.5 Traffic Safety

13.5.1 The Problem

(1) Overview

With the election of the new government under Nawaz Sharif, one of the first official acts was the establishment of the Islamic Shariah with respect to traffic safety. This act, the ensuing professional drivers' strike, and constant discussion of driver behavior in the Lahore newspapers dramatically illustrates the concern of the Government of Pakistan and the citizens of Lahore concerning traffic safety. Although the CSTS is primarily concerned with the overall development of the Lahore transport network, there is perhaps no single issue more important in both the near and long term than traffic safety. The problem for the study team is that there is very little that a team of foreign consultants with limited time and local experience can contribute to the solution to such problems, no matter how crucial the issues.

In order to establish the scale of the problem, a graphic comparison of road safety in Pakistan with other countries may be seen in Figure 13.5.1. This drawing shows clearly that the number of traffic deaths per 10,000 registered vehicles is higher in Pakistan than in any other non-African nation for the countries surveyed. The number of deaths is considerably higher on intercity highways than it is within the cities themselves due to the speeds involved. Nevertheless, the issue of death and destruction is a critical issue within the city of Lahore itself, as countless news articles and numerous studies testify. Unfortunately, a statement about the scale of the problem is a rather difficult one, as pointed out in a recent TEPA paper on traffic safety[1/] because of the almost complete lack of accident data. Moreover, the institution of an accident data file system will have to overcome the prevalent practice of the drivers involved in accidents simply "escaping the scene."

(2) Layout the Blame

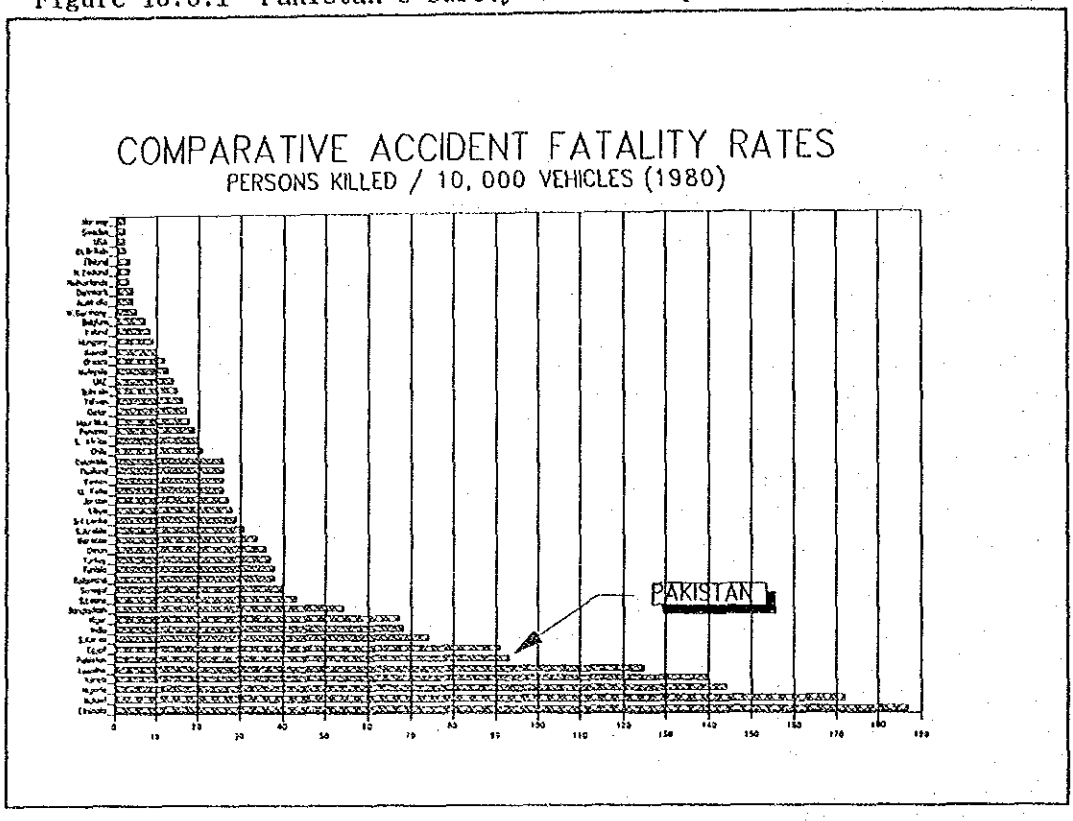
In order to address the issue of traffic safety, a few of the terms need to be defined. Safety specialists define driving as a system with three main components:

- The road
- The vehicle
- The driver

An accident is seen as the failure of one or more of the components to function as it should. With this in mind, the following are issues which are very commonly discussed in both the press and the professional writing about safety in Lahore.

1/ "Working Paper 3: Road Safety in Lahore - An Overview," LDA/TEPA, June 1990.

Figure 13.5.1 Pakistan's Safety Record Compared to Other Countries



Source: Michael McDonald, "Road Accident Data Analysis Methods", Developing World Land Transport, 1987.

In his paper on the subject of "Road Safety in Developing Countries,"[2/] Mr. Sadiq Swati placed the primary blame for traffic accidents on the performance of automobile drivers. He states that a traffic accident is basically a failure in the system of interactions of the road, the vehicle, and the driver. In Pakistan, the road and vehicle conditions are often given a large share of the blame.

1) The Road

Road conditions in Pakistan, although often of poor design standards by international comparison, the roads are generally adequate for the traffic volume they are intended to serve. In fact, he points out, many of the roads within cities throughout Pakistan and as the IBRD/TEPA reports confirm within Lahore itself, that many of the arterial roads have capacities far in excess of traffic demand. Nevertheless, these same arterial roads, he points out have the highest accident rates of any of the roads in the cities of Pakistan.[3/] Second, in addressing the issue of the quality of construction, the roads which have the highest standards of

2/ "Road Safety in Developing Countries", M. Sadiq Swati. This paper was submitted to the Institution of Engineers of Pakistan for their 32nd annual convention in Lahore in October 1990.

construction should have the lowest accident rates, which they do not. Third, roads which were improved to higher design standards in pakistan were subsequently found to have a sharp increase in the number of road accidents.

Finally, according to earlier studies carried out by Mr. Sadiq and others, "it has been clearly established that at most 5% (the comparable figure for developed countries is 3%) of accidents can be attributed to roads in Pakistan...."4/

2) The Vehicle

If vehicle condition is significant in road accidents in Pakistan, the statistics should show that vehicles involved in accidents are usually old and in a poor state of repair. In fact, the opposite seems to be the case, as most of the vehicles involved in accidents are "relatively new."5/

3) The Driver

This all leads to the conclusion that road users are the primary cause of traffic accidents in pakistan and (the author submits) lahore as well. This means that if roads are to continue to be the primary means of travel, the single most important obstacle to overcome to improve road safety in lahore is to improve the behavior of the vehicle drivers.

This is certainly not a problem unique to Pakistan. In a study on road accidents in Jordan, it was found that road users were at fault in about 95% of all accidents in Jordan. Moreover it was stated that "road accidents cost the country 34 million Jordanian Dinars (about $86 million in 1985 [US] dollars) in 1985. This amount represents about 5.6% of Jordan's gross national income."6/

4) Modification of Driver Behavior

Common approaches to modify the behavior of automobile drivers include: driver education programs (both classroom and behind the wheel), driver testing and licensing programs, and programs for traffic laws enforcement, and even improved general education.

3/ It should be said that it is he opinion of the CSTS team that this excess of capacity is in fact be a contributing cause of traffic accidents, as the streets are often so wide that drivers are encouraged to drive on the wrong side of the road for short distances instead of attempting what is often a very difficult crossing of a major thoroughfare.

4/ Swati, p. 22.

5/ Sadiq Swati, p. 23.

6/ Adli H. Balbissi, "Role of Road User and Roadway Geometrics in road Accidents in Jordan." Transportation Research Record, No. 1270 pp. 42-45. Transportation Research Board - National Research Council, Washington D.C.

In order to modify driver behavior to improve safety, programs generally fall into one of two categories: education and enforcement. In a study conducted by the OECD, it has been found that even in developed countries, it is very difficult to statistically link driver education programs with a decreased accident rate. On the contrary, it is quite easy to find strong correlation between traffic law enforcement programs and improved safety records.

This finding was verified in Islamabad by Sadiq Swati when he found dramatic decreases in the number of violations of traffic laws immediately following periods of rigorous law enforcement. Table 13.5.1 through 13.5.3 show results of the study.

Table 13.5.1 Turning Violations

Vehicle Type	Percentage of Violators	
	Before	After
Buses	55%	7%
Trucks	41%	8%
Mini buses	50%	7%
Automobiles	28%	5%
Taxis	48%	11%
Motorcycles	28%	13%
Bicycles	78%	55%

Table 13.5.1 shows the results of a survey of turning violations in Islamabad and Rawalpindi during a study in the twin cities. The first column shows the type of vehicle surveyed. The second column shows the general lack of concern of drivers under normal conditions and that drivers tended to break the law concerning turn restrictions as often as they obey it. The third column shows the tendency of drivers to break the law after a carefully controlled program of law enforcement by the local police was carried out. The improvement is dramatic.

Table 13.5.2 One-Way Violations

Vehicle Type	Percentage of Violators	
	Before	After
Buses	100%	0%
	40%	0%
Trucks	39%	0%
Mini buses	25%	15%
Automobiles	43%	5%
Taxis	50%	10%

Table 13.5.2 shows the same sort of information for one-way violators. Here, the results were even more dramatic, especially for the drivers of buses.

Table 13.5.3 Observance of Stop Signs

Sign 1: Kashmir Highway (Zero pt)

Vehicle Type	Percentage of Violators	
	Before	After
Buses	33%	67%
Trucks	41%	91%
Mini buses	28%	78%
Automobiles	37%	89%
Taxis	27%	83%
Motorcycles	32%	81%

Sign 2: 7th Avenue & Nazimuddin Rd

Vehicle Type	Percentage of Observance	
	Before	After
Buses	----	----
Trucks	7%	100%
Mini buses	12%	0%
Automobiles	24%	74%
Taxis	9%	55%
Motorcycles	21%	70%

To study improvements to the observance (rather than violations) of stop sign restrictions, two specific locations were selected for observation. Results are similar to the previous tables.

Speed violations were also studies in the vicinity of the twin cities, and it was found that the percentage of drivers who violated the speed limit dropped by about 95%.

So in summary, although road improvements must be made to increase road capacity, it seems that in terms of safety, the real key lies in the improvement of driver behavior. The key to the improvement of driver behavior, not surprisingly is centered not upon improvement of skills or in education, but in traffic law enforcement. The numerous stumbling blocks to traffic law enforcement will be discussed throughout the remainder of this paper.

(3) Existing and Planned Programs

1) Road Improvement

There are a number of on-going and planned projects and programs designed to improve road safety in the city. Programs include physical changes to improve the flow of traffic such as lane channelization at intersections, the installation of traffic signals, lane striping, street lighting, installation of pedestrian refuges and the like. A large number of these physical roadway changes are being financed by the IBRD. Others are financed through the Government of the Punjab and other sources.

2) Safety Awareness Campaign

A program which has already been instituted in the city is the annual safe driving contest in which drivers compete against each other indicating their driving maneuvering skills. This sort of contest is no doubt useful in raising awareness of drivers about the issue of driver safety and probably also provides a useful function of social contact between drivers and police officers. its actual benefit in improving driver awareness and lessening traffic accidents is not clear, however.

3) Accident Data

Another budgeted project involved in traffic safety is are the planned institution of an accident data system, which is based on a computer program developed at the Overseas Unit of the Transport and road Research Laboratory in England. This program requires as input numerous bits of detailed information concerning the accident itself, the vehicle, the driver, pedestrians and passengers, and location.

use of the program can assist the government in:

- Providing a general overview of road accidents
- making comparisons with other cities
- Identifying vulnerable individuals or groups
- Identifying physical circumstances associated with high accident rates
- Monitoring accident patterns
- Identifying accident black spots
- Determining appropriate accident prevention measures
- Monitoring the effectiveness of accident prevention measures[8/]

It is the understanding of the CSTS team that the program is available free of charge from the TRRL and that it will be installed at the office of the traffic police and at TEPA offices for joint use between the two agencies. Although implementation has not yet occurred, it use is highly recommended. It should not be necessary to point out that the success of the program is highly dependent on the quality of the input information. Drivers guilty of hit and run accidents must be dealt with sternly.

4) Police Training

An improved training facility for the traffic police is planned by TEPA, and a drivers' training school is in the request pipeline as well. In addition, there are currently "Safety Driving" contests and public awareness campaigns being conducted by the Lahore Traffic Police. Results are inconclusive at this time.

5) Unofficial Programs

In addition to the official programs, there are some unofficial actions which have been taken on the part of the traffic police such as an

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8/ Michael McDonald, "Road Accident Data Analysis Methods," Developing World Land Transport, pp. 316-319, Grosvenor press International, 1987.

agreement with the court judges about avoiding the cancellation of traffic challans. This agreement will be explained in more detail below. The agreement has had a positive impact on traffic law enforcement, but its overall effect on safety has not been evaluated.

(4) Need for action now

The need to make the streets of Lahore safe is critical. The number of cars and the amount of traffic is expected by the study team to increase dramatically within the next few years, and until strong action is taken to make roads safe the tragic loss of life, time, and property is expected to rapidly increase.

The large number of ongoing traffic management programs makes this an opportune time to emphasize the necessary institutional changes that are needed to make the roads safe. Moreover, the growing capability of TEPA to handle design should be coupled with a growing capability to handle the data management that is necessary in evaluating results of safety programs. These general facts and the very important emphasis by Nawaz Sheriff on traffic safety makes this a "window of opportunity" to make improvements. Delays will mean increased accidents and increased suffering on the part of the people of Lahore.

13.5.2 Difficulties in correcting the problems

A number of difficulties are associated with the correction of the problems in traffic safety. These difficulties will be described according to the safety engineer's system of driver, vehicle, and road.

(1) The Traffic Police - Traffic Regulation Enforcement

The most commonly discussed issue in regard to the danger of travelling in lahore is the poor discipline of road users in the city. The blame is spread almost evenly between auto and bus drivers, motor and bicycle riders, pedestrians, and other road users with each group laying the blame on each other.

In order to correct the problem of poor driver behavior, two approaches are common. The first is more strict enforcement of existing traffic laws. The second is through driver education programs. Increasing police activities in an attempt to use the first solution is probably the most obvious way to improve driver behavior, but in Lahore, the Police Department is not at present well equipped to increase its efforts for a number of reasons.

1) Lack of Mobility

The most obvious problem for the police Constables in enforcing traffic regulations is their lack of mobility. A Constable standing on a street corner or in the middle of an intersection cannot apprehend violators even at his location if they refuse to stop. The best he can hope to do is to write down their license plate number and submit it to his superiors. This is particularly difficult considering the environment in which the police work. Since almost all Constables are located at intersections only, it is obviously difficult to determine mid-block moving violations, let alone apprehend the violators. Although there are some mobile police, these

officers are Sergeants and are responsible for police supervision and are not able to spend the amount of time necessary for stopping motorists and issuing challans.

2) Difficult Communications

Beyond the traffic Constable's problem in lack of mobility, he is crippled by a lack of ability to communicate quickly with other officers in case he is able to copy down a violator's license number. This is because of the very low number of radios that are available in the field. Generally the only officers in radio contact with each other and with the dispatcher are the police Sergeants.

3) Generally Low Status of Traffic Police

Compounding the problems of the traffic Constables' lack of mobility and their lack of communications capability is the fact that motorists realize the problem. This is particularly important in that if a Constable tries to flag a motorist over, the Constable is likely to be ignored because the motorist realized that there is very little that the Constable can do about it. This is made even worse by the fact that the Constables have a very low level of prestige and consequently little power to enforce laws.
In fact, very few of the Constables have the capability to issue challans to motorists for reasons described immediately below.

4) Work Environment Problems

Other than the institutional problems associated with serving a traffic Constable are the numerous environmental problems that confront the officers in their day to day jobs. Like all policemen world-wide, there is a certain amount of danger in their job as a result of their being policemen, in the fact that they must work in the middle of busy intersections surrounded by ill-disciplined and often dangerous drivers.

Another factor is the heat in Lahore, especially during the dry season, and standing for hours in the sun while wearing a wool cap directing traffic in a dangerous intersection is a challenge for any human. This is all compounded by the number of hours that a traffic Constable works which are very long indeed. For example according to a conversation with the Superintendent of Police - Traffic, the Sergeants generally work from 7:00 AM to 10:00 PM, for either six or sometimes seven days per week.

The Constables' schedule is not much better. Constables and Head Constables work on a shift schedule in about 4 hour shifts with time off between shifts. These hours are obviously too long for anyone to do an effective job, especially considering the difficult job that they must perform and the climate of Lahore. Moreover, it is generally acknowledged that all traffic policemen, Constable and Sergeants alike, have a very low salary. It is a wonder that the Constables are willing to perform their jobs as well as they do.

Unfortunately, all the above factors combine to create a system that is ripe for corruption if challan issuing capabilities of the officers is increased. This is the main reason that Constables are not allowed to issue them. A number of partial remedies have been attempted to cope with this dilemma and are discussed below. No complete solution has been found however.

5) Inadequate resources (Inability to Control Money from Traffic Fines

The problem of financing increased salaries for traffic police officers and indeed for any police officers is compounded by the problem that money gained from challans and tickets is not kept within the police or traffic police system. In fact the money is not dedicated to any form of transport improvement at all, but simply goes into the general fund for the province. There the money can be spent in any way that is deemed desirable by the government. This leaves the police with very little incentive to try to improve the conditions of traffic in the city.

6) Uncontrollable Staff Changes

A final institutional problem confronting the Traffic Police Department is the fact that the Constables assigned to traffic can be moved to another department at any time without the approval, or even the knowledge of the Superintendent. This is mad possible by having a personnel office which is quite separate for the day to day activities of the department itself. It makes it impossible to develop any kind of traffic "expertise" within the department since the average stay for any one officer is about two years. Since the Traffic Police have among the most difficult jobs in the overall Police Department and since their prestige and pay is far from being the highest. Officers are not eager to remain as a traffic cop. This condition does not lend itself to efficient operations.

(2) The Driver - Driver Education

Driver education programs are often mentioned as solutions to the problem of poor driver behavior. This is inherently based on the assumption that better knowledge of traffic laws will decrease the amount of reckless driving on the part of drivers in Lahore. It is safe to say that driver education programs are much more effective when combined with a program of enthusiastic traffic law enforcement.

(3) The Vehicle - Vehicle inspections

The CSTS team has no knowledge of any existing system for the inspection of privately owned vehicles. Safety inspection of buses is necessary every six months as part of their route licensing. Although observations have been made by the study team of defective lights and signals on buses, it is not felt that defective safety equipment constitutes a really significant problem.

(4) The Road - Road Geometry

Another culprit which is usually cited in the discussion of traffic safety in lahore is the geometrical configuration of the roads themselves. Confusing, no-man's-land intersections, poor or no separation of traffic, parking areas conflicting with traffic flow and the like are usually discussed as being a both a traffic management and a safety problem.

(5) The Road - Lack of Signalling and Pavement Marking

Nonexistent, nonworking, or confusing signalling is another cause of traffic accidents which is frequently cited in the literature on safety. Pavement marking, although not usually cited as a safety issue can be an

important one, especially in the case of pedestrian crossings.

13.5.3 Ideas about Policing

Driver behavior is difficult for the police to control given the number of physical impediments to law enforcement which are already been discussed such as the lack of mobility of the police force, the difficulty in communicating, staff changes and the general environment under which the traffic police must work on a daily basis. The followings are directions of improvement for safer traffic in Lahore.

(1) Strengthen the Institutions

In the past, a large part of the problem of the low status of traffic officers working on the street was no doubt caused by the lack of assurance that fines would be paid. This bad situation was largely caused by the practice the cancellation of the challans by senior police officers. Although this problem was recognized for a number of years, no action was taken due to the potential of similar cancellation of challans by court officers charge with the levying of fines.

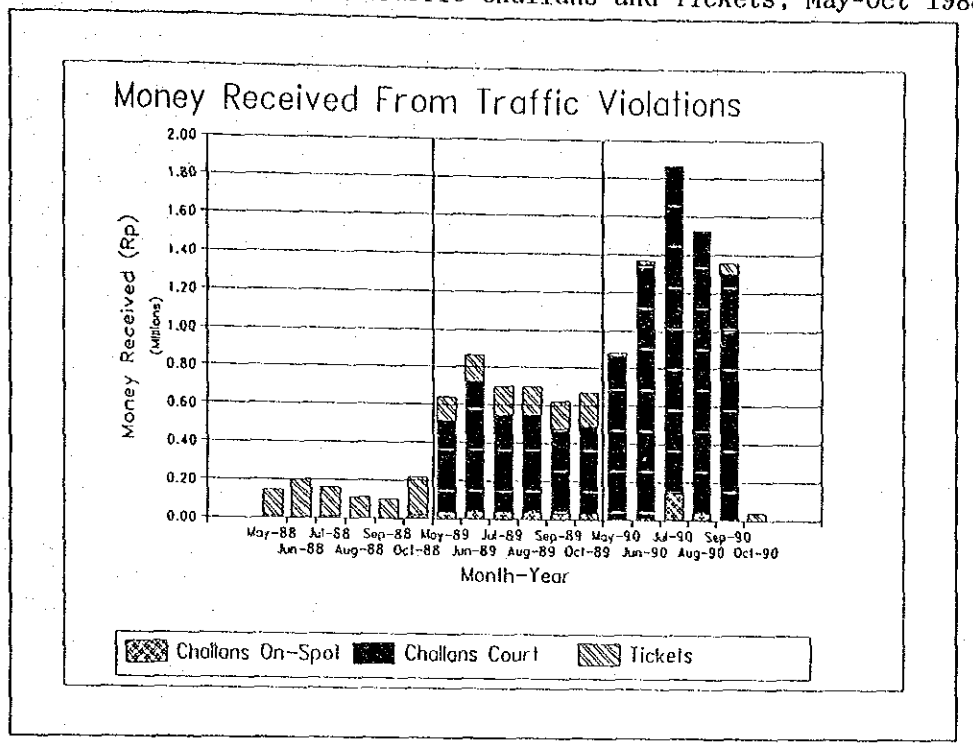
In late 1988, an agreement was made between the Superintendent of Police - Traffic (SP Traffic) and members of the court that no traffic officer (including the SP Traffic) would have the authority to cancel a written traffic challan or traffic ticket[9/] if the courts would likewise refuse to unilaterally cancel them as well. The agreement was set up so that if a driver wanted to contest a particular citation, then both he and the arresting Constable would appear in court for a judgement to be made.

After this agreement was made, a dramatic increase in the amount of money taken in by the Traffic Police occurred, as is shown in Figure 13.5.2. This figure is taken from data showing the amount of money paid for traffic challans and tickets during the six month period from May through October for the years 1988 through 1990. The chart is broken down by type of payment, and shows a dramatic increase in both the total amount of money received after the agreement between the SP Traffic and the court officers. Not only this, but the figure also clearly shows a dramatic increase in the money taken in through court proceedings.

In addition to showing an increase in money taken in, it also indicates a cyclic tendency by month over the year. This cyclic tendency is unexplained at present.

9/ A "challan" is defined as a traffic citation which is of a fairly serious nature and allows the driver to contest the charge violation in court. A "ticket" on the other hand is for a minor traffic infraction and simply states an amount which the bearer must pay. It may be paid at a bank.

Figure 13.5.2 Income from Traffic Challans and Tickets, May-Oct 1988-90



Source : Lahore Traffic Police

(2) Increase the Number of Traffic Police

Clearly, the number of Sergeants and other mobile traffic Constables must be increased if there is to be hope of improvement in performance. The reasons the numbers have not been increased to date is strictly due to the fact that the existing budget will not allow for it.

(3) Increase Mobility of Police Force

Aside from the number of working police officers is the issue of their mobility. This issue has been discussed in numerous other accounts of police problems such as the report for the PUDP as well as in earlier reports. The need of having officers moving with the traffic flow and having the ability to apprehend violators instead of just standing on street corners is obvious. Since those reports were written, however, a few developments bear comment.

Under the Junejo government in about 1986 or 1987, the decision was made that only vehicles of a certain engine size were acceptable as government supplied transport for national officials. Cars with engines over that size were given to police departments all over Pakistan for their use as police cars. The distribution of the cars was not based on local needs for the cars, but only on their availability. About 200 of the vehicles were given to all police in the Punjab, and about 70 of those were dedicated to the Lahore police. About 20 of the 70 were lost before being put into operation. Of the 50 which were put on the roads, only about 15 or 16 are still operating, even though the cars would only be about 5 years old at

present. This dramatic loss of vehicle from the original 50 is largely attributed to a lack of spare parts, generally poor maintenance, and a generally lack of accountability on the part of vehicle users.

A second issue is that recently funds have been allocated for the purchase of several motorcycles for the traffic police force. The problem is the type of vehicle that was ordered. The vehicles which will be used are the small "cafe-racer" type bike where the rider must ride almost in a lying position. These motorcycles are obviously inappropriate for the needs of the average traffic Sergeant.

13.5.4 Possible Actions

(1) New Equipment

1) Provide More Motorcycles

If the traffic police are to be able to have a more positive effect in traffic law enforcement, they are going to have to be more mobile. The preferred vehicle according to SP Traffic is the motorcycle. If the motorcycle is of an appropriate design (not the racing style) it would be appropriate as transport and an enforcement tool for all Sergeants and all Motorcycle Constables, which will be discussed below.

The number of motorcycles has not been clearly defined, due to the difficulties in contacting police officials responsible for the police fleet and fleet maintenance. However, it is safe to say that all police Sergeants should furnished with a motorcycle and each of the Motorcycle Constables should be furnished with one. Moreover, a pool of motorcycles should be established for officer's use while their normal bike is in the shop for routine maintenance or repair. This poor should also have spare motorcycles available on a check out basis for other officers that may need one from time to time. Most likely, it should be administered by the agency charged with fleet operations and repairs.

As for the moment, the provision of additional motorcycles to the traffic police is not recommended as part of the JICA project recommendation, due to the obvious administrative deficiencies in maintaining vehicles. This should be investigated further before any money is committed to such a project.

In addition to motorcycles, consideration should be given to the usefulness of a group of horse mounted police in congested areas such as the circular road. These police mounted on horses may be traffic police or others, and could be quite effective in an area which is highly congested and there is already a large number of animal drawn vehicles. This system has been used quite effectively in US cities (including New York and Philadelphia) to make police more mobile under extreme traffic congestion.

2) Provide More Two-Way Radios

Better communication is badly needed between police headquarters and the officers in the field. More hand-held and motorcycle mounted radios are necessary. It is believed that radios should be provided at a minimum to all Sergeants and Motorcycle constables, and perhaps head Constables as well. Although the idea was discussed that all working traffic Constables

should have a radio, it is now felt that placing the responsibility for the care of such an expensive piece of equipment might not be advisable, since it is likely that the cost of the radio is no doubt higher than the traffic Constable's monthly salary. An additional problem may be that the influx of a very large number of radios might tax the existing dispatching system. This will be discussed briefly below.

A related issue is the introduction of hand held radar equipment. It is felt at the present that speeds of automobiles is not very high at present, and is likely to decrease as traffic increases. It is not believed that a hand-held radar would make the traffic Constable's more efficient or that it would make their job easier. In addition, the introduction of more sophisticated microelectronic devices might just add troubles to an already extended agency.

Similar to the problems with discovering the existing system of maintenance of motorcycles, the radio and dispatching system was not investigated properly due to the difficulty in contacting responsible police administration. For that reason, no JICA proposals are to be made.

(2) Repair, Maintenance, and Dispatching Improvements

1) Vehicle Maintenance

The existing system for vehicle maintenance obviously does not work well, both as evidenced by the fact that Sergeants who have motorcycles generally maintain them themselves and the difficulty of the CSTS team in contacting the person who is in charge of this division. Regardless of the state of the fleet maintenance division, no JICA proposals will be made for improvements due to the lack of information on the facility. There is a change that such a facility should not be run by the police at all, but should be contracted out to private garages on a systematic basis. Normally contracts for repairs should be made on no more than an annual basis with open bidding to allow for competition to improve performance.

2) Radio Maintenance and Dispatching

It is not known how well the current radio dispatching system works, or how well the radios are maintained, as responsible officers were not available to the JICA team. If additional radios are added to the current system, the dispatching system must be large enough to handle the new radios. In addition, maintenance of equipment should probably be done on a contract basis.

(3) Institutional Changes

1) Police Department

(i) Motorcycle Constable

It is the position of the JICA team that the position of Motorcycle Constable should be established. The position should most likely be between the ranks of head Constable and Sergeant with the intent of developing an elite group of dedicated officers. This would be a position to which other officer could aspire. The new position would allow for an increase in the number of mobile Constables and establish a new group whose sole responsibility is to enforce

traffic regulations. The Motorcycle Constables should have the authority to issue challans to anyone, including buses, and should have a relatively high salary. The obvious reason that Sergeants cannot readily provide this function is their other administrative duties conflict with their ability to concentrate on traffic violations.

The number of Motorcycle Constables does not have to be high, as they should be mobile and able to travel anywhere in the city. Moreover, they should be in constant radio contact with the dispatcher so that their movements could be optimized. The Motorcycle Constables could work in shifts, while sharing a motorcycles with another officer to minimize costs.

(ii) Complaint and Investigations Committee

Not only in Lahore, but in every city in the world, there is concern about the corruption of police officers. In order to improve driver behavior, officers must be able to issue tickets. In order to assure honest and diligent work by traffic police officers, two steps are recommended:

- First, officers salaries should be high enough to attract qualified individuals. Combined with this should be strict management which will not tolerate even a hint of corruption.

- Second, a police complaint and investigations committee should be established. It should have the power to investigate wrongdoing up to and including the rank of SP, and must have the power to impose sanctions. It should most likely consist of high ranking police officers and private citizens who are outsiders to police business. Its operations should be publicly accountable, although clearly not all its information can be made public.

(iii) Rules for Inter-Department Transfers

In order that the traffic police might establish a group of dedicated Constables, there is a strong need to establish rules for inter-department transfers. The present system of transfers without notification even to the SP Traffic must be stopped in order to stabilize the traffic police division. If work conditions, salary, and esteem are improved through steps such as those outlined above, it is believed by the CSTS team that a more stabile traffic police force can be established.

2) Traffic Court

Although the need is not clearly established, it is the belief that court operations might be improved with the establishment of a Traffic Court. This court is likely to become necessary if the number of traffic challans is increased dramatically as the study team recommends. This court should be established with the rule that neither police officers or officers of the Traffic Court judges can cancel challans without a trial. The trial should be a formal one where both the defendant and the charging officer must appear. Although this "gentlemen's agreement" already exists and is quite effective, it should be put into writing so that the agreement will continue.

3) Insurance

Driver liability insurance coverage[10/] should be mandatory for all drivers of vehicles in the city (or state of Punjab). In the case of buses, the bus owners should provide coverage for the drivers. Insurance premiums should be based on the driver's driving record. A driver who has had more than one challan issued to him should have to pay higher rates for coverage. Therefore, it is important to make sure that insurance companies (or national agency) have access to all driving record information compiled by the police.

(4) Money from Fines

Currently all funds collected through traffic fines go directly into the general fund, and cannot be used for transportation improvements. Consideration should be given to reserving the funds for specific uses such as:

- For funds for families of people killed or injured in traffic accidents
- Road safety programs
- Police training
- Driver training programs
- Safety campaigns
- Other transportation improvements
- Possible increase in police salaries (or more levels to which they might aspire)

In any case precise accounting information on sources of income and expenses should be publicly available. This is regardless of whether the current system is continued or if the funds are earmarked for transport related expenses.

10/ Liability insurance means a policy which will pay for all damages on the part of a driver who is "at fault" in an accident. The coverage will pay for property damage and medical expenses of the innocent injured party. Liability coverage is not intended to cover damages incurred on the part of the driver "at fault".

13.6 Parking

13.6.1 Overview

Parking on and alongside streets is an important impediment to traffic flow in the city core. Moreover, even the use of existing parking lots is chaotic and generally uncontrolled. In both lots and on the streets, parked vehicles and vehicle parking maneuvers restrict traffic flow. Measures to create orderly off-street parking combined with access control can greatly increase street capacity, driver mobility, and safety.

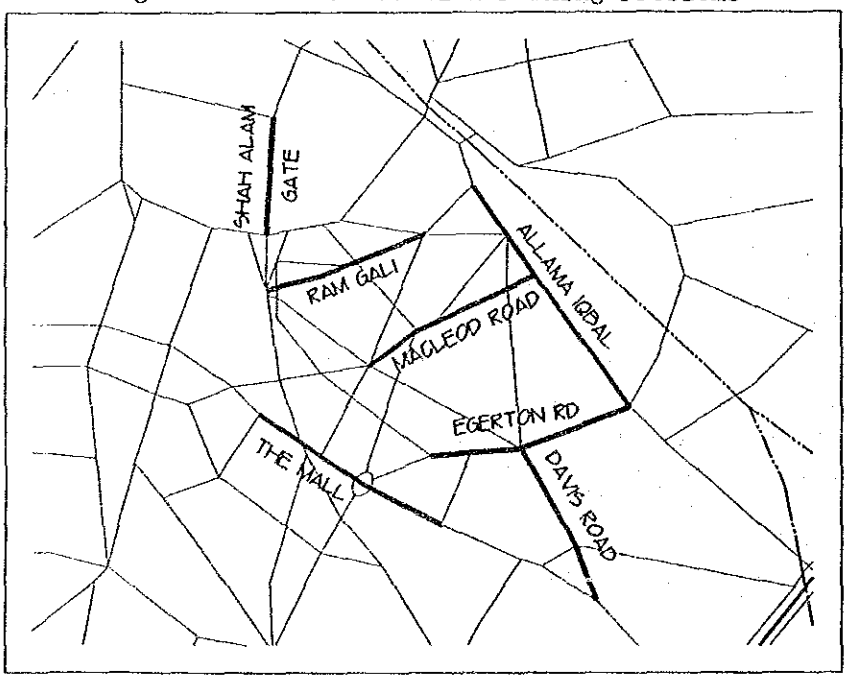
Parking measures which are part of on-going schemes are the creation of well defined on-street parking spaces, the construction of small parking lost, and the related construction bus bays. Several new parking garages in the central area of the city are also planned. Existing building regulations already incorporate parking space requirements, and parking restrictions exist in some areas. Badly need are policies for the construction of off-street parking lots, and for the institution either be public or privately run, or as will be described in later, even a mixture of the two.

13.6.2 Parking Demand

(1) Problem Areas

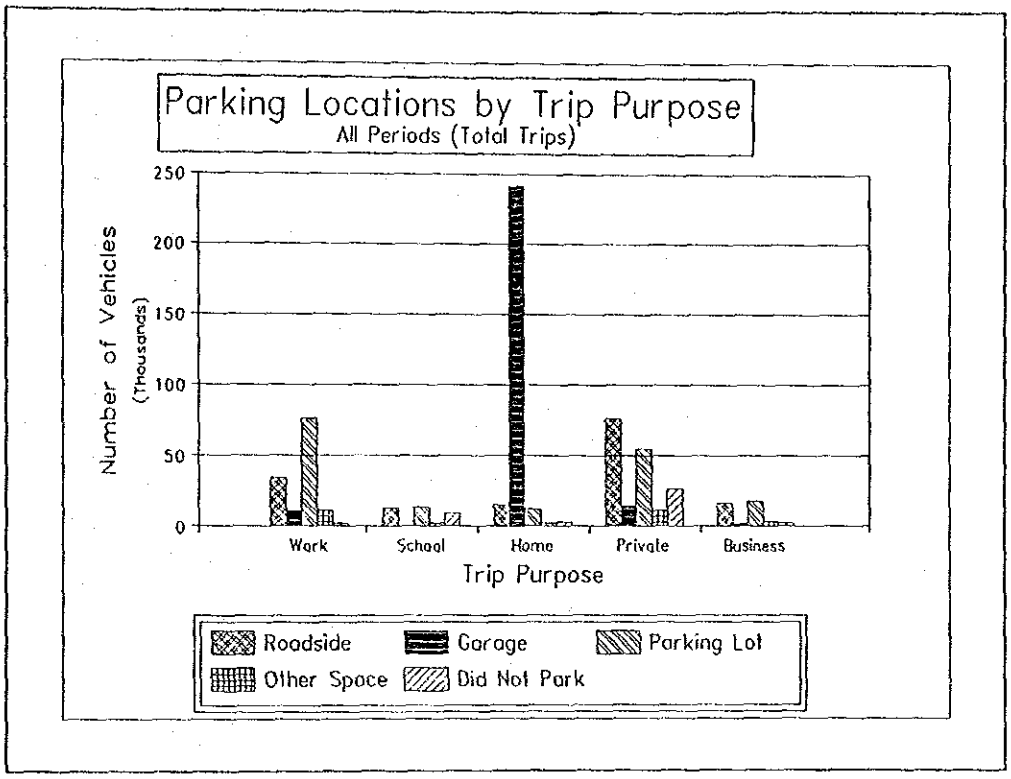
Areas which were identified by TEPA officials as being problem areas are shown in Figure 1. These areas are generally concentrated in the shopping, government office, and institutional areas clustered between the Mall, the walled city and Lahore Station. More suburban areas such as Gulberg market and Ghadaffi Stadium which have large amounts of automobile traffic are not generally as much of a problem in terms of parking. This is primarily due to the fact that ample area for parking lots exists where the use of the land is less intense.

Figure 13.6.1 Areas with Parking Problems



The problem areas are generally in centrally located areas of the town that are common destinations of the relatively affluent. These areas include streets near private schools, universities, hospitals, and government offices. In the upper income neighborhoods, there is not a significant parking problem at the present, primarily due to the fact that most people have garages, or land on which they may park their cars. This is illustrated on Figure 13.6.2, where the location of parking is shown by trip purpose.

Figure 13.6.2 Automobile Parking Locations by Trip Purpose
All Time Periods



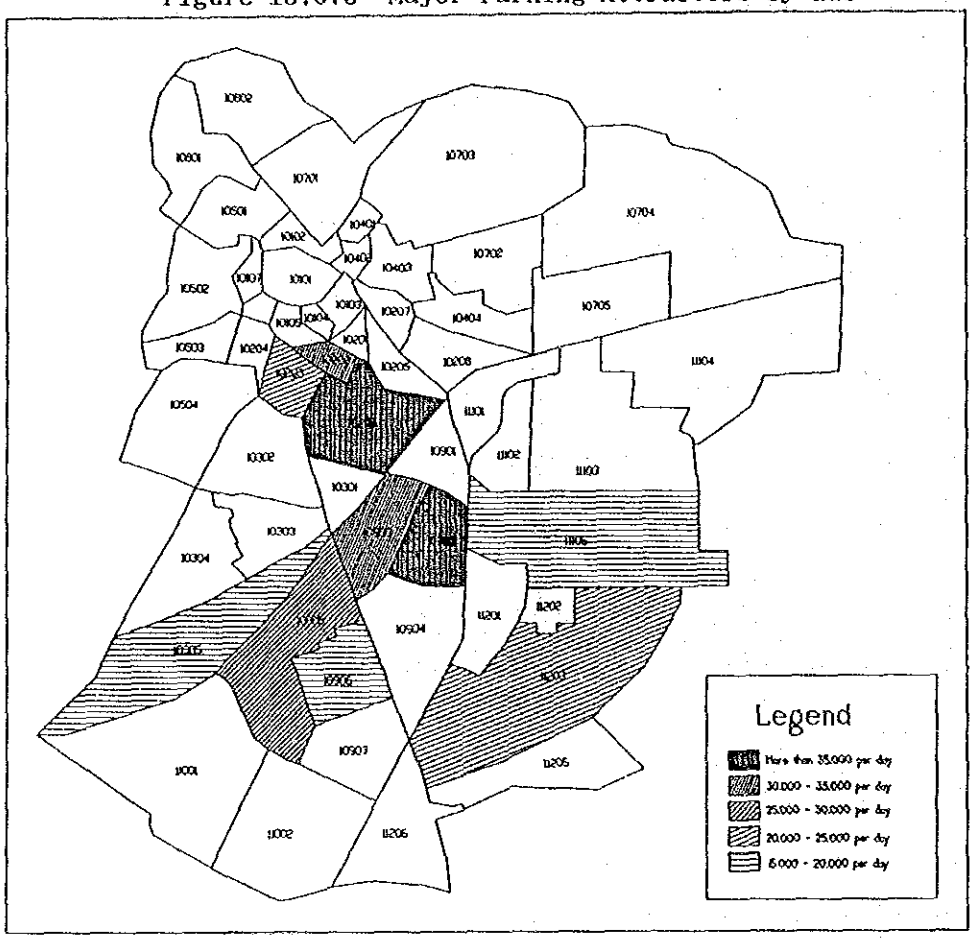
Clearly, the majority of "to home" trips end up in parking garages. A significant number of work trips and private trips end up with parking in either parking lots or on the street. As income rises, the number of vehicle trips is expected to dramatically increase. Moreover, as people shift from motorcycles to autos, parking problems are expected to rapidly worsen. This increasing demand, combined with the chaotic manner of auto parking that is common in the city at the present does not bode well for the future in Lahore. Solutions to improve on parking such as the construction of parking garages, and provisions for on-street parking are already being pursued. However, it is the opinion of the CSTS team that, similar to traffic safety, the real key to improving on the existing parking problems is to be found in law enforcement.

(2) Parking Analysis from the HIS and CSTS Modelling

The HIS (Home Interview Survey) performed by the CSTS team in 1990 yielded the basis for the number of automobiles parking in each zone as is shown in Figure 13.6.3. The number of trips is based on the number of responses to

the HIS and is expanded in each zone by the population of the zone of origin. A car is considered to have parked in a given zone if a secondary leg of a linked trip began more than 30 minutes after its predecessor leg ended.

Figure 13.6.3 Major Parking Attractors by HIS



Zone with less than 15,000 cars parking daily in the zone are not shown. The two zones with far and away the highest number of car parking maneuvers are zone 10902 (Gulberg market area) with 45,886 cars parking there during the day and zone 10206, between the Mall and Jail Road and between Queen's Road and the Canal Bank with 35,764 per day. These numbers are not surprising as these two neighborhoods are the most affluent in Lahore. Moreover, they include major shopping and office areas in the city where autos are likely to park.

A method was needed to estimate the increase in the number of automobiles and motorcycles which will be parking in particular zones for the target year of 2010. In order to do this, the CSTS 2010 origin-destination trip matrix was used to make an estimate assumption was made that the number of vehicles traveling to any particular zone in a typical day is correlated to the number of vehicles which will park in that zone. Not surprisingly, the areas with the highest proportional increase in the number of parking vehicles are in the outlying areas, largely to the south of Lahore. The only area inside the inner area which is predicted to grow by over 200% (the average being 202% for motorcycles and 248% for cars) is the area

immediately surrounding the Ravi bridge. The increase in the number of spaces needed is shown in Table 1 on the following page.

Table 13.6.1 Increase in Vehicles by Destination
Estimate of Future Parking Demand by 22 Zone System

Zone	1990 M/C	1990 Car	2010 M/C	2010 Car	M/C Increase	Car Increase
1	166,371	85,362	225,865	177,649	136%	208%
2	251,486	229,426	255,823	471,726	102%	206%
3	220,553	193,941	229,462	405,089	104%	209%
4	123,862	20,991	171,214	63,875	138%	304%
5	174,160	44,649	256,112	132,899	147%	298%
6	63,522	30,031	114,487	100,464	180%	335%
7	214,634	50,366	519,532	193,461	242%	384%
8	63,432	11,218	384,291	98,393	606%	877%
9	204,721	388,331	174,351	515,829	85%	133%
10	76,307	51,928	103,499	141,694	136%	273%
11	135,643	80,249	270,722	173,756	200%	217%
12	100,345	129,587	137,814	338,314	137%	261%
13	25,292	12,800	108,500	39,881	429%	312%
14	9,349	5,644	39,839	26,929	426%	477%
15	13,532	7,295	586,959	362,452	4338%	4968%
16	7,421	6,626	47,825	34,573	644%	522%
17	15,991	12,844	121,845	106,123	762%	826%
18	10,147	4,426	41,262	20,178	407%	456%
19	1,644	13,014	2,822	26,712	172%	205%
20	1,806	8,892	1,966	20,322	109%	229%
21	387	6,790	594	14,515	153%	214%
22	1,221	3,287	1,780	7,496	146%	228%
All	1,881,826	1,397,697	3,796,564	3,472,330	202%	248%

13.6.3 CSTS Parking Surveys

(1) Parking Turnover Survey

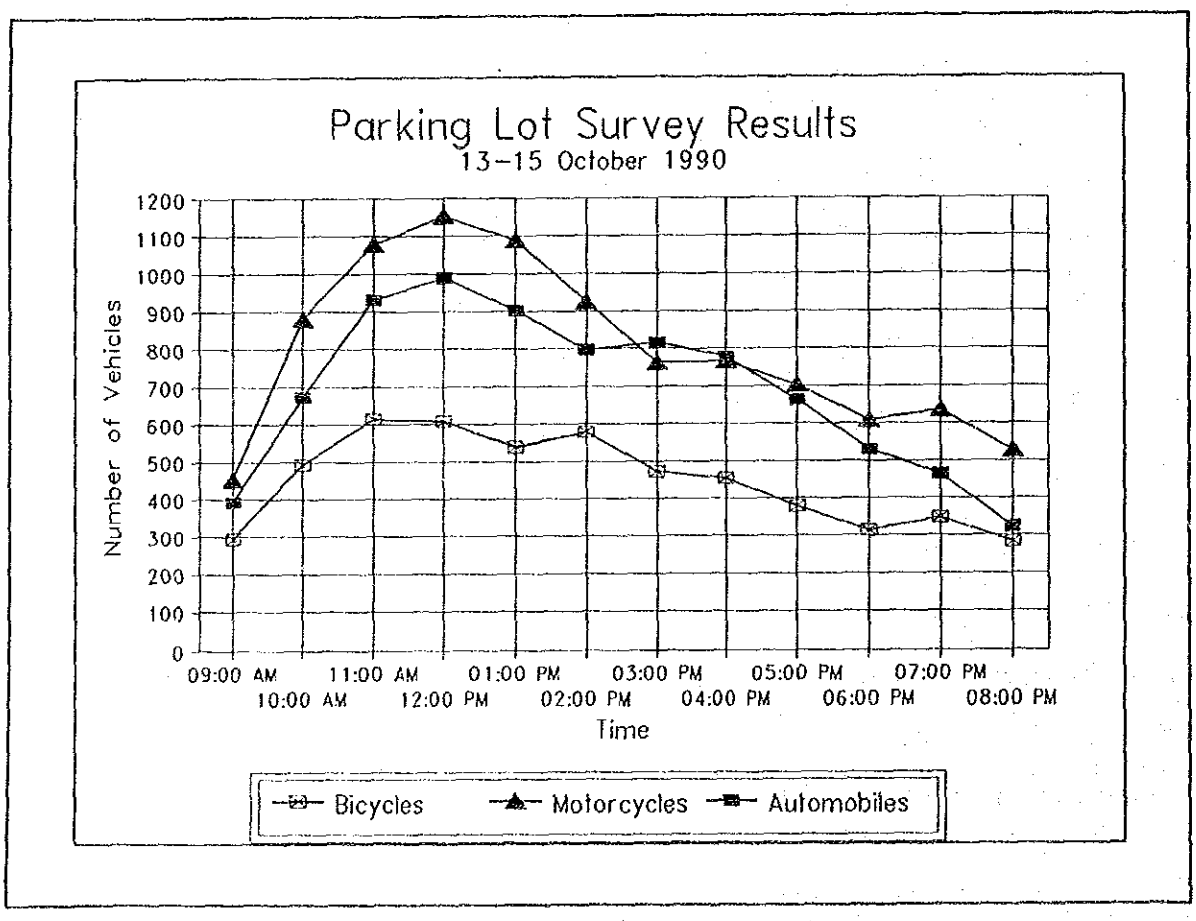
On 13-15 October 1990, (Sunday through Tuesday) the Study Team conducted a parking survey along The Mall between the Assembly Hall and the High Court. According to TEPA officials, this area is one of the most heavily used parking areas in the city on a daily basis. The survey itself was completed on the 15th of October, and data input was completed on 27 October.

The goal of the survey was to understand the number of vehicles using the parking lots along The Mall and their distribution over time. A second goal was to understand the length of time which the cars were parked in the lot. These goals were accomplished by having teams of surveyors walk through the lot and write down automobile license numbers and count motorcycles and bicycles.

The rather large area was broken down into 11 zones, which were surveyed in groups over the three day period. The survey began in the morning at 9:00 and continued until 9:00 PM, with the surveyors working in two shifts of six hours each. Each survey crew would make one pass of its assigned zone in specified time periods. Each period lasted 20 minutes, so that the crews would cover their entire zone three times in one hour. On each pass, the surveyors would record the license plate number of every auto and record the total number of bicycles and motorcycles in the zone.

It was assumed that parking characteristics would be the same on each day of the survey since all days are business days. This assumption turned out to be misguided as Sunday is a day off for some of the business in the area. However field observations were able to detect very few differences in parking characteristics during the three days. Due to the large amount of data gathered, at this time, only hourly data has been entered into the computer. This in itself totals some 8300 records. By totalling each time period, it is relatively easy to obtain a time profile of the parking. This was done and is shown in Figure 13.6.4.

Figure 13.6.4 No. of Vehicles Parked by time Period



It should be noted that a rough calculation of the capacity of the entire lot shows the capacity to be 1040 automobiles. The number of automobiles during the 12:00 peak was 989 vehicles, or about 95% of capacity. to this number must be added 1160 motorcycles, most of which occupied car parking space. Thus the lot during the peak period is considerably over capacity. This is possible due to the irregular shape of many of the parking areas, due to the tendency of motorists to double and triple park, and due to the fact that some of the motorists parked in unorthodox places such as on the sidewalks and immediately in front of shops.

Preliminary work based on three selected zones to determine the turnover rate of cars reveals the following:

Table 13.6.2 Turnover of cars in lot, CSTS Parking Study

Time spent	Number of cars	Cumulative
0 to 2 hours	881 vehicles	(66%)
1 to 3	200	(81%)
2 to 4	107	(89%)
3 to 5	60	(94%)
4 to 6	26	(96%)
5 to 7	20	(97%)
6 to 8	13	(98%)
7 to 9	9	(99%)
8 to 10	6	(99%)
9 to 11	3	(99%)
10 to 12	6	(100%)
11 to 12	1	(100%)

(2) Parking Interview Survey

At the same time as the parking lot survey, a questionnaire was given to selected short term parkers to learn their opinion of parking in the area. in this survey, 185 people were asked to respond to the following potential problems of the lot. Respondents were allowed to answer yes to as many of the statements as they deemed appropriate.

It may be interesting to note that motorists giving positive responses to one or more of the following questions: 2, 3, or 4 included 153 or 89% of the survey sample. Since all of these questions reflect an undersized parking area, it seems that motorists are all eager to increase the number of parking spaces.

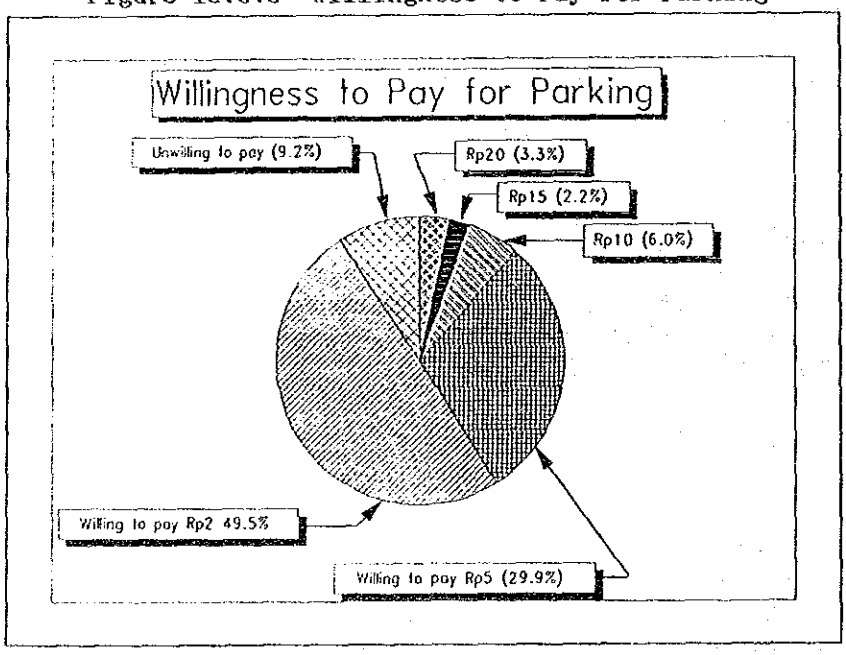
This is not surprising, considering the occupancy rates discussed in the parking lot survey. Question 6 was asked even though there is no official charge for parking in this area. This was done because of information that some people illegally charge automobile owners for "security." The going rate is 2 Rupees.

Table 13.6.3 Parking Problems
CSTS Parking Interview Survey

	Potential Problem	Number of motorists agreeing	Percent
1.	no problems	24	13%
2.	Not enough spaces	89	48%
3.	It is difficult to find a space	113	61%
4.	No spaces close to may destination	62	34%
5.	Security is bad	77	42%
6.	I am unfairly charged	13	7%
7.	It is dangerous to drive in the lot	39	21%
8.	it is dangerous to walk in the lot	36	19%
9.	Disorderly parking	83	45%
10.	Other	23	12%

When questioned about their willingness to pay for parking, motorists overwhelmingly agreed that they would be willing to pay something for improved parking. Responses are indicated in the pie chart in Figure 13.6.5.

Figure 13.6.5 Willingness to Pay for Parking



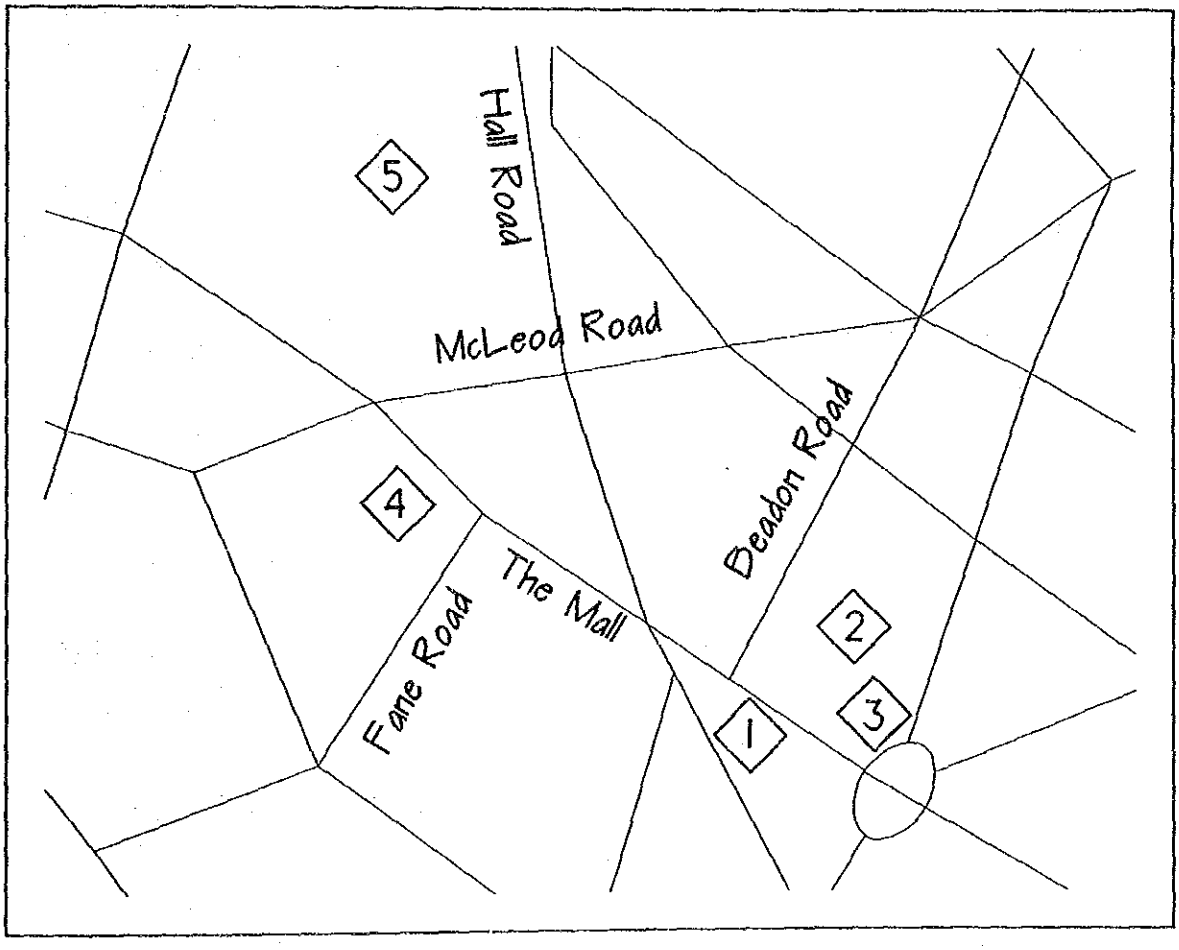
13.6.4 On-going LDA Projects

Due to the pressure for additional parking facilities in areas of existing heavy demand for parking, the LDA is currently negotiating to build parking garages. The locations of five such garages under consideration is shown in Figure 6. The first of these garages, number 1 in the figure, is to be located behind the Al Fallah Building on the south side of the Mall west of Charing Crossing. The plan is to enter into a joint venture with a developer who has a need for parking already. Although several options

exist at the present, one is for the developer is to pay for the land, and then construct a building of three stories and a basement. The basement is to be handed over to LDA or TEPA for use as a parking lot which will be managed by either TEPA or a subcontractor. The LDA will then have the option of building up to the 9th level with a larger parking garage. This can then possibly connect with a parking garage next door which is already under construction.

In this way, the LDA will be able to encourage parking lot construction without investing their own funds. The developer will benefit by having a parking lot for customers and employees facility. It is hoped that this model of semi-public parking garage construction can be carried into the construction of the other four garages whose locations are shown in Figure 13.6.6.

Figure 13.6.6 LDA Planned Parking Garages



13.6.5 Existing Regulations Related to Parking

Laws are already on the books which require developers to construct parking spaces for customers and employees based on building size. The book "Building Regulations -- 1984" by the Lahore Development Authority clearly outlines the regulations under "Part 2 Building and planning Control Requirements," "Section III - Commercial and Officers," and "Item 66 -- Parking or Vehicles." These regulations state:

(A) In the Central Areas, every prospective builder shall be required to provide parking space within the premises at the rate of:

(i) One motor car space for every 1400 square feet (128 m^2) of floor area.

(ii) One motor cycle/scooter space for every 300 square feet (27 m^2) of floor area

(iii) One cycle space for every 250 square feet (23 m^2) of floor area.

(B) Provision of parking requirements under Regulation 66(a) shall conform to the following standards:

	Motor Car	Motor Cycle	Bicycle
Bay width	8 ft (2.45 m)	2 ft 6 in (75 cm)	2 ft (60 cm)
Bay length	18 ft (5.50 m)	6 ft (1.82 m)	6 ft (1.82 m)
Turning circle	20 ft (6.1 m)	6 ft (1.82 m)	6 ft (1.82 m)
Width of single driving lane	9 ft (2.75 m)	3 ft (91 cm)	3 ft (91 cm)
Gradient of ramp	1:10	1:10	1:10

The ramp slope may be increased to maximum 1:5 provided that for slopes over 1:10, a transition at least 8 feet (2.45 m) long should be provided at each end of the ramp at one half the slope of the ramp itself.

(C) Wherever parking is provided under a permanent roof or floor;

i) No partition walls, window other than security grills, railing or necessary fire barriers shall be constructed.

ii) Adequate means of ventilation and fire protection shall be provided.

(D) Basement, if used for parking, may cover the entire plot. However, the space required to be provided under Regulation 20(i)[1/] shall be left open at the level of the basement.

(E) A ramped driveway exit rising up to a public sidewalk must have a transition section that is almost level (maximum slope 1:20) before

intersecting the sidewalk to prevent the hood of the car from obscuring the driver's view of pedestrians on a public sidewalk. Wherever an exit driveway is parallel and adjacent to property line wall is held back from the sidewalk, the required distance between driveway and wall may be reduced by one foot (30 cm), as shown in Figure 1(b).

Note: (i) For the purpose of calculating parking requirement, the gross floor area shall not include the area of mechanical plant rooms, such as air conditioning plants, electric sub-station, lifts, etc. and the area provided for use of parking and circulation of vehicles. It shall however., include area under passages, lobbies, and walls etc.

13.6.6 CSTS Recommendations

Recommendations of the CSTS team for parking control measures beyond the construction of parking garages by the LDA and the on-going programs of World Bank / TEPA are fairly straight forward. The installation of parking meters was considered, but for several reasons, the idea was not pursued. The obvious problem with parking meters is the expense. It is felt that it is very difficult to justify the expense of the meters which would have to be imported. A second problem is the fact that coins are not used in Pakistan, and a token system would have to be instituted. It is not believed that this would be reasonable given the current state of affairs in Lahore.

(1) Written warnings posted on illegally parked cars

First time offenders who are parked in an illegal area or in a disorderly manner can have written warnings placed on their cars. This may or may not include a fine.

(2) Booting of vehicles

Repeat offenders, as distinguished by their license plates[2/], can have their vehicles "booted." This is a steel device that can be attached to the wheels of their cars, and although it does not damage to the car itself, the car cannot be moved without police intervention. It has been used with a great deal of success in many U.S. cities.

(3) Removal and detention of illegally parked vehicles

As a last resort, cars which are illegally parked can be towed away and impounded. This is an important option where a car is parked in a manner where it interferes with traffic or otherwise threatens public safety.

(4) Parking Police

As in the issue of traffic safety, it is believed that the only real solution to the parking chaos in Lahore is through enforcement. It is probably true that as traffic moving violation laws are enforced more strictly, the obeying of parking regulations will follow. Enforcement in some countries is carried out by the traffic police themselves.

In many north American cities, a special force of women police officers look after parking violations. In numerous third world countries, parking lots and on-street parking are attended to by private contractors. In Jakarta, Indonesia, for example, the private contractor directs the driver to park in a certain position, and then collects a small amount of money from the driver as he heaves the space. The amount of money collected is set and does not depend on the length of time that the car has been parked. Motorcycles generally do not pay for parking.

It is believed that this sort of system may be the best system for on-street parking in Lahore. In areas where the length of stay are important, such as in the Mall shopping areas, and where parking access can be controlled, a different sort of system should apply. In these areas, a timed ticket system could be employed, where drivers pay an escalating rate for the length of time that they park. The CSTS parking study at least tentatively indicates that this charge may be on the order of Rp5 to Rp10 per hour for the first hour, and then escalate from there.

In any case, it is believed that systems for monitoring parking should most likely be under the jurisdiction of TEPA rather than the traffic police. This is largely due to the need to keep demands on the traffic police down. Moreover, TEPA is the authority for transport planning under the LDA, which has the authority to approve the construction of new facilities.

1/ A space of not less than ten feet (3.00 m) extending throughout the width of the site within the limits of the site shall be kept clear at the rear of building except for the boundary wall not exceeding 7 feet (2.20 m) in height measured from the plinth level.

2/ This assumes that the police have good radio communications with the police office and that the local dispatcher has access to database of law offenders. See Chapter on Traffic Safety.

13.7 Mode Interchange Area Development

13.7.1 General

Generally, railway stations and bus terminals where transfer points between different modes of transport exist, are considered mode interchange areas.

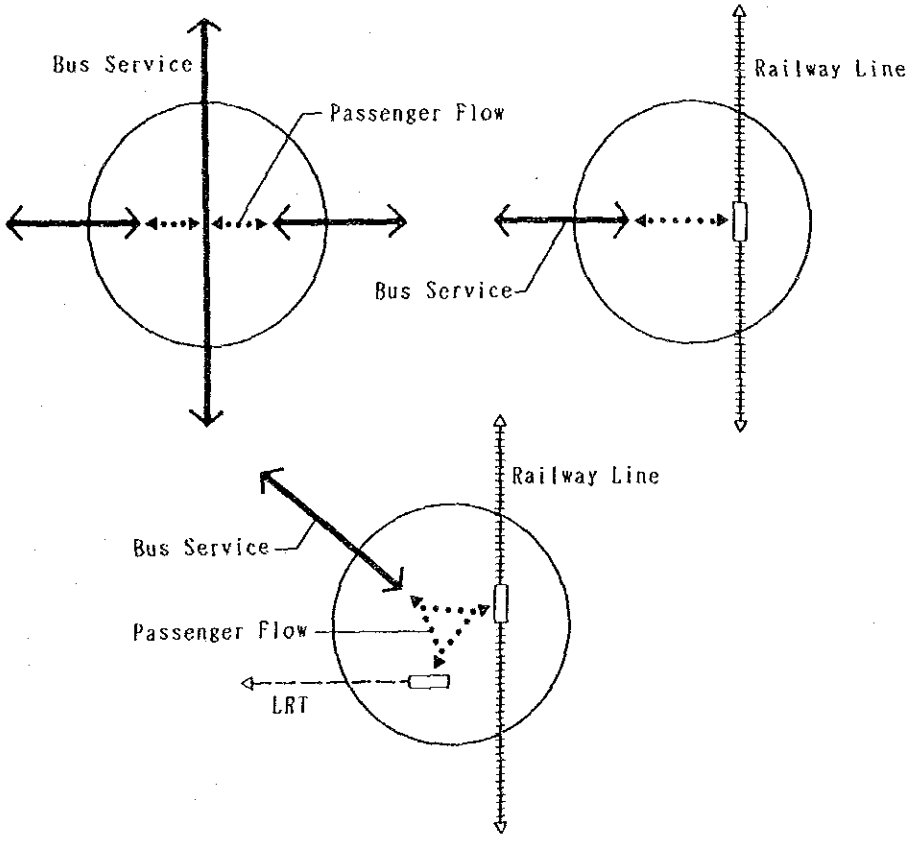
The strengthening of mode interchange areas is an effective countermeasure to the problem of public transportation because it reduces road traffic volume. In addition, a possibility exists that a new urban core would be created in the center of the mode interchange area.

Intercity bus terminals, such as Badami Bagh and Railway Station areas, function as mode interchange facilities in the LMA. On the other hand, there is a lack of mode interchange facilities for urban services because most of the bus terminals in the LMA are on-road.

It is necessary to consider a new type of mode interchange facility in conjunction with the introduction of the LRT.

In this section, it is proposed that the conceptual plan of mode interchange areas in Data Darbar and Model Town South be made for terminal stations at the first stage of the LRT.

Figure 13.7.1 Concept of Mode Interchange Areas

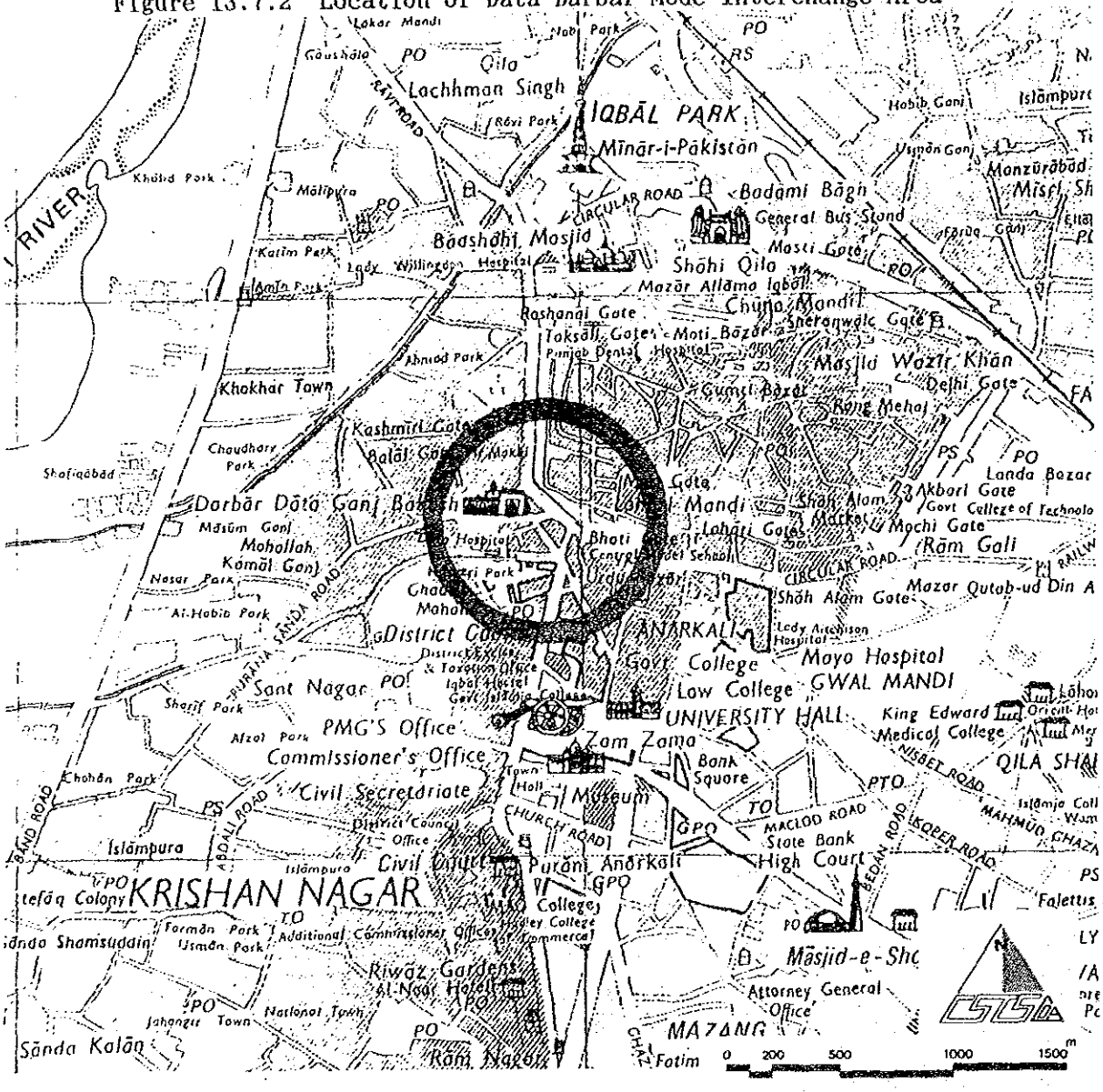


13.7.2 Data Darbar Mode Interchange Area

(1) Existing Condition

Data Darbar LRT station is located in the southwestern edge of Circular Road surrounding the Walled City. Data Ganj Bakhsh, a famous mosque in Lahore, is situated near this station and is usually crowded with devout Moslems. This area is one of the business/commercial centers in the LMA where transportation is accessible along the Ravi Road - Lower Mall corridor, one the the major transport corridors. This area is also a major transfer point not only for buses but also for animal-drawn vehicles as the tonga.

Figure 13.7.2 Location of Data Darbar Mode Interchange Area

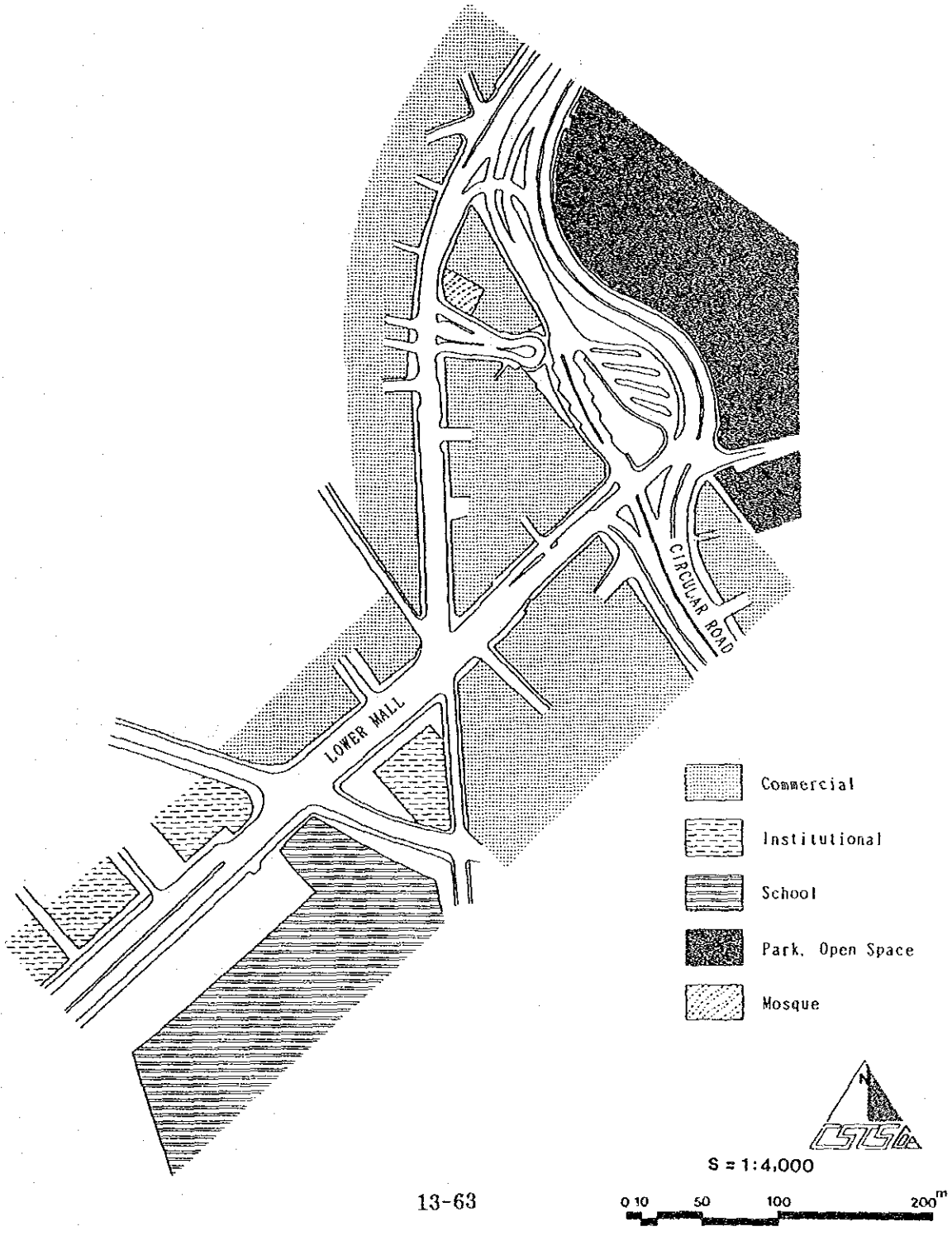


The existing land use is as follows:

Northern part of the area: Walled City, which is the historical and commercial center
Western part of the area: Data Darbar Mosque

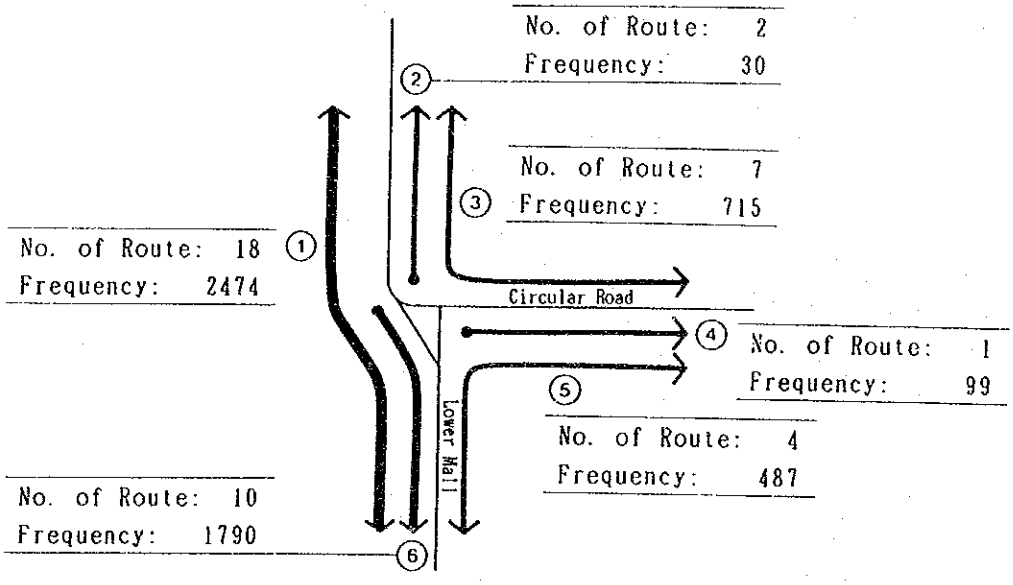
From east to south: Commercial and institutional

Figure 13.7.3 Existing Land Use



Data Darbar is located in the midst of Ravi Road - Lower Mall transport corridor, which is one of the heaviest transport corridors in the LMA. The total daily traffic volume along this corridor is approximately 100 thousand vehicles. The bus routes and daily frequency along this area are 42 and 5,600 buses, respectively. About 44% or 2,470 buses/day consist of minibuses.

Figure 13.7.4 Route Structure of the Bus



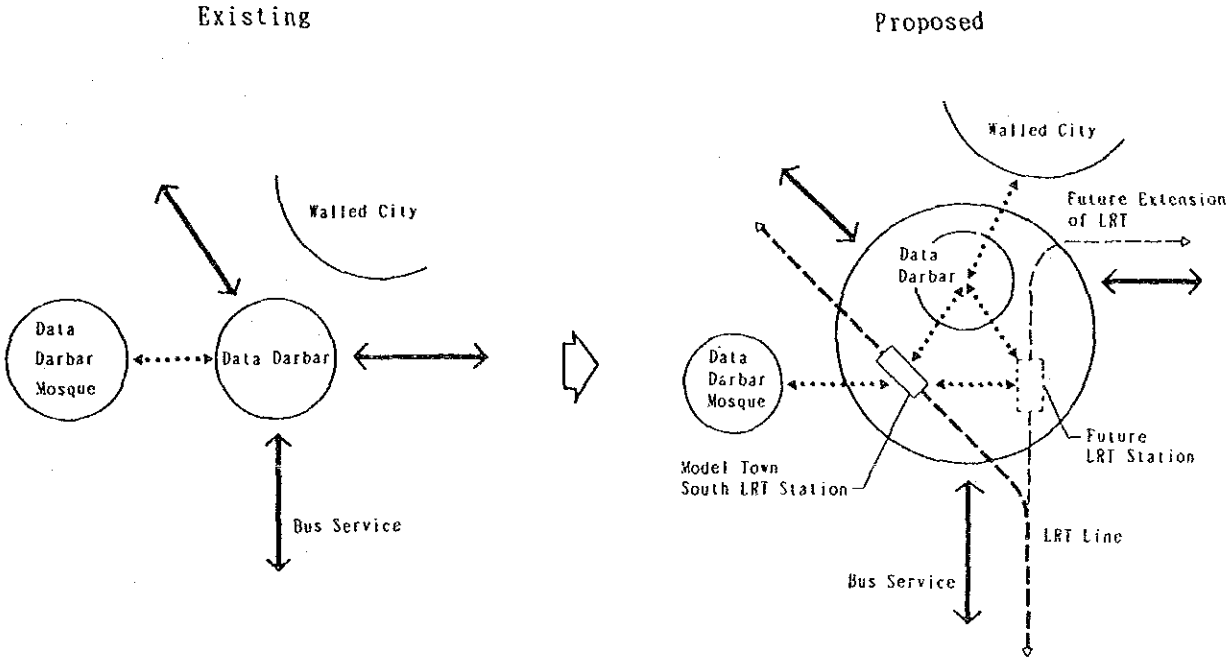
	1		2		3		4		5		6		Total	
	No. of Route	Freq.	No. of Route	Freq.	No. of Route	Freq.	No. of Route	Freq.	No. of Route	Freq.	No. of Route	Freq.	No. of Route	Freq.
PRTC	4	69	2	30	4	149	0	0	2	80	2	30	14	358
Private Bus	0	0	0	0	0	0	0	0	1	107	0	0	1	107
Minibus	9	1492	0	0	3	566	1	99	1	300	5	1120	19	3577
Suzuki	0	0	0	0	0	0	0	0	0	0	3	640	3	640
Intercity Bus	3	585	0	0	0	0	0	0	0	0	0	0	3	585
Intercity Minibus	2	328	0	0	0	0	0	0	0	0	0	0	2	328
Total	18	2474	2	30	7	715	1	99	4	487	10	1790	42	5595

(2) Planning Directions

Based on the conditions mentioned earlier and the traffic demand forecasted, the planning directions of Data Darbar mode interchange area are as follows:

- To take into account the approximately 50 thousand daily LRT riders in addition to the existing public transport users for the facility requirement of this mode interchange area for the year 2010.
- To consider the blending between the historical Walled City and the new type of public transport mode.
- To create better accessibility to the major urban facilities such as the Data Darbar mosque.
- To keep in mind the future extension of the LRT to the north and the east.

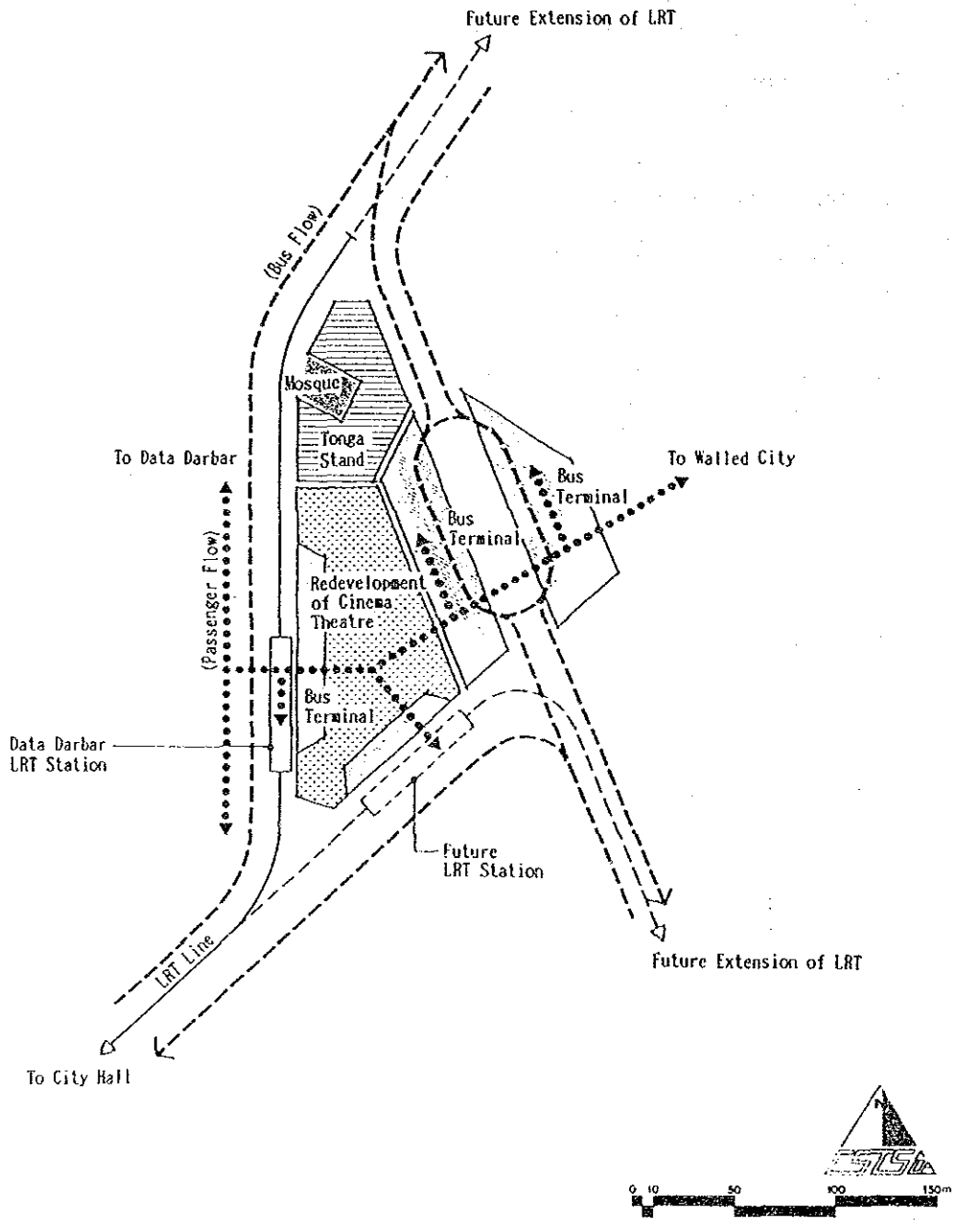
Figure 13.7.5 Planning Directions, Data Darbar Mode Interchange Area



(3) Conceptual Plan of Data Darbar Mode Interchange Area

Based on the preceding discussions, the conceptual plan of Data Darbar mode interchange area is illustrated in Figure 13.7.6.

Figure 13.7.6 Conceptual Plan, Data Darbar Mode Interchange Area



13.7.3 Model Town South Mode Interchange Area

The Model Town South LRT station is located at the intersection of Ferozepur Road and the Railway Line. Ferozepur Road has a flyover at this point.

The existing land use is as follows:

Northern part of the station: well-developed residential area such as Model Town and Gulberg
Southern part of this station: on-going housing development area
Southwestern area along the railway line : industrial area

The density of the road network is low except for Ferozepur Road which is the radial trunk road in the LMA.

The route structure of public transport is basically a through type because no major urban transport facilities exists in this area, such as a commercial complex.

Figure 13.7.7 Location of Model Town South Interchange Area

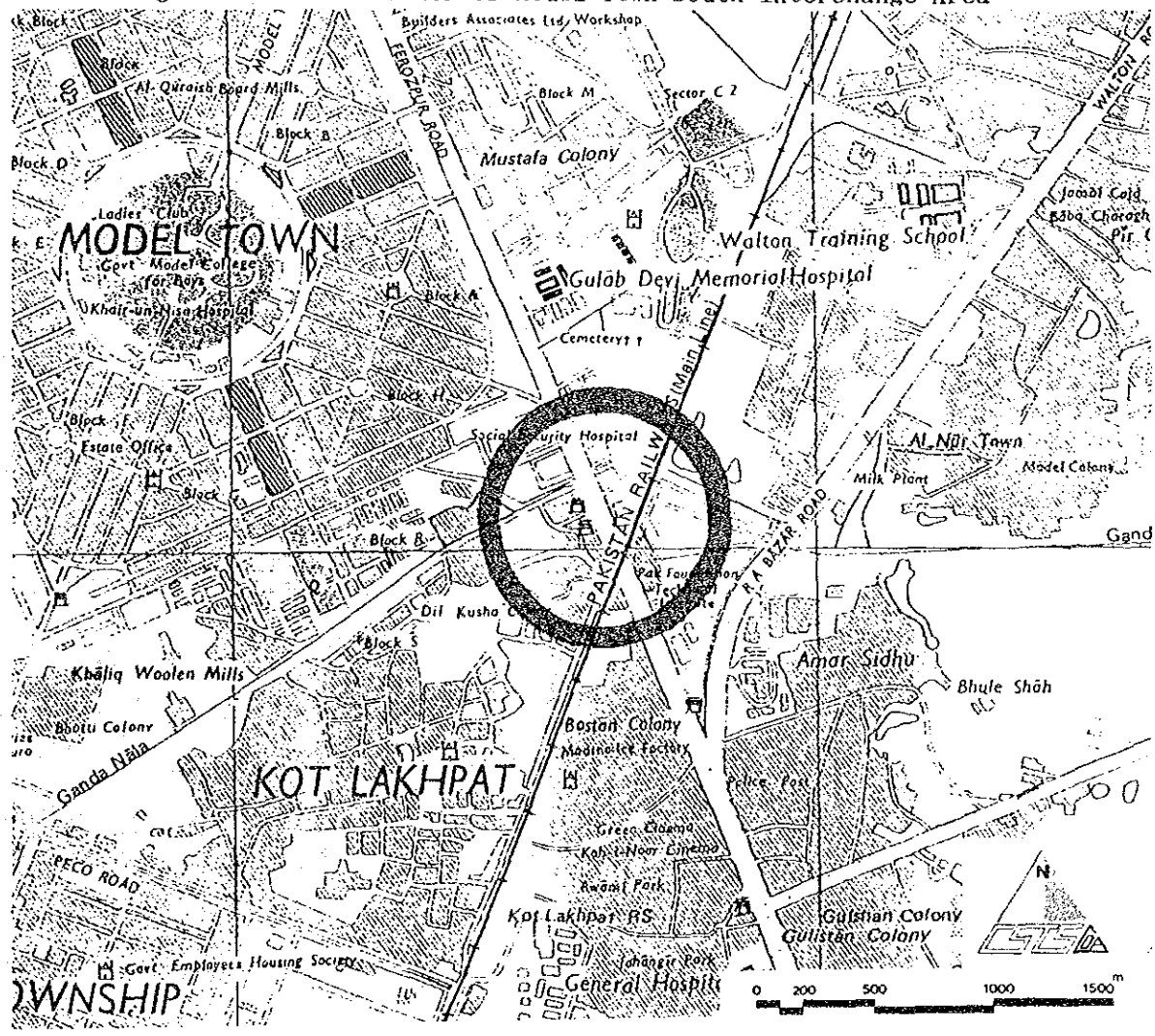
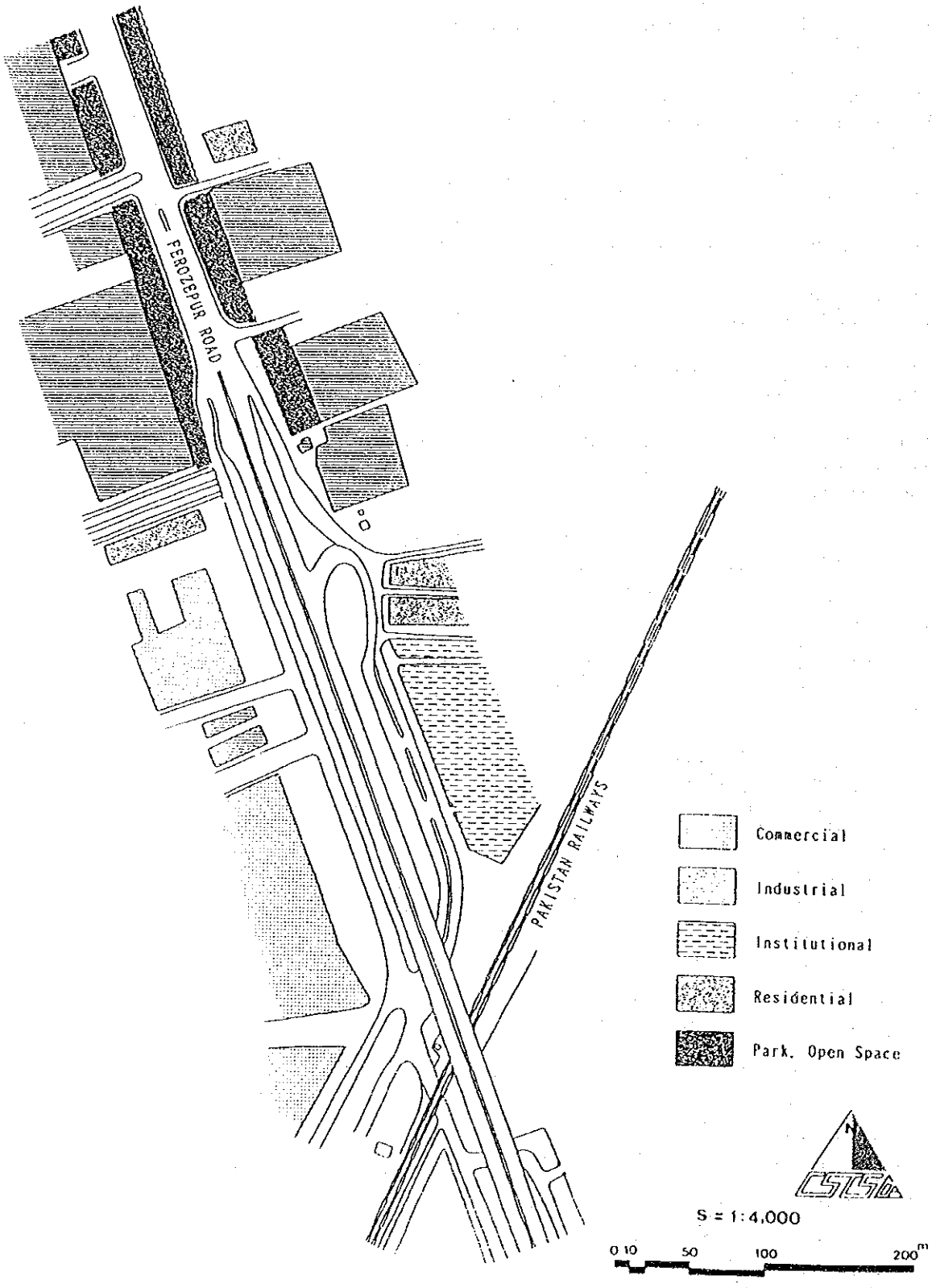
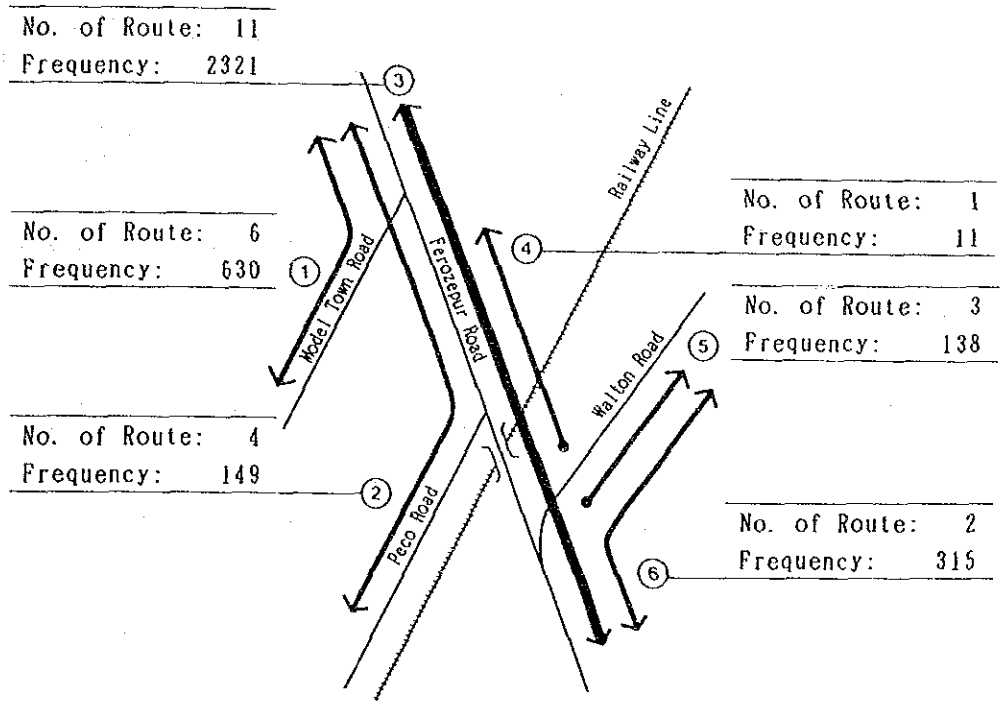


Figure 13.7.8 Existing Land Use



Ferozepur Road is not only one of the radial transport corridors but also the heaviest public transport corridor in the southern area. The total number of bus routes and daily frequency at this point is 27 and 3,560 buses, respectively. The bus route structure is mainly south - north through type along Ferozepur Road. About 64% of the total bus traffic is made up of minibuses.

Figure 13.7.9 Bus Route Structure



	1		2		3		4		5		6		Total	
	No. of Route	Freq.	No. of Route	Freq.	No. of Route	Freq.	No. of Route	Freq.	No. of Route	Freq.	No. of Route	Freq.	No. of Route	Freq.
PRTC	3	52	4	149	1	16	1	11	2	30	1	15	12	273
Private Bus	0	0	0	0	1	107	0	0	1	108	0	0	2	215
Minibus	3	578	0	0	5	1153	0	0	0	0	1	300	9	2031
Intercity Bus	0	0	0	0	2	235	0	0	0	0	0	0	2	235
Intercity Minibus	0	0	0	0	2	810	0	0	0	0	0	0	2	810
Total	6	630	4	149	11	2321	1	11	3	138	2	315	27	3564

(2) Planning Directions

Based on the above conditions and traffic demand forecast, the planning directions of Model Town South mode interchange area are as follows:

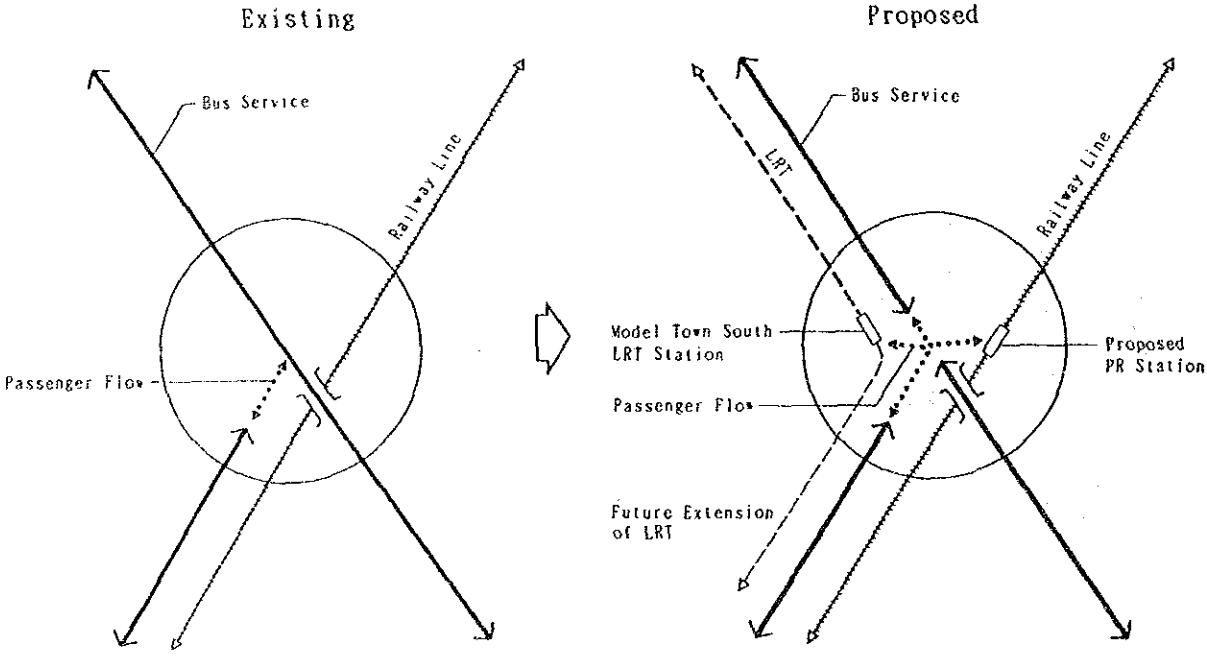
- This area has a high potential of assuming mode interchange functions, i.e., LRT station, railway line, and bus corridor; therefore, it is possible to create a new type of urban center with an additional railway station.

- It is estimated that the daily traffic demand in the year 2010 will be 85 thousand LRT passengers, 10 thousand PR passengers and 26 thousand transfer passengers between two transit modes, in addition to the existing number of bus passengers. Therefore, the proposed new type of mode interchange area at this point must be of a large scale.

- New feeder bus routes should be provided to the southern developing areas because of the lack of adequate public transport services in the area.

- It is necessary to create better pedestrian facilities for transfer passengers because the distance between two transit stations is relatively long due to the flyover at Ferozepur Road.

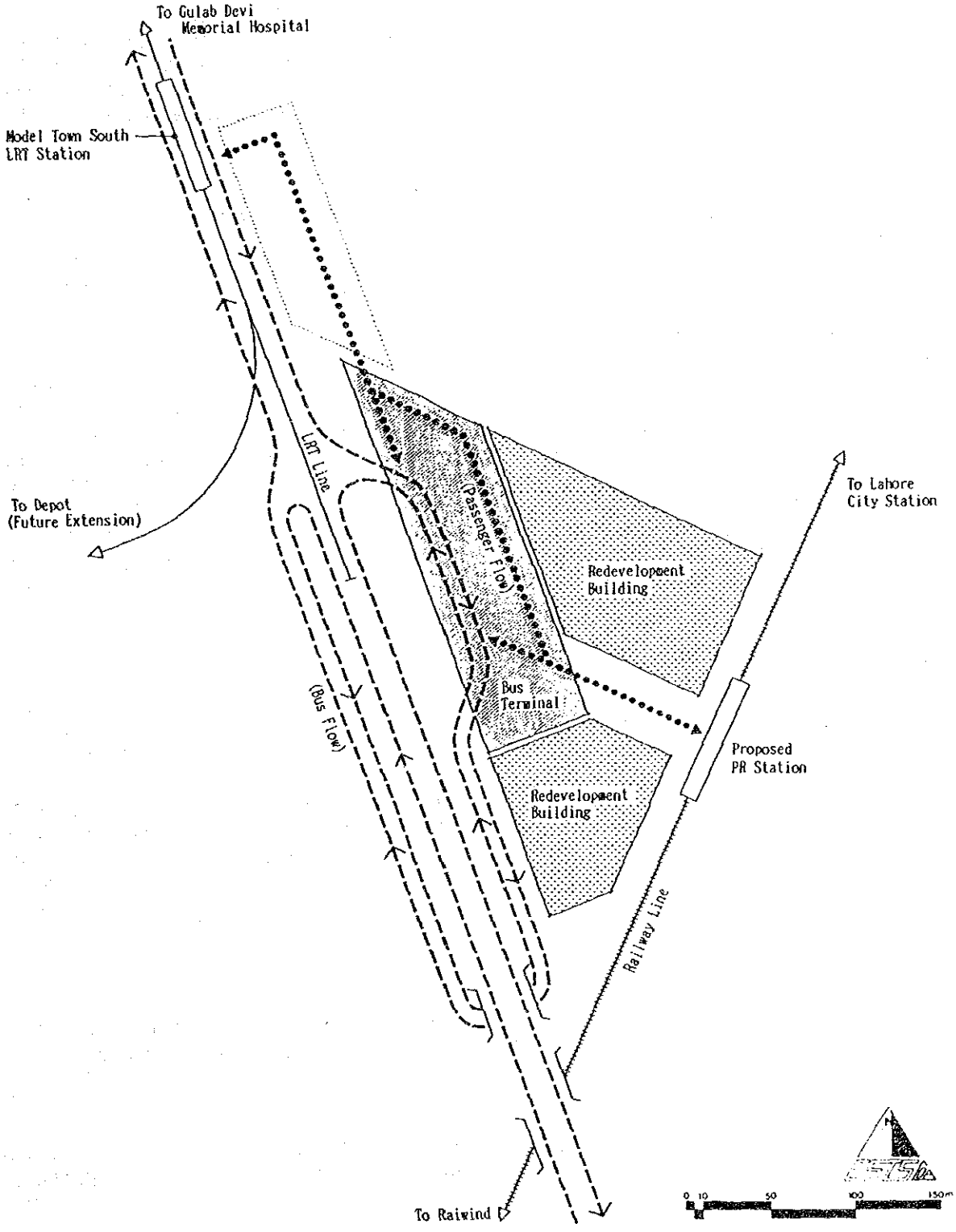
Figure 13.7.10 Planning Directions, Model Town South Mode Interchange Area



(3) Conceptual Plan of Model Town South Mode Interchange Area

Based on the above discussion, the conceptual plan of the Model Town South mode interchange area is illustrated in Figure 13.7.11.

Figure 13.7.11 Conceptual Plan of Model Town South Mode Interchange Area



13.8 Environmental Considerations

13.8.1 General

The city environment will have various impacts from the implementation of development projects such as roads, flyovers, the LRT, and related works. Measures to preserve or protect the environment should be taken into consideration and actions for the mitigation of negative impacts should be performed prior to the project implementation. CSTS recommendations for projects are formulated in Chapters 11 through 13. Some of these projects are recommend for implementation in the short term, while others are in mid-term and others as well may need immediate action to prevent and minimize environmental deterioration, depending on the nature and scale of the projects themselves.

13.8.2 Necessary Considerations

Environmental consideration necessary for the construction of the flyovers and the LRT projects are discussed below:

(1) Land Acquisition

Flyovers at selected interchanges may intrude on both private and public lands as they are designed in this study. Examples are Qartaba Chowk and the road crossings at the Canal Bank Road. An area for construction of the depot for the LRT is proposed at Ganda Nala lying between Model Town and the Township. Part of this area is already inhabited. When these projects are authorized by the government, the area should be declared for future acquisition. Action should be taken to prevent the increase in the number of inhabitants, buildings, and other structures. Physical separation of the area from the outlying community by a "green buffer" should be considered.

(2) Mode Interchange Areas

In the LRT project, two LRT stations are to be developed as modal interchanges. A major bus terminus should be integrated with the station at Data Darbar and an existing bus terminal and intercity rail station buses at Model Town South should be integrated into the LRT project. Both of these areas are already developed and land acquisition will be necessary for redevelopment into the modal interchanges. Relocation of the inhabitants of these areas should be conducted through legitimate actions in the same manner described in paragraph 13.8.2(1) above. Conflict with those living in the surrounding adjacent areas is likely to occur, but this conflict should be minimized.

(3) Green Belts and Cultural/Historical Assets

Parks, large trees, and cultural assets in Lahore should be preserved. The idea to have a insulate projects through green buffers can be considered.

(4) Construction

During the construction years, a method should be adopted to minimize inconvenience to people and the disturbance of normal traffic. Methods

should be taken also not to contaminate canals and not to reduce canal capacity.

(5) Community Integration

Development projects in Lahore should be in a manner to integrate new comers into the existing community. It should not be the exclusion of the existing community by the new comers. If it happens, it generates social conflicts among the people.

(6) Harmony between project structures and the surroundings

Project structures should be designed to be aesthetically harmonious with their surroundings. Architectural details need to be carefully considered to enhance or improve the surrounding environment.

13.8.3 Better Impacts

When CSTS proposed projects are completed, there will be benefits to the society which have not been quantified. Some of these benefits may be:

(1) Reduction of noise and engine exhaust by the development of flyovers and roads.

(2) New community development will be accelerated by projects in this study.

(3) LRT construction will constrain the increases in buses on Ferozepur Road.

13.9 Institutional Needs at TEPA

13.9.1 In-house Consultant for Traffic Management

Since the institution of TEPA at the Lahore Development Authority, it has been involved in planning and design of various aspects of road planning and construction. It has also, from the beginning, made use of various foreign consultants such as the CSTS team and numerous consultants representing the World Bank. The relationship with World Bank has been particularly useful. A qualified engineer with a great deal of international professional experience has always been available for design or for recommendations on traffic management decisions. This person could most likely not be hired under the budgetary constraints of TEPA alone, and IBRD funding has paid his salary. It is strongly advised that this practice be continued at present, until the budget will allow for such a person without external funding.

13.9.2 Program for Network Inventory

An on-going program to keep up with the physical conditions of the network itself is necessary. A great deal of effort has gone into the creation of a network for the CSTS modelling efforts. As the number of studies for transportation projects in Lahore continues, the need for an accurate inventory of the road network will become essential. Since the time needed for the creation of the CSTS network was short, it is of necessity a small one and generally not of sufficient detail for the development of a well-calibrated traffic model.

A few of computer programs exist which could assist in this network inventory which not only aid in the creation of a graphics based inventory, but also in the type of information that is kept in the inventory itself. At any rate TEPA, for its own use, needs an accurate count of what roads are located where, how they connect, how many lanes are available, what is the condition of the pavement, where is encroachment taking place, and so forth. At the present, there is no general road inventory known to the CSTS team except for the one created for this study. This CSTS output would be well used as the beginning of a complete Lahore Road Network Inventory.

(1) Signal, Sign, and Striping Monitoring and Repair

In addition to information about the road itself, TEPA should keep an inventory of all road fixtures such as traffic signals, traffic signs, and pavement striping. At present, there is a project for the installation of traffic signals, another project for the installation of signs, and a third for pavement striping. Although these projects are important, they are not, in the opinion of the CSTS team, enough. A continuing program for the surveillance, addition, and replacement of traffic signs, surveillance, addition, and replacement of traffic signs, signals, and striping needs to be instituted, and TEPA should do it.

(2) Pavement Conditions

The additional issue of the monitoring of pavement conditions is important as well, and no program for the monitoring and repair of pavement is known

to the CSTS team. This could easily be part of the network inventory kept by TEPA. Most likely the responsibility for the repair of the roads themselves should fall directly with the LDA.

(3) Continuous Traffic Counts

One of the key ingredients to traffic planning is a comprehensive inventory of traffic counts on various links throughout the network. This inventory should be kept over a long period of time in stations in the same locations so that changes in traffic volume can be studied. There is a program for the collection of counts classified by vehicle type along a cordon around the walled city. This is the sort of information which should be kept, however, it should be more extensive, and counts should be taken for often than one time per year. Information is needed to determine annual, seasonal, and daily variations in traffic. Counts also need to be taken at standard points on all major roads in the city, not only on the cordon around the walled city.

Many types of counts may be taken. If the classified vehicle counts such as those currently taken are too complex, more simple counts can be taken which give only a total number of vehicles. These can be taken either by a human enumerator or automatically through a traffic counter with a hydraulic tube stretched across the road or even on a permanent basis with an electric loop under the pavement.

13.9.3 Joint Programs with the Traffic Police

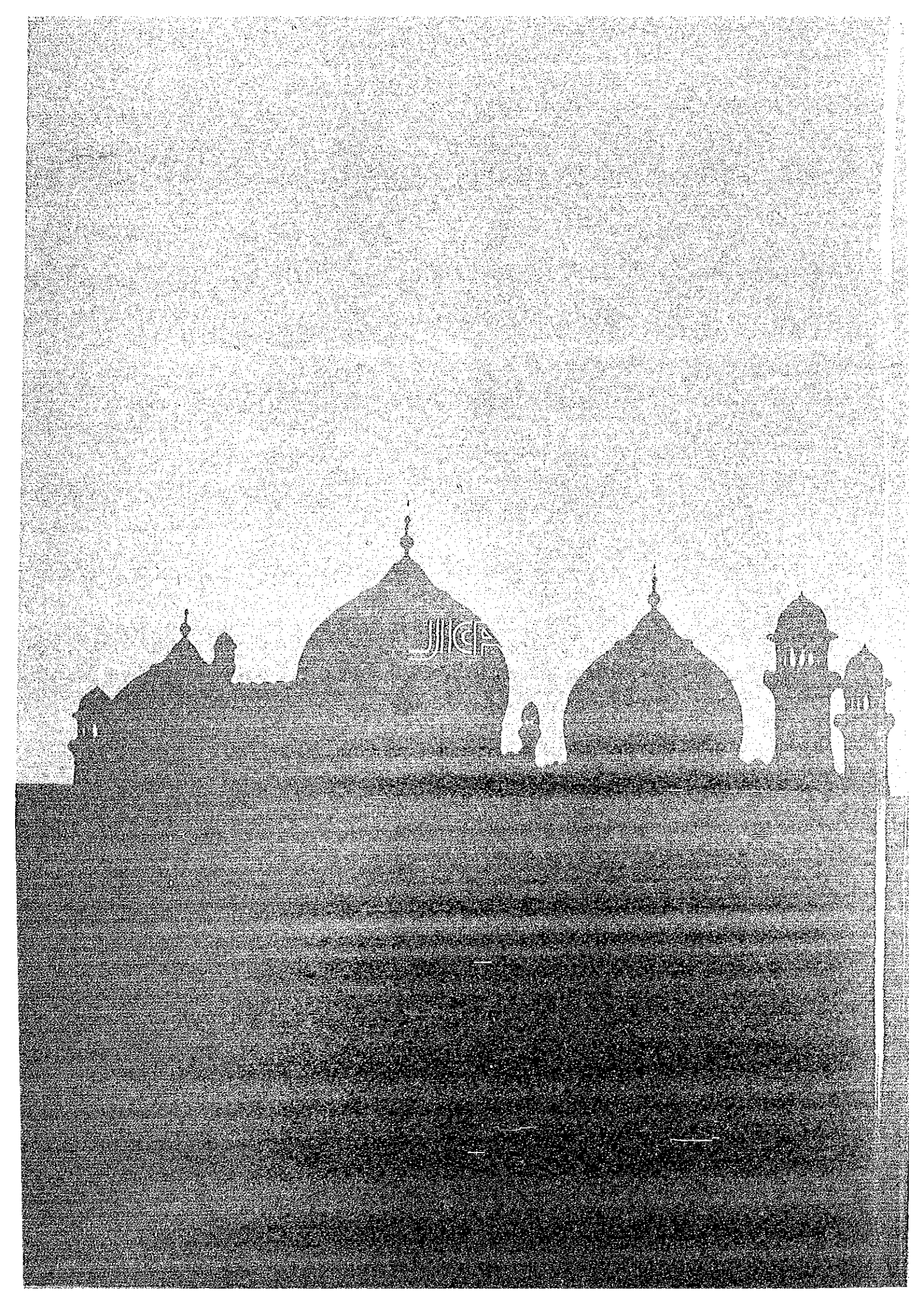
In the sections on Safety and Parking in this Final Report of this study, suggestions have been made for on-going programs with the police department.

(1) Accident Data Collection

This program of accident data collection has been suggested by numerous studies on transport in Lahore. Funding for a program has been requested to the provincial government by TEPA. This program will include the installation of microcomputer based software for accident inventory and be administered jointly by the Traffic Police and TEPA. This proposal is endorsed by the CSTS team.

(2) Parking Regulation and Enforcement

In the Parking Study, the CSTS team recommended the institution of a parking regulation enforcement group, or Parking Police under TEPA. This small group of people could concentrate in areas which are currently plagued by parking problems and relieve the Traffic Police of the burden of tending to non-moving violations. Institutional aspects of cooperation with the regular Traffic Police would have to receive careful attention, however.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