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SOUTHERN REGION PROJECT STUDY MASTER PLAN REPORT KHAMIS MUSHAYT

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

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
The Minister of Municipal and Rural Affairs

H.R.H. Prince Khalid Ibn Faisal Ibn Abdul Aziz
The Governor of Asir Province

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The U.N. Cheif Advisor--Regional and National Physical Planning Project

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The Assistant Director General of Municipal and Rural Affairs--
Southern Region

CONTENTS

1. introduction

1-1 SCOPE OR 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 1975 to 1995. 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 Plnas 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 Strategies 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 chage in population, the functional distribution of land use, infrastructure development, and policies toward the nomadic 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 4000 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. Phasing, zoning and legal framework, and recommendations for a capital investment program are developed from the Master Plan.

Planning Element 1

Planning Element 2

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Planning Element n

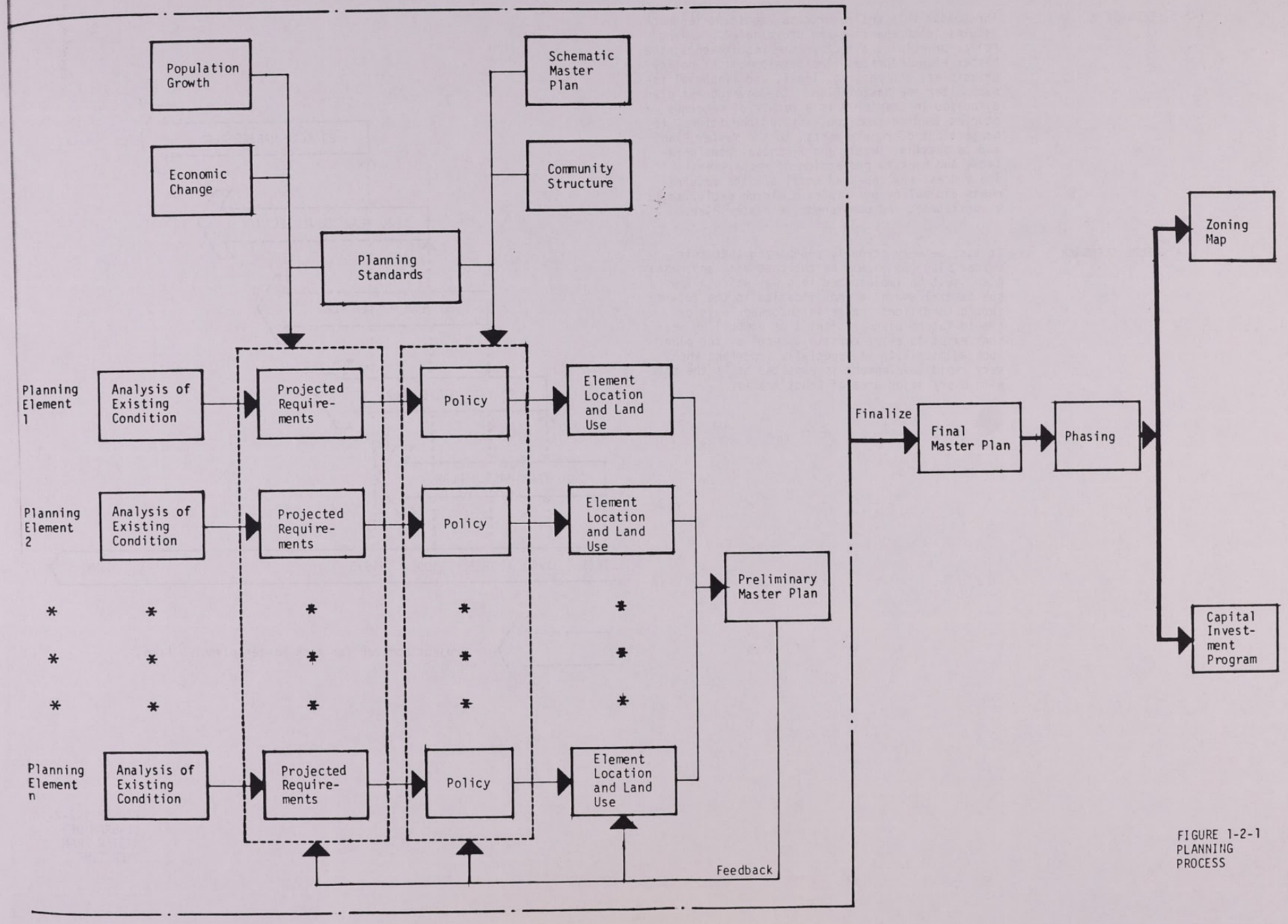

FIGURE 1-2-1
PLANNING
PROCESS

1-2-5 FEEDBACK

Throughout this entire process, constant feedback assures comprehensive and coordinated planning. Policy principles affect future requirements; the Master Plan infuences 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 nemerous 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 consistenet and comprehensive Master Plan.

1-2-6 FUTURE FEEDBACK

It must be very strongly emphasezed 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 modificátion in the future should conditions change in unforseen ways or should future planners feel that compelling reasons exist to alter certain aspects of the plan. Such adaptability if especially important when very rapid development is expected as is the case with every major area of Saudi Arabia.

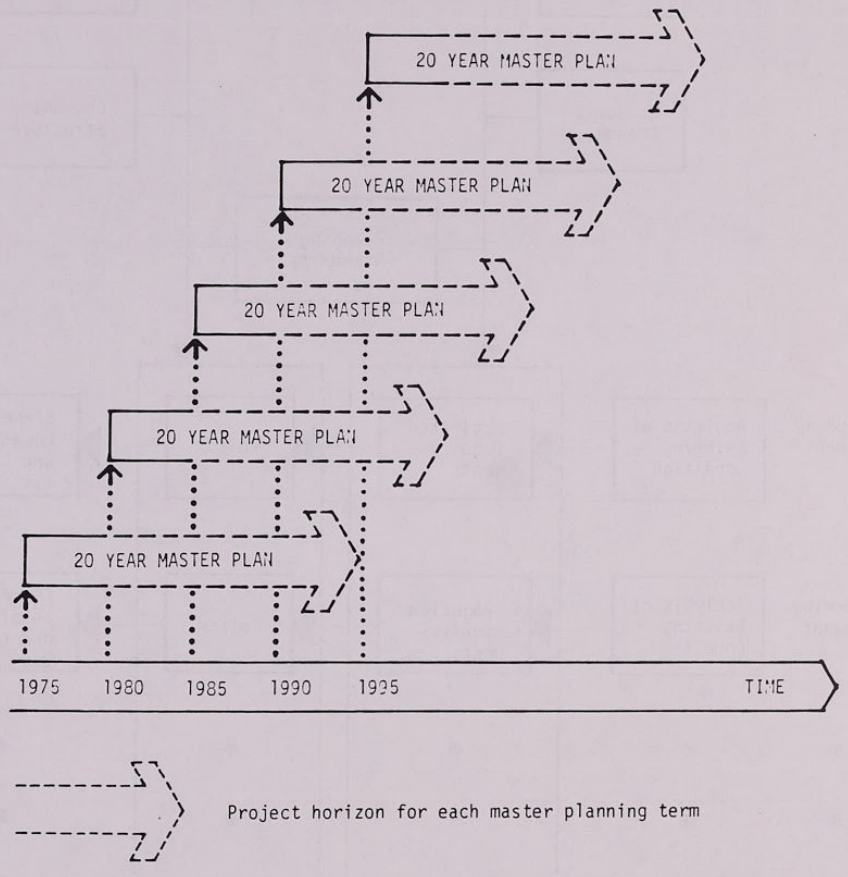

FIGURE 1-2-2
DIAGRAM OF
MASTER PLAN
OVER TIME

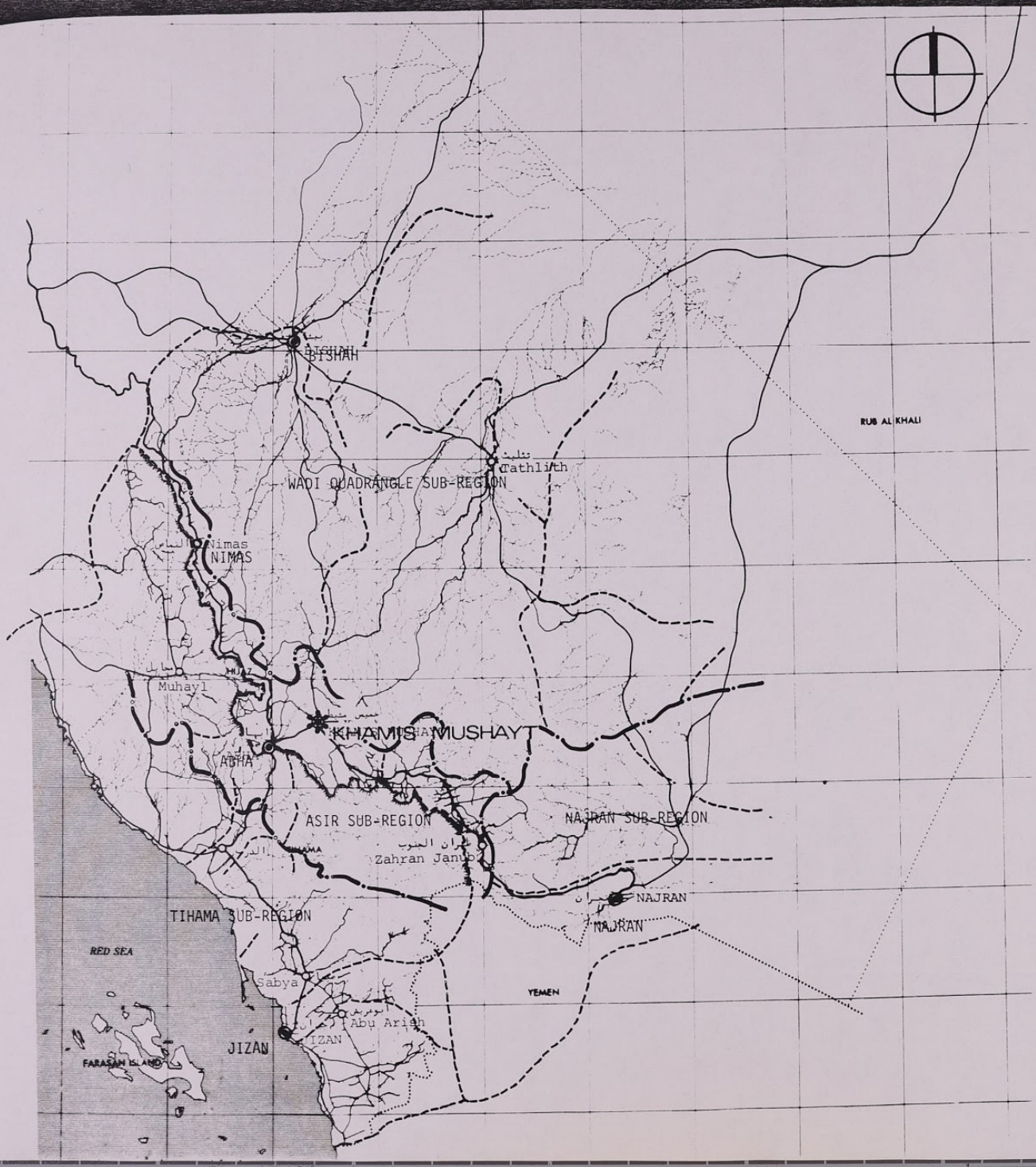

FIGURE 1-2-3
REGIONAL
LOCATION

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

RE 1-2-2
RAM OF
ER PLAN
TIME

2. summary of existing conditions

2-1 REGIONAL POLICIES AND THE CITY

Inland from the sea and within 50 km of Abha, Khamis Mushayt lies on a flat plain of the central highland plateau at the center of the Southern Region.

The Saudi Government has embarked on a policy of regional development to help lessen disparities that now exist between the eastern oil-producing areas, urban centers such as Riyadh and Jeddah, and the rest of the country.

In the Southern Region, the thrust of this plan is to improve the welfare of the people and to improve the productive capacities of the area. Each of the five cities in the Southern Region is expected to contribute something to this end.

While not yet proven to be particularly rich in mineral resources, the Southern Region has a relatively good supply of water, a temperate climate, attractive natural features with good potential for agriculture, manpower, and access to marine resources and water transportation. The region is therefore expected to develop its potential for agriculture, domestic tourism, and industry.

The Asir sub-region has a high average rainfall of 400 mm per year and excellent soil conditions, with an agricultural potential second only to Tihama. Given its favorable water supply, Khamis Mushayt is expected to greatly develop its agricultural sector to help meet the regional goal of self-sufficiency.

Because of its central location, good climate, and relatively modern urban centers, Asir has become the regional center for administration, business, commerce, manufacturing, education, and culture. Its spectacular natural features make it a perfect location for highland tourism which is expected to develop as well.

Due to its centrality to the province and the region, Khamis Mushayt has become the foremost commercial and manufacturing center for both. It is expected to continue its role and to further develop its industrial and commercial potential. Nearby Abha will share in these facilities, plus Khamis Mushayt's water supply and the airport, while maintaining its historic function as the administrative capital of the area. Khamis Mushayt and Abha are not only linked by proximity and functional interdependence, but through areas of scattered development between the two cities that overlap to form the greater urban areas of both. While this may put a greater strain on some of Khamis Mushayt's resources such as its water supply, it will also clearly enhance the commercial and manufacturing potential of the city.

2-2 MAIN FUNCTION OF THE CITY

Khamis Mushayt's function as the leading commercial and manufacturing center of the Southern Region stems from its geographic centrality, its proximity to Abha, the administrative capital, and its importance as the site of a military base.

The growth of the city's economic activity has been extremely rapid. It imports commodities transported from both the Western and the Central Regions as well as distributing goods to local residents and to other major cities and towns in the Southern Region. Its pivotal role is facilitated by its location and its connection with paved arterial roads.

Within Khamis Mushayt, there are a large number of shops, factories, and vehicle repair garages. Wooden furniture, ironware, and cement blocks are the major manufacturing products, with the bulk of the materials being imported. Local materials and cultivated products are rarely used, except in traditional industries, such as sesame oil extraction and leather and shoemaking.

The city abounds with permanent and temporary shops that handle an impressive variety of commodities and foodstuff. Goods sold include imported items such as cars, motorcycles, spare parts, radios, watches, jewelry, cosmetics, furniture, carpets, stationery, electrical supplies, native crafts, locally produced agricultural products, and imported foodstuff. Other shops perform service functions for residents such as tailoring, cleaning, and barbering.

Presently the Southern Region is a large agricultural producer. However, much is still imported. Within Khamis Mushayt itself, some of the population still depends on agriculture for their livelihood; the main crops being cereals, alfalfa, sorghum, vegetables, and decidous fruits.

Khamis Mushayt is linked to the surrounding areas in a variety of ways. Its military installations share a responsibility for the defense of the Kingdom; it depends on Abha for administrative services; its construction activities attract immigrant Yemenis; and its main food supplies are transported through neighboring cities.

SOURCE:
Initial A
Condition
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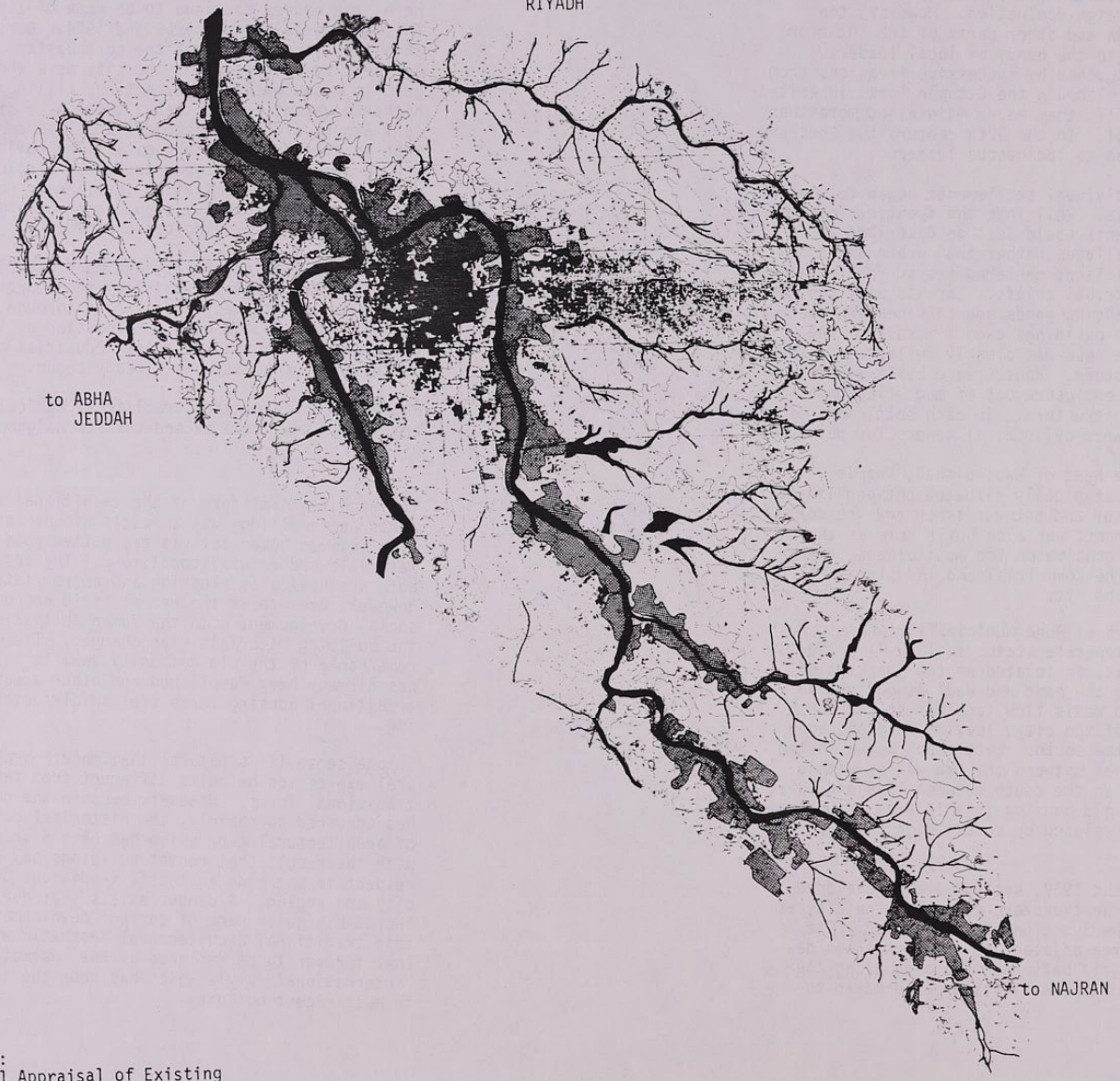
FIGURE 2-1-1
SURROUNDING
AREA

scale 1:50,000



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

2-3 HISTORICAL GROWTH AND NATURAL FEATURES

2-3-1 HISTORICAL GROWTH

Historically, Saudi Arabia underwent numerous periods of foreign domination. However, the Southern Region and other parts of the interior stayed mostly in the hands of local leaders, relatively untouched by successive invasions from the outside. Although the Ottoman Turks inherited the area in 1517, they never maintained more than nominal control. In the 17th century the Southern Region reverted to indigenous leaders.

Over time, individual settlements began to scatter along the Wadis. Well into the twentieth century these settlements could best be described as clusters of villages rather than urban areas. Most of the villages centered around fortress-like residents of tribal chiefs. Markets provided the means of exchanging goods and services and there were no public buildings except mosques. The concern for defense was clearly reflected in the local architecture. Houses were built within a fortress-like enclosure out of mud brick on a wooden-framed structure. In each settlement of houses there were cylindrical towers for defense.

Located at the head of Wadi Bishah, Khamis Mushayt is strategically situated between Tihama and the interior and between Yemen and the north. A regional airport was also built here as the Abha area was considered too mountainous, thereby enhancing the commercial and industrial potential of the city.

Formerly a part of Abha municipality, Khamis Mushayt received separate status in 1970-71 (1390-1391 A.H.). The city is located at the junction of Wadi Bishah on the east and Wadi Atwood on the west. The two Wadis flow together at the northwestern part of the city, leaving only one open direction to the south. Settlement began in the northeast corner between the two Wadis, with a slight growth to the south between 1949 and 1959. Presently the old housing in this area around the suq is being replaced by modern high rise apartments.

Between 1959 and 1969, settled areas developed away from the northeastern corner of the city as far west as the junction of Wadi Atwood. The residential area adjacent to the market was developed in a grid pattern. The area along the western side of the Wadi Bishah also began to be settled in a southwardly direction.

At the same time, a new section to the east of Wadi Bishah developed, due to the presence of the military installation and to the government's policy of encouraging the settlement of nomads. Here, the houses continue to be made of zinc. This area grew between 1969 and 1974. During this time, the density of the northeastern corner of the city increased and the city as a whole grew in a southwesterly direction, filling in hitherto vacant areas. Here, there is a significant amount of new development and less density than in other parts of the city. The buildings are more modern with concrete block, single family housing predominating the largely residential section. Presently a number of apartment buildings are also being constructed.

The commercial, industrial, and manufacturing activity has been facilitated by the improvement of the major east-west access road through the northern half of the city. Relocation of industries along this road to a new industrial park northwest of the city has already begun.

Beyond the city center, traditional agricultural areas near the Wadis extend towards neighboring villages.

2-3-2 ARCHITECTURAL AND AESTHETIC ASPECTS

The architectural form of the traditional settlements and dwellings was a result of the interaction between human activities, native building materials and natural conditions. The result was both aesthetically pleasing and appropriate. However, because of the recent rapid economic and social development both the human activities and the building materials have changed. The most remarkable of the old community dwelling clusters has already been demolished and other areas of traditional housing forms are rapidly deteriorating.

In one sense it is natural that modern architectural expression be quite different from the more traditional forms. However, because the change has occurred so rapidly, the historical continuity of architectural expression has been disrupted, with the result that recent buildings pay little respect to the rich aesthetic traditions of the city and region. A danger exists that due to the incredibly quick pace of current development, this traditional architectural aesthetic will be lost forever to be replaced by the characterless "international" style which has been the tendency in most recent buildings.

*This ar
Field S
ages.

SOURCE:
URTEC Fi
Ministry
1975

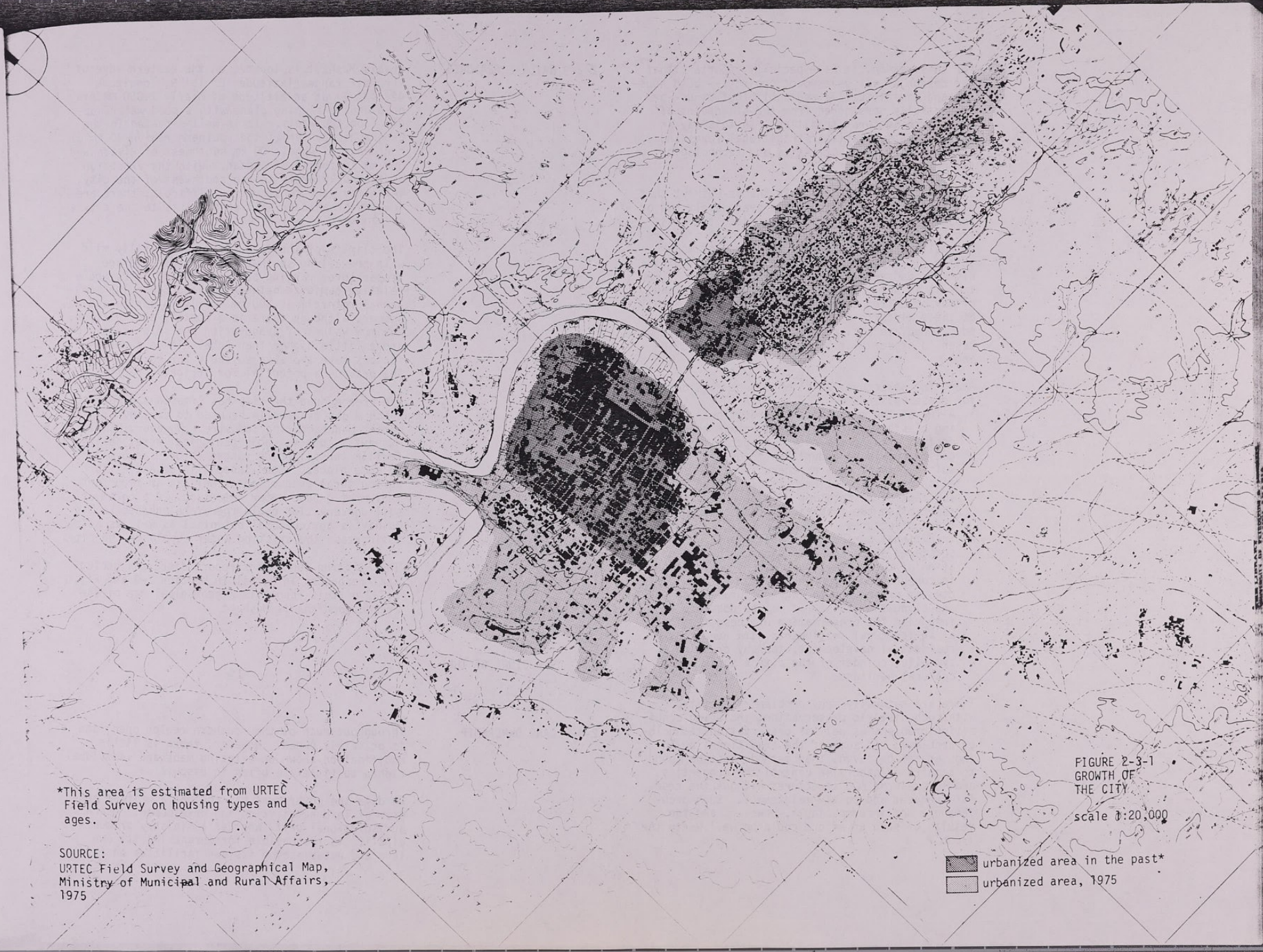


FIGURE 2-3-1
GROWTH OF THE CITY

scale 1:20,000

For this reason, it is especially important that the design of all government projects-- both housing and administrative and public buildings--be thoughtfully considered from the standpoint of local architectural tradition. In this way an appropriate synthesis of traditional forms and spaces with modern activities and technologies can be realized.

It has often been the case in Khamis-Mushayt that old traditional buildings have been demolished or substantially modified to accommodate the construction of new roadways. While it must of course be realized that due to the pressures of modernization, it may not be possible to save all of the historic and traditional buildings. At the same time it is not unimaginable that, due to a lack of any organized conservation effort, most or all of these historic sturctures may soon be destroyed. Immediate action by the government should be taken to preserve at least some of these buildings.

Among the structures which should be considered for preservation are:

1. A few of the most suitable traditional dwelling clusters which may still remain near the central area of the city. A special investigation should be undertaken to determine the suitability of some of these areas for restoration and preservation. It may happen that substantial restoration will be necessary to reestablish the traditional form of some of these structures.
2. Traditional agricultural settlements which are scattered along the wadi banks. The preservation of these dwelling clusters could be done in conjunction with conservation efforts directed at preserving the agricultural green spaces along the wadis. It may be possible to integrate the preservation of these traditional agricultural settlements with new areas of residential development, thereby creating a symbolic reminder of the city's social and cultural heritage.

There are naturally many problems associated with such historic preservation, including acquisition problems as well as preservation technology problems. If some of the traditional buildings are to be saved, then methods must be found to acquire or otherwise control the properties and to preserve mud structures without the need for frequent and costly maintenace. Such problems are not insurmountable, however, and the results of such an effort could be well worth the trouble.

2-3-3 NATURAL FEATURES

Khamis Mushayt is located on the eastern edge of the Asir range (latitude 18° 18' N, longitude 42° 43' E) at an altitude of nearly 2,000 meters on a gently sloping plane with a good water supply from two wadis. It is well-situated in the geographic center of the southern region 30 km northeast of Abha, 800 km southwest of Riyadh and 500 km southeast of Jeddah. With the exception of the rocky areas to the southwest of the city, which may make construction difficult, there are few topographic or soil constraints to the city's development in any direction.

The climate of Khamis Mushayt is generally mild with prevailing southwesterly winds, average temperatures ranging between 3°C and 35°C, and a relative humidity between 43% and 80%. The mean annual rainfall is 300 mm mostly in spring and summer, although there is a monthly accumulation. Maximum values of evaporation and solar radiation are a little higher than Abha. These favorable factors make the area suitable for horticulture and provide a potential for irrigated farming.

The area around the city has limestone deposits which might eventually be used to develop a cement manufacturing industry. However, Khamis Mushayt's most valuable geological asset is its fertile topsoil which ranges as deep as 5 meters in some places. Good topsoil is essential for agricultural production as well as an important medium of ground water retention. A program of soil conservation could therefore enhance Khamis Mushayt's agricultural potential as well as help to increase the existing water supply of the city.

The Existing Conditions report discusses geological resources in detail in section 2-3 and Fig. 2-3-2 of this report is a geological map of the area around Khamis Mushayt.

2-4 STRUCTURE OF THE CITY

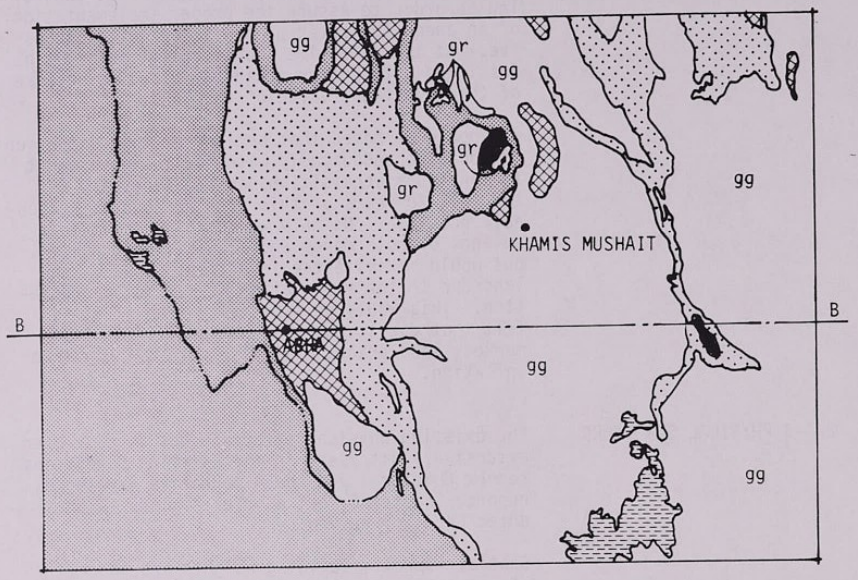
2-4-1 LAND OWNERSHIP

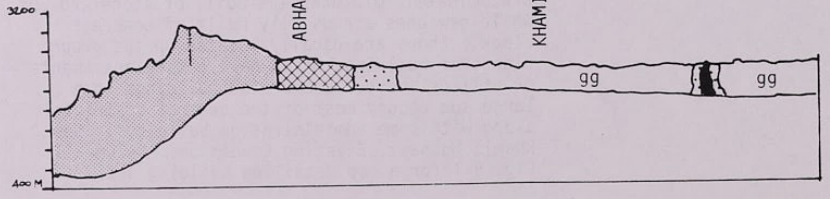
Throughout much of the southern region open land is privately owned. However, there is little codification shown on existing maps and individual rights to title are often in dispute.

To date the government has not had a unified program of land acquisition and development. Each jurisdictional unit, whether a ministry or municipality is responsible for purchasing its own land and establishing its own facilities on it.

GEOLOGICAL MAP

Scale 1:50,000





SECTION B-B

Wadi

Greenstone and Schistose Greenstone

Chlorite-Sericite Schist and Amphobolite Schist

Wajid Sandstone

gr Granite

Anphibolite, Schist and Related Rocks

gg Granite and Granodiorite

Diorite Andesite and Gabbro

FIGURE 2-3-2
GEOLOGICAL
FEATURE

The municipality purchases land from private individuals for both residential development and road construction. Following acquisition, it constructs streets and divides the land into 20 m X 20 m lots, for individual households, and community service facilities. Once subdivided, the lots are sold at nominal prices to Saudi families well below the purchase price, with generous government subsidies.

Within the city as a whole land is either privately owned by individuals or publicly by the government.

Most public facilities are located on government land although is some cases the government leases space (either buildings or land) from private owners. The beds of large wadis are owned by the government, but the flood planes in general belong to private owners. Land condemned by the government for the purpose of street construction belongs to the government, but after streets are completed any remainder is disposed of to private owners.

2-4-2 LAND VALUES

The present value of land (that is the market rate) within the city is quite high and increasing rapidly. Fig. 2-4-1 indicated land values from a study updated in January 1978 and a comparison with previous values (see Preliminary Master Plan, Fig. 2-4-1) shows dramatic increases.

While no precise formula for determinining land value can be determined, the following general rules, 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.
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 an artificial result of 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 forseeable 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. No 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 somewhat artificial 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. There are beginning to be more and more structures of 4 or more stories as development continues (for a map of 1975 building hieghts refer to Khamis Mushayt, Existing Conditions, Fig. 5-2-1. 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 while new ones are usually built of concrete block. Shops are usually located on the ground floors of buildings which have either apartments or offices above. Commercial buildings in a large suq occupy most of the central district along with some administration buildings. See Khamis Mushayt, Existing Conditions, Volume II Fig. 5-1 for a map detailing building use.

Architectural and Aesthetic Aspect, see section 2-3-2 of this report.

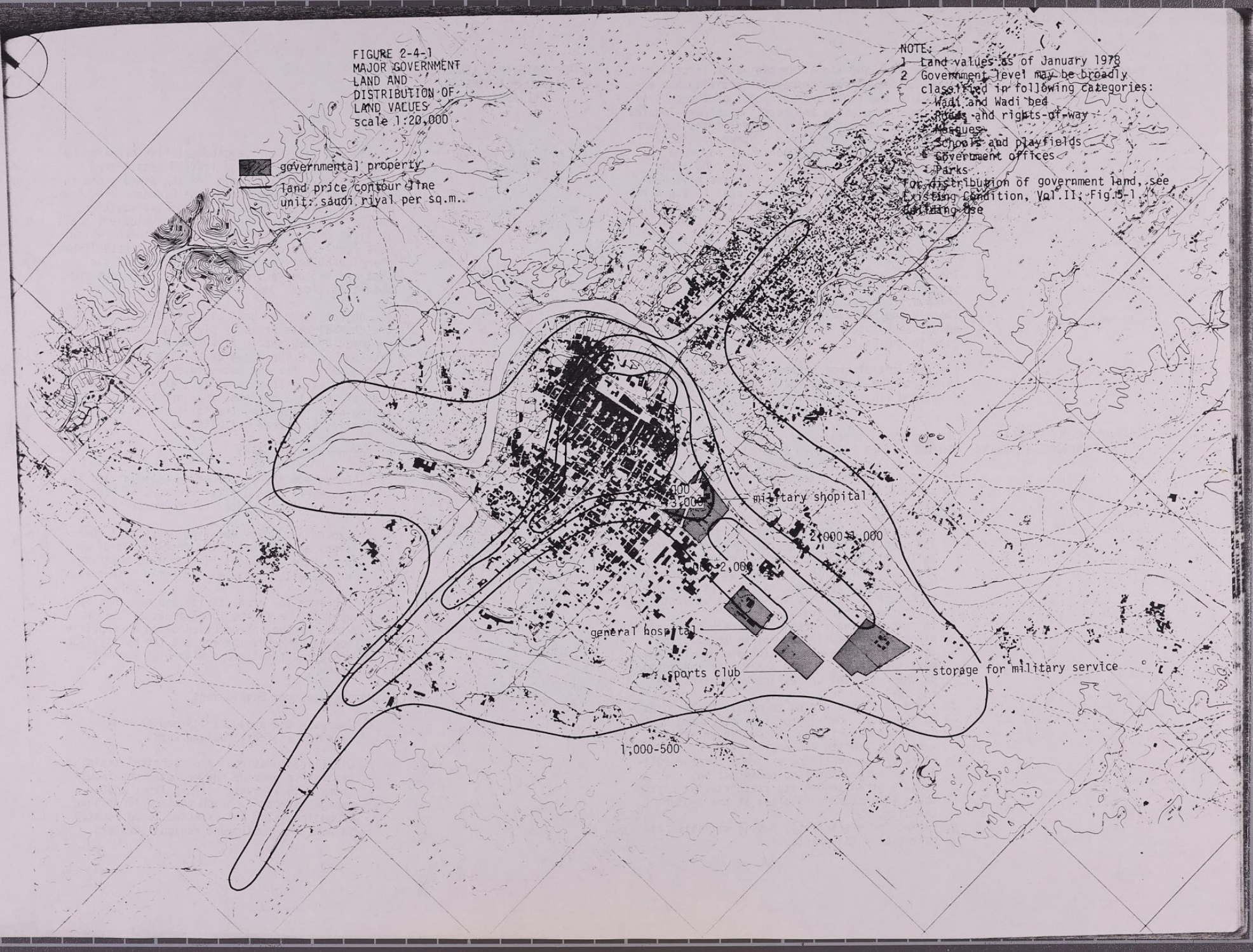
FIGURE 2-4-1
MAJOR GOVERNMENT
LAND AND
DISTRIBUTION OF
LAND VALUES
scale 1:20,000

governmental property

land price contour line
unit: saudi riyal per sq.m.

NOTE:
1 Land values as of January 1978
2 Government level 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



2-4-4 EXISTING LAND USE

Much of the land along the two wadis is still open. Although some commercial activity has extended to the south and southeast of the central area, most wholesale and retail shops are located in the open market (suq) situated at the eastern end of the Abha-Khamis road. Numerous second hand automoblie dealers, workshops for repairs, and dealers of spare parts can be found along this road. Some of these enterprises have been relocated to the new industrial area in the northwest of the city. However, behind the automobile facilities along the road, there are still a large number of workshops for wooden furniture, steel doors, and hardware.

There are few government facilities due to the proximity of the administrative center of Abha. Religious and social facilities are somewhat loosely and haphazardly dispersed due to the spontaneous rather than planned development of the city in the past.

The residential area spreads from the central market to the west and south, with the newly developed zinc hut setelement.

2-4-5 PRINCIPLE PROBLEMS OF PHYSICAL PLANNING

The principal problems of physical planning in Khamis Mushayt have been extensively discussed in the Initial Appraisals report, 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. So called urban sprawl, that is disorderly and uncontrolled horizontal development especially at the outskirts is occurring rapidly in Khamis Mushayt. This created conflicts with agricultural land use, destroys the functional structure of the city and creates aesthetically undesirable areas.
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 areas near the center of the city land prices are very high (see Fig. 2-4-1).
3. There is at present no community focal point to the city. Because of lack of controls, the center of the city has become essentially a very high density commercial area.
4. There are currently no programs for agricultural or recreation land conservation.
5. Because of an inadequate trasportation system there is extreme congestion at the center of the city.
6. Except for electricity, public utilities are essentially non-existent.

2-5 PRINCIPAL ISSUES AND PLANNING OBJECTIVES

2-5-1 OBJECTIVES AND GUIDLINES

The Second Five-Year Development Plan prepared by the Central Planning Organization established national development goals for the Kingdom and for several planning regions of the Kingdom. The Preliminary Physical Master Plan for the southern region has analyzed the national development goals in light of the resources of the southern region. As a result the preliminary report has established planning objectives for the subregions of the southern region according to their resources and potentialities.

The objectives have been classified according to the general categories of planning considerations employed by the Second Five-Year Plan: Economic Development, Human Resource Development and Social Development. For the subregional Province of Asir and the City of Khamis Mushayt, after consideration of both the national development goals and subregional resources, the following planning objectives have been established:

A. Economic Development

1. Encourage the continued development and improvement of the city's commercial sector as a regional center for commerce.

2. Expand and unify existing industrial operations and encourage the development of appropriate new industries to take advantage of the city's natural and human resources.

3. Increase the productivity and 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 Resources Development

1. Increase the productivity and earning capacity of individual workers.

2. Establish vocational and technical training centers to provide the expected new industries with adequate skilled labor and managerial staff. Such centers for higher education which are expected to be located in Abha can complement regional centers.

FIGURE 2-4-2
EXISTING
LAND USE

scale 1:20,000

SOURCE:
URTEC Field Survey, see Existing Conditions, Vol.II, Fig.4-1, Land Use, and Initial Appraisal of Existing Conditions, Fig.6-1, Distribution of Activities

3. Establish programs for the education, settlement, and assimilation of Nomadic peoples.

C. Social Development

1. Improve the quality and extent of social welfare services to the residents of Asir Province and the City of Khamis Mushayt.

2. Provide suitable housing within the city for those with limited income.

2-5-2 RELATIONSHIP OF THE MASTER PLAN TO DETAILED 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. population and housing

3-1 POPULATION PROJECTION AND DISTRIBUTION

3-1-1 EXISTING AND PROJECTED POPULATION

The population of the Asir sub-region is concentrated along the Hijaz Mountains at the edge of the upland plateau and the escarpment. Khamis Mushayt and Abha are located at the center of this high density belt. The approximate population of the sub-region in 1975 was 326,000 [1].

For the purpose of the report, the area within a 50 km radius of Khamis Mushayt, excluding what is closer to Abha, is designated as the greater urban area. This represents an hour's drive from Khamis Mushayt. The estimated total rural population in the greater urban area was 50,500 in 1975.

According to the URTEC 5% survey the population of Khamis Mushayt was 29,300 in 1975 [2], and has since been revised upward slightly to 31,930. As two projected growth rates were made: one of 4.7% per year based on existing trends, the other of 6.2% per year based on accelerated development [3].

The additional 1.5% increase between the two estimates would be the result of increased economic activity within the city that could be expected to lead to an in-migration of the unsettled native population, and a consequent accelerated growth rate. The planning target for the city is based on the average of these two projected rates. Thus, Khamis Mushayt's population could be expected to grow from 31,930 in 1975 to 88,300 in 1995, with an expected 39,500 in 1980 and 51,600 in 1985

The population of the greater urban area is acquired by adding the rural population within 50 km from Khamis Mushayt to the population of the city. The plan anticipates an annual rural growth rate of approximately 2.6% per year.

Within the city itself, foreigners constitute 19% of the population with over one-half coming from Yemen. Over 50% of the population is under 14, with a large out-migration of males between 15 and 35 seeking education, employment or going into military service. Due to recent development, inward migration is presently greater than out-migration. A relatively large number in the 35 to 39 age bracket is attributable to the presence of Government officers.

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	186,800
Low	-	88,000	73,300	152,700
Planning	105,700	82,500	64,900	77,700
Greater Urban Area				
High	-	97,500	120,300	186,800
Low	-	94,200	110,700	152,700
Planning	79,800	96,000	116,000	170,000
Urban Area				
High	-	40,600	54,800	100,100
Low	-	38,400	48,300	76,400
Planning	31,930	39,500	51,600	88,300

1995

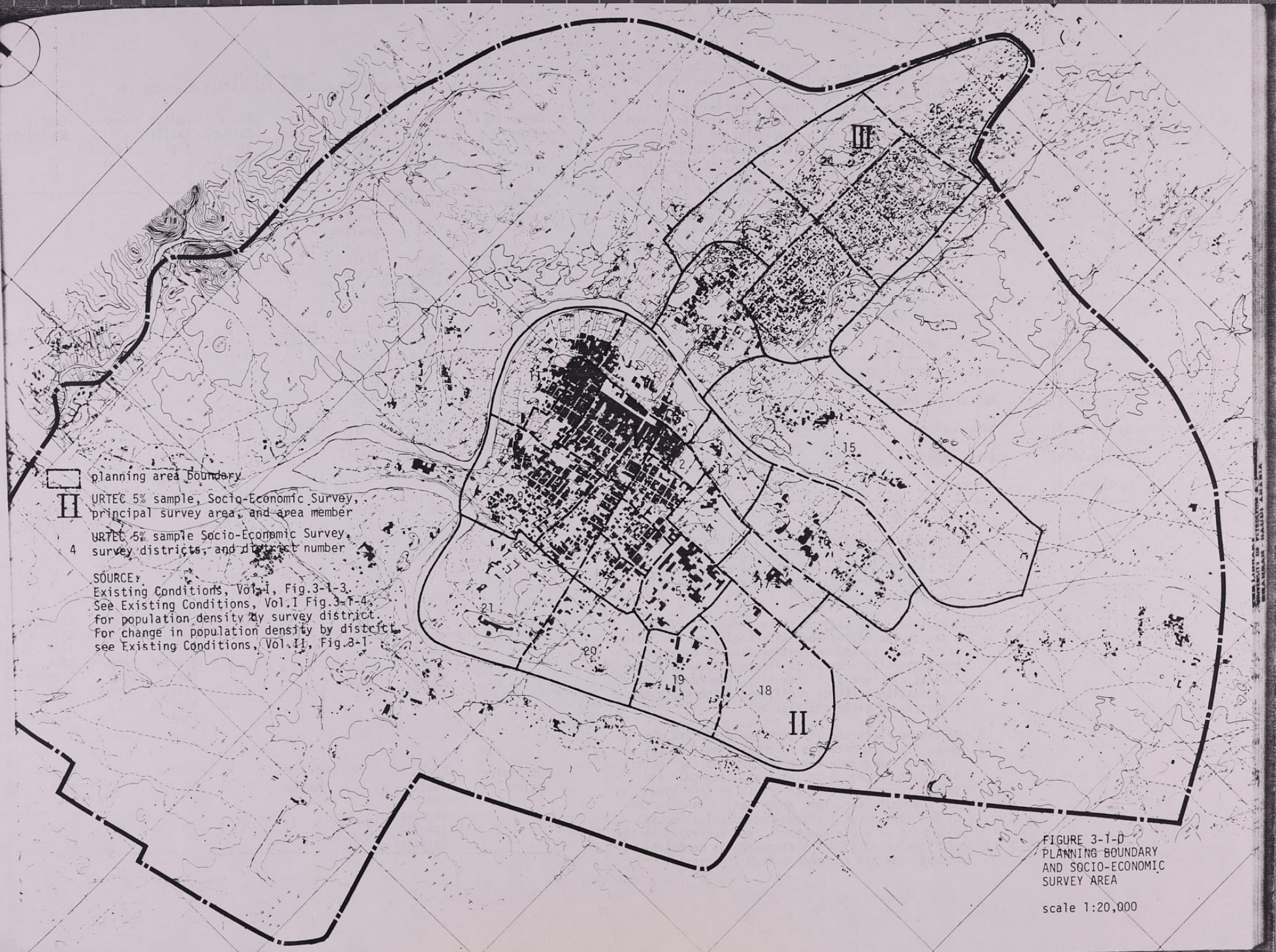
85,200
98,700
42,000

17,400
62,100
89,800

86,800
52,700
77,700

186,800
152,700
170,000

100,100
76,400
88,300



planning area boundary

II URTEC 5% sample, Socio-Economic Survey, principal survey area, and area member

4 URTEC 5% sample Socio-Economic Survey, survey districts, and district number

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

FIGURE 3-1-D
PLANNING BOUNDARY
AND SOCIO-ECONOMIC
SURVEY AREA

scale 1:20,000

3-1-2 COMMUNITY STRUCTURE

The basis for the plannign ofcommunity structure has been set forth in the Planning Standard presented in teh Appendix. These standards are based on a primary grouping of the city's population into planning districts called "neighborhoods" with a population of the order 10^3 and "communities" with a population of the order 10^4. 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	937 (say 1,000)
G_2 (Level 2)	Neighborhood	3,750 (2,500 to 5,000)
G_3 (Level 3)	Sub-Community	15,000 (10,000 to 20,000)
G_4 (Level 4)	Community	30,000 (20,000 to 40,000)

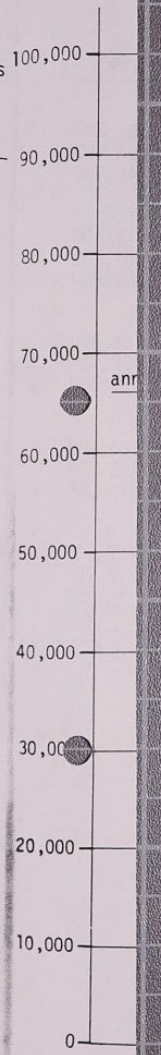
In addition, depending on population, two additional levels - city and sub-region - may be identified in order to more suitably accomodate community structure of cities and areas with relatively large populations.

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 structures 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 variation in the application of planning standards is necessary to account for and accomodate 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	Small 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 Hospital, Special Hospitals, Nursing Home	City/ Regional Shopping Center	Post Office, Police Station, Government
Sub-Region Region	College/ University Special Colleges		Eid Mosque				Government



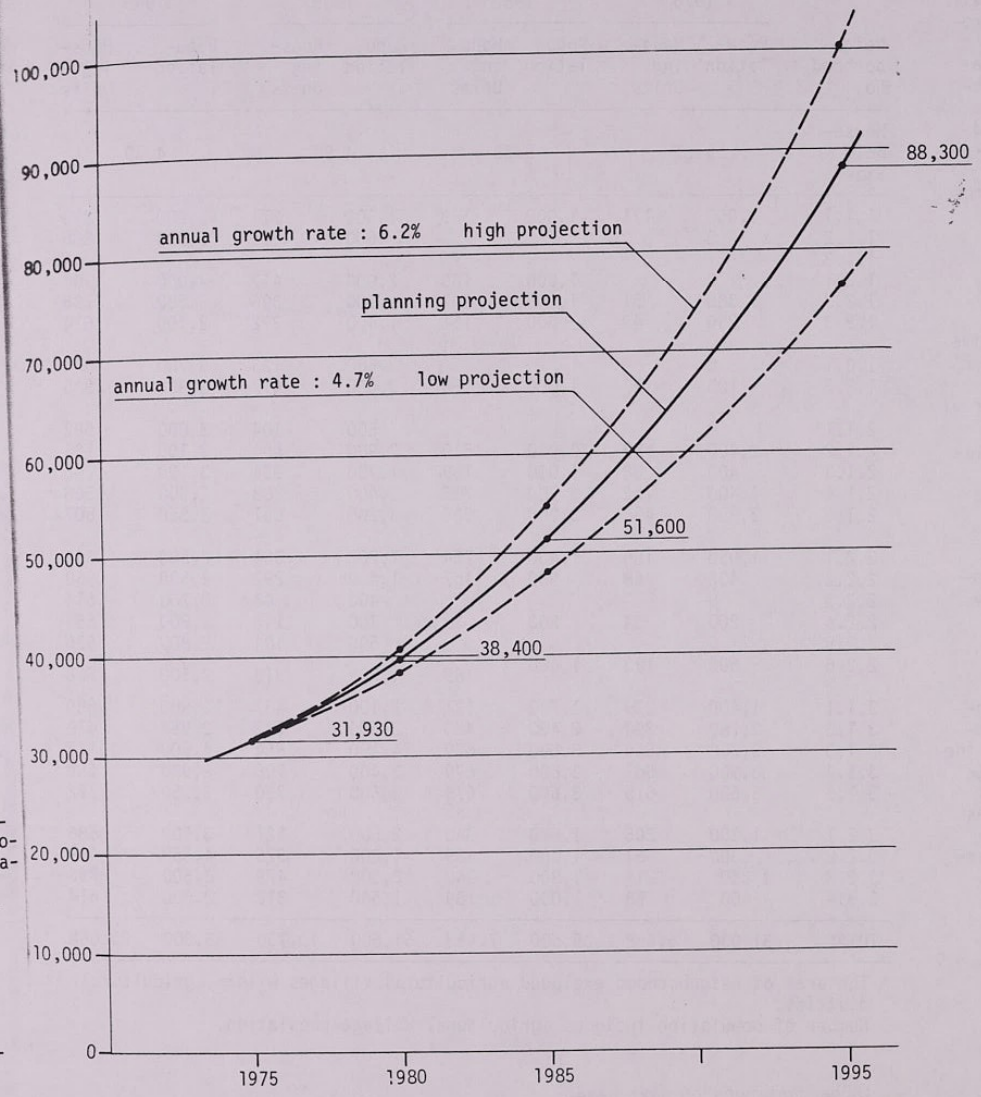
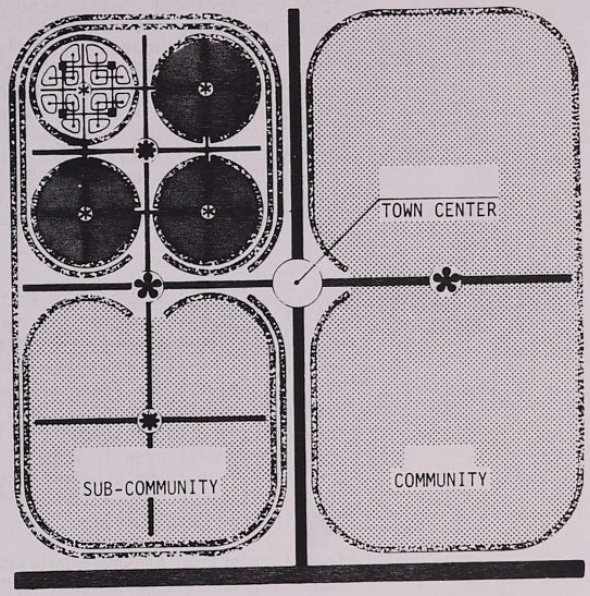


FIGURE 3-1-1
PROJECTED
GROWTH OF
POPULATION



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

The projected total population of 88,300 will, according to this plan, be divided into three communities as shown in the accompanying figure showing community structure. These three communities are arranged roughly according to the divisions created by the major wadis which pass through the city (although three neighborhoods - 1-3-1, 1-3-2 and 2-2-6 - violate this structure in a sense in order to balance community populations). Community 1 except for neighborhoods 1-3-1 and 1-3-2 lies to the west of Wadi Atwood and Wadi Bishah. Community 2 except for neighborhood 2-2-6 lies to the east of Wadi Bishah. Community 3 which includes the older parts of the city lies entirely between the two wadis.

3-1-3 POPULATION DISTRIBUTION BY NEIGHBORHOOD

Agricultural settlements exist along both wadis, although presently new single family detached houses are also being built. Settled Nomads live in the zinc housing in Community 2, and a number of single family dwellings are being built and rented to foreign workers. With a large number of foreigners and Saudi shopowners living in the dense commercial area in Community 3, the population here is extremely heterogeneous. In the south-west part of the city affluent Saudis are building new developments.

The distribution of the population is shown in Table 3-1-4. The neighborhood units of the central area have a high gross residential density of more than 100 persons per hectare (pph) [5]. The other neighborhoods beyond the wadis have lower densities of less than 100 pph.

It should be pointed out that these gross neighborhood densities do not rule out the heterogeneous or mixed distribution of densities within the the neighborhoods themselves. In fact such internal mixing of densities is desirable and will depend on the detailed implementation plans. As a corollary it should also be noted that densities detailed in the zoning plan do not necessarily correspond to these neighborhood densities.

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

Neighborhood No.	1975 Population	1975 Housing Units	1980 Population	1980 Housing Units	1985 Population	1985 Housing Units	1995 Population	1995 Housing Units
Household Size[a]	5.85		5.30		4.80		4.40	
1.1.1	1,000	171	1,000	189	1,300	271	3,600	818
1.1.2	0				600	125	3,900	886
1.1.3								
1.2.1	0		1,000	189	2,000	417	4,000	909
1.2.2	300	51	1,100	207	1,900	396	3,500	795
1.2.3	250	43	800	151	1,400	292	2,700	614
1.3.1	0				600	125	3,700	841
1.3.2	100	17	1,000	189	2,000	417	3,900	886
2.1.1	0				500	104	3,000	682
2.1.2	2,700	462	2,700	510	2,900	604	3,100	705
2.1.3	400	68	1,000	189	1,700	354	3,100	705
2.1.4	4,400	752	3,900	736	3,400	708	2,500	568
2.1.5	2,900	496	3,000	566	3,200	667	3,550	807
2.2.1	1,050	180	1,400	264	1,700	354	2,500	568
2.2.2	400	68	900	167	1,400	292	2,500	568
2.2.3	0				400	83	2,700	614
2.2.4	200	34	200	38	700	146	2,900	659
2.2.5	0				500	104	2,800	636
2.2.6	600	103	1,000	189	1,500	313	2,500	568
3.1.1	1,400	239	1,700	321	2,100	437	2,900	659
3.1.2	2,280	390	2,400	453	2,600	542	2,950	670
3.1.3	3,300	564	3,600	679	4,100	854	4,900	1,114
3.1.4	3,900	667	3,600	679	3,400	708	2,900	659
3.1.5	3,600	615	3,600	679	3,600	750	3,750	852
3.2.1	1,200	205	1,800	340	2,500	521	3,900	886
3.2.2	300	51	1,000	189	1,800	375	4,350	489
3.2.3	1,250	214	1,800	340	2,300	479	3,500	796
3.3.4	400	68	1,000	189	1,500	312	2,700	614
TOTAL	31,930	5,458	39,500	7,453	51,600	10,750	88,300	20,068

* The area of neighborhood excluded agricultural villages within agricultural district.
Number of population includes agricultural village population.

NOTES:
to be continued on next page

Hous-
ing
Units

818
886

909
795
614

841
886

682
705
705
568
807

568
568
614
659
636

568
670
1,114
659
852

886
489
796
614

20,068

ltural

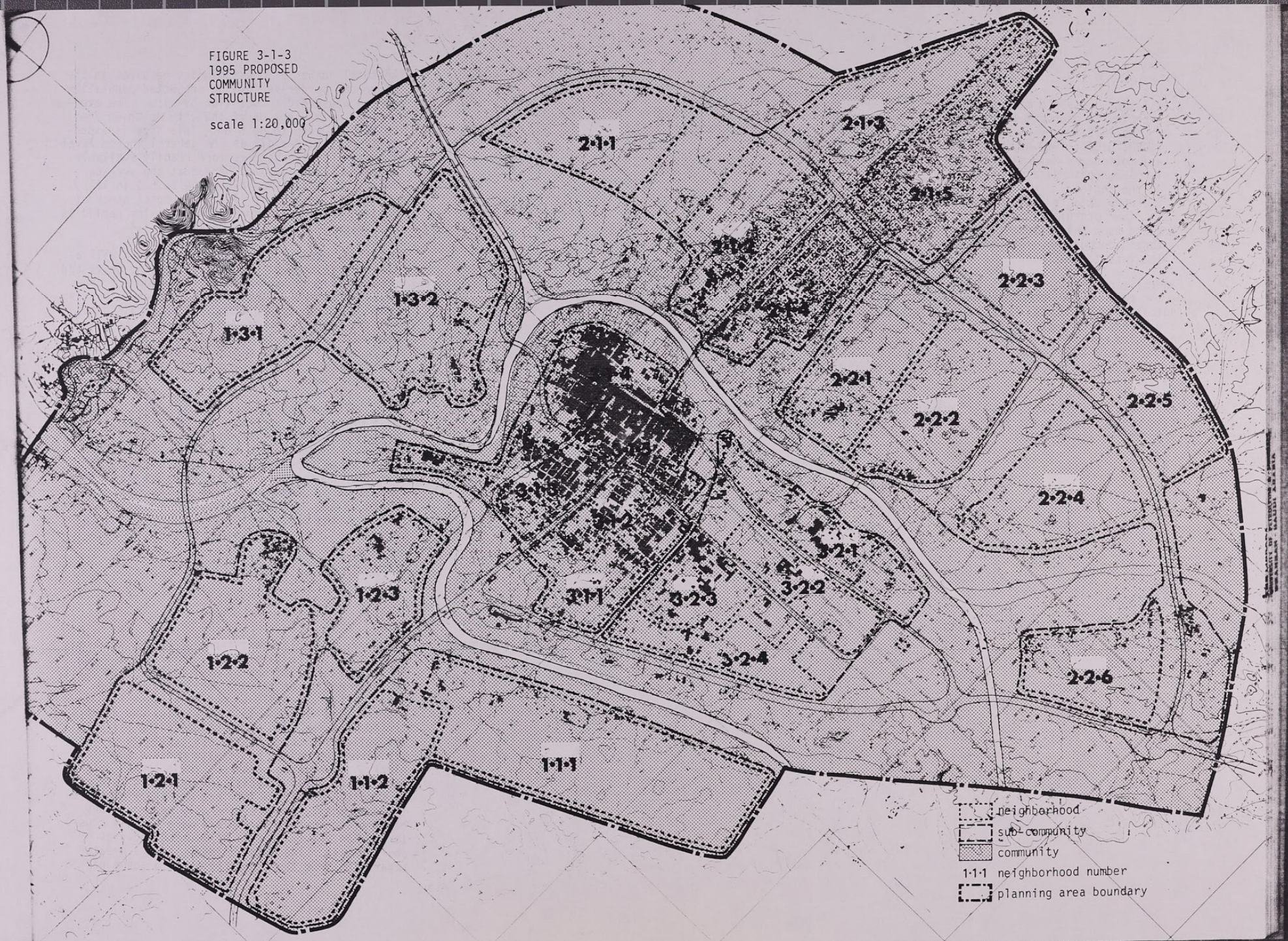


Table 3-1-4
Notes:
a. Existing household size from the URTEC 5% Sample Survey. The figure is expected to decrease in the future. The average household size determined in the 1975 Survey was 5,85 and will be reduced at a decreasing rate (1975 -1980, 0.55%; 1980-85, o.5%; 1985-1990, o.2% and 1990-1995, o.2%). This assumption was determined by using the following sources of information:
   1. Demographic data compiled by the URTEC 5% Survey for both the city and the region.
   2. Known data for developing countries compiled by the United Nations and other organizations.
   Based upon this information and the professional judgement of the consultant's demographer, standard demographic methods were applied to achieve the result shown here.

General confirmation of this trend can be demonstrated by an examination of the past history of household size in the area. The consultants survey indicated that in rural settlements which today are much like the cities were several years ago in every pertinent characteristic, there are many households with greater than 6 members and the average size is greater than that of the cities. For example the average household size in Nimas was 10 in 1976 and the average in all the villages of the Nimas village cluster was over 8.

Therefore it is clear that as urbanization occurs there is a rapid decrease in household size in the first 10 years or so, after which the decrease is expected to slow somewhat.

3-2 HOUSING NEEDS

The total number of housing units required in the future can be derived by the projected population and the household composition by size. The average size of households of the city is known from the URTEC survey to be 5.86. This size is expected to decline rapidly as the general income level rises and housing becomes more readily available. Therefore, it is assumed here that the average size of households would decline to 5.3 in 1980, 4.8 in 1985 and 4.4 in 1995. The total stock of housing units needed during the planning period is thus calculated and shown in Table 3-1-4.

Additional needs for housing construction will arise for replacement of obsolete housing units and rebuilding in connection with redevelopment programs. The size of the construction needs arising from the latter reason cannot be ascertained before the extents of redevelopment programs are determined. But, it is estimated that most of the housing units 5 years old or older will be either rebuilt or substantially rehabilitated within the coming 10 years.

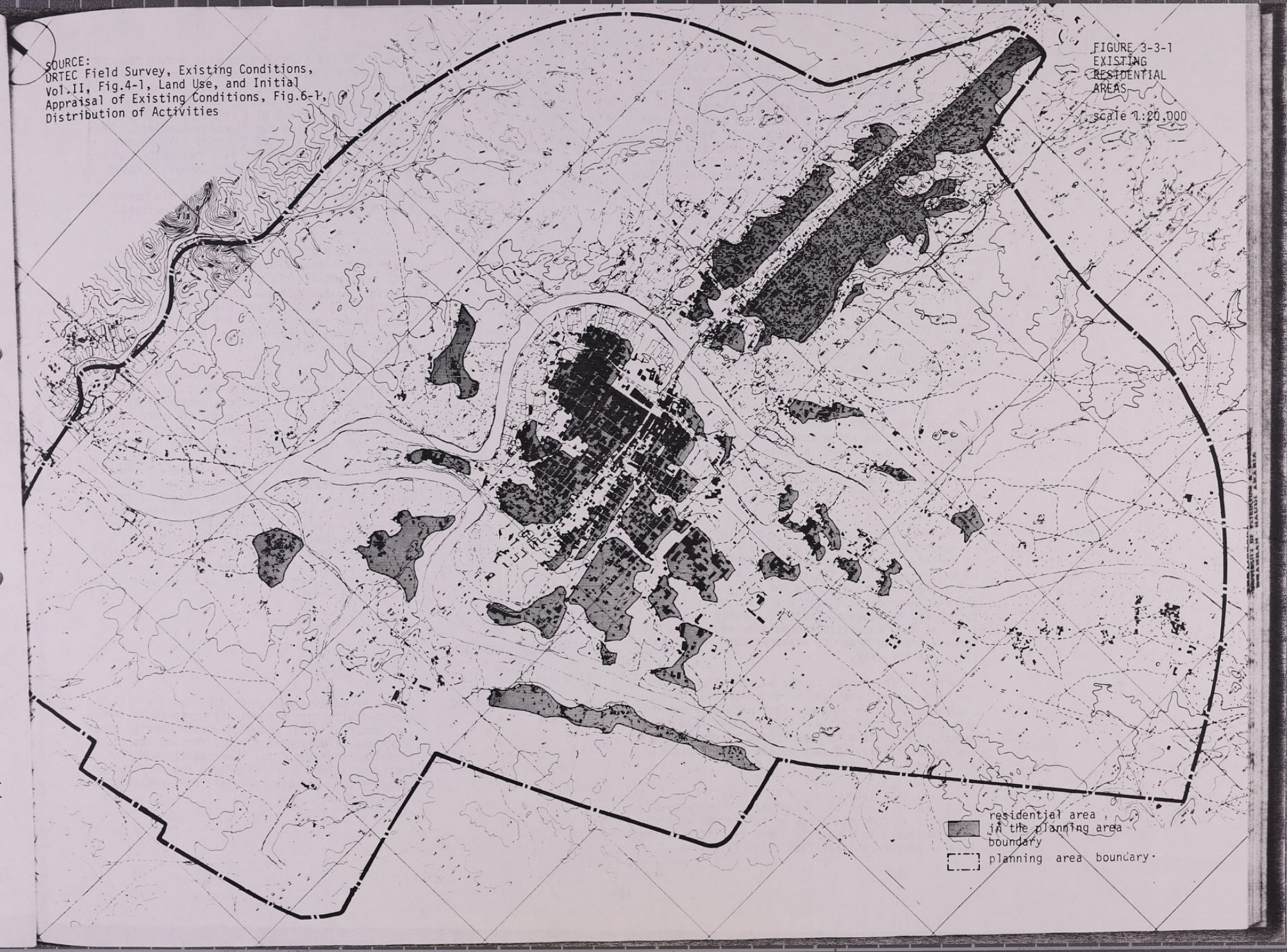
Among those which are expected or needed to be built or rebuilt, some will be financed totally by the private sector. The Government needs to assist only those who are not able to help themselves or to provide housing units directly so that they conform well to the intended spatial organization of urban activities in the city. The extent of the housing construction financed directly by the Government is, therefore, assumed here to be 30% of the future rehousing and new construction needs.

3-3 HOUSING POLICY

3-3-1 EXISTING HOUSING

There are five different types of houses in Khamis Mushayt [6]. The farm houses, which are located in the northeast corner of Wadi Bishah, form small scale community units with public mosques and wells. They are built of mud on a stone foundation ranging from one to four stories and are protected from the rain by shingles in the walls. The collective court houses are scattered primarily along the wadis, built with mud and cement blocks, and housing workers. These houses date back to the early urbanization generated by nomadic trading activity. They are one-story high, relatively small, and are generally rented. They have more common walls are are more closely clustered than the third type of housing known as court houses. These court houses have a greater separation from their neighbors and a sense of

SOURCE:
URTEC Fie
Vol.II, F
Appraisal
Distribut


SOURCE:
ORTEC Field Survey, Existing Conditions, Vol.II, Fig.4-1, Land Use, and Initial Appraisal of Existing Conditions, Fig.6-1, Distribution of Activities
FIGURE 3-3-1
EXISTING
RESIDENTIAL
AREAS
scale 1:20,000
residential area in the planning area boundary
planning area boundary

individuality, although they also share common walls. Made of cement and reinforced concrete, and generally one story high, they are also more modern. Located in the center city and somewhat to the southwest, they are rented by both blue and white collar workers. Another type of housing is represented by the tin-roofed zinc settlement to the east of Wadi Bishah. A fifth type of housing scattered throughout the city has been termed non-indigenous. More modern, rented or owned by the affluent, and made from concrete and reinforced concrete, these houses are the only type which are being built aside from those in the zinc settlement. High rise apartment buildings are also being built in the central area and along the road to Abha and Nadjran.

In all housing types there are no urban utilities except electricity. Sanitation is poorly developed, although there are plans to implement a sewage and a water system. Urban sprawl has become a problem within the center city and in the zinc settlement area due to a lack of land control and adequate planning.

With rapid urbanization, there has been a shift away from the extended family to the nuclear family, which will be reflected in the decrease in household size. Already a sense of community has been lost. It is anticipated that the plan for integrated residential neighborhood communities will help to offset this trend.

3-3-2 OBSOLESCENT HOUSING

Of the more than 5,000 existing housing units, it is expected that some 2,070 houses will have to be replaced in the course of the first two phases of the master Plan. The remaining houses may be maintained or rehabilitated for use during the planning period. Although the costs of rehabilitation and new construction are roughly equivalent, as many as possible should be encouraged for conservation in order to preserve the traditional flavor of the city.

A number of the houses in the major cities of the Southern Region have aged or deteriorated, have been abandoned, or have not kept pace with rapid development. Originally village rather than town houses, they cannot be expected to survive. There are approximately 560 such houses in districts 3.1.4 and 3.1.5.

The 1,500 zinc hut houses in districts 2.1.2, 2.1.3, 2.1.4 and 2.1.5 are temporary and will have to be rebuilt with concrete block or reinforced concrete and provided with proper sanitary facilities. The lack of proper sanitary facilities is also a problem in the high density area around the center where old mud brick houses abound. Sanitary conditions can be improved with the introduction of new utility services, although it could be difficult to install pipe networks in these old buildings which are functionally obsolete. This high density section of the city will be the commercial center as well as a residential area, and should therefore receive immediate attention.

It is suggested that some of these old houses become museums and future tourist attractions.

3-3-3 RESIDENTIAL DENSITY POLICY

As shown in Section 3-1-3 and Table 3-1-4 the central area should be developed as the high density residential, regional, civic and community center. Although these neighborhoods are to be high density ones, proper planning can nonetheless reduce congestion in the central area. In some of these residential and commercial uses can be vertically mixed.

Within the central area the downtown sections covering neighborhood units No. 3.1.4, 3.1.5, 3.3.2 and 3.2.1 have been designated as an action area. Like other cities in the Southern Region, the downtown section is grossly deficient in sanitary and utility services and other facilities.

As mentioned in Section 3-1-3 the new residential areas distribributed primarily outside both wadis will have a rather low density. Some of these residential areas have already been proposed by the Deputy Ministry for Town Planning Affairs and divided into 20 m x 20 m residential lots, with some sites reserved for community service facilities. Either the Deputy Ministry's or possibly other standards could be used to develop these areas.

3-4 HOUSING LAND USE

3-4-1 PROPOSED LAND USE: 1995

It is proposed that a high density zone will run north-south along the primary north-south internal arterial road, and that medium density zones surround it between the wadis forming the "downtown" part of the city. Low density suburban residential zones will surround the city center outside the wadi agricultural zones and along the road to Abha.

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

Table 3-3-1
PROJECTED RESIDENTIAL DENSITIES[a]

Neighbor-hood	Gross Residential Area (ha) (Low	Medium	High)	Total	Gross Residential Density (pph) 1975	1980	1985	1995
1.1.1	69			69	15	15	19	52
1.1.2	79			79	-	-	8	49
1.2.1	90			90	-	11	22	44
1.2.2	67			67	5	16	28	52
1.2.3	44			44	6	18	32	61
1.3.1	73			73	-	-	8	51
1.3.2	82			82	1	14	24	48
2.1.1	55			55	-	-	9	55
2.1.2	57.5			57.5	47	47	50	54
2.1.3	58			58	7	17	29	53
2.1.4	36			36	122	108	94	69
2.1.5	68			68	43	44	47	52
2.2.1	35			35	30	40	49	71
2.2.2	35			35	11	26	40	71
2.2.3	46.5			46.5	-	-	9	58
2.2.4	54			54	4	4	13	54
2.2.5	50			50	-	-	10	56
2.2.6	35			35	17	29	43	71
3.1.1		29		29	48	59	72	100
3.1.2		13	11	24	95	100	108	123
3.1.3		16	22	38	87	95	108	129
3.1.4		29		29	134	124	117	100
3.1.5			25	25	144	144	144	150
3.2.1		39		39	31	46	64	100
3.2.2			29	29	10	34	62	150
3.2.3		35		35	36	51	66	100
3.2.4		12	10	22	18	45	68	123
TOTAL AREA				1,304				
AVERAGE DENSITY					24	30	40	68

Notes:
a. Low Density 30 - 80 p/ha
Medium Density 80 - 130 p/ha
High Density 130 - p/ha

Table 3-4-1
REQUIRED NEW HOUSING CONSTRUCTION[a]

Neighborhood Number	1975 - 1980		1980 - 1985		1985 - 1995	
1.1.1	18		82		547	
1.1.2	-		125		761	
1.2.1	189		228		492	
1.2.2	156		189		399	
1.2.3	108		141		322	
1.3.1	-		125		716	
1.3.2	172		228		469	
2.1.1	-		104		578	
2.1.2	48	(310)[b]	94		101	
2.1.3	121	(50)	165		351	
2.1.4	-16[c]	(200)	-28	(200)	-140	(150)
2.1.5	70	(300)	101	(300)	140	
2.2.1	84		90		214	
2.2.2	99		125		276	
2.2.3	-		83		531	
2.2.4	4		108		513	
2.2.5	-		104		532	
2.2.6	86		124		255	
3.1.1	82		116		222	
3.1.2	63		89		128	
3.1.3	115		175		260	
3.1.4	12		29	(90)	-49	(100)
3.1.5	64		71	(70)	102	(300)
3.2.1	135		181		365	
3.2.2	138		186		614	
3.2.3	126		139		317	
3.2.4	121		123		302	
TOTAL	2,011	(860)	3,325	(660)	9,507	(550)

Note:
a. From Table 3-1-4 and Sec. 3-3-2
b. Figures in parentheses indicated obsolescent housing to be replaced. Rehabilitation is not included.
c. Negative numbers indicate decreases in households within a neighborhood due to the population shift.

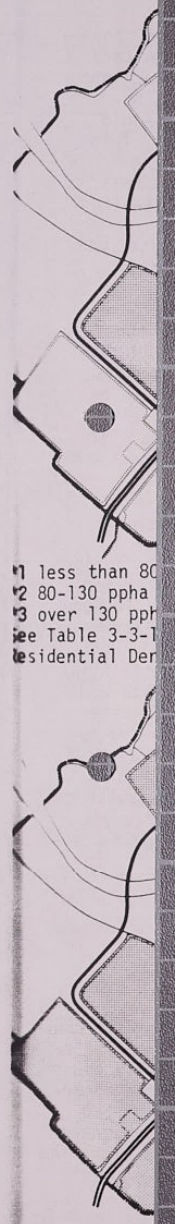


FIGURE 3-4-2
GROWTH OF
RESIDENTIAL
AREA
1975 - 1995
scale 1:40,000

3-4-2 PHASED LAND REQUIREMENT

The Deputy Ministry has proposed that parts of the central area bounded by both wadis be subdivided into residential blocks. Some land has already been acquired by the municipality, with the remainder in this section still considered to be privately owned.

Considering the redevelopment which will be required in the high density zone, it would be desirable for the Government to acquire the remainder of privately owned land if this can be feasibly done.

In the medium density zones between the wadis it is suggested that the area be developed naturally and privately rather than by the Government. Consequently, only partial land acquisition is necessary for the development of infrastructure.

Some suburban residential developments have already been approved by the Deputy Ministry and integrated into the Master Plan. In the Plan additional residential requirements other than those planned by the Deputy Ministry are proposed. Land acquisition should occur prior to Phase III (1985-95) when these areas will be developed. New land to be developed in Phase III is located both to the northwest and southwest of Wadi Atwood, northwest of the city along Wadi Bishah, and southeast of Wadi Bishah.

Phase I and II of the Plan require almost no new land development, although the population of existing areas is expected to increase and some neighborhoods will be sub-divided.

3-4-3 NEW RESIDENTIAL AREA

As discussed in Section 3-3-2 and Table 3-4-1, new housing will be constructed during each of the Phases of the Plan.

This can be accomplished in the following ways: housing construction by the Government for sale & rent, provision of bank loans for housing construction, provision of a subsidy for specific improvements within housing units such as sanitary facilities and structural reinforcement, improvement of the environment outside the houses by the Government such as the provision of sewers and street pavements.

CHAPTER 3: NOTES

1. Estimated from URTEC 5% Sample Survey, 1974 National Census, and others. See Kenzo Tange & URTEC, Southern Region Project Study. Southern Region, Preliminary Master Plan, Sec.
2. Khamis Mushayt, Existing Conditions, Sec. 3-1.
3. See also Southern Region, Preliminary Master Plan, Sec.
4. For a detailed discussion of hierarchical grouping of population and distribution of services, see Planning Standards, contained in Appendix to Southern Region, Preliminary Master Plan.
5. Persons per hectare. See Planning Standards for precise definitions of residential densities.
6. Khamis Mushayt, Existing Conditions, Sec. 6-1.

4. employment

4-1 SECTORAL COMPOSITION AND PROJECTION

4-1-1 EXISTING CONDITIONS

Only 21.3% of the population is employed, representing 46.1% of the 15 and over age group. Khamis Mushayt's development program has attracted a larte influx of foreingners who are presently still needed.

The Government is the largest employer with almost 50% of both employed Saudis and non-Yemeni expatriates working for it.

The majority of employed Saudis are protective service, transportation, and sales workers. Foreigners are 18.87% of the population and 32.5% of the labor force. Construction work, which is the second largest employment sector, is dominated by Yemenis who account for over 50% of the work force. Additional Yemenis can be found in trade and manufacturing whereas over one-half of non-Yemeni foreigners work in professional and technical capacities. Less than 20% of all workers are now self-employed.

4-1-2 PROJECTED EMPLOYMENT

The percentage of the population employed will increase by 8% in the next twenty years. Foreigners are likely to remain an active part of the labor forece as the number of Saudis will still not be sufficient to supprot the economic activity of the city.

The anticipated increment represents an addition of more than 19,000 to the work force of Khamis Mushayt by 1995. The most dramatic increases are expected in the secondary sector (construction and manufacturing), followed by the commercial sector (trade, finance, real estate), with only a small relative expansion of the primary sector (mining, agriculture, hunting, fishing). The private sector rather than the Government will become the dominant employer of the future.

Given the magnitude of the proposed development of Khamis Mushayt, there will naturally be an increased demand for labor. This is particularly so in services where expansion has been projected. The Government will need employees to man new public service facilities, including parks, recreation and community centers, and more teachers for the schools. The building of new facilities,

Table 4-1-1
PROJECTIONS OF EMPLOYMENT

	1975		1980		1985		1995	
Planning Population	31,930		39,500		51,600		88,300	
Labor Force Participation Rate	21.3%		23.3%		25.3%		29.3%	
Employment	6,801		9,203		13,055		25,872	
Primary Sector[a]	536	(7.8%)	644	(7%)	783	(6%)	1,293	(5%)
Secondary Sector[b]	1,091	(16.1%)	1,473	(16%)	2,089	(16%)	3,880	(40%)
Tertiary Sector[c]	1,452	(21.4%)	2,945	(32%)	4,610	(36%)	10,349	(40%)
Government Sector	3,152	(46.3%)	4,141	(45%)	5,483	(42%)	10,349	(40%)
Other	570	(8.4%)	0		0			

Notes:
a. PRIMARY SECTOR included Agriculture, Forestry and Hunting, Fishery, Mining.
b. SECONDARY SECTOR included Construction, Manufacturing.
c. TERTIARY SECOTR includes Trade, Finance and Insurance, Real Estate, Transport and Communication, Utilities, Services.

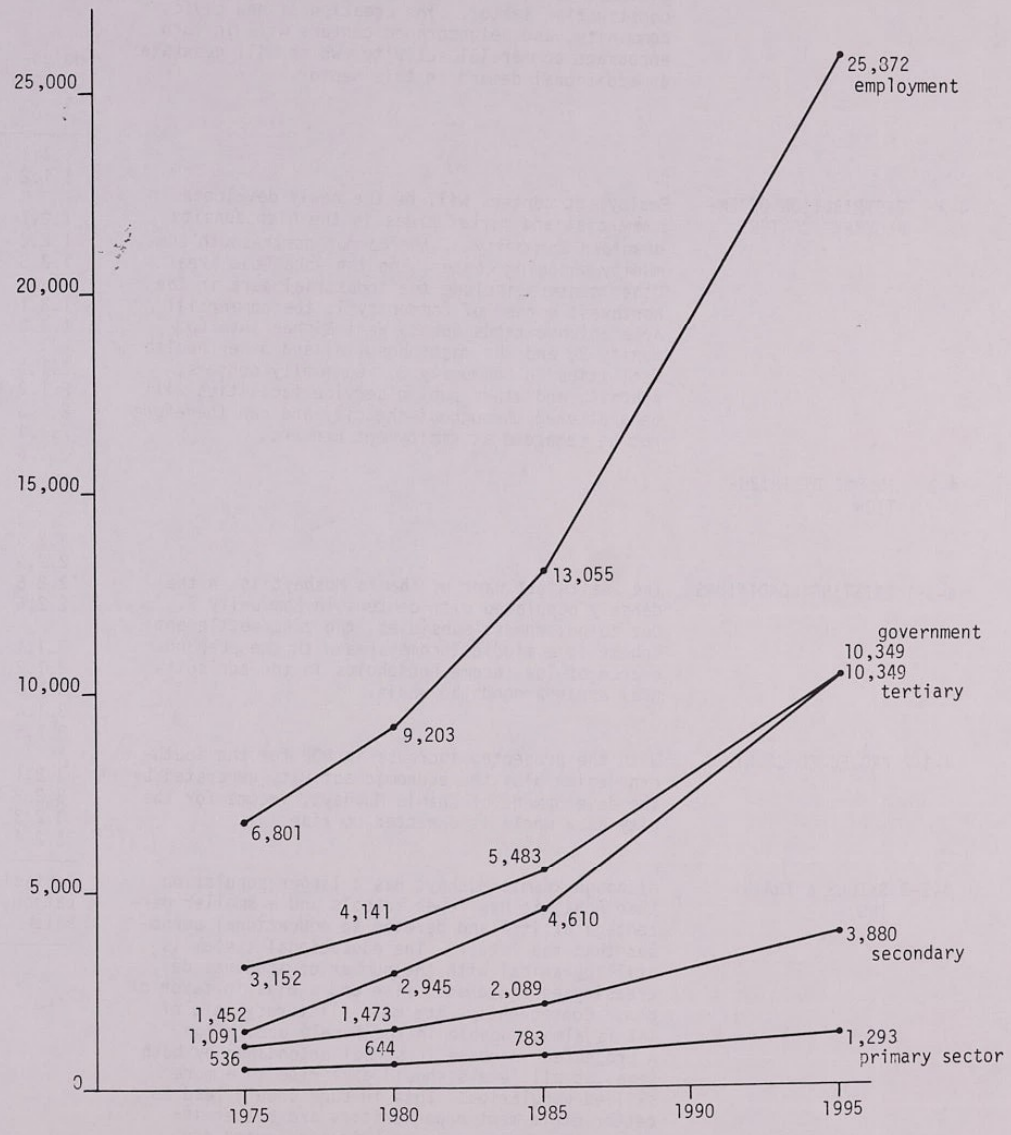


FIGURE 4-1-1
PROJECTED
GROWTH OF
EMPLOYMENT
BY SECTOR

houses, and roads is expected to generate an additional demand in the industrial area and the construction sector. The creation of new civic, community, and neighborhood centers will in turn encourage commercial activity, which will generate an additional demand in this sector.

4-2 DISTRIBUTION OF EMPLOYMENT CENTERS

Employment centers will be the newly developed commercial and market areas in the high density downtown community 3, the common north-south community shopping center, and the Abha Road area. Other centers include the industrial park in the northwest corner of Community 1, the commercial area which extends across Wadi Bishah into Community 2, and the major hospital and other health facilities in Community 3. Community centers, schools, and other public service facilities will be scattered throughout the city and can therefore not be regarded as employment centers.

4-3 INCOME DISTRIBUTION

4-3-1 EXISTING CONDITIONS

The wealthiest part of Khamis Mushayt is in the densely populated city centers in Community 3. Due to government subsidies, the zinc settlement scheme is a middle income area with the preponderance of low income households in the agricultural areas around the wadis.

4-3-2 PROJECTED GROWTH

With the projected increase in GDP for the Southern Region plus the economic activity generated by the development of Khamis Mushayt, income for the city as a whole is expected to rise.

4-3-3 SKILLS & TRAINING

Although Khamis Mushayt has a larger population than Abha, it has fewer schools and a smaller percentage of its land devoted to educational purposes than the latter. The educational system is still pyramidal with the number of students decreasing as the grades rise and a bias in favor of men. Consequently, the male illiteracy rate of 44% is almost double in the female population. A projected increase in school attendance by both sexes at all levels should give rise to a more skilled population. This in turn should lead to better employment opportunities and better incomes. An increase in technical training and teacher training schools should also help the income potential of the attendants as well.

Table 4-3-1
EMPLOYMENT BY PLANNING DISTRICT

Neighborhood No.	1975		(1980)		(1985)		1995	
	Population	Employment	Population	Employment	Population	Employment	Population	Employment
1.1.1	1,000	213	1,000	233	1,300	329	3,600	1,055
1.1.2	0	0	0	0	600	152	3,900	1,043
1.2.1	0	0	1,000	233	2,000	506	4,000	1,172
1.2.2								
1.2.3	250	53	800	186	1,400	354	2,700	791
1.3.1	0	0	0	0	600	152	3,700	1,084
1.3.2	100	21	1,000	233	2,000	506	2,900	1,143
2.1.1	0	0	0	0	500	127	3,000	879
2.1.2	2,700	575	2,700	629	2,900	734	3,100	908
2.1.3	400	85	1,000	233	1,700	430	3,100	908
2.1.4	4,400	937	3,900	909	3,400	860	2,500	732
2.1.5	2,900	618	3,000	699	3,200	810	3,550	1,040
2.2.1	1,050	224	1,400	326	1,700	430	2,500	732
2.2.2	400	85	900	210	1,400	354	2,500	732
2.2.3	0	0	0	0	400	101	2,700	791
2.2.4	200	43	200	47	700	177	2,900	850
2.2.5	0	0	0	0	500	126	2,800	820
2.2.6	600	128	1,000	233	1,500	380	2,500	732
3.1.1	1,400	298	1,700	396	2,100	531	2,900	850
3.1.2	2,280	486	2,400	559	2,600	658	2,950	864
3.1.3	3,300	703	3,600	839	4,100	1,037	4,900	1,436
3.1.4	3,900	831	3,600	839	3,400	860	2,900	8 850
3.1.5	3,600	767	3,600	839	3,600	911	3,750	1,099
3.2.1	1,200	255	1,800	419	2,500	632	3,900	1,143
3.2.2	300	64	1,000	233	1,800	455	4,350	1,275
3.2.3	1,250	266	1,800	419	2,300	582	3,500	1,026
3.2.4	400	85	1,000	233	1,500	380	2,700	791
Participation Rate	21.3%		23.3%		25.3%		29.3%	

5

mploy-ment
1,055
1,043
1,172
791
1,084
1,143
908
908
732
1,040
732
732
791
850
820
732
850
864
1,436
1,099
1,143
1,275
1,026
791

.3%

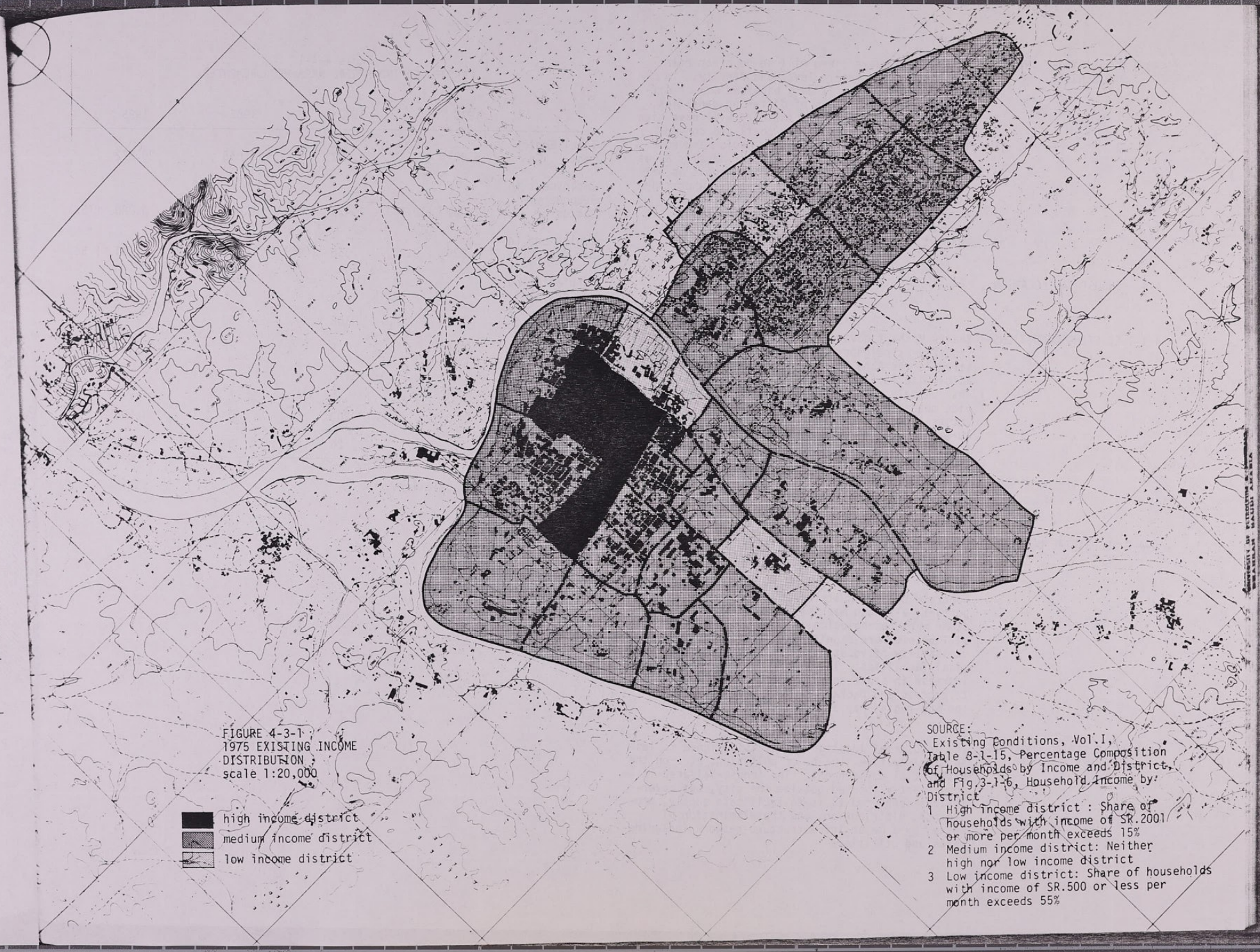


FIGURE 4-3-1
1975 EXISTING INCOME DISTRIBUTION
scale 1:20,000

high income district
medium income district
low income district

SOURCE:
Existing Conditions, Vol.I, Table 8-1-15, Percentage Composition of Households by Income and District, and Fig.3-1-6, 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: Neither high nor low income district
3 Low income district: Share of households with income of SR.500 or less per month exceeds 55%

4-3-4 RELATIONSHIP INCOME AND DENSITY

In Khamis Mushayt there will be no clear relationship between income level and density. In other words there will be a balanced mix of different incomes in areas of differing densities. For example the center of the city will have high density due to its high land costs and convenience and will house both high, medium and some low income people. Similarly lower density areas will include houses of high income people as well as low (such as farmers). In general, where land is very scarce there is a tendency for lower incomes to be associated with higher density, however, this is not really the case in Khamis Mushayt.

4-4 INDUSTRIAL LOCATION

4-4-1 EXISTING CONDITIONS

Khamis Mushayt devotes over twice as much land to industry as neighboring Abha. Most industries straddle the Abha Road. It is logical that the automobile facilities are located here and the less densely populated sections of the road provide needed drying space for the cement block factories. Enterprises for wooden and metal furniture are located along the road as well, although they can also be found behind houses in residential areas. Nevertheless, there is still a concentration towards the road. At present, both transportation network and electric supply are inadequate.

4-4-2 INDUSTRIAL DEVELOPMENT

The industrial sector of the city is expected to grow extremely rapidly and greatly increase its employment potential.

Concrete block industries will continue to be important, although machine assembly plants and other more technologically oriented manufacturing will become more significant depending on the availability of vocational skills and adequate physical facilities. There is an overall projected increase in scale and an expectation that plants to process and package agricultural products of the sub-region may also be established.

4-4-3 INDUSTRIAL LOCATION POLICY

The industrial location policy is designed to lessen the negative impacts of pollution, etc. on the residential environment. The industrial area is consequently located outside the city, but nevertheless connected to it to facilitate supply, production, distribution, and the elimination of waste, by a major infrastructure network including roads and utilities.

Table 4-4-1
PROJECTED INDUSTRIAL AREA REQUIREMENTS[a]

	1975		1980		1985		1995	
Total Employment	6,801		9,203		13,055		25,872	
Employment in Secondary Sector	1,091	(16.1%)	1,473	(16%)	2,089	(16%)	3,880	(15%)
Employment in Manufacturing	229	(3.4%)	368	(4%)	653	(5%)	1,244	(5%)
Manufacturing in Central District								
Employment	229		168		50		0	
Total Land Area (ha)	7.4		5		2		0	
Manufacturing in Outer District								
Employment	0		200		603		1,294	
Total Land Area (ha)	18		26		38		70	

Note:
a. @ 7,850m^2/1,000 population.

FIGURE 4-4-1
EXISTING AND PROPOSED INDUSTRIAL AREAS

Although the industry which is at this time anticipated is not expected to produce heavy pollution, it is nonetheless recommended that all industrial areas be separated from residential areas by landscaped buffer areas. The use of artificial hills planted with trees can reduce both noise pollution as well as so called "residential pollution."

4-4-4 INDUSTRIAL LAND USE

Many industries will be relocated in the new industrial park. Situated in the northwest corner of the city outside the densest area, it is still close to the center. This plan should promote growth by making industrial infrastructure such as utilities more economical by virtue of concentration. A new road network which will by-pass the city connecting the sewage treatment plant and power station to the industrial area is also proposed to link the overall infrastructure of the city.

5. civic, cultural, and commercial centers

5-1 GENERAL EDUCATION

5-1-1 EXISTING CONDITIONS

Khamis Mushayt has 14 educational facilities including 13 schools and one sports club. Some facilities house more than one school and the total land area occupied is quite small relative to the size and population of the city. At the present time these facilities occupy only about 3.8 ha of land whereas if the planning standards proposed by this consultant were to be met they should occupy a great deal more land (see Tables 5-1-1 (a), 5-1-1 (b), 5-1-1 (c).

5-1-2 PROJECTED ENROLLMENT AND FACILITIES

An increase in students is projected at all levels: at the elementary and intermediate school levels because of the 100% attendance policy for both girls and boys and a rise in projected population; at the secondary level due to demographic factors as well as a policy of 50% attendance for men and 30% for women. This takes into account the expected drop-out rate between intermediate and secondary schools as well as a relative increase in the number of women at this level.

According to the Plan each hierarchical unit within the city should have school facilities so that they will be distributed according to the overall Plan: sub-neighborhoods should have nurseries and kindergartens; neighborhoods, elementary schools; sub-communities, intermediate schools; and communities, secondary schools.

The Planning Standard for Educational Facilities designates the size of the facility and its enrollment, the population served, the appropriate distance from students' houses, suggested classroom size, land and floor area requirements as well as location.

Some schools have already been proposed and authorized. In the Master Plan, these schools plus the present schools are treated as existing conditions with plans for extension rather than relocation. Boy's and girl's education are handled by different ministries, and their facilities are separate at all levels. The combined projected increase of schools if from 18 to 56 at the elementary level, from 4 to 14 at the intermediate level, and from 2 to 6 at the secondary level. The total number of schools will be evenly divided between both sexes, but their size may vary at the secondary level. This stems from the fact that the Plan allocates equal numbers of schools per community, although the projected rate of attendance by sex is different. In some cases, the projected per school enrollment is different than the planning standard because of the need to conform to the community structure.

5-1-3 PROPOSED LAND USE

The projected land and floor area requirements are based on population (see Table 5-1-1), and include the land needed for playgrounds. The playgrounds are located in such a fashion as to serve the people in the neighborhood, sub-community and community as well as the students. Some playgrounds are planned inside the wadi bed park while others will be nearer the schools. Because of the existing social customes, boys and girls will use different playgrounds. The service radius of each school, as well as other planning standards, is included in the Appendix, Planning Standards at the conclusion of this report.

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

	1975	1980	1985	1995
Planning Population	31,930	39,500	51,600	88,300
Boys				
No. of School Age Population	3,800	4,700	6,200	10,600
No. of Students	3,800	4,700	6,200	10.600
No. of Schools	9	11	14	28
Total Floor Area (m^2)	17,000	21,000	27,900	47,700
Total Land Area (ha)	4.6	5.6	7.4	12.7
Playground Land Area	7.6	9.4	12.4	21.2
Total Land Area including Playground (ha)	12.2	15.0	19.8	33.9
Girls				
No. of School Age Population	3,800	4,700	6,200	10,600
No. of Students	3,800	4,700	6,200	10.600
No. of Schools	9	11	14	28
Total Floor Area (m^2)	17,000	21.000	27,900	47,700
Total Land Area (ha)	4.6	5.6	7.4	12.7
Playground Land Area	7.6	9.4	12.4	21.2
Total Land Area including Playground (ha)	12.2	15.0	19.8	33.9
Total Elementary School				
No. of Schools	18	22	28	56
Total Floor Area (m^2)	34,000	42,000	55,800	95,400
Total Land Area (ha)	24.4	30.0	39.6	67.8

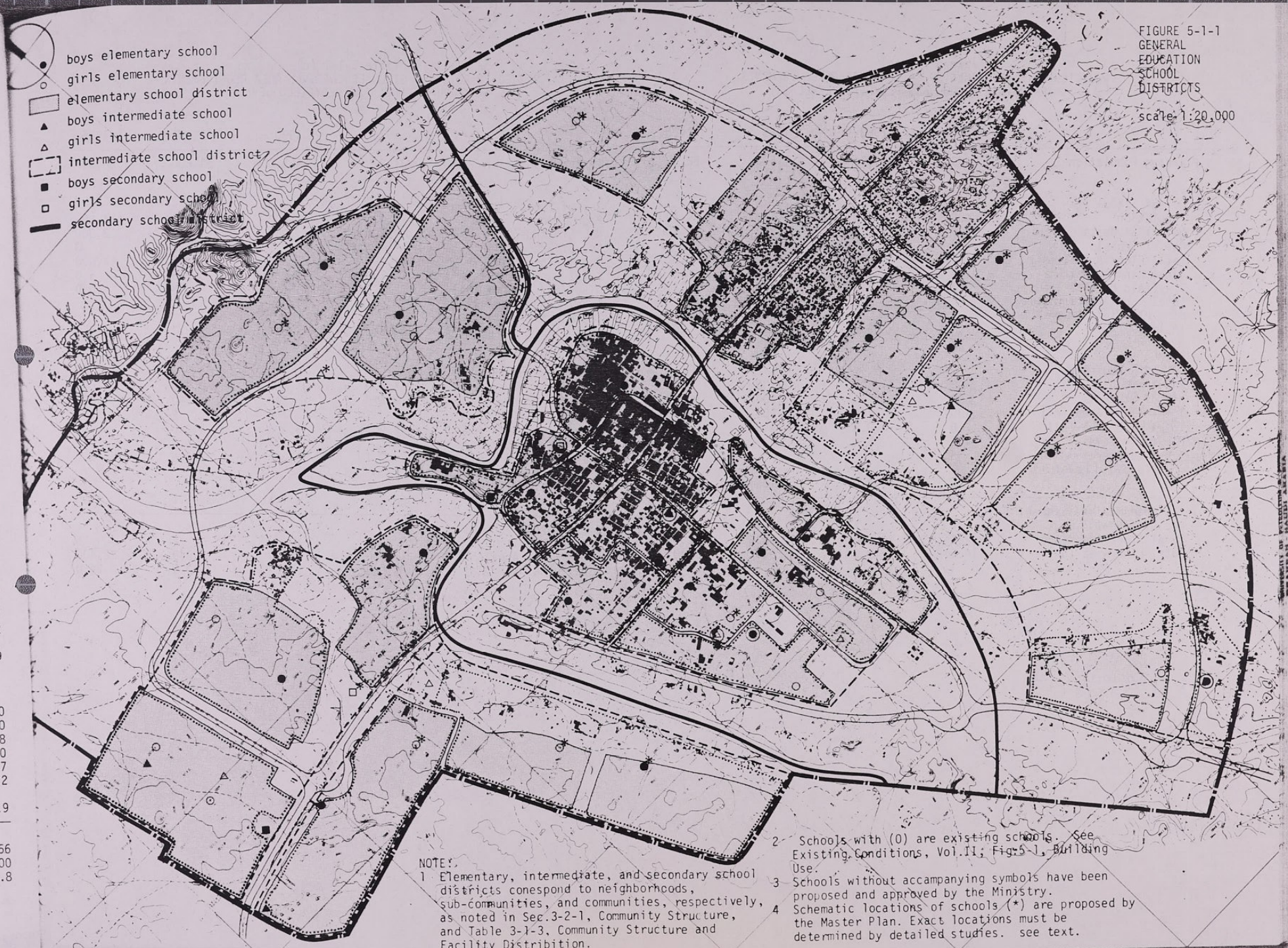


FIGURE 5-1-1
GENERAL
EDUCATION
SCHOOL
DISTRICTS

scale 1:20,000

NOTES:

1 Elementary, intermediate, and secondary school districts conespond to neighborhoods, sub-communities, and communities, respectively, as noted in Sec.3-2-1, Community Structure, and Table 3-1-3, Community Structure and Facility Distribition.

2 Schools with (O) are existing schools. See Existing Conditions, Vol.II, Fig.5-1, Building Use.

3 Schools without accampanying symbols have been proposed and approved by the Ministry.

4 Schematic locations of schools (*) are proposed by the Master Plan. Exact locations must be determined by detailed studies. see text.

Table 5-1-1 (b)
PROJECTED BOYS AND GIRLS EDUCATIONAL AREA REQUIREMENTS
INTERMEDIATE SCHOOL AND PLAYFIELD LEVEL I

	1975	1980	1985	1995
Planning Population	31,930	39,500	51,600	88,300
Boys				
No. of School Age Population	1,400	1,800	2,300	4,000
No. of Students	1,400	1,800	2,300	4,000
No. of Schools	2	3	4	7
Total Floor Area (m^2)	9,100	11,700	15,000	26,000
Total Land Area (ha)	2.8	3.6	4.6	8.0
Playfield Level I (ha)	4.2	5.4	6.9	12.0
Total Land Area including Playfield Level 1 (ha)	7.0	9.0	11.5	20.0
Girls				
No. of School Age Population	1,400	1,800	2,300	4,000
No. of Students	1,400	1,800	2,300	4,000
Total Floor Area (m^2)	9,100	11,700	15,000	26,000
Total Land Area (ha)	2.8	3.6	4.6	8.0
Playfield Level I (ha)	4.2	5.4	6.9	12.0
Total Land Area including Playfield Level 1 (ha)	7.0	9.0	11.5	20.0
Total Intermediate School				
No. of Schools	4	6	8	14
Total Floor Area (m^2)	18,200	23,400	30,000	52,000
Total Land Area (ha)	14.0	18.0	23.0	40.0

Table 5-1-1 (c)
PROJECTED BOYS AND GIRLS EDUCATIONAL AREA REQUIREMENTS
SECONDARY SCHOOL AND PLAYFIELD LEVEL II

	1975	1980	1985	1995
Planning Population	31,930	39,500	51,600	88,300
Boys				
No. of School Age Population	1,400	1,800	2,300	4,000
No. of Students	700	900	1,150	2,000
No. of Schools	1	1	2	3
Total Floor Area (m^2)	4,900	6,300	8,050	14,000
Total Land Area (ha)	1.8	2.3	2.9	5.0
Playfield Level II	3.5	4.5	5.8	10.0
Total Land Area including Playfield Level II (ha)	5.3	6.8	8.7	15.0
Girls				
No. of School Age Population	1,400	1,800	2,300	4,000
No. of Students	420	540	690	1,200
No. of Schools	1	1	2	3
Total Floor Area (m^2)	2,900	3,800	4,800	8,400
Total Land Area (ha)	1.1	1.4	1.7	3.0
Playfield Level (II)(ha)	2.1	2.7	3.5	6.0
Total Land Area including Playfield Level II (ha)	3.2	4.1	5.2	9.0
Total Secondary School				
No. of Schools	2	2	4	6
Total Floor Area (m^2)	17,800	10,100	12,850	22,400
Total Land Area (ha)	8.5	10.9	13.9	24.0

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

	1975	1980	1985	1995
Elementary				
No. of Schools	18	22	28	56
Total Floor Area (m^2)	34,000	42,000	55,800	95,400
Total Land Area (ha)	24.4	30.0	39.6	67.8
Intermediate				
No. of Schools	4	6	8	14
Total Floor Area (m^2)	18,200	23,400	30,000	52,000
Total Land Area (ha)	14.0	18.0	23.0	40.0
Secondary				
No. of Schools	2	2	4	6
Total Floor Area (m^2)	7,800	10,100	12,850	22,400
Total Land Area (ha)	8.5	10.9	13.9	24.0
Teachers School (2)				
Total Floor Area (m^2)	11,600	11,600	11,600	11,600
Total Land Area (ha)	4.2	4.2	4.2	4.2
Technical School (1)				
Total Floor Area (m^2)	5,800	5,800	5,800	5,800
Total Land Area (ha)	2.1	2.1	2.1	2.1
Technical School for Girls (1)				
Total Floor Area (m^2)	2,500	2,500	2,500	2,500
Total Land Area (ha)	1.0	1.0	1.0	1.0
College (1)				
Total Floor Area (m^2)	18,000	18,000	18,00	18,000
Total Land Area (ha)	10.1	10.1	10.1	10.1

5-2 PUBLIC AND INSTITUTIONAL FACILITIES

5-2-1 HIGHER AND SPECIAL EDUCATION

Presently, Khamis Mushayt has no facilities for higher and special education. By 1995, a college specialized in commerce as well as teacher training schools, and technical schools for boys and girls are recommended.

5-2-2 MOSQUES

According to the Master Plan, each neighborhood should have mosque and each sub-community a Jami'a mosque. In the neighborhoods the requirement for the number of mosques will increase from 11 to 36 in 1995 with a additional land area of 4 hectares. In the sub-communities, the increase is from 2 to 8 with an anticipated addition of about 14 hectares.

5-2-3 HEALTH CARE

Presently, the number of existing pharmacies is very low and their service range is city wide. The Master Plan proposes that each neighborhood have its own pharmacy and each sub-community its own diagnostic and treatment center. From 1975-95, the number of pharmacies will increase from 9 to 28, and the requirement for the number of sub-community and treatment ceters from 2 to 7, with a concommitant increase in floor and land area.

Sub-community diagnostic and treatment centers are located in the sub-community centers. The treatment centers of the three sub-communities are in their respective centers, closely integrated with the other community facilities. One treatment center is in the general hospital in the southern part of the core area.

Aside from this general hospital, there is also one military hospital in the central part of the city. If the military hospital relocated outside the city in the future, possibly the land could be used as a community park. Sometime in the next twenty years, a new general hospital, a mental hospital and a nursing home will be built.

Good planning, design, landscaping, the construction of a new road network and other facilities are all necessary.

The old community general hospital as well as the new complex all project an increase in beds, floor and land area in the next twenty years (see Table 5-2-2 (b) on next page).

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

1. Teachers School for Boys		
	Students	720 (30 students/class x 24 classrooms)
	Land Area	2.1 ha
	Floor Area	5,800 m^2
2. Teachers School for Girls		
	Students	720 (30 students/class x 24 classrooms)
	Land Area	2.1 ha
	Floor Area	5,800 m^2
3. Technical School for Boys		
	Students	720
	Land Area	2.1 ha
	Floor Area	5,800 m^2
4. Technical School for Girls		
	Students	350
	Land Area	1.0 ha
	Floor Area	2,500 m^2 (350 students x 7 m^2/student)
5. College		
	Students	1,000
	Land Area	10 ha
	Floor Area	18,000 m^2 (700 students x 15 m^2 + 300 dormitory resident students x 25 m^2)

Table 5-2-1 (b)
MOSQUES

	1975	1980	1985	1995
Planning Population	31,930	39,500	51,600	88,300
Mosque				
No. of Facilities	9	11	14	28
Total Floor Area (m^2)	8,580	11,850	15,480	26,490
Total Land Area (ha)	2.7	3.3	4.2	8.4
Jami'a Mosque				
No. of Facilities	2	3	4	7
Total Floor Area (m^2)	3,830	4,740	6,190	10,600
Total Land Area	2.6	3.2	4.1	7.1
EID Mosque				
No. of Facilities				1
Total Floor Area (m^2)				
Total Land Area				3.6
Total				
No. of Facilities	11	14	18	36
Total Floor Area (m^2)	13,410	16,590	21,670	37,090
Total Land Area (ha)	5.3	6.5	8.3	19.1

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

	1975	1980	1985	1995
Planning Population	31,930	39,500	51,600	88,300
Neighborhood Pharmacy				
No. of Facilities	9	11	14	28
Total Floor Area (m^2)	1,600	2,000	2,600	4,400
Total Land Area (ha)	0.9	1.1	1.4	2.8
Sub-Community Diagnosis and Treatment Centers				
No. of Facilities	2	3	4	7
Total Floor Area (m^2)	1,600	2,000	2,600	4,400
Total Land Area (ha)	1.0	1.2	1.5	2.6
Total Neighborhood and Sub-Community Facilities Land Area (ha)	1.9	2.3	2.9	5.4

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

	1975	1980	1985	1995
Greater Urban Planning Population	79,800	96,000	115,000	164,000
Community General Hospital (1)				
Total No. of Beds	320	380	460	660
Total Floor Area (m^2)	12,800	15,200	18,400	26,400
Total Land Area (ha)	6.0	7.2	8.6	12.3
Mental Hosptial (1)				
Total No. of Beds	400	480	580	820
Total Floor Area (m^2)	24,000	28,800	34,800	49,200
Total Land Area (ha)	8.0	9.6	11.5	16.4
Special Long-Term Hospital (1)				
Total No. of Beds	240	290	350	490
Total Floor Area (m^2)	10,800	13,100	15,800	22,100
Total Land Area (ha)	8.0	9.6	11.5	16.4
Nusing Home (1)				
Total No. of Beds	160	190	230	330
Total Floor Area (m^2)	7,200	8,600	10,400	14,900
Total Land Area (ha)	1.6	1.9	2.3	3.3
Total Land Area	23.6	28.3	33.9	48.4

5-2-4 PUBLIC ADMINISTRATION

Although some ministry branches are located in Khamis Mushayt, it is the regional commercial rather than the administrative center. Abha, the provincial and regional capital, is less than 30 km away and has a very large administrative sector. The city's municipal administration facilities are generally located near the central district but are scattered and not unified in a coherent manner.

Although the proportion of the population employed in the administrative sector is expected to remain relatively constant over the next twenty years, the absolute number is expected to go up by 2,000 necessitating an increase of 40,000 m^2 of floor space and two hectares of land to accomodate the larger number of employees. Some of this space will go to the new civic center which has been proposed for the central market area.

The larger proportion of employees in the government versus the administrative sector is inflated by the military establishment, which is a prime employer. Total government employment will increase by 6,200 during the twenty years planning period. In terms of the office space requirement it should be noted that of the total government employment increase, only the administrative sector will require substantial office space increase. This is because other government employees such as policemen, firemen and soldiers do not require office space.

Table 5-2-3
PROJECTED PUBLIC ADMINISTRATION AREA REQUIREMENTS

	1975	1980	1985	1995
Total Population	31,930	39,500	51,000	88,300
Employment in Government Sector	3,152	4,141	5,483	10,349
Employment in Public Administration	1,000	1,500	2,000	3,000
Total Floor Area (m^2)	20,000	30,000	40,000	60,000
Total Land Area (ha)	1	1.5	2	3

5-3 CULTURAL FACILITIES

Historic conservation should be designated and protected from the encroachment of new development. This includes obsolescent and decaying houses in the center city as well as some of the beautiful traditional housing clusters in the old agricultural settlement adjacent to the city along the wadis. The former might become museums and the latter tourist sites in future parks.

1995
88,300
10,349
3,000
60,000
3

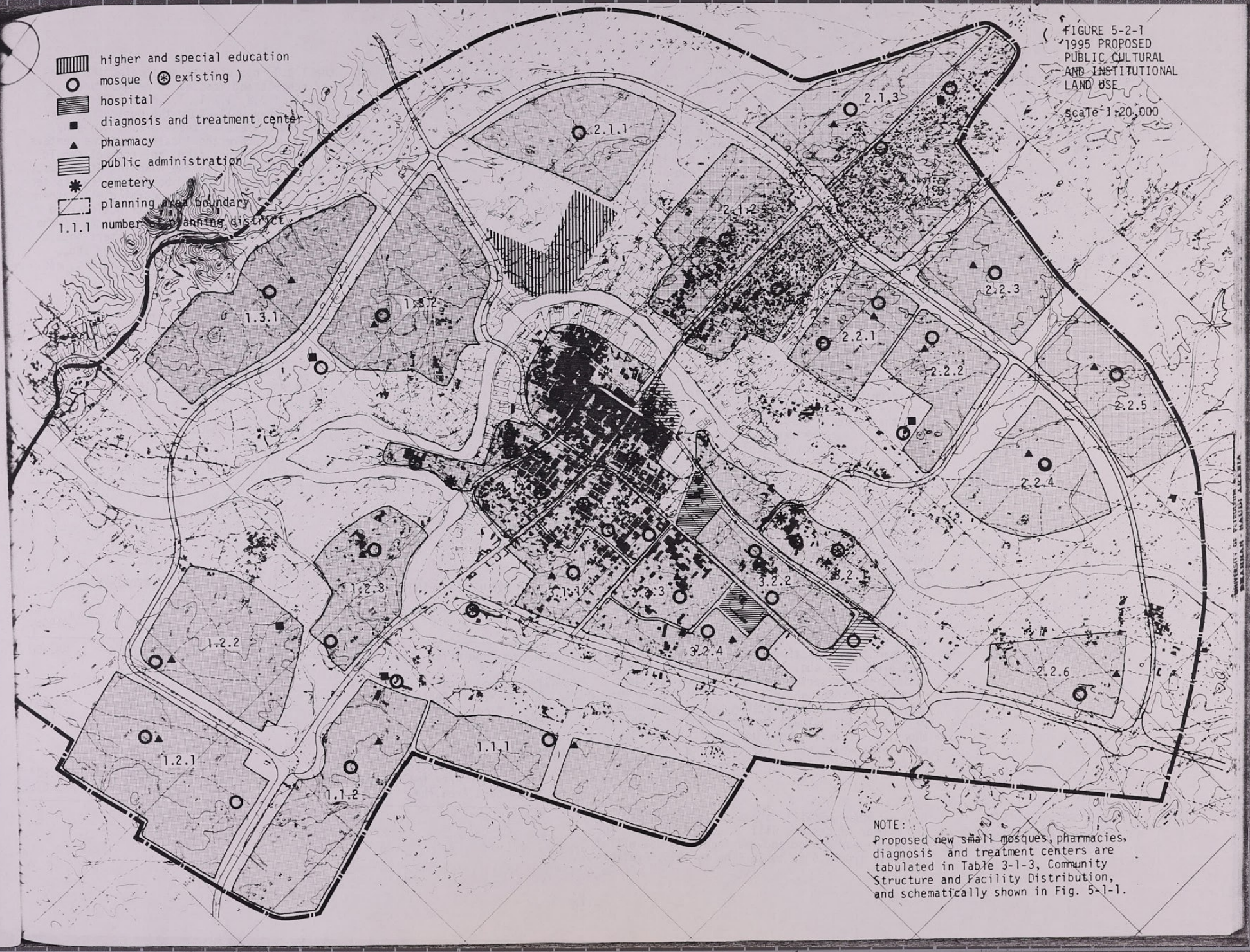


FIGURE 5-2-1
1995 PROPOSED
PUBLIC CULTURAL
AND INSTITUTIONAL
LAND USE

scale 1:20,000

NOTE:
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.

5-4 COMMERCIAL FACILITIES

5-4-1 EXISTING COMMERCIAL AREA

The commercial activities of Khamis Mushayt are distributed along the road to Abha with a concentration towards the eastern end at the intersection of the north-south road. The suq is located just to the northeast of this major intersection and has recently been rearranged to provide for more parking space.

5-4-2 PROPOSED DISTRIBUTION OF MAJOR COMMERCIAL ACTIVITIES

Presently the flow of products into the city is rather unsophisticated. Trucks bring goods directly to detail shops, causing a great deal of congestion and confusion. The plan proposes to establish a distribution center will receive large amounts of goods, store them and slowly circulate them into the city, thereby increaseing efficiency and reducing congestion from truck traffic.

City-wide and regional commercial facilities will continue to develop along the part of the Abha Road that bisects the city. The area is expected to develop as a high density zone with the eastern part becoming the civic center complex and the opposite end a new commercial area. This high density zone will be the largest shopping center in the city and will serve the region as a whole. In addition to the goods normally found in the neighborhood and community shopping center, it will supply clothes, furniture, household equipment, etc. As the population of the urban area grows (see Table 5-4-1(a)) the total regional commercial land area requirement will increase from 6.4 ha in 1975 to 13.1 ha in 1995.

An additional north-south linerar commercial strip will be a community shopping area. This is being developed as a new axis of activities to supplement the existing concentration of development around the suq. Close to a variety of civic facilities, it serves both the region and the community. Shops whose financial viability require larger populations than the neighborhood will be found in these centers: florists, shoeshops, giftshops, candy, book and toy stores, children's wear, etc. The community land area space is projected to increase from 2.4 to 6.6 ha.

5-4-3 PROPOSED DISTRIBUTION OF NEIGHBORHOOD ACTIVITIES

Each neighborhood will have a shopping center. The number of centers will go from 9 to 28 in a twenty-year period and the land area use will increase from 9.6 ha to 26.5 ha in 1995. Presently, the T.P.O. has alreasy designated the location of schools and mosques in neighborhoods, Nos. 1.2.3, 1.2.2, 1.2.1, 1.3.2, 2.1.2, 2.1.4 and 2.1.5. They will form the nucleus of the neighborhood centers in these areas. In other neighborhoods, where the locations of the centers have not yet been specified, an attempt should be made to conform with the Planning Standards. Neighborhood centers should be within five to ten minutes walking distance, integrated with other facilities and along a local distribution road connecting the center of the neighborhood to the sub-community. The neighborhood centers should house a food market, drug store, barber shop, laundry, dry cleaning facility, restaurant, etc.

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

	1975	1980	1985	1995
Greater Urban Planning Population	79,800	96,000	115,000	164,000
Total Regional Commercial Floor Area (m^2)($0.15m^2$/inh.)	12,000	14,400	17,250	24,600
Total Regional Commercial Land Area (ha) ($10.8m^2$/inh.)	6.4	7.7	9.2	13.1

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

	1975	1980	1985	1995
Planning Population	31,930	39,500	51,600	88,300
Neighborhood Retail				
No. or Retail Centers	9	11	14	28
Total Floor Area (m^2)	11,000	13,800	18,000	31,000
Total Land Area (ha)	9.6	11.9	15.5	26.5
Community Retail				
No. of Retail Centers	1	1	2	3
Total Floor Area (m^2)	4,800	5,900	7,700	13,200
Total Land Area (ha)	2.4	3.0	3.9	6.6

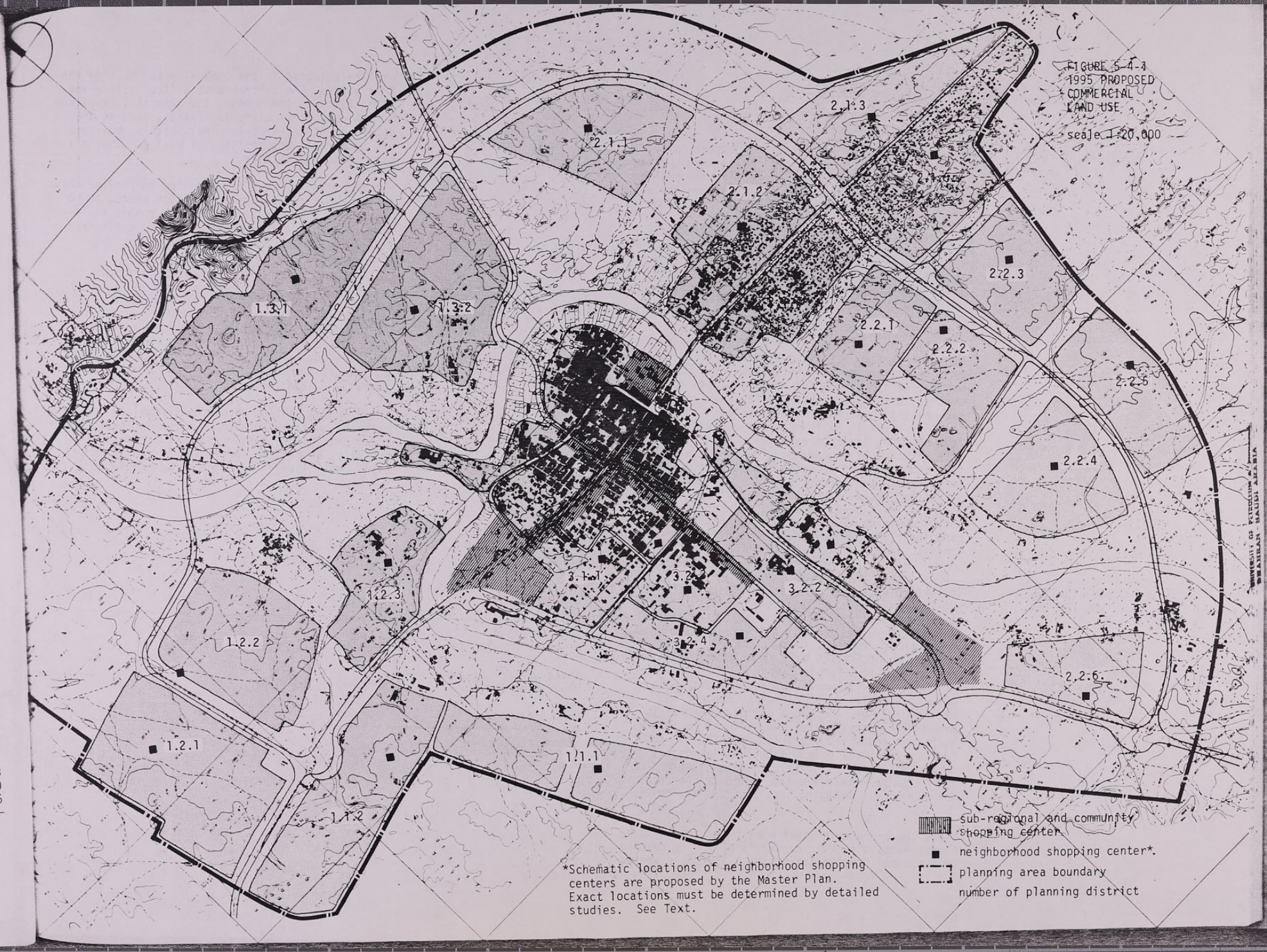


FIGURE 5-4-1
1995 PROPOSED
COMMERCIAL
LAND USE
scale 1:20,000
2.1.1
2.1.2
2.1.3
2.2.1
2.2.2
2.2.3
2.2.4
2.2.5
2.2.6
1.3.1
1.3.2
1.2.1
1.2.2
1.2.3
1.1.1
1.1.2
3.1.1
3.1.2
3.2.1
3.2.2
3.2.4
sub-regional and community shopping center
neighborhood shopping center*.
planning area boundary
number of planning district
*Schematic locations of neighborhood shopping centers are proposed by the Master Plan. Exact locations must be determined by detailed studies. See Text.

5-5 NEIGHBORHOOD AND COMMUNITY CENTRAL AREAS

5-5-1 PLANNING POLICY

Development in Khamis Mushayt has historically clustered around the old settlements near the suq and commercial districts. Presently, the problem is incoherent congested growth at the center, with urban sprawl in the growing periphery outside the downtown area.
As concentration at the center is itself desirable, the commercial district should continue as the focal point of the city, the downtown area should be reorganized in a more coherent fashion, and the tendency towards a characterless sprawl in the outlying parts of the city should be checked.

The planning policy treats the existing problems as interrelated. It divides the city into hierarchical units and sub-units (community, sub-community, neighborhood) for reasons: both to decentralize community services, thereby relieving the congestion at the center, and to disperse these services to outlying areas, keeping them from becoming residential areas without any identity or sense of community. The Plan's aim is that each unit and sub-unit should have sufficient services to maintain an integrity of its own and should not become mere appendages of the city centre. Individuals should be able to go about their day-to-day functions without having to escape their residential areas or braving downtown traffic.

5-5-2 DISTRIBUTION OF FUNCTIONS

In keeping with the above policy, each unit and sub-unit will have at least one facility for education, recreation, religion, health, commercial activities, social or cultural affairs, and some open space. Needless to say, the emphasis of the particular facilities will vary depending on the unit discussed. For instance, although every community has its own secondary schools, mosque, park, commercial area, community center, and health facility, the focus of the community is around the shopping area and cultural facilities such as museums and libraries. In the sub-communities, the focal point is the Jami'a mosque, around which the diagnostic treatment centers will also be located, while in the neighborhood the school and shopping area provides the nexus.

Since the branches of most ministries are in Abha, Khamis Mushayt's civic center is primarily devoted to municipal service activities. The civic center will be situated in the central area, housing the Emir office, the central post office, police and fire stations, the mosque, the central library and museum, and other civic facilities, such as the public transportation terminal, hotels, business and commercial enterprises, as well as other private sector facilities.

The community centers are situated to provide easy access and service each community's needs, to be integrated with the commercial and public facilities sector of each area and to be of sufficient scale that they become magnets capable of attracting a city-wide population.

Several criteria have been used to determine the location of the sub-community centers: space, direct access and therefore proximity to major distributor roads, as well as a spatial centrality to a growing population. In some cases it has been possible to satisfy the above requirements and have the community center for one area double as the sub-community center for another, thereby maximizing land use.

Neighborhood Centers should be central to the population, near the local mosque, park, and shopping area, providing a meeting place for residential activity, as well as facilities for adult education, small libraries, and entertainment.

Table 5-5-1
PROJECTED CIVIC CENTER AREA

	1975	1980	1985	1995
Greater Urban Planning Population	179,800	96,000	115,000	164,000
Civic Center Floor Area (m^2)	3,990	4,800	5,750	8,200
Land Area (ha)	4.0	4.8	5.8	8.2

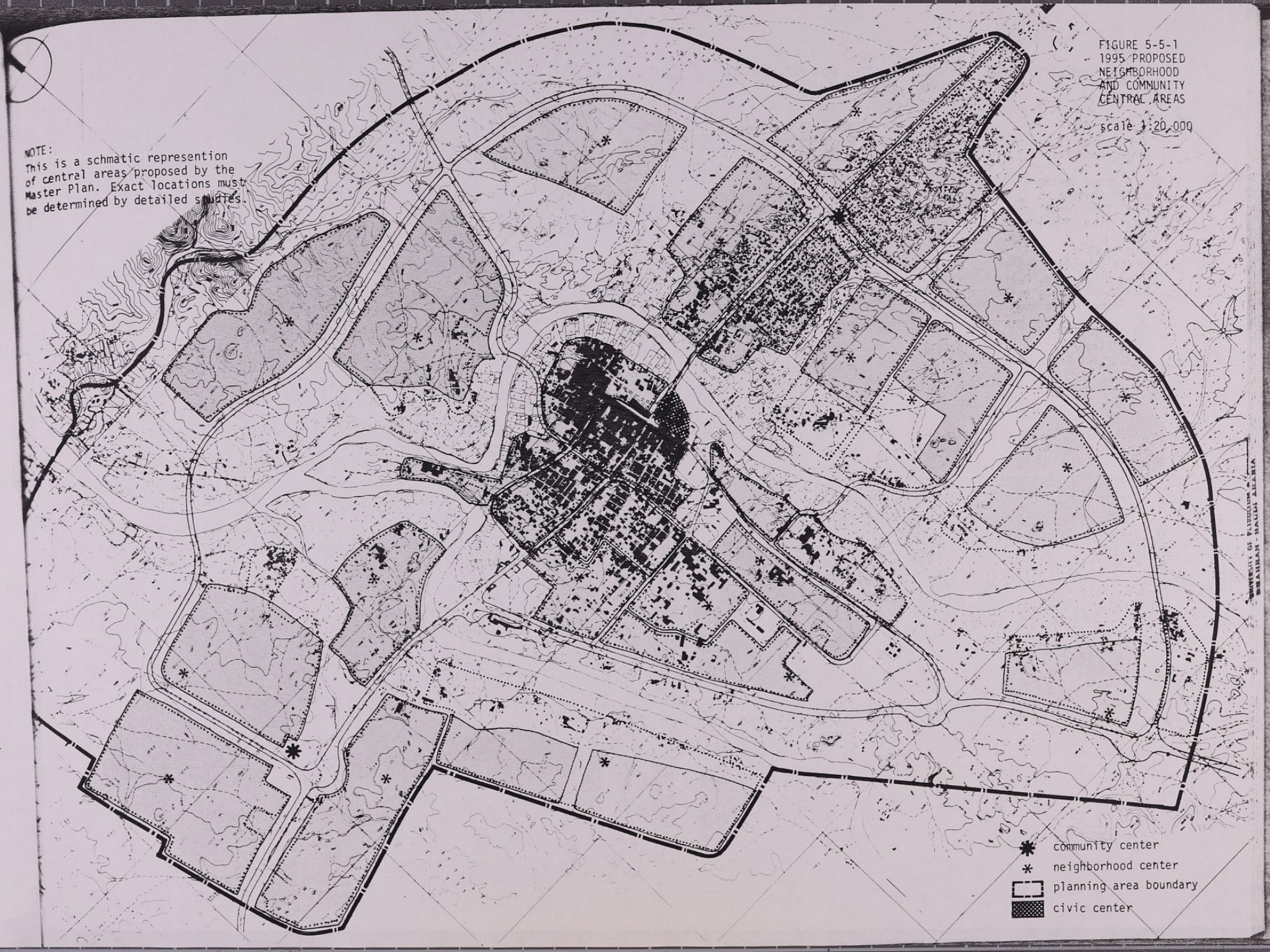


FIGURE 5-5-1
1995 PROPOSED
NEIGHBORHOOD
AND COMMUNITY
CENTRAL AREAS

scale 1:20,000

1995

164,000

8,200

8.2

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

	1975	1980	1985	1995
Planning Population	31,930	39,500	51,600	88,300
Neighborhood Center				
No. of Centers	9	11	14	28
Total Floor Area (m^2)	1,600	2,000	2,600	4,400
Total Land Area (ha)	4.5	5.5	7.0	14.0
Community Center				
No. of Community Center	1	1	2	3
Total Floor Area (m^2)	320	400	520	880
Total Land Area (ha)	1.0	1.0	2.0	3.0
Total				
Total Floor Area	1,920	2,400	3,100	5,280
Total Land Area	5.5	6.5	9.0	17.0

6. recreation and conservation

6-1 RECREATION

6-1-1 EXISTING RECREATIONAL AREAS

Currently, the area of recreational activity within the city itself is 2.4 ha located at one site at the southern edge of town and consisting of a sports club and soccer field. In the surrounding areas within two hours' drive are three popular recreation spots: Sawdah, Mahalah and Qarrah. All of these areas can be reached on paved roads but there is no public transportation, nor are there public facilities such as restrooms, benches, etc. Although these regional resort spots serve the population of Khamis Mushayt, they are outside the planning area of the city and not within the scope of this report. For more details concerning these areas, refer to the Regional Master Plan, Chapter 8.

Within the city proper, there is very little that could be called a recreational area per se. The idea of a separate space for recreation is not presently a concept that has taken root, although this is expected to change. Some vacant lots in the residential areas have been utilized as "playgrounds" for children and a few have installed swings. Children generally play in the streets, however, in part illustrating the norm of ill-defined recreational space.

6-1-2 POLICY AND REQUIREMENTS FOR RECREATIONAL DEVELOPMENT

There should be a policy to provide recreation areas for the city as a whole and for each sub-unit within the community hierarchy.

The space devoted to recreational areas conforms to the Planning standards. The areas should be linked by pedestrian footpaths that connect both hierarchical units and sub-units to themselves and each other until the whole recreational space of the city can be conceived of as a kind of web or network of linear access routes.

Furthermore, the recreation areas of the city can be divided into two types of space: active and passive. Active space is an area that has been designated for certain activities such as playgrounds, soccer fields, etc. Passive space is space which is not programmed for specific activity. In some cases the active and passive spaces interconnect.

6-1-3 RECREATIONAL LAND USE

Each residential unit will have a tot-lot for preschool children that is expected to serve a population of approximately 250. It should be in the center of the residential unit, easily visible

Table 6-1-1
PROJECTED RECREATIONAL AREA REQUIREMENTS

	1975	1980	1985	1995
Planning Population	31,930	39,500	51,600	88,300
Neighborhood Recreation				
No. of Tot-Lots	144	176	224	448
Total Land Area (ha)	7.2	8.8	11.2	22.4
No. of Nursery/Kindergarten Playlots	33	44	56	112
Total Land Area (ha)	7.2	8.8	11.2	22.4
No. of Neighborhood Parks	9	11	14	28
Total Land Area (ha)	16.0	20.0	25.8	44.2
No. of Playgrounds	18	22	28	56
Total Land Area (ha)	15.2	18.8	24.8	42.4
Total Neighborhood Recreational Area (ha)	45.6	56.4	13.0	131.4
Sub-Community Recreation				
No. of Playfields I	4	6	8	14
Total Land Area (ha)	8.4	10.8	13.8	24.0
Community Recreation				
No. of Playfields II	2	2	4	6
Total Land Area (ha)	5.6	17.2	9.3	16.0
No. of Community Parks	1	1	2	3
Total Land Area (ha)	12.8	15.8	20.6	35.3
Total Community Recreational Area (ha)	18.4	23.0	29.9	51.3
City Recreation				
Total City Park Land Area (ha)	12.8	15.8	20.6	35.3
Total Recreational Land Area (ha)	85.2	106.0	137.3	242.0

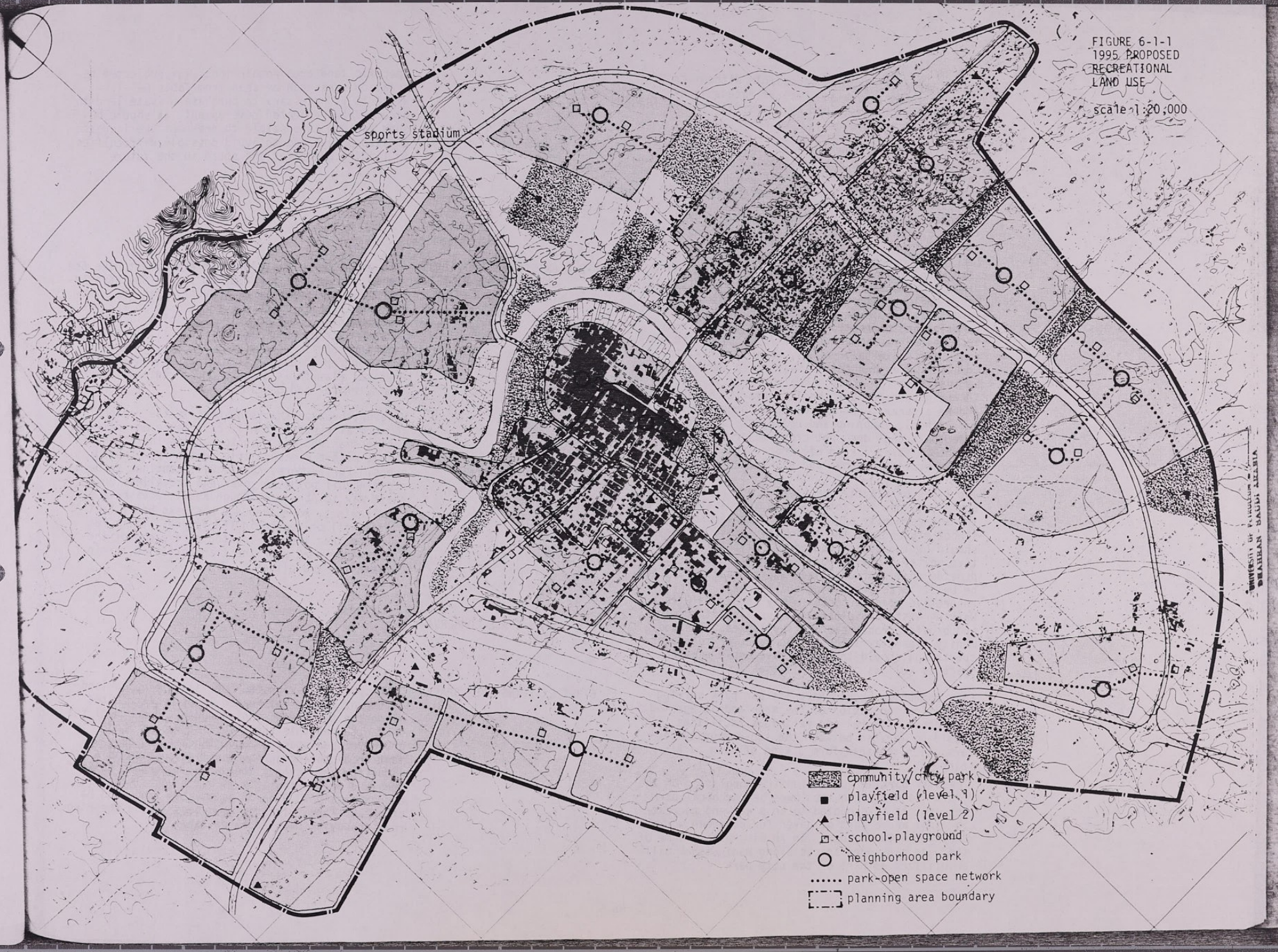


FIGURE 6-1-1
1995 PROPOSED
RECREATIONAL
LAND USE

scale 1:20,000

from the dwellings, and accessible without crossing any street, parking space or access lane--essentially circumscribed by pedestrian rather than vehicular activity.

Within the sub-neighborhood each kindergarten or nursery should have a playlot that can also be utilized by other children after school. It should be in the center of the sub-neighborhood within easy walking distance of the residents, preferably away from traffic or enclosed by a fence, and connected to the tot-lots by footpaths.

Each neighborhood should have its own park and a playground that can be shared by the boys' and girls' elementary schools. The playground should serve children at school time and others afterwards. It should be close to both elementary schools, and connected to it by a footpath away from major traffic. Adequate space should be provided for basketball courts, tennis courts,etc. Drinking water and toilet facilities should also be available for after school usage.
The neighborhood park should serve its inhabitants and be a general recreation area connected to other school, shopping and religious facilities by a footpath that does not cross major traffic, and in itself forms a kind of linear park. The park should provide benches and a swimming area.

Two types of playfields (Level 1 and Level 2) are envisaged; one for intermediate school students at the sub-community and the other for secondary school students at the community level. Both should be located in the center of their respective units, close to boys' and girls' schools, provide space for organized sports facilities, and be built to accomodate other residents of their respective neighborhoods. They should be within Walking distance, close to a bus line if possible, and provide proper parking facilities. The community area playfield will be used for spectator sports and should therefore have ample seating space as well as other facilities.

Each community should have its own park serving the entire population of the area and integrated with other cultural and religious facilities. It should be located between the sub-community centers which together form a kind of open park spine.

The city park serves the entire population of the city. Connected to the lower heirarchical park network, it is expected to be a weekend recreation spot and a sort of haven for downtown workers during the lunch hour. In Khamis Mushayt some of the wade bank open spaces along Wadi Bishah will be utilized as part of the city park.

Specific land area requirements for projected recreation areas can be seen from Table 6-1-1. Where it is necessary to purchase private land to accommodate projected development, it should be done as soon as possible to pre-empt the increase of land prices and to avoid possible difficulties in finding adequate land space in the future.

6-2 TOURISM

6-2-1 EXISTING CONDITIONS AND PROPOSED FACILITIES

Abha and other areas along the escarpment have the greatest potential for tourism in the Southern Region. Consequently, Khamis Mushayt has no existing tourist facilities and no major plan for their development. Put simply, because of a lack of tourist attractions, there is very little potential for tourism development in Khamis Mushayt. Again, refer to Chapter 8 of the Regional Final Physical Plan for a discussion of regional tourism potential and development.

However, because Khamis Mushayt is the regional commercial center, it will experience an influx of businessmen who may wish to combine their stay in Khamis with a pleasure trip to the surrounding areas. Furthermore, Khamis will continue to be a stopping off point for overland travellers on their way to Abha. Although Khamis does have a few lodgings, more adequate business hotel facilities will be needed in the future. It is recommended that they be located at the end of the Khamis-Abha road near the transportation terminal between the two cities.

6-3 OPEN SPACE CONSERVATION

6-3-1 EXISTING OPEN SPACE

Open space is designated here as cultivated land or vacant land. Cultivated land is distributed along the two wadis running north and south of the city. Beyond this there is flat vacant land. To preserve open space without threatening development or hindering agricultural production is a key issue for this city. Presently, more than half of the land within the city is built up. There is approximately 73.9 ha of cultivated land, 383 ha of vacant land, with the wadi beds inside the ring road occupying over 22 ha of land.

6-3-2 CONSERVATION POLICY

In the Master Plan, the main roads run along the two wadis at the outer edge of the cultivated land. The space to the west and east of the Wadi Atwood is a sparsely settled agricultural community with some farms. This describes the land along the banks of the Wadi Bishah as well as the area around the confluence of the two rivers to the north. The land between the minor arterials around Wadi Bishah should be conserved as open space, with low density agricultural development encouraged. Behind the minor road to the west of Wadi Atwood will be low density suburban communities. The vacant spaces behind these developments should be conserved except in the areas to the immediate west and south which are reserved for future extensions. The area between the two wadis at the confluence is extremely beautiful and should definitely be conserved. It requires immediate attention and should be purchased outright if possible. Areas beyond the city to the northeast have already been designated as conservation areas in the Plan.

The so-called outer ring road is surrounded by open park space and should provide a buffer zone to the neighborhoods.

In general, wadis with green trees should not be developed and should be kept as open space. To take one example, the area along one tributary wadi to the north of the city near the future boundary, grows numerous green trees and should be left untouched.

6-3-3 CONSERVATION OF AGRICULTURAL LAND

Khamis Mushayt lies 30 km east of Abha, on a flat plain in the Asir highland. It has a good water supply, mild weather, and as much as 300 mm rainfall. Many of the population depend on agriculture for their livelihood. Irrigation of agriculture has been practiced for thousand of years using shallow wells, wadi beds, or flood water. The shallow aquifers are regularly replenished by wadi floods and recharge usually exceeds extraction.

The main crops are cereals, fodder crops such as alfalfa and sorghum, and vegetables. In certain areas deciduous fruit trees, citrus and grapes are grown. Agricultural soils belong to the loamy-sand to sandy-loamy textural classes with the higher soils predominating. The main difficulty in soil management is efficient irrigation.

The fertility of the soils in the area is, however, surprisingly high. Farming conditions are suitable in all seasons, because the weather is mild and distribution of rainfall is relatively uniform. All agricultural products have high marketability.

Agricultural land almost surrounds the central city to the east, north and west along the wadi banks. The conservation of these areas should be encouraged both because of the direct economic benefit of agricultural production and because the green spaces created by such agriculture will provide visual relief from urban development.

6-3-4 CONSERVATION MEASURES, DEVELOPMENT CONTROL AND CONTROL OF THE OUTSKIRTS

Zoning controls can be the most effective means of controlling any kind of land use. Other methods include outright purchase of land by the government and subsidies or other monetary incentives for proper land use.

The areas on the outskirts which present the greatest challenge are those along the main regional arteries leading out of the city. In the case of Khamis Mushayt this means the road to Abha, the road to Najran and to a lesser extent the road to Bishah. At these locations, land use controls should be strictly enforced.

One of the best ways to assure that control of land at the outskirts is maintained is to strictly limit the extent of utilities development (i.e., water and sewer systems) to those areas mentioned in this plan (see Chapter 8). With no hope of water or sewers beyond this point, landowners should be very reluctant to develop land beyond these limits.

6-3-5 PROPOSED CONSERVATION AREAS

Generally the areas within 300 m of the wadis should be conserved.

6-4 HISTORIC CONSERVATION

There are two general types of structure in Khamis Mushayt which are suitable for historic conservation:

1. Old town-houses in the older sections of the central city.
2. Traditional farm houses and settlements along the wadi banks.

Of these, the former will be the most difficult to save because high land values near the center of the city will favor their replacment by new development. This is alrady happening rather quickly, and the government should consider giving immediate subsidies to owners of such historic structures who are willing to save and rehabilitate them.

The clusters of farm houses which are scattered along the wadi banks are not under the same sort of pressure, but similar incentives for their preservation, modernization (addition of modern utilities) and rehabilitation where necessary should be considered.

7. primary communication and transport

7-1 GENERAL

7-1-1 CITY LOCATION

Khamis Mushayt is situated in the geographical center of the Southern Region. Some 30 kilometers east of Abha, 800 kilometers southwest of Riyadh and 500 kilometers southeast of Jeddah, Khamis Mushayt lies at the junction of two Wadis, the Wadi Bishah and the Wadi Atwood. While Abha dominates as the administrative center, Khamis is considered the region's major commercial center. With the exception of Bishah, all of the major urban areas in the Southern Region depend on Khamis Mushayt as the main commercial distribution point for goods coming from Jeddah and Riyadh. Besides this dominating commercial function, the city also plays a vital role in the Kingdom's defense security. The largest military base in the Southern Region is located nearby. Because of favorable climatic and locational conditions, Khamis Mushayt can be expected to continue to grow as the commercial and industrial hub of the region, and together with Abha play a major role in the development of the entire region.

7-1-2 URBAN DEVELOPMENT

Because the city lies on a flat plain with many large open spaces, urban redevelopment of the old city center and development of the surrounding suburbs will be easier, cheaper and quicker. Development of the city can be described in four separate sections. The first and the oldest section lies around the area beside the Wadis. The second section is the market area in the northeastern part of the central city with its adjacent residential areas. The third section is the military installation to the south. The final and most recently developed section of the city is the eastern part where development has been basically residential in nature. Therefore, the most dominant trend in urban development for Khamis Mushayt is eastward across the Wadi.

In all, the expected rapid increase in population, together with the rapid growth of business and commercial activities by 1995, highlight the need to plan a safe and efficient transportation system for Khamis Mushayt.

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 the City of Khamis Mushayt 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 Khamis Mushayt.

7-2-2 TRANSPORTATION 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 Khamis 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 are determined and future demands for parking and terminal facilities are derived.

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 comprehenive 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 applicable to both qualitative and quantitive 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	-	520
Station Wagons	-	60
Pick-up Trucks	-	280
Jeeps	-	380

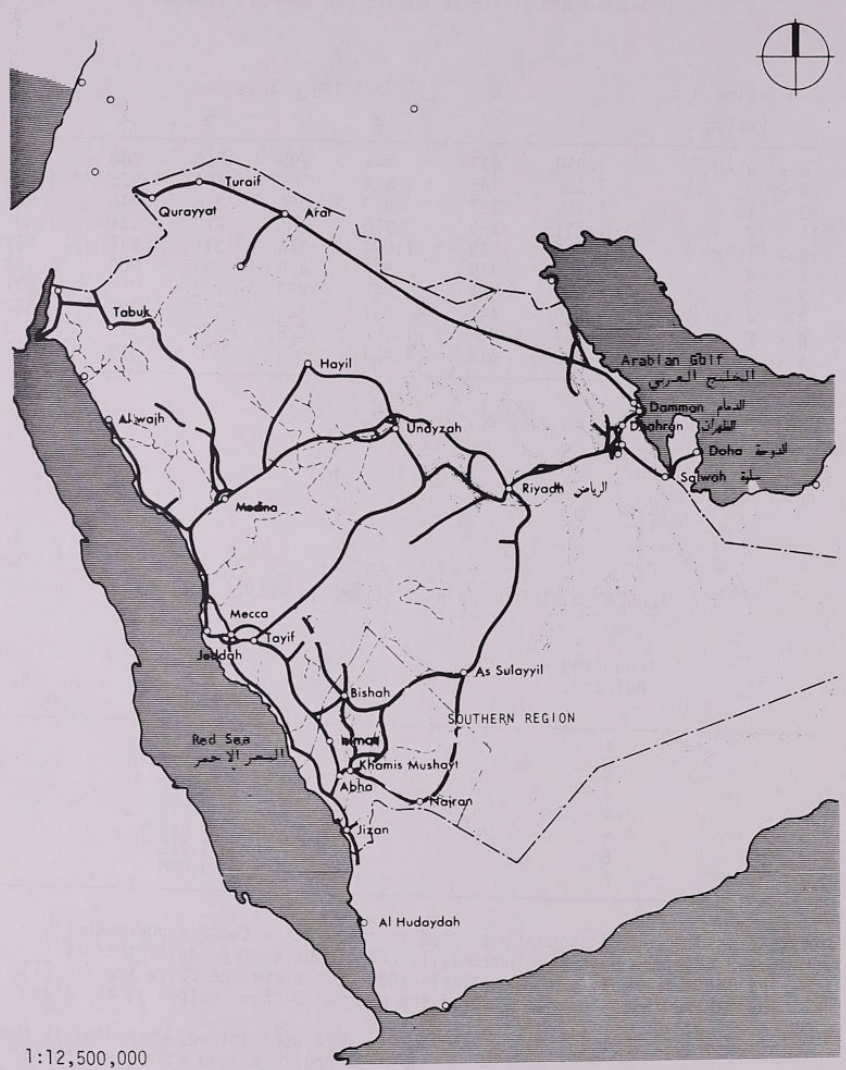


FIGURE 7-1-1
NATIONAL
ROAD NETWORK

FIGURE 7-1-2
REGIONAL
ROAD NETWORK

Large Trucks - 500

Total - 1,740

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, Fig. 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, Fig. 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 Khamis Mushayt, the city was divided into

Table 7-2-1 (a)
UPDATED HOURLY TRAFFIC COUNTS FOR KHAMIS MUSHAYT[a]

Time Period	Counting Points 1	2	3	4	5	6	7
8 - 9 AM	1,818	433	844	295	260	306	970
9 - 10	1,226	445	819	307	294	326	1,025
10 - 11	1,180	397	860	248	270	348	972
11 - 12	1,111	395	990	301	273	331	1,005
12 - 1 PM	945	388	1,094	346	311	297	942
1 - 2	708	349	804	270	263	260	722
2 - 3	908	384	841	290	222	269	841
3 - 4	970	442	891	321	246	292	827
4 - 5	1,087	468	1,106	328	304	377	973
5 - 6	1,383	514	1,404	374	309	389	1,072

Notes:
a. From a count taken on June 20, 21, 1977.

Table 7-2-1 (b)
CALCULATED MAXIMUM 24 HOUR VOLUME IN KHAMIS MUSHAYT[a]

Counting Points[b]	Number
1	11,064
2	4,112
3	11,232
4	2,992
5	2,488
6	3,112
7	3,576

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) = Maximum 24 hour volume, where (a) is the maximum hourly volume at a given point

For example, at counting point number 1 the maximum hourly volume occurred between 5 PM and 6 PM and was 1,383 vehicles, so the maximum 24 hour volume becomes:

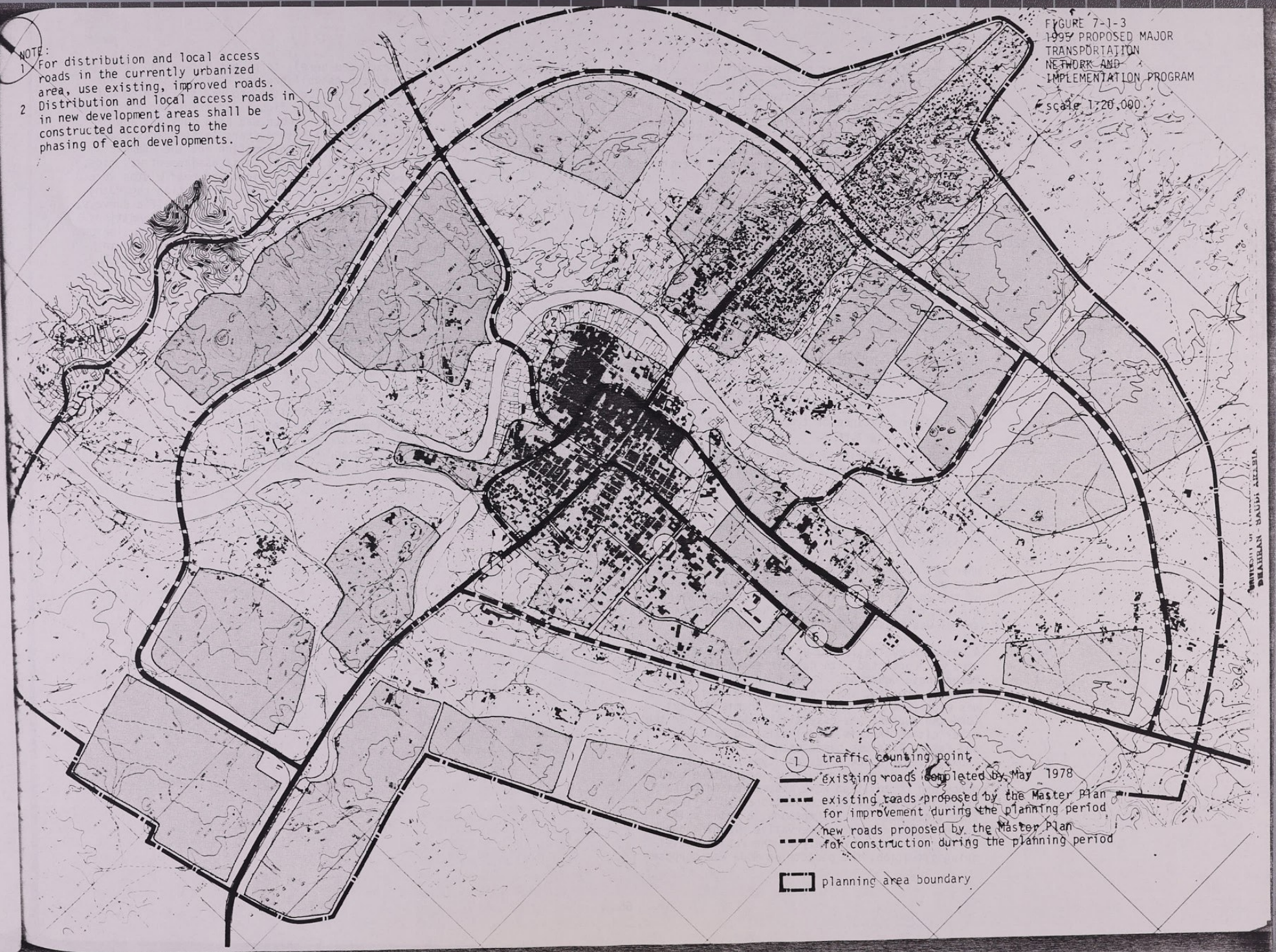
4(1,383)(2) = 11,064 as shown in the Table above.

b. The counting points are the same as those in Table 7-2-1 (a), as shown in the accompanying figure.

FIGURE 7-1-3
1995 PROPOSED MAJOR
TRANSPORTATION
NETWORK AND
IMPLEMENTATION PROGRAM

scale 1:20,000

NOTE:
1 For distribution and local access roads in the currently urbanized area, use existing, improved roads.
2 Distribution and local access roads in in new development areas shall be constructed according to the phasing of each developments.



two districts for planning purposes - six within the formerly proposed TPO outer ring road and seven outside it. 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 metmethod 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:

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

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 minumum friction path method. Resistance to travel was measured in units of time.

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 Fig. 7-2-1). For Khamis Mushayt (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 Khamis Mushayt 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. Traffic Volume and Capacity
6. Traffic Generation
7. Daily Traffic Flow Variation
8. Parking Space
9. Sidewalk Network
10. Distance From the Center
11. Time From the Center
12. Land and Road System
13. Land and Road Width
14. Land and Traffic Capacity

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	1,434	7,803	1,764	8,194	4,706	1,169	8,584	2,400	3,474	38,528
	to	1,091	7,339	1,494	7,318	4,717	1,269	9,546	2,448	2,479	37,701
TO 2	from	516	1,559	1,075	1,683	1,383	555	1,635	538	1,110	10,054
	to	800	1,006	815	1,232	936	406	1.240	658	1,078	8,171
TO 3	from	573	387	207	335	442	170	1,397	1,220	204	4,935
	to	561	309	149	339	408	124	1,283	1,077	143	4,393
TO 2*	from	602	1,851	655	2,822	2,373	624	4,057	2,180	129	(15,193)
	to	613	880	636	2,955	2,329	714	4,087	2,390	100	(15,072)
Total	from	3,125	11,600	3,701	13,034	8,804	2,518	15,673	6,338	3,917	68,710
	to	3,065	10,534	3,094	11,844	8,390	2,511	16,156	6,573	3,800	65,967
G. Total		6,190	22,134	6,795	24,878	17,194	5,029	31,829	12,911	7,717	134,677

* This point is located in Abha.

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

	Going to Work	Busi-ness	Shop-ping	Recre-ation	Home	Rece-iving and loading	Deliv-ery and un-loading	Others	Total
Origin	0.345	0.030	1.137	0.033	0.162	0.179	0.115	0.099	1.000
Destination	0.184	0.033	0.241	0.073	0.052	0.110	0.213	0.093	1.000
Total	0.259	0.032	0.146	0.054	0.103	0.142	0.167	0.096	1.000

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

A primary objective is to ensure high standards in the developing areas throughout Khamis Mushayt in 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.

A glance at the 1995 land use proposal and population projections immediately indicate that urban development relative to population will be fairly evenly spread throughout Khamis Mushayt. The city itself is centered around one large commercial, cultural and civic center. The primary industrial and commercial distrubution center,perhapas the most important generator, is located just outside the western urbanized area of the city across the Wadi Abha and north of the road to Abha. Naturally the new Abha Airport, which lies between these two main urban complexes, cannot be ignored as a main generator. However, the airport will be discussed in greater detail in the Abha Master Plan.

Table 7-2-4
SUMMARY OF TRANSPORTATION DATA

Planning Parameters	1975 Survey	1995 Projected
Planning Population	31,930	88,300
Jobs	6,810	25,872
Households	5,458	20,068
Vehicle Ownership (per thousand persons)	59.5	208.2

7-2-5 LOCATION AND DESCRIPTION OF MAIN GENERATORS

As previously mentioned, the new Abha Airport lies approximately midway between Abha and Khamis and just south of the primary regional highway connecting the two cities. This airport will handle an estimated 1,360,000 passengers annually by 1995 and is expected to generate approximately 1,600 to 1,700 vehicle trips per day from Khamis Mushayt.

Several relatively small mixed land use areas each about 15 hectares in size combine to form what can be considered the central city district. This central area comprised of commercial, cultural and public service activities, along with some high density residences, will attract approximately 20,000 to 24,000 vehicle trips per day. Surrounding this major central activity center is spread several medium density residential areas with an average population of about 3700 persons.

Because of the commercial nature of Khamis Mushayt, it is easy to see why the industrial and distribution center of about 100 hectares is the most important generator in the city. It can be expected to attract some 14,000 to 16,000 vehicular trips per day. Strategically located across the wadi slightly northwest of the city limits, this distribution center will better serve the entire Southern Region. Any other location of this attraction node would probably hamper the efficient distribution of goods throughout the Region, as well as cause heavy truck traffic and increased congestion to put an additional strain on the city's transportation system.

Physical constraints, namely the Wadi's bounding the main urban areas of the city, will require the construction of several new bridges. However, the need for these structures is essential if Khamis is to have a smooth and efficient transportation network.

It is evident then that the proper planning of the development and expansion of Khamis Mushayt is essential to the overall economic well being of the Southern Region. The proposed planned transportation betwork for Khamis Mushayt is composed of a set of two by-pass routes - one turning south just to the east of wadi Atwood and west of the central area to joint the Najran Road well to the south of the central area, and the other a "semi-ring road" turning north from the Abha - Khamis Mushayt road to the west of wadi Atwood and partially encircling the city to the north and east at a distance of about 2 km from the center. This latter road serves both as a by-pass of the central area (as does the first) and as a link connecting the proposed new residential areas north and west of the city. This system is linked to the "grid" of the central city and provides an excellent means of linking the main traffic generators as well as a simple means of phasing highway construction.

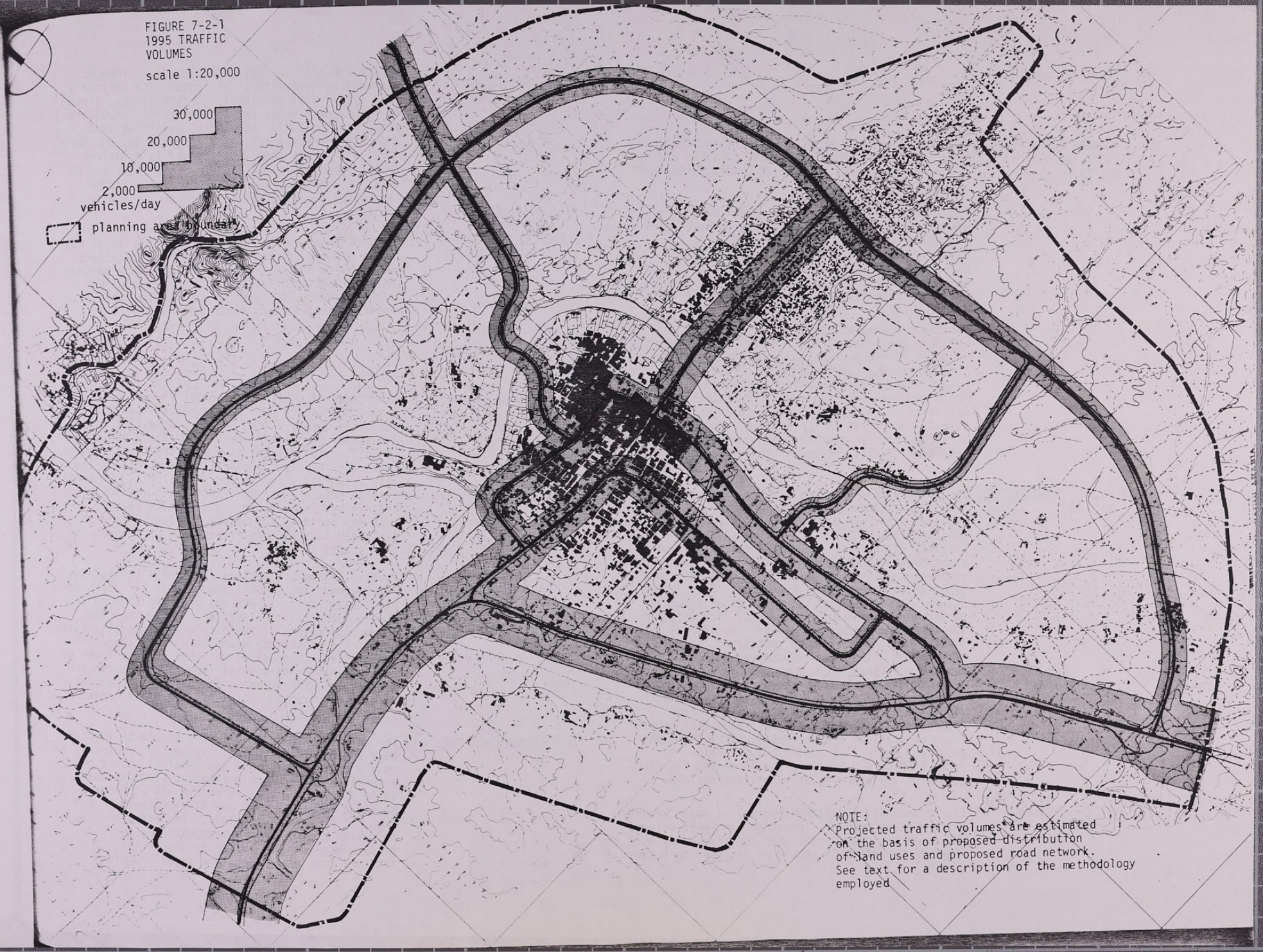


FIGURE 7-2-1
1995 TRAFFIC
VOLUMES
scale 1:20,000
30,000
20,000
10,000
2,000
vehicles/day
planning area boundary
NOTE:
Projected traffic volumes are estimated on the basis of proposed distribution of land uses and proposed road network.
See text for a description of the methodology employed

7-3 PRINCIPAL ROAD NETWORK

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 Khamis Mushayt and the country.

The urban roadway network for Khamis Mushayt 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.

Various problems arise, however, in trying to maintain these standards. In some cases, the recommended right-of-way exceeds that of the existing network. In these instances, the sole method of accommodating the recommended width would require extensive demolition. This alternative is often costly, disruptive and undesirable if undertaken in large scale. Thus a concerted effort was made here to accommodate the projected traffic volume in the existing network.

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 alow it. Refer to Fig. A-2-9 (d) in the Appending Planning Standards for examples of such intersections.

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. The 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. 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.

7-4 PUBLIC TRANSPORTATION

7-4-1 URBAN BUS TRANSIT SYSTEM

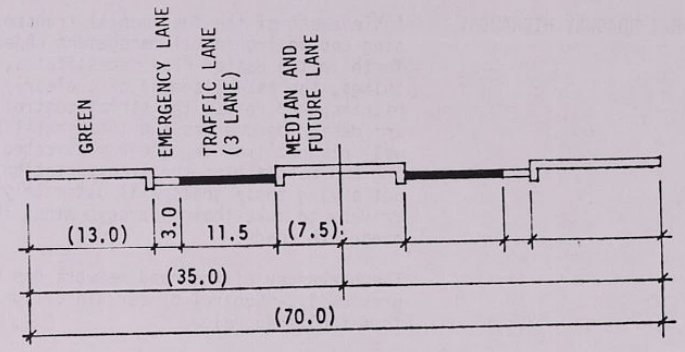
Acceptance of public transportation in the City of Khamis Mushayt is much more advanced than most of the other cities of the Region. This fact is indicated by the high percentage of taxis and buses (40.6%). With respect to public transportation, there are two major areas of concern, namely the city's central district and the airport. Present traffic between Abha and Khamis is quite heavy. Projections for 1995 indicate an even heavier demand and possibly the implementation of some sophisticated mode of mass transportation between the two cities.

Traffic volume projections for Khamis unquestionably warrant the establishment of an efficient urban transit system. Without one, the high concentration of activities and the general important commercial nature of the city will eventually place unbearable restraints upon the overall transportation system. Success of this bus system hinges on the combination of several important factors; the size of bus, riding comfort, operating schedules, station and transfer points and terminal location.

7-4-2 SYSTEM LOCATION

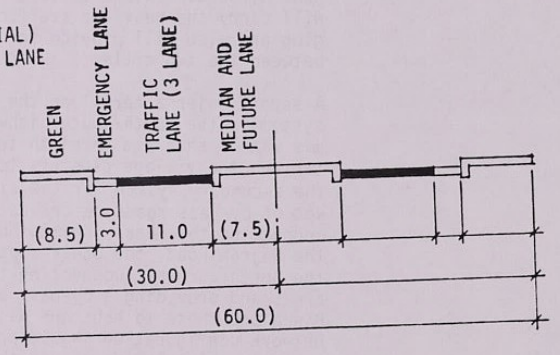
The main terminal of the system should be located near the central city activity center. However, a more precise location of the terminal should be established after a more detailed study is conducted to enhance and improve people and commodity movement and to provide the fluent access to and from the principle arterials. The efficient integration of the urban system with the intra-regional long-haul bus system is imperative. Specific locations of stations and transfer points

V1 EXAMPLE
(REGIONAL HIGHWAY)
6 LANE

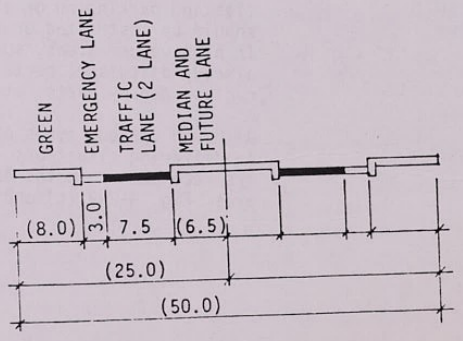


V2 EXAMPLE
(MAJOR ARTERIAL)
6 LANE AND 4 LANE

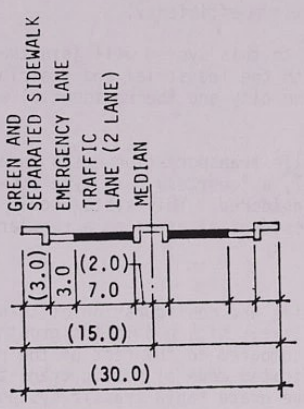
6 LANE



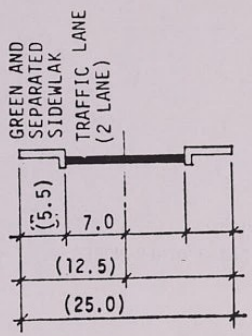
4 LANE



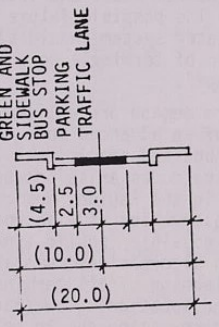
V3 EXAMPLE
(ARTERIAL)
4 LANE



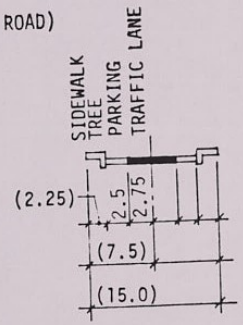
V4 EXAMPLE
(COLLECTOR)
4 LANE



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 elimenation is justified by the detail planning.

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

must be strategically placed to serve the public's need with maximum efficiency.

A major link to this system will join the center city area with the industrial and distribution area west of the city and the residential areas east of the city.

To serve public transportation needs 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

Due to the size and configuration of Khamis Mushayt and the relatively high population growth predictions, when compared to the rest of the region, a more sophisticated mode of public transit (i.e. at grade or above grade rapid transit system) will be warranted within our 20-year planning period. Therefore, provision for a "public transit corridor" within the right-of-way should be made along all of the principal inter and intra-regional highway arteries. The possible future implementation of a sophisticated system should also be considered in the location of terminals to achieve "flexible mode interchange".

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 tranportation corridors". Such alternatives must also be considered in the planning of all terminal facility configurations and location. 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 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 extending and maintaining the transportation system. 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

The main and primary arterial for Khamis Mushayt is the Intra-regional Highway to Abha and the new Abha Airport. This arterial, running east/west, will carry the heaviest traffic load in the Region and also will provide for a transit system between the two cities.

A second major arterial on the proposed primary system is the north/south highway connecting Khamis with Bishah and Tathlith to the north and Najran and the village clusters to the south.
The secondary system for the city consists of a set of by-pass roads described fully earlier - one connecting the Abha - Khamis Mushayt road with the Najran Road, the other a partial ring road to the north and west connecting the new residential areas and providing a by-pass between the road to Bisha and those to Abha and Najran. This basic network configuration should provide adequate vehicular circulation around the activity centers provided the environmental, parking and pedestrian policies are enforced. Access to frontage properties and parking on or along these arterials should be restricted or prohibited respectively. In high volume areas, such as the activity centers already discussed, certain vehicles such as motorcycles, donkey carts, etc. should be prohibited.

Although various types of interchange are possible in differing situations, examples of certain types are recommended in the Appendix, Planning Standards, Fig. A-2-9 (c) and A-2-9-(d).

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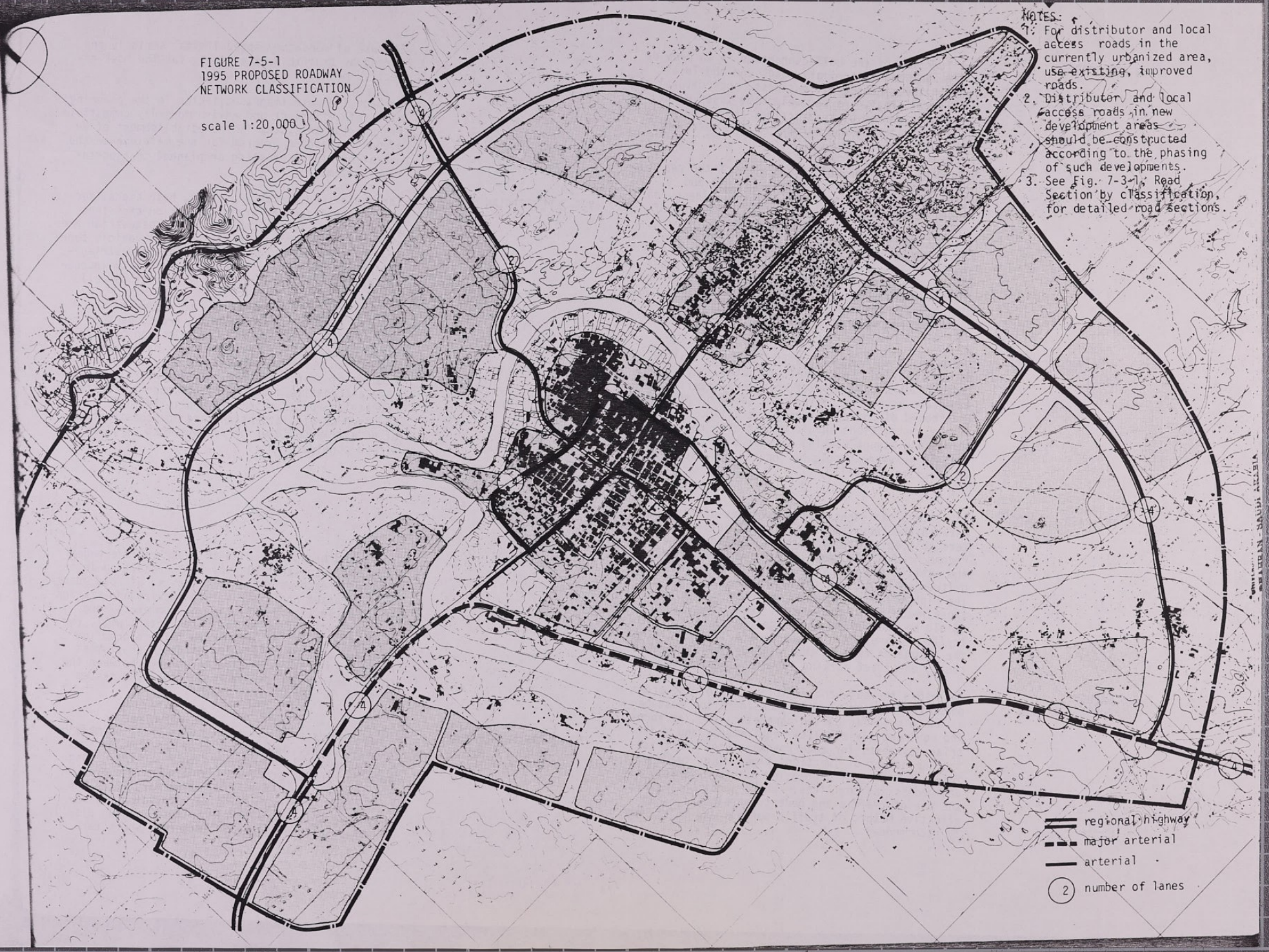
FIGURE 7-5-1
1995 PROPOSED ROADWAY
NETWORK CLASSIFICATION

scale 1:20,000



7-5-3 COLLECTORS

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.

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 casements adjacent to the valley.

7-5-5 "BY-PASS ROUTE"

To relieve the expected high volumes of traffic between the industrial and central activity centers, a special "by-pass route" configuration is recommended. This configuration will accommodate the anticipated heavy commercial traffic making deliveries to distant urban centers, as well as the high volume of private vehicles belonging to those residing in the central area. Regulations should be such as to encourage transient truck traffic to use this "by-pass route." Considering the volume of traffic that will be utilizing this route, on-street parking should be prohibited.

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 vehicle and pedestrian conflicts. Where junctions exist, the use of traffic and pedestrian signals is an effective method of traffic control and is strongly recommended.

The use of 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 system.

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 Khamis Mushayt must attempt to provide 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 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 Fig. 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, mult multi-level parking structures should be used. Appendix, Planning Standards, Fig. A-2-9 (e) for examples of multi-level parking structures.
7. 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)
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.

Specific parking data for Khamis Mushayt indicates a high percentage of parking for shopping purposes (40.7%) and a continuous parking trend of less than two hours.

This implies the need to satisfy short term parking demand prevails.

The industrial and distribution center, as planned, will generate nearly 15,000 private vehicles. The commercial, cultural and civic activity centers will attract from 20,000 to 24,000 vehicle trips to the central district.

Provisions then should be made to meet these 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 limited and strictly controlled. Loading and unloading should not occur directly from the stre street, but at loading areas at the sides or back of commerical establishements. 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 IMPACT

Design of any transportation links or terminal 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.

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 omissions to be accepted. Land use of urban activity must be controlled in the vicinity of any transportation facility.

7-7-2 METHODS AND CONTROL

As is the case with all of the cities of the Southern Region, Khamis Mushayt is presently fortunate to have a clear, clean and quiet environment. It will be the responsibility of the Administrators and Planners not to permit conditions to deteriorate, but to improve them instead.

In heavily populated areas along the most heavily traveled arteries, vegetative, earth or ma -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.

Grade separated interchanges not only increases capacity and safety, but reduces congestion, shortens travel time and efficiently transfers traffic from one roadway to another. Locations of major concern where grade separations may possibly be considered are the intersection of the Abha-Khamis Highway with the two "by-pass routes" and the intersection of the Khamis-Najran Highway with the "partial ring road" by-pass route. It is estimated that by 1995 traffic volumes will be such that grade separations may be warranted at these locations.

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 provisions of wide open right-of-ways contribute greatly to safe and comfortable transportation.

Table 7-7-1
1977 UNITED STATES
FEDERAL EXHAUST EMISSION STANDARDS & 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

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 the growth estimates prepared for the village cluster. 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 6 km of six-lane, 14 km of four-lane roadway, and 14 km of 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 S.R. 39 million. Since the bulk of this construction should be completed in the first 10 years, it is recommended that 33% or 131 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. public utilities

8-1 ELECTRICITY

8-1-1 EXISTING AND PLANNED SERVICES

The power station is to the northeast of Khamis Mushayt, and has generating capacity of 3,600 kw. Plans are underway to connect the city's power system with that of Abha and eventually with a sub-regional network linking all of the Asir Province, which will be part of a nation-wide energy supply network. There is also a two-phased plan to extend the electricity supply by creating additional lines within the northern part of the proposed ring road in the city center, along the Abha Road west of the Wadi Atwood, and in a north-south direction to the east and west of Wadi Bishah, encompassing the new residential areas across the river.

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 6 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 Khamis Mushayt must exceed 43,000 kw. The 1995 demand by district is shown in Table 8-1-1.

8-1-3 PROPOSED SERVICES

The existing and planned extension of the supply network can be seen from Fig. 8-1-1. It is proposed that additional lines be built in the new areas. Because of the growing need for power over time, an expansion of the station north of the city in a 4 ha area is being considered. However, given the development projected in the next twenty years, the present site may present a problem due to its proximity to the urbanized areas. Consequently, a new site should be sought that connects to the existing supply network.

Table 8-1-1
PROJECTED DEMAND (FOR UTILITIES)

A. Domestic Demand by Districts

Neighborhood No.	Population 1995	Electricity 0.3 kw/person	Gas 0.5 kg/day/person	Fuel 2.3l/day/person	Water 150 litres/day/person	Refuse 0.5 kg/day/person
1.1.1	3,600	1,080	1.8		540	1.8
1.1.2	3.900	1,170	1.95		585	1.95
1.2.1	4,000	1,200	2.0	Community	600	2.0
1.2.2	3,500	1,050	1.75	"1" =	525	1.75
1.2.3	2,700	810	1,35	58 kl/day	405	1.35
1.3.1	3,700	1,110	1.85		555	1.85
1.3.2	2,900	1,170	1.95		585	1.95
2.1.1	3,000	900	1.5		450	1.5
2.1.2	3,100	930	1.55		465	1.55
2.1.3	3,100	930	1.55		465	1.55
2.1.4	2,500	750	1.25		375	1.25
2.1.5	3,550	1,065	1.8	Community "2" =	533	1.8
2.2.1	2,500	750	1.25	72 kl/day	375	1.25
2.2.2	2,500	750	1.25		375	1.25
2.2.3	2,700	810	1.35		405	1.35
2.2.4	2,900	870	1.45		435	1.45
2.2.5	2,800	840	1.4		420	1.4
2.2.6	2,500	750	1.25		375	1.25
3.1.1	2,900	870	1.45		435	1.45
3.1.2	2,950	885	1.5		443	1.5
3.1.3	4,900	1,470	2.45		737	2.45
3.1.4	2,900	870	1.45	Community	435	1.45
3.1.5	3,750	1,125	1.9	"3" = 74 kl/day	563	1.9
3.2.1	3,900	1,170	1.95		585	1.95
3.2.2	4,350	1,350	2.2		653	2.2
3.2.3	3,500	1,050	1.75		525	1.75
3.2.4	2,700	810	1.35		405	1.35
Total	88,300	26,535	44.25 ton/day		13,247 m^3/day	44.25 ton/day

B. Non-Domestic Demand
(Hospitals, Schools, Stadium, Power Station, Utility Facilities, Industrial Area, Commercial and Business, Public Facilities)

	17,000	25.5	130	3,250	25.5
City Grand Total	43,535 (0.5 kw/person)	69.75 (0.8 kg/day/person)	334 (3.8 l/day/person)	16,497 (187 l/day/person)	69.75 (0.8 kg/day/person)

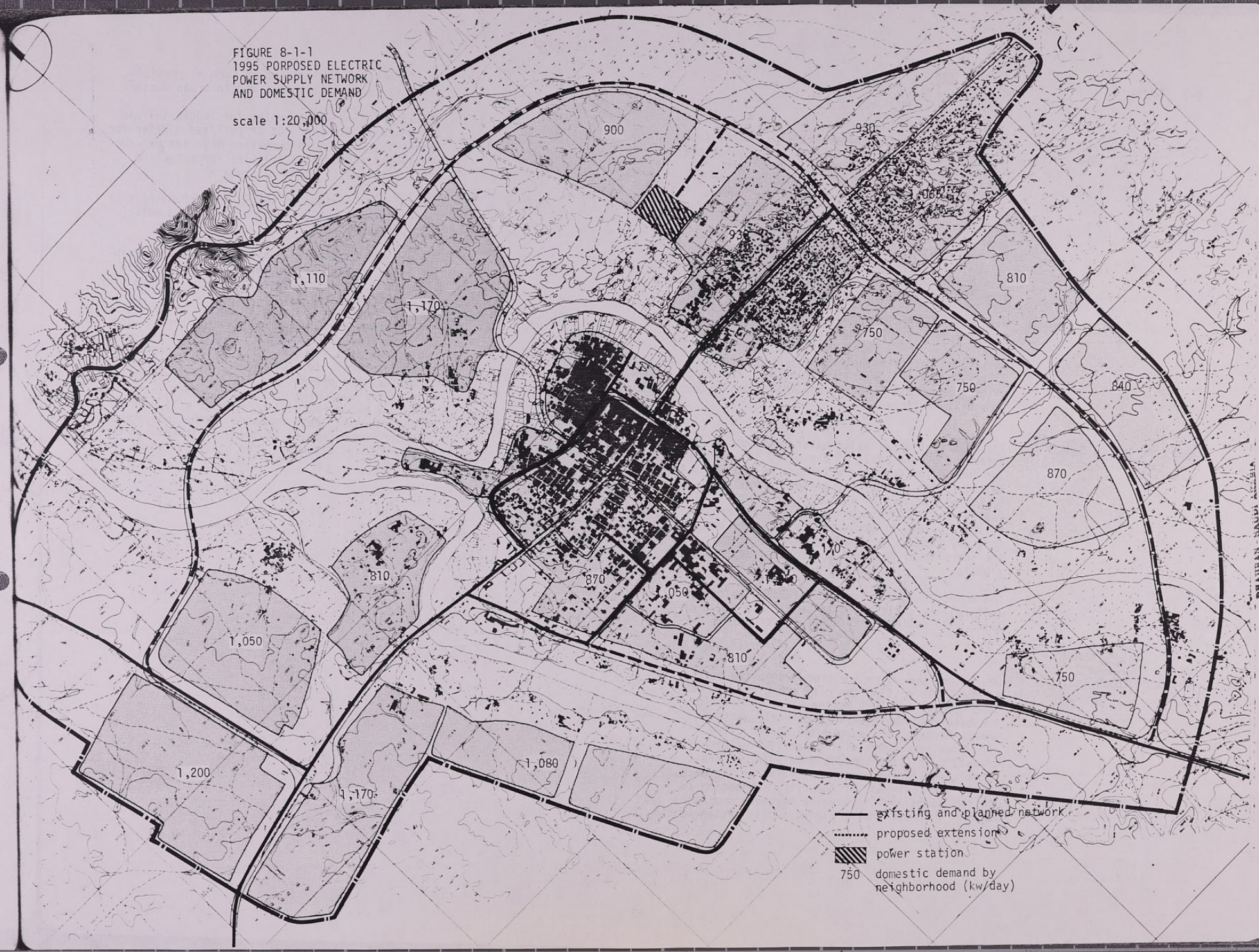


FIGURE 8-1-1
1995 PORPOSED ELECTRIC
POWER SUPPLY NETWORK
AND DOMESTIC DEMAND
scale 1:20,000
900
930
930
1,110
1,170
810
750
750
840
870
810
870
1,050
1,050
810
750
1,200
1,170
1,080
existing and planned network
proposed extension
power station
750 domestic demand by neighborhood (kw/day)

8-2 WATER

8-2-1 EXISTING AND PLANNED WATER

Khamis Mushayt has no piped municipal water system, nor are there definite plans to provide one. Water generally comes from wells which are scattered along the two wadis, although some are concentrated in two parts of the city center. The total capacity is approximately 1,000 to 1,700 tons per day [1].

The potential water resources for the city are quite high. Although its rainfall is lower than neighboring Abha, its total catchment area is around 500,000 ha, compared to 5,700 ha for Abha.

With proper management, there should be more than enough water to supply both domestic and non-domestic uses. Because of the low potential availability of water in the Abha catchment area, it is proposed that the deficit be made up with supplies from Khamis Mushayt, and that the two systems will be linked.

8-2-2 ESTIMATED DEMAND BY DISTRICT

The distribution of daily water consumption was estimated on the basis of the UTREC 5% Survey [2]. The demand for domestic water use is projected to be 150 litres per day per person in 1995, or 13,247 m^3 per day for a population of 88,300 (see Table 3-1-1). Although the estimated demand is relatively low, it would be desirable to keep it this way through price control or recycling, given the scarcity of water in the country and region as a whole.

Non-domestic demand for water (exclusive of agriculture), is anticipated to be 3,250 m^3 of the total 1995 estimate of 16,497 m^3 per day.

8-2-3 PROPOSED SERVICES

New water reservoirs are proposed on the peaks of the hills dotting the city along the boundary described in the 1995 Master Plan. A distributor main from the reservoir directly west of Khamis Mushayt will supply the center city. The other reservoirs will generally feed the distributors in their immediate or adjacent areas. Water comes to the three reservoirs on the west, south, and southwest of the city, connecting to the two additional reservoirs through pumping mains. A comprehensive piping supply system should be planned and implemented as soon as possible, since it is essential to a modern urban center.

Unlike drinking water, water for industrial and agricultural use need not be purified. Water for industrial use should therefore have another supply system including facilities for recycling waste water as is common elsewhere.

Agricultural irrigation supplied independently by farmers' wells can be considered a third water supply system.

The present availability of water in Khamis Mushayt is 22 million m^3 per year. The approximate 1995 projected yearly domestic demand for the city is 6 million m^3, with 6 million m^3 of Abha's 7 million m^3 domestic demand being met by water coming from the catchment areas around Khamis. The combined projected demand of 13 million m^3 for the two cities does not take into account industrial or agricultural use. Consequently, it is anticipated that the present available volume of 22 million m^3 per year will not be sufficient in the future [3]. Water harvesting methods will have to be used to meet these demands. Either aboveground or underground damming of the wadi streams in the Khamis Mushayt catchment area will have to be undertaken.

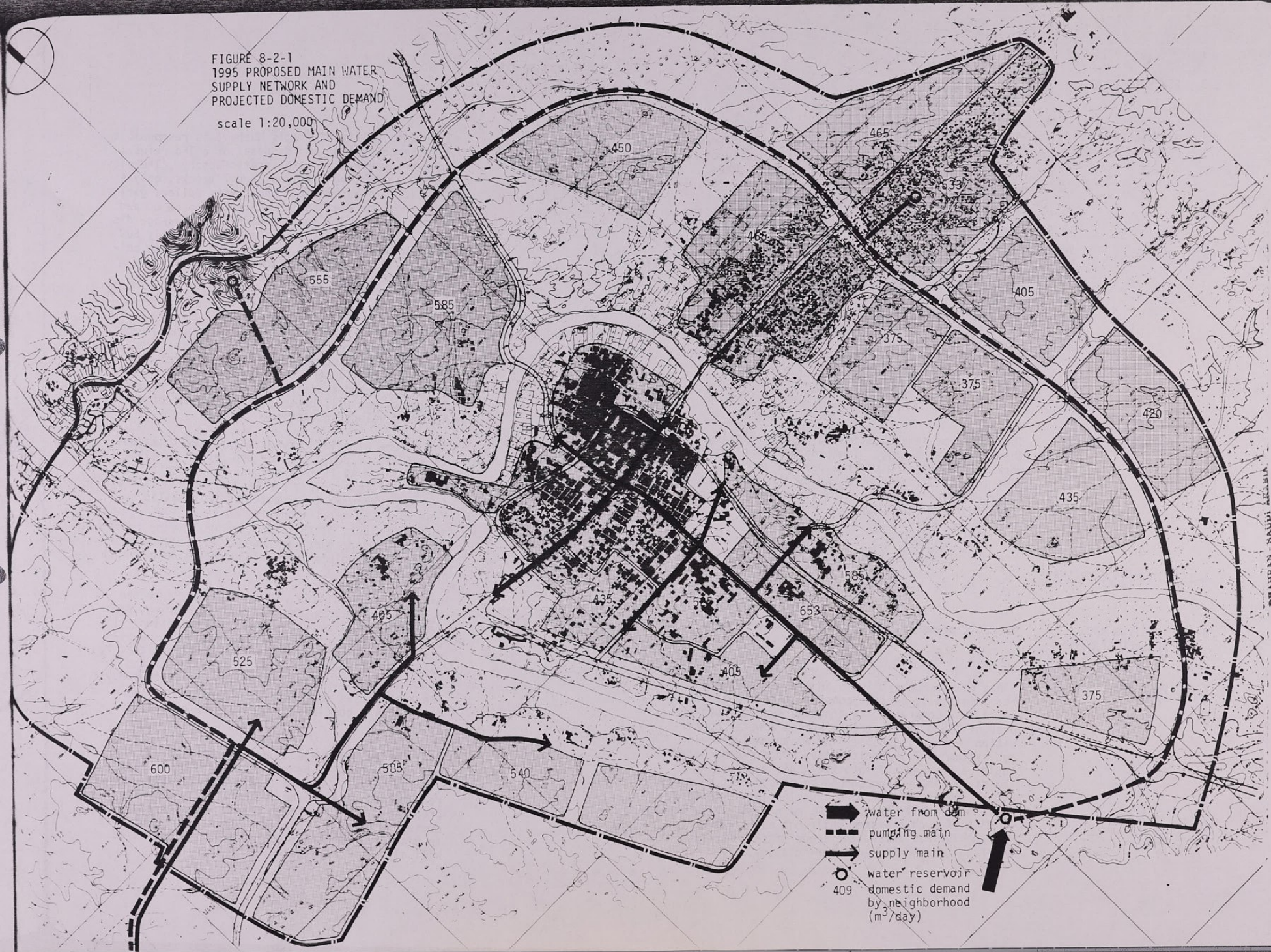


FIGURE 8-2-1
1995 PROPOSED MAIN WATER SUPPLY NETWORK AND PROJECTED DOMESTIC DEMAND

scale 1:20,000

8-3 SEWERAGE

8-3-1 EXISTING AND PLANNED SERVICES

Sewage disposal in Khamis Mushayt is currently disorganized and generally unsatisfactory. Traditionally, people have relied on the capacity of the earty 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, one municipal truck and two private trucks with a total daily capacity of 45 tons are used to clean them. This sewage is carried to a disposal site and dumped without treatment. A newly planned disposal project will aid greatly in solving this problem; however, becuase of the limited service area, it is expected that almost immediate expansion will be required [4]. In general, the sooner the implementation of the planned sewerage system, the cheaper and less difficult it will be to install.

8-3-2 PROPOSED SERVICES

The volume of sewage estimated is a little lower than the water supply. The proposed sewerage network serves only the central part of the city inside the small ring road bound by the two wadis. Consequently, an extension of the network is proposed in the Master Plan.

8-4 STORMWATER DRAINAGE

8-4-1 EXISTING AND PLANNED SERVICES

There is presently no planned drainage system.

8-4-2 PROPOSED SERVICES

Since Khamis Mushayt is in an area with fairly heavy rainfall, serious consideration should be given to a comprehensive drainage system, both to prevent flooding of streets and as a water conservation measure. Establishing a stormwater drainage system would be quite easy, since excess water could be drained off into the wadis surrounding the city. The system should be constructed along any of the asphalted roads, running into tributary wadis and finally into the two main wadis. The details of such a system while not complicated are nonetheless beyond the scope of this report and require detailed engineering study.

8-5 SOLID REFUSE COLLECTION AND DISPOSAL

8-5-1 EXISTING AND PLANNED SERVICES

The municipality of Khamis Mushayt is responsible for the collection and disposal of solid refuse; however, the results are unsatisfactory. The city has 13 collecting stations, and 7 trucks, only 4 of which are automatic. The trucks collect garbage from the stations and carry it to be dumped on the open ground in an area near the sewage disposal site. The city also has approximately 500 dustbins on the street, and 100 handcarts to collect their contents, but throwing garbage in a convenient place outside one's house is still a common practice [5].

8-5-2 PROPOSED SERVICES

Statistically it is known that the amount of solid refuse in an area rises in proportion to income; the higher the income, the greater the refuse. Given the development anticipated in Saudi Arabia, it is estimated that the amount of solid refuse in 20 years time will be equivalent to that of cities in the developed countries.

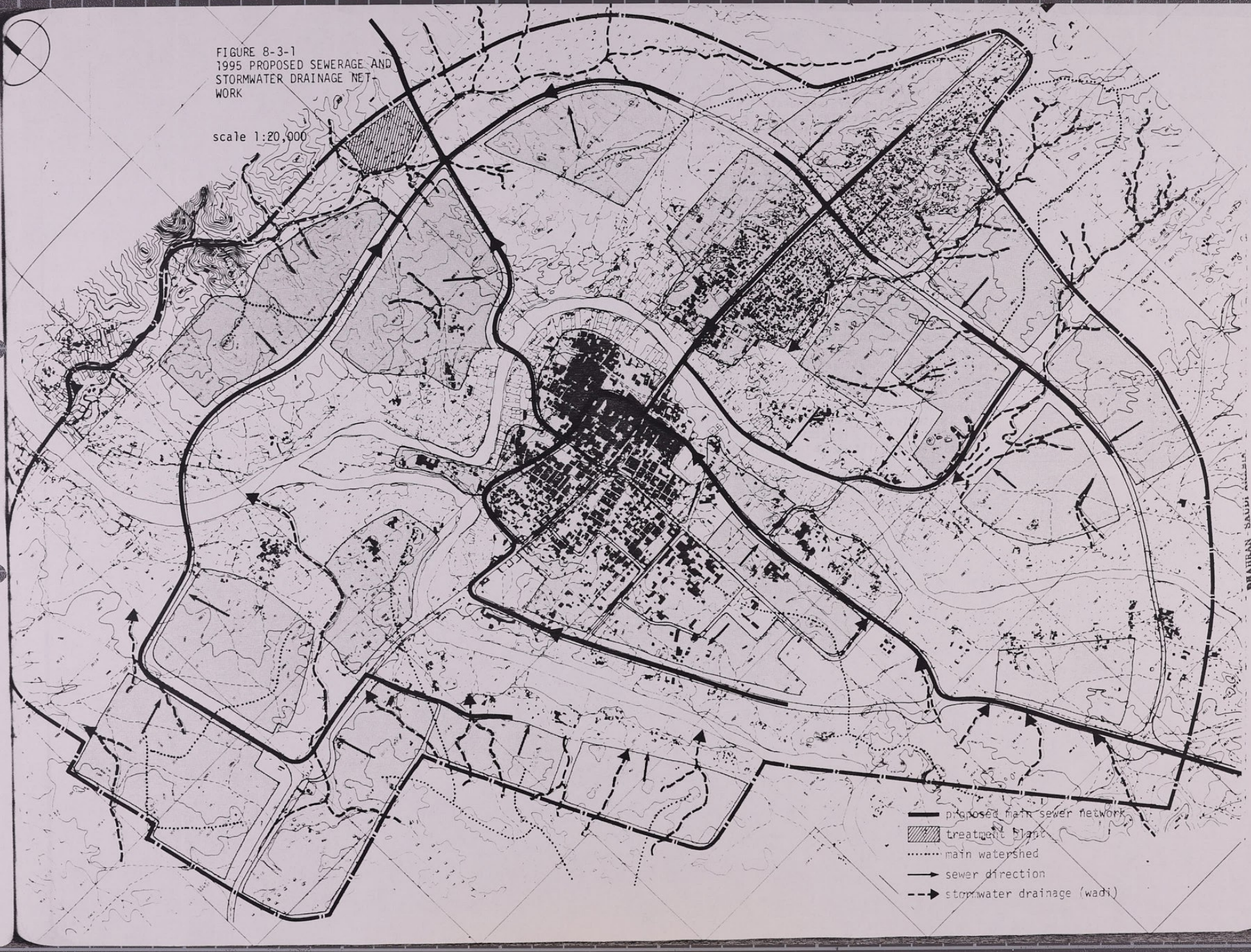
The volume of solid refuse is expected to amount to a total of 800 g per day per person by 1995, which equals 69.75 tons per day for the city as a whole. Of this, 500 g per day per person (5/8 of the total volume) is expected to be domestic refuse with the total amounting to 44.25 tons per day and the balance of 25.5 tons per day coming from industrial and other land uses. The breakdown of solid refuse volume into neighborhoods is given in Table 8-2-1

Given the anticipated volume of refuse expected by 1995, collection and disposal are serious problems which must be given immediate attention. The problem of collection could be met in two ways--either with a two-ton collection truck assigned to each neighborhood every day or with a four-ton truck per neighborhood collecting every other day. The authorities concerned will have to do a more detailed and continuous study of the collection system.

Considering the large amount of refuse of 68 tons per day which will be collected, Khamis Mushayt will definitely need an incinerator by 1995. The recommended site of the incinerator is near the proposed sewage treatment plant, where garbage is presently dumped. This is close to the major road to Bishah, where other public utility facilities will also be concentrated.

FIGURE 8-3-1
1995 PROPOSED SEWERAGE AND STORMWATER DRAINAGE NETWORK

scale 1:20,000



8-5-3 DISPOSAL LAND AND PROTECTIVE MEASURES AGAINST CONTAMINATION

It has been reliable estimated that in order to provide adequate land for incinerators and dumping, as well as all ancillary facilities, about 2 or 3 ha will be required. It should be stressed that the equipment used here should be of the most modern design which strictly limits the noxious emmissions sometimes associated with such operations. Nonetheless, a protective buffer area of artificial lanscaped hills or earth should be constructed around this facility to provide visual relief.

CHAPTER 8 NOTES:

1. Kenzo Tange & URTEC, Southern Region Project Study, Khamis Mushayt, Alternative Strategies, p. 104. All numerical references to existing conditions in this section came from Alternative Strategies.
2. Khamis Mushayt, Initial Appraisal of Existing Conditions, p. 52.
3. Figures derived from Khamis Mushayt, Alternative Strategies, p. 106, and Abha, Alternative Strategies, p. 101. Projections are based on an estimated 150 litres per day per person consumption.
4. Khamis Mushayt, Alternative Strategies, p. 106.
5. Khamis Mushayt, Alternative Strategies, p. 106, and Existing Conditions, p. 119.

9. land use

9-1 EXISTING AND PROJECTED LAND USE

9-1-1 EXISTING CONDITIONS

Existing land use was already discussed in subsection 2-4-1. Within the old T.P.O. master plan road network (e.g. the outer ring road), the land area of Khamis Mushayt is about 800 ha, over half of which is developed.

Khamis Mushayt is growing but still sparsely built up. With the exception of the zinc housing settlement east of Wadi Bishah, the rest of the developed area is concentrated between the two wadis.

Most of the city's built up land is residential, accounting for 151.3 ha, or 20% of the city's area. The densest sections fall to the north between the two wadis.
Following residential build up, other land use is almost equally divided between the social maintenance,commercial, and administrative sectors:

Table 9-1-1
EXISTING BUILT-UP LAND

Sector	Land Area (ha)	Percentage of Total (800 ha)
Residential	151.3	20.0
Social Maintenance	12.1	1.5
Administrative	12.1	1.5
Commercial	11.9	1.5
Manufacturing	7.4	0.9

This distribution might seem somewhat peculiar since Khamis Mushayt is known as the commercial center of the Southern Region, unless one adds that most of the land in the administrative sector (10.8 ha) is occupied by two hospitals with only 1.3 ha. devoted to government facilities. Furthermore the above figure for the commercial sector does not include the 3ha. occupied by the Suq, which added to built-up land devoted to manufacturing amounts to 22.1 ha or 2.7% of the total. Aside from the built up areas, cultivated land along the two wadis accounts for 73.9 ha and the wadi beds within the outer ring road (excluding Wadi Atwood) for 22 ha, leaving 383 ha of vacant land within the planned outer ring road. Therefore, in almost every direction outside the central part of the city between the two wadis, there is still a large amount of open space which, due to favorable topographic conditions can be developed [1]. Presently plans approved by the Ministry exist to develop the areas to the northwest of Wadi Atwood south of the industrial area, in the northeast corner of the city along Wadi Bishah, and to the south of the zinc hut settlement in the southwest of the city.

9-1-2 PROJECTED LAND USE AREA REQUIREMENTS

The additional land area requirements over the next twenty years can be seen from Table 9-1-2 and 10-2-1. The industrial sector will experience a greater percentage increase than any other sector in the period between 1975 and 1995. The industrial sector is followed by recreation and open space conservation and residential sectors which will also require large amounts of new land. These major increases reflect certain priorities in the projected plan; to industrialize the city, to increase the well being of the people and to provide them with greater amenities as well as to keep the commercial sector growing. The land area increases needed by sector between 1975-1995 are arranged hierarchically below.

Table 9-1-2
APPROXIMATE SECTORAL LAND USE INCREASE

Sector	Projected ha Increase From 1975-1995	Approximate Percentage Increase From 1975 Existing Conditions
Industry	112.6	2000
Recreation/Conservation	183.4	700
Residential	794.7	500
Public/Institutional	72.2	300
Commercial	0.3	200
Roads	235.1	200

9-2 SUMMARY OF LAND USE POLICIES

The 1995 Land Use Policies were developed from a set of alternatives [2]. The alternative picked was chosen over others because it seemed that it had the greatest potential to adapt to changing economic conditions.

In terms of land use policies, the plan develops the city without totally reorganizing or disrupting the existing structure. The high and medium density between the wadis in the developed northern core of the city is maintained with some modification. Some industries are relocated to the new industrial park in the northwest part of the city, while the portion of the Abha Road between the wadis is redeveloped as a commercial center bisected by a new community shopping center along a north-south arterial. These areas also continue as the high and medium density sections of the city, buffered from the new "surburban" communities, by existing open space within the boundaries of the wadis, some of which will be turned into parks and playfields, and some of which will remain as agricultural land.

While maintaining the integrity of the existing central core, the plan takes advantage of Khamis Mushayt's natural features to create a balance between agricultural and industrial development in the areas around the city. New residential neighborhoods are developed along both wadis around the semi-ring road. In many cases these neighborhoods link up with existing traditional agricultural settlements, thereby reinforcing rather than destroying the traditional evolutionary development of the city. These new low density communities will be buffered by land which is either used for agricultural cultivation or kept open. Additional residential neighborhoods will be developed in these areas to accommodate a projected growth in population. The residential development plans proposed and approved by the Deputy Ministry for Town Planning Affairs are considered as extensions of the existing conditions and incorporated in the Preliminary Master Plan.

As explained in previous sections, various neighborhoods and communities will be provided with facilities that are designed to enhance the well-being of their residents and maintain the integrity of the particular unit. To meet this end, regional and city service facilities along the major east-west arterial will extend across to Community 3 to the east of Wadi Bishah.

Land use policy also seeks to concentrate city-wide facilities in different parts of Khamis Mushayt. With the exception of the civic center, which is naturally located in the downtown area, other facilities are often placed on the outskirts of the city, to avoid congestion, to maintain the environment, and to see that the residential flavor of the city is not destroyed or even overwhelmed. The northeast corner in the open space along Wadi Bishah is reserved for higher and technical educational facilities (e.g. the college, technical schools, and teacher training schools). Industrial facilities to the northwest of the city and the public utility plants (sewage road. Industrial facilities to the northwest of the city and the public utility plants (sewage treatment, power, incinerator) to the north of the city will all be connected along a newly proposed arterial. Even the cemetery at the eastern edge of the city is designed to be within an open park area.

FIGURE 9-2-1(a)
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	U
special college	SU
neighborhood park	NP
community park or small city park	CP
city park	P
mosque	SM
jami'a mosque	JM
edi 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	NS
community shopping center	CS
sub-regional shopping center	S
fire station	FS
post offices	PO
police station	PS
government offices	G

*1 □
*2 ○
*3 ◒

NOTES:

*1 Existing facilities.
*2 Facilities proposed and approves by the Military of Municipal and Rural Affairs as of April 1978.
*3 Facilities newly proposed by the Master Plan in addition to these 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 these 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 conccerning the service population, function, area, and other requirements for various facilities, see Appendix, Planning Standards.

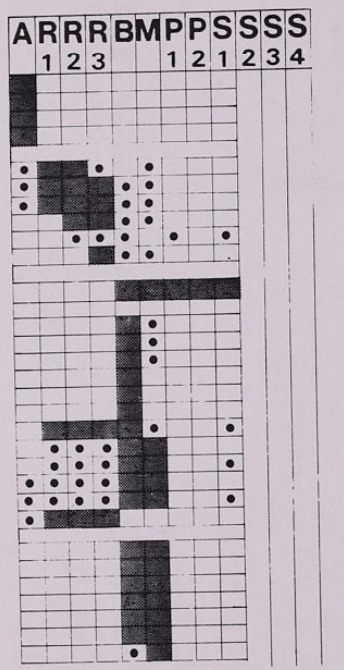
old town redevelopment	1
government and civic center	2
commercial center	3
college	4
sports stadium	5
power plant expansion	6
sewage treatment plant	7
industrial park	8

DHAHRAN - SAUDI ARABIA

permitted uses

uses requiring special permit

prohibited



cultivated land
farm and home occupation quarters
storage shade
animal barns, stables and pounds

family dwellings - detached
family dwellings - attached
family dwellings - grouped
apartement houses
hotels
rooming and boarding houses
nursing homes
caretakers and watchmen quarters

business and professional offices
merchandise stores
business and service establishments
banks and others
banks and money exchangers
other financial offices
retail and service shops
food markets
restaurants, cafes, and others
gas shops
petroleum stations
small workshop

contractor shops and yards
warehousing and storage services
construction materials yards
hardware and equipment services
freight and shipping services
machinery sales, rental and services
automotive repairs

garbage dump yards
electricity power plant yards
water supply yards
sewege treatment plant yards
manufacturing of finished products
bottling and canning plants
printing houses
food products factory
confectionary products
ice manufacturing
rolling mills
brick oven yard
agricultural processing plants
fat and fertilizer manufacturing
slaughterhouse and stock yards

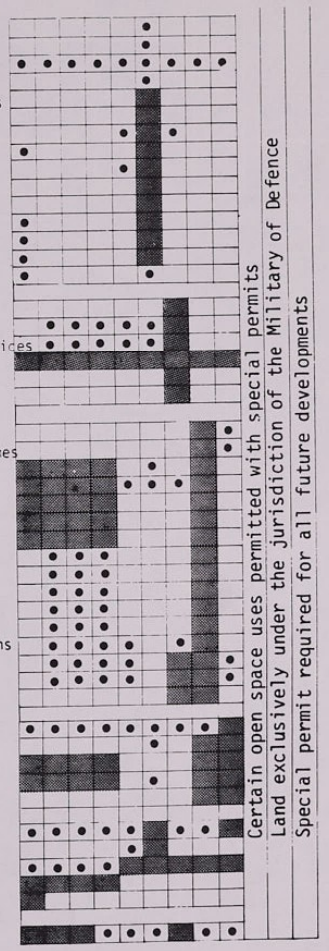
governmental offices
police and fire stations
post, telephone and telegraph offices
mosque
other religious offices
civic and community center

general hospital
special hospitals and nursing homes
diagnosis and treatment center
first aid and ambulance
nursery and kindergartens
elementary schools
intermediate schools
secondary schools
teacher's tranning schools
other special schools
colleges and universities
other educational institutions
religious schools and institutions
museums
libraries
prisons

park and recreational areas
athletic fields
club houses
playfields and playgrounds
playlots and totlots

bus and taxicab service yards
bus and taxicab garages
public parking or garages
private parking or garages
off-street parking

cemetery



Certain open space uses permitted with special permits
Land exclusively under the jurisdiction of the Military of Defence
Special permit required for all future developments

NOTES TO SUMMARY OF PERMITTED USES

NOTES:

1. The Summary of Permitted Uses indicates the detailed land uses which are permitted as a matter of right, permitted after obtaining special permits, or prohibited for each zoning classification and special district. For example, business and professional offices are permitted as a matter of right in zone B, permitted after review and obtaining special permit for zone P_1, and prohibited in others.
2. For a detailed discussion of zoning classification and requirements, see Southern Region, Final Physical Plan, Sec 13-3, Legislation and Requirements.

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	Government and civic
P	Institutional

Special District Classification	Principal Land Use
S_1	Recreational
S_2	Non-agricultural conservation
S_3	Military
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 used for classes of detialed 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.

9-3 DEVELOPMENT PLAN

9-3-1 DEVELOPMENT STRATEGY

The Development Plan requires three phases of implementation over a twenty year period: Phase I, 1975-80; Phase II, 1980-85; and Phase III, 1985-95. Certain areas will be designated for immediate attention; however, community, sub-community, and neighborhood facilities will be phased to population growth. The hinge pin of each hierarchical unit is the school around which other facilities will in turn be built. In other words, when the population reaches a certain point, an existing neighborhood may be sub-divided or a new neighborhood created and an appropriate school built. It is only when a school has been constructed that other facilities such as a small or Jami'a mosque and a local pharmacy or diagnostic clinic would be phased in. This is not to suggest however, that neighborhoods will emerge haphazardly as a function of population. The plan designates growth areas and the location of new neighborhoods specifically to avert disorganized growth and urban sprawl. The Ministry has already proposed to this end. The plan should be implemented during Phase I and II (1975-85) in these approved areas, with additional areas yet unauthorized, developed in Phase III (1985-95).

In general, there should be a concerted effort to meet the deadline for each phase of the plan, in sofar as that is possible.

Broadly speaking, the overall development during the three phases should be as follows. During the first phase, there should be an initial stocktaking of what needs to be done indicating where emphasis should be placed over time. Certain areas should also be designated for immediate action [3]. Although Phase I is rapidly coming to a close, priority items should include a) attacking some of the problems in the dense downtown section of the city specified in the Immediate Action Studies [4]. (This will be explored further in Sections 9-4 and 9-5 below). b) Identifying future land requirements on the basis of the projected 1995 map, making plans for acquisition, and carrying them out when possible. c) Working on infrastructure development (e.g. sewer and water lines) in the densest parts of the city to avoid more serious disruption later, and d) Conserving the areas along the two wadis to check urban sprawl.

During the next five years in Phase II (1980-85), the strategy to be followed is one of establishing an overall framework for broad issue areas such as housing, transportation, etc., constructing what is necessary at this stage - especially new residential housing to avert burgeoning congestion, and giving additional attention to other action areas. The Third Phase of the plan (1985-95) should use the next ten years to implement this framework, making adjustments to any new or previously unforeseen factors that might be necessary by this time.

9-3-2 PHASE I 1975-1980

In Phase I, between 1975 and 1980, the areas approved by the T. P. O. will be developed with various community, sub-community, and neighborhood boundaries being established. Some of the new neighborhoods will be linked with existing agricultural settlements along Wadi Bishah and to the northwest along Wadi Atwood.

With minor exceptions, most of the 1975 densities will be maintained during this phase of the plan. Beside the old city core, where high and medium density is the norm, the rest of the city will be sparsely settled with no significant increases in density anticipated. Only about 3,500 of the projected houses needed in the next twenty years will have to be built from 1975-80.

Three sub-community centers should be phased in during this period, and the smaller community centers should also be built as well as the teachers' colleges and the sewerage plant. The increase in power lines and minor roads should follow the overall pattern of community development at each stage, but the small ring road should be built at this time.

Whatever zoning or acquisition is necessary for the city and community parks, should be done during this phase, with additional facilities provided as is feasible.

major road completed by 1975

major road implementation in Phase I

0.09 / 0.31 population ratio* in 1975 / population ratio in 1980

0 - 0.5

0.5 - 1.0

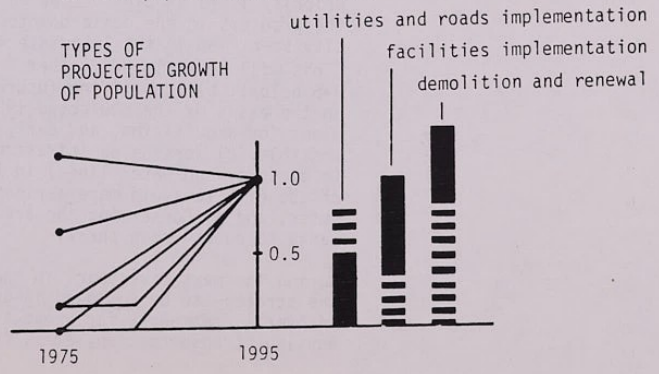
1.0 -

(population ratio in 1975)

specified development initiated in Phase I

planning area boundary

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



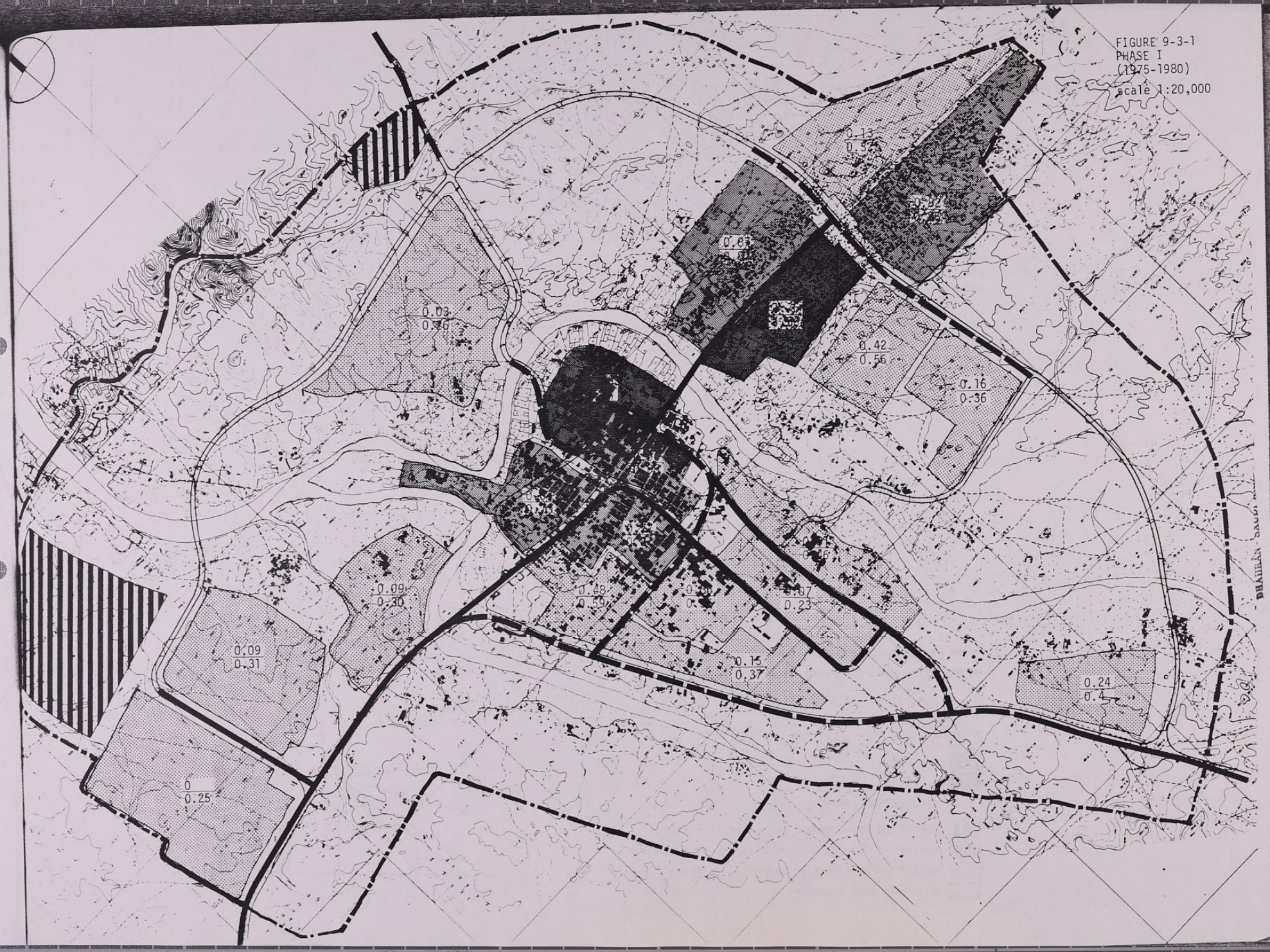


FIGURE 9-3-1
PHASE I
(1975-1980)
scale 1:20,000
0.13
0.5
0.82
0.87
0.03
0.26
0.42
0.56
0.16
0.36
0.09
0.30
0.48
0.59
0.07
0.23
0.09
0.31
0.15
0.37
0.24
0.4
0
0.25

9-3-3 PHASE II 1980-1985 There are really no major new areas planned for development in this phase. Generally, high and low density sections from Phase I will be maintained. The major shift belongs to Community 3, which will change from a low to a medium density community. Over 4,500 new houses will be needed during this phase.

Care should be taken that overall facilities - including schools - are adequate for both Community 1, where the population almost doubles and Community 2, where it increases by 50% in this five year period. A new community center in the southwest part of the city will be constructed at this time as well as the technical schools for girls and boys.

Significant infrastructure development will occur during this phase with the building of several new roads. By the end of this phase construction of all major arterials should be substantially completed along with associated utilities.

major road completed by 1980

major road implementation in Phase II

0.31 / 0.54 population ratio* in 1980 / population ratio in 1985

0 - 0.5

0.5 - 1.0

1.0 -

(population ratio in 1980)

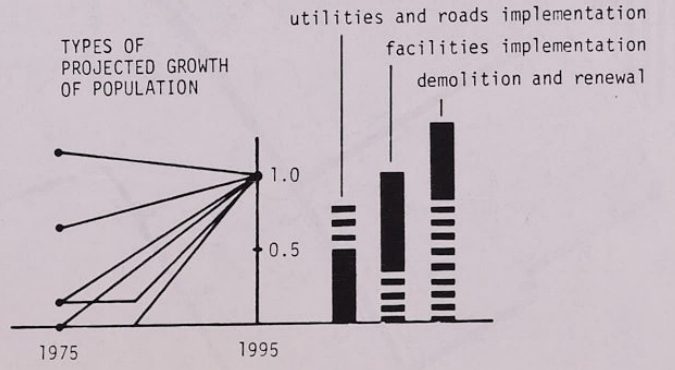
specified development initiated in Phase II

specified development continued from Phase I

specified development completed in Phase I

planning area boundary

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



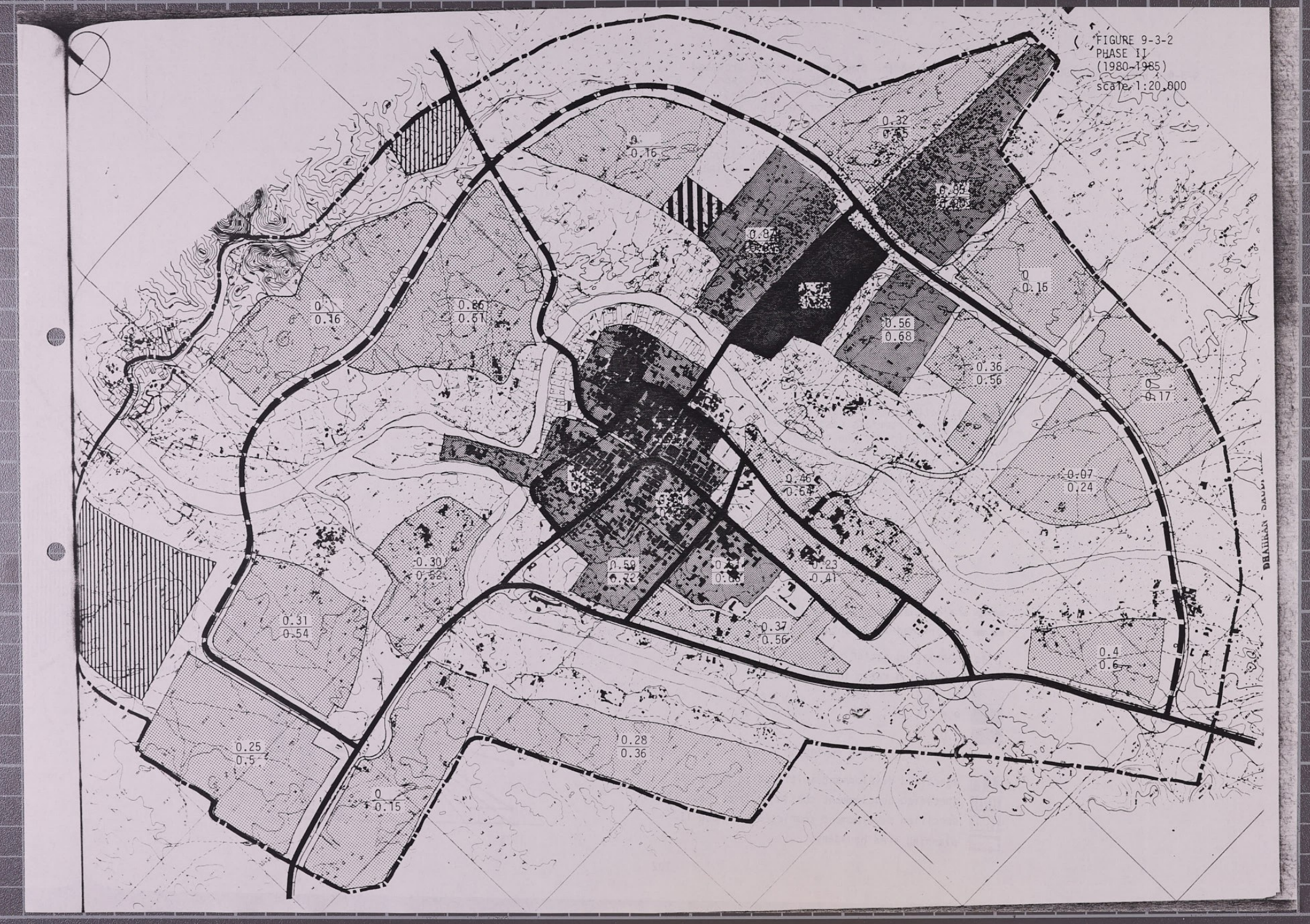


FIGURE 9-3-2
PHASE II
(1980~1985)
scale 1:20,000
0.32
0.55
0
0.16
0.87
0.85
0
0.16
0.86
0.61
0.56
0.68
0.36
0.56
0
0.17
0.46
0.64
0.07
0.24
0.30
0.52
0.58
0.72
0.23
0.41
0.31
0.54
0.37
0.56
0.4
0.6
0.25
0.5
0.28
0.36
0
0.15

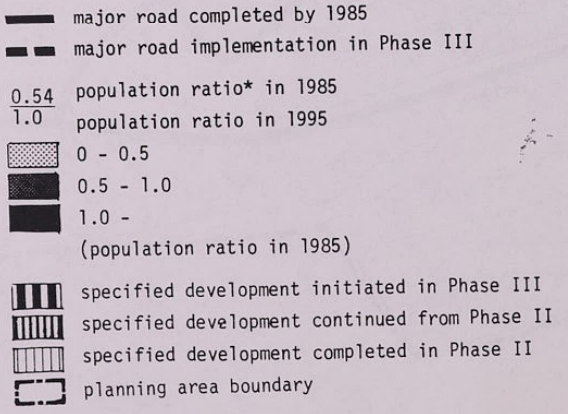
9-3-4 PHASE III 1985-95

Phase III will be the final phase of the proposed twenty year plan. Between 1985 and 1995, some sub-communities which had not yet been sub-divided will have grown to the point of becoming independant neighborhoods.

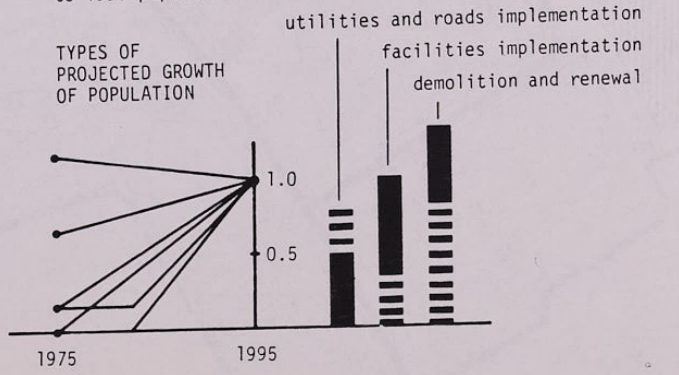
Between 1985-95, the densities of neighborhoods will have matured in the following fashion. The old settled area of Communty 3 between the 2 wadis will show an increase in density, but will remain a medium and high density area as is has been. Neighborhood 3.1.3 continues to be a medium density area, while the new communities built in 1980 and 1990, north of the city, east of Wadi Bishah and northwest of Wadi Atwood, remain low density sections of the city.

With these expected changes in density, schools and other facilities should be phased in appropriatelv and increased when necessary. The college will be built at this time. Of the more than 19,000 new houses which will have to be built in the twenty year development cycle, 11,404 will be needed between 1985 and 1995.

The construction of new roads during this period includes minor arterials east and west of the two wadis, an extension of the central minor arterials north of Wadi Bishah, an east-west minor aretrial going from the Stadium to the industrial area, and an additional bridge across the Wadi Atwood to the new residential areas.



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



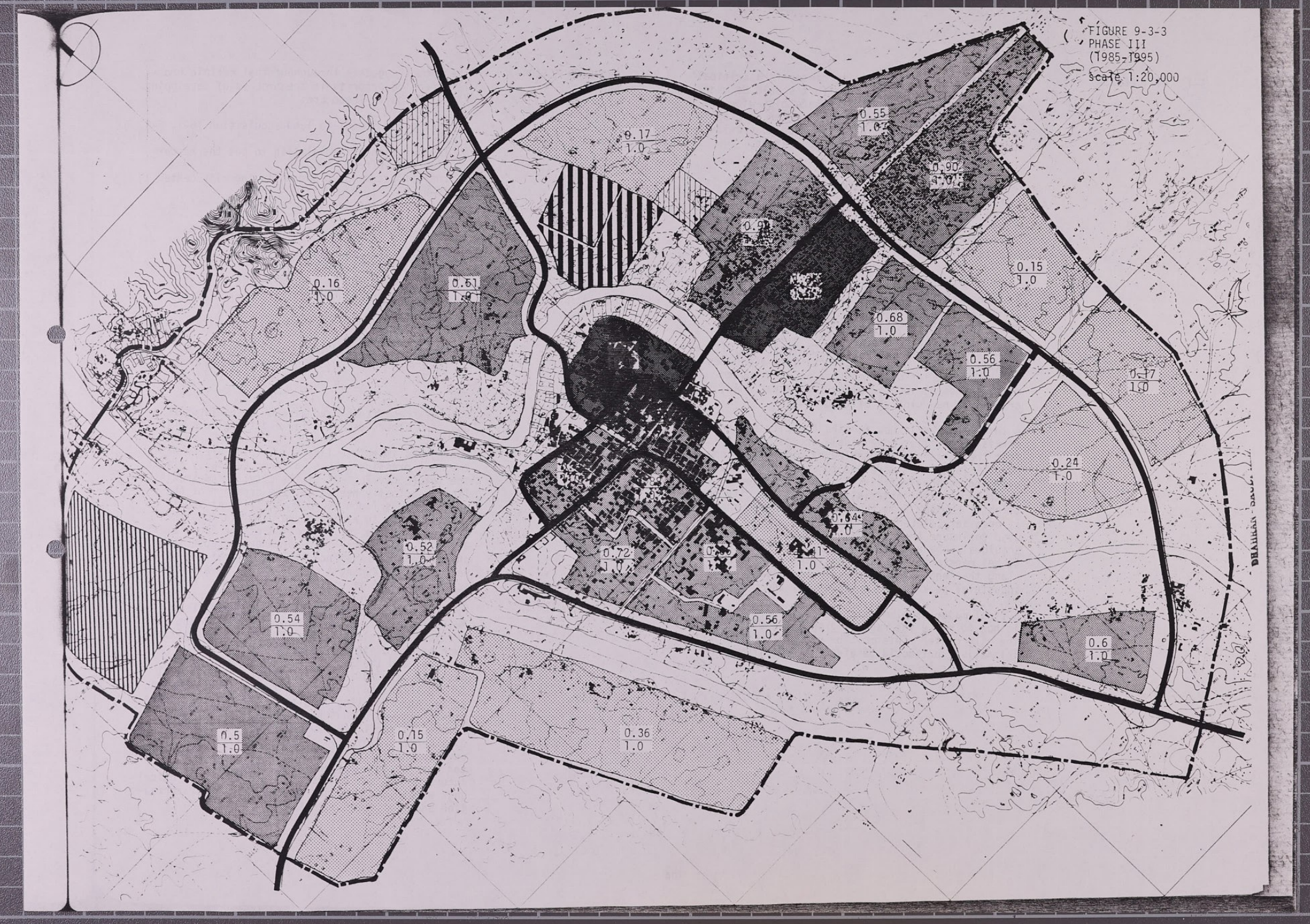


FIGURE 9-3-3
PHASE III
(1985-1995)
scale 1:20,000

9-4 CITY CENTER

The redevelopment of the city center is a critical part of the Master Plan. An effort should be made to relieve congestion, to integrate city-wide facilities, to make the commercial sector accessible to surrounding residential areas, and to provide adequate housing for a growing population.

The deflection of traffic from the city center is a major problem which will be alleviated greatly by the construction of the two major bypass arteries and the development of distribution centers for loading and unloading of trucks at the major arterials leading out of town.

A second service problem is how to reorganize the government and municipal offices in the city center (e.g., municipality buildings, the public transportation terminal, the Emir's office, The Civic Center, Library, Museum, Central Post Office, Mosque, Fire and Police Stations) into a coherent unit. Here it is suggested that all new government offices be located along the Najran Road, creating a new cluster of functions.

A third problem is how to make the city's commercial activities more widely accessible. It is felt that this can be handled by moving the commercial facilities directed to community versus city and regional affairs to a new location on a north-south minor arterial bisecting the city but slightly removed from the densest downtown area. If necessary, incentives and zoning should be used to insure these partial transfers. Zoning should also be applied, if it becomes difficult to get manufacturing and industrial enterprizes along the Abha within the wadis to relocate to the industrial park to the northwest of the city.

A final major problem which needs to be attacked is how to house the rapidly growing population in the city center. This must be undertaken by private initiative, but could be aided with government subsidies or loans.

9-5 PROPOSED ACTION AREAS

The report suggests throughout that certain problems receive priority in the process of developing Khamis Mushayt. These are:

1. Zoning and immediate land acquisition (6-1, 6-3, 10-1).
2. The adoption of legislation to put the Master Plan into effect.
3. Infrastructure development in the city center (9-2, 9-3, 10-4).
4. The collection and disposal of solid refuse (9-5).
5. Relieving congestion in the downtown area (10-4).
6. The establishment of a distribution center (5-4-3)
7. The conservation of open areas (6-1, 6-3)
8. The implementation of a stormwater drainage system (9-4)
9. The establishment of a new site for the power network (9-1).
10. Industrial relocation (10-4, 4-4).
11. Government subsidies for future housing needs (3-2).

Some of these items have already been discussed above and others demand a few additional comments.

Zoning and immediate land acquisition are perhaps the most pressing issues, as they radically affect the future development of the city. Where specific land is actually needed for the creation of new neighborhoods (such as in Phase III), it should be acquired soon to avoid future complications that might hinder the implementation of the Plan later. Also, early purchase is recommended because land prices tend to rise once it is know that the government is planning a comprehensive development scheme and that it will be the purchaser. Consequently, the timing of acquisition could radically affect the overall costs of developing Khamis Mushayt. Therefore, decisions on location and possible acquisition needed for public facilities such as the distribution center, parks, new bridges, and the Suq should be made as soon as possible. Zoning is critically important as well. Zoning is an indirect means of counteracting urban sprawl and insisting on planned versus spontaneous growth. It would thus force certain industrial and commercial facilities to relocate away from the city center. Zoning is also necessary to control development in the areas outside of the city center such as the wadi beds, to keep land open for future parks, and to ensure that every hierarchical unit within the city has adequate space for recreation and facilities such as playgrounds.

Infrastructure development (e.g., sewage and water systems) in the city center and the implementation of a stormwater drainage system area both being handled by a separate consustant. They should, however, be implemented as soon as possible. In particular, the installation of a sewage and water system in the city center is a pressing need. Both are vital to a modern city and with the expected growth in population, the lack of either could create serious hygenic problems in the future as well as unnecessary disruption if the government waits too long to take action. For the same reasons there must be an immediate overhaul of the existing system to collect and dispose of solid refuse.

There are many problems that must be attacked in the city center to insure its proper development. The relief of congestion is one. However, government loans or subsidies for housing are important here as elsewhere to insure that the architecture of new structures as well as the redevelopment of existing ones is suitable to the kind of environment desired in a modern city.

CHAPTER 9: NOTES

1. Kenzo Tange and URTEC, Southern Region Study, Alternative Strategies, Khamis Mushayt, Section 5-1.
2. Alternative Strategies, Sections 10 and 11.
3. See Khamis Mushayt, Immediate Action Studies, especially Section 1-2.
4. Khamis Mushayt, Immediate Action, Sections 1-2-2, 2-1, 2-2, 2-3-1.
5. See Table 3-1-1.
6. See Section 3-2.

10. administration and management

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

In order to deal with management problems, three alternatives were suggested in the Alternatives Strategy Report. Number 2 was chosen because it seemed more realistic and offered greater promise of realization than the other two. It proposes to

> "Establish uniform codes of regulations limited in scope to general statements of objectives to provision of planning and development procedures. Establish a network of planning offices in each region and province, equipped with broad powers to interpret, elaborate, and administer the nationally formulated regulations. These regional planning offices would be branch offices of the central planning authority." [2]

To elaborate, it is suggested first that the Master Plan be read into existing law to eliminate some of the problems discussed in the previous section. Second, it is proposed that the planning process be decentralized by making the Deputy Ministry in Riyadh responsible only for long range planning. Local, regional and municipality offices whould then be allowed to interpret and execute the Plan without further consulting Riyadh. The delegation of authority should make the process more efficient, more responsive to local needs, and less cumbersome.

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. The question as to how and in what way this will work will be discussed in Section 10-3.

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. Presently, there must be an item by item approval from Riyadh to the point where if a new fence is built in Khamis Mushayt, it cannot be done without first getting an O.K. from the Deputy Ministry. Clearly the Deputy Ministry must still continue to have some control over the trade-off of funds from sector to sector.

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 give a growing population adequate facilities, while replacing old stock.

The extent of public investment within the total required capital investments is assumed as follows:

1. Housing	
a. Site Development	100%
b. Housing Construction	30%
2. Educational Facilities	100%
3. Recreational Facilities	100%
4. Social and Religious Facilities	100%
5. Health and Welfare Facilities	100%
6. Commercial Facilities	10%
7. Public Facilities	100%
8. Public Utilities	
a. Power Facilities	100%

Table 10-2-1
IMPLEMENTATION PROGRAM, KHAMIS MUSHAYT[a]

	1975			1975 - 1980 PHASE I			1980 - 1985 PHASE II			1985 - 1995 PHASE III		
	NUMBER	TOTAL FLOOR AREA (m^2)	TOTAL LAND AREA (ha)	NUMBER	TOTAL FLOOR AREA (m^2)	TOTAL LAND AREA (ha)	NUMBER	TOTAL FLOOR AREA (m^2)	TOTAL LAND AREA (ha)	NUMBER	TOTAL FLOOR AREA (m^2)	TOTAL LAND AREA (ha)
BOYS ELEMENTARY[b]	9	17,000	12.2	2	4,000	2.8	3	6,900	4.8	14	19,800	14.1
BOYS INTERMEDIATE[b]	2	9,100	7.0	1	2,600	2.0	1	3,300	2.5	3	11,000	8.5
BOYS SECONDARY[b]	1	4,900	5.3	0	1,400	1.5	1	1,750	1.9	1	5,950	6.3
BOYS HIGHER EDUCATION[c]	1	5,800	2.1	0	0	0	-1	-5,800	-2.1	1	18,000	10.1
GIRLS ELEMENTARY[b]	9	17,000	12.2	2	4,000	2.8	3	6,900	4.8	14	19,800	14.1
GIRLS INTERMEDIATE[b]	2	9,100	7.0	1	2,600	2.0	1	3,300	2.5	3	11,000	8.5
GIRLS SECONDARY[b]	1	2,900	3.2	0	900	0.9	1	1,000	1.1	1	36,000	3.8
GIRLS HIGHER EDUCATION[c]	1	5,800	2.1	0	-3,300	-1.1	-1	-2,500	-0.1	0	0	0
TOT-LOT	144		7.2	34		1.6	46		2.4	224		11.2
PLAY-LOT (KINDERGARTEN)	36		7.2	8		1.6	12		2.4	56		11.2
NEIGHBORHOOD PARK	9		16.0	2		4.0	3		5.8	14		18.4
COMMUNITY PARK	1		12.8	0		3.0	1		4.8	1		14.7
CITY PARK	1		12.8	0		3.0	0		4.8	0		14.7
SMALL MOSQUE	9	9,850	2.7	2	2,270	0.6	3	3,630	0.9	14	11,010	4.2
JAMI'A MOSQUE	2	3,830	2.6	1	910	0.6	1	1,450	0.9	3	4,410	3.0
EID MOSQUE	-	-	-	-	-	-	-	-	-	1		3.6
NEIGHBORHOOD CENTER	9	1,600	4.5	2	400	1.0	3	600	1.5	14	1,800	7.0
COMMUNITY CENTER	1	320	1.0	0	80	0	1	120	1.0	1	360	1.0
CIVIC CULTURAL CENTER	1	3,990	4.0	0	810	0.8	0	950	1.0	0	2,450	2.4
PHARMACY	9	1,600	0.9	2	400	0.2	3	600	0.3	14	1,800	1.4
DIAGNOSIS/TREATMENT	1	1,600	0.9	2	400	0.2	3	600	0.3	3	1,800	1.1
COMMUNITY/GENERAL HSOPITAL	320 beds	12,800	6.0	60	2,400	1.2	80	3,200	1.4	200	8,000	3.7
SPECIAL HOSPITAL	800 beds	42,000	17.6	160	8,500	3.5	200	10,500	4.2	480	25,200	10.8
ADMINISTRATION	1	20,000	1.0	0	10,000	0.5	0	10,000	0.5	0	20,000	1.0
POPULATION/HOUSEHOLDS	31,930/5,458			7,570/1,995			12,100/3,297			36,700/9,318		

b. Other Facilities	100%
9. Industrial Facilities	20%
10. Transportation Facilities	100%

In Khamis Mushayt, 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 proiriities 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 time as indicated in the various phases. Investment should obviously follow the overall phasing, going first to the city center, then to the areas directly to the south, then to the newly developed areas across Wadi Bishah, etc. Simultaneously, however, certain problems will need immediate attention. Some of them--especially land acquisition and roads--will demand heavy public investment.

10-2-2 CAPITAL INVESTMENT PROGRAMME

Public investment will be greatest in the first two phases, dropping off slightly in the last. In all phases the heaviest public 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. However, Phase 1 of the Plan (1975-80) is an exception to this latter trend with public investment in transportation, health and welfare activities comsuming more than eduation. Smaller but relatively equal expenditures can be expected in social and religious facilities, public utilities, and recreation, with only half as much devoted to commerce, public facilities, and industries during all phases from 1975-95. After 1980, there should be a leveling off of investment in recreation, commerce, industry, and health.

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 as to land use. If this is decided in 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, reconstructed, altered, or repaired.

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

Districts should be zoned as Agricultural, Residential (high, medium and low density), Business & Commercial, Light and Heavy Industry, Public Land, and Special Districts such as areas to be conserved.

The way in which Khamis Mushayt should be zoned can be seen from the land use map prepared for 1995 and from the attached zoning map. The commercial district is generally concentrated near the center of the city along the Abha Road, in the new community shopping center on both sides of the minor north-south arterial, and in the suq in the northeast corner between the two wadis. All of the neighborhoods between the wadis (except 2-2-6) will be medium or high density areas.

High density areas will allow high density residential as well as commercial areas, which will permit attached, detached and group family dwellings, as well as high rise apartment buildings, hotels, and rooming houses (maximum height 30 m). Medium density areas will allow no hotels or boarding houses without a special permit. The normal family dwelling expected would be of the detached, semi-detached or group type with a maximum height of 15 m. All neighborhoods outside of the two wadis are low density residential settlements which would permit detached, and semi-detached, but no group housing.

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 m^2 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 m^2 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 m^2 (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 proram 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 contantly 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.

The industrial area, the power station, and the sewage plant 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. To further foster the conservation of open spaces, existing agricultural land should be zoned "Agricultural" and any other development prohibited without an additional permit.

CHAPTER 10: NOTES

1. For further information see Khamis Mushayt, Existing Conditions, Volume 2, November 1976, Section 8. Alternative Strategies, Sections 9-1 and 9-2.
2. Alternative Strategies, Section 9-3.

11. conurbation

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 sepending 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

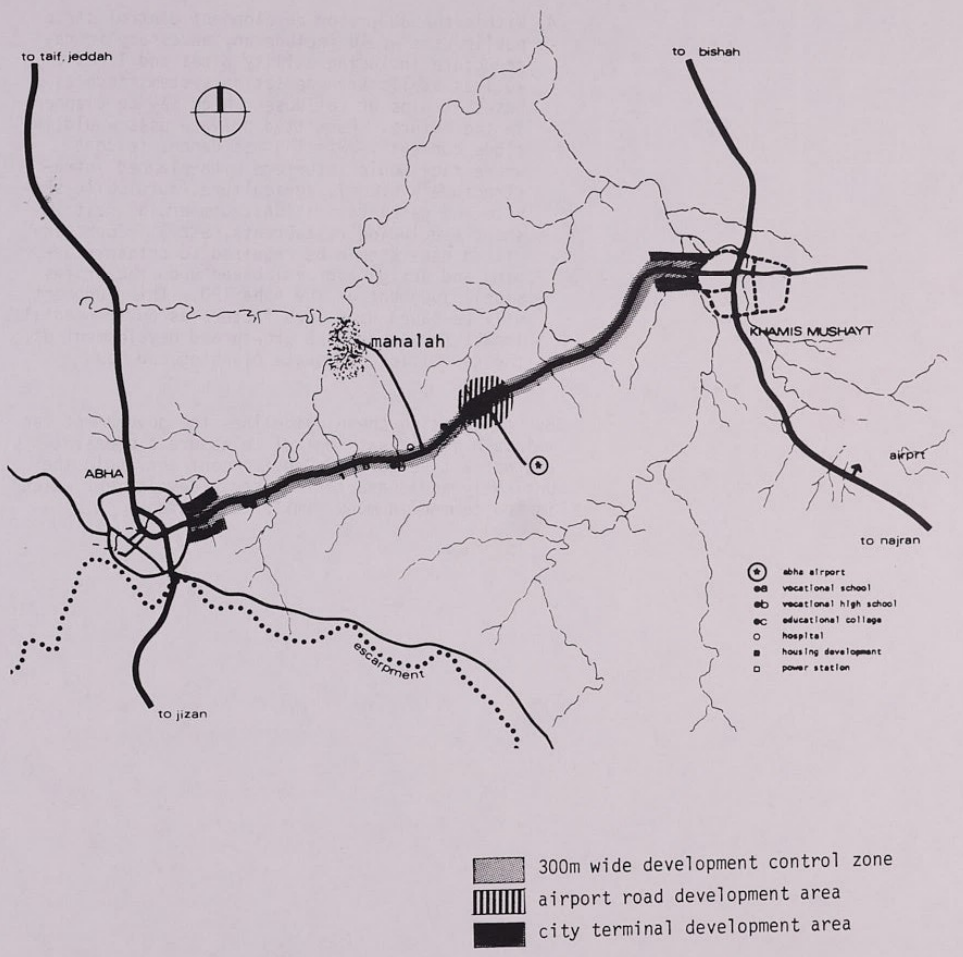


FIGURE 11-3-1
ABHA-
KHAMIS MUSHAYT
CONURBATION

scale 1:200,000

length of this road. The land within this development control strip should be purchased or otherwise strictly controlled by the government.

4. Within the 300-meter development control strip public uses would include any necessary infrastructure including utility pipes and lines as well as public transportation systems such as buses, trains or railbuses which may be planned in the future. Permitted private uses would include currently existing residences (except where they would interfere with planned infrastructure systems), agriculture, automobile service and gasoline stations, commercial rest stops (including restaurants, etc.). Such permitted uses should be required to obtain planning and design approval based upon the professional judgment of the Abha TPO. This judgment will be based upon such factors as environmental impact, impact on the growth and development of the two cities, adequate planning and good design.

By implementing these guidelines the government can maintain sufficient control to assure a pleasant and attractive roadside environment and avoid the unsightly and characterless strip development which is too common in many similar situations.

appendix: community planning standards

A-0 INTRODUCTION

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 30,000 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 10^3) and normally called "Community" scale (population of order of 10^4). The population group scale normally called "Region" (population of order of 10^5) 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 much 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 heirarchy 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	200%
Khamis Mushayt	29,300	85,000	190%
Najran	27,200	59,000	120%
Jizan	22,200	41,000	80%
Bishah	7,900	23,000	190%
Nimas Village Cluster	7,100	11,640	164%

Notes: a. Population for KTU survey area only (not necessarily represent "city population")
b. Southern Region Project Study, Existing Conditions
mary 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(b) 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 differenciate 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	ABHA	BISHAH	JIZAN	KHAMIS MUSHAYT	NAJRAN	AVERAGE	CASE
0 TO 9	3.5	3.9	3.0	3.9	4.0	3.7	3.0
10 TO 19	2.3	2.5	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:

3%/Age x 4 ages (6,7,8 and 9) + 2%/Age x 2 ages (10,11) = 16%

4%/Age x 4 ages (6,7,8 and 9) + 3%/Age x 2 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):

2%/Age x 3 ages (12,13 and 14) = 6%

3%/Age x 3 ages (12,13 and 14) = 9%

For secondary schools, enrollment in 1995 is assumed to be somehwere 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.

2%/Age x 3 ages (15,16 and 17) x 37.5% = 2.25%

3%/Age x 3 ages (15.16 and 17) x 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 NURSERY KINDERGARTEN		ELEMENTARY SCHOOL		INTERMEDIATE SCHOOL		SECONDARY SCHOOL	
	50pph	100pph	200pph	2.25%	6.0%	16.0%	22.0%	6.0%	9.0%	2.25%	3.38%
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 10^3) 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 10^4) 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 10^4) 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 10^3 is conventionally called "Neighborhood" and the grouping of population with order of 10^4 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

these traditional names and the hierarchical, structural character of the grouping into consideration, the following pattern and names are used:

Table A-1-5
SUMMARY TABLE OF POPULATION GROUPING

GROUPING LEVEL	NAME OF GROUPING	TYPICAL POPULATION
G_0 (Level 0)	Residential Unit Group	250
G_1 (Level 1)	Sub-Neighborhood	937 (Say 1000)
G_2 (Level 2)	Neighborhood	3,750 (2,500 to 5,000)
G_3 (Level 3)	Sub-Community	15,000 (10,000 to 20,000)
G_4 (Level 4)	Community	30,000 (20,000 to 40,000)

G_0 and G_1 represent sub-areas of a neighborhood to function as the smallest units of territories for intimate social activities.

A "Residential Unit Group", as the smallest grouping, provides at its center a tot-lot and seating areas for the approximately 250 residents who live in the vicinity. The service radius and scale are so small and intimate that these shared outdoor spaces are conceived almost as extensions of living room activities.

A "Sub-Neighborhood" provides nursery-kindergarten and other facilities whose immediate accessibility from the residential area and whose sense of spatial intimacy is crucial. Using Table A-1-4, it is estimated that each G_0 group has a territory of 5 ha to 1.25 ha with a radius of 120m to 60m (2 to 1 minute walking distance); each G_1 group has a territory of 20 ha to 5 ha with a radius of 250m to 125m (i.e. 4 to 2 minute walking distance), and 23 to 60 nursery-kindergarten enrollment.

The following sections assume these basic grouping ideas as guidelines. The ideas in this section, in turn, were influenced by a study of each set of standards summarized in the next section.

A-2 PLANNING STANDARDS FOR EACH FACILITY

A-2-1 PLANNING STANDARDS FOR EDUCATIONAL FACILITIES

A-2-1-1 NURSERY-KINDERGARTEN

Age of Children:	3 through 5
Enrollment:	25% to 50% of age group population is enrolled. 9% to 12% of the total population is in this age group. Therefore, 2.25% to 6% of the total population is enrolled.
Population Served:	Approximately 1000 with an acceptable range of 500 to 1,500.
Size of Facility:	40 pupils/school with an acceptable range of 20 to 80.
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.
Sub-Unit:	20 pupils/class (3 year old); 25 pupils/class (4 year old); 30 pupils/class (5 year old). 1 nurse and 1 assistant for each class are recommended.
Land Area Requirement:	$5m^2$/pupil is recommended ($3m^2$ to $7m^2$/pupil is acceptable) for building area and service area. For play area (see next section, "Nursery-Kindergarten Playlot".)
Floor Area:	$3m^2$/pupil is recommended ($2m^2$ to $4m^2$/pupil is accepted).
Location:	It shall be closely located to the center of gravity of residential sub-neighborhood and away from major traffic. Play lot is either a part of or closely located to it.
Other Requirement:	3 and 4 year old children could be separated from the 5 year old children if there is room. (Although ages are close, there is a substantial difference of activity between the two groups.) Mixed for boys and girls.

A-2-1-2 ELEMENTARY SCHOOL FOR BOYS

Age of Children:	6 through 11 (8% or 11% of total population) Boys only

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:	$12m^2$/student is recommended for building and site area.* ($12m^2$/student x 375 student = 0.5 ha) plus $400m^2$ 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. Mimimum 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:	$4.5m^2$/student, i.e. $1700m^2$/375 student is recommended. $3m^2$ to $6m^2$/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 distributer 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 paly 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:	$20m^2$/student is recommended for the building and ground area. ($20m^2$/student x 600 students = 1.2 ha) plus playfield which is either inside

	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 80m x 95m.)
Floor Area Requirement:	6.5m^2/student, i.e. 3900m^2/600 students, is recommended. 5m^2/student to 8m^2/student is also acceptable depending on the degree of non-classroom facility (library, indoor sports) programs.
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 (V_7), local access street (V_6) or distributer road (V_5) with sidewalks (See definition of V_7 through V_5 in the "Road Standard" section) It should be separated from girls' 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.

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.

A-2-1-6 SECONDARY SCHOOL FOR BOYS

Age of Student:	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, 1.50 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.
Population Served:	30,000 is recommended. 20,000 to 40,000 is also acceptable. (Even wider range is acceptable if good reasons exist.)
Size of Facility:	600 enrollment per school (300 to 900) is recommended within the enrollment assumptions described above. (M. E. Standards indicate 30 students/classroom x 18 classrooms/school = 480 students/school.)
Radius of Area Served:	Maximum 1600m (25 minute walking distance) is recommended. Larger radius is also acceptable 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 student/class (M. E. Standards recommend 30 students/class and 18 classes/school.)
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 95m, 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 95m x 110m.)
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) programs.
Location:	It should be situated in the center of grouping Level 4, i.e. "Community". It should be accessible by either footpath, lanes, alleys (V_7), local access street (V_6), distributer road (V_5) or minor collector road (V_3). It should not be directly accessible from the residential area through arterial road (V_2 or V_1). (See section on "Road Standard" for the definition of V_7 through V_1) It should be separated from secondary schools for girls.
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.

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

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. Mimimum 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:	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.

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:	500m^2/lot is recommended. 300m^2 to 1000m^2/lot is also acceptable.
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 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:	2000m^2 is recommended. 1000m^2 to 3000m^2 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:	5m^2/inhabitant is recommended; 2m^2 to 10m^2/inhabitant is also acceptable.
Location:	Situated in the center of "Neighborhood" (grouping Level G_2). 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. Secondarily 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:	20m^2/elementary school student is recommended. 10m^2 to 30m^2/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:	4m^2/inhabitant is recommended. 2m^2 to 6m^2/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 agriculatural 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:	$30m^2$/intermediate school student is recommended. $20m^2$ to $40m^2$/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 shouwer 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:	$50m^2$/secondary school student. $40m^2$ to $60m^2$/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' playfileds should be separated with enough distance. Swimming pool with full officialsize 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:	$4m^2$/inhabitant is recommended. $2m^2$ to $6m^2$/inhabitant is acceptable.
Location:	Situated at the center of city with main cultutural, 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:	$0.05m^2$/inhabitant (i.e. $125m^2$ to $250m^2$) is recommended. 0.03 to $0.1m^2$/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:	$0.01m^2$/inhabitant (i.e. $200m^2$ to $400m^2$) is recommended. $0.005m^2$ to $0.02m^2$/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 coumunity 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 $0.1m^2$/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 $0.05m^2$/inhabitant from the community center building land requirment. Floor area is $0.01m^2$/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:	$0.5m^2$/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 commerical areas, the land area requirement can be reduced to $0.25m^2$/inhabitant.
Floor Area Requirement:	$0.05m^2$/inhabitant (i.e. $300m^2$/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 cresent 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 DESEASE	1*	0	0	0	0
OBSTERICS AND GYNECOLOGY	2	1	1	1	2
OPHTHALMOLOGY & OTOLARYGOLOGY	1	0	0	0	0
HOSPITAL FOR ACCIDENT	2	1	1	1	1
FEVER (COMMUNICALE)	1*	1	0	0	0
PSYCHIATRY	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 desease and other communicable (fever) diseases. In future, the fever hospital will be separated to the new location.

Table A-2-2
DOCTOR REQUIRMENT

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 4m^2/inhabitant, i.e. 0.8 ha to 1.6ha/4000 inhabitants.

Floor Area Requirement (Sales Area): 0.25 to 0.5m^2/inhabitant (i.e. 1000m^2 to 2000m^2/4000 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,

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.

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: 0.5m^2 to 1.0m^2/inhabitant is recommended. (i.e. 1.5 ha to 3ha/30,000 inhabitants.)

Floor Area Requirement (Sales Area): 0.1m^2 to 0.2m^2/inhabitant (i.e. 3000m^2 to 6000m^2 /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: 0.5m^2 to 1.0m^2/inhabitant (i.e. 5 ha to 10ha/ 100,000 inhabitants) is recommended.

Floor Area Requirement (Sales Area): 0.1m^2 to 0.2m^2/inhabitant (i.e. 10,000m^2 to 20,000m^2/100,000 inhabitants) is recommended.

The following table indicates per capita sales areas for different sizes of the city population (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 10m^2/1000 inhabitants is recommended.

Floor Area Requirement: 3m^2/100G 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 wtih 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.

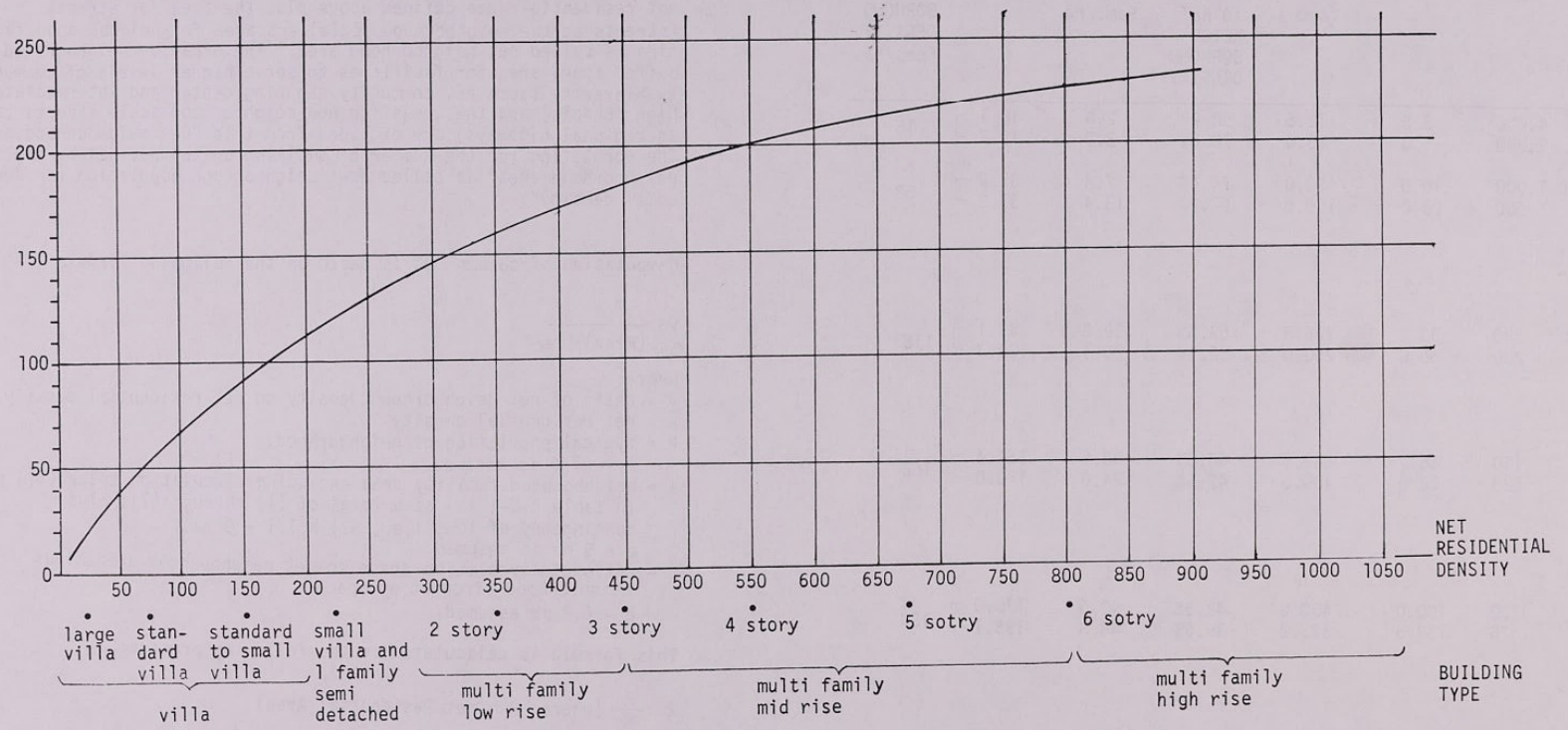
Location: Situated and concentrated in the center of town.

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 vecinity of 150 ot 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.

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 betwen net residential density and building type is depending upon the dwelling unit size, family size and many other conditions.

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 AVARAGE 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 x 1.1 ≒ 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 caliculated in the following process:

$x = \frac{P}{R}$ (where, R = net Residential Area)

$y = \frac{P/N}{P/R} = \frac{R}{N}$ (where, N = net Neighborhood Area)

$N = (R + a)\cdot(1+c)$

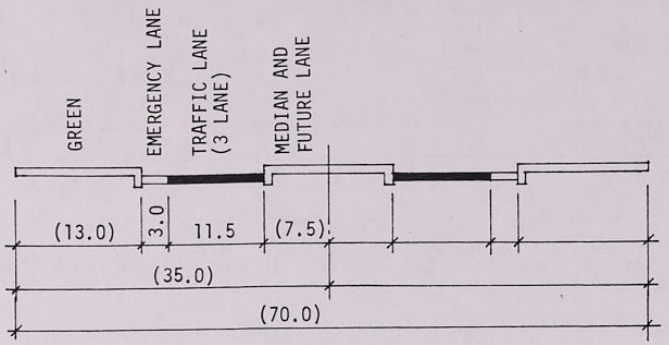
from above,

$$y = \frac{R}{(R+a).(1+c)} = \frac{P/x}{(P/x+a).(1+c)} = \frac{P}{(P+ax).(1+c)}$$

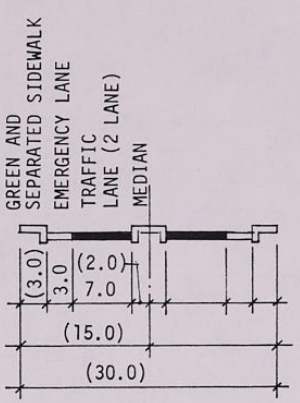
Table 10-2-1
IMPLEMENTATION PROGRAM, KHAMIS MUSHAYT[a]

	1975			1975 - 1980 PHASE I			1980 - 1985 PHASE II			1985 - 1995 PHASE III		
	NUMBER	TOTAL FLOOR AREA (m^2)	TOTAL LAND AREA (ha)	NUMBER	TOTAL FLOOR AREA (m^2)	TOTAL LAND AREA (ha)	NUMBER	TOTAL FLOOR AREA (m^2)	TOTAL LAND AREA (ha)	NUMBER	TOTAL FLOOR AREA (m^2)	TOTAL LAND AREA (ha)
BOYS ELEMENTARY[b]	9	17,000	12.2	2	4,000	2.8	3	6,900	4.8	14	19,800	14.1
BOYS INTERMEDIATE[b]	2	9,100	7.0	1	2,600	2.0	1	3,300	2.5	3	11,000	8.5
BOYS SECONDARY[b]	1	4,900	5.3	0	1,400	1.5	1	1,750	1.9	1	5,950	6.3
BOYS HIGHER EDUCATION[c]	1	5,800	2.1	0	0	0	-1	-5,800	-2.1	1	18,000	10.1
GIRLS ELEMENTARY[b]	9	17,000	12.2	2	4,000	2.8	3	6,900	4.8	14	19,800	14.1
GIRLS INTERMEDIATE[b]	2	9,100	7.0	1	2,600	2.0	1	3,300	2.5	3	11,000	8.5
GIRLS SECONDARY[b]	1	2,900	3.2	0	900	0.9	1	1,000	1.1	1	36,000	3.8
GIRLS HIGHER EDUCATION[c]	1	5,800	2.1	0	-3,300	-1.1	-1	-2,500	-0.1	0	0	0
TOT-LOT	144		7.2	34		1.6	46		2.4	224		11.2
PLAY-LOT (KINDERGARTEN)	36		7.2	8		1.6	12		2.4	56		11.2
NEIGHBORHOOD PARK	9		16.0	2		4.0	3		5.8	14		18.4
COMMUNITY PARK	1		12.8	0		3.0	1		4.8	1		14.7
CITY PARK	1		12.8	0		3.0	0		4.8	0		14.7
SMALL MOSQUE	9	9,850	2.7	2	2,270	0.6	3	3,630	0.9	14	11,010	4.2
JAMI'A MOSQUE	2	3,830	2.6	1	910	0.6	1	1,450	0.9	3	4,410	3.0
EID MOSQUE	-	-	-	-	-	-	-	-	-	1		3.6
NEIGHBORHOOD CENTER	9	1,600	4.5	2	400	1.0	3	600	1.5	14	1,800	7.0
COMMUNITY CENTER	1	320	1.0	0	80	0	1	120	1.0	1	360	1.0
CIVIC CULTURAL CENTER	1	3,990	4.0	0	810	0.8	0	950	1.0	0	2,450	2.4
PHARMACY	9	1,600	0.9	2	400	0.2	3	600	0.3	14	1,800	1.4
DIAGNOSIS/TREATMENT	1	1,600	0.9	2	400	0.2	3	600	0.3	3	1,800	1.1
COMMUNITY/GENERAL HSOPITAL	320 beds	12,800	6.0	60	2,400	1.2	80	3,200	1.4	200	8,000	3.7
SPECIAL HOSPITAL	800 beds	42,000	17.6	160	8,500	3.5	200	10,500	4.2	480	25,200	10.8
ADMINISTRATION	1	20,000	1.0	0	10,000	0.5	0	10,000	0.5	0	20,000	1.0
POPULATION/HOUSEHOLDS	31,930/5,458			7,570/1,995			12,100/3,297			36,700/9,318		

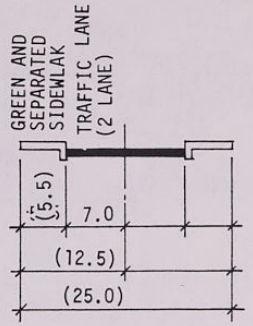
V_1 EXAMPLE
(REGIONAL HIGHWAY)
6 LANE



V_3 EXAMPLE
(ARTERIAL)
4 LANE

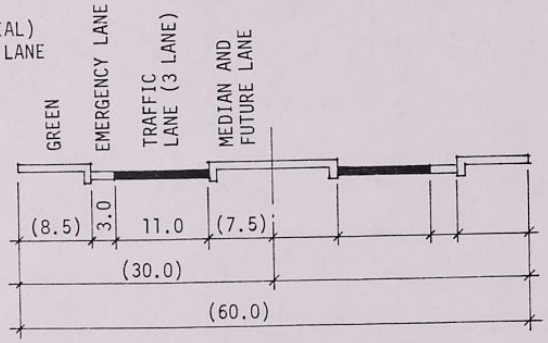


V_4 EXAMPLE
(COLLECTOR)
4 LANE

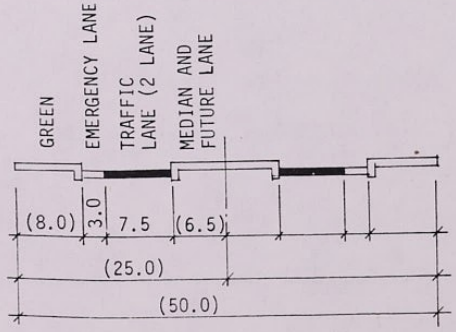


V_2 EXAMPLE
(MAJOR ARTERIAL)
6 LANE AND 4 LANE

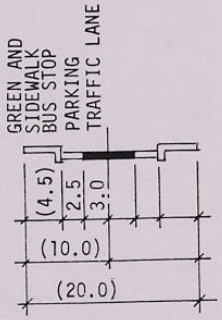
6 LANE



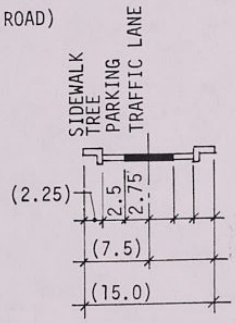
4 LANE



V_5 EXAMPLE
(DISTRIBUTOR)
2 LANE



V_6 EXAMPLE
(LOCAL ACCESS ROAD)
2 LANE

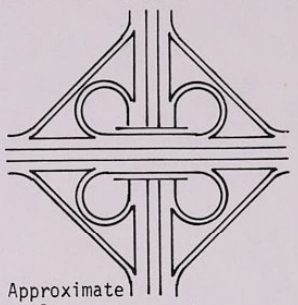
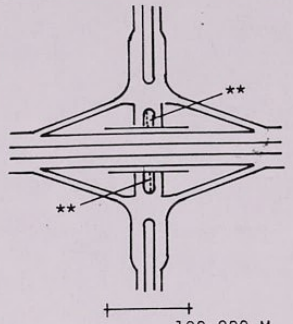
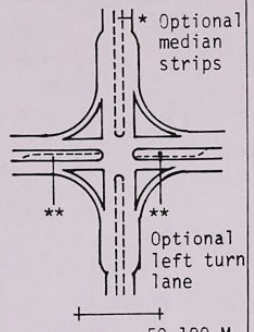
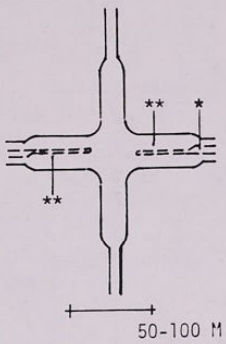
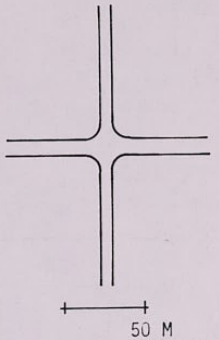
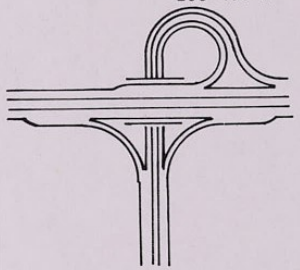
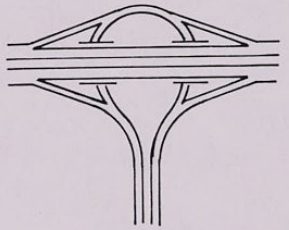
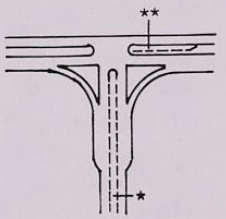
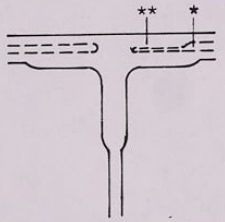
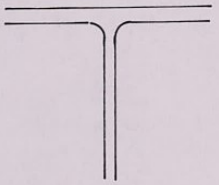


NOTE: ( ) Dimensions can vary depending on the local condition and detail design, sometimes median strip and green zone can even be eliminated where elimenation is justified by the detail planning.

FIGURE A-2-9 (b)
ROAD SECTIONS BY CLASSIFICATION
(EXAMPLE)

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			
FUNCTIONAL CLASSIFICATION	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
	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

	Cloverleaf	Diamond	Channelized	Flaired	Common
Four leg Cross intersection	 Approximate scale: 200-400 M	 100-200 M	 * Optional median strips ** Optional left turn lane 50-100 M	 50-100 M	 50 M More or less
Three leg "Tee" intersection					
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

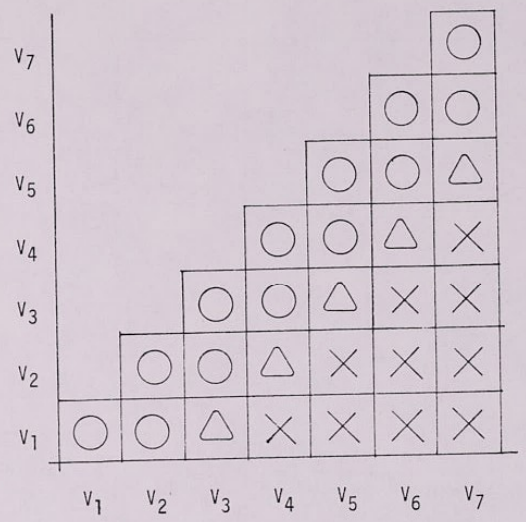


FIGURE A-2-9 (c)
ALLOWABLE ROAD
INTERCHANGES

NOTE: When two roads (with clasification Vm and Vn) intersect, then interchange (Vm/Vn) is:

Allowed	when (○)	|m-n| = 0 or 1
Not allowed	when (△)	|m-n| = 3
Allowed but not recommended	when (X)	|m-n| = 2

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
	COLLEGE WITH ATHLETIC FACILITIES				10.0
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	25.9

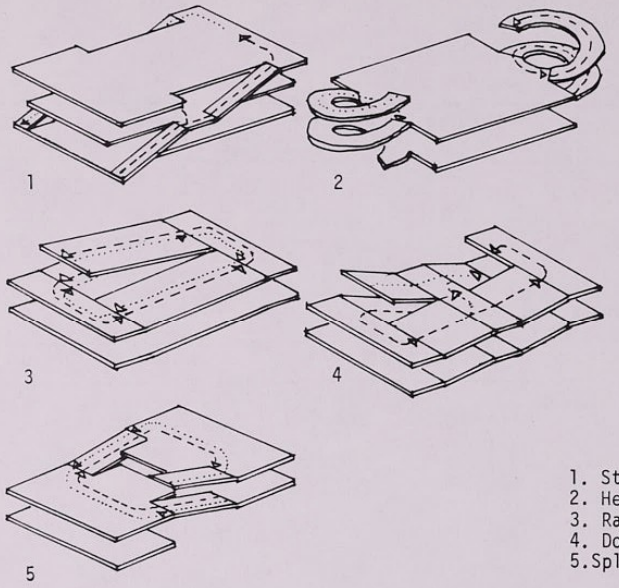
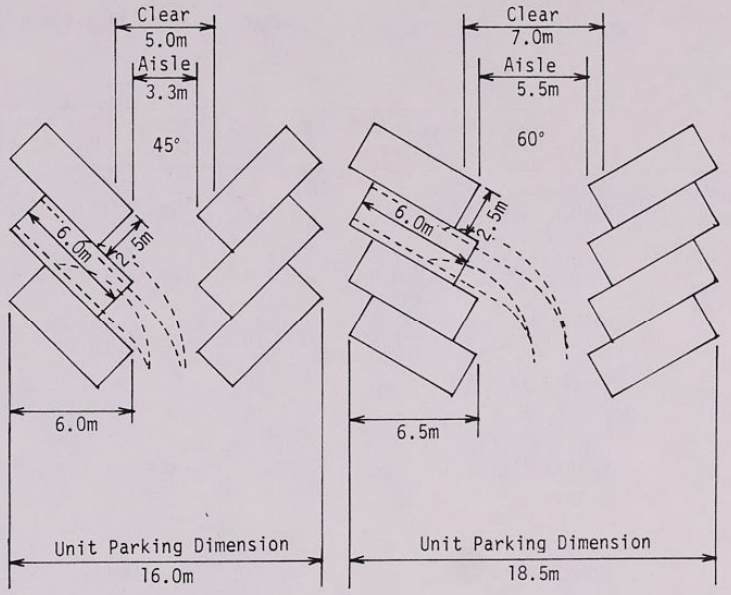


FIGURE A-2-9 (e)
STRUCTURE PARKING
(EXAMPLES)

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.



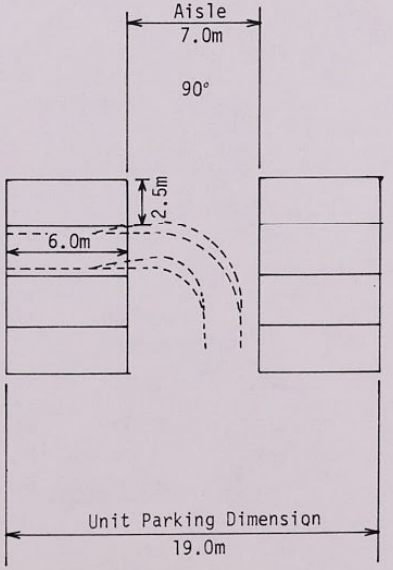


FIGURE A-2-9-(f)
UNIT PARKING
DIMENSION(EXAMPLES)

Table A-3-1(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.

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 TREAT-MENT	-	1.0	x2= 2.0	x2= 4.0
	POWER STATION	-	1.0	x2= 2.0	x2= 4.0
	GARBAGE DIS-POSAL	-	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 ppn NET DENSITY	37.5	x4= 150.0	x2= 300.0	x2= 600.0
	CASE 2 200 ppn NET DENSITY	18.8	x4= 75.0	x2= 150.0	x2= 300.0
	CASE 3 400 ppn NET DENSITY	9.4	x4= 37.5	x2= 75.0	x2= 150.0

		NEIGHBORHOOD (3750 INH)	SUB-COMM. (15,000 INH)	COMMUNITY (30,000 IHN)	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)TRANSPOR-TATION	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) thruogh (8) for small streets related "inside" of neighborhood

** Assumption: 10% of total of (1) through (8) for arteries outside of neighborhood

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If 2-3/4" tabs specify AC183-1/5
If 4" tabs specify AC183-1/3
and state tab position desired.

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