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It is the policy of the Ministry of Education to provide the highest quality of education for all students in the Kingdom of Saudi Arabia. The Ministry is committed to providing a world-class education that prepares students for the challenges of the 21st century. This report presents the findings of the study on the implementation of the National Curriculum Framework for the Southern Region. The study was conducted in the Southern Region of Saudi Arabia, which is a region with a rich cultural heritage and a growing economy. The study aimed to identify the strengths and weaknesses of the current curriculum and to provide recommendations for improvement. The study was conducted in the Southern Region of Saudi Arabia, which is a region with a rich cultural heritage and a growing economy. The study aimed to identify the strengths and weaknesses of the current curriculum and to provide recommendations for improvement. The study was conducted in the Southern Region of Saudi Arabia, which is a region with a rich cultural heritage and a growing economy. The study aimed to identify the strengths and weaknesses of the current curriculum and to provide recommendations for improvement.

SOUTHERN REGION PROJECT STUDY

MASTER PLAN REPORT

ABHA

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UNIVERSITY OF PETROLEUM & MINERALS
DHAHRAN - SAUDI ARABIA

PREFACE

It is our great honor and pleasure to have the opportunity to participate in the studies of the regional master plan for the Southern Region and master plans for the main cities of the Southern Region in the Kingdom of Saudi Arabia.

Our participation in the project was initiated in May, 1974. Since that time, under the guidance of the Ministry and with close collaboration between our offices in Tokyo and Abha, we have done our utmost to carry forward our task.

This report presents the final results of our study for the preparation of master plans for the five main cities and a village cluster in the Southern Region. The series of six reports of which this is a part represents the work of the third phase of the third stage of the Southern Region Project Study as specified in the Agreement.

The development plans contained in this report have been based on the Existing Conditions Reports, the Initial Appraisal Reports, the Alternative Strategies Reports, and the Preliminary Master Plan reports, all of which have been previously submitted to the Ministry of Municipal and Rural Affairs. The development plans have been formulated in line with the major objectives, policies and priorities adopted by the Ministry.

The development plans cover the anticipated growth of the five major cities and the village cluster, proposed land uses, infrastructure planning, and outline programs of development, land acquisition, improvement, and zoning regulations.

We therefore submit these reports as the final Master Plans of the main cities and the village cluster in the Southern Region.

1978

Kenzo Tange

Project Principal

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DISTRICT OF BAHRAIN & MUSCAT
ABHA, JEDDAH, RIYADH

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ABHA MASTER PLAN REPORT SOUTHERN REGION PROJECT STUDY

ACKNOWLEDGEMENT

In the process of the preparation of this report, valuable assistance has been given to us by numerous governmental organizations and officials. In this regard, we would like to express our particular and sincere gratitude to those listed hereunder for their kind suggestions and guidance on our progress of the study.

H.R.H. Prince Magid Ibn Abdul Aziz
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The Assistant Director General of Municipal and Rural Affairs--
Southern Region

1-1 SCOPE OF REPORT: The series of six reports of which this is a part presents the Final Master Plan for the five major cities and a village cluster in the Southern Region. The report reviews all the significant information on the existing conditions, presents future projections, and a physical Master Plan which outlines the development of the cities and the village cluster for the twenty-year planning period from 1955 to 1975. The report also contains a development strategy for the phasing of the plan and recommendations for an implementation program from which a capital investment program is prepared.

1-2 PLANNING PROCESS

1-2-1 RELATIONSHIP OF THE FINAL MASTER PLAN TO PREVIOUS REPORTS: During the course of the Southern Region Project Study, a series of five separate reports have been submitted for each of the five major cities of the Southern Region. "Initial Appraisal of Existing Conditions" and "Immediate Action" identify areas requiring immediate attention, while "Existing Conditions" and "Alternative Strategies" focus on broader issues confronting the cities and on various alternative approaches toward meeting long range planning objectives. The Preliminary Master Plan drew on all four previous reports and presented a program for the development of the city over the twenty-year planning period. These Final Master Plans were prepared based upon comments and criticism given by the Ministry and its advisers and represent a set of workable plans which respond to all the comments received by the consultant.

1-2-2 ELEMENT BY ELEMENT ANALYSIS: The various considerations affecting urban development have been classified into various "Planning Elements." Each planning element is a collection of highly interrelated topics which can be investigated in great detail and in relative independence of other elements. Taken together, however, the elements encompass an exhaustive list of issues involved in the formation of development plans. The element by element study makes possible a clear identification of trends, needs, and problems which must be addressed by the master plan.

1-2-3 COORDINATION OF PLANNING ELEMENTS: There is, at the same time, a systematic coordination of Planning Elements through the recommended Schematic Master Plan, developed in Alternative Strategy reports, and through the establishment of a "community structure," indicated by Planning Standards in the Preliminary Physical Master Plan

of the Southern Region. The master plan contains the basic strategy for the growth of the city of village cluster, the recommended directions for the change in population, the functional distribution of land use, infrastructure development, and policies toward the mobile population. The community structure, on the other hand, identifies a hierarchy of population groupings in order to properly distribute urban services and to help establish identifiable communities. The "neighborhood" of approximately 6000 residents is the basic unit of social organization and provides a logical definition of planning districts for which projections and identification of needs may be established.

Planning Element	Chapter
Housing	3
Industries	4
General Education	5
Public and Institutional Facilities	5
Cultural Facilities	5
Commercial Facilities	5
Recreation and Conservation	6
Transportation	7
Public Utilities	8

1-2-4 FLOW OF INFORMATION: For each Planning Element, first, the existing conditions are briefly reviewed. Next, the projections of populations developed in Chapter 3 and economic projections developed in Chapter 4 are applied to in the context of the Planning Standards. As a result, future requirements or projections for a particular Planning Element may be obtained. Third, a policy which will determine land use for the element is developed by considering the schematic master plan, the community structure, and the Planning Standards. The application of policy principles results in the element land use plan. Site considerations and local issues are discussed at this stage. The recommended overall development plan, or the Master Plan, is generated from the simultaneous consideration of all the individual element land use plans. Zoning, zoning and local framework, and recommendations for a capital investment program are developed from the Master Plan.

CONTENTS

<p>1. INTRODUCTION</p> <p>1-1. Scope of Report 2</p> <p>1-2. Planning Process 2</p>	<p>7. PRIMARY COMMUNICATION AND TRANSPORT</p> <p>7-1. General 68</p> <p>7-2. Land Use--Transportation Study 68</p> <p>7-3. Principal Road Network 76</p> <p>7-4. Public Transportation 78</p> <p>7-5. Traffic Control 78</p> <p>7-6. Car Parking Policy 80</p> <p>7-7. Environmental Management Policy 83</p> <p>7-8. Phasing and Cost of Recommended Improvements-- Investment needs for 5, 10 and 20 Years 84</p>
<p>2. SUMMARY OF EXISTING CONDITIONS</p> <p>2-1. Regional Policies and the City 8</p> <p>2-2. Main Function of the City 8</p> <p>2-3. Historical Growth and Natural Features 10</p> <p>2-4. Structure of the City 12</p> <p>2-5. Principal Issues and Planning Objectives 16</p>	<p>8. PUBLIC UTILITIES</p> <p>8-1. Electricity 86</p> <p>8-2. Water 88</p> <p>8-3. Sewerage 90</p> <p>8-4. Stormwater Drainage 90</p> <p>8-5. Solid Refuse Collection and Disposal 92</p>
<p>3. POPULATION AND HOUSING</p> <p>3-1. Population Projection and Distribution 22</p> <p>3-2. Housing Needs 28</p> <p>3-3. Housing Policy 28</p> <p>3-4. Housing Land Use 32</p>	<p>9. LAND USE</p> <p>9-1. Existing and Projected Land Use 94</p> <p>9-2. Summary of Land Use Policies 95</p> <p>9-3. Development Plan 103</p> <p>9-4. City Center 112</p> <p>9-5. Proposed Action Areas 112</p>
<p>4. EMPLOYMENT</p> <p>4-1. Sectoral Composition and Projection 36</p> <p>4-2. Distribution of Employment Centers 38</p> <p>4-3. Income Distribution 40</p> <p>4-4. Industrial Location 40</p>	<p>10. ADMINISTRATION AND MANAGEMENT</p> <p>10-1. Town Planning Legislation and Administration 114</p> <p>10-2. Development and Implementation Program 114</p> <p>10-3. Zoning Regulations and Administrative Measures 115</p>
<p>5. CIVIC, CULTURAL, AND COMMERCIAL CENTERS</p> <p>5-1. General Education 44</p> <p>5-2. Public and Institutional Facilities 49</p> <p>5-3. Cultural Facilities 54</p> <p>5-4. Commercial Facilities 54</p> <p>5-5. Neighborhood and Community Central Areas 58</p>	<p>11. CONURBATION</p> <p>11-1. Interdependence of Abha and Khamis Mushayt 120</p> <p>11-2. Development between Abha and Khamis Mushayt 120</p> <p>11-3. Policy for Conurbation 120</p>
<p>6. RECREATION AND CONSERVATION</p> <p>6-1. Recreation 62</p> <p>6-2. Tourism 64</p> <p>6-3. Open Space Conservation 65</p>	<p>APPENDIX: COMMUNITY PLANNING STANDARDS</p> <p>A-0 Introduction A-2</p> <p>A-1 Demographic and Density Frame for Standards A-2</p> <p>A-2 Planning Standards for Each Facility A-6</p> <p>A-3 Application of Planning Standards A-19</p>

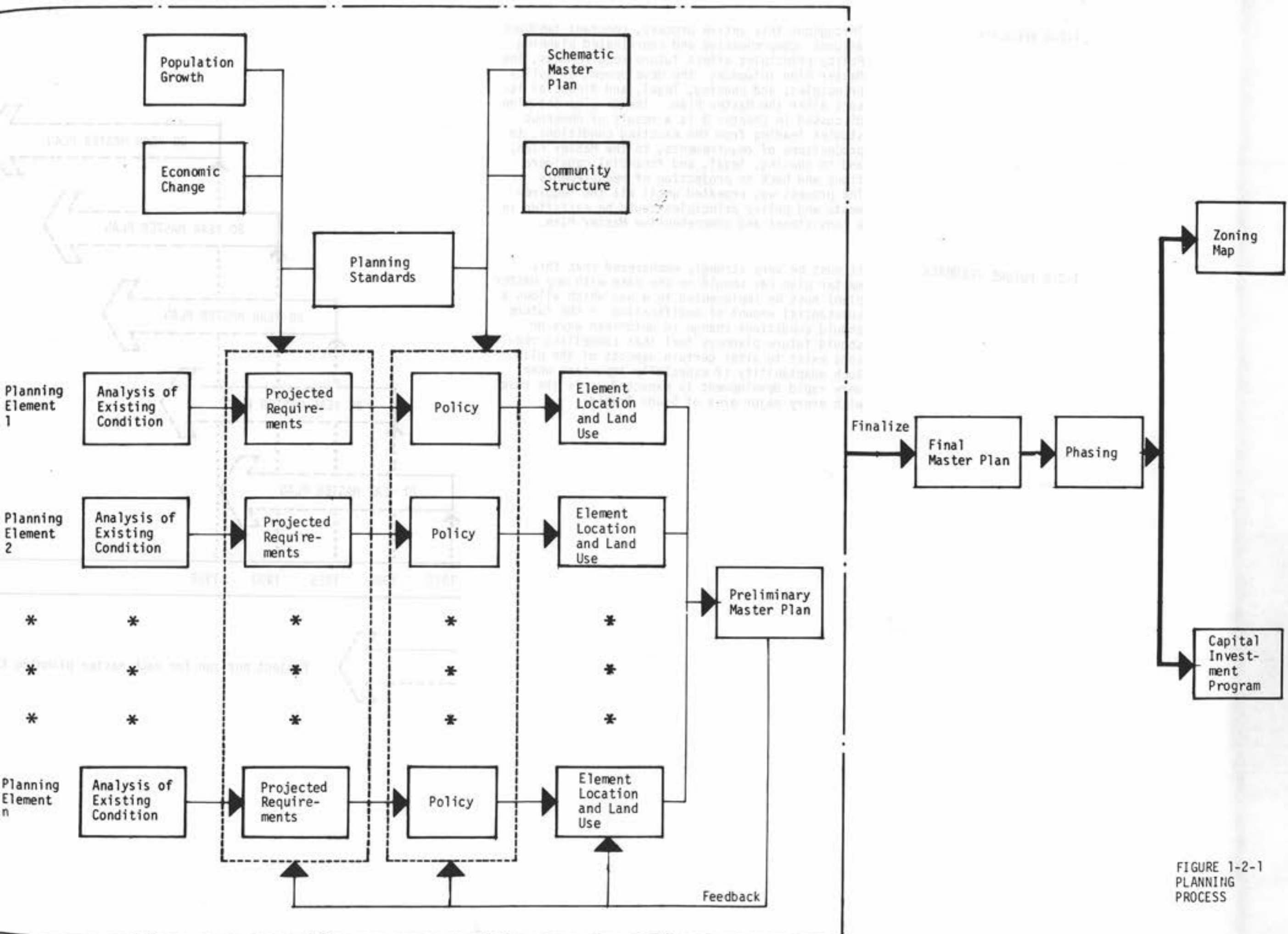


FIGURE 1-2-1
PLANNING
PROCESS

1-2-5 FEEDBACK

Throughout this entire process, constant feedback assures comprehensive and coordinated planning. Policy principles affect future requirements; the Master Plan influences the development of policy principles; and phasing, legal, and financial issues alter the Master Plan. The development plan discussed in Chapter 9 is a result of numerous studies leading from the existing conditions, to projections of requirements, to the Master Plan, and to phasing, legal, and financial considerations and back to projection of requirements. The process was repeated until all the requirements and policy principles could be satisfied in a consistent and comprehensive Master Plan.

1-2-6 FUTURE FEEDBACK

It must be very strongly emphasized that this master plan (as should be the case with any master plan) must be implemented in a way which allows a substantial amount of modification in the future should conditions change in unforeseen ways or should future planners feel that compelling reasons exist to alter certain aspects of the plan. Such adaptability is especially important when very rapid development is expected as is the case with every major area of Saudi Arabia.

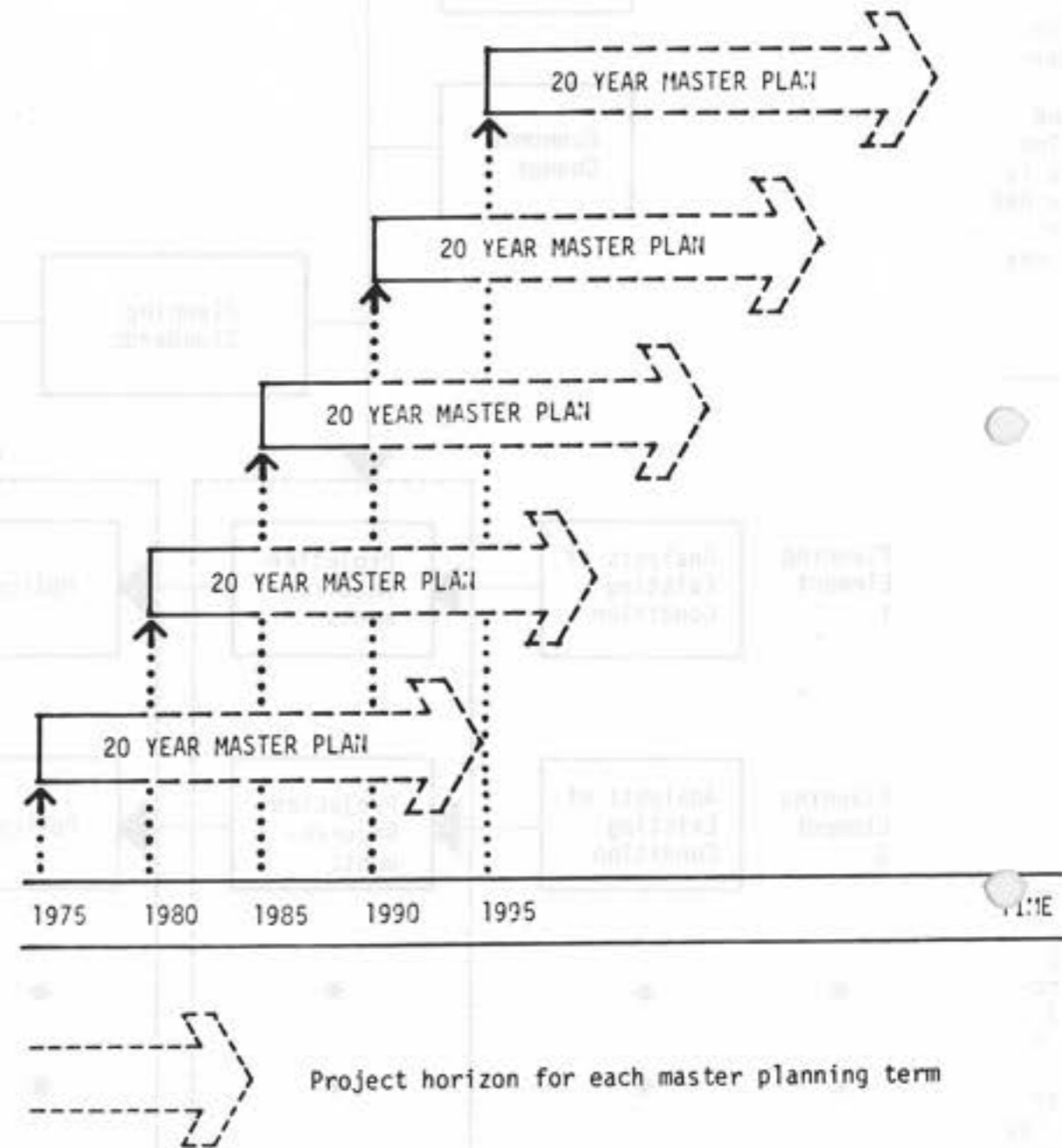
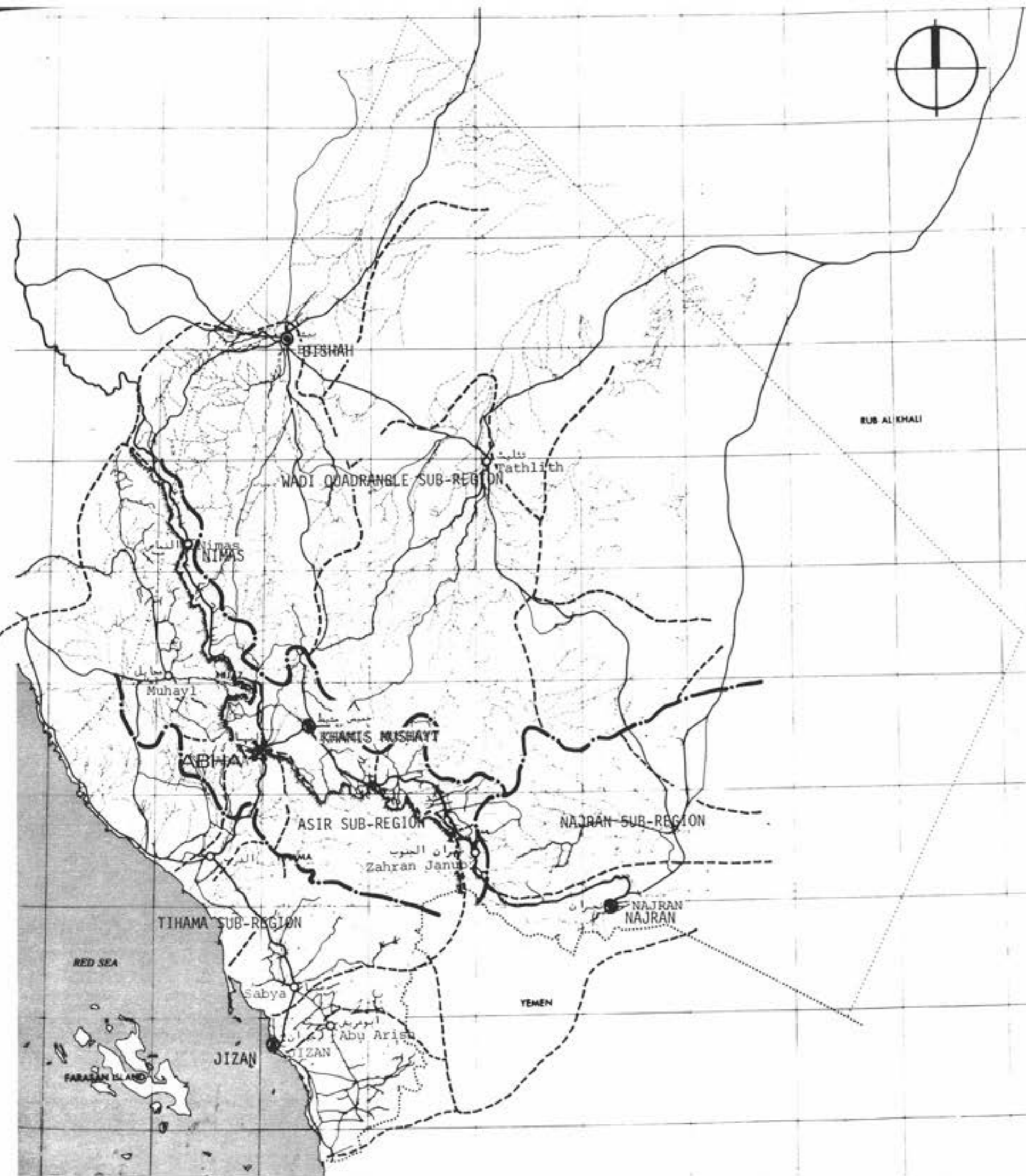


FIGURE 1
DIAGRAM
MASTER P
OVER TIM

FIGURE 1-2-3
 REGIONAL
 LOCATION
 scale 1:2,000,000



NOTE:
 For definition of sub-regions and
 wadi basins, see Southern Region,
 Physical Plan, Chap.3

--- sub-region
 wadi basin

The regional pattern of development is the primary factor in determining the location of the city. The regional pattern of development is the primary factor in determining the location of the city. The regional pattern of development is the primary factor in determining the location of the city. The regional pattern of development is the primary factor in determining the location of the city.

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2. summary of existing conditions

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2-1 REGIONAL POLICIES AND THE CITY

The regional policies detailed in the Regional Master Plan report fall into several categories including economic development, human resources development and social development. Each of these categories has several elements which can be generally applied to all of the cities of the Southern Region, as well as elements particularly appropriate to specific sub-regions and cities.

With regard to economic development in the Asir sub-region, the Regional plan identifies four areas which present particularly encouraging potential:

1. Administration, commercial activity and service delivery.
2. Production of high-value agricultural products.
3. Manufacturing activities.
4. Tourism and recreation.

The city of Abha has good potential in each of these areas but has an especially good competitive advantage in 1. Administration, commercial activity and service delivery, and 4. Tourism and recreation.

In the area of human resources development, Abha is in a unique position in the Southern Region because of the expectation of significant educational development to a much higher degree than in the other cities. Abha will become the focus of the development and implementation of regional educational policies, especially at the higher educational levels of colleges and universities.

2-2 MAIN FUNCTION OF THE CITY

Currently Abha has three primary functions within the regional context.

1. It is the regional and provincial administration center.
2. It is a developing resort and recreation center.
3. It is a collection and distribution center of goods and services for surrounding rural settlements.

The administrative nature of the city is well established by tradition, recent history and current government policy. Future government interest and investment in the Southern Region will in the short run substantially increase the activity and development of this function. In the long run, the continuing necessity for the administration of a more populous and highly developed region will assure the maintenance of a high level of administrative activity. Thus the functioning of this sector will be the primary determinant of the character and development of the city. It is both natural and necessary then that a substantial planning and

development effort be devoted to the growth and functioning of administrative services and facilities.

The functioning of the city as a center for recreation and tourism is historically and formally less well developed, although because of the excellent climate and splendid natural scenery of the area, Abha and the specific locations in the vicinity of the city such as Sawdah, Qarrah and Mohalah have been traditional, if informal centers for recreation and tourism. Because of the lack of purposeful and comprehensive study to this potential however, basic facilities necessary to its adequate development have in the past been essentially overlooked and only recently have concrete plans begun to be developed which will promote recreation and tourism in the city and its vicinity.

Abha's potential as a resort center is the best of the entire country, and the economic and social benefits of developing this function warrant substantial effort and investment.

Because of the nearby presence of Khamis Mushayt which functions as the most important commercial center in the region, it is expected that the collection/distribution/commercial functions of the city will not be as highly developed as might otherwise be expected. At the same time the development of specialized markets dealing in such items as luxury consumer goods may increase dramatically.

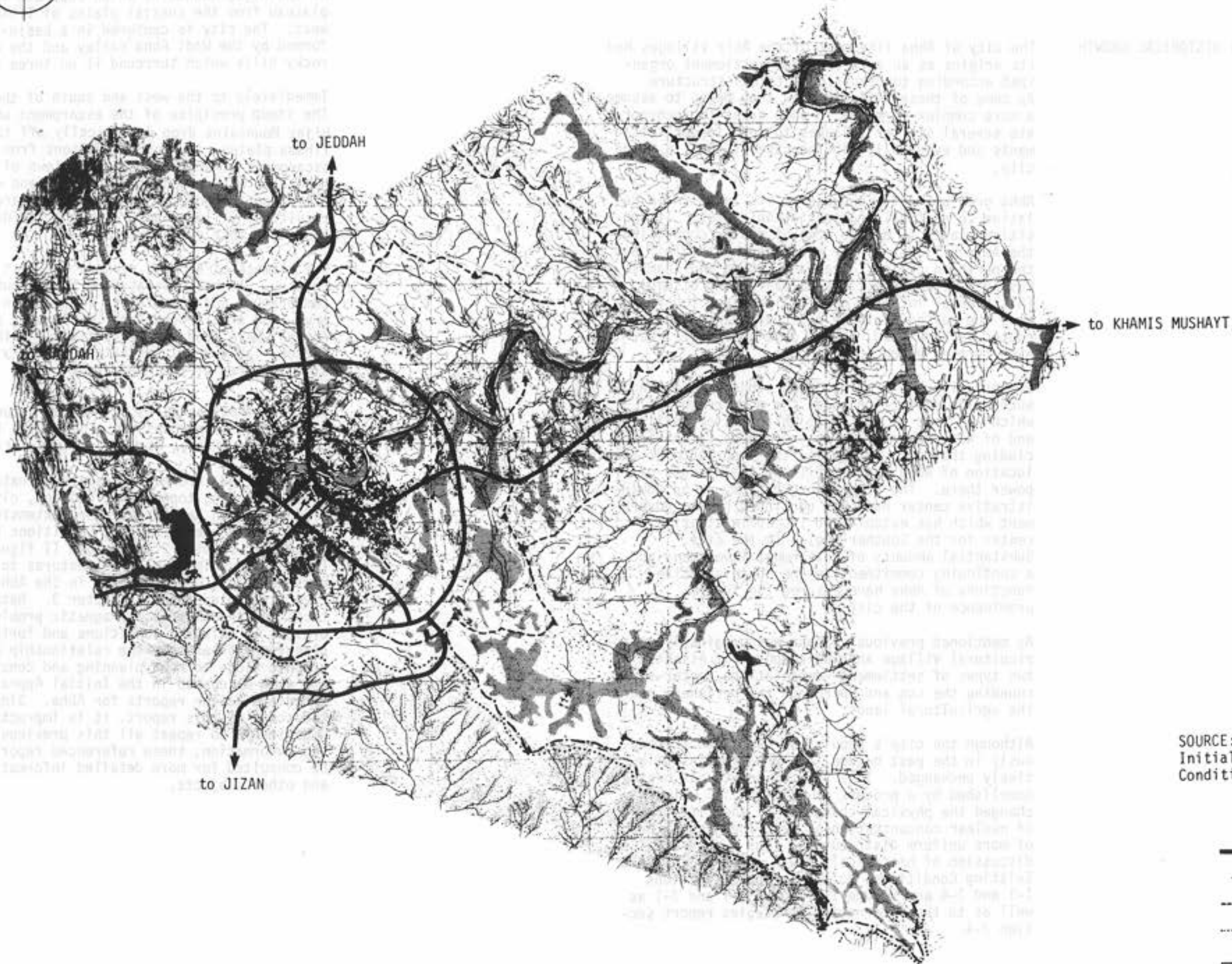
Intense development of the administration and resort functions as well as the government's educational policies and objectives for the city will lead to its establishment as an important center for education and cultural activities which will complement nicely the other activities.

In the future then it is expected that the primary functions of the city will be concentrated in these areas:

1. Government Administration.
2. Tourism and Recreation.
3. Education and Cultural Activities.
4. A primary center for distribution of services and a secondary center for collection and distribution of goods for surrounding rural settlements.



FIGURE 2-1-1
SURROUNDING
AREA
scale 1:50,000



SOURCE:
Initial Appraisal of Existing
Conditions, Fig. 2-1

- main road
- ~ wadi
- - - watershed
- escarpment
- ▲ peak
- agricultural area

2-3 HISTORICAL GROWTH AND NATURAL FEATURES

2-3-1 HISTORICAL GROWTH

The city of Abha like most of the Asir villages had its origins as an agrarian wadi settlement organized according to traditional tribal structure. As some of these villages grew they began to assume a more complex form and in some cases to incorporate several smaller villages to form larger settlements and eventually, in the case of Abha, a major city.

Abha grew primarily because of its location in relation to regional transportation routes. Its position places it at the node of routes connecting the Asir villages to the north and south, Taif and the northern cities, Jizan and Tihama and Khamis Mushayt (with connections to Najran and Bishah). This pivotal location remains important today and once the paving of these regional transportation routes is completed, Abha's development will be even further enhanced.

Historically the area has been subject to a long succession of foreign rule, the most recent of which was that of the Turks which lasted until the end of World War I. Several of these rulers including the Turks recognized the importance of the location of Abha and established their seats of power there. The city's long history as an administrative center has been continued by the government which has established its administrative center for the Souther Region in the city. Substantial amounts of government investment and a continuing commitment to the administrative functions of Abha have assured the future prominence of the city.

As mentioned previously, Abha was originally an agricultural village and was composed of essentially two types of settlement--dense at the center surrounding the suq and sparse at the periphery near the agricultural lands.

Although the city's population has grown tremendously in the past decade, its area remains relatively unchanged. This type of growth has been accomplished by a process of "filling in" which has changed the physical character of the city from one of nuclear concentration as described above to one of more uniform distribution. For a more detailed discussion of historical growth refer to the Abha Existing Conditions, Volume I report, Sections 1-1 and 1-4 and Volume II figures 1-1 and 3-1 as well as to the Alternative Strategies report section 2-4.

2-3-2 NATURAL FEATURES

Abha is situated at an altitude of about 2200 meters near the water dividing line of the Asir range of the Hijaz Mountains which separate the central plateau from the coastal plains of Tihama to the west. The city is centered in a basin-like area formed by the Wadi Abha valley and the chain of rocky hills which surround it on three sides.

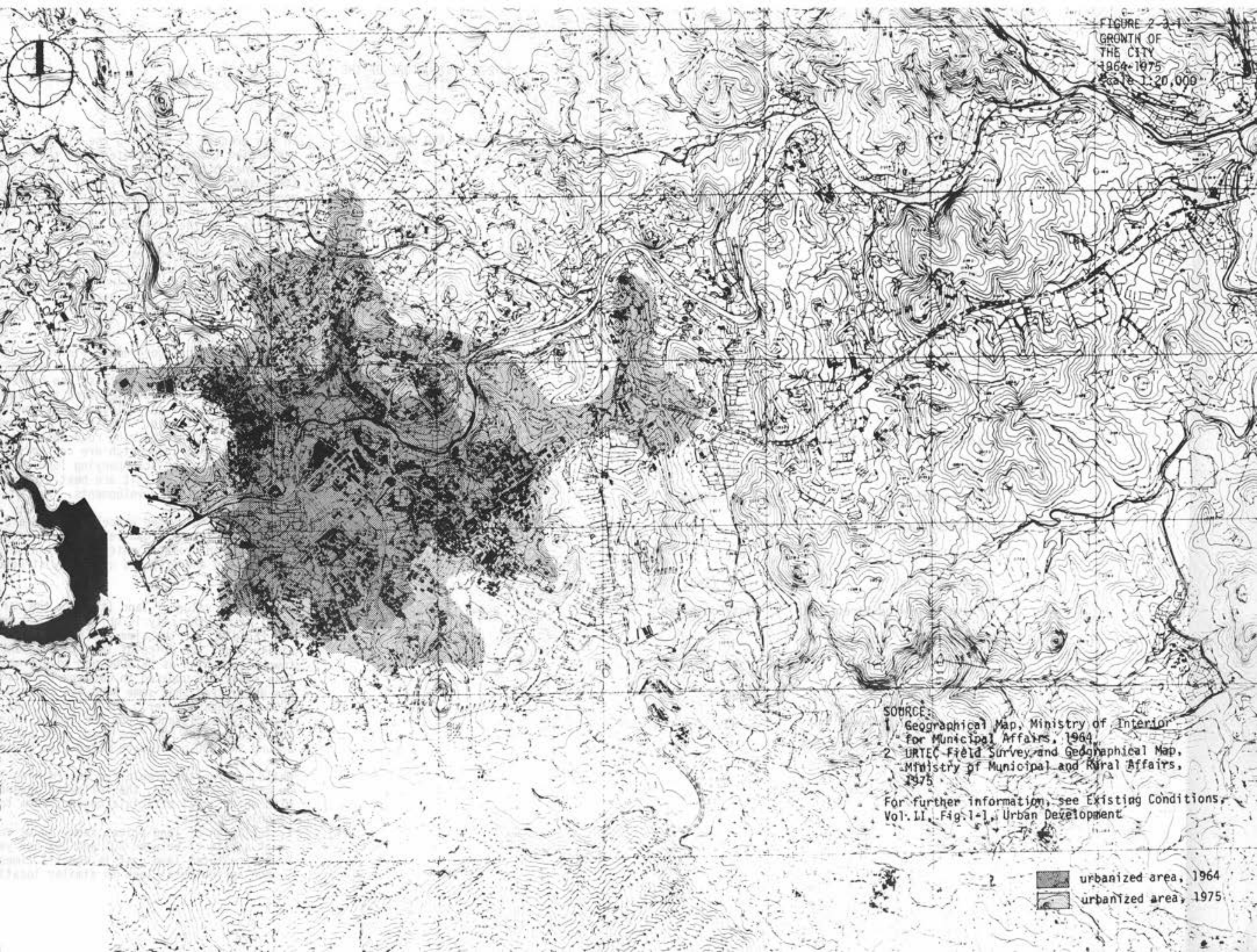
Immediately to the west and south of the city is the steep precipice of the escarpment where the Hijaz Mountains drop dramatically off toward the Tihama plains. In both directions from Abha this escarpment affords spectacular views of rugged mountains with abundant vegetation and wildlife. All along the edge of the escarpment are small agricultural villages nestled among fields which are green for most of the year.

The climate of Abha is perhaps the best in the country. It has moderate and stable humidity and temperature and the highest rainfall in the country. The area around Abha is the only part of the region where land can be cultivated without irrigation. Table 2-3-1 indicates a summary of climatic features of the Abha area.

In short from the point of view of natural features, Abha is perhaps the nicest city in the country for living, working and recreation.

More detailed information regarding natural features including topography, geology, climate, wind and so on has already been extensively presented in the Abha Existing Conditions report, Volumes I, Chapter 2 and Volume II figure 1-2. The relationship of natural features to planning considerations was presented in the Abha Alternative Strategies report, Chapter 3. Natural features and the immediate pragmatic problems they present to existing conditions and forthcoming planning (for example the relationship of topographic slope to road planning and construction) are also discussed in the Initial Appraisal and Immediate Action reports for Abha. Since within the scope of this report, it is impractical and undesirable to repeat all this previously discussed information, these referenced reports should be consulted for more detailed information on this and other subjects.

FIGURE 2-3-1
GROWTH OF
THE CITY
1964-1975
Scale 1:20,000



SOURCE:
1 Geographical Map, Ministry of Interior
for Municipal Affairs, 1964.
2 URTEC Field Survey, and Geographical Map,
Ministry of Municipal and Rural Affairs,
1975.

For further information, see Existing Conditions,
Vol. II, Fig. 1-1, Urban Development.

■ urbanized area, 1964
■ urbanized area, 1975

Table 2-3-1
Climatic Features in Abha

Air temperature (°C)	
Annual mean	16.8
Annual range	9.4
Monthly range max.	12.2 (Sept.)
Relative humidity (%)	
Annual mean	55
Monthly max.	54 (Oct.)
Range min.	45 (May)
Pan-evaporation (mm)	
Annual	2,736
Max. monthly	301 (Jun.)
Solar-radiation (g.cal/cm ² /day)	
Annual mean	532
Max. monthly	584 (May)
Wind speed (Km/hr)	
Annual mean	8.7
Max. monthly	9.7 (Feb.)
Prevailing wind direction	West/Southwest
Rainfall	
Annual average (mm)	382
Wettest month	Aug.
Altitude above sea level (m)	2,190

2-4 STRUCTURE OF THE CITY

2-4-1 LAND OWNERSHIP

In the process of planning the cities of the Southern Region it has been determined that question of land ownerships represent one of the most troublesome aspects of future development. The government is naturally anxious to utilize land which it already owns or controls for future development projects. At the same time however, the location and size of the land is not always optimum for the proposed planning scheme. In all of the planning represented in this report, it has been the objective of the project planning team to make every effort to accommodate known government land holdings within the framework of the comprehensive master plan.

Of course, various government ministries and agencies own scattered parcels of land throughout the city, and it is felt that these can be relatively easily utilized without violating the concepts of the master plan if careful consideration is given to their specific use. Within and just outside of the recently completed ring road there are several large parcels of land which are controlled by the government (see the accompanying land ownership map) and which it is felt are best used as future planned residential developments.

These government owned parcels of land are ideally placed to create a broad range of well designed demonstration projects which can fit nicely within the existing and proposed community structure.

2-4-2 LAND VALUES

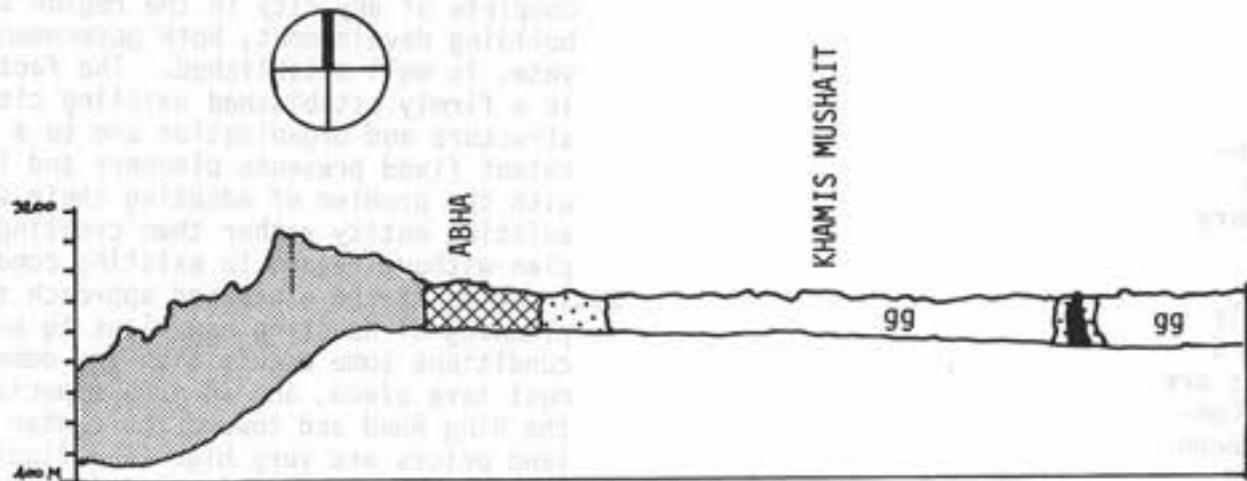
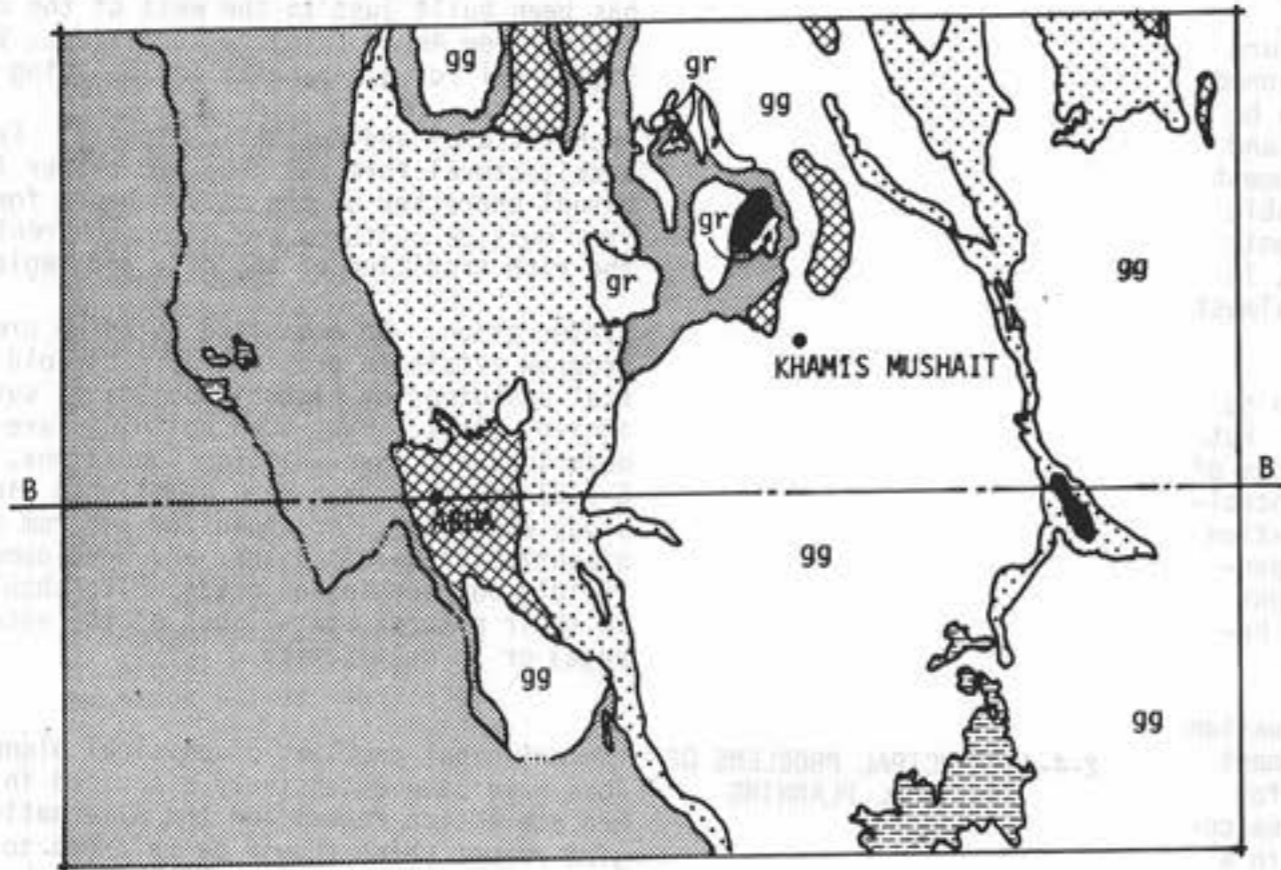
The present value of land (that is the market rate) within the city is quite high and increasing rapidly. At the time, this study was initially done, the price of land in the center of town was as high as SR 3000 per square meter. This study was updated in January 1978, and it was discovered that some land was as much as SR 8000 per square meter. The price of land drops gradually as distance from the center increases, but even outside the ring road, land can cost around SR 1000 per square meter (See Figure 2-4-1)

While no precise formula for determining land value can be determined, the following general rule with which local officials concur, seem to be roughly accurate:

1. Inflation of land prices seems to be continuing at a rate of between 20% and 30% per year.
2. Agricultural land cost is about 2 times that of non-agricultural land in similar locations.

GEOLOGICAL MAP

Scale 1:50,000



SECTION B-B




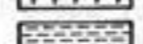
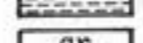
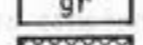

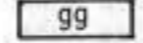
-  Wadi
-  Greenstone and Schistose Greenstone
-  Chlorite-Sericite Schist and Amphibolite Schist
-  Wajid Sandstone
-  Granite
-  Amphibolite, Schist and Related Rocks
-  Granite and Granodiorite
-  Diorite Andesite and Gabbro

FIGURE 2-3-2
GEOLOGICAL
FEATURE

3. Land in approximately a 20 meter strip along major roads is from 25% to 40% higher in price than similar land not along major roads
4. In general land of every kind increases in cost toward the center of the city.

In some sense this very high land market is resulted from the government's rapid development programs coupled with land owners future expectations of sales to accommodate the planned new development. At the same time there can be no reasonable supposition of a decrease in land price since the planned and expected development programs will continue well into the foreseeable future. When the mechanism of general economic inflation is added to this market situation, it can only be concluded that land price will almost certainly continue to increase.

The practical consequences of this situation to the master planning effort are significant. Put simply this means that the substantial amounts of land which must be acquired or otherwise controlled in order to assure the proper implementation of an adequate master plan will be quite expensive. At the same time such acquisition might be justified with proper financial planning because of the investment value of the land.

It should be noted that because of this situation it would be undoubtedly wise for the government to make such acquisitions as are necessary for the full 20 years of this plan as soon as reasonably possible. Not only would this result in a savings of both money and acquisition problems, but would maximize the investment value of the land due to the realization of maximum appreciation. This would be especially true if it is felt that due to the land market, land prices will rise more quickly than inflation.

2-4-3 PHYSICAL STRUCTURE

The existing physical structure has already been extensively discussed in the Existing Conditions report, Chapter 5 and the Alternative Strategies report Chapter 6, but a brief summary is presented here for review:

Spatial Aspect. Building heights are generally of one or two stories with a lesser number of 3 story structures. Only a few newer structures are over 4 stories in height (See Abha, Existing Conditions, Figure 5-1-2) urban sprawl—that is uncontrolled horizontal spreading of structures and functions is occurring rapidly in the absence of a controlling plan.

Building Type and Use. Residential buildings predominate. Old ones are built of stone and mud, new ones of concrete block. Shops are usually located on the ground floor of buildings which have either apartments or offices above. Administration and commercial buildings occupy most of the central district, and a new government complex has been built just to the west of the central district. See Abha, Existing Conditions, Volume II, Figure 5-1 for a map detailing building use.

Architectural and Aesthetic Aspects. Traditional architectural form was good and proper for the visual character of the city. Newer forms brought from outside cultures are often coherent to the rich tradition of the city and region.

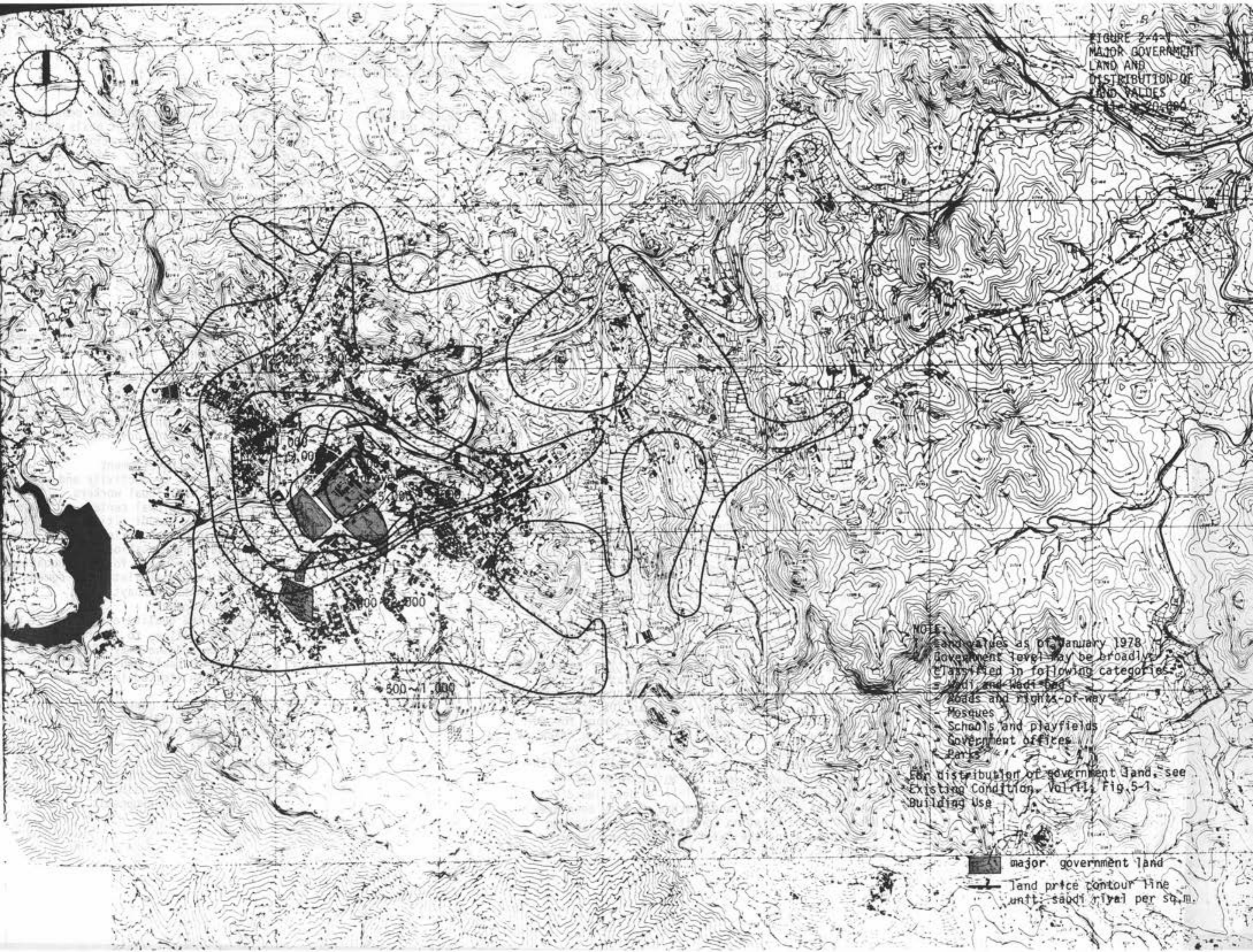
Preservation. No organized building preservation program exists to protect desirable old residential buildings or historic buildings such as ancient forts. Many such buildings are rapidly deteriorating (See Existing Conditions, Figure 6-2-2) and many have been demolished since this study was begun. No organized program of natural preservation exists either and development is rapidly encroaching on areas which should remain in their natural state (such as the escarpment edge) or in cultivation.

2-4-4 PRINCIPAL PROBLEMS OF PHYSICAL PLANNING

The principal problems of physical planning in Abha have been extensively discussed in the Immediate Action report and the Alternative Strategies report which should be referred to for detail. Several general problems have been identified and are summarized as follows:

1. Unlike some of the other cities of the Southern Region, Abha is extensively built-up and modernized. The paved road system is the most complete of any city in the region and new building development, both government and private, is well established. The fact that Abha is a firmly established existing city whose structure and organization are to a large extent fixed presents planners and implementers with the problem of adapting their work to an existing entity rather than creating an "ideal" plan without regard to existing conditions.
2. In spite of the expressed approach to physical planning of adapting new plans to existing conditions some acquisition and demolition must take place, and in Abha especially within the Ring Road and toward the center of town, land prices are very high (See figure 2-4-1)
3. So called urban sprawl, that is undesirable and uncontrolled horizontal development especially at the outskirts is occurring rapidly in

FIGURE 2-4-1
MAJOR GOVERNMENT
LAND AND
DISTRIBUTION OF
LAND VALUES
SCALE 1:20,000



NOTE:
Land values as of January 1978.
Government land may be broadly
classified in following categories:
- Wadi and Wadi bed
- Roads and rights-of-way
- Mosques
- Schools and playfields
- Government offices
- Parks
For distribution of government land, see
Existing Condition, Vol. II, Fig. 5-1.
Building Use

■ major government land
— Land price contour line
unit: Saudi Riyal per sq. m.

- Abha. This uncontrolled development often disregards existing site conditions such as topography and possible negative impacts on adjoining neighbors.
4. The hilly topography of Abha presents a problem to physical planning both because so much of the existing new development pay it so little regard and because it reduces the net amount of land available to development. In residential areas this means that the ratio of net residential area to gross residential area will be lower than usually desirable in some areas.
 5. The maintenance of the rich and beautiful aesthetic and architectural tradition of the old dwellings presents a problem because so much of the old architecture is rapidly deteriorating or being demolished and replaced by buildings designed in a non-indigenous and inappropriate style. Both architectural conservation and appropriately designed new buildings are problems which must be faced in the implementing of any new plan.

2-4-5 EXISTING LAND USE

To a great degree, existing land use as shown in the map on the opposite page, reflects the historic development of the city. Although in recent years there has been an in-filling process of development which has led to even density distribution the old pattern of concentric development around the city center may still be observed. In general residential areas are distributed around the central area with its commercial and government facilities and along the course of the wadi where substantial agricultural activity still occurs. Commercial facilities in addition to those in the central districts are distributed heavily along the road leading to Khamis Mushayt and to a lesser extent along the roads to Jizan and Taif. At the present almost all such activity is confined to the area within the ring road. The area within the ring road is approximately 1100 ha which vacant land occupies the largest area (see Table 5-1-1 in the Abha Alternative Strategies report). The next largest land use is agriculture reflecting the nature of the original settlement. At present, residential areas account for less than 10% of the area within the ring road leaving much room for future residential expansion. Except for the roads and the wadi other uses presently occupy only small percentages of the total available land within the ring road as detailed in the Alternative Strategies report (Table 5-1-1). A detailed discussion of existing land use has already been presented in the Existing Conditions report, Volume I, Chapter 4 and the Existing Conditions report, Volume II, Figure 4-1.

2-5 PRINCIPAL ISSUES AND PLANNING OBJECTIVES

2-5-1 OBJECTIVES AND GUIDELINES

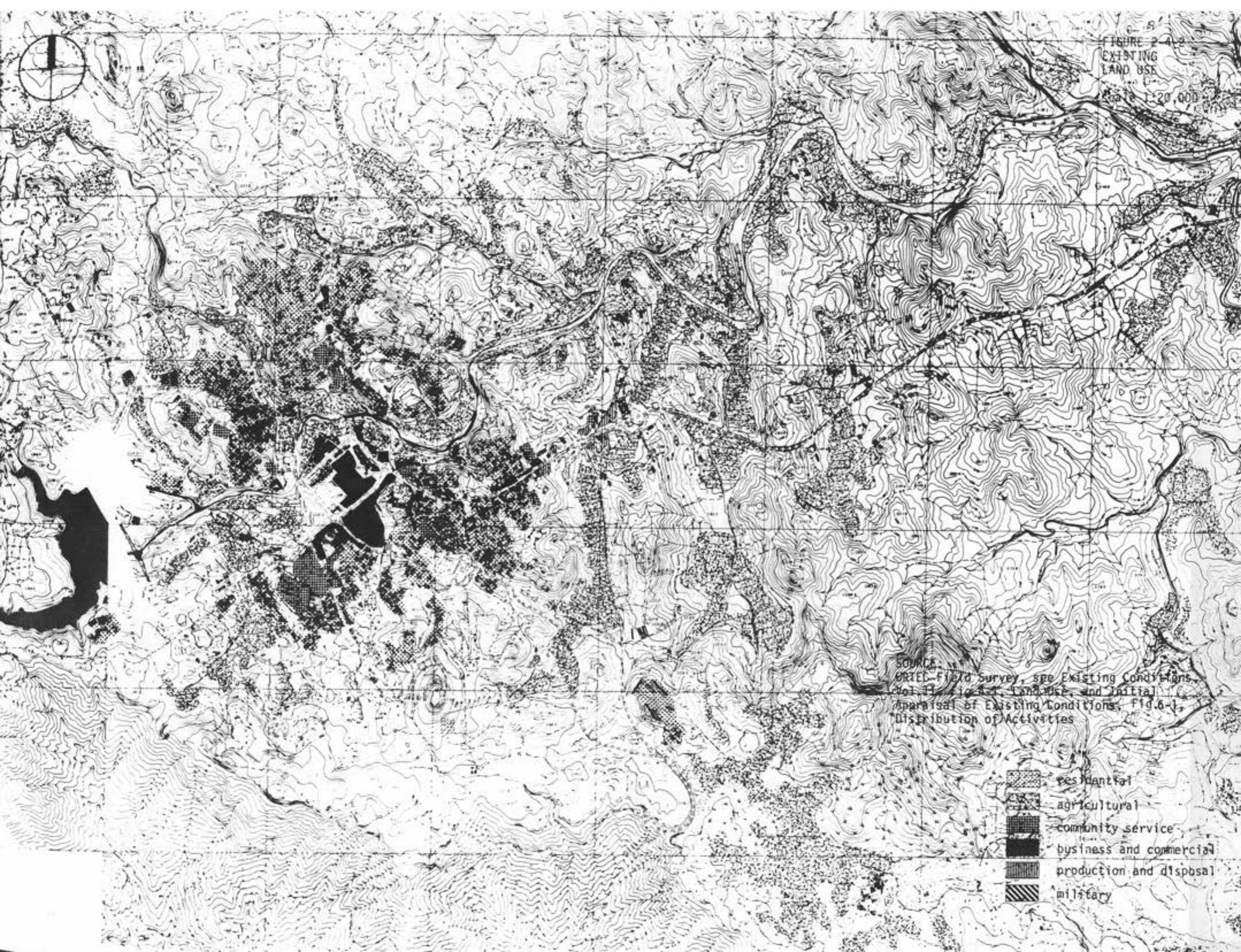
General planning objectives have been developed from the national development goals established by the Central Planning Organization in the Second Five Year Development Plan. After consideration of both these national development goals, the area's resources and the specific nature and problems of the city, the following general planning objectives have been established for the city of Abha:

- A. Economic Development
 1. Stabilize the city's important regional government sector to prepare for the eventual shift from administration of rapid development to administration of a stabilized region.
 2. Encourage conservation of the excellent natural resources of the city and the province to facilitate the development of domestic (and eventually international) tourism and resort industries.
 3. Increase the productivity and the earnings of agriculture in the rural areas of the province by the introduction of an appropriate degree of mechanization and the cultivation of agricultural crops with high economic return.
- B. Human Resource Development
 1. Increase the productivity and earning capacity of individual workers.
 2. Establish regional centers of higher education to give Saudi citizens of the Southern Region an option to leaving the region to obtain an education.
 3. Establish programs for the education, settlement and assimilation of nomads (primarily in Khamis Mushayt).
- C. Social Development
 1. Improve the quality and extent of social welfare services to the residents of Asir Province and the city of Abha.
 2. Provide suitable housing within the city for those with limited income.







In addition to these general objectives, the following planning guidelines have been established after discussion with the Ministry.

1. To utilize as much of the existing and already planned road system as is possible and consistent with proper planning.
2. To utilize where possible existing land use and approved land use proposals.

FIGURE 2-4-2
EXISTING
LAND USE
Scale 1:20,000



SOURCE:
ORTEL Field Survey, see Existing Conditions,
Vol. II, Fig. 6-1, Land Use, and Initial
Appraisal of Existing Conditions, Fig. 6-1,
Distribution of Activities

-  residential
-  agricultural
-  community service
-  business and commercial
-  production and disposal
-  military

These objectives take recognition of the facts that 1. Abha is already a well-established city with substantial development along existing road networks and 2. Land acquisition problems and costs are such that land already acquired by the government for approved uses represents a substantial investment which should not be wasted.

The general objectives and guidelines noted above have been the basis for the planning which is presented in this report.

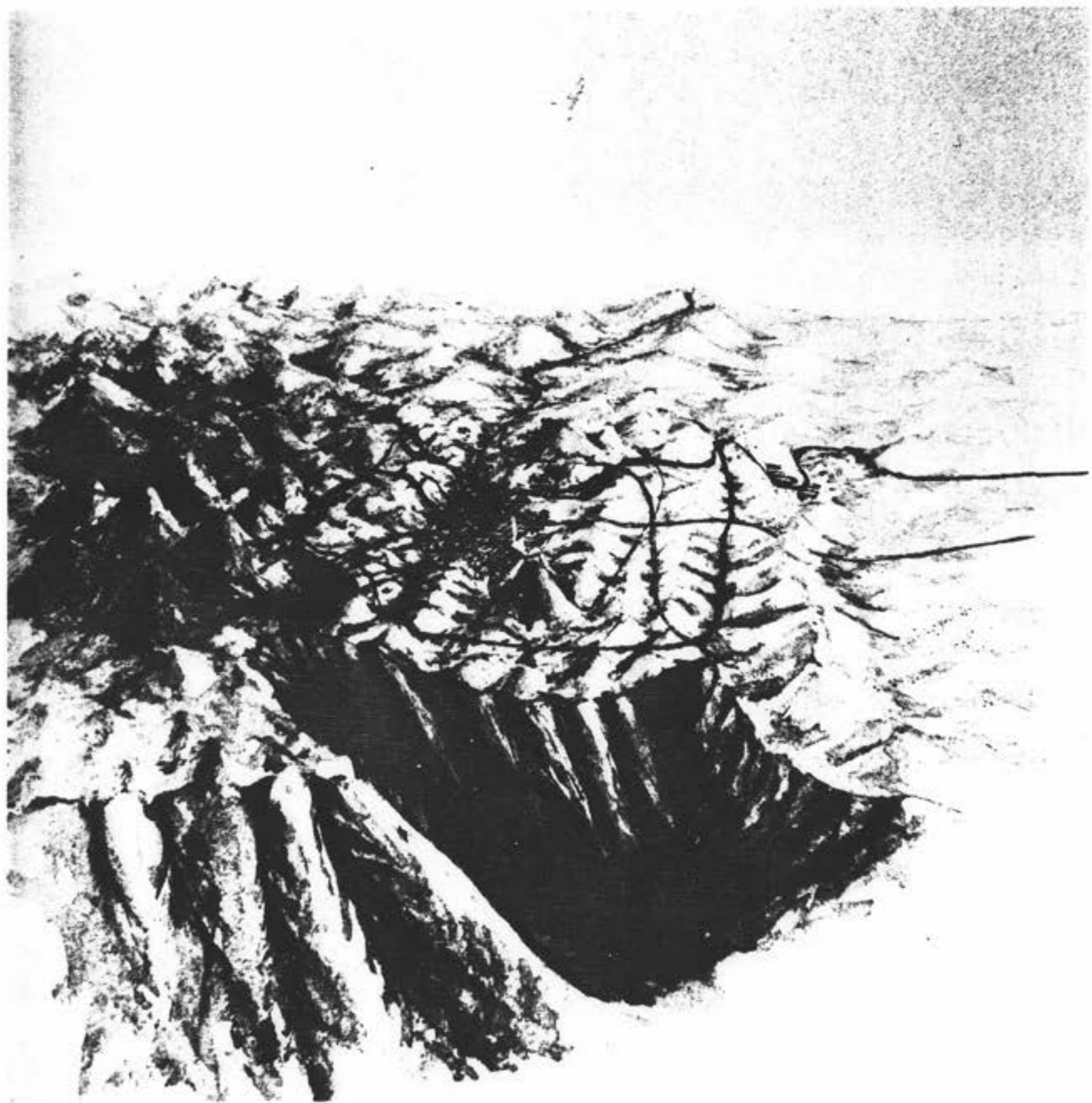
2-5-2 RELATIONSHIP OF THE MASTER PLAN TO DE- TAILED LOCAL PLANS

The master plan presented in this report is a general plan to be used by detailed planners and implementors as a guideline for future detailed plans and development. At the same time an effort has been made by the consultant to incorporate into the master plan as many of the existing detailed local plans (both government and private) as possible.

As mentioned above, the future function of this master plan will be to act as a set of guidelines for detailed local plans. As such it will serve to set general policy for:

1. Land Use
2. Location
3. Density
4. Overall organizational structure
5. Infrastructure development

Since this master plan is general, some method is required to bridge the gap between the level of detail appropriate to it, and the more detailed level necessary for future detailed local plans. For this reason a set of specific planning standards developed for the five cities of the Southern Region has been included as an appendix to this report. These planning standards will enable the general level of detail required for the overall master plan to be applied in a specific way to future detailed local plans.



3-1 POPULATION PROJECTION AND DISTRIBUTION

3-1-1 EXISTING AND PROJECTED POPULATION

The 1975 population of Abha as estimated by the URTEC 5% Survey, conducted by this consultant, is 22,100. The population according to the National Census is 30,200. Discrepancies between the URTEC Survey and National Census exist for each of the Southern Region five cities. In some cases these discrepancies are quite large and no reasonable statistical or physical explanation can be found.

In Abha's case the discrepancy is large, but much smaller than in some other cities. In addition, although the exact boundaries of the URTEC Survey are known, it has thus far been impossible to ascertain the boundaries of the National Census. For these reasons it is impossible to determine whether the URTEC and Census surveys were conducted covering the same area. Faced with this seemingly irresolvable dilemma and a relatively small discrepancy, it was decided that for planning purposes in Abha, the Census figure would be used as a base since it might include population outside the bounds of the URTEC Survey which could nonetheless affect planning decision.

With the 1975 base population of 30,200 the Alternative Strategies report projected both a low or trend population growth to 78,600 in 1995 and a high or accelerated growth to 104,400 in 1995.

The low or trend projections are based on a continuation of the present net annual growth rate of 4.9% and would result in an increase of 2.6 times the present population in the next twenty years. The high or accelerated projections assume the following goals:

1. Improvement of the economic base and activity of the city directed toward an increase in general income level.
2. Improvement of the quality of life, including increases and improvements in the city's social services, educational opportunities and recreational facilities.

As explained in the Alternative Strategies report, if these goals are met, it is not unreasonable to assume an increase in the growth rate of about 1.5% due largely to an increase in the in-migration rate of Saudis from nearby districts. Such an assumption would result in an annual growth rate of 6.4% and a 3.5 times population increase in the next 20 years.

Because of the uncertainties associated with a very ambitious development program such as is being carried out currently in Saudi Arabia, it is somewhat difficult to predict its exact nature and progress. In addition because Abha is a relatively small city with no record of past demographic shifts, it is impossible to determine with any precision patterned responses of population in reaction to economic changes. For these reasons it is difficult to say with certainty whether either the trend or accelerated projections will be realized.

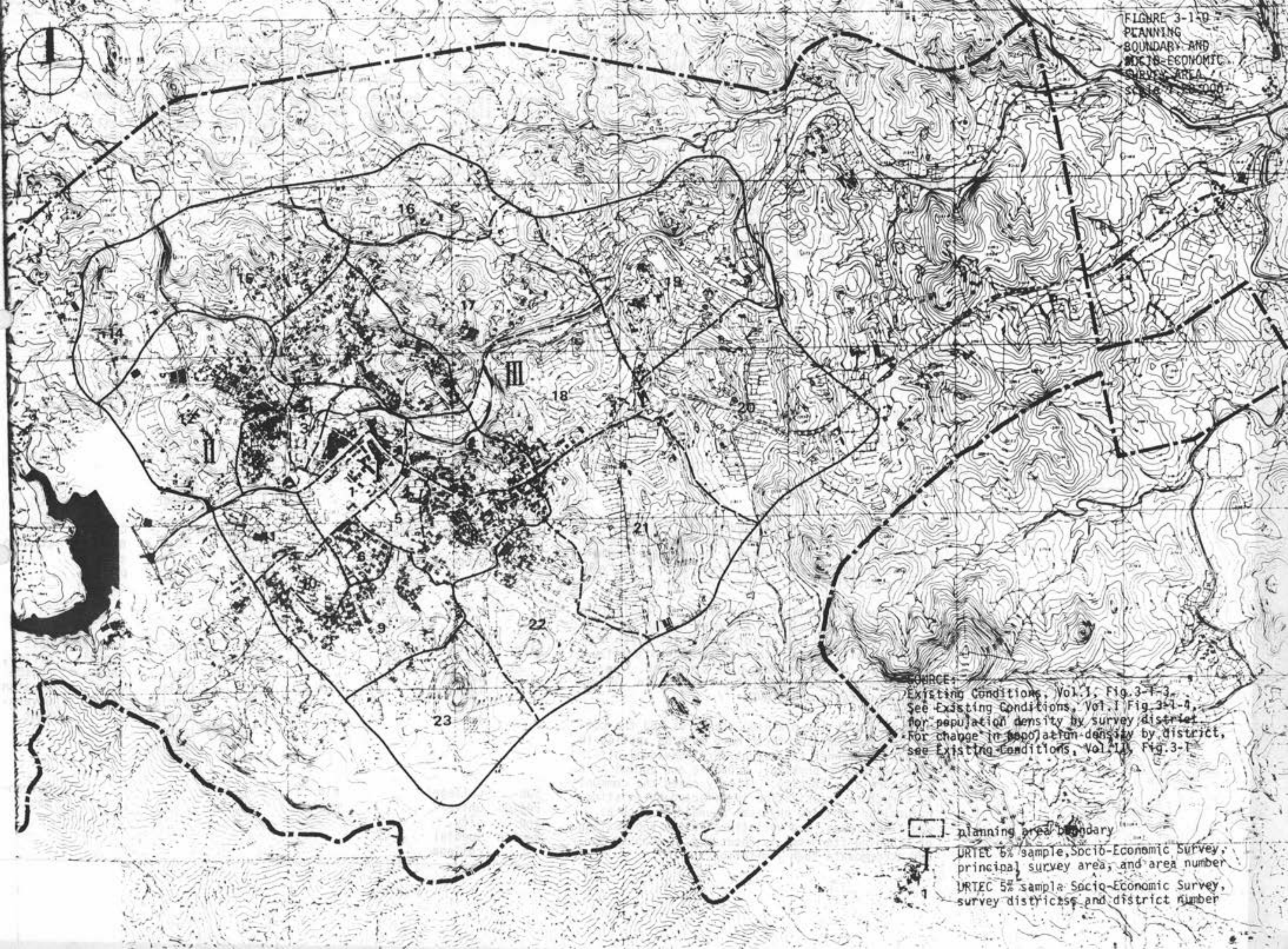
It was therefore decided that for the purposes of master planning, the average (mean) between the high and low projections would be used. With the contingencies inherent in the planning procedures used, such an approach will allow accommodation of any eventuality.

Therefore for planning purposes an annual growth rate of approximately 5.7% is assumed, resulting in a 1995 population of 91,500 of an increase of 3 times the 1975 population of 30,200.




Table 3-1-1
PROJECTIONS OF POPULATION

	1975	1980	1985	1995
Asir Sub-Region				
High	-	445,200	506,700	685,200
Low	-	552,500	487,700	598,700
Planning	403,200	443,900	497,200	642,000
Rural Population				
High	-	262,900	311,600	417,400
Low	-	255,400	292,100	362,100
Planning	217,700	259,200	301,900	389,800
Nomadic Population				
High	-	77,000	56,400	26,000
Low	-	88,000	73,300	50,800
Planning	105,700	82,500	64,900	77,700
Greater Urban Area				
High	-	63,500	81,500	136,900
Low	-	60,700	74,000	111,100
Planning	49,700	62,100	77,800	124,000
Urban Area				
High	-	41,200	56,200	104,400
Low	-	38,400	48,700	78,600
Planning	30,200	39,800	52,500	91,500

FIGURE 3-1-D
PLANNING
BOUNDARY AND
URTEC ECONOMIC
SURVEY AREA
SCALE 1:25,000



SOURCE:
Existing Conditions, Vol. I, Fig. 3-1-3.
See Existing Conditions, Vol. I Fig. 3-1-4,
for population density by survey district.
For change in population density by district,
see Existing Conditions, Vol. II, Fig. 3-1

-  planning area boundary
-  URTEC 5% sample Socio-Economic Survey, principal survey area, and area number
-  URTEC 5% sample Socio-Economic Survey, survey districts, and district number

3-1-2 COMMUNITY STRUCTURE

The basis for the planning of community structure has been set forth in the planning standards section of the Regional Master Plan. These standards are based on a primary grouping of the city's population into "neighborhoods" with a population of the order 10³ and "communities" with a population of order 10⁴. (For purpose of planning, neighborhoods are considered the principal planning districts). Neighborhoods are further subdivided into "sub-neighborhoods" and "residential unit groups" and communities are subdivided into "sub-communities" composed of from two to four neighborhoods. Cities are composed of one or more communities depending on population. The following list indicates the hierarchy of these groupings and their associated populations:

Table 3-1-2
SUBGROUPS OF COMMUNITY HIERARCHY

Grouping Level	Name Of Grouping	Typical Population
G ₀ (Level 0)	= Residential Unit Group	250
G ₁ (Level 1)	= Sub-Neighborhood	997 (say 1000)
G ₂ (Level 2)	= Neighborhood	3,750 (2,500 to 5,000)
G ₃ (Level 3)	= Sub-Community	10,000 (10,000 to 20,000)
G ₄ (Level 4)	= Community	30,000 (20,000 to 40,000)

In addition depending on population, two additional levels--city and sub-region--may be identified in order to more suitably accommodate community structure of cities and areas with relatively large population.

Associated with each of these grouping levels is a set of facilities such as schools, health facilities, mosques and recreation facilities which are hierarchically ordered to assure maximum utilization at all levels of community structure. The organization of these facilities is shown in the accompanying table and figure.

Of course both the planning standards and the community structure set forth here must be applied in a flexible manner to account for individual differences in the physical, economic and social structure of each city. In many cases the community structure organization is affected by existing natural or man-made physical boundaries such as wadis and roads, and variations in the application of planning standards is necessary to account for and accommodate such limitations.

Table 3-1-3
COMMUNITY STRUCTURE & FACILITIES DISTRIBUTION

Community Level	Education Facilities	Recreation facilities	Religious facilities	Social/cultural facilities	Health facilities	Commercial facilities	Public buildings
Residential unit group	Tot-lot	Residential seating					
Sub neighborhood	Nursery Kindergarten	Play lot					
Neighborhood	Elementary schools	School playground, Neighborhood park	Mosque	Neighborhood center	Pharmacy	Neighborhood shopping center	
Sub-community	intermediate schools	Playfield (Level 1)	Jami'a mosque		Diagnosis & treatment center		
Community	Secondary schools	Playfield (Level 2), Community park		Community center		Community shopping center	Fire station
City	Teachers schools Technical schools	City park		Civic center	General hospitals, Special hospitals, Nursing homes	City/Regional shopping center	Post office, Police station, Government
Sub-region and Region	College/university, special college		Eid mosque				Government

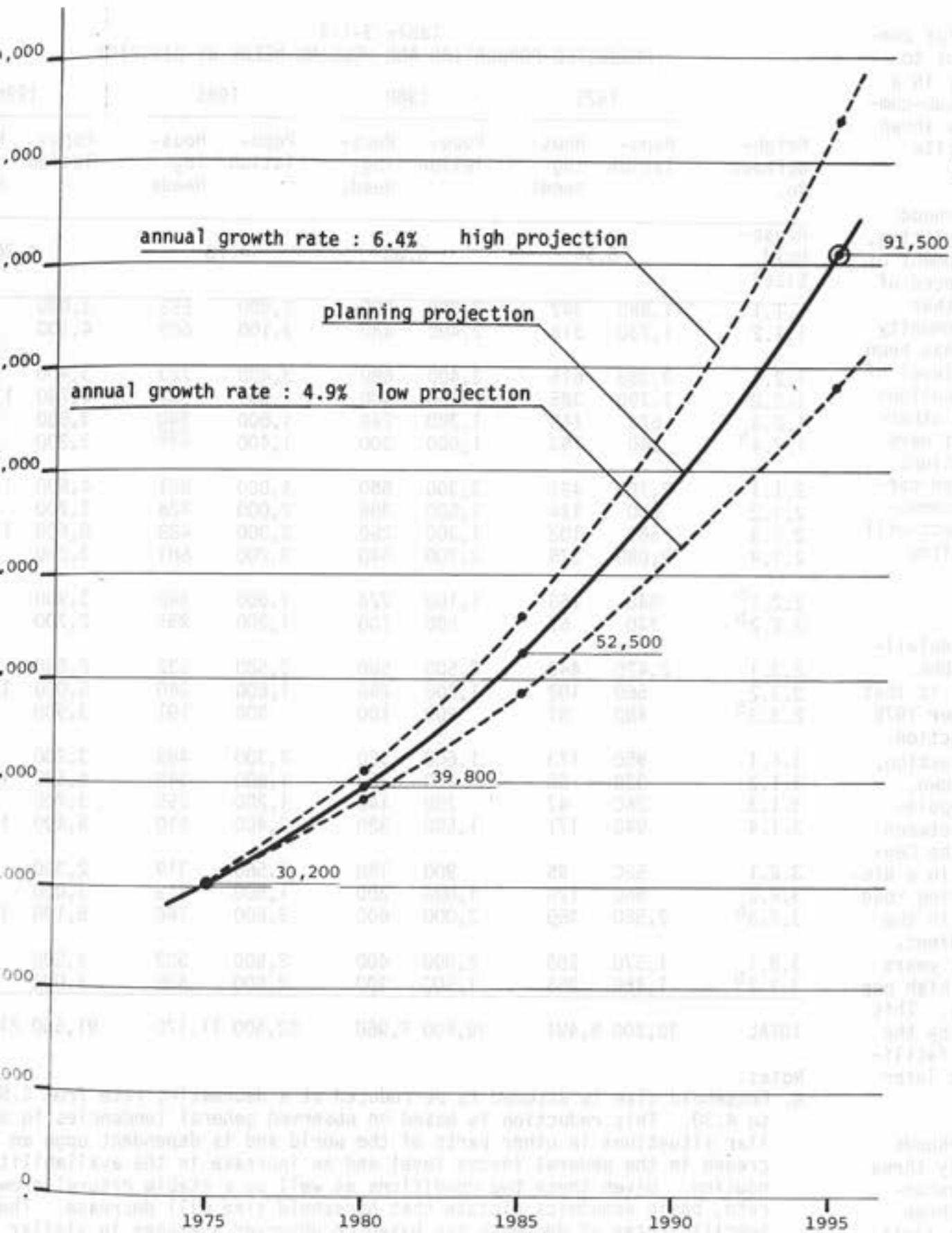
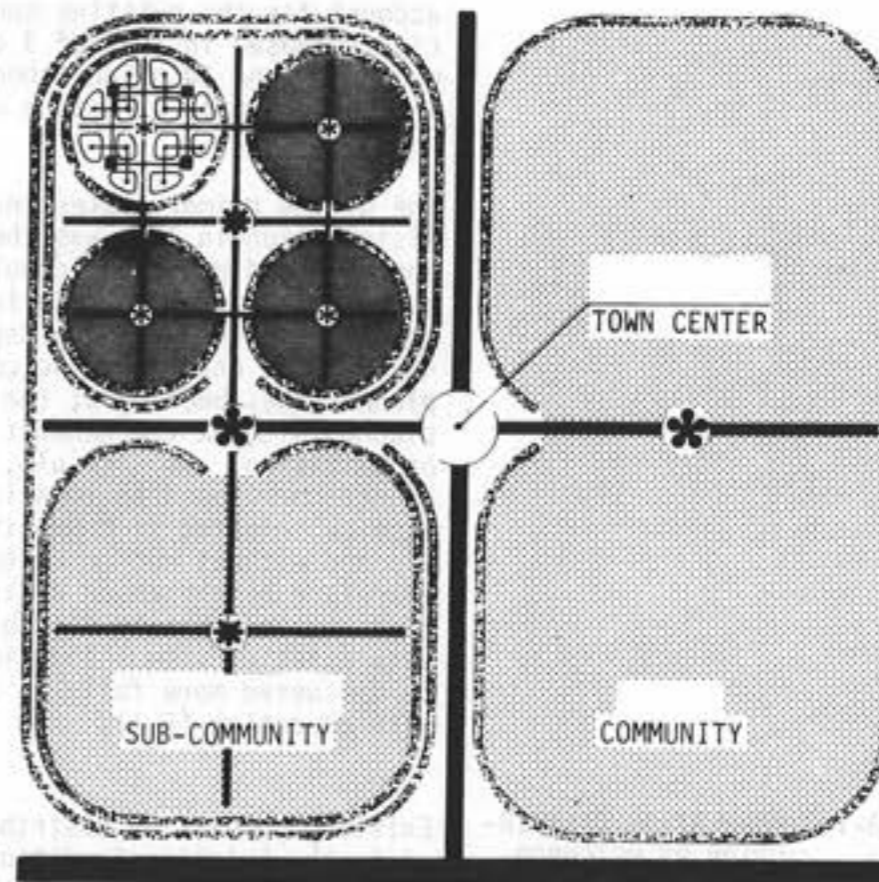


FIGURE 3-1-1
PROJECTED
GROWTH OF
POPULATION



- inter regional and regional highway
- major arterial
- minor arterial
- collector
- distributor
- local access road
- residential unit group center
- sub-neighborhood center
- neighborhood center
- sub-community center
- community center
- residential unit group
- neighborhood
- buffer zone

FIGURE 3-1-2
COMMUNITY
STRUCTURE
DIAGRAM

In Abha an application of these standards for community structure with suitable modifications to account for the existing conditions results in a city composed in 1995 of 3 communities, 8 sub-communities, and 24 neighborhoods organized as shown in the community structure map on the opposite page.

One of the primary determinants of neighborhood distribution in Abha was the location of existing, approved and proposed schools. The development of the school system in Abha is the most advanced of any city in the Southern Region. On the other hand, since until now, no comprehensive community planning has been done; the school system has been planned without the benefit of any higher level of organization. As a result, many school locations do not correspond to locations which would otherwise be selected if community organizations were planned without reference to existing locations. Therefore neighborhood distribution has been carried out in a manner flexible enough to accommodate existing school locations. This subject will be discussed more fully in the section dealing with education (5-1).

3-1-3 POPULATION DISTRIBUTION BY NEIGHBORHOOD

Existing population distribution has been detailed in the Existing Conditions report for Abha. The only modification to this distribution is that which must be made to accommodate the larger 1975 population base as described earlier in section 3-1-1. Because as was mentioned in that section, the boundaries of this population are unknown, for the purposes of master planning the population representing the difference (8,100) between the URTEC Survey population (22,100) and the Census population (30,200) has been assigned in a distributed manner to the areas outside the ring road which represent low density neighborhoods in the 1995 plan. In some sense this is an expedient, and it is recognized that for the earliest years of the plan it results in unrealistically high population for these peripheral neighborhoods. This fact has been compensated for in planning by the phasing-in of schools and other community facilities for these neighborhoods at a somewhat later date than would otherwise be expected.

As shown in Table 3-1-4, the 1995 neighborhoods range in size from 2,300 to 6,600 with only three outside the range of from 2,500 to 5,000 recommended in the planning standards. These three neighborhoods are just slightly beyond the limit of this range and will require only easily made adjustments in the sizing of their associated facilities.

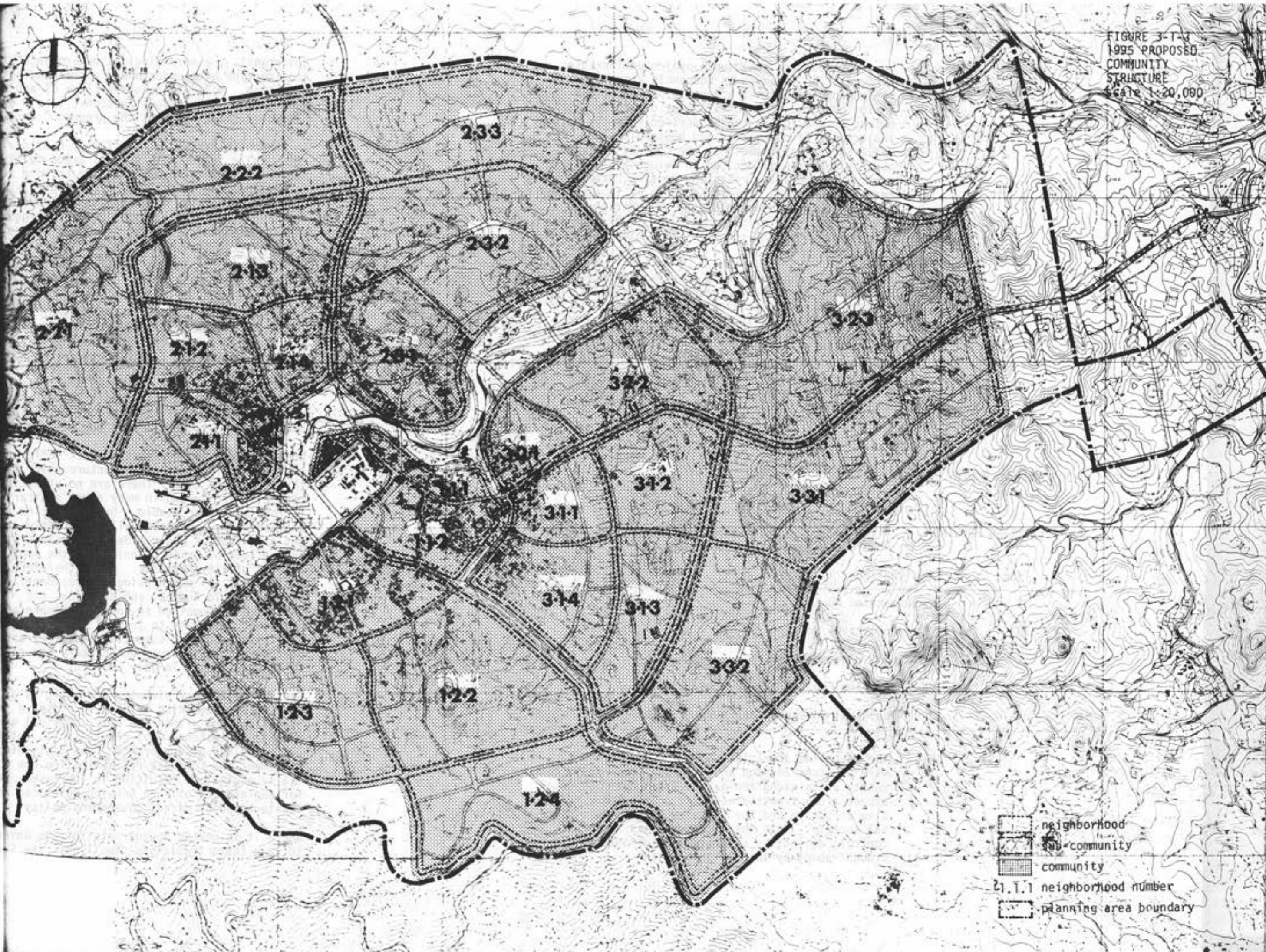
Table 3-1-4
PROJECTED POPULATION AND HOUSING NEEDS BY DISTRICT






Neighborhood No.	1975		1980		1985		1995	
	Population	Housing Needs	Population	Housing Needs	Population	Housing Needs	Population	Housing Needs
Household Size ^a	5.50		5.00		4.70		4.30	
1.1.1	1,880	342	2,000	400	2,600	553	3,000	698
1.1.2	1,730	315	2,400	480	3,100	660	4,100	953
1.2.1	3,380	615	3,400	680	3,400	723	3,400	791
1.2.2	1,790	325	2,000	400	2,500	532	4,700	1,093
1.2.3	630	115	1,200	240	1,600	340	3,800	884
1.2.4 ^b	840	153	1,000	200	1,400	298	3,200	744
2.1.1	2,700	491	3,300	660	4,000	851	4,600	1,070
2.1.2	680	124	1,500	300	2,000	426	3,200	744
2.1.3	560	102	1,300	260	2,300	489	6,600	1,535
2.1.4	2,080	378	2,700	540	3,200	681	3,200	744
2.2.1 ^b	840	153	1,100	220	1,600	340	3,900	907
2.2.2 ^b	370	67	500	100	1,200	255	2,700	628
2.3.1	2,420	440	2,500	500	2,500	532	2,500	581
2.3.2	560	102	1,200	240	1,600	340	5,000	1,163
2.3.3 ^b	480	87	500	100	900	191	3,900	907
3.1.1	950	173	1,600	320	2,300	489	3,200	744
3.1.2	320	58	900	180	1,600	340	4,500	1,047
3.1.3	260	47	700	140	1,200	255	3,400	791
3.1.4	940	171	1,600	320	2,400	510	5,400	1,256
3.2.1	520	95	900	180	1,500	319	2,300	535
3.2.2	660	120	1,000	200	1,500	319	3,000	698
3.2.3 ^b	2,580	469	3,000	600	3,600	766	5,100	1,186
3.3.1	1,570	285	2,000	400	2,500	532	3,800	884
3.3.2 ^b	1,460	265	1,500	300	2,000	426	3,000	697
TOTAL	30,200	5,491	39,800	7,960	52,500	11,170	91,500	21,279

Notes:

- Household size is assumed to be reduced at a decreasing rate from 5.50 to 4.30. This reduction is based on observed general tendencies in similar situations in other parts of the world and is dependent upon an increase in the general income level and an increase in the availability of housing. Given these two conditions as well as a stable natural growth rate, basic economics dictate that household size will decrease. The specific rates of decrease are based on observed averages in similar situations.
- 1975 populations for these districts is inflated in order to achieve consistency with national census figures (see sections 3.1.1 and 3.1.2).

FIGURE 3-1-3
1995 PROPOSED
COMMUNITY
STRUCTURE
Scale 1:20,000



-  neighborhood
-  sub-community
-  community
-  neighborhood number
-  planning area boundary

3-2 HOUSING NEEDS

Housing needs are based upon projected increases in population, changes in household size and expected obsolescence of a certain percentage of existing housing. The total amount of housing required in the future can be derived from the future projections of population and household size. The URTEC Survey has shown that the current average household size will decline in future years as the general income level rises and housing becomes more readily available. For this reason it is assumed that the average household size will decline to 5.0 in 1980, 4.7 in 1985 and 4.3 in 1995. The total required housing stock is calculated and shown in Table 3-1-4.

Much of this future housing stock will be new and result from absolute increases in population. A certain percentage however will be required to replace or substantially rebuild existing housing which becomes obsolete during the planning period. Although it is difficult to ascertain the exact extent of such needs, it is assumed that most of the currently existing housing units which are greater than five years old will be replaced or substantially rebuilt during the next 10 years. In Abha this amounts to about 3000 units.

3-3 HOUSING POLICY

3-3-1 EXISTING HOUSING

Five types of housing have been identified in the Abha area;

Type	Designation
A	Agglomerated Houses
B	Flat Collective Houses
C	Partially Renewed Houses
D	Non-Aboriginal Houses 1 (Low-Rise Concrete)
E	Non-Aboriginal Houses 2 (Multi-Story Apartments)

The so-called aboriginal houses (Types A and B) were of stone and mud and composed small scale community units along the main wadis. Their physical aspect arose from the need for a collective defensive structure and the organization of the old tribal society. With the recent changes in social control, collective security and economic structure brought about by the founding of the

3-3-2 OBSOLESCECENT HOUSING AND POLICIES FOR IMPROVEMENT

government, the morphological determinants of housing type have undergone a corresponding modification. Modernized houses (Type C) and new dwellings of modern construction (Types D and E) have been established as the predominant forms.

In peripheral areas, single family housing is the rule, while in the more central areas multi-story apartment houses are beginning to be more strongly established. A lack of any clear organization of typology or density distribution has resulted in a lack of focus for both residential neighborhoods and associated facilities. In order to provide a more liveable environment in the future it will be necessary to correct this by proper planning and implementation which is described in this report.

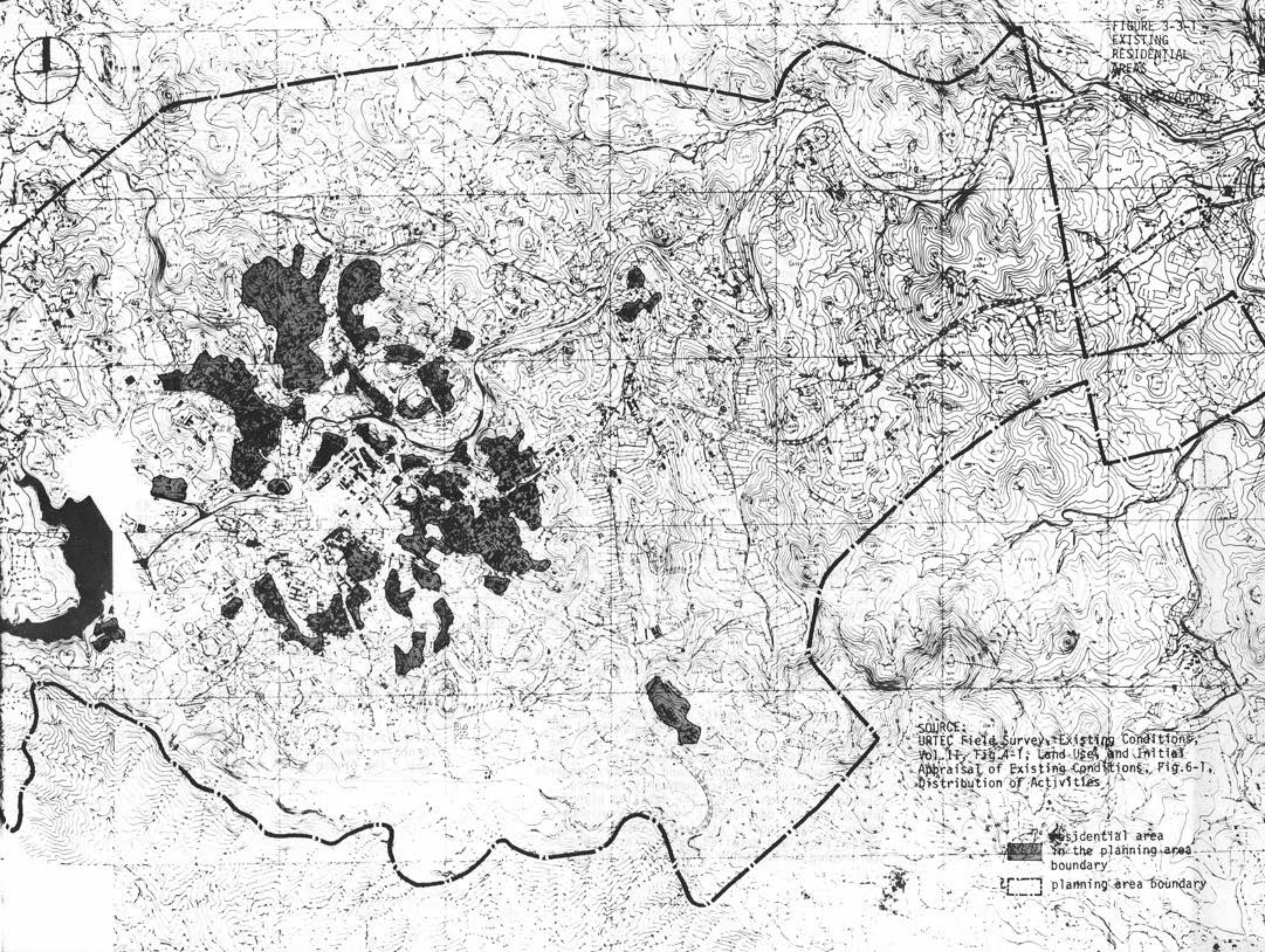
As mentioned previously, in Abha about 3000 housing units will become obsolete and require replacement or extensive remodeling during the next 10 years during the first two phases of the master plan. This requirement will be a result of physical obsolescence resulting from deterioration and collapse due to aging and inadequate maintenance, and functional obsolescence resulting from changes in housing standards and tastes.

Most of the existing housing stock suffers from the general lack of infrastructure which exists throughout the city. There are no utilities except electricity and in many areas sanitary conditions are unacceptable. Once utilities are installed these conditions will be greatly improved, yet older houses and residential areas will suffer from a lack of prior planning for the implementation of utility networks. It is therefore recommended that all new housing and residential development (single houses, sub-divisions and apartment building) be required to install or make acceptably adequate plans to install connections to all utility networks at such time that they are implemented. In this way unnecessary and costly obsolescence can be largely avoided.

During the 20 year planning period it is expected that unless something is done to preserve traditional housing within the city, physical and functional obsolescence will result in its total replacement and disappearance. The costs of replacement and complete rehabilitation are essentially equivalent resulting in increased pressure for replacement of such housing which can only be counteracted by direct government policy.

Where it is deemed appropriate for the Government to save these traditional dwellings (see Section

FIGURE 3-3-1
EXISTING
RESIDENTIAL
AREAS



SOURCE:
URTEC Field Survey, Existing Conditions,
Vol. II, Fig. A-1; Land Use, and Initial
Appraisal of Existing Conditions, Fig. 6-1,
Distribution of Activities

- residential area
in the planning area
boundary
- planning area boundary

5-3 and Figure 5-2-1) immediate plans should be drawn up for their physical rehabilitation, future functional use and adequate integration into proposed utility systems.

3-3-3 RESIDENTIAL DENSITY POLICY

Both traditional historic development and logical functional considerations dictate that there be a concentration of residential density toward the central areas of the city. The selected plan developed in the Alternative Strategies phase further dictates that higher densities be concentrated between the two major arterial roads passing through the city. The entire Alternative Strategies Report was devoted to the development of this concept and should be referred to for a detailed explanation of the reasoning behind it.

Future population growth and limitations set on the boundaries of future physical growth are both determinants of the specific density goals set for the 1995 development. The lowest net densities of around 30 persons per hectare (pph) occur in the districts outside of the ring road which surround the city on all but the southwest side (which is planned as a conservation district). Densities within the ring road but outside the central arterial are for the most part between 45 pph and 70 pph. The only exceptions to this are district 3.1.2 and part of district 1.1.1 (see Community Structure diagram) which are located adjacent to the busy Abha-Khamis artery and relatively close to the center of the city, and which are therefore subject to increased development pressures. Districts within both the ring road and the central arteries will have 1995 gross densities ranging from about 100 pph at the periphery to over 200 pph in the most central districts (part of district 1.1.1 and the residential section of district 1.1.2). Although the adaptation and implementation of zoning regulations should include sections which control densities at the levels suggested in Table 3-3-1, it should be noted that for any given neighborhood gross densities should not exceed 250 pph.

Gross neighborhood density is defined as the total resident population of a neighborhood divided by the gross neighborhood area or all the land within the neighborhood boundaries. A complete discussion of housing and density standards is given in the Appendix, Community Planning Standards Section A-2-8. The detailed planning of residential development within the neighborhoods is not properly within the scope of this master plan, and detailed decision as to whether to develop horizontally or vertically should be

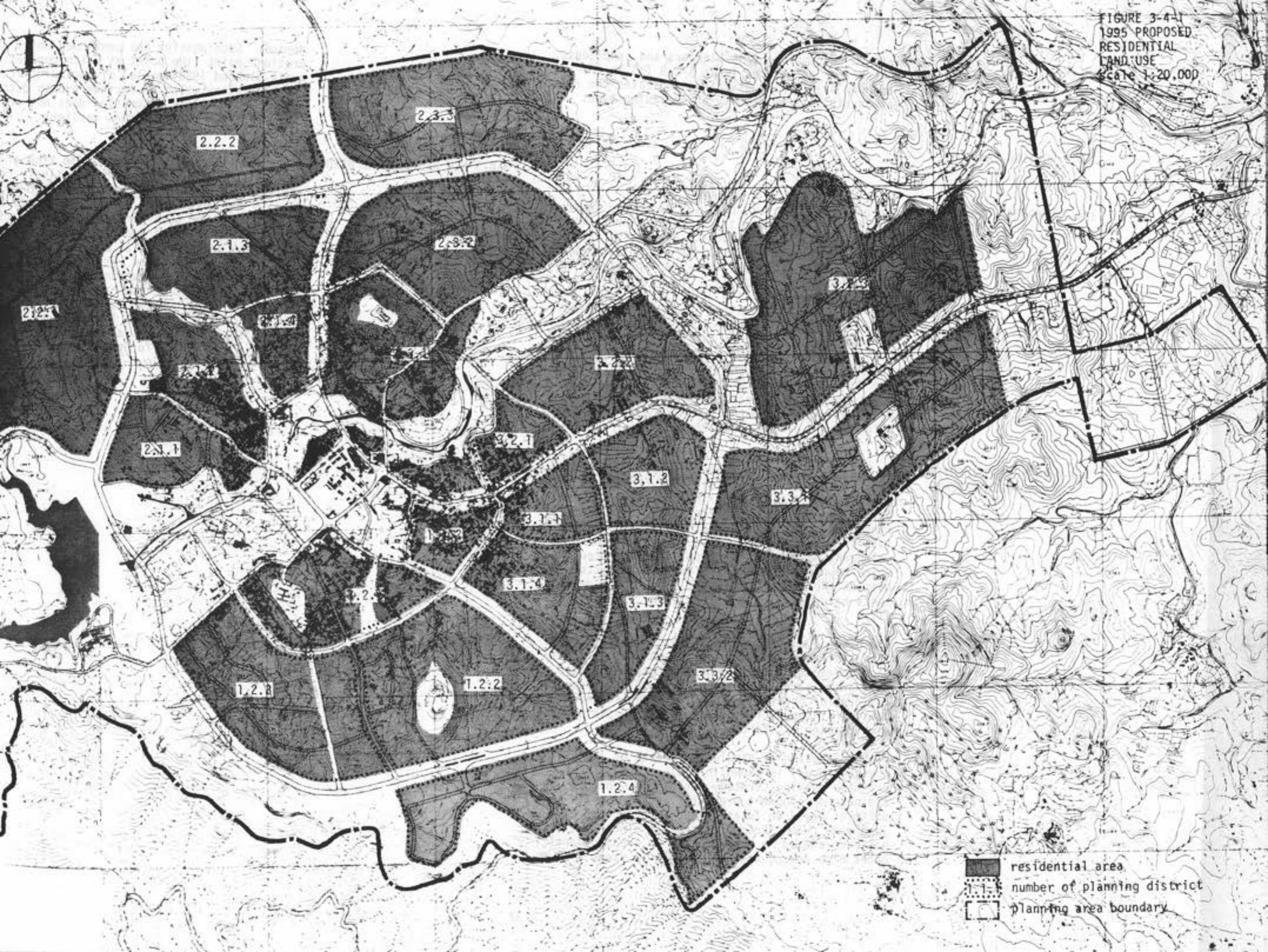
Table 3-3-1
PROJECTED RESIDENTIAL DENSITIES

Neighborhood	Gross Residential Area (ha)	Approximate Gross Residential Density			
		1975	1980	1985	1995
1.1.1 ^b	22.5	84	89	116	133
1.1.2	18.7	93	128	166	219
1.2.1	46.0	73	78	84	90
1.2.2	102.5	17	20	24	42
1.2.3	83.3	8	14	19	42
1.2.4	105.0	a	10	13	30
2.1.1 ^c	51.8	52	64	77	89
2.1.2	31.6	22	47	63	101
2.1.3	67.3	8	19	34	98
2.1.4	25.8	81	105	124	124
2.2.1	130.0	a	8	12	32
2.2.2	85.0	a	6	14	32
2.3.1	52.0	47	48	48	48
2.3.2	110.5	5	11	14	45
2.3.3	130.0	a	4	7	30
3.1.1	26.0	37	62	88	123
3.1.2	45.0	7	20	36	100
3.1.3	34.0	8	21	35	100
3.1.4	44.7	21	36	54	121
3.2.1	21.0	25	43	71	110
3.2.2	63.3	10	16	24	47
3.2.3	170.0	a	18	21	30
3.3.1	125.0	a	16	20	30
3.3.2	95.0	a	16	21	30

Notes:

- a. 1975 populations for districts outside the ring road are not meaningful because of population compensation adjustments--see Section 3-1-3.
- b. This district is divided into 2 density zones--1995 density is about 100 pph in the zone outside the artery and about 215 pph inside the artery. The figure shown is the average density.
- c. This district is divided into 2 density zones--1995 density is about 70 pph in the zone outside the artery and about 120 pph inside the artery. The figure shown is average density.

FIGURE 3-4-1
1995 PROPOSED
RESIDENTIAL
LAND USE
Scale 1:20,000



left to the implementing planners and architects. However for reference, Table A-2-8 (b) in the Appendix or Planning Standards indicates the relationship between density and building type.

3-4 HOUSING LAND USE

3-4-1 PROPOSED LAND USE

Current proposals for and policies toward residential land use in the city of Abha are non-comprehensive and lacking in focus. New residential areas arise on private initiative (which is proper) but without any clearcut Government policies for either location or density. The Government is therefore put in the position of reacting to rather than influencing the growth of residential areas. As a result many new subdivisions have sprung up without the benefit of a guiding master plan. By using the proposed density guidelines described in the previous section and Figure 3-4-1 as well as the density-typology correlations given in the Planning Standards section of the Regional Master Plan, an ordered growth of the city's residential neighborhood can be accomplished.

3-4-2 PHASED RESIDENTIAL LAND REQUIREMENTS

As has been indicated several times previously the city of Abha is already well established and has been even more clearly defined in physical terms by the completion of the ring road. Within the ring road, some form of residential development exists in nearly every section. This spreading development has led to the type of urban sprawl which has been discussed in previous reports. Even outside the ring road, recent subdivision developments have begun to appear on every side of the city.

In spite of this spreading growth, there is ample land available (assuming efficient use) to easily accommodate future residential growth. Because most areas already have some type of development, residential phasing in Abha is concerned more with phasing of population growth in each district than with phasing of additional land area per se.

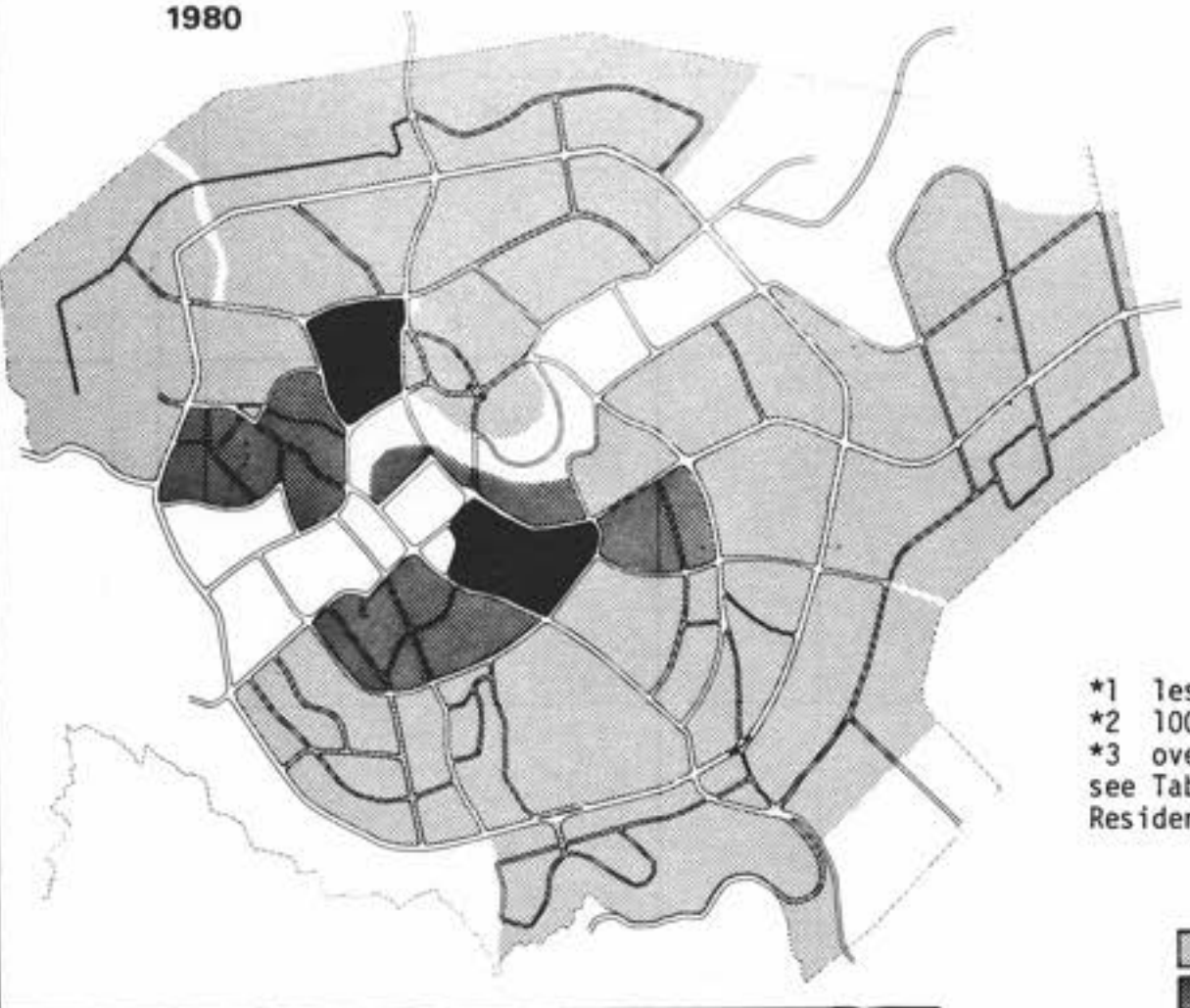
Planned phasing of population growth by district (neighborhood) is shown in Table 3-1-4. In general the phasing strategy employed has been to anticipate development pressures and demands in each district based on location and existing and planned land use. With these pressures in mind, population has been phased in most quickly in areas of anticipated high demand and more slowly in areas of low

demand. Such phasing has continued until the "saturation" point (the point at which population equals planned 1995 levels) of each district is reached, after which no further growth occurs. In most cases complete saturation does not occur until 1995, but in a few it occurs earlier.

3-4-3 NEW RESIDENTIAL NEEDS

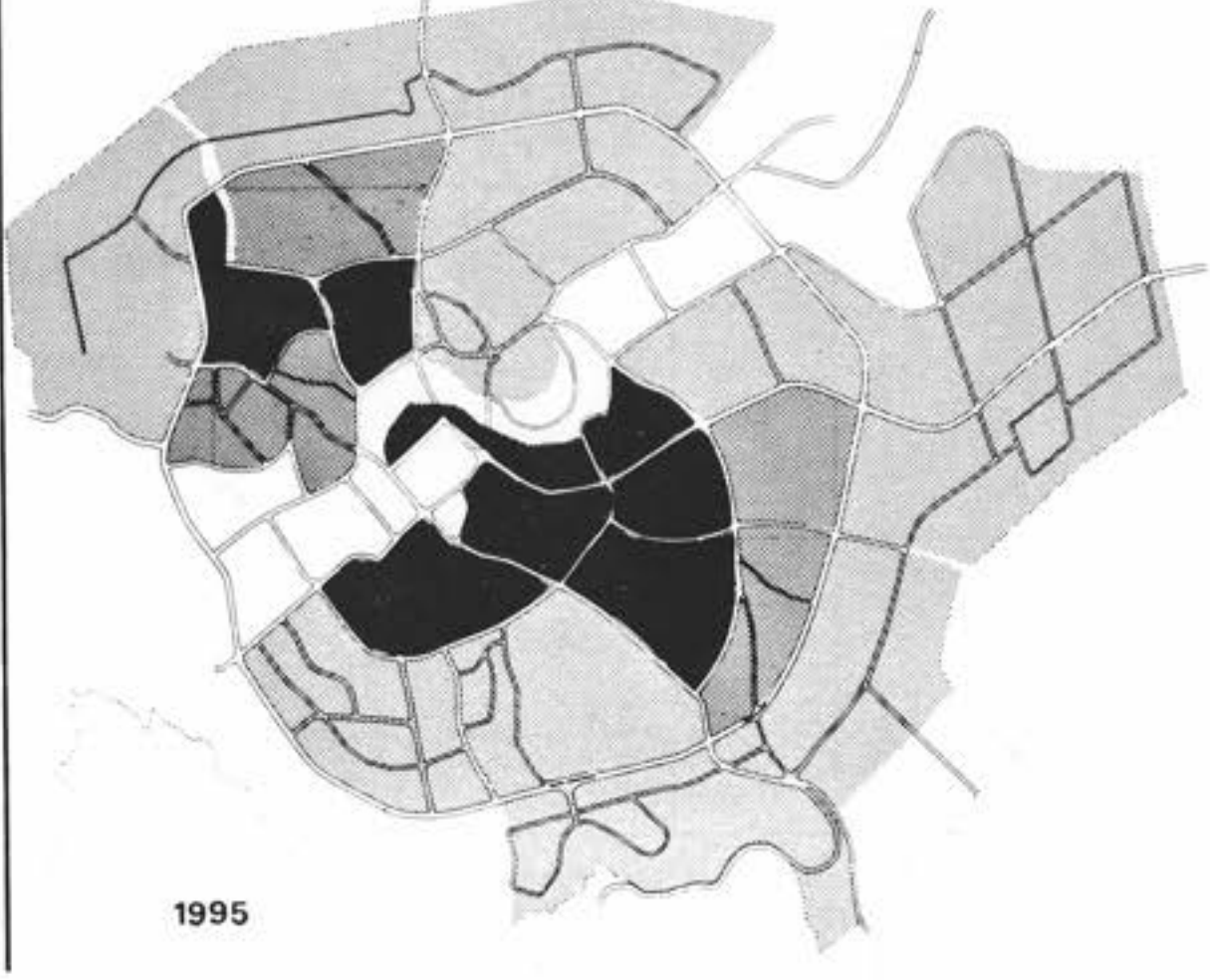
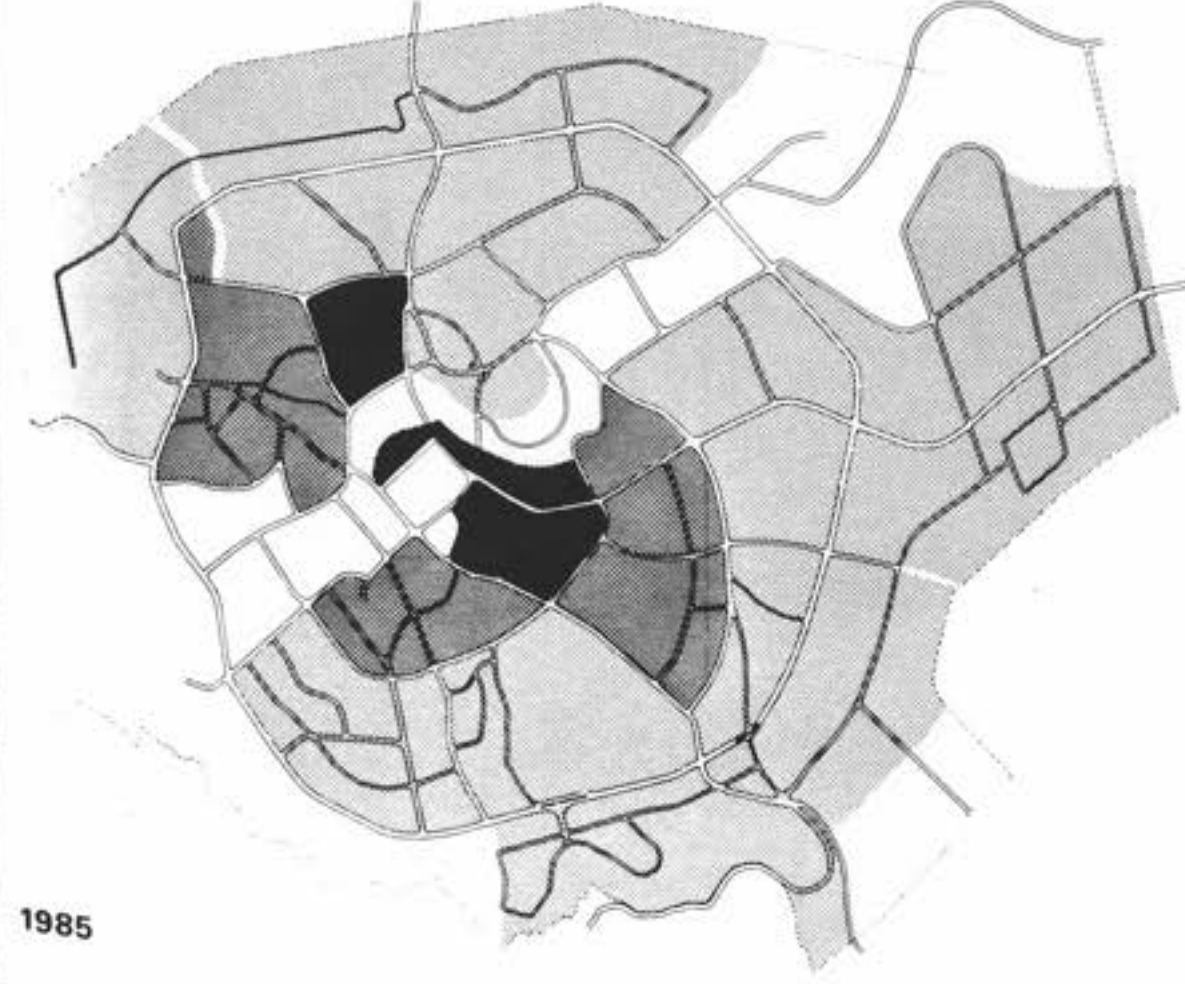
Since most areas in Abha have some kind of residential development there are relatively few really "new" areas which will come into existence in the next twenty years. Districts 2.3.3 and 3.3.2 (refer to Figure 3-1-3 for locational distribution of these districts) will be essentially new while districts 2.3.2, 3.2.3, 3.3.1 and 3.3.2 will grow from very sparsely populated areas to urban neighborhoods. Except for district 2.3.2 each of these new neighborhoods is outside the ring road and will have a relatively low development priority. For the land area of these districts, as well as projected densities see Table 3-3-1, and for population and household numbers see Table 3-1-4.

FIGURE 3-4-2.
GROWTH OF
RESIDENTIAL
AREA
1975 - 1995
scale 1:40,000



*1 less than 100 people
*2 100 - 200 people
*3 over 200 people
see Table 3-3-1, Projected
Residential Density

low density *1
medium density *2
high density *3



4. employment

4-1-1 COMPETITION ON EMPLOYMENT-
RENT-EXISTING CHARGE
1980

4-1-2 PROTECTED EMPLOYMENT
CULTURAL TRINGS AND
EMPLOYMENT BEARS

The current labor force participation rate in the
in 1970 for 1970 is shown in the following
and 1970-1971. The labor force participation rate
the population of age 15 and over. This rate
is low in the labor force and the high
of wage in the labor force and the high
and low in the labor force.

The labor force has a very high percentage of
Small business (SMB) has been created by
the government through the Small Business
Administration (SBA).

Through the industrial development program
to date is very much with the government
alone accounting for 60% of employment. Con-
sideration has been given by the general
program in the economy and government
and private accounts for 15%. Trade accounts
for 20% and all other sectors are 5%.

The labor force has been in government employ-
ment in part due to the large government in-
vestment in development and in part to the
tion as an administrative city. The more detailed
information regarding existing conditions of em-
ployment in the labor force is given in
part, Chapter 2 and the Alternative Strategy
report, Section 4-1.

During the next 20 years, the labor force part-
icipation rate is expected to increase by about
25 years from 1970 to 1990. This increase
from 1970 to 1990 is 1970. (See Table
4-1-1, Appendix A-1-1). This expected increase
is justified by the anticipated entry into the
labor force of the large pool of people currently
below the age of 15. The increase in the labor
force participation rate coupled with the increase
in production means that by 1990 employment will
reach a high of 21.500 - an increase of more than
20,000 over the present figure. During the 20
year planning period, the absolute number of gov-
ernment employees is expected to increase by more
than 10 times from the Alternative Strategy
base figure.

Employment in the secondary sector (including con-
struction and manufacturing) will increase and
eventually be equivalent with the
government in the private sector. Commercial and

4-1-3 SKILLS AND TRAINING

Program in skills and training must reflect
along with the expanded economic development
needed here. The government's great need
basic education as discussed in previous
and in Chapter 2 of this report is of course
a more important element in preparing
population for productive contribution to a
developing economy. This basic educa-
tion will serve as a solid background for
level training in secondary and higher level
educational facilities for skills and
emphasize in both the government and private
sectors.

Vocational training program which are also
being conducted at schools in other states
to train their program for the graduates
ment. Figure 4-1-1 shows the future
of workers in each trade or occupation
demand for their skills. Such program con-
tains the training in the following:

1. Technical skills for those who will enter
government sector.
2. Trade and commerce skills for those who
become businessmen and government employ-
ees. Manufacturing skills for those entering
secondary sector.
3. Vocational skills for those who will
the new construction projects and
over the twenty year planning period.
4. Skills considered appropriate for
training for those who will be
and in business in their studies and

In addition there should be special skills
programs for certain needs with the

an anticipated shift in the construction
sector as the government in the private
sector. In addition the tertiary sector
the labor force will be important as the
develop over the 20 year planning period.

In general, it is expected that demand for
will continue to increase rapidly as
employment continues. This is especially so
such as services (where new employees
be required to build and operate and
the workers and as well as construction and
health centers, etc.) and construction. The
total increase in economic activity will
commercial activity and general activities
months in this area as well.

4-1 SECTORAL COMPOSITION AND PROJECTIONS

4-1-1 COMPOSITION OF EMPLOYMENT-EXISTING CONDITIONS

The current labor force participation rate in Abha is 21.6% (or 21.7% if those seeking employment are included). This number represents 41.0% of the population of age 15 and over. This relatively low rate is due to the almost complete absence of women in the labor force and the high proportion below the age of 15.

The labor force has a very high percentage of non-Saudi workers (36.7%) who have been attracted by the employment produced by the country's large-scale development effort.

Currently, the sectoral distribution of employment in Abha is very uneven with the Government sector alone accounting for 62% of employment. Construction which has been stimulated by the general improvement in the economy and consequent development projects accounts for 12.2%. Trade accounts for 8.4% and all other sectors are below 5%.

Abha's very large dependence on Government employment is in part due to the large Government investments in development and in part to its function as an administrative city. For more detailed information regarding existing composition of employment in Abha see the Existing Conditions report, Chapter 3 and the Alternative Strategies report, Section 4-2.

4-1-2 PROJECTED EMPLOYMENT FUTURE TRENDS AND EMPLOYMENT NEEDS

During the next 20 years, the labor force participation rate is expected to increase by about 2% every five years resulting in an increase from 21.6% in 1975 to 29.6% in 1995. (See Alternative Strategies 4-2-2). This expected increase is justified by the anticipated entry into the labor force of the large pool of people currently below the age of 15. The increase in the labor force participation rate coupled with the increase in population means that by 1995 employment will reach as high as 27,100 - an increase of more than 20,000 over the present figure. During the 20 year planning period, the absolute number of government employees is expected to increase by more than 2.5 times (refer to the Alternative Strategies Report).

Employment in the secondary sector (including construction and manufacturing) will increase most dramatically as employment shifts from the Government to the private sector. Commercial and

non-government tertiary employment in general will also increase rapidly as more goods and services are required by the increasing population. The tertiary sector increase will also be aided by an anticipated shift or sub-contracting of some services from the government to the private sector. In addition the tertiary sector will by its nature add new sub-components as the economy develops over the 20 year planning period.

In general, it is expected that demand for labor will continue to outstrip supply as ambitious development continues. This is especially true in areas such as services (where new employees will be required to build and operate new public service projects such as parks, recreation and community centers, etc.) and construction. The general increase in economic activity will stimulate commercial activity and generate additional labor demands in this area as well.

4-1-3 SKILLS AND TRAINING

Progress in skills and training must naturally go along with the expanded economic development projected here. The government's great emphasis on basic education as discussed in previous reports and in Chapter 5 of this report is of course the single most important element in preparing the population for productive contribution to a rapidly developing economy. This basic education will serve as a solid background for management level training in secondary and higher level educational facilities for Saudis who wish to be managers in both the government and private sectors.

Vocational training programs which are already being conducted at schools in Abha should attempt to match their programs to the projected employment figures given here so that the future supply of workers in each trade or profession meets the demand for their skills. Such programs could include the training in the following:

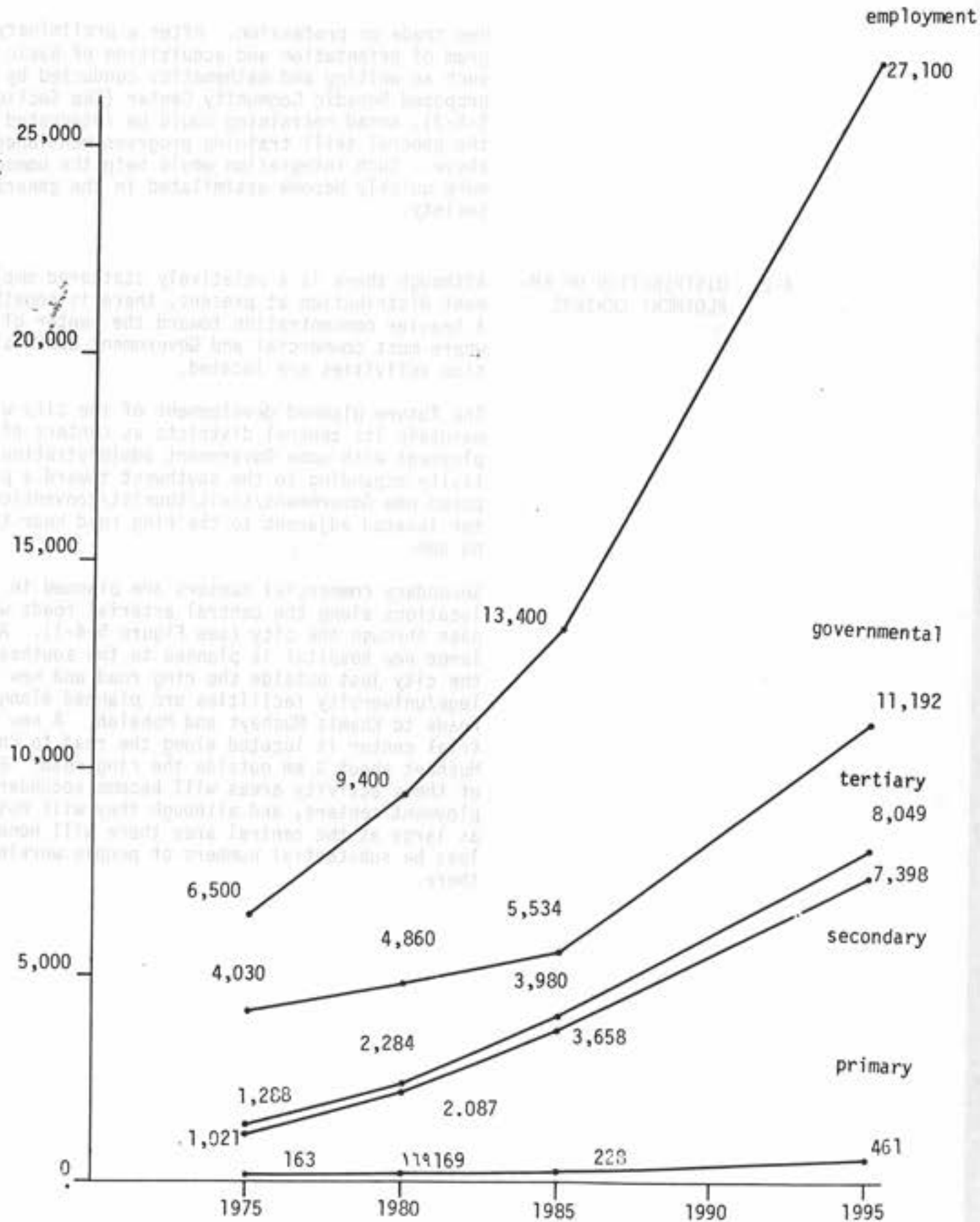
1. Clerical skills for those who will enter the government sector.
2. Trade and commerce skills for those who will become businessmen and commercial managers.
3. Manufacturing skills for those entering the secondary sector.
4. Construction skills for those who will work on the many new construction projects anticipated over the twenty year planning period.
5. Skills considered appropriate for women such as nursing, for women and hospitals and clinics, and as teachers in girls schools and colleges.

In addition there should be special skill training programs for settled nomads who wish to learn a

**Table 4-1-1
PROJECTIONS OF EMPLOYMENT**

	1975	1980	1985	1995
Planning Population	30,200	39,800	52,500	91,500
Labor Force (%) Participation Rate	21.6	23.6	25.6	29.6
Employment	6,500	9,400	13,400	27,100
Primary Sector	163	169	228	461
Secondary Sector	1,021	2,087	3,658	7,398
Tertiary Sector ^a	1,288	2,284	3,980	8,049
Government Sector	4,030	4,860	5,534	11,192

Notes:
a. All commercial and services excluding government.



**FIGURE 4-1-1
PROJECTED
GROWTH OF
EMPLOYMENT
BY SECTOR**

new trade or profession. After a preliminary program of orientation and acquisition of basic skills such as writing and mathematics conducted by the proposed Nomadic Community Center (See Section 5-5-3), noned retraining could be integrated with the general skill training programs mentioned above. Such integration would help the noneds to more quickly become assimilated in the general society.

4-2 DISTRIBUTION OF EMPLOYMENT CENTERS

Although there is a relatively scattered employment distribution at present, there is nonetheless a heavier concentration toward the center of town where most commercial and Government administration activities are located.

The future planned development of the city will maintain its central districts as centers of employment with some Government administration activity expanding to the southwest toward a proposed new Government/clinic/tourist/convention center located adjacent to the ring road near the Abnaden.

Secondary commercial centers are planned in four locations along the central arterial roads which pass through the city (see Figure 5-4-1). A large new hospital is planned to the southeast of the city just outside the ring road and new college/university facilities are planned along the roads to Khamis Mushayt and Mubalsh. A new industrial center is located along the road to Khamis Mushayt about 3 km outside the ring road. Each of these activity areas will become secondary employment centers, and although they will not be as large as the central area there will nonetheless be substantial numbers of people working there.

Table 4-3-1
EMPLOYMENT BY PLANNING DISTRICTS

Neighborhood	1975		1980		1985		1990	
	Population	Employment	Population	Employment	Population	Employment	Population	Employment
1.1.1	1880	410	2000	470	2600	670	3000	890
1.1.2	1730	370	2900	570	3100	790	4100	1210
1.2.1	3380	730	3400	800	3400	870	3400	1010
1.2.2	1790		2000	470	2500	640	4700	1390
1.2.3	870	390	1200	280	1600	410	380	1120
1.2.4	840	180	1000	236	1400	360	3290	950
2.1.1	2700	580	3300	790	4000	1020	4600	1360
2.1.2	680	150	1500	350	2000	512	3200	950
2.1.3	540	120	1300	303	2300	590	4600	1350
2.1.4	2080	450	2700	640	3200	820	3200	950
2.2.1	640	180	1100	260	1600	410	3900	1150
2.2.2	370	80	500	120	1100	330	2700	800
2.3.1	2420	520	2500	590	2500	645	2500	740
2.3.2	560	120	1200	280	1600	410	5000	1480
2.3.3	480	100	500	120	900	230	3900	1150
3.1.1	950	210	1600	380	2300	590	3200	950
3.1.2	320		900	210	1600	410	4500	1330
3.1.3	260	70	700	165	1200	310	3400	1010
3.1.4	940	200	1600	380	2400	610	5400	1600
3.2.1	520	110	900	210	1500	380	2300	640
3.2.2	440		1000	240	1500	380	3000	890
3.2.3	2580	540	3000	710	3600	820	5100	1510
3.3.1	1570	340	2000	470	2500	640	3800	1120
3.3.2	1460	320	1500	360	2000	510	3000	890
Participation Rate	21.6%		23.6%		25.6%		29.6%	

FIGURE 4-3-1
1975 EXISTING INCOME
DISTRIBUTION
Scale 1:20,000



SOURCE:
Existing Conditions, Vol. I,
Table 3-1-15, Percentage Composition
of Households by Income and District,
and Fig. 2-1-6, Household Income by
District.

1. High income district: Share of
households with income of SR 2001
or more per month exceeds 15%.

2. Medium income district: 10% with
high per low income district.

3. Low income district: Share of households
with income of SR 500 or less per
month exceeds 55%.

- high-income district
- medium income district
- low income district

4-3 INCOME DISTRIBUTION

Today there is a fairly even distribution of income levels throughout the city. There are two concentrated areas of higher income located in neighborhood districts 1.1.1 and 1.2.1 of this plan. These correspond to areas of traditionally wealthy Saudi families and of high income foreign employees respectively. In some of the less desirable central districts as well as some peripheral districts there are areas of lower income households. For the most part however middle income families are distributed throughout the city. As regional development continues and the general level of GDP rises, city-wide income levels will rise also. Such a rise in income will undoubtedly benefit both high and middle income families directly and as a consequence lower income families as well.

In order for the population in general and the lower income families in particular to take maximum advantage of the continued improvement in economic conditions, it is important that education--both general and professional/technical/vocational--be improved and aimed at providing the people with skills which are needed for future development. In this way Abha can attain a very balanced income distribution both in terms of location and income levels. For further detailed information regarding income and income distribution refer to the Abha Existing Conditions report; Figure 3-1-6 and Section 3-2-3.

4-4 INDUSTRIAL LOCATION

4-4-1 EXISTING CONDITIONS

Industrial activity in Abha occupies only 3.3 ha of land which is much less than would normally be expected for a city this size. This is in part due to the limited availability of suitable land because of the hilly topography. Manufacturing establishments which require large flat areas are more likely to be located in nearby Khamis Mushayt. In Abha the activity of this sector is limited to small scale production of furniture, door and window frames and cement blocks. With the exception of the small cement block factories which are located along the wadi banks, most such activity is concentrated primarily along the road to Khamis Mushayt and to a lesser extent along the other regional arteries which pass through the city. This existing locational distribution is logical since it places the manufacturing establishments along the primary supply routes.

4-4-2 INDUSTRIAL DEVELOPMENT

Abha's future industrial development will be closely tied to the availability of water. As has been demonstrated in the Alternative Strategies reports, although it has a relatively heavy rainfall, Abha's water resources are much more severely limited than those of Khamis Mushayt because of the small water catchment area of Abha, and significant water resource development will be required before much more water is available to industry in Abha. For further information on water resource potential, see the Abha Alternative Strategies Report, Sections 1-5 and 8-4-1 as well as the Regional Physical Master Plan, Chapter 4. The recently completed Abha dam is a significant improvement in water resource development, yet its small size and the relatively small absolute availability of water do not improve the opportunities for water related industries. Nonetheless it is prudent to assume that in the long run, non-water-related industries such as assembly plants, industries associated with construction activities and machinery servicing and repair industries will achieve a much more substantial level of development than is currently the case.

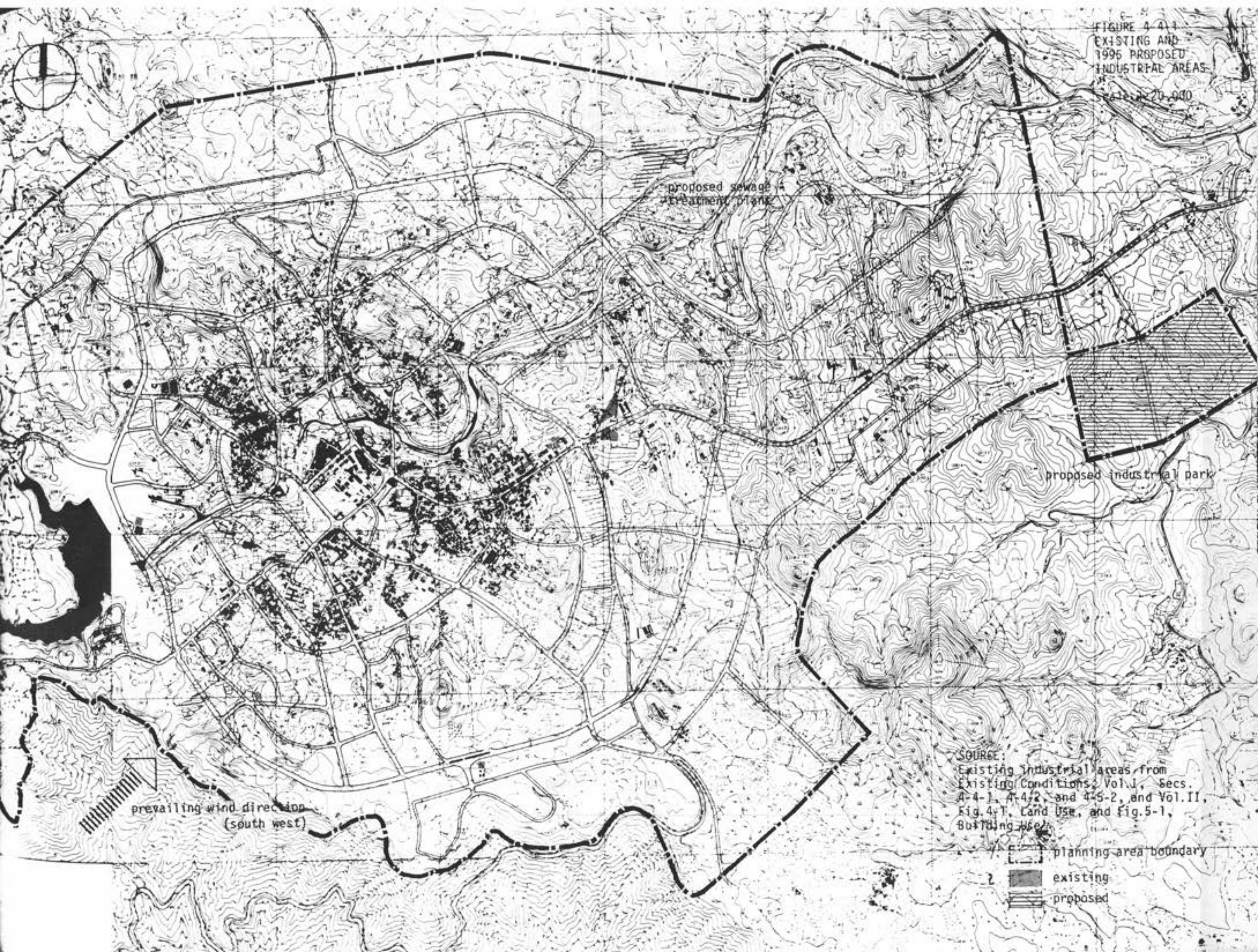
Because of Abha's role as a regional education center it is not unreasonable to suppose that manufacturing requiring relatively high levels of intellectual and technical skills will be developed during the next 20 years.

Industrial development in Abha should be complementary to that of Khamis Mushayt. Because of the more abundant availability of water as well as a more suitable topography, it is expected that larger scale or heavier industries as well as industries which require more water will be developed there to a much greater extent than in Abha.

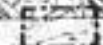


4-4-3 INDUSTRIAL LOCATION POLICY

As a long range policy it is recommended that all industry be relocated outside the residential limits of the city. This could reasonably be accomplished by 1985 through the use of land use and zoning controls. Such a policy is aimed at reducing the negative impacts of pollution, heavy traffic etc. on the residential neighborhoods. It will have the added benefit of eliminating unsightly establishments from areas which should be made as attractive as possible. (This is especially true of the unattractive cement block factories which currently blight the potentially beautiful landscape along the wadi).

FIGURE 4-4-1
EXISTING AND
1995 PROPOSED
INDUSTRIAL AREAS
SCALE: 1" = 20,000'



SOURCE:
Existing industrial areas from
Existing Conditions, Vol. I, Secs.
4-4-1, 4-4-2, and 4-5-2, and Vol. II,
Fig. 4-1, Land Use, and Fig. 5-1,
Building Use.

-  planning area boundary
-  existing
-  proposed

4-4-4 INDUSTRIAL LAND USE

In order to optimize such factors as supply and distribution of goods, distribution of utilities and location of transportation facilities it is felt that a concentrated industrial park similar to the one currently being implemented in Khamis Mushayt is the best solution for Abha. Several alternatives were shown in the Immediate Action Studies report and a location about 3 km east of the city and south of the road to Khamis Mushayt has been designated in this plan. Approximately 75 ha should be set aside to accommodate any potential increase in industrial activity during the 20 year planning period.

This is seemingly a relatively large amount of land to set aside for industrial uses, but using a generous but acceptable standard of about 7.85 m² of industrial land per capita, this is the figure which results. The conservative nature of this figure is justifiable both because of the uncertainties of future development and because the land required for this use can be relatively inexpensive land which is unsuitable for other uses.

Table 4-4-1
PROJECTED INDUSTRIAL AREA REQUIREMENTS

	1975	1980	1985	1995
Employment in Secondary Sector	1021	2087	3658	7398
Employment in Manufacturing	221	451	791	1599
Manufacturing in Central District				
Employment	221	200	0	0
Total Land Area (ha)	3.3	3.3	0	0
Manufacturing in Outer District				
Employment	0	251	791	1599
Total Land Area (ha) ^a	0	28	41	72

Note:

a. @ 7850 m²/1000 population.

5-1 GENERAL EDUCATION

5-1-1 EXISTING CONDITIONS

Abha has 23 facilities classified as educational including 16 schools. Because of the rapid pace of educational development in Abha, this number is constantly increasing even during the preparation of this report, and many new schools are planned. Currently these facilities occupy about 5 ha of land which is less than would be expected by applying commonly accepted standards. Not including college and university land requirements, the application of the planning standards given in the Regional Master Plan would indicate that over 25 ha should be presently allocated for educational purposes. The Government's announced target of 100% enrollment at elementary and intermediate schools underscores the importance placed on education and the necessity of bringing the city's educational facilities up to acceptable standards.

5-1-2 PROJECTED ENROLLMENT AND FACILITIES

There are three components to the educational planning methodology of the present study:

1. Population projections (Chapter 4) as the principal basis for educational planning.
2. Grouping of projected populations into a hierarchical order of communities called the community structure.
3. Recommended standards for enrollment and physical facilities.

Specific numerical guidelines are available in the Appendix to this report on Planning Standards. Following are some general comments on methodology.

From a study of the population structure of the five cities in the Southern Region, the expected number of children per hundred population has been computed for each age group. By applying the appropriate coefficients, the total number of school age population eligible to enroll in the primary, intermediate and secondary schools may be determined. Recommended target enrollment rates produce the total projected enrollment at each educational level and the location of the resident population and associated enrollment determine the grouping of population into appropriate school districts for elementary, intermediate and secondary schools. Finally the number of school districts forming the community structure determines the number of schools.

The total number of schools required in the future is compared with the existing number and distribution of schools. Any inadequacy in the num-

ber of schools must be corrected by conversion of existing schools or construction of new ones.

As far as possible, the boundaries of school districts have been drawn in a manner which makes maximum use of existing schools. It is recommended however, that these boundaries be reconsidered periodically in order to better reflect the underlying structure of communities in the city which may change in unforeseen ways.

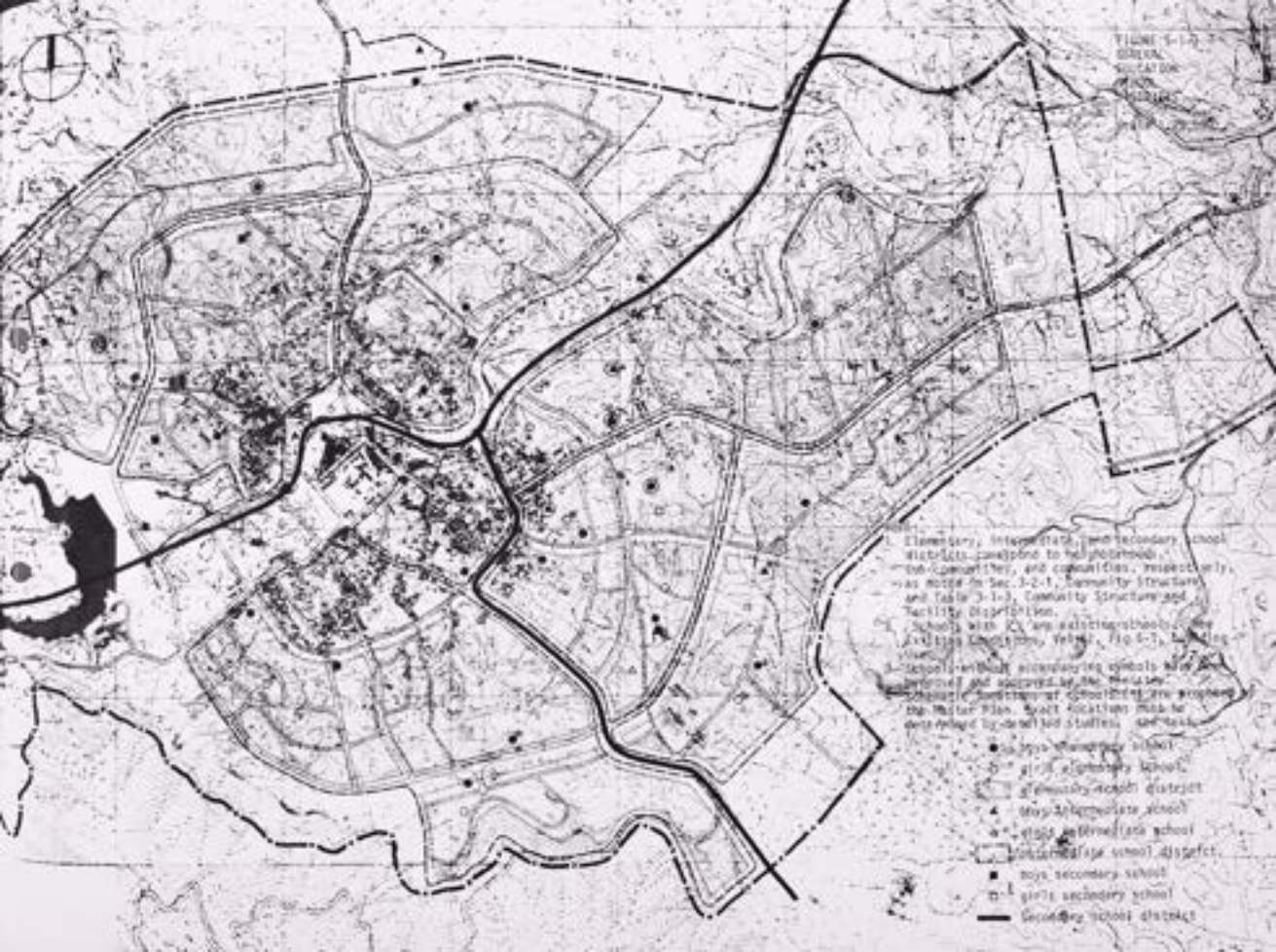
The target rates of school enrollment for 1980 and beyond are 100% for elementary boys and girls schools, 100% for intermediate boys and girls schools, 50% for secondary boys schools and 30% for secondary girls schools. These targets are at all levels except for boys elementary, somewhat higher than those set forth in the Second Development Plan. This is felt to be justifiable for a number of reasons:

1. In many cases it is expected that students from outside a school district (such as those from rural areas may attend schools within a particular district so that slight oversizing of schools is necessary for contingency).
2. Because of the very rapid development being experienced in Saudi Arabia, exact estimates of future enrollment are very difficult and it is felt that conservative planning of schools is the wisest approach.

The planning of schools is perhaps the most important component of neighborhood planning and hence of the whole community structure aspect of master planning. In Abha there are both many existing schools and many schools which have been planned and approved. Because of the requirements of the Government, the locations of these existing and approved schools have been taken as given elements in the master planning process. Community structure has been planned in order to accommodate these locations with a minimum of conversion of either school level or use (This subject has been discussed in detail in a separate report prepared for the Ministry).

Each neighborhood is planned to have one boys elementary school and one girls elementary school. The final phase of the plan in 1995 has 24 neighborhoods and hence 48 elementary schools. Intermediate schools are associated with sub-community groupings of two to four neighborhoods. The 1995 plan includes eight such sub-communities and 16 intermediate schools equally divided among boys and girls.

FIGURE 5-1-2
GENERAL
SITUATION
OF
SCHOOLS



Elementary, intermediate, and secondary school districts correspond to the postcodes, sub-communities, and communities, respectively, as noted in Sec. 3-2-1, Community Structure and Table 3-1-3, Community Structure and Facility Distribution.

Schools with "X" are existing schools, the existing locations, Table 3-1-3, Existing Schools without secondary schools were approved and approved by the Ministry. Specific locations of schools are proposed in the Master Plan. Exact locations may be determined by detailed studies. See Table 3-1-3.

- Boys elementary school
- Girl's elementary school
- Elementary school district
- ▲ Boys intermediate school
- ▲ Girl's intermediate school
- Intermediate school district
- Boys secondary school
- Girl's secondary school
- Secondary school district

Secondary schools are organized according to community groupings composed of two or three sub-communities and from six to nine neighborhoods. Each community has one boys and one girls secondary school. Since anticipated secondary enrollment is greater for boys than girls, the secondary boys schools will be significantly larger than the secondary girls schools. There are three community groupings and therefore six secondary schools in the 1995 plan. (Phasing of schools is discussed in Chapter 10)

It should be noted that the number of schools at each educational level (elementary, intermediate and secondary) does not necessarily correspond to the school age population or attendance percentages because the recommended size of schools at each level is different. Complete standards for schools and other educational facilities including service population school and classroom size and other aspects of such facilities are given in the Appendix on Planning Standards.

In general schools should be located near the center of the hierarchical community unit which they serve--elementary at the center of neighborhoods, intermediate at the center of sub-communities and secondary at the center of communities, although because of the presence of existing and planned school locations which cannot be changed this has not always been possible. In Abha for example, secondary schools are situated at the edges of their respective communities to account for approved school locations, to provide ample space for the large playfields associated with them and to act as terminal focal points for the linear community facilities organization. Table 5-1-1 indicates land and floor areas for these schools during each phase of implementation.

Playgrounds or playfields are associated with each school and are situated in such a manner that they serve both the students and the general public of the appropriate level of community structure. The land areas for these playgrounds and playfields are included in the tables accompanying this chapter as well as in Chapter 6 concerning recreation.

Table 5-1-1a
PROJECTED BOYS AND GIRLS EDUCATIONAL AREA REQUIREMENTS
ELEMENTARY SCHOOL

	1975 ^a	1980	1985	1995
Planning Population	30,200	39,800	52,500	91,500
Boys				
No. of School Age Population ^b	2,800	3,700	4,900	8,500
No. of Students	2,800	3,700	4,900	8,500
No. of Schools	8	10	14	24
Total Floor Area (m ²) ^c	12,600	16,650	22,050	38,250
Land Area For Building (ha) ^d	3.4	4.4	5.9	10.2
Playground Area (ha) ^e	5.6	7.4	9.8	17.0
Total Land Area (ha)	9.0	11.8	15.7	27.2
Girls				
No. of School Age Population ^b	2,800	3,700	4,900	8,500
No. of Students	2,800	3,700	4,900	8,500
No. of Schools	8	10	14	24
Total Floor Area (m ²) ^c	12,600	16,650	22,050	38,250
Land Area For Building (ha) ^d	3.4	4.4	5.9	10.2
Playground Area (ha) ^e	5.6	7.4	9.8	17.0
Total Land Area (ha)	9.0	11.8	15.7	27.2
Totals				
Number of Schools	16	20	28	48
Floor Area (m ²)	25,200	33,300	44,100	76,500
Total Land Area (ha)	18.0	23.6	31.4	54.4

Notes:

- Figures for 1975 indicate the required number and size of schools if the recommended standards (see Appendix Planning Standards) are to be satisfied.
- Assume 18.6% of the total population will be in age groups 6 to 11. --- See Appendix, Planning Standards Section A-1-3.
- Based on 4.5 m²/student. See Planning Standards, Section A-2-1-2 and A-2-1-3
- Land area for building includes building area (building coverage), vehicular and pedestrian circulation (including parking), setbacks and landscaping areas. 20m²/student is recommended.
- Playground area is recommended to be 20m²/student. See Planning Standards, Section A-2-2-4.

5-1-3 PROPOSED LAND USE

Table 5-1-1b
PROJECTED BOYS AND GIRLS EDUCATIONAL AREA REQUIREMENTS
INTERMEDIATE SCHOOL

	1975 ^a	1980	1985	1995
Planning Population	30,200	39,800	52,500	91,500
Boys				
No. of School Age Population ^b	1,050	1,350	1,800	3,150
No. of Students	1,050	1,350	1,800	3,150
No. of Schools	3	3	5	8
Total Floor Area (m ²) ^c	6,825	8,775	11,700	20,475
Land Area				
For Building (ha) ^d	2.1	2.7	3.6	6.3
Playfield (I) Area (ha) ^e	3.15	4.05	5.4	9.45
Total Land Area (ha)	5.25	6.75	9.0	15.75
Girls				
No. of School Age Population ^b	1,050	1,350	1,800	3,150
No. of Students	1,050	1,350	1,800	3,150
No. of Schools	3	3	5	8
Total Floor Area (m ²) ^c	6,825	8,775	11,700	20,475
Land Area				
For Building (ha) ^d	2.1	2.7	3.6	6.3
Playfield (I) Area (ha) ^e	3.15	4.05	5.4	9.45
Total Land Area (ha)	5.25	6.75	9.0	15.75
Totals				
Number of Schools	6	6	10	16
Floor Area (m ²)	13,650	17,550	23,400	40,950
Total Land Area (ha)	10.5	13.5	18.0	31.5

Notes:

- Figures for 1975 indicate the required number and size of schools if the recommended standards (see Appendix, Planning Standards) are to be satisfied.
- Assume 6.9% of the total population will be in the age groups 12 to 14 -- See Appendix, Planning Standards, Section A-1-3
- Based on 6.5 m²/student. See Planning Standards, Sections A-2-1-4 and A-2-1-5.
- Land Area for building includes building area (building coverage) vehicular and pedestrian circulation (including parking), setbacks and landscaping areas. 20m²/student is recommended.
- Playfield, level I is recommended to be 30m²/student. See Planning Standards Section A-2-2-b.

Table 5-1-1c
PROJECTED BOYS AND GIRLS EDUCATIONAL AREA REQUIREMENTS
SECONDARY SCHOOL

	1975 ^a	1980	1985	1995
Planning Population	30,200	39,800	52,500	91,500
Boys				
No. of School Age Population ^b	1,050	1,350	1,800	3,150
No. of Students ^c	550	700	900	1,600
No. of Schools	1	1	2	3
Total Floor Area (m ²) ^d	3,850	4,900	6,300	11,200
Land Area				
For Building (ha) ^e	1.4	1.8	2.3	4.0
Playfield (II) Area (ha) ^f	2.75	3.5	4.5	8.0
Total Land Area (ha)	4.15	5.3	6.8	12.0
Girls				
No. of School Age Population ^b	1,050	1,350	1,800	3,150
No. of Students ^c	300	400	550	950
No. of Schools	1	1	2	3
Total Floor Area (m ²) ^d	2,100	2,800	3,850	6,650
Land Area				
For Building (ha) ^e	0.8	1.0	1.4	2.4
Playfield (II) Area (ha) ^f	1.5	2.0	2.75	4.75
Total Land Area (ha)	2.3	3.0	4.15	7.15
Total				
Number of Schools	2	2	4	3
Total Floor Area (m ²)	5,950	7,700	10,150	17,850
Total Land Area (ha)	6.45			

Notes:

- Figures for 1975 indicate the required number and size of schools if the recommended standards are to be satisfied.
- Assume 6.9% of the total population will be in age groups 15 to 17 evenly distributed between boys and girls. See Appendix Planning Standards, Section A-1-3.
- Enrollment is assumed to be 50% for boys and 30% for girls.
- Based on 7m²/student. See Planning Standards Section A-2-1-6 and A-2-1-7.
- Land area for building includes building area (building coverage), vehicular and pedestrian circulation (including parking), and minimum setbacks and landscaping areas. 25m²/student is recommended.
- Playfield Level II at 50m²/student, See Planning Standards, Section A-2-2-7.

Table 5-1-1d
SUMMARY OF PROJECTED EDUCATIONAL AREA REQUIREMENTS

	1975	1980	1985	1995
Elementary*				
No. of Schools	16	20	28	48
Total Floor Area (m ²)	25,200	33,300	44,100	76,500
Total Land Area (ha) ^a	18.0	23.6	31.4	54.4
Intermediate*				
No. of Schools	6	6	10	16
Total Floor Area (m ²)	13,650	17,550	23,400	40,950
Total Land Area (ha) ^a	10.5	13.5	18.0	31.5
Secondary*				
No. of Schools	2	2	4	6
Total Floor Area (m ²)	5,950	7,700	10,150	17,850
Total Land Area (ha) ^a	6.45	8.3	10.95	19.15
Teachers School for Boys*(1)				
Total Floor Area (m ²)	8,700	11,500	15,100	26,400
Total Land Area (ha) ^b	3.3	4.3	5.7	9.9
Teachers School for Girls*(1)				
Total Floor Area (m ²)	8,700	11,500	15,100	26,400
Total Land Area (ha) ^b	3.3	4.3	5.7	9.9
Technical School for Boys*(1)				
Total Floor Area (m ²)	8,700	11,500	15,100	26,400
Total Land Area (ha) ^b	3.3	4.3	5.7	9.9
Technical School for Girls*(1)				
Total Floor Area (m ²)	8,700	11,500	15,100	26,400
Total Land Area (ha) ^b	3.3	4.3	5.7	9.9
College				
Total Floor Area (m ²)	(See Notes on Table 5-2-1)			
Total Land Area (ha)	(See Notes on Table 5-2-1)			
Special College (3) (Abha Only)				
Total Floor Area (m ²)	(Requirements not available at this time.)			
Total Land Area (ha)	(Requirements not available at this time.)			
Total Educational Facilities				
Land Area (ha) ^c	48.15	62.6	83.15	144.65
	+	+	+	+
		College/University Land Area		

Table 5-1-1d
Notes:

*PROJECTED APPROXIMATE ENROLLMENT PER SCHOOL

Elementary (boys and girls)	355
Intermediate (boys and girls)	400
Secondary	
boys	500
girls	350
Teachers Training Schools (boys and girls)	720
Technical Schools (boys and girls)	350

- Total land area for elementary intermediate and secondary schools includes playgrounds and playfields and appropriate levels.
- Total land area for Teacher Training Schools and Technical Schools does not include athletic playfields. The playfields of the Secondary Schools should be used by students of Teacher Training and Technical Schools.
- Overall total land areas are based on the stipulations indicated in notes a. and b. above,

5-2 PUBLIC AND INSTITUTIONAL FACILITIES

5-2-1 HIGHER AND SPECIAL EDUCATION

Currently there is a Teachers College at Abha temporarily located between Abha and Khamis Mushayt. Although specific plans are unclear at present, it is planned that this facility be integrated into a Southern Region University sometime during the next 20 years. Preliminary alternatives for the location of such a university include a site at Mohalah about midway between Abha and Khamis Mushayt and a site along the road from Abha to Mohalah about 4 km from the city. Because of the desirability of a location close to the city this latter site is recommended and assumed in this plan. Requests for the location of a 30 ha site for a mathematics college have already been received, and in this plan it is situated just outside the 1995 residential limits of the city between the Abha-Khamis Mushayt road and Wadi Abha. A proposed road and bridge passing by this site and connecting the Abha-Khamis Mushayt road with the Abha-Mohalah road will serve to link the mathematics college with the university. It is further recommended that any additional institutions of higher education such as special colleges or the proposed Islamic University expansion which will require 300 ha of land for itself and six affiliated institutions be located somewhere along this link thereby creating a large extended campus area stretching from the city to the new Southern Region University. This extended campus will incorporate nearly all of the college level institutions planned for Abha.

Lower level teacher training schools as well as both boys and girls technical schools will be required as well as their land and floor areas given in Table 5-2-1 (a).

5-2-2 MOSQUES

Mosques are arranged hierarchically according to community structure. By 1995 each neighborhood should have a mosque and each sub-community a Jami'a mosque. Because of the magnitude of expected population growth, an Eid mosque is planned for Abha by 1995. This is located west of the central district and integrated into the public park. (See Table 5-2-1 (b)).

Table 5-2-1 (a)
EDUCATIONAL INSTITUTIONS OTHER THAN
GENERAL BOYS AND GIRLS SCHOOLS

	1975	1980	1985	1995
Boys Teachers Training Schools				
No. of Schools (720 Students)	1	1	1	1
Total Floor Area (m ²)	8,700	11,500	15,100	26,400
Total Land Area (ha)	3.3	4.3	5.7	9.9
Girls Teachers Training Schools				
No. of Schools (720 Students)	1	1	1	1
Total Floor Area (m ²)	8,700	11,500	15,100	26,400
Total Land Area (ha)	3.3	4.3	5.7	9.9
Boys Technical Schools				
No. of Schools (720 Students)	1	1	1	1
Total Floor Area (m ²)	8,700	11,500	15,100	26,400
Total Land Area (ha)	3.3	4.3	5.7	9.9
Girls Technical Schools				
No. of Schools (350 Students)	1	1	1	1
Total Floor Area (m ²)	4,350	5,750	7,550	13,200
Total Land Area (ha)	1.7	2.2	2.9	5.0
College/University^a				
No. of Schools		1	1	1
Min. Total Land Area (ha)		10	NA ^b	NA ^b
Mathematics College				
No. of Schools			1	1
Floor Area (m ²)	NA ^b	NA ^b	NA ^b	NA ^b
Land Area (ha)			30	30
Special Colleges				
No. of Schools				3
Floor Area (m ²)	NA ^b	NA ^b	NA ^b	NA ^b
Land Area (ha)				6

Notes:

- Teachers College at Abha will be integrated into a Southern Region university. Planned Projections of enrollment were unavailable. However indications are that a very large land area on the order of magnitude of 1500 ha is being considered. Such a land area could accommodate any anticipated program and enrollment in the foreseeable future.
- Land and floor area requirements were not available.

Table 5-2-1 (b)
MOSQUES

5-2-3 HEALTH CARE

	1975 ^a	1980	1985	1995
Planning Population	30,200	39,800	52,500	91,500
Mosque				
No. of Facilities	7	10	14	24
Total Floor Area (m ²)	2,000	11,940	15,750	27,450
Total Land Area (ha)	2.0	2.5	3.5	6.0
Jami'a Mosque				
No. of Facilities	2	3	5	8
Total Floor Area (m ²)	1,500	4,776	6,300	10,980
Total Land Area (ha)	1.0	2.1	3.5	5.6
EID Mosque				
No. of Facilities				1
Total Floor Area (m ²)				
Total Land Area (ha)				3.5
Total				
No. of Facilities	9	13	18	31
Total Floor Area (m ²)	3,500	16,716	22,050	38,430
Total Land Area (ha)	3.0	4.6	6.3	13.7

Note:

- a. 1975 figures are given by applying the planning Standards to the population. A comparison between this figure and actual existing conditions can be made by reference to the religious institutions shown on the maps in Figure 4-1 and 5-1 in the Abha Existing Conditions report, Volume II.

Aside from malaria which is not present in Asir (except for "imported cases) diseases in this area include bilharzia and to a lesser extent cholera, diphtheria, typhoid and tuberculosis.

The center for bilharzia and malaria which is part of the Ministry of Health is located in Abha. This center concentrates on planning and research for preventative programs rather than on treatment. These diseases do not require isolation and hence no special hospitals are needed.

Diseases requiring isolation such as cholera, diphtheria, typhoid and advanced tuberculosis are treated at a special hospital for this purpose located in the Alasan area between Abha and Khamis Mushayt.

According to Ministry of Health officials, there are a very small number of cases of epidemic diseases reported in this area and these along with the endemic disease not requiring isolation can be adequately treated in a good general hospital where a special endemic disease hospital does not exist.

As with educational facilities, health care facilities too are organized according to community structure in this master plan. By 1995 a pharmacy will be located in each neighborhood center, significantly reducing service population and service area and consequently improving the quality of health services provided by these facilities.

Similarly, diagnostic and treatment centers are located in the sub-community centers and provide service to the residents of that level of community structure.

Such neighborhood and sub-community health care facilities will form an integral part of the community service plan, and should be clearly identified with their respective facilities centers. In this way every citizen of Abha will have immediate and easy access to nearby health facilities which will both serve their immediate minor medical needs and identify patients who require the more extensive care available at the city's hospitals.

Currently Abha has a city-wide general hospital and a pediatric hospital. Existing plans call for the construction of a new large (400-500 beds) general hospital on a site just outside the ring road to the southeast of the city along the road to Al Quarrah. This consultant accepts this location, but recommends that Ministry officials maintain a

certain flexibility in case those charged with detailed planning and implementation feel that another site is more acceptable

Table 5-2-2 (a) and 5-2-2 (b) indicate recommended health care facilities based upon the Planning Standards presented in the appendix. It should be noted that for each year these figures are phased with the planning population whereas actual implementation may require a different schedule. Therefore these tables should be used as basic guidelines along with the figures presented in Table 5-2-2 (c) provided by the Ministry of Health. In addition the Ministry of Health has the following requirements for Asir.

Hospital	Number
General Hospitals	20 located throughout the Souther Region
Tuberculosis Hospital	1
Obstetrics and Gynecology	2
Ophthalmology and Otolaryngology	1
Accident Hospital	2
Communicable Disease	1
Psychiatry	1

Table 5-2-2 (a)
PROJECTED HEALTH FACILITIES AREA REQUIREMENTS
NEIGHBORHOOD AND SUB-COMMUNITY FACILITIES

	1975	1980	1985	1995
Planning Population	30,200	39,800	52,500	91,500
Neighborhood Pharmacy				
No. of Facilities	8	10	.14	24
Total Floor Area (m ²)	1,510	1,990	2,625	4,575
Total Land Area (ha)	0.8	1.0	1.4	2.4
Sub-Community Diagnosis and Treatment Center				
No. of Facilities (2 in each community by 1995)	3	3	5	8
Total Floor Area (m ²)	302	398	525	915
Total Land Area (ha)	0.9	1.2	1.6	2.7
Total Neighborhood and Sub-Community Facilities Land Area (ha)	1.7	2.2	3.0	5.11

Table 5-2-2 (b)
PROJECTED HEALTH FACILITIES AREA REQUIREMENTS
COMMUNITY AND SUB-REGIONAL FACILITIES

	1975	1980	1985	1995
Greater Urban Planning Population	49,700	62,100	77,800	124,000
Community General Hospital				
No. of Facilities	1	1	1	1
Total No. of Beds	174	217	272	434
Total Floor Area (m ²)	5,220	6,510	8,160	13,020
Total Land Area (ha)	3.7	4.7	5.8	9.3
Mental Hospital (1)				
Total No. of Beds	249	311	389	620
Total Floor Area (m ²)	8,217	10,253	12,837	20,460
Total Land Area (ha)	5.0	6.2	7.8	12.4
Special Long-Term Hospital (1)				
Total No. of Beds	149	186	233	372
Total Floor Area (m ²)	4,917	6,138	7,689	12,276
Total Land Area (ha)	5.0	6.2	7.8	12.4
Nursing Home (1)				
Total No. of Beds	75	93	117	186
Total Floor Area (m ²)	2,475	3,069	3,861	6,138
Total Land Area (ha)	1.0	1.2	1.6	2.5
Total Community and Sub-Regional Facilities Land Area (ha)	14.7	18.3	23.0	36.6

Table 5-2-2 (c)
MINISTRY OF HEALTH RECOMMENDATIONS
REGARDING HOSPITAL STANDARDS

Kind of Hospital	Beds
General Hospital:	200 500
T. B. (Chest Disease) Hospital	300
Obstetrics and Gynecology:	100~200
Ophthalmology and Otolaryngology:	200
Accidents Hospital:	100
Fever (Communicable):	{100 (Jizan, Tihama) {300 (Asir)
Psychiatry:	200~300
Leprosy: (Not required in Asir)	100
<hr/> 1 General Doctor for 40~50 patient 1 Special " for 10~15 " 1 Nurse for 4~6 "	

These recommendations for health care facilities are based on generally acceptable standards as well as recommendations by the Ministry of Health. More detailed recommendations are not properly the responsibility of the consultant nor are they appropriate at this level of master planning.

5-2-4 PUBLIC ADMINISTRATION

Abha is the regional administrative center for the Southern Region as well as the provincial administrative center for Asir Province. Branches of most of the Government Ministries are located here and their facilities are constantly growing. The public administrative sector is paramount to both the economy of the city and to its general image. Administrative offices are generally grouped around the central district and a new office complex has recently been completed just to the southwest of the center. It is estimated that current employment at all levels of public administration (excluding teachers, policemen, firemen etc.) is about 2500 in Abha. Although as explained earlier it is assumed that the percentage share in the Government sector will steadily drop as the private sector becomes more active, in terms of absolute numbers, employment will increase significantly. By 1995 employment in public administration will reach almost 6000.

By applying the planning standards for administrative offices to projected employment, the projected land requirement for 1995 is about 6 ha (see Table 5-2-3). This is roughly equivalent to the current land use, indicating inefficiency in existing facilities. Although ministries should be actively encouraged to make maximum efficiency of land use a high priority in their facilities planning, it is likely that during the next 20 years significant expansion of these facilities will result in the use of up to 2 or 3 times the projected land requirement.

Within the central district, vertical and multi-functional development of Government administration facilities is considered essential. In this area Administrative office structures can be integrated with private offices and commercial facilities as well as public walkways, plazas and parks. This area should become the central symbolic focus for the city.

It has already been mentioned that a new administrative complex has been recently completed just to the southwest of the central district. Should further extension be necessary it is recommended that selected sites along the southern edge of the planned central public park be used for administrative offices. Such structures should be carefully integrated into the natural setting of the park and should present neither a physical, visual nor perceptual barrier to the enjoyment of the park.

The development along the edge of the park can be continued if necessary in the district to the southwest of the park which is planned as a civic/

Table 5-2-3
PROJECTED PUBLIC ADMINISTRATION AREA REQUIREMENTS

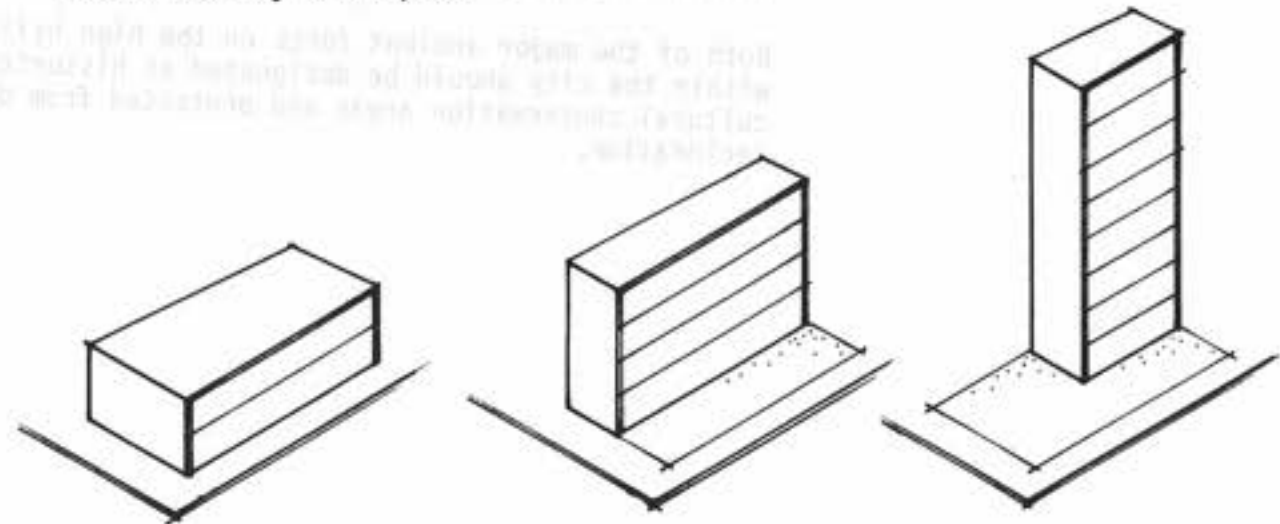
	1975	1980	1985	1995
Employment in Government Sector	4,000	4,900	5,500	11,200
Employment in Public Administration	2,500	2,900	3,400	5,900
Total Floor Area (m ²)	50,000	58,000	68,000	118,000
Total Land Area (ha) Assuming Floor Area Ratio = 2 ^a	2.5	2.9	3.4	5.9

Notes:

a. Floor Area Ratio or F.A.R. is defined as the ratio of the total floor area including all stories to the total lot area, or:

$$\text{F.A.R.} = \frac{\text{total floor area}}{\text{total lot area}}$$

When the F.A.R. is greater than one as is the case here, the total floor area can be greater than the land area. In this case with an F.A.R. of 2 the floor area can be twice the land area. This presupposes vertical development. The following illustration of possible building variations with an F.A.R. of 2 may be helpful:



F.A.R. of 2
2 stories
100% lot coverage

F.A.R. of 2
4 stories
50% lot coverage

F.A.R. of 2
8 stories
25% lot coverage

For further information see the Appendix - Planning Standards

tourist/convention center and which could easily accommodate administrative offices as well.

This plan for administrative facilities will result in a strongly unified complex which with proper planning, design and integration with the park and civic center could create a spectacularly attractive and functional town center

5-3 CULTURAL FACILITIES

Plans for a historical museum in the central district of Abha have been temporarily suspended due to inordinately high acquisition costs. Nonetheless such a facility is considered essential for the preservation of local history and culture. This is especially true in the case of a city such as Abha which is expected to become an important tourist center. A centrally located historical, cultural museum could become an important tourist attraction.

Additionally, historic conservation areas including traditional houses located in the planned public park to the southwest of the city and if possible the traditional dwelling cluster just across the wadi to the northwest of the central district, should be protected from both further development and deterioration.

Both of the major ancient forts on the high hills within the city should be designated as historic, cultural conservation areas and protected from deterioration.

5-4 COMMERCIAL FACILITIES

5-4-1 EXISTING COMMERCIAL AREAS

In general, permanent commercial facilities are widely dispersed around the city although there is some concentration in and around the central district and along the major arterial roads especially the road to Khamis Mushayt. The open-air suq is located just to the southeast of the central district and plans for the construction of new facilities to accommodate the suq have already been prepared. Currently there is about 5.5 ha of land devoted to commercial activity inside the ring road. Refer to the Existing Conditions Reports and the Alternative Strategy Reports for a complete account of existing commercial areas.

5-4-2 PROPOSED DISTRIBUTION OF MAJOR COMMERCIAL ACTIVITIES

Due to the nearby presence of Khamis Mushayt with its large and well-developed regional commercial sector, Abha's own commercial sector is not as well developed as it might be. For this reason it is important that the location and organization of centers of commercial activity be well planned both to strengthen the physical and functional structure of the city and to improve the economic activity of this sector.

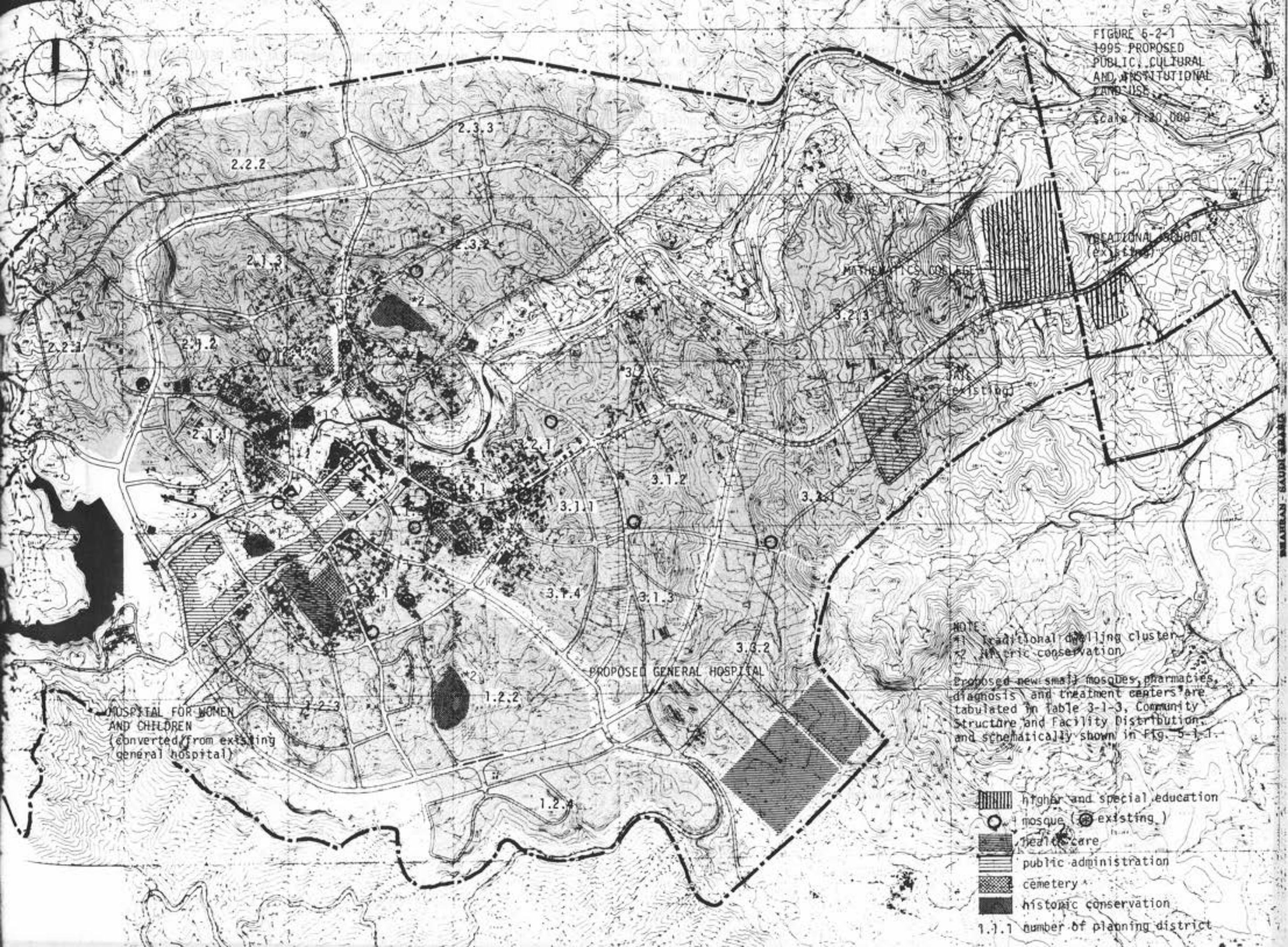
Although the commercial facilities of Khamis Mushayt will continue to attract a large regional market, it is reasonable to assume that the urban and rural population within a 30 minute driving radius (not including those areas which are closer to Khamis Mushayt) can be attracted by a well organized commercial center in Abha. The current estimated population within 30 minutes of Abha (including Abha's population itself) is almost 50,000. This greater urban population will increase to about 124,000 by 1995 providing a substantial market for the city's commercial establishments.

The central district and the district just to the southeast of this should be encouraged to continue developing as the major commercial center of the city. This can be done by zoning and by the implementation of the plans for the new suq and similar projects. By 1995 this major commercial center will require about 9.3 ha of land (see Table 5-4-1 (a)).







In addition to this major commercial center, secondary centers are needed to more conveniently serve the population of the city itself. These secondary centers are hierarchically organized to

FIGURE 5-2-1
1995 PROPOSED
PUBLIC, CULTURAL
AND INSTITUTIONAL
LAND USE

Scale 1:20,000



NOTE:
 #1 traditional dwelling cluster
 #2 historic conservation
 Proposed new small mosques, pharmacies, diagnosis and treatment centers are tabulated in Table 3-1-3, Community Structure and Facility Distribution, and schematically shown in Fig. 5-1-1.

-  higher and special education
-  mosque (● existing)
-  health care
-  public administration
-  cemetery
-  historic conservation
- 1.1.1 number of planning district

correspond with the three communities which form the city. Community 1 which surrounds the central commercial area can utilize this for its immediate needs. Communities 2 and 3 which are further from the central area require "satellite" centers. These are located along the major transportation arteries which pass through the city at the junction of collector roads which serve these communities. These secondary centers are extended to the ring road and serve to bracket the zones of higher density with convenient commercial areas. Such commercial sub-centers will also help to alleviate traffic congestion which might arise if all commercial activities were concentrated in the central area.

It is recommended that commercial facilities outside the ring road be limited to three areas only - the intersections of the ring road with 1. the Tail road, 2. the Khamis Mushayt road and 3. the Jizan road. At these locations, distribution and truck staging areas can be located outside the ring road in order to reduce the amount of heavy truck traffic passing through the city itself. Supporting commercial facilities can be appropriately located here as well.

By 1995 these community commercial areas will require about 6.9 ha of land (see Table 5-4-1 (b)) In the Appendix or Community Planning Standards, a detailed description of standards for commercial facilities is given in Section A-2-6. This indicates such relationships as service population, service radius, land and floor area requirements, location and access recommendations and so forth.

5-4-3 PROPOSED DISTRIBUTION OF NEIGHBORHOOD COMMERCIAL ACTIVITIES

Under the proposed plan, each neighborhood center will include small scale commercial establishments such as food stores, drug stores, barber shops, laundries, restaurants etc. to serve the local residents. Insofar as possible these facilities like the neighborhood centers themselves should be located in the geographical center of the neighborhood in order to most conveniently serve their customers. Such an organization will also help to reinforce the neighborhood center structure which as has already been explained includes elementary schools, playgrounds, a small mosque etc. By 1995 there will be 24 neighborhood centers with associated commercial facilities. These facilities will require about 27.5 ha of land distributed throughout the city (see Table 5-4-1 (b)).

Table 5-4-1 (a)
PROJECTED REGIONAL COMMERCIAL AREA REQUIREMENTS

	1975	1980	1985	1995
Greater Urban Planning Population	49,700	62,100	77,800	124,000
Total Regional Commercial Floor Area (m ²)	7,455	9,315	11,670	18,600
Total Regional Commercial Land Area (ha)	3.7	4.7	5.8	9.3

FIGURE 5-4-1
1995 PROPOSED
COMMERCIAL
LAND USE



- sub-regional and community shopping center
- neighborhood shopping center
- planning area boundary
- number of planning district

*Schematic locations of neighborhood shopping centers are proposed by the Master Plan. Each location must be determined by detailed studies. See Text.

5-5 NEIGHBORHOOD AND COMMUNITY CENTRAL AREAS

5-5-1 PLANNING POLICY

The master plan organizes the city's residential areas in a hierarchical manner with three major subdivisions--neighborhoods with a population of 2500 to 5000, sub-communities composed of 2 to 4 neighborhoods and communities composed of 2 or 3 sub-communities.

In one sense this represents a break from the traditional organization of the city since historically development has centered solely around the sq in the central area. However as the city continues to grow, such a monolithic concentricity becomes less desirable because of the tendency toward congestion in the center and the increasing remoteness of community facilities from the population they serve. It is in order to prevent this from happening that a hierarchical community structure has been planned. Such a structure will divide the city into smaller communities which will function individually much as the traditional city did, yet remain important components of the larger unified urban area.

Each of the three individual communities as well as their sub-components (sub-communities and neighborhoods) will have sufficient community services and facilities at an appropriate level to maintain a functional integrity of its own.

5-5-2 DISTRIBUTION OF FUNCTIONS

Each unit at each level of community structure will have facilities for education, religion, health, commercial activity, social and cultural activities and recreation/open space (see the Planning Standards section of the Regional Master Plan).

At the community level of structure the "centers" of activity are organized along linear belts which connect the boys and girls secondary schools situated at either end of the community. This linear distribution results in an arrangement of community facilities which enables easy access to all members of the community. Centers of community commercial activity are located at the points where these three linear community "centers" cross the regional arteries, thus enabling easy automobile and pedestrian access.

In addition to these facilities, a separate community center facility will be provided in order to meet the communities' needs for a gathering and meeting place for general social interaction.

Table 5-4-1 (b)
PROJECTED NEIGHBORHOOD AND COMMUNITY COMMERCIAL AREA REQUIREMENTS

	1975	1980	1985	1995
Planning Population	30,200	39,800	52,500	91,500
Neighborhood Retail				
No. of Retail Centers ^a		10	15	24
Total Floor Area (m ²) ^b	11,325	14,925	19,688	34,313
Total Land Area (ha)	9.1	11.9	15.8	27.5
Community Retail				
No. of Retail Centers				
Total Floor Area (m ²)	4,530	5,970	7,875	13,725
Total Land Area (ha)	2.3	3.0	3.9	6.9

Notes:

- a. Phased to coincide with school phasing.
- b. Based on planning standards applied to total population.

Table 5-5-1 (a)
PROJECTED SOCIAL-CULTURAL FACILITIES AREA REQUIREMENTS
NEIGHBORHOOD AND COMMUNITY CENTERS

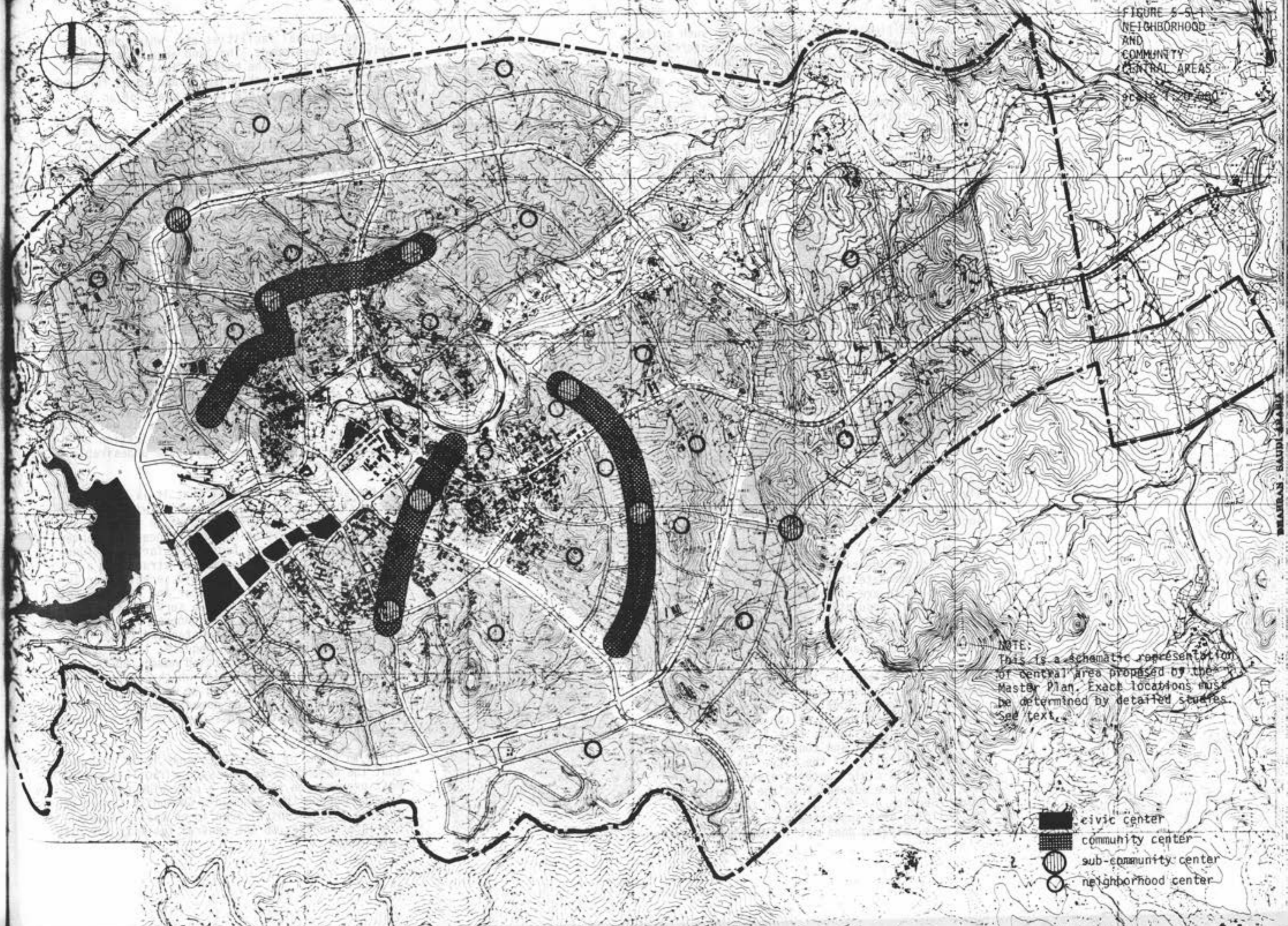
	1975	1980	1985	1995
Planning Population	30,200	39,800	52,500	91,500
Neighborhood Center				
No. of Centers	8	10	14	24
Total Floor Area (m ²)	1,510	1,990	2,625	4,575
Total Land Area (ha)	2.4	3.0	4.2	7.2
Community Center				
No. of Centers	1	1	2	3
Total Floor Area (m ²)	302	398	525	915
Total Land Area (ha)	0.6	0.6	1.2	1.8
Total Neighborhood and Community Centers				
Total Floor Area (m ²)	1,812	2,388	3,150	5,490
Total Land Area (ha)	3.0	3.6	5.4	9.0

Table 5-5-1 (b)
PROJECTED CIVIC CENTER AREA REQUIREMENTS

	1975	1980	1985	1995
Greater Urban Planning Population	49,700	62,100	77,800	124,000
Civic Center Floor Area (m ²)	2,485	3,105	3,890	6,200
Civic Center Land Area (ha)	2.5	3.1	3.9	6.2

FIGURE 5-5-1
NEIGHBORHOOD
AND
COMMUNITY
CENTRAL AREAS

SCALE 1:20,000



NOTE:
This is a schematic representation
of central area proposed by the
Master Plan. Exact locations must
be determined by detailed studies.
See text.

- civic center
- ▨ community center
- ⊝ sub-community center
- neighborhood center

BEARAS - SAUDI

These facilities can provide space for such activities as meetings, social ceremonies, entertainment, cultural activities, adult education, extracurricular school activities and so on.

At the sub-community level of structure, facilities are organized more tightly around a true center which will include intermediate schools and playfields, Jami'a mosques, diagnostic and treatment centers and public open space. The sub-community centers are situated along the linear community center zone thus integrating the functions of these two levels of structure in order to provide more comprehensive service and easier accessibility.

At the neighborhood level of structure, facilities are again organized around a central area which includes such functions as elementary schools and playgrounds, small neighborhood mosques, pharmacy health facilities, open space and a separate neighborhood center facility. These neighborhood center facilities will provide gathering and meeting space for residents of each neighborhood and provide a focus for neighborhood activities.

It should be pointed out that although at each level of community structure there is a theoretically "ideal" location for associated facilities (and such specific locations are indicated in this plan), a certain amount of flexibility may be permitted to allow for specific problems (such as land acquisition) which may arise. This flexibility is evidenced in the placement of schools in this plan which because of existing or approved locations is not always ideal.

In addition to the activity centers described above, a city-wide civic center is provided in order to accommodate those large scale community activities which are of interest to a broad spectrum of the city's population. This facility will be the cultural and social center for the city and will include an auditorium, small arena, exhibition hall, museum and art gallery.

In the Abha master plan this civic center is combined with a proposed tourist/convention center (which may also include some Government offices) located to the southwest of the planned public park. Properly designed, this facility can become a striking landmark and tourist attraction symbolizing the vitality of the city. The proposed areas for this civic center are shown in table 5-5-1(b) and are adapted from the Planning Standards (Section A-2-4-3) given in the appendix. The building area suggested here is for civic functions only and does not include hotel restaur-

5-5-3 NOMADIC COMMUNITY CENTER

ant recreational facilities etc. which should be privately developed. The land area is about ten times as large as the building area in order to provide adequate parking space and space for ample landscaping appropriate to the scale of an important civic function.

As has been mentioned in the previous reports, the nomadic population within a 40 km radius of Abha numbers about 19,000. It is expected that as general economic conditions improve in Abha, a portion of this unsettled population will be attracted into the city in order to improve the condition of their lives.

The government's primary settlement area for nomads in the Asir sub-region is located in Khamis Mushayt and is associated with the military administration there. In Khamis Mushayt there is a specifically designated area reserved for nomadic settlement. It is felt that in Abha, however, no specific settlement area is warranted. This is both because there is no general settlement program comparable to the military settlement program in Khamis Mushayt and because it is felt that the anticipated gradual settlement of nomads here is able to be easily accommodated by the general planned development of the city. Such an approach has sociological advantages as well since it prevents a segregated high concentration of a single sub-culture which might have undesirable social consequences.

At the same time it is felt that it is necessary to provide a special facility which will deal specifically with the health, education and cultural needs of newly settled nomads. Since this master plan provides adequate facilities for these functions at all levels of community structure, a "Nomadic Community Center" would serve primarily as a clearing and problem center for recently settled nomads. It would provide services to give guidance to such people when general or specific problems arise for which the standard facilities are for whatever reason inadequate; it would provide services to direct settled nomads to the proper agencies or facilities which can properly deal with certain needs; and it would provide meeting space for settled nomadic people to gather for social events or to discuss problems of mutual concern.

Since in terms of day-to-day needs it is expected that the demands made upon such a facility would most properly be served by a city-wide center, it is recommended that a Nomadic Community Center be located in the central area in an easily accessible location near to the central facility for city government.

Table 6-1-1
PROJECTED RECREATIONAL AREA REQUIREMENTS

6-1-1 EXISTING RECREATION AREAS

Within the city of Abha itself, recreation facilities are very limited. The total land area devoted to such activity is about 3.8 ha of which all but 0.6 ha is on one site in the northwest section of the city. The facilities at this site include a soccerfield and a clubhouse with such activities as table tennis. As the population is exposed more and more to the possibility of recreational activities such as sports, it is expected that the demand for recreation activities will increase dramatically necessitating the planning and implementation of many types of new facilities during the next 20 years. The remainder of this chapter is devoted to ways to develop and exploit the recreational and tourism potential in Abha.

Within a half hour drive from Abha are several naturally scenic areas which have become popular recreation spots including the areas known as Sawdah, Qarrah and Mohalah. The recreational potential of these areas is just now beginning to be realized with the study and planning for future development. Because these areas are far outside the limits of this master plan and therefore not within the scope of this report, their detailed planning cannot be discussed here. However, for a discussion of the development of regional recreational facilities at such locations, refer to the Southern Region Final Physical Plan, Section 8-3, Tourism.

6-1-2 POLICY AND REQUIREMENTS FOR RECREATIONAL DEVELOPMENT

Recreational development policy should first and foremost be aimed at providing recreation facilities within the city itself and within each sub-level of the community structure hierarchy. Such facilities are defined as described in the Planning Standards section of the Regional Master Plan and have been outlined in earlier sections of this master plan. Included in these facilities are the playgrounds and playfields of the various schools as well as the neighborhood, community and city parks. As the city grows more and more dense, such recreational open space will become much more critical to the quality of urban life, and at the same time will become much more difficult to acquire. For this reason the immediate planning for acquisition of such spaces should be given a relatively high priority.

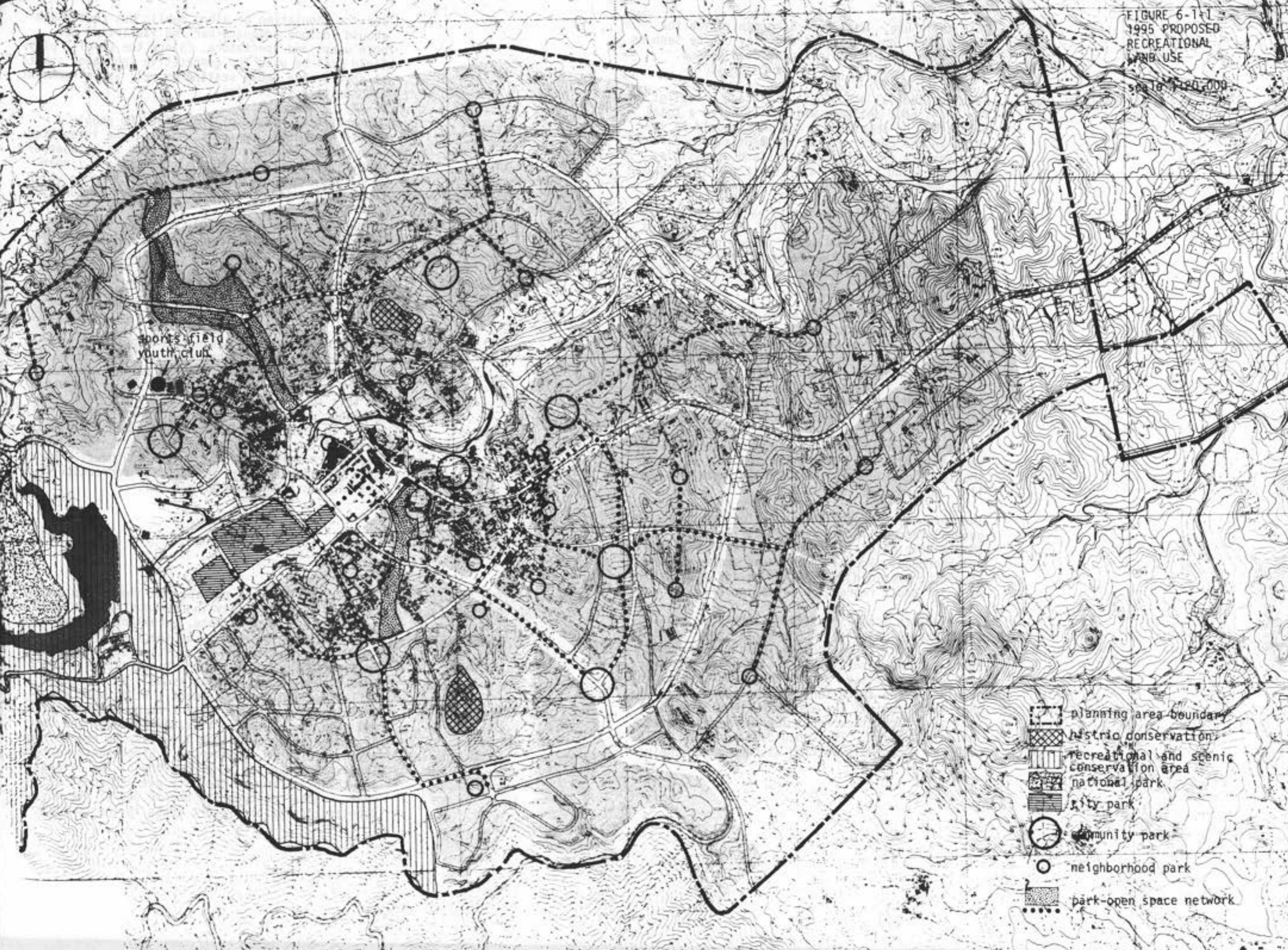
The urban recreational open spaces should be linked at each level and between levels by pedestrian footpaths or landscaped sidewalks to facili-

	1975	1980	1985	1995
Planning Population	30,200	39,800	52,500	91,500
Neighborhood Recreation				
No. of Tot Lots	121	159	210	366
Total Land Area (ha)	6.1	8.0	10.5	18.3
No. of Nursery/Kindergarten Playlots	30	40	53	92
Total Land Area (ha)	6.0	8.0	10.6	18.4
No. of Neighborhood Parks	8	10	14	24
Total Land Area (ha)	15.1	19.9	26.3	45.8
No. of Playgrounds	16	20	28	48
Total Land Area (ha)	11.2	14.8	19.6	34
Total Neighborhood Recreational Area (ha)	38.4	50.7	67.0	116.5
Sub-Community Recreation				
No. of Playfields I	6	6	10	16
Total Land Area (ha)	6.3	8.1	10.8	18.9
Community Recreation				
No. of Playfields II	2	2	4	6
Total Land Area (ha)	4.3	5.5	7.3	12.8
No. of Community Parks ^a	NA ^b	NA ^b	NA ^b	NA ^b
Total Land Area (ha)	12.1	15.9	21.0	36.6
Total Community Recreational Area (ha)	16.4	21.4	28.3	49.4
City Recreation				
Total City Park Land Area (ha)	12.1	15.9	21	36.6
Total Recreational Land Area (ha)	73.2	96.1	127.1	221.4

Note:

- Although theoretically according to the recommended planning standards there should be "one" park per community, because of the physical structure and community organization of Abha these parks are distributed linearly through the communities.
- Not applicable.

FIGURE 6-1-1
1995 PROPOSED
RECREATIONAL
LAND USE
Scale 1:20,000



sports field
youth club

-  planning area boundary
-  historic conservation
-  recreational and scenic conservation area
-  national park
-  city park
-  community park
-  neighborhood park
-  park-open space network

6-1-3 RECREATIONAL LAND USE

tate their use. With such an organization the recreational open space of the city can be seen as a web-like network of interconnected spaces.

Each residential group unit will have a tot lot for pre-school children which will serve a total population of about 250. Tot lots should be located in the center of the residential group, easily visible from the dwellings and accessible without having to cross any street, parking lot or other vehicular activity area.

At the sub-neighborhood level, each kindergarten or nursery should have a playlot able to be used during or after school hours. These playlots should be located in the center of the sub-neighborhoods away from traffic and accessible by footpaths.

Neighborhoods with a population usually between 2500 and 5000, should have a park and one or two playgrounds for the elementary schools (depending on whether in each specific case it is possible to plan a playground for use by both elementary boys and girls). These playgrounds should be near the schools which they serve, and connected to the schools by footpaths separated from any major traffic. The playgrounds should be used by school children during school hours and be available for general neighborhood use after school. Space should be provided for basketball courts and similar "medium size" sports.

The neighborhood park should be for the purpose of general recreation and with proper landscaping should help maintain a "natural" feeling in the neighborhood. Trees, green areas and benches should be provided for relaxation and a swimming pool for adult recreation can be provided as well.

Intermediate school playfields (Level 1) and secondary school playfields (Level 2) should similarly serve their school population during school hours and the general public of the sub-communities and communities after school. These playfields should provide space for organized sports activities including, at the secondary level (Level 2) full size facilities for track and field sports including soccer. They should if possible be located at acceptable walking distances for their

service population or along public bus routes and should include adequate parking facilities for both users and spectators. Since the Level 2 playfield will be used for competitive spectator sports it should have ample seating as well as refreshment and sanitary facilities.

Communities composed of around 30,000 people should have their own park which can be integrated with other community facilities such as mosques or community centers. In Abha such parks are linear in nature, forming the community center zone which connects the secondary schools of each community.

In the east area of the city near the center of Community 3 (see the discussion on community Structure and Figure 3-1-3) is land for an existing proposal already approved and purchased by TPO for a public garden which can be coordinated nicely with the community park for this community.

A city park to serve the entire population of the city (91,500 by 1995) has already been planned and approved. This park is located to the southwest of the central district and adjacent to the wadi. In this location, not only can it provide a very pleasant relaxing atmosphere, but it can also serve to link the Government and commercial facilities of the city center with the proposed civic/tourist/convention center to the southwest. Land area requirements for the specific recreation facilities is shown in Figure 6-1-1.

6-2 TOURISM

6-2-1 EXISTING CONDITIONS AND PROPOSED FACILITIES

The city of Abha has perhaps the highest potential for tourism of any city in the country. It has exceptionally good climate, excellent natural vegetation and is surrounded by spectacular views of the Hijaz escarpment. In addition it is centrally located to the popular tourist recreation areas of Sawdah, Qarrah and Mohalah as well as to scenic villages along the escarpment. It is well situated with regard to regional transportation routes, and once the new airport is completed to the east of the city, Abha will be very easy to reach from anywhere else in the country. Given these factors tourism is expected to become one of the largest growth industries in the city over the next 20 years. Abha could easily become one of the most popular tourist and resort areas in the country.

In spite of this great potential, there has in the past been very little development of projects related to tourism and this potential has remained unused. Only recently have plans been prepared to develop a new tourist city in the area of Al Sawdah and within the city itself there are no known plans directly related to tourism. Although there are at least two hotels of better-than-average quality in the city, there will undoubtedly be a demand for better and even first quality hotels in the future as greater numbers of more affluent tourists are attracted to the city.

In order to provide attractive, convenient and comfortable facilities for future tourists it is proposed that the planned civic/tourist/convention center in the southwest section of the city include as many first quality tourist facilities as possible including a first-class hotel, an ample convention center, a comprehensive recreation center including swimming pools, tennis courts, health clubs etc. and tourist oriented restaurants, coffee shops and retail commercial facilities.

The convention center should include a large auditorium, meeting rooms, conference rooms and information facilities with the anticipation of attracting both Government and private conventions year around. Once the excellent natural environment, beautiful scenery and high quality facilities become known, such a facility should have little problem supporting itself. Such a civic and tourist center should be penetrated by park areas connected to the large city park at the center of the blocks to the west of the city center. Such park areas can serve to connect the activities of the government center and the civic tourist/convention center. The presence of these two major functions on either side of the main city park will assure that there will always be activity in the area, for even after the government offices shut down for the day the activity of the civic /tourist convention center will make this a lively area.

In the scenic areas surrounding the city, including Sawdah, Qarrah and Mohalah it is recommended that public facilities including water supply, sewage facilities, shelters, benches and tables, and parking facilities be provided both to create a more attractive environment for tourists and to encourage private development of new tourist facilities. At the same time it is recommended that for each of these areas, a comprehensive conservation program be developed in order to protect areas of special scenic beauty from over development and pollution.

6-3 OPEN SPACE CONSERVATION

6-3-1 EXISTING OPEN SPACE

Vacant and cultivated land as well as land used for open recreation are considered as open space. Such space serves to relieve the denseness of the man made environment and provide softer green spaces in the midst of the urban setting. As a city grows larger and more dense such open space becomes increasingly more important to both the actual and perceived quality of life. Consequently conservation and maintenance of such open space should receive a relatively high priority in future development plans. Vacant and cultivated land currently accounts for more than half of the total land area within the ring road, although as spreading development proliferates, this figure is constantly being reduced.

Cultivated land in Abha is concentrated along the main wadi and its tributaries with some additional farmland on low-lying flat areas elsewhere. It is highly desirable to conserve such open space without either threatening agricultural production or unreasonably hindering future urban development.

Consequently this master plan assumes conservation of a strip of agricultural land along the main wadi which though it varies greatly in different locations averages about 300 meters in width. In a few locations, approved plans for schools or other buildings encroach to some extent upon this zone, but with proper and immediate zoning, such tearing down of extremely valuable agricultural open space can be prevented in the future.

Another area which must be conserved and which may be even more important to Abha's future development is the edge of the escarpment to the southwest of the city. This area has the most spectacular views of the escarpment available in the city itself, and will become increasingly important as tourism increases. Already areas with views of the escarpment to the south of the city have been lost to private development. This should not be allowed to happen on the remaining land with escarpment views.

In addition to these major conservation areas, there should be strips of green planted with grass (or alfalfa) and trees along the major traffic routes passing through the city except where commercial uses front along these routes. This is true of the areas along the ring road as well. Such strips of green area will act as a buffer between auto and truck traffic and residential areas.

6-3-3 CONSERVATION MEASURES AND DEVELOPMENT CONTROLS

Valuable open space may be conserved by two general approaches:

1. Zoning to prevent other uses
2. Government purchase.

The first approach is most appropriate where the land in question is already productively used as is the case with agricultural land. If such productive use is permitted by zoning laws, possible compensation for restriction of use would be minimized. The second approach is most appropriate where zoning restrictions might lead to unreasonable compensation as may be the case with the land at the edge of the escarpment.

6-3-4 DEVELOPMENT CONTROL ON THE OUTSKIRTS

Development on the outskirts of Abha is likely to occur most heavily in three areas----

1. Along the road to Khamis Mushayt
2. Along the road to Taif
3. Along the road to Jizan

In addition some problem may occur along the road to Al Sawdah once the expected development of tourist facilities begins.

The problem of control of development on the outskirts along the road to Khamis Mushayt is discussed in depth in Chapter 11, conurbation.

A brief summary of general policies for this area follows:

1. Development just to the east of Abha outside the ring road should be primarily residential with some institutional and industrial use.
2. Additional development may be allowed at the junction of the Abha-Khamis Mushayt road with the new airport road.
3. Beyond this zone, there should be a 300 meter wide development control strip extending the entire distance between the cities of Abha and Khamis Mushayt. Land within this strip should be purchased or strictly controlled by the government.
4. Aside from existing residential uses, the uses within the development control strip would be limited to utility pipes and lines, public transportation systems, auto service stations, etc. and agriculture.

Development control just outside the ring road along the roads to Taif and Jizan can include similar provisions except much more limited. Just outside the intersection of each of these three roads with the ring road, a commercial area should be allowed to provide a truck terminal/distribution center and planned new residential areas. Beyond these areas a 300 meter development control strip should be established for at least 3 km outside the city which complies with provision 3 and 4 above.

Along the roads to Sawdah and the upper escarpment near Abha, similar provisions should apply with the exception that projects related to recreation and tourist development could be built within the development control strip if explicitly approved by the local TPO office.

Beyond these measures and the control of the proposed conservation land along the escarpment, there should be little need of specific measures for development controls at the outskirts. City utilities including water and sewer lines will extend only to the limit indicated by this plan and this will tend to discourage development beyond this limit at the periphery. At the same time the local TPO should carefully observe the situation as it develops over the coming 20 years and be prepared to act to discourage or prevent any development with potentially negative impact anywhere on the outskirts.

7-1 GENERAL

7-1-1 LOCATION AND MAIN FUNCTION OF THE CITY

Abha is located some 1,000 kilometers southwest of Riyadh and some 680 kilometers southeast of Jeddah. Situated near the water dividing line of the Asir Mountains, it has good water availability and what can be described as a gardenlike environment, making the city well suited as a possible resort area.

Abha's influence in the Southern Region is strong, but commercially Abha is to some extent dependent on Khamis Mushayt. Basic commodities come directly from Jeddah by truck while apparel and cloth usually come either directly from Riyadh or are redistributed at Khamis Mushayt to Abha. However, Abha's main function is as administrative and political center of the Region, consequently making its population relatively affluent and generally better educated. Because of the heavy construction activity in progress, large numbers of Yemenis continue to flow into Abha. In the future, Abha will maintain its present position as administrative center and, along with nearby Khamis Mushayt, dominate the Region as an important urban complex.

7-1-2 EXPANSION AND URBAN DEVELOPMENT

Originally, Abha was developed as an agricultural village located along the Wadi Abha. Two basic types of settlements existed; namely the densely settled central area and the sparsely settled peripheries, generally located within a 600 meter radius from the center. The central area was trade-oriented surrounding the Suq, while the sparse settlements were basically agriculturally oriented.

With the rapid increase in population and number of structures in the city, a "filling-in" process of development has changed the function and nature of activities from agricultural to administrative and commercial. Together with Khamis Mushayt, some 30 kilometers to the east, this area has become the heart of the Southern Region.

Because of this vital nature of the city, it can be easily realized that the planning of a safe and efficient transportation system is an essential component of the overall expansion and development framework of Abha.

7-2 LAND USE/TRANSPORTATION STUDY

7-2-1 OBJECTIVES

The principal objectives of this study are:

1. To satisfy the long term travel demands of Abha through the establishment of an effective transportation system and;
2. To provide a practical basis for the phasing of construction relative to the expanding needs of the city.

7-2-2 TRANSPORTATION PLANNING PROCEDURE

The transportation planning procedure is based on the extension of present travel habits relative to known trends in national prosperity and vehicle ownership to project and predict future travel demands. Existing travel characteristics for Abha were derived from the analysis of data obtained from home interviews and roadside traffic surveys, carried out in 1975, and basic information on land use, population and employment obtained from planning surveys.

Based on the available data described above, the predicted total number of trips generated and attracted to each traffic zone of the city is distributed and assigned to the road network. Thus future highway requirements can be determined and future demands for parking and terminal facilities can be derived.

Vehicle ownership in Abha is presently the highest of all the cities in the Region (with the exception perhaps of Khamis Mushayt) at nearly 60 vehicles per 1,000 persons. Predictions for 1995 show ownership drastically increasing to over 200 vehicles per 1,000 persons. This growth, together with predicted population growth of nearly 3-fold, indicates a tremendous increase in traffic demand within Abha. The accompanying table highlights the changing demands in the city for the planned population estimates.

7-2-3 TRAFFIC PLANNING METHODOLOGY

Although a very detailed account of the traffic survey methodology would take far too much space to be presented here, a detailed and comprehensive survey was conducted which is outlined below.

1. Information gathering - the following classes of data were collected:

A. Socio Economic Survey. This information was gathered as a comprehensive 5% sample survey, as called for in the agreement, and provided valuable background material

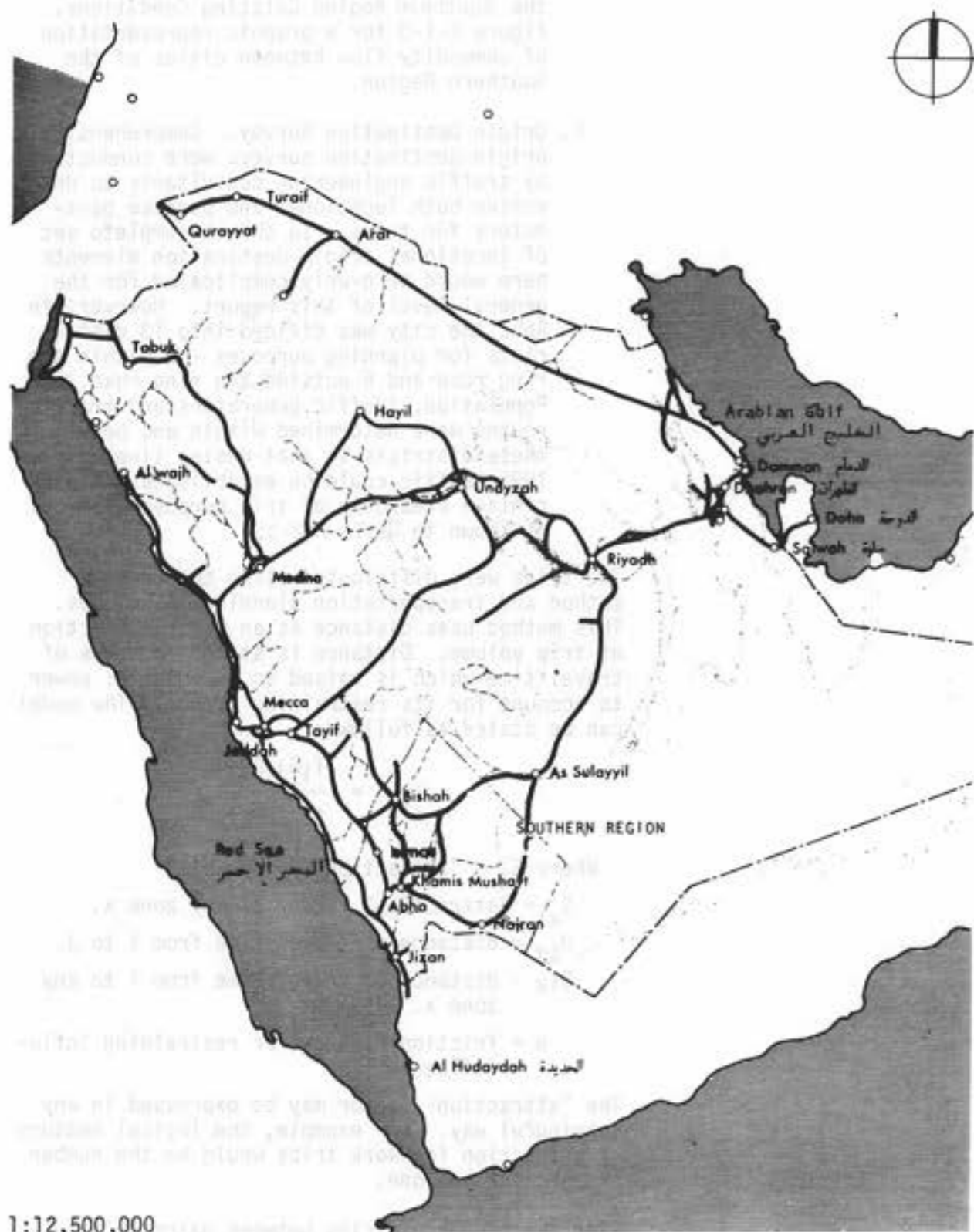


FIGURE 7-1-1
NATIONAL
ROAD NETWORK

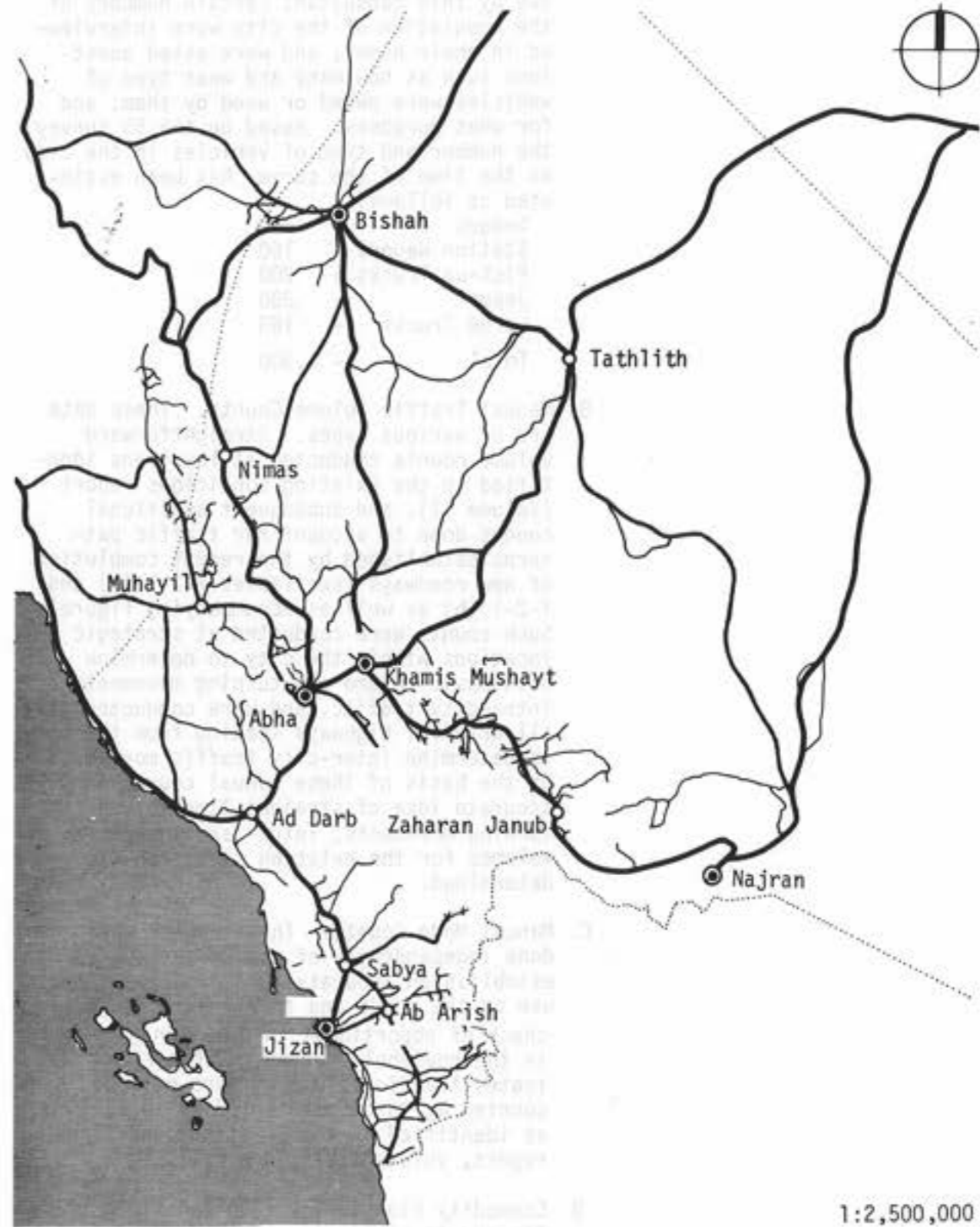


FIGURE 7-1-2
REGIONAL
ROAD NETWORK

applicable to both qualitative and quantitative interfacing with actual traffic data gathered in specific traffic surveys. In the course of the URTEC 5% survey conducted by this consultant certain numbers of the population of the city were interviewed in their homes, and were asked questions such as how many and what type of vehicles were owned or used by them, and for what purposes. Based on the 5% survey, the number and type of vehicles in the city at the time of the survey has been estimated as follows.

Sedans	-	400
Station Wagons	-	160
Pick-up Trucks	-	200
Jeeps	-	380
Large Trucks	-	160
Total	-	1,300

B. Manual Traffic Volume Counts. These data are of various types. Straightforward volume counts conducted at locations identified in the Existing Conditions report (Volume II), and subsequent additional counts done to account for traffic patterns established by the recent completion of new roadways (see Tables 7-2-1 (a) and 7-2-1 (b) as well as accompanying figure). Such counts were conducted at strategic locations within the city to determine both basic volume and turning movements of intra-city traffic, and were conducted at all arterial highways leading from the city to determine inter-city traffic movements. On the basis of these manual counts an accurate idea of straight line volume turning movements, intra- and inter-city volumes for the existing situation was determined.

C. Manual Mode Counts. These counts were done independently of the 5% survey, to establish an accurate idea of actual mode use on the roads and to act as a general check of proportional information gathered in the household survey. Table 7-2-2 indicates traffic volume by type or mode as counted at three points (TO 1, TO 2; TO 3, as identified in the Existing Conditions report, Volume II, figure 7-1).

D. Commodity Flow Survey. During field traffic counts, interviews were conducted with drivers to determine commodity flow. This was done primarily to determine such flow between cities since intra-city commodity

flow is not considered as important at this level of planning, and to some extent can be indirectly inferred from intra-city origin - destination analysis. Refer to the Southern Region Existing Conditions, figure 7-1-3 for a graphic representation of commodity flow between cities of the Southern Region.

E. Origin Destination Survey. Comprehensive origin-destination surveys were conducted by traffic engineering consultants to determine both locational and purpose parameters for trips. To show a complete set of locational origin-destination elements here would be overly complicated for the general level of this report. However, in Abha the city was divided into 13 districts for planning purposes - 7 within the ring road and 6 outside the ring road. Population, traffic generators and traffic routes were determined within and between these districts so that desire lines for 1995 traffic could be established. A percentage breakdown of trip purpose elements is shown in Table 7-2-3.

The trips were distributed using the gravity method and transportation planning techniques. This method uses distance as an inverse function of trip volume. Distance is stated in terms of travel time which is raised to exponential power to account for its restraining effect. The model can be stated as follows:

$$T_{ij} = \frac{T_i S_j / D_{ij}^n}{(S_x / D_{ix}^n)}$$

Where S_j = "attraction" factor at j

S_x = "attraction" factor at any zone x .

D_{ij} = distance or travel time from i to j .

D_{ix} = distance or travel time from i to any zone x .

n = friction exponent or restraining influence.

The "attraction" factor may be expressed in any meaningful way. For example, the logical measure of attraction for work trips would be the number of jobs in the zone.

When the number of trips between pairs of zones have been calculated they were assigned to routes of the appropriate transportation network using minimum friction path method. Resistance to travel was measured in units of time.

FIGURE 1-10
EXISTING AND PROPOSED ROAD
TRANSPORTATION
SYSTEMS
Scale 1:50,000



NOTE:
The distribution and layout of roads in the currently planned area, the existing, improved roads, existing (in and local) roads, and in any development area shall be controlled according to the standards of each development.

- (●) traffic control point
- existing roads completed by May 1970
- - - existing roads proposed by the Master Plan for improvement during the planning period
- new roads proposed by the Master Plan for construction during the planning period

A computer evaluation based on iterative procedures was conducted with certain established parameters held constant. Based upon this iterative computer program, the traffic volume assignment was made (see figure 7-2-1). For Abha (and the process was essentially the same for the other cities in this study) existing land use and future land use based upon this plan were known. Vehicle occupancy and type were determined by traffic field surveys, and future occupancy and composition were assumed based on established trends and conventional guidelines. From these data and assumptions, a modal split was established (for conservative planning due to the extreme uncertainty of the rapidly developing situation, the pedestrian mode was purposely excluded here), trips per person and trips per zone were established and consequently persons per vehicle. Once the programatic development of a satisfactory figure for trips per person was achieved, this number was held constant and applied to all future years (a standard procedure). From this information and the planned road network, a modal split assignment was made, road capacities determined and road widths were established. For further information regarding existing traffic and the initial traffic surveys, refer to the Abha Existing Conditions report, Chap. 7. Much additional information on existing conditions of traffic is included in Chap. 5 of the Initial Appraisal report, including:

1. Road Hierarchy
2. Road Width
3. Road Section
4. Implementation of Road Pavement
5. Road Inclination
6. Traffic Volume and Capacity
7. Traffic Generation
8. Daily Traffic Flow Variation
9. Parking Space
10. Sidewalk Network
11. Distance From the Center
12. Time From the Center
13. Land and Road System
14. Land and Road Width
15. Land and Traffic Capacity

7-2-4 LAND USE/TRANSPORTATION STUDY - SUMMARY OF CHANGING DEMANDS

A primary objective is to ensure high standards in the developing areas throughout the course of creating an efficient transportation system. A policy therefore is founded on three important considerations:

1. To establish an integrated land/use transportation plan.
2. To establish an attractive public transportation system.
3. To establish an efficient commodity distribution network.

Table 7-2-1 (a)
UPDATED HOURLY TRAFFIC COUNTS FOR ABHA^a

Time Period	Counting Points												
	1	2	3	4	5	6	7	8	9	10	11	12	13
8- 9AM	757	775	777	1,199	396	66	219	708	124	180	120	1,326	885
9-10	764	766	854	1,391	366	70	226	881	104	202	141	1,618	950
10-11	805	809	883	1,468	372	86	249	867	114	200	145	1,696	1,017
11-12	816	198	752	1,229	332	80	268	784	105	221	147	1,600	1,106
12- 1PM	692	918	524	1,064	353	86	206	643	100	201	166	1,587	924
1- 2	492	727	448	924	227	46	174	480	86	146	152	1,260	687
2- 3	469	506	351	705	204	34	196	550	78	95	102	1,036	610
3- 4	468	489	394	646	240	63	196	508	110	108	80	869	522
4- 5	543	675	517	843	304	113	214	655	140	130	130	1,063	711
5- 6	620	708	482	967	320	139	256	573	101	202	215	1,240	977

Notes:

- a. From a count conducted on June 19 and 20, 1977

Table 7-2 1 (b)
CALCULATED MAXIMUM 24 HOUR VOLUME IN ABHA^a

Counting Points ^b	Number
1	6,528
2	7,344
3	7,064
4	11,744
5	3,168
6	1,112
7	2,144
8	7,048
9	1,120
10	1,768
11	1,720
12	13,568
13	8,843

NOTES:

- a. Commonly accepted assumptions used in calculating these figures are:
1. The maximum hourly volume equals 25% of the average daily traffic.
 2. The maximum daily volume equals 200% of the average daily traffic. [1]
- So, the equation for calculating the maximum 24 hour volume at any given point becomes:
- $$(4)(a)(2) = 8(a) = \text{Maximum 24 hour volume, where } a \text{ is the maximum hourly volume at a given point.}$$
- For example, at counting point number 1 the maximum hourly volume occurred between 11 AM and 12 Noon and was 816 vehicles, so the maximum 24 hour volume becomes:
- $$4(816) (2) = 6,528 \text{ as shown in the Table above.}$$
- b. The counting points are the same as those in Table 7-2-1 (a), as shown in the accompanying figure.

Table 7-2-2
TRAFFIC VOLUME BY TYPE (MODE)
(VEHICLE/WEEK)

			Motor cycle	Sedan	Wagon	Taxi	Jeep	Bus	Pick up	Truck	Military	Total
TO 1	from		1,566	1,374	885	1,606	1,787	1,070	2,047	2,347	338	13,020
	to		1,958	1,441	927	1,814	1,984	1,408	2,286	2,472	469	14,759
TO 2	from		602	1,851	655	2,822	2,273	624	4,057	2,180	129	15,193
	to		613	1,880	636	2,955	2,329	712	4,087	2,390	100	15,702
TO 3	from		592	578	384	600	941	27	1,682	450	61	5,351
	to		417	460	351	433	840	23	1,516	329	33	4,402
Total	from		2,760	3,803	1,924	5,028	5,001	1,721	7,786	4,977	528	33,528
	to		2,988	3,781	1,914	5,202	5,153	2,143	7,889	5,191	602	34,863
G. Total			5,748	7,584	3,838	10,230	10,154	3,864	15,675	10,168	1,130	68,391

SOURCE: URTEC Traffic Survey, 17 -23, February 1975.

Table 7-2-3
ORIGIN DESTINATION COMPOSITION BY PURPOSE (PROPORTIONAL)

	Going to Work	Business	Shopping	Recreation	Home	Receiving and Loading	Delivery and Unloading	Others	Total
Origin	0.247	0.058	0.055	0.212	0.143	0.165	0.043	0.077	1.000
Destination	0.333	0.032	0.150	0.079	0.103	0.012	0.145	0.146	1.000
Total	0.283	0.046	0.096	0.155	0.126	0.100	0.087	0.107	1.000

SOURCE: URTEC O.D. Survey, 1974 -1975.

The urban area of the City of Abha is spread radially throughout the city fairly evenly. Present data shows the bulk of the city's population residing along the major arterials in the eastern and western sectors of the city. However, 1995 land use projections indicate a more uniform distribution of residential areas with easy access to all major arterials in the city. This pattern of expansion and development should allow the free flow of traffic throughout the city.

Table 7-2-4
SUMMARY OF TRANSPORTATION DATA FOR ABHA

Planning Parameters	1975 Survey	1995 Projected
Planning Population	30,200	90,500
Jobs	6,500	27,100
Households	5,491	21,279
Vehicle Ownership (per thousand persons)	59.2	208.3

7-2-5 LOCATION AND DESCRIPTION OF MAIN TRAFFIC GENERATORS

The main traffic generator in the city of Abha is located in the central area at the intersection of all the main arterials. The establishment of about 7,000 square meters of commercial space and about 55,000 square meters of government space is proposed in the central area by 1995. Immediately adjacent to this central area to the southeast is additional commercial space of about 10,000 square meters and to the southwest lies another large attractor/generator where reservations of about 65,000 square meters of government space, and a contingency space of about 300,000 square meters for the proposed civic/tourist center, has been made. The remainder of the city surrounding these generators is comprised mainly of residential areas with community commercial space as shown in Table 5-4-1 (b). The largest residential areas are located between the main arterials entering the city from the north and west and leaving the city to the south and east.

A large university development is planned outside the urbanized area of Abha approximately 4 km to the northeast along the road to Mohalah. The number of students that will attend is as of yet unknown. An industrial park of approximately 100 hectares in size employing some 2,000 persons is proposed to be located just east of the city and south of the Regional Highway linking Abha and

Khamis Mushayt.

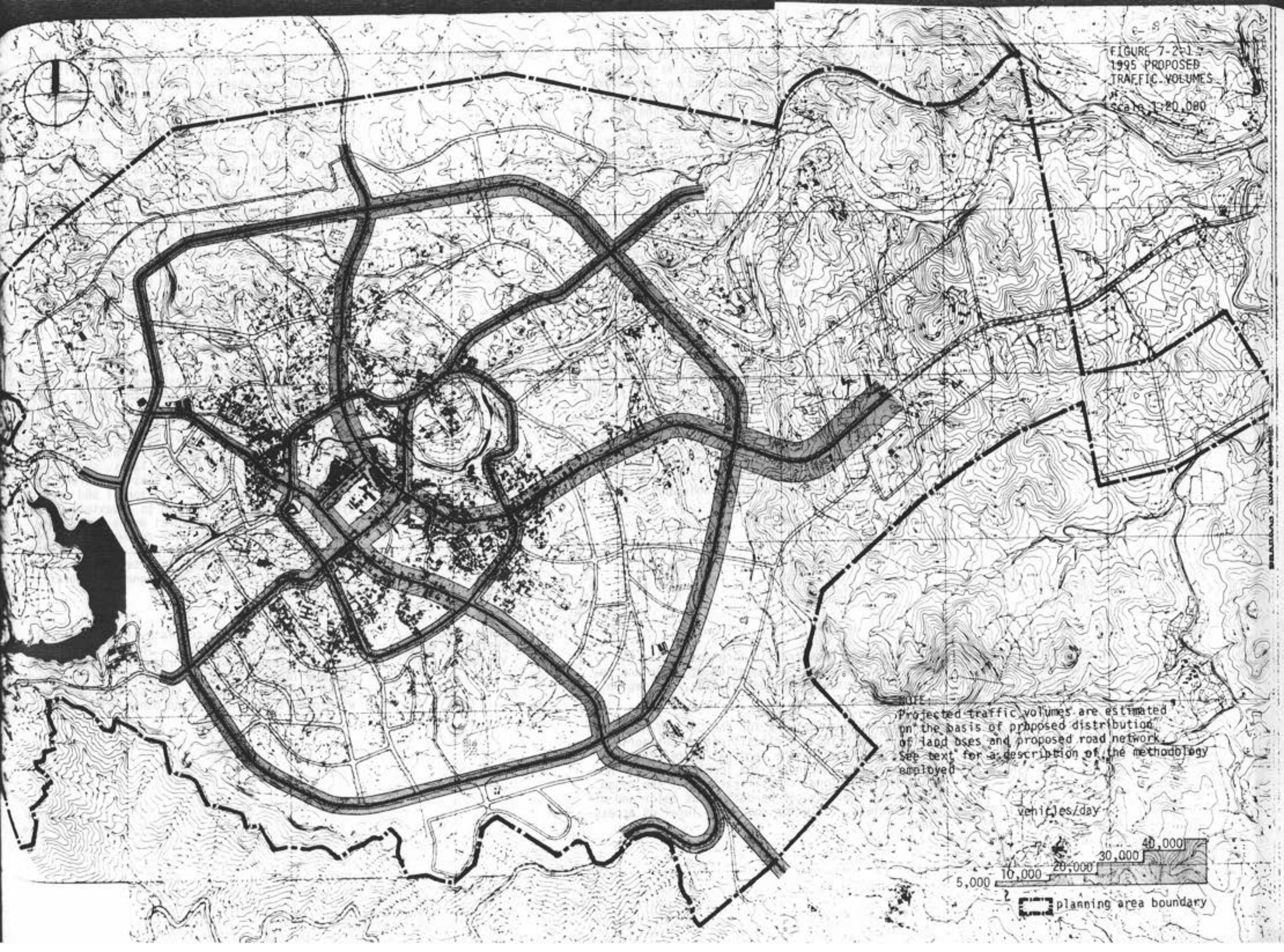
It is quite evident that a very high volume of commercial and private vehicles can be expected around the central city area and along the main arterials mentioned above. To minimize the impact of commercial traffic in the downtown area, it is recommended that the commodity distribution points be located on peripheries of the city along the main arterials. These commodity distribution points may be places just outside the ring road at each of the three major arterials leading to the city - the Khamis Mushayt road, the Jiyan road and the Taif road. As seen in Table 7-2-2, almost 15% of the total traffic in Abha consists of heavy trucks. This volume alone justifies the creation of satellite truck distribution centers and the specific concentric structure of Abha makes such centers even more important to prevent high volumes of heavy truck traffic from penetrating the central downtown area.

Persons and commodities with destinations other than Abha will be using the "by-pass" ring road rather than the heavily travelled main arterials in the city.

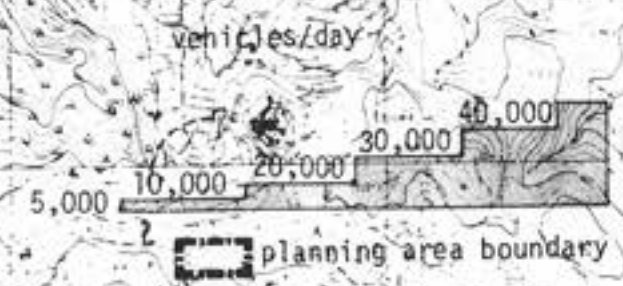
It should be noted that due to the location of existing and proposed traffic generators, the ring road is not now heavily used and will probably remain underutilized in the future. However, the consultant has been requested to attempt to increase utilization of this newly constructed road, and attempts have been made in the following:

1. Major arterials into the center of the city have been narrowed somewhat to create a "resistance" to penetrating traffic so that traffic which is not absolutely necessary in the center of the city will tend to use the ring road.
2. The trucking distribution centers mentioned earlier are located at three points, just outside the ring road, so that traffic between them and to them from the outside will tend to use the ring road.
3. The proposed new civic/tourist/convention center is located at the west of the city just inside the ring road so that traffic to and from this major center can approach directly from the ring road, thereby avoiding the congestion of the city center. In addition, this facility can include parking areas or garages for the new government center thereby further increasing the use of the western half of the ring road.

FIGURE 7-2-1
1995 PROPOSED
TRAFFIC VOLUMES
Scale: 1:20,000



NOTE:
Projected traffic volumes are estimated
on the basis of proposed distribution
of land uses and proposed road network.
See text for a description of the methodology
employed.



Natural beauty is the major asset of the Sawdah area which is planned to be developed as a recreational area serving Abha, Khamis and in the future the entire Southern Region. It is estimated that between Sawdah and the Hijaz villages along the road to and beyond Sawdah approximately 10,000 vehicles will be attracted on an average weekday. Substantial increases in traffic flow is expected on holidays and weekends, exceeding the average weekday traffic by as much as 70 percent.

7-2-6 NEW ABHA AIRPORT

In the Regional Master Plan Transportation Study, much emphasis was placed on the importance and the impacts of the new Airport located midway between Khamis and Abha. Traffic volumes along this highway are presently and will be in the future, by far, the highest in the region. Special consideration should therefore be given to this route in regard to design elements and right-of-way reservation.

It is estimated that by 1995 Abha Airport will handle some 1,360,000 passengers. Projections show approximately 800 to 1,000 vehicle trips daily will be attracted to the airport from Abha.

The Regional Master Plan Transportation Study recommended the construction of a grade separated interchange at the entrance to the airport, and establishment of wide right-of-ways to be utilized for a transit connection between Abha and Khamis to the airport.

7-3 PRINCIPAL ROAD NETWORKS

7-3-1 ROADWAY CLASSIFICATIONS AND DESIGN CRITERIA

Achievement of good traffic flow continuity depends upon the proper integration of urban and rural roadway networks throughout Abha, the region and the country.

The urban roadway network for the City of Abha will maintain the principle classification categories already described in the Regional Master Plan, namely primary, secondary and local roadways. However, the functional classifications of the urban system for the city can be defined as major and minor arterials, collector roads and local or access roads.

7-3-2 PRIMARY ROAD SYSTEM(V1, V2)

The primary road system will consist of major arterials designed for fairly high speeds with controlled access wherever possible and maximum travel comfort. Provided no major land use constraints exist along the major arterials, a wide right-of-way should be maintained. This wide right-of-way can be utilized to accommodate possible additional traffic or transit lanes in the future. Design speeds should be established at 80 km/hour maximum in urban areas, increasing to 120 km/hour outside urban areas. Horizontal and vertical alignments should correspond to these design speeds. The roadway section will be of two, four or six lanes, with a minimum 3.65 meter lane width. Unlike the primary system described in the Regional Plan, the urban primary system will consist mainly of signalized or unsignalized intersections depending on traffic conditions. Grade separations are preferred wherever the physical and economical conditions will allow it.

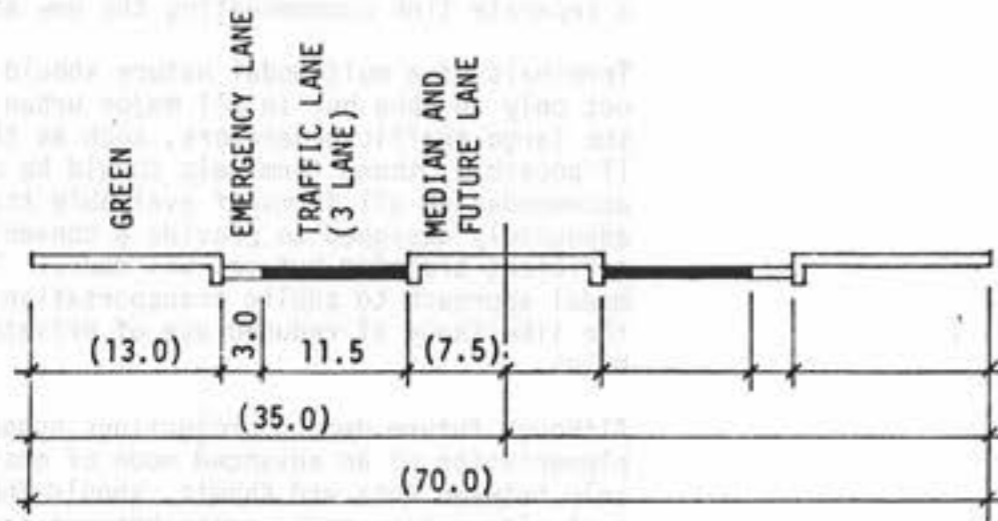
7-3-3 SECONDARY ROAD SYSTEM(V2, V3)

The secondary road system consists of major arterials and minor arterials designed for lower volumes and equal or lower speeds than the primary system. These minor arterials should be designed to accommodate the traffic coming into the city from many surrounding agricultural villages. Secondary road system will require less right-of-way; enough to accommodate necessary traffic lanes, shoulders and a minimum buffer to protect sensitive areas from air and noise pollution. Horizontal and vertical alignments should correspond to a maximum design speed of 100 km/hour in rural areas and 80 km/hour in urban areas. The roadway section will have two, four or six lanes with a minimum width of 3.50 meters per lane. Intersections will be signalized or unsignalized depending on traffic conditions.

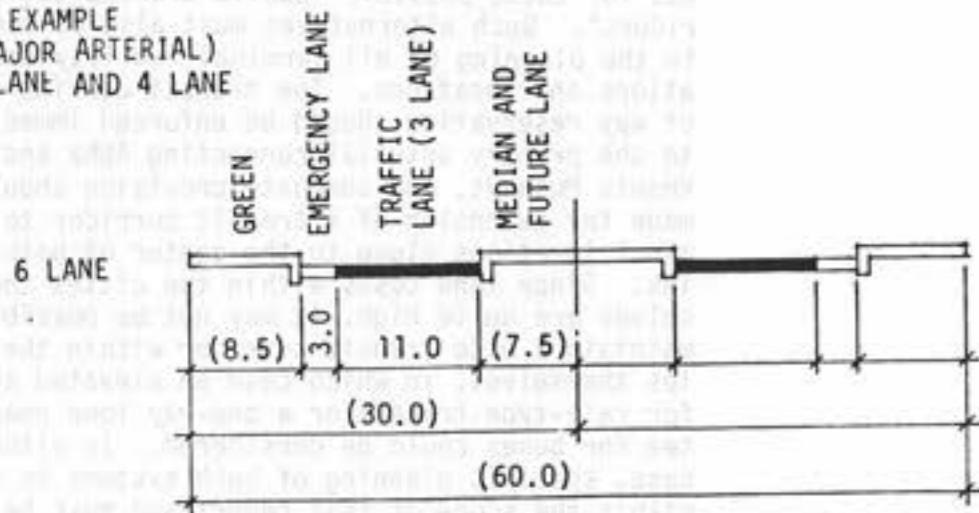
7-3-4 LOCAL ROAD SYSTEM(V4, V5, V6, V7)

The local road system consists of mostly local, collector and access roads. These local collectors will require minimum right-of-way to allow maximum land utilization. The low design speeds of 60 km/hour maximum is suggested to be compatible with pedestrian traffic and other urban activities.

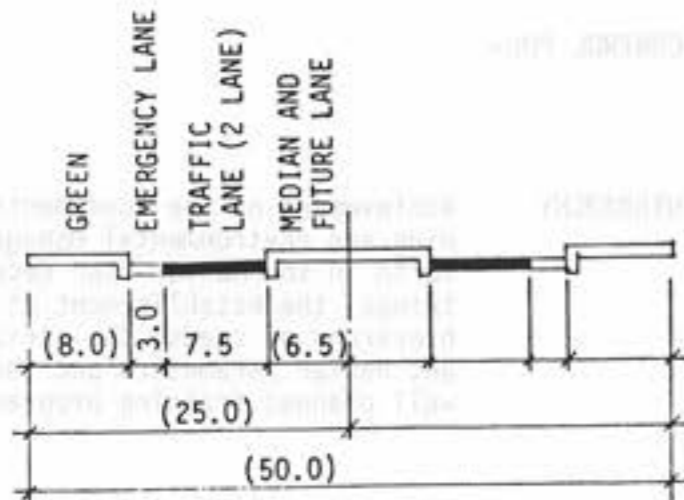
V₁ EXAMPLE
(REGIONAL HIGHWAY)
6 LANE



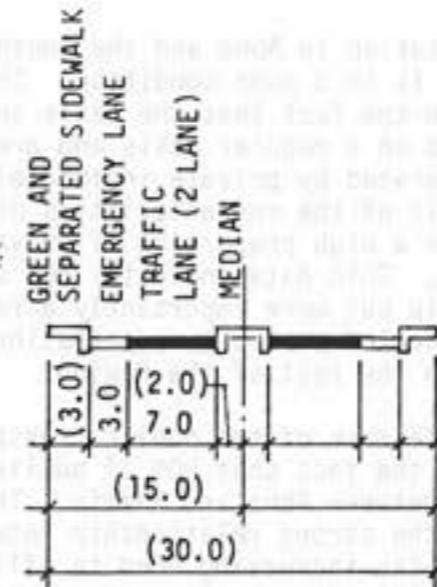
V₂ EXAMPLE
(MAJOR ARTERIAL)
6 LANE AND 4 LANE



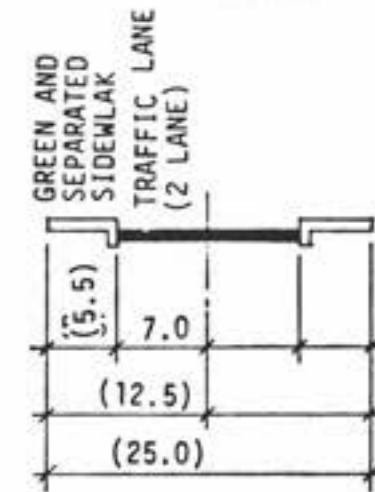
4 LANE



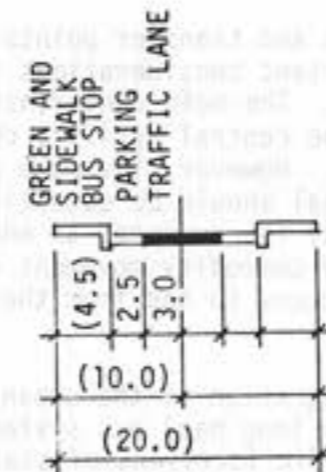
V₃ EXAMPLE
(ARTERIAL)
4 LANE



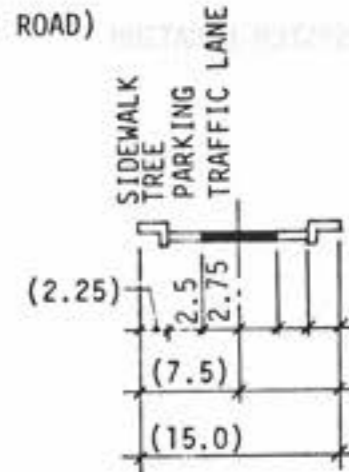
V₄ EXAMPLE
(COLLECTOR)
4 LANE



V₅ EXAMPLE
(DISTRIBUTOR)
2 LANE



V₆ EXAMPLE
(LOCAL ACCESS ROAD)
2 LANE



NOTE: () Dimensions can vary depending on the local condition and detail design, sometimes median strip and green zone can even be eliminated where elimination is justified by the detail planning.

FIGURE 7-3-1
ROAD SECTIONS BY
CLASSIFICATION
(EXAMPLE)

7-4 PUBLIC TRANSPORTATION

7-4-1 URBAN BUS TRANSIT SYSTEM

Public transportation in Abha and the Southern Region in general is in a poor condition. This can be attributed to the fact that the taxis and buses are not operated on a regular basis and are usually owned and operated by private individuals. However, analysis of the characteristics of trips in Abha indicate a high proportion of private cars, taxis and buses. This data indicates not only high vehicle ownership but more importantly a relatively advanced and accepted public transportation system when compared to the rest of the Region.

An interesting feature of the public transportation system today is the fact that 90% of public transport trips are between Abha and Khamis. This also shows not only the strong relationship between the two cities, but the increasing need to efficiently satisfy the public's demand through the establishment of a regularly scheduled, clean, comfortable and convenient public transportation system.

7-4-2 SYSTEM LOCATION

Terminal locations and transfer points for the system are very important considerations if the system is to succeed. The main center, naturally, will be located near the central activity center in the heart of the city. However, the more precise location of the terminal should be established after a more detailed study is conducted to enhance and improve people and commodity movement and to provide the fluent access to and from the major feeder system.

The efficient integration of the urban system with the intra-regional long haul bus system is imperative. Specific locations of stations and transfer points must be strategically placed to serve the public's needs with maximum efficiency. Adequate parking facilities at terminal locations are another important factor in the planning of a public transit system and will be discussed in the paragraphs to follow.

To serve the public on a more localized level, a "courtesy bus" type sub-system should be considered. This system could serve the individual residential areas on a regularly scheduled basis.

7-4-3 OTHER MODES

Projected future development patterns do not now warrant any advanced alternative mode of public transit, except possibly between Abha and Khamis. Because of the central location of Abha and Khamis

in the region and important interactions expected between those two cities, some type of connecting mass transit (i.e. at grade or elevated) is proposed and will be both socially and economically beneficial to the Southern Region. A flow between these two major cities should be continuous with a separate link accommodating the new Abha Airport.

Terminals of a multimodal nature should be planned not only in Abha but in all major urban areas near the large traffic generators, such as the airport. If possible, these terminals should be capable of accommodating all forms of available transport and adequately designed to provide a convenient and efficient transfer between all modes. The multimodal approach to public transportation enhances the likelihood of reduced use of private automobiles.

Although future demand projections suggest the implementation of an advanced mode of mass transit only between Abha and Khamis, should the need for such alternative modes arise between any other urban complexes in the Region, Design Criteria recommends the reservation of wide roadway median areas for these possible "public transportation corridors". Such alternatives must also be considered in the planning of all terminal facility configurations and locations. The transit corridor right of way reservation should be enforced immediately to the primary arterial connecting Abha and Khamis Mushayt, and adequate provision should be made for extension of a transit corridor to terminal locations close to the center of both cities. Since land costs within the cities themselves are quite high, it may not be possible to maintain a wide transit corridor within the cities themselves, in which case an elevated system for rail-type transit or a one-way loop road system for buses could be considered. In either case, specific planning of such systems is not within the scope of this report and must be carried out by future detail planners and engineers.

7-5 TRAFFIC CONTROL POLICY

7-5-1 ROADWAY HIERARCHY

Achievement of the fundamental transportation planning and environmental management objectives set forth in the Master Plan necessitates, among other things, the establishment of a clearly defined hierarchy of roads; the strict control of important design parameters and the establishment of a well planned training program directed to extend-

ing and maintaining the transportation systems. Satisfying these goals will ultimately encourage drivers to make their journeys along the most appropriate roads.

The hierarchy of the road network has been defined previously. Control of certain design parameters is established below.

7-5-2 PRIMARY AND SECONDARY SYSTEM

Due to the radial pattern of development already established in Abha, the proposed transportation network takes on a basic extended "H" type configuration with two concentric "ring routes" encircling the central area; one located approximately 700 meters radially out from the central district and the other at a distance of approximately 1 1/2 to 2 kilometers.

The "H" portion of the network consists of high speed inter-regional urban expressways. One primary arterial enters the city from the north through the central area and continues on eastward toward Khamis Mushayt. The other primary arterial enters from the west through the central area and continues on southeast toward Al Quarrah. Intersecting both of these highways in a south-westerly to northeasterly direction is the third major leg of the network. This leg consists of a secondary arterial and basically serves the more peripheral agricultural areas and the university area 4 km to the northeast.

The two "ring routes" consist of secondary arterials developed from currently existing roadways that conveniently serve as "by-pass" routes for transient traffic wishing to avoid the central city.

The basic nature of the proposed transportation structure provides the user with a number of alternatives to choose from in order to reach his destination. The provision of such alternatives reduces the possibility of congestion in the central city area and also preserves a safe environment. The expanse of the network, however, places much emphasis on the provision of an attractive public transportation system in order to successfully achieve the plan's objective. Access to frontage properties and parking on or along the arterials should be restricted or prohibited depending on specific situations. In high volume areas, such as the activity centers already discussed, certain vehicles such as donkey carts, etc. should be prohibited.

Interchange spacings should be held to a minimum of 500 meters where possible and the laying of -

7-5-3 COLLECTORS

utility services beneath the roadway should be prohibited. Various types of interchanges are possible in each particular situation, however certain types are recommended in the Appendix, Planning Standards, figures A-2-9 (c) and A-2-9 (d). A minimum right-of-way reservation of 70 meters is recommended for the roadway between Abha and Khamis where a transit corridor is desired.

The function of the collector roads is to provide a link between the primary roads and the local residential, industrial, business, agricultural and commercial areas. As redevelopment takes place, an increasing degree of restrictions should be placed on frontage access and street parking where warranted.

The collector system for Abha does not take on any distinguishable pattern. The major collectors simply connect the highly populated residential areas with the main arterials.

Secondary and minor collectors connect the residential areas with the secondary arterials and ultimately with the activity centers. These roads should facilitate the safe and free movement of traffic within the districts they serve.

For these collector roads, junction spacings should be at a minimum of 200 meters where possible. The junctions should be controlled by the traffic signals or signs depending on traffic conditions and utilities should not be placed beneath the roadway, but adjacent to right-of-way.

7-5-4 LOCAL AND ACCESS ROADS

These roads will provide a link between smaller access roads and the collector system. By design these roads should attract only local traffic for immediate access to residences, shops or offices and should discourage through traffic. Appropriate restrictions should be set with regard to access and street parking to meet particular needs. Utility services should be located in easements adjacent to the travel way.

7-5-5 GRADE SEPARATED INTERCHANGES

Grade separated interchanges not only increase capacity and safety, but reduce congestion, shorten travel time and efficiently transfer traffic

from one roadway to another. In Abha there are four intersections of major concern where the estimated future traffic volumes warrant the smooth directional transfer of flow. All of these intersections are located along the outer ring-route of the city.

The most important of these locations is the intersection of the ring-route with the intra-regional highway to Khamis Mushayt located to the east of the city. This intersection must accommodate the heaviest and probably the most important traffic in the region. Smooth transfer of heavy commercial traffic to the ring-route will encourage transient truck traffic to use this "by-pass". Similarly, the intersection of the ring-route with Highway 54 to Taif and points north warrants a second grade separated interchange to accommodate this same heavy truck traffic.

The remaining two locations recommended for grade separations are; the intersection of the ring-route with the primary arterial entering the western periphery of the city (although in this location current plans are for an at-grade "zig-zag" intersection utilizing part of the ring road in order to accommodate topographic and land ownership problems) and the intersection of the ring-route with the highway to Jizan and Al Qarrah. Both of these interchanges will carry heavy traffic loads. It is estimated that by 1995 traffic volumes will be such that grade separations will be warranted at these locations. Refer to figure A-2-9 (d) in the Appendix, Planning Standards for various examples of both at-grade and grade separated interchanges.

7-5-6 SAFETY CONSIDERATIONS

To ensure the safe and efficient use of the proposed road system, careful consideration must be given to specific design parameters such as turning movements, visibility requirements and pedestrian movements for each roadway type. Restricting the number of junctions along major roads will increase safety by decreasing possible vehicles and pedestrian conflicts. Where junctions exist, the use of traffic and pedestrian signals is an effective method of traffic control and is strongly recommended.

Mandatory speed limits, strictly enforced by traffic police, is by far the most effective means of safety control.

Perhaps the most important factor in the planning of a safe efficient and environmentally compatible transportation system is the establishment of an adequate training program for the maintenance and

operation of the existing or planned transportation systems

7-5-7 PEDESTRIAN MOVEMENT

The use of pedestrian crossings, both signalized and unsignalized, or grade separation crossings are essential in the segregation of pedestrian and vehicular activities. Restriction of vehicle penetration within the central area, or "pedestrianization" of main shopping streets, not only increases safety but improves the environment as well.

It would be quite impractical to recommend the precise locations of pedestrian crossings that may be needed in the future. The selection of such locations should be based on up-to-date surveys of pedestrian movements within the city and detailed studies of short term developments which might make alternative crossing points more attractive. Pedestrian routes which cross primary roads must be given careful attention, and the construction of pedestrian bridges or subways must be given detailed consideration.

7-6 CAR PARKING POLICY

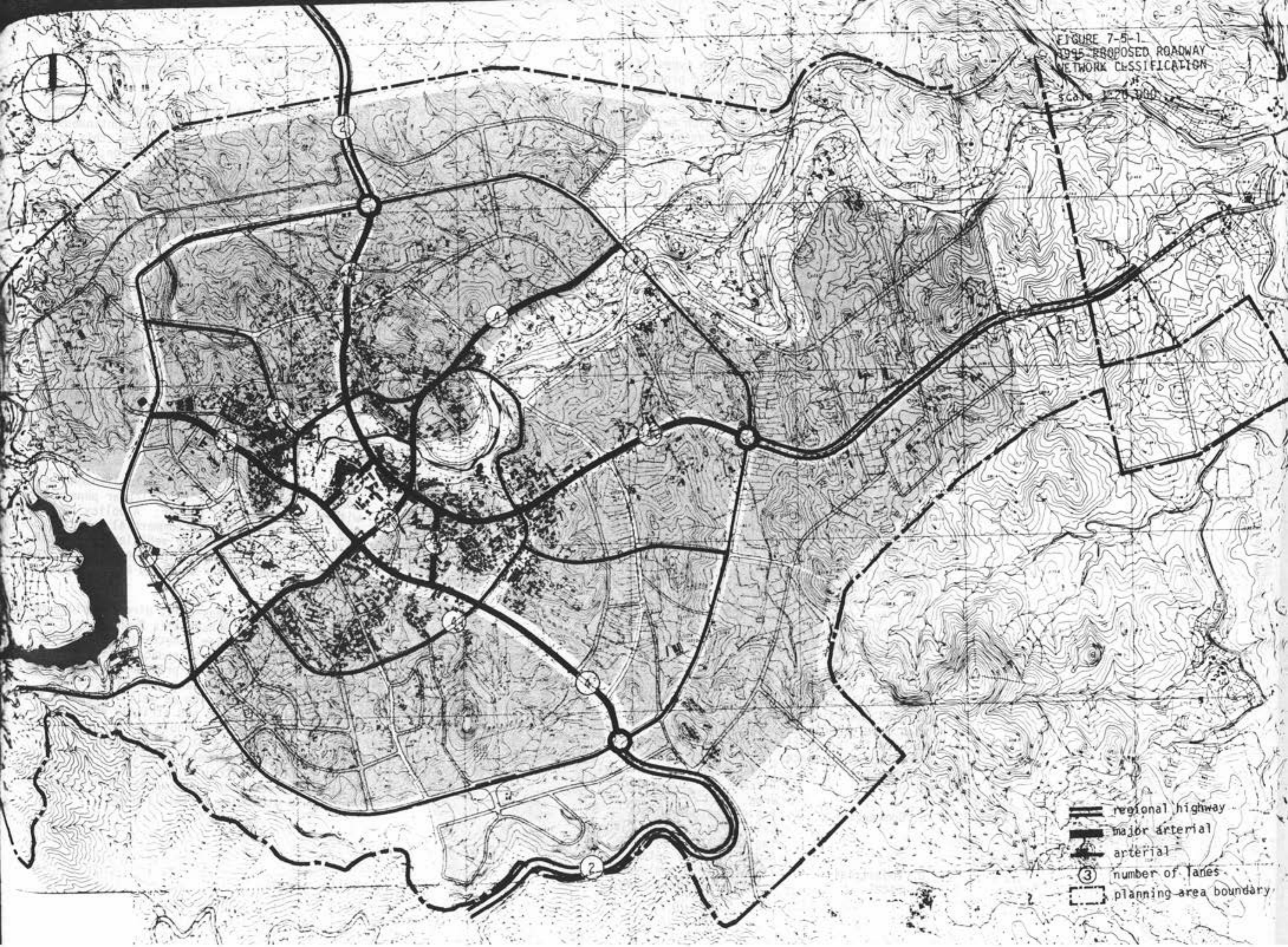
7-6-1 GENERAL






Increased prosperity will increase vehicle ownership quite substantially by 1995, resulting in increased pressures to control the use of road space and increased conflicts between moving and stationary vehicles. Concentration of commercial and business activities in the city centers will, consequently, be of major concern. Therefore, the main car parking policy for Abha must attempt to provide a reasonable balance between the capacities of the car parks and the road system planned for the central area.

7-6-2 PARKING DEMANDS

To accommodate the dominant types of trips made by vehicle users, two categories of parking demands exist, namely long and short term parking. Long term parking is attributed to workers employed in the City Center. These long term facilities can be located on peripheral sites providing reasonable access to the work center with walking distances less than 400 or 500 meters. Short term parking attributed to shopping and business trips comprises the major portion of the parking space demands. This trend can be expected to continue indicating that priority should be given to accommodating these demands conveniently within or close to the central business district. General

FIGURE 7-5-1
1995 PROPOSED ROADWAY
NETWORK CLASSIFICATION
SCALE 1:20,000



-  regional highway
-  major arterial
-  arterial
-  number of lanes
-  planning area boundary

locational policies, however, for both types of facility demands must consider specific proposals for access from the primary feeder road system and, most importantly, the competing demands for land in the central business area, which may highlight the advantages of multi-story car parks.

Additional general policies for parking planning, design and location are as follows:

1. Off street parking should be encouraged wherever possible, especially at busy intersections.
2. All parking facilities, whether on-grade or multi-story, should have painted parking stall lines. See figure A-2-9 (f) for appropriate dimensioning for such stalls.
3. On-grade parking facilities should utilize landscaped islands to subdivide large paved areas.
4. Whenever large scale development of any kind is planned (such as a civic center, central suq, etc.) parking should be included as an integral part.
5. Public parking areas should be created at all main commercial centers. These should be off-street facilities, planned in such a way as to avoid congestion at street intersections.
6. Where possible and economically feasible, multi-level parking structures should be used. These could be straight multi-story structures or split level structures which take advantages of available slope of the land. See the Appendix, Planning Standards, figure A-2-9 (e) for examples of multi-level parking structures.
7. Wherever possible, large scale parking facilities should have their primary access leading from the ring road rather than the center of the city. This will have the dual purpose of reducing traffic congestion at the center and increasing the usage of the underutilized ring road.
8. Although each parking facility, whether independent or associated with a major development, should be individually examined and planned according to the specific needs of each development, the following guidelines may be used for an initial determination of number of parking spaces.

A. Housing	- 1 space per household.
B. Office	- 1 space per 30 m ² floor area.
C. Commercial	- 1-4 spaces per 40 m ² sales area (see the planning standards section A-2-6 for more detail).
D. Industrial	- 1 space per 5 employees.
E. Hotel	- 1 space per guest room.

- | | |
|------------------|-------------------------|
| F. Entertainment | - 1 space per 10 seats. |
| G. Hospital | - 1 space per bed. |

Present parking data for Abha highlight several important characteristics; first, continuous parking for more than two hours is rare, this is generally the case for the entire region; second, parking purposes in terms of percentage do not show a biased tendency, business and shopping dominating with 28.4% and 20.2% respectively. This data implies the need to satisfy short term parking demand prevails.

The central city district, which is planned to contain the city and the regional government administration buildings is estimated to eventually generate nearly 85,000 vehicle trips per day. This area, by far, is the most important node of attractivity, perhaps in the region. Commercial areas located along the major primary arterials serving the major residential areas are estimated to attract an average of 5,000 to 7,000 vehicle trips per day each. Consequently, in order to alleviate the concentration of traffic in the central area, provisions must be made to meet these high 1995 demands through a policy of progressive development from surface to multi-story car parks.

7-6-3 VEHICULAR PENETRATION

Another consideration in the establishment of a good car parking policy is vehicular penetration within the Commercial Center. A policy restricting vehicular traffic to commercial vehicles delivering goods and private vehicles associated with families residing in the center would provide a safe environment for shopping and business activities.

Where commercial areas exist directly along major roads such as the Abha-Khamis Mushayt road within the city, vehicular penetration and access should be established to reduce possible congestion. Parking should be provided at the rear of such commercial areas, and community access should be from this side as well. Frontage parking should be limited and strictly controlled. Loading and unloading should not occur directly from the street, but at loading areas at the sides or back of commercial establishments. Such frontage control is especially important at major intersections where undesirable congestion would otherwise certainly occur.

7-7 ENVIRONMENTAL MANAGEMENT POLICY

7-7-1 THE FACTORS AND IMPACTS

Design of any transportation links or terminals should be done concurrently with environmental impact assessments to minimize adverse consequences to surrounding areas. In addition to the usual factors taken into consideration such as right-of-way acquisition, type of construction and traffic volumes it is necessary to evaluate the impact on air quality, noise levels and aesthetics of the facility.

Since noise and air quality are the most critical items in an environmental assessment, an effective Environmental Policy and National Standards must be established and enforced. As an example, the United States Environmental Standards are shown below.

After these standards are established, design parameters such as number of lanes, median widths, shoulder widths, maximum grades and roadway curvatures and design speed limits should be reviewed and modified if necessary. Governmental and administrative policies can be set as to the allowable automobile pollutant emissions to be accepted. Land use or urban activity must be controlled in the vicinity of any transportation facility.

7-7-2 METHODS AND CONTROL

Abha, like all the cities of the Southern Region, is presently fortunate to have a clear, clean and quiet environment. It will be the responsibility of the Administrators and future planners not to permit conditions to deteriorate, but to improve them instead.

In highly populated areas along the most heavily travelled arteries, vegetative, earth or man-made barriers can be used aesthetically to control objectionable noises produced by traffic. Many materials and techniques are available for the construction of these noise barriers and at a relatively low cost. The right-of-way at intersections where congestion tends to build up should be ample in size and access should be partially or fully controlled to provide a separation between traffic flow and surrounding developments which could result in reduction of noise and air pollution.

As has been previously discussed, grade separated interchanges not only increase capacity and safety, but reduce congestion, shorten travel time

Table 7-7-1
1977 UNITED STATES FEDERAL EXHAUST EMISSION STANDARDS AND CONTROL LEVELS

Type of Vehicle	Emissions Expressed in Grams Per Kilometer		
	HC	CO	NO _x
Light-duty Gasoline Passenger Car	0.94	9.4	1.25
Light-duty Diesel Passenger Car	0.94	9.4	1.25
Light-duty Gasoline Truck	1.25	12.5	1.9
Light-duty Diesel Truck	1.25	12.5	1.9

and efficiently transfer traffic from one roadway to another. Thus, it is evident that grade separations will help reduce the amount of pollutants discharged out into the atmosphere.

Aesthetics should always be kept in mind when choosing the final design of grade separations, roadway intersections or traffic control devices in general. Landscaping and provision of wide open right-of-ways contribute greatly to safe and comfortable transportation.

7-7-3 POLICY SUMMARY

Therefore, the environmental management policy must extend to the design of various interacting facilities other than just the road types and their junctions. Careful consideration must also go into the location and design of car parking areas, pedestrian routes, general traffic control devices and most importantly an attractive public transportation system with adequate terminal and transfer facilities.

7-8 PHASING AND COST OF RECOMMENDED IMPROVEMENTS - INVESTMENT NEEDS FOR 5, 10 AND 20 YEARS

Recommended construction of the road network must be related to growth estimates prepared for Abha. In order to ensure adequate widths of right-of-ways for the future transportation corridors, it is recommended that right-of-ways be established and purchased as soon as possible. The early purchase of right-of-ways will minimize costs and also will establish minimum building setbacks for future developments.

It is estimated that approximately 9 km of six-lane, 10 km of a four-lane roadway and 12 km of a two-lane roadway have to be built by the year 1995 to establish a basic road network. The total construction cost of the proposed improvements is estimated to be 38 millions S.R. Since the bulk of this construction should be completed in the first 10 years, it is recommended that 33% or 12.54 million S.R. be expended in the first 5 years, another 33% in the next 5 years, and the remaining 33% in the final 20 years of the planning period.

All costs cited are estimated in order of magnitude costs based on hypothetical road alignments and an average cost per kilometer based on 1977 costs, excluding cost of right-of-way.

CHAPTER 7 NOTES:

1. Ritter and Paquette, Highway Engineering, pp 93-96.

8-1-1 EXISTING AND PROPOSED LOADS

There are currently two electric generating plants in the city of Denver. The old power plant was the first the produce 100 kw and the new power station on the east of town's (Denver) was built in 1900. It will produce 2,000 kw. There are also plans to construct the new and modern power plant on the east of town which will produce 100 kw. The estimated maximum energy capacity for the city for further information regarding the existing energy capacity refer to the Denver Electric Board Report, Volume 1, Chapter 3 and Volume 2, Figure 2-2.

8-1-2 ESTIMATED DEMAND BY DISTRICT

Estimated maximum demand is shown in Table 8-1-2. The per person (1900) data is as follows: 1.5 kw per person based on supply, and can be justified by large expected increase in demand due to electric appliances because more electric power is expected to be used in the next 20 years. This means that generating capacity must be increased to well over 1,000 kw. The cost of power is not a limiting factor in addition, non-ferrous metal producing industries, chemical, electrical, and other industries are projected to be limited to increase the amount of power used to an additional 0.5 kw per person. The total cost of 0.5 kw per person based on 1900 generating capacity for the city of Denver would exceed \$2,000,000. The 1900 demand by district is shown in Table 8-1-1.

8. public utilities

8-1-3 PROPOSED LOADS

Estimated and planned extension of the power supply network and shown in Figure 8-1-3. In general, activity should be given to completing the supply network in all areas within the city and before the implementation of further supply lines outside the city. Water supply lines already extend into the city along the major transportation route and by 1950 all residential areas within the city should be covered by a city-wide electric supply network.

The growth of the low generating plant should be estimated and given as follows: it is well outside the city in a location which will produce negative impact on the local economy. Other detailed engineering studies from district agencies, especially in the field of the water supply, is recommended.

A. JOURNAL DEMAND BY DISTRICT

Year	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000
1950	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1955	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1960	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1965	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1970	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1975	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1980	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1985	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1990	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1995	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00

B. INDUSTRIAL DEMAND (Commercial, Public Buildings, Schools, Power Station, Utility Facilities Industry)

Year	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000
1950	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1955	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1960	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1965	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1970	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1975	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1980	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1985	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1990	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1995	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00

Commercial, Public Buildings, Schools, Power Station, Utility Facilities Industry

8-1 ELECTRICITY

Table 8-1-1

8-1-1 EXISTING AND PLANNED SERVICES

There are currently two electric generating facilities for the city of Abha. The old power station near the Abha dam produces 1,300 kw and the new power station on the road to Khamis Mushayt produces 2,400 kw when this latter power plant is completed, it will produce 6,000 kw. There are existing plans to connect the Abha and Khamis Mushayt power systems which will eventually be part of an Asir power net which in turn will be a part of the planned nationwide energy supply network. For further information regarding the existing energy supply network refer to the Abha, Existing Conditions Report, Volume I, Chapter 7 and Volume II Figure 7-2.

8-1-2 ESTIMATED DEMAND BY DISTRICT

Required potential domestic power is assumed to be about 0.3 kw per person by 1995. This is significantly higher than current demand or supply, but can be justified by large expected increases in domestic use as electric appliances become more widely used, as is certain to happen in the next 20 years. This means that generating capacity must be increased by well over 3 times the current planned total. In addition, non-domestic uses (including industry, commerce, hospitals, schools and other similar uses) are tentatively estimated to consume an amount of power equal to an additional 0.2 kw per person. The total rate of 0.5 kw per person means that 1995 generating capacity for the city of Abha must exceed 45,000 kw. The 1995 demand by district is shown in Table 8-1-1.

8-1-3 PROPOSED SERVICES

Existing and planned extensions of the power supply network are shown in Figure 8-1-1. In general priority should be given to completing the supply network to all areas within the ring road before the implementation of further supply lines outside this area. Major supply lines already extend outside the ring road along the major transportation routes and by 1995 all residential areas within the scope of this plan should be covered by a city-wide electricity network.

The present site of the new generating plant should be adequate and present no problems since it is well outside the city in a location which will minimize negative impacts on the urban population. Unless detailed engineering considerations dictate otherwise, expansion of this facility to meet future demands is recommended.

A. DOMESTIC DEMAND BY DISTRICT

Neighborhood	Population 1995	Electricity 0.3 kw/person	Gas 0.5 kg/day/person	Fuel 2.3 l/day/person	Water 150 l/day/person	Refuse 0.5 kg/day/person
1.1.1	3,000	900 kw	1.50 ton/day	6.9 kl/day	450 m ³ /day	1.50 ton/day
1.1.2	4,100	1,230	2.05	9.43	615	2.05
1.2.1	3,400	1,020	1.70	7.82	510	1.70
1.2.2	4,700	1,410	2.35	10.81	705	2.35
1.2.3	3,800	1,140	1.90	8.74	570	1.90
1.2.4	3,200	960	1.60	7.36	480	1.60
2.1.1	4,600	1,380	2.30	10.58	690	2.30
2.1.2	3,200	960	1.60	7.36	480	1.60
2.1.3	6,600	1,980	3.30	15.18	990	3.30
2.1.4	3,200	960	1.60	7.36	480	1.60
2.2.1	3,900	1,170	1.95	8.97	585	1.95
2.2.2	2,700	810	1.35	6.21	405	1.35
2.3.1	2,500	750	1.25	5.75	375	1.25
2.3.2	5,000	1,500	2.50	11.50	750	2.50
2.3.3	3,900	1,170	1.95	8.97	585	1.95
3.1.1	3,200	960	1.60	7.36	480	1.60
3.1.2	4,500	1,350	2.25	10.35	675	2.25
3.1.3	3,400	1,020	1.70	7.82	510	1.70
3.1.4	5,400	1,620	2.70	12.42	810	2.70
3.2.1	2,300	690	1.15	5.29	345	1.15
3.2.2	3,000	900	1.50	6.90	450	1.50
3.2.3	5,100	1,530	2.55	11.73	765	2.55
3.3.1	3,800	1,140	1.90	8.74	570	1.90
3.3.2	3,000	900	1.50	6.90	450	1.50
Total	91,500	27,450	45.75	210.45	13,725	45.75

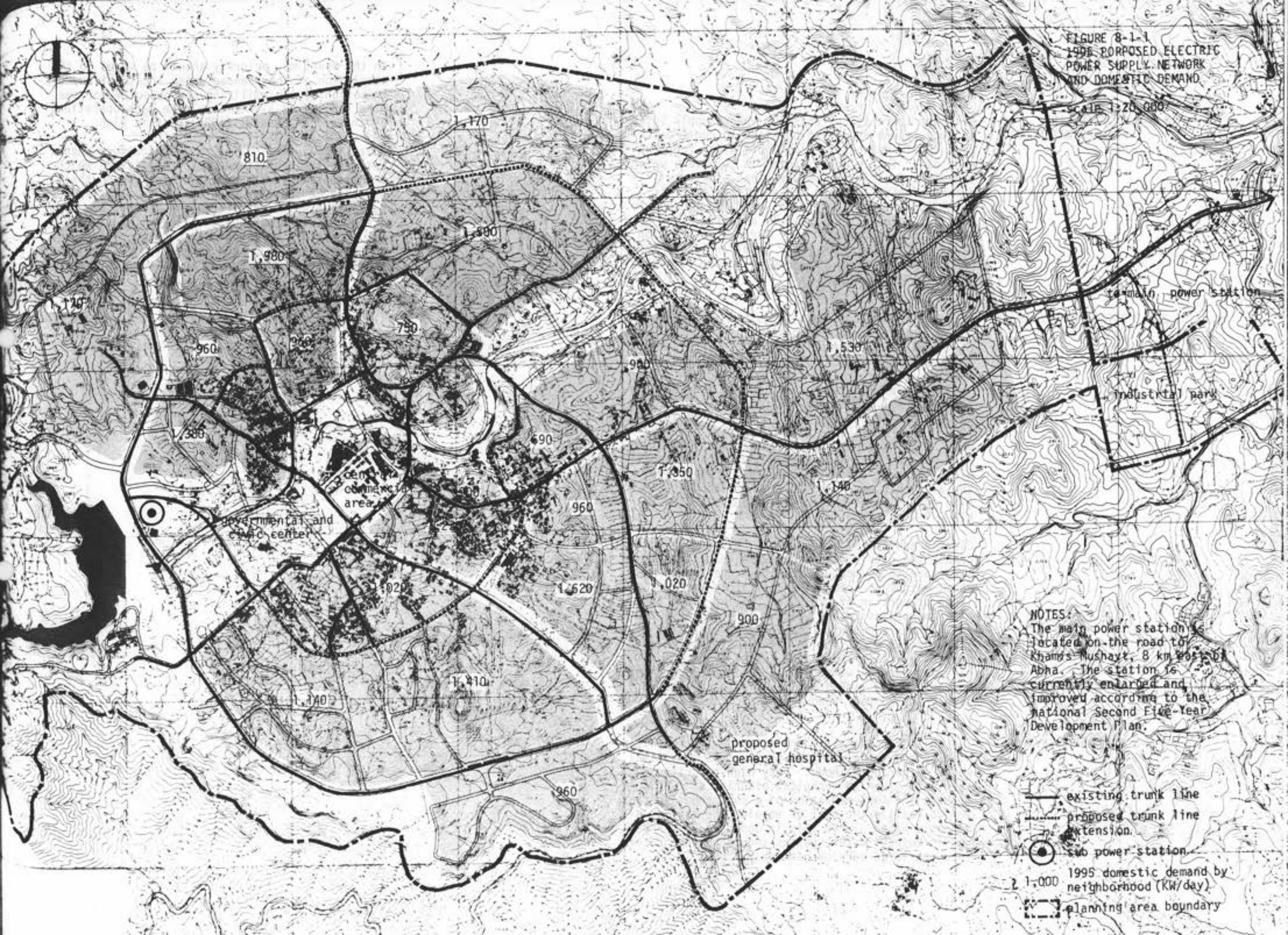
B. NON-DOMESTIC DEMAND

(Hospitals, Schools, Stadium, Power Station, Utility Facilities Industry, Business and Commercial, Public Facilities)

	18,300	27.50	145.00	3,500	27.50
City Grand Total	45,750 (0.5 kw/person)	73.25 (0.8 kg/day/person)	355.45 (3.91/day/person)	17,225 (188 l/day/person)	73.25 (0.8 kg/day/person)

FIGURE 8-1-1
1995 PROPOSED ELECTRIC
POWER SUPPLY NETWORK
AND DOMESTIC DEMAND

Scale 1:20,000



NOTES:
The main power station is located on the road to Khams Nushayt, 8 km east of Abha. The station is currently enlarged and improved according to the national Second Five-Year Development Plan.

- existing trunk line
- - - proposed trunk line extension
- sub power station
- 1,000 1995 domestic demand by neighborhood (KW/day)
- - - - - planning area boundary

8-2 WATER

8-2-1 EXISTING AND PLANNED WATER SUPPLY

Although there is currently no water supply system in Abha, there are existing plans to construct a pipe supply network to distribute water from the Abha dam. This planned system is to have a water treatment facility to assure clean, sanitary drinking water. At the present time, water is supplied from shallow ground wells and trucked to individual residences, as well as offices and commercial establishments. For further information regarding the existing water supply refer to the Abha Existing Conditions Report, Volume I, Chapter 7 and Volume II Figure 7-2.

8-2-2 ESTIMATED DEMAND BY DISTRICT

Although rainfall in Abha is quite high (around 400 mm/year) the city's location just on the edge of the Hijaz escarpment results in a very small catchment area of only 5700 ha. The maximum potential available water from this catchment area is just under a million cubic meters per year (see Section 8-4-1, Alternative Strategies, Abha). It can be seen from Table 8-1-1 that with an assumed 1995 standard of 150 liters per person per day with a 25% factor for non-domestic uses, total demand will be around 17,225 m³/day which is equivalent to about 6.3 million m³/year or over 6 times the available water from the Abha catchment basin (The demand by district is also indicated in Table 8-1-1).

Clearly additional sources must be found to increase the city's water supply if reasonable standards are to be met. Fortunately the Khamis Mushayt catchment area which ultimately receives a large proportion of the water falling along the Hijaz mountains to the west is very large (500,000 ha) and has a potential capacity of almost 45 million m³/year (see Section 8-4-1, Alternative Strategies, Khamis Mushayt). With proper technical planning the water supplies of Abha and Khamis Mushayt can be linked and be able to adequately supply the 20 year needs of both cities.

8-2-3 PROPOSED SERVICES

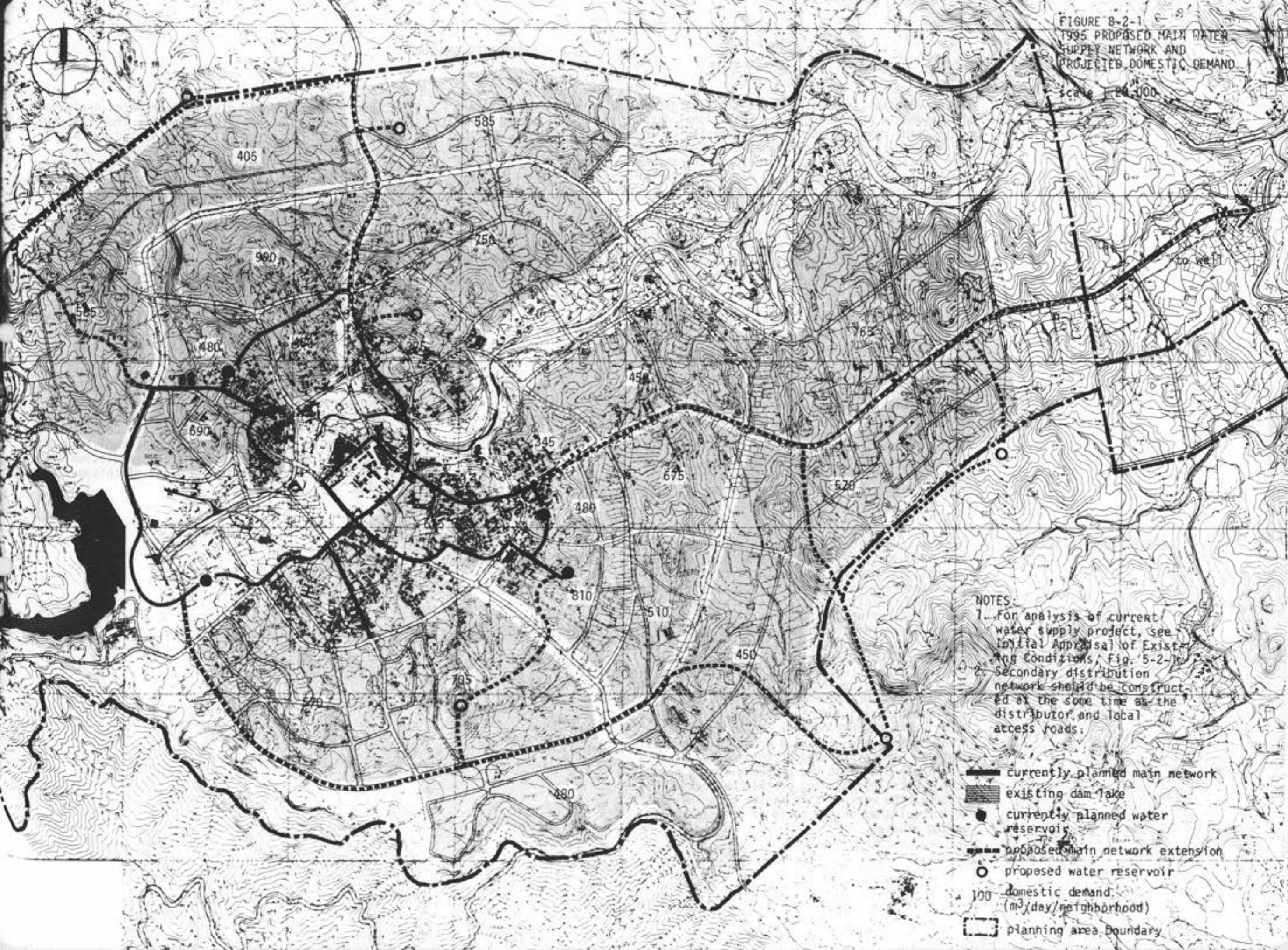
The ability to meet the projected demand for water will depend largely on the development of optimal water gathering methods. Very high priority should be given to technical planning of such methods and implementation of a comprehensive system to realize the goal of tapping the maximum available water. When this is done the Abha and Khamis Mushayt water systems should be integrated into one large service network.

In the meantime, priority should be given to the completion of the planned water treatment and distribution system utilizing the resources of the Abha dam. This system should be made operational by the end of Phase I (1980) of this plan.

Water supply for industry and agriculture need not meet the high standards of sanitation which are essential in the domestic supply, and these uses may be supplied both by ground wells and by re-cycling waste water from the planned new sewage treatment plant northeast of the city. Such re-cycling should be planned in close conjunction with the planning of the sewage treatment plant so that implementation can occur as soon as possible.

FIGURE 8-2-1
 1995 PROPOSED MAIN WATER
 SUPPLY NETWORK AND
 PROJECTED DOMESTIC DEMAND

scale 1:24,000



- NOTES:
1. For analysis of current water supply project, see Initial Appraisal of Existing Conditions, Fig. 5-2-10
 2. Secondary distribution network should be constructed at the same time as the distributor and local access roads.

- currently planned main network
- ▨ existing dam lake
- currently planned water reservoir
- - - proposed main network extension
- proposed water reservoir
- 100 domestic demand (m³/day/neighborhood)
- ▭ planning area boundary

8-3 SEWERAGE

8-3-1 EXISTING AND PLANNED SERVICES

Sewage disposal in Abha is currently disorganized and generally unsatisfactory. Traditional disposal methods have relied upon the capacity of the earth for disposal and purification. When population concentrations become large however, the capacity of the earth is quickly depleted. Currently when cesspools are unable to process the amount of sewage which is disposed in them, municipal trucks clean them and take the sewage to an on-ground dumping site where it remains exposed and untreated. These services however are generally not enough to handle the quickly increasing population, and matters are expected to become worse as time passes.

A newly planned sewage disposal project to be located to the northeast of the city will greatly alleviate this problem. It will be an uncovered facility which poses no immediate nuisance problem since it is located downwind from the city away from population concentrations. As the city grows however it may become necessary to consider covering this facility to protect new residential areas from bad smells which may arise in areas nearby sewage treatment plant. For further information regarding the existing sewage disposal system refer to the Abha Existing Conditions Report, Volume I, Chapter 7 and Volume II, Figure 7-2.

8-3-2 PROPOSED SERVICES

The existing planned sewage network generally covers adequately existing areas of population concentration. However now that the ring road is completed residential concentrations are certain to spread rapidly to all areas within the ring road. High priority should be given to expansion of the sewer network to all areas of the city within the ring road. Particular attention should be paid to installation of comprehensive sewer lines in the central areas of the city where the density of development will increase the problems associated with later implementation of underground utilities. Later when population demands warrant, this network can be expanded to areas outside the ring road and within the residential limits proposed by this master plan. See Figure 8-3-1 for the proposed sewage network. Detailed planning of this network is not properly the work of this master plan and must be accomplished on the basis of detailed engineering studies.

8-4 STORMWATER DRAINAGE

8-4-1 EXISTING AND PLANNED SERVICES

There is a currently planned stormwater drainage system which is completely separate from the sewage system. Drained water is diverted by this system into the wadis. Current plans are very limited however and do not cover most of the area within the ring road. For further information regarding the existing stormwater drainage project refer to the Abha Existing Conditions Report Volume I Chapter 7, and Volume II Figure 7-2.

8-4-2 PROPOSED SERVICES

Because Abha is a city within relatively heavy rainfall, a comprehensive drainage system should be planned and implemented in order to prevent flooding of streets and possibly costly erosion. Such a system would also be a small but valuable part of a comprehensive water conservation program. Stormwater drainage ditches should be constructed along all paved roads and should lead to mains draining into the wadis where it can be used for agricultural purposes. Here too planning and implementation should first be done for areas within the ring road and later for areas outside but within the planned city limits. Detailed planning of this network must be accomplished on the basis of detailed engineering studies which are not properly within the scope of this master plan.

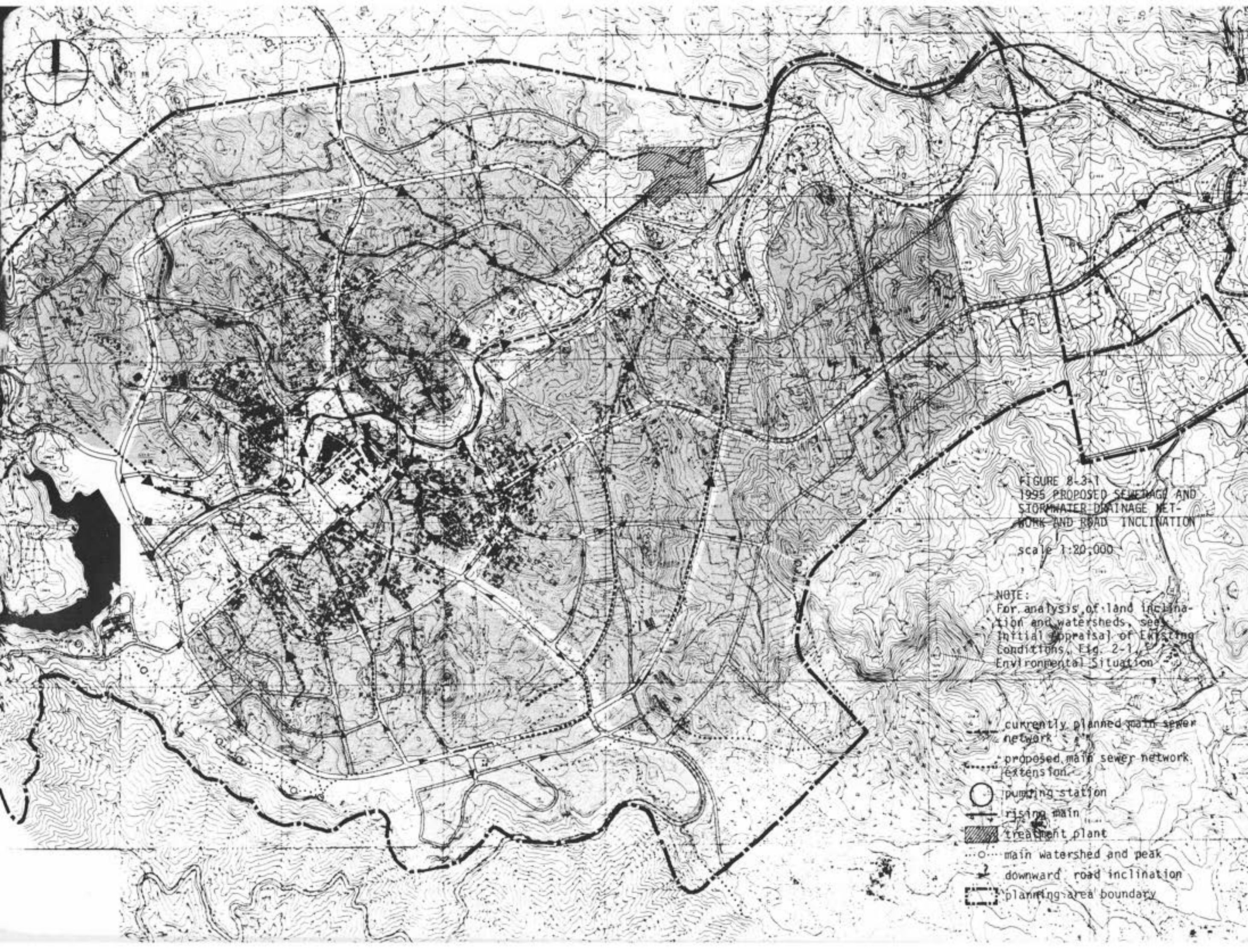


FIGURE 8-3-1
1995 PROPOSED SEWERAGE AND
STORMWATER DRAINAGE NET-
WORK AND ROAD INCLINATION

scale 1:20,000

NOTE:
For analysis of land inclina-
tion and watersheds, see
Initial Appraisal of Existing
Conditions, Fig. 2-1
Environmental Situation

- currently planned main sewer network
- proposed main sewer network extension
- pumping station
- ↑ rising main
- ▨ treatment plant
- main watershed and peak
- ↓ downward road inclination
- - - - - planning area boundary

8-5 SOLID REFUSE COL-
LECTION AND DISPOSAL

8-5-1 EXISTING AND
PLANNED SERVICES

The municipality of Abha is responsible for the collection and disposal of garbage, and although the effort is exemplary, the results are generally unsatisfactory. This is largely due to the lack of sufficient and adequate collection facilities and equipment and to the undersupply of labor to carry out this labor-intensive operation. Consequently many people simply dump garbage at a convenient location outside their homes where it remains as a health hazard, an eyesore and a general nuisance. When it is collected, garbage is taken to an open air dumping site near the escarpment to the south of the city where it is burned. For further information regarding the existing system of solid waste disposal, refer to the Existing Conditions Report, Volume I, Chapter 7 and Volume II Figure 7-2.

8-5-2 PROPOSED SERVICES

Generally it is known that as income rises, the amount of generated refuse rises also. Because of the anticipated pace of development in the country it is expected that in 20 years, refuse generation in cities such as Abha will be equivalent to that of similar sized cities in developed countries.

As shown in Table 8-1-1 this can become quite a large and serious problem with total daily refuse dumping amounting to over 73 tons. As this table shows, each neighborhood will generate an average of about 2 tons of garbage each day. This can be collected once a week with satisfactory results if adequate weekly storage facilities are required in every house and building.

Because of the large volume of daily refuse generation by 1995 it is recommended that open air dumping be abandoned in favor of high energy incineration. Such a facility could most suitably be located near the site of the planned sewage treatment facility and thus result in a minimum negative impact on the city's residential neighborhood. Detailed planning of these disposal facilities required detailed engineering studies which are not properly within the scope of this master plan.

9-1 EXISTING AND PROJECTED LAND USE

9-1-1 EXISTING CONDITIONS

Areas of existing urban land use generally coincide with the area within the ring road although there are several new residential areas just outside the ring road which are currently being developed. The area within the ring road is approximately 100 ha, and although the city is growing very rapidly over half of this land was vacant at the time of the URTEC 5% Survey. Although built-up land use is concentrated in a vaguely concentric pattern around the city center, spreading development has recently proliferated to all parts of the city.

Of the built-up uses, the residential area is the largest, accounting for 94.8 ha or 8.6% of the total land area (1100 ha). Existing land use is indicated in Table 9-1-1. As might be expected because of the administrative nature of the city, the so-called social land use (including Government) is the next largest with 11.1 ha which is equivalent to 1% of the total land area.

Apart from the built up areas, cultivated land accounts for at least 153 ha (the actual figure may be larger due to the difficulty of distinguishing fallow agricultural land) along the wadis and in other low-lying flat areas throughout the city.

The wadi beds themselves account for about 20.2 ha of land within the ring road, and vacant land and circulation spaces account for 667.2 ha.

Land use devoted to other activities such as commercial, industrial, educational and religious uses accounts for a relatively small fraction of the total land within the ring road--equal to or less than 0.5% in each of these cases.

9-1-2 PROJECTED LAND USE AREA REQUIREMENTS

The most obvious change in land use area over the next 20 years is that the city will double in size from the present 1100 ha within the ring road. This increase is largely accounted for by new residential development outside the ring road with a gross area of about 840 ha. In addition areas set aside for a new industrial park, mathematics college and buffer zone around the sewage/garbage disposal area account for over 200 additional ha.

Of course, residential land use will require the largest absolute growth, and recreation and open space requirements will account for large areas as well, in order to keep pace with the expanding population. Area devoted to roadways and parking facilities will show large increases as new roads are completed to serve both existing and new areas of the city and parking space is brought in line with acceptable standards.

Table 9-1-1
1975, NET LAND USE, ABHA

Use	Area (ha)	% of Total Area
Residential	94.8	8.6
Commercial	4.1	0.4
Industrial	3.3	0.3
Educational	4.0	0.5
Religious	1.6	0.1
Social	11.1	1.0
Cultivated	153.0	13.9
Recreation	3.8	0.3
Cemetery	9.1	0.8
Temp. Suq	1.4	0.1
Vacant/Circulation	668.2	60.6
Wadi	20.2	1.8
Major Roads	125.6	11.4
Total	1100.2	100.0

The policies affecting the 20 year plan for the city of Abha were derived from considerations developed in the Alternative Strategies report. Key issues resulting from such consideration include:

1. Because the city is already well established and built up, future development should cause as little disruption of the existing organizational structure as is possible consistent with good planning practices.
2. Higher residential densities should be concentrated between the two major regional arterial roads which pass through the city.
3. The central Government and commercial areas should be reorganized to provide a focus for the city while at the same time maintaining its outward connections with the rest of the Southern Region.
4. The master plan should reflect the desire to expand the economic and functional base of the city especially in the areas of tourism and education.
5. The plan should accommodate a phased development of infrastructure with first priority on the more dense central areas.
6. Where possible and appropriate, valuable open space, green areas, scenic locations and historic areas and structures should be conserved.
7. For the most part industry should be relocated outside of the ring road away from planned residential areas which might otherwise suffer from negative impacts of such industries.

FIGURE 9-2-1
1995 PROPOSED
MASTER PLAN

scale 1:20,000

elementary school and playground for boys	EB
elementary school and playground for girls	EG
intermediate school and playfield-level 1 for boys	IB
intermediate school and playfield-level 1 for girls	IG
secondary school and playfield-level 2 for boys	SB
secondary school and playfield-level 2 for girls	SG
teachers' school for boys	TB
teachers' school for girls	TG
technical school for boys	VB
technical school for girls	VG
colleges	V
special college	SU
neighborhood park	NP
community park or small city park	CP
city park	P
mosque	SM
Jami'a mosque	JM
aid mosque	M
neighborhood center	NC
community center	CC
civic center	C
pharmacy	PH
sub-community diagnosis and treatment center	DT
community/general hospital	H
special hospitals and nursing home	SH
neighborhood shopping center	NB
community shopping center	CB
sub-regional shopping center	S
fire station	FS
post offices	PO
police station	PS
government offices	G

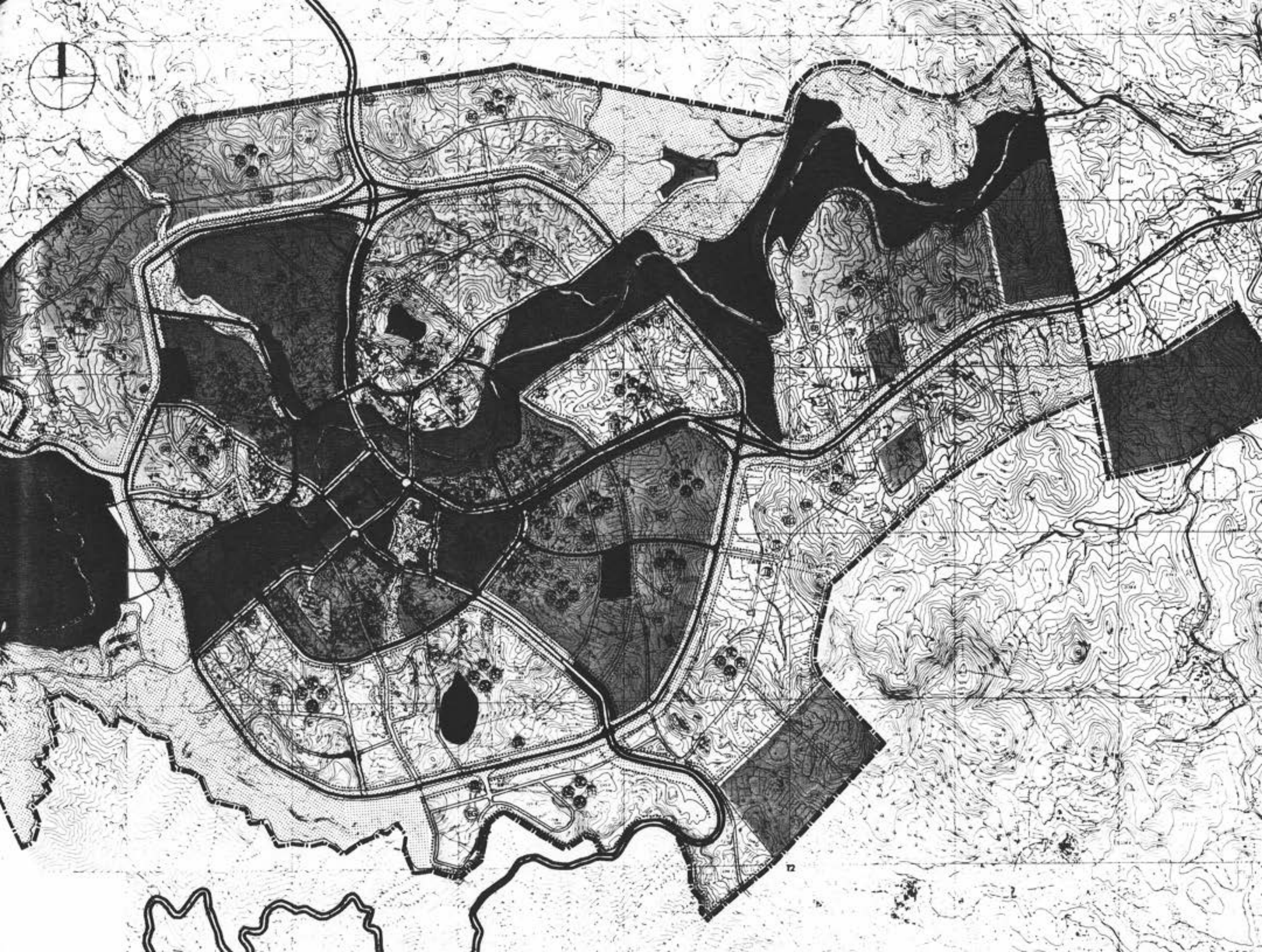


NOTES:

- *1 Existing facilities.
- *2 Facilities proposed and approved by the Ministry of Municipal and Rural Affairs as of April 1978.
- *3 Facilities newly proposed by the Master Plan in addition to those identified in *1 and *2.

Facilities are distributed according to the community structure established in accordance with Planning Standards. Facilities for neighborhoods, sub-communities, communities, and the city have been shown, but those for residential unit groups have been included as part of the general service requirements of the residential neighborhoods, hence are not shown in this plan. For further details concerning the service population, function, area, and other requirements for various facilities, see Appendix, Planning Standards.

governmental complex center	1
Civic/tourist/cultural center	2
new general hospital	3
hospital for women and children	4
mental hospital and T.B. sanatorium	5
10 km east from Abha	6
college	7
Jail	8
lake side park	9
public garden	10
industrial park	11
sewage treatment plant	12
distribution storages	
15 km east from Abha	



9-3 DEVELOPMENT PLAN

9-3-1 DEVELOPMENT STRATEGY

The 20 year development plan is to be implemented in three phases: Phase I, 1975-1980; Phase II, 1980-1985 and Phase III 1985-1995. Although certain components of the master plan will be given special development priorities, for the most part facilities associated with the community structure organization (communities, sub-communities and neighborhoods) which is the primary organizational basis for the plan will be phased according to population growth. This is possible because the standards for these facilities as detailed in the Planning Standards section (appendix) of the Regional Master Plan are ultimately tied to a given service population range.

As has already been mentioned in Chapter 5 of this master plan, the determining components of the phasing of community facilities are the city's schools. Schools have been chosen as the critical element for the following reasons.

1. In Abha the physical arrangement of the city's future neighborhood was largely dictated by the generally immutable presence of existing approved or proposed school sites. Over 50 school sites fell into this category out of a projected 1995 requirement of 70 total schools within the city limits of Abha.
2. Because of the Government's high priority on education, school construction in Abha has recently been proceeding at a very rapid pace which is likely to continue well into the future. This situation means that in all likelihood new schools will be constructed before other new community facilities in any case.
3. Regardless of the above two considerations, schools are perhaps the most important element of community structure based on their overall impact on daily life, their volume of use and their association with the widest range of the city's citizens. This is especially true in light of the Government's announced goal of 100% attendance of both boys and girls in the elementary and intermediate grades.

For these reasons both the phasing of facilities and the geographical organization of neighborhoods has been strongly influenced by existing, approved and proposed school locations.

Every attempt has been made to utilize every school of either existing, approved or proposed status. Because the planning standards for community facilities dictate that two schools (boys and girls) exist at each level of community structure (neighborhood, sub-community and community) and recommends location, service radius etc. for these schools, this task has been extremely difficult. Ultimately only four of the more than 50 school locations which fall into these categories were not utilized in the plan, and only one of these was of approved status, the others being only proposed. In several cases existing schools or approved schools of specified level were converted to a different level (e.g. elementary to intermediate) to assure an acceptable distribution. In no case was the gender of any school changed since this could be expected to cause inordinately difficult approval problems.

In many cases the utilized school locations were not ideal either in absolute terms (such as those in locations which should properly be left as wadi conservation areas) or in relative terms (such as those whose location is peripheral to the service area), but were accepted as an existing condition to be integrated into the overall plan.

Given this basic approach of tying facilities development and community phasing to the schools, concomitant problems have been identified. As with other types of development, existing and approved schools are scattered rather haphazardly around the city. Because these schools are the basis for the location and phasing of neighborhood development, this means that a step by step phased development of neighborhood leading toward the 1995 configuration is made more difficult. This problem is reinforced by the fact that within the ring road, there is no clear cut distinction between residential and vacant land. Nearly all areas of the city have some degree of residential development.

It is therefore difficult to take the approach that completely new residential neighborhoods will be phased in over the next 20 years (with the possible exception of some areas outside the ring road). For this reason phasing itself is based upon incremental increases in population within given neighborhoods rather than on the creation of new neighborhoods. Such population phasing has already been indicated in Table 3-1-3.

With this in mind, existing, approved and proposed schools are phased in at locations where projected population increases are expected to be greatest. For this reason it is not until the final phase that there is 100% correlation between school locations and neighborhood boundaries.

Given all these rather complex considerations a general development strategy may be outlined as follows:

1. 1995 neighborhood boundaries and zoning for 1995 densities should be established immediately for all projected residential areas of the city.
2. Zoning for 1995 land use should be established immediately in order to reduce potential compensation claims and to establish acceptable development patterns as soon as possible. In cases where immediate implementation of such zoning would cause undue hardship, timed variances could be given. (For example 1995 land use plans dictate that all industry be relocated outside the city. This would be quite difficult to implement immediately so 5 or 10 year zoning use variances could be granted.)
3. Infrastructure systems such as sewage and water lines should be phased in as previously indicated, that is in general within the ring road first and then in residential areas outside the ring road.

These first three measures should strongly influence population growth both in terms of location and density so that a free housing market will result in a properly phased and controlled growth of residential areas. Beyond this the following measures should be taken:

4. Schools should be phased-in as shown on the phasing maps. Until Phase III, school use will not correspond to neighborhood boundaries. Assignment of pupils to specific schools should be undertaken by the two ministries involved and be based on the following criteria:
 - a. School enrollment should be as close as possible to the figures given in Table 5-1-1 (d). Fluctuations will take place as population changes occur before new schools are built, but standard contingency factors should take account of this.
 - b. Each school will be located within a 1995 neighborhood which is established in this plan although service area will not necessarily correspond to this neighborhood until the implementation of Phase III. Nonetheless prior to the implementation of Phase III schools, all students living in a 1995

neighborhood (or sub-community) in which there is an appropriate school level should be assigned to that school. The remainder of each school's enrollment should be made up of students from neighboring districts that have no appropriate schools at that time.

c. Reassignment should take place as soon as new schools are built which correspond to 1995 neighborhoods.

5. Other community facilities which are associated with one of the three main levels of community structure will be phased in according to the phasing of schools at their corresponding level. However though schools do not correspond strictly to structural boundaries before Phase III implementation, these other facilities should. For example, at an early stage of plan implementation, two neighboring districts may share elementary schools. The facilities of the neighborhood center--mosque, pharmacy, neighborhood parks etc--should nonetheless be located in one or the other of the two neighborhoods until each neighborhood has its own elementary school. At that time the facilities of a second neighborhood center may be implemented in whichever of the two neighborhoods does not yet have them. This approach should be taken at all levels--neighborhood, sub-community and community--until completion of Phase III implementation.

In general during the first phase (1975-1980) there should be an initial appraisal of necessary measures to be taken in order to achieve implementation of the master plan. Certain areas and projects should be identified and designated for immediate action (see section 9-5), identification of and acquisition planning for future land requirements should be undertaken, and certain necessary projects involving infrastructure implementation should be started.

During Phase I boundaries for the ultimate 1995 community structure organization will be established and density and land use zoning put into effect. Designation and protection of historic and natural conservation areas should be completed by the end of Phase I. Residential densities will not undergo drastic changes from present conditions.

By 1980 population will have reached almost 40,000 and there will be 10 boys elementary, 10 girls elementary, 3 boys intermediate, 3 girls intermediate, 1 boys secondary and 1 girls secondary schools required. All but one of these schools will be on an existing, approved or proposed site. By the end of this phase the boys and girls schools in the central district should be converted to other uses consistent with the administrative/commercial nature of this area. The boys school is rapidly deteriorating and should be torn down. The girls school is a new building and could be converted to ministry office use.

In conjunction with the phased school completion there should be 10 complete neighborhood centers, 3 sub-community centers and one community center finished by 1980.

Comprehensive detailed plans for the central commercial/Government districts as well as the proposed civic/convention/tourist center should be completed during Phase I, and implementation of the central areas begun. The planned new suq should be completed or close to completion by 1980 as well.

Basic infrastructure systems including water and sewer lines should be well under way in the central district as well as neighborhoods 1.1.1, 1.1.2, 1.2.1, 2.1.1 and 2.1.4.

Comprehensive programs for historic conservation areas including the city's two major ancient forts and selected traditional dwelling clusters should be completed and set in motion. The natural conservation area along the escarpment to the southwest of the city should be completely acquired or

otherwise controlled by the Government by the end of Phase I and comprehensive, long-range plans for its use should be drawn up.

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* Implementation in residential area is mainly specified according to the population ratio to 1995 population as follows:

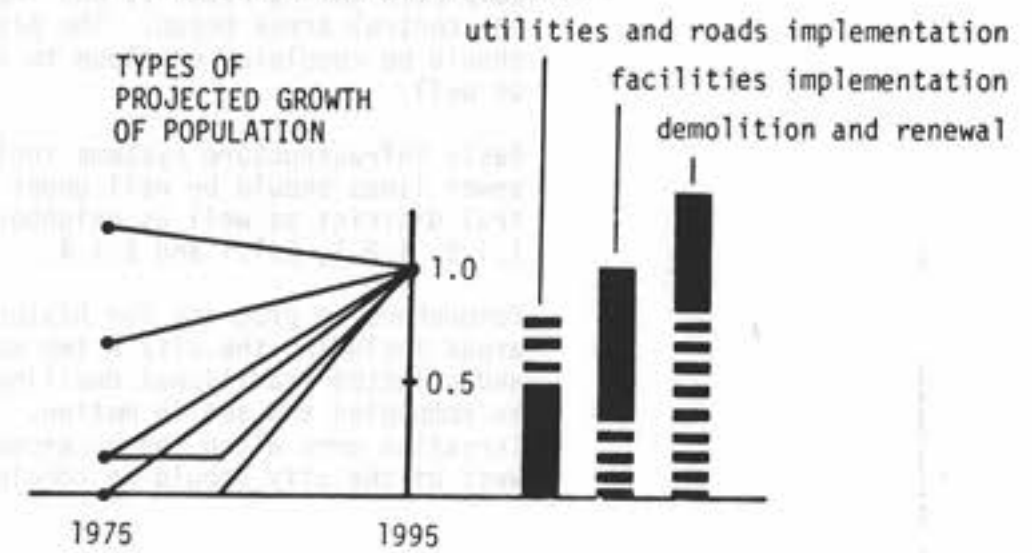
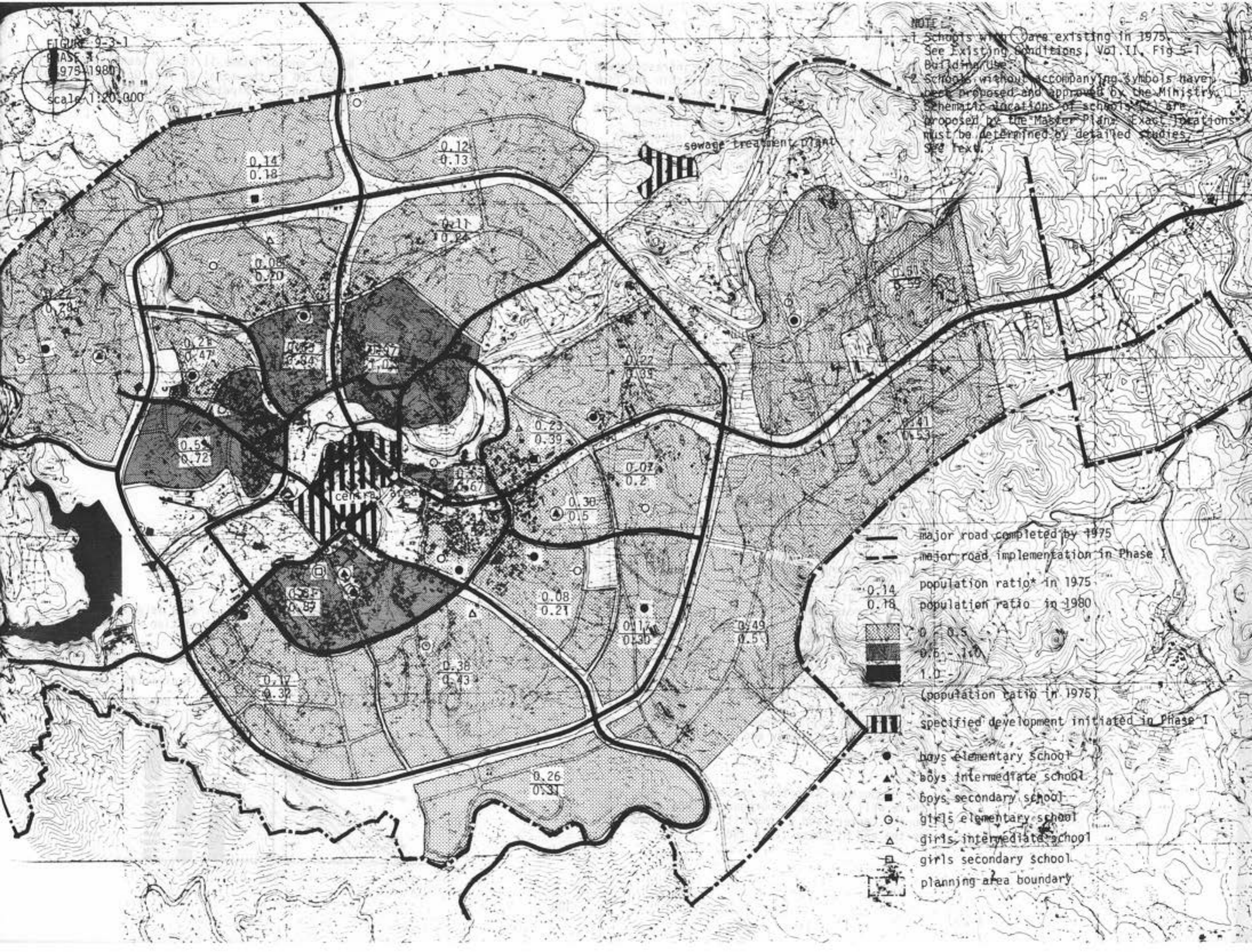


FIGURE 9-3-1
 BASE
 (1975-1980)
 scale 1:20,000

NOTE:
 1. Schools with \odot are existing in 1975. See Existing Conditions, Vol. II, Fig. 5-1 Building Use.
 2. Schools without accompanying symbols have been proposed and approved by the Ministry.
 3. Schematic locations of schools \odot are proposed by the Master Plan. Exact locations must be determined by detailed studies. See text.



- major road completed by 1975
- - - major road implementation in Phase I
- 0.14 population ratio* in 1975
- 0.18 population ratio in 1980
- 0 - 0.5
- 0.5 - 1.0
- 1.0 - (population ratio in 1975)
- ▨ specified development initiated in Phase I
- boys elementary school
- ▲ boys intermediate school
- boys secondary school
- girls elementary school
- △ girls intermediate school
- girls secondary school
- ▭ planning area boundary

During the second phase (1980-1985) infrastructure and service improvements for areas within the ring road should be completed. All of the neighborhoods within the ring road should be supplied with water and sewer facilities. Such facilities should also be nearly complete in neighborhoods 1.2.4, 2.2.1 and 2.2.2 outside the ring road which by this time will have fairly substantial population.

Road networks in the neighborhoods outside the ring road should be completed during this phase and planning for implementation of other infrastructure systems in these areas should be well under way.

Action area projects in the central districts which were identified, planned and initiated in Phase I should be completed or nearly completed during Phase II.

Government housing projects--especially those in neighborhood 1.1.1 adjacent to the central district should be completed relatively early in this phase in order to most usefully serve as examples for private development.

By the end of Phase II all industries should be relocated to the proposed new industrial park to the east of the city along the road to Khamis Mu-shayt. Major institutional development such as the new general hospital and significant elements of the several college/university proposals should be completed by the end of Phase II.

By the end of Phase II, Abha's population will increase to around 52,500 with neighborhood population increasing as shown in Table 3-1-3. According to the given standards for school size and projected increases in population there should be 14 elementary schools each for boys and girls (28 in total), 5 intermediate schools each (10 in total) and 2 secondary schools each (4 in total). However because of consideration for proper distribution of these schools the number of elementary and intermediate schools has been increased so that in 1985 there will be 15 boys elementary, 15 girls elementary, 6 boys intermediate, 6 girls intermediate, 2 boys secondary and 2 girls secondary schools.

In conjunction with this phased school development there will be 15 neighborhood centers, 6 sub-community centers and 2 community centers completed by the end of Phase II in 1985.

By the end of Phase II it has been estimated that about 70% of the total 20 year Government capital investment anticipated for the implementation of this plan will have been utilized.

* Implementation in residential area is mainly specified according to the population ratio to 1995 population as follows:

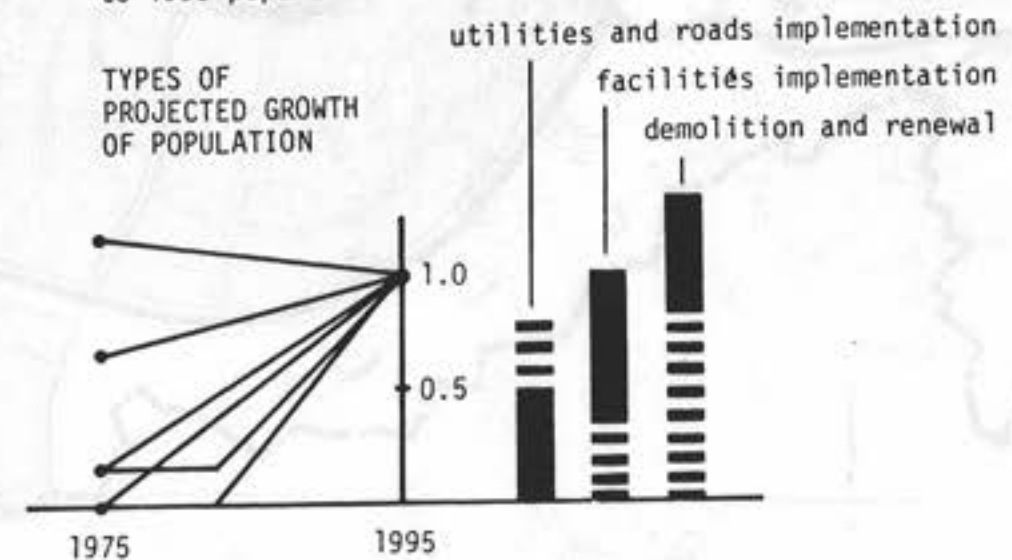
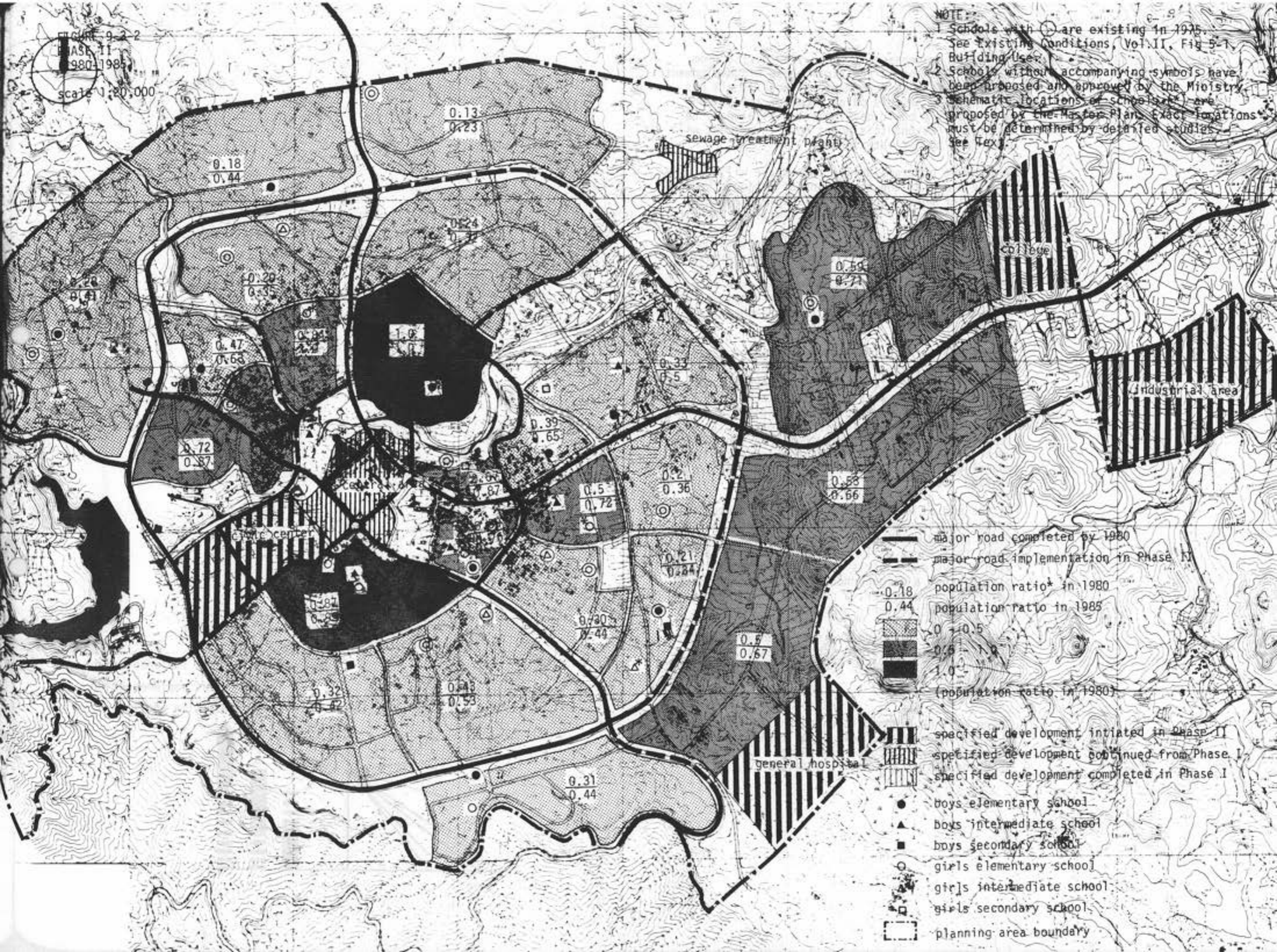


Figure 9-2-2
 Phase II
 1980-1985
 scale 1:20,000

NOTE:
 1 Schools with \odot are existing in 1975.
 See Existing Conditions, Vol. II, Fig 5-1, Building User.
 2 Schools without accompanying symbols have been proposed and approved by the Ministry Schematic locations of schools are proposed by the Master Plan. Exact locations must be determined by detailed studies. See Text.



- major road completed by 1980
- major road implementation in Phase II
- 0.18 population ratio* in 1980
- 0.44 population ratio in 1985
- 0 - 0.5
- 0.5 - 1.0
- 1.0
- (population ratio in 1980)
- specified development initiated in Phase II
- specified development continued from Phase I
- specified development completed in Phase I
- boys elementary school
- boys intermediate school
- boys secondary school
- girls elementary school
- girls intermediate school
- girls secondary school
- planning area boundary

Phase III encompasses the ten-year period from 1985 to 1995 and is the final phase of development of the present 20 year master plan. If all has gone well up to this point, most of the Government's costly basic development will already be complete. Beyond this point most investment will come from the private sector.

Government programs during this phase will be primarily aimed at the completion of projects begun in earlier phases including all infrastructure systems within the residential limits of the city.

By the end of Phase III the city's population will reach a projected 91,500 making it the largest city in the Southern Region. By this time all of the low density neighborhoods outside the ring road will have reached capacity and densities in all other neighborhoods will have reached their limits.

At the end of Phase III there will be 24 boys elementary, 24 girls elementary, 8 boys intermediate, 8 girls intermediate, 3 boys secondary and 3 girls secondary schools within the residential limits of the city. Existing school plans include a few schools which are outside the projected city limits. Schools such as these should be considered rural schools and used by the population of surrounding districts rather than by the city's population itself.

At the end of Phase III there will be centers of community structure levels to correspond with the final phased development of the schools. This means that there will be 24 neighborhoods each with a boys and a girls elementary school, school playgrounds, a neighborhood park, a small mosque, a neighborhood center, a pharmacy and a neighborhood shopping center.

There will be 8 sub-communities each with a boys and a girls intermediate school, level 1 playfields, a Jami'a mosque and a diagnostic and treatment health facility.

There will be 3 communities each with a boys and a girls secondary school, level 2 playfields, a community park, a community center, a community shopping center and a fire station.

* Implementation in residential area is mainly specified according to the population ratio to 1995 population as follows:

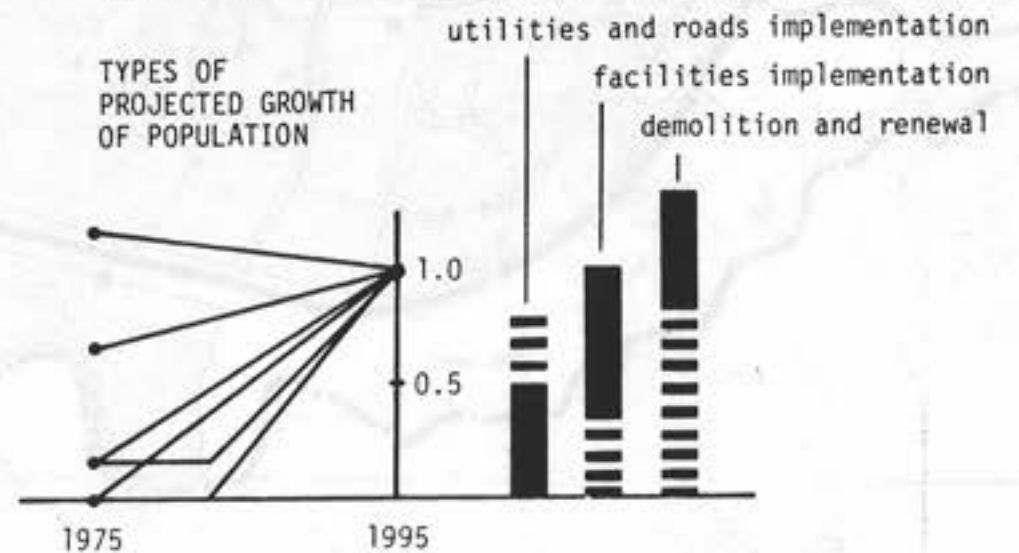
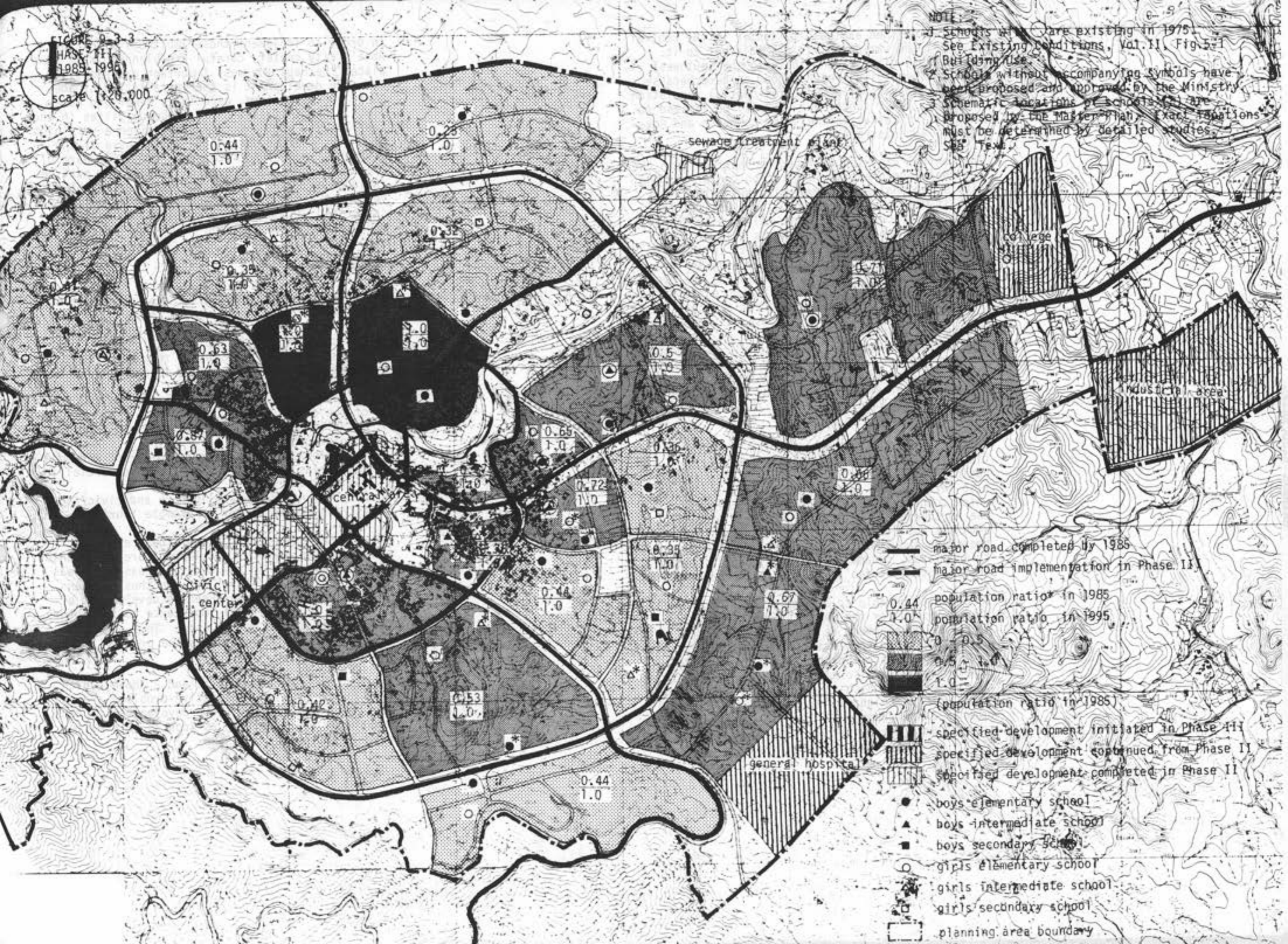


FIGURE 9-3-3
 PHASE III
 1985-1995
 scale 1:20,000

NOTE:
 1 Schools which are existing in 1975.
 2 See Existing Conditions, Vol. II, Fig. 5-1 Building Use.
 3 Schools without accompanying symbols have been proposed and approved by the Ministry of Education.
 4 Schematic locations of schools (2) are proposed by the Master Plan. Exact locations must be determined by detailed studies.
 5 See Text.



- major road completed by 1985
- - - major road implementation in Phase II
- 0.44 population ratio in 1985
- 1.0 population ratio in 1995
- 0 - 0.5 (population ratio in 1985)
- 0.5 - 1.0
- 1.0
- ▨ specified development initiated in Phase III
- ▧ specified development continued from Phase II
- ▩ specified development completed in Phase II
- boys elementary school
- ▲ boys intermediate school
- boys secondary school
- girls elementary school
- ◐ girls intermediate school
- ◑ girls secondary school
- planning area boundary

The area defined as the city center is the central district and various districts adjacent to it. The central district and those to the southwest have not been given neighborhood numbers because they will have little or no residential population in 1995. Their functional use will be limited to such activities as business and commerce and Government administration.

The central district will be the heart of both the regional Government administration center and the city's regional scale commercial activities. As such it will become the symbolic as well as the functional focus of the city. Along with the high density residential neighborhoods this area will have the highest density of activity in the city. For this reason implementation planning in this area should devote special attention to the avoidance of problems of congestion and accessibility. It has been due to these considerations that the Government administration land use has been extended to the southwest along the edge of the public park to merge with the proposed civic center/convention/tourist center. Such an arrangement extends the area of expected highest employment over a much greater area allowing many more approach roads than would be possible if this sector were more concentrated.

Activities of the central district itself will include both Government administration functions and business and commercial functions. This area will also serve as the pedestrian focus of the pathways which connect the high density neighborhoods to the northwest and southeast with each other and with the public park area. The central area therefore should include adequate space for pedestrian plazas, ornamental gardens, public seating areas, outdoor cafes as well as ample landscaping.

In order to be able to accommodate all the activities proposed for the central area, vertical or high-rise development is considered essential both for business and commercial buildings and for Government administration buildings. Such vertical development will also allow multi-level pedestrian concourses with which to connect the central district with the high and medium residential developments of neighborhood 1.1.1. In this way the central area can become a truly vital urban center with a complete range of functions.

9-5 PROPOSED ACTION AREAS

In order to implement these ambitious plans for Abha's city center, careful pre-planning must take place. Perhaps the most important pre-requisite for such development is the installation of adequate infrastructure, especially sewer and water lines. The installation of these utilities in the central area of the city must be given a very high priority, started during the first phase of the plan and finished no later than the early part of Phase II. Adequate provision for parking must be included as well. Due to the high density of development and activity, parking garages possibly integrated with buildings having other primary functions must be included in central area planning.

A number of elements of this master plan must be given very high priority, among them:

1. Land use zoning, density zoning and land acquisition planning and implementation.
2. The adoption of legislation required to put the master plan into effect and to enforce its provision.
3. Infrastructure development in the central areas of the city.
4. Establishment of historic and natural conservation programs.
5. Redevelopment of the central district and adjacent areas as the Government and commercial focus of the city.
6. Development of the public park and civic/tourist/convention center to promote tourism.

It will be noticed that all of these elements which require physical development are geographically concentrated in the central areas and areas to the southwest of this. It can thus be seen that immediate and comprehensive development of this zone is of critical importance to the future development of the entire city. This zone is for this reason designated as the primary action area.

The non-physical elements (1 and 2 above) which deal primarily with legislative problems are no less important to the future development of Abha and should be undertaken as soon as this master plan is approved.

10-1 TOWN PLANNING LEGISLATION AND ADMINISTRATION

10-1-1 EXISTING LEGISLATION AND ADMINISTRATION

The main responsibility for urban and regional planning lies with the Deputy Ministry for Town Planning Affairs. The office for the Southern Region is the Department of Town Planning in Abha, which coordinates regional planning activities. However, the responsibility of the Abha office is somewhat attenuated and it cannot plan new facilities without the approval of the Deputy Ministry in Riyadh. It is believed that the responsibilities and decision makings of the department of town planning in Abha should be increased, that is to enable the department to avoid delays and to meet the local needs and requirements of the Southern Region.

10-1-2 PROPOSED MANAGEMENT FRAMEWORK

It is suggested first that the Master Plan be read into existing law to eliminate some of these problems. Second, it is proposed that the planning process be decentralized by making the Deputy Ministry in Riyadh responsible only for long-range planning. Offices on the local, regional and municipal levels should then be allowed to interpret and execute the plan without further request for obtaining from central office in Riyadh. The delegation of authority should make the process more efficient, more responsive to local needs. Third, a comprehensive management framework requires enacting a general zoning act, tailoring each city's Master Plan to it and thereby creating a zoning map for each city.

Finally, the Deputy Ministry for Town Planning should have an annual budget, with only very general guidelines given as to the allocation of funds and the specifics left to the municipal office in question.

10-2 DEVELOPMENT AND IMPLEMENTATION PROGRAM

10-2-1 PRIORITIES AND PHASING

Development priorities can be indicated by the phasing of investment and the share of public investment in the total investment requirements. The following general rule is assumed in preparing a public investment schedule: that the standards of facilities in all sectors will be raised by 1985. Furthermore, public investment will by that time be attempting to achieve two objectives simultaneously: raising the standards of existing facilities and providing additional facilities to an increased population. Therefore, public investment seeks to provide a growing population with adequate facilities, while replacing old stock.

The extent of Government investment within the total required capital investment program in Abha is tentatively estimated as follows:

1. Housing	
a. Site Development	100%
b. Housing Construction	30%
2. Educational Facilities	100%
3. Recreation Facilities	80%
4. Social and Religious Facilities	100%
5. Health and Welfare Facilities	100%
6. Commercial Facilities	10%
7. Public Facilities	100%
8. Public Utilities	100%
9. Industrial Facilities	20%
10. Transportation Facilities	100%

Although in many cases 100% Government investment is assumed, it is recognized that in several of these areas, private investment is permitted and at least tacitly encouraged. Therefore depending on the stimulation of private enterprise, the percentage of Government investment in some sectors may be reduced from the assumed 100%.

In Abha, public investment should follow two criteria: (a) the recommendations that have been suggested in the development strategy and indicated for each phase of the plan; (b) the priorities which have been established in the sections on Proposed Action Areas (9-5) and the City Center (9-4).

New parts of the city will be developed over a period of time as indicated in the various phases. Investment should in general correspond to overall phasing, with high priority given to the city center and its associated action area, then to completion of plans within the ring road which will only be fully developed in the final phase. Although this general pattern of investment should be followed, it must be recognized that even at early stage, investment problems for later stages (such as land acquisition) may require immediate action. For this reason there may not be a direct relation between actual development priority and phasing and the associated investment.

10-2-2 CAPITAL INVESTMENT PROGRAM

Because of the immediate necessity for infrastructure development as well as the need to quickly purchase land to cover long range plan proposals (the latter need resulting from inordinately difficult and costly land acquisition problems), Government investment should be heaviest during the first two phases. As an estimate it might be assumed that percentages of the total 20 year Government investment program will be split among the three phases at a ratio of 40%, 30%, 30%. In all phases the heaviest Government investment expenditure will be in housing, although it is expected to decrease by almost half in the third phase of the Plan. The next heaviest sector across all years is in education. Social and religious facilities, public utilities, and recreation will require smaller expenditures, with only half as much devoted to commerce, public facilities, and industries during all phases from 1975-95. After 1980, investment in recreation, commerce, industry and health should level off.

10-3 ZONING REGULATIONS AND ADMINISTRATIVE MEASURES

The purpose of zoning regulations is to safeguard the health, safety and welfare of the community as well as to insure that land is available for the purposes designated in the Plan. With growth and development, legal issues will arise regarding land use. If these are decided on a case-by-case basis, development will be slow and regulatory measures may be undermined.

Zoning is essentially a legal instrument for the implementation of land use aspects of the Master Plan. A zoning ordinance divides the land area within the municipal boundaries into zones; designates the classes of industry, trade, commerce, business, residence, and other purposes for which structures are to be used in each district; and imposes varying standards of development such as setbacks, height, bulk, and other requirements for buildings and other structures to be constructed, rehabilitated, altered, or repaired.

Zoning regulations should be ratified as legal documents and administered by the Building Departments in various municipalities, assisted as necessary by the police and the courts. Applicants for building permits would have to submit the necessary documentation, including plans and specifications to the Building Department and no permit would be granted for work not in conformity to standards.

Districts should be zoned as Agricultural, Residential (high, medium and low density), Business and Commercial, Light and Heavy Industry, Public Land, and Special Districts such as areas to be conserved. Industrial areas, power stations, and sewage plants must all be zoned as special areas and appropriately screened from surrounding properties. The wadi beds, open areas surrounding them, park space within the city, and land to be conserved should also be zoned to ensure that development does not encroach upon them and destroy the environment. In order to further foster the conservation of open space within the city, existing agricultural land should be zoned "Agricultural", and any other development prohibited without additional permits.

Table 10-2-1
IMPLEMENTATION PROGRAM, ABHA^a

	1975			1975 - 1980			1980 - 1985			1985 - 1995		
				PHASE I			PHASE II			PHASE III		
	NUMBER	TOTAL FLOOR AREA (m ²)	TOTAL LAND AREA (ha)	NUMBER	TOTAL FLOOR AREA	TOTAL LAND AREA	NUMBER	TOTAL FLOOR AREA	TOTAL LAND AREA	NUMBER	TOTAL FLOOR AREA	TOTAL LAND AREA
BOYS ELEMENTARY ^b	8	12,600	9.0	2	4,050	2.8	4	5,400	3.9	10	16,200	11.5
BOYS INTERMEDIATE ^b	3	6,825	5.25	0	1,950	1.5	2	2,925	2.25	3	8,775	6.75
BOYS SECONDARY ^b	1	3,850	4.15	0	1,050	1.15	1	1,400	1.5	1	4,900	5.2
BOYS HIGHER EDUCATION ^c	2	17,400	6.6	0	5,600	2.0	0	7,200	2.8	0	22,600	8.4
GIRLS INTERMEDIATE ^b	3	6,825	5.25	0	1,950	1.5	2	2,925	2.25	3	8,775	6.75
GIRLS ELEMENTARY ^b	8	12,600	9.0	2	4,050	2.8	4	5,400	3.9	10	16,200	11.5
GIRLS SECONDARY ^b	1	2,100	2.3	0	700	0.7	1	1,050	1.15	1	2,800	3.0
GIRLS HIGHER EDUCATION ^c	2	17,400	6.6	0	5,600	2.0	0	7,200	2.8	0	22,600	8.4
TOT-LOT	121		6.1	38		1.9	51		2.5	156		7.8
PLAY-LOT (KINDERGARTEN)	30		6.0	10		2.0	13		2.6	39		7.8
NEIGHBORHOOD PARK	8		15.1	2		4.8	4		6.4	10		19.5
COMMUNITY PARK	1		12.1	0		3.8	1		5.1	1		15.6
CITY PARK	1		12.1	0		3.8	0		5.1	0		15.6
MOSQUE	8	9,060	2.0	2	2,880	0.5	4	3,810	1.0	10	11,700	2.5
JAMI'A MUSQUE	3	3,624	2.1	0	1,152	0	2	1,524	1.4	3	4,680	2.1
EID MOSQUE										1		3.5
NEIGHBORHOOD CENTER	8	1,510	2.4	2	480	0.6	4	635	1.2	10	1,950	3.0
COMMUNITY CENTER	1	302	0.6	0	96	0	1	127	0.6	1	390	0.6
CIVIC CULTURAL CENTER	1	2,485	2.5	0	620	0.6	0	785	0.8	0	2,310	2.3
PHARMACY	8	1,510	0.8	2	480	0.2	4	635	0.4	10	1,950	1.0
DIAGNOSIS/TREATMENT	3	302	0.9	0	96	0.3	2	127	0.4	3	390	1.1
COMMUNITY/GENERAL HOSPITAL (1)	174	5,220	3.7	43	1,290	1.0	55	1,650	1.1	162	4,860	3.5
SPECIAL HOSPITAL (3)	473	15,609	11.0	117	3,861	2.6	149	4,917	3.6	439	14,487	10.1
ADMINISTRATION		50,000	2.5		8,000	0.4		10,000	0.5		50,000	2.5
POPULATION/HOUSEHOLDS		30,000/5,491			9,600/2,469			12,700/3,210			39,000/10,109	

Table 10-2-1 NOTES:

- a. This table represents the facilities implementation programme for each phase of the master plan based on the application of the Planning Standards (detailed in the Appendix) to the projected populations.

For 1975 this means that the figures shown represent the proposals of this master plan rather than the existing conditions. TPO planners may compare these figures with the existing conditions to determine shortfalls in existing facilities. This method was chosen for 1975 because the very rapid pace of development implementation would have made the presentation of a comparison of existing facilities to facilities currently required by the planning standards immediately obsolete.









The figures for Phases I, II and III represent the increments of facilities to be added to those of the previous phases in order to meet the requirements of the planning standards.

To use boys elementary schools as an example, in 1975 there should be 8 schools with a total floor area of 12,600 m² and a total land area of 9.0 ha. By the end of Phase I there should be an additional 2 schools with 4,050 m² of floor area and 2.8 ha of land. Therefore by 1980 there should be 10 elementary schools (8+2) with a total land area of 16,650 m² (12,600 + 4,050) and a total land area of 11.8 ha (9.0 + 2.8). This method is carried out for each phase, with only the increments being shown and not the totals, and is intended to facilitate implementation and cost planning for each phase.




It was decided in discussions with the TPO and its U.N. advisors that it would be undesirable to give monetary figures for this implementation program because the instability of construction costs and rapid and uncertain inflation would soon render such figures meaningless. It is felt to be a much better policy to give only numbers and areas of proposed facilities and have the expert financial planners of the Ministry prepare financial analyses as they become needed. In this way the implementation program of this master plan can be kept constantly up-to-date and meaningful.

- b. Land area for boys and girls elementary, intermediate and secondary schools includes appropriate associated recreation areas. See Chap. 5, Sec. 5-1 for details.
- c. Higher education facilities for boys and girls includes teachers and technical schools, but not colleges and universities. See Table 5-1-1.

Zoning Classification Principal Land Use

A	Agricultural	
R ₁	Low density residential	
R ₂	Medium density residential	
R ₃	High density residential	
B	Business and commercial	
M	Industrial and warehousing	
P ₁	Government and civic	
P ₂	Institutional	

Special District Classification Principal Land Use

S ₁	Recreational	
S ₂	Non-agricultural conservation	
S ₄	Restricted Development	

NOTES:

1. For a detailed discussion of zoning classification and requirements, see Southern Region, Final Physical Plan, Sec. 13-3, Legislation and Regulations.
2. Principal land use is the predominant land use activity associated with each zoning classification. See Summary of Permitted uses for classes of detailed land uses permitted for each zoning classification.
3. Non-agricultural conservation includes recreation, scenic, and, in Jizan, coastal conservation area.
4. Restricted development area is land unsuitable for development due to unfavorable topographic or geological conditions, land reserved for traffic and industrial buffer areas or land specially reserved for future use.

11-1 INTERDEPENDENCE
OF ABHA AND
KHAMIS MUSHAYT

The cities of Abha and Khamis Mushayt are located only about 30 km apart and are linked by both functional and physical interdependence which is likely to increase over the 20-year period of this plan. Because of the increasing importance of this interdependence it is felt that a discussion of the nature of the physical links between the two cities and an outline for policy concerning future development in this area is warranted even though it is, strictly speaking, outside the scope of this report to do so.

The functional natures of the two cities are strikingly different and complementary. On the one hand, Khamis Mushayt is a major regional commercial center, a major military location, and an important minor center of small-scale industrial operations. Abha, on the other hand, is the regional administration center, a center for tourist activity, and a present and future center of higher education. These functional divisions are almost ideally apportioned between the two cities so that an adverse competitive situation is avoided. As has been discussed previously, this functional specialization should be encouraged in the future growth and development of the two cities in such a way that their future characters and economies are strengthened.

Both because of the regional locations and the functional interdependence of Abha and Khamis Mushayt the physical connection between the two cities assumes a greatly increased importance. In essence, the road between Abha and Khamis Mushayt serves as the vital transportation link between the western corridor of the Southern Region--Jizan, Tihama, Abha, the Hijaz village and connections to Taif and Jeddah--with the eastern corridor--Najran, Khamis Mushayt, Bishah and connections to Riyadh. As such it is perhaps the most important ground transportation route within the Southern Region, and it is expected that in the future it will serve a great deal of regional traffic.

Because of the functional interdependence of Khamis Mushayt and Abha, there is currently and will continue to be fairly large volumes of local traffic between the two cities. It is often the case that a person will live in one of the cities and work in the other, thereby necessitating at least one round trip a day.

11-2 DEVELOPMENT BETWEEN
ABHA AND
KHAMIS MUSHAYT

The factors already mentioned--proximity, functional interdependence and the importance of the connecting transportation link--are by themselves sufficient to encourage some kinds of development between Khamis Mushayt and Abha. This can already be

seen as certain types of commercial establishments such as automobile dealerships have begun to proliferate just outside each of the cities along the road connecting them. In recent years small-scale commercial, industrial and even residential developments have begun to appear in the more sparsely populated areas between the two cities.

In the future the incentives for development in this area between the cities will be even greater. The new Abha airport which is nearing completion is located about halfway between the two cities just a few kilometers south of the Abha-Khamis Mushayt road. The intersection of this road with the airport approach road will become a major intersection and the development pressure on surrounding land will increase tremendously. Already there has been a slight increase in settlement build-up in this area and once the airport is completed, additional build-up will occur rapidly.

Another spot along the Abha-Khamis Mushayt road which is likely to experience increased development in the near future is the intersection with the road to Mohalah. As planned improvements in the recreation potential of Mohalah are carried out its popularity will increase greatly, thereby increasing development pressures along its approach road and at the intersection of this road with the Abha-Khamis Mushayt road.

In addition there will undoubtedly be isolated spots of private development between Khamis Mushayt and Abha of all kinds which cannot be predicted at this time.

Such development as it occurs naturally is not in itself an undesirable phenomenon since it may be viewed as a market response to public demand. However the danger exists--and this danger is borne out by many examples in developed Western countries --that an uncontrolled proliferation of such development will lead to aesthetic, functional, and even legal chaos. For this reason, methods must be established to strictly control all future development along the Abha-Khamis Mushayt road.

11-3 POLICY FOR
CONURBATION

The term conurbation as it is used here is essentially neutral in intent--that is, by itself it is neither necessarily a good nor a bad concept or phenomenon. The linkage of growth of two nearly urban areas may have either beneficial or detrimental results depending on how such linked growth is controlled.

As this discussion has shown, the cities of Abha and Khamis Mushayt are already becoming linked to

some extent by areas of scattered development. For a variety of reasons this tendency will naturally increase in the future. It must be realized, however, that any development of this nature must evolve slowly, and it is therefore impractical to assume that any significant physical connection (other than transportation connections) will develop rapidly. The conurbation of Abha and Khamis Mushayt within the existing context is a concept that should involve the complementary synthesis of the functions and infrastructure of the two cities more than their actual physical connection. It is the infrastructure connections and the common elements which occur along those connections, whether they be agricultural, recreational, industrial, or transportation-related which must be emphasized in planning the area between the cities.

In spite of the fact that such conurbation must be allowed to evolve slowly rather than imposed as a planning policy, guidelines and controls for this evolution must be established immediately to avoid the chaos which might otherwise result. To this end the following guidelines are suggested.

1. Prior to 1995 most conurbation development should take place at the "terminal" ends--that is at the edges of Abha and Khamis Mushayt. In Khamis Mushayt the current plan proposes an industrial area as well as new residential areas adjacent to or nearby the road to Abha. In Abha the current plan proposes new residential areas, a new industrial park and an institution of higher education along the road to Khamis Mushayt.
2. The only designated exception to the policy expressed in (1) above is the area around the intersection of the Abha-Khamis Mushayt road with the new airport road. Here extensive additional development may be allowed to take place subject to careful planning and design review and analysis. Such development could include commercial and service facilities for airport users and employees, restaurants, small transit hotels, and automobile service and gasoline stations. New residential developments may be planned in this area subject to careful impact studies both to avoid detrimental environmental effects to the inhabitants caused by the proximity of the airport and to avoid adverse effects to the planned growth and development of either Abha or Khamis Mushayt.
3. In addition to the road right-of-way suggested in chapter 7 for the Abha-Khamis Mushayt road, there should be a development control strip at least 300 meters wide which extends the entire

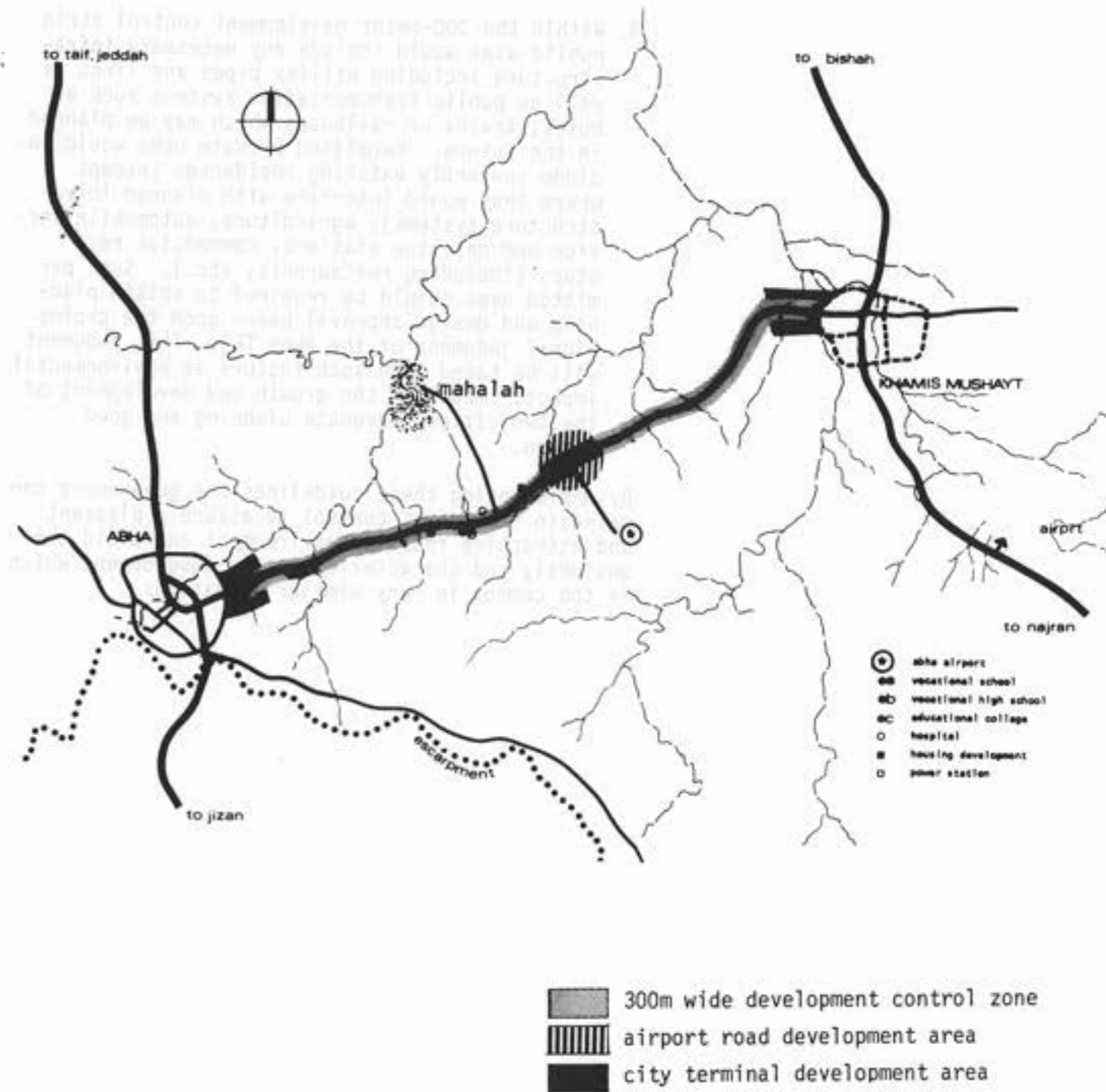


FIGURE 11-3-1
ABHA-
KHAMIS MUSHAYT
CONURBATION

scale 1:200,000

should reflect this fact. The standard is to be applied to the total of population over the area. It is not to be applied to any one part of the area. The standard is to be applied to the total of population over the area. It is not to be applied to any one part of the area. The standard is to be applied to the total of population over the area. It is not to be applied to any one part of the area.

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appendix: community planning standards

TABLE A-1
POPULATION STANDARDS FOR THE CITY OF...
1970 1980 1990

Area	1970	1980	1990
North City	15,000	20,000	25,000
Central City	10,000	15,000	20,000
South City	5,000	7,000	10,000
West City	3,000	4,000	5,000
East City	2,000	3,000	4,000
Southwest City	1,000	1,500	2,000

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A-1-2 POPULATION DENSITY

Table A-1-2 (a) summarizes the 1975 and 1995 population densities for the five cities. The Table indicates that density is low in overall city area in 1975 and therefore, in the next twenty years "in-fill" type of development is possible and recommended rather than "sprawl" type of development. The planning standards should reflect this fact. Unnecessarily low density developments in the central area should be discouraged or prohibited through these standards.

From Table A-1-2(a), following approximations are made:

1. Each city as a whole has a density of 10 pph (person per hectare) to 40 pph in 1975, and estimated density in 1995 is somewhere between 20 and 120 pph.
2. Each city's central district (approximately 100 to 200 ha area) has a density of 50 to 150 pph.
3. Each city's highest density zone (approximately 10 to 40 ha area) has a density of 100 to 200 pph.

It is also assumed that the central district density will increase from 50 to 75% and the density of a city's highest density zone may increase up to 200 pph due to the limited availability of land and of the peripheral area. If no renewal is done, no density increase is expected in the central zone. The standards should be written with a wide enough range to enable planning within the density ranges listed.

Table A-1-2(b) summarizes the density range used for the determination of planning standards.

A-1-3 SCHOOL AGE GROUP DISTRIBUTION

Table A-1-3(a) shows the per cent share per age of children in the total population. The numbers are based on the results of the 1975 5% Sample Survey. From this table it is apparent that there are 3 to 4 (3.01 to 4.20, to be exact) children per age per 100 population for the age group 0 to 9, and there are 2 to 2.5 (1.95 to 2.69, to be exact) children per age per 100 population for the age group 10 to 19. An analysis of the existing conditions indicates that the population pyramids in the cities of the Southern Region do not have normal, stabilized characteristics due to a lack of working age population. In a normal and growing population, approximately 3% and 2.5% of the total population are estimated for the age group of 0 to 9 and 10 to 19, respectively.

Presently larger numbers of children exist in

**Table A-1-2(a)
POPULATION DENSITY 1975 and 1995 (pph)^a**

	CITY AVERAGE		CENTRAL DISTRICT		HIGHEST DENSITY ZONE	
	1975	1995	1975	1995	1975	1995
Abha	20 (1100 HA)	60	50 (150 HA)	150	150 (10 HA)	200+
Khamis Mushayt	40 (720 HA)	120	100 (230 HA)	150	200 (10 HA)	200+
Najran	10 (3400 HA)	20	100 (70 HA)	150	100 (40 HA)	200+
Jizan	40 (500 HA)	80	150 (100 HA)	150	200 (10 HA)	200+
Bishah	20 (470 HA)	60	50 (100 HA)	150	100 (20 HA)	200+

Note: a. From Southern Region Study, Existing Conditions. The nearest multiple of 10 and 50 in "City Average" column and other columns respectively. City areas are defined as the 5% sample survey areas.

**Table A-1-2(b)
APPLICABLE DENSITY RANGE FOR PLANNING STANDARDS**

	DENSITY RANGE (pph)	EXAMPLE
Low Density	Up to 50	1975 City Average
Low-Medium Density	50 to 100	1975 Central District 1995 City Average
Medium Density	100 to 200	1975 Highest Density Zone 1995 Central District
High Density	200 and up	1995 Highest Density Zone

Table A-1-4
SUMMARY OF POPULATION GROUP, DENSITY, AND ENROLLMENT

POPULATION GROUP RANGE	DENSITY RANGE		RANGE OF ENROLLMENT												
	50pph	100pph	200pph	NURSERY KINDERGARTEN	2.25%	6.0%	ELEMENTARY SCHOOL	16.0%	22.0%	INTERMEDIATE SCHOOL	6.0%	9.0%	2.25%	3.38%	SECONDARY SCHOOL
500	10 ^a (178) ^b	5 (126)	2.5 (89)	12 ^c	30	80	110	30	45	11	17				
10 ³ =1000	20 (252)	10 (178)	5 (126)	23	60	160	220	60	90	23	34				
5000	100 (564)	50 (399)	25 (282)	115	300	800	1100	300	450	112	169				
10 ⁴ =10000	200 (798)	100 (564)	50 (399)	230	600	1600	2200	600	900	225	338				
50000	1000 (1784)	500 (1261)	250 (892)	1150	3000	8000	11000	3000	4500	1125	1690				
10 ⁵ =100000	2000 (2523)	1000 (1784)	500 (1261)	2300	6000	16000	22000	6000	9000	2250	3380				

Notes: a. Land Area for Group Population in Hectares.
b. Service Radius in m.
c. School Enrollment

The table indicates that a population of 10^{3a} (i.e. an a-multiple of population group 10³) provides a normally acceptable range of elementary school enrollment per school when the value of a is between 2.5 and 5, and the resulting elementary school enrollment (160a to 220a) is 400 to 1100. In this case the service area (20a to 5a) is 100 ha to 12.5 ha, and its radius from the center to the edge is 600m to 200m (for densities between 50 pph and 200 pph) which is equivalent to 10 to 3 minute walking distance. If one elementary school (if boys' and girls' schools are counted separately, then two schools) is located in this territory then both the number of enrollment per school and the walking distance to the school are acceptable to the standards recommended.

The table also indicates that a population of 10^{4b} (i.e. a b-multiple of population group 10⁴) provides a normally acceptable range of intermediate school students per school when the

value of b is between 1 and 2, and the resulting intermediate school enrollment (600b to 900b) is 600 to 1800. In this case the service area (200b to 50b) is 400 ha to 50 ha, and its service radius is 1200m to 400m (for the densities between 50 pph and 200 pph) which is equivalent to 20 minute to 6 minute walking distance. If one set of boys' and girls' intermediate schools is located in this territory then both the number of enrollment per school and the walking distance to the school are within the acceptable range of the standards recommended.

The table also shows that a population of 10^{4b} (i.e. a c-multiple of population group 10⁴) provides a normally acceptable range of secondary school enrollment per school when the value of c is between 2 to 4, and the resulting enrollment (225c to 338c) is 450 to 1352. In this case, the service area (200c to 50c) is 800 ha to 100 ha and the service radius is 1600m to 560m (for the densities between 50 pph to 200 pph) which is equivalent to 25 to 8 minute walking distance. If one set of boys' and girls' secondary school is located in this territory then both the number of enrollment per school and the distance to the school are acceptable to the standards recommended.

- From these findings, the following observations may be made for the densities and population characteristics of the cities in the region:
1. Elementary School oriented territory includes a population of 2,500 to 5,000 (3,750 represents the range as typical).
 2. Intermediate School oriented territory includes a population of 10,000 to 20,000 (15,000 represents the range as typical).
 3. Secondary School oriented territory includes a population of 20,000 to 40,000 (30,000 represents the range as typical).

Obviously the standards recommended are not so restrictive as to exclude possibilities other than those listed above. However, the range definition is justifiable not only because of the acceptability of the key standard elements normally used by the consultant but also because of the convenience in establishing a hierarchical order of population grouping. As mentioned in A-1-1 of this section, the grouping of population with order of 10³ is conventionally called "Neighborhood" and the grouping of population with order of 10⁴ is called "Community". The elementary school oriented territory defined above corresponds to a "Neighborhood" and the intermediate and secondary school oriented territories correspond to a "Community". Taking

Enrollment: Close to 100% of age group population is enrolled. 8% to 11% of the total population is enrolled (boys' school). Ministry of Education Standards (M. E. Standards) indicates that 10% of the total population is equal to the expected enrollment for boys' elementary school.

Population Served: 3,750, say 4,000, is recommended. 2,500 to 5,000 is acceptable. (Even a further deviation may be acceptable with good planning reasons.)

Size of Facility: 375 enrollment (boys only) is recommended. 200 to 550 is acceptable. (M. E. Standards indicate 450 pupils/school = 30 pupils/classroom x 15 classrooms.)

Radius of Area Served: Maximum of 300m (i.e. 5 minute walking distance), 600m (10 minute) is also acceptable. If density is less than 50 pph, and a school bus system is developed, then further expansion of the radius is also acceptable.

Sub-Unit: 30 pupils/class is recommended. 20 - 40 pupil/class is also acceptable. (M. E. Standards indicate 30 pupils/class and 15 classes/school.)

Land Area Requirement: 12m²/student is recommended for building and site area.* (12m²/student x 375 student = 0.5 ha) plus 400m² for play area for lower grades exterior activity is recommended. Playground for upper grade athletic program is located either in, or close to, the school site. Playground standard is given later. Minimum width of site is 80m. But less than 80m is also acceptable if accompanied by an acceptable layout plan. (M. E. Standards recommend 100m x 100m site; 80m x 95m as minimum.)

Floor Area: 4.5m²/student, i.e. 1700m²/375 student is recommended. 3m² to 6m²/student is also acceptable depending on the degree of programs for non-classroom facilities such as library, special purpose rooms and indoor athletic play facilities.

Location: It should be situated in the center of grouping Level 2, i.e. "Neighborhood). It should be accessible by footpath from residential areas not interrupted by major auto traffic, even by the distributor roads. It should be separated from the girls' school.

NOTE: * School "building and site" area is the area within which school buildings, access drive-way, drop-off, parking areas, court and gardens, landscaped areas and other ancillary facilities are located. Athletic play ground (or play field) and formal paved play area are excluded from the "building and site" area.

Other Requirement: Playground should be a part of or close to the school. Elementary schools should be integrated with neighborhood shopping and neighborhood cultural facilities to create a multi-activity "neighborhood center". Play area of the school should be fenced from the street.

A-2-1-3 ELEMENTARY SCHOOL FOR GIRLS

Age of population, population served, radius of area served and sub-units are the same as boys' schools. Locational requirements are similar to those of boys' elementary school. Site area for girls' elementary school is slightly small at present (M. E. Standards indicate a minimum site of 80m x 70m) and the rate of enrollment is also smaller than the rate for boys. The consultant, however, hesitates to recommend any smaller or lesser standards to girls' schools than boys' schools because of the urgent and strong necessity for girls' education in the kingdom.

A-2-1-4 INTERMEDIATE SCHOOL FOR BOYS

Age of Student: 12 through 14 (3.0 to 4.5% of total population; boys only)

Enrollment: Close to 100% of age group population is enrolled, therefore 3.0% to 4.5% of the total population is enrolled (boys). Although M. E. Standards indicate that 5% of the total population is to be enrolled for boys intermediate schools.

Population Served: 15,000 is recommended. 10,000 to 20,000 is also accepted. (Even wider range is accepted if good planning reasons exist.)

Size of Facility: 600 enrollment per school (boys) is recommended. 300 to 900 enrollment per school is also acceptable. (M. E. Standards indicate 30 students/class x 15 classes/school = 450 student/school.)

Radius of Area Served: Maximum 1200m (20 minute walking distance) is recommended. Larger radius is also accepted if density is less than 50 pph. In this case the acceptability standard should be provided on a case by case basis.

Sub-Unit: 25 to 30 students/class or homeroom (M. E. Standards recommend 30 students/classroom and 15 classrooms/school.)

Land Area Requirement: 20m²/student is recommended for the building and ground area. (20m²/student x 600 students = 1.2 ha) plus playfield which is either inside

be enrolled in the secondary school (instead of 50% for boys). 30% of age group means 0.9% to 3.16% of the total population is enrolled in a girls' secondary school.

A-2-1-8 TEACHERS' SCHOOL

Age of Student: Varies

Enrollment and Size of Faculty: M. E. Standards recommend 30 students/class x 24 classrooms/school = 720 students/school.

Population Served/Radius of Area Served: One Teachers' School for each city with population over 20,000.

Sub-Unit: 25 to 30 students/class.

Land Area Requirement: 30m²/student (2.1ha/720 students) (M.E. Standards require 100m x 100m for building and site area)

Floor Area Requirement: 8m²/student

Location: Directly accessible from the town center or from an arterial road leading to the town center.

Other Requirement: When college is established, the Teachers' School can be absorbed into it. Athletic field should be easily accessible.

A-2-1-9 TECHNICAL SCHOOL

Age of Student: Varies but over 15.

Enrollment and Size of Faculty: M. E. Standards recommend 30 students/class x 24 classes/school = 720 students/school.

Population Served/Radius of Area Served: One technical school for each city with population of 20,000 or more.

Sub-Units: 25 to 30 students/class.

Land Area Requirement: 30m²/student (2.1ha/720 students.)

Floor Area Requirement: 8m²/student. (M. E. Standards require 100m x 110m for building and site area)

Location: Directly accessible to the town center or accessible from an arterial road leading to the town center.

A-2-1-10 TECHNICAL SCHOOL FOR GIRLS INCLUDING SEWING LEARNING PROGRAM

Age of Student: Varies but over 15.

Population Served/Radius of Area Served: One female technical school for each city with population of 20,000 or more.

Land Area Requirement: 1 ha recommended. Minimum 80m x 70m.

Floor Area Requirement: 7m²/student.

Location: Accessible from the city center or from an arterial road leading to the center.

A-2-1-11 COLLEGES

Age of Student: 18 to 21 or 18 to 19.

Population Served: The first college at Abha by 1980. By 1995, Jizan, Khamis Mushayt and Najran will also have one college each.

Size of Facility: Average size of 1,000 students.

Land Area Requirement: 100m²/student to 50m²/student.

Floor Area Requirement: 15m²/student excluding dormitory facilities. (If dormitory is needed then 25m²/dormitory resident is additionally needed.)

Location: Accessible from the city center through arterial road. Locate as closely as possible to the city's central cultural area so that cultural-educational facility of the college is shared by the community.

A-2-1-12 SPECIAL COLLEGE

Age of Student: 18 to 21 or 18 to 19.

Population Served: The first special college (for medicine, agriculture and engineering) at Abha by 1995 serving the regional population.

Size of Facility: Average size of 600.

Other Requirement: Connected to major neighborhood level facilities (such as elementary school, neighborhood shopping, small mosque, etc.) by footpath without crossing major traffic. Park itself could be stretched along such a path to create a linear park along which neighborhood facilities can be clustered. Trees, green areas, seating areas with benches and paved paths should be provided. Recreational adult swimming pool with ancillary facilities may be provided.

A-2-2-4 PLAYGROUND

Main Population Served: Primarily elementary school children at school time. Secondly other inhabitants at off-school-hours and weekends.

Main Function: Active play and game for elementary school athletic programs.

Size of Population Served: 3,750, say 4,000, is recommended. 2,500 to 5,000 is acceptable. 750 children (400 to 1,100 in range) per playground are expected, of which half are boys. Boys' and girls' playground are separated and each should be located in or close to the school.

Radius of Area Served: Maximum of 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute walking distance) is also acceptable. When density is less than 50 pph, longer service radius is acceptable if safe and pleasant access to the playground is provided.

Land Area Requirement: 20m²/elementary school student is recommended. 10m² to 30m²/elem. school student is acceptable.

Location: Situated at the center of the "Neighborhood" (See "Elementary School Standards"). Situated in convenient proximity to both boys' and girls' elementary schools.

Other Requirement: Designed as an integral part of an elementary school. Connected to the elementary school and residential zone on footpath crossing no major traffic. Off-school time usage by the adult population is recommended and elementary school utilities such as water-drinking and toilet should be available for those adults. Enough pavement space should be provided for medium size sports activities such as basketball, tennis, etc. Childrens' pool, fenced and equipped with locker room and shower can be provided as a part of the playground program or a part of school program.

A-2-2-5 COMMUNITY PARK OR SMALL CITY PARK

Population Served: All residents of the "Community" whose population range is 20,000 to 40,000 (30,000 as average).

Main Function: Passive recreation on a weekly to monthly participation basis (not daily use) to be integrated with cultural, religious facilities. It also functions as a linear connector of "Community" level facilities.

Size of Population Served: 30,000 is recommended. 20,000 to 40,000 is acceptable.

Radius of Area Served: Maximum 1000m (15 minute walking distance) is recommended. 1600m (20 minute) is also acceptable. When density is less than 50 pph, longer service radius may be acceptable if the park penetrates into the residential zones as a linear park to provide safe and pleasant footpath to the center of the park.

Land Area Requirement: 4m²/inhabitant is recommended. 2m² to 6m²/inhabitant is acceptable.

Location: Situated in the center of a "Community" whose population range is 20,000 to 40,000. It should be located between two sub-community centers in order to connect them and to create a park-open space spine in the middle of which the "Community" center is located.

Other Requirement: Fruit trees or agricultural land use could be used as a part of community park function since a part of the function is as visual relief or visual buffer between two adjacent subcommunities. Where community park comes in contact with community commercial (or shopping) area, the park design should reflect an "urban park" where extensive pavement and landscaping are concentrated in a limited area.

A-2-2-6 PLAYFIELD - LEVEL 1

Main Population Served: Primarily for intermediate school students at school hour; secondarily, for other inhabitants in the "Sub-Community" at off-school-hours or weekends.

Main Function: For athletic curriculum activities of intermediate schools (boys and girls). Practice field for "Sub-Community" sports club or sports team activity.

...the standards to be applied in the development of the city plan... the standards to be applied in the development of the city plan... the standards to be applied in the development of the city plan...

It should also be noted that the standard population increase for each city is set at an average and that the standard is expected to be met by the city of each year... the standards to be applied in the development of the city plan...

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The standards for each city... the standards to be applied in the development of the city plan... the standards to be applied in the development of the city plan...

appendix: community planning standards

Table 1-1
COMMUNITY PLANNING STANDARDS

Year	Population	Area
1950	10,000	100
1955	15,000	150
1960	20,000	200
1965	25,000	250
1970	30,000	300
1975	35,000	350
1980	40,000	400

...the standards to be applied in the development of the city plan... the standards to be applied in the development of the city plan...

APPENDIX: COMMUNITY PLANNING STANDARDS

APPENDIX: COMMUNITY PLANNING STANDARDS

Planning standards and community facility design criteria are studied and summarized in this chapter. They are given here as a set of guidelines for facility planning and community grouping strategy. Obviously planning standards should vary from one locality to another reflecting different local needs and conditions. Standards should also vary from one state to the next in the development process reflecting the different constraints of each stage of development. Meanwhile standards applicable to relatively wide ranges of situations are also needed before a locally specific set of standards is created. The general standards are needed to determine or reflect policies for the region or areas covering more than one city. The study here was intended to create a set of standards with ranges wide enough to reflect all of the five cities' situations yet narrow enough to function as a guideline for the relatively detailed community planning. The standards provide recommended rigid target figures as well as their acceptable ranges providing strong guidelines whenever needed, as well as flexibility to adapt to local conditions. The standards are based on our understanding of the planning area and our general knowledge and philosophy gained through experience in other projects.

The standards for most items (such as service radius, population served and required land) depend on residential density and overall population size. In the first section of this appendix, the characteristics of population and its density are summarized for the five cities for both existing and future situations, providing the basic background reasons for the range of standards and the population grouping described in the later sections. In the second section, planning standards are described for each type of facility. They contain, as mentioned above, the recommended target numbers and their acceptable ranges. The third section presents a hypothetical example of a city of 60,000 and the distribution of land uses required.

A-1 DEMOGRAPHIC AND DENSITY FRAME FOR STANDARDS

A-1-1 OVERALL POPULATION SIZE

Table A-1-1 shows population of five cities in 1975 and 1995. In 1995 each of five cities has population of somewhere between 20,000 to 70,000. The planning standards to be described

should reflect this fact. The standard is to be applied not to the large city of population over 100,000 nor is to be applied to the small rural village of population less than 10,000. The standard here, therefore, should cover mainly the population group scale of normally called "neighborhood" scale (population of order of 10^4) and normally called "community" scale (population of order of 10^5). The population group scale normally called "region" (population of order of 10^6) should also be discussed but the former two scales should be given more emphasis.

It should also be noted that the expected population increase for each city is over 100% in average and some city like Bishah is expected to grow over 200%. In this kind of rapid growth usually the protection of group privacy becomes seriously difficult due to the fact that, for example, the once quiet residential neighborhood is bisected by the traffic which should belong to such higher level of grouping order than neighborhood or it is exposed to the regional traffic with unacceptable proximity without any buffer. The standard should cover the problem related to this matter i.e. standards for buffer zone, street hierarchy and group privacy dealing with the rapid growth of the cities.

Table A-1-1
SURVEY POPULATION^a 1975 and 1995

	1975 ^b	1995 ^c	Increase
Abha	21,900	66,000	205%
Khaila Musayt	29,300	85,000	190%
Najran	27,200	59,000	120%
Jizan	22,200	41,000	80%
Bishah	7,900	23,000	190%
Nines Village Cluster	7,100	11,640	64%

- Notes: a. Population for KTU survey area only (not necessarily represent "city population")
 b. Southern Region Project Study, Existing Conditions survey Master Plans.
 c. Southern Region Project Study, KTU estimate, in the area inside of KTU socio-economic survey area.

A-1-2 POPULATION DENSITY

Table A-1-2 (a) summarizes the 1975 and 1995 population densities for the five cities. The Table indicates that density is low in overall city area in 1975 and therefore, in the next twenty years "in-fill" type of development is possible and recommended rather than "sprawl" type of development. The planning standards should reflect this fact. Unnecessarily low density developments in the central area should be discouraged or prohibited through these standards.

From Table A-1-2(a), following approximations are made:

1. Each city as a whole has a density of 10 pph (person per hectare) to 40 pph in 1975, and estimated density in 1995 is somewhere between 20 and 120 pph.
2. Each city's central district (approximately 100 to 200 ha area) has a density of 50 to 150 pph.
3. Each city's highest density zone (approximately 10 to 40 ha area) has a density of 100 to 200 pph.

It is also assumed that the central district density will increase from 50 to 75% and the density of a city's highest density zone may increase up to 200 pph due to the limited availability of land and of the peripheral area. If no renewal is done, no density increase is expected in the central zone. The standards should be written with a wide enough range to enable planning within the density ranges listed.

Table A-1-2(b) summarizes the density range used for the determination of planning standards.

A-1-3 SCHOOL AGE GROUP DISTRIBUTION

Table A-1-3(a) shows the per cent share per age of children in the total population. The numbers are based on the results of the 1975 5% Sample Survey. From this table it is apparent that there are 3 to 4 (3.01 to 4.20, to be exact) children per age per 100 population for the age group 0 to 9, and there are 2 to 2.5 (1.95 to 2.69, to be exact) children per age per 100 population for the age group 10 to 19. An analysis of the existing conditions indicates that the population pyramids in the cities of the Southern Region do not have normal, stabilized characteristics due to a lack of working age population. In a normal and growing population, approximately 3% and 2.5% of the total population are estimated for the age group of 0 to 9 and 10 to 19, respectively.

Presently larger numbers of children exist in

**Table A-1-2(a)
POPULATION DENSITY 1975 and 1995 (pph)^a**

	CITY AVERAGE		CENTRAL DISTRICT		HIGHEST DENSITY ZONE	
	1975	1995	1975	1995	1975	1995
Abha	20 (1100 HA)	60	50 (150 HA)	150	150 (10 HA)	200+
Khamis Mushayt	40 (720 HA)	120	100 (230 HA)	150	200 (10 HA)	200+
Najran	10 (3400 HA)	20	100 (70 HA)	150	100 (40 HA)	200+
Jizan	40 (500 HA)	80	150 (100 HA)	150	200 (10 HA)	200+
Bishah	20 (470 HA)	60	50 (100 HA)	150	100 (20 HA)	200+

Note: a. From Southern Region Study, Existing Conditions. The nearest multiple of 10 and 50 in "City Average" column and other columns respectively. City areas are defined as the 5% sample survey areas.

**Table A-1-2(b)
APPLICABLE DENSITY RANGE FOR PLANNING STANDARDS**

	DENSITY RANGE (pph)	EXAMPLE
Low Density	Up to 50	1975 City Average
Low-Medium Density	50 to 100	1975 Central District 1995 City Average
Medium Density	100 to 200	1975 Highest Density Zone 1995 Central District
High Density	200 and up	1995 Highest Density Zone

these five cities than in normal cities. In the future, this deviation may be reduced by regaining working age populations back to these cities. Table A-1-3(a) indicates the range of children population taken into consideration in the determination of the standards.

Analysis of the existing distribution of the numbers of boys and girls indicates that boys and girls number basically the same for each age group, and the standards do not need to differentiate between the two, although ratio of school enrollment may differ between the sexes.

Table A-1-3(a)
POPULATION OF AGE GROUP 0 TO 19 IN THE FIVE CITIES^a
NUMBER OF CHILDREN PER AGE OUT OF 100 POPULATION
EXISTING CONDITIONS IN THE FIVE CITIES

AGE GROUP	ABNA	BISHAN	JIZAN	RIHANI MISHAYT	NAJMAN	AVERAGE	RANGE
0 TO 9	3.5	3.9	3.0	3.9	4.0	3.7	3.0
10 TO 19	2.3	2.6	2.7	2.0	2.1	2.5	2.5

NOTE: a. Southern Region Project Study, Existing Conditions

Table A-1-3(b)
APPLICABLE RANGE OF CHILDREN POPULATION FOR PLANNING STANDARDS

AGE GROUP	NUMBER OF CHILDREN OUT OF 100 POPULATION
0 TO 9	3 TO 4 Children/age
10 TO 19	2 TO 3 Children/age

Based on the Table A-1-3(b), Nursery-Kindergarten enrollment is desired as following:
If Nursery-Kindergarten (ages 3 to 5) enrollment is 25 or 50% of the total population of that age group, the enrollment may be calculated to be between 2.25% and 6.0% of the total population as shown below:

	25% ENROLLMENT	50% ENROLLMENT
3% per age x 3 ages = 9%	9% x 25% = 2.25%	9% x 50% = 4.5%
4% per age x 3 ages = 12%	12% x 25% = 3.0%	12% x 50% = 6.0%

Also based on the Table A-1-3(b), Elementary School enrollment is derived as following:
Elementary School age group is 6 through 11 and the enrollment rate should be very close to 100% for both boys and girls. Therefore 16% to 22% of the total population may be estimated for elementary school enrollment (total of boys and girls) as shown in the following calculation:

$$20/\text{Age} \times 4 \text{ ages (6,7,8 and 9)} + 25/\text{Age} \times 2 \text{ ages (10,11)} = 16\%$$

$$45/\text{Age} \times 4 \text{ ages (6,7,8 and 9)} + 35/\text{Age} \times 2 \text{ ages (10,11)} = 22\%$$

Intermediate School age group is 12 through 14, and close to 100% of the age group population should be enrolled. Intermediate school enrollment thus is estimated to be somewhere between 6% and 9% (total of boys and girls) of the total population (See below):

$$25/\text{Age} \times 3 \text{ ages (12,13 and 14)} = 6\%$$

$$35/\text{Age} \times 3 \text{ ages (12,13 and 14)} = 9\%$$

For secondary schools, enrollment in 1996 is assumed to be somewhere around 37.5% of the age group population (15,16 and 17). Secondary school enrollment is expected to be somewhere between 2.25% and 3.38% of the total population.

$$25/\text{Age} \times 3 \text{ ages (15,16 and 17)} \times 37.5\% = 2.25\%$$

$$35/\text{Age} \times 3 \text{ ages (15,16 and 17)} \times 37.5\% = 3.38\%$$

A-1-4 SUMMARY OF DEMOGRAPHIC AND DENSITY FRAMEWORKS

The key elements to be taken into consideration of planning standards which have been discussed individually, are analyzed in a combined way. Table A-1-4 shows potential population grouping on the left hand side, density and enrollment ranges across the top, and the combined implications on the contents of the table. The combined implications are in terms of land area requirements for each population group, service radii, and school enrollments.

Table A-1-4
SUMMARY OF POPULATION GROUP, DENSITY, AND ENROLLMENT

POPULATION GROUP RANGE	DENSITY RANGE		RANGE OF ENROLLMENT								
	50pph	100pph	200pph	NURSERY KINDERGARTEN	2.25% 6.0%	16.0% 22.0%	INTERMEDIATE SCHOOL	6.0% 9.0%	2.25% 3.38%	SECONDARY SCHOOL	
10 ³	10 ^a (178) ^b	5 (126)	2.5 (89)	12 ^c	30	80	110	30	45	11	17
10 ³ =1000	20 (252)	10 (178)	5 (126)	23	60	160	220	60	90	23	34
5000	100 (564)	50 (399)	25 (282)	115	300	800	1100	300	450	112	169
10 ⁴ =10000	200 (798)	100 (564)	50 (399)	230	600	1600	2200	600	900	225	338
50000	1000 (1784)	500 (1261)	250 (892)	1150	3000	8000	11000	3000	4500	1125	1690
10 ⁵ =100000	2000 (2523)	1000 (1784)	500 (1261)	2300	6000	16000	22000	6000	9000	2250	3380

Notes: a. Land Area for Group Population in Hectares.
b. Service Radius in m.
c. School Enrollment

The table indicates that a population of 10^{3a} (i.e. an a-multiple of population group 10³) provides a normally acceptable range of elementary school enrollment per school when the value of a is between 2.5 and 5, and the resulting elementary school enrollment (160a to 220a) is 400 to 1100. In this case the service area (20a to 5a) is 100 ha to 12.5 ha, and its radius from the center to the edge is 600m to 200m (for densities between 50 pph and 200 pph) which is equivalent to 10 to 3 minute walking distance. If one elementary school (if boys' and girls' schools are counted separately, then two schools) is located in this territory then both the number of enrollment per school and the walking distance to the school are acceptable to the standards recommended.

The table also indicates that a population of 10^{4b} (i.e. a b-multiple of population group 10⁴) provides a normally acceptable range of intermediate school students per school when the

value of b is between 1 and 2, and the resulting intermediate school enrollment (600b to 900b) is 600 to 1800. In this case the service area (200b to 50b) is 400 ha to 50 ha, and its service radius is 1200m to 400m (for the densities between 50 pph and 200 pph) which is equivalent to 20 minute to 6 minute walking distance. If one set of boys' and girls' intermediate schools is located in this territory then both the number of enrollment per school and the walking distance to the school are within the acceptable range of the standards recommended.

The table also shows that a population of 10^{4b} (i.e. a c-multiple of population group 10⁴) provides a normally acceptable range of secondary school enrollment per school when the value of c is between 2 to 4, and the resulting enrollment (225c to 338c) is 450 to 1352. In this case, the service area (200c to 50c) is 800 ha to 100 ha and the service radius is 1600m to 560m (for the densities between 50 pph to 200 pph) which is equivalent to 25 to 8 minute walking distance. If one set of boys' and girls' secondary school is located in this territory then both the number of enrollment per school and the distance to the school are acceptable to the standards recommended.

From these findings, the following observations may be made for the densities and population characteristics of the cities in the region:

1. Elementary School oriented territory includes a population of 2,500 to 5,000 (3,750 represents the range as typical).
2. Intermediate School oriented territory includes a population of 10,000 to 20,000 (15,000 represents the range as typical).
3. Secondary School oriented territory includes a population of 20,000 to 40,000 (30,000 represents the range as typical).

Obviously the standards recommended are not so restrictive as to exclude possibilities other than those listed above. However, the range definition is justifiable not only because of the acceptability of the key standard elements normally used by the consultant but also because of the convenience in establishing a hierarchical order of population grouping. As mentioned in A-1-1 of this section, the grouping of population with order of 10³ is conventionally called "Neighborhood" and the grouping of population with order of 10⁴ is called "Community". The elementary school oriented territory defined above corresponds to a "Neighborhood" and the intermediate and secondary school oriented territories correspond to a "Community". Taking

	of the school site or closely located to it. (See "Standards for Playfield" - Level 1.) Minimum width of site is 80m with an acceptable building layout plan. (M. E. Standards recommend 100m x 100m but not less than 60m x 90m.)	Size of Facility:	600 enrollment per school (300 to 900) is recommended while the enrollment assumptions described above. (M. E. Standards indicate 30 students/classroom x 18 classrooms/school = 480 students/school.)
Floor Area Requirement:	6.5m ² /student, i.e. 3900m ² /600 students, is recommended. 8m ² /student to 9m ² /student is also acceptable depending on the degree of non-classroom facility (library, indoor sports) program.	Radius of Area Served:	Maximum 1600m (25 minute walking distance) is recommended. Larger radius is also acceptable if density is less than 50 spm. In this case the acceptability standard should be provided on a case by case basis.
Location:	It should be situated in the center of grouping Level 3, i.e., "Sub-Community". It should be accessible either by footpath, lanes, alleys (V7), local access street (V6) or distributor road (V5) with sidewalks (See definition of V7 through V5 in the "Road Standard" section). It should be separated from girls' school.	Sub-unit:	25 to 30 student/class (M. E. Standards recommend 30 students/class and 18 classes/school.)
Other Requirements:	Playfield - Level 1 should be a part of or close to the school; it shall be used for intermediate school curriculum and also by the neighboring population for weekend and off-working-hour sports activities.	Land Area Requirement:	25m ² /student is recommended for building and ground area (25m ² /student x 600 student = 1.5 ha). In addition to the building, the playfield should be provided next to or close to the school. (See "Standards for Playfield" - Level 2.) Minimum width of site is 90m, but it could be less than that if acceptable building layout plans are provided. (M. E. Standards recommend 100m x 100m but not less than 90m x 110m.)
A-2-1-5 INTERMEDIATE SCHOOL FOR GIRLS	Age of population, population served, radius of area served, and sub-unit standards are the same as intermediate school for boys. Although the standards for girls' school are inferior at the moment, it is recommended that 100% enrollment up to intermediate school be mandatory not only for boys but also for girls. From this view point the standards for girls' school should be basically identical.	Floor Area Requirement:	7m ² /student, i.e. 4200m ² /600 students is recommended. 6m ² /student to 8m ² /student is also acceptable depending on the degree of provision of non-classroom facility (such as indoor athletic facilities) program.
		Location:	It should be situated in the center of grouping Level 4, i.e. "Community". It should be accessible by either footpath, lanes, alleys (V7), local access street (V6), distributor road (V5) or minor collector road (V4). It should not be directly accessible from the residential area through arterial road (V2 or V1). (See section on "Road Standard" for the definition of V7 through V1.) It should be separated from secondary schools for girls.
A-2-1-6 SECONDARY SCHOOL FOR BOYS	Age of Student:	Other Requirements:	Playfield - Level 2 should be a part of or close to the school. It shall be used by secondary school curriculum by the neighboring population of "Community" for weekend and off-working-hour sports activities.
	15 through 17 (3 to 4.5% of total population; boys only).		
Enrollment Assumptions:	37.5% of the age group served is assumed to be enrolled (boys enrollment is assumed 50%, girls' enrollment is assumed 30%). Therefore, 1.5% to 2.25% of total population is assumed to be enrolled for boys' secondary schools. M. E. Standards estimate that 2.5% of total population is enrolled for boys' secondary schools.	A-2-1-7 SECONDARY SCHOOL FOR GIRLS	Age of population, population served, radius of area served and sub-unit standards are the same as those of secondary school for boys. Enrollment assumptions should be lower than the case for boys. The enrollment of girl students should in the future go higher and eventually as high as the boys. For the present planning purposes, it is assumed that 30% of the girls' will
Population Served:	30,000 is recommended. 20,000 to 40,000 is also acceptable. (Even wider range is acceptable if good reasons exist.)		

Enrollment: Close to 100% of age group population is enrolled. 8% to 11% of the total population is enrolled (boys' school). Ministry of Education Standards (M. E. Standards) indicates that 10% of the total population is equal to the expected enrollment for boys' elementary school.

Population Served: 3,750, say 4,000, is recommended. 2,500 to 5,000 is acceptable. (Even a further deviation may be acceptable with good planning reasons.)

Size of Facility: 375 enrollment (boys only) is recommended. 200 to 550 is acceptable. (M. E. Standards indicate 450 pupils/school = 30 pupils/classroom x 15 classrooms.)

Radius of Area Served: Maximum of 300m (i.e. 5 minute walking distance) 600m (10 minute) is also acceptable. If density is less than 50 pph, and a school bus system is developed, then further expansion of the radius is also acceptable.

Sub-Unit: 30 pupils/class is recommended. 20 - 40 pupil/class is also acceptable. (M. E. Standards indicate 30 pupils/class and 15 classes/school.)

Land Area Requirement: 12m²/student is recommended for building and site area.* (12m²/student x 375 student = 0.5 ha) plus 400m² for play area for lower grades exterior activity is recommended. Playground for upper grade athletic program is located either in, or close to, the school site. Playground standard is given later. Minimum width of site is 80m. But less than 80m is also acceptable if accompanied by an acceptable layout plan. (M. E. Standards recommend 100m x 100m site; 80m x 95m as minimum.)

Floor Area: 4.5m²/student, i.e. 1700m²/375 student is recommended. 3m² to 6m²/student is also acceptable depending on the degree of programs for non-classroom facilities such as library, special purpose rooms and indoor athletic play facilities.

Location: It should be situated in the center of grouping Level 2, i.e. "Neighborhood). It should be accessible by footpath from residential areas not interrupted by major auto traffic, even by the distributor roads. It should be separated from the girls' school.

NOTE: * School "building and site" area is the area within which school buildings, access drive-way, drop-off, parking areas, court and gardens, landscaped areas and other ancillary facilities are located. Athletic play ground (or play field) and formal paved play area are excluded from the "building and site" area.

Other Requirement: Playground should be a part of or close to the school. Elementary schools should be integrated with neighborhood shopping and neighborhood cultural facilities to create a multi-activity "Neighborhood center". Play area of the school should be fenced from the street.

A-2-1-3 ELEMENTARY SCHOOL FOR GIRLS

Age of population, population served, radius of area served and sub-units are the same as boys' schools. Locational requirements are similar to those of boys' elementary school. Site area for girls' elementary school is slightly small at present (M. E. Standards indicate a minimum site of 80m x 70m) and the rate of enrollment is also smaller than the rate for boys. The consultant, however, hesitates to recommend any smaller or lesser standards to girls' schools than boys' schools because of the urgent and strong necessity for girls' education in the kingdom.

A-2-1-4 INTERMEDIATE SCHOOL FOR BOYS

Age of Student: 12 through 14 (3.0 to 4.5% of total population; boys only)

Enrollment: Close to 100% of age group population is enrolled, therefore 3.0% to 4.5% of the total population is enrolled (boys). Although M. E. Standards indicate that 5% of the total population is to be enrolled for boys intermediate schools.

Population Served: 15,000 is recommended. 10,000 to 20,000 is also accepted. (Even wider range is accepted if good planning reasons exist.)

Size of Facility: 600 enrollment per school (boys) is recommended. 300 to 900 enrollment per school is also acceptable. (M. E. Standards indicate 30 students/class x 15 classes/school = 450 student/school.)

Radius of Area Served: Maximum 1200m (20 minute walking distance) is recommended. Larger radius is also accepted if density is less than 50 pph. In this case the acceptability standard should be provided on a case by case basis.

Sub-Unit: 25 to 30 students/class or homeroom (M. E. Standards recommend 30 students/classroom and 15 classrooms/school.)

Land Area Requirement: 20m²/student is recommended for the building and ground area. (20m²/student x 600 students = 1.2 ha) plus playfield which is either inside

Land Area Requirement:	100m ² /student excluding dormitory facilities.		
Location:	Located on regional arterial road or major arterial road connecting to and situated close to the city center.	Main Function:	For nursery-kindergarten outdoor play or for organized group play for pre-school children.
A-2-2 PLANNING STANDARDS FOR RECREATIONAL AND ATHLETIC FACILITIES		Size of Population Served:	Approximately 1,000 inhabitants. 2.25% to 6% of the total population is enrolled in the nursery-kindergarten (See "Standards for Nursery-Kindergarten" in the previous section).
A-2-2-1 TOT-LOT		Radius of Area Served:	Maximum 200m (3 minute walking distance) is recommended. 300m (5 minute walking distance) is also acceptable if density is less than 50 pph.
Main Population:	Pre-school children 2 years old to 5 years old and their supervising adults (mothers).	Land Area Requirement:	200m ² is recommended. 100m ² to 300m ² is also acceptable.
Main function:	Infants' exterior play, supervising adults' seating, conversation, and evening stroll.	Location:	Situated in the center of "Sub-Neighborhood" (See "Nursery-Kindergarten Standards".)
Size of Population Served:	Approximately 250. 1% to 16% of the total population, i.e. 30 to 40 is in open 2 through 5.	Other Requirement:	Integral part of kindergarten design. Footpath connection to surrounding small scale lots should be provided. Should not be bordered by major traffic. If bordered by any auto traffic, fences should be provided. Play pool for children may be included.
Radius of Area Served:	Maximum 120m (2 minute walking distance) is recommended. If density is less than 50 pph, 30m (5 minute walking distance) is acceptable.		
Land Area Requirement:	50m ² /lot is recommended. 30m ² to 100m ² /lot is also acceptable.	A-2-2-3 NEIGHBORHOOD PARK	
Location:	Situated in the center of each residential group unit (or grouping level) of G ₀ as defined in A-1-4) directly accessible from each unit without crossing any street or preferably even group parking spaces or access lanes. It should be bordered by residential units or pedestrian activities but not by parking or streets.	Population Served:	All inhabitants in the "Neighborhood", all age groups.
Other Requirement:	Infant play area and seating area should be arranged in such a way as to enable adult surveillance over the infants at play. Enough planting and shaded area should be provided. Play area should be visible from as many dwelling units as possible for the adults in house to survey their children at play in the tot-lot. Connected to the nearest nursery-kindergarten playlet by footpath through narrow but well controlled exit point.	Main Function:	General recreation. Preservation of natural environment in the neighborhood. Common garden for neighborhood residents.
		Size of Population Served:	3,750, say 4,000, is recommended. 2,500 to 5,000 is accepted.
		Radius of Area Served:	Maximum 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minutes) is also acceptable. If density is less than 50 pph and access path to the park is designed over a long distance and properly separated from auto traffic, then radius may be extended.
		Land Area Requirement:	5m ² /inhabitant is recommended; 3m ² to 10m ² /inhabitant is also acceptable.
		Location:	Situated in the center of "Neighborhood" (grouping level) G ₀ . Should not be surrounded or bordered by major traffic (street classification of "collector road" or higher).
A-2-2-2 NURSERY-KINDERGARTEN PLOT			
Main Population Served:	3 to 5 year old children enrolled in nursery-kindergarten. It also serves surrounding infants, accompanied by adults, and lower grade elementary school children during off-school hours.		

be enrolled in the secondary school (instead of 50% for boys). 30% of age group means 0.9% to 3.16% of the total population is enrolled in a girls' secondary school.

A-2-1-8 TEACHERS' SCHOOL

Age of Student:	Varies
Enrollment and Size of Faculty:	M. E. Standards recommend 30 students/class x 24 classrooms/school = 720 students/school.
Population Served/Radius of Area Served:	One Teachers' School for each city with population over 20,000.
Sub-Unit:	25 to 30 students/class.
Land Area Requirement:	30m ² /student (2.1ha/720 students) (M.E. Standards require 100m x 100m for building and site area)
Floor Area Requirement:	8m ² /student
Location:	Directly accessible from the town center or from an arterial road leading to the town center.
Other Requirement:	When college is established, the Teachers' School can be absorbed into it. Athletic field should be easily accessible.

A-2-1-9 TECHNICAL SCHOOL

Age of Student:	Varies but over 15.
Enrollment and Size of Facility:	M. E. Standards recommend 30 students/class x 24 classes/school = 720 students/school.
Population Served/Radius of Area Served:	One technical school for each city with population of 20,000 or more.
Sub-Units:	25 to 30 students/class.
Land Area Requirement:	30m ² /student (2.1ha/720 students.)
Floor Area Requirement:	8m ² /student. (M. E. Standards require 100m x 110m for building and site area)
Location:	Directly accessible to the town center or accessible from an arterial road leading to the town center.

A-2-1-10 TECHNICAL SCHOOL FOR GIRLS INCLUDING SEWING LEARNING PROGRAM

Age of Student:	Varies but over 15.
Population Served/Radius of Area Served:	One female technical school for each city with population of 20,000 or more.
Land Area Requirement:	1 ha recommended. Minimum 80m x 70m.
Floor Area Requirement:	7m ² /student.
Location:	Accessible from the city center or from an arterial road leading to the center.

A-2-1-11 COLLEGES

Age of Student:	18 to 21 or 18 to 19.
Population Served:	The first college at Abha by 1980. By 1995, Jizan, Khamis Mushayt and Najran will also have one college each.
Size of Facility:	Average size of 1,000 students.
Land Area Requirement:	100m ² /student to 50m ² /student.
Floor Area Requirement:	15m ² /student excluding dormitory facilities. (If dormitory is needed then 25m ² /dormitory resident is additionally needed.)
Location:	Accessible from the city center through arterial road. Locate as closely as possible to the city's central cultural area so that cultural-educational facility of the college is shared by the community.

A-2-1-12 SPECIAL COLLEGE

Age of Student:	18 to 21 or 18 to 19.
Population Served:	The first special college (for medicine, agriculture and engineering) at Abha by 1995 serving the regional population.
Size of Facility:	Average size of 600.

Land Area Requirement: 100m²/student excluding dormitory facilities.

Location: Located on regional arterial road or major arterial road connecting to and situated close to the city center.

A-2-2 PLANNING STANDARDS FOR RECREATIONAL AND ATHLETIC FACILITIES

A-2-2-1 TOT-LOT

Main Population: Pre-school children 2 years old to 5 years old and their supervising adults (mothers).

Main Function: Infants' exterior play, supervising adults' seating, conversation, and evening stroll.

Size of Population Served: Approximately 250. 12 to 16% of the total population, i.e. 30 to 40 is in ages 2 through 5.

Radius of Area Served: Maximum 120m (2 minute walking distance) is recommended. If density is less than 50 pph, 300m (5 minute walking distance) is acceptable.

Land Area Requirement: 500m²/lot is recommended. 300m² to 1000m²/lot is also acceptable.

Location: Situated in the center of each residential group unit (or grouping level of G₀ as defined in A-1-4) directly accessible from each unit without crossing any street or preferably even group parking spaces or access lane. It should be bordered by residential units or pedestrian activities but not by parking or streets.

Other Requirement: Infant play area and seating area should be arranged in such a way as to enable adult surveillance over the infants at play. Enough planting and shaded area should be provided. Play area should be visible from as many dwelling units as possible for the adults in house to survey their children at play in the tot-lot. Connected to the nearest nursery-kindergarten playlot by footpath through narrow but well controlled exit point.

A-2-2-2 NURSERY-KINDERGARTEN PLAYLOT

Main Population Served: 3 to 5 year old children enrolled in nursery-kindergarten. It also serves surrounding infants, accompanied by adults, and lower grade

elementary school children during off-school hours.

Main Function: For nursery-kindergarten outdoor play or for organized group play for pre-school children.

Size of Population Served: Approximately 1,000 inhabitants. 2.25% to 6% of the total population is enrolled in the nursery-kindergarten (See "Standards for Nursery-Kindergarten" in the previous section).

Radius of Area Served: Maximum 200m (3 minute walking distance) is recommended. 600m (10 minute walking distance) is also acceptable if density is less than 50 pph.

Land Area Requirement: 2000m² is recommended. 1000m² to 3000m² is also acceptable.

Location: Situated in the center of "Sub-Neighborhood" (See "Nursery-Kindergarten Standards".)

Other Requirement: Integral part of kindergarten design. Footpath connection to surrounding small scale tot-lots should be provided. Should not be bordered by major traffic. If bordered by any auto traffic, fences should be provided. Play pool for children may be included.

A-2-2-3 NEIGHBORHOOD PARK

Population Served: All inhabitants in the "Neighborhood", all age groups.

Main Function: General recreation. Preservation of natural environment in the neighborhood. Common garden for neighborhood residents.

Size of Population Served: 3,750, say 4,000, is recommended. 2,500 to 5,000 is accepted.

Radius of Area Served: Maximum 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute) is also acceptable. If density is less than 50 pph and access path to the park is designed over a long distance and properly separated from auto traffic, then radius may be extended.

Land Area Requirement: 5m²/inhabitant is recommended; 2m² to 10m²/inhabitant is also acceptable.

Location: Situated in the center of "Neighborhood" (grouping Level G₂). Should not be surrounded or bordered by major traffic (street classification of "collector road" or higher).

Other Requirement: Connected to major neighborhood level facilities (such as elementary school, neighborhood shopping, small mosque, etc.) by footpath without crossing major traffic. Park itself could be stretched along such a path to create a linear park along which neighborhood facilities can be clustered. Trees, green areas, seating areas with benches and paved paths should be provided. Recreational adult swimming pool with ancillary facilities may be provided.

A-2-2-4 PLAYGROUND

Main Population Served: Primarily elementary school children at school time. Secondly other inhabitants at off-school-hours and weekends.

Main Function: Active play and game for elementary school athletic programs.

Size of Population Served: 3,750, say 4,000, is recommended. 2,500 to 5,000 is acceptable. 750 children (400 to 1,100 in range) per playground are expected, of which half are boys. Boys' and girls' playground are separated and each should be located in or close to the school.

Radius of Area Served: Maximum of 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute walking distance) is also acceptable. When density is less than 50 pph, longer service radius is acceptable if safe and pleasant access to the playground is provided.

Land Area Requirement: 20m²/elementary school student is recommended. 10m² to 30m²/elem. school student is acceptable.

Location: Situated at the center of the "Neighborhood" (See "Elementary School Standards"). Situated in convenient proximity to both boys' and girls' elementary schools.

Other Requirement: Designed as an integral part of an elementary school. Connected to the elementary school and residential zone on footpath crossing no major traffic. Off-school time usage by the adult population is recommended and elementary school utilities such as water-drinking and toilet should be available for those adults. Enough pavement space should be provided for medium size sports activities such as basketball, tennis, etc. Childrens' pool, fenced and equipped with locker room and shower can be provided as a part of the playground program or a part of school program.

A-2-2-5 COMMUNITY PARK OR SMALL CITY PARK

Population Served: All residents of the "Community" whose population range is 20,000 to 40,000 (30,000 as average).

Main Function: Passive recreation on a weekly to monthly participation basis (not daily use) to be integrated with cultural, religious facilities. It also functions as a linear connector of "Community" level facilities.

Size of Population Served: 30,000 is recommended. 20,000 to 40,000 is acceptable.

Radius of Area Served: Maximum 1000m (15 minute walking distance) is recommended. 1600m (20 minute) is also acceptable. When density is less than 50 pph, longer service radius may be acceptable if the park penetrates into the residential zones as a linear park to provide safe and pleasant footpath to the center of the park.

Land Area Requirement: 4m²/inhabitant is recommended. 2m² to 6m²/inhabitant is acceptable.

Location: Situated in the center of a "Community" whose population range is 20,000 to 40,000. It should be located between two sub-community centers in order to connect them and to create a park-open space spine in the middle of which the "Community" center is located.

Other Requirement: Fruit trees or agricultural land use could be used as a part of community park function since a part of the function is as visual relief or visual buffer between two adjacent subcommunities. Where community park comes in contact with community commercial (or shopping) area, the park design should reflect an "urban park" where extensive pavement and landscaping are concentrated in a limited area.

A-2-2-6 PLAYFIELD - LEVEL 1

Main Population Served: Primarily for intermediate school students at school hour; secondarily, for other inhabitants in the "Sub-Community" at off-school-hours or weekends.

Main Function: For athletic curriculum activities of intermediate schools (boys and girls). Practice field for "Sub-Community" sports club or sports team activity.

Size of Population Served: 15,000 is recommended. 10,000 to 20,000 is acceptable. 600 to 1800 intermediate school enrollment (boys plus girls) is assumed in the service area.

Radius of Area Served: Maximum 1200m (20 minute walking distance) is recommended. When density is less than 50 pph, longer radius is acceptable if bus service is provided the areas beyond the recommended walking distance.

Land Area Requirement: 30m²/intermediate school student is recommended. 20m² to 40m²/student is accepted.

Location: Situated at the center of a "Sub-Community", whose population range is 10,000 to 20,000, and in close proximity to or in integrated part of both boys' and girls' intermediate schools.

Other Requirement: Parking space should be provided for the adult field users (10 to 20 spaces). Official pavement sizes for game courts should be provided for sports requiring smaller spaces, such as tennis and basketball, but not necessarily full size official dimensions for the field and track. Boys' and girls' fields should be separated with enough distance. Swimming pool(s) can be provided with shower rooms and locker rooms.

A-2-2-7 PLAYFIELD - LEVEL 2

Main Population Served: Primarily for secondary school students at school hour; secondarily for the other residents in the "Community" off-school-hours or weekends.

Main Function: For athletic curriculum activity of secondary schools (boys and girls separately). Practice and competition or game for the community sports teams and clubs.

Size of Population Served: 30,000 is recommended. 20,000 to 40,000 is acceptable. 900 (450 to 1350) students per playfield are expected, 70% of whom are boys.

Radius of Area Served: Maximum 1000m (15 minute walking distance) is recommended; 1600m (20 minute) is also acceptable. When density is less than 50 pph, longer service radius may be acceptable if bus system and pleasant pedestrian path are provided to cover the "Community" and if ample parking space is provided.

Land Area Requirement: 50m²/secondary school student. 40m² to 60m²/student is also acceptable. Minimum land area is 4ha/playfield.

Location: Situated at the center of a "Community" whose population range is 20,000 to 40,000 and in close proximity to both boys' and girls' secondary schools.

Other Requirement: Parking space should be provided for the adult field users and game spectators. Full size official dimensions for courts, track and fields. Simplified spectator seating area, either by stands or by banking should be provided. Boys' and girls' playfields should be separated with enough distance. Swimming pool with full official size can be provided with full ancillary activities (indoor and outdoor).

A-2-2-8 CITY PARK

Population Served: All residents and non-resident workers of a city with a population of 60,000 or more.

Main Function: Weekend family recreation for residents. Lunch time recreation for downtown workers. Park as an integral part of city's cultural and recreational center.

Size of Population Served: 40,000 or more. In 1995 all five cities with the exception of Bishah and Najran should have a "city park". Bishah and Najran will have a "Community Park" functioning as a "small scale city park".

Radius of Area Served: Entire city. Radius varies.

Land Area Requirement: 4m²/inhabitant is recommended. 2m² to 6m²/inhabitant is acceptable.

Location: Situated at the center of city with main cultural, community, and educational functions clustered around it.

Other Requirement: Historical district and architecture are to be integrated into the network of a city park. The park is conceived as a combination of a central park and its extended network to which the lower hierarchical park network is connected. Arena (enabling indoor sports, exhibition, theater, musical festival and other multi-purpose uses) should be integrated in the city park site.

A-2-3 PLANNING STANDARDS FOR RELIGIOUS FACILITIES

A-2-3-1 SMALL MOSQUE

Population Served:	75% to 100% of the adult male in the age group 15 and above (i.e. approximately 20% to 25% of the total population potentially attends one of the mosques in the city).
Size of Population Served:	One neighborhood mosque (small mosque) for every 3,750 inhabitants (potential attendance 800 to 1000 persons) is recommended. 2500 to 5000 inhabitants (500 to 1250 prayers) is acceptable.
Radius of Area Served:	Maximum 200m (i.e. 3 minute walking distance) is recommended. 600m (10 minute walking distance) is also acceptable.
Land Area Requirement:	0.2 to 0.3 ha/mosque.
Floor Area Requirement:	1.2m ² /person, i.e. 600m ² to 1500m ² .
Location:	Situated at the center of a "Neighborhood" with population of approximately 2500 to 5000.
Other Requirement:	Elementary school and neighborhood cultural facilities should be closely linked to the mosque to foster an integration of religious and educational functions.

A-2-3-2 JAMI'A MOSQUE

Population Served:	10% of the inhabitants of the service area.
Size of Population Served:	One Jami'a Mosque for each 15,000 inhabitants (i.e. approximately 1500 prayers) is recommended. 10,000 to 20,000 inhabitant range is also accepted (i.e. 1000 to 2000 prayers).
Radius of Area Served:	Maximum 1200m (20 minute walking distance) is recommended. Larger radius may be acceptable if density is less than 50 pph. In this case standards should be provided on a case by case basis.
Land Area Requirement:	0.6 to 0.8ha/mosque.
Floor Area Requirement:	1.2m ² /prayer (i.e. 1200 to 2400m ² /mosque) is recommended.

Location: Situated at the center of a "Sub-Community" with a population of 10,000 to 20,000.

Other Requirement: Intermediate schools should be close to the mosque in order to foster an integration of religious and educational functions.

A-2-3-3 EID MOSQUE

Population Served:	1 to 2% of the population in the served area; 20 to 25% of the total population should be included for the determination of land area.
Size of Population Served:	One for every 100,000 to 300,000 population. Therefore none of the cities in the southern region can justify an Eid Mosque due to a lack of population. Abha and Khamis Mushayt's combined population in 1995 is estimated to be 151,000 and will together require one Eid Mosque.
Radius of Area Served:	Not specified.
Land Area Requirement:	0.6m ² /prayer, i.e. 1.2 ha to 3.6ha/unit is recommended.
Other Requirement:	The mosque is a fenced open area; it is provided with a guard room and a storage.

A-2-4 PLANNING STANDARDS FOR SOCIAL AND CULTURAL ACTIVITIES

A-2-4-1 NEIGHBORHOOD CENTER

Size of Population Served:	3,750 (say 4,000) is recommended. 2,500 to 5,000 is acceptable.
Main Function:	General social interactions (meetings, elementary school PTA, games). Offices for a neighborhood association to program activities, maintenance, and utilization of parks and facilities. Supervision and coordination of sub-neighborhood activity and facilities. Adult education associated with elementary school facilities and small mosque activities (including a neighborhood library).
Radius of Area Served:	Maximum 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute) is also acceptable.

If density is less than 50 pph, maximum radius may be increased depending on the local condition.

Land Area: 0.1 to 0.5ha/center. If the center abutts a neighborhood park and the park is directly accessible from the center, less than 0.1 ha is acceptable.

Floor Area Requirement: 0.05m²/inhabitant (i.e. 125m² to 250m²) is recommended. 0.03 to 0.1m²/inhabitant is also acceptable.

Location: Situated at the center of a "Neighborhood" whose population is in the range of 2,500 to 5,000. Close to the neighborhood park, playground, small mosque, and neighborhood shopping area.

Other Requirement: Courtyards and other small scale exterior spaces for seating and visual relief should be provided. Footpath access from surrounding residential area without crossing any major traffic.

A-2-4-2 COMMUNITY CENTER

Size of Population Served: 30,000 is recommended. 20,000 to 40,000 is acceptable; even wider range is acceptable if good reasons exist.

Main Function: General social interactions for residents in the "Community" (meetings, adult education, social ceremonies, entertainment, cultural activity programs, PTA for intermediate and secondary schools). Offices for a community association to program activities for maintenance and utilization of community parks, community facilities, intermediate and high school facilities and playfields.

Radius of Area Served: Maximum 1600m (25 minute walking distance) is recommended. Even larger radius is accepted if density is less than 50 pph, depending on the situation.

Land Area Requirement: 0.2 to 1.0ha/center is recommended. If the center abuts a community park and direct access to it is available, less than 0.2 ha is also acceptable. In any case 0.1 ha is the minimum.

Floor Area Requirement: 0.01m²/inhabitant (i.e. 200m² to 400m²) is recommended. 0.005m² to 0.02m²/inhabitant is also acceptable.

Location: Situated at the center of a "Community" whose population range is 20,000 to 40,000. Close to

the community park, community shopping center, Jami'a Mosque, secondary school community museum, library, youth center (these could be a part of the community center) and playfield, Level 2.

Other Requirement: Additional standards for potential components of community center:

a. Community library: One for each 30,000 inhabitants (20,000 to 40,000). Land area 0.1m²/inhabitant if library is in an independent building and not a part of community building. If the library is located in the community center, the land area is increased by 0.05m²/inhabitant from the community center building land requirement. Floor area is 0.01m²/inhabitant.

b. Community museum: Standard is identical to that of community library with the exception of museums located in a renovated old structure. In such a case, standards should be created on a case by case basis.

A-2-4-3 CIVIC CENTER

Size of Population Served: 60,000 and over. One center for every city.

Main Function: Cultural and social center for the city. Art gallery, exhibition hall, small arena, museum and auditorium are included.

Radius of Area Served: Entire city and its vicinity. Radius varies.

Land Area Requirement: 0.5m²/inhabitant (i.e. 3ha/60,000 inhabitants) or more. If the Civic Center is designed as an integral part of other downtown activities such as commercial areas, the land area requirement can be reduced to 0.25m²/inhabitant.

Floor Area Requirement: 0.05m²/inhabitant (i.e. 300m²/60,000 inhabitants) is recommended, including art gallery, exhibition hall, arena-auditorium (these facilities can be put in one structure or in separate buildings) and other general and multi-purpose rooms.

Location: Situated at the center of city with a population of 60,000 or over. Closely located to the administration-commercial center of the city and city park system.

Other Requirement: Pedestrian zone should be clearly defined, eliminating auto traffic and providing in the city a pedestrian island of which the Civic Center is a core. Downtown historical artifacts should be preserved and maintained as a part of a Civic

Center-city park complex.

A-2-5 PLANNING STANDARDS FOR HEALTH FACILITIES

A-2-5-1 PHARMACY

Size of Population Served:	One general practitioner and/or pharmacy for every neighborhood of population size 2,500 to 5,000.
Main Function:	Outdoor treatment, diagnosis, and general treatment. Providing hospital information to the residents. Providing patient information to the community clinic and higher level hospitals.
Radius of Area Served:	Maximum 300m (i.e. 5 minutes walking distance) is recommended. 600m (10 minute) is also acceptable.
Land Area Requirement:	0.1ha/unit approximately.
Floor Area Requirement:	0.05m ² /inhabitant or more.
Location:	Situated at the center of a "Neighborhood". Access by footpath without crossing major traffic.

A-2-5-2 SUB-COMMUNITY DIAGNOSIS AND TREATMENT CENTER (INCLUDING RED CRESENT BUILDING)

Size of Population Served:	One for 15,000 (10,000 to 20,000 more or less) inhabitants.
Main Function:	Public health centers for general treatment and diagnosis and for red crescent program.
Radius of Area Served:	Maximum 1200m (20 minute walking distance) is recommended. Larger radius may be acceptable when density is less than 50 pph.
Land Area Requirement:	0.3m ² /inhabitant (i.e. 0.3ha to 0.6ha/center) is recommended.
Floor Area Requirement:	0.05m ² /inhabitant (i.e. 500m ² to 1000m ² /center) or more is recommended.
Location:	Situated at the center of a "Sub-Community" with a population of 10,000 to 20,000.

A-2-5-3 COMMUNITY/GENERAL HOSPITAL

Size of Population Served:	One for each city with a population over 30,000 more or less.
Main Function:	General hospital for normal treatment clinics, diagnosis and treatment, long term care, public health, nursing units, and emergency and firstaid.
Radius of Area Served:	Varies. The hospital serves not only the city population but also the surrounding suburban population.
Land Area Requirement:	0.5m ² to 1.0m ² /inhabitant is recommended (i.e. 2.5 ha to 5ha/hospital for a city with 50,000 inhabitants).
Floor Area Requirement:	3 to 4 beds/1,000 inhabitants is recommended. 20 to 40m ² /bed is recommended. (i.e. 3000m ² to 8000m ² /hospital for a city with 50,000 inhabitants.) 200 to 500 beds/hospital is generally recommended.
Location:	Close to the center of the city yet easily accessible from the main arterial and regional road for easy emergency access and easy access for the suburban population. Psychological, visual, and accoustical relief should be secured by not locating in the middle of the built-up areas.

A-2-5-4 SPECIAL HOSPITALS AND NURSING HOME

Size of Population Served:	One mental hospital for each 50,000 inhabitants or more. One special long term hospital for each 50,000 inhabitants or more. One nursing home for each 50,000 inhabitants or more.
Land Area Requirements:	0.1ha/1000 inhabitants for mental hospital or long term hospital. 0.02ha/1000 inhabitants for nursing home.
Floor Area Requirement:	5 beds/1000 inhabitants, and 20m ² to 45m ² /bed (mental hospital). 3beds/1000 inhabitants, and 20m ² to 45m ² /bed (special long term hospital). 1 to 2beds/1000 inhabitants, and 20m ² to 45m ² /bed (nursing home).

Table A-2-1
SPECIAL HOSPITAL REQUIREMENT IN SOUTHERN REGION
(PRESENTLY IDENTIFIED BY THE MINISTRY OF HEALTH)

	ASIR	JIZAN	BISHAH	NAJRAN	TIHAMA
CHEST DISEASE	1*	0	0	0	0
OBSTETRICS AND GYNECOLOGY	2	1	1	1	2
OPHTHALMOLOGY & OTOLARYGOLOGY	1	0	0	0	0
HOSPITAL FOR ACCIDENT FEVER (COMMUNICABLE)	2	1	1	1	1
PSYCHIATRY	1*	1	0	0	0
LEPROSY	1	0	0	0	0
LEPROSY	0	1	0	0	0
TOTAL	8	4	2	2	4

NOTE: * Existing Al-Asan Hospital is for both chest disease and other communicable (fever) diseases. In future, the fever hospital will be separated to the new location.

Table A-2-2
DOCTOR REQUIREMENT

1 General doctor for 40-50 patients
1 Special doctor for 10-15 patients
1 nurse for 4-6 patients

A-2-6 PLANNING STANDARDS FOR COMMERCIAL FACILITIES

A-2-6-1 NEIGHBORHOOD SHOPPING CENTER

Size of Population Served: 4,000 inhabitants more or less. (2,500 to 5,000.)

Main Functions: Food market, drugstore, bakery, barber shop, laundry and dry cleaning, hardware, stationery, restaurant, etc.

Radius of Area Served: Maximum of 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute) is also acceptable. If density is less than 50 pph, a larger radius may be acceptable depending on the situation.

Land Area Requirement: 2 to 4m²/inhabitant, i.e. 0.8 ha to 1.6ha/4000 inhabitants.

Floor Area Requirement (Sales Area): 0.25 to 0.5m²/inhabitant (i.e. 1000m² to 2000m²/4000 inhabitants) is recommended.

Location: Situated at the center of neighborhood with population size of 2,500 to 5,000 or along the local distributor road connecting the center of the neighborhood to the "Sub-Community" with a population of 10,000 to 20,000. Closely located to or integrated with neighborhood center, neighborhood park and other neighborhood facilities.

Other Requirement: If a shopping center for a higher hierarchical group order exists in the vicinity, the neighborhood shopping center is incorporated into the larger shopping center. A portion of neighborhood shopping center could be substituted by the corner stores in the neighborhood. 1:1 parking (i.e. parking area : sales area = 1:1) is recommended. Less than 1:1 is acceptable if density is more than 100 pph.

A-2-6-2 COMMUNITY SHOPPING CENTER

Size of Population Served: 30,000 inhabitants more or less.

Main Function: Basic retail service to the "Community" population. Shops whose financial viability requires larger population than neighborhood population are located in the community shopping center (such as florist, shoe shops, giftshops, candy, lingerie, book stores, toys, childrens' wear,

radio and TV repairs, etc). "Second Floor Office" could be included.

Radius of Area Served:

Maximum 1200m (20 minute walking distance) is recommended. Larger radius is also acceptable if density is less than 50 pph and ample parking space is provided.

Land Area Requirement:

0.5m² to 1.0m²/inhabitant is recommended. (i.e. 1.5 ha to 3ha/30,000 inhabitants.)

Floor Area Requirement (Sales Area):

0.1m² to 0.2m²/inhabitant (i.e. 3000m² to 6000m²/30,000 inhabitants) is recommended.

Location:

Situated at the center of community with population size of 20,000 to 40,000 or along the arterial road connecting community center to city center. Close to or integrated with community center, park and other community facilities.

Other Requirement:

When a regional shopping center or a downtown shopping center is in the vicinity, the community shopping center may be incorporated into the larger shopping center. 2:1 parking (i.e. parking area : sales area = 2:1). Less than 2:1 is acceptable if density is more than 100 pph.

A-2-6-3 SUB-REGIONAL SHOPPING CENTER

Size of Population Served:

100,000 inhabitants or more.

Main Function:

Downtown shopping center to serve the regional population. This could also be located along a major arterial extending from the city center. It will provide, in addition to the stores normally found in the neighborhood and community shopping centers, fashion goods, furniture, household equipment, women's apparel, etc.

Radius of Area Served:

City and its neighboring communities. Regional population beyond city and its surroundings also uses on a less frequent basis.

Land Area Requirement:

0.5m² to 1.0m²/inhabitant (i.e. 5 ha to 10ha/100,000 inhabitants) is recommended.

Floor Area Requirement (Sales Area):

0.1m² to 0.2m²/inhabitant (i.e. 10,000m² to 20,000m²/100,000 inhabitants) is recommended.

The following table indicates per capita sales areas for different sizes of the city popula-

tion (including neighborhood, community and regional shopping centers):

Table A-2-6-1
SALES AREA PER CAPITA

CITY POPULATION	COMPONENTS(m ² /inh.)	TOTAL(m ² /inh.)
4,000	0.25 to 0.5	0.25 to 0.5
30,000	0.25 to 0.5 plus 0.1 to 0.2	0.35 to 0.7
100,000	0.25 to 0.5 plus 0.1 to 0.2 plus 0.1 to 0.2	0.45 to 0.9

Building area is about 1.5 times the floor area.

Location:

Situated in the downtown area of major cities or along the regional arterials leading to the major city centers.

Other Requirement:

4:1 parking is recommended. 2:1 is also acceptable if located in the middle of downtown.

A-2-7 PLANNING STANDARDS FOR PUBLIC BUILDINGS

A-2-7-1 FIRE STATION

Population Served:

One for each community of population of 20,000 to 40,000 inhabitants.

Radius of Area Served:

In a high value district:
a. Maximum 1.5 km for engine companies.
b. Maximum 2.0 km for ladder companies.
In a normal residential district:
a. Maximum 3.0 km for engine companies.
b. Maximum 5.0 km for ladder companies.
In a high density residential district:
a. Maximum 2.5 km for engine companies.
b. Maximum 3.5 km for ladder companies.

Land Area Requirement:

Approximately 10m²/1000 inhabitants is recommended.

Floor Area Requirement:

3m²/1000 inhabitants is recommended.

Location:

In residential district, station should be located to the center. Additional stations

should be near extensive industrial or business districts and near districts where there is a high life hazard. An intersection of roads is a preferred station location.

Other Requirement: Water supply system with adequate pressure should be developed. Reserve capacity: 5-day reserve with maximum daily rate.

A-2-7-2 POST OFFICES

Population Served: One post office for each city. One branch post office for each neighborhood with a population of 2,500 to 5,000.

Radius of Area Served: Maximum 300m (5 minute walking distance) is recommended for branch office. 600m (10 minute) is also acceptable if density is less than 50 pph. A larger radius is acceptable depending on the situation.

Land Area Requirement: 0.2 ha to 0.4ha/city post office.

Floor Area Requirement: $2m^2/1000$ (i.e. $100m^2/50,000$ city). City post office should be located at city center. Branch post office should be located at the center of center of neighborhood with population range of 2,500 to 5,000. It can be located inside of the neighborhood center.

A-2-7-3 POLICE STATION

Population Served: One for each city with population over 50,000, i.e. at minimum a city of 50,000 inhabitants should have one police district with approximately 10 police. (1.5 to 2.0 police/1000 inhabitants.)

Radius of Area Served: 1000ha/district (1.8 km radius) or more at a density of 50 pph or less. At lower densities, service radius may be extended. Mobile unit is needed in any case.

Land Area Requirement: 0.2 to 0.4ha/district station.

Floor Area Requirement: $2m^2/1000$ inhabitants (i.e. $100m^2/50,000$ inhabitants).

Location: Situated in the center of town with comparable distances to different parts of its service population. Corner site is preferred for the convenience of the mobile unit.

A-2-7-4 GOVERNMENT OFFICES

Population Served: One for each city. The percentage of government employment to total population is in a range from 6% to 14% (at present the 5 city average is approximately 10%) of which it is assumed 3% to 7% (half) are in administrative sectors (excluding teachers, police, firemen, etc., who have normal place of work rather than offices), i.e. 2,500 to 3,750 are located in the administrative offices (for the case of a 50,000 city).

Floor Area Requirement: Assuming 80% gross efficiency and proper use of net areas, there should be $10m^2$ to $20m^2$ /employee (i.e., $25,000m^2$ to $75,000m^2$ for city of 50,000). If FAR = 2, then land area is approximately 2.5 ha.

Location: Situated and concentrated in the center of town.

A-2-8 PLANNING STANDARDS FOR HOUSING AND DENSITY

Table A-2-8 shows the approximate ideas on the relationship between residential building types and residential densities. "Net residential density" defined as the ratio of the number of inhabitants to the total area inside the property boundary lines excluding street areas in the residential district. "Net neighborhood density" is ratio of the number of inhabitants to the net neighborhood area including amenities, schools, residential streets, and neighborhood services but excluding non-used reserve areas or areas devoted to facilities which serve community structure at a higher level than neighborhood. As shown in the right hand side of the Table, gross density for a neighborhood area varies from 15 pers./ha (for single family villa) to 252 pers./ha (for average equivalent of 10 story apartments). In reality, there is little possibility of having only single family villas or 10 story apartments in one neighborhood, exclusive of other types. It is estimated that actual, net neighborhood density in many cases is somewhere between 50 pers./ha to 200 pers./ha depending on the mixture of unit types.

As far as net residential density is concerned, it is estimated that the most probable case is in the vicinity of 150 to 200 pers./ha. For example, the combination of 10% standard villa (say $750 m^2$ site/unit, 5 persons/unit) 60% smaller villa (say $250 m^2$ site/unit, 5 persons/unit) and 30% multi-family units (say $100 m^2$ site/unit, 5 persons/unit) results in approximately 150 to 200 pers./ha of net density.

A-2-9 PLANNING STANDARDS FOR ROAD AND STREET NETWORK

Table A-2-9(a) shows the classification and standards for roads and streets. Clear recognition of the hierarchical order of the street network system is crucial to achieve group privacy in an automobile oriented society. The street network hierarchy should be integrated into the hierarchical order of facility distribution and territorial sequence to maximize the access convenience yet to minimize the potential hazard and nuisance caused by auto traffic in the residential area.

Diagram A-2-9(b) indicates typical sections for each type of road classified in Table A-2-9(a).

Diagrams A-2-9(c) and A-2-9(d) indicate general outlines for road intersections.

A-3 APPLICATION OF PLANNING STANDARDS

A-3-1 A HYPOTHETICAL EXAMPLE

Table A-3-1(a) shows an example of land area distribution based on the standards developed in the previous sections. In order to reflect the situation in the Southern Region in 1995, a hypothetical city of 60,000 inhabitants is analyzed. It is found that such a city will require approximately 1,140 ha, 750 ha or 550 ha with net residential densities of 100 pph, 200 pph, or 400 pph, respectively. (These densities correspond to net densities of "villa"; mixture of "villa" and "one family semi-detached"; and low-rise "multi-family", respectively, see Table A-2-8 column C).

Table A-3-1 (b) is based on the result of computation on Table A-3-1 (a). It shows the land distribution for each use in the hypothetical residential city of 60,000 inhabitants. It is assumed that such a city will have two "Communities" of 30,000 residents, each of which will have two "Sub-Communities" of 15,000 residents, each of

which, in turn, will have four "Neighborhoods" of 3,750 residents. Since this model does not take into consideration non-used or reserved area of the city, the percentages for the listed use per total "actual" city area should be less than those listed. The table, therefore, is a preliminary guide to the allocation of "used-land" to different uses.

A-3-2 HIERARCHICAL ORDER OF GROUPING

Figure A-3-1 shows an example layout of prototypical city in which the recommended standards are expressed as a diagram. This is merely one of many acceptable interpretations of the standards. It is not the consultants' intent to impose a fixed solution to the planning. Rather, this is just a demonstration of one example against which the planning concepts for each city may be evolved.

Use	Area (ha)	Density (pph)	Population	Percentage of City Area	Percentage of City Population
1. Villa	1140	100	60,000	100%	100%
2. Villa	750	200	30,000	66%	50%
3. Villa	550	400	15,000	48%	25%
4. Villa	400	400	10,000	35%	17%
5. Villa	300	400	7,500	26%	12%
6. Villa	200	400	5,000	18%	8%
7. Villa	150	400	3,750	13%	6%
8. Villa	100	400	2,500	9%	4%
9. Villa	75	400	1,875	7%	3%
10. Villa	50	400	1,250	4%	2%
11. Villa	30	400	750	3%	1%
12. Villa	20	400	500	2%	0.8%
13. Villa	15	400	375	1%	0.6%
14. Villa	10	400	250	1%	0.4%
15. Villa	7.5	400	1,875	0.7%	0.3%
16. Villa	5	400	1,250	0.4%	0.2%
17. Villa	3	400	750	0.3%	0.1%
18. Villa	2	400	500	0.2%	0.08%
19. Villa	1.5	400	375	0.1%	0.06%
20. Villa	1	400	250	0.09%	0.04%

Table A-2-8
RESIDENTIAL TYPES OF HOUSES AND DENSITIES

	A	B	C	D	E	F	G
	LAND AREA PER FAMILY m ²	NET DWELLING DENSITY Fam./ha	NET DENSITY* Pers./ha	RATIO OF NET RESIDENTIAL DENSITY TO NET NEIGHBORHOOD DENSITY**	NET NEIGHBORHOOD DWELLING DENSITY Fam./ha	NET NEIGHBORHOOD DENSITY Pers./ha	APPROXIMATE AVERAGE NET NEIGHBORHOOD DENSITY Pers/ha
(1) LARGE VILLA	4,000 2,000	2.5 5.0	12.5 25.0	80.9% 78.6%	2.0 3.9	10.1 19.7	15
(2) STANDARD VILLA	1,000 500	10.0 20.0	50.0 100.0	74.4% 67.2%	7.4 13.4	37.2 67.2	52
(3) 1 FAMILY SEMI-DETACHED OR SMALLER VILLA	300 200	33.3 50.0	166.5 250.0	59.5% 52.1%	19.8 26.1	99.1 130.3	115
(4) MULTI-FAMILY LOW-RISE (2 STORY)	150 125	66.7 80.0	333.5 400.0	46.3% 42.5%	30.9 34.0	154.4 170.0	162
(5) MULTI-FAMILY MID-RISE (3-5 STORY)	100 75	100.0 133.3	400.0 533.2	42.5% 36.6%	42.5 48.8	170.0 195.1	183
(6) MULTI-FAMILY HIGH RISE (6-10 STORY)	50 25	200.0 400.0	800.0 1600.0	28.5% 17.2%	57.0 68.8	228.0 275.2	252

NOTE: * 5 Pers./Fam. is assumed for building types (1) through (4);
4 Pers./Fam. is assumed for building types (5) and (6).

** -Net residential area:

Net area is the area within residential property lines. The area for streets and area for neighborhood facilities are excluded from the net residential area. The population (or number of residential units) divided by this area is called "net residential population (or dwelling) density."

-Net neighborhood area:

Net residential area defined above plus the area for streets (streets at the neighborhood scale) and area for neighborhood facilities is called net neighborhood area. The area for neighborhood buffer zone, area for facilities to serve higher levels of community hierarchy (such as, community shopping center and intermediate and high schools) and the areas for non-neighborhood scale streets (such as regional highways) are excluded from this "net neighborhood area". The population (or the number of dwelling units) divided by the "net neighborhood area" is called "net neighborhood population (or dwelling unit) density".

-Computation of column "D" is based on the following formula:

$$y = \frac{P}{(P+ax) \cdot (1+c)}$$

where:

y = ratio of net neighborhood density to net residential density

x = net residential density

P = typical population of neighborhood.

P = 3750 is assumed.

a = neighborhood facility area excluding circulation space (8.1 ha in table A-3-1 (a) as a total of (1) through (7); plus contingency of 10%, i.e., $8.1 \times 1.1 \div 9$ ha).

a = 9 ha is assumed.

c = ratio of circulation space to net neighborhood area minus neighborhood circulation space.

c = 0.2 is assumed.

This formula is calculated in the following process:

$$x = \frac{P}{R} \text{ (where, R = net Residential Area)}$$

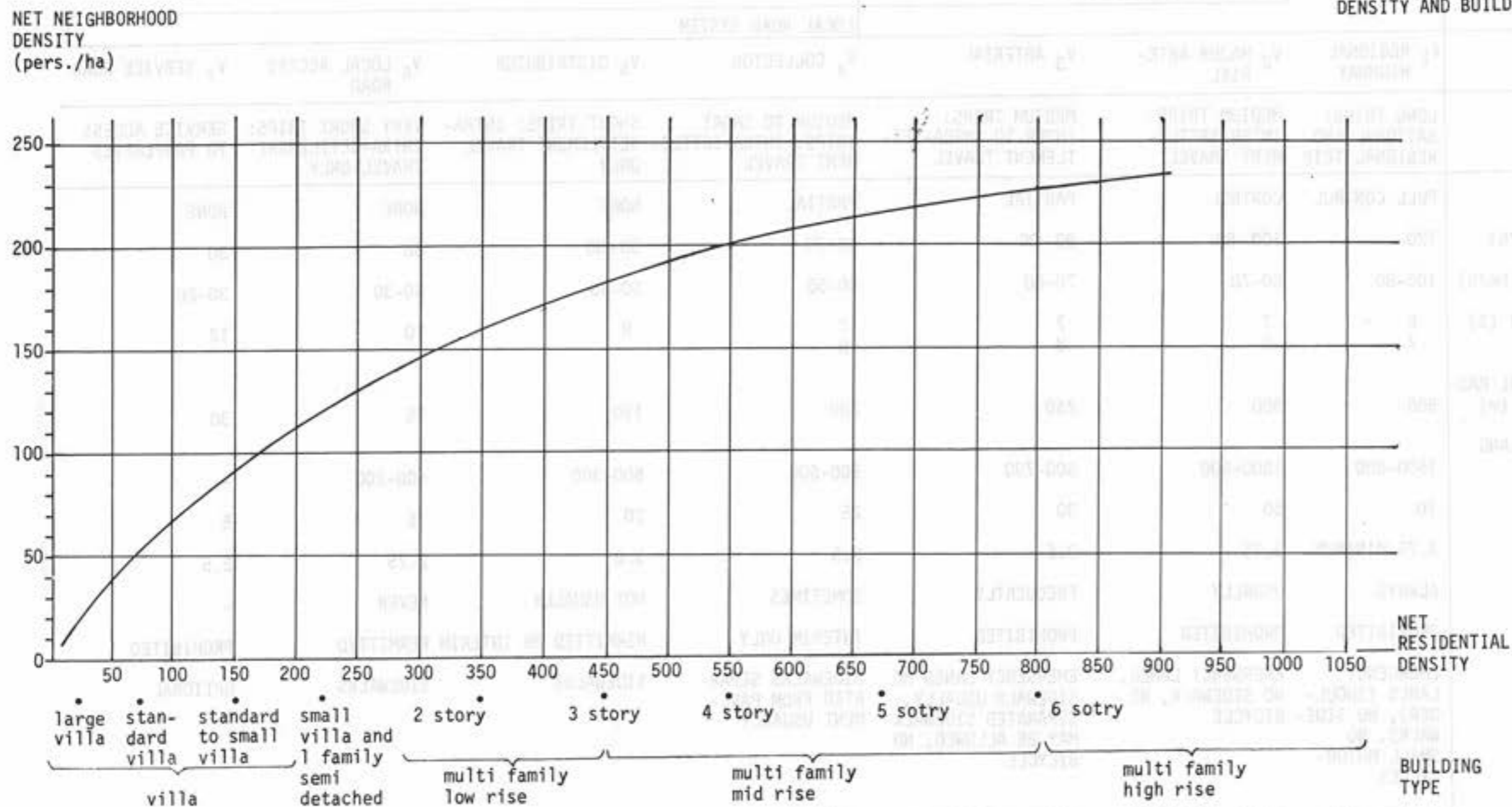
$$y = \frac{P/N}{P/R} = \frac{R}{N} \text{ (where, N = net Neighborhood Area)}$$

$$N = (R + a) \cdot (1+c)$$

from above,

$$y = \frac{R}{(R+a) \cdot (1+c)} = \frac{P/x}{(P/x+a) \cdot (1+c)} = \frac{P}{(P+ax) \cdot (1+c)}$$

FIGURE A-2-8
 RELATIONSHIP BETWEEN NET
 RESIDENTIAL DENSITY AND
 NET NEIGHBORHOOD DENSITY
 AND
 RELATIONSHIP BETWEEN NET
 DENSITY AND BUILDING TYPE



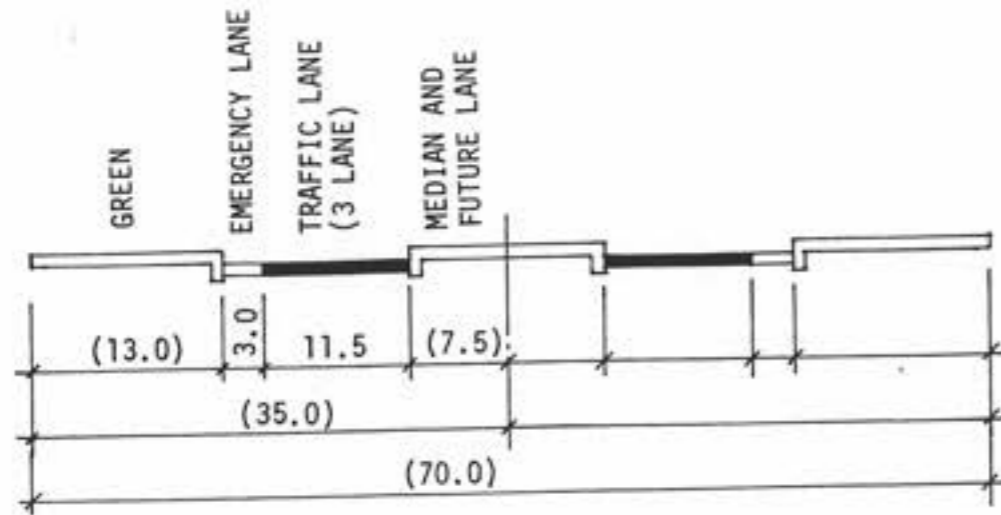
NOTE: 1. The relation between net neighborhood density and net residential density shown here is based on the discussion developed in the Section A-2-8 and Table A-2-8. It shows one "example case" and not necessarily always true. Actual relationship is depending on detail planning and design of the neighborhood. The figure is shown here for the purpose of providing "approximate example idea" of the relationship between the two densities.

2. Actual relation between net residential density and building type is depending upon the dwelling unit size, family size and many other conditions.

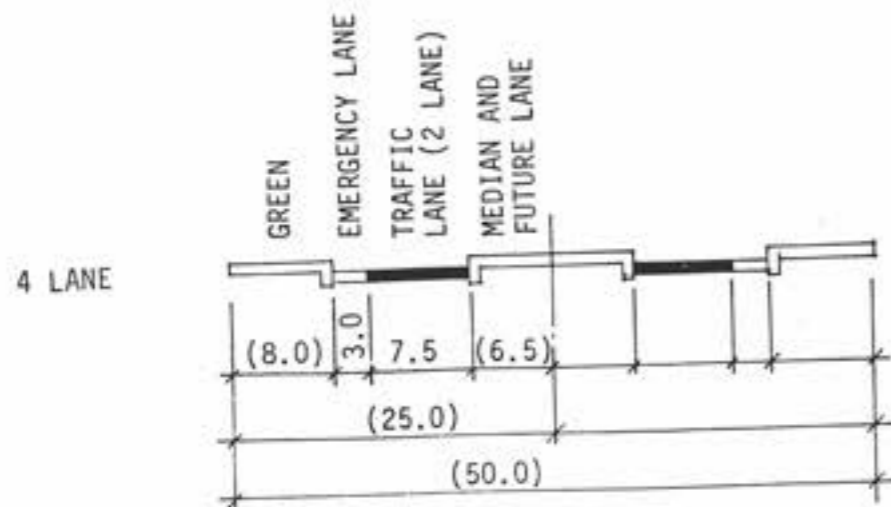
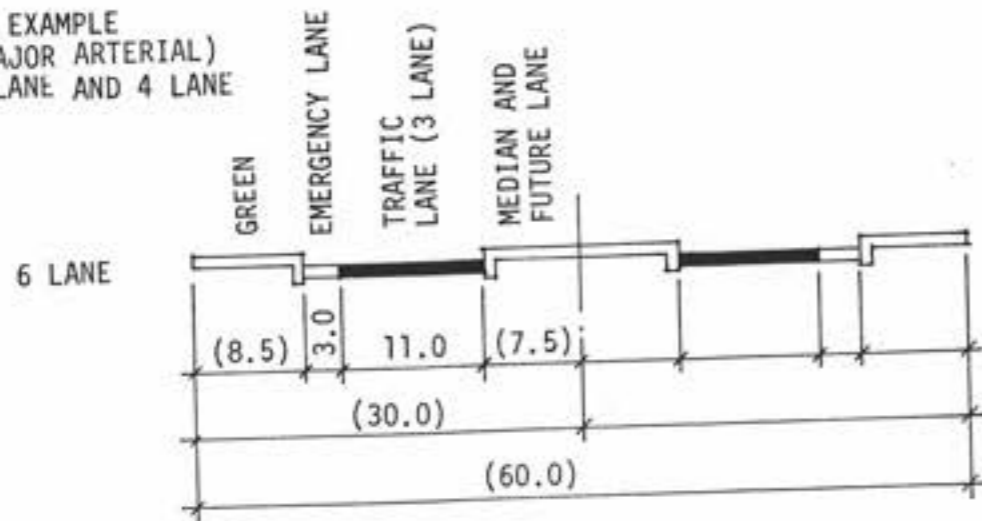
Table A-2-9(a)
CHARACTERISTICS AND HIERARCHY OF ROADS AND STREETS (RECOMMENDATION ONLY)

SYSTEM CLASSIFICATION	PRIMARY ROAD SYSTEM		SECONDARY ROAD SYSTEM				LOCAL ROAD SYSTEM	
	V ₁ REGIONAL HIGHWAY	V ₂ MAJOR ARTERIAL	V ₃ ARTERIAL	V ₄ COLLECTOR	V ₅ DISTRIBUTOR	V ₆ LOCAL ACCESS ROAD	V ₇ SERVICE ROAD	
FUNCTIONAL CLASSIFICATION	LONG TRIPS: NATIONAL AND REGIONAL TRIP	MEDIUM TRIPS: INTER-SETTLEMENT TRAVEL	MEDIUM TRIPS: INTER TO INTRA-SETTLEMENT TRAVEL	MEDIUM TO SHORT TRIPS: INTRA-SETTLEMENT TRAVEL	SHORT TRIPS: INTRA-SETTLEMENT TRAVEL ONLY	VERY SHORT TRIPS: INTRA-SETTLEMENT TRAVEL ONLY	SERVICE ACCESS TO PROPERTIES	
ACCESS CONTROL	FULL CONTROL	CONTROL	PARTIAL	PARTIAL	NONE	NONE	NONE	
DESIGN SPEED (km/h)	120	100-80	90-80	80-70	60-50	50	30	
OPERATING SPEED (km/h)	100-80	80-70	70-60	60-50	50-30	50-30	30-20	
MAXIMUM GRADE: UP (%) DOWN (%)	6 7	7 8	7 8	7 8	8	10	12	
MINIMUM HORIZONTAL RADIUS OF CURVATURE (m)	500	300	250	200	150	75	30	
HOURLY CAPACITY/LAND (VEHICLE/HOUR)	1500-800	1000-800	900-700	900-600	600-300	400-200	-	
RIGHT OF WAY (m)	70	50	30	25	20	15	5	
LANE WIDTH (m)	3.75 MINIMUM	3.75	3.5	3.5	3.0	2.75	2.5	
DIVIDED FLOW	ALWAYS	USUALLY	FREQUENTLY	SOMETIMES	NOT USUALLY	NEVER	-	
PARKING	PROHIBITED	PROHIBITED	PROHIBITED	INTERIM ONLY	PERMITTED OR INTERIM	PERMITTED	PROHIBITED	
RELATED ELEMENTS	EMERGENCY LANES (SHOULDER), NO SIDEWALKS, NO SMALL MOTORCYCLES	EMERGENCY LANES, NO SIDEWALK, NO BICYCLE	EMERGENCY LANES NO SIDEWALK USUALLY, SEPARATED SIDEWALK MAY BE ALLOWED, NO BICYCLE	SIDEWALKS SEPARATED FROM PAVEMENT USUALLY	SIDEWALKS	SIDEWALKS	OPTIONAL	
INTERSECTION TYPE	GRADE SEPARATED ALWAYS	GRADE SEPARATED IN GENERAL	GRADE SEPARATION OPTIONAL	SIGNALIZED	SIGNALIZED OR STOP SIGNS	STOP SIGN OR UNCONTROLLED	STOP SIGN OR UNCONTROLLED	
DISTANCE BETWEEN INTERSECTIONS (m)	1,000 MINIMUM	400 MINIMUM	250 MINIMUM	200 MINIMUM	200 MINIMUM WHEN POSSIBLE	-	-	
NORMAL NUMBER OF LANES	6-4 USUALLY	4 MINIMUM	4-2	4-2	2	2	1 or 2	

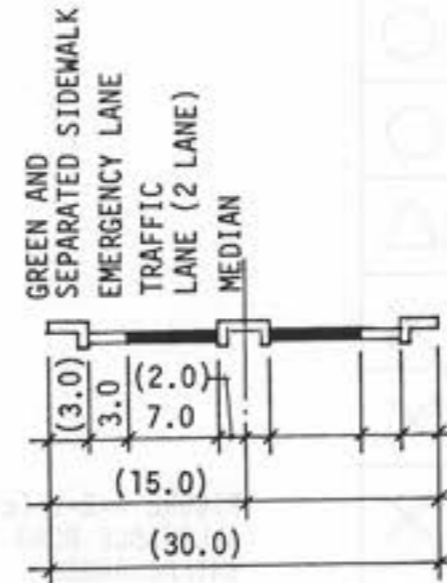
V₁ EXAMPLE
(REGIONAL HIGHWAY)
6 LANE



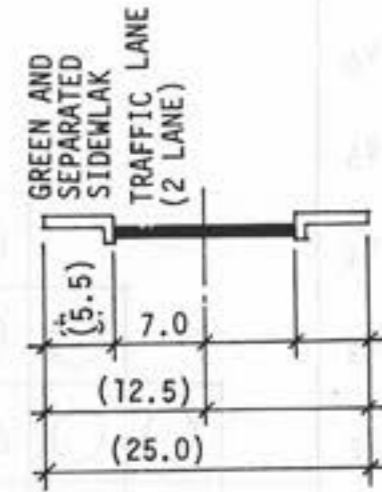
V₂ EXAMPLE
(MAJOR ARTERIAL)
6 LANE AND 4 LANE



V₃ EXAMPLE
(ARTERIAL)
4 LANE



V₄ EXAMPLE
(COLLECTOR)
4 LANE



V₅ EXAMPLE
(DISTRIBUTOR)
2 LANE



V₆ EXAMPLE
(LOCAL ACCESS ROAD)
2 LANE



NOTE: () Dimensions can vary depending on the local condition and detail design, sometimes median strip and green zone can even be eliminated where elimination is justified by the detail planning.

FIGURE A-2-9 (b)
ROAD SECTIONS BY
CLASSIFICATION
(EXAMPLE)

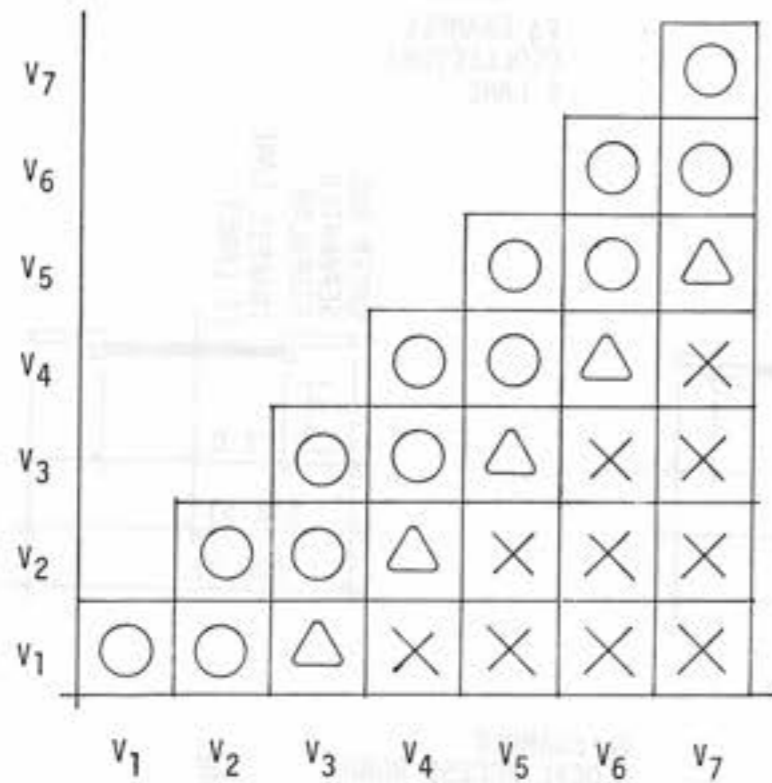

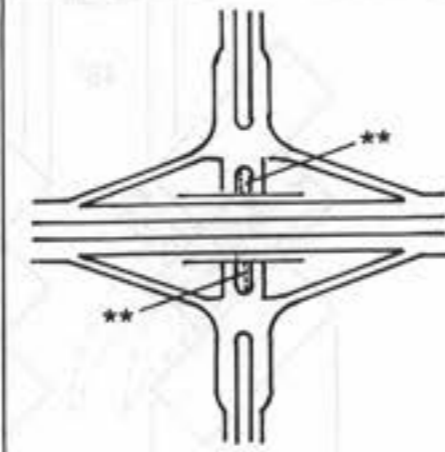
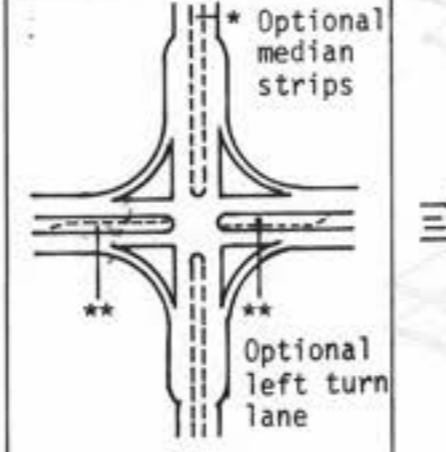
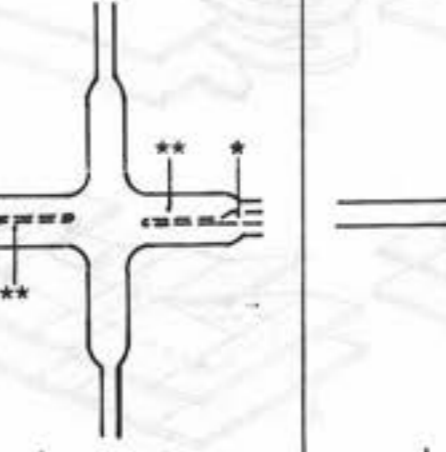
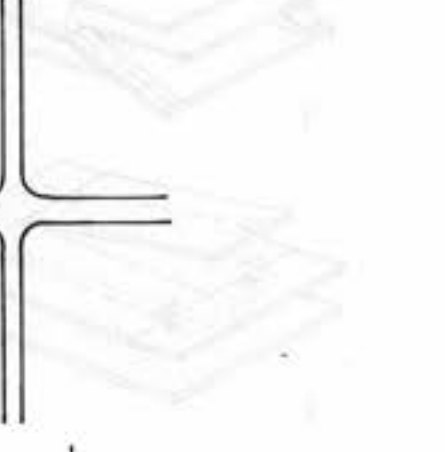
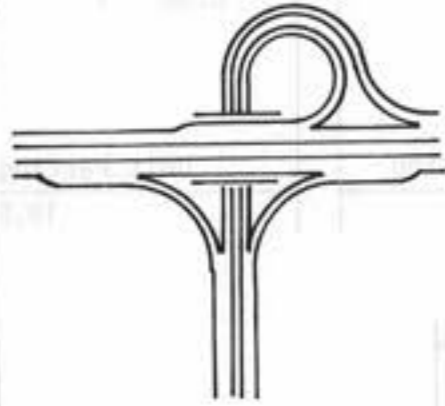
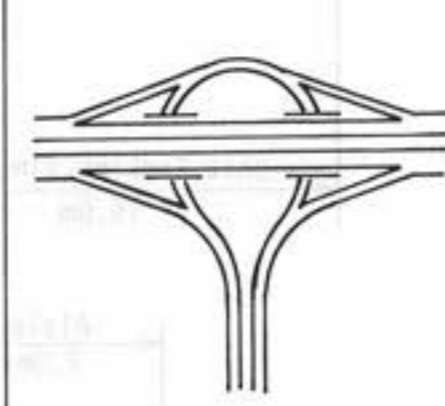
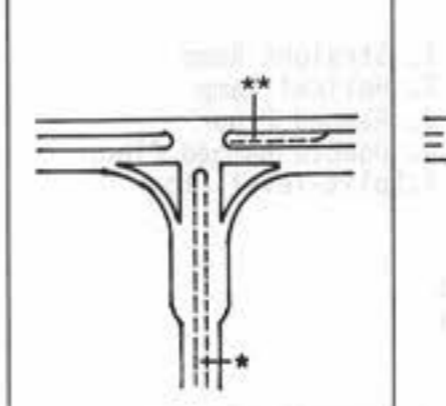
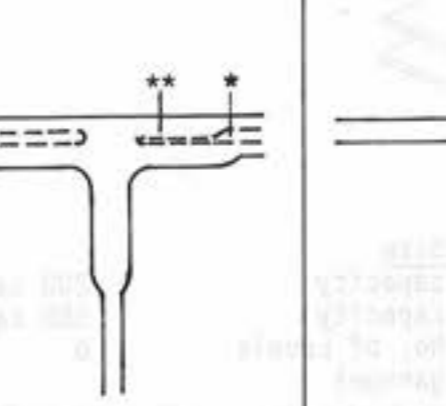
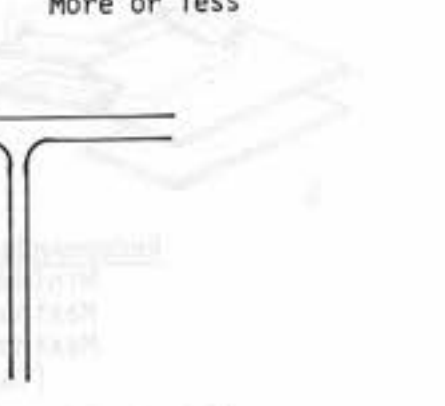


FIGURE A-2-9 (c)
ALLOWABLE ROAD
INTERCHANGES

NOTE: When two roads (with classification V_m and V_n) intersect, then interchange (V_m/V_n) is:

- Allowed when (○) $|m-n| = 0$ or 1
- Not allowed when (△) $|m-n| = 3$
- Allowed but not recommended when (X) $|m-n| = 2$

	Cloverleaf	Diamond	Channelized	Flaired	Common
Four leg Cross intersection	 <p>Approximate scale: 200-400 M</p>	 <p>100-200 M</p>	 <p>* Optional median strips ** Optional left turn lane 50-100 M</p>	 <p>** * 50-100 M</p>	 <p>50 M More or less</p>
Three leg "Tee" intersection			 <p>** *</p>	 <p>** *</p>	
Basic characteristics of intersection	Vertical separation Flow separation Ramps Speed control	Vertical separation Flow control Ramps Speed control Signal/sign control	Flow control Traffic channels Signal control	Flow control Traffic channels Signal/sign control	Sign control or Uncontrolled
Types of roads intersecting	V_1 / V_1 (V_1 intersecting V_1) V_1 / V_2 V_2 / V_2 V_2 / V_3	V_2 / V_2 V_2 / V_3 V_3 / V_3 V_3 / V_4	V_3 / V_3 V_3 / V_4 V_4 / V_4 V_4 / V_5	V_4 / V_4 V_4 / V_5 V_5 / V_5 V_5 / V_6	V_5 / V_5 V_5 / V_6 V_6 / V_6 V_6 / V_7

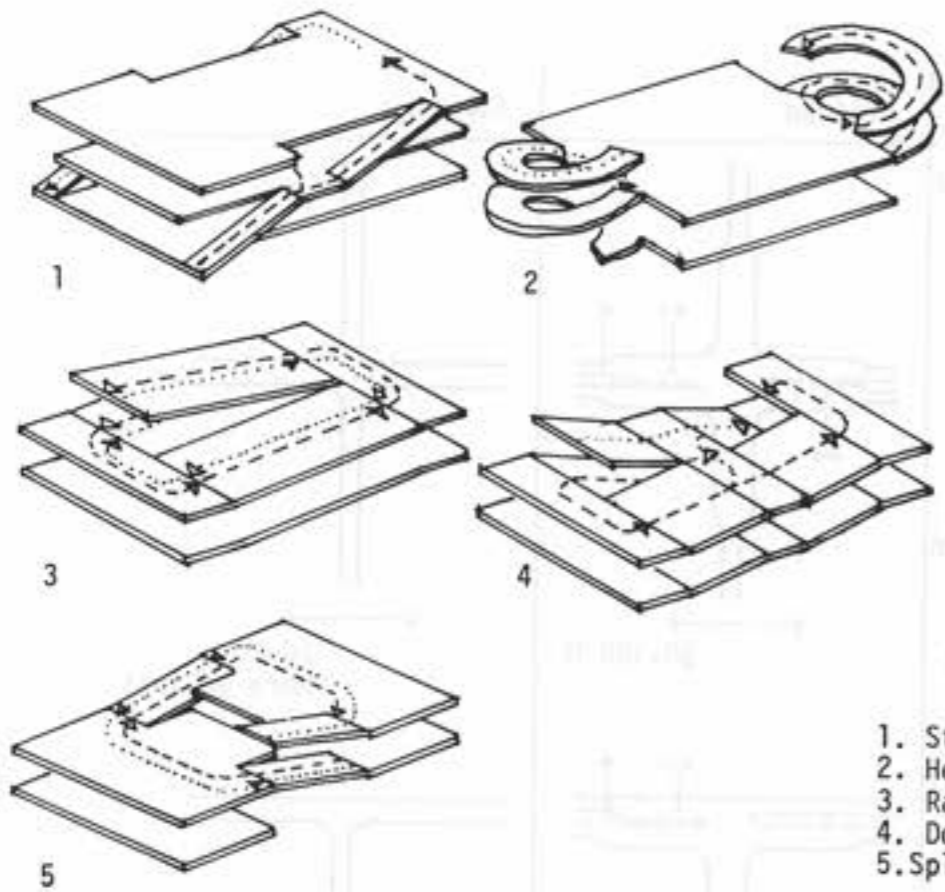
Note:
Intersections shown above are "examples" only.
Actual design should be based on detailed analysis
of each case in each location.

* Median strips may be eliminated, then
roadway width can be decreased accordingly

** Left turn lane may be provided
for safer turn (optional)

FIGURE A-2-9(d)
INTERSECTION
EXAMPLES

FIGURE A-2-9 (e)
STRUCTURE PARKING
(EXAMPLES)



1. Straight Ramp
2. Helical Ramp
3. Ramped Floor
4. Double Ramped Floor
5. Split-level Floor

Recommended Size

Minimum capacity	200 cars
Maximum capacity	500 cars
Maximum No. of Levels (for garage)	6

Unit Parking Dimensions

45° one-way	14.5 to 16.5 m.
60° one-way	17.0 to 19.0 m.
90° two-way	18.5 to 19.5 m.

Entrance and Exit

Number	At least one with multiple lanes, minimum 15 m from street intersection.
Width of lanes	3.5 m for one-way
Radius of Curb (inside)	Minimum 3.5 m.

Ramps and Driveways

Slope	15 per cent maximum.
Width	
Straight	Minimum 3.0 m.
Curved, inside lane	Minimum 3.5 m.
Curved, outside lane	Minimum 3.0 m.
Curvature	4 m. diameter to inside.

Parking Stalls

Length	5.5 m.
Width	2.5 m.

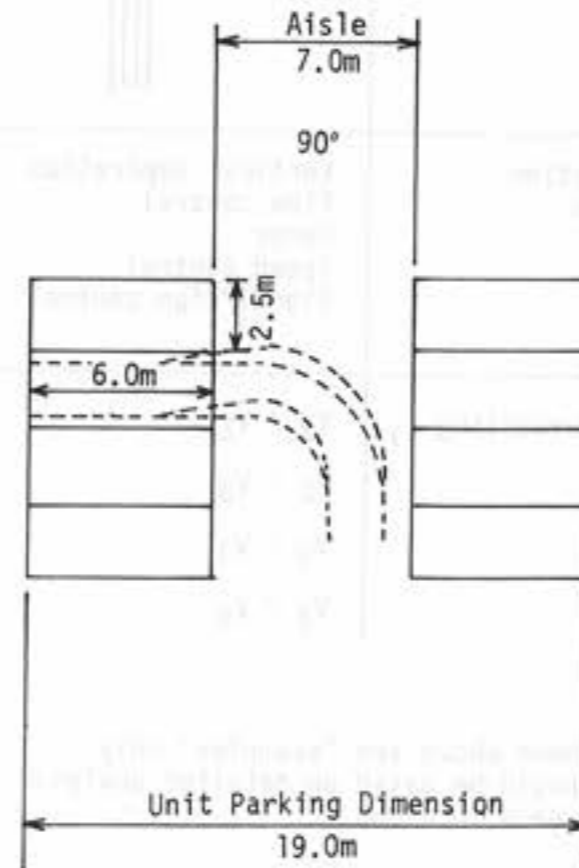
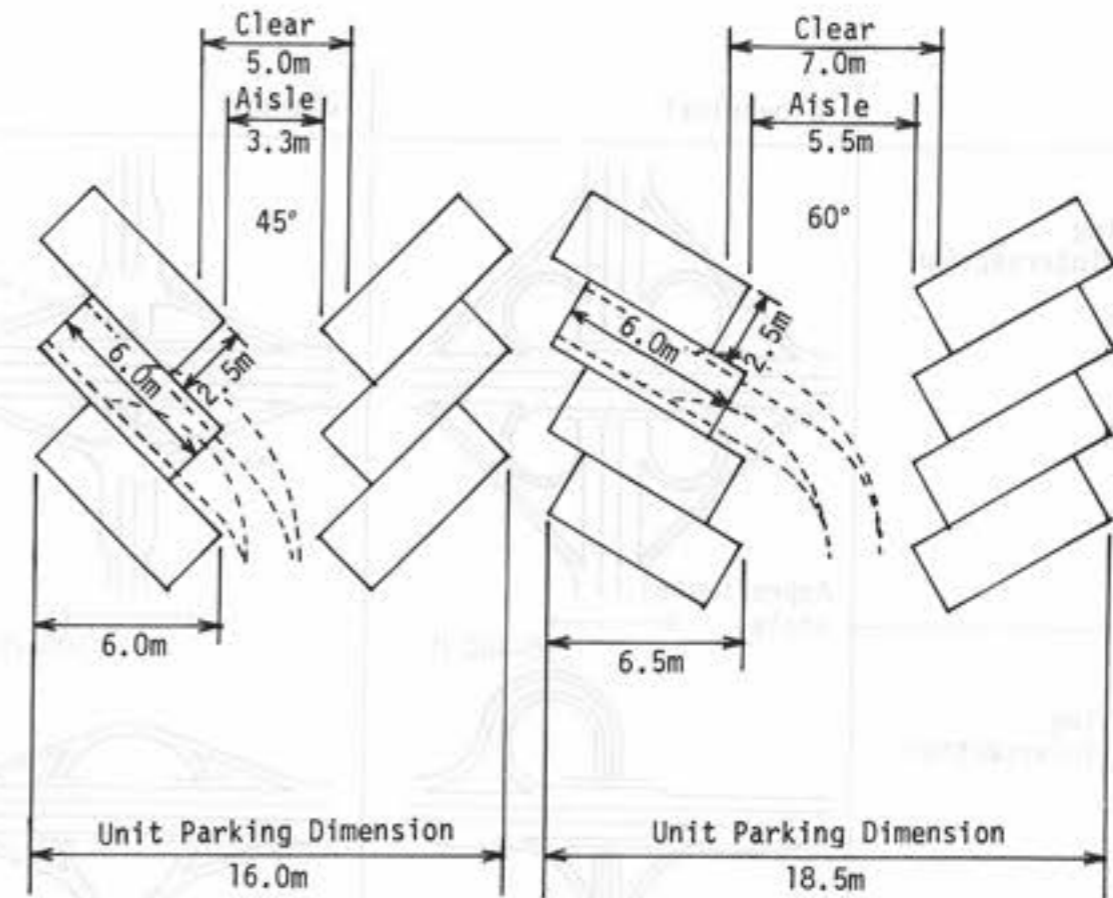


FIGURE A-2-9-(f)
UNIT PARKING
DIMENSION (EXAMPLES)

Table A-3-1(a)
LAND AREA DISTRIBUTION FOR A PROTOTYPICAL CITY OF 60,000 INHABITANTS (in ha)

		NEIGHBORHOOD (3750 Inh)	SUB-COMM. (15,000 Inh)	COMMUNITY (30,000 Inh)	CITY TOTAL (60,000 Inh)
(1) EDUCATIONAL FACILITIES	NURSERY-KINDERGARTEN	0.02x4=0.1	x4= 0.4	x2= 0.8	x2= 1.6
	ELEMENTARY SCHOOL(BOYS)	0.5	x4= 2.0	x2= 4.0	x2= 8.0
	ELEMENTARY SCHOOL(GIRLS)	0.5	x4= 2.0	x2= 4.0	x2= 8.0
	INTERMEDIATE SCHOOL(BOYS)		1.2	x2= 2.4	x2= 4.8
	INTERMEDIATE SCHOOL(GIRLS)		1.2	x2= 2.4	x2= 4.8
	SECONDARY SCHOOL(BOYS)			1.5	x2= 3.0
	SECONDARY SCHOOL(GIRLS)			0.9	x2= 1.8
	TEACHERS SCHOOL				2.1
	TECHNICAL SCHOOL(BOYS)				2.1
	TECHNICAL SCHOOL(GIRLS)				1.0
TOTAL (1)		1.1	6.8	15.6	46.7
(2) RECREATIONAL/ATHLETIC FACILITIES (to be cont.)	TOT-LOT	0.5x16=0.8	x4=3.2	x2= 6.4	x2=12.8
	NURSERY-KINDERGARTEN PLAY LOT	0.2x4=0.8	x4=3.2	x2= 6.4	x2=12.8
	NEIGHBORHOOD PARK	2.0	x4=8.0	x2=16.0	x2=32.0
	PLAYGROUND	1.5*	x4=6.0	x2=12.0	x2=24.0
	PLAYFIELD LEVEL 1		3.6**	x2= 7.2	x2=14.4

NOTE: * 0.75 ha for boy; 0.74 ha for girl
 ** 1.8 ha for boys; 1.8 ha for girls
 *** 2.0 ha for boy; 1.0 ha for girl

		NEIGHBORHOOD (3750 Inh)	SUB-COMM. (15,000 Inh)	COMMUNITY (30,000 Inh)	CITY TOTAL (60,000 Inh)
RECREATIONAL/ATHLETIC FACILITIES (CONT.)	COMMUNITY PARK	-	-	12.0	x2=24.0
	PLAYFIELD LEVEL 2	-	-	3.0***	x2= 6.0
	CITY PARK	-	-	-	24.0
TOTAL (2)		5.1	24.0	63.0	150.0
(3) CULTURAL COMMUNITY FACILITIES-RELIGIOUS, SOCIAL AND CULTURAL FACILITIES	SMALL MOSQUE	0.25	x4= 1.0	x2= 2.0	x2= 4.0
	NEIGHBORHOOD CENTER	0.3	x4= 1.2	x2= 2.4	x2= 4.8
	JAMI'A MOSQUE	-	0.7	x2= 1.4	x2= 2.8
	COMMUNITY CENTER	-	-	0.6	x2= 1.2
	CIVIC CENTER	-	-	-	3.0
TOTAL (3)		0.6	2.9	6.4	16.1
(4) HEALTH FACILITIES	PHARMACY	0.1	x4= 0.4	x2= 0.8	x2= 1.6
	DIAGNOSIS/TREATMENT CENTER	-	0.5	x2= 1.0	x2= 2.0
	GENERAL HOSPITAL	-	-	-	4.5
TOTAL (4)		0.1	0.9	1.8	8.1
(5) COMMERCIAL FACILITIES	NEIGHBORHOOD SHOPPING CENTER	1.2	x4= 4.8	x2= 9.6	x2= 19.2
	COMMUNITY SHOPPING CENTER	-	-	1.1	x2= 2.2
	DOWNTOWN SHOPPING	-	-	-	4.5
	TOTAL (5)		1.2	4.8	10.7

Table A-3-1 (a) continued

		NEIGHBORHOOD (3750 Inh)	SUB-COMM. (15,000 Inh)	COMMUNITY (30,000 Inh)	CITY TOTAL (60,000 Inh)
(6) PUBLIC FACILITIES	GOVERNMENT OFFICE	-	-	-	2.6
	POST OFFICE	-	-	0.1	x2= 0.2
	POLICE STATION	-	-	0.1	x2= 0.2
	FIRE STATION	-	-	0.1	x2= 0.2
	WATER SUPPLY STATION	-	0.5	x2= 1.0	x2= 2.0
	SEWAGE TREATMENT	-	1.0	x2= 2.0	x2= 4.0
	POWER STATION	-	1.0	x2= 2.0	x2= 4.0
	GARBAGE DISPOSAL	-	1.0	x2= 2.0	x2= 4.0
	MUNICIPAL LIBRARY OR MUSEUM	-	0.2	x2= 0.4	x2= 0.8
TOTAL (6)		-	3.7	7.7	18.0
(7) INDUSTRIAL	FACTORY, WAREHOUSE DISTRIBUTION CENTER	-	10.0	x2=20.0	x2=40.0
TOTAL (7)			10.0	20.0	40.0
TOTAL of (1) through (7)		8.1	53.1	125.2	304.5
(8) RESIDENTIAL	CASE 1 100 pph NET DENSITY	37.5	x4= 150.0	x2= 300.0	x2= 600.0
	CASE 2 200 pph NET DENSITY	18.8	x4= 75.0	x2= 150.0	x2= 300.0
	CASE 3 400 pph NET DENSITY	9.4	x4= 37.5	x2= 75.0	x2= 150.0

		NEIGHBORHOOD (3750 INH)	SUB-COMM. (15,000 INH)	COMMUNITY (30,000 INH)	CITY TOTAL (60,000 INH)
TOTAL of (1) THROUGH (8)	CASE 1	45.6	203.1	425.2	904.5
	CASE 2	26.7	128.1	275.2	604.5
	CASE 3	12.5	90.6	200.2	454.5
(9) TRANSPORTATION	STREET/SIDE-WALK* CASE 1	9.1	x4=36.4	x2=72.8	x2=145.6
	CASE 2	5.3	x4=21.2	x2=42.4	x2= 84.8
	CASE 3	3.5	x4=14.0	x2=28.0	x2= 56.0
	ARTERIES**				
	CASE 1	-	20.3	42.5	90.4
	CASE 2	-	12.8	27.5	60.4
	CASE 3	-	9.1	20.0	45.4
TOTAL (9)	CASE 1	9.1	56.7	115.3	236.0
	CASE 2	5.3	34.0	69.9	145.2
	CASE 3	3.5	23.1	48.0	101.4
GRAND TOTAL of (1) THROUGH (9)	CASE 1	54.7	259.8	540.5	1140.5
	CASE 2	32.0	162.1	345.1	749.7
	CASE 3	21.0	113.7	248.2	555.9

NOTES: * Assumption: 20% of total of (1) through (8) for small streets related "inside" of neighborhood
 ** Assumption: 10% of total of (1) through (8) for arterries outside of neighborhood

Table A-3-1(b)
 GENERAL STANDARDS FOR URBAN LAND DISTRIBUTION^a
 (% OF TOTAL AREA WITHOUT RESERVE
 LAND, NON USED OR BUFFER AREAS)

	NEIGHBORHOOD (3750 INH.)			SUB-COMMUNITY (15,000 INH.)			COMMUNITY (30,000 INH.)			CITY (60,000 INH.)		
	Case 1	Case 2	Case 3	Case 1	Case 2	Case 3	Case 1	Case 2	Case 3	Case 1	Case 2	Case 3
(1)Educational*	2.0	3.4	5.2	2.6	4.2	6.0	2.9	4.5	6.3	4.1	6.2	8.4
(2)Recreational/ Athletic	9.3	15.9	24.3	9.2	14.8	21.1	11.7	18.3	25.4	13.2	20.0	27.0
(3)Cultural/ Religion and Social	1.1	1.9	2.9	1.1	1.8	2.6	1.2	1.9	2.6	1.4	2.1	2.9
(4)Health	0.2	0.3	0.5	0.3	0.6	0.8	0.3	0.5	0.7	0.7	1.1	1.5
(5)Commercial*	2.2	3.8	5.7	1.8	3.0	4.2	2.0	3.1	4.3	2.3	3.5	4.7
(6)Public Facility	-	-	-	1.4	2.3	3.3	1.4	2.2	3.1	1.6	2.4	3.2
(7)Industrial	-	-	-	3.8	6.2	8.8	3.7	5.8	8.1	3.5	5.3	7.2
(8)Residential	68.6	58.8	44.8	57.7	46.3	33.0	55.5	43.5	30.2	52.6	40.0	27.0
(9)Transportation	16.6	16.6	16.7	21.8	21.0	20.3	21.3	20.3	19.3	20.7	19.4	18.2

Note: a. Parking is included in each use category.
 b. Case 1: 100 pph, NET RESIDENTIAL DENSITY
 c. Case 2: 200 pph, NET RESIDENTIAL DENSITY
 d. Case 3: 400 pph, NET RESIDENTIAL DENSITY
 * School athletic ie. palyground/playfield is excluded from this
 category in this computation.