

URBAN LAND UTILIZATION
CASE STUDY: RIYADH, SAUDI ARABIA

by

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1972

SUBMITTED IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF
ARCHITECTURE IN ADVANCED STUDIES
at the

MASSACHUSETTS INSTITUTE OF
TECHNOLOGY

June, 1975

Signatures of the Authors

Department of Architecture May 1975

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Horacio Caminos,

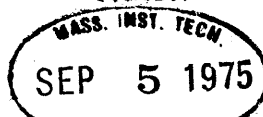
Thesis Supervisor

Accepted by

Chairman, Department Committee on Graduate Students

John Habraken

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Studies.

ABSTRACT

This is a study of urban dwelling environments with primary emphasis on land utilization: its pattern, intensity, and efficiency. Riyadh, Saudi Arabia, is taken to illustrate the various aspects. The study consists of existing dwelling environments and a model for urban land development. The National Context of Saudi Arabia and the Urban Context of Riyadh are included in brief form as well as a summary of the urban housing policy of Saudi Arabia for reference.

Five distinct urban dwelling environments in Riyadh have been identified, analyzed, and evaluated. These cases were chosen because of the time of their emergence in Riyadh, their location, and layouts, as well as the socio-economic characteristics of their inhabitants. These cases are: Ad-dira (traditional pattern); Manfoha (transitional pattern); Khazzan (contemporary pattern); Malazz (contemporary government development for its employees); Khurais (contemporary government project for low income families). The cases were analyzed on four different levels: the locality with reference to its context, a segment containing the main elements, a typical block, and a typical dwelling. In addition, eight dwelling types, representing the dwelling systems available in Riyadh, have been further identified and evaluated.

The study of the urbanization model consists of the following:

- A review of the proposed master plan of Riyadh;
- The basic studies for a physical development, including site limitations and development plans and process.
- Twelve layouts, three of them adapted from existing models, evaluated with respect to their land utilization.

Objectives:

- To illustrate the correlation between the settlement and its physical, socio-economic, and cultural context.
- To emphasize the relationship between the physical pattern and the development process of a settlement and its land utilization.

Application:

- A guide for preliminary design and evaluation of urban environments in transition.
- A stimulus for future studies.
- A point of reference for policy makers in urban dwelling environments.

Thesis Supervisor: Horacio Caminos

Title: Professor of Architecture

PREFACE

This study is based on field surveys in Riyadh, Saudi Arabia, carried out by the authors during the summer of 1974. The surveys included the physical and socio-economic aspects of selected Riyadh urban dwelling environments. The analysis and evaluations were carried out in the Urban Settlement Design Program, School of Architecture and Planning, M.I.T., during the academic years 1973-74 and 1974-75.

The surveys and evaluations of the urban dwelling environments are based on a procedure developed in the Urban Settlement Design Program. The procedure provides a basis for comparison of urban dwelling environments in different parts of the world.

Mohammed Al-Hussayen and Ali Shuaibi were responsible for all aspects of the thesis. Mohammed Al-Hussayen took particular responsibility in finalizing the case studies of Riyadh. Saleh Al-Hathloul participated fully in the preparation of the urbanization model.

The authors gratefully acknowledge the guidance and kind support of Professor Horacio Caminos during the two years of the study. They are also grateful for: the critique and assistance of Reinhard Goethert during the same period; the classes of 1973-75, 1974-76 for their comments; Dee Clarke for the editing and typing of the text; Fatima Al-Hussayen for her moral support; Riyadh University for financing the research; the Saudi Arabian Educational Mission for their kind cooperation; the Town Planning Authority, the Municipality of Riyadh, the Ministry of Interior for Municipalities, the Housing Authority in the Ministry of Finance, the Aerial Survey Department in the Ministry of Petroleum and Mineral Resources, and the Central Planning Organization for the provision of essential materials. The authors are further indebted to all who directly or indirectly contributed to this work whose names were not mentioned.

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INTRODUCTION

Urban Settlements have witnessed tremendous changes in their structure, functions, and environments during the past few decades. The problems of urban sprawl, social disintegration, and poverty are some of the results of these changes. These problems call for reassessment of the current approaches to the development of urban settlements. The isolation and study of different elements of settlements independently is indispensable to the understanding of its characteristics, but a comprehensive approach in planning and design is essential to a settlement's functioning and livability.

Urban land utilization is influenced by different situations and policy interpretations on different levels; still the study of the relationship between different elements of environments in existing conditions helps the prediction and future planning in a given urban context.

The focus of this study is on urban dwelling environments with primary emphasis on land utilization: its pattern, intensity, and efficiency.

The study attempts to illustrate the correlation between the settlement and its physical, socio-economic, and cultural context, and to emphasize the relationship between the physical pattern and the development process of a settlement and its land utilization.

The study may be applied as a guide for preliminary design and evaluation of urban environments in transition, a stimulus for future studies, and a point of reference for policy makers in urban dwelling environments.

Riyadh, Saudi Arabia, is taken to illustrate the various aspects. The study consists of two basic sections: a survey of existing dwelling environments and a model for urban land development. In addition the National Context of Saudi Arabia and the Urban context of Riyadh are included for reference.

The survey of existing dwelling environments identifies, analyzes, and evaluates five distinct urban areas in Riyadh. These cases were chosen because of the time of their emergence in Riyadh, their locations and layouts, as well as the socio-economic characteristics of their inhabitants. These cases are: Ad-Dira (traditional pattern); Manfoha (transitional pattern); Khazzan (contemporary pattern); Malazz (contemporary, Government development for its employees); Khorais (contemporary, Government project for low income families). Squatter areas are not considered in this study, but if they continue to grow, large-scale distinct dwelling environments may result. The cases were analyzed on four different levels: the locality with reference to its context; a segment showing the main elements: streets, dwellings, lots, open spaces, commercial areas, and community facilities; a typical block; and a typical dwelling. In addition, eight dwelling types, representing the dwelling systems available in Riyadh, have been further identified and evaluated.

The study of the urbanization model consists of the following: a review of the proposed master plan of Riyadh; the basic studies for a physical development, including site limitations and development plans and process; and twelve layouts, three of them adapted from existing models, evaluated with respect to their land utilization.

URBAN CONTEXT

RIYADH, SAUDI ARABIA

Riyadh is the capital and the largest city in Saudi Arabia. It is located in the Central region of the country at the intersection of major travel routes which link the Arabian Gulf to the Red Sea. The city is situated on a plateau which is 600 meters above sea level at Latitude 24° 38' North, Longitude 46° 43' East. Rain fall is rare; humidity is very low; and temperatures vary from 5°C in winter to 45°C in summer.

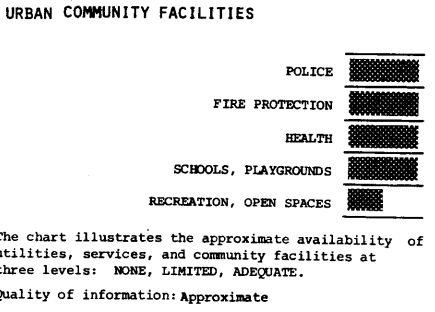
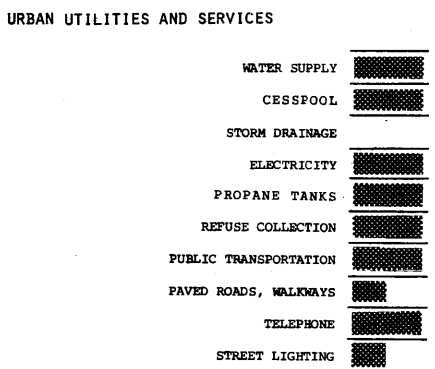
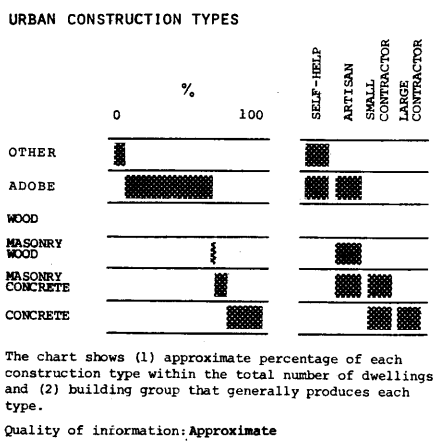
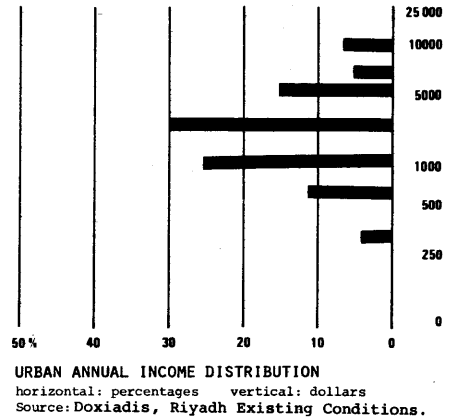
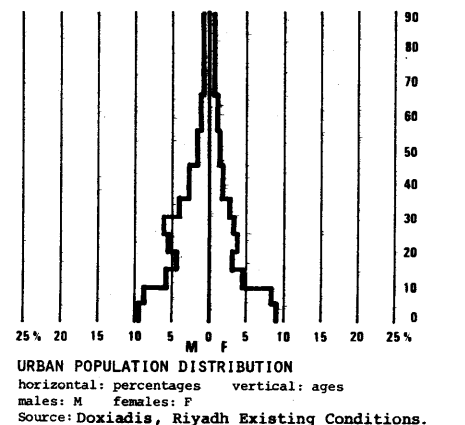
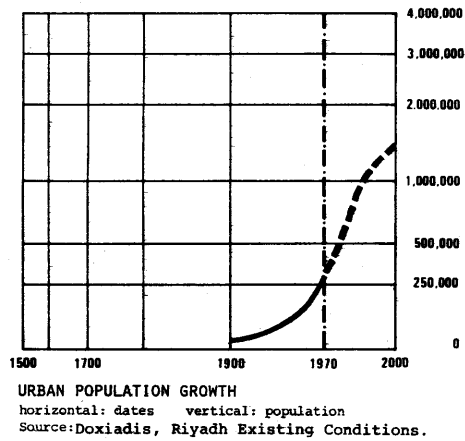
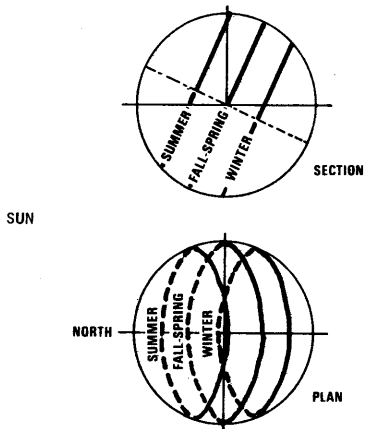
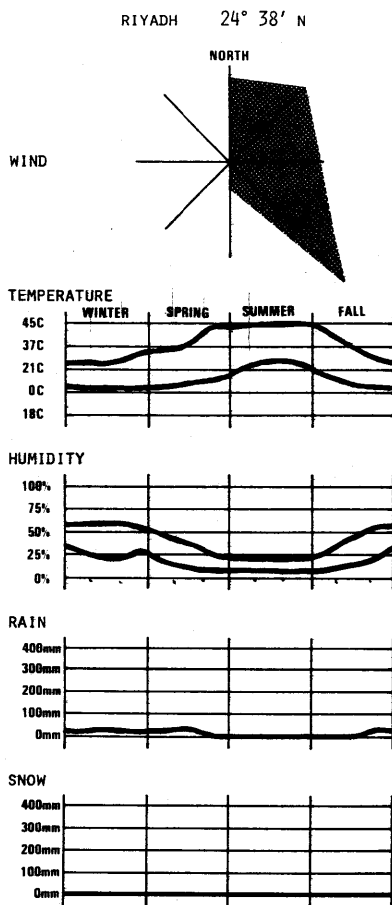
Almost 50% of the private households earn less than \$1714 per year, and that means that 50% of the private households earn less than 15% of the aggregate personal income. Households earning less than \$3428 per year make up 23%, and households who earn more than \$3430 per year make up 27% of the total population.

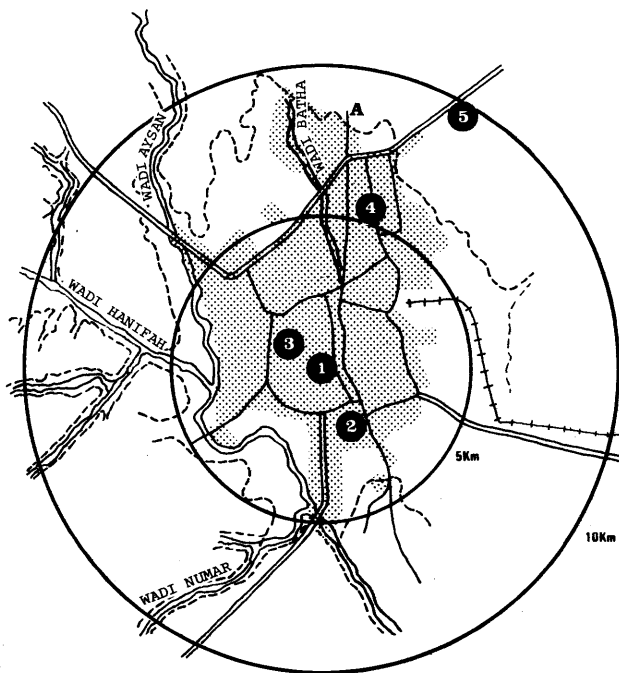
In 1968 the annual per capita income of Riyadh was \$461. For the rest of the country it was \$350-400.

The municipality of Riyadh is responsible for the current administration of the city's affairs, and jointly with the Ministry of the Interior, for all projects concerning the city, its facilities, and its infrastructure.

A high percentage of urban construction is adobe, concentrated in center of the city. New neighborhoods are of concrete construction.

There is a complete water supply system in the city, but there is a shortage of water in the summer. There is no public sanitary system, so every individual building has a separate cesspool. Sanitary and storm drainage systems are under construction. There is no public gas system, but propane gas in tanks is the main fuel.

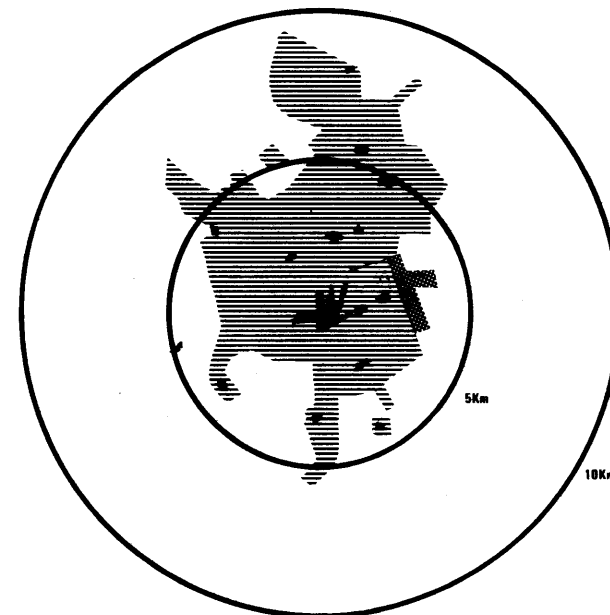




URBAN TOPOGRAPHY AND CIRCULATION

Riyadh was built between the Wadis Hanifah, Aysan and Batha in order to profit from the available water sources. Apart from the Wadis other natural features of the surrounding area are two rows of hillocks to the east and to the west. The built-up area covers an area of roughly 15km from north to south and approximately 10km from east to west. Of the major entrance points to the city, two are of major importance and these are not connected by the same route inside the city. Use of city streets is required to get from one to the other. The approaches are a) Damman-Dhahran and b) Hejaz. Three lesser accesses play an important role in the movement of traffic to and from the city.

KEY	
A Airport	① AD-DIRA
— Primary Road	② MANFOHA
—+—+— Railroad	③ KHAZZAN
..... Rapid Transit	④ MALAZZ
▨ Built-up Area	⑤ KHURAIS

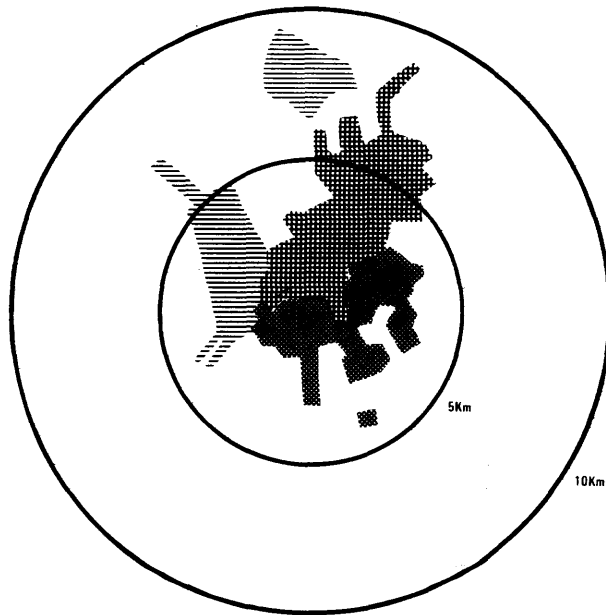


URBAN LAND USE PATTERN

Residential areas exist throughout the city. The old section of the city consists mainly of mud houses. Apartment blocks have developed within the central business district and to the north. New residential areas, which developed after 1945 generally, house mostly middle and high income groups. Although most of the commercial and business activity is concentrated in the central business district, some groups of shops have sprung up in the new residential areas. The industrial area is located to the east of the city along Kharj Road.

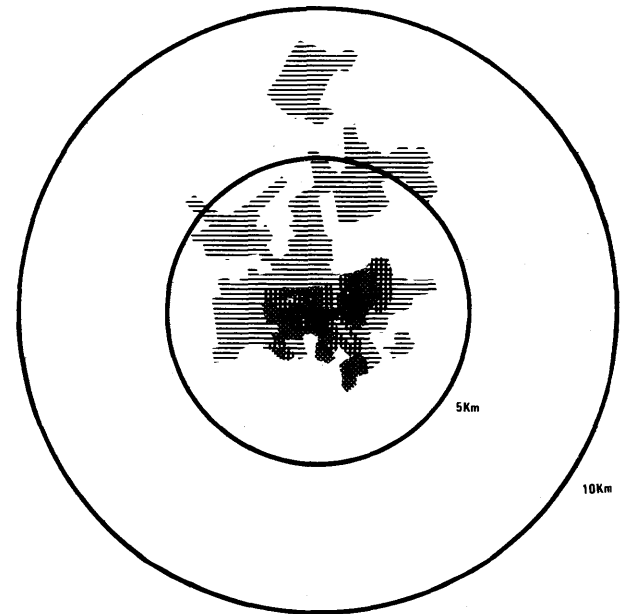
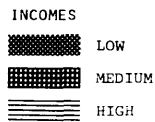
AREAS	
▨ RESIDENTIAL	
▨ COMMERCIAL	
▨ INDUSTRIAL	





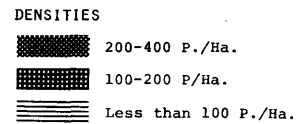
URBAN INCOME PATTERN

The very low income sector is concentrated in the city center and to the south of it. Some small squatter settlements are located in the upper class neighborhood. The middle income group lives in walk-up apartment buildings in the main commercial streets and in neighborhoods distributed around the city center. There is a concentration of the high income sector in neighborhoods towards the west and northwest of the city.



URBAN DENSITY PATTERN

The estimated population of Riyadh in 1968 was 300,000 inhabitants. Since 1960, the average annual rate of increase has been 8.5%. The birth rate contributes only 2% per annum to the increase. The additional 6.5% is attributed to migration. High population density is concentrated in the city center and in the low income neighborhoods. The new residential area in the northern and eastern parts of the city have a low population density.






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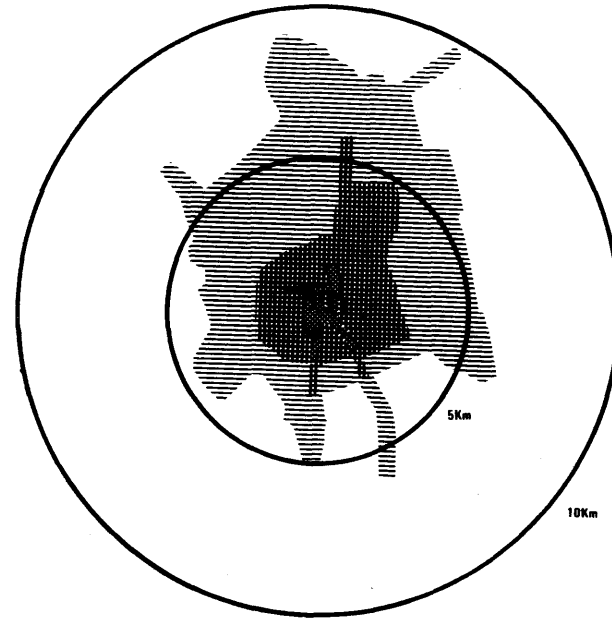


URBAN GROWTH PATTERN

Some records of ancient history, the earliest dating back to 715 B.C., mention the existence of Hajar in the general area where Riyadh was later founded. Around 1730 Riyadh became the capital of a kingdom under the Iben Saud family, but the capital was subsequently moved to Daraiya, 20km to the north, in the beginning of the 19th century. In 1818, the kingdom was defeated and the capital destroyed. In the beginning of the 20th century King Abdul Aziz Iben Saud liberated and unified many areas of the peninsula from the control of the Ottoman Empire. At the end of World War II Riyadh became the capital of Saudi Arabia.

DATES




-  1920
-  1950
-  1968

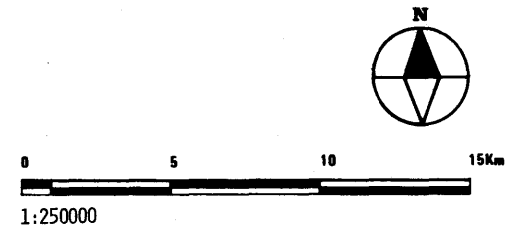


URBAN LAND VALUE PATTERN

Land prices in the Central Business District are in the range of \$500 to \$1200 per square meter. They continue to be high along the main commercial streets, and drop gradually towards the west. In the old city outside the Central Business District prices slide from \$143 to \$28 per square meter. In the new residential areas prices range from \$43 to \$14 per square meter, and in the industrial area, land costs vary from \$20 to \$7 per square meter.

PRICES

-  \$500-1200/m²
-  \$100-500/m²
-  \$3-100/m²





RIYADH, Saudi Arabia: (top) Batha Street, the main transportation and commercial spine with predominant walk-up apartment buildings.

(bottom) As-Safah, the government palace square, dominated by the increasing number of cars.



URBAN CONTEXT SOURCES

- Urban Topography and Circulation:* (accurate) Doxiadis, RIYADH EXISTING CONDITIONS, 1968.
- Urban Land Use Pattern:* (approximate) IBID.
- Urban Income Pattern:* (approximate) IBID.
- Urban Growth Pattern:* (approximate) IBID.
- Urban Density Pattern:* (approximate) IBID.
- Urban Land Value Pattern:* (approximate) IBID.
- Climate:* (accurate) IBID.
- Photographs:* Field Surveys, A. Shuaibi & M. Hussayen, 1974.
- General Information:* Doxiadis, RIYADH EXISTING CONDITIONS, 1968.

CASE STUDIES

The following section contains case studies depicting selected dwelling environments/situations in the Riyadh urban area at the present time. The 5 cases were selected according to income groups, housing systems, and proportion of the population that each system houses. Each case study is represented at four scales:

LOCALITY: A locality is defined as a relatively self-contained residential area in Riyadh. In general, it is contained within physical boundaries.

LOCALITY SEGMENT: All the localities differ in size and shape. A segment of 400X400 meters has been taken from each locality for purposes of comparison.

LOCALITY BLOCK: Within each locality segment a typical residential block has been selected to allow comparison of land utilization (patterns, percentages, and densities) that are homogeneous. The block is bounded on all sides by circulation so that the ratio of circulation to area served may be compared.

DWELLING UNIT: A typical self-contained unit for an individual, a family, or a group in each locality segment.

CASE STUDIES SURVEYED

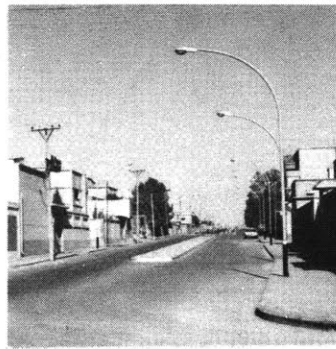
1. AD-DIRA : Private, low/middle income, Row-grouped houses/apartments.
2. MANFOHA : Private, low income, row houses.
3. KHAZZAN : Private, middle income, detached houses/ apartments.
4. MALAZZ : Public, middle/high income, detached houses.
5. KHURAIIS : Public, moderately middle income, row houses.



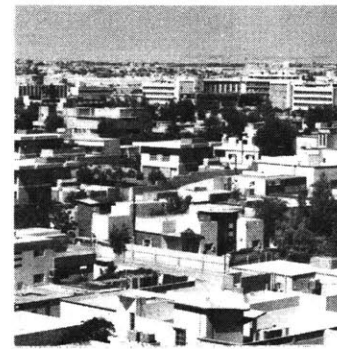
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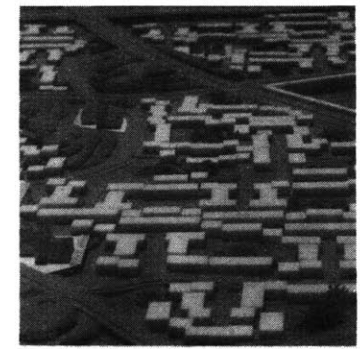
2. MANFOHA



3. KHAZZAN



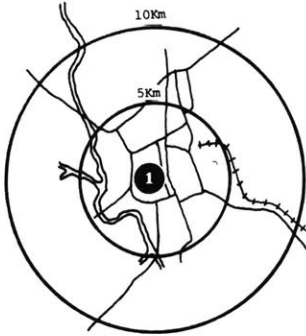
4. MALAZZ



5. KHURAIIS

1 AD-DIRA Riyadh

PRIVATE, LOW/MIDDLE INCOME,
ROW GROUPED HOUSES/APARTMENTS



LOCATION: It is located in the old city which includes the central business district and the remaining buildings of the old city.

DEVELOPMENT: Until 1930, Riyadh was a very small town with a radius of about 750m and enclosed within a wall. After it became the capital of Saudi Arabia, the area of the town grew beyond its walls and they were removed. In the Fifties, straight streets cut into the city and the central business district developed along these streets. New buildings were erected with shops occupying the ground floors and business offices in the upper floors. Most of the buildings were originally designed as residential apartments, but business offices are replacing them at an increasing rate. Most of the middle and high income families have moved from the old houses to new neighborhoods on the periphery. Many of the old homes are now used as warehouses.

AD-DIRA, Riyadh: (top) The view shows traditional house facades with their small windows to provide privacy and protection from the weather. A part of a mosque with a simple minaret is seen.

(bottom) This vegetable and fruit market is the main food supply for the city. The umbrellas are for protection from the sun.



LAYOUT: There are two types of street patterns in the locality: 1) traditional, narrow streets within the residential area; 2) wide, commercial streets, open for circulation depending on need. Open spaces are limited for parking and cemeteries.







LOCALITY PLAN


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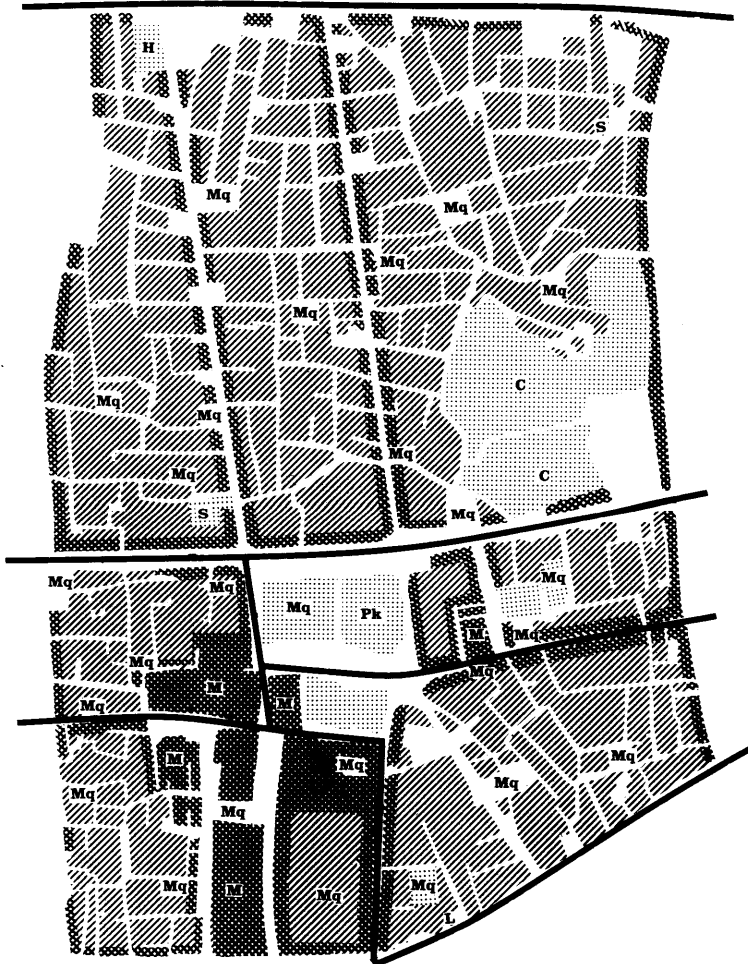
LAND USE: Commercial activities are concentrated along the main streets. The main food market is located in the south of the locality. The major mosque (Jami) and the government palace (Quaser Alhokm) occupy the central area around Safat Square. There are three schools, 23 mosques, and a clinic in the locality.

AREAS

-  RESIDENTIAL
-  COMMERCIAL
-  INDUSTRIAL
-  OPEN SPACES

KEY

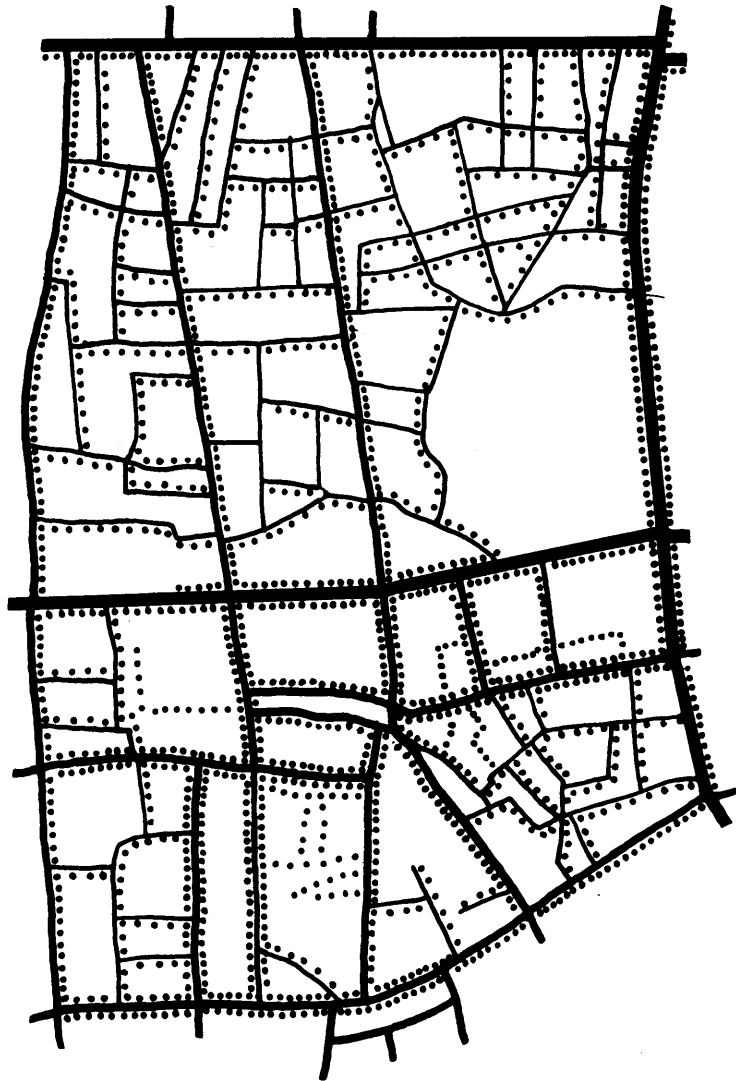
- Pk** Parking
- P** Police
- F** Fire Department
- S** School
- Mq** Mosque
- R** Recreation
- L** Library
- U** University
- H** Health
- PO** Post Office
- SS** Social Services
- M** Market
- C** Cemetery
-  Bus



LOCALITY LAND USE PATTERN

1:10000

CIRCULATION: All streets are open to vehicular and pedestrian use. Streets in the old area are narrow and unpaved. The new streets, which are used as the main commercial center for the city, are crowded by vehicles and pedestrians during shopping hours. Parking areas are very limited, and side streets are used.



KEY
—— VEHICULAR
..... PEDESTRIAN



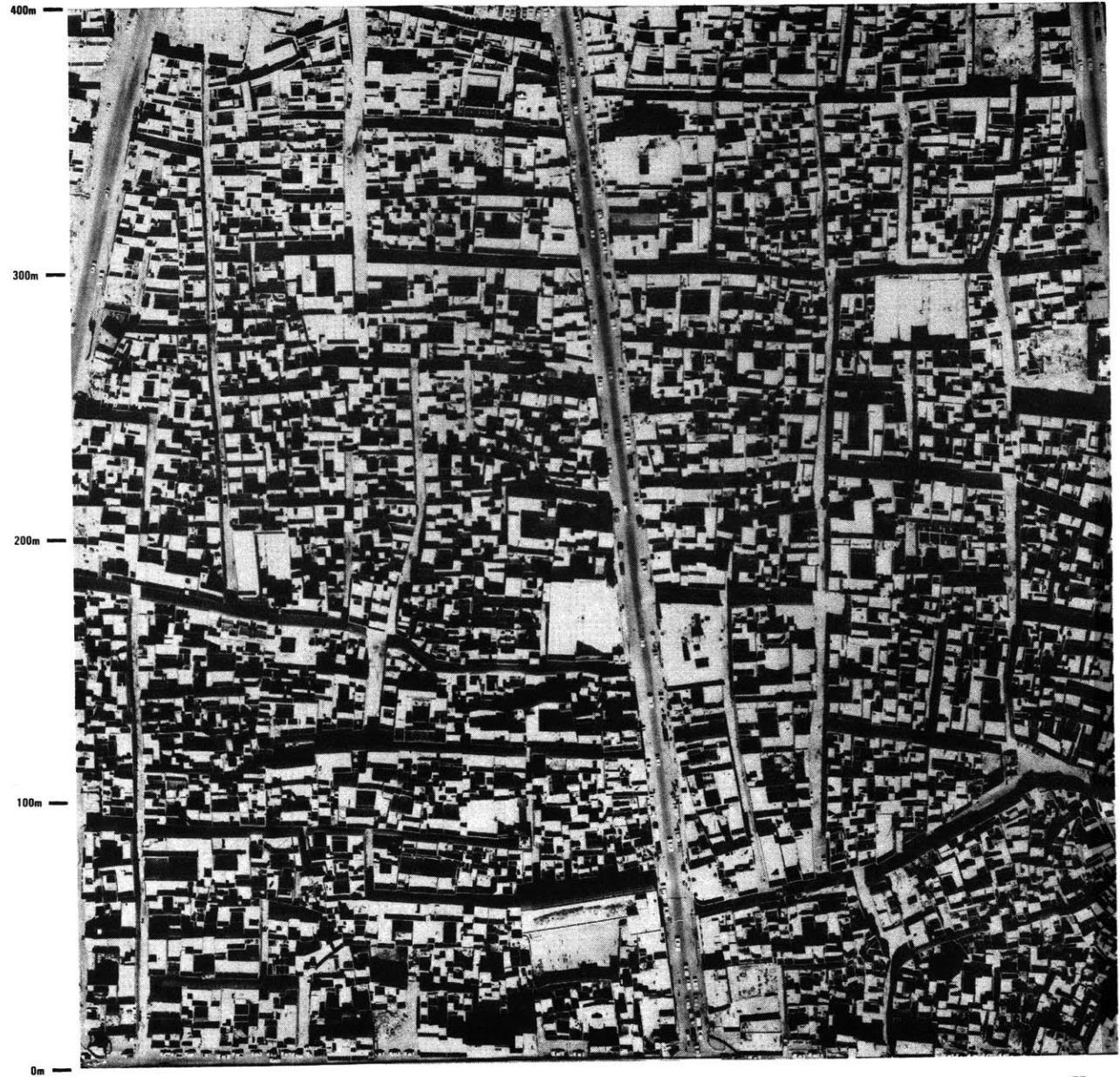
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LOCALITY CIRCULATION PATTERN

LOCALITY SEGMENT LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	707	16	44.18
DWELLING UNITS	700	16	43.75
PEOPLE	4900	16	306.25

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	2.9	18
SEMI-PUBLIC (open spaces, schools, community centers)	0.4	3
PRIVATE (dwellings, shops, factories, lots)	12.4	77
SEMI-PRIVATE (cluster courts)	0.3	2
TOTAL	16.0	100



LOCALITY SEGMENT AIR PHOTOGRAPH

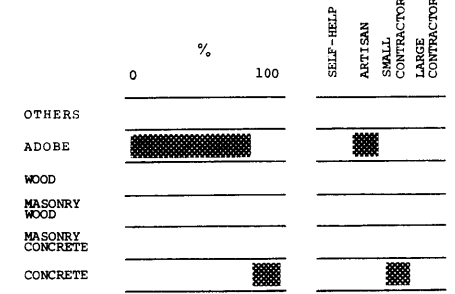


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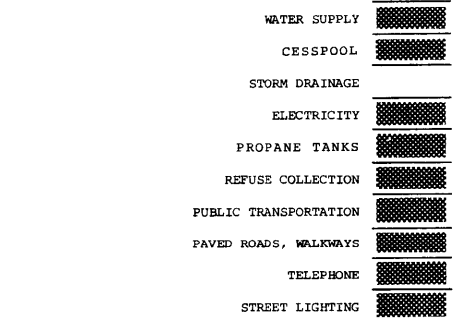
LOCALITY CONSTRUCTION TYPES



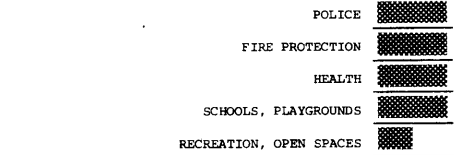
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Approximate

LOCALITY UTILITIES AND SERVICES



LOCALITY COMMUNITY FACILITIES



The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

[Stippled pattern] SELECTED BLOCK



LOCALITY SEGMENT PLAN

1:2500

LOCALITY BLOCK: The traditional pattern appears in this locality. Lot sizes vary since the locality is inhabited by different income groups. Circulation is low and even lower in semi-private areas.

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	28	0.80	35
DWELLING UNITS	28	0.80	35
PEOPLE	196	0.80	245

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.15	19
SEMI-PUBLIC (open spaces, schools, community centers)	—	—
PRIVATE (dwellings, shops, factories, lots)	0.61	76
SEMI-PRIVATE (cluster courts)	0.04	5
TOTAL	0.80	100

NETWORK EFFICIENCY

R-FACTOR

$$\frac{\text{network length (circulation)}}{\text{area served (circulation, lots)}} = \frac{179}{0.8} = 224\text{m/Ha}$$

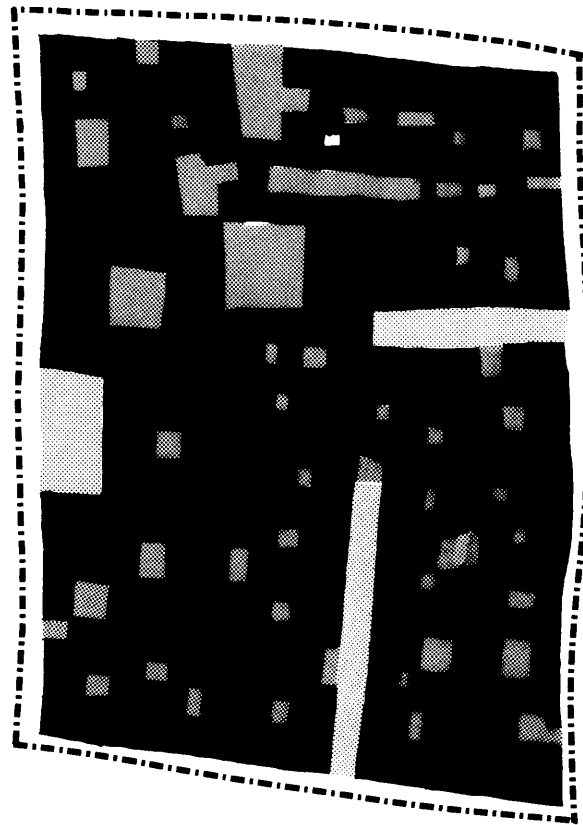
AVERAGE LOT AREA

$$\frac{\text{total area (circulation, lots)}}{\text{number of lots}} = 286\text{m}^2$$

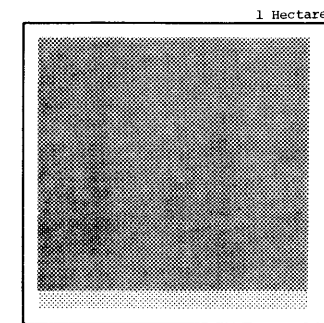
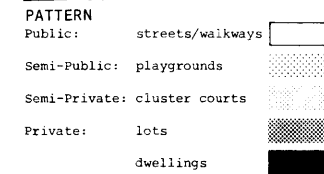
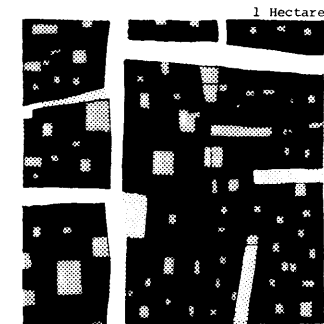


LOCALITY BLOCK PLAN

1:1000

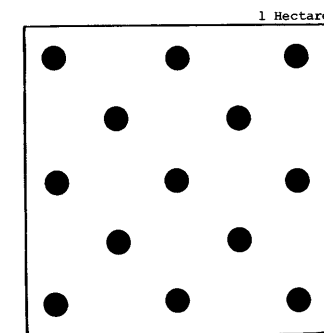


LAND UTILIZATION DIAGRAMS



PERCENTAGES

Streets/Walkways	19%
Playgrounds	-
Cluster Courts	5%
Dwellings/Lots	76%

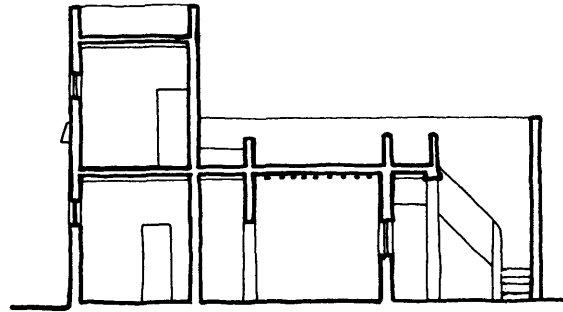


DENSITY

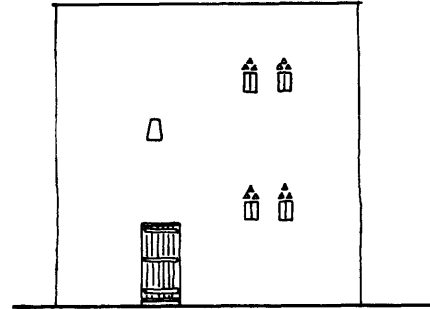
Persons/Hectare	240
	20 Persons



1:1000

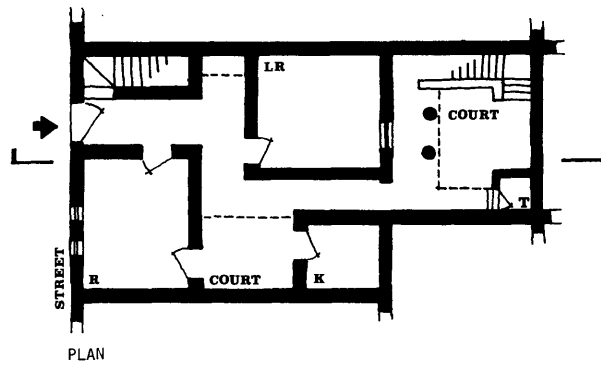


SECTION



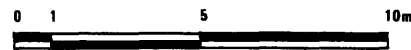
ELEVATION

TYPICAL DWELLING:
Traditional house characteris by indirect open court to the street. The central court functions as a ligh source, for air circulation, and as an open private space for family use. The rare court is used as a working area and extension of the kitchen. Reception room is located in the second floor.



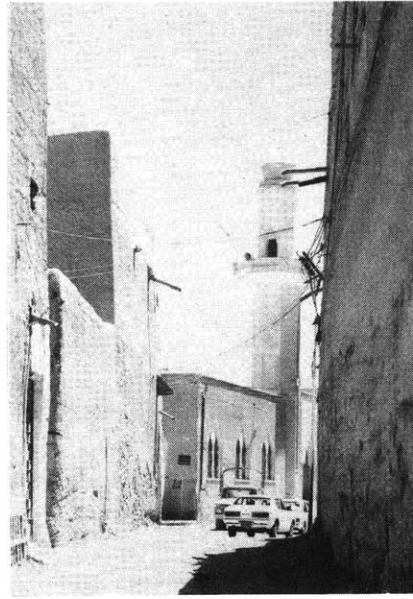
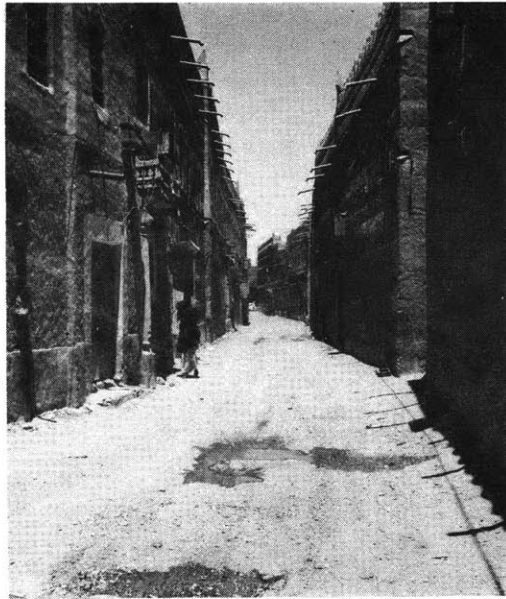
PLAN

- KEY
- LR Living Room
 - D Dining/Eating Area
 - BR Bedroom
 - K Kitchen/Cooking Area
 - T Toilet/Bathroom
 - L Laundry
 - C Closet
 - S Storage
 - R Room (multi-use)



1:200

TYPICAL DWELLING



PHYSICAL DATA (related to dwelling and land)

DWELLING UNIT
 type: House
 area (sq m): 77
 tenure: Legal ownership

LAND/LOT
 utilization: Private
 area (sq m): 77
 tenure: Legal ownership

DWELLING
 location: City center
 type: Row-grouped
 number of floors: 1
 utilization: Single family
 physical state: Fair

DWELLING DEVELOPMENT
 mode: Instant
 developer: Private
 builder: Artisan
 construction type: Adobe
 year of construction: 1945

MATERIALS
 foundation: Rubble
 floors: Concrete
 walls: Adobe
 roof: Wood/Straw/Clay

DWELLING FACILITIES
 wc: 1
 shower: 1
 kitchen: 1
 rooms: 3
 other: Courts

SOCIO-ECONOMIC DATA (related to user)

GENERAL: SOCIAL
 user's ethnic origin: Saudi from rural
 place of birth: Al-Kharj
 education level: University

NUMBER OF USERS
 married: 2
 single: 2
 children: 4
 total: 8

MIGRATION PATTERN
 number of moves: 1
 rural - urban: X
 urban - urban: -
 urban - rural: -
 why came to urban area: Employment

GENERAL: ECONOMIC
 user's income group: Middle
 employment: Government employee
 distance to work: 3km
 mode of travel: Private car

COSTS
 dwelling unit: \$7,042
 land - market value: \$150,000

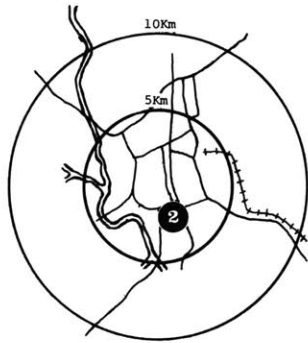
DWELLING UNIT PAYMENTS
 financing: Self-financed
 rent/mortgage: Not Available.
 % income for rent/mortgage:

LOCALITY SOURCES

Plan: (accurate) AERIAL PHOTOGRAPH. Department of Aerial Photogrammetry. Ministry of Petroleum and Minerals, 1973.
 Land Use Pattern: (accurate) DOXIADIS, Riyadh Existing Conditions, 1968.
 Circulation Pattern: (approximate) AERIAL PHOTOGRAPH, Department of Aerial Photogrammetry, Ministry of Petroleum and Minerals, 1973.
 Segment Plan: (accurate) IBID.
 Block Plan: (accurate) IBID.
 Block Land Utilization: (accurate) IBID.
 Typical Dwelling: (accurate) Fourth-year students field survey, Department of Architecture, Riyadh University, 1972.
 Physical Data: (approximate) Field Surveys, A. Shuaibi & M. Hussayen
 Socio-Economic Data: (approximate) IBID.
 Photographs: A. Shuaibi & M. Hussayen
 General Information: DOXIADIS, Riyadh Existing Conditions, 1968.

2 MANFOHA Riyadh

PRIVATE, LOW INCOME, ROW HOUSES

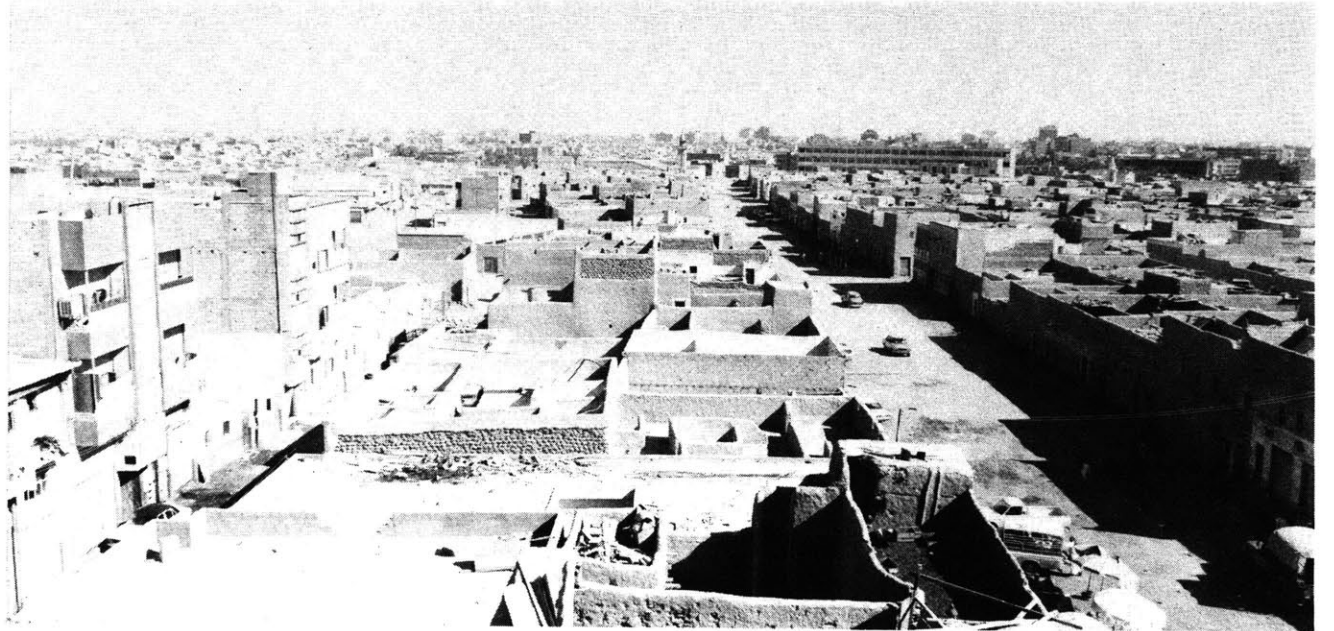
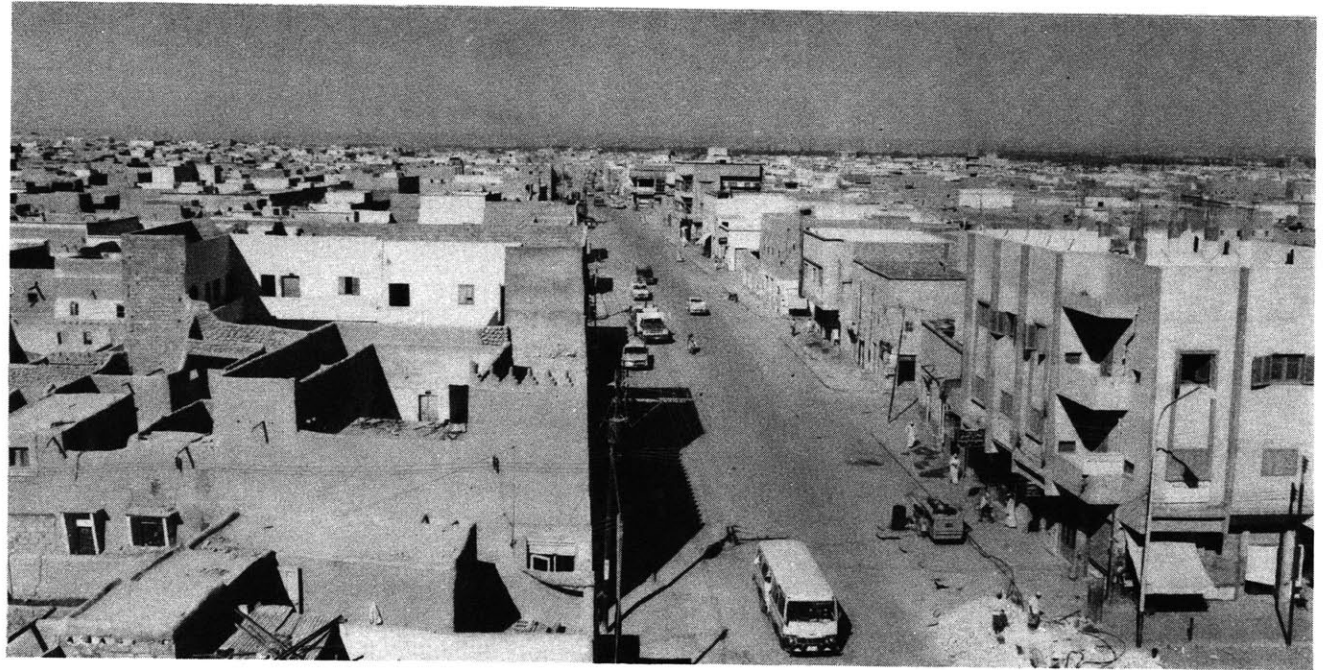


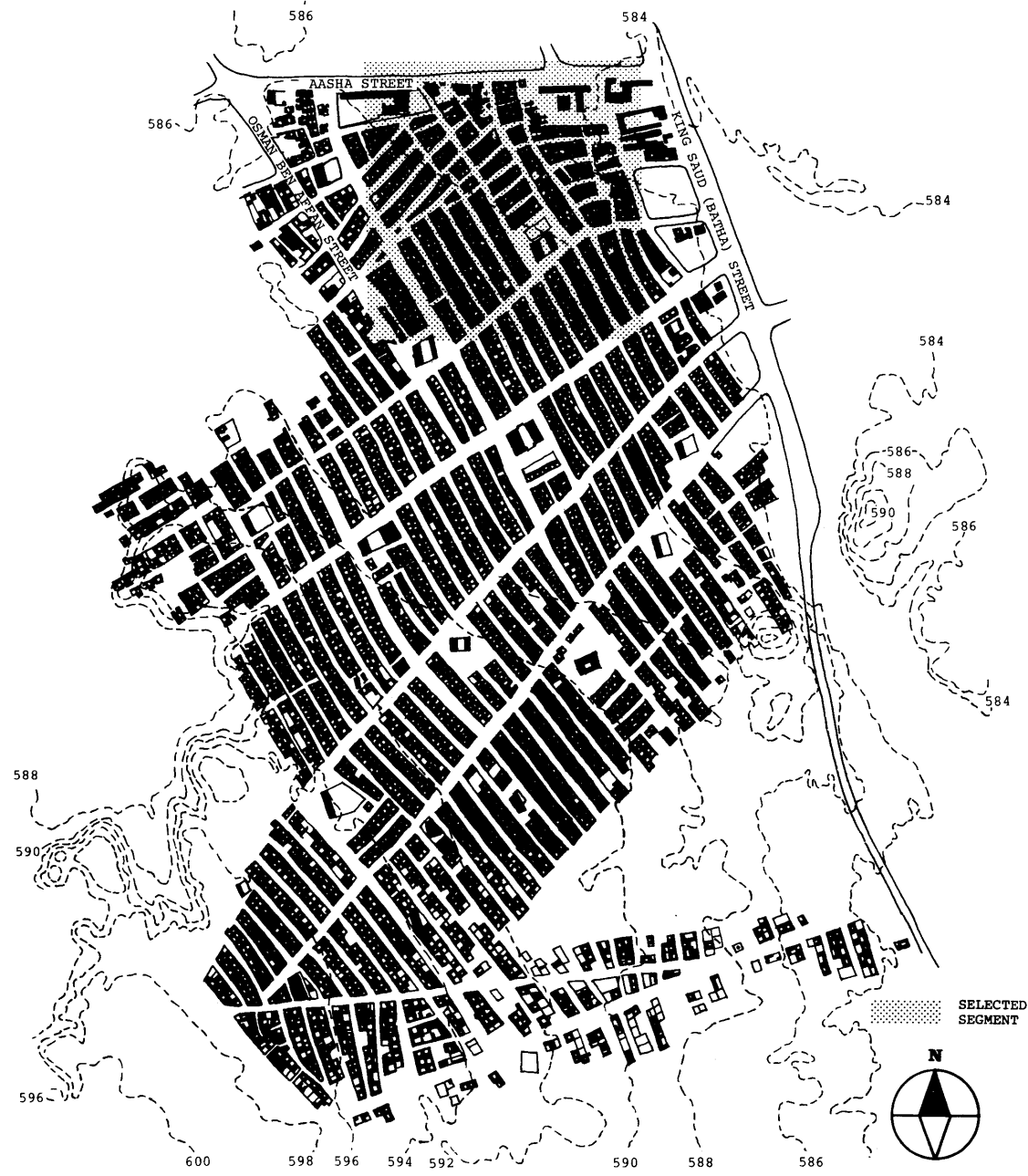
LOCATION: It is located 2km south of the city center in the inner ring.

DEVELOPMENT: It was developed by a land subdivision plan proposed by the Riyadh Municipality for the low income group. Most of the inhabitants are of nomadic origin, now working as taxi drivers. Manfoha took its name from an uninhabited, old village south of the existing locality. People developed their land by introducing new materials into the old patterns: steel in entrance doors, cement on floors and roofs.

MANFOHA, Riyadh: (top) The main commercial street with walk-up buildings used for commercial and residential use. The minibus, appearing in the front, is used for public transportation.

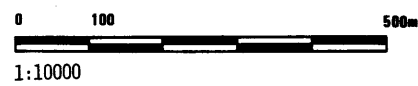
(bottom) This general view shows a typical block with its straight streets.









LAYOUT: The grid pattern with long blocks is the typical layout for Manfoha. Three main streets connect the locality to the city spine (Batha Street). Locality expansion is limited to the north and east by main street, but open to the south and west.

LOCALITY PLAN




LAND USE: The main market for the locality and surrounding area is located on the main central street, and most commercial activity is concentrated here also. There are no recreational areas except vacant public spaces around mosques. There are three schools, a women's college in the north-east corner, and 17 mosques.

AREAS

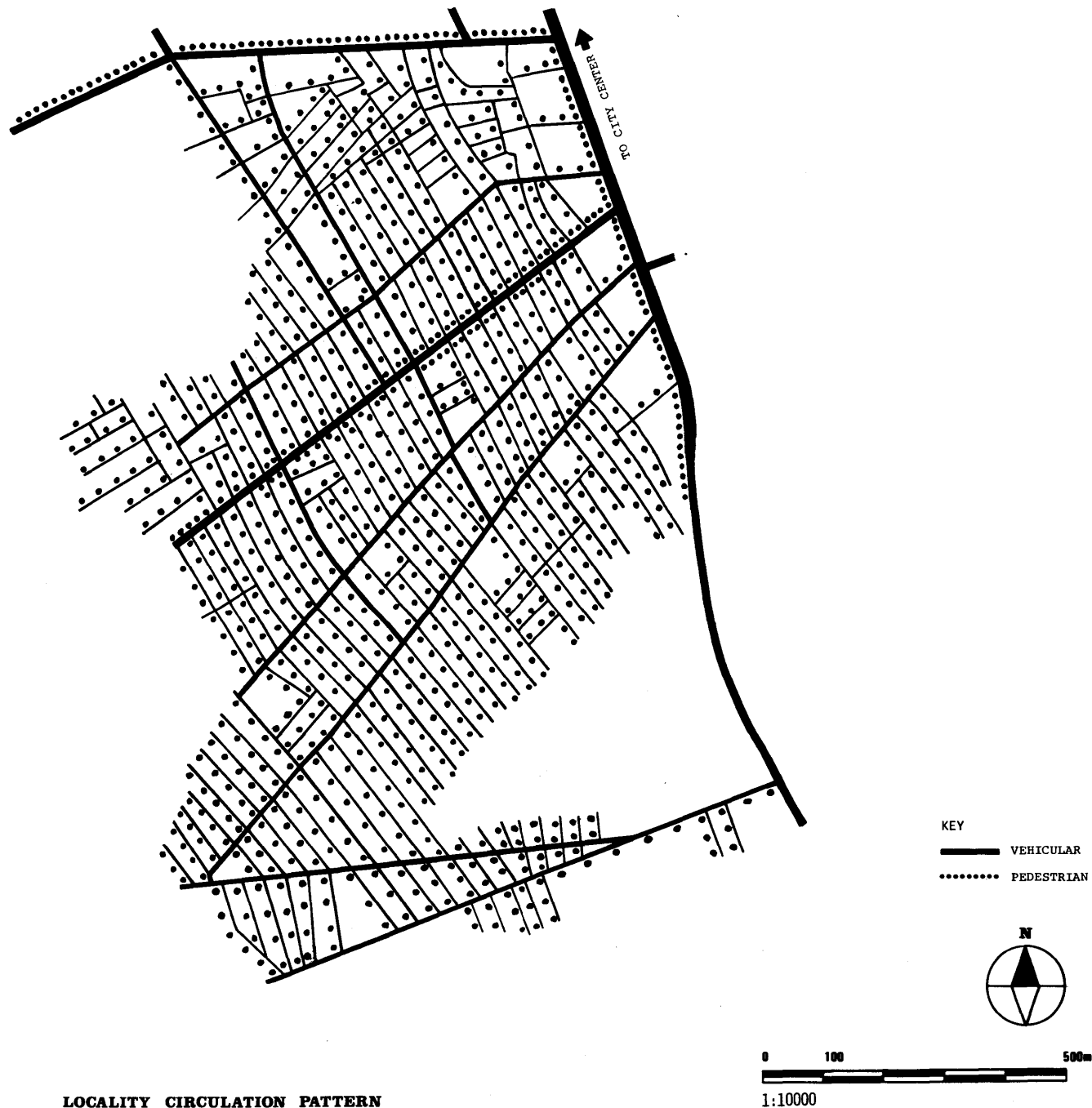
-  RESIDENTIAL
-  COMMERCIAL
-  INDUSTRIAL
-  OPEN SPACES

KEY

- Pk** Parking
- P** Police
- F** Fire Department
- S** School
- Mq** Mosque
- R** Recreation
- L** Library
- U** University
- H** Health
- PO** Post Office
- SS** Social Services
- M** Market
- C** Cemetery
-  Bus



CIRCULATION: Mixed vehicular and pedestrian circulation exists in this case study. East-west streets connect the locality by the main spine (Batha Street) and include the main circulation routes. Other streets to the north and south contain lot accesses, but with less circulation.

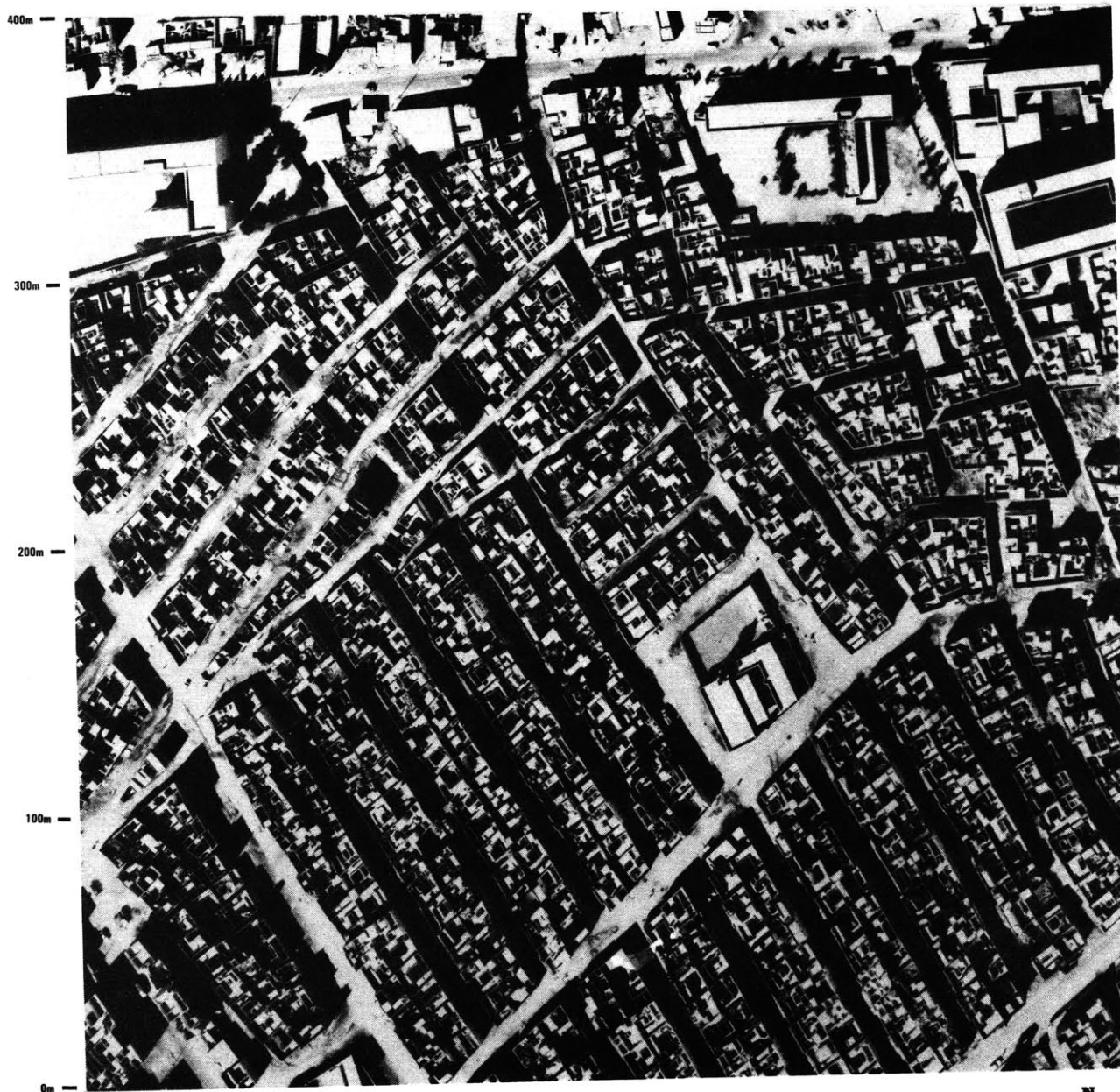


LOCALITY CIRCULATION PATTERN

LOCALITY SEGMENT LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	750	16	46.88
DWELLING UNITS	640	16	40.00
PEOPLE	4480	16	280.00

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	8.7	54
SEMI-PUBLIC (open spaces, schools, community centers)	0.4	3
PRIVATE (dwellings, shops, factories, lots)	6.9	43
SEMI-PRIVATE (cluster courts)	—	—
TOTAL	16.0	100

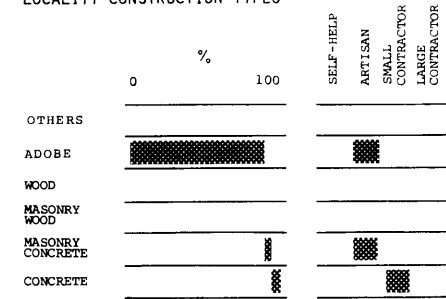


LOCALITY SEGMENT AIR PHOTOGRAPH





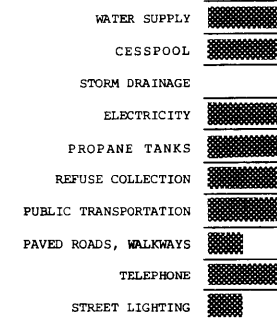
LOCALITY CONSTRUCTION TYPES



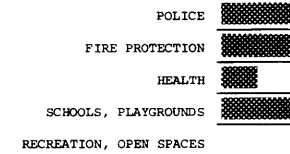
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Approximate

LOCALITY UTILITIES AND SERVICES



LOCALITY COMMUNITY FACILITIES



The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

[Dotted pattern] SELECTED BLOCK



LOCALITY SEGMENT PLAN

1:2500

BLOCK PLAN: Row houses, covering a small area, are approximately 10x10m in size. Most of the lots have one access except those that are located on block corners.

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	66	1.0	66
DWELLING UNITS	65	1.0	65
PEOPLE	455	1.0	455

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.38	38
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	0.62	62
SEMI-PRIVATE (cluster courts)	-	-
TOTAL	1.0	100

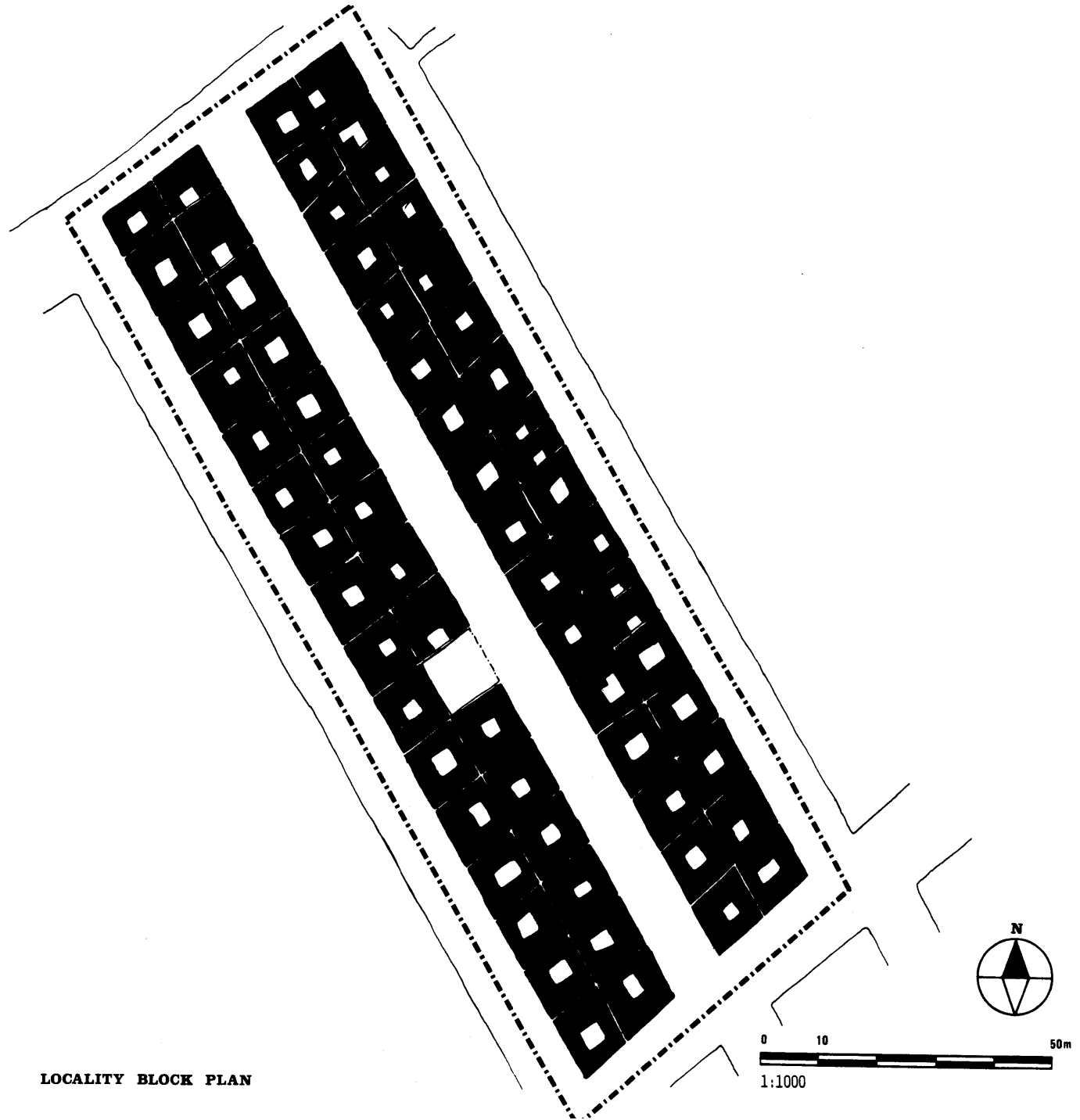
NETWORK EFFICIENCY

R-FACTOR

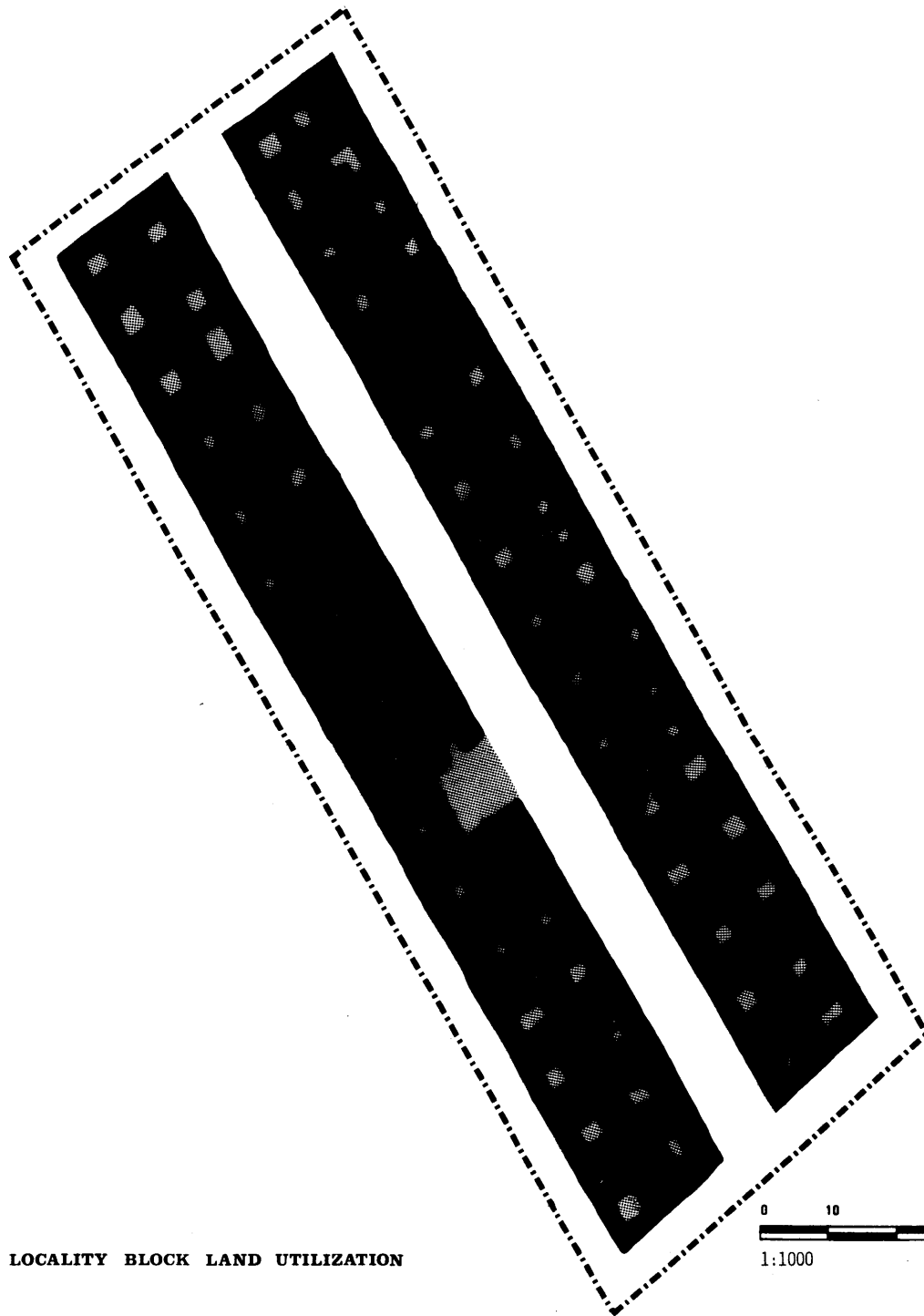
$$\frac{\text{network length (circulation)}}{\text{area served (circulation, lots)}} = \frac{405}{1} = 405\text{m/Ha}$$

AVERAGE LOT AREA

$$\frac{\text{total area (circulation, lots)}}{\text{number of lots}} = 151\text{m}^2$$



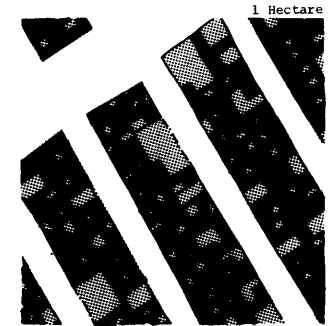
LOCALITY BLOCK PLAN








LOCALITY BLOCK LAND UTILIZATION

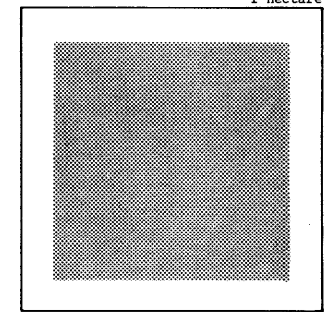


LAND UTILIZATION DIAGRAMS



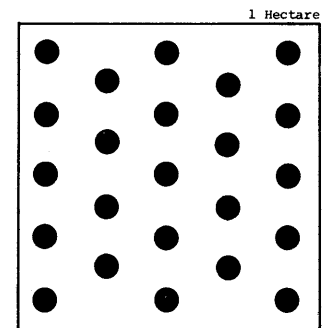
PATTERN

Public:	streets/walkways	
Semi-Public:	playgrounds	
Semi-Private:	cluster courts	
Private:	lots	
	dwellings	




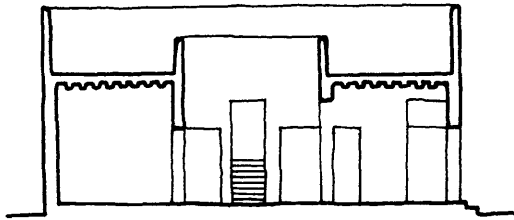
PERCENTAGES

Streets/Walkways	38%
Playgrounds	-
Cluster Courts	-
Dwellings/Lots	62%

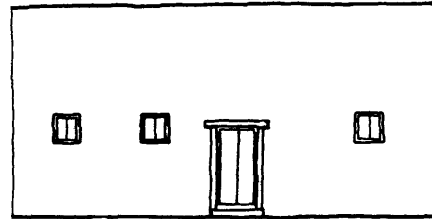


DENSITY

Persons/Hectare	460
	20 Persons

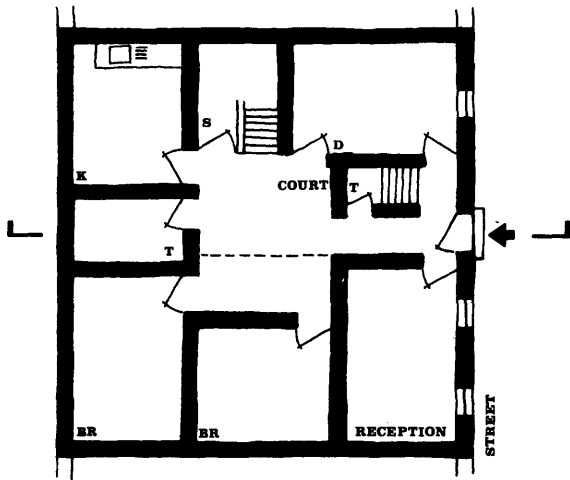


SECTION



ELEVATION

TYPICAL DWELLING: In spite of its small area, the transitional house retains enough essential elements for the low income family. The service court disappears in these dwellings. In the transitional pattern, new building materials such as concrete floors, cement plaster, and cement blocks, are used. More developed openings are found.



PLAN

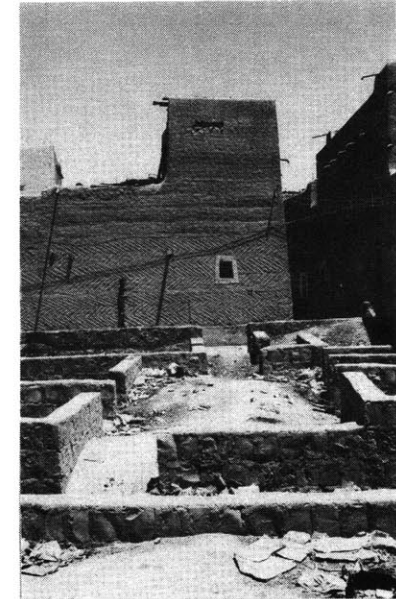
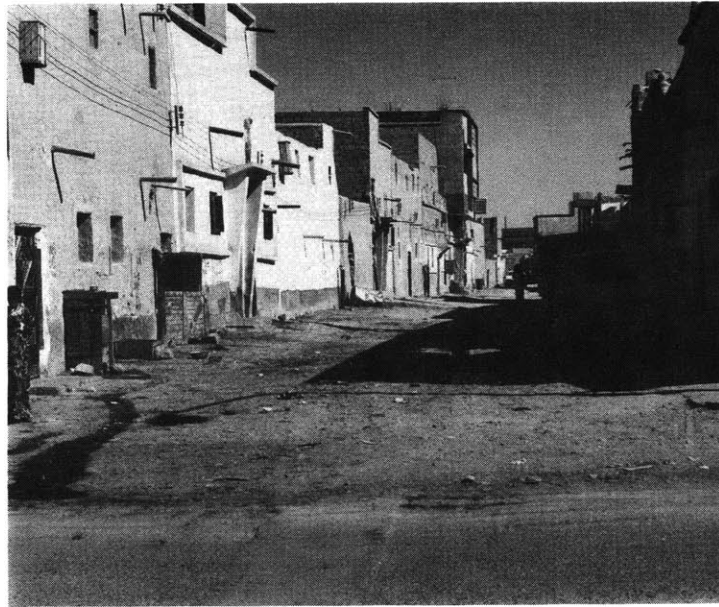
KEY

- LR Living Room
- D Dining/Eating Area
- BR Bedroom
- K Kitchen/Cooking Area
- T Toilet/Bathroom
- L Laundry
- C Closet
- S Storage
- R Room (multi-use)



1:200

TYPICAL DWELLING



PHYSICAL DATA (related to dwelling and land)

DWELLING UNIT
 type: House
 area (sq m): 121
 tenure: Legal/Ownership

LAND/LOT
 utilization: Private
 area (sq m): 121
 tenure: Legal/Ownership

DWELLING
 location: Inner Ring
 type: Row/Grouped
 number of floors: 1
 utilization: Single family
 physical state: Fair

DWELLING DEVELOPMENT
 mode: Instant
 developer: Private
 builder: Artisan
 construction type: Adobe
 year of construction: 1955

MATERIALS
 foundation: Rubble
 floors: Concrete
 walls: Adobe
 roof: Wood/Straw/Clay

DWELLING FACILITIES
 wc: 2
 shower: 1
 kitchen: 1
 rooms: 4
 other: Court

SOCIO-ECONOMIC DATA (related to user)

GENERAL: SOCIAL
 user's ethnic origin: Saudi from village
 place of birth: Majmaa
 education level: None

NUMBER OF USERS
 married: 2
 single: 2
 children: -
 total: 4

MIGRATION PATTERN
 number of moves: 1
 rural - urban: X
 urban - urban:
 urban - rural:
 why came to urban area: Employment

GENERAL: ECONOMIC
 user's income group: Low
 employment: Labor
 distance to work: 10km
 mode of travel: Public transportation

COSTS
 dwelling unit: \$3000
 land - market value: \$4260

DWELLING UNIT PAYMENTS
 financing: Self-financed
 rent/mortgage:
 % income for rent/mortgage: Not Available.

LOCALITY SOURCES

Locality Plan: (accurate) AERIAL PHOTOGRAPH, Department of Aerial Photogrammetry, Ministry of Petroleum and Minerals, 1973.

Land Use Pattern: (approximate) IBID.

Circulation Pattern: (approximate) IBID.

Segment Plan: (accurate) IBID.

Block Plan: (accurate) IBID.

Block Land Utilization: (accurate) IBID.

Typical Dwelling: (approximate) Field Surveys, A. Shuaibi & M. Hussayen

Physical Data: (approximate) IBID.

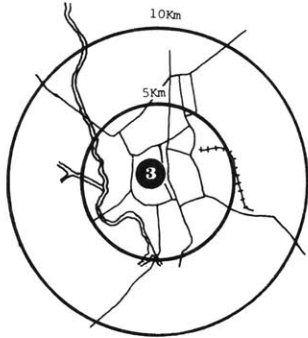
Socio-Economic Data: (approximate) IBID.

Photographs: A. Shuaibi & M. Hussayen, 1974

General Information: DOXIADIS, Riyadh Existing Conditions, 1968.

3 KHAZZAN Riyadh

PRIVATE, MIDDLE INCOME
DETACHED HOUSES/HIGH RISE APARTMENTS

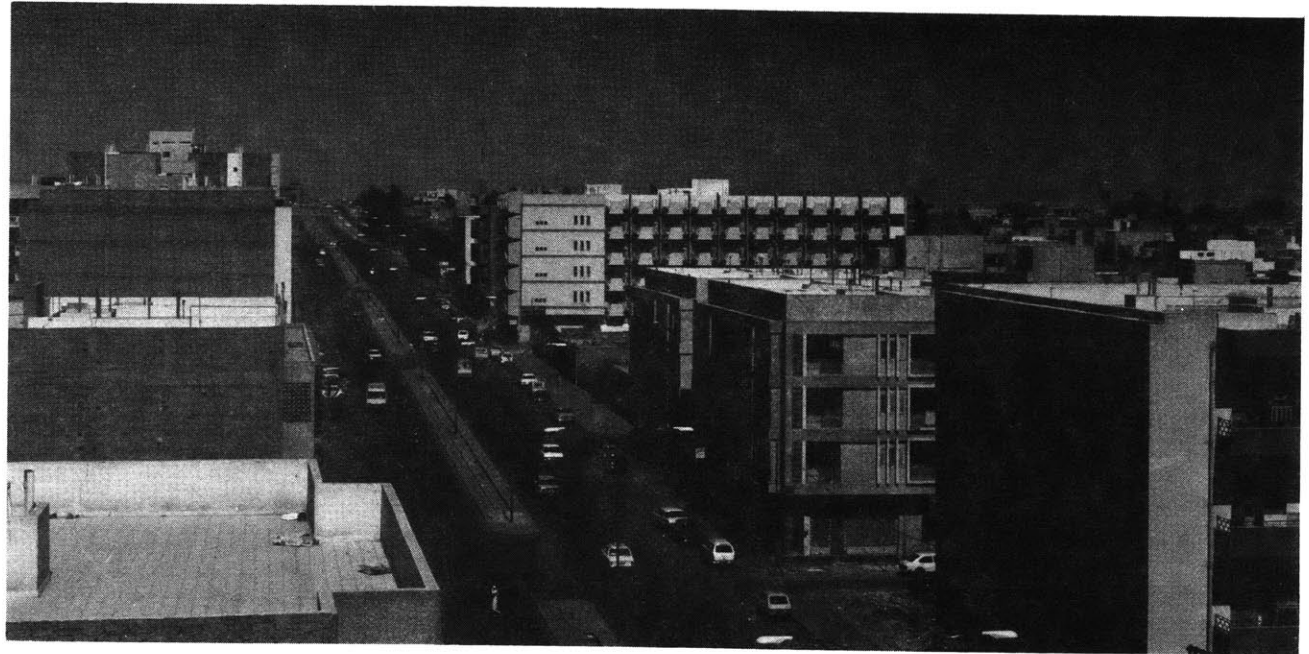


LOCATION: This locality is bordered on the north by Khazzan Street, 700 meters west of a major commercial spine (King Feisal Street) and 800 meters northwest of Al-Jamie mosque, the main mosque of Riyadh in the city center.

DEVELOPMENT: The lower part in the east was first developed with high income palaces in 1931. Some low income families also settled in the northeast beside the high income section. The remainder of the locality was subdivided and the north part was occupied by high income families in the 1950's with the southern and central parts later gradually developed as middle income areas containing walk up apartment buildings of four floors along the Khazzan Street. Seven story high-rise buildings started to be developed in the 1970's and were mostly occupied by high to middle income foreign employees or small Saudi families. Detached houses built in the 1950's are occupied by large Saudi families. The high income palaces in the north are now used by administrative buildings.

KHAZZAN, Riyadh: (top) Walk-up and high-rise buildings are seen along Khazzan Street. Commercial enterprises occupy the ground floors and the upper floors contain residential apartments.

(bottom) Western style, detached houses (villas) are distributed in the new neighborhoods.





LAYOUT: The area has wide commercial through streets with a predominately grid pattern. The lot sizes are varied. The block layout does not discourage commercial traffic infringement.

SELECTED SEGMENT







1:10000


LOCALITY PLAN

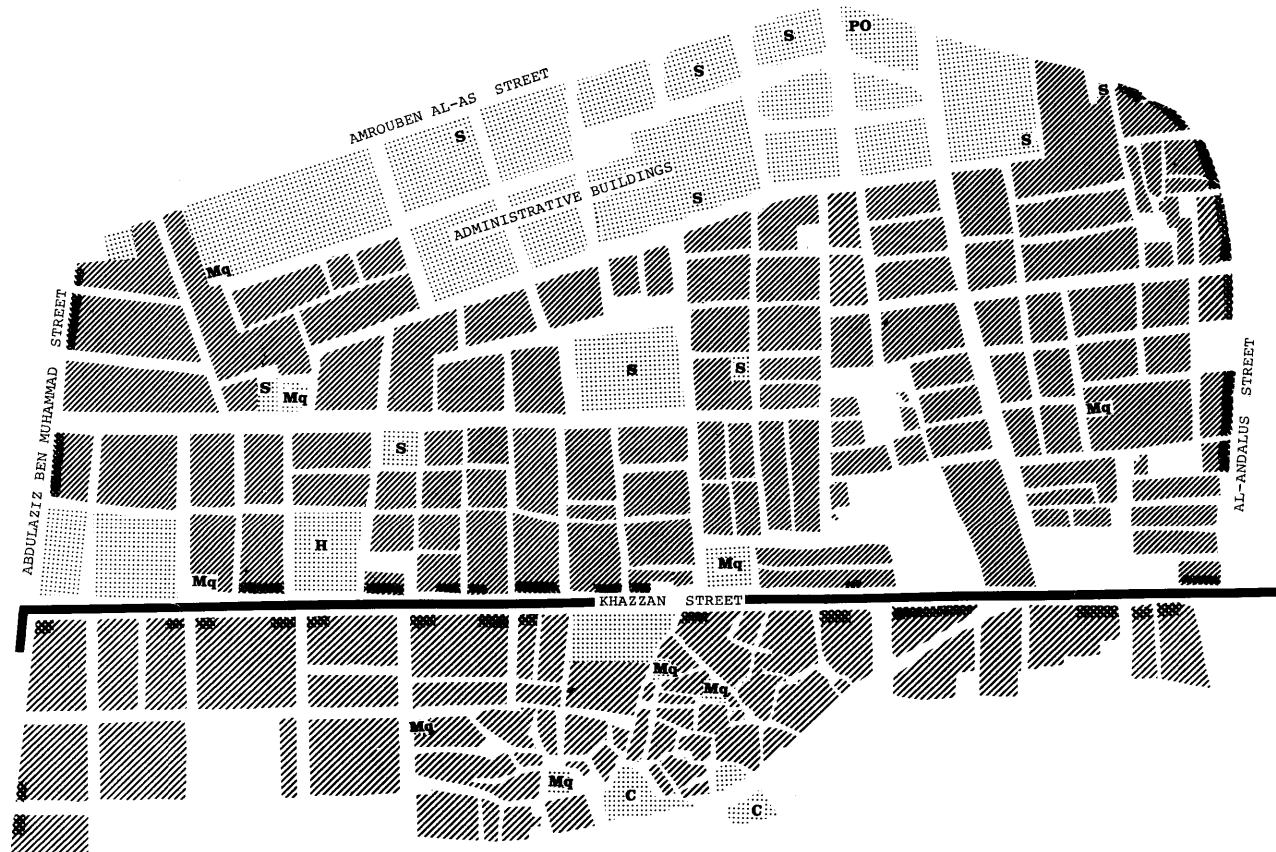
LAND USE: There is a hugh administrative complex in the north of the locality which forced the commercial activities along Khazzan Street to the south and encouraged high densities of population. A private hospital, several mosques, schools, and a public park are found in the locality.

AREAS

-  RESIDENTIAL
-  COMMERCIAL
-  INDUSTRIAL
-  OPEN SPACES

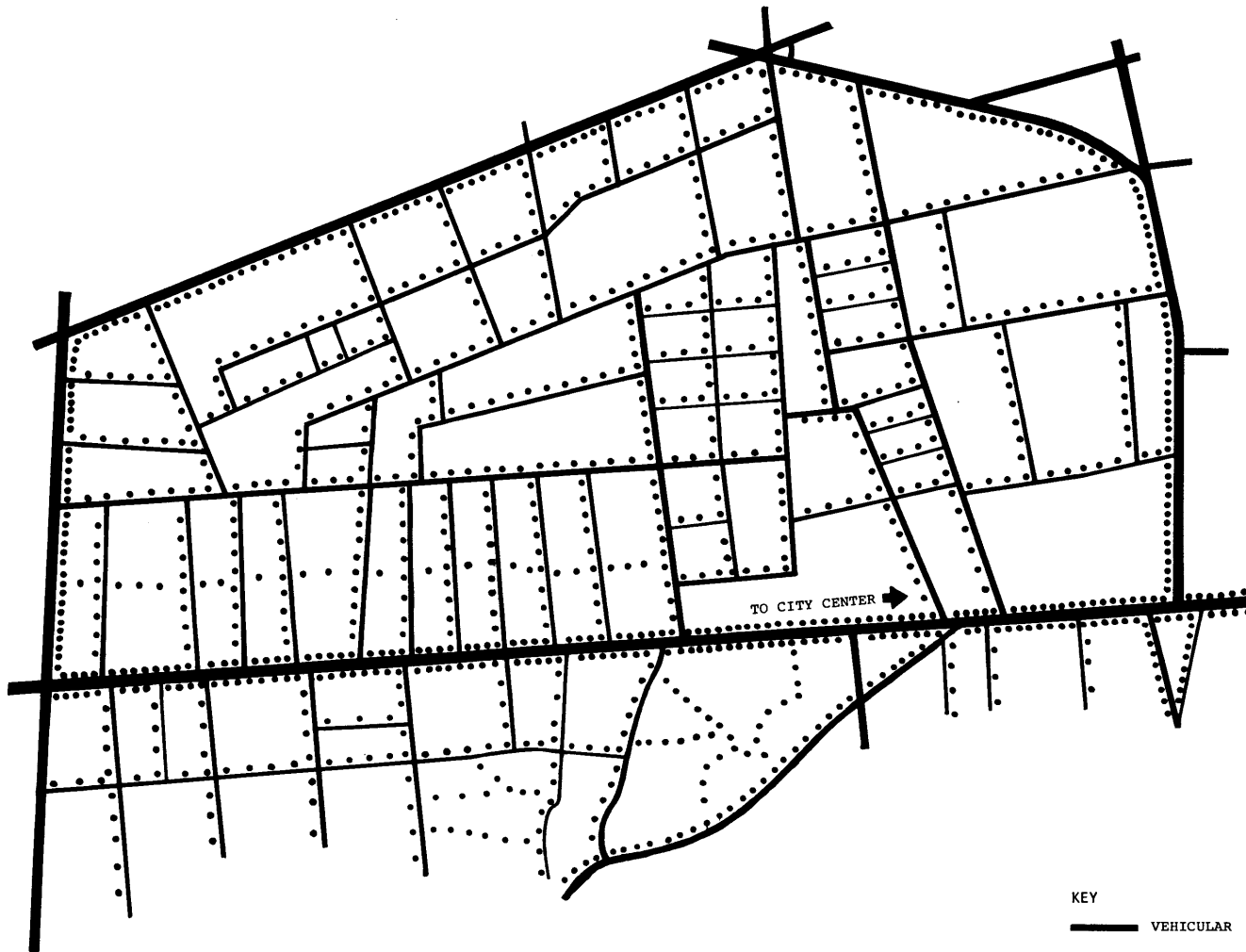
KEY

- Pk** Parking
- P** Police
- F** Fire Department
- S** School
- Mq** Mosque
- R** Recreation
- L** Library
- U** University
- H** Health
- PO** Post Office
- SS** Social Services
- M** Market
- C** Cemetery
-  Bus



LOCALITY LAND USE PATTERN

CIRCULATION: The locality is connected with the city center by public transportation, which within walking distance for all residences. The main transportation mod (for detached houses dwellers) is by private cars.



KEY
—— VEHICULAR
..... PEDESTRIAN



LOCALITY CIRCULATION PATTERN

LOCALITY SEGMENT LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	217	16	13.56
DWELLING UNITS	210	16	13.13
PEOPLE	1470	16	91.88

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	2.92	18
SEMI-PUBLIC (open spaces, schools, community centers)	0.91	6
PRIVATE (dwellings, shops, factories, lots)	12.17	76
SEMI-PRIVATE (cluster courts)	—	—
TOTAL	16.00	100



LOCALITY SEGMENT AIR PHOTOGRAPH

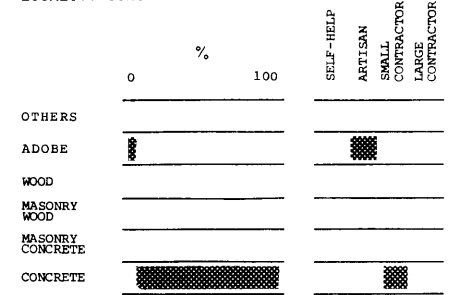


1:2500





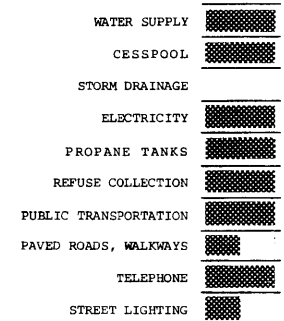
LOCALITY CONSTRUCTION TYPES



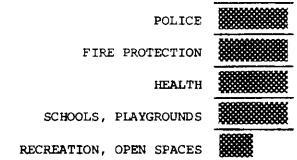
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Approximate

LOCALITY UTILITIES AND SERVICES



LOCALITY COMMUNITY FACILITIES



The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

[Dotted Pattern] SELECTED BLOCK



LOCALITY SEGMENT PLAN

1:2500

LOCALITY BLOCK: There is no definite lot size because, depending on the developer's income, some dwelling units occupy two lots or more. Common dwellings contain a front yard, a back yard, and two narrow strips of land on each side of the built area.

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	24	1.38	1.67
DWELLING UNITS	24	1.38	1.67
PEOPLE	168	1.38	121.74

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.4	39.5
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	0.98	70.5
SEMI-PRIVATE (cluster courts)	-	-
TOTAL	1.38	100

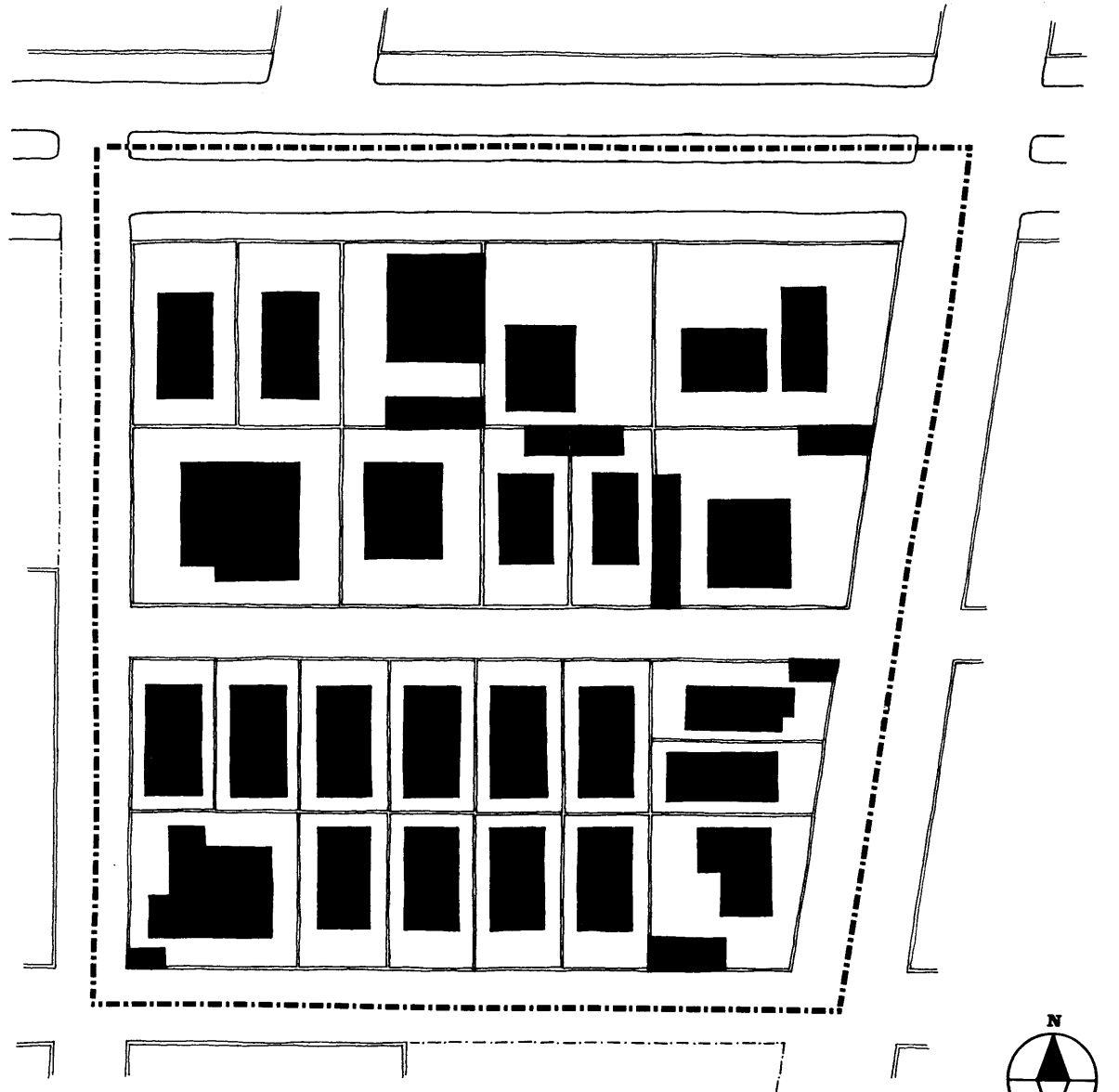
NETWORK EFFICIENCY

R-FACTOR

$$\frac{\text{network length (circulation)}}{\text{area served (circulation, lots)}} = \frac{310}{1.38} = 225\text{m/Ha}$$

AVERAGE LOT AREA

$$\frac{\text{total area (circulation, lots)}}{\text{number of lots}} = \frac{575\text{m}^2}{24}$$

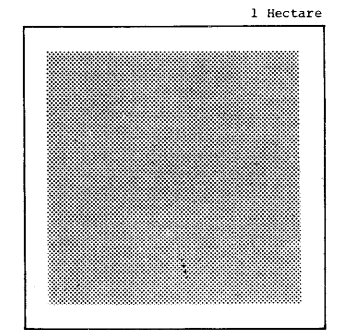
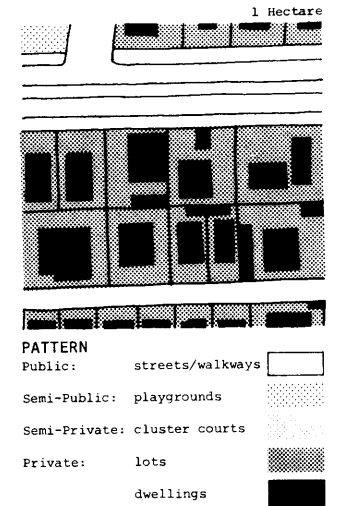
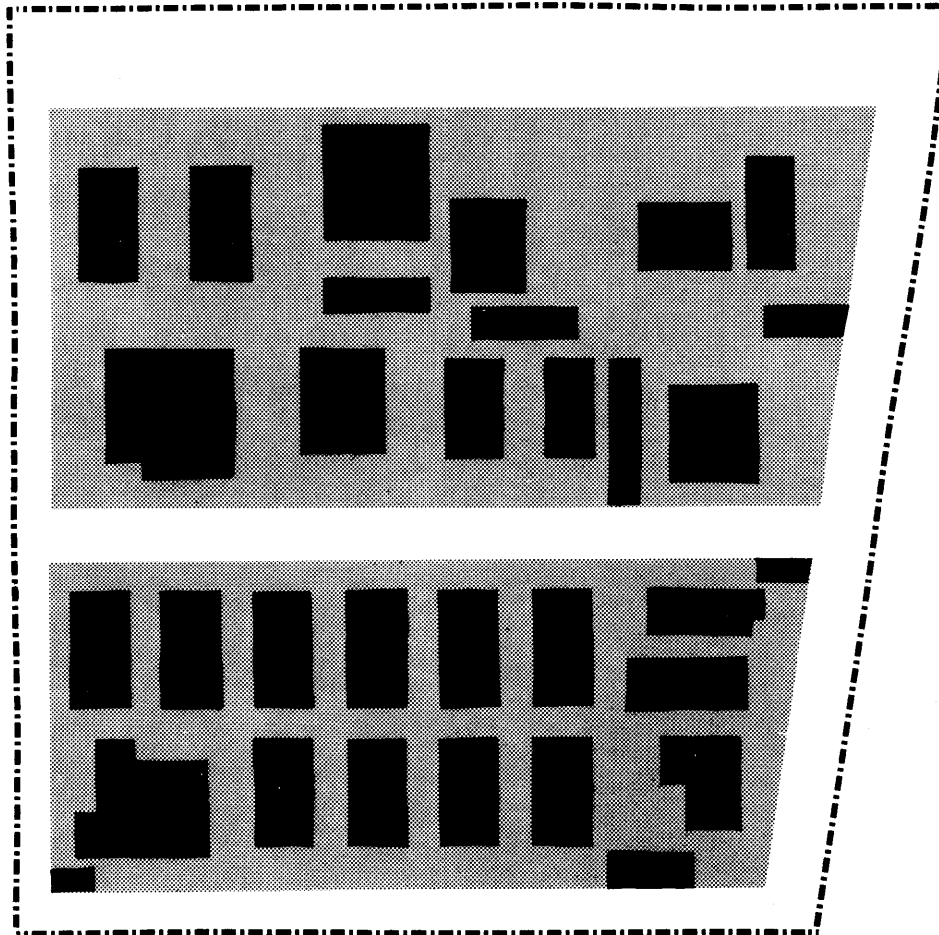


LOCALITY BLOCK PLAN

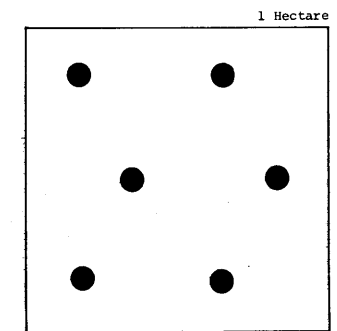


1:1000

LAND UTILIZATION DIAGRAMS



PERCENTAGES		
Streets/Walkways	30%	
Playgrounds	-	
Cluster Courts	-	
Dwellings/Lots	70%	

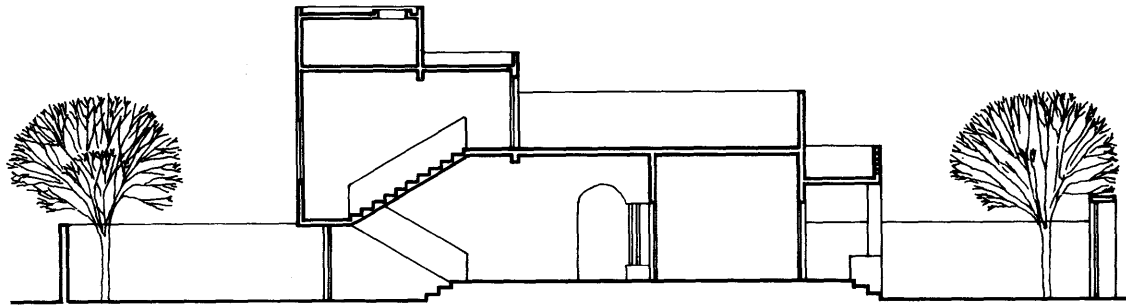


DENSITY		
Persons/Hectare	120	
	20 Persons	

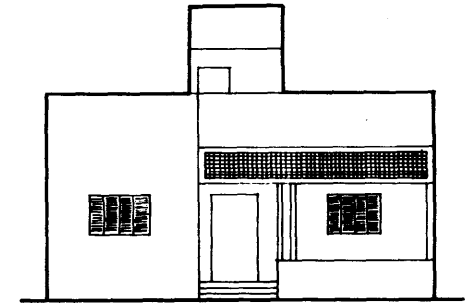


1:1000

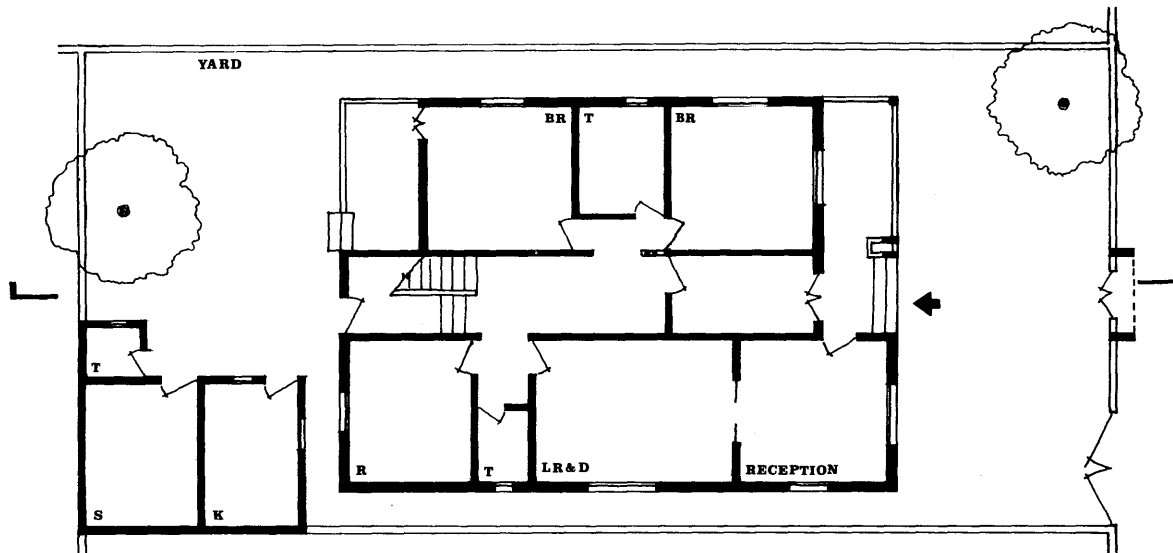
LOCALITY BLOCK LAND UTILIZATION



SECTION

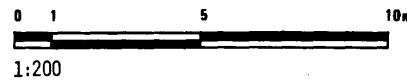


ELEVATION



PLAN

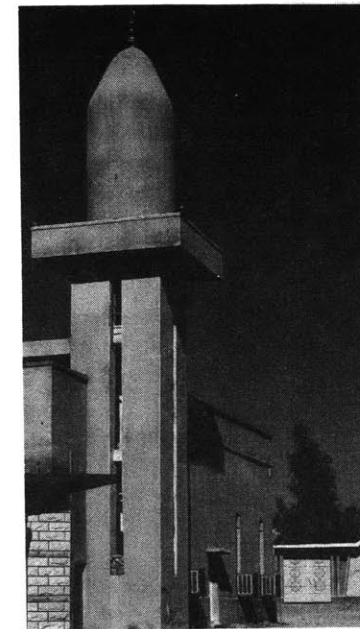
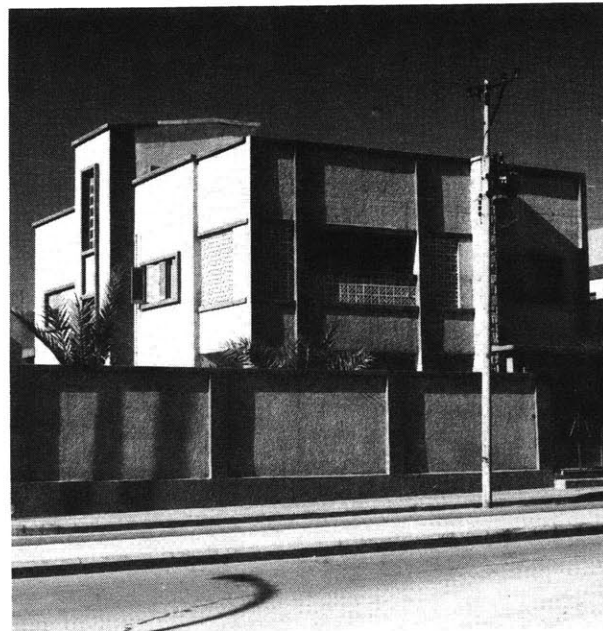
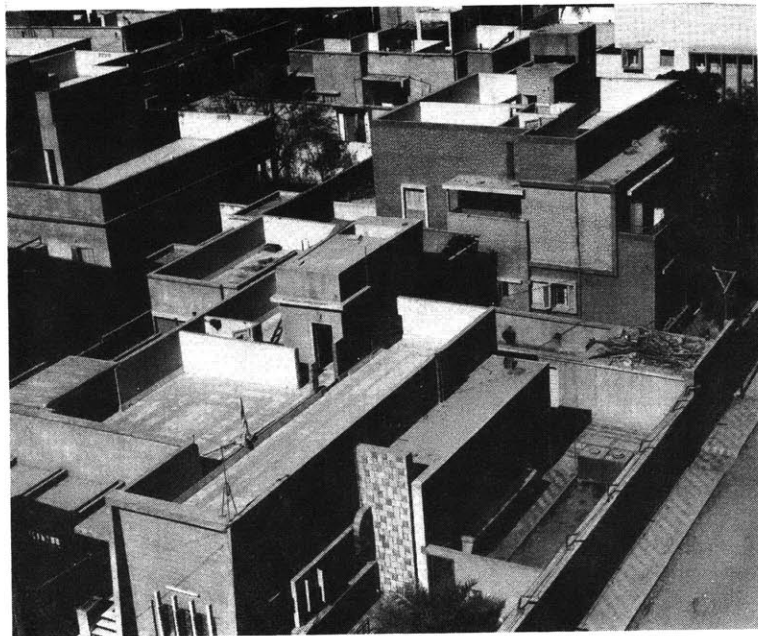
TYPICAL DWELLING



TYPICAL DWELLINGS: Originally the kitchen was located in the house, but the owner shifted the kitchen into the yard for two reasons: the need for more rooms and the desire to separate the service area from the house. Inhabitants use the front yard for greeting visitors and the back yard for private use. There is an underground reservoir, the main water supply, and an upstairs reservoir, for daily domestic use.

KEY

- LR Living Room
- D Dining/Eating Area
- BR Bedroom
- K Kitchen/Cooking Area
- T Toilet/Bathroom
- L Laundry
- C Closet
- S Storage
- R Room (multi-use)



PHYSICAL DATA (related to dwelling and land)

DWELLING UNIT
 type: House
 area (sq m): 181
 tenure: Legal ownership

LAND/LOT
 utilization: Private
 area (sq m): 351
 tenure: Legal ownership

DWELLING
 location: Inner ring
 type: Detached
 number of floors: 1
 utilization: Single family
 physical state: Good

DWELLING DEVELOPMENT
 mode: Instant
 developer: Private
 builder: Small contractor
 construction type: Concrete
 year of construction: 1965

MATERIALS
 foundation: Reinforced concrete
 floors: Mosaic tile
 walls: Cement brick
 roof: Reinforced concrete

DWELLING FACILITIES
 wc: 3
 shower: 3
 kitchen: 1
 rooms: 5
 other: Storage

SOCIO-ECONOMIC DATA (related to user)

GENERAL: SOCIAL
 user's ethnic origin: Saudi from urban
 place of birth: Mecca
 education level: University

NUMBER OF USERS
 married: 2
 single: 2
 children: 6
 total: 10

MIGRATION PATTERN
 number of moves: 1
 rural - urban:
 urban - urban: X
 urban - rural:
 why came to urban area: Commerce

GENERAL: ECONOMIC
 user's income group: Middle
 employment: Trade
 distance to work: 2km
 mode of travel: Private car

COSTS
 dwelling unit: \$28,169
 land - market value: \$11,865

DWELLING UNIT PAYMENTS
 financing: Self-financed
 rent/mortgage:
 % income for rent/mortgage:

LOCALITY SOURCES

Plan: (accurate) Aerial Photograph, Department of Aerial Photogrammetry, Ministry of Petroleum and Minerals, 1973.

Land Use Pattern: (approximate) IBID.

Circulation Pattern: (approximate) IBID.

Segment Plan: (accurate) IBID.

Block Plan: (accurate) IBID.

Block Land Utilization: (accurate) IBID.

Typical Dwelling: (approximate) Field Surveys, A. Shuaibi & M. Hussayen, 1974.

Physical Data: (approximate) IBID.

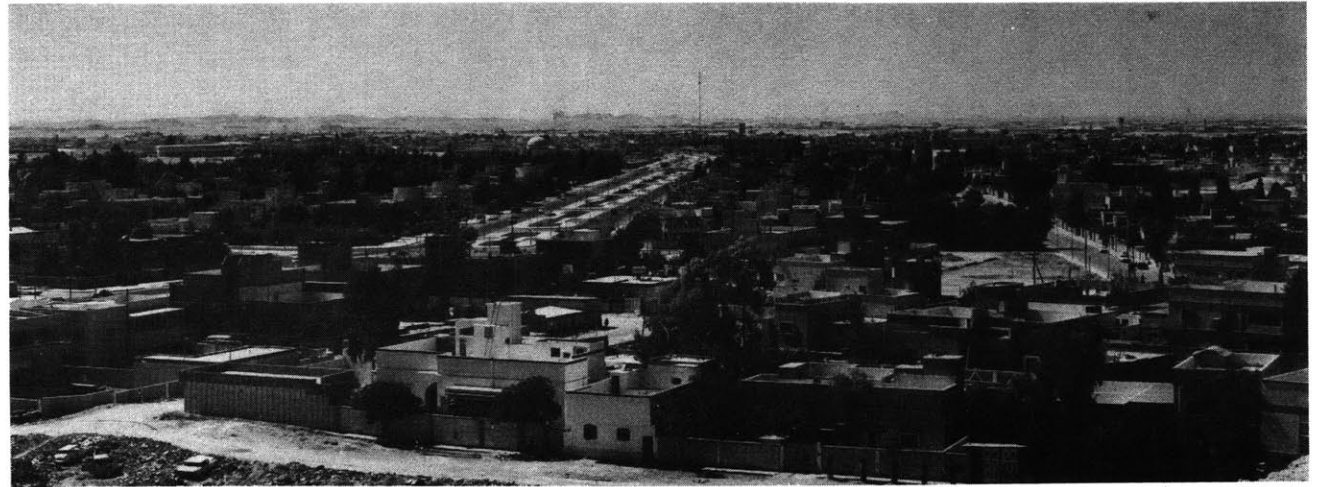
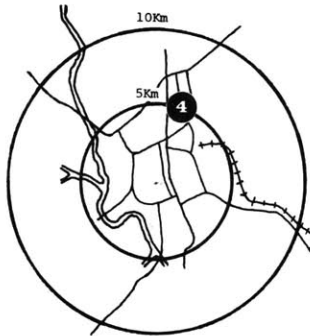
Socio-Economic Data: (approximate) IBID.

Photographs: A. Shuaibi & M. Hussayen, 1974; Doxisadis

General Information: Riyadh Existing Conditions, 1968.

4 MALAZZ Riyadh

PUBLIC, MIDDLE/HIGH INCOME,
DETACHED HOUSES



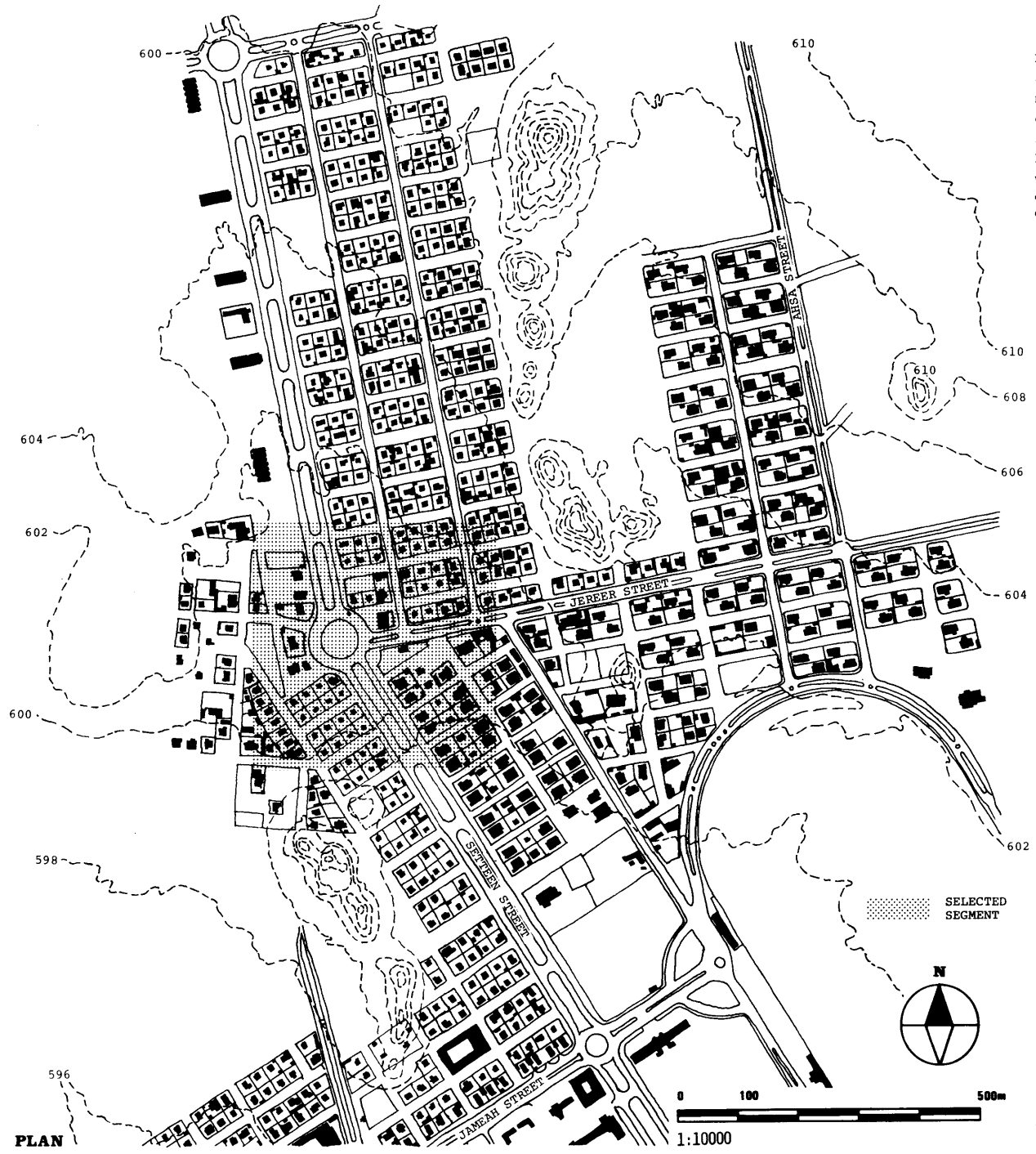
LOCATION: Malaz is located towards the north-east of the city center about 3km from the central business district.

DEVELOPMENT: Originally it was empty land that was intended to be developed as a housing project for middle income government employees when the governmental ministries were transferred from Mecca to Riyadh. The residential area has been developed gradually by individuals since then. The dwelling units are 754 detached houses (villas) and three apartment buildings with a capacity of 180 units for rent. The detached houses are in three sizes: small, medium, and large.

MALAZZ, Riyadh: (top) This general view shows part of the wide Setteen Street. University buildings appear in the back.

(bottom) This view of Malazz shows one- and two-story, detached houses. Fences surround houses for privacy.





LAYOUT: No definite boundaries define the area except for some public facilities and major traffic roads. The grid pattern predominates, intersecting streets divide the residential area into separate blocks. Most blocks are 100m x 50m, and the lot sizes within vary. The lots have a depth of 25m and a variety of widths: 25m, 40m, 37m, and 50m.

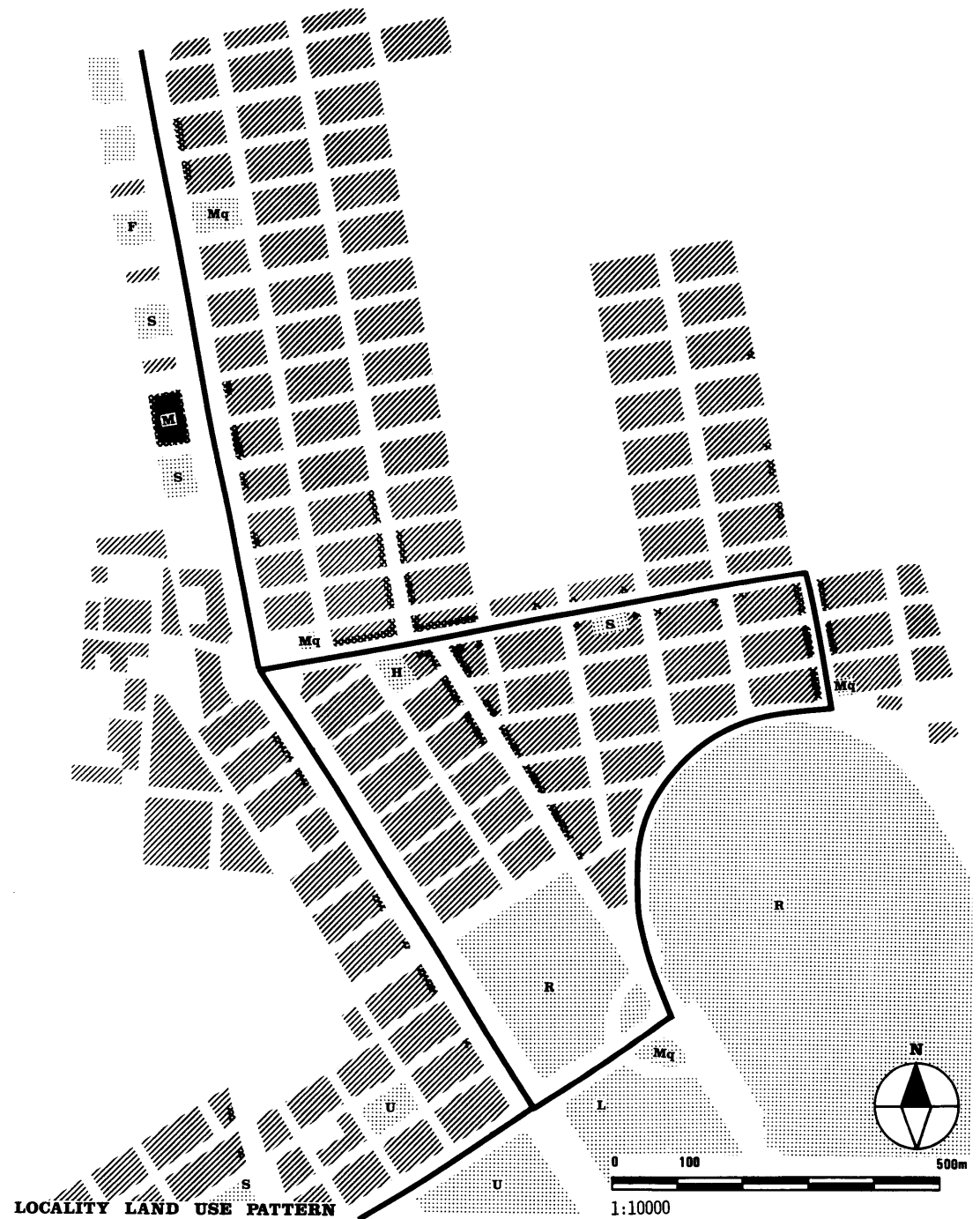
LOCALITY PLAN

1:10000

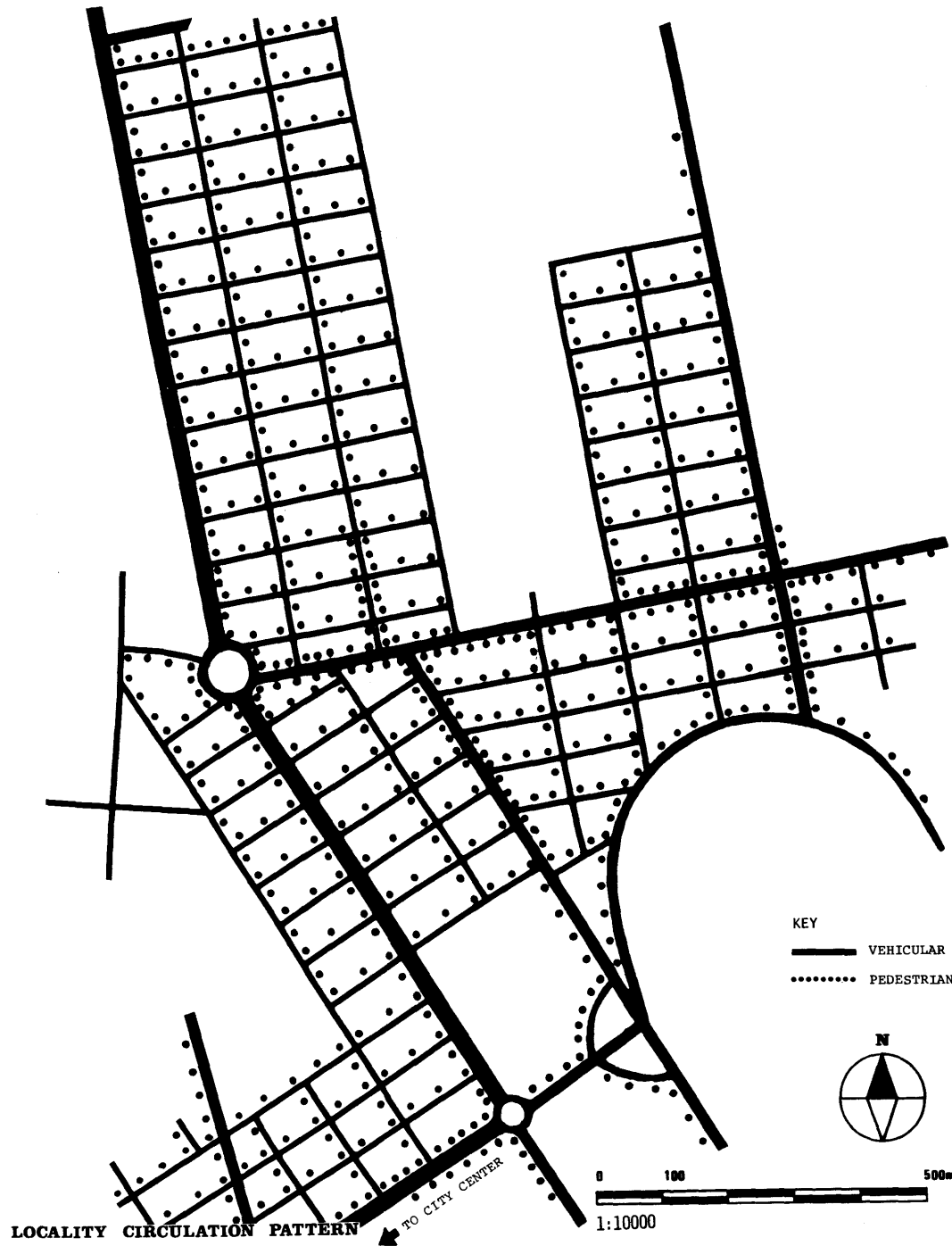
LAND USE: The administration buildings and some colleges of Riyadh University are south of the locality. There is a private hospital to the north, and a sports center to the south-east of Malaz. In addition, a zoo was founded on the eastern boundary, and there are 8 schools, 5 mosques, and a public clinic.

- AREAS
- RESIDENTIAL
 - COMMERCIAL
 - INDUSTRIAL
 - OPEN SPACES

- KEY
- Pk Parking
 - P Police
 - F Fire Department
 - S School
 - Mq Mosque
 - R Recreation
 - L Library
 - U University
 - H Health
 - PO Post Office
 - SS Social Services
 - M Market
 - C Cemetery
 - Bus
 - Rapid Transit



CIRCULATION: Because pedestrian circulation is not separated from vehicular circulation, and there are a large number of intersections without traffic lights or signs, there are many accidents. There are two main streets, University Street and Setteen Street, with smaller branches which pour into them. Pedestrian movement is very light except in the limited commercial area. Public transportation is provided along the main streets, and the majority of people have private cars.



LOCALITY SEGMENT LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	147	16	9.19
DWELLING UNITS	138	16	8.63
PEOPLE	966	16	60.38

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	7.19	45
SEMI-PUBLIC (open spaces, schools, community centers)	0.34	2
PRIVATE (dwellings, shops, factories, lots)	8.47	53
SEMI-PRIVATE (cluster courts)	—	—
TOTAL	16.00	100

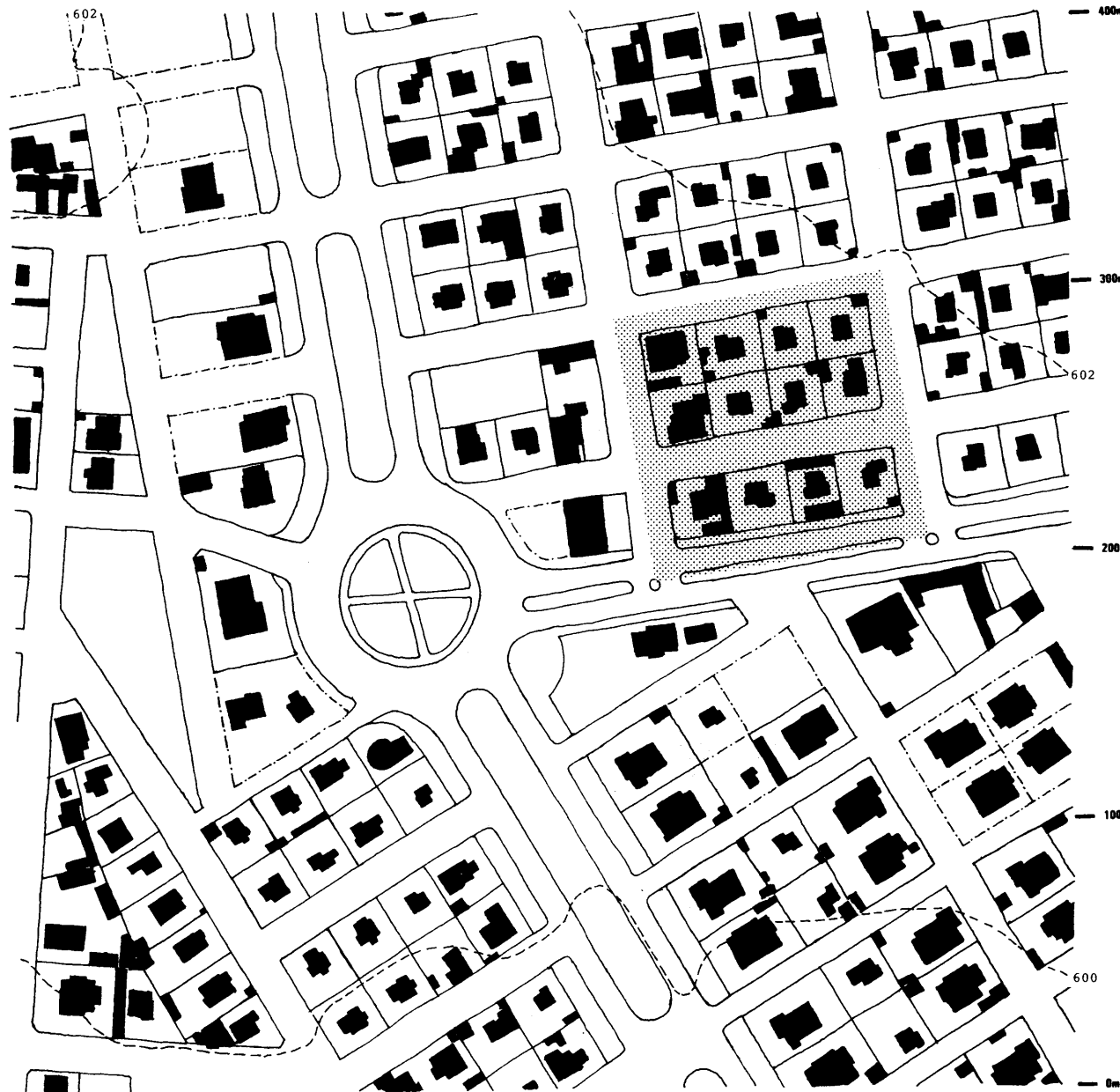


LOCALITY SEGMENT AIR PHOTOGRAPH



1:2500





LOCALITY CONSTRUCTION TYPES

	0	%	100	SELF-HELP	ARTISAN	SMALL CONTRACTOR	LARGE CONTRACTOR
OTHERS	_____			_____	_____	_____	_____
ADOBE	_____			_____	_____	_____	_____
WOOD	_____			_____	_____	_____	_____
MASONRY WOOD	_____			_____	_____	_____	_____
MASONRY CONCRETE	_____			_____	_____	_____	_____
CONCRETE	_____			_____	_____	_____	_____

The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Accurate

LOCALITY UTILITIES AND SERVICES

WATER SUPPLY	_____
CESSPOOL	_____
STORM DRAINAGE	_____
ELECTRICITY	_____
PROPANE TANKS	_____
REFUSE COLLECTION	_____
PUBLIC TRANSPORTATION	_____
PAVED ROADS, WALKWAYS	_____
TELEPHONE	_____
STREET LIGHTING	_____

LOCALITY COMMUNITY FACILITIES

POLICE	_____
FIRE PROTECTION	_____
HEALTH	_____
SCHOOLS, PLAYGROUNDS	_____
RECREATION, OPEN SPACES	_____

The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

SELECTED BLOCK

LOCALITY SEGMENT PLAN

1:2500

LOCALITY BLOCK: The pattern, Western in origin, was brought to the country to replace the traditional housing pattern. This locality was developed as a housing project with the land divided into three different lot sizes: 25 x 25m, 40 x 25m, and 50 x 50m.

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	12	1.19	10.05
DWELLING UNITS	12	1.19	10.08
PEOPLE	84	1.19	70.59

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.58	49
SEMI-PUBLIC (open spaces, schools, community centers)	—	—
PRIVATE (dwellings, shops, factories, lots)	.61	51
SEMI-PRIVATE (cluster courts)	—	—
TOTAL	1.19	100

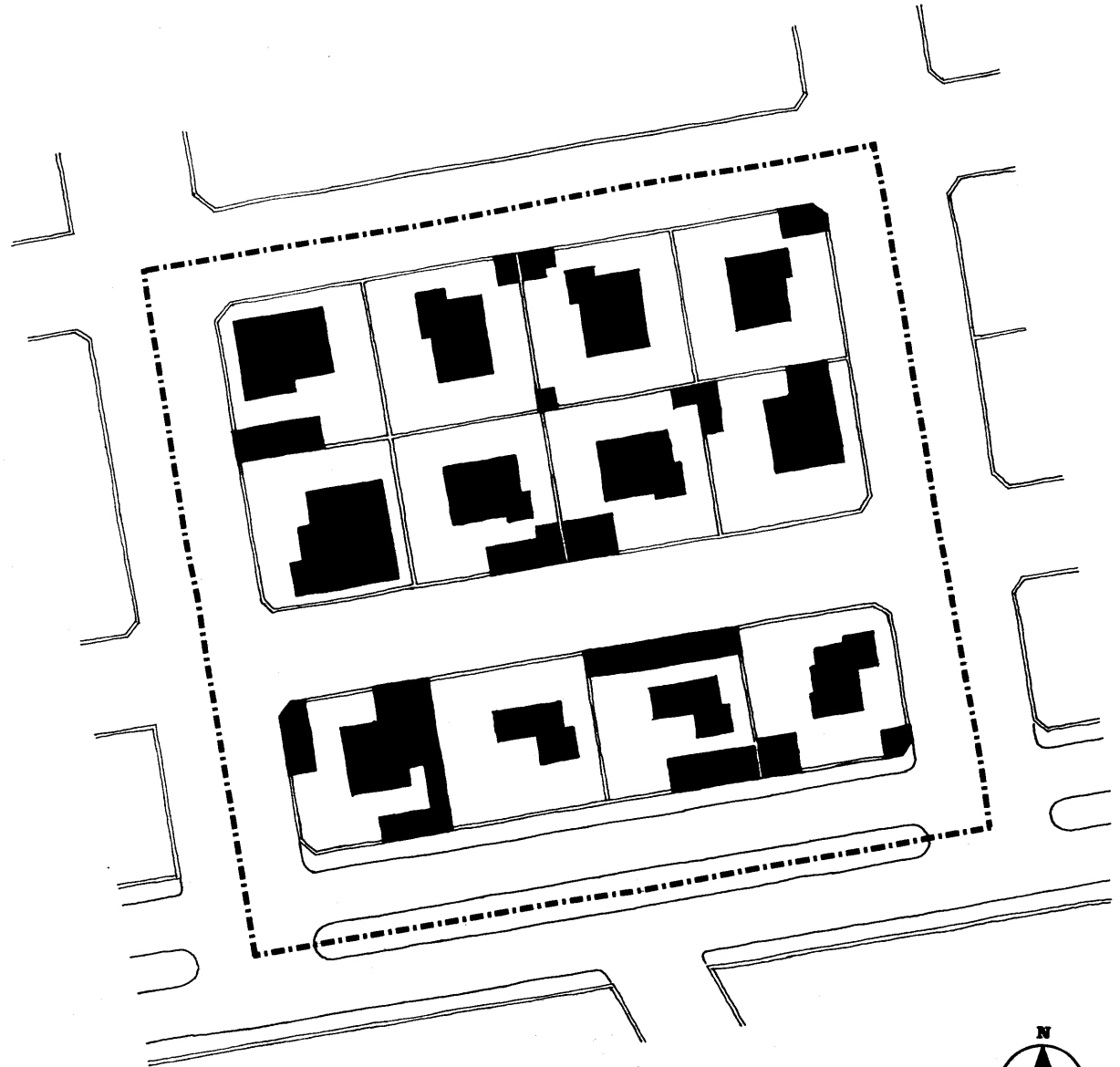
NETWORK EFFICIENCY

R-VECTOR

$$\frac{\text{network length (circulation)}}{\text{area served (circulation, lots)}} = \frac{318}{1.19} = 267\text{m/Ha}$$

AVERAGE LOT AREA

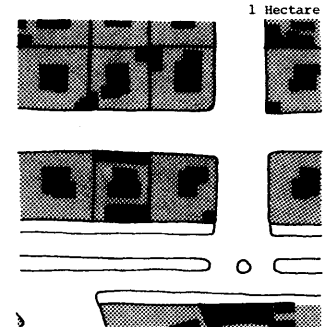
$$\frac{\text{total area (circulation, lots)}}{\text{number of lots}} = 992\text{m}^2$$



0 10 50m

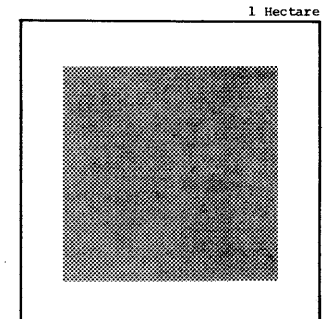
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LAND UTILIZATION DIAGRAMS



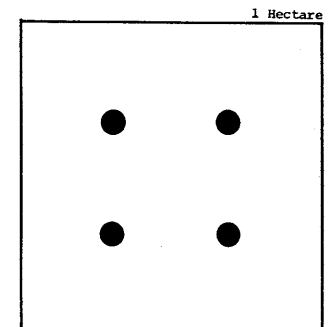
PATTERN

Public:	streets/walkways	
Semi-Public:	playgrounds	
Semi-Private:	cluster courts	
Private:	lots	
	dwellings	



PERCENTAGES

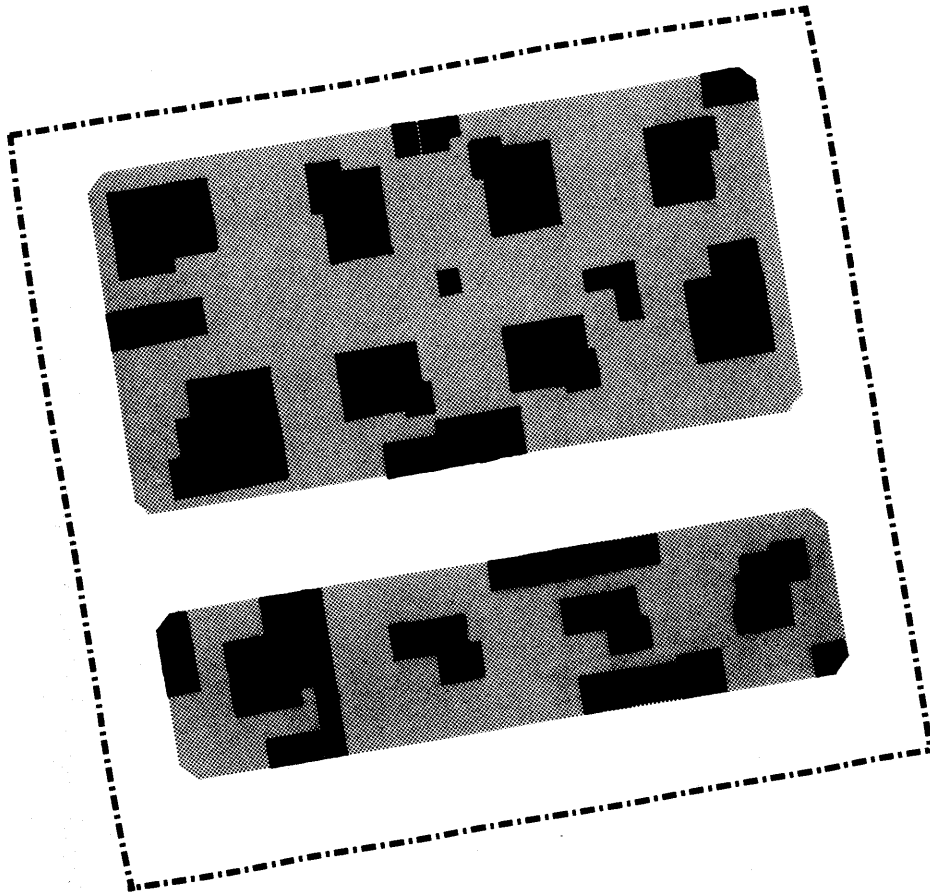
Streets/Walkways	49%
Playgrounds	—
Cluster Courts	—
Dwellings/Lots	51%



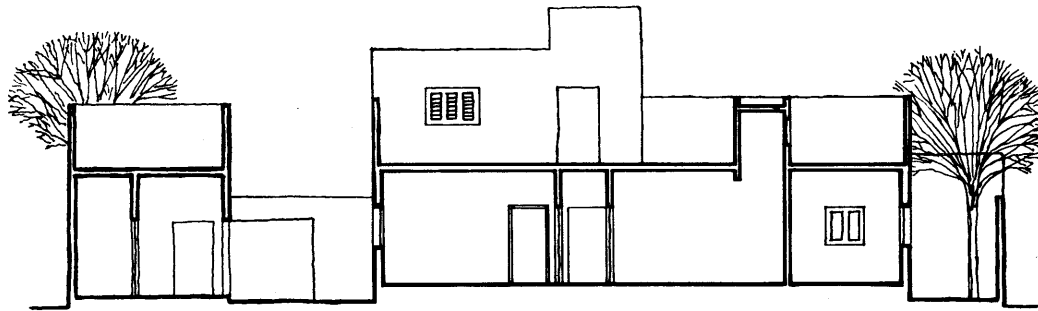
DENSITY

Persons/Hectare	80
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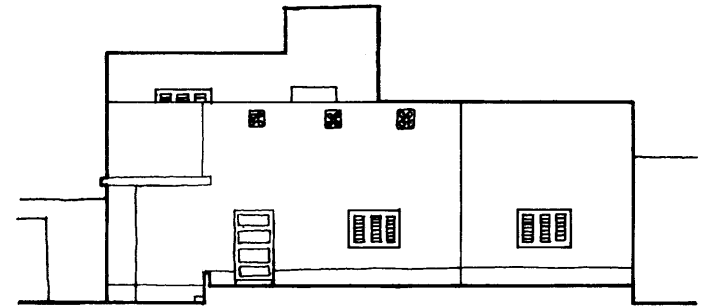
20 Persons



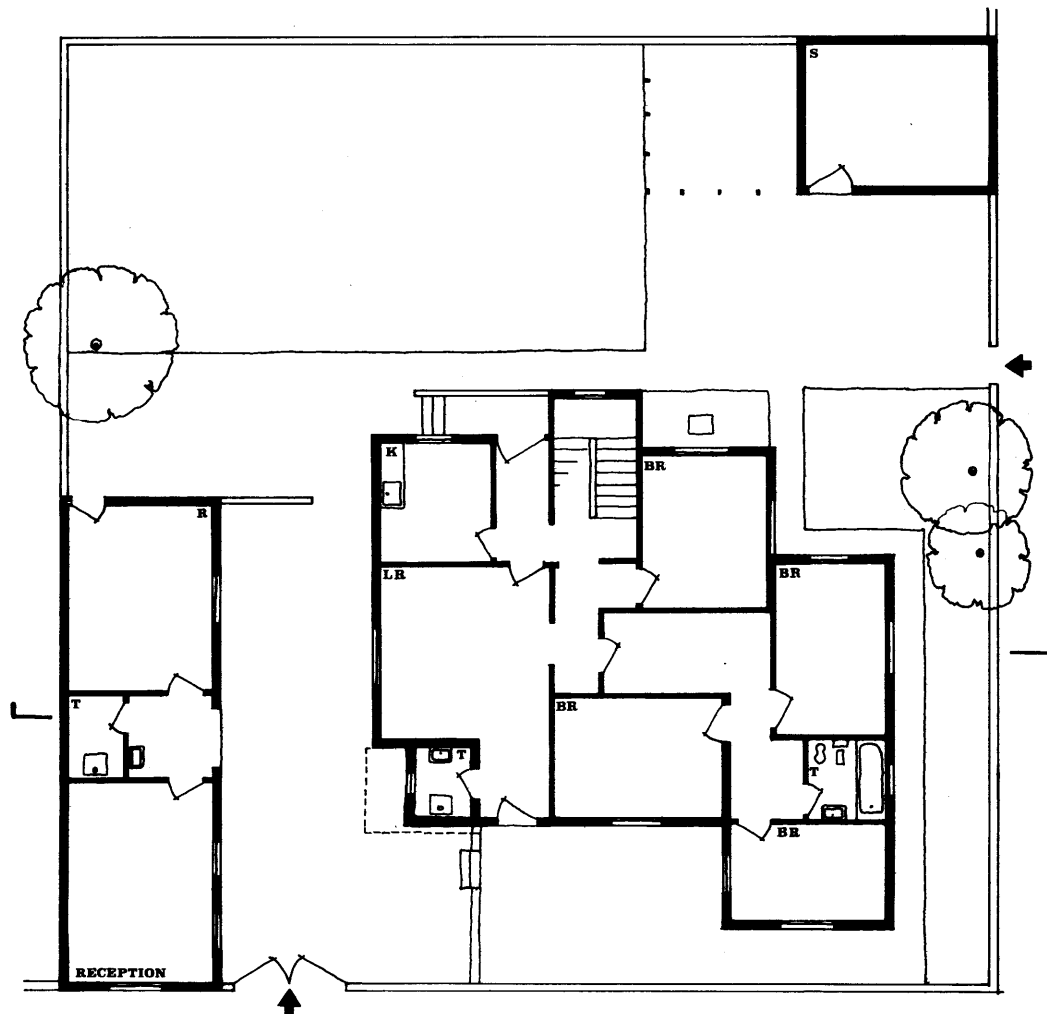
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SECTION



ELEVATION



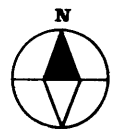
PLAN

TYPICAL DWELLING

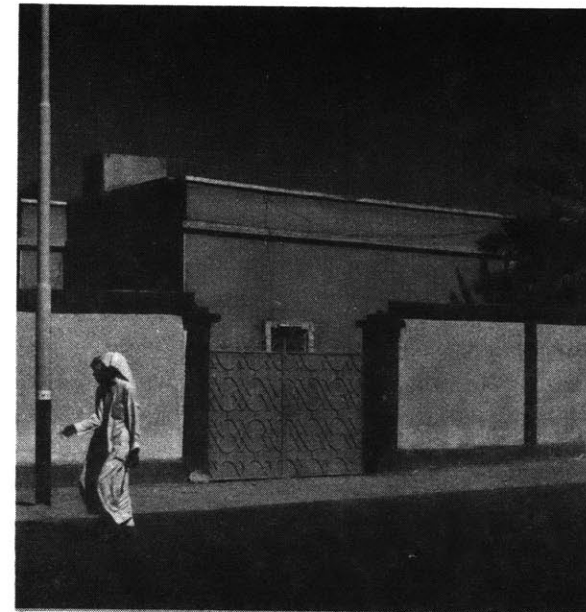
TYPICAL DWELLING: The owners increased the originally built area based upon their needs. Two bedrooms in the east and a reception area in the west were added to the original plan. The open space beside the reception area is used as an uncovered garage, and the other open space is used as a private garden. The roof serves as sleeping quarters in the summer.

KEY

- LR Living Room
- D Dining/Eating Area
- BR Bedroom
- K Kitchen/Cooking Area
- T Toilet/Bathroom
- L Laundry
- C Closet
- S Storage
- R Room (multi-use)



1:200



PHYSICAL DATA (related to dwelling and land)

DWELLING UNIT
 type: House
 area (sq m): 220
 tenure: Legal ownership

LAND/LOT
 utilization: Private
 area (sq m): 625
 tenure: Legal ownership

DWELLING
 location: Inner ring
 type: Detached
 number of floors: 1
 utilization: Single family
 physical state: Good

DWELLING DEVELOPMENT
 mode: Instant
 developer: Public
 builder: Large contractor
 construction type: Concrete
 year of construction: 1960

MATERIALS
 foundation: Poured reinforced concrete
 floors: poured reinforced concrete
 walls: Cement brick
 roof: Mosaic tiles

DWELLING FACILITIES
 wc: 2
 shower: 2
 kitchen: 1
 rooms: 7
 other: Storage

SOCIO-ECONOMIC DATA (related to user)

GENERAL: SOCIAL
 user's ethnic origin: Saudi from rural
 place of birth: Kasseem
 education level: Intermediate

NUMBER OF USERS
 married: 2
 single: 1
 children: 8
 total: 11

MIGRATION PATTERN
 number of moves: 2
 rural - urban: 1
 urban - urban: 1
 urban - rural: -

why came to urban area: Employment

GENERAL: ECONOMIC
 user's income group: Government clerk
 employment: Government clerk
 distance to work: 3.5km
 mode of travel: Private car

COSTS
 dwelling unit: \$8500
 land - market value: \$27,000

DWELLING UNIT PAYMENTS
 financing: Public
 rent/mortgage: \$36
 % income for rent/mortgage: 5%

LOCALITY SOURCES

Plan: (accurate) Aerial Photograph, Department of Aerial Photogrammetry, Ministry of Petroleum and Minerals, 1973.

Land Use Pattern: (approximate) IBID.

Circulation Pattern: (approximate) IBID.

Segment Plan: (accurate) IBID.

Block Plan: (accurate) IBID.

Block Land Utilization: (accurate) IBID.

Typical Dwelling: (approximate) Field Surveys, A. Shuaibi & M. Hussayen, 1974.

Physical Data: (approximate) IBID.

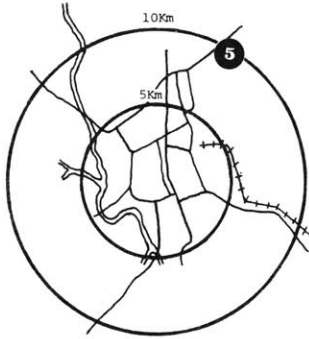
Socio-Economic Data: (approximate) IBID.

Photographs: A. Shuaibi & M. Hussayen, 1974; Doxidis

General Information: Riyadh Existing Conditions, 1968.

5 KHURAIIS Riyadh

PUBLIC, MODERATE LOW/MIDDLE INCOME,
ROW HOUSES

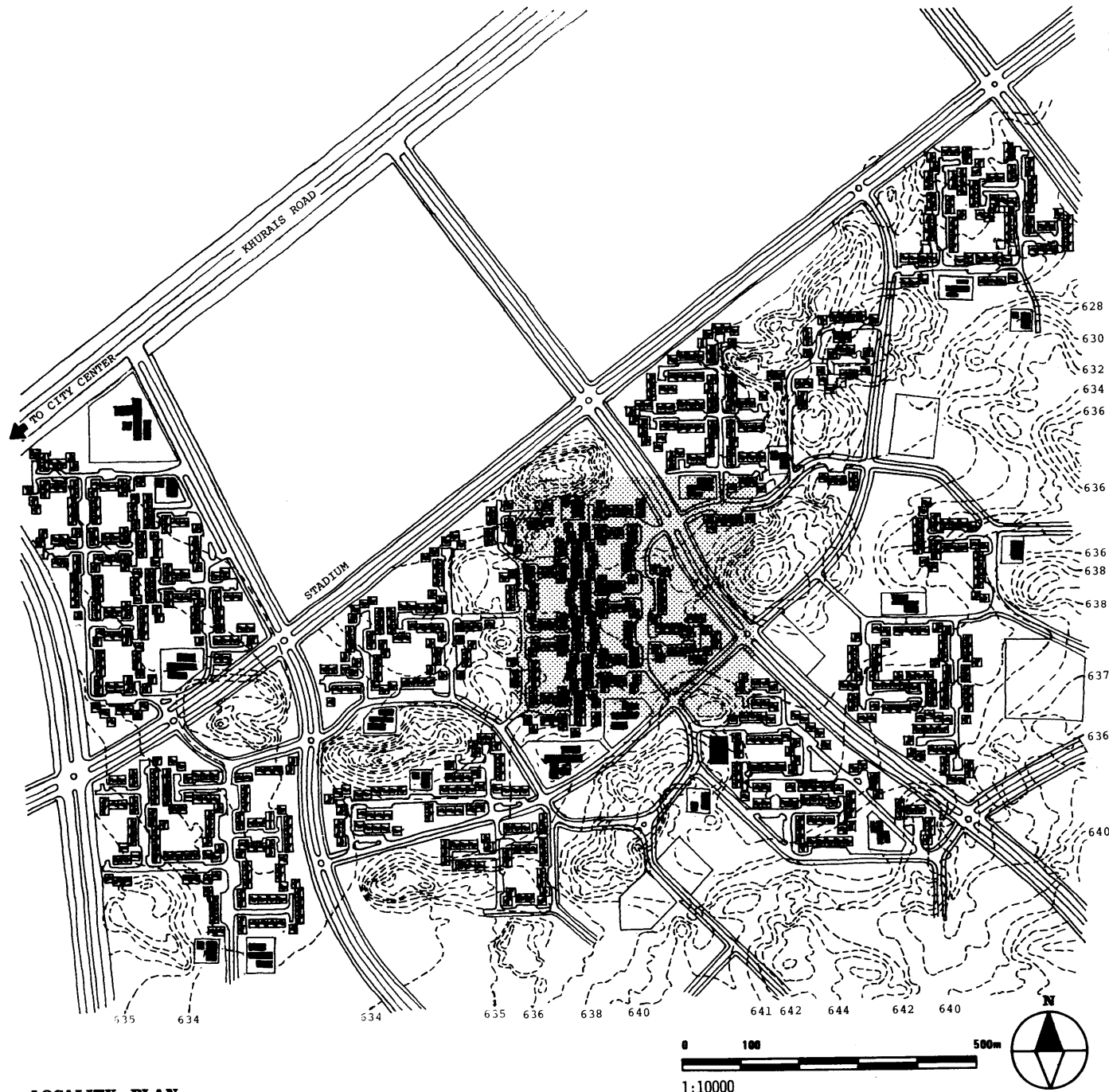


LOCATION: The project is located about 10km east of the city center on a main rout (Khurais Road) which connects Riyadh with the eastern province.

DEVELOPMENT: The new housing project, being developed by the government in stages for low and moderately low income employees, will have a capacity, in the first stage, of 1000 dwelling units, all of them single family houses. The developer will mortgage the dwelling costs on a low percentage of the family income without interest. It will be provided with public facilities and utilities.

Model of Khurais Housing Project shows dwelling units (white) and facilities buildings (black).





LAYOUT: Hills in the topography forced the design for the residential area and the circulation to take a special layout. The land is bounded by Khurais Road and the stadium to the north.





SELECTION
SEGMENT

LOCALITY PLAN




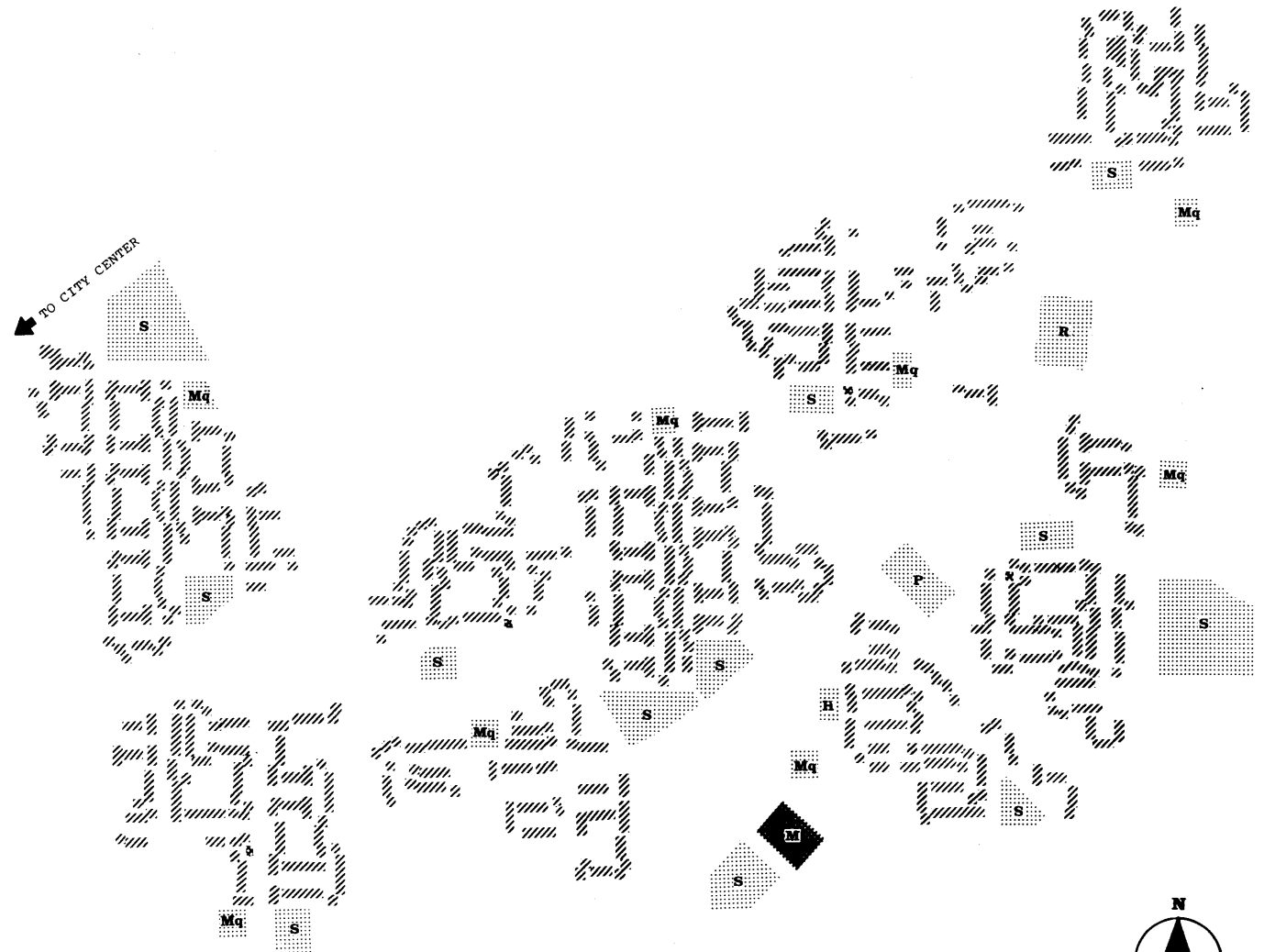
LAND USE: Commercial facilities are concentrated in a shopping center, and therefore, are separated from the residential area. The clusters are served by corner shops. The project contains 12 schools, 8 mosques, a police station, and a recreational area. The residential area consists of single family dwellings distributed throughout the entire area.

AREAS

-  RESIDENTIAL
-  COMMERCIAL
-  INDUSTRIAL
-  OPEN SPACES

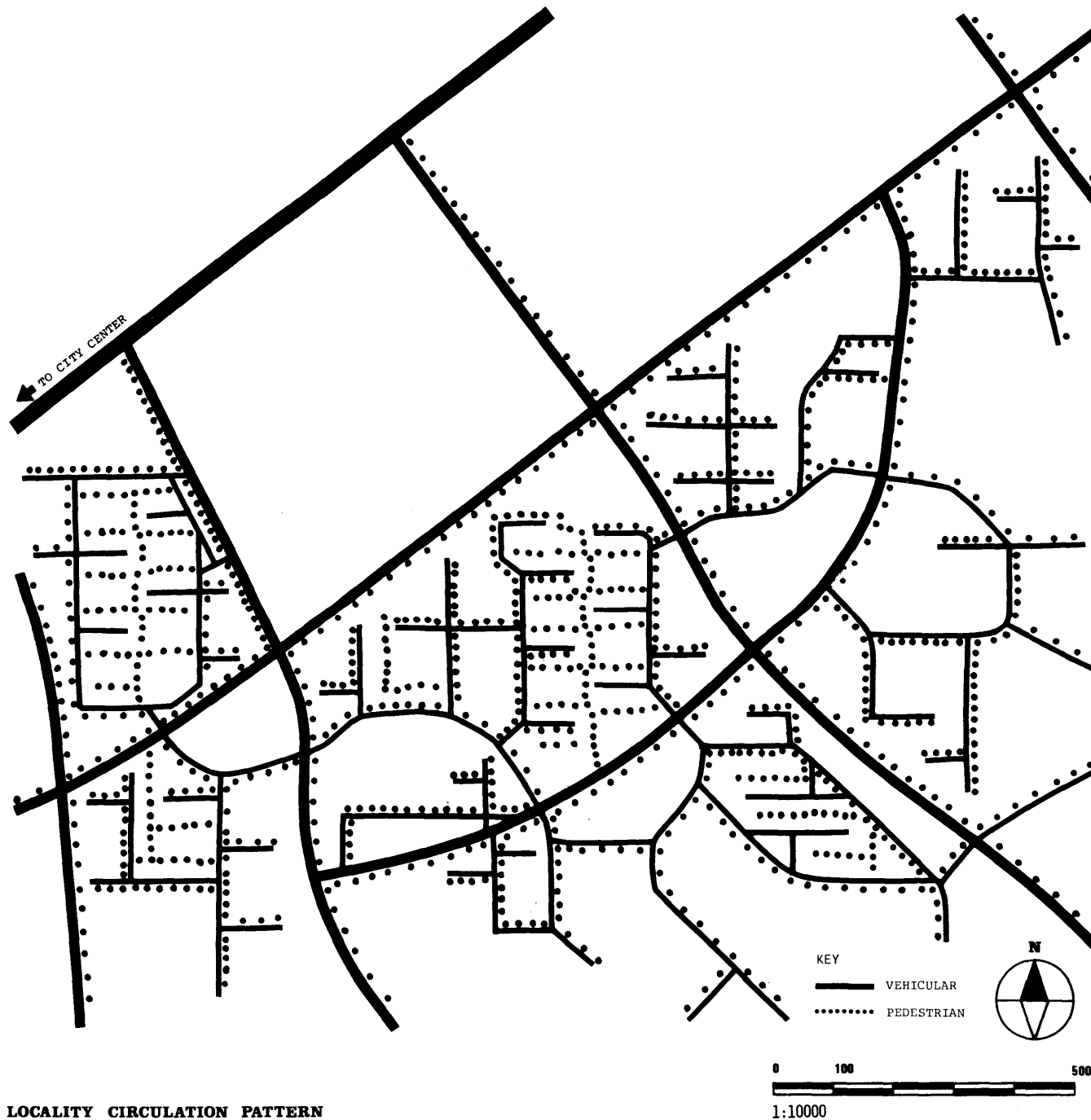
KEY

- Pk** Parking
- P** Police
- F** Fire Department
- S** School
- Mq** Mosque
- R** Recreation
- L** Library
- U** University
- H** Health
- PO** Post Office
- SS** Social Services
- M** Market
- C** Cemetery
-  Bus



LOCALITY LAND USE PATTERN





CIRCULATION: The circulation layout is designed to follow land topography. Four major roads connect the project to Khurair Road. Lines of access serve the dwellings and provide grouped parking areas. There are pedestrian foot paths in the clusters between mosques and schools.

LOCALITY CIRCULATION PATTERN

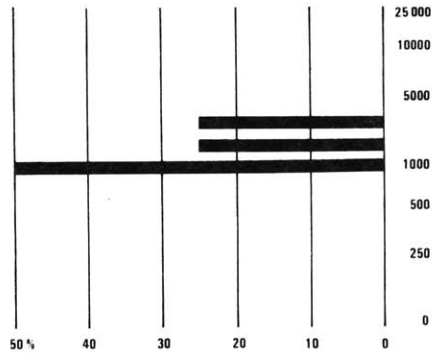


LOCALITY SEGMENT LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	164	16	10.25
DWELLING UNITS	164	16	10.25
PEOPLE	1148	16	71.75

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	11.6	76
SEMI-PUBLIC (open spaces, schools, community centers)	0.7	4
PRIVATE (dwellings, shops, factories, lots)	3.7	23
SEMI-PRIVATE (cluster courts)	—	—
TOTAL	16.0	100

INCOME: The suggested household income incomes are as follows: a) 50% of total households have incomes of \$1000/year; b) 25% have \$2000/year; c) 25% have \$3000/year.



LOCALITY ANNUAL INCOME DISTRIBUTION
horizontal: percentages vertical: dollars
Source: M & P International

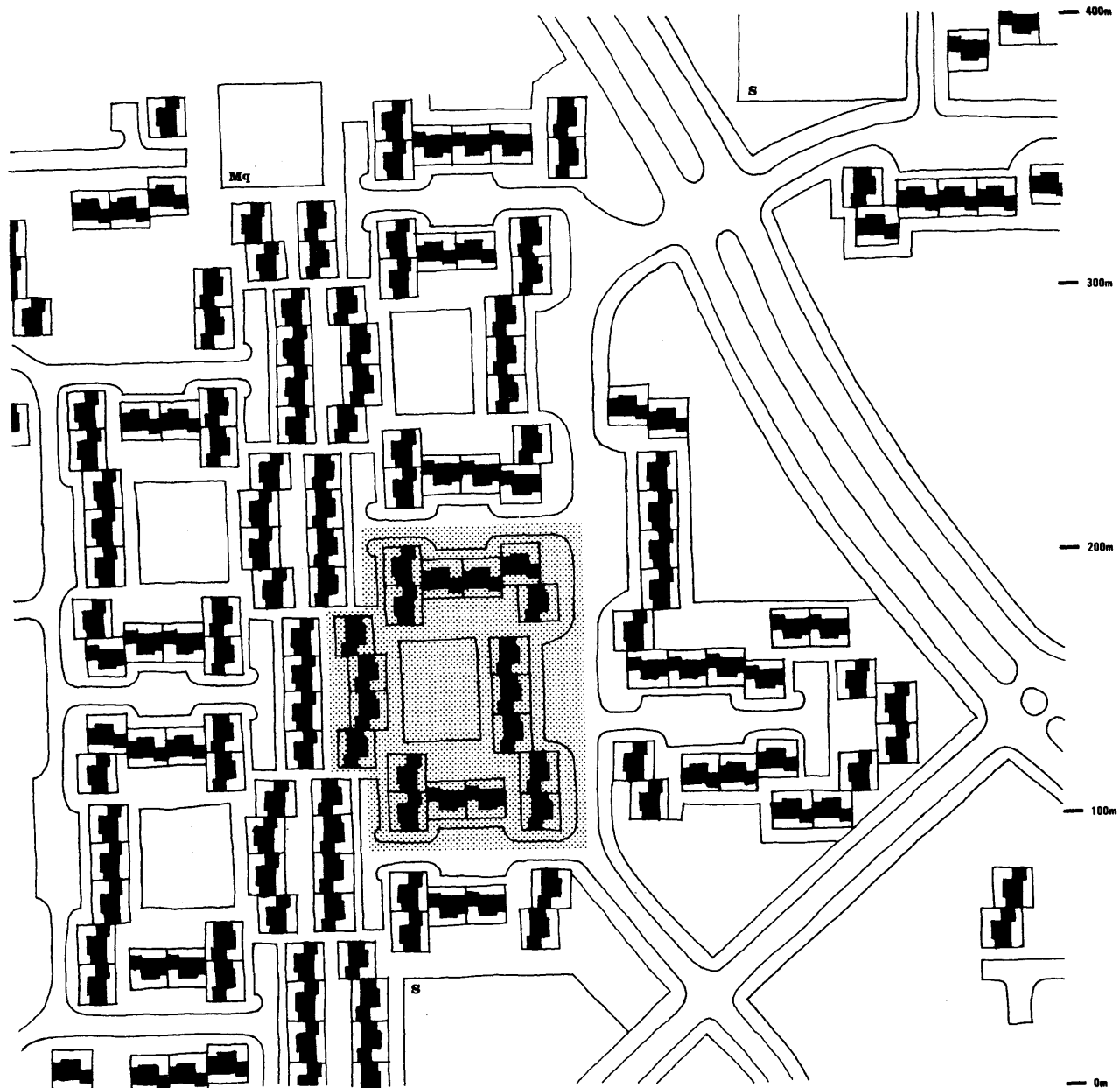


LOCALITY SEGMENT AIR PHOTOGRAPH



1:2500





LOCALITY CONSTRUCTION TYPES

	0	%	100	SELF-HELP	ARTISAN	SMALL CONTRACTOR	LARGE CONTRACTOR
OTHERS	_____			_____	_____	_____	_____
ADOBE	_____			_____	_____	_____	_____
WOOD	_____			_____	_____	_____	_____
MASONRY WOOD	_____			_____	_____	_____	_____
MASONRY CONCRETE	_____			_____	_____	_____	_____
CONCRETE	██████████			_____	_____	_____	██████████

The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.
Quality of information: Accurate

LOCALITY UTILITIES AND SERVICES

WATER SUPPLY	██████████
CESSPOOL	██████████
STORM DRAINAGE	_____
ELECTRICITY	██████████
PROPANE TANKS	██████████
REFUSE COLLECTION	██████████
PUBLIC TRANSPORTATION	██████████
PAVED ROADS, WALKWAYS	██████████
TELEPHONE	██████████
STREET LIGHTING	██████████

LOCALITY COMMUNITY FACILITIES

POLICE	██████████
FIRE PROTECTION	██████████
HEALTH	██████████
SCHOOLS, PLAYGROUNDS	██████████
RECREATION, OPEN SPACES	██████████

The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.
Quality of information: Approximate

██████████ SELECTED BLOCK



LOCALITY SEGMENT PLAN

1:2500

BLOCK PLAN: A typical block is surrounded by service streets on three sides, and on the fourth, by pedestrian paths. The lots surround a small, semi-private area used as a playground for 19 dwelling units. All lots are 15 x 15m in size.

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	19	1.13	16.81
DWELLING UNITS	19	1.13	16.81
PEOPLE	133	1.13	117.70

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.58	51
SEMI-PUBLIC (open spaces, schools, community centers)	0.12	11
PRIVATE (dwellings, shops, factories, lots)	.43	38
SEMI-PRIVATE (cluster courts)	—	—
TOTAL	1.13	100

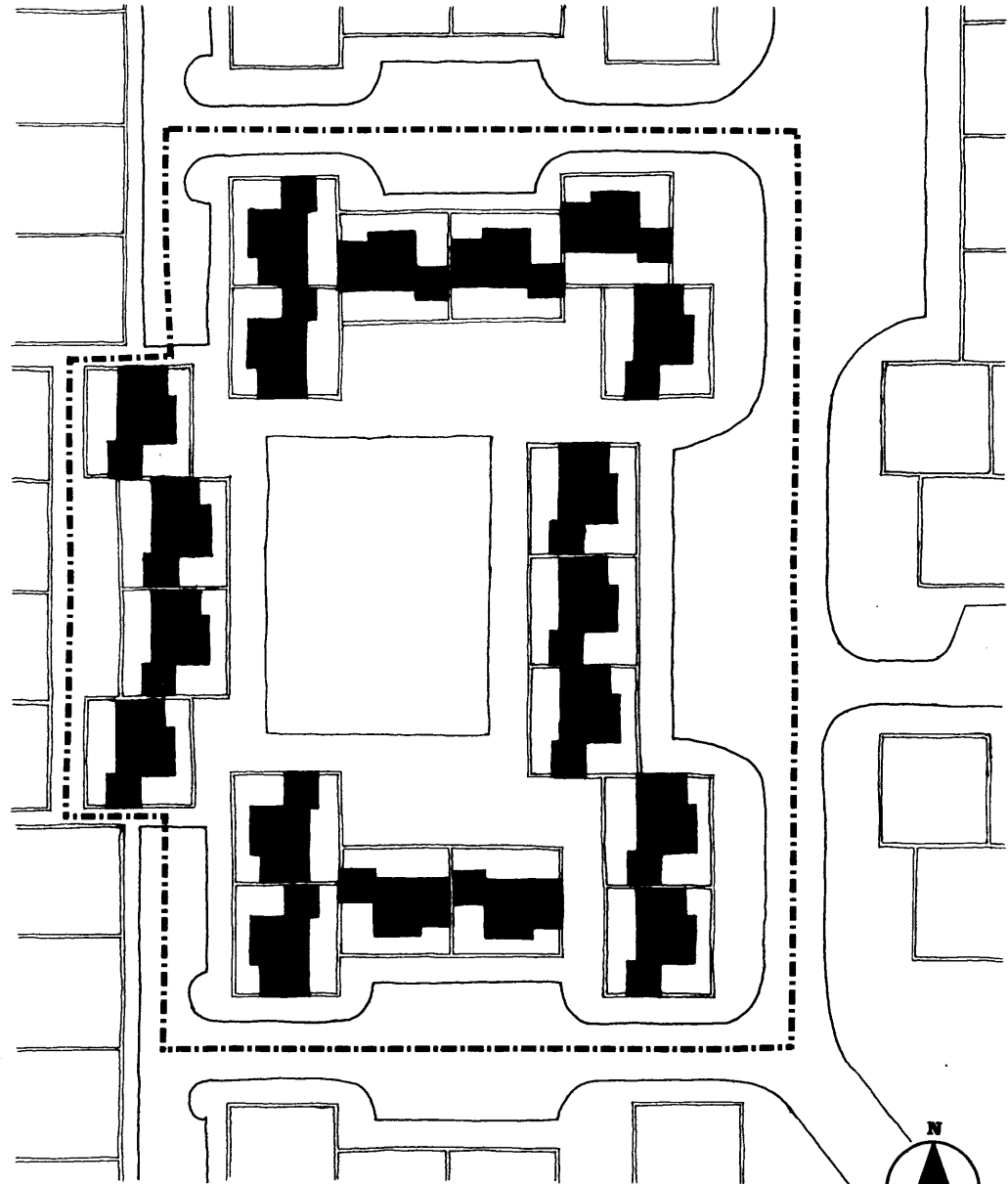
NETWORK EFFICIENCY

R-FACTOR

$$\frac{\text{network length (circulation)}}{\text{area served (circulation, lots)}} = \frac{191\text{m}}{1.13}$$
$$= 169\text{m}/\text{Ha}$$

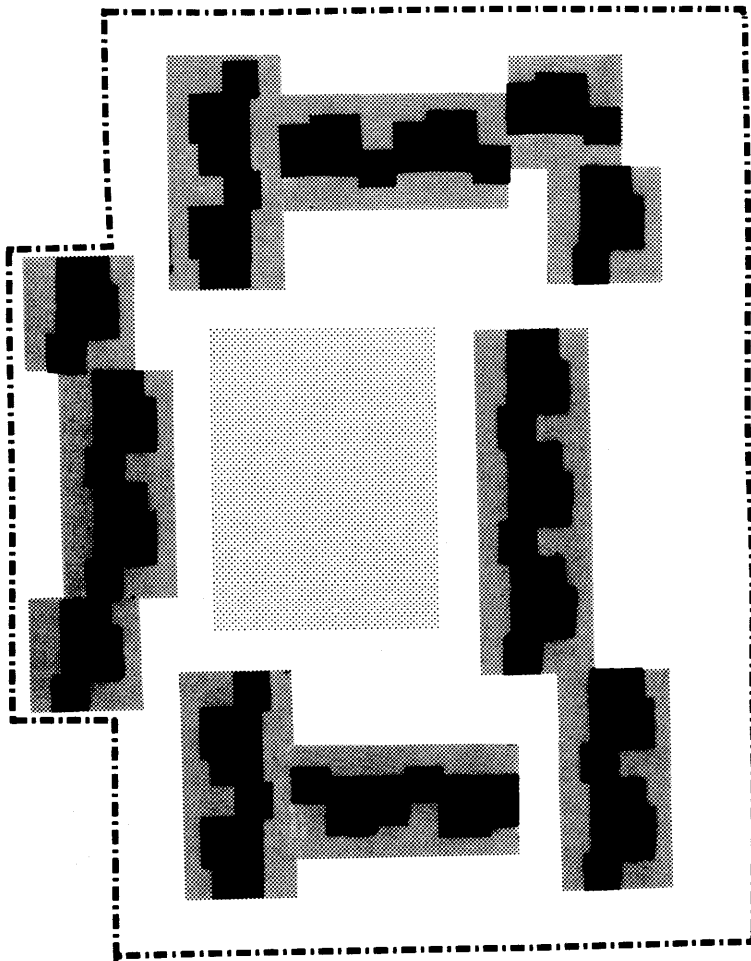
AVERAGE LOT AREA

$$\frac{\text{total area (circulation, lots)}}{\text{number of lots}} = \frac{594\text{m}^2}{19}$$



LOCALITY BLOCK PLAN

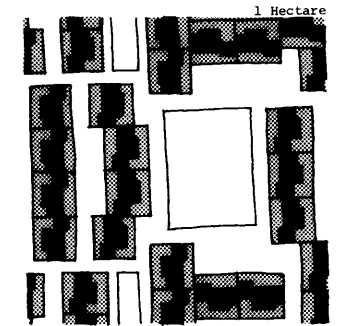




LOCALITY BLOCK LAND UTILIZATION

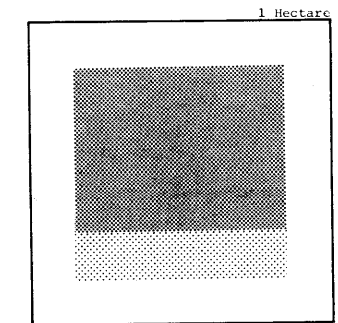
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LAND UTILIZATION DIAGRAMS



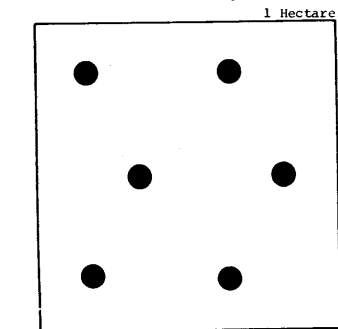
PATTERN

Public:	streets/walkways	
Semi-Public:	playgrounds	
Semi-Private:	cluster courts	
Private:	lots	
	dwellings	



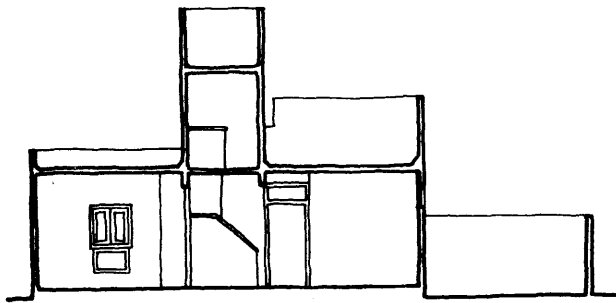
PERCENTAGES

Streets/Walkways	51%
Playgrounds	11%
Cluster Courts	-
Dwellings/Lots	38%

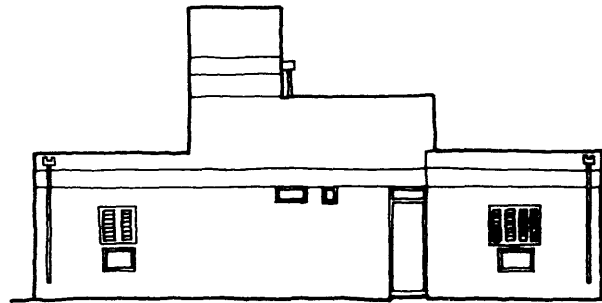


DENSITY

	Persons/Hectare	120
	20 Persons	



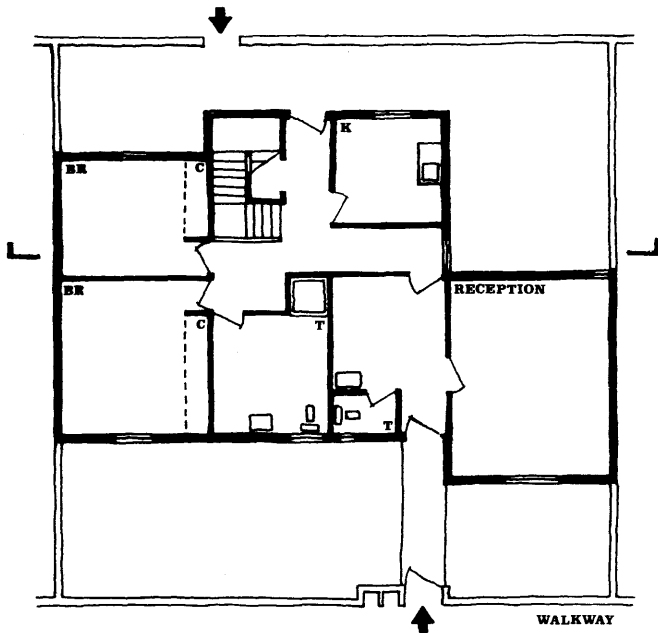
SECTION



ELEVATION

TYPICAL DWELLING: Two entrances, the main opening on a front yard and the service entrance opening on a back yard, serve the dwelling. There is a possibility for expansion horizontally or vertically. There is enough room in the bathroom for a washing machine.

STREET



PLAN

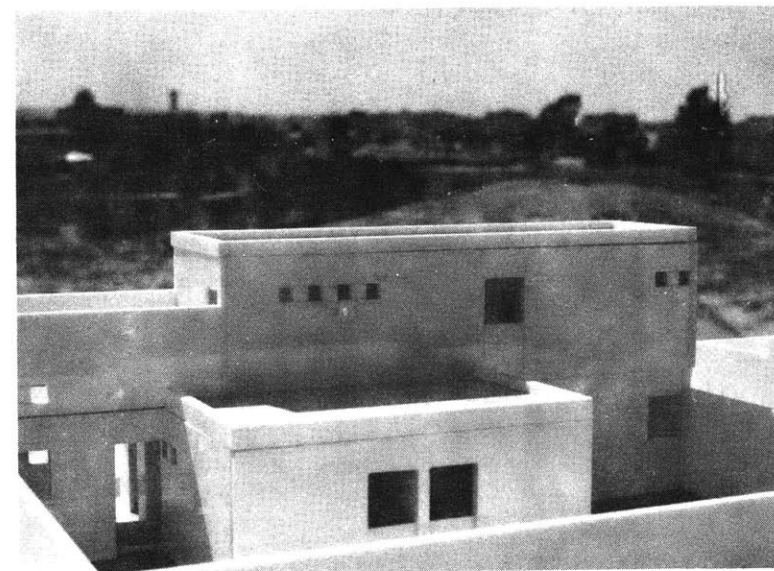
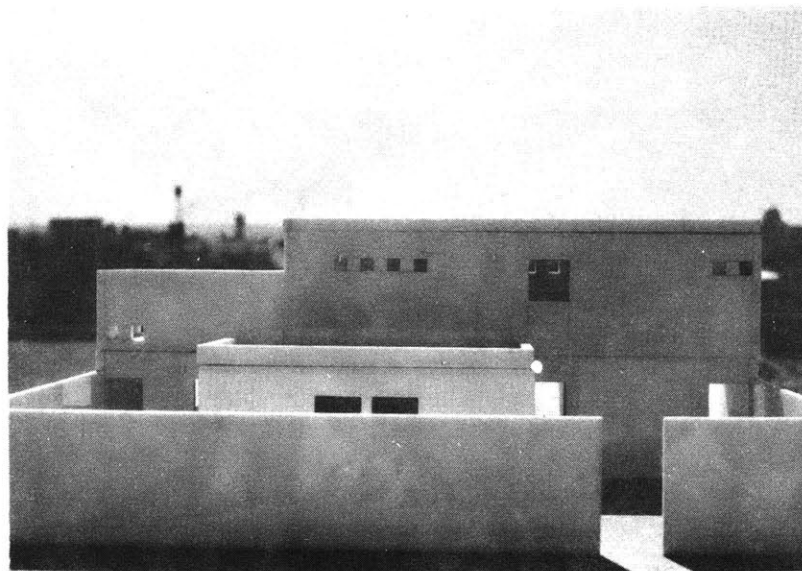
KEY

- LR Living Room
- D Dining/Eating Area
- BR Bedroom
- K Kitchen/Cooking Area
- T Toilet/Bathroom
- L Laundry
- C Closet
- S Storage
- R Room (multi-use)



1:200

TYPICAL DWELLING

**PHYSICAL DATA**

(related to dwelling and land)

DWELLING UNIT
 type: House
 area (sq m): 110
 tenure: Legal ownership

LAND/LOT
 utilization: Private
 area (sq m): 225
 tenure: Legal ownership

DWELLING
 location: Periphery
 type: Semi-detached
 number of floors: 1
 utilization: Single family
 physical state: Good

DWELLING DEVELOPMENT
 mode: Instant
 developer: Public
 builder: Large contractor
 construction type: Concrete
 year of construction: 1974

MATERIALS
 foundation: Reinforced concrete
 floors: Tiles
 walls: Cement block
 roof: Reinforced concrete slab

DWELLING FACILITIES
 wc: 2
 shower: 1
 kitchen: 1
 rooms: 3
 other: Store, yard

SOCIO-ECONOMIC DATA

(related to user)

GENERAL: SOCIAL The project is under construction, user's ethnic origin: information are not available.
 place of birth:
 education level:

NUMBER OF USERS
 married:
 single:
 children:
 total:

MIGRATION PATTERN
 number of moves:
 rural - urban:
 urban - urban:
 urban - rural:
 why came to urban area:

GENERAL: ECONOMIC
 user's income group:
 employment:
 distance to work:
 mode of travel:

COSTS
 dwelling unit:
 land - market value:

DWELLING UNIT PAYMENTS
 financing:
 rent/mortgage:
 % income for rent/mortgage:

LOCALITY SOURCES

Plan: (accurate) M & R International
 Land Use Pattern: (accurate) IBID.
 Circulation Pattern: (approximate) IBID.
 Segment Plan: (accurate) IBID.
 Block Plan: (accurate) IBID.
 Block Land Utilization: (accurate) IBID.
 Typical Dwelling: (accurate) IBID.
 Physical Data: (accurate) IBID.
 Socio-Economic Data: Unknown.
 Photographs: A. Shuaibi & M. Hussayen, 1974.
 General Information: Housing Studies in the Kingdom of Saudi Arabia, M & R International Consultants, 1973.



EVALUATIONS

The following sections are contained in the evaluations: DWELLINGS TIME/PROCESS PERSPECTIVE, models relating the case studies to their original models.

PHYSICAL DATA MATRIX, a comprehensive summary of the data with comments.

COMMUNITY FACILITIES, UTILITIES, SERVICES MATRIX, summary of the availability of facilities.

LAND UTILIZATION: PATTERNS, PERCENTAGES, DENSITIES, a graphic comparison of land utilization.

LAND UTILIZATION: OPTIMUM RANGES, a cross comparison of densities and percentages of land utilization.

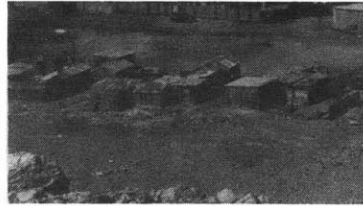
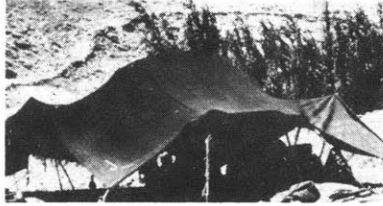
LAYOUT EFFICIENCY: a comparative graph illustrating the relationship of the circulation net works with the area served

DWELLINGS TIME/PROCESS PERSPECTIVE

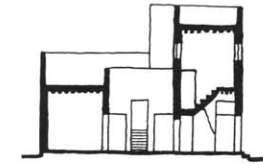
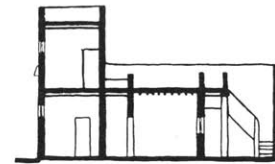
The five case studies of Riyadh city are representative of types of existing housing situations which illustrate different cases of land utilization. Case studies do not include all of the dwelling types existing in Riyadh city. Eight dwelling types represent the existing housing models presented in the following pages. The models have been distributed in the chart in an attempt to relate them to their originating models and to see them in a broader time/process perspective.

From the eight models described on the following pages, only three are Arabic models (tent, traditional, and transitional houses). One is Western oriental and four are universal. The models permit medium/high densities, with the exception of the detached house which provides low density. Five models are accessible to very low/moderately low income groups and three are accessible to medium/high income group. Five models provide efficient land utilization. Models have to be improved in terms of safety, and it is important to encourage efficiency in administrative procedures.

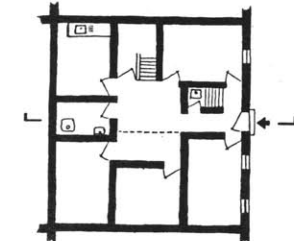
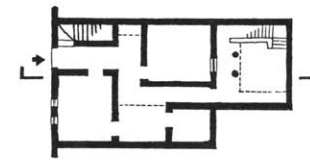
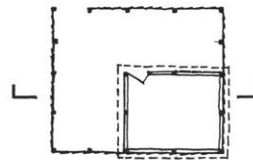
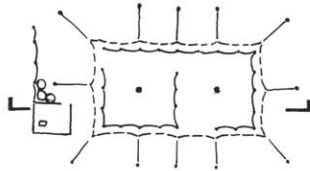
DWELLINGS TIME/PROCESS PERSPECTIVE



Section



Plan



ORIGINAL MODEL

TENT

SHACK

TRADITIONAL HOUSE

TRANSITIONAL HOUSE

Physical Characteristics

Separated or grouped movable units, used in the desert by nomads

Groups of shanties scattered in privately owned lands

Grouped interior court houses 1-2 stories, characterize with two courts. Entrance opens indirectly to the central court.
Medium/high density

Modified from the traditional model with only one central court directly connected with main entrance.
Medium/high density

Population Density

Medium/high density.

Medium/high density

Provides good land utilization and privacy.
Economic use of land is major constraint.

Provides good land utilization and privacy.
Economic use of land is major constraint.

Land/Layout

Shepherds looking for pasture lands

Economic use of land is not major constraint.

Arabic model used different income groups.

Arabic model used by different income groups.

Users

Arabic temporary structures used by tribal groups

Universal model used by very low income groups.

All the existing units were built in the past and construction of this type no longer exists.

Model was developed in Riyadh by private sector as an alternative for housing new migrants.

PRESENT MODEL

There is no change added to the structure of original model. Exterior toilets are provided in the urban areas.

Model imported to Riyadh in the recent period and used by laborers working on construction projects.

Low/moderately low income groups.

Low income groups.

Users

Very low income nomadic, migrant groups, moved to the city to look for work or to squat

Very low income groups

Case Studies

A random case from middle and high income localities

Squatters around existing projects.

AD-DIRA

MANFOHA

LAND ISSUES

ARABIC CULTURE
Permits low/medium densities. Accessible to very low income groups. Efficiency of land utilization is limited.

UNIVERSAL
Permits medium/high densities. Accessible to very low income groups.

ARABIC CULTURE
Permits medium/high densities. Accessible to low/middle income groups. Very efficient land utilization.

ARABIC CULTURE
Permits medium/high densities. Accessible to low income groups.

Comments

Not accessible to urban areas. It is suitable for temporary conditions.

Illegal model for urban areas. Does not provide protection from climate. Danger of fire.

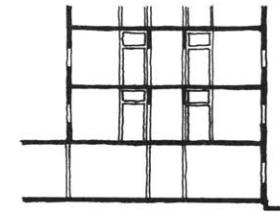
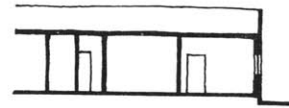
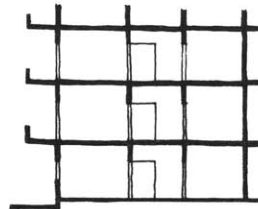
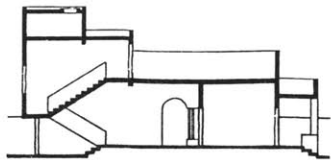
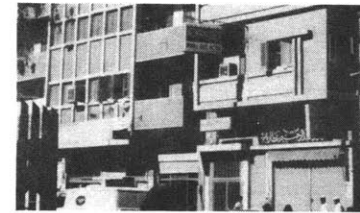
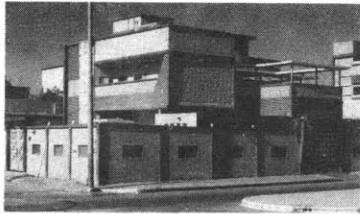
Model provides efficient land utilization, maximization of private responsibility. Provides more privacy and weather protection. Provides private courtyard.

Provides efficient land utilization, maximization of private responsibility. Provides internal courtyard.

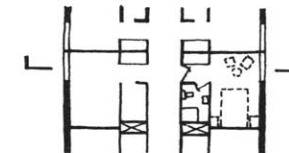
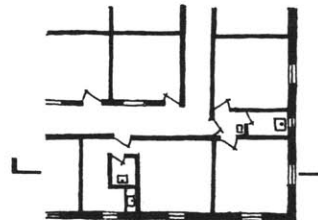
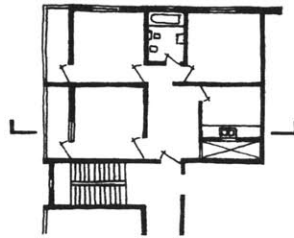
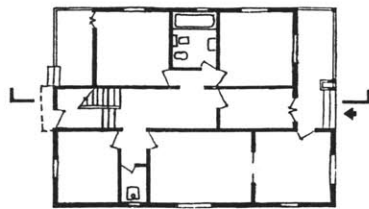
THE PAST

THE PRESENT

THE FUTURE



Section



Plan

DETACHED HOUSE

Detached row houses, 1-2 stories.

Low density

Economic use of land is not major constraint

European model used originally by middle/high income groups.

Model was imported to Riyadh in the XX Century. Used on a large scale, replaced the traditional house.

Middle/high income groups.

KHAZZAN, MALAZZ

WESTERN CULTURE

Permits low/medium population densities. Accessible to middle/high income groups.

Model provides inefficient land utilization, maximization of private responsibility, minimization of privacy and climate protection.

APARTMENT

Groups of several apartments per floor with multiple stories.

Medium/high density.

Economic use of land is a major constraint.

European, XIX Century model, used originally by middle income groups.

Model was imported to Riyadh in the XX Century. Speculation with rents, high investment in construction and utilities.

Middle income groups.

KHAZZAN

UNIVERSAL

Permits medium/high population densities. Accessible to medium/high income groups. Inefficient land utilization.

Model provides efficient land utilization, minimization of private responsibility.

TENEMENT ROOM

Groups of rooms aligned on a corridor or around interior court, one-story units.

Medium/high densities.

Economic use of land is major constraint.

Universal model used by low income groups.

As a result of the increase in educational institute and governmental administration, there is an increased demand for single-family housing.

Used by single family of low income group.

Concentrated in the central area, on Batha Street.

UNIVERSAL

Permits high population densities. Accessible to low/moderately low income groups. Very good land utilization.

Model provides efficient land utilization, minimization of private responsibility. Single groups should be encouraged to use it.

SERVICED ROOM

Rooms used by visitors and businessmen like hotel and motel rooms.

High density.

Economic use of land is major constraint.

Used by visitors for long term temporary living. For middle/high income groups.

Model was known in the Islamic countries from the X Century. The old model was developed and imported to Riyadh in the XX Century.

Middle/high income groups.

Concentrated in the city center.

UNIVERSAL

Permits high population densities. Accessible to middle/high income groups.

Model is necessary for the city. There are demands for hotels in Riyadh.

ORIGINAL MODEL

Physical Characteristics

Population Density

Land/Layout

Users

PRESENT MODEL

Users

Case Studies

LAND ISSUES

comments

THE PAST

THE PRESENT

THE FUTURE

PHYSICAL DATA MATRIX

Category	Population per Category	% of Total Population	LOCALITIES	USER	DWELLING UNIT				LAND/LOT			DWELLING				DWELLING DEVELOPMENT						
				5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
				Income	Type	Area	Ten- ure	Rent/ Mort.	Utili- zation	Area	Tenure	Loca- tion	Type	No. Floors	Utili- zat'n	Phy. State	Mode	Devel- oper	Builder	Construction Type	Date	Den.
Very Low Low Moderately Low Middle High	Shanty Room Apartment House	50m ² or less 51 - 100m ² 101m ² or more	Legal Rental Legal Ownership	20% or less of income 21% or more of income	Public Semi-Public Private	m ²	Extralegal: rental Extralegal: ownership Legal: rental Legal: ownership	City Center Inner Ring Periphery	Detached Semi-Detached Row/Group Walk-up High-rise	1 2 3 or more	Single Multiple	Bad Fair Good	Incremental Instant	Popular Public Private	Self-Help Artisan Small Contractor Large Contractor	Shack Adobe Wood Masonry/Wood Masonry/Concrete Concrete	Year of Construction	People/Ha	Locality			
A	410,000	78	1. AD-DIRA							140									1730	260	1	
			2. MANFOHA							121										1955	460	2
B	60,000	11	3. KHAZZAN							351									1960	120	3	
			4. MALAZZ							625										1965	80	4
C	30,000	6	5. KHURAI							225									1973	120	5	
			TOTAL																	500,000	95	
	24,000	5	HIGH INCOME																24,000	5		
	524,000	100	TOTAL POPULATION																524,000	100		

NA = Not Available

The physical data of the five case studies existing in Riyadh is summarized in the physical data matrix and in the following comments. The matrix permits: a) a comprehensive view of the spectrum of dwelling types; b) a comparison and determination of trends and patterns.

(1) CATEGORY: (2) POPULATION PER CATEGORY: Number of people; (3) PERCENT OF TOTAL POPULATION: (4) NAME OF LOCALITY. The five case studies have been grouped in three categories, identifying different income groups, housing systems and selected physical characteristics. The three categories shown were identified as follows:

Category/income	Pattern	Dwelling
A Low/M.Low/Middle	Old	Traditional Transitional
B Middle	New	Detached
C M.Low/Middle	Public	Detached

Category A includes the low, moderately low, and middle income groups, and represents the majority of the population (78%). Category B includes middle income groups and represents 11% of the population. Category C includes the moderately low and middle income groups in public subsidized housing and represents 6% of the population.

(5) USER INCOME GROUP: The income level is the basic indicator in the expected pattern: The higher the income, the higher is the level of the indicator. The process of housing for the low income groups is a matter of survival whereas in the higher income group, it is a service or a commodity. (Note MANFOHA, low income, adobe, 121m², in contrast with MALAZZ, middle income, concrete, 625m².)

(6) DWELLING UNIT TYPE: The percentage of shanty and room is very low. Low income groups live in old, adobe houses in and around the city center. Middle income groups live in apartments along main streets and in new detached houses.

(7) DWELLING UNIT AREA: There is a small percentage of very low income groups living in shacks or tents whose areas in this case are lower than 50m². Low and moderately low income groups live in houses having areas of more than 100m². Middle income groups live in apartments having areas of 50 - 100m² and houses having more than 100m².

(8) DWELLING UNIT TENURE: The low, moderately low, and middle income groups live in legal/ownership of their houses. Some middle income groups live in legal/rented apartments as in Ad-Dira and Khazzan.

(9) DWELLING UNIT-PERCENT INCOME FOR RENT AND MORTGAGE: In the cases of public housing projects, Malazz and Khurais, the percent of mortgage is less than 20% of the total household income. In the first three case studies, the mortgage percent is not applicable and rent percentages are not available.

(10) LAND/LOT UTILIZATION: In the five case studies, people have complete control of their land. Squatters, who are a rare phenomenon and were therefore not covered in the typologies section, have public and semi-private land utilization.

(11) LAND/LOT AREA: In the old-pattern quarters like Ad-Dira and Manfoha, the land/lot area ranges from 121m² to 140m². In the new quarters like Khazzan and Malazz, the land/lot area is more than 200m².

(12) LAND/LOT TENURE: Most of the effective tenures are legal rental and legal ownership in Riyadh city. A very low percentage are extralegal.

(13) DWELLING LOCATION: The city center is mostly occupied by low and moderately low income groups (Ad-Dira). Such groups have access to services, jobs, and facilities. The inner ring is occupied by middle income groups (Khazzan, Malazz). Khurais Housing Project is for low middle income groups located on the periphery. High income groups occupy the periphery.

(14) DWELLING TYPES: Ad-Dira has three dwelling types: row/group houses, walk-up apartments, and high-rise apartments because of its location in the city center. Manfoha, a locality of low income groups, has transitional row houses. Middle and high income groups (Khazzan, Malazz) occupy detached houses built outside the city center.

(15) DWELLING FLOORS: Most dwellings are generally one to two floor units in all income groups. Walk-up apartments are accepted as land values increase. High-rise units are provided on a limited scale for middle income groups.

(16) DWELLING UTILIZATION: Single occupancy in row/group housing (Ad-Dira, Manfoha, Khurais), multiple dwelling occupancy (Khazzan, Malazz), or walk-up apartments are the forms of utilization.

(17) DWELLING PHYSICAL STATE: The pattern of physical state is as follows: Fair states are found in low and moderately low income groups, particularly in Ad-Dira and Manfoha; good physical states are generally typical of middle income groups and of public housing.

(18) DWELLING DEVELOPMENT MODE: Incremental mode is used by low/moderately low income groups, particularly in Manfoha and Ad-Dira. Instant mode is typical of middle/high income groups and public housing projects.

(19) DWELLING DEVELOPER: The private sector deals with land subdivisions and develops their houses individually. The public sector is concerned with housing projects for low and middle income government employees.

(20) DWELLING BUILDER: Artisans are employed in most of the traditional, old-pattern (Ad-Dira, Manfoha) localities. Small contractors are hired by middle/high income groups to build individual houses. The public sector generally employs large contractors for the construction of low/middle income housing projects.

(21) DWELLING CONSTRUCTION TYPES: The most common material is adobe and it counts for approximately 60% of the dwellings in Riyadh. Concrete is typical of the new pattern, and counts for approximately 25% of the dwellings in the city.

(22) DWELLING DEVELOPMENT - YEAR OF CONSTRUCTION: The oldest case study, Ad-Dira located in the city center, was built in 1730.

This was followed by Manfoha. As a result of the transferring of the ministries from Jeddah to Riyadh, new localities were built after 1950.

(23) DWELLING DEVELOPMENT - DENSITY: There is a clear pattern between density and income group: lower densities characterize middle income groups; higher densities characterize low income groups.

COMMUNITY FACILITIES, UTILITIES/SERVICES MATRIX

Category	Population per Category	% of Total Population	LOCALITIES	COMMUNITY FACILITIES					UTILITIES AND SERVICES									Locality		
				Police	Fire Protection	Recreation	Health	Schools, Playgrounds	Refuse Collection	Water	Cesspool	Storm Drainage	Electricity	Propane Tanks	Public Transportation	Paved Roads, Walkways	Telephone		Street Lighting	
A	410,000	78	1. AD-DIRA	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1
			2. MANFOHA	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
B	60,000	11	3. KHAZZAN	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	3
			4. MALAZZ	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
C	30,000	6	5. KHURAIS	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	5
			TOTAL	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	500,000	95	TOTAL	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	24,000	5	HIGH INCOME	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	524,000	100	TOTAL POPULATION	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

The Community Facilities, Utilities/Services data of the five case studies existing in Riyadh City is summarized in the Community Facilities, Utilities/Services matrix and in the following comments:




COMMUNITY FACILITIES:

Good, efficient systems of police and fire protection are provided throughout the whole city, so adequate protection exists in the five case studies, except in Khurais which is a housing project under construction. Recreation areas are adequate in housing projects Malazz and Khurais, limited in Khazzan and Ad-Dira, and non is provided in low income locality Manfoha. Health care is adequate in most of the localities except for the low income locality Manfoha and Khurais where none is available. Schools/playgrounds are adequate throughout the city. Different levels of schools exist in every community in Riyadh.

UTILITIES AND SERVICES:

The city has an efficient refuse collection system provided by Riyadh municipality. Water supply and electrical systems are adequate for the entire city. Every building currently has a separate cesspool, until the sewerage system, now under construction is completed. There is no storm drainage in Riyadh. Propane gas is the main form of fuel, received and used in tanks. Public transportation is adequate in the main residential parts of the city and the city center. Khurais Housing Project, located on the periphery, is inaccessible by public transportation. Paved roads and walkways are adequate in the city center Ad-Dira, limited in other localities, and proposed for the housing project under construction, Khurais. The telephone system is adequate for the whole city and not available in the housing project. Street lighting is adequate in the city center and limited in other parts of the city.

The matrix illustrates the approximate availability of community facilities, utilities, and services in the 5 case studies. Three levels are indicated as follows:

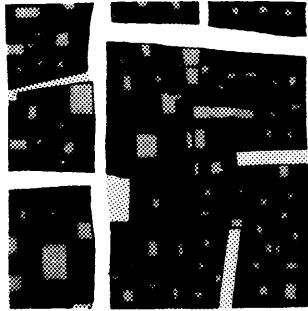
-  No provision at all.
-  Limited or occasion.
-  Adequate or normal.

**LAND UTILIZATION:
PATTERNS, PERCENTAGES, DENSITIES**

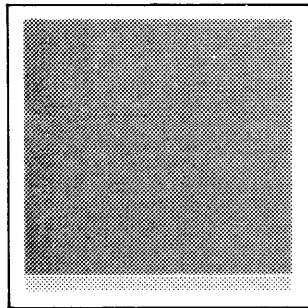
1 AD-DIRA

Houses: private traditional

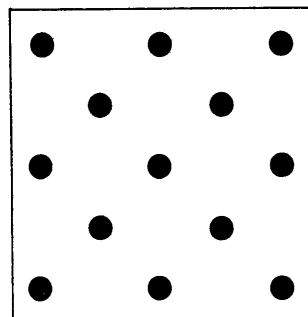
High percentage of land for lots; low percentage of public and semi-private (cul de sac) streets. There is a medium population density in interior areas and a high population density along the main streets.



PATTERNS



PERCENTAGES		
Streets/walkways	19%	
Playgrounds	-	
Cluster Courts	5%	
Dwellings/Lots	76%	

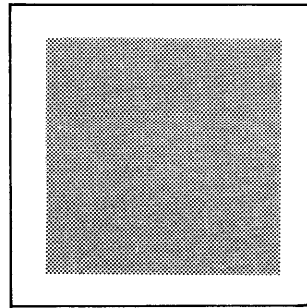
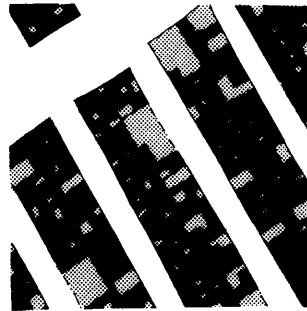


DENSITIES Persons/Hectare 260

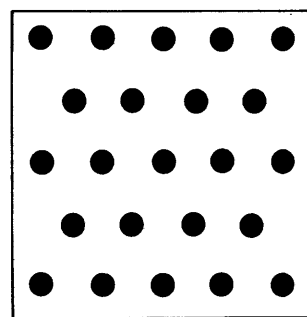
2 MANFOHA

Houses: private, low income

Medium percentage of land for streets and walkways and acceptable percentage of land for residential use; high population density.



Streets/walkways	38%
Playgrounds	-
Cluster Courts	-
Dwellings/Lots	62%

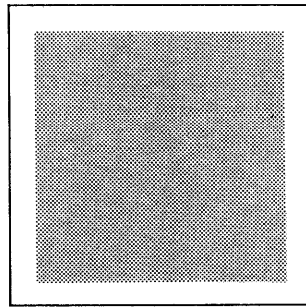
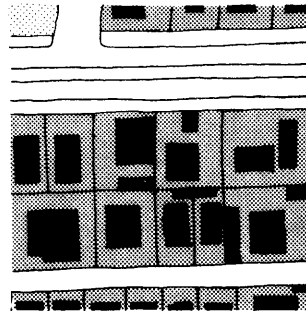


460 P/Ha.

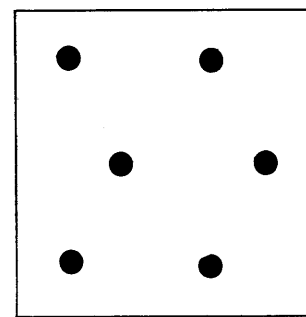
3 KHAZZAN

Houses: private, middle income

Medium percentage of land for streets and walkways; medium percentage of land for lots; low population density.



Streets/walkways	30%
Playgrounds	-
Cluster Courts	-
Dwellings/Lots	70%

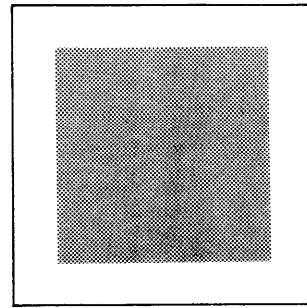
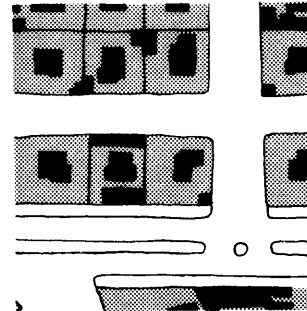


120 P/Ha.

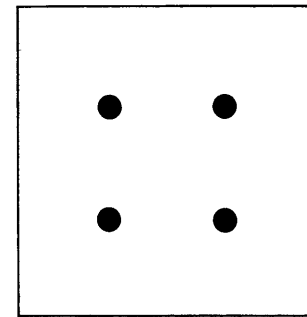
4 MALAZZ

Houses: public, medium-high income

High percentage of land for streets and walkways; all public area used for circulation; very low population density.



Streets/walkways	49%
Playgrounds	-
Cluster Courts	-
Dwellings/Lots	51%

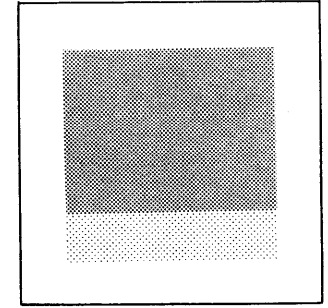
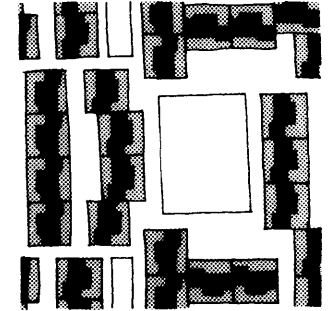


80 P/Ha.

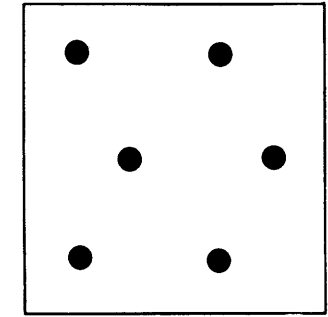
5 KHURAI

Houses: public, low-middle income

Public area for cluster's open spaces and circulation; high percentage of land for streets, walkways, and open spaces; low population density.



Streets/walkways	51%
Playgrounds	11%
Cluster Courts	-
Dwellings/Lots	38%



120 P/Ha.

**LAND UTILIZATION:
OPTIMUM RANGES**

From URBAN SETTLEMENT DESIGN PROGRAM format.

The three graphs shown are used to evaluate and to compare the 5 case studies in terms of LAND UTILIZATION PERCENTAGES and RESIDENTIAL POPULATION DENSITY.

Land utilization percentages are computed for the following areas:
a) PUBLIC: streets, walkways, open spaces; b) SEMI-PUBLIC: open spaces; c) PRIVATE: dwellings, lots.

Residential population density is the total number of persons per unit hectare. The range of desired/acceptable densities is 300 persons per Ha to 600 persons per Ha, based upon case studies and accepted zoning standards in different urban contexts in developing countries. This range can be achieved assuming that the dwelling development is of 1-3 stories, with an average built-up area of 10-20m per person and 30-35 percent of land/lot coverage.

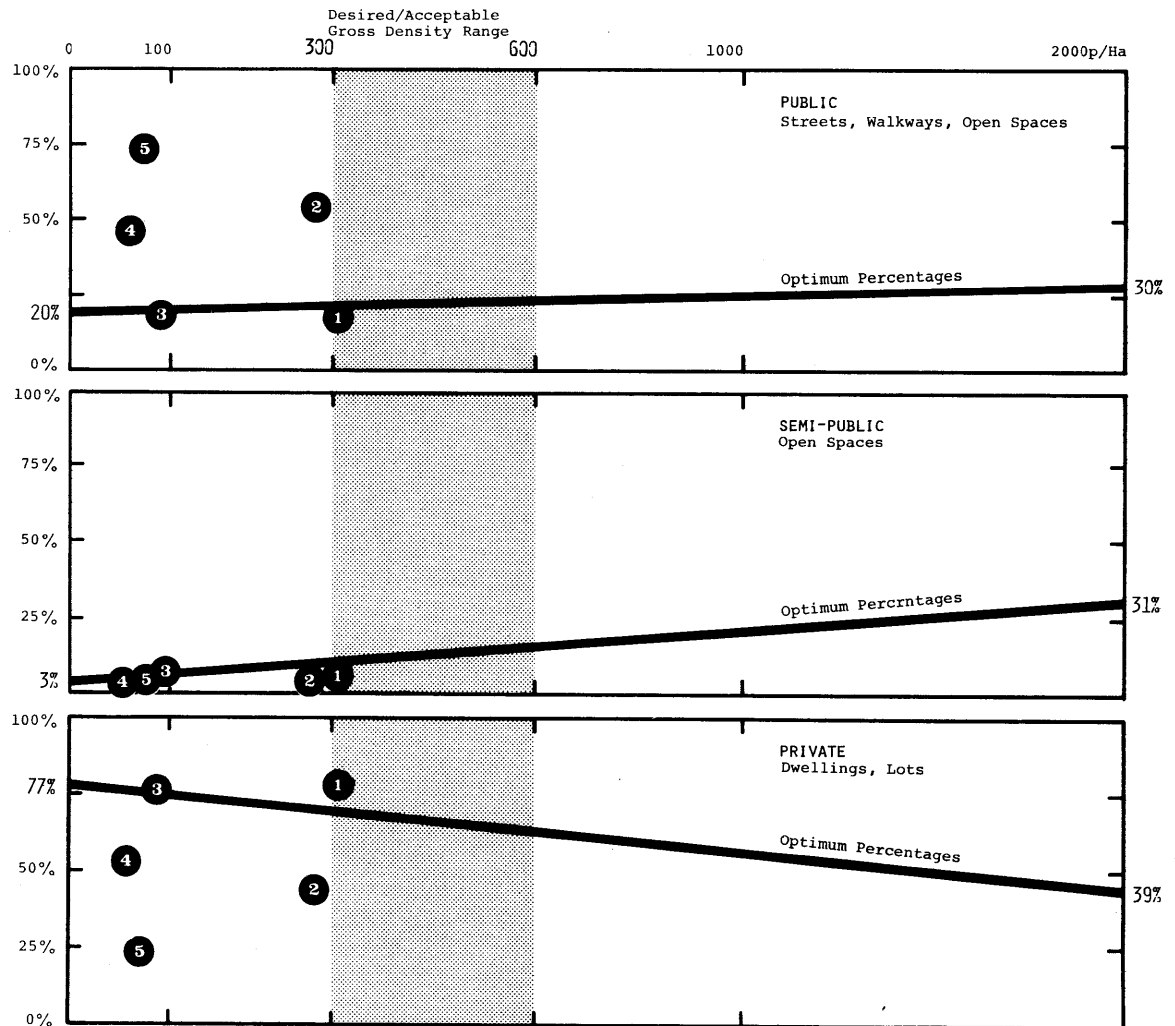
KEY
VERTICAL SCALE: Land utilization percentages (0 to 100%).
HORIZONTAL SCALE: Residential population density (0 to 2,000 persons per Ha shown on logarithmic scale).
CURVE: Range of optimum land utilization percentages (optimum values vary for different densities based upon case studies and accepted zoning standards in different contexts).
SHADED AREA: Desired/optimum efficiency of land utilization (the intersection of desired/accepted residential population densities and desired/accepted land utilization percentages).
NUMBERED DOTS: the Riyadh case studies.

Land utilization percentages are obtained from locality segments.

● PUBLIC: streets, walkways, open spaces. Areas within an urban layout used for pedestrian and vehicular circulation. The land has minimum physical controls and maximum public responsibility in initial purchase, development and maintenance. The CURVE shows: optimum area percentages for streets, walkways, and open spaces. (20-30 %, based upon case studies in Latin America and in the U.S.A.) The percentage of street and walkway areas varies slightly with density.

● SEMI-PUBLIC: open spaces. Areas within an urban layout used for supporting facilities and services. (Open spaces-playgrounds are the only supporting areas considered since the land utilization percentages are only based upon a small sector area). The land has partial or complete physical controls and public/user responsibility in development and maintenance. The CURVE shows: optimum area percentages for open spaces. (3-31%, based upon case studies in Latin America and in U.S.A.) The percentage of open spaces varies considerably with density.

● PRIVATE: dwellings, lots. Areas within an urban layout used for residential and commercial use. The land has maximum physical controls and owner/tenant/user responsibility in development and maintenance. The CURVE shows: optimum area percentages for dwellings and lots. (The range of optimum percentages of land for Public areas is 20-30% with 3-31% for Semi-public areas; therefore, the remaining 77-39% of land is for private use)



LAYOUT EFFICIENCY

From URBAN SETTLEMENT DESIGN PROGRAM format.

The comments below relate to the land utilization percentages of the Riyadh case studies. It may be observed from the graphs that only one case study is within reasonable density ranges. Only one case study satisfies all three optimum land utilization requirements (public, semi-public, private).

● **PUBLIC:** Cases above curve (2,4,5) have a high percentage of land devoted to streets and walkways; therefore, these cases constitute a great burden to the municipal government in terms of land, construction, maintenance, and operation. The case below the curve (1) has a smaller percentage of land devoted to streets and walkways. This case study is located in the city center and is a burden to the municipal government. There is only one case study (3) that has a reasonable percentage of land devoted to streets and walkways.

● **SEMI-PUBLIC:** There is no case above curve which has a higher percentage of land devoted to open areas and public facilities. Cases below the curve (1,2) have a smaller percentage of open areas and public facilities. Cases near the curve (3,4,5) have a reasonable percentage of land for open spaces and public facilities.

● **PRIVATE:** The case above the curve (1) has a high percentage of private land and therefore is a burden to the municipal government in the provision, maintenance, and operation of utilities and services. Cases below the curve (2,4,5) have low percentages of private land. Case (3) has a reasonable percentage of private land. All of the private land is within the lot area of the dwellings.

The urban LAYOUT is the physical configuration determined by the combination of networks of circulation and areas served. Networks of circulation (highways, streets, walkways) define the lines of distribution/collection of the utilities and services, and are publicly owned land. Areas served (lots, blocks) are usually privately owned land. The urban layout is a major economic determinant in the provision of utilities and services and their maintenance and operation.

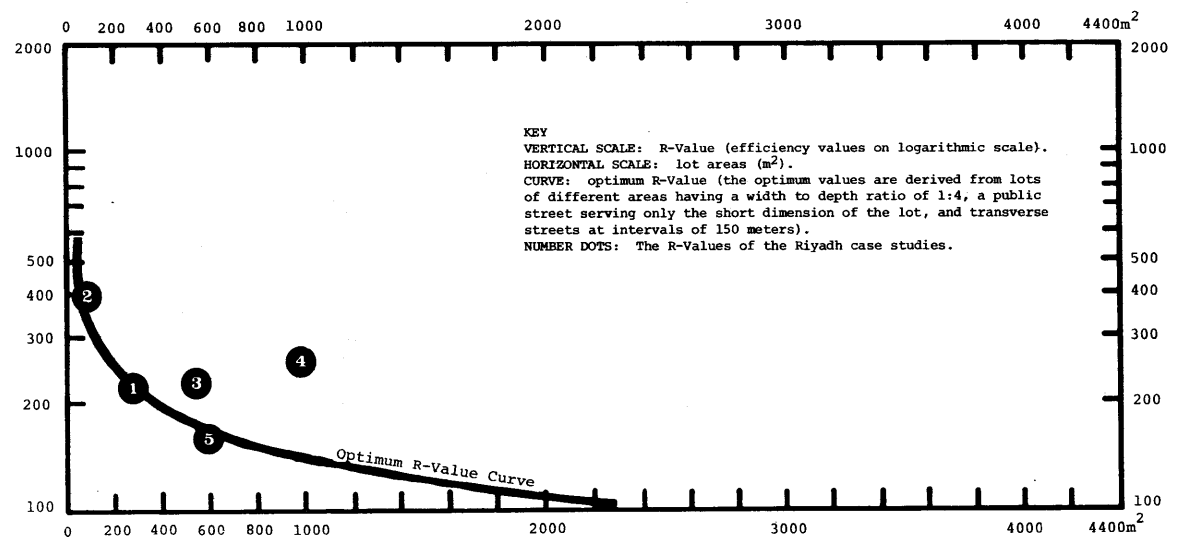
The efficiency/effectiveness of a network is the ratio of the length of the network to the area(s) served:

$$\text{EFFICIENCY OF NETWORK} = \frac{\text{network length}}{\text{area(s) served}} = \text{R-VALUE}$$

The R-Value varies inversely to the network efficiency; a smaller R indicates a higher efficiency and vice versa. The layouts of the case studies have been evaluated in terms of network efficiency and are shown in the graph below. For further information on the R-Value see: "A Method for the Evaluation of Urban Layouts", INDUSTRIAL FORUM, Volume 3, Number 2, Montreal, December, 1971.

R-VALUE SUMMARY

Cases	Degree of Efficiency	Comments
1	Efficient	Medium lots, high population density, efficient lot proportion
2	Efficient	Small lots, high population density, efficient lot proportion
3	Inefficient	Medium lots, low population density, inefficient lot proportion
4	Very Inefficient	Large lots, very low population density, inefficient lot proportion
5	Efficient	Medium lots, low population density, efficient lot proportion



URBANIZATION MODEL

Since Riyadh was chosen as the capital of Saudi Arabia, it has been growing at a very high rate. In 1930 the city population was about 20000, while in 1968 it was more than 300000. With an average rate of 7 to 10% this population growth caused tremendous problems. Housing shortage, lack of facilities, utilities and services, traffic congestion and uncontrolled development are some of these problems.

By realizing this situation the Ministry of Interior for Municipalities granted the studies of existing conditions and the master plan of the city to C. A. Doxiadis Association. The study of existing conditions was prepared in 1968, then revised in 1971. During this period the study of the master plan was carried out and it has been approved in 1974. The implementation of the plan has been assigned to the Supreme Committee for Planning of Riyadh, the Town Planning Authority and Riyadh City Council.

An abstract of the basic plans proposed by Doxiadis Association is included in the following two pages under the title Master Plan Context. The rest of the study is an attempt by the authors to provide arguments and suggestions to stimulate further studies for the development of the sub-areas (localities) of residential primary use, with an approximate dimensions of 2km x 2km in the proposed plan.

The ultimate objective of this study is to assure continuous balance and harmony between the people and their environments. Such objective can only be achieved by the creation of a dynamic design and planning practice, based on the understanding of process of urbanization and population characteristics.

Stereo type models for the development of new urban areas have been avoided because of the following reasons:

- Every site is unique in its physical characteristics and its relation to the urban context;
- population characteristics and expectations are in constant change; and that
- standards, codes and regulations reflect practical trade off between objectives and resources, so, they will not be followed unless the society can afford them.

In response to the previous argument the authors suggest the emphasis on the study of the following:

- Intensity of land utilization as a tool for the qualification of magnitude of different land uses, for the prediction of future changes and for the evaluation of different alternatives.
- Requirements and standards for community facilities, utilities and services; to decide on reservation of some land for future development and for scheduling the provision of facilities and services.
- Development plans; to ensure the consideration of important factors within one integrated framework of development.
- Development process; to ensure the continuous balance in the environment during different periods of development.
- Efficiency of land utilization; to evaluate different alternatives with regard to their efficiency of land utilization.

The scope of consideration and depth of the study has been affected by the limitations of time and distance from the case study.

MASTER PLAN CONTEXT

LAND USE: The physical plan for the development of Riyadh is composed of:

- 1) a major commercial and civic spine which extends to the northwest and the southeast of the existing business district;
- 2) an administrative area which is situated perpendicular to the civic and commercial spine;
- 3) residential districts which extend from both sides of the spine.

A strip of industrial and special-use areas runs parallel to the spine forming a man-made boundary on the northeast. On the other side, the southwest, steep cliff formations of Wadi Hanifah form a natural boundary for the city. These boundaries direct the development of the residential areas parallel to the city spine.

CIRCULATION: The plan of Riyadh shows that the vehicle will continue to be the main mode of transportation. The circulation pattern is planned to have the following hierarchy:

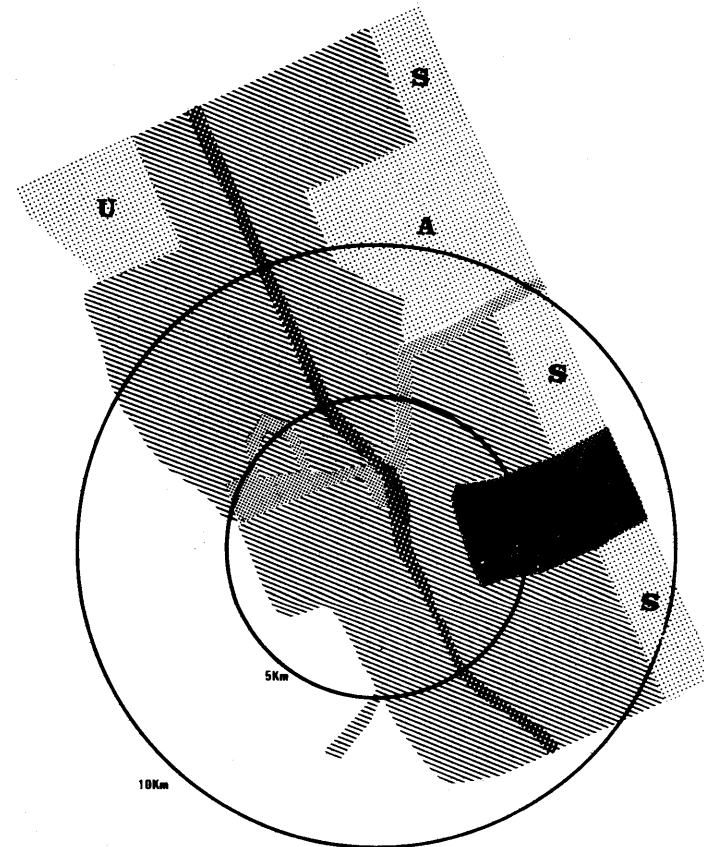
- 1) **FREEWAYS:** four major freeways connect the city with the country freeway system.
- 2) **EXPRESSWAYS:** the grid of expressways runs parallel and perpendicular to the city spine. This grid serves as boundaries for the residential areas (localities);
- 3) **MAJOR ROADS:** the grid of major roads runs through the center of residential localities. It connects these localities to each other as well as to the city spine. This grid is expected to be constructed in the first stage of residential development.

CITY STRUCTURE: The master plan divides the city into six large divisions. Each division will be composed of 8-12 localities with an average dimension of 2km x 2km. Each locality is divided into four urban units with a common center.






FORCAST OF RIYADH GROWTH

YEAR	ESTIMATED BUILT-UP AREA (Ha)	ESTIMATED POPULATION (Persons)	ESTIMATED RESIDENTIAL DENSITY (person/Ha)
1975	9,277	525,000	200
1980	13,484	685,000	--
2000	30,436	1,400,000	--

Source: Riyadh Master Plan, 1972.



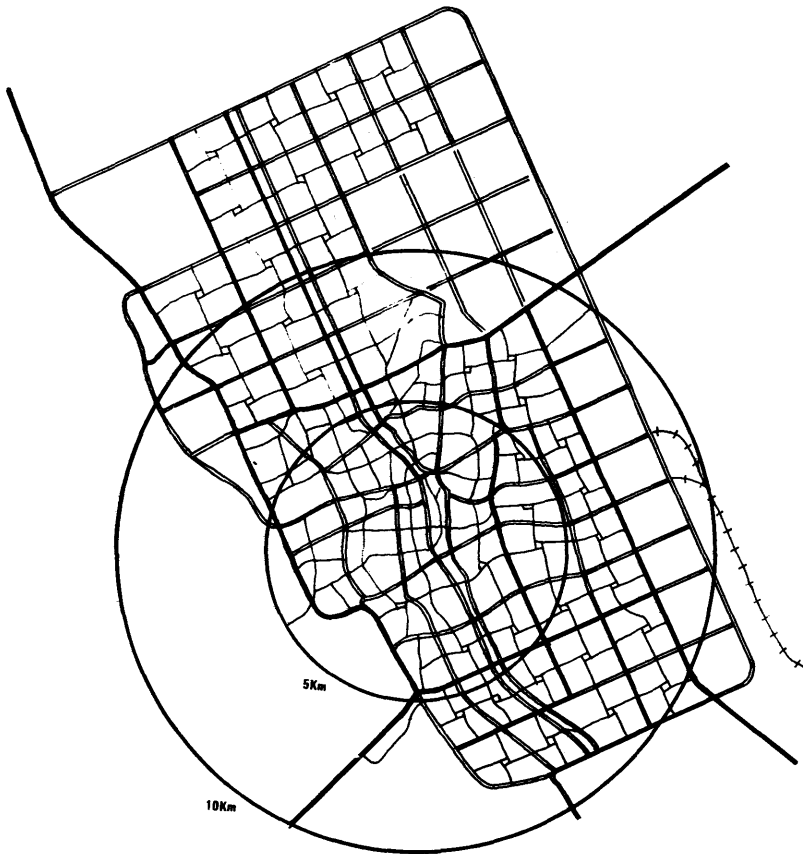
AREAS

-  RESIDENTIAL
-  COMMERCIAL
-  INDUSTRIAL
-  OPEN SPACES
-  ADMINISTRATIVE
- A** AIRPORT (FUTURE OPEN SPACE)
- S** SPECIAL USE
- U** UNIVERSITY



1:250000

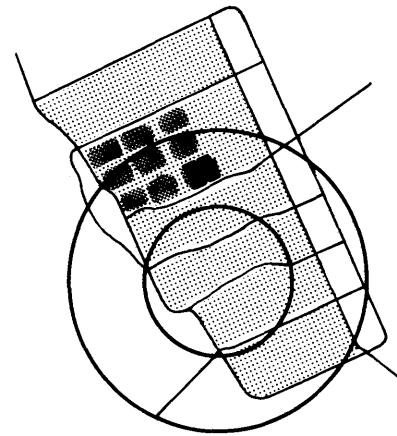
LAND USE PATTERN



- KEY**
- MAJOR ROAD
 - == EXPRESSWAY
 - FREEWAY
 - + + + + RAIL ROAD

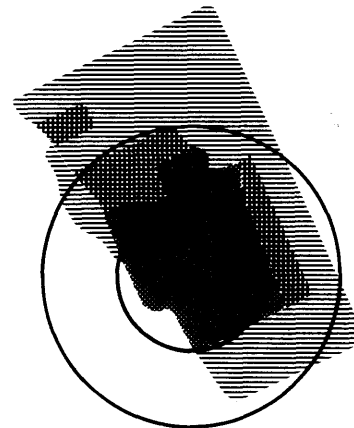


CIRCULATION PATTERN



- ▨ CITY
- ▨ LOCALITY
- ▨ LOCALITY DEVISIONS

STRUCTURE OF COMMUNITIES



- ▨ 1975 (EXISTING)
- ▨ 1980
- ▨ 2000

STAGES OF DEVELOPMENT



1:500000

LOCALITY CONTEXT

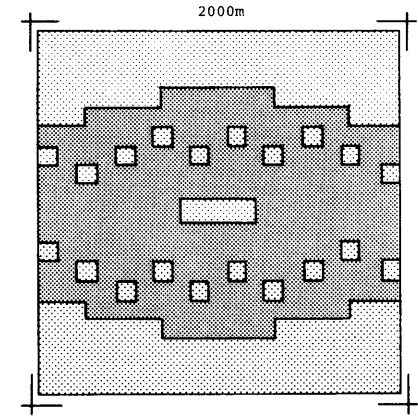
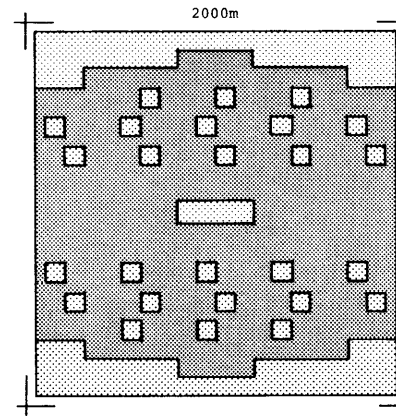
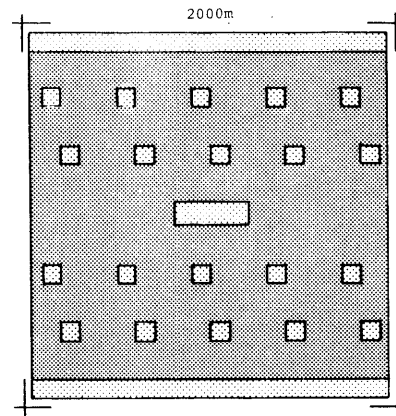
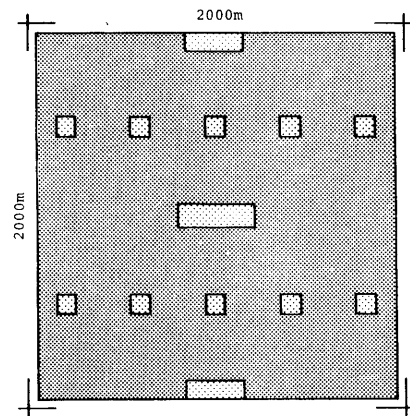
LOCALITY: is each site on the proposed master plan of division no. VI, which has approximate dimensions of 2km x 2km.

LOCALITY BOUNDARIES: are the grid of limited access expressways proposed in the master plan, which separate localities from each other.

LOCALITY ACCESS: is each point on the borders of the locality which permits the movement to extend beyond its limits. Each locality has four points of accesses. The access leading to city spine is the most important one.

LOCALITY SPINE: is the area along the major road leading to city spine. Most of side streets in the locality lead to locality spine.

COMMUNITY FACILITIES



DENSITY	50 p/Ha	200 p/Ha	400 p/Ha	600 p/Ha
POPULATION	20000 p	80000 p	160000 p	240000 p
ASSUMED CIRCULATION	25.0 %	25.0 %	25.0 %	25.0 %
COMMUNITY FACILITIES	4.4 %	15.7 %	27.8 %	44.5 %
PRIVATE AND SEMIPRIVATE	70.6 %	59.3 %	47.2 %	30.5 %

KEY

- PRIVATE AND SEMIPRIVATE (INCLUDING CIRCULATION)
- PUBLIC AND SEMIPUBLIC (INCLUDING CIRCULATION)

(Design just intended to indicate areas, not actual layout.)

Community facilities represent an important part of the land utilization pattern of any community. Usually they are considered semi-public areas, such as schools; in some cases, they might be public areas, such as parks.

The size of community facilities is determined by the number of people: the greater the number of people the larger the area required for public facilities.

The type of facilities depends on the age group of the population and their social and cultural background. In Riyadh, those under the age of fourteen represent nearly 46% of the total population, and it is likely that this trend will continue with little decline in the next two decades. This means that more area than currently provided in Riyadh will need to be devoted to schools, playgrounds, and other related activities.

The community facilities' plans indicate the relationship between population and the size of facilities needed. The elements which have been taken into consideration as necessary for a locality are: schools: kindergarten, elementary, intermediate, and secondary; recreation: playgrounds and parks; and other community facilities: health clinics and centers, mosques, libraries, clubs, police stations, fire stations, and municipal buildings.

The plans however indicate the need for:

- A careful prediction of ultimate population density (in any given context).
- Reserving land for future needed facilities.
- Measures to control population growth in planned residential areas.



LAND UTILIZATION INTENSITY

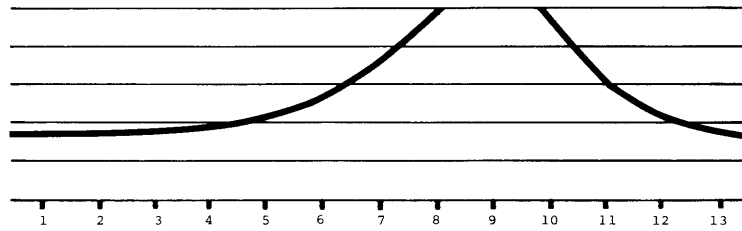
Land utilization intensity is the magnitude or degree of use of unit land by a certain activity at a certain time. The intensity is the result of a set of determinants; these are:

- 1) Generators: the sources of attraction which either stimulate the use of a certain type of activity or create the need for it, ie. employment creates the need for housing;
- 2) Transmitters: paths and modes which provide an easy access to the source of attraction, ie. subway lines, main roads;
- 3) Receivers: areas which receive the effect of generated needs, ie. a residential area around a source of employment.

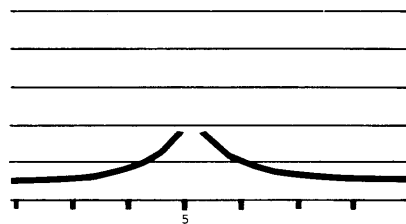
For a specific site the intensity is the result of external as well as internal effects. External effects depend upon the proximity of the site to the main determinants of the intensity such as the generators and the transmitters. Internal effects are the local conditions existing inside the site (the receiver) such as availability of utilities, topography, soil conditions, pollution, view, regulation on use, etc. Values given to any factor vary according to local conditions of different societies and different environments.

RESIDENTIAL INTENSITY: CASE OF RIYADH

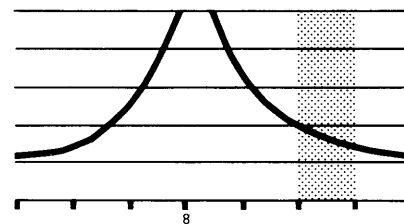
- 1) GENERATORS: The main generator for residential intensity in Riyadh is employment opportunities. Such opportunities are mainly created by:
 - Commercial and business activities located along the city spine;
 - Central government agencies located along the administrative zone;
 - Growing industries located nearby;
- 2) TRANSMITTERS: The main modes of transportation which effect the residential intensity in Riyadh are:
 - Walking;
 - Public transportation (buses and taxis);
 - Private passenger cars.



RESIDENTIAL LAND UTILIZATION INTENSITY
EFFECT ALONG COMMERCIAL AND CIVIC SPINE
horizontal: locations vertical: relative intensities



RESIDENTIAL LAND UTILIZATION INTENSITY
EFFECT OF COMMERCIAL AND CIVIC SPINE (5)
horizontal: locations vertical: relative intensities



RESIDENTIAL LAND UTILIZATION INTENSITY
EFFECT OF COMMERCIAL AND CIVIC SPINE (8)
horizontal: locations vertical: relative intensities

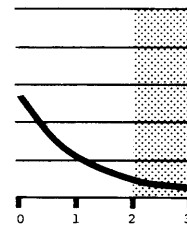
RESIDENTIAL INTENSITY CHARTS

The residential land utilization intensity charts for the city of Riyadh help to find the relative intensity value of any given site within the city. These charts are based on the preceding analysis of intensity determinants.

The relative intensities given are only hypothetical ones in order to proceed with the study. If the concept is to be applied in-depth research is necessary to determine these values in relation to their generators. The values are subject to change with time.

For a given locality in the city (say locality A), the intensity value will be determined by the total value of all determinants:

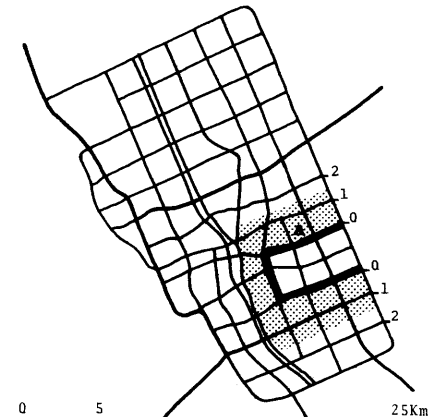
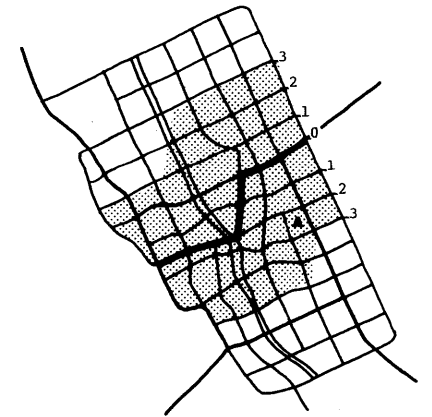
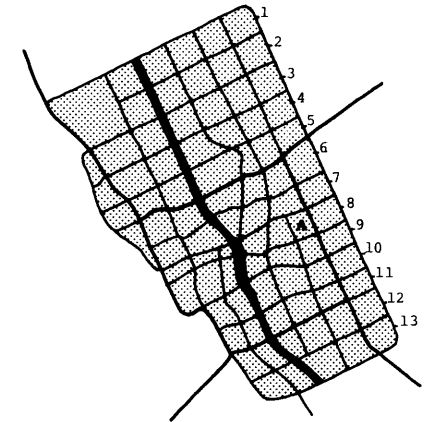
- a) Effect of commercial and civic spine, cross section (8) on which the locality is situated;
- b) Effect of administrative zone (See effect of administrative area);
- c) Effect of industrial zone (See effect of industrial area).



RESIDENTIAL LAND UTILIZATION INTENSITY
EFFECT OF ADMINISTRATIVE AREA
horizontal: locations vertical: relative intensities



RESIDENTIAL LAND UTILIZATION INTENSITY
EFFECT OF INDUSTRIAL AREA
horizontal: locations vertical: relative intensities

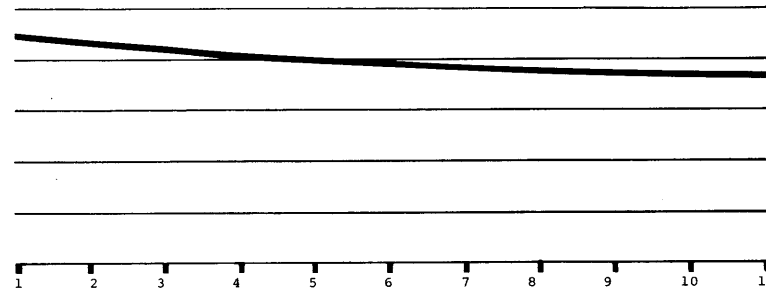


3) RECEIVERS: The area available for housing; the characteristics of each area will influence the ultimate pattern of intensities.

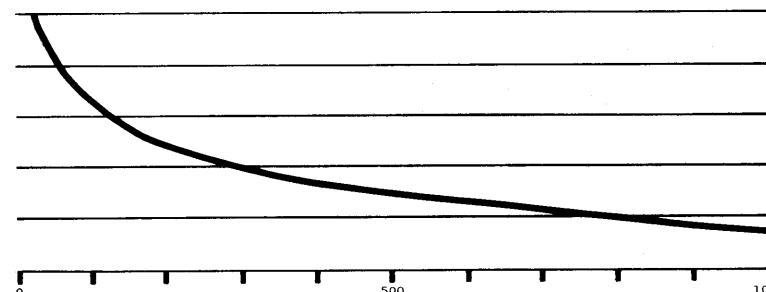
According to the preceding analysis of intensity indicators in Riyadh, the closer the site to city spine, administrative zone, and industrial zone, the higher its intensity and vice versa.

Relative intensity value of a given site within a locality depends on the value of generators and length, comfort, and reliability of available transmitters of generated activities.

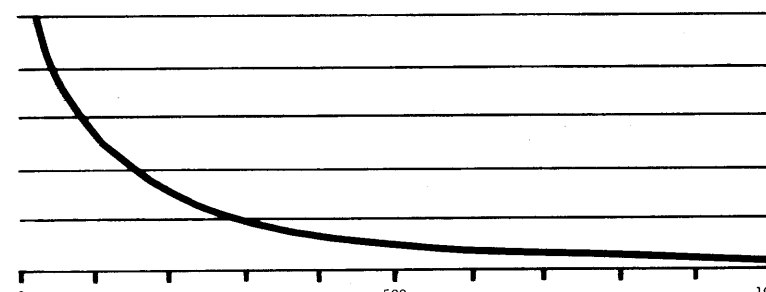
These transmitters are: pedestrian paths, vehicular roads, and public transportation lines.



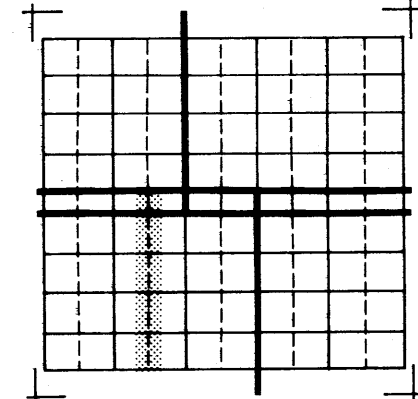
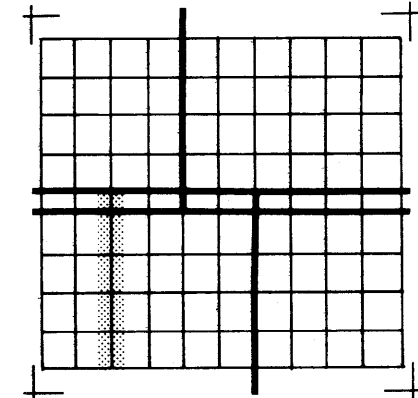
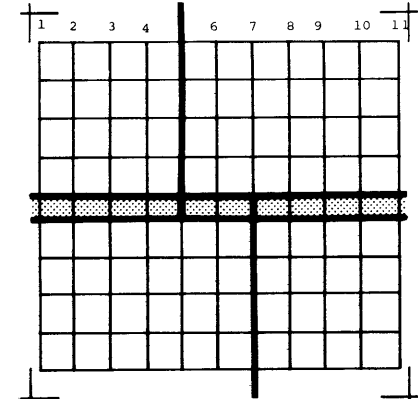
RESIDENTIAL LAND UTILIZATION INTENSITY
EFFECT ALONG LOCALITY SPINE
horizontal: locations vertical: relative intensities



RESIDENTIAL LAND UTILIZATION INTENSITY
EFFECT OF LOCALITY SPINE (VEHICULAR)
horizontal: distance vertical: relative intensities

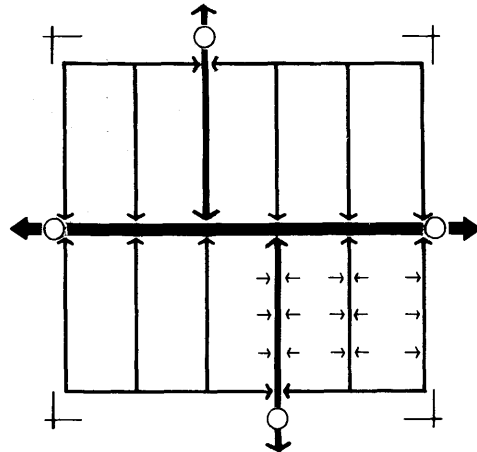


RESIDENTIAL LAND UTILIZATION INTENSITY
EFFECT OF LOCALITY SPINE (PEDESTRIAN)
horizontal: distance vertical: relative intensities

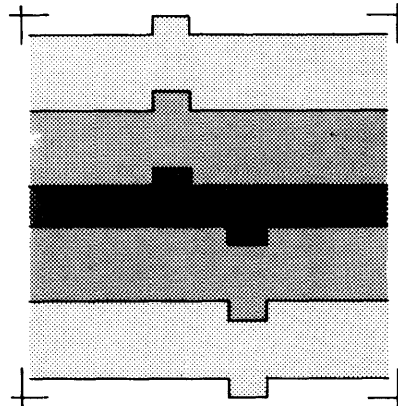
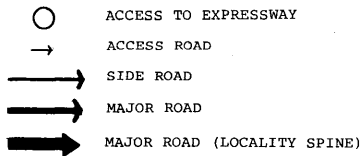


0 0.5 2Km
1:40,000

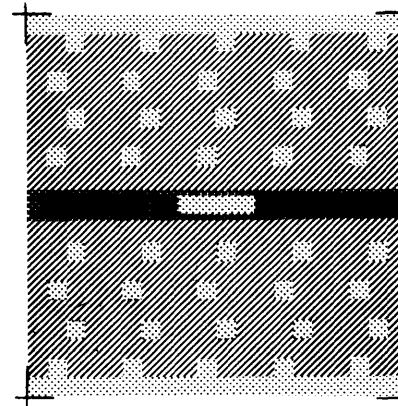
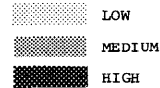
DEVELOPMENT PLANS



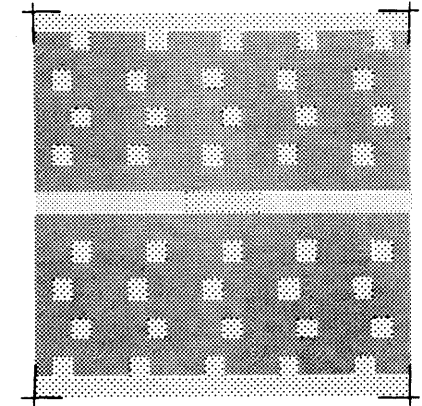
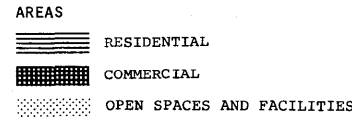
CIRCULATION PATTERN



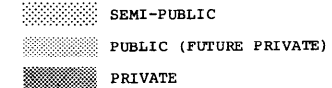
LAND UTILIZATION INTENSITY



LAND UTILIZATION PATTERN



LAND TENURE



The process of urbanization implies that following the provision of essential facilities and utilities,

- Land value will rise
- Population and building densities will increase
- Commercial growth will naturally follow certain patterns if not restricted and
- As development matures, growth and change will go hand in hand. This will require land to be structured under flexible tenure patterns.

CIRCULATION

In a given locality, the circulation pattern will be as follows:

- 1) Major roads where public transportation routes and commercial activities are located. These roads will connect the locality with the city spine and the neighboring localities;

- 2) Side roads: perpendicular to the major roads. These streets will work for transferring traffic from the access ways to major roads;
- 3) Access ways to private properties.

LAND UTILIZATION INTENSITY

With the preceding circulation pattern, the intensity value is higher near the major roads in the locality. The value decreases towards the periphery.

In the locality, one might expect nearly three zones, each has a range of different land values and intensity of use:

- Zone I: The commercial area with intensive development along major streets. This area commands the highest land values and the highest density.
- Zone II: The residential area which follows the above zone and has less density.

- Zone III: The periphery adjacent to the expressways where open buffer space is provided and low residential density is expected.

LAND UTILIZATION PATTERN

Residential: Residential growth follows the provision of utilities.

Community facilities: Provision of community facilities depends upon the growth of population.

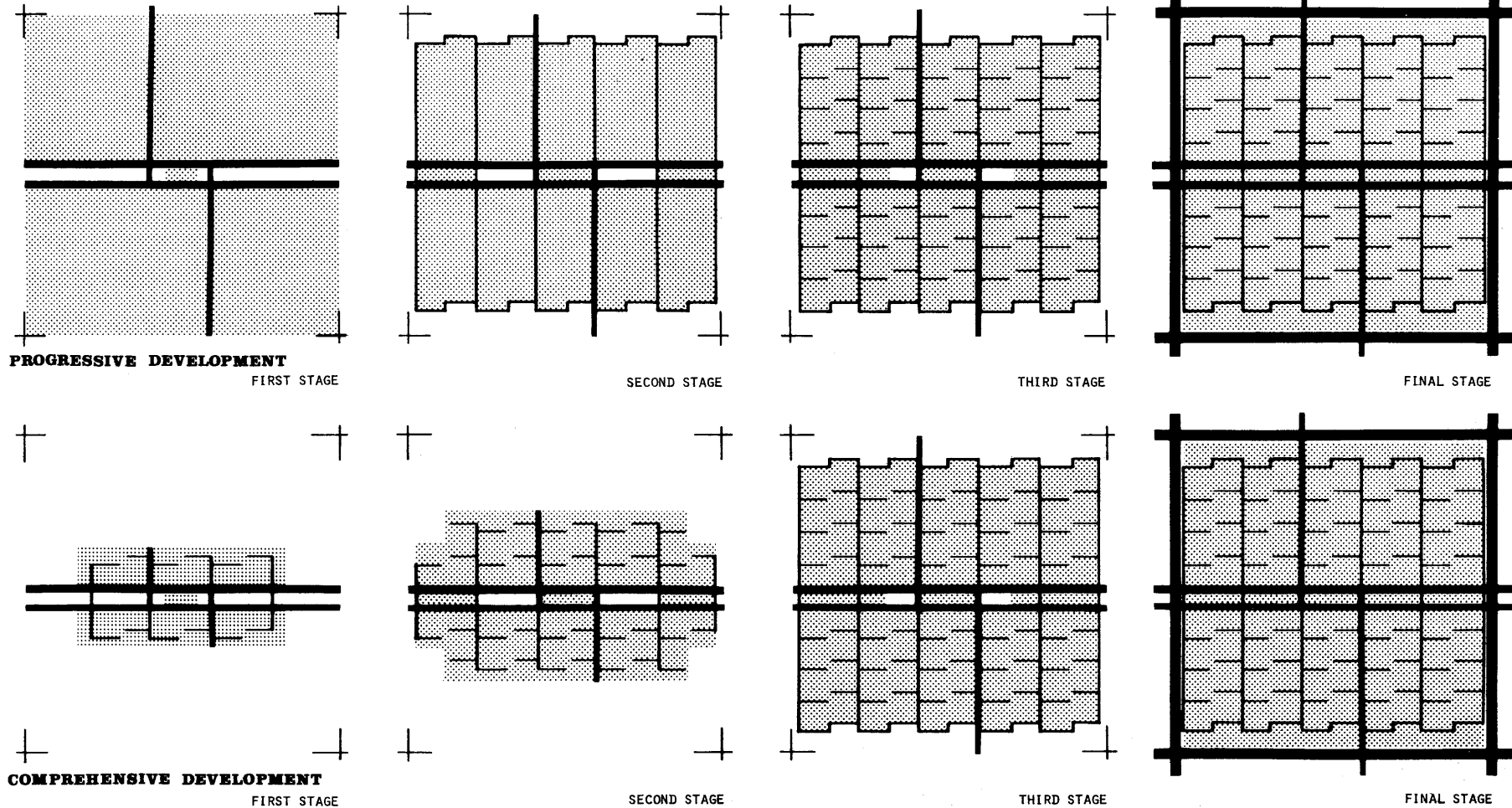
Commercial: Commercial growth follows population density and intensity of use and is expected to develop in linear patterns along the major roads in the settlement. Commercial activities in the form of corner shops is expected to develop at road intersections in a random pattern within the neighborhood.

LAND TENURE

In most of the cases in Riyadh, the land is privately owned. Since the city is responsible for the provision of facilities, utilities, and services, it should acquire land for these facilities before the development takes place.

The land tenure scheme proposes, in the case of new development, the acquisition by eminent domain of land needed for community facilities. It also proposes that the city acquire land located within the locality spine. This makes it cheaper and easier for the city to provide facilities for the inhabitants of the locality. In addition, it gives the city enough control over the development of the locality spine, and enough revenue to run the facilities, utilities and services.

DEVELOPMENT PROCESS



The term development is related to the provision of utilities, facilities and services for a growing settlement.

Two alternative approaches are illustrated here:

1) **PROGRESSIVE DEVELOPMENT:** The provision of utilities according to a pre-determined set of priorities and needs following the construction of dwellings and growth in the number of inhabitants.

Advantages:

- Equitable provision of essential facilities

for a majority of the population when the provision of all facilities is impossible; this is important for a developing country;

- Economic use of most facilities and;
- Secure investment since no risk is involved.

Disadvantages:

- Inconveniences where some services are lacking;
- Difficulty in determining priorities and timing for provision of facilities and;
- Possibilities of higher ultimate costs.

2) **STAGED COMPREHENSIVE DEVELOPMENT:** The provision of utilities and facilities instantly preceding or simultaneous with the construction of dwellings and growth in the number of inhabitants.

Advantages:

- Convenience of use and;
- Relative ease of implementation.

Disadvantages:

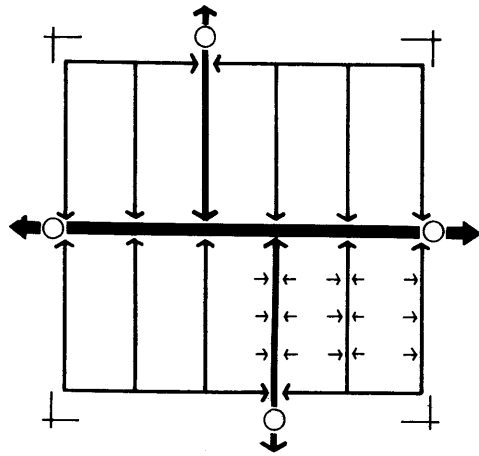
- Investment risks;
- Under use during period of population growth;
- Inequitable provision of facilities when capacity of construction and provision of

these facilities is below the rate of growth.

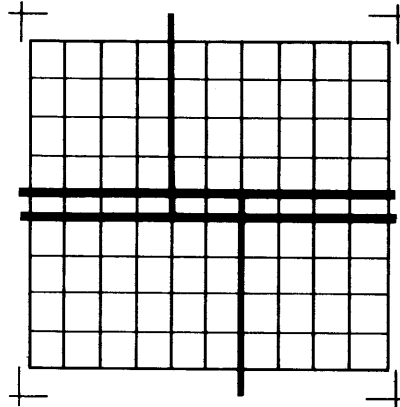
The advantages and disadvantages could be optimized through detailed studies of designs and through the cooperation of all responsible agencies during construction.



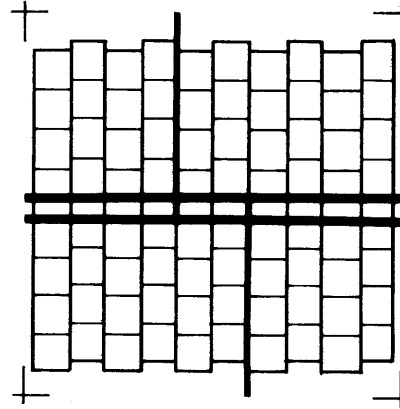
LAYOUT PATTERN



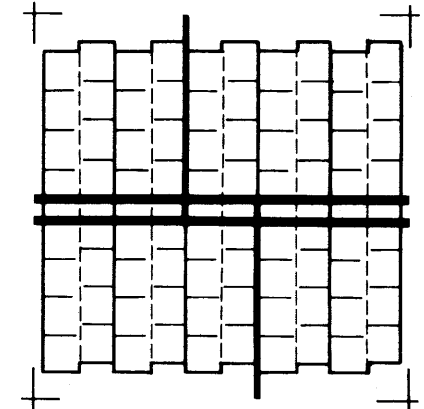
BASIC LAYOUT



GRID ALTERNATIVE



MODIFIED GRID ALTERNATIVE



SEGREGATED GRID ALTERNATIVE

KEY

- ACCESS TO EXPRESSWAY
- ACCESS ROAD
- ▬ SIDE ROAD
- ▬ MAJOR ROAD
- ▬ MAJOR ROAD (LOCALITY SPINE)

----- PEDESTRIAN

Main elements of the circulation network are the hierarchy of streets and the basic grid.

HIERARCHY OF STREETS

Requirements for each transportation mode vary greatly according to the functions of the mode. This makes it essential to determine the functions of circulation paths in each context. Hierarchy of streets in each locality is the following:

1. major roads, connecting localities to other areas;
2. side streets, connect different areas to major roads; and
3. access ways, connect properties to side streets.

BASIC GRID

The block is the cell of the layout. Dimensions of the block are limited by site conditions, convenience of use, and cost of

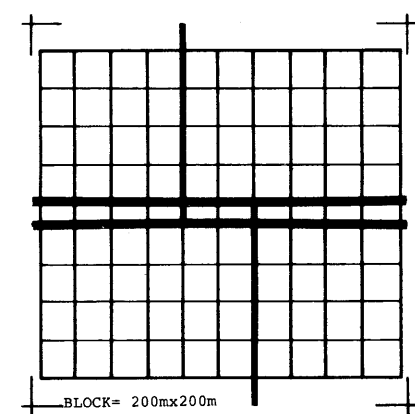
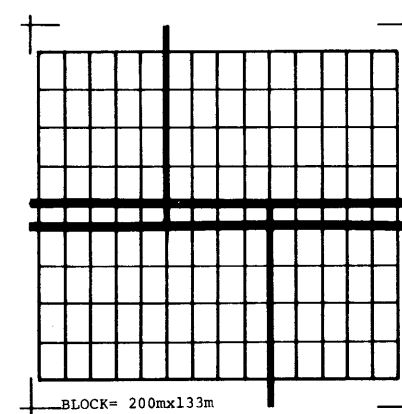
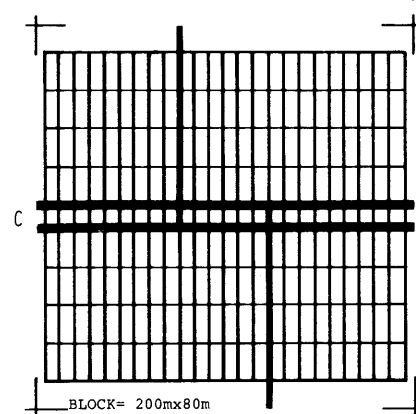
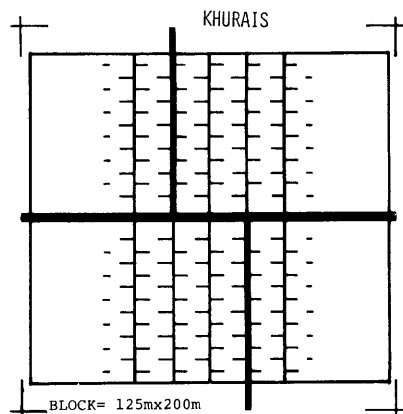
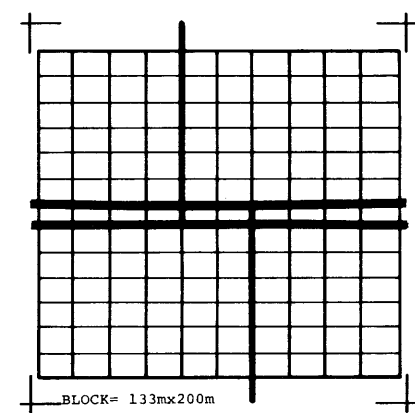
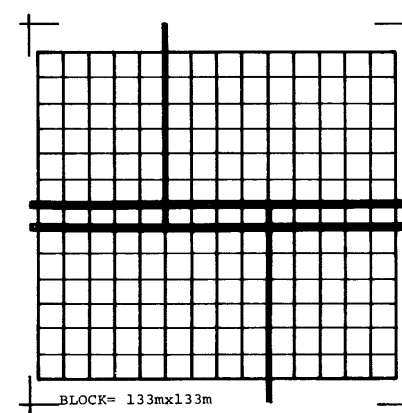
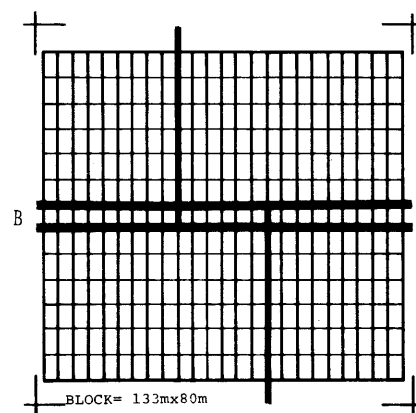
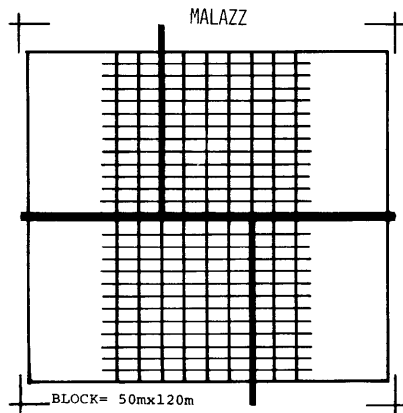
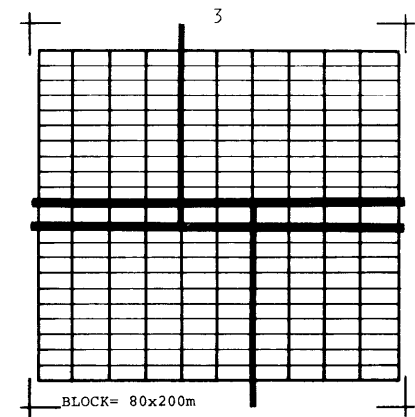
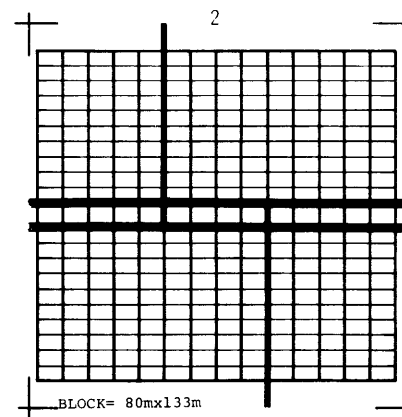
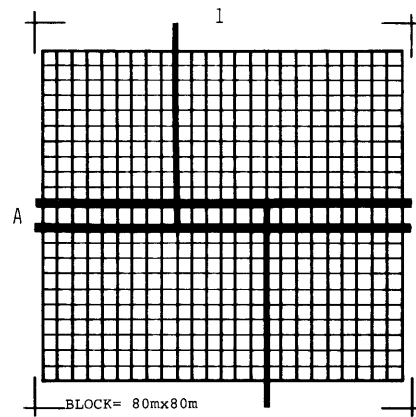
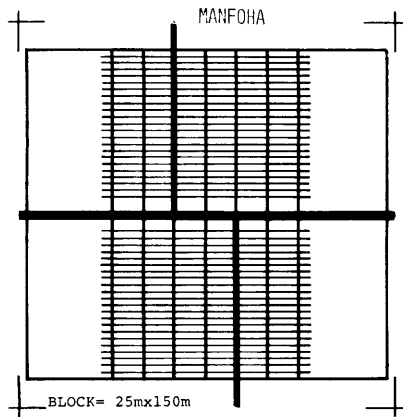
network. In this study a range of four to ten minutes of walking around the block is considered as the limit to its dimensions in urban areas. This means a range between 80m x 80m to 200m x 200m.

The circulation scheme shows the development of circulation concept:

1. the hierarchy of streets;
2. the basic grid;
3. the modified grid; and
4. the segregated, pedestrian/vehicular, grid.

The following layout alternatives comprise three existing patterns in Riyadh and nine other patterns of set forth limits of block dimensions between 80m x 80m and 200m x 200m.





EXISTING

ALTERNATIVE

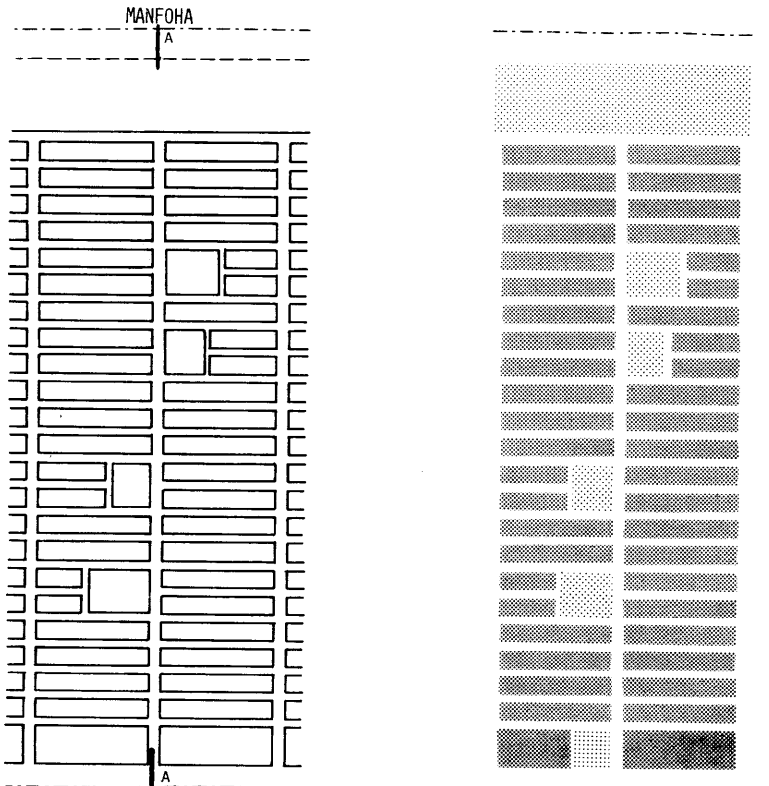
ALTERNATIVE

ALTERNATIVE

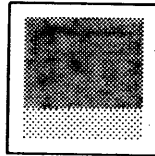


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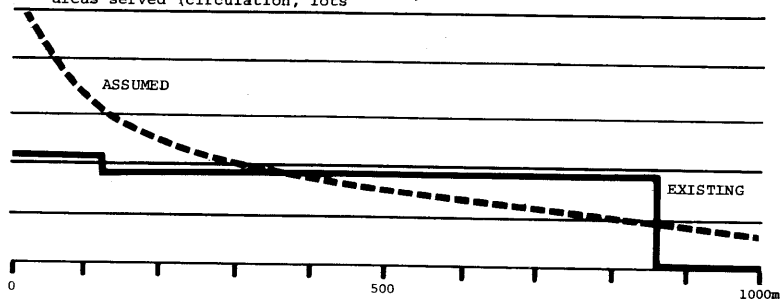
BASIC GRID ALTERNATIVES



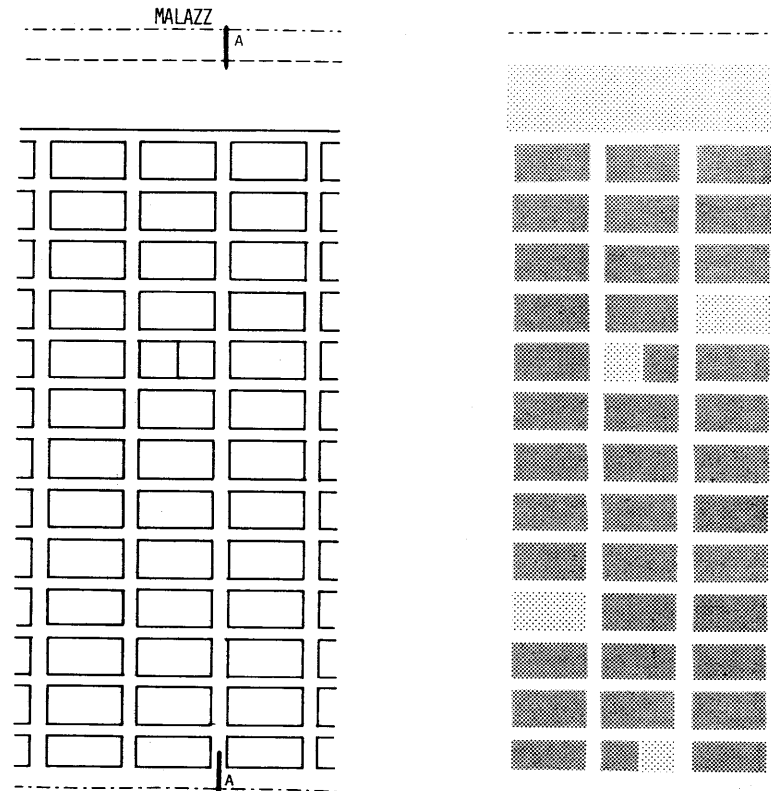
AREAS	Hectares	Percentages
PUBLIC (streets, open spaces)	11.57	35
SEMI-PUBLIC (open spaces, schools)	4.95	15
PRIVATE (dwellings, shops, lots)	16.48	50
SEMI-PRIVATE (cluster courts)	-	-
TOTAL	33.00	100



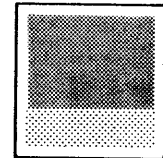
NETWORK EFFICIENCY
 $R = \frac{\text{network length (circulation)}}{\text{areas served (circulation, lots)}} = 283\text{m/Ha}$



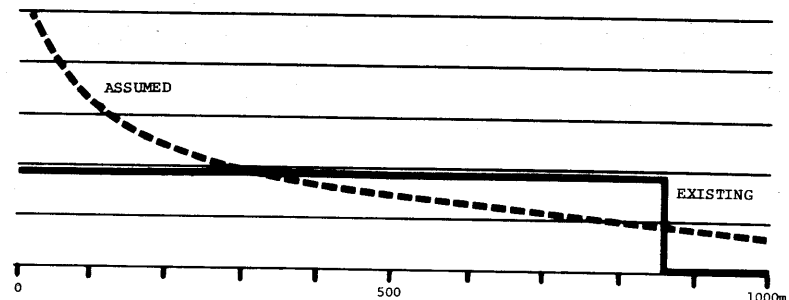
RESIDENTIAL INTENSITY
EFFECT OF LOCALITY SPINE (A-A)



AREAS	Hectares	Percentages
PUBLIC	9.54	27
SEMI-PUBLIC	5.40	15
PRIVATE	21.06	58
SEMI-PRIVATE	-	-
TOTAL	36.00	100

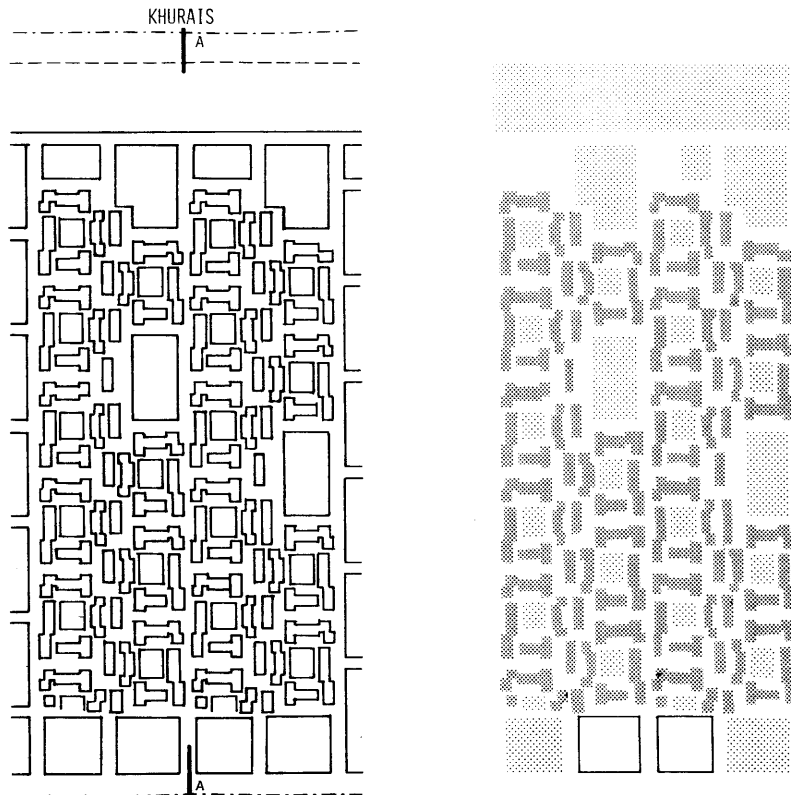


$R = 212\text{m/Ha}$



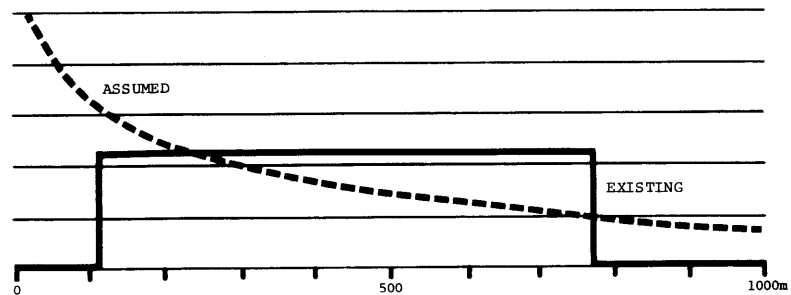
RESIDENTIAL INTENSITY
EFFECT OF LOCALITY SPINE (A-A)



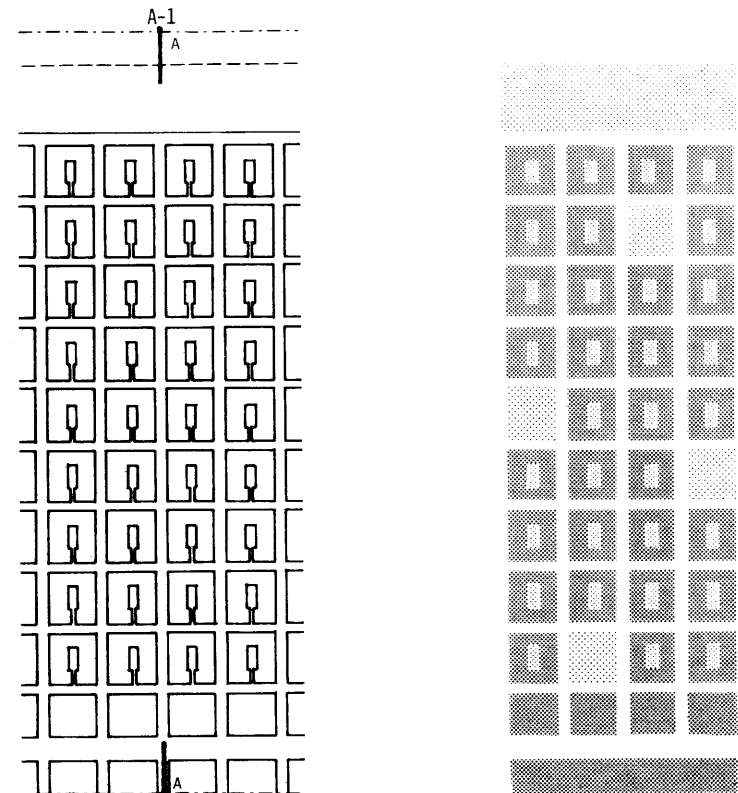


	Hectares	Percentages
PUBLIC	21.94	55
SEMI-PUBLIC	8.66	22
PRIVATE	9.40	23
SEMI-PRIVATE	-	-
NETWORK EFFICIENCY	TOTAL 40.00	100

R = 265m/Ha

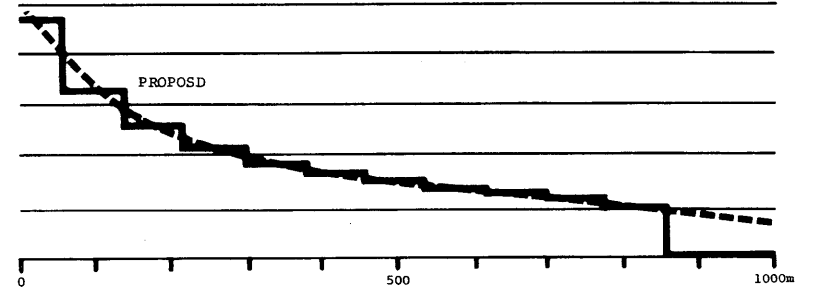


RESIDENTIAL INTENSITY
EFFECT OF LOCALITY SPINE (A-A)



	Hectares	Percentages
PUBLIC	9.63	30
SEMI-PUBLIC	4.74	15
PRIVATE AND SEMI-PRIVATE	17.23	55
TOTAL	31.60	100

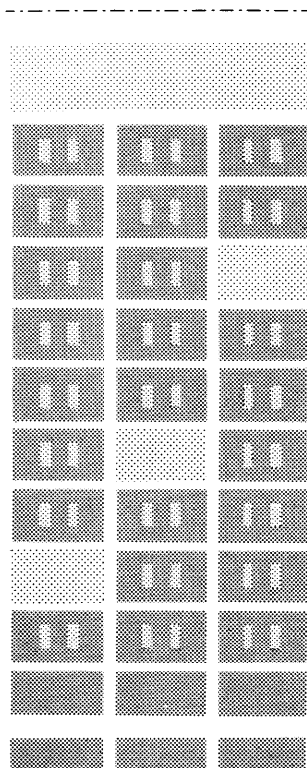
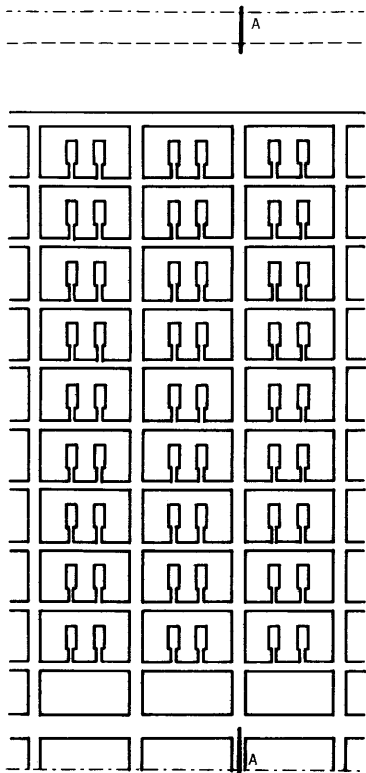
NETWORK EFFICIENCY
R = 224m/Ha



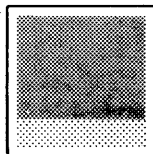
RESIDENTIAL INTENSITY
EFFECT OF LOCALITY SPINE (A-A)

0 100 500m
1:10000

A-2

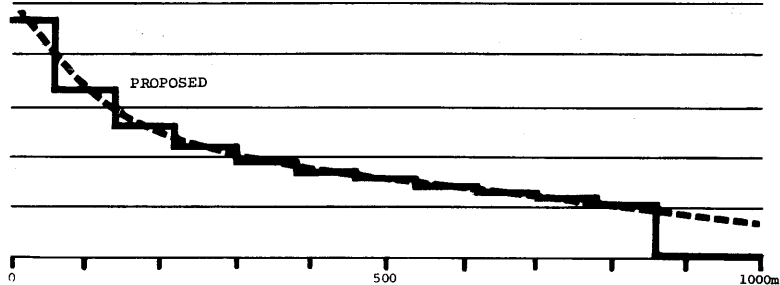


AREAS	Hectares	Percentages
PUBLIC	10.21	25
SEMI-PUBLIC	6.12	15
PRIVATE AND SEMI-PRIVATE	24.47	60
TOTAL	40.8	100



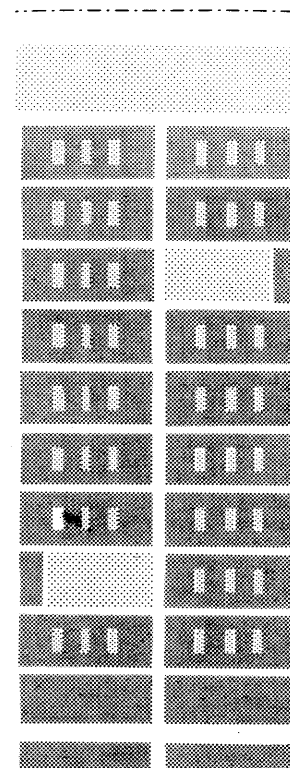
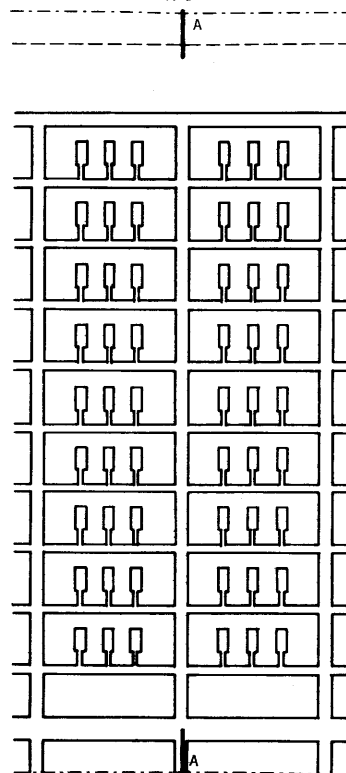
NETWORK EFFICIENCY

R = 178m/Ha

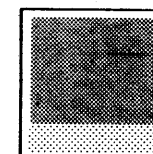


RESIDENTIAL INTENSITY
EFFECT OF LOCALITY SPINE (A-A)

A-3

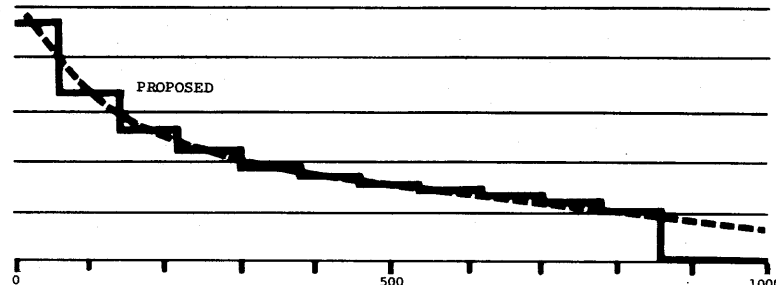


AREAS	Hectares	Percentages
PUBLIC	8.7	23
SEMI-PUBLIC	5.7	15
PRIVATE AND SEMI-PRIVATE	23.6	62
TOTAL	38.0	100



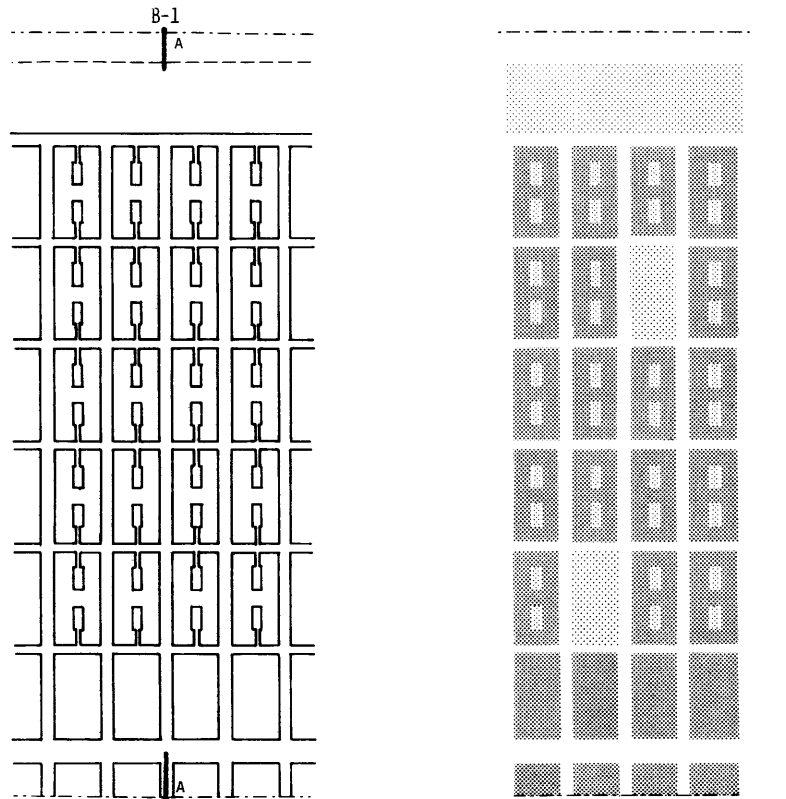
NETWORK EFFICIENCY

R = 165m/Ha

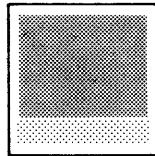


RESIDENTIAL INTENSITY
EFFECT OF LOCALITY SPINE (A-A)



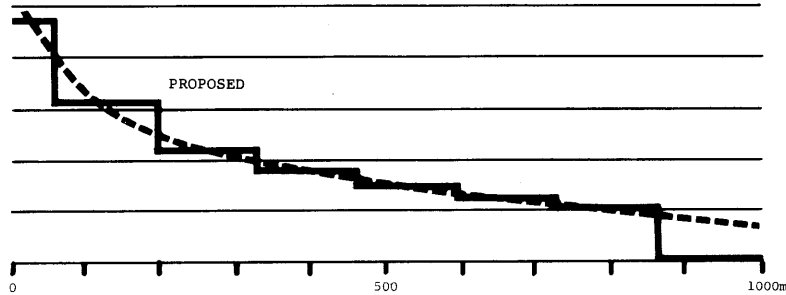


AREAS	Hectares	Percentages
PUBLIC	8.58	27
SEMI-PUBLIC	4.74	15
PRIVATE AND SEMI-PRIVATE	18.28	58
TOTAL	31.60	100

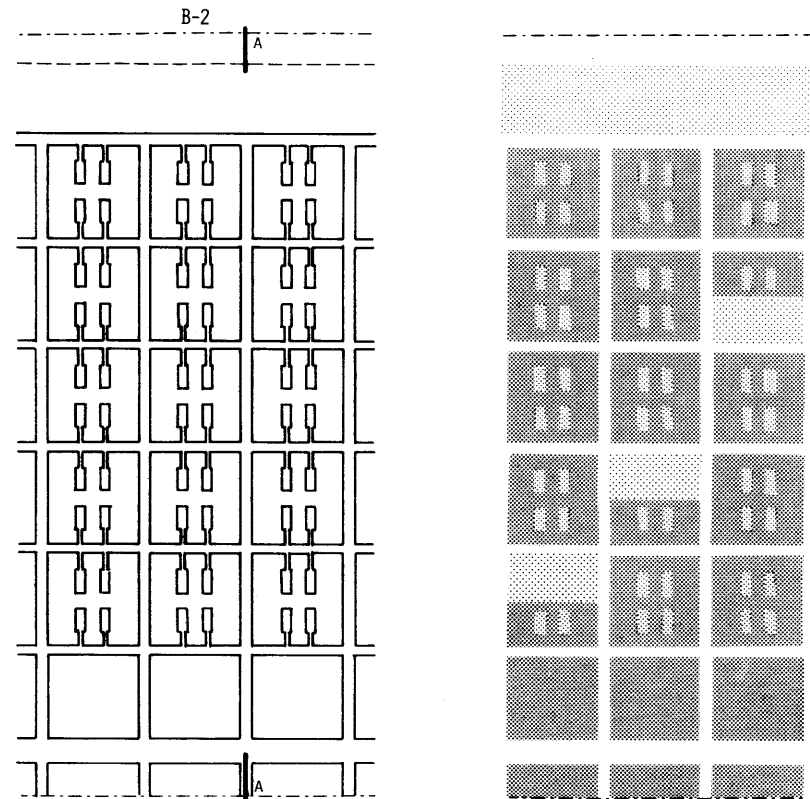


NETWORK EFFICIENCY

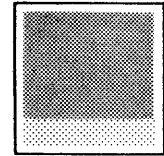
R = 184m/Ha



RESIDENTIAL INTENSITY
EFFECT OF LOCALITY SPINE (A-A)

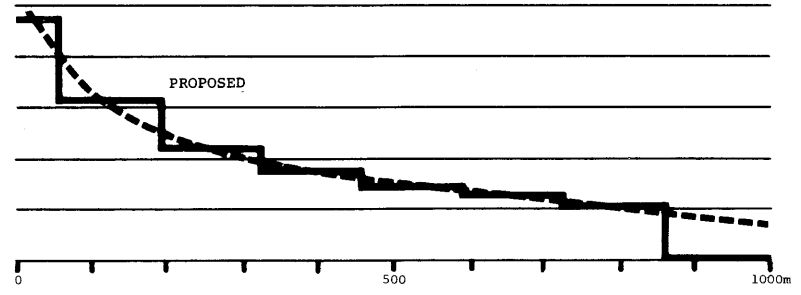


AREAS	Hectares	Percentages
PUBLIC	8.74	21
SEMI-PUBLIC	6.12	15
PRIVATE AND SEMI-PRIVATE	25.94	64
TOTAL	40.80	100



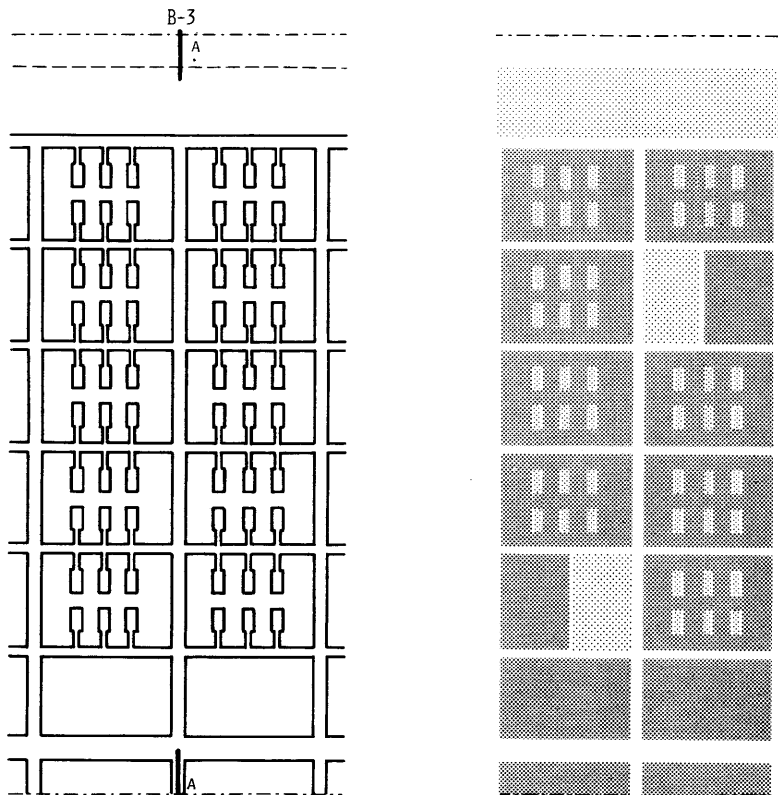
NETWORK EFFICIENCY

R = 178m/Ha

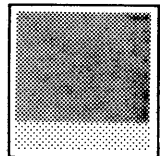


RESIDENTIAL INTENSITY
EFFECT OF LOCALITY SPINE (A-A)

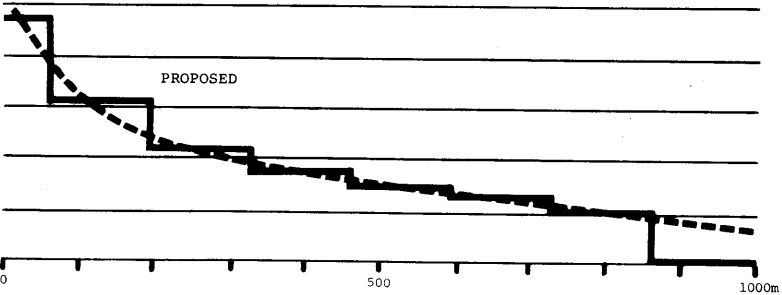




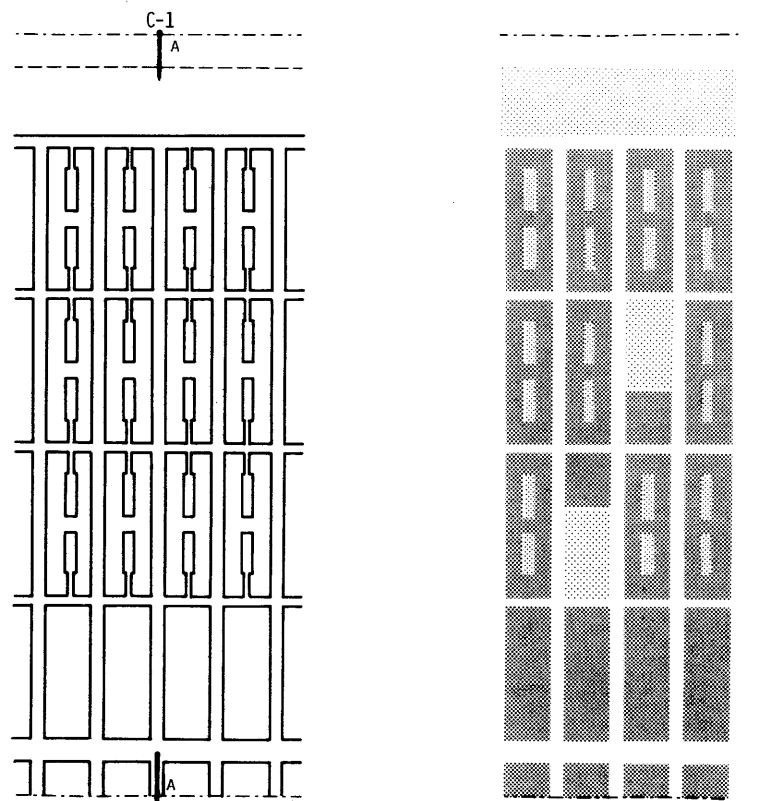
AREAS	Hectares	Percentages
PUBLIC	8.58	27
SEMI-PUBLIC	4.74	15
PRIVATE AND SEMI-PRIVATE	18.28	58
TOTAL	31.60	100



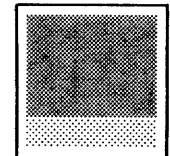
NETWORK EFFICIENCY
R = 120m/Ha



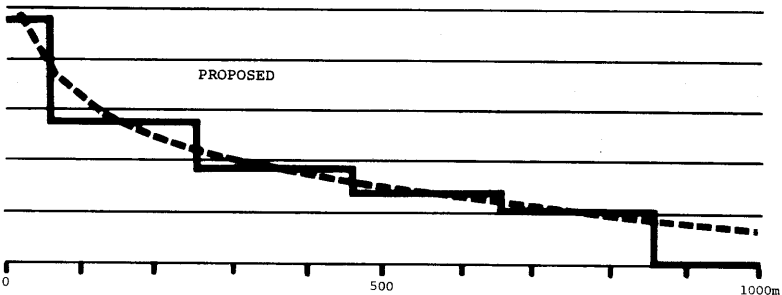
RESIDENTIAL INTENSITY
EFFECT OF LOCALITY SPINE (A-A)



AREAS	Hectares	Percentages
PUBLIC	8.07	26
SEMI-PUBLIC	4.74	15
PRIVATE AND SEMI-PRIVATE	18.79	59
TOTAL	31.60	100

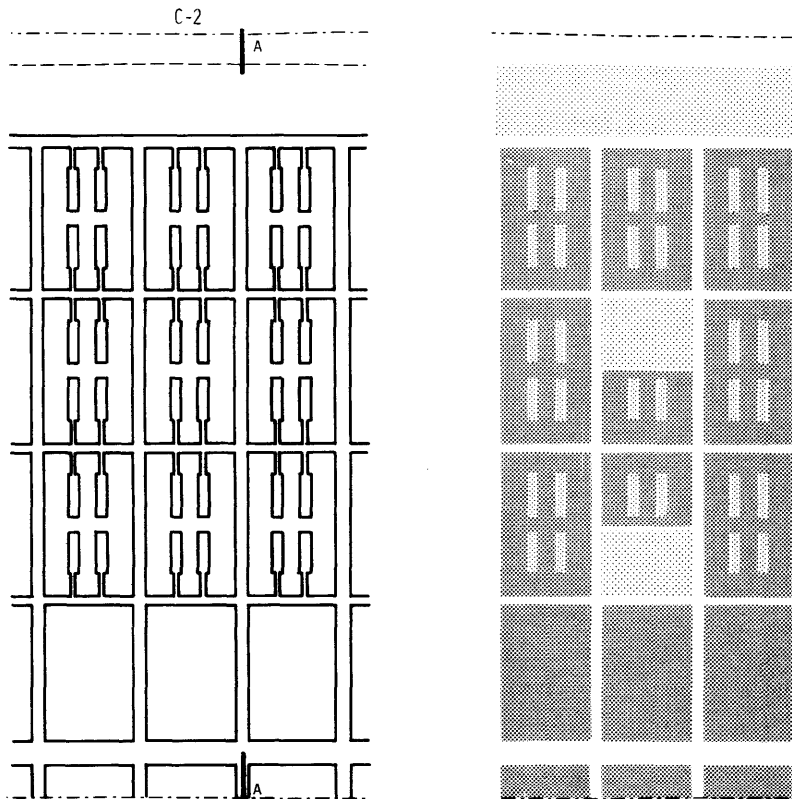


NETWORK EFFICIENCY
R = 137m/Ha

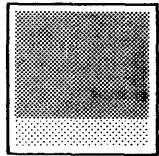


RESIDENTIAL INTENSITY
EFFECT OF LOCALITY SPINE (A-A)



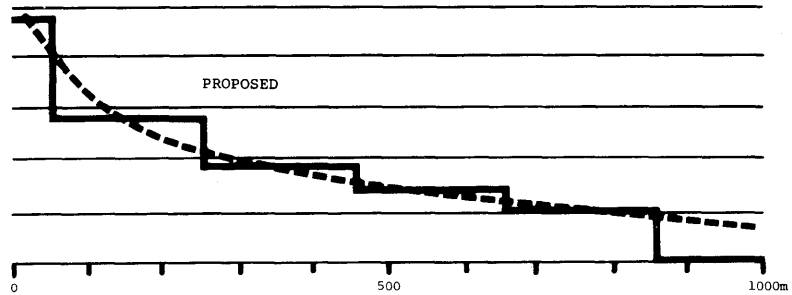


AREAS	Hectares	Percentages
PUBLIC	6.59	17
SEMI-PUBLIC	5.70	15
PRIVATE AND SEMI-PRIVATE	25.71	68
TOTAL	38.00	100

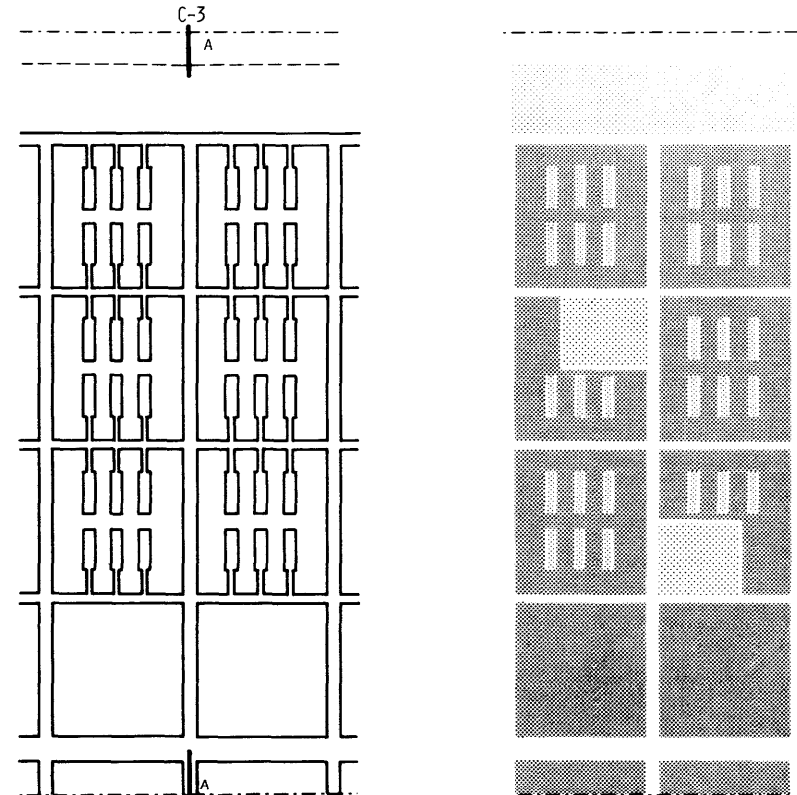


NETWORK EFFICIENCY

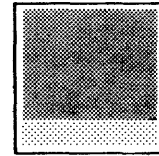
R = 100m/Ha



RESIDENTIAL INTENSITY
EFFECT OF LOCALITY SPINE (A-A)

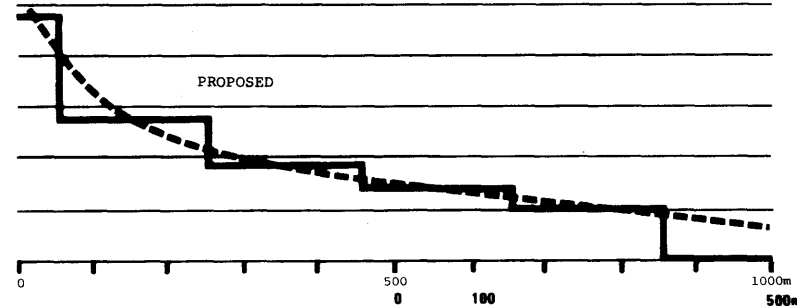


AREAS	Hectares	Percentages
PUBLIC	8.02	20
SEMI-PUBLIC	6.12	15
PRIVATE AND SEMI-PRIVATE	26.66	65
TOTAL	40.80	100



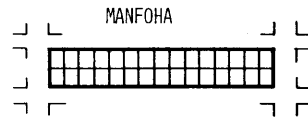
NETWORK EFFICIENCY

R = 118m/Ha



RESIDENTIAL INTENSITY
EFFECT OF LOCALITY SPINE (A-A)

1:10000

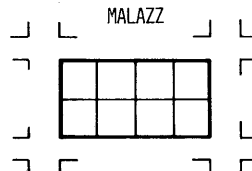


AREAS

AREAS	Hectares	Percentages
PUBLIC (Streets, Open Spaces)	0.19	33
SEMI-PUBLIC (Open Spaces, Schools)	--	--
PRIVATE (Dwellings, Shops, Lots)	0.39	67
SEMI-PRIVATE (Cluster Courts)	--	--
Total	0.58	100

NETWORK EFFICIENCY (R-Value)

R = 346m/Ha

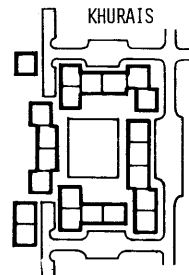


AREAS

AREAS	Hectares	Percentages
PUBLIC (Streets, Open spaces)	0.25	32
SEMI-PUBLIC (Open spaces, schools)	--	--
PRIVATE (Dwellings, shops, lots)	0.53	68
SEMI-PRIVATE (Cluster courts)	--	--
Total	0.78	100

NETWORK EFFICIENCY (R-Value)

R = 237m/Ha

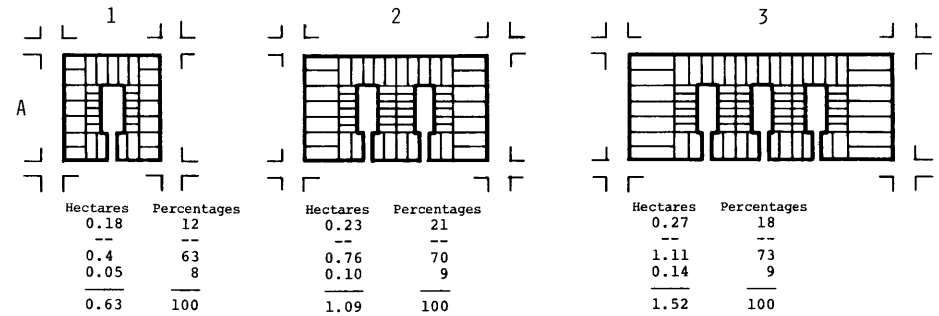


AREAS

AREAS	Hectares	Percentages
PUBLIC (Streets, open spaces)	0.61	49
SEMI-PUBLIC (Open spaces, schools)	0.14	11
PRIVATE (Dwellings, shops, lots)	0.50	40
SEMI-PRIVATE (Cluster courts)	--	--
Total	1.25	100

NETWORK EFFICIENCY (R-Value)

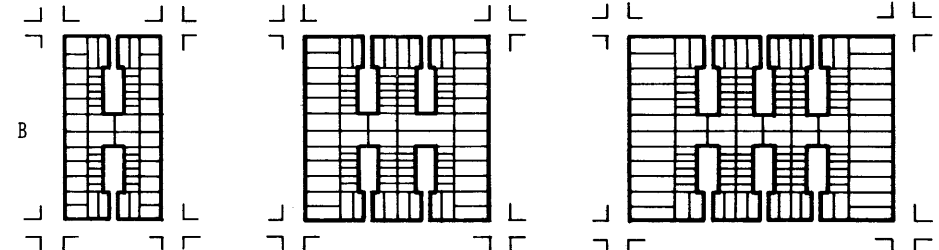
R = 350m/Ha



R = 252m/Ha

R = 199m/Ha

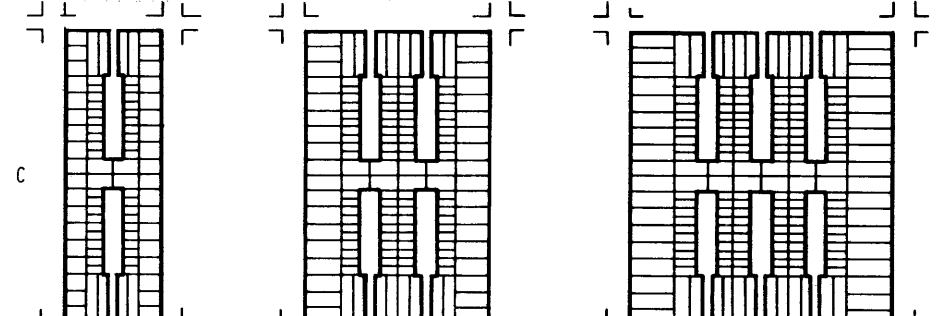
R = 178m/Ha



R = 202m/Ha

R = 149m/Ha

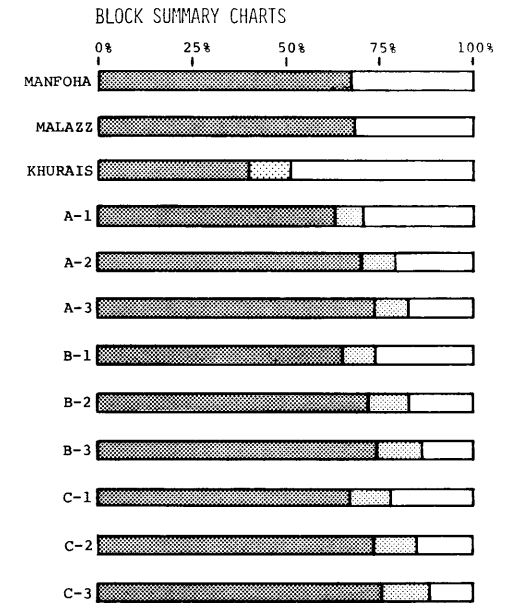
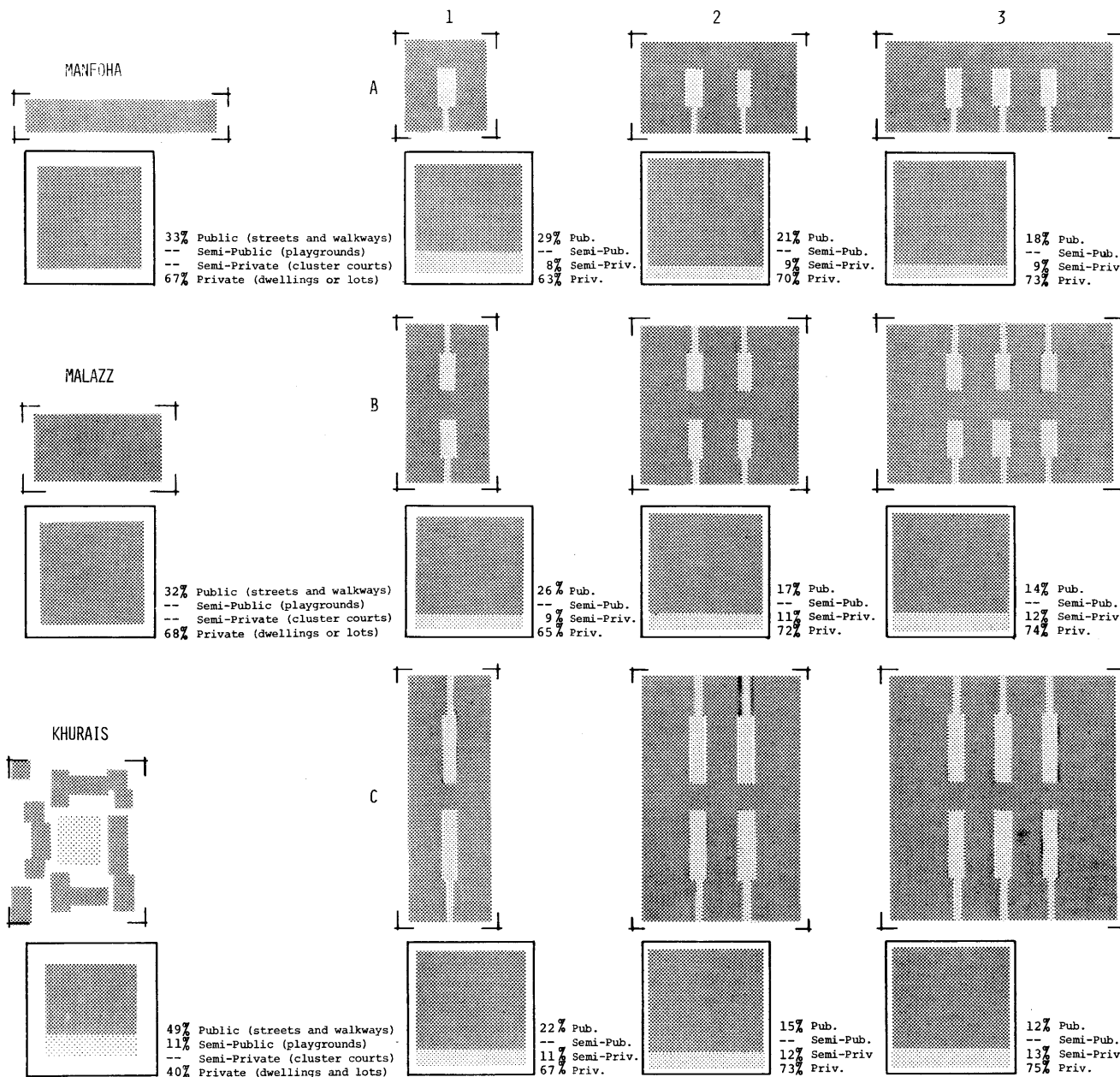
R = 128m/Ha



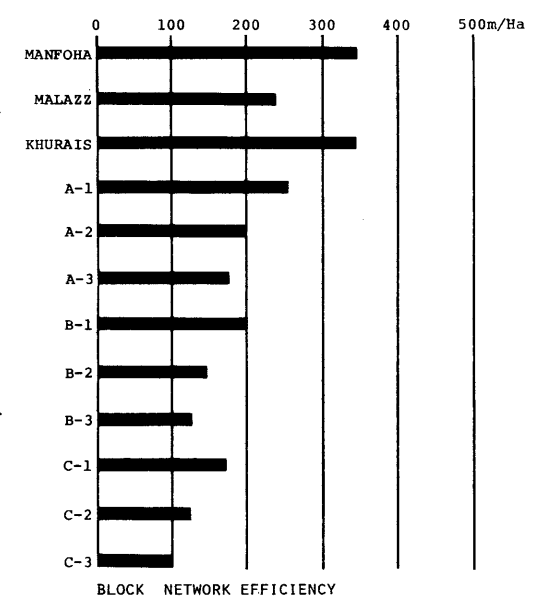
R = 177m/Ha

R = 124m/Ha

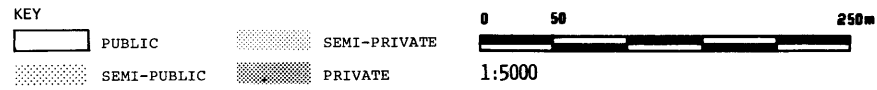
R = 103m/Ha



BLOCK LAND UTILIZATION PERCENTAGES

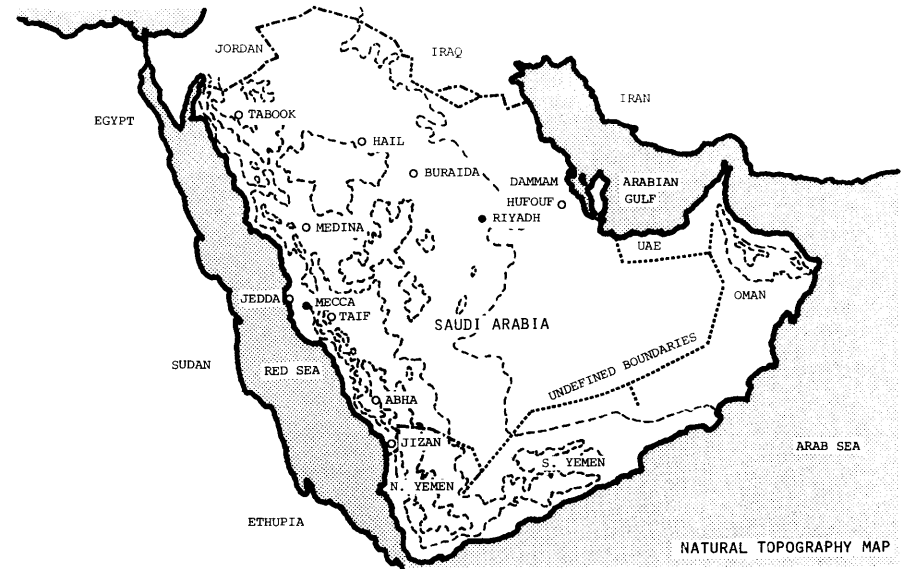
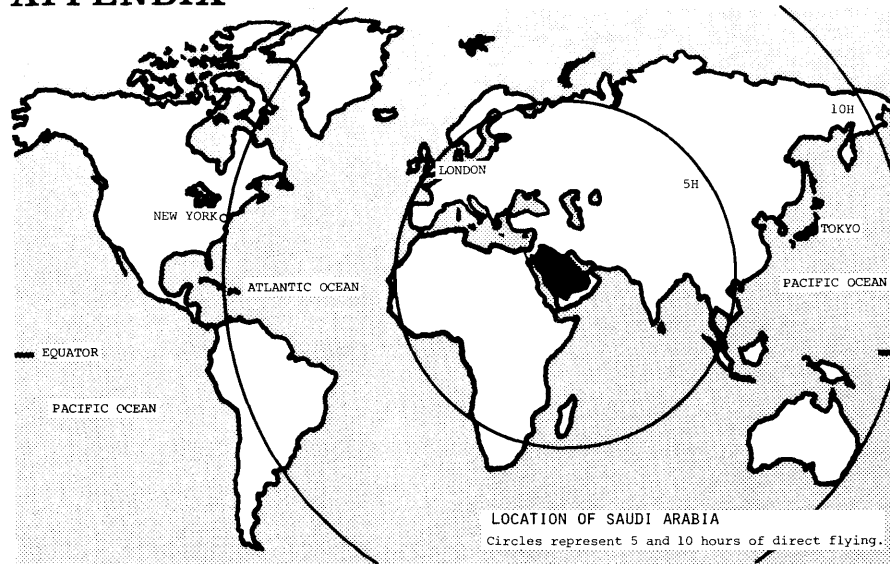


BLOCK NETWORK EFFICIENCY



BLOCK LAND UTILIZATION

APPENDIX



NATIONAL CONTEXT

Kingdom of Saudi Arabia
 Population: 6,200,000 estimated for 1975
 Area: 2,127,000 square Kilometers Approx.
 Language: Arabic and English spoken widely
 Currency: SR, Saudi Rial = 100 Halala = US \$ 0.28 in 1974
 Religion: Islam
 Government: Islamic Constitution in a modern government

Major Cities	Pop. Estimates (1975)
Mecca, spiritual capital	300,000
Riyadh, administrative cap.	570,000
Jedda, main port	460,000
Medina, spiritual city	136,000
Taif, summer capital	150,000
Dammam, eastern port	80,000
Hufouf-Mubarraz	147,000
Buraidah	83,000

LOCATION: Saudi Arabia is located in south-western Asia, occupying four fifths of the Arabian Peninsula between 34°-56° East and 15°-28° North of the equator.

HISTORY: Saudi Arabia was named as a unified kingdom after the Al-Saud family in 1932. The name also means prosperity and happiness.

The Arabian Peninsula has been inhabited by Semitic-speaking people for more than 3000 years. The earliest known, large-scale political units were the South Arabian kingdom of the Minaeans (about 1200 B.C.) and the Sabaean (before 700 B.C.). They were followed by the Himyarites (about 200 B.C.), who were preceded also by the Nabataeans in the north (about 350 B.C.).

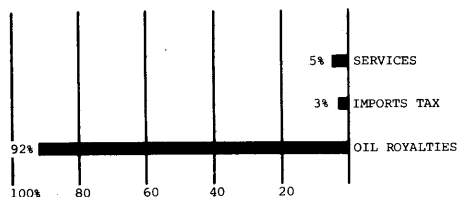
In the early 7th Century A.D., Mecca became the religious center of Islam, which comprised in the 8th Century the area from Spain in Europe to East China in Central Asia. After the Mohammedan era the capital moved to the north. It is only in the middle of the 10th century AD when the Meccan Sherifate was established.

The Ottoman Turks were recognized as rulers of Hejaz after conquering Egypt in 1517.

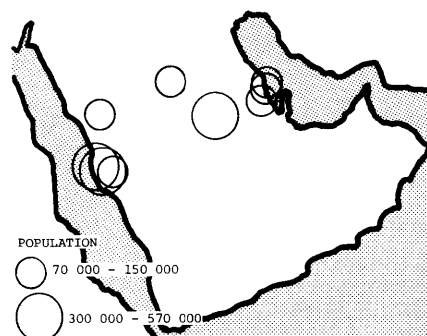
Their power also included Al-Hasa in 1550, but the control was nominal.

The Saudi Dynasty started as a religious revival movement by Emir Mohammed Ibn Saud in support of Shaik Mohammed Ibn Abd Al-Wahab (1703-1792). By 1806, Saudi forces had captured from Dariya in Najd most of the Arabian Peninsula, including Hejaz and Yemen, then parts of Iraq and Syria. Hejaz was captured in 1812 by the Ottoman-Egyptian army, and the capital Dariya in Nejd was destroyed in 1818. The Arabian Peninsula entered a period of bloodshed and intrigue after that.

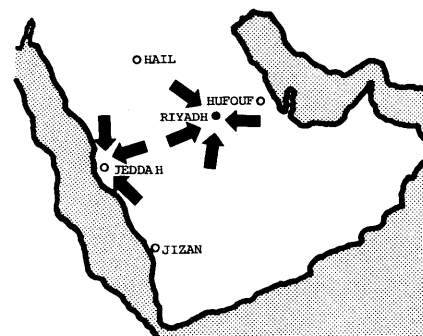
Though in exile in Kuwait, Abd al-Aziz Ibn Saud (Ibn Saud) started the creation of modern Saudi Arabia by capturing Riyadh in 1902, Najed and Al-Hasa in 1913, and Medina and Jeddah in 1925. In September 1932, the Kingdom of Saudi Arabia was created. In March 1945, Saudi Arabia accepted the principles of the United Nations and, also in that year, the Arab League.



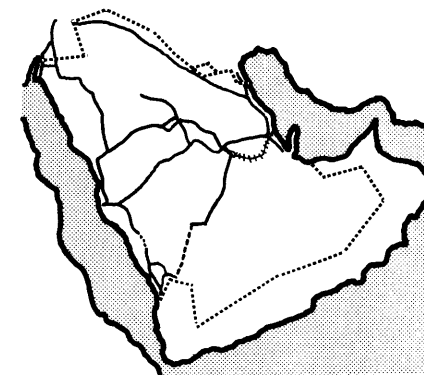
GOVERNMENT REVENUES
Year: 1971-'72
Source: Statistical Year Book (1971-'72), Riyadh



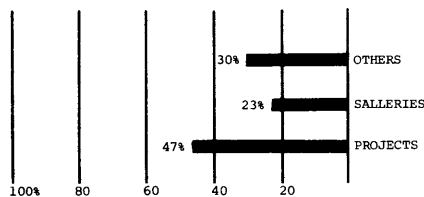
URBAN POPULATION DISTRIBUTION
MAJOR URBAN CENTERS (1974-'75)
Source: M+R International



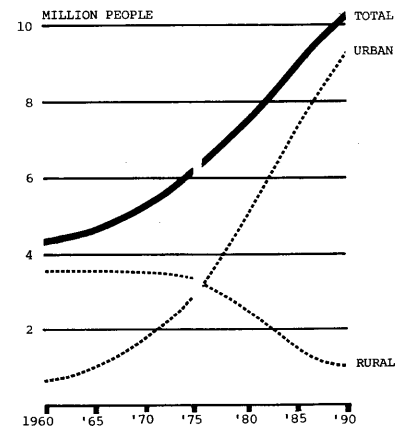
MIGRATION TRAJECTORIES



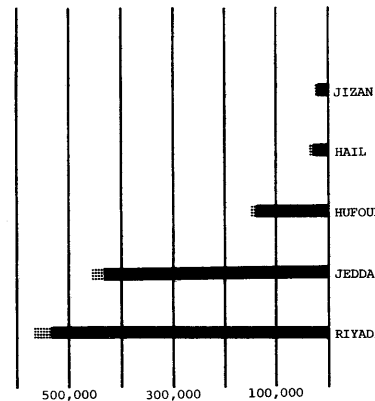
TRANSPORTATION NETWORK



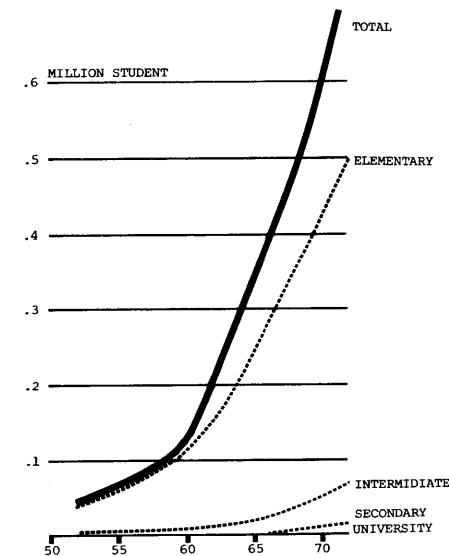
GOVERNMENT EXPENDITURES
Year: 1971-'72
Source: Statistical Year Book (1971-'72), Riyadh



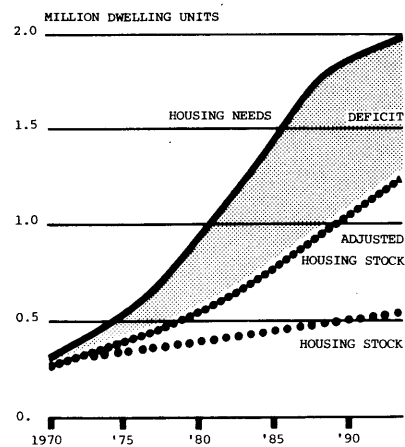
POPULATION GROWTH
Source: National Development Plan (1974-'75)



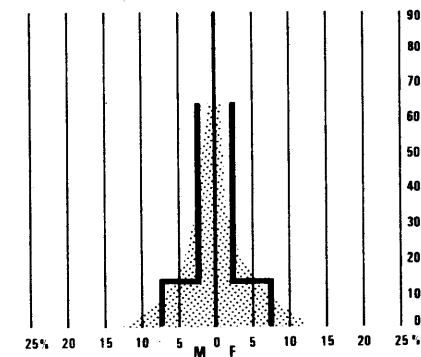
ANNUAL MIGRATION TO SOME CITIES
Source: M+R International
Quality of Information: Estimates



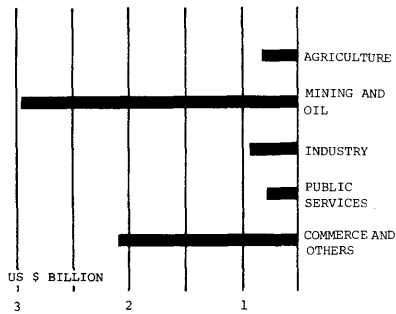
EVOLUTION OF FORMAL EDUCATION
Enrollment of Students
Source: Statistical Year Book (1971-'72)



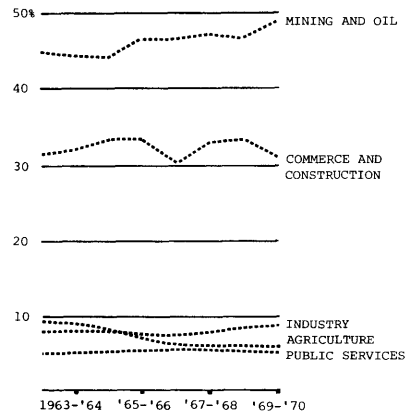
FORECAST OF HOUSING NEEDS
SOURCE: NATIONAL DEVELOPMENT PLAN (1974-'75), AND M+R INTERNATIONAL



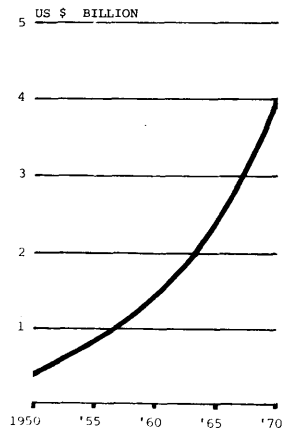
POPULATION DISTRIBUTION
horizontal: percentages vertical: ages
males: M females: F
Source:



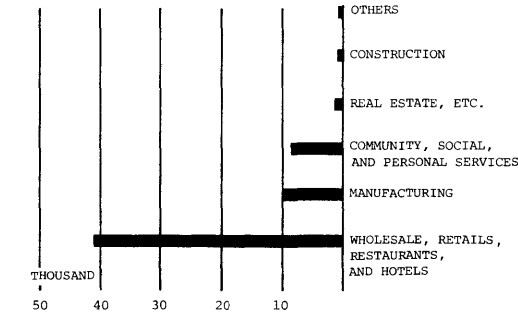
THE ECONOMIC ACTIVITIES BY SECTOR
GROSS DOMESTIC PRODUCT (1969-'70)
Source: Department of Statistics, Riyadh



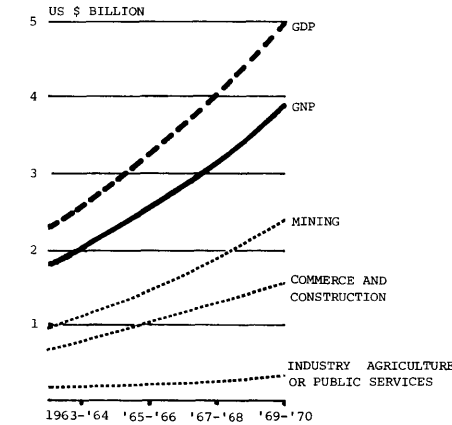
THE ECONOMIC SHIFT
GROSS DOMESTIC PRODUCT
Source: Department of Statistics, Riyadh



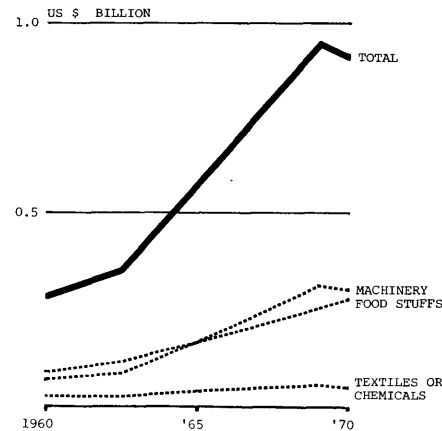
THE ECONOMIC GROWTH
GROSS NATIONAL PRODUCT
Source: Department of Statistics and Doxiadis, Riyadh



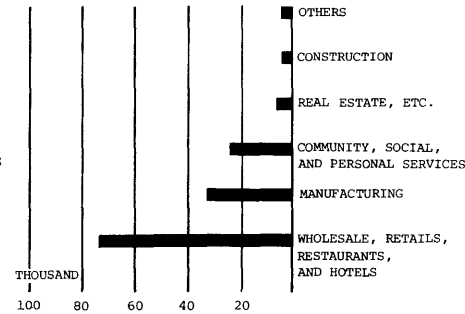
DISTRIBUTION OF EMPLOYMENT
PRIVATE ESTABLISHMENTS (1971)
Source: Statistical Year Book (1971-'72), Riyadh



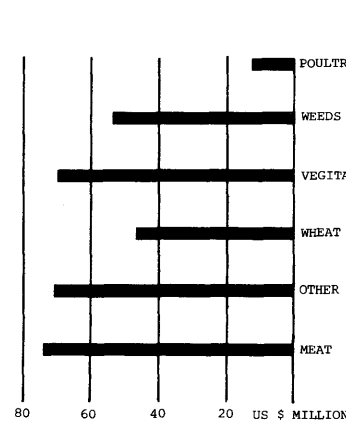
THE GROWTH OF ECONOMIC ACTIVITIES
GROSS DOMESTIC PRODUCT; by sector
Source: Department of Statistics, Riyadh



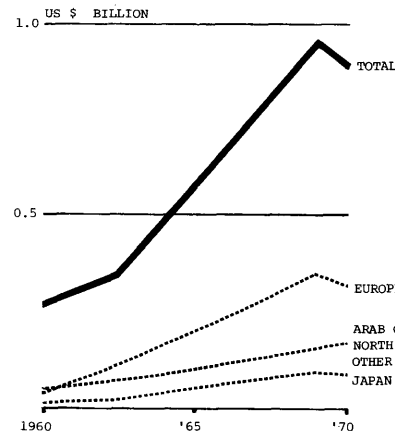
INTERNATIONAL TRADE
IMPORT TRENDS; by products
Source: Statistical Year Book (1971-'72)



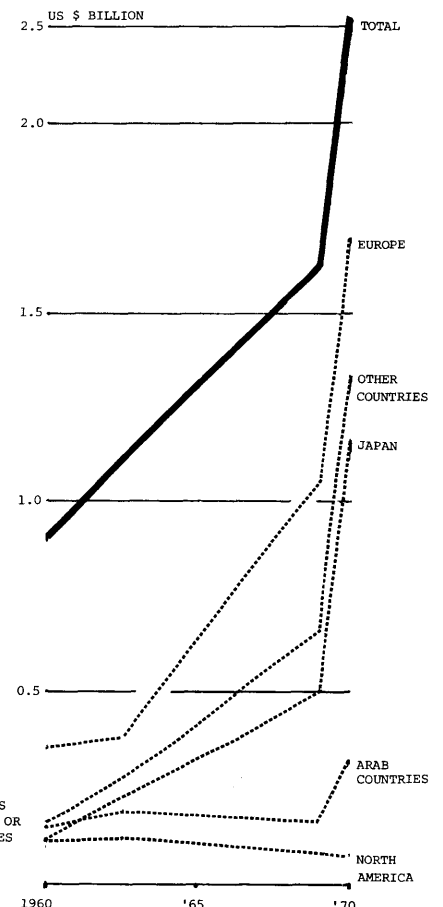
DISTRIBUTION OF EMPLOYMENT
PRIVATE LABOUR (1971)
Source: Statistical Year Book (1971-'72)



AGRICULTURAL PRODUCTION
Year: 1969-'70, Estimates
Source: National Development Plan (1969-'70)



INTERNATIONAL TRADE
IMPORT TRENDS; by regions
Source: Statistical Year Book (1971-'72)



INTERNATIONAL TRADE
EXPORT TRENDS; by regions
Source: Statistical Year Book (1971-'72)

GEOGRAPHY:

- Physical Features: The dominant feature of Saudi Arabia is the great plateau which slopes slightly to the east. It starts from the Sarawat Mountain Ranges in the west and is interrupted by the Tuwaiq low mountains which form a crescent shape facing northwest. Most of the topography is covered with free sand forming the great deserts.

- Geographic regions: The country is divided into five administrative regions supported by geographic and population concentrations. These regions have no defined boundaries. They also do not include the vast desert areas. The regions are: the Eastern, Central, Western, Northern, and Southern.

- Climate: Saudi Arabia has three distinctive climatic regions. One is the desert climate. It is hot and dry in summer, cold and moderately humid in winter. As in Riyadh, summer average maximum temperature is above 40°C and goes up to 45°C. The air cools rapidly at night. Summer relative humidity decreases to 5 percent. In winter, the average minimum temperature is as low as 7°C and can fall below freezing. Winter relative humidity is between 50 and 20 percent. Records show an average rainy days at 20, an average of 25 days of sand storms, and frost is frequent. The second region is the coastal climate, characterized by hot and humid summers and moderate and moderately humid winters. Airless, humid summer nights are common. As in Jeddah, average maximum temperature in the summer is about 37°C, but it is coupled with a relative humidity of between 30 and 85 percent; it is 100 percent on occasions. The average minimum winter temperature is 15°C. Winter relative humidity is between 75 and 35 percent. The average number of rainy days per annum is 8, and the average rainfall is 100mm. The average number of days of sand storms is 12. The average number of foggy days is 9. Third, the mountain climate is characterized by cold to moderate temperatures with moderate humidity in summer, and relatively cold temperatures and moderately humid winters. This climate is common in the mountain settlements on the Sarawat Mountain Ranges in the west. As in Khamees-Moshait, average maximum summer temperatures is about 25°C. The relative humidity in summer is between 15 and 50 percent.

The average minimum winter temperature is about 6°C and goes below freezing point. The winter relative humidity is between 30 and 85 percent. The average number of rainy days is about 35 with an average rainfall of 250mm. Five days of sand storms per year is average.

ECONOMY: The economic activities in the Arabian Peninsula were traditionally based on subsistence arid-zone agriculture, desert pastoralism, fishing, hunting, and limited mining. Pilgrimage to Mecca was of high value to the economy of Hejaz Region. Trade between India and Africa from the south and Byzantine Empire from the north was a fluctuating source of income for Hejaz and Yemen.

The role of oil replaced the traditional economic resources in increasing proportions since its discovery in 1938. It provided approximately 92 percent of the government's revenue in 1971-72.

The government's projects have concentrated on development of necessary infrastructure. Highest priority has been given to the transportation network, health, education, and water resources for agriculture, industry, and domestic uses.

GLOSSARY

- COMMUNITY:** the people living in a particular place or region and usually linked by common interests; the region itself, any population cluster.
- DEVELOPMENT:** gradual advance or growth through progressive changes; a developed tract of land.
- DWELLING:** The general, global designation of a building/shelter in which people live. A dwelling contains one or more 'dwelling units'.
- DWELLING CONSTRUCTION TYPES:** Primary dwelling construction types and materials are grouped in the following categories:
- Shack** Roof: structure - rods, branches. infill - thatch, mats, flattened tin cans, plastic or canvas sheets, cardboard, scrap wood, and/or mud.
Walls: structure - rods, branches, poles. infill - thatch, mats, flattened tin cans, plastic or canvas sheets, cardboard, scrap wood, and/or mud.
Floor: structure/infill - compacted earth.
- Adobe** Roof: structure - wood rafters. infill - thatch with mud.
Walls: structure - sundry brick mud. infill - mud.
Floor: structure/infill - compacted earth or cement.
- Wood** Roof: structure - wood rafters. infill - thatch, flattened tin cans or corrugated iron sheets.
Walls: structure - wood frame. infill - rough hewn wood planks.
Floor: structure/infill - compacted earth, wood joists, flooring.
- Masonry/Wood** Roof: structure - wood rafters. infill - corrugated iron or asbestos sheets, or terracotta tiles.
Walls: structure/infill - murrain, stone, brick, block or tile masonry without columns.
Floor: structure/infill - poured concrete slab on/off grade, wood joists, flooring.
- Masonry/Concrete** Roof: structure/infill - poured reinforced concrete with tar and gravel, or terracotta tiles.
Walls: structure/infill - murrain, stone, brick, block or tile masonry without columns, or with columns for multi-story dwellings.
Floor: structure/infill - poured concrete slab on/off grade.
- Concrete** Roof: structure/infill - poured or precast reinforced concrete with tar and gravel, or terracotta tiles.
Walls: structure - poured or precast walls or frame. infill - metal, wood, masonry, plastic.
Floor: structure/infill - poured or precast concrete slab.
- DWELLING BUILDER:** Four groups are considered:
Self-Help Built: where the dwelling unit is directly built by the user or occupant.
Artisan Built: where the dwelling unit is totally or partially built by a skilled craftsman
- hired by the user or occupant; payments can be monetary or an exchange of services.
- Small Contractor Built:** where the dwelling unit is totally built by a small organization hired by the user, occupant, or developer; 'small' contractor is defined by the scale of operations, financially and materially; the scale being limited to the construction of single dwelling units or single complexes.
- Large Contractor Built:** where the dwelling unit is totally built by a large organization hired by a developer; 'large' contractor is defined by the scale of operations, financially and materially; the scale reflects a more comprehensive and larger size of operations encompassing the building of large quantities of similar units, or a singularly large complex.
- DWELLING DENSITY:** The number of dwellings, dwelling units, people or families per unit hectare. Gross density is the density of an overall area (ex. including lots, streets). NET density is the density of selected, discrete portions of an area (ex. including only lots).
- DWELLING DEVELOPER:** Three sectors are considered in the supply of dwellings:
Popular sector: The marginal sector with limited or no access to the formal financial, administrative, legal, technical, institutions involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Popular sector generally for 'self use' and sometimes for profit.
Public sector: The government or non-profit organizations involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Public sector for service (non-profit or subsidized housing).
Private sector: The individuals, groups or societies who have access to the formal financial, administrative, legal, technical institutions in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Private sector generally for profit.
- DWELLING FLOORS:** The following number are considered:
One: single story; generally associated with detached, semi-detached and row/group dwelling types.
Two: double story; generally associated with detached, semi-detached and row/group dwelling types.
Three or More: generally associated with walk-up and high-rise dwelling types.
- DWELLING GROUP:** The context of the dwelling in its immediate surroundings.
- DWELLING LOCATION:** Three sectors of the urban area considered:
City center: the area located within a walking distance (2.5 km radius) of the commercial center of a city; relatively high residential densities.
Inner ring: the area located between the urban periphery and the city center (2.5 to 5 km radius); relatively lower residential densities.
- Periphery:** the area located between the rural areas and urban inner ring (5 or more km radius); relatively low residential densities.
- DWELLING PHYSICAL STATE:** A qualitative evaluation of the physical condition of the dwelling types: room, apartment, house; (the shanty unit is not evaluated).
Bad: generally poor state of structural stability, weather protection and maintenance.
Fair: generally acceptable state of structural stability, weather protection and maintenance with some deviation.
Good: generally acceptable state of structural stability, weather protection and maintenance without deviation.
- DWELLING UNIT:** A self-contained unit in a dwelling for an individual, a family, or a group.
- DWELLING UNIT AREA:** The dwelling unit area (m²) is the built-up, covered area of a dwelling unit.
- DWELLING UNIT COST:** The initial amount of money paid for the dwelling unit or the present monetary equivalent for replacing the dwelling unit.
- DWELLING UNIT TYPE:** Four types of dwelling units are considered:
Room: A SINGLE SPACE usually bounded by partitions and specifically used for living; for example, a living room, a dining room, a bedroom, but not a bath/toilet, kitchen, laundry, or storage room. SEVERAL ROOM UNITS are contained in a building/shelter and share the use of the parcel of land on which they are built (open spaces) as well as common facilities (circulation, toilets, kitchens).
Apartment: A MULTIPLE SPACE (room/set of rooms with bath, kitchen, etc.). SEVERAL APARTMENT UNITS are contained in a building and share the use of the parcel of land on which they are built (open spaces) as well as some common facilities (circulation).
House: A MULTIPLE SPACE (room/set of rooms with or without bath, kitchen, etc.). ONE HOUSE UNIT is contained in a building/shelter and has the private use of the parcel of land on which it is built (open spaces) as well as the facilities available.
Shanty: A SINGLE OR MULTIPLE SPACE (small, crudely built). ONE SHANTY UNIT is contained in a shelter and shares with other shanties the use of the parcel of land on which they are built (open spaces).
- DWELLING TYPE:** The physical arrangement of the dwelling unit:
Detached: individual dwelling unit, separated from others.
Semi-Detached: two dwelling units sharing a common wall (duplex).
Row/Grouped: dwelling units grouped together linearly or in clusters.
Walk-Up: dwelling units grouped in two to five stories with stairs for vertical circulation.
High-Rise: dwelling units grouped in five or more stories with stairs and lifts for vertical circulation.
- DWELLING UTILIZATION:** The utilization indicates the type of use with respect to the number of inhabitants/families.
Single: an individual or a family inhabiting a dwelling.
Multiple: a group of individuals or families inhabiting a dwelling.
- FINANCING:** The process of raising or providing funds.
Self Financed: provided by own funds.
Private/Public Financed: provided by loan.
Public Subsidized: provided by grant or aid.
- DWELLING DEVELOPMENT MODE:** Two modes are considered:
Incremental: The construction of the dwelling and the development of the local infrastructure to modern standards by stages, often starting with provisional structures and underdeveloped land. This essentially traditional procedure is generally practiced by squatters with de facto security of tenure and an adequate building site.
Instant: The formal development procedure in which all structures and services are completed before occupation.
- LAND TENURE:** The act, right, manner or term of holding land property. Types are categorized by how land is held and for what period of time. Legal definitions are established to determine the division of property among various owners, or the relationship between owner or occupier, or between creditor and owner; and between private owners and the public, and includes the assessment of taxes on private land rights and the regulation of land use through government control. There are TWO BASIC FORMS of land tenure:
Land Ownership: where the exclusive right of control and possession of a parcel of land is held in freehold.
Land Tenancy: where the temporary holding of mode or holding a parcel of land is of another.
- LAND UTILIZATION:** A qualification of the land around a dwelling in relation to user, physical controls, and responsibility.
Public: User: anyone/unlimited (streets, walkways, open spaces). Physical controls: minimum Responsibility: public sector
Semi-Public: User: limited group of people (open spaces, playgrounds, schools). Physical controls: partial or complete. Responsibility: public sector and user
Private: User: owner or tenant or squatter (dwellings, lots). Physical controls: complete. Responsibility: user
Semi-Private: User: group of owners and/or tenants (cluster courts). Physical controls: partial or complete. Responsibility: users
- LAND UTILIZATION: PHYSICAL CONTROLS:** The physical/legal means or methods of directing, regulating and coordinating the use and maintenance of land by the owners/users.

LAND UTILIZATION: RESPONSIBILITY: The quality/state of being morally/legally responsible for the use and maintenance of land by the owners/users.

PERCENT RENT/MORTGAGE: The fraction of income allocated for dwelling rental or dwelling mortgage payments; expressed as a percentage of total family income.

SUBSISTENCE INCOME: Average amount of money required for the purchase of food and fuel for an average family of 5 people to survive (\$874/year in Riyadh, 1973).

TENURE: Two situations of tenure of the dwelling units and/or the lot/land are considered:
Legal: having formal status derived from law.
Extralegal: not regulated or sanctioned by law.

Four types of tenure are considered:

Rental: where the users pay a fee (daily, weekly, monthly) for the use of the dwelling unit and/or the lot/land.

Lease: where the users pay a fee for long-term use (generally for a year) for a dwelling unit and/or the lot/land from the owner (an individual, a public agency, or a private organization). No cases of lease are shown in Typology.

Ownership: where the users hold in freehold the dwelling unit and/or the lot/land which the unit occupies.

Employer-Provided: where the users are provided a dwelling unit by an employer in exchange for services; i.e., domestic live-in servant. (Only one case is shown in the case studies.)

URBAN AREA: All developed land lying within the urban fringe (politically undefined development lying between the city and the country) including a central city and any of its satellite communities; it is not a political/governmental unit (Bartholomew, 1955).

URBANIZATION: the quality of state of being or becoming urbanized: to cause or take on urban characteristics.

USER INCOME GROUPS: Based upon the subsistence (minimum wage) income per year, five income groups are distinguished. (The subsistence income per year in Riyadh is approximately \$874).

Very low (below subsistence level) less than \$874/year:

The income group with no household income available for housing, services, or transportation.

Low (1 x subsistence level) \$874/year:

The income group that can afford limited subsidized housing.

Moderate Low (4 x subsistence level) \$3,496/year:

The income group that has access to public/private commercial housing (rental).

Middle (15 x subsistence level) \$13,110/year:

The income group that has access to private commercial housing (ownership).

High (above 15 x subsistence level) above \$13,110

The income group that represents the most economically mobile sector of the population.

INFRASTRUCTURE: The underlying foundation or basic framework for utilities and services: streets, sewage, water, network, storm drainage, electrical network, gas network, telephone network, public transportation, police and fire protection, refuse collection, health, schools, playgrounds, parks, open spaces.

LAND - MARKET VALUE: Refers to: 1) the present monetary equivalent to replace the land; 2) the present tax based value of the land; or 3) the present commercial market value of the land.

EQUIVALENTS

METRIC SYSTEM EQUIVALENTS

Linear Measures -

1 centimeter	=	0.3937 inches
1 meter = 100 centimeters	=	39.37 inches or 3.28 feet
1 kilometer = 1,000 meters	=	3,280.83 feet or 0.62137 miles
1 inch	=	2.54 centimeters
1 foot	=	0.3048 meters
1 mile	=	1.60935 kilometers

Square Measures

1 square meter	=	1,550 square inches or 10.7639 square feet
1 hectare = 10,000 sq meters	=	2.4711 acres
1 square foot	=	0.0929 square meters
1 acre	=	0.4087 hectares

DOLLAR EQUIVALENTS

All income, cost, and rent/mortgage data have been expressed in terms of the U.S. equivalent;
1 U.S. dollar = 3.5 Saudi Riyals.

QUALITY OF INFORMATION

The quality of information given in the drawings have been qualified in the following manner:

Tentative: when based upon rough estimations of limited sources.

Approximate: when deducted from different and/or not completely reliable sources.

Accurate: when taken from reliable or actual sources.

QUALITY OF SERVICES, FACILITIES AND UTILITIES

Non: when the existence of services, facilities and utilities are unavailable to a locality.

Limited: when the existence of services, facilities and utilities are available to a locality in a limited manner due to proximity.

Adequate: when the existence of services, facilities and utilities are available in/to a locality.

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URBAN DWELLING ENVIRONMENTS: MEXICO CITY, Basant, J., Cortes, J.L., Davila, R., Espinosa, E., M.I.T. Thesis, Cambridge, 1974.

USUFRUCT: The right to profit from a parcel of land or control of a parcel of land without becoming the owner or formal lessee; legal possession by decree without charge.