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# North Lebanon Roads Network and Public transport

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# 1. Transportation

Transportation in Lebanon varies greatly in quality from the ultramodern Beirut International Airport to poor road conditions in many parts of the country. The Lebanese civil war between 1975 and 1990 and the 2006 Lebanon War with Israel severely damaged the country's infrastructure.



## 1.1 Roads

Lebanon has an extensive road network throughout the country, generally in good conditions, though it varies. The main roads in the north Lebanon are:

- Beirut - Byblos - Tripoli - Aarida
- Tripoli - Bsharri – Baalbek

### 1.1.1 Motorways

Part of the main road network have been updated to dual carriageway, four-lane motorways, which are the following in North Lebanon:

- Beirut - Tripoli. Length: 81 km.
- Tripoli - Khane. Length: 20 km



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## 1.2 Buses

An overland trans-desert bus service between Beirut, Haifa, Damascus and Baghdad was established by the Nairn Transport Company of Damascus in 1923.

Beirut has frequent bus connections to other cities in Lebanon and major cities in Syria. The Lebanese Commuting Company, or LCC in short, is just one of a handful brands of public transportations all over Lebanon. On the other hand, the publicly owned buses are managed by le Office des Chemins de Fer et des Transports en Commun (OCFTC - is the Lebanese government authority which operates public transportation in Lebanon), or the "Railway and Public Transportation Authority" in English. Buses for northern destinations and Syria leave from Charles Helou Station.



Buses are popular and inexpensive and can be stopped anywhere along the way simply by hailing.

## 1.3 Ferries

Apart from the international airport, the Port of Beirut is another port of entry. As a final destination, anyone can also reach Lebanon by ferry from Cyprus, or Greece or by road from Damascus, etc. The Port of Tripoli (Lebanon) is also a port of entry and ferries usually come from Taşucu, Turkey.



## 1.4 Taxis and services

In order to get from one place to another, people can either use a service or taxis. A "service" is a lot cheaper than a "taxi" as the passenger would be sharing the cab in the first place unlike the latter, where he would have the cab to himself.

Cabs can be recognized by their red license plates (indicating that it is licensed for public transportation). The driver would pull aside for if the person hails while seeing him. He will

then ask for his destination and then will decide whether he will drive the passenger with the regular fare, an extra, or not at all.

#### **1.4.1 Types of taxis in Lebanon**

##### **1.4.1.1 Service-taxis**

One has to specify one's destination and enter the taxi only if one's destination corresponds to the itinerary of the Service-taxi. The driver stops to pick up additional passengers anywhere on the streets and drop them off generally in main squares and main streets. It remains advantageous with very low fares.

##### *Local*

LBP 2000 (\$1.33) per person or LBP 4000 (\$2.66) per person depending on how close/far the destination is. Prices within Beirut could vary depending on traffic and distance but overall should not exceed LBP 4000 per person (Maximum of LBP 5000 for Beirut outskirts). However, the driver could ask for more if the passenger intends to go to an area with high traffic.

##### *Long Distance*

Starts from LBP 5.000 (\$3.33) and goes up from there.

##### **1.4.1.2 Traditional Taxis**

The driver must not pick up additional passengers. Most of these taxis are not equipped with meters, so it is important to negotiate the fare before embarking. The regular taxi fare starts at LBP 10,000 (\$6.66).

##### **1.4.1.3 Online services**

Uber and Careem are both available in Lebanon as online services which are ordered online through the app and can be paid either online or by cash. These alternatives are sometimes cheaper than traditional taxis in Lebanon.

##### **1.4.1.4 On-call taxis**

Pick up people who have pre-booked by phone. They don't respond to hails in the street. They don't have a meter so passengers should ask the operator the price when they are booking the taxi, and double check with the driver at the end of the journey.

#### **1.4.2 Carpooling**

Carpolo App is an alternative mode of transportation in Lebanon. Upon downloading the app, users post their un-used seats and the app connects them with people who have matching rides. It is free for users on the public community and has private communities

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that can be accessed by invitation only. Carpolo uses gamification to incentivize drivers to list their empty car seats and offers incentives for carpoolers.

## 1.5 Airport

Rene Mouawad Air Base formerly and still sometimes known as Kleyate Airport used to be a military-civil joint airport in northern Lebanon, near the town of Kleyate and 6 kilometers (3.7 mi) from the Lebanese–Syrian border.

On January 2012, the Lebanese cabinet announced plans to restore the airport so that it will be used for cargo and low-cost airlines. Lebanese authorities who have visited the airport announced that the airport will encompass a 500-square-metre (5,400 sq ft) Duty Free area and that there is major consideration about connecting the airport to Tripoli and major cities using a modern railway. To date, however, nothing has come of these plans, and restoration of the airport has not yet begun.<sup>1</sup>

## 1.6 Cable Car

No cable car (telepherique) in north Lebanon.

## 1.7 Rail transport

The Lebanese rail system is not currently in use, with services having ceased due to the country's political difficulties.



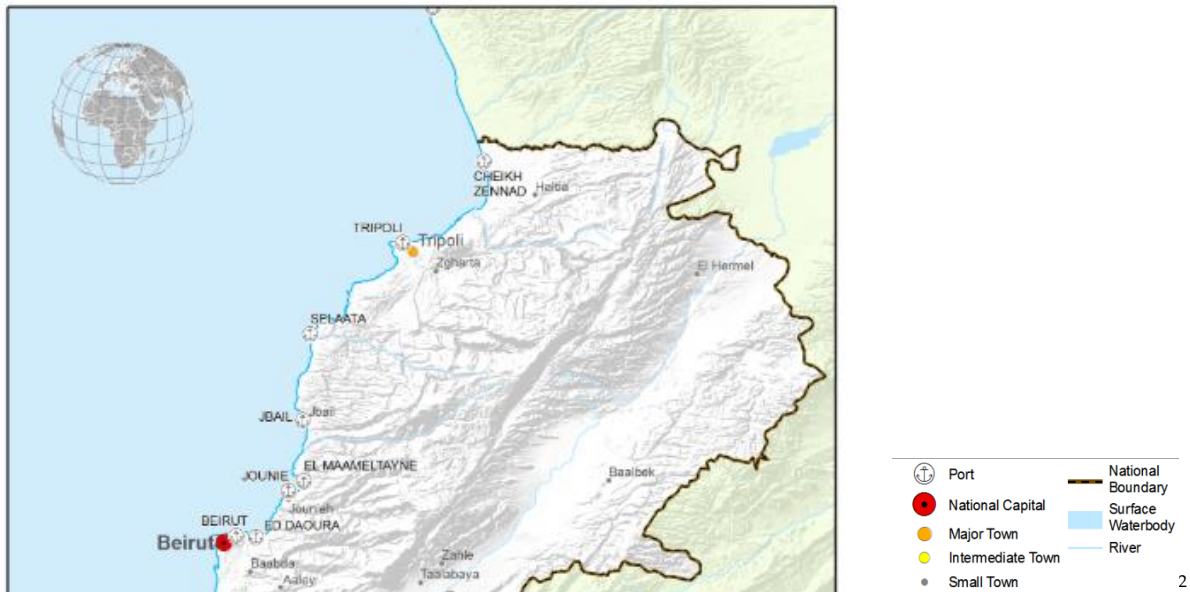
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<sup>1</sup> [https://en.wikipedia.org/wiki/Rene\\_Mouawad\\_Air\\_Base#Future\\_development](https://en.wikipedia.org/wiki/Rene_Mouawad_Air_Base#Future_development)



## 1.8 Port

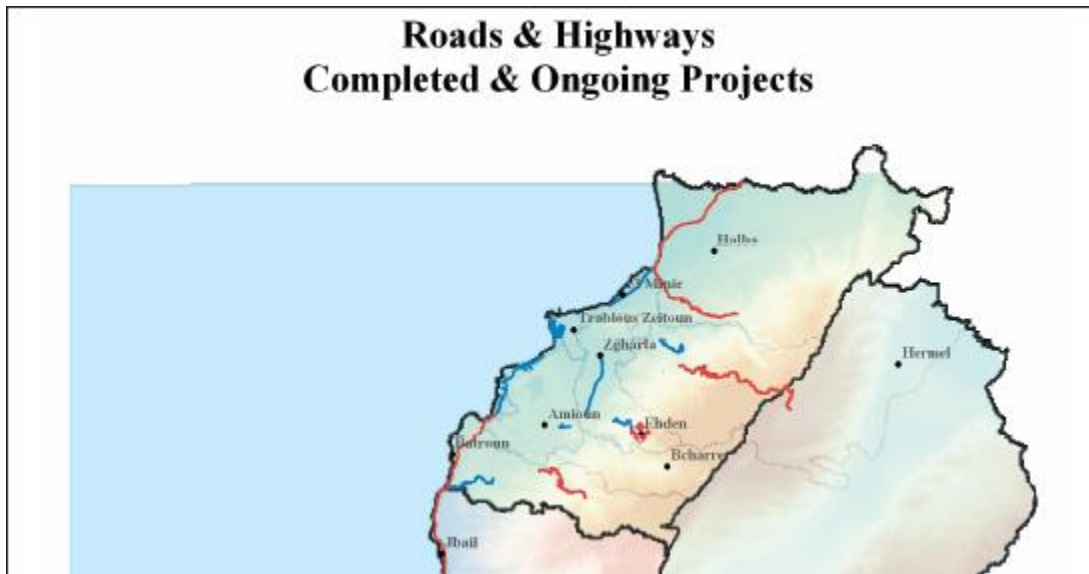
### Lebanon Port Assessment



The Port of Tripoli is the second port in Lebanon after the Port of Beirut. It has an approximate area of 3,000,000 m<sup>2</sup>, with a water area of 2,200,000 m<sup>2</sup>, a land area of 320,000 m<sup>2</sup>, and a 420,000 m<sup>2</sup> dump area adjacent to the current port, reserved for the future Container Terminal and Free Market Zone (which are under construction). Most shipments carry general goods and dry discharge such as iron, wood, and sugar, various kinds of beans, iron scrap, vehicles, and construction material. The Port of Tripoli also contains a Free Zone with an area of 150,000 m<sup>2</sup>. The Port is currently undergoing expansion projects, where a new 600 m long berth is being built for container trade, with a rear zone area of 1,200,000 m<sup>2</sup>. This zone has been approved by the Lebanese Parliament as a free economic zone. The Port of Tripoli is independent both administratively and financially, and is governed by the General Code for Public Institutions according to decree no 4513. The Port is managed by a Board of Directors composed of 5 members elected for 3 years.

<sup>2</sup> <https://dlca.logcluster.org/display/public/DLCA/2.1+Lebanon+Port+Assessment>

## 2. Roads and highways, completed and ongoing projects <sup>3</sup>



**Legend**

-  Exchange, Ongoing
-  Exchange, Completed
- Roads & Highways**
-  Ongoing
-  Completed



*Abdeh-abodyyeh road (Seawall protection and rehabilitation and widening)*

### 2.1. Tripoli - Syrian Border Connection

This project aims to improve the roads which connect North Lebanon with the Syrian border. It includes the construction of the eastern Tripoli ring road extending towards al Abdeh (20 kilometers to the north), and the widening and rehabilitation of two roads extending to Arida (along the coast), and to Abboudieh on the Syrian border. This project is

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<sup>3</sup> [http://www.cdr.gov.lb/eng/progress\\_reports/pr072005/Eroads.pdf](http://www.cdr.gov.lb/eng/progress_reports/pr072005/Eroads.pdf)

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financed by the Islamic Development Bank (IDB) and OPEC Fund for International Development (OFID). The contracts for Deir Ammar-al Abdeh road and al Abdeh-Homs/Abboudieh intersection have been awarded.

## **2.2. Sir ed Danniyeh-Jbab el Homr- Hermel:**

Studies for these sections have been completed. However, the procedures for expropriation of lands are still going on. Funding was provided by the Arab Fund for Economic and Social Development. The contract for Sir ed Danniyeh- Jbab el Homr section has been awarded, and the Jbab el Homr-Hermel Section contract was awarded in the summer of 2004. In addition, the rehabilitation works of the Dael-lower Tannourine road is expected to be completed during 2005 (US\$ 5.6 million).

Rehabilitation and development works of Tabarja-Chekka highway, financed by the European Investment Bank, were completed in the summer of 2004.



*Rehabilitation of different roads in Akkar*

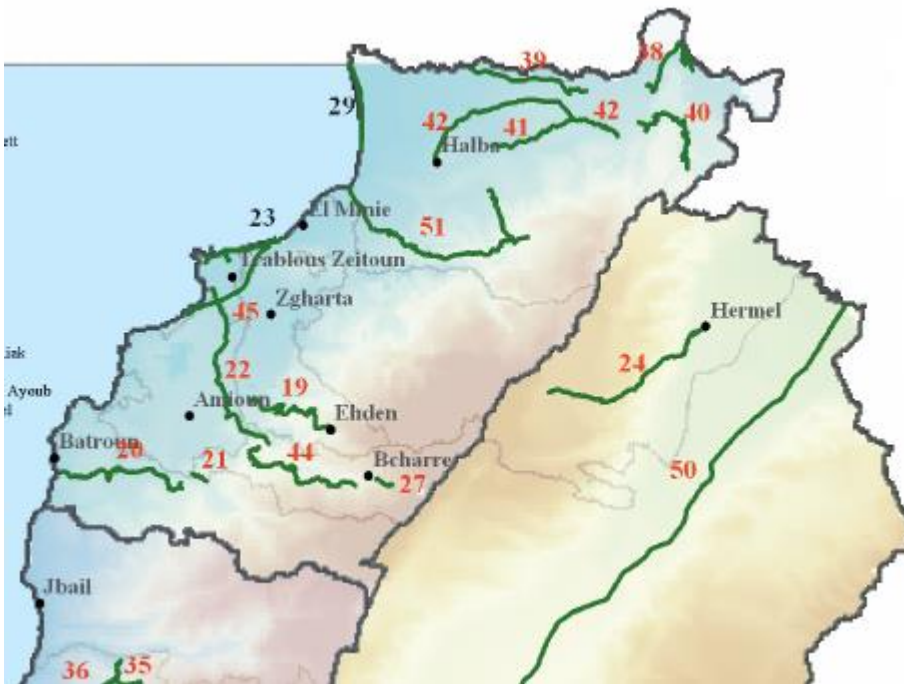


*Majdlaya-Aardat road*





*Rehabilitation of Tabarja - Chekka Highway*

### 3. Roads and highways under preparation projects<sup>4</sup>



#### Legend

-  Interchange/Exchange
-  Roads & Highways

- 19 Aito-Ihden
- 20 El Batroun-Dael
- 21 Deir Bila-kaferhalda
- 22 Bahsas-kousba
- 22 Kousba-Tourza
- 23 El Mina-El Biddawi
- 27 El Arz
- 29 Homos-El Arida
- 38 Tarik chadra-El Moukayleb
- 39 El Aboudiyeh-Anjar
- 40 Andakit - Akroum
- 41 Kafar harra - El Bira
- 42 Halba - El Bira - El kobayett
- 44 Hadass el jibeh - Hasroun
- 44 Hasroun - Bferkata
- 44 Beit Mounzer
- 45 El Kachmoun - Deir Imar
- 51 Jaweyil - Rahbeh - Berkayel



*Sir El Doniyyeh-Jbab el Homr road*

<sup>4</sup> [http://www.cdr.gov.lb/eng/progress\\_reports/pr072005/Eroads.pdf](http://www.cdr.gov.lb/eng/progress_reports/pr072005/Eroads.pdf)

## **Rehabilitation of primary and secondary roads**

Detailed studies for the rehabilitation of several sections of highways are complete. These sections are:

- Rehabilitation of Akkar roads: Studies and tender documents are under completion in phases. Awarding contracts will proceed as soon as funding becomes available.
- Options, feasibility and preliminary study for the Tripoli infrastructure development project.

#### **4. Relevant government agency**

The relevant government agency, the Ministry of Public Works and Transport in Lebanon is organized into four directorates:

- Directorate General of Land and Maritime Transport, responsible for setting, implementing and monitoring all policies related to land and maritime transport
- Directorate General of Roads and Buildings, which is responsible for the construction, rehabilitation, and maintenance of public roads and government buildings
- Directorate General of Civil Aviation, responsible for setting and implementing air transport policies within the country in compliance with international policies, and for controlling the air traffic within the Lebanese territory
- Directorate General of Urban Planning, responsible for setting and putting into practice land use policies

Additionally, the Council of Development and Reconstruction (CDR), and the Ministry of Public Works' Rehabilitation and Reconstruction are responsible for road construction and maintenance in Lebanon.

Information on Road Authority contacts can be found in the following link:

<https://dlca.logcluster.org/display/public/DLCA/4.1+Lebanon+Government+Contact+List>

## 5. Transport Corridors

Lebanon has three operating corridors with Syria. These corridors are:

- Al Masnaa- Al-Jdeidah border entry point (at the eastern part of Lebanon) 60 km from Damascus and 110km from Beirut. This is the main corridor that connects the Lebanese and Syrian capitals.
- Al-Arida-Tartous border entry point (at the northwest end of Lebanon). This corridor is located at the coastal area and widely used for cargo transportation between Syria and Lebanon. It is 45km far from Tartous on the Syrian side and 170km far from Beirut on the Lebanese side.
- Al-Abboudiyeh - Al-Dabouseyah border entry point (at the northeast end of Lebanon). This corridor connects Homs governorate (from the Syrian side) with Tripoli (from the Lebanese side). It is widely used for cargo transportation (especially in-transit cargo to Iraq).

During the winters, road challenges due to heavy snow have temporarily affected the use of the international highway leading to the Lebanon-Syrai Al Masnaa Crossing, at Dahr al Baidar area. However, this is usually cleared by the Ministry of Public Works within a maximum of one day. On a few occasions the Beirut-Damascus highway has also been closed due to security reasons, but overall remains the most consistent transport corridor from Lebanon to Syria.

Travel Times	
<b>Nearest International Airport</b>	Beirut Rafic Hariri International airport 127 KM Trucks 6 hrs Cars 3 /4 hrs
<b>Nearest Port</b>	Beirut port 118 km 5 hrs 4 hrs
<b>Nearest location with functioning wholesale markets, or with significant manufacturing or production capacity</b>	Tripoli 35 km 3 hrs 1 / 1.30 hr
<b>Other Information</b>	The route is an international highway

## 6. Distance Matrix

Distances from Capital City to Major Towns (km)								
	Beirut	Tripoli	Sidon	Batroun	Tyre	Aley	Chtaura	Halba (akkar)
Beirut		88	46	56	91	14	40	114
Tripoli			130	33	175	92	86	30
Sidon				100	45	43	66	55
Batroun					147	63	65	63
Tyre						54	106	204
Aley							28	116
Chtaura								104
Halba (akkar)								

Travel Time from Capital City to Major Towns (km)								
	Beirut	Tripoli	Saida	Batroun	Tyre	Aley	Chtaura	Halba (akkar)
Beirut		1.2 hrs	45 min	1 hr	1.5 hrs	15 min	45 min	2 hrs
Tripoli			2 hrs	30 min	2.5 hrs	1.5 hrs	1.5 hrs	30 min
Saida				2 hrs	45 min	45 min	1 hr	1 hr
Batroun					2 hrs	1 hr	1 hr	1 hr
Tyre						1 hr	2 hrs	2.5 hrs
Aley							30 min	2 hrs
Chtaura								1.5 hrs
Halba (akkar)								



## **7. Road Security**

Road Security: Good

Public transportation is generally safe. Emergency services in Lebanon are adequate. In case of a road accident, emergency numbers are 140 for the Red Cross and 125 for Civil Defence, and 112 for the Police.

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## 8. Weighbridges and Axle Load Limits

Since October 2014, in order to ease rush-hour congestion, a renewed plan by the government allows trucks to transport goods only from 10.00 hours to 14.30 hours and from 19.00 hours to 06:30 hours.

Axle load limits	Lebanon (Commercial) MT		Lebanon (Donations/ Humanitarian) MT
Truck with 2 axles	25		30
Truck with 3 axles	35		40
Truck with 4 axles	NA		NA
Semi-trailer with 3 axles	NA		NA
Semi-trailer (six wheels) with 4 axles	35		40

## 9. Road Class and Surface Conditions<sup>5</sup>

From	To	International Road No.	Distance in km	Road condition & environment		
				No of. Lanes	Age	Environment
Dabousseyah cross border (Syria-Lebanon)	Aboudeyah cross border (Lebanon-Syria)	M51	18	2	>20	Coastal
Aboudeyah cross border (Lebanon-Syria)	Tripoli	M51	5	2	>25	Coastal
Tripoli	Beirut	M51	83	4 (Note: 2 and 3 lanes at some points)	>20	Coastal
Beirut	Al-Naqoora	M51	104	3 (and 2 lanes before Tyre until Naqoura)	>20	Coastal
Jedeidah cross border (Syria-Lebanon)	Al-Masnaá cross border (Lebanon-Syria)	M30	6	2 lanes each side	>20	Mountainous
Al-Masnaa cross border (Lebanon-Syria)	Beirut	M30	53	4	>25	Mountainous
<b>Total Lebanon International Road Distance</b>			<b>269 km</b>			

<sup>5</sup> <https://dlca.logcluster.org/display/public/DLCA/2.3+Lebanon+Road+Network>



## 10. Tripoli Projects

This part is taken from a whole study with financial and numerical data. For more specific information, please have a look on the report presented in the site below:

[https://openjicareport.jica.go.jp/pdf/11688538\\_02.pdf](https://openjicareport.jica.go.jp/pdf/11688538_02.pdf)

### 10.1. TRIPOLI BOULEVARD UNDERPASS PROJECT

Tripoli Boulevard is functioning as the primary arterial street and at the same time as an international highway. It passes through the Central Urban Area of Tripoli where through and local traffic is concentrated. The section from Halim Abu Azz El-Deen Roundabout to Bisar Street (hereinafter referred to as the Central Section) is the most critical section in the Study Area in terms of traffic congestion and air pollution.

Present Condition of the Central Section:

- **Road width:** Dual 9.0 m carriageways with 4.0 m center median and 4.8 m sidewalk on both sides. Road right-of-way width is 42 m by the latest decree in 2001. It has 2 lanes with shoulder (or loading/unloading zone) on each direction.
- **Intersections:** There are 4 major intersections in the 775 m Section with an interval of 220 m to 295 m. Short interval between intersections is one of the causes of traffic congestion.
- **Traffic volume:** Tripoli Boulevard – 25,000 ~ 29,000 veh./day
- **Intersecting Roads** – 9,400 ~ 19,600 veh./day
- **On-street parking:** Shoulders on both sides are occupied by parked vehicles. One lane on each direction is frequently blocked by double parked vehicles, thus only one lane is effectively functioning as a travel way. Such condition is greatly reducing traffic capacity of the road.
- **Travel speed:** 8 ~ 20 km / hour.
- **Level of service:** F which means capacity is exceeded by traffic volume and requires urgent measures.
- **Noise level:** 100 ~ 105 dBA which is exceeded the standard of 72 dBA.

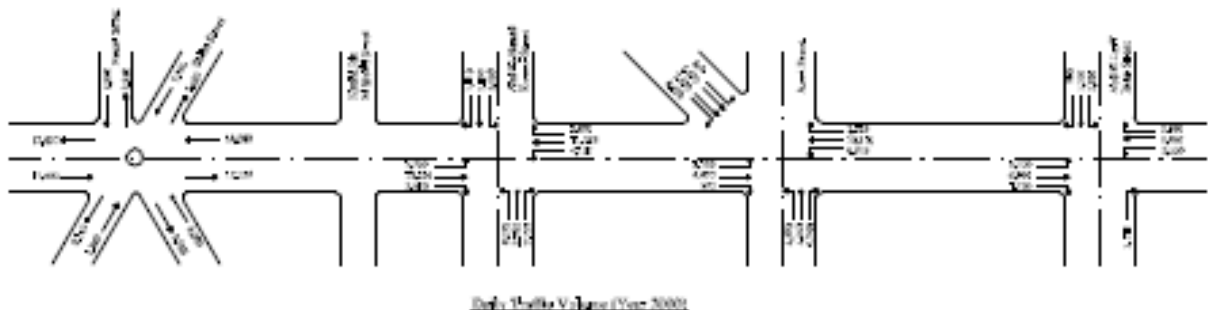


Figure 2.1-1 Present Condition of Tripoli Boulevard at Tripoli Central Area

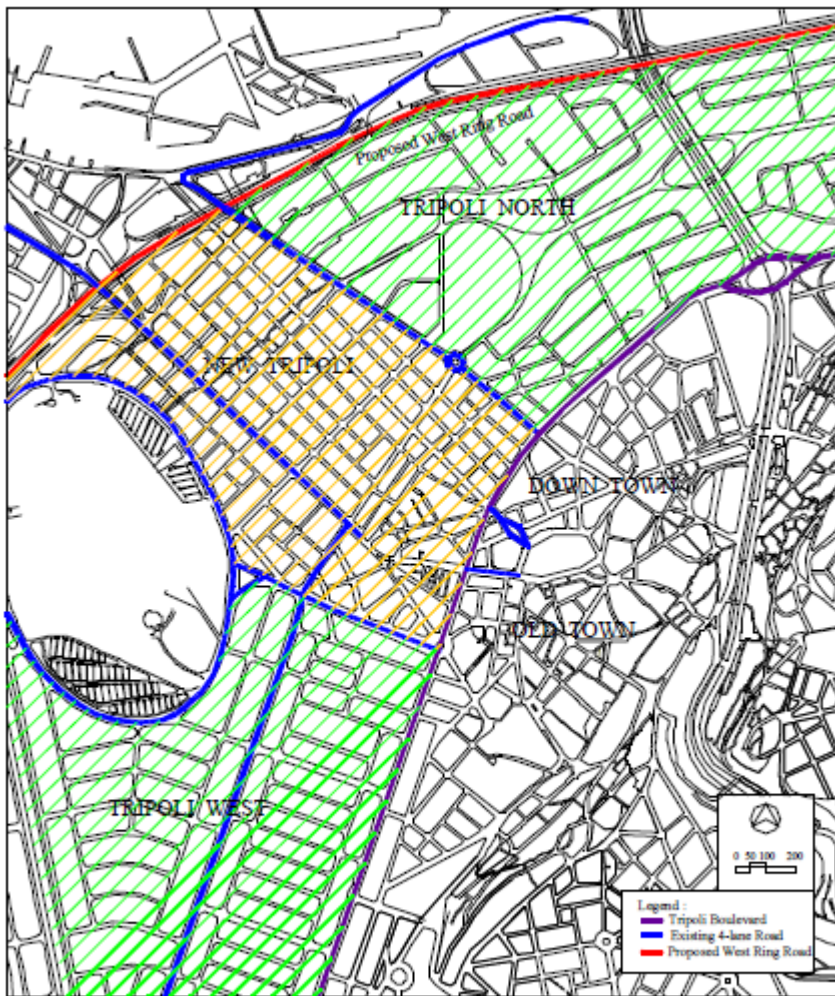


Figure 2.2-1 Road Network in Central Tripoli Area

### **Alternatives Plans**

Basically, a scheme of underpass is selected rather than overpass due to landscape and environmental considerations, as overpass schemes are opposed by all concerned authorities. Five alternatives are developed to select the optimum plan for implementation. Alternatives have different lengths and number of intersections to be under-passed, which will affect the cost and efficiency of the underpass.

- Scheme-1: To provide an individual underpass for each intersection A, B, C & D.
- Scheme-2: To provide a continuous underpass for the most congested intersections of B & C.
- Scheme-3: To provide a continuous underpass for three congested intersections of B, C & D.
- Scheme-4: To provide a continuous underpass for 3 intersections A, B & C.
- Scheme-5: To provide a continuous underpass for all 4 intersections A, B, C & D.

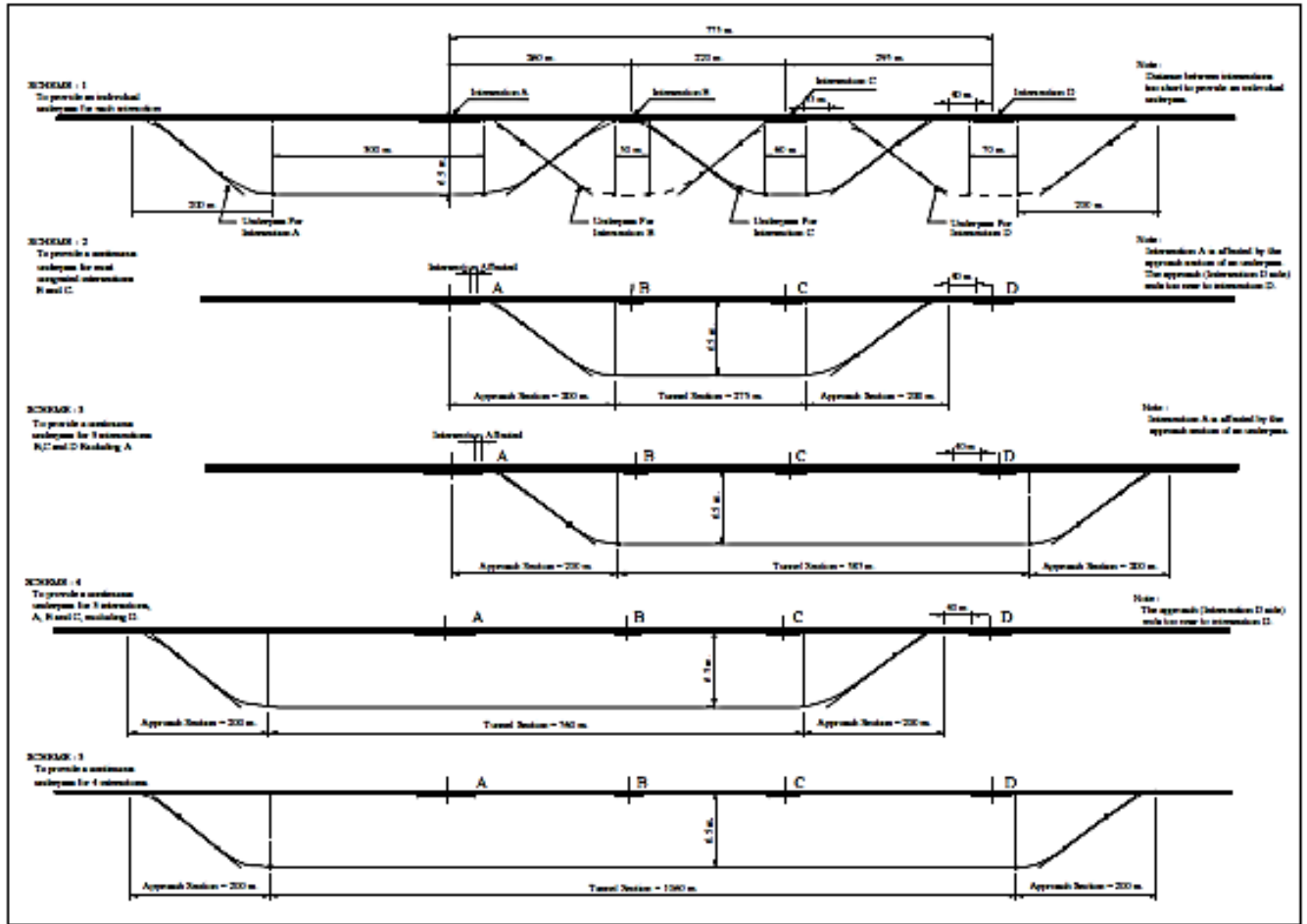


Figure 2.2-2 Alternatives of Tripoli Blvd. Underpass

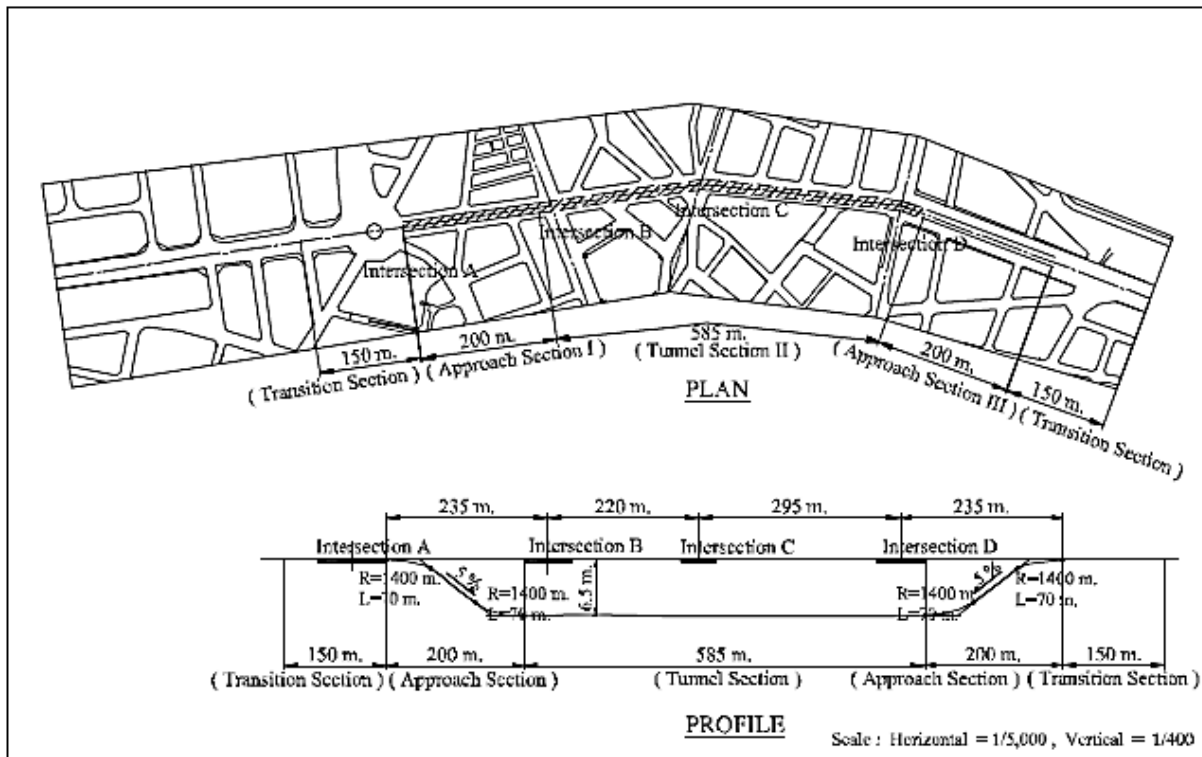


Figure 2.3-1 Tripoli Boulevard Underpass: Plan And Profile

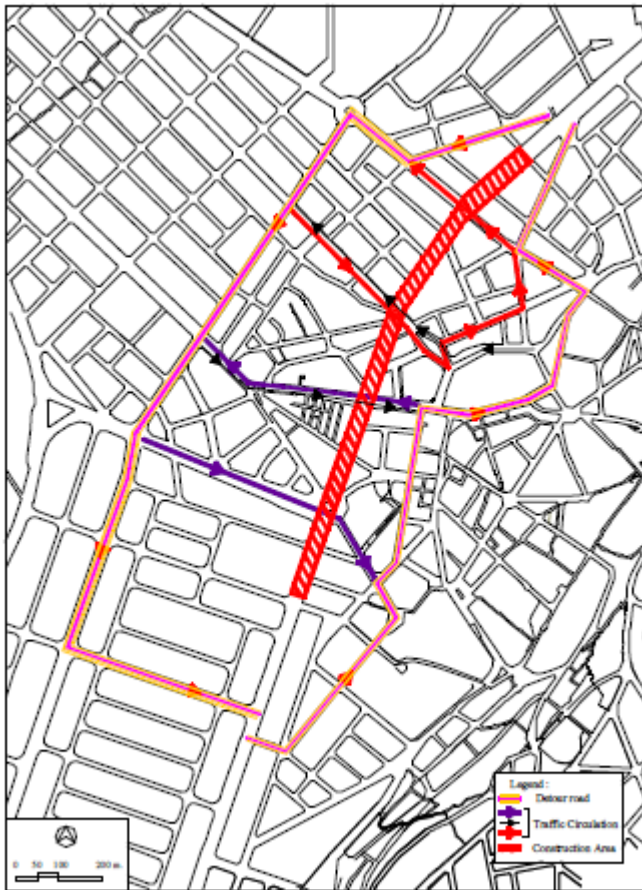


Figure 2.4-1 Detour Roads during Construction of Underpass

## 10.2. CENTRAL TRIPOLI TRANSPORT MANAGEMENT PROJECT

### PRESENT CONDITIONS AND PROBLEMS

Central Tripoli which consists of Central Business District (CBD) and extended to cover all the near surrounding main commercial streets, touristic area, old town market area and shopping area along Abou-Ali River. New Tripoli is the busiest area in the Study Area with concentration of commercial and business activities as well as cultural and historical spots. Accordingly, people are concentrated and high volume of traffic is generated and attracted in the area. Present condition and problems are as follows as shown in Figure 3.1-1.

#### a) Road Network and Road Space Utilization

- Roads are mostly narrow and road network is like a maze, particularly downtown and old city areas.
- Road space is not fully used for traffic purpose due to heavy on-street parking.
- There is no room for road widening or construction of new road due to high density roadside development.

#### b) Inter-City Buses

- There is no off-street inter-city bus terminal, but existing roads are used as the inter-city bus terminal (or on-street inter-city bus terminal).



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- Inter-city buses wait for passengers on a road until enough passengers boarded on it, thus traffic is severely disturbed.
  - On-street inter-city bus terminals are concentrated along the busiest roads.
- c) Taxis
- There is no off-street taxi terminal stand. Taxis are parking on streets to get 4 or 5 passengers.
  - Over-supply of taxi service is obvious. Many taxis cannot get passengers, but park on a street all day long.
  - Taxis are concentrated at Public Garden and J. Abd El-Nasser Square areas.
- d) On-Street Parking
- Many vehicles park along streets, narrowing a road space for travel way.
- e) One-way Traffic Operation
- One-way traffic operation is being extensively adopted in the most of areas, this system is successful, but there are some areas where this system needs to be improved.
- f) Environmental Condition
- Due to concentration of traffic, its slow moving conditions, and many old-age vehicles, air quality is seriously deteriorated.
- g) Factors affecting Tourism Development
- Historical and cultural heritages are concentrated in the old city area. Proper parking areas, improvement of sidewalks and pedestrian roads and beatification of area are needed to attract more tourists.

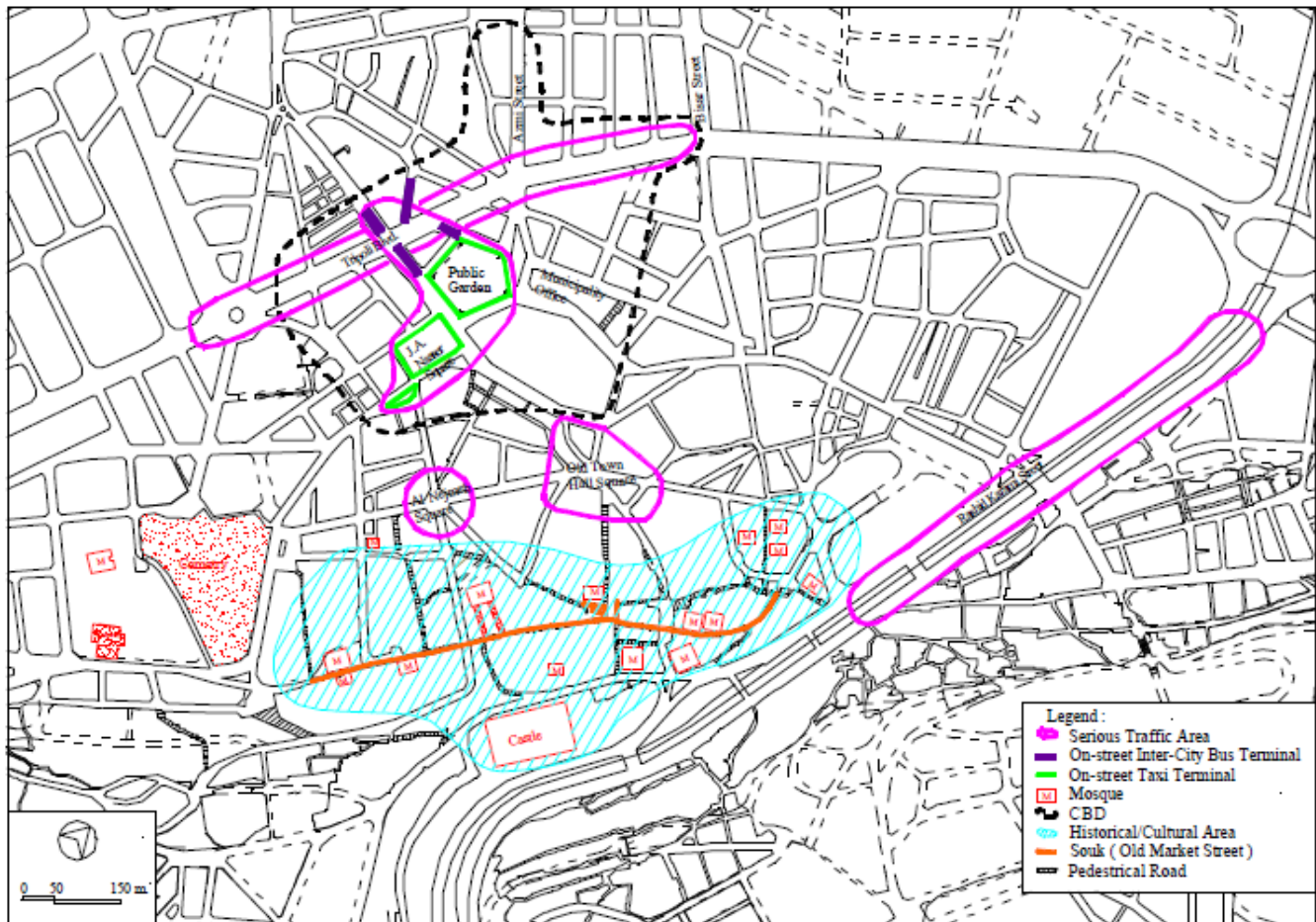


Figure 3.1-1 Present Condition of Central Tripoli Area

### PROPOSED BUS/TAXI SERVICE SYSTEM AND TERMINALS

Bus/Taxi Service System needs to be planned in relation to provision of terminals. In the Master Plan, the following are recommended:

- Introduction of City Bus (Short term: 2001-2005).
- Construction of Behsass Terminal (Short term: 2001-2005).
- Construction of Bedaoui Terminal (Medium term: 2006-2010)

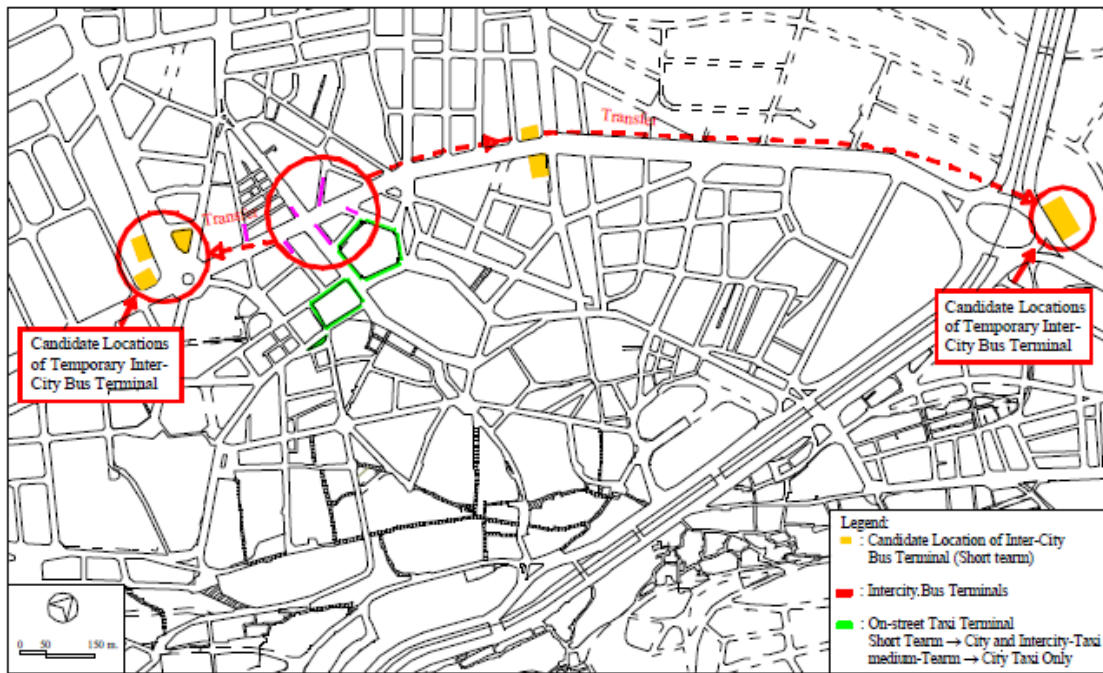


Figure 3.3-1 Candidate Location of Intercity Bus Terminals

## ONE-WAY TRAFFIC SYSTEM

### Present One-Way Traffic System

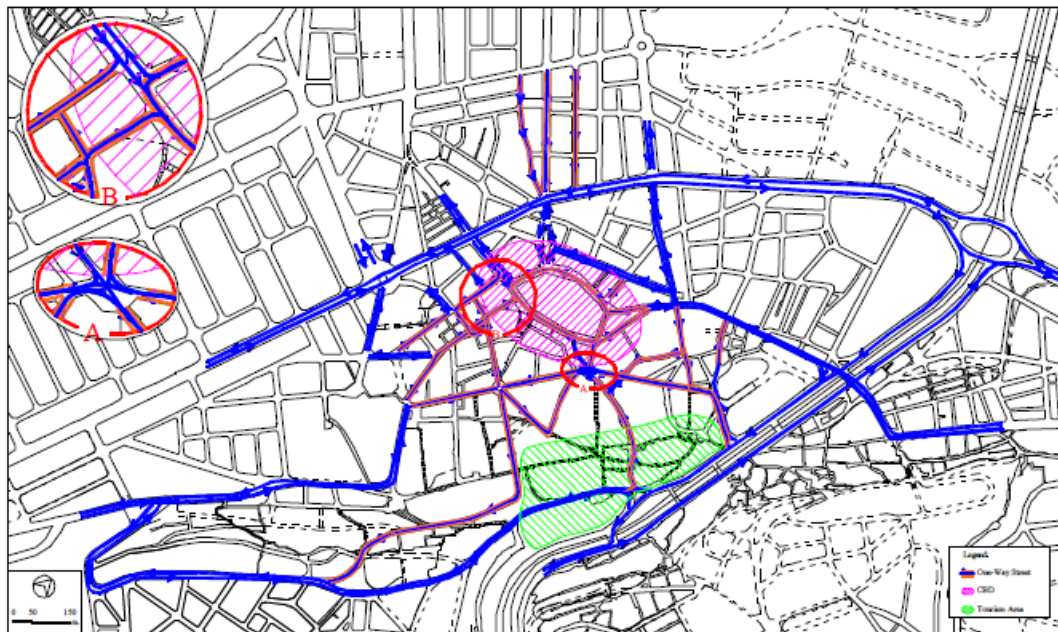


Figure 3.4-1 Present One-Way System

### Proposed One -Way Traffic System

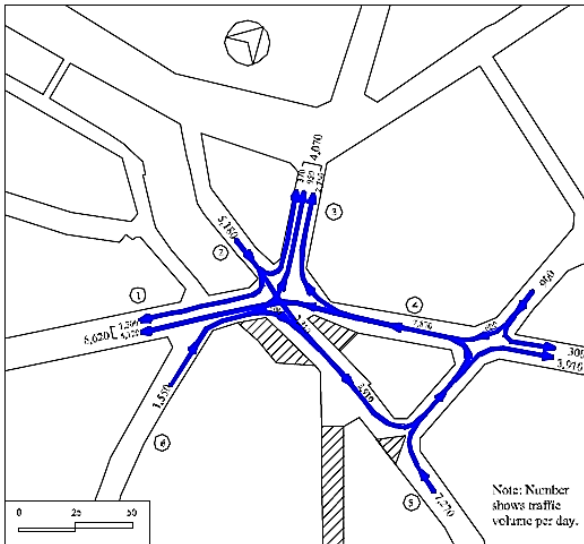


Figure: 3.4-2(a) Area A : Present One-Way System

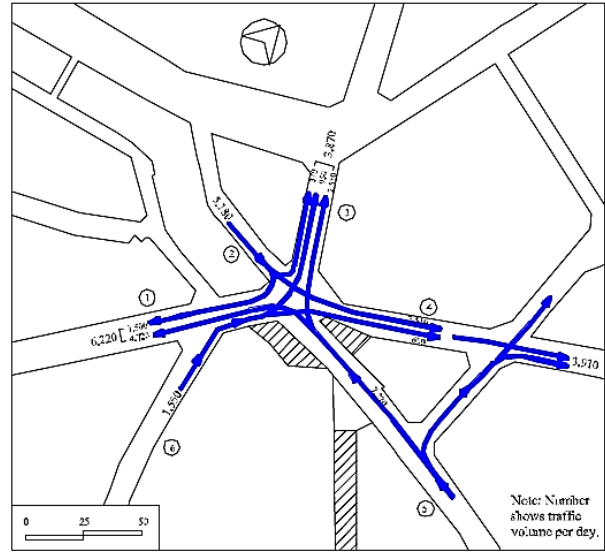


Figure: 3.4-2(b) Area A : Proposed One-Way System

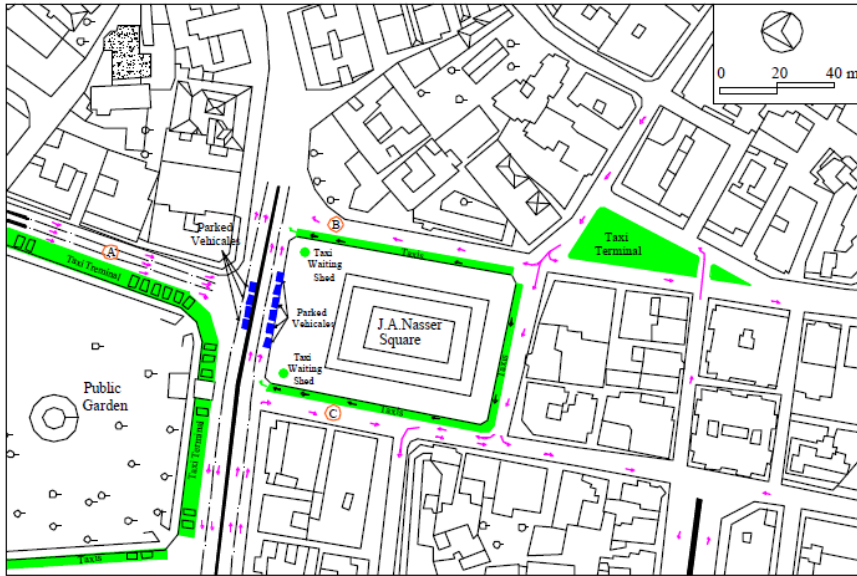


Figure: 3.4-3(a) Area B : Present One-Way System



Figure: 3.4-3(b) Area B : Proposed One-Way System

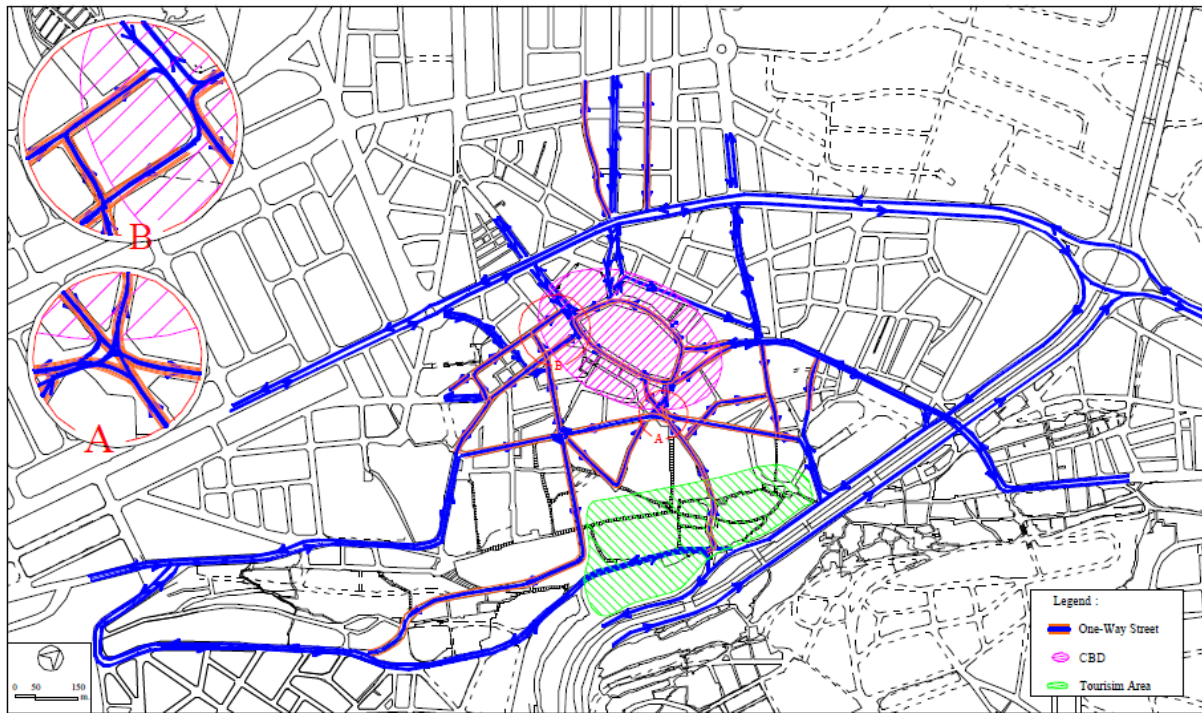


Figure 3.4-4 Proposed One-Way System

## ON-STREET AND OFF-STREET PARKING

### On-Street parking

Table 3.5-1 shows the results of the parking survey for the major corridors. The total number of vehicles parked during the working day from 8 A.M to 3 P.M. is 4,753 vehicles. The ratio of vehicles parked on sidewalk is 10% while the ratio of double parking is 15%. Table 3.5-2 shows a summary of these main findings.

Table 3.5-1 Present On-Street Parking Demand

Location	Number of Parked Vehicles	Double Parking	Sidewalk Parking
Ia	75	1	9
Ib	39	8	-
Ic	16	1	-
Id	23	1	-
IIa	182	30	8
IIb	189	29	4
IIIa	159	19	11
IIIb	171	24	9
IVa	127	24	19
IVb	98	19	10
Va	77	2	12
Vb	74	10	9
VIa	211	44	90
VIb	203	15	65
VIIa	194	33	5
VIIb	202	36	2
VIIIa	154	41	3
VIIIb	120	22	1
IX	375	48	61
Xa	196	13	5
Xb	181	16	7
XIa	161	60	3
XIb	176	56	1
XIIa	176	13	2
XIIb	163	19	5
XIIIa	238	18	8
XIIIb	272	10	8
XIV	306	46	3
XV	195	63	102
<b>Total</b>	<b>4753</b>	<b>721</b>	<b>462</b>

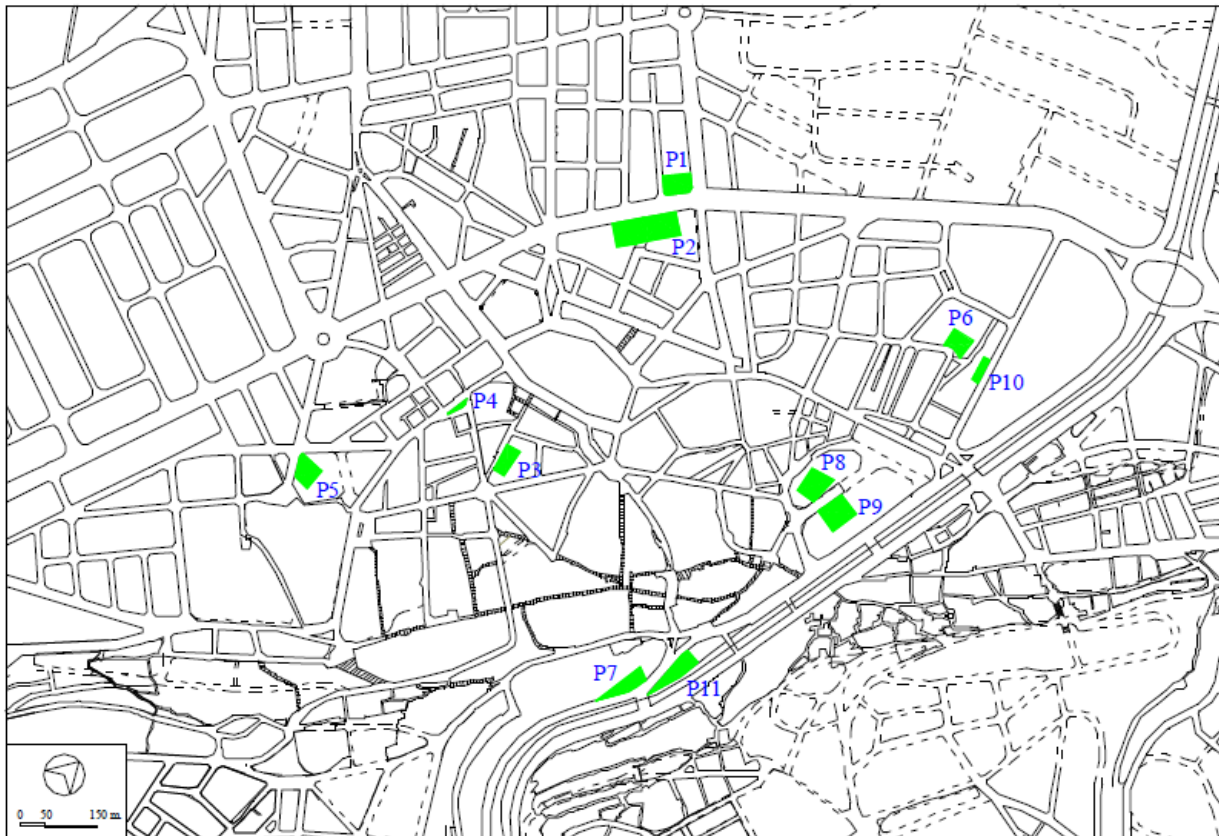


Figure 3.5-1 Locations of Off-Street Parking Areas

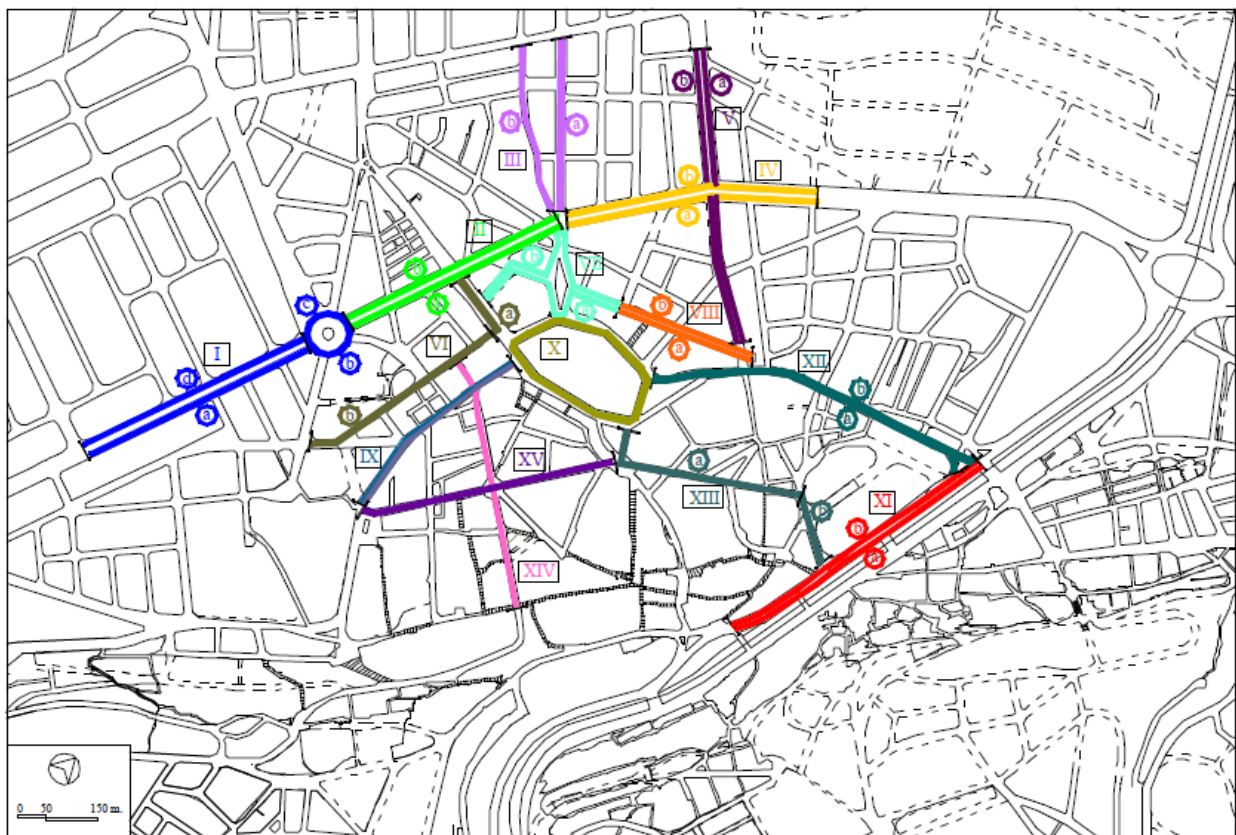


Figure 3.5-2 Locations of On-Street Parking Survey

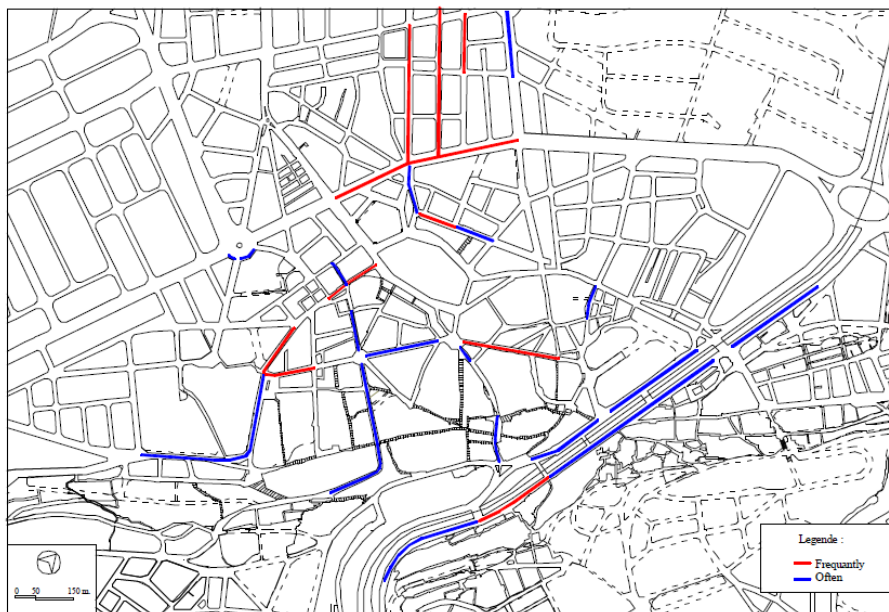
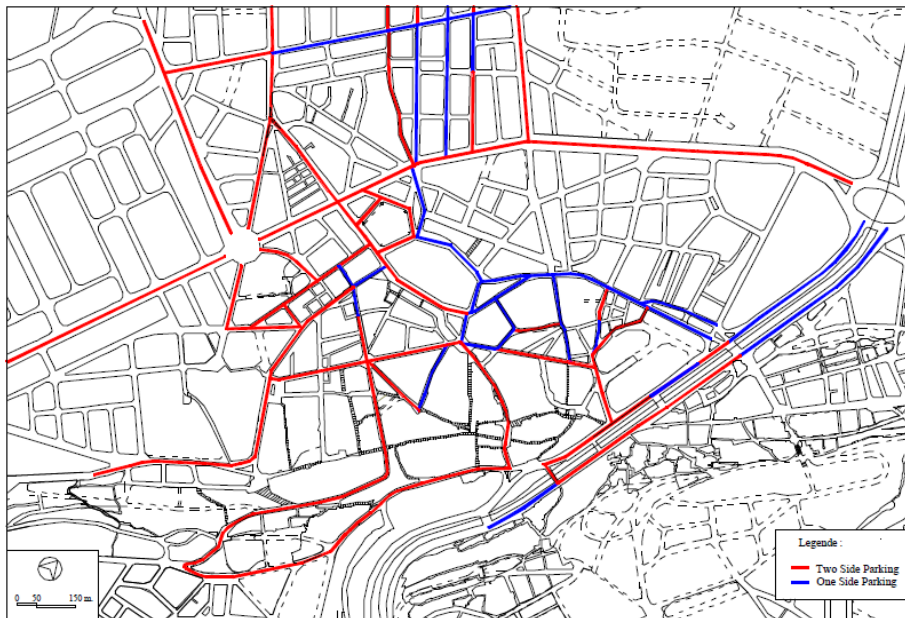
The street inventory survey shows that the on-street parking supply is about 2,000 spaces. The presently parking condition based on the street inventory survey is shown in Figure 3.5-3.

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Figure 3.5-4 shows the locations where double parking and parking on sidewalk are frequently or often observed. Based on this figure the following locations are highlighted as the locations with high demand.

- Sahet El-Tal
- El-Saraya El-Kadimah
- El-Nejma Square
- Tripoli Boulevard
- Around Tripoli Municipality
- Azmi Street
- El-Mitain Street
- Abou Ali River Near to the Old Market

Under the Master Plan Study the total present demand was estimated as 3,000 spaces. As mentioned, currently the on-street supply is about 2,000 spaces. That means under the current condition the central area needs at least additional 1,000 spaces without prohibition of the on-street parking. When the on street parking will be prohibited the central area will require 3,000 parking stalls. However, there are presently about 500 over supply off-street parking stalls which mean that the central area will be in need for an additional 2,500 stalls to manage the complete prohibition of on-street parking.



## Off Street parking

The second stage survey for the all off-street parking areas within the downtown study area shows that there are 11 locations. The survey was carried out to estimate the supply on each location. The locations are shown in Figure 3.5-1. The capacity of each location and the total off-street parking capacity is shown in Table 3.5-6.

Table 3.5-6 Off-Street Parking Capacities

Location	Area m <sup>2</sup>	Capacity Space
P1	3,400	136
P2	5,400	216
P3	800	32
P4	650	26
P5	950	38
P6	1,300	52
P7	1,200	48
P8	3,100	124
P9	800	32
P10	900	36
P11	1,300	52
Total	19,800	792

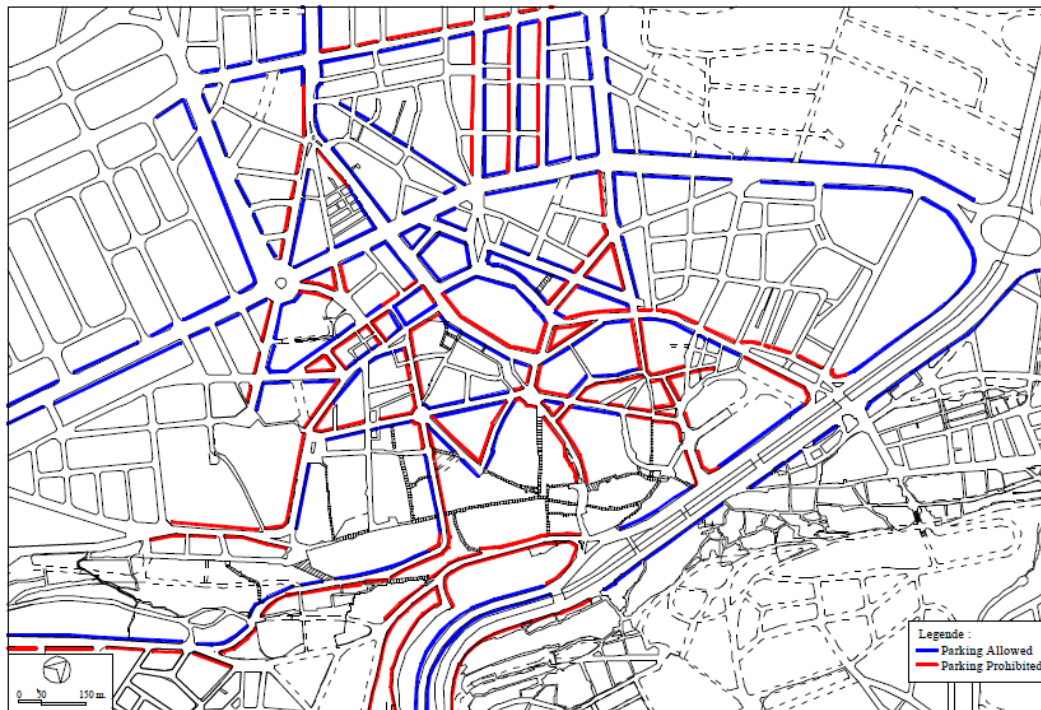


Figure 3.5-6 On-Street Parking Short Term Plan



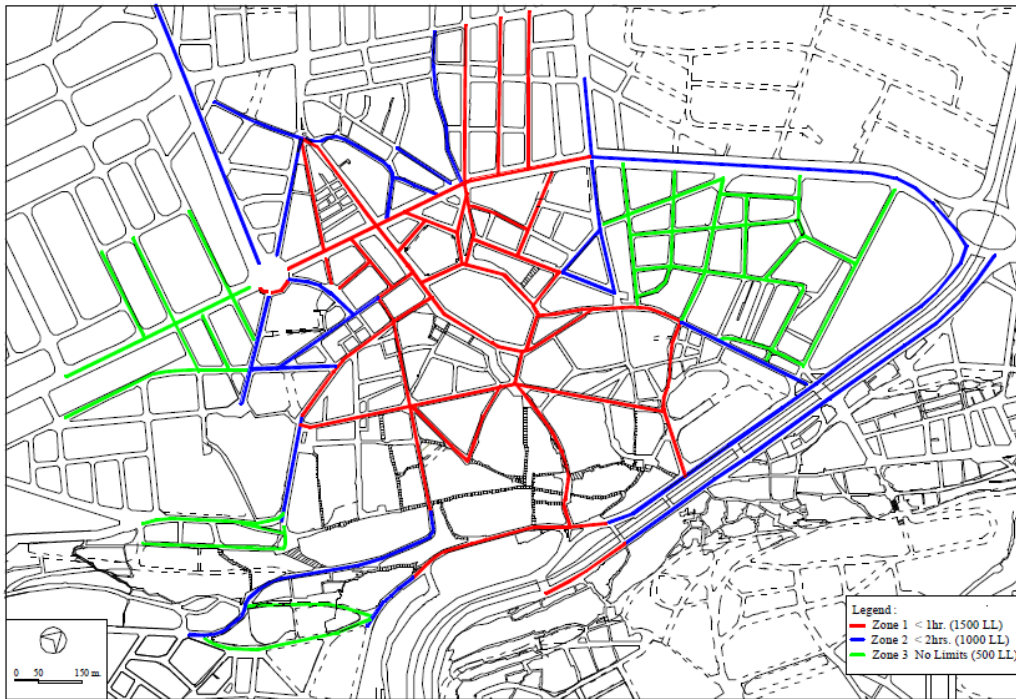


Figure 3.5-7 Time Limit Zones

## INTERSECTION IMPROVEMENT AND TRAFFIC SIGNALS

Present traffic circulation is shown early in Figure 3.4-1. The investigation highlighted two areas where traffic rerouting is required. The traffic circulation on the downtown area after the required rerouting is shown in Figure 3.4-4.

Due to this rerouting and construction of the Tripoli Boulevard underpass the intersections where improvements and traffic signals will be required during the Short-term Plan were selected as shown in Figure 3.6-1. There are eight locations where geometrical improvement and traffic signals will be required. Three of these locations are along the Tripoli Boulevard which are intersections numbers 16, 20 and 22. These three locations are already included in the traffic signal plan of the CDR. Concerning the improvements cost of these three intersections it will be included with the required cost for the construction of the underpass.

From the other five locations, there are three already included in the traffic signal plan by the CDR which are intersection numbers 14, 17 and 23. However, only intersection number 17 is included in phase I of CDR plan. The others 14 and 23 are included in phase II. Therefore, these two intersections plus the intersections at Sahet El-Taal and Al Saraya Al Kadima must be considered in the phase I of CDR traffic signal plan.

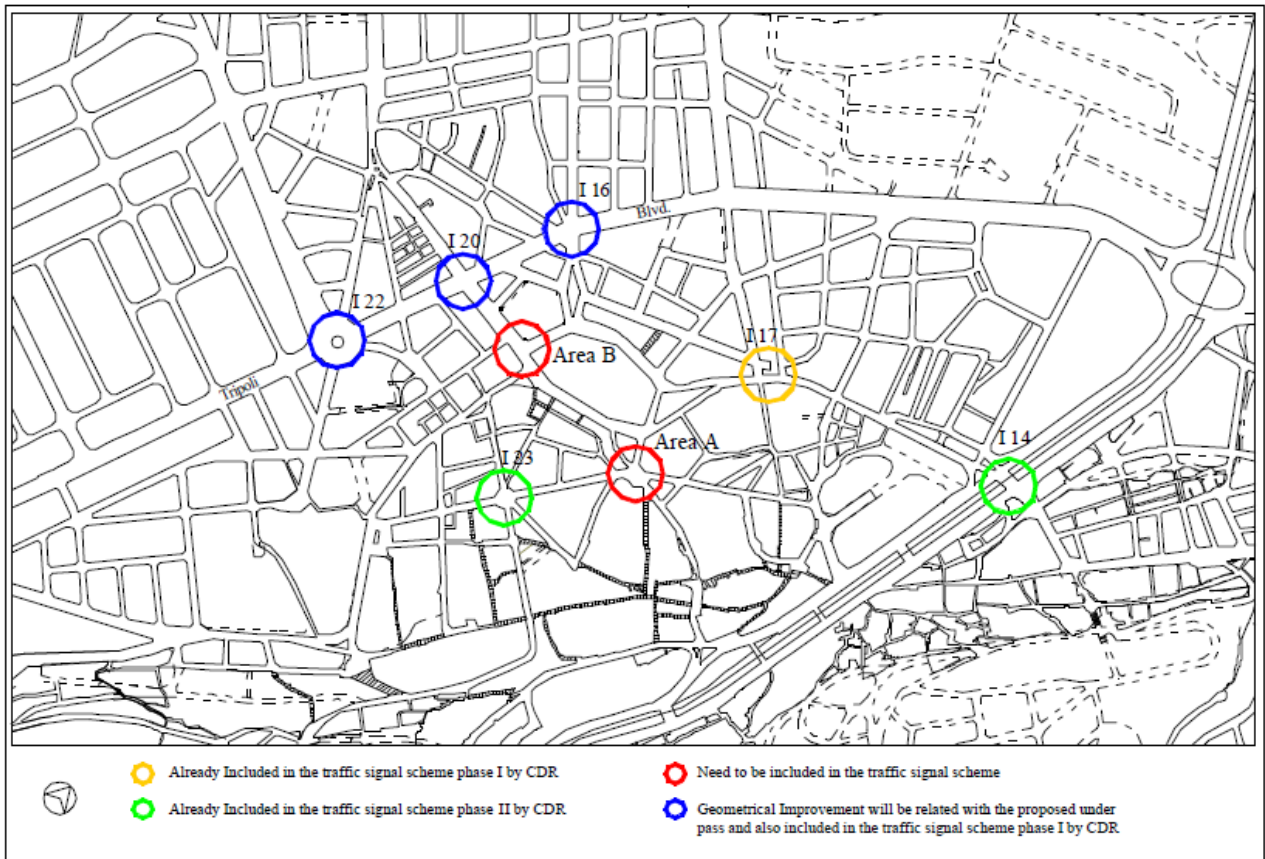


Figure 3.6-1 Main Location of Geometric Improvement

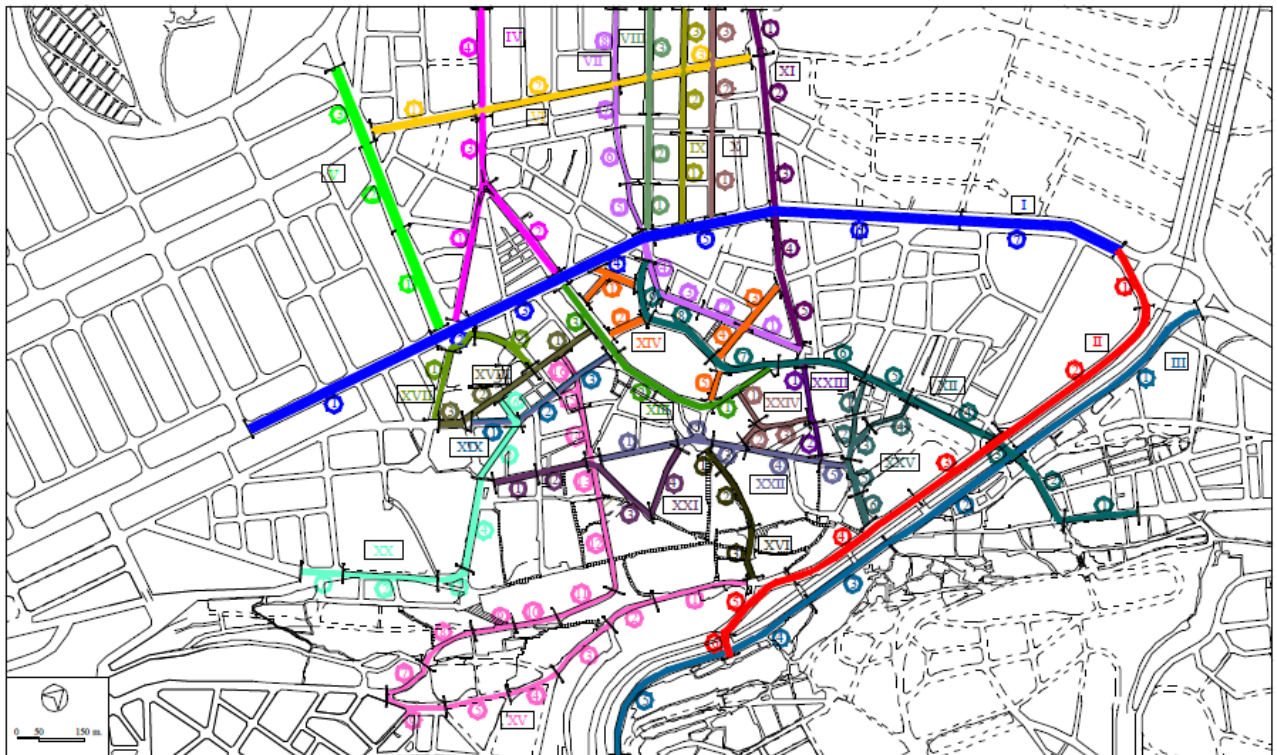


Figure 3.6-2 Location Map of Street Inventory Survey

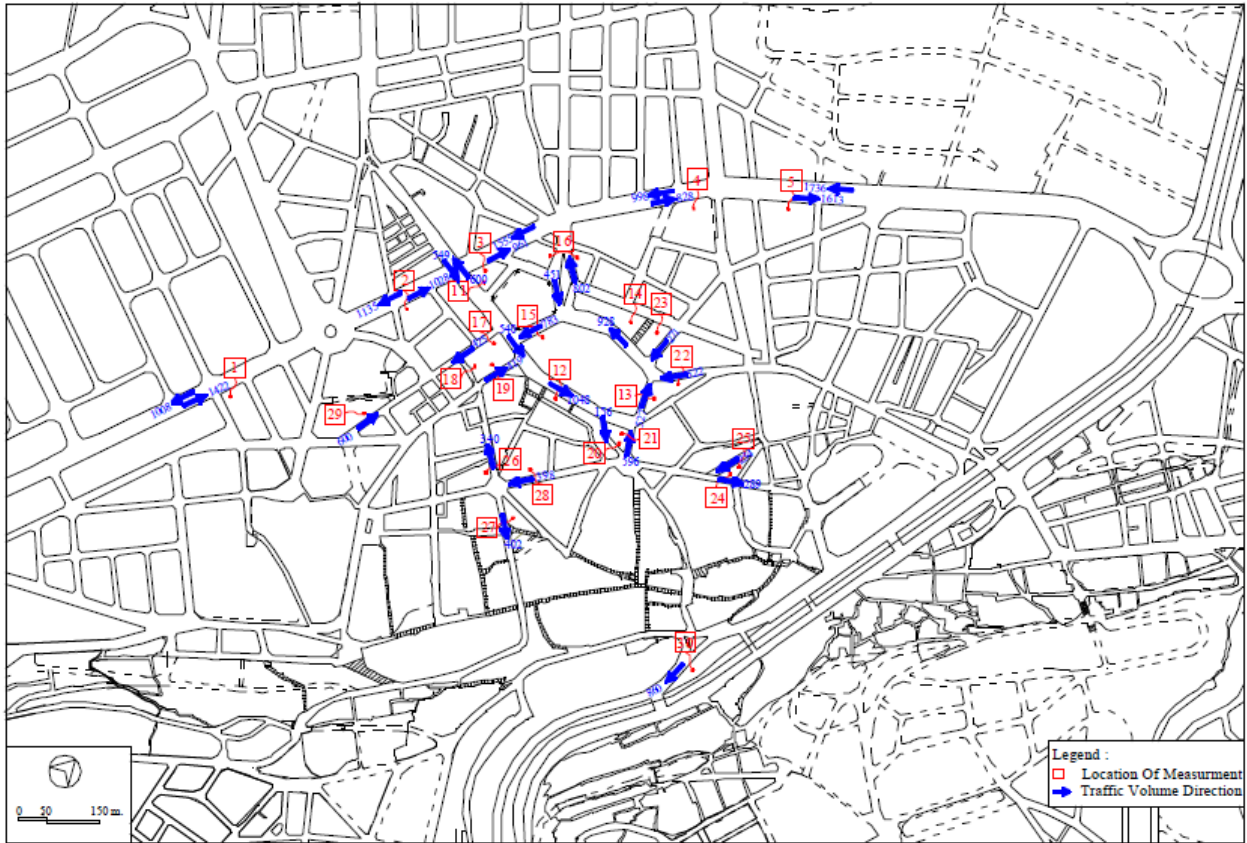


Figure 3.6-3 Maximum Hourly Traffic Volumes

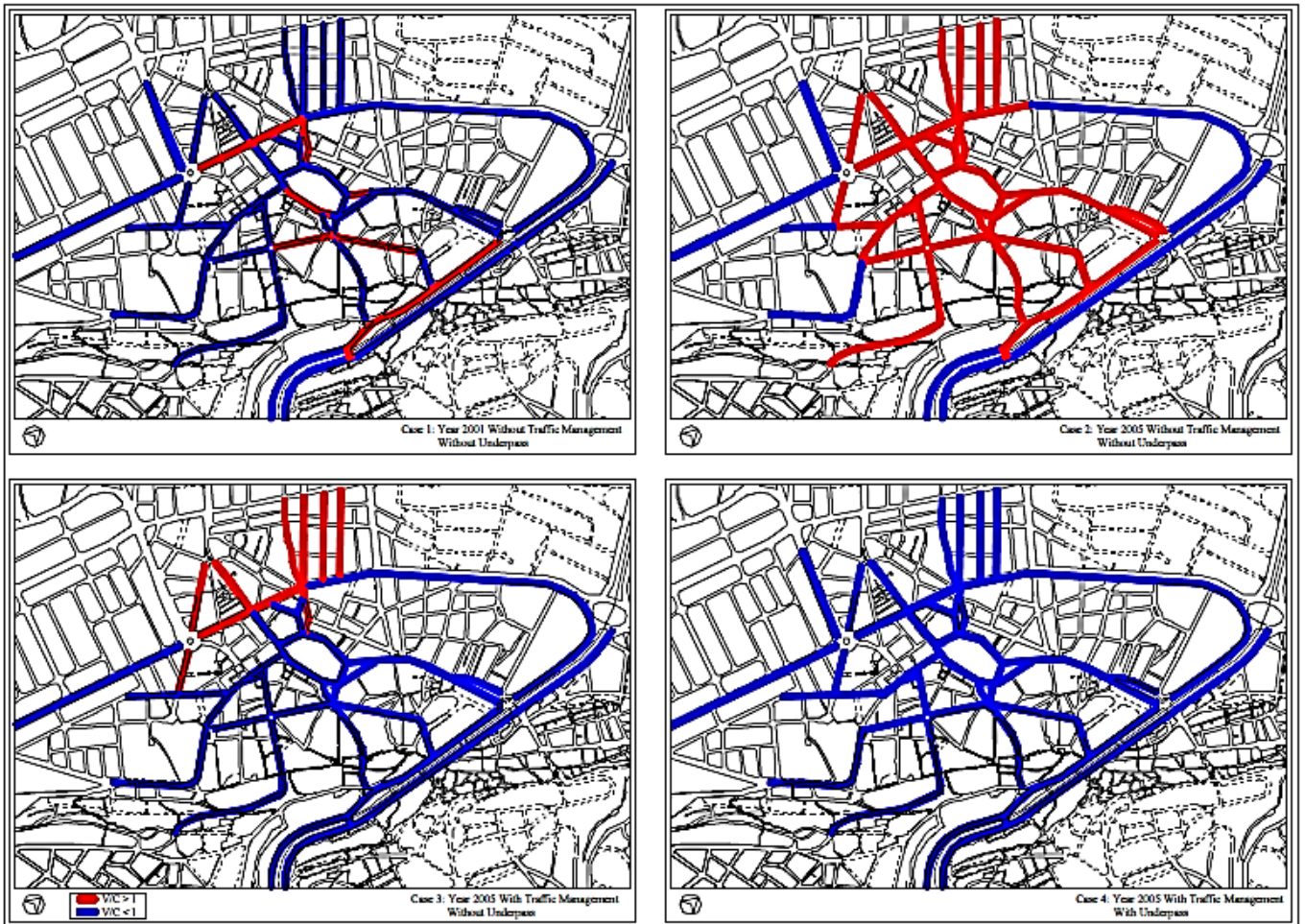


Figure 3.6-4 Congestion of Major Corridors

### Intersection Improvement and Traffic Signals

During the Short-term Plan improvement of eight intersections have to be considered. There are three intersections will be related to the underpass project. For the other five intersections that their locations are shown in Figure 3.6-1 the geometrical improvement plan and traffic phasing system are shown in Figure 3.6-6 to 3.6-11. At Sahat El-Tal two alternatives have been considered as shown in Figure 3.6-10 and 3.6-11. The first one is much better for the smooth traffic circulation but it needs to cut and add some sidewalk areas. There is no problem with this plan. However, if the Tripoli Authority dislike to carry out this modification, the second alternative can be used.

In the geometrical planning the traffic re-routing was taken into consideration. The traffic circulations in these intersections are based on the proposed one-way system plan shown in Figure 3.4-4.

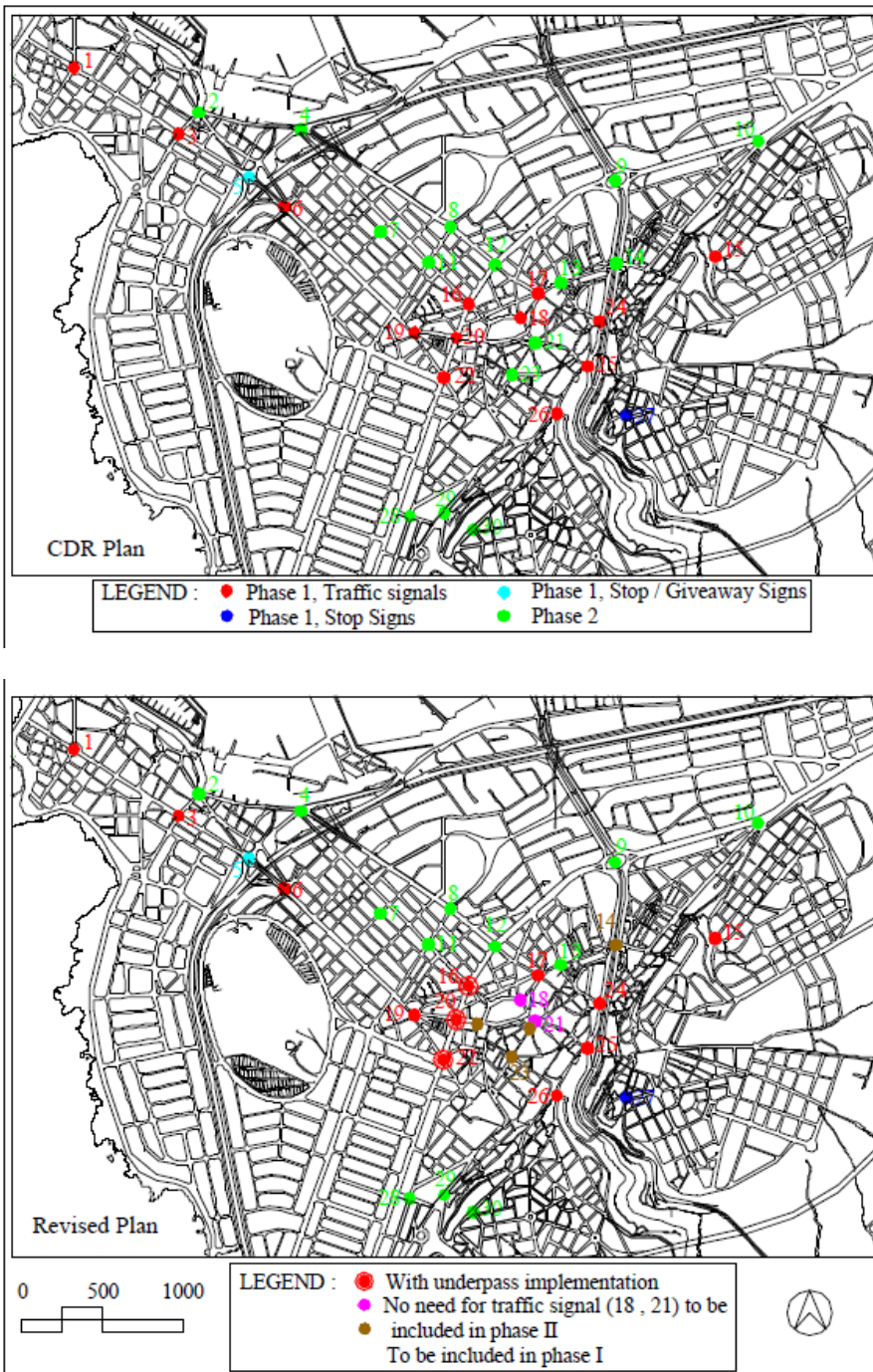


Figure 3.6-5 Review of On-Going Traffic Signal Plan

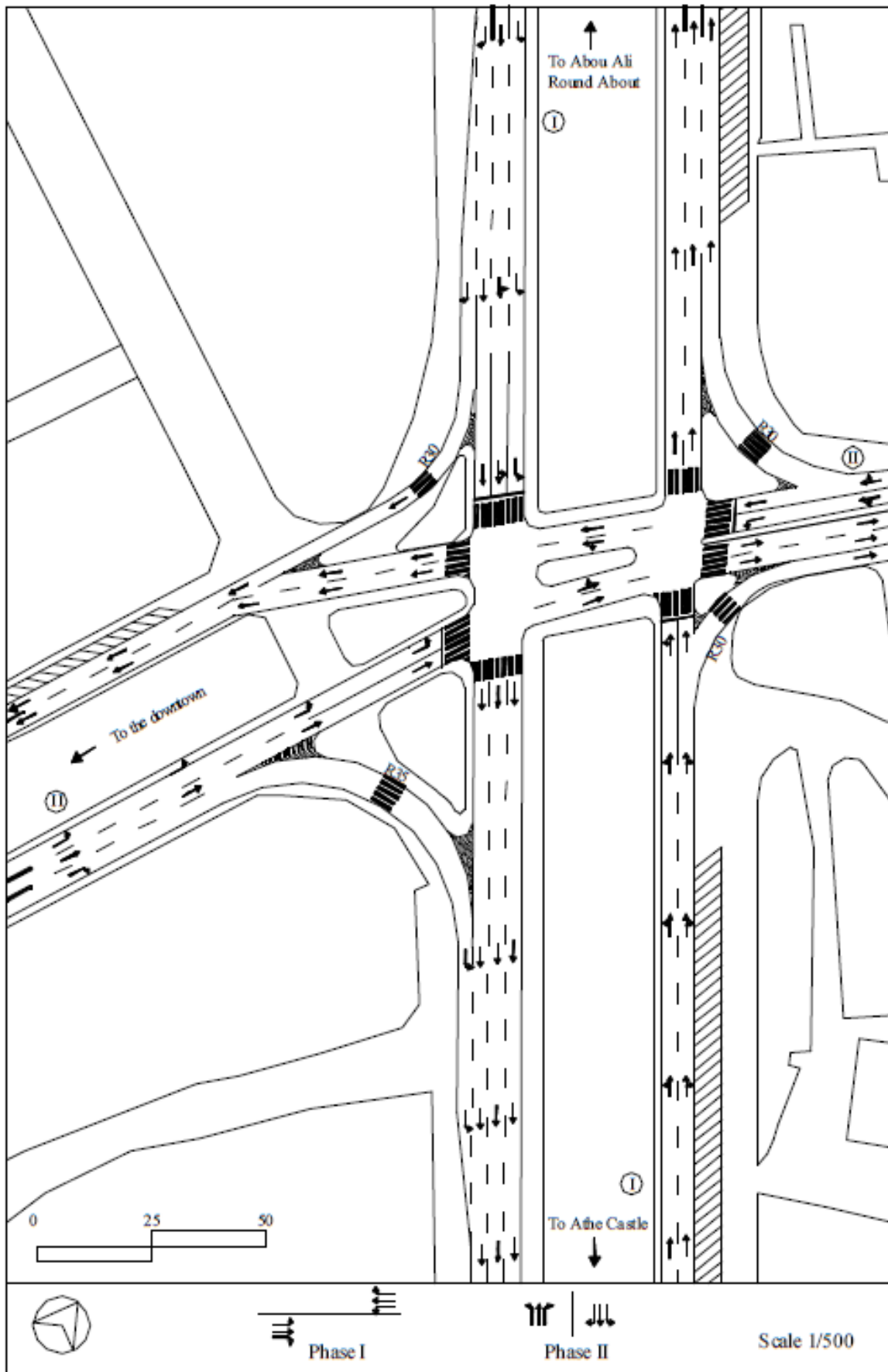


Figure 3.6-6 Geometrical Improvement and Signal Phasing for Intersection No.14

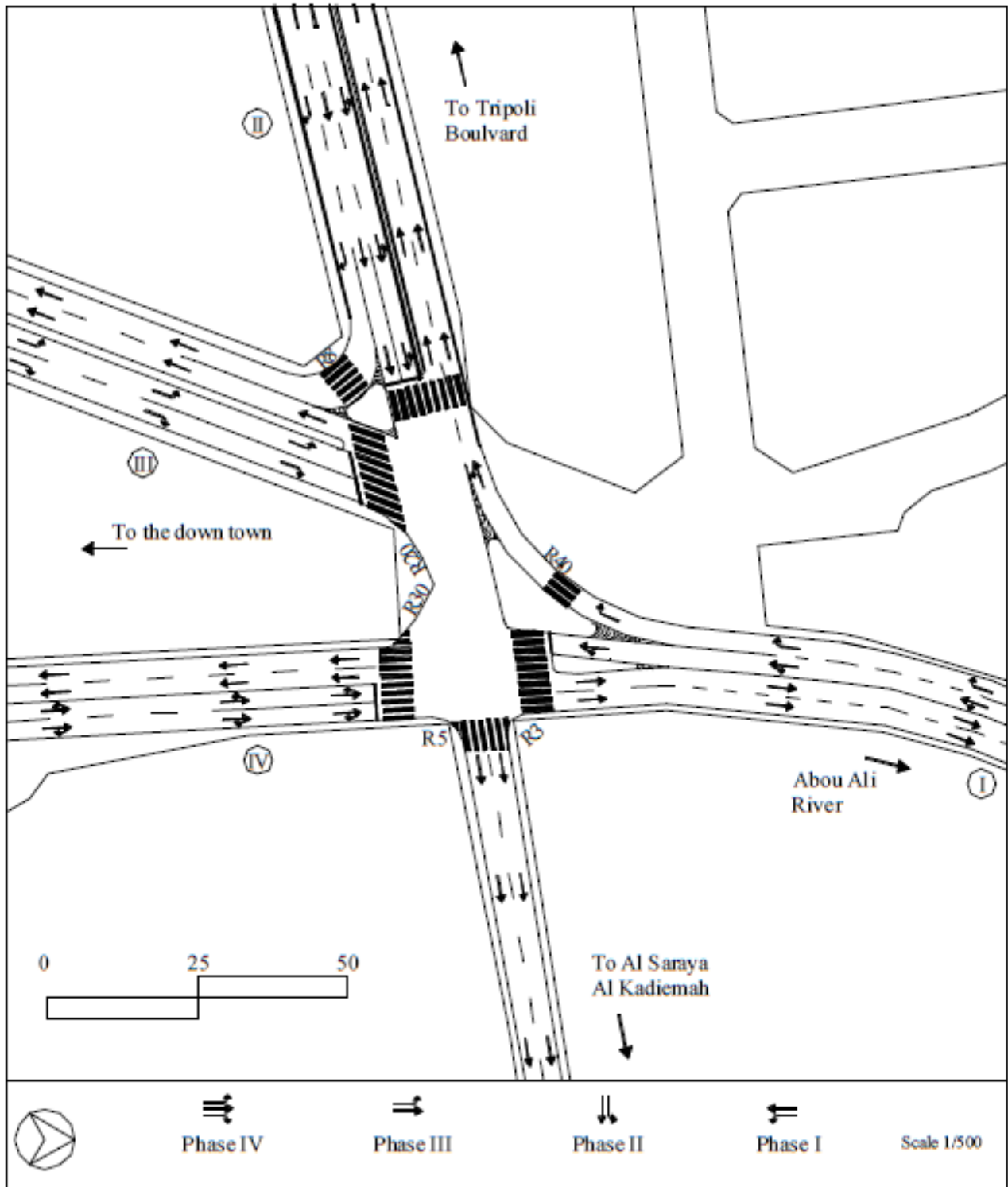


Figure 3.6-7 Geometrical Improvement and Signal Phasing for Intersection No.17

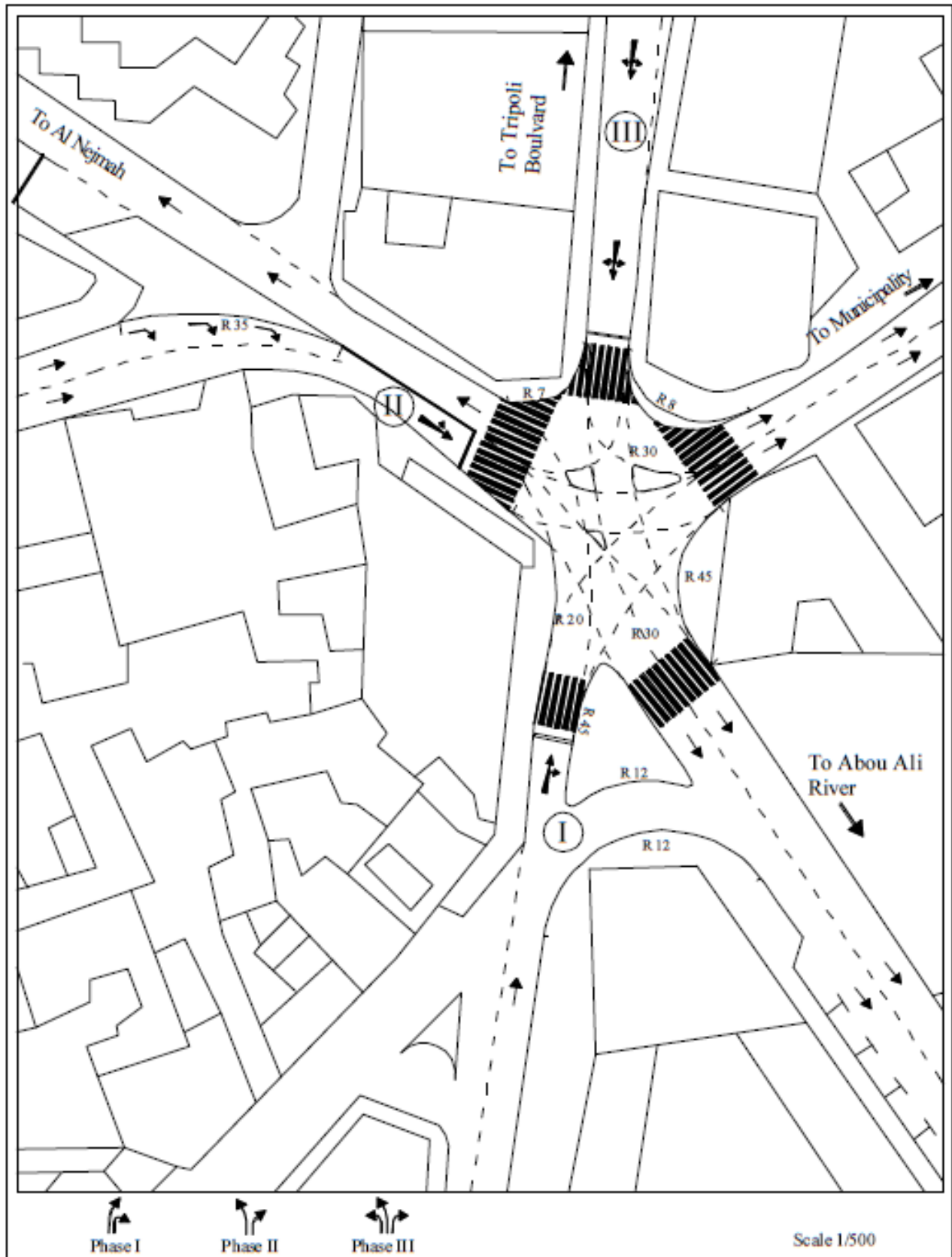


Figure 3.6-8 Geometrical Improvement and Signal Phasing for Intersection (Al Saraya Al Kadima)

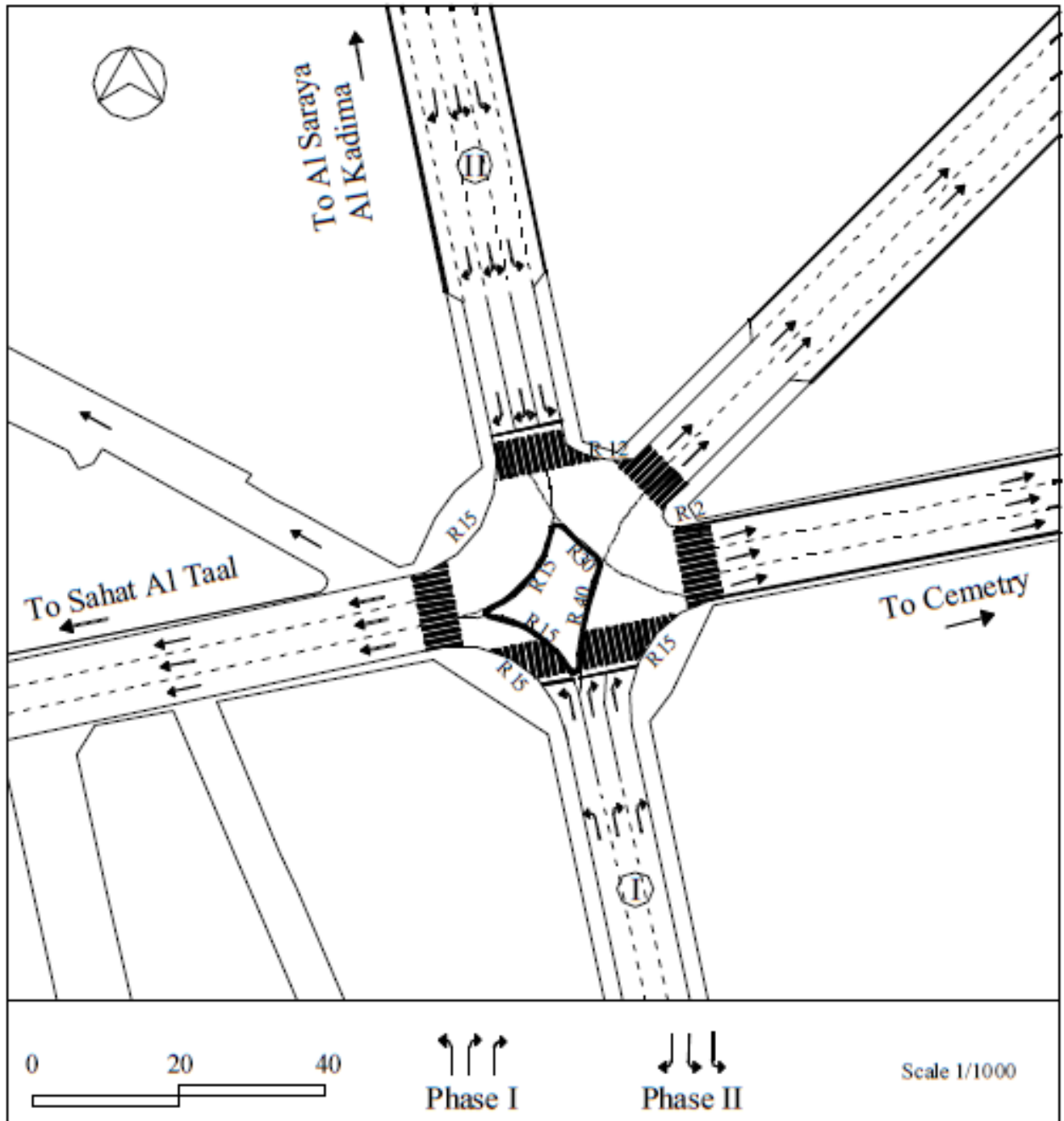


Figure 3.6-9 Geometrical Improvement and Signal Phasing for Intersection No.23 (Al-Nejmeh Square)



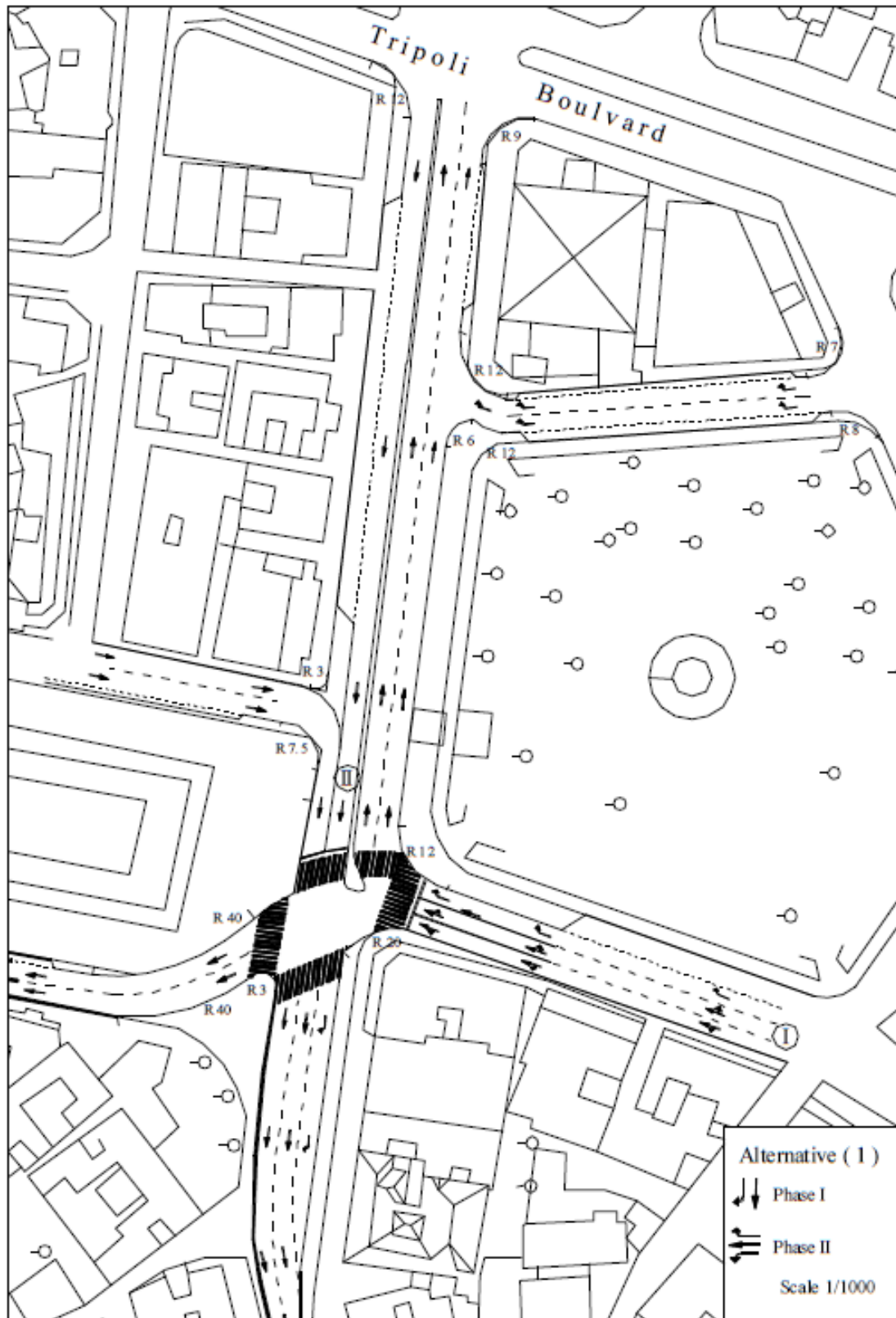


Figure 3.6-10 Geometrical Improvement and Signal Phasing at Sahat Al-Taal

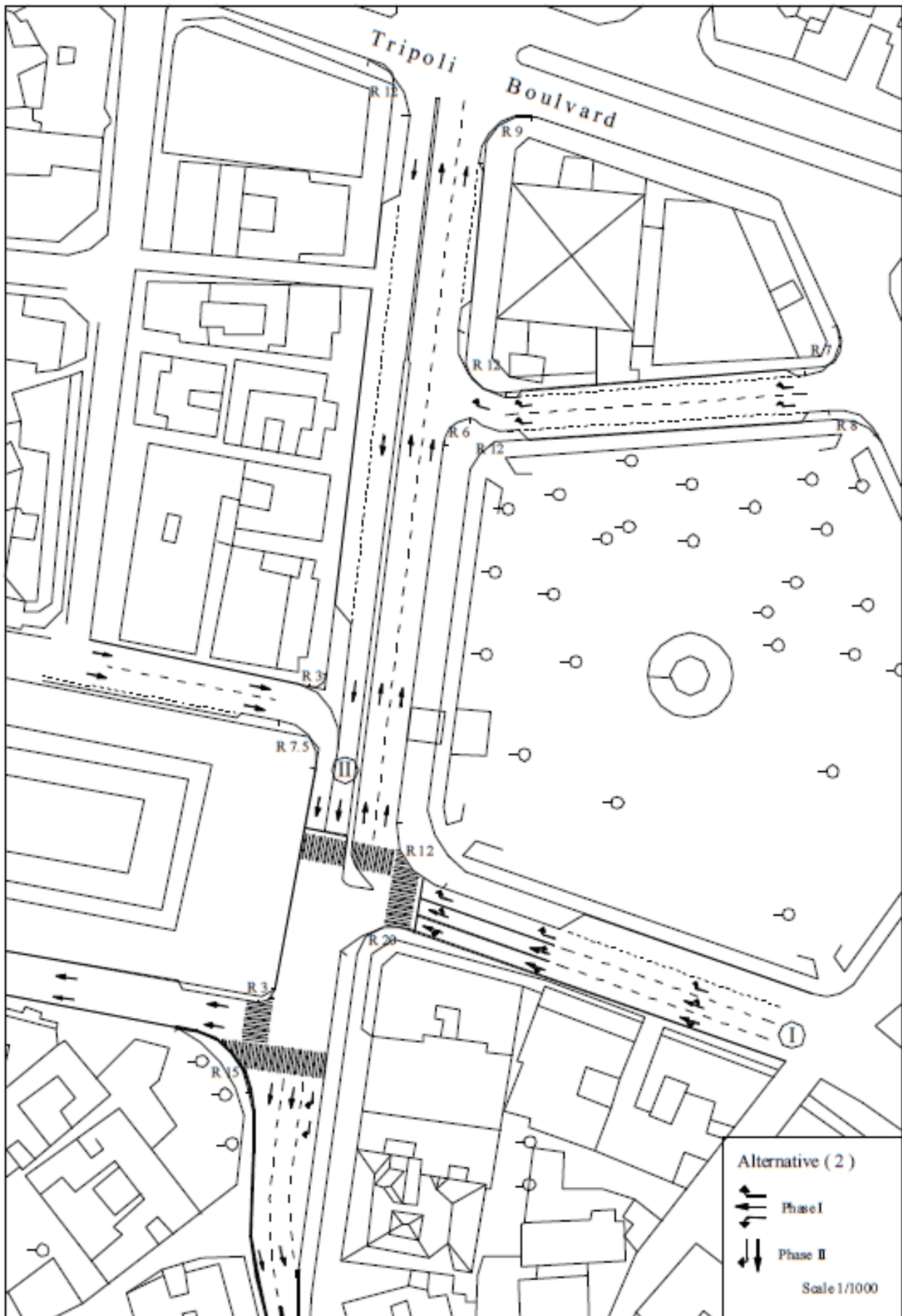


Figure 3.6-11 Geometrical Improvement and Signal Phasing at Sahat Al-Taal

TRAFFIC SAFETY FACILITIES

Traffic safety must protect the road users including both vehicle drivers and pedestrians. Recently Tripoli City suffer a considerable shortage in the traffic safety facilities such as pedestrian signals, guard rails, pedestrian over and under pass, and bad condition of sidewalk. The pavement condition can consider also under the safety facilities since the bad pavement conditions are reducing the control ability of drivers. The bad pavement condition is preventing the application of the road marking that can severely affected the safety.

**Table 3.7-1 Assessment of Pedestrian Volume and Sidewalk Capacity**

Location	Pedestrian max. volume p/min.	Sidewalk width (m)	Capacity p/min.	V/C
1a	22	2	40	0.55
1b	26	2.6	64	0.40
2a	26	3.9	116	0.22
2b	29	4.7	148	0.2
3a	13	2	40	0.33
3b	18	1.5	20	0.9
4a	20	2	40	0.5
4b	22	2	40	0.55
5a	26	2	40	0.65
5b	21	1.8	32	0.97

**Table 3.7-2 Sidewalk Conditions**

Condition	Area (m <sup>2</sup> )	Ratio
Good	8,000	10 %
Fair	32,000	40 %
Bad	40,000	50 %

**Table 3.7-3 Pavement Conditions**

Condition	Area m <sup>2</sup>	Ratio %
Good	30,000	7.5
Fair	360,000	90.0
Bad	10,000	2.5

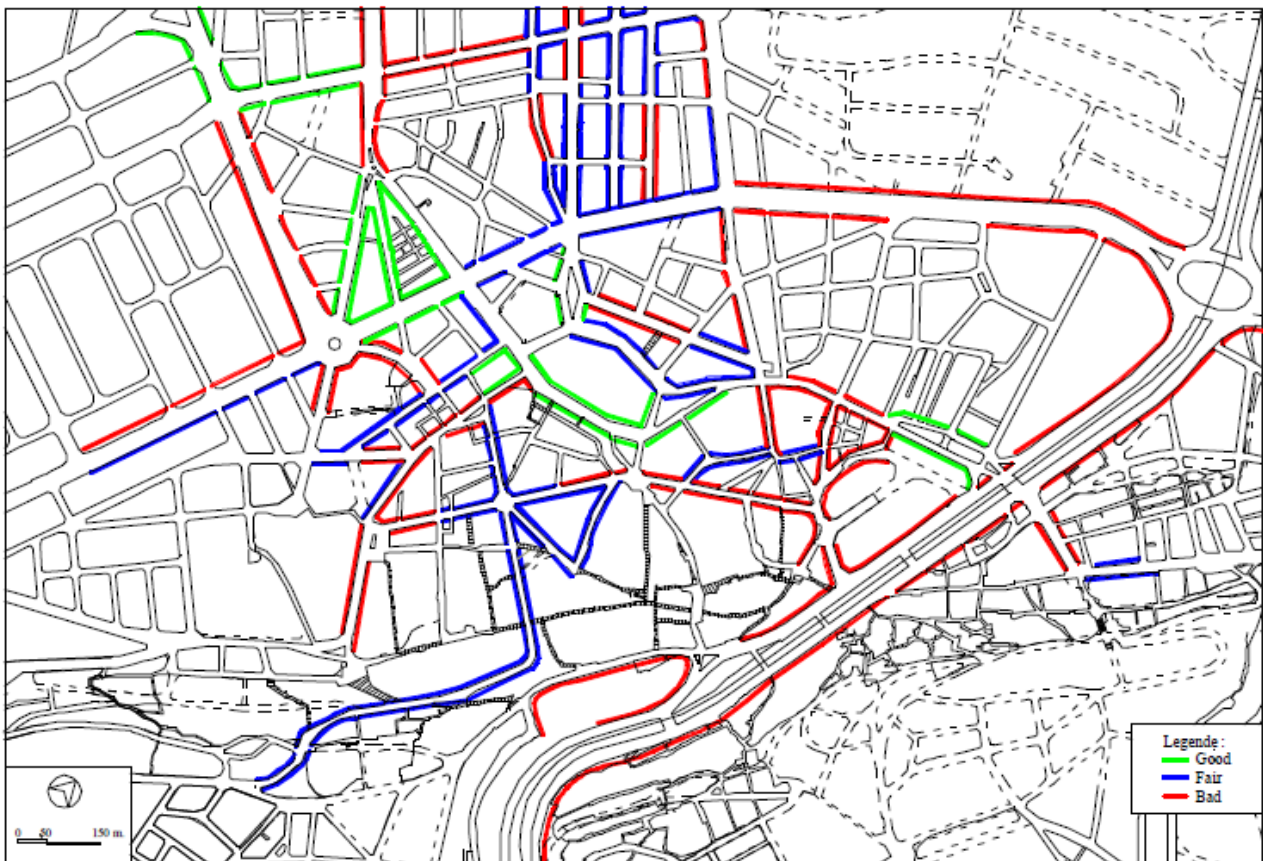
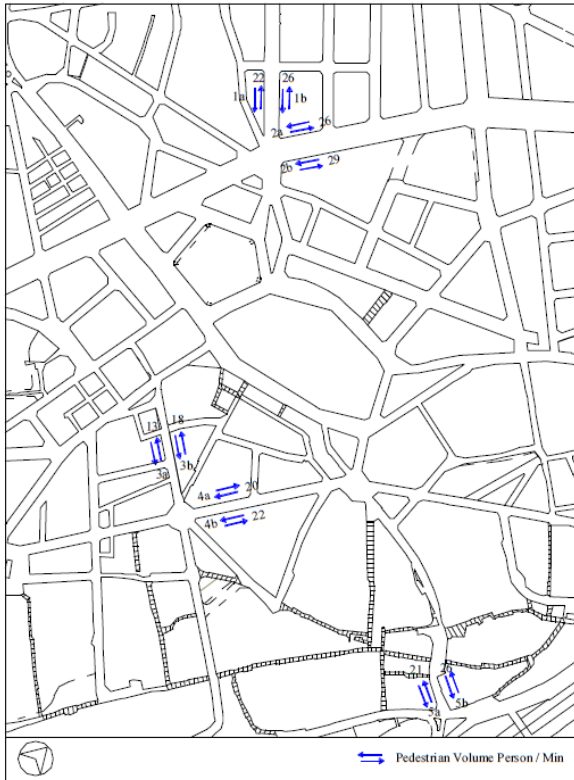


Figure 3.7-2 Present Sidewalk Conditions

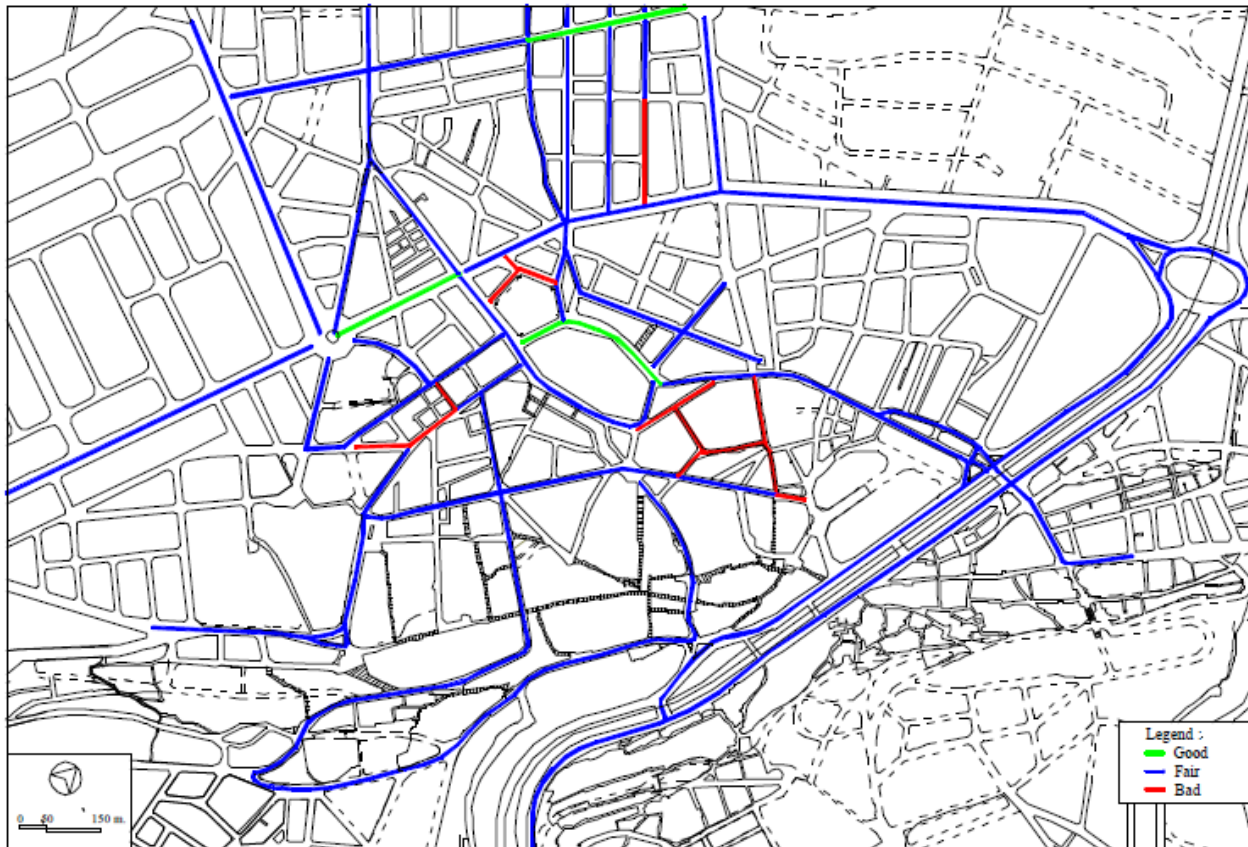


Figure 3.7-3 Present Pavement Conditions

The investigation of present condition shows that the city is in need for the safety facilities improvement in the short and medium plans. The improvement for the city as a whole was clarified before under the Master Plan Study in Technical Report-4. For the downtown area the city will need to consider the following facilities during the Short-Term Plan:

- Sidewalk Improvement
- Pavement Improvement
- Guard Rails

Traffic Signs:

Table 3.8-1 Traffic Signs Requirements

Sign Type	Required Number
Warning	240
Regulatory	120
Informatory	240

Pavement Marking:

There is no marking in all of the downtown area. In the field of the pavement marking the following marking types have been considered:

- Lane marking.
- Cross-walk marking.
- On-street parking.
- Off-street parking.
- Channelization.

Table 3.8-2 Road Marking Requirements

Type of Marking	Area (m <sup>2</sup> )
Lane	4000
Cross-walk	3000
Edge	4000
On-street	4800

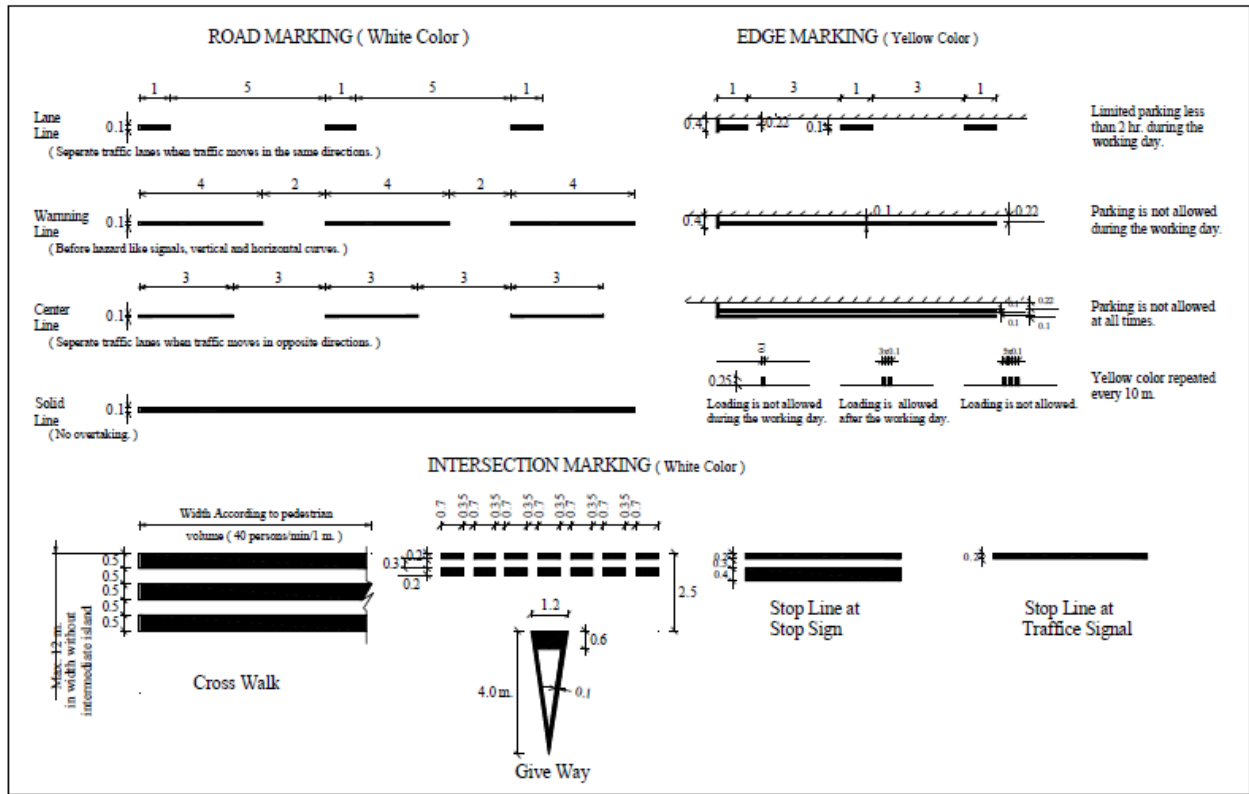


Figure 3.8-1 Typical Example of Pavement Marking