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Ministry of. 1978

Southern Region Project Study.  
Master Plan report - Bishah

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SOUTHERN REGION PROJECT STUDY

MASTER PLAN REPORT

BISHAH

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## 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.

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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.

of the Southern Region. The master plan contains the basic strategy for the growth of the city of the village cluster, the recommended directions for the change 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.

1-2 PLANNING PROCESS

1-2-1 RELATIONSHIP OF THE FINAL MASTER PLAN TO PREVIOUS REPORTS

During the course of the Southern Region Project Study, a series of five separate reports have been submitted for each of the five major cities of the Southern Region. "Initial Appraisal of Existing Conditions" and "Immediate Action" identify areas requiring immediate attention, while "Existing Conditions" and "Alternative Strategies" focus on broader issues confronting the cities and on various alternative approaches toward meeting long range planning objectives. The Preliminary Master Plan drew on all four previous reports and presented a program for the development of the city over the twenty-year planning period. These Final Master plans were prepared based upon comments and guidance given by the Ministry and their 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

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.

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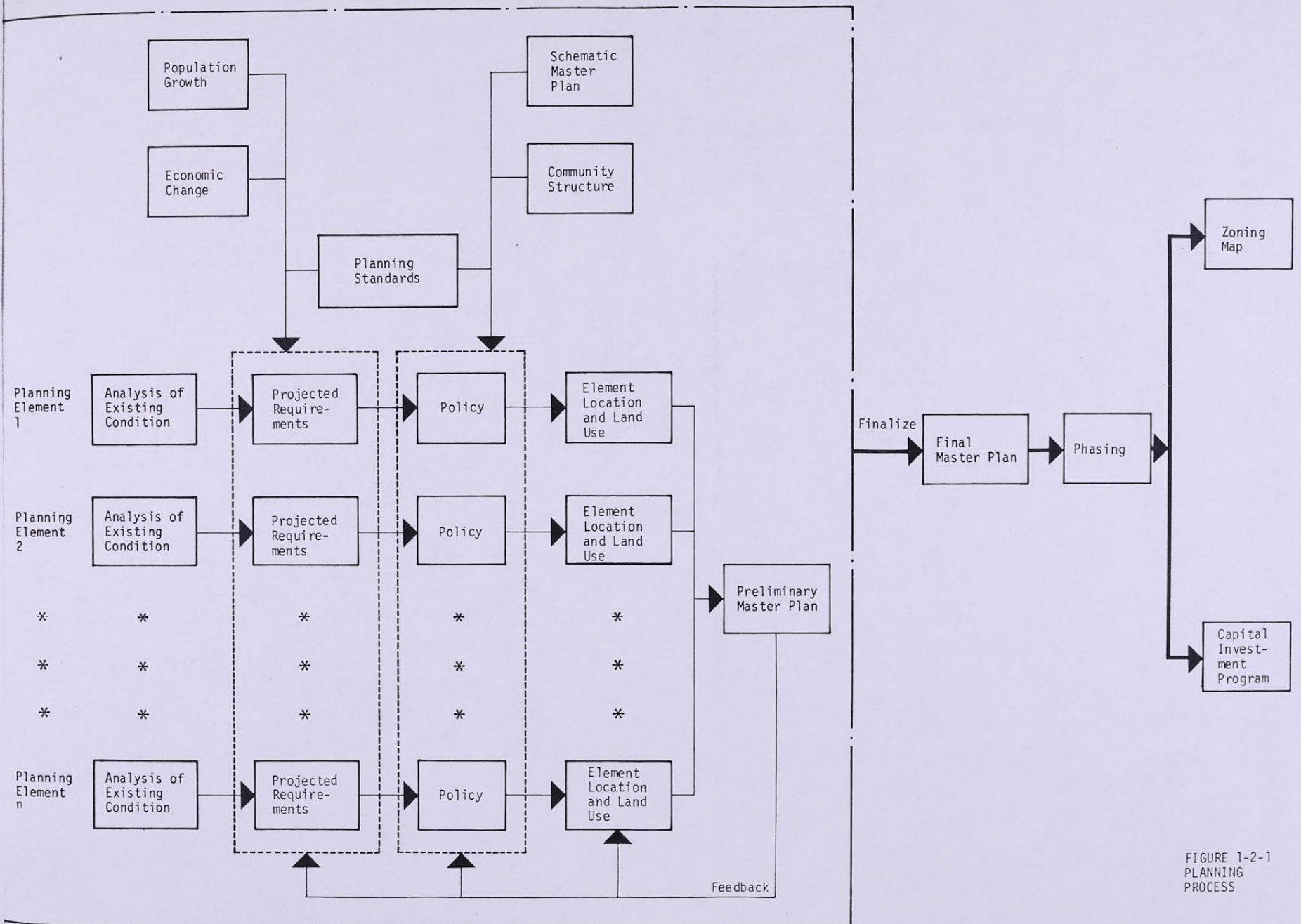


FIGURE 1-2-1  
PLANNING  
PROCESS

1-2-5 FEEDBACK

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

1-2-6 FUTURE FEEDBACK

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

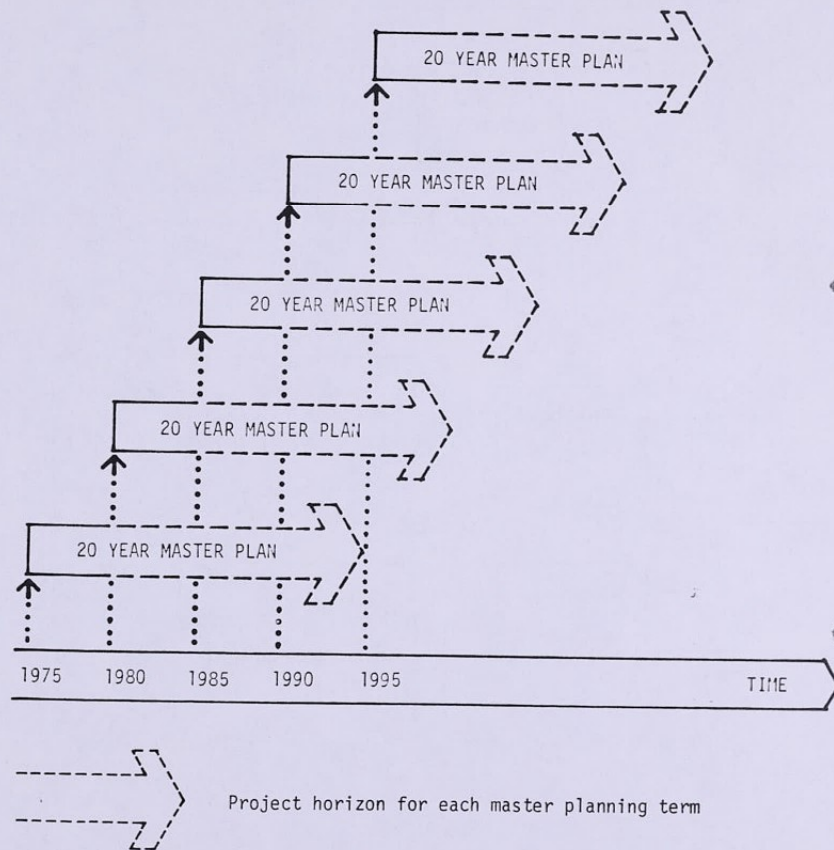


FIGURE 1-2-2  
DIAGRAM OF  
MASTER PLAN  
OVER TIME

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

TIME

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 TER PLAN  
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2. summary of existing conditions

2-1 REGIONAL POLICIES  
AND THE CITY

While Bishah shares many characteristics with Abha, Khamis Mushayt, and other cities of the Southern Region, it is located relatively close to the regional boundary. The Western Region of the Kingdom begins only about 30 km to the west of Bishah, and thus there are many social and commercial relations that exist. Al Mukharam, for example, is in the Western Region, but is within the Bishah commercial sphere of influence.

Similarly, among the cities of the Southern Region, Bishah is the closest to such national centers as Jeddah and Riyadh. These have been the recipients of many of the dates grown in and around Bishah. Recently, however, the construction of Route 54 along the Jeddah-Abha axis, and the proposed construction of a new highway along the Riyadh-Tathlith-Khamis Mushayt axis have deprived Bishah of its strategic location along traditional cross-country routes. It may be desirable to construct a modern highway linking Bishah with one of these routes if the city's position of prominence is to be maintained.

National economic activity has had an effect on Bishah and its environment. In recent years, the high volume of oil-related development in other parts of the Kingdom has caused a substantial out-migration from the Southern Region. The migrants, for the most part, have been young men aged 15-35 who make up some of the most energetic and productive sectors of the labor force. Consequently this loss is even more severe than if the out-migrants were randomly selected. Yet the Southern Region has the greatest capacity for agricultural development of any area in the Kingdom. Nearly four-fifths of the cultivated land in the nation are located in this region. If the objective of national self-sufficiency in food production is ever to be reached, it will be in large part as a consequence of the Southern Region's maximization of its agricultural output.

Part of the problem is purely economic. A worker may well obtain four or five times the salary by working in the oil fields of the Eastern Region as is possible by working as a farmer in the Southern Region. But there are other less tangible advantages in the way of opportunities for advancement, for education of oneself and one's family, health care, for entertainment, and for many other urban amenities.

Thus it is clear that if the out-migration flow is to be halted, the Southern Region must be able to provide some of the attractions and advantages that are presently drawing its people away. And Bishah is to be one place where these things can

be offered.

2-2 MAIN FUNCTION OF  
THE CITY

2-2-1 GENERAL

The main function of the city of Bishah is the administration of the Bishah Province. Unlike the twin cities of Abha and Khamis-Mushayt, however, Bishah plays a variety of other roles as the only major city in the surrounding area:

1. A commercial center serving a wide area within both the Southern and Western Regions.
2. A point of distribution for goods sent from the northern parts of the Kingdom into the Southern Region.
3. A center of agriculture, primarily date growing.
4. A center for nomads.
5. A center for the provision of educational health and other social services.

2-2-2 ADMINISTRATION

Within the administrative structure of the Southern Region, Bishah Province is formally under the jurisdiction of Abha. Yet due, among others, to the historical importance of the city of Bishah, it possesses all the administrative offices which are found in the other provincial capitals of the Southern Region. The offices of the Emir of Bishah, the branch office of the Ministry of Municipal and Rural Affairs, and branch offices of other Ministries are located in Bishah.

Of particular importance is the vast hinterland of semi-arid land extending east and north of the city, where a large number of nomadic population are found. The national government is pursuing a policy of settling the nomadic population both in the country side and the city. Due to its location, Bishah already plays a vital role as the regional link and service center for these nomads.

2-2-3 AGRICULTURE

The Southern Region has nearly four-fifth of the Kingdom's land and, in light of the goal of national self-sufficiency in food, it is essential that the Southern Region's potential be developed as much as possible.

For the present report, the Southern Region has been divided into four sub-regions. Bishah Province and portions of the Abha and Najran administrative areas have been combined into the Wadi Quadrangle Sub-Region.[1].

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






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\*For further details, refer to Table 3-4-1, Air Craft Noise and Land Use Compatibility in Bishah, Alternative Strategies Report.

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

-  wadi
-  agricultural area
-  airport

The agriculture and water availability characteristics of the Wadi Quadrangle Sub-region have been summarized in Table 2-2-1.

Agricultural lands under the direct influence of Bishah are roughly located in three corridors extending outward from the city to (1) Al Hajim, (2) Al Mukharam, and (3) Ad Dahw and beyond, all within 50 km of the city. Remaining agricultural areas are distributed in small clusters near Ya'ara, Al Amwah, Tathlith, and Yadama.

It should be emphasized that the Wadi Quadrangle is an extremely large area, and two-thirds of the population are nomadic [2]. The only areas which are under the direct influence of Bishah, agriculturally, commercially, as well as administratively, are the three corridors of settlements mentioned above, containing a total population of approximately 68,900 persons.

Within the Wadi Quadrangle and the Southern Region as a whole, however, Bishah plays an important role as a center for trading and distribution of agricultural products.

The Preliminary Physical Plan (Chap. 5) and the Final Physical Plan outline potential means of improving agricultural production throughout the Southern Region. Some of the methods applicable to Bishah and the agricultural lands surrounding the city are:

1. Improving the system and methods of irrigation
2. Adopting a more productive mix of crops for cultivation.
3. Joint use of the same land by different crops or vegetation.

These methods, along with the relative economic returns of various crops, are presented in more detail in the Preliminary and Final Physical Plans.

Agricultural policy for Bishah and the Wadi Quadrangle sub-region should place primary emphasis on improving the productivity of lands now under cultivation, rather than on developing new agricultural lands. Improving existing lands and practices is more cost effective than developing new lands. Also, there is not sufficient supply of water in areas around Bishah to enable new, large-scale agricultural development as well as improvement of present irrigation methods. For comparison of water requirements of improved irrigation with the estimated supply of water available in the Wadi Quadrangle sub-region, see Southern Region, Preliminary Physical Plan, Tables 4-3-1 and 4-4-1

#### 2-2-4 LIVESTOCK PRODUCTION

Currently the Wadi Quadrangle Sub-Region realizes some 20,000 tons of livestock production per year, of which there are 8,000 tons per year of mutton and 6,000 tons per year of poultry [3]. It has been estimated by an earlier study [4] that the average holdings of a nomadic family are two to two-and-a-half times the average holdings of a settled farmer. Since there are twice as many nomads as settled population, it is readily seen that most of the livestock production is carried out by the nomads, relying heavily on open grazing. As a result, the nomads are vulnerable to changes in weather, and the grazing areas are subject to over-use and erosion.

In order to avoid future difficulties connected with open grazing, greater effort should be made to substitute agricultural feeds (such as stalks and alfalfa) for open foraging and to closely manage the use of rangelands. These activities should be coordinated by appropriate authorities in Bishah and Tathlith.

Table 2-2-1  
AGRICULTURAL LAND AND AVAILABILITY  
OF WATER IN WADI-QUADRANGLE SUB-REGION

Total Agricultural Land (ha)	59,100
Irrigated Land	6,100
Dry Farming Land	3,000
Rangeland	50,000
Available Water Resources (Million m <sup>3</sup> )	
Existing	24.4
With Moderate Improvement	40.1
With Extensive Improvement	169.3

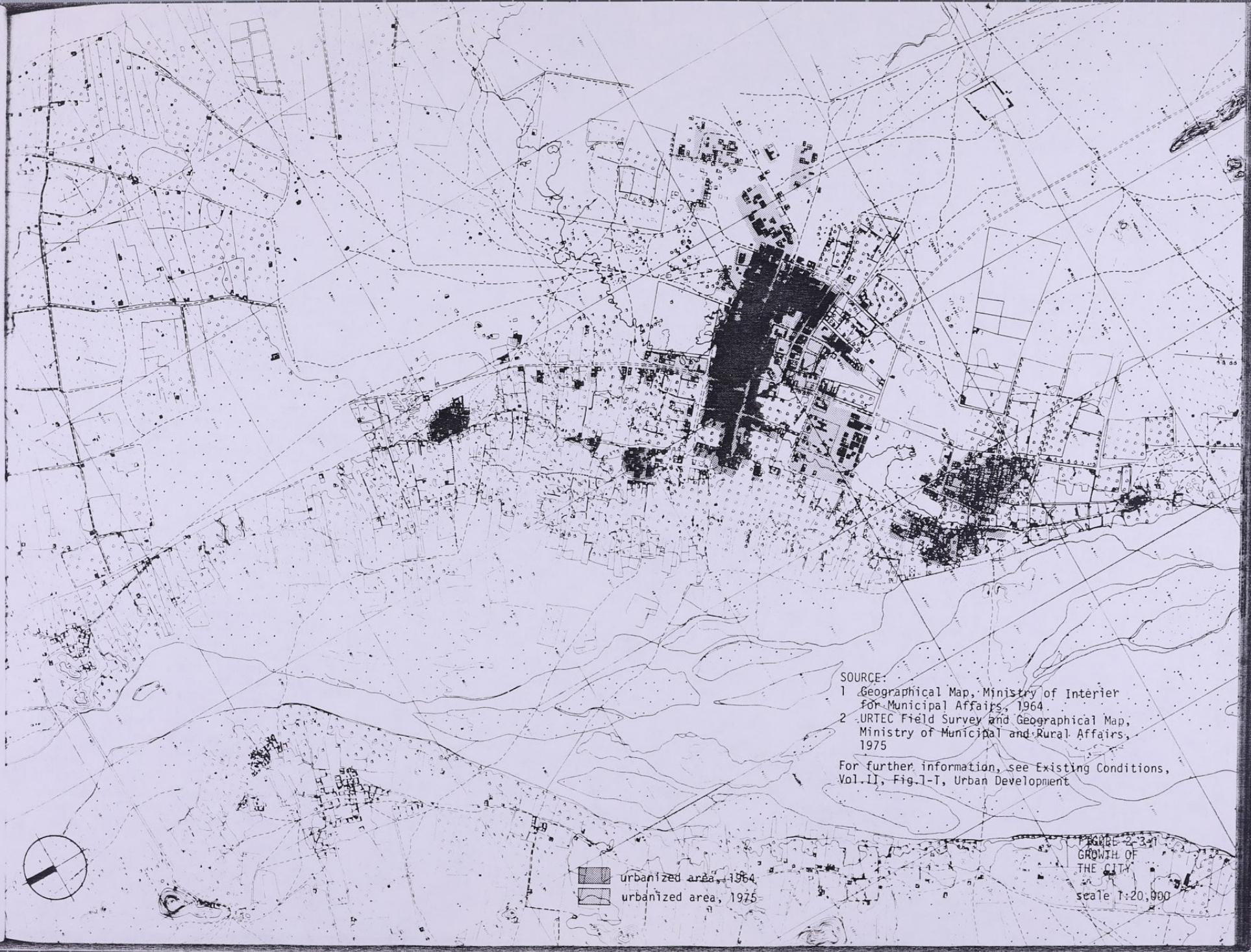
Note: For methods of estimating these data see Southern Region, Existing Conditions, Vol. I, Sec. 4-1-2, and Preliminary Physical Plan, Sec.4-3

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

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

urbanized area, 1964  
urbanized area, 1975

FIGURE 2-3-1  
GROWTH OF  
THE CITY  
scale 1:20,000

## 2-3 HISTORICAL GROWTH AND NATURAL FEATURES

### 2-3-1 GENERAL

The main geographical determinant for the location of Bishah is Wadi Bishah, a large basin which for brief periods during the year carries very large volumes of water. It becomes a river which may be several hundred meters across. There are a few wells in the area although generally the land is hot and dry with a mean annual temperature of about 25° C and rainfall of 108 mm. The elevation is 1040 meters above mean sea level.

### 2-3-2 HISTORICAL GROWTH, VISUAL AND ARCHITECTURAL CHARACTERISTICS

Historically the settlement was a collection of villages that produced dates along the wadi, and which served as a trading point for nomadic people who roamed the area. The settlement grew slowly during the early decades of the Kingdom; and in 1963 AD (1383 AH), several villages were incorporated into the municipality of Bishah.

The basic physical form of Bishah has been established largely by the following features:

1. The Wadi Bishah, which determines the availability of most of the water which is a prominent geological feature on its own, although it is possible to cross it during dry weather.
2. The agricultural lands, largely occupied by date palms, which have been developed gradually over a long period of time and which still comprise the main product of Bishah.
3. A pattern of development of streets, housing, and other features which have also developed gradually. These have been heavily impacted by the rapid growth during the past decade but still establish the basic outline of man-made features.

The future pattern of growth can be discussed with regard to five elements:

1. Direction
2. Speed (or "Schedule")
3. Character
4. Volume
5. Regulatory and Control Mechanisms

Direction is a major concern since many internal features, such as housing, must be planned in accord with projections of physical growth; and many external features, such as agricultural production centers, may be affected as well. The wadi is of significance in directing growth because most of the water sources are necessary for agriculture also follow that line. Thus much of the future de-

mands for both urban uses (housing, commercial activities) and rural uses (agriculture) are likely to be in essentially the same area. While there is a great amount of unused land farther away, it has been utilized very little except for nomads and occasional small farms or settlements. Volume is of interest, since the rate of population growth has gone from slow to rapid, and is likely to slow again somewhat. Regulatory and control mechanisms will be discussed in Chapter 10, "Administration and Management."

The traditional houses of Bishah have sun-dried, mud brick walls and mud floors on wood joists. They are typically two to three stories high, forming complexes around a courtyard. The houses of Nimran and Nughaylar are good examples of traditional architecture in the city. Although these houses do not meet the standards of a healthy environment, they are visually and architecturally an important legacy of Bishah's past. Form and materials stand in harmony with the surrounding environment defined by the wadi, the vegetation, and the local landscape. On the other hand, the recently constructed houses of concrete block often conflict with this environment. It is therefore necessary for the government to set examples and standards of design which satisfy the modern living requirements, but which also complement the traditional visual qualities of the city.

### 2-3-3 NATURAL FEATURES

#### 1. Climate

The Climate of Bishah is arid, with hot summers and mild winters. The mean monthly temperatures range from 18°C in January and December to 30.8°C in August. The annual average relative humidity is 39%. There is very little rain, 108mm per year, mostly in the spring [5]. Thus agriculture in Bishah and its surrounding area are heavily dependent on irrigation.

#### 2. Geology and Soil Condition.

##### a. Regional Geology

The geological structure of the area surrounding Bishah consists of igneous and metamorphosed rock formations. Alluvial deposits are found at surface, with occasional outcroppings of granite. The depth of the deposits range from 1 to 15 meters with depths of 20 to 30 meters recorded in some areas.

##### b. Soil

The flood plain deposits consist mainly of silt and muddy sand. Channel alluvium occurs in the Wadi and consists of coarse sand and gravel.

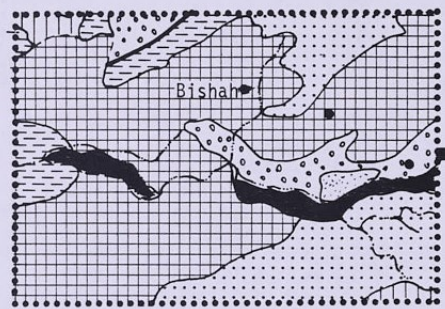
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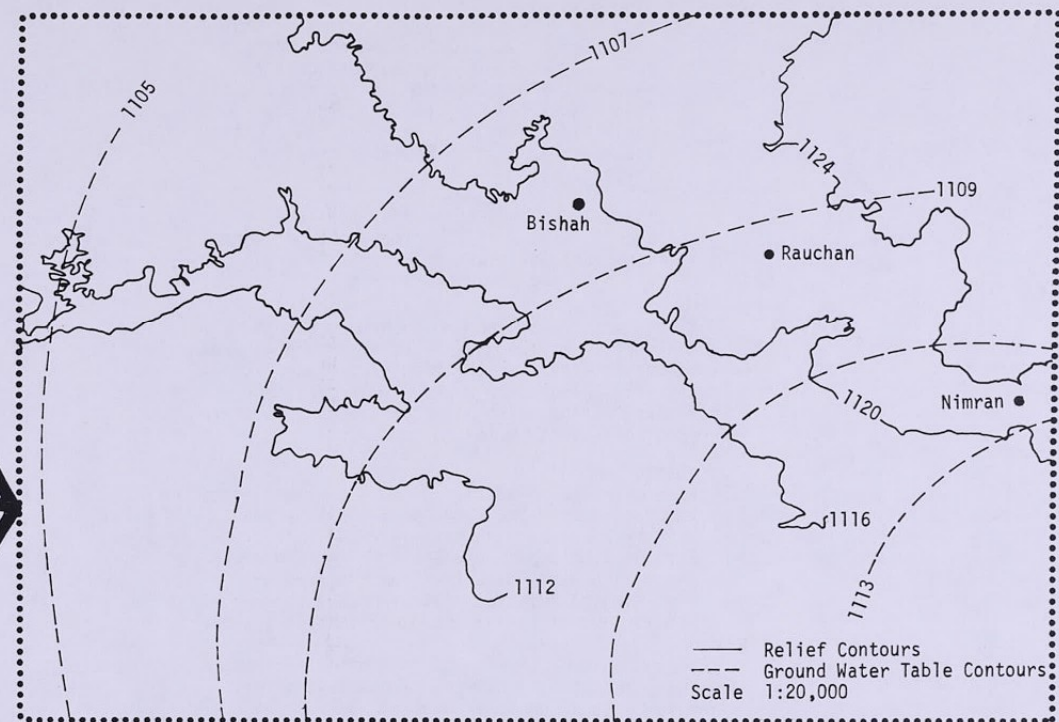
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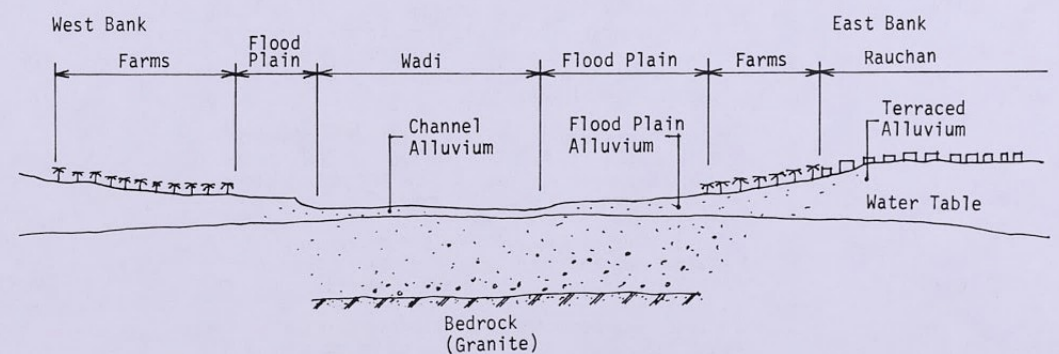
GEOLOGICAL MAP  
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- GEOLOGICAL CONTACT
- WADI
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- SILT AND GRAVEL
- GREENSTONE
- SERICITE AND CHLORITE SCHIST
- AMPHIBOLITE
- CHLORITE SCHIST



GROUND WATER TABLE CONTOURS

--- Relief Contours  
--- Ground Water Table Contours  
Scale 1:20,000



GENERALISED CROSS SECTION THROUGH WADI  
Scale 1:20,000 Horiz., 1:500 Vert.

FIGURE 2-3-2  
GEOLOGICAL  
FEATURE

c. Ground Water

Previous investigation [6] indicates that the depth of water table averages approximately 2 meters in the Wadi and over 17 meters at a distance of 3 km from the Wadi. (See Figure 2-3-2). However, the depth varies according to season by 1 to 2 meters due presumably to extensive extraction for irrigation.

There is no indication that the level of ground water will interfere with building construction in areas outside the flood plain of the seasonal river.

Thus the soil condition in and around Bishah, with the exception of the wadi flood plain, is generally acceptable for construction of ordinary structures. Buildings with unusually large ground coverage or those with elevators require separate geological studies prior to construction.

3. Wind

The principal wind direction in Bishah is east by northeast. The mean windspeed is approximately 7 km/hr, with maximum of 44 km/hr. Higher wind speeds are observed shortly after noon each day. Data from the Ministry of Defense and Aviation indicates that between 7 to 15 days of sandstorms occur in this area.

In terms of implications for planning, activities with potentially negative environmental effects should be located either on the wadi side of the city or in areas south of the city. The proposed location of the sewage treatment plant satisfies this condition. In order to protect the quality of the ground water, however, it is strongly recommended that the treatment plant be equipped with secondary and tertiary purification processes. A triangular area bounded by the airport and the road to Khamis Mushayt is also suitable for industrial use.

It is necessary to preserve as much wooded area as possible (1) to offer protection from the periodic occurrence of sandstorms and (2) to moderate the hot and arid micro climate of the city. Although pressures for conversion of agricultural land to urban uses will be strong, absence of date palms and other wooded areas in the urban center will lead to poor environmental conditions.

It is recommended that within the triangular industrial area, a buffer zone of vegetation be created along the Khamis Mushayt road for visual and environmental benefit.

2-4 STRUCTURE OF THE CITY

2-4-1 GENERAL

With the exception of some of the development which has occurred as a consequence of governmental expansion and population growth, Bishah generally maintains the structure which has been in existence for decades or even centuries. One of its striking features is the lack of public buildings aside from mosques. This should not come as a surprise since most public functions were carried out during the weekly market day. The market provided the most important means for the exchange of goods and services between producers and consumers in the Region as well as between local residents and merchants catering to the interregional trade with Yemen, the Hijaz, Najd and Africa. Only the larger agglomerations enjoyed the privilege of having storerooms for permanent trading. Even so, this did not affect the importance of the market. Indeed, the assembly of the area's inhabitants at the market location provided the best opportunity for carrying out public functions such as the administration of justice, the collection of taxes, the announcement of Government decrees and public notices, and the contracting of official business.

In addition, many social functions such as marriage engagements and the arbitration of disputes took place on market days. It is therefore natural to find that each tribe jealously guarded its market prerogatives in terms of day and location and took great pride in establishing its reputation. Its chiefs were responsible for the safety of all participants and the maintenance of law and order in all activities.

Because Bishah is an agglomeration of districts that have been put together by administrative decision, it is somewhat difficult to establish a clear delineation of the city and its sub-sections. The manner which has been chosen to accomplish this is through definition of a "central district" and an "outer district." The former contains about 7900 persons and is expected to maintain the most rapid rate of growth, nearly doubling by 1995. The latter has about 3100 and will increase by over fifty percent in the same period.

The direction of growth in the immediate future is proposed to be toward and within the "Hizami Development District" to the northeast of the present central area. After 1985, it is expected to be to the northeast.

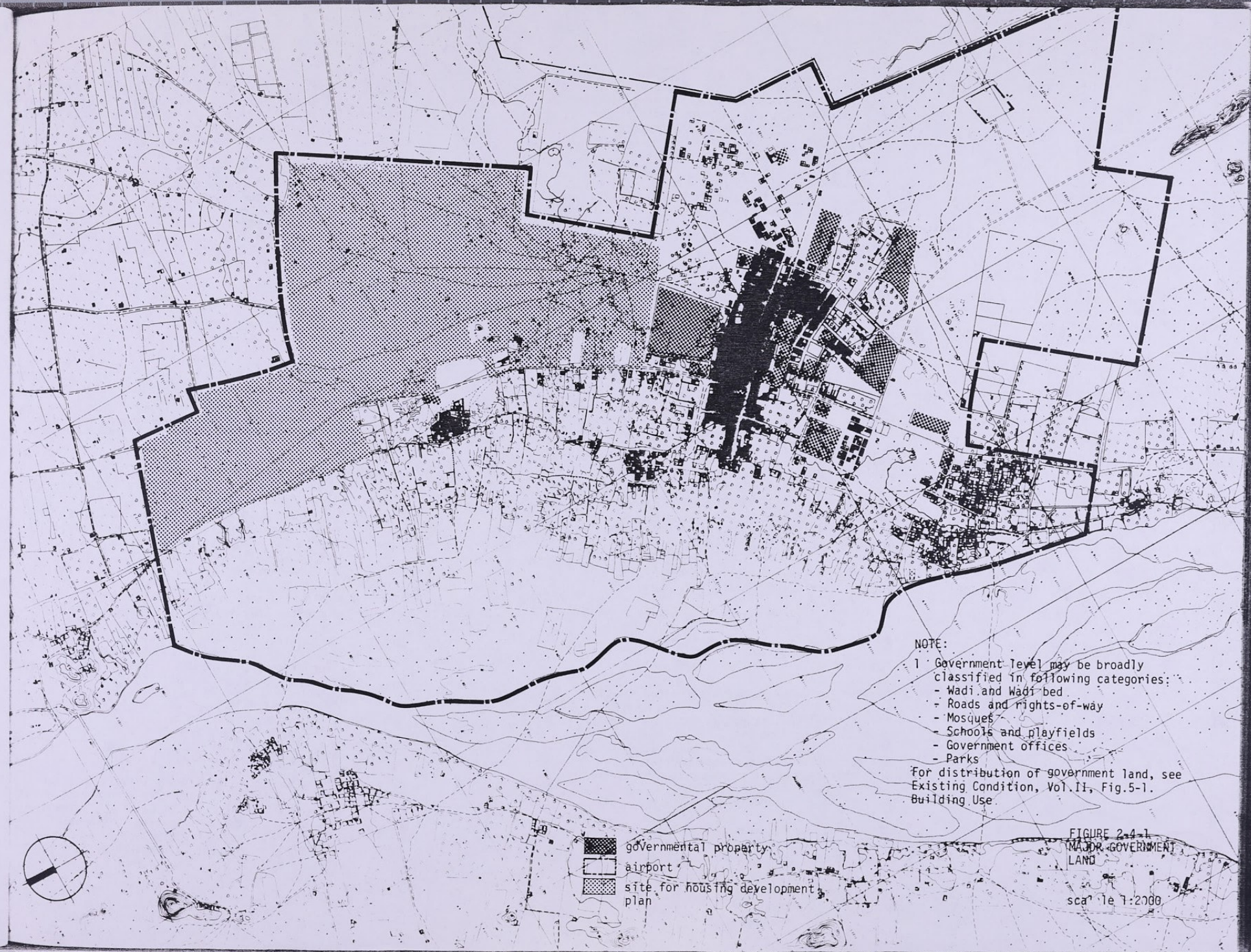


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NOTE:  
 1 Government land may be broadly  
 classified in following categories:  
 - Wadi and Wadi bed  
 - Roads and rights-of-way  
 - Mosques  
 - Schools and playfields  
 - Government offices  
 - Parks  
 For distribution of government land,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




-  governmental property
-  airport
-  site for housing development plan

FIGURE 2-4-1  
 MAJOR GOVERNMENT  
 LAND

scale 1:2000

## 2-4-2 EXISTING STRUCTURE

Heights of buildings in Bishah are generally low, varying from 1 to a maximum of 4 stories. Within the old housing districts (survey districts I-1 and I-2, Fig. 3-1-0), buildings are composed of one to three story tower houses and one to two story collective houses. In survey district I-5, one to two story public buildings and two story building complexes with shops and apartments may be found. Buildings in other parts of the city are mainly one to two stories.

Various building types, uses, and services have been described in detail in a previous report [7]. Some of the important observations are summarized below:

1. Manufacturing establishments fall into two general categories:
  - a. Small scale production mainly of building products in ground floors of buildings and houses.
  - b. Large, open-air establishments for the manufacture of cement blocks and for repair of automobiles; one establishment of the latter type possesses a large enclosed structure as well.
2. Commercial activities are housed in structures similar to these in other cities of the Southern Region:
  - a. In independent, one-story structures
  - b. On ground-floors of buildings and houses
  - c. In case of "qahwah," on second floor or on roof of buildings.
3. Educational institutions are generally housed in structures built according to the specifications of the Ministry of Education (for boys schools) and of the General Administration of Girls' Schools (for girls schools). Some exceptions are:
  - a. Schools located in converted, older houses or buildings.
  - b. Special activities, such as athletics, youth center, etc.
4. There is one hospital in Bishah, located in survey district II-9.
5. Administrative buildings are located generally in survey district I-5. It should be noted that not all administrative functions are located on government land. It is expected that these agencies will try to relocate in the future into government owned properties.
6. Some characteristics of houses in the central district have already mentioned. Existing housing is discussed in detail in Sec. 3-4.

Existing land use is presented in Fig. 2-4-2. Historically, most housing and urban facilities (such as administrative, commercial, and manufac-

## 2-5 PRINCIPAL ISSUES AND PLANNING OBJECTIVES

### 2-5-1 GENERAL

turing activities) have been concentrated in the Village of Rawshan, and use in this area has been closely analyzed in a previous report [8], and summarized in Chapter 9 of the present report. Until recently, major urban activities have been concentrated along the principal road leading to the Bishah airport. The most intensive land uses are found on either side of this road, with less intensive uses located away from it. However, since the airport is located less than 2 km from the northwestern edge of the city, there is little room for location of future facilities. One of the principal tasks facing Bishah is to develop a new direction for the growth of the city.

There are two central issues that will affect the growth and development of Bishah within the coming twenty years. These are:

1. Rate of population growth
2. Development objectives established by the Government.

Bishah has undergone a very rapid burst of population growth in the past ten to fifteen years since it was incorporated. Part of this may be thought of as being in the general frame of development of the Kingdom during this period, with urbanization increasing almost universally. But part of it is due to specific conditions affecting Bishah. One of these has been the policy of increasing governmental functions there, with the result that about 90% of the employment is associated with the Government. This increase is likely to diminish in the future and thus the population increase will be smaller, depending more upon natural increase and less upon large scale in-migration. Population projections are discussed at length in Chapter 3, "Population and Housing."

Development objectives are to be carried out in three phases:

1. Phase I 1975-1980
2. Phase II 1980-1985
3. Phase III 1985-1990

The majority of development that is to occur in Phases I and II will take place in the Hizami Development District, a section of approximately five square kilometers located to the northeast of the central area of the city. This development will include residential, commercial, and agricultural uses.

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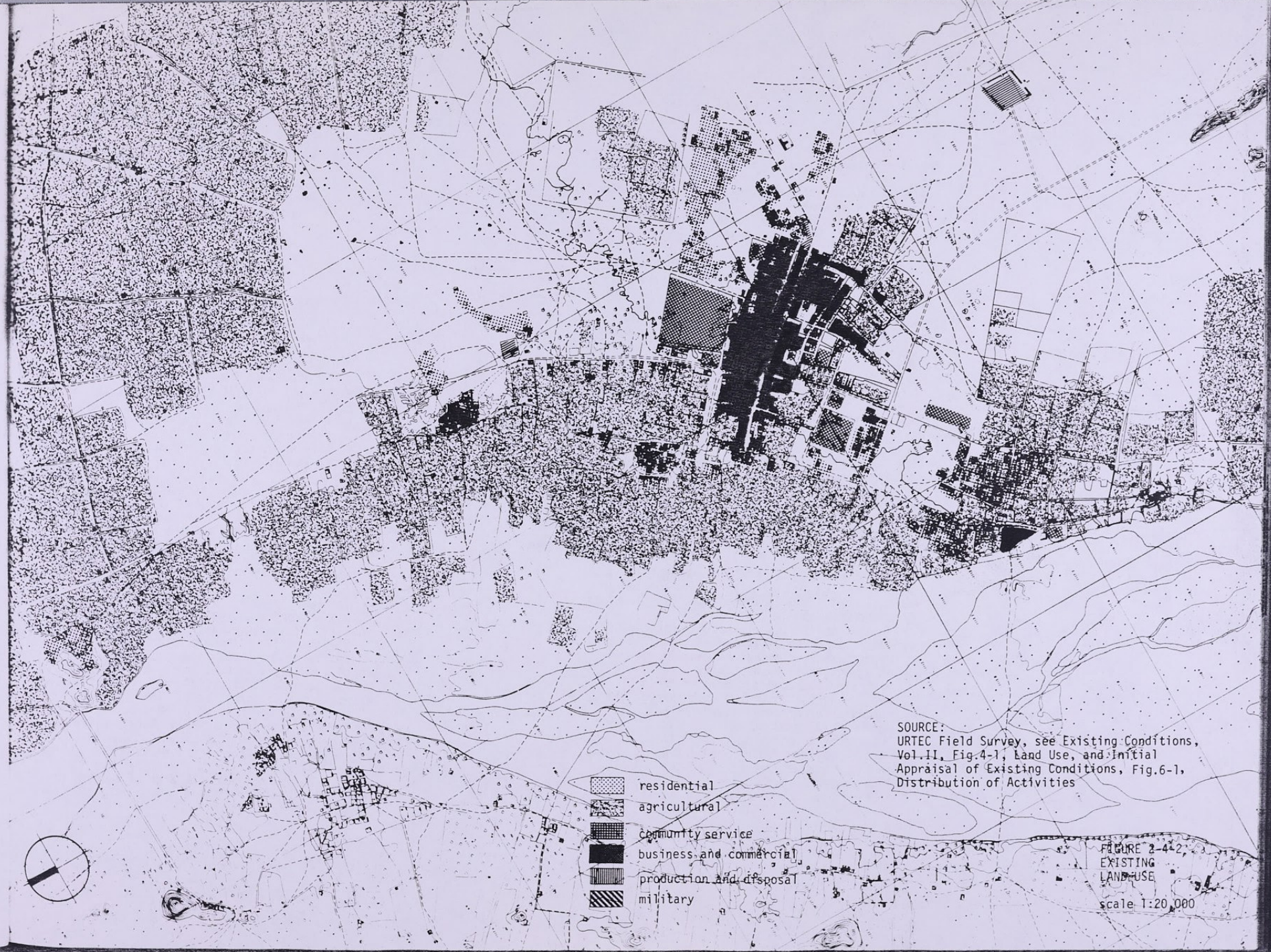
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SOURCE:  
URTEC Field Survey, see Existing Conditions,  
Vol. II, Fig. 4-1, Land Use, and Initial  
Appraisal of Existing Conditions, Fig. 6-1,  
Distribution of Activities

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

It is expected that development of this section will be in large part complete by 1985, after which growth will be re-directed to the southwest, in Phase III.

## 2-5-2 PLANNING OBJECTIVES

The immediate problems faced by the city of Bishah are:

1. To provide housing and services for a rapidly growing population.
2. To protect suitable agricultural lands from unnecessary conversion to urban uses.

The previous reports, existing conditions and alternative strategies, have identified the causes leading to these problems and the means to alleviate them.

In addition, as the only major city in the Wadi Quadrangle sub-region, Bishah must address itself to the other concerns of the sub-region, including:

1. Provision of technical, marketing, and financial services to farmers.
2. Provision of social and financial services to nomads.
3. Management of rangelands and livestock production.

At the national level, development goals have been established for the Second Five-Year Development Plan prepared by the Ministry of Planning. These goals have been examined in light of the resources of the Southern Region and its various sub-regions, resulting in regional development objectives[9].

Based on foregoing considerations, planning objectives for the city of Bishah have been adopted in consultation with the Department of Town Planning.

### A. Economic Development

1. Develop the full agricultural potential of the region through government initiated programs for water management and improvement of agricultural productivity.
2. Diversify the economic base of the sub-region and the city of Bishah through the formation of process industries based on agricultural products.
3. Promote organized, commercial livestock production based on cultivated fodder and prevent further deterioration of the interior land caused by over-grazing.

### B. Human Resources Development

1. Increase the productivity and earning capacity of individual workers.
2. Provide adequate education and training for the agricultural population in anticipation of social and economic changes.

3. Establish a program for the education settlement, and assimilation of nomads.
- ### C. Social Development
1. Improve the quality and extent of social welfare services to the residents of the sub-region.
  2. Provide adequate and suitable housing and public utilities.
  3. Protect the existing, traditional social fabric from the negative effects of regional economic development.

## 2-6 PLANNING AREA

### 2-6-1 GENERAL

The project area for the master planning of Bishah has been defined to include:

1. The Village of Rawshan (URTEC 5% Survey)
2. The Hizarim development area
3. The Village of Nughaylah
4. The Village of Rawshan al Mahdi
5. The Village of Nimran
6. A rectangular area for urban expansion south of Rawshan
7. A triangular area for industrial use adjacent to the airport.

Traditionally, urban activities of Bishah have been concentrated in the Village of Rawshan. The offices of the Emir, the branch offices of the various Ministries, and the major suq were all located in Rawshan [10]. In the absence of a clear legal boundary for the city, Rawshan came to be identified as the city of Bishah [11].

The socio-economic survey (URTEC 5% survey area was chosen on the basis of this traditional identification of Rawshan Village as the City of Bishah [12]. It became apparent during the course of the study, however, that the rapid growth of the city's population is creating pressures for residential construction and urbanization beyond the original survey area. The area of urban influence of the city of Bishah includes the villages of Nimran, Rawshan al Mahdi, Hizarim, and Nughaylah, as well as Rawshan. In addition, the recent acquisition of the Hizarim development area by the Ministry of Municipal and Rural Affairs has extended the area of concern to include the hitherto vacant land lying immediately northeast of Rawshan.

2-6-2 POPULATION, AREA  
AND LAND USE

Population of the URTEC 5% Sample Survey area has been estimated to be 7,900 [13]. Population of the planning area outside the survey area has been estimated on the basis of a combination of (1) population density of a comparable district in the survey area and (2) previously known data, such as the Feeder Roads Study [14].

The planning area is bordered by agricultural lands on the northeast and the southwest, by the wadi on the northwest, and by the airport on the southeast. The area encompasses approximately 2,000 ha of land, exclusive of the airport.

Land uses in the survey area have been identified and tabulated in Bishah, Existing Conditions, Vol. I, Table 4-2-1. Existing land uses in the planning area outside the survey area generally fall into the following categories:

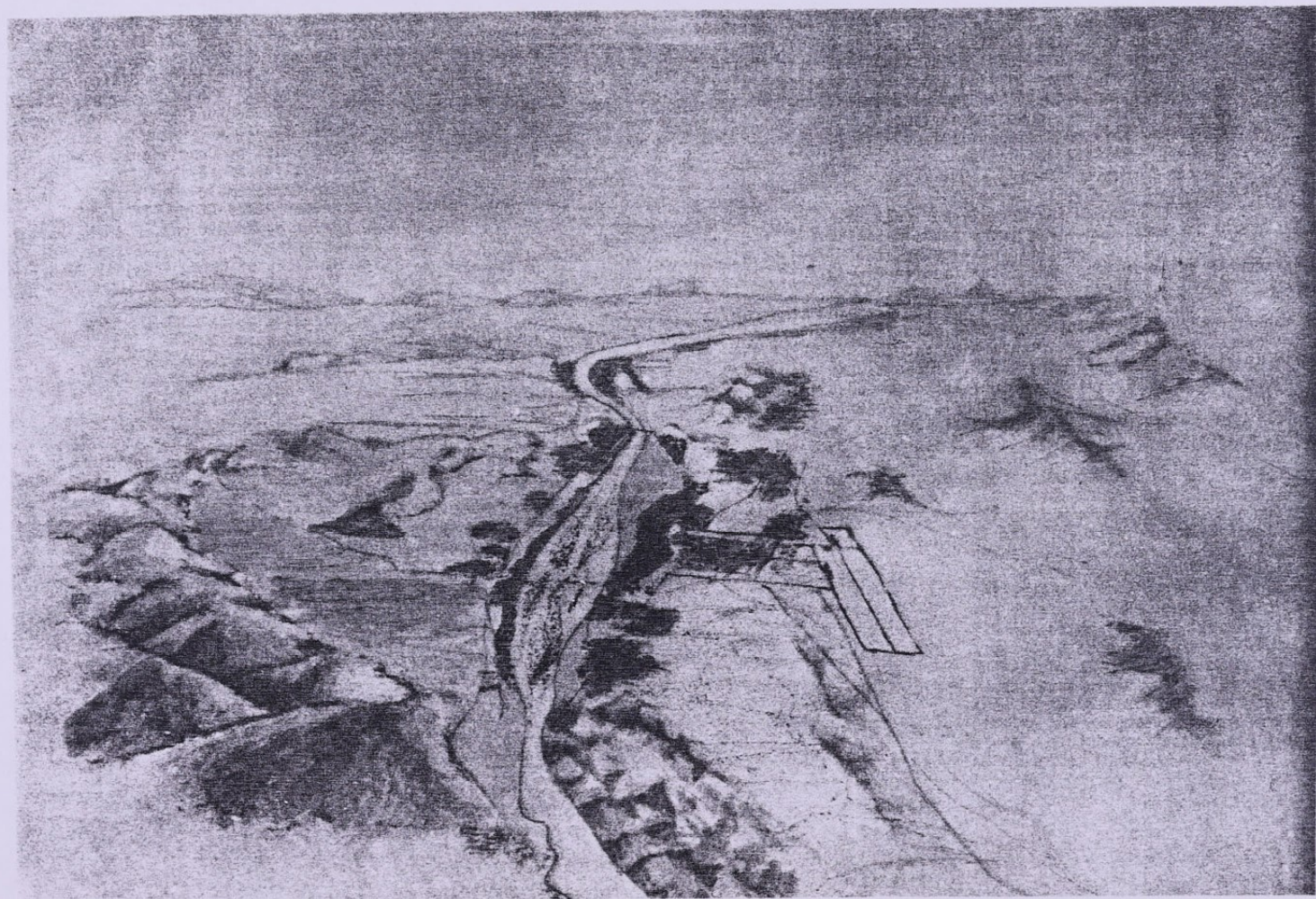
1. Private agricultural land.
2. Private residential land
3. Private vacant land
4. Public land

Of these, the private agricultural and residential lands are identified in Fig. 2-4-2, and the public lands (in particular, the Hizami development area) are identified in Fig. 2-4-1.

It should be noted that the planning area can and should change over time in response to changes in urbanization and the growth of the city. In particular, if the master planning process is repeated, as recommended in Chap. 1, the planning area should be redefined in light of the available information.

CHAPTER 2: NOTES

1. For definition of the Sub-regions- See Southern Region, Preliminary Physical Plan, Chap. 3.
2. Based on 1974 National Census, See Southern Region Preliminary Physical Plan, Table 9-1-8.
3. Southern Region, Preliminary Physical Plan, Table 6-2-5.
4. ILACO, Socio-Economic Development Plan for the South-west region of Saudi Arabia, 1973
5. For more detailed discussion of climatic factors, see Bishah, Existing Conditions, Vol. I, Sec. 2-2.
6. Ministry of Municipal and Rural Affairs, City of Bishah Water Management Preliminary Design Studies, Allott and Lormax Consulting Engineers, 1976.
7. Bishah, Existing Conditions, Vol. I, Sec.5-2.
8. Bishah, Existing Conditions, Vol. I, Chap. 4.
9. Southern Region, Preliminary Physical Plan, Sec. 3-2-2.
10. See Existing Conditions, Bishah, Vol. II, Figs. 1-1 and 5-1.
11. See for example, Ministry of Communication, Feeder Roads Study. ITALCONSULT, 1970.
12. Existing Conditions, Bishah, Vol. I, Fig.3-1-3.
13. Existing Conditions, Bishah, Vol. I, Sec. 3-1.
14. Ministry of Communication, Feeder Roads Study, ITALCONSULT, 1970



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3. population and housing

3-1 POPULATION PROJECTIONS AND HOUSING

3-1-1 EXISTING POPULATION

The 1975 population of Bishah is 11,000, 7,900 in the central district and 3,100 in the outer district. It is projected that in the period 1975-1995, the population will increase to at least 20,300 and possibly as much as 36,600. (The figure used for planning purposes is 28,000, approximately the mean of the other two.)

3-1-2 RELATIONSHIP TO THE 1974 CENSUS

According to the 1974 census conducted by the Central Department of Statistics, the population of Bishah and surrounding villages is 41,540, of which 29,267 are urban and rural settled population and 12,273 are nomadic population [1]. However, there are more than 40 so-called "surrounding villages" included in this estimate. The Census also does not report separate figures for Al Mukharam and Ad Dahw, although one is reported for Al Hajim. It is apparent, therefore, that the figure of 41,540 refers to an extended area of influence of Bishah, namely the three corridors of settlement and cultivation which extend from Bishah to northeast, northwest and southwest. Thus the combined population of 58,857 for "Bishah and surrounding villages" and Al Hajim can be regarded as the sphere of influence of the city of Bishah. Major regional activities, such as hospitals and regional commerce, should be planned on the basis of this target population.

3-1-3 POPULATION PROJECTIONS

The maximum represents an extension of the growth rate of the past few years, which is about seven percent annually. This is an extraordinarily high rate and it is not expected to be maintained. The low figure represents an annual increase of about three and one-half percent, which is based simply upon natural increase (births-deaths) with a net migration rate of zero. Even this lower figure is greater than the projected growth for all of the Wadi Quadrangle sub-region, which is only about eighteen percent over the twenty year period.

From this information, the following specific trends may be derived:

1. High fertility.
2. Relatively low mean life expectancy.
3. Increasing out-migration, primarily to other regions of the Kingdom.
4. A somewhat lower increase in the rate of immigration, primarily from Arabic countries to the south.
5. Rapid urbanization within the region.

A more detailed discussion follows:

1. The fertility rate, defined as the annual number of births per female population aged 15-49, is 20.7%, a high figure in comparison with more developed nations. This is in large part an element of traditional life in Saudi Arabia, as well as a response to a perceived need for more people.
2. Traditionally, life expectancy has been only about two-thirds of that in more developed countries. However, the increase in the health care standards now underway will produce an increase in mean life expectancy. If the fertility rate remains the same, the population will increase.
3. A variety of conditions have affected this trend, such as:
  - a. A relatively large percentage of the total national population (about 30%) has moved.
  - b. An increasing tendency by nomadic peoples to settle.
  - c. A relative lack of services and amenities in the Southern Region.
  - d. A heavy demand for workers in the hydro-

Table 3-1-1  
POPULATION PROJECTIONS

	1975	1980	1985	1995
City of Bishah				
High	-	14,700	19,800	36,600
Low	-	12,800	14,900	20,300
Planning	11,000	13,500	17,000	28,000
Central (Survey) District				
High	-	11,100	15,700	31,000
Low	-	9,300	11,000	15,400
Planning	7,900 <sup>a</sup>	10,000	13,000	23,000
Outlying Districts				
High	-	3,600	4,100	5,500
Low	-	3,500	3,900	4,900
Planning	3,100 <sup>b</sup>	3,500	4,000	5,000

Notes:

a. URTEC 5% Survey, 1975

b. URTEC Field Survey and ITALCONSULT Feeder Road Map (VILLAGE INDEX)



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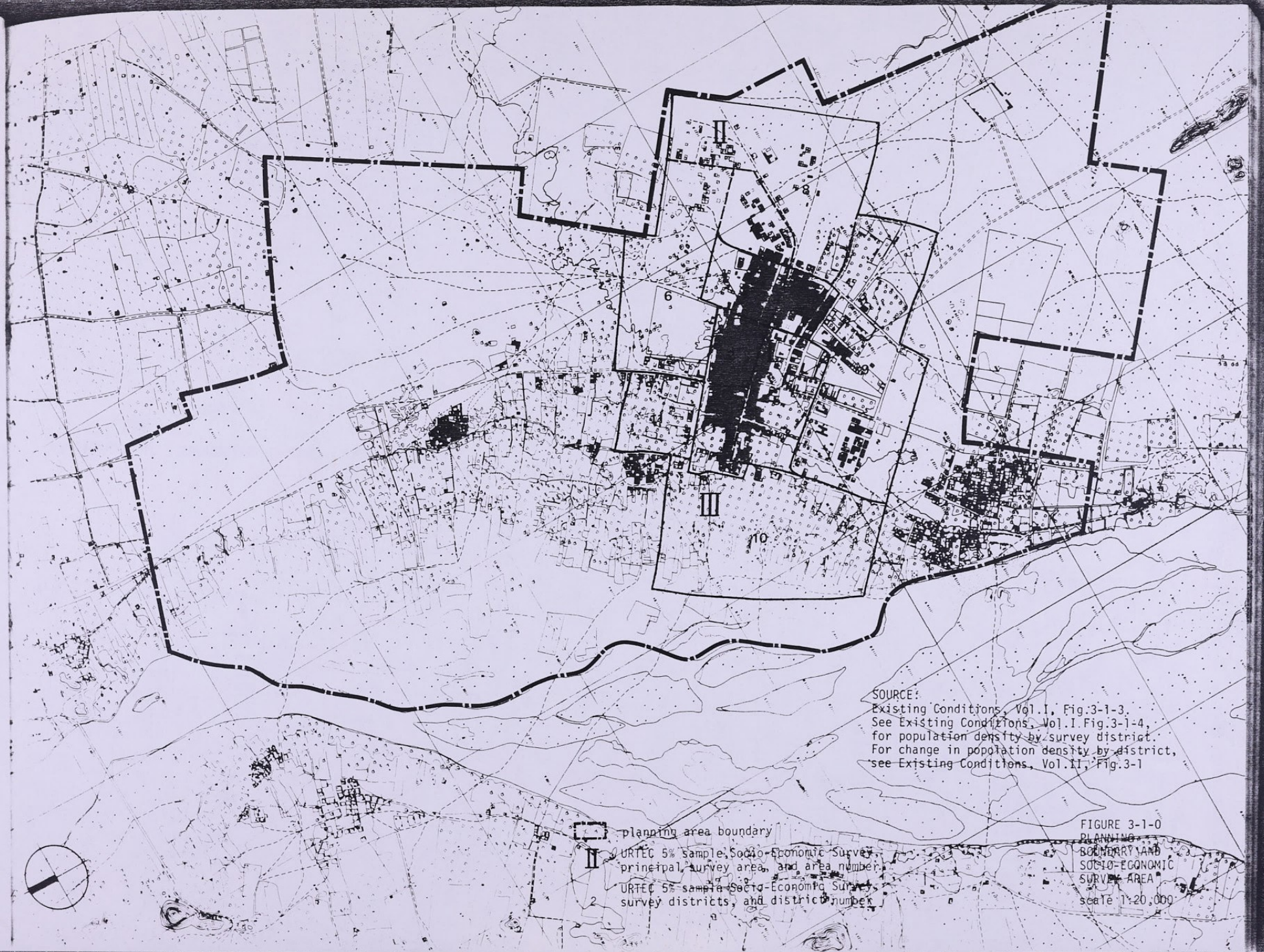
1995

36,600  
20,300  
28,000

31,000  
15,400  
23,000

5,500  
4,900  
5,000

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

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

FIGURE 3-1-0  
PLANNING  
BOUNDARY AND  
SOCIO-ECONOMIC  
SURVEY AREA  
scale 1:20,000

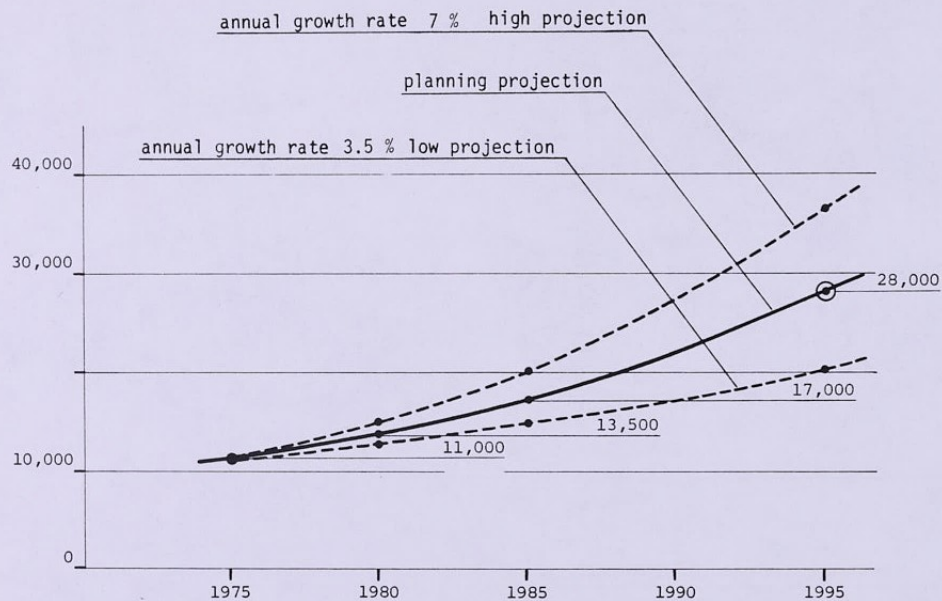
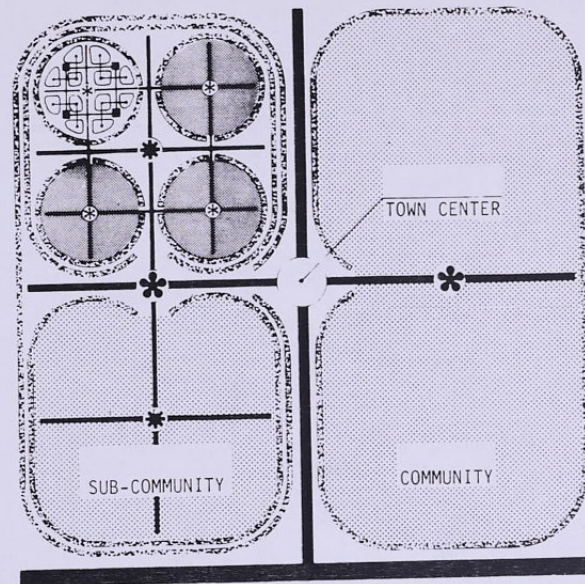


FIGURE 3-1-1  
PROJECTED  
GROWTH OF  
POPULATION



- 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

carbon industry in other parts of the Kingdom.

- e. Relatively depressed salaries. The average salary in the five cities of the Southern Region is about half that of urban industrial areas of the Eastern Region, and that rural salaries in the Southern Region are half those of urban areas.
  - f. Out-migration is most predominant among males aged 15-35; the out-migration rate of the population aged 15-25 is estimated at 75%. Further, the volume of out-migration has been doubling once every five to six years. This will have a severe impact on the regional labor force (which is only about 20% of the total population), which may be alleviated somewhat by in-migration.
4. In-migrants are of three basic types:
1. Civil servants such as teachers or Government workers assigned to the Region.
  2. Migrants from other Arabic countries, mostly Yemenis and mostly unskilled.
  3. Migrants from rural areas of the Southern Region.

### 3-2 HOUSING NEEDS

Bishah presently has one of the highest mean household sizes of any area in the Southern Region with nearly seven persons per household. This means that the present housing stock contains about 1600 units. The household size is expected to diminish, however, so that the projected increase in housing units is actually greater than the rate of population increase. The household size will decrease to 4.5 by 1995. This will require 6222 housing units, an increase of more than three and one-half the present number.

For the central district alone, there are now about 1140 housing units for a population of 7900. In 1995, the need will exist for 5100 units of housing, more than a four-fold increase.

The land area exists for accommodating these increases, but must be allocated properly. There will be a tendency to make use of good agricultural land for housing purposes if it is not halted by policy and regulation. Since agriculture is the main function of the Southern Region, and a very important activity in Bishah itself, agricultural land must be protected from the encroachment of housing and other urban uses.

FIGURE 3-1  
COMMUNITY  
STRUCTURE  
DIAGRAM

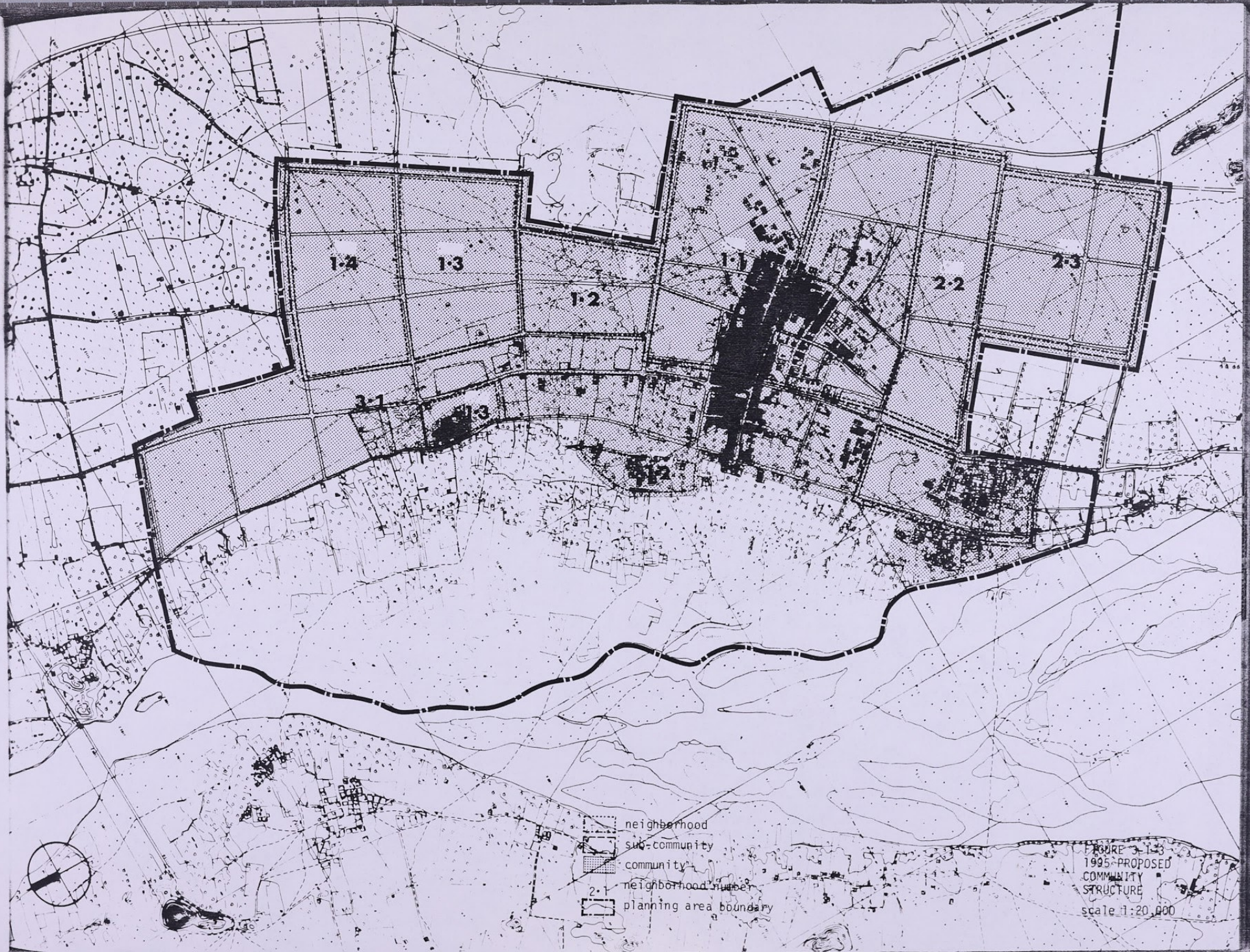
Table 3-1-2  
PROJECTED POPULATION AND HOUSING NEEDS BY DISTRICT

Planning District	1975		1980		1985		1995	
	Popula- tion <sup>a</sup>	House- holds	Popula- tion	House- holds	Popula- tion	House- holds	Popula- tion	House- holds
1.1	3,240	470	5,100	910	4,500	900	5,000	1,100
1.2	500	70	500	90	2,500	500	3,000	660
1.3	500	70	400	70	500	100	4,000	890
1.4	-	-	-	-	400	80	3,500	780
1	4,240	610	6,000	1,070	7,900	1,580	15,500	3,440
2.1	1,580	230	3,000	540	3,500	700	3,500	780
2.2	-	-	-	-	2,300	460	3,000	670
2.3	-	-	-	-	-	-	3,500	780
2.4	2,100	300	2,100	370	2,200	440	2,500	550
2	3,680	530	5,100	910	8,000	1,600	12,500	2,780
3.1	-	-	-	-	-	-	-	-
3.2	3,080	440	2,400	430	1,100	220	-	-
3	3,080	440	2,400	430	1,100	220	-	-
Total	11,000	1,580	13,500	2,410	17,000	3,400	28,000	6,220
Household Size	6.86 <sup>b</sup>		5.6		5.0		4.5	

NOTES:

a. From URTEC 5% Sample Survey and Italconsult.

b. From URTEC 5% Sample Survey. The mean household size is assumed to reduce at a decreasing rate.



It is clear that the increasing population and decreasing household size will combine to produce a tremendous need for new housing in the coming twenty years. Careful attention must be paid to the planning and implementation in order to meet the objectives of producing good quality housing for all persons, maximizing the efficiency and convenience of land use patterns, and protecting agricultural land and preventing urban sprawl.

There are two general points to this policy.

1. The provision of better housing for all citizens of the Kingdom and all residents of Bishah. The following are among the specific steps which should be taken:
  - a. housing construction by the Government for sale and rent,
  - b. provision of bank loans for housing construction,
  - c. provision of a subsidy for specific improvements within housing units such as sanitary facilities and structural reinforcement,
  - d. improvement of the environment outside of houses by the Government such as provision of sewer and street pavement.
2. Preservation of existing housing stock (as well as other buildings) through the following:
  - a. implementation of zoning and other regulatory processes as discussed in Chapter 9, "Land Use" and Chapter 10, "Administration and Management,"
  - b. designation of specific neighborhoods or houses for preservation and rehabilitation, with the latter to be heavily subsidized by the Government,
  - c. provision of a subsidy for complying with specific conditions in regard to building design set by the Government.

Due to a relatively small population size of this city, most of residential areas should have low density development with low-rise buildings. The residential areas can be classified into three with the maximum density as follows:

1. Low density      less than 100 pph
2. Medium density    100 pph to 200 pph
3. High density      over 200 pph

Due to the economic value of the central area, only high density development should be allowed in the central area. Low density development should be restricted in the peripheries, with medium density development filling in inbetween. The residential area as a whole should aim at a net density of about 30 housing units per hectare.

Table 3-3-1  
OBSOLESCENT HOUSING

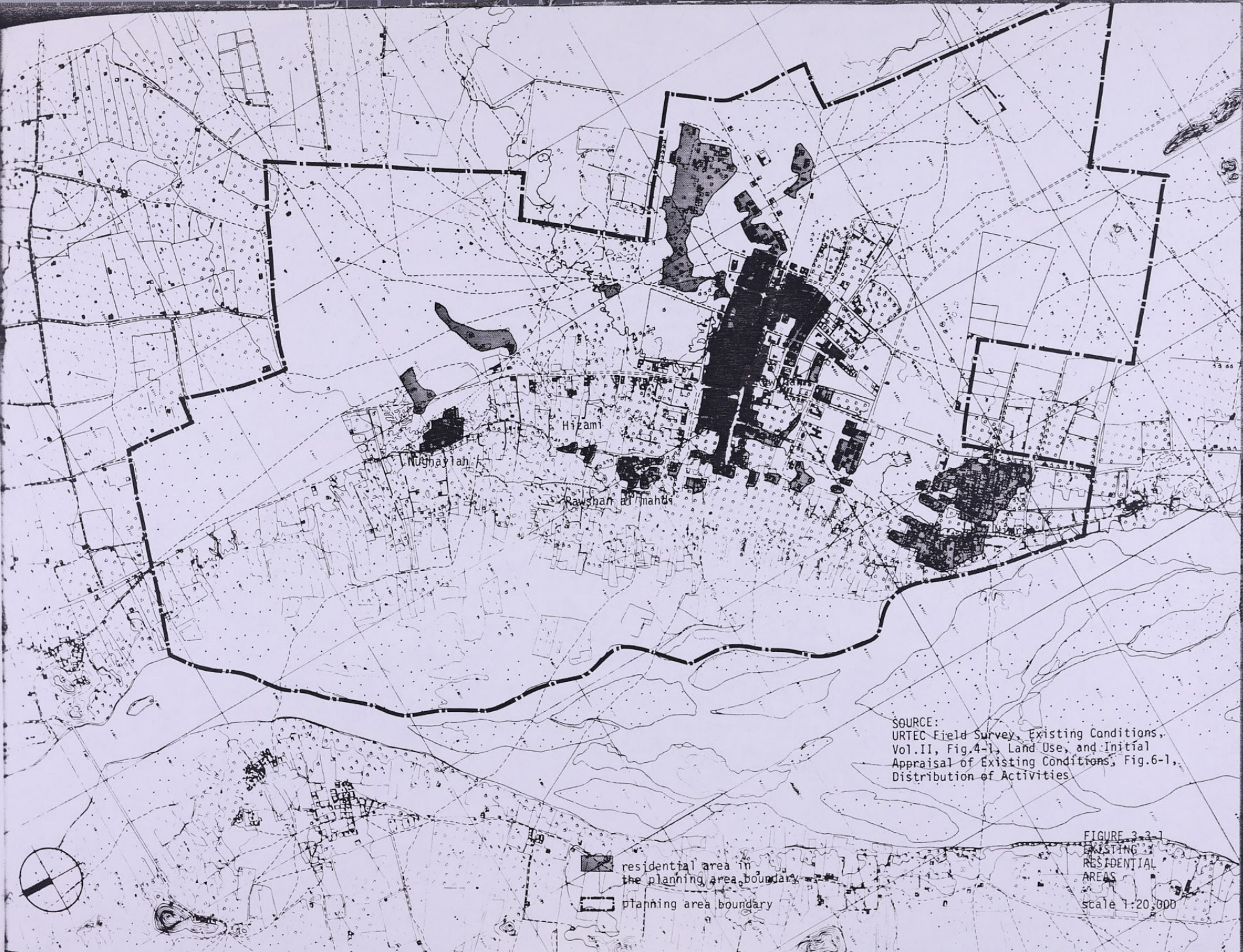
	Central District	Outlying District
Collapsing Houses	105 units	50 units
Aged Houses	245	340
Simple Shelters	790	50
Insanitary Houses	390	440

Note:

These classifications of obsolescence are not mutually exclusive. Most of aged houses and simple shelters suffer from insanitary conditions, and most collapsing houses are also aged houses. For spatial distribution of obsolescent housing, see Bishah, Initial Appraisal of Existing Conditions, Fig. 6-3-3.

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fig. 3-3.



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

residential area in  
the planning area boundary  
planning area boundary

FIGURE 3-3-1  
EXISTING  
RESIDENTIAL  
AREAS  
scale 1:20,000

3-4 HOUSING LAND USE

3-4-1 CRITICAL ISSUES

Bishah's housing needs will expand by as much as three and four times over the coming twenty years, which illustrates how the orderly and planned use of the land for residential and other purposes is of critical importance. Up to the present time, the form of housing development has been largely in accord with traditional agricultural patterns. But as the administrative and commercial functions increase their roles and as additional growth occurs, it will be necessary to plan more comprehensively. The issues that must be taken into account in establishing an orderly system of housing land use are size, density, use, and location.

1. Size. The mean size of rural housing units is about 100 m<sup>2</sup>, which seems large. However, this includes much space used for animals and storage of food and implements. Further, more than one family unit often lives in the same housing unit. In light of this, it would be possible to reduce the average size of a single family dwelling unit in the urban area in comparison with those in the rural areas, without reducing the per person space available or creating an uncomfortable living environment.
2. Density. Conservation and efficient use of land in the central parts of Bishah are important to maximize use of infrastructure and provide the most convenient manner of living and working. It is therefore the policy to increase density to a level of 1 unit/200-250 m<sup>2</sup> by zoning controls and to ensure that future development is in accord with this standard.
3. Use. Residences have traditionally been used for a variety of purposes in addition to housing, such as small shops or the keeping of animals, but it may be necessary to restrict uses in the future. If higher densities are developed, for example, it would be unsanitary for animals to be kept. Section 9, "Land Use" deals with this issue in detail.
4. Location. The location of housing is determined by a variety of factors such as existing housing locations or proximity to markets or fields. Because of the high priority which has been given to agricultural production, it is the policy to protect farmland from being changed into residential land.

3-4-2 RESIDENTIAL DENSITY AND BUILDING TYPE

The projected 1995 housing requirements of 6,220 dwelling units (Table 3-1-2) have been distributed according to a residential land use plan (Fig.3-4-1). Following the existing pattern of use, it is recommended that areas immediately adjacent to the principal road in Rawshan be set aside for high density residential. Land adjacent to this area should be preserved for medium density, and the remaining residential lands should be maintained for low density use.

Planning Standards, appendix to Southern Region Final Master Plan indicate the relationship between net neighborhood density and net residential density. In the present case, the following relationships among gross density, net neighborhood density, net residential density, and net residential density may be expected (Table 3-4-1).

Table 3-4-1  
PROPOSED RESIDENTIAL DENSITY AND BUILDING TYPE

Density Classification	Gross Density Range (pph) <sup>a</sup>	Net Neighborhood Density <sup>b</sup> (pph)	Net Residential Density <sup>c</sup> (pph)	Building Type <sup>d</sup>
Low	100	75	125	Standard to Small Villa
Medium	100 - 200	175	400	Two to three Story Multi Family
High	200	200	550	Four Story Multi-Family

Notes:

- a. Units in persons per hectare (pph).
- b. See Planning Standards, appendix to Final Physical Plan, for definitions of net neighborhood and net residential density.
- c. Obtained from Planning Standards, Fig. A-2-8.
- d. See Ibid, Table A-2-8.



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

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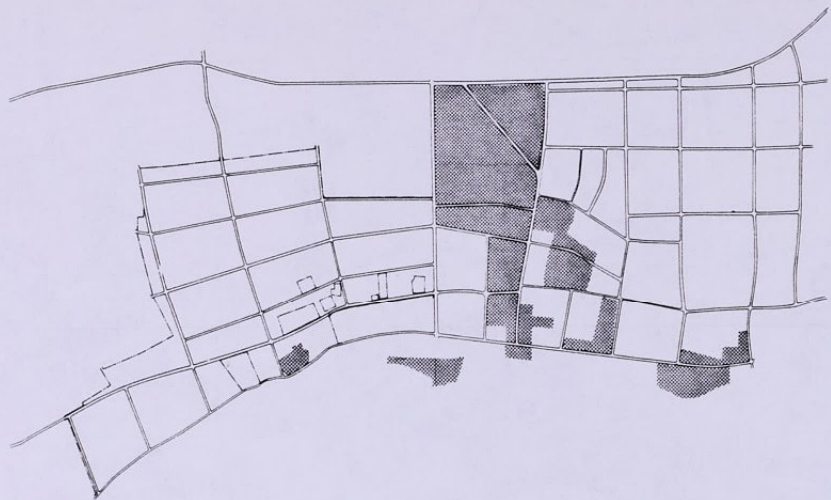
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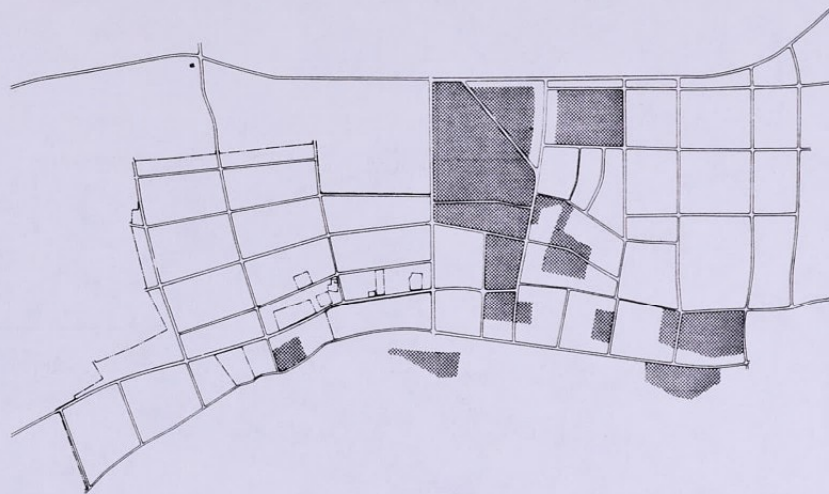
-  proposed residential area
-  1.1 planning district number
-  planning area boundary

Residential area includes  
 other land uses for  
 neighborhood services.

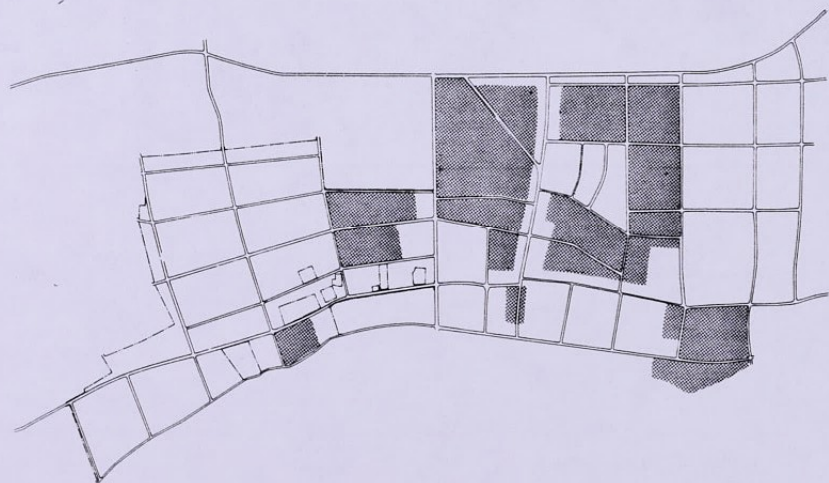
FIGURE 3-4-1  
 1995 PROPOSED  
 RESIDENTIAL  
 LAND USE  
 Scale 1:20,000



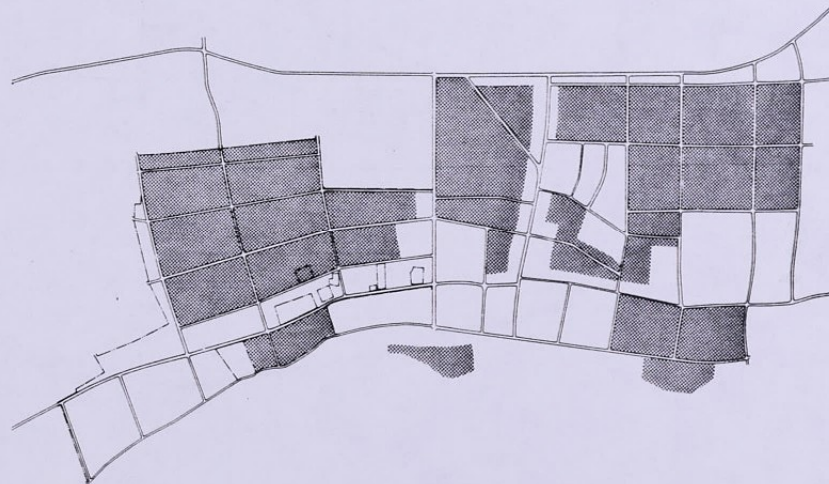
1975



1980



1985



1995


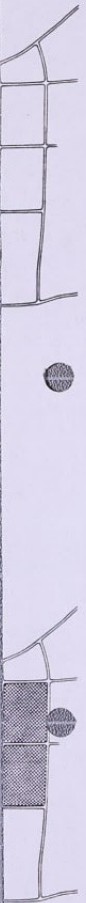
 residential area

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



4. employment

FIGURE 3-4-2  
GROWTH OF  
RESIDENTIAL  
AREA 1975 - 1990  
Scale 1:40,000

#### 4-1 SECTORAL COMPOSITION AND PROJECTIONS

##### 4-1-1 GENERAL

The dominant statistic about the present labor market is that nearly sixty percent of the jobs, and nearly ninety percent of the salaries paid are associated with the Government. This includes both jobs directly paid for or sponsored by a Governmental agency, and construction projects for Government facilities; the remainder are in some form of agricultural work.

The present situation, and that of the immediate future, is established by the following conditions:

1. A low unemployment rate. This means that there are still opportunities for jobs for those who wish to migrate to Bishah.
2. The likelihood that certain types of activities, particularly construction (which is labor-intensive) will continue, although probably at a lower rate than before.
3. A lack of any likelihood that agricultural employment will increase. This is due to the fact that date growing, which makes up most of the agricultural activity in Bishah, has a relatively low intensiveness of labor; and that any increase in the volume of date growing is likely to be accompanied by increased mechanization, thus offsetting any need for additional labor.
4. A larger indigenous labor force.

##### 4-1-2 SECTORAL DISTRIBUTION

The sectoral distribution of employment within the survey area (Fig. 3-1-0) has been estimated and analyzed in a previous report [1]. Since the planning area has been extended in this report (see Sec. 2-6 above), it is necessary to re-estimate the distribution of employment within the new project area.[2] Based on field observations and interviews conducted subsequent to the URTEC 5% Sample Survey, the following assumptions have been adopted:

1. The labor force participation rate of the population in the planning area outside the survey area is equal to the participation rate inside the survey area.

2. Approximately one-half of the employment outside the survey area are engaged in agricultural and livestock production.
3. The remaining one-half of the employment outside the survey area are distributed among the various non-agricultural sectors in roughly the same proportion as the employment inside the survey area.

Thus, of the 3,100 people lining in the planning area outside the survey area, 17.7%, or 550 workers, are assumed to be employed [3]. One-half, or 275 workers, are assumed to be engaged in agriculture and the remaining workers distributed among the other sectors. The results are summarized in Table 4-1-0.

##### 4-1-3 EMPLOYMENT PROJECTION

The following assumptions have been made in the projections of employment in Bishah:

1. Labor Force Participation Rate  
The existing labor force participation rate has been estimated on the basis of the URTEC 5% Sample Survey [4]. In the future, as more women enter the labor force and as life expectancy increases, the participation rate is expected to increase gradually over time. Increase of 2 percentage points every five years is assumed.
2. Primary Sector  
It is assumed that the agricultural employment in the city of Bishah will grow at the same expected rate as the demand for agricultural workers in the Wadi Quadrangle Sub-region as a whole. Thus the number of workers demand for irrigated farming, dry farming, and livestock production for the Wadi Quadrangle Sub-region have been aggregate to yield total growth rates of 17%, 35%, and 56% over the existing 1975 number of workers in the years 1980, 1985, and 1995, respectively [5]. At the same time, however, it is expected that mechanization will relieve approximately 5% of the farmers in 1985 and about 15% in 1995, resulting in adjusted total growth rates of 17%, 27%, and 35% in the years 1980, 1985, and 1995. [6]
3. Secondary Sector.  
It is expected that, if the full potential for agricultural process industries is realized, the present share of the workers in the secondary sector may be approximately doubled in 1995 to 15%.
4. Tertiary Sector.  
It is recommended that the government pursue a deliberate policy to encourage the growth of the tertiary sector, exclusive of government employment, in order to provide increased

services to a growing population and to reduce direct dependence on government employment at the same time.

5. Government Sector.

The recent growth of the city appears to be due in large part to recent changes in the domestic policies of the Central Government placing greater emphasis on the provision of social welfare services. These policies have relied on direct employment and transfers. In order to stabilize the local economy, however, it is recommended that the government encourage the growth of the tertiary sector and discourage the direct dependence of the workers on government employment. Thus, as a policy target, it is recommended that, although the absolute number of government employees will rise, the share of the government sector be slightly decreased to 45% overall by 1995.

6. The percentage shares of the various sectors in the intervening years between 1975 and 1995 have been interpolated from the existing and target figures.

For comparison, it may be noted that the sectoral shares of employment in the United States are 3.8%, 22.8%, 35.8%, 22.6%, and 15% in the primary, secondary, tertiary (exclusive of government), government and miscellaneous sectors, respectively. [7] Thus the target rates recommended for Bishah are reasonable in light of the special requirements of the city.

It should be emphasized, however, that the target rates are not predictions, in the sense that they presuppose a series of governmental actions, for example, to improve the present systems of irrigation, to encourage the growth of the tertiary sector, and to encourage the establishment of secondary sector activities. Without the parallel undertaking of these policies, actual employment may greatly differ from the projected figures.

Table 4-1-0  
ESTIMATED 1975 SECTORAL DISTRIBUTION OF  
EMPLOYMENT IN THE ADJUSTED PLANNING AREA

Sector	Inside URTEC Survey Area		Outside URTEC Survey Area		Adjusted Planning Area	
	No. of Workers	%	No. of Workers	Total No. of Workers	%	Sub-Total By Sector %
Primary						
Agriculture						
Livestock	-	-	275	275	14.1	14.1
Mining	-	-	-	-	-	-
Secondary						
Construction	120	8.6	24	144	7.4	8.6
Manufacturing	20	1.4	4	24	1.2	
Tertiary						
Trade	400	28.6	79	479	24.6	27.1
Finance	-	-	-	-	-	-
Insurance	-	-	-	-	-	-
Real Estate	-	-	-	-	-	-
Transportation	-	-	-	-	-	-
Communication	-	-	-	-	-	-
Utility	-	-	-	-	-	-
Service	40	2.9	8	48	2.5	
Government						
Government	800	57.1	156	956	49.0	49.0
Other	20	1.4	4	24	1.2	1.2
Other						
Total	1,400	100.0	550	1,950	100.0	100.0

Table 4-1-1a  
PROJECTIONS OF EMPLOYMENT

	1975	1980	1985	1995
Labor Force Participation Rate (%) <sup>a</sup>	17.7	19.7	21.7	25.7
Planning Population in the Central District <sup>b</sup>	7,900	10,500	13,000	23,000
Employment in the Central District	1,400	2,070	2,820	5,900
Population in Planning Area	11,000	13,500	17,000	28,000
Employment in the Planning Area	1,950	2,660	3,690	7,200

Notes:

- a. Assumed to increase 2 percentage points every five years. See Text
- b. From Table 3-1-1.
- c. Project population in the planning area times the labor force participation rate.

Table 4-1-1(b)  
PROJECTED SECTORAL COMPOSITION OF EMPLOYMENT  
IN THE PLANNING AREA

Sector	1975 Existing <sup>a</sup>		1980		1985		1995	
	No. of Workers	%	No. of Workers	%	No. of Workers	%	No. of Workers	%
Total Employment	1,950	100.0	2,660	100.0	3,690	100.0	7,200	100.0
Primary Sector	275	14.1	320	12.0	350	9.5	360	5.0
Secondary Sector	168	8.6	270	10.3	440	11.9	1,080	15.0
Tertiary Sector <sup>c</sup>	527	27.1	780	29.3	1,150	31.2	2,520	35.0
Government	956	49.0	1,290	48.4	1,750	47.4	3,240	45.0
Other	24	1.2	-	-	-	-	-	-

Notes:

- a. From Table 4-1-0
- b. For assumptions behind target shares, see text. The intervening years are interpolated from existing and target shares.
- c. All commercial and service sectors exclusive of government employment

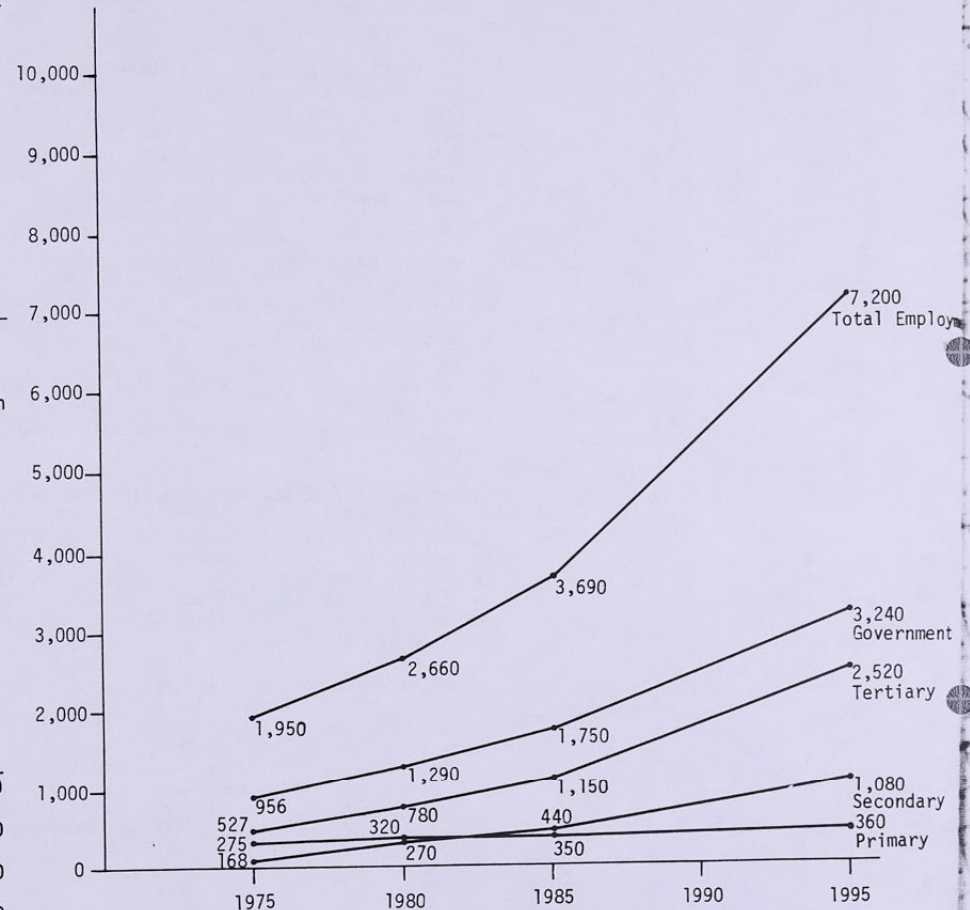


FIGURE 4-1-1  
PROJECTED  
GROWTH OF  
EMPLOYMENT BY SECTOR

● 2,200  
 Total Emp

● 3,240  
 Governme

● 2,520  
 Tertiary

● 1,080  
 Secondary

● 360  
 Primary

1995

BY SECTOR

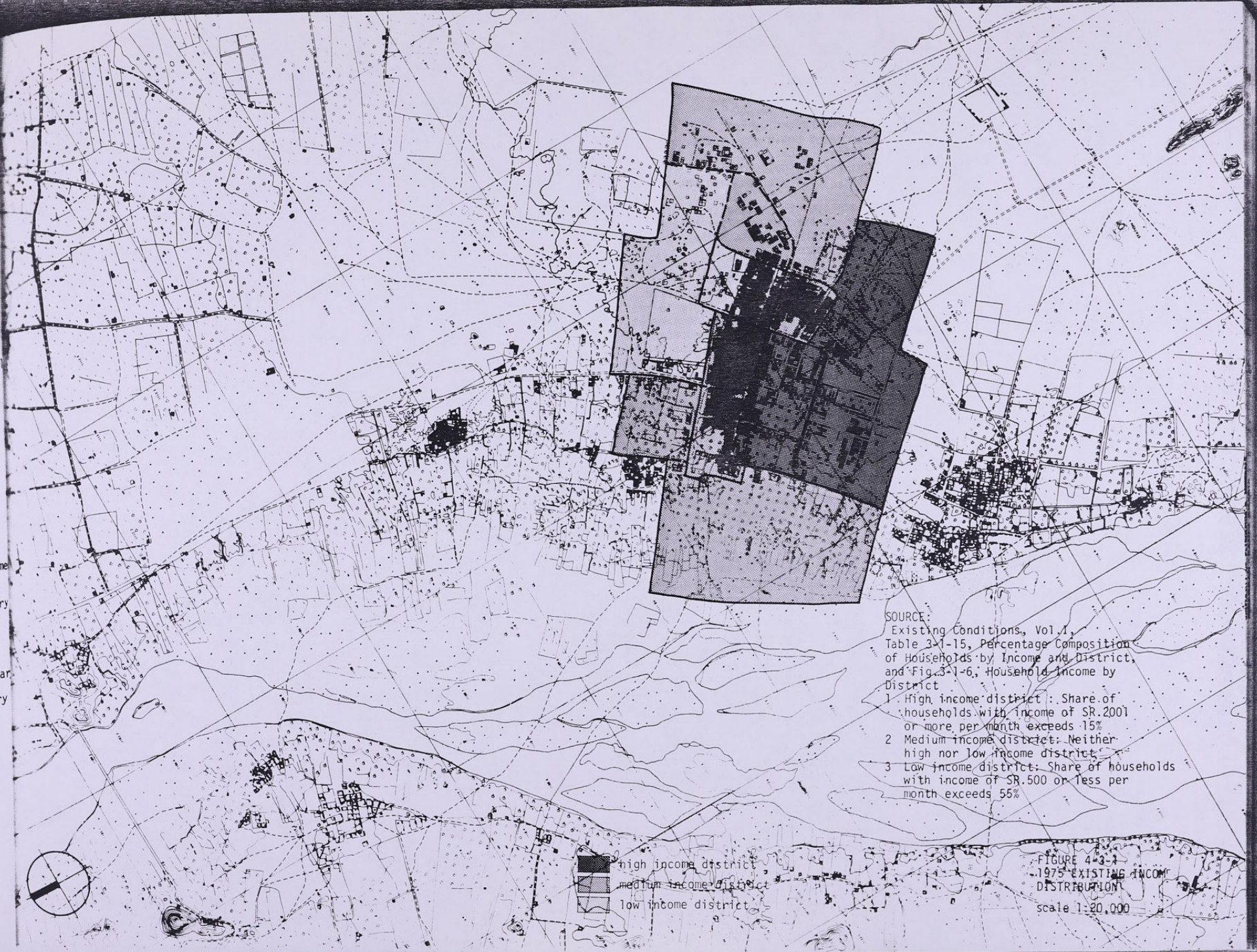


■ high income district  
 ▨ medium income district  
 ▩ low income district

SOURCE:  
 Existing Conditions, Vol.1,  
 Table 3-1-15, 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%

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



#### 4-2 DISTRIBUTION OF EMPLOYMENT CENTERS

Employment in Bishah is concentrated in the following five fields:

1. Direct Government employment.
2. Indirect Government employment, e.g. construction of Government buildings, roads, public works facilities, etc.
3. Agriculture, largely date growing.
4. Agro-industry, largely processing and packing of dates.
5. Commercial employment, ranging from informal sale of items in the Suq to distribution of commercial goods shipped into Bishah from elsewhere in the Kingdom.

Government employment takes place for the most part in the central area, with some scattered elsewhere as in schools. This is likely to remain essentially the same. Indirect Government employment takes place wherever construction and development activities are under way; for the immediate present, this is also likely to be concentrated in the central area. The possible exceptions may occur if large-scale construction takes place elsewhere, as in the building of the connector road previously discussed. Agricultural employment will continue to be located along the wadi, since it is determined by the availability of water.

Thus of the five, agro-industry and commercial employment are the sectors most capable of being influenced by Governmental policy.

#### 4-3 INCOME DISTRIBUTION

The per capita wage in Bishah is high, relative to other areas of the Southern Region, at nearly SR 1000/mo. This is a function of the relatively high salaries paid in connection with Government work, whose rate of increase is not expected to continue. Further, there is a high differential between urban and rural workers as well as one among the regions of the Kingdom. As a rule, urban workers in the Southern Region make about twice what rural or agricultural workers earn, and urban workers in other parts of the Kingdom (particularly the oil fields of the Eastern Region) make about twice the wages of their counterparts in the Southern Region. The income distribution policy thus needs to address a wage differential that varies internally within the Southern Region by two hundred or more percent, and nationally by four hundred or more percent.

It appears that the need is for a policy that will address two areas:

1. Promotion of industrial and commercial development in Bishah and the Southern Region. This is desirable because the wages available in such activities are generally higher than those found in agriculture and because of the likelihood of secondary economic activities developing from initial investment. It is also desirable as a balance to the high proportion of public employment in Bishah.
2. Support to agriculture. In all likelihood it will be necessary to provide sizeable financial support to agriculture. This will serve several objectives:
  - a. Stabilization of population and discouragement of large-scale movement.
  - b. Promotion of nomad settling.
  - c. Increase in agricultural output and promotion of national food self-sufficiency.
  - d. Promotion of the type of development which is likely to produce the greatest long-term benefits for the Kingdom.

#### 4-4 INDUSTRIAL LOCATION

##### 4-4-1 LOCATION POLICY

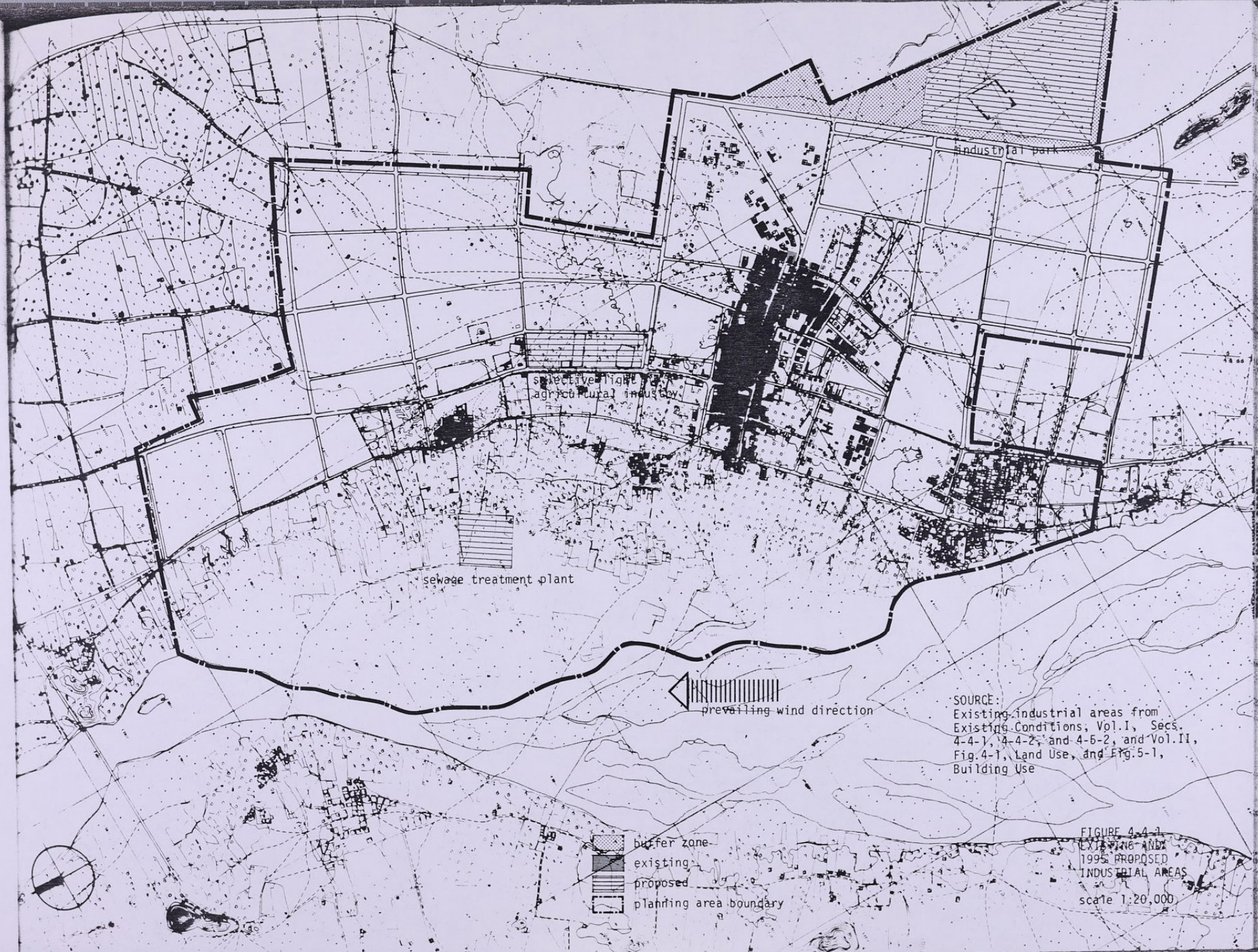
The only actual industrial use that is expected to occur in Bishah in the near future is processing of dates.

Industrial location policy should take the following objectives into account:

1. Maximization of efficiency of location with regard to transportation of raw and finished products, communication, association with similar functions, convenience of workers and patrons, and so on.
2. Maximization of the use of infrastructure, such as water supply, electric lines, and waste disposal facilities.
3. Minimizing the impact upon other uses, particularly residential and farming areas.
4. Compatibility and support to related commercial activities in order to provide the greatest support to the local and national economic and commercial needs.
5. Adherence to the land use policies with regard to location, size of plot, and intensity of use, as expressed in the plan.
6. Minimizing negative environmental impacts through proper consideration of wind direction.



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

FIGURE 4-4-1  
EXISTING AND  
1995 PROPOSED  
INDUSTRIAL AREAS  
scale 1:20,000

#### 4-4-2 INDUSTRIAL LAND USE

Based on the forgoing policy objective, two general areas have been set aside for industrial use in the city of Bishah (Fig. 4-4-1):

1. A triangular zone of approximately 1.00 ha bordered by the Bishah airport on the east and by the extension of the road to Khamis Mushayt on the northwest. It is proposed that this zone be planned in a manner similar to the new industrial zone immediately west of Khamis Mushayt. It is recommended, however, that any industry with potentially excessive smoke or noise be located further away from the city along the road to Khamis Mushayt. The triangular zone should be reserved for relatively "clean" industries which require large amounts of space, such as concrete block manufacturing, automobile repair, and a sub-regional trucking and distribution center. It is also recommended that a buffer zone of 50m or more be reserved along the Khamis Mushayt road for planting in order to provide visual and environmental relief.
2. The miscellaneous agricultural lands at the Southwest corner of the Hizami Development Area and along the newly paved road from the center of the city to Ad Dahw. Recently, the Department of Town Planning, Southern Region has approved construction of a date packing factory in this area. Because this area enjoys great accessibility both to the existing agricultural lands and to regional highways, it is recommended that a selective establishment of light agro-industries with minimum environmental impacts be permitted. Unlike the industrial area near the airport, however, applications for industrial uses between the city and the Wadi must be considered on a case-by-case basis. All large scale activities should be directed toward the new industrial area or points south along the Khamis Mushayt road.

Recently, Allott and Lomax Consulting Engineers have conducted water management studies [8] and made a recommendation for the location of a sewage treatment plant northwest of Nughaylah, at the edge of Wadi Bishah. Although the proposed site is generally acceptable, the following considerations should be met:

1. The proposal site is located downwind of the Hizami development area for the most frequent wind direction in Bishah, which is east by northeast. However, the second most frequent wind direction is northwest, and the southern portion of the Hizami development area lies directly downwind of the proposed site. Therefore, adequate consideration must be

given to possible negative effects of the seasonal northwest wind.

2. The proposed site is located at the eastern bank of Wadi Bishah. Since a large number of agricultural communities downstream of Bishah must continue to rely on underground water below and near the wadi for domestic and agricultural water supply, there must be absolutely no contamination of the water in or below the wadi. In order to insure that contamination will not occur,
  - a. The treatment plant must be constructed with particular care for possible leakage, and
  - b. Secondary and tertiary treatments, as well as the primary treatment, should be made before the effluent is discharged.
3. The proposed site is subject to potential flooding by the seasonal wadi. The treatment plant must be sufficiently protected from such flooding.

#### CHAPTER 4 NOTES

1. Bishah, Existing Conditions, Vol. I, Sec.3-2.
2. See Bishah, Alternative Strategies, Sec.4-1-1.
3. See Table 3-1-1 above and Table 4-1-1a.
4. Bishah, Existing Conditions Vol. I, Sec.3-2.
5. From Southern Region, Preliminary Physical Plan, Tables 5-2-16, 5-2-17, and 5-2-18.
6. For a discussion of mechanization, See Southern Region, Preliminary Physical Plan, Sec. 7-2.
7. Bureau of Labor Statistics, U.S. Department of Commerce, 1977.
8. Ministry of Municipal and Rural Affairs, City of Bishah, Water Management Preliminary Design Studies, Allott & Lomax Consulting Engineers.

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## 5-1 GENERAL EDUCATION

### 5-1-1 EXISTING CONDITIONS

A Directorate of Education existed in this area for a long time, and in 1954 it was upgraded to ministerial level. The budget of the ministry has been enlarged considerably in recent years, although reaching nomads and those in remote areas has been difficult. At present the adult literacy rate is fairly low, but over ninety per cent of the children attend elementary school so that a dramatic increase in the educational level will come with the rising generation.

At present there are two boys elementary schools and two for girls in the central district of Bishah. In the outlying areas there are typically a boys school and girls school for every three to five hundred school-age children. The more remote villages depend upon Bishah for higher education, since it has the only intermediate and teacher training schools in the area.

The adult male literacy rate is in excess of fifty per cent, which is twice that of some areas in the Southern Kingdom; it is likely that this high rate is at least partly a consequence of well-educated persons who have migrated into Bishah recently, and not necessarily an indication of a high school attendance rate by the indigenous population in the past. The female literacy rate is much lower, about twenty-five per cent. However, the present attendance rates are in excess of ninety-five per cent for boys and ninety per cent for girls, so that literacy rates should increase rapidly in the coming years.

### 5-1-2 PROJECTED ENROLLMENT AND FACILITIES

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

1. Population projections (Chap.4) as the principal basis for educational planning.
2. Grouping of projected populations into a hierarchical order of communities, called the Community Structure.
3. Recommended Standards for enrollment and physical facilities.

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

From a study of the population structure of the five cities in the Southern Region, the expected number of children per hundred population has been computed for each age group. By applying the appropriate coefficients, the total numbers of school age population eligible to enroll in the primary, intermediate, and secondary schools

may be determined. Recommended target enrollment rates produce the total projected enrollment at each educational level, and the size of the resident population and that of the expected enrollment determine a grouping of population into appropriate school districts for elementary, intermediate, and secondary schools. Finally the number of school districts forming the Community Structure determines the number of schools.

The total number of schools required in the future is compared with the existing number and distribution of schools. Any inadequacy in the number of schools must be corrected by conversion of existing schools or construction of new schools.

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

The target rates of school enrollment for 1980 and beyond are 100% for elementary boys and girls schools, 100% for intermediate boys and girls schools, 50% for secondary boys school, and 30% for secondary girls school. Although there may be some difficulty in achieving these rates by 1980, assumption of these rates is justified by the following, temporary characteristics of existing general education in the Southern Region:

1. Currently, there are some discrepancies between the ages of some students and their grade levels in school. This is due to irregular entry ages in the past and to some instances of uneven advancement.
2. Because there are few schools outside the city, many children from the surrounding rural areas also attend the schools in the city. As schools are built in rural areas, it is expected that the children will be able to attend schools in their own neighborhoods.

Thus, each neighborhood in the planning area will have one boys elementary school and one girls elementary school. Each sub-community will have one boys and one girls intermediate school, and Bishah as a whole will be equivalent to a community with one boys and one girls secondary school.

Numerical projections have been made on the basis of standards contained in Planning Standards, appendix to Southern Region, Preliminary and Final Physical Plans. The projections are summarized in Tables 5-1-1a, 5-1-1b, and 5-1-1c.

Table 5-1-1a  
PROJECTED GENERAL EDUCATION AREA REQUIREMENTS

ELEMENTARY

	1975 <sup>a</sup>	1980	1985	1995
Planning Population	11,000	13,500	17,000	28,000
<b>Boys</b>				
No. of School Age Population <sup>b</sup>	1,050	1,300	1,600	2,700
No. of Students	1,050	1,300	1,600	2,700
No. of Schools	3	4	6	9
Total Floor Area (m <sup>2</sup> ) <sup>c</sup>	4,730	5,850	7,200	12,200
Land Area for Building(ha) <sup>d</sup>	1.3	1.6	1.9	3.2
Playground Area(ha) <sup>e</sup>	2.1	2.6	3.2	5.4
Total Land Area(ha)	3.4	4.2	5.1	8.6
<b>Girls</b>				
No. of School-Age Population <sup>b</sup>	1,050	1,300	1,600	2,700
No. of Students	1,050	1,300	1,600	2,700
No. of Schools	3	4	6	9
Total Floor Area (m <sup>2</sup> ) <sup>c</sup>	4,730	5,850	7,200	12,200
Land Area for Building(ha) <sup>d</sup>	1.3	1.6	1.9	3.2
Playground Area(ha) <sup>e</sup>	2.1	2.6	3.2	5.4
Total Land Area (ha)	3.4	4.2	5.1	8.6
<b>Total</b>				
No. of Schools	6	8	12	18
Total Floor Area (m <sup>2</sup> )	9,900	12,160	15,300	25,200
Total Land Area(ha)	6.8	8.4	10.2	17.2

Notes:

- Figures for 1975 indicate the required number and size of schools, if the recommended standards are to be satisfied
- Assume 19% of the total population will be in age groups 6 to 11.
- Based on 4.5 m<sup>2</sup>/student. See Planning Standards, Sec. A-2-1-2 and A-2-1-3.
- Land area for building includes building area (building coverage), vehicular and pedestrian circulation (including parking), and minimum setbacks and landscaping. 20m<sup>2</sup>/student is recommended.
- Playground area at 20m<sup>2</sup>/student. See Planning Standards, Sec. A-2-2-4.

Table 5-1-1b  
PROJECTED GENERAL EDUCATION AREA REQUIREMENTS

INTERMEDIATE

	1975 <sup>a</sup>	1980	1985	1995
Planning Population	11,000	13,500	17,000	28,000
<b>Boys</b>				
No. of School Age Population <sup>b</sup>	410	510	640	1,050
No. of Students	410	510	640	1,050
No. of Schools	1	1	2	2
Total Floor Area (m <sup>2</sup> ) <sup>c</sup>	2,700	3,300	4,200	6,800
Land Area for Building(ha) <sup>d</sup>	0.8	1.0	1.3	2.1
Playfield (I) Area(ha) <sup>e</sup>	1.2	1.5	1.9	3.2
Total Land Area(ha)	2.0	2.5	3.2	5.3
<b>Girls</b>				
No. of School Age Population <sup>b</sup>	410	510	640	1,050
No. of Students	410	510	640	1,050
No. of Schools	1	1	2	2
Total Floor Area (m <sup>2</sup> ) <sup>c</sup>	2,700	3,300	4,200	6,800
Land Area for Building(ha) <sup>d</sup>	0.8	1.0	1.3	2.1
Playfield (I) Area(ha) <sup>e</sup>	1.2	1.5	1.9	3.2
Total Land Area (ha)	2.0	2.5	3.2	5.3
<b>Total</b>				
No. of Schools	2	2	4	4
Total Floor Area (m <sup>2</sup> )	5,400	6,600	8,400	13,600
Total Land Area (ha)	4.0	5.0	6.4	10.6

Notes:

- Figures for 1975 indicate the required number and size of schools, if the recommended standards are to be satisfied.
- Assume 7.5% of the total population will be in age groups 12-14.
- Based on 6.5 m<sup>2</sup>/student. See Planning Standards, Sec. A-2-1-4 and A-2-1-5.
- Land area for building includes building area (building coverage), vehicular and pedestrian circulation (including parking), and minimum setbacks and landscaping 20m<sup>2</sup>/student is recommended.
- Playfield, Level I, at 30m<sup>2</sup>/student. See Planning Standards, Sec. A-2-2-6.

Table 5-1-1c  
PROJECTED GENERAL EDUCATION AREA REQUIREMENTS

SECONDARY

	1975 <sup>a</sup>	1980	1985	1995
Planning Population	11,000	13,500	17,000	28,000
Boys				
No. of School Age Population <sup>b</sup>	410	510	640	1,050
No. of Students <sup>c</sup>	205	255	320	525
No. of Schools	1	1	1	1
Total Floor Area (m <sup>2</sup> ) <sup>d</sup>	1,400	1,800	2,200	3,700
Land Area for Building (ha) <sup>e</sup>	0.5	0.6	0.8	1.3
Playfield (II) Area (ha) <sup>f</sup>	1.0	1.3	1.6	2.6
Total Land Area (ha)	1.5	1.9	2.4	3.9
Girls				
No. of School Age Population <sup>b</sup>	410	510	640	1,050
No. of Students <sup>c</sup>	120	150	190	320
No. of Schools	1	1	1	1
Total Floor Area (m <sup>2</sup> ) <sup>d</sup>	800	1,100	1,300	2,200
Land Area for Building (ha) <sup>e</sup>	0.3	0.4	0.5	0.8
Playfield (II) Area (ha) <sup>f</sup>	0.6	0.8	1.0	1.6
Total Land Area (ha)	0.9	1.2	1.5	2.4
Total				
No. of Schools	2	2	2	2
Total Floor Area (m <sup>2</sup> )	2,200	2,900	3,500	5,900
Total Land Area (ha)	2.4	3.1	3.9	6.3

Notes:

- Figures for 1975 indicate the required number and size of schools, if the recommended standards are to be satisfied.
- Assume 7.5% of the total population will be in age groups 15 to 17, evenly divided between boys and girls.
- Enrollment rate is assumed to be 50% for boys and 30% for girls.
- Based on 7m<sup>2</sup>/student, See Planning Standards, Sec. A-2-1-6 and A-2-1-7.
- Land area for building includes building area (building coverage), vehicular and pedestrian circulation (including parking), and minimum setbacks and landscaping. 25m<sup>2</sup>/student is recommended.
- Playfield, Level II, at 50m<sup>2</sup>/student. See Planning Standards, Sec. A-2-2-7.

5-1-3 PROPOSED LAND USE

In general, schools should be located near the centers of the particular community units which they serve. In a small city such as Bishah, however, it is possible to depart from this recommendation.

Recently, the Department of Town Planning-Southern Region, has approved the location of a boys educational center northeast of Rawshan. Due to its centrality, this is an appropriate site for intermediate and secondary schools.

5-2 PUBLIC AND INSTITUTIONAL FACILITIES

5-2-1 HIGHER AND SPECIAL EDUCATION

The only institution of higher learning now in operation in Bishah is the teachers training school, whose nine teachers and twenty-six students hold classes in a facility shared with another school. Future development should be based on the following:

- It is likely that there will be a dramatic increase in the number of persons attending school, particularly the higher levels.
- It is necessary that an adequate teacher-pupil ratio be maintained; thus more teachers will be needed.
- Improvements should be made in the quality of the school as well as the size. An independent facility suitable for higher education should be obtained.

Bishah and the surrounding area have a large nomadic population whose children will attend schools both in the city and in the rural areas. Of the 1,900 school age boys from nomadic families, it is assumed that up to 20%, or 400 boys, will be attending elementary, intermediate, and secondary schools in Bishah. Although this number is expected to decrease significantly as the settlement of nomadic population proceeds, there is a need to construct a special dormitory for children attending schools in Bishah. Suggested site and standards are presented in Table 5-2-1b.

Because of the strong, traditional considerations which influence the education of girls, it is expected that there will not be a demand for girls dormitory. However, should such a demand materialize, a girls dormitory may be constructed with the same space standards as the boys dormitory.

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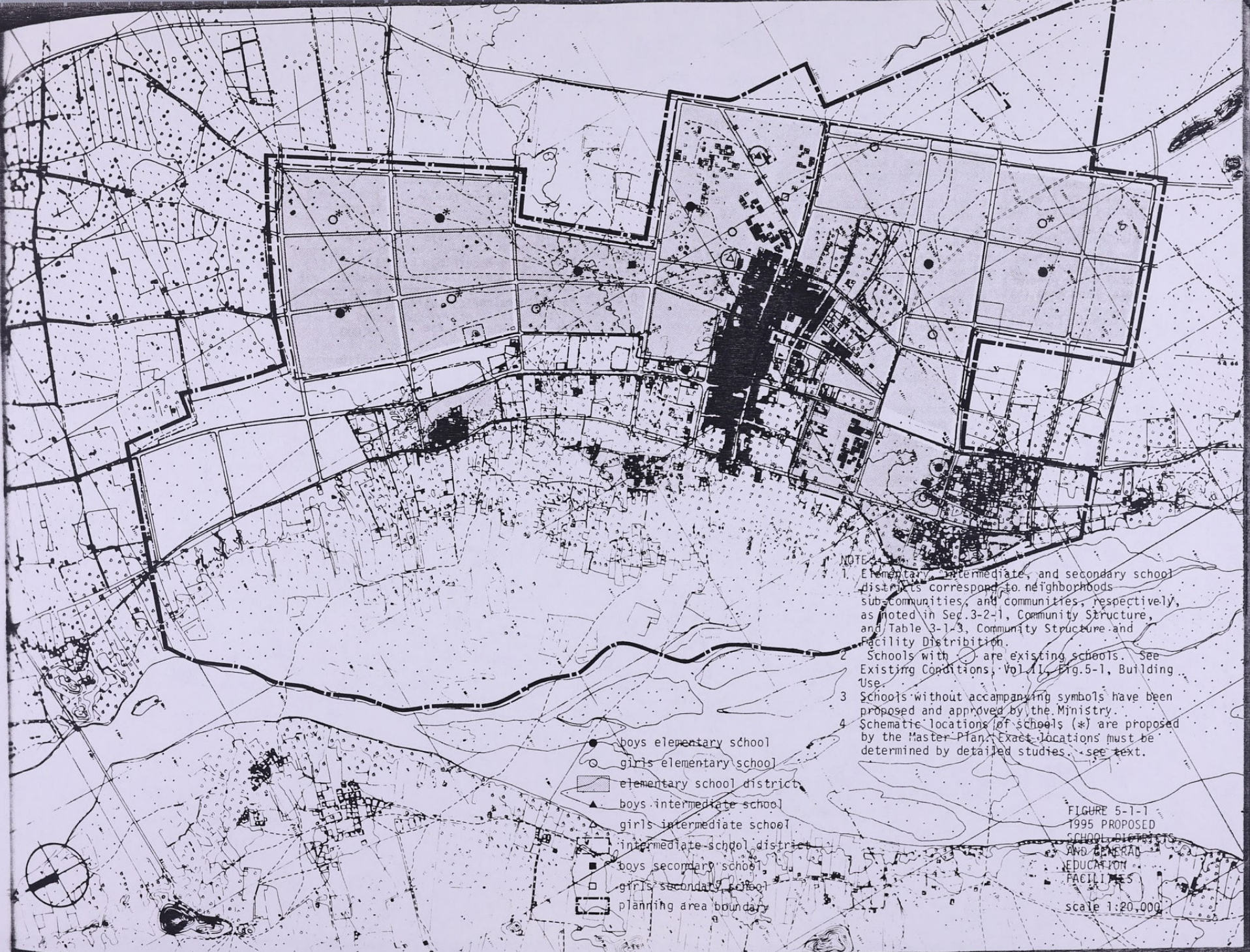
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- NOTE:
1. Elementary, intermediate, and secondary school districts correspond to neighborhoods, sub-communities, and communities, respectively, as noted in Sec. 3-2-1, Community Structure, and Table 3-1-3, Community Structure and Facility Distribution.
  2. Schools with are existing schools. See Existing Conditions, Vol. II, Fig. 5-1, Building Use.
  3. Schools without accompanying 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.

- boys elementary school
- girls elementary school
- elementary school district
- boys intermediate school
- girls intermediate school
- intermediate school district
- boys secondary school
- girls secondary school
- planning area boundary

FIGURE 5-1-1  
1995 PROPOSED  
SCHOOL DISTRICTS  
AND GENERAL  
EDUCATION  
FACILITIES  
scale 1:20,000

Table 5-2-1a  
PROJECTED HIGHER AND SPECIAL EDUCATION AREA REQUIREMENTS

	1975 <sup>a</sup>	1980	1985	1995
<b>Boys Teacher Training School</b>				
No. of Students <sup>b</sup>	60	80	100	160
No. of Schools <sup>c</sup>	-	-	1	1
Total Floor Area (m <sup>2</sup> ) <sup>d</sup>	500	600	800	1,300
Total Land Area (ha) <sup>e</sup>	0.2	0.2	0.3	0.5
<b>Girls Teacher Training School</b>				
No. of Students	40	50	60	100
No. of Schools	-	-	1	1
Total Floor Area (m <sup>2</sup> )	300	400	500	800
Total Land Area (ha)	0.1	0.2	0.2	0.3
<b>Boys Technical School</b>				
No. of Students	60	80	100	160
No. of Schools	-	-	-	-
Total Floor Area (m <sup>2</sup> )	500	600	800	1,200
Total Land Area (ha)	0.2	0.2	0.3	0.5
<b>Girls Technical School</b>				
No. of Students	40	50	60	100
No. of Schools	-	-	-	-
Total Floor Area (m <sup>2</sup> )	300	400	500	800
Total Land Area (ha)	0.1	0.2	0.2	0.3
<b>Total</b>				
No. of Schools <sup>c</sup>	-	-	2	2
Total Floor Area (m <sup>2</sup> )	1,600	2,000	2,600	4,200
Total Land Area (ha)	0.6	0.8	1.0	1.6

Notes:

- Figures for 1975 indicate the required number and size of schools, if the recommended standards are to be satisfied.
- Number of students enrolled in teacher training schools is assumed to be equivalent to 15% of boys aged 15 to 17 and 10% of girls aged 14 to 17. Same standards are used for technical schools. Unlike the students in secondary schools, who are assumed to be residents of Bishah, students in teacher training and technical schools will come from a wider area within the Wadi Quadrangle sub-region.
- Due to the small size of the schools during the first several years of the 20-year period, it is recommended that the teacher training and technical programs be housed along with the secondary school. After 1985, a separate building should be constructed for joint use by the boys teacher training and boys technical programs, and another building for use by girls teacher training and technical schools.
- Based on 8 m<sup>2</sup>/student. See Planning Standards, Sec. A-2-1-8 and A-2-1-9.
- Based on 30m<sup>2</sup>/student. These areas do not include grounds for athletic activities. The playfields of secondary schools should be shared with the students of teacher training and technical schools.

Table 5-2-1b  
BOYS DORMITORY FOR CHILDREN OF NOMADIC POPULATION

	1975 <sup>a</sup>	1980	1985	1995
<b>Planning Projection of Nomadic Population in Bishah and Surrounding Area<sup>b</sup></b>				
	12,300	9,600	7,500	4,500
<b>No. of School Age Boys<sup>c</sup></b>				
	1,900	1,500	1,100	700
<b>No. of Boys Requiring Accommodation</b>				
	400	300	200	150
<b>No. of Dormitories</b>				
	1	1	1	1
<b>Total Floor Area (m<sup>2</sup>)<sup>e</sup></b>				
	6,000	4,500	3,000	2,200
<b>Total Land Area (ha)<sup>f</sup></b>				
	1.0	1.0	1.0	1.0

Notes:

- Figures for 1975 indicate the number and size of dormitories, if the recommended standards are to be satisfied.
- It is assumed that the nomadic population to be served by this facility is limited to those living in Bishah and surrounding areas as listed in the 1974 National Census (See Southern Region, Preliminary Physical Plan, Table 9-1-8). The planning projections are based on the average of the high and low projections for the nomadic population in the Wadi Quadrangle Sub-region.
- The number of boys expected to be in the appropriate age categories for elementary, intermediate, and secondary schools. 15.1% of the total population are assumed to be in this age category. See Planning Standards, Sec. A-1-3.
- It is assumed that some 20% of the boys in the school age categories will attend schools in Bishah. The remaining boys are assumed to attend schools in the rural areas outside the city. It should be noted that these boys are in addition to the expected number of students residing in the city, but they are included in the total expected enrollment as defined in Tables 5-1-1a, 5-1-1b, and 5-1-1c, due to the high enrollment rates assumed in the first years of the project period.
- 15m<sup>2</sup>/student is recommended, of which one-half is reserved for the exclusive use by the student. It should be noted that the demand for dormitory accommodation by nomadic children is assumed to decrease along with the decrease in nomadic population. It may be assumed, however, that excess capacity will be used by other students seeking accommodation in the city.
- 1.0 ha/facility is assumed.



## 5-2-2 MOSQUES

Mosques are required and arranged hierarchically according to community structure. By 1995 each neighborhood should have mosque and each sub-community a Jami'a mosque. The mosques should be located near the centers of the community units which they serve. Educational and cultural facilities should be closely linked to the mosques in order to foster an integration of religious and educational functions.

## 5-2-3 HEALTH CARE

Unlike some of the other areas in the Southern Region, there are no serious epidemic diseases in Bishah [1]. Health and medical needs of the city and its surrounding area are generally routine or preventive, and there are almost no cases of malaria or Bilharzia which are serious threats to health in the Tihama Sub-region

Health problems in Bishah are primarily related to general hygiene. In particular, contamination of publicly supplied water is a serious health hazard. Samples of water have been examined by Allott and Lenox [2] and found to be unsuitable for human consumption. Garbage disposal is also inadequately controlled. As the population of the city increases, present practice of open-air dumping should be discontinued.

Thus, the objectives of health care policy in Bishah should therefore follow the national objectives of the Kingdom to provide a comprehensive system of preventive health services. In particular, health care policy in Bishah should strive:

1. To increase the number of modern hospital beds so that by 1980 the standard of 2.5 beds per 100 population will be met.
2. To increase the number of clinics, dispensaries, and other subordinate facilities so that such services are convenient to all sectors of the population.
3. To increase the number of supportive facilities so that it is not necessary for patients to be hospitalized unless there is a real need.
4. To strengthen the system of on-going primary health care and preventive services.
6. To establish a program of nutritional education, with governmental provision of supplements as necessary.
7. To improve public health supportive systems, such as sanitation, inoculation, and other means of disease control.
8. To increase the number of physicians to a ratio of 1 per 2,000 population by 1980.
9. To establish health education programs.

10. To establish a health administration system with primary responsibility at the local level.

Medical services in Bishah in 1975 were concentrated in one general hospital with 62 beds. There were at that time six general practitioners, two specialists, and one dentist, and the hospital treated nearly 46,000 patients.

Currently, the Ministry of Health is planning a new general hospital in Bishah, one hospital for obstetrics and gynecology, and one hospital for accidents [3]. Of the three, a site for the new general hospital has already been recommended by the Department of Town Planning, Southern Region.

The following are some of the issues to be considered in the siting and distribution of new health facilities:

1. Bishah provides medical services to a wide area of the Wadi Quadrangle Sub-region. Hence a new facility should be located in an area easily accessible from the surrounding communities as well as the central urban area. In this regard, the northwestern portion of the new Hizami development area has several desirable characteristics for health care facilities [See Fig. 5-2-1]:
  - a. The land is already owned by the government.
  - b. The land is located away from residential areas which have been planned for most of the development area.
  - c. The land is accessible from the regional thoroughfare which connects Rawshan with the new bridge across Wadi Bishah.
  - d. The land is bordered by quiet, agricultural lands.
  - e. There are some 67 ha of land in this area, sufficient to support a complex of several large hospitals which can share personnel and facilities for an efficient use of resources. Thus, the site recommended by the Department of Town Planning is highly appropriate for the new general hospital.
2. According to the Director General of the Ministry of Health, Southern Region, six accident hospitals are planned for the region, one of which is to be located in Bishah. For reasons already given, a site in the northwestern portion of the Hizami development area should be considered.
3. The Ministry of Health is also planning to construct an obstetrics and gynecology hospital. When the new general hospital is completed, it is recommended that the existing general hospital west of Rawshan be converted for use by an

obstetrics and gynecology program, until such time as a new, expanded facility is required. The new facility should also be located in the northwestern portion of the Hizami development area.

4. There are many advantages to be gained by siting the various hospitals into one complex. Personnel and facilities may be shared; unnecessary duplication of facilities and grounds can be eliminated; and the available resources can be utilized most efficiently. In order to realize these advantages, however, it is necessary to have a phased program for an orderly construction of the facilities. Studies should be undertaken to establish a master plan for the health services complex.
5. The existing hospital should be maintained as an out-patient clinic, even after a new general hospital and other medical facilities have been constructed. The present site is appropriate for out-patient services, since
  - a. It is located close to Al Rawshan and accessible to a large segment of Bishah's population.
  - b. It is located near agricultural lands bordering the wadi, but away from the commercial district of Al Rawshan.

#### 5-2-4 PUBLIC ADMINISTRATION

The public administration functions carried out in Bishah are as follows:

1. Office of the Emir
2. Local offices of the national government, mostly the Ministry of Municipal and Rural Affairs
3. General offices of the municipality
4. Public service office (postal office, telegraph office, driver's license bureau, etc.)
5. Civil Defense Department (fire and police services, etc.)
6. National defense facility
7. Courthouse
8. Prison

Together these occupy about 4.5 ha. This requirement is expected nearly to more than double by 1995.

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

	1975 <sup>a</sup>	1980	1985	1995
Planning Population	11,000	13,500	17,000	28,000
Neighborhood Pharmacy				
No. of Facilities	3	4	6	9
Total Floor Area (m <sup>2</sup> ) <sup>b</sup>	550	700	850	1,400
Total Land Area (ha) <sup>c</sup>	0.4	0.4	0.6	0.9
Sub-Community Diagnosis and Treatment Center				
No. of Facilities	1	1	2	2
Total Floor Area (m <sup>2</sup> ) <sup>d</sup>	100	100	200	200
Total Land Area (ha) <sup>e</sup>	0.3	0.4	0.5	0.8
Total Neighborhood and Sub-Community Facilities				
Total Floor Area (m <sup>2</sup> )	650	800	1,050	1,600
Total Land Area (ha)	0.7	0.8	1.1	1.7

Notes:

- a. Figures for 1975 indicate the number and size of facility, if the recommended standards are to be satisfied. There is no existing pharmacy or treatment center in Bishah.
- b. 0.05m<sup>2</sup>/inhabitant. See Planning Standards, Sec. A-2-5 for this and other recommended standards.
- c. 0.1 ha/unit. There should be one pharmacy for each neighborhood.
- d. 0.01 m<sup>2</sup>/inhabitant.
- e. 0.3 m<sup>2</sup>/inhabitant. There should be one treatment center for each sub-community.

NOTE:  
Proposed new small mosques, pharmacies,  
clinics, and treatment centers are  
tabulated in Table 3-1. Community  
Structure and Facility Distribution  
and schematically shown in Fig. 5-2-1.

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







-  higher and special education
-  mosque (⊕ existing)
-  hospital
-  pharmacy
-  public administration
-  cemetery
-  historic conservation
-  planning area boundary
-  number of planning district

FIGURE 5-2-1  
1995 PROPOSED  
PUBLIC, CULTURAL  
AND INSTITUTIONAL  
LAND USE  
scale 1:20,000

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

	1975	1980	1985	1995
Extended Service Area				
Planning Population <sup>a</sup>	41,500	44,300	48,700	61,700
Recommended Size of Community General Hospital (No. of Beds) <sup>b</sup>	150	160	170	220
Recommended Size of Special Hospital (No. of Beds) <sup>c</sup>	100	130	150	190
Existing General Hospital (No. of Beds)	62	62	62 <sup>d</sup>	- <sup>e</sup>
Land Area (ha)	4.2	4.2	4.2	4.2
Proposed NewsGeneral Hospital <sup>e</sup>	-	-	200-500	200-500
Land Area (ha) <sup>f</sup>	-	-	28.0	28.0
Proposed Obstetrics and Gynecology Hospital <sup>e</sup>	-	-	-	100-200
Land Area (ha) <sup>g</sup>	-	-	-	18.0
Proposed Hospital for Accidents <sup>e</sup>	-	-	-	100
Land Area (ha) <sup>g</sup>	-	-	-	10.0
Total Land Area Existing and Proposed (ha)	4.2	4.2	32.2	60.2

Notes:

- The population of Bishah and the surrounding area according to the 1974 National Census. The population is assumed to grow at an average of high and low projections for the wadi quadrangle sub-region (Southern Region, Preliminary Physical Plan, Table 9-3-5).
- Recommended standard is 3.5 beds/1000 inhabitants. See Planning Standards, Sec. A-2-5-3.
- Recommended standard is 3 beds/1000 inhabitants. See Planning Standards, Sec. A-2-5-4.
- It is assumed that, at the completion of a new general hospital, the existing hospital will be temporarily converted to obstetrics and gynecology hospital. When a new obstetrics and gynecology hospital is built, the old hospital should be converted into a community out-patient clinic without facilities for hospitalization.
- Information on proposed hospital obtained from Ministry of Health, Southern Region, and health Office, Abha.

Table 5-2-3  
PROJECTED PUBLIC ADMINISTRATION AREA REQUIREMENTS

	1975 Existing	1980	1985	1995
Employment in Government				
Sector <sup>a</sup>	956	1,290	1,750	3,240
Employment in Public Administration <sup>b</sup>	480	650	880	1,620
Total Floor Area (m <sup>2</sup> ) <sup>c</sup>	13,800 <sup>d</sup>	16,200	22,000	32,400
Total Land Area (ha) <sup>e</sup>	4.5 <sup>d</sup>	4.8	6.6	9.7

Notes:

- From Table 4-1-1b.
- Assumed to be one half of total government employment. The remaining employees are teachers, policemen, and other non-administrative workers.
- Gross floor area per employee is assumed to decline from nearly 30m<sup>2</sup>/employee at present to 20m<sup>2</sup>/employee in 1995. If recommended space standard in Planning Standards, Sec. A-2-7-4.
- Date on existing facilities obtained from field observation and 1974 aerial photographs and map. See Bishah, Existing Conditions, Vol. I, Table 4-2-1, and Vol. II, Fig. 5-1. Buildings are assumed to be one and a half stories high on the average.
- Gross site area is presently some three times the gross floor area. This ratio is assumed to remain constant in the future, although a ratio of 2 is acceptable. See Planning Standards, Sec. A-2-7-4.

Notes, Table 5-2-2b, Continued:

- Site of approximately this size is under consideration by the Department of Town Planning, Southern Region.
- Computed at land area per bed approximately equivalent to the proposed new general hospital.

5-3 CULTURAL FACILITIES

There are many buildings in Bisha which have been constructed from indigenous materials. It is desirable to maintain them for the following reasons:

1. They represent a significant aspect of traditional life in the Southern Region.
2. They have been well developed over a period of time and needs according to climate and use.
3. Rehabilitation and upgrading of old buildings is less expensive than tearing them down and building new ones.
4. They can be built of locally available materials with local labor.

Among the actions that can be taken to protect and conserve this architectural heritage are:

1. Establishing a system of incentives through taxes and subsidies to encourage maintenance and upgrading of existing buildings.
2. Establishing a policy by the government to rehabilitate existing buildings and re-use them whenever possible, rather than construct new buildings.
3. Establishing a system of zoning and land use regulations which will protect and preserve such buildings.

5-4 COMMERCIAL FACILITIES

5-4-1 GENERAL

Bishah has traditionally served as commercial center to the area around it and to nomads. However, it has not yet developed a comprehensive and well-designed commercial area within the city itself. There are several objectives associated with such a center, including:

1. Maximizing the efficiency of commercial exchanges
2. Maximizing the efficiency of transportation of goods into and from the suq, and the convenience of the consumer
3. Protecting adjacent neighborhoods from intrusion of commercial activities
4. Establishing a hierarchical system of commercial facilities for convenience and efficiency.

Commercial facilities in Bishah include 189 permanent shops and 100 temporary shops or stalls in the suq, for a total of 289. This provides the highest ratio of shops to population of any city in the Southern Region, which demonstrates Bishah's commercial importance

Because there has not yet developed a truly unified and comprehensive commercial district, it is necessary to take special steps in Bishah to encourage such a development. This is discussed in section 5-5, "Neighborhood and Community Central Areas."

5-4-2 PROPOSED DISTRIBUTION OF COMMERCIAL ACTIVITIES

Future commercial development in Bishah will occur in response to two types of retail needs of the city. First, in addition to the existing commercial facilities in Al Rawshan, two neighborhood retail centers must be established to serve the immediate, daily needs of new population expected in the Hizami development area and in the extension area south of Al Rawshan (see Fig. 5-4-1). Establishments such as bakeries, dry goods stores, drugstores, laundry, and barber shop will locate in these neighborhood retail centers. Second, the community and sub-regional commercial facilities of Al Rawshan must expand in response to increased population in Bishah's extended areas of influence along the three corridors to Al Mukharam, Ad Dahw, and Al Hazim. Florists, bookstores, toy stores, radio repair shops, among others, will locate in Bishah to serve this larger population. In order to estimate this second type of facilities, the population of Bishah and surrounding areas, as defined in the 1974 National Census, is used as a base for future projection.

5-5 NEIGHBORHOOD AND COMMUNITY CENTRAL AREAS

In the "Planning Standard" section, reference is made to the process of grouping neighborhoods in a hierarchical fashion to establish various functions and activities at the most appropriate and effective level. Five levels have been established as follows:

1. Residential Unit Group. This consists of about 250 persons, many of whom may be related and practically all of whom will know each other. Most of the activities carried on at this level are essentially private or family oriented; only a few facilities, such as tot lots and open space, are provided. It is important to maintain the integrity of such a unit and not split it up by construction of major roads or streets.
2. Sub-neighborhood. This consists of about 1,000 and is closely related in its function to the residential unit group. Basically recreational areas are provided at this level.

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Table 5-4-1  
PROJECTED COMMERCIAL AREA REQUIREMENTS

	1975 Existing <sup>a</sup>	1980	1985	1995
A1 Rawshan Commercial District				
Neighborhood Retail Service Population <sup>b</sup>	11,000	13,500	11,300	11,000
Total Floor Area (m <sup>2</sup> ) <sup>c</sup>	1,810	2,800 <sup>d</sup>	2,800 <sup>d</sup>	2,800
Total Land Area (ha) <sup>e</sup>	3.0	3.3	3.3	3.3
Community Retail				
Service Population <sup>f</sup>	41,500	44,300	48,700	61,700
Total Floor Area (m <sup>2</sup> ) <sup>g</sup>	2,710	4,400	4,900	6,200
Total Land Area (ha) <sup>h</sup>	3.5	4.1	5.3	7.6
A1 Rawshan Sub-Total				
Total Floor Area (m <sup>2</sup> )	4,520	7,200	7,700	9,000
Total Land Area (ha)	6.5	7.4	8.6	10.9
Hizami Neighborhood				
Retail Center				
Service Population <sup>2</sup>	-	-	3,400	10,500
Total Floor Area (m <sup>2</sup> ) <sup>c</sup>	-	-	900	2,600
Total Land Area (ha) <sup>e</sup>	-	-	1.0	3.2
South Rawshan				
Neighborhood Retail Center				
Service Population (m <sup>2</sup> ) <sup>j</sup>	-	-	2,300	6,500
Total Floor Area (m <sup>2</sup> ) <sup>c</sup>	-	-	600	1,600
Total Land Area (ha) <sup>e</sup>	-	-	0.7	2.0
Total Commercial Area				
Total Floor Area (m <sup>2</sup> )	4,520	7,200	9,200	13,200
Total Land Area (ha)	6.5	7.4	10.3	16.1

Notes:

- There are currently 4,520 m<sup>2</sup> of commercial space on 6.5 ha of land. See Bishah, Initial Appraisal of Existing Conditions, Fig. 6-2, and Existing Conditions, Vol. I, Table 4-2-1. Taking into consideration the greater demand per service population for neighborhood over community facilities, it is assumed that approximately 40% of the commercial space is devoted to neighborhood retail needs and 60% to community retail.
- The service population for A1 Rawshan neighborhood retail is the entire planning area of Bishah from 1975 to 1980. After 1980, it is proposed that new retail centers be opened north and south of the existing central area, and the service population neighborhood retail in A1 Rawshan will be limited to planning districts 1.1 and 2.1.
- 0.25 m<sup>2</sup>/inhabitant. See Planning Standards, Sec. A-2-6-1.
- Since the current demand for commercial floor area per service population is lower than 0.25 m<sup>2</sup>/inhabitant, these figures are transitional.
- 3 m<sup>2</sup>/inhabitant. See Planning Standards, Sec. A-2-6-1.
- Population of Bishah and the surrounding area, from 1974 National Census. The population is assumed to grow at an average rate expected for the Wadi Quadrangle sub-region. See Southern Region, Preliminary Physical Plan, Table 9-3-5.

Table 5-5-1  
PROJECTED SOCIO-CULTURAL FACILITIES AREA REQUIREMENTS  
NEIGHBORHOOD AND COMMUNITY CENTERS

	1975 <sup>a</sup>	1980	1985	1995
Planning Population	11,000	13,000	17,000	28,000
Neighborhood Center				
No. of Centers <sup>b</sup>	3	4	6	9
Total Floor Area (m <sup>2</sup> ) <sup>c</sup>	5,500	6,800	8,500	14,000
Total Land Area (ha) <sup>d</sup>	0.3	0.4	0.6	0.9
Community Center <sup>e</sup>				
Total Floor Area (m <sup>2</sup> ) <sup>f</sup>	-	-	90	140
Total Land Area (ha) <sup>g</sup>	-	-	0.2	0.2
Total Neighborhood and Community Centers				
Total Floor Area (m <sup>2</sup> )	5,500	6,800	8,590	14,140
Total Land Area (ha)	0.3	0.4	0.8	1.1

Notes:

- Figures for 1975 are the proposed size of facilities of the recommended standards are to be satisfied.
- Corresponds to the number of neighborhoods.
- 0.5 m<sup>2</sup>/inhabitant. See Planning Standards, Sec. A-2-4-1
- 0.1 ha/center, assuming that the center is located adjacent to a neighborhood park.
- Due to the small size of the city, no community center is proposed until 1905, at which time one center should be built.
- 0.01 m<sup>2</sup>/inhabitant. See Planning Standards, Sec. A-2-4-2.
- 0.2 ha/center, assuming that the center is located adjacent to a community park. See *Ibid*.

Notes, Table 5-4-1, Continued:

- 0.1 m<sup>2</sup>/inhabitant. See Planning Standards, Sec. A-2-6-2.
- 0.75 m<sup>2</sup>/inhabitant. *Ibid*.
- Population in the Hizami development area, planning districts 1.2, 1.3, and 1.4. Retail center is assumed established by 1985.
- Population in the south Rawshan extension area, planning districts 2.2 and 2.3. Retail center is assumed established by 1985.

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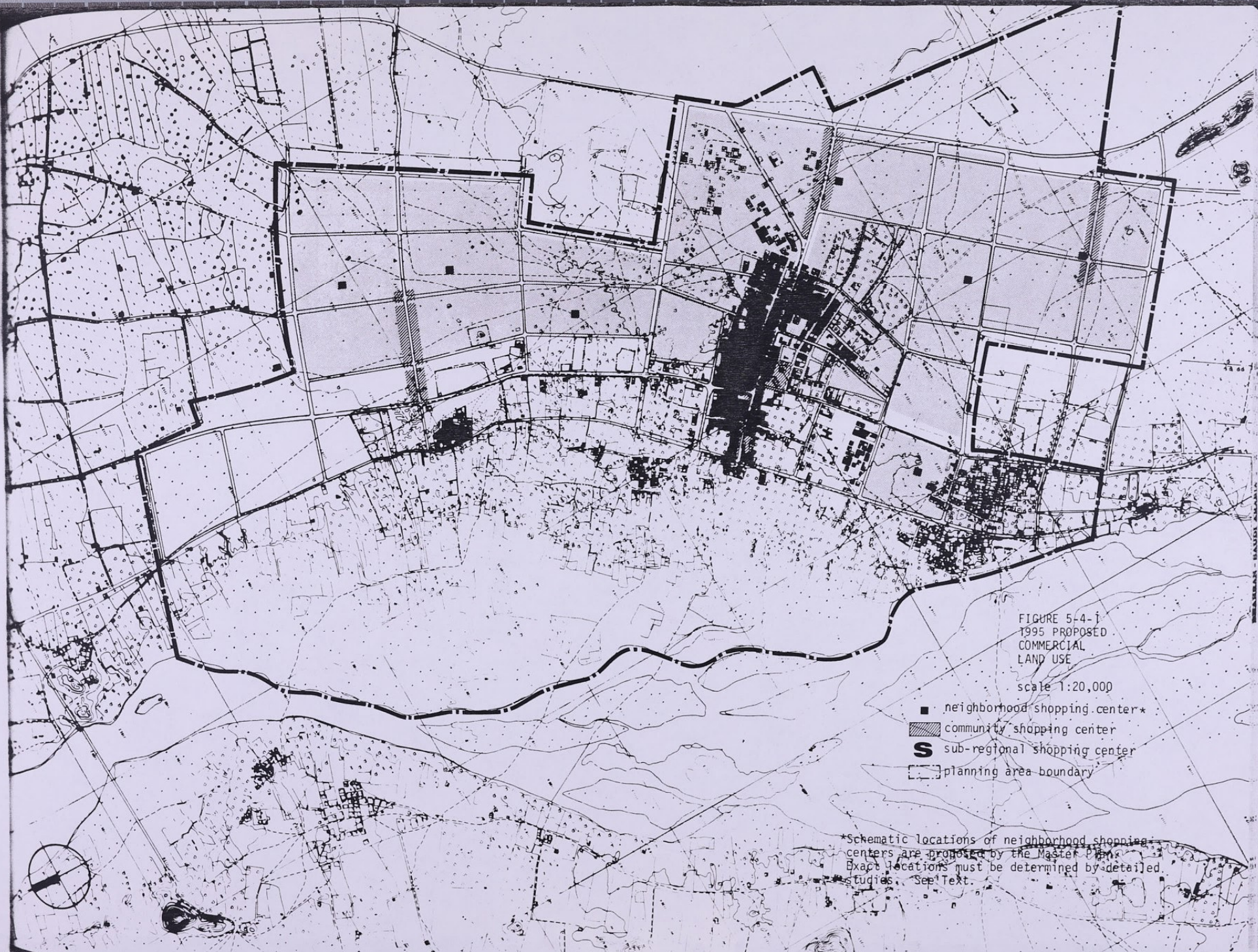


FIGURE 5-4-1  
1995 PROPOSED  
COMMERCIAL  
LAND USE

scale 1:20,000

- neighborhood shopping center\*
- ▨ community shopping center
- S sub-regional shopping center
- ▭ planning area boundary

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

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3. Neighborhood. This consists of 2,500-5,000 persons and is the lowest level at which a large number of functions, such as parks, small stores, and elementary schools are provided.
4. Sub-community. Since this consists of 10,000-20,000 persons, it may be the level at which city functions take place.
5. Community. Consisting of 20,000-40,000, this level provides essential services not only to its own residents, but those in the surrounding countryside.

In general, this element of the standard applies to Bishah Schools, recreation facilities, and health care are proposed in accordance with it. However, because of the need to establish a better-planned, more comprehensive commercial center, certain changes are made in the manner of the spatial distribution of stores and shops. Primarily this means that many smaller shops and stores that would ordinarily be located within residential unit groups or sub-neighborhoods in a scattered pattern are now proposed to be concentrated together. Three commercial centers, located along major streets and spaced parallel to each other two to two and one-half km apart.

In addition, a neighborhood center should be built for each neighborhood. The center can provide space for general social interactions of the residents in the neighborhood as well as offices for a neighborhood association responsible for supervision and coordination of various activities at the neighborhood and the residential unit group levels. After 1985, when the city reaches a sufficient size, a community center should also be provided. This center can provide some of the services available from civic centers in the other, larger cities. The resulting area requirements are summarized in Table 5-5-1 and diagrammatically represented in Fig. 5-5-1.

#### CHAPTER NOTES 5:

1. From interviews with Dr. Bashir Hagi, Director General, Ministry of Health, Southern Region, and Dr. Al Sayed Hilali, Director of Health Office, Abha.
2. Ministry of Municipal and Rural Affairs, City of Bishah Water Management Preliminary Design Studies, Allott and Lomax, Consulting Engineers, 1976.
3. The Ministry of Health had previously planned for Bishah a hospital for treatment of tuberculosis, a mental hospital, and other facilities in addition to a new general hospital. See Southern Region, Existing Conditions, Vol. 0, Sec. 8-2-2, and Bishah, Existing Conditions, Vol. I, Sec. 4-7. Since the proposed program of hospitals has been revised, it may be inferred that the treatment of tuberculosis and mental illness is not required at a scale which necessitates the construction of separate institutions.



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





-  community center
-  sub-community center
-  neighborhood center
-  planning area boundary

FIGURE 5-5-1  
1995 PROPOSED  
NEIGHBORHOOD  
AND COMMUNITY  
GENERAL AREAS  
scale 1:20,000



6. recreation and conservation

## 6-1 RECREATION

### 6-1-1 EXISTING RECREATION AREAS

With the exception of a single field of approximately 1.3 ha located southeast of the hospital and used for soccer and other team sports, there are no organized sports or recreation facilities. Such activities are important for many reasons, including:

1. Provision of outdoor physical activities for children and adults, particularly those whose work does not allow sufficient exercise for good health and for children in school.
2. Provision of an amenity to make the Southern Region a more attractive place to live and to stem the flow of out-migration.
3. Making the urbanized area more aesthetically pleasant.

### 6-1-2 POLICY AND REQUIREMENTS FOR RECREATIONAL DEVELOPMENT

Reference is made in the Planning Standards to land area requirements for recreational purposes. These range from specifying a .05 ha "tot lot" for roughly every 250 residents, to a 12+ ha community park for a city of 30,000 population. These are arranged in a hierarchical fashion of increasing size and number of people served. Again, the tot lot is the lowest, followed by the playground, two types of sports fields, and the neighborhood and city parks which allow for many types of activities. A sub-community of 11,000 (approximately the present size of Bishah should have recreational areas totaling 18.9 ha; so that there is now a shortfall of 17.3 ha. The projected increase to a population of about 30,000 calls for 63 ha of recreational land. The standard specifies the distribution of this land via type of facility. In addition, the plan calls for a small stadium to be located adjacent to the central commercial area to serve Bisha and the surrounding areas.

It might seem that recreation would be a low priority development need in comparison with commercial or industrial development; but it is an important sector of the overall growth process. It can improve living conditions significantly if properly handled. Thus implementation of the recreation elements of the plan should take place concurrently with the others.

### 6-1-3 RECREATIONAL LAND USE

Recreational land use requirements have been computed on the basis of projected population of the Bishah planning area and recreational planning standards contained in the appendix to the Preliminary and Final Physical Plan of the Southern Region. The resulting land areas are tabulated in Table 6-1-1.

Three general types of recreational land use are proposed:

1. Neighborhood recreation, consisting of a range of open space activities from tot lots to neighborhood park.

With the exception of playgrounds for elementary schools, discussed below, it is recommended that the various neighborhood level recreational spaces be planned in such a way as to form a linear network of pedestrian paths linking the various social and commercial facilities which serve the neighborhood. The elementary school, the mosque, the neighborhood commercial center should all be accessible by such a pedestrian way. Thus, the neighborhood park is not a single, large area but an elongated, linear park. See Fig. 6-1-1. for suggested plan of this neighborhood recreation space.

2. Community City Park

It is proposed that the land area programmed for this purpose be divided into two sections:

- a. A new park and recreation area along the southwestern edge of the Al Rawshan redevelopment plan (see Fig. 6-1-1), proposed by the Department of Town Planning, Southern Region.

- b. A community park embedded in a complex of recreational and educational activities at the southwestern edge of the Hizami development area. The Department of Town Planning, Southern Region, has proposed a boys educational complex, consisting of one intermediate and one secondary school, and a small stadium in this area. It is therefore suggested, that a site immediately northwest of the stadium site be also designated a community park. This will enable the formation of a unified recreational area consisting of a community park, the community stadium, and the playfields levels I and II associated with the boys schools. Since this combined site is located between the existing Al Rawshan area, the residential sections of the new Hizami development area, the site is favorably located to act as the central recreational facility for the entire city.

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- playfield (level 1)
- ▲ playfield (level 2)
- school playground
- neighborhood park
- ..... park-open space network
- planning area boundary

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

Table 6-1-1  
PROJECTED RECREATIONAL AREA REQUIREMENTS

	1975 Existing	1980	1985	1995
Planning Population	11,000	13,500	17,000	28,000
<b>Neighborhood Recreation</b>				
No. of Tot Lots <sup>a</sup>	-	54	68	112
Total Land Area (ha) <sup>b</sup>	-	2.7	3.4	5.6
<b>garden Play Lots<sup>c</sup></b>				
No. of Nursery/Kindergarten Play Lots <sup>c</sup>	-	14	17	28
Total Land Area (ha) <sup>d</sup>	-	2.8	3.4	5.6
<b>Neighborhood Parks<sup>e</sup></b>				
No. of Neighborhood Parks <sup>e</sup>	-	4	6	9
Total Land Area (ha) <sup>f</sup>	-	6.8	8.5	14.0
<b>Playgrounds<sup>g,h</sup></b>				
No. of Playgrounds <sup>g,h</sup>	-	8	12	18
Total Land Area (ha) <sup>i</sup>	-	5.2	6.4	10.8
Total Neighborhood Recreational Area (ha)	-	17.5	21.7	36.0
<b>Sub-Community Recreation</b>				
No. of Playfields I <sup>j,k</sup>	1	2	4	4
Total Land Area <sup>k</sup>	1.3	3.0	3.8	6.4
<b>Community Recreation</b>				
No. of Playfields II <sup>l,h</sup>	-	2	2	2
Total Land Area <sup>m</sup>	-	2.1	2.6	4.2
<b>Community/City Park<sup>n</sup></b>				
Total Land Area	-	5.4	6.8	11.2
Total Community Recreational Area (ha)	-	7.5	9.4	15.4
Total Recreational Land Use Area (ha)	1.3	28.0	34.9	57.8
Total Recreational Area Less School Associated Grounds and Fields (ha) <sup>p</sup>	-	17.7	22.1	36.4

Notes:

- a. Estimated on the basis of service population of 250 per tot lot. Planning Standards, Sec. A-2-2-1.
- b. 500 m<sup>2</sup>/tot lot.
- c. Service population of 1, 00 per play lot. Planning Standards, Sec. A-2-2-2.
- d. 2,000 m<sup>2</sup>/play lot.
- e. One park per neighborhood. Planning Standards, Sec. A-2-2-3.
- f. 5 m<sup>2</sup>/inhabitant.
- g. One playground per elementary school. It is necessary to allocate separate playgrounds to boys and girls schools.
- h. In terms of acquisition, service, and maintenance, playgrounds and playfields

3. Playgrounds and Playfields associated with elementary, intermediate, and secondary schools. Some areas are acquired and maintained by the Ministry of Education or by the Directorate of Girls Schools. As such, these sites cannot be included in the city's parks and recreation program. From a more general point of view, however, the playgrounds and playfields are recreational uses of the land. Furthermore, it is recommended that, during non-school hours, the grounds be made available to members of the community at large.

In addition to these facilities, a fourth zone is suggested for inclusion in "recreational" land use planning. This is the linear zone of public and commercial activities along the main road in Al Rawshan leading to the Bishah airport. This zone will not accommodate any active recreational use, such as sports, but it can provide high visual and environmental relief through extensive planting. The main road should become a tree-lined avenue. At the same time, it is proposed that, behind the rear of buildings facing the main road, there be islands of parking spaces intermixed with small planted areas, acting as the receiving end of the neighborhood pedestrian network and as a buffer between the commercial zone and the residential district adjacent to it.

Notes, Table 6-1-1, Continued

- I and II, should be included in the area requirements for elementary, intermediate, and secondary schools, respectively, since the major user of these grounds is the school athletic program. They are included here solely to illustrate the overall recreational land use of the city.
- i. 20 m<sup>2</sup>/elementary school student. See Table 5-1-1a.
- j. One playfield I per intermediate school. It is necessary to allocate separate playfields to boys and girls schools.
- k. 30 m<sup>2</sup>/intermediate school student. See Table 5-1-1b.
- l. One playfield II per secondary school. It is necessary to allocate separate playfields to boys and girls schools. Students from teacher training and technical schools should also have access to these fields.
- m. 50 m<sup>2</sup>/secondary school student, See Table 5-1-1c.
- n. Due to the relatively small size of the city, the community and the city parks are combined. 4 m<sup>2</sup>/inhabitant is recommended. Planning Standards, Sec. A-2-2-5.
- o. Total recreational area excluding playgrounds and playfields I and II. This area is the proper component of the city's parks and recreation program.

6-2 TOURISM

The Bishah area offers little in the way of opportunities for tourism, due to its rather hot and arid climate. It would thus be a better use of funds to develop such areas as the escarpment around Nimas, or the coast near Jizan.

Due to the high rate of commercial activity in Bishah, including its relations with areas outside the Southern Region, it would be desirable to improve hotel facilities. The central area and the area around the airport lend themselves to this purpose.

Except for some agricultural products, Bishah depends on the major cities like Riyadh, Jeddah and Abha-Khamis Mushayt for supply of goods and services. Long-distance, surface traffic is essential for the city's development. Currently, there are no facilities for rest and refueling on the roads to the major cities. It is therefore recommended that such facilities be established to enable motorists to obtain food and gasoline while traveling between the cities.

6-3 OPEN SPACE CONSERVATION

There are many opportunities for the application of the principles of conservation, including the following:

1. Natural features:
  - a. wilderness and undeveloped land
  - b. land which is particularly sensitive or fragile
  - c. land for recreation
  - d. land reserved for special future uses
  - e. land to be kept undeveloped within urban areas such as parks and open space.
2. Man-made features:
  - a. sites of historical or archeological interest
  - b. sites which demonstrate distinctive features of culture or living style
  - c. land which is left undeveloped or underdeveloped to act as a buffer or protection to adjacent land
  - d. land which serves a special function, such as being allowed to lie fallow to "rest" from growing crops, prevent erosion, or increase run-off.

More specifically, for Bishah conservation policy should address the following issues:

1. Protection of environmentally sensitive land to avoid destruction or damage.
2. Maintenance of a balance in rural areas between lands under cultivation and those allowed to lie fallow.
3. Maintenance of a balance in urban areas to provide a minimal amount of park land and open space.
4. Awareness of the impact on the environment.
5. Preservation and appropriate re-use of housing and other man-made facilities built in a traditional style.

Thus the Wadi basin and the area around it, the date-growing lands, and the old-style buildings in Bisha are in need of conservation protection. The means for implementing this are discussed in chapter 10, "Administration and Management."





7. primary communication and transport

## 7-1 GENERAL

### 7-1-1 CITY LOCATION

Located on an inland plateau along the Wadi Bishah, Bishah is some 650 kilometers southwest of Riyadh; about 390 kilometers southeast of Jeddah and approximately 260 kilometers north of Abha. Traditionally an agricultural center, it is particularly noted as one of the largest date producing centers of the region, exporting dates to Jeddah and Riyadh. Situated near the border of the Western and Southern Regions in the northernmost section of the Southern Region, Bishah also serves as a very important trading center involved in many commercial activities with large neighboring areas. Strategically, the city serves as an intermediate stopping point for commodities enroute from Jeddah to Abha and vicinity. As most of the other cities of the region, administrative dependence is on Abha and Riyadh. Commercial dependence however is on Jeddah from which foods such as flour, rice, sugar, fish, etc. are received. Relatively speaking, Bishah is more closely linked to Jeddah than it is to Abha and Khamis Mushayt. Therefore, the growth of the city will depend not only on the development of the Southern Region but also on that of the Western Region, a position not shared by the rest of the region.

### 7-1-2 URBAN DEVELOPMENT

Until recently, development of Bishah during the past decade has been gradual but steady. A major change in the development of Bishah has been the extension of the city center to the south. Additional construction and improvements to the already well established grid pattern of streets has facilitated urban expansion outside the city center.

From analysis of planning data available, development of Bishah can be expected to continue at a more rapid rate but still in a more balanced manner. That is, development of urban and rural areas will progress together without trade, commerce or agriculture dominating the city's function.

The planning of a safe and efficient transportation system for Bishah then is essential to insure the success of the city's continued overall development, as well as that of both the Southern and Western Regions.

## 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 Bishah through the establishment of an effective transportation system, and
2. To provide a practical basis for the phasing of construction relative to the expanding needs of the City of Bishah.

### 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 Bishah were derived from the analysis of data obtained from home interviews and roadside traffic surveys carried out in 1975 and 1977 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 comprehensive survey was conducted which is outlined below.

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

- A. Socio Economic Survey. This information was gathered as a comprehensive 5% sample survey, as called for in the agreement and provided valuable background material applicable to both qualitative and quantitative interfacing with actual traffic data gathered in specific traffic surveys. In the course of the URTEC 5% survey conducted by this consultant certain numbers of the population of the city were interviewed in their homes, and were asked questions such as how many and what type of vehicles were owned or used by them, and for what purposes. Based on the 5% survey, the number and type of vehicles in the city at the time of the survey has been estimated as follows:

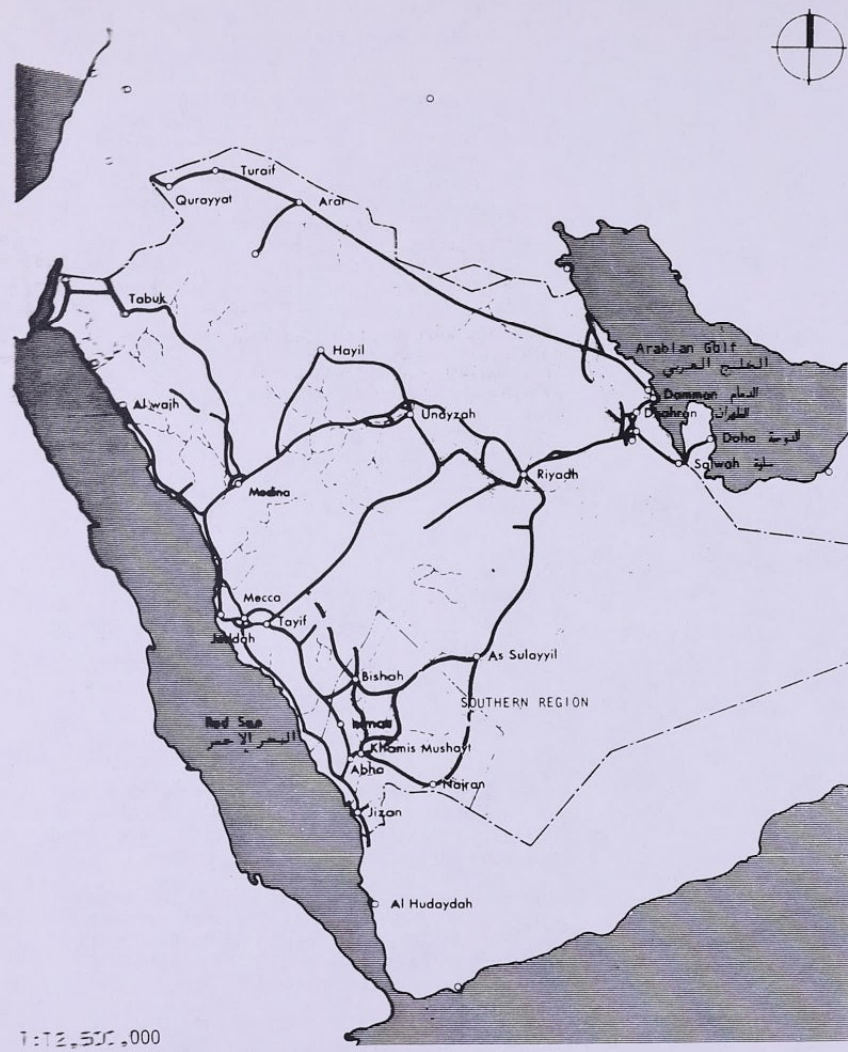


FIGURE 7-1-1  
NATIONAL  
ROAD NETWORK

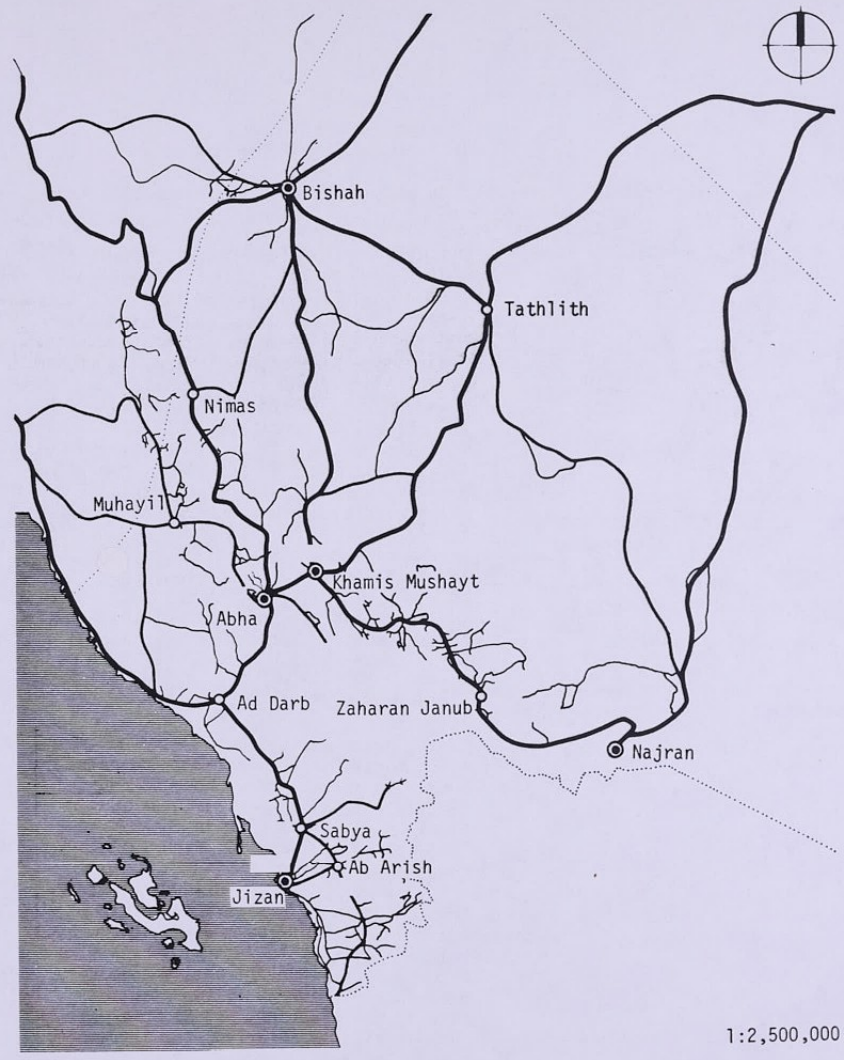


FIGURE 7-1-2  
REGIONAL  
ROAD NETWORK

Sedans	-	0
Station Wagons	-	20
Pick-up Trucks	-	260
Jeeps	-	140
Large Trucks	-	40
Total	-	460

(The lack of sedans is due to the limitations of a 5% survey for a small population - this does not actually mean that there are no sedans in the city.)

- 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 six points (TO 1, TO 2, TO 3, TO 4, TO 5, TO 6, as identified in the Existing Conditions report, Vol 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 Bishah the city was divided into 25 districts for planning purposes - 19 within the planning area and 6 outside the planning area. 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 Fig. 7-2-3.

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

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

Where  $S_j$  = "attraction" factor at  $j$

$S_x$  = "attraction" factor at any zone  $x$ .

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

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

$n$  = friction exponent or restraining influence.

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

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

A computer evaluation based on iterative procedures was conducted with certain established parameters held constant. Based upon this iterative computer program, the traffic volume assignment was made (see Figure 7-2-1). For Bishah (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 occu-

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- ① traffic counting point
- existing roads completed by May 1978
- - - existing roads proposed by the Master Plan for improvement during the planning period
- - - new roads proposed by the Master Plan for construction during the planning period under construction
- planning area boundary

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

FIGURE 7-1-3  
1995 PROPOSED MAJOR  
TRANSPORTATION  
NETWORK AND  
IMPLEMENTATION PROGRAM  
scale 1:20,000

10000' 10000' 10000'

pancy 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 programmatic 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 Bishah 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 7-2-1 (a)  
UPDATED HOURLY TRAFFIC COUNTS FOR BISHAHA

Time Period	Counting Points					
	1	2	3	4	5	6
8 - 9 AM	97	440	625	647	885	145
9 - 10	136	389	512	665	911	148
10 - 11	151	415	600	662	949	119
11 - 12	167	396	544	581	886	133
12 - 1 PM	111	319	463	458	770	123
1 - 2	66	199	254	314	491	66
2 - 3	62	195	213	212	416	77
3 - 4	91	199	277	203	390	62
4 - 5	101	228	290	357	561	103
5 - 6	122	294	391	484	642	106

Notes:

- a. From a count taken on June 26, 27, 28, and 29, 1977

Table 7-2-1 (b)  
CALCULATED MAXIMUM 24 HOUR VOLUME IN BISHAHA

Counting Points <sup>b</sup>	Number
1	1,336
2	3,520
3	5,000
4	5,320
5	7,600
6	1,184

Notes:

- a. Commonly accepted assumptions used in calculating these figures are:

1. The maximum hourly volume equals 25% of the average daily traffic
  2. The maximum daily volume equals 200% of the average daily traffic [1].
- So, the equation for calculating the maximum 24 hour volume at any given point becomes:

$$(4)(a)(2) = 8(a) = \text{Maximum 24 hour volume, where (a) is the maximum hourly volume at a given point.}$$

For example, at counting point number 1, the maximum hourly volume occurred between 11 AM and 12 Noon and was 167 vehicles, so the maximum 24 hour volume becomes:

$$4(167)(2) = 1,336 \text{ as shown in the Table above.}$$

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

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

		Motor cycle	Sedan	Wagon	Taxi	Jeep	Bus	Pick up	Truck	Mili- tary	Total
TO 1	from	195	7	40	-	105	14	795	744	2	1,902
	to	171	6	34	-	100	16	825	746	12	1,910
TO 2	from	414	21	35	-	331	2	739	635	2	2,179
	to	543	18	38	-	465	6	825	663	2	2,558
TO 3	from	761	121	394	8	603	3	876	1,012	31	3,809
	to	431	97	500	2	560	5	816	871	62	3,344
TO 4	from	353	14	33	11	274	16	1,437	448	8	2,594
	to	294	11	38	29	259	16	1,431	434	0	2,521
TO 5	from	484	50	47	66	418	84	1,476	329	48	3,002
	to	655	30	10	13	606	39	1,468	303	27	3,151
TO 6	from	721	87	175	-	609	26	1,849	1,372	83	4,922
	to	546	46	257	7	462	49	1,409	942	114	3,832
Total	from	2,928	300	724	85	2,340	145	7,172	4,540	174	18,408
	to	2,640	208	877	51	2,452	131	6,774	3,959	224	17,316
G. Total		5,568	508	1,601	136	4,792	276	13,946	8,499	398	35,724

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

	Going to Work	Busi- ness	Shop- ping	Recre- ation	Home	Receiv- ing and Loading	Delivery and un- loading	Others	Total
Origin	0.466	0.059	0.016	0.038	0.071	0.033	0.086	0.242	1.000
Desti- nation	1.240	0.058	0.507	0.016	0.020	0.060	-	0.100	1.000
Total	0.320	0.059	0.325	0.024	0.039	0.050	0.032	0.152	1.000

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

7-2-4 LAND USE/TRANSPOR-  
TATION STUDY--SUMMARY  
OF CHANGING DEMAND

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

The urban area of Bishah is centered about one major traffic generator, namely the high density residential, civic and commercial center located in the city's center. Two smaller yet significant commercial centers flank this major generator; one located in the southwestern sector of the city serving the low density residences in that area; the second located in the northeast sector of the city adjacent to the zone designated for public and recreational use. Agriculture dominates the land use to the northeast and to the north along the Wadi.

Table 7-2-4  
SUMMARY OF TRANSPORTATION DATA

Planning Parameters	1975 Survey	1995 Projected
Planning Population	11,000	27,000
Jobs	2,580	7,000
Households	1,564	5,910
Vehicle Ownership (per thousand persons)	58.1	204.1

7-2-5 LOCATION AND DESCRIPTION OF GENERATORS

Of primary importance as a node of attractivity is the administrative and commercial center located in the heart of the city. This center will contain approximately 40,000 square meters of open market with 500 square meters of commercial floor area. With over one third of the city's population residing in this central area, some local congestion problems may occur.

The southwest sector of Bishah will be composed mainly of medium and low density residences served by a commercial area of some 4,500 meters. Immediately to the south of this area, bordering the highway from Khamis Mushayt, lies a proposed industrial area of 37 hectares with several hundred employees.

Dominating the northeastern sector of the city, surrounded by agricultural, public and recreational land and serving the highest populated residential area, lies the third major traffic generator. This center contains a commercial area of nearly 4,000 square meters, a proposed sports stadium of 9 hectares and, finally, an abundance (in excess of 25 hectares) of land reserved for public use. To the extreme northeast corner of the city, a Regional General Hospital, to contain several hundred beds, is proposed.

The final major generator for the City of Bishah is the airport located just a few kilometers to the east of the city. An estimated 208,000 passengers can be expected to enplane and deplane annually by 1995. Vehicular transfer between the city and the airport is made along the city's main north/south artery. This route originates in the heart of the central activity center and runs southeasterly, dividing the central area in half and finally terminating at the airport.

Because of the linear expansion of Bishah along the Wadi, the proposed grid road network in high density urban centers provides an excellent means of linking the main traffic generators, as well as a simple means of phasing highway construction.

7-3 PRINCIPAL ROAD NETWORKS

7-3-1 ROADWAY CLASSIFICATIONS AND DESIGN CRITERIA

Achievement of good traffic flow continuity depends upon the proper integration of urban and rural roadway networks throughout the vicinity of Bishah and the country.

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

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

The primary road system will consist of major arterials designed for fairly high speeds with controlled access wherever possible and maximum travel comfort. Provided no major land use constraints exist along the major arterials, a wide right-of-way 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 or four lanes, with a minimum 3.65 meter lane width. Unlike the primary system described in the Regional Plan, the urban primary system will consist mainly of signalized or unsignalized intersections depending on traffic conditions. Grade separations are preferred wherever the physical and economical conditions will allow it.

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

The secondary road system consists of major arterials and minor arterials designed for lower volumes and equal or lower speeds than the primary system. These minor arterials should be designed to accommodate the traffic coming into the city from many surrounding agricultural villages. 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. The roadway section will have two or four lanes with a minimum width of 3.50 meters per lane. Intersections will be signalized or unsignalized depending on traffic conditions.



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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.

10,000  
5,000  
3,000  
1,000  
vehicles/day  
planning area boundary

FIGURE 7-23  
1985 PROPOSED  
TRAFFIC VOLUMES  
scale 1:20,000

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

As opposed to the other major urban areas in the Southern Region, the trend toward acceptance of public transportation in Bishah has not yet been established. Presently, taxis and buses are not as prevalent as pick-ups used as omnibuses. The relatively small physical scale of the city could be a possible reason for this characteristic. However, as development continues and congestion builds from increased traffic demands in the central urbanized areas, the establishment of an efficient urban bus transit system will undoubtedly be warranted. Success of attracting potential users will depend on a combination of several important factors; the size of bus, riding comfort, operating schedules, station locations and transfer points and terminal locations.

7-4-2 SYSTEM LOCATION

Because of the simple layout and nature of activities occurring in Bishah, it seems only natural to place the main hub of the public transit system near the central city area. From this hub the system can serve the commercial and other major activity centers in the north area of the city, the airport located several kilometers directly east of the site and, finally, the heavily populated activity center located in the southeast sector of the city. Integration of this urban system, with the regional public transit system or the long haul bus system, can be easily accomplished by placing one terminal point along the highway to Khamis Mushayt in the south and another at the north end of the city along the road to Jeddah, both having direct links to the central hub. Flexible interchanges at these main terminals, allowing the efficient transfer between all modes, is essential. Adequate parking facilities at all terminal locations is another important factor in the planning of a public transit system.

Because of the close proximity of the residential areas to the main city activities, a more localized or "courtesy bus" type transit system should

be considered. This system, serving specific residential areas on a regularly scheduled basis, would reduce the number of vehicular shopping trips made to the shopping center and, consequently, also reduces demand for parking.

7-4-3 OTHER MODES

Due to the size and configuration of the city, and the relatively small 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 systems) would not be warranted until well beyond our 20-year planning period. However, the realization that it will eventually be necessary should be a major consideration in the planning of the overall transportation system. Therefore, provision for a "Public transit corridor" within the right-of-way should be made along all of the principle inter and intra-regional highway arteries. This realization should also be considered for the location of terminals to achieve "flexible mode Interchange".

7-5 TRAFFIC CONTROL POLICY

7-5-1 ROADWAY HIERARCHY

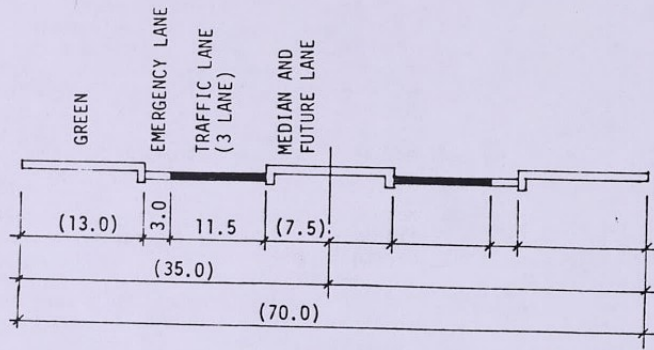
Achievement of the fundamental transportation planning and environmental management objectives set forth in the Master plan necessitates, among other things, the establishment of a clearly defined hierarchy of roads; the strict control of important design parameters and the establishment of a well planned training program directed to extending and maintaining the transportation systems. Satisfying these goals will ultimately encourage drivers to make their journeys along the most appropriate roads.

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

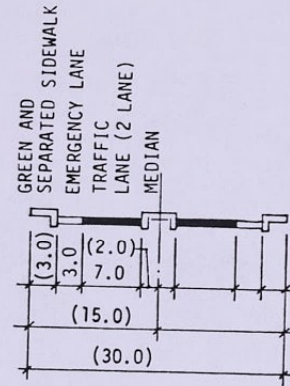
7-5-2 PRIMARY AND SECONDARY SYSTEM

The main primary arterial for Bishah is the highway from Khamis Mushayt approaching the city from the south. This route proceeds westerly through the central activity center, then takes a northerly direction on to Jeddah. Truck traffic along this arterial can be expected to be heavy. Interconnected with this primary arterial are four major secondary arterials. These arterials, shown in the accompanying Figure, link up all of the major

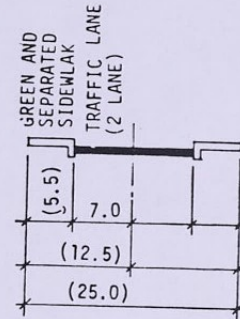
V<sub>1</sub> EXAMPLE  
(REGIONAL HIGHWAY)  
6 LANE



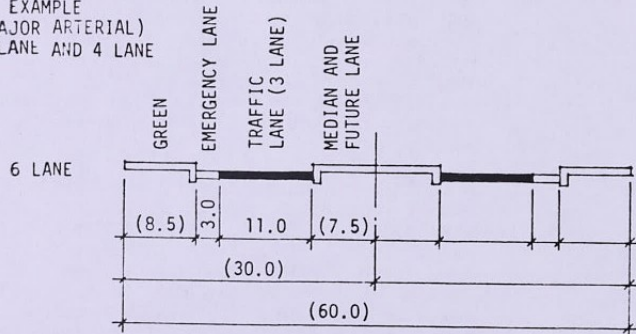
V<sub>3</sub> EXAMPLE  
(ARTERIAL)  
4 LANE



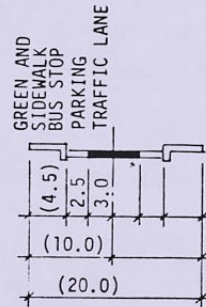
V<sub>4</sub> EXAMPLE  
(COLLECTOR)  
4 LANE



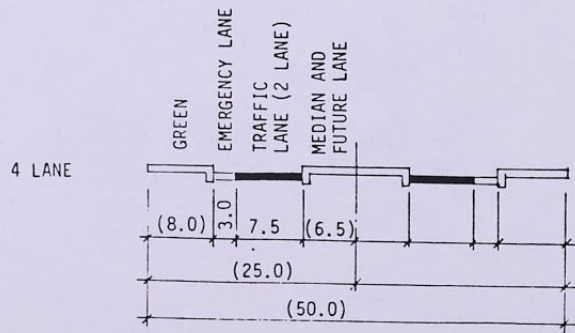
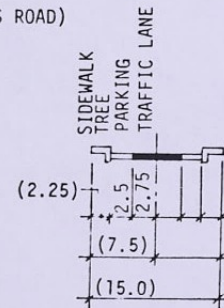
V<sub>2</sub> EXAMPLE  
(MAJOR ARTERIAL)  
6 LANE AND 4 LANE



V<sub>5</sub> EXAMPLE  
(DISTRIBUTOR)  
2 LANE



V<sub>6</sub> EXAMPLE  
(LOCAL ACCESS ROAD)  
2 LANE



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

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

activity centers in a nearly perfect grid pattern. By distributing traffic flow and avoiding concentration toward any particular point, 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.

Interchange spacings should be held to a minimum of 500 meters where possible and the laying of utility services beneath the roadway should be prohibited. Various types of interchanges are possible in each particular situation, however, certain types are recommended in the Appendix, Planning Standards, Figs. A-2-9 (c) and A-2-9 (d). The two most critical interchanges are those at the north at Hiyami and the south at South Rawshan where city arterials meet the major regional arterials to Jeddah and Khamis Mushayt. In general a right-of-way reservation of 70 meters is recommended.

#### 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.

The basic grid pattern composed mostly of major collectors lends itself to the easy implementation of a one-way circulatory system, if need be.

Secondary and minor collectors connect the residential areas with the secondary arterials and ultimately 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.

#### 7-5-5 SAFETY CONSIDERATIONS

Utility services should be located in easements adjacent to the travel way.

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

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

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

#### 7-5-6 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.

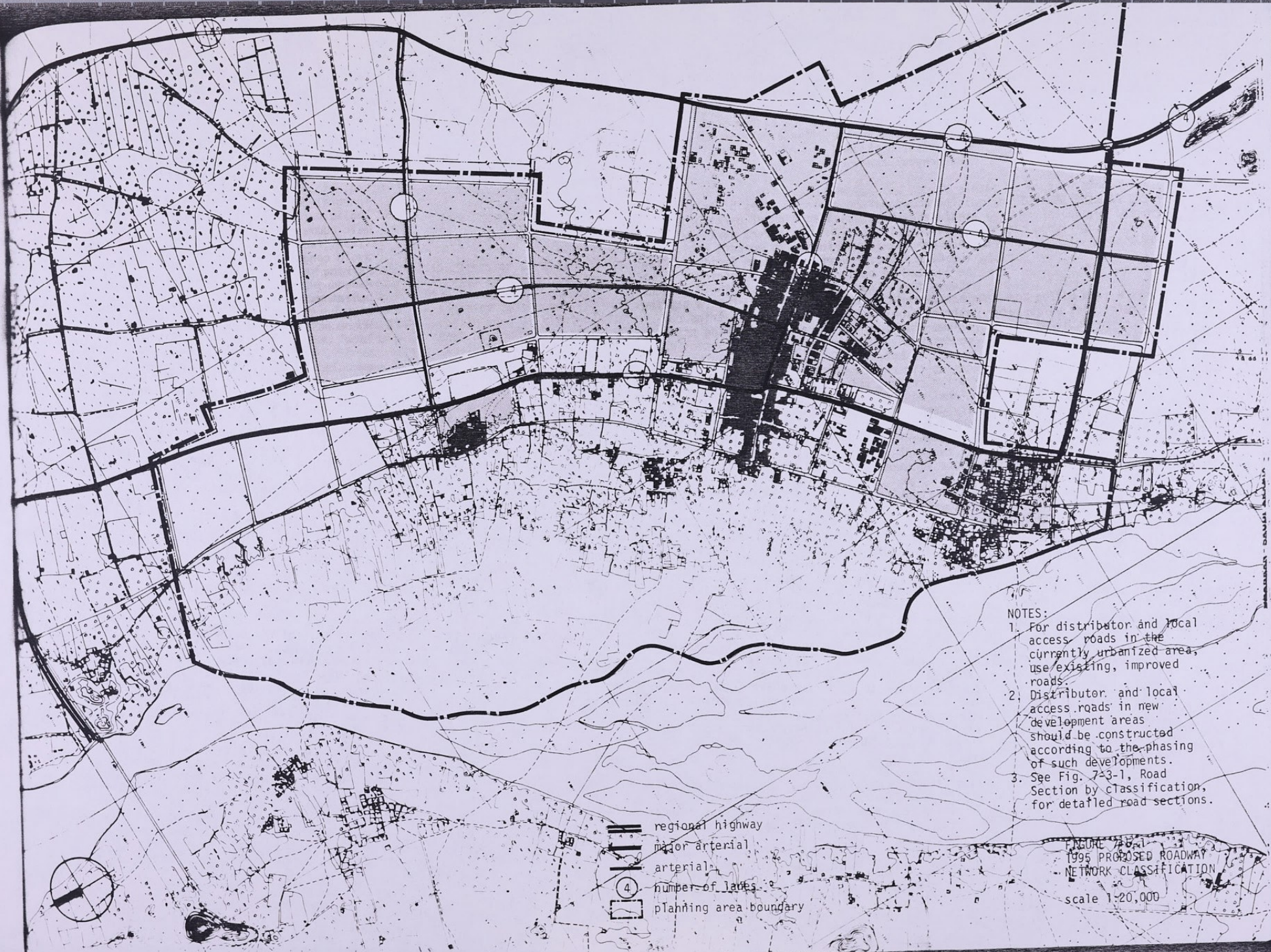
It would be quite impractical to recommend the precise locations of pedestrian crossing that may be needed in the future. The selection of such locations should be based on up-to-date surveys of pedestrian movements within the city and detailed studies of short term developments which might make alternative 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

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

- NOTES:
1. For distributor and local access roads in the currently urbanized area, use existing, improved roads.
  2. Distributor and local access roads in new development areas should be constructed according to the phasing of such developments.
  3. See Fig. 7-3-1, Road Section by classification, for detailed road sections.

FIGURE 7-3-1  
1995 PROPOSED ROADWAY  
NETWORK CLASSIFICATION  
scale 1:20,000

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 Bishah must attempt to provide a reasonable balance between the capacities of the car parks and the road system planned for the central area.

#### 7-6-2 PARKING DEMANDS

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

Explicit parking data for Bishah indicates that the parking problem in and around the central area is most serious. Figures show a high percentage of parking for shopping purposes (44.2%) and a low number of cars parking continuously for greater than two hours. This highlights the need to satisfy short term parking demands.

The planned central area activity center, composed of commercial and administrative functions, can be expected to generate nearly 65,000 personal trips or approximately 32,000 to 34,000 private vehicles. The secondary generator located in the northern sector will probably attract nearly 11,000 personal trips or 5,000 to 6,000 vehicular trips. These two examples of traffic and parking demands should highlight the fact that provisions must be made to meet these 1995 requirements through a policy of progressive development from surface to 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. Parking in the central commercial district (Al Rawshan) should be provided behind the row of buildings facing the main road leading to the Bishah airport.
6. Where possible and economically feasible, 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<sup>2</sup> floor area
  - C. Commercial - 1-4 spaces per 40 m<sup>2</sup> sales area (see the planning standards section A-2-6 for more detail).
  - D. Industrial - 1 space per employee
  - E. Hotel - 1 space per guest
  - F. Entertainment - 1 space per 10 seats
  - G. Hospital - 1 space per bed

#### 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 major commercial areas exist such as at Al Rawshan, South Rawshan and Hizami vehicular penetration and access should be established to reduce possible congestion. Parking should be provided at the rear of such commercial areas, and community access should be from this side as well. Frontage parking should be limited and strictly controlled. Loading and unloading should not occur directly from the street, but at loading

areas at the sides or back of commercial establishments. Such frontage control is especially important at major intersections where undesirable congestion would otherwise certainly occur.

## 7-7 ENVIRONMENTAL MANAGEMENT POLICY

### 7-7-1 THE FACTORS AND IMPACTS

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

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

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

### 7-7-2 METHODS AND CONTROL

Bishah and the surrounding vicinity 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 populated areas located along the primary system, vegetative, earth or man-made barriers can be used aesthetically to control objectionable noises produced by traffic. Many materials and techniques are available for the construction of these noise barriers and at a relatively low cost. The right-of-way at intersections where congestion tends to build up should be ample in size and access should be partially or fully controlled to provide 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. However, the use of grade separations in or around Bishah will probably not be warranted until well beyond our 20 year design period.

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

### 7-7-3 POLICY SUMMARY

The environmental management policy must extend to the design of various interacting facilities other than just the road types and their junction. 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 IMPROVEMENT--INVESTMENT NEEDS FOR 5, 10 AND 20 YEARS

Recommended construction of the road network must be related to the growth estimates prepared for Bishah. In order to ensure adequate widths of right-of-ways for the future transportation corridors, it 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 15 km of a four-lane roadway and 10 km of a two-lane roadway have to be built by the year 1995 to establish a basic road network. The total construction cost of the proposed improvements is estimated to be 27.0 millions S.R. Since the bulk of this construction should be completed in the first 10 years, it is recommended that 33% or 9.0 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.

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

Type of Vehicle	Emissions Expressed in Grams per Kilometer		
	HC	CO	NO <sub>x</sub>
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

CHAPTER 7 NOTES:

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



8. public utilities

8-1 ELECTRICITY

A 900 kw electrical generating plant and associated transmission equipment was completed in 1976. This plant now provides power for an area extending from Nimran to Nughaylah. By existing requirements, this is a satisfactory supply, but it does not take into account any commercial or industrial usage. The general rule is that each fully developed commercial use requires 10 kw and each industrial use 25 kw.

By 1995, it is projected that 3500 kw will be available; this is inadequate for residential use, based upon the expected size of the population.

Attention should be paid to the possibility of interconnecting the Bisha generating station with others, allowing mutual assistance and equalization of load. Also, consideration should be given to alternative sources for electrical power generation. Due to the climate, solar energy should be explored.

8-2 WATER

The present water supply comes from a well located in the vicinity of the village of Nimran. The pumping station operates eighteen hours per day, three days per week. Both the gross water supply and the distribution system are considered inadequate. Immediate improvements include:

1. The addition of two new wells outside the central area.
2. Replacement of the distribution and plumbing system with modern facilities of greater capacity.

The estimated current demand for water is 0.95 tons per person per month. For a population of 11,000, the annual demand is 0.125 million cubic meters (MC) per year. The existing supply from wells is estimated to be 1,000 tons per day, or 0.365 MCM/yr. It is estimated that the domestic water consumption in 1995 will average 150 liters per person per day. In order to account for other non-industrial, urban areas, the target user population should be multiplied by a correction factor of 1.25. For projected planning population of 28,000 in 1995, it is estimated that the demand for water will be

$$28,000 \times 1.25 \times 150 = 5,250,000 \text{ liters/day}$$

which is approximately 1.9 MCM/yr. or 5.2 times the existing supply.

It is the national policy that industrial and commercial facilities which use large volumes of water be located near the coast, where extensive

Table 8-1-1  
1995 PROJECTED DEMAND FOR PUBLIC UTILITIES SERVICES

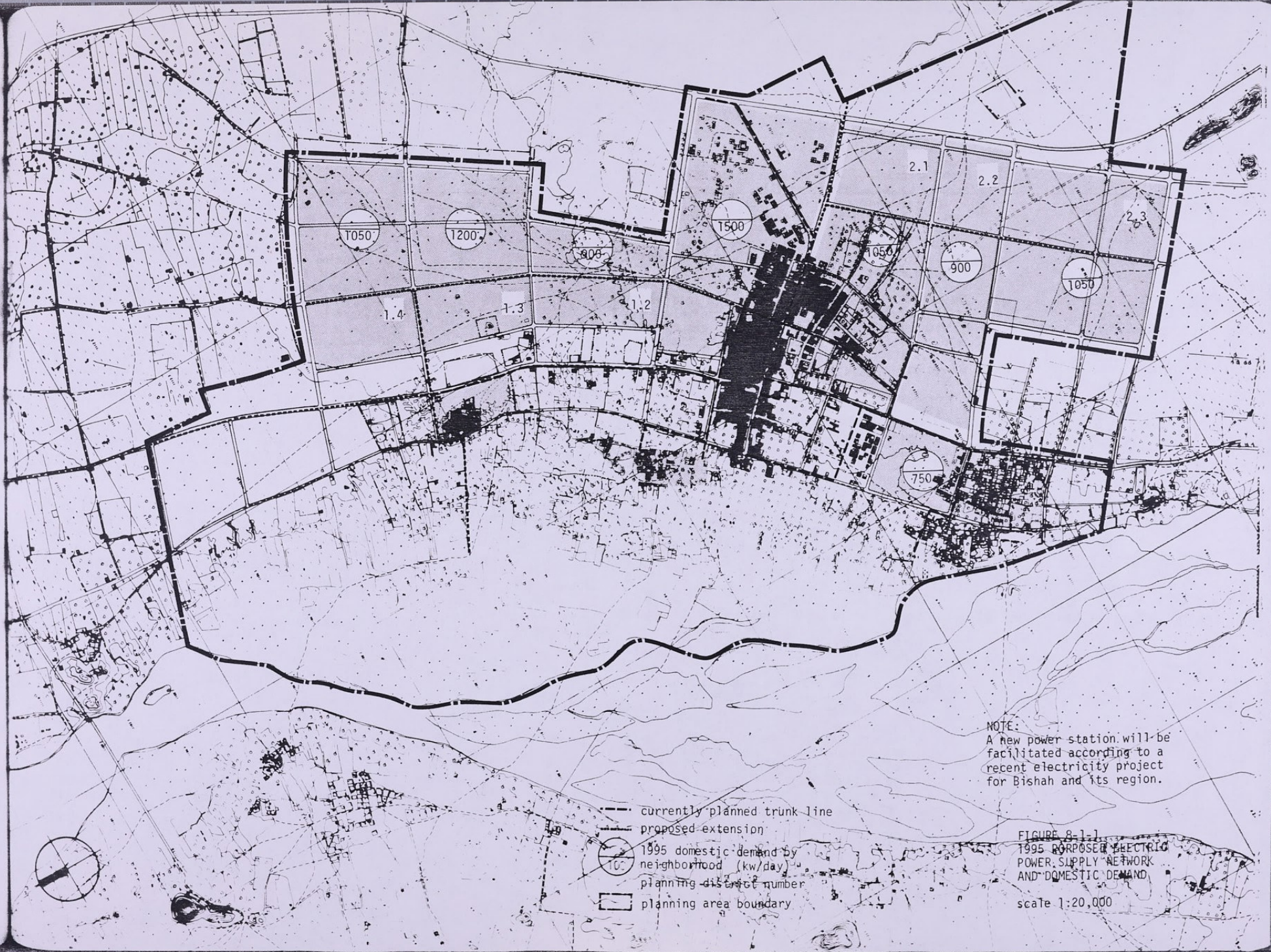
A. DOMESTIC DEMAND BY DISTRICT

Neighborhood	Population 1995	Electricity 0.3 kw/person	Gas 0.5 kg/day/person	Fuel 2.3 l/day/person	Water 150 l/day/person	Refuse 0.5 kg/day Person
1.1	5,000	1500kw	2.50 ton/day	11.50kl/day	750m <sup>2</sup> /day	2.50 ton/day
1.2	3,000	900	1.50	6.90	450	1.50
1.3	4,000	1200	2.00	9.20	600	2.00
1.4	3,500	1050	1.75	8.05	525	1.75
1.	15,500	4650	7.75	36.65	2,325	7.75
2.1	3,500	1050	1.75	8.05	525	1.75
2.2	3,000	900	1.50	6.90	450	1.50
2.3	3,500	1050	1.75	8.05	525	1.75
2.4	2,500	750	1.25	5.75	375	1.25
2	12,500	3750	6.25	28.75	1,875	6.25
Total	28,000	8400	14.00	64.40	4,200	14.00

B. NON-DOMESTIC DEMAND

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

	5,600	8.40	44.80	1,064	8.40
City	14,000	22.40	109.20	5,264	22.40
Gravel	(0.5kw/person)	(0.8kw/day/person)	(139 l/day/person)	(188 l/day/person)	(0.8 kg/day/person)
Total					



NOTE:  
 A new power station will be facilitated according to a recent electricity project for Bishah and its region.

- currently planned trunk line
- proposed extension
- 1000 1995 domestic demand by neighborhood (kw/day)
- - - - - planning district number
- ▭ planning area boundary

FIGURE 8-1-1  
 1995 PROPOSED ELECTRIC  
 POWER SUPPLY NETWORK  
 AND DOMESTIC DEMAND  
 scale 1:20,000

desalination projects are proposed. Accordingly, the demand for water for such purposes in Bishah is not expected to increase substantially.

### 8-3 SEWERAGE

There are no unified sanitary sewage facilities in Bishahat present, with the population depending largely upon cesspools, privies, and septic tanks. As the more intense urban form of land use continues, however, such facilities will no longer serve. Insufficient or unsatisfactory treatment of sanitary sewage can produce severe health problems. At present there is a new system in the planning stage.

The volume of sanitary sewage produced in a community is essentially a function of the volume of water used. Since domestic water consumption is estimated to increase more than four times by 1995, sanitary sewage generation will increase accordingly.

The sewage system consists of two functions: removal and disposal. Removal is a fairly simple process whereby sewage is transported by gravity flow through pipes to the disposal area. Disposal in the new facility will consist, first, of treating the effluent so that it is not dangerous or offensive and then allowing it to be degraded by the elements. It is possible to recover a portion of the effluent to use as fertilizer if it is treated so that dangerous microorganisms are destroyed. The new facility will utilize both primary and secondary treatment.

### 8-4 STORMWATER DRAINAGE

Although a comprehensive system is in the design stage, Bishah currently does not have a complete system for orderly disposal of stormwater. There is a potential for danger, since the entire annual rainfall of 108 mm may be delivered in one or two heavy rainstorms. Flooding, destruction of property, and even danger to humans and animals may result. This problem can be severe even in relatively undeveloped areas, but is particularly hazardous in urban areas since the runoff is increased by prepared surfaces. In areas of dry rocky or sandy soil of high permeability, runoff may be as little as one percent of that which falls as rain, but when the ground is paved and there are roofs, terraces, and other impermeable surfaces, runoff may be as much as ninety percent.

The policy for future development must include provisions for handling large volumes of storm-

water. Among others, this policy should include requirements for the following.

1. Construction of roads, paved surfaces, and other land use projects in such a way that stormwater is quickly and effectively channeled away. Such floodways need not be sophisticated and may simply be curbs, or drainage ditches; but they must be of sufficient strength and capacity.
2. Location of important buildings and structures, such as residences, warehouses, public facilities, and power plants, away from the wadis and natural paths which floodwaters follow.
3. Ensuring of potential sources of pollutants, such as petroleum storage areas, are away from likely paths of drainage. It is desirable that storm and sanitary sewage systems be kept separate.

The new system will have two distinctive features:

1. Use of streets, rooftops, and other surfaces to assist in collecting rainwater. It should be noted, however, that water which flows along streets and roads must be purified if it is to be used for human or animal consumption.
2. Protection of certain areas now subject to flooding, so that they may be put to productive use.

### 8-5 SOLID REFUSE COLLECTION AND DISPOSAL

The present system of garbage collection is by means of a series of central collection sites which are distributed around the city. Five one-ton trucks operated by the municipality haul it to one of three disposal sites, selected on the basis of wind direction. The garbage is burned in the open air. The trucks make a maximum of four trips a day, and up to twenty tons of garbage may be collected. The estimated quantity of solid refuse in the city is between six and eight tons per day.







There are several problems associated with this system:

1. The capacity is insufficient
2. The laws and customs are such that some people do not bring their garbage to the collection points, but simply throw it onto the street or vacant lots. This results in insects and rodents.
3. The system of burning garbage is inefficient with regard both to complete disposal of the waste and to re-use of the land.

Future development policy must take into account the likelihood of the following:

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-  proposed main network
-  well
-  proposed water reservoir
-  domestic demand by neighborhood (ton/day)
-  planning district number
-  planning area boundary

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

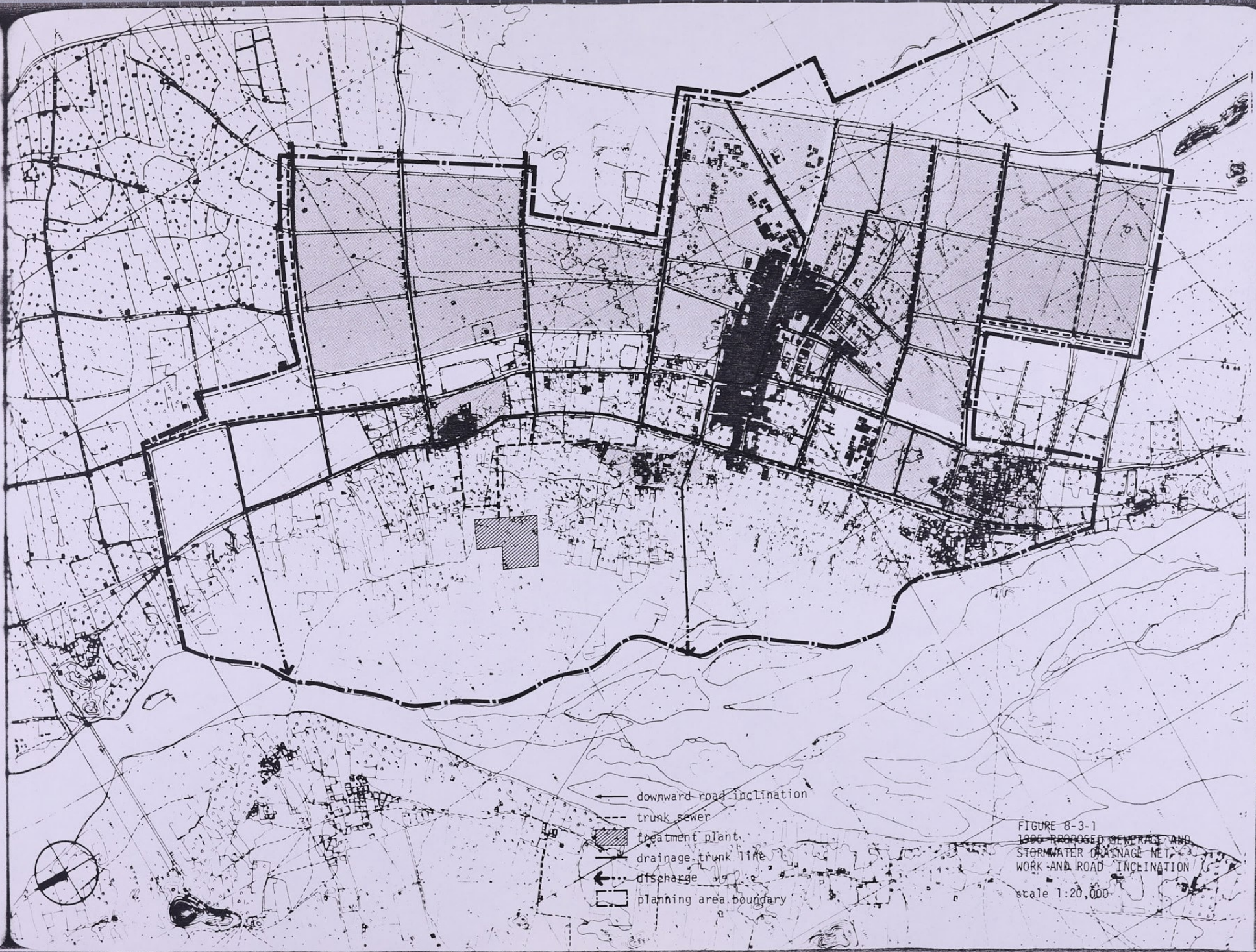
FIGURE 8-2-1  
1995 PROPOSED MAIN WATER  
SUPPLY NETWORK AND  
PROJECTED DOMESTIC DEMAND  
scale 1:20,000

1. An annual increase in the population of approximately 5%, resulting in at least a proportional increase in garbage production.
2. An increase in the degree of urban development, resulting in a lowered capacity to dispose of one's garbage by such means as feeding it to animals or using it as fertilizer.
3. An increase in the per capita income, which typically produces an increase in the per capita production of garbage.
4. An increase in commercial and industrial activity, with a commensurate increase in generation of waste materials.

This output of solid refuse appears likely to increase by a factor of three or four and possibly more.

Among the steps which should be taken are the following:

1. More efficient and effective collection, such as the use of "dumpsters" and other techniques.
2. Increased collection activities, and at a lower level of community organization. Direct pick-up from large generators may prove feasible.
3. Recovery and recycling of certain waste products such as scrap metal, glass, and fibers (paper, cloth, etc.)
4. Proper disposal techniques so that landfills may be covered over and put to productive uses in the future.
5. Enactment and enforcement of laws against littering the streets and dumping garbage in illegal places.



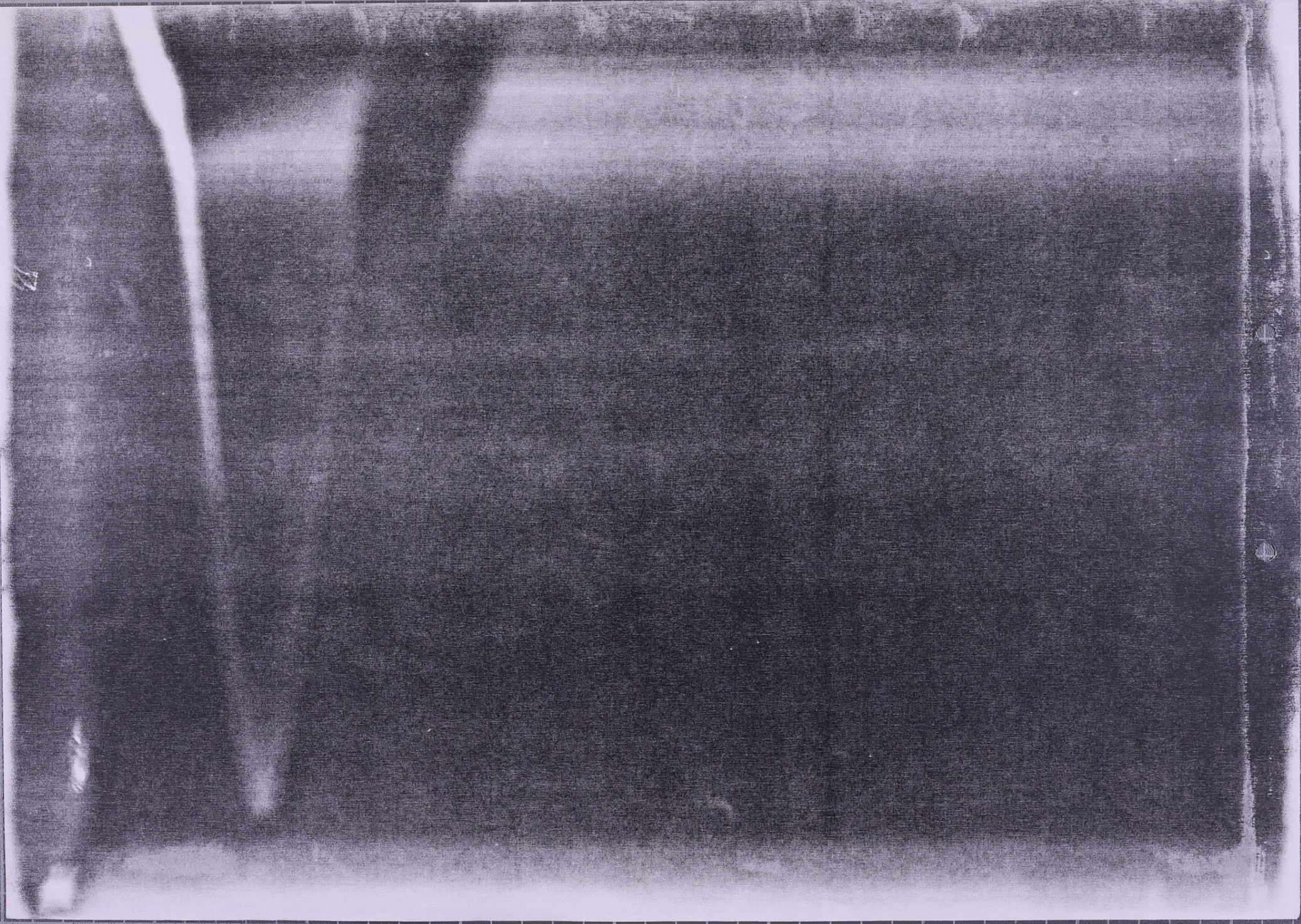
- downward road inclination
- - - trunk sewer
- ▨ treatment plant
- drainage trunk line
- ← discharge
- - - planning area boundary

FIGURE 8-3-1  
 1996 PROPOSED GENERAL AND  
 STORMWATER DRAINAGE NETWORK AND ROAD INCLINATION  
 scale 1:20,000





9. land use



9-2 SUMMARY OF LAND USE  
POLICIES

Since Bishah has thus far developed in a somewhat random and uncontrolled fashion, and consequently has a low degree of intensity of use, even in its central area, it is important that policies be framed to counter these trends. Two fundamental principles are involved;

1. Development of the urban center with as high an intensity of land use as feasible, for the purpose of maximizing the efficiency and effectiveness of the commercial, industrial, civic, and administrative functions carried on there, and minimizing sprawl and disorder. In particular, these objectives are:
  - a. Maximizing the efficiency of commercial and other exchanges.
  - b. Maximizing the efficiency of transportation of goods into and from the sqq, and the convenience of the consumer.
  - c. Protecting adjacent neighborhoods from intrusion of commercial activities.
  - d. Establishing a hierarchical system of commercial facilities for convenience and efficiency.
2. Protection of adjacent agricultural areas with regard to the following:
  - a. Prevention of the extension or intrusion of urban uses into productive farm land.
  - b. Prevention of the construction of potentially hazardous uses in the vicinity of farmlands; for example, not allowing an industrial use with high volumes of traffic that might disturb animals.
  - c. Construction of new urban or high-intensity uses only on land that does not have a high potential for agricultural development.
  - d. In general, remembering that some of the most productive and valuable farmlands are in close proximity to the urbanized areas, and making certain that they do not become affected in an undesirable way.

9-1 EXISTING AND PROJECTED LAND USE

The central district of Bishah has about 400 ha of land. About 78 ha of this forms the intensely developed central area, and about three-quarters of that or 57 ha is used for housing. The remainder of the central district is less intensively developed, with little or no permanently constructed facilities on it. It is used for cultivation, cemetery, a temporary suq, or is simply vacant.

On the whole, therefore, Bishah is not a concentrated city. With few exceptions, there are no types of land use which restrict development; these exceptions include the Wadi Basin, the date plantations which are located along the wadi, and a large 15 ha cemetery northwest of the central district which has blocked further expansion in that direction. Otherwise there has been nothing to cause the development of a concentrated and unified urbanized area or to halt sprawl. Conversely, there continue to be large areas of cultivated land within the interior part of the city.

The government has been successful to some extent in controlling the land by sub-dividing and the construction of infra-structure. A grid-pattern of streets has developed. Even so, the more recent urban development has been less concentrated and intense than that in the older sections.

It is projected that the demand for urban land uses will increase by two to two and one-half times by 1995. The biggest increase will be in educational facilities. The smallest increase is likely to occur in commercial land use, due to the policy of increasing the intensity and concentration of its use, rather than increasing the volume of land actually occupied.

Several five-year phases of development have been proposed, with specific objectives for each. These are discussed in subsequent sections.

TABLE 9-1-1  
EXISTING LAND USE AREAS, CENTRAL DISTRICT

Activity	Area (ha)	%
Residential	57.6	13.1
Commercial	6.5	1.5
Industrial	0.8	0.2
Educational	5.7	1.3
Religious	0.9	0.2
Social	8.8	2.0
Military	-	-
Agricultural	45.3	10.3
Recreational	1.3	0.3
Cemetery	17.1	3.9
Vacant	241.4	54.9
Major Road Network	54.6	12.4
Total	440.0	100.0

FIGURE 9-2-1  
1995 PROPOSED  
MASTER PLAN

scale 1:20,000

elementary school and playground for boys	EB
elementary school and playground for girls	EG
intermediate school and playfield-level 1 for boys	IB
intermediate school and playfield-level 1 for girls	IG
secondary school and playfield-level 2 for boys	SB
secondary school and playfield-level 2 for girls	SG
teachers' school for boys	TB
teachers' school for girls	TG
technical school for boys	VB
technical school for girls	VG
colleges	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 approved by the Military of Municipal and Rural Affairs as of April 1978.  
\*3 Facilities newly proposed by the Master Plan in addition to those identified in \*1 and \*2.

Facilities are distributed according to the community structure established in accordance with Planning Standards. Facilities for neighborhoods, sub-communities, communities, and the city have been shown, but 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 concerning the service population, function, area, and other requirements for various facilities, see Appendix, Planning Standards.


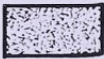

Hizami development area	1
Hizami development area reserved	2
lands for government	
new general hospital	3
sports stadium	4
boys educational center	5
special agriculture developed	6
case by case basis	
city garden	7
hospital for women and children	8
selective light agricultural	9
industry	
date canning factory	10
sewage treatment plant	11
industry park	12



Zoning Classification	Principal Land Use	
--------------------------	--------------------	--

A	Agricultural	
R1	Low density residential	
R2	Medium density residential	
B	Business and commercial	
M	Industrial and warehousing	
P1	Government and civic	
P2	Institutional	

Special District Classification	Principal Land Use	
------------------------------------	--------------------	--

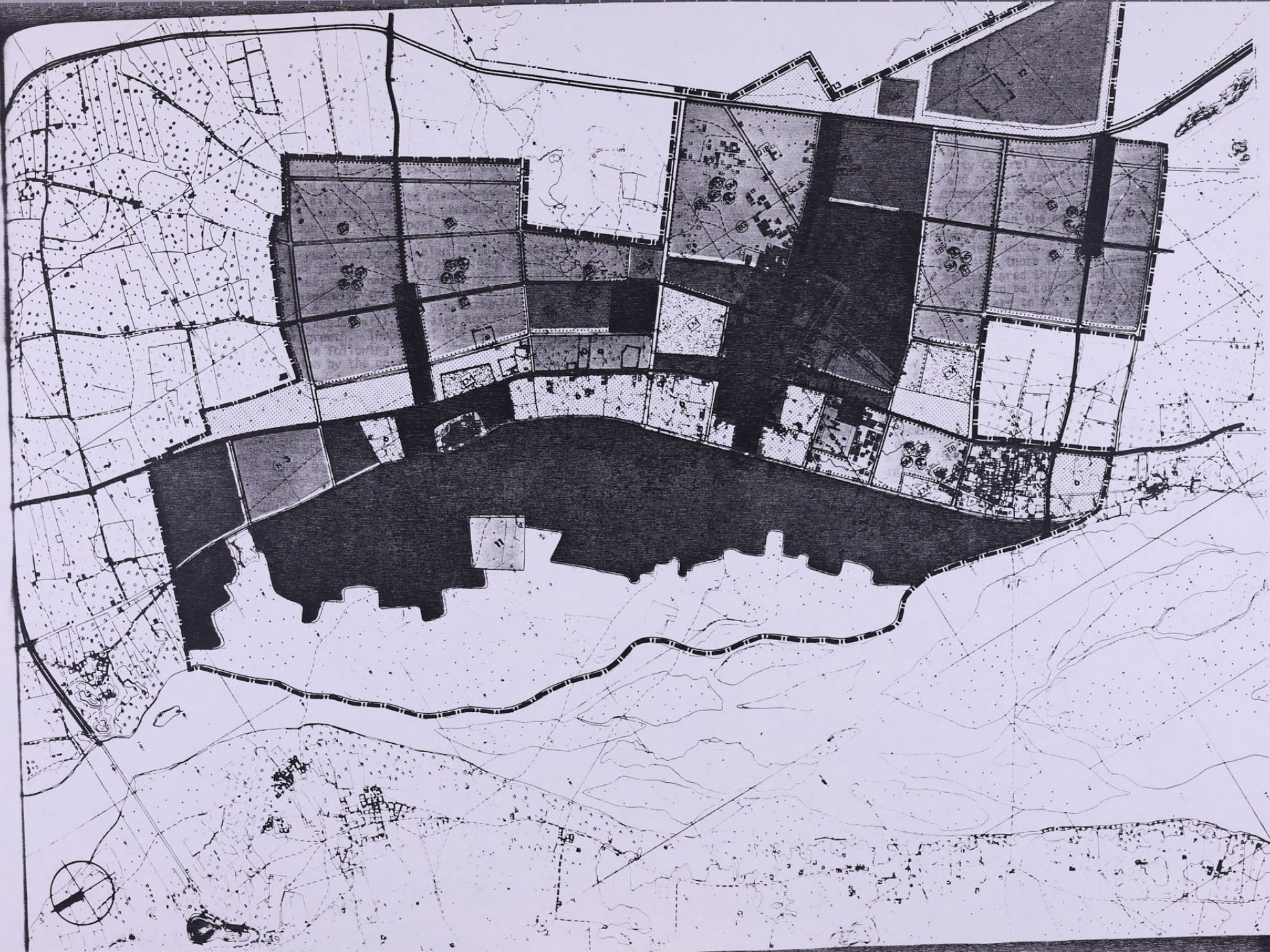
S1	Recreational	
S2	Non-agricultural conservatio	
S4	Restricted Development	

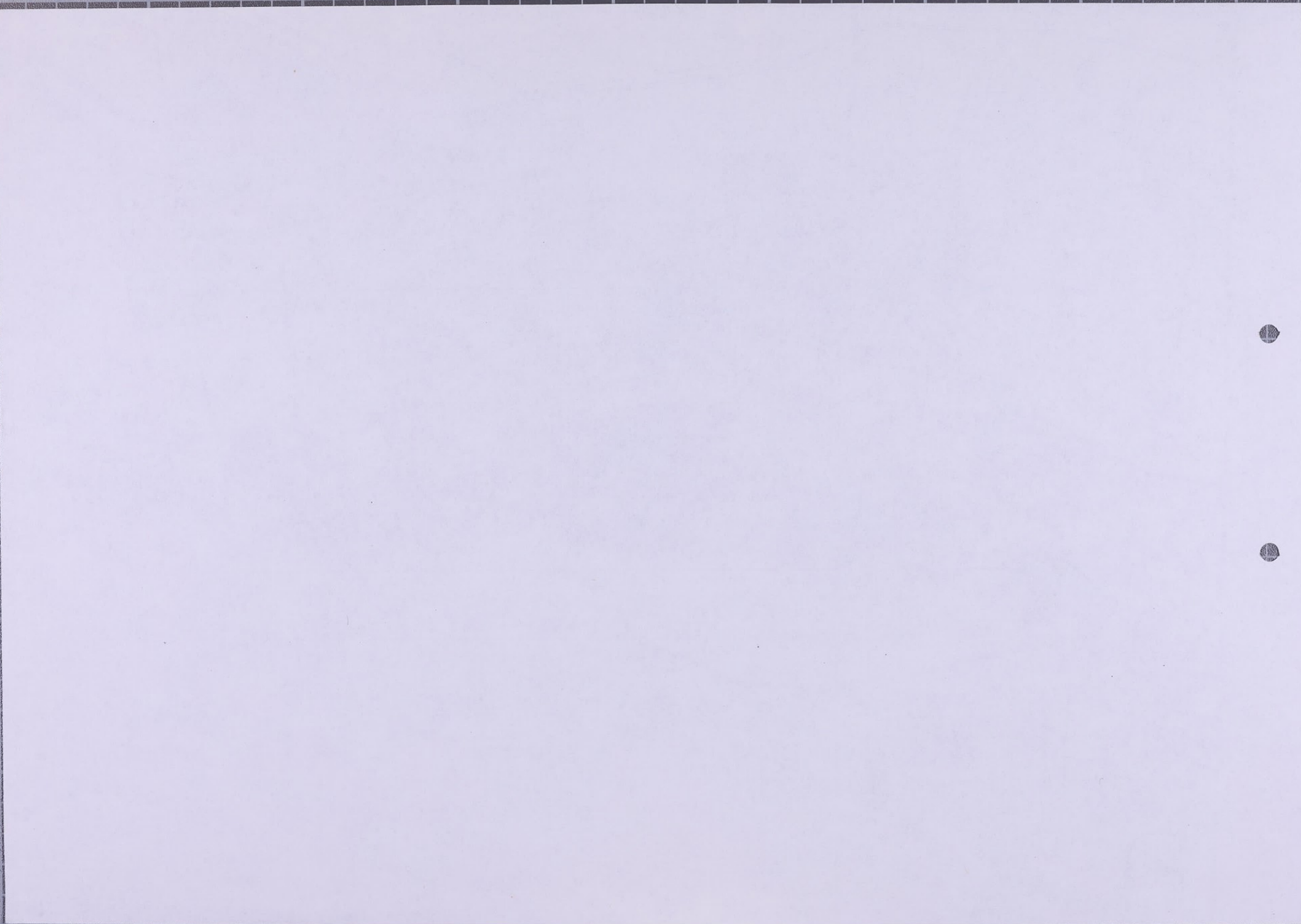
NOTES:

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









The development plan outlines the principles and strategies to guide future public investment in the city of Bishah. The proposed master plan presented in Fig. 9-2-1 is a graphic representation of the recommended, target distribution of activities, based on projected growth of the city and on standards for essential urban services for the projected population. The master plan is a summary of all the detailed element-by-element analyses and land use proposals presented in Chapters 2 through 8 of this report.

The 20 year development plan is to be implemented in three phases: Phase I, 1975-1980; Phase II, 1980-1985; and Phase III, 1985-1995. Facilities associated with the community structure organization (i.e., communities, sub-communities, and neighborhoods) will be phased according to population growth. Throughout the three phases, however, the following issues should receive major attention by the government:

1. Continued expansion of the administrative sector and its use of land, although at a somewhat lower rate than in the past.
2. Maintenance of the agricultural sector, particularly the date plantations, but with little large-scale expansion.
3. Continued expansion of the population and the land used for residential purposes, but at a lower rate than in the past decade and with a greater concentration of housing units per ha.
4. Continued expansion of the number and level of activity of the commercial sector, but little or no expansion of the land occupied by it, producing a significant increase in the concentration and intensity of commercial uses.

Among the specific steps that are to be taken to promote and guide the appropriate form of development are the following:

1. Establishment of a hierarchical system of neighborhoods, communities, and so on, to provide for the most effective use of facilities. This is described in Section 5-5, "Neighborhood and Community Central Areas", and applies to all public and private facilities except those in the commercial sector.
2. Commercial facilities are to be handled somewhat differently, due to the need to produce a more comprehensive, unified, and coherent concentration of such units. Most commercial facilities, including those which in other cities would be scattered through small residential groups, are to be concentrated in three areas. These are to be located along major streets parallel to each other and one to two km apart.
3. Expansion of Bishah has been planned with regard to particular areas and phases. The areas are:
  1. The Hizami development area, a 400 ha site to the north of the Central Area (Al Rawshan).
  2. A second site to the south of the Central Area.

The form that this development will take is discussed in Section 9-5, "Action Areas".

9-4 CITY CENTER

The central part of Bishah has not yet developed into a sufficiently unified and concentrated area to fulfill all the functions that are expected of it. In the future, however, policies should promote a better form of development. Among the particular uses that will be constructed, enlarged, or intensified in the city center are:

1. Practically all commercial activities.
2. Community or civic center, and most other cultural and social facilities.
3. The general hospital (but not the tuberculosis or mental hospital).
4. Mosques
5. Governmental functions, at both national and municipal levels.
6. Most residential uses
7. Those agricultural uses already in existence in the Central Area.

9-5 PROPOSED ACTION AREAS

Action areas consist of two types:

1. Those involving specific functions such as the stadium or the hospitals.
2. Those involving more general development, such as the Hizami Development Area.

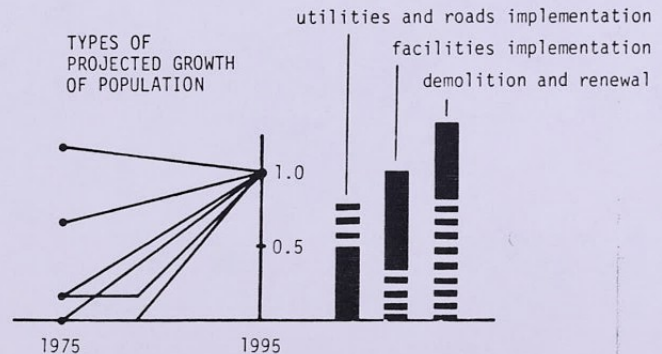
The following general concepts have been established:

1. The principal directions for the growth of the city should be, first, northward from Al Rawshan parallel to the wadi and, second, southward from Al Rawshan parallel to the wadi (the former contains the Hizami development district and is to be accomplished during Phases I and II, 1975-1985).
2. Major urban developments should be contained between the road from Al Rawshan to the bridge and points north and the road along the edge of the airport, extending toward Khamis Mushayt.
3. The existing agricultural areas should be preserved as much as possible.
4. Residential neighborhoods should have a degree of community cohesion and territorial integrity. In particular, regional traffic should be minimized in residential neighborhoods.
5. Residential density should be the highest near the central district of Al Rawshan and should decrease toward the development fringes.

These objectives have been translated into a land use plan. For the Hizami development area, three general zones of land use have been established:

1. Residential area
2. Neighborhood commercial area
3. Public and miscellaneous activities area.

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





industrial park

0.13  
0.1

0.17  
0.17

0.67  
1.02

0.45  
0.86

general hospital

sewage treatment plant

planning area boundary

- major road completed by 1975
- - - major road implementation in Phase I

0.17 population ratio\* in 1975  
0.83 population ratio in 1980

- ▨ 0 - 0.5
- ▩ 0.5 - 1.0
- 1.0 -

(population ratio in 1975)

- ▤ specified development initiated in Phase I

FIGURE 9-3-1  
PHASE I  
(1975-1980)

scale 1:20,000



The planning population for the Hizami development area has been derived within the context of the general master plan for the city of Bishah. The consultant has projected that there will be some 28,000 people in Bishah in 1995, of whom approximately 10,000 will live in the Hizami development area.

This population is distributed in two neighborhoods which comprise the residential area. The neighborhood will generally be centered around boys and girls elementary schools, and a mosque. Other small-scale amenities, such as nurseries, tot lots, neighborhood center and park should be distributed within the residential area.

Commercial activities and other facilities for the service of the entire Hizami development area should be located close to one another in the "Neighborhood Commercial Area". It is expected that most of the day-to-day consumer needs of the residents in the development area will be satisfied here.

Finally, a zone has been set aside along the major road extending northward from Al Rawshan to the bridge across Wadi Bishah. This zone serves two principal purposes:

1. It incorporates the many private lands which could not be acquired by the Municipality for the Hizami development project.
2. High degree of vehicular accessibility is suitable for those public and institutional facilities which would serve the population of the greater Bishah area from Al Hifah to Ad Dahw and, in some instances, the Bishah sub-region as well.

#### 9-6 RELATIONSHIP OF THE MASTER PLAN TO THE DETAILED LOCAL PLANS

The master Plan directly affects several detailed local plans under consideration for Bishah by the Deputy Ministry for Town Planning Affairs.

First, a General Plan for the redevelopment of Al Rawshan has been approved by the Ministry, and roads and facilities have been constructed according to this plan[1]. The present Master Plan fully incorporates the existing general plan. It is clear, however, that the Rawshan district alone is not capable of housing all the expected increase in population after 1985. The Master Plan provides planning guides for the development of the city beyond 1985.

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

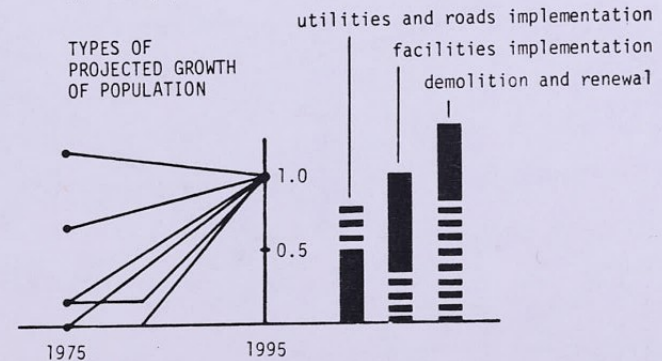




FIGURE 91-3-2  
 PHASE II  
 (1980-1985)  
 scale 1:20,000

Second, the Ministry of Municipal and Rural Affairs has commissioned Allott and Lomax Consulting Engineers, to make a study of water management in Bishah. The Master Plan has been coordinated with the various findings and recommendations of the preliminary report submitted by Allott and Lomax [2]. However, it is essential that the following issues be incorporated in all future consideration of Bishah's water management:

1. The water and sewage plan proposed in the Preliminary Design Studies covers only the Rawshan and the southern portion of the Hizami development area. The water management studies should incorporate the entire Hizami development area and the proposed extension area south of Al Rawshan.
2. The proposed sewage treatment plant should be equipped with secondary and tertiary treatments before the effluent is discharged into the wadi.
3. Sufficient consideration should be given to all potential sources of leakage leading to contamination of the ground water as well as the wadi (See also Sec. 2-3-3 above)

Third, as indicated in Sec. 9-5, the government has recently acquired the Hizami development area for planning of residential services and government facilities. At the request of the Department of Town Planning, Southern Region, a separate report, outlining a development strategy for this area, has been submitted. The Master Plan fully incorporates the recommendations of that report, as modified in consultations with the Department.

Fourth, the Master Plan incorporates several specific planning projects and development permits approved by the Department of Town Planning, Southern Region. Among these are:

1. Boys educational complex and a small stadium to be located in the southwestern portion of the Hizami development area.
2. A community/city park in Al Rawshan district.
3. A date packing factory to be located northeast of Al Rawshan, along the road to Ad Dahw.
4. A new general hospital to be located northeast of Al Rawshan.

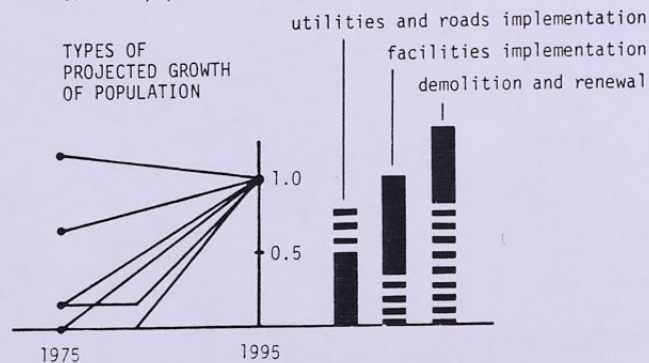
All of the above projects have been discussed in the present report.

#### Chapter 9 Notes:

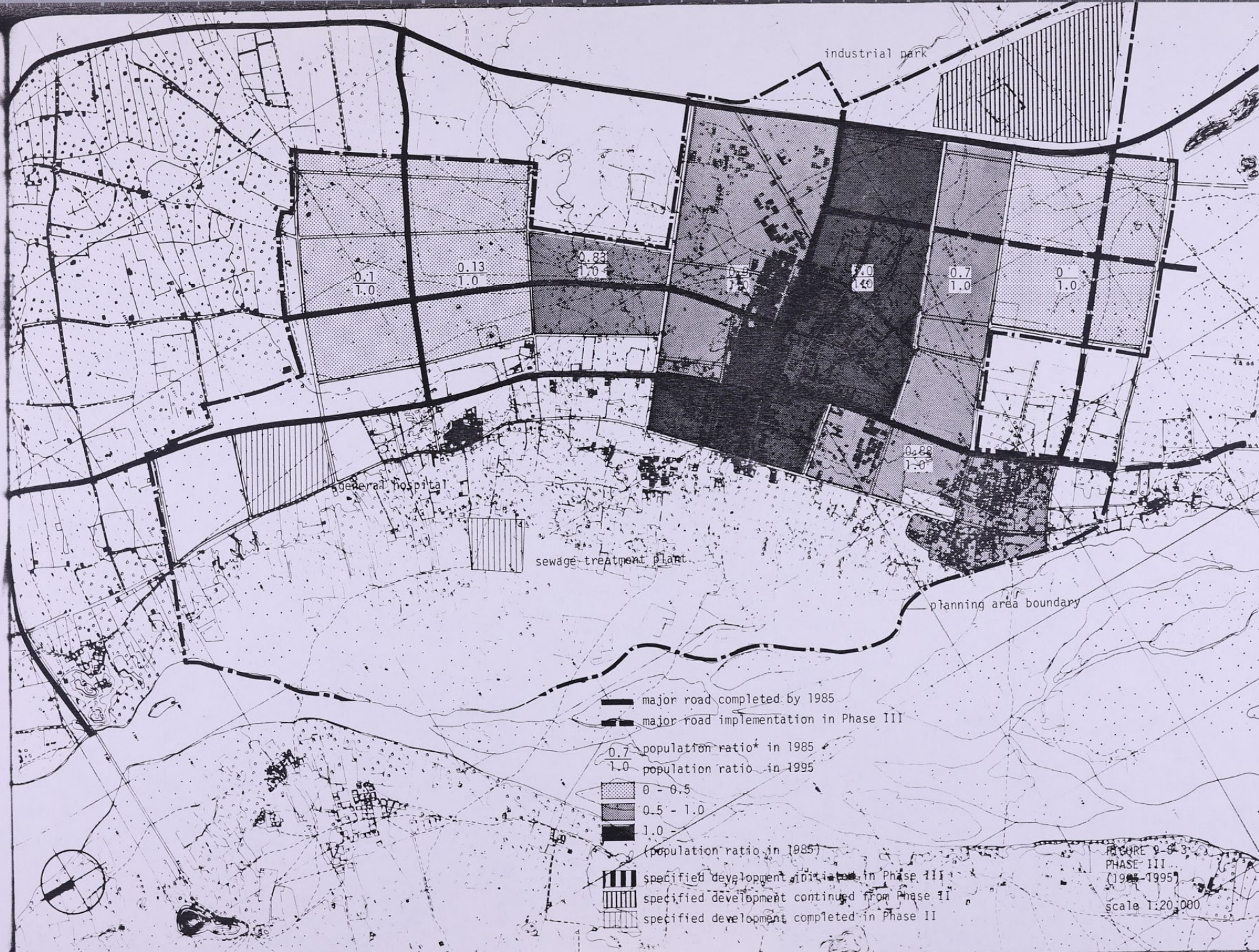
The Master Plan presented in this report summarizes the long-range policy guidelines related to (1) density, (2) land use, (3) general locational policy, and (4) structural organization of the city. Detailed implementation plans should be developed subsequent to this report. The Planning Standards appended to this report form the linkage between the Master Plan and the detailed local plans which follow.

1. See Bishah Existing Conditions, Vol. I, Fig. 8-2-1.
2. Ministry of Municipal and Rural Affairs, City of Bishah, Water Management, Preliminary Design Studies, Allott and Lomax Consulting Engineers, 1976.

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







industrial park

0.1  
1.0

0.13  
1.0

0.83  
1.0

0.7  
1.0

0.40  
1.40

0.7  
1.0

0  
1.0

general hospital

sewage treatment plant

planning area boundary









-  major road completed by 1985
-  major road implementation in Phase III
- 0.7 population ratio\* in 1985
- 1.0 population ratio in 1995
-  0 - 0.5
-  0.5 - 1.0
-  1.0 -
- (population ratio in 1985)
-  specified development initiated in Phase III
-  specified development continued from Phase II
-  specified development completed in Phase II

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



10. administration and management

10-1 TOWN PLANNING 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.

Four fundamental actions are required:

1. After it is finally approved, the Master Plan for Bisha should be made into law, rather than being considered a guide without authority.
2. The planning and implementation process should be revised, with a division of power as follows:
  - a. The Deputy Ministry in Riyadh should have policy and decision making authority for long range planning.
  - b. Regional and municipal authorities should have the power to interpret, administer, and implement the plan without the necessity of further consultation with the central office.
3. A zoning map, tailored to the needs of each city and its development goals, should be prepared in accordance with the Master Plan. This is discussed in Section 10-3.
4. Most of the power for budgeting should be at the local level, with general supervision at the level of the Deputy Minister.

10-2 DEVELOPMENT AND IMPLEMENTATION

There will be a large volume of public investment in the near future. This should be done in accordance with the following guides:

1. The phasing should be done so that maximum speed and efficiency are accomplished, with minimum disruption.
2. Construction of new facilities should be done in a way that favors the broadest level of development as possible and does not favor a particular area except as directed by the plan.
3. Public investment should be done in a way that encourages appropriate private investment.

The amount of public investment that is necessary to stimulate a given type of private development is 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%
b. Other Facilities	100%
9. Industrial Facilities	20%
10. Transportation Facilities	100%

Public investment will be greatest in the first two phases, dropping off slightly in the last, with SR 260 estimated for 1975-80, SR 200 for 1980-85, and SR 190 for 1985-95. 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

Table 10-2-1  
IMPLEMENTATION PROGRAM, BISHAH<sup>a</sup>

	1975			1975 - 1980			1980 - 1985			1985 - 1995		
	NUMBER	TOTAL FLOOR AREA (m <sup>2</sup> )	TOTAL LAND AREA (ha)	PHASE I			PHASE II			PHASE III		
				NUMBER	TOTAL FLOOR AREA (m <sup>2</sup> )	TOTAL LAND AREA (ha)	NUMBER	TOTAL FLOOR AREA (m <sup>2</sup> )	TOTAL LAND AREA (ha)	NUMBER	TOTAL FLOOR AREA (m <sup>2</sup> )	TOTAL LAND AREA (ha)
BOYS ELEMENTARY <sup>b</sup>	3	4,702	3.4	1	1,378	0.9	2	1,570	1.2	3	4,950	3.5
BOYS INTERMEDIATE <sup>b</sup>	1	2,684	2.1	0	616	0	1	900	0.3	1	2,700	0.8
BOYS SECONDARY <sup>b</sup>	1	546	4.2	0	213	0	0	300	0.1	0	1,000	0.3
BOYS HIGHER EDUCATION	0	0	0	2	1,100	1.2	0	400	0.1	0	900	0.2
GIRLS ELEMENTARY <sup>b</sup>	3	4,702	3.4	1	1,348	0.9	2	1,570	1.2	2	4,950	3.5
GIRLS INTERMEDIATE <sup>b</sup>	1	2,684	2.1	1	616	0	0	900	0.3	1	2,700	0.8
GIRLS SECONDARY <sup>b</sup>	1	329	4.1	0	75	0	0	200	0.1	0	400	0.1
GIRLS HIGHER EDUCATION <sup>b</sup>	0	0	0	2	750	1.2	0	350	0	0	400	0.1
TOT-LOT	44		2.2	10		0.5	13		0.6	33		1.6
PLAY-LOT (KINDERGARTEN)	11		2.2	3		0.5	13		0.7	9		2.0
NEIGHBORHOOD PARK	3		5.5	1		1.25	1		2.1	3		5.0
COMMUNITY PARK	0		0	0		0	2		10.8	0		0
CITY PARK	0		0	0		0	1		2.0	0		0
SMALL MOSQUE	3	3,160	0.75	1	720	0.25	2	1,008	0.25	2	3,168	0.5
JAMI'A MOSQUE	1	1,320	0.7	0	300	0	0	420	0	1	1,320	0.7
EID MOSQUE	0	0	0	0	0	0	0	0	0	0	0	0
NEIGHBORHOOD CENTER	3	550	0.9	1	125	0.3	2	175	0.6	2	550	0.6
COMMUNITY CENTER	1	110	0.6	0	25	0	0	35	0	0	110	0
CIVIC CULTURAL CENTER	0	0	0									
PHARMACY	3	550	0.3	1	125	0.1	2	175	0.2	2	550	0.2
DIAGNOSIS/TREATMENT	1	550	0.3	0	125	0.1	1	175	0.1	1	550	0.3
COMMUNITY/GENERAL HOSPITAL	39	1,170	0.8	9	270	0.2	12	360	0.3	39	1,170	0.8
SPECIAL HOSPITALS	0	0	0	450	17,500	14.3	50	2,500	0	120	5,000	0
	beds											
	beds											
ADMINISTRATION		16,000	4.2		3,000	1.0		3,000	0.8		21,000	6.0
POPULATION/HOUSEHOLD		11,000/1,580			2,500/830			3,500/990			11,000/2,820	

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<sup>2</sup> 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<sup>2</sup> 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<sup>2</sup> (12,600 + 4,050) and a total land area of 11.8 ha (9.0 + 2.8). This method is carried out for each phase, with only the increments being shown and not the totals, and is intended to facilitate implementation and cost planning for each phase.

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

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

sector across all years is in education. However, Phase I of the Plan (1975-80) is an exception to this latter trend with public investment in transportation, health and welfare activities consuming more than education. 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

#### 10-3-1 LEGISLATIVE 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, assisted as necessary by the police and the courts. Applicants for building permits would have to submit the necessary documentation, including plans and specifications to the Building Department and no permit would be granted for work not in conformity to its standards.

At a minimum, the following districts should be established for Bisha:

1. Agricultural
  - a. High-Intensity
  - b. General Cultivation
  - c. Rangeland

2. Residential
  - a. High Density (urban)
  - b. Possibly Medium Density
  - c. Low Density (rural)
3. Commercial (See Section 5.5)
  - a. Neighborhood
  - b. Community
  - c. Regional
4. Public Use
  - a. Administrative
  - b. Religious
  - c. Health
  - d. Others, As Necessary
5. Special
  - a. Conservation Districts
  - b. Water Harvesting Areas
  - c. Flood-prone Areas
  - d. Others, As Necessary

#### 10-3-2 CONTROL OF DEVELOPMENT IN OUTSKIRTS

As the population of Bishah increases, there will be pressures for the landowners near the city to convert their land to urban uses. The current general plan of Al Rawshan and the proposed Hizami development are designed to relieve these pressures and direct the demand for housing into planned residential areas. Nevertheless, some farm lands will have a high potential for development because they are near the existing center of activities in Al Rawshan and are relatively desirable for the existing planting and date palms. This is particularly true for the agricultural lands between Al Rawshan and the wadi.

Such pressures, however, should be strongly resisted for the following reasons:

1. The existing date farms and other agricultural lands are the primary economic resources of the city. These lands have been cultivated because they are close to the wadi and the ground water supplied by the seasonal flow of the river. Converting such lands to urban uses, which do not require large quantities of water, will deprive the city of some of its most productive lands.
2. The greenery of date palms and other produce benefits the city environmentally as well as visually, by providing moisture and shade. Without such plants, the city will be hotter and more arid during the summer.
3. Any sizable development of the agricultural land will deflect demand for housing in the Hizami development area, jeopardizing the possibility of the Hizami area to develop into a viable community.

Thus all intensive, urban use of the agricultural lands along the wadi should be prohibited. Some of the measures available to the government to enforce this policy are:

1. Zoning of all such lands for agricultural use. This will enable the city to legally control the future use of the agricultural land.
2. Limiting public utility services, including water, sewage, and electricity, only for those uses allowed under agricultural zoning or under special permit.
3. Withholding approval for development of any intensive, urban activity on agricultural land.
4. Outright purchase of the land and conservation for the common benefit of the city.

The importance of conserving agricultural lands in Bishah cannot be overemphasized. Management of future pressures for the development of these outlying areas is one of the critical tasks facing the government.



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.

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 hierarchy and group privacy dealing with the rapid growth of the cities.

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

Table A-1-1  
SURVEY POPULATION<sup>a</sup> 1975 and 1995

	1975 <sup>b</sup>	1995 <sup>c</sup>	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 many 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)<sup>a</sup>

	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 differentiate between the two, although ratio of school enrollment may differ between the sexes.

Table A-1-3(a)  
POPULATION OF AGE GROUP 0 TO 19 IN THE FIVE CITIES<sup>a</sup>  
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:

$$3\%/Age \times 4 \text{ ages (6,7,8 and 9)} + 2\%/Age \times 2 \text{ ages (10,11)} = 16\%$$

$$4\%/Age \times 4 \text{ ages (6,7,8 and 9)} + 3\%/Age \times 2 \text{ ages (10,11)} = 22\%$$

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

$$2\%/Age \times 3 \text{ ages (12,13 and 14)} = 6\%$$

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

For secondary schools, enrollment in 1995 is assumed to be somewhere around 37.5% of the age group population (15,16 and 17). Secondary school enrollment is expected to be somewhere between 2.25% and 3.38% of the total population.

$$2\%/Age \times 3 \text{ ages (15,16 and 17)} \times 37.5\% = 2.25\%$$

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

#### A-1-4 SUMMARY OF DEMOGRAPHIC AND DENSITY FRAMEWORKS

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

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

POPULATION GROUP RANGE	DENSITY RANGE		RANGE OF ENROLLMENT		ENROLLMENT		INTERMEDIATE SCHOOL		SECONDARY SCHOOL		
	50pph	100pph	200pph	2.25% to 5.0%	16.0%	22.0%	6.0%	9.0%	2.25%	3.38%	
500	10 <sup>a</sup> (178) <sup>b</sup>	5 (126)	2.5 (89)	12 <sup>c</sup>	30	80	110	30	45	11	17
10 <sup>3</sup> =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 <sup>4</sup> =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 <sup>5</sup> =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<sup>3a</sup> (i.e. an a-multiple of population group 10<sup>3</sup>) 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<sup>4b</sup> (i.e. a b-multiple of population group 10<sup>4</sup>) 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<sup>4b</sup> (i.e. a c-multiple of population group 10<sup>4</sup>) 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<sup>3</sup> is conventionally called "Neighborhood" and the grouping of population with order of 10<sup>4</sup> 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 <sub>0</sub> (Level 0)	Residential Unit Group	250
G <sub>1</sub> (Level 1)	Sub-Neighborhood	937 (Say 1000)
G <sub>2</sub> (Level 2)	Neighborhood	3,750 (2,500 to 5,000)
G <sub>3</sub> (Level 3)	Sub-Community	15,000 (10,000 to 20,000)
G <sub>4</sub> (Level 4)	Community	30,000 (20,000 to 40,000)

G<sub>0</sub> and G<sub>1</sub> 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<sub>0</sub> 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<sub>1</sub> 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 <sup>2</sup> /pupil is recommended (3m <sup>2</sup> to 7m <sup>2</sup> /pupil is acceptable) for building area and service area. For play area (see next section, "Nursery-Kindergarten Playlot".)
Floor Area:	3m <sup>2</sup> /pupil is recommended (2m <sup>2</sup> to 4m <sup>2</sup> /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
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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. Minimum width of site is 80m. But less than 80m is also acceptable if accompanied by an acceptable layout plan. (M. E. Standards recommend 100m x 100m site; 80m x 95m as minimum.)

Floor Area:  $4.5m^2$ /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 distributor roads. It should be separated from the girls' school.

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

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

#### A-2-1-3 ELEMENTARY SCHOOL FOR GIRLS

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

#### A-2-1-4 INTERMEDIATE SCHOOL FOR BOYS

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

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

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

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

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

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

Land Area Requirement:  $20m^2$ /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.)	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.)
Floor Area Requirement:	6.5m <sup>2</sup> /student, i.e. 3900m <sup>2</sup> /600 students, is recommended. 5m <sup>2</sup> /student to 8m <sup>2</sup> /student is also acceptable depending on the degree of non-classroom facility (library, indoor sports) programs.	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.
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 <sub>7</sub> ), local access street (V <sub>6</sub> ) or distributor road (V <sub>5</sub> ) with sidewalks (See definition of V <sub>7</sub> through V <sub>5</sub> in the "Road Standard" section) It should be separated from girls' school.	Sub-Unit:	25 to 30 student/class (M. E. Standards recommend 30 students/class and 18 classes/school.)
Other Requirements:	Playfield - Level 1 should be a part of or close to the school; it shall be used for intermediate school curriculum and also by the neighboring population for weekend and off-working-hour sports activities.	Land Area Requirement:	25m <sup>2</sup> /student is recommended for building and ground area (25m <sup>2</sup> /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.)
A-2-1-5 INTERMEDIATE SCHOOL FOR GIRLS	Age of population, population served, radius of area served, and sub-unit standards are the same as intermediate school for boys. Although the standards for girls' school are inferior at the moment, it is recommended that 100% enrollment up to intermediate school be mandatory not only for boys but also for girls. From this view point the standards for girls' school should be basically identical.	Floor Area Requirement:	7m <sup>2</sup> /student, i.e. 4200m <sup>2</sup> /600 students is recommended. 6m <sup>2</sup> /student to 8m <sup>2</sup> /student is also acceptable depending on the degree of provision of non-classroom facility (such as indoor athletic facilities) programs.
A-2-1-6 SECONDARY SCHOOL FOR BOYS		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 <sub>7</sub> ), local access street (V <sub>6</sub> ), distributor road (V <sub>5</sub> ) or minor collector road (V <sub>3</sub> ). It should not be directly accessible from the residential area through arterial road (V <sub>2</sub> or V <sub>1</sub> ). (See section on "Road Standard" for the definition of V <sub>7</sub> through V <sub>1</sub> ) It should be separated from secondary schools for girls.
Age of Student:	15 through 17 (3 to 4.5% of total population; boys only).	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.
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.	A-2-1-7 SECONDARY SCHOOL FOR GIRLS	Age of population, population served, radius of area served and sub-unit standards are the same as those of secondary school for boys. Enrollment assumptions should be lower than the case for boys. The enrollment of girl students should in the future go higher and eventually as high as the boys. For the present planning purposes, it is assumed that 30% of the girls' will
Population Served:	30,000 is recommended. 20,000 to 40,000 is also acceptable. (Even wider range is acceptable if good reasons exist.)		



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<sup>2</sup>/student (2.1ha/720 students) (M.E. Standards require 100m x 100m for building and site area)

Floor Area Requirement: 8m<sup>2</sup>/student

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

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

#### A-2-1-9 TECHNICAL SCHOOL

Age of Student: Varies but over 15.

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

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

Sub-Units: 25 to 30 students/class.

Land Area Requirement: 30m<sup>2</sup>/student (2.1ha/720 students.)

Floor Area Requirement: 8m<sup>2</sup>/student. (M. E. Standards require 100m x 110m for building and site area)

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

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

Age of Student: Varies but over 15.

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

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

Floor Area Requirement: 7m<sup>2</sup>/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<sup>2</sup>/student to 50m<sup>2</sup>/student.

Floor Area Requirement: 15m<sup>2</sup>/student excluding dormitory facilities. (If dormitory is needed then 25m<sup>2</sup>/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<sup>2</sup>/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<sup>2</sup>/lot is recommended. 300m<sup>2</sup> to 1000m<sup>2</sup>/lot is also acceptable.

Location: Situated in the center of each residential group unit (or grouping level of G<sub>0</sub> 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<sup>2</sup> is recommended. 1000m<sup>2</sup> to 3000m<sup>2</sup> 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<sup>2</sup>/inhabitant is recommended; 2m<sup>2</sup> to 10m<sup>2</sup>/inhabitant is also acceptable.

Location: Situated in the center of "Neighborhood" (grouping Level G<sub>2</sub>). Should not be surrounded or bordered by major traffic (street classification of "collector road" or higher).

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

#### A-2-2-4 PLAYGROUND

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

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

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

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

Land Area Requirement: 20m<sup>2</sup>/elementary school student is recommended. 10m<sup>2</sup> to 30m<sup>2</sup>/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<sup>2</sup>/inhabitant is recommended. 2m<sup>2</sup> to 6m<sup>2</sup>/inhabitant is acceptable.

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

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

#### A-2-2-6 PLAYFIELD - LEVEL 1

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

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

Size of Population Served: 15,000 is recommended. 10,000 to 20,000 is acceptable. 600 to 1800 intermediate school enrollment (boys plus girls) is assumed in the service area.

Radius of Area Served: Maximum 1200m (20 minute walking distance) is recommended. When density is less than 50 pph, longer radius is acceptable if bus service is provided the areas beyond the recommended walking distance.

Land Area Requirement: 30m<sup>2</sup>/intermediate school student is recommended. 20m<sup>2</sup> to 40m<sup>2</sup>/student is accepted.

Location: Situated at the center of a "Sub-Community", whose population range is 10,000 to 20,000, and in close proximity to or in integrated part of both boys' and girls' intermediate schools.

Other Requirement: Parking space should be provided for the adult field users (10 to 20 spaces). Official pavement sizes for game courts should be provided for sports requiring smaller spaces, such as tennis and basketball, but not necessarily full size official dimensions for the field and track. Boys' and girls' fields should be separated with enough distance. Swimming pool(s) can be provided with shower rooms and locker rooms.

A-2-2-7 PLAYFIELD - LEVEL 2

Main Population Served: Primarily for secondary school students at school hour; secondarily for the other residents in the "Community" off-school-hours or weekends.

Main Function: For athletic curriculum activity of secondary schools (boys and girls separately). Practice and competition or game for the community sports teams and clubs.

Size of Population Served: 30,000 is recommended. 20,000 to 40,000 is acceptable. 900 (450 to 1350) students per playfield are expected, 70% of whom are boys.

Radius of Area Served: Maximum 1000m (15 minute walking distance) is recommended; 1600m (20 minute) is also acceptable. When density is less than 50 pph, longer service radius may be acceptable if bus system and pleasant pedestrian path are provided to cover the "Community" and if ample parking space is provided.

Land Area Requirement: 50m<sup>2</sup>/secondary school student. 40m<sup>2</sup> student is also acceptable. Minimum is 4ha/playfield.

Location: Situated at the center of a "Community" population range is 20,000 to 40,000 in close proximity to both boys' and girls' intermediate schools.

Other Requirement: Parking space should be provided for field users and game spectators. Full official dimensions for courts, track Simplified spectator seating area, stands or by banking should be provided and girls' playfields should be separated with enough distance. Swimming pool with cialize can be provided with full activities (indoor and outdoor).

A-2-2-8 CITY PARK

Population Served: All residents and non-resident workers with a population of 60,000 or more.

Main Function: Weekend family recreation for residents time recreation for downtown workers an integral part of city's cultural tional center.

Size of Population Served: 40,000 or more. In 1995 all five the exception of Bishah and Najran a "city park". Bishah and Najran "Community Park" functioning as a city park".

Radius of Area Served: Entire city. Radius varies.

Land Area Requirement: 4m<sup>2</sup>/inhabitant is recommended. 2m<sup>2</sup> habitant is acceptable.

Location: Situated at the center of city with tural, community, and educational clustered around it.

Other Requirement: Historical district and architecture integrated into the network of a park is conceived as a combination park and its extended network to which hierarchical park network is connect (enabling indoor sports, exhibition, musical festival and other multi- should be integrated in the city park

50m<sup>2</sup>/secondary school student. 40m<sup>2</sup> student is also acceptable. Minimum is 4ha/playfield.

Situated at the center of a "Community" population range is 20,000 to 40,000 in close proximity to both boys' and girls' intermediate schools.

Parking space should be provided for field users and game spectators. Full official dimensions for courts, track Simplified spectator seating area, stands or by banking should be provided and girls' playfields should be separated with enough distance. Swimming pool with cialize can be provided with full activities (indoor and outdoor).

All residents and non-resident workers with a population of 60,000 or more.

Weekend family recreation for residents time recreation for downtown workers an integral part of city's cultural tional center.

In 1995 all five the exception of Bishah and Najran a "city park". Bishah and Najran "Community Park" functioning as a city park".

Entire city. Radius varies.

4m<sup>2</sup>/inhabitant is recommended. 2m<sup>2</sup> habitant is acceptable.

Situated at the center of city with tural, community, and educational clustered around it.

Historical district and architecture integrated into the network of a park is conceived as a combination park and its extended network to which hierarchical park network is connect (enabling indoor sports, exhibition, musical festival and other multi- should be integrated in the city park

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 <sup>2</sup> /person, i.e. 600m <sup>2</sup> to 1500m <sup>2</sup> .
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 <sup>2</sup> /prayer (i.e. 1200 to 2400m <sup>2</sup> /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 <sup>2</sup> /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<sup>2</sup>/inhabitant (i.e. 125m<sup>2</sup> to 250m<sup>2</sup>) is recommended. 0.03 to 0.1m<sup>2</sup>/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<sup>2</sup>/inhabitant (i.e. 200m<sup>2</sup> to 400m<sup>2</sup>) is recommended. 0.005m<sup>2</sup> to 0.02m<sup>2</sup>/inhabitant is also acceptable.
- Location: Situated at the center of a "Community" whose population range is 20,000 to 40,000. Close to

the community park, community shopping center, Jami'a Mosque, secondary school community museum, library, youth center (these could be a part of the community center) and playfield, Level 2.

#### Other Requirement:

Additional standards for potential components of community center:

a. Community library: One for each 30,000 inhabitants (20,000 to 40,000). Land area 0.1m<sup>2</sup>/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<sup>2</sup>/inhabitant from the community center building land requirement. Floor area is 0.01m<sup>2</sup>/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<sup>2</sup>/inhabitant (i.e. 3ha/60,000 inhabitants) or more. If the Civic Center is designed as an integral part of other downtown activities such as commercial areas, the land area requirement can be reduced to 0.25m<sup>2</sup>/inhabitant.
- Floor Area Requirement: 0.05m<sup>2</sup>/inhabitant (i.e. 300m<sup>2</sup>/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

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 (COMMUNICABLE)	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 disease 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 SHOP-  
PING 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<sup>2</sup>/inhabitant, i.e. 0.8 ha to 1.6ha/4000 inhabitants.

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

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<sup>2</sup>/inhabitant or more.

Location: Situated at the center of a "Neighborhood". Access by footpath without crossing major traffic.

##### A-2-5-2 SUB-COMMUNITY DIAGNOSIS AND TREATMENT CENTER (INCLUDING RED CRESENT BUILDING)

Size of Population Served: One for 15,000 (10,000 to 20,000 more or less) inhabitants.

Main Function: Public health centers for general treatment and diagnosis and for red crescent program.

Radius of Area Served: Maximum 1200m (20 minute walking distance) is recommended. Larger radius may be acceptable when density is less than 50 pph.

Land Area Requirement: 0.3m<sup>2</sup>/inhabitant (i.e. 0.3ha to 0.6ha/center) is recommended.

Floor Area Requirement: 0.05m<sup>2</sup>/inhabitant (i.e. 500m<sup>2</sup> to 1000m<sup>2</sup>/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<sup>2</sup> to 1.0m<sup>2</sup>/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<sup>2</sup>/bed is recommended. (i.e. 3000m<sup>2</sup> to 8000m<sup>2</sup>/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<sup>2</sup> to 45m<sup>2</sup>/bed (mental hospital). 3beds/1000 inhabitants, and 20m<sup>2</sup> to 45m<sup>2</sup>/bed (special long term hospital). 1 to 2beds/1000 inhabitants, and 20m<sup>2</sup> to 45m<sup>2</sup>/bed (nursing home).



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 popula-

tion (including neighborhood, community and regional shopping centers):

Table A-2-6-1  
SALES AREA PER CAPITA

CITY POPULATION	COMPONENTS( $m^2$ /inh.)	TOTAL( $m^2$ /inh.)
4,000	0.25 to 0.5	0.25 to 0.5
30,000	0.25 to 0.5 plus 0.1 to 0.2	0.35 to 0.7
100,000	0.25 to 0.5 plus 0.1 to 0.2 plus 0.1 to 0.2	0.45 to 0.9

Building area is about 1.5 times the floor area.

Location: Situated in the downtown area of major cities or along the regional arterials leading to the major city centers.

Other Requirement: 4:1 parking is recommended. 2:1 is also acceptable if located in the middle of downtown.

#### A-2-7 PLANNING STANDARDS FOR PUBLIC BUILDINGS

##### A-2-7-1 FIRE STATION

Population Served: One for each community of population of 20,000 to 40,000 inhabitants.

Radius of Area Served: In a high value district:  
a. Maximum 1.5 km for engine companies.  
b. Maximum 2.0 km for ladder companies.  
In a normal residential district:  
a. Maximum 3.0 km for engine companies.  
b. Maximum 5.0 km for ladder companies.  
In a high density residential district:  
a. Maximum 2.5 km for engine companies.  
b. Maximum 3.5 km for ladder companies.

Land Area Requirement: Approximately  $10m^2$ /1000 inhabitants is recommended.

Floor Area Requirement:  $3m^2$ /1000 inhabitants is recommended.

Location: In residential district, station should be located to the center. Additional stations

should be near extensive industrial or business districts and near districts where there is a high life hazard. An intersection of roads is a preferred station location.

Other Requirement: Water supply system with adequate pressure should be developed. Reserve capacity: 5-day reserve with maximum daily rate.

#### A-2-7-2 POST OFFICES

Population Served: One post office for each city. One branch post office for each neighborhood with a population of 2,500 to 5,000.

Radius of Area Served: Maximum 300m (5 minute walking distance) is recommended for branch office. 600m (10 minute) is also acceptable if density is less than 50 pph. A larger radius is acceptable depending on the situation.

Land Area Requirement: 0.2 ha to 0.4ha/city post office.

Floor Area Requirement:  $2m^2/1000$  (i.e.  $100m^2/50,000$  city). City post office should be located at city center. Branch post office should be located at the center of center of neighborhood with population range of 2,500 to 5,000. It can be located inside of the neighborhood center.

#### A-2-7-3 POLICE STATION

Population Served: One for each city with population over 50,000, i.e. at minimum a city of 50,000 inhabitants should have one police district with approximately 10 police. (1.5 to 2.0 police/1000 inhabitants.)

Radius of Area Served: 1000ha/district (1.8 km radius) or more at a density of 50 pph or less. At lower densities, service radius may be extended. Mobile unit is needed in any case.

Land Area Requirement: 0.2 to 0.4ha/district station.

Floor Area Requirement:  $2m^2/1000$  inhabitants (i.e.  $100m^2/50,000$  inhabitants).

Location: Situated in the center of town with comparable distances to different parts of its service population. Corner site is preferred for the convenience of the mobile unit.

#### A-2-7-4 GOVERNMENT OFFICES

Population Served: One for each city. The percentage of government employment to total population is in a range from 6% to 14% (at present the 5 city average is approximately 10%) of which it is assumed 3% to 7% (half) are in administrative sectors (excluding teachers, police, firemen, etc., who have normal place of work rather than offices), i.e. 2,500 to 3,750 are located in the administrative offices (for the case of a 50,000 city).

Floor Area Requirement: Assuming 80% gross efficiency and proper use of net areas, there should be  $10m^2$  to  $20m^2$ /employee (i.e.,  $25,000m^2$  to  $75,000m^2$  for city of 50,000). If FAR = 2, then land area is approximately 2.5 ha.

Location: Situated and concentrated in the center of town.

#### A-2-8 PLANNING STANDARDS FOR HOUSING AND DENSITY

Table A-2-8 shows the approximate ideas on the relationship between residential building types and residential densities. "Net residential density" defined as the ratio of the number of inhabitants to the total area inside the property boundary lines excluding street areas in the residential district. "Net neighborhood density" is ratio of the number of inhabitants to the net neighborhood area including amenities, schools, residential streets, and neighborhood services but excluding non-used reserve areas or areas devoted to facilities which serve community structure at a higher level than neighborhood. As shown in the right hand side of the Table, gross density for a neighborhood area varies from 15 pers./ha (for single family villa) to 252 pers./ha (for average equivalent of 10 story apartments). In reality, there is little possibility of having only single family villas or 10 story apartments in one neighborhood, exclusive of other types. It is estimated that actual, net neighborhood density in many cases is somewhere between 50 pers./ha to 200 pers./ha depending on the mixture of unit types.

As far as net residential density is concerned, it is estimated that the most probable case is in the vicinity of 150 to 200 pers./ha. For example, the combination of 10% standard villa (say  $750 m^2$  site/unit, 5 persons/unit) 60% smaller villa (say  $250 m^2$  site/unit, 5 persons/unit) and 30% multi-family units (say  $100 m^2$  site/unit, 5 persons/unit) results in approximately 150 to 200 pers./ha of net density.

A-2-9 PLANNING STANDARDS FOR ROAD AND STREET NETWORK

Table A-2-9(a) shows the classification and standards for roads and streets. Clear recognition of the hierarchical order of the street network system is crucial to achieve group privacy in an automobile oriented society. The street network hierarchy should be integrated into the hierarchical order of facility distribution and territorial sequence to maximize the access convenience yet to minimize the potential hazard and nuisance caused by auto traffic in the residential area.

Diagram A-2-9(b) indicates typical sections for each type of road classified in Table A-2-9(a).

Diagrams A-2-9(c) and A-2-9(d) indicate general outlines for road intersections.

A-3 APPLICATION OF PLANNING STANDARDS

A-3-1 A HYPOTHETICAL EXAMPLE

Table A-3-1(a) shows an example of land area distribution based on the standards developed in the previous sections. In order to reflect the situation in the Southern Region in 1995, a hypothetical city of 60,000 inhabitants is analyzed. It is found that such a city will require approximately 1,140 ha, 750 ha or 550 ha with net residential densities of 100 pph, 200 pph, or 400 pph, respectively. (These densities correspond to net densities of "villa"; mixture of "villa" and "one family semi-detached"; and low-rise "multi-family", respectively, see Table A-2-8 column C).

Table A-3-1 (b) is based on the result of computation on Table A-3-1 (a). It shows the land distribution for each use in the hypothetical residential city of 60,000 inhabitants. It is assumed that such a city will have two "Communities" of 30,000 residents, each of which will have two "Sub-Communities" of 15,000 residents, each of

which, in turn, will have four "Neighborhoods" of 3,750 residents. Since this model does not take into consideration non-used or reserved area of the city, the percentages for the listed use per total "actual" city area should be less than those listed. The table, therefore, is a preliminary guide to the allocation of "used-land" to different uses.

A-3-2 HIERARCHICAL ORDER OF GROUPING

Figure A-3-1 shows an example layout of prototypical city in which the recommended standards are expressed as a diagram. This is merely one of many acceptable interpretations of the standards. It is not the consultants' intent to impose a fixed solution to the planning. Rather, this is just a demonstration of one example against which the planning concepts for each city may be evolved.

RESIDENTIAL TYPES AND DENSITIES

	A	B	C	D	E	F	G
	LAND AREA PER FAMILY m <sup>2</sup>	NET DWELLING DENSITY Fam./ha	NET DENSITY Pers./ha	PERCENTAGE OF IDENTICAL DENSITY NET NEIGHBORHOOD DENSITY**	NET NEIGHBORHOOD DWELLING DENSITY Fam./ha	NET NEIGHBORHOOD DENSITY Pers./ha	APPROXIMATE AVERAGE NET NEIGHBORHOOD DENSITY Pers/ha
(1) LARGE VILLA	4,000 2,000	2.5 5.0	12.5 25.0	30.9% 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% 87.2%	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	39.5% 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	400.0 533.3	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 calculated in the following process:

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

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

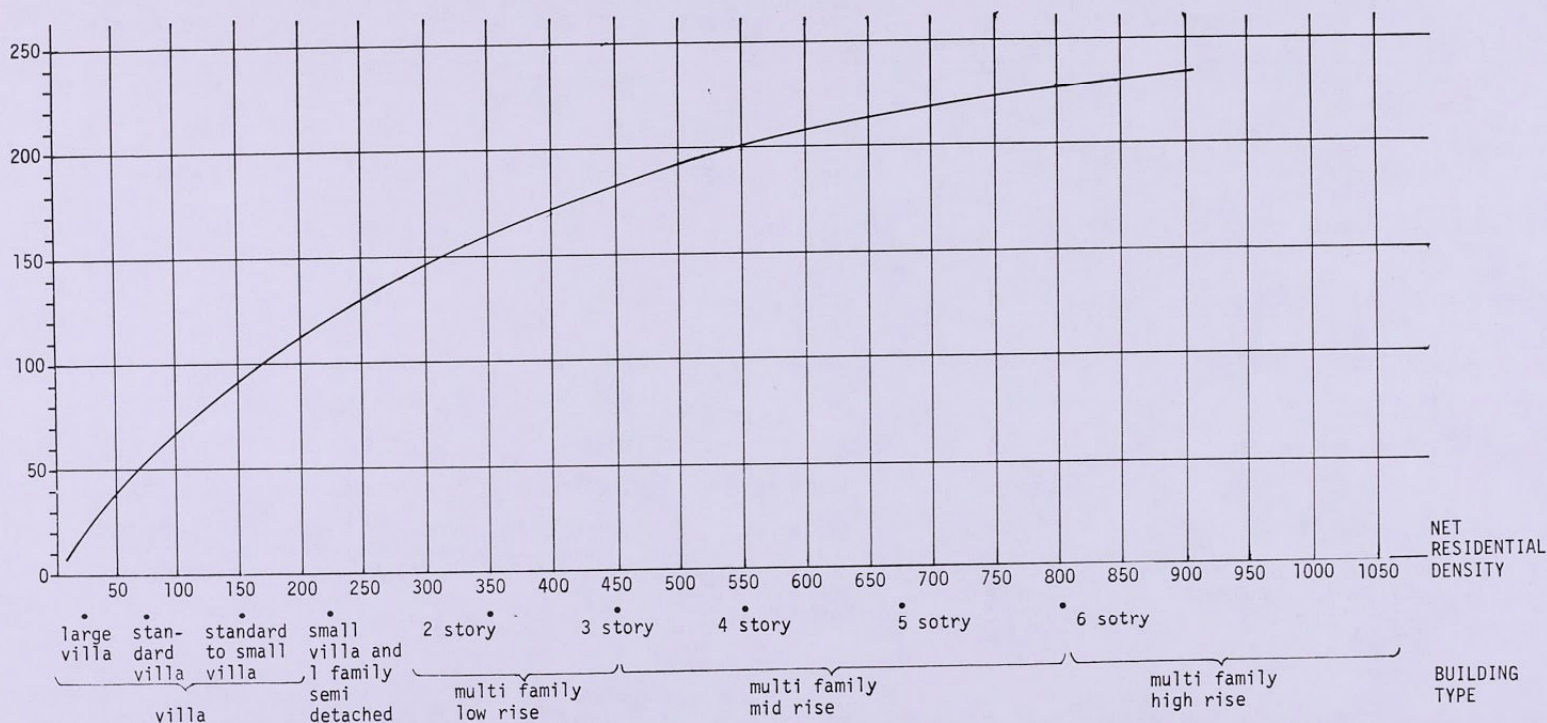
$$N = (R + a) \cdot (1+c)$$

from above,

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

FIGURE A-2-8  
 RELATIONSHIP BETWEEN NET  
 RESIDENTIAL DENSITY AND  
 NET NEIGHBORHOOD DENSITY  
 AND  
 RELATIONSHIP BETWEEN NET  
 DENSITY AND BUILDING TYPE

NET NEIGHBORHOOD  
 DENSITY  
 (pers./ha)

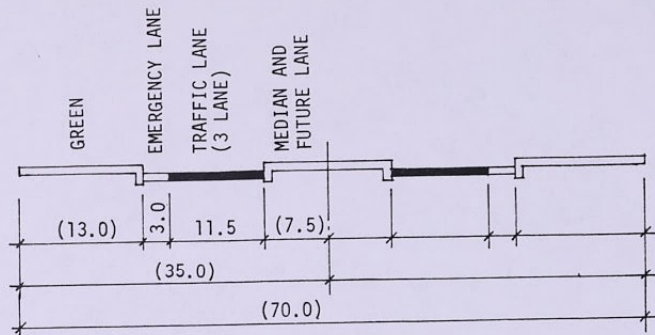


- NOTE: 1. The relation between net neighborhood density and net residential density shown here is based on the discussion developed in the Section A-2-8 and Table A-2-8. It shows one "example case" and not necessarily always true. Actual relationship is depending on detail planning and design of the neighborhood. The figure is shown here for the purpose of providing "approximate example idea" of the relationship between the two densities.
2. Actual relation between net residential density and building type is depending upon the dwelling unit size, family size and many other conditions.

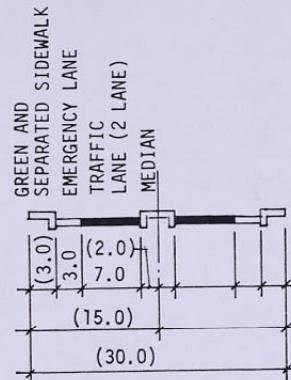
Table A-2-9(a)  
CHARACTERISTICS AND HIERARCHY OF ROADS AND STREETS (RECOMMENDATION ONLY)

SYSTEM CLASSIFICATION	PRIMARY ROAD SYSTEM		SECONDARY ROAD SYSTEM		LOCAL ROAD SYSTEM		
	V <sub>1</sub> REGIONAL HIGHWAY	V <sub>2</sub> MAJOR ARTERIAL	V <sub>3</sub> ARTERIAL	V <sub>4</sub> COLLECTOR	V <sub>5</sub> DISTRIBUTOR	V <sub>6</sub> LOCAL ACCESS ROAD	V <sub>7</sub> SERVICE ROAD
FUNCTIONAL CLASSIFICATION	LONG TRIPS: NATIONAL AND REGIONAL TRIP	MEDIUM TRIPS: INTER-SETTLEMENT TRAVEL	MEDIUM TRIPS: INTER TO INTRA-SETTLEMENT TRAVEL	MEDIUM TO SHORT TRIPS: INTRA-SETTLEMENT TRAVEL	SHORT TRIPS: INTRA-SETTLEMENT TRAVEL ONLY	VERY SHORT TRIPS: INTRA-SETTLEMENT TRAVEL ONLY	SERVICE ACCESS TO PROPERTIES
ACCESS CONTROL	FULL CONTROL	CONTROL	PARTIAL	PARTIAL	NONE	NONE	NONE
DESIGN SPEED (km/h)	120	100-80	90-80	80-70	60-50	50	30
OPERATING SPEED (km/h)	100-80	80-70	70-60	60-50	50-30	50-30	30-20
MAXIMUM GRADE: UP (%) DOWN (%)	6 7	7 8	7 8	7 8	8	10	12
MINIMUM HORIZONTAL RADIUS OF CURVATURE (m)	500	300	250	200	150	75	30
HOURLY CAPACITY/LAND (VEHICLE/HOUR)	1500-800	1000-800	900-700	900-600	600-300	400-200	-
RIGHT OF WAY (m)	70	50	30	25	20	15	5
LANE WIDTH (m)	3.75 MINIMUM	3.75	3.5	3.5	3.0	2.75	2.5
DIVIDED FLOW	ALWAYS	USUALLY	FREQUENTLY	SOMETIMES	NOT USUALLY	NEVER	-
PARKING	PROHIBITED	PROHIBITED	PROHIBITED	INTERIM ONLY	PERMITTED OR INTERIM	PERMITTED	PROHIBITED
RELATED ELEMENTS	EMERGENCY LANES (SHOULDER), NO SIDEWALKS, NO SMALL MOTOR-CYCLES	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

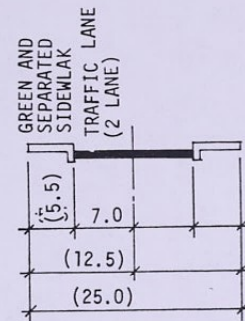
V<sub>1</sub> EXAMPLE  
(REGIONAL HIGHWAY)  
6 LANE



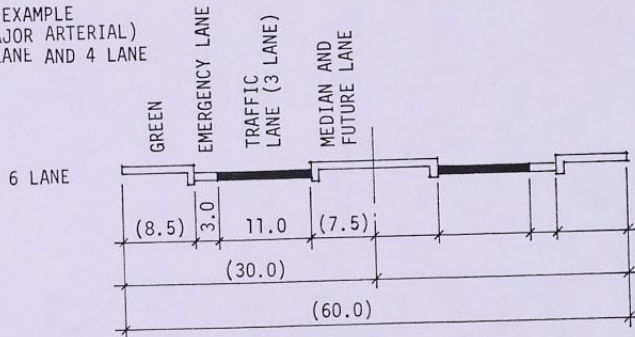
V<sub>3</sub> EXAMPLE  
(ARTERIAL)  
4 LANE



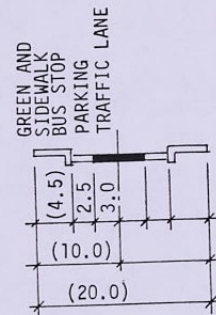
V<sub>4</sub> EXAMPLE  
(COLLECTOR)  
4 LANE



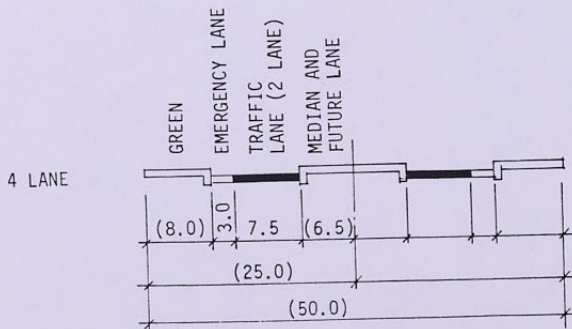
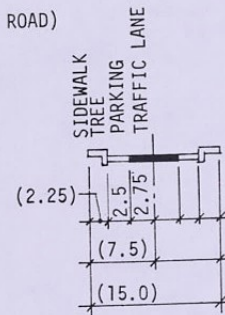
V<sub>2</sub> EXAMPLE  
(MAJOR ARTERIAL)  
6 LANE AND 4 LANE



V<sub>5</sub> EXAMPLE  
(DISTRIBUTOR)  
2 LANE



V<sub>6</sub> EXAMPLE  
(LOCAL ACCESS ROAD)  
2 LANE



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

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

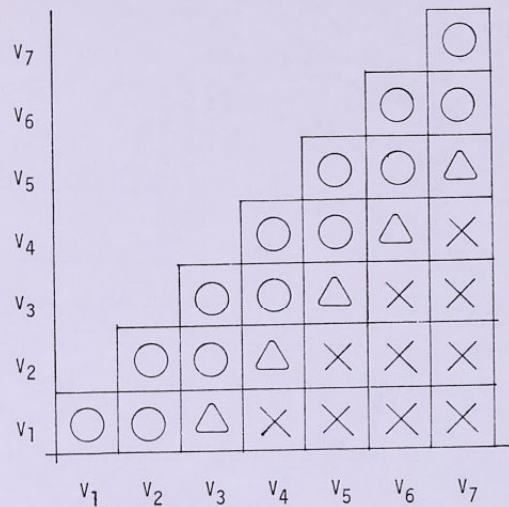
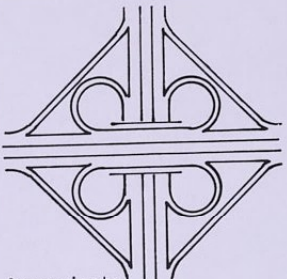
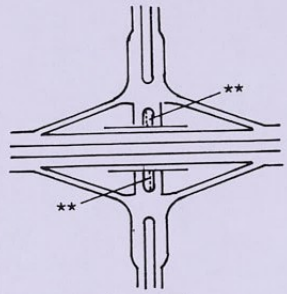
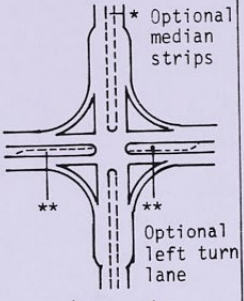
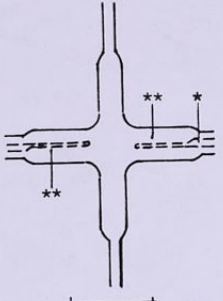
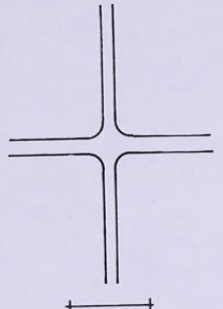
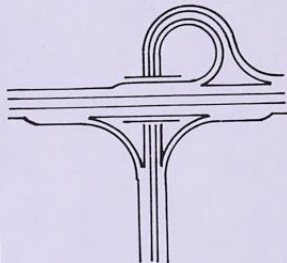
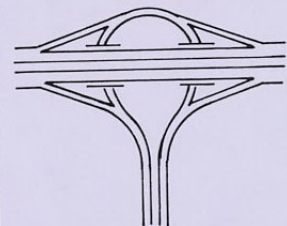
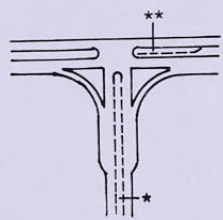
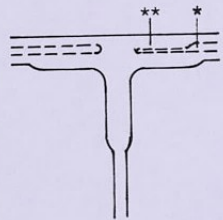
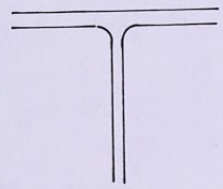


FIGURE A-2-9 (c)  
ALLOWABLE ROAD  
INTERCHANGES

NOTE: When two roads (with classification  $V_m$  and  $V_n$ ) intersect, then interchange ( $V_m/V_n$ ) is:

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



	Cloverleaf	Diamond	Channelized	Flaired	Common
Four leg Cross intersection	 <p>Approximate scale: <math>\pm</math> 200-400 M</p>	 <p>100-200 M</p>	 <p>50-100 M</p>	 <p>50-100 M</p>	 <p>50 M More or less</p>
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

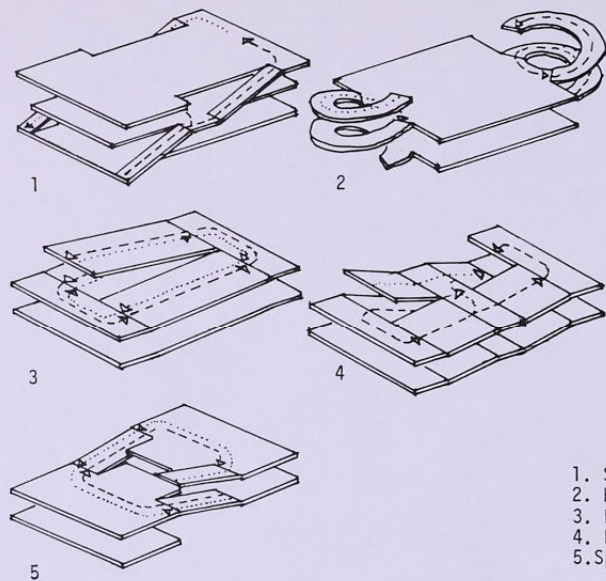


FIGURE A-2-9 (e)  
STRUCTURE PARKING  
(EXAMPLES)

1. Straight Ramp
2. Helical Ramp
3. Ramped Floor
4. Double Ramped Floor
5. Split-level Floor

Recommended Size

Minimum capacity	200 cars
Maximum capacity	500 cars
Maximum No. of Levels (for garage)	6

Unit Parking Dimensions

45° one-way	14.5 to 16.5 m.
60° one-way	17.0 to 19.0 m.
90° two-way	18.5 to 19.5 m.

Entrance and Exit

Number	At least one with multiple lanes, minimum 15 m from street intersection.
Width of lanes	3.5 m for one-way
Radius of Curb (inside)	Minimum 3.5 m.

Ramps and Driveways

Slope	15 per cent maximum.
Width	
Straight	Minimum 3.0 m.
Curved, inside lane	Minimum 3.5 m.
Curved, outside lane	Minimum 3.0 m.
Curvature	4 m. diameter to inside.

Parking Stalls

Length	5.5 m.
Width	2.5 m.

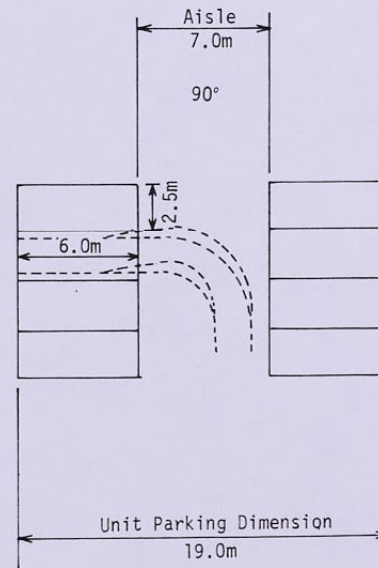
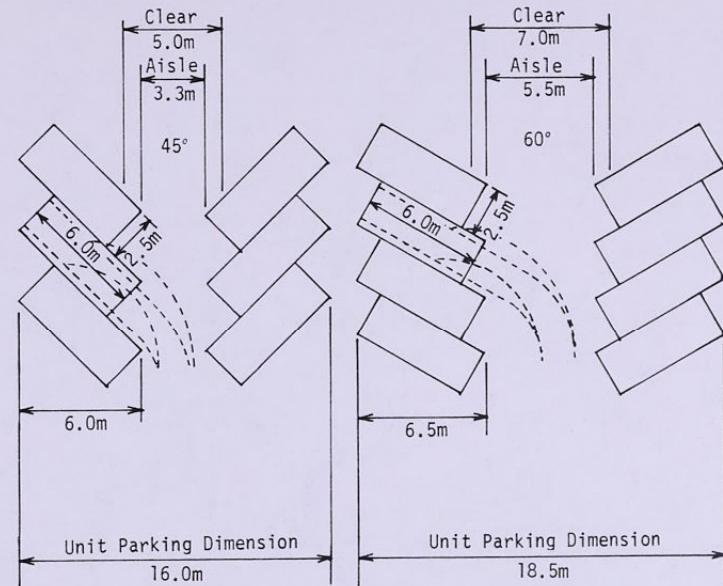


FIGURE A-2-9-(f)  
UNIT PARKING  
DIMENSION (EXAMPLES)

Table A-3-1(a)  
LAND AREA DISTRIBUTION FOR A PROTOTYPICAL CITY OF 60,000 INHABITANTS (in ha)

		NEIGHBORHOOD (3750 Inh)	SUB-COMM. (15,000 Inh)	COMMUNITY (30,000 Inh)	CITY TOTAL (60,000 Inh)	
(1) EDUCATIONAL FACILITIES	NURSERY-KINDERGARTEN	0.02x4=0.1	x4= 0.4	x2= 0.8	x2= 1.6	
	ELEMENTARY SCHOOL (BOYS)	0.5	x4= 2.0	x2= 4.0	x2= 8.0	
	ELEMENTARY SCHOOL (GIRLS)	0.5	x4= 2.0	x2= 4.0	x2= 8.0	
	INTERMEDIATE SCHOOL (BOYS)		1.2	x2= 2.4	x2= 4.8	
	INTERMEDIATE SCHOOL (GIRLS)		1.2	x2= 2.4	x2= 4.8	
	SECONDARY SCHOOL (BOYS)			1.5	x2= 3.0	
	SECONDARY SCHOOL (GIRLS)			0.9	x2= 1.8	
	TEACHERS SCHOOL				2.1	
	TECHNICAL SCHOOL (BOYS)				2.1	
	TECHNICAL SCHOOL (GIRLS)				1.0	
	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 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

Table A-3-1 (a) continued

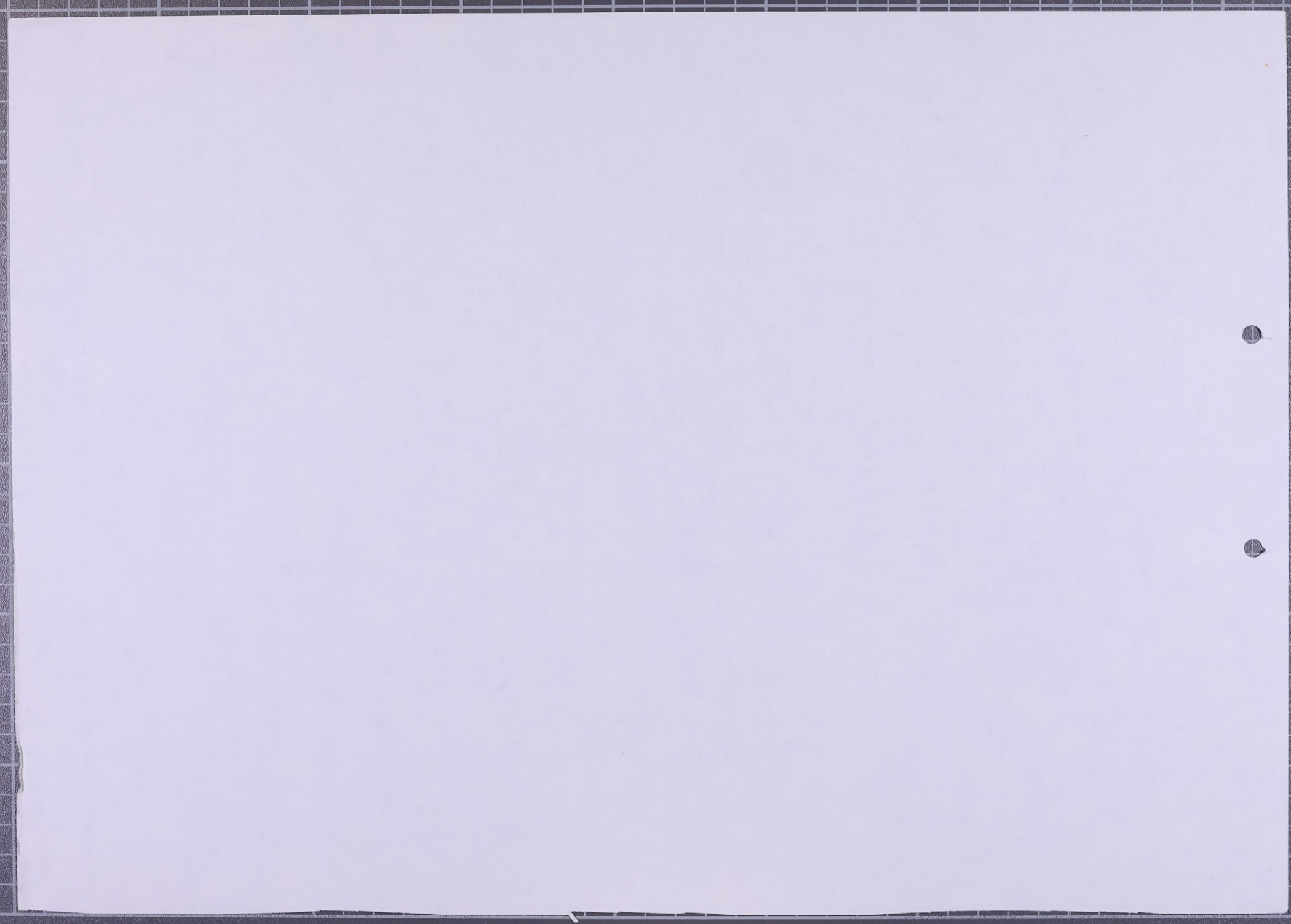
		NEIGHBORHOOD (3750 Inh)	SUB-COMM. (15,000 Inh)	COMMUNITY (30,000 Inh)	CITY TOTAL (60,000 Inh)			NEIGHBORHOOD (3750 INH)	SUB-COMM. (15,000 INH)	COMMUNITY (30,000 INH)	CITY TOTAL (60,000 INH)
(6) PUBLIC FACILITIES	GOVERNMENT OFFICE	-			2.6	TOTAL of (1) THROUGH (8)	CASE 1	45.6	203.1	425.2	904.5
	POST OFFICE	-		0.1	x2= 0.2		CASE 2	26.7	128.1	275.2	604.5
	POLICE STATION	-		0.1	x2= 0.2		CASE 3	12.5	90.6	200.2	454.5
	FIRE STATION	-		0.1	x2= 0.2	(9) TRANSPORTATION	STREET/SIDE-WALK* CASE 1	9.1	x4=36.4	x2=72.8	x2=145.6
	WATER SUPPLY STATION	-	0.5	x2= 1.0	x2= 2.0		CASE 2	5.3	x4=21.2	x2=42.4	x2= 84.8
	SEWAGE TREATMENT	-	1.0	x2= 2.0	x2= 4.0		CASE 3	3.5	x4=14.0	x2=28.0	x2= 56.0
	POWER STATION	-	1.0	x2= 2.0	x2= 4.0		ARTERIES**				
	GARBAGE DISPOSAL	-	1.0	x2= 2.0	x2= 4.0		CASE 1	-	20.3	42.5	90.4
	MUNICIPAL LIBRARY OR MUSEUM	-	0.2	x2= 0.4	x2= 0.8		CASE 2	-	12.8	27.5	60.4
							CASE 3	-	9.1	20.0	45.4
TOTAL (6)		-	3.7	7.7	18.0	TOTAL (9)	CASE 1	9.1	56.7	115.3	236.0
(7) INDUSTRIAL	FACTORY, WAREHOUSE DISTRIBUTION CENTER	-	10.0	x2=20.0	x2=40.0		CASE 2	5.3	34.0	69.9	145.2
TOTAL (7)		10.0	20.0	40.0		CASE 3	3.5	23.1	48.0	101.4	
TOTAL of (1) through (7)	8.1	53.1	125.2	304.5	GRAND TOTAL of (1) THROUGH (9)	CASE 1	54.7	259.8	540.5	1140.5	
(8) RESIDENTIAL	CASE 1 100 pph NET DENSITY	37.5	x4= 150.0	x2= 300.0	x2= 600.0		CASE 2	32.0	162.1	345.1	749.7
	CASE 2 200 pph NET DENSITY	18.8	x4= 75.0	x2= 150.0	x2= 300.0		CASE 3	21.0	113.7	248.2	555.9
	CASE 3 400 pph NET DENSITY	9.4	x4= 37.5	x2= 75.0	x2= 150.0	NOTES:					

\* Assumption: 20% of total of (1) through (8) for small streets related "inside" of neighborhood  
 \*\* Assumption: 10% of total of (1) through (8) for arteries outside of neighborhood

Table A-3-1(b)  
 GENERAL STANDARDS FOR URBAN LAND DISTRIBUTION<sup>a</sup>  
 (% 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.





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